TBL Consultants, LLC — Memorandum

To: Pat Boldt, WRCAC
Bruce Scott, WRCAC

Date: August 27, 2021
cc: TBL Project Files

From: Jim Klang, TBL Consultants, LLC

RE: Comments on Lake Elsinore/Canyon Lake Alternative Nutrient Reference Conditions

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Introduction

TBL Consultants, LLC (TBL) presents these comments regarding the use of the newly revised watershed reference condition concentration for the 2018 Draft Lake Elsinore and Canyon Lake Nutrient Total Maximum Daily Load Update (2018 Draft LE/CL Nutrient TMDL Update) at a request by Western Riverside County Agriculture Coalition (WRCAC).

General Comment: TBL recommends the TMDL Task Force to not accept the 2021 Alternative Reference Condition without the RWQCB first hiring an objective third party local expert to fully review the methods used to develop the reference condition concentration criteria.

Comment #1: A serious misapplication of the US EPA River and Stream nutrient criteria development guidance is being used by the RWQCB to determine the appropriate 2021 revised river and stream reference condition TN and TP concentrations. There is a high likelihood the use of the 2021 proposed revision to the 2018 LE/CL Nutrient TMDL Update loading allocations will require nonpoint source discharge levels that are <u>below</u> natural background conditions.

Comment #2: Both Lake models' setup and prediction results as presented in the CDM Smith presentations to the TMDL Task Force on January 25th, May 17th, and June 23rd have concerns that the model predictions used to justify the 2021 revisions are within the model's probable range of error. Presentations included several figures that raise this concern for the AEM3D Canyon Lake response to the revised loadings and GLM calibration and validation setup, and resulting model lake response prediction capability at the resolution necessary to accurately claim benefits in chlorophyll-a reductions when switching the 2018 reference condition concentrations to the proposed 2021 revision.

The sections below present the technical support for the submitted Comments #1 and #2. And this memorandum closes with a short biography of the author, that supports the author has the professional experience necessary to submit germane comments.

Technical Support for Comment #1

Comment #1: A serious misapplication of the US EPA River and Stream nutrient criteria development guidance is being used by the RWQCB to determine the appropriate 2021 revised river and stream reference condition TN and TP concentrations. There is a high likelihood the use of the 2021 proposed revision to the

2018 LE/CL Nutrient TMDL Update loading allocations will require nonpoint source discharge levels that are below natural background conditions.

Use of Ecoregion Reference Conditions: The peer review concerns of higher than expected phosphorus concentrations from the Cranston Guard Station monitoring dataset ignore the purpose of ecoregion groupings regarding use and consideration of the local conditions and data. The following data review points out the unique conditions and characteristics in Southern California that make national comparisons inappropriate. Conversely, the draft 2018 LE/CL Nutrient TMDL Update appropriately settled on using the Cranston Guard Station's median values from the sampling period of record to determine external watershed loading concentrations that reflect natural background conditions. During the reference condition determination process the draft TMDL update correctly compared the Cranston Guard Station's dataset to other, smaller, stream datasets in the San Jacinto River Watershed in subwatershed located below the Mystic Lake outlet; collected in primarily undeveloped areas. The medians value selected are well below the range of values compared. In fact, the document states a margin of safety over 10 percent is being provided.

According to US EPA Recommended Ambient Water Quality Criteria for Nutrients[1] the stated purpose of the recommended water quality criteria is:

> "… Over the past two decades, EPA has worked with states and authorized tribes to adopt regional-specific and locally appropriate water quality criteria for nutrients in lakes, reservoirs, rivers, streams, estuaries, coastal marine waters, and wetlands. …"

The use of ecoregions is a predominant part of setting reference conditions and Tetra Tech, Inc. (2002) explained a key principle of ecoregions that is being ignored by the proposed 2021 reference condition concentration value determinations:

> "Landscape- and local-scale factors influence the expression of waterbody habitats. Landscape-scale factors, such as climate, geology, and vegetation operate over large areas, are stable over long time periods (hundreds to thousands of years) and act to shape the overall character and attainable condition within drainage networks. Local-scale factors are a function of ultimate factors and refer to local conditions of geology, landform, and biotic processes that operate over smaller areas (e.g., stream reach scales) and over shorter time spans (years to decades). A hierarchical classification system that integrates both landscape-scale factors and local-scale factors provides the organizational framework necessary to address the spatial variability inherent in aquatic habitats."

The Tetra Tech, Inc. paper also noted:

> "The RTAG conducted a pilot project in 1999 and 2000 to evaluate regional reference conditions for streams and rivers in aggregated Ecoregion I1 (Western Forested Mountains). The results of this project suggested that the proposed reference condition distributions

[1] US EPA. EPA's Recommended Ambient Water Quality Criteria for Nutrients. Accessed August 13, 2021, online at: https://www.epa.gov/nutrient-policy-data/epas-recommended-ambient-water-quality-criteria-nutrients

> used by EPA would require some refinement and supporting studies to ensure that the adopted criteria were appropriate."

Figures 1 and 2 illustrate the progress being made by US EPA on recognizing the unique local characteristics present in the San Jacinto River Watershed. Figure 1 is a Map of local subecoregions ecoregions developed circa 2000. Figure 2 is a subecoregion map that includes subecoregion categories for 85 – specific to Southern California/Northern Baja Coast; replacing the generalized ecoregion 6 which runs from near the northern border of California to Southern California. Likewise, the general ecoregion 8 has been subdivided into categories that include a group from 8a that is specifically for Southern California Mountains, and 8f Southern California Montane Conifer Forest where the Cranston Guard Station's subwatershed is located. Figure 3 is an image presented in the draft 2018 LE/CL Nutrient TMDL Update to assist in confirming the location of the Cranston Guard Station location relative to Subecoregions 8e and 8f.

Table 1, presents a USGS SPARROW Mapper review of key total phosphorus (TP) accumulated average annual source loads (kg) for several the Southern California catchments. The catchments provided were selected to demonstrate reference condition reaches, meaning with minimally impacted conditions from human source types.

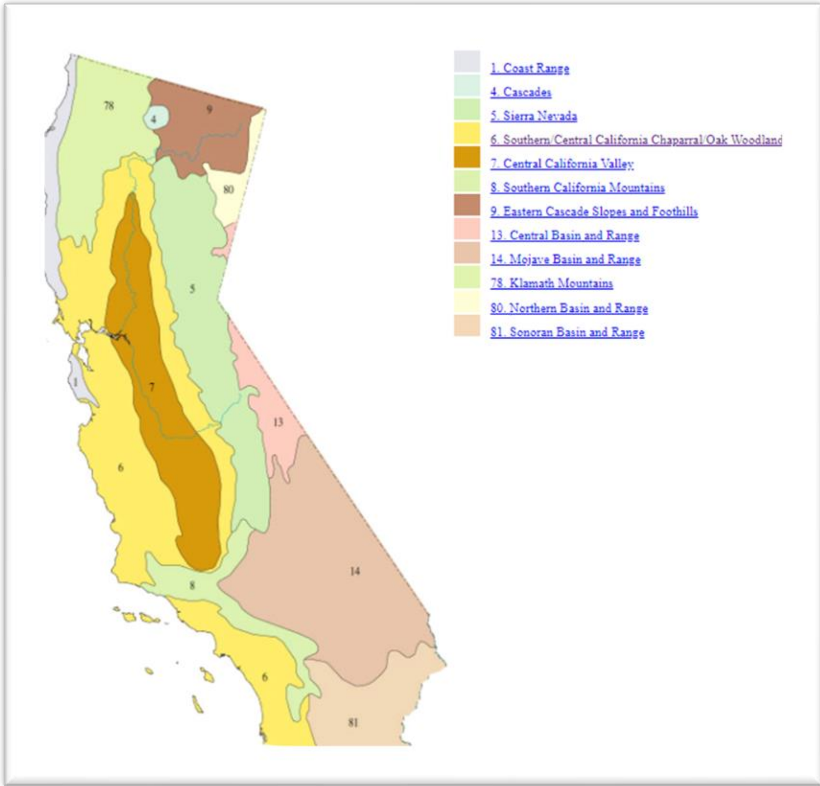
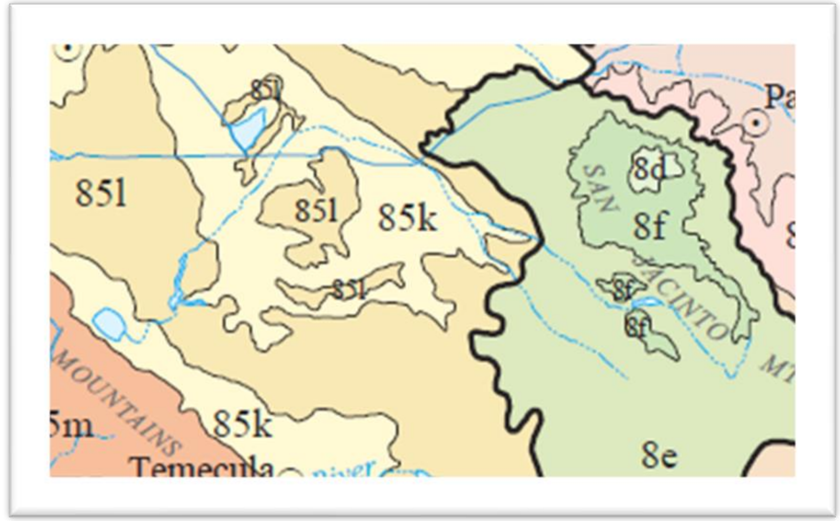


Figure 1, Level III Ecoregions of California, Revised April 2000 by the National Health and Environmental Effects Research Laboratory, (Purdue University, 2021) US EPA



	85	**Southern California/Northern Baja Coast**
	85a	Santa Barbara Coastal Plain and Terraces
	85b	Oxnard Plain and Valleys
	85c	Venturan-Angeleno Coastal Hills
	85d	Los Angeles Plain
	85e	Diegan Coastal Terraces
	85f	Diegan Coastal Hills and Valleys
	85g	Diegan Western Granitic Foothills
	85h	Morena/Boundary Mountain Chaparral
	85i	Northern Channel Islands
	85j	Southern Channel Islands
	85k	Inland Valleys
	85l	Inland Hills
	85m	Santa Ana Mountains

Figure 2, Level III Ecoregions of Southern California, Revised 2016 mapped by the US Department of the Interior and the US Geologic Survey (US EPA, 2016)

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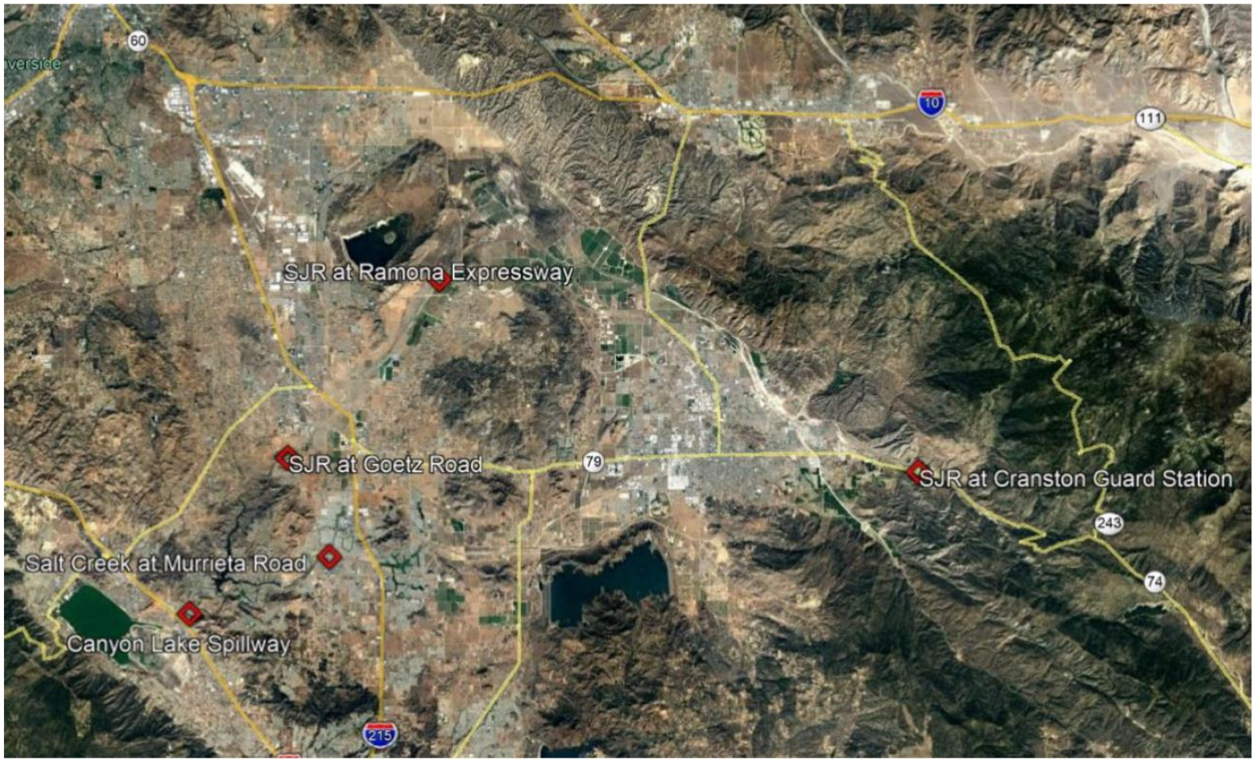

Figure 3, 2018 draft of the LE/CL Nutrient TMDL Update, Figure 8-1, an aerial photo overlaying a map of watershed monitoring stations (CDM Smith, 2018)

Figures 1 and 2 above, are presented to compare the California subecoregions 6 and 8 maps created circa 2000 (Purdue University, 2021) with the improved ecoregion delineations that recognize local characteristics in the Southern California subecoregions 85(i) and 8(i) as indications of the advancements being made in regards to ecoregion delineation resolution improvements to accommodate local conditions in the 2016 California map (US EPA, 2016); note that Figure 2 image is an excerpt of the full map, and captures primarily the San Jacinto River Watershed.

Table 1, USGS SPARRPW Mapper Accumulated Total Phosphorus Load (kg)s

USGS SPARROW Mapper Assessed Catchment Names and Watershed Locations of Accumulated Total Phosphorus Source Loads from Minimally Impacted Mountain Catchments					
SPARROW Catchment #	**CA 22535256 (Cranston Guard Station)**	**CA 22555976 (Adj. North of SJR)**	**CA 22547491 (Adj. South of SJR)**	**CA 8244222**	**OR 23894480**
8-Digit HUC (Location)	**San Jacinto River (Southern CA)**	**Santa Ana River (Southern CA)**	**Santa Margarita River (Southern CA)**	**Trinity River (Northern CA)**	**North Umqua River (Southern Oregon)**
Urban Land (kgs)	**71.16**	**273.04**	**12.26**	**44.92**	**300.19**
All Catchments: Wastewater Treatment Discharge = 0 (kgs)					
Fertilizer and Manure Applied to Cropland (kgs)	**79.25**	**24.45**	**118.23**	**6.09**	**3.65**
Grazing Cattle Manure Applied (kgs)	**0.27**	**50.72**	**171.32**	**0**	**0**
Weathering of Upland Geologic Material (kgs)	**246.13**	**505.66**	**22.16**	**8,659.46**	**1,198.04**
Channel Sources (kgs) / (% of Total)	**13,394.55 (97%)**	**13,527.12 (94%)**	**3,161.95 (91%)**	**216.20 (2%)**	**603.32 (29%)**
All Catchments: Springs = 0 (kgs)					
Total Accumulated TP Load (kg)	**13,792**	**14,381.99**	**3,485.92**	**8,926.67**	**2,102.20**
Contributing Area (km²)	**369.80**	**544.56**	**140.58**	**261.59**	**173.63**

Table 1 presents the USGS SPARROW Mapper (USGS, 2012) accumulated loads for five catchments that span the Pacific Mapper's north to south coverage. As depicted in the Figures 1 and 2 regarding refined delineations of ecoregions, the USGS modeling package provides a strong indicator of a substantial influence in TP loading from local geology, climate and vegetation cover differences.

USGS SPARROW Mapper Definition of Accumulated Load: The predicted mean annual load of the constituent (kilograms or metric tons per year) leaving a stream reach that reflects the accumulated mass of the constituent contributed by all sources in the total drainage area upstream of the reach outlet. The accumulated value includes the effects of in-stream attenuation processes in all upstream reaches.

Furthermore, the US EPA nutrient criteria development guidance documents for both rivers and streams, and lakes and reservoirs recommend using reference watershed 75th percentile values when available, and then the use of the 25th percentile values from all watershed monitoring datasets when reference conditions are not available (US EPA, 2000a; US EPA, 2000b; US EPA, 2000c; US EPA, 2001a; US EPA, 2001b). This approach was acknowledged and presented in a figure on slide 12, in the CDM Smith presentation to the TMDL Task Force on January 25th; and as stated on slide 12, the "Presumption is that a reference watershed results in reference conditions in downstream waters". However, as a response to the peer review questions regarding uncertainty with high concentration values, the proposed 2021 reference condition concentration determination approach appears to have been one of how to adjust the Cranston Guard Station percentile to become a better reflection of typical national reference conditions in mountain watersheds settings instead of further investigating what local value reference conditions are more likely to be and defend the findings based on local characteristics.

Canyon Lake: By focusing on artificially adjusting the Cranston Guard Station to the 25th percentile concentrations, the technical approach ignores the hydrology of the contributing subwatersheds and the subecoregions of the San Jacinto River Watershed. The hydrology and loading mass balance for Canyon Lake is complex and not obvious to all readers of the draft 2018 LE/CL Nutrient TMDL Update. Specifically, all sources of nutrient loadings that impact Canyon Lake are from sources located in Subecoregions 85k and 85l (Figure 2) and downstream of Mystic Lake.

Subwatersheds above Mystic Lake do not exert external loading stressors to Canyon Lake. The draft 2018 LE/CL Nutrient TMDL Update hydrology framework is based on the understanding of the Canyon Lake external loading from the watershed has no loading from the TMDL subwatershed zones 7 – 9. That is because during dry and moderate precipitation years the hydraulic retention (storage) provided by Mystic Lake is sufficient to prevent lake overflows from occurring. During wet years, when Mystic Lake does overflow, the loading from TMDL zones 7 – 9 and TMDL zones 2 through 6 is at such a large quantity of flow that it exceeds the Canyon Lake hydraulic residence time, creating conditions that completely flush the lake. Any incoming loading passes through Canyon Lake and proceeds downstream to Lake Elsinore.

However, due to lack of adequate river and stream nutrient sampling datasets the draft 2018 LE/CL Nutrient TMDL Update is based on a logical decision to assess the more robust Cranston Guard Station monitoring records for use as a surrogate dataset. This station's contributing watershed is in the completely different Aggregate Ecoregion (III), Subecoregion (8) than the waterbody of concern and its river and stream subwatersheds. Subecoregion 8 watersheds do not load Canyon Lake. TBL supports using both the approach and the findings that were presented in the 2018 sections regarding determination of the reference condition concentrations over the 2021 revised reference condition concentrations. Albeit, without having reviewed the full body of work, this statement is based on CDM Smith presentations to the TMDL Task Force dated January 25, 2021; May 17, 2021; and June 23, 2021.

Lake Elsinore: According to the CDM Smith methods applied in the draft 2018 LE/CL Nutrient TMDL Update (CDM Smith, 2020), the nutrient loading from TMDL subwatershed Zones, including Subecoregion 8 forested mountain lands, have 90 percent of the estimated source loading sequestered in Mystic Lake. Because only 10 percent of the TMDL Zone 7 – 9 subwatershed discharges impact Lake Elsinore it is highly likely that the Subecoregion 85k and 85l watershed external loadings dominate Lake Elsinore's conditions. And, TBL recommends a third party local expert review of the 2021 reference condition concentration determination process before removing the 2018 median value selection used in the 2018 LE/CL Nutrient TMDL Update.

Furthermore, being a terminal lake care must be taken when setting water quality objectives to fit the waterbody type. As stated by US EPA guidance document for lakes and reservoirs nutrient criteria (US EPA, 2001a):

> "EPA expects that the values presented in this document generally represent nutrient levels that protect against the adverse effects of cultural over enrichment and are based on information available to the Agency at the time of this publication. However, States and Tribes should critically evaluate this information in light of the specific uses that need to be protected. For example, more sensitive uses may require more stringent criteria to ensure adequate protection. On the other hand, overly stringent levels of protection against cultural eutrophication may actually fall below the natural load of nutrients for certain waterbodies. In cases such as these, the level of nutrients specified may not be sufficient to support a productive fishery. In the criteria derivation process, it is important to distinguish between the natural load associated with a specific waterbody using historical data and expert judgment and current reference conditions. These elements of the criteria derivation process are best addressed by States and Tribes with access to information and local expertise. Therefore, EPA strongly encourages States and Tribes to use the information contained in this document to develop more refined criteria according to the methods described in EPA's technical guidance manuals for specific waterbody types."

For the reasons state above in Comment #1, TBL is concerned that if the 2021 revision are implemented, using the 25 percentile adjustment, the watershed external loading assessment will require discharge allocations based on lower than natural background conditions.

Technical Support for Comment #2

Comment #2: Both Lake models' setup and prediction results as presented in the CDM Smith presentations to the TMDL Task Force on January 25th, May 17th, and June 23rd have concerns that the model predictions used to justify the 2021 revisions are within the model's probable range of error. Presentations included several figures that raise this concern for the AEM3D Canyon Lake response to the revised loadings and GLM calibration and validation setup, and resulting model lake response prediction capability at the resolution necessary to accurately claim benefits in chlorophyll-a reductions when switching the 2018 reference condition concentrations to the proposed 2021 revision.

For the Canyon Lake AEM3D in lake model, Slide 5 in the CDM Smith presentation on June 23rd indicates a small median chlorophyll-a concentration reduction of 4.4 µg/L; and, the period assessed maximum concentrations predicted a decrease of 11.2 µg/L. Slide 7 from the same presentation illustrates that the East Bay, and Main Lake predicted 2021 reference conditions comparisons with observed data have inverse seasonal relationships (Figure 2). Because algal growth is predicated in part on water column temperatures it is not intuitive for a seasonal switch in peak events. The slide 7 comments state "Main Lake concentrations deviated more, seasonal trends distorted".

For the Lake Elsinore GLM, Slides 4 and 5 in the May 17th presentation illustrates the model's calibration period and validation period by providing comparisons of two different types of daily observations (i.e., near-surface and depth integrated) and the model's predicted concentration at 2 meters below the lake surface for chlorophyll-a, TN and TP. However, the graphic provided is limited because the observation types do not have a period where they overlap; this limits readers ability to visually evaluate any changes that may have occurred during the model's validation period (Figure 3). [TBL understands that this switch in observation data is not a modeler switch, but may more likely be from a change in sampling collection methods.] In Slide 8 of the May 17th presentation regarding chlorophyll-a, all GLM scenarios predicted sizable increases in chlorophyll-a concentrations where the measured values often had little, no, or sometimes being a decrease in chlorophyll-a concentrations.

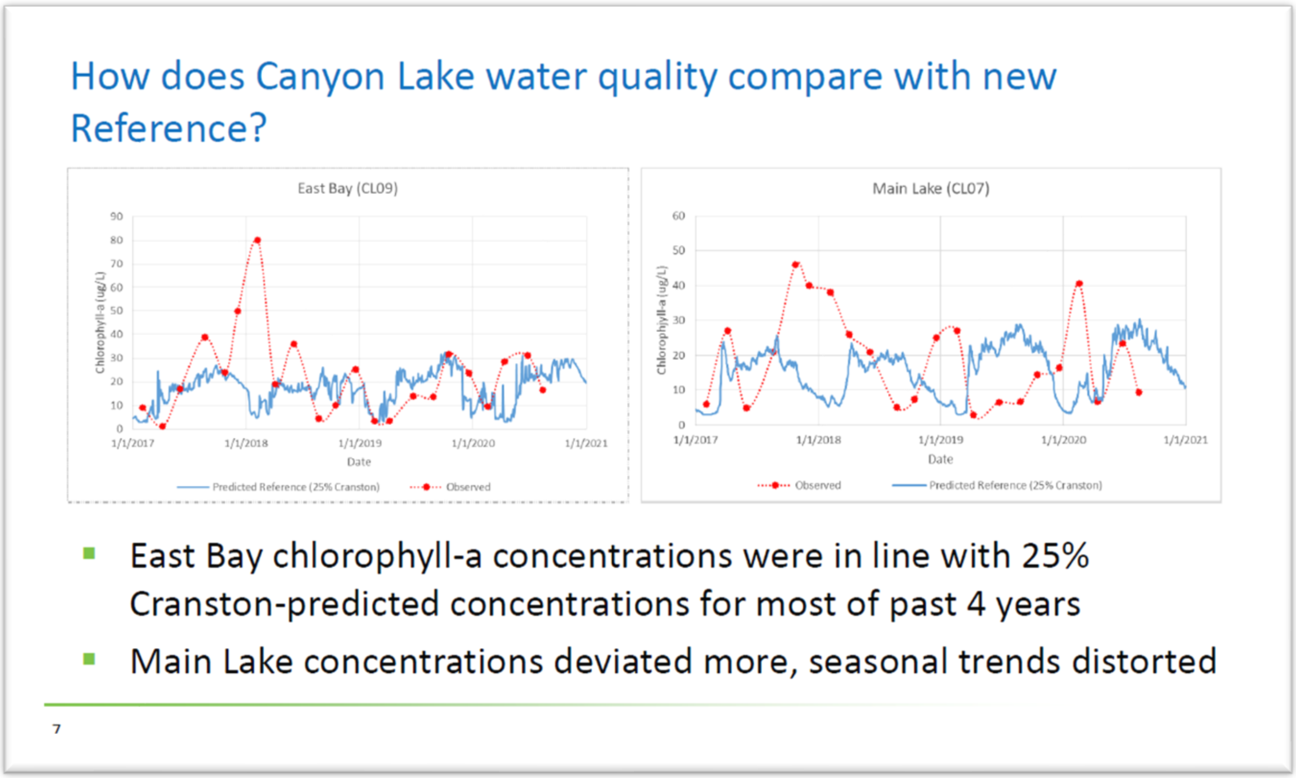

Figure 2, June 23, 2021 CDM Smith presentation Slide7 for the TMDL Task Force that illustrates a seasonal distortion between predicted 25th percentile chlorophyll-a concentration by the AEM3D model and observed current concentrations.

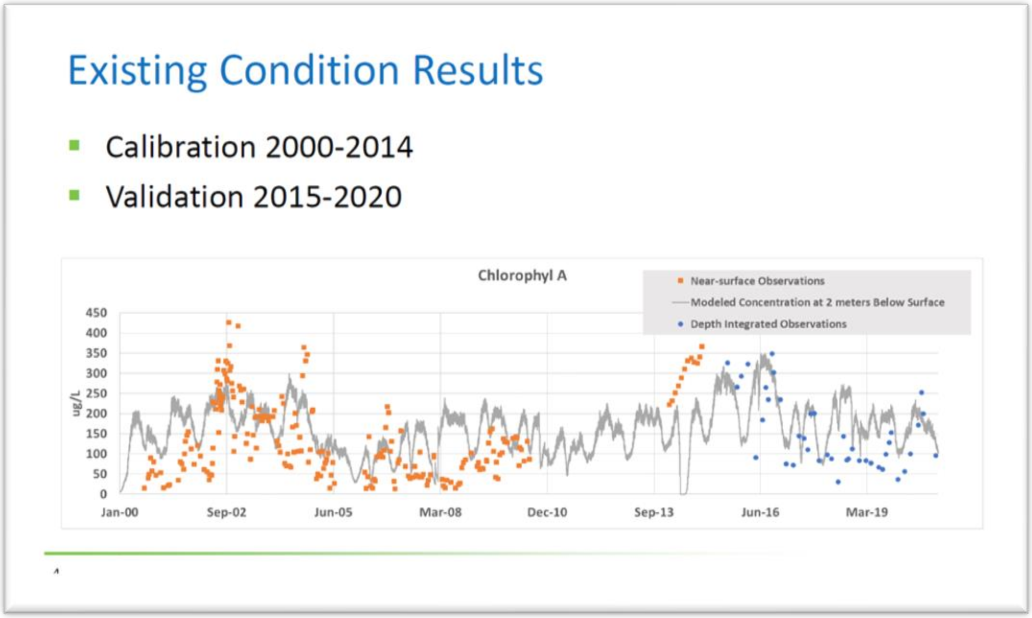

Figure 3, May 17, 2021 CDM Smith presentation Slide 4 for the TMDL Task Force that illustrates the goodness-of-fit using two different types of observed data for comparison of model validation performance. This switch in observed data type substantially limits the readers ability regarding confirmation of the GLM validation period. As, both datasets vary subustantially from the model concentration prediction value for a different depth, can a different validation statistic be provided?

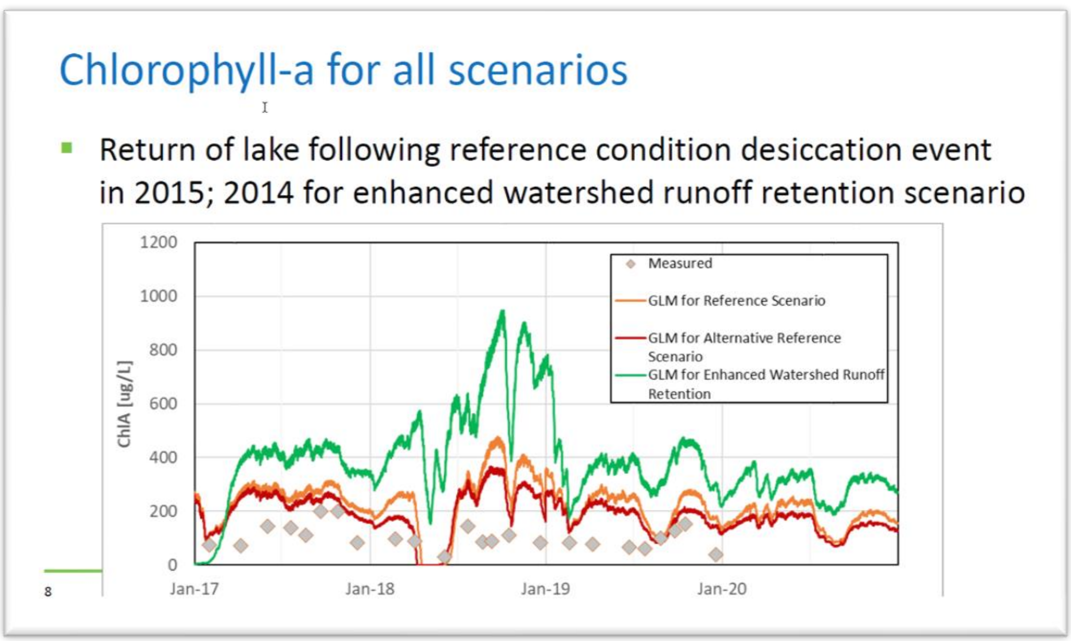

Figure 4, May 17, 2021 CDM Smith presentation Slide 8 for the TMDL Task Force that illustrates the predicted values for three different scenarios during a weather record where a comparison with actual observed values indicated good water quality conditions. The observed chlorophyll-a values are well below any of the reference condition scenarios present.

Author Biography

I, Jim Klang, PE (MN), am the sole member of TBL Consultants, LLC. The comments above are respectfully offered for consideration, and are based on years of professional experience working in this field as a technical representative for watershed management, TMDL study development and environmental markets. Careful consideration was given before issuing each comment; the due diligence included applying a weight of evidence approach that required having references that support or do not support each comment presented. When there were insufficient materials gathered to make an appropriated case, or when the presentation data did not supply a full understanding the CDM Smith figures or statements for the TMDL Task Force the comments are phrased as a question. When there was an overwhelming set of references documents supporting the findings, the comments are provided as statements. My work history includes being employed both as a staff member in a Clean Water Act delegated state agency and an engineer working in water quality for two environmental consulting firms for the last 36 years. The agency, Minnesota Pollution Control Agency's workload included wastewater and nonpoint source for over 25 years starting in 1985. In 1991, I began serving as the Best Management Practice Senior Engineer until 2005. This assignment included assisting with the facilitation of watershed-based approaches for protection and restoration of Minnesota's vast water resources. In early 2005 I was promoted to the position of the Agency's TMDL Principal Engineer, and remained in this position until late November 2006 when I left the Agency for the private sector. The MPCA TMDL duties included TMDL protocol development for dissolved oxygen impairments, providing technical support for the development of turbidity and bacteria impairment TMDL protocols. And, serving as the MPCA's technical representative and/or lead on over twenty TMDLs. During the time spent in these two Agency positions MPCA activities applied a concerted effort towards working on lake and stream nutrient water quality issues; in order to protect and restore the state's abundant list of lakes and 93,000 miles of rivers and stream. The largest effort was working with eutrophication impairments; as a private sector consultant my workload experience has continue to be dominated by water quality environmental market applications on both watershed management and drinking water source supply markets.

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