Response to Public Comments

TMDL Responsiveness Summary for TMDLs Proposed 2012

- WBIDs 1475, 1440A, 1440, 1440F Anclote River Bayou - Anclote River
- WBIDs 1498, 1507, 1507A, 1513E, 1513F, 1516, 1563 Brushy, Rocky Creek, Double Branch, Sweetwater Creek
- WBIDs 1535 & 1556 Minnow Creek and Cedar Creek
- WBID 1633B McKay Creek
- WBID 1662 Pinellas Park Ditch
- WBID 1666A Bullfrog Creek
- WBIDs 1716A, 1716B, 1716C, 1716D Clam Bayou
- WBID 1778 Cockroach Bay
- WBID 3081 Horse Creek
- WBID 420 Pace Mill Creek
- WBID 846A Jones Creek

July 2013

Region 4

Atlanta, GA

Contents

Numeric Nutrient Criteria Development

General response to comments regarding status of NNC in Florida:

Commenter's on this TMDL and other proposed TMDLs addressing nutrients in Florida have raised questions about whether and how these TMDLs are impacted by ongoing activities to establish numeric nutrient criteria in Florida.

In 1979, FDEP adopted narrative criteria for nutrients applicable to waters designated as Class I (Potable Water Supply), Class II (Shellfish Propagation or Harvesting), and Class III (Recreation and for propagation and maintenance of a healthy, well-balanced population of fish and wildlife). See paragraphs 62-302.530(47)(a) and (b), F.A.C. FDEP recently adopted numeric nutrient criteria (NNC) for many Class I, II, and III waters in the state, including streams. See sections 62-302.531 and .532, F.A.C. The State's NNC numerically interpret part of the state narrative criteria for nutrients, at paragraph 62-302.530(47)(b), F.A.C., which provides that nutrients may not cause an imbalance of flora and fauna. FDEP submitted its NNC to EPA for review pursuant to section 303(c) of the CWA and on November 30, 2012, EPA approved those criteria as consistent with the requirements of the CWA. The state criteria, however, are not yet effective for state law purposes.

Also, in November 2010, EPA promulgated numeric nutrient criteria for Class III inland waters in Florida, including streams, pursuant to a Consent Decree in Florida Wildlife Federation, et. al. v. EPA, No. 4:08-cv-00324-RH-WCS (N.D. Fla.). On February 18, 2012, the streams criteria were remanded back to EPA by the District Court for further explanation. On November 30, 2012, EPA re-proposed its stream NNC for those flowing waters not covered by Florida's NNC rule. Those criteria have not been finalized.

Therefore, for streams in Florida, the applicable nutrient water quality standard for CWA purposes remains the narrative criteria. While FDEP's nutrient rule is not yet effective for state law purposes, EPA believes that FDEP's numeric nutrient criteria represent FDEP's most recent interpretation of paragraph 62-302.530(47)(b), F.A.C. Also, the other part of the state narrative criteria for nutrients, at paragraph 62-302.530(47)(a), F.A.C., remains applicable to all Class I, II, and III waters in Florida.[1] Paragraph 62-302.530(47)(a) requires nutrients to be limited as necessary to prevent violations of other Florida water quality standards.

In developing the TMDLs for the consent decree, EPA considered both paragraphs 62-302.530(47)(a) and (b). The nutrient end point for these TMDLs represents the level of nutrients that will prevent nutrients from causing or contributing to nonattainment of the

[1] Paragraph 62-302.530(47)(a), F.A.C. will remain applicable to all Class I, II, and III waters even after FDEP's nutrient rule becomes effective. See subsection 62-302.531(1), F.A.C.

State's dissolved oxygen criteria pursuant to paragraph 62-302.530(47)(a). That endpoint, which requires that nutrients be reduced to natural background levels, was determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

General Comments on TMDLs

Mosaic

Comment:

Second, the Tampa Bay TMDLs appear to use as their regulatory target natural background conditions, rather than protection of designated use. The Clean Water Act authorizes EPA to set water quality criteria (and, by extension, TMDLs) to protect designated uses, not natural background conditions. *See* 33 U.S.C. § 1313(d)(1)(C) (authorizing states to establish TMDLs at levels to protect water quality standards); *see also, e.g.*, 40 C.F.R. §§ 131.11(a)(1), 131.3(b), 131,3(i) (defining water quality standards as consisting of, or as designed to protect, designated uses). In analogous circumstances, use of the wrong regulatory target to set water quality criteria has been found to be arbitrary and capricious. *See Florida Wildlife Federation v. Jackson*, 853 F. Supp. 1138, 1168,1169 (N.D. Fla. 2012) (striking as arbitrary and capricious EPA water quality criteria for Florida streams because EPA "aimed at the wrong target."). Thus, EPA's use of natural background conditions rather than designated use is legally, as well as technically, unjustified and without foundation.

Response:

The TMDL targets for the Tampa Bay area used the State of Florida's applicable water quality standards. In the case of these TMDLs the most restrictive water quality standard was the State's dissolved oxygen standard. Determining whether a waterbody is meeting its designated use is done by assessing the applicable water quality standards. In developing the TMDLs for the consent decree, EPA considered both paragraphs 62-302.530(47)(a) and (b). The nutrient end point for these TMDLs represents the level of nutrients that will prevent nutrients from causing or contributing to nonattainment of the State's dissolved oxygen criteria pursuant to paragraph 62-302.530(47)(a). That endpoint, which requires that nutrients be reduced to natural background levels, was determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

Third, as discussed in greater detail in the attached comments, EPA inappropriately based its TMDLs on the current FDEP DO criteria. *See* Fla. Admin. Code 62 302.530(30).

EPA is fully aware that this standard was established *forty* years ago, and FDEP has concluded that the criteria are no longer scientifically valid. FDEP is in the process of revising this standard, based on more recent and substantial scientific information on the biological impacts of DO on waterbodies. While FDEP has not yet finalized its revised DO

criteria, EPA absolutely could and should have made use of the more recent science that FDEP is relying on in setting a DO endpoint for these TMDLs.

To rely on a DO criterion that the Agency knows to be outdated when better and more reliable information and analysis is readily available, is not scientifically defensible and does not comport with the requirements of the Clean Water Act.

Response:

TMDLs are developed to the applicable water quality standards and cannot be used to establish a different water quality standard. There exists a separate process in establishing water quality standards. EPA does acknowledge that FDEP has begun the process of changing their dissolved oxygen criteria. Until this process is completed and approved by EPA pursuant to section 303(c) of the CWA, the current water quality standard for dissolved oxygen is effective for Clean Water Act purposes.

Comment:

1. The EPA proposed TMDLs fail to address the listed impairments or causative pollutants

The proposed TMDLs for all 18 WBIDs were derived using mechanistic models that assign nutrient loads based on achieving a natural DO condition (modeled DO concentrations in the absence of anthropogenic influence). In other words, the TMDL is based solely on achieving a certain DO condition. However, this approach ignores the listed impairments and causative pollutants for many of the subject waterbodies. In this set of 18 WBIDs, many different scenarios exist where EPA has failed to correctly address the listed impairments and/or causative pollutants.

For example, 11 of the 18 waterbodies are listed for nutrients based on current and/or historic chlorophyll-a concentrations along with listed impairments for DO, based on exceedances of the current DO standard (5.0 mg/L)[1]. The proposed TMDLs, while mentioning the established targets are DO and nutrients, do not in any way address the nutrient impairment separate from the DO impairment. The draft documents do not provide any evidence or explanation on how achieving the nutrient loads designed to address the DO impairment will also address the nutrient impairment based on chlorophyll-a concentrations. The mechanistic models used to develop the TMDLs assume a stoichiometric relationship between DO and nutrients that are used to predict a nutrient reduction target intended to increase DO levels. However, EPA provides no analysis in the TMDL documents identifying that any relationship between DO and nutrients exists in these waterbodies, and therefore no evidence that achieving the nutrient target will result in any effect on DO. Furthermore, EPA has provided no data or analysis to indicate that achieving the nutrient load targets proposed in the TMDLs will result in attainment of the

chlorophyll- a thresholds set for fresh and estuarine waters in 62-303, F.A.C. By failing to equate nutrient concentrations and nutrient targets in these waterbodies with attainment of the chlorophyll-a thresholds (exceedances of which were the basis for the nutrient impairment listing), EPA has failed to derive meaningful TMDLs that address the impairment listings and provide scientifically defensible water quality goals.

Response:

When developing the TMDL, EPA has determined that the dissolved oxygen standard could not be met under a natural condition. This determination set all loadings of nutrients to a natural condition (no anthropogenic sources). Because Florida's regulations do not allow the abatement of natural conditions to meet water quality standards, EPA concludes that at the natural condition there are no other reductions needed because the dissolved oxygen standard represents the most sensitive endpoint.

Comment:

In addition to not addressing the nutrient impairments in the proposed TMDLs, EPA failed to utilize the most current information regarding some of the waterbodies. WBIDs 1498, 1513E, and 1513F are either not listed or have been delisted by FDEP for nutrients and DO; however, EPA, relying on outdated information, has proposed DO and nutrient TMDLs for these waterbodies. In the case of WBID 1498, the 1998 303(d) list of impaired waters lists the WBID as impaired for DO. As information from FDEP makes clear, during Florida's Group 1 Cycle 3 watershed assessment period, WBID 1498 was delisted for DO based on analysis that indicated the observed low DO was a natural condition and the waterbody exhibits a healthy biological community. This delisting was approved by Secretarial Order on February 12, 2013.

Response:

While some of these WBIDs have been placed in other categories of Florida's 303(d) list, they still remain listed for the purposes of the TMDL consent decree. All waterbodies were independently assessed by EPA and it was determined that they were impaired and TMDL needed to be developed.

Comment:

WBIDs 1513E and 1513F are new WBID designations resulting from splitting up the original WBID (1513) into two new WBIDs during the Group 1 Cycle 3 assessment period. WBID 1513 was included on EPA's 1998 303(d) list of impaired waters for DO and nutrients, but the two new WBIDs are not. In fact, FDEP lists WBIDs 1513E and 1513F as category 4d for DO (impaired but with no causative pollutant identified) and as category 3b (insufficient data) for nutrients. Under the Clean Water Act (CWA) and following EPA

guidance, TMDLs are not required for category 4d or 3b listed waterbodies, only a category 5 listing requires TMDL development (FDEP 2012, see Table 7.5, pg. 120). Both of these designations (4d and 3b) require additional information and analysis to determine a causative pollutant or determine if the designated uses of the waterbody are attained. As described here, EPA has failed to accurately address the listed impairments for many of the waterbodies in the proposed TMDLs, and in at least a few cases has proposed TMDLs for waterbodies that are unnecessary. EPA should withdraw the proposed TMDLs until such time that the correct impairments can be addressed with analysis that reflects the most up to date information available for these waterbodies.

Response:

The listing category of 4D is a State of Florida listing category, where a causative pollutant could not be determined using their screen thresholds. While this is not category 5, it is not category 2 meeting designated uses and a TMDL has to be developed under the TMDL consent decree.

Comment:

2. It is inappropriate for EPA to base the proposed TMDLs on "natural conditions;" instead, achieving and maintaining Designated Uses must be the target.

In all five TMDL documents, EPA's mechanistic modeling exercise concludes Florida's current DO standard cannot be achieved without abating natural conditions. EPA states that their natural conditions modeling scenario (removal of all anthropogenic influence) results in DO concentrations that are still below the current DO standard. Therefore, EPA concludes the appropriate target would be to set the TMDL to achieve the "natural condition" instead of the water quality standard.

Section 303(d) of the federal Clean Water Act and the Florida Watershed Restoration Act state that TMDLs must be developed for all waters that are not meeting their designated uses (FDEP 2003). Further, a TMDL is defined by FDEP as maximum amount of a given pollutant that a water body can absorb and still maintain its designated uses (FDEP 2003). The waterbodies addressed in the proposed TMDLs are designated as Class II or III marine and fresh waters that have designated uses defined as shellfish propagation or harvesting (Class II) or fish consumption; recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife (Class III).

Response:

As previously stated above, EPA did not target natural conditions for these TMDLs. The State of Florida's dissolved oxygen criteria was used to determine the allowable a load.

Because the dissolved oxygen criterion could not be met under the natural condition, there is no assimilative capacity for any anthropogenic sources.

Comment:

In the proposed TMDL documents, EPA has provided no support to equate the natural conditions modeling scenario with designated uses. TMDLs are set to achieve and maintain designated uses, not to achieve natural conditions. Therefore, EPA is aiming for the wrong target by deriving TMDLs for these waterbodies that are intended to achieve natural conditions.

Response:

See response above.

Comment:

Based on EPA's own analysis that indicates the current DO criterion cannot be met in these waterbodies, and that EPA has no basis for using "natural conditions" as a surrogate for designated use, EPA must present an alternate basis for setting a TMDL. EPA should evaluate the observed DO data in these waterbodies against the FDEP proposed DO criteria (FDEP 2013) that is expected to be finalized as soon as this month. Many of these waterbodies may currently achieve the proposed criteria, which will make them a candidate for delisting and render these proposed TMDLs inaccurate and moot. In cases where the waterbody may not meet the proposed DO criteria, a proposed TMDL set to achieve the revised DO standard would be more appropriate.

EPA should postpone development of these TMDLs until the FDEP has finalized the proposed DO criterion, or if EPA is compelled to develop these TMDLs now, the proposed criteria should be used as the target. Under the CWA, EPA is required to use the best available science to make sound regulatory decisions. FDEP and EPA are fully aware the existing DO criterion is 40 years old and was based on limited scientific information regarding the response of warm water species to low DO conditions (FDEP 2013). Many of Florida's minimally disturbed and healthy fresh and marine water systems naturally have DO that falls below the existing DO criteria (FDEP 2013). FDEP concluded that given the variety of physical, biological, chemical, and climatological factors that are capable of producing waters with naturally low DO conditions, the current DO criteria are overly simplistic and do not accurately reflect natural variability in DO or thresholds necessary to protect aquatic life (FDEP 2013). The proposed criteria represent the best available science using recently collected data in Florida's minimally disturbed waterbodies and were derived based on the low DO tolerances of Florida specific organisms. Any DO TMDL proposed by EPA needs to utilize the best available science reflected in the proposed DO criteria instead of the current, outdated, scientifically flawed

DO criterion. Based on the fact that EPA has used the wrong regulatory target to derive these proposed TMDLs and that the existing DO criteria are known to be flawed and in the process of revision (FDEP 2013), EPA should withdraw these proposed TMDLs and revisit the impairment status of these waterbodies with respect to the proposed DO standard. Only after employing a scientifically defensible target, utilizing the best available science, can the determination be made on which waterbodies need a TMDL and what action should be taken.

Response:

These TMDLs were developed to the applicable water quality standard for dissolved oxygen for Clean Water Act purposes. EPA does acknowledge that the State of Florida has begun the process to change the dissolved oxygen standard, when and if this new standard is approved for Clean Water Act purposes, this TMDL can be reevaluated.

Comment:

3. The mechanistic models used by EPA are not properly documented, are poorly calibrated, and do not address the uncertainty of modeling results; thus, the proposed TMDL load allocations and reductions are flawed.

All five proposed TMDLs employ a mechanistic modeling approach to developing load and wasteload allocations for nutrients (total nitrogen and/or total phosphorus) intended to address a listed nutrient and/or dissolved oxygen impairment. The models used in the approach are a combination of models: LSPC (watershed), EFDC (surface water), and WASP7 (water quality). The use of these models to justify specific load allocations and reductions for the 18 waterbodies is fundamentally flawed. First, EPA does not present proper documentation of the detailed structural and parameter assumptions that were made during model building. Second, model predictions are often very poor, with the model both under and overestimating key parameters in certain WBIDs according to the calibration results. Finally, the authors of the TMDL reports do not quantify model uncertainty and how that uncertainty affects the confidence we should have in the resulting load allocations and reductions.

a. EPA does not present model documentation

Each of the TMDL reports refers to the mechanistic models as a subset of the Tampa Bay model used for the EPA estuarine numeric nutrient criteria development, citing EPA Technical Support documents (USEPA 2012a and 2012b). However, review of the referenced TSDs reveal that while general information on the model setup (common to all Florida estuaries) was given in USEPA 2012a, there is no Tampa Bay specific information contained in either document because EPA chose not to propose its own estuarine criteria

for Tampa Bay using this methodology. Instead, EPA accepted the values finalized by FDEP for Tampa Bay, which were based on an estuary-specific model that were specifically developed for the Tampa Bay estuary and its tributaries; the FDEP model may be a more appropriate basis for the proposed TMDLs than EPA's methodology. Because EPA did not finalize the Tampa Bay model for use in the proposed numeric nutrient criteria, it has provided no detailed documentation on how the Tampa Bay model, and consequently the models for these 5 TMDLs, was constructed. It is critical to the review and evaluation of any model to know how input parameters are defined, how they are averaged over space and time, how sensitive they are to deviations from assumed literature values, and how well- calibrated the final model is to observed data. The models used in these TMDL reports need a large number of input parameters, such as spatially-explicit soils, climate, and landuse or estimated chemical and physical ratios based on literature values. These input parameters may be difficult to or are rarely measured, exhibit a high degree of spatial heterogeneity, or may be especially sensitive. Averaging these values over space and time, or worse, using literature values collected in an unrelated system when observed data in Tampa Bay was not available, may mean that the resulting model is not representative of the actual system of interest (Shirmohammadi et al. 2006). The TMDL report authors do not provide any of the details needed to evaluate how decisions in input parameters, scaling, model algorithms, etc. have affected the overall uncertainty, accuracy, and applicability of the final model predictions of current and "natural" conditions.

Response:

The documentation for the development of the Tampa Bay wide models was available from EPA Region 4 upon request. Other commenter's were provided the documents. Furthermore all model input files were available during the commenting period. Literature values were not used to calibrate the EFDC/WASP models, the parameters and kinetic constants that were used in the model simulation were adjusted during the calibration process. For the watershed model many of the input data is spatially measured (soil type, landuse types, and meteorological conditions).

EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

b. Model predictions are often very poor for key parameters

One of the major flaws of these TMDL reports is that both the model calibration methodology and results are very poor. In these TMDL reports, the authors appear to

verify model calibration by relying only a visual comparison of measured and modeled concentrations. (The authors may have performed other calibration exercises during the development of the original Tampa Bay model (USEPA 2012a), but they have provided no documentation on those specific methods or results for Tampa Bay in the Technical Support Document (USEPA 2012b).) Model performance can be and should have been calculated using standard arithmetic metrics (i.e. R-squared, standard error of the mean, bias, precision, etc.), so a rigorous evaluation of the ability of the model to reproduce the observed water quality can be performed. In addition, an examination of the limited calibration graphics in these

TMDLs indicate that the individual models often under or overestimate oxygen, nutrient, and chlorophyll concentrations compared to actual observed data. For example, the WASP model for Bullfrog Creek, 1666A, underestimates both measured total phosphorus (by 0.3 – 0.6 mg/L) and chlorophyll (by > 50 µg/L) concentrations, while the LSPC model overestimates observed dissolved oxygen concentrations for WBIDs 1489, 1522A, and 1534 (by 1 - 4 mg/L). Such poor calibration of model predictions under current condition scenarios compared to observed values can indicate the input data (soils, climate, water quality) is too limited, is not representative of the system, is scaled inappropriately, or is based on textbook assumptions that are not applicable in the system of interest. According to a study that reviewed how mechanistic models are used for TMDL applications, "many DO models are still not capable of simulating some of the most complex drivers of DO dynamics, partly because the scientific community does not yet fully understand these processes, and the models continue to require user−estimated inputs for these processes" (Muñoz-Carpena et al. 2006). Although the models used in these 5 TMDLs may be complex and capable of incorporating a wide variety of input data, a model is only valuable for regulatory use if it is able to realistically predict observed or theoretical conditions within an acceptable level of uncertainty. The poor calibration results of these 5 TMDLs mean that the model predictions are highly uncertain; using these results to quantify differences in current and natural scenarios is irresponsible.

Response:

EPA agrees that with just about any model application there is always room for improvement in the calibration. These TMDL models were calibrated to best represent average conditions; this is because the average condition will be evaluated for developing the TMDL.

EPA disagrees with the premise that water quality models are not capable of simulating the dissolved oxygen cycle. The commenter did not provide enough information to determine what element of the dissolved oxygen cycle is not represented.

Comment:

c. EPA does not quantify model uncertainty and how that uncertainty affects the confidence we should have in the resulting load allocations and reductions

Muñoz-Carpena and others (2006) have expressed their concerns about how mechanistic models are used for TMDL applications and other regulatory purposes; their reviews included models (EFDC and WASP7) used by EPA in the five TMDLs we have discussed (Vellidis et al. 2006). The authors of the review had several important concerns that we feel are especially applicable to these 5 TMDLs for the Tampa Bay basin: a) authors overstate the power and understate the limitations of models, b) model selection should be adaptive and study-specific rather than using the same "toolbox" for every problem, and c) parameter sensitivity analysis and model uncertainty analysis of results are essential but rarely done. Robertson and others (2009) reiterates the importance of explicitly measuring and quantifying uncertainty in model predictions, discussing how predicted loads may differ superficially, but may not be statistically different when model uncertainty is taken into account. Model uncertainty analysis is particularly important for those TMDLs where the current condition and natural condition scenario dissolved oxygen predictions are almost identical (as seen in the dissolved oxygen cumulative distribution functions).

Response:

EPA does understand that it is critical to try to estimate uncertainty in model predictions. EPA relied on time variable mechanistic models to aid in the TMDL determination. These models were applied from 1997 through 2009, these long term simulations were conducted to account for meteorological variability and its impact on water quality. While it is possible to do uncertainty analysis at a single condition (steady state) there are no formal methods for conducting uncertainty analysis with time variable models. Instead of uncertainty analysis EPA routinely conducts sensitivity analysis of assumptions and parameters during the calibration process.

Comment:

The 2001 National Academy of Sciences report "Assessing the TMDL Approach to Water Quality Management" strongly recommends that EPA conduct an explicit uncertainty analysis as part of the TMDL process (NRC, 2001):

"The TMDL program currently accounts for the uncertainty embedded in the modeling exercise by applying a margin of safety (MOS); EPA should end the practice of arbitrary selection of the MOS and instead require uncertainty analysis as the basis for MOS determination. Because reduction of the MOS can potentially lead to a significant reduction in TMDL implementation cost, EPA should place a high priority on selecting and developing TMDL models with minimal forecast error."

The MOS is intended to reflect uncertainty in the forecast of the TMDL model(s). Despite the advice of the NRC (2001), EPA does not conduct an explicit analysis of uncertainty,

and instead relies on simplistic assumptions of an implicit MOS "*since the TMDL targets for nutrients were set to natural background conditions."* EPA's implicit MOS assumes that the natural and current condition model scenarios are based on sound science and produce predictions that are comparable to observed data, an assumption that we have challenged in our discussion above. Thus, their implicit MOS provides no real assurance that their model-based allocations and reductions are realistic or would result in actual water quality improvements in the target waterbodies. To properly conduct an implicit MOS, the conservative model assumptions (e.g., model parameter choices) should reflect the uncertainty in these model assumptions/parameters, not the predicted endpoint (natural background conditions).

Given the complete lack of detailed parameterization information for these TMDL models, it is impossible for the reader to evaluate the model uncertainty in any detail. However, the poor calibration exhibited in the limited calibration analysis presented and the very minor differences in dissolved oxygen distributions between current and natural scenarios give very little support for the large percent load reductions that are proposed in these TMDLs. EPA should withdraw these TMDLs and perform a model sensitivity and uncertainty analysis to determine if the models are capable of realistically predicting current conditions and if the natural condition scenario is actually making predictions of dissolved oxygen that are statistically different from the current conditions scenario.

Response:

See previous response in regards to uncertainty analysis. As for the selection of an implicit margin of safety, the Clean Water Act defines it as a way to account for unknown information. It does not explicitly state that it should represent uncertainty in determination. EPA is aware of the comments from the National Academy of Sciences; EPA has asked the Academy for assistance in how to do the uncertainty analysis for time variable models and admitted they are no formal methods.

WBIDs 1475/1440A/1440/1440F Anclote River Bayou - Anclote River

General

Michael Garrett (Pasco County), Pinellas County & Florida Department of Transportation (FDOT)

Comment:

1. Figure 2.1: Figure is blurry and should be replaced with higher quality image.

Response:

Comment noted. The current maps are able to demonstrate the current necessary data and will not be updated.

Comment:

2. The second and third paragraphs in Section 3.0 on Page 3 contain repeated information on the characteristics of the Anclote River

Response:

This has been corrected in the TMDL Report.

Comment:

3. Section 3.1: The presentation on climate (especially rainfall) should be expanded. As watershed modeling was done for this TMDL, representative rainfall/meteorology stations were defined. These could be identified and presentations of data provided to show the variations year to year and other important statistics.

Response:

Section 3.1 provides a general overview of the climate and provides sufficient information. For the TMDL, Florida State Climate Center data from station 088824 Tarpon Springs SWG Plant was used to simulate rainfall and meteorology, and has been noted in the TMDL report. The station is in the downstream segment of the Anclote River. Processed precipitation and meteorological data is provided in the weather file available as part of the administrative records.

Comment:

4. Section 3.2: This section should be expanded and should include a graphic showing the drainage basins for these waterbody segments (WBIDs) used in the LSPC modeling and including the National Hydrography Dataset (NHD) flow lines. Additionally, there are two U.S. Geological Survey (USGS) gages that are presently maintained and have data for the period of interest of this TMDL. The graphic below shows the locations of the stations within system. These data should be presented in this section with discussions of what the data show in terms of system hydrology.

Response:

Images showing the drainage basins for the Anclote River are found in sections 3.3 and 7.1. The TMDL presents information regarding USGS station USGS 02310000 in Section 7.1.

Comment:

5. Figure 3.1: This figure is blurry and zoomed out too far to be useful. It would be helpful to provide better quality images with some zoomed-in views by specific WBID

Response:

Comment noted. The current maps are able to demonstrate the current necessary data and will not be updated.

Comment:

6. Figure 3.2: This figure is blurry. A better quality image should be provided.

Response:

Comment noted. The current maps are able to demonstrate the current necessary data and will not be updated.

Assessment

Michael Garrett (Pasco County), Pinellas County & Florida Department of Transportation (FDOT)

Comment:

8. Given the extent of some of these WBIDs (specifically 1440 and 1440F) and the number of stations and their spatial distribution, it is very important that a water quality assessment look at the spatial variations and not just the lumped results.

Response:

EPA believes that the information provided in Section 5 is adequate. EPA's goal in presenting measured water quality data is to provide the public both a quantitative and qualitative view of the overall health of each WBID. All stations located within each WBID are considered when identifying water quality violations.

Comment:

13. Chl a levels in WBID 1475 are low overall, although the data are limited.

Response:

EPA agrees that there is limited chlorophyll a data in WBID 1475.

Comment:

12. Chlorophyll a (Chl a) levels in 1440 and 1440F are extremely low and clearly do not provide any indication of eutrophication or negative impact from nutrients. It is important

to establish the relationship between low DO and causative relationships that link to nutrients. The low Chl a levels do not support a link, and certainly do not support a link to the levels of reductions proposed.

Response:

Please see EPA's general response to comments received regarding the impacts on this TMDL of ongoing activities to establish numeric nutrient criteria in Florida. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

11. WBID 1440F (the freshwater portion of the main stem of the Anclote) has very low overall nutrient levels (0.09 mg/L TP and 0.85 mg/L TN). These values are below the NNC values of 0.12 mg/L and 1.54 mg/L respectively.

Response:

Please see EPA's general response to comments received regarding the impacts on this TMDL of ongoing activities to establish numeric nutrient criteria in Florida. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

9. Similarly, WBID 1440A has stations in multiple locations throughout the Bayou and these spatial differences need to be understood.

Response:

Please see response to comment 8.

Comment:

10. WBID 1475 has a geomean TP levels above the present EPA standard of 0.12 milligrams per liter (mg/L), but this is based upon limited data.

Response:

EPA agrees there is limited TP data in WBID 1475 that is above the EPA standard.

Comment:

7. The water quality conditions in any WBID are a function of multiple causative factors, and these factors can be unique to that WBID. As such, a proper water quality assessment should focus on a WBID-by-WBID analysis outlining what the data show, any unique aspects of the data, and spatial differences in results within the WBID based upon sampling conducted at different locations and at different depths. The water quality assessment provided within the TMDL document simply provides lumped graphics with all stations from any one WBID, and a global discussion of ranges of data. Modeling of waterbodies requires a complete understanding of the conditions in that waterbody, and the water quality assessment is the first step in that understanding. The assessment provided is insufficient for the purpose of developing an understanding of the water quality conditions in the individual WBIDs.

Response:

Section 5 adequately details the measured water quality data by providing a statistical summary of the measured data and providing figures of the measured data. As discussed in Section 5 of the TMDL report, there are several factors that may affect the concentration of dissolved oxygen in a waterbody. Among these factors is anthropogenic over-enrichment of nutrients (i.e. nitrogen and phosphorus) and oxygen-demanding substances (quantified as biochemical oxygen demand). Nutrient levels affect DO concentrations directly and indirectly. The process of nitrification, in which bacteria convert ammonia-nitrogen to nitrate-nitrogen, directly consumes oxygen from the water. Indirect effects of excessive nutrient loading involve over-stimulation of aquatic plant growth, which leads to exacerbated diurnal swings in DO as the plants photosynthesize during daylight hours, and respire at night. Replenishment of oxygen levels may be inhibited if excessive growth of aquatic plants above the water surface blocks sunlight from reaching submerged vegetation, reducing their ability to photosynthesize. Decomposition of algal and other types of organic matter, such as dead plants and animals, also uses up DO from the water.

Analytical Approach

Michael Garrett (Pasco County), Pinellas County & Florida Department of Transportation (FDOT)

Comment:

33. As was defined for the EFDC model, two layers is most likely not sufficient to represent the levels of stratification in the system.

Response:

As stated earlier, depth in the Anclote River is typically less than 5 feet, which allows for mixing throughout the system. The salinity plots were provided which show little stratification, specifically immediately upstream of the mouth of the river. For this reason, EPA believes that two vertical layers are sufficient to model the stratification that can occur in the Anclote River System.

Comment:

24. The model used two layers in the vertical. This is not a sufficient number to represent conditions where estuarine systems show significant stratification. The data in the system show that the system does stratify and this stratification can be significant.

Response:

EPA agrees that stratification can and does occur in the Anclote River system. However, depth in the Anclote River is typically less than 5 feet, which allows for mixing throughout the system. For this reason, EPA believes that two vertical layers are sufficient to model the stratification that can occur in the Anclote River System.

Comment:

25. The two primary stations for calibration of the hydrodynamic model were where the river crosses Highway 585 and where it crosses Lodestar Road. There appears to be a good bit of data missing from the comparisons at 585. Examination of the data files shows that there is salinity and temperature data in all years at this location, but only data in 2002. All data needs to be provided for the comparison, as this is a key station. Additionally, the data need to be parsed to show separately the surface and bottom comparisons. There is no indication in the data what depth is being plotted.

Response:

EPA reviewed IWR 44 and found that data was only available in 2002 at station 21FLPDEMAMB 01-1, and has therefore provided all of the available data for this station. EPA plotted salinity data at all depths.

Comment:

26. While more data are plotted for the station at Lodestar Road, the same issue with depth on the data exists, i.e., the data are not parsed by surface and bottom. This makes the calibration plots unusable.

Response:

The calibration plots for salinity show both the surface and bottom salinity. The figures show that there is very little stratification between the two layers, likely because the Anclote River is relatively shallow, which allows for mixing. A review of the data found that most data was taken at the surface.

Comment:

27. While data are limited, it appears that the salinity intrusion shown going up to station 21FLGW3509 is not supported by the data.

Response:

There is some salinity intrusion that is moving up through the Anclote River. Salinity data at this location is greater than 0, which indicates that there may be some salinity influence in this area of the river.

Comment:

29. Overall, the EFDC hydrodynamic model calibration is not sufficient. Key processes that govern the transport and exchange along the tidal portion of the river are not accounted for or demonstrated within the report. This is not a simple, small tributary, but rather a large riverine/estuarine system that has complex hydrodynamics driven by tidal fluctuations and stratification.

Response:

EPA believes that the model does demonstrate the transport and exchange of the Anclote riverine and estuarine system, accurately representing the tidal fluctuations and stratification. FDOT will need to be more specific as to what is not account for in the EFDC model.

Comment:

32. The DO calibration is poor. The model appears to consistently predict low DO values not found in the system. Additionally, as was identified in the hydrodynamic model, there is no parsing of the surface and bottom DO data. Plots need to be provided at both levels separately with the appropriate data to allow comparison.

Response:

A review of the data shows that much of the DO data collection occurred in the upper portion of the Anclote River. Due to this, the simulated surface DO concentrations were calibrated to the measured data. The surface DO matches the annual trends that occur in

the measured DO. There were no DO measurements to compare with the bottom layer of the model.

Comment:

1. EPA used a series of complex watershed and receiving water models to assess the DO responses to changes in nutrient loads. Based upon a review of the TMDL document and supporting information, significant technical issues were raised relative to the adequacy of the models' physical representation of the system and the model calibration. While the documentation is helpful, some model development details are not provided, some key model-to-data comparisons are not provided, some methods of model application are not reasonable, and some of the calibration and validation results presented bring the model into question.

Response:

EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are engineering tools that allow EPA to make informed decisions when determining a TMDL. These tools are very complex and to document every feature, parameter, constant or data point that is used in the model(s) would be very difficult. All of the modeling tools are publically available and include very detailed user's manual that provide a description of the input and how it is used in the model. Initial model constants are set to typical values from like areas where the model has been was applied in the past. During the calibration process it is not uncommon to change several constants to better represent the current area being modeled.

Comment:

36. The model consistently over predicts the Chl a levels.

Response:

EPA disagrees that the model is consistently over predicting chlorophyll a. The chlorophyll a calibration represents the overall best calibration that could be achieved in the Anclote River system. Overall, the model is able to represent the chl-a trend at the four calibration stations. At station 21FLGW 3509, the model predicts concentrations of 1 ug/L more than 90 percent of the time, which is similar to the measured data. Additionally, measured chla concentrations at station 21FLPDEMAMB 01-3 range from 1 ug/L to 36 ug/L, and the modeled data ranges from 1 ug/L to 39 ug/L.

Comment:

35. The nutrient species comparisons with the data based upon the WASP model output should be provided.

Response:

Both TN and TP are presented and are well calibrated, and TMDL reductions are applied to these two parameters.

Comment:

23. The grid representation presented in Figure 7.6 has numerous significant issues. Some key issues are: a. this system is a complex one with multiple turns, side channels, adjacent marsh areas, etc. The coarse grid illustrated cannot reasonably represent the system. b. The bayou area itself is complicated with multiple lobes, etc. This is represented by two coarse grids c. The system has shallow areas as well as channelized areas that are basically represented as one grid cell. d. The grid is unacceptable for use and, therefore, all subsequent hydrodynamic results and ultimately water quality results from it are not usable.

Response:

EPA believes the grid is an accurate representation of the overall flow and hydrodynamics of the Anclote River system. The current grid follows the multiple turns within the river and encompasses adjacent channel and marsh areas that are frequently wet. A finer resolution grid would not alter the overall hydrology and water quality representation within the Anclote River. The model was well calibrated to salinity and temperature in the system, indicating the grid is able to represent the hydrodynamics and water quality of the system.

Comment:

34. The downward trend in TN that was upstream data is also seen in the downstream results. The model is not capturing this. As such, by the end of the simulation, the TN predicted values are high.

Response:

EPA believes the model is able to capture the total nitrogen trend throughout the modeling period. TN concentrations ranged from 0.2 mg/L to 2 mg/L throughout the modeling period, and measurements at 2 mg/L were taken in 2009, during the final year of the modeling period.

Comment:

28. The temperature simulation comparisons show that the model is at times over predicting the temperature ranges.

Response:

The temperature calibration is able to predict the overall annual trend in temperature fluctuation. The data ranges from 33 degrees to 10 degrees Celsius. During periods where the model predicts temperatures outside this range, such as in the winter of 2007 and 2008, very little measured data was available.

Comment:

31. Examination of the data at one of the available data stations shows that there is some correlation between salinity stratification and DO stratification in the system. As such, in order for the WASP model to be useful in simulating DO conditions, it must be shown that the model accurately represents the level of stratification and its changing nature. This was not done.

Response:

A review of the data shows that much of the DO data collection occurred in the upper portion of the Anclote River. Due to this, the simulated surface DO concentrations were calibrated to the measured data. The surface DO matches the annual trends that occur in the measured DO.

Comment:

16. The report refers to the overall Crystal River LSPC model relative to the model inputs and coefficients. As a separate LSPC model, focused specifically on the Anclote watershed was developed for this TMDL, the documentation and presentation of the model needs to be presented for that model and the report/information made available for review.

Response:

The larger Crystal River Watershed modeling reports are available on www.regulations.gov and can be found under the Florida Numeric Nutrient Criteria Technical Support Documents, Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and Appendix D: Hydrodynamic and Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems, and their associated attachments. There were no changes to modeling inputs, assumptions, or data sources, and this information was provided in section 7.1.1 of the TMDL report and describes data inputs for land use, hydrologic soil groups, and weather information, as well as data used to set-up the subwatershed delineation. Calibration parameters were adjusted, and calibration results were provided in the Anclote River TMDL report.

Comment:

22. The report needs to provide a detailed discussion and plots of all EFDC model input conditions and coefficients, including flows and meteorology (with plots of all boundary conditions). Additionally, a detailed discussion and presentation of the bathymetric data utilized must be provided. It must show that the physical conditions, bathymetry and shoreline are well represented by the hydrodynamic model.

Response:

The complete list of physical, hydrologic, and chemical inputs and all relevant model coefficients is too lengthy to include in the modeling report. The administrative record for this TMDL contains all of the models and their associated input files. This information is available to the public upon request and may be reviewed at any time.

Comment:

3. At present, Florida is in the process of developing and approving revised DO criteria. While it is recognized that these criteria have not received final approval at this time, Florida Department of Environmental Protection (FDEP) acknowledged that the current DO standards are not appropriate, which led to the development of the new proposed DO criteria. Given this position regarding the DO standards, the determination that the system would not meet the DO criteria even under natural loadings may not reflect the "best science" as defined by EPA and FDEP and may be inappropriate for defining load

Response:

EPA does acknowledge that Florida has begun the process of changing their dissolved oxygen criteria. Until this process is completed and approved by EPA pursuant to section 303(c) of the CWA, the current water quality standard for dissolved oxygen is effective for Clean Water Act purposes. If and when Florida changes their water quality standard for dissolved oxygen, this TMDL could be re-visited in the future.

Comment:

4. The watershed modeling does not appear to account for some specific hydrologic aspects of the system that are critical. Additionally, available local data (including flow measurement locations) were not utilized directly in the LSPC model calibration.

Response:

EPA believes the watershed modeling accounted for all important aspects of hydrology in the system. FDOT needs to be more specific regarding what critical hydrologic aspects it believes were not incorporated into the model. The LSPC model utilized USGS

02310000 for LSPC calibration, which is located in the freshwater portion of the Anclote River.

Comment:

5. The EFDC/WASP model grid representation is too coarse and not representative of the system complexities and is not sufficient for the hydrodynamic or water quality.

Response:

EPA believes the grid is an accurate representation of the overall flow and hydrodynamics of the Anclote River system. A finer resolution grid which would not alter the overall hydrology and water quality representation within the Anclote River. The model was well calibrated to salinity and temperature in the system, indicating the grid is able to represents the hydrodynamics and water quality of the system.

Comment:

14. The analytic approach relies upon three different models. This includes the LSPC model to simulate the loads entering receiving waters and the hydrology within the freshwater reaches (main stem and tributaries), EFDC to simulate the hydrodynamics within the tidal portions of the Anclote River and the Bayou, and WASP to simulate water quality conditions in the freshwater reaches and the tidal portion modeled by EFDC. The following provides comments on each model system in general and by WBID.

Response:

EPA did use three different models- LSPC, EFDC, and WASP- for the Anclote River system TMDL report.

Comment:

15. The image in Figure 7.1 is very blurry and hard to read. A clearer image is needed.

Response:

Comment noted. The current maps are able to demonstrate the current necessary data and will not be updated.

Comment:

2. The TMDL loads are all based on the LSPC model simulation of the natural condition. While this is a common practice in TMDL development, there are no assurances that the model is accurately projecting the natural background loads. It would be useful to do some comparisons of what the natural load is with more pristine waterbodies so that some determination can be made of how realistic the natural condition loads are. This is

especially relevant based on the recommended load reductions identified for TN and TP as it relates to DO.

Response:

EPA acknowledges that it is common practice to use LSPC model simulations of natural conditions to determine background loading. Unfortunately, in the Tampa Bay watershed in the areas with similar geographic location, soils, and elevations are all highly developed and there are no immediate areas with available data that can be utilized for such a scenario. The model parameters, which were from the larger Tampa model used for the Florida Numeric Nutrient Criteria, were reviewed by multiple groups, including several offices within the EPA and by the Florida Department of Environmental Protection. These parameters reflect an intensive and rigorous calibration effort of the model.

Comment:

17. LSPC Model Inputs a. For the LSPC model subwatersheds and reaches, it is necessary to provide the physical information, i.e., reach lengths, depths, slopes, etc., so that the reasonableness of them can be assessed against the physical characteristics of the system. These data would usually be provided is a separate modeling report or an appendix. b. A detailed presentation of the model inputs, i.e., rainfall, meteorology, is needed. c. Data on the model parameters by subwatershed must be provided, including all physical coefficients, etc., as well as the water quality model coefficients.

Response:

The LPSC model inputs were available and provided in the administrative records. A fully list of the physical coefficients, water quality model coefficients, reach lengths, depths, and slopes, would have been too lengthy too include in the TMDL report.

Comment:

30. The report needs to provide a detailed discussion and plots of all WASP model input conditions and coefficients, including inflowing concentrations and assumptions for sediment oxygen demand (SOD) and other benthic processes.

Response:

The WASP input conditions are described in the TMDL report. Additional information, including inflowing concentrations, are available in the WASP model which was available as part of the administrative record.

Comment:

18. LSPC Hydrology Calibration a. Figure 7.2 presents a flow comparison that appears to be from a calibration performed on the larger Crystal River watershed model. The graph is difficult to read and does not provide the ability to assess the goodness of fit of the model results. The graphic quality aside, plots need to be provided for all available flow measurements against the Anclote watershed LSPC model to assure the model is predicting the hydrology accurately. b. There are two USGS flow monitoring locations that could be utilized for the hydrologic calibration. These were shown in the Figure following Comment 4. The presentation should include readable graphics and appropriate statistical comparisons. c. As even the natural condition loading is dependent upon an initial model that is accurately calibrated, this first step not being done properly negates any use of the model for future or natural condition scenarios.

Response:

The Anclote River LSPC model utilized the hydrology calibration parameterization as the larger Crystal River watershed model. Statistical comparisons at this plot are provided in the references Crystal Watershed Modeling Report available on regulations.gov. EPA concurs that there is an additional gage on the Anclote River, 02310075. However, this gage is further downstream and is tidally influenced, which makes it inappropriate to compare modeling results from LSPC to the measured data. The model is sufficiently calibration the Anclote River Gage at USGS 02310000, which allows to be utilized for future and natural conditions scenarios.

Comment:

19. LSPC/WASP Water Quality Calibration a. For each WBID, the WASP model coefficients used in the reach simulations need to be provided to allow assessment of the reasonableness. b. Since the WASP model is utilized, a discussion of the speciation of the nutrient data from the LSPC model simulations (which predicts TN and TP) needs to be provided. c. Comparisons of the nutrient species (i.e., organic versus inorganic) WASP predictions with the available data need to be provided. d. The LSPC model comparisons are provided at one location. This station is located about two-thirds of the way down the freshwater WBID portion. There are multiple locations along the river where data are available. It would be useful to present more than one location, given the length of the WBID. It would also have been good to show some data at the more downstream area of the freshwater. e. No calibration results are presented for 1475, which is the other freshwater WBID being considered. While the data are somewhat limited, it would have been good to see how the model is doing on that WBID, given how different the data, especially for TP and TN, are in that WBID. f. WBID 1440F – Anclote River i. 5-daybiochemical oxygen demand (BOD5): The results seem reasonable given the limited data. ii. TN: The data show a downward trend over the period of measurement that is not seen in the data. As such, while the model is representative of conditions at the

beginning of the simulation, by the end, the model is over predicting TN levels. iii. TP: there is a significant shift in the data around 2002 that needs to be explained. Overall, following the shift, the TP is over predicted by the

Response:

The complete list of physical, hydrologic, and chemical inputs and all relevant model coefficients in the WASP7 model is too lengthy to include in the modeling report. The administrative record for this TMDL contains all of the models and their associated input files. This information is available to the public upon request and may be reviewed at any time. This file includes the speciation of the LSPC model simulations to TN and TP. Both TN and TP are presented and are well calibrated, and TMDL reductions are applied to these two parameters. The current TMDL report presents the modeled WASP simulations at multiple sites in the Anclote River, including data collection points in the freshwater WBID. The WASP modeled simulated the instream nutrient processes, which made it a better representation of the mechanistic model system that the LSPC model at these sites. EPA believes the model is able to capture the total nitrogen trend throughout the modeling period. TN concentrations ranged from 0.2 mg/L to 2 mg/L throughout the modeling period, and measurements at 2 mg/L were taken in 2009, during the final year of the modeling period. The EPA has also reviewed the TP data and found that TP data was greater in 2002 at station 21FLGW 3509. At this time, EPA does not have additional information that could explain this phenomenon. The model is able to represent the measured TP data reasonable well throughout the system.

Comment:

20. The text is inconsistent in its description of how tidal forcing was done for the Anclote River Estuary Model. The text states "The Anclote River Estuary model used hourly water surface elevation time series data from the National Oceanic and Atmospheric Administration (NOAA) tidal stations to simulate tides at the open boundary. Observed temperature data at water quality stations were used to simulate the temperature at the open boundaries, and average salinity in the Gulf of Mexico was used to simulate salinity. The Big Bend Estuary was calibrated to measured NOAA tidal stations, and the Big Bend model was used to simulate the open boundary conditions in the Anclote River model." The text needs to be clear on how open boundary conditions for the Anclote Model were developed. Based upon examination of the PSER file, it appears that the Big Bend model was utilized for the tidal forcing. Some presentation showing that this is a reasonable tidal condition needs to be provided, at least against some available data locally.

Response:

The paragraph has been revised to properly indicate that information from the Big Bend model was used for tidal forcings. Within the TMDL report, the model presents the

salinity calibration compared to measured salinity data in the Anclote River, which was used to demonstrate that the model was reasonable simulating the tidal condition. The Big Bend model results are available on regulations.gov as part of the Florida Numeric Nutrient Criteria reports.

Comment:

21. Based upon the PSER file, the tidal forcing in the model is at a 2-hour interval. Generally, to provide an accurate representation of forcing tides for a model, data spaced at a maximum of 30 minutes to 1 hour would be used. This indicates a lack of understanding of hydrodynamic modeling in tidally driven systems.

Response:

The Gulf of Mexico has relatively small tides when compared to open oceans because it has a narrow connection with the Atlantic Ocean. Additionally, because the mouth of the Anclote River is protected due to the presence of multiple islands, the tidal fluctuation is typically less than a meter, and occurs diurnally. Because of the small tides, a 2-hour interval is sufficient to model the tidally driven hydrodynamic system.

TMDL Determination

Michael Garrett & FDOT

Comment:

40. Given the issues with the LSPC model calibration at all levels (hydrology and water quality), it is not appropriate to utilize the model for any future or existing condition projection purpose and, therefore, the results provided for the TMDL are not defensible.

Response:

EPA believes, as stated in responses to previous comments, that the LSPC water quality model is adequately calibrated and can be used to establish TMDL load reductions and conditions, including natural condition loads.

Comment:

41. The report states: "During the development of this TMDL, it was determined that the natural condition scenario (removal of all anthropogenic sources and land uses) did not meet the Florida standards for DO. The DO was greater during the natural condition run, and nutrient loadings from the natural condition scenario were therefore used to determine the TMDL in accordance with the Natural Conditions narrative rule." Previous comments have shown that all of the models (LSPC, WASP) have significant issues in their projection of DO. Therefore, they are not useable in assessing DO compliance.

Response:

EPA believes, as stated in responses to previous comments, that the LSPC and WASP water quality models are adequately calibrated and can be used to establish TMDL load reductions and conditions, including natural condition loads.

Comment:

38. Comments on the LSPC hydrologic and water quality calibrations presented above identify that this model is not sufficiently calibrated (or demonstrated to be calibrated) through the presentations provided. As such, it is not usable for predictive purposes, i.e., determination of "natural" condition loads.

Response:

EPA believes, as stated in responses to previous comments, that the LSPC water quality model is adequately calibrated and can be used to establish TMDL load reductions and conditions, including natural condition loads.

Comment:

37. In all WBIDs, the TMDL is based upon the determination that even under "natural" loading conditions; the DO would not meet the Florida State standard. Based upon this determination, the TMDL is defined as the "natural" condition loading, as defined by the LSPC model, and the percent reductions are based upon the difference between the LSPC "natural" load and the LSPC existing load. While the determination that the WBIDs would not meet DO criteria even under "natural" loading may not be incorrect, the modeling presented within this report is not sufficient to make that determination (see previous comments on model calibration).

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and a technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Comment:

39. Table 7.3 provides the "natural condition" instream concentrations predicted by the LSPC and WASP models based upon the input of the natural land uses. The values for some of the TN and TP are unreasonable as natural condition concentrations. Prior to publishing values for natural conditions in TMDLs, EPA needs to review the available literature on the area to determine what constitutes "natural" nutrient levels in these systems. As has been stated in multiple comments provided to EPA in the past, where natural conditions are utilized to define a TMDL, they must demonstrate that their "natural" condition modeling is reasonable.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and a technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

WBIDs 1498/1507/1507A/1513E/1513F/1516/1563 Brushy/Rocky Creek/Double Branch/Sweetwater Creek

Michael Williams (Hillsborough County), Pinellas County and FDOT

Comment:

1. EPA used a series of complex watershed and receiving water models to assess the DO responses to changes in nutrient loads. Based upon a review of the TMDL document and supporting information, significant technical issues were raised relative to the adequacy of the models physical representation of the system and the model calibration. While the documentation is helpful, some model development details are not provided, some key model-to-data comparisons are not provided, some methods of model application are not reasonable, and some of the calibration and validation results presented bring the model into question.

Response:

EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are

engineering tools that allow EPA to make informed decisions when determining a TMDL. These tools are very complex and to document every feature, parameter, constant or data point that is used in the model(s) would be very difficult. All of the modeling tools are publically available and include very detailed user's manual that provide a description of the input and how it is used in the model. Initial model constants are set to typical values from like areas where the model has been was applied in the past. During the calibration process it is not uncommon to change several constants to better represent the current area being modeled.

Endpoints/Water Quality Targets

Michael Williams (Hillsborough County), Pinellas County and FDOT

Comment:

3. At present, Florida is in the process of developing and approving revised DO criteria. While it is recognized that these criteria have not received final approval at this time, Florida Department of Environmental Protection (FDEP) acknowledges that the current DO standards are not appropriate, which led to the development of the new proposed DO criteria. Given this position regarding the DO standards, the determination that the system would not meet the DO criteria even under natural loadings does not reflect the "best science" as defined by EPA and FDEP and is inappropriate for defining load reductions.

Response:

EPA does acknowledge that Florida has begun the process of changing their dissolved oxygen criteria. Until this process is completed and approved by EPA pursuant to section 303(c) of the CWA, the current water quality standard for dissolved oxygen is effective for Clean Water Act purposes. If and when Florida changes their water quality standard for dissolved oxygen, this TMDL could be re-visited in the future.

Analytical Approach

Michael Williams (Hillsborough County), Pinellas County and FDOT

Comment:

29. The BOD comparisons in Figure 7.37 are for Station 141, which would be upstream of the structure on Lower Rocky Creek. It therefore should not be used for comparison purposes.

Response:

The upper portion of the WASP grid in the Rocky Creek channel is dominated by freshwater flows from the LSPC model and is not tidally influenced, similar to the Rocky

Creek channel. For this reason, the model is able to represent the water quality at this upper location, as can be seen when reviewing the calibration plots. Please see Response to Comment 29 in the Analytical Approach.

Comment:

18. The calibration plots presented to demonstrate that the models are reasonably predicting water quality in the stream segments show the model at many locations and for numerous parameters doing a very poor job of simulation. Specific example plots are provided below.

Response:

What is presented to in the TMDL is best calibration to all observed data at all stations in the Rocky Creek system. EPA has reviewed the current calibration and found that DO was reasonable simulated in both the watershed and estuarine areas of the model, matching the overall trends and variability. Additionally, the nutrient calibration plots as a whole were also able to simulate the overall trends and variability in the data.

Comment:

19. No coefficient values utilized in the water quality simulations are provided in the TMDL report or the November 2011 Tampa Bay Watershed report. The full set of model coefficients needs to be provided in the report since the LSPC model is being utilized to project water quality levels in the stream segments. Specifically, the sediment oxygen demand (SOD) values utilized in the model are needed, along with re-aeration coefficients, as these are critical to the DO simulations.

Response:

EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are engineering tools that allow EPA to make informed decisions when determining a TMDL. These tools are very complex and to document every feature, parameter, constant or data point that is used in the model(s) would be very difficult. All of the modeling tools are publically available and include very detailed user's manual that provide a description of the input and how it is used in the model. Initial model constants are set to typical values from like areas where the model has been was applied in the past. During the calibration process it is not uncommon to change several constants to better represent the current area being modeled.

Comment:

20. No actual stream segment geometry is provided in the report to allow an evaluation of the accuracy of the channel cross-sections used in the LSPC models. As stream geometry is critical to accurate representation of DO, some discussion that shows for each reach used in the DO simulations how the model accurately reflects the velocities that drive re-aeration needs to be provided.

Response:

The LSPC model has a representative reach defined for each sub-watershed, and the main channel stem within each sub-watershed was used as the representative reach. The characteristics for each reach include the length and slope of the reach, the channel geometry and the connectivity between the sub-watersheds. Length and slope data for each reach was obtained using the USGS National Elevation Dataset (NED) Digital Elevation Maps (DEM) and the USGS National Hydrography Dataset (NHD). Each representative reach in LSPC was assumed to be a completely mixed, one-dimensional segment with a trapezoidal cross section. Velocities vary throughout the channel in each subwatershed because of changes in the stream geometry. The model represents an average of these geometries using the NHD data.

Comment:

21. The EFDC/WASP model grid representation of the geometry of the estuarine system is crude and should be improved. Specific issues include; a. The Courtney Campbell Causeway is a major component driving the circulation in the upper portions of Old Tampa Bay (OTB). The model grid within OTB actually crosses the causeway with no regard to its existence. b. The grid going up Lower Rocky Creek extends past the structure that separates the estuarine portion from the freshwater portion. This structure does not allow upstream flow, and it appears that the model does not account for this.

Response:

The upper portion of the WASP grid in the Rocky Creek channel is dominated by freshwater flows from the LSPC model and is not tidally influenced, similar to the Rocky Creek channel. For this reason, the model is able to represent the water quality at this upper location, as can be seen when reviewing the calibration plots.

Comment:

22. Nothing is provided to show what boundary conditions were utilized to drive the sub-model. Examination of the PSER, TSER, and SSER files indicates that the values seem reasonable, but there is sufficient data available from Environmental Protection Commission of Hillsborough County (EPC) stations and National Oceanic and

Atmospheric Administration (NOAA) tide stations in the area of the boundary of the sub-model to show that the values utilized are reasonable.

Response:

EPA agrees that the data in the PSER, TSER, and SSER files are reasonable and provide necessary information needed to accurately simulate the tidal fluctuations in the tidal portion of the Rocky Creek system. EPA also acknowledges that there is EPC and NOAA data in the region.

Comment:

23. For the salinity and temperature comparisons, one of the stations shown on the grid as a comparison station is actually not the one utilized for Lower Rocky Creek. Station 141 is identified in the figure but in actuality Station 103 is presented in the graphics.

Response:

This has been corrected in the figure. The figure now identifies station 103 as a calibration figure as well.

Comment:

24. Given that the structure on lower Rocky Creek does not appear to be accounted for in the model, the hydrodynamics of that system are suspect and the model should be revised.

Response:

EPA has parsed flow according to typical conditions at the Rocky Creek and Channel A structures and believe that the hydrodynamics are well represented. A review of the salinity and temperature calibration indicate that the model is well calibrated and the hydrodynamics are being properly represented.

Comment:

25. The report states: "Water quality parameters from the Tampa Bay NNC WASP model were used for initial parameter population for the Rocky Creek WASP7 model. The Rocky Creek estuary model calibration was reviewed against water quality data located in IWR44. Following review, the calibration was adjusted accordingly to provide the best existing scenario model calibration for the water quality parameters of concern". As the parameters were changed in order to develop a site specific WASP calibration separate from the original Tampa Bay calibration, a table of model coefficients must be provided to allow proper review.

Response: A table of model coefficients would be too lengthy to include in the TMDL report. There were available in the WASP model as part of the administrative record and could be reviewed at any time.

Comment:

26. Nothing is presented to show what was used as the boundary conditions for the water quality model. The statements are made that these come from the larger Tampa Bay model but the time series extractions utilized need to be provided and the results compared to the available EPC data in the area of OTB at the boundary.

Response:

The LSPC watershed load is used as the boundary condition for the upstream water quality in the WASP model. The Tampa Bay model was reviewed against measured data in the Tampa Bay area. These calibration plots were available as part of the Technical Support Document for the Florida Numeric Nutrient Criteria on regulations.gov.

Comment:

28. An f-ratio of 1.5 was used for the BOD5 to ultimate carbonaceous biochemical oxygen demand (CBODU) conversion. Some justification for this number based on local conditions needs to be provided.

Response:

The f-ratio was used as a calibration parameter to determine the appropriate transformation of BOD5 from the watershed loads to CBODU. There was no data available to EPA to support or refute this conversion rate.

Comment:

30. Comparisons are presented consistently for Station 141; this is not appropriate.

Response:

EPA believes the model is able to accurately reflect the water quality at Station 141, and has presented the results accordingly.

Comment:

31. The Chl a comparisons show some significant errors.

Response:

EPA has reviewed the current chlorophyll a calibration and believes that it is able to match the overall measured chlorophyll a trend at most stations.

Comment:

32. Only TN and TP comparisons are provided. Generally, WASP modeling of estuarine systems also presents the individual species comparisons. The data for the species are available and, therefore, the comparisons should be provided.

Response:

Both TN and TP are presented and are well calibrated, and TMDL reductions are applied to these two parameters.

Comment:

33. Model comparisons generally include a combination of graphical and statistical comparisons. No statistical comparisons are provided for the water quality calibration. This needs to be included in the report.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. The graphical results presented in the TMDL are within range of the measured results and represent the water quality and hydrodynamic trends present in the model, indicating that the model calibration is sufficient for determining TMDL load reductions.

Comment:

4. All the maps provide too much of a zoomed-out view. The report would benefit from some greater detail and multiple maps to show the different areas, their watershed boundaries, and WBID boundaries.

Response:

Comment noted. The current maps are able to demonstrate the current necessary data and will not be updated.

Comment:

17. All of the gages need to be used to demonstrate that the model is accurately predicting the hydrology in the area, using the LSPC model developed for this TMDL. Since loads are a key component of this TMDL, and hydrologic simulation is the first aspect that needs to be calibrated, this lack of calibration (and the nearly Poor ranking of the one that is presented) makes the watershed model suspect in its present state.

Response:

EPA agrees that loading is a key component of the TMDL. For the calibration gage presented in the Tampa Watershed report that received a Fair rating, this was due to differences during low flow, specifically modeled flows less than 1 cfs (Figure 7.3 in the TMDL Report). The model simulated flows of 1 cfs, while measured flows were less than 0.1 cfs. The current watershed model presents the best overall hydrology calibration for the Tampa Bay area.

Comment:

27. The report identifies that speciation of the TN and TP data were done for the WASP modeling but the ratios utilized for the speciation are not presented in the report. If this was taken as a global parameter from the overall Tampa Bay modeling, this would be an issue, since this would tend to be a very site-specific ratio depending upon the nature of the watershed.

Response:

EPA understands that speciation of TN and TP can vary within regions, For the Rocky Creek System, the following speciation was used for yotal nitrogen: 10% NH4, 50% Organic N, and 40% NO2NO3. For total phosphorus, the following speciation was used: 50% PO4, 50%, Organic P.

Comment:

7. The TN data for the freshwater WBIDs is low in comparison to the present FDEP NNC for Peninsular streams. The data show overall geomeans ranging from 1.27 mg/L down to 0.88 mg/L. The peninsular standard is 1.54 mg/L. Given that the FDEP numbers are based upon biologically healthy systems (which include DO), the levels of reduction prescribed (around 60 to 70 percent, and higher for the WLA) are not sensible.

Response:

EPA does acknowledge that both Florida and EPA have proposed numeric nutrient criteria for Florida flowing waters. EPA recently approved Florida's numeric nutrient criteria for flowing waters in Florida. While these criteria have been approved they are not effective for Clean Water Act purposes. Furthermore, Florida's numeric nutrient criteria still provides a provision that nutrients cannot cause a violation of any other water quality standard, this TMDL was done to the dissolved oxygen criteria. In the case of this TMDL the dissolved oxygen criterion is not met. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph

62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

4. The watershed modeling does not appear to account for some specific hydrologic aspects of the system that are critical. Additionally, significant amounts of available local data (including numerous flow measurement locations) were not utilized in the LSPC model calibration.

Response:

EPA believes the model accounts for critical hydrologic aspects of the system. FDOT will need to clarify what they consider to be critical aspects.

Comment:

5. The EFDC/WASP model grid representation should be improved. There are some aspects of the system (existence of structures) that are not accounted

Response:

EPA believes that the current model grid is able to accurately simulate the hydrodynamics and water quality of the Rocky Creek system.

Comment:

1. The report references 2012 modeling reports for the Tampa Bay Watershed and Tampa Bay that are not provided. EPA did provide 2011 reports for the LSPC modeling, but there is no assurance that the 2011 reports are the ones to be utilized. Additionally, no reports of the Tampa Bay EFDC and WASP model (which is referenced as being utilized for boundary condition development of sub-models) are provided.

Response:

The 2011 reports provided for the LSPC modeling can be utilized. Additionally, the Tampa Bay EFDC and WASP model reports were available upon request.

Comment:

2. Section 3.2: There is some very specific hydrology of the system that should be described in this section. This relates primarily to the flow in the Rocky Creek, Channel A, Brushy Creek group. The structure on Channel A is maintained at a higher elevation than the structure on Rocky Creek. As such, other than during very high flow events, the

flows that would go down Channel A are backwatered and flow down Rocky Creek. This is not discussed or described.

Response:

No data was available to EPA that fully documented the flow in Channel A and Lower Rocky Creek at the structures. For this reason, EPA modeled the system using LSPC to the best of its ability and believes the LSPC model was able to provide an accurate representation of the typical flow in these two channels.

Comment:

3. Figure 3.1 is so broad a view as to make it not particularly useful. A larger figure, with a more zoomed-in view, or multiple figures would help to allow the reader to see how the land uses break down by area.

Response:

Comment noted. The current maps are able to demonstrate the current necessary data and will not be updated.

Comment:

6. For WBID 1498, all 5-day biochemical oxygen demand (BOD5) data other than one are less than 2.0 milligrams per liter (mg/L). FDEP's criteria for BOD causing DO impairment is 2.0 mg/L, and the practical measurement limit is around 2.0 mg/L. It does not make sense then that a percent reduction of around 41 percent is being recommended.

Response:

The TMDL established load reductions for BOD at the natural condition, which is also true for nitrogen and phosphorus. In the natural condition scenario, 41 percent of the BOD in the system is from anthropogenic sources, indicating that even though BOD is often below 2 mg/L in the system, which a large portion of BOD is from anthropogenic sources. By reducing BOD this insures that no anthropogenic loadings are causing or contributing to depression of the dissolved oxygen concentration.

Comment:

16. The report identifies the scores and rankings as follows: "The summation of the weighted scores was assigned a qualitative descriptor of Very Good (VG), Good (G), Fair (F), or Poor (P). The highest possible score was 80 and the lowest possible score was 20. Scores from 80-76 were rated as VG, 75-56 G, 55-36 F, and 35-20 P". This means that the one gage presented was at the low end of a Fair rating in terms of hydrologic calibration and was close to being defined as Poor.

Response:

For the calibration gage presented in the Tampa Watershed report that received a Fair rating, this was due to differences during low flow, specifically modeled flows less than 1 cfs (Figure 7.3 in the TMDL Report). The model simulated flows of 1 cfs, while measured flows were less than 0.1 cfs. The current watershed model presents the best overall hydrology calibration for the Tampa Bay area.

Comment:

2. The TMDL loads are all based on the LSPC model simulation of the natural condition. While this is a common practice in TMDL development, there are no assurances that the model is accurately projecting the natural background loads. It would be useful to do some comparisons of what the natural load is with more pristine waterbodies so that some determination can be made of how realistic the natural condition loads are. This is especially relevant based on the recommended load reductions identified for TP as it relates to DO. The TMDL would require around a 90 percent reduction in TP for both the non-point sources and point sources in some waterbody segments (WBIDs), but the analyses of the data would not seem to support this level of reduction.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Comment:

5. As outlined earlier, the figures are difficult to read and busy where the station locations are shown (Figures 5-1 through 5-3).

Response:

Comment noted. The current maps are able to demonstrate the current necessary data and will not be updated.

Comment:

8. The TP data for the freshwater WBIDs is low in comparison to the present FDEP NNC for Peninsular streams. The data show overall geomeans ranging from 0.11 mg/L down to 0.07 mg/L. The peninsular standard is 0.12 mg/L. Given that the FDEP numbers are based upon biologically healthy systems (which include DO) the levels of reduction prescribed (around 90 to 93 percent, and higher for the WLA) are not sensible.

Response:

EPA does acknowledge that both Florida and EPA have proposed numeric nutrient criteria for Florida flowing waters. EPA recently approved Florida's numeric nutrient criteria for flowing waters in Florida. While these criteria have been approved they are not effective for Clean Water Act purposes. Furthermore, Florida's numeric nutrient criteria still provides a provision that nutrients cannot cause a violation of any other water quality standard, this TMDL was done to the dissolved oxygen criteria. In the case of this TMDL the dissolved oxygen criterion is not met. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

9. The Chlorophyll a (Chl a) levels in all of the freshwater systems are very low (geomeans from 3 to around 5 micrograms per liter (µg/L)). This is well below FDEP's criteria for listing for freshwater systems.

Response:

There are instances in many WBID of chlorophyll a concentrations greater than 20 µg/L. Please see EPA's general response to comments received regarding the impacts on this TMDL of ongoing activities to establish numeric nutrient criteria in Florida. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

10. Figure 7.1 is blurry and hard to read to see the subwatersheds. It would be useful to provide clearer more zoomed-in views to aid the reader in understanding the subwatershed breakdowns.

Response:

Comment noted. The current maps are able to demonstrate the current necessary data and will not be updated.

Comment:

11. The LSPC model description states "The assumption of a fixed depth, area, volume, outflow relationship rules out cases where the flow reverses direction or where one reach influences another upstream of it in a time-dependent way". Channel A (above the structure) does reverse direction based upon the elevations of the structures at Channel A versus Lower Rocky Creek and this reversal is consistent. Based upon this issue, LSPC would not be appropriate for this area, especially if it does not account for the complex management of the two structures on Channel A and Lower Rocky Creek.

Response:

No data was available to EPA that fully documented the flow in Channel A and Lower Rocky Creek at the structures. For this reason, EPA modeled the system using LSPC to the best of its ability and believes the LSPC model was able to provide an accurate representation of the typical flow in these two channels.

Comment:

12. In 2007, a watershed plan was developed for the Brushy Creek/Rocky Creek and Sweetwater Creek (Ayers, 2007). This was a comprehensive assessment of the conditions in the watershed and would have been useful information for EPA to utilize in its watershed modeling. It would have provided critical local knowledge on the characteristics of the watershed, and should be utilized by EPA for this document.

Response:

Thank you for informing the EPA about the watershed protection plan. EPA has reviewed the document and found that many of the data sources utilized in developing the report and model were identical or similar to those used to develop the TMDL model and report.

Comment:

13. The report lists that point sources were included in the watershed modeling but no data are presented to show what those inputs were in the TMDL report or the overall LSPC modeling report from November of 2011 provided by EPA. The TMDL report merely

states, "The NPDES geographic information system (GIS) coverages, provided by FDEP were adopted as the starting point for the evaluation of point sources for the Florida watershed models and reflected discharges as of December 2009. In areas where data was incomplete, data from EPA-PCS was used. Following data collection, any remaining gaps in the data that were three months or less were filled by averaging data from before and after gap months. If the gaps in the data were larger than three months the long term average was supplied. Point sources that were designated as reuse facilities were not input directly into the model, but were accounted for in the adjustment of the hydrologic calibration parameters." The actual time series input to the model needs to be provided in the report to allow an evaluation of the reasonableness of the values.

Response:

The time series that was used for the point sources is available in the administrative record as part of the LSPC model.

Comment:

14. The report states that the parameters for the hydrology were based upon the larger model which was calibrated to local flow measurements. No list of stations are provided. Since a separate LSPC model was developed for this system, flow calibration at available gages in the system need to be utilized using this model and presented within this report. There were numerous stations available within the watershed modeled for calibration, including: a. USGS 02306500SWEETWATER CREEK NEAR SULPHUR SPRINGS FL b. USGS 02306647 SWEETWATER CREEK NEAR TAMPA FL c. USGS 02307000 ROCKY CREEK NEAR SULFER SPRINGS FL d. USGS 02306950 BRUSHY CREEK NEAR CITRUS PARK FL

Response:

EPA has reviewed many of the stations and found that gages 02306500 and 02306950 only collected data in 2008 and 2009. The TMDL report now presents LSPC outputs at stations USGS 02307000 and USGS 02306647.

Comment:

15. In the November 2011 Tampa Bay Watershed LSPC modeling report, which was provided to us by EPA for this review, the model calibrations for hydrology for the overall Tampa Bay Watershed were provided. Of these four stations, only one is presented in the Tampa Bay Watershed report, USGS 02307000. Based on the statistics presented, this gage had a calibration/validation score of 36 and was rated as "Fair".

Response:

The most recent Tampa Bay Watershed model, which was completed in November 2012, presents utilized additional stations for the Tampa Bay for calibration and data was presented for ten stations. USGS gage 0230700 was still rated as Fair.

TMDL Determination

Michael Williams (Hillsborough County) and FDOT

Comment:

34. The natural condition concentrations in the target WBIDs indicate that the natural condition loads may be unreasonable. This is especially true in the freshwater portions. The TN concentrations are on the order of 0.5 to 0.8 mg/L and the TP concentrations are on the order of 0.01 mg/L in some WBIDs. As the natural condition loads are the critical aspect of the TMDL and define the percent reductions, it is necessary to evaluate the results against other natural systems in the area to determine if the values prescribed are reasonable. Comparison with other natural systems is the only way to demonstrate that the loads are a reasonable representation of natural conditions.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Comment:

35. The report states: Figure 7.57 through Figure 7.63 provide the cumulative distribution function of DO concentrations for both the modeled existing condition and natural condition results in the impaired WBIDs. The cumulative distribution curve shows there is an increase in DO concentrations in the natural condition scenario, specifically in DO concentration values less than 5 mg/L in the existing condition run. While this is the case for some, it is not for all of them. Some of the distribution curves show nearly identical results between the existing and natural condition.

Response:

EPA acknowledges that the increase in DO concentrations between the existing and natural condition scenarios varied. In all cases, DO increase by at least 0.1 mg/L, and the increase typically occurred at DO concentrations less than 5 mg/L. This indicates that natural condition is more protective of the waterbodies and should be utilized as the TMDL load reduction.

WBIDs 1535/1556 Minnow Creek and Cedar Creek

Endpoints/Water Quality Targets

Thomas Gibson, Pinellas County, City of Dunedin and FDOT

Comment:

4. At present, Florida is in the process of developing and approving revised DO criteria. While it is recognized that these criteria have not received final approval at this time, Florida Department of Environmental Protection (FDEP) acknowledged that the current DO standards are not appropriate, which has led to the development of new proposed DO criteria. Given this position regarding the DO standards, the determination that the system would not meet the DO criteria at all times even with the large reductions in TN, TP, and BOD loads called for in the proposed TMDLs may not reflect the "best science" and may be inappropriate for defining load reductions.

Response:

EPA does acknowledge that Florida has begun the process of changing their dissolved oxygen criteria. Until this process is completed and approved by EPA pursuant to section 303(c) of the CWA, the current water quality standard for dissolved oxygen is effective for Clean Water Act purposes. If and when Florida changes their water quality standard for dissolved oxygen, this TMDL could be re-visited in the future.

Assessment

Thomas Gibson, Pinellas County, City of Dunedin and FDOT

Comment:

2. The difference in average DO concentration between the current and "natural" condition model results is 0.2 mg/L or less in each WBID, resulting from reductions in TN loads of 81 percent or more, TP loads of 86 percent or more, and BOD loads of 58 percent or more. Sufficient confidence in the ability of the model to simulate observed conditions has not been provided in this document to produce a convincing argument that such a large reduction in loadings (and the effort associated with achieving this) would result in the predicted small improvement in DO conditions. The observed mean DO in WBID 1535 was 4.80 mg/L, compared to the existing condition model run output mean DO of 5.67

mg/L, 0.87 mg/L greater than the observed mean. Similarly, the observed mean DO in WBID 1556 was 4.36 mg/L, compared to the existing condition model run output mean DO of 7.05 mg/L, 2.69 mg/L greater than the observed mean. These comparisons do not provide reassurance that the model is sufficiently calibrated for use in TMDL development.

Response:

The current model is able to match the seasonal DO trend in the measured water quality data. EPA determined that while under a natural conditions the dissolved oxygen criteria is not met. There is a difference in predicted dissolved oxygen concentrations between the current and natural condition scenarios which indicates anthropogenic sources are causing a depression in dissolved oxygen (both the average and minimum). Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

3. The observed mean TN in WBID 1535 was 0.94 mg/L, compared to the existing condition model run output mean TN of 0.51 mg/L, 0.43 mg/L less than the observed mean. Similarly, the observed mean TN in WBID 1556 was 1.11 mg/L, compared to the existing condition model run output mean TN of 0.59 mg/L, 0.52 mg/L less than the observed mean. These under predictions of existing conditions TN concentrations by nearly 50 percent do not provide reassurance that the model is sufficiently calibrated for use in TMDL development

Response:

EPA relies on both graphical and statistical metrics to determine model calibration. Water quality data was limited and not collected every year. During periods that nutrient data was collected, the model captured many of the high nutrient occurrences. The statistical metric FDOT is referring to are for the entire modeling period and may not adequately reflect the model calibration.

Analytical Approach

Thomas Gibson, Pinellas County, City of Dunedin and FDOT

Comment:

14. There are many more salinity data sites in Clearwater Harbor within the hydrodynamic model domain for comparison of modeled and observed data (Janicki Environmental and Atkins, 2011). Utilization of all the available data for quantitative calibration comparison is warranted to support the contention that the model is simulating observed responses to observed forcing functions.

Response:

EPA calibrated to data sites located within the model using IWR 44 data and did not calibrate to sites in the main Clearwater Harbor using other data sources.

Comment:

24. Without quantitative measures assuring that the calibration is sufficient to simulate observed responses to observed forcing functions, any additional scenarios involving changes to loadings are not convincing as appropriate potential TMDLs.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. The graphical results presented in the TMDL are within range of the measured results and represent the water quality and hydrodynamic trends present in the model, indicating that the model calibration is sufficient for determining TMDL load reductions.

Comment:

18. Similarly, no quantitative calibration metrics were provided for the TN, TP, BOD, and Chl a comparison plots of modeled and observed data (Figures 7.19 through 7.26) within the model domain.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

16. No mention is made of atmospheric deposition of TN and TP loads directly to the surface of the waterbodies modeled. Atmospheric deposition loads in the Tampa Bay area have been shown to be a significant fraction (25 to 40 percent) of the total loading to Tampa Bay, and are likely important considerations when developing the loadings for the WASP model domain in this WBID.

Response:

Atmospheric deposition was included in the WASP model and can be found in WASP .wif file which was available as part of the administrative record.

Comment:

17. It is noted that the Coastal Pinellas calibration was adjusted to provide the best existing scenario model calibration. For the comparison of simulated and observed DO at stations in WBID 1535 (Figure 7.17 of EPA, 2013), the simulated DO signal never showed DO values as low as those observed. For the comparison at the station in WBID 1556 (Figure 7.18 of EPA, 2013), it is very difficult to discern the symbols for the observed data for

comparison to the simulated data, but the means are very different, as noted previously in Comment 2 (simulated mean=7.05 mg/L, observed mean=4.36 mg/L). No quantitative calibration metrics other than the means were provided for the comparison of measured and observed DO, so that the capability of the model to simulated observed conditions is not supported.

Response:

EPA did present the best achievable DO model calibration for the Coastal Pinellas model. EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

19. Figure 7.26 is mislabeled, the figure shows simulated and measured Chl a, not total phosphorus.

Response:

This has been corrected in the TMDL report.

Comment:

20. Although no mean value during the existing condition model period is provided, it is obvious from the figures comparing simulated Chl a to observed data (Figures 7.25 and 7.26) that the model is severely over predicting Chl a concentrations in both WBIDs

Response:

Water quality data is limited for chlorophyll a and is only available for approximately three years. The model provided the best chlorophyll a calibration given the current data available.

Comment:

22. The assumption directing the modeling effort for this proposed TMDL is that reduction of nutrient loads will improve DO conditions. A report prepared for Pinellas County by Atkins, Inc., (Atkins, 2012), and provided in the County's comments to EPA previously (August 2012), showed no strong relationships between potential causative water quality constituents (TN, TP, and BOD) and DO. The FDEP has classified WBID 1535 as 4D (no causative pollutant determined). Only Cedar Creek (WBID 1556) was included in the FDEP Verified List (Group 5, Cycle 1) of impaired waterbodies. Minnow Creek (WBID 1535) was included on the Group 5, Cycle 1 list of waters to be proposed for delisting for nutrients from the current 303(d) list.

Response:

As discussed in Section 5 of the TMDL report, there are several factors that may affect the concentration of dissolved oxygen in a waterbody. Among these factors is anthropogenic over-enrichment of nutrients (i.e. nitrogen and phosphorus) and oxygen demanding substances (quantified as biochemical oxygen demand). Nutrient levels affect DO concentrations directly and indirectly. The process of nitrification, in which bacteria

convert ammonia-nitrogen to nitrate-nitrogen, directly consumes oxygen from the water. Indirect effects of excessive nutrient loading involve over-stimulation of aquatic plant growth, which leads to exacerbated diurnal swings in DO as the plants photosynthesize during daylight hours, and respire at night. Replenishment of oxygen levels may be inhibited if excessive growth of aquatic plants above the water surface blocks sunlight from reaching submerged vegetation, reducing their ability to photosynthesize. Decomposition of algal and other types of organic matter, such as dead plants and animals, also uses up DO from the water. The lack of strong statistical correlations between paired measurements of total nitrogen (TN), or total phosphorus (TP) and DO or chlorophyll is not uncommon, particularly in Florida's streams and rivers. This is due to the complexity of nutrient cycling in natural waterbodies, which results in variable time lags between the introduction of nutrients and their uptake and use by algae or other aquatic plants. Nutrients may be stored in sediment and/or organic materials and eventually re-introduced to the water column. Less available forms of nutrients such as organics must be broken down before they can be recycled for uptake. Other considerations include the fact that measuring chlorophyll concentrations in a water sample only provides a "snapshot" of the concentrations at the time and place the sample was taken, and the measurement only captures phytoplankton, the free-floating algae, and will not capture other types such as attached algae (periphyton), algae growing on bottom sediments (benthic), and other aquatic plants (macrophytes). It is also not uncommon to have difficulty showing a strong statistical correlation between paired measurements of DO and BOD concentrations, but this does not automatically mean that the decomposition of excessive organic materials has no influence on the oxygen regime of that waterbody. BOD values are generated by laboratory tests that measure the amount of oxygen consumed by bacteria as they decompose the organic matter in a water sample over a given period of time, at a specified temperature. The standard test period for BOD is 5 days at 20 degrees Celsius; this measurement is termed BOD5. While BOD5 measurements are usually able to capture the majority of oxygen demand from the first (carbonaceous) stage of decomposition, five days is typically not enough time to allow for complete biochemical oxidation of the organic matter in a water sample. The nitrogenous stage, whereby oxygen is consumed in the process of converting organic nitrogen, ammonia and nitrite to nitrate-nitrogen, typically begins after a BOD5 test has ended. Tests that last 20 days or longer are required to measure the full oxygen demand. These long-term BOD tests are not performed as frequently as 5-day tests, especially when several BOD measurements will be made as part of a general monitoring program. Another factor to consider when attempting to correlate paired measurements of DO and BOD is that the DO concentration measure at a particular location and time is the result of processes that have already occurred, whereas the BOD concentration at the same location and time reflects an oxygen demand that will be exerted on the waterbody.

Comment:

23. No sensitivity analyses were provided for changes in nutrient supplies (TN, TP), BOD, or SOD. This information should be obtained after the model is appropriately calibrated, to determine the important drivers of DO dynamics in the system and allow focused effort on effective management.

Response:

EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

13. The only salinity calibration information presented for the hydrodynamic model was for modeled and observed salinity at 21FLTPA 28033238246245, 21FLTPA 28033158246322, and 21FLPDEM09-03 (Figures 7.13 and 7.14 of EPA, 2013). The simulated salinity does not appear to track the observed salinity well at all, and no distribution comparison of simulated and observed salinity is provided with quantitative statistics to support the contention that the model is calibrated.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. EPA reviewed the salinity calibration for the Coastal Pinellas model and felt that it was able to accurately represent the tidal influences in the system.

Comment:

12. Similarly, comparisons of modeled and observed TN (Figure 2) and TP (Figure 3) at 21FLTPA 28033158246322 and 21FLPDEM09-02 do not support the contention that the model is calibrated, with the modeled ranges greatly exceeding the observed ranges.

Response:

The model was able to predict the overall total nitrogen trends that occurred in the watersheds, including season trends that occurred at some site. There were rare periods, typically during summer storm events, where the model predicted total nitrogen values greater than the measured data.

Comment:

21. Figure 7.37 of the proposed TMDL document provides a cumulative distribution function (CDF) plot of DO for both existing and "natural" condition model output. The existing condition simulated DO is never below 4 mg/L, so that the marine DO criteria is met for the minimum concentration, assuming the plotted model output is more frequently than daily average. Please identify the frequency of the plotted model output so that it can be compared against the state standards appropriately. It would make most sense to provide separate plots for the minimum (not less than 4 mg/L instantaneous) and the daily average (not less than 5 mg/L).

Response:

The current cumulative distribution plots provide the daily average modeled dissolved oxygen concentrations for both the existing and natural condition model outputs, and this has been clarified in the TMDL report. The TMDLs was done for daily average DO,

therefore including a plot of instantaneous modeled DO would not add any additional information that could be utilized for the TMDL determination.

Comment:

2. The TMDL loads are all based upon the LSPC model simulation of some set of conditions under which the water quality model uses as input "natural" condition loadings. While this is a common practice in TMDL development, there are no assurances that the model is accurately projecting the effects of reduced loads on the water quality in the stream. It would be useful to perform a more rigorous calibration effort of the watershed and waterbody models, providing sufficient calibration metric comparisons to allow for a degree of confidence in the models' responses to inputs. It would also be helpful if a more detailed assessment of the reasonableness of the "natural" conditions was provided.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Comment:

15. It is noted in the proposed TMDL report that the water quality parameters from the Tampa Bay WASP7 model were used to populate the Coastal Pinellas model. No presentation of the Tampa Bay WASP7 model calibration is provided either here or in EPA 2012b, making it impossible to determine if this parameter set is appropriate.

Response:

EPA describes the data inputs from the larger Tampa Bay Watershed model that were used in the development of the Coastal Pinellas WASP model. The Coastal Pinellas WASP model was available for review as part of the administrative record. Additionally, these reports are available at www.regulations.gov as part of the Florida Numeric Nutrient Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the estuary reports are available in Appendix D: Hydrodynamic and Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments.

Comment:

11. The modeled DO time series used for calibration comparison at 21FLTPA 28033158246322 and 21FLPDEM09-02 appear to be annually repeating signals, with little variation, as opposed to the observed data, which have a much greater range (Figure 1). This indicates the model is not reproducing observed DO distributions or temporal patterns

sufficiently to support that the model is calibrated.

Response:

DO varies at temporal and spatial scales due to many biological, chemical, and physical processes. This variation is often cyclical with annual repeating signals due air temperature which effects the growth of phytoplankton and controls the concentration of DO that can be dissolved in the water column. The DO calibration varies at each calibraion station, and EPA has provided the best overall calibration that could be achieved.

Comment:

1. EPA uses a series of complex watershed and receiving water models to assess the DO responses to nutrient loads. Based upon a detailed review of the documents presented and other documents describing the model developed for the Florida NNC effort (utilized for this TMDL development), some technical issues were raised relative to the adequacy of the models' calibration and the sufficiency of the documentation to provide assurance that the models are adequately simulating the key processes impacting the end results. While the documentation provided is extensive and EPA is to be commended for its detailed work, some model development details are not provided, some key model-to-data comparisons are not provided, some methods of model application are not reasonable, and the calibration results presented bring the model into question. Sufficient information is not provided to indicate that the model suite is appropriately calibrated to determine that total nitrogen (TN) load reductions of 82 and 81 percent, total phosphorus (TP) load reductions of 87 and 86 percent, and biochemical oxygen demand (BOD) load reductions of 60 and 58 percent in WBIDs 1535 and 1556, respectively, would result in improvement of the DO conditions in the waterbodies.

Response:

EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are engineering tools that allow EPA to make informed decisions when determining a TMDL. These tools are very complex and to document every feature, parameter, constant or data point that is used in the model(s) would be very difficult. All of the modeling tools are publically available and include very detailed user's manual that provide a description of the input and how it is used in the model. Initial model constants are set to typical values from like areas where the model has been was applied in the past. During the calibration process it is not uncommon to change several constants to better represent the current area being modeled.

Comment:

1. Why was only the mechanistic modeling approach utilized? Why were empirical/ statistical methods not used to evaluate the existing data to determine if there were utilizable relationships between loadings and DO in the creeks? Loadings development has been completed for the system for 1985-2008 as part of the Clearwater Harbor and St. Joseph Sound State of the Resource Report (Janicki Environmental and Atkins, 2011), so data are available for testing of stressor-response models in the two creeks.

Response:

Mechanistic modeling was utilized because it allowed EPA to run numerous scenarios when needed for TMDL development. The calibration of the model to a data collected at different stations during different years. Additionally, it can be difficult to find meaningful relationships between nutrient loadings and DO, particularly in Florida's streams and rivers. This is due to the complexity of nutrient cycling in natural waterbodies, which results in variable time lags between the introduction of nutrients and their uptake and use by algae or other aquatic plants. Nutrients may be stored in sediment and/or organic materials and eventually re-introduced to the water column. Less available forms of nutrients such as organics must be broken down before they can be recycled for uptake. Other considerations include the fact that measuring chlorophyll concentrations in a water sample only provides a "snapshot" of the concentrations at the time and place the sample was taken, and the measurement only captures phytoplankton, the free-floating algae, and will not capture other types such as attached algae (periphyton), algae growing on bottom sediments (benthic), and other aquatic plants (macrophytes). Mechanistic models allowed for the simulation of these complex systems over space and time.

Comment:

5. When developing the natural condition scenario, EPA reduced sediment oxygen demand (SOD) from the existing condition by the same fraction as Chlorophyll a (Chl a) was reduced in the initial natural condition run compared to the existing condition. No justification is provided for this methodology. It should be recalled that in many systems in the Tampa Bay area, SOD likely results from more than just Chl a, with many systems subjected to inputs of other organic materials that impact SOD.

Response:

EPA agrees that SOD changes based on input of organic materials. The methodology to reduce SOD in the natural condition run uses a Chl a ratio, but Chl a is influenced by the nutrient loading contributions entering Smack Bayou. The methodology to reduce SOD is commonly utilized by the Florida Department of Environmental Protection, and as also been used by the Army Corps of Engineers and has been supported in papers and reports, including Steven Chapra's Surface Water-Quality Modeling.

Comment:

6. Why were no nutrient load reduction scenarios completed to evaluate the effects of differing percentage reductions for TP, while keeping the TN reduction at that represented by the "natural" condition? Given the nitrogen limitation common in the region, it may well be that the model would show that the outcome was not sensitive to TP load reductions, and so would indicate that TP load reductions were not needed. A sensitivity analysis to these loads would be very helpful.

Response:

The EPA TMDL loads were calculated to ensure protective values of DO in accordance with the natural condition water quality using the definition of natural background. By reducing all nutrient loads, EPA ensures that DO is protected. EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants

and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

7. The time series of predicted and observed data are provided for 2002-2011. However, in Section 7.0, it is stated that the period of simulation considered in the TMDL development was 2002-2009. Please clarify.

Response:

This has been corrected in the TMDL report.

Comment:

8. The LSPC model utilized data inputs from the Crystal Watershed model developed for the Florida NNC effort (EPA, 2012a). Modeled flow output from the Crystal Watershed was calibrated to only one flow gage [U.S. Geological Survey (USGS) 02310000] in the watershed extending from just south of the Withlacoochee River to the southern end of Pinellas County. At this one flow gage, the model over predicted flows between the 10th and 70th percentile exceedances. This is not only problematic as far as providing convincing information that the watershed model is correctly calibrated, but this also happens to be the flow gage most heavily impacted by groundwater withdrawals for public water supply. Additional calibration should be done on this watershed model prior to applying the data inputs to smaller subwatersheds, as done for this TMDL.

Response:

Limited hydrology flow data was available for the Crystal Watershed during the modeling time period, therefore data was calibration to one flow gage, USGS 02310000. The error in total volume was 1.22%, indicating the model was able to represent average flow in the Crystal watershed.

Comment:

9. Based on the description of the model calibration provided in EPA 2012a for the water quality portion of the Crystal Watershed model, why was water quality calibration done using water quality data from only three sites? Many more freshwater data are available within this model domain. The watershed water quality model calibration is insufficient to assure us that the model is useful for TMDL development.

Response:

EPA acknowledges that there are additional water quality stations in Crystal. To develop the Coastal Pinellas LSPC model, EPA reviewed measured water quality data and adjusted the calibration as necessary to stations located within 1535 and 1556.

Comment:

10. Why were so few statistical values provided for many of the calibration metrics available for both flow and water quality within the Crystal Watershed calibration discussion (EPA, 2012a)?

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. For the larger Crystal Watershed model, both graphical and evaluative metric were provided in the referenced Technical Support Document, and EPA found the quantity of statistical values to be sufficient.

TMDL Determination

Thomas Gibson and FDOT

Comment:

3. Model results indicate nearly identical DO conditions in the existing condition and the "natural" condition that incorporates the proposed TMDL load reductions. The levels of load reductions identified in the document do not seem warranted based upon this result.

Response:

EPA acknowledges that in the natural condition scenario DO values are still less than 5mg/L. Because the predicted dissolved oxygen concentrations in the natural condition are still below the applicable criteria, there is no assimilative capacity for anthropogenic sources.

Typographical

Thomas Gibson and FDOT

Comment:

4. Since both these WBIDs are marine, inclusion of discussion of the FDEP freshwater NNC is unnecessary and may be confusing.

Response:

The information provided in section 4.1 describes the ongoing efforts of EPA and FDEP to establish numeric nutrient criteria in Florida, which includes both freshwater and marine criteria. The information provided is clear and concise, and the TMDL clearly states that the narrative nutrient criteria is still applicable for this TMDL.

WBID 1633B McKay Creek

Endpoints/Water Quality Targets

Florida Department of Transportation (FDOT)

Comment:

3. At present, Florida is in the process of developing and approving revised DO criteria. While it is recognized that these criteria have not received final approval at this time,

Florida Department of Environmental Protection (FDEP) acknowledged that the current DO standards are not appropriate, which has led to the development of new proposed DO criteria. Given this position regarding the DO standards, the determination that the system would not meet the DO criteria at all times even with a 78 percent reduction in TN loads and 85 percent reduction in TP loads may not reflect the "best science" and may be inappropriate for defining load reductions.

Response:

EPA does acknowledge that Florida has begun the process of changing their dissolved oxygen criteria. Until this process is completed and approved by EPA pursuant to section 303(c) of the CWA, the current water quality standard for dissolved oxygen is effective for Clean Water Act purposes. If and when Florida changes their water quality standard for dissolved oxygen, this TMDL could be re-visited in the future.

Comment:

3. The FDEP freshwater NNC for the Peninsula region, in which this WBID is contained, are TN=1.54 mg/L and TP=0.12 mg/L. During the 2002-2010 period, these criteria were not exceeded by the annual geometric mean values for TN and TP during any year. This indicates that since the criteria are not being exceeded, something other than nutrients is resulting in the DO not meeting the existing State standards, so that basing the TMDL on nutrient reductions is not warranted.

Response:

There are other indices that are measured and compared to Florida's water quality standards which if not met the waterbody is determined to be impaired. Furthermore, Florida's numeric nutrient criteria still provides a provision that nutrients cannot cause a violation of any other water quality standard, this TMDL was done to the dissolved oxygen criteria. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Analytical Approach

Florida Department of Transportation

Comment:

22. Without quantitative measures assuring that the calibration is sufficient to simulate observed responses to observed forcing functions, any additional scenarios involving changes to loadings are not convincing as appropriate potential TMDLs.

Response:

The current total phosphorus calibration is able to meet the overall trends in measured water quality data and does not show significant errors. The current model provides the best calibration that could be achieved given current available watershed data. Therefore,

the model can be used to develop TMDLs.

Comment:

12. Comparison of flow observations to modeled values was presented at sites 21FLPDEM27-10 and 21FLPDEM27-09, which provide limited flow observations. Here, the observed values are all very low in comparison to the modeled flows. There is a USGS gage (02309110) on the creek with daily gage height information since 2003, which could be utilized for comparisons, if not with LSPC output then with the EFDC water surface elevation output. This would seem much more convincing evidence of hydrologic calibration for the creek.

Response:

The observed data was taken during low flow periods, and the current modeled data shows a good fit to data during this period. There was no flow calibration data available during storm events in McKay Creek. The LSPC model has a representative reach defined for each sub-watershed, and the main channel stem within each sub-watershed was used as the representative reach. The characteristics for each reach include the length and slope of the reach, the channel geometry and the connectivity between the sub-watersheds. Each reach is defined as an average, and therefore would not have identical channel geometry to that of USGS gage 02309110, which would prevent comparison of gage height.

Comment:

13. The modeled DO time series used for calibration comparison at 21FLPDEM27-10 and 21FLPDEM27-09 appear to be annually repeating signals, with little variation, as opposed to the observed data, which have a much greater range (Figure 1). This indicates the model is not reproducing observed DO distributions or temporal patterns sufficiently to support that the model is calibrated.

Response:

DO varies at temporal and spatial scales due to many biological, chemical, and physical processes. This variation is often cyclical with annual repeating signals due air temperature which effects the growth of phytoplankton and controls the concentration of DO that can be dissolved in the water column. The measured DO water quality data also have an annual repeating signal for this reason.

Comment:

14. Similarly, comparisons of modeled and observed TN (Figure 2), TP (Figure 3), and total suspended solids (TSS) (Figure 4) at 21FLPDEM27-10 and 21FLPDEM27-09 do not support the contention that the model is calibrated, with the modeled ranges greatly exceeding the observed ranges.

Response:

Most of the measured TSS data in McKay Creek occurs during low flow periods and does not capture storm flow events, when the highest TSS measurements would occur. For this reason, the model is considered to be well calibrated to TSS.

Comment:

15. The only salinity calibration information presented for the hydrodynamic model was for modeled and observed salinity at 21FLPDEM27-01 and 21FLTPA 27541328249207 (Figure 7.17 of EPA, 2013). The simulated salinity does not appear to track the observed salinity well at all, and no distribution comparison of simulated and observed salinity is provided with quantitative statistics to support the contention that the model is calibrated.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. Currently, the model is under predicting salinity at stations 21FLPDEM27-01 and 21FLTPA 27541328249207. However, increasing salinity would have caused the tidal influence to be too high further upstream.

Comment:

17. It is noted in the proposed TMDL report that the water quality parameters from the Tampa Bay WASP7 model were used to populate the McKay Creek WASP7 model. No presentation of the Tampa Bay WASP7 model calibration is provided either here or in EPA 2012b, making it impossible to determine if this parameter set is appropriate.

Response:

EPA describes the data inputs from the larger Tampa Bay Watershed model that were used in the development of the McKay Creek WASP model. The McKay Creek WASP model was available for review as part of the administrative record. Additionally, these reports are available at www.regulations.gov as part of the Florida Numeric Nutrient Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the estuary reports are available in Appendix D: Hydrodynamic and Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments.

Comment:

19. It is noted that the McKay Creek calibration was adjusted to provide the best existing scenario model calibration. At each of the stations for which comparisons were provided, simulated DO followed a very regular pattern from year to year, while observed DO showed considerable inter-annual variation (Figure 5). No quantitative calibration metrics were provided for the comparison of measured and observed DO, so that the capability of the model to simulated observed conditions is not supported.

Response:

DO varies at temporal and spatial scales due to many biological, chemical, and physical processes. This variation is often cyclical with annual repeating signals due air temperature which effects the growth of phytoplankton and controls the concentration of DO that can be dissolved in the water column. The measured DO water quality data also have an annual repeating signal for this reason. EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in

representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

11. Why were so few statistical values provided for many of the calibration metrics available for both flow and water quality, both within the proposed TMDL report (EPA, 2013) and the larger Crystal Watershed calibration discussion (EPA, 2012a)?

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. For the larger Crystal Watershed model, both graphical and evaluative metric were provided in the referenced Technical Support Document, and EPA found the quantity of statistical values to be sufficient.

Comment:

21. No sensitivity analyses were provided for changes in nutrient supplies (TN, TP), BOD, or SOD. This information should be obtained after the model is appropriately calibrated to determine the important drivers of DO dynamics in the system and allow focused effort on effective management.

Response:

EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

16. There are many more salinity data sites in Clearwater Harbor within the hydrodynamic model domain for comparison of modeled and observed data (Janicki Environmental and Atkins, 2011). Utilization of all the available data for quantitative calibration comparison is warranted to support the contention that the model is simulating observed responses to observed forcing functions.

Response:

EPA used data included in IWR because of its data screening process.

Comment:

20. Similarly, no quantitative calibration metrics were provided for the TN, TP, BOD, and Chl a comparison plots of modeled and observed data within the model domain. This is most important for those sites within the freshwater portion of McKay Creek, since the TMDL is being established for this area.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

2. The difference in average DO concentration between the current and "natural" condition model results is less than 0.2 milligrams per liter (mg/L), resulting from a reduction in TN loads of 78 percent and TP loads of 85 percent. Sufficient confidence in the ability of the model to simulate observed conditions has not been provided in this document to produce a convincing argument that such a large reduction in loadings (and the effort associated with achieving this) would result in the predicted small improvement in DO conditions. The observed mean DO of 5.73 mg/L is compared to the existing condition model run output mean DO of 6.94 mg/L, which does not provide sufficient reassurance that the model is sufficiently calibrated for use in TMDL development.

Response:

The current model is able to match the seasonal DO trend in the measured water quality data. EPA determined that while under natural conditions the dissolved oxygen criteria is not met. There is a difference in predicted dissolved oxygen concentrations between the current and natural condition scenarios which indicates anthropogenic sources are causing a depression in dissolved oxygen. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

18. No mention is made of atmospheric deposition of TN and TP loads directly to the surface of the waterbodies modeled. Atmospheric deposition loads in the Tampa Bay area have been shown to be a significant fraction (25 to 40 percent) of the total loading to Tampa Bay, and are likely important considerations when developing the loadings for the WASP model domain in this WBID.

Response:

Atmospheric deposition was included in the WASP model and can be found in WASP.wif file which was available as part of the administrative record.

Comment:

1. EPA uses a series of complex watershed and receiving water models to assess the DO responses to nutrient loads. Based upon a detailed review of the documents presented and other documents describing the model developed for the Florida NNC effort (utilized for this TMDL development), some technical issues were raised relative to the adequacy of the models' calibration and the sufficiency of the documentation to provide assurance that the models are adequately simulating the key processes impacting the end results. While the

documentation provided is extensive and EPA is to be commended for its detailed work, some model development details are not provided, some key model-to-data comparisons are not provided, some methods of model application are not reasonable, and the calibration results presented bring the model into question. Sufficient information is not provided to indicate that the model suite is appropriately calibrated to determine that a 78 percent reduction in total nitrogen (TN) loads and 85 percent reduction in total phosphorus (TP) loads would result in improvement of the DO conditions in the waterbody.

Response:

EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are engineering tools that allow EPA to make informed decisions when determining a TMDL. These tools are very complex and to document every feature, parameter, constant or data point that is used in the model(s) would be very difficult. All of the modeling tools are publically available and include very detailed user's manual that provide a description of the input and how it is used in the model. Initial model constants are set to typical values from like areas where the model has been was applied in the past. During the calibration process it is not uncommon to change several constants to better represent the current area being modeled. EPA believes that the modeling report in the TMDL was sufficient to describe the TMDL analysis. The TMDL report includes calibration results for hydrodynamic and water quality results from the EFDC and WASP models used to develop the McKay Creek TMDL. The natural condition scenario also shows that reducing nutrients in McKay Creek would result in an increase in DO concentrations.

Comment:

10. According to the model calibration provided in EPA 2012a for the water quality portion of the Crystal Watershed model, why was water quality calibration done using water quality data from only three sites? Many more freshwater data are available within this model domain. The watershed water quality model calibration is insufficient to assure us that the model is useful for TMDL development.

Response:

EPA acknowledges that there are additional water quality stations in Crystal. To develop the McKay Creek LSPC model, EPA reviewed measured water quality data and adjusted the calibration as necessary to stations 21FLPDEM27-09 and 21FLPDEM27-10, located within the McKay Creek watershed.

Comment:

1. Why was only the mechanistic modeling approach utilized? Why were empirical/ statistical methods not used to evaluate the existing data to determine if there were utilizable relationships between loadings and DO in the freshwater portion of McKay Creek? Loadings development has been completed for the system for 1985-2008 as part of the Clearwater Harbor and St. Joseph Sound State of the Resource Report (Janicki Environmental and Atkins, 2011), so that data are available for testing of stressor-response models in the system.

Response:

Mechanistic modeling was utilized because it allowed EPA to run numerous scenarios when needed for TMDL development. The calibration of the model to a data collected at different stations during different years. Additionally, it can be difficult to find meaningful relationships between nutrient loadings and DO, particularly in Florida's streams and rivers. This is due to the complexity of nutrient cycling in natural waterbodies, which results in variable time lags between the introduction of nutrients and their uptake and use by algae or other aquatic plants. Nutrients may be stored in sediment and/or organic materials and eventually re-introduced to the water column. Less available forms of nutrients such as organics must be broken down before they can be recycled for uptake. Other considerations include the fact that measuring chlorophyll concentrations in a water sample only provides a "snapshot" of the concentrations at the time and place the sample was taken, and the measurement only captures phytoplankton, the free-floating algae, and will not capture other types such as attached algae (periphyton), algae growing on bottom sediments (benthic), and other aquatic plants (macrophytes). Mechanistic models allowed for the simulation of these complex systems over space and time

Comment:

4. The loading reductions of 78 percent TN and 85 percent TP result in "natural" condition mean TN concentrations of 0.14 mg/L and mean TP concentrations of 0.01 mg/L. Each of these concentrations is less than 10 percent of the inland NNC for the Peninsula region (see Comment 3), suggesting that the stream concentrations of TN and TP must be reduced to levels less than 10 percent of those determined to be appropriate for healthy systems. This does not make sense.

Response:

Please see the response to comment 3.

Comment:

6. When developing the natural condition scenario, EPA reduced sediment oxygen demand (SOD) from the existing condition by the same fraction as Chlorophyll a (Chl a) was reduced in the initial natural condition run compared to the existing condition. No justification is provided for this methodology. It should be recalled that in many systems in the Tampa Bay area, SOD likely results from more than just Chl a, with many systems subjected to inputs of other organic materials that impact SOD.

Response:

When EPA develops the natural condition run, the SOD rate that is used in the natural condition model is attenuated based upon the magnitude of change in the loadings. EPA has developed an SOD response curve which relates changes in expected SOD as a function in the change in loads using a spreadsheet version of Dominic DiToro's sediment diagenesis model.

Comment:

7. Why were no nutrient load reduction scenarios completed to evaluate the effects of differing percentage reductions for TP, while keeping the TN reduction at that represented by the natural condition? Given the nitrogen limitation common in the region, it may well be that the model would show that the outcome was not sensitive to TP load reductions,

and so would indicate that TP load reductions were not needed. A sensitivity analysis to these loads would be very helpful.

Response:

The EPA TMDL loads were calculated to ensure protective values of DO in accordance with the natural condition water quality using the definition of natural background. By reducing all nutrient loads, EPA ensures that DO is protected. EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

9. The LSPC model utilized data inputs from the Crystal Watershed model developed for the Florida NNC effort (EPA, 2012a). Modeled flow output from the Crystal Watershed was calibrated to only one flow gage [U.S. Geological Survey (USGS) 02310000] in the watershed extending from just south of the Withlacoochee River to the southern end of Pinellas County. At this one flow gage, the model overpredicted flows between the 10th and 70th percentile exceedences. This is not only problematic as far as providing convincing information that the watershed model is correctly calibrated, but this also happens to be the flow gage most heavily impacted by groundwater withdrawals for public water supply. Additional calibration should be done on this watershed model prior to applying the data inputs to smaller subwatersheds, as done for this TMDL.

Response:

Limited hydrology flow data was available for the Crystal Watershed during the modeling time period, therefore data was calibration to one flow gage, USGS 02310000. The error in total volume was 1.22%, indicating the model was able to represent average flow in the Crystal watershed.

Comment:

2. The TMDL loads are all based upon the LSPC model simulation of some set of conditions under which the water quality model uses as input "natural" condition loadings. While this is a common practice in TMDL development, there are no assurances that the model is accurately projecting the effects of reduced loads on the water quality in the stream. It would be useful to perform a more rigorous calibration effort of the watershed and waterbody models, providing sufficient calibration metric comparisons to allow for a degree of confidence in the models' responses to inputs. It would also be helpful if a more detailed assessment of the reasonableness of the "natural" conditions was provided.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and a technical approach

to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Typographical

Florida Department of Transportation

Comment:

5. Section 7.2.2 notes that "…point sources located in the model were removed for the natural condition analysis," but there are no facilities permitted through the National Pollutant Discharge Elimination System (NPDES) in this WBID.

Response:

There are no NPDES permitted facilities in the WBID, and this sentence has been removed.

Comment:

8. The City of St. Petersburg is not in the McKay Creek watershed, contrary to the last table on page vi.

Response:

This has been updated in the report.

WBID 1662 Pinellas Park Ditch

Endpoints/Water Quality Targets

Florida Department of Transportation and Pinellas County

Comment:

3. At present, Florida is in the process of developing and approving revised DO criteria. While it is recognized that these criteria have not received final approval at this time, Florida Department of Environmental Protection (FDEP) acknowledged that the current DO standards are not appropriate, which has led to the development of new proposed DO criteria. Given this position regarding the DO standards, the determination that the system would not meet the DO criteria at all times even with an 80 percent reduction in TN loads, an 85 percent reduction in TP loads, and a 67 percent reduction in BOD loads may not reflect the "best science" and may be inappropriate for defining load reductions.

Response:

EPA does acknowledge that Florida has begun the process of changing their dissolved oxygen criteria. Until this process is completed and approved by EPA pursuant to section 303(c) of the CWA, the current water quality standard for dissolved oxygen is effective for

Clean Water Act purposes. If and when Florida changes their water quality standard for dissolved oxygen, this TMDL could be re-visited in the future.

Analytical Approach

Florida Department of Transportation and Pinellas County

Comment:

17. Why were salinity data from the Pinellas County sites within the Cross Bayou Canal not utilized for establishment of boundary conditions?

Response:

Salinity data from sites within Pinellas County were used to establish boundary conditions. These sites were taken from outside the models domain.

Comment:

18. In Section 7.1.3 of the proposed TMDL document, it is noted that the speciation of TN and TP was accomplished using proportions derived from Bullfrog Creek watershed water quality data. Bullfrog Creek is on the eastern side of Tampa Bay, where land use and underlying geological formations are considerably different than in the Pinellas Park Ditch No. 1 and Cross Bayou watershed. Why were the water quality data from Pinellas Park Ditch No. 1 watershed or the adjacent Cross Bayou Canal watershed not used to accomplish this speciation?

Response:

This is a typographical error and the report, and it has been updated.

Comment:

19. What information was used to establish the water quality boundary conditions in the Cross Bayou Canal, both at the northeastern and southwestern boundaries? No description of this is provided. There are Pinellas County monitoring sites throughout the Cross Bayou Canal that could provide this information.

Response:

Water quality loading from the LSPC models were input into the northeastern and southwestern boundaries.

Comment:

20. It is noted in the proposed TMDL report that the water quality parameters from the Tampa Bay WASP7 model were used to populate the Pinellas Park Ditch No. 1 model. No presentation of the Tampa Bay WASP7 model calibration is provided either here or in EPA 2012b, making it impossible to determine if this parameter set is appropriate.

Response:

EPA describes the data inputs from the larger Tampa Bay Watershed model that were used in the development of the Bullfrog Creek WASP model. The Pinellas Park Ditch WASP model was available for review as part of the administrative record. Additionally, these reports are available at www.regulations.gov as part of the Florida Numeric Nutrient

Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the estuary reports are available in Appendix D: Hydrodynamic and Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments.

Comment:

21. No mention is made of atmospheric deposition of TN and TP loads directly to the surface of the waterbodies modeled. Atmospheric deposition loads in the Tampa Bay area have been shown to be a significant fraction (25 to 40 percent) of the total loading to Tampa Bay, and are likely important considerations when developing the loadings for the WASP model domain in this WBID.

Response:

Atmospheric deposition was included in the WASP model and can be found in WASP.wif file which was available as part of the administrative record.

Comment:

22. It is noted that the Pinellas Park Ditch No. 1 calibration was adjusted to provide the best existing scenario model calibration. At the one station for which comparisons were provided, no quantitative calibration metrics were provided for the comparison of measured and observed DO, so that the capability of the model to simulated observed conditions is not supported.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

23. The text notes that the model was calibrated to four water quality stations, but the figures only provide one station for comparison. Where are the other three stations located and why were figures not provided for these comparisons as well?

Response:

This is a typographical mistake and has been corrected in the report.

Comment:

24. Similarly, no quantitative calibration metrics were provided for the TN, TP, BOD, and Chl a comparison plots of modeled and observed data within the model domain.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

16. The only salinity calibration information presented for the hydrodynamic model was for modeled and observed salinity at 21FLTPA 27510058244141 (Figure 7.8 of EPA, 2013). Given the relatively short time period of measured data, why were data from the Cross Bayou Canal not utilized as additional calibration comparison? Distribution comparisons of simulated and observed salinity with quantitative statistics from sites within WBID 1662 and within the remainder of the hydrodynamic model domain should be used to support the contention that the model is calibrated.

Response:

The calibration presented data of interest in the impaired WBID at station 21FLTPA 27510058244141. The model was calibrated to salinity and temperature in Pinellas Park Ditch. The calibration at this location shows that the model is able to represent the hydrodynamics, correctly estimating the tidal amplitude in the salinity plot.

Comment:

1. EPA uses a series of complex watershed and receiving water models to assess the DO responses to nutrient loads. Based upon a detailed review of the documents presented and other documents describing the model developed for the Florida NNC effort (utilized for this TMDL development), some technical issues were raised relative to the adequacy of the models' calibration and the sufficiency of the documentation to provide assurance that the models are adequately simulating the key processes impacting the end results. While the documentation provided is extensive and EPA is to be commended for its detailed work, some model development details are not provided, some key model-to-data comparisons are not provided, some methods of model application are not reasonable, and the calibration results presented bring the model into question. Sufficient information is not provided to indicate that the model suite is appropriately calibrated to determine that an 80 percent reduction in total nitrogen (TN) loads, an 85 percent reduction in total phosphorus (TP) loads, and a 67 percent reduction in biochemical oxygen demand (BOD) loads would result in improvement of the DO conditions in the waterbody.

Response:

EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are engineering tools that allow EPA to make informed decisions when determining a TMDL. These tools are very complex and to document every feature, parameter, constant or data point that is used in the model(s) would be very difficult. All of the modeling tools are publically available and include very detailed user's manual that provide a description of the input and how it is used in the model. Initial model constants are set to typical values from like areas where the model has been was applied in the past. During the calibration process it is not uncommon to change several constants to better represent the current area being modeled. The documentation of the larger Tampa Bay Watershed and EFDC models are available at www.regulations.gov as part of the Florida Numeric Nutrient Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the estuary reports are available in Appendix D: Hydrodynamic and

Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments. EPA believes that the modeling report in the TMDL was sufficient to describe the TMDL analysis. The TMDL report includes calibration results for hydrodynamic and water quality results from the EFDC and WASP models used to develop the Pinellas Park Ditch TMDL. The natural condition scenario also shows that reducing nutrients in Pinellas Park Ditch would result in an increase in DO concentrations.

Comment:

6. Why were no nutrient load reduction scenarios completed to evaluate the effects of differing percentage reductions for TP, while keeping the TN reduction at that represented by the natural condition? Given the nitrogen limitation common in the region, it may well be that the model would show that the outcome was not sensitive to TP load reductions, and so would indicate that TP load reductions were not needed. A sensitivity analysis to these loads would be very helpful.

Response:

The EPA TMDL loads were calculated to ensure protective values of DO in accordance with the natural condition water quality using the definition of natural background. By reducing all nutrient loads, EPA ensures that DO is protected. EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

25. The assumption directing the modeling effort for this proposed TMDL is that reduction of nutrient loads will improve DO conditions. A report prepared for Pinellas County by Atkins, Inc., (Atkins, 2012), and provided in the County's comments to EPA previously (August 2012), showed no strong relationships between potential causative water quality constituents (TN, TP, and BOD) and DO. Pinellas Park Ditch No. 1 (WBID 1662) was included on the Group 5, Cycle 2 list of waters proposed for delisting for nutrients from the current 303(d) list based on Chl a values less than 11 micrograms per liter (µg/L), as 17 of the 23 samples from this WBID were below the detection limit.

Response:

The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b). Additionally, EPA does agree that chlorophyll a levels are low in Pinellas Park Ditch. This TMDL was done to protect anthropogenic sources from causing or contributing to dissolved oxygen concentrations below the States criteria.

Comment:

15. Why is the grid system presented in Figure 7.7 of the report (EPA, 2013) not better refined to more accurately represent the Cross Bayou Canal and associated adjacent and connected waterbodies? It seems that only a little additional effort would be necessary to

refine the grid system to more accurately represent the volume of the canal system and the connectedness of adjacent connected pools, instead of representing the 30 to 70 meter (m) wide canal by cells 200 to 300 m wide, as indicated in the geographic information system (GIS) and model input files provided by EPA.

Response:

The grid was created to represent the major tributaries and inputs that could influence Pinellas Park Ditch. A finer resolution grid which took into account the detailed canal system and connected pools would change the overall hydrodynamic and water quality calibration. The model was calibrated to salinity and temperature in Pinellas Park Ditch, indicating that the current grid and simulation is appropriate.

Comment:

14. Comparisons of modeled and observed TN and TP (Figures 7.5 and 7.6 of EPA 2013) show the modeled ranges greatly exceeding the observed ranges.

Response:

Overall, the model is able to match the trends in TN and TP. The model rarely predicts TN concentrations greater than 2 mg/L and TP concentrations greater than 0.2 mg/L, and most of the high nutrient concentrations occur during high flow events in the summer.

Comment:

13. The modeled DO time series used for calibration comparison at 21FLTPA 27510058244141 appears to be an annually repeating signal, with little variation. Do the data in the adjacent Cross Bayou Canal show similar repeating signals?

Response:

DO varies at temporal and spatial scales due to many biological, chemical, and physical processes. This variation is often cyclical with annual repeating signals due air temperature which effects the growth of phytoplankton and controls the concentration of DO that can be dissolved in the water column. The annual repeating signals occur throughout the model, including Cross Bayou Canal.

Comment:

12. Why were so few statistical values provided for many of the calibration metrics available for both flow and water quality, both within the proposed TMDL report (EPA, 2013) and the larger Crystal Watershed calibration discussion (EPA, 2012a)?

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. For the larger Crystal Watershed model, both graphical and evaluative metric were provided in the referenced Technical Support Document, and EPA found the quantity of statistical values to be sufficient.

Comment:

11. According to the model calibration provided in EPA 2012a for the water quality portion of the Crystal Watershed model, why was water quality calibration done using water quality data from only three sites? Many more freshwater data are available within this model domain. The watershed water quality model calibration is insufficient to assure that the model is useful for TMDL development.

Response:

EPA acknowledges that there are additional water quality stations in Crystal. To develop the Pinellas Park Ditch LSPC model, EPA reviewed measured water quality data and adjusted the calibration as necessary to station 21FLTPA 27510058244141, located within WBID 1662.

Comment:

9. The simulation period is noted as January 1, 2002 to December 31, 2009, but the time series of LSPC model output are from January 2000 to December 2009.

Response:

The simulation period of the WASP and EFDC models are from January 2002 through December 2009, but the LSPC model simulation is from January 2000 through December 2009.

Comment:

5. When developing the natural condition scenario, EPA reduced sediment oxygen demand (SOD) from the existing condition by the same fraction as Chlorophyll a (Chl a) was reduced in the initial natural condition run compared to the existing condition. No justification is provided for this methodology. It should be recalled that in many systems in the Tampa Bay area, SOD likely results from more than just Chl a, with many systems subjected to inputs of other organic materials that impact SOD.

Response:

When EPA develops the natural condition run, the SOD rate that is used in the natural condition model is attenuated based upon the magnitude of change in the loadings. EPA has developed an SOD response curve which relates changes in expected SOD as a function in the change in loads using a spreadsheet version of Dominic DiToro's sediment diagenesis model.

Comment:

3. The link between nutrient loads and DO condition through chlorophyll is not well supported by this modeling effort. The simulated existing condition chlorophyll does not accurately reproduce the measured data (see Figure 7.14 of the proposed TMDL report, EPA 2013), suggesting that the nutrient and DO dynamics of the system are not being accurately represented in the modeling effort.

Response:

Please see EPA's general response to comments received regarding the impacts on this TMDL of ongoing activities to establish numeric nutrient criteria in Florida. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved

oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

2. Sufficient confidence in the ability of the model to simulate observed conditions has not been provided in this document to produce a convincing argument that such a large reduction in loadings (and the effort associated with achieving this) will result in the predicted small improvement in DO conditions. The observed mean DO of 4.86 milligrams per liter (mg/L) can be compared to the existing condition model run output mean DO of 5.70 mg/L, which does not provide sufficient reassurance that the model is sufficiently calibrated for use in TMDL development.

Response:

The current model is able to match the seasonal DO trend in the measured water quality data. EPA determined that while under a natural conditions the dissolved oxygen criteria is not met. There is a difference in predicted dissolved oxygen concentrations between the current and natural condition scenarios which indicates anthropogenic sources are causing a depression in dissolved oxygen. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

1. Why was only the mechanistic modeling approach utilized? Why were empirical/ statistical methods not used to evaluate the existing data to determine if there were utilizable relationships between loadings and DO in Pinellas Park Ditch No. 1? Loadings development has been completed for the system for 1985-2011 as part of the Tampa Bay Estuary Program Reasonable Assurance process, so data are available for testing of stressor-response models in the system.

Response:

Mechanistic modeling was utilized because it allowed EPA to run numerous scenarios when needed for TMDL development. The calibration of the model to a data collected at different stations during different years. Additionally, it can be difficult to find meaningful relationships between nutrient loadings and DO, particularly in Florida's streams and rivers. This is due to the complexity of nutrient cycling in natural waterbodies, which results in variable time lags between the introduction of nutrients and their uptake and use by algae or other aquatic plants. Nutrients may be stored in sediment and/or organic materials and eventually re-introduced to the water column. Less available forms of nutrients such as organics must be broken down before they can be recycled for uptake. Other considerations include the fact that measuring chlorophyll concentrations in a water

sample only provides a "snapshot" of the concentrations at the time and place the sample was taken, and the measurement only captures phytoplankton, the free-floating algae, and will not capture other types such as attached algae (periphyton), algae growing on bottom sediments (benthic), and other aquatic plants (macrophytes). Mechanistic models allowed for the simulation of these complex systems over space and time.

Comment:

2. The TMDL loads are all based upon the LSPC model simulation of some set of conditions under which the water quality model uses as input "natural" condition loadings. While this is a common practice in TMDL development, there are no assurances that the model is accurately projecting the effects of reduced loads on the water quality in the stream. It would be useful to perform a more rigorous calibration effort of the watershed and waterbody models, providing sufficient calibration metric comparisons to allow for a degree of confidence in the models' responses to inputs. It would also be helpful if a more detailed assessment of the reasonableness of the "natural" conditions was provided.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and a technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Comment:

27. Without quantitative measures assuring that the calibration is sufficient to simulate observed responses to observed forcing functions, any additional scenarios involving changes to loadings are not convincing as appropriate potential TMDLs.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. The graphical results presented in the TMDL are within range of the measured results and represent the water quality and hydrodynamic trends present in the model, indicating that the model calibration is sufficient for determining TMDL load reductions.

Comment:

10. The LSPC model utilized data inputs from the Crystal Watershed model developed for the Florida NNC effort (EPA, 2012a). Modeled flow output from the Crystal Watershed was calibrated to only one flow gage (USGS 02310000) in the watershed extending from just south of the Withlacoochee River to the southern end of Pinellas County. At this one

flow gage, the model over predicted flows between the 10th and 70th percentile exceedences. This is not only problematic as far as providing convincing information that the watershed model is correctly calibrated, but this also happens to be the flow gage most heavily impacted by groundwater withdrawals for public water supply. Additional calibration should be done on this watershed model prior to applying the data inputs to smaller subwatersheds, as done for this TMDL.

Response:

Limited hydrology flow data was available for the Crystal Watershed during the modeling time period, therefore data was calibration to one flow gage, USGS 02310000. The error in total volume was 1.22%, indicating the model was able to represent average flow in the Crystal watershed.

Comment:

26. No sensitivity analyses were provided for changes in nutrient supplies (TN, TP), BOD, or SOD. This information should be obtained after the model is appropriately calibrated to determine the important drivers of DO dynamics in the system and allow focused effort on effective management.

Response:

EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Typographical

Florida Department of Transportation and Pinellas County

Comment:

8. Since this WBID is marine, inclusion of discussion of the FDEP freshwater NNC is unnecessary and may be confusing.

Response:

The information provided in section 4.1 describes the ongoing efforts of EPA and FDEP to establish numeric nutrient criteria in Florida, which includes both freshwater and marine criteria. The information provided is clear and concise, and the TMDL clearly states that the narrative nutrient criterion is still applicable for this TMDL.

Comment:

7. Section 3.3 mentions the Anclote River drainage area. This should be the Pinellas Park Ditch No. 1 drainage area.

Response:

This has been corrected in the TMDL report.

Comment:

4. Section 7.2.2 notes that "…point sources located in the model were removed for the natural condition analysis," but there are no facilities permitted through the National Pollutant Discharge Elimination System (NPDES) in this WBID.

Response:

There are no NPDES permitted facilities in the WBID, and this sentence has been removed.

WBID 1666A Bullfrog Creek

General

Michael Williams (Hillsborough County) and FDOT

Comment:

4. Section 7.2.2 notes that "…point sources located in the model were removed for the natural condition analysis", but there are no NPDES-permitted facilities in this WBID.

Response:

There is NPDES permit FLS000006 in the area.

Endpoints/Water Quality Targets

Michael Williams (Hillsborough County) and FDOT

Comment:

3. At present, Florida is in the process of developing and approving revised DO criteria. While it is recognized that these criteria have not received final approval at this time, Florida Department of Environmental Protection (FDEP) acknowledged that the current DO standards are not appropriate, which has led to the development of new, proposed DO criteria. Given this position regarding the DO standards, the determination that the system would not meet the DO criteria even with significant reductions in TN, TP, and BOD loads does not reflect the "best science" and is inappropriate for defining load reductions.

Response:

EPA does acknowledge that Florida has begun the process of changing their dissolved oxygen criteria. Until this process is completed and approved by EPA pursuant to section 303(c) of the CWA, the current water quality standard for dissolved oxygen is effective for Clean Water Act purposes. If and when Florida changes their water quality standard for dissolved oxygen, this TMDL could be re-visited in the future.

Analytical Approach

Michael Williams (Hillsborough County) and FDOT

Comment:

25. It is also noted that the Bullfrog Creek calibration was adjusted to provide the best existing scenario model calibration. At the estuarine station for which comparison was provided, simulated DO followed a very regular pattern from year to year, while observed DO showed considerable inter-annual variation and a greater annual range (Figure 4). No quantitative calibration metrics were provided for the comparison of measured and observed DO, so that the capability of the model to simulated observed conditions is not supported.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. EPA reviewed the DO calibration for Bullfrog Creek and found that the model was sufficiently representing the annual trends in DO.

Comment:

17. The only salinity calibration information presented for the hydrodynamic model was for modeled and observed salinity at 21FLHILL144, in the estuarine portion of Bullfrog Creek. No distribution comparison of simulated and observed salinity is provided with quantitative statistics to support the contention that the model is calibrated.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. EPA reviewed the salinity calibration at 21FLHILL144 and felt that it accurately represented the tidal fluxes in the WBID.

Comment:

18. The plot of modeled and observed salinity at 21FLHILL144 shows missing salinity data for 2004-2005 and 2006-2007. The water quality database obtained directly from the Environmental Protection Commission of Hillsborough County (EPCHC) contains both bottom and surface salinity for these periods. For some reason the Impaired Waters Rule (IWR) database does not include these data. However, the IWR database does contain specific conductance from these periods, from which associated salinity values can be

calculated. Filling the missing data periods with observed data would allow for more observed data for a comparison of modeled and observed salinity distributions.

Response:

Currently the plot shows data for four years during the calibration period which EPA is sufficient to support the calibration. EPA used data included in IWR because of its data screening process. EPCHC should review its data and contact FDEP for inclusion of the salinity data in IWR.

Comment:

19. The plot of modeled and observed salinity contains observed data collected near the bottom. No similar plot is provided for surface salinity, although the model does contain two vertical layers. Use of all the observed data in comparison to model output would provide a better evaluation of the model's calibration status.

Response:

Please see response to comment 18.

Comment:

20. Additional salinity data within the model domain in Tampa Bay are available from various monitoring programs and would be useful for supporting model calibration. Utilization of all the available data for quantitative calibration comparison is warranted in support of the contention that the model is simulating observed responses to observed forcing functions.

Response:

Please see response to comment 18.

Comment:

16. The Tampa Bay EFDC model created for Florida NNC was utilized for the Bullfrog Creek model. However, no presentation of the Tampa Bay EFDC model was provided in the Technical Support Document (TSD) (EPA, 2012b), so the appropriateness of this model and associated parameter set for use in TMDL evaluation cannot be determined.

Response:

EPA describes the data inputs from the larger Tampa Bay Watershed model that were used in the development of the Bullfrog Creek EFDC model. Additionally, these reports are available at www.regulations.gov as part of the Florida Numeric Nutrient Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the estuary reports are available in Appendix D: Hydrodynamic and

Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments.

Comment:

24. It is unclear how the WASP and EFDC model grid cells are appropriate representations of the estuarine portion of Bullfrog Creek. As provided in Figure 7.7 of the proposed TMDL document, the downstream-most tidal stream cells are very wide and only incorporate one of the channels of the estuarine creek. Without appropriate representation of the physiography of the stream, even given appropriate loadings from the watershed, it is unlikely that water quality can be simulated successfully.

Response:

Please see response to comment 21.

Comment:

21. Comparison of the grid system provided in the proposed TMDL document [and the model input files and geographic information system (GIS) grid coverage] to aerial photographs of Bullfrog Creek show that the multiple channels of the tidal area and the associated mangrove islets separating the channels were all accounted for as water cells in the model. It is very important to accurately represent the physiography of this system when attempting to simulate water quality conditions, as the volume of a water segment/grid is essential in determining the concentration resulting from loadings and exchange with Tampa Bay proper. The most downstream cell within the Bullfrog Creek model grid has a north-south extent of more than 350 meters (m), whereas the total combined channel width here is on the order of 100 to 150 m.

Response:

The grid was created based on shorelines. A finer resolution grid which took into account all the small mangrove inlets and channels would not alter the overall hydrology and water quality representation within Bullfrog Creek. The model was calibrated to salinity and temperature upstream of the inlet area in Bullfrog Creek with respect to water quality, and calibration at this point shows that the model is not overestimating tidal amplitude within the Creek, indicating that the current grid and simulation is appropriate.

Comment:

26. Similarly, no quantitative calibration metrics were provided for the TN, TP, and Chl a comparison plots of modeled and observed data within the model domain. TN appears to be over predicted, TP under predicted during the first half of the time period, and Chl a under predicted for the entire period.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

27. No sensitivity analyses were provided for changes in nutrient supplies (TN, TP), BOD, or SOD. This information should be obtained after the model is appropriately calibrated, to determine the important drivers of DO dynamics in the system and allow focused effort on effective management.

Response:

EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

28. Without quantitative measures assuring that the calibration is sufficient to simulate observed responses to observed forcing functions, any additional scenarios involving changes to loadings are not convincing as appropriate potential TMDLs.

Response:

As stated previously, EPA believes that the model is well calibrated and has provided graphical comparison of model to measured water quality data, which is considered to be the best calibration to all observed data at all stations.

Comment:

1. EPA uses a series of complex watershed and receiving water models to assess the DO responses to nutrient and organic carbon [biochemical oxygen demand (BOD)] loads. Based upon a detailed review of the documents presented and other documents describing the models developed for the Florida NNC effort (utilized for this TMDL development), some technical issues were raised relative to the adequacy of the models' calibration and the sufficiency of the documentation to provide assurance that the models are adequately simulating the key processes impacting the end results. No documentation is provided for the Tampa Bay Watershed or EFDC models in the EPA NNC documents, so no assessment of the calibration status of these large models is possible. For the models utilized in the TMDL proposal, some model development details are not provided, some key model-to-data comparisons are not provided, some methods of model application are not reasonable, and some of the calibration/validation results presented bring the model into

question. Sufficient information is not provided to indicate that the model suite is appropriately calibrated to determine that a 65 percent reduction in total nitrogen (TN) loads, a 93 percent reduction in total phosphorus (TP) loads, and a 33 percent reduction in BOD loads would result in DO conditions corresponding to "natural" conditions.

Response:

EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are engineering tools that allow EPA to make informed decisions when determining a TMDL. These tools are very complex and to document every feature, parameter, constant or data point that is used in the model(s) would be very difficult. All of the modeling tools are publically available and include very detailed user's manual that provide a description of the input and how it is used in the model. Initial model constants are set to typical values from like areas where the model has been was applied in the past. During the calibration process it is not uncommon to change several constants to better represent the current area being modeled. The documentation of the larger Tampa Bay Watershed and EFDC models are available at www.regulations.gov as part of the Florida Numeric Nutrient Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the estuary reports are available in Appendix D: Hydrodynamic and Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments. EPA believes that the modeling report in the TMDL was sufficient to describe the TMDL analysis. The TMDL report includes calibration results for hydrodynamic and water quality results from the EFDC and WASP models used to develop the Bullfrog Creek TMDL. The natural condition scenario also shows that reducing nutrients in Smacks Bayou would result in an increase in DO concentrations.

Comment:

22. It is noted in the proposed TMDL report that the water quality parameters from the Tampa Bay WASP7 model were used to populate the Bullfrog Creek WASP7 model. No presentation of the Tampa Bay WASP7 model calibration is provided either here or in EPA 2012b, making it impossible to determine if this parameter set is appropriate.

Response:

EPA describes the data inputs from the larger Tampa Bay Watershed model that were used in the development of the Bullfrog Creek WASP model. The Bullfrog Creek WASP model was available for review as part of the administrative record. Additionally, these reports are available at www.regulations.gov as part of the Florida Numeric Nutrient Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the estuary reports are available in Appendix D: Hydrodynamic and

Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments.

Comment:

2. The TMDL loads are all based upon the LSPC model simulation of some set of conditions under which the water quality model uses as input "natural" condition loadings. While this is a common practice in TMDL development, there are no assurances that the model is accurately projecting the effects of reduced loads on the water quality in the stream. It would be useful to perform a more rigorous calibration effort of the watershed and waterbody models, providing sufficient calibration metric comparisons to allow for a degree of confidence in the models' responses to inputs. A more detailed assessment of the reasonableness of the "natural" condition should also be provided.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and a technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Comment:

14. The modeled DO signals provided for proof of calibration of the watershed model are not in the WBID of interest, but upstream in the freshwater portion of Bullfrog Creek, at 21FLHILL132. Here, modeled DO data appear to be an annually repeating signal, with little variation, as opposed to the observed data, which have a greater range (Figure 1). This indicates the model is not reproducing observed DO distributions or temporal patterns sufficiently to support that the model is calibrated. The watershed water quality model calibration is insufficient to assure us that the model is useful for TMDL development.

Response:

EPA calibrated the WASP model, which can simulate the hydrodynamics in the marine portion, to DO in WBID 1666A at station 21FLHILL 144. The LSPC model provided watershed loadings from the Bullfrog Creek watershed, and was calibrated to the freshwater water quality sites. The measured water quality data also have an annual repeating signal, which the LSPC model simulated.

Comment:

13. Why were no statistical values provided for any calibration metrics available for both flow and water quality within the proposed TMDL report (EPA, 2013) and the larger Tampa Bay Watershed model?

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. However, for the larger Tampa Watershed model, both graphical and evaluative metric were provided in the referenced Technical Support Document. Calibration metrics were available for the larger Tampa Bay Watershed model in the Technical Support Document for the Florida Numeric Nutrient Criteria which is available on www.regulations.gov.

Comment:

12. Similarly, no information is provided regarding the calibration of the water quality portion of the LSPC model for the Tampa Bay Watershed, so no assessment of the parameterization is possible.

Response:

The TMDL report presents calibration plots for water quality calibration in Bullfrog Creek. The model was available as part of the administrative record for this TMDL and contains the model parameterization. This information was made available to FDOT.

Comment:

11. The proposed TMDL document notes that the Bullfrog Creek watershed model was parameterized based on the Tampa Bay Watershed model, which was calibrated from continuous flow USGS gages. This calibration information is not provided here nor in the EPA 2012a document, so no assessment of this parameterization is possible.

Response:

The Bullfrog Creek Model utilized the parameterization from the larger Tampa Bay Watershed model. The Tampa Bay Watershed model did evaluate flow at USGS gage 02300700. These figures have been included in the TMDL report. The model was available as part of the administrative record for this TMDL and contains the model parameterization. This information was made available to FDOT.

Comment:

10. Why were the daily U.S. Geological Survey (USGS) flow data available at 02300700 (Bullfrog Creek near Wimauma FL; 1977 - Current) not utilized to evaluate flow

calibration of the watershed model? Similarly, why was the USGS gage height data available at 02300703 (Bullfrog Creek near Riverview FL; 2003 - Current) not utilized to evaluate either the LSPC model or the hydrodynamic model?

Response:

The Bullfrog Creek Model utilized the parameterization from the larger Tampa Bay Watershed model. The Tampa Bay Watershed model did evaluate flow at USGS gage 02300700. These figures have been included in the TMDL report.

Comment:

9. The LSPC model utilized data inputs from the Tampa Bay Watershed model developed for the Florida NNC effort (EPA, 2012a), although this specific watershed model was not utilized or described in the EPA 2012a document. No calibration information was presented for the Tampa Bay Watershed model, from which input data were used for the Bullfrog Creek watershed model.

Response:

These reports are available at www.regulations.gov as part of the Florida Numeric Nutrient Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the estuary reports are available in Appendix D: Hydrodynamic and Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments. In the TMDL report, EPA describes the data inputs from the larger Tampa Bay Watershed model that were used in the development of the Bullfrog Creek LSPC model.

Comment:

15. Similarly, comparisons of modeled and observed TN (Figure 2) and TP (Figure 3) at 21FLHILL132, in the freshwater portion of Bullfrog Creek upstream of the TMDL WBID, do not support that the model is calibrated, with the modeled values typically greater by a factor of 2 than the observed values.

Response:

EPA believes the model is well calibrated and is able to present the overall trends in measured total nitrogen entering the system. The current model provides the best calibration that could be achieved given current available watershed data and available calibration time at the Horse Creek stations.

Comment:

1. Why was only the mechanistic modeling approach utilized? Why weren't empirical/statistical methods used to evaluate the existing data to determine if there were

utilizable relationships between loadings and DO in the tidal portion of Bullfrog Creek? Loadings development has been completed for the system for 1985-2011 as part of the Tampa Bay Estuary Program Reasonable Assurance process, so that data are available for testing of stressor-response models in the system.

Response:

Mechanistic modeling was utilized because it allowed EPA to run numerous scenarios when needed for TMDL development. The calibration of the model to a data collected at different stations during different years. Additionally, it can be difficult to find meaningful relationships between nutrient loadings and DO, particularly in Florida's streams and rivers. This is due to the complexity of nutrient cycling in natural waterbodies, which results in variable time lags between the introduction of nutrients and their uptake and use by algae or other aquatic plants. Nutrients may be stored in sediment and/or organic materials and eventually re-introduced to the water column. Less available forms of nutrients such as organics must be broken down before they can be recycled for uptake. Other considerations include the fact that measuring chlorophyll concentrations in a water sample only provides a "snapshot" of the concentrations at the time and place the sample was taken, and the measurement only captures phytoplankton, the free-floating algae, and will not capture other types such as attached algae (periphyton), algae growing on bottom sediments (benthic), and other aquatic plants (macrophytes). Mechanistic models allowed for the simulation of these complex systems over space and time.

Comment:

2. Sufficient confidence in the ability of the model to simulate observed conditions has not been provided in this document to produce a convincing argument that such a large reduction in loadings (and the effort associated with achieving this) will result in the predicted small improvement in DO conditions. The observed mean DO of 4.33 milligrams per liter (mg/L) can be compared to the existing condition model run output mean DO of 5.02 mg/L, which does not provide sufficient reassurance that the model is sufficiently calibrated for use in TMDL development. Without this reassurance, reliance on the model results to support a simulated increase of 0.10 mg/L in DO (from the mean 5.02 mg/L of the simulated current condition to the mean 5.12 mg/L of the simulated "natural" condition) resulting from such extreme load reductions is not reasonable.

Response:

The current model is able to match the seasonal DO trend in the measured water quality data, as shown in Figure 7.10. EPA determined that while under a natural conditions the dissolved oxygen criteria is not met. There is a difference in predicted dissolved oxygen concentrations between the current and natural condition scenarios which indicates anthropogenic sources are causing a depression in dissolved oxygen. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved

oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

3. The link between nutrient loads and DO condition through chlorophyll is not well supported by this modeling effort. The simulated existing condition chlorophyll does not accurately reproduce the measured data (see Figure 7.14 of the proposed TMDL report, EPA 2013), suggesting that the nutrient and DO dynamics of the system are not being accurately represented in the modeling effort.

Response:

This TMDL determined that the applicable water quality standards were not met under a natural condition. The conclusion would be that no anthropogenic sources are causing the impairment. But because the applicable water quality standards are not being met there is no assimilative capacity for anthropogenic sources.

Comment:

23. No mention is made of atmospheric deposition of TN and TP loads directly to the surface of the waterbodies modeled. Atmospheric deposition loads in the Tampa Bay area have been shown to be a significant fraction (25 to 40 percent) of the total loading to Tampa Bay, and are likely important considerations when developing the loadings for the WASP model domain in this WBID.

Response:

Atmospheric deposition was included in the WASP model and can be found in WASP.wif file which was available as part of the administrative record.

Comment:

5. When developing the "natural" condition scenarios, EPA reduced sediment oxygen demand (SOD) from the existing condition by the same fraction as which chlorophyll a (Chl a) was reduced compared to the existing condition. No justification is provided for this methodology. It should be recalled that in many systems in the Tampa Bay area, SOD likely results from more than just Chl a, with many systems subjected to inputs of other organic materials that impact SOD.

Response:

EPA agrees that SOD changes based on input of organic materials. The methodology to reduce SOD in the natural condition run uses a Chl a ratio, but Chl a is influenced by the

nutrient loading contributions entering Smack Bayou. The methodology to reduce SOD is commonly utilized by the Florida Department of Environmental Protection, and was also been used by the Army Corps of Engineers and has been supported in papers and reports, including Steven Chapra's Surface Water-Quality Modeling.

TMDL Determination

Michael Williams (Hillsborough County) and FDOT

Comment:

6. Why were no nutrient load reduction scenarios completed to evaluate different combinations of reductions? Given the nitrogen limitation common in the region, it may well be that the model would show that only the TN load would need to be reduced. Similarly, what were the relative impacts of reducing TN, TP, and BOD loads? A sensitivity analysis to these loads should be done.

Response:

The EPA TMDL loads were calculated to ensure protective values of DO in accordance with the natural condition water quality using the definition of natural background. By reducing all nutrient loads, EPA ensures that DO is protected. EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Typographical

Michael Williams (Hillsborough County) and FDOT

Comment:

8. There are numerous occurrences of "Error! Reference source not found." within the document, when a figure should be referenced.

Response:

This has been corrected in the TMDL report.

Comment:

7. Since this WBID is marine, inclusion of discussion of the FDEP freshwater NNC is unnecessary and confusing.

Response:

The information provided in section 4.1 describes the ongoing efforts of EPA and FDEP to establish numeric nutrient criteria in Florida, which includes both freshwater and marine criteria. The information provided is clear and concise, and the TMDL clearly states that the narrative nutrient criterion is still applicable for this TMDL.

WBID 1716A/1716B/1716C/1716D Clam Bayou

General

Thomas Gibson (City of St. Petersburg), Pinellas County and FDOT

Comment:

1) The City objects to these TMDLs because significant and costly watershed restoration and stormwater water quality treatment ponds have been completed. The main purpose of this project is to improve water quality discharging to Clam Bayou and thence to Boca Ciega Bay, the downstream receiving waterbody for the Clam Bayou watershed. To establish a TMDL without consideration of this project is premature and potentially not appropriate and does not recognize the significant, long-term efforts and public investments in improving water quality made by the City and SWFWMD.

Response:

EPA acknowledges the ongoing effort by the City to improve water quality in Clam Bayou. However, the current TMDL indicates that additional progress can still be made to improve water quality. At this time, sampling is just commencing, and adequate data is not available to assess the potential benefits of the ongoing project. At present though, the TMDL must be established pursuant to the schedule of EPA's commitments in the 1998 Consent Decree in the Florida TMDL lawsuit (Florida Wildlife Federation, et al. v. Carol Browner, et al., Civil Action No. 4: 98CV356-WS, 1998). However, the TMDL may be revised if additional data or information becomes available. As the restoration work continues to improve water quality, the City should be able to demonstrate that they are able to decrease nutrient loading in Clam Bayou.

Endpoints/Water Quality Targets

Thomas Gibson, Pinellas County and FDOT

Comment:

4) The model proposes total nitrogen concentrations which are below the background conditions of Boca Ciega Bay, a pristine bay.

Response:

Boca Ciega Bay is an aquatic preserve and outstanding Florida water located in an urbanized area. In recent decades, several stormwater abatement projects were conducted to improve water quality in the Bay. Reducing total nitrogen in Clam Bayou will continue to enhance and preserve the water quality in Boca Ciega Bay.

Comment:

3. At present, Florida is in the process of developing and approving revised DO criteria. While it is recognized that these criteria have not received final approval at this time, Florida Department of Environmental Protection (FDEP) acknowledged that the current DO standards are not appropriate, which has led to the development of new proposed DO criteria. Given this position regarding the DO standards, the determination that the system would not meet the DO criteria at all times even with the reductions resulting from "natural" condition loadings may not reflect the "best science" and may be inappropriate for defining load reductions.

Response:

EPA does acknowledge that Florida has begun the process of changing their dissolved oxygen criteria. Until this process is completed and approved by EPA pursuant to section 303(c) of the CWA, the current water quality standard for dissolved oxygen is effective for Clean Water Act purposes. If and when Florida changes their water quality standard for dissolved oxygen, this TMDL could be re-visited in the future.

Assessment

Thomas Gibson, Pinellas County and FDOT

Comment:

5) FDEP has proposed to delist WBIDs 1716A, 1716B and 1716D from being impaired and had submitted this to EPA in March 2012. 1716C, as well as 1716A and 1716B, flow into the regional stormwater ponds prior to flowing into 1716D, which has seen significant habitat restoration.

Response:

EPA acknowledges the significant work that went into the basin, even with this wok the dissolved oxygen standard is not met.

Analytical Approach

Thomas Gibson and FDOT

Comment:

2) The modeled existing conditions for TN shown in Table 7.3 are significantly below the FDEP's proposed nutrient criteria and are most likely unachievable. They are also lower than the existing conditions of Boca Ciega Bay.

Response:

The model is well calibrated to the measured water quality data in Clam Bayou, which is located upstream of Boca Ciega Bay. Because the existing model is calibrated to measured data, it indicates that these concentrations are currently achievable, regardless of the proposed FDEP nutrient criteria.

Comment:

3) As per the TMDL document, modeling in support of the TMDLs showed that under natural conditions, the DO criteria are not met.

Response:

EPA agrees the dissolved oxygen standard is not met under the natural condition. Therefore this TMDL is set at the natural condition loads as there is no assimilative capacity for anthropogenic sources.

Comment:

25. No sensitivity analyses were provided for changes in nutrient supplies (TN, TP), BOD, or SOD. This information should be obtained after the model is appropriately calibrated, to determine the important drivers of DO dynamics in the system and allow focused effort on effective management.

Response:

EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

15. The modeled DO time series used for calibration comparison at 21FLPDEM45-03 and 21FLPDEM46-01 appear to be annually repeating signals, with little variation, as opposed to the observed data, which have a much greater range (Figure 1). This indicates the model is not reproducing observed DO distributions or temporal patterns sufficiently to support that the model is calibrated.

Response:

DO varies at temporal and spatial scales due to many biological, chemical, and physical processes. This variation is often cyclical with annual repeating signals due air temperature which effects the growth of phytoplankton and controls the concentration of DO that can be dissolved in the water column. The DO calibration varies at each calibration station, and EPA has provided the best overall calibration that could be achieved.

Comment:

17. No salinity calibration information was presented for the hydrodynamic model. Salinity data during the model period are available at the marine stations 21FLPDEM48-05, 21FLTPA 274414908241375, 21FLTPA 274425108241352, 21FLTPA 27443468241194, 21FLTPA 27444078240537, and 21FLTPA 27444078241071. Inclusion of comparisons of existing conditions model output to measured data provides some assurance that the model is reacting correctly to watershed hydrologic loadings and boundary conditions tidal forcings.

Response:

A salinity plot has been provided in the revised TMDL report at the calibration station 21FLTPA 27443468241194 located in WBID 1716D.

Comment:

19. Based on the model input files provided by EPA, including a GIS coverage of the grid system for the EFDC and WASP models, it appears that the dxdy.inp file for the EFDC model contains two columns of grid cells to the west of the cells provided in the GIS file and shown in Figure 7.1 of the proposed TMDL document.

Response:

EPA has reviewed the dxdy.inp file, cell.inp file, and GIS file. The GIS file provided shows the WASP grid cells, and it was identified as the WASP grid in the TMDL report. The EFDC model does have two additional columns of cells on the west side in the open boundary of Clam Bayou.

Comment:

20. In Section 7.1.3 of the proposed TMDL document, it is noted that the speciation of TN and TP was accomplished using proportions derived from Bullfrog Creek watershed water quality data. Bullfrog Creek is on the eastern side of Tampa Bay, where land use and underlying geological formations are considerably different than in the Clam Bayou

watershed. Why were the water quality data from the Clam Bayou watershed not used to accomplish this speciation

Response:

This is a typographical error and has been corrected.

Comment:

21. It is noted in the proposed TMDL report that the water quality parameters from the Tampa Bay WASP7 model were used to populate the Clam Bayou WASP7 model. No presentation of the Tampa Bay WASP7 model calibration is provided either here or in EPA 2012b, making it impossible to determine if this parameter set is appropriate.

Response:

EPA describes the data inputs from the larger Tampa Bay Watershed model that were used in the development of the Bullfrog Creek WASP model. The Bullfrog Creek WASP model was available for review as part of the administrative record. Additionally, these reports are available at www.regulations.gov as part of the Florida Numeric Nutrient Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the estuary reports are available in Appendix D: Hydrodynamic and Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments.

Comment:

22. No mention is made of atmospheric deposition of TN and TP loads directly to the surface of the waterbodies modeled. Direct atmospheric deposition loads in the Tampa Bay area have been shown to be a significant fraction (25 to 40 percent) of the total loading to Tampa Bay, and are likely important considerations when developing the loadings for the WASP model domain in this WBID.

Response:

Atmospheric deposition was included in the WASP model and can be found in WASP .wif file which was available as part of the administrative record.

Comment:

24. Similarly, no quantitative calibration metrics were provided for the TN, TP, BOD, and Chl a comparison plots of modeled and observed data within the model domain.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

26. Why is the cumulative distribution function comparison of DO for existing and "natural" condition model runs only provided for WBID 1716D (Figure 7.27 of the proposed TMDL document)? What does this comparison look like for the remaining three WBIDs?

Response:

Any reductions that occurred in 1716D would have to be redistributed through the system to all other WBIDs, WBID 1716A, 1716B, and 1716C, all contribute flows to 1716D. For this reason, natural condition results were only shows for WBID 1716D. Table 7.3 lists the average natural condition scenarios concentrations of TN, TP, BOD, and DO in all WBIDs, which shows an increase in DO concentrations in all WBIDs over the existing condition scenario. The cumulative distribution comparison for 1716D is similar to that of the three remaining WBIDs.

Comment:

27. Why are time series of measured water quality and existing condition WASP model output only provided for four stations, three in WBID 1716B (stations 21FLPDEM46-03, 21FLTPA27490158241217, and 21FLTPA27451788141338) and one in WBID 1716D (Station 21FLTPA27443468241194)? How good are the comparisons between modeled and measured water quality in the other WBIDs and at other sites in WBIDs 1716B and 1716D?

Response:

EPA selected stations with the best available data for calibration comparison and provided calibration plots at these stations. The remaining stations in WBID 1716D did not collect data during the modeling period (2002 through 2009) and could not be compared.

Comment:

28. The current condition concentrations within each WBID are provided in Table 7.1 of the proposed TMDL document. This table is an exact replica of the same table in the preceding draft TMDL proposal for the Clam Bayou system published in June 2012 (EPA, 2012c). The following table, Table 7.2, provides the current condition loadings for the

WBIDs, and is also exactly the same as in the previous draft document. The natural condition concentrations provided in Table 7.3 of the current document (EPA, 2013) are exactly the same as in the previous document (EPA, 2012c) except for the DO concentrations in each WBID. How is this possible? What has changed since the June 2012 document such that only "natural" condition DO has been impacted, while no other constituent concentrations have changed?

Response:

The water quality calibration did not change between this TMDL report and the preceding draft TMDL report, therefore there were no changes to Table 7.1 and most of table 7.3. However, watershed loading did change in WBID 1716C, and Tables 7.2 and 7.4 have been updated to reflect that. The methodology used to determine natural condition SOD was changed, and the description of this process can be found in Section 7.2.2.

Comment:

16. Similarly, comparisons of modeled and observed TN (Figure 2) and TP (Figure 3) at 21FLPDEM45-03 and 21FLPDEM46-01 do not support the contention that the model is calibrated, with the modeled ranges greatly exceeding the observed ranges.

Response:

The model is able to correctly represent the season trends that occur in the measured nitrogen and phosphorus data, with most modeled TN values ranging between 0.5 mg/L and 1.5mg/L, which is similar to the TN concentrations of the measured data. Additionally, the model predicts TP values between 0.05 mg/L and 0.2 mg/L most of the time, and the measured data has TP values ranging between 0.02 mg/L and 0.2 mg/L. During some storm events, the model does show spike in nutrient concentrations.

Comment:

29. Without quantitative measures assuring that the calibration is sufficient to simulate observed responses to observed forcing functions, any additional scenarios involving changes to loadings are not convincing as appropriate potential TMDLs.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. The graphical results presented in the TMDL are within range of the measured results and represent the water quality and hydrodynamcic trends present in the model, indicating that the model calibration is sufficient for determining TMDL load reductions.

Comment:

14. Why were so few statistical values provided for many of the calibration metrics available for both flow and water quality, both within the proposed TMDL report (EPA, 2013) and the larger Crystal Watershed calibration discussion (EPA, 2012a)?

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development. For the larger Crystal Watershed model, both graphical and evaluative metric were provided in the referenced Technical Support Document, and EPA found the quantity of statistical values to be sufficient.

Comment:

23. It is noted that the Clam Bayou calibration was adjusted to provide the best existing scenario model calibration. At each of the stations for which comparisons were provided, simulated DO followed a very regular pattern from year to year, while observed DO showed considerable inter-annual variation (Figure 4). No quantitative calibration metrics were provided for the comparison of measured and observed DO, so that the capability of the model to simulated observed conditions is not supported.

Response:

DO varies at temporal and spatial scales due to many biological, chemical, and physical processes. This variation is often cyclical with annual repeating signals due air temperature which effects the growth of phytoplankton and controls the concentration of DO that can be dissolved in the water column. The DO calibration varies at each calibration station, and EPA has provided the best overall calibration that could be achieved. EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

4. The EPA modeling effort does not account for the recent restoration efforts recently completed by the City of St. Petersburg and the Southwest Florida Water Management District (SWFWMD). Evaluation of the DO conditions in Clam Bayou proper (WBID 1716D) with respect to the FDEP-proposed revised DO criteria for marine waters indicates that conditions have improved considerably between 2004 and 2010. There were no violations of the proposed daily criterion during 2010 in WBID 1716D, compared to five of

the seven observations in 2004 being in violation of the proposed daily criterion. The large improvements in water quality may well be a result of the efforts then underway by the City and SWFWMD to restore the system. It is expected that the monitoring data currently being collected following completion of the restoration project will indicate additional improvements in water quality in the system, and specifically in DO conditions in Clam Bayou.

Response:

EPA applauds the current restoration efforts that underway in Clam Bayou. The TMDL was developed using available data from 2002 through 2009, and utilized mechanistic models for this time period. If water quality has improved since 2009, as suggested occurred based on measured water quality data, then the City is well on its way to meeting the TMDL loads set in this report.

Comment:

18. There are many more salinity data sites in Clam Bayou and Boca Ciega Bay within the hydrodynamic model domain for comparison of modeled and observed data. Utilization of all the available data for quantitative calibration comparison is warranted to support the contention that the model is simulating observed responses to observed forcing functions.

Response:

A salinity plot has been provided in the revised TMDL report at the calibration station 21FLTPA 27443468241194 located in WBID 1716D.

Comment:

13. Based on the description of the model calibration provided in EPA 2012a for the water quality portion of the Crystal Watershed model, why was water quality calibration done using water quality data from only three sites? Many more freshwater data are available within this model domain. The watershed water quality model calibration is insufficient to assure that the model is useful for TMDL development.

Response:

EPA acknowledges that there are additional water quality stations in Crystal. To develop the Clam Bayou LSPC model, EPA reviewed measured water quality data and adjusted the calibration as necessary to stations 21FLPDEM46-01 and 21FLPDEM45-03, located in freshwater portions of the WBIDs.

Comment:

2. The TMDL loads are all based upon the LSPC model simulation of some set of conditions under which the water quality model uses as input "natural" condition loadings. While this is a common practice in TMDL development, there are no assurances that the model is accurately projecting the effects of reduced loads on the water quality in the stream. It would be useful to perform a more rigorous calibration effort of the watershed and waterbody models, providing sufficient calibration metric comparisons to allow for a degree of confidence in the models' responses to inputs. It would also be helpful if a more detailed assessment of the reasonableness of the "natural" conditions was provided.

Response:

EPA acknowledges that it is common practice to use LSPC model simulations of natural conditions to determine background loading. Unfortunately, in the Tampa Bay watershed in the areas with similar geographic location, soils, and elevations are all highly developed and there are no immediate areas with available data that can be utilized for such a scenario. The model parameters, which were from the larger Tampa model used for the Florida Numeric Nutrient Criteria, were reviewed by multiple groups, including several offices within the EPA and by the Florida Department of Environmental Protection. These parameters reflect an intensive and rigorous calibration effort of the model.

Comment:

1. Why was only the mechanistic modeling approach utilized? Why weren't empirical/ statistical methods used to evaluate the existing data to determine if there were utilizable relationships between loadings and DO in the Clam Bayou system? Loadings development has been completed for the system for 1985-2011 as part of the Tampa Bay Estuary Program Reasonable Assurance process, so data are available for testing of stressor-response models in the system.

Response:

Mechanistic modeling was utilized because it allowed EPA to run numerous scenarios when needed for TMDL development. The calibration of the model to a data collected at different stations during different years. Additionally, it can be difficult to find meaningful relationships between nutrient loadings and DO, particularly in Florida's streams and rivers. This is due to the complexity of nutrient cycling in natural waterbodies, which results in variable time lags between the introduction of nutrients and their uptake and use by algae or other aquatic plants. Nutrients may be stored in sediment and/or organic materials and eventually re-introduced to the water column. Less available forms of nutrients such as organics must be broken down before they can be recycled for uptake. Other considerations include the fact that measuring chlorophyll concentrations in a water sample only provides a "snapshot" of the concentrations at the time and place the sample

was taken, and the measurement only captures phytoplankton, the free-floating algae, and will not capture other types such as attached algae (periphyton), algae growing on bottom sediments (benthic), and other aquatic plants (macrophytes). Mechanistic models allowed for the simulation of these complex systems over space and time.

Comment:

2. The difference in average DO concentration between the current and "natural" condition model results is 0.5 milligrams per liter (mg/L) or less for all four WBIDs, resulting from reductions in TN loads of 76 to 82 percent, TP loads of 81 to 86 percent, and BOD loads of 59 to 72 percent. Sufficient confidence in the ability of the model to simulate observed conditions has not been provided in this document to produce a convincing argument that such a large reduction in loadings (and the effort associated with achieving this) would result in the predicted small improvement in DO conditions. The observed mean DO of 4.08 mg/L in WBID 1716D can be compared to the existing condition model run output mean DO of 5.90 mg/L, which does not provide sufficient assurance that the model is calibrated for use in TMDL development.

Response:

In the natural condition scenario, the DO concentrations increased, which indicates that natural condition is more protective of the waterbodies and should be utilized as the TMDL load reduction. EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Comment:

3. The FDEP freshwater NNC for the Peninsula region, in which this WBID is contained, are TN=1.54 mg/L and TP=0.12 mg/L. As shown in Table 5.2 of the proposed TMDL document (EPA, 2013), the measured mean and geometric mean TN concentrations in the freshwater WBIDs (1716A and 1716B) are considerably less than the TN criterion, as are the TP statistics when compared to the TP criterion. This indicates that since the criteria are not being exceeded, something other than nutrients is resulting in the DO not meeting the existing State standards, so basing the TMDL on nutrient reductions is not warranted. It is unclear how reducing the modeled TN concentrations from approximately one-third of

the TN criterion (from the existing condition model output) to approximately one-fifth of the TN criterion (from the "natural" condition model output) is beneficial to the freshwater streams in these two

Response:

EPA does acknowledge that both Florida and EPA have proposed numeric nutrient criteria for Florida flowing waters. EPA recently approved Florida's numeric nutrient criteria for flowing waters in Florida. While these criteria have been approved they are not effective for Clean Water Act purposes. Furthermore, Florida's numeric nutrient criteria still provides a provision that nutrients cannot cause a violation of any other water quality standard, this TMDL was done to the dissolved oxygen criteria. In the case of this TMDL the dissolved oxygen criterion is not met. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

4. The waterway in WBID 1716A runs on the surface for about 0.5 kilometer (km) from its beginning, then is enclosed by box culverts for more than a kilometer before discharging to WBID 1716D, and should not be considered a waterbody for which a TMDL is necessary or appropriate.

Response:

EPA is required to establish a TMDL in pursuant to the schedule of EPA's commitments in the 1998 Consent Decree in the Florida TMDL lawsuit (Florida Wildlife Federation, et al. v. Carol Browner, et al., Civil Action No. 4: 98CV356-WS, 1998). Additionally, WBID 1716D is listed as impaired as well, in partial due to excessive nutrient loads from WBID 1716A. Reducing nutrient loads in WBID 1716A improves overall water quality in that WBID and is protective of WBID 1716D.

Comment:

5. Data for the ditched channel in WBID 1716C is from three water quality monitoring sites in roadside drainage channels, and should not be utilized for impairment determination.

Response:

According to IWR 44, the stations are located in the Clam Bayou Drain. Additionally, all stations within a WBID are used when determine impairments.

Comment:

7. Why were no nutrient load reduction scenarios completed to evaluate the effects of differing percentage reductions for TP, while keeping the TN reduction at that represented by the "natural" condition? Given the nitrogen limitation common in the region, it may well be that the model would show that the outcome was not sensitive to TP load reductions, and so would indicate that TP load reductions were not needed. A sensitivity analysis to these loads would be very helpful.

Response:

EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

8. Table 7.2 (presenting the current condition loadings) and Table 7.4 (presenting the "natural" conditions loadings) differ considerably from the TMDL summary tables at the beginning of the document and in Section 8, for WBIDs 1716C and 1716D. It is our assumption in this review that these two tables (7.2 and 7.4) are incorrect for these two WBIDs, with the intended values provided in the summary tables and in Section 8. Please revise accordingly.

Response:

Table 7.2 and 7.4 have been revised accordingly. Previous comments indicated that excess flow from Lake Maggiore does not drain the WBID 1716C and this was corrected in the last iterations of model scenarios.

Comment:

9. It would be helpful to make it very clear that the current and "natural" condition loadings to WBID 1716D include all loads from the upstream WBIDs, so that the total system loading reductions proposed in this TMDL are those for the downstream WBID 1716D. If this assumption is incorrect, please explain how the relatively small WIBD 1716D has greater loads than the other three WBIDs combined.

Response:

Flow from WBIDs 1716A, 1716B, and portions of 1716C drain to 1716D, which increases flow and loads in 1716D. All WBIDs were reduced to natural condition, or background condition loading. Therefore, reductions to WBID 1716D includes reductions to loads from the upstream WBIDs.

Comment:

12. The LSPC model utilized data inputs from the Crystal Watershed model developed for the Florida NNC effort (EPA, 2012a). Modeled flow output from the Crystal Watershed was calibrated to only one flow gage [U.S. Geological Survey (USGS) 02310000] in the watershed, extending from just south of the Withlacoochee River to the southern end of Pinellas County. At this one flow gage, the model overpredicted flows between the 10th and 70th percentile exceedences. This is not only problematic as far as providing convincing information that the watershed model is correctly calibrated, but this also happens to be the flow gage most heavily impacted by groundwater withdrawals for public water supply. Additional calibration should be done on this watershed model prior to applying the data inputs to smaller subwatersheds, as done for this TMDL.

Response:

Limited hydrology flow data was available for the Crystal Watershed during the modeling time period, therefore data was calibration to one flow gage, USGS 02310000. The error in total volume was 1.22%, indicating the model was able to represent average flow in the Crystal watershed. Additionally, no flow or hydrologic data was available for the Crystal watershed. Therefore, this was the best available data to use to develop the hydrology model for the Clam Bayou system.

Comment:

10. Use of these proposed DO criteria in an evaluation of the data obtained from the Clam Bayou proper WBID (1716D) is warranted, as the focus of the proposed TMDL is on defining loads commensurate with attaining state water quality criteria, as defined by DO conditions. The monitoring data available in WBID 1716D is for 2004 (one site) and 2010 (three sites), as shown in Figure 5.17 of the proposed TMDL document (EPA, 2013). As can be seen when examining the data provided in Figure 5.17 of the TMDL document, the more recent data are representative of better DO conditions in the bayou. It should be recalled that the data collection effort in Clam Bayou was not developed with the FDEP-proposed criteria in mind, so there are no multiple days of collection in any 7 day period and only very few multiple days of collection in any 30-day period. It is notable that the fraction of violations declined considerably between 2004 and 2010. There were no violations of the proposed daily criterion during 2010 in WBID 1716D, compared to five of the seven observations in 2004 being in violation of the proposed daily criterion.

The large improvements in water quality are likely one result of the efforts then underway by the City of St. Petersburg and SWFWMD to restore the system. It is expected that the monitoring data currently being collected following completion of the restoration project will indicate additional improvements in water quality in the system and, specifically, in DO conditions in Clam Bayou.

Response:

EPA has reviewed the data in WBID 1716D in Figure 5.17 and determined that dissolved oxygen concentrations were slightly higher in 2010. However, DO measurements were less that the State water quality standard 12 times during the 2010 sampling period which contradicts the FDOT assertion that there were no violations in 2010. EPA agrees that the improvement in water quality may be due to the improvements in stormwater runoff that the City has recently implemented.

Comment:

1. EPA uses a series of complex watershed and receiving water models to assess the DO responses to nutrient and biochemical oxygen demand (BOD) loads. Based upon a detailed review of the documents presented and other documents describing the model developed for the Florida NNC effort (utilized for this TMDL development), some technical issues were raised relative to the adequacy of the models' calibration and the sufficiency of the documentation to provide assurance that the models are adequately simulating the key processes impacting the end results. While the documentation provided is extensive and EPA is to be commended for its detailed work, some model development details are not provided, many key model-to-data comparisons are not provided, some methods of model application are not reasonable, and the calibration results presented bring the models' usefulness for this purpose into question. Sufficient information is not provided to indicate that the model suite is appropriately calibrated to determine that reductions in total nitrogen (TN), total phosphorus (TP), and BOD loads would result in improvements of the DO conditions in the WBIDs.

Response:

EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are engineering tools that allow EPA to make informed decisions when determining a TMDL. These tools are very complex and to document every feature, parameter, constant or data point that is used in the model(s) would be very difficult. All of the modeling tools are publically available and include very detailed user's manual that provide a description of the input and how it is used in the model. Initial model constants are set to typical values from like areas where the model has been was applied in the past. During the calibration

process it is not uncommon to change several constants to better represent the current area being modeled.

Comment:

11. Table 5.2 of the proposed TMDL document (EPA, 2013) provides water quality statistics for each of the WBIDS. Statistics are also provided in the time series plots of water quality constituents in each WBID in Figures 5.2 through 5.21. The statistics provided in the table often do not match the statistics provided in the figures.

Response:

The table has been revised to match the figures. The error most often occurred in the BOD statistics.

Comment:

6. When developing the "natural" condition scenario, EPA reduced sediment oxygen demand (SOD) from the existing condition by the same fraction as Chlorophyll a (Chl a) was reduced in the initial "natural" condition run compared to the existing condition. No justification is provided for this methodology. It should be recalled that in many systems in the Tampa Bay area, SOD likely results from more than just Chl a, with many systems subjected to inputs of other organic materials that impact SOD.

Response:

EPA agrees that SOD changes based on input of organic materials. The methodology to reduce SOD in the natural condition run uses a Chl a ratio, but Chl a is influenced by the nutrient loading contributions entering Smack Bayou. The methodology to reduce SOD is commonly utilized by the Florida Department of Environmental Protection, and was also been used by the Army Corps of Engineers and has been supported in papers and reports, including Steven Chapra's Surface Water-Quality Modeling.

WBID 1778 Cockroach bay

Assessment

Michael Williams (Hillsborough County) & FDOT

Comment:

3. At present, Florida is in the process of developing and approving revised DO criteria. While it is recognized that these criteria have not received final approval at this time, Florida Department of Environmental Protection (FDEP) acknowledges that the current DO standards are not appropriate, which has led to the development of the new proposed

DO criteria. Given this position regarding the DO standards, the determination that the system would not meet the current DO criteria even under natural loadings does not reflect the "best science" as defined by EPA and FDEP and is inappropriate for defining load reductions.

Response:

EPA does acknowledge that Florida has begun the process of changing their dissolved oxygen criteria. Until this process is completed and approved by EPA pursuant to section 303(c) of the CWA, the current water quality standard for dissolved oxygen is effective for Clean Water Act purposes. If and when Florida changes their water quality standard for dissolved oxygen, this TMDL could be re-visited in the future.

Comment:

9. Cockroach Bay contains areas with limestone outcrops, and upwelling of groundwater has been reported but not quantified. This should be recognized as a potential source of nutrient inputs to the bay.

Response:

EPA would require upwelling of groundwater to be quantified to be included in the TMDL analysis.

Analytical Approach

Michael Garrett & FDOT

Comment:

15. The Tampa Bay EFDC model created for Florida NNC was utilized for the Cockroach Bay model. However, no presentation of the Tampa Bay EFDC model was provided in the Technical Support Document (TSD) (EPA, 2012b), so the appropriateness of this model and associated parameter set for use in TMDL evaluation cannot be determined.

Response:

EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are engineering tools that allow EPA to make informed decisions when determining a TMDL. The documentation of the larger Tampa Bay Watershed and EFDC models are available at www.regulations.gov as part of the Florida Numeric Nutrient Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the

estuary reports are available in Appendix D: Hydrodynamic and Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments.

Comment:

16. The only salinity calibration information presented for the hydrodynamic model was for modeled and observed salinity at 21FLHILL136 in Cockroach Bay. No distribution comparison of simulated and observed salinity is provided with quantitative statistics to support the contention that the model is calibrated.

Response:

The model was calibrated to the station in Cockroach Bay that provided the most data. Of the 25 other stations located in the Bay, 24 recorded data for salinity prior to 2002, and only once. The remaining station had very little salinity and water quality data and EPA did not believe it would assist in calibration. EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

17. The salinity data record at 21FLHILL136 as displayed in Figure 7.9 of the proposed TMDL document has no observations for much of the record. However, the Environmental Protection Commission of Hillsborough County (EPCHC) dataset provides mid-depth salinity for this site for the entire model period. These data should be utilized for this comparison.

Response:

EPA utilized the IWR 44 data because all data has been adequately screened. EPCHC should review its data and contact FDEP for inclusion of the salinity data in IWR.

Comment:

18. No quantitative calibration metrics were provided for the comparison plots of modeled and observed data within the model domain.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

19. Additional salinity data within the model domain in Tampa Bay are available from various monitoring programs and would be useful for supporting model calibration. Utilization of all the available data for quantitative calibration comparison is warranted in support of the contention that the model is simulating observed responses to observed forcing functions.

Response:

Please see response to comment 17.

Comment:

20. It is noted in the proposed TMDL report that the water quality parameters from the Tampa Bay WASP7 model were used to populate the Cockroach Bay WASP7 model. No presentation of the Tampa Bay WASP7 model calibration is provided either here or in EPA 2012b, making it impossible to determine if this parameter set is appropriate.

Response:

EPA describes the data inputs from the larger Tampa Bay Watershed model that were used in the development of the Cockroach Bay WASP model. The Cockroach Bay WASP model was available for review as part of the administrative record. Additionally, these reports are available at www.regulations.gov as part of the Florida Numeric Nutrient Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the estuary reports are available in Appendix D: Hydrodynamic and Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments.

Comment:

21. No mention is made of atmospheric deposition of TN and TP loads directly to the surface of the waterbodies modeled. Atmospheric deposition loads in the Tampa Bay area have been shown to be a significant fraction (25 to 40 percent) of the total loading to Tampa Bay, and are likely important considerations when developing the loadings for the WASP model domain in this WBID.

Response:

Atmospheric deposition was included in the WASP model and can be found in WASP .wif file which was available as part of the administrative record.

Comment:

25. No sensitivity analyses were provided for changes in nutrient supplies (TN, TP), BOD, or SOD. This information should be obtained after the model is appropriately calibrated to determine the important drivers of DO dynamics in the system and allow focused effort on effective management.

Response:

EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

23. Similarly, no quantitative calibration metrics were provided for the TN, TP, and Chl a comparison plots of modeled and observed data within the model domain.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration, would not aid in TMDL development.

Comment:

24. Additional water quality data within the model domain in Tampa Bay are available from various monitoring programs and would be useful for supporting model calibration. Utilization of all the available data for quantitative calibration comparison is warranted in support of the contention that the model is simulating observed responses to observed forcing functions.

Response:

EPA utilized the data that was available in IWR 44 because data in IWR has been screened and reviewed.

Comment:

12. Similarly, no information is provided regarding the calibration of the water quality portion of the LSPC model for the Tampa Bay Watershed, so no assessment of the parameterization is possible.

Response:

Please see response to comment 10. Additionally, the TMDL report presents calibration plots for water quality calibration in the Cockroach Bay watershed. The model was available as part of the administrative record for this TMDL and contains the model parameterization.

Comment:

26. Without quantitative measures assuring that the calibration is sufficient to simulate observed responses to observed forcing functions, any additional scenarios involving changes to loadings are not convincing as appropriate potential TMDLs.

Response:

As stated previously, EPA believes that the model is well calibrated and has provided graphical comparison of model to measured water quality data, which is considered to be the best calibration to all observed data at all stations.

Comment:

22. It is also noted that the Cockroach Bay calibration was adjusted to provide the best existing scenario model calibration. At the estuarine station for which comparison was provided, simulated DO followed a very regular pattern from year to year, while observed DO showed considerable inter-annual variation and a greater annual range (Figure 3). No quantitative calibration metrics were provided for the comparison of measured and observed DO, so that the capability of the model to simulated observed conditions is not supported.

Response:

EPA acknowledges that the measured dissolved oxygen data demonstrates a greater range in values than the modeled dissolved oxygen data. However, the model does not over predict or under predict the DO and is able to provide a sufficient representation of the measured data for that reason.

Comment:

1. Why was only the mechanistic modeling approach utilized? Why weren't empirical/statistical methods used to evaluate the existing data to determine if there were utilizable relationships between loadings and DO in Cockroach Bay? Loadings development has been completed for the system for 1985-2011 as part of the Tampa Bay Estuary Program Reasonable Assurance process, so data are available for testing of stressor-response models in the system.

Response:

Mechanistic modeling was utilized because it allowed EPA to run numerous scenarios when needed for TMDL development. The calibration of the model to a data collected at different stations during different years. Additionally, it can be difficult to find meaningful relationships between nutrient loadings and DO, particularly in Florida's streams and rivers. This is due to the complexity of nutrient cycling in natural waterbodies, which results in variable time lags between the introduction of nutrients and their uptake and use by algae or other aquatic plants. Nutrients may be stored in sediment and/or organic materials and eventually re-introduced to the water column. Less available forms of nutrients such as organics must be broken down before they can be recycled for uptake. Other considerations include the fact that measuring chlorophyll concentrations in a water sample only provides a "snapshot" of the concentrations at the time and place the sample was taken, and the measurement only captures phytoplankton, the free-floating algae, and will not capture other types such as attached algae (periphyton), algae growing on bottom sediments (benthic), and other aquatic plants (macrophytes). Mechanistic models allowed for the simulation of these complex systems over space and time.

Comment:

14. The watershed model consistently overpredicts BOD (Figure 2). As can be seen, measured values are all below 2 mg/L, while most of the modeled values are greater than 2. A value of 2 mg/L has been used as a threshold level for BOD in many TMDL determinations so an accurate simulation of this variable is critical.

Response:

EPA has presented the best calibration to observed data at in the modeling report given current available watershed data and available calibration time. FDEP often uses a value of 2 mg/L has a critical threshold value. However, each waterbody is unique and critical thresholds can vary and be less than 2 mg/L.

Comment:

1. EPA used a series of complex watershed and receiving water models to assess the DO responses to changes in nutrient loads. Based upon a review of the TMDL document and supporting information, some technical issues were raised relative to the adequacy of the models' calibration to provide assurance that the models are adequate to simulate the key processes that affect the end results. While provided documentation is helpful, some model development details are not provided, some key model-to-data comparisons are not provided, some methods of model application are not reasonable, and some of the calibration and validation results (or lack thereof) presented bring the model into question.

Response:

EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are engineering tools that allow EPA to make informed decisions when determining a TMDL. These tools are very complex and to document every feature, parameter, constant or data point that is used in the model(s) would be very difficult. All of the modeling tools are publically available and include very detailed user's manual that provide a description of the input and how it is used in the model. Initial model constants are set to typical values from like areas where the model has been was applied in the past. During the calibration process it is not uncommon to change several constants to better represent the current area being modeled.

Comment:

13. There is no quantifiable assessment of calibration of the Cockroach Bay watershed model. Plots comparing observed and predicted values are provided, but no meaningful discussion of the accuracy of calibration is provided. Additionally, no validation of the watershed model was provided.

Response:

EPA routinely provides graphical comparison of models, which are sufficient for determining the capabilities of models in representing the measured trends of the waterbody. A presentation of the statistical comparisons, which are also often subjective to definitions regarding sufficient calibration. No validation was performed of the watershed model because of the limited availability of data. All available data in IWR 44 was utilized to assist in calibration of the watershed model.

Comment:

2. Sufficient confidence in the ability of the model to simulate observed conditions has not been provided in this document to produce a convincing argument that such a large reduction in loadings (and the effort associated with achieving this) will result in the predicted improvement in DO conditions. The observed mean DO of 5.65 milligrams per liter (mg/L) can be compared to the existing condition model run output mean DO of 4.72 mg/L, which does not provide reassurance that the model is sufficiently calibrated for use in TMDL development. Without this reassurance, reliance on the model results to support a simulated increase of 1.51 mg/L in DO (from the mean 4.72 mg/L of the simulated current condition to the mean 6.23 mg/L of the simulated "natural" condition) resulting from such extreme load reductions is not reasonable.

Response:

The current model is able to match the seasonal DO trend in the measured water quality data. EPA determined that while under a natural conditions the dissolved oxygen criteria is not met. There is a difference in predicted dissolved oxygen concentrations between the current and natural condition scenarios which indicates anthropogenic sources are causing a depression in dissolved oxygen. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

3. The link between nutrient loads and DO condition through chlorophyll is not well supported by this modeling effort. The simulated existing condition chlorophyll does not accurately reproduce the measured data (see Figure 7.15 of the proposed TMDL report, EPA 2013), suggesting that the nutrient and DO dynamics of the system are not being accurately represented in the modeling effort.

Response:

Please see EPA's general response to comments received regarding the impacts on this TMDL of ongoing activities to establish numeric nutrient criteria in Florida. Because the waterbody was on the Florida's CWA section 303(d) list for nutrients and dissolved oxygen, EPA was required to consider the impacts of nutrients on dissolved oxygen, pursuant to paragraph 62-302.530(47)(a), F.A.C. The basis for this TMDL is the nutrient endpoint which implements paragraph 62-302.530(47)(a), as that endpoint determined to be more stringent than the level of nutrients that may be necessary to prevent an imbalance of flora and fauna pursuant to paragraph 62-302.530(47)(b).

Comment:

4. Section 7.2.2 notes that "…point sources located in the model were removed for the natural condition analysis," but there are no facilities permitted by the National Pollutant Discharge Elimination System (NPDES) in this WBID.

Response:

Permit FLS000006 is in the area.

Comment:

6. Why were no nutrient load reduction scenarios completed to evaluate different combinations of reductions? Given the nitrogen limitation common in the region, it may well be that the model would show that only the TN load would need to be reduced. Similarly, what were the relative impacts of reducing TN, TP, and BOD loads? A sensitivity analysis to these loads should be very helpful.

Response:

EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

8. For all three models, there was very little description provided regarding model development and behavior. The following are comments that apply to all the models: • No error or sensitivity analyses were included. • No information regarding other potential critical processes is shown.

Response:

EPA routinely performs sensitivity analysis during the calibration process. What is presented to in the modeling report and/or in the development of the TMDL is best calibration to all observed data at all stations. A presentation of the sensitivity of model predictions to changes in constants and kinetics would not help in determining a TMDL as a set of conditions are needed for calculating a TMDL.

Comment:

10. The LSPC model utilized data inputs from the Tampa Bay Watershed model developed for the Florida NNC effort (EPA, 2012a), although this specific watershed model was not utilized or described in the EPA 2012a document. No calibration information was presented for the Tampa Bay Watershed model, from which input data were used for the Cockroach Bay watershed model.

Response:

These reports are available at www.regulations.gov as part of the Florida Numeric Nutrient Criteria Technical Support Documents. The watershed reports are available in Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and their attachments, and the estuary reports are available in Appendix D: Hydrodynamic and

Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems and their attachments. In the TMDL report, EPA describes the data inputs from the larger Tampa Bay Watershed model that were used in the development of the Cockroach Bay LSPC model.

Comment:

5. When developing the "natural" condition scenarios, EPA reduced sediment oxygen demand (SOD) from the existing condition by the same fraction as which Chlorophyll a (Chl a) was reduced compared to the existing condition. No justification is provided for this methodology. It should be recalled that in many systems in the Tampa Bay area, SOD likely results from more than just Chl a, with many systems subjected to inputs of other organic materials that impact SOD.

Response:

EPA agrees that SOD changes based on input of organic materials. The methodology to reduce SOD in the natural condition run uses a Chl a ratio, but Chl a is influenced by the nutrient loading contributions entering Smack Bayou. The methodology to reduce SOD is commonly utilized by the Florida Department of Environmental Protection, and has also been used by the Army Corps of Engineers and has been supported in papers and reports, including Steven Chapra's Surface Water-Quality Modeling.

Comment:

11. The proposed TMDL document notes that the Cockroach Bay watershed model was parameterized based on the Tampa Bay Watershed model, which was calibrated from continuous flow U.S. Geological Survey (USGS) gages. This calibration information is not provided here or in the EPA 2012a document, so no assessment of this parameterization is possible.

Response:

Please see the response to comment 10.

TMDL Determination

Michael Garrett & FDOT

Comment:

2. The TMDL loads are based on the LSPC model simulation of the "natural" condition. While this is a common practice in TMDL development, there are no assurances that the model is accurately projecting the natural background loads. It would be useful to do some comparisons of what the natural load is with more pristine waterbodies so that some

determination can be made of how realistic the natural condition loads are. This is especially relevant based on the recommended load reductions identified for TP as it relates to DO. The proposed TMDL would require a 95 percent reduction in TP, but the data would not seem to support this level of reduction. This is of concern because estuarine waterbodies along the west coast of Florida, including Cockroach Bay and receiving water Tampa Bay, are typically nitrogen limited and phosphorus is not a management concern.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Typographical

Michael Garrett & FDOT

Comment:

7. Since this WBID is marine, inclusion of discussion of the FDEP freshwater Numeric Nutrient Criteria (NNC) is unnecessary and confusing.

Response:

The information provided in section 4.1 describes the ongoing efforts of EPA and FDEP to establish numeric nutrient criteria in Florida, which includes both freshwater and marine criteria. The information provided is clear and concise, and the TMDL clearly states that the narrative nutrient criterion is still applicable for this TMDL.

WBID 3081 Horse Creek

General

Brevard County and Florida Department of Transportation

Comment:

6. Figure 3.2: The image is blurry. A revised better quality image should be provided. Also, it would be more useful if a zoomed-in view were provided that primarily included the subwatershed and not the full surrounding area

Response:

The current map is able to demonstrate the current necessary data and will not be updated. Additional figures in the TMDL report have smaller scales and offer a more zoomed-in view.

Comment:

4. Figure 3.1: The image is blurry. A revised better quality image should be provided. Also, a more zoomed-in view should be provided, but this will not need to present the whole area.

Response:

The current map is able to demonstrate the current necessary data and will not be updated. Additional figures in the TMDL report have smaller scales and offer a more zoomed-in view.

Comment:

1. Figure 2.1: The image is blurry. A revised better quality image should be provided. Also, a more zoomed-in view should be provided.

Response:

The purpose of Figure 2.1 is to demonstrate the location of WBID 3081 on the Atlantic Coast. Additional figures are provided throughout the document that shows a smaller scale. The figure is legible, and replacing this image with a sharper version would increase the overall file size of the document.

Endpoints/Water Quality Targets

Brevard County and Florida Department of Transportation

Comment:

3. At present, Florida is in the process of developing and approving revised DO criteria. While it is recognized that these criteria have not received final approval at this time, Florida Department of Environmental Protection (FDEP) acknowledged that the current DO standards are not appropriate, which led to the development of the new proposed DO criteria. Given this position regarding the DO standards, the determination that the system

would not meet the DO criteria even under natural loadings may not reflect the "best science" as defined by EPA and FDEP and may be inappropriate for defining load

Response:

EPA does acknowledge that Florida has begun the process of changing their dissolved oxygen criteria. Until this process is completed and approved by EPA pursuant to section 303(c) of the CWA, the current water quality standard for dissolved oxygen is effective for Clean Water Act purposes. If and when Florida changes their water quality standard for dissolved oxygen, this TMDL could be re-visited in the future.

Comment:

7. Section 4.2: This section of the TMDL report needs to identify that, at present, FDEP is looking to revise the DO criteria in Florida. Similar language as that provided in Section 4.2 should be added that acknowledges efforts to modify criteria and that the TMDL will be modified if criteria change.

Response:

EPA does acknowledge that Florida has begun the process of changing their dissolved oxygen criteria. Until this process is completed and approved by EPA pursuant to section 303(c) of the CWA, the current water quality standard for dissolved oxygen is effective for Clean Water Act purposes. If and when Florida changes their water quality standard for dissolved oxygen, this TMDL could be re-visited in the future.

Assessment

Brevard County and Florida Department of Transportation

Comment:

8. The data are analyzed as upper Horse Creek and Lower Horse Creek. This is reasonable given that the lower stations showed marine conditions [salinities as high as 33 parts per thousand (ppt) and as low as 1 ppt], while the upper stations are all generally less than 1 ppt, actually representing a more freshwater condition.

Response:

EPA agrees that the upper station has very little tidal influence.

Comment:

11. The Chlorophyll a (Chl a) levels in the upper stations are low throughout the period of available data. The geomean levels are below 4 micrograms per liter (µg/L) in the marine portion and less than 3 µg/L in the freshwater portion. Generally, for nutrients to impact

DO concentrations, some level of eutrophication needs to occur. The DO is then either impacted through direct water column respiration or through settling of phytoplankton and an increase in sediment oxygen demand (SOD). The Chl a levels measured would not seem to indicate that either of these pathways is occurring.

Response:

EPA does agree that chlorophyll a levels are relatively low in Horse Creek. This TMDL was done to protect anthropogenic sources from causing or contributing to dissolved oxygen concentrations below the States criteria. Additionally, the nutrient cycling that occurs in Florida waterbodies, including chlorophyll a growth, is very complex. Nutrients may be stored in sediment and/or organic materials and eventually re-introduced to the water column. Less available forms of nutrients such as organics must be broken down before they can be recycled for uptake. Other considerations include the fact that measuring chlorophyll concentrations in a water sample only provides a "snapshot" of the concentrations at the time and place the sample was taken, and the measurement only captures phytoplankton, the free-floating algae, and will not capture other types such as attached algae (periphyton), algae growing on bottom sediments (benthic), and other aquatic plants (macrophytes). Mechanistic models allowed for the simulation of these complex systems over space and time.

Comment:

9. The TN and TP data in both the upper and lower reaches are low. In the upper reaches where the conditions are more freshwater, the TN levels show geomean levels around 0.9 milligrams per liter (mg/L), which is well below the 1.5 mg/L Numeric Nutrient Criteria (NNC) applicable to freshwaters. TP levels in the upper stations show geomean levels near 0.07 mg/L also well below the freshwater NNC.

Response:

EPA does acknowledge that both Florida and EPA have proposed numeric nutrient criteria for Florida flowing waters. EPA recently approved Florida's numeric nutrient criteria for flowing waters in Florida. While these criteria have been approved they are not effective for Clean Water Act purposes. Florida's numeric nutrient criteria still provides a provision that nutrients cannot cause a violation of any other water quality standard, this TMDL was done to the dissolved oxygen criteria. Additionally, these values are for freshwater systems, and Horse Creek is classified as marine, and would be subject to different NNC criteria.

Comment:

10. The analysis of the nutrient data should include some presentation and direct discussion of the nutrient species, not just TN and TP.

Response:

Both TN and TP are presented and are well calibrated, and TMDL reductions are applied to these two parameters.

Analytical Approach

Brevard County and Florida Department of Transportation

Comment:

24. As with the salinity, the DO data are taken at depth and there are multiple measurements at any one time and station. No discussion of what data the model are compared to and from which level in the model (surface or bottom).

Response:

Please see response to comment 20. EPA has reviewed the DO data at the HUS station in IWR 44. All salinity data provided in IWR 44 was collected at depth less than 1 meter in the surface of Horse Creek, therefore there was no need to parse the data by stratification. EPA utilized a 2-level model because hydrodynamics and water quality can vary in tidally influenced streams. Horse Creek is a small, tidal creek and EPA does not expect there to be a wide range of gradients within the Creek, making a 2-level model sufficient.

Comment:

19. Figure 7.8: The image is blurry. A higher quality image should be provided for the report. The grid representation (as seen in the plot) is somewhat crude and no specific information on grid widths/depths and how they were specifically derived is provided. Preliminary examination of the DXDY file indicates that the smallest grid width in the model is 20 meters. Using aerial photography, in the wider areas downstream of the railroad bridge, the widths are 20 meters. In the upper reaches (above the railroad bridge), the widths are on the order of 2 to 3 meters. Therefore, the physical representation of the stream is not reasonable. Additionally there are side tributaries that impact the hydrodynamics that are not represented.

Response:

The current maps are able to demonstrate the current necessary data and will not be updated. EPA disagrees that the current resolution of the WASP and EFDC grid cells is too coarse. The model allows for the representation of the hydrodynamic circulation

within the Horse Creek, as evident by the salinity and temperature calibration. The smaller tributaries entering Horse Creek have a small influence on the main stem and any impacts on hydrodynamics would be limited to the immediate area at the confluence because the majority of flow is in the main reach.

Comment:

29. Table 7.1: This table presents the current condition concentrations for TN, TP, BOD, and DO. There is clearly a typo in the current condition TP, which is identified as 0.74 mg/L. This cannot be correct. Additionally, the BOD current condition is identified at 1.0 mg/L. Given that FDEP identifies 2.0 mg/L as a cutoff for defining anthropogenic BOD impacts, this value seems low and would not seem to warrant any need for load reductions. There is also no discussion identifying at what location these concentrations were derived. It would make sense that it was at the downstream-most point of the WBID, but this is not discussed.

Response:

The TP has been revised to read 0.074 mg/L. These concentrations were derived at the downstream-most point of the WBID. The TMDL established load reductions for BOD at the natural condition, which is also true for nitrogen and phosphorus. In the natural condition scenario, 53 percent of the BOD in the system is from anthropogenic sources, indicating that even though BOD is often below 2 mg/L in the system that a large portion of BOD is from anthropogenic sources. By reducing BOD this insures that no anthropogenic loadings are causing or contributing to depression of the dissolved oxygen concentration.

Comment:

28. Figures 7.16 and 7.17: The WASP-simulated TP concentrations at both the upper and lower Horse Creek stations show significant errors

Response:

The current total phosphorus calibration is able to meet the overall trends in measured water quality data and does not show significant errors. The current model provides the best calibration that could be achieved given current available watershed data and available calibration time at the Horse Creek stations.

Comment:

25. Figure 7.12 and 7.13: the WASP-simulated DO concentrations show significant error, with the upper Horse Creek stations showing the greatest discrepancy.

Response:

Data at station 21FLSJWMIRLSHUS ranged from 10 mg/L to 0 mg/L, with DO being measured at its lowest during the summer. The modeled DO at this station also ranged from 10 mg/L to 0 mg/L, indicating that the model was able to accurately represent the modeled DO. At Upper Horse Creek, the model did predict lower DO concentrations that what was measured during the summer. However, because of the representation at the lower Horse Creek station, the DO calibration was considered to be adequate for modeling purposes.

Comment:

27. Figure 7.15: The WASP model consistently overpredicts the TN levels at the lower Horse Creek stations

Response:

The current model provides the best calibration that could be achieved given current available watershed data and available calibration time at the Horse Creek stations.

Comment:

30. Figures 7.26 and 7.27 present probability curves for the DO predictions to demonstrate the natural versus existing conditions. The errors in the DO calibration identified above raise significant doubt to the validity of these curves.

Response:

As was stated previously, DO for at Lower Horse Creek was well calibrated. The probability curves presented show increases in DO mg/L in the natural condition scenario.

Comment:

23. The full WASP model coefficients utilized including SOD need to be provided within the report to allow review

Response:

The complete list of physical, hydrologic, and chemical inputs and all relevant model coefficients is too lengthy to include in the modeling report. The administrative record for this TMDL contains all of the models and their associated input files. This information is available to the public upon request and may be reviewed at any time.

Comment:

22. The report identifies that the LSPC TN and TP data were parsed into species data prior to input into WASP, but the report does not say how they were parsed. This needs to be provided to determine if the breakdowns are reasonable versus data.

Response:

For total nitrogen, 90% of the LSPC watershed load was assumed to be organic nitrogen, and 5% was assumed to be ammonia, and 5% was assumed to be nitrate-nitrite. For total phosphorus, 50% was assumed to be orthophosphate and 50% was assumed to be organic phosphorus.

Comment:

21. Figures 7.10 and 7.11: The temperature predictions in the WASP model show a larger range than that seen in the data at both the upper and lower Horse Creek stations, with the upper level showing the most significant deviation. This may be a function of the degree of shading/buffering in the upper reaches that the model does not capture or due to the intrusion of downstream waters due to the inaccurate representation of the creek volumes.

Response:

The modeled temperature data accurately simulated the measured temperature data, including measured data collected during the summer months. During the winter months, the model is predicting low stream temperatures. However, during many of these periods, such as in the winter of 2003, no measured water quality data is collected.

Comment:

20. Figure 7.9: This figure presents the primary hydrodynamic calibration comparison using the salinity at the St. Johns River Water Management District (SJRWMD) measurement station where US 1 crosses the creek near the mouth. There is no identification if the data are surface or below surface data or some average level. Examination of the data at the SJRWMD HUS station shows that, at times, there is a significant level of salinity stratification and the data are at multiple levels. No discussion of this is provided so what do the data represent? The data need to be parsed by level, any stratification seen identified, and the model results compared accordingly. It is questionable whether a 2-level model is sufficient here.

Response:

EPA has reviewed the salinity data at the HUS station in IWR 44. All salinity data provided in IWR 44 was collected at depth less than 1 meter in the surface of Horse Creek. Figure 7.9 compares the surface salinity calibration of Horse Creek to measured salinity data. Because all data presented was taken at a shallow depth, there was no need to parse the data by stratification. EPA utilized a 2-level model because hydrodynamics and water quality can vary in tidally influenced streams. Horse Creek is a small, tidal creek and EPA does not expect there to be a wide range of gradients within the Creek, making a 2-level model sufficient.

Comment:

3. Section 3.2: This section should be expanded and should include a graphic showing the drainage basins for this WBID used in the LSPC modeling and including the National Hydrography Dataset (NHD) flow lines.

Response:

Figure 3.2, located in section 3.3, shows the LSPC drainage boundary and NHD flowline. A larger version of the figure is also presented in section 7.1.

Comment:

18. The report identifies that data were utilized to define the Indian River Lagoon water quality boundary, the location of the data stations utilized needs to be provided along with plots of the boundary condition data including salinity, temperature, all nutrient parameters, and BOD.

Response:

The water quality data that was used to develop the boundary condition files in the Horse Creek model can be found in the EFDC and WASP model, which is available as part of the administrative record. The following stations were utilized to develop the boundary condition: Biochemical Oxygen Demand: 21FLONRM27011749 Corrected chlorophyll a: 21FLSJWMHUS Dissolved Oxygen: 21FLA 76190SEAS, 21FLA 76192SEAS, 21FLA 76193SEAS, 21FLSJWMHUS, 21FLSEAS76SEAS190, 21FLSEAS76SEAS192, 21FLSEAS76SEAS193 Ammonium: 21FLSJWMHUS Nitrate+Nitrite: 21FLONRM27011749, 21FLSJWMHUS Total Nitrogen: 21FLSJWMHUS Total Phosphorus: 21FLONRM27011749, 21FLSJWMHUS Total Suspended Solids: 21FLONRM27011749, 21FLSJWMHUS

Comment:

26. Figure 7.14: This is supposed to be a plot of the simulated versus measured TN at the upper Horse Creek stations but the image from the DO plot from 7.13 is shown

Response:

This has been correct in the TMDL report.

Comment:

1. EPA used a series of complex watershed and receiving water models to assess the DO responses to changes in nutrient/BOD loads. Based upon a review of the TMDL document and supporting information (model files), significant technical issues were

raised relative to the adequacy of the models' representation of the system and the model calibration. While the documentation is helpful, some model development details are not provided, some key model-to-data comparisons are not provided, some methods of model application are not reasonable, and some of the calibration and validation results presented bring the models into question.

Response:

EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are engineering tools that allow EPA to make informed decisions when determining a TMDL. These tools are very complex and to document every feature, parameter, constant or data point that is used in the model(s) would be very difficult. All of the modeling tools are publically available and include very detailed user's manual that provide a description of the input and how it is used in the model. Initial model constants are set to typical values from like areas where the model has been was applied in the past. During the calibration process it is not uncommon to change several constants to better represent the current area being modeled.

Comment:

2. Section 3.1: The presentation on climate (especially rainfall) should be expanded. As watershed modeling was done for this TMDL, representative rainfall/meteorology stations were defined and these could be identified and presentations of data provided.

Response:

Section 3.1 provides a general overview of the climate and provides sufficient information. For the TMDL, Florida State Climate Center data from station 085612 Melbourne was used to simulate rainfall and meteorology, and has been noted in the TMDL report. The station is approximately 5 miles from Horse Creek. Processed precipitation and meteorological data is provided in the weather file available as part of the administrative records.

Comment:

5. Section 3.3: The dates for the land-use data presented and the source needs to be provided

Response:

The SJRWMD 2004 land use coverage was used to evaluate current land use in WBID 3081. This has been noted in the TMDL report.

Comment:

12. Section 7.1.1: The report states "An LSPC model was utilized to estimate the nutrient loads within and discharged from the Horse Creek watershed. The LSPC model utilized the data inputs, including land use and weather data, from the larger Indian River Watershed model (EPA 2012a and EPA 2012b) ." The defined reports are not available for review. That aside, since a stand-alone LSPC application was developed for specific use on the Horse Creek Watershed, complete model documentation (including all inputs, assumptions, data sources, calibration results, etc.) for that application needs to be provided as part of the TMDL documentation. While some information is provided within the TMDL report, it is not sufficient for full review of the model development and application.

Response:

The larger Indian River Watershed modeling reports are available on www.regulations.gov and can be found under the Florida Numeric Nutrient Criteria Technical Support Documents, Appendix C: Watershed Hydrology and Water Quality Modeling Report for Florida Watersheds and Appendix D: Hydrodynamic and Water Quality Modeling Report for Nutrient Criteria for Florida Estuary Systems, and their associated attachments. There were no changes to modeling inputs, assumptions, or data sources, and this information was provided in section 7.1.1 of the TMDL report and describes data inputs for land use, hydrologic soil groups, and weather information, as well as data used to set-up the subwatershed delineation. Calibration parameters were adjusted, and calibration results were provided in the report at the freshwater station located in Horse Creek.

Comment:

13. Figure 7.1: The image is blurry and should be replaced by a higher quality image.

Response:

EPA believes this image is fully legible.

Comment:

14. Section 7.1.1: The report states: "The LSPC model has a representative reach defined for each sub-watershed, and the main channel stem within each sub-watershed was used as the representative reach. The characteristics for each reach include the length and slope of the reach, the channel geometry and the connectivity between the sub-watersheds. Length and slope data for each reach was obtained using the USGS DEM and NHD data." The reach geometry data need to be provided to present a representation of the freshwater portions of Horse Creek.

Response:

The LSPC model has a representative reach defined for each sub-watershed, and the main channel stem within each sub-watershed was used as the representative reach. The characteristics for each reach include the length and slope of the reach, the channel geometry and the connectivity between the sub-watersheds. Length and slope data for each reach was obtained using the USGS National Elevation Dataset (NED) Digital Elevation Maps (DEM) and the USGS National Hydrography Dataset (NHD). Each representative reach in LSPC was assumed to be a completely mixed, one-dimensional segment with a trapezoidal cross section. Velocities vary throughout the channel in each subwatershed because of changes in the stream geometry. The model represents an average of these geometries using the NHD data.

Comment:

15. Section 7.1.1: The report states: "No continuous measured flow data was located in the Horse Creek watershed, so no calibration updates were done for flow in Horse Creek and the Indian River Watershed model parameterization was used". While no flow measurements were available during the time of the model calibration 2002 to 2009, a flow gage was available up until 1992. While this would not be a perfect comparison given the land use changes, it would be better than no calibration comparison.

Response:

EPA agrees that this methodology would not be perfect due to land use changes. Additionally, the current LSPC modeling period does not include years prior to 1996.

Comment:

16. According to the labels on the figures, the LSPC calibration comparisons are done to the lower Horse Creek stations. As these stations are in a highly tidally influenced area (with high salinity levels at times), it is not appropriate to do a direct LSPC reach output comparison. As such, Figures 7.3 through 7.7 are not useful or relevant. Given the nature of the EFDC/WASP model, and the grid coverage that includes both the upper and lower Horse Creek stations, the comparisons provided in the EFDC discussions are relevant for the accuracy of the simulations.

Response:

Figure 7.3 through Figure 7.7 demonstrate that the current LPSC model calibration is closely predicting water quality in Horse Creek. The WASP simulation is more relevant to discussions because it includes the tidal hydrodynamics and water quality influences from Indian River Lagoon.

Comment:

17. The report states: "The Horse Creek Estuary model used hourly water surface elevation time series data from the National Oceanic and Atmospheric Administration (NOAA) tidal stations to simulate tides at the open boundary." The exact station where this data came from needs to be defined in the report and a plot of the tides used at the grid open boundary needs to be provided.

Response:

1. The NOAA tidal station used to simulate the tides at the open boundary was the Vero Beach, FL station (8722125). This data can be found at www.tidesandcurrents.noaa.gov. The tidal data used to develop the Horse Creek model can be found in the EFDC model, which is available as part of the administrative record.

Comment:

2. The TMDL loads are all based on the LSPC model simulation of the natural condition. While this is a common practice in TMDL development, there are no assurances that the model is accurately projecting the natural background loads. Examination of the loads versus the concentrations for the natural and existing conditions identified an unreasonable level of difference in the LSPC projected flows. It would be useful to do some comparisons of what the natural load is with more pristine waterbodies so that some determination can be made of how realistic the natural condition loads are. This is especially relevant based on the recommended load reductions identified as they relate to DO. The TMDL would require 83 percent reductions in TP and 80 percent reductions in TN. The analyses of the available TN and TP data in relation to typical levels and the presently proposed NNC would not seem to support this level of reduction.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

TMDL Determination

Florida Department of Transportation

Comment:

31. In the Horse Creek WBID, the TMDL is based upon the determination that even under "natural" loading conditions; the DO would not meet the Florida State Standard. Based upon this determination, the TMDL is defined as the "natural" condition loading as defined by the LSPC model, and the percent reductions are based upon the difference between the LSPC "natural" load and the LSPC existing load.

Response:

EPA acknowledges that in the natural condition scenario DO values are still less than 5mg/L. However, there was an increase in DO concentrations, specifically in values less than 5 mg/L, in the natural condition scenario as compared to the existing condition scenario. Therefore, the natural condition scenario is more protective of the waterbodies.

Comment:

32. Comments on the LSPC water quality calibrations presented above identify that this model is not sufficiently calibrated (or demonstrated to be calibrated) through the presentations provided. As such, it is not usable for predictive purposes, i.e., determination of "natural" condition loads.

Response:

EPA believes, as stated in responses to previous comments, that the LSPC water quality model is adequately calibrated and can be used to establish TMDL load reductions and conditions, including natural condition loads.

Comment:

33. Comparison of the natural condition versus the existing condition concentrations relative to the natural versus existing condition loads indicates that the flows under the natural condition would be four times smaller than the flows under the existing condition. Given the nature of the watershed, this does not seem reasonable. A plot showing the natural condition hydrology in comparison to the existing condition from the QSER input file to EFDC shows the differences. The plot shows that there is a highly significant change in the overall flow leaving the system and that the natural versus existing condition loads are highly dependent upon the models hydrology predictions and the degree to which a natural watershed would drain versus the present condition. While the impervious area is reduced under a natural condition load scenario, there would be a greater infiltration that should increase the baseflow conditions. The LSPC simulations do not seem to reflect

this. In actuality, examination of the low flow periods indicates that baseflow in the "natural" condition model is less. EPA needs to provide some level of assurance that the "natural" loads are reasonable and make sense.

Response:

The changes in the flow regime between the existing and natural condition scenario included transforming all anthropogenic landuse types to upland forest and wetlands. This included the removal of impervious landuses as well; this caused drastic reductions in peak flow and a small reduction in baseflow.

WBID 420 Pace Mill Creek

General

Florida Department of Transportation

Comment:

3. There is a significant amount of information missing from the TMDL report regarding how the modeling was performed and, as such, a complete review of the model and its assumptions is not possible.

Response:

It is not clear what significant missing information is referred to by the commenter. EPA believes that the modeling report was sufficient to describe what was done. Moreover, the administrative record for this TMDL contains all of the models and their associated input and output files. This information is available to the public and could have been reviewed at any time. EPA Region 4 makes all of the model(s), model input(s) and data that are used to develop a TMDL available to the public upon request. The modeling tools that are used are engineering tools that allow EPA to make informed decisions when determining a TMDL. These tools are very complex and to document every feature, parameter, constant or data point that is used in the model(s) would be very difficult. All of the modeling tools are publically available and include very detailed user's manual that provide a description of the input and how it is used in the model.

Comment:

4. The natural condition load, or rather the difference between the natural condition load and the existing load, determines the reductions required to comply with the TMDL. There is basically no information provided to demonstrate that the LSPC model is reasonably simulating the hydrology and loading under the existing condition or that the conversion to natural is reasonable.

Response:

There are no USGS flow gages or measured flow data in either Pace Mill Creek. As stated in the TMDL report, the parameters from the Pensacola Model used in development of the Florida Numeric Nutrient Criteria were to develop the flow model for WBID 420. The modeling appendix for the Pensacola Model is available, which shows that flow is very well calibrated within the watershed. EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Comment:

1. An important aspect of any evaluation of a waterbody is a detailed and comprehensive data analysis. This type of analysis defines what the conditions are and what a model needs to simulate. The discussions and analyses presented in Section 5 are insufficient and should be expanded. The discussions should include a comparison of water quality across all stations in the waterbody to gain an understanding of how water quality varies longitudinally along the creek.

Response:

Section 5 adequately details the measured water quality data by providing a statistical summary of the measured data and providing figures of the measured data. As discussed in Section 5 of the TMDL report, there are several factors that may affect the concentration of dissolved oxygen in a waterbody. Among these factors is anthropogenic over-enrichment of nutrients (i.e. nitrogen and phosphorus) and oxygen-demanding substances (quantified as biochemical oxygen demand). Nutrient levels affect DO concentrations directly and indirectly. The process of nitrification, in which bacteria convert ammonia-nitrogen to nitrate-nitrogen, directly consumes oxygen from the water. Indirect effects of excessive nutrient loading involve over-stimulation of aquatic plant growth, which leads to exacerbated diurnal swings in DO as the plants photosynthesize during daylight hours, and respire at night. Replenishment of oxygen levels may be inhibited if excessive growth of aquatic plants above the water surface blocks sunlight from reaching submerged vegetation, reducing their ability to photosynthesize. Decomposition of algal and other types of organic matter, such as dead plants and animals, also uses up DO from the water.

Source and Load Assessment

Florida Department of Transportation

Comment:

10. The land-use-specific discussions make statements regarding the relative event mean concentrations (EMCs) for each land use. For example, in Section 6.2.1, Urban Areas, a sentence reads, "Land uses in this category typically have somewhat high total nitrogen event mean concentrations and average total phosphorus event mean concentrations." Literature values as well as values used in the model, if applicable, should be presented for each land use to validate these relative statements.

Response:

Modeling coefficients for each land use can be found in the models, which are available as part of the administrative record. Modeling coefficients were adjusted (within range of literature) to calibrate the watershed model to observed condition. Literature values reviewed include: USEPA. 1985. Rates, Constants, and Kinetics. Formulations in Surface Water Quality Modeling. 2nd ed. EPA/600/3-85/040. U.S. Environmental Protection Agency, Environmental Research Laboratory., Athens, GA. USEPA. 2000. BASINS Technical Note 6. Estimating Hydrology and Hydraulic Parameters for HSPF. EPA-823-R00-012. U.S. Environmental Protection Agency, Office of Water, Washington, DC. USEPA. 2006. BASINS Technical Note 8. Sediment Parameter and Calibration Guidance for HSPF. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

Comment:

1. Some better maps with greater resolution should be provided in the report to allow a better visualization of the watershed.

Response:

Comment noted. The current maps are able to demonstrate the current necessary data and will not be updated.

Assessment

Florida Department of Transportation

Comment:

8. The one year with sufficient data to assess the proposed TN and TP criteria shows TP levels are well below the criteria and TN levels are only 26 percent above. This is not really indicative of a system needing 80 percent reductions.

Response:

WBID 420 is listed as impaired for dissolved oxygen. The proposed state numeric nutrient criterion for phosphorous, referred to by the commenter, was not developed to ensure that the dissolved oxygen (DO) standard is met instream. EPA developed the TMDL to meet the currently adopted water quality standards for DO. During the development of the TMDL, it was determined that Pace Mill Creek would not meet the dissolved oxygen standard, even under natural conditions with anthropogenic pollutant sources removed. For this reason, the system was assumed to be greater than its current assimilative capacity, which warranted the large nutrient reductions.

Comment:

7. The Chlorophyll a (Chl a) levels in the system are consistently low and do not support the conclusions that large nutrient reductions are needed.

Response:

Although there are several instances of elevated chlorophyll concentrations, the data do not suggest a chronic overgrowth of phytoplankton algae. However, it is important to interpret the data with the understanding that measuring chlorophyll concentrations in a water sample only captures phytoplankton, the free-floating algae, and will not capture other types such as attached algae (periphyton), algae growing on bottom sediments (benthic), and other aquatic plants (macrophytes). Many of these samples were taken during the winter months when chlorophyll a is expected to be lower.

Comment:

6. There are two very low DO readings, less than 1 mg/L, found at the Guernsey Road station. During the time of both of these readings, the system in that area had very high color [250 and 500 platinum-cobalt unit (PCU)]. High color can be an indication of a system that, at times, can have naturally low DO levels. Some evaluation of this factor should be provided. On the same day where the upstream station showed the very low DO, the downstream station was above 5.0 mg/L.

Response:

EPA agrees that high organic levels are correlated with color and may be indicative of natural blackwater systems. However, the Pace Mill Creek watershed upstream of Guernsey Road station is primarily urban with some agriculture. Given the presence of anthropogenic sources of pollution that can cause or contribute to low dissolved oxygen, it is difficult to demonstrate that those instances when Pace Mill Creek did not meet the DO standard are entirely natural, and not caused or exacerbated by pollutants.

Comment:

5. Data in the WBID are highly limited. There are only data in 3 years (2006, 2007, 2009). For 2006 and 2007, there are only data from 1 month of each year, December and January, respectively. In 2009, there are multiple months with data. This is a highly limited data set upon which to do assessment or modeling.

Response:

The assessment and modeling for the Pace Mill Creek TMDL was derived using the best available information at the time of the development of the TMDL, which included data collected during several years in several months. Approximately two dozen sample points were collected for each water quality parameter over these three years, which provides adequate data to assess and develop a model. The Pace Mill Creek model was well calibrated to the data collected and was able to represent the measured water quality trends.

Comment:

4. There are two primary stations where data were collected in the system. One is an upstream station at Guernsey Road, and the other is a downstream station at US90. Examination of the data shows that all of the DO violations occur at the upstream station. No violations of the 5.0 mg/L criteria are found at the downstream station. Also, there are some additional stations between and above these two stations, and none of these have any DO violations. Some discussion of this longitudinal characteristic of the system should be provided in the report.

Response:

This phenomenon may be due to the increase in the forested wetland buffer along Pace Mill Creek. However, all water quality measurements are used to determine if there is a DO violation, regardless of their location within a WBID. The measured data indicates that portions of Pace Mill Creek have low DO, and a TMDL was developed to address the violation. Given the high level of development in this area of the watershed, and the presence of anthropogenic sources of pollution that can cause or contribute to low DO, it was assumed that anthropogenic sources were the cause of the low DO at this location.

Comment:

3. The discussion of available water quality data and the water quality regime of the waterbody are not sufficient. This section should identify specific stations where DO violations occur and provide some discussion of the observed relationships between low DO and total nitrogen (TN), total phosphorus (TP), and biochemical oxygen demand (BOD). For purposes of model calibration and development, it is not helpful to look at statistics that are averaged over the entire WBID.

Response:

EPA believes that the information provided in Section 5 is adequate. EPA's goal in presenting measured water quality data is to provide the public both a quantitative and qualitative view of the overall health of each WBID. All stations located within each WBID are considered when identifying water quality violations, and given the amount of monitoring data that is available for any given WBID, it can be difficult to provide meaningful information for each station within WBIDs.

Comment:

9. The levels of BOD are low as shown by the data. All values are below 2.0 or at non-detect, except for one value near 5 mg/L. None of the periods when the DO values are below the criteria exhibit BOD levels above 2.0 mg/L. This would not seem to indicate a BOD problem, at least as seen from the limited data.

Response:

The comment is correct in identifying that most of the BOD values are at or below non-detect. However, the Pace Mill Creek model indicates that BOD is lower in the natural condition scenario, which indicates that current BOD concentrations are elevated in the waterbody.

Analytical Approach

Florida Department of Transportation

Comment:

12. There are two water quality stations as identified in the Section 5 comments that represent both upstream and downstream conditions. These two locations have a similar amount of data. Both should be shown and the model needs to demonstrate that it simulates the longitudinal variation in DO as prescribed in the Section 5 comments. The model as currently presented utilizes data from only one location.

Response:

An additional DO plot has been presented which shows the DO calibration at the

downstream locations. Currently, no measured DO violations occur at the downstream station, therefore emphasis was placed on the upstream station and calibration at that station.

Comment:

26. The model predicts an increase in average DO from 7.42 mg/L to 7.50 mg/L, or a 1.1 percent increase compared with existing conditions. Given that the model is not an exact predictive tool and this increase is well within the expected model error, the very large reductions proposed to achieve such an insignificant increase in DO hardly seem reasonable.

Response:

The cumulative distribution function curve shows that, under modeled natural conditions, the average daily DO concentration will be greater than 5 mg/L and will not exceed the state standard. For this reason, the reduction in nutrients is appropriate.

Comment:

Model calibrations are shown and existing conditions defined using little to no data. In addition, many of the data points to which the model is calibrated are coded as below the laboratory method detection limit (MDL). All of the data used for the BOD "calibration" are below the MDL of 2.0 mg/L as are the 2006/2007 TP data and much of the chlorophyll a data.

Response:

The assessment and modeling for the Pace Mill Creek TMDL was derived using the best available information at the time of the development of the TMDL, which included data collected during several years in several months. Approximately two dozen sample points were collected for each water quality parameter over these three years, which provides adequate data to assess and develop a model. The Pace Mill Creek model was well calibrated to the data collected and was able to represent the measured water quality trends.

Comment:

25. Tables 7.1 and 7.3 should include statistics for Chl a. The tables should also include which statistic is being presented as well as a comparison to actual data.

Response:

This has been updated in the tables.

Comment:

27. The average TN in the natural condition scenario is shown to be 0.12 mg/L. This is extremely low for a freshwater system and not a reasonable result that reflects typical values of TN in unimpacted west Florida streams. Even the average modeled current condition TN is a very low 0.44 mg/L.

Response:

The current total nitrogen concentrations in the measured data range from 0.24 mg/L to 0.82 mg/L and have an average concentration at that location and have an average concentration of 0.48 mg/L. The model is accurately predicting the trends in TN concentration in Pace Mill Creek. Therefore, the modeled condition of 0.44 mg/L is not unreasonable in this system.

Comment:

24. The model frequently predicts Chl a values above 20 micrograms per liter (µg/L), with several spikes as high as 30 µg/L. This is completely inconsistent with the data that show a maximum measured value of 18 µg/L and many values below the MDL. MDL is most often reported as 1 µg/L.

Response:

As mentioned previously, there is limited data in the Pace Mill Creek system. Chlorophyll a data that was collected at station 21FLBRA 420-A was collected during the winter when chlorophyll a concentrations would be expected to be lower. Additionally, one measurement at 21FLPNS 33020227 measured chlorophyll a concentrations at approximately 18 µg/L. For this reason, it is reasonable to assume that chlorophyll a may be high during the summer periods in Pace Mill Creek.

Comment:

28. The natural condition load, or rather the difference between the natural condition load and the existing load, determines the reductions required to comply with the TMDL. There is basically no information provided to demonstrate that the LSPC model is reasonably simulating the hydrology and loading under the existing condition or that the conversion to natural is reasonable.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Comment:

23. When developing the natural condition scenario, EPA reduced sediment oxygen demand (SOD) from the existing condition by the same fraction as Chl a was reduced in the initial natural condition run compared to the existing condition. No justification is

provided for this methodology. In many systems, SOD likely results from more than just Chl a, with many systems subjected to inputs of other organic materials that impact SOD. Please provide additional discussion of the validity of the assumption that SOD decreases linearly with Chl a. Are there regional or site-specific data or literature citations to justify this assumption?

Response:

EPA agrees that SOD changes based on input of organic materials. The methodology to reduce SOD in the natural condition run uses a Chl a ratio, but Chl a is influenced by the nutrient loading contributions entering Smack Bayou. The methodology to reduce SOD is commonly utilized by the Florida Department of Environmental Protection, and as also been used by the Army Corps of Engineers and has been supported in papers and reports, including Steven Chapra's Surface Water-Quality Modeling.

Comment:

22. For a WASP model, comparison of the nitrogen and phosphorus species should also be presented.

Response:

Both TN and TP are presented and are well calibrated, and TMDL reductions are applied to these two parameters.

Comment:

21. For consistency, the BOD calibration plot (Figure 7.4) should extend through the end of 2009 with the 2009 data shown. These data include four additional values, two of which are reported as below the MDL of 0.2 mg/L and the other two below the laboratory practical quantitation limit (PQL).

Response:

This has been corrected in the TMDL report. The graph now extends through December 31, 2009.

Comment:

18. In general, the data in the WBID are so limited as to not really allow any kind of reasonable model comparisons. Moreover, the model only utilizes data collected from one location in the system. The stations may have different numbers, but they are at the same location.

Response:

EPA utilized the best available data for calibration. Very limited data was available in Pace Mill Creek, and data was collected at the same location by two different stations.

Comment:

17. Summertime temperatures in the model are predicted up to 33 to 34 degrees Celsius (°C) and the winter lows as low as 6°C. While the data are limited, none of the available data show the highs and lows in the model. The highest measured temperature is 24°C in September, and the lowest measured temperature is 10°C in December.

Response:

The modeled temperature data accurately simulated the measured temperature data, including measured data collected during the winter months. No summertime data was collected at the stations shown in Pace Mill Creek, and the trends used to simulate the winter and fall data were used to determine the summer temperatures.

Comment:

16. The TMDL report, or separate model report, should include a full list of LSPC, WASP, and EFDC input coefficients.

Response:

The complete list of physical, hydrologic, and chemical inputs and all relevant model coefficients is too lengthy to include in the modeling report. The administrative record for this TMDL contains all of the models and their associated input files. This information is available to the public upon request and may be reviewed at any time

Comment:

15. The length-to-width ratio of the grid cells in the upper reaches of the grid ranges from about 45:1 to 85:1. These are very high ratios that suggest a high potential for model instability. How was model stability verified? Please provide confirmation of model stability.

Response:

When model instability occurs, the EFDC model discontinues simulation, which did not occur with the current grid. In WASP, instability of numerical dispersion can be controlled by manipulating the time step. Model results were reviewed to determine if the model was predicting nutrient concentrations that were outside of the normal predicted range, which did not occur.

Comment:

13. The model appears to extend into Escambia Bay, so the lower portion of the model must be marine in nature, although the whole WBID is listed as fresh. The data should be evaluated to see if salinity intrusion is seen at all in the data, given the extent of the modeling and WBID. The connection with Upper Escambia Bay appears to be more complicated than is represented in the model. Certainly there is more restriction moving up from the bay into the creek than the model shows.

Response:

The entire WBID is classified as marine. The model takes into account the restriction of tidal influence moving from the bay into the creek by increasing slope in the dxdy file and narrowing the channel as it does according to aerial imagery. Salinity data available at the downstream stations indicate that there is a small tidal influence at this location.

Comment:

11. The presentation of the inputs and calibration of the localized models must be complete and able to stand alone to allow an assessment of their ability to simulate the hydrologic, hydrodynamic, and water quality process in the Pace Mill Creek Basin. There is a significant amount of missing information relative to the inputs and coefficients used in the models. This includes the LSPC, EFDC, and WASP models. This missing information does not allow for a complete assessment of the model accuracy.

Response:

EPA believes that the report was sufficient to describe what was done. The complete list of physical, hydrologic, and chemical inputs and all relevant model coefficients is too lengthy to include in the modeling report. Moreover, the administrative record for this TMDL contains all of the models and their associated input and output files. This information is available to the public and could have been reviewed at any time. The administrative record for this TMDL contains all of the models and their associated input and output files.

Comment:

14. As shown in the following figures, the grid is a poor representation of the system, particularly in the lower reaches of the Creek.

Response:

EPA disagrees that the current resolution of the WASP and EFDC grid cells is too coarse. The model allows for the representation of the hydrodynamic and water quality simulations within Pace Mill Creek, including the lower reaches of the Creek. Additional grid cells would not improve the overall calibration.

Comment:

19. The report states that the model was calibrated to four water quality stations. Calibrations are shown for just two stations, and these two stations are in the same location.

Response:

This was a typographical error and has been corrected.

TMDL Determination

Florida Department of Transportation

Comment:

2. Overall, there are very limited data in this waterbody segment (WBID), making reasonable model calibration difficult. For data that are presented, the model is poorly calibrated. In addition, the model grid is not a reasonable representation of the system. Because of the extensive problems with the model, it should not be used to establish a TMDL.

Response:

The assessment and modeling for the Pace Mill Creek TMDL was derived using the best available information at the time of the development of the TMDL, which included data collected during several years in several months. Approximately two dozen sample points were collected for each water quality parameter over these three years, which provides adequate data to assess and develop a model. The Pace Mill Creek model was well calibrated to the data collected and was able to represent the measured water quality trends.

Typographical

Florida Department of Transportation

Comment:

2. The header for this section has 4.0 in it twice.

Response:

This has been corrected in the TMDL report.

WBID 846A Jones Creek

General

Florida Department of Transportation

Comment:

1. An important aspect of any evaluation of a waterbody is a detailed and comprehensive data analysis. This type of analysis defines what the conditions are and what a model needs to simulate. The discussions and analyses presented in Section 5 are insufficient and could be improved.

Response:

Section 5 adequately details the measured water quality data by providing a statistical

summary of the measured data and providing figures of the measured data. As discussed in Section 5 of the TMDL report, there are several factors that may affect the concentration of dissolved oxygen in a waterbody. Among these factors is anthropogenic over-enrichment of nutrients (i.e. nitrogen and phosphorus) and oxygen-demanding substances (quantified as biochemical oxygen demand). Nutrient levels affect DO concentrations directly and indirectly. The process of nitrification, in which bacteria convert ammonia-nitrogen to nitrate-nitrogen, directly consumes oxygen from the water. Indirect effects of excessive nutrient loading involve over-stimulation of aquatic plant growth, which leads to exacerbated diurnal swings in DO as the plants photosynthesize during daylight hours, and respire at night. Replenishment of oxygen levels may be inhibited if excessive growth of aquatic plants above the water surface blocks sunlight from reaching submerged vegetation, reducing their ability to photosynthesize. Decomposition of algal and other types of organic matter, such as dead plants and animals, also uses up DO from the water.

Comment:

2. The Bayou Chico Watershed model, which included the Jones Creek subwatershed, used the same parameters as the larger Pensacola watershed model. Because 90 percent or more of the area covered by the Pensacola watershed model has completely different physiographic characteristics than those found in the Bayou Chico watershed, this brings into question how well the Bayou Chico watershed model is simulating the actual hydrologic processes in the watershed.

Response:

There was no data available for hydrologic calibration in the Bayou Chico Watershed. For this reason, the hydrologic parameters had to be used from the larger model. The model was successfully calibrated to the region, and for this reason, it was determined that the model was able to represent the hydrology of Jones Creek.

Comment:

3. The model grid of the receiving waters used in the EFDC hydrodynamic model and the WASP water quality model misrepresents the system geometry. The quality of the physical representation brings into question how well the models are simulating the physical processes occurring in Jones Creek and Bayou Chico.

Response:

EPA is unsure of how the model misrepresent the system geometry. In Figure 7.1 the grid is overlain on the aerial imagery of Bayou Chico, and the grid follows the Bayou Chico boundaries and Jones Creek hydrology.

Assessment

Florida Department of Transportation

Comment:

1. Data Analysis discussion is highly limited and poorly written. The discussion should address station locations and the relative comparisons, not simply present statistics for the entire waterbody segment (WBID). For example, the Florida Department of Environmental Protection (FDEP), in the development of a nutrient TMDL for Bayou Chico, has identified high levels of inorganic nutrients coming out of Jackson Creek, another tributary to Bayou Chico. This type of information should be evaluated and discussed, as it goes to proper understanding the system being modeled and, thus, proper model setup.

Response:

EPA believes that the information provided in Section 5 is adequate. EPA's goal in presenting measured water quality data is to provide the public both a quantitative and qualitative view of the overall health of each WBID. All stations located within each WBID are considered when identifying water quality violations, and given the amount of monitoring data that is available for any given WBID, it can be difficult to provide meaningful information for each station within WBIDs. Additionally, information pertaining to waterbodies such as Jackson Creek, which are not contributing to Jones Creek, is not necessary.

Comment:

5. Summertime temperatures in the model are predicted up to 33 to 34 degrees Celsius (°C) and the winter lows as low as 8°C. The measured temperatures at the point of the model comparisons (see the following graph) do not exhibit that level of variation. In addition, the complete data set for temperature available in the Impaired Waters Rule (IWR) is not presented in the calibration. There are data available from another station (21FLPNS 33020210) at the same location as the one listed on the plots.

Response:

The modeled temperature data accurately simulated the measured temperature data, including measured data collected during the winter months. No data summertime data in August and September and wintertime data in January was collected at the stations shown in Jones Creek, and the trends used to simulate the winter and fall data were used to determine the summer temperatures.

Comment:

6. It appears that there are missing data from all of the plots that could be added, based upon examination of the IWR and stations local to the grid location.

Response:

EPA reviewed the data in the plots and found that data from station 21FLBFA 33020118 in IWR 44 was presented.

Comment:

3. Chlorophyll a (Chl a) levels are low throughout the WBID, with many values at non-detect.

Response:

EPA acknowledges that chlorophyll a levels are low in WBID 846A.

Comment:

2. The levels of biochemical oxygen demand (BOD) are low as shown by the data, with a mean of 1.15 mg/L and a maximum of 3.6 mg/L. Only 10 percent of the values presented in the report are greater than 2.0 mg/L. FDEP generally does not considered an average of 2.0 mg/L or lower as impaired.

Response:

**The TMDL established load reductions for BOD at the natural condition, which is also true for nitrogen and phosphorus. In the natural condition scenario, 29 percent of the BOD in the system is from anthropogenic sources, indicating that even though BOD is often below 2 mg/L in the system, which a large portion of BOD is from anthropogenic sources. By reducing BOD this insures that no anthropogenic loadings are causing or contributing to depression of the dissolved oxygen concentration.

Analytical Approach

Florida Department of Transportation

Comment:

4. The Jones Creek TMDL assessment relies upon LSPC modeling for a series of local subwatersheds that is referred to as the Bayou Chico watershed model. The report states that this model utilizes the parameterization in the Pensacola Watershed model. However, the justification for doing this is not presented in the report and may in fact, be inappropriate. The Pensacola watershed model covers two physiographic regions, the Western Highlands and the Gulf Coast Lowlands (Randazzo and Jones, 1997). Approximately 90 percent or more of the area covered by the Pensacola watershed model is in the Western Highlands, which has completely different physiographic characteristics than those found in the Bayou Chico watershed, which is in the Gulf Coast Lowlands. Fernald and Purdum (1998) indicate that estimated average annual runoff for the watershed north of Escambia and East Bay is 25 to 30 inches, as compared to 15 to 20 inches in the Bayou Chico watershed. Given that the Pensacola watershed model was calibrated to

available U.S. Geological Survey (USGS) flow monitoring stations that are all located upstream of Escambia and East Bays, this brings into question how well the Bayou Chico watershed model is simulating the actual hydrologic processes in the Bayou Chico watershed, including the Jones Creek subwatershed. The assumption that watershed parameterization for the entire Pensacola Bay watershed would apply to the Bayou Chico watershed, including the Jones Creek subwatershed may not be reasonable.

Response:

No hydrologic data was available in the Bayou Chico watershed that could be used to review or revise the current parameterization and calibration of the model. Therefore, the Pensacola model, which is well calibrated, was determined to be the best available model to use for to develop hydrology in Bayou Chico. The Bayou Chico watershed model utilizes precipitation and climate data from weather station 086997, Pensacola Regional Airport, located within a several miles of Bayou Chico. This ensures that the rainfall in the Bayou Chico model is correctly represented.

Comment:

13. The "natural" condition load or, more to the point, the difference between the natural condition load and the existing load is a key part of this TMDL. The prediction of "natural" condition loadings and in-stream nutrient concentrations is a critical aspect to this TMDL. More detail assessment of the reasonableness of the "natural" conditions needs to be provided.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the methodology is not perfect, it does use best available information and technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.

Comment:

7. The DO calibration could be improved. The low values in the system are clearly not represented well with the model. Additionally, all of the data do not appear to be provided for the calibration (see the following plot).

Response:

Measured dissolved oxygen data at station 21FLBFA 33020118 ranged from 0.5 mg/L to 9 mg/L, and in the current model modeled DO ranges from 1 mg/L to 10 mg/L and is able to replicate the trend in the measured data. This indicates that the model is able to represent DO in Jones Creek. The model was calibrated to data in IWR 44.

Comment:

8. The total phosphorus (TP) calibration presented on Figure 7.9 and shown below appears to have issues and needs to be improved.

Response:

The modeled total phosphorus is able to predict the overall trends in the measured water quality data. The current model provides the best calibration that could be achieved given current available watershed data and available calibration time.

Comment:

9. The figure below shows the model grid used for the EFDC and WASP models in Bayou Chico and its tributaries including Jones Creek. This representation of the system has some issues that affect the hydrodynamic and water quality. The grid overestimates the entrance width from Pensacola Bay into Bayou Chico by a factor of 2, which could result in an overestimation of exchange between Pensacola Bay and Bayou Chico. In model development, the shoreline representation is one aspect that can be accurate. Given the lack of tide data in the interior to assure that the tidal wave is progressing appropriately, an accurate representation of the geometric conditions is critical. Also, grid cells located in the tributaries to Bayou Chico are constructed at ratios ranging from 10:1 to 40:1, which could lead to numerical instabilities. These errors introduced at the starting point for the receiving water modeling makes the results produced by the EFDC and WASP models suspect.

Response:

EPA believes that the current grid is an accurate representation of the Bayou Chico and Jones Creek system. The model did not overestimate There were no numerical instabilities in the model.

Comment:

10. Model comparisons should be shown for the complete Bayou Chico watershed and receiving water models, not just the one station in Jones Creek. The model accuracy is relative to the full model simulations including the tidal portions. The model comparisons

should include temperature, nutrients and chlorophyll for available locations throughout the spatial domains of the Bayou Chico watershed and receiving water models

Response:

Additional figures in the tidally influenced area of Bayou Chico have been provided in the report.

Comment:

11. For a WASP model, comparison of the nitrogen and phosphorus species should also be presented.

Response:

Both TN and TP are presented and are well calibrated, and TMDL reductions are applied to these two parameters.

Comment:

12. sediment oxygen demand (SOD) is a sensitive parameter in WASP. Additional discussion and presentation of how SOD values were established in the existing WASP model as well how they were adjusted for the "natural" condition is needed. The report states that SOD was revised by using the following formula: SODrevised= (Avg Chlanatural / Avg Chlaexisting)* SODexisting. The lower, revised SOD represents the change expected in SOD following excessive nutrient removal from the system. However, the report does not provide a complete explanation of the process of how the final SOD revised was reached.

Response:

When EPA develops the natural condition run, the SOD rate that is used in the natural condition model is attenuated based upon the magnitude of change in the loadings. EPA has developed an SOD response curve which relates changes in expected SOD as a function in the change in loads using a spreadsheet version of Dominic DiToro's sediment diagenesis model.

Comment:

4. The U.S. Environmental Protection Agency (EPA) prediction of "natural" condition loadings and in-stream nutrient concentrations is a critical aspect to this TMDL. More detail assessment of the reasonableness of the "natural" conditions needs to be provided.

Response:

EPA relies on the natural condition scenario to determine if all applicable water quality standards can be met when there are no anthropogenic sources. EPA realizes to parameterize a watershed to a natural condition requires some assumptions. EPA Region 4 has been using this methodology to develop nutrient TMDLs for over 8 years. While the

methodology is not perfect, it does use best available information and technical approach to determine whether a particular water quality standard could ever be met. This methodology has been improved through the years based upon feedback from stakeholders and FDEP. Florida regulations will not allow the abatement of a natural condition; this determination is needed to determine the maximum load reduction that would have to occur without reducing to below natural conditions.