APPENDIX G-1

Compiled peer review information.

From:	Doug Leeper
To:	dtomasko@esassoc.com
Cc:	Yonas Ghile; Xinjian Chen; Chris Anastasiou; Kristina Deak; Chris Zajac; Adrienne E. Vining; Mike R. Bray
Subject:	SWFWMD Peer Review Information
Date:	Wednesday, March 25, 2020 7:38:00 AM
Attachments:	Agenda-Lower Peace_Shell Min Flows Peer Rev Telecon 2020-04-03_V3.pdf

Dave:

As part of an ongoing reevaluation of the minimum flows currently established for the Lower Peace River, Southwest Florida Water Management District staff have developed new, proposed minimum flows for the Lower Peace River and proposed minimum flows for Lower Shell Creek. As you know or will learn during the peer review process, minimum flow sets a limit beyond which further water withdrawals would be significantly harmful to the water resources or ecology of the area.

An informational web page for the proposed minimum flows is available on the District web site at https://www.swfwmd.state.fl.us/projects/mfls/lower-peace-river/lower-shell-creek.

A draft report on the currently proposed minimum flows for the Lower Peace River and Lower Shell Creek was presented to the District Governing Board on March 24, 2020. The report and appendices are available in PDF format from the Minimum Flows and Levels Documents page of the District web site at: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports.

The Word version of the draft minimum flows report is large (19.9 meg), so I will try to send it to you in a subsequent email. If the file turns out to be too large to send via email, I will post it to an FTP site and provide instructions for downloading the file.

As we have discussed, there will be no face-to-face panel meetings All panel meetings, which are currently scheduled for April 3, 13, 20 and 27 and June 8 and 22 will be conducted using teleconferencing and Microsoft Teams. Even if you do not have Teams on your computer you should be able to participate in the teleconferences via a web-based version of the software.

An agenda for the April 3 review teleconference, with call-in and Teams log-in information is attached. I will forward Outlook meeting invitations to you for all of the panel teleconferences. Information concerning the peer review panel teleconferences will also be available on the District's Boards, Meetings and Events calendar at: https://www.swfwmd.state.fl.us/about/calendar/202004, and on the web board that is being established for the review process.

During the April 3 review kick-off teleconference, I'll provide information concerning use of the web board that will be your sole avenue of communication with other review panelists between teleconferences. The web board is being established for panel communications and file sharing, and to allow the public to view these interactions. The web board will be available for communications between April 3 and June 26, when the peer review panel's final report is expected to be delivered to the District. During that period, member of the public that register to use the web board will also be able to post comments regarding the peer review process. The web board will remain open for viewing through at least the end of this year.

As the peer review panel chair, you can communicate directly with me and other District staff during the review process to discuss logistical issues concerning the review, teleconferences, etc. However, substantive discussion of technical and scientific information should be conducted during the review teleconferences of via the web board, once it is available for use.

Let me know if you have any questions or need assistance accessing the draft report and appendices posted on the District web site.

Thanks again for agreeing to participate in this peer review process.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

Doug Leeper
MFLs Program Lead
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1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From:	Doug Leeper
To:	Laura Bedinger (lbedinger@waterandair.com)
Cc:	Yonas Ghile; Xinjian Chen; Chris Anastasiou; Kristina Deak; Chris Zajac; Adrienne E. Vining; Mike R. Bray
Subject:	SWFWMD Peer Review Information
Date:	Wednesday, March 25, 2020 7:42:00 AM
Attachments:	Agenda-Lower Peace_Shell Min Flows Peer Rev Telecon 2020-04-03_V3.pdf

Laura:

As part of an ongoing reevaluation of the minimum flows currently established for the Lower Peace River, Southwest Florida Water Management District staff have developed new, proposed minimum flows for the Lower Peace River and proposed minimum flows for Lower Shell Creek. As you know or will learn during the peer review process, minimum flow sets a limit beyond which further water withdrawals would be significantly harmful to the water resources or ecology of the area.

An informational web page for the proposed minimum flows is available on the District web site at https://www.swfwmd.state.fl.us/projects/mfls/lower-peace-river/lower-shell-creek.

A draft report on the currently proposed minimum flows for the Lower Peace River and Lower Shell Creek was presented to the District Governing Board on March 24, 2020. The report and appendices are available in PDF format from the Minimum Flows and Levels Documents page of the District web site at: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports.

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During the April 3 review kick-off teleconference, I'll provide information concerning use of the web board that will be your sole avenue of communication with other review panelists between teleconferences. The web board is being established for panel communications and file sharing, and to allow the public to view these interactions. The web board will be available for communications between April 3 and June 26, when the peer review panel's final report is expected to be delivered to the District. During that period, member of the public that register to use the web board will also be able to post comments regarding the peer review process. The web board will remain open for viewing through at least the end of this year.

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Let me know if you have any questions or need assistance accessing the draft report and appendices posted on the District web site.

Thanks again for agreeing to participate in this peer review process.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
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Doug.leeper@watermatters.org

Doug Leeper
MFLs Program Lead
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Doug Leeper
MFLs Program Lead
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Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: Doug Leeper
To: pete.pp@gmail.com
Cc: Yonas Ghile; Xinjian Chen; Chris Anastasiou; Kristina Deak; Chris Zajac; Adrienne E. Vining; Mike R. Bray
Subject: SWFWMD Peer Review Information
Date: Wednesday, March 25, 2020 7:40:00 AM
Attachments: Agenda-Lower Peace_Shell Min Flows Peer Rev Telecon 2020-04-03_V3.pdf

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Peter:

As part of an ongoing reevaluation of the minimum flows currently established for the Lower Peace River, Southwest Florida Water Management District staff have developed new, proposed minimum flows for the Lower Peace River and proposed minimum flows for Lower Shell Creek. As you know or will learn during the peer review process, minimum flow sets a limit beyond which further water withdrawals would be significantly harmful to the water resources or ecology of the area.

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Let me know if you have any questions or need assistance accessing the draft report and appendices posted on the District web site.

Thanks again for agreeing to participate in this peer review process.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
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Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

Southwest Florida Water Management District Conflict of Interest Statement Used for Peer Review

Southwest Florida Water Management District

WATERMATTERS.ORG · 1-800-423-1476

Potential Conflict of Interest Statement

1. Please describe any present or past working relationships with SWFWMD (e.g., contracts, relatives, research collaborators, or former employment with the District).

   Water & Air Research, Inc. (Water & Air) is frequently a contractor for SWFWMD. I have worked at Water & Air since August of 2013 and have worked on a variety of SWFWMD projects during that time. The projects I have done substantial work on for the District include: Lower Hillsborough River Biological Assessment and Five Year Evaluation (H400); several different projects monitoring submerged aquatic vegetation (SAV) in the Rainbow River; Kings Bay SAV monitoring; oyster and barnacle assessment for Homosassa, Chassahowitzka, and Lower Withlacoochee; and two projects focused on Springs Coast Rivers SAV monitoring (includes Homosassa, Chassahowitzka, Rainbow, and Weeki Wachee).

   I have never been employed by SWFWMD and have no relatives that I am aware are employed with SWFWMD

600519

2. Have you ever been, or are you now, associated with any organization with a vested interest in District activities (e.g., environmental groups, civic organizations, agricultural interests, business interests, etc.)?

   No __________________ YES________________(If yes, please describe and include the nature and length of the relationship and whether any litigation was involved).

   I have been a Sierra Club member at the national level for a good portion of my life. I have never been directly involved in any litigation. I am not familiar with any Sierra Club activities related to SWFWMD and have not been involved with the Sierra Club's efforts that relate to any SWFWMD activities.

Signed:____Date: ______________

ATTACHMENT 1

Southwest Florida Water Management District Conflict of Interest

Statement Used for Peer Review

Potential Conflict of Interest Statement

1. Please describe any present or past working relationships with SWFWMD (e.g., contracts, relatives, research collaborators, or former employment with the District).

   I was the Principal Investigator of a SWFWMD-funded project for University of Florida around 2000-2002 (not sure about exact dates).

2. Have you ever been, or are you now, associated with any organization with a vested interest in District activities (e.g., environmental groups, civic organizations, agricultural interests, business interests, etc.)?

   No no_________________ Yes _______________ (If yes, please describe and include the nature and length of the relationship and whether any litigation was involved).

Signed:____ Date: March 16, 2020

Southwest Florida Water Management District Conflict of Interest Statement Used for Peer Review

Southwest Florida
Water Management District
WATERMATTERS.ORG · 1-800-423-1476

Potential Conflict of Interest Statement

1. Please describe any present or past working relationships with SWFWMD (e.g., contracts, relatives, research collaborators, or former employment with the District).

   Water & Air Research, Inc. (Water & Air) is frequently a contractor for SWFWMD. I have worked at Water & Air since August of 2013 and have worked on a variety of SWFWMD projects during that time. The projects I have done substantial work on for the District include: Lower Hillsborough River Biological Assessment and Five Year Evaluation (H400); several different projects monitoring submerged aquatic vegetation (SAV) in the Rainbow River; Kings Bay SAV monitoring; oyster and barnacle assessment for Homosassa, Chassahowitzka, and Lower Withlacoochee; and two projects focused on Springs Coast Rivers SAV monitoring (includes Homosassa, Chassahowitzka, Rainbow, and Weeki Wachee).

   I have never been employed by SWFWMD and have no relatives that I am aware are employed with SWFWMD

2. Have you ever been, or are you now, associated with any organization with a vested interest in District activities (e.g., environmental groups, civic organizations, agricultural interests, business interests, etc.)?

   No ______________ YES ✓ (If yes, please describe and include the nature and length of the relationship and whether any litigation was involved).

   I have been a Sierra Club member at the national level for a good portion of my life. I have never been directly involved in any litigation. I am not familiar with any Sierra Club activities related to SWFWMD and have not been involved with the Sierra Club's efforts that relate to any SWFWMD activities.

Signed: Laura Bedinger Date: 3/25/2020

Notice of Meeting/Workshop Hearing

WATER MANAGEMENT DISTRICTS
Southwest Florida Water Management District

RULE NO.: RULE TITLE:
40D-8.041 Minimum Flows

The Southwest Florida Water Management District announces a workshop to which all persons are invited.

DATES AND TIMES: A website (the "WebBoard") will be used to allow public access to and participation in communications among the chairman and members of the independent peer review panel created to conduct a review of the proposed Minimum Flows for the Lower Peace River and Lower Shell Creek in Desoto and Charlotte Counties. The WebBoard will be available for public viewing from 9:00 a.m. April 3, 2020 through December 31, 2020, and will be available for public comment from 9:00 a.m. on April 3, 2020, through 5:00 p.m. on June 26, 2020.

PLACE: https://swfwmd.discussion.community/categories

GENERAL SUBJECT MATTER TO BE CONSIDERED: Beginning on April 3, 2020, and continuing through December 31, 2020, interested parties may view communications and documents posted electronically on the WebBoard. The WebBoard will be active and peer review panelists may post information and pose questions, revisions, additions, or deletions to one another, and the public can provide comment directly on any aspect of the proposed Minimum Flows from 9:00 a.m. on April 3, 2020, through 5:00 p.m. on June 26, 2020.

In addition to the WebBoard, the peer reviewers will participate in a series of teleconferences on the proposed Minimum Flows, to be held as follows:

DATE AND TIME: April 3, 2020, 9:00 a.m. – 12:00 Noon

PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 131261057#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_ZTQ4MmFkNGQtNjYwYi00MWE0LTgwNDgtZTFmYzUxYTllNDRh%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.

DATE AND TIME: April 13, 2020, 1:00 p.m. – 3:00 p.m.

PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 852057527#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_NzI4MzRkNDAtYmFjNy00MGU0LWI5MTQtYWRiNzFjZmIxNWJl%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.

DATE AND TIME: April 20, 2020, 1:00 p.m. – 3:00 p.m.

PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 69490332#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_ZTJjOTA1NjUtZDhlYS00MjRlLWFjZDItYjBkOTY4NWZmMjU2%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.

DATE AND TIME: April 27, 2020, 1:00 p.m. – 3:00 p.m.

PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 740405097#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_ODYzNDhjYjAtODU2NC00ZjMwLWI3ZTEtZDFmZTI4YTI1Y2I1%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.

DATE AND TIME: June 8, 2020, 1:00 p.m. – 3:00 p.m.

PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 619330915#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_NzU1YWI1ZGItNWRhZC00MTEyLTg2NDEtMGYyNzllZTdiNzll%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.

DATE AND TIME: June 22, 2020, 1:00 p.m. – 3:00 p.m.
PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 551367222#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_OGQxMmE1MTYtYzAwNy00OWVjLTkyMDItYzc4NmM0ODk1MGEy%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.
NOTE: One or more members of the District's Governing Board may attend these meetings.
A copy of the agenda may be obtained by contacting: A copy of the agenda for the teleconferences may be obtained by contacting: Doug Leeper, MFLs Program Lead, at (352)796-7211, ext. 4272, or Doug.Leeper@swfwmd.state.fl.us. Agendas will also be accessible at https://swfwmd.discussion.community/categories.
Pursuant to the provisions of the Americans with Disabilities Act, any person requiring special accommodations to participate in this workshop/meeting is asked to advise the agency at least 5 days before the workshop/meeting by contacting: SWFWMD Human Resources Office, (352)796-7211, ext. 4706; 1(800)423-1476 (FL only), ext. 4706 or email to ADACoordinator@swfwmd.state.fl.us. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1(800)955-8771 (TDD) or 1(800)955-8770 (Voice).
For more information, you may contact: For more information, you may contact: Doug Leeper at (352)796-7211, ext. 4272, or by email at Doug.Leeper@swfwmd.state.fl.us.

From:	Doug Leeper
To:	dtomasko@esassoc.com; Laura Bedinger (lbedinger@waterandair.com); pete.pp@gmail.com
Cc:	Yonas Ghile; Xinjian Chen; Chris Anastasiou; Kristina Deak; Chris Zajac; Randy Smith; Eric DeHaven; Adrienne E. Vining; Mike R. Bray; Dennis Ragosta; Cindy C. Rodriguez
Subject:	SWFWMD Peer Review Kick-Off Teleconference Files
Date:	Friday, April 3, 2020 8:30:00 AM
Attachments:	Agenda-Lower Peace_Shell Min Flows Peer Rev Telecon 2020-04-03_V3.pdf Peace_Shell Peer Rev Mtg Slides 2020-04-03--WITH EXTRAS_V3.pdf Peer Review Sunshine Law Briefing Lower Peace and Shell Creek MFLs.pdf Virtual Site Visit Info 2020-04-03.pdf

Panelists:

- Attached are PDF versions of the four files that will be used/discussed during today's teleconference.
    - Agenda (you already have this)
    - General peer review presentation (which includes an overview of the peer review process, the peer review web forum and the proposed minimum flows)
    - Sunshine Law briefing presentation
    - "Virtual site visit" information
- Am sending them directly to you in case any of us encounter difficulties with the TEAMS display for the teleconference.
- Plan to also post all of the documents to the web forum that has been established for the peer review. Note that I will discuss the web forum during today's teleconference.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Independent Scientific Peer Review of Minimum Flows Proposed for the Lower Peace River and Lower Shell Creek
Date: Thursday, April 2, 2020 4:29:00 PM

SWFWMD WebBoards

TomHughes has started a new topic.

Independent Scientific Peer Review of Minimum Flows Proposed for the Lower Peace River and Lower Shell Creek

Posted Apr 02 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Minimum flows are limits established by the District Governing Board for flowing surface water bodies that are intended to prevent significant harm to the water resources or ecology of an area that may be caused by water withdrawals. Minimum flows were originally established for the Lower Peace River in 2010. Proposed minimum flows based on reevaluation of these established minimum flows, and new minimum flows proposed for Lower Shell Creek are summarized in a draft report and appendices available on the District's Minimum Flows and Levels Documents and Reports page.

The District will voluntarily subject all scientific or technical data, methodologies, models, and scientific and technical assumptions used to support development of the proposed minimum flows to independent scientific peer review. A panel of three independent, recognized experts in the fields of hydrology, hydrogeology, limnology, biology and other scientific disciplines will review the proposed minimum flows and prepare a final peer-review report for the District Governing Board.

Visit Topic

To unsubscribe from these emails, you can stop receiving notifications for new topics.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Peer Review Panel Meetings
Date: Thursday, April 2, 2020 4:30:01 PM

SWFWMD WebBoards

TomHughes has started a new topic.

Peer Review Panel Meetings

Posted Apr 02 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Meetings conducted by the peer review panel will occur in April and June 2020. They will include an initial, in-person meeting, with a field trip to both river systems, as well as web-based teleconferences facilitated from the District's Brooksville office. The meetings will include opportunities for public comment on the review process

Visit Topic

To unsubscribe from these emails, you can stop receiving notifications for new topics.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Peer Review Panel Teleconference - April 3, 2020
Date: Friday, April 3, 2020 1:39:52 PM

SWFWMD WebBoards

Doug Leeper has started a new topic.

Peer Review Panel Teleconference - April 3, 2020

Posted Apr 03 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Four files associated with the April 3, 2020 Lower Peace/Lower Shell minimum flows peer review panel teleconference are attached:
Agenda-Lower Peace_Shell Min Flows Peer Rev Telecon 2020-04-03_V3
Peace_Shell Peer Rev Mtg Slides 2020-04-03--WITH EXTRAS_V3
Peer Review Sunshine Law Briefing Lower Peace and Shell Creek MFLs
Virtual Site Visit Info 2020-04-03

Virtual Si... 2.38 MB

Agenda-... 124.70 KB

Peer Revi... 238.95 KB

Peace_S... 2.31 MB

Visit Topic

To unsubscribe from these emails, you can stop receiving notifications for new topics.

Southwest Florida Water Management District

2379 Broad Street, Brooksville, Florida 34604-6899
(352) 796-7211 or 1-800-423-1476 (FL only)
WaterMatters.org

An Equal Opportunity Employer

MEETING NOTICE

AGENDA

Southwest Florida Water Management District
Scientific Peer Review Panel Meeting
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

FRIDAY, APRIL 3, 2020
9:00 AM TO 12:00 PM

TELECONFERENCE

Call-in number: 1 (786)-749-6127; Conference ID: 131 261 057#
Teams teleconference link: Join Microsoft Teams Meeting
Detailed Teams teleconference link:
https://teams.microsoft.com/l/meetup-join/19%3ameeting_ZTQ4MmFkNGQtNjYwYi00MWE0LTgwNDgtZTFmYzUxYTllNDRh%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d
Additional Teams information link: Learn more about Teams

All meetings are open to the public.

1. Welcome/introductions/peer review overview and web forum information facilitated by Doug Leeper, District MFLs Program Lead
2. Sunshine Law information by Adrienne Vining, District Assistant General Counsel
3. Proposed minimum flows by Yonas Ghile, Lead Hydrologist
4. Panel business/logistics facilitated by Doug Leeper, Dave Tomasko, Panel Chair; Y. Peter Sheng, Panelist; and Laura Bedinger, Panelist
5. Public comment period moderated by Doug Leeper

Participants will be asked to save their comments until the public comment portion of the teleconference. If you wish to speak during the public comment period, please identify yourself to the Moderator (Doug Leeper), who will then facilitate your input. Comments will be limited to three minutes per speaker. In appropriate circumstances, the Moderator may grant exceptions to the three-minute limit.

For questions or to submit additional public comment on the peer review of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, please use the Web Board at https://swfwmd.discussion.community/categories that has been established to allow public access to and participation in communications among the Panel Chair and other members of the independent peer review panel created to conduct the peer review. The Web Board will be available for public comment from 8:00 a.m. on April 3, 2020, through 5:00 p.m. on June 26, 2020, and available for public viewing from April 3, 2019 through at least December 31, 2020. Questions or additional public comment may alternatively be submitted to Doug Leeper by email at doug.leeper@watermatters.org, by telephone at 352-397-7840 or 1-800-423-1476 or 352-796-7211, extension 4272, or by mail at the address listed at the top of this agenda.

For persons without access to the Internet, access to the Web Board during the public comment period is available at the headquarters office of the Southwest Florida Water Management District, 2379 Broad Street, Brooksville, Florida, 8:00 a.m. – 5:00 p.m., Eastern Daylight Time, Monday through Friday.

Bartow Office
170 Century Boulevard
Bartow, FL 33830-7700
863-534-1448 or 1-800-492-7862

Sarasota Office
78 Sarasota Center Boulevard
Sarasota, FL 34240-9711
941-377-3722 or 1-800-320-3503

Tampa Office
7601 US Highway 301 North
Tampa, FL 33637-6759
813-985-7481 or 1-800-836-0797

Scientific Peer Review Panel Meeting
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Friday, April 3, 2020
9:00 a.m. to 12:00 p.m.
Call-in number: 1 (786)-749-6127; Conference ID: 131 261 057#
Teams teleconference link: Join Microsoft Teams Meeting

1. Welcome/introductions/peer review overview and web forum information facilitated by Doug Leeper, District MFLs Program Lead.
2. Sunshine Law information by Adrienne Vining, District Assistant General Counsel.
3. Proposed minimum flows by Doug Leeper
4. Panel business/logistics facilitated by Doug Leeper, Dave Tomasko, Panel Chair, Y. Peter Sheng, Panelist, and Laura Bedinger, Panelist.
5. Public comment period moderated by Doug Leeper

Peer Review Overview

April 3, 2020

Doug Leeper
MFLs Program Lead

Minimum Flows

- The **minimum flow** for a given watercourse is the limit at which further withdrawals would be significantly harmful to the water resources of the area.

  – Section 373.042, Florida Statutes

- Minimum flow rules are used in District permitting and planning programs

Some Legal Directives for Minimum Flows and Levels

Sections 373.042 and 373.0421, Florida Statutes and Rule 62-40.473, Florida Administrative Code

- Address natural seasonal fluctuations, nonconsumptive uses and environmental values
- Use best information available
- Consider changes and structural alterations to waters and watersheds and their effects on hydrology
- Recovery or prevention strategies must be implemented when minimum flows and levels are not currently being met or not expected to be met within 20 years
- Minimum flows and levels are to be reevaluated periodically and revised as needed
- May use **independent scientific peer review**

Peer Review Panelist's Charge

- Complete conflict of interest form
- Prepare monthly progress reports
- Review draft minimum flow report and other appropriate materials
- Participate in meeting/teleconferences and post information to the web board
- Provide as-needed follow-up services
- Additional panel chair tasks: agenda and report preparation and posting, task assignments.
- Collaborate on an initial peer review panel report, review District staff's response to the initial panel report and collaborate on a final peer review panel report to (*see next slide*):

Peer Review Panelist's Charge (continued)

- Determine whether District conclusions are supported by analyses/results presented
- Determine whether data/information were properly collected and used, any data exclusions were justified, and the data were the best available information
- Determine whether technical assumptions are clearly stated, reasonable and consistent with the best available information, and if better analyses could be used
- Determine whether procedures and analyses were appropriate and reasonable, based on the best available data, correctly applied, limitations were handled appropriately, and conclusions are supported by the data
- For methods judged to be not scientifically reasonable, describe scientific deficiencies, identify remedies, if any, or alternative methods
- As appropriate, identify and characterize effort involved for preferred alternative methods that could be used in lieu of scientifically reasonable methods that were used

Peer Review Schedule

Event/Item	Start	End
Peer review initiated; conflict of interest forms completed	3/25/2020	3/25/2020
Panelists review minimum flows report	3/25/2020	4/02/2020
Publicly-noticed kick-off meeting (teleconference), 9:00 am - 12:00 pm	4/03/2020	4/03/2020
WebForum (WebBoard): posting WebForum (WebBoard): viewing	4/03/2020 4/03/2020	6/26/2020 12/31/2020
Teleconference, 1:00 - 4:00 pm Teleconference, 1:00 - 4:00 pm Teleconference, 1:00 - 4:00 pm	4/13/2020 4/20/2020 4/27/2020	4/13/2020 4/20/2020 4/27/2020
Panelists post written review comments on web board and collaborate on an initial peer review panel report	4/03/2020	4/30/2020
Panel takes a brief hiatus while staff prepares response to initial peer review, and revises the minimum flow report	5/01/2020	5/29/2020

Peer Review Schedule (continued)

Event/Item	Start	End
Panelists review staff response to initial peer review and revised minimum flow report	6/01/2020	6/05/2020
Teleconference, 1:00 - 3:00 pm Teleconference, 1:00 - 3:00 pm	6/08/22020 6/22/2020	6/08/22020 6/22/2020
Panelists post written review comments on web board and collaborate on an initial peer review panel report	6/01/2020	6/26/2020
Panelists provide as-needed services (e.g., consultation, additional review, Governing Board presentation)	6/29/2020	12/31/22020

Steps for Minimum Flows Development

- Draft minimum flows report to District Governing Board (March 24, 2020)
- Stakeholder outreach (ongoing through August 2020)
- Peer Review of proposed minimum flows (ongoing through June 26, 2020)
- Public workshop on proposed minimum flows (August 2020)
- Lower Shell Creek Recovery Strategy Development (ongoing through August 2020)
- "Final" minimum flows report and request for initiation of rulemaking to District Governing Board (September 22, 2020)

Information on the District Web Site

- Minimum flows and level documents and reports: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports
- Minimum flows page for the Lower Peace River and Lower Shell Creek: https://www.swfwmd.state.fl.us/projects/mfls/lower-peace-river/lower-shell-creek
- Meeting/teleconference announcements posted on the Boards, Meetings & Events calendar: https://www.swfwmd.state.fl.us/about/calendar/month
- SWFWMD WebForum: https://swfwmd.discussion.community

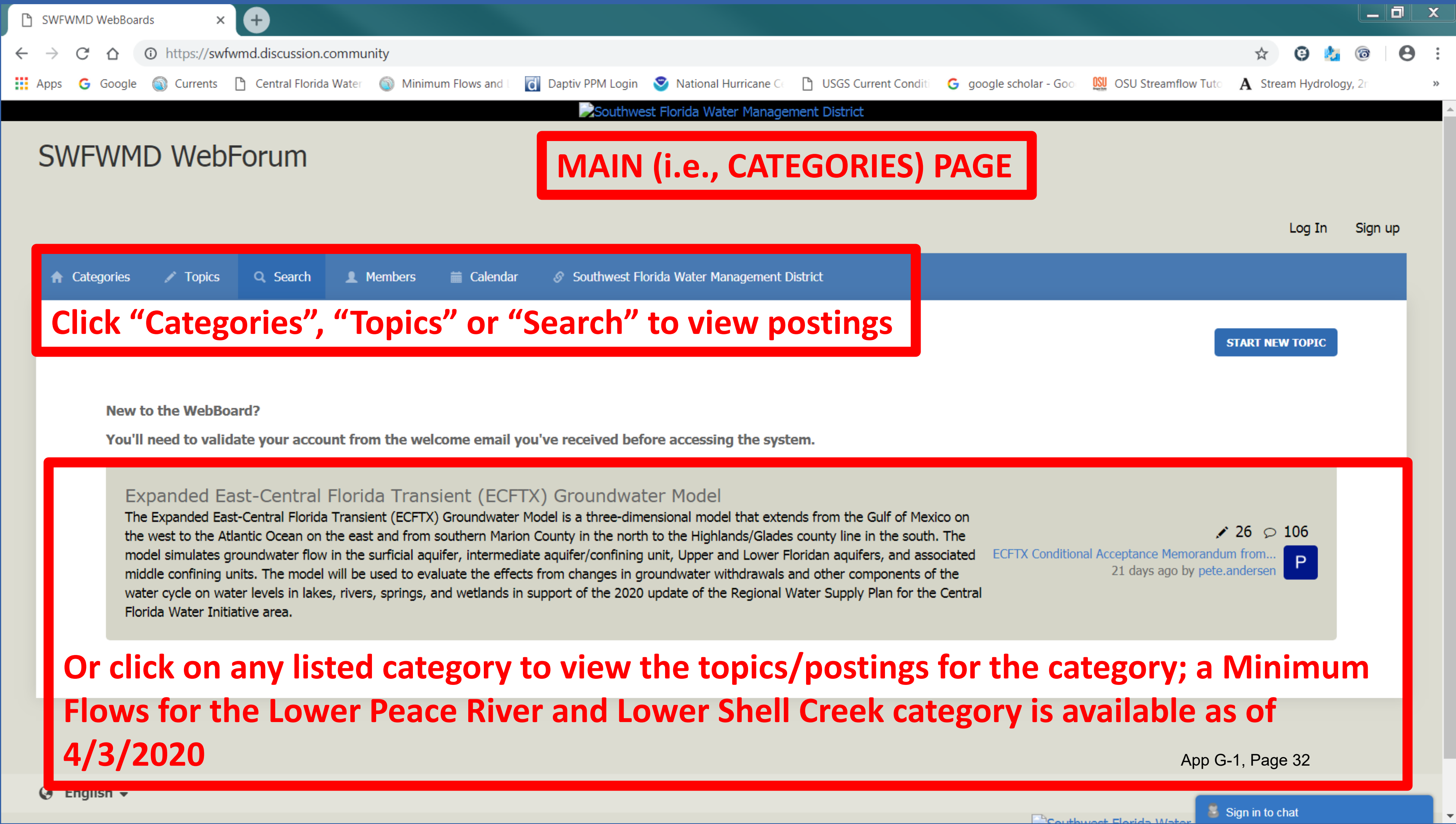
Using the SWFWMD WebForum

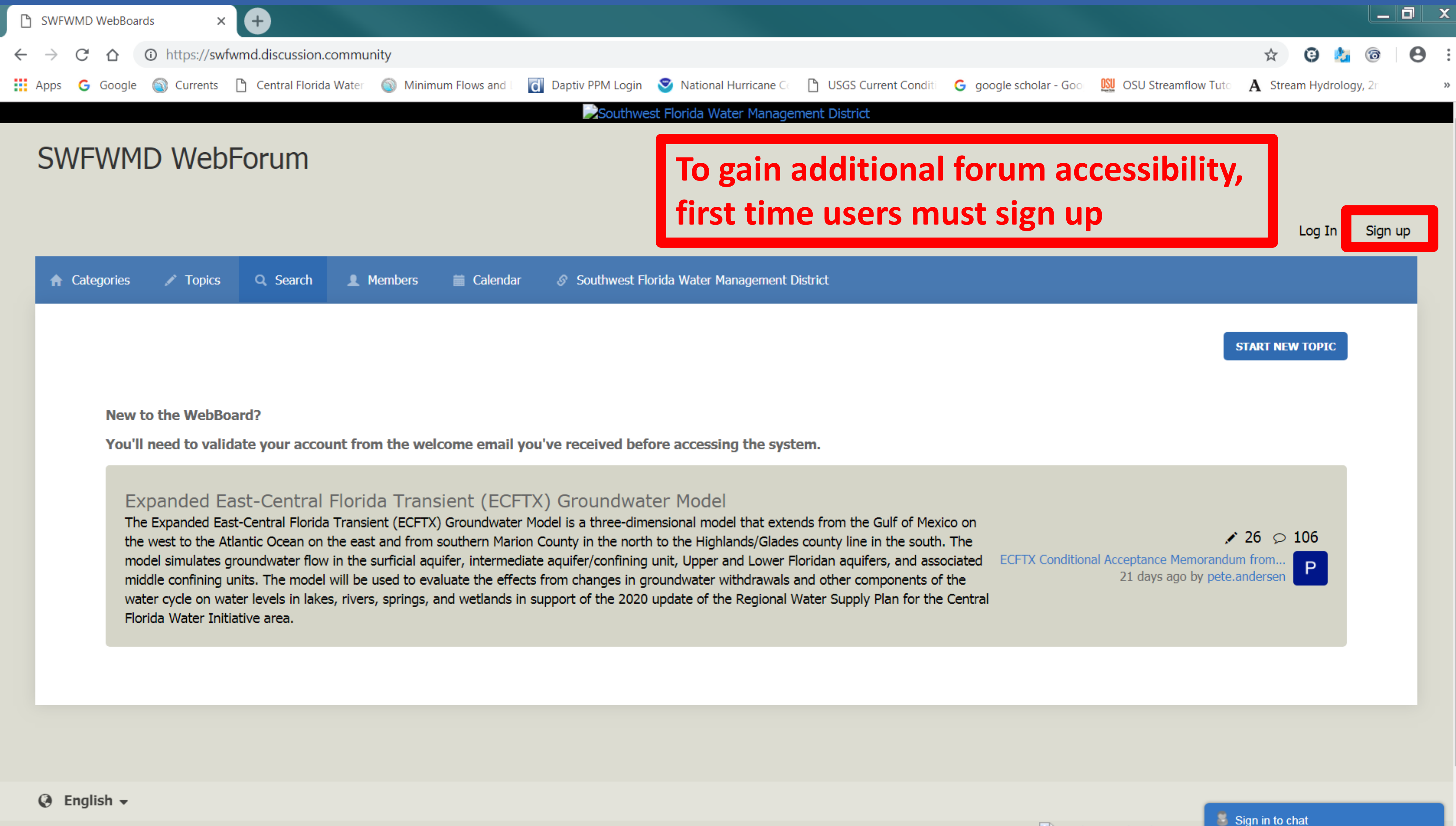
April 3, 2020

Doug Leeper
MFLs Program Lead

SWFWMD WebForum Page

https://swfwmd.discussion.community

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SWFWMD WebForum
To gain additional forum accessibility, first time users must sign up
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Sign up
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Southwest Florida Water Management District
START NEW TOPIC
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You'll need to validate your account from the welcome email you've received before accessing the system.
Expanded East-Central Florida Transient (ECFTX) Groundwater Model
The Expanded East-Central Florida Transient (ECFTX) Groundwater Model is a three-dimensional model that extends from the Gulf of Mexico on the west to the Atlantic Ocean on the east and from southern Marion County in the north to the Highlands/Glades county line in the south. The model simulates groundwater flow in the surficial aquifer, intermediate aquifer/confining unit, Upper and Lower Floridan aquifers, and associated middle confining units. The model will be used to evaluate the effects from changes in groundwater withdrawals and other components of the water cycle on water levels in lakes, rivers, springs, and wetlands in support of the 2020 update of the Regional Water Supply Plan for the Central Florida Water Initiative area.
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106
ECFTX Conditional Acceptance Memorandum from...
21 days ago by pete.andersen
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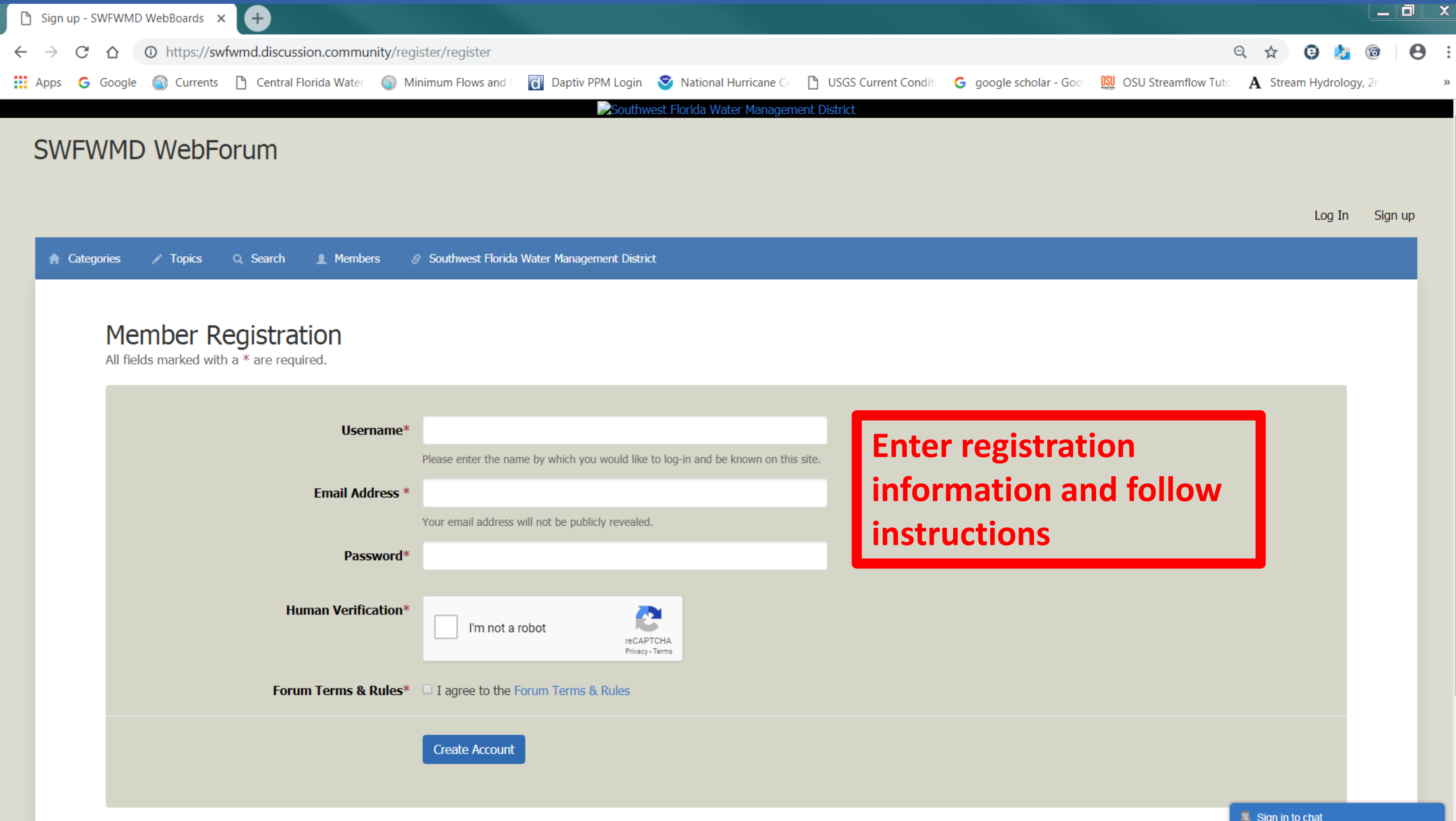
English
Sign in to chat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All fields marked with a * are required.
Username*
Please enter the name by which you would like to log-in and be known on this site.
Email Address *
Your email address will not be publicly revealed.
Password*
Human Verification*
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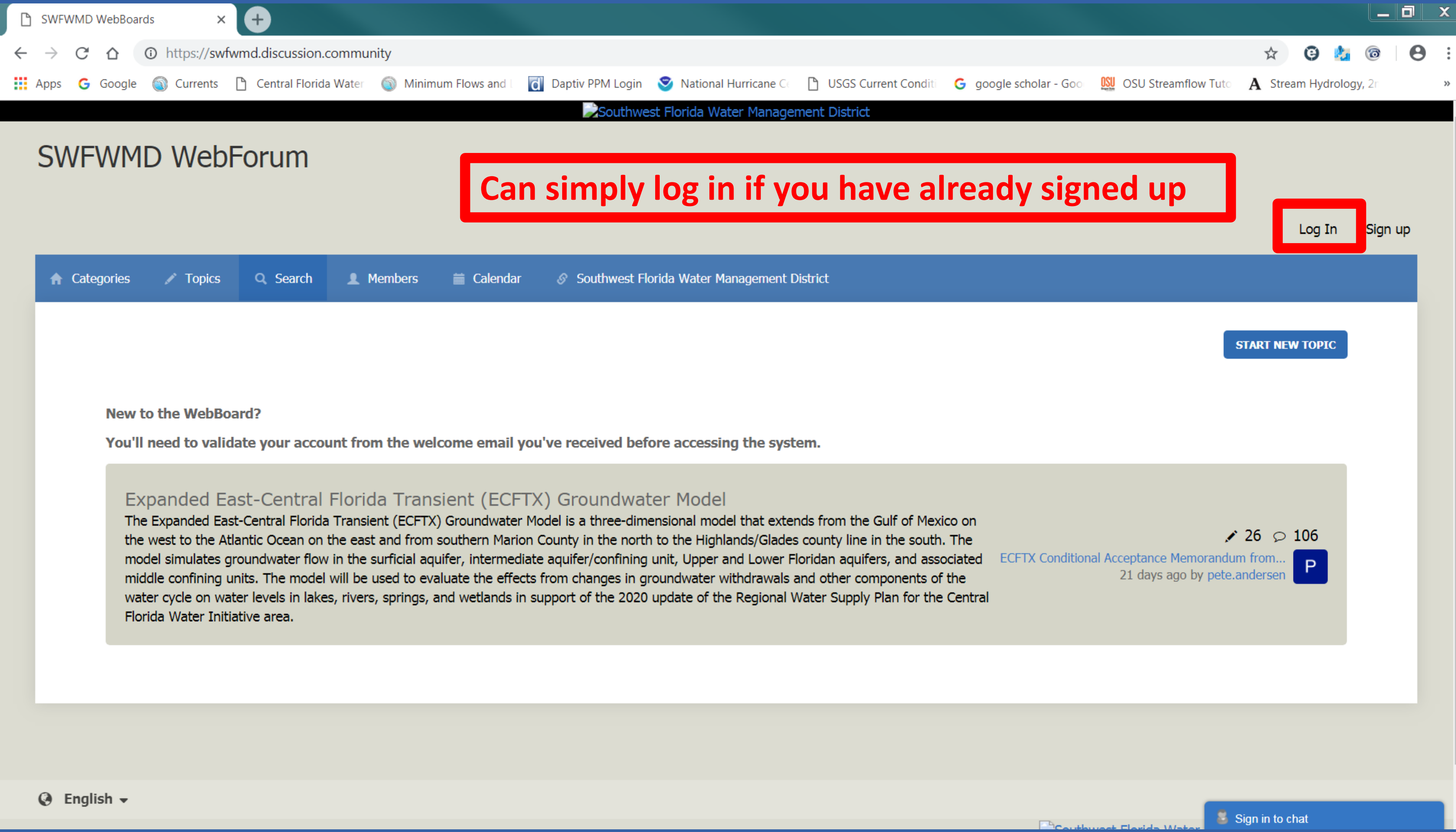
reCAPTCHA
Privacy - Terms
Forum Terms & Rules*
I agree to the Forum Terms & Rules
Create Account
Sign in to chat
Enter registration information and follow instructions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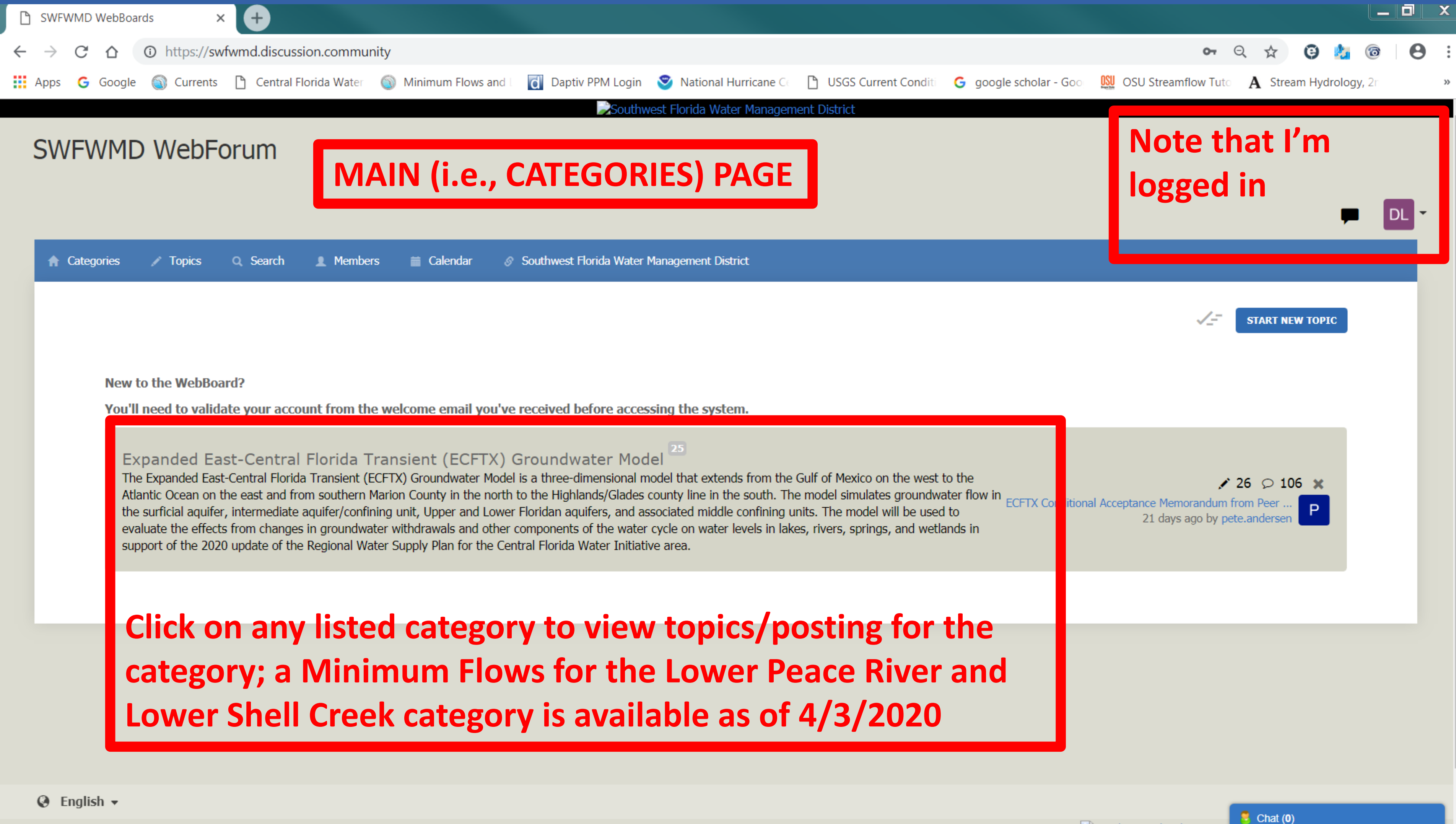
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26
106
21 days ago by pete.andersen
Click on any listed category to view topics/posting for the category; a Minimum Flows for the Lower Peace River and Lower Shell Creek category is available as of 4/3/2020
English
Chat (0)

TOPICS PAGE EXAMPLE

SWFWMD WebForum

Categories | Topics | Search | Members | Calendar | Southwest Florida Water Management District

Expanded East-Central Florida Transient (ECFTX) Groundwater Model

START NEW TOPIC

“+” button allows “following” of topics via email notification

1 to 25 of 26

Latest | New | Top

ECFTX Conditional Acceptance Memorandum from Peer Review Panel
Attached is a memorandum signed by the Peer Review Panel giving conditional acceptance of the ECFTX model based on our review of materials we have... — 1 | 0 | 21 | 22d — Started by pete.andersen

December 12, 2018 Peer Review Meeting Summary
Attached is a draft summary memorandum of the ECFTX transient model peer review meeting held on December 12, 2018 for the teams review and comment. — 1 | 0 | 23 | 2M — Started by rbasso

Peer Review Requests for additional information
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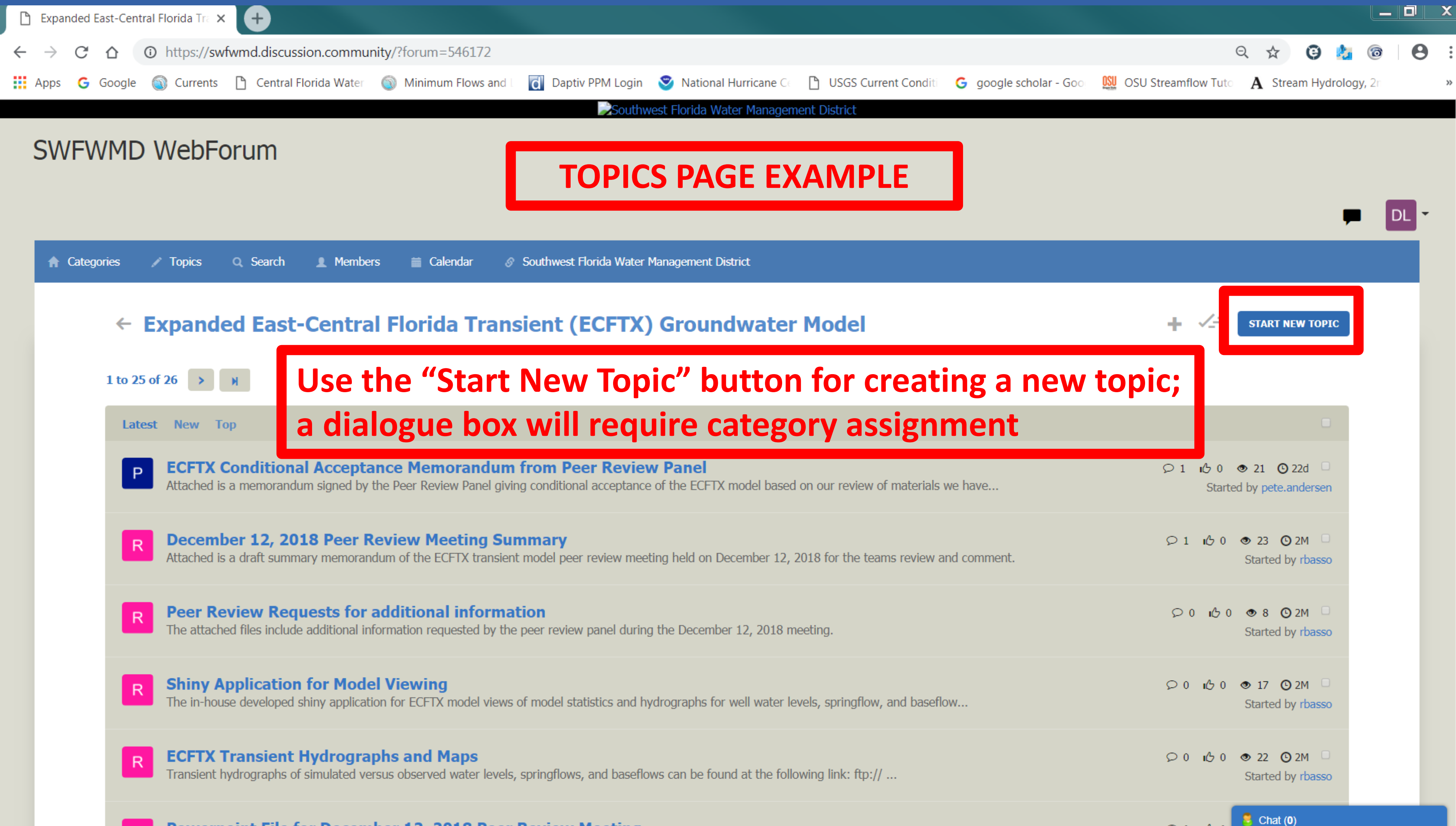
Shiny Application for Model Viewing
The in-house developed shiny application for ECFTX model views of model statistics and hydrographs for well water levels, springflow, and baseflow... — 0 | 0 | 17 | 2M — Started by rbasso

ECFTX Transient Hydrographs and Maps
Transient hydrographs of simulated versus observed water levels, springflows, and baseflows can be found at the following link: ftp:// ... — 0 | 0 | 22 | 2M — Started by rbasso

Chat (0)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1 to 25 of 26
Use the "Start New Topic" button for creating a new topic;
a dialogue box will require category assignment
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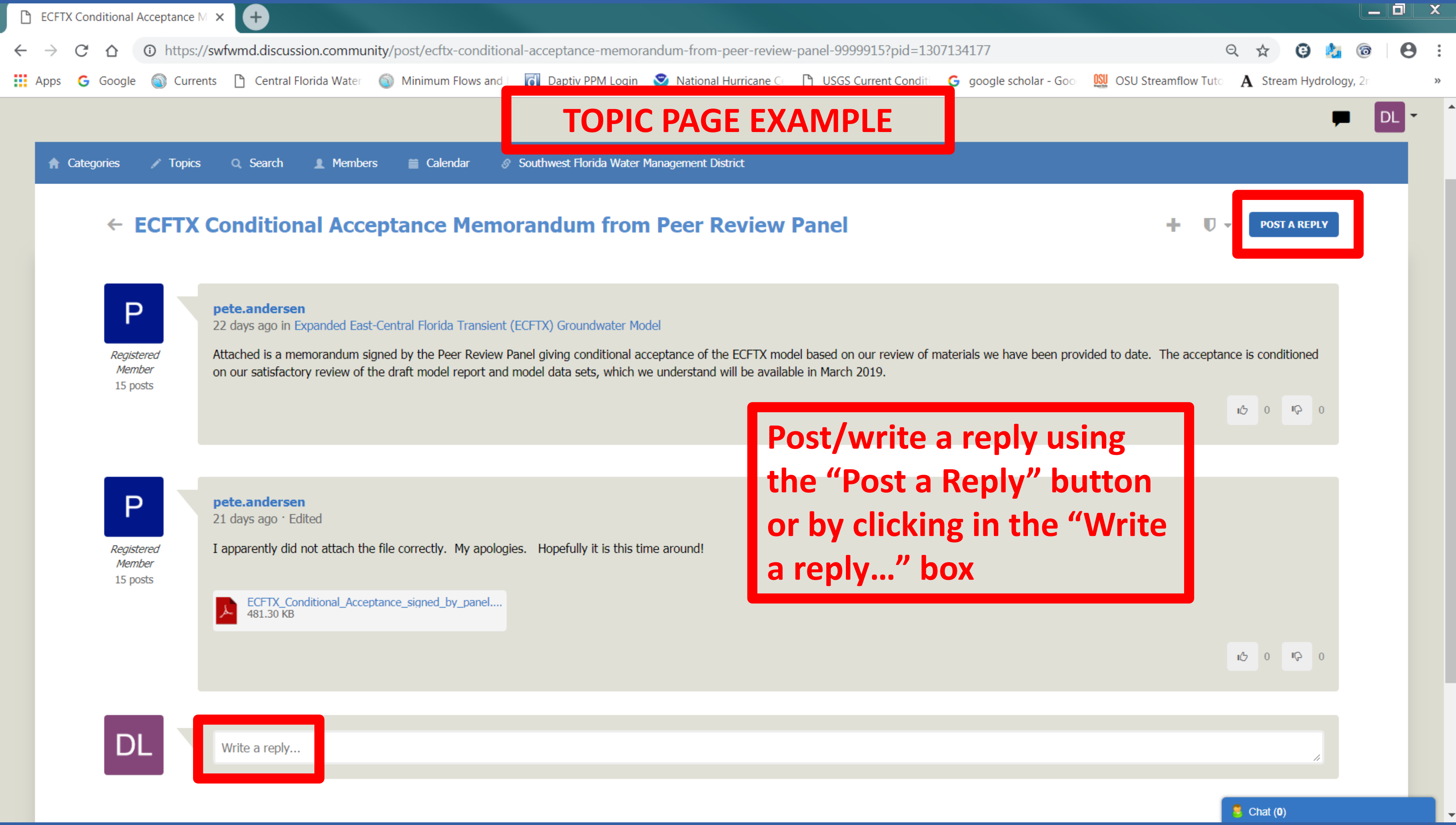
Powerpoint File for December 12, 2018 Peer Review Meeting
Chat (0)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POST A REPLY
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Registered Member
15 posts
pete.andersen
22 days ago in Expanded East-Central Florida Transient (ECFTX) Groundwater Model
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Post/write a reply using the “Post a Reply” button or by clicking in the “Write a reply…” box
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Registered Member
15 posts
pete.andersen
21 days ago · Edited
I apparently did not attach the file correctly. My apologies. Hopefully it is this time around!
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Write a reply...
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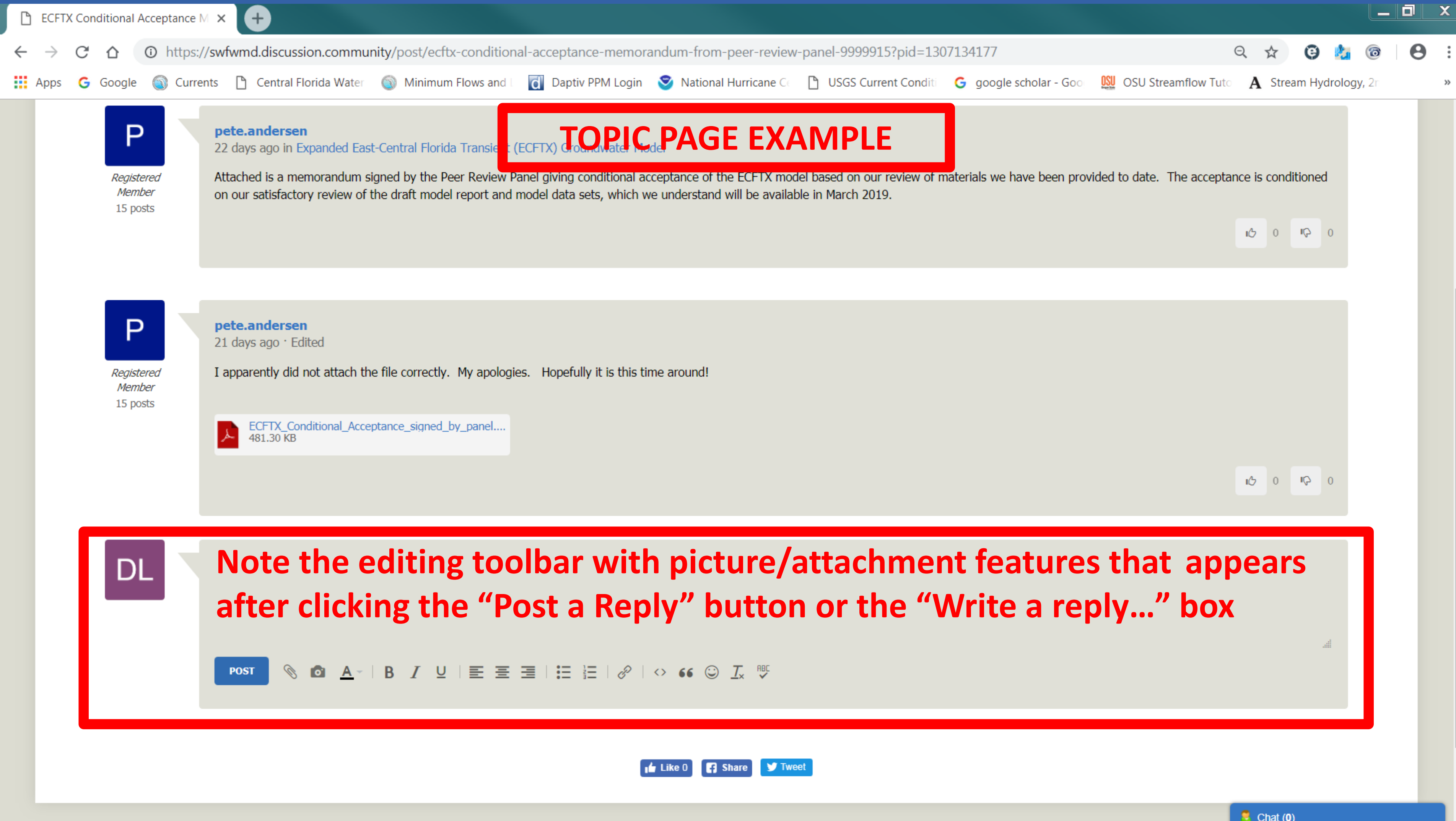
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Sunshine Law Information

(see other slide file)

April 20, 2020

Adrienne Vining
Assistant General Counsel

Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

April 3, 2020

Doug Leeper
MFLs Program Lead

Minimum Flows
Development and Implementation

- Use the best information available for consideration of ten environmental values identified in the State Water Resource Implementation Rule
- Use data and tools for predicting withdrawal-related impacts
- Select most sensitive criterion or criteria to identify recommended minimum flows
- Consider stakeholder input and independent, scientific peer review findings
- Develop necessary recovery and prevention strategies
- Initiate and complete rulemaking
- Continue monitoring and conduct status assessments

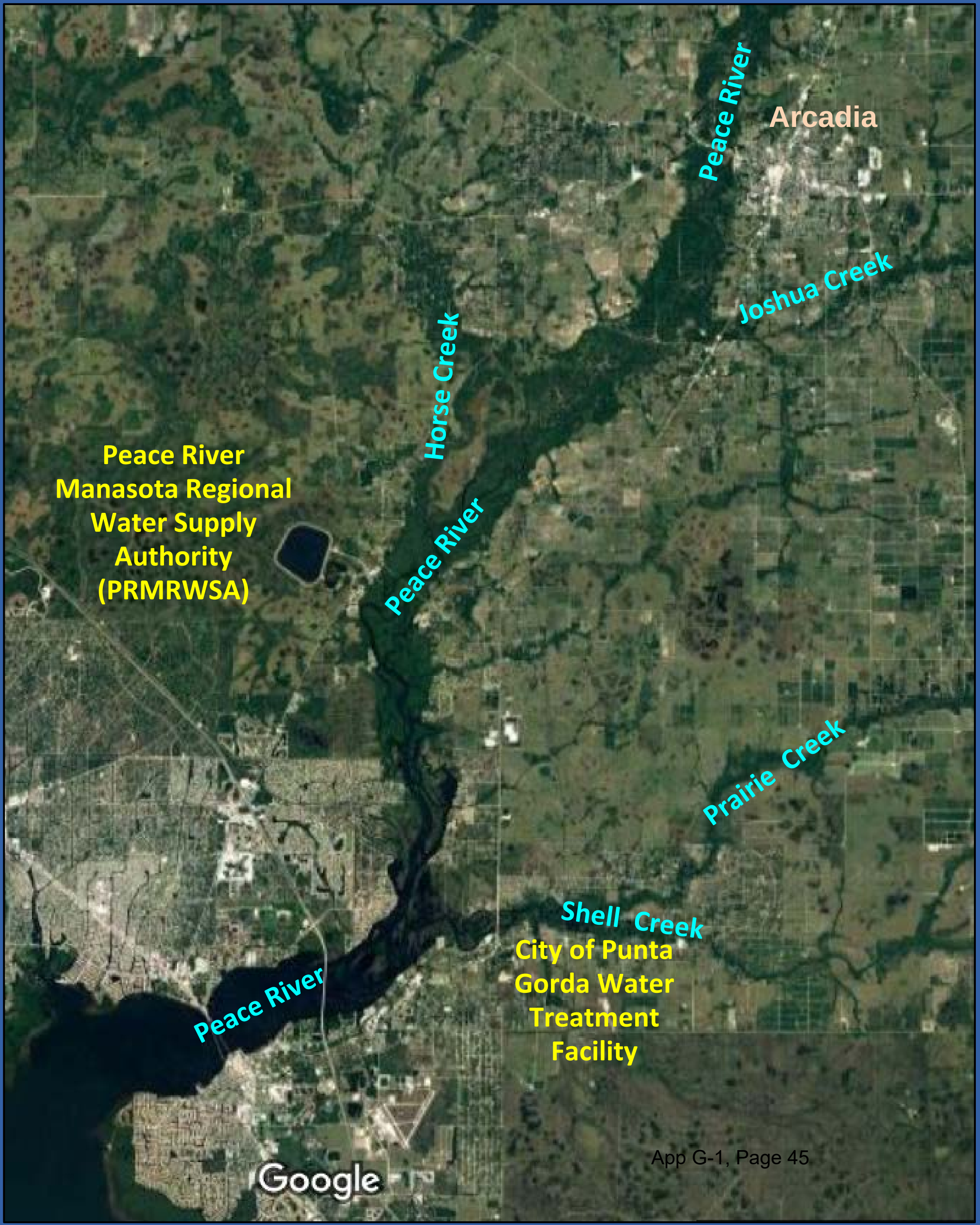
Minimum Flows and Significant Harm

- The **minimum flow** for a given watercourse is the limit at which further withdrawals would be significantly harmful to the water resources of the area. *– Section 373.042, Florida Statutes*

- The District uses a 15% change in habitat or resource to identify significant harm; approach is supported by peer review panels and scientific literature

Lower Peace River

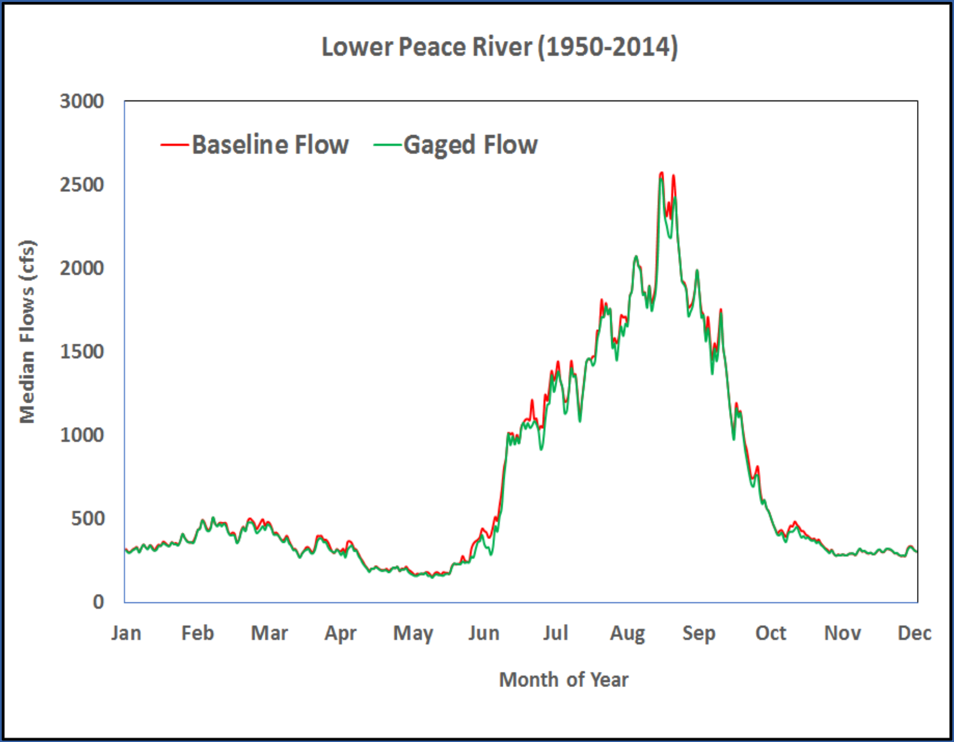
- River segment downstream of Arcadia
- Minimum flows
  - Adopted in 2010
  - Initial reevaluation in 2015
  - Comprehensive reevaluation and adoption scheduled for 2020
- Based on combined flows:
  - Peace River at Arcadia
  - Joshua Creek at Nocatee
  - Horse Creek near Arcadia
- PRMRWSA withdraws water from the Peace River

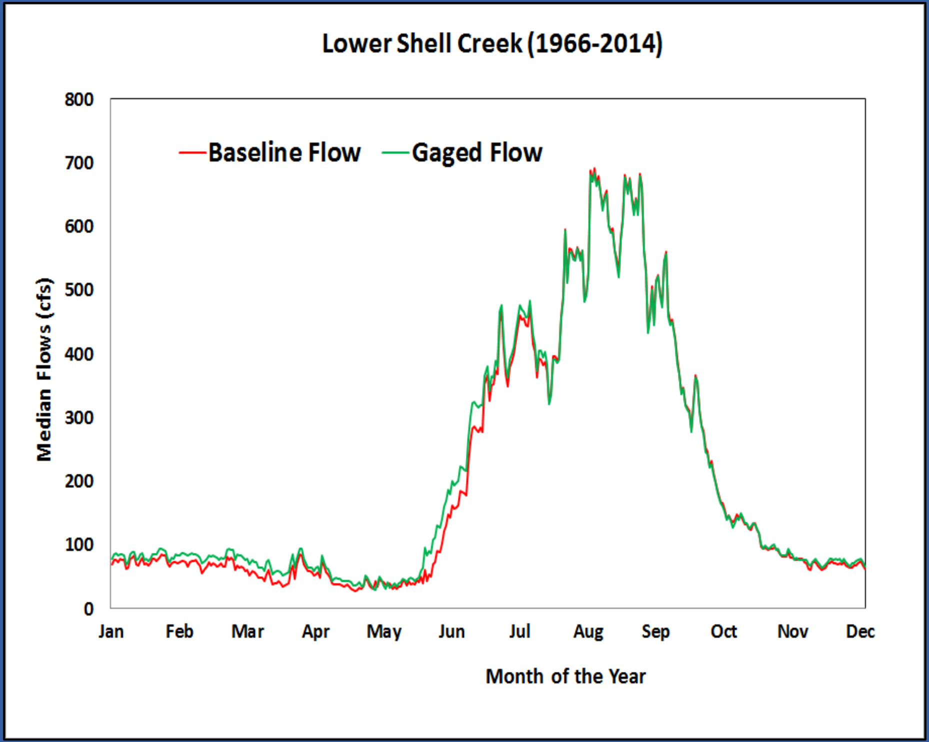


Lower Shell Creek

- Creek segment from Hendrickson Dam to confluence with the Peace River
- No adopted minimum flows
  - Adoption scheduled for 2020
- Will be based on flows:
  - Shell Creek near Punta Gorda
- City of Punta Gorda withdraws water from Shell Creek Reservoir, which was constructed in 1965

Updated Baseline Flows

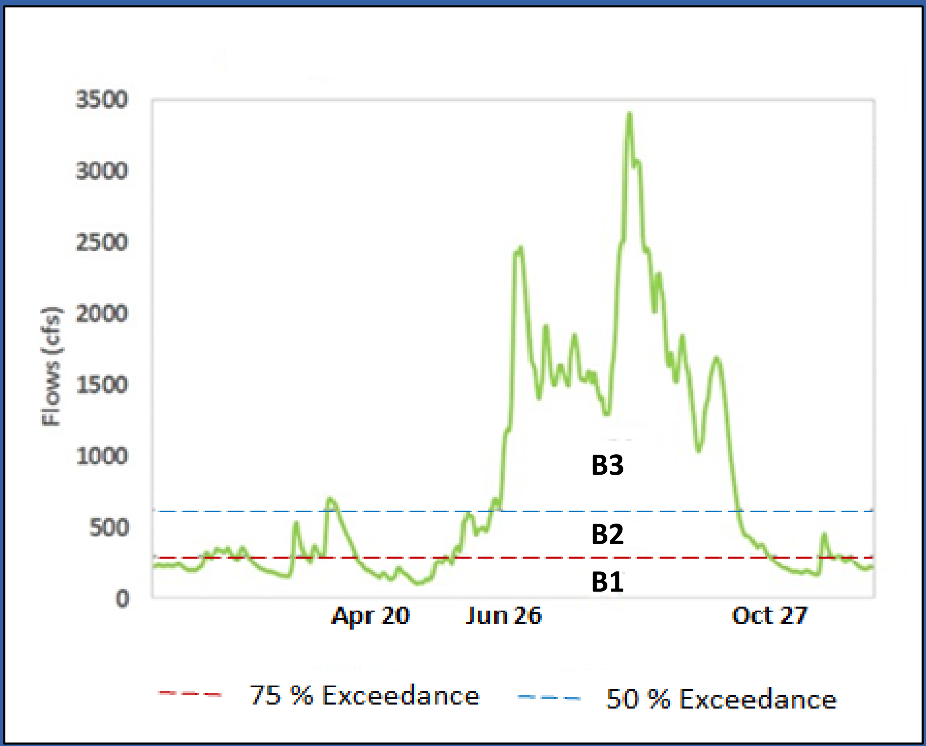




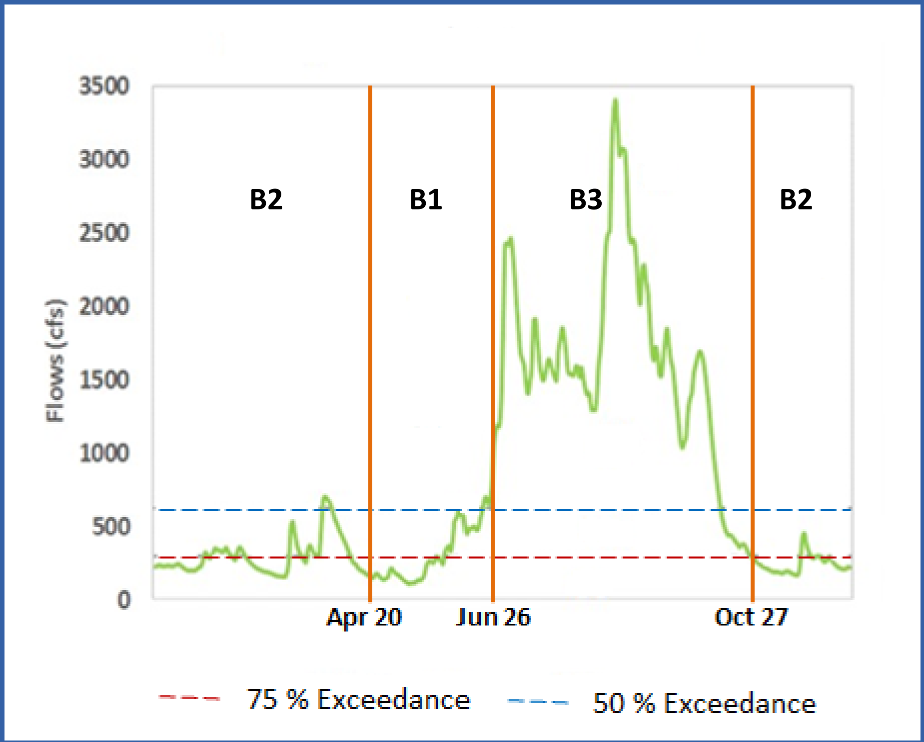
- Baseline flows (flows with no withdrawal impacts) developed for the Lower Peace River (1950 – 2014) and Shell Creek (1966 – 2014)

Developed Flow-Based Blocks

Currently Used
Flow-Based Blocks



Previously Used
Calendar-Based Blocks

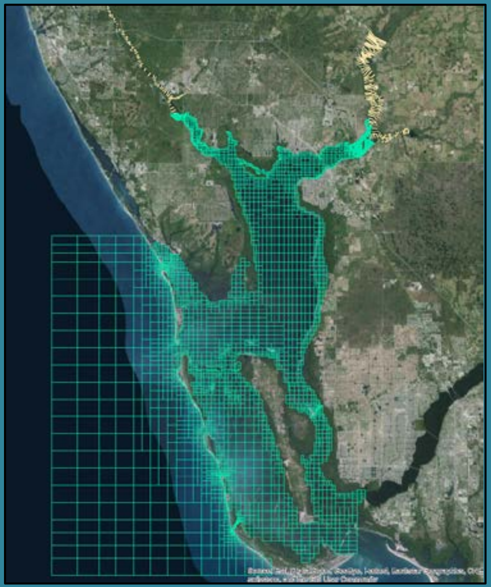


- Flow-based blocks better represent low, medium and high flow conditions for minimum flows development and implementation

Enhanced Hydrodynamic Modeling

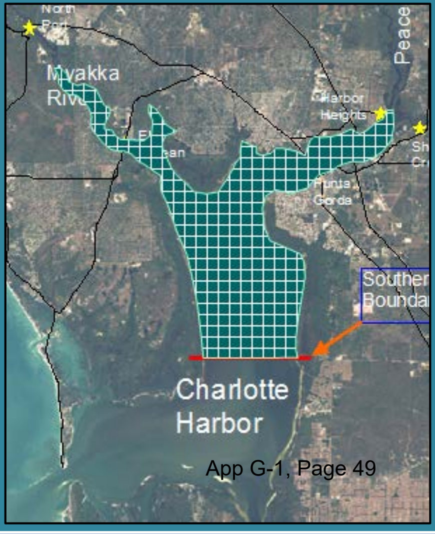
Current model (Chen 2020)

- Unstructured 3D hydrodynamic model
- Includes entire Charlotte Harbor
- New LiDAR and bathymetry data
- 21-month calibration/validation period
- 7.7-year simulation period (Jan 2007 – Aug 2014)



Previously used model (Chen 2010)

- Structured 3D hydrodynamic model
- Limited to Upper Charlotte Harbor
- 13-month calibration/validation period
- 3-year simulation period (2000 - 2002)



Enhanced Ecological Criteria and Considerations

Current Ecological Criteria and Considerations	Previous (2010 Evaluation) Ecological Criteria and Considerations
▪ Salinity-based habitats (<2, <5, <10, <15, <20 psu) ▪ Floodplain inundation ▪ Habitats for 7 fish species and Blue Crab ▪ Water quality (dissolved oxygen, nutrients, chlorophyll, color)	▪ Salinity-based habitats (<2, <5, <10, <15, <20 psu)

- **< 2 psu salinity volume** was the metric most sensitive to modeled flow reductions
- Minimum flows developed based on preserving 85% of **< 2 psu salinity volume**

Proposed Minimum Flows for the Lower Peace River

Block	If Combined Flow at Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee Gages on Previous Day is:	Allowable Flow Reduction is:
All	Less than130 cfs	0%
Block 1	Between 130 cfs and 149 cfs Between 149 cfs and 297 cfs	Flow in excess of 130 cfs 13% of flow
Block 2	Between 297 cfs and 386 cfs Between 386 cfs and 622 cfs	Flow in excess of 297 cfs plus 39 cfs* 23% of flow
Block 3	Between 622 cfs and 1,037 cfs Greater than 1,037 cfs	Flow in excess of 622 cfs plus 143 cfs** 40% of flow

* 39 cfs is 13% of 297 cfs

** 143 cfs is 23% of 622 cfs

The total permitted maximum withdrawals on any day shall not exceed 400 cfs

Proposed Minimum Flows for the Lower Peace River

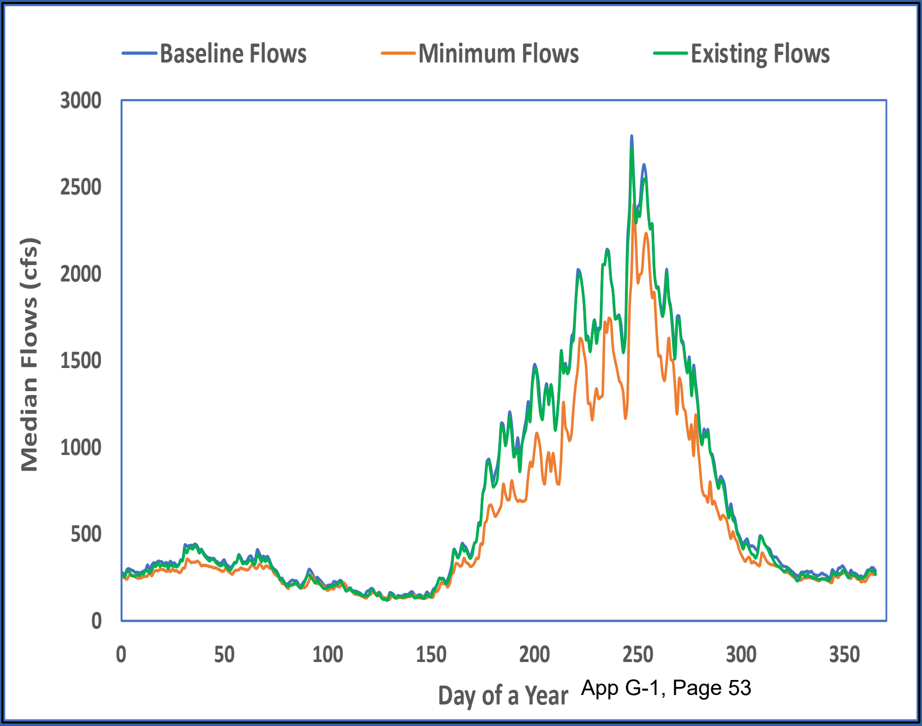
Block	If Combined Flow at Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee Gages on Previous Day is:	Allowable Flow Reduction is:
All	Less than130 cfs	0%
Block 1	Between 130 cfs and 149 cfs Between 149 cfs and 297 cfs	Flow in excess of 130 cfs 13% of flow
Block 2	Between 297 cfs and 386 cfs Between 386 cfs and 622 cfs	23% of (flow – 297 cfs), plus 39 cfs* 23% of flow
Block 3	Between 622 cfs and 1,037 cfs Greater than 1,037 cfs	40% of (flow – 622 cfs), plus 143 cfs** 40% of flow

* 39 cfs is 13% of 297 cfs
** 143 cfs is 23% of 622 cfs
The total permitted maximum withdrawals on any day shall not exceed 400 cfs

Minimum Flows Status for the Lower Peace River

- Proposed Lower Peace River minimum flows are currently met, and are projected to be met during the next 20-year planning period

Period	Statistics	Baseline Flows (cfs)	Minimum Flows (cfs)	Existing Flows (cfs)
	5-Yr Mean	1180.4	1014.9	1163.9
Annual	10-Yr Mean	1182.3	1017.5	1166.7
	5-Yr Median	522.9	403	506.2
	10-Yr Median	523.5	403.4	507.7
	5-Yr Mean	294.8	270.4	287.2
Block 1	10-Yr Mean	302.8	278.3	295.3
	5-Yr Median	248.1	226.6	241
	10-Yr Median	256.1	234.6	249.1
	5-Yr Mean	491.2	398.6	471.2
Block 2	10-Yr Mean	495.9	401.9	476.7
	5-Yr Median	449.3	359.1	428.5
	10-Yr Median	452.1	361.9	432.2
	5-Yr Mean	2140.9	1817.9	2115.9
Block 3	10-Yr Mean	2134.2	1813.7	2110.7
	5-Yr Median	1531.9	1168.3	1507.1
	10-Yr Median	1518.5	1158.2	1494.9



App G-1, Page 53

Proposed Minimum Flows for Lower Shell Creek

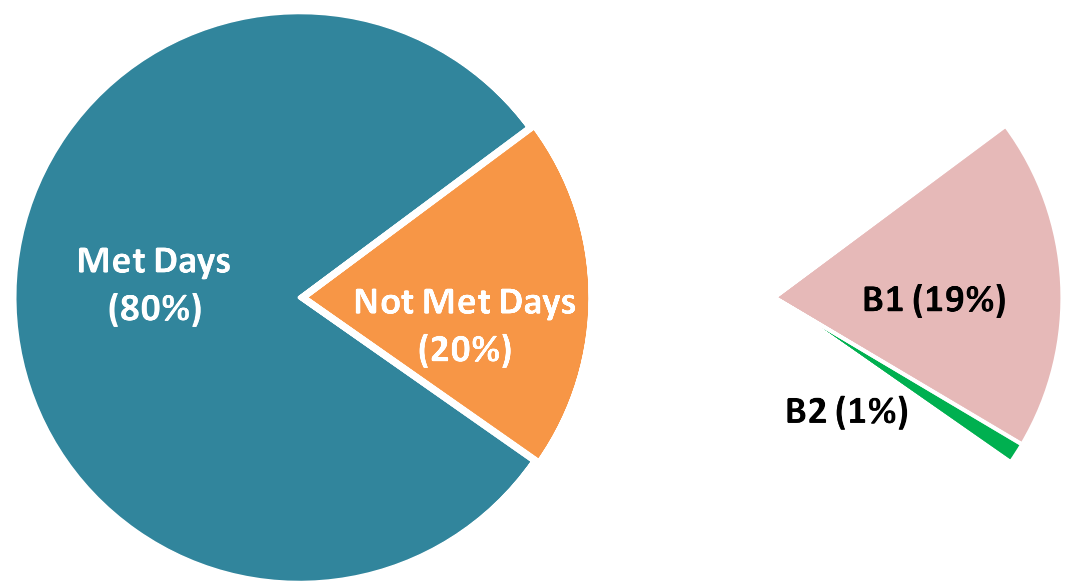
Block	If Inflow to Reservoir on Previous Day is:	Required Flow at Hendrickson Dam is:
Block 1	Between 0 cfs and 56 cfs	87% of inflow
Block 2	Between 56 cfs and 137 cfs	77% of inflow
Block 3	Greater than 137 cfs	60% of inflow

- No Low Flow or maximum daily withdrawal thresholds are required, as the City of Punta Gorda withdrawals are from Shell Creek Reservoir, not directly from the Creek

Minimum Flows Status for Lower Shell Creek

- Proposed Lower Shell Creek minimum flows for low (B1) and medium flow (B2) blocks are not met

- A recovery strategy would need to be adopted along with adoption of the minimum flows



Proposed Minimum Flows Summary

- Proposed minimum flows for the Lower Peace River and Lower Shell Creek are based on maintaining 85% of the 2 psu salinity habitat
- Proposed minimum flows are protective of all environmental values identified for consideration when establishing minimum flows
- Proposed Lower Peace River minimum flow is currently met, and projected to be met during the next 20-year planning period
- Proposed minimum flows for Lower Shell Creek are currently not met, and a recovery strategy is required

Public Comment

April 3, 2020

Doug Leeper
MFLs Program Lead

Contact Information

Name: Douglas A. Leeper

Title: MFLs Program Lead

Mail: Southwest Florida Water Mgmt. District
2379 Broad St.
Brooksville, FL 34604-6899

Phone: 1-800-423-1476 or 352-796-7211,
Extension 4272

E-Mail: doug.leeper@watermatters.org

Web Site: watermatters.org

EXTRAS

Adopted Lower Peace River Minimum Flows & PRMRWSA Water Use Permit Conditions

Combined Flows from gages @ Arcadia, Horse and Joshua	Allowable Flow Reductions for Minimum Flows (and Permit Conditions)		
	Block 1 (Apr 20 - Jun 25)	Block 2 (Oct 27 – Apr 19)	Block 3 (Jun 26 - Oct 26)
<130 cfs	0% (0%)		
130 - 625 cfs	16% (16%)		
≥ 625 cfs	16% *(16%*)	29%* (28%*)	38%* (28%*)
* Maximum daily withdrawal also limited to 400 cfs			

- Although permitted to withdraw up to 400 cfs (258 mgd), in a settlement agreement the PRMRWSA agreed to a 325 cfs (210 mgd) maximum to offset impacts from potential PRWC withdrawals

Monthly Average PRMRWSA Withdrawals from the Lower Peace River

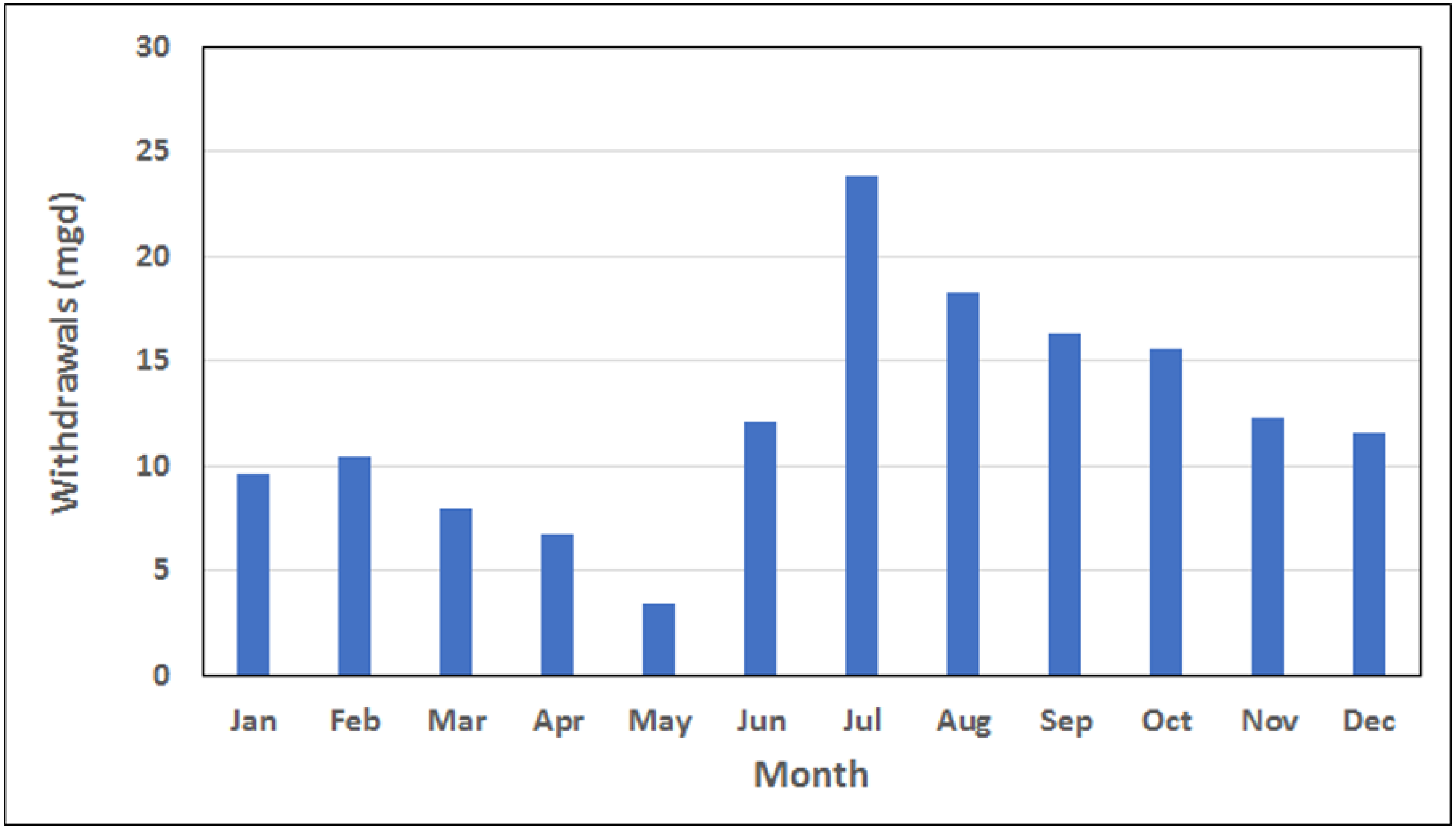


Figure 2-19. Monthly average withdrawals (cfs) from the Peace River by the PRMRWSA for the period 1980 through 2018.

Monthly Average City of Punta Gorda Withdrawals from Shell Creek Reservoir

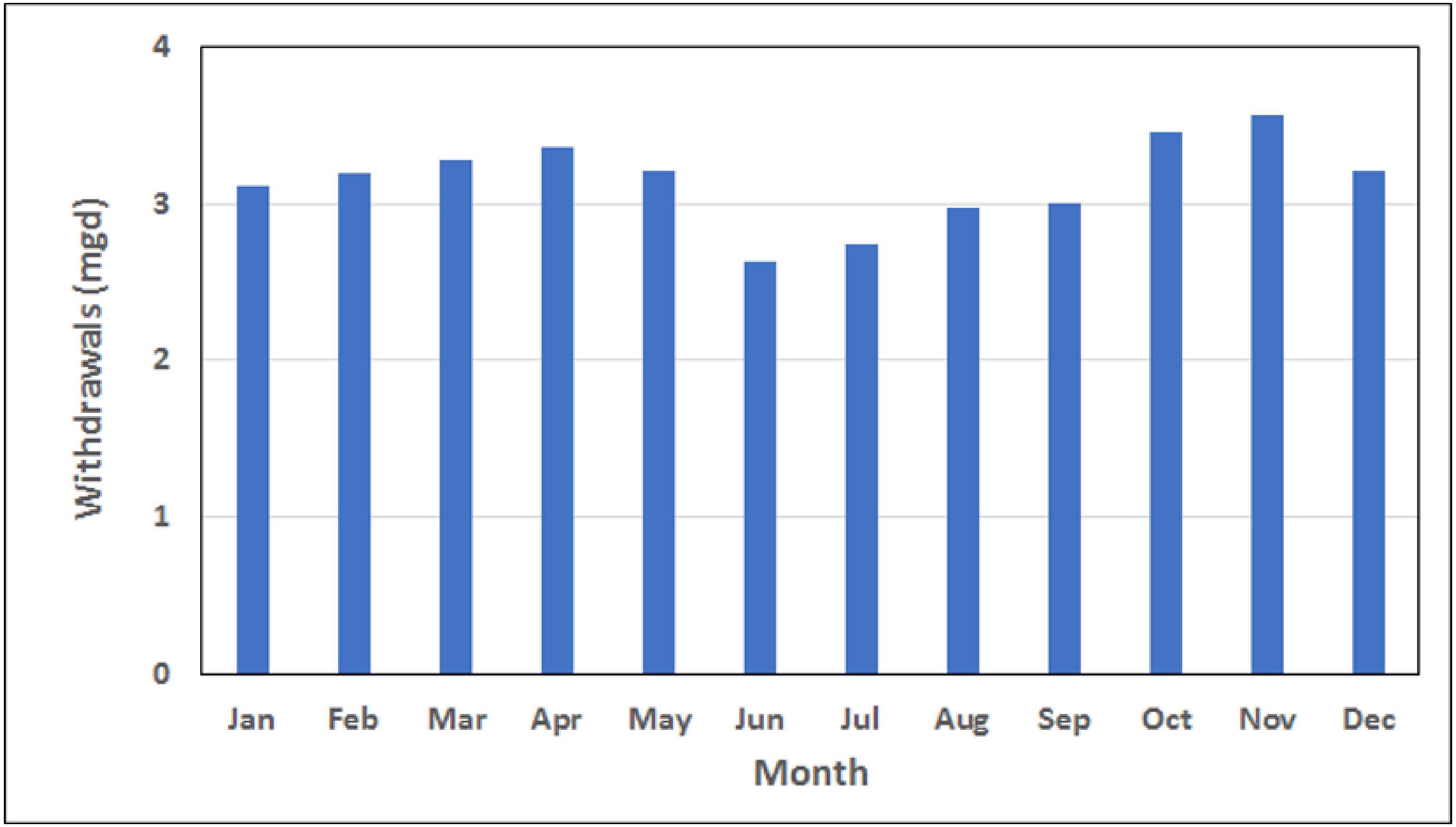


Figure 2-20. Monthly average withdrawals (cfs) from Shell Creek Reservoir by the City of Punta Gorda for the period 1972 through 2018.

Salinity Habitat Modeling Results

Table 6-4. Summary less than 2 psu, 5 psu, 10psu, 15 psu and 20 psu salinity habitats by block under the proposed minimum flow relative to baseline scenario.

Block 1									
	Water Volume (Million m^3)			Bottom Area (Million m^2)			Shoreline Length (km)		
Salinity (<psu)	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change
2	10.8	9.1	15.0%	7.3	6.4	12.4%	44.1	38.2	13.3%
5	18.2	16.8	7.5%	11.2	10.3	7.3%	69.0	64.7	6.2%
10	25.8	24.7	4.0%	15.0	14.5	3.5%	88.9	86.8	2.4%
15	31.4	30.6	2.4%	18.1	17.7	2.3%	96.4	95.9	0.5%
20	43.5	42.2	3.2%	24.0	23.4	2.5%	99.9	99.9	0.1%
Block 2									
	Water Volume (Million m^3)			Bottom Area (Million m^2)			Shoreline Length (km)		
Salinity (<psu)	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change
2	21.5	18.3	15.0%	13.2	11.5	12.8%	78.5	69.3	11.8%
5	26.4	24.2	8.2%	15.7	14.5	7.2%	89.3	85.0	4.8%
10	31.4	29.8	5.2%	18.4	17.5	4.9%	95.7	94.2	1.6%
15	40.1	37.5	6.7%	22.5	21.3	5.2%	99.5	98.9	0.7%
20	60.7	56.0	7.8%	31.2	29.3	5.9%	101.8	101.5	0.3%
Block 3									
	Water Volume (Million m^3)			Bottom Area (Million m^2)			Shoreline Length (km)		
Salinity (<psu)	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change
2	32.9	28.0	15.0%	19.6	16.9	13.9%	94.1	88.0	6.5%
5	38.4	32.7	14.8%	21.8	19.1	12.5%	97.8	94.1	3.8%
10	49.2	41.9	14.8%	26.2	23.0	12.0%	100.5	98.8	1.8%
15	65.0	55.2	15.0%	32.6	28.6	12.0%	102.4	101.3	1.1%
20	85.1	76.9	9.7%	41.8	37.9	9.4%	103.4	103.1	0.3%

Sunshine Law Briefing for Scientific Peer Reviewers

Southwest Florida Water Management District

Office of General Counsel
Adrienne Vining, Assistant General Counsel

Government in the Sunshine
What Does It Mean?

Every person has the right of access to public meetings and records.

- Article 1, Section 24, Florida Constitution
- Section 286.011, Florida Statutes ("Sunshine Law")

Right of Access

Article 1, Section 24, Florida Constitution

(a) Every person has the right to inspect or copy any public record made or received in connection with the official business of any public body....

(b) All meetings of any collegial public body of the executive branch of state government or of any...special district, at which official acts are to be taken or at which public business of such body is to be transacted or discussed, shall be open and noticed to the public....

Public Meetings

Section 286.011, Florida Statutes

(1) All meetings of any board or commission of any state agency…at which official acts are to be taken are declared to be public meetings open to the public at all times…. The board or commission must provide reasonable notice of all such meetings.

(2) The minutes of a meeting of any such board or commission of any such state agency or authority shall be promptly recorded, and such records shall be open to public inspection….

Government in the Sunshine
What Is a "Meeting"?

In this context, a meeting is any communication between two or more peer review panelists, regarding any and all peer review subject matter.

Examples include the peer review panel Microsoft Teams sessions and the WebBoard.

Government in the Sunshine Process

1. **PUBLIC**

   Panel meetings will be publicly accessible via Microsoft Teams and the WebBoard.

2. **NOTICE**

   Notice of the meetings will be published in the Florida Administrative Register at least seven days in advance.

3. **AGENDA**

   An agenda will be provided on the WebBoard before each panel Microsoft Teams session.

4. **MINUTES**

   Minutes of the panel Microsoft Teams sessions will be taken and promptly memorialized. All comments made on the WebBoard will be available for viewing throughout the rulemaking process.

Panel Communications

Communications among peer reviewers regarding the peer review subject matter may only occur during:

- Panel Microsoft Teams sessions, or
- the WebBoard.

Panelists <u>cannot</u> engage in private discussions with each other about the peer review.

This bars <u>any</u> private communication about the peer review:

- in person,
- by telephone,
- by email,
- by text,
- on Facebook and Twitter,
- via private or direct messaging,
- on internet forums, blogs, or
- any other means of interpersonal communication not listed.

- The District requires that communications among peer reviewers occur <u>only</u> during the panel Microsoft Teams sessions or via the publicly accessible WebBoard.
- Please do <u>not</u> engage in <u>inaudible</u> discussions during a public meeting.

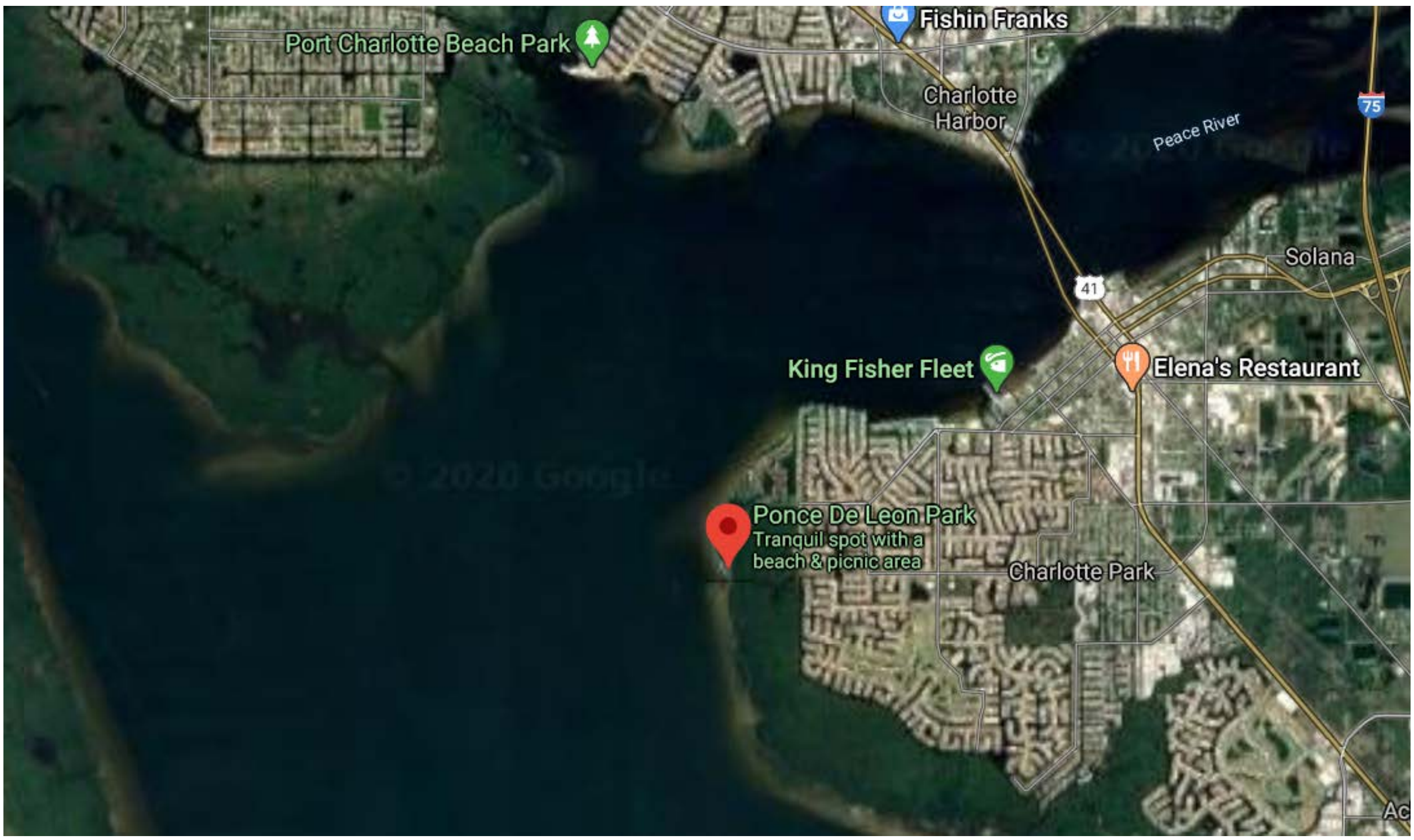
Questions?

Lower Peace River and Lower Shell Creek Minimum Flows Peer Review Virtual Site Visit Information

Prepared by Doug Leeper on 2020-04-03 using information from Google Maps and other web sites.

Charlotte Harbor

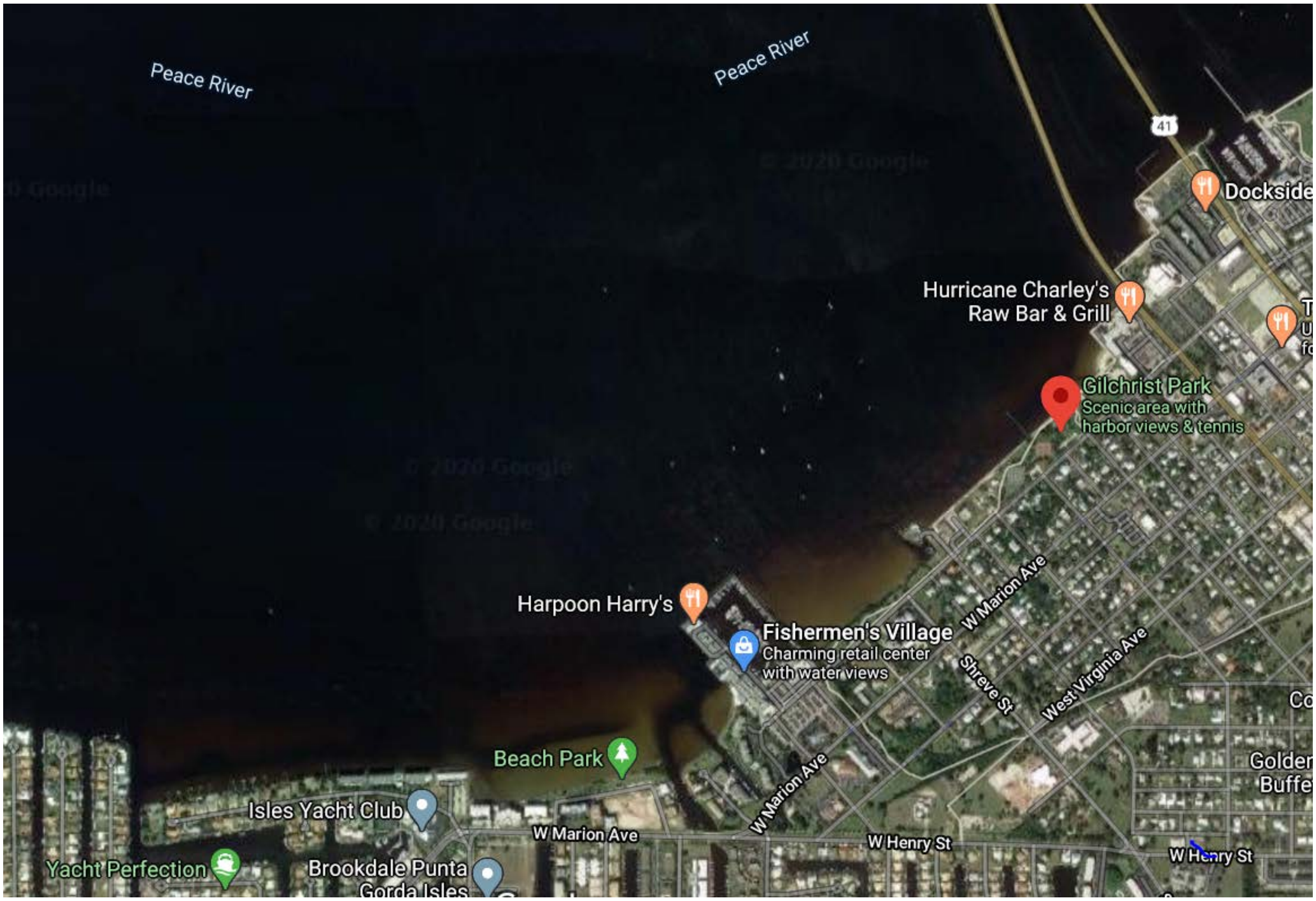
Ponce DeLeon Park
3400 Ponce de Leon Pkwy, Punta Gorda, FL 33950
City of Punta Gorda Park
(941) 575-5041**, (**941) 575-3324, (941) 575-5050, (941) 575-3367




Google

Peace River

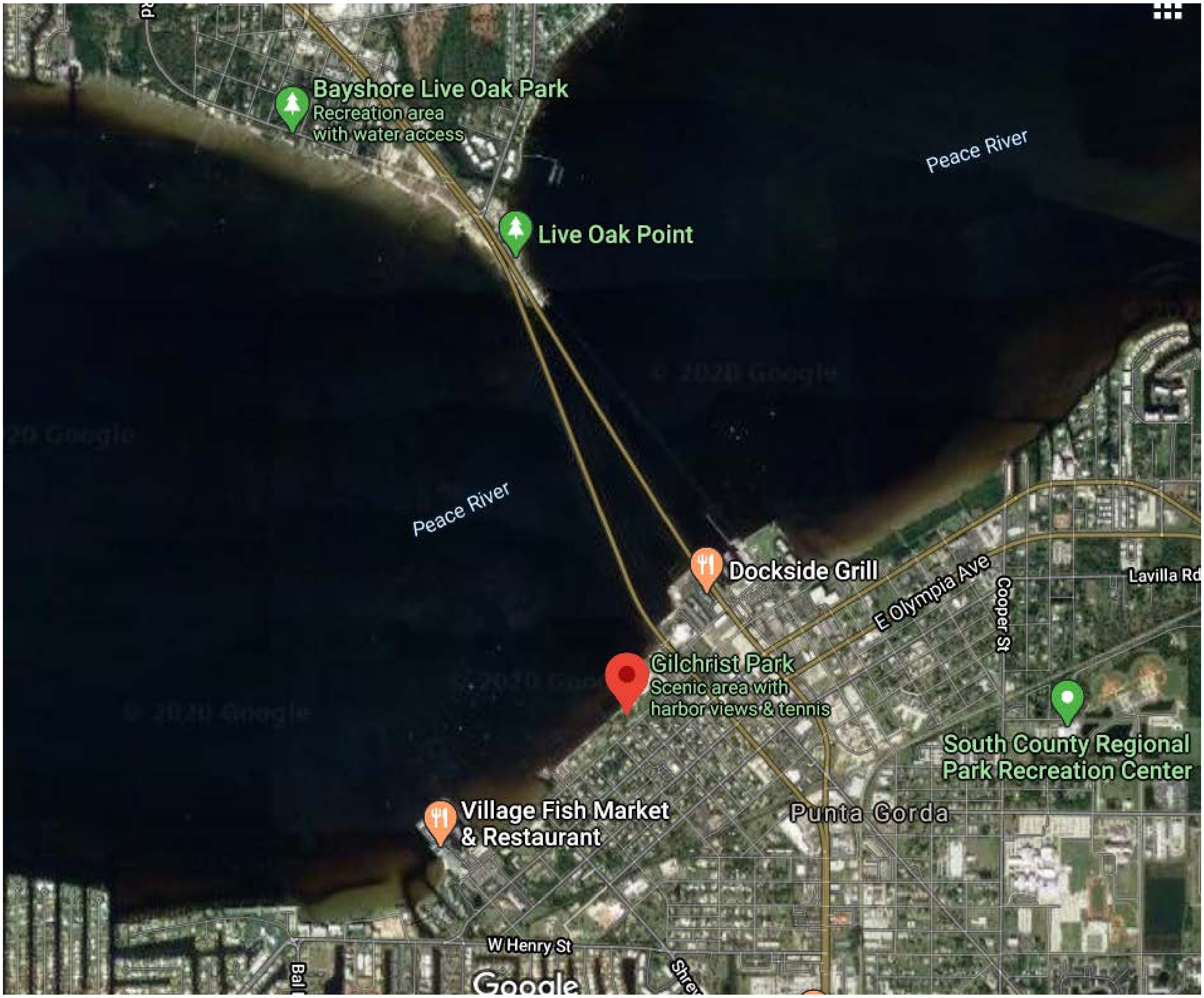
Beach Park
1422 Park Beach Cir, Punta Gorda, FL 3395
City of Punta Gorda
(941) 575-5041**,** (941) 575-3324, (941) 575-5050, (941) 575-3367




Google

Peace River

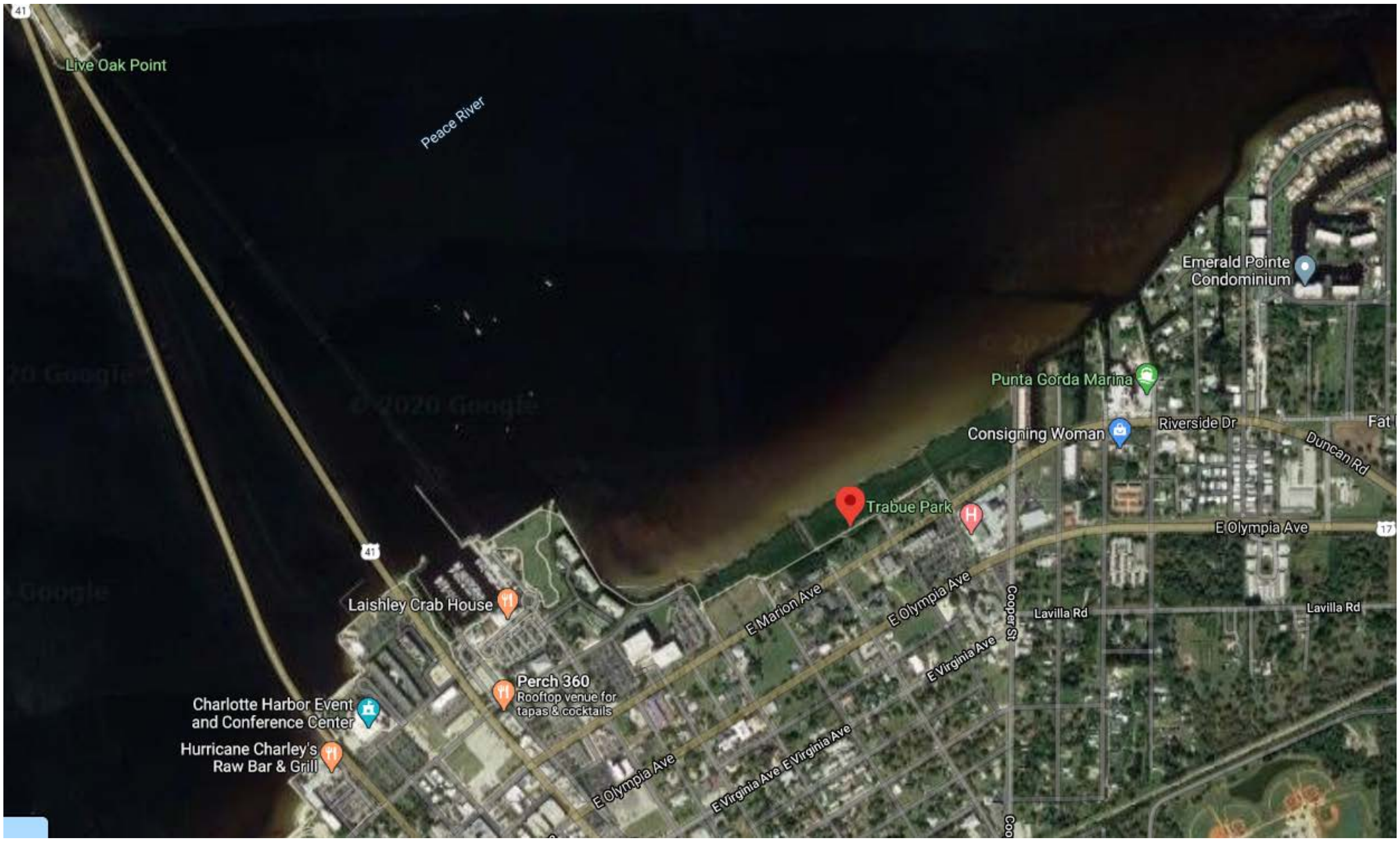
Gilchrest Park
400 W Retta Esplanade, Punta Gorda, FL 3395
City of Punta Gorda Park
(941) 575-5041**,** (941) 575-3324, (941) 575-5050, (941) 575-3367

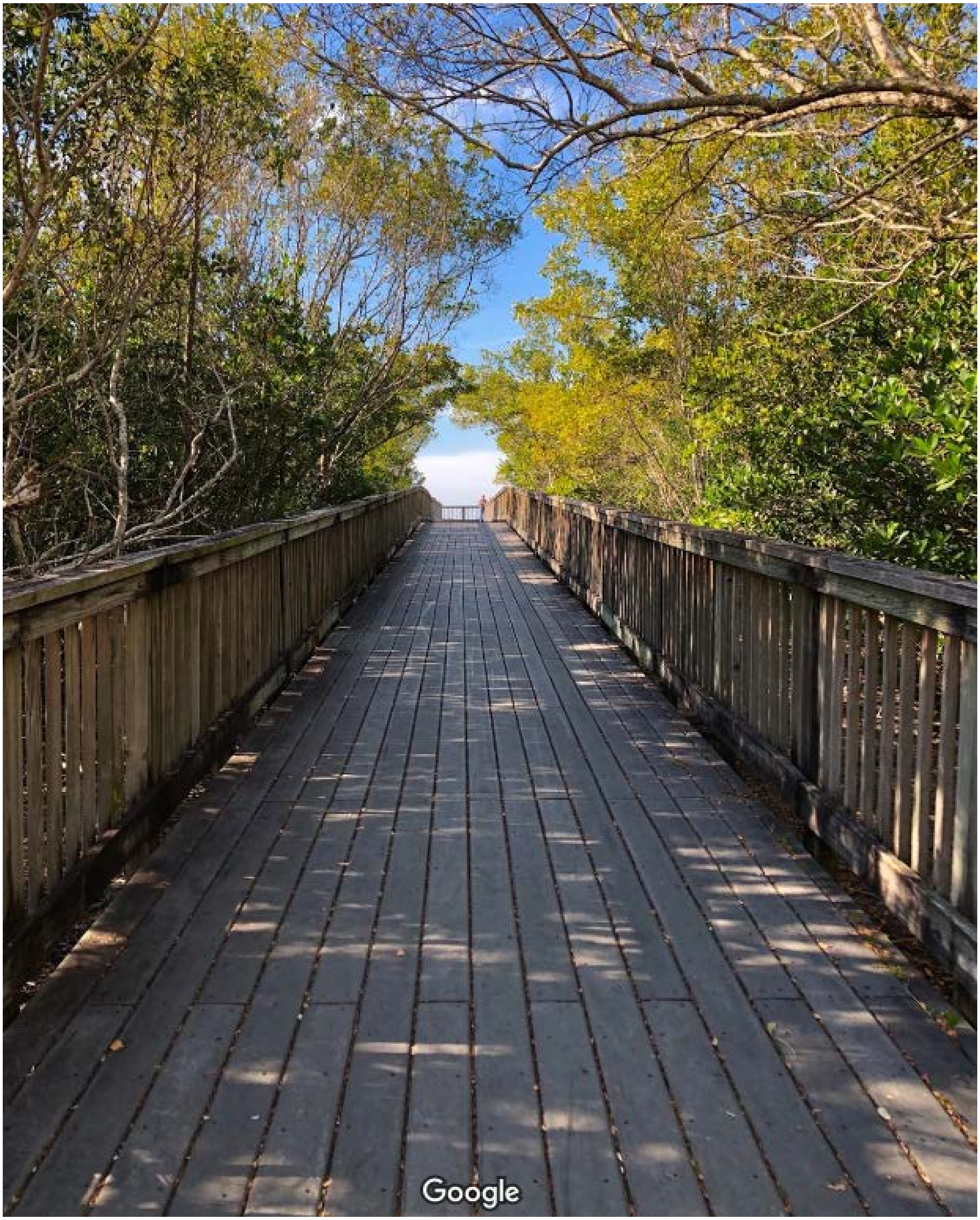



Google

Peace River

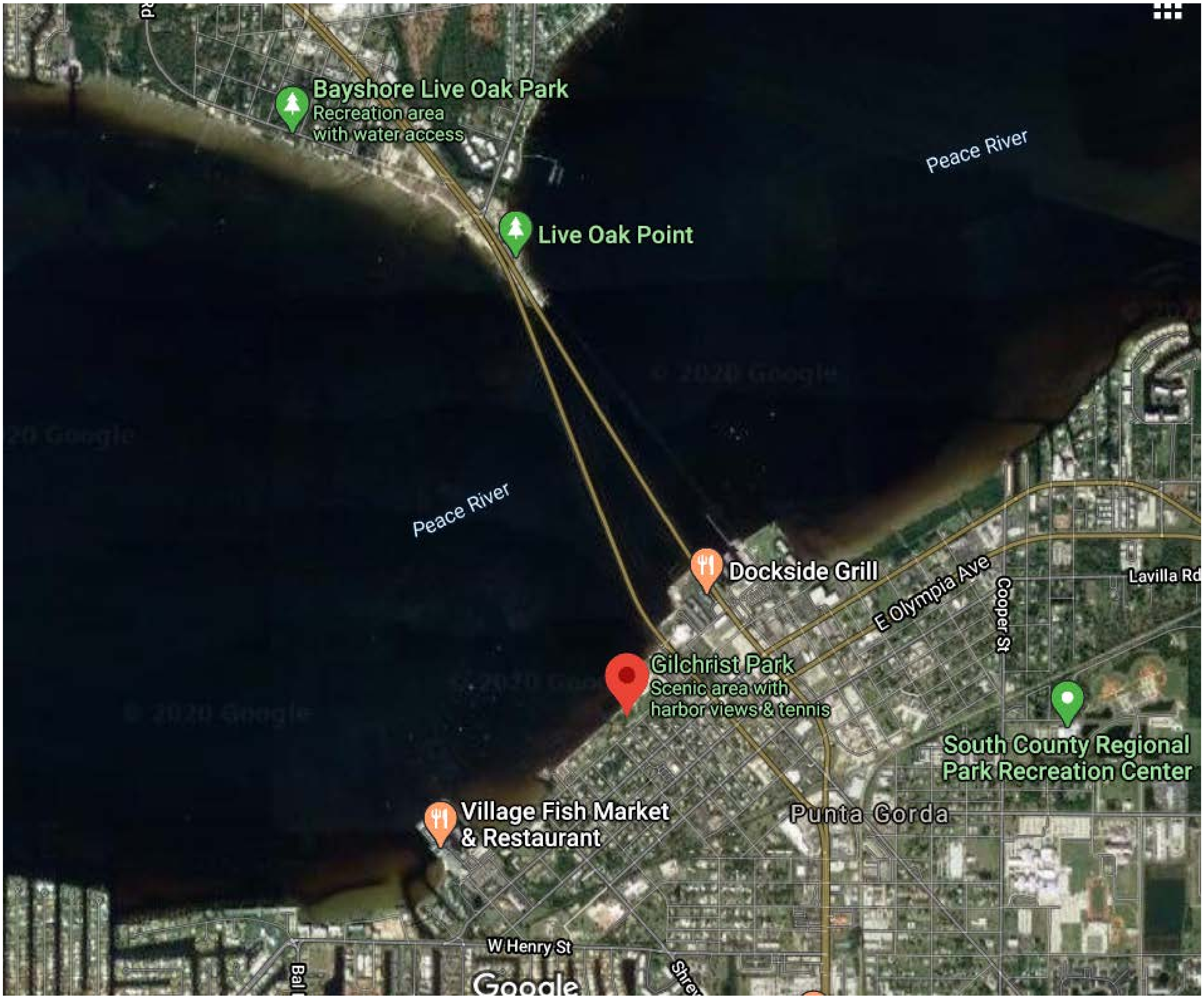
Trabue Park
Patty Ave, Punta Gorda, FL 33950
City of Punta Gorda Park
(941) 575-5041**,** (941) 575-3324, (941) 575-5050, (941) 575-3367




Google

Peace River

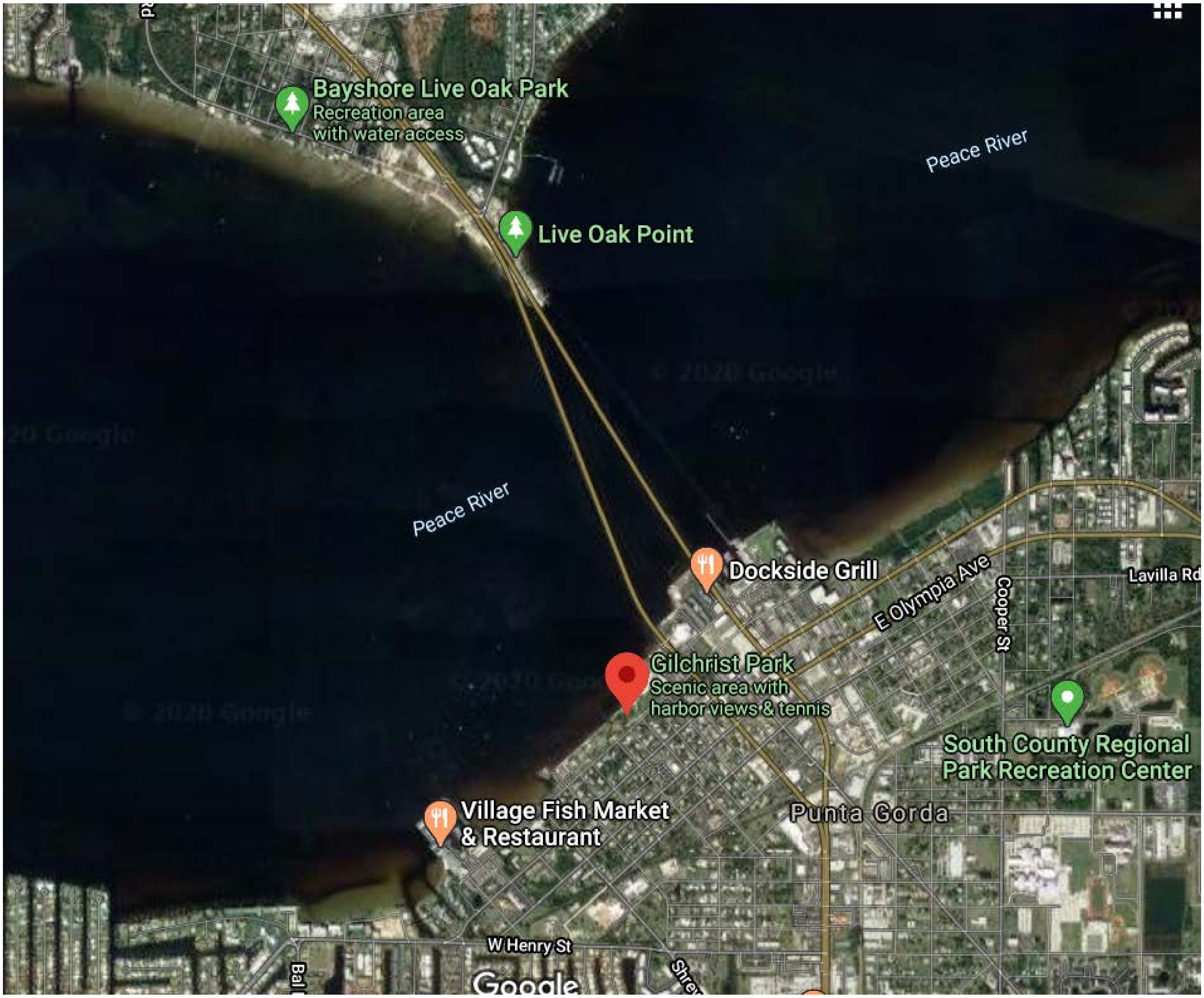
Live Oak Point
5100 Tamiami Trail, Port Charlotte, FL 33980
Charlotte County Park
(941) 625-7529




Google

Peace River

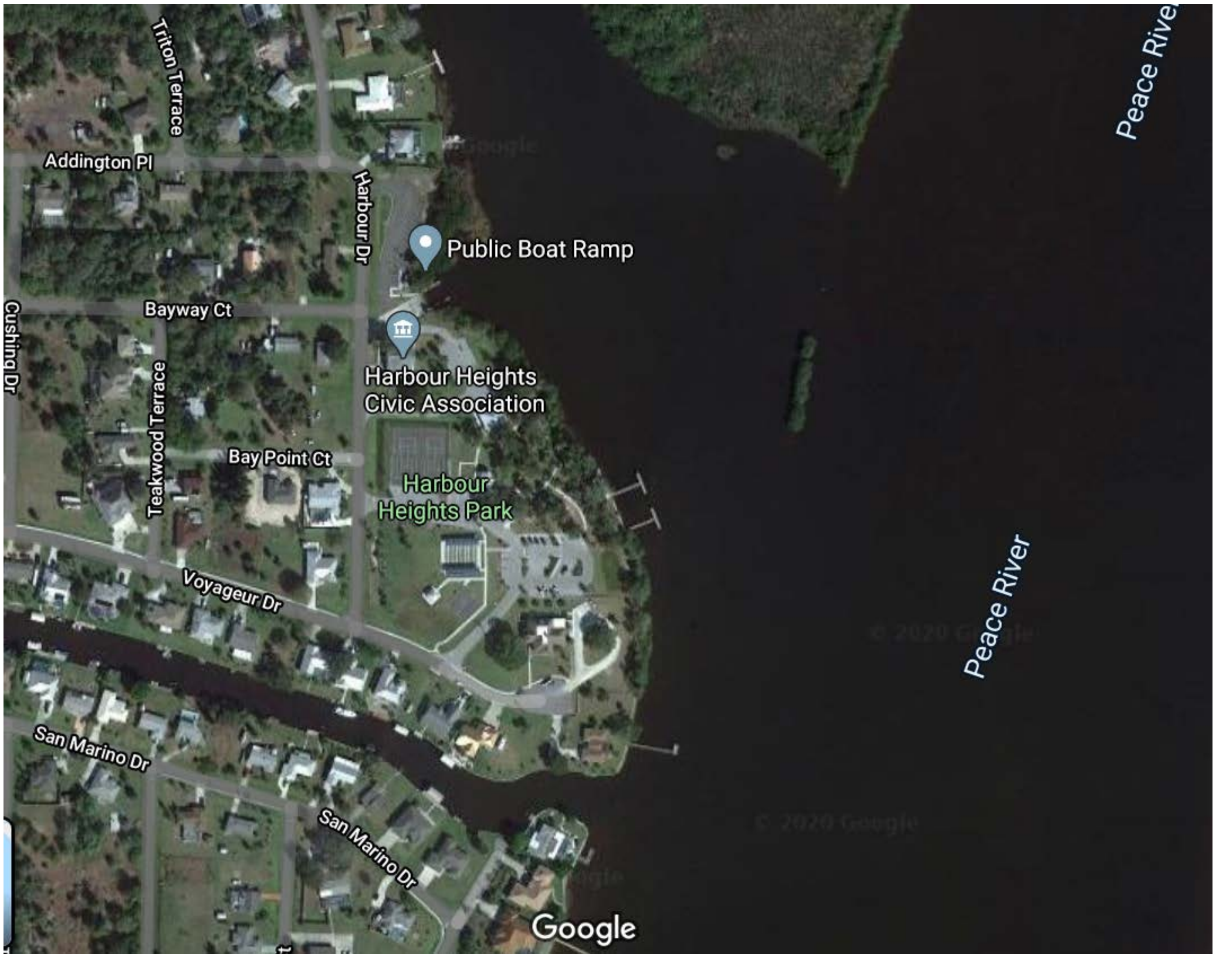
Bayshore Live Oak Park
23157 Bayshore Rd, Port Charlotte, FL 3398
Charlotte County Park
(941) 627-1628




Google

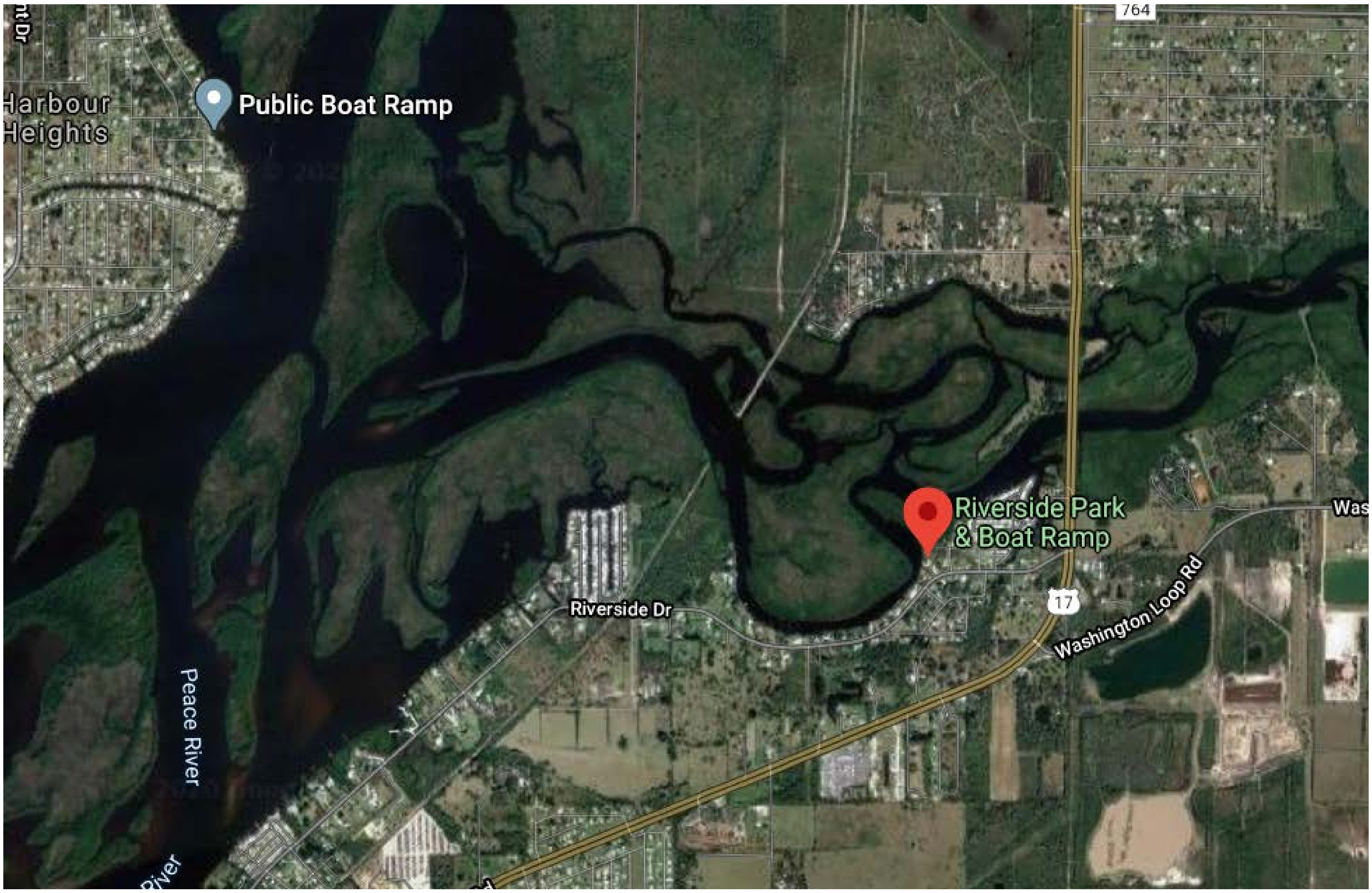
Peace River (near Confluence with Shell Creek)

Harbor Heights Park
27420 Voyageur Dr
Punta Gorda, FL 33983
Charlotte County Park and Boat Ramp
(941) 627-1628



Shell Creek

Riverside Park and Boat Ramp
8120 Riverside Dr, Punta Gorda, FL 33982
Charlotte County Park and Boat Ramp
(941) 505-8686




PARK RULES

Shell Creek

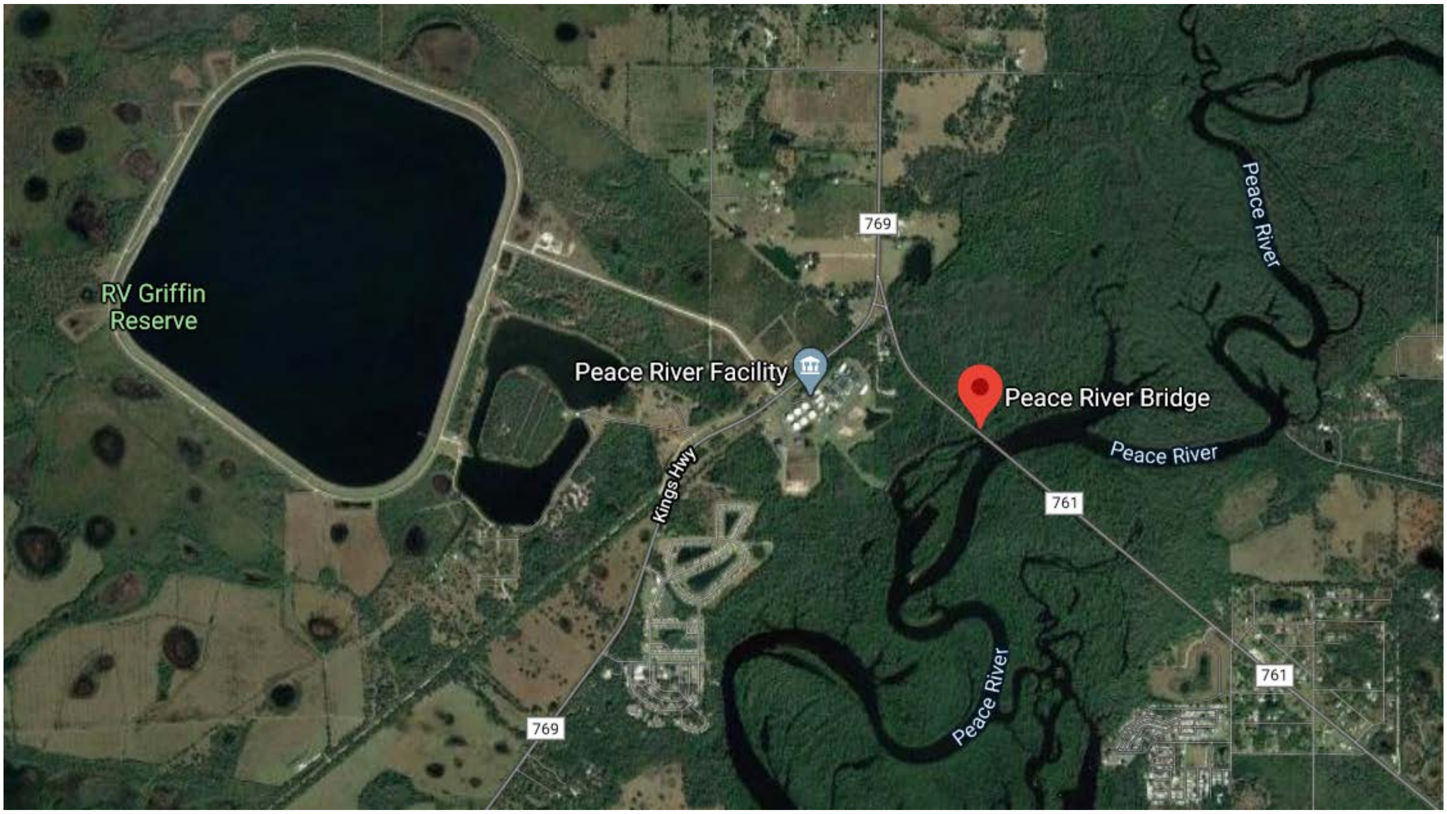
Hendrickson Dam

City of Punta Gorda Water Treatment Plan
38100 Washington Loop Rd, Punta Gorda, FL 33982
(941) 639-2057

Photo from City of Punta Gorda Water Treatment Plant web page:
http://www.ci.punta-gorda.fl.us/government/water-waste-water/water-treatment-plant

Peace River (near Peace River Manasota Regional Water Supply Facility)

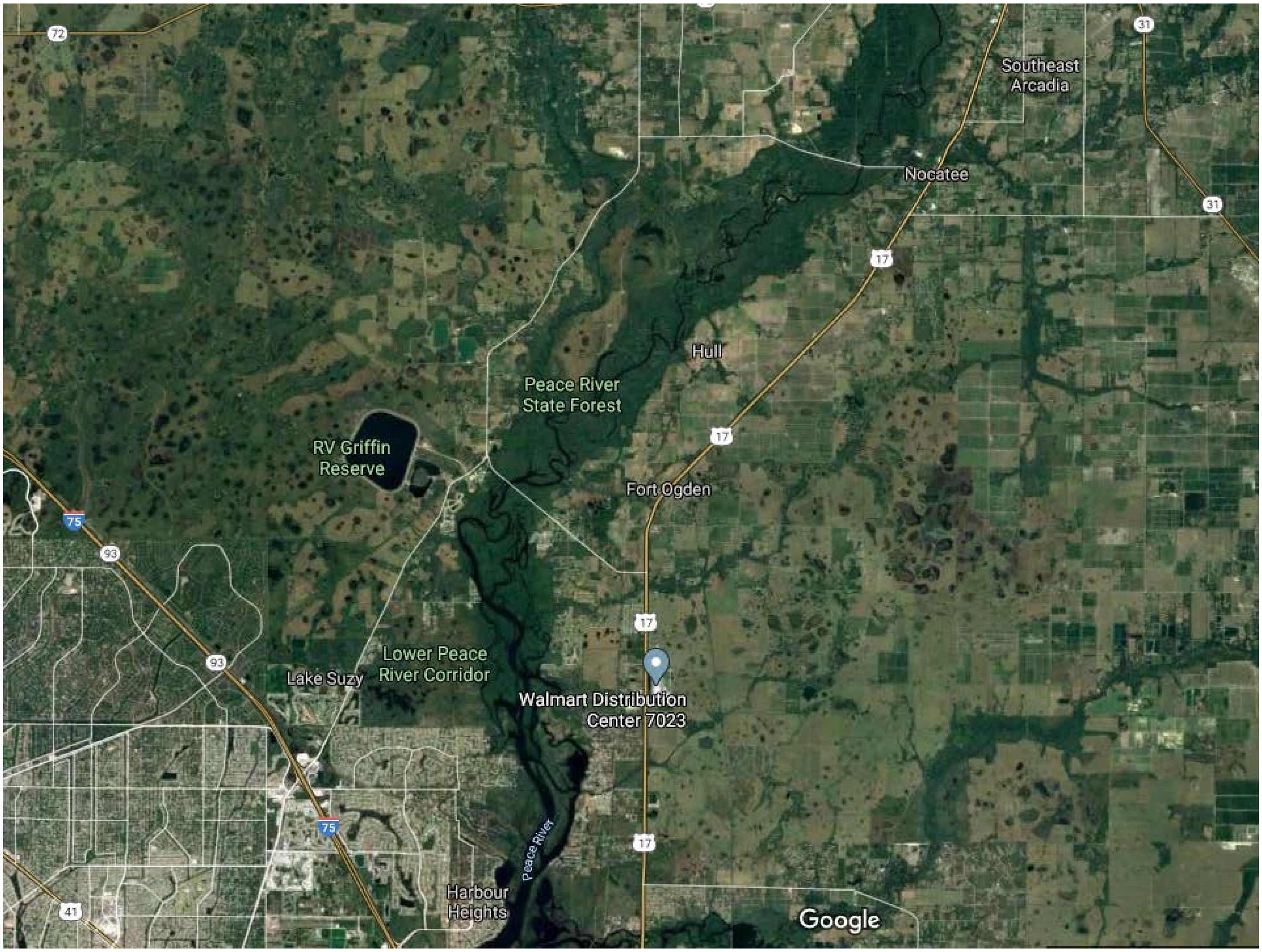
Peace River Bridge
8789 Co Rd 761, Arcadia, FL 34269
NOTE: No public access/parking area.




Google

Peace River

Peace River State Forest
Arcadia, FL 34269
(863) 491-5318




Google

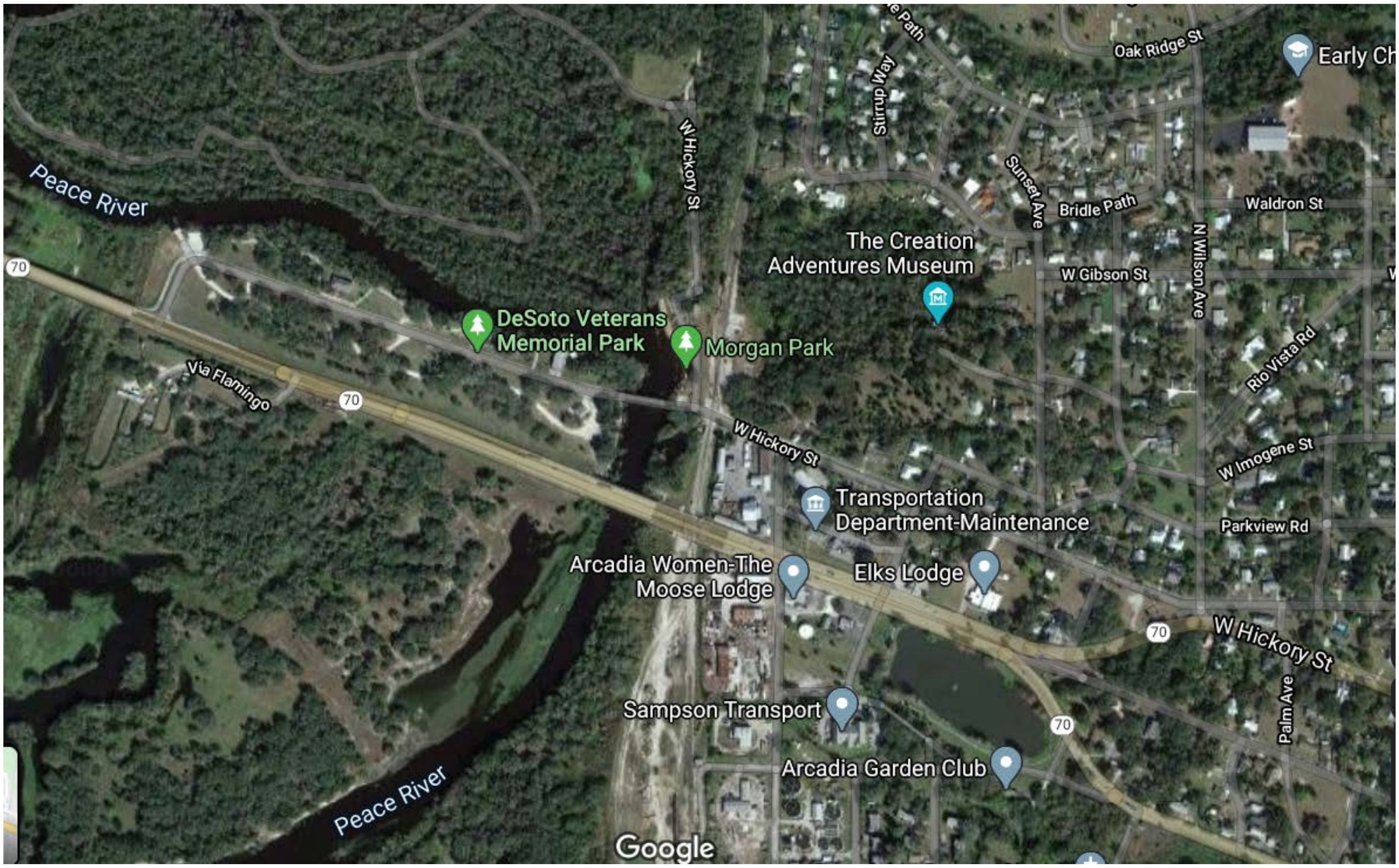
Peace River (near confluence with Joshua Creek)

Nocatee Boat Ramp
Co Rd 760, Arcadia, FL 34269
DeSoto County Boat Ramp
(863) 491-7507


Google

Peace River (near U.S. Geological Survey Peace River at Arcadia gage)

DeSoto Veterans Memorial Park
2195 American Legion Drive
Arcadia, FL 34266
DeSoto County Park and Boat Ramp
(863) 491-7507




Google

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 3, 2020
Date: Friday, April 3, 2020 4:27:09 PM

SWFWMD WebBoards

Doug Leeper has replied to a topic.

Peer Review Panel Teleconference - April 3, 2020

Posted Apr 03 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Summary of the April 3, 2020 peer review panel teleconference is attached.
Lower Peace_Shell Peer Review 2020-04-03 Teleconference Summary

Lower Peace_Shell Peer Review 2020-04-03 Tele...
43.28 KB

Visit Topic

To unsubscribe from these emails, you can stop receiving notifications for new replies.

MEETING SUMMARY

Southwest Florida Water Management District
Scientific Peer Review Panel Teleconference
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Facilitated as a Video and Telephone-Based Teleconference

April 3, 2020

The Southwest Florida Water Management District (District) organized and facilitated a meeting of the independent scientific peer review panel reviewing a draft District report on proposed minimum flows for the Lowe Peace River and Lower Shell Creek. The meeting was facilitated as a teleconference/videoconference using the Microsoft Teams Videoconferencing Platform.

The meeting was held from 9:00 a.m. to approximately 11:20 a.m. on April 3, 2020.

The meeting was advertised in the Florida Administrative Register and on the District's web site. In addition, notifications concerning the event were distributed to local governments, other agencies, and stakeholder groups or representatives.

Meeting participants that chose to identify themselves included:

Peer Review Panel
Laura Bedinger, Peer Review Panelist
Peter Sheng, Peer Review Panelist
Dave Tomasko, Peer Review Panel Chair

District Staff

Chris Anastasiou	Yonas Ghile	Randy Smith
Mike Bray	Doug Leeper	Chris Tumminia
XinJian Chen	Jordan Miller	Adrienne Vining
Kristina Deak	Dennis Ragosta	Chris Zajac
Eric DeHaven	Cindy Rodriguez	

Others
Richard Anderson, Peace River Manasota Regional Water Supply Authority
Laura Baumberger, Carollo Engineers, Inc.
Mike Coates, Peace River Manasota Regional Water Supply Authority
Laura Donaldson, Manson Bolves Donaldson Varn Attorneys at Law
Jim Guida, Progressive Water Resources
Victoria Steinnecker, Carollo Engineers, Inc.
Stefani Weeks, Florida Department of Environmental Protection

The meeting was initiated with panelist introductions and identification of other participants. District staff made several presentations that addressed: the peer review process, a publicly-noticed webforum established and maintained by the District for exchange of information relevant to the peer review in accordance with Florida's government-in-the-sunshine law requirements, a sunshine law briefing for the peer review panelists, an overview of the minimum flows proposed for the Lower Peace River and Lower Shell Creek, and potential panelist virtual-tours of sites along the river and creek.

Panelist posed a few questions concerning the presentations. Those of a technical nature included: whether the baseline flows described during the teleconference were further adjusted for the modeling of potential sea level rise scenarios; whether a maximum withdrawal cap or limit was being proposed for both the Lower Peace River and Lower Shell Creek; and whether all the days during the assessment period that the proposed minimum flows for Shell Creek were met occurred during the high-flow, Block 3 period.

The panel subsequently devoted time to discussion regarding how they anticipated proceeding with the review. They determined that they would post initial comments and questions concerning the draft minimum flows report on the peer review webforum prior to the panel teleconference scheduled for April 13, 2020. Dave Tomasko indicated he planned to create and post a draft outline/document for use in the compilation of all the panelist's initial comments/questions.

The panel and District staff discussed a process for the development and posting of panel teleconference agendas and summaries to the webforum. Doug Leeper indicated he would post the agenda and presentation materials used during the meeting to a new topic on the peer review webforum.

Following the panel's discussion of review logistics, Doug Leeper asked if any members of the public wished to provide any oral comment on the peer review process or the proposed minimum flows. No public comments were provided. Doug Leeper indicated that comments and inquiries regarding the peer review or minimum flows development process could also be posted to the webforum, as well as directly to him or other District staff.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Peer Review Panel Teleconference - April 13, 2020
Date: Monday, April 6, 2020 2:31:13 PM

SWFWMD WebBoards

Doug Leeper has started a new topic.

Peer Review Panel Teleconference - April 13, 2020

Posted Apr 06 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Agenda for the April 13, 2020 Lower Peace River/Lower Shell Creek minimum flows peer review panel teleconference is attached.
File: Agenda-Lower Peace_Shell Min FlowsPeer Rev Telecon 2020-04-13

Agenda-Lower Peace_Shell Min FlowsPeer Rev Te...
137.35 KB

Visit Topic

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Southwest Florida Water Management District

2379 Broad Street, Brooksville, Florida 34604-6899
(352) 796-7211 or 1-800-423-1476 (FL only)
WaterMatters.org

An Equal Opportunity Employer

The Southwest Florida Water Management District (District) does not discriminate on the basis of disability. This nondiscrimination policy involves every aspect of the District's functions, including access to and participation in the District's programs, services and activities. Anyone requiring reasonable accommodation, or would like information as to the existence and location of accessible services, activities, and facilities, as provided for in the Americans with Disabilities Act, should contact Donna Kaspari, Sr. Performance Management Professional, at 2379 Broad St., Brooksville, FL 34604-6899; telephone (352) 796-7211 or 1-800-423-1476 (FL only), ext. 4706; or email ADACoordinator@WaterMatters.org. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1-800-955-8771 (TDD) or 1-800-955-8770 (Voice). If requested, appropriate auxiliary aids and services will be provided at any public meeting, forum, or event of the District. In the event of a complaint, please follow the grievance procedure located at WaterMatters.org/ADA.

MEETING NOTICE

AGENDA

Southwest Florida Water Management District
Scientific Peer Review Panel Meeting
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

MONDAY, APRIL 13, 2020
1:00 PM TO 3:00 PM

TELECONFERENCE
Call-in number: 1 (786)-749-6127; Conference ID: 852 057 527#
Teams teleconference link: Join Microsoft Teams Meeting

Detailed Teams teleconference link:
https://teams.microsoft.com/l/meetup-join/19%3ameeting_NzI4MzRkNDAtYmFjNy00MGU0LWI5MTQtYWRiNzFjZmIxNWJl%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d

All meetings are open to the public.

1. Welcome/introductions facilitated by Doug Leeper, District MFLs Program Lead

2. Panel discussion by Dave Tomasko, Panel Chair; Y. Peter Sheng, Panelist; and Laura Bedinger, Panelist; facilitated by Doug Leeper
   a. Presentation/discussion of first round of comments/questions by each Panelist
   b. Data requests and questions for District staff
   c. Discussion of specific items/issues
   d. Discussion of next steps and assignments

3. Public comment period moderated by Doug Leeper

Participants will be asked to save their comments until the public comment portion of the teleconference. If you wish to speak during the public comment period, please identify yourself to the Moderator (Doug Leeper), who will then facilitate your input. Comments will be limited to three minutes per speaker. In appropriate circumstances, the Moderator may grant exceptions to the three-minute limit.

For questions or to submit additional public comment on the peer review of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, please use the Web Board at https://swfwmd.discussion.community/categories that has been established to allow public access to and participation in communications among the Panel Chair and other members of the independent peer review panel created to conduct the peer review. The Web Board will be available for public comment from 8:00 a.m. on April 3, 2020, through 5:00 p.m. on June 26, 2020, and available for public viewing from April 3, 2019 through at least December 31, 2020. Questions or additional public comment may alternatively be submitted to Doug Leeper by email at doug.leeper@watermatters.org, by telephone at 352-397-7840 or 1-800-423-1476 or 352-796-7211, extension 4272, or by mail at the address listed at the top of this agenda.

For persons without access to the Internet, access to the Web Board during the public comment period is available at the headquarters office of the Southwest Florida Water Management District, 2379 Broad Street, Brooksville, Florida, 8:00 a.m. – 5:00 p.m., Eastern Daylight Time, Monday through Friday.

Bartow Office
170 Century Boulevard
Bartow, FL 33830-7700
863-534-1448 or 1-800-492-7862

Sarasota Office
78 Sarasota Center Boulevard
Sarasota, FL 34240-9711
941-377-3722 or 1-800-320-3503

Tampa Office
7601 US Highway 301 North
Tampa, FL 33637-6759
813-985-7481 or 1-800-836-0797

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 13, 2020
Date: Tuesday, April 7, 2020 1:49:58 PM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - April 13, 2020

Posted Apr 07 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Attached is my summary of initial comments on the draft MFL, to be discussed, in conjunction with comments from Peter and Laura, on our next Teleconference.

Draft Peer Review comments - Tomasko - 4-07-2...
19.60 KB

Visit Topic

DRAFT OUTLINE OF COMMENTS – D. Tomasko

Comments and/or requests for clarification

1. The MFL does not incorporate some of the other regulatory programs that overlap with MFL topics:
    a. SWIM Plan not referenced (which included documentation of impacts of hydrologic alterations on health of Charlotte Harbor)
    b. No reference to Pollutant Load Reduction Goal, as laid out in SWIM Plan (see comment 3). Even though reference is made to FDEP's Numeric Nutrient Concentration (NNC) criteria.
    c. NNC criteria set by FDEP mentioned, however, nutrient forms included are not the same as the nutrient forms included in NNC criteria (see comment 5).
    d. Adoption and subsequent implementation of the proposed MFL would not complicate the TMDL, as shown in the text. But mention should be made of the PLRG, and its links to high flow requirements as necessary for the "reset button" of bottom water hypoxia in Charlotte Harbor.
    e. The MFL statute does not state that MFLs are to address every management issue, but the MFL should include language that addresses whether or not non-attainment of the MFL would make it less likely that other regulatory programs would meet their goals?
2. Related to very high flows and the "reset button" for Charlotte Harbor due to salinity stratification and bottom water hypoxia…
    a. It appears improbable that even maximum water withdrawals would reduce flows sufficient to prevent bottom water hypoxia, which requires an average flow of 10,000 CFS at Arcadia (Stoker et al 1989) – roughly equivalent to total gaged PR flow of about 20,000 cfs
    b. Proposed max withdrawal of 400 cfs represents ca. 2% of the minimum flow from PR watershed required to initiate stratification of 10 ppt in Harbor. Consequently, maximum withdrawal appears to be protective of the "reset button" of bottom water hypoxia.
    c. However, would be helpful to see the District-developed MFL reference the District-developed and NEP-approved PLRG, which is based on protecting natural phenomena of bottom water hypoxia from becoming increased ***or reduced*** by human activities
3. The MFL seems to be based upon the "significant harm threshold" of 15% for salinity-based habitats
    a. Text implies that this is to be a default approach for MFLs, to be used only if other approaches to develop thresholds were not found (e.g., fish passage of 0.6-foot depth {for UPR}, wetland inundation elevations, etc.)
    b. The wetland inundation approach and water quality approaches are modeled and results discussed, but text is not very robust that 15% threshold for salinity-habitat metric was needed as a fallback guidance for "significant harm"
    c. While used in many MFLs, a potential 14% loss of habitat being considered to be "not significant" is not universally applied, including District regulatory programs
        i. Development permits are not allowed to arbitrarily eliminate 14% of wetlands without repercussions

        ii. Coastal construction is not allowed to arbitrarily cause the loss of 14% of the seagrass habitat in, for example, Lemon Bay
        iii. Enhanced text justifying the need to defer to 15% threshold would be helpful. Is this the best approach, based on inability to identify other thresholds, or does it represent a repeated use of what has become the default metric of acceptable impacts?

4. Lack of maximum flow diversion quantity of Shell Creek is problematic
    a. Is this based on assumption that Shell Creek flows are only of concern in Lower Shell Creek?
    b. Mean annual flows for LPR (PR @ Arcadia, HC and JC) of 1,302 cfs. Mean annual flow of SC 363 cfs, so mean flow of SC ca. 28% of mean LPR flows
        i. If high flows for the LPR are important to protect the health and functioning of Charlotte Harbor (400 cfs maximum diversion) why wouldn't SC high flows be similarly considered in terms of health of the Harbor?
        ii. Not likely that max withdrawals (if set) for LSC would affect threshold values for stratification, but should be mentioned/acknowledged
5. Water quality review (Section 3.3)
    a. Make sure that analyses used "Chlorophyll-a (corrected for phaeophytin)" rather than "Chlorophyll" – too vague as to what the units were.
        i. Revise text as appropriate, or revise analyses, if needed
    b. Section 3.3.1.4 – why aren't nitrate plus nitrite and Total Kjeldahl Nitrogen (TKN) combined into Total Nitrogen (TN) for analysis?
        i. Helpful to have it broken down to this level, but NNC criteria and PLRG "hold the line" goal are both based on TN concentrations or loads, respectively
    c. Section 3.3.1.5 – why is "Orthophosphorus" examined, and not Total Phosphorus (TP)?
        i. Does this mean only dissolved inorganic phosphate (i.e., soluble reactive phosphate; SRP) examined?
        ii. If so, then SRP is potentially not conservative
        iii. If section refers to TP, then revise text to say TP
    d. Figure 3-11 – flows vs. salinity
        i. Data from stations 6 and 15.5 are located at or below the point of confluence of flows from SC into the LPR
        ii. Without accounting for SC flows, this might underestimate total flows by ca. 25 to 30%
        iii. Add in LSC flows for these relations, or explain why not relevant
    e. Figures 3-12 through 3-16
        i. Values on y-axis appear to be for Coefficient of Correlation (CC) for Spearman's Rank Correlation
            1. Spearman's used to test for monotonic but non-linear (potentially exponential) correlations of ranked data
            2. Were data not tested for parametric analyses? (even if non-linear)
        ii. Label on y-axis is of water quality parameters, not values of CC for tested relationships. Confusing.

   iii. Does the appearance of a bar imply that relationship is statistically significant? CC values alone do not by themselves imply statistical significance
   iv. Are lack of bars equal to CC value of zero, or not significant?
  f. Section 3.3.3.4 – see comments above…why reference to TKN and OP?
   i. Are nitrate and nitrite not available? Why reference to TKN, not TN?
   ii. Are data truly orthophosphorus, or Total Phosphorus?
  g. Section 3.3.4 – reference made to role of "tide, residence time, nutrients) as likely affecting chlorophyll concentrations
   i. Figure 3-26 shows summer time color values in LSC of > 200 PCU
   ii. Equal consideration should be given to potential role of color as reason for observation (Figure 3-22) of lower chlorophyll-a(?) values in summer
   iii. Is there a potential that a maximum or minimum withdrawal limit might be important for keeping color levels high enough to keep chlorophyll-a below threshold values to limit nutrient sensitivity?
6. Section 5.2 – Identification of need to change the 3-block system with set dates to a 3-block system based on flows is well developed, and that modification appears to be appropriate and logical
7. Section 5.3.1 – interpretation of results shown in Figure 5-3 seem to suggest that if flow yields match the pattern seen in Charlie Creek in 1950 to 1969, then results are "…indicating that there has not been a significant anthropogenic impact over time…"
  a. However, Kissingen Spring stopped flowing in 1950, and the MFL should discuss why Charlie Creek had more natural flow pattern than UPR in 1950 to 1969. Not saying Charlie Creek isn't a good reference, but citation of lack of agricultural or mining land uses upstream of the gage would support its use as a reference condition.
  b. How does PR @ Arcadia higher yield in 1950-1969 match up with loss of Kissingen Spring? Seems counter to the idea that flows in the Upper Peace River were <u>already</u> reduced by anthropogenic impacts by 1950
  c. Text for figure 5-3 explicitly states that Joshua Creek displays increased hydrologic yield (cfs/mi2) during April to May – more flow than in 1950 to 1969 period
   i. Yet Table 5-1 has no trend over time (Seasonal Kendall Tau) for Joshua Creek
   ii. Is it possible that Seasonal Kendall Tau finds no significant trend, because the deviation in flows is only occurring in 2 to 3 months per year?
   iii. Keep in mind that a Seasonal Kendall Tau value is calculated from 12 individual (in the case of monthly) estimates of trend. If 10 are non-trending, and 2 are strongly trending, then "overall" could be no trend.
   iv. Test for flows on a monthly time step, to ensure consistency between Table 5-1 and the interpretation or results in Figure 5-3.
  d. PRIM model results (Table 5-2) suggest reducing groundwater withdrawals will increase flow in the UPR, but decrease flows in Joshua and Charlie
   i. This differential response appears logical if the destination of groundwater withdrawals differs between the UPR and Joshua and Charlie Creeks, but it should be discussed in greater detail - why the difference in direction of response?

8. Section 5.3.3 – the PRIM model includes the assumption that irrigation efficiencies are 60 and 85% for row crops and citrus, respectively – very important to the algorithm. But where is reference for this assumption?
    a. For mechanistic models, assumptions are supposed to be generated by literature or data, then incorporated into models, and then models “calibrated” by comparing output to predictions
    b. Is this a model assumption that was based on literature, of was observed vs. modeled flows from these systems used to develop the assumed irrigation efficiencies?
9. Section 5.4 – potential techniques for developing thresholds for MFLS are briefly discussed, but then 15% threshold for “significant harm” is then relied upon for salinity-habitat metric
    a. See comments listed above.
10. Section 5.4.1 – Was not 130 cfs initially established as a breakpoint/threshold value for the upstream movement of the 2 psu isohaline?
11. Section 6.2 – The logic for a maximum withdrawal threshold not being included for Lower Shell Creek is not clear. Suggestive of a disconnect of some sort between withdrawing from Shell Creek Reservoir is not impactful to flows and ecology of Lower Shell Creek?
12. Section 6.3 – appears that flow reductions of 0, 10, 20, 40% etc. are applied and CDF plots to see what level of flow reduction creates a more than 15% decrease in salinity-habitat and floodplain inundation.
    a. While not in and of itself problematic, this should be the default approach, if other thresholds did not arise
    b. Floodplain inundation less sensitive than salinity-habitat metrics – good that not used
    c. Salinity-habitat metrics are related to essential fish habitat (EFH)? Is this implied, or actually tested? Was not sure why EFH not tied to salinity-habitat metric as much as I was expecting.

From:	Notestein, Sky
To:	Doug Leeper
Subject:	Lower Shell Creek meeting
Date:	Wednesday, April 8, 2020 10:28:02 AM
Attachments:	image001.png

Hey Doug,

Hope you're doing great and working remotely!

DEP mentioned you recently held a Lower Shell Creek teleconference meeting. I wanted to see if I could get your agenda and other posted documents and hear how the virtual meeting went.

Let me know if you have a good time for me to call around lunch or after 4 pm today.

Take care and thanks Sky

Sky Notestein
Senior Project Manager
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Water and Land Resources Division
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From:	Doug Leeper
To:	Notestein, Sky
Cc:	Yonas Ghile; Xinjian Chen; Chris Anastasiou; Kristina Deak; Chris Zajac
Subject:	RE: Lower Shell Creek meeting
Date:	Wednesday, April 8, 2020 11:04:00 AM
Attachments:	image001.png Agenda-Lower Peace Shell Min Flows Peer Rev Telecon 2020-04-03 V3.pdf Peace Shell Peer Rev Mtg Slides 2020-04-03--WITH EXTRAS V3.pdf Peer Review Sunshine Law Briefing Lower Peace and Shell Creek MFLs.pdf Virtual Site Visit Info 2020-04-03.pdf Lower Peace Shell Peer Review 2020-04-03 Teleconference Summary.pdf Email to Agencies-SWFWMD Draft Minimum Flows for Lower Peace River and Lower Shell Creek.pdf

Hey Sky:

- All good here – hope the same for you.
- RE call: 11 to 11:30 or between 12 and 1 are good for me today.
- Six files (Agenda, min flow/peer review slides, sunshine law slides, a "virtual site visit" file , a meeting summary, and a status announcement email) are attached.
    - The status announcement email includes links to relevant web pages and the webforum we are using for the peer review.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: Notestein, Sky <Sky.Notestein@srwmd.org>
Sent: Wednesday, April 8, 2020 10:28 AM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Lower Shell Creek meeting

Hey Doug,

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P

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1 posts

PeterSheng
3 hours ago

Attached is my summary of preliminary comments on the draft MFL. It is subject to modification as I continue to read the reports.

MFL review comments - Peter Sheng.docx
26.57 KB

0 0

Comments on MFL for Lower Peace River and Shell Creek

General Comments:

1. Overall effort is very comprehensive, covering all relevant aspects and issues. Reports are well written.
2. Changing from the old calendar-based blocking regime to the new flow-based blocking regime is a major improvement.
3. Hydrodynamic modeling is a big step forward from the previous effort, due to the use of 3D model and extension of model domain into the Gulf of Mexico. The 3D model is peer-reviewed and robust. Verification of the model is rigorous.
4. Uncertainty and inaccuracy of the hydrologic model remains a concern.
5. The base flow is constructed from the average flow during 1950-2014 for LPR and 1966-2014 for LSC. To account for climate change effect, however, is it more appropriate to place more weight on flow conditions in the past 20 years?
6. Considering sea level rise effect on MFL is commendable. The sea level rise values, which are based on the USACE study in 2013, appear to be at least 50% lower than those recommended by NOAA (2017) which is the leading U.S. climate agency. Are future predictions on precipitation, wind, atmospheric temperature, land use, and storms all incorporated into the new MFL?
7. Explanation on how and why the new MFL flow reduction strategy is better than the old MFL flow reduction strategy could be improved. For example, would it be useful to demonstrate that, under the new proposed MFL, the impact of flow reduction for any given year in the past 5-10 years would be much better than the old strategy?
8. Instead of measuring the impact of flow reduction in terms of 15% reduction of various habitats, is it possible to quantify the impact in terms of economic damage?
9. Southwest Florida is prone to hurricanes and hurricane-induced flooding. For example, Hurricane Elena (1985), Charley (2004), Wilma (2006), and Irma (2017) all impacted the lower Peace River area with storm surge, high flow, salinity stratification, and sometimes hypoxia. After Hurricane Charley, it was reported that flow in the Peace River peaked and water smelled like septic tank because of hypoxia. Predictions by most climate scientists suggest hurricanes will become more intense in the future. How will the proposed MFL guide the flow reduction during hurricane events?
10. Shouldn't the MFL be updated every five years, instead of every 10-15 years, in a changing climate?
11. How about creating a dynamic MFL with a realtime nowcast/forecast system for the Peace River, Shell Creek, and Charlotte Harbor region? The system can nowcast the current flow/salinity and forecast the future flow/salinity during the next 48-72 hours. Allowable flow reduction can be determined based on the nowcast/forecast flow/salinity conditions in the system.
12. SWFWMD has jurisdiction over the northern Charlotte Harbor system while SFWMD has jurisdiction over the southern part of the system, including Caloosahatchee River which sends a large amount of water into the estuarine system. Given sufficiently long time, water from Caloosahatchee could impact the flow in the northern part of Charlotte Harbor. Does the hydrodynamic model include Caloosahatchee flow as the boundary condition?

Executive Summary

1. Can someone define “significantly harmful”? Is it to be determined by the District or State Legislature?
2. What is “best information available”? Please define.
3. Second to the last line on page vii: “hydrodynamic” should be “hydrodynamic model”.
4. Base flow was divided into three flow blocks. Is it the best possible way? Can it be broken into 4 or 5 blocks? How does the MFL outcome vary with the number of blocks?
5. Any impact on the wetlands by flow reduction?
6. Should Table for LPR on page ix be numbered?
7. How do you prove the proposed MFL summarized in the table is the BEST possible?
8. Should Table for LSC be numbered?
9. It is concerning that minimum flow for SC is and will not be met for the next 20 years. Does it mean City of Punta Gorda will have water shortage for the next 20 years?
10. District is committed to “periodic” reevaluation and revision of minimum flow for LPR and LSC. Please define “periodic”.

Chapter 1 Introduction

1. Page 3 - “The proposed minimum flows, which are described in this report…..” should provide a reference to a Chapter number or Table number somewhere in the report.
2. Page 4 - Can “best information available” be defined? What is its legal definition? Scientific definition?
3. Page 6 - What are “Alternative hydrologic regimes”?
4. Can the definition of “impacted flows” be improved. It is unclear.
5. Page 11- “a loss of more than 15 percent habitat” is over how long a time period and with what time lag?
6. Does the “15% harm” guideline apply to all the habitats?
7. Is it more appropriate to consider 15% reduction in economic value?
8. To prove the success of the proposed new MFL, did the District confirm that there will not be significant harm to resources and habitats if it were applied to any year in the last five years?
9. Would the new MFL significantly reduce the harm to habitats and resources than the old MFL?
10. Page 14 – Why not use the 3D model in the rivers as well as the Charlotte Harbor?
11. Page 15 - I assume the 3D model has moving boundary feature?

Chapter 2 Physical and Hydrolgic Description

1. Figure 2-2 on Page 18: This lower left corner of this map does not look similar to a Google map for the region. Perhaps it is good to show a Google map for the region?
2. Figure 2-3 – Please explain the dark map which corresponds to the white region in the larger map shown in the inset.
3. Table 2-1. No need to show % again after the numbers.
4. What is the LiDAR data for the land area used in this MFL study? Is it 2017 data? I understand Florida took LiDAR data over Southwest Florida after Irma in 2017.
5. Page 30 – Line #2 “can all affected” should be “can all be affected”.
6. Are all elevation and bathymetry data converted to NAVD88?
7. What is the vertical datum for the water level at the open boundary condition of the 3D model?
8. On Page 37, it was said that many executive orders were issued in 2009. How were these orders determined? With modeling? What were the impact on the ecosystem and resources?
9. Do you set a goal for total water supply first, then determine the flow reduction strategy? Or is it the other way around?
10. The sentence on the bottom of page 37 “However,…..” is unclear. Please clarify.

Chapter 3 Water Quality

1. Please define “flow lags”. Is it “flow at previous x days”?
2. Figure 3-23 – label “salinity” should be “chlorophyll”.
3. Given the importance of flow and salinity in affecting the water quality and ecosystem, hydrodynamics and hydrodynamic modeling is the cornerstone of the MFL study. However, “hydrodynamic modeling” does not appear in the report until page 57 in a very short paragraph: “Given the strong interaction between freshwater flows and salt transport processes, a coupled 3D and 2D hydrodynamic model (Chen 2020) was developed to estimate responses of salinity to reductions in freshwater inflows and support development of proposed minimum flows for the Lower Peace River and Shell Creek. The hydrodynamic model is discussed briefly in Chapter 5 and in greater detail in the Appendix C.”
4. It would be appropriate for a chapter on flow, water level, and salinity with some more details on the hydrodynamic modeling effort as well as a good summary of flow and salinity in the system and how they might influence the other elements of the study. Describe the model assumptions, input and output, and setup for the various scenarios it simulated.
5. Table 3-1 tries to explain the isohaline location trend. Please explain the meaning of it more clearly with simple layman language without statistical jargons.
6. Same for Table 3-2. What is Table 3-2 trying to say? No hypoxia during summer months due to flow reduction?
7. Same for Table 3-4, 3-5, 3-6, 3-7.
8. Figure 3-12, 3-13, 3-14, 3-15, 3-16 are highly technical figures with lots of statistical terminologies. Please explain in simple language the meanings of these plots.
9. Stoker et al. (1998, USGS Report) measured the flow and salinity along the Peace River during 1982 – 1985. They found that significant salinity stratification (10 psu between bottom and surface salinity) occurred along the lower reaches of the river when Peace River flow at Arcadia was between 487 and 1420 cfs, or when 5-day sum of discharge was over 20,000 cfs. Kim et al. (2010, ECSS) found that, during 2000, bottom-water hypoxic conditions occur during

periods with relatively steady moderate to high (5-40m3/s or 180-1440 cfs freshwater inflows and sediment oxygen demand (SOD). Spring-neap tide also has significant impact on the formation of hypoxia. High flow condition is found almost throughout the B3 block period during June-October in the Base Flow. So how often is hypoxia expected to occur during the summer month with and without flow reduction? During these high flow events, can more flow be withdrawn to reduce the likelihood of salinity stratification and hypoxia?

10. Empirical, regression, and statistical models are used for the water quality analysis. In the long run, is it more appropriate to develop a dynamic water quality model for the estuarine and riverine system?

Chapter 4 Ecological Resources

1. Vegetation map shown in Figure 4-1 is from 1998. Seems outdated.
2. Figure 4-2 is difficult to see. Please use different color tones for the seagrass.
3. Page 76 – "decreased flows may also contribute to increases in dissolved oxygen concentrations." Is it so? Flow reduction will lead to increased DO?

Chapter 5 Flow Blocks, Baseline Flows, resources of concern and modeling tools relevant to minimum flows development

1. Should indicate the meaning of curves with green and blue colors. What if 1994-2014 model results are used? Climate in the past two decades is likely more different from the previous years so flow data during 1994-2014 maybe more meaningful to consider here.
2. Did the hydrodynamic simulation for the 1950-2014 and 2007-2014 periods use the appropriate atmospheric forcing including air temperature, cloud cover, wind, and ocean forcing over the region? For example, my understanding is that wind data from only one local wind station was used in the model simulation. Perhaps it would be worthwhile to use predictions by regional wind model, e.g., the NOAA NAM (North Atlantic Mesoscale) model to more accurately capture the wind influence?
3. Perhaps it would be useful to understand how and why the base flows vary with different time periods 2007-2014, 1950-2014, and 1994-2014 before determining which the best base flows are?
4. Please explain "With this new approach, the determination of transitional flow trigger (e.g. 625 cfs in the existing Lower Peace River minimum flows, Table 1-1) is not required when high flows remained depressed due to climatological conditions."
5. It might be useful to produce a "flushing map" (50% renewal time map) for the various sections of the flow system. The map can be used to aid the discussion of flow effect on DO, water quality, fishery, etc.
6. Page 77 mentions the following: "Hurricanes can cause high river-inflows events, which reduce the salinity in the area and reduce dissolved oxygen." Were these events simulated by the models used for this study?
7. Figure 5-8 shows the domain of the 3D model used for the MFL study. This should have been shown in a new chapter on hydrodynamics (flow, water level, and salinity), preceding the water quality chapter.
8. Hydrologic model prediction of the watershed flow remains to eb a weak link in the new MFL study as the previous one. Improvement is needed.

9. Figure 5-11. There is a typo in the figure caption: "independent" is mis-spelled.
10. Water quality "models" are relatively simplistic and empirical compared to the hydrodynamic model. Consider the use of a dynamic water quality model?

Chapter 6

1. During hurricanes and king tide events, is 400 cfs still the maximum flow withdrawal?
2. Should "minimum flows scenario" be replaced by "minimum flow scenarios"?
3. The stated sea level changes at Ft. Myers station for the period from 2010 to 2035 are 0.20, 0.33, and 0.76 feet, respectively. These values are lower than the latest NOAA predictions.

Appendix C Hydrodynamic Modeling

1. This Appendix deserves to be a separate Chapter.
2. The 3D hydrodynamic model is very robust and efficient. Most results generally agree well with observations.
3. Page 16, Line#5. "friction" should be "fraction".
4. Figure 3-11 on page 57 - Model simulated salinity missed several observed salinity peaks. Observed salinity range is between 10-25 psu but simulated salinity is between 20-26 psu. These occurred mostly during the hurricane season.
5. Perhaps it is useful to try to use more wind data from nearby airports, instead of only one station. Can also try to find NOAA NAM wind fields or Navy wind fields (from Naval Research Lab) for the region.
6. During the last MFL study, watershed model greatly over-estimated the flow from the watershed into Peace River and Charlotte Harbor. There is no improvement in the watershed modeling in this MFL study.
7. Good choice of skill index.
8. On page 42 – "January 2017" should be "January 2007".
9. On page 44 – "exited" should be "existed".
10. Figure 37 simulated "shoreline length". Please define. Is flooding-and-during a part of the 3D and 2D model?
11. Has alternative model domain been considered for the southern part? The alternative would move the southern boundary to the south of San Carlos Bay and use the water level and salinity provided by the USF model as boundary condition there, but use flow conditions in Caloosahatchee measured by SFWMD as boundary condition. I am assuming that the current 3D model uses the water level and salinity inside Caloosatchee provided by the USF model. If this is true, my concern is the Caloosahatchee flow is not correctly represented in the 3D simulation. Our simulations found that, given sufficient time (~ 1 month), high flow in Caloosahatchee could reach the northern Charlotte Harbor.
12. Sea level rise values for 2020, 2030, 2040, 2050 are based on USACE's estimate. On the website provided in Appendix C, it states that the sea level values are based on a 2012 study by the National Academies and a USACE report in 2013. Since 2013, there has been rapid development of new and more robust predictions on future sea level values. NOAA, the leading U.S. climate agency, published a comprehensive report on the future sea level rise values throughout the U.S., including southwest Florida. The NOAA sea level rise values for Ft. Myers area are typically

twice of the USACE values. It would be prudent to use the NOAA values and recalculate the impact of Sea Level Rise on MFL in the LPR and LSC. M<ore information can be supplied if requested by the SWFMWD.

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Member
1 posts

MFL review comments - Peter Sheng.docx
26.57 KB

QUOTE 0 0

DT

Registered Member
2 posts

David Tomasko
an hour ago

Thanks Peter. For today's meeting, I think that we should briefly summarize our comments so that the District staff will know what are comments that might require a simple correction, and what are comments that may need them to spend additional time on. For example, we don't have to review typos with them today, but I think that we could point out what are concerns that they should focus on, given the timeline for this report. I'll start off, and then if you want to go next Peter, and then Laura, if she has comments ready, or just wants to talk through her initial thoughts on the draft MFL.

0 0

L

Registered Member
1 posts

lbedinger
41 minutes ago

Yes, sounds good, Dave. I will post a quick summary of my initial thoughts before the meeting. I read both of your (yours and Peter's) posted documents and had some of the same points. I made some notes on those and the main report and appendices. One thing I would like to talk about the fish population modeling work and its source data (Appendix E).

0 0

DL

Write a reply...

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1 posts

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0 0

DL

Write a reply...

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9:17 AM
4/13/2020

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 13, 2020
Date: Monday, April 13, 2020 11:24:32 AM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - April 13, 2020

Posted Apr 13 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Sounds good, Dave. Talk to you and Laura soon.

Visit Topic

Or reply directly to this email

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 13, 2020
Date: Monday, April 13, 2020 12:00:25 PM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - April 13, 2020

Posted Apr 13 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Here are some initial thoughts and comments. I focused more on the ecology and water quality areas in these.

Bedinger_First_Comments_Peace_MFL.docx
18.71 KB

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First Comments on Proposed Minimum Flows for Lower Peace River and Lower Shell Creek

L. Bedinger

Overall

- The report was well written and thorough.
- I also thought the new blocking system seems to be an improvement on the old calendar-based one for guaranteeing flows. This seems to be a point of strong agreement.
- When using/looking at the flow record from the entire period (1950 for LPR and 1966 for LSC), might it make sense to examine that data in decadal blocks or the like to look for changes over time? This also applies to the water quality appendix where means of the entire POR are presented. Would like to see 5 or 10 year means in addition.
- Would like to further discuss the 15% reduction (vs 10% or 20% for example) in the most sensitive habitats (oligohaline) as significant harm. Is this mainly just because this number has been previously used by other MFLs? Could the report more fully explain and support use of this as the standard for "significant harm" in this system? Section 1.3.5 could have more information specific to this system (if possible). However, it does seem like a logical choice considering the need for surface water withdrawal for water supply.

Water Quality Section and Data: Chapter 3 and Appendix F

- Positive there is increased monitoring of salinity in recent years. The isohaline-based stations seem like a good idea when coupled with fixed location stations.
- Figure 3-3. Might it be better not to lump all the data from 1976 through 2016 exclusively, but show box and whiskers for smaller time periods (by decade?) as well, so the reader can look for trends? DO data (3.3.1.2) also lumped from 1976 to 2016 when shown.
- As Dave stated, specify chlorophyll *a* in section heading and first paragraph of 3.3.1.3. Again, I would like to see box and whisker of smaller time periods for this variable. There is not mention of day length being a factor driving seasonal phytoplankton biomass changes. Would it be important and separate from river flow?
- With regard to phosphorus, Appendix F (p. 5) states that since 2003 the HBMP program is "reporting phosphorus concentrations as orthophosphate (which is usually more than ninety percent total phosphorus)". A couple of comments and questions: first I think there is a typo that it should say that orthophosphate usually makes up 90% of the total phosphorous. Is orthophosphate being monitored instead of total phosphorus as it is a cheaper or simpler lab test? Is the percentage of the total phosphorus made up by orthophosphate constant in the Peace River? Maybe provide a reference or data.
- With regard to nitrogen, it appears the HBMP program is collecting samples that are analyzed for total nitrogen (1983 to 2018 in table 2.2 of Appendix F). In the main report NOx and TKN are shown rather than TN. Why? Or am I missing something? Again I would also like to see the data graphed with some visual of changes over time (decade blocks for box and whisker?).
- In dissolved oxygen and chlorophyll section/methods, there is no breakdown of readings into day or night values. Would day length/sunlight intensity that vary with seasons be worth mentioning in addition to water color and nutrients. Assuming surface DO decreases overnight and during darker periods in response to less photosynthesis by phytoplankton and benthic

algae. Is the extent of hypoxia an issues, not just that is less than a threshold value, but by how much? When water flow increases, how much is river depth affected? Is increased depth a driver of lower DO on the bottom?

Ecological Resources Section and Data: Chapter 4 and Appendix E

- I agree with Peter, the examination of plant communities from 1998 seems outdated. Maybe these plant communities should be assessed/mapped every 10 years to look for shifts?
- Was there historically more seagrass in the lower Peace River than there is now? Is this known?
- HBMP data collection has shifted away from monitoring populations of fish and macroinvertebrates in recent years to focus on physical factors, water quality, and phytoplankton (biomass via chlorophyll *a*). It is assumed that these are the drivers and that direct monitoring of biotic communities is not needed or not informative? Would data on these communities and benthic algae also be important for assessing the MFL?
- It looks like FIM collected fish data during 2016 but the modeling in Appendix E only includes data collected from 1996 to 2013. The report does not address changes from 2013 to 2016. Since the MFL was implemented in 2010, it seems like recent changes would be most informative and helpful for assessing the MFL.
- How reliable are the designations of euryhaline etc. when applied to the animals? Are they being found where they are supposed to be? (I mean in LPR and LSC are animals showing any flexibility in habitat/distribution when compared with predicted distribution with regard to average salinity.)
- Should sawfish (*Pristis pectinata*) and manatee habitat in LPR be given special attention due to their special statuses with regard to protection? Maybe the species chosen for the HSM model adequately represent the needs of sawfish? Could the main report text be more specific about the salinity requirements of sawfish at different life stages?
- With regard to the methods of the HSM modeling and data collection: it appears there are a couple of layers of extrapolation. CPUE is predicted based on biotic variables, then the predicted CPUE information was used to extrapolate population abundance, then the effect of water withdrawals on each species-life stage was modeled. Just want to make sure I understand and point out the layering of extrapolation. The model uses data collected through 2013. Will more recent data be input soon? Are the factors used to estimate populations enough? Are things like fishing and disturbance (dredging? Bottom types/structure) not also important?
- It looks like no benthic invertebrate sampling has been conducted since the implementation of the MFL. Maybe this should be implemented at least every 10 years (if not every five). These organisms role in food webs and for water filtration and grazing of benthic algae should be mentioned. More on the recent status of oyster populations could also be included.

Questions

- Is the lack of a rule for maximum withdrawal from Shell Creek a jurisdiction issue?
- What are the future plans for monitoring the fish, invertebrate, and other biotic communities going forward to continue to assess how the minimum flow implementation is affecting them?

Small Edits

- Use lowercase for common names, example: “blue crab”.
- Table 1-1 could have within cell formatting improved to match text in final column to the column that precedes it (the lines are not spaced out in the final column).
- Consider using ISO date format in tables (example Table 2-3).
- Page 47. “higher **in** surface water”
- Page 49. “food” repeats in first sentence of first paragraph
- Use spaces on either side of an equals sign.
- Appendix E page 7 “BF” appears, but should be “BL” in Creation of HSM maps?
- Wording of the first sentence of 5.1 needs to be improved “resources of concern”.
- Page 88 “The PRIM was run on data from a 13 year period” – second paragraph
- Wording in bottom paragraph on page 98 “freshwater plants tolerant of low salinity”
- Page 113 < 2 **psu** in second paragraph

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 13, 2020
Date: Monday, April 13, 2020 12:57:20 PM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - April 13, 2020

Posted Apr 13 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Laura: Thanks! After intro from Doug, are you guys okay with me going through my comments first, and then perhaps Laura, and then Peter. Chair, then alphabetical? I think that our goal here is not to get an answer to everything, but we've given the District a rough outline of our comments, so that they can come back at the next meeting with responses. this should cut back on the time needed for producing our initial draft report.

Dave

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Or reply directly to this email

Email followed content: Never Weekly | Daily | **Immediately** |

To unsubscribe from these emails, you can unfollow this topic.

From:	Angel Martin
To:	Doug Leeper
Subject:	Minimum Flows--Lower Peace River and Lower Shell Creek
Date:	Monday, April 13, 2020 5:01:07 PM

As per the discussion concerning the subject peer review panel teleconference for the Lower Peace River and Lower Shell Creek, the following are my comments/suggestions for consideration that I briefly discussed.

1. Concerning the stratification of freshwater/saltwater in the open waters of Charlotte Bay, Mr. Tomasko clearly answered my questions and described the processes involved when a large volume of freshwater is discharged to the bay. I suggest that the two reports that Mr. Tomasko referred to be included in the final report.
2. Suggest further discussion of the base flow component determined with the modeling and how reasonable is this component when compared to other available information.
3. Suggest adding some discussion in the final report (a paragraph or two) on model limitation and uncertainty (as discussed by Mr. Sheng) and which parameters may be more uncertain for developing minimum flows and levels.
4. Suggest adding a section on possible future data collection and updating the analysis and models. For example, perhaps additional vegetation data are needed. Also, there are locations where tributaries may require gaging for better model simulation and analysis. Additional data may be required to reduce model uncertainty as discussed in item 3 above. As mentioned during the teleconference by others, the analysis should be reviewed on a regular and systematic basis. As additional data are collected and analyzed, the models should be updated and revised and the minimum flows and levels adjusted, if warranted.

I appreciate being able to comment on this important work. Please contact me if you need any additional information or clarification.

____

Angel Martin
813-767-6944

From: Doug Leeper
To: Angel Martin
Cc: Yonas Ghile; Xinjian Chen; Kristina Deak; Chris Anastasiou; Chris Zajac; Randy Smith; Eric DeHaven; Adrienne E. Vining; Mike R. Bray
Subject: RE: Minimum Flows--Lower Peace River and Lower Shell Creek
Date: Tuesday, April 14, 2020 7:52:00 AM

Angel:

- Thanks for contributing to the Lower Peace River/Lower Shell Creek minimum flows peer review teleconference yesterday and submitting your comments in writing.
- Your comments will be shared with staff for consideration and noted in the meeting summary that will be prepared for yesterday's teleconference.
- With your permission, I will also post your email to the peer review webforum. Let me know if this is OK or you would prefer that I not do so.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: Angel Martin <amartin217@tampabay.rr.com>
Sent: Monday, April 13, 2020 5:01 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Minimum Flows--Lower Peace River and Lower Shell Creek

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____

Angel Martin
813-767-6944

From: Angel Martin
To: Doug Leeper
Subject: RE: Minimum Flows--Lower Peace River and Lower Shell Creek--Reply
Date: Tuesday, April 14, 2020 9:01:56 AM

OK to post. Thanks for the opportunity to comment.

____

Angel Martin

From: Doug Leeper [mailto:Doug.Leeper@swfwmd.state.fl.us]
Sent: Tuesday, April 14, 2020 7:52 AM
To: Angel Martin <amartin217@tampabay.rr.com>
Cc: Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>; Xinjian Chen <Xinjian.Chen@swfwmd.state.fl.us>; Kristina Deak <Kristina.Deak@swfwmd.state.fl.us>; Chris Anastasiou <Chris.Anastasiou@swfwmd.state.fl.us>; Chris Zajac <Chris.Zajac@swfwmd.state.fl.us>; Randy Smith <Randy.Smith@swfwmd.state.fl.us>; Eric DeHaven <Eric.Dehaven@swfwmd.state.fl.us>; Adrienne E. Vining <Adrienne.Vining@swfwmd.state.fl.us>; Mike R. Bray <Mike.Bray@swfwmd.state.fl.us>
Subject: RE: Minimum Flows--Lower Peace River and Lower Shell Creek

Angel:

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- Your comments will be shared with staff for consideration and noted in the meeting summary that will be prepared for yesterday's teleconference.
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Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
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2379 Broad Street (U.S. Hwy. 41 South)
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I appreciate being able to comment on this important work. Please contact me if you need any additional information or clarification.

____

Angel Martin
813-767-6944

DL

Moderator

95 posts

Doug Leeper

13 days ago

Written comments e-mailed to Doug Leeper by Angel Martin on April 13, 2020, based on his oral comments provided during the April 13, 2020 peer review panel teleconference.

<><><><><>

As per the discussion concerning the subject peer review panel teleconference for the Lower Peace River and Lower Shell Creek, the following are my comments/suggestions for consideration that I briefly discussed.

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I appreciate being able to comment on this important work. Please contact me if you need any additional information or clarification.

Angel Martin

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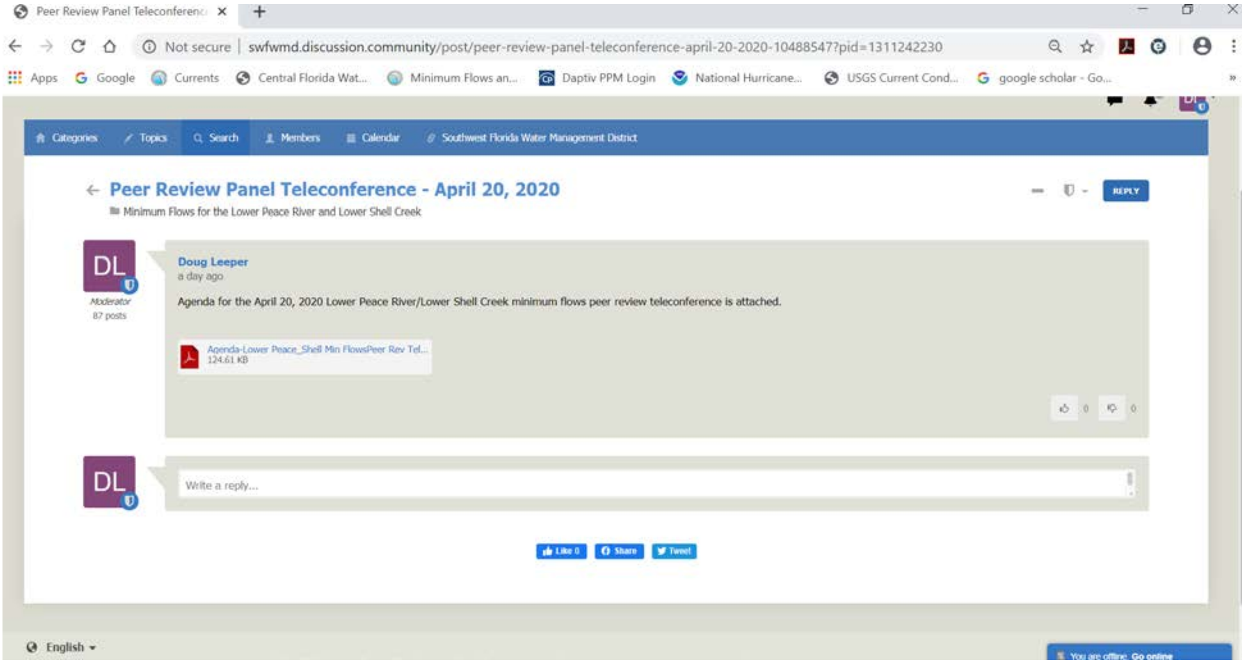

Peer Review Panel Teleconferenc
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Minimum Flows for the Lower Peace River and Lower Shell Creek
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Doug Leeper
a day ago
Agenda for the April 20, 2020 Lower Peace River/Lower Shell Creek minimum flows peer review teleconference is attached.
Agenda-Lower Peace_Shell Min FlowsPeer Rev Tel...
124.61 KB
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Southwest Florida Water Management District

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(352) 796-7211 or 1-800-423-1476 (FL only)
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MEETING NOTICE

AGENDA

Southwest Florida Water Management District
Scientific Peer Review Panel Meeting
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

MONDAY, APRIL 20, 2020
1:00 PM TO 3:00 PM

TELECONFERENCE
Call-in number: 1 (786)-749-6127; Conference ID: 694 903 32#
Teams teleconference link: Join Microsoft Teams Meeting

Detailed Teams teleconference link:
https://teams.microsoft.com/l/meetup-join/19%3ameeting_ZTJjOTA1NjUtZDhlYS00MjRlLWFjZDItYjBkOTY4NWZmMjU2%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d

All meetings are open to the public.

1. Welcome/introductions facilitated by Doug Leeper, District MFLs Program Lead

2. Panel discussion by Dave Tomasko, Panel Chair; Y. Peter Sheng, Panelist; and Laura Bedinger, Panelist; facilitated by Doug Leeper
   a. Discussion of initial panel comments/questions and initial District responses
   b. Discussion of any additional panel comments/questions
   c. Discussion of next steps and assignments

3. Public comment period moderated by Doug Leeper

Participants will be asked to save their comments until the public comment portion of the teleconference. If you wish to speak during the public comment period, please identify yourself to the Moderator (Doug Leeper), who will then facilitate your input. Comments will be limited to three minutes per speaker. In appropriate circumstances, the Moderator may grant exceptions to the three-minute limit.

For questions or to submit additional public comment on the peer review of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, please use the Web Board at https://swfwmd.discussion.community/categories that has been established to allow public access to and participation in communications among the Panel Chair and other members of the independent peer review panel created to conduct the peer review. The Web Board will be available for public comment from 8:00 a.m. on April 3, 2020, through 5:00 p.m. on June 26, 2020, and available for public viewing from April 3, 2019 through at least December 31, 2020. Questions or additional public comment may alternatively be submitted to Doug Leeper by email at doug.leeper@watermatters.org, by telephone at 352-397-7840 or 1-800-423-1476 or 352-796-7211, extension 4272, or by mail at the address listed at the top of this agenda.

For persons without access to the Internet, access to the Web Board during the public comment period is available at the headquarters office of the Southwest Florida Water Management District, 2379 Broad Street, Brooksville, Florida, 8:00 a.m. – 5:00 p.m., Eastern Daylight Time, Monday through Friday.

Bartow Office
170 Century Boulevard
Bartow, FL 33830-7700
863-534-1448 or 1-800-492-7862

Sarasota Office
78 Sarasota Center Boulevard
Sarasota, FL 34240-9711
941-377-3722 or 1-800-320-3503

Tampa Office
7601 US Highway 301 North
Tampa, FL 33637-6759
813-985-7481 or 1-800-836-0797

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 20, 2020
Date: Thursday, April 16, 2020 12:25:29 PM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - April 20, 2020

Posted Apr 16 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I got the notification, Doug.

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To unsubscribe from these emails, you can unfollow this category or unfollow this topic.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 20, 2020
Date: Thursday, April 16, 2020 1:11:21 PM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - April 20, 2020

Posted Apr 16 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

This worked for me

Visit Topic

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 20, 2020
Date: Thursday, April 16, 2020 5:43:01 PM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - April 20, 2020

Posted Apr 16 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Works for me as well!

Visit Topic

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Email followed content: Never Weekly | Daily | **Immediately** |

To unsubscribe from these emails, you can unfollow this category or unfollow this topic.

DL

Moderator
90 posts

Doug Leeper
a few seconds ago

Peer review status slides used for discussion led by Doug Leeper during the 2020-04-20 Lower Peace River/Lower Shell Creek minimum flows peer review panel teleconference.

Peace_Shell Peer Review Status Slides 2020-04-2...
211.94 KB

Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Peer Review Status

April 20, 2020

Doug Leeper
MFLs Program Lead

Minimum Flows

- The **minimum flow** for a given watercourse is the limit at which further <u>withdrawals</u> would be significantly harmful to the water resources of the area. *– Section 373.042, Florida Statutes*

- Minimum flow rules are used in District permitting and planning programs

Some Legal Directives for Minimum Flows and Levels

Sections 373.042 and 373.0421, Florida Statutes and Rule 62-40.473, Florida Administrative Code

- Address natural seasonal fluctuations, nonconsumptive uses and environmental values
- Use best information available
- Consider changes and structural alterations to waters and watersheds and their effects on hydrology
- Recovery or prevention strategies must be implemented when minimum flows and levels are not currently being met or not expected to be met within 20 years
- Minimum flows and levels are to be reevaluated periodically and revised as needed
- May use **independent scientific peer review**

Peer Review Panelist's Charge

- Complete conflict of interest form
- Prepare monthly progress reports
- Review draft minimum flow report and other appropriate materials
- Participate in meeting/teleconferences and post information to the web board
- Provide as-needed follow-up services
- Additional panel chair tasks: agenda and report preparation and posting, task assignments.
- Collaborate on an initial peer review panel report, review District staff's response to the initial panel report and collaborate on a final peer review panel report to (*see next slide*):

Peer Review Panelist's Charge (paraphrased from agreement language)

- Determine whether District conclusions are supported by analyses/results presented
- Determine whether data/information were properly collected and used, any data exclusions were justified, and the data were the best available information
- Determine whether technical assumptions are clearly stated, reasonable and consistent with the best available information, and if better analyses could be used
- Determine whether procedures and analyses were appropriate and reasonable, based on the best available data, correctly applied, limitations were handled appropriately, and conclusions are supported by the data
- For methods judged to be not scientifically reasonable, describe scientific deficiencies, identify remedies, if any, or alternative methods
- As appropriate, identify and characterize effort involved for preferred alternative methods that could be used in lieu of scientifically reasonable methods that were used

Peer Review Schedule

Event/Item	Start	End
Peer review initiated; conflict of interest forms completed	3/25/2020	3/25/2020
Panelists review minimum flows report	3/25/2020	4/02/2020
Publicly-noticed kick-off meeting (teleconference), 9:00 am - 12:00 pm	4/03/2020	4/03/2020
WebForum (WebBoard): posting WebForum (WebBoard): viewing	4/03/2020 4/03/2020	6/26/2020 12/31/2020
Teleconference, 1:00 - 4:00 pm Teleconference, 1:00 - 4:00 pm Teleconference, 1:00 - 4:00 pm	4/13/2020 4/20/2020 4/27/2020	4/13/2020 4/20/2020 4/27/2020
Panelists post written review comments on web board and collaborate on an initial peer review panel report	4/03/2020	4/30/2020
Panel takes a brief hiatus while staff prepares response to initial peer review, and revises the minimum flow report	5/01/2020	5/29/2020

Peer Review Schedule (continued)

Event/Item	Start	End
Panelists review staff response to initial peer review and revised minimum flow report	6/01/2020	6/05/2020
Teleconference, 1:00 - 3:00 pm Teleconference, 1:00 - 3:00 pm	6/08/22020 6/22/2020	6/08/22020 6/22/2020
Panelists post written review comments on web board and collaborate on an initial peer review panel report	6/01/2020	6/26/2020
Panelists provide as-needed services (e.g., consultation, additional review, Governing Board presentation)	6/29/2020	12/31/22020

Information on the District Web Site

- Minimum flows and level documents and reports: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports
- Minimum flows page for the Lower Peace River and Lower Shell Creek: https://www.swfwmd.state.fl.us/projects/mfls/lower-peace-river/lower-shell-creek
- Meeting/teleconference announcements posted on the Boards, Meetings & Events calendar: https://www.swfwmd.state.fl.us/about/calendar/month
- SWFWMD WebForum: https://swfwmd.discussion.community

Contact Information

Name: Douglas A. Leeper

Title: MFLs Program Lead

Mail: Southwest Florida Water Mgmt. District
2379 Broad St.
Brooksville, FL 34604-6899

Phone: 1-800-423-1476 or 352-796-7211, Extension 4272

E-Mail: doug.leeper@watermatters.org

Web Site: watermatters.org

DL

Moderator
89 posts

Doug Leeper
a few seconds ago

Draft summary of the April 13, 2020 Lower Peace River/Lower Shell Creek minimum flows peer review panel teleconference is attached. Draft was prepared and reviewed by Doug Leeper and Dave Tomasko. Once reviewed/revised/approved by Lara Bedinger and Peter Sheng (and Doug Leeper and Dave Tomasko if changes are made) a final version of the summary will be posted to the webforum. Approval can occur through the webforum or during the panel's teleconference scheduled for 4/20/2020.

W Lower Peace_Shell Peer Review 2020-04-13 Telec...
30.51 KB

QUOTE

MEETING SUMMARY

Southwest Florida Water Management District
Scientific Peer Review Panel Teleconference
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Facilitated as a Video and Telephone-Based Teleconference

April 13, 2020

The Southwest Florida Water Management District (District) organized and facilitated a meeting of the independent scientific peer review panel reviewing a draft District report on proposed minimum flows for the Lowe Peace River and Lower Shell Creek. The meeting was facilitated as a teleconference/videoconference using the Microsoft Teams Videoconferencing Platform.

The meeting was held from 9:00 a.m. to approximately 3:20 p.m. on April 13, 2020.

The meeting was advertised in the Florida Administrative Register and on the District's web site. In addition, notifications concerning the event were distributed to local governments, other agencies, and stakeholder groups or representatives.

Meeting participants that chose to identify themselves included:

Peer Review Panel
Laura Bedinger, Peer Review Panelist
Peter Sheng, Peer Review Panelist
Dave Tomasko, Peer Review Panel Chair

District Staff

Chris Anastasiou	Yonas Ghile	Randy Smith
Mike Bray	Doug Leeper	Adrienne Vining
XinJian Chen	Dennis Ragosta	Chris Zajac
Kristina Deak	Cindy Rodriguez	

Others
Angel Martin
Unidentified stakeholder

The meeting was initiated by Doug Leeper with panelist introductions and identification of other participants.

Mr. Leeper then led a brief discussion of logistical issues for the review process, including submission of monthly progress reports to the District by each panelist and development of summaries for panel teleconferences.

Dave Tomasko, Laura Bedinger and Peter Sheng subsequently summarized their initial comments on the District's draft minimum flows report. These discussions were facilitated using written comments each panelist had previously posted the review webforum based on their initial review of the District's draft minimum flows report. In general, the panelists noted that the draft minimum flows report was well-written, relatively understandable. They indicated that at this time, there initial review has not identified any apparent "fatal flaws" in the work supporting development of the proposed minimum flows, but noted that there a several issues that should or could be addressed currently or in the future to support minimum flows development, implementation or reevaluation for the Lower Peace River and Lower Shell Creek.

The panel and District staff agreed that it would be appropriate for District staff to begin developing written responses to all comments included in the panelist's initial written comments and questions. In addition, all agreed that is likely some responses to panelist comments and questions can be developed and as appropriate, acted upon and considered by the panel on a relatively near-term basis, while others may be associated with identification of potential actions that if implemented, would be expected to occur on a long-term basis.

District staff indicated they would begin working on written responses to all initial comments of the panelists and would post available responses to the review webforum prior to the panel's teleconference scheduled for April 20, 2020. The panelists indicated they planned to review and discuss the available District responses during their April 20, 2020 teleconference.

Dr. Tomasko indicated that he planned to compile all panelist comments and District responses in a preliminary draft of the panel's initial peer review report by April 24, 2020. The panel agreed that it would plan on discussing and reviewing the preliminary draft of the initial review report during the panel teleconference scheduled for April 27, 2020, in anticipation of completing their initial peer review panel report by April 30, 2020.

Following the panel's discussion of their initial review findings and plans for development of an initial peer review report, Mr. Leeper asked if any members of the public wished to provide any comment on the peer review process or the proposed minimum flows. One stakeholder, Angel Martin, provided input that included: a question regarding known information regarding the effects of large inflows from the Peace River on biota in Charlotte Harbor; the reasonableness of river base flows used in minimum flow analyses; the need for additional discussion of uncertainties associated with the hydrodynamic modeling used for minimum flows development; and discussion of the need for additional, future data collection efforts in the greater, Lower Peace River/Lower Shell Creek/Charlotte Harbor system. Mr. Martin indicated he would submit his comments to the District in written form; these comments were posted to the review webforum by Mr. Leeper.

DL

Moderator
91 posts

Doug Leeper
a few seconds ago

Initial, draft District staff responses to initial comments developed by the Lower Peace River/Lower Shell Creek minimum flows peer review panel.

Draft Peer Rev comms-Sheng_Dist Resp 2020-04-... 292.80 KB

Draft Peer Rev comms-Tomasko_District Resp 202... 220.78 KB

Draft Peer Rev comms-Bedinger_Dist Resp 2020-0... 199.54 KB

NOTES:

- Original comments by Laura Bedinger from 2020-04-13 in blue font.
    - Blue highlighting in the original comments identifies potential typos in the original comments that were revised and identified for consideration.
- District responses in black-font *italics*; excerpts from the original minimum flows report in black-font (not italicized).
    - Yellow-highlighted text in District responses indicates potential changes (revisions, deletions and additions) to the text of the original draft minimum flows report.
    - Note that some District responses are currently “in development”, and all District responses should be considered preliminary and potentially subject to change.
- File version (date): 2020-04-20.

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First Comments on Proposed Minimum Flows for Lower Peace River and Lower Shell Creek
L. Bedinger

Overall

- The report was well written and thorough.

  Response:
  We thank you for this comment.

- I also thought the new blocking system seems to be an improvement on the old calendar-based one for guaranteeing flows. This seems to be a point of strong agreement.

  Response:
  We thank you for this comment.

- When using/looking at the flow record from the entire period (1950 for LPR and 1966 for LSC), might it make sense to examine that data in decadal blocks or the like to look for changes over time? This also applies to the water quality appendix where means of the entire POR are presented. Would like to see 5 or 10 year means in addition.

  Response:
  The historic flow records for Lower Peace River and Shell Creek were examined using mean annual flows (Section 2.71 of the draft minimum flows report). As part of baseline flow development for Lower Peace River, the historic flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Charlie Creek were examined in multi-decadal blocks (roughly 20 years) as shown in Figure 5.3 of the draft report. As part of minimum flow assessment for the Lower Peace River, 5- and 10 -year moving averages were calculated for river flows under baseline, minimum flow and existing flow scenarios (see Table 7.1).

- Would like to further discuss the 15% reduction (vs 10% or 20% for example) in the most sensitive habitats (oligohaline) as significant harm. Is this mainly just because this number has been previously used by other MFLs? Could the report more fully explain and support use of this as the standard for "significant harm" in this system? Section 1.3.5 could have more information specific to this system (if possible). However, it does seem like a logical choice considering the need for surface water withdrawal for water supply.

  Response:
  Response development is in progress.

Water Quality Section and Data: Chapter 3 and Appendix F

- Positive there is increased monitoring of salinity in recent years. The isohaline-based stations seem like a good idea when coupled with fixed location stations.

  Response:
  We agree and thank you for this comment.

- Figure 3-3. Might it be better not to lump all the data from 1976 through 2016 exclusively, but show box and whiskers for smaller time periods (by decade?) as well, so the reader can look for trends? DO data (3.3.1.2) also lumped from 1976 to 2016 when shown.

  Response:
  Janicki Environmental, Inc. (2019) performed a time-series analysis for each water quality constituent at each monitoring station, with particular emphasis on distinguishing between the effects of periods prior to and after implementation associated with implementation of the currently established minimum flows, by separating data collected before and after January 1, 2011. The evaluation showed no significant deleterious alteration of any water quality constituent.

  They also supplied time series plots for constituents over time within their report (pp. 35-39 of JEI, Inc. [2019], which is included as an appendix to the draft minimum flows report) and the appendices of their report (Appendix F and G), which the reader may be directed to for further information. From evaluation of the time series plots, the relatively large error bars shown in the box and whisker plots likely reflect seasonal variation, rather than significant inter-annual variation. Further analysis of temporal variation by smaller subsets of years is unlikely to yield additional informative results. That being said, it should be a relatively quick job in R to produce the requested plots. We will further evaluate whether these additional analyses are necessary.

- As Dave stated, specify chlorophyll *a* in section heading and first paragraph of 3.3.1.3. Again, I would like to see box and whisker of smaller time periods for this variable. There is not mention of day length being a factor driving seasonal phytoplankton biomass changes. Would it be important and separate from river flow?

<u>*Response:*</u>
Atkins (2014b) examined variability in Lower Peace River Chlorophyll A in relation to solar radiation. By principal component analysis of all available data for the system, levels of solar radiation described less variance than did variables related to freshwater inflows, including lagged flows, water age, water color, and upstream nutrient loading rates. Flow-mediated characteristics could be characterized for different segments of the estuary and differing temporal intervals, whereas light and temperature metrics did not allow for separation among river segments.

Some early spring increases in phytoplankton densities in the lower Peace River coincide with an increase in light intensity, higher water temperatures, and longer water ages, particularly when coupled with regeneration of nitrogen from organic-rich sediments delivered from previous wet-season high river flows. These spring increases may also be influenced by relatively brief periods of freshwater inflows from seasonal cold fronts. High flow conditions in the wet summer months may increase water color, significantly limiting sunlight attenuation in the water column, regardless of day length. Phytoplankton declines in the fall can be related to continued high water color from continued freshwater inflow, followed by a breakdown in thermal/salinity stratification in November and December and a combination of declining temperature and flows.

- With regard to phosphorus, Appendix F (p. 5) states that since 2003 the HBMP program is "reporting phosphorus concentrations as orthophosphate (which is usually more than ninety percent total phosphorus)". A couple of comments and questions: first I think there is a typo that it should say that orthophosphate usually makes up 90% of the total phosphorous. Is orthophosphate being monitored instead of total phosphorus as it is a cheaper or simpler lab test? Is the percentage of the total phosphorus made up by orthophosphate constant in the Peace River? Maybe provide a reference or data.

<u>*Response:*</u>
You are correct regarding the typo: the sentence in should state that orthophosphate typically makes up to 90% of total phosphorous per the HBMP. Total phosphorous data are not currently reported at all HBMP stations, so orthophosphate was analyzed by Janicki (2019) in addition to total phosphate from available sites (1997-2018). Total phosphorous concentrations from HBMP sites were evaluated in relation to freshwater inflow in the 2010 Lower Peace minimum flows study (SWFWMD 2010) and no relationships were found.

- With regard to nitrogen, it appears the HBMP program is collecting samples that are analyzed for total nitrogen (1983 to 2018 in table 2.2 of Appendix F). In the main report NOx and TKN are shown rather than TN. Why? Or am I missing something? Again, I would also like to see the data graphed with some visual of changes over time (decade blocks for box and whisker?).

Response:
The samples analyzed for TN referenced in Table 2.2 of Appendix F to the draft minimum flows report refer to the moving isohaline-based locations. The main report uses figures from the fixed station-based locations in order to show spatial variability. These figures were produced by Janicki (2019) for NOX and TKN. Appendix F includes temporal plots for each parameter analyzed for both the moving isohaline-based and fixed station-based locations.

- In dissolved oxygen and chlorophyll section/methods, there is no breakdown of readings into day or night values. Would day length/sunlight intensity that vary with seasons be worth mentioning in addition to water color and nutrients. Assuming surface DO decreases overnight and during darker periods in response to less photosynthesis by phytoplankton and benthic algae. Is the extent of hypoxia an issue, not just that is less than a threshold value, but by how much? When water flow increases, how much is river depth affected? Is increased depth a driver of lower DO on the bottom?

Response:
There is insufficient data to provide partitioning of into day/night values and analyses for dissolved oxygen and chlorophyll. One continuous recorder was established for dissolved oxygen at RK 12.7. For HBMP sampling, monthly water samples were taken for the moving isohaline and fixed sampling stations were sampled near high tide.

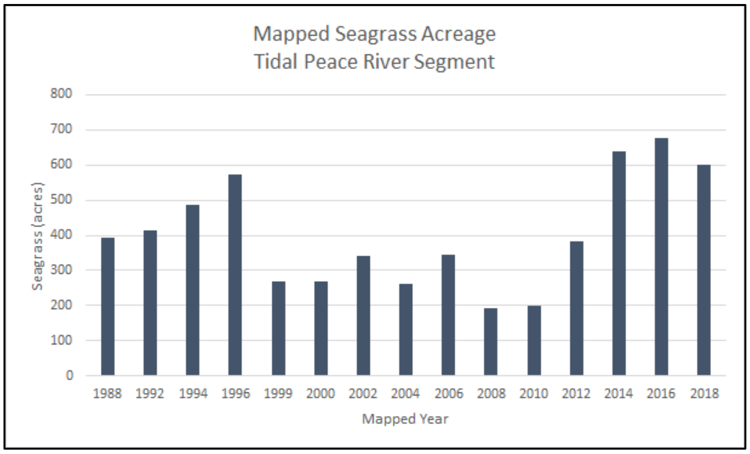
Ecological Resources Section and Data: Chapter 4 and Appendix E

- I agree with Peter, the examination of plant communities from 1998 seems outdated. Maybe these plant communities should be assessed/mapped every 10 years to look for shifts?

Response:
We will review available vegetation and land-use land cover information to determine whether these data can be used to augment the characterization of Lowe Peace/Shell System vegetation in the draft minimum flows report. In addition, we will consider vegetation data collection and mapping needs for future evaluations of the system.

- Was there historically more seagrass in the lower Peace River than there is now? Is this known?

Response:
The District has been mapping seagrasses in Charlotte Harbor using aerial photography since 1988. Others have attempted to use older imagery to infer historical seagrass extent, but with very limited success. For the Tidal Peace River segment of Charlotte Harbor, seagrass extent is greater today than in 1988, as shown below. We will consider including this figure (or a similar figure) and associated text in the revised version of the draft minimum flows report.



- HBMP data collection has shifted away from monitoring populations of fish and macroinvertebrates in recent years to focus on physical factors, water quality, and phytoplankton (biomass via chlorophyll *a*). It is assumed that these are the drivers and that direct monitoring of biotic communities is not needed or not informative? Would data on these communities and benthic algae also be important for assessing the MFL?

  Response:
  In 1996, the Charlotte Harbor HBMP Scientific Review Panel reviewed the ongoing elements of the HBMP program and recommended several changes to the monitoring program study elements. The Panel recommended that HBMP monitoring should primarily focus on assessing long-term trends in key physical, chemical, and biological characteristics that can be directly linked to potential effects associated with withdrawals at the Peace River Manasota Regional Water Supply Authority's Peace River Facility. The Panel also noted that less effort should be focused on indirect biological indicators that are not intended to evaluate influence of withdrawals, once a baseline level of information has been collected.

  We believe the information that has been collected to date and summarized in our draft minimum flows report is sufficient for a determination of recommend minimum flows for the Lower Peace/Shell System. We continue to support ongoing data collection efforts for the system and will consider additional sampling and analytical efforts as needed, for future minimum flow reevaluations.

- It looks like FIM collected fish data during 2016 but the modeling in Appendix E only includes data collected from 1996 to 2013. The report does not address changes from 2013 to 2016. Since the MFL was implemented in 2010, it seems like recent changes would be most informative and helpful for assessing the MFL.

  Response:
  This will be taken into consideration for future evaluations of the system.

- How reliable are the designations of euryhaline etc. when applied to the animals? Are they being found where they are supposed to be? (I mean in LPR and LSC are animals showing any flexibility in habitat/distribution when compared with predicted distribution with regard to average salinity.)

  __Response:__
  The fish population modeling using habitat suitability was not used as a criterion for development of the proposed minimum flows, rather it was used for consideration of potential effects of implementation of the proposed minimum flows on representative, important taxa populating the system. Because the model does not incorporate some factors, such as competition, predation and fishing pressure that can affect fish and invertebrate distributions, we used the model to assess how habitat suitability zones simulated under baseline condition would change with implementation of the proposed minimum flows.

- Should sawfish (*Pristis pectinata*) and manatee habitat in LPR be given special attention due to their special statuses with regard to protection? Maybe the species chosen for the HSM model adequately represent the needs of sawfish? Could the main report text be more specific about the salinity requirements of sawfish at different life stages?

  __Response:__
  Juvenile sawfish (<3 years of age) are able to move in response to salinity fluctuations with high site fidelity upon a return to baseline conditions, with largescale movement most notable after significant freshwater inflow (>500 m^3/s) from tropical disturbances (Poulakis 2016). Sawfish movements examined in the Caloosahatchee River demonstrate downstream movement when salinities approach 0 psu and upstream movement at salinities approaching 30 psu (Poulakis 2013). Therefore, protection of the sensitive salinity habitat would not positively affect their distribution, although maintenance of natural freshwater flows would benefit their capacity to locate nursery grounds (Poulakis 2016). The species chosen for the HSM model reflect those with affinities for low salinity habitats.

- With regard to the methods of the HSM modeling and data collection: it appears there are a couple of layers of extrapolation. CPUE is predicted based on biotic variables, then the predicted CPUE information was used to extrapolate population abundance, then the effect of water withdrawals on each species-life stage was modeled. Just want to make sure I understand and point out the layering of extrapolation. The model uses data collected through 2013. Will more recent data be input soon? Are the factors used to estimate populations enough? Are things like fishing and disturbance (dredging? Bottom types/structure) not also important?

  __Response:__
  Catch-per-unit-effort (CPUE) is a direct calculation from FIM catch data, standardized to the gear type used. These data, the data use for development of the habitat suitability models, and the modeling results were considered the best available data at the time for consideration in support of the development of the proposed minimum flows.

As noted in our response to one of your previous comments above we noted that like all models, the habitat models that we used to assess habitat suitability for several estuarine taxa, include some limitations. However, we think they are reasonably suited for our consideration of potential changes in habitat suitability between the baseline flow condition and conditions associated with flow reductions that would actually exceed the allowable flow reductions that are prescribed by the proposed minimum flows. On this last issue, please note that a maximum withdrawal limit was not used to develop the minimum flow-related record used to characterize habitat suitability for the "minimum flows" scenario.

The habitat suitability models, in their current or an enhanced form may be used for future minimum flow evaluations for the Lower Peace River and Lower Shell Creek. They would likely not be used if alternative tools that provide superior information were to become available.

- It looks like no benthic invertebrate sampling has been conducted since the implementation of the MFL. Maybe this should be implemented at least every 10 years (if not every five). These organisms role in food webs and for water filtration and grazing of benthic algae should be mentioned. More on the recent status of oyster populations could also be included.

Response:
Oysters: As of December 2019, the Florida Fish and Wildlife Conservation Commission GIS database for oyster habitat does not extend into the Lower Peace River system. The preliminary results of the 2017 Trabue Harborwalk Oyster Habitat Restoration project indicate the successful production of >360,000 oysters and an increase of approximately 1 million macroinvertebrates over a one year period in the northern Charlotte Harbor (Geselbracht et al. 2017). Updated analysis of benthic invertebrate community assemblages should be incorporated into future evaluations of the Lower Peace River system.

Development of this response indicated that while the Geselbracht et al. (2017) report was included in the literature cited section, a follow-up report (Geselbracht et al. 2018) was not. Also, the listing of a report by Gates (2009) was found to be incorrectly ordered in the list of cited literature and a typo was noted in the Gelesbracht et al. (2018) listing. Excerpted citations from the draft minimum flows report are shown below with planned corrections and the addition of the 2018 report by Geselbracht and others highlighted in yellow.

Gates, M.T. 2009. Hydrologic conditions of the Upper Peace River in Polk County, Florida.

Geselbracht, L., Graves, A., and ~~Brich~~ Birch, A. 2017. Trabue Harborwalk oyster habitat restoration project: overview and one-year monitoring results. The Nature Conservancy. pp 47.

Geselbracht, L., Graves, A., and Birch, A. 2018. Trabue Harborwalk oyster habitat restoration project: two year post installation results. The Nature Conservancy. pp 11.

~~Gates, M.T. 2009. Hydrologic conditions of the Upper Peace River in Polk County, Florida~~.

Questions

- Is the lack of a rule for maximum withdrawal from Shell Creek a jurisdiction issue?

  Response development is in progress.

- What are the future plans for monitoring the fish, invertebrate, and other biotic communities going forward to continue to assess how the minimum flow implementation is affecting them?

  Response:
  The District plans to continue to support the monitoring and assessment of physical factors (flow, water temperature, color and extinction coefficients), water quality (salinity, nitrogen, phosphorus, nitrate/nitrite and reactive silica concentrations), and phytoplankton biomass (chlorophyll a) that can be directly linked to the freshwater inflow variation and withdrawals.

  We also plan to continue to support ongoing seagrass mapping efforts in the Lower Peace/Shell System, and, as described in the 2020 Charlotte Harbor Surface Water Management and Improvement (SWIM) Plan currently under development, support projects that will enhance environmental conditions in the harbor and contributing watersheds. Future reevaluations of minimum flows established for the Lower Peace River and Lower Shell Creek will also likely be associated with targeted sampling of biological components of the system.

Small Edits

- Use lowercase for common names, example: “blue crab”.

  Response:
  The current American Fisheries Society guide to publication style indicates all portions of the common names of fish species should be capitalized, and we have adhered to this recommendation in the draft minimum flows report.

- Table 1-1 could have within cell formatting improved to match text in final column to the column that precedes it (the lines are not spaced out in the final column).

  Response:
  We agree that the formatting of rule information contained within the sub-table included in Table 1-1 can be improved to improve clarity and will do so in the revised version of the draft minimum flows report.

- Consider using ISO date format in tables (example Table 2-3).

  Response:
  We will consider using International Organization for Standardization (ISO) date formatting (e.g., YYY-MM-DD) for dates used in tables but may continue to use “standard” date formatting styles employed in most District documents.

- Page 47. “higher **in** surface water”

  Response:
  We could not locate text on page 47 of the draft report that seems to be in need of revision.

- Page 49. “food” repeats in first sentence of first paragraph

  Response:
  The first sentence on page 49 will be modified as indicated below with yellow highlighting in the revised version of the draft minimum flows report.

  > Chlorophyll concentrations can serve as an indicator of phytoplankton biomass, which is an important component of the ~~food~~ Lower Peace/Shell System food web.

- Use spaces on either side of an equals sign.

  Response:
  This suggested change will be incorporated at all appropriate locations within the text of the revised draft minimum flows report.

- Appendix E page 7 “BF” appears, but should be “BL” in Creation of HSM maps?

  __Response:__
  We will revise the sentence in the “Creation of HSM Maps” subsection on page 7 of the fish habitat suitability modeling appendix to change “BF” to “BL.”

- Wording of the first sentence of 5.1 needs to be improved “resources of concern”.

  __Response:__
  The topic sentence of Section 5.1 will be revised to change “concerns” to “concern.”

- Page 88 “The PRIM was run on data from a 13 year period” – second paragraph

  __Response:__
  The topic sentence of the second paragraph on page 88 of the draft minimum flows report will be revised to change “13 years” to “13-year.”

- Wording in bottom paragraph on page 98 “freshwater plants tolerant of low salinity”

  __Response:__
  The wording in the referenced paragraph will be modified in the revised minimum flows report as indicated below in yellow. The misspelling of “bulrush” will also be corrected.

  > They also report that freshwater plants, which are tolerant of low levels of salinity, ~~which~~ and are often dominant in brackish marshes (e.g., cattails, sawgrass, and ~~bullrush~~bulrush), were most common where median surface salinity values were less than 4 psu.

- Page 113 < 2 **psu** in second paragraph

  __Response:__
  In the revised draft minimum flows report, the referenced “< 2” will be changed to “<2.”

NOTES:

- Original comments by Peter Sheng from 2020-04-10 in blue font.
    - Blue highlighting in the original comments identifies potential typos in the original comments that were revised and identified for consideration.
- District responses in black-font *italics*; excerpts from the original minimum flows report in black-font (not italicized).
    - Yellow-highlighted text in District responses indicates potential changes (revisions, deletions and additions) to the text of the original draft minimum flows report.
    - Note that some District responses are currently "in development", and all District responses should be considered preliminary and potentially subject to change.
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Comments on MFL for Lower Peace River and Shell Creek

General Comments:

1. Overall effort is very comprehensive, covering all relevant aspects and issues. Reports are well written.

   Response:
   We thank you for this comment.

2. Changing from the old calendar-based blocking regime to the new flow-based blocking regime is a major improvement.

   Response:
   We thank you for this comment.

3. Hydrodynamic modeling is a big step forward from the previous effort, due to the use of 3D model and extension of model domain into the Gulf of Mexico. The 3D model is peer-reviewed and robust. Verification of the model is rigorous.

   Response:
   We thank you for this comment.

4. Uncertainty and inaccuracy of the hydrologic model remains a concern.

   Response:
   We acknowledge that there are uncertainty and inaccuracy in the estimation of ungaged flow, which accounts for about 10 – 16% of the entire Peace River watershed. About 84 – 90% of the watershed is gaged by the U.S. Geological Survey and the hydrologic loading to the Lower Peace

River from the gaged watershed is reliable. For our minimum flow analyses, we used the best available data, in combination of what we learned from the previous hydrodynamic simulation of the system and a comparison of two previous hydrologic studies of the watershed, to estimate the ungaged flow to the Lower Peace River.

Additional response development associated with incorporation of uncertainty information in the body of the minimum flows report and the hydrodynamic modeling appendix (Chen 2018) is in progress.

With regard to modeling and data uncertainty, we think it is worth noting that we use an adaptive management approach for minimum flows development and implementation, which includes routine status assessments and as necessary, reevaluation of established minimum flows. When possible, these activities are conducted to attempt to minimize uncertainty in our results and recommendations.

5. The base flow is constructed from the average flow during 1950-2014 for LPR and 1966-2014 for LSC. To account for climate change effect, however, is it more appropriate to place more weight on flow conditions in the past 20 years?

   Response:
   We think it is best to use hydrologic data (e.g., rainfall and flow records) for the longest period within reason, to best capture the climatic variability that is integrated in the data. Furthermore, as noted in our response to Comment 4 above, the District uses an adaptive management approach for minimum flows development and implementation, which includes routine status assessments and as necessary, reevaluation of established minimum flows.

6. Considering sea level rise effect on MFL is commendable. The sea level rise values, which are based on the USACE study in 2013, appear to be at least 50% lower than those recommended by NOAA (2017) which is the leading U.S. climate agency. Are future predictions on precipitation, wind, atmospheric temperature, land use, and storms all incorporated into the new MFL?

   Response:
   We did not develop the proposed minimum flows based on consideration of sea level rise (SLR). However, we evaluated the proposed minimum flows under three SLR scenarios to help determine if and when a future re-evaluation of the minimum flows may be necessary. It turns out that even when we used the U.S. Army Corps of Engineer (USACE) SLR estimates, which are generally lower than the National Oceanic and Atmospheric Administration (NOAA) SLR estimates, a future re-evaluation for the Lower Peace River and Lower Shell Creek minimum flows appears to be needed.

   We will note the differences between the water levels we used for the three SLR scenarios that we assessed and those predicted by NOAA in the revised minimum flows report.

7. Explanation on how and why the new MFL flow reduction strategy is better than the old MFL flow reduction strategy could be improved. For example, would it be useful to demonstrate that, under the new proposed MFL, the impact of flow reduction for any given year in the past 5-10 years would be much better than the old strategy?

   Response:
   The existing and proposed minimum flow for the Lower Peace River were both MFLs developed based on a 15% reduction in water volume with a salinity of <2 psu and are expected to provide similar levels of resource protection. However, the change from use of calendar-based blocks to flow-based blocks for the proposed minimum flows for the Lower Peace River and use of the flow-based blocks for the minimum flows proposed for Lower Shell Creek allows more withdrawals when high flows associated with storm events occur on any day of the year.

8. Instead of measuring the impact of flow reduction in terms of 15% reduction of various habitats, is it possible to quantify the impact in terms of economic damage?

   Response:
   Minimum flows are developed and established into District rules in accordance with directives and guidelines included in relevant sections of the Florida Statutes and Florida Administrative Code. For example, the Water Resource Implementation Rule specifies that ten environmental values (recreation in and on the water; rish and wildlife habitats and the passage of fish; estuarine resources; transfer of detrital material; maintenance of freshwater storage and supply; aesthetic and scenic attributes; filtration and absorption of nutrients and other pollutants; sediment loads; water quality; and navigation) must be considered when establishing minimum flows and minimum water levels, and each was considered for development of the proposed minimum flows for the Lower Peace River and Lower Shell Creek.

   Although none of the environmental values were evaluated in economic terms it may be reasonable to associate many or all of them with some form of an economic valuation system. We do not, however, think this is an appropriate approach for implementation of the directive and guidance associated with minimum flows and levels establishment provided by state laws and regulations.

   Nonetheless, we note that the process of minimum flows establishment culminates in rulemaking. State Law governing rulemaking in Florida requires an assessment of estimated regulatory cost associated with development and amendment of rules. This activity will be undertaken as the process of establishing minimum flows for the Lower Peace River and Lower Shell Creek proceeds.

9. Southwest Florida is prone to hurricanes and hurricane-induced flooding. For example, Hurricane Elena (1985), Charley (2004), Wilma (2006), and Irma (2017) all impacted the lower Peace River area with storm surge, high flow, salinity stratification, and sometimes hypoxia. After Hurricane Charley, it was reported that flow in the Peace River peaked and water smelled like septic tank

because of hypoxia. Predictions by most climate scientists suggest hurricanes will become more intense in the future. How will the proposed MFL guide the flow reduction during hurricane events?

<u>Response:</u>
In response to your question, we think it is useful to note that minimum flows are to be established as the limit beyond which further withdrawals would be significantly harmful to the water resources or ecology of the area. Therefore, in the case of extreme high-flow conditions associated with hurricanes and other major storm events, achieving minimum flow requirement is not anticipated to be an issue. However, it is worth noting that District rules allow for the consideration of public health and safety for implementation of all District rules and policies.

10. Shouldn't the MFL be updated every five years, instead of every 10-15 years, in a changing climate?

<u>Response:</u>
Development of minimum flows is a relatively lengthy process involving compilation of relevant data, development or refinement of analytical methods and approaches, and coordination with local governments and other affected stakeholders. In addition, the District is engaged in the establishment and reevaluation of numerous priority water bodies. For these reasons, we note that there are practical limitations concerning minimum flow reevaluation schedules. However, it is worth noting that minimum flow status assessments are conducted annually, on a five-year basis in conjunction with regional water supply planning, and on an as-needed basis associated with reviews for water use permit applications and renewals. Results from these assessments are part of the District's adaptive management approach to minimum flows development and implementation and can be used to inform decisions regarding the need for minimum flow reevaluation.

11. How about creating a dynamic MFL with a realtime nowcast/forecast system for the Peace River, Shell Creek, and Charlotte Harbor region? The system can nowcast the current flow/salinity and forecast the future flow/salinity during the next 48-72 hours. Allowable flow reduction can be determined based on the nowcast/forecast flow/salinity conditions in the system.

<u>Response:</u>
This is an intriguing suggestion, although we do not think it is applicable to the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. The minimum flows (and minimum water levels) are typically assumed to correspond with long-term hydrologic and environmental conditions, and in the case of the Lower Peace River and Lower Shell Creek were developed based on central tendencies of environmental responses to changes in flow simulated every fifteen-minutes for a 7.7 year simulation period. Further, we add that estuarine organisms are adapted to cope with a wide range of salinities and the small changes in salinity, attributable to the currently proposed minimum flows, are unlikely to alter the ecological integrity of the naturally dynamic Lower Peace/Shell System or Charlotte Harbor.

We note, however, that established minimum flows can be and are used to develop withdrawal-related conditions in water use permits, on both long-term and short-term bases. For example, in the case of the existing and proposed minimum flows for the Lower Peace River, permit conditions that limit withdrawals based on the previous day's average flow have been and are expected to be successfully implemented. These types of permit conditions are developed by District staff in coordination with permittees based on identified regulatory constraints, such as established minimum flows, the needs of the permitee and other practical considerations.

12. SWFWMD has jurisdiction over the northern Charlotte Harbor system while SFWMD has jurisdiction over the southern part of the system, including Caloosahatchee River which sends a large amount of water into the estuarine system. Given sufficiently long time, water from Caloosahatchee could impact the flow in the northern part of Charlotte Harbor. Does the hydrodynamic model include Caloosahatchee flow as the boundary condition?

    Response:
    Although Caloosahatchee River flow was not directly used as boundary conditions near the mouth of the river, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model.

    This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.

Executive Summary

1. Can someone define "significantly harmful"? Is it to be determined by the District or State Legislature?

   Response:
   Significant harm and significantly harmful are not defined by the State Legislature. For minimum flows and levels development, each water management district of the state or the Florida Department of Environmental Protection identify specific thresholds or criteria that can be associated with significant harm.

2. What is "best information available"? Please define.

   Response:
   In accordance with direction provided by the Florida Legislature, District staff use the best available information when determining minimum flows. Determinations regarding the best available information are made by District staff based on professional judgment, with consideration of input from all stakeholders. These data include information that exists at the initiation of the minimum flows development process and information that is acquired specifically to fill data requirements deemed necessary for establishment of the best, defensible minimum flows.

3. Second to the last line on page vii: "hydrodynamic" should be "hydrodynamic model".

   Response:
   This oversight will be corrected in the revised version of the minimum flows report.

4. Base flow was divided into three flow blocks. Is it the best possible way? Can it be broken into 4 or 5 blocks? How does the MFL outcome vary with the number of blocks?

   Response:
   In theory, any number of flow blocks could be identified and used for minimum flows development and implementation. For practical purposes, use of three flow blocks for minimum flows development and implementation for water use permitting, planning and water resource protection has proven to be successful. One reason for this success in runoff driven lotic systems is that the blocks have been developed with consideration of low, medium and high flow conditions that are known to be important for the physical, chemical and biological functions and structure of riverine systems.

   We have not conducted analyses associated with development of proposed minimum flows for the Lower Peace River and Lower Shell Creek with varying numbers of flow-based blocks.

5. Any impact on the wetlands by flow reduction?

Response:

As described in Section 6.4 of the draft minimum flows report, impacts on wetlands associated with the range flow reductions assessed to support minimum flows development are minimal.

6. Should Table for LPR on page ix be numbered?

Response:

Yes, the table that includes the proposed minimum flows for the Lower Peace River in the Executive Summary will be numbered as "Table ES-1." In addition, a table caption will be added and the text referencing the table will be modified accordingly in the revised minimum flows report.

7. How do you prove the proposed MFL summarized in the table is the BEST possible?

Response:

District staff has compiled and uses the best available information for development of the proposed minimum flows. These data have been assembled based on reviews by staff, consultants to the District, stakeholders and previous peer review panels that have considered minimum flows previously proposed for the Lower Peace River, Lower Shell Creek, Middle Peace River, Upper Peace River and a water reservation proposed for Lake Hancock.

Staff acknowledges that findings from the current, ongoing peer review and stakeholder review and comment could result in identification of additional information that can be considered the best available for development of the proposed minimum flows. If this occurs, the revised minimum flows report will be amended to reflect inclusion and consideration of the updated, best available information.

8. Should Table for LSC be numbered?

Response:

Yes, the table that includes the proposed minimum flows for Lower Shell Creek in the Executive Summary will be numbered as "Table ES-2." In addition, a table caption will be added and the text referencing the table will be modified accordingly in the revised minimum flows report.

9. It is concerning that minimum flow for SC is and will not be met for the next 20 years. Does it mean City of Punta Gorda will have water shortage for the next 20 years?

Response:

No. Water supply planning completed by the District and the City of Punta Gorda has identified existing sources and projects for additional sources to meet projected demands for the next 20-year planning horizon.

10. District is committed to "periodic" reevaluation and revision of minimum flow for LPR and LSC. Please define "periodic".

    Response:
    The Florida Statutes stipulate that "minimum flows and minimum water levels shall be reevaluated periodically and revised as needed." The term, "periodically" is not defined by the State Legislature.

    However, it is worth noting that the District supports or requires continuous or near-continuous monitoring of hydrologic factors such as flows and withdrawal rates as part of its regulatory programs. These data are used in annual minimum flow status assessments, assessments conducted on a five-year basis in support of regional water supply planning and status assessments that may be completed on an as-needed basis for permitting or project requirements. These assessments as well as additional analyses, such as consideration of sea level changes, can inform decisions concerning the "periodic" need for reevaluation of the established minimum flows.

Chapter 1 Introduction

1. Page 3 - "The proposed minimum flows, which are described in this report….." should provide a reference to a Chapter number or Table number somewhere in the report.

    Response:
    A reference to a specific table or section of the report will added to the revised version of the minimum flows report.

2. Page 4 - Can "best information available" be defined? What is its legal definition? Scientific definition?

    Response:
    We are not aware of a legal definition for "best available information" in the context of the establishment of minimum flows or minimum water levels in Florida. In practical terms, best available information used by the District has been data that has been collected and/or compiled by the District, its consultants or others that exists at the time of a minimum flow or minimum water level is determined and is judged to be reliable and adequate for minimum flows or levels development and assessment. This information typically consists of data that has been collected for purposes other than the development of minimum flows or levels and data that has been specifically collected to support minimum flow or level determinations and assessments.

3. Page 6 - What are “Alternative hydrologic regimes”?

   Response:
   In this sentence, “alternative hydrologic regimes” are meant to be hydrologic regimes, i.e., patterns of flow or water levels, that differ from the hydrologic regime or regimes associated with non-withdrawal impacted conditions.

4. Can the definition of “impacted flows” be improved? It is unclear.

   Response:
   We can attempt to revise the definition for “impacted flows” in the revised minimum flows report. A suggested revision of the definition, which we think also necessitates a change to the definition for “modeled flows” within the report is shown below. Yellow highlighting identifies suggested changes for the two definitions.

   - *Modeled flows are flows that are derived using a variety of modeling approaches. Examples include flows predicted using numerical groundwater flow models, flows predicted with statistical models derived from either observed or other modeled hydrologic data, and impacted flows which have been adjusted for withdrawal-related flow increases or decreases.*

   - *Impacted flows are flows that include withdrawal-related impacts. Impacted flows can be reported flows, and they can also be modeled flows ~~based on simulated groundwater withdrawal scenarios~~.*

5. Page 11- “a loss of more than 15 percent habitat” is over how long a time period and with what time lag?

   Response:
   The percentage change in habitat is based on the full modeling, i.e., evaluation period. In this case, the average water column volume with a salinity less than 2 psu simulated for the period from 1997 through 2014 under the baseline scenario is reduced by 15% in association with the percentage flow reduction associated with the minimum flows.

6. Does the “15% harm” guideline apply to all the habitats?

   Response:
   We have typically used a fifteen percent change criterion for habitats and resources assessed in support of minimum flows development. These assessments have included changes in the area, volume and shoreline length exposed to specified salinities or salinity-ranges, changes in area and volume of thermally-favorable habitat, and changes in habitat suitability based

on preferences for a variety of factors, including substrate/cover types, water depths, water velocities, water temperature and dissolved oxygen.

7. Is it more appropriate to consider 15% reduction in economic value?

   <u>Response:</u>
   Minimum flows are developed and established into District rules in accordance with directives and guidelines included in relevant sections of the Florida Statutes and Florida Administrative Code. For example, the Water Resource Implementation Rule specifies that ten environmental values (recreation in and on the water; rish and wildlife habitats and the passage of fish; estuarine resources; transfer of detrital material; maintenance of freshwater storage and supply; aesthetic and scenic attributes; filtration and absorption of nutrients and other pollutants; sediment loads; water quality; and navigation) must be considered when establishing minimum flows and minimum water levels, and each was considered for development of the proposed minimum flows for the Lower Peace River and Lower Shell Creek.

   Although none of the environmental values were evaluated in economic terms it may be reasonable to associate many or all of them in terms of economic valuation systems. We do not, however, think this is an appropriate approach for implementation of the directive and guidance associated with minimum flows and levels establishment provided by state laws and regulations.

   Nonetheless, we note that the process of minimum flows establishment culminates in rulemaking. State Law governing rulemaking in Florida requires an assessment of estimated regulatory cost associated with development and amendment of rules. This activity will be undertaken as the process of establishing minimum flows for the Lower Peace River and Lower Shell Creek proceeds.

8. To prove the success of the proposed new MFL, did the District confirm that there will not be significant harm to resources and habitats if it were applied to any year in the last five years?

   <u>Response:</u>
   The currently existing minimum flow for the Lower Peace River was used to develop conditions in the existing permit issued to the Peace River Manasota Regional Water Supply Authority (PRMRWSA) for direct withdrawals from the Peace River. Compliance with this permit and all water use permits issued by the District is governed by permit-specific reporting conditions. For the permit issued to the PRMRWSA and the permit issued to the City of Punta Gorda for direct withdrawals from Shell Creek Reservoir, permit reporting conditions include those associated with the reporting of withdrawal rates and hydrobiological monitoring requirements. These permit conditions are being complied with by the permitees. Similar permit conditions, including withdrawal constraints and reporting requirements are expected to be included in revisions to the permits issued to the PRMRWSA and City of Punta Gorda

upon establishment of the currently proposed minimum flows for the Lower Peace River and Lower Shell Creek.

During the past few years, District staff have conducted hydrologic assessments associated with permitting issues in the Peace River basin and the development of a water reservation for Lake Hancock and Lower Saddle Creek in the upper portion of the basin. These model-based analyses have not identified concerns associated with currently existing or proposed minimum flows for simulations of recent time periods.

9. Would the new MFL significantly reduce the harm to habitats and resources than the old MFL?

   Response:
   Staff is required by State Law to use the best available information for the calculation of all minimum flows. We think we have done so for our current determination of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, and therefore do not think it is necessary or appropriate to make comparisons regarding resource protection between the existing and proposed minimum flows. We hold this opinion, because we cannot envision a situation where we would not make minimum flow recommendations based on the best currently available information.

10. Page 14 – Why not use the 3D model in the rivers as well as the Charlotte Harbor?

    Response:
    We used the 2-D model in the river portions of the model domain for efficiency and for better resolution of the river cross sections.

11. Page 15 - I assume the 3D model has moving boundary feature?

    Response:
    Yes, this is a correct assumption.

Chapter 2 Physical and Hydrologic Description

1. Figure 2-2 on Page 18: This lower left corner of this map does not look similar to a Google map for the region. Perhaps it is good to show a Google map for the region?

   Response:
   We do not understand this comment and would like to clarify what is being noted and requested. However, we add that when possible, we prefer to use GIS-based layers and data that are maintained by the District's Mapping and GIS Section for creation of maps and figures included in District documents.

2. Figure 2-3 – Please explain the dark map which corresponds to the white region in the larger map shown in the inset.

   Response:
   We plan to modify this map of the Shell Creek watershed in the revised minimum flows report to include and note the "lower" Shell Creek segment (i.e., Lower Shell Creek), Shell Creek Reservoir, the "upper" Shell Creek segment and Prairie Creek.

3. Table 2-1. No need to show % again after the numbers.

   Response:
   We agree and will delete the % symbol from the table cells containing the percentage values in the revised minimum flows report.

4. What is the LiDAR data for the land area used in this MFL study? Is it 2017 data? I understand Florida took LiDAR data over Southwest Florida after Irma in 2017.

   Response:
   As noted on Page 23 of the draft minimum flows report notes the LiDAR data collection, mapping, verification and delivery to the District was conducted in 2015.

5. Page 30 – Line #2 "can all affected" should be "can all be affected".

   Response:
   We agree and this change will be made to the revised minimum flows report.

6. Are all elevation and bathymetry data converted to NAVD88?

   Response:
   Most elevation data and references to elevations are presented relative to the North American Vertical Datum of 1988 (NAVD88). However, we note that in the descriptive information included in Section 2.1 on page 16 of the draft minimum flows report a reference is made to the Peace River originating in an area of Polk County at an elevation of about 100 feet above the National Geodetic Vertical Datum of 1929.

   We also note that a water surface elevation of 5.0 feet is included in the description of Shell Creek Reservoir in Section 5.5.3 on page 91 of the draft minimum flows report. We will review the source for this information (PBS&J 2007) and amend the description of the water surface elevation to reference a specific datum, if necessary.

   For development of the revised version of the minimum flows report, we will further review the text, table and figures include in the draft minimum flows report to ensure that presentation of elevation data that are not referenced to NAVD88 are clearly identified.

7. What is the vertical datum for the water level at the open boundary condition of the 3D model?

   <u>Response:</u>
   The vertical datum for the boundary condition water levels is NAVD88.

8. On Page 37, it was said that many executive orders were issued in 2009. How were these orders determined? With modeling? What were the impact on the ecosystem and resources?

   <u>Response:</u>
   The executive orders noted for Peace River withdrawals by the Peace River Manasota Regional Water Supply Authority were issued by the District based on the severity of drought conditions and allowable percent-of-flow reductions that were available from proposed minimum flows for the Lower Peace River at the times the orders were issued.

   As noted in the Peace River Hydrobiological Monitoring Program 2011 HBMP Comprehensive Report (Atkins 2013), and in reference to withdrawals at the Peace River Manasota Regional water Supply authority facility where withdrawals are made from the Peace River "(n)one of the extensive HBMP analyses done to date have indicated that either measured or modeled changes resulting from Facility withdrawals have been of sufficient magnitude (relative to the far greater natural degree of variation in freshwater inflows) to have affected the long-term physical, chemical or biological characteristics of the lower Peace River/upper Charlotte Harbor estuarine system."

   Based on the preceding paragraph, staff notes that two references included in the draft minimum flows report, and their citation in the body of the document should be revised as shown below.

   > Atkins, Inc. 2013b. ~~Draft~~ River Hydrobiological Monitoring Program 2011 HBMP Comprehensive ~~summary report~~Report, June 2013 (Revised December 2013). ~~Draft report prepared~~ Prepared for the Peace River Manasota Regional Water Supply Authority.

9. Do you set a goal for total water supply first, then determine the flow reduction strategy? Or is it the other way around?

   <u>Response:</u>
   The goal is to identify flow reductions that maintain specified criteria that can be associated with significant harm to accomplish this, we develop a baseline hydrologic record or records to reflect flows expected in the absence of withdrawal effects, then sequentially reduce these flows to assess potential changes in environmental criteria and limits at which the criteria targets would be exceeded.

10. The sentence on the bottom of page 37 "However,….." is unclear. Please clarify.

Response:

We plan to revise the text on the bottom of page 37 of the draft minimum flows report to try to clarify the similarities between allowable flow reductions included in the current minimum flows established for the Lower Peace River and the withdrawal limits specified in the permit that allows the Peace River Manasota Regional Water Supply Authority to withdraw water from the river.

Excerpt from page 37 of the draft minimum flows report with changes highlighted in yellow:

In 2009, the PRMRWSA expanded the Peace River Facility to increase its pumping capacity from 44 million gallons per day (mgd) to a maximum diversion of 120 million mgd and built a 6 billion gallons reservoir. In 2011, the District issued a revised version of the water use permit for facility withdrawals (Table 2-4) that was consistent with the minimum flows for the Lower Peace River (see Table 1-1) that had been adopted in 2010.

Most of the allowable diversions specified in the revised 2011 water use permit were identical to those included in the adopted minimum flow rule. However, allowable diversions ~~specified by the permit~~ when the combined flows at the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee gages exceed 625 cfs during Blocks 2 and 3 ~~are~~were, respectively, 1% and 10% less than the withdrawal limits included in the currently established Lower Peace River minimum flows rule. The 2011 water use permit authorize~~s~~d a daily maximum withdrawal of 120 mgd, annual average withdrawal of 32.855 mgd and monthly maximum withdrawals 38.3 mgd, with no withdrawals allowed if the combined previous day flow at the three gages ~~is~~was less than 130 cfs.

Chapter 3 Water Quality

1. Please define "flow lags". Is it "flow at previous x days"?

Response:

For the water quality analyses, lagged-flows refers to average flows for periods ranging from 2 to 60 days prior to the date of water quality sampling event.

The following excerpt from Section 3.2.2 on page 56 of the draft minimum flows report will be amended to clarify what is meant by lagged-flows.

For the more recent analyses, Janicki Environmental Inc. (2019) used bivariate plots to examine the relationships between flows and various water quality constituents using data obtained from 5 HBMP fixed-stations. Spearman's rank correlation was also conducted for water quality constituents of interest and lag-average flows with lag-periods between 2 and 60 days (i.e., periods including the sampling day and the preceding day, the sampling day and the preceding two days, etc., through the sampling day and the preceding 59 days) to determine the temporal scale at which the constituents might be correlated to flows.

2. Figure 3-23 – label “salinity” should be “chlorophyll”.

   Response:
   The image used for the figure was reproduced from a figure (Figure 5-103) in a report by Atkins, Inc. (2017), which included an axis-labelling error. Nonetheless, for our revised minimum flows report we will revise Figure 3-23 to change “salinity” to “chlorophyll” in the y-axis label. In addition, we will review axis labels used throughout the minimum flows report and associated appendices for accuracy and note potential errors in previously published documents that are included as report appendices.

   In reviewing the Figure identified in this comment, we noted that the Atkins, Inc. (2017) report cited in the Figure 3-23 caption of the draft minimum flows report is not listed in the literature cited section of the report. To address this oversight, we will add the following reference to the revised minimum flow report.

   Atkins, Inc. 2017. Shell Creek Hydrobiological Monitoring Program Five-year Comprehensive Summary Report, Water Use Permit No. 200871.010. Prepared for the City of Punta Gorda, Florida.

3. Given the importance of flow and salinity in affecting the water quality and ecosystem, hydrodynamics and hydrodynamic modeling is the cornerstone of the MFL study. However, “hydrodynamic modeling” does not appear in the report until page 57 in a very short paragraph: “Given the strong interaction between freshwater flows and salt transport processes, a coupled 3D and 2D hydrodynamic model (Chen 2020) was developed to estimate responses of salinity to reductions in freshwater inflows and support development of proposed minimum flows for the Lower Peace River and Shell Creek. The hydrodynamic model is discussed briefly in Chapter 5 and in greater detail in the Appendix C.”

   Response:
   We think it is appropriate to introduce the development of a hydrodynamic model for assessing flow-related changes in salinity in the Lower Peace/Shell System in the section of the draft minimum flows report that addresses system salinity.

   An excerpt from page 57 in Section 3.3.2.1 of the draft minimum flows report is reproduced below and recommended changes and additions to the text that will be included in the revised report are highlighted in yellow. These changes emphasize our efforts to develop and update models used for minimum flow development to develop and use the best available information for minimum flows development.

Given the strong interaction between freshwater flows, ~~and~~ water circulation, and salinity ~~salt~~ transport processes, the District (SWFWMD 2010) previously developed a coupled 3D and 2D hydrodynamic model (Sheng et al. 2006, Chen ~~2020~~2008) ~~was developed~~ to estimate responses of salinity to reductions in freshwater inflows and support development of the currently established ~~proposed~~ minimum flows for the Lower Peace River ~~and Shell Creek~~. In addition, a regression model was developed to average water-column salinity at any location in Lower Shell creek as a function of flow and other factors, including site location, season, tide stage, flow in the Peace River and salinity in the northeastern portion of Charlotte Harbor (SWFWMD 2010).

As part of the current minimum flow reevaluation and development process for the Lower Peace/Shell System, the hydrodynamic model was upgraded and the model domain was substantially expanded to include the Lower Peace River, Lower Shell Creek, Lower Myakka River, all of Charlotte Harbor, Gasparilla Sound, Pine Island Sound, Matlacha Pass and the most downstream portion of Caloosahatchee River. The upgraded hydrodynamic model is discussed briefly in Chapter 5 and in greater detail in ~~the~~ Chen (2020), which is included as Appendix C to this report.

Inclusion of the additional text highlighted above will require the addition of the following reference to the literature cited section of the revised, draft minimum flows report.

Sheng, Y.P., Kim, T., Davis, J. and Schofield, S. 2006. Hydrodynamic Modeling and Monitoring of Charlotte Harbor in Support of the Determination of Minimum Flows for the Lower Peace and Myakka Rivers, Final report. University of Florida Civil and Coastal Engineering Department. Gainesville, Florida. Prepared for the Southwest Florida Water Management District. Brooksville, Florida.

4. It would be appropriate for a chapter on flow, water level, and salinity with some more details on the hydrodynamic modeling effort as well as a good summary of flow and salinity in the system and how they might influence the other elements of the study. Describe the model assumptions, input and output, and setup for the various scenarios it simulated.

   Response:
   We will consider the recommendations in this comment and determine whether the suggested inclusions in the body of the report are warranted.

5. Table 3-1 tries to explain the isohaline location trend. Please explain the meaning of it more clearly with simple layman language without statistical jargons.

   Response:
   We note that the text on page 47 preceding and which refers to Table 3-1 indicates the trend analysis identified an upstream movement of the 0 psu and 20 psu isohalines for period from 1984 through 2016.

To improve understanding of the information presented in the table, we will, however, modify the table legend in the revised report as indicated below with yellow highlighting.

> **Table 3-1. Trend tests (seasonal Mann Kendall) for movement of 0, 6, 12 and 20 psu isohaline locations for the period 1984 through 2016 (source: Janicki Environmental, Inc. 2017). Positive, significant statistics indicate upstream isohaline movement, i.e., higher salinities further upstream in the Lower Peace River.**

While developing revised text for the figure caption, we determined that similar changes that clarify the presented statistical results and better indicate that the results pertain to the Lower Peace River (and in some cases Charlotte Harbor near the mouth of the river, we also plan to revise captions for several additional tables and figures in the draft report section, including Tables, 3-2, 3-3, 3-4 3-5, 3-6 and 3-7, and Figures 3-3, 3-4, 3-5, 3-7, 3-8, 3-9 and 3-10.

6. Same for Table 3-2. What is Table 3-2 trying to say? No hypoxia during summer months due to flow reduction?

   <u>Response:</u>
   We note that the text on page 47 preceding and which refers to Table 3-2 indicates the trend analysis identified dissolved oxygen concentrations in surface waters associated with the 0 psu isohaline increased for period from 1984 through 2016. We do not think the information presented in the table can be used to claim there is no hypoxia in surface waters of the Lower Peace River during the wet, summer season.
   Also, we anticipate modifying the text in the figure caption as noted in our response to comment 5 for Chapter 3 above, to improve presentation of the results.

7. Same for Table 3-4, 3-5, 3-6, 3-7.

   <u>Response:</u>
   We anticipate revising captions for each of these tables as noted in our response to comment 5 for Chapter 3 above, to improve presentation of the result. We also anticipate reviewing text associated with presentation of the water quality information presented in each table to determine whether any revisions to the text are needed.

8. Figure 3-12, 3-13, 3-14, 3-15, 3-16 are highly technical figures with lots of statistical terminologies. Please explain in simple language the meanings of these plots.

   <u>Response:</u>
   To improve presentation of the correlation analyses results presented in Figures 3-12 through 3-16, we will amend the statistical methods description included in Section 3.3.2 on Page 56 of the minimum flows report. The anticipated amendments for the revised report are highlighted below.

Excerpt below is from page 56 within Section 3.3.2 of the draft minimum flows report, with anticipated revisions (text additions) highlighted in yellow.

For the more recent analyses, Janicki Environmental Inc. (2019) used bivariate plots to examine the relationships between flows and various water quality constituents using data obtained from 5 HBMP fixed-stations.

Spearman's rank correlation was also conducted for water quality constituents of interest and lag-average flows with lag-periods between 2 and 60 days (i.e., the sampling day plus the previous day, through the sampling day plus the previous 11 days and the same day plus 20, 29, 44, and 59 days) to determine the temporal scale at which the constituents might be correlated to flows.

Correlation coefficients derived from the Spearman's rank correlation analyses range between 1 and -1 with negative correlations indicating that as flows increase the magnitude or concentration of the constituent of interest decreases. Correlation coefficients above an absolute value of 0.5 were considered strong correlation for this analysis while others were considered weak.

Excerpt from page 56 within Section 3.3.2 of the draft minimum flows report, with anticipated revisions highlighted in yellow. Similar modifications will be made for all similar plots in the revised version of the draft minimum flows report.

Figure 3-12. Spearman's rank correlation between lag average flows and chlorophyll a concentrations at selected HBMP fixed-stations in the Lower Peace River and Charlotte Harbor near the river mouth (see Figure 3-2 for locations) Correlation coefficients range from 1 to -1, with positive values indicating higher concentrations with higher flows and negative values indicating higher concentration with lower flows. Dashed line identifies 0.5 and -0.5 values used to identify strong correlations (reproduced from Janicki 2019).

9. Stoker et al. (1998, USGS Report) measured the flow and salinity along the Peace River during 1982 – 1985. They found that significant salinity stratification (10 psu between bottom and surface salinity) occurred along the lower reaches of the river when Peace River flow at Arcadia was between 487 and 1420 cfs, or when 5-day sum of discharge was over 20,000 cfs. Kim et al. (2010, ECSS) found that, during 2000, bottom-water hypoxic conditions occur during periods with relatively steady moderate to high (5-40m3/s or 180-1440 cfs freshwater inflows and sediment oxygen demand (SOD). Spring-neap tide also has significant impact on the formation of hypoxia. High flow condition is found almost throughout the B3 block period during June-October in the Base Flow. So how often is hypoxia expected to occur during the summer month with and without flow reduction? During these high flow events, can more flow be withdrawn to reduce the likelihood of salinity stratification and hypoxia?

Response:
Although we are not certain, we wonder whether reference to "Base Flow" in the comment above was actually a reference to the "baseline" flow used for the minimum flow analyses.

We have not quantified differences during the summer, wet season between the baseline flow record and the baseline flow record reduces by the allowable, block-specific flow reductions included in the proposed minimum flows. However, during high-flow events, we do not anticipate withdrawal-related flow reductions to substantially affect the likelihood of occurrence of hypoxia that is associated with salinity stratification and introduction of large volumes of highly-colored water into the estuary. Further, we note that the currently established minimum flow and the proposed minimum flow for the Lower Peace River include a 400 cfs maximum withdrawal or flow reduction limit that effectively eliminated withdrawal-related flow reductions during high-flow events.

10. Empirical, regression, and statistical models are used for the water quality analysis. In the long run, is it more appropriate to develop a dynamic water quality model for the estuarine and riverine system?

    Response:
    We agree that development of a dynamic water quality model could be useful for a variety of water management activities, including minimum flows establishment. However, we do not think it is necessary for development of minimum flows for the Lower Peace River or Lower Shell Creek.

Chapter 4 Ecological Resources

1. Vegetation map shown in Figure 4-1 is from 1998. Seems outdated.

   Response:
   We are not aware of any recent, comprehensive, species or genus-level vegetation maps for the Lower Peace/Shell System that would represent an update to Figure 4-1 in the draft minimum flows report.

   We are, however, aware of selected, updated maps of the vegetation of the area, including a map of salt marsh versus mangrove coverage *based on 2009 and 2011 District land use data that* is available in the FWC Coastal Habitat Integrated Mapping and Monitoring Program (CHIMMP) chapter for Charlotte Harbor (https://myfwc.com/media/12063/chimmp2017-chapter06-charlotte-harbor.pdf). This map does not, however, include species level classifications. More detailed maps based on data from 2015 are available in the 2016 Charlotte Harbor National Estuary Program technical report number 16-3 (http://chnep.wateratlas.usf.edu/upload/documents/Mangrove-Heart-Attack-Draft-30Sept2016.pdf; see pages 59 and 66), which may be a valid solution *for presentation of more current vegetation coverage in the Lower Peace/Shell System.*

For the revised minimum flows report, we plan to further investigate the feasibility and utility of developing vegetation maps of the Lower Peace/Shell System based on recent land use/cover GIS layers.

2. Figure 4-2 is difficult to see. Please use different color tones for the seagrass.

   Response:
   We will modify the figure map to provide better contrast for the mapped seagrass coverage.

3. Page 76 – "decreased flows may also contribute to increases in dissolved oxygen concentrations." Is it so? Flow reduction will lead to increased DO?

   Response:
   The concept is further explained in the papers cited in Section 4.2, and we think it is adequately summarized in the section. Additional, potential effects of decreased flows could include those associated with an increase in the influence of tidal fluctuations which can lead to the formation of a well-mixed system. Also, if sediment loads from land decrease as a function of reduced flows, water clarity could increase, leading to an increase in primary production.

Chapter 5 Flow Blocks, Baseline Flows, resources of concern and modeling tools relevant to minimum flows development

1. Should indicate the meaning of curves with green and blue colors. What if 1994-2014 model results are used? Climate in the past two decades is likely more different from the previous years so flow data during 1994-2014 maybe more meaningful to consider here.

   Response:
   We assume this question is referring to Figure 5.1. The blue and green curves demonstrate how calendar-based blocks would look if we used a longer record (1950-2014) and a shorter record (2007-2014). For the minimum flows, the 2007-2014 period was used.

2. Did the hydrodynamic simulation for the 1950-2014 and 2007-2014 periods use the appropriate atmospheric forcing including air temperature, cloud cover, wind, and ocean forcing over the region? For example, my understanding is that wind data from only one local wind station was used in the model simulation. Perhaps it would be worthwhile to use predictions by regional wind model, e.g., the NOAA NAM (North Atlantic Mesoscale) model to more accurately capture the wind influence?

   Response:
   The hydrodynamic model was run only for the 2007 through 2014 period.

3. Perhaps it would be useful to understand how and why the base flows vary with different time periods 2007-2014, 1950-2014, and 1994-2014 before determining which the best base flows are?

   <u>Response:</u>
   Response development is in progress.

4. Please explain "With this new approach, the determination of transitional flow trigger (e.g. 625 cfs in the existing Lower Peace River minimum flows, Table 1-1) is not required when high flows remained depressed due to climatological conditions."

   <u>Response:</u>
   Typical summer wet season, high flows would be subject to the allowable flow reduction associated with Block 3. However, if flows during the typical wet season fall within the flow-range associated with Block 2 (the medium flow range block), the allowable percent-of-flow reductions associated with the Block 2 minimum flows rather than the allowable percent-of-flow reduction associated with the Block 3 would be applicable. This use of flow-based blocks achieves a goal similar to that which was used for development of the "flow trigger" used for the currently adopted Lower Peace River minimum flows.

5. It might be useful to produce a "flushing map" (50% renewal time map) for the various sections of the flow system. The map can be used to aid the discussion of flow effect on DO, water quality, fishery, etc.

   <u>Response:</u>
   We agree that transport timescales are useful in the discussion of flow effects on DO and other environmental factors. We will consider how to best incorporate this type of information in the revised version of the draft minimum flows report.

6. Page 77 mentions the following: "Hurricanes can cause high river-inflows events, which reduce the salinity in the area and reduce dissolved oxygen." Were these events simulated by the models used for this study?

   <u>Response:</u>
   The model was run from 2007 through 2014 and there were some major storm and drought events but not hurricanes.

7. Figure 5-8 shows the domain of the 3D model used for the MFL study. This should have been shown in a new chapter on hydrodynamics (flow, water level, and salinity), preceding the water quality chapter.

   <u>Response:</u>

The District's standard format for minimum flow reports involves the identification of ecological criteria followed by the description of tools that will be used to model or assess the criteria. Both the water quality (Chapter 3) and ecological resources (Chapter 4) summaries were appropriately described prior to presentation and discussion of the hydrodynamic model and other tools used for minimum flows development.

8. Hydrologic model prediction of the watershed flow remains to be a weak link in the new MFL study as the previous one. Improvement is needed.

   Response:

   We believe the hydrologic models used for predicting watershed flows were sufficient for supporting our minimum flows analyses. We think it is appropriate to consider improving these modeling efforts for future minimum flow evaluations. In addition, we will identify uncertainty associated with hydrologic model predictions in an updated version of our hydrodynamic modeling report (currently Chen [2018]; an appendix to the draft minimum flows report).

9. Figure 5-11. There is a typo in the figure caption: "independent" is mis-spelled.

   Response:
   We will correct this typo for the figure caption in the revised minimum flows report.

10. Water quality "models" are relatively simplistic and empirical compared to the hydrodynamic model. Consider the use of a dynamic water quality model?

    Response:
    We agree that development of a dynamic water quality model could be useful for a variety of water management activities, including minimum flows establishment. However, we do not think it is necessary for development of minimum flows for the Lower Peace River or Lower Shell Creek.

Chapter 6

1. During hurricanes and king tide events, is 400 cfs still the maximum flow withdrawal?

   Response:
   Yes, the 400 cfs maximum withdrawal for the Lower Peace River is applicable at all times. The only exception would during a period defined by a policy decision or directive of the District Governing Board, or an Order issued by the District's Executive Director. Further, we note that hurricanes and king tides are extreme hydrological events and we don't expect PRMRWSA to withdraw water, especially during hurricanes.

2. Should "minimum flows scenario" be replaced by "minimum flow scenarios"?

Response:
We searched Chapter 6 of the draft minimum flows report and found the phrase "minimum flow scenario" was used in Section 6.6.1 on Page 117. As indicated below with yellow highlighting we will modify the phrase as suggested in the revised minimum flows report.

> For the HSM simulations, habitat zones were categorized into Low, Moderate, High and Optimum zones by percentages based on natural break classification in ArcGIS. Table 6-9 presents seasonal habitat zone percentages and changes between the baseline and minimum flows scenarios for the assessed taxa. Black colored percent change values indicate the percentages for the minimum flows scenarios were less than the corresponding baseline percentages. Red colored percent change values indicate the percentages for the minimum flows scenarios were greater than the corresponding baseline percentages.

3. The stated sea level changes at Ft. Myers station for the period from 2010 to 2035 are 0.20, 0.33, and 0.76 feet, respectively. These values are lower than the latest NOAA predictions.

Response:
See relevant response to General Comment 6 above.

Appendix C Hydrodynamic Modeling

1. This Appendix deserves to be a separate Chapter.

Response:
We will consider including additional information (e.g., a separate chapter or chapter section) on the hydrodynamic model in the revised version of the draft minimum flows report.

2. The 3D hydrodynamic model is very robust and efficient. Most results generally agree well with observations.

Response:
We thank you for this comment.

3. Page 16, Line#5. "friction" should be "fraction".

Response:
Will make this change in the revised version of the draft minimum flows report.

4. Figure 3-11 on page 57 - Model simulated salinity missed several observed salinity peaks. Observed salinity range is between 10-25 psu but simulated salinity is between 20-26 psu. These occurred mostly during the hurricane season.

Response:
We think the noted mismatch is mostly due to errors in the downstream salinity boundary condition during the wet season. We note that the original USF model for the system had a worse match at the Mote Marine station.

5. Perhaps it is useful to try to use more wind data from nearby airports, instead of only one station. Can also try to find NOAA NAM wind fields or Navy wind fields (from Naval Research Lab) for the region.

   Response:
   We looked at these data sources for wind data, but it appears that there are still not enough wind data measurement stations in the region to allow us to describe the spatial variability of the Charlotte Harbor system. For simplicity, we chose to use one wind station for our analyses. It would be beneficial to use multiple wind stations and we will consider this option in future studies.

6. During the last MFL study, watershed model greatly over-estimated the flow from the watershed into Peace River and Charlotte Harbor. There is no improvement in the watershed modeling in this MFL study.

   Response:
   We considered the problem of the over-estimation of ungaged flow in our previous minimum flows study for the system. We made some adjustment to get the best ungaged flow estimate based on the previous hydrodynamic study of the Charlotte Harbor system and a comparison with another hydrologic study of the watershed.

7. Good choice of skill index.

   Response:
   We thank you for this comment.

8. On page 42 – "January 2017" should be "January 2007".

   Response:
   We will make this correction in the revised version of the report.

9. On page 44 – "exited" should be "existed".

   Response:
   We will make this correction in the revised version of the report.

10. Figure 37 simulated "shoreline length". Please define. Is flooding-and-during a part of the 3D and 2D model?

Response:
The shoreline length is the actual length of the shoreline seen by the model. The dynamically coupled 3D-2DV model can track shoreline variations and allow the computation of the shoreline length at every time step. In the 3D model, because bottom elevations are defined and given at the four corners of the Cartesian grid, shoreline can be calculated using the bilinear interpolation with known water level if all grid corners are not submerged or emerged. In the 2DV model, the shoreline length can be calculated based on the water level, the grid length, and the river width, which varies with both vertically and longitudinally.

11. Has alternative model domain been considered for the southern part? The alternative would move the southern boundary to the south of San Carlos Bay and use the water level and salinity provided by the USF model as boundary condition there, but use flow conditions in Caloosahatchee measured by SFWMD as boundary condition. I am assuming that the current 3D model uses the water level and salinity inside Caloosahatchee provided by the USF model. If this is true, my concern is the Caloosahatchee flow is not correctly represented in the 3D simulation. Our simulations found that, given sufficient time (~ 1 month), high flow in Caloosahatchee could reach the northern Charlotte Harbor.

Response:
Yes, the current model uses USF model results in the Caloosahatchee River. Effects of Caloosahatchee River flow are indirectly considered in the water level, salinity, and temperature boundary conditions, as the USF model included Caloosahatchee and its flow.

12. Sea level rise values for 2020, 2030, 2040, 2050 are based on USACE's estimate. On the website provided in Appendix C, it states that the sea level values are based on a 2012 study by the National Academies and a USACE report in 2013. Since 2013, there has been rapid development of new and more robust predictions on future sea level values. NOAA, the leading U.S. climate agency, published a comprehensive report on the future sea level rise values throughout the U.S., including southwest Florida. The NOAA sea level rise values for Ft. Myers area are typically twice of the USACE values. It would be prudent to use the NOAA values and recalculate the impact of Sea Level Rise on MFL in the LPR and LSC. M<ore information can be supplied if requested by the SWFMWD.

Response:
It is true that we didn't use the newest findings of SLR research for our current minimum flows study. In fact, a majority of our modeling effort for the minimum flows evaluation was complete about 4 - 5 years ago, before the new SLR results were available. We should have updated our SLR model runs at the time when the draft minimum flow report was written. Nevertheless, as noted above in response to other SLR-related comments, our conclusion that salinity effects predicted for various SLR scenarios indicate the need for a future minimum flows re-evaluation will not change as a result of additional modeling with even higher sea level conditions.

NOTES:

- Original comments by Dave Tomasko from 2020-04-07 in blue font.
    - o Blue highlighting in the original comments identifies potential typos in the original comments that were revised and identified for consideration.
- District responses in black-font *italics*; excerpts from the original minimum flows report in black-font (not italicized).
    - o Yellow-highlighted text in District responses indicates potential changes (revisions, deletions and additions) to the text of the original draft minimum flows report.
    - o Note that some District responses are currently "in development", and all District responses should be considered preliminary and potentially subject to change.
- File version (date): 2020-04-20.

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DRAFT OUTLINE OF COMMENTS – D. Tomasko

Comments and/or requests for clarification

1. The MFL does not incorporate some of the other regulatory programs that overlap with MFL topics:
    a. SWIM Plan not referenced (which included documentation of impacts of hydrologic alterations on health of Charlotte Harbor)

    Response:

    - *The District's 2000 SWIM plan and the 2020 SWIM plan currently under development are mentioned and cited in the draft minimum flows report.*
        - o *Excerpt from Page 41 of the draft minimum flows report:*

          In addition, Charlotte Harbor is designated a Southwest Florida Water Management District Surface Water Improvement and Management (SWIM) Priority Waterbody and has a comprehensive SWIM Plan (SWFWMD 2000) that identifies management strategies intended to prevent water quality degradation. An updated SWIM Plan (SWFWMD 2020-in preparation) is currently under development.

        - o *Excerpt from Page 75 of the draft minimum flows report:*

          Seagrass coverage in the greater Charlotte Harbor area has remained relatively constant since the late 1980s, although the highest coverage estimates have been reported for the last three biennial surveys, which were conducted for 2014, 2016 and 2018. A peak coverage of 20,280 acres was estimated for 2016 (SWFMWD 2020-in preparation).

- *Excerpt from page 151 of the literature cited section of the draft minimum flows report to indicate the 2000 SWIM plan is included in the document:*

  Southwest Florida Water Management District (SWFWMD). 2000. Charlotte Harbor Surface Water Improvement and Management (SWIM) Plan. Brooksville, Florida.

- *Excerpt from page 151 of the literature cited section of the draft minimum flows report (with a suggested addition and typo correction) to indicate the 2020 SWIM plan is included in the document:*

  Southwest Florida Water Management District (SWFWMD). 2020-in preparation. Charlotte Harbor Surface Water Improvement & Management (SWIM) Plan update, ~~Marhc~~ March 2020 – draft. Brooksville, Florida.

- *Staff will look in other sections of the draft minimum flows repot to identify where the SWIM plan(s) may appropriately be cited. Some examples are indicated below.*

  - *Excerpt from page 41 of the draft minimum flows report (with a suggested addition):*

    In addition, Charlotte Harbor is designated a Southwest Florida Water Management District Surface Water Improvement and Management (SWIM) Priority Waterbody and has a comprehensive SWIM Plan (SWFWMD 2000) that is currently being updated (SWFWMD 2020-in preparation) and which identifies management strategies intended to prevent water quality degradation.

b. No reference to Pollutant Load Reduction Goal, as laid out in SWIM Plan (see comment 3). Even though reference is made to FDEP's Numeric Nutrient Concentration (NNC) criteria.

<u>*Response:*</u>

- *The following new section will be added to the revised minimum flows report between Sections 3.2 and 3.2:*

- ## 3.X. Pollutant Load Reduction Goal

  The 2000 SWIM Plan for Charlotte Harbor (SWFWMD 2000) included a Pollutant Load Reduction Goal (PLRG) that was developed to “hold the line” on nitrogen loads from the Peace River watershed to Charlotte Harbor. The PLRG was developed based on potential increases in bottom water hypoxia in the harbor that could be associated with increased nitrogen loads.

  The hold-the-line approach was also developed with acknowledgement of environmental effects associated with the relatively large, seasonal inflows of fresh, water with high concentration of dissolved organic matter to Charlotte Harbor from the Peace and Myakka Rivers. These inflows lead to natural stratification patterns that are associated with low dissolved oxygen concentrations (CDM 1998) and strongly affect seagrass biomass and productivity (Tomasko and Hall 1999).

  As noted in the 2020 Charlotte Harbor SWIM plan update (SWFWMD 2020-in preparation), the “hold-the-line” approach is apparently being adequately implemented for the gaged portion of the Peace River watershed. Modeling results of nitrogen loading indicate the average load from the gaged portion of the Peace River for two seven year periods, 1985 through 1992 and 2009 through 2015 differ by less than 0.5%.

  The recently completed Lake Hancock Lake Level Modification and Lake Hancock Outfall Treatment Marsh projects (SWFWMD 2020), and additional projects to be implemented in the future will continue to support the “hold-the-line” approach for nutrient loading from the Peace River basin.

- *Based on the inclusion of the new Pollutant Load Reduction Goal section, the following documents will be added to the literature cited section of the revised minimum flows report. Note the reference date for SWFWMD (2020) may require some modification based on multiple SWFWMD 2020 documents.*

CDM. 1998. The study of seasonal and spatial patterns of hypoxia in Upper Charlotte Harbor. Report to the Southwest Florida Water Management District. Brooksville, Florida.

Southwest Florida Water Management District (SWFWMD). 2020. Lake Hancock Lake Level Modification and Outfall treatment Projects.

https://www.swfwmd.state.fl.us/projects/lake-hancock. Accessed on April 17, 2020.

Tomasko, D.A. and M.O. Hall. 1999. Productivity and biomass of the seagrass *Thalassia testudinum* along a gradient of freshwater influence in Charlotte Harbor, Florida. Estuaries. 22, 592-602.

c. NNC criteria set by FDEP mentioned, however, nutrient forms included are not the same as the nutrient forms included in NNC criteria (see comment 5).

Response:

- *Response development is in progress.*

d. Adoption and subsequent implementation of the proposed MFL would not complicate the TMDL, as shown in the text. But mention should be made of the PLRG, and its links to high flow requirements as necessary for the "reset button" of bottom water hypoxia in Charlotte Harbor.

Response:

- *As noted above in response to comment 1.b. above, a new section on the Pollutant Load Reduction Goal identified for Charlotte Harbor will be added to the revised minimum flows report.*

e. The MFL statute does not state that MFLs are to address every management issue, but the MFL should include language that addresses whether or not non-attainment of the MFL would make it less likely that other regulatory programs would meet their goals?

Response:

- *The proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed in accordance with all requirements for minimum flows establishment included in the Florida Statutes and Water Resource Implementation Rule. The minimum flows established for the river and creek will be implemented in accordance with these legislative and regulatory directives through the District's permitting and planning programs and activities.*

2. Related to very high flows and the "reset button" for Charlotte Harbor due to salinity stratification and bottom water hypoxia…
   a. It appears improbable that even maximum water withdrawals would reduce flows sufficient to prevent bottom water hypoxia, which requires an average flow of 10,000 CFS at Arcadia (Stoker et al 1989) – roughly equivalent to total gaged PR flow of about 20,000 cfs.

Response:

- *We agree.*

b. Proposed max withdrawal of 400 cfs represents ca. 2% of the minimum flow from PR watershed required to initiate stratification of 10 ppt in Harbor. Consequently, maximum withdrawal appears to be protective of the "reset button" of bottom water hypoxia.

Response:

- *We agree.*

c. However, would be helpful to see the District-developed MFL reference the District-developed and NEP-approved PLRG, which is based on protecting natural phenomena of bottom water hypoxia from becoming increased ***or reduced*** by human activities

Response:

- *As noted above in response to comment 1.b. above, a new section on the Pollutant Load Reduction Goal identified for Charlotte Harbor will be added to the revised minimum flows report.*

3. The MFL seems to be based upon the "significant harm threshold" of 15% for salinity-based habitats

a. Text implies that this is to be a default approach for MFLs, to be used only if other approaches to develop thresholds were not found (e.g., fish passage of 0.6-foot depth {for UPR}, wetland inundation elevations, etc.)

Response:

- *We and many independent scientific peer review panels that have assessed our previous minimum flows development efforts think assessment of flow-related habitat changes on a percentage basis is a reasonable and useful approach for minimum flows development. This approach permits evaluation various environmental factors that exhibit a continuous response, without notable inflection points or thresholds, in response to changes in flows.*

  When possible and reasonable, we use percent-change-in-habitat metrics in conjunction with threshold-based criteria. This information collectively provides assurance that we are developing minimum flow recommendations based on the best available information.

b. The wetland inundation approach and water quality approaches are modeled and results discussed, but text is not very robust that 15% threshold for salinity-habitat metric was needed as a fallback guidance for "significant harm"

Response:

- *As noted in our response to Comment 3a above, we do not consider our use of potential changes in salinity-based habitats to be a "fall-back" approach for minimum flows development.*

  When possible, we use all reasonable percent-change-in-habitat metrics in conjunction with appropriate threshold-based criteria, to establish minimum flow recommendations.

c. While used in many MFLs, a potential 14% loss of habitat being considered to be "not significant" is not universally applied, including District regulatory programs
   - Development permits are not allowed to arbitrarily eliminate 14% of wetlands without repercussions
   - Coastal construction is not allowed to arbitrarily cause the loss of 14% of the seagrass habitat in, for example, Lemon Bay
   - Enhanced text justifying the need to defer to 15% threshold would be helpful. Is this the best approach, based on inability to identify other thresholds, or does it represent a repeated use of what has become the default metric of acceptable impacts?

<u>*Response:*</u>

- *As note in our response to Comment 1e above, the proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed in accordance with all requirements for minimum flows establishment included in the Florida Statutes and Water Resource Implementation Rule. The minimum flows established for the river and creek will be implemented in accordance with these legislative and regulatory directives through the District's permitting and planning programs and activities.*

4. Lack of maximum flow diversion quantity of Shell Creek is problematic

a. Is this based on assumption that Shell Creek flows are only of concern in Lower Shell Creek?

<u>*Response:*</u>

- *Response development is in progress.*

b. Mean annual flows for LPR (PR @ Arcadia, HC and JC) of 1,302 cfs. Mean annual flow of SC 363 cfs, so mean flow of SC ca. 28% of mean LPR flows
   - If high flows for the LPR are important to protect the health and functioning of Charlotte Harbor (400 cfs maximum diversion) why wouldn't SC high flows be similarly considered in terms of health of the Harbor?

   <u>*Response:*</u>

- See our response to Comment 4a above and 11 below, which in our opinion, both address this question.

o Not likely that max withdrawals (if set) for LSC would affect threshold values for stratification, but should be mentioned/acknowledged

Response:

- *Please see our response to the Comment 4a above and 11 below, which we think also address this question.*

5. Water quality review (Section 3.3)
   a. Make sure that analyses used "Chlorophyll-a (corrected for phaeophytin)" rather than "Chlorophyll" – too vague as to what the units were.
      o Revise text as appropriate, or revise analyses, if needed

      Response:

      - On page 49, paragraph 2 of the draft minimum flows report we note that "[f]or, simplicity, in this report, chlorophyll a is denoted as chlorophyll."
      - Also, page 43 of Appendix A, states "[t]he HBMP data are reported as uncorrected Chlorophyll."

   b. Section 3.3.1.4 – why aren't nitrate plus nitrite and Total Kjeldahl Nitrogen (TKN) combined into Total Nitrogen (TN) for analysis?
      i. Helpful to have it broken down to this level, but NNC criteria and PLRG "hold the line" goal are both based on TN concentrations or loads, respectively

      Response:

      - *Analyses presented are from the Peace River HBMP 2016 Comprehensive Report which did not analyze for TN.*
      - *We further note that further development of this response is in progress.*

   c. Section 3.3.1.5 – why is "Orthophosphorus" examined, and not Total Phosphorus (TP)?
      i. Does this mean only dissolved inorganic phosphate (i.e., soluble reactive phosphate; SRP) examined?
      ii. If so, then SRP is potentially not conservative
      iii. If section refers to TP, then revise text to say TP

      Response:

      - *TP data were not available. Page 4 of Appendix F, states: "*[s]ince 2003, the HBMP program has reported phosphorous concentrations as orthophosphate..."
      - *We further note that further development of this response is in progress.*

   d. Figure 3-11 – flows vs. salinity

i. Data from stations 6 and 15.5 are located at or below the point of confluence of flows from SC into the LPR
ii. Without accounting for SC flows, this might underestimate total flows by ca. 25 to 30%
iii. Add in LSC flows for these relations, or explain why not relevant

Response:

- *Response development is in progress.*

e. Figures 3-12 through 3-16
   i. Values on y-axis appear to be for Coefficient of Correlation (CC) for Spearman's Rank Correlation
      1. Spearman's used to test for monotonic but non-linear (potentially exponential) correlations of ranked data
      2. Were data not tested for parametric analyses? (even if non-linear)
   ii. Label on y-axis is of water quality parameters, not values of CC for tested relationships. Confusing.
   iii. Does the appearance of a bar imply that relationship is statistically significant? CC values alone do not by themselves imply statistical significance
   iv. Are lack of bars equal to CC value of zero, or not significant?

Response:

- *Y-axis labels for figures 3-12 through 3-16 will be changed to Coefficient of Correlation for each parameter in the revised minimum flows report.*
- *Water quality summary statistics, including tests for normality by parameter are included as appendices to Appendix F of the draft minimum flows report.*
- *Parametric analyses were not used. However, bivariate plots were constructed to visually examine the relationship between flows and different water quality constituents using the 5 Hydrobiological Monitoring Program fixed water quality stations. A LOESS smoother was added to represent locally weighted average relationship. These analyses are summarized in section 5.0 of Appendix F.*
- *The correlation coefficient (y-axis) ranges from 1 to –1. A correlation coefficient greater than 0.5 or less than –0.5 (represented in the figures by a broken line) was considered to be a strong correlation. For clarification, this explanation will be added to the text in the revised minimum flows report.*
- *The lack of bars indicates no test was conducted. Spearman's rank correlation was conducted between the constituent of interest and the lag average flows using the time-steps listed below.*
  - *Daily lag average between day 2 and 14*
  - *Day 21 – three week lag average*
  - *Day 30 – month lag average*
  - *Day 45 - month and a half lag average*
  - *Day 60 – three month lag average.*

Descriptions of these periods used for calculation of lag-average flows will be included in the revised minimum flows report.

f. Section 3.3.3.4 – see comments above…why reference to TKN and OP?
    i. Are nitrate and nitrite not available? Why reference to TKN, not TN?
    ii. Are data truly orthophosphorus, or Total Phosphorus?

Response:

- *Response development is in progress.*

g. Section 3.3.4 – reference made to role of "tide, residence time, nutrients) as likely affecting chlorophyll concentrations
    i. Figure 3-26 shows summer time color values in LSC of > 200 PCU
    ii. Equal consideration should be given to potential role of color as reason for observation (Figure 3-22) of lower chlorophyll-a(?) values in summer
    iii. Is there a potential that a maximum or minimum withdrawal limit might be important for keeping color levels high enough to keep chlorophyll-a below threshold values to limit nutrient sensitivity?

Response:

- *Response development is in progress.*

6. Section 5.2 – Identification of need to change the 3-block system with set dates to a 3-block system based on flows is well developed, and that modification appears to be appropriate and logical

Response:

- *We agree.*

7. Section 5.3.1 – interpretation of results shown in Figure 5-3 seem to suggest that if flow yields match the pattern seen in Charlie Creek in 1950 to 1969, then results are "…indicating that there has not been a significant anthropogenic impact over time…"
    a. However, Kissingen Spring stopped flowing in 1950, and the MFL should discuss why Charlie Creek had more natural flow pattern than UPR in 1950 to 1969. Not saying Charlie Creek isn't a good reference, but citation of lack of agricultural or mining land uses upstream of the gage would support its use as a reference condition.

Response:

- *Response development is in progress.*

b. How does PR @ Arcadia higher yield in 1950-1969 match up with loss of Kissingen Spring? Seems counter to the idea that flows in the Upper Peace River were already reduced by anthropogenic impacts by 1950

Response:

- *Response development is in progress.*

c. Text for figure 5-3 explicitly states that Joshua Creek displays increased hydrologic yield (cfs/mi2) during April to May – more flow than in 1950 to 1969 period
   i. Yet Table 5-1 has no trend over time (Seasonal Kendall Tau) for Joshua Creek
   ii. Is it possible that Seasonal Kendall Tau finds no significant trend, because the deviation in flows is only occurring in 2 to 3 months per year?
   iii. Keep in mind that a Seasonal Kendall Tau value is calculated from 12 individual (in the case of monthly) estimates of trend. If 10 are non-trending, and 2 are strongly trending, then "overall" could be no trend.
   iv. Test for flows on a monthly time step, to ensure consistency between Table 5-1 and the interpretation or results in Figure 5-3.

Response:

- *Response development is in progress.*

d. PRIM model results (Table 5-2) suggest reducing groundwater withdrawals will increase flow in the UPR, but decrease flows in Joshua and Charlie
   i. This differential response appears logical if the destination of groundwater withdrawals differs between the UPR and Joshua and Charlie Creeks, but it should be discussed in greater detail - why the difference in direction of response?

Response:

- *Response development is in progress.*

8. Section 5.3.3 – the PRIM model includes the assumption that irrigation efficiencies are 60 and 85% for row crops and citrus, respectively – very important to the algorithm. But where is reference for this assumption?
   a. For mechanistic models, assumptions are supposed to be generated by literature or data, then incorporated into models, and then models "calibrated" by comparing output to predictions
   b. Is this a model assumption that was based on literature, of was observed vs. modeled flows from these systems used to develop the assumed irrigation efficiencies?

   Response:

   - *Response development is in progress.*

9. Section 5.4 – potential techniques for developing thresholds for MFLS are briefly discussed, but then 15% threshold for "significant harm" is then relied upon for salinity-habitat metric
   a. See comments listed above.

Response:

- *Please see our responses to Comments 3a, 3b and 3c above.*

10. Section 5.4.1 – Was not 130 cfs initially established as a breakpoint/threshold value for the upstream movement of the 2 psu isohaline?

Response:

- *The 130 cfs low flow threshold was established primarily to minimize water quality concerns associated with surface water withdrawals at the Peace River Manasota Regional Water Supply Authority's Peace River Facility.*

11. Section 6.2 – The logic for a maximum withdrawal threshold not being included for Lower Shell Creek is not clear. Suggestive of a disconnect of some sort between withdrawing from Shell Creek Reservoir is not impactful to flows and ecology of Lower Shell Creek?

Response:

- *Response development is in progress.*

12. Section 6.3 – appears that flow reductions of 0, 10, 20, 40% etc. are applied and CDF plots to see what level of flow reduction creates a more than 15% decrease in salinity-habitat and floodplain inundation.
    a. While not in and of itself problematic, this should be the default approach, if other thresholds did not arise
    b. Floodplain inundation less sensitive than salinity-habitat metrics – good that not used
    c. Salinity-habitat metrics are related to essential fish habitat (EFH)? Is this implied, or actually tested? Was not sure why EFH not tied to salinity-habitat metric as much as I was expecting.

Response:

- *Response development is in progress.*

DL

Moderator
92 posts

Doug Leeper
a few seconds ago

Final summary of the April 13, 2020 Lower Peace River/Lower Shell Creek minimum flows peer review panel teleconference is attached. Differences between the attached file and the draft summary include correction of the start time for the teleconference and the correction of a few typographical and grammatical errors.

Lower Peace_Shell Peer Review 2020-04-13 Telec...
44.05 KB

QUOTE

MEETING SUMMARY

Southwest Florida Water Management District
Scientific Peer Review Panel Teleconference
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Facilitated as a Video and Telephone-Based Teleconference

April 13, 2020

The Southwest Florida Water Management District (District) organized and facilitated a meeting of the independent scientific peer review panel reviewing a draft District report on proposed minimum flows for the Lowe Peace River and Lower Shell Creek. The meeting was facilitated as a teleconference/videoconference using the Microsoft Teams Videoconferencing Platform.

The meeting was held from 1:00 p.m. to approximately 3:20 p.m. on April 13, 2020.

The meeting was advertised in the Florida Administrative Register and on the District's web site. In addition, notifications concerning the event were distributed to local governments, other agencies, and stakeholder groups or representatives.

Meeting participants that chose to identify themselves included:

<u>Peer Review Panel</u>
Laura Bedinger, Peer Review Panelist
Peter Sheng, Peer Review Panelist
Dave Tomasko, Peer Review Panel Chair

<u>District Staff</u>
Chris Anastasiou
Mike Bray
XinJian Chen
Kristina Deak
Yonas Ghile
Doug Leeper
Dennis Ragosta
Cindy Rodriguez
Randy Smith
Adrienne Vining
Chris Zajac

<u>Others</u>
Angel Martin
Unidentified stakeholder

The meeting was initiated by Doug Leeper with panelist introductions and identification of other participants.

Mr. Leeper then led a brief discussion of logistical issues for the review process, including submission of monthly progress reports to the District by each panelist and development of summaries for panel teleconferences.

Dave Tomasko, Laura Bedinger and Peter Sheng subsequently summarized their initial comments on the District's draft minimum flows report. These discussions were facilitated using written comments each panelist had previously posted to the review webforum based on their initial review of the District's draft minimum flows report. In general, the panelists noted that the draft minimum flows report was well-written and relatively understandable. They indicated that at this time, their initial review has not identified any apparent "fatal flaws" in the work supporting development of the proposed minimum flows, but noted that there are several issues that should or could be addressed currently or in the future to support minimum flows development, implementation or reevaluation for the Lower Peace River and Lower Shell Creek.

The panel and District staff agreed that it would be appropriate for District staff to begin developing written responses to all comments included in the panelist's initial written comments and questions. In addition, all agreed that it is likely some responses to panelist comments and questions can be developed and as appropriate, acted upon and considered by the panel on a relatively near-term basis, while others may be associated with identification of potential actions that, if implemented, would be expected to occur on a long-term basis.

District staff indicated they would begin working on written responses to all initial comments of the panelists and would post available responses to the review webforum prior to the panel's teleconference scheduled for April 20, 2020. The panelists indicated they planned to review and discuss the available District responses during their April 20, 2020 teleconference.

Dr. Tomasko indicated that he planned to compile all panelist comments and District responses in a preliminary draft of the panel's initial peer review report by April 24, 2020. The panel agreed that it would plan on discussing and reviewing the preliminary draft of the initial review report during the panel teleconference scheduled for April 27, 2020, in anticipation of completing their initial peer review panel report by April 30, 2020.

Following the panel's discussion of their initial review findings and plans for development of an initial peer review report, Mr. Leeper asked if any members of the public wished to provide any comment on the peer review process or the proposed minimum flows. One stakeholder, Angel Martin, provided input that included: a question regarding known information regarding the effects of large inflows from the Peace River on biota in Charlotte Harbor; the reasonableness of river base flows used in minimum flow analyses; the need for additional discussion of uncertainties associated with the hydrodynamic modeling used for minimum flows development; and discussion of the need for additional, future data collection efforts in the greater, Lower Peace River/Lower Shell Creek/Charlotte Harbor system. Mr. Martin indicated he would submit his comments to the District in written form; these comments were posted to the review webforum by Mr. Leeper.

DL

Moderator

93 posts

Doug Leeper

a few seconds ago

Draft summary of the 2020-04-20 teleconference of the Lower Peace River/Lower Shell Creek minimum flows peer review panel. Draft summary prepared by Doug Leeper and Dave Tomasko. Requesting review/revision/acceptance by Laura Bedinger and Peter Sheng.

DRAFT_Lower Peace_Shell Peer Rev 2020-04-20 ...
30.75 KB

MEETING SUMMARY

Southwest Florida Water Management District
Scientific Peer Review Panel Teleconference
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Facilitated as a Video and Telephone-Based Teleconference

April 20, 2020

The Southwest Florida Water Management District (District) organized and facilitated a meeting of the independent scientific peer review panel convened to review a draft District report on proposed minimum flows for the Lowe Peace River and Lower Shell Creek. The meeting was facilitated as a teleconference/videoconference using the Microsoft Teams Videoconferencing Platform.

The meeting was held from 1:00 p.m. to approximately 3:05 p.m. on April 20, 2020.

The meeting was advertised in the Florida Administrative Register and on the District's web site. In addition, notifications concerning the event were distributed to local governments, other agencies, and stakeholder groups or representatives.

Meeting participants that chose to identify themselves included:

Peer Review Panel
Laura Bedinger, Peer Review Panelist
Peter Sheng, Peer Review Panelist
Dave Tomasko, Peer Review Panel Chair

District Staff
Mike Bray
XinJian Chen
Yonas Ghile
Doug Leeper
Dennis Ragosta
Cindy Rodriguez
Randy Smith
Adrienne Vining
Chris Zajac

Others
Jessica Stempien, Florida Department of Agriculture and Consumer Services
Laura Donaldson, Manson Bolves Donaldson

The meeting was initiated by Doug Leeper with panelist introductions and identification of other participants.

Mr. Leeper subsequently led a brief review and status update concerning the review process. For his discussion, Mr. Leeper used a presentation and discussion that highlighted information about minimum flows, minimum flow development, the panel's scope of work identified for their review, and the review schedule. The presentation had previously been made available to meeting participants on the peer review webforum established for the review process.

The panel (Dr. Dave Tomasko, Dr. Laura Bedinger and Dr. Peter Shen) used the review status and update discussion to explore options for addressing the specific questions and topics that the District has asked the panel to address as part of their review. All panelists concurred that associating their initial comments and questions, and the relevant responses already provide by District staff, with the specific questions and topics required for the review would be a reasonable and effective format for their initial peer review report. Dave Tomasko indicated he planned to develop a draft of the initial peer review report prior to the next peer review panel meeting, which is scheduled for April 27, 2020. The panel affirmed that following their April 27, 2020 meeting, they fully anticipated submitting an initial peer review report to the District by April 30, 2020.

At the request of Dr. Tomasko, Mr. Leeper briefly reviewed draft response documents that District staff had prepared based on the initial comments and questions previously developed by all three panelists. Mr. Leeper indicated that staff has developed draft responses to many of the panelist's questions and comments, and that he had posted files containing the draft responses to the review webforum just prior to the beginning of the current panel meeting. Mr. Leeper added that District staff planned to continue working on responses for the remainder of the issues identified by the panelists and would also likely be refining some of their initial draft responses.

Discussion concerning the District's draft responses to the panel's questions and comments addressed numerous topics, including: consideration and summarization of period-of-record hydrologic data in decadal or multi-decadal time-steps; consideration and summarization of period-of-record water quality data in decadal time-steps; specific water quality constituents that were assessed; availability and plans for collection of biological data, including assessments of vegetation, benthos, plankton and nekton; future modeling of fish and potentially, manatee habitats; inclusion of flow-reduction maxima in the proposed minimum flows; discussion of the Pollutant Load Reduction Goal established for the Lower Peace River; presentation of results from selected statistical analyses; sea level increase estimates used for estimating future salinity conditions; minimum flows and their use in and relationship with other District programs; the importance of (water) color in the lower Peace/Shell System and Charlotte Harbor; description and analysis of flow trends; development of baseline flows used for the minimum flow analyses; issues related to use of the Peace River Integrated Model; and use of fifteen-percent change criteria, threshold-based criteria and the most sensitive criteria for minimum flows development.

Following discussion of the District's draft responses to the panel's initial review findings and plans for panel's development of an initial peer review report, Mr. Leeper asked if any members of the public wished to provide any comment on the peer review process or the proposed minimum flows. After determining that no stakeholders wished to provide comment during the meeting, Mr. Leeper adjourned the meeting.

From:	Angel Martin
To:	Doug Leeper
Subject:	RE: SWFWMD WebBoards Digest--Information and Question
Date:	Tuesday, April 21, 2020 3:23:12 PM

Received the subject email for the WebBoard notification. Thanks for the notification. I did not receive an invitation for the subject meeting on Monday (April 20) and had not checked the Web site since the middle of last week to see if there was a meeting notification—that is why I did not participate. I assume that the meeting was open to the public? Let me know if there are any questions concerning my comments or need any additional information.

Angel

____

Angel Martin

From: noreply@discussion.community [mailto:noreply@discussion.community] **On Behalf Of** SWFWMD WebBoards
Sent: Tuesday, April 21, 2020 4:31 AM
To: amartin217@tampabay.rr.com
Subject: SWFWMD WebBoards Digest

Hi amartin217,

Here are the top topics at SWFWMD WebBoards since last week.

- **Peer Review Panel Teleconference - April 20, 2020**
  Started by Doug Leeper in Minimum Flows for the Lower Peace River and Lower Shell Creek

Thank you,
SWFWMD WebBoards
https://swfwmd.discussion.community

This digest is sent when you haven't visited the forum in over a week. If you'd rather not receive future emails, you can unsubscribe.

From:	Doug Leeper
To:	Angel Martin
Bcc:	Yonas Ghile; Xinjian Chen; Chris Anastasiou; Kristina Deak; Chris Zajac; Randy Smith; Eric DeHaven; Adrienne E. Vining; Mike R. Bray; Owen Thornberry; April D. Breton
Subject:	RE: SWFWMD WebBoards Digest--Information and Question
Date:	Tuesday, April 21, 2020 3:52:00 PM

Angel:

- Sorry you were missed the Lower Peace/Shell Creek minimum flows peer review panel teleconference yesterday.
- For your information, I just posted a draft summary for the meeting to the webforum.
- All scheduled peer review panel meetings are open to the public. The remaining meetings are scheduled for 4/27, 6/8 and 6/22. Note that the meetings are listed in the District calendar.
  - https://www.swfwmd.state.fl.us/about/calendar
- Thanks again for your previous comments and look forward to your continued participation in the process.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: Angel Martin <amartin217@tampabay.rr.com>
Sent: Tuesday, April 21, 2020 3:23 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: RE: SWFWMD WebBoards Digest--Information and Question

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To: amartin217@tampabay.rr.com
Subject: SWFWMD WebBoards Digest

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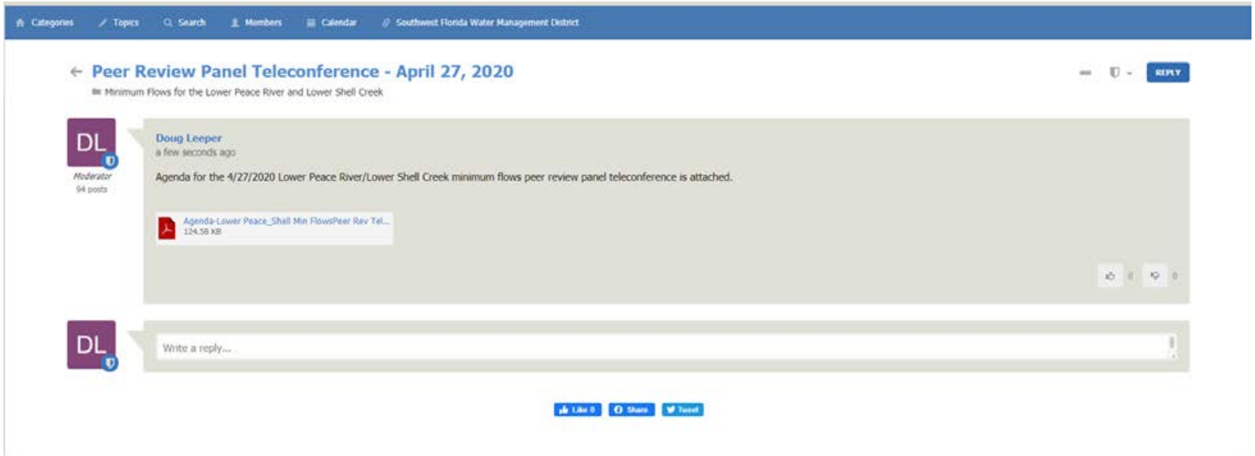
- **Peer Review Panel Teleconference - April 20, 2020**
  Started by Doug Leeper in Minimum Flows for the Lower Peace River and Lower Shell Creek

Thank you,
SWFWMD WebBoards
https://swfwmd.discussion.community

This digest is sent when you haven't visited the forum in over a week. If you'd rather not receive future emails, you can unsubscribe.



Categories Topics Search Members Calendar Southwest Florida Water Management District

Peer Review Panel Teleconference - April 27, 2020

Minimum Flows for the Lower Peace River and Lower Shell Creek

DL

Moderator

94 posts

Doug Leeper

a few seconds ago

Agenda for the 4/27/2020 Lower Peace River/Lower Shell Creek minimum flows peer review panel teleconference is attached.

Agenda-Lower Peace_Shell Min FlowsPeer Rev Tel...

124.58 KB

REPLY

DL

Write a reply...

Like 0 Share Tweet

Southwest Florida Water Management District

2379 Broad Street, Brooksville, Florida 34604-6899
(352) 796-7211 or 1-800-423-1476 (FL only)
WaterMatters.org

An Equal Opportunity Employer

The Southwest Florida Water Management District (District) does not discriminate on the basis of disability. This nondiscrimination policy involves every aspect of the District's functions, including access to and participation in the District's programs, services and activities. Anyone requiring reasonable accommodation, or would like information as to the existence and location of accessible services, activities, and facilities, as provided for in the Americans with Disabilities Act, should contact Donna Kaspari, Sr. Performance Management Professional, at 2379 Broad St., Brooksville, FL 34604-6899; telephone (352) 796-7211 or 1-800-423-1476 (FL only), ext. 4706; or email ADACoordinator@WaterMatters.org. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1-800-955-8771 (TDD) or 1-800-955-8770 (Voice). If requested, appropriate auxiliary aids and services will be provided at any public meeting, forum, or event of the District. In the event of a complaint, please follow the grievance procedure located at WaterMatters.org/ADA.

MEETING NOTICE

AGENDA

Southwest Florida Water Management District
Scientific Peer Review Panel Meeting
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

MONDAY, APRIL 27, 2020
1:00 PM TO 3:00 PM

TELECONFERENCE
Call-in number: 1 (786)-749-6127; Conference ID: 740 405 097#
Teams teleconference link: Join Microsoft Teams Meeting

Detailed Teams teleconference link:
https://teams.microsoft.com/l/meetup-join/19%3ameeting_ODYzNDhjYjAtODU2NC00ZjMwLWI3ZTEtZDFmZTI4YTI1Y2I1%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d

All meetings are open to the public.

1. Welcome/introductions facilitated by Doug Leeper, District MFLs Program Lead

2. Panel discussion by Dave Tomasko, Panel Chair; Y. Peter Sheng, Panelist; and Laura Bedinger, Panelist; facilitated by Doug Leeper
   a. Discussion of additional panel comments/questions and initial District responses
   b. Discussion of draft initial peer review panel report
   c. Discussion of next steps and assignments

3. Public comment period moderated by Doug Leeper

Participants will be asked to save their comments until the public comment portion of the teleconference. If you wish to speak during the public comment period, please identify yourself to the Moderator (Doug Leeper), who will then facilitate your input. Comments will be limited to three minutes per speaker. In appropriate circumstances, the Moderator may grant exceptions to the three-minute limit.

For questions or to submit additional public comment on the peer review of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, please use the Web Board at https://swfwmd.discussion.community/categories that has been established to allow public access to and participation in communications among the Panel Chair and other members of the independent peer review panel created to conduct the peer review. The Web Board will be available for public comment from 8:00 a.m. on April 3, 2020, through 5:00 p.m. on June 26, 2020, and available for public viewing from April 3, 2019 through at least December 31, 2020. Questions or additional public comment may alternatively be submitted to Doug Leeper by email at doug.leeper@watermatters.org, by telephone at 352-397-7840 or 1-800-423-1476 or 352-796-7211, extension 4272, or by mail at the address listed at the top of this agenda.

For persons without access to the Internet, access to the Web Board during the public comment period is available at the headquarters office of the Southwest Florida Water Management District, 2379 Broad Street, Brooksville, Florida, 8:00 a.m. – 5:00 p.m., Eastern Daylight Time, Monday through Friday.

Bartow Office
170 Century Boulevard
Bartow, FL 33830-7700
863-534-1448 or 1-800-492-7862

Sarasota Office
78 Sarasota Center Boulevard
Sarasota, FL 34240-9711
941-377-3722 or 1-800-320-3503

Tampa Office
7601 US Highway 301 North
Tampa, FL 33637-6759
813-985-7481 or 1-800-836-0797

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 20, 2020
Date: Wednesday, April 22, 2020 12:20:29 PM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - April 20, 2020

Posted Apr 22 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I attach my review of the District's response to my initial comments.

I also approve the Draft Summary of the 2020-04-20 teleconference of the LPR/LSC MFL peer review panel. A minor correction - in the text my name was spelled as Peter Shen instead of Peter Sheng.

Draft Peer Rev comms-Sheng_Dist Resp 2020-04...
531.32 KB

Visit Topic

Or reply directly to this email

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Additional Comments by Peter Sheng to the District's response. 2020-04-22

- I greatly appreciate the very comprehensive and in-depth responses by the District.
- Most responses completely addressed my earlier comments, so I made no further comments on those responses.
- I have made additional comments (in red) to a few responses for District's consideration.

NOTES:

- Original comments by Peter Sheng from 2020-04-10 in blue font.
    - Blue highlighting in the original comments identifies potential typos in the original comments that were revised and identified for consideration.
- District responses in black-font *italics*; excerpts from the original minimum flows report in black-font (not italicized).
    - Yellow-highlighted text in District responses indicates potential changes (revisions, deletions and additions) to the text of the original draft minimum flows report.
    - Note that some District responses are currently "in development", and all District responses should be considered preliminary and potentially subject to change.
- File version (date): 2020-04-20.

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Comments on MFL for Lower Peace River and Shell Creek

General Comments:

1. Overall effort is very comprehensive, covering all relevant aspects and issues. Reports are well written.

    Response:
    We thank you for this comment.

2. Changing from the old calendar-based blocking regime to the new flow-based blocking regime is a major improvement.

    Response:
    We thank you for this comment.

3. Hydrodynamic modeling is a big step forward from the previous effort, due to the use of 3D model and extension of model domain into the Gulf of Mexico. The 3D model is peer-reviewed and robust. Verification of the model is rigorous.

    Response:
    We thank you for this comment.

4. Uncertainty and inaccuracy of the hydrologic model remains a concern.

<u>*Response:*</u>
We acknowledge that there are uncertainty and inaccuracy in the estimation of ungaged flow, which accounts for about 10 – 16% of the entire Peace River watershed. About 84 – 90% of the watershed is gaged by the U.S. Geological Survey and the hydrologic loading to the Lower Peace

River from the gaged watershed is reliable. For our minimum flow analyses, we used the best available data, in combination of what we learned from the previous hydrodynamic simulation of the system and a comparison of two previous hydrologic studies of the watershed, to estimate the ungaged flow to the Lower Peace River.

Additional response development associated with incorporation of uncertainty information in the body of the minimum flows report and the hydrodynamic modeling appendix (Chen 2018) is in progress.

With regard to modeling and data uncertainty, we think it is worth noting that we use an adaptive management approach for minimum flows development and implementation, which includes routine status assessments and as necessary, reevaluation of established minimum flows. When possible, these activities are conducted to attempt to minimize uncertainty in our results and recommendations.

5. The base flow is constructed from the average flow during 1950-2014 for LPR and 1966-2014 for LSC. To account for climate change effect, however, is it more appropriate to place more weight on flow conditions in the past 20 years?

   Response:
   We think it is best to use hydrologic data (e.g., rainfall and flow records) for the longest period within reason, to best capture the climatic variability that is integrated in the data. Furthermore, as noted in our response to Comment 4 above, the District uses an adaptive management approach for minimum flows development and implementation, which includes routine status assessments and as necessary, reevaluation of established minimum flows.

   In a changing climate, long-term (50-100 years) average data are not necessarily more representative of the more recent and near future hydrologic conditions. Instead, data within the recent decades may be more representative of the hydrological conditions for the MFL development.

6. Considering sea level rise effect on MFL is commendable. The sea level rise values, which are based on the USACE study in 2013, appear to be at least 50% lower than those recommended by NOAA (2017) which is the leading U.S. climate agency. Are future predictions on precipitation, wind, atmospheric temperature, land use, and storms all incorporated into the new MFL?

   Response:
   We did not develop the proposed minimum flows based on consideration of sea level rise (SLR). However, we evaluated the proposed minimum flows under three SLR scenarios to help determine if and when a future re-evaluation of the minimum flows may be necessary. It turns out that even when we used the U.S. Army Corps of Engineer (USACE) SLR estimates, which are generally lower than the National Oceanic and Atmospheric Administration (NOAA) SLR estimates, a future re-evaluation for the Lower Peace River and Lower Shell Creek minimum flows appears to be needed.

We will note the differences between the water levels we used for the three SLR scenarios that we assessed and those predicted by NOAA in the revised minimum flows report.

Thanks for clarifying that SLR is not incorporated in the MFL. It is good to hear that you think an evaluation of the SLR impact on MFL appears to be needed. However, your decision not to evaluate the impact of SLR on MFL is based on the use of the very optimistic and somewhat outdated SLR projection by the USACE. As you know, projections on SLR have been revised many times since 2010, based on latest research on climate change and sea level rise. For example, the USACE prediction of SLR (based on their 2013 report) for Ft. Myers in 2035 is 0.2, 0.35, 0.76 ft for the low, medium, and high scenario. In comparison, prediction by NOAA (2017) shows 0.47 ft, 0.80 ft and 1.22 ft for the low, medium and high scenario in 2035. These values, which should be considered the BEST AVAILABLE INFORMATION on SLR for this region, are 100% larger than those you tested. Therefore, it is highly recommended that you use the NOAA SLR values to evaluate the potential impact of SLR on MFL. This should not be a major undertaking since the models for MFL can be readily run by simply changing the sea level condition on the open boundary. Since sea level is definitely rising and the Florida Governor has recognized the threat of SLR and intends to improve Florida's resiliency against SLR, it is probably prudent to consider the impact of SLR on MFL now than later.

7. Explanation on how and why the new MFL flow reduction strategy is better than the old MFL flow reduction strategy could be improved. For example, would it be useful to demonstrate that, under the new proposed MFL, the impact of flow reduction for any given year in the past 5-10 years would be much better than the old strategy?

   <u>*Response:*</u>
   The existing and proposed minimum flow for the Lower Peace River were both MFLs developed based on a 15% reduction in water volume with a salinity of <2 psu and are expected to provide similar levels of resource protection. However, the change from use of calendar-based blocks to flow-based blocks for the proposed minimum flows for the Lower Peace River and use of the flow-based blocks for the minimum flows proposed for Lower Shell Creek allows more withdrawals when high flows associated with storm events occur on any day of the year.

8. Instead of measuring the impact of flow reduction in terms of 15% reduction of various habitats, is it possible to quantify the impact in terms of economic damage?

   <u>*Response:*</u>
   Minimum flows are developed and established into District rules in accordance with directives and guidelines included in relevant sections of the Florida Statutes and Florida Administrative Code. For example, the Water Resource Implementation Rule specifies that ten environmental values (recreation in and on the water; rish and wildlife habitats and the passage of fish; estuarine resources; transfer of detrital material; maintenance of freshwater storage and supply; aesthetic and scenic attributes; filtration and absorption of nutrients and other pollutants; sediment loads; water quality; and navigation) must be considered when establishing minimum flows and minimum water levels, and each was considered for development of the proposed minimum flows for the Lower Peace River and Lower Shell Creek.

Although none of the environmental values were evaluated in economic terms it may be reasonable to associate many or all of them with some form of an economic valuation system. We do not, however, think this is an appropriate approach for implementation of the directive and guidance associated with minimum flows and levels establishment provided by state laws and regulations.

Nonetheless, we note that the process of minimum flows establishment culminates in rulemaking. State Law governing rulemaking in Florida requires an assessment of estimated regulatory cost associated with development and amendment of rules. This activity will be undertaken as the process of establishing minimum flows for the Lower Peace River and Lower Shell Creek proceeds.

"An assessment of estimated regulatory cost associated with development and amendment of rules" sounds like an "economic" assessment.

9. Southwest Florida is prone to hurricanes and hurricane-induced flooding. For example, Hurricane Elena (1985), Charley (2004), Wilma (2006), and Irma (2017) all impacted the lower Peace River area with storm surge, high flow, salinity stratification, and sometimes hypoxia. After Hurricane Charley, it was reported that flow in the Peace River peaked and water smelled like septic tank because of hypoxia. Predictions by most climate scientists suggest hurricanes will become more intense in the future. How will the proposed MFL guide the flow reduction during hurricane events?

    Response:
    In response to your question, we think it is useful to note that minimum flows are to be established as the limit beyond which further withdrawals would be significantly harmful to the water resources or ecology of the area. Therefore, in the case of extreme high-flow conditions associated with hurricanes and other major storm events, achieving minimum flow requirement is not anticipated to be an issue. However, it is worth noting that ***District rules allow for the consideration of public health and safety for implementation of all District rules and policies.***

    So does it mean that MFL will ensure that the freshwater withdrawn from the rivers meet established water quality standard?

10. Shouldn't the MFL be updated every five years, instead of every 10-15 years, in a changing climate?

    Response:
    Development of minimum flows is a relatively lengthy process involving compilation of relevant data, development or refinement of analytical methods and approaches, and coordination with local governments and other affected stakeholders. In addition, the District is engaged in the establishment and reevaluation of numerous priority water bodies. For these reasons, we note that there are practical limitations concerning minimum flow reevaluation schedules. However, it is worth noting that minimum flow status assessments are conducted annually, on a five-year basis in conjunction with regional water supply planning, and on an as-needed basis associated with reviews for water use permit applications and renewals. Results from these assessments are part of the District's adaptive management approach to minimum flows development and

implementation and can be used to inform decisions regarding the need for minimum flow reevaluation.

Perhaps it would be a good idea to evaluate the current and future climate condition during your five-year evaluation with regional water supply planning to determine if the MFL needs to be updated?

11. How about creating a dynamic MFL with a realtime nowcast/forecast system for the Peace River, Shell Creek, and Charlotte Harbor region? The system can nowcast the current flow/salinity and forecast the future flow/salinity during the next 48-72 hours. Allowable flow reduction can be determined based on the nowcast/forecast flow/salinity conditions in the system.

Response:
This is an intriguing suggestion, although we do not think it is applicable to the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. The minimum flows (and minimum water levels) are typically assumed to correspond with long-term hydrologic and environmental conditions, and in the case of the Lower Peace River and Lower Shell Creek were developed based on central tendencies of environmental responses to changes in flow simulated every fifteen-minutes for a 7.7 year simulation period. Further, we add that estuarine organisms are adapted to cope with a wide range of salinities and the small changes in salinity, attributable to the currently proposed minimum flows, are unlikely to alter the ecological integrity of the naturally dynamic Lower Peace/Shell System or Charlotte Harbor.

We note, however, that established minimum flows can be and are used to develop withdrawal-related conditions in water use permits, on both long-term and short-term bases. For example, in the case of the existing and proposed minimum flows for the Lower Peace River, permit conditions that limit withdrawals based on the previous day's average flow have been and are expected to be successfully implemented. These types of permit conditions are developed by District staff in coordination with permittees based on identified regulatory constraints, such as established minimum flows, the needs of the permitee and other practical considerations.

12. SWFWMD has jurisdiction over the northern Charlotte Harbor system while SFWMD has jurisdiction over the southern part of the system, including Caloosahatchee River which sends a large amount of water into the estuarine system. Given sufficiently long time, water from Caloosahatchee could impact the flow in the northern part of Charlotte Harbor. Does the hydrodynamic model include Caloosahatchee flow as the boundary condition?

Response:
Although Caloosahatchee River flow was not directly used as boundary conditions near the mouth of the river, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model.

This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.

Executive Summary

1. Can someone define "significantly harmful"? Is it to be determined by the District or State Legislature?

   Response:
   Significant harm and significantly harmful are not defined by the State Legislature. For minimum flows and levels development, each water management district of the state or the Florida Department of Environmental Protection identify specific thresholds or criteria that can be associated with significant harm.

2. What is "best information available"? Please define.

   Response:
   In accordance with direction provided by the Florida Legislature, District staff use the best available information when determining minimum flows. Determinations regarding the best available information are made by District staff based on professional judgment, with consideration of input from all stakeholders. These data include information that exists at the initiation of the minimum flows development process and information that is acquired specifically to fill data requirements deemed necessary for establishment of the best, defensible minimum flows.

3. Second to the last line on page vii: "hydrodynamic" should be "hydrodynamic model".

   Response:
   This oversight will be corrected in the revised version of the minimum flows report.

4. Base flow was divided into three flow blocks. Is it the best possible way? Can it be broken into 4 or 5 blocks? How does the MFL outcome vary with the number of blocks?

   Response:
   In theory, any number of flow blocks could be identified and used for minimum flows development and implementation. For practical purposes, use of three flow blocks for minimum flows development and implementation for water use permitting, planning and water resource protection has proven to be successful. One reason for this success in runoff driven lotic systems is that the blocks have been developed with consideration of low, medium and high flow conditions that are known to be important for the physical, chemical and biological functions and structure of riverine systems.

   We have not conducted analyses associated with development of proposed minimum flows for the Lower Peace River and Lower Shell Creek with varying numbers of flow-based blocks.

5. Any impact on the wetlands by flow reduction?

    Response:
    As described in Section 6.4 of the draft minimum flows report, impacts on wetlands associated with the range flow reductions assessed to support minimum flows development are minimal.

6. Should Table for LPR on page ix be numbered?

    Response:
    Yes, the table that includes the proposed minimum flows for the Lower Peace River in the Executive Summary will be numbered as "Table ES-1." In addition, a table caption will be added and the text referencing the table will be modified accordingly in the revised minimum flows report.

7. How do you prove the proposed MFL summarized in the table is the BEST possible?

    Response:
    District staff has compiled and uses the best available information for development of the proposed minimum flows. These data have been assembled based on reviews by staff, consultants to the District, stakeholders and previous peer review panels that have considered minimum flows previously proposed for the Lower Peace River, Lower Shell Creek, Middle Peace River, Upper Peace River and a water reservation proposed for Lake Hancock.

    Staff acknowledges that findings from the current, ongoing peer review and stakeholder review and comment could result in identification of additional information that can be considered the best available for development of the proposed minimum flows. If this occurs, the revised minimum flows report will be amended to reflect inclusion and consideration of the updated, best available information.

8. Should Table for LSC be numbered?

    Response:
    Yes, the table that includes the proposed minimum flows for Lower Shell Creek in the Executive Summary will be numbered as "Table ES-2." In addition, a table caption will be added and the text referencing the table will be modified accordingly in the revised minimum flows report.

9. It is concerning that minimum flow for SC is and will not be met for the next 20 years. Does it mean City of Punta Gorda will have water shortage for the next 20 years?

    Response:

No. Water supply planning completed by the District and the City of Punta Gorda has identified existing sources and projects for additional sources to meet projected demands for the next 20-year planning horizon.

10. District is committed to "periodic" reevaluation and revision of minimum flow for LPR and LSC. Please define "periodic".

    Response:
    The Florida Statutes stipulate that "minimum flows and minimum water levels shall be reevaluated periodically and revised as needed." The term, "periodically" is not defined by the State Legislature.

    However, it is worth noting that the District supports or requires continuous or near-continuous monitoring of hydrologic factors such as flows and withdrawal rates as part of its regulatory programs. These data are used in annual minimum flow status assessments, assessments conducted on a five-year basis in support of regional water supply planning and status assessments that may be completed on an as-needed basis for permitting or project requirements. These assessments as well as additional analyses, such as consideration of sea level changes, can inform decisions concerning the "periodic" need for reevaluation of the established minimum flows.

Chapter 1 Introduction

1. Page 3 - "The proposed minimum flows, which are described in this report….." should provide a reference to a Chapter number or Table number somewhere in the report.

   Response:
   A reference to a specific table or section of the report will added to the revised version of the minimum flows report.

2. Page 4 - Can "best information available" be defined? What is its legal definition? Scientific definition?

   Response:
   We are not aware of a legal definition for "best available information" in the context of the establishment of minimum flows or minimum water levels in Florida. In practical terms, best available information used by the District has been data that has been collected and/or compiled by the District, its consultants or others that exists at the time of a minimum flow or minimum water level is determined and is judged to be reliable and adequate for minimum flows or levels development and assessment. This information typically consists of data that has been collected for purposes other than the development of minimum flows or levels and data that has been specifically collected to support minimum flow or level determinations and assessments.

So the best available information is based on the judgement of the District, its consultants, and others.

3. Page 6 - What are "Alternative hydrologic regimes"?

   <u>*Response:*</u>
   In this sentence, "alternative hydrologic regimes" are meant to be hydrologic regimes, i.e., patterns of flow or water levels, that differ from the hydrologic regime or regimes associated with non-withdrawal impacted conditions.

4. Can the definition of "impacted flows" be improved? It is unclear.

   <u>*Response:*</u>
   We can attempt to revise the definition for "impacted flows" in the revised minimum flows report. A suggested revision of the definition, which we think also necessitates a change to the definition for "modeled flows" within the report is shown below. Yellow highlighting identifies suggested changes for the two definitions.

   - *Modeled flows are flows that are derived using a variety of modeling approaches. Examples include flows predicted using numerical groundwater flow models, flows predicted with statistical models derived from either observed or other modeled hydrologic data, and impacted flows which have been adjusted for withdrawal-related flow increases or decreases.*

   - *Impacted flows are flows that include withdrawal-related impacts. Impacted flows can be reported flows, and they can also be modeled flows b~~ased on simulated groundwater withdrawal scenarios.~~*

   Impacted flows are flows that include impacts. Still kind of circulatory. What do you call flows that include flow withdrawals but with little impacts?

5. Page 11- "a loss of more than 15 percent habitat" is over how long a time period and with what time lag?

   <u>*Response:*</u>
   The percentage change in habitat is based on the full modeling, i.e., evaluation period. In this case, the average water column volume with a salinity less than 2 psu simulated for the period from 1997 through 2014 under the baseline scenario is reduced by 15% in association with the percentage flow reduction associated with the minimum flows.

6. Does the "15% harm" guideline apply to all the habitats?

   <u>*Response:*</u>
   We have typically used a fifteen percent change criterion for habitats and resources assessed

in support of minimum flows development. These assessments have included changes in the area, volume and shoreline length exposed to specified salinities or salinity-ranges, changes in area and volume of thermally-favorable habitat, and changes in habitat suitability based on preferences for a variety of factors, including substrate/cover types, water depths, water velocities, water temperature and dissolved oxygen.

7. Is it more appropriate to consider 15% reduction in economic value?

   <u>Response:</u>
   Minimum flows are developed and established into District rules in accordance with directives and guidelines included in relevant sections of the Florida Statutes and Florida Administrative Code. For example, the Water Resource Implementation Rule specifies that ten environmental values (recreation in and on the water; rish and wildlife habitats and the passage of fish; estuarine resources; transfer of detrital material; maintenance of freshwater storage and supply; aesthetic and scenic attributes; filtration and absorption of nutrients and other pollutants; sediment loads; water quality; and navigation) must be considered when establishing minimum flows and minimum water levels, and each was considered for development of the proposed minimum flows for the Lower Peace River and Lower Shell Creek.

   Although none of the environmental values were evaluated in economic terms it may be reasonable to associate many or all of them in terms of economic valuation systems. We do not, however, think this is an appropriate approach for implementation of the directive and guidance associated with minimum flows and levels establishment provided by state laws and regulations.

   Nonetheless, we note that the process of minimum flows establishment culminates in rulemaking. State Law governing rulemaking in Florida requires an assessment of estimated regulatory cost associated with development and amendment of rules. This activity will be undertaken as the process of establishing minimum flows for the Lower Peace River and Lower Shell Creek proceeds.

8. To prove the success of the proposed new MFL, did the District confirm that there will not be significant harm to resources and habitats if it were applied to any year in the last five years?

   <u>Response:</u>
   The currently existing minimum flow for the Lower Peace River was used to develop conditions in the existing permit issued to the Peace River Manasota Regional Water Supply Authority (PRMRWSA) for direct withdrawals from the Peace River. Compliance with this permit and all water use permits issued by the District is governed by permit-specific reporting conditions. For the permit issued to the PRMRWSA and the permit issued to the City of Punta Gorda for direct withdrawals from Shell Creek Reservoir, permit reporting conditions include those associated with the reporting of withdrawal rates and hydrobiological monitoring requirements. These permit conditions are being complied with by the permitees. Similar permit conditions, including withdrawal constraints and reporting requirements are expected to be included in revisions to the permits issued to the PRMRWSA and City of Punta Gorda

upon establishment of the currently proposed minimum flows for the Lower Peace River and Lower Shell Creek.

During the past few years, District staff have conducted hydrologic assessments associated with permitting issues in the Peace River basin and the development of a water reservation for Lake Hancock and Lower Saddle Creek in the upper portion of the basin. These model-based analyses have not identified concerns associated with currently existing or proposed minimum flows for simulations of recent time periods.

9. Would the new MFL significantly reduce the harm to habitats and resources than the old MFL?

   Response:
   Staff is required by State Law to use the best available information for the calculation of all minimum flows. We think we have done so for our current determination of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, and therefore do not think it is necessary or appropriate to make comparisons regarding resource protection between the existing and proposed minimum flows. We hold this opinion, because we cannot envision a situation where we would not make minimum flow recommendations based on the best currently available information.

   It would be reassuring to know that the new rules do indeed lead to improved outcome (more freshwater withdrawal with no significant harm on the habitats) than the old rules. It seems that the District believes the new rules will lead to better outcome although it is not proven.

10. Page 14 – Why not use the 3D model in the rivers as well as the Charlotte Harbor?

    Response:
    We used the 2-D model in the river portions of the model domain for efficiency and for better resolution of the river cross sections.

    Can you please elaborate this? I though 3D model would better represent the cross sections.

11. Page 15 - I assume the 3D model has moving boundary feature?

    Response:
    Yes, this is a correct assumption.

Chapter 2 Physical and Hydrologic Description

1. Figure 2-2 on Page 18: This lower left corner of this map does not look similar to a Google map for the region. Perhaps it is good to show a Google map for the region?

   Response:

We do not understand this comment and would like to clarify what is being noted and requested. However, we add that when possible, we prefer to use GIS-based layers and data that are maintained by the District's Mapping and GIS Section for creation of maps and figures included in District documents.

If you look at a Google street map for the upper Charlotte Harbor area including Punta Gorda and Highway 41, then compare it to Figure 2-2. It is difficult to relate/connect the two maps.

2. Figure 2-3 – Please explain the dark map which corresponds to the white region in the larger map shown in the inset.

   Response:
   We plan to modify this map of the Shell Creek watershed in the revised minimum flows report to include and note the "lower" Shell Creek segment (i.e., Lower Shell Creek), Shell Creek Reservoir, the "upper" Shell Creek segment and Prairie Creek.

3. Table 2-1. No need to show % again after the numbers.

   Response:
   We agree and will delete the % symbol from the table cells containing the percentage values in the revised minimum flows report.

4. What is the LiDAR data for the land area used in this MFL study? Is it 2017 data? I understand Florida took LiDAR data over Southwest Florida after Irma in 2017.

   Response:
   As noted on Page 23 of the draft minimum flows report notes the LiDAR data collection, mapping, verification and delivery to the District was conducted in 2015.

   Does Florida have 2017 LiDAR data for the region? I know 2017 LiDAR data exist for Collier County.

5. Page 30 – Line #2 "can all affected" should be "can all be affected".

   Response:
   We agree and this change will be made to the revised minimum flows report.

6. Are all elevation and bathymetry data converted to NAVD88?

   Response:
   Most elevation data and references to elevations are presented relative to the North American Vertical Datum of 1988 (NAVD88). However, we note that in the descriptive information included in Section 2.1 on page 16 of the draft minimum flows report a reference is made to the Peace River originating in an area of Polk County at an elevation of about 100 feet above the National Geodetic Vertical Datum of 1929.

We also note that a water surface elevation of 5.0 feet is included in the description of Shell Creek Reservoir in Section 5.5.3 on page 91 of the draft minimum flows report. We will review the source for this information (PBS&J 2007) and amend the description of the water surface elevation to reference a specific datum, if necessary.

For development of the revised version of the minimum flows report, we will further review the text, table and figures include in the draft minimum flows report to ensure that presentation of elevation data that are not referenced to NAVD88 are clearly identified.

7. What is the vertical datum for the water level at the open boundary condition of the 3D model?

Response:
The vertical datum for the boundary condition water levels is NAVD88.

Was it set to the 2000 water level?

8. On Page 37, it was said that many executive orders were issued in 2009. How were these orders determined? With modeling? What were the impact on the ecosystem and resources?

Response:
The executive orders noted for Peace River withdrawals by the Peace River Manasota Regional Water Supply Authority were issued by the District based on the severity of drought conditions and allowable percent-of-flow reductions that were available from proposed minimum flows for the Lower Peace River at the times the orders were issued.

As noted in the Peace River Hydrobiological Monitoring Program 2011 HBMP Comprehensive Report (Atkins 2013), and in reference to withdrawals at the Peace River Manasota Regional water Supply authority facility where withdrawals are made from the Peace River "(n)one of the extensive HBMP analyses done to date have indicated that either measured or modeled changes resulting from Facility withdrawals have been of sufficient magnitude (relative to the far greater natural degree of variation in freshwater inflows) to have affected the long-term physical, chemical or biological characteristics of the lower Peace River/upper Charlotte Harbor estuarine system."

Based on the preceding paragraph, staff notes that two references included in the draft minimum flows report, and their citation in the body of the document should be revised as shown below.

Atkins, Inc. 2013b. ~~Draft~~ River Hydrobiological Monitoring Program 2011 HBMP Comprehensive ~~summary report~~Report, June 2013 (Revised December 2013). D~~raft report prepared~~ Prepared for the Peace River Manasota Regional Water Supply Authority.

9. Do you set a goal for total water supply first, then determine the flow reduction strategy? Or is it the other way around?

Response:

The goal is to identify flow reductions that maintain specified criteria that can be associated with significant harm to accomplish this, we develop a baseline hydrologic record or records to reflect flows expected in the absence of withdrawal effects, then sequentially reduce these flows to assess potential changes in environmental criteria and limits at which the criteria targets would be exceeded.

10. The sentence on the bottom of page 37 "However,….." is unclear. Please clarify.

Response:

We plan to revise the text on the bottom of page 37 of the draft minimum flows report to try to clarify the similarities between allowable flow reductions included in the current minimum flows established for the Lower Peace River and the withdrawal limits specified in the permit that allows the Peace River Manasota Regional Water Supply Authority to withdraw water from the river.

Excerpt from page 37 of the draft minimum flows report with changes highlighted in yellow:

> *In 2009, the PRMRWSA expanded the Peace River Facility to increase its pumping capacity from 44 million gallons per day (mgd) to a maximum diversion of 120 million mgd and built a 6 billion gallons reservoir. In 2011, the District issued a revised version of the water use permit for facility withdrawals (Table 2-4) that was consistent with the minimum flows for the Lower Peace River (see Table 1-1) that had been adopted in 2010.*
>
> *Most of the allowable diversions specified in the revised 2011 water use permit were identical to those included in the adopted minimum flow rule. However, allowable diversions ~~specified by the permit~~ when the combined flows at the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee gages exceed 625 cfs during Blocks 2 and 3 ~~are~~were, respectively, 1% and 10% less than the withdrawal limits included in the currently established Lower Peace River minimum flows rule. The 2011 water use permit authorizesd a daily maximum withdrawal of 120 mgd, annual average withdrawal of 32.855 mgd and monthly maximum withdrawals 38.3 mgd, with no withdrawals allowed if the combined previous day flow at the three gages i~~s~~was less than 130 cfs.*

Chapter 3 Water Quality

1. Please define "flow lags". Is it "flow at previous x days"?

Response:

For the water quality analyses, lagged-flows refers to average flows for periods ranging from 2 to 60 days prior to the date of water quality sampling event.

The following excerpt from Section 3.2.2 on page 56 of the draft minimum flows report will be amended to clarify what is meant by lagged-flows.

For the more recent analyses, Janicki Environmental Inc. (2019) used bivariate plots to examine the relationships between flows and various water quality constituents using data obtained from 5 HBMP fixed-stations. Spearman's rank correlation was also conducted for water quality constituents of interest and lag-average flows with lag-periods between 2 and 60 days (i.e., periods including the sampling day and the preceding day, the sampling day and the preceding two days, etc., through the sampling day and the preceding 59 days) to determine the temporal scale at which the constituents might be correlated to flows.

2. Figure 3-23 – label "salinity" should be "chlorophyll".

<u>*Response:*</u>
The image used for the figure was reproduced from a figure (Figure 5-103) in a report by Atkins, Inc. (2017), which included an axis-labelling error. Nonetheless, for our revised minimum flows report we will revise Figure 3-23 to change "salinity" to "chlorophyll" in the y-axis label. In addition, we will review axis labels used throughout the minimum flows report and associated appendices for accuracy and note potential errors in previously published documents that are included as report appendices.

In reviewing the Figure identified in this comment, we noted that the Atkins, Inc. (2017) report cited in the Figure 3-23 caption of the draft minimum flows report is not listed in the literature cited section of the report. To address this oversight, we will add the following reference to the revised minimum flow report.

Atkins, Inc. 2017. Shell Creek Hydrobiological Monitoring Program Five-year Comprehensive Summary Report, Water Use Permit No. 200871.010. Prepared for the City of Punta Gorda, Florida.

3. Given the importance of flow and salinity in affecting the water quality and ecosystem, hydrodynamics and hydrodynamic modeling is the cornerstone of the MFL study. However, "hydrodynamic modeling" does not appear in the report until page 57 in a very short paragraph: "Given the strong interaction between freshwater flows and salt transport processes, a coupled 3D and 2D hydrodynamic model (Chen 2020) was developed to estimate responses of salinity to reductions in freshwater inflows and support development of proposed minimum flows for the Lower Peace River and Shell Creek. The hydrodynamic model is discussed briefly in Chapter 5 and in greater detail in the Appendix C."

<u>*Response:*</u>
We think it is appropriate to introduce the development of a hydrodynamic model for assessing flow-related changes in salinity in the Lower Peace/Shell System in the section of the draft minimum flows report that addresses system salinity.

An excerpt from page 57 in Section 3.3.2.1 of the draft minimum flows report is reproduced below and recommended changes and additions to the text that will be included in the revised report are highlighted in yellow. These changes emphasize our efforts to develop and update *models used for minimum flow development to develop and use the best available information for minimum flows development.*

Given the strong interaction between freshwater flows~~, and~~ water circulation, and salinity ~~salt~~ transport processes, the District (SWFWMD 2010) previously developed a coupled 3D and 2D hydrodynamic model (Sheng et al. 2006, Chen ~~2020~~2008) ~~was developed~~ to estimate responses of salinity to reductions in freshwater inflows and support development of the currently established minimum flows for the Lower Peace River and. In addition, a regression model was developed to average water-column salinity at any location in Lower Shell creek as a function of flow and other factors, including site location, season, tide stage, flow in the Peace River and salinity in the northeastern portion of Charlotte Harbor (SWFWMD 2010).

As part of the current minimum flow reevaluation and development process for the Lower Peace/Shell System, the hydrodynamic model was upgraded and the model domain was substantially expanded to include the Lower Peace River, Lower Shell Creek, Lower Myakka River, all of Charlotte Harbor, Gasparilla Sound, Pine Island Sound, Matlacha Pass and the most downstream portion of Caloosahatchee River. The upgraded hydrodynamic model is discussed briefly in Chapter 5 and in greater detail in ~~the~~ Chen (2020), which is included as Appendix C to this report.

Inclusion of the additional text highlighted above will require the addition of the following reference to the literature cited section of the revised, draft minimum flows report.

Sheng, Y.P., Kim, T., Davis, J. and Schofield, S. 2006. Hydrodynamic Modeling and Monitoring of Charlotte Harbor in Support of the Determination of Minimum Flows for the Lower Peace and Myakka Rivers, Final report. University of Florida Civil and Coastal Engineering Department. Gainesville, Florida. Prepared for the Southwest Florida Water Management District. Brooksville, Florida.

4. It would be appropriate for a chapter on flow, water level, and salinity with some more details on the hydrodynamic modeling effort as well as a good summary of flow and salinity in the system and how they might influence the other elements of the study. Describe the model assumptions, input and output, and setup for the various scenarios it simulated.

Response:
We will consider the recommendations in this comment and determine whether the suggested inclusions in the body of the report are warranted.

Great! This should strengthen the MFL report.

5. Table 3-1 tries to explain the isohaline location trend. Please explain the meaning of it more clearly with simple layman language without statistical jargons.

Response:
We note that the text on page 47 preceding and which refers to Table 3-1 indicates the trend analysis identified an upstream movement of the 0 psu and 20 psu isohalines for period from 1984 through 2016.

To improve understanding of the information presented in the table, we will, however, modify the table legend in the revised report as indicated below with yellow highlighting.

Table 3-1. Trend tests (seasonal Mann Kendall) for movement of 0, 6, 12 and 20 psu isohaline locations for the period 1984 through 2016 (source: Janicki Environmental, Inc. 2017). Positive, significant statistics indicate upstream isohaline movement, i.e., higher

salinities further upstream in the Lower Peace River.

While developing revised text for the figure caption, we determined that similar changes that clarify the presented statistical results and better indicate that the results pertain to the Lower Peace River (and in some cases Charlotte Harbor near the mouth of the river, we also plan to revise captions for several additional tables and figures in the draft report section, including Tables, 3-2, 3-3, 3-4 3-5, 3-6 and 3-7, and Figures 3-3, 3-4, 3-5, 3-7, 3-8, 3-9 and 3-10.

6. Same for Table 3-2. What is Table 3-2 trying to say? No hypoxia during summer months due to flow reduction?

Response:
We note that the text on page 47 preceding and which refers to Table 3-2 indicates the trend analysis identified dissolved oxygen concentrations in surface waters associated with the 0 psu isohaline increased for period from 1984 through 2016. We do not think the information presented in the table can be used to claim there is no hypoxia in surface waters of the Lower Peace River during the wet, summer season.
Also, we anticipate modifying the text in the figure caption as noted in our response to comment 5 for Chapter 3 above, to improve presentation of the results.

7. Same for Table 3-4, 3-5, 3-6, 3-7.

Response:
We anticipate revising captions for each of these tables as noted in our response to comment 5 for Chapter 3 above, to improve presentation of the result. We also anticipate reviewing text associated with presentation of the water quality information presented in each table to determine whether any revisions to the text are needed.

8. Figure 3-12, 3-13, 3-14, 3-15, 3-16 are highly technical figures with lots of statistical terminologies. Please explain in simple language the meanings of these plots.

Response:
To improve presentation of the correlation analyses results presented in Figures 3-12 through 3-16, we will amend the statistical methods description included in Section 3.3.2 on Page 56 of the minimum flows report. The anticipated amendments for the revised report are highlighted below.

Excerpt below is from page 56 within Section 3.3.2 of the draft minimum flows report, with anticipated revisions (text additions) highlighted in yellow.

For the more recent analyses, Janicki Environmental Inc. (2019) used bivariate plots to examine the relationships between flows and various water quality constituents using data obtained from 5 HBMP fixed-stations.

Spearman's rank correlation was also conducted for water quality constituents of interest and lag-average flows with lag-periods between 2 and 60 days (i.e., the sampling day plus the previous day, through the sampling day plus the previous 11 days and the same day plus 20, 29, 44, and 59 days) to determine the temporal scale at which the constituents might be correlated to flows.

Correlation coefficients derived from the Spearman's rank correlation analyses range between 1 and -1 with negative correlations indicating that as flows increase the magnitude or concentration of the constituent of interest decreases. Correlation coefficients above an absolute value of 0.5 were considered strong correlation for this analysis while others were considered weak.

Excerpt from page 56 within Section 3.3.2 of the draft minimum flows report, with anticipated revisions highlighted in yellow. Similar modifications will be made for all similar plots in the revised version of the draft minimum flows report.

Figure 3-12. Spearman's rank correlation between lag average flows and chlorophyll a concentrations at selected HBMP fixed-stations in the Lower Peace River and Charlotte Harbor near the river mouth (see Figure 3-2 for locations) Correlation coefficients range from 1 to -1, with positive values indicating higher concentrations with higher flows and negative values indicating higher concentration with lower flows. Dashed line identifies 0.5 and -0.5 values used to identify strong correlations (reproduced from Janicki 2019).

9. Stoker et al. (1998, USGS Report) measured the flow and salinity along the Peace River during 1982 – 1985. They found that significant salinity stratification (10 psu between bottom and surface salinity) occurred along the lower reaches of the river when Peace River flow at Arcadia was between 487 and 1420 cfs, or when 5-day sum of discharge was over 20,000 cfs. Kim et al. (2010, ECSS) found that, during 2000, bottom-water hypoxic conditions occur during periods with relatively steady moderate to high (5-40m3/s or 180-1440 cfs freshwater inflows and sediment oxygen demand (SOD). Spring-neap tide also has significant impact on the formation of hypoxia. High flow condition is found almost throughout the B3 block period during June-October in the Base Flow. So how often is hypoxia expected to occur during the summer month with and without flow reduction? During these high flow events, can more flow be withdrawn to reduce the likelihood of salinity stratification and hypoxia?

<u>*Response:*</u>
Although we are not certain, we wonder whether reference to "Base Flow" in the comment above was actually a reference to the "baseline" flow used for the minimum flow analyses.

Yes. I was referring to baseline flow. Thanks for your correction!

We have not quantified differences during the summer, wet season between the baseline flow record and the baseline flow record reduces by the allowable, block-specific flow reductions included in the proposed minimum flows. However, during high-flow events, we do not anticipate withdrawal-related flow reductions to substantially affect the likelihood of occurrence of hypoxia that is associated with salinity stratification and introduction of large volumes of highly-colored water into the estuary. Further, we note that the currently established minimum flow and the proposed minimum flow for the Lower Peace River include *a 400 cfs maximum withdrawal or flow reduction limit that effectively eliminated withdrawal-related flow reductions during high-flow events.*

What is withdrawal-related flow reductions? Withdrawal-related flow withdrawal? Not sure what you are saying.

Since hypoxia has been mentioned many times in the MFL report and during our panel discussion, I recommend a more elaborate discussion on this topic somewhere in the report. According to Dave Tomasko, naturally-occurring hypoxia is a necessary trigger for the Charlotte Harbor estuarine system, but there is also non naturally-occuring hypoxia which may be related to high-color river flow. How to flow withdrawal affect the naturally-occurring and non-naturally-occurring hypoxia? What are the high flow values that trigger these hypoxia? 20000 cfs according to Stoker et al.? 1000 cfs according to Kim et al.?

10. Empirical, regression, and statistical models are used for the water quality analysis. In the long run, is it more appropriate to develop a dynamic water quality model for the estuarine and riverine system?

    Response:
    We agree that development of a dynamic water quality model could be useful for a variety of water management activities, including minimum flows establishment. However, we do not think it is necessary for development of minimum flows for the Lower Peace River or Lower Shell Creek.

    I agree that the development of a dynamic water quality model would be useful for a variety of water management activities, including establishing MFLs for various waterbodies under the jurisdiction of the District, although it may not be necessary for the MFL of LPR and LSC.

Chapter 4 Ecological Resources

1. Vegetation map shown in Figure 4-1 is from 1998. Seems outdated.

    Response:
    We are not aware of any recent, comprehensive, species or genus-level vegetation maps for the Lower Peace/Shell System that would represent an update to Figure 4-1 in the draft minimum flows report.

    We are, however, aware of selected, updated maps of the vegetation of the area, including a map of salt marsh versus mangrove coverage *based on 2009 and 2011 District land use data that* is available in the FWC Coastal Habitat Integrated Mapping and Monitoring Program (CHIMMP) chapter for Charlotte Harbor (https://myfwc.com/media/12063/chimmp2017-chapter06-charlotte-harbor.pdf). This map does not, however, include species level classifications. More detailed maps based on data from 2015 are available in the 2016 Charlotte Harbor National Estuary Program technical report number 16-3 (http://chnep.wateratlas.usf.edu/upload/documents/Mangrove-Heart-Attack-Draft-30Sept2016.pdf; see pages 59 and 66), which may be a valid solution *for presentation of more current vegetation coverage in the Lower Peace/Shell System.*

For the revised minimum flows report, we plan to further investigate the feasibility and utility of developing vegetation maps of the Lower Peace/Shell System based on recent land use/cover GIS layers.

2. Figure 4-2 is difficult to see. Please use different color tones for the seagrass.

   Response:
   We will modify the figure map to provide better contrast for the mapped seagrass coverage.

3. Page 76 – "decreased flows may also contribute to increases in dissolved oxygen concentrations." Is it so? Flow reduction will lead to increased DO?

   Response:
   The concept is further explained in the papers cited in Section 4.2, and we think it is adequately summarized in the section. Additional, potential effects of decreased flows could include those associated with an increase in the influence of tidal fluctuations which can lead to the formation of a well-mixed system. Also, if sediment loads from land decrease as a function of reduced flows, water clarity could increase, leading to an increase in primary production.

   I recommend adding your response into p.76 when this "concept" is mentioned.

Chapter 5 Flow Blocks, Baseline Flows, resources of concern and modeling tools relevant to minimum flows development

1. Should indicate the meaning of curves with green and blue colors. What if 1994-2014 model results are used? Climate in the past two decades is likely more different from the previous years so flow data during 1994-2014 maybe more meaningful to consider here.

   Response:
   We assume this question is referring to Figure 5.1. The blue and green curves demonstrate how calendar-based blocks would look if we used a longer record (1950-2014) and a shorter record (2007-2014). For the minimum flows, the 2007-2014 period was used.

2. Did the hydrodynamic simulation for the 1950-2014 and 2007-2014 periods use the appropriate atmospheric forcing including air temperature, cloud cover, wind, and ocean forcing over the region? For example, my understanding is that wind data from only one local wind station was used in the model simulation. Perhaps it would be worthwhile to use predictions by regional wind model, e.g., the NOAA NAM (North Atlantic Mesoscale) model to more accurately capture the wind influence?

<u>Response:</u>
The hydrodynamic model was run only for the 2007 through 2014 period.

3. Perhaps it would be useful to understand how and why the base flows vary with different time periods 2007-2014, 1950-2014, and 1994-2014 before determining which the best base flows are?

   Response:
   Response development is in progress.

   Looking forward to your response!

4. Please explain "With this new approach, the determination of transitional flow trigger (e.g. 625 cfs in the existing Lower Peace River minimum flows, Table 1-1) is not required when high flows remained depressed due to climatological conditions."

   Response:
   Typical summer wet season, high flows would be subject to the allowable flow reduction associated with Block 3. However, if flows during the typical wet season fall within the flow-range associated with Block 2 (the medium flow range block), the allowable percent-of-flow reductions associated with the Block 2 minimum flows rather than the allowable percent-of-flow reduction associated with the Block 3 would be applicable. This use of flow-based blocks achieves a goal similar to that which was used for development of the "flow trigger" used for the currently adopted Lower Peace River minimum flows.

5. It might be useful to produce a "flushing map" (50% renewal time map) for the various sections of the flow system. The map can be used to aid the discussion of flow effect on DO, water quality, fishery, etc.

   Response:
   We agree that transport timescales are useful in the discussion of flow effects on DO and other environmental factors. We will consider how to best incorporate this type of information in the revised version of the draft minimum flows report.

   Excellent!

6. Page 77 mentions the following: "Hurricanes can cause high river-inflows events, which reduce the salinity in the area and reduce dissolved oxygen." Were these events simulated by the models used for this study?

   Response:
   The model was run from 2007 through 2014 and there were some major storm and drought events but not hurricanes.

7. Figure 5-8 shows the domain of the 3D model used for the MFL study. This should have been shown in a new chapter on hydrodynamics (flow, water level, and salinity), preceding the water quality chapter.

Response:

The District's standard format for minimum flow reports involves the identification of ecological criteria followed by the description of tools that will be used to model or assess the criteria. Both the water quality (Chapter 3) and ecological resources (Chapter 4) summaries were appropriately described prior to presentation and discussion of the hydrodynamic model and other tools used for minimum flows development.

I am not trying to change the District's standard procedure, but just thought it would be useful to educate the readers of the MFL report how the major elements of the MFL issues – flow, water level, salinity, water quality, and ecological resources are connected. Nothing too technical but a holistic overview of the connections among the various elements of concern. Models can be mentioned but will not be described in detail except in the appendix. Once the District has done that, this new chapter or section could be used in every MFL report in the future. Just a suggestion.

8. Hydrologic model prediction of the watershed flow remains to be a weak link in the new MFL study as the previous one. Improvement is needed.

   Response:

   We believe the hydrologic models used for predicting watershed flows were sufficient for supporting our minimum flows analyses. We think it is appropriate to consider improving these modeling efforts for future minimum flow evaluations. In addition, we will identify uncertainty associated with hydrologic model predictions in an updated version of our hydrodynamic modeling report (currently Chen [2018]; an appendix to the draft minimum flows report).

9. Figure 5-11. There is a typo in the figure caption: "independent" is mis-spelled.

   Response:
   We will correct this typo for the figure caption in the revised minimum flows report.

10. Water quality "models" are relatively simplistic and empirical compared to the hydrodynamic model. Consider the use of a dynamic water quality model?

    Response:
    We agree that development of a dynamic water quality model could be useful for a variety of water management activities, including minimum flows establishment. However, we do not think it is necessary for development of minimum flows for the Lower Peace River or Lower Shell Creek.

Chapter 6

1. During hurricanes and king tide events, is 400 cfs still the maximum flow withdrawal?

Response:
Yes, the 400 cfs maximum withdrawal for the Lower Peace River is applicable at all times. The only exception would during a period defined by a policy decision or directive of the District Governing Board, or an Order issued by the District's Executive Director. Further, we note that hurricanes and king tides are extreme hydrological events and we don't expect PRMRWSA to withdraw water, especially during hurricanes.

2. Should "minimum flows scenario" be replaced by "minimum flow scenarios"?

Response:
We searched Chapter 6 of the draft minimum flows report and found the phrase "minimum flow scenario" was used in Section 6.6.1 on Page 117. As indicated below with yellow highlighting we will modify the phrase as suggested in the revised minimum flows report.

For the HSM simulations, habitat zones were categorized into Low, Moderate, High and Optimum zones by percentages based on natural break classification in ArcGIS. Table 6-9 presents seasonal habitat zone percentages and changes between the baseline and minimum flows scenarios for the assessed taxa. Black colored percent change values indicate the percentages for the minimum flows scenarios were less than the corresponding baseline percentages. Red colored percent change values indicate the percentages for the minimum flows scenarios were greater than the corresponding baseline percentages.

Don't want to be picky, but is "minimum flow scenarios" or "minimum flows scenarios" better?

3. The stated sea level changes at Ft. Myers station for the period from 2010 to 2035 are 0.20, 0.33, and 0.76 feet, respectively. These values are lower than the latest NOAA predictions.

Response:
See relevant response to General Comment 6 above.

Appendix C Hydrodynamic Modeling

1. This Appendix deserves to be a separate Chapter.

Response:
We will consider including additional information (e.g., a separate chapter or chapter section) on the hydrodynamic model in the revised version of the draft minimum flows report.

2. The 3D hydrodynamic model is very robust and efficient. Most results generally agree well with observations.

Response:
We thank you for this comment.

3. Page 16, Line#5. “friction” should be “fraction”.

   Response:
   Will make this change in the revised version of the draft minimum flows report.

4. Figure 3-11 on page 57 - Model simulated salinity missed several observed salinity peaks. Observed salinity range is between 10-25 psu but simulated salinity is between 20-26 psu. These occurred mostly during the hurricane season.

   Response:
   We think the noted mismatch is mostly due to errors in the downstream salinity boundary condition during the wet season. We note that the original USF model for the system had a worse match at the Mote Marine station.

   I assume the error in the USF model might be related to the inaccurate wind field in the region and/or inaccurate river flow conditions they used.

5. Perhaps it is useful to try to use more wind data from nearby airports, instead of only one station. Can also try to find NOAA NAM wind fields or Navy wind fields (from Naval Research Lab) for the region.

   Response:
   We looked at these data sources for wind data, but it appears that there are still not enough wind data measurement stations in the region to allow us to describe the spatial variability of the Charlotte Harbor system. For simplicity, we chose to use one wind station for our analyses. It would be beneficial to use multiple wind stations and we will consider this option in future studies.

6. During the last MFL study, watershed model greatly over-estimated the flow from the watershed into Peace River and Charlotte Harbor. There is no improvement in the watershed modeling in this MFL study.

   Response:
   We considered the problem of the over-estimation of ungaged flow in our previous minimum flows study for the system. We made some adjustment to get the best ungaged flow estimate based on the previous hydrodynamic study of the Charlotte Harbor system and a comparison with another hydrologic study of the watershed.

7. Good choice of skill index.

   Response:
   We thank you for this comment.

8. On page 42 – “January 2017” should be “January 2007”.

   Response:

We will make this correction in the revised version of the report.

9. On page 44 – “exited” should be “existed”.

Response:
We will make this correction in the revised version of the report.

10. Figure 37 simulated “shoreline length”. Please define. Is flooding-and-during a part of the 3D and 2D model?

Response:
The shoreline length is the actual length of the shoreline seen by the model. The dynamically coupled 3D-2DV model can track shoreline variations and allow the computation of the shoreline length at every time step. In the 3D model, because bottom elevations are defined and given at the four corners of the Cartesian grid, shoreline can be calculated using the bilinear interpolation with known water level if all grid corners are not submerged or emerged. In the 2DV model, the shoreline length can be calculated based on the water level, the grid length, and the river width, which varies with both vertically and longitudinally.

11. Has alternative model domain been considered for the southern part? The alternative would move the southern boundary to the south of San Carlos Bay and use the water level and salinity provided by the USF model as boundary condition there, but use flow conditions in Caloosahatchee measured by SFWMD as boundary condition. I am assuming that the current 3D model uses the water level and salinity inside Caloosahatchee provided by the USF model. If this is true, my concern is the Caloosahatchee flow is not correctly represented in the 3D simulation. Our simulations found that, given sufficient time (~ 1 month), high flow in Caloosahatchee could reach the northern Charlotte Harbor.

Response:
Yes, the current model uses USF model results in the Caloosahatchee River. Effects of Caloosahatchee River flow are indirectly considered in the water level, salinity, and temperature boundary conditions, as the USF model included Caloosahatchee and its flow.

12. Sea level rise values for 2020, 2030, 2040, 2050 are based on USACE’s estimate. On the website provided in Appendix C, it states that the sea level values are based on a 2012 study by the National Academies and a USACE report in 2013. Since 2013, there has been rapid development of new and more robust predictions on future sea level values. NOAA, the leading U.S. climate agency, published a comprehensive report on the future sea level rise values throughout the U.S., including southwest Florida. The NOAA sea level rise values for Ft. Myers area are typically twice of the USACE values. It would be prudent to use the NOAA values and recalculate the impact of Sea Level Rise on MFL in the LPR and LSC. M<ore information can be supplied if requested by the SWFMWD.

Response:
It is true that we didn’t use the newest findings of SLR research for our current minimum flows study. In fact, a majority of our modeling effort for the minimum flows evaluation was complete

about 4 - 5 years ago, before the new SLR results were available. We should have updated our SLR model runs at the time when the draft minimum flow report was written. Nevertheless, as noted above in response to other SLR-related comments, our conclusion that salinity effects predicted for various SLR scenarios indicate the need for a future minimum flows re-evaluation will not change as a result of additional modeling with even higher sea level conditions.

This response differs somewhat from the earlier response on the SLR issue. Are you certain that the impact of high SLR value, say 1.22 ft for 2035, will not change the MFL? Would it be prudent to check it out so you can say it for sure?

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 20, 2020
Date: Thursday, April 23, 2020 4:55:44 PM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - April 20, 2020

Posted Apr 23 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I also approve the Draft Summary of the 2020-04-20 teleconference meeting minutes.

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DL
Moderator
95 posts

Doug Leeper
a few seconds ago

Approved summary of the 2020-04-20 teleconference of the Lower Peace River/Lower Shell Creek minimum flows peer review panel is attached.

Lower Peace_Shell Peer Rev 2020-04-20 Telecon ...
44.33 KB

MEETING SUMMARY

Southwest Florida Water Management District
Scientific Peer Review Panel Teleconference
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Facilitated as a Video and Telephone-Based Teleconference

April 20, 2020

The Southwest Florida Water Management District (District) organized and facilitated a meeting of the independent scientific peer review panel convened to review a draft District report on proposed minimum flows for the Lowe Peace River and Lower Shell Creek. The meeting was facilitated as a teleconference/videoconference using the Microsoft Teams Videoconferencing Platform.

The meeting was held from 1:00 p.m. to approximately 3:05 p.m. on April 20, 2020.

The meeting was advertised in the Florida Administrative Register and on the District's web site. In addition, notifications concerning the event were distributed to local governments, other agencies, and stakeholder groups or representatives.

Meeting participants that chose to identify themselves included:

Peer Review Panel
Laura Bedinger, Peer Review Panelist
Peter Sheng, Peer Review Panelist
Dave Tomasko, Peer Review Panel Chair

District Staff

Mike Bray	Doug Leeper	Randy Smith
XinJian Chen	Dennis Ragosta	Adrienne Vining
Yonas Ghile	Cindy Rodriguez	Chris Zajac

Others
Jessica Stempien, Florida Department of Agriculture and Consumer Services
Laura Donaldson, Manson Bolves Donaldson

The meeting was initiated by Doug Leeper with panelist introductions and identification of other participants.

Mr. Leeper subsequently led a brief review and status update concerning the review process. For his discussion, Mr. Leeper used a presentation and discussion that highlighted information about minimum flows, minimum flow development, the panel's scope of work identified for their review, and the review schedule. The presentation had previously been made available to meeting participants on the peer review webforum established for the review process.

The panel (Dr. Dave Tomasko, Dr. Laura Bedinger and Dr. Peter Sheng) used the review status and update discussion to explore options for addressing the specific questions and topics that the District has asked the panel to address as part of their review. All panelists concurred that associating their initial comments and questions, and the relevant responses already provide by District staff, with the specific questions and topics required for the review would be a reasonable and effective format for their initial peer review report. Dave Tomasko indicated he planned to develop a draft of the initial peer review report prior to the next peer review panel meeting, which is scheduled for April 27, 2020. The panel affirmed that following their April 27, 2020 meeting, they fully anticipated submitting an initial peer review report to the District by April 30, 2020.

At the request of Dr. Tomasko, Mr. Leeper briefly reviewed draft response documents that District staff had prepared based on the initial comments and questions previously developed by all three panelists. Mr. Leeper indicated that staff has developed draft responses to many of the panelist's questions and comments, and that he had posted files containing the draft responses to the review webforum just prior to the beginning of the current panel meeting. Mr. Leeper added that District staff planned to continue working on responses for the remainder of the issues identified by the panelists and would also likely be refining some of their initial draft responses.

Discussion concerning the District's draft responses to the panel's questions and comments addressed numerous topics, including: consideration and summarization of period-of-record hydrologic data in decadal or multi-decadal time-steps; consideration and summarization of period-of-record water quality data in decadal time-steps; specific water quality constituents that were assessed; availability and plans for collection of biological data, including assessments of vegetation, benthos, plankton and nekton; future modeling of fish and potentially, manatee habitats; inclusion of flow-reduction maxima in the proposed minimum flows; discussion of the Pollutant Load Reduction Goal established for the Lower Peace River; presentation of results from selected statistical analyses; sea level increase estimates used for estimating future salinity conditions; minimum flows and their use in and relationship with other District programs; the importance of (water) color in the lower Peace/Shell System and Charlotte Harbor; description and analysis of flow trends; development of baseline flows used for the minimum flow analyses; issues related to use of the Peace River Integrated Model; and use of fifteen-percent change criteria, threshold-based criteria and the most sensitive criteria for minimum flows development.

Following discussion of the District's draft responses to the panel's initial review findings and plans for panel's development of an initial peer review report, Mr. Leeper asked if any members of the public wished to provide any comment on the peer review process or the proposed minimum flows. After determining that no stakeholders wished to provide comment during the meeting, Mr. Leeper adjourned the meeting.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 20, 2020
Date: Friday, April 24, 2020 10:32:12 AM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - April 20, 2020

Posted Apr 24 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Attached is my first draft of the Peer Review Panel's initial report to the District. At this stage, it is ready for review, comment and editing by Drs. Bedinger and Sheng - it is not to be considered as the initial report from the Panel, but a first draft for the other two panel members to review. Working remotely, this is a bit of a challenge to produce such a document, so I would suggest that Drs. Bedinger and Sheng either save any changes in track changes mode, or to provide me with a separate file or communication related to specific edits that they feel are required. The format of the report is based on our discussions earlier this week - it includes a section by section summary of comments in tabular form, along with brief text to explain (if necessary) the comments or concerns raised. Other elements include a section of the table referring to the specific Panel Charge that the comments are in response to - which can be fairly broad. A third section of the tabular presentation of comments notes whether or not a topic was raised by more than one Panel member. A topic raised by only a single member is not less "important" than one raised by all members, as it may reflect knowledge or training that only one Panel member has. However, if a more generic topic was raised by more than one Panel member, the District should pay particular concern to such issues.

Pending receipt of comments and edits from the other two panel members, this draft report will be provided in a revised form to the District by April 30, at the latest.

I anticipate that our Teleconference this coming Monday will mostly consist of Panel member comments on the draft report attached here. While it is helpful for the District to have prior knowledge of the Panel members concerns - based on earlier files the Panel members have transmitted to the District, the District response to this report is part of the next phase of this effort - it is not to be included in this initial report.

See you all (virtually) Monday - Dave

Lower Peace River and Shell Creek MFL Peer Revi...
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Scientific Peer Review Panel Review of "Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report"

Prepared for:

Southwest Florida Water Management District

Prepared by:

Laura Bedinger, Ph.D. – Panel Member

Peter Sheng, Ph.D. – Panel Member

David Tomasko, Ph.D. – Chair

Draft April 2020

Introduction

The Southwest Florida Water Management District (District) has contracted with a Peer Review Panel (PRP) comprised of Laura Bedinger, Ph.D., Peter Sheng, Ph.D. and David Tomasko, Ph.D. to provide a technical peer review of its proposed minimum flows and levels (MFLs) for the Lower Peace River (LPR) and Lower Shell Creek (LSC), as outlined in the report “Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report” dated March 20, 2020, along with additional appendices.

The draft MFL report summarizes prior efforts to establish MFL guidance for the Lower Peace River and Lower Shell Creek, which were adopted in 2010. For the purposes of the draft MFL report, the LPR is defined as the river segment from the USGS gage location at Arcadia down to Charlotte Harbor, while the LSC is defined as the segment of the creek that extends from the Hendrickson Dam at Shell Creek Reservoir to the confluence of Shell Creek with the Lower Peace River.

The District’s prior MFL guidance for the previously developed minimum flows for the LPR and LSC (2010) was adopted into District regulatory guidance by the adoption of the prior MFL report, and became effective regulatory guidance in August of 2010, as Rule 40D-8.041(8), Florida Administrative Code (FAC).

The original MFL guidance contained within FAC Rule 40D-8.041(8) is as follows:

Period	Effective Dates	Where Flow on Previous Day Equals:	Minimum Flow Is
Annually	January 1 through December 31	≤ 130 cfs > 130 cfs	Actual flow (no surface water withdrawals permitted) Seasonally dependent – see Blocks below
Block 1	April 20 through June 25	≤ 130 cfs > 130 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs
Block 2	October 28 through April 19	≤ 130 cfs > 130 cfs and < 625 cfs ≥ 625 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs previous day’s flow minus 29%
Block 3	June 26 through October 27	≤ 130 cfs > 130 cfs and < 625 cfs ≥625 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs previous day’s flow minus 38%

In the 2010 MFL, the District developed draft guidance for the LSC, and determined that a recovery strategy was needed for the LSC, as existing (at the time) flow rates in the LSC were below the draft MFL guidance developed for the LSC. Based on this finding, and the need to develop a recovery strategy for the LSC, draft MFL guidance for the LSC was not adopted into District rules.

The revised MFL guidance for the LPR, from the draft MFL report, is listed below:

Block	If Combined Flow on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs >149 cfs - 297 cfs	Flow - 130 cfs 13% of flow
Block 2	>297 cfs - 386 cfs >386 cfs - 622 cfs	23% of (flow - 297 cfs) plus 13% of remaining flow 23% of flow
Block 3	>622 cfs - 1037 cfs >1,037 cfs	40% of (flow - 622 cfs) plus 23% of remaining flow 40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

The draft MFL guidance for the LSC is listed below:

Block	If Inflow to Reservoir on Previous Day is	Allowable Flow Release
Block 1	<56 cfs	87% of inflow
Block 2	56 cfs - 137 cfs	77% of inflow
Block 3	>137 cfs	60% of inflow

The most immediate difference between the initial (2010) and draft revised MFL guidance for the LPR is the move from a calendar-based regulatory approach to guidance that is based on defined threshold flow levels – which vary over the course of a year. The MFL guidance for the LSC is the first such guidance for that system, as noted above.

Peer Review Panel Responsibilities

To begin, the District's charge to the empaneled PRP was for the members to become familiar with the relevant regulatory background.

In the State of Florida, Florida Statutes Section 373.042 states that for waterbodies such as the LPR and the LSC, MFL guidance shall represent the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The regulatory guidance further states that MFLs shall be calculated using the best information available, that the Governing Board shall consider and may provide for non-consumptive uses in the establishment of MFLs, and when appropriate, MFLs may be calculated to reflect seasonal variation.

Additional and more detailed guidance on the development of MFLs is provided in FAC 62-40, which states that MFLs should consider the following concerns: 1) recreation, 2) fish and wildlife habitats, 3) estuarine resources, 4) transfer of detrital material, 5) maintenance of freshwater storage and supply, 6) aesthetics, 7) filtration and absorption of pollutants and/or nutrients, 8) sediment loads, 9) water quality, and 10) navigation.

As such, MFLs are to cover not only the protection of natural resources, but also navigation, recreation, and – of great importance to the LSC in particular – the maintenance of freshwater storage and supply.

In its broadest sense, the Peer Review Panel is charged with the following six tasks, as related to their review of the 2020 Draft MFL for the LPR and the LSC systems:

1) Determine whether District conclusions are supported by analyses/results presented
2) Determine whether data/information were properly collected and used, any data exclusions were justified, and the data were the best available information
3) Determine whether technical assumptions are clearly stated, reasonable and consistent with the best available information, and if better analyses could be used
4) Determine whether procedures and analyses were appropriate and reasonable, based on the best available data, correctly applied, limitations were handled appropriately, and conclusions are supported by the data
5) For methods judged to be not scientifically reasonable, describe scientific deficiencies, identify remedies, if any, or alternative methods
6) As appropriate, identify and characterize effort involved for preferred alternative methods that could be used in lieu of scientifically reasonable methods that were used

Summary of Review Panel Comments

After discussion in publically-accessible Teleconferences, the PRP decided to produce a draft MFL review report using the following format: 1) PRP comments would be compiled for all reviewers at a time, based on the sequencing of the Draft MFL, 2) PRP comments would first be summarized in tabular form, by report section, in terms of the concern – briefly described – and the relevant PRP charge for which the concern was raised, and 3) additional text would follow to provide any needed back up for the concern.

The Tabular presentation of comments and concerns is tied to the 6 main charges of the PRP in a manner that likely over-simplifies the PRP process. Nonetheless, the PRP felt that this was an appropriate method to show the links between PRP comments and the specific contractual obligations of each PRP member.

The PRP report format appears to differ from most other Peer Review reports, which tend to list concerns by individual reviewers one at a time. Using the report format we selected, we believe that the District review process will be more efficient, as shared concerns can be captured at one time, rather than perhaps being listed two or three times in different sections of the Peer Review report. This report makes no effort to attribute individual comments to individual reviewers. However, a separate column on the summary table for each section notes whether or not a comment or concern was raised by more than one reviewer. This should not be construed such that comments raised by more than one reviewer are more "important" than others, as it could be that an algorithm or conclusion raised as an issue by one reviewer was not known to be potentially problematic by others. However, should a topic be raised as a concern by more than one reviewer, on a general topic, this could be viewed by the District as indicative of a shared concern worthy of specific attention.

If the same comment or concern was raised in more than one location, due that topic arising in more than one part of the draft MFL report, it would be listed in tabular form each time it was encountered, but supplementary text would not necessarily be included in latter portions of the report, to minimize repetition.

In addition, initial comments from the PRP are included for each member, as Appendices.

The Peer Review Panels comments are captured for this Draft Report, starting below:

Overall Comments

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
MFL report was comprehensive, well-written and thorough	1 to 5	Yes
Basing MFL on specific flows, vs. calendar dates, a good idea	2, 3, 4	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Hydrodynamic modeling represents a substantial improvement from prior efforts	4, 5	No
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	No
Uncertainty about accuracy of hydrologic model is a concern	1, 3, 4	Yes
Baseflow constructed with data up to 2014 – would more recent data help understand the influence of climate change over the next 20 years?	2, 4, 6	No
Would be helpful to quantify actual or potential benefits associated with changes to existing MFL guidance	4, 5	Yes
Importance of high flows, bottom water hypoxia and other in-Harbor phenomena	2, 3	Yes
Development of a "dynamic" MFL with real-time now-cast/forecast capabilities	5	No
Potential influence of inflows to the Harbor from other far-field sources	2, 4, 5	Yes

The PRP felt that the draft MFL report was obviously the result of an impressive effort by the District and its Consultants. The variety, quantity and quality of data that was compiled, collected, analyzed and interpreted was universally viewed as impressive, and obviously indicative of the MFL process being approached in a thorough and professional manner by District staff.

The conversion of the MFL guidance from a calendar-based system to a flow-based guidance was considered to be a valuable improvement over the earlier guidance.

The District's use of a 15% threshold for "significant harm" will be considered elsewhere in the report, but the primary concern raised by the PRP was not that there was anything inherently "wrong" with the threshold, but the District's MFL report contains language that suggests that threshold values for withdrawal limits should first focus on a search to develop locally-relevant threshold values, such as the 0.6' fish passage criteria used in the Upper Peace River MFL, or perhaps water quality "triggers" or inflection points for wetland inundation frequencies. A thorough and detailed review of the MFL does show that such locally-derived triggers were examined, and that no link could be made for water quality, and that wetland inundation triggers were less protective than the 15% salinity-habitat metric. However, the MFL report would be more useful for future reviewers (and future District staff, perhaps) if the process that led to the adoption of the 15% threshold value for the salinity-habitat metric was more thoroughly, yet succinctly, discussed in the Executive Summary and elsewhere in the repot.

PRP members felt that while the expanded and more detailed hydrodynamic model used in the MFL was a substantial improvement over prior efforts, the issue of baseline conditions and the overall hydrologic output for non-gaged portions of the watershed continued to have limitations.

The PRP also sought to have the MFL report include reference to other regulatory guidance documents. For example, while the draft MFL report included reference to the lack of compliance of the LPR with various water quality criteria developed by FDEP, it did not include reference to the Pollutant Load Reduction Goal (PLRG) developed for Charlotte Harbor. While this is not a specific charge of the enabling legislation for setting MFLs, the PRP felt that public agencies should seek to develop regulatory guidance that is as complementary – or at least consistent with – guidance from other local, regional and/or state agencies.

Issues associated with the potential influence of the Caloosahatchee River and/or inflows from the south were of concern to the PRP, especially in light of recent adverse impacts to seagrass resources along the eastern wall – impacts that could be attributed to the Peace River, given its much closer proximity.

Comments on Executive Summary

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Definition of “significant harm”	1, 4	Yes
Definition of “best available information”	2, 3	No
Could MFL be set for more than 3 flow blocks?	3, 4	No
Concern over LSC low flow conditions	1, 2	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	No
Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP’s Numeric Nutrient Concentration (NNC) criteria	2, 4, 5, 6	Yes
Need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	1, 4	Yes
15% threshold value for “significant harm” needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health	2, 4, 5	Yes

The PRP found that it would be helpful for the draft MFL to attempt to define the terms “significant harm” and “best available information” in the Executive Summary. While not all terms will be clearly defined, their use in the Executive Summary suggests that they are standard phrases recognizable to the reader, which they are not.

Concerns were raised by the PRP related to the absence of a maximum flow value for the LSC, compared to a proposed value of 400 cfs for the Lower Peace River. This seems to be a function of the District determining that the area of interest for MFL development for the LSC ends at its downstream boundary with the LPR, even though the area of concern for the LPR extends out into Charlotte Harbor. Since flows from the LSC average (on an annual time step) perhaps 20 to 30% of the annual average flows of the LPR, if flows from the LPR are important to the Harbor such that a maximum withdrawal value of 400 cfs is included in the draft MFL, it would appear that a similar maximum diversion criterion could also be derived for the LSC.

Comments on Chapter 2 – Physical and Hydrologic Description

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Issues related to clarity of maps and figures	2, 3	No
Question related to LiDAR sources	2, 4	No
Use of NGVD29 vs. NAVD88 for elevation and bathymetry data	2, 4, 6	No
Question about the order of MFL development vs. water supply planning efforts	4	No
Definition of flow lag	2, 4	No
Mislabeling of y-axis on Figure 3.23	3, 4, 5, 6	No
Importance of hydrodynamic model description	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes
Table 3- 1 – better explanation of location of isohaline location trends needed	1, 3, 5	No
Tables 3-2, 3, 4 to 3-7, and 3-12 to 3-16 – better explanation of summertime hypoxia development and other data presentations needed	1, 3, 5	Yes

Figures 2-2 and 2-3 could be made clearer and easier to read. And the use of “%” should be used rather than “percent’ to shorten the report. More substantively, the elevation and bathymetry data appear to be compromised to some extent by the use of both NGVD29 and NAVD88 as datums for elevation, as tied to LiDAR and the development of the hydrologic model.

The PRP felt that the draft MFL should more clearly describe the timeline of development of MFL guidance, as it relates to water supply. As MFLs must take into consideration existing water supply needs, the timing of the development of water supply plans and MFLs could be addressed earlier and more succinctly in the draft MFL report.

As important as the hydrologic and hydrodynamic models are, the PRP felt that they could have been described in greater detail earlier in the draft report. While the hydrodynamic model is viewed as a substantial improvement from the work included in the 2010 MFL report, the hydrologic model has limitations related to those portions of the watershed located downstream of gages. Also, and touched on later, the factors that account for the conclusion that a result of groundwater withdrawals is a reduction in baseflow in parts of the Peace River watershed, but an increase in baseflow in locations such as Joshua Creek – those factors should be discussed in greater detail. The assumptions and data limitations associated with quantifying the water budget from both ungauged and gauged sources should be more clearly discussed.

Comments on Chapter 3 – Water Quality

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Salinity data presented in Figure 3-3 not that helpful	1, 4	No
Influences of factors other than flow on concentrations of Chlorophyll-a	1, 4, 6	Yes
Values of phosphorus only shown for orthophosphorus	2, 4, 5, 6	Yes
Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite	2, 4, 5, 6	Yes
Definition needed for “flow-lag”	2, 3	No
Various figures have legends that appear to be mislabeled	1, 4	Yes
Importance of hydrodynamic model description	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes
More refined explanation needed for isohaline location trend analyses	1, 4	Yes
Better description of results shown Figures 3-12 to 3-16	1, 4	Yes
Value of developing dynamic water quality model, vs. empirical approaches	4, 5	No
Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included	1, 4, 5, 6	No

The PRP felt that some of the figures in the draft MFL were not overly useful, or could benefit from restructuring. For example, Figure 3-3 shows the variability in levels of salinity at various locations in the LPR. However, the analyses were conducted on 40 years of data, and variability could be due to seasonal variability, inter-annual variability, or some combination of both. Figure 3-3 is not entirely clear, as to what it is meant to convey to the reader. Suggestions were raised as to how the data could be displayed to address these concerns.

Related to this issue, Figures 3-12 to 3-16 are confusing, as the label on the y-axis does not match what the draft MFL report suggests is displayed. This likely is a result of a “short cut” in terms of description of what the graphics are intended to display. A more detailed description of the intent of the figures (what they are meant to convey) would be useful, as they currently are confusing to the reader.

The draft MFL report seems to focus on flows and residence time, as an influence on concentrations of chlorophyll-a. While this is a worthwhile issue to investigate, several decades of work on the LPR and upper Charlotte Harbor have indicated that the amount of colored dissolved organic matter (CDOM) in the system is likely a key consideration. As well, the role – if any – of zooplankton grazing should be at least mentioned as an additional moderating influence on chlorophyll-a concentrations.

This section includes analyses on water quality variables that need additional attention. For example, Section 3.3.1.3 on “chlorophyll” does not specify that the analyses refer to chlorophyll-a that is corrected for the presence of phaeophytin. While that appears to be the case, the words “corrected” and “phaeophytin” reside only in the appendices, not in the report itself.

The draft MFL reports on “Orthophosphorus” which likely refers to concentrations of orthophosphate, not Total Phosphorus. Orthophosphorus is a bit of technical jargon short cut for orthophosphate, which is the dissolved inorganic form of phosphorus. While this could in fact represent 90% of the total pool of phosphorus, it could also represent a substantially smaller percentage. The suggestion made by the PRP is to conduct analyses on those stations and data sets that have total phosphorus, as that is the most complete form of nutrient content, and is also the nutrient form for which FDEP’s NNC criteria have been developed.

The draft MFL report discuses status and trends in both TKN and nitrate plus nitrite, but does not add the two together to calculate the abundance of Total Nitrogen. Since Total Nitrogen is the form of nutrient that is most complete, and is the form of nitrogen in FDEP’s NNC criteria, and the form that is involved in the PLRG for Charlotte Harbor, these analyses should be redone using Total Nitrogen, not TKN and nitrate plus nitrite.

When exploring empirical relationships between LPR flows and salinity in the LPR, it should be noted that two of the stations involved in those assessments are located below the confluence of the LSC. On an annual basis, LSC flows average about 20 to 30% of the flow of the LPR. Therefore, not including LSC flows in the flow vs. salinity empirical relationships could limit the explanatory power of the derived relationships.

The PRP also suggested the District consider the value of a mechanistic water quality model for the LSC, LPR and Upper Charlotte Harbor. However, such a model should be addressed with caution, due to the influences of factors that may or may not have been quantified to the level that would be necessary for inclusion in a water quality model.

Comments on Chapter 4 – Ecological Resources

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Plant community data set from 1988 is problematic	2, 3, 4	Yes
Status and trends in seagrass coverage in the LPR	2, 4	No
Concern over shift in HBMP focus to physical factors, rather than fish communities macroinvertebrates, and/or macroalgae	2, 3, 4	Yes
Fisheries Independent Monitoring data from 2016 not included in the modeling approach (Appendix E)	2, 3, 4	No
Are fish communities actually found in salinity zones where the habitat models expect them to be found?	2, 3, 4	No
Should endangered species, such as sawfish and manatees, be included in MFL assessments?	2, 3, 4	No
Was catch per unit effort (CPUE) derived from actual data, or a model prediction?	1, 2, 4	No
Figure 4-2 difficult to review	1, 3	Yes

The PRP was concerned about the reasonableness of analyses related to plant communities that were last quantified in 1988. It is not known to the PRP if the physical locations of various plant communities have changed over time since 1988, although 32 years of sea level rise could result in migration of some communities upstream, in response to increased salt influence.

Members of the PRP would like the draft MFL report to more thoroughly discuss the reason(s) why biotic variables such as fish abundance, macroinvertebrates, and/or macroalgae are not currently monitored to the same extent as they were in past years. A more detailed description of the relationship between the Hydro-biological Monitoring

Program (HBMP), guidance from the HBMP review committee, and the data set used to develop the draft MFL would be helpful.

Questions related to the relative use (if any) of listed species should be considered, especially as how they were included (sawfish) in the proposed MFL for the Caloosahatchee River. It might be helpful to NOT include rarely occurring species in the development of MFL guidance, but the draft MFL should at least include language that suggests why the decision to not include them is an appropriate decision.

Comments on Chapter 5 – Resources of Concern and Modeling Tools

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Figure 5-1 could be more clearly identified as to what the graphics are meant to represent	3, 4	No
Timeframe and data sources used to develop the hydrodynamic model	1, 3, 4	No
Need to understand basis for variation in baseflow differences over different time periods	1, 3, 4, 6	Yes
Not clear what is meant as to transitional flow triggers, which seem to incorporate calendar-based flow blocks back into MFL guidance	3, 4, 5	No
Helpful to include a graphical display of residence time/flushing rates	4, 5	No
Language related to impacts of hurricanes based on model runs	1, 2, 4, 5	Yes
Request for more information related to the hydrodynamic model	4, 5	No
Limitations of hydrologic model in ungagged portions of the watershed should be discussed in more detail	1, 3, 4	No
Suggested development of a dynamic water quality model, vs. empirical approaches	4, 5	No
Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed	1, 3, 4, 6	No
Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations	1, 3, 4	No
Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed	1, 3, 4, 6	No
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
Basis for 15% as threshold for “significant harm” needs more detail	1, 3, 5	Yes

Members of the PRP felt that data limitations associated with various aspects and algorithms of the hydrologic model should be better addressed. Differences in baseflow during different time periods, for different sub-basins, require more detailed discussion. These issues are particularly important for those portions of the LPR and LSC watershed that are downstream of USGS gage sites. Even for locations that are in gaged portions of the LPR and LSC watersheds, the following issues should be discussed in greater detail:

- Why is it expected that some parts of the LPR watershed would have reduced baseflow with increased groundwater withdrawals, while other areas would have increased baseflow?
- If Charlie Creek's hydrologic yield (cfs/square mile) during 1950 to 1969 is a good reference condition, why is that? Is this due to the characteristics of the watershed being more "natural" than other locations at other times?
- As the algorithms in the PRIM modeling effort are important for the hydrologic model development, it should be more clearly stated where relevant algorithms came from, lest a reader conclude that the algorithms were developed after the model runs, as opposed to the algorithms perhaps being <u>modified</u> from default values during the calibration phase of model development

The PRP noted that in the last MFL report (2019) the hydrologic model greatly over-estimated the flow from the watershed into the LPR and Charlotte Harbor, which seems to have been acknowledged by the District.

Portions of this chapter appear to be internally inconsistent. For example, Table 5-1 displays result of a Seasonal Kendall Tau test that found no monotonic trends over time for flows in Joshua Creek, and yet figures and text in the same section refer to the observed increases in dry season flows during the period of April to May as being evidence of an anthropogenic influence on dry season flows. The District should consider that the use of a Seasonal Kendall Tau test can give results at odds with an examination of flow data on a monthly time step, and consider a flow analysis on the monthly time step most useful for their discussion and later model development.

As was noted in earlier sections, the basis for there not being a maximum flow diversion threshold for the LSC, while such a value (400 cfs) exists for the LPR should be better explained. While the PRP realizes that the District is currently working to develop a recovery strategy for low flow conditions for the LSC, this issue relates to high flows, and the PRP does not yet understand why a similar maximum flow diversion threshold could not be developed for the LSC, particularly for times when inflows to the reservoir are matched (or nearly so) by outflows into the LSC from the reservoir.

As was noted elsewhere, the draft MFL report should further develop the reason(s) why a 15% reduction in the salinity-habitat metric is considered to not be problematic, vs. other thresholds.

Comments on Chapter 6 – Recommended Minimum Flow Values

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?	2	No
Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades	1, 2, 3, 4	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes

Many of the PRP's comments related to Chapter 6 and the proposed MFL values had been made in earlier portions of this PRP draft report. These include the following main features:

- The shift from calendar-based to flow-based thresholds is to be commended
- Issues with the various algorithms and model components for the hydrologic model should be discussed in greater detail
- The District's logic for relying on a 15% change in habitat as being protective of "significant harm" should be elaborated on, and concerns related to why other techniques did not give rise to locally-relevant threshold guidance should be made more clearly
- The lack of a maximum flow diversion threshold for the LSC seems to be a function of a somewhat arbitrary truncation of the area of concern to that portion of the LSC upstream from its confluence with the LPR. No such restriction is placed on the LPR, which has a 400 cfs maximum diversion threshold which appears to be protective of portions of Charlotte Harbor beyond the downstream boundary of the LPR alone

In addition to previously raised concerns, the PRP felt that incorporating sea level rise scenarios was very useful, but that the more recent values derived by NOAA would be the most appropriate values to use.

Typos and Comments on Various Appendices

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Appendix E – page 7 – typo	5	No
Section 5.1 – typo	5	No
Page 88 – typo	5	No
Page 98 – clarification needed	5	No
Page 113 – change spacing	5	No
Appendix C should be a separate chapter	5	No
Page 16 – typo	5	No
Figure 3-11, page 57 – model failed to predict several observed salinity peaks	1, 2, 3, 5	No
Use of wind data from nearby airports might be helpful	1, 2, 3, 5	No
Appendix C – typo on page 42	5	No
Appendix C – typo on page 44	5	No
Appendix C – definition of shoreline length needed	2, 4	No
Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor	1, 2, 3, 5	Yes

From:	Angel Martin
To:	Doug Leeper
Subject:	Lower Peace River/Lower Shell Creek--Comments
Date:	Monday, April 27, 2020 3:20:31 PM

As per the teleconference on April 27, 2020, concerning minimum flows for the Lower Peace River and Lower Shell Creek, below are a couple of questions/comments for consideration.

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Angel Martin
813-767-6944

From:	Doug Leeper
To:	Angel Martin
Cc:	Yonas Ghile; Xinjian Chen; Chris Anastasiou; Kristina Deak
Subject:	RE: Lower Peace River/Lower Shell Creek--Comments
Date:	Monday, April 27, 2020 3:38:00 PM

Thanks, Angel. As discussed, I will post your comments to the peer review webforum.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: Angel Martin <amartin217@tampabay.rr.com>
Sent: Monday, April 27, 2020 3:20 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Lower Peace River/Lower Shell Creek--Comments

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Angel Martin
813-767-6944

DL

Moderator
96 posts

Doug Leeper
a few seconds ago

Written comments submitted by Mr. Angel Martin to Doug Leeper on 4/27/2020 based on oral comments provided during the 4/27/2020 peer review panel teleconference.

<><><><><>
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Angel Martin

<><><><><>

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Monday, April 27, 2020 4:35:37 PM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted Apr 27 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Attached is my revised version of the PRP report that Dave prepared. Revision was based on today's online discussion.

Lower Peace River and Shell Creek MFL Peer Revi...
597.40 KB

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Scientific Peer Review Panel Review of "Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report"

Prepared for:

Southwest Florida Water Management District

Prepared by:

Laura Bedinger, Ph.D. – Panel Member

Peter Sheng, Ph.D. – Panel Member

David Tomasko, Ph.D. – Chair

Draft April 2020

Introduction

The Southwest Florida Water Management District (District) has contracted with a Peer Review Panel (PRP) comprised of Laura Bedinger, Ph.D., Peter Sheng, Ph.D. and David Tomasko, Ph.D. to provide a technical peer review of its proposed minimum flows and levels (MFLs) for the Lower Peace River (LPR) and Lower Shell Creek (LSC), as outlined in the report “Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report” dated March 20, 2020, along with additional appendices.

The draft MFL report summarizes prior efforts to establish MFL guidance for the Lower Peace River and Lower Shell Creek, which was adopted in 2010. For the purposes of the draft MFL report, the LPR is defined as the river segment from the USGS gage location at Arcadia down to Charlotte Harbor, while the LSC is defined as the segment of the creek that extends from the Hendrickson Dam at Shell Creek Reservoir to the confluence of Shell Creek with the Lower Peace River.

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The District’s prior MFL guidance for the previously developed minimum flows for the LPR and LSC (2010) was adopted into District regulatory guidance by the adoption of the prior MFL report, and became effective regulatory guidance in August of 2010, as Rule 40D-8.041(8), Florida Administrative Code (FAC).

The original MFL guidance contained within FAC Rule 40D-8.041(8) is as follows:

Period	Effective Dates	Where Flow on Previous Day Equals:	Minimum Flow Is
Annually	January 1 through December 31	≤ 130 cfs > 130 cfs	Actual flow (no surface water withdrawals permitted) Seasonally dependent – see Blocks below
Block 1	April 20 through June 25	≤ 130 cfs > 130 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs
Block 2	October 28 through April 19	≤ 130 cfs > 130 cfs and < 625 cfs ≥ 625 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs previous day’s flow minus 29%
Block 3	June 26 through October 27	≤ 130 cfs > 130 cfs and < 625 cfs ≥625 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs previous day’s flow minus 38%

In the 2010 MFL, the District developed draft guidance for the LSC, and determined that a recovery strategy was needed for the LSC, as existing (at the time) flow rates in the LSC were below the draft MFL guidance developed for the LSC. Based on this finding, and the need to develop a recovery strategy for the LSC, draft MFL guidance for the LSC was not adopted into District rules.

The revised MFL guidance for the LPR, from the draft MFL report, is listed below:

Block	If Combined Flow on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs >149 cfs - 297 cfs	Flow - 130 cfs 13% of flow
Block 2	>297 cfs - 386 cfs >386 cfs - 622 cfs	23% of (flow - 297 cfs) plus 13% of remaining flow 23% of flow
Block 3	>622 cfs - 1037 cfs >1,037 cfs	40% of (flow - 622 cfs) plus 23% of remaining flow 40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

The draft MFL guidance for the LSC is listed below:

Block	If Inflow to Reservoir on Previous Day is	Allowable Flow Release
Block 1	<56 cfs	87% of inflow
Block 2	56 cfs - 137 cfs	77% of inflow
Block 3	>137 cfs	60% of inflow

The most immediate difference between the initial (2010) and draft revised MFL guidance for the LPR is the move from a calendar-based regulatory approach to guidance that is based on defined threshold flow levels – which vary over the course of a year. The MFL guidance for the LSC is the first such guidance for that system, as noted above.

Peer Review Panel Responsibilities

To begin, the District's charge to the empaneled PRP was for the members to become familiar with the relevant regulatory background.

In the State of Florida, Florida Statutes Section 373.042 states that for waterbodies such as the LPR and the LSC, MFL guidance shall represent the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The regulatory guidance further states that MFLs shall be calculated using the best information available, that the Governing Board shall consider and may provide for non-consumptive uses in the establishment of MFLs, and when appropriate, MFLs may be calculated to reflect seasonal variation.

Additional and more detailed guidance on the development of MFLs is provided in FAC 62-40, which states that MFLs should consider the following concerns: 1) recreation, 2) fish and wildlife habitats, 3) estuarine resources, 4) transfer of detrital material, 5) maintenance of freshwater storage and supply, 6) aesthetics, 7) filtration and absorption of pollutants and/or nutrients, 8) sediment loads, 9) water quality, and 10) navigation.

As such, MFLs are to cover not only the protection of natural resources, but also navigation, recreation, and – of great importance to the LSC in particular – the maintenance of freshwater storage and supply.

In its broadest sense, the Peer Review Panel is charged with the following six tasks, as related to their review of the 2020 Draft MFL for the LPR and the LSC systems:

1) Determine whether District conclusions are supported by analyses/results presented
2) Determine whether data/information were properly collected and used, any data exclusions were justified, and the data were the best available information
3) Determine whether technical assumptions are clearly stated, reasonable and consistent with the best available information, and if better analyses could be used
4) Determine whether procedures and analyses were appropriate and reasonable, based on the best available data, correctly applied, limitations were handled appropriately, and conclusions are supported by the data
5) For methods judged to be not scientifically reasonable, describe scientific deficiencies, identify remedies, if any, or alternative methods
6) As appropriate, identify and characterize effort involved for preferred alternative methods that could be used in lieu of scientifically reasonable methods that were used

Summary of Review Panel Comments

After discussion in publically-accessible Teleconferences, the PRP decided to produce a draft MFL review report using the following format: 1) PRP comments would be compiled for all reviewers at a time, based on the sequencing of the Draft MFL, 2) PRP comments would first be summarized in tabular form, by report section, in terms of the concern – briefly described – and the relevant PRP charge for which the concern was raised, and 3) additional text would follow to provide any needed back up for the concern.

The Tabular presentation of comments and concerns is tied to the 6 main charges of the PRP in a manner that likely over-simplifies the PRP process. Nonetheless, the PRP felt that this was an appropriate method to show the links between PRP comments and the specific contractual obligations of each PRP member.

The PRP report format appears to differ from most other Peer Review reports, which tend to list concerns by individual reviewers one at a time. Using the report format we selected, we believe that the District review process will be more efficient, as shared concerns can be captured at one time, rather than perhaps being listed two or three times in different sections of the Peer Review report. This report makes no effort to attribute individual comments to individual reviewers. However, a separate column on the summary table for each section notes whether or not a comment or concern was raised by more than one reviewer. This should not be construed such that comments raised by more than one reviewer are more "important" than others, as it could be that an algorithm or conclusion raised as an issue by one reviewer was not known to be potentially problematic by others.

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If the same comment or concern was raised in more than one location, due that topic arising in more than one part of the draft MFL report, it would be listed in tabular form each time it was encountered, but supplementary text would not necessarily be included in latter portions of the report, to minimize repetition.

In addition, initial comments from the PRP are included for each member, as Appendices.

The Peer Review Panels comments are captured for this Draft Report, starting below:

Overall Comments

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
MFL report was comprehensive, well-written and thorough	1 to 5	Yes
Basing MFL on specific flows, vs. calendar dates, a good idea	2, 3, 4	Yes
15% threshold value for “significant harm” needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Hydrodynamic modeling represents a substantial improvement from prior efforts	4, 5	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	Yes
Uncertainty and accuracy of hydrologic model should be discussed in more detail	1, 3, 4	Yes
Baseflow constructed with data up to 2014 – would more recent data help understand the influence of climate change over the next 20 years?	2, 4, 6	Yes
Would be helpful to quantify actual or potential benefits associated with changes to existing MFL guidance	4, 5	Yes
Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows on bottom water hypoxia and other phenomena	2, 3	Yes
Consider development of a “dynamic” MFL with real-time now-cast/forecast capabilities	5	No
Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee	2, 4, 5	Yes
Analyze the potential impact of sea level rise on the MFL, using best available SLR data for 2020-2050	2. 4. 5	Yes

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The PRP felt that the draft MFL report was obviously the result of an impressive effort by the District and its Consultants. The variety, quantity and quality of data that was compiled, collected, analyzed and interpreted, as well as the hydrodynamic model, was universally viewed as impressive, and obviously indicative of the MFL process being approached in a thorough and professional manner by District staff.

The conversion of the MFL guidance from a calendar-based system to a flow-based guidance was considered to be a valuable improvement over the earlier guidance.

The District's use of a 15% threshold for "significant harm" will be considered elsewhere in the report, but the primary concern raised by the PRP was not that there was anything inherently "wrong" with the threshold, but the District's MFL report contains language that suggests that threshold values for withdrawal limits should first focus on a search to develop locally-relevant threshold values, such as the 0.6' fish passage criteria used in the Upper Peace River MFL, or perhaps water quality "triggers" or inflection points for wetland inundation frequencies. A thorough and detailed review of the MFL does show that such locally-derived triggers were examined, and that no link could be made for water quality, and that wetland inundation triggers were less protective than the 15% salinity-habitat metric. However, the MFL report would be more useful for future reviewers (and future District staff, perhaps) if the process that led to the adoption of the 15% threshold value for the salinity-habitat metric was more thoroughly, yet succinctly, discussed in the Executive Summary and elsewhere in the repot.

PRP members felt that while the expanded and more detailed hydrodynamic model used in the MFL was a substantial improvement over prior efforts, the issue of baseline conditions and the overall hydrologic output for non-gaged portions of the watershed continued to have limitations.

The PRP also sought to have the MFL report include reference to other regulatory guidance documents. For example, while the draft MFL report included reference to the lack of compliance of the LPR with various water quality criteria developed by FDEP, it did not include reference to the Pollutant Load Reduction Goal (PLRG) developed for Charlotte Harbor. While this is not a specific charge of the enabling legislation for setting MFLs, the PRP felt that public agencies should seek to develop regulatory guidance that is as complementary – or at least consistent with – guidance from other local, regional and/or state agencies.

Issues associated with the potential influence of the Caloosahatchee River and/or inflows from the south were of concern to the PRP, especially in light of recent adverse impacts to seagrass resources along the eastern wall – impacts that could be attributed to the Peace River, given its much closer proximity.

In view of the rapidly accelerating sea level rise, the PRP felt it would be prudent to consider the potential impact of SLR on the MFL by using the NOAA (2017) projection of SLR for Fort Myers in 2020-2050. For example, as a first step. the impact of SLR on the volume of 2-psu water in 2020-2050 could be investigated using the low, medium, and high SLR values from NOAA (2017).

Comments on Executive Summary

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Definition of “significant harm”	1, 4	Yes
Definition of “best available information”	2, 3	No
Could MFL be set for more than 3 flow blocks?	3, 4	No
Concern over LSC low flow conditions	1, 2	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	No
Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP’s Numeric Nutrient Concentration (NNC) criteria	2, 4, 5, 6	Yes
Need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	1, 4	Yes
15% threshold value for “significant harm” needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health	2, 4, 5	Yes
Say something about potential impact of SLR on MFL	2, 4, 5	No

The PRP found that it would be helpful for the draft MFL to attempt to define the terms “significant harm” and “best available information” in the Executive Summary. While not all terms will be clearly defined, their use in the Executive Summary suggests that they are standard phrases recognizable to the reader, which they are not.

Concerns were raised by the PRP related to the absence of a maximum flow value for the LSC, compared to a proposed value of 400 cfs for the Lower Peace River. This seems to be a function of the District determining that the area of interest for MFL development for the LSC ends at its downstream boundary with the LPR, even though the area of concern for the LPR extends out into Charlotte Harbor. Since flows from the LSC average (on an annual time step) perhaps 20 to 30% of the annual average flows of the LPR, if flows from the LPR are important to the Harbor such that a maximum withdrawal value of 400 cfs is included in the draft MFL, it would appear that a similar maximum diversion criterion could also be derived for the LSC.

The report recognized that climate change have affected the sea level and precipitation in the region. In a changing climate, as the sea level continues to accelerate in the world and specifically in southwest Florida, the impact of SLR on MFL will need to be fully addressed at sometime in the future. Baseline flow will need to incorporate future SLR and flow conditions, instead of completely relying on historical flows.

Comments on Chapter 2 – Physical and Hydrologic Description

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Issues related to clarity of maps and figures	2, 3	No
Question related to LiDAR sources	2, 4	No
Use of NGVD29 vs. NAVD88 for elevation and bathymetry data	2, 4, 6	No
Question about the order of MFL development vs. water supply planning efforts	4	No
Definition of flow lag	2, 4	No
Discuss the importance of hydrodynamics and hydrodynamic modeling	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes
	1, 3, 5	No
	1, 3, 5	Yes

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Deleted: Tables 3-2, 3, 4 to 3-7, and 3-12 to 3-16 – better explanation of summertime hypoxia development and other data presentations needed

Figures 2-2 and 2-3 could be made clearer and easier to read. And the use of "%" should be used rather than "percent' to shorten the report. More substantively, the elevation and bathymetry data appear to be compromised to some extent by the use of both NGVD29 and NAVD88 as datums for elevation, as tied to LiDAR and the development of the hydrologic model.

The PRP felt that the draft MFL should more clearly describe the timeline of development of MFL guidance, as it relates to water supply. As MFLs must take into consideration existing water supply needs, the timing of the development of water supply plans and MFLs could be addressed earlier and more succinctly in the draft MFL report.

As important as the hydrologic and hydrodynamic models are, the PRP felt that they could have been described in greater detail earlier in the draft report. While the hydrodynamic model is viewed as a substantial improvement from the work included in the 2010 MFL report, the hydrologic model has limitations related to those portions of the watershed located downstream of gages. Also, and touched on later, the factors that account for the conclusion that a result of groundwater withdrawals is a reduction in baseflow in parts of the Peace River watershed, but an increase in baseflow in locations such as Joshua Creek – those factors should be discussed in greater detail. The assumptions and data limitations associated with quantifying the water budget from both ungauged and gauged sources should be more clearly discussed.

Comments on Chapter 3 – Water Quality

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Salinity data presented in Figure 3-3 not that helpful	1, 4	No
Influences of factors other than flow on concentrations of Chlorophyll-a	1, 4, 6	Yes
Values of phosphorus only shown for orthophosphorus	2, 4, 5, 6	Yes
Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite	2, 4, 5, 6	Yes
Definition needed for "flow-lag"	2, 3	No
Various figures have legends that appear to be mislabeled	1, 4	Yes
Mislabeling of y-axis on Figure 3.23	3, 4, 5, 6	No
Importance of hydrodynamic model description	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes
More refined explanation needed for isohaline location trend analyses	1, 4	Yes
Better description of results shown Figures 3-12 to 3-16	1, 4	Yes
Value of developing dynamic water quality model, vs. empirical approaches	4, 5	No
Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included	1, 4, 5, 6	No
Table 3-1 – improve explanation of location of isohaline location trends	1, 3, 5	No
Table 3-2 ,3, 4 to 3-7 and 3-12 tp 3-16 – improve explanation of summertime hypoxia development and other data presentations	1, 3, 5	No

The PRP felt that some of the figures in the draft MFL were not overly useful, or could benefit from restructuring. For example, Figure 3-3 shows the variability in levels of salinity at various locations in the LPR. However, the analyses were conducted on 40 years of data, and variability could be due to seasonal variability, inter-annual variability, or some combination of both. Figure 3-3 is not entirely clear, as to what it is meant to convey to the reader. Suggestions were raised as to how the data could be displayed to address these concerns.

Related to this issue, Figures 3-12 to 3-16 are confusing, as the label on the y-axis does not match what the draft MFL report suggests is displayed. This likely is a result of a "short cut" in terms of description of what the graphics are intended to display. A more detailed description of the intent of the figures (what they are meant to convey) would be useful, as they currently are confusing to the reader.

The draft MFL report seems to focus on flows and residence time, as an influence on concentrations of chlorophyll-a. While this is a worthwhile issue to investigate, several decades of work on the LPR and upper Charlotte Harbor have indicated that the amount of colored dissolved organic matter (CDOM) in the system is likely a key consideration. As well, the role – if any – of zooplankton grazing should be at least mentioned as an additional moderating influence on chlorophyll-a concentrations.

This section includes analyses on water quality variables that need additional attention. For example, Section 3.3.1.3 on "chlorophyll" does not specify that the analyses refer to chlorophyll-a that is corrected for the presence of phaeophytin. While that appears to be the case, the words "corrected" and "phaeophytin" reside only in the appendices, not in the report itself.

The draft MFL reports on "Orthophosphorus" which likely refers to concentrations of orthophosphate, not Total Phosphorus. Orthophosphorus is a bit of technical jargon short cut for orthophosphate, which is the dissolved inorganic form of phosphorus. While this could in fact represent 90% of the total pool of phosphorus, it could also represent a substantially smaller percentage. The suggestion made by the PRP is to conduct analyses on those stations and data sets that have total phosphorus, as that is the most complete form of nutrient content, and is also the nutrient form for which FDEP's NNC criteria have been developed.

The draft MFL report discuses status and trends in both TKN and nitrate plus nitrite, but does not add the two together to calculate the abundance of Total Nitrogen. Since Total Nitrogen is the form of nutrient that is most complete, and is the form of nitrogen in FDEP's NNC criteria, and the form that is involved in the PLRG for Charlotte Harbor, these analyses should be redone using Total Nitrogen, not TKN and nitrate plus nitrite.

When exploring empirical relationships between LPR flows and salinity in the LPR, it should be noted that two of the stations involved in those assessments are located below the confluence of the LSC. On an annual basis, LSC flows average about 20 to 30% of the flow of the LPR. Therefore, not including LSC flows in the flow vs. salinity empirical relationships could limit the explanatory power of the derived relationships.

The PRP also suggested the District consider the value of a mechanistic water quality model for the LSC, LPR and Upper Charlotte Harbor. THE PRP, However, recognizes

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that developing such a model would require addressing the influences of factors and parameters that may or may not have been adequately understood/quantified and more data maybe needed.

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Comments on Chapter 4 – Ecological Resources

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Plant community data set from 1998 is problematic	2, 3, 4	Yes
Status and trends in seagrass coverage in the LPR	2, 4	No
Concern over shift in HBMP focus to physical factors, rather than fish communities macroinvertebrates, and/or macroalgae	2, 3, 4	Yes
Fisheries Independent Monitoring data from 2016 not included in the modeling approach (Appendix E)	2, 3, 4	No
Are fish communities actually found in salinity zones where the habitat models expect them to be found?	2, 3, 4	No
Should endangered species, such as sawfish and manatees, be included in MFL assessments?	2, 3, 4	No
Was catch per unit effort (CPUE) derived from actual data, or a model prediction?	1, 2, 4	No
Figure 4-2 difficult to review	1, 3	Yes

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The PRP was concerned about the reasonableness of analyses related to plant communities that were last quantified in 1998. It is not known to the PRP if the physical locations of various plant communities have changed over time since 1988, although 22 years of sea level rise could result in migration of some communities upstream, in response to increased salt influence.

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Members of the PRP would like the draft MFL report to more thoroughly discuss the reason(s) why biotic variables such as fish abundance, macroinvertebrates, and/or macroalgae are not currently monitored to the same extent as they were in past years. A more detailed description of the relationship between the Hydro-biological Monitoring

Program (HBMP), guidance from the HBMP review committee, and the data set used to develop the draft MFL would be helpful.

Questions related to the relative use (if any) of listed species should be considered, especially as how they were included (sawfish) in the proposed MFL for the Caloosahatchee River. It might be helpful to NOT include rarely occurring species in the development of MFL guidance, but the draft MFL should at least include language that suggests why the decision to not include them is an appropriate decision.

Comments on Chapter 5 – Resources of Concern and Modeling Tools

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Figure 5-1 could be more clearly identified as to what the graphics are meant to represent	3, 4	No
Timeframe and data sources used to develop the hydrodynamic model	1, 3, 4	No
Need to understand basis for variation in baseflow differences over different time periods	1, 3, 4, 6	Yes
Further clarify the meaning of "transitional flow triggers"	3, 4, 5	No
Helpful to include a graphical display of residence time/flushing rates	4, 5	No
Language related to impacts of hurricanes based on model runs	1, 2, 4, 5	Yes
Request for more information related to the hydrodynamic model	4, 5	No
Limitations of hydrologic model in ungagged portions of the watershed should be discussed in more detail	1, 3, 4	No
Suggested development of a dynamic water quality model, vs. empirical approaches	4, 5	No
Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed	1, 3, 4, 6	No
Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations	1, 3, 4	No
Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed	1, 3, 4, 6	No
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
Basis for 15% as threshold for "significant harm" needs more detail	1, 3, 5	Yes

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Members of the PRP felt that data limitations associated with various aspects and algorithms of the hydrologic model should be better addressed. Differences in baseflow during different time periods, for different sub-basins, require more detailed discussion. These issues are particularly important for those portions of the LPR and LSC watershed that are downstream of USGS gage sites. Even for locations that are in gaged portions of the LPR and LSC watersheds, the following issues should be discussed in greater detail:

- Why is it expected that some parts of the LPR watershed would have reduced baseflow with increased groundwater withdrawals, while other areas would have increased baseflow?
- If Charlie Creek's hydrologic yield (cfs/square mile) during 1950 to 1969 is a good reference condition, why is that? Is this due to the characteristics of the watershed being more "natural" than other locations at other times?
- As the algorithms in the PRIM modeling effort are important for the hydrologic model development, it should be more clearly stated where relevant algorithms came from, lest a reader conclude that the algorithms were developed after the model runs, as opposed to the algorithms perhaps being modified from default values during the calibration phase of model development

The PRP noted that in the last MFL report (2010) the hydrologic model greatly over-estimated the ungagged flow from the watershed into the LPR and Charlotte Harbor, which seems to have been acknowledged by the District.

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Portions of this chapter appear to be internally inconsistent. For example, Table 5-1 displays result of a Seasonal Kendall Tau test that found no monotonic trends over time for flows in Joshua Creek, and yet figures and text in the same section refer to the observed increases in dry season flows during the period of April to May as being evidence of an anthropogenic influence on dry season flows. The District should consider that the use of a Seasonal Kendall Tau test can give results at odds with an examination of flow data on a monthly time step, and consider a flow analysis on the monthly time step most useful for their discussion and later model development.

As was noted in earlier sections, the basis for there not being a maximum flow diversion threshold for the LSC, while such a value (400 cfs) exists for the LPR should be better explained. While the PRP realizes that the District is currently working to develop a recovery strategy for low flow conditions for the LSC, this issue relates to high flows, and the PRP does not yet understand why a similar maximum flow diversion threshold could not be developed for the LSC, particularly for times when inflows to the reservoir are matched (or nearly so) by outflows into the LSC from the reservoir.

As was noted elsewhere, the draft MFL report should further develop the reason(s) why a 15% reduction in the salinity-habitat metric is considered to not be problematic, vs. other thresholds.

Comments on Chapter 6 – Recommended Minimum Flow Values

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?	2	No
Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades	1, 2, 3, 4	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes

Many of the PRP's comments related to Chapter 6 and the proposed MFL values had been made in earlier portions of this PRP draft report. These include the following main features:

- The shift from calendar-based to flow-based thresholds is to be commended
- Issues with the various algorithms and model components for the hydrologic model should be discussed in greater detail
- The District's logic for relying on a 15% change in habitat as being protective of "significant harm" should be elaborated on, and concerns related to why other techniques did not give rise to locally-relevant threshold guidance should be made more clearly
- The lack of a maximum flow diversion threshold for the LSC seems to be a function of a somewhat arbitrary truncation of the area of concern to that portion of the LSC upstream from its confluence with the LPR. No such restriction is placed on the LPR, which has a 400 cfs maximum diversion threshold which appears to be protective of portions of Charlotte Harbor beyond the downstream boundary of the LPR alone

In addition to previously raised concerns, the PRP felt that incorporating sea level rise scenarios was very useful, but that the more recent values derived by NOAA would be the most appropriate values to use.

Typos and Comments on Various Appendices

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Appendix E – page 7 – typo	5	No
Section 5.1 – typo	5	No
Page 88 – typo	5	No
Page 98 – clarification needed	5	No
Page 113 – change spacing	5	No
Appendix C should be a separate chapter	5	No
Page 16 – typo	5	No
Figure 3-11, page 57 – model failed to predict several observed salinity peaks	1, 2, 3, 5	No
Use of wind data from nearby airports might be helpful	1, 2, 3, 5	No
Appendix C – typo on page 42	5	No
Appendix C – typo on page 44	5	No
Appendix C – definition of shoreline length needed	2, 4	No
Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor	1, 2, 3, 5	Yes

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Monday, April 27, 2020 4:37:02 PM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted Apr 27 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I will send another version with some more revisions by tomorrow noon.

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Monday, April 27, 2020 4:53:59 PM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted Apr 27 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

thank you Peter! Let us know when you've got the version ready for Laura to review and revise, and Laura, let me know when you're done. and then I'll include both the Track Changes version after I'm through it again, and a final version with no edits showing which I'll send back out to you two - hopefully Wednesday. To the both of you - thanks for all the great work you've done on this!

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Tuesday, April 28, 2020 10:37:22 AM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted Apr 28 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Laura and Dave, The new version is attached for your review. Thanks Dave again for making this easier for us.

Lower Peace River and Shell Creek MFL Peer Revi...
601.94 KB

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Scientific Peer Review Panel Review of "Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report"

Prepared for:

Southwest Florida Water Management District

Prepared by:

Laura Bedinger, Ph.D. – Panel Member

Peter Sheng, Ph.D. – Panel Member

David Tomasko, Ph.D. – Chair

Draft April 2020

Introduction

The Southwest Florida Water Management District (District) has contracted with a Peer Review Panel (PRP) comprised of Laura Bedinger, Ph.D., Peter Sheng, Ph.D. and David Tomasko, Ph.D. to provide a technical peer review of its proposed minimum flows and levels (MFLs) for the Lower Peace River (LPR) and Lower Shell Creek (LSC), as outlined in the report “Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report” dated March 20, 2020, along with additional appendices.

The draft MFL report summarizes prior efforts to establish MFL guidance for the Lower Peace River and Lower Shell Creek, which was adopted in 2010. For the purposes of the draft MFL report, the LPR is defined as the river segment from the USGS gage location at Arcadia down to Charlotte Harbor, while the LSC is defined as the segment of the creek that extends from the Hendrickson Dam at Shell Creek Reservoir to the confluence of Shell Creek with the Lower Peace River.

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The District’s prior MFL guidance for the previously developed minimum flows for the LPR and LSC (2010) was adopted into District regulatory guidance by the adoption of the prior MFL report, and became effective regulatory guidance in August of 2010, as Rule 40D-8.041(8), Florida Administrative Code (FAC).

The original MFL guidance contained within FAC Rule 40D-8.041(8) is as follows:

Period	Effective Dates	Where Flow on Previous Day Equals:	Minimum Flow Is
Annually	January 1 through December 31	≤ 130 cfs > 130 cfs	Actual flow (no surface water withdrawals permitted) Seasonally dependent – see Blocks below
Block 1	April 20 through June 25	≤ 130 cfs > 130 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs
Block 2	October 28 through April 19	≤ 130 cfs > 130 cfs and < 625 cfs ≥ 625 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs previous day’s flow minus 29%
Block 3	June 26 through October 27	≤ 130 cfs > 130 cfs and < 625 cfs ≥625 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs previous day’s flow minus 38%

In the 2010 MFL, the District developed draft guidance for the LSC, and determined that a recovery strategy was needed for the LSC, as existing (at the time) flow rates in the LSC were below the draft MFL guidance developed for the LSC. Based on this finding, and the need to develop a recovery strategy for the LSC, draft MFL guidance for the LSC was not adopted into District rules.

The revised MFL guidance for the LPR, from the draft MFL report, is listed below:

Block	If Combined Flow on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs >149 cfs - 297 cfs	Flow - 130 cfs 13% of flow
Block 2	>297 cfs - 386 cfs >386 cfs - 622 cfs	23% of (flow - 297 cfs) plus 13% of remaining flow 23% of flow
Block 3	>622 cfs - 1037 cfs >1,037 cfs	40% of (flow - 622 cfs) plus 23% of remaining flow 40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

The draft MFL guidance for the LSC is listed below:

Block	If Inflow to Reservoir on Previous Day is	Allowable Flow Release
Block 1	<56 cfs	87% of inflow
Block 2	56 cfs - 137 cfs	77% of inflow
Block 3	>137 cfs	60% of inflow

The most immediate difference between the initial (2010) and draft revised MFL guidance for the LPR is the move from a calendar-based regulatory approach to guidance that is based on defined threshold flow levels – which vary over the course of a year. The MFL guidance for the LSC is the first such guidance for that system, as noted above.

Peer Review Panel Responsibilities

To begin, the District's charge to the empaneled PRP was for the members to become familiar with the relevant regulatory background.

In the State of Florida, Florida Statutes Section 373.042 states that for waterbodies such as the LPR and the LSC, MFL guidance shall represent the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The regulatory guidance further states that MFLs shall be calculated using the best information available, that the Governing Board shall consider and may provide for non-consumptive uses in the establishment of MFLs, and when appropriate, MFLs may be calculated to reflect seasonal variation.

Additional and more detailed guidance on the development of MFLs is provided in FAC 62-40, which states that MFLs should consider the following concerns: 1) recreation, 2) fish and wildlife habitats, 3) estuarine resources, 4) transfer of detrital material, 5) maintenance of freshwater storage and supply, 6) aesthetics, 7) filtration and absorption of pollutants and/or nutrients, 8) sediment loads, 9) water quality, and 10) navigation.

As such, MFLs are to cover not only the protection of natural resources, but also navigation, recreation, and – of great importance to the LSC in particular – the maintenance of freshwater storage and supply.

In its broadest sense, the Peer Review Panel is charged with the following six tasks, as related to their review of the 2020 Draft MFL for the LPR and the LSC systems:

1) Determine whether District conclusions are supported by analyses/results presented
2) Determine whether data/information were properly collected and used, any data exclusions were justified, and the data were the best available information
3) Determine whether technical assumptions are clearly stated, reasonable and consistent with the best available information, and if better analyses could be used
4) Determine whether procedures and analyses were appropriate and reasonable, based on the best available data, correctly applied, limitations were handled appropriately, and conclusions are supported by the data
5) For methods judged to be not scientifically reasonable, describe scientific deficiencies, identify remedies, if any, or alternative methods
6) As appropriate, identify and characterize effort involved for preferred alternative methods that could be used in lieu of scientifically reasonable methods that were used

Summary of Review Panel Comments

After discussion in publically-accessible Teleconferences, the PRP decided to produce a draft MFL review report using the following format: 1) PRP comments would be compiled for all reviewers at a time, based on the sequencing of the Draft MFL, 2) PRP comments would first be summarized in tabular form, by report section, in terms of the concern – briefly described – and the relevant PRP charge for which the concern was raised, and 3) additional text would follow to provide any needed back up for the concern.

The Tabular presentation of comments and concerns is tied to the 6 main charges of the PRP in a manner that likely over-simplifies the PRP process. Nonetheless, the PRP felt that this was an appropriate method to show the links between PRP comments and the specific contractual obligations of each PRP member.

The PRP report format appears to differ from most other Peer Review reports, which tend to list concerns by individual reviewers one at a time. Using the report format we selected, we believe that the District review process will be more efficient, as shared concerns can be captured at one time, rather than perhaps being listed two or three times in different sections of the Peer Review report. This report makes no effort to attribute individual comments to individual reviewers. However, a separate column on the summary table for each section notes whether or not a comment or concern was raised by more than one reviewer. This should not be construed such that comments raised by more than one reviewer are more "important" than others, as it could be that an algorithm or conclusion raised as an issue by one reviewer was not known to be potentially problematic by others.

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If the same comment or concern was raised in more than one location, due that topic arising in more than one part of the draft MFL report, it would be listed in tabular form each time it was encountered, but supplementary text would not necessarily be included in latter portions of the report, to minimize repetition.

In addition, initial comments from the PRP are included for each member, as Appendices.

The Peer Review Panels comments are captured for this Draft Report, starting below:

Overall Comments

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
MFL report was comprehensive, well-written and thorough	1 to 5	Yes
Basing MFL on specific flows, vs. calendar dates, a good idea	2, 3, 4	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Hydrodynamic modeling represents a substantial improvement from prior efforts	4, 5	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	Yes
Uncertainty and accuracy of hydrologic model should be discussed in more detail	1, 3, 4	Yes
In a changing climate, long-term (50-100 year) averaged flow are not necessarily more indicative of the hydrologic conditions in the next 15-20 years. Should more recent data in the past two decades be given more weight in the development of the baseline flow which was based on the average in 1950-2014?	2, 4, 6	Yes
Would be helpful to quantify actual or potential benefits associated with changes to existing MFL guidance	4, 5	Yes
Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows on bottom water hypoxia and other phenomena	2, 3	Yes
Consider development of a "dynamic" MFL with real-time now-cast/forecast capabilities	5	No
Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee	2, 4, 5	Yes

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Analyze the potential impact of sea level rise on the MFL, using best available SLR data for 2020-2050	2. 4. 5	Yes

The PRP felt that the draft MFL report was obviously the result of an impressive effort by the District and its Consultants. The variety, quantity and quality of data that was compiled, collected, analyzed and interpreted, as well as the hydrodynamic model, was universally viewed as impressive, and obviously indicative of the MFL process being approached in a thorough and professional manner by District staff.

The conversion of the MFL guidance from a calendar-based system to a flow-based guidance was considered to be a valuable improvement over the earlier guidance.

The District's use of a 15% threshold for "significant harm" will be considered elsewhere in the report, but the primary concern raised by the PRP was not that there was anything inherently "wrong" with the threshold, but the District's MFL report contains language that suggests that threshold values for withdrawal limits should first focus on a search to develop locally-relevant threshold values, such as the 0.6' fish passage criteria used in the Upper Peace River MFL, or perhaps water quality "triggers" or inflection points for wetland inundation frequencies. A thorough and detailed review of the MFL does show that such locally-derived triggers were examined, and that no link could be made for water quality, and that wetland inundation triggers were less protective than the 15% salinity-habitat metric. However, the MFL report would be more useful for future reviewers (and future District staff, perhaps) if the process that led to the adoption of the 15% threshold value for the salinity-habitat metric was more thoroughly, yet succinctly, discussed in the Executive Summary and elsewhere in the repot.

PRP members felt that while the expanded and more detailed hydrodynamic model used in the MFL was a substantial improvement over prior efforts, the issue of baseline conditions and the overall hydrologic output for non-gaged portions of the watershed continued to have limitations.

The PRP also sought to have the MFL report include reference to other regulatory guidance documents. For example, while the draft MFL report included reference to the lack of compliance of the LPR with various water quality criteria developed by FDEP, it did not include reference to the Pollutant Load Reduction Goal (PLRG) developed for Charlotte Harbor. While this is not a specific charge of the enabling legislation for setting MFLs, the PRP felt that public agencies should seek to develop regulatory guidance that is as complementary – or at least consistent with – guidance from other local, regional and/or state agencies.

Issues associated with the potential influence of the Caloosahatchee River and/or inflows from the south were of concern to the PRP, especially in light of recent adverse

impacts to seagrass resources along the eastern wall – impacts that could be attributed to the Peace River, given its much closer proximity.

In view of the rapidly accelerating sea level rise, the PRP felt it would be prudent to consider the potential impact of SLR on the MFL by using the NOAA (2017) projection of SLR for Fort Myers in 2020-2050. For example, as a first step. the impact of SLR on the volume of 2-psu water in 2020-2050 could be investigated using the low, medium, and high SLR values corresponding to the 50 percentile SLR projection for 2100 (3.3 ft global mean sea level rise of 3.3 ft) from NOAA (2017). The NOAA projection for Fort Myers in 2035 is 0.47, 0.80, 1.22 ft for the low, medium, high scenarios, respectively. The USACE SLR values used by the District are 0.2, 0.35, 0.76 ft, based on their 2013 report. Due to the increasing SLR and Florida Governor's effort in building coastal resiliency against the rising sea level, the PRP felt it is prudent for the District to use the best available information on SLR in its consideration of the potential impact of SLR on the MFL.

In consideration of the rapidly changing climate, the PRP recommends that, during its five-year evaluation with the regional water supply planning, the District evaluates the current and future climate conditions to determine if the MFL needs to be updated sooner than its regular schedule.

Comments on Executive Summary

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Definition of "significant harm"	1, 4	Yes
Definition of "best available information"	2, 3	No
Could MFL be set for more than 3 flow blocks?	3, 4	No
Concern over LSC low flow conditions	1, 2	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	No
Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP's Numeric Nutrient Concentration (NNC) criteria	2, 4, 5, 6	Yes
Explain the need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	1, 4	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health	2, 4, 5	Yes
Say something about potential impact of SLR on the MFL	2, 4, 5	No

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The PRP found that it would be helpful for the draft MFL to attempt to define the terms "significant harm" and "best available information" in the Executive Summary. While not all terms will be clearly defined, their use in the Executive Summary suggests that they are standard phrases recognizable to the reader, which they are not.

Concerns were raised by the PRP related to the absence of a maximum flow value for the LSC, compared to a proposed value of 400 cfs for the Lower Peace River. This seems to be a function of the District determining that the area of interest for MFL development for the LSC ends at its downstream boundary with the LPR, even though the area of concern for the LPR extends out into Charlotte Harbor. Since flows from the LSC average (on an annual time step) perhaps 20 to 30% of the annual average flows of the LPR, if flows from the LPR are important to the Harbor such that a maximum withdrawal value of 400 cfs is included in the draft MFL, it would appear that a similar maximum diversion criterion could also be derived for the LSC.

The report recognized that climate change has significantly affected the sea level and precipitation in the region. In a changing climate, as the sea level continues to accelerate in the world and specifically in southwest Florida, the impact of SLR on MFL will need to be fully addressed at sometime in the near future. Baseline flow will need to incorporate future SLR and flow conditions, instead of completely relying on averaged long-term historical flows.

Comments on Chapter 2 – Physical and Hydrologic Description

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Issues related to clarity of maps and figures, for example, enhancing Figure 2-2 so it is better related/connected to a Google street map for the same area	2, 3	No
Question related to LiDAR sources, for example, is 2017 LiDAR data for the region available from the state?	2, 4	No
Use of NGVD29 vs. NAVD88 for elevation and bathymetry data	2, 4, 6	No
Question about the order of MFL development vs. water supply planning efforts	4	No
Definition of flow lag	2, 4	No
Discuss the iimportance of hydrodynamics and hydrodynamic modeling	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes
	1, 3, 5	No
	1, 3, 5	Yes

Figures 2-2 and 2-3 could be made clearer and easier to read. And the use of "%" should be used rather than "percent' to shorten the report. More substantively, the elevation and bathymetry data appear to be compromised to some extent by the use of both NGVD29 and NAVD88 as datums for elevation, as tied to LiDAR and the development of the hydrologic model.

The PRP felt that the draft MFL should more clearly describe the timeline of development of MFL guidance, as it relates to water supply. As MFLs must take into consideration existing water supply needs, the timing of the development of water supply plans and MFLs could be addressed earlier and more succinctly in the draft MFL report.

As important as the hydrologic and hydrodynamic models are, the PRP felt that they could have been described in greater detail earlier in the draft report. While the hydrodynamic model is viewed as a substantial improvement from the work included in the 2010 MFL report, the hydrologic model has limitations related to those portions of

Commented [PS2]: What about Chapter 1? Please see my response to District's response. One of my comments was for the District to demonstrate that the new MFL would result in much better outcome, i.e., more freshwater withdrawn without significantly harming the habitats?"

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Deleted: Tables 3-2, 3, 4 to 3-7, and 3-12 to 3-16 – better explanation of summertime hypoxia development and other data presentations needed the watershed located downstream of gages. Also, and touched on later, the factors that account for the conclusion that a result of groundwater withdrawals is a reduction in baseflow in parts of the Peace River watershed, but an increase in baseflow in locations such as Joshua Creek – those factors should be discussed in greater detail. The assumptions and data limitations associated with quantifying the water budget from both ungauged and gauged sources should be more clearly discussed.

Comments on Chapter 3 – Water Quality

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Salinity data presented in Figure 3-3 not that helpful	1, 4	No
Influences of factors other than flow on concentrations of Chlorophyll-a	1, 4, 6	Yes
Values of phosphorus only shown for orthophosphorus	2, 4, 5, 6	Yes
Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite	2, 4, 5, 6	Yes
Definition needed for "flow-lag"	2, 3	No
Various figures have legends that appear to be mislabeled	1, 4	Yes
Mislabeling of y-axis on Figure 3.23	3, 4, 5, 6	No
Importance of hydrodynamic model description	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes
More refined explanation needed for isohaline location trend analyses	1, 4	Yes
Better description of results shown Figures 3-12 to 3-16	1, 4	Yes
Value of developing dynamic water quality model, vs. empirical approaches	4, 5	No
Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included	1, 4, 5, 6	No
Table 3-1 – improve explanation of location of isohaline location trends	1, 3, 5	No
Table 3-2 ,3, 4 to 3-7 and 3-12 tp 3-16 – improve explanation of summertime hypoxia development and other data presentations	1, 3, 5	No

The PRP felt that some of the figures in the draft MFL were not overly useful, or could benefit from restructuring. For example, Figure 3-3 shows the variability in levels of salinity at various locations in the LPR. However, the analyses were conducted on 40 years of data, and variability could be due to seasonal variability, inter-annual variability, or some combination of both. Figure 3-3 is not entirely clear, as to what it is meant to convey to the reader. Suggestions were raised as to how the data could be displayed to address these concerns.

Related to this issue, Figures 3-12 to 3-16 are confusing, as the label on the y-axis does not match what the draft MFL report suggests is displayed. This likely is a result of a "short cut" in terms of description of what the graphics are intended to display. A more detailed description of the intent of the figures (what they are meant to convey) would be useful, as they currently are confusing to the reader.

The draft MFL report seems to focus on flows and residence time, as an influence on concentrations of chlorophyll-a. While this is a worthwhile issue to investigate, several decades of work on the LPR and upper Charlotte Harbor have indicated that the amount of colored dissolved organic matter (CDOM) in the system is likely a key consideration. As well, the role – if any – of zooplankton grazing should be at least mentioned as an additional moderating influence on chlorophyll-a concentrations.

This section includes analyses on water quality variables that need additional attention. For example, Section 3.3.1.3 on "chlorophyll" does not specify that the analyses refer to chlorophyll-a that is corrected for the presence of phaeophytin. While that appears to be the case, the words "corrected" and "phaeophytin" reside only in the appendices, not in the report itself.

The draft MFL reports on "Orthophosphorus" which likely refers to concentrations of orthophosphate, not Total Phosphorus. Orthophosphorus is a bit of technical jargon short cut for orthophosphate, which is the dissolved inorganic form of phosphorus. While this could in fact represent 90% of the total pool of phosphorus, it could also represent a substantially smaller percentage. The suggestion made by the PRP is to conduct analyses on those stations and data sets that have total phosphorus, as that is the most complete form of nutrient content, and is also the nutrient form for which FDEP's NNC criteria have been developed.

The draft MFL report discuses status and trends in both TKN and nitrate plus nitrite, but does not add the two together to calculate the abundance of Total Nitrogen. Since Total Nitrogen is the form of nutrient that is most complete, and is the form of nitrogen in FDEP's NNC criteria, and the form that is involved in the PLRG for Charlotte Harbor, these analyses should be redone using Total Nitrogen, not TKN and nitrate plus nitrite.

When exploring empirical relationships between LPR flows and salinity in the LPR, it should be noted that two of the stations involved in those assessments are located below the confluence of the LSC. On an annual basis, LSC flows average about 20 to 30% of the flow of the LPR. Therefore, not including LSC flows in the flow vs. salinity empirical relationships could limit the explanatory power of the derived relationships.

The PRP also suggested the District consider the value of a mechanistic water quality model for the LSC, LPR and Upper Charlotte Harbor. Such a mechanistic model, although my not be necessary for the MFL for LPR and LSC, should benefit a variety of water management decisions on the Charlotte Harbor estuarine-riverine system by the District. THE PRP, However, recognizes that developing such a model would require addressing the influences of factors and parameters that may or may not have been adequately understood/quantified and more data maybe needed.

Hypoxia was mentioned numerous times in the report and during our discussion. It would be good to have a more comprehensive discussion on the naturally-occurring as well as non-naturally-occurring hypoxia, how they impact the Charlotte Harbor system, how they are influenced by the high flow from Peace River (e.g., what flow triggers hypoxia? 20000 cfs? 1000 cfs?), and how will they be affected by the MFL.

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Comments on Chapter 4 – Ecological Resources

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Plant community data set from 1998 is problematic	2, 3, 4	Yes
Status and trends in seagrass coverage in the LPR	2, 4	No
Concern over shift in HBMP focus to physical factors, rather than fish communities macroinvertebrates, and/or macroalgae	2, 3, 4	Yes
Fisheries Independent Monitoring data from 2016 not included in the modeling approach (Appendix E)	2, 3, 4	No
Are fish communities actually found in salinity zones where the habitat models expect them to be found?	2, 3, 4	No
Should endangered species, such as sawfish and manatees, be included in MFL assessments?	2, 3, 4	No
Was catch per unit effort (CPUE) derived from actual data, or a model prediction?	1, 2, 4	No
Figure 4-2 difficult to review	1, 3	Yes
Explain "decreased flow may also contribute to increases in dissolved oxygen concentrations". Add your response to p.76 of the report.	1, 3	No

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The PRP was concerned about the reasonableness of analyses related to plant communities that were last quantified in 1998. It is not known to the PRP if the physical locations of various plant communities have changed over time since 1988, although 22 years of sea level rise could result in migration of some communities upstream, in response to increased salt influence.

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Members of the PRP would like the draft MFL report to more thoroughly discuss the reason(s) why biotic variables such as fish abundance, macroinvertebrates, and/or macroalgae are not currently monitored to the same extent as they were in past years. A more detailed description of the relationship between the Hydro-biological Monitoring Program (HBMP), guidance from the HBMP review committee, and the data set used to develop the draft MFL would be helpful.

Questions related to the relative use (if any) of listed species should be considered, especially as how they were included (sawfish) in the proposed MFL for the Caloosahatchee River. It might be helpful to NOT include rarely occurring species in the development of MFL guidance, but the draft MFL should at least include language that suggests why the decision to not include them is an appropriate decision.

Comments on Chapter 5 – Resources of Concern and Modeling Tools

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Figure 5-1 could be more clearly identified as to what the graphics are meant to represent	3, 4	No
Timeframe and data sources used to develop the hydrodynamic model	1, 3, 4	No
Need to understand basis for variation in baseflow differences over different time periods	1, 3, 4, 6	Yes
Further clarify the meaning of "transitional flow triggers", using simple terminology such as "safety valves" to explain concept.	3, 4, 5	No
Helpful to include a graphical display of residence time/flushing rates	4, 5	No
Language related to impacts of hurricanes based on model runs	1, 2, 4, 5	Yes
Request for more information related to the hydrodynamic model, including consider the possibility of adding a short chapter which gives a holistic overview on the role of hydrodynamics (flow and water level, salinity, temperature, flushing) on water quality, ecology and fishery. Such a chapter can be used in many future MFL reports.	4, 5	No
Limitations of hydrologic model in ungagged portions of the watershed should be discussed in more detail	1, 3, 4	No
Suggested development of a dynamic water quality model, vs. empirical approaches	4, 5	No
Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed	1, 3, 4, 6	No
Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations	1, 3, 4	No

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Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed	1, 3, 4, 6	No
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
Basis for 15% as threshold for "significant harm" needs more detail	1, 3, 5	Yes

Members of the PRP felt that data limitations associated with various aspects and algorithms of the hydrologic model should be better addressed. Differences in baseflow during different time periods, for different sub-basins, require more detailed discussion. These issues are particularly important for those portions of the LPR and LSC watershed that are downstream of USGS gage sites. Even for locations that are in gaged portions of the LPR and LSC watersheds, the following issues should be discussed in greater detail:

- Why is it expected that some parts of the LPR watershed would have reduced baseflow with increased groundwater withdrawals, while other areas would have increased baseflow?
- If Charlie Creek's hydrologic yield (cfs/square mile) during 1950 to 1969 is a good reference condition, why is that? Is this due to the characteristics of the watershed being more "natural" than other locations at other times?
- As the algorithms in the PRIM modeling effort are important for the hydrologic model development, it should be more clearly stated where relevant algorithms came from, lest a reader conclude that the algorithms were developed after the model runs, as opposed to the algorithms perhaps being modified from default values during the calibration phase of model development

The PRP noted that in the last MFL report (2010) the hydrologic model greatly over-estimated the ungagged flow from the watershed into the LPR and Charlotte Harbor, which seems to have been acknowledged by the District.

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Portions of this chapter appear to be internally inconsistent. For example, Table 5-1 displays result of a Seasonal Kendall Tau test that found no monotonic trends over time for flows in Joshua Creek, and yet figures and text in the same section refer to the observed increases in dry season flows during the period of April to May as being evidence of an anthropogenic influence on dry season flows. The District should consider that the use of a Seasonal Kendall Tau test can give results at odds with an examination of flow data on a monthly time step, and consider a flow analysis on the monthly time step most useful for their discussion and later model development.

As was noted in earlier sections, the basis for there not being a maximum flow diversion threshold for the LSC, while such a value (400 cfs) exists for the LPR should be better explained. While the PRP realizes that the District is currently working to develop a recovery strategy for low flow conditions for the LSC, this issue relates to high flows, and the PRP does not yet understand why a similar maximum flow diversion threshold could not be developed for the LSC, particularly for times when inflows to the reservoir are matched (or nearly so) by outflows into the LSC from the reservoir.

As was noted elsewhere, the draft MFL report should further develop the reason(s) why a 15% reduction in the salinity-habitat metric is considered to not be problematic, vs. other thresholds.

Comments on Chapter 6 – Recommended Minimum Flow Values

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?	2	No
Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades	1, 2, 3, 4	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes

Many of the PRP's comments related to Chapter 6 and the proposed MFL values had been made in earlier portions of this PRP draft report. These include the following main features:

- The shift from calendar-based to flow-based thresholds is to be commended
- Issues with the various algorithms and model components for the hydrologic model should be discussed in greater detail
- The District's logic for relying on a 15% change in habitat as being protective of "significant harm" should be elaborated on, and concerns related to why other techniques did not give rise to locally-relevant threshold guidance should be made more clearly
- The lack of a maximum flow diversion threshold for the LSC seems to be a function of a somewhat arbitrary truncation of the area of concern to that portion of the LSC upstream from its confluence with the LPR. No such restriction is placed on the LPR, which has a 400 cfs maximum diversion threshold which appears to be protective of portions of Charlotte Harbor beyond the downstream boundary of the LPR alone

In addition to previously raised concerns, the PRP felt that incorporating sea level rise scenarios was very useful, but that the more recent values derived by NOAA would be the most appropriate values to use.

Typos and Comments on Various Appendices

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
Appendix E – page 7 – typo	5	No
Section 5.1 – typo	5	No
Page 88 – typo	5	No
Page 98 – clarification needed	5	No
Page 113 – change spacing	5	No
Appendix C should be a separate chapter	5	No
Page 16 – typo	5	No
Figure 3-11, page 57 – model failed to predict several observed salinity peaks	1, 2, 3, 5	No
Use of wind data from nearby airports might be helpful	1, 2, 3, 5	No
Appendix C – typo on page 42	5	No
Appendix C – typo on page 44	5	No
Appendix C – definition of shoreline length needed	2, 4	No
Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor	1, 2, 3, 5	Yes

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Tuesday, April 28, 2020 10:40:07 AM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted Apr 28 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Thanks, Peter. I will download and work on this. Will try to put the file back on here by 5 pm.

Visit Topic

Or reply directly to this email

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Tuesday, April 28, 2020 10:59:44 AM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted Apr 28 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Thanks Peter! And thanks Laura!

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To unsubscribe from these emails, you can unfollow this category or unfollow this topic.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Tuesday, April 28, 2020 6:41:02 PM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted Apr 28 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Here is the document with my changes completed with the Track Changes function on. I labeled the file with Peter's and my initials. Please let me know if you have questions.

Lower Peace River and Shell Creek MFL Peer Revi...
612.89 KB

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Scientific Peer Review Panel Review of “Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report”

Prepared for:

Southwest Florida Water Management District

Prepared by:

Laura Bedinger, Ph.D. – Panel Member

Peter Sheng, Ph.D. – Panel Member

David Tomasko, Ph.D. – Chair

Draft April 2020

Introduction

The Southwest Florida Water Management District (District) has contracted with a Peer Review Panel (PRP) comprised of Laura Bedinger, Ph.D., Peter Sheng, Ph.D. and David Tomasko, Ph.D. to provide a technical peer review of its proposed minimum flows and levels (MFLs) for the Lower Peace River (LPR) and Lower Shell Creek (LSC), as outlined in the report “Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report” dated March 20, 2020 along with six appendices.

The draft MFL report summarizes prior efforts to establish MFL guidance for the Lower Peace River and Lower Shell Creek, which was adopted in 2010. For the purposes of the draft MFL report, the LPR is defined as the river segment from the USGS gage location at Arcadia down to Charlotte Harbor, while the LSC is defined as the segment of the creek that extends from the Hendrickson Dam at Shell Creek Reservoir to the confluence of Shell Creek with the Lower Peace River.

The District’s prior MFL guidance for the previously developed minimum flows for the LPR and LSC (2010) was adopted into District regulatory guidance by the adoption of the prior MFL report, and became effective regulatory guidance in August of 2010, as Rule 40D-8.041(8), Florida Administrative Code (FAC).

The original MFL guidance contained within FAC Rule 40D-8.041(8) is as follows:

Period	Effective Dates	Where Flow on Previous Day Equals:	Minimum Flow Is
Annually	January 1 through December 31	≤ 130 cfs > 130 cfs	Actual flow (no surface water withdrawals permitted) Seasonally dependent – see Blocks below
Block 1	April 20 through June 25	≤ 130 cfs > 130 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs
Block 2	October 28 through April 19	≤ 130 cfs > 130 cfs and < 625 cfs ≥ 625 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs previous day’s flow minus 29%
Block 3	June 26 through October 27	≤ 130 cfs > 130 cfs and < 625 cfs ≥625 cfs	Actual flow (no surface water withdrawals permitted) previous day’s flow minus 16% but not less than 130 cfs previous day’s flow minus 38%

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In the 2010 MFL, the District developed draft guidance for the LSC, and determined that a recovery strategy was needed for the LSC, as existing (at the time) flow rates in the LSC were below the draft MFL guidance developed for the LSC. Based on this finding, and the need to develop a recovery strategy for the LSC, draft MFL guidance for the LSC was not adopted into District rules.

The revised MFL guidance for the LPR, from the draft MFL report, is listed below:

Block	If Combined Flow on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs >149 cfs - 297 cfs	Flow - 130 cfs 13% of flow
Block 2	>297 cfs - 386 cfs >386 cfs - 622 cfs	23% of (flow - 297 cfs) plus 13% of remaining flow 23% of flow
Block 3	>622 cfs - 1037 cfs >1,037 cfs	40% of (flow - 622 cfs) plus 23% of remaining flow 40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

The draft MFL guidance for the LSC is listed below:

Block	If Inflow to Reservoir on Previous Day is	Allowable Flow Release
Block 1	<56 cfs	87% of inflow
Block 2	56 cfs - 137 cfs	77% of inflow
Block 3	>137 cfs	60% of inflow

The most immediate difference between the initial (2010) and draft revised MFL guidance for the LPR is the move from a calendar-based regulatory approach to guidance that is based on defined threshold flow levels – which vary over the course of a year. The MFL guidance for the LSC is the first such guidance for that system, as noted above.

Peer Review Panel Responsibilities

To begin, the District's charge to the empaneled PRP was for the members to become familiar with the relevant regulatory background.

In the State of Florida, Florida Statutes Section 373.042 states that for waterbodies such as the LPR and the LSC, MFL guidance shall represent the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The regulatory guidance further states that MFLs shall be calculated using the best information available, that the Governing Board shall consider and may provide for non-consumptive uses in the establishment of MFLs, and when appropriate, MFLs may be calculated to reflect seasonal variation.

Additional and more detailed guidance on the development of MFLs is provided in FAC 62-40, which states that MFLs should consider the following concerns: 1) recreation, 2) fish and wildlife habitats, 3) estuarine resources, 4) transfer of detrital material, 5) maintenance of freshwater storage and supply, 6) aesthetics, 7) filtration and absorption of pollutants and/or nutrients, 8) sediment loads, 9) water quality, and 10) navigation.

As such, MFLs are to cover not only the protection of natural resources, but also navigation, recreation, and – of great importance to the LSC in particular – the maintenance of freshwater storage and supply.

In its broadest sense, the Peer Review Panel is charged with the following six tasks, as related to their review of the 2020 Draft MFL for the LPR and the LSC systems:

1) Determine whether District conclusions are supported by analyses/results presented
2) Determine whether data/information were properly collected and used, any data exclusions were justified, and the data were the best available information
3) Determine whether technical assumptions are clearly stated, reasonable and consistent with the best available information, and if better analyses could be used
4) Determine whether procedures and analyses were appropriate and reasonable, based on the best available data, correctly applied, limitations were handled appropriately, and conclusions are supported by the data
5) For methods judged to be not scientifically reasonable, describe scientific deficiencies, identify remedies, if any, or alternative methods
6) As appropriate, identify and characterize effort involved for preferred alternative methods that could be used in lieu of scientifically reasonable methods that were used

Summary of Review Panel Comments

After discussion in publicly-accessible teleconferences, the PRP decided to produce a draft MFL review report using the following format: 1) PRP comments would be compiled for all reviewers at a time, based on the sequencing of the Draft MFL, 2) PRP comments would first be summarized in tabular form, by report section, in terms of the concern – briefly described – and the relevant PRP charge for which the concern was raised, and 3) additional text would follow to provide any needed back up for the concern.

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The tabular presentation of comments and concerns is tied to the 6 main charges of the PRP in a manner that likely over-simplifies the PRP process. Nonetheless, the PRP felt that this was an appropriate method to show the links between PRP comments and the specific contractual obligations of each PRP member.

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The PRP report format appears to differ from most other Peer Review reports, which tend to list concerns by individual reviewers one at a time. Using the report format we selected, we believe that the District review process will be more efficient, as shared concerns can be captured at one time, rather than perhaps being listed two or three times in different sections of the Peer Review report. This report makes no effort to attribute individual comments to individual reviewers. However, a separate column on the summary table for each section notes whether or not a comment or concern was raised by more than one reviewer. This should not be construed such that comments raised by more than one reviewer are more "important" than others, as it could be that an algorithm or conclusion raised as an issue by one reviewer was not known to be potentially problematic by others.

Commented [LB2R1]: I like this paragraph, but agree this sentence is not needed.

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If the same comment or concern was raised in more than one location, due that topic arising in more than one part of the draft MFL report, it would be listed in tabular form each time it was encountered, but supplementary text would not necessarily be included in latter portions of the report, to minimize repetition.

In addition, initial comments from the PRP are included for each member, as Appendices.

Commented [LB3]: We agreed to this on the call.

The Peer Review Panel's comments are captured for this Draft Report, starting below:

Overall Comments

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
MFL report was comprehensive, well-written and thorough	1 to 5	Yes
Basing MFL on specific flows, vs. calendar dates, a good idea	2, 3, 4	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Hydrodynamic modeling represents a substantial improvement from prior efforts	4, 5	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	Yes
Uncertainty and accuracy of hydrologic model should be discussed in more detail	1, 3, 4	Yes
In a changing climate, long-term (50-100 year) averaged flow are not necessarily more indicative of the hydrologic conditions in the next 15-20 years. Should more recent data in the past two decades be given more weight in the development of the baseline flow which was based on the average in 1950-2014?	2, 4, 6	Yes
Would be helpful to quantify actual or potential benefits associated with changes to existing MFL guidance	4, 5	Yes
Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows on bottom water hypoxia and other phenomena	2, 3	Yes
Consider development of a "dynamic" MFL with real-time now-cast/forecast capabilities	5	No
Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee	2, 4, 5	Yes

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Analyze the potential impact of sea level rise on the MFL, using best available SLR data for 2020-2050	2. 4. 5	Yes

The PRP felt that the draft MFL report was obviously the result of an impressive effort by the District and its consultants. The variety, quantity and quality of data that was compiled, collected, analyzed and interpreted, as well as the hydrodynamic model, was universally viewed as impressive, and obviously indicative of the MFL process being approached in a thorough and professional manner by District staff.

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The conversion of the MFL guidance from a calendar-based system to a flow-based guidance was considered to be a valuable improvement over the earlier guidance.

The District's use of a 15% threshold for "significant harm" will be considered elsewhere in the report, but the primary concern raised by the PRP was not that there was anything inherently "wrong" with the threshold, but the District's MFL report contains language that suggests that threshold values for withdrawal limits should first focus on a search to develop locally-relevant threshold values, such as the 0.6' fish passage criteria used in the Upper Peace River MFL, or perhaps water quality "triggers" or inflection points for wetland inundation frequencies. A thorough and detailed review of the MFL does show that such locally-derived triggers were examined, and that no link could be made for water quality, and that wetland inundation triggers were less protective than the 15% salinity-habitat metric. However, the MFL report would be more useful for future reviewers (and future District staff, perhaps) if the process that led to the adoption of the 15% threshold value for the salinity-habitat metric was more thoroughly, yet succinctly, discussed in the Executive Summary and elsewhere in the repot.

PRP members felt that while the expanded and more detailed hydrodynamic model used in the MFL was a substantial improvement over prior efforts, the issue of baseline conditions and the overall hydrologic output for non-gaged portions of the watershed continued to have limitations.

The PRP also sought to have the MFL report include reference to other regulatory guidance documents. For example, while the draft MFL report included reference to the lack of compliance of the LPR with various water quality criteria developed by FDEP, it did not include reference to the Pollutant Load Reduction Goal (PLRG) developed for Charlotte Harbor. While this is not a specific charge of the enabling legislation for setting MFLs, the PRP felt that public agencies should seek to develop regulatory guidance that is as complementary – or at least consistent with – guidance from other local, regional and/or state agencies.

Issues associated with the potential influence of the Caloosahatchee River and/or inflows from the south were of concern to the PRP, especially in light of recent adverse

impacts to seagrass resources along the eastern wall – impacts that could be attributed to the Peace River, given its much closer proximity.

In view of rapidly accelerating sea level rise (SLR), the PRP felt it would be prudent to consider the potential impact of SLR on the MFL by using the NOAA (2017) projection of SLR for Fort Myers in 2020-2050. For example, as a first step the impact of SLR on the volume of 2-psu water in 2020-2050 could be investigated using the low, medium, and high SLR values corresponding to the 50 percentile SLR projection for 2100 (3.3 ft global mean sea level rise of 3.3 ft) from NOAA (2017). The NOAA projection for Fort Myers in 2035 is 0.47, 0.80, 1.22 ft for the low, medium, high scenarios, respectively. The USACE SLR values used by the District are 0.2, 0.35, 0.76 ft, based on their 2013 report. Due to the increasing SLR and Florida Governor's effort in building coastal resiliency against the rising sea level, the PRP felt it is prudent for the District to use the best available information on SLR in its consideration of the potential impact of SLR on the MFL.

In consideration of the rapidly changing climate, the PRP recommends that, during its five-year evaluation with the regional water supply planning, the District evaluates the current and future climate conditions to determine if the MFL needs to be updated sooner than its regular schedule.

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Comments on Executive Summary

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Definition of "significant harm"	1, 4	Yes
Definition of "best available information"	2, 3	No
Could MFL be set for more than 3 flow blocks?	3, 4	Yes
Concern over LSC low flow conditions	1, 2	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	No
Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP's Numeric Nutrient Concentration (NNC) criteria	2, 4, 5, 6	Yes
Explain the need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	1, 4	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health	2, 4, 5	Yes
Say something about potential impact of SLR on the MFL	2, 4, 5	No

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The PRP found that it would be helpful for the draft MFL to attempt to define the terms "significant harm" and "best available information" in the Executive Summary. While not all terms will be clearly defined, their use in the Executive Summary suggests that they are standard phrases recognizable to the reader, which they are not.

Concerns were raised by the PRP related to the absence of a maximum flow value for the LSC, compared to a proposed value of 400 cfs for the Lower Peace River. This seems to be a function of the District determining that the area of interest for MFL development for the LSC ends at its downstream boundary with the LPR, even though the area of concern for the LPR extends out into Charlotte Harbor. Since flows from the LSC average (on an annual time step) perhaps 20 to 30% of the annual average flows of the LPR, if flows from the LPR are important to the Harbor such that a maximum withdrawal value of 400 cfs is included in the draft MFL, it would appear that a similar maximum diversion criterion could also be derived for the LSC.

The report recognized that climate change has significantly affected the sea level and precipitation in the region. In a changing climate, as the sea level rise continues to accelerate in the world and specifically in southwest Florida, the impact of SLR on MFL will need to be fully addressed at some time in the near future. Baseline flow will need to incorporate future SLR and flow conditions, instead of completely relying on averaged long-term historical flows.

Comments on Chapter 1 – Introduction

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Formatting of Table 1-1 Improve within cell formatting so text in final column matches up with that in preceding columns	5	No
1.2.1 Remove 's from Florida in title	5	No

Comments on Chapter 2 – Physical and Hydrologic Description

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Issues related to clarity of maps and figures, for example, enhancing Figure 2-2 so it is better related/connected to a Google street map for the same area	2, 3	Yes
Question related to LiDAR sources, for example, is 2017 LiDAR data for the region available from the state?	2, 4	No
Use of NGVD29 vs. NAVD88 for elevation and bathymetry data	2, 4, 6	No
Question about the order of MFL development vs. water supply planning efforts	4	No
Definition of flow lag	2, 4	No
Consider adding a most recent 10 or 20 year average bar to Figures 2-12 to 2-16 in addition to the one that is the long-term average for POR	5	No
Discuss the importance of hydrodynamics and hydrodynamic modeling	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes

Commented [LB4]: Maybe add some of our thoughts on 15% here, as this is where they introduce it.

Commented [LB5]: We could make a general statement about liking the introduction.

Commented [PS6]: What about Chapter 1? Please see my response to District's response. One of my comments was for the District to demonstrate that the new MFL would result in much better outcome, i.e., more freshwater withdrawn without significantly harming the habitats?"

Commented [LB7R6]: I added this section. I will let Dave fill in your comments.

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Commented [LB8]: Possibly include km scale on maps too.

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Deleted: Mislabeling of y-axis on Figure 3.23

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Figures 2-2 and 2-3 could be made clearer and easier to read. And the use of “%” should be used rather than “percent’ to shorten the report. More substantively, the elevation and bathymetry data appear to be compromised to some extent by the use of both NGVD29 and NAVD88 as datums for elevation, as tied to LiDAR and the development of the hydrologic model.

The PRP felt that the draft MFL should more clearly describe the timeline of development of MFL guidance, as it relates to water supply. As MFLs must take into consideration existing water supply needs, the timing of the development of water supply plans and MFLs could be addressed earlier and more succinctly in the draft MFL report.

As important as the hydrologic and hydrodynamic models are, the PRP felt that they could have been described in greater detail earlier in the draft report. While the hydrodynamic model is viewed as a substantial improvement from the work included in the 2010 MFL report, the hydrologic model has limitations related to those portions of the watershed located downstream of gages. Also, and touched on later, the factors that account for the conclusion that a result of groundwater withdrawals is a reduction in baseflow in parts of the Peace River watershed, but an increase in baseflow in locations such as Joshua Creek – those factors should be discussed in greater detail. The assumptions and data limitations associated with quantifying the water budget from both ungauged and gauged sources should be more clearly discussed.

Comments on Chapter 3 – Water Quality

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Salinity data presented in Figure 3-3 not that helpful	1, 4	No
Influences of factors other than flow on concentrations of chlorophyll *a*	1, 4, 6	Yes
Values of phosphorus only shown for orthophosphorus	2, 4, 5, 6	Yes
Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite	2, 4, 5, 6	Yes
Definition needed for “flow-lag”	2, 3	No
Various figures have legends that appear to be mislabeled	1, 4	Yes
Figure 3-22 caption says it is dissolved oxygen, but y-axis says chl *a*	3, 4, 5, 6	No
Mislabeling of y-axis on Figure 3.23	3, 4, 5, 6	Yes
Importance of hydrodynamic model description	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes
More refined explanation needed for isohaline location trend analyses	1, 4	Yes
Better description of results shown Figures 3-12 to 3-16	1, 4	Yes
Value of developing dynamic water quality model, vs. empirical approaches	4, 5	No
Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included	1, 4, 5, 6	No
Table 3-1 – improve explanation of location of isohaline location trends	1, 3, 5	Yes
Table 3-2 ,3, 4 to 3-7 and 3-12 tp 3-16 – improve explanation of summertime hypoxia development and other data presentations	1, 3, 5	Yes

Commented [LB10]: Additional box and whisker for pre and post MFL salinity data at the stations might be informative for the reader.
Similar comment for DO figure (3-4) and chlorophyll (3-5), nitrogen (3-7) and P (3-8)

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Commented [LB11]: I agree and have mentioned we need more than a p-value here.

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Commented [LB12]: Same comment as above.

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Commented [LB13]: Maybe separate this into two comments, one about data presentations in general and one about hypoxia. My agreement is data presentation part (as noted by me previously).

The PRP felt that some of the figures in the draft MFL were not overly useful, or could benefit from restructuring. For example, Figure 3-3 shows the variability in levels of salinity at various locations in the LPR. However, the analyses were conducted on 40 years of data, and variability could be due to seasonal variability, inter-annual variability, or some combination of both. Figure 3-3 is not entirely clear, as to what it is meant to convey to the reader. Suggestions were raised as to how the data could be displayed to address these concerns.

Related to this issue, Figures 3-12 to 3-16 are confusing, as the label on the y-axis does not match what the draft MFL report suggests is displayed. This likely is a result of a “short cut” in terms of description of what the graphics are intended to display. A more detailed description of the intent of the figures (what they are meant to convey) would be useful, as they currently are confusing to the reader.

The draft MFL report seems to focus on flows and residence time, as an influence on concentrations of chlorophyll *a*. While this is a worthwhile issue to investigate, several decades of work on the LPR and upper Charlotte Harbor have indicated that the amount of colored dissolved organic matter (CDOM) in the system is likely a key consideration. As well, the role – if any – of zooplankton grazing should be at least mentioned as an additional moderating influence on chlorophyll-a concentrations.

This section includes analyses on water quality variables that need additional attention. For example, Section 3.3.1.3 on “chlorophyll” does not specify that the analyses refer to chlorophyll-a that is corrected for the presence of phaeophytin. While that appears to be the case, the words “corrected” and “phaeophytin” reside only in the appendices, not in the report itself.

The draft MFL reports on “Ortho-phosphorus” which likely refers to concentrations of orthophosphate, not Total Phosphorus. Orthophosphorus is a bit of technical jargon short cut for orthophosphate, which is the dissolved inorganic form of phosphorus. While this could in fact represent 90% of the total pool of phosphorus, it could also represent a substantially smaller percentage. The suggestion made by the PRP is to conduct analyses on those stations and data sets that have total phosphorus, as that is the most complete form of nutrient content, and is also the nutrient form for which FDEP’s NNC criteria have been developed.

The draft MFL report discuses status and trends in both TKN and nitrate plus nitrite, but does not add the two together to calculate the abundance of Total Nitrogen. Since Total Nitrogen is the form of nutrient that is most complete, and is the form of nitrogen in FDEP’s NNC criteria, and the form that is involved in the PLRG for Charlotte Harbor, these analyses should be redone using Total Nitrogen, not TKN and nitrate plus nitrite.

When exploring empirical relationships between LPR flows and salinity in the LPR, it should be noted that two of the stations involved in those assessments are located below the confluence of the LSC. On an annual basis, LSC flows average about 20 to

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Commented [LB14]: Note that in the District’s response to you, they say the chl a data from the HBMP program is uncorrected chl a.

Commented [LB15]: Note Figure 3-8 caption uses “orthophosphate”. While Figure 3-9 has “ortho-phosphorus”.

Commented [LB16]: At least they should explain that they are using orthophosphate instead of total phosphorus for some/all stations due to that data being collected by the HBMP program. Orthophosphate should probably capture fertilizer loads etc.

30% of the flow of the LPR. Therefore, not including LSC flows in the flow vs. salinity empirical relationships could limit the explanatory power of the derived relationships.

The PRP also suggested the District consider the value of a mechanistic water quality model for the LSC, LPR and Upper Charlotte Harbor. Such a mechanistic model, although my not be necessary for the MFL for LPR and LSC, should benefit a variety of water management decisions on the Charlotte Harbor estuarine-riverine system by the District. The PRP, however, recognizes that developing such a model would require addressing the influences of factors and parameters that may or may not have been adequately understood/quantified and more data may be needed.

Hypoxia was mentioned numerous times in the report and during our discussions. It would be good to have a more comprehensive discussion in the report on the naturally-occurring as well as non-naturally-occurring hypoxia, how they impact the Charlotte Harbor system, how they are influenced by the high flow from Peace River (e.g., what rate of flow triggers hypoxia? 20000 cfs? 1000 cfs?), and how will they be affected by the MFL.

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<u>**Comments on Chapter 4 – Ecological Resources**</u>

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Plant community data set from 1998 is problematic	2, 3, 4	Yes
Status and trends in seagrass coverage in the LPR over time	2, 4	No
Concern over shift in HBMP focus to physical factors, rather than fish communities, macroinvertebrates, and/or macroalgae	2, 3, 4	Yes
Fisheries Independent Monitoring newest data from 2016 not included in the modeling approach (Appendix E) or compared to data collected through 2013	2, 3, 4	No
Should endangered species, such as sawfish and manatees, be included in MFL assessments?	2, 3, 4	No
In Appendix E it is stated that "predicted CPUE grids" were derived from catch data and these predictions were used to generate the population estimates which were used to model the effect of water withdrawals	1, 2, 4	No
Figure 4-2 difficult to review due color choices	1, 3	Yes
Explain "decreased flow may also contribute to increases in dissolved oxygen concentrations". Add your response to p.76 of the report.	1, 3	No

The PRP was concerned about the reasonableness of analyses related to plant communities that were last quantified in 1998. It is not known to the PRP if the physical

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Deleted: Are… fish communities actually found in salinity zones where the habitat models expect them to be found?
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locations of various plant communities have changed over time since 1988, although 22 years of sea level rise could result in migration of some communities upstream, in response to increased marine influence.

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Members of the PRP would like the draft MFL report to more thoroughly discuss the reason(s) why biotic variables such as fish abundance, macroinvertebrates, and/or macroalgae are not currently monitored to the same extent as they were in past years. A more detailed description of the relationship between the Hydro-biological Monitoring Program (HBMP), guidance from the HBMP review committee, and the data set used to develop the draft MFL would be helpful.

The PRP observed the levels of extrapolation involved in using HSM (habitat suitability modeling) to determine the effects of minimum flow conditions on the seven fish and one commercially important invertebrate. Populations were estimated and then effects on these estimated populations via changes in environmental conditions (temperature and salinity only) were modeled.

Questions related to the relative use (if any) by listed species should be considered, especially as how they were included (sawfish) in the proposed MFL for the Caloosahatchee River. The report could be a little more detailed/specific about the relationship of sawfish lifestages to salinity/freshwater flows. It might be helpful to NOT include rarely occurring species in the development of MFL guidance, but the draft MFL should at least include language that suggests why the decision to not include them is an appropriate decision.

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Comments on Chapter 5 – Resources of Concern and Modeling Tools

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Figure 5-1 could be more clearly identified as to what the graphics are meant to represent	3, 4	No
Timeframe and data sources used to develop the hydrodynamic model	1, 3, 4	No
Need to understand basis for variation in baseflow differences over different time periods	1, 3, 4, 6	Yes
Further clarify the meaning of "transitional flow triggers", using simple terminology such as "safety valves" to explain concept.	3, 4, 5	No
Helpful to include a graphical display of residence time/flushing rates	4, 5	Yes
Language related to impacts of hurricanes based on model runs	1, 2, 4, 5	Yes
Request for more information related to the hydrodynamic model, including consider the possibility of adding a short chapter which gives a holistic overview on the role of hydrodynamics (flow and water level, salinity, temperature, flushing) on water quality, ecology and fishery. Such a chapter can be used in many future MFL reports.	4, 5	No
Limitations of hydrologic model in ungaged portions of the watershed should be discussed in more detail	1, 3, 4	No
Suggested development of a dynamic water quality model, vs. empirical approaches	4, 5	No
Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed	1, 3, 4, 6	No
Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations	1, 3, 4	No

Commented [LB18]: Maybe clarify "exceedance" in the caption. I believe it means a shortfall. I follow the color lines meaning.

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Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed	1, 3, 4, 6	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
Basis for 15% as threshold for “significant harm” needs more detail	1, 3, 5	Yes

Members of the PRP felt that data limitations associated with various aspects and algorithms of the hydrologic model should be better addressed. Differences in baseflow during different time periods, for different sub-basins, require more detailed discussion. These issues are particularly important for those portions of the LPR and LSC watershed that are downstream of USGS gage sites. Even for locations that are in gaged portions of the LPR and LSC watersheds, the following issues should be discussed in greater detail:

- Why is it expected that some parts of the LPR watershed would have reduced baseflow with increased groundwater withdrawals, while other areas would have increased baseflow?
- If Charlie Creek’s hydrologic yield (cfs/square mile) during 1950 to 1969 is a good reference condition, why is that? Is this due to the characteristics of the watershed being more “natural” than other locations at other times?
- As the algorithms in the PRIM modeling effort are important for the hydrologic model development, it should be more clearly stated where relevant algorithms came from, lest a reader conclude that the algorithms were developed after the model runs, as opposed to the algorithms perhaps being modified from default values during the calibration phase of model development

The PRP noted that in the last MFL report (2010) the hydrologic model greatly over-estimated the ungaged flow from the watershed into the LPR and Charlotte Harbor, which seems to have been acknowledged by the District.

Portions of this chapter appear to be internally inconsistent. For example, Table 5-1 displays result of a Seasonal Kendall Tau test that found no monotonic trends over time for flows in Joshua Creek, and yet figures and text in the same section refer to the observed increases in dry season flows during the period of April to May as being evidence of an anthropogenic influence on dry season flows. The District should consider that the use of a Seasonal Kendall Tau test can give results at odds with an examination of flow data on a monthly time step, and consider a flow analysis on the monthly time step most useful for their discussion and later model development.

As was noted in earlier sections, the basis for there not being a maximum flow diversion threshold for the LSC, while such a value (400 cfs) exists for the LPR should be better

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Commented [LB19]: Do we want to use “gaged” or “gauged”? I know USGS uses “gage” for some reason.

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explained. While the PRP realizes that the District is currently working to develop a recovery strategy for low flow conditions for the LSC, this issue relates to high flows, and the PRP does not yet understand why a similar maximum flow diversion threshold could not be developed for the LSC, particularly for times when inflows to the reservoir are matched (or nearly so) by outflows into the LSC from the reservoir.

As was noted elsewhere, the draft MFL report should further develop the reason(s) why a 15% reduction in the salinity-habitat metric is considered to not be problematic, vs. other thresholds.

Comments on Chapter 6 – Recommended Minimum Flow Values

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?	2	No
Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades	1, 2, 3, 4	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes

Many of the PRP's comments related to Chapter 6 and the proposed MFL values had been made in earlier portions of this PRP draft report. These include the following main features:

- The shift from calendar-based to flow-based thresholds is to be commended
- Issues with the various algorithms and model components for the hydrologic model should be discussed in greater detail
- The District's logic for relying on a 15% change in habitat as being protective of "significant harm" should be elaborated on, and concerns related to why other techniques did not give rise to locally-relevant threshold guidance should be made more clearly
- The lack of a maximum flow diversion threshold for the LSC seems to be a function of a somewhat arbitrary truncation of the area of concern to that portion of the LSC upstream from its confluence with the LPR. No such restriction is placed on the LPR, which has a 400 cfs maximum diversion threshold which appears to be protective of portions of Charlotte Harbor beyond the downstream boundary of the LPR alone

In addition to previously raised concerns, the PRP felt that incorporating sea level rise scenarios was very useful, but that the more recent values derived by NOAA would be the most appropriate values to use.

Commented [LB20]: Note we have no section for section 7. Error in x-axis label for Figure 7-1 "Day of Year'

Typos and Comments on Various Appendices

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Appendix E – page 7 – typo	5	No
Section 5.1 – typo	5	No
Page 88 – typo – add "on data from a 13-year period"	5	No
Page 96 – typo, first sentence "result in"	5	No
Page 98 – clarification needed	5	No
Page 113 – "psu" missing from first sentence of second paragraph, also change spacing	5	No
Appendix C should be a separate chapter	5	No
Page 16 – typo in title	5	No
Page 47 replace "is" with "in" first sentence of 3.3.1.2.	5	No
Figure 3-11, page 57 – model failed to predict several observed salinity peaks	1, 2, 3, 5	No
Caption of Figure 3-27 typo	5	No
Use of wind data from nearby airports might be helpful	1, 2, 3, 5	No
Appendix C – typo on page 42	5	No
Appendix C – typo on page 44	5	No
Appendix C – definition of shoreline length needed	2, 4	No
Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor	1, 2, 3, 5	Yes
Caption for Figure 2-13 needs a space	5	No
Consider adding conversion table	5	No

Commented [LB21]: My thought here is that wording is a bit backwards, theses are freshwater plants that tolerate some salinity. Maybe if it said "low levels of salinity". Freshwater plants prefer low to no salinity. They mean plants that do well in slightly brackish water. Not too important.

Commented [LB22]: General comment to ensure use of a space around equals signs and greater than or less than signs.

Commented [LB23]: A stakeholder raised and I agree.

DL

Moderator
97 posts

Doug Leeper
a few seconds ago

Dave, Laura and Peter:
Based on a quick look at the latest version of your draft initial peer review report posted by Laura yesterday, I have a few editorial comments to provide for your consideration. Please see the attached file (with my initials added to the end of the filename) for comments and suggestions intended to help clarify the prefatory or background information section of your draft document. Also, let me know if you have any questions regarding my comments.

Lower Peace River and Shell Creek MFL Peer Revi...
616.81 KB

Scientific Peer Review Panel Review of "Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report"

Commented [DL1]: 1) For the deliverable, suggest changing "Draft Report" to "Draft Initial Report" for working drafts and to "Initial Report" for the deliverable for this first phase of the review process.
2) Using this approach, your working versions of the final report could include "Draft Final Report" in the title and for the ultimate deliverable, the title could include "Final Report."

Prepared for:

Southwest Florida Water Management District

Prepared by:

Laura Bedinger, Ph.D. – Panel Member

Peter Sheng, Ph.D. – Panel Member

David Tomasko, Ph.D. – Chair

Draft April 2020

Introduction

The Southwest Florida Water Management District (District) has contracted with a Peer Review Panel (PRP) comprised of Laura Bedinger, Ph.D., Peter Sheng, Ph.D. and David Tomasko, Ph.D. to provide an independent, scientific peer review of its proposed minimum flows and levels (MFLs) for the Lower Peace River (LPR) and Lower Shell Creek (LSC), as outlined in the report "Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report" dated March 20, 2020 along with six appendices.

The draft MFLs report summarizes prior efforts to establish MFLs guidance for the Lower Peace River and Lower Shell Creek. For the purposes of the draft MFL report, the LPR is defined as the river segment from the USGS gage location at Arcadia down to Charlotte Harbor, while the LSC is defined as the segment of the creek that extends from the Hendrickson Dam at Shell Creek Reservoir to the confluence of Shell Creek with the Lower Peace River.

The District's prior MFL guidance for the previously developed minimum flows for the LPR and guidance proposed for LSC were summarized in a 2010 District report. This information supported adoption of minimum flows for the Lower Peace River into District Rules as Rule 40D-8.041(8), Florida Administrative Code (FAC) that became effective in August 2010.

The original MFLs guidance contained within Rule 40D-8.041(8), FAC is as follows:

Period	Effective Dates	Where Flow on Previous Day Equals:	Minimum Flow Is
Annually	January 1 through December 31	≤ 130 cfs* > 130 cfs	Actual flow (no surface water withdrawals permitted) Seasonally dependent – see Blocks below In addition, the total permitted maximum withdrawals on any day shall not exceed 400 cfs
Block 1	April 20 through June 25	≤ 130 cfs > 130 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs
Block 2	October 28 through April 19	≤ 130 cfs > 130 cfs and < 625 cfs ≥ 625 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs Previous day's flow minus 29%

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Commented [DL2]: I recommend not including this acronym here and in other places in the paper substituting "minimum flows" for "MFL" or "MFLs."

Rather than make this change/revision in the remainder of the report, I've typically just changed "MFL" to "MFLs."

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Commented [DL4]: Note: row spacing matters in this table.

Commented [DL5]: The phrase "The total permitted maximum…" is in the current rule. Could include here as I've done with track changes or put at the bottom of the table as is done in the following table that summarizes the currently proposed minimum flows for the Lower Peace River.

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Block 3	June 26 through October 27	≤ 130 cfs > 130 cfs and < 625 cfs ≥625 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs Previous day's flow minus 38%

*cfs = cubic feet per second

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In 2010, the District developed draft minimum flows guidance for the LSC, and determined that a recovery strategy was needed for the LSC, as existing (at the time) flow rates in the LSC were below the draft MFL guidance developed for the LSC. Based on this finding, and the need to develop a recovery strategy for the LSC, draft MFL guidance for the LSC was not adopted into District rules.

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The revised MFL guidance for the LPR, from the draft 2020 MFLs report, is listed below:

Block	If Combined Flow on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs >149 cfs - 297 cfs	Flow - 130 cfs 13% of flow
Block 2	>297 cfs - 386 cfs >386 cfs - 622 cfs	23% of (flow - 297 cfs) plus 13% of remaining flow 23% of flow
Block 3	>622 cfs - 1037 cfs >1,037 cfs	40% of (flow - 622 cfs) plus 23% of remaining flow 40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

The MFLs guidance for the LSC from the draft 2020 MFLs report is listed below:

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Block	If Inflow to Reservoir on Previous Day is	Allowable Flow Release
Block 1	<56 cfs	87% of inflow
Block 2	56 cfs - 137 cfs	77% of inflow
Block 3	>137 cfs	60% of inflow

The most apparent difference between the initial (2010) and draft revised MFL guidance for the LPR (and that proposed for LSC) is the move from a calendar-based regulatory approach to guidance that is based on defined threshold flow levels – which vary over the course of a year.

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Commented [DL6]: The District's 2010 report included minimum flow recommendations for the LPR and LSC, so the original last sentence here is incorrect. That's why I deleted it.

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Peer Review Panel Responsibilities

To begin, the District's charge to the empaneled PRP was for the members to become familiar with the relevant regulatory background.

Commented [DL8]: Not sure you've defined this acronym and not sure why you want to use it, rather than a simple term, such as "panel" or "Panel."

Section 373.042 of the Florida Statutes, states that for waterbodies such as the LPR and the LSC, established minimum flows represent the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The legislative guidance further states that MFLs shall be calculated using the best information available, that the Governing Board shall consider and may provide for non-consumptive uses in the establishment of MFLs, and when appropriate, MFLs may be calculated to reflect seasonal variation.

Commented [DL9]: Or alternatively, if you don't want to begin with "Section…", could use something like "The Florida Statutes (section 373.042) state that…."

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Additional and more detailed guidance on the development of MFLs is provided in Rule 62-40, FAC, which states that MFLs should consider the following concerns: 1) recreation, 2) fish and wildlife habitats, 3) estuarine resources, 4) transfer of detrital material, 5) maintenance of freshwater storage and supply, 6) aesthetics, 7) filtration and absorption of pollutants and/or nutrients, 8) sediment loads, 9) water quality, and 10) navigation.

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As such, MFLs are to cover not only the protection of natural resources, but also navigation, recreation, and – of great importance to the LSC in particular – the maintenance of freshwater storage and supply.

Commented [DL10]: Worth noting that recreation can be associated with natural system values.

Commented [DL11]: Opinion only: don't agree with sentiment associated with use of this phrase here.

In its broadest sense, the Peer Review Panel is charged with the following six tasks, as related to their review of the 2020 Draft MFL for the LPR and the LSC:

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1) Determine whether District conclusions are supported by analyses/results presented
2) Determine whether data/information were properly collected and used, any data exclusions were justified, and the data were the best available information
3) Determine whether technical assumptions are clearly stated, reasonable and consistent with the best available information, and if better analyses could be used
4) Determine whether procedures and analyses were appropriate and reasonable, based on the best available data, correctly applied, limitations were handled appropriately, and conclusions are supported by the data
5) For methods judged to be not scientifically reasonable, describe scientific deficiencies, identify remedies, if any, or alternative methods

6) As appropriate, identify and characterize effort involved for preferred alternative methods that could be used in lieu of scientifically reasonable methods that were used

Summary of Review Panel Comments

After discussion in publicly-accessible teleconferences, the PRP decided to produce a draft MFLs review report using the following format: 1) PRP comments by all panelists would be compiled, based on the sequencing of the Draft MFL, 2) PRP comments would first be summarized in tabular form, by report section, in terms of the concern – briefly described – and the relevant PRP charge for which the concern was raised, and 3) additional text would follow to provide any needed back-up for the concern.

The tabular presentation of comments and concerns is tied to the 6 main charges of the PRP in a manner that likely over-simplifies the PRP process. Nonetheless, the PRP felt that this was an appropriate method to show the links between PRP comments and the specific contractual obligations of each PRP member.

The PRP report format appears to differ from most other Peer Review reports, which tend to separately list concerns by individual reviewers. Using the report format we selected, we believe that the District review process will be more efficient, as shared concerns can be characterized once, rather than perhaps being listed two or three times in different sections of the Peer Review report. This report makes no effort to attribute individual comments to individual reviewers. However, a separate column on the summary table for each section notes whether or not a comment or concern was raised by more than one reviewer. This should not be construed such that comments raised by more than one reviewer are more "important" than others, as it could be that an algorithm or conclusion raised as an issue by one reviewer was not known to be potentially problematic by others.

If the same comment or concern was raised in more than one location, due that topic arising in more than one part of the draft MFLs report, it would be listed in tabular form each time it was encountered, but supplementary text would not necessarily be included in latter portions of the report, to minimize repetition.

In addition, initial comments from the PRP are included for each member, as Appendices.

The Peer Review Panel's comments are captured for this Draft Report, starting below:

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Commented [LB13R12]: I like this paragraph, but agree this sentence is not needed.

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Commented [LB14]: We agreed to this on the call.

Commented [DL15]: Note switch from acronym use to use of a phrase, i.e., from "PRP" or "PRP's" to "Peer Review Panel's."

Overall Comments

Summary of concern/comment	Relevant PRP charge	Raised by more than PRP member?
MFL report was comprehensive, well-written and thorough	1 to 5	Yes
Basing MFL on specific flows, vs. calendar dates, a good idea	2, 3, 4	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Hydrodynamic modeling represents a substantial improvement from prior efforts	4, 5	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	Yes
Uncertainty and accuracy of hydrologic model should be discussed in more detail	1, 3, 4	Yes
In a changing climate, long-term (50-100 year) averaged flow are not necessarily more indicative of the hydrologic conditions in the next 15-20 years. Should more recent data in the past two decades be given more weight in the development of the baseline flow which was based on the average in 1950-2014?	2, 4, 6	Yes
Would be helpful to quantify actual or potential benefits associated with changes to existing MFL guidance	4, 5	Yes
Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows on bottom water hypoxia and other phenomena	2, 3	Yes
Consider development of a "dynamic" MFL with real-time now-cast/forecast capabilities	5	No
Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee	2, 4, 5	Yes

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Analyze the potential impact of sea level rise on the MFL, using best available SLR data for 2020-2050	2. 4. 5	Yes

The PRP felt that the draft MFL report was obviously the result of an impressive effort by the District and its consultants. The variety, quantity and quality of data that was compiled, collected, analyzed and interpreted, as well as the hydrodynamic model, was universally viewed as impressive, and obviously indicative of the MFL process being approached in a thorough and professional manner by District staff.

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The conversion of the MFL guidance from a calendar-based system to a flow-based guidance was considered to be a valuable improvement over the earlier guidance.

The District's use of a 15% threshold for "significant harm" will be considered elsewhere in the report, but the primary concern raised by the PRP was not that there was anything inherently "wrong" with the threshold, but the District's MFL report contains language that suggests that threshold values for withdrawal limits should first focus on a search to develop locally-relevant threshold values, such as the 0.6' fish passage criteria used in the Upper Peace River MFL, or perhaps water quality "triggers" or inflection points for wetland inundation frequencies. A thorough and detailed review of the MFL does show that such locally-derived triggers were examined, and that no link could be made for water quality, and that wetland inundation triggers were less protective than the 15% salinity-habitat metric. However, the MFL report would be more useful for future reviewers (and future District staff, perhaps) if the process that led to the adoption of the 15% threshold value for the salinity-habitat metric was more thoroughly, yet succinctly, discussed in the Executive Summary and elsewhere in the repot.

PRP members felt that while the expanded and more detailed hydrodynamic model used in the MFL was a substantial improvement over prior efforts, the issue of baseline conditions and the overall hydrologic output for non-gaged portions of the watershed continued to have limitations.

The PRP also sought to have the MFL report include reference to other regulatory guidance documents. For example, while the draft MFL report included reference to the lack of compliance of the LPR with various water quality criteria developed by FDEP, it did not include reference to the Pollutant Load Reduction Goal (PLRG) developed for Charlotte Harbor. While this is not a specific charge of the enabling legislation for setting MFLs, the PRP felt that public agencies should seek to develop regulatory guidance that is as complementary – or at least consistent with – guidance from other local, regional and/or state agencies.

Issues associated with the potential influence of the Caloosahatchee River and/or inflows from the south were of concern to the PRP, especially in light of recent adverse

impacts to seagrass resources along the eastern wall – impacts that could be attributed to the Peace River, given its much closer proximity.

In view of rapidly accelerating sea level rise (SLR), the PRP felt it would be prudent to consider the potential impact of SLR on the MFL by using the NOAA (2017) projection of SLR for Fort Myers in 2020-2050. For example, as a first step the impact of SLR on the volume of 2-psu water in 2020-2050 could be investigated using the low, medium, and high SLR values corresponding to the 50 percentile SLR projection for 2100 (3.3 ft global mean sea level rise of 3.3 ft) from NOAA (2017). The NOAA projection for Fort Myers in 2035 is 0.47, 0.80, 1.22 ft for the low, medium, high scenarios, respectively. The USACE SLR values used by the District are 0.2, 0.35, 0.76 ft, based on their 2013 report. Due to the increasing SLR and Florida Governor's effort in building coastal resiliency against the rising sea level, the PRP felt it is prudent for the District to use the best available information on SLR in its consideration of the potential impact of SLR on the MFL.

In consideration of the rapidly changing climate, the PRP recommends that, during its five-year evaluation with the regional water supply planning, the District evaluates the current and future climate conditions to determine if the MFL needs to be updated sooner than its regular schedule.

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Comments on Executive Summary

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Definition of "significant harm"	1, 4	Yes
Definition of "best available information"	2, 3	No
Could MFL be set for more than 3 flow blocks?	3, 4	Yes
Concern over LSC low flow conditions	1, 2	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	No
Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP's Numeric Nutrient Concentration (NNC) criteria	2, 4, 5, 6	Yes
Explain the need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	1, 4	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health	2, 4, 5	Yes
Say something about potential impact of SLR on the MFL	2, 4, 5	No

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The PRP found that it would be helpful for the draft MFL to attempt to define the terms "significant harm" and "best available information" in the Executive Summary. While not all terms will be clearly defined, their use in the Executive Summary suggests that they are standard phrases recognizable to the reader, which they are not.

Concerns were raised by the PRP related to the absence of a maximum flow value for the LSC, compared to a proposed value of 400 cfs for the Lower Peace River. This seems to be a function of the District determining that the area of interest for MFL development for the LSC ends at its downstream boundary with the LPR, even though the area of concern for the LPR extends out into Charlotte Harbor. Since flows from the LSC average (on an annual time step) perhaps 20 to 30% of the annual average flows of the LPR, if flows from the LPR are important to the Harbor such that a maximum withdrawal value of 400 cfs is included in the draft MFL, it would appear that a similar maximum diversion criterion could also be derived for the LSC.

The report recognized that climate change has significantly affected the sea level and precipitation in the region. In a changing climate, as the sea level rise continues to accelerate in the world and specifically in southwest Florida, the impact of SLR on MFL will need to be fully addressed at some time in the near future. Baseline flow will need to incorporate future SLR and flow conditions, instead of completely relying on averaged long-term historical flows.

Comments on Chapter 1 – Introduction

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Formatting of Table 1-1 Improve within cell formatting so text in final column matches up with that in preceding columns	5	No
1.2.1 Remove 's from Florida in title	5	No

Commented [LB16]: Maybe add some of our thoughts on 15% here, as this is where they introduce it.

Commented [LB17]: We could make a general statement about liking the introduction.

Comments on Chapter 2 – Physical and Hydrologic Description

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Issues related to clarity of maps and figures, for example, enhancing Figure 2-2 so it is better related/connected to a Google street map for the same area	2, 3	Yes
Question related to LiDAR sources, for example, is 2017 LiDAR data for the region available from the state?	2, 4	No
Use of NGVD29 vs. NAVD88 for elevation and bathymetry data	2, 4, 6	No
Question about the order of MFL development vs. water supply planning efforts	4	No
Definition of flow lag	2, 4	No
Consider adding a most recent 10 or 20 year average bar to Figures 2-12 to 2-16 in addition to the one that is the long-term average for POR	5	No
Discuss the importance of hydrodynamics and hydrodynamic modeling	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes

Commented [PS18]: What about Chapter 1? Please see my response to District's response. One of my comments was for the District to demonstrate that the new MFL would result in much better outcome, i.e., more freshwater withdrawn without significantly harming the habitats?"

Commented [LB19R18]: I added this section. I will let Dave fill in your comments.

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Commented [LB20]: Possibly include km scale on maps too.

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Deleted: , 6

Deleted: Mislabeling of y-axis on Figure 3.23

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Deleted: model description

Deleted: Table 3- 1 – better explanation of location of isohaline location trends needed

Figures 2-2 and 2-3 could be made clearer and easier to read. And the use of “%” should be used rather than “percent’ to shorten the report. More substantively, the elevation and bathymetry data appear to be compromised to some extent by the use of both NGVD29 and NAVD88 as datums for elevation, as tied to LiDAR and the development of the hydrologic model.

The PRP felt that the draft MFL should more clearly describe the timeline of development of MFL guidance, as it relates to water supply. As MFLs must take into consideration existing water supply needs, the timing of the development of water supply plans and MFLs could be addressed earlier and more succinctly in the draft MFL report.

As important as the hydrologic and hydrodynamic models are, the PRP felt that they could have been described in greater detail earlier in the draft report. While the hydrodynamic model is viewed as a substantial improvement from the work included in the 2010 MFL report, the hydrologic model has limitations related to those portions of the watershed located downstream of gages. Also, and touched on later, the factors that account for the conclusion that a result of groundwater withdrawals is a reduction in baseflow in parts of the Peace River watershed, but an increase in baseflow in locations such as Joshua Creek – those factors should be discussed in greater detail. The assumptions and data limitations associated with quantifying the water budget from both ungauged and gauged sources should be more clearly discussed.

Comments on Chapter 3 – Water Quality

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Salinity data presented in Figure 3-3 not that helpful	1, 4	No
Influences of factors other than flow on concentrations of chlorophyll *a*	1, 4, 6	Yes
Values of phosphorus only shown for orthophosphorus	2, 4, 5, 6	Yes
Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite	2, 4, 5, 6	Yes
Definition needed for "flow-lag"	2, 3	No
Various figures have legends that appear to be mislabeled	1, 4	Yes
Figure 3-22 caption says it is dissolved oxygen, but y-axis says chl *a*	3, 4, 5, 6	No
Mislabeling of y-axis on Figure 3.23	3, 4, 5, 6	Yes
Importance of hydrodynamic model description	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes
More refined explanation needed for isohaline location trend analyses	1, 4	Yes
Better description of results shown Figures 3-12 to 3-16	1, 4	Yes
Value of developing dynamic water quality model, vs. empirical approaches	4, 5	No
Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included	1, 4, 5, 6	No
Table 3-1 – improve explanation of location of isohaline location trends	1, 3, 5	Yes
Table 3-2 ,3, 4 to 3-7 and 3-12 tp 3-16 – improve explanation of summertime hypoxia development and other data presentations	1, 3, 5	Yes

Commented [LB22]: Additional box and whisker for pre and post MFL salinity data at the stations might be informative for the reader.
Similar comment for DO figure (3-4) and chlorophyll (3-5), nitrogen (3-7) and P (3-8)

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Commented [LB23]: I agree and have mentioned we need more than a p-value here.

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Commented [LB24]: Same comment as above.

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Commented [LB25]: Maybe separate this into two comments, one about data presentations in general and one about hypoxia. My agreement is data presentation part (as noted by me previously).

The PRP felt that some of the figures in the draft MFL were not overly useful, or could benefit from restructuring. For example, Figure 3-3 shows the variability in levels of salinity at various locations in the LPR. However, the analyses were conducted on 40 years of data, and variability could be due to seasonal variability, inter-annual variability, or some combination of both. Figure 3-3 is not entirely clear, as to what it is meant to convey to the reader. Suggestions were raised as to how the data could be displayed to address these concerns.

Related to this issue, Figures 3-12 to 3-16 are confusing, as the label on the y-axis does not match what the draft MFL report suggests is displayed. This likely is a result of a "short cut" in terms of description of what the graphics are intended to display. A more detailed description of the intent of the figures (what they are meant to convey) would be useful, as they currently are confusing to the reader.

The draft MFL report seems to focus on flows and residence time, as an influence on concentrations of chlorophyll *a*. While this is a worthwhile issue to investigate, several decades of work on the LPR and upper Charlotte Harbor have indicated that the amount of colored dissolved organic matter (CDOM) in the system is likely a key consideration. As well, the role – if any – of zooplankton grazing should be at least mentioned as an additional moderating influence on chlorophyll-a concentrations.

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This section includes analyses on water quality variables that need additional attention. For example, Section 3.3.1.3 on "chlorophyll" does not specify that the analyses refer to chlorophyll-a that is corrected for the presence of phaeophytin. While that appears to be the case, the words "corrected" and "phaeophytin" reside only in the appendices, not in the report itself.

Commented [LB26]: Note that in the District's response to you, they say the chl a data from the HBMP program is uncorrected chl a.

The draft MFL reports on "Ortho-phosphorus" which likely refers to concentrations of orthophosphate, not Total Phosphorus. Orthophosphorus is a bit of technical jargon short cut for orthophosphate, which is the dissolved inorganic form of phosphorus. While this could in fact represent 90% of the total pool of phosphorus, it could also represent a substantially smaller percentage. The suggestion made by the PRP is to conduct analyses on those stations and data sets that have total phosphorus, as that is the most complete form of nutrient content, and is also the nutrient form for which FDEP's NNC criteria have been developed.

Commented [LB27]: Note Figure 3-8 caption uses "orthophosphate". While Figure 3-9 has "ortho-phosphorus".

Commented [LB28]: At least they should explain that they are using orthophosphate instead of total phosphorus for some/all stations due to that data being collected by the HBMP program. Orthophosphate should probably capture fertilizer loads etc.

The draft MFL report discuses status and trends in both TKN and nitrate plus nitrite, but does not add the two together to calculate the abundance of Total Nitrogen. Since Total Nitrogen is the form of nutrient that is most complete, and is the form of nitrogen in FDEP's NNC criteria, and the form that is involved in the PLRG for Charlotte Harbor, these analyses should be redone using Total Nitrogen, not TKN and nitrate plus nitrite.

When exploring empirical relationships between LPR flows and salinity in the LPR, it should be noted that two of the stations involved in those assessments are located below the confluence of the LSC. On an annual basis, LSC flows average about 20 to

30% of the flow of the LPR. Therefore, not including LSC flows in the flow vs. salinity empirical relationships could limit the explanatory power of the derived relationships.

The PRP also suggested the District consider the value of a mechanistic water quality model for the LSC, LPR and Upper Charlotte Harbor. Such a mechanistic model, although my not be necessary for the MFL for LPR and LSC, should benefit a variety of water management decisions on the Charlotte Harbor estuarine-riverine system by the District. The PRP, however, recognizes that developing such a model would require addressing the influences of factors and parameters that may or may not have been adequately understood/quantified and more data may be needed.

Hypoxia was mentioned numerous times in the report and during our discussions. It would be good to have a more comprehensive discussion in the report on the naturally-occurring as well as non-naturally-occurring hypoxia, how they impact the Charlotte Harbor system, how they are influenced by the high flow from Peace River (e.g., what rate of flow triggers hypoxia? 20000 cfs? 1000 cfs?), and how will they be affected by the MFL.

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Comments on Chapter 4 – Ecological Resources

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Plant community data set from 1998 is problematic	2, 3, 4	Yes
Status and trends in seagrass coverage in the LPR over time	2, 4	No
Concern over shift in HBMP focus to physical factors, rather than fish communities, macroinvertebrates, and/or macroalgae	2, 3, 4	Yes
Fisheries Independent Monitoring newest data from 2016 not included in the modeling approach (Appendix E) or compared to data collected through 2013	2, 3, 4	No
Should endangered species, such as sawfish and manatees, be included in MFL assessments?	2, 3, 4	No
In Appendix E it is stated that "predicted CPUE grids" were derived from catch data and these predictions were used to generate the population estimates which were used to model the effect of water withdrawals	1, 2, 4	No
Figure 4-2 difficult to review due color choices	1, 3	Yes
Explain "decreased flow may also contribute to increases in dissolved oxygen concentrations". Add your response to p.76 of the report.	1, 3	No

The PRP was concerned about the reasonableness of analyses related to plant communities that were last quantified in 1998. It is not known to the PRP if the physical

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Deleted: Are… fish communities actually found in salinity zones where the habitat models expect them to be found?
2, 3, 4

Deleted: Was catch per unit effort (CPUE) derived from actual data, or a model prediction?

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locations of various plant communities have changed over time since 1988, although 22 years of sea level rise could result in migration of some communities upstream, in response to increased marine influence.

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Members of the PRP would like the draft MFL report to more thoroughly discuss the reason(s) why biotic variables such as fish abundance, macroinvertebrates, and/or macroalgae are not currently monitored to the same extent as they were in past years. A more detailed description of the relationship between the Hydro-biological Monitoring Program (HBMP), guidance from the HBMP review committee, and the data set used to develop the draft MFL would be helpful.

The PRP observed the levels of extrapolation involved in using HSM (habitat suitability modeling) to determine the effects of minimum flow conditions on the seven fish and one commercially important invertebrate. Populations were estimated and then effects on these estimated populations via changes in environmental conditions (temperature and salinity only) were modeled.

Questions related to the relative use (if any) by listed species should be considered, especially as how they were included (sawfish) in the proposed MFL for the Caloosahatchee River. The report could be a little more detailed/specific about the relationship of sawfish lifestages to salinity/freshwater flows. It might be helpful to NOT include rarely occurring species in the development of MFL guidance, but the draft MFL should at least include language that suggests why the decision to not include them is an appropriate decision.

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Comments on Chapter 5 – Resources of Concern and Modeling Tools

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Figure 5-1 could be more clearly identified as to what the graphics are meant to represent	3, 4	No
Timeframe and data sources used to develop the hydrodynamic model	1, 3, 4	No
Need to understand basis for variation in baseflow differences over different time periods	1, 3, 4, 6	Yes
Further clarify the meaning of "transitional flow triggers", using simple terminology such as "safety valves" to explain concept.	3, 4, 5	No
Helpful to include a graphical display of residence time/flushing rates	4, 5	Yes
Language related to impacts of hurricanes based on model runs	1, 2, 4, 5	Yes
Request for more information related to the hydrodynamic model, including consider the possibility of adding a short chapter which gives a holistic overview on the role of hydrodynamics (flow and water level, salinity, temperature, flushing) on water quality, ecology and fishery. Such a chapter can be used in many future MFL reports.	4, 5	No
Limitations of hydrologic model in ungaged portions of the watershed should be discussed in more detail	1, 3, 4	No
Suggested development of a dynamic water quality model, vs. empirical approaches	4, 5	No
Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed	1, 3, 4, 6	No
Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations	1, 3, 4	No

Commented [LB30]: Maybe clarify "exceedance" in the caption. I believe it means a shortfall. I follow the color lines meaning.

Deleted: Not clear what is meant as to

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Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed	1, 3, 4, 6	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
Basis for 15% as threshold for "significant harm" needs more detail	1, 3, 5	Yes

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Members of the PRP felt that data limitations associated with various aspects and algorithms of the hydrologic model should be better addressed. Differences in baseflow during different time periods, for different sub-basins, require more detailed discussion. These issues are particularly important for those portions of the LPR and LSC watershed that are downstream of USGS gage sites. Even for locations that are in gaged portions of the LPR and LSC watersheds, the following issues should be discussed in greater detail:

- Why is it expected that some parts of the LPR watershed would have reduced baseflow with increased groundwater withdrawals, while other areas would have increased baseflow?
- If Charlie Creek's hydrologic yield (cfs/square mile) during 1950 to 1969 is a good reference condition, why is that? Is this due to the characteristics of the watershed being more "natural" than other locations at other times?
- As the algorithms in the PRIM modeling effort are important for the hydrologic model development, it should be more clearly stated where relevant algorithms came from, lest a reader conclude that the algorithms were developed after the model runs, as opposed to the algorithms perhaps being modified from default values during the calibration phase of model development

The PRP noted that in the last MFL report (2010) the hydrologic model greatly over-estimated the ungaged flow from the watershed into the LPR and Charlotte Harbor, which seems to have been acknowledged by the District.

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Commented [LB31]: Do we want to use "gaged" or "gauged"? I know USGS uses "gage" for some reason.

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Portions of this chapter appear to be internally inconsistent. For example, Table 5-1 displays result of a Seasonal Kendall Tau test that found no monotonic trends over time for flows in Joshua Creek, and yet figures and text in the same section refer to the observed increases in dry season flows during the period of April to May as being evidence of an anthropogenic influence on dry season flows. The District should consider that the use of a Seasonal Kendall Tau test can give results at odds with an examination of flow data on a monthly time step, and consider a flow analysis on the monthly time step most useful for their discussion and later model development.

As was noted in earlier sections, the basis for there not being a maximum flow diversion threshold for the LSC, while such a value (400 cfs) exists for the LPR should be better explained. While the PRP realizes that the District is currently working to develop a recovery strategy for low flow conditions for the LSC, this issue relates to high flows, and the PRP does not yet understand why a similar maximum flow diversion threshold could not be developed for the LSC, particularly for times when inflows to the reservoir are matched (or nearly so) by outflows into the LSC from the reservoir.

As was noted elsewhere, the draft MFL report should further develop the reason(s) why a 15% reduction in the salinity-habitat metric is considered to not be problematic, vs. other thresholds.

Comments on Chapter 6 – Recommended Minimum Flow Values

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?	2	No
Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades	1, 2, 3, 4	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes

Many of the PRP's comments related to Chapter 6 and the proposed MFL values had been made in earlier portions of this PRP draft report. These include the following main features:

- The shift from calendar-based to flow-based thresholds is to be commended
- Issues with the various algorithms and model components for the hydrologic model should be discussed in greater detail
- The District's logic for relying on a 15% change in habitat as being protective of "significant harm" should be elaborated on, and concerns related to why other techniques did not give rise to locally-relevant threshold guidance should be made more clearly
- The lack of a maximum flow diversion threshold for the LSC seems to be a function of a somewhat arbitrary truncation of the area of concern to that portion of the LSC upstream from its confluence with the LPR. No such restriction is placed on the LPR, which has a 400 cfs maximum diversion threshold which appears to be protective of portions of Charlotte Harbor beyond the downstream boundary of the LPR alone

In addition to previously raised concerns, the PRP felt that incorporating sea level rise scenarios was very useful, but that the more recent values derived by NOAA would be the most appropriate values to use.

Commented [LB32]: Note we have no section for section 7. Error in x-axis label for Figure 7-1 "Day of Year'

Typos and Comments on Various Appendices

Summary of concern/comment	Relevant PRP charge	Raised by more than one PRP member?
Appendix E – page 7 – typo	5	No
Section 5.1 – typo	5	No
Page 88 – typo – add "on data from a 13-year period"	5	No
Page 96 – typo, first sentence "result in"	5	No
Page 98 – clarification needed	5	No
Page 113 – "psu" missing from first sentence of second paragraph, also change spacing	5	No
Appendix C should be a separate chapter	5	No
Page 16 – typo in title	5	No
Page 47 replace "is" with "in" first sentence of 3.3.1.2.	5	No
Figure 3-11, page 57 – model failed to predict several observed salinity peaks	1, 2, 3, 5	No
Caption of Figure 3-27 typo	5	No
Use of wind data from nearby airports might be helpful	1, 2, 3, 5	No
Appendix C – typo on page 42	5	No
Appendix C – typo on page 44	5	No
Appendix C – definition of shoreline length needed	2, 4	No
Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor	1, 2, 3, 5	Yes
Caption for Figure 2-13 needs a space	5	No
Consider adding conversion table	5	No

Commented [LB33]: My thought here is that wording is a bit backwards, theses are freshwater plants that tolerate some salinity. Maybe if it said "low levels of salinity". Freshwater plants prefer low to no salinity. They mean plants that do well in slightly brackish water. Not too important.

Commented [LB34]: General comment to ensure use of a space around equals signs and greater than or less than signs.

Commented [LB35]: A stakeholder raised and I agree.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Wednesday, April 29, 2020 9:12:32 AM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted Apr 29 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Folks:

I've gotten a copy of the report with edits from Peter and Laura, and some editorial review comments from Doug. I will work from this latest version to produce the final of the initial report from the Panel, and will include the initial comments from Laura, Peter and myself as Appendices. I hope to produce this and post it later today, but if not, certainly by COB tomorrow.

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Wednesday, April 29, 2020 10:24:30 AM

SWFWMD WebBoards

Carollo Engineers, Inc. has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted Apr 29 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Hello,

I think Table 6-8 (in the MFL draft report) does not make sense. It says "Summary of allowable percent reduction" in the caption but "Allowable Flow Release" in the table. Can someone explain "allowable flow release" please? It sounds like during Block 1, 87% of the flow is allowed to be released, which seems odd if Block 1 is low flow. Also, I cannot find this language (allowable flow release) in any other MFL (FAC 40D-8).
I think Table 3 (in the recovery strategy) makes much more sense.

MFL Report.jpg

MFL Recovery.jpg

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Table 6-8. Summary of allowable percent reduction in flow for Lower Shell Creek based on flow measured at the outfall of Hendrickson Dam and withdrawals from Shell Creek Reservoir by the City of Punta Gorda.

Block	If Inflow to Reservoir on Previous Day is		Allowable Flow Release
Block 1	<56 cfs		87% of inflow
Block 2	56 cfs - 137 cfs		77% of inflow
Block 3	>137 cfs		60% of inflow

Table 3: Summary of allowable percent reductions for Lower Shell Creek based on flow measured at the outfall of the Hendrickson Dam and previous day withdrawals from the reservoir.

Flow Range	Allowable Flow Reduction from Baseline Flows
Block 1 (0-56 cfs)	13%
Block 2 (>56 – 137 cfs)	23%
Block 3 (>137 cfs)	40%

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Wednesday, April 29, 2020 1:26:39 PM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted Apr 29 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Doug:

Attached is the Final Initial Report from the Peer Review Panel. This report includes edits and additional text from both Laura Bedinger and Peter Sheng, as well as incorporating editorial comments from yourself. I have also included the initial document review comments from Laura, Peter and myself as appendices. I have formatted the report and looked for typos, errors or misspellings or similar in the text of the report itself, but did not alter the information in the Appendices, as those documents are included here as they were written and received.

I wanted to thank you and District staff on your work here - we all thought the Draft MFL was a useful and thorough document that reflects the importance of the resources of concern, as well as the obvious professionalism of District staff.

I also wanted to thank both Laura and Peter for their timely and insightful comments and the efforts they expended on the production of this report. The value of this report is largely a function of the skillsets and attention to detail provided by Laura and Peter. While this report summarizes our combined efforts, if there are any portions of the report that do not adequately or accurately reflect the review performed by Laura and Peter, that is on me.

This should fulfill our obligations for the tasks of review of the MFL report and production of the Initial Peer Review Panel Report. We eagerly await the receipt of the District's formal response to this Initial Report.

Sincerely,

Dave

Lower Peace River and Shell Creek MFL Peer Revi...
619.53 KB

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Scientific Peer Review Panel Review of "Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek" – Final Initial Report

Prepared for:

Southwest Florida Water Management District

Prepared by:

Laura Bedinger, Ph.D. – Panel Member

Peter Sheng, Ph.D. – Panel Member

David Tomasko, Ph.D. – Chair

Draft April 2020

Introduction

The Southwest Florida Water Management District (District) has contracted with a Peer Review Panel (Panel) comprised of Laura Bedinger, Ph.D., Peter Sheng, Ph.D. and David Tomasko, Ph.D. to provide an independent, scientific peer review of its proposed minimum flows and levels for the Lower Peace River (LPR) and Lower Shell Creek (LSC), as outlined in the report “Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report” dated March 20, 2020 along with six appendices.

The draft MFLs report summarizes prior efforts to establish MFLs guidance for the Lower Peace River and Lower Shell Creek. For the purposes of the draft MFL report, the LPR is defined as the river segment from the USGS gage location at Arcadia down to Charlotte Harbor, while the LSC is defined as the segment of the creek that extends from the Hendrickson Dam at Shell Creek Reservoir to the confluence of Shell Creek with the Lower Peace River.

The District’s prior MFL guidance for the previously developed minimum flows for the LPR and guidance proposed for LSC were summarized in a 2010 District report. This information supported adoption of minimum flows for the Lower Peace River into District Rules as Rule 40D-8.041(8), Florida Administrative Code (FAC) that became effective in August 2010, as shown below:

Period	Effective Dates	Where Flow on Previous Day Equals:	Minimum Flow Is
Annually	January 1 through December 31	≤ 130 cfs* > 130 cfs	Actual flow (no surface water withdrawals permitted) Seasonally dependent – see Blocks below In addition, the total permitted maximum withdrawals on any day shall not exceed 400 cfs
Block 1	April 20 through June 25	≤ 130 cfs > 130 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs
Block 2	October 28 through April 19	≤ 130 cfs > 130 cfs and < 625 cfs ≥ 625 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs Previous day's flow minus 29%
Block 3	June 26 through October 27	≤ 130 cfs > 130 cfs and < 625 cfs ≥625 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs Previous day's flow minus 38%

*cfs = cubic feet per second

In 2010, the District developed draft minimum flows guidance for the LSC, and determined that a recovery strategy was needed for the LSC, as existing (at the time) flow rates in the LSC were below the draft MFL guidance developed for the LSC. Based on this finding, and the need to develop a recovery strategy for the LSC, draft MFL guidance for the LSC was not adopted into District rules.

The revised MFL guidance for the LPR, from the draft 2020 MFLs report, is listed below:

Block	If Combined Flow on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs >149 cfs - 297 cfs	Flow - 130 cfs 13% of flow
Block 2	>297 cfs - 386 cfs >386 cfs - 622 cfs	23% of (flow - 297 cfs) plus 13% of remaining flow 23% of flow
Block 3	>622 cfs - 1037 cfs >1,037 cfs	40% of (flow - 622 cfs) plus 23% of remaining flow 40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

The MFLs guidance for the LSC from the draft 2020 MFLs report is listed below:

Block	If Inflow to Reservoir on Previous Day is	Allowable Flow Release
Block 1	<56 cfs	87% of inflow
Block 2	56 cfs - 137 cfs	77% of inflow
Block 3	>137 cfs	60% of inflow

The most apparent difference between the initial (2010) and draft revised MFL guidance for the LPR (and that proposed for LSC) is the move from a calendar-based regulatory approach to guidance that is based on defined threshold flow levels – which vary over the course of a year.

Peer Review Panel Responsibilities

To begin, the District's charge to the Peer Review Panel (Panel) was for the members to become familiar with the relevant regulatory background.

Section 373.042 of the Florida Statutes, states that for waterbodies such as the LPR and the LSC, established minimum flows represent the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The legislative guidance further states that MFLs shall be calculated using the best information available, that the Governing Board shall consider and may provide for non-consumptive uses in the establishment of MFLs, and when appropriate, MFLs may be calculated to reflect seasonal variation.

Additional and more detailed guidance on the development of MFLs is provided in Rule 62-40, FAC, which states that MFLs should consider the following concerns: 1) recreation, 2) fish and wildlife habitats, 3) estuarine resources, 4) transfer of detrital material, 5) maintenance of freshwater storage and supply, 6) aesthetics, 7) filtration and absorption of pollutants and/or nutrients, 8) sediment loads, 9) water quality, and 10) navigation.

As such, MFLs are to cover not only the protection of natural resources, but also navigation, recreation, and – for r the LSC in particular – the maintenance of freshwater storage and supply.

In its broadest sense, the Panel is charged with the following six tasks, as related to their review of the 2020 Draft MFL for the LPR and the LSC:

1) Determine whether District conclusions are supported by analyses/results presented
2) Determine whether data/information were properly collected and used, any data exclusions were justified, and the data were the best available information
3) Determine whether technical assumptions are clearly stated, reasonable and consistent with the best available information, and if better analyses could be used
4) Determine whether procedures and analyses were appropriate and reasonable, based on the best available data, correctly applied, limitations were handled appropriately, and conclusions are supported by the data
5) For methods judged to be not scientifically reasonable, describe scientific deficiencies, identify remedies, if any, or alternative methods

6) As appropriate, identify and characterize effort involved for preferred alternative methods that could be used in lieu of scientifically reasonable methods that were used

Summary of Review Panel Comments

After discussion in publicly-accessible teleconferences, the Panel decided to produce a draft MFLs review report using the following format: 1) Panel comments by all panelists would be compiled, based on the sequencing of the Draft MFL, 2) Panel comments would first be summarized in tabular form, by report section, in terms of the concern – briefly described – and the relevant Panel charge for which the concern was raised, and 3) additional text would follow to provide any needed back-up for the concern.

The tabular presentation of comments and concerns is tied to the 6 main charges of the Panel in a manner that likely over-simplifies the Panel process. Nonetheless, the Panel felt that this was an appropriate method to show the links between Panel comments and the specific contractual obligations of each Panel member.

The Panel report format appears to differ from most other Peer Review reports, which tend to separately list concerns by individual reviewers. Using the report format we selected, we believe that the District review process will be more efficient, as shared concerns can be characterized once, rather than perhaps being listed two or three times in different sections of the Peer Review report. This report makes no effort to attribute individual comments to individual reviewers. However, a separate column on the summary table for each section notes whether or not a comment or concern was raised by more than one reviewer. This should not be construed such that comments raised by more than one reviewer are more "important" than others, as it could be that an algorithm or conclusion raised as an issue by one reviewer was not known to be potentially problematic by others.

If the same comment or concern was raised in more than one location, due that topic arising in more than one part of the draft MFLs report, it would be listed in tabular form each time it was encountered, but supplementary text would not necessarily be included in latter portions of the report, to minimize repetition.

In addition, initial comments from the Panel are included for each member, as Appendices.

The Panel's comments are captured for this Draft Report, starting below:

Overall Comments and/or Concerns

Summary of concern/comment	Relevant Panel charge	Raised by more than Panel member?
MFL report was comprehensive, well-written and thorough	1 to 5	Yes
Basing MFL on specific flows, vs. calendar dates, a good idea	2, 3, 4	Yes
15% threshold value for “significant harm” needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Hydrodynamic modeling represents a substantial improvement from prior efforts	4, 5	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	Yes
Uncertainty and accuracy of hydrologic model should be discussed in more detail	1, 3, 4	Yes
In a changing climate, long-term (50-100 year) averaged flow are not necessarily more indicative of the hydrologic conditions in the next 15-20 years. Should more recent data in the past two decades be given more weight in the development of the baseline flow which was based on the average in 1950-2014?	2, 4, 6	Yes
Would be helpful to quantify actual or potential benefits associated with changes to existing MFL guidance	4, 5	Yes
Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows on bottom water hypoxia and other phenomena	2, 3	Yes
Consider development of a “dynamic” MFL with real-time now-cast/forecast capabilities	5	No
Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee	2, 4, 5	Yes
Analyze the potential impact of sea level rise on the MFL, using best available SLR data for 2020-2050	2. 4. 5	Yes

The Panel felt that the draft MFL report was obviously the result of an impressive effort by the District and its consultants. The variety, quantity and quality of data that was compiled, collected, analyzed and interpreted, as well as the hydrodynamic model, was universally viewed as impressive, and obviously indicative of the MFL process being approached in a thorough and professional manner by District staff.

The conversion of the MFL guidance from a calendar-based system to a flow-based guidance was considered to be a valuable improvement over the earlier guidance.

The District's use of a 15% threshold for "significant harm" will be considered elsewhere in the report, but the primary concern raised by the Panel was not that there was anything inherently "wrong" with the threshold, but the District's MFL report contains language that suggests that threshold values for withdrawal limits should first focus on a search to develop locally-relevant threshold values, such as the 0.6' fish passage criteria used in the Upper Peace River MFL, or perhaps water quality "triggers" or inflection points for wetland inundation frequencies. A thorough and detailed review of the MFL does show that such locally-derived triggers were examined, and that no link could be made for water quality, and that wetland inundation triggers were less protective than the 15% salinity-habitat metric. However, the MFL report would be more useful for future reviewers (and future District staff, perhaps) if the process that led to the adoption of the 15% threshold value for the salinity-habitat metric was more thoroughly, yet succinctly, discussed in the Executive Summary and elsewhere in the repot.

Panel members felt that while the expanded and more detailed hydrodynamic model used in the MFL was a substantial improvement over prior efforts, the issue of baseline conditions and the overall hydrologic output for non-gaged portions of the watershed continued to have limitations.

The Panel also sought to have the MFL report include reference to other regulatory guidance documents. For example, while the draft MFL report included reference to the lack of compliance of the LPR with various water quality criteria developed by FDEP, it did not include reference to the Pollutant Load Reduction Goal (PLRG) developed for Charlotte Harbor. While this is not a specific charge of the enabling legislation for setting MFLs, the Panel felt that public agencies should seek to develop regulatory guidance that is as complementary – or at least consistent with – guidance from other local, regional and/or state agencies.

Issues associated with the potential influence of the Caloosahatchee River and/or inflows from the south were of concern to the Panel, especially in light of recent adverse impacts to seagrass resources along the eastern wall – impacts that could be attributed to the Peace River, given its much closer proximity.

In view of rapidly accelerating sea level rise (SLR), the Panel felt it would be prudent to consider the potential impact of SLR on the MFL by using the NOAA (2017) projection of SLR for Fort Myers in 2020-2050. For example, as a first step the impact of SLR on the volume of 2-psu water in 2020-2050 could be investigated using the low, medium, and high SLR values corresponding to the 50 percentile SLR projection for 2100 (3.3 ft global mean sea level rise of 3.3 ft) from NOAA (2017). The NOAA projection for Fort Myers in 2035 is 0.47, 0.80, 1.22 ft for the low, medium, high scenarios, respectively. The USACE SLR values used by the District are 0.2, 0.35, 0.76 ft, based on their 2013 report. Due to the increasing SLR and Florida Governor's effort in building coastal resiliency against the rising sea level, the Panel felt it is prudent for the District to use the best available information on SLR in its consideration of the potential impact of SLR on the MFL.

In consideration of the rapidly changing climate, the Panel recommends that, during its five-year evaluation with the regional water supply planning, the District evaluates the current and future climate conditions to determine if the MFL needs to be updated sooner than its regular schedule.

Comments on Executive Summary

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Definition of “significant harm”	1, 4	Yes
Definition of “best available information”	2, 3	No
Could MFL be set for more than 3 flow blocks?	3, 4	Yes
Concern over LSC low flow conditions	1, 2	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	No
Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP’s Numeric Nutrient Concentration (NNC) criteria	2, 4, 5, 6	Yes
Explain the need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	1, 4	Yes
15% threshold value for “significant harm” needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health	2, 4, 5	Yes
Say something about potential impact of SLR on the MFL	2, 4, 5	No

The Panel found that it would be helpful for the draft MFL to attempt to define the terms “significant harm” and “best available information” in the Executive Summary. While not all terms will be clearly defined, their use in the Executive Summary suggests that they are standard phrases recognizable to the reader, which they are not.

Concerns were raised by the Panel related to the absence of a maximum flow value for the LSC, compared to a proposed value of 400 cfs for the Lower Peace River. This seems to be a function of the District determining that the area of interest for MFL development for the LSC ends at its downstream boundary with the LPR, even though the area of concern for the LPR extends out into Charlotte Harbor. Since flows from the LSC average (on an annual time step) perhaps 20 to 30% of the annual average flows of the LPR, if flows from the LPR are important to the Harbor such that a maximum withdrawal value of 400 cfs is included in the draft MFL, it would appear that a similar maximum diversion criterion could also be derived for the LSC.

The report recognized that climate change has significantly affected the sea level and precipitation in the region. In a changing climate, as the sea level rise continues to accelerate in the world and specifically in southwest Florida, the impact of SLR on MFL will need to be fully addressed at some time in the near future. Baseline flow will need to incorporate future SLR and flow conditions, instead of completely relying on averaged long-term historical flows.

Comments on Chapter 1 – Introduction

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Formatting of Table 1-1 Improve within cell formatting so text in final column matches up with that in preceding columns	5	No
1.2.1 Remove ‘s from Florida in title	5	No

The Panel felt that the draft MFL report’s Introduction was well developed, and gave the Panel a thorough introduction to the LPR and LSC, as well as the District’s responsibilities. As is noted in other parts of this report, the Panel concluded that the definition of significant harm requires a careful discussion, not just of literature that supports proposed guidance criteria, but the diversity of opinions about the topic.

Comments on Chapter 2 – Physical and Hydrologic Description

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Issues related to clarity of maps and figures, for example, enhancing Figure 2-2 so it is better related/connected to a Google street map for the same area. In addition, river scales are discussed or displayed in both miles and km. Perhaps use both metrics each time.	2, 3	Yes
Question related to LiDAR sources, for example, is 2017 LiDAR data for the region available from the state?	2, 4	No
Use of NGVD29 vs. NAVD88 for elevation and bathymetry data	2, 4, 6	No
Question about the order of MFL development vs. water supply planning efforts	4	No
Definition of flow lag	2, 4	No
Consider adding a most recent 10 or 20 year average bar to Figures 2-12 to 2-16 in addition to the one that is the long-term average for POR	5	No
Discuss the importance of hydrodynamics and hydrodynamic modeling	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes

Figures 2-2 and 2-3 could be made clearer and easier to read. And the use of “%” should be used rather than “percent’ to shorten the report. More substantively, the elevation and bathymetry data appear to be compromised to some extent by the use of both NGVD29 and NAVD88 as datums for elevation, as tied to LiDAR and the development of the hydrologic model.

The Panel felt that the draft MFL should more clearly describe the timeline of development of MFL guidance, as it relates to water supply. As MFLs must take into consideration existing water supply needs, the timing of the development of water supply plans and MFLs could be addressed earlier and more succinctly in the draft MFL report.

As important as the hydrologic and hydrodynamic models are, the Panel felt that they could have been described in greater detail earlier in the draft report. While the hydrodynamic model is viewed as a substantial improvement from the work included in the 2010 MFL report, the hydrologic model has limitations related to those portions of the watershed located downstream of gages. Also, and touched on later, the factors that account for the conclusion that a result of groundwater withdrawals is a reduction in baseflow in parts of the Peace River watershed, but an increase in baseflow in locations such as Joshua Creek – those factors should be discussed in greater detail. The assumptions and data limitations associated with quantifying the water budget from both ungauged and gauged sources should be more clearly discussed.

Comments on Chapter 3 – Water Quality

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Salinity data presented in Figure 3-3 not that helpful	1, 4	No
Influences of factors other than flow on concentrations of chlorophyll *a*	1, 4, 6	Yes
Values of phosphorus only shown for orthophosphorus	2, 4, 5, 6	Yes
Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite	2, 4, 5, 6	Yes
Definition needed for “flow-lag”	2, 3	No
Various figures have legends that appear to be mislabeled	1, 4	Yes
Figure 3-22 caption says it is dissolved oxygen, but y-axis says chl *a*	3, 4, 5, 6	No
Mislabeling of y-axis on Figure 3.23	3, 4, 5, 6	Yes
Importance of hydrodynamic model description	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes
More refined explanation needed for isohaline location trend analyses	1, 4	Yes
Better description of results shown Figures 3-12 to 3-16	1, 4	Yes
Value of developing dynamic water quality model, vs. empirical approaches	4, 5	No
Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included	1, 4, 5, 6	No
Table 3-1 – improve explanation of location of isohaline location trends	1, 3, 5	Yes
Table 3-2 ,3, 4 to 3-7 and 3-12 tp 3-16 – improve explanation of summertime hypoxia development and other data presentations	1, 3, 5	Yes

The Panel felt that some of the figures in the draft MFL were not overly useful, or could benefit from restructuring. For example, Figure 3-3 shows the variability in levels of salinity at various locations in the LPR. However, the analyses were conducted on 40 years of data, and variability could be due to seasonal variability, inter-annual variability, or some combination of both. Figure 3-3 is not entirely clear, as to what it is meant to convey to the reader. Suggestions were raised as to how the data could be displayed to address these concerns. For example, additional box and whisker plots could be displayed for pre and post MFL salinity data would be informative for the reader. Similar modifications could be make for DO (Figure 3-4) and chlorophyll-*a* (Figure 3-5), nitrogen (Figure 3-7) and phosphorus (Figure 3-8)

Related to this issue, Figures 3-12 to 3-16 are confusing, as the label on the y-axis does not match what the draft MFL report suggests is displayed. This likely is a result of a “short cut” in terms of description of what the graphics are intended to display. A more detailed description of the intent of the figures (what they are meant to convey) would be useful, as they currently are confusing to the reader.

The draft MFL report seems to focus on flows and residence time, as an influence on concentrations of chlorophyll *a*. While this is a worthwhile issue to investigate, several decades of work on the LPR and upper Charlotte Harbor have indicated that the amount of colored dissolved organic matter (CDOM) in the system is likely a key consideration. As well, the role – if any – of zooplankton grazing should be at least mentioned as an additional moderating influence on chlorophyll-a concentrations.

This section includes analyses on water quality variables that need additional attention. For example, Section 3.3.1.3 on “chlorophyll” does not specify that the analyses refer to chlorophyll-a that is corrected for the presence of phaeophytin. The state of Florida’s regulatory programs for water quality no longer accept un-corrected chlorophyll-*a* for analysis. If the water quality data sets used for analysis were not corrected for phaeophytin, they are of limited value for comparison with other systems and with relevant regulatory criteria. The reader should not have to search in the appendices to determine what the word “chlorophyll” refers to.

The draft MFL reports on “Ortho-phosphorus” which likely refers to concentrations of orthophosphate, not Total Phosphorus. Orthophosphorus appears to be a bit of technical jargon short cut for orthophosphate, which is the dissolved inorganic form of phosphorus. While this could represent 90% of the total pool of phosphorus, it could also represent a substantially smaller percentage. The suggestion made by the Panel is to conduct analyses on those stations and data sets that have total phosphorus, as that is the most complete form of nutrient content, and is also the nutrient form for which FDEP’s NNC criteria have been developed.

The draft MFL report discuses status and trends in both TKN and nitrate plus nitrite, but does not add the two together to calculate the abundance of Total Nitrogen. Since Total Nitrogen is the form of nutrient that is most complete, and is the form of nitrogen in FDEP’s NNC criteria, and the form that is involved in the PLRG for Charlotte Harbor, these analyses should be redone using Total Nitrogen, not TKN and nitrate plus nitrite.

When exploring empirical relationships between LPR flows and salinity in the LPR, it should be noted that two of the stations involved in those assessments are located below the confluence of the LSC. On an annual basis, LSC flows average about 20 to 30% of the flow of the LPR. Therefore, not including LSC flows in the flow vs. salinity empirical relationships could limit the explanatory power of the derived relationships.

The Panel also suggested the District consider the value of a mechanistic water quality model for the LSC, LPR and Upper Charlotte Harbor. Such a mechanistic model, although my not be necessary for the MFL for LPR and LSC, should benefit a variety of water management decisions on the Charlotte Harbor estuarine-riverine system by the District. The Panel, however, recognizes that developing such a model would require addressing the influences of factors and parameters that may or may not have been adequately understood/quantified and more data may be needed.

Hypoxia was mentioned numerous times in the report and during our discussions. It would be good to have a more comprehensive discussion in the report on the naturally-occurring as well as non-naturally-occurring hypoxia, how they impact the Charlotte Harbor system, how they are influenced by the high flow from Peace River (e.g., what rate of flow triggers hypoxia? 20000 cfs? 1000 cfs?), and how will they be affected by the MFL.

Comments on Chapter 4 – Ecological Resources

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Plant community data set from 1998 is problematic	2, 3, 4	Yes
Status and trends in seagrass coverage in the LPR over time	2, 4	No
Concern over shift in HBMP focus to physical factors, rather than fish communities, macroinvertebrates, and/or macroalgae	2, 3, 4	Yes
Fisheries Independent Monitoring newest data from 2016 not included in the modeling approach (Appendix E) or compared to data collected through 2013	2, 3, 4	No
Should endangered species, such as sawfish and manatees, be included in MFL assessments?	2, 3, 4	No
In Appendix E it is stated that “predicted CPUE grids” were derived from catch data and these predictions were used to generate the population estimates which were used to model the effect of water withdrawals	1, 2, 4	No
Figure 4-2 difficult to review due color choices	1, 3	Yes
Explain “decreased flow may also contribute to increases in dissolved oxygen concentrations”. Add your response to p.76 of the report.	1, 3	No

The Panel was concerned about the reasonableness of analyses related to plant communities that were last quantified in 1998. It is not known to the Panel if the physical locations of various plant communities have changed over time since 1988, although 22 years of sea level rise could result in migration of some communities upstream, in response to increased marine influence.

Members of the Panel would like the draft MFL report to more thoroughly discuss the reason(s) why biotic variables such as fish abundance, macroinvertebrates, and/or macroalgae are not currently monitored to the same extent as they were in past years. A more detailed description of the relationship between the Hydro-biological Monitoring Program (HBMP), guidance from the HBMP review committee, and the data set used to develop the draft MFL would be helpful.

The Panel observed the levels of extrapolation involved in using HSM (habitat suitability modeling) to determine the effects of minimum flow conditions on the seven fish and one commercially important invertebrate. Populations were estimated and then effects on these estimated populations via changes in environmental conditions (temperature and salinity only) were modeled.

Questions related to the relative use (if any) by listed species should be considered, especially as how they were included (sawfish) in the proposed MFL for the Caloosahatchee River. The report could be a little more detailed/specific about the relationship of sawfish lifestages to salinity/freshwater flows. It might be helpful to NOT include rarely occurring species in the development of MFL guidance, but the draft MFL should at least include language that suggests why the decision to not include them is an appropriate decision.

Comments on Chapter 5 – Resources of Concern and Modeling Tools

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Figure 5-1 could be more clearly identified as to what the graphics are meant to represent, in terms of "exceedance"	3, 4	No
Timeframe and data sources used to develop the hydrodynamic model	1, 3, 4	No
Need to understand basis for variation in baseflow differences over different time periods	1, 3, 4, 6	Yes
Further clarify the meaning of "transitional flow triggers", using simple terminology such as "safety valves" to explain concept.	3, 4, 5	No
Helpful to include a graphical display of residence time/flushing rates	4, 5	Yes
Language related to impacts of hurricanes based on model runs	1, 2, 4, 5	Yes
Request for more information related to the hydrodynamic model, including consider the possibility of adding a short chapter which gives a holistic overview on the role of hydrodynamics (flow and water level, salinity, temperature, flushing) on water quality, ecology and fishery.	4, 5	No
Limitations of hydrologic model in ungaged portions of the watershed should be discussed in more detail	1, 3, 4	No
Suggested development of a dynamic water quality model, vs. empirical approaches	4, 5	No
Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed	1, 3, 4, 6	No
Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations	1, 3, 4	No
Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed	1, 3, 4, 6	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
Basis for 15% as threshold for "significant harm" needs more detail	1, 3, 5	Yes

Members of the Panel felt that data limitations associated with various aspects and algorithms of the hydrologic model should be better addressed. Differences in baseflow during different time periods, for different sub-basins, require more detailed discussion. These issues are particularly important for those portions of the LPR and LSC watershed that are downstream of USGS gage sites. Even for locations that are in gaged portions of the LPR and LSC watersheds, the following issues should be discussed in greater detail:

- Why is it expected that some parts of the LPR watershed would have reduced baseflow with increased groundwater withdrawals, while other areas would have increased baseflow?
- If Charlie Creek's hydrologic yield (cfs/square mile) during 1950 to 1969 is a good reference condition, why is that? Is this due to the characteristics of the watershed being more "natural" than other locations at other times?
- As the algorithms in the PRIM modeling effort are important for the hydrologic model development, it should be more clearly stated where relevant algorithms came from, lest a reader conclude that the algorithms were developed after the model runs, as opposed to the algorithms perhaps being <u>modified</u> from default values during the calibration phase of model development

The Panel noted that in the last MFL report (2010) the hydrologic model greatly over-estimated the ungaged flow from the watershed into the LPR and Charlotte Harbor, which seems to have been acknowledged by the District.

Portions of this chapter appear to be internally inconsistent. For example, Table 5-1 displays result of a Seasonal Kendall Tau test that found no monotonic trends over time for flows in Joshua Creek, and yet figures and text in the same section refer to the observed increases in dry season flows during the period of April to May as being evidence of an anthropogenic influence on dry season flows. The District should consider that the use of a Seasonal Kendall Tau test can give results at odds with an examination of flow data on a monthly time step, and consider a flow analysis on the monthly time step most useful for their discussion and later model development.

As was noted in earlier sections, the basis for there not being a maximum flow diversion threshold for the LSC, while such a value (400 cfs) exists for the LPR should be better explained. While the Panel realizes that the District is currently working to develop a recovery strategy for low flow conditions for the LSC, this issue relates to high flows, and the Panel does not yet understand why a similar maximum flow diversion threshold could not be developed for the LSC, particularly for times when inflows to the reservoir are matched (or nearly so) by outflows into the LSC from the reservoir.

As was noted elsewhere, the draft MFL report should further develop the reason(s) why a 15% reduction in the salinity-habitat metric is considered to not be problematic, vs. other thresholds.

Comments on Chapter 6 – Recommended Minimum Flow Values

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?	2	No
Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades	1, 2, 3, 4	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
15% threshold value for “significant harm” needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes

Many of the Panel’s comments related to Chapter 6 and the proposed MFL values had been made in earlier portions of this Panel draft report. These include the following main features:

- The shift from calendar-based to flow-based thresholds is to be commended
- Issues with the various algorithms and model components for the hydrologic model should be discussed in greater detail
- The District’s logic for relying on a 15% change in habitat as being protective of “significant harm” should be elaborated on, and concerns related to why other techniques did not give rise to locally-relevant threshold guidance should be made more clearly
- The lack of a maximum flow diversion threshold for the LSC seems to be a function of a somewhat arbitrary truncation of the area of concern to that portion of the LSC upstream from its confluence with the LPR. No such restriction is placed on the LPR, which has a 400 cfs maximum diversion threshold which appears to be protective of portions of Charlotte Harbor beyond the downstream boundary of the LPR alone

In addition to previously raised concerns, the Panel felt that incorporating sea level rise scenarios was very useful, but that the more recent values derived by NOAA would be the most appropriate values to use.

Typos and Comments on Various Appendices

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Appendix E – page 7 – typo	5	No
Section 5.1 – typo	5	No
Page 88 – typo – add “on data from a 13-year period”	5	No
Page 96 – typo, first sentence “result in”	5	No
Page 98 – clarification needed	5	No
Page 113 – “psu” missing from first sentence of second paragraph, also change spacing	5	No
Appendix C should be a separate chapter	5	No
Page 16 – typo in title	5	No
Page 47 replace “is” with “in” first sentence of 3.3.1.2.	5	No
Figure 3-11, page 57 – model failed to predict several observed salinity peaks	1, 2, 3, 5	No
Caption of Figure 3-27 typo	5	No
Use of wind data from nearby airports might be helpful	1, 2, 3, 5	No
Appendix C – typo on page 42	5	No
Appendix C – typo on page 44	5	No
Appendix C – definition of shoreline length needed	2, 4	No
Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor	1, 2, 3, 5	Yes
Caption for Figure 2-13 needs a space	5	Yes
Consider adding conversion table	5	Yes

Appendices – Initial Written Comments from Drs. Laura Bedinger, Y. Peter Sheng and David Tomasko

First Comments on Proposed Minimum Flows for Lower Peace River and Lower Shell Creek

L. Bedinger

Overall

- The report was well written and thorough.
- I also thought the new blocking system seems to be an improvement on the old calendar-based one for guaranteeing flows. This seems to be a point of strong agreement.
- When using/looking at the flow record from the entire period (1950 for LPR and 1966 for LSC), might it make sense to examine that data in decadal blocks or the like to look for changes over time? This also applies to the water quality appendix where means of the entire POR are presented. Would like to see 5 or 10 year means in addition.
- Would like to further discuss the 15% reduction (vs 10% or 20% for example) in the most sensitive habitats (oligohaline) as significant harm. Is this mainly just because this number has been previously used by other MFLs? Could the report more fully explain and support use of this as the standard for "significant harm" in this system? Section 1.3.5 could have more information specific to this system (if possible). However, it does seem like a logical choice considering the need for surface water withdrawal for water supply.

Water Quality Section and Data: Chapter 3 and Appendix F

- Positive there is increased monitoring of salinity in recent years. The isohaline-based stations seem like a good idea when coupled with fixed location stations.
- Figure 3-3. Might it be better not to lump all the data from 1976 through 2016 exclusively, but show box and whiskers for smaller time periods (by decade?) as well, so the reader can look for trends? DO data (3.3.1.2) also lumped from 1976 to 2016 when shown.
- As Dave stated, specify chlorophyll *a* in section heading and first paragraph of 3.3.1.3. Again, I would like to see box and whisker of smaller time periods for this variable. There is not mention of day length being a factor driving seasonal phytoplankton biomass changes. Would it be important and separate from river flow?
- With regard to phosphorus, Appendix F (p. 5) states that since 2003 the HBMP program is "reporting phosphorus concentrations as orthophosphate (which is usually more than ninety percent total phosphorus)". A couple of comments and questions: first I think there is a typo that it should say that orthophosphate usually makes up 90% of the total phosphorous. Is orthophosphate being monitored instead of total phosphorus as it is a cheaper or simpler lab test? Is the percentage of the total phosphorus made up by orthophosphate constant in the Peace River? Maybe provide a reference or data.
- With regard to nitrogen, it appears the HBMP program is collecting samples that are analyzed for total nitrogen (1983 to 2018 in table 2.2 of Appendix F). In the main report NOx and TKN are shown rather than TN. Why? Or am I missing something? Again I would also like to see the data graphed with some visual of changes over time (decade blocks for box and whisker?).
- In dissolved oxygen and chlorophyll section/methods, there is no breakdown of readings into day or night values. Would day length/sunlight intensity that vary with seasons be worth mentioning in addition to water color and nutrients. Assuming surface DO decreases overnight and during darker periods in response to less photosynthesis by phytoplankton and benthic algae. Is the extent of hypoxia an issues, not just that is less than a threshold value, but by how

much? When water flow increases, how much is river depth affected? Is increased depth a driver of lower DO on the bottom?

Ecological Resources Section and Data: Chapter 4 and Appendix E

- I agree with Peter, the examination of plant communities from 1998 seems outdated. Maybe these plant communities should be assessed/mapped every 10 years to look for shifts?
- Was there historically more seagrass in the lower Peace River than there is now? Is this known?
- HBMP data collection has shifted away from monitoring populations of fish and macroinvertebrates in recent years to focus on physical factors, water quality, and phytoplankton (biomass via chlorophyll *a*). It is assumed that these are the drivers and that direct monitoring of biotic communities is not needed or not informative? Would data on these communities and benthic algae also be important for assessing the MFL?
- It looks like FIM collected fish data during 2016 but the modeling in Appendix E only includes data collected from 1996 to 2013. The report does not address changes from 2013 to 2016. Since the MFL was implemented in 2010, it seems like recent changes would be most informative and helpful for assessing the MFL.
- How reliable are the designations of euryhaline etc. when applied to the animals? Are they being found where they are supposed to be? (I mean in LPR and LSC are animals showing any flexibility in habitat/distribution when compared with predicted distribution with regard to average salinity.)
- Should sawfish (*Pristis pectinata*) and manatee habitat in LPR be given special attention due to their special statuses with regard to protection? Maybe the species chosen for the HSM model adequately represent the needs of sawfish? Could the main report text be more specific about the salinity requirements of sawfish at different life stages?
- With regard to the methods of the HSM modeling and data collection: it appears there are a couple of layers of extrapolation. CPUE is predicted based on biotic variables, then the predicted CPUE information was used to extrapolate population abundance, then the effect of water withdrawals on each species-life stage was modeled. Just want to make sure I understand and point out the layering of extrapolation. The model uses data collected through 2013. Will more recent data be input soon? Are the factors used to estimate populations enough? Are things like fishing and disturbance (dredging? Bottom types/structure) not also important?
- It looks like no benthic invertebrate sampling has been conducted since the implementation of the MFL. Maybe this should be implemented at least every 10 years (if not every five). These organisms role in food webs and for water filtration and grazing of benthic algae should be mentioned. More on the recent status of oyster populations could also be included.

Questions

- Is the lack of a rule for maximum withdrawal from Shell Creek a jurisdiction issue?
- What are the future plans for monitoring the fish, invertebrate, and other biotic communities going forward to continue to assess how the minimum flow implementation is affecting them?

Small Edits

- Use lowercase for common names, example: “blue crab”.
- Table 1-1 could have within cell formatting improved to match text in final column to the column that precedes it (the lines are not spaced out in the final column).
- Consider using ISO date format in tables (example Table 2-3).
- Page 47. “higher **in** surface water”
- Page 49. “food” repeats in first sentence of first paragraph
- Use spaces on either side of an equals sign.
- Appendix E page 7 “BF” appears, but should be “BL” in Creation of HSM maps?
- Wording of the first sentence of 5.1 needs to be improved “resources of concern”.
- Page 88 “The PRIM was run on data from a 13 year period” – second paragraph
- Wording in bottom paragraph on page 98 “freshwater plants tolerant of low salinity”
- Page 113 < 2 **psu** in second paragraph

Comments on MFL for Lower Peace River and Shell Creek - Peter Sheng

General Comments:

1. Overall effort is very comprehensive, covering all relevant aspects and issues. Reports are well written.
2. Changing from the old calendar-based blocking regime to the new flow-based blocking regime is a major improvement.
3. Hydrodynamic modeling is a big step forward from the previous effort, due to the use of 3D model and extension of model domain into the Gulf of Mexico. The 3D model is peer-reviewed and robust. Verification of the model is rigorous.
4. Uncertainty and inaccuracy of the hydrologic model remains a concern.
5. The base flow is constructed from the average flow during 1950-2014 for LPR and 1966-2014 for LSC. To account for climate change effect, however, is it more appropriate to place more weight on flow conditions in the past 20 years?
6. Considering sea level rise effect on MFL is commendable. The sea level rise values, which are based on the USACE study in 2013, appear to be at least 50% lower than those recommended by NOAA (2017) which is the leading U.S. climate agency. Are future predictions on precipitation, wind, atmospheric temperature, land use, and storms all incorporated into the new MFL?
7. Explanation on how and why the new MFL flow reduction strategy is better than the old MFL flow reduction strategy could be improved. For example, would it be useful to demonstrate that, under the new proposed MFL, the impact of flow reduction for any given year in the past 5-10 years would be much better than the old strategy?
8. Instead of measuring the impact of flow reduction in terms of 15% reduction of various habitats, is it possible to quantify the impact in terms of economic damage?
9. Southwest Florida is prone to hurricanes and hurricane-induced flooding. For example, Hurricane Elena (1985), Charley (2004), Wilma (2006), and Irma (2017) all impacted the lower Peace River area with storm surge, high flow, salinity stratification, and sometimes hypoxia. After Hurricane Charley, it was reported that flow in the Peace River peaked and water smelled like septic tank because of hypoxia. Predictions by most climate scientists suggest hurricanes will become more intense in the future. How will the proposed MFL guide the flow reduction during hurricane events?
10. Shouldn't the MFL be updated every five years, instead of every 10-15 years, in a changing climate?
11. How about creating a dynamic MFL with a realtime nowcast/forecast system for the Peace River, Shell Creek, and Charlotte Harbor region? The system can nowcast the current flow/salinity and forecast the future flow/salinity during the next 48-72 hours. Allowable flow reduction can be determined based on the nowcast/forecast flow/salinity conditions in the system.
12. SWFWMD has jurisdiction over the northern Charlotte Harbor system while SFWMD has jurisdiction over the southern part of the system, including Caloosahatchee River which sends a large amount of water into the estuarine system. Given sufficiently long time, water from Caloosahatchee could impact the flow in the northern part of Charlotte Harbor. Does the hydrodynamic model include Caloosahatchee flow as the boundary condition?

Executive Summary

1. Can someone define “significantly harmful”? Is it to be determined by the District or State Legislature?
2. What is “best information available”? Please define.
3. Second to the last line on page vii: “hydrodynamic” should be “hydrodynamic model”.
4. Base flow was divided into three flow blocks. Is it the best possible way? Can it be broken into 4 or 5 blocks? How does the MFL outcome vary with the number of blocks?
5. Any impact on the wetlands by flow reduction?
6. Should Table for LPR on page ix be numbered?
7. How do you prove the proposed MFL summarized in the table is the BEST possible?
8. Should Table for LSC be numbered?
9. It is concerning that minimum flow for SC is and will not be met for the next 20 years. Does it mean City of Punta Gorda will have water shortage for the next 20 years?
10. District is committed to “periodic” reevaluation and revision of minimum flow for LPR and LSC. Please define “periodic”.

Chapter 1 Introduction

1. Page 3 - “The proposed minimum flows, which are described in this report…..” should provide a reference to a Chapter number or Table number somewhere in the report.
2. Page 4 - Can “best information available” be defined? What is its legal definition? Scientific definition?
3. Page 6 - What are “Alternative hydrologic regimes”?
4. Can the definition of “impacted flows” be improved. It is unclear.
5. Page 11- “a loss of more than 15 percent habitat” is over how long a time period and with what time lag?
6. Does the “15% harm” guideline apply to all the habitats?
7. Is it more appropriate to consider 15% reduction in economic value?
8. To prove the success of the proposed new MFL, did the District confirm that there will not be significant harm to resources and habitats if it were applied to any year in the last five years?
9. Would the new MFL significantly reduce the harm to habitats and resources than the old MFL?
10. Page 14 – Why not use the 3D model in the rivers as well as the Charlotte Harbor?
11. Page 15 - I assume the 3D model has moving boundary feature?

Chapter 2 Physical and Hydrolgic Description

1. Figure 2-2 on Page 18: This lower left corner of this map does not look similar to a Google map for the region. Perhaps it is good to show a Google map for the region?
2. Figure 2-3 – Please explain the dark map which corresponds to the white region in the larger map shown in the inset.
3. Table 2-1. No need to show % again after the numbers.
4. What is the LiDAR data for the land area used in this MFL study? Is it 2017 data? I understand Florida took LiDAR data over Southwest Florida after Irma in 2017.

5. Page 30 – Line #2 “can all affected” should be “can all be affected”.
6. Are all elevation and bathymetry data converted to NAVD88?
7. What is the vertical datum for the water level at the open boundary condition of the 3D model?
8. On Page 37, it was said that many executive orders were issued in 2009. How were these orders determined? With modeling? What were the impact on the ecosystem and resources?
9. Do you set a goal for total water supply first, then determine the flow reduction strategy? Or is it the other way around?
10. The sentence on the bottom of page 37 “However,…..” is unclear. Please clarify.

Chapter 3 Water Quality

1. Please define “flow lags”. Is it “flow at previous x days”?
2. Figure 3-23 – label “salinity” should be “chlorophyll”.
3. Given the importance of flow and salinity in affecting the water quality and ecosystem, hydrodynamics and hydrodynamic modeling is the cornerstone of the MFL study. However, “hydrodynamic modeling” does not appear in the report until page 57 in a very short paragraph: “Given the strong interaction between freshwater flows and salt transport processes, a coupled 3D and 2D hydrodynamic model (Chen 2020) was developed to estimate responses of salinity to reductions in freshwater inflows and support development of proposed minimum flows for the Lower Peace River and Shell Creek. The hydrodynamic model is discussed briefly in Chapter 5 and in greater detail in the Appendix C.”
4. It would be appropriate for a chapter on flow, water level, and salinity with some more details on the hydrodynamic modeling effort as well as a good summary of flow and salinity in the system and how they might influence the other elements of the study. Describe the model assumptions, input and output, and setup for the various scenarios it simulated.
5. Table 3-1 tries to explain the isohaline location trend. Please explain the meaning of it more clearly with simple layman language without statistical jargons.
6. Same for Table 3-2. What is Table 3-2 trying to say? No hypoxia during summer months due to flow reduction?
7. Same for Table 3-4, 3-5, 3-6, 3-7.
8. Figure 3-12, 3-13, 3-14, 3-15, 3-16 are highly technical figures with lots of statistical terminologies. Please explain in simple language the meanings of these plots.
9. Stoker et al. (1998, USGS Report) measured the flow and salinity along the Peace River during 1982 – 1985. They found that significant salinity stratification (10 psu between bottom and surface salinity) occurred along the lower reaches of the river when Peace River flow at Arcadia was between 487 and 1420 cfs, or when 5-day sum of discharge was over 20,000 cfs. Kim et al. (2010, ECSS) found that, during 2000, bottom-water hypoxic conditions occur during periods with relatively steady moderate to high (5-40m3/s or 180-1440 cfs freshwater inflows and sediment oxygen demand (SOD). Spring-neap tide also has significant impact on the formation of hypoxia. High flow condition is found almost throughout the B3 block period during June-October in the Base Flow. So how often is hypoxia expected to occur during the summer month with and without flow reduction? During these high flow events, can more flow be withdrawn to reduce the likelihood of salinity stratification and hypoxia?

10. Empirical, regression, and statistical models are used for the water quality analysis. In the long run, is it more appropriate to develop a dynamic water quality model for the estuarine and riverine system?

Chapter 4 Ecological Resources

1. Vegetation map shown in Figure 4-1 is from 1998. Seems outdated.
2. Figure 4-2 is difficult to see. Please use different color tones for the seagrass.
3. Page 76 – "decreased flows may also contribute to increases in dissolved oxygen concentrations." Is it so? Flow reduction will lead to increased DO?

Chapter 5 Flow Blocks, Baseline Flows, resources of concern and modeling tools relevant to minimum flows development

1. Should indicate the meaning of curves with green and blue colors. What if 1994-2014 model results are used? Climate in the past two decades is likely more different from the previous years so flow data during 1994-2014 maybe more meaningful to consider here.
2. Did the hydrodynamic simulation for the 1950-2014 and 2007-2014 periods use the appropriate atmospheric forcing including air temperature, cloud cover, wind, and ocean forcing over the region? For example, my understanding is that wind data from only one local wind station was used in the model simulation. Perhaps it would be worthwhile to use predictions by regional wind model, e.g., the NOAA NAM (North Atlantic Mesoscale) model to more accurately capture the wind influence?
3. Perhaps it would be useful to understand how and why the base flows vary with different time periods 2007-2014, 1950-2014, and 1994-2014 before determining which the best base flows are?
4. Please explain "With this new approach, the determination of transitional flow trigger (e.g. 625 cfs in the existing Lower Peace River minimum flows, Table 1-1) is not required when high flows remained depressed due to climatological conditions."
5. It might be useful to produce a "flushing map" (50% renewal time map) for the various sections of the flow system. The map can be used to aid the discussion of flow effect on DO, water quality, fishery, etc.
6. Page 77 mentions the following: "Hurricanes can cause high river-inflows events, which reduce the salinity in the area and reduce dissolved oxygen." Were these events simulated by the models used for this study?
7. Figure 5-8 shows the domain of the 3D model used for the MFL study. This should have been shown in a new chapter on hydrodynamics (flow, water level, and salinity), preceding the water quality chapter.
8. Hydrologic model prediction of the watershed flow remains to eb a weak link in the new MFL study as the previous one. Improvement is needed.
9. Figure 5-11. There is a typo in the figure caption: "independent" is mis-spelled.
10. Water quality "models" are relatively simplistic and empirical compared to the hydrodynamic model. Consider the use of a dynamic water quality model?

Chapter 6

1. During hurricanes and king tide events, is 400 cfs still the maximum flow withdrawal?
2. Should “minimum flows scenario” be replaced by “minimum flow scenarios”?
3. The stated sea level changes at Ft. Myers station for the period from 2010 to 2035 are 0.20, 0.33, and 0.76 feet, respectively. These values are lower than the latest NOAA predictions.

Appendix C Hydrodynamic Modeling

1. This Appendix deserves to be a separate Chapter.
2. The 3D hydrodynamic model is very robust and efficient. Most results generally agree well with observations.
3. Page 16, Line#5. “friction” should be “fraction”.
4. Figure 3-11 on page 57 - Model simulated salinity missed several observed salinity peaks. Observed salinity range is between 10-25 psu but simulated salinity is between 20-26 psu. These occurred mostly during the hurricane season.
5. Perhaps it is useful to try to use more wind data from nearby airports, instead of only one station. Can also try to find NOAA NAM wind fields or Navy wind fields (from Naval Research Lab) for the region.
6. During the last MFL study, watershed model greatly over-estimated the flow from the watershed into Peace River and Charlotte Harbor. There is no improvement in the watershed modeling in this MFL study.
7. Good choice of skill index.
8. On page 42 – “January 2017” should be “January 2007”.
9. On page 44 – “exited” should be “existed”.
10. Figure 37 simulated “shoreline length”. Please define. Is flooding-and-during a part of the 3D and 2D model?
11. Has alternative model domain been considered for the southern part? The alternative would move the southern boundary to the south of San Carlos Bay and use the water level and salinity provided by the USF model as boundary condition there, but use flow conditions in Caloosahatchee measured by SFWMD as boundary condition. I am assuming that the current 3D model uses the water level and salinity inside Caloosatchee provided by the USF model. If this is true, my concern is the Caloosahatchee flow is not correctly represented in the 3D simulation. Our simulations found that, given sufficient time (~ 1 month), high flow in Caloosahatchee could reach the northern Charlotte Harbor.
12. Sea level rise values for 2020, 2030, 2040, 2050 are based on USACE’s estimate. On the website provided in Appendix C, it states that the sea level values are based on a 2012 study by the National Academies and a USACE report in 2013. Since 2013, there has been rapid development of new and more robust predictions on future sea level values. NOAA, the leading U.S. climate agency, published a comprehensive report on the future sea level rise values throughout the U.S., including southwest Florida. The NOAA sea level rise values for Ft. Myers area are typically twice of the USACE values. It would be prudent to use the NOAA values and recalculate the impact of Sea Level Rise on MFL in the LPR and LSC. M<ore information can be supplied if requested by the SWFMWD.

DRAFT OUTLINE OF COMMENTS – D. Tomasko

Comments and/or requests for clarification

1. The MFL does not incorporate some of the other regulatory programs that overlap with MFL topics:
    a. SWIM Plan not referenced (which included documentation of impacts of hydrologic alterations on health of Charlotte Harbor)
    b. No reference to Pollutant Load Reduction Goal, as laid out in SWIM Plan (see comment 3). Even though reference is made to FDEP's Numeric Nutrient Concentration (NNC) criteria.
    c. NNC criteria set by FDEP mentioned, however, nutrient forms included are not the same as the nutrient forms included in NNC criteria (see comment 5).
    d. Adoption and subsequent implementation of the proposed MFL would not complicate the TMDL, as shown in the text. But mention should be made of the PLRG, and its links to high flow requirements as necessary for the "reset button" of bottom water hypoxia in Charlotte Harbor.
    e. The MFL statute does not state that MFLs are to address every management issue, but the MFL should include language that addresses whether or not non-attainment of the MFL would make it less likely that other regulatory programs would meet their goals?
2. Related to very high flows and the "reset button" for Charlotte Harbor due to salinity stratification and bottom water hypoxia…
    a. It appears improbable that even maximum water withdrawals would reduce flows sufficient to prevent bottom water hypoxia, which requires an average flow of 10,000 CFS at Arcadia (Stoker et al 1989) – roughly equivalent to total gaged PR flow of about 20,000 cfs
    b. Proposed max withdrawal of 400 cfs represents ca. 2% of the minimum flow from PR watershed required to initiate stratification of 10 ppt in Harbor. Consequently, maximum withdrawal appears to be protective of the "reset button" of bottom water hypoxia.
    c. However, would be helpful to see the District-developed MFL reference the District-developed and NEP-approved PLRG, which is based on protecting natural phenomena of bottom water hypoxia from becoming increased ***or reduced*** by human activities
3. The MFL seems to be based upon the "significant harm threshold" of 15% for salinity-based habitats
    a. Text implies that this is to be a default approach for MFLs, to be used only if other approaches to develop thresholds were not found (e.g., fish passage of 0.6-foot depth {for UPR}, wetland inundation elevations, etc.)
    b. The wetland inundation approach and water quality approaches are modeled and results discussed, but text is not very robust that 15% threshold for salinity-habitat metric was needed as a fallback guidance for "significant harm"
    c. While used in many MFLs, a potential 14% loss of habitat being considered to be "not significant" is not universally applied, including District regulatory programs
        i. Development permits are not allowed to arbitrarily eliminate 14% of wetlands without repercussions

    ii. Coastal construction is not allowed to arbitrarily cause the loss of 14% of the seagrass habitat in, for example, Lemon Bay
    iii. Enhanced text justifying the need to defer to 15% threshold would be helpful. Is this the best approach, based on inability to identify other thresholds, or does it represent a repeated use of what has become the default metric of acceptable impacts?

4. Lack of maximum flow diversion quantity of Shell Creek is problematic
    a. Is this based on assumption that Shell Creek flows are only of concern in Lower Shell Creek?
    b. Mean annual flows for LPR (PR @ Arcadia, HC and JC) of 1,302 cfs. Mean annual flow of SC 363 cfs, so mean flow of SC ca. 28% of mean LPR flows
        i. If high flows for the LPR are important to protect the health and functioning of Charlotte Harbor (400 cfs maximum diversion) why wouldn't SC high flows be similarly considered in terms of health of the Harbor?
        ii. Not likely that max withdrawals (if set) for LSC would affect threshold values for stratification, but should be mentioned/acknowledged
5. Water quality review (Section 3.3)
    a. Make sure that analyses used "Chlorophyll-a (corrected for phaeophytin)" rather than "Chlorophyll" – too vague as to what the units were.
        i. Revise text as appropriate, or revise analyses, if needed
    b. Section 3.3.1.4 – why aren't nitrate plus nitrite and Total Kjeldahl Nitrogen (TKN) combined into Total Nitrogen (TN) for analysis?
        i. Helpful to have it broken down to this level, but NNC criteria and PLRG "hold the line" goal are both based on TN concentrations or loads, respectively
    c. Section 3.3.1.5 – why is "Orthophosphorus" examined, and not Total Phosphorus (TP)?
        i. Does this mean only dissolved inorganic phosphate (i.e., soluble reactive phosphate; SRP) examined?
        ii. If so, then SRP is potentially not conservative
        iii. If section refers to TP, then revise text to say TP
    d. Figure 3-11 – flows vs. salinity
        i. Data from stations 6 and 15.5 are located at or below the point of confluence of flows from SC into the LPR
        ii. Without accounting for SC flows, this might underestimate total flows by ca. 25 to 30%
        iii. Add in LSC flows for these relations, or explain why not relevant
    e. Figures 3-12 through 3-16
        i. Values on y-axis appear to be for Coefficient of Correlation (CC) for Spearman's Rank Correlation
            1. Spearman's used to test for monotonic but non-linear (potentially exponential) correlations of ranked data
            2. Were data not tested for parametric analyses? (even if non-linear)
        ii. Label on y-axis is of water quality parameters, not values of CC for tested relationships. Confusing.

iii. Does the appearance of a bar imply that relationship is statistically significant? CC values alone do not by themselves imply statistical significance
iv. Are lack of bars equal to CC value of zero, or not significant?

f. Section 3.3.3.4 – see comments above…why reference to TKN and OP?
    i. Are nitrate and nitrite not available? Why reference to TKN, not TN?
    ii. Are data truly orthophosphorus, or Total Phosphorus?
g. Section 3.3.4 – reference made to role of "tide, residence time, nutrients) as likely affecting chlorophyll concentrations
    i. Figure 3-26 shows summer time color values in LSC of > 200 PCU
    ii. Equal consideration should be given to potential role of color as reason for observation (Figure 3-22) of lower chlorophyll-a(?) values in summer
    iii. Is there a potential that a maximum or minimum withdrawal limit might be important for keeping color levels high enough to keep chlorophyll-a below threshold values to limit nutrient sensitivity?

6. Section 5.2 – Identification of need to change the 3-block system with set dates to a 3-block system based on flows is well developed, and that modification appears to be appropriate and logical
7. Section 5.3.1 – interpretation of results shown in Figure 5-3 seem to suggest that if flow yields match the pattern seen in Charlie Creek in 1950 to 1969, then results are "…indicating that there has not been a significant anthropogenic impact over time…"
    a. However, Kissingen Spring stopped flowing in 1950, and the MFL should discuss why Charlie Creek had more natural flow pattern than UPR in 1950 to 1969. Not saying Charlie Creek isn't a good reference, but citation of lack of agricultural or mining land uses upstream of the gage would support its use as a reference condition.
    b. How does PR @ Arcadia higher yield in 1950-1969 match up with loss of Kissingen Spring? Seems counter to the idea that flows in the Upper Peace River were <u>already</u> reduced by anthropogenic impacts by 1950
    c. Text for figure 5-3 explicitly states that Joshua Creek displays increased hydrologic yield (cfs/mi2) during April to May – more flow than in 1950 to 1969 period
        i. Yet Table 5-1 has no trend over time (Seasonal Kendall Tau) for Joshua Creek
        ii. Is it possible that Seasonal Kendall Tau finds no significant trend, because the deviation in flows is only occurring in 2 to 3 months per year?
        iii. Keep in mind that a Seasonal Kendall Tau value is calculated from 12 individual (in the case of monthly) estimates of trend. If 10 are non-trending, and 2 are strongly trending, then "overall" could be no trend.
        iv. Test for flows on a monthly time step, to ensure consistency between Table 5-1 and the interpretation or results in Figure 5-3.
    d. PRIM model results (Table 5-2) suggest reducing groundwater withdrawals will increase flow in the UPR, but decrease flows in Joshua and Charlie
        i. This differential response appears logical if the destination of groundwater withdrawals differs between the UPR and Joshua and Charlie Creeks, but it should be discussed in greater detail - why the difference in direction of response?

8. Section 5.3.3 – the PRIM model includes the assumption that irrigation efficiencies are 60 and 85% for row crops and citrus, respectively – very important to the algorithm. But where is reference for this assumption?
    a. For mechanistic models, assumptions are supposed to be generated by literature or data, then incorporated into models, and then models "calibrated" by comparing output to predictions
    b. Is this a model assumption that was based on literature, of was observed vs. modeled flows from these systems used to develop the assumed irrigation efficiencies?
9. Section 5.4 – potential techniques for developing thresholds for MFLS are briefly discussed, but then 15% threshold for "significant harm" is then relied upon for salinity-habitat metric
    a. See comments listed above.
10. Section 5.4.1 – Was not 130 cfs initially established as a breakpoint/threshold value for the upstream movement of the 2 psu isohaline?
11. Section 6.2 – The logic for a maximum withdrawal threshold not being included for Lower Shell Creek is not clear. Suggestive of a disconnect of some sort between withdrawing from Shell Creek Reservoir is not impactful to flows and ecology of Lower Shell Creek?
12. Section 6.3 – appears that flow reductions of 0, 10, 20, 40% etc. are applied and CDF plots to see what level of flow reduction creates a more than 15% decrease in salinity-habitat and floodplain inundation.
    a. While not in and of itself problematic, this should be the default approach, if other thresholds did not arise
    b. Floodplain inundation less sensitive than salinity-habitat metrics – good that not used
    c. Salinity-habitat metrics are related to essential fish habitat (EFH)? Is this implied, or actually tested? Was not sure why EFH not tied to salinity-habitat metric as much as I was expecting.

From:	noreply@discussion.community on behalf of SWFWMD WebBoards
To:	Doug Leeper
Subject:	Re: Peer Review Panel Teleconference - April 13, 2020
Date:	Thursday, April 30, 2020 9:06:51 AM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - April 13, 2020

Posted Apr 30 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Doug:

Found what appears to be an error in the MFL report - at least something worth looking into. Figure 6-3 and the text associated with that figure refers to the reference system of Charlie Creek, and the reference time period of 1950 to 1969. However, it does not appear that the USGS flow data are available for the entirety of 1950 - at least the flow data on the USGS web site. The earliest first year with flows for each month is 1951, not 1950. Two things - either the District used an incomplete 1950 data set for flows, or it used 1951 for flows, and the figure legend should be modified. Won't be a huge difference, but something I just found out - looking at the data set for Charlie Creek for other purposes.

Dave

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DL

Moderator
98 posts

Doug Leeper
a few seconds ago

Draft summary for the 4/27/2020 Lower Peace River/Lower Shell Creek minimum flows peer review panel teleconference is attached. Following review and approval or revision by the panelists, a final teleconference summary will be posted.

Lower Peace_Shell Peer Rev 2020-04-27 Telecon ...
30.05 KB

QUOTE

MEETING SUMMARY

Southwest Florida Water Management District
Scientific Peer Review Panel Teleconference
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Facilitated as a Video and Telephone-Based Teleconference

April 27, 2020

The Southwest Florida Water Management District (District) organized and facilitated a meeting of the independent scientific peer review panel convened to review a draft District report on proposed minimum flows for the Lowe Peace River and Lower Shell Creek. The meeting was facilitated as a teleconference/videoconference using the Microsoft Teams Videoconferencing Platform.

The meeting was held from 1:00 p.m. to approximately 2:40 p.m. on April 27, 2020.

The meeting was advertised in the Florida Administrative Register and on the District's web site. In addition, notifications concerning the event were distributed to local governments, other agencies, and stakeholder groups or representatives.

Meeting participants that chose to identify themselves included:

Peer Review Panel
Laura Bedinger, Peer Review Panelist
Peter Sheng, Peer Review Panelist
Dave Tomasko, Peer Review Panel Chair

District Staff

Chris Anastasiou	Yonas Ghile	Cindy Rodriguez
Mike Bray	Doug Leeper	Randy Smith
XinJian Chen	Jordan Miller	Adrienne Vining
Kristina Deak	Dennis Ragosta	Chris Zajac

Others
Angel Martin
Jessica Stempien, Florida Department of Agriculture and Consumer Services

The meeting was initiated by Doug Leeper with panelist introductions and a request that other participants who wished to do so identify themselves. Mr. Leeper then briefly reviewed the status of the review process and the remaining review schedule.

Next, the panel, Laura Bedinger, Peter Sheng and Dave Tomasko, discussed their plans to complete an updated, initial peer review panel report by April 30, 2020 and post the report to the webforum established for the review process. The panelist agreed to amend the currently posted first draft of their initial peer review report through sequential postings to the webforum. Dr. Sheng indicated he would post the first updated version of the draft report to the webforum for use by Dr. Bedinger, who would subsequently post a further updated version of the draft report to the webforum for use by Dr. Tomasko. Dr. Tomasko noted he would further amend the draft report and post it to the webforum on April 29, 2020 for a final review by all panelists.

Following any necessary revisions, Dr. Tomasko noted he anticipated posting the panel's initial peer review report to the webforum by April 30, 2020.

After discussing plans for completion of their initial peer review report, the panel discussed the format and content of their initial peer review report. The panel agreed the draft initial report prepared by Dr. Tomasko was a reasonable format for their final report and that it adequately captured most of the comments, issues and concerns previously identified and documented by each panelist. Following a discussion of all information included in the draft, initial report, and necessary amendments to the document, Dr. Tomasko afforded District staff the opportunity to ask for clarification on a few items included in the draft, initial report.

Following discussion concerning development of the panel's draft initial peer review report, Mr. Leeper asked if any members of the public wished to provide any comment on the peer review process or the proposed minimum flows. Mr. Angel Martin suggested that the District should consider amending the draft minimum flows report to note that new, up-to-date climate change information will be considered in future minimum flow analyses and to include conversion and description/definition tables for hydrologic, water quality and vertical control values discussed in the report.

Following the public input session, Mr. Leeper adjourned the meeting.

DL

Moderator
99 posts

Doug Leeper
a few seconds ago

Reply to 4/29/2020 post by Carollo Engineers, Inc. concerning Table 6-8 in the District's draft minimum flows report:

- We thank Carollo Engineering, Inc. for their post.
- District staff agree that Table 6-8 and its caption are not correct.
- We anticipate changing the table and caption in the revised, draft minimum flows report to indicate the listed percentage values represent required flow releases and to eliminate reference to withdrawals from Shell Creek by the City of Punta Gorda.

DL
Moderator
100 posts

Doug Leeper
a few seconds ago

Reply to 4/30/2020 post by David Tomakso regarding presentation of Charlie Creek flows:

Thanks, Dave. We will look into this issue and address any concerns regarding presentation of the Charlie Creek flow record in Figure 5-3 and the text associated with that figure in the next draft version of the District's minimum flows report.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Monday, May 4, 2020 11:13:21 AM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted May 04 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I have reviewed the meeting minutes from our last teleconference and approve them.

Visit Topic

Or reply directly to this email

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Tuesday, May 5, 2020 9:01:03 AM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted May 05 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I approve of the meeting summary posted by Doug.

Visit Topic

Or reply directly to this email

Email followed content: Never Weekly | Daily | **Immediately** |

To unsubscribe from these emails, you can unfollow this category or unfollow this topic.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - April 27, 2020
Date: Tuesday, May 5, 2020 8:49:34 AM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - April 27, 2020

Posted May 05 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I approve of the meeting summary from Doug Leeper, as posted

Visit Topic

Or reply directly to this email

Email followed content: Never Weekly | Daily | **Immediately** |

To unsubscribe from these emails, you can unfollow this category or unfollow this topic.

DL

Moderator
101 posts

Doug Leeper
a few seconds ago

Approved summary of the 2020-04-27 teleconference of the Lower Peace River/Lower Shell Creek minimum flows peer review panel is attached

Lower Peace_Shell Peer Rev 2020-04-27 Telecon ...
85.51 KB

MEETING SUMMARY

Southwest Florida Water Management District
Scientific Peer Review Panel Teleconference
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Facilitated as a Video and Telephone-Based Teleconference

April 27, 2020

The Southwest Florida Water Management District (District) organized and facilitated a meeting of the independent scientific peer review panel convened to review a draft District report on proposed minimum flows for the Lowe Peace River and Lower Shell Creek. The meeting was facilitated as a teleconference/videoconference using the Microsoft Teams Videoconferencing Platform.

The meeting was held from 1:00 p.m. to approximately 2:40 p.m. on April 27, 2020.

The meeting was advertised in the Florida Administrative Register and on the District's web site. In addition, notifications concerning the event were distributed to local governments, other agencies, and stakeholder groups or representatives.

Meeting participants that chose to identify themselves included:

Peer Review Panel
Laura Bedinger, Peer Review Panelist
Peter Sheng, Peer Review Panelist
Dave Tomasko, Peer Review Panel Chair

District Staff

Chris Anastasiou	Yonas Ghile	Cindy Rodriguez
Mike Bray	Doug Leeper	Randy Smith
XinJian Chen	Jordan Miller	Adrienne Vining
Kristina Deak	Dennis Ragosta	Chris Zajac

Others
Angel Martin
Jessica Stempien, Florida Department of Agriculture and Consumer Services

The meeting was initiated by Doug Leeper with panelist introductions and a request that other participants who wished to do so identify themselves. Mr. Leeper then briefly reviewed the status of the review process and the remaining review schedule.

Next, the panel, Laura Bedinger, Peter Sheng and Dave Tomasko, discussed their plans to complete an updated, initial peer review panel report by April 30, 2020 and post the report to the webforum established for the review process. The panelist agreed to amend the currently posted first draft of their initial peer review report through sequential postings to the webforum. Dr. Sheng indicated he would post the first updated version of the draft report to the webforum for use by Dr. Bedinger, who would subsequently post a further updated version of the draft report to the webforum for use by Dr. Tomasko. Dr. Tomasko noted he would further amend the draft report and post it to the webforum on April 29, 2020 for a final review by all panelists.

Following any necessary revisions, Dr. Tomasko noted he anticipated posting the panel's initial peer review report to the webforum by April 30, 2020.

After discussing plans for completion of their initial peer review report, the panel discussed the format and content of their initial peer review report. The panel agreed the draft initial report prepared by Dr. Tomasko was a reasonable format for their final report and that it adequately captured most of the comments, issues and concerns previously identified and documented by each panelist. Following a discussion of all information included in the draft, initial report, and necessary amendments to the document, Dr. Tomasko afforded District staff the opportunity to ask for clarification on a few items included in the draft, initial report.

Following discussion concerning development of the panel's draft initial peer review report, Mr. Leeper asked if any members of the public wished to provide any comment on the peer review process or the proposed minimum flows. Mr. Angel Martin suggested that the District should consider amending the draft minimum flows report to note that new, up-to-date climate change information will be considered in future minimum flow analyses and to include conversion and description/definition tables for hydrologic, water quality and vertical control values discussed in the report.

Following the public input session, Mr. Leeper adjourned the meeting.

← District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows

REPLY

Minimum Flows for the Lower Peace River and Lower Shell Creek

DL

Moderator
102 posts

Doug Leeper
a few seconds ago

Hi all:

I've created this new topic for communications pertaining to the District's ongoing development of a response to the panel's initial peer review report.

District staff are developing the response document and updating the draft minimum flows report this month to support the panel's development of a final peer review report in June.

Doug Leeper

0 0

DL

Moderator
103 posts

Doug Leeper
a few seconds ago

Hi Peter:

One of your original, preliminary comments referenced a 2017 NOAA document:

Considering sea level rise effect on MFL is commendable. The sea level rise values, which are based on the USACE study in 2013, appear to be at least 50% lower than those recommended by NOAA (2017) which is the leading U.S. climate agency. Are future predictions on precipitation, wind, atmospheric temperature, land use, and storms all incorporated into the new MFL?

Could you please provide a copy of the 2017 NOAA document (or at least a more detailed reference) for us to use for our ongoing consideration of potential sea level rise effects on salinity in the Lower Peace/Shell System?

Thanks,

Doug Leeper

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows
Date: Friday, May 8, 2020 2:47:18 PM

SWFWMD WebBoards

xchen has replied to a topic.

District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows

Posted May 08 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Dr. Sheng,

I got the following NOAA SLC estimates. Please confirm. Thanks!

XinJian

Scenarios for
FORT MYERS
NOAA2017 VLM: 0.00151
feet/yr
All values are expressed in
feet

	NOAA2017 VLM	NOAA2017 Low	NOAA2017 Int-Low	NOAA2017 Intermediate	NOAA2017 Int-High	NOAA2017 High	NOAA2017 Extreme
2000	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34
2010	-0.33	-0.25	-0.21	-0.15	-0.08	-0.02	-0.02
2020	-0.31	-0.08	-0.02	0.12	0.25	0.35	0.38
2030	-0.3	0.05	0.15	0.38	0.61	0.84	0.94
2040	-0.28	0.21	0.35	0.67	1.03	1.4	1.66
2050	-0.27	0.38	0.54	1.03	1.56	2.15	2.54
2060	-0.25	0.51	0.74	1.46	2.22	3.07	3.69
2070	-0.24	0.64	0.9	1.89	2.94	4.12	4.97
2080	-0.22	0.77	1.1	2.38	3.79	5.27	6.48
2090	-0.21	0.87	1.26	2.9	4.68	6.58	8.19
2100	-0.19	0.97	1.43	3.43	5.66	8.02	10.02

Visit Topic

Or reply directly to this email

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows
Date: Saturday, May 9, 2020 3:55:12 PM

SWFWMD WebBoards

PeterSheng has replied to a topic.

District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows

Posted May 09 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

XinJian,

Here is the Excel file with the Regional Sea Level (RSL) predicted by NOAA (2017) for Fort Myers.
I recommend using the 0.3-MED, 1.0-MED, and 2.0-M values. My numbers are in cm, and yours are in ft, but they seem to agree.
Peter Sheng

Copy of fortmyers_local_slr_3x3 scenarios to 210...
10.04 KB

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Email followed content: Never Weekly | Daily | **Immediately** |

To unsubscribe from these emails, you can unfollow this category or unfollow this topic.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows
Date: Monday, May 11, 2020 9:16:26 AM

SWFWMD WebBoards

xchen has replied to a topic.

District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows

Posted May 11 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Dr. Sheng,

Thanks. I converted the above table to cm and used 2000 as the base level, the numbers matched those in your table exactly.

As a result, the NOAA-predicted SLRs during 2010 through 2035 would be 0.38' (11.58 cm), 0.68' (20.57 cm), and 1.14' (34.75 cm) for low (0.3-MED), intermediate (1.0-MED), and high (2.0-MED) estimates, respectively.

XinJian

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Or reply directly to this email

Email followed content: Never Weekly | Daily | **Immediately** |

To unsubscribe from these emails, you can unfollow this category or unfollow this topic.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows
Date: Monday, May 11, 2020 10:33:31 AM

SWFWMD WebBoards

PeterSheng has replied to a topic.

District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows

Posted May 11 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Xinjian,

Thanks! I am glad we got the same numbers!

Peter Sheng

Visit Topic

Or reply directly to this email

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows
Date: Monday, May 11, 2020 12:45:43 PM

SWFWMD WebBoards

David Tomasko has replied to a topic.

District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows

Posted May 11 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Worth considering - normalize the SLR projections with 2020 as the start date, not 2010. If you use the SLR calculator itself, rather than rely on someone else's results table, you can pick any start date you want. After all, what people really care about is the change from existing conditions, rather than a default date of 2010, for example.

Visit Topic

Or reply directly to this email

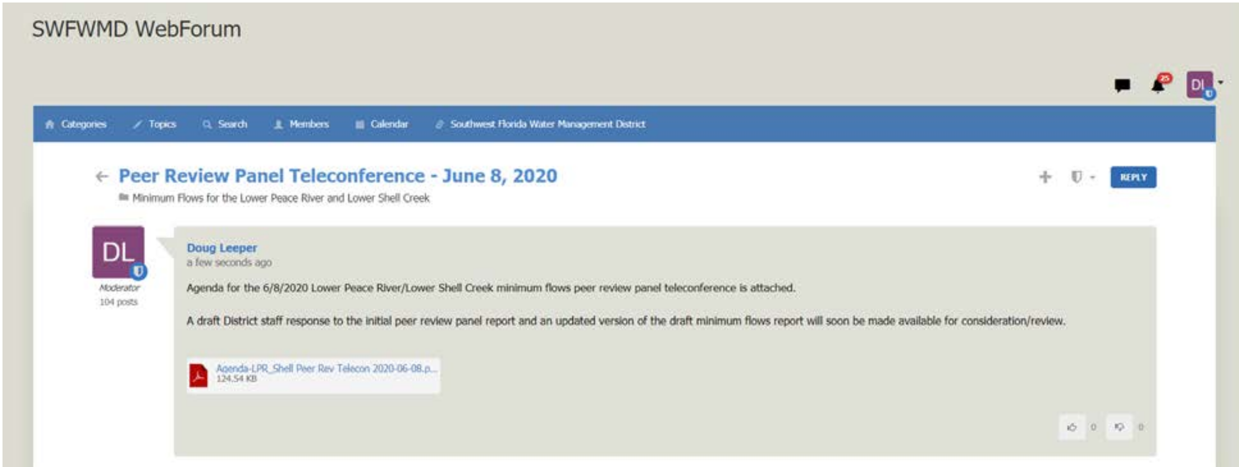
From:	Doug Leeper
To:	Sid Flannery
Cc:	Yonas Ghile; Chris Zajac
Subject:	RE: LPR and Shell Peer Review Web Forum link
Date:	Tuesday, May 26, 2020 1:16:00 PM
Attachments:	WebForum Use.pdf

https://swfwmd.discussion.community/?forum=788051

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: Sid Flannery <sidflannery22@gmail.com>
Sent: Tuesday, May 26, 2020 9:23 AM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject:

Hello Doug,
Since you are back at work today, can you give me a quick call. All is well.
Sid
813-245-0331


SWFWMD WebForum

Categories Topics Search Members Calendar Southwest Florida Water Management District

Peer Review Panel Teleconference - June 8, 2020

Minimum Flows for the Lower Peace River and Lower Shell Creek

REPLY

DL

Moderator

104 posts

Doug Leeper

a few seconds ago

Agenda for the 6/8/2020 Lower Peace River/Lower Shell Creek minimum flows peer review panel teleconference is attached.

A draft District staff response to the initial peer review panel report and an updated version of the draft minimum flows report will soon be made available for consideration/review.

Agenda-LPR_Shell Peer Rev Telecon 2020-06-08.p...

124.54 KB

Southwest Florida Water Management District

2379 Broad Street, Brooksville, Florida 34604-6899
(352) 796-7211 or 1-800-423-1476 (FL only)
WaterMatters.org

An Equal Opportunity Employer

The Southwest Florida Water Management District (District) does not discriminate on the basis of disability. This nondiscrimination policy involves every aspect of the District's functions, including access to and participation in the District's programs, services and activities. Anyone requiring reasonable accommodation, or would like information as to the existence and location of accessible services, activities, and facilities, as provided for in the Americans with Disabilities Act, should contact Donna Kaspari, Sr. Performance Management Professional, at 2379 Broad St., Brooksville, FL 34604-6899; telephone (352) 796-7211 or 1-800-423-1476 (FL only), ext. 4706; or email ADACoordinator@WaterMatters.org. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1-800-955-8771 (TDD) or 1-800-955-8770 (Voice). If requested, appropriate auxiliary aids and services will be provided at any public meeting, forum, or event of the District. In the event of a complaint, please follow the grievance procedure located at WaterMatters.org/ADA.

MEETING NOTICE

AGENDA
Southwest Florida Water Management District
Scientific Peer Review Panel Meeting
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

MONDAY, JUNE 8, 2020
1:00 PM TO 3:00 PM

TELECONFERENCE
Call-in number: 1 (786)-749-6127; Conference ID: 619 330 915#

Teams teleconference link: Join Microsoft Teams Meeting

Detailed Teams teleconference link:
https://teams.microsoft.com/l/meetup-join/19%3ameeting_NzU1YWI1ZGItNWRhZC00MTEyLTg2NDEtMGYyNzllZTdiNzll%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d

All meetings are open to the public.

1. Welcome/introductions facilitated by Doug Leeper, District MFLs Program Lead.

2. Panel discussion by Dave Tomasko, Panel Chair; Y. Peter Sheng, Panelist; and Laura Bedinger, Panelist; facilitated by Doug Leeper.
   a. General discussion of District staff response to the Panel's initial peer review report and the District's revised minimum flows report.
   b. Discussion of specific Panel comments and District staff responses that may require clarification or further consideration.
   c. Discussion regarding development of the Panel's final peer review report.
   d. Recap of next steps and action items.

3. Public comment period moderated by Doug Leeper.

Participants will be asked to save their comments until the public comment portion of the teleconference. If you wish to speak during the public comment period, please identify yourself to the Moderator (Doug Leeper), who will then facilitate your input. Comments will be limited to three minutes per speaker. In appropriate circumstances, the Moderator may grant exceptions to the three-minute limit.

For questions or to submit additional public comment on the peer review of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, please use the Web Board at https://swfwmd.discussion.community/categories that has been established to allow public access to and participation in communications among the Panel Chair and other members of the independent peer review panel created to conduct the peer review. The Web Board will be available for public comment from 8:00 a.m. on April 3, 2020, through 5:00 p.m. on June 26, 2020, and available for public viewing from April 3, 2019 through at least December 31, 2020. Questions or additional public comment may alternatively be submitted to Doug Leeper by email at doug.leeper@watermatters.org, by telephone at 352-397-7840 or 1-800-423-1476 or 352-796-7211, extension 4272, or by mail at the address listed at the top of this agenda.

Bartow Office	**Sarasota Office**	**Tampa Office**
170 Century Boulevard	78 Sarasota Center Boulevard	7601 US Highway 301 North
Bartow, FL 33830-7700	Sarasota, FL 34240-9711	Tampa, FL 33637-6759
863-534-1448 or 1-800-492-7862	941-377-3722 or 1-800-320-3503	813-985-7481 or 1-800-836-0797

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Message from PeterSheng entitled "NOAA REPORT"
Date: Saturday, May 30, 2020 12:13:19 PM

SWFWMD WebBoards

PeterSheng sent you a message.

SUBJECT: **NOAA REPORT** DELETE

Doug,

I will provide the report later today.

Thanks,

Peter

p.s. Xinjian and I communicated on this a few weeks ago so I though he had the report already, but I will send the complete title.

Reply

Or reply directly to this email

DL

Moderator
105 posts

Doug Leeper
a few seconds ago

The District staff response to the panel's initial peer review report and a revised version of the draft minimum flows report for the Lower Peace River and Lower Shell Creek are attached for the panel's consideration. Updates made to the draft minimum flows report are noted with yellow highlighting.

The panel will discuss these documents during their review teleconference on June 8, 2020.

LPR_Shell Peer Rev Staff Resp 2020-06-01.pdf
368.16 KB

LPR_Shell Draft Min Flows 2020-06-01.pdf
4.88 MB

Southwest Florida Water Management District Response to the Initial Peer Review of Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

June 1, 2020

Natural Systems and Restoration Bureau
Resource Manamgment Division

Southwest Florida Water Management District Response to the Initial Peer Review of Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

June 1, 2020

Yonas Ghile, Ph.D., P.H., Lead Hydrologist
XinJian Chen, Ph.D., PE, Chief Professional Engineer
Douglas A. Leeper, MFLs Program Lead
Chris Anastasiou, Ph.D., Chief Water Quality Scientist
Kristina Deak, Ph.D., Staff Environmental Scientist

Natural Systems and Restoration Bureau
Resource Management Division
Southwest Florida Water Management District
2379 Broad Street
Brooksville, Florida 34604

Acknowledgments

We thank Mike Bray, Eric DeHaven, Tom Hughes, Jennette Seachrist, Virginia Singer, Randy Smith, Adrienne Vining, Don Weaver, Lei Yang and Chris Zajac with the Southwest Florida Water Management District for their contributions and useful suggestions concerning the work summarized in this document and support with the initial phase of the peer review process.

We also thank Angel Martin, and Victoria Steinnecker with Carollo Engineering, Inc., for comment provided during the initial phase of the peer review process. In addition, we thank the peer review panelists, Laura Bedinger, Peter Sheng and Dave Tomasko, for development of the initial peer review panel report on the District's proposed minimum flows for the Lower Peace River and Lower Shell Creek that served as the basis for development of this document.

Table of Contents

Minimum Flows Peer Review Process and Purpose of this Report

On March 25, 2020, the Southwest Florida Water Management District voluntarily convened a panel for the independent, scientific peer review of minimum flows proposed for the Lower Peace River and Lower Shell Creek. Minimum flows are defined in the Florida Statutes as the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. Upon establishment by rule, minimum flows are used by the District or Department of Environmental Protection for water-use permitting, environmental resource permitting and water supply planning.

For minimum flows establishment, the Florida Statutes define independent scientific peer review as the review of scientific data, theories, and methodologies by a panel of independent, recognized experts in the fields of hydrology, hydrogeology, limnology, and other scientific disciplines.

The panel reviewing the proposed minimum flows for the Lower Peace River and Lower Shell Creek consisted of a Chairperson, David Tomasko, Ph.D., with Environmental Sciences Associates, Inc., and Panelists Laura Bedinger, Ph.D., with Water and Air Research, Inc., and Y. Peter Sheng, Ph.D., with Aqua Dynamics, Inc. The panel was tasked with reviewing the proposed minimum flows based on information included in a District report titled, “Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report” dated March 20, 2020, and appendices associated with the report.

Three phases were identified for the peer review process. The initial phase, which has been completed, involved the panel’s review of the District’s draft minimum flows report and development of an initial peer review report that summarized panel findings and recommendations concerning the proposed minimum flows. The second phase, which served as the basis for development and dissemination of this “response” document by District staff, involved development of responses to the panel’s initial peer review report. In addition, the District’s draft minimum flows report was updated during the second review phase based on recommendations identified in the panel’s initial peer review report, and as noted in this response document. The third phase of the review will involve the panel’s consideration of this response document, the updated, draft minimum flows report, any other relevant information, and development of a final peer review report concerning the proposed minimum flows.

The Panel completed the first phase of their review by posting a report titled, “Scientific Peer Review Panel Review of ‘Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek’ – Final Initial Report” to the review web forum on April 29, 2020.

Development of the panel’s initial peer review report during the first phase of the review was supported by the District through facilitation of publicly noticed and accessible, internet-based teleconferences on April 3, 13, 20 and 27, 2020 and use of an internet-based web forum (web board) that became available on April 3, 2020. District facilitation of the review web forum continued through the second phase of the review and will also continue through the third review phase. Two internet-based teleconferences will also be facilitated by the District during the third phase of the review, to further support the panel's development of a final peer review report.

All Panel communications during the review process have occurred and will continue to occur only during the review teleconferences and through use of the review web forum. District facilitation and the panel's sole use of the teleconferences and web forum for review-related communications ensures panel activities are conducted in accordance with Florida's Government-in-the-Sunshine Law and provides opportunities for public comment on the review process and the proposed minimum flows for the Lower Peace River and Lower Shell Creek.

Format of the Panel's Initial Peer Review Report

In their initial peer review report, the panel tabularized general comments, comments pertaining to specific sections of the District's draft minimum flows report, typographical errors, and comments pertaining to the draft minimum flows report appendices. Supporting information concerning the panel comments was also provided in narrative form. In addition, specific comments and questions identified by each panelist in preparation for development of the panel's initial peer review report were included as appendices.

Format of District Staff Responses to the Initial Peer Review Report

District staff reviewed the panel's initial peer review report and developed staff responses to panel comments. A format similar to that used by the panel for presentation of their comments is employed here to organize the staff responses.

Staff responses to the tabularized panel comments are included in tabular format in this document. Additional responses associated with the supporting information included in narrative form in the body of the panel's report are also incorporated into the document, where appropriate. Staff responses to the specific comments and questions included in the appendix to the panel's initial peer review report are not included in this staff response document, as initial, draft responses to these comments were previously provided to the panel.

Panel Comments and District Staff Responses

Table 1. Overall Panel Comments and/or Concerns and District Staff Responses.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response
1a	*MFL report was comprehensive, well-written and thorough*	We thank the panel for this comment.
1b	*Basing MFL on specific flows, vs. calendar dates, a good idea*	We thank the panel for this comment.
1c	*15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable*	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" below for our response to this comment.
1d	*Hydrodynamic modeling represents a substantial improvement from prior efforts*	We agree and thank the panel for this comment.
1e	*Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)*	The proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed in accordance with all requirements for minimum flows establishment included in the Florida Statutes and Water Resource Implementation Rule. The minimum flows established for the river and creek will be implemented in accordance with these and other legislative and regulatory directives through the District's permitting and planning programs and other water management activities. With regard to other water management activities, we note, for example, the District's 2000 Charlotte Harbor Surface Water Improvement and Management (SWIM) plan and the 2020 SWIM plan currently under development for the harbor are mentioned and cited in the revised, draft minimum flows report. The SWIM plans are mentioned in the water quality classification

		Section 3.1, a newly added Section 3.2.2 on the Pollutant Load Reduction Goal for the Lower Peace River and Section 4.1.5, which addresses seagrasses.
1f	*Uncertainty and accuracy of hydrologic model should be discussed in more detail*	We considered the over-estimation of ungaged flow in our previous, 2010 minimum flows study for the Lower Peace/Shell System. We adjusted flow records to get the best ungaged flow estimate based on the previous hydrodynamic study of the Charlotte Harbor system and the flow estimation from those ungaged sites using a surface water model HSPF (Ross et al. 2005). In addition, a drainage ratio method was used to improve streamflow estimation at ungaged sites based on neighboring gaged sites. We acknowledge that there is still uncertainty and inaccuracy in our estimates of ungaged flow, which accounts for about 16% of the entire Peace River watershed drainage. About 84% of the Peace River watershed is gaged by the U.S. Geological Survey and the hydrologic loading to the Lower Peace River from the gaged watershed is reliable. For our minimum flow analyses, we used the best available data, in combination of what we learned from the previous hydrodynamic simulation of the system, and a comparison of two other hydrologic studies of the watershed to estimate the ungaged flow to the Lower Peace River. We added new text addressing ungaged flow estimation to Section 5.3.1 of the revised, draft minimum flows report. Additional response development associated with incorporation of uncertainty information in the body of the minimum flows report and the hydrodynamic modeling appendix (Chen 2020) was also added.

		Regarding modeling and data uncertainty, we think it is worth emphasizing that as discussed in Section 1.3.7 of the draft minimum flows report, the District uses an adaptive management approach for minimum flows development and implementation, which includes routine status assessments and, as necessary, reevaluation of established minimum flows. When possible, these activities are conducted to attempt to minimize uncertainty in our results and recommendations.
1g	*In a changing climate, long-term (50-100 year) averaged flow are not necessarily more indicative of the hydrologic conditions in the next 15-20 years. Should more recent data in the past two decades be given more weight in the development of the baseline flow which was based on the average in 1950-2014?*	We think it is best to use hydrologic data (e.g., flow records) for the longest period, within reason, to best capture the climatic variability integrated in the data. As part of baseline flow development for Lower Peace River, historic flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Charlie Creek were examined in multi-decadal blocks (roughly 20 years) as shown in Figure 5.3 of the draft minimum flows report. Per the request of the peer reviewers, we added short-term (2000-2018) mean annual flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Shell Creek to Section 2.7.1 in the revised, draft minimum flows report. In addition, as noted in response 4f in Table 4 below, we added the short term average flow values to Figures 2-12 through 2-16 within the report section. We also note that as part of minimum flow assessment for the Lower Peace River, 5- and 10 -year moving averages were calculated for river flows under baseline, minimum flow and existing flow scenarios

		(see Table 7.1 in the revised, draft minimum flows report). We also think it is worth emphasizing again that the District uses an adaptive management approach for minimum flows development and implementation that includes routine status assessments and, as necessary, reevaluation of established minimum flows.
1h	*Would be helpful to quantify actual or potential benefits associated with changes to existing MFL guidance*	Staff is required by State Law to use the best available information for the calculation of all minimum flows. We have used the best information available for our current determination of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, and therefore do not think it is necessary or appropriate to make comparisons regarding resource protection between the existing and proposed minimum flows. That said, we note that the existing and proposed minimum flow for the Lower Peace River were both developed based on a 15% reduction in water volume with a salinity of <2 psu and are expected to provide similar levels of resource protection. However, the change from use of calendar-based blocks to flow-based blocks for the proposed minimum flows for the Lower Peace River and use of the flow-based blocks for the minimum flows proposed for Lower Shell Creek allows more withdrawals when high flows associated with storm events occur on any day of the year.
1i	*Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows*	We included additional information on the importance of hydrodynamics in several sections of the revised, draft minimum flows report. For example, we added text to the end of Section 1.5 that emphasizes the

	on bottom water hypoxia and other phenomena	adopted minimum flows for the Lower Peace River and the proposed minimum flows for the river and Lower Shell Creek were based on potential flow-related changes in salinities assessed with hydrodynamic models. In addition, we added a new section (Section 3.2.2) on the pollutant load reduction goal for the Lower Peace River, emphasizing the environmental effects associated with relatively large, seasonal inflows to Charlotte Harbor. We also emphasized the importance of hydrodynamics in text added to the beginning of Section 3.3.1.
1j	*Consider development of a "dynamic" MFL with real-time now-cast/forecast capabilities*	This is an intriguing suggestion, although we do not think development of a dynamic water quality model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. Minimum flows (and minimum water levels) are typically assumed to correspond with long-term hydrologic and environmental conditions, and in the case of the Lower Peace River and Lower Shell Creek were developed based on central tendencies of environmental responses to changes in flow simulated every 90 seconds (or 75 or 72 seconds during a few short periods when storms occurred) for a 7.7 year simulation period. Further, we add that estuarine organisms are adapted to cope with a wide range of salinities and the small changes in salinity, attributable to the currently proposed minimum flows, are unlikely to alter the ecological integrity of the naturally dynamic Lower Peace/Shell System or Charlotte Harbor.

		We note, however, that established minimum flows can be and are used to develop withdrawal-related conditions in water use permits, on both long-term and short-term bases. For example, in the case of the existing and proposed minimum flows for the Lower Peace River, permit conditions that limit withdrawals based on the previous day's average flow have been and are expected to be successfully implemented. These types of permit conditions are developed by District staff in coordination with permittees based on identified regulatory constraints, such as established minimum flows, the needs of the permittee and other practical considerations.
1k	*Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee*	Although flow from the Caloosahatchee River was not directly used as boundary conditions near the mouth of the Caloosahatchee River, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. We also think it is valuable to comment on the complexity of inflows that can impact environmental conditions in Charlotte Harbor. For example, proliferation of drift algae and apparent loss of seagrass has been observed along the east wall region of the harbor and may be related to the Red Tide event of 2017-2018. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.
1l	*Analyze the potential impact of sea level rise on the MFL, using best*	We did not develop the proposed minimum flows based on future sea level conditions. However, we evaluated the proposed

	available SLR data for 2020-2050	minimum flows under three SLR scenarios to help determine when a future re-evaluation of the minimum flows may be necessary. Although we used U.S. Army Corps of Engineer (USACE) SLR estimates, which are generally lower than those of the National Oceanic and Atmospheric Administration (NOAA), our results supported the need for consideration of a future reevaluation for the Lower Peace River and Lower Shell Creek minimum flows. Future reevaluations will be based on actual sea level conditions and other factors. Following the review panel's suggestion, we have conducted new model runs using NOAA et al. (2017) SLR estimates and are in the process of revising the draft minimum flows report based on an analysis of the new model results.

Supporting Narrative Panel Comments and District Staff Responses Associated with Table 1

<u>Narrative Panel Comment(s):</u>
The Panel felt that the draft MFL report was obviously the result of an impressive effort by the District and its consultants. The variety, quantity and quality of data that was compiled, collected, analyzed and interpreted, as well as the hydrodynamic model, was universally viewed as impressive, and obviously indicative of the MFL process being approached in a thorough and professional manner by District staff.

<u>District Staff Response:</u>
We thank the panel for these comments.

<u>Narrative Panel Comment:</u>
The conversion of the MFL guidance from a calendar-based system to a flow-based guidance was considered to be a valuable improvement over the earlier guidance.

<u>District Staff Response:</u>
We agree and thank the panel for this comment.

Narrative Panel Comment(s):

The District's use of a 15% threshold for "significant harm" will be considered elsewhere in the report, but the primary concern raised by the Panel was not that there was anything inherently "wrong" with the threshold, but the District's MFL report contains language that suggests that threshold values for withdrawal limits should first focus on a search to develop locally-relevant threshold values, such as the 0.6' fish passage criteria used in the Upper Peace River MFL, or perhaps water quality "triggers" or inflection points for wetland inundation frequencies. A thorough and detailed review of the MFL does show that such locally-derived triggers were examined, and that no link could be made for water quality, and that wetland inundation triggers were less protective than the 15% salinity-habitat metric. However, the MFL report would be more useful for future reviewers (and future District staff, perhaps) if the process that led to the adoption of the 15% threshold value for the salinity-habitat metric was more thoroughly, yet succinctly, discussed in the Executive Summary and elsewhere in the report.

District Staff Response:

We appreciate the panel's support of our use of a percent-change approach to development of the proposed minimum flows for the Lower Peace River and Lower Shell Creek. We and the many independent scientific peer review panels that have assessed our previous minimum flows maintain assessment of flow-related habitat changes on a percentage basis is a reasonable and useful approach for establishing minimum flows. This approach permits evaluation of various environmental factors that exhibit a continuous or incremental response, without notable thresholds, to changes in flows.

When possible and reasonable, we use percent-change-in-habitat metrics in conjunction with threshold-based criteria for establishing minimum flows. This does not imply that we think either type of metric is superior. However, when available, consideration of both types of metrics collectively provides assurance that we are developing minimum flow recommendations based on the best available information.

We have typically used a fifteen percent change criterion for habitats and resources assessed in support of minimum flows development. These assessments have included changes in the area, volume and shoreline length exposed to specified salinities or salinity-ranges, changes in area and volume of thermally-favorable habitat, and changes in habitat suitability based on preferences for a variety of factors, including substrate/cover types, water depths, water velocities, water temperature and dissolved oxygen. We are pleased to note that percent-of-change approaches similar to those used by the District are under consideration or being used by other water management districts within the state and elsewhere by other regulatory groups.

As noted in the Executive Summary and other sections of the draft minimum flows report we focused on a variety of environmental factors for development and consideration of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, including: maintenance of biologically relevant salinities with water volumes, shoreline lengths and bottom areas associated with salinities ranging from 2 to 20 psu; inundation of floodplain wetlands; habitats for selected fish species and Blue Crab; and water quality. Also, as noted throughout the report, our proposed minimum flows were based on the criterion exhibiting the greatest sensitivity to flow reductions.

In addition, we note that the proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed in accordance with all requirements for minimum flows establishment included in the Florida Statutes and Water Resource Implementation Rule. The minimum flows established for the river and creek will be implemented in accordance with these legislative and regulatory directives through the District's permitting and planning programs and activities.

As recommended by the panel, we amended the Executive Summary (see paragraph 7) of the revised draft minimum flows report to note this aspect of the percent-of-flow approach.

Finally, in response to this panel comment, we note that our recommended use of flow-based blocks rather than calendar-based blocks for the proposed Lower Peace and Lower Shell minimum flows addresses differing environmental responses that may be associated with specific flow thresholds or ranges. For example, during the typical summer wet season, high flows would be subject to the allowable flow reduction associated with the minimum flows proposed for Block 3. However, if flows during the typical wet season fall within the flow-range associated with Block 2 (the medium flow range block), the allowable percent-of-flow reductions associated with the Block 2 minimum flows rather than the allowable percent-of-flow reduction associated with the Block 3 would be applicable. This use of flow-based blocks achieves a goal similar to that which was used for development of the “flow trigger” used for the currently adopted Lower Peace River minimum flows.

<u>Narrative Panel Comment(s):</u>
Panel members felt that while the expanded and more detailed hydrodynamic model used in the MFL was a substantial improvement over prior efforts, the issue of baseline conditions and the overall hydrologic output for non-gaged portions of the watershed continued to have limitations.

<u>District Staff Response:</u>
Please refer to response 1f in Table 1 for our response to these comments.

Narrative Panel Comment(s):

The Panel also sought to have the MFL report include reference to other regulatory guidance documents. For example, while the draft MFL report included reference to the lack of compliance of the LPR with various water quality criteria developed by FDEP, it did not include reference to the Pollutant Load Reduction Goal (PLRG) developed for Charlotte Harbor. While this is not a specific charge of the enabling legislation for setting MFLs, the Panel felt that public agencies should seek to develop regulatory guidance that is as complementary – or at least consistent with – guidance from other local, regional and/or state agencies.

District Staff Response:

Please refer to response 1e in Table 1 for our response to this comment.

Narrative Panel Comment(s):

Issues associated with the potential influence of the Caloosahatchee River and/or inflows from the south were of concern to the Panel, especially in light of recent adverse impacts to seagrass resources along the eastern wall – impacts that could be attributed to the Peace River, given its much closer proximity.

District Staff Response:

Please refer to response 1k in Table 1 for our response to this comment.

Narrative Panel Comment(s):

In view of rapidly accelerating sea level rise (SLR), the Panel felt it would be prudent to consider the potential impact of SLR on the MFL by using the NOAA (2017) projection of SLR for Fort Myers in 2020-2050. For example, as a first step the impact of SLR on the volume of 2-psu water in 2020-2050 could be investigated using the low, medium, and high SLR values corresponding to the 50 percentile SLR projection for 2100 (3.3 ft global mean sea level rise of 3.3 ft) from NOAA (2017). The NOAA projection for Fort Myers in 2035 is 0.47, 0.80, 1.22 ft for the low, medium, high scenarios, respectively. The USACE SLR values used by the District are 0.2, 0.35, 0.76 ft, based on their 2013 report. Due to the increasing SLR and Florida Governor's effort in building coastal resiliency against the rising sea level, the Panel felt it is prudent for the District to use the best available information on SLR in its consideration of the potential impact of SLR on the MFL.

District Staff Response:

See response 1l in Table 1 for our response to these comments.

Narrative Panel Comment(s):

In consideration of the rapidly changing climate, the Panel recommends that, during its five-year evaluation with the regional water supply planning, the District evaluates the *current and future climate conditions to determine if the MFL needs to be updated sooner than its regular schedule.*

District Staff Response:
Climate change can affect natural systems and may also affect water supply sources and patterns of water-use demand. As noted in the District's draft 2020 regional water supply plan (SWFWMD 2020-in preparation), for water supply needs and projects, the District has assumed a "monitor and adapt" approach toward climate change. We will continue to actively monitor current research projects, both locally and nationally, interpret the results, and initiate appropriate actions deemed necessary to protect our water resources against the effects of climate change.

As noted in response 1l in Table 1, our current and future investigations of sea level change highlight our adaptive management approach (see responses 1f and 1g in Table 1) to potential effects of sea level rise on the Lower Peace/Shell System.

We note however, that there are limitations to prioritization of water bodies for minimum flows and levels development and reevaluation. These constraints include current and future District staffing and budgetary considerations for the numerous, water bodies currently prioritized for minimum flows establishment.

Table 2. Panel Comments on Executive Summary and District Staff Responses.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response
2a	*Definition of "significant harm"*	Significant harm and significantly harmful are not defined by the State Legislature. For minimum flows and levels development, each water management district of the state or the Florida Department of Environmental Protection identify specific thresholds or criteria that can be associated with significant harm. We incorporated additional information concerning significant harm into the first paragraph of the Executive Summary in the revised, draft minimum flows report.
2b	*Definition of "best available information"*	In accordance with direction provided by the Florida Legislature, District staff use the best available information when determining minimum flows. Determinations regarding the best available information are made by District staff based on professional judgment, with consideration of input from all stakeholders. The best available information includes information that exists at the initiation of the minimum flows development process and information that is acquired specifically to fill data requirements deemed necessary for establishment of the best, defensible minimum flows. We do not think a definition for "best available information" is needed in the Executive Summary of the minimum flows report. However, we added the characterization of "best available information" above to the first paragraph of

		Section 1.5 in the revised, draft minimum flows report.
2c	*Could MFL be set for more than 3 flow blocks?*	In theory, any number of flow blocks could be identified and used for minimum flows development and implementation. For practical purposes, use of three flow blocks for the District's development and implementation of minimum flows for water use permitting, planning and water resource protection has proven to be successful. One reason for this success in the management of runoff driven lotic systems is that the flow blocks associated with established minimum flows have been developed with consideration of low, medium and high flow conditions that are known to be important for the physical, chemical and biological functions and structure of riverine systems. We have not conducted analyses associated with development of proposed minimum flows for the Lower Peace River and Lower Shell Creek with varying numbers of flow-based blocks.
2d	*Concern over LSC low flow conditions*	Please refer to response 2i in this table.
2e	*Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)*	Please refer to response 1e in Table 1 for our response to this comment.
2f	*Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP's Numeric Nutrient Concentration (NNC) criteria*	We analyzed water quality data to explore potential linkages between flow and water quality parameters as is required by the Water Resource Implementation Rule, not to validate or to infer compliance with the Numeric Nutrient Criteria adopted by FDEP

2g	Explain the need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	We agree with the preliminary comments below that are included in the appendices to the Panel's initial peer review report: *"It appears improbable that even maximum water withdrawals would reduce flows sufficient to prevent bottom water hypoxia, which requires an average flow of 10,000 CFS at Arcadia (Stoker et al, 1989 – U.S. Geological Survey Publication XXXXX) – roughly equivalent to total gaged PR flow of about 20,000 cfs."* "*Proposed max withdrawal of 400 cfs represents ca. 2% of the minimum flow from PR watershed required to initiate stratification of 10 ppt in Harbor. Consequently, maximum withdrawal appears to be protective of the "reset button" of bottom water hypoxia."* We have therefore included text in a new Section (3.2.2) and at the beginning of Section 3.3.1 in the revised, draft minimum flows report to emphasize the importance of hydrodynamics and high inflows to Charlotte Harbor.
2h	*15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable*	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.
2i	*Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health*	The proposed minimum flows for Lower Shell Creek are to be implemented based on discharge of a percentage of the inflow to Shell Creek Reservoir. For example, the allowable flow reduction of 23% for Block 2 flows, means that quantity of water equal to 77% of the inflows to the reservoir must be discharged downstream of Hendrickson Dam.

		This minimum flow is required, irrespective of withdrawals from the reservoir. By associating the minimum flows with rates of inflow to the reservoir, we believe the ecology of Lower Shell Creek is protected from significant harm associated with water withdrawals. Thus, a maximum flow diversion quantity is not required for the Lower Shell Creek. For minimum flows development purposes, Shell Creek is partitioned into the Upper Shell Creek and Lower Shell Creek, separated by Hendrickson Dam. The only significant, permitted withdrawal directly from Shell Creek is associated with the permit issued by the District to the City of Punta Gorda for withdrawals from Shell Creek Reservoir, the portion of the upper creek impounded by the dam. Because the proposed minimum flows for Lower Shell Creek are based on maintaining block-specific percentages of inflow to Shell Creek Reservoir from Upper Shell Creek (and Prairie Creek) and the City's withdrawals are from the multi-year storage in the reservoir storage, a maximum withdrawal limit (i.e., a maximum flow reduction) is not needed for the Lower Shell Creek minimum flows. Also, of note, the permit issued to the City for withdrawals from Shell Creek Reservoir includes monthly and annual average maximum withdrawal limits. We further note that preliminary comments prepared by the panel and used to support development of their initial peer review report, indicated it is "*[n]ot likely that max withdrawals (if set) for LSC would affect*

		threshold values for stratification, but should be mentioned/ acknowledged We agree with this assertion, and note that for a recent period from 1996 through 2016, mean annual flow in the Lower Peace River, based on flows in the River at Arcadia and flows from Joshua and Horse creeks was 1,279 cfs, while flows to Lower Shell Creek from the same period were 388 cfs. This information, which has been included in Section 2.7.1 of the revised, draft minimum flows report, indicates the Shell Creek watershed accounts for only about 25% of the combined flows from the Peace River and Shell Creek watersheds. Based on the information provided here, we do not currently intend to recommend inclusion of a maximum withdrawal cap or limit as part of the proposed minimum flows for Lower Shell Creek. We will, however, continue to assess and, as necessary, consider this recommendation of the panel for potential, future reevaluations of minimum flows established for the creek.
2j	*Say something about potential impact of SLR on the MFL*	Sea level rise effects on salinity habitats were assessed in the District's draft minimum flows report to help evaluate the potential need for future reevaluation of the proposed minimum flows. As noted in response 1l in Table 1, analyses based on modeled scenarios associated with SLR predictions from the U.S. Army Corps of Engineers indicated the need for reevaluation of minimum flows established for the Lower Peace River and Lower Shell Creek. We acknowledge the SLR estimates used in our initial analyses are conservative. We

		have run the hydrodynamic model using the most recent SLR estimates by the National Oceanic and Atmospheric Administration (NOAA et al. 2017), and plan to update the revised, draft minimum flows report based on results of these SLR simulations.

Supporting Narrative Panel Comments and District Staff Responses Associated with Table 2

Panel Comment(s):
The Panel found that it would be helpful for the draft MFL to attempt to define the terms "significant harm" and "best available information" in the Executive Summary. While not all terms will be clearly defined, their use in the Executive Summary suggests that they are standard phrases recognizable to the reader, which they are not.

District Staff Response:
Please see responses 2a and 2b in Table 2 for our response to these comments.

Narrative Panel Comment(s):
Concerns were raised by the Panel related to the absence of a maximum flow value for the LSC, compared to a proposed value of 400 cfs for the Lower Peace River. This seems to be a function of the District determining that the area of interest for MFL development for the LSC ends at its downstream boundary with the LPR, even though the area of concern for the LPR extends out into Charlotte Harbor. Since flows from the LSC average (on an annual time step) perhaps 20 to 30% of the annual average flows of the LPR, if flows from the LPR are important to the Harbor such that a maximum withdrawal value of 400 cfs is included in the draft MFL, it would appear that a similar maximum diversion criterion could also be derived for the LSC.

District Staff Response:
Please see response 2i in Table 2 for our response to this comment.

Narrative Panel Comment(s):
The report recognized that climate change has significantly affected the sea level and precipitation in the region. In a changing climate, as the sea level rise continues to accelerate in the world and specifically in southwest Florida, the impact of SLR on MFL will need to be fully addressed at some time in the near future. Baseline flow will need to incorporate future SLR and flow conditions, instead of completely relying on averaged long-term historical flows.

District Staff Response:

In our minimum flows report we acknowledge the potential effects of sea level change on the Lower Peace/Shell System. We further note that sea level and climate-related changes are integrated into the hydrologic data used to support development of the proposed minimum flows. As part of our analyses, we have also considered possible future conditions through assessment of potential effects of sea level rise on salinity conditions in the system and Charlotte Harbor.

We anticipate using a similar approach for future minimum flow assessments of the Lower Peace/Shell System, with the expectation that sea-level-rise effects and climatic effects will generally be integrated into the hydrologic data (e.g., stream flows) used for the analyses. Based on our adaptive management approach to minimum flows development, we also anticipate incorporation of any additional, relevant information concerning climatic effects on hydrological data that may become available.

Table 3. Panel Comments on Chapter 1 – Introduction and District Staff Responses.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response
3a	*Formatting of Table 1-1 Improve within cell formatting so text in final column matches up with that in preceding columns*	Table 1-1 was reformatted in the revised, draft minimum flows report to align information contained in the final column with that in the preceding column.
3b	*1.2.1 Remove 's from Florida in title*	We changed "Florida's" to "Florida" in the Section 1.2.1 title in the revised, draft minimum flows report.

Supporting Narrative Panel Comments and District Staff Responses Associated with Table 3

Narrative Panel Comment(s):
The Panel felt that the draft MFL report's Introduction was well developed, and gave the Panel a thorough introduction to the LPR and LSC, as well as the District's responsibilities. As is noted in other parts of this report, the Panel concluded that the definition of significant harm requires a careful discussion, not just of literature that supports proposed guidance criteria, but the diversity of opinions about the topic.

District Staff Response:
We thank the panel for their comments concerning the introduction information included in Chapter 1 of the draft minimum flows report. Regarding our definition of significant harm, please refer to our response 2a in Table 2.

Table 4. Panel Comments on Chapter 2 – Physical and Hydrologic Description and District Staff Responses.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response
4a	*Issues related to clarity of maps and figures, for example, enhancing Figure 2-2 so it is better related/connected to a Google street map for the same area. In addition, river scales are discussed or displayed in both miles and km. Perhaps use both metrics each time.*	Figures 2.2 and 2.3 have been updated in the revised, draft minimum flows report. In addition, an inset map was included in Figure 2.2, and we clarified the purpose of the inset maps in both Figure 2.2 and Figure 2.3. We acknowledge that differing metrics are used to depict distances in maps included in the draft report. Some of the maps are reproductions from other sources and for this reason, we have continued to present maps using both the U.S. Customary and Standard International metrics.
4b	*Question related to LiDAR sources, for example, is 2017 LiDAR data for the region available from the state?*	The LiDAR photogrammetric data collection (Aerial Cartographic of America, Inc. 2015) was conducted primarily to support development of the District's hydrodynamic model for minimum flows development. These data were the best available information of this type in 2016, when the hydrodynamic model was calibrated and validated. State-wide 2019 LiDAR data are currently under review. These and other available data will be considered for use in future evaluations of minimum flows for the Lower Peace/Shell System.
4c	*Use of NGVD29 vs. NAVD88 for elevation and bathymetry data*	Most elevation data and references to elevations in the draft minimum flows report are presented relative to the North American Vertical Datum of 1988 (NAVD88). However, we note that in the descriptive information included in Section 2.1 on page 16 of the draft minimum flows report a

		reference is made to the Peace River originating in an area of Polk County at an elevation of about 100 feet above the National Geodetic Vertical Datum of 1929. We also note that a water surface elevation of 5.0 feet is included in the description of Shell Creek Reservoir in Section 5.5.3 on page 91 of the draft minimum flows report. For development of the hydrodynamic model for Charlotte Harbor, all the variables associated with elevation are referenced to NAVD88.
4d	*Question about the order of MFL development vs. water supply planning efforts*	The development or reevaluation of minimum flows is a relatively lengthy process involving compilation of relevant data, development or refinement of analytical methods and approaches, and coordination with local governments and other affected stakeholders. In addition, the District is typically engaged in the concurrent development of minimum flows for several priority water bodies. For these reasons, there are practical limitations concerning minimum flows development and reevaluation schedules. It is worth noting, however, that minimum flow status assessments are conducted annually, on a five-year basis in conjunction with regional water supply planning, and on an as-needed basis associated with reviews for water use permit applications and renewals. Results from these assessments are part of the District's adaptive management approach to minimum flows development and implementation and can be used to inform decisions regarding the need for minimum flow reevaluation.

4e	*Definition of flow lag*	For the water quality analyses included in the draft minimum flows report, lagged-flows refers to average flows for periods ranging from 2 to 60 days prior to the date of water quality sampling event. Text in Section 3.2.2 in the revised, draft minimum flows report was amended with a parenthetic phrase to clarify what is meant by lagged-flows.
4f	*Consider adding a most recent 10 or 20 year average bar to Figures 2-12 to 2-16 in addition to the one that is the long-term average for POR*	Short term average (2000-2018) flows were added to Figures 2-12 to 2-16 in the revised, draft minimum flows report. Please refer to our response 1g in Table 1 for additional information.
4g	*Discuss the importance of hydrodynamics and hydrodynamic modeling*	The standard format for the District's minimum flow reports involves identification of ecological criteria followed by descriptions of tools used to model or assess the criteria. The hydrodynamic model is identified in the introductory (Chapter 1), where we discuss the substantial data enhancements that were undertaken to improve upon the model that was previously used for development of the existing Lower Peace River minimum flows. To better emphasize the primacy of the hydrodynamic model for our current minimum flows assessments we split the paragraph following the numbered list of major initiatives and updates within Section 1.5 into two paragraphs in the revised, draft minimum flows report, and amended the first of the two paragraphs to clearly indicate that like the previous minimum flows effort, the current effort was based on salinity modeling conducted through hydrodynamic modeling.

		The hydrodynamic model is also notably mentioned in the system description (Chapter 2), water quality (Chapter 3) and resources of concern/modeling tools (Chapter 5) chapters. As noted in our response to comment 5i in Table 5 below, we also amended the brief discussion of the model in the salinity section of Chapter 3 included in the revised draft minimum flows report. We also emphasized the importance of hydrodynamics in a new section (Section 3.2.2) on the pollutant load reduction goal for the Lower Peace River and new text added to the beginning of the descriptive water quality information section (Section 3.3.1). Finally, in Chapter 5 of the revised minimum flows report, the development and application of the UnLESS model to the Charlotte Harbor system has been substantially expanded to include more information on model setup, input data, model calibration and verifications and modeling uncertainty. As noted in the draft minimum flows report, detailed information on the model and its use are also discussed in Chen (2020) which is included as Appendix C to the report.
4h	*Additional and more detailed description of hydrodynamic model elements needed*	Chapter 5 is expanded to include a brief description of the hydrodynamic model for Charlotte Harbor. Please also refer to our response 4g in this table.

Supporting Narrative Panel Comments and District Staff Responses Associated with Table 4

Narrative Panel Comment(s):
Figures 2-2 and 2-3 could be made clearer and easier to read. And the use of “%” should be used rather than “percent’ to shorten the report.

District Staff Response:

Please refer to response 4a in Table 4 for our response concerning Figures 2-2 and 2-3. With regard to using "%" vs. "percent" or "percentage", we used "%" when referring to a specific numeric value, retained "percent" in "percent-of-flow" terminology, and retained "percentage" when referring to values generally, when specific numeric values were not being described.

Narrative Panel Comment(s):

More substantively, the elevation and bathymetry data appear to be compromised to some extent by the use of both NGVD29 and NAVD88 as datums for elevation, as tied to LiDAR and the development of the hydrologic model.

District Staff Response:

Please refer to response 4c in Table 4 for our response to this comment.

Narrative Panel Comment(s):

The Panel felt that the draft MFL should more clearly describe the timeline of development of MFL guidance, as it relates to water supply. As MFLs must take into consideration existing water supply needs, the timing of the development of water supply plans and MFLs could be addressed earlier and more succinctly in the draft MFL report.

District Staff Response:

Please refer to response 4d in Table 4 to these comments.

Narrative Panel Comment(s):

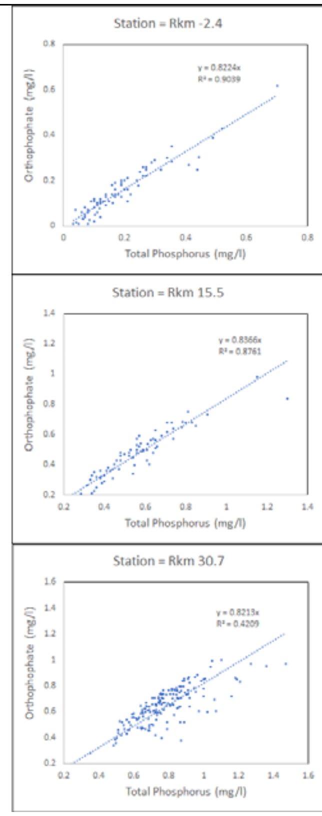
As important as the hydrologic and hydrodynamic models are, the Panel felt that they could have been described in greater detail earlier in the draft report. While the hydrodynamic model is viewed as a substantial improvement from the work included in the 2010 MFL report, the hydrologic model has limitations related to those portions of the watershed located downstream of gages. Also, and touched on later, the factors that account for the conclusion that a result of groundwater withdrawals is a reduction in baseflow in parts of the Peace River watershed, but an increase in baseflow in locations such as Joshua Creek – those factors should be discussed in greater detail. The assumptions and data limitations associated with quantifying the water budget from both ungauged and gauged sources should be more clearly discussed.

District Staff Response:

Please refer to responses 1f in Table 1, 4g and 4h in Table 4, 5i and 5j in Table 5, and 7c, 7k and 7l in Table 7 for our responses to these comments.

Table 5. Panel Comments on Chapter 3 – Water Quality and District Staff Responses.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response
5a	*Salinity data presented in Figure 3-3 not that helpful*	We note that variability in the salinity data presented in Figure 3-3 can be attributed to seasonal, inter-annual variation and other factors. However, as noted in the report text associated with the figure, we think the figure is helpful in portraying longitudinal and seasonal salinity variation in the Lower Peace River as well as salinity differences in the water column at selected sites.
5b	*Influences of factors other than flow on concentrations of chlorophyll a*	We added additional text in Section 3.3.1.3 of the revised, draft minimum flows report.
5c	*Values of phosphorus only shown for orthophosphorus*	Total phosphorus measurement for the Hydrobiological Monitoring Program (HBMP) was terminated in 2003. We investigated our use of ortho-phosphorus vs. total phosphorus by conducting scatterplot analyses for data from 5 stations for the period 1996 through 2003. As indicated in the figures below, about 81-88% of total phosphorus is attributed to ortho-phosphorus, suggesting that results expected for total phosphorus may generally be similar to those determined for ortho-phosphorus.

		 We included information concerning the current measurement of ortho-phosphorus for the Peace River HBMP and the correlation between orthophosphorus and total phosphorus in Section 3.3.1.1.5 of the revised, draft minimum flows report.
5d	*Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite*	We added results for total nitrogen to Section 3.3.1.4.
5e	*Definition needed for "flow-lag"*	Please see response 4e in Table 4 for our response to this comment.
5f	*Various figures have legends that appear to be mislabeled*	Numerous figure legends were corrected in the revised, draft minimum flows report.
5g	*Figure 3-22 caption says it is dissolved oxygen, but y-axis says chl a*	The Figure 3-22 caption was corrected in the revised, draft minimum flows report to indicate that the plot shows chlorophyll concentrations.

5h	*Mislabeling of y-axis on Figure 3.23*	The y-axis label for Figure 3-23 was changed from “Salinity (PSU)” to “Chlorophyll” in the revised, draft minimum flows report.
5i	*Importance of hydrodynamic model description*	We agree that description of the hydrodynamic model and its primacy for the analyses presented in our draft minimum flows report should be emphasized. As noted in response 4g in Table 4, we modified text in Section 1.5 of revised minimum flows report to emphasize our prior and current use of hydrodynamic modeling to support minimum flows development for the Lower Peace River and Lower Shell Creek. In addition, we substantially expanded the presentation of model information included in Chapter 5. We also think it is appropriate to discuss the development and use of a hydrodynamic model for assessing flow-related changes in salinity in the Lower Peace/Shell System in Section 3.3.2.1 of the draft minimum flows report, which addresses system salinity. Our mention of the hydrodynamic model in the water quality chapter (Chapter 3) in the original draft report, and additional related text added to the revised draft report serve as another useful preview of the more detailed discussion of the model in Chapter 5 and the referenced model report, Chen (2020), included in the report appendices. We also note that within Section 2.3.2.1 of the revised, draft minimum flows report, we substantially modified the text to emphasize our efforts to develop and use the best available information, in this case the hydrodynamic model, for minimum flows development.

5j	*Additional and more detailed description of hydrodynamic model elements needed*	In addition to modifications to the text in Section 3.2.2.1 of the draft, revised minimum flows report noted in our previous response 5i in this table, we also amended text associated with the model in Chapter 5 and in the model report (Chen 2020) included as Appendix C to the report.
5k	*More refined explanation needed for isohaline location trend analyses*	Please refer to response 5o in this table.
5l	*Better description of results shown Figures 3-12 to 3-16*	To improve presentation of the correlation analyses results presented in Figures 3-12 through 3-16, we amended the figure captions within Sections 3.3.2.2 through 3.3.2.5 of the revised, draft minimum flows report. We also modified the statistical methods description included in Section 3.3.2 to better describe the lagged-flows used in the analysis and to summarize our interpretation of the correlation statistics derived from the analyses and presented in Figure 3-12 through 3-16.
5m	*Value of developing dynamic water quality model, vs. empirical approaches*	As noted in response 1j in Table 1 we understand the potential value of a dynamic water quality model for the Lower Peace/Shell System, but do not think development of such a model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. See response 1j for additional information concerning our response.
5n	*Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC,*	Lower Shell Creek and Lower Peace River flows were combined for depiction of the flow-salinity relationships for Stations 6.6 and 15.5 in Figure 3-11 in the revised, draft minimum flows report. In addition, the figure

	but flows from the LSC are not included	caption and associated text within Section 3.3.2.1 of the revised, draft minimum flows report were updated.
5o	*Table 3-1 – improve explanation of location of isohaline location trends*	We note that the text on page 47 preceding and which refers to Table 3-1 indicates the trend analysis identified an upstream movement of the 0 psu and 20 psu isohalines for period from 1984 through 2016. To improve understanding of the information presented in the table, we added a footnote to Table 3-1 in the revised draft minimum flows report to characterize our interpretation of the presented, significant statistics, i.e., that positive, significant statistics indicate upstream isohaline movement. While revising Table 3-1, we determined that changes to clarify the presented statistical results and better indicate that the results pertain to the Lower Peace River (and in some cases Charlotte Harbor near the mouth of the river) were needed for several other tables and figure within Chapter 3. So, we revised captions and/or footnotes for several additional tables and figures in the revised draft minimum flows report, including Tables, 3-2, 3-3, 3-4 3-5, 3-6 and 3-7, and Figures 3-3, 3-4, 3-5,3-6, 3-7, 3-8, 3-9 and 3-10.
5p	*Table 3-2 ,3, 4 to 3-7 and 3-12 to 3-16 – improve explanation of summertime hypoxia development and other data presentations*	The text in Section 3.3.1.2 preceding Table 3-2 notes the trend analysis indicated dissolved oxygen concentrations in surface waters associated with the 0 psu isohaline increased for period from 1984 through 2016. We do not think the information presented in the table can be used to assert there is no hypoxia in surface waters of the Lower Peace River during the wet, summer season.

		However, as noted in responses 5i and 5o in this table, we amended the captions, column headers, and/or footnotes for Tables 3-2, 3-3, 3-4 through 3-7 and Figures 3-12 through 3-16 within the revised, draft minimum flows report. We also updated the statistical methods description included in Section 3.3.2 within the revised, draft minimum flows report to enhance presentation of the results.

Supporting Narrative Panel Comments and District Staff Responses Associated with Table 5

Narrative Panel Comment(s):
The Panel felt that some of the figures in the draft MFL were not overly useful, or could benefit from restructuring. For example, Figure 3-3 shows the variability in levels of salinity at various locations in the LPR. However, the analyses were conducted on 40 years of data, and variability could be due to seasonal variability, inter-annual variability, or some combination of both. Figure 3-3 is not entirely clear, as to what it is meant to convey to the reader. Suggestions were raised as to how the data could be displayed to address these concerns. For example, additional box and whisker plots could be displayed for pre and post MFL salinity data would be informative for the reader. Similar modifications could be make [sic: made] for DO (Figure 3-4) and chlorophyll-a (Figure 3-5), nitrogen (Figure 3-7) and phosphorus (Figure 3-8).

District Staff Response:
We agree that variability in the salinity data presented in Figure 3-3 could be attributed to seasonal, inter-annual variation and other factors. However, as noted in the report text associated with the figure, we think the figure is helpful in portraying longitudinal and seasonal salinity variation in the Lower Peace River as well as salinity differences in the water column at selected sites.

Janicki Environmental, Inc. (2019) performed a time-series analysis for each water quality constituent at each monitoring station, with particular emphasis on distinguishing between the effects of periods prior to and after implementation associated with implementation of the currently established minimum flows, by separating data collected before and after January 1, 2011. The evaluation showed no significant deleterious alteration of any water quality constituent.

They also supplied time series plots for constituents over time within their report (pp. 35-39 of JEI, Inc. [2019], which is included as an appendix to the draft minimum flows report) and the appendices of their report (Appendix F and G), which the panel may be directed to for further information. From evaluation of the time series plots, the relatively large error bars shown in the box and whisker plots likely reflect seasonal variation, rather than significant inter-annual variation. Further analysis of temporal variation by smaller subsets of years is unlikely to yield additional informative results.

Narrative Panel Comment(s):
Related to this issue, Figures 3-12 to 3-16 are confusing, as the label on the y-axis does not match what the draft MFL report suggests is displayed. This likely is a result of a "short cut" in terms of description of what the graphics are intended to display. A more detailed description of the intent of the figures (what they are meant to convey) would be useful, as they currently are confusing to the reader.

District Staff Response:
Please refer to response 5l in Table 5 for our response to this comment.

Narrative Panel Comment(s):
The draft MFL report seems to focus on flows and residence time, as an influence on concentrations of chlorophyll a. While this is a worthwhile issue to investigate, several decades of work on the LPR and upper Charlotte Harbor have indicated that the amount of colored dissolved organic matter (CDOM) in the system is likely a key consideration. As well, the role – if any – of zooplankton grazing should be at least mentioned as an additional moderating influence on chlorophyll-a concentrations.

District Staff Response:
Please see response 5b in Table 5 for our response to this comment.

Narrative Panel Comment(s):
This section includes analyses on water quality variables that need additional attention. For example, Section 3.3.1.3 on "chlorophyll" does not specify that the analyses refer to chlorophyll-a that is corrected for the presence of phaeophytin. The state of Florida's regulatory programs for water quality no longer accept un-corrected chlorophyll-a for analysis. If the water quality data sets used for analysis were not corrected for phaeophytin, they are of limited value for comparison with other systems and with relevant regulatory criteria. The reader should not have to search in the appendices to determine what the word "chlorophyll" refers to.

District Staff Response:
On page 49, paragraph 2 of our original, draft minimum flows report we note that "[f]or, simplicity, in this report, chlorophyll a is denoted as chlorophyll." Also, page 43 of

Appendix F to the draft minimum flows report states "[t]he HBMP data are reported as uncorrected Chlorophyll."

Section 3.3.1.3 of the revised, draft minimum flows report was updated to include additional text that clarifies the chlorophyll data that were analyzed and discussed.

<u>Narrative Panel Comment(s):</u>
The draft MFL reports on "Ortho-phosphorus" which likely refers to concentrations of orthophosphate, not Total Phosphorus. Orthophosphorus appears to be a bit of technical jargon short cut for orthophosphate, which is the dissolved inorganic form of phosphorus. While this could represent 90% of the total pool of phosphorus, it could also represent a substantially smaller percentage. The suggestion made by the Panel is to conduct analyses on those stations and data sets that have total phosphorus, as that is the most complete form of nutrient content, and is also the nutrient form for which FDEP's NNC criteria have been developed.

<u>District Staff Response:</u>
Please refer to response 5c in Table 5 for our response to these comments.

<u>Narrative Panel Comment(s):</u>
The draft MFL report discuses status and trends in both TKN and nitrate plus nitrite, but does not add the two together to calculate the abundance of Total Nitrogen. Since Total Nitrogen is the form of nutrient that is most complete, and is the form of nitrogen in FDEP's NNC criteria, and the form that is involved in the PLRG for Charlotte Harbor, these using Total Nitrogen, not TKN and nitrate plus nitrite.

<u>District Staff Response:</u>
As noted in response 5d in Table 5, information on Total Nitrogen was added to the revised, draft minimum flows report.

<u>Narrative Panel Comment(s):</u>
When exploring empirical relationships between LPR flows and salinity in the LPR, it should be noted that two of the stations involved in those assessments are located below the confluence of the LSC. On an annual basis, LSC flows average about 20 to 30% of the flow of the LPR. Therefore, not including LSC flows in the flow vs. salinity empirical relationships could limit the explanatory power of the derived relationships.

<u>District Staff Response:</u>
We agree. As noted in response 5n in Table 5, Shell Creek flows were combined with Lower Peace River flows the for stations at and below the confluence of Shell Creek and the Peace River.

Narrative Panel Comment(s):

The Panel also suggested the District consider the value of a mechanistic water quality model for the LSC, LPR and Upper Charlotte Harbor. Such a mechanistic model, although my not be [sic: not] necessary for the MFL for LPR and LSC, should benefit a variety of water management decisions on the Charlotte Harbor estuarine-riverine system by the District. The Panel, however, recognizes that developing such a model would require addressing the influences of factors and parameters that may or may not have been adequately understood/quantified and more data may be needed.

District Staff Response:

As indicated in response 5m in Table 5, please refer to response1j in Table 1 for our response to this comment.

Narrative Panel Comment(s):

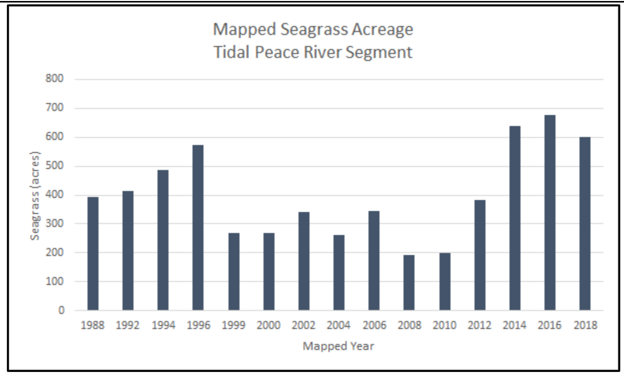
Hypoxia was mentioned numerous times in the report and during our discussions. It would be good to have a more comprehensive discussion in the report on the naturally-occurring as well as non-naturally-occurring hypoxia, how they impact the Charlotte Harbor system, how they are influenced by the high flow from Peace River (e.g., what rate of flow triggers hypoxia? 20000 cfs? 1000 cfs?), and how will they be affected by the MFL.

District Staff Response:

Please see response 1i in Table 1, response 2g in Table 2 and response 5p in Table 5.

Table 6. Panel Comments on Chapter 4 – Ecological Resources and District Staff Responses.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response
6a	*Plant community data set from 1998 is problematic*	We are not aware of any recent, comprehensive, species or genus-level vegetation maps for the Lower Peace/Shell System that would represent an update to the detailed information presented in Figure 4-1 in the original, draft minimum flows report. However, we developed and included a replacement, coarser-level vegetation map based on the 2017 SWFWMD land use/cover GIS layers in the revised, draft minimum flows report. In addition, we anticipate considering vegetation data collection and mapping needs for future evaluations of the system.
6b	*Status and trends in seagrass coverage in the LPR over time*	The District has been mapping seagrasses in Charlotte Harbor using aerial photography since 1988. Others have attempted to use older imagery to infer historical seagrass extent, but with very limited success. For the Tidal Peace River segment of Charlotte Harbor, recent seagrass extent (estimated for 2014, 2016 and 2018) is greater today than any time since 1988, as shown below.

		 We included this figure and associated text in Section 4.1.5 of the revised, draft minimum flows report to augment the presented seagrass information.
6c	*Concern over shift in HBMP focus to physical factors, rather than fish communities, macroinvertebrates, and/or macroalgae*	In 1996, the Charlotte Harbor Hydrobiological Monitoring Program (HBMP) Scientific Review Panel reviewed the ongoing elements of the HBMP program and recommended several changes to the monitoring program study elements. The Panel recommended that HBMP monitoring should primarily focus on assessing long-term trends in key physical, chemical, and biological characteristics that can be directly linked to potential effects associated with withdrawals at the Peace River Manasota Regional Water Supply Authority's Peace River Facility. They also noted that less effort should be focused on indirect biological indicators that are not intended to evaluate influence of withdrawals, once a baseline level of information has been collected. As summarized in Appendix A of the Peace River Hydrobiological Monitoring Program 2016 HBMP Comprehensive Report (JEI 2017), subsequent meetings of the HBMP Scientific Review panel have continued to shape the current HBMP. Reference to this summary document has been included in Section 3.3.1 of the revised, draft minimum

		flows report to provide additional information concerning the evolution of the HBMP. We think the biological and other information collected to date and summarized in our draft minimum flows report is sufficient for development of recommended minimum flows for the Lower Peace/Shell System. We note that this information has been collected in support of the required HBMP, other monitoring programs, and studies specifically undertaken by the District to directly support minimum flows development. However, in support of our adaptive management approach to minimum flows development and implementation, we continue to support ongoing data collection efforts for the Lower Peace/Shell system and will consider additional sampling and analysis of biological data as needed, for future minimum flow reevaluations.
6d	*Fisheries Independent Monitoring newest data from 2016 not included in the modeling approach (Appendix E) or compared to data collected through 2013*	At the time of model development, the best available data were used. However, consideration of more recent data has been requested from the Florida Fish and Wildlife Conservation Commission (FWC) and a comparison of abundance of the taxa and size classes examined in this model will be performed to determine if there are any significant differences between modeled years and more recent sampling years. Results from this analysis will be included in future updates to the draft minimum flows report. As noted in Section 4.2.1 of the draft minimum flows report, Call et al., (2013) performed a survey on fish communities

		within the Lower Peace River throughout 2007 to 2010 and found no temporal variation in fish communities across years, suggesting a generally stable system within the river. To augment presentation of information on the fish assemblage in the Lower Peace/Shell System, the descriptive FWC Fisheries-Independent Monitoring data from 2016 presented in Section 4.2.1 of our original draft minimum flows report has been replaced with the most recent available data (2018) in the revised, draft minimum flows report.
6e	*Should endangered species, such as sawfish and manatees, be included in MFL assessments?*	Endangered and listed species should be and are considered when developing minimum flows. For example, in Section 4.2.1 of the draft minimum flows report we noted that juvenile sawfish (<3 years of age) are able to move in response to salinity fluctuations with high site fidelity upon a return to baseline conditions, with large-scale movement most notable after significant freshwater inflow (>500 cubic meters per second) from tropical disturbances (Poulakis 2016). We also noted that Sawfish movements examined in the Caloosahatchee River demonstrate downstream movement when salinities approach 0 psu and upstream movement at salinities approaching 30 psu (Poulakis 2013). Therefore, protection of the sensitive salinity habitat would not positively affect their distribution, although maintenance of natural freshwater flows would benefit their capacity to locate nursery grounds (Poulakis 2016). Further we note that the species chosen for the HSM modeling used to support our

		minimum flow analyses reflect those with affinities for low salinity habitats. A strong positive correlation between Common Snook (*Centropomus undecimalis*) abundance and flow was observed in the Lower Peace River (Blewett 2017). Body condition was also elevated during years of increased river flow. This increased abundance and condition with increased flow was hypothesized to be related to enhanced prey availability with greater floodplain inundation. Per the floodplain inundation analysis performed by HSW (2016) in support of our minimum flows work (Appendix D), the proposed minimum flows will not significantly impact total inundated floodplain wetland area associated with the baseline flow condition, and are therefore unlikely to impact the abundance or condition of Common Snook. For development of minimum flows for river systems or creeks dominated by spring flow we typically consider manatee usage of thermal refuges during acute and chronic cold-water events. Given the lack of spring discharge to the Lower Peace/Shell system we do not think assessment of potential, flow-related changes in thermally-favorable habitat usage by manatees is necessary for our development of minimum flows for the river and creek.
6f	*In Appendix E it is stated that "predicted CPUE grids" were derived from catch data and these predictions were used to generate the population estimates which were used*	Catch-per-unit-effort (CPUE) is a direct calculation from Florida Fish and Wildlife Conservation Commission's Fisheries Independent Monitoring (FIM) catch data, standardized to the gear type used. These data, all the data used for development of the habitat suitability models (HSMs), and the modeling results were considered the

	to model the effect of water withdrawals	best available information at the time for support of the development of the proposed minimum flows. The fish population modeling using habitat suitability was not used as a criterion for development of the proposed minimum flows, rather it was used for consideration of potential effects of implementation of the proposed minimum flows on representative, important taxa populating the system. Because the model does not incorporate some factors, such as competition, predation and fishing pressure that can affect fish and invertebrate distributions, we used the model to assess how habitat suitability zones simulated under baseline condition would change with implementation of the proposed minimum flows. Like all models, the habitat models that we used to assess habitat suitability for several estuarine taxa, include limitations. We augmented Section 5.3.3 in the revised, draft minimum flows report to fully discuss these limitations and modeling uncertainties. However, we continue to think the HSMs developed to support our minimum flows work are well suited for consideration of potential changes in habitat suitability between the baseline flow condition and reduced flow conditions. Regarding this potential habitat change assessment, we note that the flow reduction scenario assessed in support of our minimum flows analyses actually exceeds the allowable flow reductions prescribed by the minimum flows that are proposed for the Lower

		Peace River/Shell System. A maximum withdrawal limit was not included or used to develop the “minimum flows” scenario used to characterize habitat suitability with the HSM under reduced flow conditions. The HSMs, in their current or an enhanced form may be used for future minimum flow evaluations for the Lower Peace River and Lower Shell Creek. They would likely not be used if alternative tools that provide superior information were to become available.
6g	*Figure 4-2 difficult to review due color choices*	Figure 4-2 was reformatted for the revised, draft minimum flows report to improve clarity.
6h	*Explain “decreased flow may also contribute to increases in dissolved oxygen concentrations”. Add your response to p.76 of the report.*	Potential relationships between decreased flows and oxygen concentrations are explained in the papers cited in Section 4.2 of the draft minimum flows report, and we think these relationships are adequately summarized in the section. However, we acknowledge that additional, potential effects of decreased flows could include those associated with an increase in the influence of tidal fluctuations which can lead to the formation of a well-mixed system. Also, if sediment loads from the watershed decrease as a function of reduced flows, water clarity could increase, leading to an increase in primary production. We included additional text associated with these factors in the last paragraph of Section 4.2 of the revised, draft minimum flows report, and split the paragraph into two paragraphs to improve readability of the text.

Supporting Narrative Panel Comments and District Staff Responses Associated with Table 6

Narrative Panel Comment(s):

The Panel was concerned about the reasonableness of analyses related to plant communities that were last quantified in 1998. It is not known to the Panel if the physical locations of various plant communities have changed over time since 1988, although 22 years of sea level rise could result in migration of some communities upstream, in response to increased marine influence.

District Staff Response:

As noted in response 6a in Table 6, we updated the general vegetation cover map in the revised, draft minimum flows report.

Narrative Panel Comment(s):

Members of the Panel would like the draft MFL report to more thoroughly discuss the reason(s) why biotic variables such as fish abundance, macroinvertebrates, and/or macroalgae are not currently monitored to the same extent as they were in past years. A more detailed description of the relationship between the Hydro-biological Monitoring Program (HBMP), guidance from the HBMP review committee, and the data set used to develop the draft MFL would be helpful.

District Staff Response:

Please refer to comment 6c in Table 6 for our response to these comments.

Narrative Panel Comment(s):

The Panel observed the levels of extrapolation involved in using HSM (habitat suitability modeling) to determine the effects of minimum flow conditions on the seven fish and one commercially important invertebrate. Populations were estimated and then effects on these estimated populations via changes in environmental conditions (temperature and salinity only) were modeled.

District Staff Response:

Please refer to comment 6f in Table 6 for our response to this comment.

Narrative Panel Comment(s):

Questions related to the relative use (if any) by listed species should be considered, especially as how they were included (sawfish) in the proposed MFL for the Caloosahatchee River. The report could be a little more detailed/specific about the relationship of sawfish lifestages to salinity/freshwater flows. It might be helpful to NOT include rarely occurring species in the development of MFL guidance, but the draft MFL *should at least include language that suggests why the decision to not include them is an appropriate decision.*

<u>District Staff Response:</u>
Please refer to comment 6e in Table 6 for our response to these comments.

Table 7. Panel Comments on Chapter 5 – Resources of Concern and Modeling Tools, and District Staff Responses.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response
7a	*Figure 5-1 could be more clearly identified as to what the graphics are meant to represent, in terms of "exceedance"*	Figure 5-1 shows mismatch of fixed-date blocks using a long flow record (1950- 2014) and short flow record (2007- 2014) based on 75% exceedance (red dashed line) and 50% exceedance (blue dashed line). This is the reason for the change from date-based to flow-based blocks that are depicted in Figure 5-2.
7b	*Timeframe and data sources used to develop the hydrodynamic model*	The timeframe used for the hydrodynamic model is briefly described in Section 5.5.1 and in Appendix C. Sources of bathymetric LiDAR and tide data are described in Sections 2.4 and 2.6. Flows are briefly described in Section 2.7 and Sections 5.3.2 and 5.3.3. More information about the hydrodynamic model was added in Section 5.5.1 of the revised, draft minimum flows report.
7c	*Need to understand basis for variation in baseflow differences over different time periods*	Baseline flow from 1994 through 2006 was used with the PRIM model to simulate groundwater withdrawals and land use change impacts on Peace River flows. Baseline flow from 2007 through 2014, seasonally-corrected based on PRIM model run output, was used with the hydrodynamic model to simulate salinity, depth and water temperature in the Lower Peace/Shell System and Charlotte Harbor. Baseline flow from 1950 through 2014 was used for comparison against gaged flow data for minimum flows status assessment, after seasonal correction has been made to gaged data based on the output of the PRIM model. Please see Section 7.1 and Table 7.1 in the revised, draft minimum flows report for additional information.

7d	*Further clarify the meaning of "transitional flow triggers", using simple terminology such as "safety valves" to explain concept.*	The currently adopted Lower Peace River minimum flows are based on calendar date-based blocks, and a transitional "flow trigger" (625 cfs) was required when high flows remained depressed due to climatological conditions. The newly proposed minimum flows for the Lower Peace River were developed using flow-based blocks that include flows of 297 cfs and 622 cfs that respectively represent transitions between low to medium and medium to high flows. Similarly, flow transitions for the proposed minimum flows for Lower Shell Creek are 56 cfs and 137 cfs, respectively. Given that the proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed for flow-based blocks associated with transitions from low to medium to high flows, the identification of additional flow triggers" as a "safety valve" to account for out-of-season flows is not necessary.
7e	*Helpful to include a graphical display of residence time/flushing rates*	We agree that transport timescales are useful for discussion of flow effects on dissolved oxygen concentrations and other environmental factors. In our future evaluations of dissolved oxygen and eutrophication in the Lower Peace/Shell System and Upper Charlotte Harbor, we will consider discussion and presentation of transport timescales information.
7f	*Language related to impacts of hurricanes based on model runs*	For the minimum flow analyses, the hydrodynamic model was run from 2007 through 2014, a period which included major storm and drought events but not hurricanes. In response to this question, we also think it is useful to note that minimum flows are to be established as the limit beyond which further

		withdrawals would be significantly harmful to the water resources or ecology of the area. Therefore, in the case of extreme high-flow conditions associated with hurricanes and other major storm events, achieving a minimum flow requirement is not anticipated to be an issue. We add, however, that District rules allow for the consideration of public health and safety for implementation of all District rules and policies.
7g	*Request for more information related to the hydrodynamic model, including consider the possibility of adding a short chapter which gives a holistic overview on the role of hydrodynamics (flow and water level, salinity, temperature, flushing) on water quality, ecology and fishery.*	Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.
7h	*Limitations of hydrologic model in ungaged portions of the watershed should be discussed in more detail*	Please refer to response 1f in Table 1 for our response to this comment.
7i	*Suggested development of a dynamic water quality model, vs. empirical approaches*	Please refer to comment 1j in Table 1 for our response to this comment.
7j	*Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed*	Baseline flow for Lower Peace River was estimated based on Peace River Integrated Model (PRIM) outputs. Charlie Creek was simply used as a reference for a multi-decadal comparison of historical flows. The justification for this use of data from Charlie Creek is based on information presented in PB&J (2007) and trend analysis described in Section 5.3.1 of the minimum flows report.

7k	*Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations*	As noted in Section 5.3.1, the Peace River Integrated Model (PRIM) was used to investigate effects of climate variability, groundwater pumping, land use changes and other factors on flows in the Peace River. Also, as noted in the report section, flow reductions and increases for differing portions of the watershed are predicted based on the distribution of existing withdrawals, differing degrees of agricultural return flows from groundwater pumping due partly to the tighter confinement on the upper Floridan Aquifer in the lower Peace River area, and differing amounts of excess baseflow associated with agricultural withdrawals. As recommended by the peer review panel, a monthly trend analysis has been conducted and the discussion in Section 5.3.1 of the revised, draft minimum flows report has been updated to indicate why groundwater withdrawals are associated with flow decreases in the Upper Peace watershed and some flow increases in Lower Peace region.
7l	*Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed*	For development of baseline flow record used in the minimum flow analyses, irrigation efficiencies of 60 and 85% for row crops and citrus, respectively, were used to adjust Shell Creek flows by accounting for groundwater discharge that resulted from agricultural practices in the Shell Creek watershed. These assumed efficiencies are the same as those that were identified in the District's 2010 report on proposed minimum flows for the Lower Peace River and Lower Shell Creek.

		As mentioned in the revised, draft minimum flows report in Section 5.3.3, the rates and periods of application were taken from the University of Florida Institute of Food and Agricultural Sciences (IFAS) recommendations for nearby Manatee County.
7m	*Logic for not including a maximum diversion quantity for LSC is not clear*	Please refer to response 2i in Table 2.
7n	*Basis for 15% as threshold for “significant harm” needs more detail*	Please refer to the “Table 1 - Supporting Narrative Panel Comment and District Staff Responses” section above for our response to this comment.

Supporting Narrative Panel Comments and District Staff Responses Associated with Table 7

Narrative Panel Comment(s):
Members of the Panel felt that data limitations associated with various aspects and algorithms of the hydrologic model should be better addressed. Differences in baseflow during different time periods, for different sub-basins, require more detailed discussion.

These issues are particularly important for those portions of the LPR and LSC watershed that are downstream of USGS gage sites. Even for locations that are in gaged portions of the LPR and LSC watersheds, the following issues should be discussed in greater detail:

- *Why is it expected that some parts of the LPR watershed would have reduced baseflow with increased groundwater withdrawals, while other areas would have increased baseflow?*

District Staff Response:
Please refer to response 7k in Table 7 above for our response to this comment.

- *If Charlie Creek’s hydrologic yield (cfs/square mile) during 1950 to 1969 is a good reference condition, why is that? Is this due to the characteristics of the watershed being more “natural” than other locations at other times?*

District Staff Response:
Please refer to response 7j in Table 7 above for our response to this comment.

- *As the algorithms in the PRIM modeling effort are important for the hydrologic model development, it should be more clearly stated where relevant algorithms came from, lest a reader conclude that the algorithms were developed after the model runs, as opposed to the algorithms perhaps being <u>modified</u> from default values during the calibration phase of model development.*

<u>District Staff Response:</u>
We agree. We only included the final PRIM report (2012) on predictive model simulation results in the appendices to the draft minimum flows report. There are two other PRIM reports (2008 and 2011) that briefly describe the sources of data information, model structure and assumptions, as well as calibration and validation results. If necessary, we can provide the reports to the review panel and as appropriate consider citing them in the revised, draft minimum flows report.

<u>Narrative Panel Comment(s):</u>
The Panel noted that in the last MFL report (2010) the hydrologic model greatly over-estimated the ungaged flow from the watershed into the LPR and Charlotte Harbor, which seems to have been acknowledged by the District.

<u>District Staff Response:</u>
We agree that we have acknowledged and addressed this issue with the original hydrodynamic model used for establishing the currently adopted minimum flows for the Lower Peace River. For some of the ungaged watersheds, we have used a drainage ratio method using nearby gaged data and reduced the over-estimation. As noted in response 7h in Table 7, our response to this comment is include in response 1f in Table 1.

<u>Narrative Panel Comment(s):</u>
Portions of this chapter appear to be internally inconsistent. For example, Table 5-1 displays result of a Seasonal Kendall Tau test that found no monotonic trends over time for flows in Joshua Creek, and yet figures and text in the same section refer to the observed increases in dry season flows during the period of April to May as being evidence of an anthropogenic influence on dry season flows. The District should consider that the use of a Seasonal Kendall Tau test can give results at odds with an examination of flow data on a monthly time step, and consider a flow analysis on the monthly time step most useful for their discussion and later model development.

<u>District Staff Response:</u>
We agree. Trend analysis using monthly time-step has been conducted. Information associated with this analysis and new results have been added to Section 5.3.1 of the revised, draft minimum flows report.

Narrative Panel Comment(s):

As was noted in earlier sections, the basis for there not being a maximum flow diversion threshold for the LSC, while such a value (400 cfs) exists for the LPR should be better explained. While the Panel realizes that the District is currently working to develop a recovery strategy for low flow conditions for the LSC, this issue relates to high flows, and the Panel does not yet understand why a similar maximum flow diversion threshold could not be developed for the LSC, particularly for times when inflows to the reservoir are matched (or nearly so) by outflows into the LSC from the reservoir.

District Staff Response:

Please see response 2i in Table 2 for our response to this comment.

Narrative Panel Comment(s):

As was noted elsewhere, the draft MFL report should further develop the reason(s) why a 15% reduction in the salinity-habitat metric is considered to not be problematic, vs. other thresholds.

District Staff Response:

Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.

Table 8. Panel Comments on Chapter 6 – Recommended Minimum Flow Values and District staff Responses.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response
8a	*Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?*	Yes. The 400 cfs maximum withdrawal for the Lower Peace River is applicable at all times. The only exceptions would occur during a period defined by a policy decision or directive of the District Governing Board, or an Order issued by the District's Executive Director. We further note that hurricanes and king tides are extreme hydrological events and we do not expect PRMRWSA to withdraw water during these events, especially during hurricanes.
8b	*Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades*	Please refer to response 1l and 2j for our responses to this comment.
8c	*Logic for not including a maximum diversion quantity for LSC is not clear*	Please refer to response 2i in Table 2.
8d	*15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable*	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.

Supporting Narrative Panel Comments and District Staff Responses Associated with Table 8

Narrative Panel Comment(s):
Many of the Panel's comments related to Chapter 6 and the proposed MFL values had been made in earlier portions of this Panel draft report. These include the following main features:

- *The shift from calendar-based to flow-based thresholds is to be commended*

District Staff Response:
We thank the panel for this comment.

- *Issues with the various algorithms and model components for the hydrologic model should be discussed in greater detail*

District Staff Response:
We updated the revised, draft minimum flows report to clearly address uncertainty issues associated with development and use of the UnLESS hydrodynamic model and other models for salinity habitat assessment (see Section 5.1.1.4), floodplain inundation (see Section 5.5.2) and fish and invertebrate habitat suitability modeling (see Section 5.5.3).

- *The District's logic for relying on a 15% change in habitat as being protective of "significant harm" should be elaborated on, and concerns related to why other techniques did not give rise to locally-relevant threshold guidance should be made more clearly'*

District Staff Response:
Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.

- *The lack of a maximum flow diversion threshold for the LSC seems to be a function of a somewhat arbitrary truncation of the area of concern to that portion of the LSC upstream from its confluence with the LPR. No such restriction is placed on the LPR, which has a 400 cfs maximum diversion threshold which appears to be protective of portions of Charlotte Harbor beyond the downstream boundary of the LPR alone.*

District Staff Response:
Please refer to response 2i in Table 2.

Narrative Panel Comment(s):
In addition to previously raised concerns, the Panel felt that incorporating sea level rise scenarios was very useful, but that the more recent values derived by NOAA would be the most appropriate values to use.

District Staff Response:
Please refer to response 1l and 2j for our responses to this comment.

Table 9. Panel-identified Typos and Comments on Various Appendices and District Staff Responses.

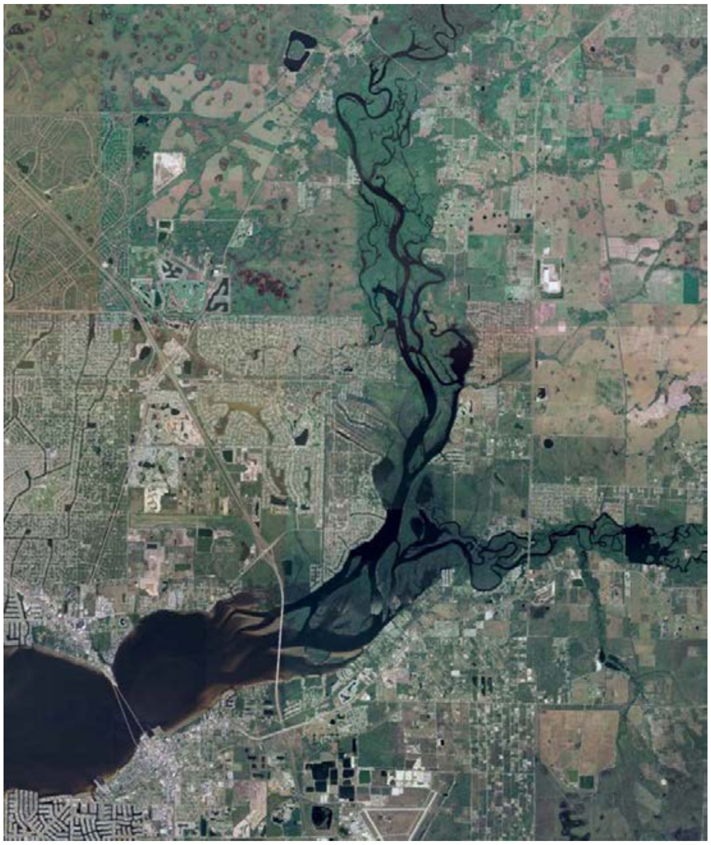
Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response
9a	*Appendix E – page 7 – typo*	The incorrect usage of the acronym "BF" to refer to the Baseline flow condition used for the habitat suitability modeling will be corrected to "BL" in the appendix or an errata sheet will be added to the appendix to identify the typographical error.
9b	*Section 5.1 – typo*	The misspelling of "indicators" in Section 5.1 was corrected in the revised, draft minimum flows report.
9c	*Page 88 – typo – add "on data from a 13-year period"*	We were not able to determine where to add the identified phrase to the report. We will seek further panel guidance to help address this comment.
9d	*Page 96 – typo, first sentence "result in"*	We corrected this typo (i.e., changed "resulting" to "result in") in the first numbered item listed in Section 5.4 of the revised, draft minimum flows report.
9e	*Page 98 – clarification needed*	We were not able to determine where clarification was needed on this page of the report. We will seek further panel guidance to help address this comment.
9f	*Page 113 – "psu" missing from first sentence of second paragraph, also change spacing*	We included the missing "psu" metric in the first sentence of the paragraph after Table 6-4 within Section 6.3 of the revised, draft minimum flows report. We did not, however, note any spacing issues on the section page.
9g	*Appendix C should be a separate chapter*	Instead of creating a new report chapter, we chose to amend information on the hydrodynamic model development included in Chapter 3 and especially in Chapter 5. Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.
9h	*Page 16 – typo in title*	Changed "HYDROLGIC" to "HYDROLOGIC" in the Chapter 2 title.

9i	*Page 47 replace “is” with “in” first sentence of 3.3.1.2.*	We could not locate text on page 47 of the original draft report that seemed to need revision. However, we improved the referenced sentence in the revised, draft minimum flows report by changing “water” to “waters” in the first sentence of Section 3.3.1.2.
9j	*Figure 3-11, page 57 – model failed to predict several observed salinity peaks*	We think the referenced mismatches are mostly due to errors in the downstream salinity boundary condition during the wet season. We note that the original University of South Florida model for the system had a worse match at the Mote Marine station.
9k	*Caption of Figure 3-27 typo*	We deleted “shows” from the caption for Figure 3-27 in the revised, draft minimum flows report.
9l	*Use of wind data from nearby airports might be helpful*	We looked at these sources for wind data to use for model development and applications but determined there are not enough wind data measurement stations in the region to allow us to describe the spatial variability of the Charlotte Harbor system. For simplicity, we chose to use a single wind station for our analyses. As noted in Appendix C (Chen 2020), we used wind data measured at the SWFWMD Peace River II ET site prior to 2/7/2013 and data from the Mote Marine station after that date. We agree that is would be beneficial to use multiple wind stations for modeling efforts similar to those undertaken for our minimum flow analyses, and we will consider this recommendation for future studies.
9m	*Appendix C – typo on page 42*	This typographical error was corrected in the revised appendix.
9n	*Appendix C – typo on page 44*	This typographical error was corrected in the revised appendix.
9o	*Appendix C – definition of shoreline*	The shoreline length is the actual length of the shoreline calculated by the

	e length needed	hydrodynamic model. The dynamically coupled 3D-2DV model can track shoreline variations and allow the computation of the shoreline length at every time step. In the 3D model, because bottom elevations are defined and given at the four corners of the Cartesian grid, shoreline can be calculated using the bilinear interpolation with known water level if all grid corners are not submerged or emerged. In the 2DV model, the shoreline length can be calculated based on the water level, the grid length, and the river width, which varies with both vertically and longitudinally. This descriptive information for shoreline length was included in the revised version of Appendix C.
9p	*Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor*	Although Caloosahatchee River flow was not directly used as boundary conditions near the mouth of the river, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. Specifically, the effects of Caloosahatchee River flow were indirectly considered in the water level, salinity, and temperature boundary conditions, as the USF model included Caloosahatchee and its flow. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.

9q	*Caption for Figure 2-13 needs a space*	We corrected this typo by adding a space between “through” and “2018” in the caption for Figure 2-13 in the revised, draft minimum flows report.
9r	*Consider adding conversion table*	We included a conversion table in the revised, draft minimum flows report.

Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek, Draft Report



June 1, 2020

Southwest Florida Water Management District

Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek, Draft Report

June 1, 2020

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APPENDICES – included on a Compact Disc Attached to the Inside Back Cover

Appendix A - HydroGeoLogic, Inc. 2012. The Peace River Integrated Modeling project (PRIM) - Phase V Predictive model simulations. Prepared for Southwest Florida Water Management District, January 2012.

Appendix B - HSW 2016. MFL Technical Support – Lower Peace River Update of Baseline Flow for Shell Creek. Prepared for Southwest Florida Water Management District, April 2016.

Appendix C - Chen 2020. Simulating Hydrodynamics in Charlotte Harbor and its Major Tributaries. Prepared for Recommended Minimum Flows for the Lower Peace River and Lower Shell Creek SWFWMD Draft report.

Appendix D - HSW 2016. Technical Memorandum – Lower Peace River - Floodplain Analysis. Prepared for Southwest Florida Water Management District, November 2016.

Appendix E – Rubec, J.P., Santi, C., Ghile, Y.B., and Xinjian Chen, X. 2018. Modeling to Assess Spatial Distributions and Population Numbers of Estuarine Species in the Lower Peace River and Charlotte Harbor, Florida. Prepared for the Southwest Florida Water Management District.

Appendix F – Janicki Environmental, Inc. 2019. Lower Peace River water quality study. Final Report Prepared for Southwest Florida Water Management District. Brooksville.

Acronym List Table

Acronym	Definition
ADCP	acoustic Doppler current Profiler
AIC	Akaike Information Criterion
cfs	cubic feet per second (ft^3/s)
CDF	Cumulative Distribution Function
CLC	[Florida] Cooperative Land Cover [Map] of the Florida Fish and Wildlife Conservation Commission and Florida Natural Areas Inventory
CPUE	Catch-per-unit-effort
CPUE-GC	Catch-per-unit-effort corrected for sampling gear type
GAM	General Additive Model
DEM	Digital Elevation Model
District	Southwest Florida Water Management District
F.A.C	Florida Administrative Code
FFWCC	Florida Fish and Wildlife Conservation Commission
FIM	Fisheries-Independent Monitoring of the FWRI
F.S.	Florida Statutes
FWRI	Fish an Wildlife Research Institute of the FFWCC
GIS	Geographic Information System
HA	Habitat Availability
HSM(s)	Habitat Suitability Model(s)
HSPF	Hydrological Simulation Program-FORTRAN
MAE	Mean absolute error (for statistical analyses)
ME	Mean error (for statistical analyses)
MFL	Minimum Flow and/or Minimum Water Level (as defined in Section 373.042, F.S.)
mg	million gallons
mgd	million gallons per day
mi^2	square miles
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Administration
R^2	Coefficient of determination (for statistical analyses)
SERC	Statement of Estimated Regulatory Cost
SID	WMIS Site Identifier
SWFWMD	Southwest Florida Water Management District
USGS	United States Geological Survey / Department of Interior.
WMIS	Water Management Information System

Conversion Unit Table

Metric to U.S. Customary		
Multiply	By	To Obtain
cubic meters per second (m^3/s)	35.31	cubic feet per second (cfs)
cubic meters per second (m^3/s)	23	million gallons per day (mgd)
millimeters (mm)	0.03937	inches (in)
centimeter (cm)	0.3937	inches (in)
meters (m)	3.281	feet (feet)
kilometers (km)	0.6214	statute miles (mi)
square meters (m^2)	10.76	square feet ($feet^2$)
square kilometers (km^2)	0.3861	square miles (square miles)
hectares (ha)	2.471	acres
liters (l)	0.2642	gallons
cubic meters (m^3)	35.315	cubic feet ($feet^3$)
cubic meters (m^3)	0.0008110	acre-feet
milligrams (mg)	0.00003527	ounces
grams (g)	0.03527	ounces
kilograms (kg)	2.205	pounds
Celsius degrees (ºC)	1.8*(ºC) + 32	Fahrenheit (ºF)
U.S. Customary to Metric		
Multiply	By	To Obtain
inches (in)	25.40	millimeters (mm)
inches (in)	2.54	centimeters (cm)
feet (feet)	0.3048	meters (m)
statute miles (mi)	1.609	kilometers (km)
square feet ($feet^2$)	0.0929	square meters (m^2)
square miles (square miles)	2.590	square kilometers (km^2)
acres	0.4047	hectares (ha)
gallons (gal)	3.785	liters (l)
cubic feet ($feet^3$)	0.02831	cubic meters (m^3)
acre-feet	1233.0	cubic meters (m^3)
Fahrenheit (ºF)	0.5556*(ºF-32)	Celsius degrees (ºC)
U.S. Customary to U.S. Customary		
Multiply	By	To Obtain
acre	43560	square feet ($feet^2$)
square miles (square miles)	640	acres
cubic feet per second (cfs)	0.646	million gallons per day (mgd)

EXECUTIVE SUMMARY

The Southwest Florida Water Management District has been directed by the State Legislature to establish minimum flows for flowing watercourses within its boundary. As currently defined by statute, "the minimum flow for a given watercourse shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area." For minimum flows development, each water management district of the state or the Florida Department of Environmental Protection identify specific metrics or criteria that can be associated with significant harm. Once adopted into the District's Water Levels and Rates of Flow Rules within the Florida Administrative Code, minimum flows can be used for water supply planning, water use permitting and environmental resource regulation.

This report summarizes proposed minimum flows for the Lower Peace River and Lower Shell Creek developed by the District as part of a comprehensive reevaluation of minimum flows previously established for the Lower Peace River. For minimum flow purposes, the Lower Peace River is defined as the river segment from the U. S. Geological Survey Peace River at Arcadia, Florida gage downstream to Charlotte Harbor. Lower Shell Creek is defined as the segment of the creek that extends from the Hendrickson Dam at Shell Creek Reservoir to the confluence of Shell Creek with the Lower Peace River.

The District previously developed minimum flows for the Lower Peace River and drafted proposed minimum flows for Lower Shell Creek in 2010. In July 2010, minimum flows for the Lower Peace River were adopted into District rules that became effective in August 2010. The established Lower Peace River minimum flows rule requires the reevaluation of the minimum flows within five years of their adoption to incorporate additional ecological data. In response to this timeline, the District completed an initial reevaluation of the minimum flows in 2015 and has currently scheduled completion of a more comprehensive reevaluation for 2020.

In support of the comprehensive reevaluation described in this report, proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed using the best information available, as required by the Florida Statutes, and were based on all relevant environmental values identified in the Florida Water Resource Implementation Rule for consideration when setting minimum flows.

For the comprehensive minimum flows reevaluation, the District: updated hydrologic data sets used in the analyses; re-mapped the bathymetry of the Lower Peace River; Lower Myakka and Charlotte Harbor; produced a LiDAR-based high resolution digital elevation model for the area; refined a hydrodynamic model used to predict salinity, water level and temperature in the system; and expanded application of the hydrodynamic model to the entire Charlotte Harbor. In addition, habitat modeling for a number of estuarine dependent fish species and Blue Crab, water quality analysis and floodplain inundation analysis for the upper portion of the Lower Peace River were conducted.

Baseline flow records used for the minimum flows analyses were developed for the Lower Peace River and Lower Shell Creek to account for decreases and increases (from excess agricultural runoff) in gaged flows that were associated with surface and groundwater withdrawals. The Lower Peace River baseline flow record extended from 1950 through 2014 and the Lower Shell Creek baseline flows extended from 1966 through 2014. Flow-based blocks corresponding to periods of low (Block 1), medium (Block 2), and high (Block 3) flows based on the annual 75% and 50% exceedance of the baseline flow records were identified to develop proposed minimum flows for the river and creek.

The Lower Peace River and Lower Shell Creek were modeled as one system, “the Lower Peace/Shell System”, to appropriately characterize the strong hydrologic interactions between the river, creek and Charlotte Harbor. Block-specific percent-of-flow reductions associated with significant harm thresholds based on a 15% reduction in the most sensitive assessed habitat were used to develop proposed minimum flows for the system. Use of percent-change-based metrics permitted assessment of environmental factors that typically exhibit continuous or incremental responses to changes in flows. Environmental resources or goals assessed for development of the minimum flows for the Lower Peace River and Lower Shell Creek included: maintenance of biologically relevant salinities with water volumes, shoreline lengths and bottom areas associated with salinities ranging from 2 to 20 psu; inundation of floodplain wetlands; habitats for selected fish species and Blue Crab; and water quality.

These analyses indicated that the < 2 practical salinity unit (psu) salinity zone was the most sensitive criterion to flow reductions in the Lower Peace/Shell System. Based on this criterion, proposed minimum flows in the Lower Peace River and Lower Shell Creek were determined for each flow-based block as percentages of baseline flows. This approach also permitted identification of allowable percent-of-flow reductions that can be used to describe the proposed minimum flows. The proposed minimum flows were developed with consideration of and are protective of all relevant environmental values identified for consideration in the Water Resource Implementation Rule when establishing minimum flows and levels.

Proposed allowable percent-of-flow reductions in the Lower Peace River were defined for each block as percentage reductions in the total combined baseline flow at the Peace River at Arcadia (USGS No. 02296750), Joshua Creek at Nocatee (USGS No. 02297100), and Horse Creek near Arcadia (USGS No. 02297310) gage sites. Results from models runs conducted to evaluate relationships between flows and environmental criteria in the Lower Peace/Shell System did not exhibit breakpoints or inflections. However, a low flow threshold of 130 cfs was identified as an operational, minimum flow criterion for the Lower Peace River to assist in maintaining freshwater conditions at the withdrawal point of the Peace River Manasota Regional Water Supply Authority (PRMRWSA). This low flow threshold of 130 cfs has been included in currently established minimum flows for the Lower Peace River and successfully implemented for permitted withdrawals by the PRMRWSA since 2010. Allowable percent-of-flow reductions associated with the proposed minimum flows for the Lower Peace River are summarized in the following table.

Block	If Combined Flow on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs >149 cfs - 297 cfs	Flow - 130 cfs 13% of flow
Block 2	>297 cfs - 386 cfs >386 cfs - 622 cfs	23% of (flow - 297 cfs) plus 13% of remaining flow 23% of flow
Block 3	>622 cfs - 1037 cfs >1037 cfs	40% of (flow - 622 cfs) plus 23% of remaining flow 40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

Minimum flows status assessments for the Lower Peace River were conducted based on the best available information, using block-specific and five-year and ten-year moving mean and median flow statistics. The assessment results indicated that the proposed minimum flows for the Lower Peace River are being met and are also expected to be met over the next 20 years. Development of a recovery strategy or specific prevention strategy associated with adoption of the proposed minimum flows for the Lower Peace River is, therefore, not necessary. If approved by the District Governing Board, the proposed minimum flows identified in this report for the Lower Peace River will replace the currently adopted minimum flows for the river included in District rules.

Similar to the minimum flows proposed for the Lower Peace River, proposed minimum flows for Lower Shell Creek are block-based minimum flows that specify allowable reductions in baseline flows into Shell Creek Reservoir. Required releases associated with the proposed minimum flows for Lower Shell Creek, expressed as percentage of inflow to Shell Creek Reservoir are summarized in the following table.

Block	If Inflow to Reservoir on Previous Day is	Allowable Flow Release
Block 1	<56 cfs	87% of inflow

Block 2	56 cfs - 137 cfs	77% of inflow
Block 3	>137 cfs	60% of inflow

Based on the best available information, the proposed minimum flows for Lower Shell Creek are not being met and would continue to not be met during the next 20-year planning horizon. In coordination with the City of Punta Gorda, the District has accordingly prepared a draft recovery strategy to achieve the proposed minimum flows for Lower Shell Creek and prevent the flows from falling below the proposed minimum flows during the next 20 years. The draft recovery strategy also ensures provision of sufficient water supplies for all existing and projected water demands of the City of Punta Gorda.

If approved by the District Governing Board, the proposed minimum flows identified in this report for Lower Shell Creek and the recovery strategy for Lower Shell Creek will be included in District rules.

Based on insight that may be gained from stakeholder and Governing Board review, staff notes that the proposed minimum flows presented in this report for the Lower Peace River and Lower Shell Creek may be modified prior to adoption of associated rule amendments into Rule 40D-8.041, F.A.C.

Because climate change, structural alterations and other changes in the watershed could potentially affect flow characteristics, and because additional information relevant to minimum flows development may become available, the District is committed to periodic reevaluation and, if necessary, revision of minimum flows for Lower Peace River and Lower Shell Creek.

CHAPTER 1 - INTRODUCTION

1.1. Reevaluation of 2010 Lower Peace River Minimum Flows and Development of Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

This report documents a reevaluation of the minimum flows for the Lower Peace River and development of new, proposed minimum flows for the Lower Peace River and Lower Shell Creek. For minimum flow purposes, the Lower Peace River is defined as the river segment from the U. S. Geological Survey (USGS) Peace River at Arcadia, Florida gage downstream to Charlotte Harbor. Lower Shell Creek is defined as the segment of the creek that extends downstream from the Hendrickson Dam at Shell Creek Reservoir to the confluence of Shell Creek with the Lower Peace River.

The Southwest Florida Water Management District (or District) initiated work supporting development of minimum flows for the Lower Peace River in 2007. After an extensive review process, which included the District's facilitation of independent scientific peer review, minimum flows for the Lower Peace River were adopted into the District's Water Levels and Rates of Flow rules (specifically Rule 40D-8.041(8), Florida Administrative Code or F.A.C.) in July 2010, and the minimum flow rule for the river became effective in August 2010.

The currently adopted Lower Peace River minimum flows (Table 1-1) are based on the sum of the combined flows of the USGS Peace River at Arcadia, FL gage (02296750) plus the flow at the USGS Horse Creek near Arcadia, FL gage (02297310), and the USGS Joshua Creek at Nocatee, FL gage (02297100).

The Lower Peace River minimum flows are both seasonal and flow dependent and include a low flow threshold that is applicable throughout the year as well as seasonally dependent (i.e., block-specific) minimum flows that specify allowable reductions in the sum of flows at the three gages denoted above that would occur in the absence of any permitted upstream withdrawals. The Lower Peace River minimum flows rule also specifies that the total permitted maximum withdrawals on any day shall not exceed 400 cfs and includes summary flow statistics that can be used as a tool to assess whether flows in the Lower Peace River remain above flow rates that are expected to occur with implementation of the minimum flows requirements.

Table 1-1. Minimum flows for the Lower Peace River adopted into Rule 40D-8.041(8), Florida Administrative Code (note that "cfs" is an abbreviation for "cubic feet per second", and "USGS" is an acronym for the United States Geological Survey).

CHAPTER 40D-8
WATER LEVELS AND RATES OF FLOW

40D-8.041 Minimum Flows.

(8) Minimum Flows for the lower Peace River.

(a) The Minimum Flows are to ensure that the minimum hydrologic requirements of the water resources or ecology of the natural systems associated with the estuarine reach of the lower Peace River are met.

(b) Minimum Flows for the estuarine reach of the lower Peace River are based on the sum of the combined flows of the USGS Peace River near Arcadia Gage #02296750 plus the flow at the USGS Horse Creek near Arcadia Gage #02297310, and the USGS Joshua Creek at Nocatee Gage #02297100, and are set forth in Table 8-20 below. Minimum Flows for the lower Peace River are both seasonal and flow dependent. One standard, the Minimum Low Flow Threshold, is flow based and applied continuously regardless of season. No surface water withdrawals shall be permitted that would cumulatively cause the flow to be reduced below the Minimum Low Flow Threshold of 130 cfs based on the sum of the mean daily flows for the three gages listed above. Additionally, permitted withdrawals shall cease when flows are below the Minimum Low Flow Threshold of 130 cfs. The total permitted maximum withdrawals on any day shall not exceed 400 cfs. There are also three seasonally dependent or Block specific Minimum Flows that are based on the sum of the mean daily flows for the three gages denoted above that would occur in the absence of any permitted upstream withdrawals. The Block Minimum Flows are based on potential changes in habitat availability for select salinity ranges within a season.

Table 8-20-Minimum Flow for Lower Peace River based on the sum of flows from Horse Creek, Joshua Creek, and the Peace River at Arcadia gages.

Period	Effective Dates	Where Flow on Previous Day Equals:	Minimum Flow Is
Annually	January 1 through December 31	≤130 cfs >130 cfs	Actual flow (no surface water withdrawals permitted) Seasonally dependent – see Blocks below
Block 1	April 20 through June 25	≤130 cfs >130 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs
Block 2	October 28 through April 19	≤130 cfs >130 cfs and <625 cfs ≥625 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs Previous day's flow minus 29%
Block 3	June 26 through October 27	≤130 cfs >130 cfs and <625 cfs ≥625 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs Previous day's flow minus 38%

The District developed draft minimum flow recommendations for Lower Shell Creek in 2010 in conjunction with the development of minimum flows for the Lower Peace River. As part of that effort, the District determined that a recovery strategy would be required for Lower Shell Creek, because the existing flow rates in the creek were below the draft minimum flows. Based on the need for development of recovery strategies, the draft minimum flows for Lower Shell Creek were not adopted into District rules.

The minimum flows rule established for the Lower Peace River in 2010 requires the reevaluation of the minimum flows within five years of their adoption to incorporate additional ecological data. Five years from the date of adoption was in July 2015 and in keeping with the specified timeline, the District prepared an initial reevaluation report to summarize progress made until 2015 and highlight ongoing activities to support a more comprehensive minimum flow reevaluation scheduled for completion in 2018. Revision of this reevaluation timeline, with completion scheduled for 2020 permitted further improvement of the District's hydrodynamic model of the Lower Peace River, extension of the model domain to Lower Shell Creek and the entire Charlotte Harbor, and analysis of potential flow-related changes in water quality, floodplain wetlands, and fish habitats.

Based on comprehensive analyses, the District has developed new, proposed minimum flows for the Lower Peace River and Lower Shell Creek. The proposed minimum flows, which are described in this report, were developed with consideration of and are protective of all relevant environmental values identified for consideration in the Water Resource Implementation Rule when establishing minimum flows or levels (see Rule 62-40.473, Florida Administrative Code, or F.A.C.). If adopted by the District's Governing Board, the proposed minimum flows for Lower Peace River will replace the existing minimum flows for Lower Peace River that are included in the District's Water Levels and Rates of Flow Rules, and the proposed minimum flows for Lower Shell Creek will be added to the rules. In addition, any necessary recovery or prevention strategies that may be required based on a determination that the proposed minimum flows are currently or are projected to not be met during the next 20 years will be included in the District's Recovery and Prevention Strategies for Minimum Flows and Levels Rules (Chapter 40D-80, F.A.C.). Once adopted by rule, the minimum flows and any necessary recovery strategies will support District water-use permitting, water-supply planning and other water management activities.

Although the Lower Peace River and Lower Shell Creek are two individual water bodies, they are hydrologically connected – Lower Shell Creek is a tributary of the Lower Peace River. The two water bodies can be and for much of the minimum flows analyses described in this report, were modeled as a single system, the "Lower Peace/Shell

System.” Consideration of this combined “system” was critical to understanding potential effects of changes in flows in the Lower Peace River, Lower Shell Creek and Charlotte Harbor, the receiving water body at the terminus of the Lower Peace River.

1.2. Legal Directives for Establishment of Minimum Flows and Levels

1.2.1. Relevant Florida Statues and Rules

Flowing surface waters provide numerous benefits to society and are an integral part of the natural functioning of ecosystems within the state of Florida. Surface water withdrawals can directly affect the water volume or rate of flow in rivers. Similarly, groundwater withdrawals have the potential to alter groundwater levels and thereby reduce the water volume or flow in rivers. These cause-and-effect relationships between water withdrawals and reduced flows in surface watercourses have been recognized by the Florida State Legislature through enactment and updates of the Florida Water Resources Act of 1972 (Chapter 373, Florida Statutes or “F.S.”). Based on this legislation, the District has the responsibility for establishing minimum flows for all surface watercourses within its boundary. Five primary legal directives guide the District’s establishment and implementation of minimum flows:

1. Section 373.042 of The Florida Water Resources Act of 1972 (Chapter 373, F.S.) directs the Department of Environmental Protection (FDEP) or the District to establish minimum flows for all surface watercourses in the area. This section states that “the minimum flow and minimum water level shall be calculated by the department and the governing board using the best information available.” This statute also establishes the priority list and schedule which is annually updated and approved by the District Governing Board. Section 373.042 also allows for the establishment of an independent scientific peer review panel and use of a final report prepared by a peer review panel when establishing minimum flows and minimum water levels.

2. Section 373.0421, F.S., allows for considerations and exclusions concerning minimum flows or minimum water level establishment, including changes and structural alterations to watersheds, surface waters and aquifers and their effects. In cases where dams, or extensive channelization have altered the hydrology of a system for flood control and water supply purposes, the District attempts to balance protecting environmental values with the human needs that are met by these alterations. This section also requires that recovery and prevention strategies must be adopted and implemented if flows in a water body are not

currently meeting or are projected to not meet an applicable minimum flow within the next 20 years. In addition, the periodic and as needed, revision of established minimum flows and minimum water levels is required.

3. Rule 62-40.473 of the Florida Water Resource Implementation Rule (Chapter 62-40, F.A.C.), provides goals, objectives and guidance regarding the establishment of minimum flows and minimum water levels. This rule identifies the ten environmental values described in section 1.2.2 below that are to be considered when establishing minimum flows and minimum water levels. In recognition of the fact that flows naturally vary, this rule also states that minimum flows should be expressed as multiple flows defining a minimum hydrological regime to the extent practical and necessary.

4. Chapter 40D-8, F.A.C., the District's Water Levels and Rates of Flow Rules, describes the minimum flows established for surface watercourses in the District. Rule 40D-041(8), F.A.C., include the currently adopted minimum flows for the Lower Peace River and establishes a schedule for their reevaluation.

5. Chapter 40D-80, F.A.C., the District's Recovery and Prevention Strategies for Minimum Flows and Levels Rules, sets forth the regulatory portions of the recovery or prevention strategies to achieve or protect, as applicable, the minimum flows and minimum water levels established by the District.

The District's Minimum Flows and Levels Program addresses all relevant requirements expressed in the Water Resource Implementation Rule and the Water Resources Act of 1972. The District has developed specific methods for establishing minimum flows or minimum water levels for lakes, wetlands, rivers, springs and aquifers, subjected the methods to independent, scientific peer-review, and in some cases, adopted the methods into its Water Level and Rates of Flow Rule. In addition, regulatory components of recovery strategies necessary for the restoration of minimum flows and minimum water levels that are not currently being met have been adopted into the District's Recovery and Prevention Strategies for Minimum Flows and Levels Rule (Chapter 40D-80, F.A.C.).

A summary of efforts completed for the District's Minimum Flows and Levels Program is provided by Hancock et al. (2010). Additional information pertaining to the establishment and implementation of minimum flows and other related issues is available from the District's Minimum Flows and Levels (Environmental Flows) Program web page at https://www.swfwmd.state.fl.us/projects/mfls.

1.2.2. Environmental Values

The Florida Water Resource Implementation Rule, specifically Rule 62-40.473, F.A.C., provides additional guidance for the minimum flows and levels establishment, requiring that "…consideration shall be given to natural seasonal fluctuations in water flows or levels, nonconsumptive uses, and environmental values associated with coastal, estuarine, riverine, spring, aquatic and wetlands ecology, including:

a) Recreation in and on the water;
b) Fish and wildlife habitats and the passage of fish;
c) Estuarine resources;
d) Transfer of detrital material;
e) Maintenance of freshwater storage and supply;
f) Aesthetic and scenic attributes;
g) Filtration and absorption of nutrients and other pollutants;
h) Sediment loads;
i) Water quality; and
j) Navigation.

The ways in which these environmental values were considered for development of proposed minimum flows for the Lower Peace/Shell System are discussed in Chapter 6.

1.3. Development of Minimum Flows and Levels

Implementation of the District's Minimum Flows and Levels Program is based on three fundamental assumptions:

1. Alterations to hydrology will have consequences for the environmental values listed in Rule 62.40.473, F.A.C., and Section 1.2.2 of this report.

2. Relationships between some of these altered variables can be quantified and used to develop significant harm thresholds or criteria that are useful for establishing minimum flows and levels.

3. Alternative hydrologic regimes may exist that differ from non-withdrawal impacted conditions but are sufficient to protect water resources and the ecology of these resources from significant harm.

Support for these assumptions is provided by a large body of published scientific work addressing relationships between hydrology, ecology and human-use values associated with water resources (e.g., see reviews and syntheses by Postel and Richer 2003, Wantzen et al. 2008, Poff et al. 1997, Poff and Zimmerman 2010). This information has been used by the District and other water management districts within the state to identify significant harm thresholds or criteria supporting development of minimum flows and minimum water levels for over 400 water bodies (FDEP 2019), as summarized in numerous publications associated with these efforts (e.g., SFWMD 2000, 2006, Flannery et al. 2002, SRWMD 2004, 2005, Neubauer et al. 2008, Mace 2009).

With regard to the assumption associated with alternative hydrologic regimes, consider a historic condition for an unaltered river or lake system with no local groundwater or surface water withdrawal impacts. A new hydrologic regime for the system would be associated with each increase in water use, from small withdrawals that have no measurable effect on the historic regime to large withdrawals that could substantially alter the regime. A threshold hydrologic regime may exist that is lower or less than the historic regime, but still protects the water resources and ecology of the system from significant harm. This threshold regime could conceptually allow for water withdrawals, while protecting the water resources and ecology of the area. Thus, minimum flows and minimum water levels may represent minimum acceptable rather than historic or potentially optimal hydrologic conditions.

1.3.1. Flow Definitions and Concepts

To address all relevant requirements of the legal directives associated with minimum flows and aid in the understanding of information presented in this report, we think it is appropriate to elaborate on several flow-related definitions and concepts, including the following.

- Flow or streamflow refers to discharge, i.e., the rate a specified volume of water flows past a point for some unit of time. For minimum flow purposes, flow is typically expressed in cubic feet per second (cfs).

- Long-term is defined in Rule 40D-8.021, F.A.C., as an evaluation period for establishing minimum flows and levels that spans the range of hydrologic conditions which can be expected to occur based upon historical records.

- Reported flows are directly measured or estimated by a relationship developed using measured flows and water depth or velocity. Examples include measured and estimated flows reported by the USGS and those included in the District's Water Management Information System. Most reported flows are actually estimated using velocity and water-depth measurements or regressions or other models developed from empirical measurements. For example, reported flows are typically estimated from measured water levels using rating curves. Reported flows are alternatively referred to as *observed or gaged* flows*.*

- Modeled flows are flows that are derived using a variety of modeling approaches. Examples include flows predicted using numerical groundwater flow models, flows predicted with statistical models derived from either observed or other modeled hydrologic data, and impacted flows adjusted for withdrawal-related flow increases or decreases.

- Impacted flows are flows that include withdrawal-related impacts. Impacted flows can be *reported flows*, and they can also be *modeled flows* based on simulated groundwater withdrawal scenarios.

- Baseline flows are flows that have occurred or are expected in the absence of withdrawal impacts. Baseline flows may be *reported flows* if data exists prior to any withdrawal impacts. More typically, baseline flows are *modeled flows*. Baseline flows are alternatively referred to as *natural, unimpacted, unimpaired or historic* flows.

- Minimum flow is defined by the Florida Water Resources Act of 1972 as "the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area."

- A flow regime is a hydrologic regime characterized by the quantity, timing and variation of flows in a river. Rule 62-40.473, F.A.C., dictates that "minimum flows and levels should be expressed as multiple flows or levels defining a minimum hydrologic regime, to the extent practical and necessary to establish the limit beyond which further withdrawals would be significantly harmful to the water resources or the ecology of the area as provided in Section 373.042(1), F.S."

1.3.2. Baseline Flow Conditions

Use of significant harm criteria for minimum flows development is predicated upon identification of a baseline flow record or records that characterize environmental conditions expected in the absence of withdrawals. For river segments or entire rivers where flows are currently or have not historically been affected by water withdrawals, reported flows for the period without withdrawal effects or, respectively, for the entire period of record can be used as baseline flows. More typically, reported flows are impacted flows that incorporate withdrawal effects, or are available for a limited period, and baseline flows must be modeled.

Once developed, a baseline flow record or records can be used in association with significant harm criteria for identifying potential flow reductions and establishing minimum flows that are not expected to result in significant harm. In some cases, a single baseline flow record is used; in other situations, or for differing analyses, use of two or more baseline flow records is necessary.

1.3.3. Building Block Approach

Building-block approaches for environmental flow efforts frequently involve categorization of the flow regime into discrete blocks defined by flow volume and/or day of the year or water-year (summarized in Postel and Richter 2003). These blocks are then “assembled” to create a prescribed flow regime that includes necessary elements of the natural flow regime or another specified flow regime.

The District’s building-block approach has typically involved assessing the potential for significant harm separately within three seasons of the year, including the late spring dry season referred to as Block 1, the summer wet season referred to as Block 3, and an intermediate flow season as Block 2. Our use of these three blocks is based on the typical seasonal variation of flows in streams in west-central Florida that are dominated by surface runoff. This seasonal, building-block approach allows for the assessment of potential changes in habitat availability and other environmental values for periods of relatively higher or lower flows, when they may be most critical for maintaining ecological structure and function or exhibit increased sensitivity to flow reductions (Flannery et al. 2002).

For some baseflow-dominated systems, for example, short, coastal rivers where discharge from spring vents accounts for much of the flow, use of a seasonal, building-block approach may not be necessary.

In addition, association of blocks with specific flow-ranges, which typically, but not always correspond with seasonal periods, may be appropriate for establishing minimum flows for some systems.

1.3.4. Low Flow Threshold

Criteria used to establish low flow threshold in freshwater rivers, such as fish passage depths or potential changes in wetted perimeter (i.e., stream bottom) generally do not apply in estuaries, because tides largely control water levels at low flows and these environmental values may not be strongly associated with flows in lower river segments Although this is the case in the Lower Peace/Shell System, a Low flow threshold has been adopted for the Lower Peace River. This Low Flow Threshold was developed based upon identifying flows associated with maintaining freshwater conditions at the Peace River Manasota Regional Water Supply Authority (PRMRWSA) Water Treatment Facility where water is withdrawn directly from the river.

1.3.5. Significant Harm and 15% Change Criteria

Significant harm is the criterion on which the establishment of minimum flows must be made to protect the water resources and ecology of the area, but no definition of significant harm is provided in the Water Resources Act of 1972 or the Water Resource Implementation Rule. This makes the District or FDEP responsible for determining the conditions that constitute significant harm in each priority water body within the District.

Criteria for setting minimum flows are selected based on their relevance to environmental values identified in the Water Resource Implementation Rule and confidence in their predicted responses to flow alterations. The District uses a weight-of-evidence approach to determine if the most sensitive assessed criterion is appropriate for establishing a minimum flow, or if multiple criteria will be considered collectively.

For criteria selection and use, the District uses natural breakpoints, inflections, or thresholds when available. For example, in perennially flowing freshwater systems, a water depth of 0.6 ft is used to establish a minimum low flow threshold for promoting fish passage and flow continuity. Another threshold-based criterion used for flowing freshwater systems is the lowest wetted perimeter inflection point, where inflections in curves relating flow and wetted perimeter are used to determine threshold flows for significant harm.

When natural breakpoints, inflections, or thresholds are not available, the District has used a presumptive 15% habitat or resource-reduction standard as a criterion for significant harm. The basis for the management decision to equate a 15% change to significant harm lies, in part, with a recommendation put forth by the peer-review panel that considered the District's proposed minimum flows for the upper Peace River. In their report, the panelists note that “In general, instream flow analysts consider a loss of more than 15% habitat, as compared to undisturbed or current conditions, to be a significant impact on that population or assemblage” (Gore et al. 2002). The panel’s assertion was based on consideration of environmental flow studies employing the Physical Habitat Simulation System (PHABSIM) for analyzing flow, water depth and substrate preferences that define aquatic species habitat availability. Nineteen peer review panels have evaluated the District’s use of the 15% standard for significant harm. Although many have questioned its use, they have generally been supportive of the use of a 15% change criterion for evaluating effects of potential flow reductions on habitats or resources when determining minimum flows.

Potential loss of habitats and resources in other systems has been managed using methods other than the 15% resource reduction standard. In some cases, resources have been protected less conservatively: habitat loss > 30% compared with historical flows (Jowett 1993) and preventing > 20% reduction to historical commercial fisheries harvests (Powell et al. 2002). Dunbar et al. (1998) note, “… an alternative approach is to select the flow giving the 80% habitat exceedance percentile,” which is equivalent to an allowable 20% decrease from baseline conditions. More recently, the Nature Conservancy proposed that in cases where harm to habitat and resources is not quantified, presumptive standards of 10% to 20% reduction in natural flows will provide high to moderate levels of protection, respectively (Richter et al. 2011).

Gleeson and Richter (2017) suggest that “high levels of ecological protection will be provided if groundwater pumping decreases monthly natural baseflow by less than 10% through time.” Presumptive flow-based criteria such as these assume that resources are protected when more detailed relationships between flow and resources of interest are not available. Habitat- or resource-based presumptions of harm are based on data and analyses linking incremental reductions in flow to reductions in resources or habitats. As such, the 15% habitat- or resource-based standard makes more use of the best information available than a presumptive, flow-based criterion would. In the absence of natural breakpoints, inflections, or thresholds, the 15% presumptive habitat or resource-based standard for significant harm represents the District’s best use of the best available information.

1.3.6. Percent-of-flow Method

Through use of 15% habitat or resource-reduction standards, the District has typically incorporated percent-of-flow methods into its building-block approach for establishing minimum flows. The percent-of-flow method is considered a “top-down” approach

(Arthington et al. 1998, Brizga et al. 2002, Arthington 2012), in that modeled scenarios involving incremental reductions in baseline flows and resultant changes in important ecological parameters are evaluated to determine the flow reductions that would potentially result in significant harm to the river. The percent-of-flow method is regarded as a progressive method for water management (Alber 2002, Postel and Richter 2003, National Research Council 2005, Instream Flow Council 2002). A goal for use of the percent-of-flow method is to ensure that temporal patterns of the natural flow regime of the river are largely maintained, with some allowable flow reductions for water supply.

The District has successfully used a percent-of-flow method, often in combination with a low flow threshold, to establish minimum flows for numerous flowing systems including the Upper and Lower Alafia River, Upper and Lower Anclote River, Upper Braden River, Chassahowitzka River/Chassahowitzka Spring Group, Crystal River/Kings Bay Spring Group, Gum Slough Spring Run, Homosassa River/Homosassa Spring Group, Upper Hillsborough River, Upper and Lower Myakka River, Middle and Lower Peace River, Upper and Lower Pithlachascotee River, Rainbow River/Rainbow Spring Group and Weeki Wachee River/Weeki Wachee Spring Group.

Minimum flows developed using the percent-of-flow method allow permitted surface-water users to withdraw a percentage of streamflow at the time of the withdrawal and permitted groundwater users to potentially reduce baseline flows by prescribed percentages on a long-term basis. By proportionally scaling water withdrawals to the rate of flow, the percent-of-flow method minimizes adverse impacts that could result from withdrawal of large volumes of water during low flow periods, especially when river systems may be vulnerable to flow reductions. Similarly, larger volumes may be available for withdrawal during periods of higher flows.

The percent-of-flow approach has been effectively implemented for numerous permitted surface water withdrawals within the District, including those associated with water-supply withdrawals from the Peace River, Alafia River, and Little Manatee River. These withdrawals are typically based on a percentage of the previous day's average flow. Applications of the percent-of-flow method for regulation of groundwater withdrawals involve different considerations that must account for the gradual and more diffuse manner in which changes in groundwater levels are manifested in changes in streamflow. The percent-of-flow method has, however, been successfully implemented to regulate groundwater withdrawals throughout the District.

1.3.7. Adaptive Management

Adaptive management is a standard approach for reducing the inherent uncertainty associated with natural resource management (Williams and Brown 2014) and is recommended by the U.S. Department of the Interior for decision making in the face of uncertainty about management impacts (Williams et al. 2009). Adaptive management is a systematic, iterative approach to meeting management objectives in the face of uncertainty through continued monitoring and refinement of management actions based on consideration of alternatives and stakeholder input (Herrick et al. 2019).

Between the adoption of minimum flows for the Lower Peace River in 2010 and this 2020 reevaluation, the District and other agencies (e.g., PRMRWSA, USGS, Florida Fish and Wildlife Conservation Commission) have continued monitoring the Lower Peace/Shell System through collection of data on fish, plants, invertebrates, water quality, water flows and levels; evaluated compliance with permitted withdrawal requirements; and assessed the status of minimum flows in the Lower Peace River.

For example, a rule-required reevaluation of minimum flows established for the Lower Peace River (SWFMWD 2015) documented compliance with all regulatory constraints, included a summary ecosystem assessment, and described then-ongoing and planned projects and data collection efforts that would be used to support a more comprehensive minimum flows reevaluation.

The more comprehensive reevaluation of adopted minimum flows for the Lower Peace River and previously developed draft minimum flows for Lower Shell Creek described in this report reflects the application of an adaptive management strategy for dealing with uncertainty associated with determining withdrawal impacts on physical, biological, and chemical aspects of the river/creek system. Continued adaptive management will require ongoing monitoring, assessment, and periodic reevaluation of all minimum flows that are ultimately adopted for the Lower Peace River and Lower Shell Creek.

1.4. Vertical Datums

The District has recently converted from use of the National Geodetic Vertical Datum of 1929 (NGVD 29) to use of the North American Vertical Datum of 1988 (NAVD 88) for measuring and reporting vertical elevations. In some circumstances within this document, elevation data that were collected or reported relative to mean sea level or relative to NGVD 29 are converted to elevations relative to NAVD 88. All datum conversions were derived using the Corpscon 6.0 software distributed by the United States Army Corps of Engineers.

1.5. Updates Made in Reevaluation of the Minimum Flows

Much of the information associated with the technical assumptions, methods and analyses described in the 2010 minimum flows report (SWFWMD 2010) and the 2015 reevaluation for the Lower Peace River minimum flows (SWFWMD 2015) also support the current minimum flow reevaluation. However, several analytical methods described in the previous efforts were updated and improved where necessary to ensure use of the "best available information" for minimum flows development. For minimum flows development, we note that the best available information includes information that exists at the initiation of the minimum flows development process and information that is acquired specifically to fill data requirements deemed necessary for establishment of the best, defensible minimum flows.

Since 2011, the District initiated several technical projects to support updates for the reevaluation. These major initiatives and updates can be briefly summarized as follows.

1. The District developed the Peace River Integrated Model (PRIM) to gain a better understanding of the factors that control the Peace River flows and investigate effects of climate variability, groundwater pumping and land use changes.

2. The District's original building-block approach for characterizing the flow regime for the Lower Peace River and Lower Shell Creek was based on fixed dates. This fixed-date approach for block definition is not currently considered appropriate for representing seasonal flow regimes for the system in some years, when flows remain relatively low or high throughout the year. To overcome this issue, the District used flow-based blocks that correspond with typical, seasonal periods of low, medium and high flows.

3. A new hydrodynamic model was developed to substantially improve the prediction of water levels, salinities and water temperatures in the Lower Peace/Shell System and Charlotte Harbor.
   a. The hydrodynamic model used in 2010 was a coupled model which dynamically links a laterally averaged two-dimensional (2D) model with a three-dimensional (3D) model. The 3D model was updated to a 3D unstructured Cartesian grid model.
   b. The 2010 hydrodynamic model boundary was limited to the Lower Peace River-Lower Myakka River-Upper Charlotte Harbor area. For the 2020 modeling study, the boundary was extended to the entire Charlotte Harbor, including portions of the Caloosahatchee River.

c. A 13-month calibration/verification period in the 2010 study was extended to a 20-month period for development of the 2020 hydrodynamic model.

d. A new bathymetry survey was conducted for the Charlotte Harbor area and the tidal reaches of the Myakka and Peace Rivers for use in the reevaluation. These new survey data addressed discrepancies associated with landscape alterations that occurred in the region in 2004 due to Hurricane Charley.

e. To improve model predictions in overbank areas, a high resolution Digital Elevation Model (DEM) was developed using Light Direction and Ranging (LiDAR) photogrammetric mapping, and a new data collection tower was installed to collect hourly boundary conditions (e.g., salinity, temperature) in the upper Charlotte Harbor.

4. The estimation of flows from ungaged streams, creeks and canals that directly or indirectly flow into the Upper Charlotte Harbor Basin was updated.

The District approach for setting minimum flows in 2010 was based on the maintenance of the volume and distribution of various salinity zones. This was also the case for development of the currently proposed minimum flows for the Lower Peace River and Lower Shell Creek summarized in this report, with the newly created hydrodynamic model providing the primary basis for the effort.

To further investigate and potentially strengthen the protection of estuarine resources, the District developed Habitat Suitability Models (HSMs) for predicting effects of flow changes to abundance of eight fish species. The District also examined various floodplain features, including soils and vegetation communities along selected cross-sections in the Lower Peace River and evaluated how their inundation may be affected by changes in river flows. The District also investigated whether the seasonal timing and locations of chlorophyll maximum changes in the estuary is associated with and can be predicted from withdrawals from the Lower Peace River and Lower Shell Creek (Atkins, Inc. 2014). In 2019, Janicki Environmental, Inc. was contracted to update the 2014 work by Atkins and investigate the interactions between freshwater inflows and water quality constituents in the Lower Peace/Shell System.

The District has used information from these initiatives and updates, along with other best available information described in this document to develop currently recommended minimum flows for the Lower Peace River and Lower Shell Creek. The hydrology, geology, soils, and land use of the Lower Peace/Shell System are described in Chapter 2. Chapter 3 summarized water quality information for the system and ecological resources (i.e., shoreline vegetation, fish, and benthic macroinvertebrates) are described in Chapter 4. Chapter 5 describes the various methods used to develop the minimum flows. Results of the analyses, including the recommended minimum flows and assessments of the ten environmental values listed in the Water Resource Implementation Rule for consideration developing minimum flows and water levels are presented in Chapter 6. Information related to compliance and minimum flow status assessment are provided in Chapter 7.

CHAPTER 2 - PHYSICAL AND HYDROLOGIC DESCRIPTION OF THE LOWER PEACE RIVER AND LOWER SHELL CREEK

This chapter presents brief descriptions of the Peace River and Shell Creek watersheds including their location, physiography, climate, hydrogeology, land-use and cover, soils, freshwater flows and water use relevant to the development of minimum flows for the Lower Peace River and Lower Shell Creek.

2.1. Peace River and Shell Creek Watersheds

The Peace River watershed (Figure 2-1) is approximately 2,350 square miles and extends from the headwaters in Polk County to the river mouth in Charlotte Harbor (PBS&J 1999; SWFWMD 2010a). The Peace River watershed includes small portions of eastern Sarasota and Manatee counties, parts of central and southern Polk County, most of Hardee and DeSoto counties, part of northern Charlotte County, and western portions of Highlands County. The Peace Creek Drainage Canal and Saddle Creek join south of Lake Hancock near Bartow to form the Peace River. The river originates at an elevation of approximately 100 feet NGVD 29 (Kelly et al. 2005) and flows south for approximately 75 miles into the northeastern portion of Charlotte Harbor near the City of Punta Gorda. Other major tributaries to the Peace River include Payne Creek, Charlie Creek, Horse Creek, Joshua Creek, and Shell Creek (Figure 2-2).

The Peace River is a free-flowing system over its entire length, although flows in two of its tributaries, Saddle Creek and Shell Creek are regulated (Kelly et al. 2005). The Peace River represents a major source of fresh water to Charlotte Harbor, a bay with a surface area of approximately 142 square miles and an average depth of about 11 feet (Kelly et al. 2005). The Peace River, with approximately three-times the freshwater flow as the Myakka River, is a major influence on the freshwater inflow to the Charlotte Harbor (SWFWMD 2010a). The average flow into Charlotte Harbor from the Peace River (including Shell Creek) is 2,010 cfs (Hammett 1990).

For the purpose of minimum flow development, the Lower Peace River is defined as the portion of the river below the USGS Peace River at SR 70 at Arcadia, FL gage (02296750) (Figure 2-2). Upstream from Arcadia, the channel of the Peace River is well defined, while downstream the floodplain widens and the channel becomes braided (Hammett 1990; SWFWMD 2010a). The portion of the watershed downstream of Arcadia represents approximately 42% (990 square miles) of the entire Peace River watershed. Three major tributaries flow into the Lower Peace River: Joshua Creek, Horse Creek, and Shell Creek.

Of these three tributaries, Shell Creek is the largest at 434 square miles, Horse Creek is the second largest at 245 square miles, and Joshua Creek is the smallest at 121 square miles.

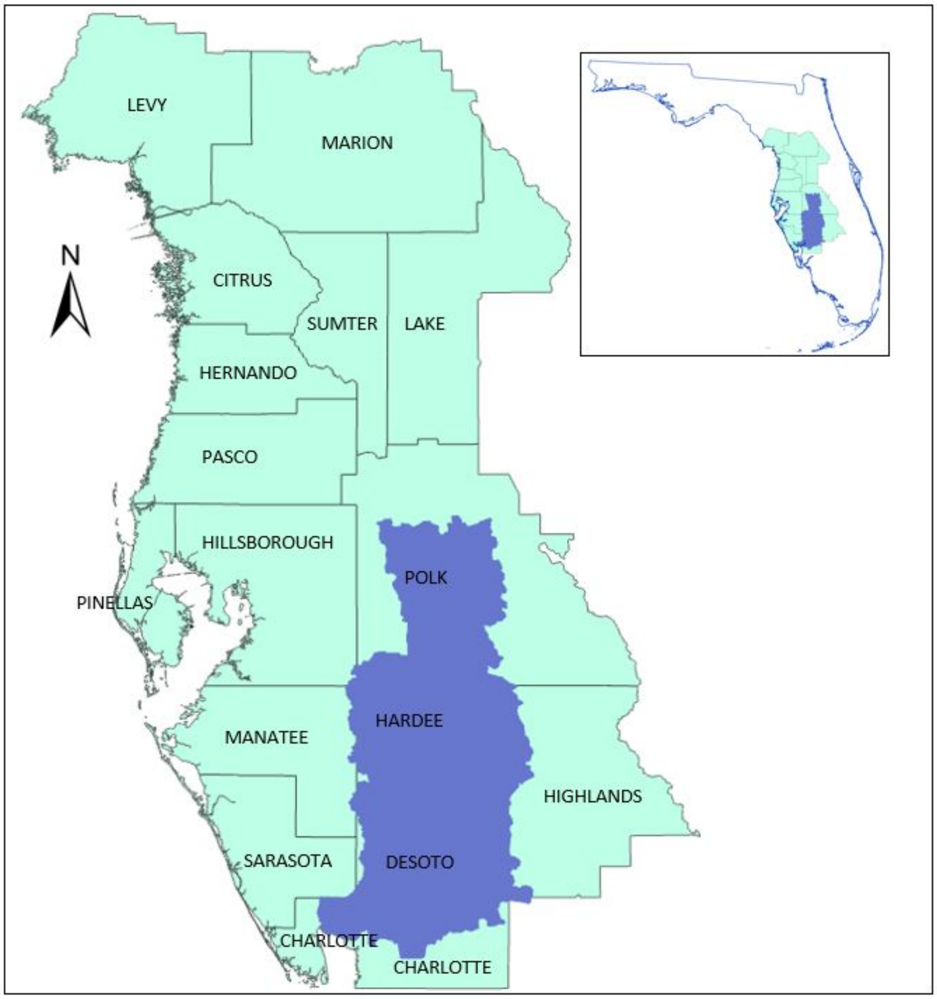

Figure 2-1. Location of the Peace River watershed within the Southwest Florida Water Management District.

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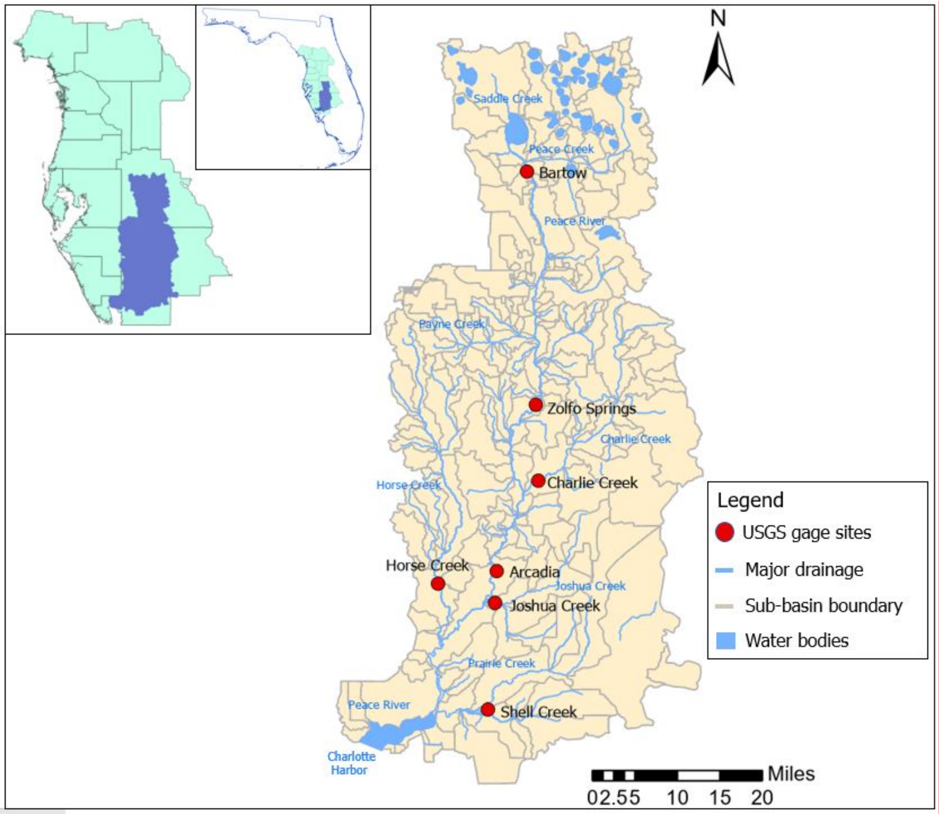

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Figure 2-2. Map of the Peace River watershed showing the Peace River main-stem and tributaries, sub-basins and selected long-term USGS gage site locations. The inset map highlights the location of the Peace River watershed both within the SWFWMD and in the state of Florida.

The Shell Creek watershed (Figure 2-3 basin extends from its headwaters in Desoto and Charlotte Counties and flows into the lower tidal reach of the Peace River near the City of Punta Gorda. Shell Creek is impounded by Hendrickson Dam below the confluence of Prairie Creek with Shell Creek, east of U.S. Route 17, approximately eight miles east of the City of Punta Gorda. The impounded section of the creek, Shell Creek Reservoir, is the primary water supply for the City (Stanley Consultants, Inc. 2006; PBS&J 2007). For the purpose of minimum flow development, Lower Shell Creek is defined as the portion of the creek extending from Hendrickson Dam to the confluence of Shell Creek with the Lower Peace River, a distance of approximately 6.2 miles (SWFWMD, 2010).

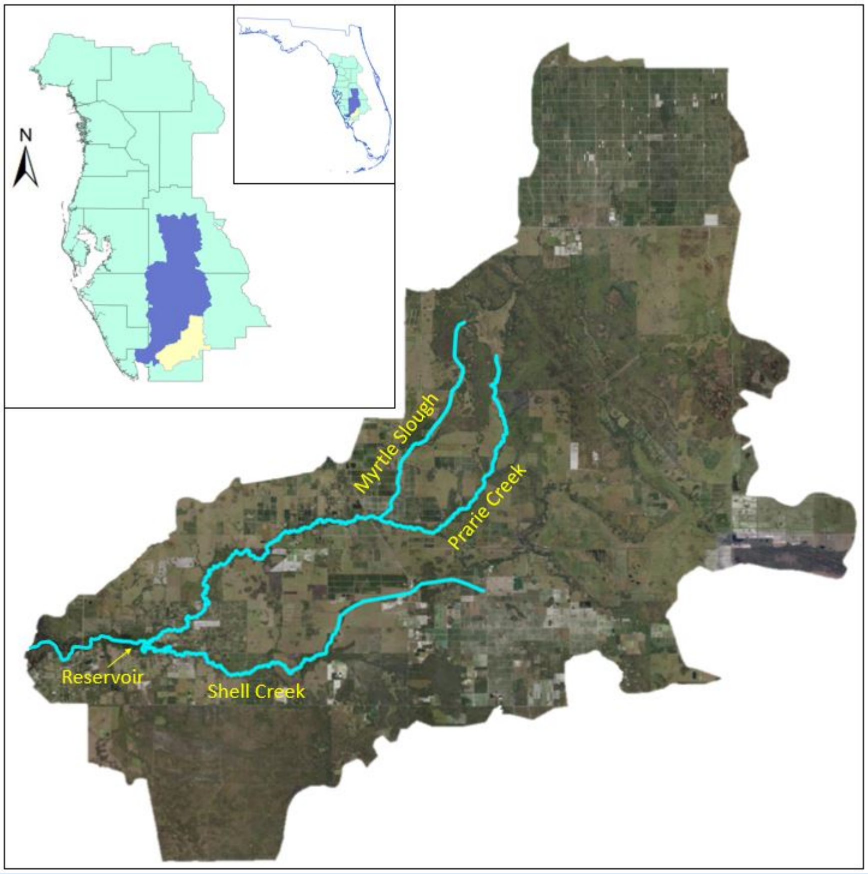

Figure 2-3. Map of the Shell Creek watershed. The inset map indicates the location of the Shell Creek (yellow) watershed within the larger Peace River watershed (purple) in the SWFWMD and the watershed's location in the state of Florida.

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2.2. Land Use and Land Cover

The 2017 land use map for Lower Peace/Shell System is depicted in Figure 2-4. The land use and land cover features were categorized according to the Florida Land Use and

Cover Classification System (FLUCCS). Wetlands buffer most of the Lower Peace River and Lower Shell Creek channels and the remaining dominant land uses are agricultural, range land, and urban developments near the mouth of the Peace River. Land use and land cover within the Peace River watershed have changed over time in order to facilitate agricultural and residential/urban development (FDEP 2007).

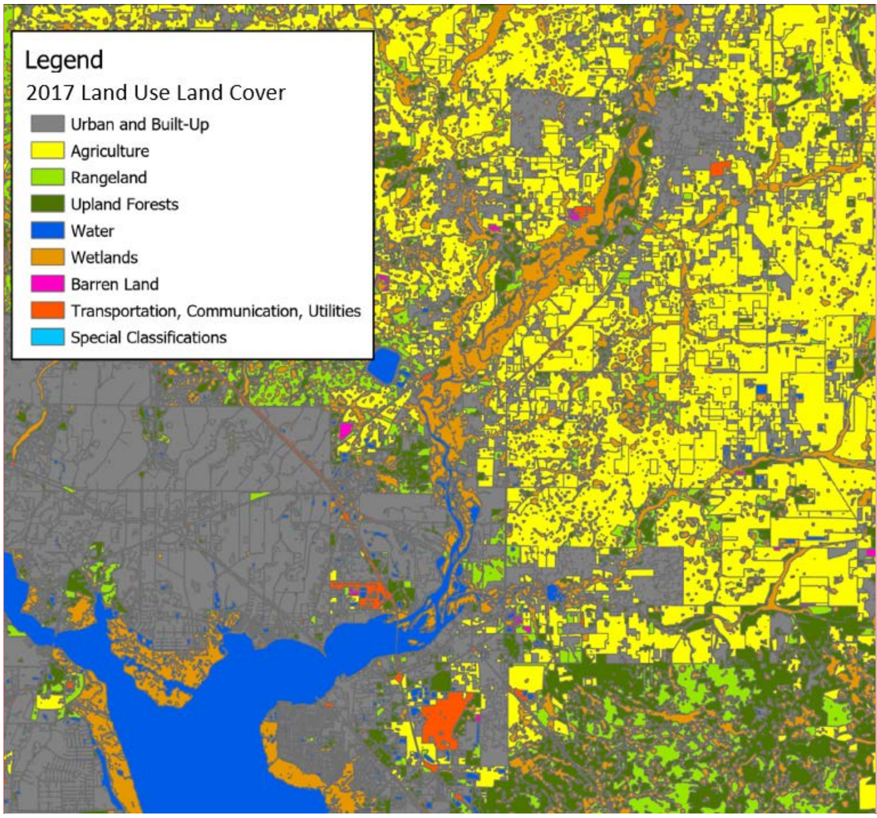

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Figure 2-4. Land use map of the Lower Peace River watershed (SWFWMD 2017).

Land use change in the Peace River basin from 1990 to 2017 are summarized in Table 2-1. Based on the 2017 data, citrus and other agriculture combined comprised 38.6% of the land use and land cover in the Peace River watershed. Upland forest and wetlands account for a combined 24.8%, while urban account for approximately 21.6%. Lakes and open water accounts for less than 5% of the land cover of the basin (Table 2-1). The changes to more intensive agricultural land uses has caused an increasing pattern in streamflow in many of the Peace River tributaries, especially the Horse, Joshua and Shell Creeks. Flow changes associated with land use change are described in Chapter 5.

Table 2-1. Land use change in the Peace River watershed between 1990 and 2017.

Land use and land cover	1990		1999		2009		2017	
	Mi^2	%	Mi^2	%	Mi^2	%	Mi^2	%
Urban	433	18.9	506	21.8	502	21.3	498	21.6
Agriculture	981	42.9	966	41.5	912	39.0	890	38.6
Rangeland	193	8.4	175	7.5	139	6.3	141	6.1
Upland Forests	210	9.2	190	8.2	129	5.6	129	5.6
Water	77	3.4	86	3.7	92	4.1	93	4.0
Wetlands	356	15.6	359	15.4	438	19.3	443	19.2
Barren Land (Mining)	3	0.1	3	0.1	3	0.2	5	0.2
Transportation, Utilities	9	0.4	9	0.4	14	0.6	14	0.6
Other	27	1.2	31	1.3	76	3.6	91	3.9

2.3. Soils

Soils within the Lower Peace and Shell Creek watersheds (Figure 2-5) are primarily classified as A/D (mix of high infiltration rate and moderate infiltration rate) and B/D (mix of moderate infiltration rate and slow infiltration rate) hydrologic soil groups. Class D (very slow infiltration rate and high run off potential) soils buffer the Shell Creek channel upstream of the reservoir, with isolated areas of Class A soils (high infiltration rate and low run off potential) further from the channel but still within the floodplain areas.

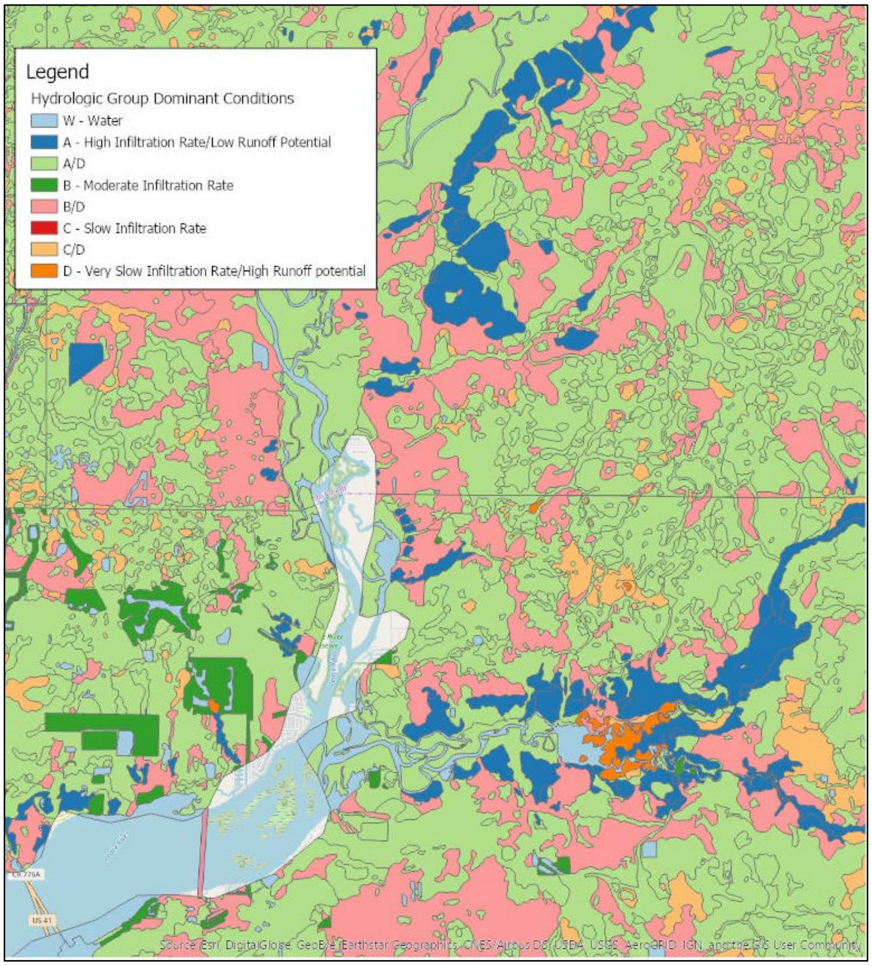

Figure 2-5. Soil types in the Lower Peace River watershed (SWFWMD 2019).

2.4. Bathymetry and Morphometry

The morphology of a riverine system can strongly influence the hydrology and biology of the system. For example, the shape of the river can affect current velocities and sediment composition and distribution. Sediment composition and distribution, in turn can affect benthic organisms and vegetation. The shape of the river also determines the volume of water it can contain, which can affect habitat zonation and availability (SWFWMD 2010a).

For the 2010 minimum flows study of the Lower Peace/Shell System, information pertaining to system morphology and bathymetry were obtained from PBS&J (1998), Mote Marine Lab (2002), and Wang (2004). Comparison of these bathymetric data with more recently collected survey data (i.e., LiDAR data) identified some discrepancies for portions of the Lower Peace River and the Lower Myakka River. These discrepancies may be attributable to landscape alterations associated with Hurricane Charley in 2004. To eliminate these discrepancies and improve model performance, new LiDAR, shoreline mapping and bathymetric surveying of the Charlotte Harbor and the tidal reaches of the Myakka, Peace River and the Caloosahatchee Rivers were conducted in 2013.

The LiDAR photogrammetric mapping was conducted by Aerial Cartographic of America, Inc. (2015) and covered an area of approximately 150 square miles, extending from Lake Hancock in Polk County to Sand Hill in Charlotte County (Figure 2-6a). The Lower Peace River portion of the LiDAR data collection effort was conducted primarily to support development of the District's hydrodynamic model for the reevaluation and development of minimum flows for the Lower Peace/Shell System. All LiDAR data were collected using approved Multi-beam Green & Infrared LiDAR photogrammetric mapping sensors. Routing sensor calibration and maintenance were performed as needed to ensure proper function of the LiDAR system. The LiDAR data were verified by Wantman Group Inc. (2015) and delivered to District in March 2015. District staff completed a final data review and produced a digital, high resolution elevation model (DEM) to support development of a new hydrodynamic model for the Lower Peace/Shell System.

Wang (2013) mapped shorelines using a Trimble RTK GPS mounted on board the survey vessels and measured bottom elevations for inundated areas using a synchronized Odem narrow beam precision echo sounder with the RTK GPS. A total of 4,862,650 survey points and over 994 miles survey lines were collected for the assessed area (Figure 2-6b). Measurement errors associated with motion waves and tidal water-level variations were filtered-out using accepted techniques.

Bathymetry surveys obtained from Wang (2004) for the Lower Shell creek portion of the Lower Peace/Shell System were added to the bathymetric data collected by Wang (2013) for development of the hydrodynamic model domain, which included the Lower Peace River, Lower Shell Creek, the Lower Myakka River, a lower portion of the Caloosahatchee River, and Charlotte Harbor.

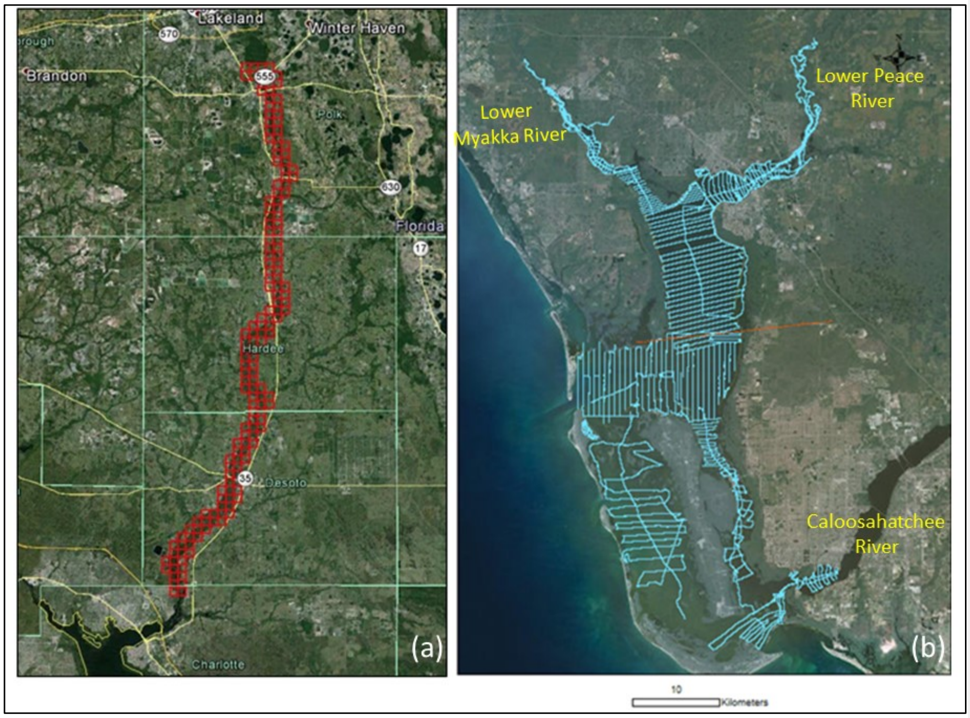

Figure 2-6. (a) LiDAR-surveyed area for the Peace River and (b) shoreline and river cross-section bathymetric survey for the Lower Peace River, Myakka River, Caloosahatchee River, and Charlotte Harbor.

The bathymetric data collected by Wang (2013) were rasterized to a resolution of 15 square meter size by Rubec et al. (2018). Generally, the bathymetric map indicated depths of less than three meters for most areas of the Lower Peace River and Lower Myakka River. Depths in Charlotte Harbor ranges from four to twelve meters (Figure 2-7). Bathymetry surveys obtained from Wang (2004) also indicated depths of less than three meters for most areas of the Lower Shell creek portion.

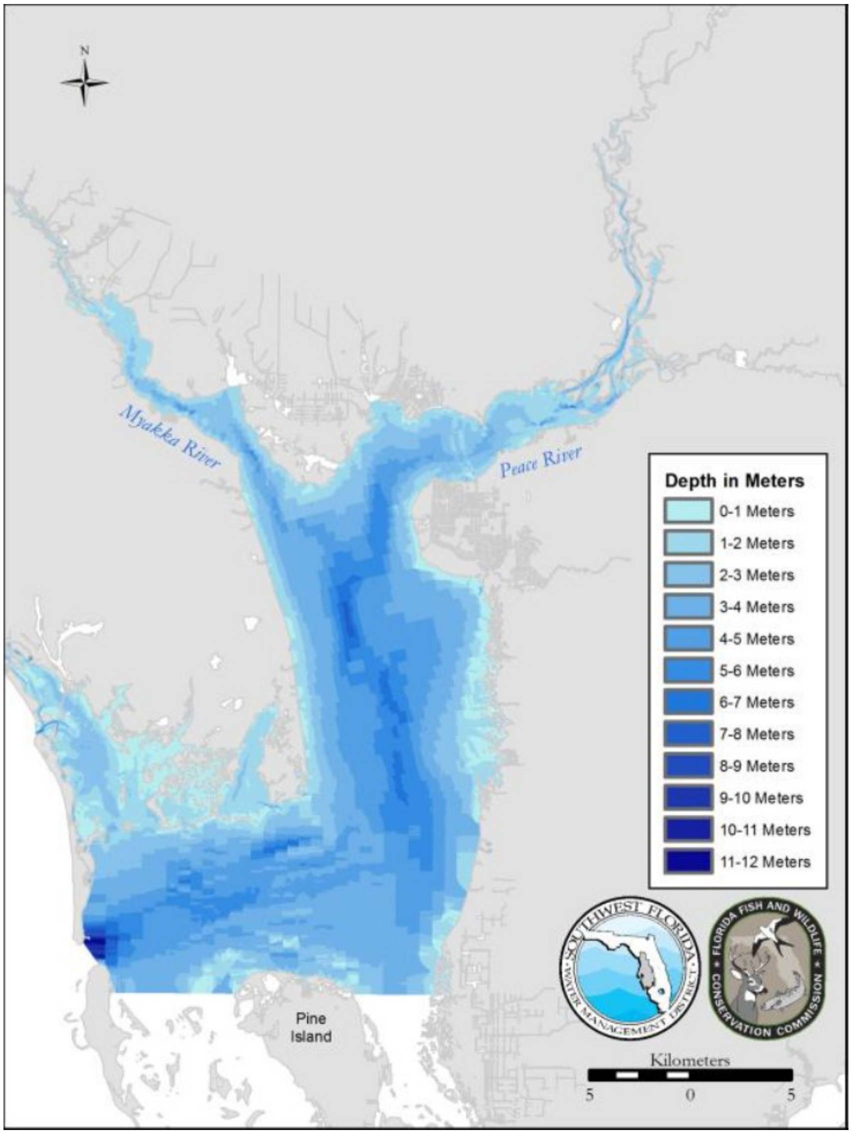

Figure 2-7. Bathymetric map for the Lower Peace River, Lower Myakka River and Charlotte Harbor (reproduced from Rubec et al. 2018).

2.5. Climate

The climate of west-central Florida can be characterized as humid subtropical. The mean annual temperature in the region ranges from 91°F in July and August to a typical low of 49° F in January. The average annual rainfall based on the Arcadia National Weather Service site (Site Identification [SID] number 24570) is approximately 49 inches and more than 60% of the annual rainfall occurs during the months of June, July, August and September. The Arcadia site has a rainfall record that extends back to 1908 (Figure 2-8). Annual rainfall totals of less than long term average (49 inches) were recorded for 49 years during the period of record from 1908 through 2018, while the highest three yearly rainfall totals occurred in 1947, 1982 and 1959 with 80, 78 and 74 inches respectively.

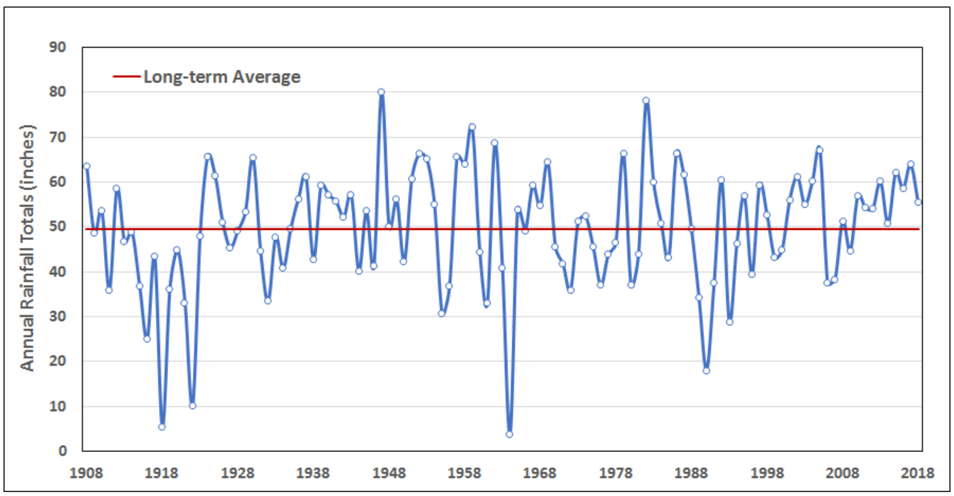

Figure 2-8. Annual rainfall totals (inch) at the Arcadia National Weather Service site (District Site Identification [SID] 24570) from 1908 through 2015.

Average monthly rainfall at the Arcadia site exhibits the typical June-September rainfall peak and lower values during the remainder of the year. Within this general seasonal cycle, rainfall intensities and frequencies are controlled by the effects of larger scale oscillations, notably the Atlantic Multidecadal Oscillation (AMO) and the El Niño-Southern Oscillation (ENSO) (Kelly 2004; Kelly and Gore 2008).

The AMO is an index of Sea Surface Temperature (SST) anomalies averaged over the North Atlantic from 0–70°N and has a strong influence on summer rainfall over the conterminous U.S. (McCabe et al. 2004). The ENSO, a naturally occurring phenomenon associated with an irregular cycle of warming and cooling of SSTs in the tropical Pacific Ocean (5°N to 5°S, 150° to 90°W) is also known as dominant force causing climate variations over the U.S. and much of the globe (Hansen et al. 1997; Schmidt and Luther 2002).

To better understand how these climate indices are related to the temporal variability of streamflow in the Lower Peace/Shell System, the mean annual SST patterns tracked by these two indices and the Lower Peace River streamflow (i.e., the sum of flows at the USGS Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee gages) were normalized. Plots of 5- and 10-year moving averages of the normalized values of AMO and the Lower Peace River streamflow are shown in Figure 2-9. A similar pattern is evident in the two data sets, with higher flows occurring during warmer AMO phases and lower flows occurring during cooler AMO phases. The Pearson's coefficient between 5-year running means of AMO and Lower Peace River streamflow series is 0.68, while the Pearson's coefficient between 10-year running means of AMO and Lower Peace River streamflow series is 0.83. This is consistent with Kelly's (2004) previous findings for the river.

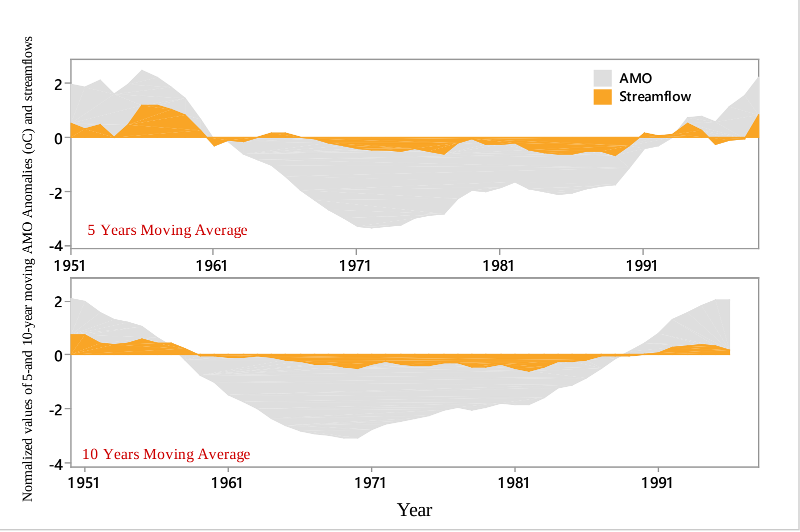

Figure 2-9. Normalized values of 5-and 10-year moving averages of annual AMO anomalies and Lower Peace River flows (i.e., the sum of flows at the USGS Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee gages) for the period 1951 through 1998.

Superimposed within the AMO cycle, the ENSO anomalies were also related to the year-to-year streamflow variability in the Lower Peace River as shown in Figure 2-10. El Niño years are wetter than La Niña years in the region. However, El Niño effects during the summer wet season are somewhat attenuated by the seasonal occurrence of thunderstorms (Kelly and Gore 2008).

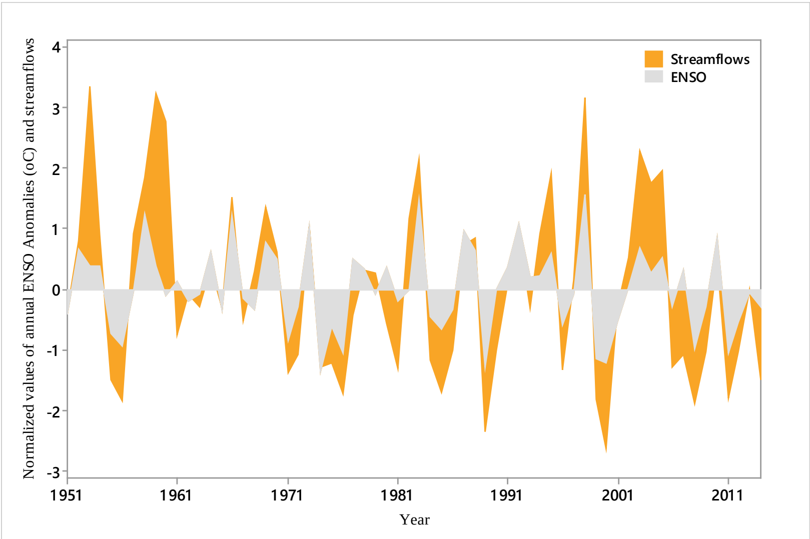

Figure 2-10. Normalized values of annual ENSO anomalies (°C) and Lower Peace River flows (i.e., the sum of flows at the USGS Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee gages) for the period 1951 through 2014.

2.6. Tides

The entire Lower Peace/Shell System is tidally affected. Tidal-flow currents move seawater up into the estuary during high tides and tidally-based currents contribute to the draining of seawater during low tides. The extent to which flow currents move upstream or downstream is also dependent upon the amount freshwater entering the system. Water levels in the Lower Peace/Shell System are typically highest during the summer wet season rather than during the dry season, reflecting the increased freshwater inflows from the Peace River and Shell Creek.

Using data from USGS continuous recorder at the USGS Peace River at Harbor Heights, FL gage site (No. 02297460), water height for the period from 2007 through 2014 tide fluctuated between –3.8 to 3.3 feet (Figure 2-11a) while data collected at the USGS Peace River at Punta Gorda, FL gage (No. 02298300) from 2007 through 2014 indicates that tide fluctuates between –2.7 to 2.3 feet (Figure 2-11b). Median stage levels were -0.2 and -0.32 feet (NAVD88) at the at Harbour Heights and Punta Gorda sites, respectively.

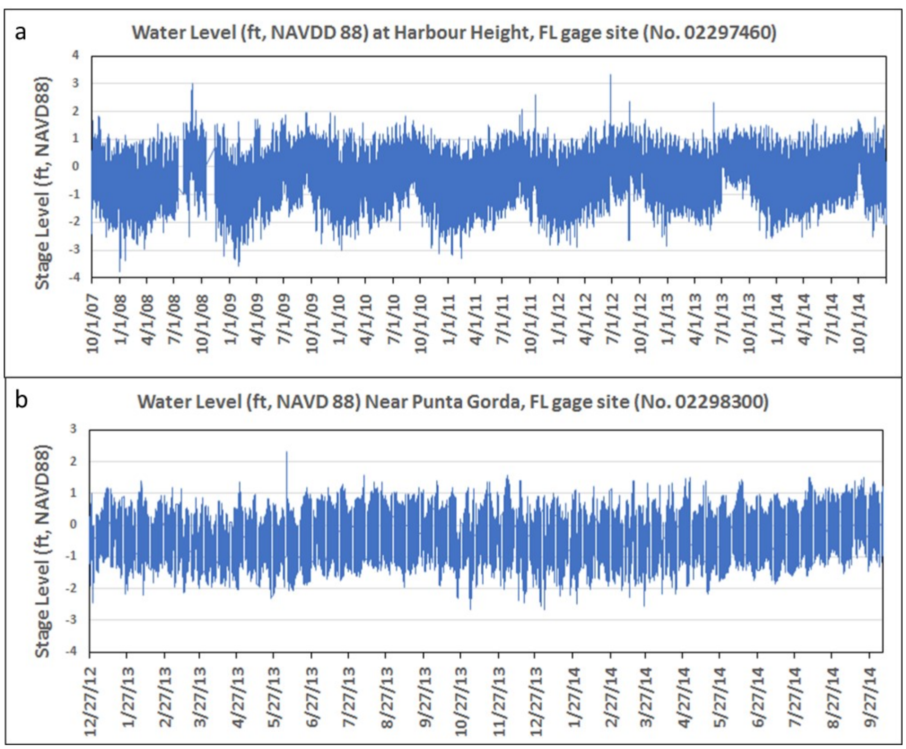

Figure 2-11. Water levels (ft, NAVD88) at a) Harbour Height (USGS gage No. 02297460) from 2007 through 2014 and b) near Punta Gorda (USGS gage No. 02298300) from 2012 through 2014.

2.7. Streamflow

Streamflow represents the sum of the contributions of groundwater, runoff, direct rainfall, and anthropogenic discharges (e.g., wastewater) minus the volume of water that is lost due to evapotranspiration, losses to groundwater, and withdrawals. The physical, chemical, and biological properties of aquatic ecosystems can all be affected by the hydrologic regime (Poff and Ward 1989, 1990), so substantial ecological changes can be associated with long-term changes in flows. In tidal rivers like the Lower Peace/Shell System, freshwater inflow can affect water residence time and is a critical determinant of the spatial and temporal variation in salinity. In turn, salinity is a critical determinant of the structure and function of tidal river and estuarine ecosystems.

There are four USGS gages (see Figure 2-2) where flows that enter the Lower Peace/Shell System are recorded: Peace River at SR 70 at Arcadia, FL (USGS gage 02296750), Horse Creek at SR 72 near Arcadia, FL (USGS gage 02297310), Joshua Creek at Nocatee, FL (USGS gage 02297100), and Shell Creek near Punta Gorda, FL (USGS gage 02298202).

2.7.1. Mean Annual Flows

Peace River flows have been measured at the Arcadia gage since 1932. Mean annual flows at the gage for the period 1950 through 2018 are shown in Figure 2-12. The mean annual flows for this period ranged from a minimum of 139 cfs in 2000 to a maximum of 2,724 cfs in 1953, with a long-term (1950-2018) average of 1,000 cfs and recent, short-term (2000-2018) average of 961 cfs.

The period of record for Horse Creek near Arcadia flows is from 1950 to the present. Mean annual flows in the creek for the period 1950 through 2018 are shown in Figure 2-13. The minimum and maximum Horse Creek mean annual flows of 23 cfs and 494 cfs occurred respectively in 2007 and 1959. The long-term (1950-2018) and recent, short-term (2000-2018) mean annual flows in Horse Creek near Arcadia are 190 cfs and 193 cfs respectively.

Measured flows for Joshua Creek at Nocatee are also available for the period 1950 to the present. Figure 2-14 shows the annual mean flows in the creek for the period 1950 through 2018. The minimum annual mean flow of 24 cfs occurred in 1956 and the maximum of 264 cfs in 1953. The long-term mean (1950-2018) annual flow in Joshua

Creek at Nocatee is 112 cfs and the recent, short-term (2000-2018) mean annual flow is 126 cfs

Minimum flows for Lower Peace River are established based on the sum of flows from Peace River at Arcadia gage, the Horse Creek near Arcadia gage, and Joshua Creek at Nocatee gage. The mean annual combined flows from these three gage sites for the period 1950 through 2018 are presented in Figure 2-15. The combined mean annual flows ranged from a minimum of 221 cfs in 2000 to a maximum of 3,465 cfs in 1953. The long-term (1950-2018) and recent, short-term (2000-2018) combined mean annual flows in the Peace River at Arcadia, Horse Creek near Arcadia, and Joshua Creek at Nocatee gages are 1,302 cfs and 1,279 cfs, respectively.

Minimum flows for Lower Shell Creek are established based on flows measured at the Shell Creek near Punta Gorda gage. Shell Creek is impounded by the Hendrickson Dam for public water supply approximately 6.2 miles upstream of the confluence of the creek with the Lower Peace River. The dam presents a barrier to the downstream flow conveyance when water levels in the reservoir drop below the spillway crest elevation of 5 ft. Medium and higher flow of Shell Creek are minimally affected by the presence of the low-elevation dam.

The mean annual flows at the Shell Creek near Punta Gorda gage for the period from 1966 through 2018 are shown in Figure 2-16. The minimum mean annual flow of 115 cfs occurred in 2007 and the maximum of 821 cfs occurred in 1995. The long-term mean (1966-2018) annual flow at the site is 363 cfs, while the short-term (1966-2018) mean annual flow is 389 cfs.

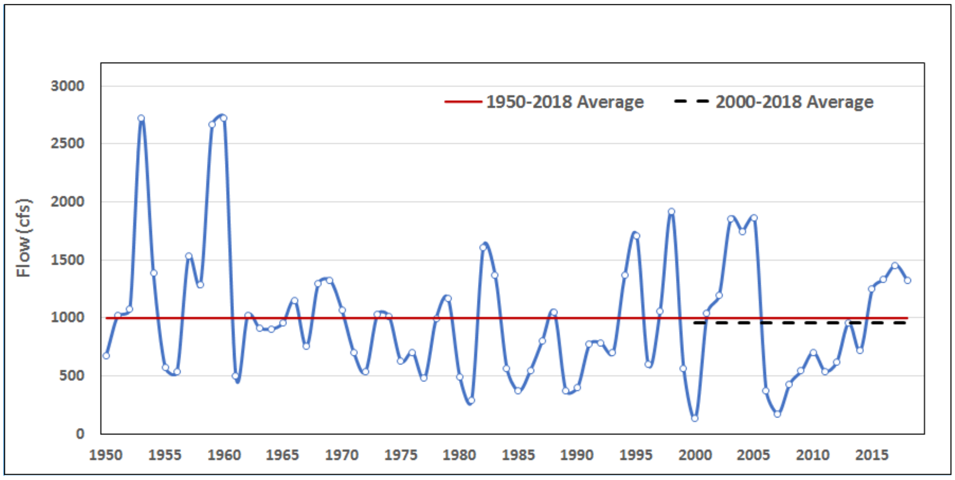

Figure 2-12. Time series of mean annual flows (cfs) at the USGS Peace River at SR 70 at Arcadia, FL gage for the period 1950 through 2018, with long-term average (red line) and short-term (2000-2018) average (black dashed line).

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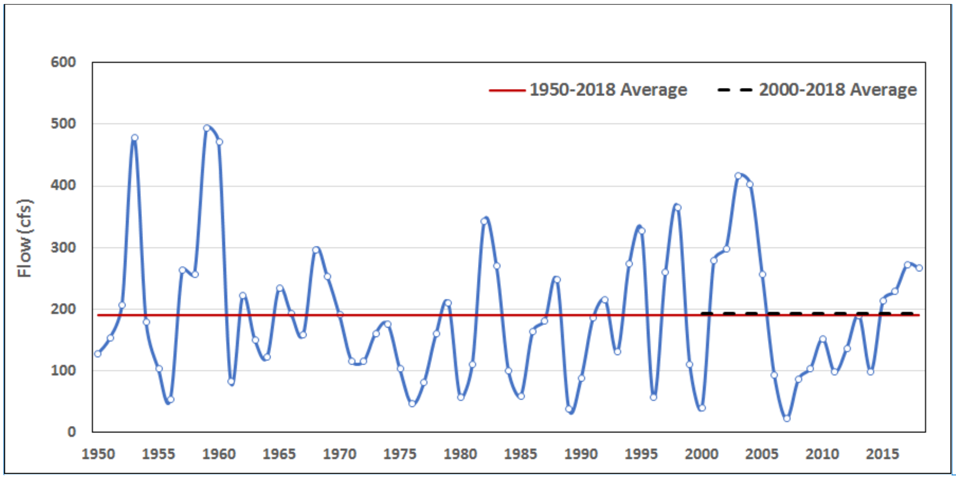

Figure 2-13. Time series of mean annual flows (cfs) at the USGS Horse Creek at SR 72 near Arcadia, FL gage for the period 1950 through 2018, with long-term average (red line) and short-term (2000-2018) average (black dashed line).

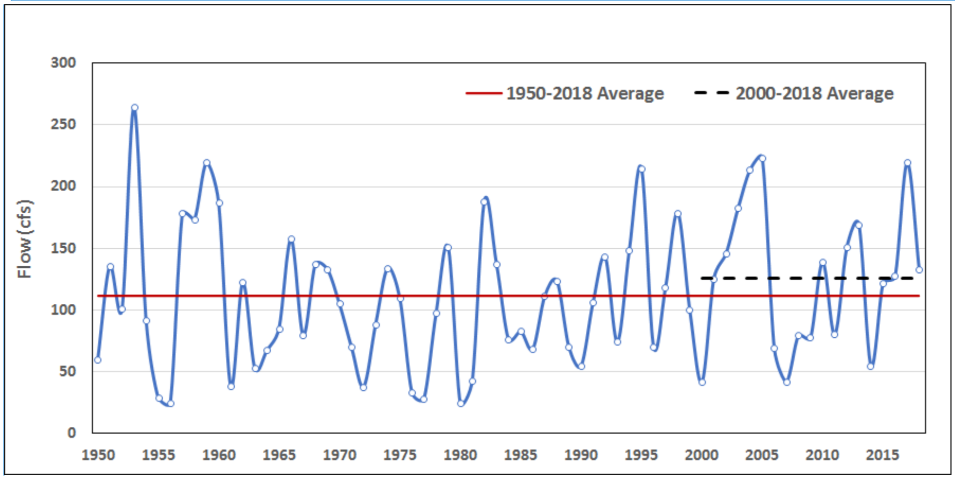

Figure 2-14. Time series of mean annual flows and long-term average flow (cfs) at the USGS Joshua Creek at Nocatee, FL gage for the period 1950 through 2018, with long-term average (red line) and short-term (2000-2018) average (black dashed line).

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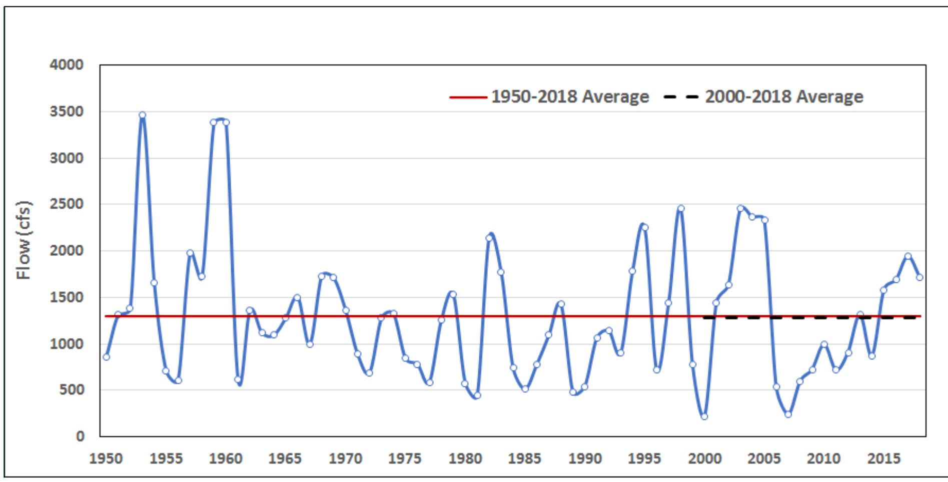

Figure 2-15. Time series of combined mean annual flows (cfs) at the USGS Peace River at Arcadia, Horse Creek near Arcadia, and Joshua Creek at Nocatee gages

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for the period 1950 through 2018. Long-term average and short-term (2000-2018) average indicated by red line and black dashed line respectively.

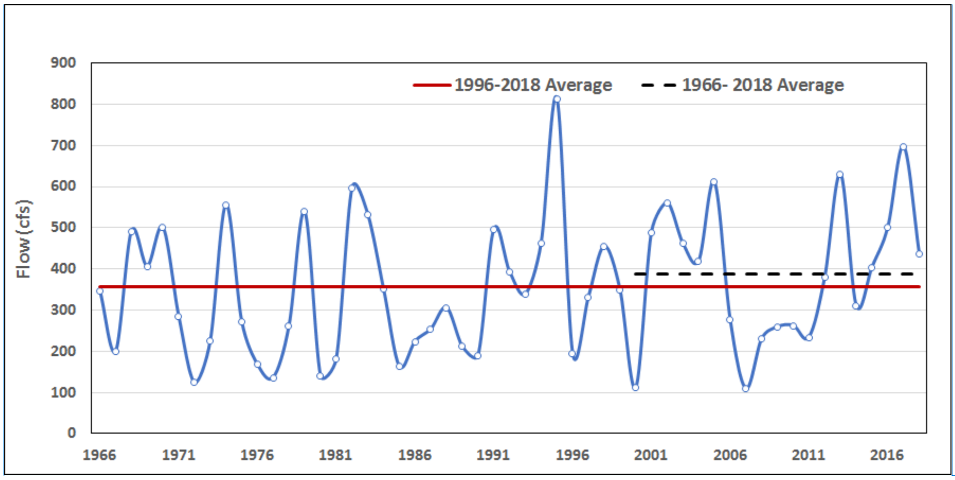

Figure 2-16. Time series of mean annual flows (cfs) at the USGS Shell Creek near Punta Gorda, FL gage for the period 1966 through 2018, with long-term average (red line) and short-term (2000-2018) average (black dashed line).

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2.7.2. Seasonal Flows

Box and whisker plots of the daily flows at the Peace River at Arcadia, Horse Creek near Arcadia, Joshua Creek at Nocatee, and Shell Creek near Punta Gorda gages are presented in Figure 2-17. The typical seasonal distribution of flows in the Peace River generally follows the seasonal pattern of rainfall in west-central Florida, with high flows occurring during a four-month summer wet season (June to September) followed by medium and low flow periods associated with the dry season that extends from October to May. Streamflow reaches its lowest values in May and June, when potential evapotranspiration rates are high, groundwater levels are low, and surface water storages available in sinks, depressions, soils and wetlands are high. In the late summer and fall, surface and ground-water levels are higher, soils are more saturated, and there is much greater streamflow production for each unit of rainfall, with peak flows typically occurring in August and September.

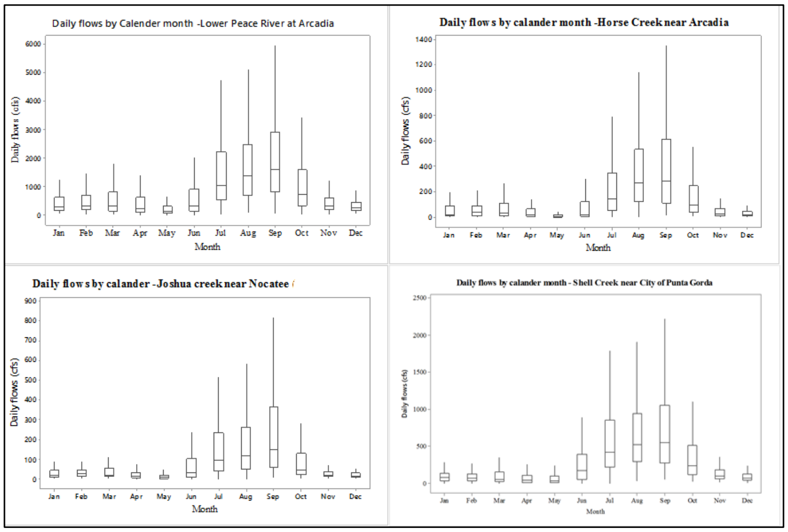

Figure 2-17. Box and whisker plots of daily flows (cfs) by calendar month for the USGS Peace River at Arcadia, Horse Creek near Arcadia, Joshua Creek at Nocatee and Shell Creek near Punta Gorda gages. Boxes represent the inter-quartile range; whiskers represent lowest and highest observations.

Flows in the Peace River have been affected by mining and agricultural activities, drainage alterations and water withdrawals. Phosphate mining and domestic waste discharges to the river have gradually declined since the mid-1980s, while agricultural runoff originating from groundwater withdrawals has contributed to increased baseflow in the Joshua, Horse, Prairie, and Shell Creek tributaries (SWFWMD 2002). Studies conducted by HydroGeoLogic, Inc. (2012) indicate that groundwater withdrawals have a significant impact on the Upper Peace River flows, but much less impact on flows at the lower segment of the Peace River. The lessened impact at the Lower Peace at Arcadia can be attributed to the much tighter confinement of the Upper Floridan Aquifer in the lower area of Peace River basin. Additional information pertaining to anthropogenic impacts on flows in the Lower Peace/Shell System is provided in Section 2.9 below and in Chapter 5.

2.8. Hydrogeology and Aquifer Levels

The hydrogeology of the Peace River basin includes a surficial, intermediate and the Floridan aquifer systems. The uppermost system is the unconfined surficial aquifer composed primarily of unconsolidated quartz sand, silt, and clayey sand (SWFWMD 2004; Gates 2009). The surficial aquifer is mainly recharged by rainfall and other sources of recharge, including wastewater, reclaimed water, septic effluent, and irrigation of agricultural land or landscape areas (Weber 1999; Spechler and Kroening 2007; McBride et al. 2015). The water table is at or near the land surface near the river, wetlands, tributary streams, and natural lakes in the northern portion of the Peace River basin. Areas of higher elevation typically exhibit a water table of about 5 to 10 feet below the land surface depending on the rain season and topography (McBride et al. 2015). The hydraulic conductivities range from 20 to 50 ft/day in the lower area of the Peace River basin (SWFWMD, 2001; HydroGeoLogic, Inc. 2009).

Underlying the surficial aquifer is the confined intermediate aquifer consisting of water bearing and confining beds between the overlying surficial aquifer system and the underlying Floridan aquifer system (Gates 2009; HydroGeoLogic, Inc. 2009). The water-bearing units are confined above and below by less permeable materials such as sandy clay, clay and marl (Duerr and Enos 1991; SWFWMD 2001). The confining units hinder vertical movement of groundwater between the overlying surficial aquifer and the underlying Upper Floridan aquifer, but it is a leaky aquifer system (Duerr and Enos 1991; Spechler and Kroening 2007; HydroGeoLogic, Inc. 2009). The Intermediate Aquifer is relatively thin in the upper reaches of the Peace River basin and thickens to the south (SWFWMD 2001). The elevation of the top of the intermediate aquifer system ranges from about 25 feet below sea level in northeastern DeSoto County to about 100 feet above sea level in northwestern Hardee County (Duerr and Enos 1991; Gates 2009).

Underlying the Intermediate Aquifer, the confined Floridan Aquifer exists as a major source of fresh groundwater for most of southwest Florida. The Floridan Aquifer is composed primarily of limestone and dolostone that are hydraulically highly permeable (Duerr and Enos 1991; Weber 1999; Gates 2009). The Floridan Aquifer is subdivided into the Upper Floridan aquifer and Lower Floridan aquifer which are separated by a confining unit. The Upper Floridan aquifer is separated from the Intermediate Aquifer by a lower Hawthorn Group confining unit consisting of clays and dolomitic limestones (Gates 2009; HydroGeoLogic, Inc. 2009; Lewelling and Metz 2009). About 85% to 90% of all groundwater is derived from the Upper Floridan aquifer. The Lower Floridan aquifer is generally brine-saturated (SWFWMD 2004), there is an ongoing feasibility study in the upper Peace River region to derive water supply from it. Geology in the Upper Peace River area (upstream of Fort Meade) is dominated by karst features and large sinks (SWFWMD 2002). Historically, substantial amounts of the groundwater were withdrawn from the region and contributed to the decline of groundwater levels and the disappearance of flow from Kissengen Spring near Bartow (SWFWMD 2002; FDEP 2007; Lewelling and Metz 2009). Figure 2-18 presents groundwater elevation history near Arcadia at District Site Identification (SID) number 24144, which is used to monitor water levels within the Upper Floridan aquifer. Aquifer water levels at the site have generally fluctuated between 34 and 49 feet NAVD88 during the period from 2011 through 2018. Water levels since 2011 have generally increased, although no significant trend is evident.

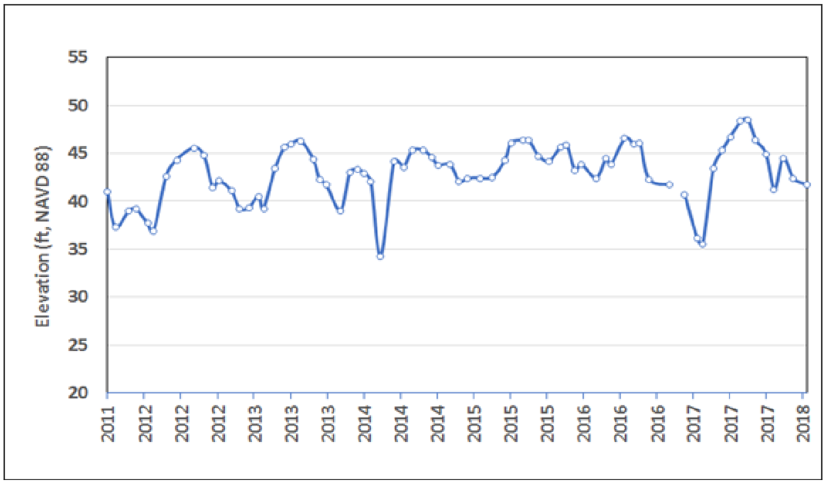

Figure 2-18. Average daily water level elevations (NAVD88) in the Upper Floridan aquifer at District Site Identification (SID) 24144 near Arcadia for the period 2011 through 2018.

2.9. Water Use

While groundwater has historically served the majority of consumptive uses of water in the Peace River basin, there are two major surface water supplies in the southern portion of the basin. The PRMRWSA withdraws water from the Lower Peace River and the City of Punta Gorda withdraws water from the Shell Creek Reservoir.

The PRMRWSA is the primary existing legal water user on the Peace River, with the first permit for withdrawals at this site (Water Use Permit 27500016) issued in 1975 (Table 2-

2). Withdrawals from Peace River authorized by this original permit began in 1980. The intake for the PRMRWSA Peace River facility is located on a slough connected to the west bank of the river approximately 19 miles upstream of the river mouth at Charlotte Harbor (SWFWMD 2010a).

Subsequent to issuance of the original permit in 1975, additional and revised permits (Tables 2-2) were issued by the District to regulate permitted withdrawals from the river by the PRMRWSA.

Table 2-2. Historic PRMRWSA's water use permits (source: Atkins, Inc. 2013a).

Year	December 1975	March 1979	May 1982	October 1988	March 1996
Water Use Permit	27500016	27602923	202923	2010420	2010420.02
Average Permitted withdrawal (mgd)	5.0	5.0	8.2	10.7	32.7
Maximum Permitted withdrawal (mgd)	12 &18	12 &18	22	22	90
Low Flow Cutoff (cfs)	91-664*	91-664*	100-664*	100 & 664*	130**
Maximum Percent of Withdrawals (%)	5	5	n/a	10	10

* Withdrawals based on historic monthly averages
** Withdrawals based on the preceding actual daily flow at the USGS Peace River at Arcadia gage

In response to the severity of the 2006-2009 drought in the region, the 1996 version of the water use permit was modified several times through issuance of several executive orders (Table 2-3).

In 2009, the PRMRWSA expanded the Peace River Facility to increase its pumping capacity from 44 million gallons per day (mgd) to a maximum diversion of 120 million mgd and built a 6 billion gallon reservoir. In 2011, the District issued a revised version of the water use permit for facility withdrawals (Table 2-4) that was consistent with the minimum flows for the Lower Peace River (see Table 1-1) that had been adopted in 2010. However, allowable diversions specified by the permit when the combined flows at the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee gages exceed 625 cfs during Blocks 2 and 3 are, respectively, 1% and 10% less than the withdrawal limits included in the currently established Lower Peace River minimum flows rule. The 2011 water use permit authorizes a daily maximum withdrawal of 120 mgd, annual average withdrawal of 32.855 mgd and monthly maximum withdrawals 38.3 mgd, with no withdrawals allowed if the combined previous day flow at the three gages is less than 130 cfs.

Table 2-3. Historic modifications of the water use permit issued to the PRMRWSA in 1996 through executive orders issued by the District in response to the severity of the 2006-2009 drought in the region (source: Atkins, Inc. 2014a).

Event	Effective Dates	Low flow Threshold	Gages Used	Withdrawal Issued
Temporary WUP*	12/1/06 to 8/12/08	90 cfs	Arcadia	10%
Executive Order	8/13/07 to 8/29/08	130 cfs	Arcadia + Horse + Joshua	12%
Executive Order	8/30/07 to 10/31/08	90 cfs	Arcadia + Horse + Joshua	12%
Executive Order	11/1/07 to 4/19/09	90 cfs	Arcadia + Horse + Joshua	14% to 330 cfs 21% > 330 cfs
Executive Order	4/20/08 to 6/25/08	90 cfs	Arcadia + Horse + Joshua	10% to 221 cfs 26% >221 cfs
Executive Order	6/26/08 to 10/26/08	90 cfs	Arcadia + Horse + Joshua	12% to 1370 cfs 15% > 1370 cfs
Executive Order**	10/23/08 - 7/15/09	90 cfs	Arcadia + Horse + Joshua	**4/20-6/25** 10% to 221 cfs 26% >221 cfs **6/26-10/26** 12% to 1370 cfs 15% >1370 cfs **10/27-4/19** 14% to 330 cfs 15% above 330 cfs
Executive Order	7/16/09 to March 2010	Same as above but increases maximum withdrawal from 90 to 120 mgd		

* Note 1: The temp WUP was extended each month by the governing board until the first Executive Order was approved
** Note 2: Variable % withdrawal based on District proposed MFL criteria

Table 2-4. Permitted withdrawals from the Lower Peace River by the PRMRWSA based on the sum of flows at the USGS Horse Creek near Arcadia, Joshua Creek at Nocatee, and the Peace River at Arcadia gages.

Period	Effective Dates	Where Flow on Previous Day Equals	Allowed Withdrawals
Block 1	April 20 through June 25	≤130 cfs	0 cfs
		>130 cfs	16% of the previous day's flow*
Block 2	October 28 through April 19	≤130 cfs	0 cfs
		>130 cfs and < 625 cfs	16% of the previous day's flow*
		≥ 625 cfs	28% of the previous day's flow*
Block 3	June 26 through October 27	≤130 cfs	0 cfs
		>130 cfs and < 625 cfs	16% of the previous day's flow*
		≥ 625 cfs	28% of the previous day's flow*

*The total permitted maximum withdrawals on any day shall not exceed 400 cfs.

On February 26, 2019, the permit issued to the PRMRWSA was renewed for a 50-year period, with an increase in the daily maximum withdrawal from 120 mgd to 258 mgd (400 cfs) and an increase in the annual average withdrawal from 32.855 mgd (51 cfs) to 80 mgd (124 cfs). However, before the renewal of the permit the PRMRWSA entered into agreement with the Polk Regional Water Cooperative (PRWC) to reduce the permitted maximum daily withdrawal by up to 48 mgd (74.2 cfs) (i.e., to 210 mgd or 325 cfs) to offset impacts from future permitted withdrawals by the PRWC from Peace Creek in Polk County for natural system restoration and potable supply or from the Upper Peace River in Polk County for storage in reservoirs or other approved consumptive uses – ultimately for potable use.

If a water use permit is not issued to the PRWC for withdrawals from Peace Creek or the Upper Peace River within 10 years of the issuance date of the agreement, then the PRMRWSA shall no longer be bound by the agreement.

Monthly average withdrawals at the PRMRWSA Peace River facility for the period 1980 through 2014 are shown in Figure 2-19. The highest average withdrawals occur in July and the lowest in May. The City of Punta Gorda withdraws water from Shell Creek reservoir upstream of Hendrickson Dam, as authorized by Water User Permit 2000871.011 issued by the District in 2018, with an expiration date of 2027. The current permit allows for an average withdrawal of 8.1 mgd (12.5 cfs) and a maximum peak monthly withdrawal of 11.73 mgd (18.1 cfs). Monthly average withdrawals from Shell

Creek Reservoir by the City of Punta Gorda from 1972 through 2014 ranged from 4 cfs in July to 5.5 cfs in November and are shown in Figure 2-20.

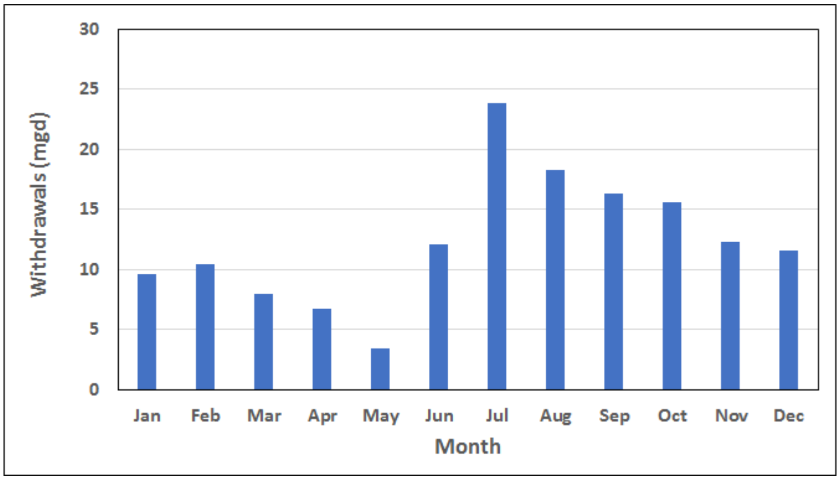

Figure 2-19. Monthly average withdrawals (cfs) from the Peace River by the PRMRWSA for the period 1980 through 2018.

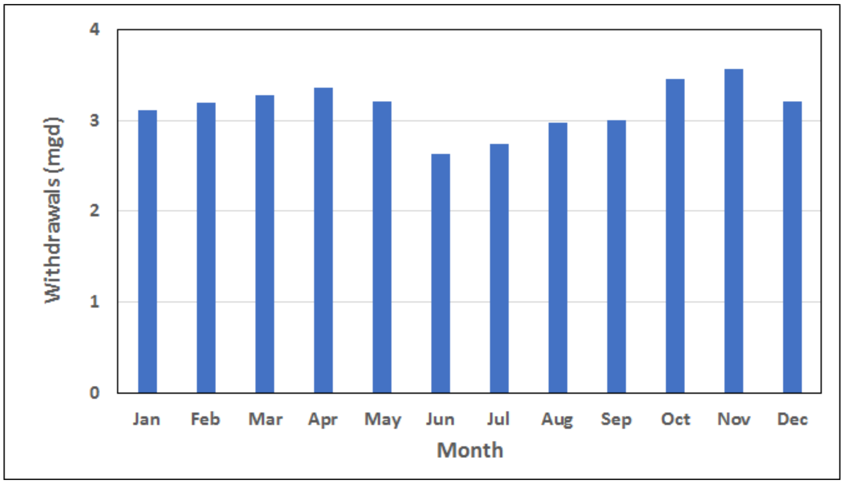

Figure 2-20. Monthly average withdrawals (cfs) from Shell Creek Reservoir by the City of Punta Gorda for the period 1972 through 2018.

CHAPTER 3 - WATER QUALITY CHRACTERSTICS

Water quality is one of ten “Environmental Values” defined in the State Water Resource Implementation Rule for consideration when establishing minimum flows. Water quality of the Lower Peace/Shell System and Charlotte Harbor have been studied by several agencies, including FDEP (2007, 2019), Charlotte Harbor Environmental Center (1999, 2000, 2001, 2002, 2003), PRMRWSA (PB&J 1998, 1999, 2002, 2003, 2004, 2005, 2006b, 2007, 2008, 2009, 2010; Atkins 2011, 2012, 2013a, 2013b, 2014a, 2014b, 2017); Janicki Environmental, Inc. (2017): City of Punta Gorda (PBS&J 2006a, 2010), the USGS (Stoker et al. 1989, Stoker 1992) and the District (Coastal Environmental, Inc. 1996; CDM 1998, SWFWMD 2001, 2002; Kelly et al. 2005; SWFWMD 2006, 2007, 2010, 2015; Ghile and Leeper 2015; Janicki Environmental, Inc. 2019). Although flow can affect water quality, findings summarized to date for the Lower Peace/Shell System indicate that withdrawals have had very little measurable influence on system water quality.

3.1. Water Quality Classification

Under Rule 62-302.200, F.A.C., Florida’s surface water quality standards consist of four components: 1) the designated use or classification of each water body, 2) the surface water quality criteria (numeric and narrative) for each water body, which are established to protect its designated use, 3) the anti-degradation policy, and 4) moderating provisions, such as mixing zones. Each surface water body in Florida is classified according to its present and future most beneficial use, referred to as its designated use, with class-specific water quality criteria for select physical and chemical parameters, which are established to protect the water body’s designated use (Chapter 62-302, F.A.C.).

Charlotte Harbor is classified as a Class II water body with a designated use of shellfish propagation or harvesting (Rule 62-302.400(17)(b), F.A.C.). The Lower Peace River and Lower Shell Creek are classified as Class III waters with designated uses of recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife (Rule 62-302.400(15), F.A.C.) The Gasparilla Sound-Charlotte Harbor Aquatic Preserve and Cape Haze Aquatic Preserve are classified as Outstanding Florida Waters, a designation associated with Florida’s anti-degradation policy (Rule 62-302.700, F.A.C.). In addition, Charlotte Harbor is designated a Southwest Florida Water Management District Surface Water Improvement and Management (SWIM) Priority Waterbody and has a comprehensive SWIM Plan (SWFWMD 2000) that is currently being updated (SWFWMD 2020-in preparation) and which identifies management strategies intended to prevent water quality degradation.

Specific water quality criteria corresponding to each surface water classification are listed in Rules 62-302.500 through 62-302.540, and 62-302.800, F.A.C. Numeric interpretations of narrative nutrient water quality criteria for all Class I, II and III waters of Florida (Rule 62.302.531, F.A.C.) became effective in 2012. Estuary-specific numeric interpretations of the narrative nutrient criteria (Rule 62.302.532, F.A.C.), also became effective in 2012. The estuarine-specific rules apply to Charlotte Harbor Proper but are not applicable to the Lower Peace River and Lower Shell Creek, which are tidally influenced areas that fluctuate between predominantly marine and predominantly fresh waters during typical climatic and hydrologic conditions.

3.2. Impaired Waters and Pollutant Load Reduction Goal

3.2.1 Impaired Waters

Section 303(d) of the Federal Clean Water Act requires each state to identify and list "impaired" waters where applicable water quality criteria are not being met. In addition, development of Total Maximum Daily Loads (TMDLs) is required for impaired water bodies. A TMDL is the amount of a specific pollutant that a receiving water body can assimilate without causing exceedance of water quality standards. To meet the reporting requirements of the Federal Clean Water Act, the State of Florida publishes the Integrated Water Quality Assessment for Florida. Assessment is made based on specific segments each assigned a specific Waterbody Identification (WBID) number.

Several WBIDs in the Lower Peace River and Lower Shell Creek (Figure 3-1) are included on the most recent statewide comprehensive verified list of impaired waters published on November 15, 2019 (FDEP 2019). Within the Lower Peace River, WBID 2056B (Middle Peace River Estuary [Middle Segment]) and WBID 2056C2 (Peace River Estuary [Upper Segment South]) are listed as impaired due to nutrients based on total nitrogen concentration exceedances. WBID 2056D (Alligator Bay) is listed as impaired for nutrients based on chlorophyll-a exceedance in a single year. In the upper portion of the Lower Peace River, WBID 1623C (Peace River Above Joshua Creek) is listed for fecal coliform exceedances. Downstream, near the mouth of the river, WBIDS 2060A1 (Myakka Cutoff [Western Portion]) and 2060A2 (Myakka Cutoff [Eastern Portion]) are impaired for fecal coliform based on the shellfish harvesting classification being not fully approved by the Environmental Assessment Section (SEAS) of the Florida Department of Agriculture and Consumer Services.

Additionally, although iron concentrations in the Lower Peace River WBIDs 2056A, 2056B and 2056C2 are due in part to naturally occurring groundwater inputs, these WBIDs are listed as impaired because the FDEP could not eliminate possible anthropogenic sources of the metal. In Shell Creek, WBID 2041A (Shell Creek below Hendrickson Dam) is listed as impaired for nutrients, based on total nitrogen and total phosphorus concentration exceedances.

To date, no TMDLs have been developed for specific WBIDs in the Lower Peace River or Lower Shell Creek (FDEP 2019). However, Florida's statewide TMDL for mercury (FDEP 2013) is applicable to the river and creek.

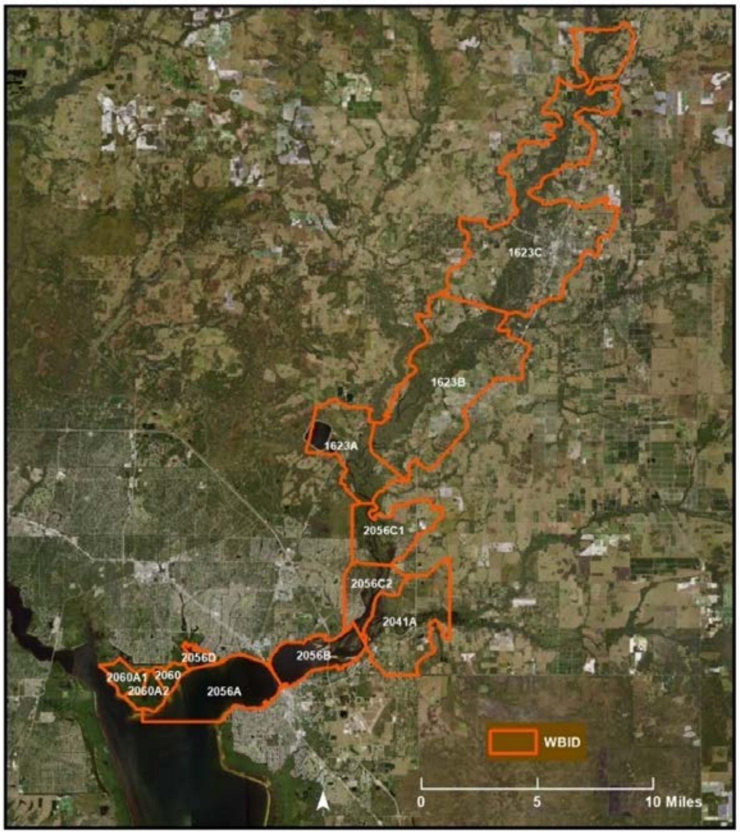

Figure 3-1. Selected Florida Department of Environmental Protection Waterbody Identification (WBID) boundaries in the vicinity of the Lower Peace River and Lower Shell Creek.

3.2.2. Pollutant Load Reduction Goal

The 2000 SWIM Plan for Charlotte Harbor (SWFWMD 2000) included a Pollutant Load Reduction Goal (PLRG) that was developed to "hold the line" on nitrogen loads from the Peace River watershed to Charlotte Harbor. The PLRG was developed based on potential increases in bottom water hypoxia in the harbor that could be associated with increased nitrogen loads.

The hold-the-line approach was also developed with acknowledgement of environmental effects associated with the relatively large, seasonal inflows of fresh water with high concentration of dissolved organic matter to Charlotte Harbor from the Peace and Myakka Rivers. These inflows lead to natural stratification patterns that are associated with low dissolved oxygen concentrations (CDM 1998) and strongly affect seagrass biomass and productivity (Tomasko and Hall 1999).

As noted in the 2020 Charlotte Harbor SWIM plan update (SWFWMD 2020-in preparation), the "hold-the-line" approach is being adequately implemented for the gaged portion of the Peace River watershed. Modeling results of nitrogen loading indicate the average load from the gaged portion of the Peace River for two seven-year periods, 1985 through 1992 and 2009 through 2015 differ by less than 0.5%.

The recently completed Lake Hancock Lake Level Modification and Lake Hancock Outfall Treatment Marsh projects (SWFWMD 2020), and additional projects to be implemented in the future will continue to support the "hold-the-line" approach for nutrient loading from the Peace River basin.

3.3. Water Quality Review

In support of the current reevaluation and development of proposed minimum flows for the Lower Peace River and Lower Shell Creek, studies completed after publication of the District's 2010 minimum flows report for the Lower Peace River (SWFWMD 2010) that included in-depth analyses of the spatial and temporal variation in water quality within the system were reviewed. Key studies included in the review include the following.

1. Atkins, Inc. (2014b), which was prepared for the District to assess relationships between freshwater inflow and nutrient loading with chlorophyll concentrations and primary production in the Lower Peace /Shell System and upper Charlotte Harbor.

2. Janicki Environmental, Inc. (2017) prepared for the PRMRWSA to provide the District with information for evaluating environmental effects of withdrawals from the Peace River Facility.
3. Janicki Environmental, Inc. (2019), which is included as Appendix F to this minimum flows report, was prepared for the District to investigate relationships between freshwater inflow and water quality in the tidal portion of the Lower Peace/Shell System, and ensure that the proposed minimum flows resulting from the current minimum flows reevaluation/development process do not result in unacceptable water quality impacts, and
4. Atkins, Inc. (2017) prepared for the City of Punta Gorda for evaluating environmental effects of withdrawals from Shell Creek Reservoir.

3.3.1. Water Quality Characteristics in the Lower Peace River

Stoker et al. (1989) addressed hydraulic and salinity characteristics of the tidal reach of the Peace River, concluding that the hydraulic characteristics of the tidal river are influenced primarily by fluctuations in tidal stage. They also note that salinity characteristics in the tidal portion of the Peace River are influenced by freshwater inflows, tide, and the salinity in Charlotte Harbor, and that wind effects may occasionally become important by affecting tidal patterns. Stoker (1992) further investigated salinity variation due to freshwater inflow and tides and the potential changes in salinity due to altered freshwater inflow into Charlotte Harbor, noting that seasonal fluctuations in salinity in the harbor occur primarily in response to fluctuations in freshwater inflow from the Peace, Myakka, and Caloosahatchee rivers. Also, as noted in section 3.2.2 of this chapter, the importance of inflows to the harbor of fresh water with high concentration of dissolved organic matter are associated with natural patterns of low dissolved oxygen concentrations. Collectively, these and numerous other studies highlight the importance of water quality within the Lower Peace/Shell System and the receiving, Charlotte Harbor.

Pursuant to Water Use Permit 20010420, PRMRWSA has been implementing a Peace River hydrobiological monitoring program (HBMP) since 1976 to provide the District with information sufficient for evaluating environmental effects of Peace River facility withdrawals. Over the years, elements of the HBMP have been modified to enhance understanding of the Lower Peace/Shell System and upper Charlotte Harbor. Much of the recent HBMP data collection has focused on physical factors (water temperature, color and extinction coefficients), water quality (salinity, nitrogen, phosphorus, nitrate/nitrite and reactive silica), and phytoplankton biomass (chlorophyll *a*) that may be directly linked to freshwater inflow variation. Appendix A to the Peace River Hydrobiological Monitoring Program 2016 HBMP Comprehensive Report (Janicki Environmental, Inc. 2017) summarizes efforts of a scientific review panel, which was initiated in 1996, that have helped shape the current HBMP.

Since many biotic communities are dependent on estuarine salinity variation for survival, the need to collect salinity data at much greater frequencies was identified during the 1996 renewal of the permit issued to the PRMRWSA. The PRMRWSA subsequently deployed three additional continuous floating surface salinity recorders in December of 2005, two additional similar recorders again in May 2008, and three more recorders by the end of June 2011. In December 2009, the USGS installed near-surface and near-bottom continuous recorders immediately adjacent to the PRMRWSA Peace River Water Treatment Facility intake structure. The HBMP fixed-station sampling locations for the Lower Peace River are shown Figure 3-2.

Janicki Environmental, Inc. (2017) selected a representative group of stations (Rkm 2.4, 6.6, 15.5, 23.6, and 30.7; see Figure 3-2) and moving isohaline-based stations (0, 6, 12, and 20 psu) to evaluate spatial and temporal variation and long-term trends of key water quality characteristics for the Lower Peace River. For trend analysis, a method developed by Coastal Environmental, Inc. (1996) for FDEP using seasonally-weighted yearly averages and a seasonal Mann-Kendall (SMK) trend test (Hirsch et al. 1982; Hirsch and Slack 1984) was used. Summary results of the SMK trend analyses are presented in this chapter. Much of the information provided in this chapter are either taken directly or paraphrased for brevity from the Janicki Environmental, Inc. (2017) HBMP report and the Janicki Environmental, Inc. (2019) water quality study report, which is included as Appendix F to this document.

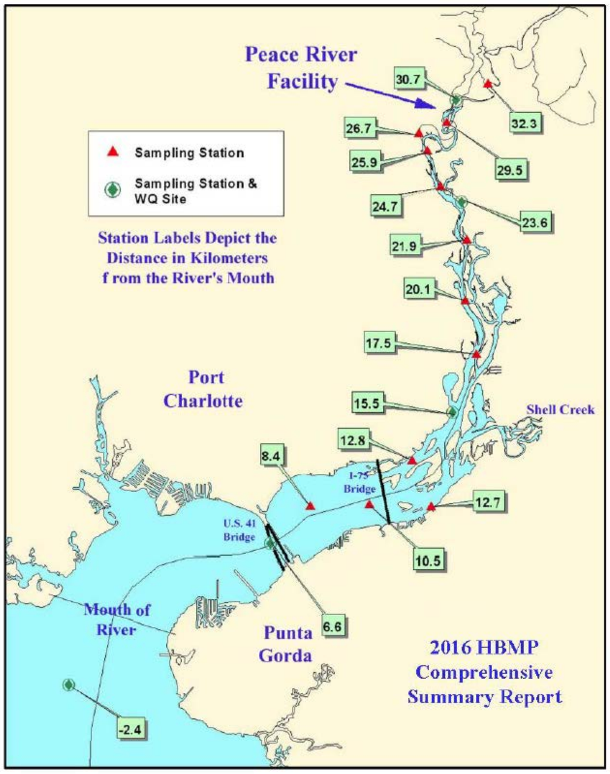

Figure 3-2. Map of the Lower Peace River HBMP fixed-station sampling sites installed during 2005, 2008, and 2011 by the PRMRWSA (reproduced from Janicki 2017).

3.3.1.1. Salinity

Monthly salinity (surface and bottom) data collected at fixed stations Rkm -2.4, 6.6, 15.5, 23.6, and 30.7 between 1976 and 2016 show that as expected, salinity was lowest during the wet season, from July through September and highest during the dry season, from January to March (Figure 3-3).

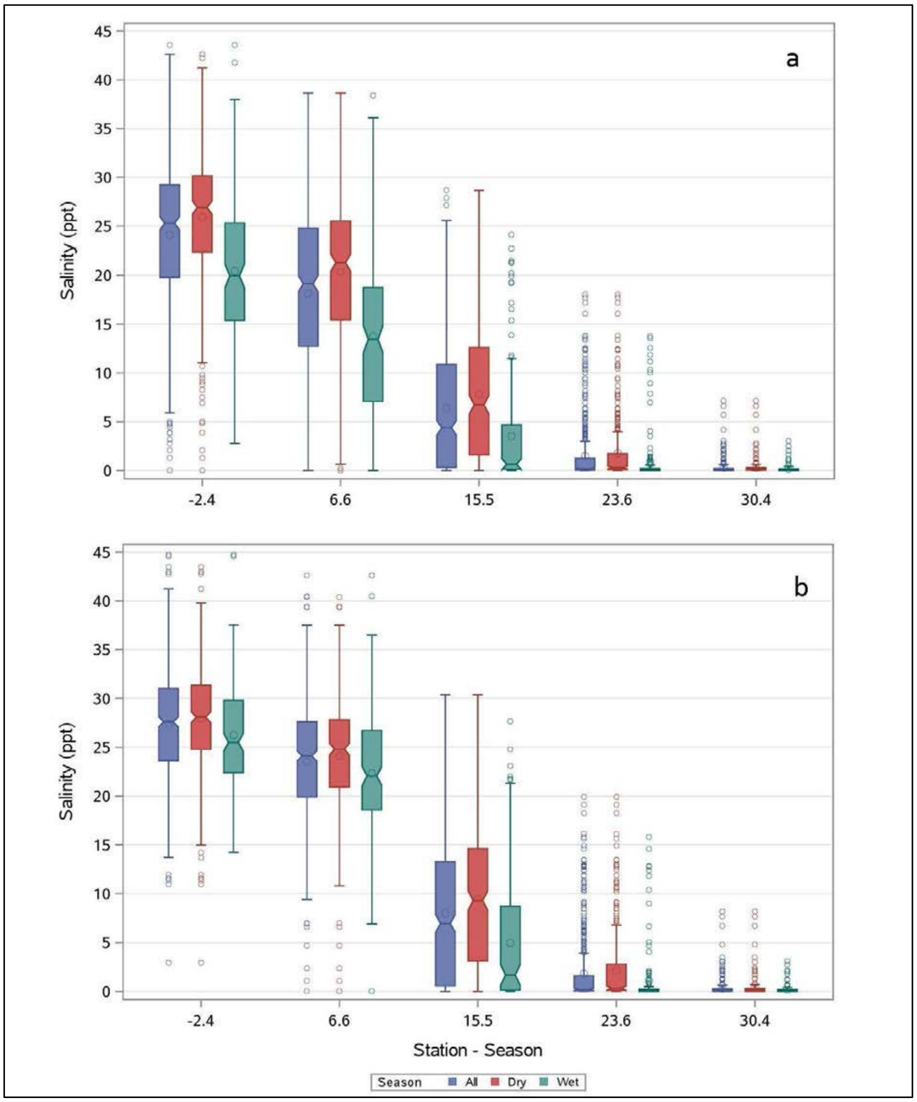

Figure 3-3. Box and whisker plots of a) surface and b) bottom salinity measured at selected HBMP fixed-station locations in the Lower Peace River and near the river mouth (see Figure 3-2) between 1976 and 2016 (reproduced from Janicki Environmental, Inc. 2017).

In addition, Figure 3-3 shows a distinct longitudinal spatial salinity gradient along these fixed stations. Salinity levels were much higher near the vicinity of the river mouth (Rkm -2.4) and are typically low (< 0.5 psu) upstream of the PRMRWSA water-intake location. Similar patterns were observed for both surface and bottom salinity levels, even though salinity values are greater for bottom measurements than those taken at the surface as expected. The inter-annual variability in salinity generally increased from upstream station (Rkm 30.4) to the most downstream station where seasonal differences reached up to 40 psu.

Trend analyses indicated an upstream-movement trend for 0 psu, 6 psu, 12 psu and 20 psu isohaline locations during the 1984 through 2016 period (Table 3-1). The upstream movement trend for 0 psu and 20 psu were significant at 95% confidence level. A possible explanation for these trends is the prolonged droughts that occurred in 2000, 2007 and 2014.

Table 3-1. Trend tests (seasonal Mann Kendall) for movement of 0, 6, 12 and 20 psu isohaline locations for the period 1984 through 2016 (source: Janicki Environmental, Inc. 2017).

	Trend Test for Isohaline Location Movement			
	0 psu	**6 psu**	**12 psu**	**20 psu**
P value	0.037*	0.227	0.171	0.044*

* Upstream movement significant at 0.05 level

3.3.1.2. Dissolved Oxygen

Dissolved oxygen (DO) concentrations in the Lower Peace River and Charlotte Harbor were typically higher in surface waters than near the bottom of the estuary. Seasonal patterns in DO concentrations were typically evident in the Lower Peace/Shell System and Charlotte Harbor, with lower DO levels occurring during the wet season in association with higher water temperatures and increased phytoplankton production. Surface concentrations of DO at monitoring stations were similar throughout the system. However, bottom dissolved oxygen levels tended to be somewhat lower in the downstream portion of the monitored area, especially during summer periods of increased freshwater inflow and increased vertical stratification of the water column (Figure 3-4).

Table 3-2 summarizes the results of trend tests for statistically significant changes in dissolved oxygen at the selected (0 psu, 6 psu, 12 psu and 20 psu) moving isohaline locations. Surface dissolved oxygen levels at the 0 psu isohaline location exhibited a statistically significant increasing trend through time. Again, this may be related to the extended periods of drought and reduced freshwater inflows in 2000, 2007 and 2014.

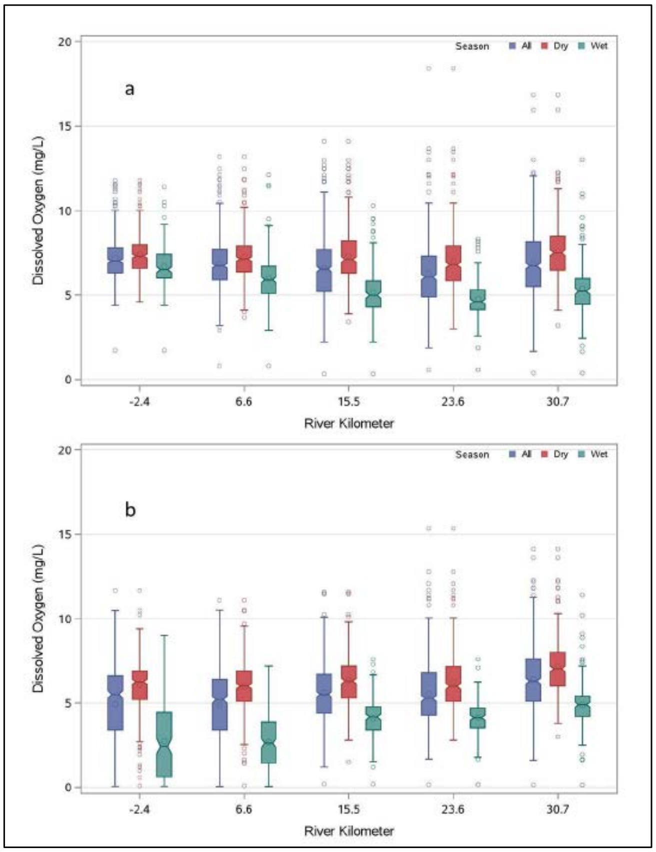

Figure 3-4. Box and whisker plots of a) surface and b) bottom dissolved oxygen levels measured at selected HBMP fixed-station locations in the Lower Peace River and near the river mouth (see Figure 3-2) between 1976 and 2016 (reproduced from Janicki Environmental, Inc. 2017).

Table 3-2. Trend tests (seasonal Mann Kendall) of surface dissolved oxygen concentrations for the period 1984 through 2016 at 0, 6, 12 and 20 psu moving isohaline locations. (source: Janicki Environmental, Inc. 2017).

	Trend Test for Dissolved Oxygen Levels at Isohaline Locations			
	0 psu	**6 psu**	**12 psu**	**20 psu**
P value	0.016*	0.316	0.121	0.192

* Significant increasing trend at 0.05 level

3.3.1.3. Chlorophyll

Chlorophyll concentrations can serve as an indicator of phytoplankton biomass, an important component of the Lower Peace River/Shell Creek food web. Chlorophyll concentrations are highly variable to season, location, and nutrient concentrations in the Charlotte Harbor estuary (Montgomery, et al. 1991). Conceptually, freshwater withdrawals have the potential to influence chlorophyll levels primarily through one of three major mechanisms: decreased colored dissolved organic matter (color), nutrient load reductions, and longer residence times. Color is reduced with decreases in freshwater flow, thereby reducing light-limitation and increasing light penetration into the water column. Nutrient loads positively correlate with flow and chlorophyll, whereas, residence time has a negative relationship with flow. The location of peak chlorophyll concentration would be expected to coincide with the zone of maximum residence time in the Lower Peace/Shell System, and in the upper Charlotte Harbor estuary. While flow can be a major influence affecting chlorophyll concentration and distribution in upper Charlotte Harbor, other factors, many of which covary with flow, can also affect chlorophyll. For example, during periods of high flow, physical factors like vertical stratification can regulate phytoplankton bloom dynamics. Temperature can also regulate chlorophyll production, with lower concentrations during the winter dry season when flow tends to be less, but water temperatures are at a minimum.

Although there are many types of chlorophyll, chlorophyll *a* is commonly assessed for aquatic ecosystems studies. For simplicity, in this report, chlorophyll *a*, uncorrected for phaeophytin, is denoted as chlorophyll. Figure 3-5 shows box and whisker plots of longitudinal pattern of chlorophyll at selected fixed stations in the Lower Peace River and upper Charlotte Harbor. Average chlorophyll concentration was highest in the middle portion (Rkm 15.5) of the monitored area. In the lower portion of the system, average chlorophyll values tended to increase during the summer wet season, while in the upper monitored area, chlorophyll values were lower in the wet season.

Depending on the magnitude of flows, color and water age, high chlorophyll levels may occur throughout the year. However, there are distinct temporal patterns of chlorophyll within certain regions of the Lower Peace/Shell System and Charlotte Harbor. In the most downstream portion of the monitored area (e.g., <Rkm -2.1), a relatively small phytoplankton peak was common in the wet season when high freshwater inflows introduce nutrients into the slow moving, clear harbor waters. The highest chlorophyll concentrations occurred, however, during fall (Figure 3-6) when freshwater inputs declined after conveying nitrogen loadings, allowing tidal inputs to decrease water color and allow more light penetration and phytoplankton production. In the upper portion of estuarine system (e.g., >Rkm 27.1) highest chlorophyll levels occurred during the spring dry season (Figure 3-6) when the low freshwater inflows provide enough nutrients to support phytoplankton production and residence time is relatively long (Atkins, Inc. 2014b).

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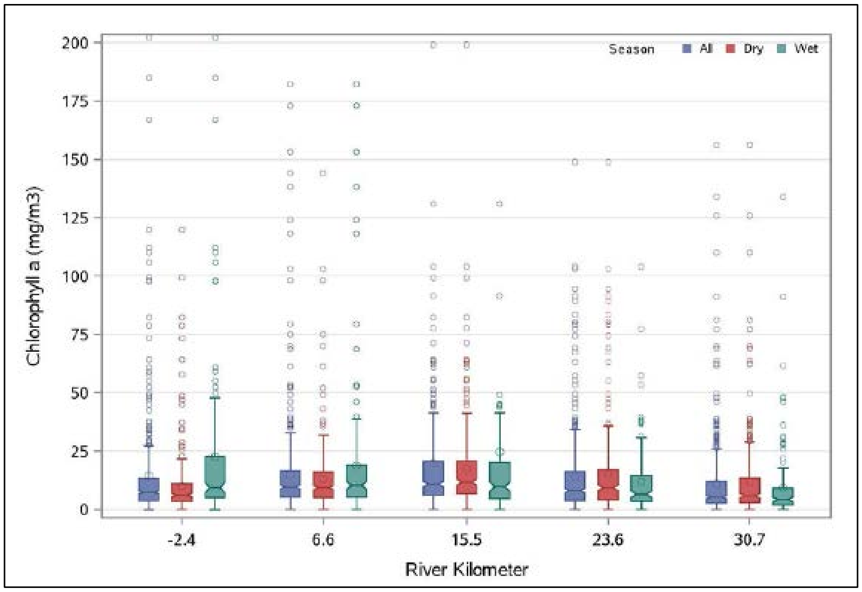


Figure 3-5. Box and whisker plots of chlorophyll measured at selected HBMP fixed-station locations (see Figure 3-2) between 1976 and 2016 in the Lower Peace River and near the river mouth (reproduced from Janicki Environmental, Inc. 2017).

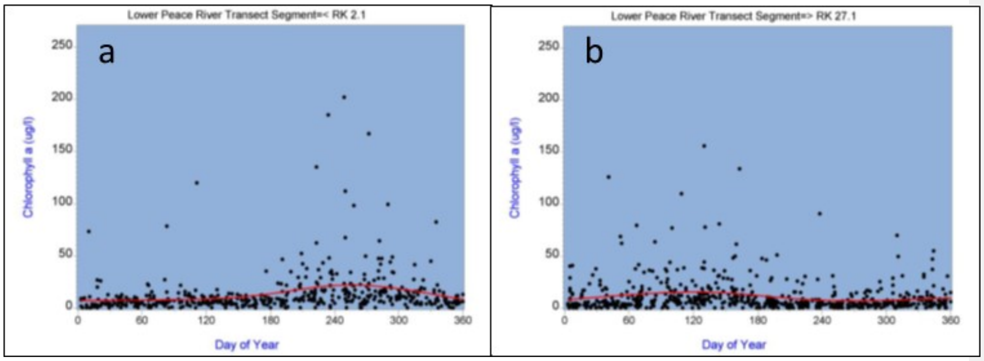


Figure 3-6. Plots of chlorophyll at a) Rkm 2.1 and b) Rkm 27.1 in the Lower Peace/Shell System and upper Charlotte Harbor (see Figure 3-2) (reproduced from Atkins, Inc., 2014b).

Previous HBMP studies (PBS&J, Inc. 2009) reported declines in chlorophyll concentrations during late 1970s and early 1980s. Since that time, however, higher concentrations have been observed; for example, the peaks that occurred from 2004 through 2006, following the high nutrient loading associated with Hurricanes Charley, Francis and Jeanne in 2004 (PBS&J, Inc. 2009). Over the entire monitoring period (1976 through 2016), increases in chlorophyll concentrations within the upper portion of the estuary (0 to 12 psu isohaline locations) were not statistically significant. Chlorophyll increases associated with location of the 20 psu isohaline were, however, significant (Table 3-3).

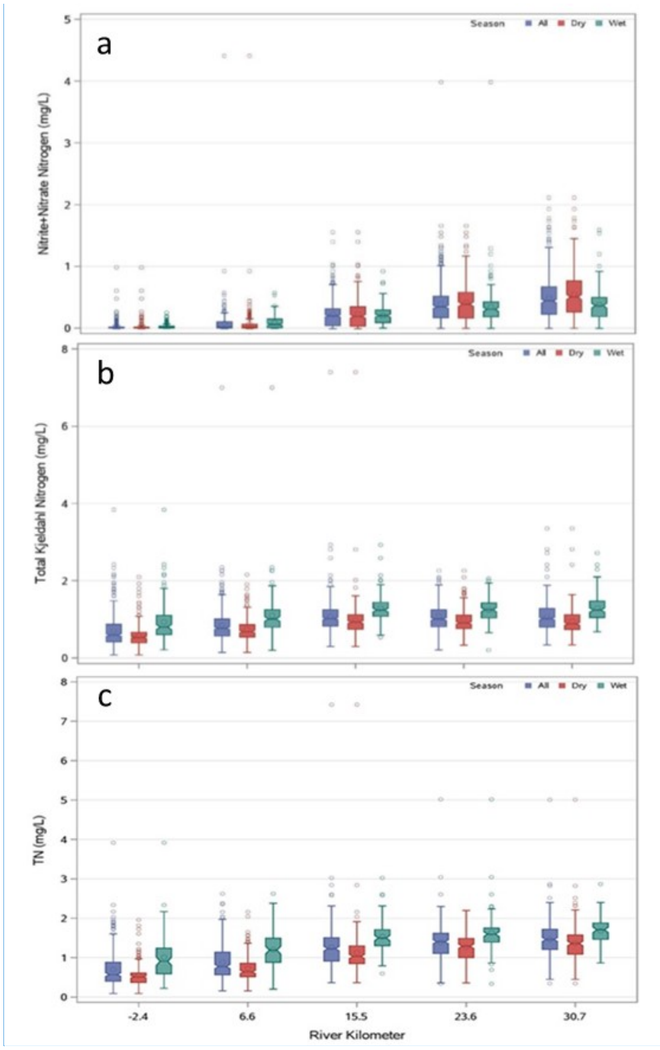
Table 3-3. Trend tests (seasonal Mann Kendall) of chlorophyll concentrations for the period 1984 through 2016 at 0, 6, 12 and 20 psu moving isohaline locations. (source: Janicki Environmental, Inc. 2017).

	Trend Test for Chlorophyll at Isohaline Locations			
	0 psu	6 psu	12 psu	20 psu
P value	0.540	0.402	0.930	0.041*

* Significant increasing trend at 0.05 level

3.3.1.4. Total Nitrogen, Nitrate+Nitrite, and Total Kjeldahl Nitrogen

Concentrations of total nitrogen (TN) has been reported in the HBMP. Inorganic nitrate+nitrite (NOX), and total Kjeldahl nitrogen (TKN) are also reported in the HBMP and are presented here. TN is the sum of NOX and TKN. TKN is the sum of Organic Nitrogen and Ammonia. Box and whisker plots depicting spatial and temporal variability in TN, NOX, and TKN at selected fixed stations in the Lower Peace River / Shell Creek System, and Charlotte Harbor are presented in Figure 3-7. NOX concentrations progressively decreased moving downstream along the sampling locations in association with reduced color and nitrogen uptake by phytoplankton. Figure 3-7a shows that dissolved NOX concentrations near the mouth of the Lower Peace River (Rkm -2.4) were typically at or near detection limits. NOX concentrations were lower in wet season than in the dry season at upstream stations. Unlike NOX, TKN concentrations were typically highest during the summer wet season rather than during the dry season, reflecting the increased freshwater inflow inputs of organic nitrogen from Peace River and Shell Creek watersheds (Figure 3-7b). Because TN is simply the sum of NOX and TKN, the spatial and temporal trends are a combination of both nitrogen species (Figure 3-7c).



Commented [YG11]: Updated figure (to includeTN).

Figure 3-7. Box and whisker plots of a) Nitrate+Nitrite (NOX), b) Total Kjeldahl Nitrogen (TKN), and c) Total Nitrogen (TN) concentrations measured at selected HBMP fixed-station locations in the Lower Peace River and near the river mouth (see Figure 3-2) between 1996 and 2016 (reproduced from Janicki Environmental, Inc. 2017).

Trend tests for NOX concentrations exhibited a significant decreasing trend for the 0 and 6 psu isohaline locations, while a significant increasing trend was observed for the 20 psu isohaline for the period from 1984 through 2016 (Table 3-4). Trend tests for TKN did not indicate any trend at all isohaline locations. Decreasing trends in TN concentrations over the monitoring period 1984 through 2016 were identified at 0 psu and 6 psu isohaline locations but were not significant at an 0.05 alpha-level (Table 3-4).

Table 3-4. Trend tests (seasonal Mann Kendall) for NOX, TKN and TN concentrations for the period 1984 through 2016 at 0, 6, 12 and 20 psu moving isohaline locations (source: Janicki Environmental, Inc. 2017).

	P values			
	0 psu	6 psu	12 psu	20 psu
NOX	0.00*	0.00*	0.96	0.01**
TKN	0.67	0.45	0.53	0.76
TN	0.06	0.10	0.41	0.66

* Significant decreasing trend at 0.05 level
** Significant Increasing trend at 0.05 level

3.3.1.5. Ortho-phosphorus

Natural phosphorus concentrations in the Lower Peace/Shell System and upper Charlotte Harbor are high due to the extensive area of phosphate deposits that exist in the Peace River basin. Phosphorus concentrations in the estuary generally reflect both the spatial and temporal variation in Peace River freshwater inputs. The highest phosphorus concentrations are typically associated with seasonal low river flows when the influences of groundwater discharges are more pronounced.

For the Peace River HBMP, total phosphorus measurement was terminated in 2003 and phosphorus concentrations are currently reported as orthophosphate. However, scatterplot analyses of ortho-phosphorus vs. total phosphorus for the period 1996 through 2003 at 5 stations indicated about 81-88% of total phosphorus is attributed to ortho-phosphorus (data not shown).

Ortho-phosphorus concentrations at selected fixed-station locations were indicative a longitudinal gradient with values decreasing from upstream to downstream in the estuary (Figure 3-8). The patterns and responses of ortho-phosphorus to increasing flows in the

Lower Peace/Shell System and Charlotte Harbor estuarine were like those exhibited for NOX.

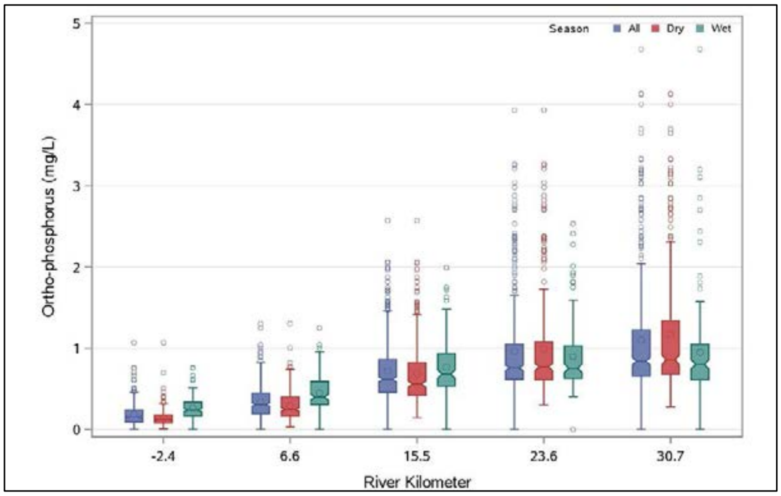


Figure 3-8. Box and whisker plots of orthophosphate measured at selected HBMP fixed-station locations in the Lower Peace River and near the river mouth (see Figure 3-2) between 1976 and 2016 (reproduced from Janicki Environmental, Inc. 2017).

Lower ortho-phosphorus levels in upstream stations (Rkms 23.6 and to 30.7) during wet season were likely associated with reduced influence of groundwater discharges to surface waters in summer, when surface runoff is greater.

Stricter regulations in late 1970s resulted in subsequent decreases in both point and nonpoint discharges to surface waters from phosphate-mining areas. This was associated with substantially decreased magnitude and seasonal variability of phosphorus concentrations in the Lower Peace/Shell System and Charlotte Harbor (Figure 3-9). However, from 2004 through 2008, phosphorus levels throughout the lower Peace River/upper Charlotte Harbor estuary were elevated. In the 2006 HBMP Comprehensive Summary Report, PBS&J, Inc. (2009) suggested that the historically high flows that occurred in the upper Peace River watershed following Hurricanes Charley, Francis and Jeanne in August and September 2004 were associated with increased phosphorus concentrations throughout the system. Subsequent investigations conducted by PBS&J

(2009, 2010) and Atkins (2011, 2012) concluded that the direct cause for the observed increase in phosphorus levels was more likely to have been related to surface water discharges during the closure of the Ft. Meade phospho-gypsum stack system within the Whidden Creek Basin of the upper Peace River watershed. Since about 2009, phosphorus concentrations similar to those observed prior to 2004 have been observed (Figure 3-9).

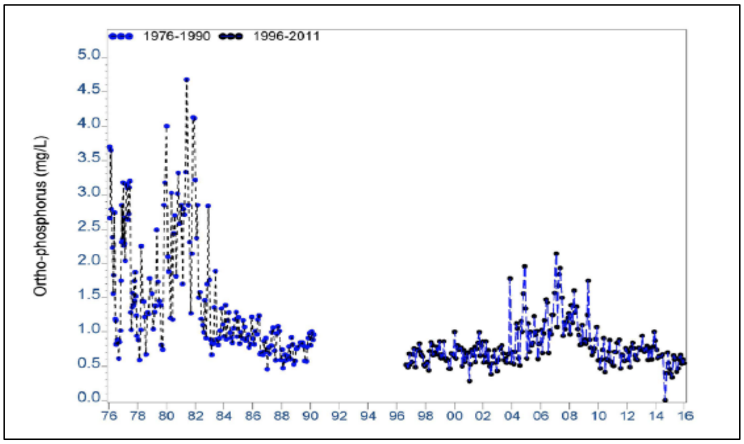


Figure 3-9. Monthly long-term surface ortho-phosphorus at river kilometer 30.7 in the Lower Peace River (see Figure 3-2) for the period from 1976 through 2016 (reproduced from Janicki Environmental, Inc. 2017).

A trend test for the ortho-phosphorus time series identified a significant increasing trend for the most saline water (i.e., in association with the 20 psu isohaline) but not for the other assessed isohalines (Table 3-5).

Table 3-5. Trend tests (seasonal Mann Kendall) of total ortho-phosphorus concentrations for the period 1984 through 2016 at 0, 6, 12 and 20 psu moving isohaline locations. (source: Janicki Environmental, Inc. 2017).

	Trend test for Ortho-phosphorus at Isohaline Locations			
	0 psu	6 psu	12 psu	20 psu
P value	0.103	0.192	0.584	0.001*

* Significant at 0.05 level

3.3.1.6. Color

Commented [DL12]: "Water Color" changed to "Color" throughout this section.

Color affects light penetration into the water column and can thereby influence the abundance and distribution of phytoplankton. Figure 3-10 shows longitudinal gradients in color, reported as the concentration of dissolved and suspended organic and inorganic particles, at the fixed monitoring stations Rkms -2.4, 6.6, 15.5, 23.6 and 30.7. Color levels were typically higher upstream than in the lower portions of the estuary. This typical gradient was more pronounced during the wet season than the dry season (Figure 3-10).

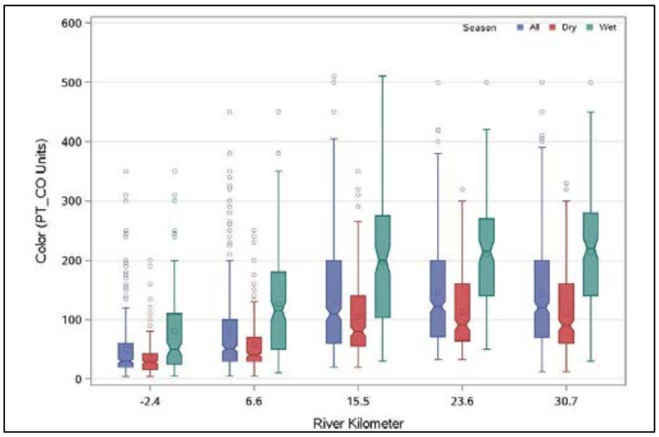


Figure 3-10. Box and whisker plots of color measured at selected HBMP fixed-station locations in the Lower Peace River and near the river mouth (see Figure 3-2) between 1976 and 2016 (reproduced from Janicki Environmental, Inc. 2017).

The SKM method of trend testing indicated significant increases in color within salinity zones 6 psu, 12 psu and 20 psu. These trends reflect the high concentration of organic and inorganic compounds delivered to the estuary during periods of high flows (Table 3-6).

Table 3-6. Trend tests (seasonal Mann Kendall) of color levels for the period 1984 through 2016 at 0, 6, 12 and 20 psu moving isohaline locations. (source: Janicki Environmental, Inc. 2017).

	Trend Test for Color at Isohaline Locations			
	0 psu	6 psu	12 psu	20 psu

P value	0.075	0.001*	0.000*	0.000*

* Significant at 0.05 level

3.3.2. Relationships between Lower Peace River Flow and Water Quality Constituents

As part of the minimum flows reevaluation/development process for the Lower Peace/Shell System, the District consulted with Akins, Inc. (2014), to assess relationships between chlorophyll and freshwater inflows to the system. In 2019, Janicki Environmental Inc. was contracted by the District to further investigate relationships between flows and water quality in the Lower Peace/Shell System and assess whether proposed minimum flows for the system would result in adverse effects on water quality constituents other than salinity.

For the more recent analyses, Janicki Environmental Inc. (2019) used bivariate plots to examine the relationships between flows and various water quality constituents using data obtained from 5 HBMP fixed-stations. Spearman's rank correlation was also conducted for water quality constituents of interest and lag-average flows with lag-periods between 2 and 60 days (i.e., periods including the sampling day and the preceding day, the sampling day and the preceding two days, etc., through the sampling day and the preceding 59 days) to determine the temporal scale at which the constituents might be correlated to flows.

Correlation coefficients derived from the Spearman's rank correlation analyses range between 1 and -1 with negative correlations indicating that as flows increase the magnitude or concentration of the constituent of interest decreases. Correlation coefficients above an absolute value of 0.5 were considered strong correlation for this analysis while others were considered weak.

3.3.2.1. Relationships between Flow and Salinity

Although there is considerable natural variation in salinity for a given flow condition, salinity declines at any given location in the Lower Peace/Shell System for increasing freshwater inflow. Salinity field observations from a representative group of HBMP fixed-stations were plotted against freshwater inflows in the Lower Peace River and Shell Creek (Figure 3-11). As expected, salinity was more responsive to freshwater inflow at the most upstream station (Rkm 30.4), and least responsive to flows at the downstream station (Rkm 6.6).

Given the strong interaction between freshwater flows, water circulation and salinity transport processes, the District (SWFWMD 2010) previously developed a coupled 3D and 2D hydrodynamic model (Sheng et al. 2006, Chen 2008) to estimate responses of salinity to reductions in freshwater inflows and support development of currently established minimum flows for the Lower Peace River. In addition, a regression model was developed to average water-column salinity at any location in Lower Shell creek as a function of flow and other factors, including site location, season, tide stage, flow in the Peace River and salinity in the northeastern portion of Charlotte Harbor (SWFWMD 2010).

As part of the current minimum flow reevaluation and development process for the Lower Peace/Shell System, the hydrodynamic model was upgraded and the model domain was substantially expanded to include the Lower Peace River, Lower Shell Creek, Lower Myakka River, all of Charlotte Harbor, Gasparilla Sound, Pine Island Sound, Matlacha Pass and the most downstream portion of Caloosahatchee River. The upgraded hydrodynamic model is discussed briefly in Chapter 5 and in greater detail in Chen (2020), which is included as Appendix C to this report.

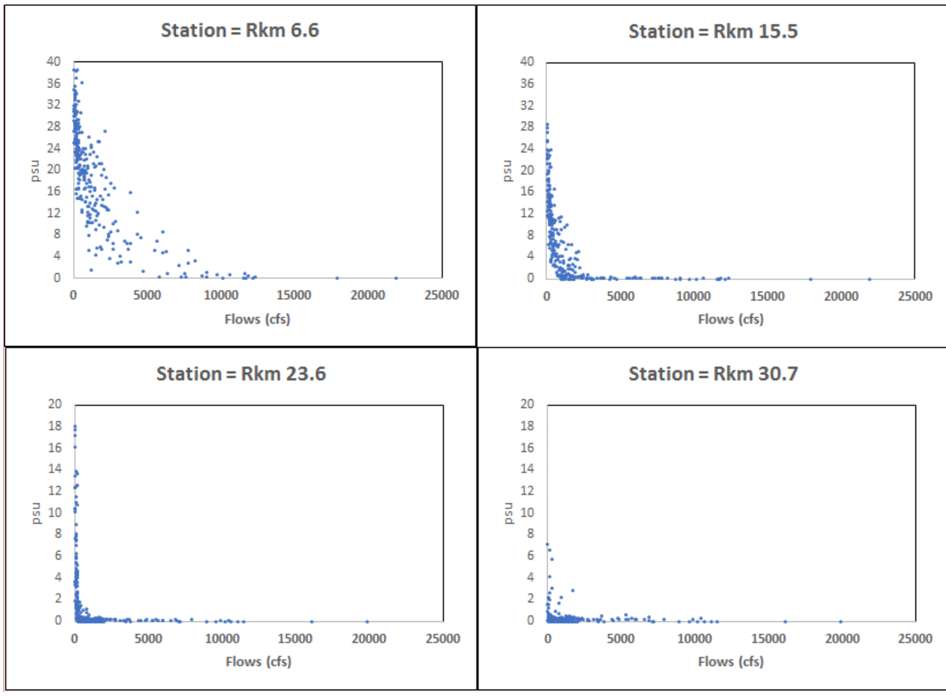


Figure 3-11. Scatter plots of the Lower Peace River and Shell Creek flows versus salinity at Rkms 6.6 and 15.5 stations, and Lower Peace River flows versus salinity at Rkms 23.6 and 30.7 stations.

Commented [DL13]: Updated figure (for stations downstream of confluence of Peace and Shell to include the combined Peace-Shell flows).

3.3.2.2. Relationships between Flow and Chlorophyll

The relationship between flows and chlorophyll was found to be site-dependent and variable across the Lower Peace River, likely in response to the combined effects of nutrient supply and residence time. As freshwater inflow initially increases from a low flow condition, chlorophyll is expected to increase in response to the increased nutrient supply. However, when flow rate increases further, the negative effects of shortening residence time become greater than the positive effects of increasing nutrient supply, and the chlorophyll concentrations decline (Atkins, 2014b).

Plots of the relationship between flow and chlorophyll at the selected HBMP fixed-stations are presented in Figure 3-12. A positive correlation at the furthest downstream station (Rkm -2.4) indicates higher flows resulted in higher chlorophyll concentrations, had no effect at river kilometer 6.6, and a resulted in lower chlorophyll levels for upstream stations (Rkms 15.5, 23.6 30.7). There was little difference in correlations among flow lags at the downstream station while in the uppermost stations shorter lag averages were better correlated with chlorophyll than longer lag averages.

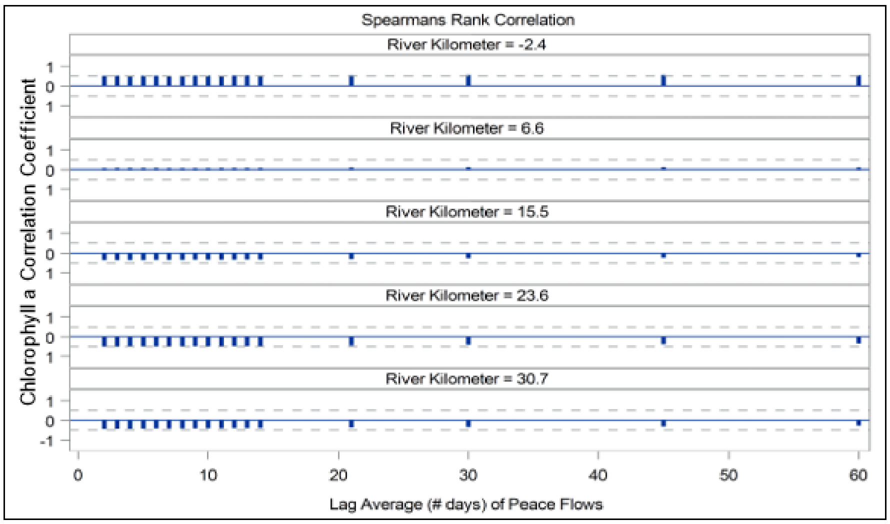


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Figure 3-12. Spearman's rank correlation between lag average flows and chlorophyll a concentrations at selected HBMP fixed-stations in the Lower Peace River and near the river mouth (see Figure 3-2 for locations). Correlation coefficients range from 1 to -1, with positive values indicating higher concentrations with higher flows and negative values indicating higher concentration with lower flows. Dashed line identifies 0.5 and -0.5 values used to identify strong correlations (reproduced from Janicki 2019).

3.3.2.3. Relationships between Flow and Dissolved Oxygen

Percent of saturation was used to evaluate dissolved oxygen (DO) correlations with flows. The relationship is seasonally dependent with stronger correlations in the wet season than in dry the season. Plots of Spearman's rank corrections shows a negative correlation with all flow lags at all stations (Figure 3-13). Shorter lags (less than 10 days) were more correlated with flows than longer lags at all stations.

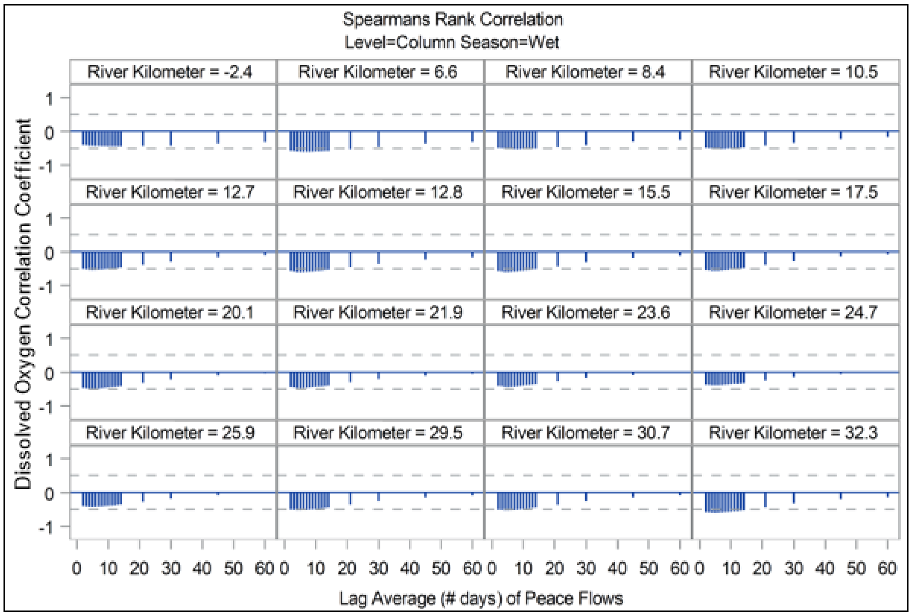

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Figure 3-13. Spearman's rank correlation between lag average flows and water column average dissolved oxygen (% saturation) concentrations during the wet season season at selected HBMP fixed-stations in the Lower Peace River and near the river mouth (see Figure 3-2 for locations). Correlation coefficients range from 1 to -1, with positive values indicating higher concentrations with higher flows and negative values indicating higher concentration with lower flows. Dashed line identifies 0.5 and -0.5 values used to identify strong correlations (reproduced from Janicki 2019).

3.3.2.4. Relationships between Flow and Nutrients

Total nitrogen concentrations were positively correlated with lag average flows at all assessed HBMP fixed-stations (Figure 3-14), while orthophosphate concentrations were positively related to flows only at stations in the lower portion of the system (Figure 3-15), with similar correlation coefficients for all lag averages. At upstream stations orthophosphate concentration correlations with flow are weak and negative indicating that higher flows result in lower orthophosphate concentrations in the upper portion of river.

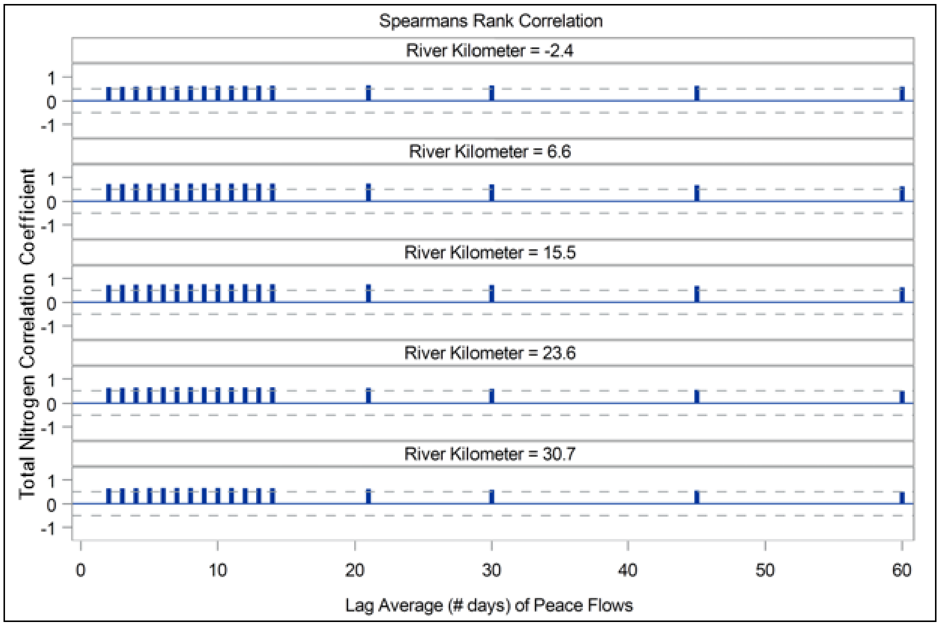

Figure 3-14. Spearman's rank correlation between lag average flows and Total nitrogen concentrations at selected HBMP fixed-stations in the Lower Peace River and near the river mouth (see Figure 3-2 for locations). Correlation coefficients range from 1 to -1, with positive values indicating higher concentrations with higher flows and negative values indicating higher concentration with lower flows. Dashed line identifies 0.5 and -0.5 values used to identify strong correlations (reproduced from Janicki 2019).

Commented [DL16]: Updated figure (Y-axis label revised).

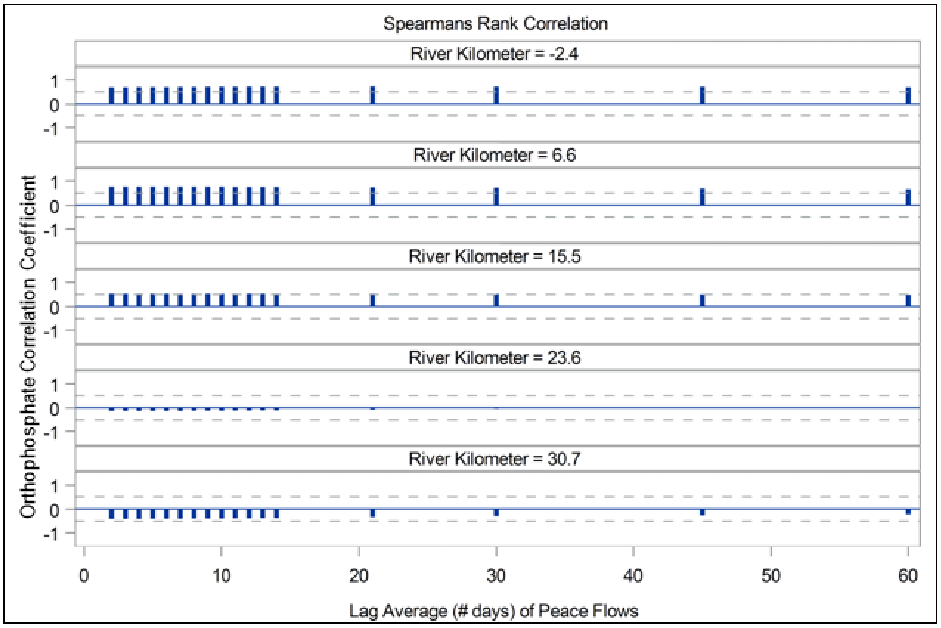

Figure 3-15. Spearman's rank correlation between lag average flows and orthophosphate concentrations at selected HBMP fixed-stations in the Lower Peace River and near the river mouth (see Figure 3-2 for locations). Correlation coefficients range from 1 to -1, with positive values indicating higher concentrations with higher flows and negative values indicating higher concentration with lower flows. Dashed line identifies 0.5 and -0.5 values used to identify strong correlations (reproduced from Janicki 2019).

Commented [DL17]: Updated figure (Y-axis label revised).

3.3.2.5. Relationships between Flow and Color

Commented [DL18]: "Water Color" changed to "Color" in this section.

Color was also examined as a potential covariate since flows have a strong seasonal correlation with colored dissolved organic matter in the Lower Peace/Shell System, with correlation coefficients above 0.5 for all stations (Figure 3-15). Correlation coefficients were very similar across lag averages and among stations as shown in Figure 3-16.

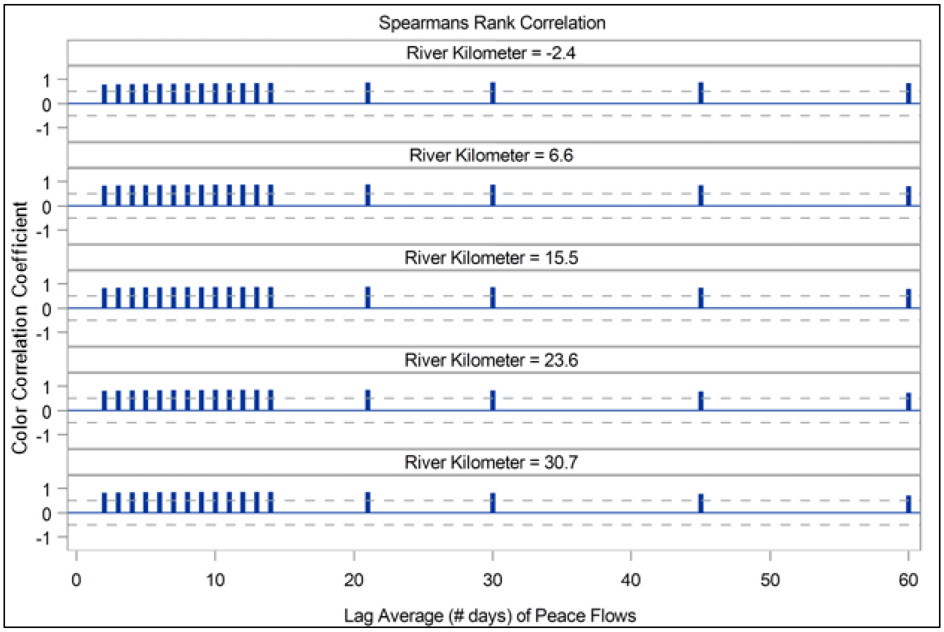

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Figure 3-16. Spearman's rank correlation between lag average flows and color at selected HBMP fixed-stations in the Lower Peace River and near the river mouth (see Figure 3-2 for locations). Correlation coefficients range from 1 to -1, with positive values indicating higher concentrations with higher flows and negative values indicating higher concentration with lower flows. Dashed line identifies 0.5 and -0.5 values used to identify strong correlations (reproduced from Janicki 2019).

In conclusion, statistically significant relationships were found between salinity and average lag freshwater flows at all assessed stations. Chlorophyll correlations with flow were site dependent within the Lower Peace/Shell System. A positive chlorophyll versus flow relationship was identified for the downstream stations while an inverse relationship was identified at upstream stations. The relationship between DO and flow was found to be seasonally dependent with correlations much stronger in the wet season than in the dry season. Nutrient loadings (nitrogen and phosphorus) and color were directly, i.e., positively related to flow. Additional information concerning water quality constituents and freshwater flow assessments is provided in Janicki Environmental Inc. (2019), appended as Appendix F.

3.3.3. Water Quality Characteristics in Lower Shell Creek

The City of Punta Gorda has been implementing an HBMP since 1991 to evaluate potential effects of withdrawals from the Shell Creek Reservoir on environmental conditions in Lower Shell Creek. The Shell Creek HBMP includes monthly sampling of in-situ profiling of water column salinity at 19 fixed sampling stations and monthly sampling of surface water chemistry at 10 stations (Figure 3-17).

Atkins, Inc. (2017) selected water chemistry stations 4, 5, 6, 7 and 9 and salinity stations 11, 16 and 17 for spatial variability analyses of salinity, dissolved oxygen (DO) and chlorophyll in the Lower Shell Creek. Temporal variability (monthly and annual) was analyzed at station 11, just downstream from Hendrickson Dam.

Long-term patterns of change were also summarized at stations at Hendrickson Dam (station 3) and upstream on Upper Shell Creek (station 2) and Prairie Creek (station 1). At these three stations, seasonal Kendall Tau tests were also conducted for water quality trend analyses. Data from the period from 1991 through 2014 was used for the spatial and temporal variations in water quality parameters reported by Atkins (2017).

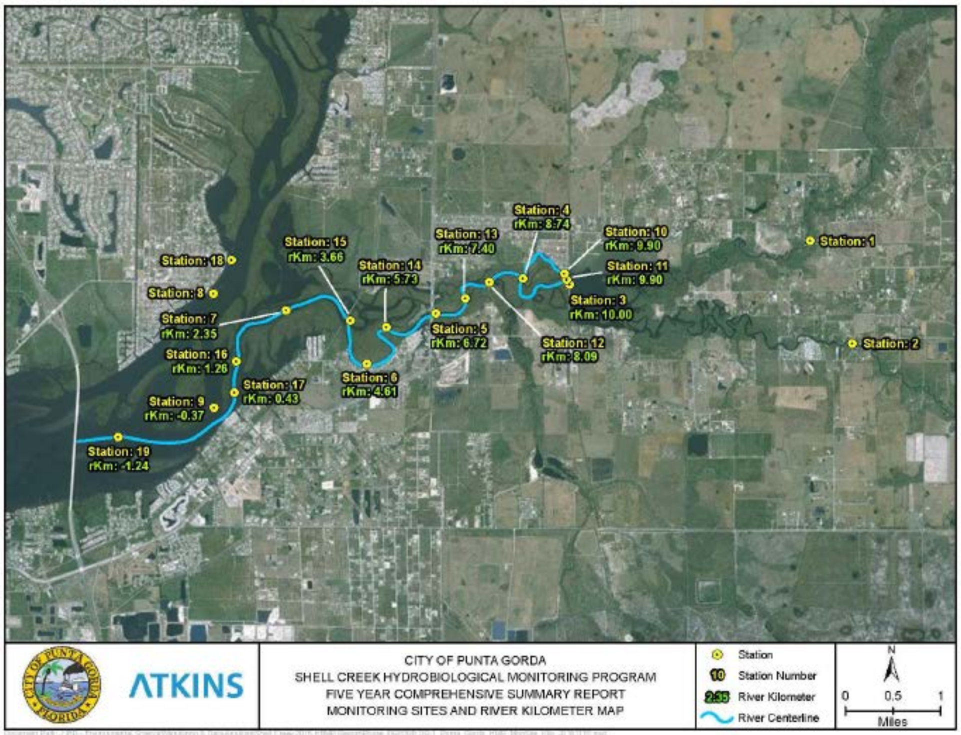

Figure 3-17. City of Punta Gorda Shell Creek HBMP salinity and water chemistry sampling locations (reproduced from Atkins (2017).

3.3.3.1. Salinity

Monthly average surface, midwater and bottom salinity from 1991 through 2014 at station 11 just below Hendrickson Dam shows that salinity was lowest during the wet season, from July through September and highest during the dry season from January to June (Figure 3-18), reflecting the seasonal changes in rainfall and flow.

Vertical salinity stratification between surface and midwater was not significant, especially in the drier months from April through June. Vertical stratification was, however, apparent throughout the year, with surface water typically fresher than bottom water, as expected.

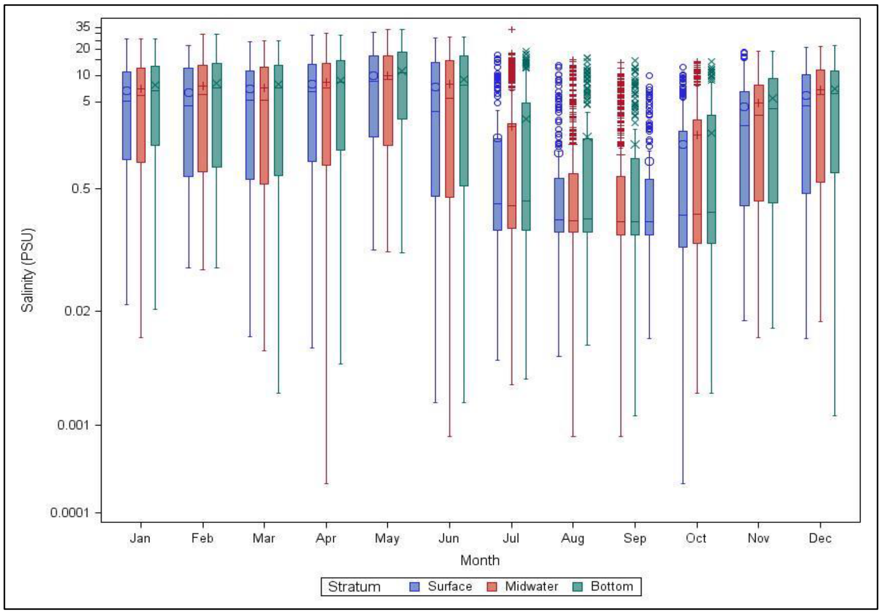

Figure 3-18. Box and whisker plots of monthly average surface, midwater and bottom salinity at station 11 (see Figure 3-17) between 1991 and 2014 (reproduced from Atkins, Inc. 2017).

Figure 3-19 shows annual average salinity of surface, midwater and bottom waters at stations 4, 5, 6, 7, 9 and in situ stations 11, 16 and 17. A distinct longitudinal spatial salinity gradient along these fixed stations is evident, with highest salinities near the river mouth (e.g., at Station 9) and lower salinities in the upper portion of Lower Shell Creek. At station 11, just downstream from the Hendrickson Dam, salinities were typically < 0.1 psu. The high salinity gradient along the lower portion of the Lower Shell Creek (e.g., at stations 9, 17, 16 and 7) is attributed to high tides in the Lower Peace River that pushes salinity into the creek.

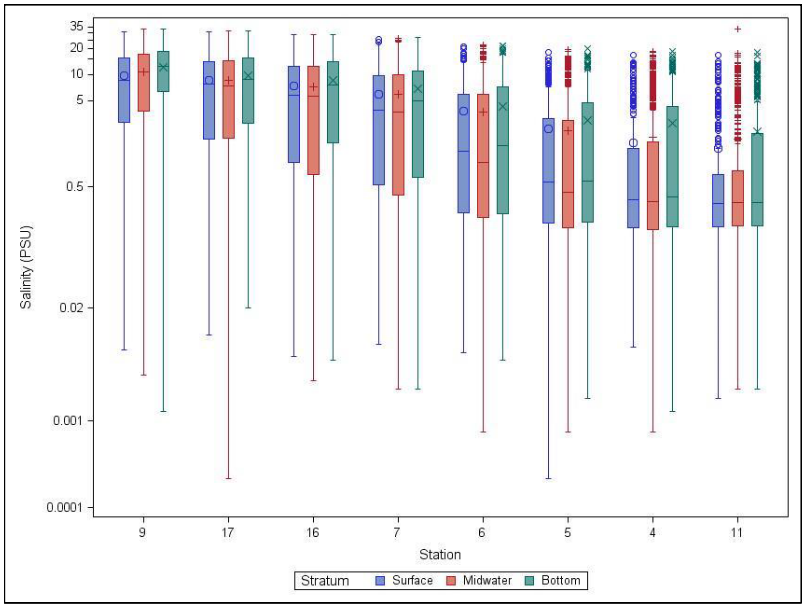

Figure 3-19. Box and whisker plots of surface, midwater and bottom salinity at selected fixed-stations (see Figure 3-17) between 1991 and 2014 (reproduced from Atkins, Inc. 2017). Stations are arrayed from downstream to upstream along the x-axis.

3.3.3.2. Dissolved Oxygen

Dissolved oxygen concentrations in Lower Shell Creek exhibited vertical stratification, with typically higher values in surface and midwaters than in the bottom waters (Figure 3-20). As is in the Lower Peace River, seasonal patterns in DO concentrations were evident in Lower Shell Creek, with lower DO levels occurring during the wet season in association with higher water temperatures and increased phytoplankton production (Figure 3-20). Surface concentrations of DO at monitoring stations were similar throughout the system (Figure 3-21).

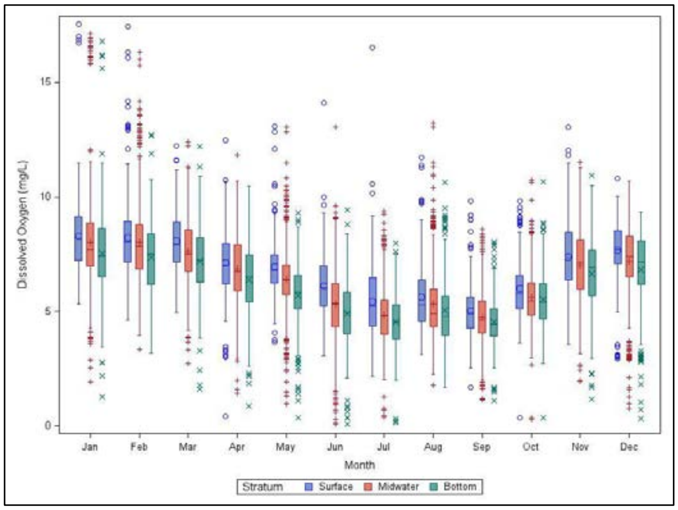

Figure 3-20. Box and whisker plots of monthly surface, midwater and bottom dissolved oxygen concentrations at station 11 (see Figure 3-17) between 1991 and 2014 (reproduced from Atkins, Inc. 2017).

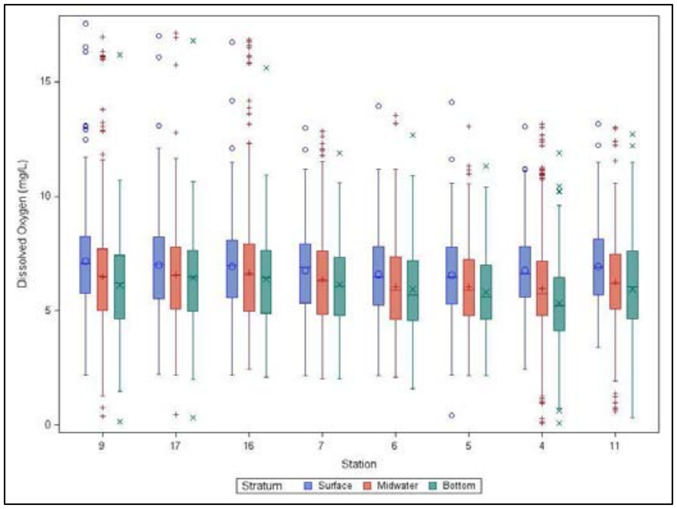

Figure 3-21. Box and whisker plots of surface, midwater and bottom dissolved oxygen concentrations at selected fixed-stations (see Figure 3-17) between 1991 and 2014 (reproduced from Atkins, Inc. 2017).

3.3.3.3. Chlorophyll

Chlorophyll concentrations in Lower Shell Creek were lowest during summer and were relatively higher during November and December (Figure 3-22) when freshwater flows and nutrient inputs declined. Higher chlorophyll levels also occurred during the spring dry season (April and May) when residence time was relatively long. However, monthly mean chlorophyll concentrations were mostly under 20 ug/L (Figure 3-22). Variation in chlorophyll concentrations among stations was minimal as expected (Figure 3-23).

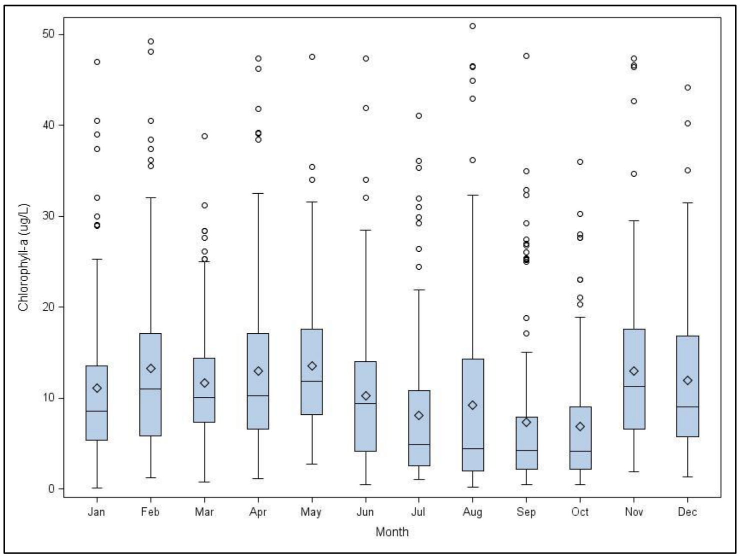

Figure 3-22. Box and whisker plots of monthly surface, midwater and bottom chlorophyll concentrations at selected fixed-stations (see Figure 3-17) between 1991 and 2014 (reproduced from Atkins, Inc. 2017).

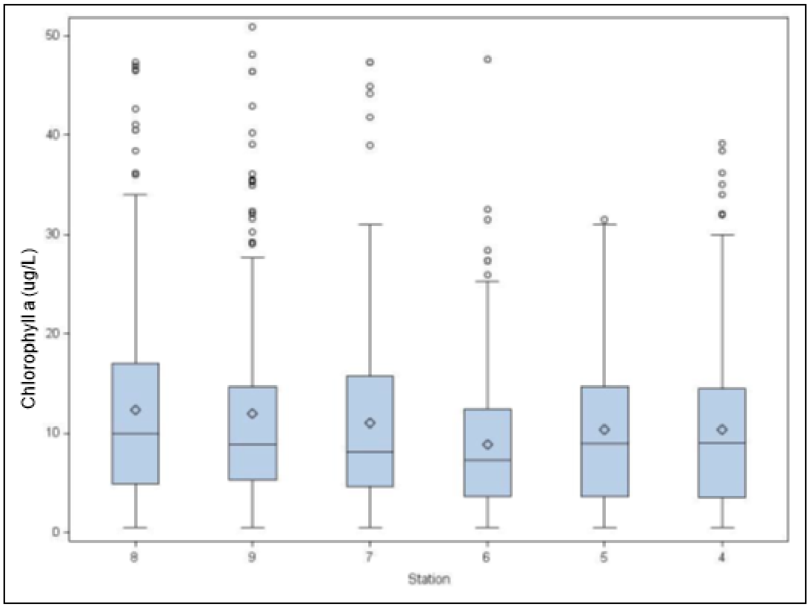

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Figure 3-23 Box and whisker plots of chlorophyll concentrations at selected fixed-stations (see Figure 3-17) in Lower Shell Creek (reproduced from Atkins, Inc. 2017).

3.3.3.4. Total Kjeldahl Nitrogen and Ortho-phosphorus

Box and whisker plots depicting temporal variability in total Kjeldahl nitrogen (TKN) and ortho-phosphorus at station 4 in Lower Shell Creek is presented in Figure 3-24. TKN concentrations were typically highest during the summer wet season reflecting the increased freshwater inflow inputs of organic nitrogen from Shell Creek watershed (Figure 3-24). In contrast, highest phosphorus concentrations were typically associated with seasonal low river flows when the influence of groundwater discharges are high (Figure 3-24).

TKN concentrations progressively decreased moving downstream along the sampling locations (Figure 3-25), in association with reduced water color and nitrogen uptake by phytoplankton. Unlike TKN, ortho-phosphorus concentrations did not exhibit a longitudinal gradient, (Figure 3-25).

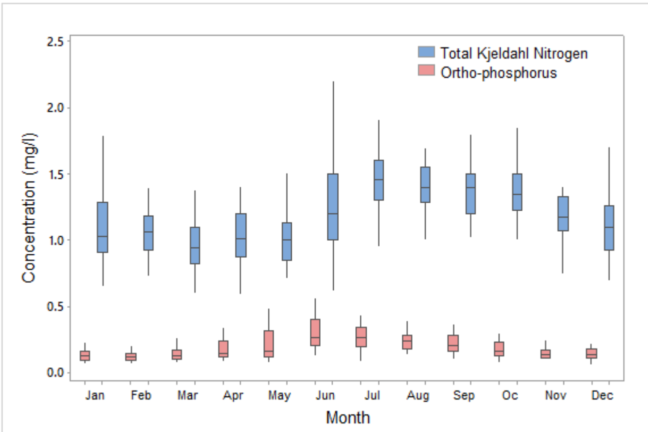

Figure 3-24. Monthly box and whisker plots of TKN and ortho-phosphorus at station 4 (see Figure 3-17) in Lower Shell Creek between 1991 and 2018.

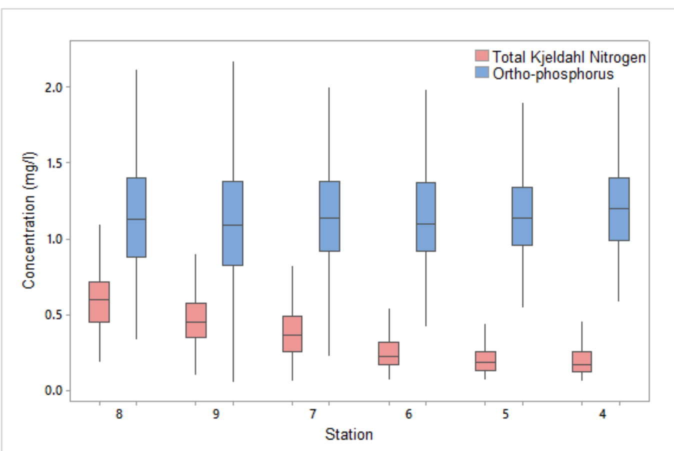

Figure 3-25. Box and whisker plots of TKN and ortho-phosphorus concentrations at selected fixed-stations (see Figure 3-17) in Lower Shell Creek between 1991 and 2018.

3.3.3.5. Color

Commented [DL21]: "Water Color" changed to "Color" in this section.

Color was typically highest during the summer wet season reflecting the increased freshwater inflow inputs of dissolved and suspended organic and inorganic particles from Shell Creek watershed (Figure 3-26). Figure 3-27 shows longitudinal gradients in water color at the monitoring stations 4, 5, 6, 7, 9 and 8. Color levels were typically similar along Lower Shell Creek, especially at stations 4,5 and 6. The slight increase along stations 7,9 and 8 is attributed to the inputs of organic and inorganic particles from the Peace River.

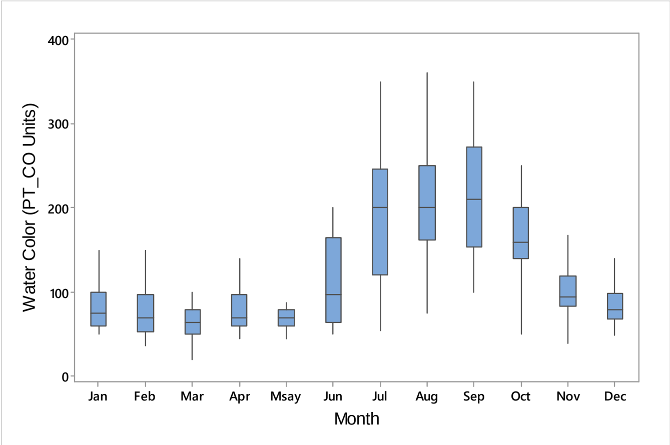

Figure 3-26. Box and whisker plots of monthly color at station 4 (see Figure 3-17) between 1991 and 2018.

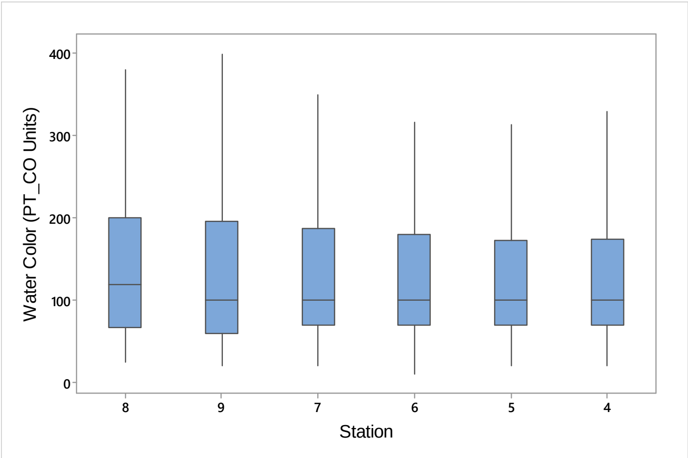

Figure 3-27. shows Box and whisker plots of color at selected fixed-stations (see Figure 3-17) in the Lower Shell Creek between 1991 and 2018.

3.3.4. Relationships between Shell Creek Flow and Water Quality Constituents

Table 3-7 shows relationships between flow and salinity, DO and chlorophyll at stations 11, 4, 5, 6, 7, 16, 17, 9 and 8 in Lower Shell Creek. Concentrations of these three water quality parameters decreased with increasing flows in the creek (Table 3-8). Coefficient of determination values (R^2) for the relationships were weak, however, indicating that other factors (e.g., tide, residence time, nutrients) likely affect these water quality parameters in Lower Shell Creek.

Table 3-7. Relationships between flow and salinity dissolved oxygen and chlorophyll at selected stations in the Lower Shell creek between and 1991-2014 (reproduced from Atkins, Inc. 2017).

Station	Salinity		Dissolved Oxygen		Chlorophyll	
	R^2	Slope	R^2	Slope	R^2	Slope
4	0.07	Decreasing	0.06	Decreasing	0.17	Decreasing
5	0.10	Decreasing	0.09	Decreasing	0.17	Decreasing
6	0.13	Decreasing	0.10	Decreasing	0.14	Decreasing
7	0.17	Decreasing	0.10	Decreasing	0.13	Decreasing

9	0.24	Decreasing	0.10	Decreasing	0.07	Decreasing
8	0.19	Decreasing	0.12	Decreasing	0.08	Decreasing

CHAPTER 4 – ECOLOGICAL RESOURCES

Estuaries are dynamic and complex ecosystems that provide connectivity between freshwater and marine environments and are strongly influenced by freshwater inflows and oceanic tides. Changes to the freshwater flow regime can affect factors such as salinity, dissolved oxygen, nutrient loading, chlorophyll, and water clarity, which in turn affect the production and distribution of fish species, macroinvertebrates, vegetation and other ecological resources.

Numerous studies have characterized the flora and fauna of the Lower Peace/Shell System. Many of these studies are discussed in the District's 2010 minimum flows report for the system (SWFWMD 2010a). In this chapter, we briefly highlight some of this information and additional studies completed after 2010 as part of the District's adaptive management approach for water resources and in support of the current minimum flows development/reevaluation process.

4.1. Vegetation

4.1.1. Shoreline Vegetation

Shoreline vegetative communities along southwest Florida tidal rivers, such as the Lower Peace/Shell System, typically transition from forested freshwater wetlands in upstream areas to tidal freshwater forest/marsh communities, and to brackish and salt marsh communities in middle to lower reaches. Descriptive information on the vegetation communities along the shores of the Lower Peace/Shell System are available from FMRI (1998) and PBS&J (1999). The recent distribution of major vegetative communities within the system is shown in Figure 4-1.

4.1.2. Bottomland Hardwood and Mixed Wetland Forests

Bottomland hardwoods are a wetland forest type that includes a diverse array of hydric hardwood species. Generally, these wetlands occur on rich alluvial silt- and clay-rich sediments deposited by river overflow. Common species in bottomland hardwood forests along the upper part of the Lower Peace River include bald cypress (*Taxodium distichum*), water hickory (*Carya aquatica*), ash (*Fraxinus caroliniana*) and red maple *(Acer rubrum)*. These forests are subject to periodic inundation from the river during periods of high flows, and more frequently, to tidal water-level fluctuations that occur in the lower part of the system (SWFWMD 2010a).Though classified as bottomland hardwoods by FMRI (1998), these forests are more properly classified as tidal freshwater forested wetlands using the terminology applied by Conner et al (2007). Excessive saltwater intrusion into the tidal freshwater forested wetlands of the Lower Peace River could affect their persistence and distribution. FMRI (1998) also identified mixed wetland forests downstream of the PRMWRSA Water Treatment Facility intake in the Lower Peace River floodplain. These forests are found at higher elevations and include habitats that can be considered uplands (FMRI 1998). Common tree and shrub species within these mixed wetland forests included sabal palm (*Sabal palmetto*), wax myrtle (*Myrica cerifica*), oaks (*Quercus* spp.) and saltbush (*Baccharis halmifolia*).

4.1.3. Tidal Marshes and Saltmarshes

Tidal marshes provide important foraging, refuge and reproductive habitat for a wide variety of species (Odum et al. 1988; McIvor et al. 1989; Shellenbarger 2007). Tidal fresh-water marshes are generally associated with salinities of <0.5 psu, although infrequent saltwater incursions may occur. Plant diversity is high in tidal marshes, as they typically include species tolerant of freshwater conditions and those associated with oligohaline (<0.5 to 5 psu) conditions.

Tidal fresh-water marshes in the Lower Peace/Shell System include sawgrass (*Cladium jamaicense*), bulrushes, wild rice (*Zizania aquatica*), cattail (*Typha* spp.), arrowhead (*Sagitaria latifolia),* water parsnip (*Sium suave*), pickerelweed (*Pontedaria cordata*), spatterdock (*Nuphar luteum*), and other fresh-water emergent marsh plants (Clewell et al. 1999; Clewell et al. 2002). Some of these species, including cattail and sawgrass, as well as other species such as bulrush (*Scirpus* spp.) and leatherfern (*Acrostichum danaefolium*) are considered representative of oligohaline marshes. These marshes provide extended foraging ground, temporary refuge from predation, and essential nursery habitat for many animal species. The fisheries habitat value of tidal freshwater marshes is likely equivalent to those of downstream, higher salinity marshes (Odum et al. 1984). Beck et al. (2000) identified “tidal fresh marshes” as a high priority habitat target for conservation in the northern Gulf of Mexico.

Saltmarshes dominated by black needlerush (*Juncus roemerianus*) occur downstream of fresh and oligohaline marshes in the Lower Peace/Shell System. Saltmarshes are characterized by somewhat higher salinities, frequently in the mesohaline (5 to 18 psu) salinity range (Stout 1984, Clewell et al. 2002). Plant species that intergrade along the boundary between oligohaline marshes and saltmarshes in the Lower Peace River include sawgrass, black needlerush, bulrushes, cordgrasses (*Spartina* spp.), and lance-leaved arrowhead (*Sagittaria lancifolia*) (Clewell et al. 2002; PBS&J 2004).

4.1.4. Mangroves

Mangroves are tropical trees that occur in brackish and saltwater environments, typically near the mouths of tidal rivers. While mangroves can physiologically grow in freshwater, mangrove communities only become established in saltwater systems, because of the absence of competition from freshwater species (Odum *et al.* 1982). Red and white mangroves *(Rhizophora mangle* and *Laguncularia racemosa)* are most common downstream of the confluence of Lower Shell Creek and the Lower Peace River (see Figure 4-1).

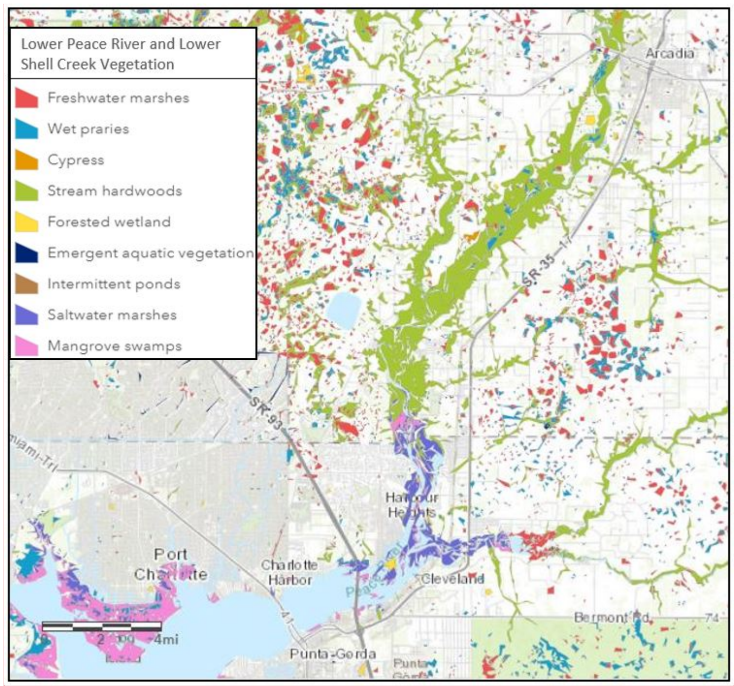

Figure 4-1. Lower Peace/Shell System vegetation (source: *Land Use Land Cover 2017 layer* maintained by the SWFWMD Mapping and GIS Section).

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4.1.5. Seagrasses

Seagrasses are important coastal resources, based on their habitat value, and roles in sediment stabilization, nutrient dynamics and carbon cycling. Seagrass distribution in the

Charlotte Harbor area, including the Lower Peace River and Lower Shell Creek, has been summarized in numerous studies (e.g., McPherson et al. 1996, Corbett 2006, Greenwalt-Boswell et al. 2006, Tomasko and Hall 1999, Brown et al. 2013, Tomasko et al. 2005, 2018). Many of these investigations are based on the District's (e.g., SWFMWD 2018, Quantum Spatial, Inc. 2019). long-term, biennial seagrass mapping efforts.

Seagrass species in the Charlotte Harbor area include shoalgrass (*Halodule wrightii)*, turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), *star grass* (*Halophila eglemanni*), paddle grass (*Halophila decipiens*), and widgeongrass (*Ruppia maritima*) (Corbett 2006). Shoal grass, turtle grass and manatee grass are the most common species, although shoal grass is not found in the Peace and Myakka rivers (Brown et al. 2013). In general seagrasses are only patchily distributed in the most downstream portion of the Lower Peace River and are not found in Lower Shell Creek, as indicated by mapping completed in 2018 (Figure 4-2).

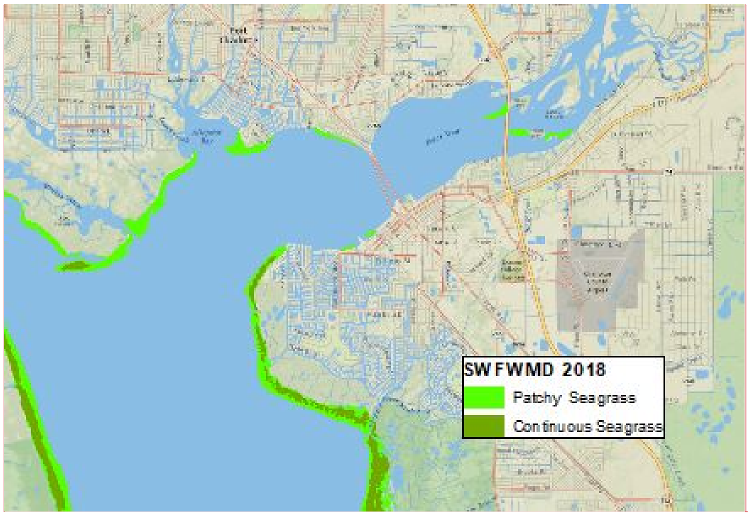

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Figure 4-2. Seagrass distribution and density in the Lower Peace River, Lower Shell Creek and upper portion of Charlotte Harbor (source: 2018 Sea Grasses layer maintained by the SWFWMD Mapping and GIS Section). "Continuous Seagrass" indicates coverage from ~75% to 100% and "Patchy Seagrass" is associated with coverage from ~ 25% to 75%.

Seagrass coverage in the greater Charlotte Harbor area has remained relatively consistent since the late 1980s, although the highest coverage estimates have been reported for the last three biennial surveys, which were conducted in 2014, 2016 and 2018. Figure 4-3 illustrates this pattern of recent, increased coverage for the Tidal Peace River segment of Charlotte Harbor.

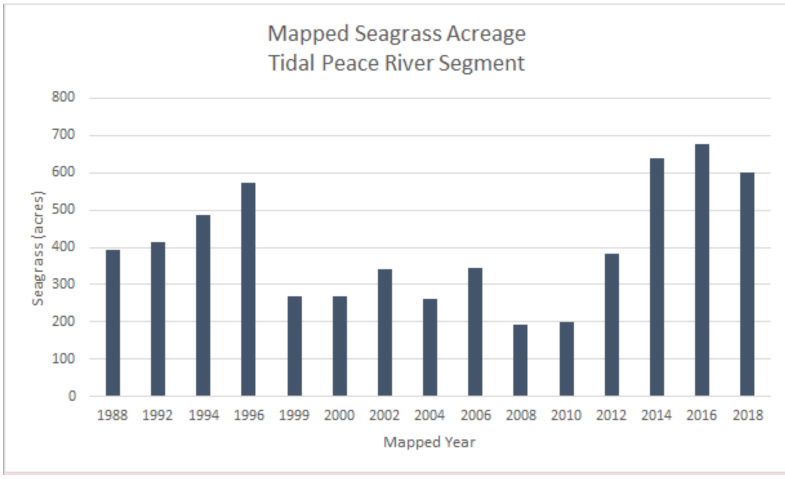

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Figure 4-3. Mapped seagrass acreage in the tidal Peace River segment of Charlotte Harbor from 1988 through 2018.

4.2. Fish and Benthic Macroinvertebrates

Salinity is an important physical factor affecting the biota of tidal rivers, and is, in turn, influenced by the amount of freshwater inflow as well as the effects of tides. Osmotic limitations restrict the ability of many freshwater species from using habitat in downstream portions that are tidally influenced. Osmotic constraints also restrict marine species access to low salinity and fresh-water habitats. During high flow periods, salinity at a given location is expected to be lower than during an average or low flow year, expanding the habitat available for freshwater and oligohaline (< 5 psu) organisms. In contrast, during low flow periods, saline water may extend further upstream, facilitating habitat expansion for estuarine species while contracting the habitat available for freshwater organisms (Alber 2002). Estuaries also support euryhaline communities, which are organisms that can tolerate a wide range of salinities and have adapted to seasonal fluctuations in flow regimes (Banks et al. 1991). Many species, including estuarine-dependent fish, rely on different salinity zones, during different life stages (Wang and Raney 1971; Peebles 2002; Greenwood et al. 2004; Rubec et al. 2018).

Freshwater inflow can affect substrate composition in tidal rivers based on effects associated with current velocity, and input and transport of sediments and organic matter. At lower flows, downstream sediment transport is diminished. This may adversely affect habitat availability for emergent vegetation and may contribute to the retention of contaminants in the estuary (Alber 2002). Additionally, if freshwater flows are diminished, tidal currents may displace coarser sediments upstream (Flemer and Champ 2006), altering the physical habitat of benthic organisms. Generally, biotic abundance and diversity increases with increasing substrate stability and the presence of organic detritus (Allan 1995).

The magnitude and timing of freshwater inflows affect the amount of nutrients and organic matter that enters a waterway. Higher flows are associated with increased nutrient loading and lower nutrient concentrations. Low flows contribute to decreased turbidity, increased water clarity (Alber 2002; Flemer and Champ 2006). Under extreme low flows primary production could even shift from a phytoplankton-based system to one driven by benthic algae (Baird and Heymans 1996). Increased secondary production by benthic organisms is typically observed after a period of increased flow (Kalke and Montagna 1989; Bate et al. 2002).

Flow can affect dissolved oxygen concentrations in different ways. Decreased flows may increase hydraulic residence times in tidal rivers which, can interact with the effects of nutrient loading and lead to lowered levels of dissolved oxygen associated with development of algal blooms. However, decreased flows may also contribute to increases in dissolved oxygen concentrations as a result of enhanced algal growth. Also, in association with reduced flows, the volume of density-stratified water in the estuary may be reduced as a result of decreased flows and lead to increased mixing of oxygenated surface water with bottom waters (Alber 2002; Flemer and Champ 2006).

Any adverse effects of flow on dissolved oxygen could have an impact on the organisms that live in the river. For example, Fraser (1997) looked at the relationship between physiochemical factors and fish abundance in Upper Charlotte Harbor, and noted a sharp decrease in fish abundance and number of species in areas where dissolved oxygen was less than 2 mg/L.

4.2.1. Fish and Planktonic/Nektonic Invertebrates

The Florida Fish and Wildlife Conservation Commission (FFWCC) Fisheries-Independent Monitoring (FIM) program has been monitoring the relative abundance of fishery resources in Charlotte Harbor since 1989. During 2018, FIM conducted monthly sampling of fish and selected invertebrates in Charlotte Harbor, including fish and invertebrates of recreational or commercial importance, (FWRI 2018). The region was divided by zones (Figure 4-3) for the general Charlotte Harbor area, Peace, Myakka, and Caloosahatchee Rivers, and Alligator Creek. Monthly stratified-random sampling was conducted in all regions and followed multi-gear approach, which allowed collection of data on various life-history stages of fish and invertebrates from a variety of habitats. All fish captured were counted and identified to the lowest practical taxonomical level. Certain taxa were not identified to species due to the possibility of hybridization (e.g., Menhaden, *Brevoortia* spp.) or juveniles that were morphologically indistinguishable (e.g., Mojarras; *Eucinostomus* spp. <40 mm standard length).

From 1,476 samples (i.e., seine hauls and otter trawls) collected in 2018 in the full study area, 143 fish taxa and 13 invertebrate taxa were identified. Of the 453,677 animals collected throughout the entire study area, the most numerous species were: Bay Anchovy (*Anchoa mitchili*), Pinfish (*Lagodon rhomboides*), Silversides (*Menidia* spp.), and Mojarras.

The 84 samples collected within the Lower Peace/Shell System portion (i.e., area P, Figure 4-3) of the study area yielded 11,681 animals from 66 taxa. The three most abundant taxa in this area were (Table 4-1): Bay Anchovy (n=8,015), Silversides (n=896), and Hogchoker (*Trinectes maculatus*) (n=647). The three most abundant taxa of commercial and recreational importance (Table 4-2), were: Southern Kingfish (*Menticirrhus americanus*) (n=210), Sand Seatrout (*Cynoscion arenarius*) (n=132), and Pink Shrimp (*Farfantepenaeus duorarum*) (n=59). The high abundance of Bay Anchovy in the Lower Peace/Shell System has also been reported by others (e.g., Wang and Raney 1971, Fraser 1997, Greenwood et al. 2004, Idelberger and Greenwood 2005, SWFWMD 2010a, Peebles and Burghart 2013).

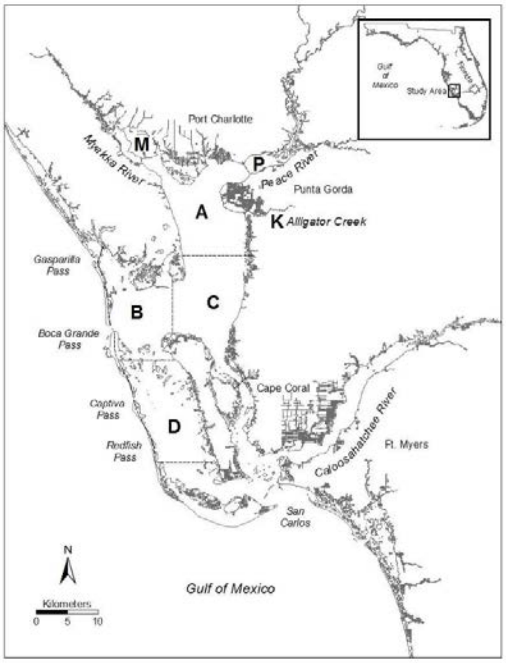

Figure 4-3. Map of Charlotte Harbor sampling area. A-D general area, M: Myakka River, P: Peace River, K: Alligator Creek. Figure extracted from the Fisheries-Independent Monitoring Annual Report (reproduced from FWRI 2018).

The lower reaches of the Peace River provide habitat to popular gamefish such as the Common Snook (*Centropomus undecimalis*) and Largemouth Bass (*Micropterus salmoides*). Common Snook are tropical, euryhaline fish that are obligate marine spawners, but use oligohaline portions of tidal rivers as adults (Blewett et al. 2009; Blewett et al. 2017). Blewett and Stevens (2013) looked at the effects of environmental disturbances on the abundance of these two species. Hurricanes can cause high river-inflows events, which reduce the salinity in the area and reduce dissolved oxygen. In such events, freshwater obligate fishes such as the Largemouth Bass can be confined to the hypoxic freshwater regions of the river and experience high mortality rates. Euryhaline fishes would have the advantage of leaving the affected areas and find more suitable habitat. Changes in the physicochemical characteristics of a tidal river can change the distribution and abundance of the resident and transient species (Wang and Raney 1971, Call et al. 2013).

Table 4-1. Top ten most abundant taxa found in Peace River from a total of 66 taxa and 11,681 animals collected during 84 sampling events (source: FWRI 2018).

Scientific Name	Common Name	Number of Animals
Anchoa mitchilli	Bay Anchovy	8,015
Menidia spp.	Silversides	896
Trinectes maculatus	Hogchoker	647
Eucinostomus spp.	Mojarra	563
Eucinostomus harengulus	Tidewater Mojarra	318
Menticirrhus americanus	Southern Kingfish	210
Cynoscion arenarius	Sand Seatrout	132
Calliniectes sapidus	Blue Crab	131
Membras martinica	Rough Silverside	93
Gambusia holbrooki	Eastern Mosquitofish	63

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Table 4-2. Taxa of commercial or recreational importance found in the Peace River from a total of 66 taxa and 11,681 animals collected during 84 sampling events (source: FWRI 2018).

Scientific Name	Common Name	Number of Animals
Menticirrhus americanus	Southern Kingfish	210
Cynoscion arenarius	Sand Seatrout	132
Callinectes sapidus	Blue Crab	131
Farfantepenaeus duorarum	Pink Shrimp	59
Leistosomus xanthurus	Spot	53
Centropomus undecimalis	Common Snook	28
Mugil cephalus	Striped Mullet	19
Sciaenops ocellatus	Red Drum	16
Lutjanus griseus	Gray Snapper	5
Archosargus pobatocephalus	Sheepshead	3
Micropterus salmoides	Largemouth Bass	3
Cynoscion nebulosus	Spotted Seatrout	2
Elops saurus	Ladyfish	2
Mugil trichodon	Fantail Mullet	2

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Call et al. (2013) also looked at the freshwater fish communities and habitat use in the Upper, Middle and Lower portions of the Peace River. The objectives of their study were to a) determine fish community metrics in the freshwater portion of the Peace River, b) identify differences in fish communities among sections of the river, and c) evaluate fish association with quantified habitat. Fish were sampled by electrofishing during spring and fall of 2007 through 2010. This project concluded that fish communities vary spatially in the river, but not temporally across seasons or years. This variability was correlated to variables such as macrophyte cover, woody debris, depth, and water velocity. Species such as the Eastern Mosquitofish (*Gambusia holbrooki*), Seminole Killifish (*Fundulus seminolis*), Redear Sunfish (*Lepomis microlophus*), and Bluegill (*Lepomis macrochirus*) were more likely to be found in the lower portions of the Peace River than the Upper (above the Zolfo Springs area) and Middle (from the Arcadia and Zolfo Springs areas) portions. Other species found in the oligohaline portions of the Peace River are the Rainwater Killifish (*Lucania parva*) and Hogchoker, which are both estuarine residents (Stevens et al. 2013).

Smalltooth Sawfish (*Pristis pectinata*) also inhabit parts of the Lower Peace/Shell System. These were the first elasmobranch (i.e., shark, skates, and rays) to be listed as endangered under the Endangered Species Act in 2003. The Charlotte Harbor estuary contains two distinct nursery hotspots for Smalltooth Sawfish juveniles: 1) the Caloosahatchee River and 2) the Peace River (Simpfendorfer 2001; Poulakis et al. 2011; Scharer et al. 2017). Recent studies by the FFWCC used acoustic monitoring to track Smalltooth Sawfish movement within nursery hotspots as a function of freshwater inflows (Poulakis et al. 2013; 2016). This behavioral response to freshwater inflows, i.e., movement into identified hotspots, was more commonly reported for the Sawfish population in the Caloosahatchee River (Scharer et al. 2017). The juvenile sawfish population in the Peace River seemed to be more tolerant of lower salinities and showed higher site fidelity as it would travel a smaller distance downriver before returning to their nursery grounds, compared to the population in Caloosahatchee (Huston et al. 2017; Scharer et al. 2017). The shoreline of the Caloosahatchee River has been altered by the creation of seawall canal systems, whereas the Peace River is less developed, with more natural shorelines.

4.2.2. Macroinvertebrates in the Lower Peace/Shell System

There have been limited number of benthic sampling events to study the benthic fauna of the Lower Peace River and Shell Creek. Mote Marine Laboratory studied the benthic invertebrates within the tidal Peace River and Shell Creek (Mote Marine Laboratory 2002; 2005). The Mote Marine Laboratory study divided the Lower Peace River into four longitudinal zones (Figure 4-4). These zones were based upon an analysis of long-term mean bottom salinity data. Zone 1 had mean bottom salinities of <0.5 psu. Zone 2 had mean bottom salinities ranging from 0.5 to 8.0 psu. Zone 3 had mean bottom salinities ranging from 8.0 to 16.0 psu and Zone 4 had mean bottom salinities >16 psu.

The dominant taxa within each of the zones were as follows:

- Zone 1 had predominantly freshwater taxa that can tolerate low salinities. These include the invasive Asiatic Clam (*Corbicula fluminensis)*, hydrobiid gastropods and non-biting midge (Chironomidae) larvae.
- Zone 2 (including Hunter Creek) had predominantly estuarine taxa such as the amphipods *Apocorophium lacustre* and *Grandidierella bonnieroides*; and some freshwater taxa such as non-biting midge larvae.
- Zone 3 (Lower Peace River proper) was also dominated by estuarine taxa. Although, unlike Zone 2, bivalves, including the Dwarf Surf Clam (*Mulinia lateralis)*, Atlantic Paper Mussel (*Amygdalum papyrium*), and Carolina Marshclam (*Polymesoda caroliniana*) were more highly ranked. Amphipods were more abundant in Zone 3 than in Zone 2.
- Zone 4 was dominated by estuarine bivalves and crustaceans.

The dominant species in Shell Creek included the Carolina Marshclam, the amphipod *Grandidierella bonnieroides*, and hydrobiid gastropods (Mote Marine Laboratory 2005).

The District funded a study that looked at the relationship of mollusk distribution to the physiochemical characteristics and freshwater inflows in tidal rivers of Southwest Florida (Montagna 2006). The study reported relatively high abundance of the Asiatic Clam, which represented the dominant taxa in the overall number of mollusks samples in Lower Peace River. This introduced bivalve can survive salinities up to 13 psu, but in sampling events on the Peace River, was found in higher densities in salinities equal or lower than 2 psu. Montagna (2006) also concluded that salinity had the strongest correlation with the structure of the mollusk community, compared to other abiotic variables such as temperature, pH, and sedimentation.

Oyster habitat can also be found in the estuaries within the Lower Peace/Shell System and Charlotte Harbor estuarine system. Although adult oysters can temporarily tolerate a wide range of salinities (0–42.5 psu), their optimal salinity habitat lies between 14 to 28 psu (Barnes et al. 2007). Their upstream extent is limited by low reproductive rates and low spat recruitment in salinities 0–15 psu. At high salinities (e.g., >25 psu), oysters are limited by increased stress and disease prevalence by the protozoan *Perkinsus marinus*, which has devastated oyster populations in the Atlantic and Gulf of Mexico (Barnes et al. 2007). Oyster bars provide refuge for a variety of other invertebrates such as bivalves, gastropods, small crustaceans (e.g., crabs and amphipods), and polychaete worms (Mote Marine Laboratory 2007).

The oyster restoration plan by Boswell et al. (2012), identified the tidal portion of Lower Peace River downstream of the ~~the~~ Interstate-75 bridge as area suitable for restoration. The recommended areas for restoration were: Northwest of Punta Gorda Isles, Alligator Bay, and in the vicinity of Hog Island. The restoration plan defined oyster habitat as substrate upon which a self-sustaining native oyster community could develop and provide habitat for commensal flora and fauna. The results from the restoration suitability model (Boswell et al. 2012), have further led to pilot studies for oyster restoration near the Trabue Harborwalk park in Punta Gorda (Geselbracht et al. 2017).

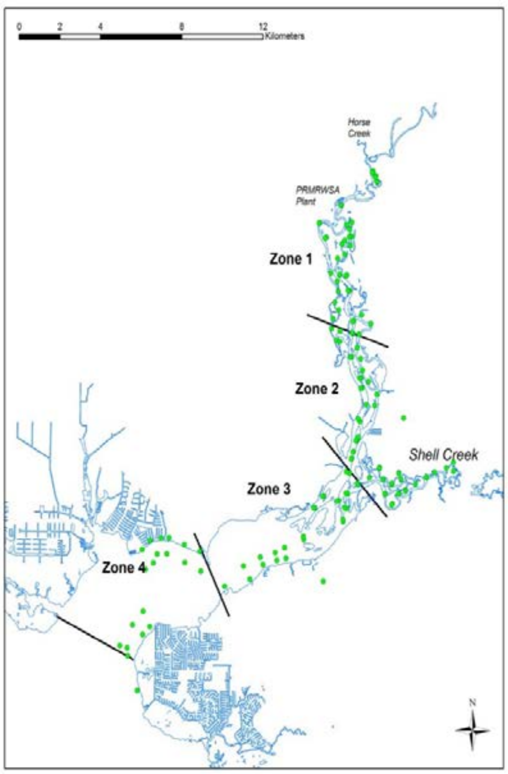

Figure 4-4. Location of benthic sampling station in the Lower Peace River and Shell Creek (Mote Marine Laboratory 2002; 2005).

CHAPTER 5 –FLOW BLOCKS, BASELINE FLOWS, RESOURCES OF CONCERN AND MODELING TOOLS RELEVANT TO MINIMUM FLOWS DEVELOPMENT

5.1. Overview

Resources of concerns and methods used to determine the minimum flow requirements for the Lower Peace River and Lower Shell Creek are described in this chapter. The approach outlined for the river involves identification of a proposed low flow threshold, and development of prescribed flow reductions proposed for periods of low, medium and high flows (Blocks 1, 2 and 3). The low flow threshold is used to identify a minimum flow condition and is expected to be applicable to river flows throughout the year. The prescribed flow reductions are based on limiting potential changes in key habitat indicators that may be associated with changes in river flows during Blocks 1, 2 and 3.

5.2. Flow Blocks

For most rivers in the District, there is a repetitive annual flow regime that can be described on the basis of three periods. These three periods are characterized by low, medium, and high flows and for the purpose of developing minimum flows and levels, are termed Block 1, Block 2, and Block 3, respectively (Kelly et al. 2005). For the original characterization of the specific blocks, flow records for long-term USGS gage sites including the Alafia River at Lithia, the Hillsborough River at Zephyrhills, the Myakka River near Sarasota, the Peace River at Arcadia, and the Withlacoochee River at Croom were reviewed. Block 1 was defined as beginning when the average median daily flow for a given time period fell below and stayed below the annual 75% exceedance flow (April 20 - June 24, for the originally assessed records). Block 3 was defined as beginning when the average median daily flow exceeded and stayed above the annual 50% exceedance flow (June 25 - October 27, for the originally assessed records). The medium flow period, Block 2, was defined as extending from the end of Block 3 to the beginning of Block 1 (October 28 – April 19, for the originally assessed records).

Estuaries are tidally influenced ecosystems where freshwater flow from a contributing watershed mixes with saltwater from a receiving ocean, bay, or gulf. Given the complex and dynamic interaction between fresh and marine waters, we determined it was necessary to develop a 3D hydrodynamic model of the Lower Peace/Shell System to provide detailed information on water circulation, and salinity and temperature distributions for a baseline and a series of flow scenarios with different percent-of-flow reductions. Analyses of seasonal flows for the Peace River (i.e., the sum of flows at the USGS Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee) for the 2007 through 2014 period that were simulated with the hydrodynamic model indicated that flows during the Block 2 period (October 28 – April 19) identified in the original 2005 analyses was dominated by flows less than the annual 75% exceedance flow as opposed to flows between 75% and 50% exceedance flows (Figure 5-1). The fixed-date block definition was therefore not considered appropriate for characterizing the seasonal flow regimes of the 2007 through 2014 period.

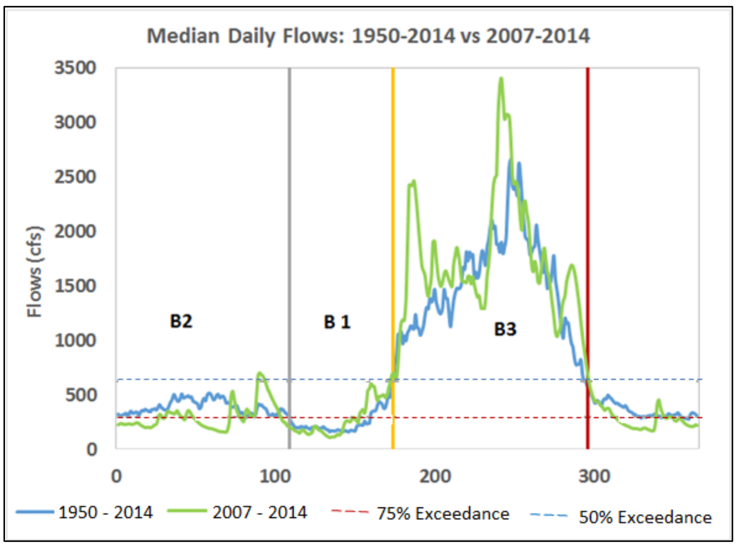

Figure 5-1. Comparison of median flows in the Lower Peace River (combined flows in the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee) for 1950 through 2014 and 2007 through 2014 under the calendar day-based seasonal flow blocks.

To address this issue, the District used the annual 75% and 50% exceedance flow thresholds to define the flow-based blocks, as shown in Figure 5-2. Based on the long-term, historic flow data from 1950 through 2014, the annual 75% and 50% exceedance flow thresholds for the Lower Peace River are 297 and 622 cfs, respectively. For Shell Creek, the annual 75% and 50% exceedance flows using available long-term, historic flow data for the period from 1966 through 2014 are, respectively, 56 and 137 cfs. With this new approach, the determination of transitional flow trigger (e.g. 625 cfs in the existing

Lower Peace River minimum flows, Table 1-1) is not required when high flows remained depressed due to climatological conditions.

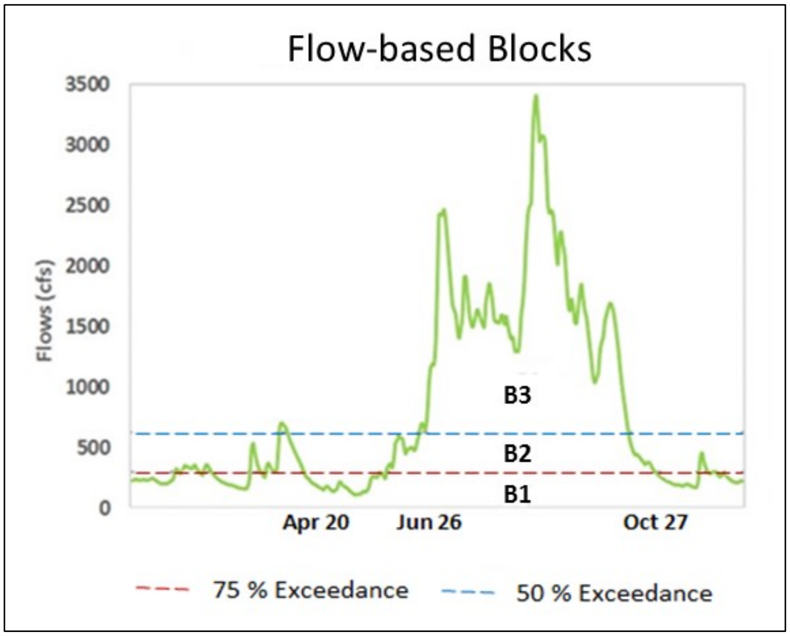

Figure 5-2. Median flows in the Lower Peace River (combined flows in the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee) for 2007 through 2014 (green line) and flow-based blocks defined using 75% and 50% exceedance flows derived from long-term, historic flow data for 1950 through 2014.

5.3. Reconstruction of Baseline Flows

A number of investigators (e.g., Hammett, 1990; Flannery and Barcelo 1998; Kelly 2004; Kelly et al. 2005; Kelly and Gore 2008) have examined trends in the Peace River flows and have reached a variety of conclusions regarding anthropogenic effects on the river's flows. Using data collected through 1985, Hammett (1990) concluded that "much of the flow decline seen in the Peace River is attributable to factors other than rainfall." In contrast, others (e.g., Kelly 2004; Kelly et al. 2005; Kelly and Gore 2008) have identified climate as a major factor for most of the flow decline observed for the river from the 1970s through the 1990s.

Assessing the Lower Peace/Shell System flow records for anthropogenic impacts is essential for determination of minimum flows. Flow variation associated with warming and cooling of the Atlantic Multi-decadal Oscillation (AMO) and El Niño Southern Oscillation (ENSO) were investigated. To gain a better understanding of factors that control Peace River flows and simulate the effects of climate, groundwater withdrawals, land use change, District findings from the Peace River Integrated Model (PRIM) project, which was completed in 2012, were also evaluated. Collectively, these data were used to construct a baseline flow record for Lower Peace River as described in subsection 5.3.2 of this chapter. This process included adding withdrawals from the river by the PRMWSA to the gaged flow record.

The baseline flow record for Shell Creek was constructed by subtracting excess groundwater runoff from the gaged flow record and adding the City of Punta Gorda's withdrawals from the Shell Creek Reservoir to the adjusted record. The approach used to construct the Shell Creek baseline flows is briefly described in subsection 5.3.3.

5.3.1. Flow Trends and Possible Causes

For trend analysis, we compiled flow data collected through 2018 for the USGS Peace River at Bartow, FL (02294650), Peace River at Zolfo Springs, FL (02295637), Peace River at Arcadia, FL (02296750) gage sites, and for gages on the major tributaries to the river, including the Horse Creek near Arcadia, FL (02297310), Shell Creek near Punta Gorda, FL (02298202), Charlie Creek near Gardner, FL (02296500), and Joshua Creek at Nocatee, FL (02297100) sites. Rainfall data (Site ID 24570) from 1951 through 2014 for the Peace River watershed were obtained from the District's Water Management Information System (WMIS) (http://www.swfwmd.state.fl.us/data).

Using the nonparametric Mann-Kendall's trend test on monthly time-step, trend analysis for rainfall identified a significant decreasing trend at alpha level of 0.05 for February and October. Monthly trending patterns for Peace River flows at Arcadia and Charlie Creek flows were shown to be similar. However, Peace River flows at Arcadia exhibited a significant decreasing trend for February, March and May, whereas the Charlie Creek flows show no significant decreasing trends for all months. Peace flows at Zolfo Springs exhibited significant declining trends for January through June, and flows at Bartow from January through June, as well as November and December exhibited significant decreasing trends. Flows at Joshua Creek exhibited increasing trend for most months, but these trends were only significant for January, April, May, November and December (Table 5-1).

The decreasing trends in the Peace River at Arcadia, Bartow and Zolfo Springs are primarily the result of rainfall declines through time, but also partly reflect effects of increased groundwater withdrawals in the upper Peace River watershed. The lack of significant declining trends in Horse Creek and Joshua Creek can likely be attributed to flow increases from agricultural return flows in recent decades. Charlie Creek flows exhibited no trend pattern for most of the months, suggesting that anthropogenic influences on Charlie Creek flows are minimal. The Peace River cumulative impact study by PBS&J (2007) also concluded that, among the watersheds in the Peace River Basin, Charlie Creek remains relatively un-impacted, with no phosphate mining and limited urbanization.

Table 5-1. Trend analysis for rainfall and flows in the Peace River at Arcadia, Bartow and Zolfo Springs, and Horse, Shell, Charlie and Joshua Creeks.

Commented [YG27]: Updated table (a monthly trend analysis was conducted, so these are new results).

Month	**Peace River Rainfall**		**Peace River at Arcadia**		**Horse Creek**		**Joshua Creek**	
	P	**Trend Direction**	**P**	**Trend Direction**	**P**	**Trend Direction**	**P**	**Trend Direction**
Jan	0.52	No trend	0.11	Decreasing	0.74	No trend	0.01*	Increasing
Feb	0.05*	Decreasing	0.02*	Decreasing	0.28	Decreasing	0.06	Increasing
Mar	0.88	No trend	0.02*	Decreasing	0.37	No trend	0.11	Increasing
Apr	0.98	No trend	0.12	Decreasing	0.79	No trend	0.02*	Increasing
May	0.97	No trend	0.04*	Decreasing	0.09	Increasing	0.00*	Increasing
Jun	0.27	No trend	0.34	No trend	0.23	Increasing	0.09	Increasing
Jul	0.97	No trend	0.83	No trend	0.68	No trend	0.18	Increasing
Aug	0.08	Increasing	1.00	No trend	0.5	Increasing	0.06	Increasing
Sep	0.72	No trend	0.90	No trend	0.64	Increasing	0.29	Increasing
Oct	0.02*	Decreasing	0.78	No trend	0.89	No trend	0.82	No trend
Nov	0.11	Decreasing	0.40	No trend	0.65	Increasing	0.03*	Increasing
Dec	0.14	Decreasing	0.37	No trend	0.46	No trend	0.00*	Increasing
Month	**Charlie Creek**		**Shell Creek**		**Peace River at Zolfo Springs**		**Peace River at Bartow**	
	P	**Trend Direction**	**P**	**Trend Direction**	**P**	**Trend Direction**	**P**	**Trend Direction**
Jan	0.65	No trend	0.18	Decreasing	0.02*	Decreasing	0.01*	Decreasing
Feb	0.42	Decreasing	0.05*	Decreasing	0.00*	Decreasing	0.00*	Decreasing
Mar	0.22	Decreasing	0.03*	Decreasing	0.01*	Decreasing	0.00*	Decreasing
Apr	0.56	No trend	0.20	Decreasing	0.03*	Decreasing	0.08	Decreasing
May	0.82	No trend	0.29	Decreasing	0.00*	Decreasing	0.00*	Decreasing

Jun	0.85	No trend	0.92	No trend	0.04*	Decreasing	0.02*	Decreasing
Jul	0.60	No trend	0.22	Increasing	0.57	Decreasing	0.36	Decreasing
Aug	0.91	No trend	0.22	Increasing	0.86	No trend	0.36	Decreasing
Sep	0.61	No trend	0.05*	Increasing	0.81	No trend	0.85	No trend
Oct	0.74	No trend	0.63	Increasing	0.86	No trend	0.57	No trend
Nov	0.91	No trend	0.98	No trend	0.06	Decreasing	0.02*	Decreasing
Dec	0.42	No trend	0.45	No trend	0.07	Decreasing	0.03*	Decreasing

* p values significant at an alpha level of 0.05

Using flows from Charlie Creek as a reference, a comparison of median daily flows per unit area for three periods for the Peace River at Arcadia, Horse Creek and Joshua Creek is presented in Figure 5-3. If climate is the major controlling factor, one should expect similar flow patterns in these neighboring watersheds. Figure 5-3 suggests that flow patterns in the Peace River at Arcadia for the periods 1970-1995 and 1996-2014 remain similar to the pattern observed during the period 1950-1969, indicating that there has not been a significant anthropogenic impact over time as seen in Horse and Joshua Creeks. The 1950-1969 flow patterns for Horse and Charlie Creeks were similar for most of the year with the exception that Horse Creek flows during May-June were relatively lower than the flows in Charlie Creek. During the periods of 1970-1995 and 1996-2013, however, the May through June flows in Horse Creek increased over time (see the middle and lower panels of Figure 5-3). These increases are consistent with the timing of growing season where return flows from irrigated fields is expected to contribute to streamflow. The flow in Joshua Creek clearly shows an increasing trend throughout the year since the early 1970s and the trend has increased significantly during the 1996-2013 period (Figure 5-3, lower panel). This is attributed largely to return flows from irrigated fields. Historic data for conductivity and nitrite +nitrate nitrogen in Joshua Creek also shows an increasing pattern due to changes to more intensive agricultural land uses and discharges of mineralized groundwater into the creek.

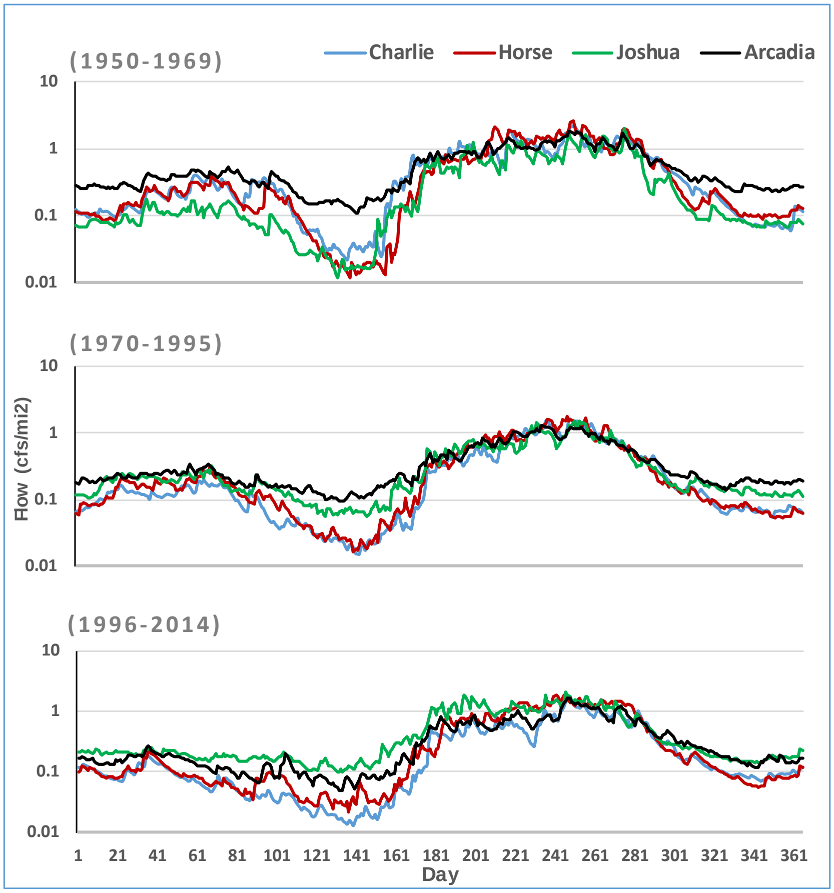

Figure 5-3. Comparison of median daily flows [logarithmic scale] for three time periods for the USGS Peace River at Arcadia, Charlie Creek near Gardner, Horse Creek near Arcadia and Joshua Creek at Nocatee gages. Data from 1950 begin on May 01.

Although we believe that the variations in Peace River flows are largely controlled by climate, a comprehensive study was necessary to better understand the relative impact of anthropogenic factors that influenced flow decreases in the upper and middle Peace River and flow increases in Horse, and Joshua Creeks. The District developed the PRIM for investigating effects of climate variability, groundwater pumping, land use changes and other factors on flows in the Peace River. Detailed information on model components, required inputs and the results of calibration and validation as well as scenarios that have been simulated are documented in HydroGeoLogic, Inc. (2009, 2011 and 2012).

The PRIM was run for a 13 year period from 1994 through 2006 with measured groundwater withdrawals. The daily flows produced by PRIM agreed fairly well with the observed streamflow in the Peace River at Arcadia (r^2=0.82), Joshua Creek at Nocatee (r^2=0.57) and Horse Creek near Arcadia (r^2=0.78) that collectively make up the Lower Peace River flows.

After calibration with measured flows that potentially integrate withdrawal effects, PRIM was run for two groundwater withdrawal scenarios (25% and 50% reduction) to assess the effects of reducing pumping on streamflow in the Peace River Basin. Effects of reduced groundwater withdrawals were strong in the Peace River at Bartow and Ft. Meade (6% increase in flow), moderate at Zolfo Springs (2.1% increase in flow) and minimal at Arcadia and in Horse Creek (<1% increase in flow) for a 50% groundwater withdrawal reduction. The modeled simulations also indicated a 3.8% decrease in Joshua Creek flows when groundwater withdrawals were reduced by 50% (Table 5-2).

Table 5-2. Impact of groundwater withdrawals on streamflow in the Peace River and selected tributaries (HydroGeoLogic, Inc. 2012).

Gage Site	Streamflow Changes	
	25% Pumping Reduction (%)	50% Pumping Reduction (%)
Peace River at Bartow	3.00%	6.00%
Peace River at Ft. Meade	3.00%	6.00%
Peace River at Zolfo	0.91%	2.09%
Peace River at Arcadia	0.22%	0.65%
Horse Creek	0.00%	0.00%
Joshua Creek	-1.84%	-3.75%
Charlie Creek	-1.49%	-2.26%
Payne Creek	0.50%	0.50%

This result is indicative of the degree to which agricultural return flows from groundwater pumping have increased flows in Joshua Creek. Generally, the lesser impacts to Peace River flows below Zolfo Springs at Arcadia and in Horse Creek are due partly to the tighter confinement on the upper Floridan Aquifer in the lower Peace River area. In addition, streamflow reduction due to groundwater withdrawals may partly be compensated for by excess baseflow associated with agriculture (HydroGeoLogic, Inc. 2012).

Since groundwater demands vary seasonally, development of a daily flow record corrected for seasonal effects of groundwater withdrawals, rather than yearly average, was required for minimum flows analyses. The development of a daily Lower Peace River baseline flow record based on seasonal groundwater withdrawals is briefly discussed in the sub-section which follows.

5.3.2. Lower Peace River Baseline Flows

Results from the PRIM simulations indicated a strong linear relationship between groundwater withdrawal percentage change and streamflow. Daily flows for zero groundwater withdrawals were therefore extrapolated using linear regressions developed from the PRIM scenarios results. However, given the uncertainties associated with model inputs and simplified assumptions and approximations of complex hydrologic interactions in the model, the daily flows generated using PRIM were not considered appropriate for use. Rather, the simulation results were aggregated into a longer time-scale for use in establishing a reasonable cause-and-effect relationship between baseline and impacted flows.

The specific steps undertaken to develop the Lower Peace River daily baseline flows were as follows:

(1) The daily simulated flows for both the actual and zero-pumping scenarios were aggregated into seasonal flow blocks corresponding to the periods of low, medium and high flows used to establish the Lower Peace River minimum flows.

(2) The aggregated flow block values for the 13-year period from 1994 through 2006 were averaged and used to calculate the block-specific average percentage differences in flows between the pumping and zero-pumping scenarios.

(3) The daily gaged flows measured in the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee were corrected for the effects of groundwater withdrawals using the average percentage flow change calculated for each seasonal block in step 2.

(4) The daily baseline flows for Lower Peace River for the period from 1950 through 2014 were calculated by combining the corrected daily flows for these three gage sites. However, 2007 through 2014 period was used as input in the hydrodynamic model.

Estimated percentage changes expected in the absence of groundwater withdrawals for flows in the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee are presented in Table 5-3. Although the percentage differences in flows in the Peace River at Arcadia and Horse Creek do not differ much between the actual and the estimated zero groundwater withdrawal condition, the estimated streamflow is diminished in the dry season (Block 1) for the reduced (zero) pumping condition. This is due predominantly to runoff associated with agricultural withdrawals from surficial and intermediate aquifers discharging into the river and creek. The effects of agricultural runoffs are more pronounced in Joshua Creek, where runoff associated with groundwater withdrawals for agricultural purposes has increased block-specific flows in the creek from 6.1 to 21.4%. These results indicate that agricultural groundwater withdrawals constitute a significant percentage of the Joshua Creek flows throughout the year.

Table 5-3. Estimated block-specific percentage changes in flows in the absence of groundwater withdrawals (and associated runoff).

Gage	Seasonal streamflow percentage changes		
	Block 1	**Block 3**	**Block 2**
Peace River at Arcadia	-1.0%	0.8%	2.1%
Horse Creek near Arcadia	-1.2%	0.6%	0.3%
Joshua Creek at Nocatee	-21.3%	-6.1%	-8.5%

The PRIM was developed to account for all major hydrologic processes, including rainfall, runoff, groundwater exchange, evapotranspiration, net evaporation from lakes, wastewater returns by municipal, industrial and agricultural uses, as well as groundwater pumping and discharges. However, like any physically based model, PRIM is limited by uncertainties that stem mainly from model assumptions, input errors and parameter estimation. To minimize these uncertainties, seasonal, rather than, daily or monthly adjustments were used to reconstruct the baseline flows for the Lower Peace River. Detailed information on the PRIM is provided in HydroGeoLogic, Inc. (2012) report (included as Appendix A).

Median daily baseline and gaged combined flows for the period 1950 through 2014 for the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee gage sites are shown in Figure 5-4. During April, May and June, the long-term monthly average combined baseline flows is shown to decrease by 0.2%, 2.6% and 2.3%, respectively, due to removal of agricultural return flows from the gaged flows. For the remaining months, the long-term monthly average combined baseline flows increased ranging from 0.2% in March to 0.9% in October.

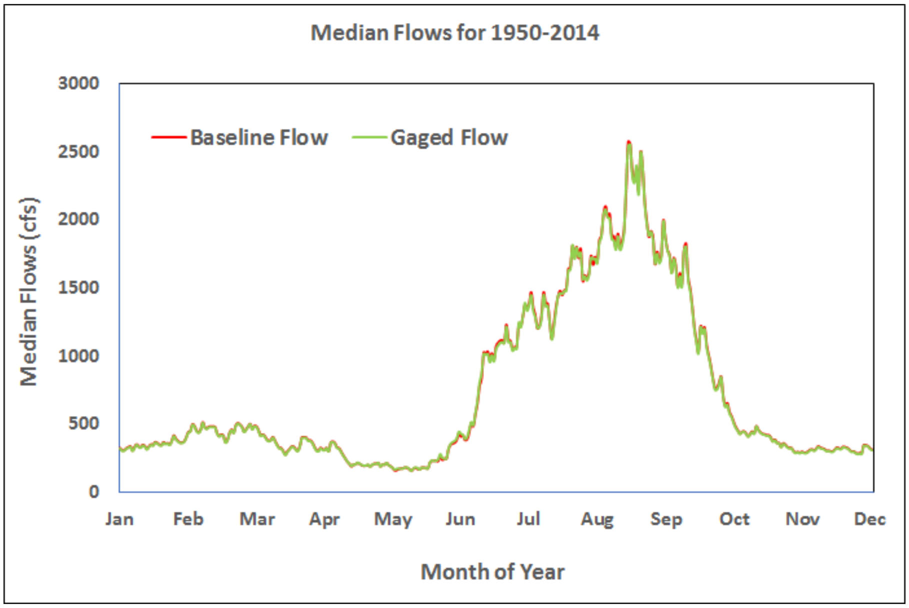

Figure 5-4. Median daily baseline and gaged flows for the Lower Peace River (combined flows in the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee) for the period from 1950 through 2014.

5.3.3. Lower Shell Creek Baseline Flows

The observed discharge from Shell Creek Reservoir at Hendrickson Dam has been increased by the addition of runoff associated with groundwater pumped for agricultural purposes and been decreased by City of Punta Gorda withdrawals from the reservoir. The dam and reservoir were constructed in 1965. The reservoir extends over 800 acres, with a maximum depth of 12 feet, and a total storage capacity of approximately 765 million gallons at a water surface elevation of 5.0 feet (PBS&J, 2007). The record of discharges from the dam begins in 1966 and the record of potable withdrawals from the reservoir begins in 1972, when the mean annual withdrawal was 2.0 cfs.

Because of backwater effects from the reservoir, there are no immediately upstream gages on Shell Creek or Prairie Creek that can be used to estimate inflows to the reservoir. Several adjustments were made to the gaged flow at the reservoir outfall, i.e., at the USGS Shell Creek near Punta Gorda, FL (02298202) gage, to account for missing records, withdrawals from the reservoir by the City of Punta Gorda, recorded zero flow days at the gage, and additional flows into the reservoir from agricultural runoff in the watershed.

The period of record for Shell Creek near Punta Gorda gage is from 1966 to the present, with missing records from October 1, 1987 to September 30, 1994. To infill the missing flow records, a regression was developed using the flows measured at the Shell Creek near Punta Gorda gage and the USGS Prairie Creek near Fort Ogden, FL (02298123) gage. Prairie Creek is a major tributary to Shell Creek, accounting for approximately 62% of the Shell Creek watershed above Shell Creek near the Punta Gorda gage.

Various approaches were used to account for withdrawals from Shell Creek Reservoir by the City of Punta Gorda. When measurable flow over the dam occurred at the Shell Creek near Punta Gorda gage, flows were adjusted simply by adding the withdrawal quantities back to the gaged flows. For 479 days in the flow record when flow was reported as zero at the gage at the dam, a regression-based approach was developed using Shell Creek near Punta Gorda flows and flows measured at the Prairie Creek near Fort Ogden and the USGS Charlie Creek near Gardner (02296500) gage. The regression based on Charlie Creek flows was necessary because flows in Prairie Creek were not monitored from October 1, 1968 to September 30, 1977.

The third correction to the observed discharge record at the Shell Creek near Punta Gorda gage involved adjusting for anthropogenic groundwater discharges that result from agricultural practices in the watershed. Two approaches were used to estimate the contribution of excess irrigation water to the volume of water in the reservoir. First, an estimate of the monthly fraction of excess irrigation water in the reservoir was developed from the observed reservoir chloride level and the ratio of groundwater to surface water reaching the reservoir. Second, excess irrigation flows were estimated for Shell Creek and Prairie Creek using recommended irrigation rates and application inefficiencies for crops specific to the watershed. Rates and periods of application were taken from the

Institute of Food and Agricultural Sciences (IFAS) recommendations for nearby Manatee County.

To estimate excess irrigation contributions to the Shell Creek Reservoir, it was assumed that row crops were irrigated using open ditch sub-irrigation techniques (ridge and furrow) and that citrus was irrigated using drip (trickle irrigation). As was done for the District's previous development of proposed minimum flows for the Lower Peace River and Lower Shell Creek (SWFWDM 2010), irrigation efficiency was assumed to be 60% and 85%, respectively, for row crops and citrus irrigation. Irrigation areas, application rates, periods and excess rate of flow delivered from Prairie Creek and Upper Shell Creek to the reservoir are listed in Table 5-4. The average excess irrigation flow estimates were 7.6 cfs for Prairie Creek and 9.5 cfs for Shell Creek. Using a mass balance equation, monthly estimates of excess groundwater flow in the reservoir were computed as shown in Table 5-5. Detailed information on the mass balance equation is provided in the HSW Engineering, Inc. (2016), included as Appendix B.

Table 5-4. Irrigation efficiency, periods, application rates and excess flows for row crops and citrus in Prairie Creek and Shell Creek (SWFWMD 2010).

Crop Type	Irrigation Efficiency	Irrigation Period		Application Rates (in/d)	Prairie Creek			Shell Creek		
		Start	End		Area (acres)	Irrigation Rates (cfs)	Excess Flow (cfs)	Area (acres)	Irrigation Rates (cfs)	Excess Flow (cfs)
Row Crops	**60%**	15-Jan	15-May	0.375	1,170	18.4	7.4	2,400	37.8	15.1
		15-Aug	14-Nov	0.272		13.4	5.3		27.4	11.0
		15-Nov	15-Dec	0.125		6.1	2.5		12.6	5.0
Citrus	**85%**	1-Apr	31-May	0.058	35,004	85.3	12.8	12,647	85.3	4.6
		1-Oct	15-Dec	0.032		47.1	7.1		47.1	2.6
				Average			**7.6**			**9.5**

Table 5-5. Excess groundwater flow at the Shell Creek Near Punta Gorda gage (HSW Engineering, Inc. 2016).

Month	Average Rainfall (in)	Average Evaporation (in)	Average Flow (cfs)	Withdrawals (cfs)	Stage (ft)	Volume (mg)	Area (acres)	Chlorides (mg/l)	Total Excess Groundwater Flow (cfs)
1	0.06	0.084	147.16	4.81	5.18	1082	642	137.52	13.1
2	0.08	0.102	157.00	4.94	5.21	1092	643	149.35	17.0
3	0.09	0.138	215.98	5.06	5.25	1102	645	151.51	22.7
4	0.06	0.158	103.36	5.27	5.15	1074	640	161.19	13.5
5	0.10	0.171	79.25	5.15	5.09	1057	638	164.22	10.5
6	0.29	0.160	488.40	4.16	5.36	1137	650	143.41	41.8
7	0.25	0.151	688.19	4.03	5.54	1188	658	107.03	15.6
8	0.27	0.151	722.86	4.36	5.57	1196	659	85.99	0.0
9	0.22	0.138	822.38	4.44	5.63	1214	661	73.76	0.0
10	0.10	0.123	442.37	5.14	5.36	1136	650	89.87	1.1
11	0.06	0.091	171.33	5.47	5.20	1089	643	111.58	8.2
12	0.06	0.077	141.81	4.96	5.17	1080	641	123.95	9.3

The pattern of the monthly excess flow, expressed as the ratio of groundwater flow (Total Excess Groundwater Flow in Table 5-5) to surface water flow (Average Flow (cfs) in table 5-5), is consistent with observed chloride concentration in the reservoir (Figure 5-5).

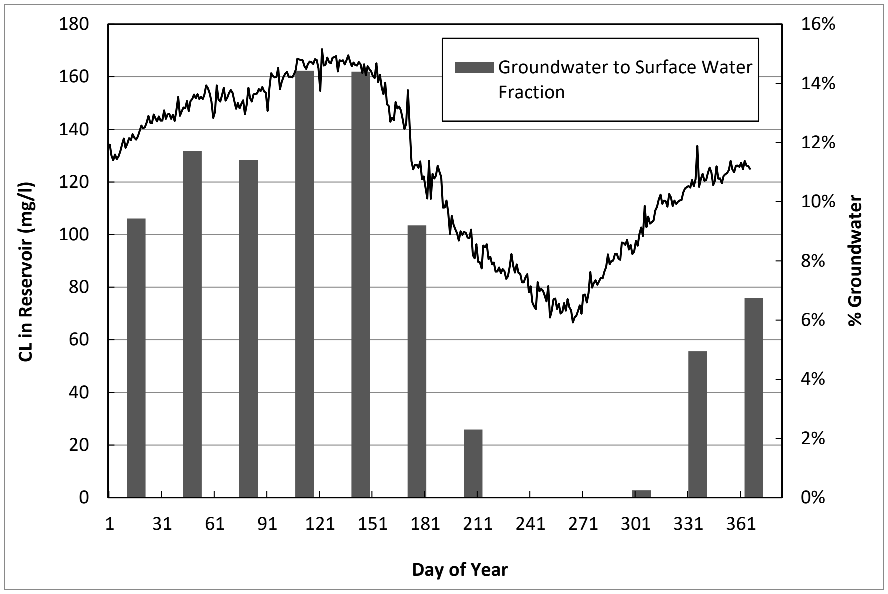

Figure 5-5. Measured chloride (CL) in Shell Creek Reservoir and estimated groundwater to surface water fraction (HSW Engineering, Inc. 2016).

Based on the reported City of Punta Gorda withdrawals from Shell Creek Reservoir, flows into and out of the reservoir, and estimates of inflow from groundwater withdrawals associated with agricultural uses, a baseline flow record for Shell Creek was developed for the period from 1966 through 2014. The baseline record was developed by subtracting excess groundwater runoff from the gaged flow record and adding the City of Punta Gorda's withdrawals from the Shell Creek Reservoir to the adjusted record.

Median daily flows for the period 1966 through 2014 for baseline record and gaged flows at the Shell Creek near Punta Gorda gage are shown in Figure 5-6. Except in July and August, there was a contribution from excess irrigation flow that ranged from 1.1cfs in October to 41.8 cfs in June (see Table 5-5).

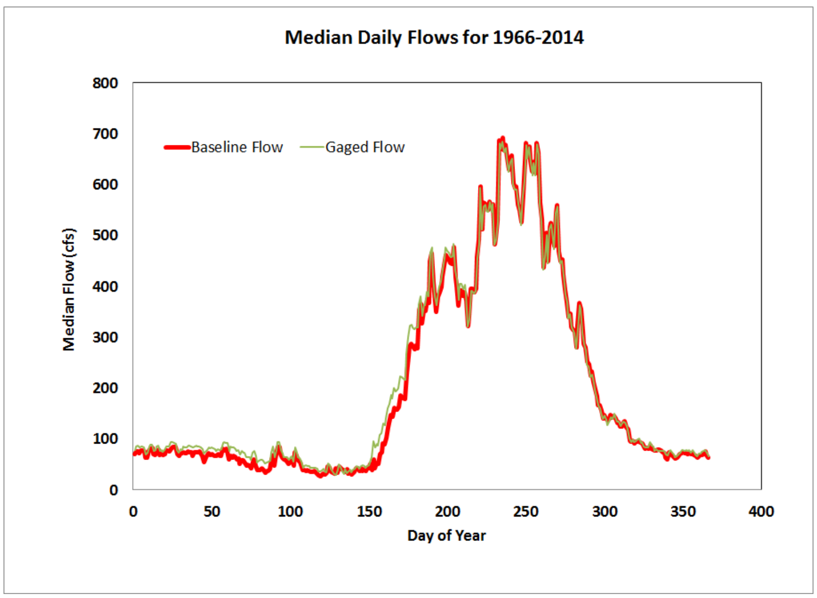

Figure 5-6. Comparison of median daily baseline and gaged flows for the Shell Creek near Punta Gorda gage for the period from 1966 through 2014 (HSW Engineering, Inc. 2016).

5.4. Resources of Concern for Determining Minimum Flows

The District approach for setting minimum flows is habitat-based. Because river systems include a great variety of aquatic and wetland habitats that support diverse biological communities, it is necessary to identify key ecological resources for consideration, and when possible, determine hydrologic requirements for specific habitats associated with the resources. It is assumed that protecting the resources of concern will also provide protection for other ecological aspects or functions of the river system that are more difficult to quantify, such as transfer of detrital material and the maintenance of river channel geomorphology (Kelly et al. 2005). Resource management goals that were subject to technical analysis for the development of minimum flows for the Lower Peace River and Lower Shell Creek and the relevant environmental values associated with each of these goals are listed below.

1. Determination of a low flow threshold to provide protection for ecological resources of the river by prohibiting withdrawal impacts during critical low flow periods and prevent water users from reducing flows to rates that will result in brackish water at the PRMRSWA intake.

   Relevant environmental values: fish and wildlife habitats and the passage of fish, estuarine resources, transfer of detrital material, maintenance of freshwater storage and supply, filtration and absorption of nutrients and other pollutants, and water quality.

2. Maintenance of biologically relevant salinities over a range of flow conditions that protect the distribution of fish species, benthic macroinvertebrates and shoreline vegetation communities.

   Relevant environmental values: recreation in and on the water, fish and wildlife habitats and the passage of fish, estuarine resources, transfer of detrital material, aesthetic and scenic attributes, filtration and absorption of nutrients and other pollutants, sediment loads and water quality.

3. Maintenance of seasonal hydrologic connections between the river channel and floodplain to ensure the persistence of floodplain structure and function.

   Relevant environmental values: recreation in and on the water, fish and wildlife habitats and the passage of fish, estuarine resources, transfer of detrital material, *aesthetic and scenic attributes, filtration and absorption of nutrients and other pollutants, sediment loads, water quality and navigation.*

Once the low flow threshold is established, the criteria used for seasonal minimum flows development was maintenance of 85% of the most sensitive criterion associated with the resource management goals.

To further investigate and strengthen the protection of the Lower Peace/Shell System, two additional resource management goals were subject to technical analysis for evaluation of recommended minimum flows. The evaluations involved two scenarios, one with no freshwater withdrawals (i.e., the baseline condition) and the other with maximum withdrawals allowed by minimum flows recommended for the Lower Peace/Shell System. The two management goals and the relevant environmental values associated with these goals are listed below.

1. Assess how the proposed minimum flows will affect the abundance and distribution of selected fishes in the Lower Peace/Shell System and Charlotte Harbor.

   Relevant environmental values: recreation in and on the water, fish and wildlife habitats and the passage of fish, estuarine resources and aesthetic and scenic attributes.

2. Assess how the proposed minimum flows will affect the status and trends in water quality parameters of the Lower Peace/Shell System.

   Relevant environmental values: recreation in and on the water, fish and wildlife habitats and the passage of fish, estuarine resources, transfer of detrital material, aesthetic and scenic attributes, filtration, and absorption of nutrients and other pollutants, and water quality.

5.4.1. Low Flow Threshold

Protection of aquatic resources associated with low flows is an important component of minimum flows development. A low flow threshold is defined as a flow rate below which no surface water withdrawals are allowed throughout the year. Although flows less than the low flow threshold may occur at any time of year and, they are most likely to occur during the dry season, i.e., in Block 1.

For the estuarine Lower Peace/Shell System, goals for developing a low flow threshold are to minimize upstream saline incursions that could affect salinity at an existing, permitted withdrawal location on the Lower Peace River, and to minimize adverse effects on the ecology of the river.

In establishing the 2010 minimum flows for the Lower Peace River, models developed to relate flows to ecological criteria in the Lower Peace River and Shell Creek showed no breakpoints or inflections in these relationships at low flows, thus it was concluded that development of a low flow threshold based on ecological criteria was not necessary. However, maintaining fresh water at the PRMRWSA Peace River Water Treatment Facility was identified as an operational criterion for establishing a low flow threshold to prevent intake of brackish water from the river. Based on this criterion and analyses conducted in 2009, a low flow threshold of 130 cfs for the sum of the flows at the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee gages was identified and subsequently included in the minimum flows established for the Lower Peace River and in the water use permit issued to the PRMRWSA by the District. The low flow threshold for the Lower Peace River stipulates that when the previous day's combined flows from Peace River at Arcadia, Horse Creek and Joshua Creek gages is less than or equal to 130 cfs, no withdrawal is allowed from the river. The continued need for a low flow threshold for the Lower Peace River minimum flows is anticipated as part of the current minimum flows reevaluation process for the Lower Peace River.

As part of the 2010 development of minimum flows for the Lower Peace River, a low flow threshold was not identified for Lower Shell Creek, as the City of Punta Gorda is permitted to withdraw water from the reservoir upstream of Hendrickson Dam. Development of a low flow threshold for Lower Shell Creek as part of the current minimum flows reevaluation/development of minimum flows for the Lower Peace and Lower Shell Creek is similarly not anticipated.

5.4.2. Biologically Relevant Salinities Zones

Alterations to timing and amount of freshwater inflow has a direct and instantaneous impact on salinity while impacts on other water quality constituents and biological communities may be indirect and are typically manifested on longer time scales (Atkins, Inc. 2013a). Since many estuarine communities are dependent on salinity variation for persistence and reproduction, the District uses the response of salinity distributions to change in freshwater flow as important, protective criteria for establishing estuarine minimum flows.

Various salinity zone classifications have been used to evaluate ecological characteristics of estuaries. Based on the Venice System for classification of marine waters (Anonymous 1958), five salinity zones have been established: limnetic (freshwater) at <0.5 psu, oligohaline at 0.5 to 5 psu, mesohaline at 5 to 18 psu, polyhaline at 18 to 30 psu, and euhaline at > 30 psu. Schireiber and Gill (1995) used a three-tiered salinity classification for identifying and assessing important fish habitats: tidal freshwater (0 to 0.5 psu), mixing (0.5 to 25 psu) and seawater (>25 psu).

Bulger et. al (1993), used a principal component analysis (PCA) of fish catch data from the mid-Atlantic region to establish four overlapping, biologically important salinity ranges of 0 to 4 psu, 2 to 14 psu, 1 to 18 psu and 16 to 27 psu. Using combined data from the nine study rivers in west-central Florida, Janicki Environmental, Inc. (2006) used an PCA of species presence-absence data to identify salinity zones of 0 to 7 psu, 7 to 18 psu, and 18-29 psu that were related to macroinvertebrate community structure. In a survey of seven rivers on the coast of west-central Florida, Clewell et al. (2002) found that sensitive freshwater plants were mainly located upstream of the median location of 2 psu salinity in the river channels. They also report that freshwater plants tolerant of low salinity, which are often dominant in brackish marshes (e.g., cattails, sawgrass, and bullrush), were most common where median surface salinity values were less than 4 psu. These plants also occurred in somewhat higher salinity waters but were rarely found where median salinity values exceeded 12 psu. Similarly, in a study of the Suwannee River estuary, Clewell et al. (1999) found that the transition from sawgrass to saltmarsh species occurred where maximum salinities in the dry season were near 10 psu. To assess the relationship between fish community structure and salinity in the Lower Peace/Shell System, PCA was used to identify four salinity classes separately for seines and trawls, and scores greater than 0.60 were used as a criterion for identifying the significantly correlated salinity classes (Figure 5-7).

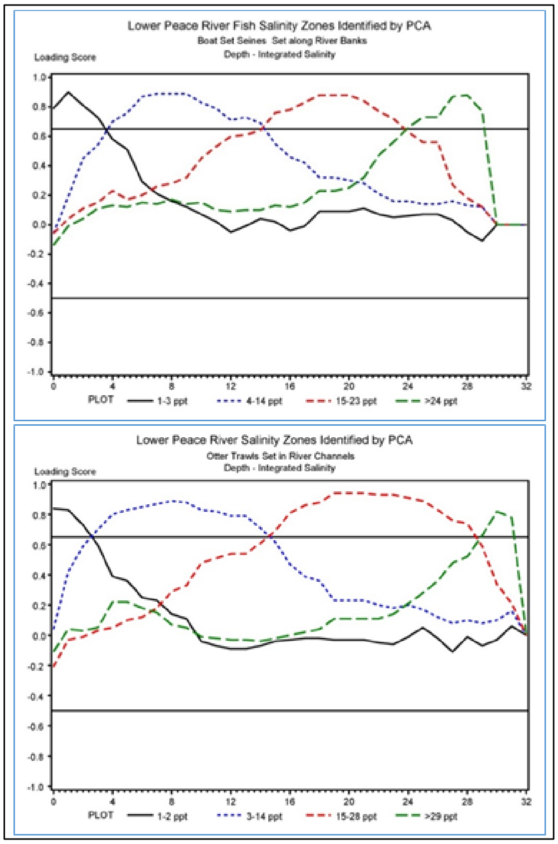

Figure 5-7. Salinity classes identified by Principal Component Analysis for the Lower Peace River, based upon the distribution of fish captured in seine (upper panel) and trawl (lower panel) samples. (Data source: FWRI 1998).

Based on these findings and other literature (e.g., Beck et al. 2000, Hoyer et al. 2004, Jassby et al. 1995, Kimmerer et al. 2002, SFWMD 2002, Water Resource Associates, Inc. et al. 2005, Tampa Bay National Estuary Program 2006, Culter 2010), five isohalines (<2, <5, <10, <15 and <20 psu) were selected to represent the boundaries of salinity zones that are important to either shoreline plant communities, benthic macroinvertebrates, or fishes in the Lower Peace/Shell System. The <2 and <15 psu zones were chosen because analysis of fish community structure in the Lower Peace River reveals break points at approximately 2 and 15 psu. The <5 psu zone corresponds to the upper limit of the oligohaline zone in the Venice system. The < 10 psu zone roughly serves as a mid-point to the mesohaline zone and is critical for saltmarsh species according to Clewell et al. (1999).

5.4.3. Floodplain, Soils and Vegetation

Ensuring sufficient flows for biological communities associated with river floodplains is an important component of the development of minimum flows. Periodic inundation of riparian floodplains by high flows is closely linked with the overall biological productivity of river ecosystems (Crance 1988, Junk et al. 1989). Many fish and wildlife species associated with rivers use both instream and floodplain habitats, and inundation of the river floodplains greatly expands the habitat and food resources available to these organisms (Wharton et al. 1982, Ainsle et al. 1999, Blewett et al. 2017, Hill and Cichra 2002). Inundation during high flows also provides a subsidy of water and nutrients that supports high rates of primary production in river floodplains (Conner and Day 1976, Brinson et al. 1981). This primary production produces large amounts of organic detritus, which is critical to food webs on the floodplain and within the river channel (Vannote et al. 1980, Gregory et al. 1991). Floodplain inundation also contributes to other physical-chemical processes that can affect biological production, uptake and transformation of macro-nutrients (Kuensler 1989, Walbridge and Lockaby 1994).

Soils in river floodplains exhibit physical and chemical properties that are important to the overall function of the river ecosystem (Wharton et al. 1982, Stanturf and Schenholtz 1998). Anaerobic soil conditions can persist in areas where river flooding or soil saturation is of sufficient depth and duration. The decomposition of organic matter is much slower in anaerobic environments, and mucky or peaty organic soils can develop in saturated or inundated floodplain zones (Tate 1980, Brown et al. 1990). Although these soils may dry out on a seasonal basis, typically long hydroperiods contribute to their high organic content. Plant species that grow on flooded, organic soils are tolerant of anoxic conditions and the physical structure of these soils (Hook and Brown 1973, McKevlin et al. 1998). Such adaptations can be an important selective mechanism that determines plant community composition. Because changes in river hydrology can potentially affect the distribution and characteristics of floodplain soils, soil distributions and their relationship to river hydrology are routinely investigated as part of minimum flows and levels determinations for District rivers.

Based on the Cooperative Land Cover (CLC) Map developed by the Florida Fish and Wildlife Conservation Commission and Florida Natural Areas Inventory, the lower portion of the Peace River is predominantly classified as floodplain swamp. However, land-based field examination identified at least two distinguishable floodplain zones (HSW Engineering, Inc. 2016). The inner floodplain wetland zone had an over story dominated by cypress (*Taxodium distichum*) where soils are permanently or semi-permanently flooded. The outer floodplain wetland zone is distinguishable by the predominance of over story species such as Laurel oak (*Quercus laurifolia*), Water oak (*Quercus nigra*) and Red maple (*Acer rubrum*).

5.4.4. Fish Abundance and Distribution

Relationships between freshwater inflow and the abundance and distribution of selected estuarine dependent fishes and invertebrates were examined to evaluate potential impacts of the recommended minimum flows on fish habitats in the Lower Peace/Shell System and Charlotte Harbor (Rubec et al., 2018; included as Appendix E to this report). A primary goal of this investigation was to ensure that the recommended minimum flows do not result in unacceptable environmental impacts to fish populations.

The project included development and use of habitat suitability modeling and related mapping (e.g., creation of Habitat Suitability Models [HSMs] and maps) for eight estuarine-dependent taxa. Based on review of previous studies of Charlotte Harbor and consultation with Dr. Ernst Peebles of the University of South Florida College of Marine Science, the FFWCC identified seven fish or fish life-history stages and one commercially-important invertebrate species that are known to be responsive to freshwater inflows in the Lower Peace/Shell System and Charlotte Harbor:

1. Juvenile Bay Anchovy (*Anchoa mitchilli*) (15-29 mm Standard Length (SL));
2. Adult Bay Anchovy (*Anchoa mitchilli*) (30-60 mm SL);
3. Early Juvenile Southern Kingfish (*Menticirrhus americanus*) ((10-119 mm SL);
4. Early-Juvenile Red Drum (*Sciaenops ocellatus*) (10-299 mm SL);
5. Early-Juvenile Spot (*Leiostomus xanthurus*) (10-149 mm SL);
6. Juvenile Sand Seatrout (*Cynoscion arenarius*) (10-149 mm SL);
7. Hogchoker (*Trinectes maculatus*) (10-100 mm SL); and
8. Blue Crab (*Callinectes sapidus*) (10-150 mm SL).

The HSMs were developed for two scenarios, one with no freshwater withdrawals (baseline) and another associated with the maximum percent-of-flow reductions allowed by the proposed minimum flows for the Lower Peace River and Lower Shell Creek. This latter scenario did not, however, include a maximum flow-reduction cap or limit for water withdrawals that is included in the proposed minimum flows for the Lower Peace River.

5.4.5. Water Quality

As part of the District's efforts to evaluate the proposed minimum flows for the Lower Peace River and Lower Shell Creek, Janicki Environmental, Inc. (2019) was contracted to evaluate relationships between flows and observed water quality. The specific tasks within this study consisted of data compilation, summarizing existing studies, conducting exploratory data analysis, conducting stochastic predictive modeling and synthesizing information regarding the potential effects of the proposed minimum flows on selected water quality constituents.

For the evaluation, water quality data from the PRMRWSA and City of Punta Gorda's HBMP databases, as well as from multiple sources including FDEP's Impaired Water Rule (IWR) database and USGS continuous recorders were used. Emphasis was given to the effects of flow on total nitrogen, total phosphorus, chlorophyll and dissolved oxygen concentrations, which may all be directly influenced by freshwater withdrawals.

5.5. Technical Approaches for Addressing Resources of Concern

5.5.1. Salinity-based Habitat Modeling

In establishing the 2010 minimum flows for the Lower Peace River, a coupled 3D-2DV model, named Lakes and Estuary Simulation System (LESS) was developed, which dynamically links a laterally averaged two-dimensional model (LAMFE) and a three-dimensional hydrodynamic model (LESS3D) to simulate circulations, salinity transport processes, and thermal dynamics in a domain that includes the upper portion of Lower Peace River, Lower Myakka River and Upper Charlotte Harbor (Chen 2008).

As part of the current minimum flow reevaluation and development process, the LESS model was upgraded to unstructured LESS model (UnLESS), which dynamically links the LAMFE (Chen 2003) with a 3D unstructured Cartesian grid model, named UnLESS3D (Chen 2011 & 2012). For application of the UnLESS model, the simulation domain is divided into a 3D subdomain and a 2DV subdomain, with the former being simulated with the UnLESS3D model and the latter with the LAMFE model. As both UnLESS3D and LAMFE can fit the bottom bathymetry and the shoreline and automatically track the dynamic position of the shoreline, the UnLESS model retains all these features.

5.5.1.1 Setup of the UnLESS Model

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As shown in Figure 2-6, a new bathymetry survey was conducted for Charlotte Harbor and the tidal reaches of the Myakka and Peace rivers. These new bathymetry data, along with available high-resolution LiDAR data, were used for the grid generation of the UnLESS model for Charlotte Harbor.

Fig. 5-8 shows the simulation domain and model mesh for the current modeling study of the hydrodynamics, salinity transport processes, and thermodynamics in the Lower Peace/Shell System and greater Charlotte Harbor estuary. In the figure, the 3D grids consist of different sizes of rectangular bricks (tiles) plotted in green and 2DV grids are bounded by cross-sections plotted with yellow lines. The 3D subdomain includes the entire Charlotte Harbor, Gasparilla Sound, Pine Island Sound, Matlacha Pass and the most downstream portion of Caloosahatchee River, the downstream 16.13 kilometers of the lower Peace River, the downstream 12.64 kilometers of the lower Myakka River, and the most downstream 1.74 km of the Shell Creek, and an offshore area which is about 20 – 30 km into the Gulf of Mexico. The 2DV subdomain includes the main stems of the Lower Peace River, Lower Myakka River, and Lower Shell Creek, as well as their branches. The downstream 3.67 km of the Big Slough Canal is also included in the 2DV subdomain. The upstream limits of the 2DV subdomain are at a cross section just downstream of the confluence of Horse Creek with the Lower Peace River, at River-kilometer 37.27 for the Lower Myakka River, and at the base of the Hendrickson Dam for Shell Creek.

The Caloosahatchee River was not included in the simulation domain, as it has relatively insignificant interactions with the Lower Peace River and Lower Shell Creek. Although Caloosahatchee River flows may only slightly affect salinity and temperature in the Lower Peace/Shell System, their effects were indirectly considered in the simulation with the proper specification of the open boundaries near the mouth of the Peace River.

In Fig. 5-8, the 3D subdomain was discretized with 4,790 grids in the horizontal plane and 17 layers in the vertical direction. Vertical spacings of the 17 layers varied from 0.4 m to 4 m, while the dimension of the unstructured Cartesian grid varied from 37.5 m × 37.5 m in Peace River and Shell Creek to 3,500 m × 2,400 m for the offshore area, where the first number represents the length in the *x*-direction and the second number the length in the *y*-direction. The 2DV subdomain was discretized with 311 longitudinal grids and the same 17 vertical layers as those in the 3D subdomain. The longitudinal spacing in the 2DV subdomain varied from 39 m to 4,147 m.

In summary, the updated model domain included the entire Charlotte Harbor, entire Lower Peace River, Lower Shell Creek, Lower Myakka River, Gasparilla Sound, Pine Island

Sound, Matlacha Pass and the most downstream portion of Caloosahatchee River (Figure 5-8).

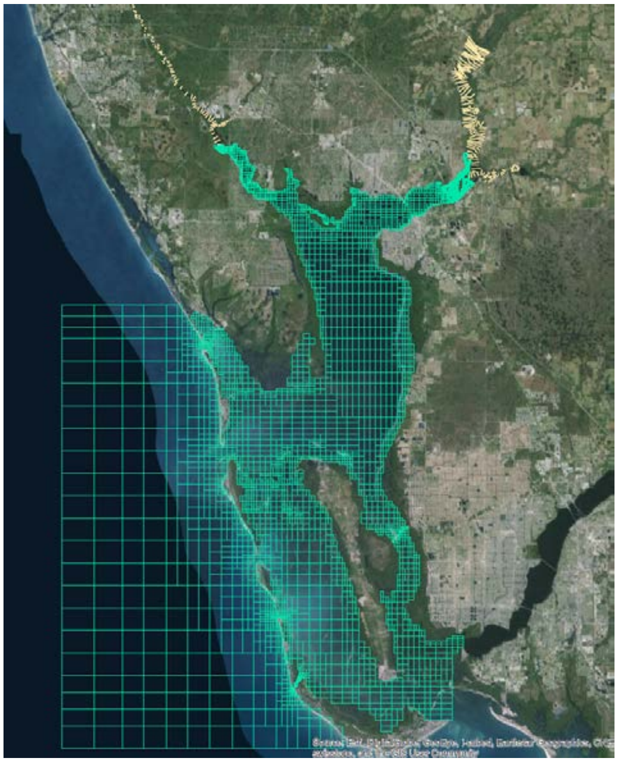

Figure 5-8. Mesh and simulation domain of the UnLESS hydrodynamic model developed to support the current reevaluation and development of minimum flows for the Lower Peace River and Lower Shell Creek. Green gridded area depicts area addressed with a three-dimensional hydrodynamic model (UnLESS3D). Areas identified with yellow cross-sections were addressed with a laterally averaged two-dimensional model (LAMFE).

5.5.1.2 UnLESS Hydrodynamic Model Input Data

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Input data used to drive the UnLESS model include flow data at the upstream boundaries, water level, salinity, and temperature data at the downstream open boundaries, as well as meteorological data for wind shear stress and heat flux calculations at the free surface. Some of these input data are directly measured in the system, while others are estimated using models. Based on the availability of all the data, including those to drive the model (input data) and to calibrate/verify the model (as discussed in the next section), a 20-month period between January 2013 and August 2014 was chosen for the modeling study.

At the upstream boundaries of the Lower Peace River, Shell Creek, and Lower Myakka River, including the Blackburn and Big Slough canals, freshwater flows, which included both gaged and estimated flows, were specified. Gaged flow used at the upstream boundary of the Lower Peace River included data measured at the Peace River at Arcadia, Joshua Creek at Nocatee, and Horse Creek near Arcadia USGS gage sites. At the upstream boundary of the Lower Shell Creek, gaged flow was from the USGS Shell Creek near Punta Gorda site. For the Myakka River, gaged flows were those measured at the Myakka River near SR 72 near Sarasota, FL (No. 02298830), Big Slough at Tropicaire Blvd. near North Port, Florida (No. 02299450), and Blackburn Canal near Venice, Florida (No. 02299692) USGS sites.

The total area gaged at the Peace River at Arcadia, Joshua Creek at Nocatee, and Horse Creek near Arcadia accounts for about 84% of the Peace River watershed. The remaining 16% of the Peace River watershed is ungaged with unknown freshwater contribution to the Charlotte Harbor. For the Myakka River, about one half of the watershed is ungaged. Although gaged flows contribute most of the total hydrologic loading to the Charlotte Harbor estuary, ungaged flows make up a substantial fraction of freshwater inflow to the estuary and affect salinity distributions in the simulation domain. For these reasons, good estimation of ungaged flows into the simulation domain is important. Details about the methods used to estimate ungaged flows for the Peace and Myakka Rivers can be found in Ghile and Leeper (2015).

Another freshwater inflow loss to Charlotte Harbor is associated with the Blackburn Canal, which drains the Myakka River and connects the river with Donna/Roberts Bay on the Florida Gulf Coast. Withdrawals by the PRMRWSA represents freshwater inflow loss to the Lower Peace River/Shell Creek and the greater Charlotte Harbor system and are accounted for in the input data for the UnLESS hydrodynamic model. Another freshwater inflow loss to Charlotte Harbor is associated with the Blackburn Canal, which drains the Myakka River and connects the river with Donna/Roberts Bay on the Florida Gulf Coast. We used USGS tide-filtered (residual) daily mean flow at the Blackburn Canal near

Venice site measured on and before May 4, 2013 and estimated the daily Blackburn Canal flow after May 5, 2013 using a correlation between gaged flow at the Myakka River near SR 72 near Sarasota USGS site and that in Blackburn Canal.

Boundary conditions of water level, salinity, and temperature at the downstream open boundaries in the Gulf of Mexico and Caloosahatchee River during the simulation period were provided by Zheng and Weisberg (2014) from their WFCOM model. Water levels and salinities and temperatures in eight equal-spacing σ layers were provided along the south, west, and north open boundaries in the Gulf as well as in the Caloosahatchee River (see Fig. 5-8). Because the UnLESS model is a z-level model, salinity and temperature results from the WFCOM model were interpolated from the eight σ layers to eight fixed elevations before they were read to the UnLESS model, which further interpolates these boundary conditions from the eight fixed elevations to the 17 z-level layers in UnLESS each time step.

Weather data used for the Charlotte Harbor UnLESS model included rainfall, wind speed and direction, solar radiation, air humidity, and air temperature. These data were measured at a station in Charlotte Harbor during 2/7/2013 – 8/31/2014. For time periods prior to February 7, 2013, average rainfall data at the following District sites in the watershed, which are close to the simulation domain, was used: New Charlotte South (SID 24710), Punta Gorda 4 ESE NWS (SID 25105), Punta Gorda NWS (SID 24711), ROMP TR1-2 Tropical Gulf (SID 25220), and ROMP TR3-1 Point Lonesome (SID 25218). Measured solar radiation, air humidity, air temperature, and wind speed and direction at the District site Peace River II ET (SID 24571) were used prior to February 7, 2013.

5.5.1.3 UnLESS Hydrodynamic Model Calibration and Verification

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There were five real-time data stations available in the Charlotte Harbor estuarine system that can be used for model calibration and verification. These stations included one in the upper portion of Charlotte Harbor, which was established and maintained by the Mote Marine Laboratory (Mote), two in the Lower Peace River (Peace River at Punta Gorda, Florida (No. 02298300) (PR_PG) and Peace River at Harbour Heights, Florida (No. 02297460) (PR_PRH) sites operated by the USGS. The two Shell Creek stations were the Shell Creek near Punta Gorda (SC_PG) station and the Shell Creek below the reservoir (SC_BR) station, which were both maintained by the District. Mote and PR_PG are in the 3D subdomain, while PR_HT, SC_PG, and SC_BR are in the 2DV subdomain.

Measured data at these stations included water levels, salinities, and temperatures. Except for the Mote station, where top, mid-depth, and bottom salinities and temperatures were measured, all stations have top and bottom salinity and temperature measurements. At the Mote station, real-time current data were collected with an acoustic Doppler current Profiler (ADCP), which measured current speed and direction in six bins, covering the depth between -3.25 m, NAVD88 and -0.25 m, NAVD88 with each bin being about 0.5 m in height.

Out of the 20-month modeling study period, model calibration was from August 2013 to August 2014, while model verification was from January 2013 to July 2013. Model calibration involved adjusting model parameters such as bottom roughness, eddy viscosities and diffusivities, etc., in the 3D and 2DV subdomains to obtain best matches between model results and field data at the five measurement stations. After the model was calibrated and verified, the model was run for the entire 20-month period from January 2013 to August 2014.

The time step used in the simulation was 90 seconds for most of the simulation period, but was reduced to 75 or 72 seconds during a few short periods when storms occurred. With a grid size as small as 37.5 m × 37.5 m in or near the passes, where the water depth is relatively deep (> 6 m), the gravity wave celerity is no less than 7.6 m sec-1 and the Courant number is greater than 14 even when $\Delta t = 72$ seconds. In other words, The UnLESS model can be run with a Courant number that is greater than 14 without any stability problems.

Comparisons of time series of simulated water levels, velocities, salinities, and temperatures were made with measured real-time data at the five stations. Modeled velocities at the vertical layers are interpolated to the exact elevations of the ADCP bins for comparison with measured data. Similarly, modeled salinities and temperatures over the water depth are interpolated to the exact elevations of the salinity and temperature sensors for comparison with field data. Discussions of model results of water level, salinity, temperature, and current and visual comparisons of time series of modeled variables with measured data can be found in Appendix C.

Although visual comparisons of model results with field data indicated that the UnLESS model has been successfully calibrated and verified for the Charlotte Harbor estuarine system, including its major tributaries, model skills were also assessed to quantify the model performance. A skill assessment parameter of Willmott (1981) was used to judge the agreement between model results and measured data. The Willmott skill assessment parameter varies between 0 and 1, i.e., a perfect agreement between simulated results and measured data yields a skill of one and a complete disagreement yields a skill of zero.

In addition to the Willmott skill parameters for simulated water levels, salinities, and temperatures at the five stations, other statistical parameters such as the coefficient of determination (R^2 value), the mean error (ME), and the mean absolute error (MAE) were also calculated to quantify the error of the model. As such, the skill metrics includes a total of four statistical measurements, which are not only calculated for results at each individual sensor but also for those at all the sensors at all the five stations to get the overall measurements of the model performance for water level, salinity, temperature, and current predictions. A discussion of the model performance at each individual sensor for the five stations is provided in Appendix C.

Table 5-6 lists the overall skill metrics for water level, salinity, temperature predictions by the UnLESS model. Although the model performance varies for predicting different variables, the overall skills for all four variables are satisfactory. We therefore concluded that the UnLESS model was successfully calibrated and verified for the Lower Peace River/Shell System and is appropriate for assessment of effects of the flow reduction on salinity habitats in support of minimum flows establishment.

Table 5-6 Skill metrics for water level, salinity, temperature, and current predictions by the UnLESS hydrodynamic model during the calibration and verification periods.

Variable	Calibration Period				Verification Period			
	ME	MAE	R2	Skill	ME	MAE	R^2	Skill
Water Level (cm)	-0.34	7.90	0.78	0.94	0.52	7.36	0.80	0.94
Salinity (psu)	-0.35	0.83	0.99	0.99	-0.33	0.99	0.98	0.99
Temperature (oC)	-0.15	1.84	0.89	0.94	0.02	1.74	0.87	0.95
Velocity (cm/s)	-0.38	5.64	0.81	0.95	-0.31	5.49	0.81	0.95

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5.5.1.4 UnLESS Hydrodynamic Model Uncertainty

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Although the UnLESS model is well calibrated and validated against real-time field data of water level, current, salinity, and temperature measured at five locations in the simulation domain, the model is subject to uncertainties with some model parameters and input data. Chen (2012) examined sensitivities of simulated salinity habitats in the Lower Manatee/Braden River system to bottom roughness (z_0), ambient vertical eddy viscosity/diffusivity (AVEVD), horizontal eddy viscosity/diffusivity (HEVD), and ungaged flows (UGF) and found that low salinity habitats are most sensitive to AVEVD, followed by UGF, z_0, and HEVD, with HEVD's influence being almost one order of magnitude smaller than the other three. The sensitivity analysis of Chen (2012) provides insight into effects of uncertainties in AVEVD, Z0, HEVD, and UGF on salinity habitats in the Lower Peace River/Shell Creek system simulated by the UnLESS hydrodynamic model. While AVEVD, Z_0, and HEVD have been extensively discussed and researched in literature and involve relatively small uncertainties, uncertainties associated with flow estimation from several small ungaged streams, creeks and canals that directly or indirectly flow into the Upper portion of Charlotte Harbor are difficult to quantify. Previously, the flows from those ungaged sites were simulated using a surface water model HSPF, Hydrological Simulation Program-FORTRAN (Ross, et al. 2005). The HSPF model has been less accurate than preferred for this area, due to the strong effects of surface/groundwater interactions on streamflow in the area, and a lack of explicit representation of the hydro-geologic processes that control baseflow which is typically needed for modeling purposes. In addition, large portions of the ungaged area have been altered to urban land use, and not knowing how much of the urbanized area is directly flowing into the drainage systems and how much is draining into waste water treatment systems has affected model accuracy.

As an alternative, a simple drainage ratio based method was used to estimate streamflow at some of the ungaged sites from neighboring gaged sites. The gaged sites were weighted based on their proximity and similarity in runoff response to a given ungaged site. The drainage area ratio method generally allowed maintenance of the hydrograph patterns observed in the gaged basins and improved the performance of the UnLESS hydrodynamic model. However, there are uncertainty errors in this method, as some altered ungaged basins (e.g., basins dominated by urban land use) do not exhibit runoff responses similar to neighboring gaged basins.

5.5.1.5 UnLess Hydrodynamic Model Simulations

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As discussed in Section 3.5 above, freshwater inflows to Charlotte Harbor are reduced by withdrawals and augmented by excess agricultural runoff. These effects on flows were accounted for in the development of baseline flow records for the Lower Peace River and Lower Shell Creek that were used in model simulations.

After calibration against measured real-time salinity and water elevation data collected by the District and the USGS at five stations, the UNLESS model was run for a 8-year period, from 2007 through 2014 using baseline flows (i.e., flows corrected for withdrawals and return-irrigation flows) and numerous reduced flow scenarios. Results from the reduced flow scenarios were compared with results from the baseline scenario to evaluate effects of various freshwater inflow reductions on the water volume, shoreline and bottom area salinity habitats in the Lower Peace/Shell System.

For each scenario simulation, model outputs (water level, salinity and temperature) were summed across space to produce instantaneous total habitats for one-hour intervals. These instantaneous estimates were averaged across the entire 8-year simulation period to produce estimates of shoreline length, total water volume, and bottom area for the entire system at salinity concentrations ranging from ≤0.5 psu to ≤20 psu. Water volume was calculated across all model layers and shoreline habitat was calculated based on bottom elevations at the four corners of a model grid and the simulated water surface elevation. Bottom-layer salinity zones in model grids were used for estimate bottom-area salinity habitats.

The method used to evaluate changes between baseline and reduced-flow scenarios involved preparing cumulative distribution function (CDF) plots of habitat area, shoreline and volume for baseline flows and the different flow reduction scenarios. The CDF plots are a useful tool, as they incorporate the spatial extent and the temporal persistence that a given salinity zone is achieved. This allows quantification of habitat availability in terms of both space and time.

The method used to compare alternative scenarios to the baseline condition using CDF plots is illustrated in Figure 5-9. The habitat available for a given scenario is estimated by calculating the area under the curve from a CDF plot. The blue-hatched area (area under the curve) in Figure 5-9a is the estimate of the habitat available for baseline flows (HA_B) for the entire modeling period. Figure 5-9b presents the habitat available under an alternative scenario, e.g., Scenario 1 (HA_{S1}), for the same period. The difference in area between the two curves is the habitat loss from the baseline condition for the specific flow reduction scenario (Figure 5-9c).

Using this approach, the relative change from baseline can be calculated for selected flow reduction scenarios. For the reevaluation and development of minimum flows for the Lower Peace River and Lower Shell Creek, relative flow reductions from baseline flows associated with preserving 85% of <2, <5, <10, <15 and <20 psu salinity-based habitats were calculated to determine minimum flows for the three blocks previously described in Section 5.2. These habitats were assessed using nine simulations, including the baseline scenario and scenarios associated with 5, 10, 15, 20, 25, 30, 35 and 40% reductions in baseline flows. When necessary linear interpolation was used to identify specific flow reductions intermediate to the reduced flow scenarios that were associated with more than a 15% reduction in salinity habitat.

Once the block-specific minimum flows were determined, evaluation of potential sea level change was evaluated for low, intermediate and high rates of sea level rise for the period from 2010 through 2035. This evaluation was conducted to estimate potential salinity habitat metrics might be determined in the future under both the baseline and the proposed minimum flow scenarios.

Details about the model theory of the dynamically coupled model UnLESS can be found in Appendix C and in Chen (2020).

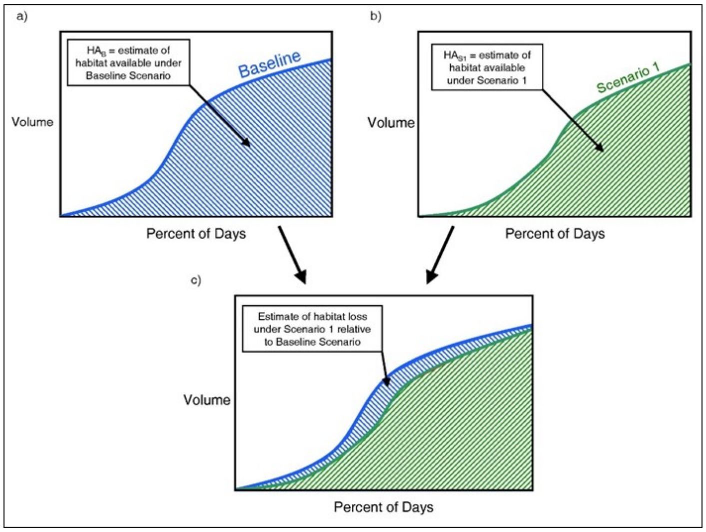

Figure 5-9. Example of area under curve calculated from a CDF plot: (a) represents the area under the curve for the baseline condition; (b) represents the area under the curve for an alternative flow reduction Scenario 1; and (c) represents the loss of habitat for the flow reduction relative to the habit associated with the baseline condition.

5.5.2. Floodplain Inundation Modeling

In support of the development of proposed minimum flows for the Lower Peace River and Lower Shell Creek, the District contracted with HSW Engineering, Inc. (2016; included as Appendix D to this report) to evaluate relationships between flows and floodplain wetland inundation patterns for the Lower Peace River. The evaluation focused on the Lower Peace River based on the occurrence of floodplain swamp in that portion of the Lower

Peace/Shell system. Floodplain swamp are not found in Lower Shell Creek, likely as a function of the location of the Hendrickson Dam in the portion of the Shell Creek watershed that is most strongly affected by incursion of higher-salinity water from the Peace River and Charlotte Harbor.

The framework for simulating floodplain inundation areas for the Lower Peace River involved using the UnLESS model to simulate a water-surface profile at selected, surveyed cross-sections within the Lower Peace River area (Figure 5-10), and GeoRAS to process those water surface profiles and generate floodplain inundation profiles in ArcGIS 10.6. The framework also required a high-quality DEM representing the ground surface and a land cover map reflecting the location and extent of wetlands along the Lower Peace River (Figure 5-10).

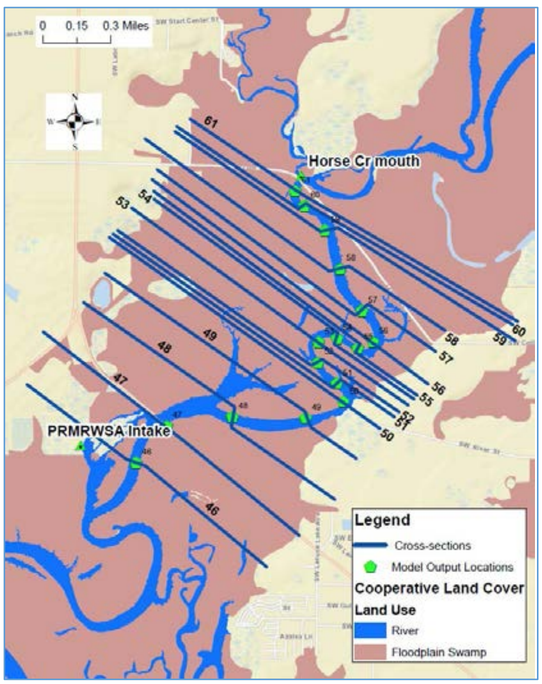

Figure 5-10. Location of cross-sections and wetlands for a floodplain inundation assessment for the Lower Peace River.

The steps involved in the floodplain inundation modeling, detailed in HSW Engineering, Inc. (2016; see Appendix D), were as follows:

1. The UnLESS model was run for the period from 2007 through 2014 and provided water surface elevation at the surveyed cross-sections. The water surface elevation in the study area is controlled by flows in the Lower Peace River and tides. To capture the flow-tide variability, 10 flow scenarios and 8 stage scenarios were evaluated resulting in 80 water surface elevation combinations at each cross-section.
2. The 80 water elevations were converted to triangulated irregular networks (TINs) using GeoRAS in ArcGIS for the representation of water surfaces.
3. The water-elevation TINs were rasterized in GIS at a spatial resolution of the DEM (i.e., 5 ft by 5 ft).
4. The rasterized water surface profiles and DEM data were overlain to determine the extent and depths of inundation. Inundation area was defined as the area encompassed by the intersection of the water surface and land surface.
5. The total inundated floodplain wetland area was determined for each of the 80 flow-stage scenarios by converting the rasterized inundation areas to shapefiles and overlaying with the CLC land cover shapefile.
6. To quantify a daily inundated wetland area, a flow-stage-inundated area rating curve was developed using piecewise regression analysis in IBM® SPSS statistical software.
7. Using the rating curve, a daily time series of inundated floodplain wetland area for the baseline condition was generated for the period from 2007 through 2014.
8. A total available inundated floodplain area was calculated for the baseline condition by summing the daily time-series area values.
9. Steps 7 and 8 were repeated for scenarios associated with 5%, 10%, 15%, 20%, 25%, 30%, 35% and 40 % reductions in the baseline flows.

Habitat decreases for the reduced flow scenarios were calculated by subtracting the total available inundated floodplain area for each simulation from the total available inundated floodplain area for the baseline condition to determine which, if any of the flow reduction scenarios resulted in more than a 15% reduction in inundated floodplain wetland area.

Multiple sources of uncertainty can be associated with our floodplain inundation modeling for the Lower Peace River. These sources can be ascribed to hydrologic data (e.g., gaged tide stage and flows) measurement errors; spatial (horizontal and vertical) ground elevation measurement and data-processing errors associated with DEM development; estimation of flows from ungaged watersheds used in the hydrodynamic modeling analyses (see Section 5.5.1.4); and uncertainty associated with the Florida CLC map layer.

5.5.3. Fish Habitat Modeling

The Habitat Suitability Modeling (HSM) completed for the District by Rubec et al. (2018; included as Appendix E to this report) was based on information in the FFWCC Fish and Wildlife Research Institute (FWRI) Fisheries-Independent Monitoring (FIM) database that was collected from 2004-2013 and information associated with the District's hydrodynamic modeling of the Lower Peace/Shell System and Charlotte Harbor for the period from 2007 through 2014.

Steps involved in the model framework used to assess impacts of the proposed minimum flows on the abundance of selected fish and Blue Crab in the Lower Peace/Shell System and Charlotte Harbor were as follows:

1. Datasets for the selected fish and invertebrate species or life-stages, including catch numbers and effort, temperature, salinity, dissolved oxygen, and site-depth at capture for the period from 1996 through 2013 were extracted from the FIM database. Bottom types at the FIM sampling locations were extracted from the National Oceanic and Atmospheric (NOAA) database.
2. The data were converted to habitat grids with 15m x 15m cells using kriging in ArcGIS (Figure 5-12).
3. Datasets for salinity and temperature derived from UnLESS hydrodynamic model were averaged within seasons across years (2007 through 2014) and used to create seasonal salinity and seasonal temperature grids in the study area.
4. Non-linear splines were fit to fish catch rate data (catch-per-unit-effort or CPUE) across gradients for water temperature, salinity, dissolved oxygen, bottom type, and depth. The HSMs were built using statistical functions that choose the best combination of environmental variables based on the lowest Akaike Information Criterion (AIC).
5. Predicted sampling gear corrected CPUEs (or GC-CPUEs) derived from the HSM analyses were imported into the ArcGIS datasets/layers to create baseline seasonal GC-CPUE grids for each species or life-stage.
6. Each continuous GC-CPUE grid was partitioned into four zones (Low, Moderate, High, Optimum) using the Jenks natural breaks classification method to create seasonal HSM maps.
7. Graphs of observed mean GC-CPUEs across the zonal grids were used to spatially validate the reliability of the predicted HSM maps. Increasing mean observed GC-CPUEs across the zones indicated agreement between the FIM data that went into the models and the predicted HSM maps.
8. Steps 5 and 7 were repeated for a proposed minimum flow scenario.

9. Potential decreases in habitat area and population numbers were calculated by subtracting results from a proposed minimum flows scenario (which was based on the maximum percent-of-flow reductions associated with the proposed minimum flows but did not include the maximum flow-reduction cap or limit for water withdrawals that is included in the proposed minimum flows for the Lower Peace River) from the baseline scenario results to predict potential impacts of the proposed minimum flows on the abundance of selected fishes and a commercially important invertebrate in the Lower Peace/Shell System.

Multiple sources of uncertainty can be associated with our habitat suitability modeling for the Lower Peace/Shell System and Charlotte Harbor. Specific sources of uncertainty that could affect the accuracy of the HSM modeling, particularly the estimation of population numbers, include:

- Hydrologic data (e.g., gaged tide stage and flows) measurement errors.
- Spatial (horizontal and vertical) topographic (ground elevation and bathymetric data) measurement and data-processing errors.
- Use of NOAA bottom-type data surveyed in the 1880s, that may have been changed over the years (e.g., due to hurricanes).
- Uncertainty associated with spatial interpolation of environmental data (salinity, dissolved oxygen, temperature, substrate and bathymetry) to a 15 x 15 m grid size.
- Assumption that dissolved oxygen remained time-invariant within each season for baseline and proposed minimum flows scenarios.
- Estimation of flows from ungaged watershed used in the hydrodynamic modeling analyses (see Section 5.5.1.4).
- Parameterization uncertainty associated with the delta-type generalized additive models (GAMs) used to associate CPUE-GC data with environmental variables.

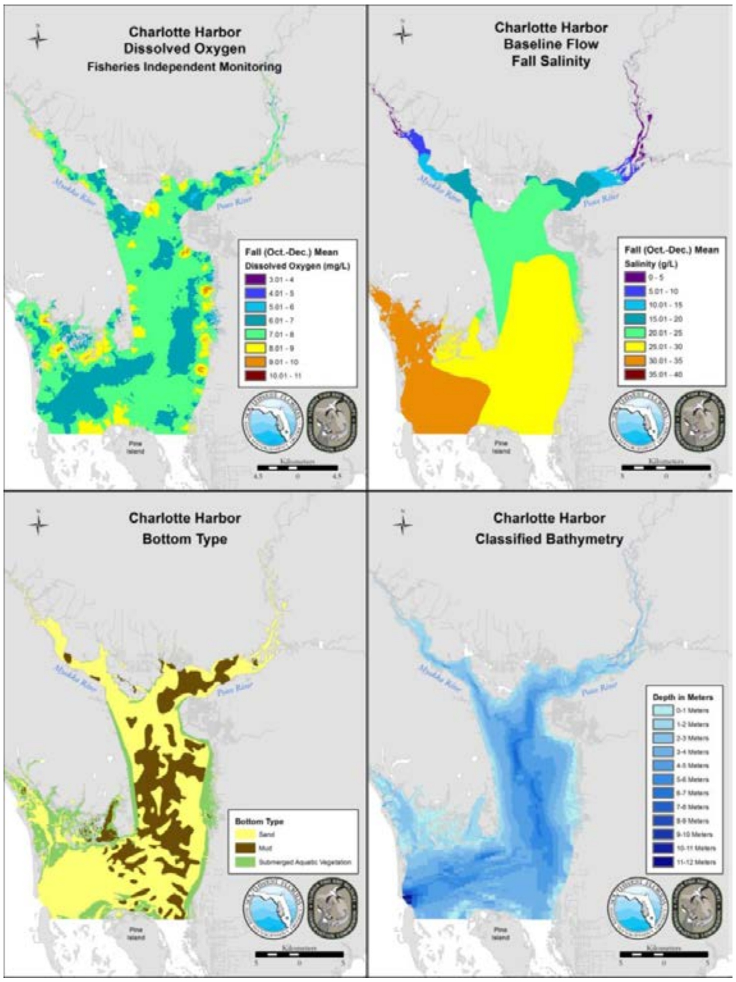

Figure 5-11. Example habitat information used for habitat suitability modeling (HSM) for fish and an invertebrate in the Lower Peace River/ Shell System and Charlotte Harbor: a) seasonal (fall) dissolved oxygen concentrations from Florida Fish and Wildlife Conservation Commission Fisheries Independent Monitoring sampling in 1966 through 2013; b) seasonal (fall) salinity based on District hydrodynamic modeling for the period from 2007 through 2014; c) bottom type from a National Oceanic and Atmospheric Administration database; and d) District bathymetric data collected to support hydrodynamic modeling.

5.5.4. Water Quality Modeling

As part of the District's efforts to assess the impacts of proposed minimum flows for the Lower Peace River and Lower Shell Creek on water quality, Janicki Environmental, Inc. through Applied Technology and Management, Inc. (ATM) was contracted to evaluate relationships between flows to the Lower Peace/Shell System and observed water quality in the system. As detailed in the Janicki Environmental, Inc. (2019) water quality report, included as Appendix F to this document, the following steps were undertaken to evaluate the proposed minimum flows for the Lower Peace/Shell System.

1. Screening methods were used to detect potential outliers or possibly erroneous data in the various datasets explored. The screening methods included robust regression analysis implemented using the RobustReg procedure in SAS® software.
2. Descriptive evaluations of the screened time-series data were conducted. The evaluation included comparisons of water quality prior to and after implementation of the minimum flow rule, using January 1, 2011 to differentiate the pre- and post-minimum flow implementation periods.
3. Statistical models (logistic regression, non-parametric regression and conditional inference trees) were developed to examine relationships between flow and dissolved oxygen, chlorophyll, total nitrogen and total phosphorus concentrations.
4. Spearman's rank correlation was conducted between the constituent of interest and lag-average flows between 2 and 60 days to determine the temporal scale on which these constituents might be correlated (e.g., 10, 30, 60 days) in the Lower Peace/Shell System.
5. Skillful regressions were used to evaluate the potential effects of flow reductions associated with the proposed minimum flows for the Lower Peace River and Lower Shell Creek on water quality.

CHAPTER 6 – RESULTS OF THE MINIMUM FLOW ANALYSES AND RECOMMENDED MINIUMUM FLOWS

Generally, the District approach for setting minimum flows is habitat-based and involves assessment of sensitive ecological resources that provide protection to all relevant environmental values identified in the Water Resource Implementation Rule for consideration when establishing minimum flows or levels.

For the Lower Peace River and Lower Shell Creek, the District's approach for determining minimum flows involved development and use of baseline flow (i.e., flows expected in the absence of withdrawal impacts) records for the Lower Peace River and Lower Shell Creek and a series of flow records reflecting incremental decreases from the baseline flow records. Using these flow records the District applied the percent-of-flow method and 15% change in habitat criteria to determine the minimum flow recommendations for the Lower Peace River and Lower Shell Creek. For the Lower Peace River, the minimum flow analysis also includes a development of low flow threshold and a maximum daily withdrawal that are applicable throughout the year.

6.1. Low Flow Threshold

Results from model simulations that relate flows to ecological criteria in the Lower Peace/Shell System do not exhibit breakpoints or inflections at low flows. Thus, it was concluded that a low flow threshold based on ecological criteria could not be established.

However, a low flow threshold of 130 cfs for the sum of the flows from Peace River at Arcadia, Joshua Creek at Nocatee, and Horse Creek near Arcadia is required to maintain freshwater at the withdrawal intake at the PRMRWSA Peace River Water Treatment Facility. This low flow threshold is an operational criterion and has been used since August 2010. It's continued inclusion in minimum flows proposed for the Lower Peace River is recommended.

A low flow threshold was not identified for Lower Shell Creek, as the City of Punta Gorda is permitted to withdraw water from Shell Creek Reservoir, above Hendrickson Dam.

6.2. Maximum Withdrawal Threshold

A maximum diversion of 400 cfs from Lower Peace River was included in the Lower Peace River minimum flows rule that became effective in August 2010. Staff recommend continued use of the 400 cfs maximum diversion rate for withdrawals from the Lower Peace River. This will ensure that high flows are protected while meeting the water needs of the PRMRWSA service area over the next 20 years. It is important to note that the 400 cfs withdrawal limit is only for withdrawals from the Lower Peace River.

A maximum withdrawal limit was not identified or recommended for Lower Shell Creek. The City of Punta Gorda is permitted to withdraw water from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek. For this reason, development of a maximum withdrawal rate is not considered necessary for Lower Shell Creek.

6.3. Salinity Habitat Results

Potential flow related changes in salinity-based habitats were evaluated using the District's UnLESS model (Chen 2020). Isohaline locations expressed as river kilometers were used to calculate the extent of shoreline, river bottom area and water volume habitat associated with specified salinities using cumulative physical metrics described in Section 5.5.1. Baseline and eight reduced-flow simulation results were compared to identify potential flow reductions associated with more than a 15% reduction in habitat.

Isohaline locations move upstream and downstream in the river channel with mixing driven by both tide and freshwater inflows. As described in Section 5.4.3., the <2, <5, <10, <15, and <20 psu isohalines were selected for the minimum flow analyses to represent the boundaries of salinity habitats that are important to shoreline plant communities, benthic macroinvertebrates, zooplankton and nekton, i.e., floating and free swimming fish and invertebrates.

Scenario simulations were conducted for the eight-year period from 2007 through 2014 using UnLESS. Model scenarios included baseline flows (0% reduction), and reductions from baseline flows ranging from 1% up to 40%. For each flow reduction scenario, the daily quantities for each respective salinity habitat in the Lower Peace River and Lower Shell Creek were combined to yield system-wide totals that were assessed by flow-based blocks. Comparison of baseline and reduced-flow scenario results and, when necessary, linear interpolation were used to identify flow reductions associated with a 15% decrease in each salinity habitat.

The water volume associated with salinity less than 2 psu habitat was the most sensitive salinity-habitat criterion. Based on this criterion, percent-of-flow reductions corresponding to a 15% decrease in habitat from baseline yielded potentially allowable flow reductions of 13%, 23% and 40%, respectively, for Blocks 1, 2 and 3. Table 6-4 provides the absolute value reductions in <2, < 5, <10, <15 and <20 psu water volume, bottom area and shoreline length salinity habitats and percentage changes due to flow reductions of 13% in Block 1, 23% in Block 2 and 40% in Block 3.

Table 6-4. Summary less than 2 psu, 5 psu, 10 psu, 15 psu and 20 psu salinity habitats by block under the proposed minimum flow relative to baseline scenario.

Block 1									
	Water Volume (Million m^3)			Bottom Area (Million m^2)			Shoreline Length (km)		
Salinity (<psu)	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change
2	10.8	9.1	15.0%	7.3	6.4	12.4%	44.1	38.2	13.3%
5	18.2	16.8	7.5%	11.2	10.3	7.3%	69.0	64.7	6.2%
10	25.8	24.7	4.0%	15.0	14.5	3.5%	88.9	86.8	2.4%
15	31.4	30.6	2.4%	18.1	17.7	2.3%	96.4	95.9	0.5%
20	43.5	42.2	3.2%	24.0	23.4	2.5%	99.9	99.9	0.1%
Block 2									
	Water Volume (Million m^3)			Bottom Area (Million m^2)			Shoreline Length (km)		
Salinity (<psu)	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change
2	21.5	18.3	15.0%	13.2	11.5	12.8%	78.5	69.3	11.8%
5	26.4	24.2	8.2%	15.7	14.5	7.2%	89.3	85.0	4.8%
10	31.4	29.8	5.2%	18.4	17.5	4.9%	95.7	94.2	1.6%
15	40.1	37.5	6.7%	22.5	21.3	5.2%	99.5	98.9	0.7%
20	60.7	56.0	7.8%	31.2	29.3	5.9%	101.8	101.5	0.3%
Block 3									
	Water Volume (Million m^3)			Bottom Area (Million m^2)			Shoreline Length (km)		
Salinity (<psu)	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change
2	32.9	28.0	15.0%	19.6	16.9	13.9%	94.1	88.0	6.5%
5	38.4	32.7	14.8%	21.8	19.1	12.5%	97.8	94.1	3.8%
10	49.2	41.9	14.8%	26.2	23.0	12.0%	100.5	98.8	1.8%
15	65.0	55.2	15.0%	32.6	28.6	12.0%	102.4	101.3	1.1%
20	85.1	76.9	9.7%	41.8	37.9	9.4%	103.4	103.1	0.3%

For all blocks, the decrease in <2 psu water volume habitat is 15% as expected, since the proposed minimum flows were established based on 15% decrease in the most restrictive habitat, i.e., the <2 psu water volume. The decrease in < 2 psu bottom area habitat associated with the proposed minimum flows ranges from 12.4% in Block 1 to 13.9% in Block 3, while the decreases are 13.3% in Block 1, 11.8% in Block 2 and 6.5% in Block 3 for the < 2 psu shoreline length habitat.

During Block 1, 13% reductions in baseline flows could reduce the salinity volume habitats by 3.2% to 15%, the bottom area habitats by 2.5% to 12.4% and the shoreline length habitats by 0.1% to 13.3%. Under medium-flow conditions associated with Block 2, 23% reductions in baseline flows could reduce the salinity volume habitats by 7.8% to 15%, the bottom area habitats by 5.9% to 12.8% and the shoreline length habitats by 0.3% to 11.8%. Salinity habitats were found to be relatively less sensitive to flow reductions under high-flow conditions associated with Block 3. Forty-percent reductions in baseline flows during Block 3 reduced the salinity volume habitats by 9.7% to 15%, the bottom area habitats by 9.4% to 13.9% and the shoreline length habitats by 0.3% to 6.5%.

6.4. Floodplain Inundation Results

The floodplain wetlands habitat criterion for the Lower Peace/Shell System was evaluated by analyzing time-series of inundated areas in the Lower Peace River portion of the system simulated with the UnLESS model (Chen 2020). Iterative analyses of hourly inundated floodplain wetlands area were conducted for all days of the year for the 2007 through 2014 baseline flow period and for a series of reduced baseline flow conditions. Reductions in average wetland inundation area corresponding to various flow reductions for the eight-year simulation period are provided in Table 6-5.

Table 6-5. Reduction in average inundated area of floodplain wetlands in a portion of the Lower Peace River associated with ~~to~~ various flow reductions from the baseline condition from 2007 through 2014.

Flow Reduction Scenarios	Average Stage (ft, NAVD 88)	Inundation Floodplain Wetland Area (acre)	Change in Inundation area Relative to Baseline (%)
Baseline	0.07	129.3	-
5%	0.067	128.1	0.9
10%	0.063	126.8	2.0
15%	0.061	125.9	2.6
20%	0.059	124.9	3.4
25%	0.055	123.7	4.3
30%	0.051	122.3	5.4
35%	0.048	121.3	6.2
40%	0.046	120.3	7.0

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The analysis shows that a 40% flow reduction could occur without exceeding a 7% decrease in the total inundated floodplain wetland area associated with the baseline flow condition. Considering only the percent-of-flow reductions in Block 3, a 40% reduction from baseline flows would be associated with a 10% decrease in inundated floodplain wetland habitat (Table 6-6). The 10% reduction in inundation area attributable to the proposed 40% withdrawal during high flow period is unlikely to alter the structure and functions of the floodplain wetland community in the Lower Peace River. This criterion is less sensitive than the salinity habitats discussed in Section 6.3 and was therefore not directly used to identify specific allowable percent-of-flow reductions that would be included in the proposed minimum flows for the Lower Peace River and Shell Creek.

Table 6-6. Reduction in average inundated floodplain wetland area in a portion of the Lower Peace River associated with various flow reductions from baseline conditions for high flow season (July to October) from 2007 through 2014.

Flow Reduction Scenarios	Average Stage (ft, NAVD 88)	Inundation Floodplain Wetland Area (acre)	Change in Inundation area Relative to Baseline (%)
Baseline	0.30	189.4	-
5%	0.29	186.7	1.40%
10%	0.29	183.9	2.90%
15%	0.28	181.7	4.00%
20%	0.28	179.8	5.10%
25%	0.27	177.0	6.50%
30%	0.26	174.0	8.10%
35%	0.25	171.8	9.30%
40%	0.25	169.7	10.40%

6.5. Summary of Recommended Minimum Flows

To support development of recommended minimum flows for the Lower Peace River and Lower Shell Creek, flow requirements associated with maintaining 85% of salinity-based habitats associated with a baseline flow condition were evaluated for three flow-based blocks corresponding with low (Block 1), medium (Block 2) and high (Block 3) flow ranges that collectively include the full hydrologic regime of the system. For the Lower Peace River portion of the Lower Peace/Shell System, effects of potential flow reductions from baseline flow condition were also evaluated for floodplain habitats for the entire year and during Block 3. In addition, a recommended Low Flow Threshold and Maximum Withdrawal Limit were developed.

Of the two habitat-based analyses assessed for the Lower Peace River portion of the Lower Peace/Shell System, salinity water volume associated with <2 psu was the most sensitive metric. Based on this most sensitive criterion, recommended minimum flows that include block-specific, allowable percent-of-flow reductions in the combined flow at the USGS Peace River at Arcadia (No. 02296750), Horse Creek near Arcadia (No. 02297310), and Joshua Creek at Nocatee (No. 02297100) gages were identified for the for Lower Peace River (Table 6-7). The recommended minimum flows for the Lower Peace River also include a low flow threshold of 130 cfs (based on the combined flows of the three USGS gages), and a maximum daily withdrawal limit of 400 cfs. Inclusion of the low flow threshold addresses water quality concerns associated with withdrawals from the river at the PRMRWSA Peace River Water Treatment Facility and offers protection to the ecology of the river, while the maximum daily withdrawal limit is intended to ensure protection of extremely high flows while meeting the water needs of the region.

Table 6-7. Summary of allowable percent-of-flow reduction for the Lower Peace River based on the combined flow from the USGS Horse Creek near Arcadia, Joshua Creek near Nocatee and the Peace River at Arcadia gages.

Block	If Combined Flow on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs >149 cfs - 297 cfs	Flow - 130 cfs 13% of flow
Block 2	>297 cfs - 386 cfs >386 cfs - 622 cfs	23% of (flow - 297 cfs) plus 13% of remaining flow 23% of flow
Block 3	>622 cfs - 1037 cfs >1037 cfs	40% of (flow - 622 cfs) plus 23% of remaining flow 40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

Minimum flows proposed for Lower Shell Creek (Table 6-8) were based on potential changes in the <2 psu water volume identified as the most sensitive metric for the Lower Peace/Shell System. The minimum flows for Lower Shell Creek specify required percent-of-flow releases in baseline flows at the outfall of Hendrickson Dam, where with support from the District, the USGS maintains the Shell Creek near Punta Gorda, FL gage (No. 02298202).

Table 6-8. Summary of allowable percent-of-flow release for Lower Shell Creek based on flow measured at the outfall of Hendrickson Dam and withdrawals from Shell Creek Reservoir by the City of Punta Gorda.

Block	If Inflow to Reservoir on Previous Day is	Allowable Flow Release
Block 1	<56 cfs	87% of inflow
Block 2	56 cfs - 137 cfs	77% of inflow
Block 3	>137 cfs	60% of inflow

For the proposed Lower Shell Creek minimum flows, baseline flows are the daily flows measured at the gage plus the daily withdrawal quantities made by the City of Punta from Shell Creek Reservoir. A maximum withdrawal limit was not identified or recommended for the Lower Shell Creek.

6.6. Evaluation of Proposed Minimum Flows

As described in Section 5.4, the proposed minimum flows were evaluated to assess potential effects on fish and invertebrate populations and water quality in the Lower Peace/Shell System and Charlotte Harbor. These environmental value assessments involved analysis of two scenarios, one with no freshwater flow reductions or withdrawals (i.e., the baseline condition) and the other with reduced flows based on the maximum withdrawals allowed by the recommended minimum flows for the Lower Peace River and Lower Shell Creek.

6.6.1. Fish Habitat Results

Habitat suitability models (HSMs) developed by Rubec et al. (2018) were run for the baseline flow condition and a scenario with flow reductions associated with the maximum withdrawals allowed by the proposed minimum flows for the Lower Peace/Shell System. This latter scenario, did not, however, include the maximum withdrawal cap or limit that is included in the proposed minimum flows for the Lower Peace River portion of the Lower Peace/Shell System.

The HSMs were applied to seven fish species life-stages and a specific size-class of Blue Crab which are known to exhibit preferences for low to moderate salinities and are abundant in the Lower Peace/Shell System and Charlotte Harbor.

For the HSM simulations, habitat zones were categorized into Low, Moderate, High and Optimum zones by percentages based on natural break classification in ArcGIS. Table 6-9 presents seasonal habitat zone percentages and changes between the baseline and minimum flows scenarios for the assessed taxa. Black colored percent change values indicate the percentages for the minimum flows scenario were less than the corresponding baseline percentages. Red colored percent change values indicate the percentages for the minimum flows scenario were greater than the corresponding baseline percentages.

TABLE 6-9. Seasonal percent of HSM zones for species life stages in the Lower Peace/Shell System and Charlotte Harbor for Baseline (BL) and Minimum Flows (MF) scenarios. Note that the MF scenario was based on maximum percent-of-flow reductions associated with the proposed minimum flows but did not include a maximum flow-reduction cap, i.e., limit, for withdrawals from the Lower Peace River.

		Fall			Winter			Spring			Summer	
Species Life-Stage	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
HSM Zone	BL	MF	Change	BL	MF	Change	BL	MF	Change	BL	MF	Change
Juv-Adult Hogchoker												
Low	96.10	96.41	0.31	90.51	91.50	0.99	94.01	94.99	0.98	94.63	95.23	0.60
Moderate	2.55	2.42	0.13	8.11	7.33	0.78	4.51	3.78	0.73	2.64	2.31	0.33
High	1.15	0.99	0.16	1.12	0.98	0.14	1.21	1.02	0.19	1.47	1.25	0.22
Optimum	0.20	0.18	0.02	0.26	0.20	0.06	0.28	0.21	0.07	1.27	1.21	0.06
Juvenile Sand Seatrout												
Low	87.93	89.62	1.69	95.53	96.31	0.78	43.78	45.68	1.90	62.99	70.07	7.08
Moderate	10.14	8.55	1.59	3.81	3.07	0.74	25.66	26.39	0.73	22.91	20.48	2.43
High	1.60	1.52	0.08	0.56	0.53	0.03	18.53	16.58	1.95	12.87	8.53	4.34
Optimum	0.33	0.32	0.01	0.10	0.09	0.01	12.04	11.35	0.69	1.22	0.93	0.29
Juv-Adult Blue Crab												
Low	80.75	81.73	0.98	49.72	51.65	1.93	91.26	91.81	0.55	46.60	50.51	3.91
Moderate	7.90	7.98	0.08	27.72	27.15	0.57	3.20	2.88	0.32	28.06	27.22	0.84
High	8.75	7.89	0.86	13.74	12.88	0.86	3.57	3.55	0.02	15.75	14.97	0.78
Optimum	2.60	2.41	0.19	8.82	8.32	0.50	1.97	1.75	0.22	8.59	7.30	1.29
Early-Juvenile S. Kingfish												
Low	85.69	87.49	1.80	48.44	50.33	1.89	90.15	91.02	0.87	62.18	69.12	6.94
Moderate	5.82	5.16	0.66	29.05	29.24	0.19	5.34	4.99	0.35	21.96	19.24	2.72
High	6.76	5.88	0.88	16.98	15.86	1.12	3.93	3.58	0.35	12.03	8.78	3.25
Optimum	1.73	1.46	0.27	5.52	4.57	0.95	0.58	0.41	0.17	3.83	2.86	0.97
Juvenile Bay Anchovy												
Low	54.76	57.53	2.77	57.70	59.34	1.64	67.69	69.04	1.35	52.87	55.54	2.67
Moderate	25.86	24.44	1.42	21.31	20.67	0.64	16.07	15.50	0.57	22.03	20.53	1.50
High	10.75	9.83	0.92	12.75	12.25	0.50	9.58	9.12	0.46	15.23	15.29	0.06
Optimum	8.62	8.20	0.42	8.24	7.74	0.50	6.65	6.34	0.31	9.87	8.64	1.23
Adult Bay Anchovy												
Low	54.76	57.53	2.77	56.75	58.23	1.48	67.70	69.04	1.34	52.86	55.54	2.68
Moderate	25.86	24.44	1.42	26.02	25.32	0.70	16.07	15.50	0.57	22.04	20.53	1.51
High	10.75	9.83	0.92	10.14	9.53	0.61	9.58	9.12	0.46	15.23	15.29	0.06
Optimum	8.62	8.20	0.42	7.09	6.92	0.17	6.65	6.34	0.31	9.87	8.64	1.23
Early-Juvenile Red Drum												
Low	51.97	52.28	0.31	44.47	44.85	0.38	48.43	48.43	0.00	43.92	46.76	2.84
Moderate	19.62	19.37	0.25	27.35	26.98	0.37	26.65	26.65	0.00	23.43	23.26	0.17
High	17.65	18.06	0.41	18.38	18.31	0.07	15.00	15.00	0.00	27.83	26.11	1.72
Optimum	11.12	10.28	0.84	9.80	9.86	0.06	9.93	9.93	0.00	4.81	3.87	0.94
Early-Juvenile Spot												
Low	68.74	65.02	3.72	45.70	46.18	0.48	65.43	65.65	0.22	39.49	34.58	4.91
Moderate	23.78	26.60	2.82	25.46	25.45	0.01	24.18	24.37	0.19	40.42	39.80	0.62
High	6.16	6.70	0.54	18.27	18.49	0.22	7.78	7.63	0.15	17.20	22.03	4.83
Optimum	1.33	1.68	0.35	10.56	9.89	0.67	2.60	2.35	0.25	2.89	3.59	0.70

As expected, the percentage of predicted Optimum, High, and Moderate zone areas for resident species were mostly higher for the Baseline condition than for the minimum flow condition. However, predicted changes in zonal areas were small: all were <7% and most were <3%. In addition, differences in Optimum and High zones between the baseline and minimum flows condition were all <5%, with most <1%. Collectively, these results indicate effects of flow reductions associated with the proposed minimum flows on representative fish habitats in the Lower Peace/Shell System are not significant. In addition, these results can be considered conservative for the resources, as the implementation of minimum flows that include the proposed maximum withdrawal limit for the Lower Peace River would be associated with smaller reductions in flows to the Lower Peace/Shell System and Charlotte Harbor.

Based on these fish habitat assessment results, the proposed minimum flows are not expected to adversely affect the local abundances of fish and Blue Crab in the Lower Peace/Shell System. Appendix E provides additional information on the HSM modeling.

6.6.2. Water Quality Results

Predictive modeling conducted by Janicki Environmental Inc. (2019) concluded that there was no evidence that flow reductions associated with the proposed minimum flows would have significant negative effects on water quality in the Lower Peace/Shell System. As was the case for the fish and crab habitat assessment, the water quality assessments may be considered conservative as the minimum flows condition used in the analyses did not include the maximum withdrawal cap or limit that is included in the proposed minimum flows for the Lower Peace River portion of the Lower Peace/Shell System.

Nutrient concentrations (total nitrogen and orthophosphate) and color were positively related to flows irrespective of season. These results suggest that flow reductions would not increase the risk to ecological components that may be susceptible to high nutrient concentrations and color.

Correlations between dissolved oxygen (DO) saturation and flows were generally weak in the dry season. However, a relatively strong negative correlation was observed in the wet season as increased flows were associated with decreased DO percent-saturation at all sampling stations. This result suggests flow reductions associated with the proposed minimum flows would not be expected to adversely affect dissolved oxygen levels in the Lower Peace/Shell System.

An example of predictions for exceedance of water quality criterion for DO saturation at a bottom-sampling station at river kilometer 6.6 is provided in Figure 6-1. Janicki Environmental Inc. (2019), included as Appendix F to this document, includes comparable results for other sites and other water quality constituents.

Chlorophyll concentration response to flows varies across the Lower Peace/Shell System as a function of seasonally-variable flows. A nonparametric statistical model developed for estimating chlorophyll based on site location and natural-log transformed flows indicated that highest chlorophyll concentrations in downstream areas are associated with high flows and highest concentrations in the upstream area of the system are associated with low flows. These findings can likely be associated with differences in residence times, tidal mixing and light penetration in different portions of the system.

The statistical models developed as part of this analysis indicate that chlorophyll levels reductions associated with flow reductions are likely to reduce chlorophyll concentrations in one portion of the system and increase chlorophyll levels in another section, resulting in a net-zero change for the system. Figure 6-2 clearly illustrates this result, with cumulative distribution function (CDF) curves for the baseline and minimum flow scenarios that are nearly indistinguishable.

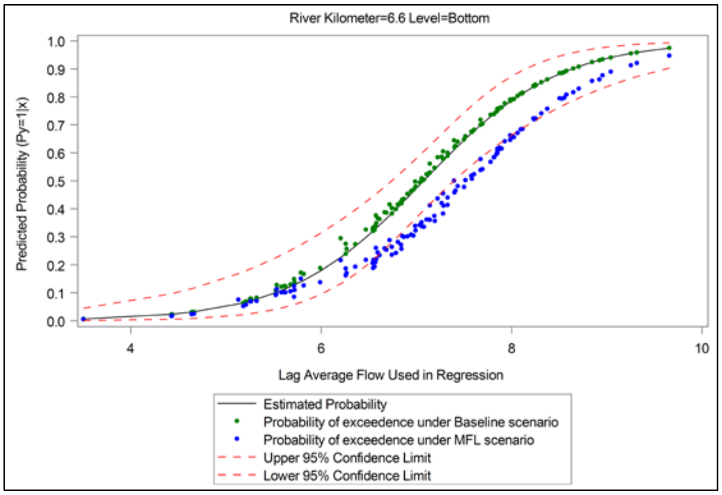

Figure 6-1. Wet season logistic regression predictions for bottom dissolved oxygen (% saturation) exceedances under baseline and minimum flow scenarios at the Rkm 6.6 location (see Figure 3-1) in the Lower Peace/Shell System.

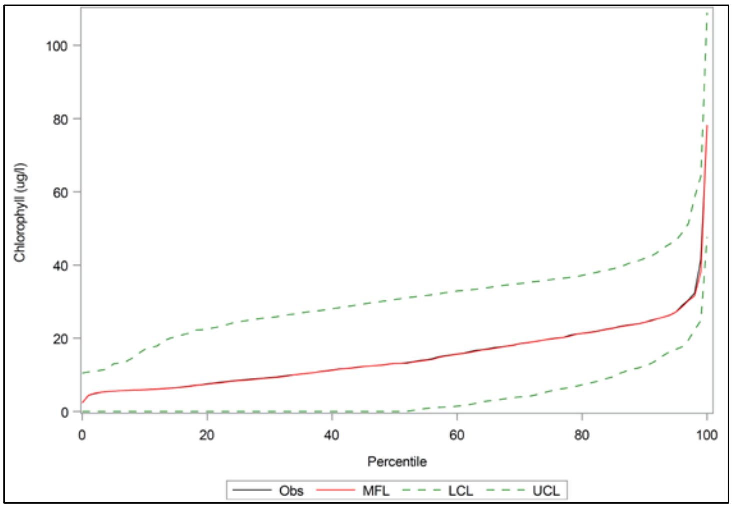

Figure 6-2. Cumulative distribution frequency curves for chlorophyll concentrations for baseline (Obs) and minimum flows (MFL) scenarios. The green dashed lines are upper and lower 95% confidence limits.

Overall, Janicki Environmental Inc. (2019) concluded that there is no evidence that the proposed minimum flows for the Lower Peace River and Lower Shell Creek would have a significant effect on water quality, to the extent it would pose any additional risk to the ecological components in the system.

6.7. Consideration of Environmenal Values

Rule 62-40.473, F.A.C., within the Water Resource Implementation Rule, requires that when establishing minimum flows and levels *"consideration shall be given to natural seasonal fluctuations in water flows or levels, nonconsumptive uses, and environmental values associated with coastal, estuarine, riverine, spring, aquatic and wetlands ecology, including: (a) Recreation in and on the water; (b) Fish and wildlife habitats and the passage of fish; (c) Estuarine resources; (d) Transfer of detrital material; (e) Maintenance of freshwater storage and supply; (f) Aesthetic and scenic attributes; (g) Filtration and absorption of nutrients and other pollutants; (h) Sediment loads; (i) Water quality; and (j) Navigation.*"

Primary factors considered for development of the proposed minimum flows for Lower Peace River and Lower Shell Creek included potential, flow-related changes in salinity-based habitats, floodplain wetland inundation, fish and Blue Crab habitats and water quality. Based on assessments associated with these factors, the proposed minimum flows are protective of all relevant environmental values identified for consideration in the Water Resource Implementation in Rule as well as those included in the Water Resources Act of 1972 that pertain to the establishment of minimum flows and minimum water levels.

6.7.1 Recreation in and On the Water

Recreation in and on the water was considered through characterization of water depths, and assessment of potential changes in water levels, salinities, floodplain inundation, fish and invertebrate habitats, and water quality.

Bathymetric information used for consideration of water depths in the Lower Peace/Shell System and upper portion of Charlotte Harbor is summarized in Section 2.4. Water levels in the system are strongly influenced by tides (see Section 2.6) and were modeled as described in Sections 5.4.3, 5.4.4, 5.5.1, 5.5.2, 5.5.3, 6.3, 6.4 and 6.6.1. These analyses predicted average water level reductions of less than 0.1 ft in the Lower Peace River for maximum flow reductions associated with the proposed minimum flows. These minor changes in water levels are not expected to adversely impact recreation in and on the water within the Lower Peace/Shell System (Section 6.4, Tables 6-5 and 6-6).

Some recreational activities, including fishing, wildlife and natural system observation and study, and swimming can be associated with water salinities. These recreational activities were, therefore, considered through use of a hydrodynamic model to evaluate potential changes in salinities ranging from 2 to 20 psu. Results from the modeling efforts were used to develop minimum flow recommendations that are expected to support maintenance of natural salinity distributions throughout the Lower Peace/Shell System.

Assessments of potential changes in floodplain inundation patterns (Sections 5.4.4, 5.5.2 and 6.4) indicated that flow reductions of up to 40% reduction could occur without exceeding a 10% decrease in the total inundated floodplain wetland area associated with the baseline flow condition in the Lower Peace River. The criterion is less sensitive than the salinity habitat used for development of the proposed minimum flows for the Lower Peace River and Lower Shell Creek and is considered protective of the wetland resource.

Assessments of potential effect of flow reductions that could occur with implementation of the proposed minimum flows also indicated that habitats for several important fish species and Blue Crab (Sections 5.4.5, 5.5.3 and 6.6.1) and water quality constituents other than salinity (Sections 5.4.6, 5.5.4, 6.6.2) are not expected to be adversely impacted by implementation of the proposed minimum flows.

6.7.2 Fish and Wildlife Habitats and the Passage of Fish

Information concerning fish and invertebrate nekton and plankton, and benthic macroinvertebrates was summarized in Chapter 4 to support consideration the environmental value, fish and wildlife habitats and the passage of fish. These biological assemblages include taxa that populate the Lower Peace/Shell System based in part on their tolerance of narrow and/or broad ranges of salinities.

Modeling of spatial and temporal distributions of habitats based on water volume, shoreline length and bottom area associated with salinities ranging from 2 to 20 psu with a hydrodynamic model (Sections 5.4.3, 5.5.1 and 6.3) provided a means for evaluating potential flow-related changes in habitats for fish and other taxa. Results from these analyses were used to identify block-specific percent-of-flow reductions that are protective of these salinity-habitats and were used to develop proposed minimum flows for the Lower Peace River and Lower Shell Creek.

In addition, Habitat Suitability Modeling and associated mapping were conducted to evaluate effects of maximum flow reductions that could be associated with the proposed minimum flows on seven fish species and Blue Crab (Sections 5.4.5, 5.5.3, and 6.6.1). Results from the analyses indicated the proposed minimum flows are not expected to cause any substantial changes to the local abundance of the assessed taxa in the Lower Peace/Shell System.

In low-gradient systems, fish passage is primarily a function of water depth. As discussed for the environmental value Recreation in and on the Water (Section 6.7.1), water levels in the Lower Peace/Shell System are primarily influenced by tides and are predicted to be only minimally affected by the maximum flow reductions associated with the proposed minimum flows. Implementation of the proposed minimum flows is, therefore, not expected to adversely affect fish passage within the Lower Peace River or Lower Shell Creek.

6.7.3 Estuarine Resources

Estuarine resources were considered for development of proposed minimum flows for the Lower Peace River and Lower Shell Creek through data collection, characterization and analysis of physical, hydrological, chemical, and ecological aspects of the system.

Physical and hydrological characterizations of the system were included in Chapter 2. Information concerning water quality characteristics of the Lower Peace/Shell System, other than salinity, and relationships between selected water quality constituents and flow was summarized in Chapter 3 and Sections 5.4.6, 5.5.4, and 6.6.2.

Summaries of ecological resources of concern, including vegetation assemblages, fish and invertebrate nekton and plankton, and benthic macroinvertebrates and responses of these assemblages to changes in flows to the Lower Peace/Shell System were provided in Chapter 4 and Sections 5.4, 5.5, 6.4, 6.6.1 and 6.6.2.

Assessment of potential, flow-related changes in the spatial and temporal distributions of salinity-based habitats, including water volumes, shoreline lengths and bottom areas associated with salinities ranging from 2 to 20 psu with a hydrodynamic model was a primary means for considering estuarine resources in the Lower Peace/Shell System. Sections 5.5.1 and 6.3 (and Section 6.7 that follows this discussion of environmental values considerations) summarize findings from these analyses, which were ultimately used to support development of the minimum flows recommended for the Lower Peace River and Lower Shell Creek.

In addition, Habitat Suitability Modeling and associated mapping was used for evaluating effects of maximum flow reductions that could be associated with the proposed minimum flows for seven estuarine fish species and Blue Crab (Sections 5.5.3 and 6.6.1).

6.7.4 Transfer of Detrital Material

Detrital material in rivers and estuaries includes dead, particulate organic material that may originate from upland, floodplain and in-channel areas. Detrital transfer occurs laterally and longitudinally in flowing water bodies as a function of water levels, flows, velocities and residence times. Transport processes may be especially strong during periods of high water levels and flows when hydrologic interactions between the floodplain and the channel are strongest and large quantities of suspended materials may be moved through the system.

The transfer of detrital material was considered for development of proposed minimum flows for the Lower Peace River and Lower Shell Creek through use of a percent-of-flow approach intended to maintain characteristics of the baseline flow regime and associated salinity-based habitats (Sections 5.4.2, 5.5.1, and 6.3) and patterns of floodplain inundation (Section 5.4.4, 5.5.2 and 6.4) expected in the absence of withdrawal impacts. Maintenance of salinity-based and floodplain habitats is expected to support their structural and functional contributions to detrital transfer processes, including roles as sources or sinks for detritus generation, export and use.

Transfer of detrital material in rivers and estuaries is also dependent on water velocities and residence time. Like water surface elevation, water velocities are not expected to vary much in the Lower Peace/Shell System, based on strong tidal effects.

6.7.5 Maintenance of Freshwater Storage and Supply

Maintenance of freshwater storage and supply is protected through implementation of the District's Water Use Permitting Program based on the inclusion of conditions in water use permits which stipulate that permitted withdrawals will not lead to violation of any adopted minimum flows or levels, as well as the cumulative impact analysis that occurs for new permits or increased allocations for existing permits.

This environmental value was also considered for development of the proposed minimum flows for the Lower Peace River and Lower Shell Creek through use of the PRIM for predictions of withdrawal impacts on groundwater levels and stream flows that were used to develop baseline flow information for the minimum flow analyses. Information on surface water withdrawals from the Peace River by the PRWMRWSA and from Shell Creek by the City of Punta Gorda were similarly used for baseline flow development.

The value was also considered through development of proposed minimum flows that include block-specific, allowable percent-of-flow reductions that can be easily used to develop permit conditions for existing and future surface-water withdrawals.

Inclusion of a low flow threshold and maximum withdrawal cap in the proposed minimum flows for the Lower Peace River portion of the system can also be associated with consideration of the maintenance of freshwater storage and supply.

6.7.6 Aesthetic and Scenic Attributes

Aesthetic and scenic attributes of the Lower Peace/Shell System are inextricably linked to other values such as recreation in and on the water, fish and wildlife and the passage of fish, estuarine resources, transfer of detrital material, filtration and absorption of nutrients and other pollutants, sediment loads, water quality and navigation.

As discussed in previous and subsequent sub-sections of this chapter, all of these environmental values have been considered and, in some cases associate with specific criteria used in habitat-based methods to develop minimum flow recommendations for the Lower Peace River and Lower Shell Creek. As a consequence, the recommended minimum flows ensure that the aesthetic and scenic attributes of the system are protected.

6.7.7 Filtration and Absorption of Nutrients and Other Pollutants

Filtration and absorption of nutrients and other pollutants were considered by assessing system bathymetry, vegetation characterizations, floodplain inundation, water quality characterization, and salinity-based water column, river bottom and shoreline habitats.

Many of these factors are shared with considerations associated with and discussed in previous and subsequent sub-sections of this chapter, including those associated with recreation in and on the water (6.7.1), fish and wildlife and the passage of fish (6.7.2), estuarine resources (6.7.3), transfer of detrital material (6.7.4), sediment loads (6.7.8) and water quality (6.7.9).

6.7.8 Sediment Loads

As with the transfer of detrital material, sediment loads are not expected to be reduced in the Lower Peace/Shell System in response to potential flow reductions associated with implementation of the proposed minimum flows. Sediment loads typically increase during flood events, when floodplains are inundated, and large flows transport large quantities of sediment during these infrequent events.

Sediment loads in rivers and estuaries are also dependent on water velocities and residence time. Like water surface elevation, water velocities are not expected to vary much in the system, based on strong tidal effects on velocities relative to the effects associated with inflows.

Sediment loads were considered for development of proposed minimum flows for the Lower Peace River and Lower Shell Creek through use of a percent-of-flow approach intended to maintain characteristics of the baseline flow regime and associated salinity-based habitats (Sections 5.4.2, 5.5.1, and 6.3) and patterns of floodplain inundation

(Section 5.4.4, 5.5.2 and 6.4) expected in the absence of withdrawal impacts. Maintenance of salinity-based and floodplain habitats is expected to support their structural and functional contributions to detrital transfer processes, including roles as sources or sinks for detritus generation, export and use. Any changes in sediment loads associated with implementation of the reevaluated minimum flow are expected to be negligible.

6.7.9 Water Quality

Consideration of water quality was discussed in Chapter 3 and Sections 5.4.3, 5.4.6, 5.5.1, 5.5.4, 6.3 and 6.6.2. As noted in Section 6.6.2, water quality constituents in the Lower Peace/Shell System is not expected to substantially change in response to flow reductions associated with implementation of the proposed minimum flows. The proposed minimum flows for the Lower Peace River and Lower Shell Creek recommended in this report are, therefore, not expected to negatively affect water quality or impair the water designated use of either water body.

If water quality parameters are protected, many other environmental values that can be associated with water quality are also afforded protection. As discussed in previous sub-sections of the report, this protection can be extended to recreation in and on the water (Section 6.7.1), fish and wildlife habitat and the passage of fish (Section 6.7.2), estuarine resources (Section 6.7.3), transfer of detrital material (Section 6.7.4), maintenance of freshwater storage and supply (Section 6.7.5), aesthetic and scenic attributes (Section 6.7.6), and filtration and absorption of nutrients and other pollutants (Section 6.7.7).

6.7.10 Navigation

Commercial and recreational boating in the Lower Peace/Shell System is extensive. Swett et al. (2012) identify five marinas in the Lower Peace River downstream from the I-75 bridge and 8 existing or planned public boat ramps in the lower Peace River and Lower Shell Creek.

As described in Section 6.7.1 for the environmental value recreation in and on the water, navigation was considered by mapping water depth and physical characteristics of the system (Section 2.4), considering tidal fluctuations (Section 2.6), and modeling and assessment of potential changes in water levels (Sections 5.4.3, 5.4.4, 5.4.5, 5.5.1, 5.5.2, 5.5.3, 6.3, 6.4 and 6.6.1).

Consideration of this information showed that water level reductions of <0.1 ft were predicted for potential flow reductions that could occur in association with implementation of the proposed minimum flows. Based on these potential changes and because water depth necessary for navigation in the Lower Peace/Shell System is strongly affected by tidal, seasonal, and long-term sea level trends and variation, navigation is not expected to be affected by the allowable reductions in flow associated with the proposed minimum flows.

6.8. Potential Impacts of Sea Level Rise

Commented [DL35]: Section will be updated when ongoing SLR re-analyses are completed.

Sea level rise (SLR) may alter available habitat for species with narrow salinity tolerances by decreasing bottom friction and shifting isohaline wedges further upriver (Obeysekera et al. 2011; Chen 2020). Historical trends based on monthly measurements at Cedar Key (NOAA 2016a) and St. Petersburg (NOAA 2016b) reveal an average increase of 2.32 mm per year, which is equivalent to a change of 0.76 feet in 100 years (Leeper et al. 2018). Near the Lower Peace/Shell System, at the NOAA Fort Myers station, sea level has increased at a rate of 3.11 mm per year (equivalent to 1.02 feet for a 100-year period) between 1965 and 2018 (NOAA 2020).

The upstream movement of isohalines associated with rising sea level will affect salinity-based habitats under both baseline and withdrawal-impacted flows by shifting isohalines upstream. For minimum flow status assessments, the District (SWFWMD 2015) uses projections of sea level change recommended by the United States Army Corps of Engineers (USACE) guidance for the design projects along the Florida Gulf coast. The USACE (2019) recommends three levels of SLR scenarios. A low scenario based on continuing historical linear increases, an intermediate scenario (NRC Curve I) and a high scenario (NRC curve III). Based on information available from the low, intermediate, and high estimates of SLR at the NOAA Ft. Myers station for the period from 2010 to 2035 are 0.20, 0.33, and 0.76 feet, respectively.

For an initial analysis of the impact of sea level change on the Lower Peace River/Shell System, effect of these three SLR scenarios were compared with the baseline condition used to develop the minimum flows proposed for the system. For the comparisons, 0.20, 0.33, and 0.76-foot water level increases associated with the low, intermediate and high SLR scenarios were added to the water boundary conditions of the UnLESS model with the assumption that the added water would have the same salinity and temperature values as the top-layer of the model (Chen 2020). The SLR scenario simulations were conducted under baseline flow conditions, i.e., with high sea levels but no-withdrawal impacts, for the period 2007 through 2014. Results from the SLR scenarios were compared with the previously completed baseline conditions scenario associated with current (i.e., recent) sea level conditions.

Greater relative changes from the baseline, current condition were predicted for habitats associated with <2 psu than for the habitats associated with salinities of <5, <10 and <15 psu. Table 6-10 shows the changes in habitats associated within <2 psu for the low, intermediate and high SLR scenarios, relative to the current sea level scenario.

Habitats associate with the low flow Block 1 were the most strongly affected by changing sea level, with the largest decrease predicted for water column volume and shoreline length habitats. A decrease of 13% was predicted for these two sensitive salinity habitats for the low SLR scenario during Block 1, with habitat decreases of 49-50% predicted for the high SLR scenario. Bottom area associated with <2 psu water during Block 1 was also predicted to decrease with increased SLR, with decreases ranging from 3 to 19% relative to the no-SLR condition.

Under medium (Block 2) and high (Block 3) flow conditions, increased SLR was predicted to be associated 2 to16% increases in bottom habitat associated with water with salinities <2 psu.

Table 6-10. Percent change in less than 2 psu baseline habitat simulated for the three sea level rise (SLR) scenarios relative to a current sea level scenario by low (Block 1), intermediate (B2) and high (Block 3) flow blocks for the Lower Peace/Shell System for the period from 2007 through 2014, using the UnLess hydrodynamic model.

Scenarios	Percent (%) Change in < 2 psu Salinity Habitat								
	Volume			Bottom Area			Shoreline		
	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3
Low SLR	-13	-3	0	-3	+2	+3	-13	-4	0
Intermediate SLR	-21	-6	0	-6	+4	+6	-22	-8	-1
High SLR	-49	-18	+1	-19	+6	+16	-50	-21	-2

Commented [DL36]: Updated table (added "(%)" here and deleted % from listed values).

Simulations based on flow reductions associated with baseline conditions for low, intermediate and high SLR scenarios were also conducted for the period from 2007 through 2014 to evaluate if the percent-of-flow reductions associated with the < 2 psu salinity habitats that were used for development of the proposed minimum flows would be exceeded in the future, based on the SLR projections.

Table 6-11 provides habitat changes associated with the currently proposed minimum flows for the Lower Peace River and Lower Shell Creek relative to corresponding baseline conditions under low, intermediate and high sea level rise projections for habitats associated with salinities of <2 psu**.** Water volume habitats associated with a salinity of <2 psu exhibited the most sensitive response to the combined effect of sea level rise and flow reductions associated with the currently proposed minimum flows.

Reducing the baseline conditions projected for each SLR scenario by the 13%, 23% and 40% allowable percent-of-flow reductions associated with the current minimum flows proposed, respectively, for Blocks 1, 2 and 3, is predicted to result in 26% to 30%, 20% to 29%, and 13% to 16% decreases in water volume habitat with a salinity of <2 psu. With the exception of the predicted decreases in the <2 psu water volume for the low and intermediate SLR conditions during Block 3, habitat decreases in excess of an allowable 15% change may be expected for future SLR conditions.

Results from these analyses suggest that SLR will have a significant effect on amplifying the effects of flow reductions on salinity-based habitats during Blocks 1 and 2. The effect of SLR during Block 3 is, however, within the 15% reduction habitat limit except for water volume <2 psu salinity under high SLR scenario that was decreased by 16%. Collectively, these findings indicate that minimum flows established for the Lower Peace River and Lower Shell Creek should be reevaluated within 10 to 15 years after they are adopted into rule, to establish new baseline flow conditions that may occur as a result of SLR.

Table 6-11. Percent change in less than 2 psu baseline habitat simulated for three sea level rise (SLR) scenarios relative to a current sea level scenario by low (Block 1), intermediate (B2) and high (Block 3) flow blocks for the Lower Peace/Shell System for the period from 2007 through 2014, using the UnLess hydrodynamic model.

Scenarios	Percent (%) Change in < 2 psu Salinity Habitat								
	Volume			Bottom Area			Shoreline		
	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3
Low SLR	-26	-20	-13	-20	-16	-12	-23	-16	-6
Intermediate SLR	-30	-22	-14	22	-17	-13	-27	-18	-6
High SLR	-30	-29	-16	-25	-22	-13	-29	-25	-9

Commented [DL37]: Updated table (added "(%)" here and deleted % from listed values).

CHAPTER 7 - MINIMUM FLOW STATUS ASESSMENT AND IMPLEMENTATION

The current status of the flow regime of the Lower Peace River and Lower Shell Creek were assessed to determine whether flows in the river are currently and are projected over the next twenty years to remain above limits associated with the recommended minimum flows for the river. These assessments were completed because the Florida Water Resources Act of 1972 stipulates that if the existing flow or level in a water body is below, or projected to fall within 20 years below, an applicable minimum flow or level, the FDEP or the governing board as part of the regional water supply plan shall adopt or modify and implement a recovery strategy to either achieve recovery to the established minimum flow or level as soon as practical or prevent the existing flow or level from falling below the established minimum flow or level.

7.1. Minimum Flows Status Assessment for the Lower Peace River

The initial step in the minimum flow status assessment for the Lower Peace River required an understanding of historic and current flow conditions and evaluation of the extent to which withdrawals or other anthropogenic factors have affected flows in the river. As briefly noted in Section 5.5.2, anthropogenic impacts have not resulted in much change in Lower Peace River flows, based on flow reductions estimated for the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee gages. Estimated monthly flow reductions in the combined flows from these three gages due to withdrawal-related effects generally ranged from 0.2% in March to 0.9% in October for a 13-year assessment period.

Minimum Flows Rule 40D-8.041(8c), F.A.C., sets forth minimum five-year and ten-year moving mean and median flow statistics as a tool for assessing whether flows in the Lower Peace River remain above flow rates that are expected to occur with implementation of the currently adopted minimum flows. To assess the status of the proposed minimum flows in the Lower Peace River, five-year and ten-year moving mean and median flow statistics were computed for a zero-withdrawals (baseline) scenario using the daily baseline flows for the period 1950 through 2018. The analysis was repeated for two other scenarios; one associated with existing withdrawals (i.e., the baseline flows minus withdrawals from the river by the PRMRWSA) and the other with minimum flows-based withdrawals (i.e., baseline flow minus withdrawals allowed by the minimum flows recommended for the Lower Peace River).

Computed five-year and ten-year moving mean and median flow values for the three scenarios are provided in Table 7-1. The five-year and ten-year moving mean and median flow statistics calculated for the existing withdrawals scenario are higher than the corresponding flow statistics calculated for minimum flows-based withdrawal scenario, which indicates that the recommended minimum flows for the Lower Peace River are being met.

Table 7-1. Five-year and ten-year moving mean and median flow statistics for zero-withdrawals (baseline), existing withdrawals and minimum flows-based withdrawals scenarios for the Lower Peace River for the period from 1950 through 2018.

Period	Statistics	Zero-Withdrawals Scenario (cfs)	Existing Withdrawals Scenario[a] (cfs)	Minimum Flows-Based Withdrawals Scenario[b] (cfs)
Annual	5-Yr Mean	1180.4	1163.9	1014.9
	10-Yr Mean	1182.3	1166.7	1017.5
	5-Yr Median	522.9	506.2	403.0
	10-Yr Median	523.5	507.7	403.4
Block 1	5-Yr Mean	294.8	287.2	270.4
	10-Yr Mean	302.8	295.3	278.3
	5-Yr Median	248.1	241.0	226.6
	10-Yr Median	256.1	249.1	234.6
Block 2	5-Yr Mean	491.2	471.2	398.6
	10-Yr Mean	495.9	476.7	401.9
	5-Yr Median	449.3	428.5	359.1
	10-Yr Median	452.1	432.2	361.9
Block 3	5-Yr Mean	2140.9	2115.9	1817.9
	10-Yr Mean	2134.2	2110.7	1813.7
	5-Yr Median	1531.9	1507.1	1168.3
	10-Yr Median	1518.5	1494.9	1158.2

[a] Baseline flows minus withdrawals by the PRMRWSA at the Peace River Facility.
[b] Baseline flows minus the maximum allowable percent-of-flow reductions associated with the proposed minimum flows for the Lower Peace River, with inclusion of the proposed 400 cfs maximum daily withdrawal rate

Hydrographs of median daily flows in the Lower Peace River for the zero withdrawals, existing withdrawals and minimum flows-based withdrawal scenarios (Figure 7-1) clearly indicate the existing-withdrawals condition flows are above flows that would be required to meet the proposed minimum flows. These findings indicate that development and concurrent adoption and expeditious implementation of a recovery strategy would not be necessary for adoption of the proposed minimum flows for the Lower Peace River.

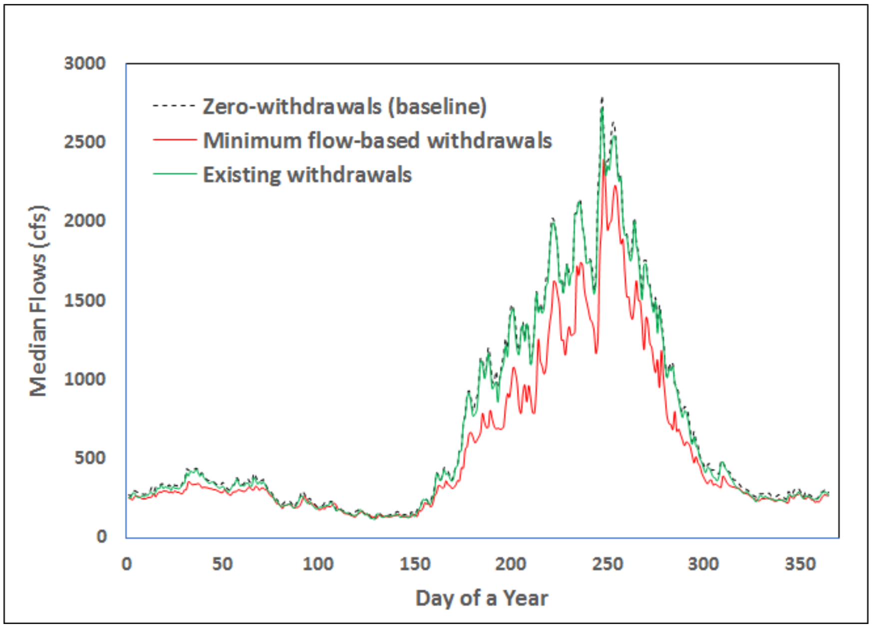

Figure 7-1. Median daily Lower Peace River flows for the zero-withdrawals (i.e., baseline; dashed black line), minimum flow-based withdrawals (solid red line) and existing withdrawals (solid green line) scenarios.

As discussed in Section 2.9, the water use permit issued to the PRMRWSA for withdrawals from the Peace River includes withdrawal limit conditions based on the currently adopted minimum flows for the Lower Peace River. These permit conditions are expected to be modified based on changes to the District's minimum flow rules that would be necessary upon adoption of the proposed minimum flows for the Lower Peace River described in this report.

Given this expectation for the currently permitted withdrawals from the Peace River and the expectation that any withdrawals that may affect flows in the river will similarly be conditioned to ensure compliance with adopted minimum flows that could be affected by the proposed withdrawals, the proposed minimum flows for the Lower Peace River are also expected to be met over the next 20 years and beyond. Development of a specific prevention strategy is, therefore, not necessary at this time.

Because water withdrawals, climatic variation, structural alterations and other changes in the watersheds and contributing groundwater basin can influence river flow regimes, minimum flow status assessments for the Lower Peace River are and will continue to be completed by the District on an annual basis, on a five-year basis as part of the regional water supply planning process, and on an as-needed basis in association with permitting and project-related activities. In addition, consideration of these factors that affect river flows as well as additional information relevant to the minimum flows that may become available, the District is committed to the periodic reevaluation and as necessary revision of the minimum flows established for the Lower Peace River.

In support of this commitment, the District, in cooperation with the USGS, will continue to monitor and assess the status of flows in the Lower Peace River as well as other portions of the watershed, and continue to work with others on refinement of tools such as the PRIM that were used for development and assessment of the proposed minimum flows.

7.2. Minimum Flow Status Assessment for Lower Shell Creek

The observed discharge from Shell Creek Reservoir across the Hendrickson Dam to Lower Shell Creek has been increased or augmented by excess irrigation flow associated with groundwater pumped for agricultural purposes and decreased by City of Punta Gorda withdrawals from the reservoir (see Section 5.3.3).

To account for these factors and support assessment of the status of the proposed minimum flows for Lower Shell Creek, a spreadsheet-based mass balance model was developed for the reservoir based on daily historical flows in Shell Creek for a 47-year period, from 1972 through 2018. For model development and use we assumed that historical flows provided a reasonable basis for estimating future flows. Several factors were accounted for in the model, including configuration of the in-stream, Shell Creek Reservoir, the configuration of Hendrickson Dam, withdrawal records, and withdrawal restrictions associated with the proposed minimum flows for Lower Shell Creek. Shell Creek Reservoir has a usable volume of approximately 320 million gallons (Personal

Communication with City of Punta Gorda). Hendrickson Dam is a rectangular, sharp-crested weir with free overflow. Water flowing into the reservoir from the Shell Creek and Prairie Creek is retained up to the crest elevation of the dam, which is approximately 5 ft. Excess flow spills over the dam into the Lower Shell Creek, which merges with the lower Peace River to flow into Charlotte Harbor.

Under the existing structural condition (i.e., with downstream flow only occurring when water levels exceed the dam crest elevation), modeling results indicated the proposed minimum flows for Lower Shell Creek would not have been met approximately 20% of days in the 47-year simulation period. Similar results were predicted for both the current water-use demand of 5.4 mgd and the demands projected over the next 20 years. Days the minimum flows would not have been met occurred most often during low flow periods, i.e., in Block 1, during the dry season (Figure 7-2). Suppression of flows to Lower Shell Creek by the dam and increased occurrence of low reservoir water levels resulting from withdrawals contributed to the simulated, non-compliance with the proposed minimum flows.

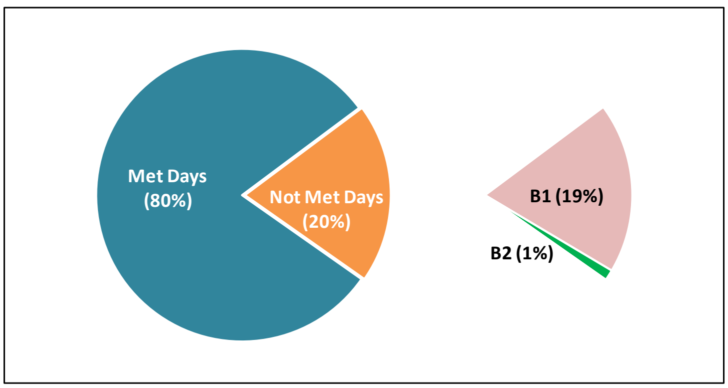

Figure 7-2. Percent of days proposed minimum flows for Lower Shell Creek would have been met and would not have been met for a 47-year evaluation period, from 1972 through 2018, based on the City of Punta Gorda's current withdrawal demand of 5.4 mgd and use of a mass-balance model; the pie slice on the right illustrates the days the proposed minimum flows would not have been met during low-flow periods (B1 = Block 1 and B2 = Block 2; see Table 6-8 for block-specific flow ranges).

Based on this assessment, it was concluded that flows in Lower Shell Creek are currently below the proposed minimum flows for the creek. Development and concurrent adoption and expeditious implementation of a recovery strategy would, therefore, be necessary for adoption of the proposed minimum flows for Lower Shell Creek.

Based on direction provided in Section 373.0421, F.S., the District has prepared a draft recovery strategy for the Lower Shell Creek minimum flows (Ghile et al., 2020), which includes several components expected to collectively recovery minimum flows required by the currently proposed minimum flows for the creek, while simultaneously providing sufficient water supplies for all existing and projected water demands of the City of Punta Gorda. The identified recovery project components include the ongoing Reverse Osmosis Project (RO Project) and the ongoing PRMRWSA Regional Integrated Loop System Phase 1 Interconnect Project (Phase 1 Interconnect Project), which are both anticipated to become operational in 2020, as well as an appropriate bypass facility for moving water past Hendrickson Dam that will be selected during a feasibility-study process and is anticipated to be operational in 2025 (Table 7-2.).

Table 7-2. Draft timeline for completion of the proposed Lower Shell Creek recovery strategy components.

Project	Completion Date
Reverse Osmosis (RO) Project	June 2020
Phase 1 Interconnect Project	May 2020
Proposed Hendrickson Dam Bypass Facility Project	August 2025
Regulatory actions, including: • Inclusion of minimum flow and recovery strategy conditions in the water use permit issued to the City of Punta Gorda that authorizes withdrawals from the Shell Creek Reservoir • Amendment of the District's regional water supply plan to include all projects identified in the recovery strategy • Adoption of recovery strategy rules, as necessary • Approval of any necessary Statements of Estimated Regulatory Costs (SERCs)	July 2021 (with subsequent revisions based on strategy component timelines and completions)

Because of the need for minimum flow recovery, and because water withdrawals, climatic variation, structural alterations and other changes in the watersheds and contributing groundwater basin can influence river flow regimes, minimum flow status assessments for Lower Shell Creek will be completed by the District on an annual basis, on a five-year basis as part of the regional water supply planning process, and on an as-needed basis in association with permitting and project-related activities. In addition, consideration of these factors that affect flows in the creek, as well as additional information relevant to the minimum flows that may become available, the District is committed to the periodic reevaluation and as necessary revision of the minimum flows established for Lower Shell Creek.

In support of this commitment, the District, in cooperation with the USGS, will continue to monitor and assess the status of flows in Lower Shell Creek as well as other portions of the watershed, and continue to work with others on refinement of tools that were used for development and assessment of the proposed minimum flows.

7.3. Minimum Flows Implementation

District water use permits include, among other conditions, requirements that permitted water use will not lead to violation of adopted minimum flows and levels. Ongoing, periodic status assessments, like those described in the preceding section of this report will be an important component of the implementation of minimum flows that are to be adopted for the Lower Peace River and Lower Shell Creek.

7.3.1 Implementation for Lower Peace River

Combined flows from Horse Creek near Arcadia, Joshua Creek at Nocatee and the Peace River at Arcadia gages will be used to potentially limit permitted surface water withdrawals from the Lower Peace River. Several examples are provided below to illustrate how these gaged flows and the recommended minimum flows for Lower Peace River (see Table 6-7) should be implemented.

If combined flow from Horse Creek, Joshua Creek and the Peace River at Arcadia gages is less than 130 cfs, no water should be withdrawn from any point in the Lower Peace River. During Block 1, the allowable withdrawal is up to 13% but it is not allowed to lower the combined flow below 130 cfs. If, for example, the combined, gaged flow on a given day in Block 1 is 135 cfs, only 5 cfs would be withdrawn to maintain the 130 cfs flow associated with the low flow threshold of 130 cfs.

Similar constraints could apply to withdrawals under Block 2 and 3 flow conditions. If, for example, the combined gaged flow on a given day in Block 2 is 300 cfs, a withdrawal of 69 cfs (23% of *300 cfs) would cause the combined flow to drop below 297 cfs. Therefore, only flow in excess of 297 cfs (3 cfs) plus 13% of 297 cfs should be withdrawn to comply with the proposed minimum flows for the Lower Peace River. Similarly, for a combined flow of 650 cfs on a given day in Block 3, flow in excess of 622 cfs (28 cfs) plus 23% of 622 cfs would be withdrawn to comply with the proposed minimum flows.

Finally, the total permitted maximum withdrawals from the Lower Peace River on any day shall not exceed 400 cfs.

7.3.2 Implementation for Lower Shell Creek

Like, the Lower Peace River minimum flows, the proposed minimum flows for Lower Shell Creek are flow-dependent (i.e., block-specific) minimum flows that specify allowable reductions in flows. For Lower Shell Creek, the allowable reductions are calculated based on previous-day inflows to Shell Creek Reservoir estimated using flows measured at the outfall of Hendrickson Dam (USGS 02298202), reservoir storage, and City of Punta Gorda withdrawals from the reservoir.

The previous-day inflow is indirectly calculated using a reservoir mass balance equation (Equation 7) because direct reservoir inflow measurement is not possible due to reservoir backwater effect. The mass balance equation is:

$$I_{i-1} = V_i - V_{i-1} + D_{i-1} + W_{i-1} \qquad \text{Equation 7.1}$$

where, I_{i-1} is the previous day's inflow to reservoir (cfs), V_i is today's reservoir storage (cfs), V_{i-1} is the previous day's reservoir storage (cfs), D_{i-1} is previous day's discharge to Lower Shell Creek (cfs) at Hendrickson Dam, and W_{i-1} is previous day's withdrawals from reservoir (cfs).

The District will incorporate conditions addressing the minimum flows and recovery strategy for the Lower Shell Creek into the water use permit issued to the City of Punta Gorda for withdrawals from Shell Creek Reservoir. These permit conditions may subsequently be modified based on completion and implementation of the various components of the proposed recovery strategy, especially a dam-bypass facility project.

The District may also adopt rule language associated with the recovery strategy for Lower Shell Creek into Chapter 40D-80, F.A.C. Finally, ongoing minimum flows and recovery strategy status assessments will be conducted on an as needed, annual and five-year basis. Detailed information on the planned recovery strategy for Lower Shell Creek is provided in Ghile et al. (2020).

CHAPTER 8 – LITERATURE CITED

Aerial Cartographic of America, Inc. 2015. Peace River corridor LiDAR topographic and hydrographic Survey. Prepared for Southwest Florida Water Management District, April 2015.

Ainsle, W.B., B.A. Pruitt, R.D. Smith, T.H. Roberts, E.J. Sparks, and M. Miller. 1999. A regional guidebook for assessing the functions of low gradient riverine wetlands in western Kentucky. U.S. Army Corp of Engineers Waterways Experiment Station. Technical Report WRP-DE-17.

Alber, M. 2002. A conceptual model of estuarine freshwater inflow management. Estuaries 25: 1246-1261.

Allan, J.D. 1995. Stream ecology: structure and function of running waters. Chapman and Hall, London. Pp. 388.

Anonymous. 1958. The Venice System for the classification of marine waters according to salinity. Limnology and Oceanography 3: 346-347.

Arthington, A.H., B. J. Pusey, S.O. Brizga, R.O. McCloskar, S.E. Burn and I.O. Growns. 1998. Comparative evaluation of environmental flow assessment techniques: R & D Requirements. Occasional Paper 24/98 Published by the Land and Water Resources Research and Development Corporation. Canberra, Australia.

Arthington, A.H. 2012. Environmental Flows: saving rivers for the third millennium. University of California Press. Berkeley, California.

Atkins, Inc. 2011. 2010 HBMP Annual Data Report. Final report prepared for the Peace River Manasota Regional Water Supply Authority.

Atkins, Inc. 2012. 2011 HBMP Annual Data Report. Final report prepared for the Peace River Manasota Regional Water Supply Authority.

Atkins, Inc. 2013a. 2012 HBMP Annual Data Report. Final report prepared for the Peace River Manasota Regional Water Supply Authority.

Atkins, Inc. 2013b. Draft 2011 HBMP Comprehensive summary report. Draft report prepared for the Peace River Manasota Regional Water Supply Authority.

Atkins, Inc. 2014a. 2013 HBMP Annual Data Report. Final report prepared for the Peace River Manasota Regional Water Supply Authority.

Atkins, Inc. 2014b. An analysis the relationships of freshwater inflow and nutrient loading with chlorophyll values and primary production rates in the Lower Peace River. July 2014, Report to the Southwest Florida Water Management District.

Banks, M.A., G.J. Holt, and J.M. Wakeman. 1991. Age-linked changes in salinity tolerance of larval Spotted Seatrout (*Cynoscion nebulosus*, Cuvier). Journal of Fish Biology 39: 505–514.

Barnes, T. K., A. K. Volety, K. Chartier, F. J. Mazzotti, and L. Pearlstine. 2007. A habitat suitability index model for the eastern oyster (*Crassostrea virginica*), a tool for restoration of the Caloosahatchee Estuary, Florida. Journal of Shellfish Research 26: 949–959.

Bate, G.C., A.K. Whitfield, J.B. Adams, P. Huizinga, and T.H. Wooldridge. 2002. The importance of the river-estuary interface (REI) zone in estuaries. Water SA 28:271–279.

Beck, M.W., M. Odaya, J. J. Bachant, J. Bergen, B. Keller, R. Martin, R. Mathews, C. Porter, and G. Ramseur. 2000. Identification of priority sites for conservation in the Northern Gulf of Mexico: an ecoregional plan. Report prepared for the USEPA Gulf of Mexico Program. The Nature Conservancy, Arlington, Virginia.

Blewett, D.A., and P.W. Stevens. 2013. The effects of environmental disturbance on the abundance of two recreationally-important fishes in a subtropical floodplain river." Florida Scientist 76: 191–97.

Blewett, D.A., P.W. Stevens, T.R. Champeau, and R.G. Taylor. 2009. Use of rivers by Common Snook *Centropomus undecimalis* in southwest Florida: A first step in addressing the overwintering paradigm. Florida Scientist 72:310–324.

Blewett, D.A., P.W. Stevens, and T. Carter. 2017. Ecological effects of river flooding on abundamce and body condition of a large, euryhaline fish. Marin Ecology Progress Series 563: 211-218.

Boswell, J., J. Ott, A. Birch, and D. Cobb. 2012. Charlotte Harbor National Estuary Program oyster habitat restoration plan. Charlotte Harbor National Estuary Program Technical Report.

Brinson, M.M., B.L. Swift, R.C. Plantico and J.S. Barclay. 1981. Riparian ecosystems: their ecology and status. U.S. Fish and Wildlife Service, Biological Services Program Report FWS/OBS-81/17. Washington, D.C.

Brizga, S.O., A.H. Arthington, S.C. Choy, M.J. Kennard, S.J. MacKay, B.J. Pusey and G.L. Werren. 2002. Benchmarking, a "top-down' methodology for assessing environmental flows in Australian waters. Environmental Flows for River Systems; An International Working Conference an Assessment and Implementation, Incorporating the 4th International Ecohydraulics Symposium, Conference Proceedings, Cape Town, South Africa.

Brown, M., R. Leary, N. Langenberg, M. McMurray, and H. Stafford. 2013. Results of the Florida Department of Environmental Protection Charlotte Harbor Aquatic Preserves' seagrass monitoring program from 1999-2009. Florida Scientist 76: 92-106.

Brown, M.T., J.M. Schaefer, and K.H. Brandt. 1990. Buffer zones for water, wetlands and wildlife in East Central Florida. CFW Publication #89-07. Florida Agricultural

Experiment Stations Journal Series No. T-00061. East Central Florida Regional Planning Council.

Bulger, A. J., B.P. Hayden, M.E. Monaco, D.M. Nelson and M.G. McCormick-Ray. 1993. Biologically-based estuarine salinity zones derived from a multivariate analysis.

Call, M.E., D. Sechler, S. Canter, and P. Stevens. 2013. Freshwater fish communities and habitat use in the Peace River, Florida. Florida Scientist 76. Charlotte Harbor NEP Special Issue of Florida Scientist "The State of Our Watersheds and Estuaries": 150–165.

Cartographic of America, Inc. 2015. Peace River Corridor LiDAR topographic and hydrographic survey. Prepared for Southwest Florida Water Management District, April 2015.

CDM. 1998. The study of seasonal and spatial patterns of hypoxia in Upper Charlotte Harbor. Report to the Southwest Florida Water Management District. Brooksville, Florida.

Chen, X., 2003. An efficient finite difference scheme for simulating hydrodynamics in narrow rivers and estuaries, *Int. J. Numer. Methods Fluids*, 42, 233–247.

Chen, X. 2004. A Cartesian method for fitting the bathymetry and tracking the dynamic position of the shoreline in a three-dimensional, hydrodynamic model. Journal of Computational Physics 200: 749-768.

Chen, X. 2008. Hydrodynamic Simulations of the Lower Peace River-Lower Myakka River - Upper Charlotte Harbor System in support of determining minimum flows for the Lower Peace River and Lower Myakka River in southwest Florida. Southwest Florida Water Management District. Brooksville, Florida.

Chen, X., 2011. A three-dimensional hydrodynamic model for shallow waters using unstructured Cartesian grids*. Int. J. Numer. Methods in Fluids* 66, 885–905. doi:10.1002/fld.2290.

Chen, X., 2012. Simulating hydrodynamics in a spring-fed estuary using a three-dimensional unstructured Cartesian grid model, *Estuarine, Coastal and Shelf Science* 115, 246 - 259, doi: 10.1016/j.ecss.2012.09.007.

Chen, X. 2020. Simulating hydrodynamics in Charlotte Harbor and its major tributaries. Prepared for recommended minimum flows for the Lower Peace River/Shell Creek. Southwest Florida Water Management District Draft report. Brooksville, Florida.

Clewell, A.F., M.S. Flannery, S.S. Janicki, R.D. Einsenwerth and R.T. Montgomery. 2002. An analysis of the vegetation-salinity relationships in seven tidal rivers on the coast of west-central Florida. Draft. Southwest Florida Water \Management District Technical Report.

Clewell, A.F., R.S. Beaman, C.L. Coultas and M.E. Lasley. 1999. Suwannee River tidal marsh vegetation and its response to external variables and endogenous community processes. Prepared by A.F. Clewell, Inc. Prepared for Suwannee River Water Management District.

Charlotte Harbor Environmental Center. 1999. Annual report on water quality status and trends in the Peace and Myakka River basins report to the Charlotte Harbor National Estuary Program.

Charlotte Harbor Environmental Center. 2000. Background information on watershed. management issues in the Peace and Myakka River Basins, Charlotte Harbor Environmental Center, Inc., Punta Gorda, Florida.

Charlotte Harbor Environmental Center. 2001. Annual report on water quality status and trends in the Peace and Myakka River basins, Charlotte Harbor National Estuary Program.

Charlotte Harbor Environmental Center. 2002. Peace and Myakka River water quality summary, Charlotte Harbor Environmental Center, Inc., Punta Gorda, Florida. Prepared for Charlotte Harbor NEP by CHEC.

Charlotte Harbor Environmental Center. 2003. Peace and Myakka River watershed issues. A look at what we know and what we need to now through data and literature review.

Coastal Environmental, Inc. 1996. Review and analyses of meteorological, tributary flow, and water quality data from the Charlotte Harbor estuarine system. Prepared for the Southwest Florida Water Management District.

Conner, W. H. T. W. Doyle, and K. W. Krauss (eds.). 2007. Ecology of tidal freshwater forested wetlands of the southeastern United States. Springer Verlag Publishing. City, State.

Conner, W.H. and J.W. Day. 1976. Productivity and composition of a bald cypress-water tupelo site and a bottomland hardwood site in a Louisiana swamp. American Journal of Botany 63: 1354-1364.

Corbett, C.A. 2007. Seagrass coverge changes in Charlotte Harbor, Florida. Florida Scientist 69: 7-23.

Crance, J.H. 1988. Relationships between palustrine forested wetlands of forested riparian floodplains and fishery resources: A review. Biological Report 88(32): U.S. Fish and Wildlife Service. Washington, D.C.

Culter, J.K. 2010. Evaluation of the spatial extent, density, and growth rates of barnacle in the Crystal, Homosassa and Withlacoochee Rivers, Florida. Prepared by Mote Marine Laboratory, Sarasota, Florida for the Southwest Florida Water Management District, Brooksville, Florida.

Duerr, A.D. and Enos, G.M. 1991. Hydrogeology of the intermediate aquifer system and Upper Floridan aquifer, Hardee and DeSoto Counties, Florida: U.S. Geological Survey Water-Resources Investigations Report 90-4104.

Dunbar, M.J., A, Gustard, M.C. Acreman, and C.R. Elliott. 1998. Overseas approaches to setting river flow objectives. Institute of Hydrology. R&D Technical Report W6-161. Oxon, England.

Fish and Wildlife Research Institute (FWRI). 2018. Fisheries-Independent Monitoring Program 2018 Annual Data Summary Report. Florida Fish and Wildlife Conservation Commission, Florida.

Flannery, M. and M. Barcelo. 1998. Spatial and temporal patterns of streamflow trends in the upper Charlotte Harbor watershed. In Proceedings of the Charlotte Harbor 9-4 Public Conference and Technical Symposium. Charlotte Harbor National Estuary Program. Technical Report. No. 98-02.

Flannery, M.S., E. P. Peebles, and R. T. Montgomery. 2002. A percent-of-flow approach for managing reductions to freshwater inflow from unimpounded rivers to southwest Florida estuaries. Estuaries 25:1318-1332.

Flemer, D.A. and M.A. Champ. 2006**.** What is the future fate of estuaries given nutrient over-enrichment, freshwater diversion and low flows? Marine Pollution Bulletin 52: 247-258.

Florida Department of Environmental Protection (FDEP). 2007. Final Report: Peace River cumulative impact study: Report prepared by PBS&J for the Florida Department of Environmental Protection and the Southwest Florida Water Management District, 383.

Florida Department of Environmental Protection (FDEP). 2013. Final report: Mercury TMDL for the State of Florida. Tallahassee, Florida. 104 p.

Florida Department of Environmental Protection (FDEP). 2019. Statewide annual report on Total Maximum Daily Loads, basin management action plans, Minimum Flows or Minimum Water Levels, and Recovery or Prevention Strategies. Tallahassee, Florida. 89 p.

Florida Marine Research Institute. 1998. Development of GIS-based maps to determine the status and trends of oligohaline vegetation in the tidal Peace and Myakka Rivers. Prepared for the SWIM Section of the Southwest Florida Water Management District. Tampa, Florida.

Fraser, T.H. 1997. Abundance, seasonality, community indices, trends and relationships with physiochemical factors of trawled fish in upper Charlotte Harbor, Florida. Bulletin of Marine Science 60: 739–763.

Geselbracht, L., Graves, A., and Brich, A. 2017. Trabue Harborwalk oyster habitat restoration project: overview and one-year monitoring results. The Nature Conservancy. pp 47.

Gates, M.T. 2009. Hydrologic conditions of the Upper Peace River in Polk County, Florida.

Ghile, Y.B. and D.A., Leeper. 2015. Initial reevaluation of the minimum flows and levels for the Lower Peace River, Internal Review Draft June 30, 2015. Southwest Florida Water Management District. Brooksville, Florida.

Ghile, Y.B., D.A., Leeper and L., Yang 2020. Proposed recovery strategy for the Lower Shell Creek, draft report, December 30, 2019. Southwest Florida Water Management District. Brooksville, Florida.

Gleeson, T. and Richter, B., 2017. How much groundwater can we pump and protect environmental flows through time? Presumptive standards for conjunctive management of aquifers and rivers. River Research and Applications, 34: 83-92.

Gore, J. A., C. Dahm, and C. Climas. 2002. A Review of “Upper Peace River: An analysis of minimum flows and levels”. Prepared for: Southwest Florida Water Management District. Brooksville, Florida.

Greenwalt-Boswell, J.M, J.A. Hale, K.S. Fuhr, and J.A. Ott. 2007. Seagrass species composition and distribution trends in relation to salinity fluctuations in Charlotte Harbor, Florida. Florida Scientist 69: 24-35.

Greenwood, M.F.D., R.E. Matheson, Jr., T.C. MacDonald, and R.H. McMichael, Jr. 2004. Assessment of relationships between freshwater inflow and populations of fish and selected macroinvertebrates in the Peace River and Shell Creek, Florida. Prepared for the Southwest Florida Water Management District.

Gregory, S.V., Swanson, F.J., McKee, W.A. and Cummins, K.W. 1991. An ecosystem perspective on riparian zones. Bioscience 41: 540-551.

Hammett, K. M. 1990. Land use, water use, streamflow characteristics, and water quality characteristics of the Charlotte Harbor inflow area, Florida: U.S. Geological Survey Water-Supply Paper Open-File Report 87-472.

Hancock, M.C., D.A. Leeper, M.D. Barcelo and M.H. Kelly. 2010. Minimum flows and levels development, compliance, and reporting in the Southwest Florida Water Management District. Brooksville, Florida.

Hansen, J.W., Hodges, A.W. and Jones, J.W. 1997. ENSO Influences on agriculture in the southeastern United States. Journal of Climate 11: 404-411.

Herrick, G., Chen, X., Anastasiou, C., Basso, R., Mendez-Ferrer, N., Ortega, N., Rogers, D. and Leeper A.D. 2019. Reevaluation of minimum flows for the Homosassa River System – Final Draft. Southwest Florida Water Management District, Brooksville Florida.

Hill, J. E. and C.E. Cichra. 2002. Minimum flows and levels criteria development. Evaluation of the importance of water depth and frequency of water levels / flows on fish population dynamics. Literature review and summary. The effects of water levels on fish populations. Institute of Food and Agricultural Sciences, Department of Fisheries and Aquatic Sciences. University of Florida.

Hook, D.D. and C.L. Brown. 1973. Root adaptations and relative flood tolerance of five hardwood species. Forest Science 19: 225-229.

Hoyer, M.V., T.K. Frazer, S.K. Notestein, and D.E Canfield. 2004. Vegetative characteristics of three low-lying Florida coastal rivers in relation to flow, light, salinity and nutrients. Hydrobiologia 528: 31-43.

HSW Engineering, Inc. 2016. MFL Technical Support – Lower Peace River update of baseline flow for Shell Creek. Prepared for Southwest Florida Water Management District, January 2016.

Huston, C., P. Stevens, R. Blaxton, S. Tolley, R. Scharer, B. Tornwall, and G. Poulakis. 2017. Diel movements of juvenile Smalltooth Sawfish: implications for defining the size of a nursery hotspot. Endangered Species Research 34: 311–322. doi:10.3354/esr00851.

HydroGeoLogic, Inc. 2009. The Peace River Integrated Modeling project (PRIM) - Phase III Saddle Creek integrated model. Prepared for Southwest Florida Water Management District, December 2008.

HydroGeoLogic, Inc. 2011. The Peace River Integrated Modeling project (PRIM) - Final report IV Basin-wide model. Prepared for Southwest Florida Water Management District, May 2011.

HydroGeoLogic, Inc. 2012. The Peace River Integrated Modeling project (PRIM) - Phase V Predictive model simulations. Prepared for Southwest Florida Water Management District, January 2012.

Idelberger, C.F. and M.F.D. Greenwood. 2005. Seasonal variation in fish assemblages within the estuarine portions of the Myakka and Peace Rivers, Southwest Florida. Gulf of Mexico Science 23: 224.

Instream Flow Council. 2002. Instream flows for riverine resource stewardship. Instream Flow Council, United States.

Janicki Environmental, Inc. 2006. Development of analytical tools for the establishment of minimum flows based upon macroinvertebrate communities of Southwest Florida tidal rivers. Prepared for: Southwest Florida Water Management District. Brooksville, Florida.

Janicki Environmental, Inc. 2019. Lower Peace River water quality study. Prepared in support of minimum flows reevaluation for Lower Peace River/Shell Creek. Southwest Florida Water Management District. Brooksville, Florida.

Jassby, A. D., W.J. Kimmerer, S.G. Monismith, C. Armor, J. E. Cloern, T. M. Powell, J.R. Schubel, and T. J. Vendlinski. 1995. Isohaline position as a habitat indicator for estuarine populations. Ecological Applications 51: 272-289.

Jowett, I.G. 1993. Minimum flow requirements for instream habitat in Wellington rivers. NZ Freshwater Miscellaneous Report No. 63. National Institute of Water and Atmospheric Research, Christchurch. 33 pp.

Junk, W. P., P.B. Bayley and R.E. Sparks. 1989. The flood pulse concept in river-floodplain systems. Pp. 110-127 in D.P. Dodge (ed.) Proceedings of the International Large River Symposium. Special Publication of the Canadian Journal of Fisheries and Aquatic Sciences 106.

Kalke, R.D., and P.A. Montagna. 1989. A review: The effects of freshwater inflow on the benthos of three Texas estuaries. Report to the Texas Water Development Board. Marine Science Institute, University of Texas at Austin. Port Aransas, Texas.

Kelly, B.J., Jr. and W.D. Burback. 1976. Responses of embryonic *Cyathura polita* (Stimpson) (Isopoda: Anthuridea) to varying salinity. Chesapeake Science 17:159-167.

Kelly, M. 2004. Florida river flow patterns and the Atlantic multidecadal oscillation. Southwest Florida Water Management District. Brooksville, Florida. Aerial

Kelly, M. H., A. B. Munson, J. Morales, and D. A. Leeper. 2005. Proposed minimum flows for the middle segment of the Peace River, from Zolfo Springs to Arcadia. Ecologic Evaluation Section. Southwest Florida Water Management District. Brooksville, Florida

Kelly, M.H. and Gore, J.A. 2008. Florida river flow patterns and the Atlantic multidecadal oscillation. River Research and Applications 24: 598-616.

Kimmerer, W.J. 2002. Effects of freshwater flow on abundance of estuarine organisms: physical effects or trophic linkages? Marine Ecology Progress Series 243:39-55.

Kuensler, E.J. 1989. Values of forested wetlands as filters for sediments and nutrients. Pp. 85-96 in D.D. Hook and R. Lea (eds.), Proceedings of the Symposium: the forested wetlands of the United States. USDA Forest Service, Southeastern Forest Experimental Station, General Technical Report SE-50. City, State.

Latimer, J.S. and J. R. Kelly. 2003. Proposed classification scheme for predicting sensitivity of coastal receiving waters to effects of nutrients. From: Aquatic Stressors Framework and Implementation Plan for Effects Research in Support of GROUPRA 2.2.3. Prepared for National Health and Environmental Effects Research Laboratory and Office of Water, Office of Science and Technology Criteria and Standards Division AED. Contribution number AED-03-04-001.

Leeper, D. G. Herrick, R. Basso, M. Heyl and Y. Ghile. 2018. Recommended minimum flows for the Pithlachascotee River. Springs and Environmental Flows. Southwest Florida Water Management District. Brooksville, Florida.

Lewelling B.R. and P.A Metz. 2009. Hydrologic conditions that influence streamflow losses in a karst region of the Upper Peace River, Polk County, Florida.

Mace, J. 2009. Minimum levels reevaluation: Gore Lake Flagler County, Florida. Technical Publication SJ2009003. St. Johns River Water Management District. Palatka, Florida.

McBride, T. and M. Barcelo. 2015. Technical memorandum to Yonas Ghile, Subject: Lake Wales water budget model, Rainfall Correlation Model, and Historic Percentile Estimations. Southwest Florida Water Management District. Brooksville, Florida.

McCabe, G.J., Palecki, M.A. and Betancourt, J.L. 2004. Pacific and Atlantic Ocean influences on multidecadal drought frequency in the United States. Proceedings of the National Academy of Sciences 101: 4136-4141.

McIvor, C.C., L.P. Rozas, and W.E. Odum. 1989. Use of the marsh surface by fishes in tidal freshwater wetlands. Pages 541-552, in R.R. Sharitz and J.W. Gibbons, (eds). Freshwater Wetlands and Wildlife DOE Symposium Series No. 61. USDOE Office of Scientific and Technical Information, Oak Ridge, Tennessee.

McKevlin, M.R., D.D. Hook, and A. A. Rozelle. 1998. Adaptations of plants to flooding and soil waterlogging. Pp. 173-204, in Messina, M. G. and W H. Conner (eds.). Southern Forested Wetlands: Ecology and Management. Lewis Publishers.

McPherson, B.F., R.L Miller, and Y.E. Stoker. 1996. Physical, chemical and biological characteristics of the Charlotte Harbor basin and estuarine system in southwest Florida – a summary of the 1982-1089 U.S. Geological Survey Charlotte Harbor assessment and other studies. Prepared in cooperaiont with the Florida Department of Environemantal Protection. U.S. Geological Survey Water-Supply Paper 2486. Denver, Colorado. 32 p.

Montagna, P., J. N., Boyer, and B. Hodges1992. Scientific peer review of the proposed minimum flows and levels for the Lower Peace River and Shell Creek. Prepared for the Southwest Florida Water Management District, Brooksville, Florida.

Montagna, P. A. and R. D. Kalke. 1992. The effect of freshwater inflow on meiofaunal and macrofaunal populations in the Guadalupe and Nueces estuaries, Texas. Estuaries 15: 307-326.

Montgomery, R.T., B. McPherson, and E. Emmons. 1991. Effects of nitrogen and phosphorus additions on phytoplankton productivity and chlorophyll a in a subtropical estuary, Charlotte Harbor, Florida. In Water Resources Investigations Report, 38. Tallahassee, Florida: United States Geological Survey.

Mote Marine Laboratory. 2002. Benthic macroinvertebrate and mollusc indicators. Phase II, Final Report for Peace River Regional Water Supply Facility Hydrobiological Monitoring Program WUP No. 2010420.03. Submitted to: Peace River/ Manasota Regional Water Supply Authority Peace River Regional Water Supply Facility, Arcadia, Florida.

Mote Marine Laboratory. 2005. Distribution of macrobenthic invertebrates in Shell Creek as related to salinity and sediment structure. Submitted to Southwest Florida Water Management District, Brooksville Florida. Mote Marine Laboratory Technical Report No. 1029.

Mote Marine Laboratory. 2007. Benthic invertebrate species richness & diversity at different habitats in the greater Charlotte Harbor System. Submitted to Charlotte Harbor National Estuary Program. Mote Marine Laboratory Technical Report No. 1169.

National Oceanic and Atmospheric Organization (NOAA). 2016a. Tides and currents, sea level trends, 8727520 Cedar Key, Florida. Retrieved from http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8727520.

National Oceanic and Atmospheric Organization (NOAA). 2016b. Tides and currents, sea level trends, 8726520 St. Petersburg, Florida. Retrieved from http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8726520.

National Oceanic and Atmospheric Organization (NOAA). 2020. Tides and currents, sea level trends, 8725520 Fort Myers, Florida. Retrieved from http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8726520.

National Research Council. 2005. The science of instream flows: A Review of the Texas Instream Flow Program. The National Academy Press. Washington, DC.

Neubauer, C.P., G.B. Hall, E.F. Lowe, C.P. Robison, R.B. Hupalo and L.W. Keenan. 2008. Minimum flows and levels method of the St. Johns River Water Management District, Florida, USA. Environmental Management 42: 1101-1114.

Obeysekera, J., J. Park, M. Irizarry-Ortiz, P. Trimble, J. Barnes, J. VanArman, W. Said and E. Gadsinski. 2011. Past and projected trends in climate and sea level for south Florida. Prepared by Hydrologic and Environmental Systems Modeling. External Review Draft dated May 24, 2011. South Florida Water Management District. West Palm Beach, Florida.

Odum, W.E., L.P. Rozas, and C.C. McIvor. 1988. A comparison of fish and invertebrate community composition in tidal freshwater and oligohaline marsh systems. Pages 561-569. Estuarine Wetlands and Interactions. Timber Press, Portland, Oregon.

Odum, W.E., T. J. Smith, III., J. K. Hoover, and C.C. McIvor. 1984. The ecology of tidal freshwater marshes of the United States east coast: A community profile. U.S. Fish and Wildlife Service. Washington, D.C. FWS/OBS-83/17.

Page, L. M., H Espinosa-Perez, L. T. Findley, C. R. Gilbert, R. N. Lea, N. E. Mandrak, R. L. Mayden, and J. S. Nelson. 2013. Common and scientific names of fishes from the United States, Canada, and Mexico. 7th edition. Bethesda, Maryland. https://fisheries.org/docs/pub_fish_names.pdf.

PBS&J, Inc. 1998. Morphometric habitat analysis of the Lower Peace River. Prepared for the Southwest Florida Water Management District and the Peace River Manasota Regional Water Supply Authority.

PBS&J, Inc. 1999. Summary of historical information relevant to the hydrobiological monitoring of the Lower Peace River and Upper Charlotte Harbor Estuarine

System. Final report prepared for the Peace River Manasota Regional Water Supply Authority.
PBS&J, Inc. 2000. Morphometric habitat analysis of the Lower Peace River. Final report prepared for the Peace River Manasota Regional Water Supply Authority.
PBS&J, Inc. 2002. HBMP midterm interpretive report. Final report prepared for the Peace River Manasota Regional Water Supply Authority.
PBS&J, Inc. 2003. 2002 HBMP annual data report. Final report prepared for the Peace River Manasota Regional Water Supply Authority.
PBS&J, Inc. 2004. 2003 HBMP annual data report. Final report prepared for the Peace River Manasota Regional Water Supply Authority.
PBS&J, Inc. 2005. 2004 HBMP annual data report. Final report prepared for the Peace River Manasota Regional Water Supply Authority.
PBS&J, Inc. 2006a. Assessment of potential Shell Creek impacts resulting from changes in City of Punta Gorda facility withdrawals. Final report submitted to the Peace River/Manasota Regional Water Supply Authority & City of Punta Gorda Utilities Department.
PBS&J, Inc. 2006b. 2005 HBMP annual data report. Final report prepared for the Peace River Manasota Regional Water Supply Authority.
PBS&J, Inc. 2007. Peace River cumulative impact study. Final report prepared for the Florida Department of Environmental Protection Bureau of Mine Reclamation and the Southwest Florida Water Management District.
PBS&J, Inc. 2008. 2007 HBMP annual data report. Final report prepared for the Peace River Manasota Regional Water Supply Authority.
PBS&J, Inc. 2009. 2006 HBMP Comprehensive summary report. Revised final report prepared for the Peace River/Manasota Regional Water Supply Authority.
PBS&J, Inc. 2010. 2009 HBMP annual data report. Final report prepared for the Peace River Manasota Regional Water Supply Authority.
PBS&J, Inc. 2010. City of Punta Gorda Shell Creek five year comprehensive summary report. Prepared for the City of Punta Gorda.
Peebles, E. 2002. An Assessment of the effects of freshwater inflows on fish and invertebrate habitat use in the Peace River and Shell Creek estuaries. Prepared for the Southwest Water Management District and the Peace River Manasota Regional Water Supply Authority. Prepared by the College of Marine Science, University of South Florida. St. Petersburg, Florida.
Peebles, E. and Burghardt, S.E. 2013. 2002. Database amendment and analysis update for plankton-net surveys of the Lower Peace River and Shell Creek estuaries, including revised regressions for distribution and abundance responses. Prepared for the Southwest Water Management District. Prepared by the College of Marine Science, University of South Florida. St. Petersburg, Florida.

Poff, N.L., and Ward, J.V. 1989. Implications of streamflow variability and predictability for lotic community structure—A regional analysis of streamflow patterns: Canadian Journal of Fisheries and Aquatic Sciences. 46:1,805–1,818.

Poff, N.L., and Ward, J.V. 1990. Physical habitat template of lotic systems—recovery in the context of historical pattern of spatio-temporal heterogeneity: Environmental Management 14: 629– 645.

Poff, N.L., J.D. Allan, M.B. Bain, J.R. Karr, K.L. Prestegaard, B.D. Richter, R.E. Sparks and J.C. Stromberg. 1997. The natural flow regime: A paradigm for river conservation and restoration. Bioscience 47: 769-784.

Poff, N.L. and Zimmerman, J.K., 2010. Ecological responses to altered flow regimes: a literature review to inform the science and management of environmental flows. Freshwater Biology 55: 194-205.

Postel, S., and B. Richter. 2003. Rivers for Life: Managing water for people and nature. Island Press. Washington D.C. 253 pp.

Poulakis, G.R., P.W. Stevens, A.A. Timmers, C.J. Stafford, and C.A. Simpfendorfer. 2013. Movements of juvenile endangered Smalltooth Sawfish, *Pristis pectinata*, in an estuarine river system: use of non-main-stem river habitats and lagged responses to freshwater inflow-related changes. Environmental Biology of Fishes 96: 763–78.

Poulakis, G.R., P.W. Stevens, A.A. Timmers, C.J. Stafford, D.D. Chapman, K.A. Feldheim, M.R. Heupel, and C. Curtis. 2016. Long-term site fidelity of endangered Smalltooth Sawfish (*Pristis pectinata*) from different mothers. Fishery Bulletin 114: 461-475.

Poulakis, G.R., P.W. Stevens, A.A. Timmers, T.R. Wiley, and C.A. Simpfendorfer. 2011. Abiotic affinities and spatiotemporal distribution of the endangered smalltooth sawfish, *Pristis pectinata*, in a south-western Florida nursery. Marine and Freshwater Research 62: 1165.

Powell, G.L., Matsumoto, J. and Brock, D.A. 2002. Methods for determining minimum freshwater inflow needs of Texas bays and estuaries. Estuaries 25: 1262-1274.

Quantum Spatial, Inc. 2019. SWFWMD seagrass 2018, manual photo-interpretation, final report for the seagrass distribution from Tarpon Springs to Boca Grande – TWA180001071. St. Petersuburg, Florida. Prepared for the Southwest Florida Water Management District. Brooksville, Florida.

Richter, B.D., Davis, M.M., Apse, C. and Konrad, C. 2011. A presumptive standard for environmental flow protection. River Research and Applications 28(8) DOI: 10.1002/rra.1511.

Ross, M.A., A. Said, K. Trout, and J. Zhang, 2005. Hydrologic Modeling of Streamflow from Ungaged Areas in the Upper Charlotte Harbor Basin – Phase 2, Prepared for the Southwest Florida Water Management District. Department of Civil and Environmental Engineering, University of South Florida, Tampa, Florida.

Rubec, J.P., Santi, C., Ghile, Y.B., and Xinjian Chen, X. 2018. Modeling to assess spatial distributions and population numbers of estuarine species, in the Lower Peace River, Shell Creek and Charlotte Harbor, Florida. Final Report Prepared for the Southwest Florida Water Management District.

Scharer, R., P. Stevens, C. Shea, and G. Poulakis. 2017. All nurseries are not created equal: large-scale habitat use patterns in two Smalltooth Sawfish nurseries. Endangered Species Research 34: 473–492.

Schmidt, N. and M.E. Luther. 2002. ENSO impacts on salinity in Tampa Bay, Florida. Estuaries 25: 976-984.

Schreiber, R. A. and T. A. Gill. 1995. Identification and mapping of essential fish habitat: an approach to assessment and protection. Habitat Policy and Management Division, NMFS; and Strategic Environmental Assessments Division, NOS, NOAA. 40 p.

Seidemann, D.E. 1991. Metal pollution in sediments of Jamaica Bay, New York, USA—an urban estuary. Environmental Management 15: 73-81.

Shellenbarger Jones, A. 2007. Overview of mid-Atlantic coastal habitats and environmental implications of sea level rise. EPA CCSP 4.1.

Sheng, Y.P., Kim, T., Davis, J. and Schofield, S. 2006. Hydrodynamic Modeling and Monitoring of Charlotte Harbor in Support of the Determination of Minimum Flows for the Lower Peace and Myakka Rivers, Final report. University of Florida Civil and Coastal Engineering Department. Gainesville, Florida. Prepared for the Southwest Florida Water Management District. Brooksville, Florida.

Simpfendorfer, C.A. 2001. Essential habitat of Smalltooth Sawfish *(Pristis pectinata).* Mote Marine Technical Report 786. Mote Marine Laboratory, Sarasota, Florida.

South Florida Water Management District (SFWMD). 2000. Technical documentation to support development of minimum levels for the Caloosahatchee River and estuary, November 2005. West Palm Beach, Florida.

South Florida Water Management District (SFWMD). 2002. Final draft – technical documentation to support development of minimum flows and levels for the northwest Fork of the Loxahatchee River. West Palm Beach, Florida.

South Florida Water Management District (SFWMD). 2006. Technical document to support development of minimum levels for Lake Istokpoga, November 2005. West Palm Beach, Florida.

Southwest Florida Water Management District (SWFWMD). 2000. Charlotte Harbor Surface Water Improvement and Management (SWIM) Plan. Brooksville, Florida.

Southwest Florida Water Management District (SWFWMD). 2001. Peace River Comprehensive Watershed Management Plan. Volume 1. Draft. Brooksville, Florida.

Southwest Florida Water Management District (SWFWMD). 2002. Upper Peace River, an analysis of minimum flows and levels. Brooksville, Florida.

Southwest Florida Water Management District (SWFWMD). 2004. The Determination of minimum flows for Sulphur Springs, Tampa, Florida. Brooksville, Florida.

Southwest Florida Water Management District (SWFWMD). 2007. Proposed minimum flows for the Lower Peace River and Shell Creek, August 24, 2007 peer review draft. Brooksville Florida. Southwest Florida Water Management District (SWFWMD). 2008. The determination of minimum flows for the Lower Alafia River Estuary. Brooksville Florida.

Southwest Florida Water Management District (SWFWMD). 2010. Proposed minimum flows and levels for the Lower Peace River and Shell Creek. April 2010 final report. Brooksville, Florida. Southwest Florida Water Management District (SWFWMD). 2011. The 2010 update of the regional water supply plan, Governing Board approved July 2011. Brooksville, Florida.

Southwest Florida Water Management District (SWFWMD). 2015. Protocol for addressing sea level change when establishing minimum flows and levels and recovery assessments. Memorandum. March 17, 2015. Brooksville, Florida.

Southwest Florida Water Management District (SWFWMD). 2018. Seagrass mapping results. Surface Water and Improvement and Management Program. Brooksville, Florida.

Southwest Florida Water Management District (SWFWMD). 2020. Lake Hancock Lake Level Modification and Outfall treatment Projects. https://www.swfwmd.state.fl.us/projects/lake-hancock. Accessed on April 17,

Southwest Florida Water Management District (SWFWMD). 2020-in preparation. Charlotte Harbor Surface Water Improvement & Management (SWIM) Plan update, March 2020 – draft. Brooksville, Florida.

Spechler, R.M. and Kroening, S.E. 2007. Hydrology of Polk County, Florida. Prepared in cooperation with the Polk County Board of County Commissioners South Florida Water Management District Southwest Florida Water Management District St. Johns River Water Management District.

Stanley Consultants, Inc., 2006.Hendrickson Dam evaluation. Earth Embankment Section. Prepared for City Punta Gorda, Charlotte County, Florida.

Stanturf, J.A. and S.H. Schoenholtz. 1998. Soils and landform. P. 123-147. *In* M.G. Messina and W.H. Conner (eds.) Southern Forested Wetlands: Ecology and Management. Lewis Publishers, Boca Raton, Florida.

Stevens, P.W., M.F.D. Greenwood, and D.A. Blewett. 2013. Fish assemblages in the oligohaline stretch of a southwest Florida river during periods of extreme freshwater inflow variation. Transactions of the American Fisheries Society 142: 1644–58.

Stoker, Y.E., S.E. Henderson, and B.P. McPherson. 1989. Hydraulic and salinity characteristics of the tidal reach of the Peace River, Southwestern Florida. U.S. Geological Survey Water-Resources Investigations Report 88-4162.

Stoker, Y.E. 1992. Salinity Distribution and Variation with Freshwater Inflow and Tide, and Potential Changes in Salinity due to Altered Freshwater Inflow in the Charlotte Harbor Estuarine System, Florida. U.S. Geological Survey Water-Resources Investigations Report 92-4062.

Stout, J. P. 1984. The ecology of irregularly flooded salt marshes of the northeastern Gulf of Mexico: a community profile. Biological Report 85 (7.1). U.S. Fish and Wildlife Service, Washington D.C.

Suwannee River Water Management District (SRWMD). 2004. Development of Madison Blue Spring-based MFL technical report. Live Oak, Florida.

Suwannee River Water Management District (SRWMD). 2005. Technical report, MFL establishment for the lower Suwannee River & estuary, Little Fanning, Fanning & Manatee springs. Live Oak, Florida.

Swett, R.A., T.A. Fik, T. Ruppert, G. Davidson, C. Guevarna, and B. Staugler. 2012. Planning for the future of recreational boating access to Charlotte County Waterways: 2010 – 2050. Florida Sea Gran College Program, TP-186, October 2012. University of Florida, Gainesville, Florida. Prepared for the West Coast Inland Navigation District and the Charlotte County Board of County Commissioners.

Tampa Bay National Estuary Program. 2006. Charting the course: the comprehensive conservation and management plan for Tampa Bay. St. Petersburg, Florida.

Tate, R.L. III. 1980. Microbial oxidation of organic matter in Histosols. Advances in Microbial Ecology 4: 169-201.

Tomakso, D. A., C.A. Corbett, H.S. Greening and G.E. Raulerson. 2005. Spatial and temporal variation in seagrass coverage in Southwest Florida: assessing the relative effects of anthropogenic nutrient load reductions and rainfall in four contiguous estuaries. Marine Pollution Bulletin 50: 797-805.

Tomakso, D. A. and M.O. Hall. 1999. Productivity and biomass of seagrass Thalassia testudinum along a gradient of freshwater influence in Charlotte Harbor, Florida. Estuaries 22: 592-602.

United States Army Corps of Engineers (USACE) 2019. Global changes, incorporating sea level change in civil works programs. ER 1100-2-8162. June 15, 2019. Washington, D.C.

Vannote, R.L., G.W. Minshall, K.W. Cummins. 1980. The river continuum concept. Canadian Journal of Fisheries and Aquatic Sciences 37: 130-137.

Walbridge, M.R. and B.G. Lockaby. 1994. Effect of forest management of biogeochemical functions in southern forested wetlands. Wetlands 11: 417-439.

Wang, J.C.S., and E.C. Raney. 1971. Distribution and fluctuations in the fish fauna of the Charlotte Harbor estuary, Florida. Charlotte Harbor Estuarine Studies. Mote Marine Lab. 56 pp.

Wang, P. 2004. Bathymetric survey at Upper Peace River, Shell Creek, and Dona-Roberts Bay. Prepared for: Southwest Florida Water Management District.

Wang, P. 2013. Shoreline mapping and bathymetric survey for the Charlotte Harbor and Lower Peace/Myakka River System. Prepared for Southwest Florida Water Management District, March 2013.

Wantman Group Inc. 2015. Surveyor's report – Lower Peace River. Prepared for the Southwest Florida Water Management District, May 2015.

Wantzen, K.M., K.O. Rothhaupt, M. Morti, M.G. Cantonati, L.G. Toth and P. Fisher, (editors). 2008. Ecological effects of water-level fluctuations in lakes. Development in Hydrobiology, Volume 204. Springer Netherlands.

Water Resource Associates, Inc., SDII Global, and Janicki Environmental, Inc. 2005. MFL Establishment for the Lower Suwannee River & Estuary, Little Fanning, Fanning, & Manatee Springs. Prepared for: Suwannee River Water Management District.

Weber, K.A 1999. Impacts of groundwater withdrawals in Polk and Hardee Counties and the ridge area of Highlands County. Report of the Southwest Florida Water Management District. Brooksville Florida.

Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. Adaptive Management: The U.S. Department of the Interior Technical Guide. Adaptive Management Working Group, U.S. Department of the Interior. Washington, DC.

Williams, B.K. and E.D. Brown. 2014. Adaptive management: from more talk to real action. Environmental Management 53: 465-479.

Willmott, C.J., 1981. On the validation of models. *Physical Geography* 2, 184-194.

Wharton, C. H., W. M. Kitchens, E. C. Pendleton, and T. W. Snipe. 1982. The ecology of bottomland hardwood swamps of the southeast: a community profile. U. S. Fish and Wildlife Service, Biological Services Program, Washington, D.C. FWS/OBS-81/37. 133 pp.

Zheng, L., Weisberg, R.H., 2014. *Water Level, Salinity and Temperature Simulations near Charlotte Harbor from the West Florida Coastal Ocean Model*. Submitted to Southwest Florida Water Management District. University of South Florida, St. Petersburg, Fla.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows
Date: Monday, June 1, 2020 4:39:57 PM

SWFWMD WebBoards

PeterSheng has replied to a topic.

District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows

Posted Jun 01 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Doug,

Here is the NOAA report that I referred to.

Peter

techrpt83_Global_and_Regional_SLR_Scenarios_...
6.99 MB

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows
Date: Thursday, June 4, 2020 10:22:23 AM

SWFWMD WebBoards

David Tomasko has replied to a topic.

District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows

Posted Jun 04 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Peter and Laura:

For our Panel meeting this coming Monday, let's all review the District response, and the revised MFL, and have our general thoughts ready for discussion. if you'd like to summarize your thoughts on the District response in an email, please do so. But I don't think that we need to have a "formal" write up of your thoughts as we did on the preliminary panel report. Based on our discussion Monday, I will develop a draft second report to hand out to you - potentially within next week. This will allow us to deliver our second report for internal review amongst ourselves, and deliver to the District our "final" second report well within out contractual timeline.

Again, please review not only the District response, but the revised Draft MFL, and have your comments ready for discussion at Monday's next Panel meeting.

Thanks!

Dave

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows
Date: Thursday, June 4, 2020 1:51:07 PM

SWFWMD WebBoards

PeterSheng has replied to a topic.

District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows

Posted Jun 04 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Dave,

Will do.

Thanks,

Peter

Visit Topic

Or reply directly to this email

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows
Date: Thursday, June 4, 2020 2:05:09 PM

SWFWMD WebBoards

lbedinger has replied to a topic.

District Response to Initial Peer Review Report on Lower Peace River and Lower Shell Creek Minimum Flows

Posted Jun 04 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Sounds good.

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To unsubscribe from these emails, you can unfollow this category or unfollow this topic.

From: Angel Martin
To: Doug Leeper
Subject: Comments--Peer review--Lower Peace River and Lower Shell Creek
Date: Monday, June 8, 2020 3:54:32 PM

Concerning the Scientific Peer Review Panel Meeting for the Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek, I offer the following two general comments.

1. Make the discussion and associated figures and tables as clear as possible. Make certain that the decreasing, increasing, and no trends are clearly defined and associated with the appropriate confidence interval—assume that a 5% (0.05) is clearly defined. Be consistent with these terms. For example, both decreasing and declining trends are used in the document.
2. Please include in the text discussion, where appropriate, that there is uncertainty in the determination of the 15% threshold for significant harm. Additional data collection and analysis may be used in adjusting this value either higher or lower. Uncertainty needs to be discussed in the assignment of Minimum flows and Levels.

Please contact me if you need any additional information or clarification. Thank you for the opportunity to comment.

____

Angel Martin
813-767-6944

DL
Moderator
107 posts

Doug Leeper
a few seconds ago

Comments from Angel Martin provided via email to Doug Leeper, as a follow-up to oral comments provided during the June 8, 2020 peer review panel teleconference.

Concerning the Scientific Peer Review Panel Meeting for the Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek, I offer the following two general comments.

1. Make the discussion and associated figures and tables as clear as possible. Make certain that the decreasing, increasing, and no trends are clearly defined and associated with the appropriate confidence interval—assume that a 5% (0.05) is clearly defined. Be consistent with these terms. For example, both decreasing and declining trends are used in the document.
2. Please include in the text discussion, where appropriate, that there is uncertainty in the determination of the 15% threshold for significant harm. Additional data collection and analysis may be used in adjusting this value either higher or lower. Uncertainty needs to be discussed in the assignment of Minimum flows and Levels.

Please contact me if you need any additional information or clarification. Thank you for the opportunity to comment.

Angel Martin

DL

Moderator

106 posts

Doug Leeper

a few seconds ago

Microsoft Word version of the District staff response to the panel's initial peer review report is attached, as requested by Dave Tomasko during the panel's June 8, 2020 teleconference. The file will be used to assist in the preparation of a draft version of the panel's final peer review report.

LPR_Shell Peer Rev Staff Resp 2020-06-01.docx
217.91 KB

P

Registered Member
13 posts

PeterSheng
15 hours ago

Hi Doug and everyone,

Apologies for joining today's call a bit late due to Internet issues on my end.

Peter

0 0

← Peer Review Panel Teleconference - June 22, 2020

Minimum Flows for the Lower Peace River and Lower Shell Creek

REPLY

DL

Moderator

108 posts

Doug Leeper

a few seconds ago

Agenda for the 6/22/2020 Lower Peace River/Lower Shell Creek minimum flows peer review panel teleconference is attached.

Agenda-LPR_Shell Peer Rev Telecon 2020-06-22.p...
137.33 KB

0 0

DL

Write a reply...

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MEETING NOTICE

AGENDA

Southwest Florida Water Management District
Scientific Peer Review Panel Meeting
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

MONDAY, JUNE 22, 2020
1:00 PM TO 3:00 PM

TELECONFERENCE
Call-in number: 1 (786)-749-6127; Conference ID: 551 367 222#

Teams teleconference link: Join Microsoft Teams Meeting

Detailed Teams teleconference link:
https://teams.microsoft.com/l/meetup-join/19%3ameeting_OGQxMmE1MTYtYzAwNy00OWVjLTkyMDItYzc4NmM0ODk1MGEy%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d

All meetings are open to the public.

1. Welcome/introductions facilitated by Doug Leeper, District MFLs Program Lead.

2. Panel discussion by Dave Tomasko, Panel Chair; Y. Peter Sheng, Panelist; and Laura Bedinger, Panelist; facilitated by Doug Leeper.
   a. Continued discussion of District staff response to the Panel's initial peer review report and the District's revised minimum flows report.
   b. Discussion of the Panel's draft final peer review report.
   d. Recap of next steps and action items.

3. Public comment period moderated by Doug Leeper.

Participants will be asked to save their comments until the public comment portion of the teleconference. If you wish to speak during the public comment period, please identify yourself to the Moderator (Doug Leeper), who will then facilitate your input. Comments will be limited to three minutes per speaker. In appropriate circumstances, the Moderator may grant exceptions to the three-minute limit.

For questions or to submit additional public comment on the peer review of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, please use the Web Board at https://swfwmd.discussion.community/categories that has been established to allow public access to and participation in communications among the Panel Chair and other members of the independent peer review panel created to conduct the peer review. The Web Board will be available for public comment from 8:00 a.m. on April 3, 2020, through 5:00 p.m. on June 26, 2020, and available for public viewing from April 3, 2019 through at least December 31, 2020. Questions or additional public comment may alternatively be submitted to Doug Leeper by email at doug.leeper@watermatters.org, by telephone at 352-397-7840 or 1-800-423-1476 or 352-796-7211, extension 4272, or by mail at the address listed at the top of this agenda.

Bartow Office
170 Century Boulevard
Bartow, FL 33830-7700
863-534-1448 or 1-800-492-7862

Sarasota Office
78 Sarasota Center Boulevard
Sarasota, FL 34240-9711
941-377-3722 or 1-800-320-3503

Tampa Office
7601 US Highway 301 North
Tampa, FL 33637-6759
813-985-7481 or 1-800-836-0797

DL

Moderator
109 posts

Doug Leeper
a few seconds ago

Draft 2020-06-08 peer review panel teleconference summary is attached for review and approval/acceptance by Laura Bedinger and Peter Sheng. Hes been developed and reviewed by Dave Tomasko and Doug Leeper.

DRAFT Lower Peace_Shell Peer Rev 2020-06-08 T...
30.79 KB

MEETING SUMMARY

Southwest Florida Water Management District
Scientific Peer Review Panel Teleconference
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Facilitated as a Video and Telephone-Based Teleconference

June 8, 2020

The Southwest Florida Water Management District (District) organized and facilitated a meeting of the independent scientific peer review panel convened to review a draft District report on proposed minimum flows for the Lowe Peace River and Lower Shell Creek. The meeting was facilitated as a teleconference/videoconference using the Microsoft Teams Videoconferencing Platform.

The meeting was held from 1:00 p.m. to approximately 3:15 p.m. on June 8, 2020.

The meeting was advertised in the Florida Administrative Register and on the District's web site. In addition, notifications concerning the event were distributed to local governments, other agencies, and stakeholder groups or representatives.

Meeting participants that chose to identify themselves are listed below.

Peer Review Panel
Laura Bedinger, Peer Review Panelist
Peter Sheng, Peer Review Panelist
Dave Tomasko, Peer Review Panel Chair

District Staff
Mike Bray
XinJian Chen
Eric DeHaven
Yonas Ghile
Doug Leeper
Jordan Miller
Dennis Ragosta
Cindy Rodriguez
Adrienne Vining
Chris Zajac

Others
Angel Martin

The meeting was initiated by Doug Leeper with a status update for the peer review process and a request that all teleconference participants who wished to do so identify themselves.

Next, the panelists, Laura Bedinger, Peter Sheng and Dave Tomasko, discussed plans to complete a final peer review panel report by June 26, 2020 and post the report to the webforum established for the review process.

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 8, 2020
Date: Tuesday, June 9, 2020 11:46:34 AM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - June 8, 2020

Posted Jun 09 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I approve the teleconference summary.

Visit Topic

Or reply directly to this email

Email followed content: Never | Weekly | Daily | **Immediately** |

To unsubscribe from these emails, you can unfollow this topic.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 8, 2020
Date: Tuesday, June 9, 2020 11:54:16 AM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - June 8, 2020

Posted Jun 09 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I also approve the summary.

Visit Topic

Or reply directly to this email

Email followed content: Never | Weekly | Daily | **Immediately** |

To unsubscribe from these emails, you can unfollow this topic.

DL

Moderator

111 posts

Doug Leeper

a few seconds ago

Amended 6/22/2020 agenda is attached (with corrected date in one of the footnotes).

Agenda-LPR_Shell Peer Rev Telecon 2020-06-22_...
137.38 KB

Southwest Florida Water Management District

2379 Broad Street, Brooksville, Florida 34604-6899
(352) 796-7211 or 1-800-423-1476 (FL only)
WaterMatters.org

MEETING NOTICE

AGENDA

Southwest Florida Water Management District
Scientific Peer Review Panel Meeting
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

MONDAY, JUNE 22, 2020
1:00 PM TO 3:00 PM

TELECONFERENCE
Call-in number: 1 (786)-749-6127; Conference ID: 551 367 222#

Teams teleconference link: Join Microsoft Teams Meeting

Detailed Teams teleconference link:
https://teams.microsoft.com/l/meetup-join/19%3ameeting_OGQxMmE1MTYtYzAwNy00OWVjLTkyMDItYzc4NmM0ODk1MGEy%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d

All meetings are open to the public.

1. Welcome/introductions facilitated by Doug Leeper, District MFLs Program Lead.

2. Panel discussion by Dave Tomasko, Panel Chair; Y. Peter Sheng, Panelist; and Laura Bedinger, Panelist; facilitated by Doug Leeper.
   a. Continued discussion of District staff response to the Panel's initial peer review report and the District's revised minimum flows report.
   b. Discussion of the Panel's draft final peer review report.
   d. Recap of next steps and action items.

3. Public comment period moderated by Doug Leeper.

Participants will be asked to save their comments until the public comment portion of the teleconference. If you wish to speak during the public comment period, please identify yourself to the Moderator (Doug Leeper), who will then facilitate your input. Comments will be limited to three minutes per speaker. In appropriate circumstances, the Moderator may grant exceptions to the three-minute limit.

For questions or to submit additional public comment on the peer review of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, please use the Web Board at https://swfwmd.discussion.community/categories that has been established to allow public access to and participation in communications among the Panel Chair and other members of the independent peer review panel created to conduct the peer review. The Web Board will be available for public comment from 8:00 a.m. on April 3, 2020, through 5:00 p.m. on June 26, 2020, and available for public viewing from April 3, 2020 through at least December 31, 2020. Questions or additional public comment may alternatively be submitted to Doug Leeper by email at doug.leeper@watermatters.org, by telephone at 352-397-7840 or 1-800-423-1476 or 352-796-7211, extension 4272, or by mail at the address listed at the top of this agenda.

MEETING SUMMARY

Southwest Florida Water Management District
Scientific Peer Review Panel Teleconference
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Facilitated as a Video and Telephone-Based Teleconference

June 8, 2020

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The meeting was held from 1:00 p.m. to approximately 3:15 p.m. on June 8, 2020.

The meeting was advertised in the Florida Administrative Register and on the District's web site. In addition, notifications concerning the event were distributed to local governments, other agencies, and stakeholder groups or representatives.

Meeting participants that chose to identify themselves are listed below.

Peer Review Panel
Laura Bedinger, Peer Review Panelist
Peter Sheng, Peer Review Panelist
Dave Tomasko, Peer Review Panel Chair

District Staff
Mike Bray
XinJian Chen
Eric DeHaven
Yonas Ghile
Doug Leeper
Jordan Miller
Dennis Ragosta
Cindy Rodriguez
Adrienne Vining
Chris Zajac

Others
Angel Martin

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DL

Moderator
110 posts

Doug Leeper
a few seconds ago

Final approved 6/08/2020 peer review panel teleconference summary is attached

Lower Peace_Shell Peer Rev 2020-06-08 Telecon ...
43.24 KB

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To:	Doug Leeper
Cc:	Virginia Singer; Chris Zajac; Yonas Ghile; Xinjian Chen; Kristina Deak; Chris Anastasiou
Subject:	RE: Email Notifications for Scientific Peer Review Panel?
Date:	Wednesday, June 10, 2020 3:12:15 PM

Hi Doug

Thanks for your very thorough response (as always). I'm always appreciative of the District's efforts to keep the public informed and its openness to public input.

My inquiry was primarily focused on the Lower Peace MFL process as I'm just trying to stay up to date on it. I was (incorrectly) assuming that the District might maintain a list of interested parties to whom it might mail out notices, like it sometimes does for other District activities like watershed studies, WUP/ERP Advisory groups, etc. I would certainly appreciate being notified by email of MFL peer review meetings and public workshops throughout the District if that is an option. Thanks for the heads up on the 6/22 call and all the great work the District continues to do!

Jim

James P. Guida, P.G.
Principal
Progressive Water Resources, LLC
6561 Palmer Park Circle
Sarasota, Florida 34238
Email: jguida@prowatersource.com
Office: (941) 552-5657
Cell: (941) 706-5042
Please note that PWR is continuing to operate at full capacity and is capable of serving all of our Client's needs during this unfortunate event. We have implemented a variety of new operational procedures to ensure the health and safety of our staff and Clients, and are stricty following the CDC and FDOH guidelines. If there is anything we can do to assist, please do not hesitate to contact us.

From: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Sent: Wednesday, June 10, 2020 1:43 PM
To: James Guida <jguida@prowatersource.com>
Cc: Virginia Singer <Virginia.Singer@swfwmd.state.fl.us>; Chris Zajac <Chris.Zajac@swfwmd.state.fl.us>; Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>; Xinjian Chen <Xinjian.Chen@swfwmd.state.fl.us>; Kristina Deak <Kristina.Deak@swfwmd.state.fl.us>; Chris Anastasiou <Chris.Anastasiou@swfwmd.state.fl.us>
Subject: RE: Email Notifications for Scientific Peer Review Panel?

Hi Jim:

- We (technical MFLs staff) do not send out announcements regarding planned Governing Board presentations concerning MFLs status or requests for initiation of rulemaking associate with MFLs establishment.

    - I've copied **Virginia Singer,** our Boards and Executive Services Manager, on this email, as her group may maintain an email list and distribute emails associated with Board activities or other District activities.
- MFLs technical staff does, however, typically distribute emails announcing planned peer review processes and public workshops associated with MFLs development.
    - If you would like, I will ask all MFLs staff to include you on future emails associated with MFLs peer review meetings and public workshops.
        - Let me know if you are only interested in the current Lower Peace/Lower Shell peer review and I won't ask others to include you on future MFLs activity announcements.
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https://swfwmd.discussion.community/?forum=788051

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: James Guida <jguida@prowatersource.com>
Sent: Tuesday, June 9, 2020 8:25 AM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Email Notifications for Scientific Peer Review Panel?

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Friday, June 12, 2020 10:34:30 AM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 12 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Peter and Laura:

Attached please find the first draft of the table that could be used for the Panel to respond to the District's review of our initial report. This is intended to concisely portray the comments and/or concerns we initially raised, the District's responses, and then the Panel's response to the District response. In keeping with our last conference call, I formatted this table with two columns - the first covers whether or not the Panel agreed with the adequacy of the District response, and the second column covers whether or not the revised MFL report (as of June 1) was modified in a manner consistent with our concerns. Though usually the responses were followed up with a modified report, that was not always the case. For example, there are "concerns" about water quality parameters, influence of the Caloosahatchee River, etc. that were responded to by the District in an adequate manner, but there is not enough time or an ability to modify the report in response to these concerns. The vast majority of our comments were responded to in their entirety - but our goal is not to get to 100% agreement on all topics, it is to provide an overview of the adequacy of the MFL effort - and to highlight any actual or perceived issues the Panel has with both the original draft MFL, and the revised MFL report submitted in response to our comments.

Please go through this document - perhaps do it one at a time(?) - in track changes mode and then send it back to me. I will then add the sort of text we had in the initial report up front for each section, so that the final report will be more than simply a table. I think that a similar format to our initial report will help folks see the logic of the topics we raised. While I wrote quite a bit, there are places where either or both of you need to comment - I left those columns empty except for "Laura or Peter". Text that is highlighted in yellow requires your special attention - please edit as you see fit. In other portions of the table, the District response is straight forward, as is the response from the Panel. But review for your agreement (or not) as this is my starting point, not our final table as a Panel.

I could not figure out how to get rid of that "draft" watermark on top of the page! I think it's in the header, but each time I tried to edit the header, I couldn't get it removed. So please feel free to get that out of the document, if you can. Finally, to keep on schedule, could you please get your edits made this coming week? That would give me time to incorporate your edits into a revised table, and to add the previously included text from the Initial Report as a way to summarize the topics on a chapter by chapter basis.

Thanks - and have a good weekend - Dave

draft table for Final Report 6-12-2020.docx
99.31 KB

Visit Topic

Or reply directly to this email

Email followed content: Never | Weekly | Daily | **Immediately** |

To unsubscribe from these emails, you can unfollow this category or unfollow this topic.

Table 1 – Review of District Responses – Overall Panel Comments

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
MFL report was comprehensive, well-written and thorough	We thank the panel for this comment.	No response required	No response required
Basing MFL on specific flows, vs. calendar dates, a good idea	We thank the panel for this comment.	No response required	No response required
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" below for our response to this comment.	This important topic is discussed by the District, and examples given of the reasonableness of the 15% threshold. However, the point remains that while examples can be found that support its application, it is not universally agreed as an acceptable level of impact for all activities (e.g., wetland impacts from construction, impacts to seagrass from dredging, etc.)	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values.
Hydrodynamic modeling represents a substantial improvement from prior efforts	We agree and thank the panel for this comment.	No response required	No response required
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	The proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed in accordance with all requirements for minimum flows establishment included in the Florida Statutes and Water Resource Implementation Rule. The minimum flows established for the river and creek will be implemented in accordance with these and other legislative and regulatory directives through the District's permitting and planning programs and other water management activities. With regard to other water management activities, we note, for example, the District's 2000 Charlotte Harbor Surface Water Improvement and Management (SWIM) plan and the 2020 SWIM plan currently under development for the harbor are mentioned and cited in the revised, draft minimum flows report. The SWIM plans are mentioned in the water quality classification Section 3.1, a newly added Section 3.2.2 on the Pollutant Load Reduction Goal for the Lower Peace River and Section 4.1.5, which addresses seagrasses.	Yes	Additional text clearly spells out the linkages between the MFL's need to protect the very highest flows coming into the Harbor, which requires an attention to high flows that is not as evident for rivers that discharge to locations such as Tampa Bay and the Springs Coast.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Uncertainty and accuracy of hydrologic model should be discussed in more detail	We considered the over-estimation of ungaged flow in our previous, 2010 minimum flows study for the Lower Peace/Shell System. We adjusted flow records to get the best ungaged flow estimate based on the previous hydrodynamic study of the Charlotte Harbor system and the flow estimation from those ungaged sites using a surface water model HSPF (Ross et al. 2005). In addition, a drainage ratio method was used to improve streamflow estimation at ungaged sites based on neighboring gaged sites. We acknowledge that there is still uncertainty and inaccuracy in our estimates of ungaged flow, which accounts for about 16% of the entire Peace River watershed drainage. About 84% of the Peace River watershed is gaged by the U.S. Geological Survey and the hydrologic loading to the Lower Peace River from the gaged watershed is reliable. For our minimum flow analyses, we used the best available data, in combination of what we learned from the previous hydrodynamic simulation of the system, and a comparison of two other hydrologic studies of the watershed to estimate the ungaged flow to the Lower Peace River. We added new text addressing ungaged flow estimation to Section 5.3.1 of the revised, draft minimum flows report. Additional response development associated with incorporation of uncertainty information in the body of the minimum flows report and the hydrodynamic modeling appendix (Chen 2020) was also added. Regarding modeling and data uncertainty, we think it is worth emphasizing that as discussed in Section 1.3.7 of the draft minimum flows report, the District uses an adaptive management approach for minimum flows development and implementation, which includes routine status assessments and, as necessary, reevaluation of established minimum flows. When possible, these activities are conducted to attempt to minimize uncertainty in our results and recommendations.	Yes, the level of uncertainty is clearly spelled out in the District response.	The level of uncertainty associated with flow estimates for the ungaged portions of the Peace and Lower Shell Creek are better described in the District response to the Initial Panel Report. However, the revised MFL report titled "revised LPR_Shell Draft Min Flows2020-06-01.pdf" does not yet include the same level of explanation of these uncertainties as the District response laid out in the file "LPR_Shell Peer Rev Staff Resp 2020-06-01". As such, while the Peer Review Panel is now more aware of the reasonableness and appropriateness of the District's approach, the public document may not give others the same level of understanding, at least in the revised MFL report from June 1, 2020.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
In a changing climate, long-term (50-100 year) averaged flow are not necessarily more indicative of the hydrologic conditions in the next 15-20 years. Should more recent data in the past two decades be given more weight in the development of the baseline flow which was based on the average in 1950-2014?	We think it is best to use hydrologic data (e.g., flow records) for the longest period, within reason, to best capture the climatic variability integrated in the data. As part of baseline flow development for Lower Peace River, historic flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Charlie Creek were examined in multi-decadal blocks (roughly 20 years) as shown in Figure 5.3 of the draft minimum flows report. Per the request of the peer reviewers, we added short-term (2000-2018) mean annual flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Shell Creek to Section 2.7.1 in the revised, draft minimum flows report. In addition, as noted in response 4f in Table 4 below, we added the short term average flow values to Figures 2-12 through 2-16 within the report section. We also note that as part of minimum flow assessment for the Lower Peace River, 5- and 10 -year moving averages were calculated for river flows under baseline, minimum flow and existing flow scenarios (see Table 7.1 in the revised, draft minimum flows report). We also think it is worth emphasizing again that the District uses an adaptive management approach for minimum flows development and implementation that includes routine status assessments and, as necessary, reevaluation of established minimum flows.	Yes	Additional text and revised figures include the information requested.
Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows on bottom water hypoxia and other phenomena	We included additional information on the importance of hydrodynamics in several sections of the revised, draft minimum flows report. For example, we added text to the end of Section 1.5 that emphasizes the adopted minimum flows for the Lower Peace River and the proposed minimum flows for the river and Lower Shell Creek were based on potential flow-related changes in salinities assessed with hydrodynamic models. In addition, we added a new section (Section 3.2.2) on the pollutant load reduction goal for the Lower Peace River, emphasizing the environmental effects associated with relatively large, seasonal inflows to Charlotte Harbor. We also emphasized the importance of hydrodynamics in text added to the beginning of Section 3.3.1.	Yes	Additional text links the need to protect the very highest inflows to bottom water hypoxia, and the link between bottom water hypoxia and the Harbor's adopted Pollutant Load Reduction Goal.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Consider development of a "dynamic" MFL with real-time now-cast/forecast capabilities	This is an intriguing suggestion, although we do not think development of a dynamic water quality model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. Minimum flows (and minimum water levels) are typically assumed to correspond with long-term hydrologic and environmental conditions, and in the case of the Lower Peace River and Lower Shell Creek were developed based on central tendencies of environmental responses to changes in flow simulated every 90 seconds (or 75 or 72 seconds during a few short periods when storms occurred) for a 7.7 year simulation period. Further, we add that estuarine organisms are adapted to cope with a wide range of salinities and the small changes in salinity, attributable to the currently proposed minimum flows, are unlikely to alter the ecological integrity of the naturally dynamic Lower Peace/Shell System or Charlotte Harbor. We note, however, that established minimum flows can be and are used to develop withdrawal-related conditions in water use permits, on both long-term and short-term bases. For example, in the case of the existing and proposed minimum flows for the Lower Peace River, permit conditions that limit withdrawals based on the previous day's average flow have been and are expected to be successfully implemented. These types of permit conditions are developed by District staff in coordination with permittees based on identified regulatory constraints, such as established minimum flows, the needs of the permittee and other practical considerations.	Yes	Additional text and revised figures include the information requested.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee	Although flow from the Caloosahatchee River was not directly used as boundary conditions near the mouth of the Caloosahatchee River, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. We also think it is valuable to comment on the complexity of inflows that can impact environmental conditions in Charlotte Harbor. For example, proliferation of drift algae and apparent loss of seagrass has been observed along the east wall region of the harbor and may be related to the Red Tide event of 2017-2018. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.	Yes, the issues related to red tide, potential impacts from the Caloosahatchee River and the potential for adverse impacts to the Harbor from sources other than the Peace and Myakka is realized by the District, and included in the response to the Panel's Initial Report.	The District's response to the Panel's comment displays an understanding of the issue of impacts to the Harbor from influences outside the control of the District itself. However, the revised MFL report titled "revised LPR_Shell Draft Min Flows2020-06-01.pdf" does not yet include the same level of discussion as the District response laid out in the file "LPR_Shell Peer Rev Staff Resp 2020-06-01". While the Caloosahatchee River is listed as a model element, the revised MFL report does not include the words "red tide" or references to the sort of impacts described in the District's response to the Panel. As such, while the Peer Review Panel is now more aware of District's awareness of this issue, the public document may not give other reviewers the same level of understanding, at least in the revised MFL report from June 1, 2020.
Analyze the potential impact of sea level rise on the MFL, using best available SLR data for 2020-2050	We did not develop the proposed minimum flows based on future sea level conditions. However, we evaluated the proposed minimum flows under three SLR scenarios to help determine when a future re-evaluation of the minimum flows may be necessary. Although we used U.S. Army Corps of Engineer (USACE) SLR estimates, which are generally lower than those of the National Oceanic and Atmospheric Administration (NOAA), our results supported the need for consideration of a future reevaluation for the Lower Peace River and Lower Shell Creek minimum flows. Future reevaluations will be based on actual sea level conditions and other factors. Following the review panel's suggestion, we have conducted new model runs using NOAA et al. (2017) SLR estimates and are in the process of revising the draft minimum flows report based on an analysis of the new model results.	Yes	Additional text and revised figures include the information requested.

Table 2 – Review of District Responses – Executive Summary

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Definition of "significant harm"	Significant harm and significantly harmful are not defined by the State Legislature. For minimum flows and levels development, each water management district of the state or the Florida Department of Environmental Protection identify specific thresholds or criteria that can be associated with significant harm. We incorporated additional information concerning significant harm into the first paragraph of the Executive Summary in the revised, draft minimum flows report.	Yes	Modified text in both the Executive Summary and Section 1.3 better explains the logic behind the District's interpretation of how "significant harm" is quantified, as well as the background information used to support their approach to quantifying such.
Definition of "best available information"	In accordance with direction provided by the Florida Legislature, District staff use the best available information when determining minimum flows. Determinations regarding the best available information are made by District staff based on professional judgment, with consideration of input from all stakeholders. The best available information includes information that exists at the initiation of the minimum flows development process and information that is acquired specifically to fill data requirements deemed necessary for establishment of the best, defensible minimum flows. We do not think a definition for "best available information" is needed in the Executive Summary of the minimum flows report. However, we added the characterization of "best available information" above to the first paragraph of Section 1.5 in the revised, draft minimum flows report.	Yes	Modified text in both the Executive Summary and Section 1.3.5 and 1.5 better explains the modifier of "best available" when used to construct the MFL using existing data sources

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Could MFL be set for more than 3 flow blocks?	In theory, any number of flow blocks could be identified and used for minimum flows development and implementation. For practical purposes, use of three flow blocks for the District's development and implementation of minimum flows for water use permitting, planning and water resource protection has proven to be successful. One reason for this success in the management of runoff driven lotic systems is that the flow blocks associated with established minimum flows have been developed with consideration of low, medium and high flow conditions that are known to be important for the physical, chemical and biological functions and structure of riverine systems. We have not conducted analyses associated with development of proposed minimum flows for the Lower Peace River and Lower Shell Creek with varying numbers of flow-based blocks.	Yes	Issue did not need to be included in revised MFL report – was raised for consideration, rather than a requested modification to the draft report.
Concern over LSC low flow conditions	Please refer to response 2i in this table.	Yes – District response is quite clear that the proposed minimum flow guidance is not being met, but that adherence to the guidance contained within the MFL would enhance ecosystem function, compared to existing condition.	The revised MFL report clearly states that the proposed minimum flow guidance for the Lower Shell Creek is not being met, and requires a recovery strategy. Table 7-2 clearly lays out the steps involved in the recovery strategy for the Lower Shell Creek.
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	Please refer to response 1e in Table 1 for our response to this comment.	Yes	Additional text clearly spells out the linkages between the MFL's role in protecting the health of the Lower Peace River, Lower Shell Creek and Charlotte Harbor, in light of concurrent efforts to monitor, protect and/or restore ecological health in those same systems.
Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP's Numeric Nutrient Concentration (NNC) criteria	We analyzed water quality data to explore potential linkages between flow and water quality parameters as is required by the Water Resource Implementation Rule, not to validate or to infer compliance with the Numeric Nutrient Criteria adopted by FDEP	Yes – but the issues associated with incomplete analytical techniques for phosphorus (i.e., reporting only orthophosphate) and chlorophyll-a (i.e., reporting values not corrected for phaeophytin) are problematic.	If water quality data are important enough to collect, analyze and interpret, then they are important enough to do such in a scientifically appropriate form. The WSA should collect all forms of phosphorus, not just orthophosphate, and values for chlorophyll-a should be corrected for phaeophytin. While these points cannot be "corrected" in the MFL report, this issue should be resolved prior to the production of the next MFL update.

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Explain the need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	We agree with the preliminary comments below that are included in the appendices to the Panel's initial peer review report: *"It appears improbable that even maximum water withdrawals would reduce flows sufficient to prevent bottom water hypoxia, which requires an average flow of 10,000 CFS at Arcadia (Stoker et al, 1989 – U.S. Geological Survey Publication XXXXX) – roughly equivalent to total gaged PR flow of about 20,000 cfs."* *"Proposed max withdrawal of 400 cfs represents ca. 2% of the minimum flow from PR watershed required to initiate stratification of 10 ppt in Harbor. Consequently, maximum withdrawal appears to be protective of the "reset button" of bottom water hypoxia."* We have therefore included text in a new Section (3.2.2) and at the beginning of Section 3.3.1 in the revised, draft minimum flows report to emphasize the importance of hydrodynamics and high inflows to Charlotte Harbor.	Yes	Additional text links the need to protect the very highest inflows to bottom water hypoxia, and the link between bottom water hypoxia and the Harbor's adopted Pollutant Load Reduction Goal.
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	This important topic is discussed by the District, and examples given of the reasonableness of the 15% threshold. However, the point remains that while examples can be found that support its application, it is not universally agreed as an acceptable level of impact for all activities (e.g., wetland impacts from construction, impacts to seagrass from dredging, etc.)	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values.

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health	The proposed minimum flows for Lower Shell Creek are to be implemented based on discharge of a percentage of the inflow to Shell Creek Reservoir. For example, the allowable flow reduction of 23% for Block 2 flows, means that quantity of water equal to 77% of the inflows to the reservoir must be discharged downstream of Hendrickson Dam. This minimum flow is required, irrespective of withdrawals from the reservoir. By associating the minimum flows with rates of inflow to the reservoir, we believe the ecology of Lower Shell Creek is protected from significant harm associated with water withdrawals. Thus, a maximum flow diversion quantity is not required for the Lower Shell Creek. For minimum flows development purposes, Shell Creek is partitioned into the Upper Shell Creek and Lower Shell Creek, separated by Hendrickson Dam. The only significant, permitted withdrawal directly from Shell Creek is associated with the permit issued by the District to the City of Punta Gorda for withdrawals from Shell Creek Reservoir, the portion of the upper creek impounded by the dam. Because the proposed minimum flows for Lower Shell Creek are based on maintaining block-specific percentages of inflow to Shell Creek Reservoir from Upper Shell Creek (and Prairie Creek) and the City's withdrawals are from the multi-year storage in the reservoir storage, a maximum withdrawal limit (i.e., a maximum flow reduction) is not needed for the Lower Shell Creek minimum flows. Also, of note, the permit issued to the City for withdrawals from Shell Creek Reservoir includes monthly and annual average maximum withdrawal limits. We further note that preliminary comments prepared by the panel and used to support development of their initial peer review report, indicated it is "*[n]ot likely that max withdrawals (if set) for LSC would affect threshold values for stratification, but should be mentioned/ acknowledged* We agree with this assertion, and note that for a recent period from 1996 through 2016, mean annual flow in the Lower Peace River, based on flows in the River at Arcadia and flows from Joshua and Horse creeks was 1,279 cfs, while flows to Lower Shell Creek from the same	Not entirely. The District's response is very detailed, and lays out the logic of them not including a maximum flow diversion quantity for Lower Shell Creek. However, the Panel's concerns about the lack of incorporation of a maximum diversion quantity remain. The District's logic for including a maximum diversion quantity of 400 cfs for the Lower Peace River are that diversions above and beyond that amount might be problematic for regions beyond the boundaries of the Lower Peace River – areas out into the Harbor itself. The lack of similar maximum diversion guidance for the Lower Shell Creek does not follow the same logic. While it is true that such quantities are not likely to be reached – not "requiring" such guidance does not diminish the value of developing such guidance.	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as protecting the health of the Harbor is concerned. Since it is acknowledged by the District (in their response) that it is unlikely that a potential maximum diversion quantity for the Lower Shell Creek MFL would be problematic for existing users, it is concerning that the District does not more fully consider the benefits of establishing similar maximum diversion guidance for the Lower Shell Creek as was included for the Lower Peace River.

	period were 388 cfs. This information, which has been included in Section 2.7.1 of the revised, draft minimum flows report, indicates the Shell Creek watershed accounts for only about 25% of the combined flows from the Peace River and Shell Creek watersheds. Based on the information provided here, we do not currently intend to recommend inclusion of a maximum withdrawal cap or limit as part of the proposed minimum flows for Lower Shell Creek. We will, however, continue to assess and, as necessary, consider this recommendation of the panel for potential, future reevaluations of minimum flows established for the creek.		
Say something about potential impact of SLR on the MFL	Sea level rise effects on salinity habitats were assessed in the District's draft minimum flows report to help evaluate the potential need for future reevaluation of the proposed minimum flows. As noted in response 1l in Table 1, analyses based on modeled scenarios associated with SLR predictions from the U.S. Army Corps of Engineers indicated the need for reevaluation of minimum flows established for the Lower Peace River and Lower Shell Creek. We acknowledge the SLR estimates used in our initial analyses are conservative. We have run the hydrodynamic model using the most recent SLR estimates by the National Oceanic and Atmospheric Administration (NOAA et al. 2017), and plan to update the revised, draft minimum flows report based on results of these SLR simulations.	Yes	Additional text and revised figures include the information requested.

Table 3 – Review of District Responses – Chapter 1 – Introduction

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Formatting of Table 1-1 Improve within cell formatting so text in final column matches up with that in preceding columns	Table 1-1 was reformatted in the revised, draft minimum flows report to align information contained in the final column with that in the preceding column.	Yes	Modified table now formatted correctly
1.2.1 Remove 's from Florida in title	We changed "Florida's" to "Florida" in the Section 1.2.1 title in the revised, draft minimum flows report.	Yes	Modified text now correct

Table 4 – Review of District Responses – Chapter 2 Physical and Hydrologic Description

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Issues related to clarity of maps and figures, for example, enhancing Figure 2-2 so it is better related/connected to a Google street map for the same area. In addition, river scales are discussed or displayed in both miles and km. Perhaps use both metrics each time.	Figures 2.2 and 2.3 have been updated in the revised, draft minimum flows report. In addition, an inset map was included in Figure 2.2, and we clarified the purpose of the inset maps in both Figure 2.2 and Figure 2.3. We acknowledge that differing metrics are used to depict distances in maps included in the draft report. Some of the maps are reproductions from other sources and for this reason, we have continued to present maps using both the U.S. Customary and Standard International metrics.	Yes	Map clarity issue has been addressed. Issues of station locations and listings in both km and miles (as well as station names alone) can be dealt with through expanded text of legend for those figures where other entities have produced the graphics.
Question related to LiDAR sources, for example, is 2017 LiDAR data for the region available from the state?	The LiDAR photogrammetric data collection (Aerial Cartographic of America, Inc. 2015) was conducted primarily to support development of the District's hydrodynamic model for minimum flows development. These data were the best available information of this type in 2016, when the hydrodynamic model was calibrated and validated. State-wide 2019 LiDAR data are currently under review. These and other available data will be considered for use in future evaluations of minimum flows for the Lower Peace/Shell System.	Yes	Laura and Peter…..
Use of NGVD29 vs. NAVD88 for elevation and bathymetry data	Most elevation data and references to elevations in the draft minimum flows report are presented relative to the North American Vertical Datum of 1988 (NAVD88). However, we note that in the descriptive information included in Section 2.1 on page 16 of the draft minimum flows report a reference is made to the Peace River originating in an area of Polk County at an elevation of about 100 feet above the National Geodetic Vertical Datum of 1929. We also note that a water surface elevation of 5.0 feet is included in the description of Shell Creek Reservoir in Section 5.5.3 on page 91 of the draft minimum flows report. For development of the hydrodynamic model for Charlotte Harbor, all the variables associated with elevation are referenced to NAVD88.	Yes	Laura and Peter…..

Table 4 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Question about the order of MFL development vs. water supply planning efforts	The development or reevaluation of minimum flows is a relatively lengthy process involving compilation of relevant data, development or refinement of analytical methods and approaches, and coordination with local governments and other affected stakeholders. In addition, the District is typically engaged in the concurrent development of minimum flows for several priority water bodies. For these reasons, there are practical limitations concerning minimum flows development and reevaluation schedules. It is worth noting, however, that minimum flow status assessments are conducted annually, on a five-year basis in conjunction with regional water supply planning, and on an as-needed basis associated with reviews for water use permit applications and renewals. Results from these assessments are part of the District's adaptive management approach to minimum flows development and implementation and can be used to inform decisions regarding the need for minimum flow reevaluation.	Yes	Laura and Peter…..
Definition of flow lag	For the water quality analyses included in the draft minimum flows report, lagged-flows refers to average flows for periods ranging from 2 to 60 days prior to the date of water quality sampling event. Text in Section 3.2.2 in the revised, draft minimum flows report was amended with a parenthetic phrase to clarify what is meant by lagged-flows.	Yes	Peter…..
Consider adding a most recent 10 or 20 year average bar to Figures 2-12 to 2-16 in addition to the one that is the long-term average for POR	Short term average (2000-2018) flows were added to Figures 2-12 to 2-16 in the revised, draft minimum flows report. Please refer to our response 1g in Table 1 for additional information.	Yes	Additional average value now included in Figures 2-12 to 2-16.
Discuss the importance of hydrodynamics and hydrodynamic modeling	The standard format for the District's minimum flow reports involves identification of ecological criteria followed by descriptions of tools used to model or assess the criteria. The hydrodynamic model is identified in the introductory (Chapter 1), where we discuss the substantial data enhancements that were undertaken to improve upon the model that was previously used for development of the existing Lower Peace River minimum flows. To better emphasize the primacy of the hydrodynamic model for our current minimum flows assessments we split the paragraph following	Yes	Peter…..

	the numbered list of major initiatives and updates within Section 1.5 into two paragraphs in the revised, draft minimum flows report, and amended the first of the two paragraphs to clearly indicate that like the previous minimum flows effort, the current effort was based on salinity modeling conducted through hydrodynamic modeling. The hydrodynamic model is also notably mentioned in the system description (Chapter 2), water quality (Chapter 3) and resources of concern/modeling tools (Chapter 5) chapters. As noted in our response to comment 5i in Table 5 below, we also amended the brief discussion of the model in the salinity section of Chapter 3 included in the revised draft minimum flows report. We also emphasized the importance of hydrodynamics in a new section (Section 3.2.2) on the pollutant load reduction goal for the Lower Peace River and new text added to the beginning of the descriptive water quality information section (Section 3.3.1). Finally, in Chapter 5 of the revised minimum flows report, the development and application of the UnLESS model to the Charlotte Harbor system has been substantially expanded to include more information on model setup, input data, model calibration and verifications and modeling uncertainty. As noted in the draft minimum flows report, detailed information on the model and its use are also discussed in Chen (2020) which is included as Appendix C to the report.		
Additional and more detailed description of hydrodynamic model elements needed	Chapter 5 is expanded to include a brief description of the hydrodynamic model for Charlotte Harbor. Please also refer to our response 4g in this table.	Yes	Peter…..

Table 5 – Review of District Responses - Chapter 3 Water Quality

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Salinity data presented in Figure 3-3 not that helpful	We note that variability in the salinity data presented in Figure 3-3 can be attributed to seasonal, inter-annual variation and other factors. However, as noted in the report text associated with the figure, we think the figure is helpful in portraying longitudinal and seasonal salinity variation in the Lower Peace River as well as salinity differences in the water column at selected sites.	Yes??	Laura?
Influences of factors other than flow on concentrations of chlorophyll a	We added additional text in Section 3.3.1.3 of the revised, draft minimum flows report.	Yes	Section 3.3.1.3 gives a more thorough review of factors that can influence chlorophyll-a than in the prior report.
Values of phosphorus only shown for orthophosphorus	Total phosphorus measurement for the Hydrobiological Monitoring Program (HBMP) was terminated in 2003. We investigated our use of ortho-phosphorus vs. total phosphorus by conducting scatterplot analyses for data from 5 stations for the period 1996 through 2003. As indicated in the figures below, about 81-88% of total phosphorus is attributed to ortho-phosphorus, suggesting that results expected for total phosphorus may generally be similar to those determined for ortho-phosphorus. We included information concerning the current measurement of ortho-phosphorus for the Peace River HBMP and the correlation between orthophosphorus and total phosphorus in Section 3.3.1.1.5 of the revised, draft minimum flows report.	Yes, but the draft final report does not include the level of detail included in the District's response to the Panel.	The inclusion of only dissolved inorganic forms of phosphorus is problematic. While this is not the District's data collection effort, it is a data collection effort that is conducted for compliance with a water supply permit, to ensure that withdrawals do not adversely impact ecosystem health. The percentage of phosphorus that is orthophosphate may average 80%, but that value likely varies over the length of the river (as does NOx as a function of TN) and with different seasons. This data shortcoming should be pointed out and addressed prior to the analysis of data for later reports.
Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite	We added results for total nitrogen to Section 3.3.1.4.	Yes	Revised results and analysis are in-line with request.
Definition needed for "flow-lag"	Please see response 4e in Table 4 for our response to this comment.	Yes	Peter
Various figures have legends that appear to be mislabeled	Numerous figure legends were corrected in the revised, draft minimum flows report.	Yes??	Laura and Peter…..
Figure 3-22 caption says it is dissolved oxygen, but y-axis says chl a	The Figure 3-22 caption was corrected in the revised, draft minimum flows report to indicate that the plot shows chlorophyll concentrations.	Maybe no…	Figure legend now correct in terming the data chlorophyll- but the legend refers to "surface, midwater and bottom" values? Is that correct?

Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Mislabeling of y-axis on Figure 3.23	The y-axis label for Figure 3-23 was changed from "Salinity (PSU)" to "Chlorophyll" in the revised, draft minimum flows report.	Yes	Label changed as requested
Importance of hydrodynamic model description	We agree that description of the hydrodynamic model and its primacy for the analyses presented in our draft minimum flows report should be emphasized. As noted in response 4g in Table 4, we modified text in Section 1.5 of revised minimum flows report to emphasize our prior and current use of hydrodynamic modeling to support minimum flows development for the Lower Peace River and Lower Shell Creek. In addition, we substantially expanded the presentation of model information included in Chapter 5. We also think it is appropriate to discuss the development and use of a hydrodynamic model for assessing flow-related changes in salinity in the Lower Peace/Shell System in Section 3.3.2.1 of the draft minimum flows report, which addresses system salinity. Our mention of the hydrodynamic model in the water quality chapter (Chapter 3) in the original draft report, and additional related text added to the revised draft report serve as another useful preview of the more detailed discussion of the model in Chapter 5 and the referenced model report, Chen (2020), included in the report appendices. We also note that within Section 2.3.2.1 of the revised, draft minimum flows report, we substantially modified the text to emphasize our efforts to develop and use the best available information, in this case the hydrodynamic model, for minimum flows development.	Yes	Peter??
Additional and more detailed description of hydrodynamic model elements needed	In addition to modifications to the text in Section 3.2.2.1 of the draft, revised minimum flows report noted in our previous response 5i in this table, we also amended text associated with the model in Chapter 5 and in the model report (Chen 2020) included as Appendix C to the report.	Yes	Peter??
More refined explanation needed for isohaline location trend analyses	Please refer to response 5o in this table.	Yes?	Laura and Peter??
Better description of results shown Figures 3-12 to 3-16	To improve presentation of the correlation analyses results presented in Figures 3-12 through 3-16, we amended the figure captions within Sections 3.3.2.2 through 3.3.2.5 of the revised, draft minimum flows report. We also modified the statistical methods description included in Section 3.3.2 to better describe the lagged-flows used in the analysis and to summarize our interpretation of the correlation statistics derived from the analyses and presented in Figure 3-12 through 3-16.	Yes	Description more detailed and labels now accurate for the displayed data

Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Value of developing dynamic water quality model, vs. empirical approaches	As noted in response 1j in Table 1 we understand the potential value of a dynamic water quality model for the Lower Peace/Shell System, but do not think development of such a model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. See response 1j for additional information concerning our response.	Yes	Peter??
Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included	Lower Shell Creek and Lower Peace River flows were combined for depiction of the flow-salinity relationships for Stations 6.6 and 15.5 in Figure 3-11 in the revised, draft minimum flows report. In addition, the figure caption and associated text within Section 3.3.2.1 of the revised, draft minimum flows report were updated.	Partially	The salinity data now are plotted against the totality of inflows – from both the Lower Peace River and Shell Creek. However, the graphic does not display equations, statistical significance, etc. The text says that "…salinity was more responsive to freshwater inflow…" at upstream stations without defining what that means. I would suggest saying that "…variation in flow explained a greater amount of the variability in salinity at upstream stations, but was statistically significant at all stations examined here."
Table 3-1 – improve explanation of location of isohaline location trends	We note that the text on page 47 preceding and which refers to Table 3-1 indicates the trend analysis identified an upstream movement of the 0 psu and 20 psu isohalines for period from 1984 through 2016. To improve understanding of the information presented in the table, we added a footnote to Table 3-1 in the revised draft minimum flows report to characterize our interpretation of the presented, significant statistics, i.e., that positive, significant statistics indicate upstream isohaline movement. While revising Table 3-1, we determined that changes to clarify the presented statistical results and better indicate that the results pertain to the Lower Peace River (and in some cases Charlotte Harbor near the mouth of the river) were needed for several other tables and figure within Chapter 3. So, we revised captions and/or footnotes for several additional tables and figures in the revised draft minimum flows report, including Tables, 3-2, 3-3, 3-4 3-5, 3-6 and 3-7, and Figures 3-3, 3-4, 3-5,3-6, 3-7, 3-8, 3-9 and 3-10.	Yes	Table 3-1 and preceding text explains that the trend test was for detecting an upstream movement of the location of the 0 and 20 psu isohalines.

Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Table 3-2 ,3, 4 to 3-7 and 3-12 to 3-16 – improve explanation of summertime hypoxia development and other data presentations	The text in Section 3.3.1.2 preceding Table 3-2 notes the trend analysis indicated dissolved oxygen concentrations in surface waters associated with the 0 psu isohaline increased for period from 1984 through 2016. We do not think the information presented in the table can be used to assert there is no hypoxia in surface waters of the Lower Peace River during the wet, summer season. However, as noted in responses 5i and 5o in this table, we amended the captions, column headers, and/or footnotes for Tables 3-2, 3-3, 3-4 through 3-7 and Figures 3-12 through 3-16 within the revised, draft minimum flows report. We also updated the statistical methods description included in Section 3.3.2 within the revised, draft minimum flows report to enhance presentation of the results.	Yes	Figures 3-3 and 3-4 seem to be portraying different versions of the same phenomena – salinity is apt to be higher in the bottom waters, and dissolved oxygen lower, particularly in the wet season. This is all useful information, but it begs the question of is there "too much" data to interpret. Fixed station salinity, temp and DO for bottom and surface waters as well as isohaline sampling for the same parameters for surface and bottom waters. Does it make sense to continue to collect both? Isn't the value of the isohaline sampling the locations alone? Do we really need what appears to be redundant water quality data?

Table 6 – Review of District Responses - Panel Comments on Chapter 4 Ecological Resources

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Plant community data set from 1998 is problematic	We are not aware of any recent, comprehensive, species or genus-level vegetation maps for the Lower Peace/Shell System that would represent an update to the detailed information presented in Figure 4-1 in the original, draft minimum flows report. However, we developed and included a replacement, coarser-level vegetation map based on the 2017 SWFWMD land use/cover GIS layers in the revised, draft minimum flows report. In addition, we anticipate considering vegetation data collection and mapping needs for future evaluations of the system.	Yes	Updated information is much more helpful
Status and trends in seagrass coverage in the LPR over time	The District has been mapping seagrasses in Charlotte Harbor using aerial photography since 1988. Others have attempted to use older imagery to infer historical seagrass extent, but with very limited success. For the Tidal Peace River segment of Charlotte Harbor, recent seagrass extent (estimated for 2014, 2016 and 2018) is greater today than any time since 1988, as shown below. We included this figure and associated text in Section 4.1.5 of the revised, draft minimum flows report to augment the presented seagrass information.	Yes	Inclusion of such information is appreciated

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Concern over shift in HBMP focus to physical factors, rather than fish communities, macroinvertebrates, and/or macroalgae	In 1996, the Charlotte Harbor Hydrobiological Monitoring Program (HBMP) Scientific Review Panel reviewed the ongoing elements of the HBMP program and recommended several changes to the monitoring program study elements. The Panel recommended that HBMP monitoring should primarily focus on assessing long-term trends in key physical, chemical, and biological characteristics that can be directly linked to potential effects associated with withdrawals at the Peace River Manasota Regional Water Supply Authority's Peace River Facility. They also noted that less effort should be focused on indirect biological indicators that are not intended to evaluate influence of withdrawals, once a baseline level of information has been collected. As summarized in Appendix A of the Peace River Hydrobiological Monitoring Program 2016 HBMP Comprehensive Report (JEI 2017), subsequent meetings of the HBMP Scientific Review panel have continued to shape the current HBMP. Reference to this summary document has been included in Section 3.3.1 of the revised, draft minimum flows report to provide additional information concerning the evolution of the HBMP. We think the biological and other information collected to date and summarized in our draft minimum flows report is sufficient for development of recommended minimum flows for the Lower Peace/Shell System. We note that this information has been collected in support of the required HBMP, other monitoring programs, and studies specifically undertaken by the District to directly support minimum flows development. However, in support of our adaptive management approach to minimum flows development and implementation, we continue to support ongoing data collection efforts for the Lower Peace/Shell system and will consider additional sampling and analysis of biological data as needed, for future minimum flow reevaluations.	Yes??	Laura?

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Fisheries Independent Monitoring newest data from 2016 not included in the modeling approach (Appendix E) or compared to data collected through 2013	At the time of model development, the best available data were used. However, consideration of more recent data has been requested from the Florida Fish and Wildlife Conservation Commission (FWC) and a comparison of abundance of the taxa and size classes examined in this model will be performed to determine if there are any significant differences between modeled years and more recent sampling years. Results from this analysis will be included in future updates to the draft minimum flows report. As noted in Section 4.2.1 of the draft minimum flows report, Call et al., (2013) performed a survey on fish communities within the Lower Peace River throughout 2007 to 2010 and found no temporal variation in fish communities across years, suggesting a generally stable system within the river. To augment presentation of information on the fish assemblage in the Lower Peace/Shell System, the descriptive FWC Fisheries-Independent Monitoring data from 2016 presented in Section 4.2.1 of our original draft minimum flows report has been replaced with the most recent available data (2018) in the revised, draft minimum flows report.	Yes??	Laura?

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Should endangered species, such as sawfish and manatees, be included in MFL assessments?	Endangered and listed species should be and are considered when developing minimum flows. For example, in Section 4.2.1 of the draft minimum flows report we noted that juvenile sawfish (<3 years of age) are able to move in response to salinity fluctuations with high site fidelity upon a return to baseline conditions, with large-scale movement most notable after significant freshwater inflow (>500 cubic meters per second) from tropical disturbances (Poulakis 2016). We also noted that Sawfish movements examined in the Caloosahatchee River demonstrate downstream movement when salinities approach 0 psu and upstream movement at salinities approaching 30 psu (Poulakis 2013). Therefore, protection of the sensitive salinity habitat would not positively affect their distribution, although maintenance of natural freshwater flows would benefit their capacity to locate nursery grounds (Poulakis 2016). Further we note that the species chosen for the HSM modeling used to support our minimum flow analyses reflect those with affinities for low salinity habitats. A strong positive correlation between Common Snook (*Centropomus undecimalis*) abundance and flow was observed in the Lower Peace River (Blewett 2017). Body condition was also elevated during years of increased river flow. This increased abundance and condition with increased flow was hypothesized to be related to enhanced prey availability with greater floodplain inundation. Per the floodplain inundation analysis performed by HSW (2016) in support of our minimum flows work (Appendix D), the proposed minimum flows will not significantly impact total inundated floodplain wetland area associated with the baseline flow condition, and are therefore unlikely to impact the abundance or condition of Common Snook. For development of minimum flows for river systems or creeks dominated by spring flow we typically consider manatee usage of thermal refuges during acute and chronic cold-water events. Given the lack of spring discharge to the Lower Peace/Shell system we do not think assessment of potential, flow-related changes in thermally-favorable habitat usage by manatees is necessary for our development of minimum flows for the river and creek.	Yes??	Laura?

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
In Appendix E it is stated that "predicted CPUE grids" were derived from catch data and these predictions were used to generate the population estimates which were used to model the effect of water withdrawals	Catch-per-unit-effort (CPUE) is a direct calculation from Florida Fish and Wildlife Conservation Commission's Fisheries Independent Monitoring (FIM) catch data, standardized to the gear type used. These data, all the data used for development of the habitat suitability models (HSMs), and the modeling results were considered the best available information at the time for support of the development of the proposed minimum flows. The fish population modeling using habitat suitability was not used as a criterion for development of the proposed minimum flows, rather it was used for consideration of potential effects of implementation of the proposed minimum flows on representative, important taxa populating the system. Because the model does not incorporate some factors, such as competition, predation and fishing pressure that can affect fish and invertebrate distributions, we used the model to assess how habitat suitability zones simulated under baseline condition would change with implementation of the proposed minimum flows. Like all models, the habitat models that we used to assess habitat suitability for several estuarine taxa, include limitations. We augmented Section 5.3.3 in the revised, draft minimum flows report to fully discuss these limitations and modeling uncertainties. However, we continue to think the HSMs developed to support our minimum flows work are well suited for consideration of potential changes in habitat suitability between the baseline flow condition and reduced flow conditions. Regarding this potential habitat change assessment, we note that the flow reduction scenario assessed in support of our minimum flows analyses actually exceeds the allowable flow reductions prescribed by the minimum flows that are proposed for the Lower Peace River/Shell System. A maximum withdrawal limit was not included or used to develop the "minimum flows" scenario used to characterize habitat suitability with the HSM under reduced flow conditions. The HSMs, in their current or an enhanced form may be used for future minimum flow evaluations for the Lower Peace River and Lower Shell Creek. They would likely not be used if alternative tools that provide superior information were to become available.	Yes??	Laura?

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Figure 4-2 difficult to review due color choices	Figure 4-2 was reformatted for the revised, draft minimum flows report to improve clarity.	Yes	Figure much improved
Explain "decreased flow may also contribute to increases in dissolved oxygen concentrations". Add your response to p.76 of the report.	Potential relationships between decreased flows and oxygen concentrations are explained in the papers cited in Section 4.2 of the draft minimum flows report, and we think these relationships are adequately summarized in the section. However, we acknowledge that additional, potential effects of decreased flows could include those associated with an increase in the influence of tidal fluctuations which can lead to the formation of a well-mixed system. Also, if sediment loads from the watershed decrease as a function of reduced flows, water clarity could increase, leading to an increase in primary production. We included additional text associated with these factors in the last paragraph of Section 4.2 of the revised, draft minimum flows report, and split the paragraph into two paragraphs to improve readability of the text.	Partially	The District's response, in Section 4.2 seems to refer to the potential for increased algal growth under low flow conditions, due to some combination of factors (e.g.., increased water clarity, increased residence time). However, algal growth only increases oxygen concentrations in day light hours – more phytoplankton means both higher highs (in the day) **and lower lows** (at night). The impacts of lower flows on oxygen may not be detectable with a data set that is based on daytime samples. Therefore, the concern remains, and the language in the revised MFL report is perhaps overly simplistic.

Table 7 - Panel Comments on Chapter 5 – Resources of Concern and Modeling Tools

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Figure 5-1 could be more clearly identified as to what the graphics are meant to represent, in terms of "exceedance"	Figure 5-1 shows mismatch of fixed-date blocks using a long flow record (1950- 2014) and short flow record (2007- 2014) based on 75% exceedance (red dashed line) and 50% exceedance (blue dashed line). This is the reason for the change from date-based to flow-based blocks that are depicted in Figure 5-2.	Yes	Revised figure is easier to interpret
Timeframe and data sources used to develop the hydrodynamic model	The timeframe used for the hydrodynamic model is briefly described in Section 5.5.1 and in Appendix C. Sources of bathymetric LiDAR and tide data are described in Sections 2.4 and 2.6. Flows are briefly described in Section 2.7 and Sections 5.3.2 and 5.3.3. More information about the hydrodynamic model was added in Section 5.5.1 of the revised, draft minimum flows report.	Yes	Peter?
Need to understand basis for variation in baseflow differences over different time periods	Baseline flow from 1994 through 2006 was used with the PRIM model to simulate groundwater withdrawals and land use change impacts on Peace River flows. Baseline flow from 2007 through 2014, seasonally-corrected based on PRIM model run output, was used with the hydrodynamic model to simulate salinity, depth and water temperature in the Lower Peace/Shell System and Charlotte Harbor. Baseline flow from 1950 through 2014 was used for comparison against gaged flow data for minimum flows status assessment, after seasonal correction has been made to gaged data based on the output of the PRIM model. Please see Section 7.1 and Table 7.1 in the revised, draft minimum flows report for additional information.	Yes	Peter?
Further clarify the meaning of "transitional flow triggers", using simple terminology such as "safety valves" to explain concept.	The currently adopted Lower Peace River minimum flows are based on calendar date- based blocks, and a transitional "flow trigger" (625 cfs) was required when high flows remained depressed due to climatological conditions. The newly proposed minimum flows for the Lower Peace River were developed using flow-based blocks that include flows of 297 cfs and 622 cfs that respectively represent transitions between low to medium and medium to high flows. Similarly, flow transitions for the proposed minimum flows for Lower Shell Creek are 56 cfs and 137 cfs, respectively. Given that the proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed for flow-based blocks associated with transitions from low to medium to high flows, the identification of additional flow triggers" as a "safety valve" to account for out-of-season flows is not necessary.	Yes	Laura & Peter?

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Helpful to include a graphical display of residence time/flushing rates	We agree that transport timescales are useful for discussion of flow effects on dissolved oxygen concentrations and other environmental factors. In our future evaluations of dissolved oxygen and eutrophication in the Lower Peace/Shell System and Upper Charlotte Harbor, we will consider discussion and presentation of transport timescales information.	Partial	Peter?
Language related to impacts of hurricanes based on model runs	For the minimum flow analyses, the hydrodynamic model was run from 2007 through 2014, a period which included major storm and drought events but not hurricanes. In response to this question, we also think it is useful to note that minimum flows are to be established as the limit beyond which further withdrawals would be significantly harmful to the water resources or ecology of the area. Therefore, in the case of extreme high-flow conditions associated with hurricanes and other major storm events, achieving a minimum flow requirement is not anticipated to be an issue. We add, however, that District rules allow for the consideration of public health and safety for implementation of all District rules and policies.	Yes	Peter?
Request for more information related to the hydrodynamic model, including consider the possibility of adding a short chapter which gives a holistic overview on the role of hydrodynamics (flow and water level, salinity, temperature, flushing) on water quality, ecology and fishery.	Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.	Yes	Peter?
Limitations of hydrologic model in ungaged portions of the watershed should be discussed in more detail	Please refer to response 1f in Table 1 for our response to this comment.	Yes	Peter?
Suggested development of a dynamic water quality model, vs. empirical approaches	Please refer to comment 1j in Table 1 for our response to this comment.	Yes	Peter?

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed	Baseline flow for Lower Peace River was estimated based on Peace River Integrated Model (PRIM) outputs. Charlie Creek was simply used as a reference for a multi-decadal comparison of historical flows. The justification for this use of data from Charlie Creek is based on information presented in PB&J (2007) and trend analysis described in Section 5.3.1 of the minimum flows report.	Partially	Reference is made to the PBS&J report (2007) which used Charlie Creek's flow as not impacted by human activities during the 1950? To 1969 period. But, a reference to the natural condition of the watershed (included in the PBS&J report) would say why that's the case.
Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations	As noted in Section 5.3.1, the Peace River Integrated Model (PRIM) was used to investigate effects of climate variability, groundwater pumping, land use changes and other factors on flows in the Peace River. Also, as noted in the report section, flow reductions and increases for differing portions of the watershed are predicted based on the distribution of existing withdrawals, differing degrees of agricultural return flows from groundwater pumping due partly to the tighter confinement on the upper Floridan Aquifer in the lower Peace River area, and differing amounts of excess baseflow associated with agricultural withdrawals. As recommended by the peer review panel, a monthly trend analysis has been conducted and the discussion in Section 5.3.1 of the revised, draft minimum flows report has been updated to indicate why groundwater withdrawals are associated with flow decreases in the Upper Peace watershed and some flow increases in Lower Peace region.	Yes	Section 5.3.1 better explains the totality of issues associated with increased flows in the dry season that are not explained by rainfall.

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed	For development of baseline flow record used in the minimum flow analyses, irrigation efficiencies of 60 and 85% for row crops and citrus, respectively, were used to adjust Shell Creek flows by accounting for groundwater discharge that resulted from agricultural practices in the Shell Creek watershed. These assumed efficiencies are the same as those that were identified in the District's 2010 report on proposed minimum flows for the Lower Peace River and Lower Shell Creek. As mentioned in the revised, draft minimum flows report in Section 5.3.3, the rates and periods of application were taken from the University of Florida Institute of Food and Agricultural Sciences (IFAS) recommendations for nearby Manatee County.	Yes	Reference to UF IFAS as a source of those coefficients is sufficient and appreciated.
Logic for not including a maximum diversion quantity for LSC is not clear	Please refer to response 2i in Table 2.	Partially	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as the protection of the health of the Harbor is concerned. Since it is acknowledged by the District (in their response) that it is unlikely that a potential maximum diversion quantity would be problematic for existing users, it is concerning that the District does not more fully consider the benefits of establishing similar maximum diversion guidance for the Lower Shell Creek as was included for the Lower Peace River.
Basis for 15% as threshold for "significant harm" needs more detail	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	Partially	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any <u>potentially</u> more conservative approaches such as inflection points or threshold values.

Table 8 - Panel Comments on Chapter 6 – Recommended Minimum Flow Values

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?	Yes. The 400 cfs maximum withdrawal for the Lower Peace River is applicable at all times. The only exceptions would occur during a period defined by a policy decision or directive of the District Governing Board, or an Order issued by the District's Executive Director. We further note that hurricanes and king tides are extreme hydrological events and we do not expect PRMRWSA to withdraw water during these events, especially during hurricanes.	Yes	Peter?
Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades	Please refer to response 1l and 2j for our responses to this comment.	Yes?	Peter?
Logic for not including a maximum diversion quantity for LSC is not clear	Please refer to response 2i in Table 2.	Partially	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as the protection of the health of the Harbor is concerned.
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	Partially	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values.

Table 9 – Typos and Comments on Various Appendices

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Appendix E – page 7 – typo	The incorrect usage of the acronym "BF" to refer to the Baseline flow condition used for the habitat suitability modeling will be corrected to "BL" in the appendix or an errata sheet will be added to the appendix to identify the typographical error.	Yes	Laura?
Section 5.1 – typo	The misspelling of "indicators" in Section 5.1 was corrected in the revised, draft minimum flows report.	Yes	Laura?
Page 88 – typo – add "on data from a 13-year period"	We were not able to determine where to add the identified phrase to the report. We will seek further panel guidance to help address this comment.	Yes	Laura?
Page 96 – typo, first sentence "result in"	We corrected this typo (i.e., changed "resulting" to "result in") in the first numbered item listed in Section 5.4 of the revised, draft minimum flows report.	Yes	Laura?
Page 98 – clarification needed	We were not able to determine where clarification was needed on this page of the report. We will seek further panel guidance to help address this comment.	Yes	Laura?
Page 113 – "psu" missing from first sentence of second paragraph, also change spacing	We included the missing "psu" metric in the first sentence of the paragraph after Table 6-4 within Section 6.3 of the revised, draft minimum flows report. We did not, however, note any spacing issues on the section page.	Yes	Laura?
Appendix C should be a separate chapter	Instead of creating a new report chapter, we chose to amend information on the hydrodynamic model development included in Chapter 3 and especially in Chapter 5. Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.	Yes	Peter?
Page 16 – typo in title	Changed "HYDROLGIC" to "HYDROLOGIC" in the Chapter 2 title.	Yes	Peter?
Page 47 replace "is" with "in" first sentence of 3.3.1.2.	We could not locate text on page 47 of the original draft report that seemed to need revision. However, we improved the referenced sentence in the revised, draft minimum flows report by changing "water" to "waters" in the first sentence of Section 3.3.1.2.	Yes	Laura?
Figure 3-11, page 57 – model failed to predict several observed salinity peaks	We think the referenced mismatches are mostly due to errors in the downstream salinity boundary condition during the wet season. We note that the original University of South Florida model for the system had a worse match at the Mote Marine station.	Yes	Peter?

Table 9- continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Caption of Figure 3-27 typo	We deleted "shows" from the caption for Figure 3-27 in the revised, draft minimum flows report.	Yes	Laura?
Use of wind data from nearby airports might be helpful	We looked at these sources for wind data to use for model development and applications but determined there are not enough wind data measurement stations in the region to allow us to describe the spatial variability of the Charlotte Harbor system. For simplicity, we chose to use a single wind station for our analyses. As noted in Appendix C (Chen 2020), we used wind data measured at the SWFWMD Peace River II ET site prior to 2/7/2013 and data from the Mote Marine station after that date. We agree that is would be beneficial to use multiple wind stations for modeling efforts similar to those undertaken for our minimum flow analyses, and we will consider this recommendation for future studies.	Yes	Peter?
Appendix C – typo on page 42	This typographical error was corrected in the revised appendix.	Yes	Laura?
Appendix C – typo on page 44	This typographical error was corrected in the revised appendix.	Yes	Laura?
Appendix C – definition of shoreline e length needed	The shoreline length is the actual length of the shoreline calculated by the hydrodynamic model. The dynamically coupled 3D-2DV model can track shoreline variations and allow the computation of the shoreline length at every time step. In the 3D model, because bottom elevations are defined and given at the four corners of the Cartesian grid, shoreline can be calculated using the bilinear interpolation with known water level if all grid corners are not submerged or emerged. In the 2DV model, the shoreline length can be calculated based on the water level, the grid length, and the river width, which varies with both vertically and longitudinally. This descriptive information for shoreline length was included in the revised version of Appendix C.	Yes	Laura?

Table 9- continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor	Although Caloosahatchee River flow was not directly used as boundary conditions near the mouth of the river, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. Specifically, the effects of Caloosahatchee River flow were indirectly considered in the water level, salinity, and temperature boundary conditions, as the USF model included Caloosahatchee and its flow. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.	Yes	Peter?
Caption for Figure 2-13 needs a space	We corrected this typo by adding a space between "through" and "2018" in the caption for Figure 2-13 in the revised, draft minimum flows report.	Yes	Laura?
Consider adding conversion table	We included a conversion table in the revised, draft minimum flows report.	Yes	Laura?

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: New signup: helms
Date: Friday, June 12, 2020 12:39:44 PM

SWFWMD WebBoards

helms has registered on the forum.

#7237071 DELETE

dhelms@carollo.com

142.196.244.201 (Oviedo, United States)

View Profile

To stop receiving email notifications of new registrations, unsubscribe.

DL

Moderator

112 posts

Doug Leeper

in a few seconds

Posting a revised version of Section 8 (Potential Impacts of Sea Level Rise) of the draft minimum flows report for the Lower Peace River and Lower Shell Creek. The report section was revised to address the peer review panel request that NOAA sea level rise estimates be considered and incorporated into the document.

Revised SLR Section_Draft 2020-06-16.pdf
122.11 KB

Potential Impacts of Sea Level Rise

6.8 Potential Impacts of Sea Level Rise

Commented [DL1]: Yonas Ghile/Doug Leeper (6/15/2020): Sea level rise section updated based on peer review panel recommendation to include analyses/results based on NOAA SLR estimates.

Sea level rise (SLR) may alter available habitat for species with narrow salinity tolerances by decreasing bottom friction and shifting isohaline wedges further upriver (Obeysekera et al. 2011; Chen 2020). Historical trends based on monthly measurements reported by the National Oceanic and Atmospheric Administration (NOAA) at Cedar Key (NOAA 2016a) and St. Petersburg (NOAA 2016b) reveal an average increase of 2.32 mm per year, which is equivalent to a change of 0.76 feet in 100 years (Leeper et al. 2018). Near the Lower Peace/Shell System, at the NOAA Fort Myers station, sea level has increased at a rate of 3.11 mm per year (equivalent to 1.02 feet for a 100-year period) between 1965 and 2018 (NOAA 2020).

The upstream movement of isohalines associated with rising sea level will affect salinity-based habitats under both baseline and withdrawal-impacted flows by shifting isohalines upstream. For minimum flow status assessments, the District (SWFWMD 2015) has typically used sea level change projections recommended by the United States Army Corps of Engineers (USACE) as guidance for the design of projects along the Florida Gulf coast. The USACE (2019) recommends three levels of SLR scenarios. A low scenario based on continuing historical linear increases, an intermediate scenario (NRC Curve I) and a high scenario (NRC curve III). Based on information available from the low, intermediate, and high estimates of SLR at the NOAA Ft. Myers station for the period from 2010 to 2035 are 0.20, 0.33, and 0.76 feet, respectively. We used these three SLR predictions to evaluate potential SLR effects on the Lower Peace/Shell System.

A recent NOAA project, the US Global Change Research Program 2017 (Sweet et al., 2017), provides higher SLR estimates at the NOAA Ft. Myers station, with low, intermediate, and high SLR estimates of 0.38, 0.68, and 1.14 feet, respectively predicted for the period between 2010 and 2035. Following a suggestion by the review panel convened to evaluate the District's proposed minimum flows for the Lower Peace River and Lower Shell Creek, we also used the NOAA 2017 SLR estimates for assessment of potential SLR effects on the Lower Peace/Shell System.

For these analyses, effects of the two sets of three SLR scenarios on low-salinity habitat were compared with the baseline condition used to develop the minimum flows proposed for the Lower Peace River and Lower Shell Creek. For the comparisons, 0.20 and 0.38-foot, 0.33 and 0.68-foot, and 0.76 and 1.14-foot water level increases associated with the low, intermediate and high SLR scenarios were added to the water boundary conditions of the UnLESS model with the assumption that the added water would have the same salinity and temperature values as the top-layer of the model (Chen 2020). The SLR scenario simulations were conducted under baseline flow conditions, i.e., with high sea levels but no-withdrawal impacts, for the period 2007 through 2014. Results from the SLR scenarios were compared with the previously completed baseline conditions scenario associated with current (i.e., recent) sea level conditions.

Greater relative changes from the baseline, current condition were predicted for habitats associated with <2 psu than for the habitats associated with salinities of <5, <10 and <15 psu. Table 6-10 shows the changes in baseline habitats associated within <2 psu for the low, intermediate and high SLR scenarios, relative to the current sea level scenario.

Habitats associated with the low flow Block 1 were the most strongly affected by changing sea level, with the largest decrease predicted for water column volume and shoreline length habitats. Decreases ranging from 13 to 27% were predicted for these two sensitive salinity habitats for the low SLR scenario during Block 1, with habitat decreases from 49 to 70% predicted for the high SLR scenario. Bottom area associated with <2 psu water during Block 1 was also predicted to decrease with increased SLR, with decreases ranging from 4 to 36% relative to the no-SLR condition.

Changes in baseline low salinity habitats associated with increasing SLR scenarios during Blocks 2 and 3 were more moderate than those predicted for Block 1. However, reductions of up to 26% and 34% were simulated for water volume and shoreline length habitats, respectively, under high SLR conditions during Block 2. In addition, baseline low-salinity water volume and bottom area habitats increases of up to 2% and 24% were, respectively predicted during Block 3 under high SLR conditions.

Table 6-10. Percent change in less than 2 psu baseline habitat simulated for the three sea level rise (SLR) scenarios relative to a current sea level scenario by low (Block 1), intermediate (Block 2) and high (Block 3) flow blocks for the Lower Peace/Shell System for the period from 2007 through 2014, using the UnLESS hydrodynamic model. Percent change values based on USACE-recommended SLR predictions and in parentheses, NOAA-recommended SLR predictions.

Scenarios	Percent (%) Change in < 2 psu Salinity Habitat								
	Volume			Bottom Area			Shoreline		
	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3
Low SLR	-13 (-26)	-3 (-7)	0 (0)	-4 (-10)	+2 (+4)	+3 (+7)	-14 (-27)	-5 (-10)	0 (-1)

Commented [DL2]: Previously updated table (added "(%)" here and deleted % from listed values).

Commented [DL3]: (6/15/2020) Table updated again to include NOAA SLR projection-based results and corrections.

Intermediate SLR	-22 (-45)	-6 (-14)	0 (+1)	-8 (-19)	+4 (+6)	+6 (+14)	-24 (-46)	-8 (-19)	-1 (-1)
High SLR	-49 (-65)	-17 (-26)	+1 (+2)	-22 (-36)	+7 (+7)	+16 (+24)	-52 (-70)	-21 (-34)	-2 (-3)

Simulations based on flow reductions from the baseline conditions associated with the low, intermediate and high SLR scenarios were also conducted for the period from 2007 through 2014 to assess whether the percent-of-flow reductions associated with the <2 psu salinity habitats that were used for development of the proposed minimum flows may be exceeded in the future, based on the SLR projections.

Table 6-11 provides habitat changes associated with the currently proposed minimum flows for the Lower Peace River and Lower Shell Creek relative to corresponding baseline conditions under low, intermediate and high sea level rise projections for habitats associated with salinities of <2 psu**.** Water volume habitats associated with a salinity of <2 psu exhibited the most sensitive response to the combined effect of sea level rise and flow reductions associated with the currently proposed minimum flows.

Reducing the baseline conditions projected for each SLR scenario by the 13%, 23% and 40% allowable percent-of-flow reductions associated with the current minimum flows proposed, respectively, for Blocks 1, 2 and 3, is predicted to result in 26% to 36%, 20% to 36%, and 13% to 18% decreases in water volume habitat with a salinity of <2 psu. Decreases in bottom area and shoreline length associated with salinities of <2 psu are also predicted to exceed an allowable 15% change from baseline conditions during Blocks 1 and 2 for all assessed SLR scenarios.

Results from these analyses suggest that SLR will have a significant effect on amplifying the effects of flow reductions on salinity-based habitats during Blocks 1 and 2. The effect of SLR during Block 3 is, however, within the 15% reduction habitat limit except for water volume <2 psu under high SLR scenario, which decreased by 16% and 18%, respectively, based on SLR estimates derived using USACE and NOAA-recommendations. Given the differences between the USACE and NOAA SLR projections, it is important to acknowledge that there is uncertainty in climate models regarding sea level rise projection. Nevertheless, these findings indicate that minimum flows established for the Lower Peace River and Lower Shell Creek may need to be reevaluated within 10 to 15 years after they are adopted into rule, to establish new baseline flow conditions that may occur as a result of SLR.

Table 6-11. Percent change in less than 2 psu baseline habitat for three sea level rise (SLR) scenarios for simulated flow reductions associated with the minimum flows proposed for the Lower Peace River and Lower Shell Creek. Habitat changes were predicted for low (Block 1), intermediate (Block 2) and high (Block 3) flow blocks for the period from 2007 through 2014, using the UnLESS hydrodynamic model. Percent change values based on USACE-recommended SLR predictions and in parentheses, NOAA-recommended SLR predictions.

Scenarios	Percent (%) Change in < 2 psu Salinity Habitat								
	Volume			Bottom Area			Shoreline		
	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3
Low SLR	-26 (-31)	-20 (-23)	-13 (-14)	-21 (-23)	-16 (-18)	-12 (-12)	-23 (-27)	-16 (-20)	-5 (-6)
Intermediate SLR	-30 (-32)	-22 (-27)	-14 (-15)	-23 (-25)	-18 (-21)	-12 (-13)	-26 (-30)	-19 (-24)	-6 (-8)
High SLR	-33 (-36)	-29 (-36)	-16 (-18)	-26 (-30)	-22 (-26)	-13 (-13)	-31 (-33)	-26 (-34)	-8 (-11)

Commented [DL4]: Previously updated table (added "(%)" here and deleted % from listed values).

Commented [DL5]: (6/15/2020) Table updated again to include NOAA SLR projection-based results and corrections.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Tuesday, June 16, 2020 4:00:44 PM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 16 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I should be able to post my comments by tomorrow at 5 pm. Does that work for you, Dave and Peter?

Visit Topic

Or reply directly to this email

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: New signup: ssunder
Date: Wednesday, June 17, 2020 9:09:12 AM

SWFWMD WebBoards

ssunder has registered on the forum.

#7242125 DELETE

ssunder@sfwmd.gov

104.129.205.39 (Charlotte, United States)

View Profile

To stop receiving email notifications of new registrations, unsubscribe.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Friday, June 19, 2020 10:40:30 AM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 19 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Folks:

Was out most of the week - not feeling good. Waiting to hear back on whether or not just a flu, or something a bit more problematic (guess...). Either way, feeling better today than yesterday, and better yesterday than the day before. Hopefully, will be back to near-normal Monday, and will be able to take the edits from Laura and Peter - after discussing them next Monday - and get the final report done on time next week. If anything changes that will scramble the deadline, I'll let you know ASAP.

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Monday, June 22, 2020 12:14:16 AM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 22 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

So sorry to hear you are sick, Dave.

I was not sure if I should upload my edits to the document at this stage or not. I am attaching them here.

Talk to you soon,
Laura

draft table for Final Report_LB.docx
113.41 KB

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Table 1 – Review of District Responses – Overall Panel Comments

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
MFL report was comprehensive, well-written and thorough	We thank the panel for this comment.	No response required	No response required
Basing MFL on specific flows, vs. calendar dates, a good idea	We thank the panel for this comment.	No response required	No response required
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" below for our response to this comment.	This important topic is discussed by the District, and examples given of the reasonableness of the 15% threshold. However, the point remains that while examples can be found that support its application, it is not universally agreed as an acceptable level of impact for all activities (e.g., wetland impacts from construction, impacts to seagrass from dredging, etc.)	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values.
Hydrodynamic modeling represents a substantial improvement from prior efforts	We agree and thank the panel for this comment.	No response required	No response required
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	The proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed in accordance with all requirements for minimum flows establishment included in the Florida Statutes and Water Resource Implementation Rule. The minimum flows established for the river and creek will be implemented in accordance with these and other legislative and regulatory directives through the District's permitting and planning programs and other water management activities. With regard to other water management activities, we note, for example, the District's 2000 Charlotte Harbor Surface Water Improvement and Management (SWIM) plan and the 2020 SWIM plan currently under development for the harbor are mentioned and cited in the revised, draft minimum flows report. The SWIM plans are mentioned in the water quality classification Section 3.1, a newly added Section 3.2.2 on the Pollutant Load Reduction Goal for the Lower Peace River and Section 4.1.5, which addresses seagrasses.	Yes	Additional text clearly spells out the linkages between the MFL's need to protect the very highest flows coming into the Harbor, which requires an attention to high flows that is not as evident for rivers that discharge to locations such as Tampa Bay and the Springs Coast.

Commented [LB1]: Do we want to note the text in the original report is unchanged after our review? (See 1.3.5 both versions). Papers are cited to show 15% is on par with what is done in other systems to provide "high to moderate protection". Still wondering if there is any way to tie the 15% more closely to effects in this specific system.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Uncertainty and accuracy of hydrologic model should be discussed in more detail	We considered the over-estimation of ungaged flow in our previous, 2010 minimum flows study for the Lower Peace/Shell System. We adjusted flow records to get the best ungaged flow estimate based on the previous hydrodynamic study of the Charlotte Harbor system and the flow estimation from those ungaged sites using a surface water model HSPF (Ross et al. 2005). In addition, a drainage ratio method was used to improve streamflow estimation at ungaged sites based on neighboring gaged sites. We acknowledge that there is still uncertainty and inaccuracy in our estimates of ungaged flow, which accounts for about 16% of the entire Peace River watershed drainage. About 84% of the Peace River watershed is gaged by the U.S. Geological Survey and the hydrologic loading to the Lower Peace River from the gaged watershed is reliable. For our minimum flow analyses, we used the best available data, in combination of what we learned from the previous hydrodynamic simulation of the system, and a comparison of two other hydrologic studies of the watershed to estimate the ungaged flow to the Lower Peace River. We added new text addressing ungaged flow estimation to Section 5.3.1 of the revised, draft minimum flows report. Additional response development associated with incorporation of uncertainty information in the body of the minimum flows report and the hydrodynamic modeling appendix (Chen 2020) was also added. Regarding modeling and data uncertainty, we think it is worth emphasizing that as discussed in Section 1.3.7 of the draft minimum flows report, the District uses an adaptive management approach for minimum flows development and implementation, which includes routine status assessments and, as necessary, reevaluation of established minimum flows. When possible, these activities are conducted to attempt to minimize uncertainty in our results and recommendations.	Yes, the level of uncertainty is clearly spelled out in the District response.	The level of uncertainty associated with flow estimates for the ungaged portions of the Peace and Lower Shell Creek are better described in the District response to the Initial Panel Report. However, the revised MFL report titled "revised LPR_Shell Draft Min Flows2020-06-01.pdf" does not yet include the same level of explanation of these uncertainties as the District response laid out in the file "LPR_Shell Peer Rev Staff Resp 2020-06-01". As such, while the Peer Review Panel is now more aware of the reasonableness and appropriateness of the District's approach, the public document may not give others the same level of understanding, at least in the revised MFL report from June 1, 2020.

Commented [LB2]: Agreed. I don't have anything to add here.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
In a changing climate, long-term (50-100 year) averaged flow are not necessarily more indicative of the hydrologic conditions in the next 15-20 years. Should more recent data in the past two decades be given more weight in the development of the baseline flow which was based on the average in 1950-2014?	We think it is best to use hydrologic data (e.g., flow records) for the longest period, within reason, to best capture the climatic variability integrated in the data. As part of baseline flow development for Lower Peace River, historic flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Charlie Creek were examined in multi-decadal blocks (roughly 20 years) as shown in Figure 5.3 of the draft minimum flows report. Per the request of the peer reviewers, we added short-term (2000-2018) mean annual flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Shell Creek to Section 2.7.1 in the revised, draft minimum flows report. In addition, as noted in response 4f in Table 4 below, we added the short term average flow values to Figures 2-12 through 2-16 within the report section. We also note that as part of minimum flow assessment for the Lower Peace River, 5- and 10 -year moving averages were calculated for river flows under baseline, minimum flow and existing flow scenarios (see Table 7.1 in the revised, draft minimum flows report). We also think it is worth emphasizing again that the District uses an adaptive management approach for minimum flows development and implementation that includes routine status assessments and, as necessary, reevaluation of established minimum flows.	Yes? – see next box	Additional text and revised figures include the information requested. Consider excluding the 2000 to 2018 data to create a comparison dataset that is just older data. 2000 to 2018 was added to the graph with the full data set (1950 to 2018), but it would be nice to compare the recent period to the past (exclusively). This new version with three lines could be used for Figures 2-12 through Figure 2-16. Text could then be added that compare the last two decades to the period leading up to them.
Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows on bottom water hypoxia and other phenomena	We included additional information on the importance of hydrodynamics in several sections of the revised, draft minimum flows report. For example, we added text to the end of Section 1.5 that emphasizes the adopted minimum flows for the Lower Peace River and the proposed minimum flows for the river and Lower Shell Creek were based on potential flow-related changes in salinities assessed with hydrodynamic models. In addition, we added a new section (Section 3.2.2) on the pollutant load reduction goal for the Lower Peace River, emphasizing the environmental effects associated with relatively large, seasonal inflows to Charlotte Harbor. We also emphasized the importance of hydrodynamics in text added to the beginning of Section 3.3.1.	Yes	Additional text links the need to protect the very highest inflows to bottom water hypoxia, and the link between bottom water hypoxia and the Harbor's adopted Pollutant Load Reduction Goal.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Consider development of a "dynamic" MFL with real-time now-cast/forecast capabilities	This is an intriguing suggestion, although we do not think development of a dynamic water quality model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. Minimum flows (and minimum water levels) are typically assumed to correspond with long-term hydrologic and environmental conditions, and in the case of the Lower Peace River and Lower Shell Creek were developed based on central tendencies of environmental responses to changes in flow simulated every 90 seconds (or 75 or 72 seconds during a few short periods when storms occurred) for a 7.7 year simulation period. Further, we add that estuarine organisms are adapted to cope with a wide range of salinities and the small changes in salinity, attributable to the currently proposed minimum flows, are unlikely to alter the ecological integrity of the naturally dynamic Lower Peace/Shell System or Charlotte Harbor. We note, however, that established minimum flows can be and are used to develop withdrawal-related conditions in water use permits, on both long-term and short-term bases. For example, in the case of the existing and proposed minimum flows for the Lower Peace River, permit conditions that limit withdrawals based on the previous day's average flow have been and are expected to be successfully implemented. These types of permit conditions are developed by District staff in coordination with permittees based on identified regulatory constraints, such as established minimum flows, the needs of the permittee and other practical considerations.	Yes	Additional text and revised figures include the information requested.

Commented [LB3]: Peter?

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee	Although flow from the Caloosahatchee River was not directly used as boundary conditions near the mouth of the Caloosahatchee River, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. We also think it is valuable to comment on the complexity of inflows that can impact environmental conditions in Charlotte Harbor. For example, proliferation of drift algae and apparent loss of seagrass has been observed along the east wall region of the harbor and may be related to the Red Tide event of 2017-2018. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.	Yes, the issues related to red tide, potential impacts from the Caloosahatchee River and the potential for adverse impacts to the Harbor from sources other than the Peace and Myakka is realized by the District, and included in the response to the Panel's Initial Report.	The District's response to the Panel's comment displays an understanding of the issue of impacts to the Harbor from influences outside the control of the District itself. However, the revised MFL report titled "revised LPR_Shell Draft Min Flows2020-06-01.pdf" does not yet include the same level of discussion as the District response laid out in the file "LPR_Shell Peer Rev Staff Resp 2020-06-01". While the Caloosahatchee River is listed as a model element, the revised MFL report does not include the words "red tide" or references to the sort of impacts described in the District's response to the Panel. As such, while the Peer Review Panel is now more aware of District's awareness of this issue, the public document may not give other reviewers the same level of understanding, at least in the revised MFL report from June 1, 2020.
Analyze the potential impact of sea level rise on the MFL, using best available SLR data for 2020-2050	We did not develop the proposed minimum flows based on future sea level conditions. However, we evaluated the proposed minimum flows under three SLR scenarios to help determine when a future re-evaluation of the minimum flows may be necessary. Although we used U.S. Army Corps of Engineer (USACE) SLR estimates, which are generally lower than those of the National Oceanic and Atmospheric Administration (NOAA), our results supported the need for consideration of a future reevaluation for the Lower Peace River and Lower Shell Creek minimum flows. Future reevaluations will be based on actual sea level conditions and other factors. Following the review panel's suggestion, we have conducted new model runs using NOAA et al. (2017) SLR estimates and are in the process of revising the draft minimum flows report based on an analysis of the new model results.	Yes	Additional text and revised figures include the information requested. I think the tables 6-10 and 6-11 need to be combined for easier comparison. Possibly consider expanding the text that discusses these results.

Commented [LB4]: I agree.

Table 2 – Review of District Responses – Executive Summary

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Definition of "significant harm"	Significant harm and significantly harmful are not defined by the State Legislature. For minimum flows and levels development, each water management district of the state or the Florida Department of Environmental Protection identify specific thresholds or criteria that can be associated with significant harm. We incorporated additional information concerning significant harm into the first paragraph of the Executive Summary in the revised, draft minimum flows report.	Yes	Modified text in both the Executive Summary and Section 1.3 better explains the logic behind the District's interpretation of how "significant harm" is quantified, as well as the background information used to support their approach to quantifying such.
Definition of "best available information"	In accordance with direction provided by the Florida Legislature, District staff use the best available information when determining minimum flows. Determinations regarding the best available information are made by District staff based on professional judgment, with consideration of input from all stakeholders. The best available information includes information that exists at the initiation of the minimum flows development process and information that is acquired specifically to fill data requirements deemed necessary for establishment of the best, defensible minimum flows. We do not think a definition for "best available information" is needed in the Executive Summary of the minimum flows report. However, we added the characterization of "best available information" above to the first paragraph of Section 1.5 in the revised, draft minimum flows report.	Yes	Modified text in both the Executive Summary and Section 1.3.5 and 1.5 better explains the modifier of "best available" when used to construct the MFL using existing data sources

Commented [LB5]: Section 1.3 was not altered.

Commented [LB6]: No new text was added in section 1.3.5.

Commented [LB7]: Was expanded on here.

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Could MFL be set for more than 3 flow blocks?	In theory, any number of flow blocks could be identified and used for minimum flows development and implementation. For practical purposes, use of three flow blocks for the District's development and implementation of minimum flows for water use permitting, planning and water resource protection has proven to be successful. One reason for this success in the management of runoff driven lotic systems is that the flow blocks associated with established minimum flows have been developed with consideration of low, medium and high flow conditions that are known to be important for the physical, chemical and biological functions and structure of riverine systems. We have not conducted analyses associated with development of proposed minimum flows for the Lower Peace River and Lower Shell Creek with varying numbers of flow-based blocks.	Yes	Issue did not need to be included in revised MFL report – was raised for consideration, rather than a requested modification to the draft report.
Concern over LSC low flow conditions	Please refer to response 2i in this table.	Yes – District response is quite clear that the proposed minimum flow guidance is not being met, but that adherence to the guidance contained within the MFL would enhance ecosystem function, compared to existing condition.	The revised MFL report clearly states that the proposed minimum flow guidance for the Lower Shell Creek is not being met, and requires a recovery strategy. Table 7-2 clearly lays out the steps involved in the recovery strategy for the Lower Shell Creek.
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	Please refer to response 1e in Table 1 for our response to this comment.	Yes	Additional text clearly spells out the linkages between the MFL's role in protecting the health of the Lower Peace River, Lower Shell Creek and Charlotte Harbor, in light of concurrent efforts to monitor, protect and/or restore ecological health in those same systems.
Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP's Numeric Nutrient Concentration (NNC) criteria	We analyzed water quality data to explore potential linkages between flow and water quality parameters as is required by the Water Resource Implementation Rule, not to validate or to infer compliance with the Numeric Nutrient Criteria adopted by FDEP	Yes – but the issues associated with incomplete analytical techniques for phosphorus (i.e., reporting only orthophosphate) and chlorophyll-a (i.e., reporting values not corrected for phaeophytin) are problematic.	If water quality data are important enough to collect, analyze and interpret, then they are important enough to do such in a scientifically appropriate form. The WSA should collect all forms of phosphorus, not just orthophosphate, and values for chlorophyll-a should be corrected for phaeophytin. While these points cannot be "corrected" in the MFL report, this issue should be resolved prior to the production of the next MFL update.

Commented [LB8]: This table was not altered.

Commented [LB9]: HBMP program may need to alter the water quality analyses they complete.

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Explain the need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	We agree with the preliminary comments below that are included in the appendices to the Panel's initial peer review report: *"It appears improbable that even maximum water withdrawals would reduce flows sufficient to prevent bottom water hypoxia, which requires an average flow of 10,000 CFS at Arcadia (Stoker et al, 1989 – U.S. Geological Survey Publication XXXXX) – roughly equivalent to total gaged PR flow of about 20,000 cfs."* *"Proposed max withdrawal of 400 cfs represents ca. 2% of the minimum flow from PR watershed required to initiate stratification of 10 ppt in Harbor. Consequently, maximum withdrawal appears to be protective of the "reset button" of bottom water hypoxia."* We have therefore included text in a new Section (3.2.2) and at the beginning of Section 3.3.1 in the revised, draft minimum flows report to emphasize the importance of hydrodynamics and high inflows to Charlotte Harbor.	Yes	Additional text links the need to protect the very highest inflows to bottom water hypoxia, and the link between bottom water hypoxia and the Harbor's adopted Pollutant Load Reduction Goal.
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	This important topic is discussed by the District, and examples given of the reasonableness of the 15% threshold. However, the point remains that while examples can be found that support its application, it is not universally agreed as an acceptable level of impact for all activities (e.g., wetland impacts from construction, impacts to seagrass from dredging, etc.)	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any <u>potentially</u> more conservative approaches such as inflection points or threshold values.

Commented [LB10]: See my previous comment on the 15%.

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health	The proposed minimum flows for Lower Shell Creek are to be implemented based on discharge of a percentage of the inflow to Shell Creek Reservoir. For example, the allowable flow reduction of 23% for Block 2 flows, means that quantity of water equal to 77% of the inflows to the reservoir must be discharged downstream of Hendrickson Dam. This minimum flow is required, irrespective of withdrawals from the reservoir. By associating the minimum flows with rates of inflow to the reservoir, we believe the ecology of Lower Shell Creek is protected from significant harm associated with water withdrawals. Thus, a maximum flow diversion quantity is not required for the Lower Shell Creek. For minimum flows development purposes, Shell Creek is partitioned into the Upper Shell Creek and Lower Shell Creek, separated by Hendrickson Dam. The only significant, permitted withdrawal directly from Shell Creek is associated with the permit issued by the District to the City of Punta Gorda for withdrawals from Shell Creek Reservoir, the portion of the upper creek impounded by the dam. Because the proposed minimum flows for Lower Shell Creek are based on maintaining block-specific percentages of inflow to Shell Creek Reservoir from Upper Shell Creek (and Prairie Creek) and the City's withdrawals are from the multi-year storage in the reservoir storage, a maximum withdrawal limit (i.e., a maximum flow reduction) is not needed for the Lower Shell Creek minimum flows. Also, of note, the permit issued to the City for withdrawals from Shell Creek Reservoir includes monthly and annual average maximum withdrawal limits. We further note that preliminary comments prepared by the panel and used to support development of their initial peer review report, indicated it is "*[n]ot likely that max withdrawals (if set) for LSC would affect threshold values for stratification, but should be mentioned/ acknowledged* We agree with this assertion, and note that for a recent period from 1996 through 2016, mean annual flow in the Lower Peace River, based on flows in the River at Arcadia and flows from Joshua and Horse creeks was 1,279 cfs, while flows to Lower Shell Creek from the same	Not entirely. The District's response is very detailed, and lays out the logic of them not including a maximum flow diversion quantity for Lower Shell Creek. However, the Panel's concerns about the lack of incorporation of a maximum diversion quantity remain. The District's logic for including a maximum diversion quantity of 400 cfs for the Lower Peace River are that diversions above and beyond that amount might be problematic for regions beyond the boundaries of the Lower Peace River – areas out into the Harbor itself. The lack of similar maximum diversion guidance for the Lower Shell Creek does not follow the same logic. While it is true that such quantities are not likely to be reached – not "requiring" such guidance does not diminish the value of developing such guidance.	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as protecting the health of the Harbor is concerned. Since it is acknowledged by the District (in their response) that it is unlikely that a potential maximum diversion quantity for the Lower Shell Creek MFL would be problematic for existing users, it is concerning that the District does not more fully consider the benefits of establishing similar maximum diversion guidance for the Lower Shell Creek as was included for the Lower Peace River.

	period were 388 cfs. This information, which has been included in Section 2.7.1 of the revised, draft minimum flows report, indicates the Shell Creek watershed accounts for only about 25% of the combined flows from the Peace River and Shell Creek watersheds. Based on the information provided here, we do not currently intend to recommend inclusion of a maximum withdrawal cap or limit as part of the proposed minimum flows for Lower Shell Creek. We will, however, continue to assess and, as necessary, consider this recommendation of the panel for potential, future reevaluations of minimum flows established for the creek.		
Say something about potential impact of SLR on the MFL	Sea level rise effects on salinity habitats were assessed in the District's draft minimum flows report to help evaluate the potential need for future reevaluation of the proposed minimum flows. As noted in response 1l in Table 1, analyses based on modeled scenarios associated with SLR predictions from the U.S. Army Corps of Engineers indicated the need for reevaluation of minimum flows established for the Lower Peace River and Lower Shell Creek. We acknowledge the SLR estimates used in our initial analyses are conservative. We have run the hydrodynamic model using the most recent SLR estimates by the National Oceanic and Atmospheric Administration (NOAA et al. 2017), and plan to update the revised, draft minimum flows report based on results of these SLR simulations.	Yes	Additional text and revised figures include the information requested.

Commented [LB11]: See previous comment about table reformat and request for more text discussing these results.

Table 3 – Review of District Responses – Chapter 1 – Introduction

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Formatting of Table 1-1 Improve within cell formatting so text in final column matches up with that in preceding columns	Table 1-1 was reformatted in the revised, draft minimum flows report to align information contained in the final column with that in the preceding column.	Yes	Modified table now formatted correctly
1.2.1 Remove 's from Florida in title	We changed "Florida's" to "Florida" in the Section 1.2.1 title in the revised, draft minimum flows report.	Yes	Modified text now correct

Table 4 – Review of District Responses – Chapter 2 Physical and Hydrologic Description

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Issues related to clarity of maps and figures, for example, enhancing Figure 2-2 so it is better related/connected to a Google street map for the same area. In addition, river scales are discussed or displayed in both miles and km. Perhaps use both metrics each time.	Figures 2.2 and 2.3 have been updated in the revised, draft minimum flows report. In addition, an inset map was included in Figure 2.2, and we clarified the purpose of the inset maps in both Figure 2.2 and Figure 2.3. We acknowledge that differing metrics are used to depict distances in maps included in the draft report. Some of the maps are reproductions from other sources and for this reason, we have continued to present maps using both the U.S. Customary and Standard International metrics.	Yes	Map clarity issue has been addressed. Issues of station locations and listings in both km and miles (as well as station names alone) can be dealt with through expanded text of legend for those figures where other entities have produced the graphics.
Question related to LiDAR sources, for example, is 2017 LiDAR data for the region available from the state?	The LiDAR photogrammetric data collection (Aerial Cartographic of America, Inc. 2015) was conducted primarily to support development of the District's hydrodynamic model for minimum flows development. These data were the best available information of this type in 2016, when the hydrodynamic model was calibrated and validated. State-wide 2019 LiDAR data are currently under review. These and other available data will be considered for use in future evaluations of minimum flows for the Lower Peace/Shell System.	Yes	Laura and Peter…..
Use of NGVD29 vs. NAVD88 for elevation and bathymetry data	Most elevation data and references to elevations in the draft minimum flows report are presented relative to the North American Vertical Datum of 1988 (NAVD88). However, we note that in the descriptive information included in Section 2.1 on page 16 of the draft minimum flows report a reference is made to the Peace River originating in an area of Polk County at an elevation of about 100 feet above the National Geodetic Vertical Datum of 1929. We also note that a water surface elevation of 5.0 feet is included in the description of Shell Creek Reservoir in Section 5.5.3 on page 91 of the draft minimum flows report. For development of the hydrodynamic model for Charlotte Harbor, all the variables associated with elevation are referenced to NAVD88.	Yes	Laura and Peter…..

Commented [LB12]: 2015 seems recent enough to me.

Table 4 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Question about the order of MFL development vs. water supply planning efforts	The development or reevaluation of minimum flows is a relatively lengthy process involving compilation of relevant data, development or refinement of analytical methods and approaches, and coordination with local governments and other affected stakeholders. In addition, the District is typically engaged in the concurrent development of minimum flows for several priority water bodies. For these reasons, there are practical limitations concerning minimum flows development and reevaluation schedules. It is worth noting, however, that minimum flow status assessments are conducted annually, on a five-year basis in conjunction with regional water supply planning, and on an as-needed basis associated with reviews for water use permit applications and renewals. Results from these assessments are part of the District's adaptive management approach to minimum flows development and implementation and can be used to inform decisions regarding the need for minimum flow reevaluation.	Yes	Laura and Peter…..
Definition of flow lag	For the water quality analyses included in the draft minimum flows report, lagged-flows refers to average flows for periods ranging from 2 to 60 days prior to the date of water quality sampling event. Text in Section 3.2.2 in the revised, draft minimum flows report was amended with a parenthetic phrase to clarify what is meant by lagged-flows.	Yes	Peter…..
Consider adding a most recent 10 or 20 year average bar to Figures 2-12 to 2-16 in addition to the one that is the long-term average for POR	Short term average (2000-2018) flows were added to Figures 2-12 to 2-16 in the revised, draft minimum flows report. Please refer to our response 1g in Table 1 for additional information.	Yes	Additional average value now included in Figures 2-12 to 2-16. Consider adding a third line that excludes recent data to show average from only historical data. The past and present can be compared.
Discuss the importance of hydrodynamics and hydrodynamic modeling	The standard format for the District's minimum flow reports involves identification of ecological criteria followed by descriptions of tools used to model or assess the criteria. The hydrodynamic model is identified in the introductory (Chapter 1), where we discuss the substantial data enhancements that were undertaken to improve upon the model that was previously used for development of the existing Lower Peace River minimum flows. To better emphasize the primacy of the hydrodynamic model for our current minimum flows assessments we split the paragraph following	Yes	Peter…..

	the numbered list of major initiatives and updates within Section 1.5 into two paragraphs in the revised, draft minimum flows report, and amended the first of the two paragraphs to clearly indicate that like the previous minimum flows effort, the current effort was based on salinity modeling conducted through hydrodynamic modeling. The hydrodynamic model is also notably mentioned in the system description (Chapter 2), water quality (Chapter 3) and resources of concern/modeling tools (Chapter 5) chapters. As noted in our response to comment 5i in Table 5 below, we also amended the brief discussion of the model in the salinity section of Chapter 3 included in the revised draft minimum flows report. We also emphasized the importance of hydrodynamics in a new section (Section 3.2.2) on the pollutant load reduction goal for the Lower Peace River and new text added to the beginning of the descriptive water quality information section (Section 3.3.1). Finally, in Chapter 5 of the revised minimum flows report, the development and application of the UnLESS model to the Charlotte Harbor system has been substantially expanded to include more information on model setup, input data, model calibration and verifications and modeling uncertainty. As noted in the draft minimum flows report, detailed information on the model and its use are also discussed in Chen (2020) which is included as Appendix C to the report.		
Additional and more detailed description of hydrodynamic model elements needed	Chapter 5 is expanded to include a brief description of the hydrodynamic model for Charlotte Harbor. Please also refer to our response 4g in this table.	Yes	Peter…..

Table 5 – Review of District Responses - Chapter 3 Water Quality

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Salinity data presented in Figure 3-3 not that helpful	We note that variability in the salinity data presented in Figure 3-3 can be attributed to seasonal, inter-annual variation and other factors. However, as noted in the report text associated with the figure, we think the figure is helpful in portraying longitudinal and seasonal salinity variation in the Lower Peace River as well as salinity differences in the water column at selected sites.	Sort of?	I agree the figure is helpful to show variability longitudinally along the river and the dry season and the wet season (which are not defined in the figure caption). Data are inclusive of 1976 to 2016. This does not tell us anything about pre and post MFL conditions. Now that the blocks are not date-based, how important are wet/dry seasons? Something that correlates rainfall and salinity might be more interesting and the longitudinal comparisons could remain.
Influences of factors other than flow on concentrations of chlorophyll a	We added additional text in Section 3.3.1.3 of the revised, draft minimum flows report.	Yes	Section 3.3.1.3 gives a more thorough review of factors that can influence chlorophyll-a than in the prior report. Might be good to add something how the data not being corrected for phaeophytin affects interpretation.
Values of phosphorus only shown for orthophosphorus	Total phosphorus measurement for the Hydrobiological Monitoring Program (HBMP) was terminated in 2003. We investigated our use of ortho-phosphorus vs. total phosphorus by conducting scatterplot analyses for data from 5 stations for the period 1996 through 2003. As indicated in the figures below, about 81-88% of total phosphorus is attributed to ortho-phosphorus, suggesting that results expected for total phosphorus may generally be similar to those determined for ortho-phosphorus. We included information concerning the current measurement of ortho-phosphorus for the Peace River HBMP and the correlation between orthophosphorus and total phosphorus in Section 3.3.1.5 of the revised, draft minimum flows report.	Yes, but the draft final report does not include the level of detail included in the District's response to the Panel.	The inclusion of only dissolved inorganic forms of phosphorus is problematic. While this is not the District's data collection effort, it is a data collection effort that is conducted for compliance with a water supply permit, to ensure that withdrawals do not adversely impact ecosystem health. The percentage of phosphorus that is orthophosphate may average 80%, but that value likely varies over the length of the river (as does NOx as a function of TN) and with different seasons. This data shortcoming should be pointed out and addressed prior to the analysis of data for later reports.
Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite	We added results for total nitrogen to Section 3.3.1.4.	Yes	Revised results and analysis are in-line with request.
Definition needed for "flow-lag"	Please see response 4e in Table 4 for our response to this comment.	Yes	Peter
Various figures have legends that appear to be mislabeled	Numerous figure legends were corrected in the revised, draft minimum flows report.	Yes??	Captions have generally improved. Define wet and dry season in figure captions. Format as "NOx". In Table 3-7 add (or replace with) Rkm

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			to station number so readers know the upstream/downstream position. Figure 3-17 shows the stations are not number sequentially. Figures 3-19, 3-21, 3-23, 3-25, 3-27 all could have Rkm on x-axis. Remove "shows" 3-27.
Figure 3-22 caption says it is dissolved oxygen, but y-axis says chl a	The Figure 3-22 caption was corrected in the revised, draft minimum flows report to indicate that the plot shows chlorophyll concentrations.	Maybe no…	Figure legend now correct in terming the data chlorophyll- but the legend refers to "surface, midwater and bottom" values? Is that correct?

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Commented [LB14]: Yes, it appears the caption needs another edit as it looks like chlorophyll was not measured at three places in the water column.

Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Mislabeling of y-axis on Figure 3.23	The y-axis label for Figure 3-23 was changed from "Salinity (PSU)" to "Chlorophyll" in the revised, draft minimum flows report.	Yes	Label changed as requested
Importance of hydrodynamic model description	We agree that description of the hydrodynamic model and its primacy for the analyses presented in our draft minimum flows report should be emphasized. As noted in response 4g in Table 4, we modified text in Section 1.5 of revised minimum flows report to emphasize our prior and current use of hydrodynamic modeling to support minimum flows development for the Lower Peace River and Lower Shell Creek. In addition, we substantially expanded the presentation of model information included in Chapter 5. We also think it is appropriate to discuss the development and use of a hydrodynamic model for assessing flow-related changes in salinity in the Lower Peace/Shell System in Section 3.3.2.1 of the draft minimum flows report, which addresses system salinity. Our mention of the hydrodynamic model in the water quality chapter (Chapter 3) in the original draft report, and additional related text added to the revised draft report serve as another useful preview of the more detailed discussion of the model in Chapter 5 and the referenced model report, Chen (2020), included in the report appendices. We also note that within Section 2.3.2.1 of the revised, draft minimum flows report, we substantially modified the text to emphasize our efforts to develop and use the best available information, in this case the hydrodynamic model, for minimum flows development.	Yes	Peter??
Additional and more detailed description of hydrodynamic model elements needed	In addition to modifications to the text in Section 3.2.2.1 of the draft, revised minimum flows report noted in our previous response 5i in this table, we also amended text associated with the model in Chapter 5 and in the model report (Chen 2020) included as Appendix C to the report.	Yes	Peter??
More refined explanation needed for isohaline location trend analyses	Please refer to response 5o in this table.	Yes?	Test could be expanded slights here. The table footnote does help.
Better description of results shown Figures 3-12 to 3-16	To improve presentation of the correlation analyses results presented in Figures 3-12 through 3-16, we amended the figure captions within Sections 3.3.2.2 through 3.3.2.5 of the revised, draft minimum flows report. We also modified the statistical methods description included in Section 3.3.2 to better describe the lagged-flows used in the analysis and to summarize our interpretation of the correlation statistics derived from the analyses and presented in Figure 3-12 through 3-16.	Yes	Description more detailed and labels now accurate for the displayed data

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Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Value of developing dynamic water quality model, vs. empirical approaches	As noted in response 1j in Table 1 we understand the potential value of a dynamic water quality model for the Lower Peace/Shell System, but do not think development of such a model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. See response 1j for additional information concerning our response.	Yes	Peter??
Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included	Lower Shell Creek and Lower Peace River flows were combined for depiction of the flow-salinity relationships for Stations 6.6 and 15.5 in Figure 3-11 in the revised, draft minimum flows report. In addition, the figure caption and associated text within Section 3.3.2.1 of the revised, draft minimum flows report were updated.	Partially	The salinity data now are plotted against the totality of inflows – from both the Lower Peace River and Shell Creek. However, the graphic does not display equations, statistical significance, etc. The text says that "…salinity was more responsive to freshwater inflow…" at upstream stations without defining what that means. I would suggest saying that "…variation in flow explained a greater amount of the variability in salinity at upstream stations, but was statistically significant at all stations examined here."
Table 3-1 – improve explanation of location of isohaline location trends	We note that the text on page 47 preceding and which refers to Table 3-1 indicates the trend analysis identified an upstream movement of the 0 psu and 20 psu isohalines for period from 1984 through 2016. To improve understanding of the information presented in the table, we added a footnote to Table 3-1 in the revised draft minimum flows report to characterize our interpretation of the presented, significant statistics, i.e., that positive, significant statistics indicate upstream isohaline movement. While revising Table 3-1, we determined that changes to clarify the presented statistical results and better indicate that the results pertain to the Lower Peace River (and in some cases Charlotte Harbor near the mouth of the river) were needed for several other tables and figure within Chapter 3. So, we revised captions and/or footnotes for several additional tables and figures in the revised draft minimum flows report, including Tables, 3-2, 3-3, 3-4 3-5, 3-6 and 3-7, and Figures 3-3, 3-4, 3-5,3-6, 3-7, 3-8, 3-9 and 3-10.	Yes	Table 3-1 and preceding text explains that the trend test was for detecting an upstream movement of the location of the 0 and 20 psu isohalines. The text regarding Table 3-1 is incorrect. There was only a trend for 0 and 20 psu, but the text says there was one for all four isohaline locations.

Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Table 3-2 ,3, 4 to 3-7 and 3-12 to 3-16 – improve explanation of summertime hypoxia development and other data presentations	The text in Section 3.3.1.2 preceding Table 3-2 notes the trend analysis indicated dissolved oxygen concentrations in surface waters associated with the 0 psu isohaline increased for period from 1984 through 2016. We do not think the information presented in the table can be used to assert there is no hypoxia in surface waters of the Lower Peace River during the wet, summer season. However, as noted in responses 5i and 5o in this table, we amended the captions, column headers, and/or footnotes for Tables 3-2, 3-3, 3-4 through 3-7 and Figures 3-12 through 3-16 within the revised, draft minimum flows report. We also updated the statistical methods description included in Section 3.3.2 within the revised, draft minimum flows report to enhance presentation of the results.	Yes	Figures 3-3 and 3-4 seem to be portraying different versions of the same phenomena – salinity is apt to be higher in the bottom waters, and dissolved oxygen lower, particularly in the wet season. This is all useful information, but it begs the question of is there "too much" data to interpret. Fixed station salinity, temp and DO for bottom and surface waters as well as isohaline sampling for the same parameters for surface and bottom waters. Does it make sense to continue to collect both? Isn't the value of the isohaline sampling the locations alone? Do we really need what appears to be redundant water quality data? I disagree here. I think the fixed geographic locations and the salinity-based stations serve different purposes and both are important to keep.

Table 6 – Review of District Responses - Panel Comments on Chapter 4 Ecological Resources

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Plant community data set from 1998 is problematic	We are not aware of any recent, comprehensive, species or genus-level vegetation maps for the Lower Peace/Shell System that would represent an update to the detailed information presented in Figure 4-1 in the original, draft minimum flows report. However, we developed and included a replacement, coarser-level vegetation map based on the 2017 SWFWMD land use/cover GIS layers in the revised, draft minimum flows report. In addition, we anticipate considering vegetation data collection and mapping needs for future evaluations of the system.	Yes	Updated information is much more helpful
Status and trends in seagrass coverage in the LPR over time	The District has been mapping seagrasses in Charlotte Harbor using aerial photography since 1988. Others have attempted to use older imagery to infer historical seagrass extent, but with very limited success. For the Tidal Peace River segment of Charlotte Harbor, recent seagrass extent (estimated for 2014, 2016 and 2018) is greater today than any time since 1988, as shown below. We included this figure and associated text in Section 4.1.5 of the revised, draft minimum flows report to augment the presented seagrass information.	Yes	Inclusion of such information is appreciated

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Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Concern over shift in HBMP focus to physical factors, rather than fish communities, macroinvertebrates, and/or macroalgae	In 1996, the Charlotte Harbor Hydrobiological Monitoring Program (HBMP) Scientific Review Panel reviewed the ongoing elements of the HBMP program and recommended several changes to the monitoring program study elements. The Panel recommended that HBMP monitoring should primarily focus on assessing long-term trends in key physical, chemical, and biological characteristics that can be directly linked to potential effects associated with withdrawals at the Peace River Manasota Regional Water Supply Authority's Peace River Facility. They also noted that less effort should be focused on indirect biological indicators that are not intended to evaluate influence of withdrawals, once a baseline level of information has been collected. As summarized in Appendix A of the Peace River Hydrobiological Monitoring Program 2016 HBMP Comprehensive Report (JEI 2017), subsequent meetings of the HBMP Scientific Review panel have continued to shape the current HBMP. Reference to this summary document has been included in Section 3.3.1 of the revised, draft minimum flows report to provide additional information concerning the evolution of the HBMP. We think the biological and other information collected to date and summarized in our draft minimum flows report is sufficient for development of recommended minimum flows for the Lower Peace/Shell System. We note that this information has been collected in support of the required HBMP, other monitoring programs, and studies specifically undertaken by the District to directly support minimum flows development. However, in support of our adaptive management approach to minimum flows development and implementation, we continue to support ongoing data collection efforts for the Lower Peace/Shell system and will consider additional sampling and analysis of biological data as needed, for future minimum flow reevaluations.	Yes	The report has no new text on this topic. The explanation here is good, but maybe something should be added to report explaining this shift away from biological indicators.

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Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Fisheries Independent Monitoring newest data from 2016 not included in the modeling approach (Appendix E) or compared to data collected through 2013	At the time of model development, the best available data were used. However, consideration of more recent data has been requested from the Florida Fish and Wildlife Conservation Commission (FWC) and a comparison of abundance of the taxa and size classes examined in this model will be performed to determine if there are any significant differences between modeled years and more recent sampling years. Results from this analysis will be included in future updates to the draft minimum flows report. As noted in Section 4.2.1 of the draft minimum flows report, Call et al., (2013) performed a survey on fish communities within the Lower Peace River throughout 2007 to 2010 and found no temporal variation in fish communities across years, suggesting a generally stable system within the river. To augment presentation of information on the fish assemblage in the Lower Peace/Shell System, the descriptive FWC Fisheries-Independent Monitoring data from 2018 presented in Section 4.2.1 of our original draft minimum flows report has been replaced with the most recent available data (2018) in the revised, draft minimum flows report.	Yes	Yes, good to have newer data from 2018.

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Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Should endangered species, such as sawfish and manatees, be included in MFL assessments?	Endangered and listed species should be and are considered when developing minimum flows. For example, in Section 4.2.1 of the draft minimum flows report we noted that juvenile sawfish (<3 years of age) are able to move in response to salinity fluctuations with high site fidelity upon a return to baseline conditions, with large-scale movement most notable after significant freshwater inflow (>500 cubic meters per second) from tropical disturbances (Poulakis 2016). We also noted that Sawfish movements examined in the Caloosahatchee River demonstrate downstream movement when salinities approach 0 psu and upstream movement at salinities approaching 30 psu (Poulakis 2013). Therefore, protection of the sensitive salinity habitat would not positively affect their distribution, although maintenance of natural freshwater flows would benefit their capacity to locate nursery grounds (Poulakis 2016). Further we note that the species chosen for the HSM modeling used to support our minimum flow analyses reflect those with affinities for low salinity habitats. A strong positive correlation between Common Snook (*Centropomus undecimalis*) abundance and flow was observed in the Lower Peace River (Blewett 2017). Body condition was also elevated during years of increased river flow. This increased abundance and condition with increased flow was hypothesized to be related to enhanced prey availability with greater floodplain inundation. Per the floodplain inundation analysis performed by HSW (2016) in support of our minimum flows work (Appendix D), the proposed minimum flows will not significantly impact total inundated floodplain wetland area associated with the baseline flow condition, and are therefore unlikely to impact the abundance or condition of Common Snook. For development of minimum flows for river systems or creeks dominated by spring flow we typically consider manatee usage of thermal refuges during acute and chronic cold-water events. Given the lack of spring discharge to the Lower Peace/Shell system we do not think assessment of potential, flow-related changes in thermally-favorable habitat usage by manatees is necessary for our development of minimum flows for the river and creek.	The response is clarifying.	Would like to see some of the information provided in the response added to the report text that was not changed. The parts about juvenile and age-specific salinity preferences of sawfish would fill in the information I was missing when reading the report.

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Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
In Appendix E it is stated that "predicted CPUE grids" were derived from catch data and these predictions were used to generate the population estimates which were used to model the effect of water withdrawals	Catch-per-unit-effort (CPUE) is a direct calculation from Florida Fish and Wildlife Conservation Commission's Fisheries Independent Monitoring (FIM) catch data, standardized to the gear type used. These data, all the data used for development of the habitat suitability models (HSMs), and the modeling results were considered the best available information at the time for support of the development of the proposed minimum flows. The fish population modeling using habitat suitability was not used as a criterion for development of the proposed minimum flows, rather it was used for consideration of potential effects of implementation of the proposed minimum flows on representative, important taxa populating the system. Because the model does not incorporate some factors, such as competition, predation and fishing pressure that can affect fish and invertebrate distributions, we used the model to assess how habitat suitability zones simulated under baseline condition would change with implementation of the proposed minimum flows. Like all models, the habitat models that we used to assess habitat suitability for several estuarine taxa, include limitations. We augmented Section 5.5.3 in the revised, draft minimum flows report to fully discuss these limitations and modeling uncertainties. However, we continue to think the HSMs developed to support our minimum flows work are well suited for consideration of potential changes in habitat suitability between the baseline flow condition and reduced flow conditions. Regarding this potential habitat change assessment, we note that the flow reduction scenario assessed in support of our minimum flows analyses actually exceeds the allowable flow reductions prescribed by the minimum flows that are proposed for the Lower Peace River/Shell System. A maximum withdrawal limit was not included or used to develop the "minimum flows" scenario used to characterize habitat suitability with the HSM under reduced flow conditions. The HSMs, in their current or an enhanced form may be used for future minimum flow evaluations for the Lower Peace River and Lower Shell Creek. They would likely not be used if alternative tools that provide superior information were to become available.	Yes, good explanation	They updated 5.5.3. It says 1880s in the bulleted list at the end of the section. Probably this is meant to be 1980s? Otherwise, good updates.

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Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Figure 4-2 difficult to review due color choices	Figure 4-2 was reformatted for the revised, draft minimum flows report to improve clarity.	Yes	Figure much improved, but make larger.
Explain "decreased flow may also contribute to increases in dissolved oxygen concentrations". Add your response to p.76 of the report.	Potential relationships between decreased flows and oxygen concentrations are explained in the papers cited in Section 4.2 of the draft minimum flows report, and we think these relationships are adequately summarized in the section. However, we acknowledge that additional, potential effects of decreased flows could include those associated with an increase in the influence of tidal fluctuations which can lead to the formation of a well-mixed system. Also, if sediment loads from the watershed decrease as a function of reduced flows, water clarity could increase, leading to an increase in primary production. We included additional text associated with these factors in the last paragraph of Section 4.2 of the revised, draft minimum flows report, and split the paragraph into two paragraphs to improve readability of the text.	Partially	The District's response, in Section 4.2 seems to refer to the potential for increased algal growth under low flow conditions, due to some combination of factors (e.g.., increased water clarity, increased residence time). However, algal growth only increases oxygen concentrations in day light hours – more phytoplankton means both higher highs (in the day) **and lower lows** (at night). Some discussion of algae's day/night impacts on DO is warranted. The impacts of lower flows on oxygen may not be detectable with a data set that is based on daytime samples. Therefore, the concern remains, and the language in the revised MFL report is perhaps overly simplistic.

Table 7 - Panel Comments on Chapter 5 – Resources of Concern and Modeling Tools

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Figure 5-1 could be more clearly identified as to what the graphics are meant to represent, in terms of "exceedance"	Figure 5-1 shows mismatch of fixed-date blocks using a long flow record (1950- 2014) and short flow record (2007- 2014) based on 75% exceedance (red dashed line) and 50% exceedance (blue dashed line). This is the reason for the change from date-based to flow-based blocks that are depicted in Figure 5-2.	Yes	Figure 5-1 is unchanged. Figure 5-2 is also unchanged. Again the recent data is included in "the long flow record". Again would like to see three lines (full dataset, past, and recent).
Timeframe and data sources used to develop the hydrodynamic model	The timeframe used for the hydrodynamic model is briefly described in Section 5.5.1 and in Appendix C. Sources of bathymetric LiDAR and tide data are described in Sections 2.4 and 2.6. Flows are briefly described in Section 2.7 and Sections 5.3.2 and 5.3.3. More information about the hydrodynamic model was added in Section 5.5.1 of the revised, draft minimum flows report.	Yes	Peter?
Need to understand basis for variation in baseflow differences over different time periods	Baseline flow from 1994 through 2006 was used with the PRIM model to simulate groundwater withdrawals and land use change impacts on Peace River flows. Baseline flow from 2007 through 2014, seasonally-corrected based on PRIM model run output, was used with the hydrodynamic model to simulate salinity, depth and water temperature in the Lower Peace/Shell System and Charlotte Harbor. Baseline flow from 1950 through 2014 was used for comparison against gaged flow data for minimum flows status assessment, after seasonal correction has been made to gaged data based on the output of the PRIM model. Please see Section 7.1 and Table 7.1 in the revised, draft minimum flows report for additional information.	Yes	Peter?
Further clarify the meaning of "transitional flow triggers", using simple terminology such as "safety valves" to explain concept.	The currently adopted Lower Peace River minimum flows are based on calendar date- based blocks, and a transitional "flow trigger" (625 cfs) was required when high flows remained depressed due to climatological conditions. The newly proposed minimum flows for the Lower Peace River were developed using flow-based blocks that include flows of 297 cfs and 622 cfs that respectively represent transitions between low to medium and medium to high flows. Similarly, flow transitions for the proposed minimum flows for Lower Shell Creek are 56 cfs and 137 cfs, respectively. Given that the proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed for flow-based blocks associated with transitions from low to medium to high flows, the identification of additional flow triggers" as a "safety valve" to account for out-of-season flows is not necessary.	Yes	Laura & Peter?

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Commented [LB17]: I'm fine here.

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Helpful to include a graphical display of residence time/flushing rates	We agree that transport timescales are useful for discussion of flow effects on dissolved oxygen concentrations and other environmental factors. In our future evaluations of dissolved oxygen and eutrophication in the Lower Peace/Shell System and Upper Charlotte Harbor, we will consider discussion and presentation of transport timescales information.	Partial	Peter?
Language related to impacts of hurricanes based on model runs	For the minimum flow analyses, the hydrodynamic model was run from 2007 through 2014, a period which included major storm and drought events but not hurricanes. In response to this question, we also think it is useful to note that minimum flows are to be established as the limit beyond which further withdrawals would be significantly harmful to the water resources or ecology of the area. Therefore, in the case of extreme high-flow conditions associated with hurricanes and other major storm events, achieving a minimum flow requirement is not anticipated to be an issue. We add, however, that District rules allow for the consideration of public health and safety for implementation of all District rules and policies.	Yes	Peter?
Request for more information related to the hydrodynamic model, including consider the possibility of adding a short chapter which gives a holistic overview on the role of hydrodynamics (flow and water level, salinity, temperature, flushing) on water quality, ecology and fishery.	Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.	Yes	Peter?
Limitations of hydrologic model in ungaged portions of the watershed should be discussed in more detail	Please refer to response 1f in Table 1 for our response to this comment.	Yes	Peter?
Suggested development of a dynamic water quality model, vs. empirical approaches	Please refer to comment 1j in Table 1 for our response to this comment.	Yes	Peter?

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed	Baseline flow for Lower Peace River was estimated based on Peace River Integrated Model (PRIM) outputs. Charlie Creek was simply used as a reference for a multi-decadal comparison of historical flows. The justification for this use of data from Charlie Creek is based on information presented in PB&J (2007) and trend analysis described in Section 5.3.1 of the minimum flows report.	Partially	Reference is made to the PBS&J report (2007) which used Charlie Creek's flow as not impacted by human activities during the 1950? To 1969 period. But, a reference to the natural condition of the watershed (included in the PBS&J report) would say why that's the case.
Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations	As noted in Section 5.3.1, the Peace River Integrated Model (PRIM) was used to investigate effects of climate variability, groundwater pumping, land use changes and other factors on flows in the Peace River. Also, as noted in the report section, flow reductions and increases for differing portions of the watershed are predicted based on the distribution of existing withdrawals, differing degrees of agricultural return flows from groundwater pumping due partly to the tighter confinement on the upper Floridan Aquifer in the lower Peace River area, and differing amounts of excess baseflow associated with agricultural withdrawals. As recommended by the peer review panel, a monthly trend analysis has been conducted and the discussion in Section 5.3.1 of the revised, draft minimum flows report has been updated to indicate why groundwater withdrawals are associated with flow decreases in the Upper Peace watershed and some flow increases in Lower Peace region.	Yes	Section 5.3.1 better explains the totality of issues associated with increased flows in the dry season that are not explained by rainfall.

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed	For development of baseline flow record used in the minimum flow analyses, irrigation efficiencies of 60 and 85% for row crops and citrus, respectively, were used to adjust Shell Creek flows by accounting for groundwater discharge that resulted from agricultural practices in the Shell Creek watershed. These assumed efficiencies are the same as those that were identified in the District's 2010 report on proposed minimum flows for the Lower Peace River and Lower Shell Creek. As mentioned in the revised, draft minimum flows report in Section 5.3.3, the rates and periods of application were taken from the University of Florida Institute of Food and Agricultural Sciences (IFAS) recommendations for nearby Manatee County.	Yes	Reference to UF IFAS as a source of those coefficients is sufficient and appreciated.
Logic for not including a maximum diversion quantity for LSC is not clear	Please refer to response 2i in Table 2.	Partially	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as the protection of the health of the Harbor is concerned. Since it is acknowledged by the District (in their response) that it is unlikely that a potential maximum diversion quantity would be problematic for existing users, it is concerning that the District does not more fully consider the benefits of establishing similar maximum diversion guidance for the Lower Shell Creek as was included for the Lower Peace River.
Basis for 15% as threshold for "significant harm" needs more detail	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	Partially	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values.

Table 8 - Panel Comments on Chapter 6 – Recommended Minimum Flow Values

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?	Yes. The 400 cfs maximum withdrawal for the Lower Peace River is applicable at all times. The only exceptions would occur during a period defined by a policy decision or directive of the District Governing Board, or an Order issued by the District's Executive Director. We further note that hurricanes and king tides are extreme hydrological events and we do not expect PRMRWSA to withdraw water during these events, especially during hurricanes.	Yes	Peter?
Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades	Please refer to response 1l and 2j for our responses to this comment.	Yes?	Peter?
Logic for not including a maximum diversion quantity for LSC is not clear	Please refer to response 2i in Table 2.	Partially	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as the protection of the health of the Harbor is concerned.
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	Partially	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values.

Table 9 – Typos and Comments on Various Appendices

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Appendix E – page 7 – typo	The incorrect usage of the acronym "BF" to refer to the Baseline flow condition used for the habitat suitability modeling will be corrected to "BL" in the appendix or an errata sheet will be added to the appendix to identify the typographical error.	Yes	We did not receive revised appendices. I assume it is fine now.
Section 5.1 – typo	The misspelling of "indicators" in Section 5.1 was corrected in the revised, draft minimum flows report.	Yes	Yes
Page 84 – typo – add "on data from a 13-year period"	We were not able to determine where to add the identified phrase to the report. We will seek further panel guidance to help address this comment.	No	Still needs to be fixed. First sentence of second paragraph.
Page 96 – typo, first sentence "result in"	We corrected this typo (i.e., changed "resulting" to "result in") in the first numbered item listed in Section 5.4 of the revised, draft minimum flows report.	Yes	Yes
Page 95 – clarification needed	We were not able to determine where clarification was needed on this page of the report. We will seek further panel guidance to help address this comment.	Yes	It's probably fine. Might be better to say freshwater plants that tolerate "some salinity".
Page 117 – "psu" missing from first sentence of second paragraph, also change spacing	We included the missing "psu" metric in the first sentence of the paragraph after Table 6-4 within Section 6.3 of the revised, draft minimum flows report. We did not, however, note any spacing issues on the section page.	Yes and no	psu added, add spaces between less than signs and the number 2. (Check for spacing around < and > throughout.)
Appendix C should be a separate chapter	Instead of creating a new report chapter, we chose to amend information on the hydrodynamic model development included in Chapter 3 and especially in Chapter 5. Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.	Yes	Peter?
Page 16 – typo in title	Changed "HYDROLGIC" to "HYDROLOGIC" in the Chapter 2 title.	Yes	Yes
Page 47 replace "is" with "in" first sentence of 3.3.1.2.	We could not locate text on page 47 of the original draft report that seemed to need revision. However, we improved the referenced sentence in the revised, draft minimum flows report by changing "water" to "waters" in the first sentence of Section 3.3.1.2.	Yes	Yes, was fixed and not highlighted.
Figure 3-11, page 57 – model failed to predict several observed salinity peaks	We think the referenced mismatches are mostly due to errors in the downstream salinity boundary condition during the wet season. We note that the original University of South Florida model for the system had a worse match at the Mote Marine station.	Yes	Peter?

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Table 9- continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Caption of Figure 3-27 typo	We deleted "shows" from the caption for Figure 3-27 in the revised, draft minimum flows report.	No	Highlighted but not removed.
Use of wind data from nearby airports might be helpful	We looked at these sources for wind data to use for model development and applications but determined there are not enough wind data measurement stations in the region to allow us to describe the spatial variability of the Charlotte Harbor system. For simplicity, we chose to use a single wind station for our analyses. As noted in Appendix C (Chen 2020), we used wind data measured at the SWFWMD Peace River II ET site prior to 2/7/2013 and data from the Mote Marine station after that date. We agree that is would be beneficial to use multiple wind stations for modeling efforts similar to those undertaken for our minimum flow analyses, and we will consider this recommendation for future studies.	Yes	Peter?
Appendix C – typo on page 42	This typographical error was corrected in the revised appendix.	Yes	We did not receive revised appendices. I assume it is fine now.
Appendix C – typo on page 44	This typographical error was corrected in the revised appendix.	Yes	We did not receive revised appendices. I assume it is fine now.
Appendix C – definition of shoreline e length needed	The shoreline length is the actual length of the shoreline calculated by the hydrodynamic model. The dynamically coupled 3D-2DV model can track shoreline variations and allow the computation of the shoreline length at every time step. In the 3D model, because bottom elevations are defined and given at the four corners of the Cartesian grid, shoreline can be calculated using the bilinear interpolation with known water level if all grid corners are not submerged or emerged. In the 2DV model, the shoreline length can be calculated based on the water level, the grid length, and the river width, which varies with both vertically and longitudinally. This descriptive information for shoreline length was included in the revised version of Appendix C.	Yes	We did not receive revised appendices. I assume it is fine now.

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Table 9- continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor	Although Caloosahatchee River flow was not directly used as boundary conditions near the mouth of the river, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. Specifically, the effects of Caloosahatchee River flow were indirectly considered in the water level, salinity, and temperature boundary conditions, as the USF model included Caloosahatchee and its flow. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.	Yes	Peter?
Caption for Figure 2-13 needs a space	We corrected this typo by adding a space between "through" and "2018" in the caption for Figure 2-13 in the revised, draft minimum flows report.	Yes	Yes
Consider adding conversion table	We included a conversion table in the revised, draft minimum flows report.	Yes	Should have Rkm

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Monday, June 22, 2020 8:50:07 AM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 22 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Good morning Dave,

Hope you are feeling better today!

I attach my edits to the document here.

Peter

draft table for Final Report 6-12-2020-PS.docx
100.67 KB

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Table 1 – Review of District Responses – Overall Panel Comments

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
MFL report was comprehensive, well-written and thorough	We thank the panel for this comment.	No response required	No response required
Basing MFL on specific flows, vs. calendar dates, a good idea	We thank the panel for this comment.	No response required	No response required
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" below for our response to this comment.	This important topic is discussed by the District, and examples given of the reasonableness of the 15% threshold. However, the point remains that while examples can be found that support its application, it is not universally agreed as an acceptable level of impact for all activities (e.g., wetland impacts from construction, impacts to seagrass from dredging, etc.)	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values. However, there is lack of scientific evidence that 15% should be applied to all habitats uniformly.
Hydrodynamic modeling represents a substantial improvement from prior efforts	We agree and thank the panel for this comment.	No response required	No response required
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	The proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed in accordance with all requirements for minimum flows establishment included in the Florida Statutes and Water Resource Implementation Rule. The minimum flows established for the river and creek will be implemented in accordance with these and other legislative and regulatory directives through the District's permitting and planning programs and other water management activities. With regard to other water management activities, we note, for example, the District's 2000 Charlotte Harbor Surface Water Improvement and Management (SWIM) plan and the 2020 SWIM plan currently under development for the harbor are mentioned and cited in the revised, draft minimum flows report. The SWIM plans are mentioned in the water quality classification Section 3.1, a newly added Section 3.2.2 on the Pollutant Load Reduction Goal for the Lower Peace River and Section 4.1.5, which addresses seagrasses.	Yes	Additional text clearly spells out the linkages between the MFL's need to protect the very highest flows coming into the Harbor, which requires an attention to high flows that is not as evident for rivers that discharge to locations such as Tampa Bay and the Springs Coast.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Uncertainty and accuracy of hydrologic model should be discussed in more detail	We considered the over-estimation of ungaged flow in our previous, 2010 minimum flows study for the Lower Peace/Shell System. We adjusted flow records to get the best ungaged flow estimate based on the previous hydrodynamic study of the Charlotte Harbor system and the flow estimation from those ungaged sites using a surface water model HSPF (Ross et al. 2005). In addition, a drainage ratio method was used to improve streamflow estimation at ungaged sites based on neighboring gaged sites. We acknowledge that there is still uncertainty and inaccuracy in our estimates of ungaged flow, which accounts for about 16% of the entire Peace River watershed drainage. About 84% of the Peace River watershed is gaged by the U.S. Geological Survey and the hydrologic loading to the Lower Peace River from the gaged watershed is reliable. For our minimum flow analyses, we used the best available data, in combination of what we learned from the previous hydrodynamic simulation of the system, and a comparison of two other hydrologic studies of the watershed to estimate the ungaged flow to the Lower Peace River. We added new text addressing ungaged flow estimation to Section 5.3.1 of the revised, draft minimum flows report. Additional response development associated with incorporation of uncertainty information in the body of the minimum flows report and the hydrodynamic modeling appendix (Chen 2020) was also added. Regarding modeling and data uncertainty, we think it is worth emphasizing that as discussed in Section 1.3.7 of the draft minimum flows report, the District uses an adaptive management approach for minimum flows development and implementation, which includes routine status assessments and, as necessary, reevaluation of established minimum flows. When possible, these activities are conducted to attempt to minimize uncertainty in our results and recommendations.	Yes, the level of uncertainty is clearly spelled out in the District response.	The level of uncertainty associated with flow estimates for the ungaged portions of the Peace and Lower Shell Creek are better described in the District response to the Initial Panel Report. However, the revised MFL report titled "revised LPR Shell Draft Min Flows2020-06-01.pdf" does not yet include the same level of explanation of these uncertainties as the District response laid out in the file "LPR_Shell Peer Rev Staff Resp 2020-06-01". As such, while the Peer Review Panel is now more aware of the reasonableness and appropriateness of the District's approach, the public document may not give others the same level of understanding, at least in the revised MFL report from June 1, 2020. Uncertainties associated with the hydrodynamic modeling has been clearly explained in the revised report.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
In a changing climate, long-term (50-100 year) averaged flow are not necessarily more indicative of the hydrologic conditions in the next 15-20 years. Should more recent data in the past two decades be given more weight in the development of the baseline flow which was based on the average in 1950-2014?	We think it is best to use hydrologic data (e.g., flow records) for the longest period, within reason, to best capture the climatic variability integrated in the data. As part of baseline flow development for Lower Peace River, historic flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Charlie Creek were examined in multi-decadal blocks (roughly 20 years) as shown in Figure 5.3 of the draft minimum flows report. Per the request of the peer reviewers, we added short-term (2000-2018) mean annual flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Shell Creek to Section 2.7.1 in the revised, draft minimum flows report. In addition, as noted in response 4f in Table 4 below, we added the short term average flow values to Figures 2-12 through 2-16 within the report section. We also note that as part of minimum flow assessment for the Lower Peace River, 5- and 10 -year moving averages were calculated for river flows under baseline, minimum flow and existing flow scenarios (see Table 7.1 in the revised, draft minimum flows report). We also think it is worth emphasizing again that the District uses an adaptive management approach for minimum flows development and implementation that includes routine status assessments and, as necessary, reevaluation of established minimum flows.	Yes	Additional text and revised figures include the information requested.
Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows on bottom water hypoxia and other phenomena	We included additional information on the importance of hydrodynamics in several sections of the revised, draft minimum flows report. For example, we added text to the end of Section 1.5 that emphasizes the adopted minimum flows for the Lower Peace River and the proposed minimum flows for the river and Lower Shell Creek were based on potential flow-related changes in salinities assessed with hydrodynamic models. In addition, we added a new section (Section 3.2.2) on the pollutant load reduction goal for the Lower Peace River, emphasizing the environmental effects associated with relatively large, seasonal inflows to Charlotte Harbor. We also emphasized the importance of hydrodynamics in text added to the beginning of Section 3.3.1.	Yes	Additional text links the need to protect the very highest inflows to bottom water hypoxia, and the link between bottom water hypoxia and the Harbor's adopted Pollutant Load Reduction Goal.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Consider development of a "dynamic" MFL with real-time now-cast/forecast capabilities	This is an intriguing suggestion, although we do not think development of a dynamic water quality model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. Minimum flows (and minimum water levels) are typically assumed to correspond with long-term hydrologic and environmental conditions, and in the case of the Lower Peace River and Lower Shell Creek were developed based on central tendencies of environmental responses to changes in flow simulated every 90 seconds (or 75 or 72 seconds during a few short periods when storms occurred) for a 7.7 year simulation period. Further, we add that estuarine organisms are adapted to cope with a wide range of salinities and the small changes in salinity, attributable to the currently proposed minimum flows, are unlikely to alter the ecological integrity of the naturally dynamic Lower Peace/Shell System or Charlotte Harbor. We note, however, that established minimum flows can be and are used to develop withdrawal-related conditions in water use permits, on both long-term and short-term bases. For example, in the case of the existing and proposed minimum flows for the Lower Peace River, permit conditions that limit withdrawals based on the previous day's average flow have been and are expected to be successfully implemented. These types of permit conditions are developed by District staff in coordination with permittees based on identified regulatory constraints, such as established minimum flows, the needs of the permittee and other practical considerations.	Yes	Additional text and revised figures include the information requested.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee	Although flow from the Caloosahatchee River was not directly used as boundary conditions near the mouth of the Caloosahatchee River, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. We also think it is valuable to comment on the complexity of inflows that can impact environmental conditions in Charlotte Harbor. For example, proliferation of drift algae and apparent loss of seagrass has been observed along the east wall region of the harbor and may be related to the Red Tide event of 2017-2018. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.	Yes, the issues related to red tide, potential impacts from the Caloosahatchee River and the potential for adverse impacts to the Harbor from sources other than the Peace and Myakka is realized by the District, and included in the response to the Panel's Initial Report.	The District's response to the Panel's comment displays an understanding of the issue of impacts to the Harbor from influences outside the control of the District itself. However, the revised MFL report titled "revised LPR_Shell Draft Min Flows2020-06-01.pdf" does not yet include the same level of discussion as the District response laid out in the file "LPR_Shell Peer Rev Staff Resp 2020-06-01". While the Caloosahatchee River is listed as a model element, the revised MFL report does not include the words "red tide" or references to the sort of impacts described in the District's response to the Panel. As such, while the Peer Review Panel is now more aware of District's awareness of this issue, the public document may not give other reviewers the same level of understanding, at least in the revised MFL report from June 1, 2020.
Analyze the potential impact of sea level rise on the MFL, using best available SLR data for 2020-2050	We did not develop the proposed minimum flows based on future sea level conditions. However, we evaluated the proposed minimum flows under three SLR scenarios to help determine when a future re-evaluation of the minimum flows may be necessary. Although we used U.S. Army Corps of Engineer (USACE) SLR estimates, which are generally lower than those of the National Oceanic and Atmospheric Administration (NOAA), our results supported the need for consideration of a future reevaluation for the Lower Peace River and Lower Shell Creek minimum flows. Future reevaluations will be based on actual sea level conditions and other factors. Following the review panel's suggestion, we have conducted new model runs using NOAA et al. (2017) SLR estimates and are in the process of revising the draft minimum flows report based on an analysis of the new model results.	Yes	Additional text and revised figures include the information requested.

Table 2 – Review of District Responses – Executive Summary

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Definition of "significant harm"	Significant harm and significantly harmful are not defined by the State Legislature. For minimum flows and levels development, each water management district of the state or the Florida Department of Environmental Protection identify specific thresholds or criteria that can be associated with significant harm. We incorporated additional information concerning significant harm into the first paragraph of the Executive Summary in the revised, draft minimum flows report.	Yes	Modified text in both the Executive Summary and Section 1.3 better explains the logic behind the District's interpretation of how "significant harm" is quantified, as well as the background information used to support their approach to quantifying such.
Definition of "best available information"	In accordance with direction provided by the Florida Legislature, District staff use the best available information when determining minimum flows. Determinations regarding the best available information are made by District staff based on professional judgment, with consideration of input from all stakeholders. The best available information includes information that exists at the initiation of the minimum flows development process and information that is acquired specifically to fill data requirements deemed necessary for establishment of the best, defensible minimum flows. We do not think a definition for "best available information" is needed in the Executive Summary of the minimum flows report. However, we added the characterization of "best available information" above to the first paragraph of Section 1.5 in the revised, draft minimum flows report.	Yes	Modified text in both the Executive Summary and Section 1.3.5 and 1.5 better explains the modifier of "best available" when used to construct the MFL using existing data sources

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Could MFL be set for more than 3 flow blocks?	In theory, any number of flow blocks could be identified and used for minimum flows development and implementation. For practical purposes, use of three flow blocks for the District's development and implementation of minimum flows for water use permitting, planning and water resource protection has proven to be successful. One reason for this success in the management of runoff driven lotic systems is that the flow blocks associated with established minimum flows have been developed with consideration of low, medium and high flow conditions that are known to be important for the physical, chemical and biological functions and structure of riverine systems. We have not conducted analyses associated with development of proposed minimum flows for the Lower Peace River and Lower Shell Creek with varying numbers of flow-based blocks.	Yes	Issue did not need to be included in revised MFL report – was raised for consideration, rather than a requested modification to the draft report.
Concern over LSC low flow conditions	Please refer to response 2i in this table.	Yes – District response is quite clear that the proposed minimum flow guidance is not being met, but that adherence to the guidance contained within the MFL would enhance ecosystem function, compared to existing condition.	The revised MFL report clearly states that the proposed minimum flow guidance for the Lower Shell Creek is not being met, and requires a recovery strategy. Table 7-2 clearly lays out the steps involved in the recovery strategy for the Lower Shell Creek.
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	Please refer to response 1e in Table 1 for our response to this comment.	Yes	Additional text clearly spells out the linkages between the MFL's role in protecting the health of the Lower Peace River, Lower Shell Creek and Charlotte Harbor, in light of concurrent efforts to monitor, protect and/or restore ecological health in those same systems.
Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP's Numeric Nutrient Concentration (NNC) criteria	We analyzed water quality data to explore potential linkages between flow and water quality parameters as is required by the Water Resource Implementation Rule, not to validate or to infer compliance with the Numeric Nutrient Criteria adopted by FDEP	Yes – but the issues associated with incomplete analytical techniques for phosphorus (i.e., reporting only orthophosphate) and chlorophyll-a (i.e., reporting values not corrected for phaeophytin) are problematic.	If water quality data are important enough to collect, analyze and interpret, then they are important enough to do such in a scientifically appropriate form. The WSA should collect all forms of phosphorus, not just orthophosphate, and values for chlorophyll-a should be corrected for phaeophytin. While these points cannot be "corrected" in the MFL report, this issue should be resolved prior to the production of the next MFL update.

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Explain the need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	We agree with the preliminary comments below that are included in the appendices to the Panel's initial peer review report: *"It appears improbable that even maximum water withdrawals would reduce flows sufficient to prevent bottom water hypoxia, which requires an average flow of 10,000 CFS at Arcadia (Stoker et al, 1989 – U.S. Geological Survey Publication XXXXX) – roughly equivalent to total gaged PR flow of about 20,000 cfs."* *"Proposed max withdrawal of 400 cfs represents ca. 2% of the minimum flow from PR watershed required to initiate stratification of 10 ppt in Harbor. Consequently, maximum withdrawal appears to be protective of the "reset button" of bottom water hypoxia."* We have therefore included text in a new Section (3.2.2) and at the beginning of Section 3.3.1 in the revised, draft minimum flows report to emphasize the importance of hydrodynamics and high inflows to Charlotte Harbor.	Yes	Additional text links the need to protect the very highest inflows to bottom water hypoxia, and the link between bottom water hypoxia and the Harbor's adopted Pollutant Load Reduction Goal.
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	This important topic is discussed by the District, and examples given of the reasonableness of the 15% threshold. However, the point remains that while examples can be found that support its application, it is not universally agreed as an acceptable level of impact for all activities (e.g., wetland impacts from construction, impacts to seagrass from dredging, etc.)	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values.

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health	The proposed minimum flows for Lower Shell Creek are to be implemented based on discharge of a percentage of the inflow to Shell Creek Reservoir. For example, the allowable flow reduction of 23% for Block 2 flows, means that quantity of water equal to 77% of the inflows to the reservoir must be discharged downstream of Hendrickson Dam. This minimum flow is required, irrespective of withdrawals from the reservoir. By associating the minimum flows with rates of inflow to the reservoir, we believe the ecology of Lower Shell Creek is protected from significant harm associated with water withdrawals. Thus, a maximum flow diversion quantity is not required for the Lower Shell Creek. For minimum flows development purposes, Shell Creek is partitioned into the Upper Shell Creek and Lower Shell Creek, separated by Hendrickson Dam. The only significant, permitted withdrawal directly from Shell Creek is associated with the permit issued by the District to the City of Punta Gorda for withdrawals from Shell Creek Reservoir, the portion of the upper creek impounded by the dam. Because the proposed minimum flows for Lower Shell Creek are based on maintaining block-specific percentages of inflow to Shell Creek Reservoir from Upper Shell Creek (and Prairie Creek) and the City's withdrawals are from the multi-year storage in the reservoir storage, a maximum withdrawal limit (i.e., a maximum flow reduction) is not needed for the Lower Shell Creek minimum flows. Also, of note, the permit issued to the City for withdrawals from Shell Creek Reservoir includes monthly and annual average maximum withdrawal limits. We further note that preliminary comments prepared by the panel and used to support development of their initial peer review report, indicated it is "*[n]ot likely that max withdrawals (if set) for LSC would affect threshold values for stratification, but should be mentioned/ acknowledged* We agree with this assertion, and note that for a recent period from 1996 through 2016, mean annual flow in the Lower Peace River, based on flows in the River at Arcadia and flows from Joshua and Horse creeks was 1,279 cfs, while flows to Lower Shell Creek from the same	Not entirely. The District's response is very detailed, and lays out the logic of them not including a maximum flow diversion quantity for Lower Shell Creek. However, the Panel's concerns about the lack of incorporation of a maximum diversion quantity remain. The District's logic for including a maximum diversion quantity of 400 cfs for the Lower Peace River are that diversions above and beyond that amount might be problematic for regions beyond the boundaries of the Lower Peace River – areas out into the Harbor itself. The lack of similar maximum diversion guidance for the Lower Shell Creek does not follow the same logic. While it is true that such quantities are not likely to be reached – not "requiring" such guidance does not diminish the value of developing such guidance.	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as protecting the health of the Harbor is concerned. Since it is acknowledged by the District (in their response) that it is unlikely that a potential maximum diversion quantity for the Lower Shell Creek MFL would be problematic for existing users, it is concerning that the District does not more fully consider the benefits of establishing similar maximum diversion guidance for the Lower Shell Creek as was included for the Lower Peace River.

	period were 388 cfs. This information, which has been included in Section 2.7.1 of the revised, draft minimum flows report, indicates the Shell Creek watershed accounts for only about 25% of the combined flows from the Peace River and Shell Creek watersheds. Based on the information provided here, we do not currently intend to recommend inclusion of a maximum withdrawal cap or limit as part of the proposed minimum flows for Lower Shell Creek. We will, however, continue to assess and, as necessary, consider this recommendation of the panel for potential, future reevaluations of minimum flows established for the creek.		
Say something about potential impact of SLR on the MFL	Sea level rise effects on salinity habitats were assessed in the District's draft minimum flows report to help evaluate the potential need for future reevaluation of the proposed minimum flows. As noted in response 1l in Table 1, analyses based on modeled scenarios associated with SLR predictions from the U.S. Army Corps of Engineers indicated the need for reevaluation of minimum flows established for the Lower Peace River and Lower Shell Creek. We acknowledge the SLR estimates used in our initial analyses are conservative. We have run the hydrodynamic model using the most recent SLR estimates by the National Oceanic and Atmospheric Administration (NOAA et al. 2017), and plan to update the revised, draft minimum flows report based on results of these SLR simulations.	Yes	Additional text and revised figures include the information requested. New model results using the NOAA sea level rise scenario are yet to be added to the report.

Table 3 – Review of District Responses – Chapter 1 – Introduction

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Formatting of Table 1-1 Improve within cell formatting so text in final column matches up with that in preceding columns	Table 1-1 was reformatted in the revised, draft minimum flows report to align information contained in the final column with that in the preceding column.	Yes	Modified table now formatted correctly
1.2.1 Remove 's from Florida in title	We changed "Florida's" to "Florida" in the Section 1.2.1 title in the revised, draft minimum flows report.	Yes	Modified text now correct

Table 4 – Review of District Responses – Chapter 2 Physical and Hydrologic Description

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Issues related to clarity of maps and figures, for example, enhancing Figure 2-2 so it is better related/connected to a Google street map for the same area. In addition, river scales are discussed or displayed in both miles and km. Perhaps use both metrics each time.	Figures 2.2 and 2.3 have been updated in the revised, draft minimum flows report. In addition, an inset map was included in Figure 2.2, and we clarified the purpose of the inset maps in both Figure 2.2 and Figure 2.3. We acknowledge that differing metrics are used to depict distances in maps included in the draft report. Some of the maps are reproductions from other sources and for this reason, we have continued to present maps using both the U.S. Customary and Standard International metrics.	Yes	Map clarity issue has been addressed. Issues of station locations and listings in both km and miles (as well as station names alone) can be dealt with through expanded text of legend for those figures where other entities have produced the graphics.
Question related to LiDAR sources, for example, is 2017 LiDAR data for the region available from the state?	The LiDAR photogrammetric data collection (Aerial Cartographic of America, Inc. 2015) was conducted primarily to support development of the District's hydrodynamic model for minimum flows development. These data were the best available information of this type in 2016, when the hydrodynamic model was calibrated and validated. State-wide 2019 LiDAR data are currently under review. These and other available data will be considered for use in future evaluations of minimum flows for the Lower Peace/Shell System.	Yes	Yes
Use of NGVD29 vs. NAVD88 for elevation and bathymetry data	Most elevation data and references to elevations in the draft minimum flows report are presented relative to the North American Vertical Datum of 1988 (NAVD88). However, we note that in the descriptive information included in Section 2.1 on page 16 of the draft minimum flows report a reference is made to the Peace River originating in an area of Polk County at an elevation of about 100 feet above the National Geodetic Vertical Datum of 1929. We also note that a water surface elevation of 5.0 feet is included in the description of Shell Creek Reservoir in Section 5.5.3 on page 91 of the draft minimum flows report. For development of the hydrodynamic model for Charlotte Harbor, all the variables associated with elevation are referenced to NAVD88.	Yes	Yes

Table 4 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Question about the order of MFL development vs. water supply planning efforts	The development or reevaluation of minimum flows is a relatively lengthy process involving compilation of relevant data, development or refinement of analytical methods and approaches, and coordination with local governments and other affected stakeholders. In addition, the District is typically engaged in the concurrent development of minimum flows for several priority water bodies. For these reasons, there are practical limitations concerning minimum flows development and reevaluation schedules. It is worth noting, however, that minimum flow status assessments are conducted annually, on a five-year basis in conjunction with regional water supply planning, and on an as-needed basis associated with reviews for water use permit applications and renewals. Results from these assessments are part of the District's adaptive management approach to minimum flows development and implementation and can be used to inform decisions regarding the need for minimum flow reevaluation.	Yes	Yes
Definition of flow lag	For the water quality analyses included in the draft minimum flows report, lagged-flows refers to average flows for periods ranging from 2 to 60 days prior to the date of water quality sampling event. Text in Section 3.2.2 in the revised, draft minimum flows report was amended with a parenthetic phrase to clarify what is meant by lagged-flows.	Yes	Yes.
Consider adding a most recent 10 or 20 year average bar to Figures 2-12 to 2-16 in addition to the one that is the long-term average for POR	Short term average (2000-2018) flows were added to Figures 2-12 to 2-16 in the revised, draft minimum flows report. Please refer to our response 1g in Table 1 for additional information.	Yes	Additional average value now included in Figures 2-12 to 2-16.
Discuss the importance of hydrodynamics and hydrodynamic modeling	The standard format for the District's minimum flow reports involves identification of ecological criteria followed by descriptions of tools used to model or assess the criteria. The hydrodynamic model is identified in the introductory (Chapter 1), where we discuss the substantial data enhancements that were undertaken to improve upon the model that was previously used for development of the existing Lower Peace River minimum flows. To better emphasize the primacy of the hydrodynamic model for our current minimum flows assessments we split the paragraph following	Yes	Yes. Additional text added to the report and Appendix C clarify the importance of hydrodynamics and hydrodynamic modeling in MFL study very well.

	the numbered list of major initiatives and updates within Section 1.5 into two paragraphs in the revised, draft minimum flows report, and amended the first of the two paragraphs to clearly indicate that like the previous minimum flows effort, the current effort was based on salinity modeling conducted through hydrodynamic modeling. The hydrodynamic model is also notably mentioned in the system description (Chapter 2), water quality (Chapter 3) and resources of concern/modeling tools (Chapter 5) chapters. As noted in our response to comment 5i in Table 5 below, we also amended the brief discussion of the model in the salinity section of Chapter 3 included in the revised draft minimum flows report. We also emphasized the importance of hydrodynamics in a new section (Section 3.2.2) on the pollutant load reduction goal for the Lower Peace River and new text added to the beginning of the descriptive water quality information section (Section 3.3.1). Finally, in Chapter 5 of the revised minimum flows report, the development and application of the UnLESS model to the Charlotte Harbor system has been substantially expanded to include more information on model setup, input data, model calibration and verifications and modeling uncertainty. As noted in the draft minimum flows report, detailed information on the model and its use are also discussed in Chen (2020) which is included as Appendix C to the report.		
Additional and more detailed description of hydrodynamic model elements needed	Chapter 5 is expanded to include a brief description of the hydrodynamic model for Charlotte Harbor. Please also refer to our response 4g in this table.	Yes	Yes.

Table 5 – Review of District Responses - Chapter 3 Water Quality

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Salinity data presented in Figure 3-3 not that helpful	We note that variability in the salinity data presented in Figure 3-3 can be attributed to seasonal, inter-annual variation and other factors. However, as noted in the report text associated with the figure, we think the figure is helpful in portraying longitudinal and seasonal salinity variation in the Lower Peace River as well as salinity differences in the water column at selected sites.	Yes??	Laura?
Influences of factors other than flow on concentrations of chlorophyll a	We added additional text in Section 3.3.1.3 of the revised, draft minimum flows report.	Yes	Section 3.3.1.3 gives a more thorough review of factors that can influence chlorophyll-a than in the prior report.
Values of phosphorus only shown for orthophosphorus	Total phosphorus measurement for the Hydrobiological Monitoring Program (HBMP) was terminated in 2003. We investigated our use of ortho-phosphorus vs. total phosphorus by conducting scatterplot analyses for data from 5 stations for the period 1996 through 2003. As indicated in the figures below, about 81-88% of total phosphorus is attributed to ortho-phosphorus, suggesting that results expected for total phosphorus may generally be similar to those determined for ortho-phosphorus. We included information concerning the current measurement of ortho-phosphorus for the Peace River HBMP and the correlation between orthophosphorus and total phosphorus in Section 3.3.1.1.5 of the revised, draft minimum flows report.	Yes, but the draft final report does not include the level of detail included in the District's response to the Panel.	The inclusion of only dissolved inorganic forms of phosphorus is problematic. While this is not the District's data collection effort, it is a data collection effort that is conducted for compliance with a water supply permit, to ensure that withdrawals do not adversely impact ecosystem health. The percentage of phosphorus that is orthophosphate may average 80%, but that value likely varies over the length of the river (as does NOx as a function of TN) and with different seasons. This data shortcoming should be pointed out and addressed prior to the analysis of data for later reports.
Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite	We added results for total nitrogen to Section 3.3.1.4.	Yes	Revised results and analysis are in-line with request.
Definition needed for "flow-lag"	Please see response 4e in Table 4 for our response to this comment.	Yes	Yes
Various figures have legends that appear to be mislabeled	Numerous figure legends were corrected in the revised, draft minimum flows report.	Yes	Yes
Figure 3-22 caption says it is dissolved oxygen, but y-axis says chl a	The Figure 3-22 caption was corrected in the revised, draft minimum flows report to indicate that the plot shows chlorophyll concentrations.	Maybe no…	Figure legend now correct in terming the data chlorophyll- but the legend refers to "surface, midwater and bottom" values? Is that correct?

Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Mislabeling of y-axis on Figure 3.23	The y-axis label for Figure 3-23 was changed from "Salinity (PSU)" to "Chlorophyll" in the revised, draft minimum flows report.	Yes	Label changed as requested
Importance of hydrodynamic model description	We agree that description of the hydrodynamic model and its primacy for the analyses presented in our draft minimum flows report should be emphasized. As noted in response 4g in Table 4, we modified text in Section 1.5 of revised minimum flows report to emphasize our prior and current use of hydrodynamic modeling to support minimum flows development for the Lower Peace River and Lower Shell Creek. In addition, we substantially expanded the presentation of model information included in Chapter 5. We also think it is appropriate to discuss the development and use of a hydrodynamic model for assessing flow-related changes in salinity in the Lower Peace/Shell System in Section 3.3.2.1 of the draft minimum flows report, which addresses system salinity. Our mention of the hydrodynamic model in the water quality chapter (Chapter 3) in the original draft report, and additional related text added to the revised draft report serve as another useful preview of the more detailed discussion of the model in Chapter 5 and the referenced model report, Chen (2020), included in the report appendices. We also note that within Section 2.3.2.1 of the revised, draft minimum flows report, we substantially modified the text to emphasize our efforts to develop and use the best available information, in this case the hydrodynamic model, for minimum flows development.	Yes	Yes. Additional text and explanation in the revised report are satisfactory.
Additional and more detailed description of hydrodynamic model elements needed	In addition to modifications to the text in Section 3.2.2.1 of the draft, revised minimum flows report noted in our previous response 5i in this table, we also amended text associated with the model in Chapter 5 and in the model report (Chen 2020) included as Appendix C to the report.	Yes	Yes
More refined explanation needed for isohaline location trend analyses	Please refer to response 5o in this table.	Yes?	Laura and Peter??
Better description of results shown Figures 3-12 to 3-16	To improve presentation of the correlation analyses results presented in Figures 3-12 through 3-16, we amended the figure captions within Sections 3.3.2.2 through 3.3.2.5 of the revised, draft minimum flows report. We also modified the statistical methods description included in Section 3.3.2 to better describe the lagged-flows used in the analysis and to summarize our interpretation of the correlation statistics derived from the analyses and presented in Figure 3-12 through 3-16.	Yes	Description more detailed and labels now accurate for the displayed data

Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Value of developing dynamic water quality model, vs. empirical approaches	As noted in response 1j in Table 1 we understand the potential value of a dynamic water quality model for the Lower Peace/Shell System, but do not think development of such a model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. See response 1j for additional information concerning our response.	Yes	Yes.
Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included	Lower Shell Creek and Lower Peace River flows were combined for depiction of the flow-salinity relationships for Stations 6.6 and 15.5 in Figure 3-11 in the revised, draft minimum flows report. In addition, the figure caption and associated text within Section 3.3.2.1 of the revised, draft minimum flows report were updated.	Partially	The salinity data now are plotted against the totality of inflows – from both the Lower Peace River and Shell Creek. However, the graphic does not display equations, statistical significance, etc. The text says that "…salinity was more responsive to freshwater inflow…" at upstream stations without defining what that means. I would suggest saying that "…variation in flow explained a greater amount of the variability in salinity at upstream stations, but was statistically significant at all stations examined here."
Table 3-1 – improve explanation of location of isohaline location trends	We note that the text on page 47 preceding and which refers to Table 3-1 indicates the trend analysis identified an upstream movement of the 0 psu and 20 psu isohalines for period from 1984 through 2016. To improve understanding of the information presented in the table, we added a footnote to Table 3-1 in the revised draft minimum flows report to characterize our interpretation of the presented, significant statistics, i.e., that positive, significant statistics indicate upstream isohaline movement. While revising Table 3-1, we determined that changes to clarify the presented statistical results and better indicate that the results pertain to the Lower Peace River (and in some cases Charlotte Harbor near the mouth of the river) were needed for several other tables and figure within Chapter 3. So, we revised captions and/or footnotes for several additional tables and figures in the revised draft minimum flows report, including Tables, 3-2, 3-3, 3-4 3-5, 3-6 and 3-7, and Figures 3-3, 3-4, 3-5,3-6, 3-7, 3-8, 3-9 and 3-10.	Yes	Table 3-1 and preceding text explains that the trend test was for detecting an upstream movement of the location of the 0 and 20 psu isohalines.

Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Table 3-2 ,3, 4 to 3-7 and 3-12 to 3-16 – improve explanation of summertime hypoxia development and other data presentations	The text in Section 3.3.1.2 preceding Table 3-2 notes the trend analysis indicated dissolved oxygen concentrations in surface waters associated with the 0 psu isohaline increased for period from 1984 through 2016. We do not think the information presented in the table can be used to assert there is no hypoxia in surface waters of the Lower Peace River during the wet, summer season. However, as noted in responses 5i and 5o in this table, we amended the captions, column headers, and/or footnotes for Tables 3-2, 3-3, 3-4 through 3-7 and Figures 3-12 through 3-16 within the revised, draft minimum flows report. We also updated the statistical methods description included in Section 3.3.2 within the revised, draft minimum flows report to enhance presentation of the results.	Yes	Figures 3-3 and 3-4 seem to be portraying different versions of the same phenomena – salinity is apt to be higher in the bottom waters, and dissolved oxygen lower, particularly in the wet season. This is all useful information, but it begs the question of is there "too much" data to interpret. Fixed station salinity, temp and DO for bottom and surface waters as well as isohaline sampling for the same parameters for surface and bottom waters. Does it make sense to continue to collect both? Isn't the value of the isohaline sampling the locations alone? Do we really need what appears to be redundant water quality data?

Table 6 – Review of District Responses - Panel Comments on Chapter 4 Ecological Resources

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Plant community data set from 1998 is problematic	We are not aware of any recent, comprehensive, species or genus-level vegetation maps for the Lower Peace/Shell System that would represent an update to the detailed information presented in Figure 4-1 in the original, draft minimum flows report. However, we developed and included a replacement, coarser-level vegetation map based on the 2017 SWFWMD land use/cover GIS layers in the revised, draft minimum flows report. In addition, we anticipate considering vegetation data collection and mapping needs for future evaluations of the system.	Yes	Updated information is much more helpful
Status and trends in seagrass coverage in the LPR over time	The District has been mapping seagrasses in Charlotte Harbor using aerial photography since 1988. Others have attempted to use older imagery to infer historical seagrass extent, but with very limited success. For the Tidal Peace River segment of Charlotte Harbor, recent seagrass extent (estimated for 2014, 2016 and 2018) is greater today than any time since 1988, as shown below. We included this figure and associated text in Section 4.1.5 of the revised, draft minimum flows report to augment the presented seagrass information.	Yes	Inclusion of such information is appreciated

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Concern over shift in HBMP focus to physical factors, rather than fish communities, macroinvertebrates, and/or macroalgae	In 1996, the Charlotte Harbor Hydrobiological Monitoring Program (HBMP) Scientific Review Panel reviewed the ongoing elements of the HBMP program and recommended several changes to the monitoring program study elements. The Panel recommended that HBMP monitoring should primarily focus on assessing long-term trends in key physical, chemical, and biological characteristics that can be directly linked to potential effects associated with withdrawals at the Peace River Manasota Regional Water Supply Authority's Peace River Facility. They also noted that less effort should be focused on indirect biological indicators that are not intended to evaluate influence of withdrawals, once a baseline level of information has been collected. As summarized in Appendix A of the Peace River Hydrobiological Monitoring Program 2016 HBMP Comprehensive Report (JEI 2017), subsequent meetings of the HBMP Scientific Review panel have continued to shape the current HBMP. Reference to this summary document has been included in Section 3.3.1 of the revised, draft minimum flows report to provide additional information concerning the evolution of the HBMP. We think the biological and other information collected to date and summarized in our draft minimum flows report is sufficient for development of recommended minimum flows for the Lower Peace/Shell System. We note that this information has been collected in support of the required HBMP, other monitoring programs, and studies specifically undertaken by the District to directly support minimum flows development. However, in support of our adaptive management approach to minimum flows development and implementation, we continue to support ongoing data collection efforts for the Lower Peace/Shell system and will consider additional sampling and analysis of biological data as needed, for future minimum flow reevaluations.	Yes??	Laura?

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Fisheries Independent Monitoring newest data from 2016 not included in the modeling approach (Appendix E) or compared to data collected through 2013	At the time of model development, the best available data were used. However, consideration of more recent data has been requested from the Florida Fish and Wildlife Conservation Commission (FWC) and a comparison of abundance of the taxa and size classes examined in this model will be performed to determine if there are any significant differences between modeled years and more recent sampling years. Results from this analysis will be included in future updates to the draft minimum flows report. As noted in Section 4.2.1 of the draft minimum flows report, Call et al., (2013) performed a survey on fish communities within the Lower Peace River throughout 2007 to 2010 and found no temporal variation in fish communities across years, suggesting a generally stable system within the river. To augment presentation of information on the fish assemblage in the Lower Peace/Shell System, the descriptive FWC Fisheries-Independent Monitoring data from 2016 presented in Section 4.2.1 of our original draft minimum flows report has been replaced with the most recent available data (2018) in the revised, draft minimum flows report.	Yes??	Laura?

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Should endangered species, such as sawfish and manatees, be included in MFL assessments?	Endangered and listed species should be and are considered when developing minimum flows. For example, in Section 4.2.1 of the draft minimum flows report we noted that juvenile sawfish (<3 years of age) are able to move in response to salinity fluctuations with high site fidelity upon a return to baseline conditions, with large-scale movement most notable after significant freshwater inflow (>500 cubic meters per second) from tropical disturbances (Poulakis 2016). We also noted that Sawfish movements examined in the Caloosahatchee River demonstrate downstream movement when salinities approach 0 psu and upstream movement at salinities approaching 30 psu (Poulakis 2013). Therefore, protection of the sensitive salinity habitat would not positively affect their distribution, although maintenance of natural freshwater flows would benefit their capacity to locate nursery grounds (Poulakis 2016). Further we note that the species chosen for the HSM modeling used to support our minimum flow analyses reflect those with affinities for low salinity habitats. A strong positive correlation between Common Snook (*Centropomus undecimalis*) abundance and flow was observed in the Lower Peace River (Blewett 2017). Body condition was also elevated during years of increased river flow. This increased abundance and condition with increased flow was hypothesized to be related to enhanced prey availability with greater floodplain inundation. Per the floodplain inundation analysis performed by HSW (2016) in support of our minimum flows work (Appendix D), the proposed minimum flows will not significantly impact total inundated floodplain wetland area associated with the baseline flow condition, and are therefore unlikely to impact the abundance or condition of Common Snook. For development of minimum flows for river systems or creeks dominated by spring flow we typically consider manatee usage of thermal refuges during acute and chronic cold-water events. Given the lack of spring discharge to the Lower Peace/Shell system we do not think assessment of potential, flow-related changes in thermally-favorable habitat usage by manatees is necessary for our development of minimum flows for the river and creek.	Yes??	Laura?

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
In Appendix E it is stated that "predicted CPUE grids" were derived from catch data and these predictions were used to generate the population estimates which were used to model the effect of water withdrawals	Catch-per-unit-effort (CPUE) is a direct calculation from Florida Fish and Wildlife Conservation Commission's Fisheries Independent Monitoring (FIM) catch data, standardized to the gear type used. These data, all the data used for development of the habitat suitability models (HSMs), and the modeling results were considered the best available information at the time for support of the development of the proposed minimum flows. The fish population modeling using habitat suitability was not used as a criterion for development of the proposed minimum flows, rather it was used for consideration of potential effects of implementation of the proposed minimum flows on representative, important taxa populating the system. Because the model does not incorporate some factors, such as competition, predation and fishing pressure that can affect fish and invertebrate distributions, we used the model to assess how habitat suitability zones simulated under baseline condition would change with implementation of the proposed minimum flows. Like all models, the habitat models that we used to assess habitat suitability for several estuarine taxa, include limitations. We augmented Section 5.3.3 in the revised, draft minimum flows report to fully discuss these limitations and modeling uncertainties. However, we continue to think the HSMs developed to support our minimum flows work are well suited for consideration of potential changes in habitat suitability between the baseline flow condition and reduced flow conditions. Regarding this potential habitat change assessment, we note that the flow reduction scenario assessed in support of our minimum flows analyses actually exceeds the allowable flow reductions prescribed by the minimum flows that are proposed for the Lower Peace River/Shell System. A maximum withdrawal limit was not included or used to develop the "minimum flows" scenario used to characterize habitat suitability with the HSM under reduced flow conditions. The HSMs, in their current or an enhanced form may be used for future minimum flow evaluations for the Lower Peace River and Lower Shell Creek. They would likely not be used if alternative tools that provide superior information were to become available.	Yes??	Laura?

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Figure 4-2 difficult to review due color choices	Figure 4-2 was reformatted for the revised, draft minimum flows report to improve clarity.	Yes	Figure much improved
Explain "decreased flow may also contribute to increases in dissolved oxygen concentrations". Add your response to p.76 of the report.	Potential relationships between decreased flows and oxygen concentrations are explained in the papers cited in Section 4.2 of the draft minimum flows report, and we think these relationships are adequately summarized in the section. However, we acknowledge that additional, potential effects of decreased flows could include those associated with an increase in the influence of tidal fluctuations which can lead to the formation of a well-mixed system. Also, if sediment loads from the watershed decrease as a function of reduced flows, water clarity could increase, leading to an increase in primary production. We included additional text associated with these factors in the last paragraph of Section 4.2 of the revised, draft minimum flows report, and split the paragraph into two paragraphs to improve readability of the text.	Partially	The District's response, in Section 4.2 seems to refer to the potential for increased algal growth under low flow conditions, due to some combination of factors (e.g.., increased water clarity, increased residence time). However, algal growth only increases oxygen concentrations in day light hours – more phytoplankton means both higher highs (in the day) **and lower lows** (at night). The impacts of lower flows on oxygen may not be detectable with a data set that is based on daytime samples. Therefore, the concern remains, and the language in the revised MFL report is perhaps overly simplistic.

Table 7 - Panel Comments on Chapter 5 – Resources of Concern and Modeling Tools

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Figure 5-1 could be more clearly identified as to what the graphics are meant to represent, in terms of "exceedance"	Figure 5-1 shows mismatch of fixed-date blocks using a long flow record (1950- 2014) and short flow record (2007- 2014) based on 75% exceedance (red dashed line) and 50% exceedance (blue dashed line). This is the reason for the change from date-based to flow-based blocks that are depicted in Figure 5-2.	Yes	Revised figure is easier to interpret
Timeframe and data sources used to develop the hydrodynamic model	The timeframe used for the hydrodynamic model is briefly described in Section 5.5.1 and in Appendix C. Sources of bathymetric LiDAR and tide data are described in Sections 2.4 and 2.6. Flows are briefly described in Section 2.7 and Sections 5.3.2 and 5.3.3. More information about the hydrodynamic model was added in Section 5.5.1 of the revised, draft minimum flows report.	Yes	Yes.
Need to understand basis for variation in baseflow differences over different time periods	Baseline flow from 1994 through 2006 was used with the PRIM model to simulate groundwater withdrawals and land use change impacts on Peace River flows. Baseline flow from 2007 through 2014, seasonally-corrected based on PRIM model run output, was used with the hydrodynamic model to simulate salinity, depth and water temperature in the Lower Peace/Shell System and Charlotte Harbor. Baseline flow from 1950 through 2014 was used for comparison against gaged flow data for minimum flows status assessment, after seasonal correction has been made to gaged data based on the output of the PRIM model. Please see Section 7.1 and Table 7.1 in the revised, draft minimum flows report for additional information.	Yes	Yes.
Further clarify the meaning of "transitional flow triggers", using simple terminology such as "safety valves" to explain concept.	The currently adopted Lower Peace River minimum flows are based on calendar date- based blocks, and a transitional "flow trigger" (625 cfs) was required when high flows remained depressed due to climatological conditions. The newly proposed minimum flows for the Lower Peace River were developed using flow-based blocks that include flows of 297 cfs and 622 cfs that respectively represent transitions between low to medium and medium to high flows. Similarly, flow transitions for the proposed minimum flows for Lower Shell Creek are 56 cfs and 137 cfs, respectively. Given that the proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed for flow-based blocks associated with transitions from low to medium to high flows, the identification of additional flow triggers" as a "safety valve" to account for out-of-season flows is not necessary.	Yes	Yes

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Helpful to include a graphical display of residence time/flushing rates	We agree that transport timescales are useful for discussion of flow effects on dissolved oxygen concentrations and other environmental factors. In our future evaluations of dissolved oxygen and eutrophication in the Lower Peace/Shell System and Upper Charlotte Harbor, we will consider discussion and presentation of transport timescales information.	Partial	Yes.
Language related to impacts of hurricanes based on model runs	For the minimum flow analyses, the hydrodynamic model was run from 2007 through 2014, a period which included major storm and drought events but not hurricanes. In response to this question, we also think it is useful to note that minimum flows are to be established as the limit beyond which further withdrawals would be significantly harmful to the water resources or ecology of the area. Therefore, in the case of extreme high-flow conditions associated with hurricanes and other major storm events, achieving a minimum flow requirement is not anticipated to be an issue. We add, however, that District rules allow for the consideration of public health and safety for implementation of all District rules and policies.	Yes	Yes.
Request for more information related to the hydrodynamic model, including consider the possibility of adding a short chapter which gives a holistic overview on the role of hydrodynamics (flow and water level, salinity, temperature, flushing) on water quality, ecology and fishery.	Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.	Yes	Yes
Limitations of hydrologic model in ungaged portions of the watershed should be discussed in more detail	Please refer to response 1f in Table 1 for our response to this comment.	Yes	Yes
Suggested development of a dynamic water quality model, vs. empirical approaches	Please refer to comment 1j in Table 1 for our response to this comment.	Yes	Yes

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed	Baseline flow for Lower Peace River was estimated based on Peace River Integrated Model (PRIM) outputs. Charlie Creek was simply used as a reference for a multi-decadal comparison of historical flows. The justification for this use of data from Charlie Creek is based on information presented in PB&J (2007) and trend analysis described in Section 5.3.1 of the minimum flows report.	Partially	Reference is made to the PBS&J report (2007) which used Charlie Creek's flow as not impacted by human activities during the 1950? To 1969 period. But, a reference to the natural condition of the watershed (included in the PBS&J report) would say why that's the case.
Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations	As noted in Section 5.3.1, the Peace River Integrated Model (PRIM) was used to investigate effects of climate variability, groundwater pumping, land use changes and other factors on flows in the Peace River. Also, as noted in the report section, flow reductions and increases for differing portions of the watershed are predicted based on the distribution of existing withdrawals, differing degrees of agricultural return flows from groundwater pumping due partly to the tighter confinement on the upper Floridan Aquifer in the lower Peace River area, and differing amounts of excess baseflow associated with agricultural withdrawals. As recommended by the peer review panel, a monthly trend analysis has been conducted and the discussion in Section 5.3.1 of the revised, draft minimum flows report has been updated to indicate why groundwater withdrawals are associated with flow decreases in the Upper Peace watershed and some flow increases in Lower Peace region.	Yes	Section 5.3.1 better explains the totality of issues associated with increased flows in the dry season that are not explained by rainfall.

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed	For development of baseline flow record used in the minimum flow analyses, irrigation efficiencies of 60 and 85% for row crops and citrus, respectively, were used to adjust Shell Creek flows by accounting for groundwater discharge that resulted from agricultural practices in the Shell Creek watershed. These assumed efficiencies are the same as those that were identified in the District's 2010 report on proposed minimum flows for the Lower Peace River and Lower Shell Creek. As mentioned in the revised, draft minimum flows report in Section 5.3.3, the rates and periods of application were taken from the University of Florida Institute of Food and Agricultural Sciences (IFAS) recommendations for nearby Manatee County.	Yes	Reference to UF IFAS as a source of those coefficients is sufficient and appreciated.
Logic for not including a maximum diversion quantity for LSC is not clear	Please refer to response 2i in Table 2.	Partially	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as the protection of the health of the Harbor is concerned. Since it is acknowledged by the District (in their response) that it is unlikely that a potential maximum diversion quantity would be problematic for existing users, it is concerning that the District does not more fully consider the benefits of establishing similar maximum diversion guidance for the Lower Shell Creek as was included for the Lower Peace River.
Basis for 15% as threshold for "significant harm" needs more detail	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	Partially	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any <u>potentially</u> more conservative approaches such as inflection points or threshold values.

Table 8 - Panel Comments on Chapter 6 – Recommended Minimum Flow Values

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?	Yes. The 400 cfs maximum withdrawal for the Lower Peace River is applicable at all times. The only exceptions would occur during a period defined by a policy decision or directive of the District Governing Board, or an Order issued by the District's Executive Director. We further note that hurricanes and king tides are extreme hydrological events and we do not expect PRMRWSA to withdraw water during these events, especially during hurricanes.	Yes	Yes.
Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades	Please refer to response 1l and 2j for our responses to this comment.	Yes	Section 6.8 is not updated.
Logic for not including a maximum diversion quantity for LSC is not clear	Please refer to response 2i in Table 2.	Partially	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as the protection of the health of the Harbor is concerned.
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	Partially	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values.

Table 9 – Typos and Comments on Various Appendices

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Appendix E – page 7 – typo	The incorrect usage of the acronym "BF" to refer to the Baseline flow condition used for the habitat suitability modeling will be corrected to "BL" in the appendix or an errata sheet will be added to the appendix to identify the typographical error.	Yes	Laura?
Section 5.1 – typo	The misspelling of "indicators" in Section 5.1 was corrected in the revised, draft minimum flows report.	Yes	Laura?
Page 88 – typo – add "on data from a 13-year period"	We were not able to determine where to add the identified phrase to the report. We will seek further panel guidance to help address this comment.	Yes	Laura?
Page 96 – typo, first sentence "result in"	We corrected this typo (i.e., changed "resulting" to "result in") in the first numbered item listed in Section 5.4 of the revised, draft minimum flows report.	Yes	Laura?
Page 98 – clarification needed	We were not able to determine where clarification was needed on this page of the report. We will seek further panel guidance to help address this comment.	Yes	Laura?
Page 113 – "psu" missing from first sentence of second paragraph, also change spacing	We included the missing "psu" metric in the first sentence of the paragraph after Table 6-4 within Section 6.3 of the revised, draft minimum flows report. We did not, however, note any spacing issues on the section page.	Yes	Laura?
Appendix C should be a separate chapter	Instead of creating a new report chapter, we chose to amend information on the hydrodynamic model development included in Chapter 3 and especially in Chapter 5. Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.	Yes	Yes.
Page 16 – typo in title	Changed "HYDROLGIC" to "HYDROLOGIC" in the Chapter 2 title.	Yes	Yes
Page 47 replace "is" with "in" first sentence of 3.3.1.2.	We could not locate text on page 47 of the original draft report that seemed to need revision. However, we improved the referenced sentence in the revised, draft minimum flows report by changing "water" to "waters" in the first sentence of Section 3.3.1.2.	Yes	Laura?
Figure 3-11, page 57 – model failed to predict several observed salinity peaks	We think the referenced mismatches are mostly due to errors in the downstream salinity boundary condition during the wet season. We note that the original University of South Florida model for the system had a worse match at the Mote Marine station.	Yes	Yes.

Table 9- continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Caption of Figure 3-27 typo	We deleted "shows" from the caption for Figure 3-27 in the revised, draft minimum flows report.	Yes	Laura?
Use of wind data from nearby airports might be helpful	We looked at these sources for wind data to use for model development and applications but determined there are not enough wind data measurement stations in the region to allow us to describe the spatial variability of the Charlotte Harbor system. For simplicity, we chose to use a single wind station for our analyses. As noted in Appendix C (Chen 2020), we used wind data measured at the SWFWMD Peace River II ET site prior to 2/7/2013 and data from the Mote Marine station after that date. We agree that is would be beneficial to use multiple wind stations for modeling efforts similar to those undertaken for our minimum flow analyses, and we will consider this recommendation for future studies.	Yes	Yes.
Appendix C – typo on page 42	This typographical error was corrected in the revised appendix.	Yes	Laura?
Appendix C – typo on page 44	This typographical error was corrected in the revised appendix.	Yes	Laura?
Appendix C – definition of shoreline e length needed	The shoreline length is the actual length of the shoreline calculated by the hydrodynamic model. The dynamically coupled 3D-2DV model can track shoreline variations and allow the computation of the shoreline length at every time step. In the 3D model, because bottom elevations are defined and given at the four corners of the Cartesian grid, shoreline can be calculated using the bilinear interpolation with known water level if all grid corners are not submerged or emerged. In the 2DV model, the shoreline length can be calculated based on the water level, the grid length, and the river width, which varies with both vertically and longitudinally. This descriptive information for shoreline length was included in the revised version of Appendix C.	Yes	Laura?

Table 9- continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor	Although Caloosahatchee River flow was not directly used as boundary conditions near the mouth of the river, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. Specifically, the effects of Caloosahatchee River flow were indirectly considered in the water level, salinity, and temperature boundary conditions, as the USF model included Caloosahatchee and its flow. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.	Yes	It would be good to establish some relationship with SFWMD to share current and future information on Caloosahatchee River flow. The USF model run was for the past.
Caption for Figure 2-13 needs a space	We corrected this typo by adding a space between "through" and "2018" in the caption for Figure 2-13 in the revised, draft minimum flows report.	Yes	Laura?
Consider adding conversion table	We included a conversion table in the revised, draft minimum flows report.	Yes	Laura?

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Monday, June 22, 2020 12:03:41 PM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 22 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Laura and Peter:

Thanks for the edits and additions. For today's meeting, let's decide which ones we can skip over, and which ones we should spend more time on, to make sure that the Final Report represents our combined (or individual) responses to the District responses to our initial comments. Sorry to not have this put into the final report format, but I was out sick until Friday. Much better now though - and no concerns about finishing this off in the next two or three days.

Dave

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Monday, June 22, 2020 12:22:30 PM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 22 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

The revised version of the report does include additional writing on the model results using NOAA SLR values. The following statement in the report needs to be discussed:

Given the differences between the USACE and NOAA SLR projections, it is important to acknowledge that there is uncertainty in climate models regarding sea level rise projection. Nevertheless, these findings indicate that minimum flows established for the Lower Peace River and Lower Shell Creek may need to be reevaluated within 10 to 15 years after they are adopted into rule, to establish new baseline flow conditions that may occur as a result of SLR.

Peter

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Monday, June 22, 2020 12:55:10 PM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 22 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Image of SLR tables on one page together for discussion.

SLR rise tables.jpg
264.47 KB

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To unsubscribe from these emails, you can unfollow this category or unfollow this topic.

Table 6-10. Percent change in less than 2 psu baseline habitat simulated for the three sea level rise (SLR) scenarios relative to a current sea level scenario by low (Block 1), intermediate (Block 2) and high (Block 3) flow blocks for the Lower Peace/Shell System for the period from 2007 through 2014, using the UnLESS hydrodynamic model. Percent change values based on USACE-recommended SLR predictions and in parentheses, NOAA-recommended SLR predictions.

baseline

Scenarios	Percent (%) Change in < 2 psu Salinity Habitat								
	Volume			Bottom Area			Shoreline		
	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3
Low SLR	-13 (-26)	-3 (-7)	0 (0)	-4 (-10)	+2 (+4)	+3 (+7)	-14 (-27)	-5 (-10)	0 (-1)
Intermediate SLR	-22 (-45)	-6 (-14)	0 (+1)	-8 (-19)	+4 (+6)	+6 (+14)	-24 (-46)	-8 (-19)	-1 (-1)
High SLR	-49 (-65)	-17 (-26)	+1 (+2)	-22 (-36)	+7 (+7)	+16 (+24)	-52 (-70)	-21 (-34)	-2 (-3)

Commented [DL2]: Previously updated table (added "(%)" here and deleted % from listed values).

Commented [DL3]: (6/15/2020) Table updated again to include NOAA SLR projection-based results and corrections

Table 6-11. Percent change in less than 2 psu baseline habitat for three sea level rise (SLR) scenarios for simulated flow reductions associated with the minimum flows proposed for the Lower Peace River and Lower Shell Creek. Habitat changes were predicted for low (Block 1), intermediate (Block 2) and high (Block 3) flow blocks for the period from 2007 through 2014, using the UnLESS hydrodynamic model. Percent change values based on USACE-recommended SLR predictions and in parentheses, NOAA-recommended SLR predictions.

w/ MF

Scenarios	Percent (%) Change in < 2 psu Salinity Habitat								
	Volume			Bottom Area			Shoreline		
	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3
Low SLR	-26 (-31)	-20 (-23)	-13 (-14)	-21 (-23)	-16 (-18)	-12 (-12)	-23 (-27)	-16 (-20)	-5 (-6)
Intermediate SLR	-30 (-32)	-22 (-27)	-14 (-15)	-23 (-25)	-18 (-21)	-12 (-13)	-26 (-30)	-19 (-24)	-6 (-8)
High SLR	-33 (-36)	-29 (-36)	-16 (-18)	-26 (-30)	-22 (-26)	-13 (-13)	-31 (-33)	-26 (-34)	-8 (-11)

Commented [DL4]: Previously updated table (added "(%)" here and deleted % from listed values).

Commented [DL5]: (6/15/2020) Table updated again to include NOAA SLR projection-based results and corrections

+ = positive effect

– = negative effect

From: Angel Martin
To: Doug Leeper
Subject: RE: Minimum Flows--Lower Peace River and Lower Shell Creek--June 22, 2020
Date: Monday, June 22, 2020 3:09:49 PM

Doug,

As per the discussion with the peer review panel concerning the subject proposed minimum flows, I offer the following comments following today's conference call.

The text that accompanies tables 6-10 and 6-11 concerning the sea-level rise information and discussion needs further clarification and expansion. The baseline sea-level conditions (two conditions for table 6-10 and six for table 6-11 as I understand) on which the MFLs are based must be clear. The plus and minus values shown on the tables bust be clearly defined. There should be some text added that as additional sea-level data and conditions become available, the MFLs may be adjusted by the District. As Doug Leeper mentioned, it must be made clear that the MFLs are determined based on the effects of withdrawals and not specifically on sea-level change. The sea-level conditions are considered part of the baseline conditions. The possible sea-level rise issues may add to the uncertainty in the determination of the MFLs.

Please contact me if you need any clarifications or additional information. Thank you for the opportunity to comment on the proposed MFLs for the Lower Peace River and Lower Shell Creek.

____

Angel Martin
813-767-6944

DL

Moderator
113 posts

Doug Leeper
a few seconds ago

Comments from Angel Martin provided via email to Doug Leeper, as a follow-up to oral comments provided during the June 8, 2022 peer review panel teleconference.

As per the discussion with the peer review panel concerning the subject proposed minimum flows, I offer the following comments following today's conference call.

The text that accompanies tables 6-10 and 6-11 concerning the sea-level rise information and discussion needs further clarification and expansion. The baseline sea-level conditions (two conditions for table 6-10 and six for table 6-11 as I understand) on which the MFLs are based must be clear. The plus and minus values shown on the tables bust be clearly defined. There should be some text added that as additional sea-level data and conditions become available, the MFLs may be adjusted by the District. As Doug Leeper mentioned, it must be made clear that the MFLs are determined based on the effects of withdrawals and not specifically on sea-level change. The sea-level conditions are considered part of the baseline conditions. The possible sea-level rise issues may add to the uncertainty in the determination of the MFLs.

Please contact me if you need any clarifications or additional information. Thank you for the opportunity to comment on the proposed MFLs for the Lower Peace River and Lower Shell Creek.

Angel Martin

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Monday, June 22, 2020 2:50:10 PM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 22 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

My comments are related to the effect of Sea Level Rise on MFL:

Tables 6-10 and 6-11 should be better explained. Describe the "baseline" that the values are compared to. Explain the fact that the USACE SLR values came from older scientific study while NOAA SLR values are based on the latest Sea Level and Climate Sciences. Authors of the NOAA report include some of the best Sea Level scientists and practitioners. Therefore, the NOAA SLR values represent the best available science. Discrepancy between the USACE and NOAA values reflect the older science and the most updated science, but they do not reflect the uncertainties of climate models.

Based on the significant impact on the habitat during the NOAA sea level scenarios, as shown in Table 6-10 and 6-11, SWFWMD should consider revising the MFL in 5 years, instead of 10-15 years.

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From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Monday, June 22, 2020 4:22:12 PM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 22 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Dave,

I am looking back over my notes from this afternoon and want to confirm whether or not you still need me to write text relating to the shift away from biological indicators in the HBMP program or if that was resolved enough on the phone or if you want to handle it. No problem either way, I could do it first thing in the morning tomorrow if desired.

I think we are good on the 15%, but I can add something more if you think that would be helpful.

Also, I am not sure where we left the discussion about adding an average bar to graphs that shows data exclusively from the past. If you would like me to contribute something further about this for one of those boxes I can do that. Or if you would like to handle it or we can skip it.

Thanks,
Laura

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DL

Moderator
114 posts

Doug Leeper
a few seconds ago

Draft 2020-06-22 peer review panel teleconference summary is attached for review and approval/acceptance by Laura Bedinger and Peter Sheng. Hes been developed and reviewed by Dave Tomasko and Doug Leeper

W Lower Peace_Shell Peer Rev 2020-06-22 Telecon ...
30.54 KB

MEETING SUMMARY

Southwest Florida Water Management District
Scientific Peer Review Panel Teleconference
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Facilitated as a Video and Telephone-Based Teleconference

June 22, 2020

The Southwest Florida Water Management District (District) organized and facilitated a meeting of the independent scientific peer review panel convened to review a draft District report on proposed minimum flows for the Lowe Peace River and Lower Shell Creek. The meeting was facilitated as a teleconference/videoconference using the Microsoft Teams Videoconferencing Platform.

The meeting was held from 1:00 p.m. to approximately 2:45 p.m. on June 22, 2020.

The meeting was advertised in the Florida Administrative Register and on the District's web site. In addition, notifications concerning the event were distributed to local governments, other agencies, and stakeholder groups or representatives.

Meeting participants that chose to identify themselves are listed below.

<u>Peer Review Panel</u>
Laura Bedinger, Peer Review Panelist
Peter Sheng, Peer Review Panelist
Dave Tomasko, Peer Review Panel Chair

<u>District Staff</u>

Mike Bray	Yonas Ghile	Cindy Rodriguez
XinJian Chen	Doug Leeper	Adrienne Vining
Kristina Deak	Dennis Ragosta	Chris Zajac

<u>Others</u>
Angel Martin
Jim Guida

The meeting was initiated by Doug Leeper with a review of the meeting agenda, a status update for the peer review process and a request that all teleconference participants who wished to do so identify themselves.

Next, the panelists, Laura Bedinger, Peter Sheng and Dave Tomasko, discussed plans to complete a final peer review panel report by June 26, 2020 and post the report to the webforum established for the review process.

To facilitate this process, Dr. Tomasko led a discussion of the panelist's draft tabularized responses to the District responses to the panel's initial peer review report. Each panelist had previously posted their additions to the draft tabularized responses document to the review webforum. Focused areas of discussion included: the District's revised presentation of potential sea level rise effects on salinity-based habitats that were assessed for development of the proposed minimum flows; panel comments concerning water quality information collected as part of the Hydrobiological Monitoring Programs established to address permitting requirements associated with surface water withdrawals from the Peace River and Shell Creek; presentation of descriptive information on long-term and short-term flows in the systems; and future biological data collection needs for the river, creek and Charlotte Harbor.

The panelists noted they planned on making some minor revisions to their tabularized comments document over the next few days and posting the proposed changes to the webforum. Dr. Tomasko indicated he would use the panel's updated table to prepare and post a draft final peer review report to the webforum for subsequent review and revision by the panel. Finally, Dr. Tomasko indicated that he would like to have the panel's final peer review report posted to the webforum by June 25th, 2020, one day in advance of the originally planned posting date.

Following the panel-business portion of the teleconference, Mr. Leeper asked if any members of the public wished to comment on the peer review process or the proposed minimum flows. Mr. Angel Martin noted that the District should work to clarify its presentation of potential sea level rise effects on salinity-based habitats, uncertainty associated with sea level rise predictions, and the planned use of sea level rise information in future minimum flows assessments for the Lower Peace River and Shell Creek.

Following the public input session, Mr. Leeper adjourned the meeting.

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Wednesday, June 24, 2020 1:07:53 PM

SWFWMD WebBoards

PeterSheng has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 24 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I approve the Draft 2020-06-22 peer review panel teleconference summary.

Thanks,
Peter Sheng

Visit Topic

Or reply directly to this email

From: noreply@discussion.community on behalf of SWFWMD WebBoards
To: Doug Leeper
Subject: Re: Peer Review Panel Teleconference - June 22, 2020
Date: Thursday, June 25, 2020 10:16:27 AM

SWFWMD WebBoards

lbedinger has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 25 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

I also approve the teleconference summary.

Visit Topic

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Email followed content: Never | Weekly | Daily | **Immediately** |

To unsubscribe from these emails, you can unfollow this category or unfollow this topic.

DL

Moderator

115 posts

Doug Leeper

a few seconds ago

Final approved 2020-06-22 peer review panel teleconference summary is attached.

Lower Peace_Shell Peer Rev 2020-06-22 Telecon ...

42.80 KB

QUOTE

MEETING SUMMARY

Southwest Florida Water Management District
Scientific Peer Review Panel Teleconference
Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Facilitated as a Video and Telephone-Based Teleconference

June 22, 2020

The Southwest Florida Water Management District (District) organized and facilitated a meeting of the independent scientific peer review panel convened to review a draft District report on proposed minimum flows for the Lowe Peace River and Lower Shell Creek. The meeting was facilitated as a teleconference/videoconference using the Microsoft Teams Videoconferencing Platform.

The meeting was held from 1:00 p.m. to approximately 2:45 p.m. on June 22, 2020.

The meeting was advertised in the Florida Administrative Register and on the District's web site. In addition, notifications concerning the event were distributed to local governments, other agencies, and stakeholder groups or representatives.

Meeting participants that chose to identify themselves are listed below.

<u>Peer Review Panel</u>
Laura Bedinger, Peer Review Panelist
Peter Sheng, Peer Review Panelist
Dave Tomasko, Peer Review Panel Chair

<u>District Staff</u>

Mike Bray	Yonas Ghile	Cindy Rodriguez
XinJian Chen	Doug Leeper	Adrienne Vining
Kristina Deak	Dennis Ragosta	Chris Zajac

<u>Others</u>
Angel Martin
Jim Guida

The meeting was initiated by Doug Leeper with a review of the meeting agenda, a status update for the peer review process and a request that all teleconference participants who wished to do so identify themselves.

Next, the panelists, Laura Bedinger, Peter Sheng and Dave Tomasko, discussed plans to complete a final peer review panel report by June 26, 2020 and post the report to the webforum established for the review process.

To facilitate this process, Dr. Tomasko led a discussion of the panelist's draft tabularized responses to the District responses to the panel's initial peer review report. Each panelist had previously posted their additions to the draft tabularized responses document to the review webforum. Focused areas of discussion included: the District's revised presentation of potential sea level rise effects on salinity-based habitats that were assessed for development of the proposed minimum flows; panel comments concerning water quality information collected as part of the Hydrobiological Monitoring Programs established to address permitting requirements associated with surface water withdrawals from the Peace River and Shell Creek; presentation of descriptive information on long-term and short-term flows in the systems; and future biological data collection needs for the river, creek and Charlotte Harbor.

The panelists noted they planned on making some minor revisions to their tabularized comments document over the next few days and posting the proposed changes to the webforum. Dr. Tomasko indicated he would use the panel's updated table to prepare and post a draft final peer review report to the webforum for subsequent review and revision by the panel. Finally, Dr. Tomasko indicated that he would like to have the panel's final peer review report posted to the webforum by June 25th, 2020, one day in advance of the originally planned posting date.

Following the panel-business portion of the teleconference, Mr. Leeper asked if any members of the public wished to comment on the peer review process or the proposed minimum flows. Mr. Angel Martin noted that the District should work to clarify its presentation of potential sea level rise effects on salinity-based habitats, uncertainty associated with sea level rise predictions, and the planned use of sea level rise information in future minimum flows assessments for the Lower Peace River and Shell Creek.

Following the public input session, Mr. Leeper adjourned the meeting.

From:	noreply@discussion.community on behalf of SWFWMD WebBoards
To:	Doug Leeper
Subject:	Re: Peer Review Panel Teleconference - June 22, 2020
Date:	Thursday, June 25, 2020 2:13:26 PM

SWFWMD WebBoards

David Tomasko has replied to a topic.

Peer Review Panel Teleconference - June 22, 2020

Posted Jun 25 in the Minimum Flows for the Lower Peace River and Lower Shell Creek category

Folks:

Attached is the Peer Review Panel's Final Report. It is formatted as we discussed during our meeting earlier this week, with the following sections: 1) an introduction to the Panel Charges and the MFLs, 2) a summary of the process used to develop the Interim Report, and 3) sections that include introductory text and tabular summary of the following items: the Panel concern raised in the Interim Report, the District response to those concerns, the Panel's review of District responses, and - if available - Panel comments on changes made to the revised draft MFL report.

Any typos or formatting issues are mine alone, but I did want to thank both Peter and Laura for the time and effort they put into not just reviewing the MFL report, but in documenting their comments, and reviewing the text and tables used to develop the Interim and Final Panel reports.

I also wanted to pass along the gratitude that the three of us felt, in terms of the level of professionalism and concern that was so evident in the MFL reports we reviewed. The three of us live and work in Florida, and I wanted to convey how much I appreciate the level of effort District staff put into the development of this regulatory guidance. Florida faces many challenges over the next few decades, and the work of the employees of the SWFWMD, along with its very talented consultants, goes along way towards making me feel that the right people are paying attention to these important topics.

Sincerely,

David Tomasko

Lower Peace River and Shell Creek MFL Peer Revi...
636.29 KB

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Scientific Peer Review Panel Review of "Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek" – Final Report

Prepared for:

Southwest Florida Water Management District

Prepared by:

Laura Bedinger, Ph.D. – Panel Member

Peter Sheng, Ph.D. – Panel Member

David Tomasko, Ph.D. – Chair

June 2020

Introduction

The Southwest Florida Water Management District (District) contracted with a Peer Review Panel (Panel) comprised of Laura Bedinger, Ph.D., Peter Sheng, Ph.D. and David Tomasko, Ph.D. to provide an independent, scientific peer review of its proposed minimum flows and levels for the Lower Peace River (LPR) and Lower Shell Creek (LSC), as outlined in the report “Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report” dated March 20, 2020 along with six appendices.

The draft MFL report summarizes prior efforts to establish MFL guidance for the Lower Peace River and Lower Shell Creek. For the purposes of the draft MFL report, the LPR is defined as the river segment from the USGS gage location at Arcadia down to Charlotte Harbor, while the LSC is defined as the segment of the creek that extends from the Hendrickson Dam at Shell Creek Reservoir to the confluence of Shell Creek with the Lower Peace River.

The District’s prior MFL guidance for the previously developed minimum flows for the LPR and guidance proposed for LSC were summarized in a 2010 District report. This information supported the adoption of the MFL for the Lower Peace River into District Rules as Rule 40D-8.041(8), Florida Administrative Code (FAC) that became effective in August 2010, as shown below:

Period	Effective Dates	Where Flow on Previous Day Equals:	Minimum Flow Is
Annually	January 1 through December 31	≤ 130 cfs* > 130 cfs	Actual flow (no surface water withdrawals permitted) Seasonally dependent – see Blocks below In addition, the total permitted maximum withdrawals on any day shall not exceed 400 cfs
Block 1	April 20 through June 25	≤ 130 cfs > 130 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs
Block 2	October 28 through April 19	≤ 130 cfs > 130 cfs and < 625 cfs ≥ 625 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs Previous day's flow minus 29%
Block 3	June 26 through October 27	≤ 130 cfs > 130 cfs and < 625 cfs ≥625 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs Previous day's flow minus 38%

*cfs = cubic feet per second

In 2010, the District developed draft minimum flows guidance for the LSC, and determined that a recovery strategy was needed for the LSC, as existing (at the time) flow rates in the LSC were below the draft MFL guidance developed for the LSC. Based on this finding, and the need to develop a recovery strategy for the LSC, draft MFL guidance for the LSC was not adopted into District rules.

The revised MFL guidance for the LPR, from the draft 2020 MFL report, is listed below:

Block	If Combined Flow on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs >149 cfs - 297 cfs	Flow - 130 cfs 13% of flow
Block 2	>297 cfs - 386 cfs >386 cfs - 622 cfs	23% of (flow - 297 cfs) plus 13% of remaining flow 23% of flow
Block 3	>622 cfs - 1037 cfs >1,037 cfs	40% of (flow - 622 cfs) plus 23% of remaining flow 40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

The MFL guidance for the LSC from the draft 2020 MFL report is listed below:

Block	If Inflow to Reservoir on Previous Day is	Allowable Flow Release
Block 1	<56 cfs	87% of inflow
Block 2	56 cfs - 137 cfs	77% of inflow
Block 3	>137 cfs	60% of inflow

The most apparent difference between the initial (2010) and draft revised MFL guidance for the LPR (and that proposed for LSC) is the move from a calendar-based regulatory approach to guidance that is based on defined threshold flow levels – which vary over the course of a year. The biggest difference between MFL guidance for LPR and LSC is that there is a maximum diversion quantity value for the LPR, but not for the LSC.

Peer Review Panel Responsibilities

The District's charge to the Panel was for the members to become familiar with the relevant regulatory background, and to use that information in the development of their report.

Section 373.042 of the Florida Statutes, states that for waterbodies such as the LPR and the LSC, established minimum flows represent the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The legislative guidance further states that MFLs shall be calculated using the best information available, that the Governing Board shall consider and may provide for non-consumptive uses in the establishment of MFL, and when appropriate, MFL may be calculated to reflect seasonal variation.

Additional and more detailed guidance on the development of MFL is provided in Rule 62-40, FAC, which states that MFL should consider the following concerns: 1) recreation, 2) fish and wildlife habitats, 3) estuarine resources, 4) transfer of detrital material, 5) maintenance of freshwater storage and supply, 6) aesthetics, 7) filtration and absorption of pollutants and/or nutrients, 8) sediment loads, 9) water quality, and 10) navigation.

As such, MFL are to cover not only the protection of natural resources, but also navigation, recreation, and – for r the LSC in particular – the maintenance of freshwater storage and supply.

In its broadest sense, the Panel is charged with the following six tasks, as related to their review of the 2020 Draft MFL for the LPR and the LSC:

1) Determine whether District conclusions are supported by analyses/results presented
2) Determine whether data/information were properly collected and used, any data exclusions were justified, and the data were the best available information
3) Determine whether technical assumptions are clearly stated, reasonable and consistent with the best available information, and if better analyses could be used
4) Determine whether procedures and analyses were appropriate and reasonable, based on the best available data, correctly applied, limitations were handled appropriately, and conclusions are supported by the data
5) For methods judged to be not scientifically reasonable, describe scientific deficiencies, identify remedies, if any, or alternative methods

6) As appropriate, identify and characterize effort involved for preferred alternative methods that could be used in lieu of scientifically reasonable methods that were used

Format of the Panel's Final Report

After discussion in publicly-accessible teleconferences, the Panel decided to produce an interim MFL review report using the following format: 1) Panel comments by all panelists would be compiled, based on the sequencing of the Draft MFL, 2) Panel comments would first be summarized in tabular form, by report section, in terms of the concern – briefly described – and the relevant Panel charge for which the concern was raised, and 3) additional text would provide additional background for the concern.

The Initial Panel report format was selected to allow for a more efficient District review process, as shared concerns were characterized in one location, rather than the more traditional approach, where concerns from other Panels might be listed in multiple locations in different sections of their Peer Review report. The Initial Report was constructed from the comments from individual Panel members, with their individual comments included as Appendices to the main body of the Initial Report.

After receiving the Interim Report, District staff reviewed the Panel's concerns, and responded to the comments in writing. For some of the Panel concerns, sufficient time existed to modify the draft MFL report, if the District agreed with the suggested modifications. On those occasions, the Panel members could review not only the District response to their concerns, but the modifications to the draft MFL report. Not all comments could be addressed in a revised draft MFL report. For example, the Panel members pointed out concerns with the water quality parameter list being collected and analyzed for the Hydrobiological Monitoring Program (HBMP). While the concerns about HBMP water quality parameters remain, changes to the monitoring program can only occur moving forward in time.

This Final Report should be viewed in context with the Initial Report. The Panel's Initial Report provided detailed information on a number of concerns or general comments related to the draft MFL for the Lower Peace River and Lower Shell Creek. Those comments were then responded to by District staff, and in some cases, the draft MFL was revised in response to those comments. This Final Report summarizes the Panel's subsequent response to the District's response to the Initial Report, including any modifications to the draft MFL report that could be completed prior to the development of this Final Report.

This Final Report has the following format: 1) a brief summary of the comments on the draft MFL, by individual MFL sections, and 2) a tabular summary of the Panel's review of District responses to the Panel concerns. The tabular summary includes four columns: 1) a summary of the Panel concerns, 2) a summary of District Responses, 3) whether the Panel was satisfied with the District response, and 4) whether any provided modifications of the draft MFL were satisfactory.

Overall Panel Comments on the Draft MFL

The Panel felt that the draft and revised MFL reports represented an impressive effort by the District and its consultants. The variety, quantity and quality of data that was compiled, collected, analyzed and interpreted, as well as the hydrodynamic and hydrologic modelling efforts were viewed as impressive, and obviously indicative of the MFL process being approached in a thorough and professional manner by District staff. The conversion of MFL guidance from a calendar-based system to flow-based criteria was considered to be a valuable improvement over the earlier guidance.

The District's use of a 15% threshold for "significant harm" was one of the primary concerns raised by the Panel. While the Panel concluded that there is nothing inherently "wrong" with the proposed threshold, the Panel believes that the draft MFL report should balance both the existing literature that supports the appropriateness of such guidance, as well as to note that such guidance is not universally accepted as a threefold of acceptable habitat loss for all regulatory programs. The Panel agreed that alternative and locally-derived thresholds were sought after, and that no more protective links could be made for water quality, and that wetland inundation thresholds were actually less protective than the 15% flow-based salinity-habitat metric.

Panel members felt that while the expanded and more detailed hydrodynamic model used in the MFL was a substantial improvement over prior efforts, the issue of baseline conditions and the overall hydrologic output for non-gaged portions of the watershed will continue to have limitations, and additional revisions will be helpful, as data allow.

The Panel was pleased that the District's revised draft MFL report now includes reference to other regulatory guidance documents. For example, the revised draft MFL report now includes reference to the Pollutant Load Reduction Goal developed for Charlotte Harbor. The Panel felt that public agencies should seek to develop regulatory guidance that is as complementary – or at least consistent with – guidance from other local, regional and/or state agencies.

The Panel believes that closer coordination with the South Florida Water Management may be needed, to better quantify potential current and future impacts to the health of portions of Charlotte Harbor associated with the quantity and quality of water discharged from the Caloosahatchee River. This should continue to be a concern to the District, in light of recent adverse impacts to seagrass resources along the eastern wall region of Charlotte Harbor – impacts that could be attributed by some to the Peace River, given its much closer proximity, compared to the Caloosahatchee River.

Related to the issue of accelerating rates of sea level rise (SLR), the Panel felt it would be prudent to consider the potential impact of SLR on the MFL by using the NOAA (2017) projection of SLR for Fort Myers in 2020-2050. The revised draft MFL does include the numbers from the more recent NOAA report. As the field of SLR impacts is adjusting predictions, as needed, based on additional data collection, the newer report from NOAA should be considered the "best available science" as relates to this concern.

The Panel and the District are in sync as to the potential impacts of future SLR on the quantity of low-salinity habitat in the Lower Peace River, as results displayed in the revised draft MFL report suggest that the protective benefits of the MFL might be offset within a few decades by realistic expectations of future SLR.

In consideration of the rapidly changing climate, the Panel recommends that, future evaluations of the MFL, as well as coordination with the regional water supply utilities should be cognizant of these potential impacts, and should work together to determine if modifications to future MFL guidance may be warranted, as actual SLR impacts arise.

A summary of the Panel's review of District responses to overall comments from the Panel is shown in Table 1.

Table 1 – Review of District Responses – Overall Panel Comments

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
MFL report was comprehensive, well-written and thorough	We thank the panel for this comment.	No response required	No response required
Basing MFL on specific flows, vs. calendar dates, a good idea	We thank the panel for this comment.	No response required	No response required
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" below for our response to this comment.	This important topic is discussed by the District, and examples given of the reasonableness of the 15% threshold. However, the point remains that while examples can be found that support its application, it is not universally agreed as an acceptable level of impact for all activities (e.g., wetland impacts from construction, impacts to seagrass from dredging, etc.)	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any <u>potentially</u> more conservative approaches such as inflection points or threshold values. Although citations reference the reasonableness of using a 15% threshold to provide "high to moderate" protection from impacts, those are not universally-accepted as definitive thresholds for "significant harm" and may not necessarily by appropriate in all situations.
Hydrodynamic modeling represents a substantial improvement from prior efforts	We agree and thank the panel for this comment.	No response required	No response required
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	The proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed in accordance with all requirements for minimum flows establishment included in the Florida Statutes and Water Resource Implementation Rule. The minimum flows established for the river and creek will be implemented in accordance with these and other legislative and regulatory directives through the District's permitting and planning programs and other water management activities. With regard to other water management activities, we note, for example, the District's 2000 Charlotte Harbor Surface Water Improvement and Management (SWIM) plan and the 2020 SWIM plan currently under development for the harbor are mentioned and cited in the revised, draft minimum flows report. The SWIM plans are mentioned in the water quality classification Section 3.1, a newly added Section 3.2.2 on the Pollutant Load Reduction Goal for the Lower Peace River and Section 4.1.5, which addresses seagrasses.	Yes	Additional text clearly spells out the linkages between the MFL's need to protect the very highest flows coming into the Harbor, which requires an attention to high flows that is not as evident for rivers that discharge to locations such as Tampa Bay and the Springs Coast.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Uncertainty and accuracy of hydrologic model should be discussed in more detail	We considered the over-estimation of ungaged flow in our previous, 2010 minimum flows study for the Lower Peace/Shell System. We adjusted flow records to get the best ungaged flow estimate based on the previous hydrodynamic study of the Charlotte Harbor system and the flow estimation from those ungaged sites using a surface water model HSPF (Ross et al. 2005). In addition, a drainage ratio method was used to improve streamflow estimation at ungaged sites based on neighboring gaged sites. We acknowledge that there is still uncertainty and inaccuracy in our estimates of ungaged flow, which accounts for about 16% of the entire Peace River watershed drainage. About 84% of the Peace River watershed is gaged by the U.S. Geological Survey and the hydrologic loading to the Lower Peace River from the gaged watershed is reliable. For our minimum flow analyses, we used the best available data, in combination of what we learned from the previous hydrodynamic simulation of the system, and a comparison of two other hydrologic studies of the watershed to estimate the ungaged flow to the Lower Peace River. We added new text addressing ungaged flow estimation to Section 5.3.1 of the revised, draft minimum flows report. Additional response development associated with incorporation of uncertainty information in the body of the minimum flows report and the hydrodynamic modeling appendix (Chen 2020) was also added. Regarding modeling and data uncertainty, we think it is worth emphasizing that as discussed in Section 1.3.7 of the draft minimum flows report, the District uses an adaptive management approach for minimum flows development and implementation, which includes routine status assessments and, as necessary, reevaluation of established minimum flows. When possible, these activities are conducted to attempt to minimize uncertainty in our results and recommendations.	Yes, the level of uncertainty is clearly spelled out in the District response.	The level of uncertainty associated with flow estimates for the ungaged portions of the Peace and Lower Shell Creek are better described in the District response to the Initial Panel Report. However, the revised MFL report titled "revised LPR_Shell Draft Min Flows2020-06-01.pdf" does not yet include the same level of explanation of these uncertainties as the District response laid out in the file "LPR_Shell Peer Rev Staff Resp 2020-06-01". As such, while the Peer Review Panel is now more aware of the reasonableness and appropriateness of the District's approach, the public document may not give others the same level of understanding, at least in the revised MFL report from June 1, 2020.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
In a changing climate, long-term (50-100 year) averaged flow are not necessarily more indicative of the hydrologic conditions in the next 15-20 years. Should more recent data in the past two decades be given more weight in the development of the baseline flow which was based on the average in 1950-2014?	We think it is best to use hydrologic data (e.g., flow records) for the longest period, within reason, to best capture the climatic variability integrated in the data. As part of baseline flow development for Lower Peace River, historic flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Charlie Creek were examined in multi-decadal blocks (roughly 20 years) as shown in Figure 5.3 of the draft minimum flows report. Per the request of the peer reviewers, we added short-term (2000-2018) mean annual flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Shell Creek to Section 2.7.1 in the revised, draft minimum flows report. In addition, as noted in response 4f in Table 4 below, we added the short term average flow values to Figures 2-12 through 2-16 within the report section. We also note that as part of minimum flow assessment for the Lower Peace River, 5- and 10 -year moving averages were calculated for river flows under baseline, minimum flow and existing flow scenarios (see Table 7.1 in the revised, draft minimum flows report). We also think it is worth emphasizing again that the District uses an adaptive management approach for minimum flows development and implementation that includes routine status assessments and, as necessary, reevaluation of established minimum flows.	Yes	Additional text and revised figures include the requested data analysis. However, the District should consider the value of separately displaying data from 2000 to 2018, to compare the recent period with the prior-to-recent period.
Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows on bottom water hypoxia and other phenomena	We included additional information on the importance of hydrodynamics in several sections of the revised, draft minimum flows report. For example, we added text to the end of Section 1.5 that emphasizes the adopted minimum flows for the Lower Peace River and the proposed minimum flows for the river and Lower Shell Creek were based on potential flow-related changes in salinities assessed with hydrodynamic models. In addition, we added a new section (Section 3.2.2) on the pollutant load reduction goal for the Lower Peace River, emphasizing the environmental effects associated with relatively large, seasonal inflows to Charlotte Harbor. We also emphasized the importance of hydrodynamics in text added to the beginning of Section 3.3.1.	Yes	Additional text links the need to protect the very highest inflows to bottom water hypoxia, and the link between bottom water hypoxia and the Harbor's adopted Pollutant Load Reduction Goal.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Consider development of a "dynamic" MFL with real-time now-cast/forecast capabilities	This is an intriguing suggestion, although we do not think development of a dynamic water quality model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. Minimum flows (and minimum water levels) are typically assumed to correspond with long-term hydrologic and environmental conditions, and in the case of the Lower Peace River and Lower Shell Creek were developed based on central tendencies of environmental responses to changes in flow simulated every 90 seconds (or 75 or 72 seconds during a few short periods when storms occurred) for a 7.7 year simulation period. Further, we add that estuarine organisms are adapted to cope with a wide range of salinities and the small changes in salinity, attributable to the currently proposed minimum flows, are unlikely to alter the ecological integrity of the naturally dynamic Lower Peace/Shell System or Charlotte Harbor. We note, however, that established minimum flows can be and are used to develop withdrawal-related conditions in water use permits, on both long-term and short-term bases. For example, in the case of the existing and proposed minimum flows for the Lower Peace River, permit conditions that limit withdrawals based on the previous day's average flow have been and are expected to be successfully implemented. These types of permit conditions are developed by District staff in coordination with permittees based on identified regulatory constraints, such as established minimum flows, the needs of the permittee and other practical considerations.	Yes	Additional text and revised figures include the information requested.

Table 1 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee	Although flow from the Caloosahatchee River was not directly used as boundary conditions near the mouth of the Caloosahatchee River, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. We also think it is valuable to comment on the complexity of inflows that can impact environmental conditions in Charlotte Harbor. For example, proliferation of drift algae and apparent loss of seagrass has been observed along the east wall region of the harbor and may be related to the Red Tide event of 2017-2018. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.	Yes, the issues related to red tide, potential impacts from the Caloosahatchee River and the potential for adverse impacts to the Harbor from sources other than the Peace and Myakka is realized by the District, and included in the response to the Panel's Initial Report.	The District's response to the Panel's comment displays an understanding of the issue of impacts to the Harbor from influences outside the control of the District itself. However, the revised MFL report titled "revised LPR_Shell Draft Min Flows2020-06-01.pdf" does not yet include the same level of discussion as the District response laid out in the file "LPR_Shell Peer Rev Staff Resp 2020-06-01". While the Caloosahatchee River is listed as a model element, the revised MFL report does not include the words "red tide" or references to the sort of impacts described in the District's response to the Panel. As such, while the Peer Review Panel is now more aware of District's awareness of this issue, the public document may not give other reviewers the same level of understanding, at least in the revised MFL report from June 1, 2020.
Analyze the potential impact of sea level rise on the MFL, using best available SLR data for 2020-2050	We did not develop the proposed minimum flows based on future sea level conditions. However, we evaluated the proposed minimum flows under three SLR scenarios to help determine when a future re-evaluation of the minimum flows may be necessary. Although we used U.S. Army Corps of Engineer (USACE) SLR estimates, which are generally lower than those of the National Oceanic and Atmospheric Administration (NOAA), our results supported the need for consideration of a future reevaluation for the Lower Peace River and Lower Shell Creek minimum flows. Future reevaluations will be based on actual sea level conditions and other factors. Following the review panel's suggestion, we have conducted new model runs using NOAA et al. (2017) SLR estimates and are in the process of revising the draft minimum flows report based on an analysis of the new model results.	Yes	Additional text and revised figures include the information requested. However, the differing baseline conditions and rates of anticipated sea level rise displayed in the two tables could be better explained. It should also be noted that the 2017 SLR estimates from NOAA should be considered not just another example of SLR estimates to be compared to the earlier USACE values, but the most up-to-date estimates, and thus the "best available science".

Comments on Executive Summary

The draft MFL report was revised to incorporate language that the Panel recommended to better define the terms "significant harm" and "best available information" in the Executive Summary.

Concerns were raised by the Panel related to the absence of a maximum flow value for the LSC, compared to a proposed value of 400 cfs for the Lower Peace River. This seems to be a function of the District determining that the area of interest for MFL development for the LSC ends at its downstream boundary with the LPR, even though the area of concern for the LPR extends out into Charlotte Harbor. Since flows from the LSC average (on an annual time step) perhaps 20 to 30% of the annual average flows of the LPR, if flows from the LPR are important to the Harbor such that a maximum withdrawal value of 400 cfs is included in the draft MFL, it would appear that a similar maximum diversion criterion could also be derived for the LSC. The revised MFL report does not include a proposed maximum flow value for the LSC, and while the Panel understands the District's points for not including such guidance, the Panel suggests that such guidance ought to be considered.

The Panel and the District are in agreement that the impact of SLR will need to be carefully monitored in the near future, as the impacts of SLR could offset the protections laid out as the basis for the protective nature of the MFL guidance.

A summary of the Panel's review of District responses to Panel comments on the Executive Summary is shown in Table 2.

Table 2 – Review of District Responses – Executive Summary

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Definition of "significant harm"	Significant harm and significantly harmful are not defined by the State Legislature. For minimum flows and levels development, each water management district of the state or the Florida Department of Environmental Protection identify specific thresholds or criteria that can be associated with significant harm. We incorporated additional information concerning significant harm into the first paragraph of the Executive Summary in the revised, draft minimum flows report.	Yes	Modified text in the Executive Summary better explains the logic behind the District's interpretation of how "significant harm" is quantified, as well as the background information used to support their approach to quantifying such.
Definition of "best available information"	In accordance with direction provided by the Florida Legislature, District staff use the best available information when determining minimum flows. Determinations regarding the best available information are made by District staff based on professional judgment, with consideration of input from all stakeholders. The best available information includes information that exists at the initiation of the minimum flows development process and information that is acquired specifically to fill data requirements deemed necessary for establishment of the best, defensible minimum flows. We do not think a definition for "best available information" is needed in the Executive Summary of the minimum flows report. However, we added the characterization of "best available information" above to the first paragraph of Section 1.5 in the revised, draft minimum flows report.	Yes	Modified text in both the Executive Summary and Section 1.5 better explains the modifier of "best available" when used to construct the MFL using existing data sources

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Could MFL be set for more than 3 flow blocks?	In theory, any number of flow blocks could be identified and used for minimum flows development and implementation. For practical purposes, use of three flow blocks for the District's development and implementation of minimum flows for water use permitting, planning and water resource protection has proven to be successful. One reason for this success in the management of runoff driven lotic systems is that the flow blocks associated with established minimum flows have been developed with consideration of low, medium and high flow conditions that are known to be important for the physical, chemical and biological functions and structure of riverine systems. We have not conducted analyses associated with development of proposed minimum flows for the Lower Peace River and Lower Shell Creek with varying numbers of flow-based blocks.	Yes	Issue did not need to be included in revised MFL report – was raised for consideration, rather than a requested modification to the draft report.
Concern over LSC low flow conditions	Please refer to response 2i in this table.	Yes – District response is quite clear that the proposed minimum flow guidance is not being met, but that adherence to the guidance contained within the MFL would enhance ecosystem function, compared to existing condition.	The revised MFL report clearly states that the proposed minimum flow guidance for the Lower Shell Creek is not being met, and requires a recovery strategy. Table 7-2 lays out the steps involved in the recovery strategy for the Lower Shell Creek.
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	Please refer to response 1e in Table 1 for our response to this comment.	Yes	Additional text clearly spells out the linkages between the MFL's role in protecting the health of the Lower Peace River, Lower Shell Creek and Charlotte Harbor, in light of concurrent efforts to monitor, protect and/or restore ecological health in those same systems.
Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP's Numeric Nutrient Concentration (NNC) criteria	We analyzed water quality data to explore potential linkages between flow and water quality parameters as is required by the Water Resource Implementation Rule, not to validate or to infer compliance with the Numeric Nutrient Criteria adopted by FDEP	Yes – but the issues associated with incomplete analytical techniques for phosphorus (i.e., reporting only orthophosphate) and chlorophyll-a (i.e., reporting values not corrected for phaeophytin) are problematic.	The HBMP's parameter list should collect all forms of phosphorus, not just orthophosphate, and values for chlorophyll-a should be corrected for phaeophytin. While these points cannot be "corrected" in the MFL report, this issue should be resolved prior to the production of the next MFL update.

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Explain the need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	We agree with the preliminary comments below that are included in the appendices to the Panel's initial peer review report: *"It appears improbable that even maximum water withdrawals would reduce flows sufficient to prevent bottom water hypoxia, which requires an average flow of 10,000 CFS at Arcadia (Stoker et al, 1989 – U.S. Geological Survey Publication XXXXX) – roughly equivalent to total gaged PR flow of about 20,000 cfs."* *"Proposed max withdrawal of 400 cfs represents ca. 2% of the minimum flow from PR watershed required to initiate stratification of 10 ppt in Harbor. Consequently, maximum withdrawal appears to be protective of the "reset button" of bottom water hypoxia."* We have therefore included text in a new Section (3.2.2) and at the beginning of Section 3.3.1 in the revised, draft minimum flows report to emphasize the importance of hydrodynamics and high inflows to Charlotte Harbor.	Yes	Additional text links the need to protect the very highest inflows to bottom water hypoxia, and the link between bottom water hypoxia and the Harbor's adopted Pollutant Load Reduction Goal.
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	This important topic is discussed by the District, and examples given of the reasonableness of the 15% threshold. However, the point remains that while examples can be found that support its application, it is not universally agreed as an acceptable level of impact for all activities (e.g., wetland impacts from construction, impacts to seagrass from dredging, etc.)	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values. Although citations reference the reasonableness of using a 15% threshold to provide "high to moderate" protection from impacts, those are not universally-accepted as definitive thresholds for "significant harm" and may not necessarily by appropriate in all situations.

Table 2 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health	The proposed minimum flows for Lower Shell Creek are to be implemented based on discharge of a percentage of the inflow to Shell Creek Reservoir. For example, the allowable flow reduction of 23% for Block 2 flows, means that quantity of water equal to 77% of the inflows to the reservoir must be discharged downstream of Hendrickson Dam. This minimum flow is required, irrespective of withdrawals from the reservoir. By associating the minimum flows with rates of inflow to the reservoir, we believe the ecology of Lower Shell Creek is protected from significant harm associated with water withdrawals. Thus, a maximum flow diversion quantity is not required for the Lower Shell Creek. For minimum flows development purposes, Shell Creek is partitioned into the Upper Shell Creek and Lower Shell Creek, separated by Hendrickson Dam. The only significant, permitted withdrawal directly from Shell Creek is associated with the permit issued by the District to the City of Punta Gorda for withdrawals from Shell Creek Reservoir, the portion of the upper creek impounded by the dam. Because the proposed minimum flows for Lower Shell Creek are based on maintaining block-specific percentages of inflow to Shell Creek Reservoir from Upper Shell Creek (and Prairie Creek) and the City's withdrawals are from the multi-year storage in the reservoir storage, a maximum withdrawal limit (i.e., a maximum flow reduction) is not needed for the Lower Shell Creek minimum flows. Also, of note, the permit issued to the City for withdrawals from Shell Creek Reservoir includes monthly and annual average maximum withdrawal limits. We further note that preliminary comments prepared by the panel and used to support development of their initial peer review report, indicated it is "*[n]ot likely that max withdrawals (if set) for LSC would affect threshold values for stratification, but should be mentioned/ acknowledged* We agree with this assertion, and note that for a recent period from 1996 through 2016, mean annual flow in the Lower Peace River, based on flows in the River at Arcadia and flows from Joshua and Horse creeks was 1,279 cfs, while flows to Lower Shell Creek from the same	Not entirely. The District's response is very detailed, and lays out the logic of them not including a maximum flow diversion quantity for Lower Shell Creek. However, the Panel's concerns about the lack of incorporation of a maximum diversion quantity remain. The District's logic for including a maximum diversion quantity of 400 cfs for the Lower Peace River are that diversions above and beyond that amount might be problematic for regions beyond the boundaries of the Lower Peace River – areas out into the Harbor itself. The lack of similar maximum diversion guidance for the Lower Shell Creek does not follow the same logic. While it is true that such quantities are not likely to be reached – not "requiring" such guidance does not diminish the value of developing such guidance.	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as protecting the health of the Harbor is concerned. Since it is acknowledged by the District (in their response) that it is unlikely that a potential maximum diversion quantity for the Lower Shell Creek MFL would be problematic for existing users, it is not entirely clear to the Panel why the District does not more fully consider the benefits of establishing similar maximum diversion guidance for the Lower Shell Creek as was included for the Lower Peace River.

	period were 388 cfs. This information, which has been included in Section 2.7.1 of the revised, draft minimum flows report, indicates the Shell Creek watershed accounts for only about 25% of the combined flows from the Peace River and Shell Creek watersheds. Based on the information provided here, we do not currently intend to recommend inclusion of a maximum withdrawal cap or limit as part of the proposed minimum flows for Lower Shell Creek. We will, however, continue to assess and, as necessary, consider this recommendation of the panel for potential, future reevaluations of minimum flows established for the creek.		
Say something about potential impact of SLR on the MFL	Sea level rise effects on salinity habitats were assessed in the District's draft minimum flows report to help evaluate the potential need for future reevaluation of the proposed minimum flows. As noted in response 1l in Table 1, analyses based on modeled scenarios associated with SLR predictions from the U.S. Army Corps of Engineers indicated the need for reevaluation of minimum flows established for the Lower Peace River and Lower Shell Creek. We acknowledge the SLR estimates used in our initial analyses are conservative. We have run the hydrodynamic model using the most recent SLR estimates by the National Oceanic and Atmospheric Administration (NOAA et al. 2017), and plan to update the revised, draft minimum flows report based on results of these SLR simulations.	Yes	Additional text and revised figures include the some of the additional information and discussion requested. The results displayed in the revised Draft MFL report suggest that anticipated rates of SLR are likely to impact the available low salinity habitat to a degree that be above and beyond the levels of impact meant to be protected through the implementation of this MFL. The implications of anticipated SLR on low salinity habitats needs to be assessed at regular intervals.

Comments on Chapter 1 – Introduction

The Panel felt that the draft MFL report's Introduction was well developed, and gave the Panel a thorough introduction to the LPR and LSC, as well as the District's responsibilities. As is noted in other parts of this report, the Panel concluded that the definition of significant harm requires a careful discussion, not just of literature that supports proposed guidance criteria, but the diversity of opinions about the topic.

A summary of the Panel's review of District responses to Panel comments on Chapter 1 – Introduction is shown in Table 3.

Table 3 – Review of District Responses – Chapter 1 – Introduction

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Formatting of Table 1-1 Improve within cell formatting so text in final column matches up with that in preceding columns	Table 1-1 was reformatted in the revised, draft minimum flows report to align information contained in the final column with that in the preceding column.	Yes	Modified table now formatted correctly
1.2.1 Remove 's from Florida in title	We changed "Florida's" to "Florida" in the Section 1.2.1 title in the revised, draft minimum flows report.	Yes	Modified text now correct

Comments on Chapter 2 – Physical and Hydrologic Description

As noted in the Panel's Initial Report, there were a number of modifications to text, figure legends and other fairly routine edits that were appropriate. The District's responses were favorable, and those portions of the draft MFL report that could be revised in time for the Panel's review were appreciated.

As important as the hydrologic and hydrodynamic models are, the Panel felt that they could have been described in greater detail earlier in the draft report, and the Panel viewed the revisions as being responsive to these concerns. The assumptions and data limitations associated with quantifying the water budget from both ungauged and gauged sources are more clearly discussed in the revised draft MFL report.

A summary of the Panel's review of District responses to Panel comments on Chapter 2 – Physical and Hydrologic Description is shown in Table 4.

Table 4 – Review of District Responses – Chapter 2 Physical and Hydrologic Description

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Issues related to clarity of maps and figures, for example, enhancing Figure 2-2 so it is better related/connected to a Google street map for the same area. In addition, river scales are discussed or displayed in both miles and km. Perhaps use both metrics each time.	Figures 2.2 and 2.3 have been updated in the revised, draft minimum flows report. In addition, an inset map was included in Figure 2.2, and we clarified the purpose of the inset maps in both Figure 2.2 and Figure 2.3. We acknowledge that differing metrics are used to depict distances in maps included in the draft report. Some of the maps are reproductions from other sources and for this reason, we have continued to present maps using both the U.S. Customary and Standard International metrics.	Yes	Map clarity issue has been addressed. Issues of station locations and listings in both km and miles (as well as station names alone) can be dealt with through expanded text of legend for those figures where other entities have produced the graphics.
Question related to LiDAR sources, for example, is 2017 LiDAR data for the region available from the state?	The LiDAR photogrammetric data collection (Aerial Cartographic of America, Inc. 2015) was conducted primarily to support development of the District's hydrodynamic model for minimum flows development. These data were the best available information of this type in 2016, when the hydrodynamic model was calibrated and validated. State-wide 2019 LiDAR data are currently under review. These and other available data will be considered for use in future evaluations of minimum flows for the Lower Peace/Shell System.	Yes	Yes
Use of NGVD29 vs. NAVD88 for elevation and bathymetry data	Most elevation data and references to elevations in the draft minimum flows report are presented relative to the North American Vertical Datum of 1988 (NAVD88). However, we note that in the descriptive information included in Section 2.1 on page 16 of the draft minimum flows report a reference is made to the Peace River originating in an area of Polk County at an elevation of about 100 feet above the National Geodetic Vertical Datum of 1929. We also note that a water surface elevation of 5.0 feet is included in the description of Shell Creek Reservoir in Section 5.5.3 on page 91 of the draft minimum flows report. For development of the hydrodynamic model for Charlotte Harbor, all the variables associated with elevation are referenced to NAVD88.	Yes	Yes

Table 4 – continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Question about the order of MFL development vs. water supply planning efforts	The development or reevaluation of minimum flows is a relatively lengthy process involving compilation of relevant data, development or refinement of analytical methods and approaches, and coordination with local governments and other affected stakeholders. In addition, the District is typically engaged in the concurrent development of minimum flows for several priority water bodies. For these reasons, there are practical limitations concerning minimum flows development and reevaluation schedules. It is worth noting, however, that minimum flow status assessments are conducted annually, on a five-year basis in conjunction with regional water supply planning, and on an as-needed basis associated with reviews for water use permit applications and renewals. Results from these assessments are part of the District's adaptive management approach to minimum flows development and implementation and can be used to inform decisions regarding the need for minimum flow reevaluation.	Yes	Yes
Definition of flow lag	For the water quality analyses included in the draft minimum flows report, lagged-flows refers to average flows for periods ranging from 2 to 60 days prior to the date of water quality sampling event. Text in Section 3.2.2 in the revised, draft minimum flows report was amended with a parenthetic phrase to clarify what is meant by lagged-flows.	Yes	Yes
Consider adding a most recent 10 or 20 year average bar to Figures 2-12 to 2-16 in addition to the one that is the long-term average for POR	Short term average (2000-2018) flows were added to Figures 2-12 to 2-16 in the revised, draft minimum flows report. Please refer to our response 1g in Table 1 for additional information.	Yes	Additional average value now included in Figures 2-12 to 2-16. The District should consider adding a third line that excludes recent data to show average values calculated solely from historical data, so that the period of record minus the recent past and recent-past values can be directly compared.
Discuss the importance of hydrodynamics and hydrodynamic modeling	The standard format for the District's minimum flow reports involves identification of ecological criteria followed by descriptions of tools used to model or assess the criteria. The hydrodynamic model is identified in the introductory (Chapter 1), where we discuss the substantial data enhancements that were undertaken to improve upon the model that was previously used for development of the existing Lower Peace River minimum flows. To better emphasize the primacy of the hydrodynamic model for our current minimum flows assessments	Yes	Yes

	we split the paragraph following the numbered list of major initiatives and updates within Section 1.5 into two paragraphs in the revised, draft minimum flows report, and amended the first of the two paragraphs to clearly indicate that like the previous minimum flows effort, the current effort was based on salinity modeling conducted through hydrodynamic modeling. The hydrodynamic model is also notably mentioned in the system description (Chapter 2), water quality (Chapter 3) and resources of concern/modeling tools (Chapter 5) chapters. As noted in our response to comment 5i in Table 5 below, we also amended the brief discussion of the model in the salinity section of Chapter 3 included in the revised draft minimum flows report. We also emphasized the importance of hydrodynamics in a new section (Section 3.2.2) on the pollutant load reduction goal for the Lower Peace River and new text added to the beginning of the descriptive water quality information section (Section 3.3.1). Finally, in Chapter 5 of the revised minimum flows report, the development and application of the UnLESS model to the Charlotte Harbor system has been substantially expanded to include more information on model setup, input data, model calibration and verifications and modeling uncertainty. As noted in the draft minimum flows report, detailed information on the model and its use are also discussed in Chen (2020) which is included as Appendix C to the report.		
Additional and more detailed description of hydrodynamic model elements needed	Chapter 5 is expanded to include a brief description of the hydrodynamic model for Charlotte Harbor. Please also refer to our response 4g in this table.	Yes	Yes

Comments on Chapter 3 – Water Quality

The Panel felt that some of the figures in the draft MFL were confusing, and in need of restructuring. Most of the requested modifications were made in the revised MFL report viewed by the Panel.

The draft MFL report seemed to focus on flows and residence time, as potentially the sole (or at least primary) influences on concentrations of chlorophyll *a*. In addition, several decades of work on the LPR and upper Charlotte Harbor have indicated that the amount of colored dissolved organic matter (CDOM) in the system is likely a key influence, among other factors. The revised draft MFL report has added language that more accurately reflects the multiple factors that can influence phytoplankton populations, above and beyond residence time alone.

The District's responses to Panel comments (as outlined in the Initial Report) supported the Panel's concerns related to the water quality parameters collected by the Hydrobiological Monitoring Program (HBMP) that is used to ensure compliance with relevant water use permits. For example, it appears that the values of "chlorophyll" used in the water quality analyses in the draft MFL report refer to chlorophyll-a, but not chlorophyll-a that has been corrected for phaeophytin. This is problematic, as FDEP and other regulatory agencies do not include chlorophyll-a values for water quality analyses if the values are not corrected for phaeophytin.

The draft MFL report included information on "Ortho-phosphorus" which the District informed the Panel refers to concentrations of orthophosphate, not Total Phosphorus. Orthophosphorus appears to be a bit of technical jargon term for orthophosphate, which is the dissolved inorganic ionic form of phosphorus. While this could represent 90% of the total pool of phosphorus – as suggested by District staff and/or its consultants – that proportion is likely to vary in time and space in the Lower Peace River and Lower Shell Creek. The HBMP monitoring programs' parameter list should be modified to include Total Phosphorus, in addition to orthophosphate. Neither should be referred to as "othophosphorus" as that term is misleading.

The revised MFL now includes the development of empirical relationships between LPR flows and salinity in the LPR that also include flow data from the LSC, as two of the stations involved in the assessments are located below the confluence of the LSC. That is an improvement over the original draft report.

The revised draft MFL report now includes a more comprehensive discussion of the various natural and anthropogenic influences on bottom water hypoxia in the LPR and Charlotte Harbor.

A summary of the Panel's review of District responses to Panel comments on Chapter 3 – Water Quality is shown in Table 5.

Table 5 – Review of District Responses - Chapter 3 Water Quality

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Salinity data presented in Figure 3-3 not that helpful	We note that variability in the salinity data presented in Figure 3-3 can be attributed to seasonal, inter-annual variation and other factors. However, as noted in the report text associated with the figure, we think the figure is helpful in portraying longitudinal and seasonal salinity variation in the Lower Peace River as well as salinity differences in the water column at selected sites.	Mostly	Data are inclusive of 1976 to 2016. This does not directly compare pre and post MFL conditions. Also, as flow blocks are no longer date-based, perhaps it is not as important to categorize data into wet vs. dry seasons
Influences of factors other than flow on concentrations of chlorophyll a	We added additional text in Section 3.3.1.3 of the revised, draft minimum flows report.	Yes	Section 3.3.1.3 gives a more thorough review of factors that can influence chlorophyll-a than in the prior report. Might be good to add something how the data not being corrected for phaeophytin affects interpretation.
Values of phosphorus only shown for "orthophosphorus"	Total phosphorus measurement for the Hydrobiological Monitoring Program (HBMP) was terminated in 2003. We investigated our use of ortho-phosphorus vs. total phosphorus by conducting scatterplot analyses for data from 5 stations for the period 1996 through 2003. As indicated in the figures below, about 81-88% of total phosphorus is attributed to ortho-phosphorus, suggesting that results expected for total phosphorus may generally be similar to those determined for ortho-phosphorus. We included information concerning the current measurement of ortho-phosphorus for the Peace River HBMP and the correlation between orthophosphorus and total phosphorus in Section 3.3.1.5 of the revised, draft minimum flows report.	Yes, but the draft final report does not include the level of detail included in the District's response to the Panel.	The inclusion of only dissolved inorganic forms of phosphorus is problematic. While this is not the District's data collection effort, it is a data collection effort that is conducted for compliance with a water supply permit. The percentage of phosphorus that is orthophosphate may average 80%, but that value likely varies over the length of the river and with different seasons. The final MFL report should replace all text and data legends that contain "orthophosphorus" with "orthophosphate".
Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite	We added results for total nitrogen to Section 3.3.1.4.	Yes	Revised results and analysis are in-line with request.
Definition needed for "flow-lag"	Please see response 4e in Table 4 for our response to this comment.	Yes	Yes
Various figures have legends that appear to be mislabeled	Numerous figure legends were corrected in the revised, draft minimum flows report.	Mostly	Captions have improved, but the final report should clearly define wet and dry season in figure captions. Format as "NOx". In Table 3-7 add (or replace with) Rkm to station number so readers know the upstream/downstream position. Figure 3-17 shows the stations are not numbered sequentially. Figures 3-19, 3-21, 3-23, 3-25, 3-27 all could have Rkm on x-axis. Remove "shows" 3-27.

Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Mislabeling of y-axis on Figure 3.23	The y-axis label for Figure 3-23 was changed from "Salinity (PSU)" to "Chlorophyll" in the revised, draft minimum flows report.	Yes	Label changed as requested
Importance of hydrodynamic model description	We agree that description of the hydrodynamic model and its primacy for the analyses presented in our draft minimum flows report should be emphasized. As noted in response 4g in Table 4, we modified text in Section 1.5 of revised minimum flows report to emphasize our prior and current use of hydrodynamic modeling to support minimum flows development for the Lower Peace River and Lower Shell Creek. In addition, we substantially expanded the presentation of model information included in Chapter 5. We also think it is appropriate to discuss the development and use of a hydrodynamic model for assessing flow-related changes in salinity in the Lower Peace/Shell System in Section 3.3.2.1 of the draft minimum flows report, which addresses system salinity. Our mention of the hydrodynamic model in the water quality chapter (Chapter 3) in the original draft report, and additional related text added to the revised draft report serve as another useful preview of the more detailed discussion of the model in Chapter 5 and the referenced model report, Chen (2020), included in the report appendices. We also note that within Section 2.3.2.1 of the revised, draft minimum flows report, we substantially modified the text to emphasize our efforts to develop and use the best available information, in this case the hydrodynamic model, for minimum flows development.	Yes	Yes. Additional text and explanation in the revised report are satisfactory.
Additional and more detailed description of hydrodynamic model elements needed	In addition to modifications to the text in Section 3.2.2.1 of the draft, revised minimum flows report noted in our previous response 5i in this table, we also amended text associated with the model in Chapter 5 and in the model report (Chen 2020) included as Appendix C to the report.	Yes	Yes
More refined explanation needed for isohaline location trend analyses	Please refer to response 5o in this table.	Mostly	Test could be expanded slightly, although the table footnote does help.
Better description of results shown Figures 3-12 to 3-16	To improve presentation of the correlation analyses results presented in Figures 3-12 through 3-16, we amended the figure captions within Sections 3.3.2.2 through 3.3.2.5 of the revised, draft minimum flows report. We also modified the statistical methods description included in Section 3.3.2 to better describe the lagged-flows used in the analysis and to summarize our interpretation of the correlation statistics derived from the analyses and presented in Figure 3-12 through 3-16.	Yes	Description more detailed and labels now accurate for the displayed data

Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Value of developing dynamic water quality model, vs. empirical approaches	As noted in response 1j in Table 1 we understand the potential value of a dynamic water quality model for the Lower Peace/Shell System, but do not think development of such a model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. See response 1j for additional information concerning our response.	Yes	Yes
Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included	Lower Shell Creek and Lower Peace River flows were combined for depiction of the flow-salinity relationships for Stations 6.6 and 15.5 in Figure 3-11 in the revised, draft minimum flows report. In addition, the figure caption and associated text within Section 3.3.2.1 of the revised, draft minimum flows report were updated.	Partially	The salinity data now are plotted against the totality of inflows – from both the Lower Peace River and Shell Creek. However, the graphic does not display equations, statistical significance, etc. The text says that "…salinity was more responsive to freshwater inflow…" at upstream stations without defining what that means. Consider replacing that text with "…variation in flow explained a greater amount of the variability in salinity at upstream stations, but was statistically significant at all stations examined here."
Table 3-1 – improve explanation of location of isohaline location trends	We note that the text on page 47 preceding and which refers to Table 3-1 indicates the trend analysis identified an upstream movement of the 0 psu and 20 psu isohalines for period from 1984 through 2016. To improve understanding of the information presented in the table, we added a footnote to Table 3-1 in the revised draft minimum flows report to characterize our interpretation of the presented, significant statistics, i.e., that positive, significant statistics indicate upstream isohaline movement. While revising Table 3-1, we determined that changes to clarify the presented statistical results and better indicate that the results pertain to the Lower Peace River (and in some cases Charlotte Harbor near the mouth of the river) were needed for several other tables and figure within Chapter 3. So, we revised captions and/or footnotes for several additional tables and figures in the revised draft minimum flows report, including Tables, 3-2, 3-3, 3-4 3-5, 3-6 and 3-7, and Figures 3-3, 3-4, 3-5,3-6, 3-7, 3-8, 3-9 and 3-10.	Partially	Table 3-1 and preceding text explains that the trend test was for detecting an upstream movement of the location of the 0 and 20 psu isohalines. However, the text regarding Table 3-1 is incorrect, as there was only a trend for 0 and 20 psu isohalines, while t the text suggests there was a trend for all four isohaline locations.

Table 5 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Table 3-2 ,3, 4 to 3-7 and 3-12 to 3-16 – improve explanation of summertime hypoxia development and other data presentations	The text in Section 3.3.1.2 preceding Table 3-2 notes the trend analysis indicated dissolved oxygen concentrations in surface waters associated with the 0 psu isohaline increased for period from 1984 through 2016. We do not think the information presented in the table can be used to assert there is no hypoxia in surface waters of the Lower Peace River during the wet, summer season. However, as noted in responses 5i and 5o in this table, we amended the captions, column headers, and/or footnotes for Tables 3-2, 3-3, 3-4 through 3-7 and Figures 3-12 through 3-16 within the revised, draft minimum flows report. We also updated the statistical methods description included in Section 3.3.2 within the revised, draft minimum flows report to enhance presentation of the results.	Yes	Figures 3-3 and 3-4 seem to be portraying different versions of the same phenomena – salinity is apt to be higher in the bottom waters, and dissolved oxygen lower, particularly in the wet season. The Panel has concluded that fixed geographic locations and the salinity-based stations serve different purposes and both are important to keep.

Comments on Chapter 4 – Ecological Resources

The Panel was concerned about the reasonableness of analyses related to plant communities that were last quantified in 1998, and the District's revised draft MFL report was modified to include the newer information requested. In response to Panel comments related to the value of continuing to collect biotic variables such as fish abundance, macroinvertebrates, and/or macroalgae, the District's responses were mostly in line with Panel expectations: biological data are not as easy to "model" for scenario development as physical and chemical parameters such as dissolved oxygen and salinity.   A more detailed description of the relationship between the Hydro-biological Monitoring Program (HBMP), guidance from the HBMP review committee, and the data set used to develop the draft MFL will be helpful for future reviewers.

The District's explanations of the relative value of including information related to listed species was found to be responsive to the Panel's concerns. The revised draft MFL report includes more details about the relationship of sawfish life history stages and their relationship both freshwater inflows and salinity.

A summary of the Panel's review of District responses to Panel comments on Chapter 4 – Ecological Resources is shown in Table 6.

Table 6 – Review of District Responses - Panel Comments on Chapter 4 Ecological Resources

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Plant community data set from 1998 is problematic	We are not aware of any recent, comprehensive, species or genus-level vegetation maps for the Lower Peace/Shell System that would represent an update to the detailed information presented in Figure 4-1 in the original, draft minimum flows report. However, we developed and included a replacement, coarser-level vegetation map based on the 2017 SWFWMD land use/cover GIS layers in the revised, draft minimum flows report. In addition, we anticipate considering vegetation data collection and mapping needs for future evaluations of the system.	Yes	Updated information is much more helpful
Status and trends in seagrass coverage in the LPR over time	The District has been mapping seagrasses in Charlotte Harbor using aerial photography since 1988. Others have attempted to use older imagery to infer historical seagrass extent, but with very limited success. For the Tidal Peace River segment of Charlotte Harbor, recent seagrass extent (estimated for 2014, 2016 and 2018) is greater today than any time since 1988, as shown below. We included this figure and associated text in Section 4.1.5 of the revised, draft minimum flows report to augment the presented seagrass information.	Yes	Inclusion of such information is appreciated

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Concern over shift in HBMP focus to physical factors, rather than fish communities, macroinvertebrates, and/or macroalgae	In 1996, the Charlotte Harbor Hydrobiological Monitoring Program (HBMP) Scientific Review Panel reviewed the ongoing elements of the HBMP program and recommended several changes to the monitoring program study elements. The Panel recommended that HBMP monitoring should primarily focus on assessing long-term trends in key physical, chemical, and biological characteristics that can be directly linked to potential effects associated with withdrawals at the Peace River Manasota Regional Water Supply Authority's Peace River Facility. They also noted that less effort should be focused on indirect biological indicators that are not intended to evaluate influence of withdrawals, once a baseline level of information has been collected. As summarized in Appendix A of the Peace River Hydrobiological Monitoring Program 2016 HBMP Comprehensive Report (JEI 2017), subsequent meetings of the HBMP Scientific Review panel have continued to shape the current HBMP. Reference to this summary document has been included in Section 3.3.1 of the revised, draft minimum flows report to provide additional information concerning the evolution of the HBMP. We think the biological and other information collected to date and summarized in our draft minimum flows report is sufficient for development of recommended minimum flows for the Lower Peace/Shell System. We note that this information has been collected in support of the required HBMP, other monitoring programs, and studies specifically undertaken by the District to directly support minimum flows development. However, in support of our adaptive management approach to minimum flows development and implementation, we continue to support ongoing data collection efforts for the Lower Peace/Shell system and will consider additional sampling and analysis of biological data as needed, for future minimum flow reevaluations.	Partially	The District should explain in greater detail the relationship(s) between biological data that will be continued to be collected to ensure compliance with the intent of the MFL, even if such data are not capable of being used for modeling purposes.

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Fisheries Independent Monitoring newest data from 2016 not included in the modeling approach (Appendix E) or compared to data collected through 2013	At the time of model development, the best available data were used. However, consideration of more recent data has been requested from the Florida Fish and Wildlife Conservation Commission (FWC) and a comparison of abundance of the taxa and size classes examined in this model will be performed to determine if there are any significant differences between modeled years and more recent sampling years. Results from this analysis will be included in future updates to the draft minimum flows report. As noted in Section 4.2.1 of the draft minimum flows report, Call et al., (2013) performed a survey on fish communities within the Lower Peace River throughout 2007 to 2010 and found no temporal variation in fish communities across years, suggesting a generally stable system within the river. To augment presentation of information on the fish assemblage in the Lower Peace/Shell System, the descriptive FWC Fisheries-Independent Monitoring data from 2018 presented in Section 4.2.1 of our original draft minimum flows report has been replaced with the most recent available data (2018) in the revised, draft minimum flows report.	Yes	Yes, the addition of additional data is useful.

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Should endangered species, such as sawfish and manatees, be included in MFL assessments?	Endangered and listed species should be and are considered when developing minimum flows. For example, in Section 4.2.1 of the draft minimum flows report we noted that juvenile sawfish (<3 years of age) are able to move in response to salinity fluctuations with high site fidelity upon a return to baseline conditions, with large-scale movement most notable after significant freshwater inflow (>500 cubic meters per second) from tropical disturbances (Poulakis 2016). We also noted that Sawfish movements examined in the Caloosahatchee River demonstrate downstream movement when salinities approach 0 psu and upstream movement at salinities approaching 30 psu (Poulakis 2013). Therefore, protection of the sensitive salinity habitat would not positively affect their distribution, although maintenance of natural freshwater flows would benefit their capacity to locate nursery grounds (Poulakis 2016). Further we note that the species chosen for the HSM modeling used to support our minimum flow analyses reflect those with affinities for low salinity habitats. A strong positive correlation between Common Snook (*Centropomus undecimalis*) abundance and flow was observed in the Lower Peace River (Blewett 2017). Body condition was also elevated during years of increased river flow. This increased abundance and condition with increased flow was hypothesized to be related to enhanced prey availability with greater floodplain inundation. Per the floodplain inundation analysis performed by HSW (2016) in support of our minimum flows work (Appendix D), the proposed minimum flows will not significantly impact total inundated floodplain wetland area associated with the baseline flow condition, and are therefore unlikely to impact the abundance or condition of Common Snook. For development of minimum flows for river systems or creeks dominated by spring flow we typically consider manatee usage of thermal refuges during acute and chronic cold-water events. Given the lack of spring discharge to the Lower Peace/Shell system we do not think assessment of potential, flow-related changes in thermally-favorable habitat usage by manatees is necessary for our development of minimum flows for the river and creek.	The additional information included in the District's response is clarifying.	The District should consider including more of the information provided in the response to the final MFL report. In particular, information related to juvenile and age-specific salinity preferences of sawfish would be helpful to include in the final MFL.

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
In Appendix E it is stated that "predicted CPUE grids" were derived from catch data and these predictions were used to generate the population estimates which were used to model the effect of water withdrawals	Catch-per-unit-effort (CPUE) is a direct calculation from Florida Fish and Wildlife Conservation Commission's Fisheries Independent Monitoring (FIM) catch data, standardized to the gear type used. These data, all the data used for development of the habitat suitability models (HSMs), and the modeling results were considered the best available information at the time for support of the development of the proposed minimum flows. The fish population modeling using habitat suitability was not used as a criterion for development of the proposed minimum flows, rather it was used for consideration of potential effects of implementation of the proposed minimum flows on representative, important taxa populating the system. Because the model does not incorporate some factors, such as competition, predation and fishing pressure that can affect fish and invertebrate distributions, we used the model to assess how habitat suitability zones simulated under baseline condition would change with implementation of the proposed minimum flows. Like all models, the habitat models that we used to assess habitat suitability for several estuarine taxa, include limitations. We augmented Section 5.5.3 in the revised, draft minimum flows report to fully discuss these limitations and modeling uncertainties. However, we continue to think the HSMs developed to support our minimum flows work are well suited for consideration of potential changes in habitat suitability between the baseline flow condition and reduced flow conditions. Regarding this potential habitat change assessment, we note that the flow reduction scenario assessed in support of our minimum flows analyses actually exceeds the allowable flow reductions prescribed by the minimum flows that are proposed for the Lower Peace River/Shell System. A maximum withdrawal limit was not included or used to develop the "minimum flows" scenario used to characterize habitat suitability with the HSM under reduced flow conditions. The HSMs, in their current or an enhanced form may be used for future minimum flow evaluations for the Lower Peace River and Lower Shell Creek. They would likely not be used if alternative tools that provide superior information were to become available.	Yes	The revised MFL refers to the date "1880s" in the bulleted list at the end of the section. This likely is meant to be "1980s"

Table 6 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Figure 4-2 difficult to review due color choices	Figure 4-2 was reformatted for the revised, draft minimum flows report to improve clarity.	Mostly	The figure much improved, but should be made larger.
Explain "decreased flow may also contribute to increases in dissolved oxygen concentrations". Add your response to p.76 of the report.	Potential relationships between decreased flows and oxygen concentrations are explained in the papers cited in Section 4.2 of the draft minimum flows report, and we think these relationships are adequately summarized in the section. However, we acknowledge that additional, potential effects of decreased flows could include those associated with an increase in the influence of tidal fluctuations which can lead to the formation of a well-mixed system. Also, if sediment loads from the watershed decrease as a function of reduced flows, water clarity could increase, leading to an increase in primary production. We included additional text associated with these factors in the last paragraph of Section 4.2 of the revised, draft minimum flows report, and split the paragraph into two paragraphs to improve readability of the text.	Partially	The District's response, in Section 4.2 seems to refer to the potential for increased algal growth under low flow conditions, due to some combination of factors (e.g.., increased water clarity, increased residence time). However, algal growth only increases oxygen concentrations in day light hours – more phytoplankton means both higher highs (in the day) **and lower lows** (at night). Some discussion of algae's day/night impacts on DO is warranted. The impacts of lower flows on oxygen may not be detectable with a data set that is based on daytime samples. Therefore, the concern remains, and the language in the revised MFL report is perhaps overly simplistic.

Comments on Chapter 5 – Resources of Concern and Modeling Tools

The revised draft MFL report was responsive to Panel concerns related to data limitations associated with various aspects and algorithms of the hydrologic model. The basis for observed differences in baseflow during different time periods, for different sub-basins, was given a more detailed discussion. The Panel and District both agree that these issues are particularly important for those portions of the LPR and LSC watershed that are downstream of USGS gage sites.

The revised draft MFL report more clearly spells out the data sets used to develop the algorithms in the PRIM modeling effort, as was requested by the Panel. The Panel noted that in the last MFL report (2010) the hydrologic model greatly over-estimated the ungaged flow from the watershed into the LPR and Charlotte Harbor, which has been acknowledged by the District in the revised draft MFL report

Portions of this chapter that had previously been internally inconsistent were modified in the revised draft MFL report. For example, the prior discrepancy between results shown in Table 5-1 and figures and text describing distinct upward trends in dry season flows have been addressed. In light of this issue, it is hoped that future MFL reports pay special attention to the potential for results from Seasonal Kendall Tau tests to be at odds with both parametric and non-parametric statistical tests that look at the same data sets on a monthly time step. The over application of the Seasonal Kendall Tau test can give rise to conclusions about a lack of trends that is based on the structure of data assignment in that test, rather than within-year trends that are obvious upon the display of data on monthly time steps.

As was noted in earlier sections, the Panel understands the District's reasons for not including a maximum flow diversion threshold for the LSC, even though such a value (400 cfs) was developed for the LPR. While the Panel appreciates the regulatory limitations associated with the development of MFL guidance, concerns over the role of LSC discharges on the ecological health of the LPR (below LSC) and Charlotte Harbor remain, regardless of the artificial distinction between the Upper and Lower portions of Shell Creek.

As noted previously, the Panel feels that the revised draft MFL report includes a more thorough explanation of why a 15% reduction in the salinity-habitat metric was considered protective, but it also believes that the District should keep in mind that not all regulatory programs that are meant to protect the quantity and quality of natural habitats similarly reply upon the conclusion that a 15% impact is the threshold for significant harm.

A summary of the Panel's review of District responses to Panel comments on Chapter 5 – Resources of Concern and Modelling Tools is shown in Table 7.

Table 7 - Panel Comments on Chapter 5 – Resources of Concern and Modeling Tools

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Figure 5-1 could be more clearly identified as to what the graphics are meant to represent, in terms of "exceedance"	Figure 5-1 shows mismatch of fixed-date blocks using a long flow record (1950- 2014) and short flow record (2007- 2014) based on 75% exceedance (red dashed line) and 50% exceedance (blue dashed line). This is the reason for the change from date-based to flow-based blocks that are depicted in Figure 5-2.	Partially	Figures 5-1 and 5-2 are unchanged. The Panel believes that the since recent data is included in "the long flow record". it would also be useful to display the data using three data sets: period of record, period of record minus recent past, and then the recent past
Timeframe and data sources used to develop the hydrodynamic model	The timeframe used for the hydrodynamic model is briefly described in Section 5.5.1 and in Appendix C. Sources of bathymetric LiDAR and tide data are described in Sections 2.4 and 2.6. Flows are briefly described in Section 2.7 and Sections 5.3.2 and 5.3.3. More information about the hydrodynamic model was added in Section 5.5.1 of the revised, draft minimum flows report.	Yes	Yes
Need to understand basis for variation in baseflow differences over different time periods	Baseline flow from 1994 through 2006 was used with the PRIM model to simulate groundwater withdrawals and land use change impacts on Peace River flows. Baseline flow from 2007 through 2014, seasonally-corrected based on PRIM model run output, was used with the hydrodynamic model to simulate salinity, depth and water temperature in the Lower Peace/Shell System and Charlotte Harbor. Baseline flow from 1950 through 2014 was used for comparison against gaged flow data for minimum flows status assessment, after seasonal correction has been made to gaged data based on the output of the PRIM model. Please see Section 7.1 and Table 7.1 in the revised, draft minimum flows report for additional information.	Yes	Yes
Further clarify the meaning of "transitional flow triggers", using simple terminology such as "safety valves" to explain concept.	The currently adopted Lower Peace River minimum flows are based on calendar date- based blocks, and a transitional "flow trigger" (625 cfs) was required when high flows remained depressed due to climatological conditions. The newly proposed minimum flows for the Lower Peace River were developed using flow-based blocks that include flows of 297 cfs and 622 cfs that respectively represent transitions between low to medium and medium to high flows. Similarly, flow transitions for the proposed minimum flows for Lower Shell Creek are 56 cfs and 137 cfs, respectively. Given that the proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed for flow-based blocks associated with transitions from low to medium to high flows, the identification of additional flow triggers" as a "safety valve" to account for out-of-season flows is not necessary.	Yes	Yes

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Helpful to include a graphical display of residence time/flushing rates	We agree that transport timescales are useful for discussion of flow effects on dissolved oxygen concentrations and other environmental factors. In our future evaluations of dissolved oxygen and eutrophication in the Lower Peace/Shell System and Upper Charlotte Harbor, we will consider discussion and presentation of transport timescales information.	Partial	Yes
Language related to impacts of hurricanes based on model runs	For the minimum flow analyses, the hydrodynamic model was run from 2007 through 2014, a period which included major storm and drought events but not hurricanes. In response to this question, we also think it is useful to note that minimum flows are to be established as the limit beyond which further withdrawals would be significantly harmful to the water resources or ecology of the area. Therefore, in the case of extreme high-flow conditions associated with hurricanes and other major storm events, achieving a minimum flow requirement is not anticipated to be an issue. We add, however, that District rules allow for the consideration of public health and safety for implementation of all District rules and policies.	Yes	Yes
Request for more information related to the hydrodynamic model, including consider the possibility of adding a short chapter which gives a holistic overview on the role of hydrodynamics (flow and water level, salinity, temperature, flushing) on water quality, ecology and fishery.	Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.	Yes	Yes
Limitations of hydrologic model in ungaged portions of the watershed should be discussed in more detail	Please refer to response 1f in Table 1 for our response to this comment.	Yes	Yes
Suggested development of a dynamic water quality model, vs. empirical approaches	Please refer to comment 1j in Table 1 for our response to this comment.	Yes	Yes

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed	Baseline flow for Lower Peace River was estimated based on Peace River Integrated Model (PRIM) outputs. Charlie Creek was simply used as a reference for a multi-decadal comparison of historical flows. The justification for this use of data from Charlie Creek is based on information presented in PB&J (2007) and trend analysis described in Section 5.3.1 of the minimum flows report.	Partially	Reference is made to the PBS&J report (2007) which used Charlie Creek's flow as not impacted by human activities during the 1950? To 1969 period. But, a reference to the natural condition of the watershed (included in the PBS&J report) would say why that's the case.
Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations	As noted in Section 5.3.1, the Peace River Integrated Model (PRIM) was used to investigate effects of climate variability, groundwater pumping, land use changes and other factors on flows in the Peace River. Also, as noted in the report section, flow reductions and increases for differing portions of the watershed are predicted based on the distribution of existing withdrawals, differing degrees of agricultural return flows from groundwater pumping due partly to the tighter confinement on the upper Floridan Aquifer in the lower Peace River area, and differing amounts of excess baseflow associated with agricultural withdrawals. As recommended by the peer review panel, a monthly trend analysis has been conducted and the discussion in Section 5.3.1 of the revised, draft minimum flows report has been updated to indicate why groundwater withdrawals are associated with flow decreases in the Upper Peace watershed and some flow increases in Lower Peace region.	Yes	Section 5.3.1 better explains the totality of issues associated with increased flows in the dry season that are not explained by rainfall.

Table 7 - continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed	For development of baseline flow record used in the minimum flow analyses, irrigation efficiencies of 60 and 85% for row crops and citrus, respectively, were used to adjust Shell Creek flows by accounting for groundwater discharge that resulted from agricultural practices in the Shell Creek watershed. These assumed efficiencies are the same as those that were identified in the District's 2010 report on proposed minimum flows for the Lower Peace River and Lower Shell Creek. As mentioned in the revised, draft minimum flows report in Section 5.3.3, the rates and periods of application were taken from the University of Florida Institute of Food and Agricultural Sciences (IFAS) recommendations for nearby Manatee County.	Yes	Reference to UF IFAS as a source of those coefficients is sufficient and appreciated.
Logic for not including a maximum diversion quantity for LSC is not clear	Please refer to response 2i in Table 2.	Partially	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as the protection of the health of the Harbor is concerned.
Basis for 15% as threshold for "significant harm" needs more detail	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	Partially	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any <u>potentially</u> more conservative approaches such as inflection points or threshold values.
Figure 3-22 caption says it is dissolved oxygen, but y-axis says chl a	The Figure 3-22 caption was corrected in the revised, draft minimum flows report to indicate that the plot shows chlorophyll concentrations.	Mostly	Figure legend now correct in terming the data chlorophyll- but the legend refers to "surface, midwater and bottom" values, which does not appear to be correct, unless chlorophyll was collected at three depths in the water column

Comments on Chapter 6 – Recommended Minimum Flow Values

Many of the Panel's comments related to Chapter 6 and the proposed MFL values had been made in earlier portions of this report. These include the following:

- The shift from calendar-based to flow-based thresholds is to be commended
- Issues with the various algorithms and model components for the hydrologic model should be discussed in greater detail
- The District's logic for relying on a 15% change in habitat as being protective of "significant harm" should be elaborated on, and concerns related to why other techniques did not give rise to locally-relevant threshold guidance should be made more clearly
- The lack of a maximum flow diversion threshold for the LSC seems to be a function of a somewhat arbitrary truncation of the area of concern to that portion of the LSC upstream from its confluence with the LPR. No such restriction is placed on the LPR, which has a 400 cfs maximum diversion threshold which appears to be protective of portions of Charlotte Harbor beyond the downstream boundary of the LPR alone

The revised draft MFL does not incorporate all of the Panel's concerns, most notably the continued lack of a maximum diversion threshold for the LSC. And while the Panel understands the District's logic and rationale for not including such guidance, the Panel believes that the concerns that merited the development of a maximum diversion quantity for the LPR exist for the LSC as well, even if the LSC boundaries of concern to the MFL are complicated by the artificial distinction between the LSC and the rest of its watershed due to the man-made structure of the Hendrickson Dam.

A summary of the Panel's review of District responses to Panel comments on Chapter 6 – Recommended Minimum Flow Values is shown in Table 8.

Table 8 - Panel Comments on Chapter 6 – Recommended Minimum Flow Values

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?	Yes. The 400 cfs maximum withdrawal for the Lower Peace River is applicable at all times. The only exceptions would occur during a period defined by a policy decision or directive of the District Governing Board, or an Order issued by the District's Executive Director. We further note that hurricanes and king tides are extreme hydrological events and we do not expect PRMRWSA to withdraw water during these events, especially during hurricanes.	Yes	Yes
Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades	Please refer to response 1l and 2j for our responses to this comment.	Yes	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	Please refer to response 2i in Table 2.	Partially	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as the protection of the health of the Harbor is concerned.
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	Partially	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values.

Finally, a summary of the Panel's review of District responses to various noted typos, or other miscellaneous comments is shown in Table 9.

Table 9 – Typos and Comments on Various Appendices

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Appendix E – page 7 – typo	The incorrect usage of the acronym "BF" to refer to the Baseline flow condition used for the habitat suitability modeling will be corrected to "BL" in the appendix or an errata sheet will be added to the appendix to identify the typographical error.	Yes	Presumably
Section 5.1 – typo	The misspelling of "indicators" in Section 5.1 was corrected in the revised, draft minimum flows report.	Yes	Yes
Page 84 – typo – add "on data from a 13-year period"	We were not able to determine where to add the identified phrase to the report. We will seek further panel guidance to help address this comment.	No	. First sentence of second paragraph appears to need revision in revised draft MFL report.
Page 96 – typo, first sentence "result in"	We corrected this typo (i.e., changed "resulting" to "result in") in the first numbered item listed in Section 5.4 of the revised, draft minimum flows report.	Yes	Yes
Page 95 – clarification needed	We were not able to determine where clarification was needed on this page of the report. We will seek further panel guidance to help address this comment.	Yes	Considering replacing language with "freshwater plants that tolerate some combination of salinity levels and durations"
Page 117 – "psu" missing from first sentence of second paragraph, also change spacing	We included the missing "psu" metric in the first sentence of the paragraph after Table 6-4 within Section 6.3 of the revised, draft minimum flows report. We did not, however, note any spacing issues on the section page.	Partially	The unit "psu" added, but the report should, add spaces between less than signs and the number 2, and check for spacing around < and > throughout the MFL report
Appendix C should be a separate chapter	Instead of creating a new report chapter, we chose to amend information on the hydrodynamic model development included in Chapter 3 and especially in Chapter 5. Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.	Yes	Yes
Page 16 – typo in title	Changed "HYDROLGIC" to "HYDROLOGIC" in the Chapter 2 title.	Yes	Yes
Page 47 replace "is" with "in" first sentence of 3.3.1.2.	We could not locate text on page 47 of the original draft report that seemed to need revision. However, we improved the referenced sentence in the revised, draft minimum flows report by changing "water" to "waters" in the first sentence of Section 3.3.1.2.	Yes	Yes,
Figure 3-11, page 57 – model failed to predict several observed salinity peaks	We think the referenced mismatches are mostly due to errors in the downstream salinity boundary condition during the wet season. We note that the original University of South Florida model for the system had a worse match at the Mote Marine station.	Yes	Yes

Table 9- continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Caption of Figure 3-27 typo	We deleted "shows" from the caption for Figure 3-27 in the revised, draft minimum flows report.	No	Highlighted but not removed.
Use of wind data from nearby airports might be helpful	We looked at these sources for wind data to use for model development and applications but determined there are not enough wind data measurement stations in the region to allow us to describe the spatial variability of the Charlotte Harbor system. For simplicity, we chose to use a single wind station for our analyses. As noted in Appendix C (Chen 2020), we used wind data measured at the SWFWMD Peace River II ET site prior to 2/7/2013 and data from the Mote Marine station after that date. We agree that is would be beneficial to use multiple wind stations for modeling efforts similar to those undertaken for our minimum flow analyses, and we will consider this recommendation for future studies.	Yes	Yes
Appendix C – typo on page 42	This typographical error was corrected in the revised appendix.	Yes	Presumably
Appendix C – typo on page 44	This typographical error was corrected in the revised appendix.	Yes	Presumably
Appendix C – definition of shoreline e length needed	The shoreline length is the actual length of the shoreline calculated by the hydrodynamic model. The dynamically coupled 3D-2DV model can track shoreline variations and allow the computation of the shoreline length at every time step. In the 3D model, because bottom elevations are defined and given at the four corners of the Cartesian grid, shoreline can be calculated using the bilinear interpolation with known water level if all grid corners are not submerged or emerged. In the 2DV model, the shoreline length can be calculated based on the water level, the grid length, and the river width, which varies with both vertically and longitudinally. This descriptive information for shoreline length was included in the revised version of Appendix C.	Yes	Presumably

Table 9- continued

Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panels' Satisfaction?
Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor	Although Caloosahatchee River flow was not directly used as boundary conditions near the mouth of the river, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. Specifically, the effects of Caloosahatchee River flow were indirectly considered in the water level, salinity, and temperature boundary conditions, as the USF model included Caloosahatchee and its flow. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.	Mostly	The Panel recommends that a more formal relationship with the SFWMD be used to share current and future information on the potential impacts to at least the lower portions of Charlotte Harbor "proper" of discharges from the Caloosahatchee River.
Caption for Figure 2-13 needs a space	We corrected this typo by adding a space between "through" and "2018" in the caption for Figure 2-13 in the revised, draft minimum flows report.	Yes	Yes
Consider adding conversion table	We included a conversion table in the revised, draft minimum flows report.	Yes	The table should also include Rkm

Southwest Florida Water Management District Final Staff Response to the Final Peer Review Report Concerning Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

October 21, 2020

Natural Systems and Restoration Bureau
Resource Management Division

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October 21, 2020

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Finally, we thank Angel Martin, and Victoria Steinnecker with Carollo Engineering, Inc., for comments provided during the peer review process.

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Section 1: Minimum Flows Peer Review Process and Purpose of this Final Staff Response Document

The Southwest Florida Water Management District voluntarily convened a panel of scientists (Panel) on March 25, 2020 for the independent, scientific peer review of minimum flows proposed for the Lower Peace River and Lower Shell Creek. Minimum flows are defined in the Florida Statutes as the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. Upon establishment by rule, minimum flows are used by the District or Department of Environmental Protection for water-use permitting, environmental resource permitting and water supply planning.

For minimum flows establishment, the Florida Statutes define independent scientific peer review as the review of scientific data, theories, and methodologies by a panel of independent, recognized experts in the fields of hydrology, hydrogeology, limnology, and other scientific disciplines.

The Panel reviewing the proposed minimum flows for the Lower Peace River and Lower Shell Creek consisted of a Chairperson, David Tomasko, Ph.D., with Environmental Sciences Associates, Inc., and Panelists Laura Bedinger, Ph.D., with Water and Air Research, Inc., and Y. Peter Sheng, Ph.D., with Aqua Dynamics, Inc. The panel was tasked with reviewing the proposed minimum flows based on information included in a District report titled, *Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report" dated March 20, 2020*, and appendices associated with the report.

Three phases were identified for the peer review process. The initial phase involved the Panel's review of the District's draft minimum flows report and development of an initial peer review report. On April 29, 2020, the Panel completed their *Scientific Peer Review Panel Review of "Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek" – Final Initial Report, Draft April 2020*, which summarizes the Panel's initial findings and recommendations concerning the proposed minimum flows.

The second phase of the review involved consideration of the Panel's initial findings by District staff, development of staff responses to the Panel's initial peer review report and the updating of the draft minimum flows report based on recommendations in the Panel's initial peer review report. District staff responses to the Panel's initial findings were summarized in the June 1, 2020 report, *Southwest Florida Water Management District Response to the Initial Peer Review of Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek*, which was provided to the Panel along with an updated version of the draft minimum flows report.

The third phase of the review involved the Panel's consideration of the District staff response document, the updated draft minimum flows report and an updated draft report section concerning analyses associated with potential sea level rise. The third phase of the review concluded on June 25, 2020 with the Panel's completion of their final peer review report titled, *Scientific Peer Review Panel Review of "Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek" – Final Report, June 2020*.

The District supported all three phases of the review process through facilitation of six publicly noticed and accessible, internet-based teleconferences, which were held on April 3, 13, 20, and 27, and June 8 and 22, 2020. In support of the review, the District also established and moderated an internet-based web forum (web board) for review-related Panel communications. The web forum was available for use beginning on April 3, 2020 and closed to further uploading of documents and posting of new comments on June 30, 2020. However, the web forum will remain available for viewing through at least December 31, 2020.

All Panel communications concerning the review occurred during the District-facilitated teleconferences or through use of the web forum. This ensured Panel discussions and deliberations were conducted in accordance with Florida's Government-in-the-Sunshine Law and provided opportunities for public comment on the review process and the proposed minimum flows for the Lower Peace River and Lower Shell Creek.

Following completion of the third phase of the peer review, District staff prepared this document to highlight findings included in the final peer review report and to ensure all Panel comments and recommendations were fully addressed.

Section 2: Peer Review and Response Report Formats

Format of the Panel's Initial Peer Review Report

In their initial peer review report, the Panel tabularized general comments, comments pertaining to specific sections of the District's draft minimum flows report, typographical errors, and comments pertaining to the draft minimum flows report appendices. Supporting information concerning the tabularized Panel comments was provided in narrative form. In addition, specific comments and questions identified by each panelist that were used for development of the Panel's initial peer review report and discussed during panel teleconferences during for the first phase of the review were included as appendices to the Panel's initial peer review report.

Format of District Staff Response to the Initial Peer Review Report

The District used a format similar to that used by the Panel to develop a staff-response document during the second phase of the review. Staff responses to the tabularized Panel comments from the initial peer review report were included in tabular format in the response document. Additional responses associated with the supporting information included in narrative form in the body of the Panel's initial peer review report were also incorporated into the staff response document, where appropriate. Staff responses to the specific comments and questions included in the appendix to the Panel's initial peer review report were not included in the staff response document, as initial, draft responses to these comments were provided to the Panel during the first phase of the review.

Format of the Panel's Final Peer Review Report

In their final peer review report, the Panel summarized the District's proposed minimum flows and panel tasks, provided general comments on the District's draft minimum flows report in narrative form, and included a table that characterized the Panel's level of satisfaction with the District response to each of the general comments identified in the panel's initial peer review report as well as the Panel's level of satisfaction with updates (or planned updates) the District made (or indicated it would make) to the draft minimum flows report in response to the general comments.

Specific comments pertaining to each section of the report were similarly presented in narrative and tabular form, along with characterization of the Panel's level of satisfaction with the District staff response and updates to the draft minimum flows report. A tabularized summary of typographical errors and other miscellaneous panelist comments and the Panel's level of satisfaction regarding District actions undertaken or identified to address the errors and comments was also included.

Format of this District Staff Response to the Final Peer Review Report

For this final staff response document, District staff have included a section that highlights general comments included in the Panel's final report. In addition, all tables included in the Panel's final peer review report have been included in this document in amended form – columns have been added to each table to incorporate comment/response identifiers used in the District's previous response document and final District staff comments on the Panel's comments and suggestions.

Section 3: General or "Overall" Panel Comments in the Final Peer Review Report and District Staff Responses

District staff agree with the Panel's general comments, in which they expressed support for the District's development of proposed minimum flows (i.e., MFL) for the Lower Peace River and Lower Shell Creek. For example, the Panel noted the following:

> *"The Panel felt that the draft and revised MFL reports represented an impressive effort by the District and its consultants."*
>
> *"The variety, quantity and quality of data that was compiled, collected, analyzed and interpreted, as well as the hydrodynamic and hydrologic modelling efforts were viewed as impressive, and obviously indicative of the MFL process being approached in a thorough and professional manner by District staff."*
>
> *"The conversion of MFL guidance from a calendar-based system to flow-based criteria was considered to be a valuable improvement over the earlier guidance."*
>
> *"The District's use of a 15% threshold for "significant harm" was one of the primary concerns raised by the Panel. While the Panel concluded that there is nothing inherently "wrong" with the proposed threshold, the Panel believes that the draft MFL report should balance both the existing literature that supports the appropriateness of such guidance, as well as to note that such guidance is not universally accepted as a threefold* [*sic*] *of acceptable habitat loss for all regulatory programs. The Panel agreed that alternative and locally-derived thresholds were sought after, and that no more protective links could be made for water quality, and that wetland inundation thresholds were actually less protective than the 15% flow-based salinity-habitat metric."*
>
> *"Panel members felt that while the expanded and more detailed hydrodynamic model used in the MFL was a substantial improvement over prior efforts, the issue of baseline conditions and the overall hydrologic output for non-gaged portions of the watershed will continue to have limitations, and additional revisions will be helpful, as data allow."*

In their final peer review report, and throughout the review process, the Panel clearly identified the need for consideration of the proposed minimum flows in the context of broader regulatory activities and a coordinated, adaptive approach to water resource management. For example, as noted in their comments below, the Panel advocated for and was supportive of enhancement to the minimum flow report that address other regulatory guidance documents, identified the continued need for continued District coordination with the South Florida Water Management District, and highlighted the need for consideration of environmental changes that may result from future see level conditions.

“The Panel was pleased that the District’s revised draft MFL report now includes reference to other regulatory guidance documents. For example, the revised draft MFL report now includes reference to the Pollutant Load Reduction Goal developed for Charlotte Harbor. The Panel felt that public agencies should seek to develop regulatory guidance that is as complementary – or at least consistent with – guidance from other local, regional and/or state agencies.”

“The Panel believes that closer coordination with the South Florida Water Management may be needed, to better quantify potential current and future impacts to the health of portions of Charlotte Harbor associated with the quantity and quality of water discharged from the Caloosahatchee River. This should continue to be a concern to the District, in light of recent adverse impacts to seagrass resources along the eastern wall region of Charlotte Harbor – impacts that could be attributed by some to the Peace River, given its much closer proximity, compared to the Caloosahatchee River.”

“Related to the issue of accelerating rates of sea level rise (SLR), the Panel felt it would be prudent to consider the potential impact of SLR on the MFL by using the NOAA (2017) projection of SLR for Fort Myers in 2020-2050. The revised draft MFL does include the numbers from the more recent NOAA report. As the field of SLR impacts is adjusting predictions, as needed, based on additional data collection, the newer report from NOAA should be considered the “best available science” as relates to this concern.

“The Panel and the District are in sync as to the potential impacts of future SLR on the quantity of low-salinity habitat in the Lower Peace River, as results displayed in the revised draft MFL report suggest that the protective benefits of the MFL might be offset within a few decades by realistic expectations of future SLR.”

“In consideration of the rapidly changing climate, the Panel recommends that, future evaluations of the MFL, as well as coordination with the regional water supply utilities should be cognizant of these potential impacts, and should work together to determine if modifications to future MFL guidance may be warranted, as actual SLR impacts arise.”

District staff agree with these panel comments and suggestions, and anticipate using an adaptive management approach to monitor, assess and as necessary, reevaluate minimum flows established for the Lower Peace River and Lower Shell Creek.

Section 4: Panel Comment Table from the Final Peer Review Report Amended with Final District Staff Responses

Table 1 – Review of District Responses – Overall Panel Comments, Amended to Include Final District Staff Responses

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response (Table and Comment References Refer to June 1, 2020 Staff Response Document)	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
1a	*MFL report was comprehensive, well-written and thorough*	We thank the panel for this comment.	No response required	No response required	No response required.
1b	*Basing MFL on specific flows, vs. calendar dates, a good idea*	We thank the panel for this comment.	No response required	No response required	No response required.
1c	*15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable*	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" below for our response to this comment.	This important topic is discussed by the District, and examples given of the reasonableness of the 15% threshold. However, the point remains that while examples can be found that support its application, it is not universally agreed as an acceptable level of impact for all activities (e.g., wetland impacts from construction, impacts to seagrass from dredging, etc.)	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any <u>potentially</u> more conservative approaches such as inflection points or threshold values. Although citations reference the reasonableness of using a 15% threshold to provide "high to moderate" protection from impacts, those are not universally-accepted as definitive thresholds for "significant harm" and may not necessarily by [*sic*] appropriate in all situations.	No response required.
1d	*Hydrodynamic modeling represents a substantial improvement from prior efforts*	We agree and thank the panel for this comment.	No response required	No response required	No response required.
1e	*Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)*	The proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed in accordance with all requirements for minimum flows establishment included in the Florida Statutes and Water Resource Implementation Rule. The minimum flows established for the river and creek will be implemented in accordance with these and other legislative and regulatory directives through the District's permitting and planning programs and other water management activities.	Yes	Additional text clearly spells out the linkages between the MFL's need to protect the very highest flows coming into the Harbor, which requires an attention to high flows that is not as evident for rivers that discharge to locations such as Tampa Bay and the Springs Coast.	No response required.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response (Table and Comment References Refer to June 1, 2020 Staff Response Document)	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		With regard to other water management activities, we note, for example, the District's 2000 Charlotte Harbor Surface Water Improvement and Management (SWIM) plan and the 2020 SWIM plan currently under development for the harbor are mentioned and cited in the revised, draft minimum flows report. The SWIM plans are mentioned in the water quality classification Section 3.1, a newly added Section 3.2.2 on the Pollutant Load Reduction Goal for the Lower Peace River and Section 4.1.5, which addresses seagrasses.			
1f	*Uncertainty and accuracy of hydrologic model should be discussed in more detail*	We considered the over-estimation of ungaged flow in our previous, 2010 minimum flows study for the Lower Peace/Shell System. We adjusted flow records to get the best ungaged flow estimate based on the previous hydrodynamic study of the Charlotte Harbor system and the flow estimation from those ungaged sites using a surface water model HSPF (Ross et al. 2005). In addition, a drainage ratio method was used to improve streamflow estimation at ungaged sites based on neighboring gaged sites. We acknowledge that there is still uncertainty and inaccuracy in our estimates of ungaged flow, which accounts for about 16% of the entire Peace River watershed drainage. About 84% of the Peace River watershed is gaged by the U.S. Geological Survey and the hydrologic loading to the Lower Peace River from the gaged watershed is reliable. For our minimum flow analyses, we used the best available data, in combination of what we learned from the previous hydrodynamic simulation of the system, and a comparison of two other hydrologic studies of the watershed to estimate the ungaged flow to the Lower Peace River.	Yes, the level of uncertainty is clearly spelled out in the District response.	The level of uncertainty associated with flow estimates for the ungaged portions of the Peace and Lower Shell Creek are better described in the District response to the Initial Panel Report. However, the revised MFL report titled "revised LPR_Shell Draft Min Flows2020-06-01.pdf" does not yet include the same level of explanation of these uncertainties as the District response laid out in the file "LPR_Shell Peer Rev Staff Resp 2020-06-01". As such, while the Peer Review Panel is now more aware of the reasonableness and appropriateness of the District's approach, the public document may not give others the same level of understanding, at least in the revised MFL report from June 1, 2020.	The updated, draft minimum flows report has been further revised to include additional information from the District response document.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response (Table and Comment References Refer to June 1, 2020 Staff Response Document)	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		We added new text addressing ungaged flow estimation to Section 5.3.1 of the revised, draft minimum flows report. Additional response development associated with incorporation of uncertainty information in the body of the minimum flows report and the hydrodynamic modeling appendix (Chen 2020) was also added. Regarding modeling and data uncertainty, we think it is worth emphasizing that as discussed in Section 1.3.7 of the draft minimum flows report, the District uses an adaptive management approach for minimum flows development and implementation, which includes routine status assessments and, as necessary, reevaluation of established minimum flows. When possible, these activities are conducted to attempt to minimize uncertainty in our results and recommendations.			
1g	*In a changing climate, long-term (50-100 year) averaged flow are not necessarily more indicative of the hydrologic conditions in the next 15-20 years. Should more recent data in the past two decades be given more weight in the development of the baseline flow which was based on the average in 1950-2014?*	We think it is best to use hydrologic data (e.g., flow records) for the longest period, within reason, to best capture the climatic variability integrated in the data. As part of baseline flow development for Lower Peace River, historic flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Charlie Creek were examined in multi-decadal blocks (roughly 20 years) as shown in Figure 5.3 of the draft minimum flows report. Per the request of the peer reviewers, we added short-term (2000-2018) mean annual flows for Peace River at Arcadia, Horse Creek, Joshua Creek and Shell Creek to Section 2.7.1 in the revised, draft minimum flows report. In addition, as noted in response 4f in Table 4 below, we added the short-term average flow values to Figures 2-12 through 2-16 within the report section.	Yes	Additional text and revised figures include the requested data analysis. However, the District should consider the value of separately displaying data from 2000 to 2018, to compare the recent period with the prior-to-recent period.	As noted by the Panel, the draft minimum flows report was updated to include short-term (2000-2018) mean annual flows information for contrast with long-term average flows. This additional information is useful for characterization of more recent flow conditions in the Peace River at Arcadia, Horse Creek, Joshua Creek and Shell Creek. However, because the proposed minimum flows were based on long-term flow conditions, we do not see the utility of contrasting the more recent short-term flow values with flows from a pre-2000 period.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response (Table and Comment References Refer to June 1, 2020 Staff Response Document)	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		We also note that as part of minimum flow assessment for the Lower Peace River, 5- and 10 -year moving averages were calculated for river flows under baseline, minimum flow and existing flow scenarios (see Table 7.1 in the revised, draft minimum flows report). We also think it is worth emphasizing again that the District uses an adaptive management approach for minimum flows development and implementation that includes routine status assessments and, as necessary, reevaluation of established minimum flows.			Furthermore, we again note that flow comparisons for several multi-decadal periods are provided and discussed in Section 5.3.1 of the updated, draft minimum flows report.
1h	*Would be helpful to quantify actual or potential benefits associated with changes to existing MFL guidance*	Staff is required by State Law to use the best available information for the calculation of all minimum flows. We have used the best information available for our current determination of the proposed minimum flows for the Lower Peace River and Lower Shell Creek, and therefore do not think it is necessary or appropriate to make comparisons regarding resource protection between the existing and proposed minimum flows. That said, we note that the existing and proposed minimum flow for the Lower Peace River were both developed based on a 15% reduction in water volume with a salinity of <2 psu and are expected to provide similar levels of resource protection. However, the change from use of calendar-based blocks to flow-based blocks for the proposed minimum flows for the Lower Peace River and use of the flow-based blocks for the minimum flows proposed for Lower Shell Creek allows more withdrawals when high flows associated with storm events occur on any day of the year.	---	Yes.	This comment was included in the panel's initial peer review report and the staff response was included in the District's staff response to the initial peer review report. The panel comment and staff response were discussed during a panel teleconference, and the panel indicated satisfaction with the staff response. However, the initial panel comment and staff response were not included in the panel's final peer review report. To promote continuity in presentation of panel comments and staff responses, this original panel comment and staff response are included here.
1i	*Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows*	We included additional information on the importance of hydrodynamics in several sections of the revised, draft minimum flows report. For example, we added text to the end of Section 1.5 that emphasizes the	Yes	Additional text links the need to protect the very highest inflows to bottom water hypoxia, and the link between bottom water hypoxia and the Harbor's adopted Pollutant Load Reduction Goal.	No response required.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response (Table and Comment References Refer to June 1, 2020 Staff Response Document)	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
	on bottom water hypoxia and other phenomena	adopted minimum flows for the Lower Peace River and the proposed minimum flows for the river and Lower Shell Creek were based on potential flow-related changes in salinities assessed with hydrodynamic models. In addition, we added a new section (Section 3.2.2) on the pollutant load reduction goal for the Lower Peace River, emphasizing the environmental effects associated with relatively large, seasonal inflows to Charlotte Harbor. We also emphasized the importance of hydrodynamics in text added to the beginning of Section 3.3.1.			
1j	*Consider development of a "dynamic" MFL with real-time now-cast/forecast capabilities*	This is an intriguing suggestion, although we do not think development of a dynamic water quality model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. Minimum flows (and minimum water levels) are typically assumed to correspond with long-term hydrologic and environmental conditions, and in the case of the Lower Peace River and Lower Shell Creek were developed based on central tendencies of environmental responses to changes in flow simulated every 90 seconds (or 75 or 72 seconds during a few short periods when storms occurred) for a 7.7 year simulation period. Further, we add that estuarine organisms are adapted to cope with a wide range of salinities and the small changes in salinity, attributable to the currently proposed minimum flows, are unlikely to alter the ecological integrity of the naturally dynamic Lower Peace/Shell System or Charlotte Harbor. We note, however, that established minimum flows can be and are used to develop withdrawal-related conditions in water use permits, on both long-term and short-term	Yes	Additional text and revised figures include the information requested.	No response required.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response (Table and Comment References Refer to June 1, 2020 Staff Response Document)	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		bases. For example, in the case of the existing and proposed minimum flows for the Lower Peace River, permit conditions that limit withdrawals based on the previous day's average flow have been and are expected to be successfully implemented. These types of permit conditions are developed by District staff in coordination with permittees based on identified regulatory constraints, such as established minimum flows, the needs of the permittee and other practical considerations.			
1k	*Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee*	Although flow from the Caloosahatchee River was not directly used as boundary conditions near the mouth of the Caloosahatchee River, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. We also think it is valuable to comment on the complexity of inflows that can impact environmental conditions in Charlotte Harbor. For example, proliferation of drift algae and apparent loss of seagrass has been observed along the east wall region of the harbor and may be related to the Red Tide event of 2017-2018. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.	Yes, the issues related to red tide, potential impacts from the Caloosahatchee River and the potential for adverse impacts to the Harbor from sources other than the Peace and Myakka is realized by the District, and included in the response to the Panel's Initial Report.	The District's response to the Panel's comment displays an understanding of the issue of impacts to the Harbor from influences outside the control of the District itself. However, the revised MFL report titled "revised LPR_Shell Draft Min Flows2020-06-01.pdf" does not yet include the same level of discussion as the District response laid out in the file "LPR_Shell Peer Rev Staff Resp 2020-06-01". While the Caloosahatchee River is listed as a model element, the revised MFL report does not include the words "red tide" or references to the sort of impacts described in the District's response to the Panel. As such, while the Peer Review Panel is now more aware of District's awareness of this issue, the public document may not give other reviewers the same level of understanding, at least in the	The District's June 1, 2020 document, titled, "Southwest Florida Water Management District Response to the Initial Peer Review of Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek" referenced by the Panel will be included in the appendices to the updated, draft minimum flows report.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response (Table and Comment References Refer to June 1, 2020 Staff Response Document)	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
				revised MFL report from June 1, 2020.	
1l	*Analyze the potential impact of sea level rise on the MFL, using best available SLR data for 2020-2050*	We did not develop the proposed minimum flows based on future sea level conditions. However, we evaluated the proposed minimum flows under three SLR scenarios to help determine when a future re-evaluation of the minimum flows may be necessary. Although we used U.S. Army Corps of Engineer (USACE) SLR estimates, which are generally lower than those of the National Oceanic and Atmospheric Administration (NOAA), our results supported the need for consideration of a future reevaluation for the Lower Peace River and Lower Shell Creek minimum flows. Future reevaluations will be based on actual sea level conditions and other factors. Following the review panel's suggestion, we have conducted new model runs using NOAA et al. (2017) SLR estimates and are in the process of revising the draft minimum flows report based on an analysis of the new model results.	Yes	Additional text and revised figures include the information requested. However, the differing baseline conditions and rates of anticipated sea level rise displayed in the two tables could be better explained. It should also be noted that the 2017 SLR estimates from NOAA should be considered not just another example of SLR estimates to be compared to the earlier USACE values, but the most up-to-date estimates, and thus the "best available science".	Section 6.8 of the updated, draft minimum flows report was revised to indicate the SLR estimates based on Sweet et al. (2017) are more up to date than those derived using the approach identified by the USACE (2019).

Table 2 – Review of District Responses – Executive Summary, Amended to Include Final District Staff Responses

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
2A	*Definition of "significant harm"*	Significant harm and significantly harmful are not defined by the State Legislature. For minimum flows and levels development, each water management district of the state or the Florida Department of Environmental Protection identify specific thresholds or criteria that can be associated with significant harm. We incorporated additional information concerning significant harm into the first paragraph of the Executive Summary in the revised, draft minimum flows report.	Yes	Modified text in the Executive Summary better explains the logic behind the District's interpretation of how "significant harm" is quantified, as well as the background information used to support their approach to quantifying such.	No response required.
2B	*Definition of "best available information"*	In accordance with direction provided by the Florida Legislature, District staff use the best available information when determining minimum flows. Determinations regarding the best available information are made by District staff based on professional judgment, with consideration of input from all stakeholders. The best available information includes information that exists at the initiation of the minimum flows development process and information that is acquired specifically to fill data requirements deemed necessary for establishment of the best, defensible minimum flows. We do not think a definition for "best available information" is needed in the Executive Summary of the minimum flows report. However, we added the characterization of "best available information" above to the first paragraph of Section 1.5 in the revised, draft minimum flows report.	Yes	Modified text in both the Executive Summary and Section 1.5 better explains the modifier of "best available" when used to construct the MFL using existing data sources	No response required.
2c	*Could MFL be set for more than 3 flow blocks?*	In theory, any number of flow blocks could be identified and used for minimum flows development and implementation. For practical purposes, use of three flow blocks for the District's development and implementation of minimum flows for water use permitting, planning	Yes	Issue did not need to be included in revised MFL report – was raised for consideration, rather than a requested modification to the draft report.	No response required.

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		and water resource protection has proven to be successful. One reason for this success in the management of runoff driven lotic systems is that the flow blocks associated with established minimum flows have been developed with consideration of low, medium and high flow conditions that are known to be important for the physical, chemical and biological functions and structure of riverine systems. We have not conducted analyses associated with development of proposed minimum flows for the Lower Peace River and Lower Shell Creek with varying numbers of flow-based blocks.			
2d	*Concern over LSC low flow conditions*	Please refer to response 2i in this table.	Yes – District response is quite clear that the proposed minimum flow guidance is not being met, but that adherence to the guidance contained within the MFL would enhance ecosystem function, compared to existing condition.	The revised MFL report clearly states that the proposed minimum flow guidance for the Lower Shell Creek is not being met and requires a recovery strategy. Table 7-2 lays out the steps involved in the recovery strategy for the Lower Shell Creek.	Staff agrees with the panel's comments included here. However, further investigation of the need for a recovery or prevention strategy for Lower Shell Creek is ongoing. Findings from these investigations are expected to be completed in 2021 when staff anticipates recommending the Governing Board initiate rulemaking for minimum flows proposes for Lower Shell Creek.
2e	*Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)*	Please refer to response 1e in Table 1 for our response to this comment.	Yes	Additional text clearly spells out the linkages between the MFL's role in protecting the health of the Lower Peace River, Lower Shell Creek and Charlotte Harbor, in light of concurrent efforts to monitor, protect and/or restore ecological health in those same systems.	No response required.
2f	*Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP's Numeric Nutrient*	We analyzed water quality data to explore potential linkages between flow and water quality parameters as is required by the Water Resource Implementation Rule, not to validate or to infer compliance with the Numeric Nutrient Criteria adopted by FDEP	Yes – but the issues associated with incomplete analytical techniques for phosphorus (i.e., reporting only	HBMP's parameter list should collect all forms of phosphorus, not just orthophosphate, and values for chlorophyll-a should be corrected for phaeophytin.	District Regulation Division staff will be provided with the Panel's concerns regarding HBMP data-collection parameters.

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	Concentration (NNC) criteria		orthophosphate) and chlorophyll-a (i.e., reporting values not corrected for phaeophytin) are problematic.	While these points cannot be "corrected" in the MFL report, this issue should be resolved prior to the production of the next MFL update.	
2g	Explain the need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	We agree with the preliminary comments below that are included in the appendices to the Panel's initial peer review report: *"It appears improbable that even maximum water withdrawals would reduce flows sufficient to prevent bottom water hypoxia, which requires an average flow of 10,000 CFS at Arcadia (Stoker et al, 1989 – U.S. Geological Survey Publication XXXXX) – roughly equivalent to total gaged PR flow of about 20,000 cfs."* "*Proposed max withdrawal of 400 cfs represents ca. 2% of the minimum flow from PR watershed required to initiate stratification of 10 ppt in Harbor. Consequently, maximum withdrawal appears to be protective of the "reset button" of bottom water hypoxia."* We have therefore included text in a new Section (3.2.2) and at the beginning of Section 3.3.1 in the revised, draft minimum flows report to emphasize the importance of hydrodynamics and high inflows to Charlotte Harbor.	Yes	Additional text links the need to protect the very highest inflows to bottom water hypoxia, and the link between bottom water hypoxia and the Harbor's adopted Pollutant Load Reduction Goal.	No response required.
2h	*15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable*	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	This important topic is discussed by the District, and examples given of the reasonableness of the 15% threshold. However, the point remains that while examples can be found that support its application, it is not universally agreed as an acceptable level of	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any <u>potentially</u> more conservative approaches such as inflection points or threshold values. Although citations reference the reasonableness of using a 15% threshold to provide "high to moderate" protection from	No response required.

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			impact for all activities (e.g., wetland impacts from construction, impacts to seagrass from dredging, etc.)	impacts, those are not universally accepted as definitive thresholds for "significant harm" and may not necessarily by appropriate in all situations.	
2i	*Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health*	The proposed minimum flows for Lower Shell Creek are to be implemented based on discharge of a percentage of the inflow to Shell Creek Reservoir. For example, the allowable flow reduction of 23% for Block 2 flows, means that quantity of water equal to 77% of the inflows to the reservoir must be discharged downstream of Hendrickson Dam. This minimum flow is required, irrespective of withdrawals from the reservoir. By associating the minimum flows with rates of inflow to the reservoir, we believe the ecology of Lower Shell Creek is protected from significant harm associated with water withdrawals. Thus, a maximum flow diversion quantity is not required for the Lower Shell Creek. For minimum flows development purposes, Shell Creek is partitioned into the Upper Shell Creek and Lower Shell Creek, separated by Hendrickson Dam. The only significant, permitted withdrawal directly from Shell Creek is associated with the permit issued by the District to the City of Punta Gorda for withdrawals from Shell Creek Reservoir, the portion of the upper creek impounded by the dam. Because the proposed minimum flows for Lower Shell Creek are based on maintaining block-specific percentages of inflow to Shell Creek Reservoir from Upper Shell Creek (and Prairie Creek) and the City's withdrawals are from the multi-year storage in the reservoir storage, a maximum withdrawal limit (i.e., a maximum flow reduction) is not needed for the Lower Shell Creek minimum flows. Also, of note, the permit issued	Not entirely. The District's response is very detailed and lays out the logic of them not including a maximum flow diversion quantity for Lower Shell Creek. However, the Panel's concerns about the lack of incorporation of a maximum diversion quantity remain. The District's logic for including a maximum diversion quantity of 400 cfs for the Lower Peace River are that diversions above and beyond that amount might be problematic for regions beyond the boundaries of the Lower Peace River – areas out into the Harbor itself. The lack of similar maximum diversion guidance for the Lower Shell Creek does not follow the same logic. While it is true that such quantities are not likely to be reached – not "requiring" such guidance does not	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as protecting the health of the Harbor is concerned. Since it is acknowledged by the District (in their response) that it is unlikely that a potential maximum diversion quantity for the Lower Shell Creek MFL would be problematic for existing users, it is not entirely clear to the Panel why the District does not more fully consider the benefits of establishing similar maximum diversion guidance for the Lower Shell Creek as was included for the Lower Peace River.	District staff has not currently identified the need for inclusion of a maximum diversion (i.e., withdrawal) quantity in the minimum flows proposed for Lower Shell Creek.

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		to the City for withdrawals from Shell Creek Reservoir includes monthly and annual average maximum withdrawal limits. We further note that preliminary comments prepared by the panel and used to support development of their initial peer review report, indicated it is "*[n]ot likely that max withdrawals (if set) for LSC would affect threshold values for stratification, but should be mentioned/ acknowledged* We agree with this assertion, and note that for a recent period from 1996 through 2016, mean annual flow in the Lower Peace River, based on flows in the River at Arcadia and flows from Joshua and Horse creeks was 1,279 cfs, while flows to Lower Shell Creek from the same period were 388 cfs. This information, which has been included in Section 2.7.1 of the revised, draft minimum flows report, indicates the Shell Creek watershed accounts for only about 25% of the combined flows from the Peace River and Shell Creek watersheds. Based on the information provided here, we do not currently intend to recommend inclusion of a maximum withdrawal cap or limit as part of the proposed minimum flows for Lower Shell Creek. We will, however, continue to assess and, as necessary, consider this recommendation of the panel for potential, future reevaluations of minimum flows established for the creek.	diminish the value of developing such guidance.		
2j	*Say something about potential impact of SLR on the MFL*	Sea level rise effects on salinity habitats were assessed in the District's draft minimum flows report to help evaluate the potential need for future reevaluation of the proposed minimum flows. As noted in response 1l in Table 1, analyses based on modeled scenarios associated with SLR predictions from the U.S. Army Corps of Engineers indicated the need for reevaluation of minimum	Yes	Additional text and revised figures include the some of the additional information and discussion requested. The results displayed in the revised Draft MFL report suggest that anticipated rates of SLR are likely to impact the available low salinity habitat to a degree that be [*sic*] above	We agree that the implications of SLR on low salinity habitats should be assessed at regular intervals, and note in Section 6.8 of the draft minimum flows report that "…minimum flows for the Lower Peace River and Lower Shell Creek may need to be revaluated within 10 to 15 years after they are adopted into rule, to establish new baseline

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		flows established for the Lower Peace River and Lower Shell Creek. We acknowledge the SLR estimates used in our initial analyses are conservative. We have run the hydrodynamic model using the most recent SLR estimates by the National Oceanic and Atmospheric Administration (NOAA et al. 2017), and plan to update the revised, draft minimum flows report based on results of these SLR simulations.		and beyond the levels of impact meant to be protected through the implementation of this MFL. The implications of anticipated SLR on low salinity habitats needs to be assessed at regular intervals.	flow conditions that may occur as a result of SLR."

Table 3 – Review of District Responses – Chapter 1 – Introduction, Amended to Include Final District Staff Responses

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
3a	*Formatting of Table 1-1 Improve within cell formatting so text in final column matches up with that in preceding columns*	Table 1-1 was reformatted in the revised, draft minimum flows report to align information contained in the final column with that in the preceding column.	Yes	Modified table now formatted correctly	No response required.
3b	*1.2.1 Remove 's from Florida in title*	We changed "Florida's" to "Florida" in the Section 1.2.1 title in the revised, draft minimum flows report.	Yes	Modified text now correct	No response required.

Table 4 – Review of District Responses – Chapter 2 Physical and Hydrologic Description, Amended to Include Final District Staff Responses

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
4a	*Issues related to clarity of maps and figures, for example, enhancing Figure 2-2 so it is better related/connected to a Google street map for the same area. In addition, river scales are discussed or displayed in both miles and km. Perhaps use both metrics each time.*	Figures 2.2 and 2.3 have been updated in the revised, draft minimum flows report. In addition, an inset map was included in Figure 2.2, and we clarified the purpose of the inset maps in both Figure 2.2 and Figure 2.3. We acknowledge that differing metrics are used to depict distances in maps included in the draft report. Some of the maps are reproductions from other sources and for this reason, we have continued to present maps using both the U.S. Customary and Standard International metrics.	Yes	Map clarity issue has been addressed. Issues of station locations and listings in both km and miles (as well as station names alone) can be dealt with through expanded text of legend for those figures where other entities have produced the graphics.	Potential issues concerning station location depicted in figures and table have been addressed by noting correspondence between sampling locations and the river kilometer (RKm) system used for the minimum flow analyses.
4b	*Question related to LiDAR sources, for example, is 2017 LiDAR data for the region available from the state?*	The LiDAR photogrammetric data collection (Aerial Cartographic of America, Inc. 2015) was conducted primarily to support development of the District's hydrodynamic model for minimum flows development. These data were the best available information of this type in 2016, when the hydrodynamic model was calibrated and validated. State-wide 2019 LiDAR data are currently under review. These and other available data will be considered for use in future evaluations of minimum flows for the Lower Peace/Shell System.	Yes	Yes	No response required.
4c	*Use of NGVD29 vs. NAVD88 for elevation and bathymetry data*	Most elevation data and references to elevations in the draft minimum flows report are presented relative to the North American Vertical Datum of 1988 (NAVD88). However, we note that in the descriptive information included in Section 2.1 on page 16 of the draft minimum flows report a	Yes	Yes	No response required.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		reference is made to the Peace River originating in an area of Polk County at an elevation of about 100 feet above the National Geodetic Vertical Datum of 1929. We also note that a water surface elevation of 5.0 feet is included in the description of Shell Creek Reservoir in Section 5.5.3 on page 91 of the draft minimum flows report. For development of the hydrodynamic model for Charlotte Harbor, all the variables associated with elevation are referenced to NAVD88.			
4d	*Question about the order of MFL development vs. water supply planning efforts*	The development or reevaluation of minimum flows is a relatively lengthy process involving compilation of relevant data, development or refinement of analytical methods and approaches, and coordination with local governments and other affected stakeholders. In addition, the District is typically engaged in the concurrent development of minimum flows for several priority water bodies. For these reasons, there are practical limitations concerning minimum flows development and reevaluation schedules. It is worth noting, however, that minimum flow status assessments are conducted annually, on a five-year basis in conjunction with regional water supply planning, and on an as-needed basis associated with reviews for water use permit applications and renewals. Results from these assessments are part of the District's adaptive management approach to minimum flows development and implementation and can be used to inform decisions regarding the need for minimum flow reevaluation.	Yes	Yes	No response required.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
4e	*Definition of flow lag*	For the water quality analyses included in the draft minimum flows report, lagged-flows refers to average flows for periods ranging from 2 to 60 days prior to the date of water quality sampling event. Text in Section 3.2.2 in the revised, draft minimum flows report was amended with a parenthetic phrase to clarify what is meant by lagged-flows.	Yes	Yes	No response required.
4f	*Consider adding a most recent 10- or 20-year average bar to Figures 2-12 to 2-16 in addition to the one that is the long-term average for POR*	Short term average (2000-2018) flows were added to Figures 2-12 to 2-16 in the revised, draft minimum flows report. Please refer to our response 1g in Table 1 for additional information.	Yes	Additional average value now included in Figures 2-12 to 2-16. The District should consider adding a third line that excludes recent data to show average values calculated solely from historical data, so that the period of record minus the recent past and recent-past values can be directly compared.	As noted by the Panel, the draft minimum flows report was updated to include short-term (2000-2018) mean annual flows information for contrast with long-term average flows. This addition is useful for characterization of more recent flow conditions in the Peace River at Arcadia, Horse Creek, Joshua Creek and Shell Creek. However, because the proposed minimum flows were based on long-term flow conditions, we do not see the utility of contrasting the more recent short-term flow values with flows from a pre-2000 period. Furthermore, we again note that flow comparisons for several multi-decadal periods are provided and discussed in

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
					Section 5.3.1 of the updated, draft minimum flows report.
4g	*Discuss the importance of hydrodynamics and hydrodynamic modeling*	The standard format for the District's minimum flow reports involves identification of ecological criteria followed by descriptions of tools used to model or assess the criteria. The hydrodynamic model is identified in the introductory (Chapter 1), where we discuss the substantial data enhancements that were undertaken to improve upon the model that was previously used for development of the existing Lower Peace River minimum flows. To better emphasize the primacy of the hydrodynamic model for our current minimum flows assessments we split the paragraph following the numbered list of major initiatives and updates within Section 1.5 into two paragraphs in the revised, draft minimum flows report, and amended the first of the two paragraphs to clearly indicate that like the previous minimum flows effort, the current effort was based on salinity modeling conducted through hydrodynamic modeling. The hydrodynamic model is also notably mentioned in the system description (Chapter 2), water quality (Chapter 3) and resources of concern/modeling tools (Chapter 5) chapters. As noted in our response to comment 5i in Table 5 below, we also amended the brief discussion of the model in the salinity section of Chapter 3 included in the revised draft minimum flows report. We also emphasized the importance of hydrodynamics in a new section (Section	Yes	Yes	No response required.

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		3.2.2) on the pollutant load reduction goal for the Lower Peace River and new text added to the beginning of the descriptive water quality information section (Section 3.3.1). Finally, in Chapter 5 of the revised minimum flows report, the development and application of the UnLESS model to the Charlotte Harbor system has been substantially expanded to include more information on model setup, input data, model calibration and verifications and modeling uncertainty. As noted in the draft minimum flows report, detailed information on the model and its use are also discussed in Chen (2020) which is included as Appendix C to the report.			
4h	*Additional and more detailed description of hydrodynamic model elements needed*	Chapter 5 is expanded to include a brief description of the hydrodynamic model for Charlotte Harbor. Please also refer to our response 4g in this table.	Yes	Yes	No response required.

Table 5 – Review of District Responses - Chapter 3 Water Quality, Amended to Include Final District Staff Responses

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
5a	*Salinity data presented in Figure 3-3 not that helpful*	We note that variability in the salinity data presented in Figure 3-3 can be attributed to seasonal, inter-annual variation and other factors. However, as noted in the report text associated with the figure, we think the figure is helpful in portraying longitudinal and seasonal salinity variation in the Lower Peace River as well as salinity differences in the water column at selected sites.	Mostly	Data are inclusive of 1976 to 2016. This does not directly compare pre and post MFL conditions. Also, as flow blocks are no longer date-based, perhaps it is not as important to categorize data into wet vs. dry seasons	No response required.
5b	*Influences of factors other than flow on concentrations of chlorophyll a*	We added additional text in Section 3.3.1.3 of the revised, draft minimum flows report.	Yes	Section 3.3.1.3 gives a more thorough review of factors that can influence chlorophyll-a than in the prior report. Might be good to add something how the data not being corrected for phaeophytin affects interpretation.	No response required. We note that Section 3.3.1.3 indicates the reported chlorophyll data are uncorrected for phaeophytin.
5c	*Values of phosphorus only shown for "orthophosphorus"*	Total phosphorus measurement for the Hydrobiological Monitoring Program (HBMP) was terminated in 2003. We investigated our use of ortho-phosphorus vs. total phosphorus by conducting scatterplot analyses for data from 5 stations for the period 1996 through 2003. As indicated in the figures below, about 81-88% of total phosphorus is attributed to ortho-phosphorus, suggesting that results expected for total phosphorus may generally be similar to those determined for ortho-phosphorus. We included information concerning the current measurement of ortho-phosphorus for the Peace River HBMP and the correlation between orthophosphorus and total	Yes, but the draft final report does not include the level of detail included in the District's response to the Panel.	The inclusion of only dissolved inorganic forms of phosphorus is problematic. While this is not the District's data collection effort, it is a data collection effort that is conducted for compliance with a water supply permit. The percentage of phosphorus that is orthophosphate may average 80%, but that value likely varies over the length of the river and with different seasons. The final MFL report should replace all text and data legends that contain	References to "orthophosphorus" were changed to "orthophosphate" in the updated, draft report.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		phosphorus in Section 3.3.1.5 of the revised, draft minimum flows report.		"orthophosphorus" with "orthophosphate".	
5d	*Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite*	We added results for total nitrogen to Section 3.3.1.4.	Yes	Revised results and analysis are in-line with request.	No response required.
5e	*Definition needed for "flow-lag"*	Please see response 4e in Table 4 for our response to this comment.	Yes	Yes	No response required.
5f	*Various figures have legends that appear to be mislabeled*	Numerous figure legends were corrected in the revised, draft minimum flows report.	Mostly	Captions have improved, but the final report should clearly define wet and dry season in figure captions. Format as "NOx". In Table 3-7 add (or replace with) Rkm to station number so readers know the upstream/downstream position. Figure 3-17 shows the stations are not numbered sequentially. Figures 3-19, 3-21, 3-23, 3-25, 3-27 all could have Rkm on x-axis. Remove "shows" 3-27.	Captions for all figures in Section 3.3.1 depicting "wet" and "dry" season water quality values for the Lower Peace Rivers were modified in the updated, draft minimum flows report to clearly define the respective seasons. Formatting for presentation of nitrate+nitrite information as "NOx" has been included in the updated, draft report. Table 3-7 was updated in the draft report to include river kilometer information. Captions for all figures in Section 3.3.3 were updated in the draft report to clarify sampling locations associated with water quality data presented for Lower Shell Creek. The errant inclusion of "shows" in the caption for Figure 3-27 was deleted from the updated, draft report.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
5g	*Figure 3-22 caption says it is dissolved oxygen, but y-axis says chl a*	The Figure 3-22 caption was corrected in the revised, draft minimum flows report to indicate that the plot shows chlorophyll concentrations.	---	---	This comment and response were not included in Table 5 of the final peer review report but were included in Table 7 of the final peer review report. See comment/response 7o in Table 7 below for information on the Panel's level of satisfaction with the original District staff response and the final staff response.
5h	*Mislabeling of y-axis on Figure 3.23*	The y-axis label for Figure 3-23 was changed from "Salinity (PSU)" to "Chlorophyll" in the revised, draft minimum flows report.	Yes	Label changed as requested	No response required.
5i	*Importance of hydrodynamic model description*	We agree that description of the hydrodynamic model and its primacy for the analyses presented in our draft minimum flows report should be emphasized. As noted in response 4g in Table 4, we modified text in Section 1.5 of revised minimum flows report to emphasize our prior and current use of hydrodynamic modeling to support minimum flows development for the Lower Peace River and Lower Shell Creek. In addition, we substantially expanded the presentation of model information included in Chapter 5. We also think it is appropriate to discuss the development and use of a hydrodynamic model for assessing flow-related changes in salinity in the Lower Peace/Shell System in Section 3.3.2.1 of the draft minimum flows report, which addresses system salinity. Our mention of the hydrodynamic model in the water quality chapter (Chapter 3) in the original draft report, and additional related text added to the revised draft report serve as another useful preview of the more detailed discussion of the model in Chapter 5 and the referenced model report, Chen (2020), included in the report appendices.	Yes	Yes. Additional text and explanation in the revised report are satisfactory.	No response required.

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		We also note that within Section 2.3.2.1 of the revised, draft minimum flows report, we substantially modified the text to emphasize our efforts to develop and use the best available information, in this case the hydrodynamic model, for minimum flows development.			
5j	*Additional and more detailed description of hydrodynamic model elements needed*	In addition to modifications to the text in Section 3.2.2.1 of the draft, revised minimum flows report noted in our previous response 5i in this table, we also amended text associated with the model in Chapter 5 and in the model report (Chen 2020) included as Appendix C to the report.	Yes	Yes	No response required.
5k	*More refined explanation needed for isohaline location trend analyses*	Please refer to response 5o in this table.	Mostly	Test could be expanded slightly, although the table footnote does help.	No response required. We think the text modification and footnote included in the draft report are sufficient.
5l	*Better description of results shown Figures 3-12 to 3-16*	To improve presentation of the correlation analyses results presented in Figures 3-12 through 3-16, we amended the figure captions within Sections 3.3.2.2 through 3.3.2.5 of the revised, draft minimum flows report. We also modified the statistical methods description included in Section 3.3.2 to better describe the lagged-flows used in the analysis and to summarize our interpretation of the correlation statistics derived from the analyses and presented in Figure 3-12 through 3-16.	Yes	Description more detailed and labels now accurate for the displayed data	No response required.
5m	*Value of developing dynamic water quality model, vs. empirical approaches*	As noted in response 1j in Table 1 we understand the potential value of a dynamic water quality model for the Lower Peace/Shell System, but do not think development of such a model (for water quality parameters other than salinity and temperature) is necessary for the current development of proposed minimum flows for the Lower Peace River and Lower Shell Creek.	Yes	Yes	No response required.

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		See response 1j for additional information concerning our response.			
5n	*Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included*	Lower Shell Creek and Lower Peace River flows were combined for depiction of the flow-salinity relationships for Stations 6.6 and 15.5 in Figure 3-11 in the revised, draft minimum flows report. In addition, the figure caption and associated text within Section 3.3.2.1 of the revised, draft minimum flows report were updated.	Partially	The salinity data now are plotted against the totality of inflows – from both the Lower Peace River and Shell Creek. However, the graphic does not display equations, statistical significance, etc. The text says that "…salinity was more responsive to freshwater inflow…" at upstream stations without defining what that means. Consider replacing that text with "…variation in flow explained a greater amount of the variability in salinity at upstream stations but was statistically significant at all stations examined here."	The statement in Section 3.3.2.1. which indicated that "…salinity was more responsive to freshwater inflow…" was replaced with "variation in flow explained a greater amount of the variability in salinity at upstream stations (RKms 23.6 and 30.4) than in the downstream stations (RKms 6.6 and 15.5).
5o	*Table 3-1 – improve explanation of location of isohaline location trends*	We note that the text on page 47 preceding and which refers to Table 3-1 indicates the trend analysis identified an upstream movement of the 0 psu and 20 psu isohalines for period from 1984 through 2016. To improve understanding of the information presented in the table, we added a footnote to Table 3-1 in the revised draft minimum flows report to characterize our interpretation of the presented, significant statistics, i.e., that positive, significant statistics indicate upstream isohaline movement. While revising Table 3-1, we determined that changes to clarify the presented statistical results and better indicate that the results pertain to the Lower Peace River (and in some cases Charlotte Harbor near the mouth of the	Partially	Table 3-1 and preceding text explains that the trend test was for detecting an upstream movement of the location of the 0 and 20 psu isohalines. However, the text regarding Table 3-1 is incorrect, as there was only a trend for 0 and 20 psu isohalines, while t the text suggests there was a trend for all four isohaline locations.	Text preceding Table 3-1 was revised in the updated, draft minimum flows report to indicate significant, upstream movement was identified for only the 0 psu and 20 psu isohalines for the assessed period.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		river) were needed for several other tables and figure within Chapter 3. So, we revised captions and/or footnotes for several additional tables and figures in the revised draft minimum flows report, including Tables, 3-2, 3-3, 3-4, 3-5, 3-6 and 3-7, and Figures 3-3, 3-4, 3-5, 3-6, 3-7, 3-8, 3-9 and 3-10.			
5p	*Table 3-2 ,3, 4 to 3-7 and 3-12 to 3-16 – improve explanation of summertime hypoxia development and other data presentations*	The text in Section 3.3.1.2 preceding Table 3-2 notes the trend analysis indicated dissolved oxygen concentrations in surface waters associated with the 0 psu isohaline increased for period from 1984 through 2016. We do not think the information presented in the table can be used to assert there is no hypoxia in surface waters of the Lower Peace River during the wet, summer season. However, as noted in responses 5i and 5o in this table, we amended the captions, column headers, and/or footnotes for Tables 3-2, 3-3, 3-4 through 3-7 and Figures 3-12 through 3-16 within the revised, draft minimum flows report. We also updated the statistical methods description included in Section 3.3.2 within the revised, draft minimum flows report to enhance presentation of the results.	Yes	Figures 3-3 and 3-4 seem to be portraying different versions of the same phenomena – salinity is apt to be higher in the bottom waters, and dissolved oxygen lower, particularly in the wet season. The Panel has concluded that fixed geographic locations and the salinity-based stations serve different purposes, and both are important to keep.	No response required.

Table 6 – Review of District Responses - Panel Comments on Chapter 4 Ecological Resources, Amended to Include Final District Staff Responses

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
6a	*Plant community data set from 1998 is problematic*	We are not aware of any recent, comprehensive, species or genus-level vegetation maps for the Lower Peace/Shell System that would represent an update to the detailed information presented in Figure 4-1 in the original, draft minimum flows report. However, we developed and included a replacement, coarser-level vegetation map based on the 2017 SWFWMD land use/cover GIS layers in the revised, draft minimum flows report. In addition, we anticipate considering vegetation data collection and mapping needs for future evaluations of the system.	Yes	Updated information is much more helpful	No response required.
6b	*Status and trends in seagrass coverage in the LPR over time*	The District has been mapping seagrasses in Charlotte Harbor using aerial photography since 1988. Others have attempted to use older imagery to infer historical seagrass extent, but with very limited success. For the Tidal Peace River segment of Charlotte Harbor, recent seagrass extent (estimated for 2014, 2016 and 2018) is greater today than any time since 1988, as shown below. We included this figure and associated text in Section 4.1.5 of the revised, draft minimum flows report to augment the presented seagrass information.	Yes	Inclusion of such information is appreciated	No response required.
6c	*Concern over shift in HBMP focus to physical factors, rather than fish communities, macroinvertebrates, and/or macroalgae*	In 1996, the Charlotte Harbor Hydrobiological Monitoring Program (HBMP) Scientific Review Panel reviewed the ongoing elements of the HBMP program and recommended several changes to the monitoring program study elements. The Panel recommended that HBMP monitoring should primarily focus on assessing long-term trends in key physical, chemical, and biological characteristics that can be directly linked to potential effects associated with withdrawals at the Peace River Manasota Regional Water Supply Authority's Peace River Facility. They also noted that less effort should be focused on indirect biological indicators that are not intended to	Partially	The District should explain in greater detail the relationship(s) between biological data that will be continued to be collected to ensure compliance with the intent of the MFL, even if such data are not capable of being used for modeling purposes.	Minimum flows status assessments will primarily be based on monitoring of flows and permitted withdrawal quantities. With regard to biological data collection in the Lower Peace/Shell System, the District is likely to continue supporting

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		evaluate influence of withdrawals, once a baseline level of information has been collected. As summarized in Appendix A of the Peace River Hydrobiological Monitoring Program 2016 HBMP Comprehensive Report (JEI 2017), subsequent meetings of the HBMP Scientific Review panel have continued to shape the current HBMP. Reference to this summary document has been included in Section 3.3.1 of the revised, draft minimum flows report to provide additional information concerning the evolution of the HBMP. We think the biological and other information collected to date and summarized in our draft minimum flows report is sufficient for development of recommended minimum flows for the Lower Peace/Shell System. We note that this information has been collected in support of the required HBMP, other monitoring programs, and studies specifically undertaken by the District to directly support minimum flows development. However, in support of our adaptive management approach to minimum flows development and implementation, we continue to support ongoing data collection efforts for the Lower Peace/Shell system and will consider additional sampling and analysis of biological data as needed, for future minimum flow reevaluations.			long-term, seagrass mapping efforts, and anticipated funding data collection on other vegetative communities, benthic macroinvertebrates and fish, as needed, to support any future reevaluations of minimum flows established for the system, as indicated in Chapter Four.
6d	*Fisheries Independent Monitoring newest data from 2016 not included in the modeling approach (Appendix E) or compared to data collected through 2013*	At the time of model development, the best available data were used. However, consideration of more recent data has been requested from the Florida Fish and Wildlife Conservation Commission (FWC) and a comparison of abundance of the taxa and size classes examined in this model will be performed to determine if there are any significant differences between modeled years and more recent sampling years. Results from this analysis will be included in future updates to the draft minimum flows report. As noted in Section 4.2.1 of the draft minimum flows report, Call et al., (2013) performed a survey on fish communities within the Lower Peace River throughout 2007 to 2010 and found no temporal variation in fish communities across years, suggesting a generally stable system within the river.	Yes	Yes, the addition of additional data is useful.	The abundances of modeled taxa and size classes from the most recent available data (2014-2018) were compared data from an equivalent subset of modeled years (2009-2013). There were no statistically significant differences in abundance of any size class of the examined taxa between modeled and more recent years, with the exception of

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		To augment presentation of information on the fish assemblage in the Lower Peace/Shell System, the descriptive FWC Fisheries-Independent Monitoring data from 2018 presented in Section 4.2.1 of our original draft minimum flows report has been replaced with the most recent available data (2018) in the revised, draft minimum flows report.			early juvenile Spot caught by one gear type. Therefore, staff did not consider remodeling the newer data to be necessary.
6e	*Should endangered species, such as sawfish and manatees, be included in MFL assessments?*	Endangered and listed species should be and are considered when developing minimum flows. For example, in Section 4.2.1 of the draft minimum flows report we noted that juvenile sawfish (<3 years of age) are able to move in response to salinity fluctuations with high site fidelity upon a return to baseline conditions, with large-scale movement most notable after significant freshwater inflow (>500 cubic meters per second) from tropical disturbances (Poulakis 2016). We also noted that Sawfish movements examined in the Caloosahatchee River demonstrate downstream movement when salinities approach 0 psu and upstream movement at salinities approaching 30 psu (Poulakis 2013). Therefore, protection of the sensitive salinity habitat would not positively affect their distribution, although maintenance of natural freshwater flows would benefit their capacity to locate nursery grounds (Poulakis 2016). Further we note that the species chosen for the HSM modeling used to support our minimum flow analyses reflect those with affinities for low salinity habitats. A strong positive correlation between Common Snook (*Centropomus undecimalis*) abundance and flow was observed in the Lower Peace River (Blewett 2017). Body condition was also elevated during years of increased river flow. This increased abundance and condition with increased flow was hypothesized to be related to enhanced prey availability with greater floodplain inundation. Per the floodplain inundation analysis performed by HSW (2016) in support of our minimum flows work (Appendix D), the proposed minimum flows will not significantly impact total inundated floodplain wetland area associated with the baseline flow condition,	The additional information included in the District's response is clarifying.	The District should consider including more of the information provided in the response to the final MFL report. In particular, information related to juvenile and age-specific salinity preferences of sawfish would be helpful to include in the final MFL.	Text in Section 4.2.1 of the draft minimum flows report was further updated to include information regarding age-specific preferences of Sawfish.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		and are therefore unlikely to impact the abundance or condition of Common Snook. For development of minimum flows for river systems or creeks dominated by spring flow we typically consider manatee usage of thermal refuges during acute and chronic cold-water events. Given the lack of spring discharge to the Lower Peace/Shell system we do not think assessment of potential, flow-related changes in thermally-favorable habitat usage by manatees is necessary for our development of minimum flows for the river and creek.			
6f	*In Appendix E it is stated that "predicted CPUE grids" were derived from catch data and these predictions were used to generate the population estimates which were used to model the effect of water withdrawals*	Catch-per-unit-effort (CPUE) is a direct calculation from Florida Fish and Wildlife Conservation Commission's Fisheries Independent Monitoring (FIM) catch data, standardized to the gear type used. These data, all the data used for development of the habitat suitability models (HSMs), and the modeling results were considered the best available information at the time for support of the development of the proposed minimum flows. The fish population modeling using habitat suitability was not used as a criterion for development of the proposed minimum flows, rather it was used for consideration of potential effects of implementation of the proposed minimum flows on representative, important taxa populating the system. Because the model does not incorporate some factors, such as competition, predation and fishing pressure that can affect fish and invertebrate distributions, we used the model to assess how habitat suitability zones simulated under baseline condition would change with implementation of the proposed minimum flows. Like all models, the habitat models that we used to assess habitat suitability for several estuarine taxa, include limitations. We augmented Section 5.5.3 in the revised, draft minimum flows report to fully discuss these limitations and modeling uncertainties. However, we continue to think the HSMs developed to support our minimum flows work are well suited for consideration of potential changes in habitat suitability between the baseline flow condition and reduced flow conditions. Regarding this potential habitat change assessment, we note that the flow reduction scenario assessed in support of our minimum flows analyses	Yes	The revised MFL refers to the date "1880s" in the bulleted list at the end of the section. This likely is meant to be "1980s"	The term "1880s" was replace with "1980s" in the updated, draft minimum flows report.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		actually exceeds the allowable flow reductions prescribed by the minimum flows that are proposed for the Lower Peace River/Shell System. A maximum withdrawal limit was not included or used to develop the "minimum flows" scenario used to characterize habitat suitability with the HSM under reduced flow conditions. The HSMs, in their current or an enhanced form may be used for future minimum flow evaluations for the Lower Peace River and Lower Shell Creek. They would likely not be used if alternative tools that provide superior information were to become available.			
6g	*Figure 4-2 difficult to review due color choices*	Figure 4-2 was reformatted for the revised, draft minimum flows report to improve clarity.	Mostly	The figure much improved, but should be made larger.	Figure 4-2 was enlarged as much as feasible, while maintaining appropriate pagination for the updated, draft minimum flows report.
6h	*Explain "decreased flow may also contribute to increases in dissolved oxygen concentrations". Add your response to p.76 of the report.*	Potential relationships between decreased flows and oxygen concentrations are explained in the papers cited in Section 4.2 of the draft minimum flows report, and we think these relationships are adequately summarized in the section. However, we acknowledge that additional, potential effects of decreased flows could include those associated with an increase in the influence of tidal fluctuations which can lead to the formation of a well-mixed system. Also, if sediment loads from the watershed decrease as a function of reduced flows, water clarity could increase, leading to an increase in primary production. We included additional text associated with these factors in the last paragraph of Section 4.2 of the revised, draft minimum flows report, and split the paragraph into two paragraphs to improve readability of the text.	Partially	The District's response, in Section 4.2 seems to refer to the potential for increased algal growth under low flow conditions, due to some combination of factors (e.g.., increased water clarity, increased residence time). However, algal growth only increases oxygen concentrations in day light hours – more phytoplankton means both higher highs (in the day) **and lower lows** (at night). Some discussion of algae's day/night impacts on DO is warranted. The impacts of lower flows on oxygen may not	Relevant text in Section 4.2 was modified in the updated, draft minimum flows report to address potential diurnal effects of flow changes on oxygen concentrations as a result of increased phytoplankton productivity and respiration.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
				be detectable with a data set that is based on daytime samples. Therefore, the concern remains, and the language in the revised MFL report is perhaps overly simplistic.	

Table 7 – Panel Comments on Chapter 5 – Resources of Concern and Modeling Tools, Amended to Include Final District Staff Responses

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
7a	*Figure 5-1 could be more clearly identified as to what the graphics are meant to represent, in terms of "exceedance"*	Figure 5-1 shows mismatch of fixed-date blocks using a long flow record (1950- 2014) and short flow record (2007- 2014) based on 75% exceedance (red dashed line) and 50% exceedance (blue dashed line). This is the reason for the change from date-based to flow-based blocks that are depicted in Figure 5-2.	Partially	Figures 5-1 and 5-2 are unchanged. The Panel believes that the since recent data is included in "the long flow record". it would also be useful to display the data using three data sets: period of record, period of record minus recent past, and then the recent past	The graphs are used to demonstrate differences between and the rationale for using flow-based blocks vs calendar-based blocks, using flow data that were available at the time the hydrodynamic model was run (through 2014).
7b	*Timeframe and data sources used to develop the hydrodynamic model*	The timeframe used for the hydrodynamic model is briefly described in Section 5.5.1 and in Appendix C. Sources of bathymetric LiDAR and tide data are described in Sections 2.4 and 2.6. Flows are briefly described in Section 2.7 and Sections 5.3.2 and 5.3.3. More information about the hydrodynamic model was added in Section 5.5.1 of the revised, draft minimum flows report.	Yes	Yes	No response required.
7c	*Need to understand basis for variation in baseflow differences over different time periods*	Baseline flow from 1994 through 2006 was used with the PRIM model to simulate groundwater withdrawals and land use change impacts on Peace River flows. Baseline flow from 2007 through 2014, seasonally-corrected based on PRIM model run output, was used with the hydrodynamic model to simulate salinity, depth and water temperature in the Lower Peace/Shell System and Charlotte Harbor. Baseline flow from 1950 through 2014 was used for comparison against gaged flow data for minimum flows status assessment, after seasonal correction has been made to gaged data based on the output of the PRIM model. Please see Section 7.1 and Table 7.1 in the revised, draft minimum flows report for additional information.	Yes	Yes	No response required.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
7d	*Further clarify the meaning of "transitional flow triggers", using simple terminology such as "safety valves" to explain concept.*	The currently adopted Lower Peace River minimum flows are based on calendar date-based blocks, and a transitional "flow trigger" (625 cfs) was required when high flows remained depressed due to climatological conditions. The newly proposed minimum flows for the Lower Peace River were developed using flow-based blocks that include flows of 297 cfs and 622 cfs that respectively represent transitions between low to medium and medium to high flows. Similarly, flow transitions for the proposed minimum flows for Lower Shell Creek are 56 cfs and 137 cfs, respectively. Given that the proposed minimum flows for the Lower Peace River and Lower Shell Creek were developed for flow-based blocks associated with transitions from low to medium to high flows, the identification of additional flow triggers" as a "safety valve" to account for out-of-season flows is not necessary.	Yes	Yes	No response required.
7e	*Helpful to include a graphical display of residence time/flushing rates*	We agree that transport timescales are useful for discussion of flow effects on dissolved oxygen concentrations and other environmental factors. In our future evaluations of dissolved oxygen and eutrophication in the Lower Peace/Shell System and Upper Charlotte Harbor, we will consider discussion and presentation of transport timescales information.	Partial	Yes	No response required.
7f	*Language related to impacts of hurricanes based on model runs*	For the minimum flow analyses, the hydrodynamic model was run from 2007 through 2014, a period which included major storm and drought events but not hurricanes. In response to this question, we also think it is useful to note that minimum flows are to be established as the limit beyond which further withdrawals would be significantly harmful to the water resources or ecology of the area. Therefore, in the case of extreme high-flow conditions associated with hurricanes and other	Yes	Yes	No response required.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		major storm events, achieving a minimum flow requirement is not anticipated to be an issue. We add, however, that District rules allow for the consideration of public health and safety for implementation of all District rules and policies.			
7g	*Request for more information related to the hydrodynamic model, including consider the possibility of adding a short chapter which gives a holistic overview on the role of hydrodynamics (flow and water level, salinity, temperature, flushing) on water quality, ecology and fishery.*	Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.	Yes	Yes	No response required.
7h	*Limitations of hydrologic model in ungaged portions of the watershed should be discussed in more detail*	Please refer to response 1f in Table 1 for our response to this comment.	Yes	Yes	No response required.
7i	*Suggested development of a dynamic water quality model, vs. empirical approaches*	Please refer to comment 1j in Table 1 for our response to this comment.	Yes	Yes	No response required.
7j	*Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed*	Baseline flow for Lower Peace River was estimated based on Peace River Integrated Model (PRIM) outputs. Charlie Creek was simply used as a reference for a multi-decadal comparison of historical flows. The justification for this use of data from Charlie Creek is based on information presented in PB&J (2007) and trend analysis described in Section 5.3.1 of the minimum flows report.	Partially	Reference is made to the PBS&J report (2007) which used Charlie Creek's flow as not impacted by human activities during the 1950? To 1969 period. But, a reference to the natural condition of the watershed (included in the PBS&J report) would say why that's the case.	Text preceding Table 5-1 in Section 5.3.1 of the updated, draft minimum flows report includes the following: "Trend analysis conducted by PBS&J (2007) indicated that the Charlie Creek historic flows are consistent with the timing of the wet and dry climate periods in southwest Florida. Based on land use change analysis for the period from 1940 to 1999, they found that, among the nine watersheds in the Peace River Basin, Charlie Creek remains relatively un-impacted, with no phosphate mining and limited urbanization and agriculture."

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
7k	*Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations*	As noted in Section 5.3.1, the Peace River Integrated Model (PRIM) was used to investigate effects of climate variability, groundwater pumping, land use changes and other factors on flows in the Peace River. Also, as noted in the report section, flow reductions and increases for differing portions of the watershed are predicted based on the distribution of existing withdrawals, differing degrees of agricultural return flows from groundwater pumping due partly to the tighter confinement on the upper Floridan Aquifer in the lower Peace River area, and differing amounts of excess baseflow associated with agricultural withdrawals. As recommended by the peer review panel, a monthly trend analysis has been conducted and the discussion in Section 5.3.1 of the revised, draft minimum flows report has been updated to indicate why groundwater withdrawals are associated with flow decreases in the Upper Peace watershed and some flow increases in Lower Peace region.	Yes	Section 5.3.1 better explains the totality of issues associated with increased flows in the dry season that are not explained by rainfall.	No response required.
7l	*Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed*	For development of baseline flow record used in the minimum flow analyses, irrigation efficiencies of 60 and 85% for row crops and citrus, respectively, were used to adjust Shell Creek flows by accounting for groundwater discharge that resulted from agricultural practices in the Shell Creek watershed. These assumed efficiencies are the same as those that were identified in the District's 2010 report on proposed minimum flows for the Lower Peace River and Lower Shell Creek. As mentioned in the revised, draft minimum flows report in Section 5.3.3, the rates and periods of application were taken from the	Yes	Reference to UF IFAS as a source of those coefficients is sufficient and appreciated.	No response required.

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
		University of Florida Institute of Food and Agricultural Sciences (IFAS) recommendations for nearby Manatee County.			
7m	*Logic for not including a maximum diversion quantity for LSC is not clear*	Please refer to response 2i in Table 2.	Partially	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as the protection of the health of the Harbor is concerned.	District staff has not currently identified the need for inclusion of a maximum diversion (i.e., withdrawal) quantity in the minimum flows proposed for Lower Shell Creek.
7n	*Basis for 15% as threshold for "significant harm" needs more detail*	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	Partially	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any <u>potentially</u> more conservative approaches such as inflection points or threshold values.	No response required.
7o	*Figure 3-22 caption says it is dissolved oxygen, but y-axis says chl a*	The Figure 3-22 caption was corrected in the revised, draft minimum flows report to indicate that the plot shows chlorophyll concentrations.	Mostly	Figure legend now correct in terming the data chlorophyll- but the legend refers to "surface, midwater and bottom" values, which does not appear to be correct, unless chlorophyll was collected at three depths in the water column	Figure 3-22 and associated text in Section 3.3.3.3 were revised in the updated, draft minimum flows report to indicate that mid-water chlorophyll concentrations are presented. Note: This comment and the original staff response were

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
					included as comment/response 5g in the original District staff response document.

Table 8 – Panel Comments on Chapter 6 – Recommended Minimum Flow Values, Amended to Include Final District Staff Responses

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
8a	*Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?*	Yes. The 400 cfs maximum withdrawal for the Lower Peace River is applicable at all times. The only exceptions would occur during a period defined by a policy decision or directive of the District Governing Board, or an Order issued by the District's Executive Director. We further note that hurricanes and king tides are extreme hydrological events and we do not expect PRMRWSA to withdraw water during these events, especially during hurricanes.	Yes	Yes	No response required.
8b	*Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades*	Please refer to response 1l and 2j for our responses to this comment.	Yes	Yes	No response required.
8c	*Logic for not including a maximum diversion quantity for LSC is not clear*	Please refer to response 2i in Table 2.	Partially	The District's reluctance to include a maximum diversion quantity for the Lower Shell Creek seems at odds with the inclusion of such guidance for the Lower Peace River. The logic for not including a maximum diversion quantity for Lower Shell Creek seems to rest on the statement (Section 6.2) that withdrawals are "…from Shell Creek Reservoir upstream of Hendrickson Dam, not directly from the lower portion of Shell Creek." This may be an important distinction for regulatory reasons, but it is not an important distinction as far as	District staff has not currently identified the need for inclusion of a maximum diversion (i.e., withdrawal) quantity in the minimum flows proposed for Lower Shell Creek.

				the protection of the health of the Harbor is concerned.	
8d	*15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable*	Please refer to the "Table 1 - Supporting Narrative Panel Comment and District Staff Responses" section above for our response to this comment.	Partially	The reviewers feel that the District has sought to apply the best approach that can be reasonably expected to work in the absence of any potentially more conservative approaches such as inflection points or threshold values.	No response required.

Table 9 – Typos and Comments on Various Appendices, Amended to Include Final District Staff Responses

Comment/ Response Identifier	Summary of Panel Concern/Comment	District Staff Response	Panel Satisfaction with District Response?	Revised MFL Report Modified to the Panel's Satisfaction?	District Staff Response (Final)
9a	*Appendix E – page 7 – typo*	The incorrect usage of the acronym "BF" to refer to the Baseline flow condition used for the habitat suitability modeling will be corrected to "BL" in the appendix or an errata sheet will be added to the appendix to identify the typographical error.	Yes	Presumably	The typographical was corrected in the appendix.
9b	*Section 5.1 – typo*	The misspelling of "indicators" in Section 5.1 was corrected in the revised, draft minimum flows report.	Yes	Yes	No response required.
9c	*Page 84 – typo – add "on data from a 13-year period"*	We were not able to determine where to add the identified phrase to the report. We will seek further panel guidance to help address this comment.	No	First sentence of second paragraph appears to need revision in revised draft MFL report.	A sentence in Section 5.3.1 was modified in the updated, draft minimum flows report to improve clarity, as suggested. The amended sentence now reads: The PRIM was used with measured groundwater withdrawals to simulate flows for a 13-year period, from 1994 through 2006.
9d	*Page 96 – typo, first sentence "result in"*	We corrected this typo (i.e., changed "resulting" to "result in") in the first numbered item listed in Section 5.4 of the revised, draft minimum flows report.	Yes	Yes	No response required.
9e	*Page 95 – clarification needed*	We were not able to determine where clarification was needed on this page of the report. We will seek further panel guidance to help address this comment.	Yes	Considering replacing language with "freshwater plants that tolerate some combination of salinity levels and durations"	A sentence in Section 5.4.2 was modified in the updated, draft minimum flows report to improve clarity, as suggested. The amended sentence now reads: Clewell et al. (2002) found that freshwater plants that tolerate some combination of salinity levels and durations were primarily located upstream of the median location of 2 psu salinity in the river channels.
9f	*Page 117 – "psu" missing from first sentence of second paragraph, also change spacing*	We included the missing "psu" metric in the first sentence of the paragraph after Table 6-4 within Section 6.3 of the revised, draft minimum flows report. We did not, however, note any spacing issues on the section page.	Partially	The unit "psu" added, but the report should, add spaces between less than signs and the number 2, and check for spacing around < and > throughout the MFL report	The draft minimum flows report was updated to include spaces before and after all equality/inequality symbols.

9g	*Appendix C should be a separate chapter*	Instead of creating a new report chapter, we chose to amend information on the hydrodynamic model development included in Chapter 3 and especially in Chapter 5. Please see response 4g in Table 4 and 5i in Table 5 for our responses to this comment.	Yes	Yes	No response required.
9h	*Page 16 – typo in title*	Changed “HYDROLGIC” to “HYDROLOGIC” in the Chapter 2 title.	Yes	Yes	No response required.
9i	*Page 47 replace “is” with “in” first sentence of 3.3.1.2.*	We could not locate text on page 47 of the original draft report that seemed to need revision. However, we improved the referenced sentence in the revised, draft minimum flows report by changing “water” to “waters” in the first sentence of Section 3.3.1.2.	Yes	Yes	No response required.
9j	*Figure 3-11, page 57 – model failed to predict several observed salinity peaks*	We think the referenced mismatches are mostly due to errors in the downstream salinity boundary condition during the wet season. We note that the original University of South Florida model for the system had a worse match at the Mote Marine station.	Yes	Yes	No response required.
9k	*Caption of Figure 3-27 typo*	We deleted “shows” from the caption for Figure 3-27 in the revised, draft minimum flows report.	No	Highlighted but not removed.	The word “shows” was deleted from the caption for Figure 3-27 in the updated, draft minimum flows report.
9l	*Use of wind data from nearby airports might be helpful*	We looked at these sources for wind data to use for model development and applications but determined there are not enough wind data measurement stations in the region to allow us to describe the spatial variability of the Charlotte Harbor system. For simplicity, we chose to use a single wind station for our analyses. As noted in Appendix C (Chen 2020), we used wind data measured at the SWFWMD Peace River II ET site prior to 2/7/2013 and data from the Mote Marine station after that date. We agree that is would be beneficial to use multiple wind stations for modeling efforts similar to those undertaken for our minimum flow analyses, and we will	Yes	Yes	No response required.

		consider this recommendation for future studies.			
9m	*Appendix C – typo on page 42*	This typographical error was corrected in the revised appendix.	Yes	Presumably	This typographical error was corrected in the updated appendix.
9n	*Appendix C – typo on page 44*	This typographical error was corrected in the revised appendix.	Yes	Presumably	This typographical error was corrected in the updated appendix.
9o	*Appendix C – definition of shoreline length needed*	The shoreline length is the actual length of the shoreline calculated by the hydrodynamic model. The dynamically coupled 3D-2DV model can track shoreline variations and allow the computation of the shoreline length at every time step. In the 3D model, because bottom elevations are defined and given at the four corners of the Cartesian grid, shoreline can be calculated using the bilinear interpolation with known water level if all grid corners are not submerged or emerged. In the 2DV model, the shoreline length can be calculated based on the water level, the grid length, and the river width, which varies with both vertically and longitudinally. This descriptive information for shoreline length was included in the revised version of Appendix C.	Yes	Presumably	Descriptive information regarding shoreline length was included in the updated appendix.
9p	*Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor*	Although Caloosahatchee River flow was not directly used as boundary conditions near the mouth of the river, its effects are included in the hydrodynamic model, as the Caloosahatchee River flow was included in the USF WFCOM model. Specifically, the effects of Caloosahatchee River flow were indirectly considered in the water level, salinity, and temperature boundary conditions, as the USF model included Caloosahatchee and its flow. This question provides a good opportunity to emphasize that the sharing of information concerning minimum flows and other resource management issues among the	Mostly	The Panel recommends that a more formal relationship with the SFWMD be used to share current and future information on the potential impacts to at least the lower portions of Charlotte Harbor "proper" of discharges from the Caloosahatchee River.	As noted in our original response, staff will continue to share information on minimum flows development with staff from the South Florida Water Management District.

		state water management districts and other agencies/organizations charged with water resource management is an important component of water resource management in Florida.			
9q	*Caption for Figure 2-13 needs a space*	We corrected this typo by adding a space between “through” and “2018” in the caption for Figure 2-13 in the revised, draft minimum flows report.	Yes	Yes	No response required.
9r	*Consider adding conversion table*	We included a conversion table in the revised, draft minimum flows report.	Yes	The table should also include Rkm	The acronym “RKm” has been added to the acronym table in the updated, draft minimum flows report.