REPLENISH
Big Bear

Antidegradation Analysis for Proposed Discharges to Stanfield Marsh/Big Bear Lake and Shay Pond

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February 2022

Acknowledgment of Credit

This report is financed under the Water Quality, Supply and Infrastructure Improvement Act of 2014, administered by the State of California, Department of Water Resources.

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4,4' DDT	4,4' Dichlorodiphenyltrichloroethane
AF	Acre Foot
AFY	Acre Feet Per Year
AGR	Agricultural Supply Beneficial Benefit
APU	Administrative Procedures Update
BBARWA	Big Bear Area Regional Wastewater Agency
BBCCSD	Big Bear City Community Service District
BBLDWP	Big Bear Lake Department Of Water And Power
BBMWD	Big Bear Municipal Water District
BO	Biological Opinion
BOD	Biological Oxygen Demand
BVBGSA	Bear Valley Basin Groundwater Sustainability Agency
CCC	Criterion Continuous Concentration
CDFW	California Department Of Fish And Wildlife
CEQA	California Environmental Quality Act
COLD	Cold Freshwater Habitat Beneficial Benefit
CSA53	County of San Bernardino Service Area
CTR	California Toxics Rule
CWA	Clean Water Act
DAC	Disadvantaged Community
DDW	California State Water Resources Control Board Division Of Drinking Water
DO	Dissolved Oxygen
EIR	Environmental Impact Report
GPM	Gallons Per Minute
GSP	Groundwater Sustainability Plan
GWR	Groundwater Recharge Beneficial Benefit
LWA	Larry Walker Associates
MCL	Maximum Contaminant Level
MG	Million Gallons
MGD	Million Gallon Per Day
MUN	Municipal And Domestic Supply Beneficial Benefit
NPDES	National Pollutant Discharge Elimination System
NTR	National Toxics Rule
MBAS	Methylene Blue-Activated Substances
MDL	Method Of Detection Limit

mg/L	Milligrams Per Liter
MSL	Mean Sea Level
Mutual	Bear Valley Mutual Water Company
N/A	Not Applicable
ND	Non-Detect
NS	Not Sampled
O&M	Operations And Maintenance
PCB	Polychlorinated Biphenyls
REC1	Water Contact Recreation Beneficial Benefit
REC2	Non-Contact Water Recreation Beneficial Benefit
RARE	Rare, Threatened, Or Endangered Species Beneficial Benefit
RL	Reporting Limit
RO	Reverse Osmosis
ROWD	Report Of Waste Discharge
SAR	Santa Ana River
SBNF	San Bernardino National Forest
SBVMWD	San Bernardino Valley Municipal Water District
SPWN	Spawning, Reproduction, and/or Early Development Beneficial Benefit
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TIN	Total Inorganic Nitrogen
TKN	Total Kjeldahl Nitrogen
TM	Technical Memorandum
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TOT	Transient Occupancy Tax
TP	Total Phosphorus
TSS	Total Suspended Solids
U.S. EPA	United States Environmental Protection Agency
USFWS	United States Fish And Wildlife Service
UV	Ultraviolet
VOCs	Volatile Organic Compounds
WARM	Warm Freshwater Habitat Beneficial Benefit
WDR	Waste Discharge Requirements
WILD	Wildlife Habitat Beneficial Benefit
WLA	Wasteload Allocation
WOTUS	Waters Of The U.S

WQO	Water Quality Objective
WSC	Water Systems Consulting
WWTP	Wastewater Treatment Plant

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EXECUTIVE SUMMARY

Project Description

The Big Bear Area Regional Wastewater Agency (BBARWA) operates an existing regional wastewater treatment plant (WWTP) and related facilities in the Big Bear Valley (Valley). BBARWA has partnered with Big Bear City Community Service District (BBCCSD), Big Bear Lake Department of Water and Power (BBLDWP), Big Bear Municipal Water District (BBMWD), and Bear Valley Basin Groundwater Sustainability Agency (BVBGSA), collectively known as the Agency Team, to develop the Replenish Big Bear Program. The Replenish Big Bear Program is intended to help protect the Valley and the Santa Ana Watershed from the impacts of drought and variable precipitation by recovering a water resource currently discharged outside of the watershed. The program is comprised of several elements; the first project includes treatment upgrades at the BBARWA WWTP to produce disinfected, advanced treated effluent by providing tertiary filtration, reverse osmosis (RO) treatment, and ultraviolet (UV) disinfection for 100% of the water proposed to be discharged to Stanfield Marsh Wildlife and Waterfowl Preserve (Stanfield Marsh), a tributary of Big Bear Lake (Lake) and a separate discharge to Shay Pond, a tributary of Shay Creek. These discharges are referred to as the "Lake discharge" and the "Shay Pond discharge" and the approximate discharge locations are shown in **Figure ES-1**.

The new BBARWA WWTP facilities will be designed for a treatment capacity of 2.2 million gallons per day (MGD). By 2040, accounting for expected growth, it is estimated that the WWTP could produce 2,210 acre-feet per year (AFY) of advanced treated effluent, assuming a 99% total recovery rate could be achieved (90% RO recovery and 90% recovery of brine through brine minimization). Up to 80 AFY of the disinfected, advanced treated effluent will be sent to Shay Pond discharge, and any remaining disinfected, advanced treated effluent will be sent to the Lake discharge. All remaining flows in excess of the new treatment train's 2.2 MGD capacity will continue to be treated to undisinfected secondary standards and conveyed to BBARWA's existing Lucerne Valley site, which is regulated by the Colorado River Basin Regional Water Quality Control Board.

As described in the Technical Memorandum (Attachment B of the ROWD package) titled *Approach to Address Big Bear Lake Nutrient Total Maximum Daily Load in the NPDES Permit for Big Bear Area Regional Wastewater Agency (WSC & LWA, 2022)*, the Agency Team proposes to implement a total phosphorus (TP) Offset Program for the Lake discharge to attain net zero TP loads to the Lake to be consistent with the assumptions of the Big Bear Lake Nutrient Total Maximum

Daily Load (Nutrient TMDL) for Dry Hydrologic Conditions. While a portion of the disinfected, advanced treated effluent is planned for discharge to Shay Pond, the maximum anticipated Lake discharge of 2,210 AFY, coupled with the TP Offset Program in the Lake, is the basis of the antidegradation analysis for the Lake discharge. Modeling analysis has also been conducted to evaluate a range of additional scenarios; these results are presented herein to provide additional information.

The proposed Lake discharge will be physically discharged at the east end of Stanfield Marsh, then flow through the Marsh into the Lake through a set of culverts under Stanfield Cutoff. Due to prolonged drought conditions, Stanfield Marsh has been mostly dry since 2015. Therefore, current ambient water quality data is not available. Additionally, the water quality objectives (WQOs) specified for the Lake in the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) are more stringent than those for Stanfield Marsh. Therefore, this antidegradation analysis focuses on the impacts to water quality in the Lake.

This antidegradation analysis provides the Santa Ana Regional Water Quality Control Board (Regional Water Board) with the information needed to determine whether the proposed Lake discharge and Shay Pond discharge are consistent with the State of California (State) and federal antidegradation policies.

Note that the Replenish Big Bear Program also includes subsequent uses of Lake water for purposes such as 1) landscape irrigation, construction uses, and snowmaking at the golf course and ski resort and 2) direct groundwater recharge in Sand Canyon. It is anticipated that these uses will be regulated separately and are not discussed in this antidegradation report. Coordination with the California State Water Resources Control Board Division of Drinking Water (DDW) is underway to regulate these recycled water uses.

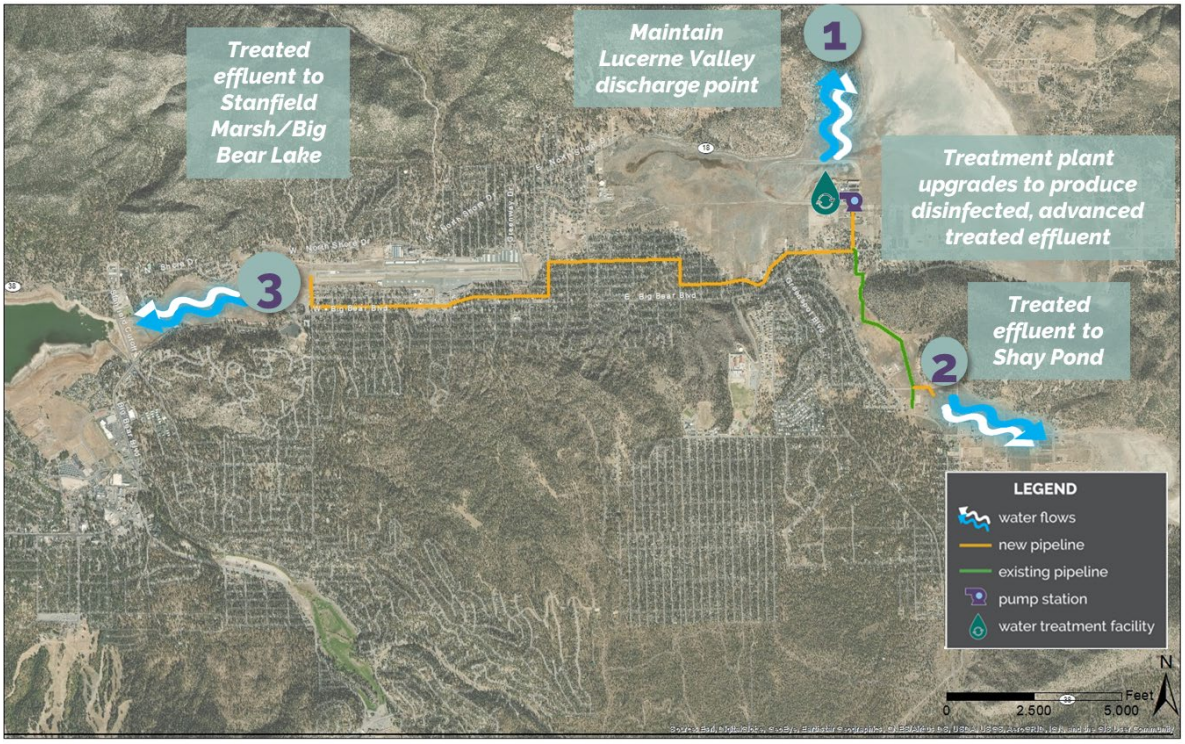


Figure ES - 1. Replenish Big Bear Program Lake and Shay Pond Discharge Locations

Water Quality Impacts of Proposed Discharges

The Replenish Big Bear Program Lake discharge is anticipated to improve Lake water quality for total dissolved solids (TDS), total phosphorus (TP), total nitrogen (TN), and chlorophyll-a as compared to modeled baseline (no project) conditions, and result in similar water quality for total inorganic nitrogen (TIN) as compared to the modeled baseline. In addition, the proposed discharge is anticipated to feature concentrations similar to or lower than ambient water quality and the most stringent WQO or criterion for all constituents evaluated except for boron. For boron, concentrations in the Lake are anticipated to increase as compared to baseline conditions, but remain well below the most stringent WQO of 0.75 mg/L.

The Shay Pond discharge is anticipated to be of better quality than the current potable water supply and ambient water quality for most constituents of interest. However, additional data may be needed to confirm these findings. Like the Lake discharge, boron may be the only constituent in the disinfected, advanced treated effluent discharged to Shay Pond that could be above existing ambient water quality for the constituent. However, it is well below the WQO of 0.75 mg/L that exists for the protection of water used to irrigate boron-sensitive agricultural crops, which is not a use of the water in Shay Pond. Additional coordination with the California Department of Fish and Wildlife (CDFW) will be conducted to ensure the Unarmored Threespine Stickleback (Stickleback) fish, a federally and State listed endangered species, and located in Shay Pond are protected.

Consistency with Antidegradation Policies

The proposed project, the discharge of disinfected, advanced treated BBARWA effluent to (1) Stanfield Marsh/ Lake at a discharge rate up to 2,210 AFY and (2) Shay Pond at a discharge rate up to 80 AFY, is determined to comprise best practicable treatment and control and is consistent with federal and State antidegradation policies for the following reasons:

- The proposed discharge to both Stanfield Marsh/ Lake and Shay Pond will not adversely affect existing or probable beneficial uses of either receiving water or downstream receiving waters, nor will the discharges cause water quality to not meet applicable water quality objectives.
- Overall, the proposed discharge is estimated to improve water quality in the Lake for TDS, TN, TP, and chlorophyll-a, maintain similar water quality for TIN, and have a very minor impact on boron. Future boron concentrations in the Lake are estimated to increase very slightly due to the proposed BBARWA discharge but are estimated to remain well below the 0.75 mg/L Basin Plan objective for boron (see **Table 7** and **Section 5.3.2**). The Lake Analysis shows that projected ambient Lake concentrations of TIN and chlorophyll-a with the proposed discharge will exist below their relevant WQO (TIN) or TMDL target (chlorophyll-a). The Lake Analysis also shows that ambient Lake concentration of TDS and TP with the proposed discharge are estimated to exceed the 175 mg/L TDS WQO and the 35 µg/L TP TMDL target, respectively. However, the modeled baseline (no project) condition is projected to result in Lake concentrations for TDS, TP, TIN, and chlorophyll-a that exceed those concentrations more often than all modeled BBARWA discharge scenarios. Modeled results for the proposed BBARWA discharge, when combined with a TP Offset Program (see Attachment B of the ROWD package), show the greatest improvements to future, ambient Lake concentrations as compared to the modeled baseline (no project) condition.

- Overall, the proposed BBARWA discharge is estimated to have a very minor impact on Shay Pond water quality and Shay Creek water quality downstream of the pond. The proposed project is estimated to potentially cause a very minor increase in boron concentrations in the pond and downstream in Shay Creek, but concentrations are estimated to remain well below the 0.75 mg/L Basin Plan objective for boron. The disinfected, advanced treated effluent proposed for discharge to the pond is anticipated to lower the concentrations of those constituents listed in **Table 13** as compared to existing ambient concentrations that are largely influenced by the groundwater currently discharged by BBCCSD to the pond to maintain water levels for the endangered Stickleback.
- Based on the above, the request to permit a new discharge to both Stanfield Marsh/ Lake and Shay Pond is consistent with federal and State antidegradation policies in that the minor lowering of water quality boron in the Lake (see **Table 7**) and Shay Pond (see **Table 13**) is necessary to accommodate important economic or social development[1], will not unreasonably affect beneficial uses, will not cause further exceedances of applicable WQOs, and is consistent with the maximum benefit to the people of the State.
- Based on the above, the request to permit new discharges to Stanfield Marsh/ Lake and Shay Pond are consistent with the Porter-Cologne Act in that the resulting water quality will constitute the highest water quality that is reasonable, considering all demands placed on the waters, economic and social considerations, and other public interest factors.

The proposed discharge of disinfected, advanced treated BBARWA effluent to Stanfield Marsh/ Lake and Shay Pond also fully supports California's *Recycled Water Policy* (SWRCB, 2013) in that it would result in an increased use of recycled water from municipal wastewater sources, would incrementally reduce reliance on the vagaries of annual precipitation, and would assist in the sustainable management of surface and groundwater resources.

[1] Maintain and improve recreation and tourism in the Big Bear Lake region which in turn stimulates the local and regional economies.

1 INTRODUCTION

This section provides an overview of the Replenish Big Bear Program, description of the proposed discharges to Stanfield Marsh, a tributary of the Lake, and a separate discharge to Shay Pond, a tributary of Shay Creek. This section also discusses the purpose and approach used in this antidegradation analysis report.

1.1 Program Overview

BBARWA is a joint powers authority formed in 1974 to provide centralized wastewater conveyance, treatment, and disposal for the City of Big Bear Lake, representing approximately 47% of the total connections, BBCCSD, representing approximately 48% of the total connections, and County of San Bernardino Service Area 53B (CSA53), representing approximately 5% of the total connections. Each of these member agencies maintains and operates its own wastewater collection system that conveys wastewater to BBARWA's interceptor system for transport to the BBARWA WWTP. The BBARWA service area includes the entire Valley and covers about 79,000 acres. BBARWA owns and operates a regional WWTP to treat the Valley's wastewater and currently discharges undisinfected secondary effluent to Lucerne Valley, which is located outside the Santa Ana Watershed.

The Replenish Big Bear Program is a collaborative regional water resources program being implemented by Agency Team to help protect the Valley and the Santa Ana Watershed from the impacts of drought and variable precipitation through the recovery of this local water resource currently discharged outside of the watershed.

The Replenish Big Bear Program is comprised of three independent projects:

1) Discharge of disinfected, advanced treated effluent to Stanfield Marsh, which is tributary to the Lake, and a separate discharge to Shay Pond;
2) Use of Lake water for purposes such as landscape irrigation of the local golf course, construction uses and snowmaking; and
3) Use of Lake water for groundwater recharge in Sand Canyon.

The first project is the subject of this antidegradation analysis and is foundational to the Replenish Big Bear Program and necessary to enable implementation of the subsequent uses of Lake water. As part of the first project, the BBARWA WWTP will be upgraded to produce disinfected, advanced treated effluent through tertiary filtration using ultrafiltration, and RO treatment with UV disinfection for the proposed discharges to the Lake and Shay Pond.

Although the proposed Lake discharge will be physically discharged at the east end of Stanfield Marsh, then flow through the Marsh into the Lake through a set of culverts under Stanfield Cutoff, this antidegradation analysis was completed for the Lake since Stanfield Marsh has been mostly dry since 2015. Therefore, current ambient water quality data is not available for this antidegradation analysis. Additionally, the WQOs specified for the Lake in the Basin Plan are more stringent than those for Stanfield Marsh.

Figure 1 shows the WWTP and proposed discharge locations, which are components of the first project. The proposed project's two discharge points will allow BBARWA to minimize the discharge of disinfected, advanced treated effluent outside of the watershed. The Lake discharge will increase Lake levels to better support beneficial uses including recreation and habitat, particularly during times of drought. The Shay Pond discharge will replace potable water currently discharged to the waterbody to maintain the water flow through the pond. Up to 80 AFY of disinfected, advanced treated effluent will be sent to Shay Pond, and any remaining disinfected, advanced treated effluent will be sent to the Lake.

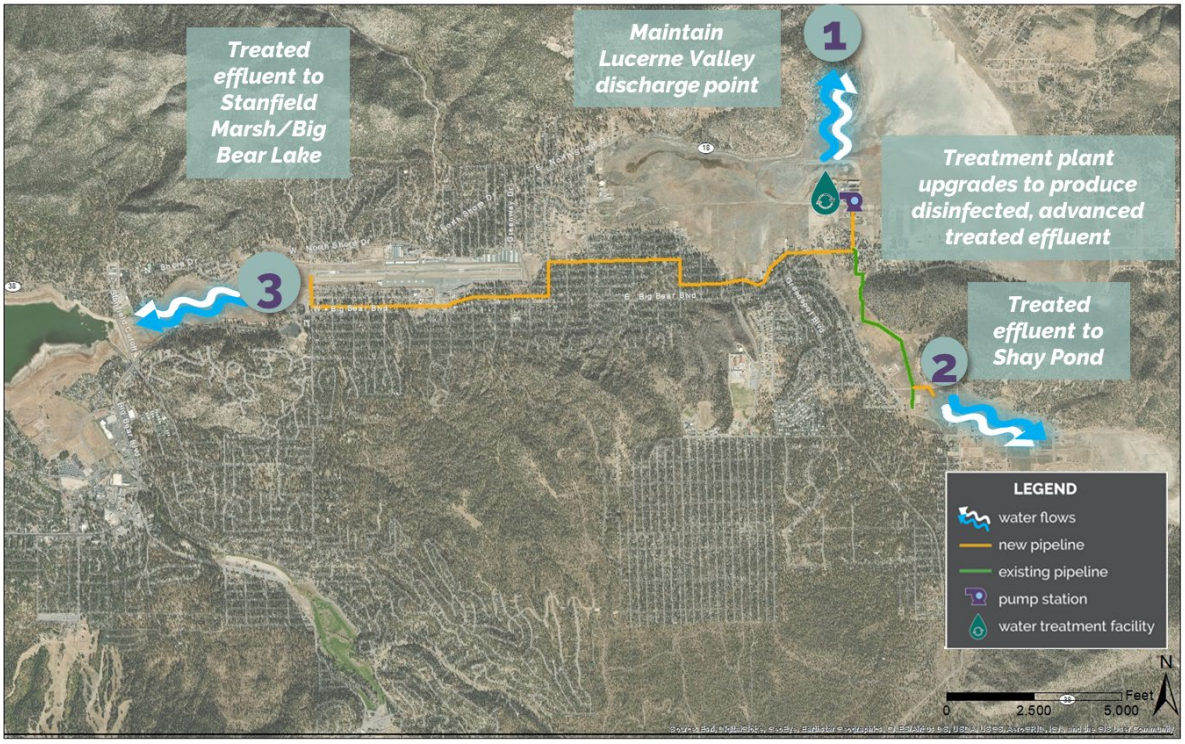


Figure 1. Replenish Big Bear Program Lake and Shay Pond Discharge Locations

The other two projects will utilize Lake water for purposes such as1) landscape irrigation, construction uses, and snowmaking at the ski resort, and 2) direct groundwater recharge in Sand Canyon. **Figure 2** shows the general location of these two projects. The golf course irrigation, construction uses, and snowmaking project can be implemented using existing infrastructure used for snowmaking that draws water from the Lake. The Sand Canyon recharge project will require construction of a pump station, pipeline, recharge ponds and monitoring wells and may be implemented in parallel with the Lake discharge.

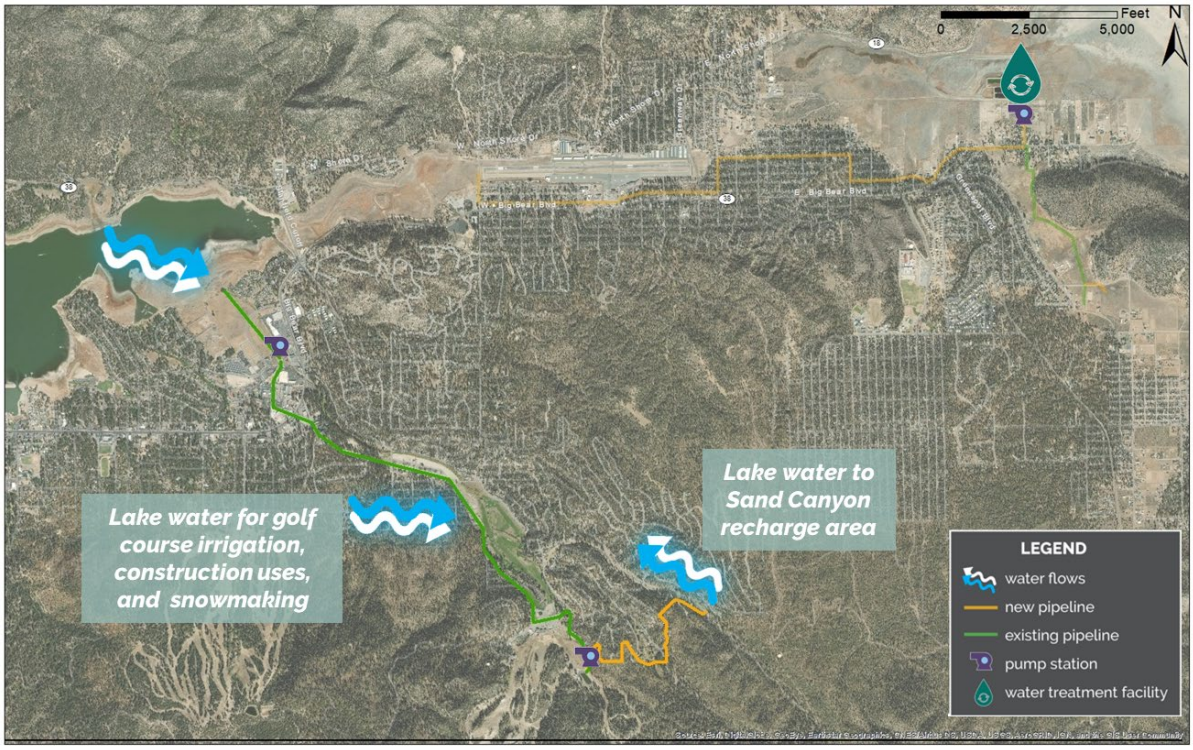


Figure 2. Replenish Big Bear Program Subsequent Uses of Lake Water

1.2 Project Description

The discharge of disinfected, advanced treated effluent to Stanfield Marsh, which is tributary to the Lake, and a separate discharge to Shay Pond is the subject of this antidegradation analysis. The proposed discharges require the construction of WWTP upgrades, an effluent booster pump station at the WWTP site and approximately seven (7) miles of pipeline to convey water to the discharge locations.

Figure 3 shows a process flow diagram of the existing BBARWA WWTP treatment process.

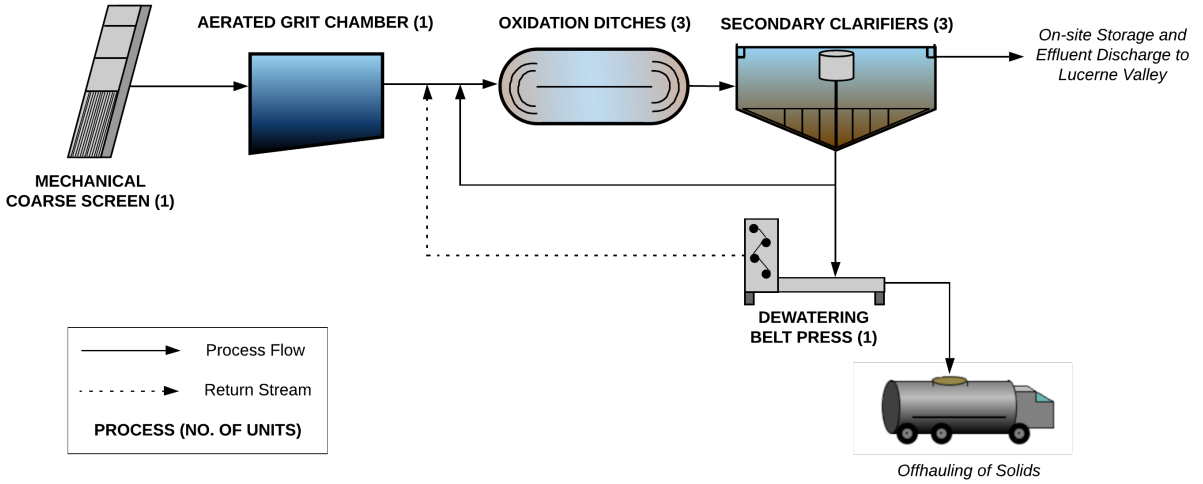


Figure 3. BBARWA Existing WWTP Process Flow Diagram

The existing BBARWA WWTP secondary treatment facility has a capacity of 4.89 MGD and a hydraulic capacity of 9.1 MGD. The WWTP treats commercial and domestic wastewater from the City of Big Bear Lake, BBCCSD, and CSA53 collection systems. The existing treatment process includes the following:

- Preliminary treatment consisting of a mechanical coarse screen and an aerated grit chamber;
- Secondary treatment consisting of extended aeration oxidation ditches and secondary clarifiers; and
- Solids handling through a dewatering belt filter press.

Treated effluent is temporarily stored on-site prior to discharge to Lucerne Valley and dewatered solids are hauled off-site. The undisinfected secondary effluent discharged to Lucerne Valley is currently used to irrigate crops used for livestock feed. This discharge is regulated under Order R7-2021-0023 Waste Discharge Requirements (WDR) permit, issued by the Colorado River Basin Regional Water Quality Control Board (**Appendix A**).

The proposed upgrades, as shown in **Figure 4**, to the BBARWA WWTP to produce disinfected, advanced treated effluent include:

- Biological nutrient removal improvements to the existing oxidation ditches for improved nitrification and denitrification;
- Tertiary filtration and nitrogen and phosphorus removal via denitrification filters;

- Low- and high-pressure filtration with ultrafiltration (UF) membranes and 90% recovery RO membranes;
- Brine pellet reactor for brine minimization to produce a total system recovery of 99%; and
- UV disinfection.

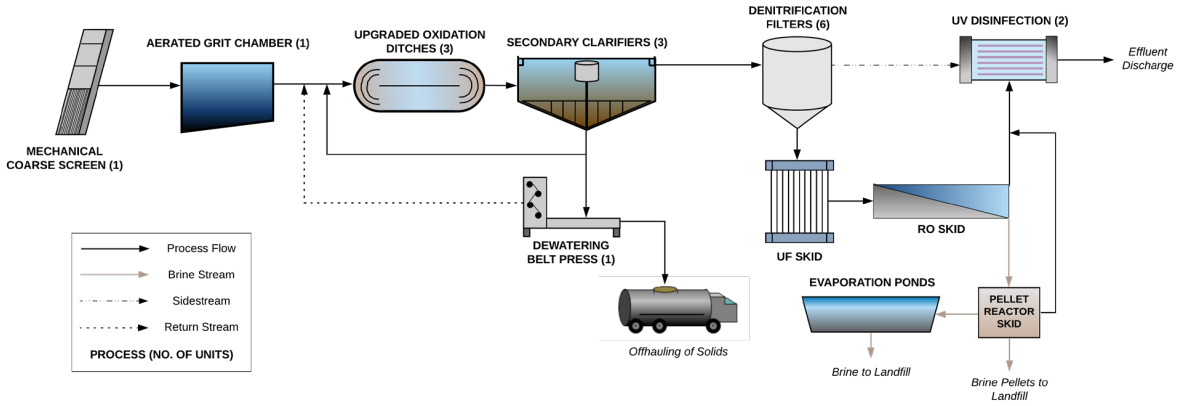


Figure 4. BBARWA Proposed WWTP Treatment Upgrades Flow Diagram

The proposed upgrades (i.e., new advanced treatment train) would be designed for a treatment capacity of 2.2 MGD. By 2040, accounting for expected growth, it is estimated that the WWTP could produce 2,210 AFY of advanced treated effluent, assuming a 99% total recovery rate could be achieved (90% RO recovery and 90% recovery of brine through brine minimization). The WWTP currently produces about 2.0 MGD of undisinfected secondary effluent on an average annual basis.

The RO brine management option included in the preliminary design for Replenish Big Bear is a brine minimization pellet reactor to reduce the volume of brine produced by the RO process. The reduced brine stream from the pellet reactor will be conveyed to evaporation ponds located on BBARWA WWTP property. It is assumed that an RO recovery of 90% at 2.2 MGD influent flow would result in 0.22 MGD of RO brine to be minimized through the pellet reactor and approximately 0.022 MGD of liquid brine to be conveyed to the evaporation pond based on a pellet reactor recovery of 90%. A total evaporation pond area of 23 acres is needed for the brine stream. The RO brine management strategy will be evaluated further as the Project enters the design phase, along with refinements to total system recoveries based on site-specific piloting results.

BBARWA also plans to maintain the existing Lucerne Valley discharge location. All WWTP process water in excess of the new treatment train's 2.2 MGD capacity will continue to be treated to undisinfected secondary levels and conveyed to the existing Lucerne Valley site, consistent with the current, permitted discharge requirements of the existing BBARWA WWTP.

1.3 Purpose of Report

As required by the Clean Water Act (CWA), the discharge of any pollutant or combination of pollutants to surface waters that are deemed waters of the United States (U.S.), as is the Lake discharge and potentially Shay Pond discharge, must be regulated by a National Pollutant Discharge Elimination System (NPDES) permit. Because the two proposed discharge locations are new discharges to surface waters of the U.S., a NPDES permit governing the proposed discharges must be requested from the Regional Water Board.

Under the State and federal antidegradation policies, the Regional Water Board is required to make a finding regarding the satisfaction of the policies as they pertain to surface water discharges for which the Regional Water Board issues a NPDES permit. The State antidegradation policy, which incorporates the federal antidegradation policy, seeks to maintain the existing high quality of water to the maximum extent possible, and only allows a lowering of water quality if:

- Changes in water quality are consistent with maximum benefit to the people of the state, will not unreasonably affect present and potential beneficial uses, and will not result in water quality lower than applicable standards, and
- Waste discharge requirements for a proposed discharge will result in the best practicable treatment or control of the discharge necessary to assure:
    - No pollution or nuisance; and
    - Highest water quality consistent with maximum benefit to the people of the State.

The purpose of this report is to provide the Regional Water Board with the information needed to determine whether the proposed discharges are consistent with State and federal antidegradation policies. This antidegradation analysis includes assessments of water quality impacts on the receiving waters and downstream receiving waters estimated to result from the proposed project; an evaluation of how these estimated changes in water quality compare to applicable WQO and relevant water quality criteria; how estimated changes in water quality may affect existing or probable beneficial uses; and a finding of consistency with antidegradation policies.

1.4 Analysis Approach

The following antidegradation analysis is tailored to be consistent with federal and State antidegradation policies and the guidance provided in the Administrative Procedures Update (APU) 90-004. Pursuant to the APU guidelines, this analysis follows the provisions for a "simple analysis" and evaluates whether changes in water quality resulting from the proposed new discharges to the Lake and Shay Pond are "*consistent with maximum benefit to the people of the State, will not unreasonably affect uses and will not cause water quality to be less than water quality objectives and that the discharge provides protection of existing in-stream beneficial uses and water quality necessary to protect those uses.*"

In general, the data available for existing secondary effluent quality, projected disinfected advanced treated effluent quality, and ambient water quality were assessed to determine if the proposed future discharge would result in concentrations that exceed existing ambient water quality and/or relevant WQOs or criteria. For constituents anticipated to lead to a lowering of existing ambient water quality or an exceedance of relevant WQOs or criteria, further analysis was conducted.

Additionally, TDS, TIN, TN, TP, and chlorophyll-a were evaluated using a two dimensional (2D) hydrodynamic-water quality model (CE-QUAL-W2) developed for Big Bear Lake by Dr. Michael A. Anderson (Dr. Anderson), a limnologist who has in-depth knowledge of the Lake. The model evaluation was conducted to help select the preferred treatment alternative and assess the impacts of the proposed Lake discharge on constituents of interest. The water quality impacts with and without the proposed project were assessed for three different treatment alternatives as documented in *Big Bear Lake Analysis: Replenish Big Bear* (2021 Lake Model Analysis; **Appendix B**). Additional model updates were recently completed to incorporate additional discharge volume scenarios and seasonal variability and documented in *Replenish Big Bear: Modeling of Higher Flows and with Zero TP Load* (2022 Lake Model Update; **Appendix C**). The model results from both analyses are discussed in this report.

For constituents not able to be evaluated by the CE-QUAL-W2 model, their potential impacts with regard to a lowering of existing ambient water quality and/or the exceedance of relevant WQOs or criteria were assessed using a simple mass balance equation.

2 REGULATORY REQUIREMENTS

This section summarizes the federal and State antidegradation policies considered in this antidegradation analysis.

2.1 Applicable Laws and Policies

The federal Clean Water Act (CWA) requires states to adopt, with United States Environmental Protection Agency (U.S. EPA) approval, water quality standards applicable to all intrastate waters (33 U.S.C. § 1313). U.S. EPA regulations also require state water quality standard submittals to include an antidegradation policy to protect beneficial uses and prevent further degradation of high-quality waters (33 U.S.C. § 1313(d)(4)(B); 40 C.F.R. § 131.12). The State's antidegradation policy is embodied in State Water Resources Control Board (SWRCB) Resolution 68-16.

BBARWA's requested discharge of disinfected, advanced treated effluent to the Lake and to Shay Pond requires the application of WQOs contained in the Basin Plan, as well as criteria promulgated by the U.S. EPA for California waters. Both the federal and State antidegradation policies apply to the proposed surface water discharges of treated effluent to the Lake and to Shay Pond.

2.2 Federal Policies and Guidance

The federal antidegradation policy is designed to protect existing uses and the level of water quality necessary to protect existing uses and provide protection for higher quality and outstanding national water resources. The federal policy directs states to adopt a statewide policy that includes the following primary provisions (40 C.F.R. § 131.12).

1) *Existing in-stream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.*

2) *Where the quality of waters exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after the full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost effective and reasonable best management practices for nonpoint source control*

3) *Where high quality waters constitute an outstanding National resource, such as water of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.*

4) *In those cases where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with Section 316 of the Act.*

Based on guidance developed by the U.S. EPA, Region 9 (Guidance on Implementing the Antidegradation Provisions of 40 C.F.R. § 131.12 (U.S. EPA, 1987)) and guidance issued by SWRCB with regard to application of the Federal Antidegradation Policy (Memorandum from William R. Attwater to Regional Board Executive Officers Federal Antidegradation Policy (Attwater, Oct. 1987)), application of the federal antidegradation policy is triggered by a lowering, or potential lowering, of surface water quality. A proposed increase in the volume of an existing discharge or a new discharge to surface water is typically considered a trigger to the application of the federal antidegradation policy. Because the Project is proposing two new discharges to surface waters, the federal antidegradation policy applies.

Both the Lake and Shay Pond are not designated as outstanding natural resource waters and therefore, the receiving waters are not subject to that portion of the federal policy. The application to other portions of the policy is determined on a constituent-by-constituent basis. For a water body where water quality is not significantly better than needed to meet designated uses, either because it does not meet or it just meets applicable water quality objectives or criteria to protect beneficial uses, a new discharge cannot cause further impairment.

For waters with water quality that is better than necessary to support beneficial uses, the new discharge may not lower water quality unless such lowering is necessary to accommodate important economic or social development. In August 2005, the U.S. EPA issued a memorandum discussing antidegradation reviews and significance thresholds (Memorandum from Ephraim S. King, Director, Office of Science and Technology, U.S. EPA, Office of Water to Water Management Division Directors, Regions 1-10 (August 2005). As discussed in the memorandum, an intent of the policy "is to maintain and protect high quality waters and not to allow for any degradation beyond a *de minimis* level without having made a demonstration, with opportunity for public input, that such lowering is necessary and important." (Memorandum at p. 1). U.S. EPA has determined that the significance threshold of a 10% reduction in available assimilative capacity is "workable and protective in identifying those significant lowering of water quality that should receive a full… antidegradation review, including public participation." (U.S. EPA, 2005). This determination by U.S. EPA is helpful in determining the magnitude of water quality change that is determined to be of significant interest in the antidegradation analysis.

2.3 State Policies and Guidance

2.3.1 Resolution 68-16

The State issued its own antidegradation policy in 1968 to protect and maintain existing water quality in California. The State's Resolution 68-16 is interpreted to incorporate the federal antidegradation policy and satisfies the federal regulation requiring states to adopt their own antidegradation policies. Resolution 68-16 states, in part:

1) *Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial uses of such water and will not result in water quality less than that prescribed in the policies.*

2) *Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality water will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.*

2.3.2 1987 Policy Memorandum

In 1987, SWRCB issued a policy memorandum to the Regional Water Quality Control Boards (Regional Water Boards) to provide guidance on the application of the federal antidegradation policy for State and Regional Water Board actions, including establishing water quality objectives, issuing NPDES permits, and adopting waivers and exceptions to water quality objectives or control measures (Attwater, 1987). In conducting these actions, the Regional Water Boards must assure protection of existing beneficial uses, that significant lowering of water quality is necessary to accommodate important economic or social development, and that outstanding national resource waters be maintained and protected. The 2005 U.S. EPA guidance referenced in the Federal Policies and Guidance Section above is useful in determining whether changes in water quality that may result from a proposed action are significant.

2.3.3 Administrative Procedures Update (APU) 90-004

SWRCB issued guidance (APU 90-004) to all Regional Water Boards in 1990 regarding the implementation of State and federal antidegradation policies in NPDES permits. By using this guidance, Regional Water Boards are to determine if a proposed discharge is consistent with the intent and purpose of the State and federal antidegradation policies. APU 90-004 provides Regional Water Boards with guidance on the appropriate level of analysis that may be necessary, distinguishing between the need for a "simple" antidegradation analysis and a "complete" antidegradation analysis. If it is determined that a simple analysis is not appropriate based on the estimated level of impact of the new discharge, then a more rigorous analysis – a complete analysis – is appropriate. A primary focus of the complete analysis is the determination of whether and the degree to which water quality is lowered as compared to the socioeconomic costs of maintaining existing water quality. This determination greatly influences the level of analysis required and the level of scrutiny applied to the "balancing test" – that is, whether the discharge is necessary to accommodate important economic and social development, and whether a water quality change is consistent with the maximum benefit to the people of the State.

The antidegradation analysis addresses the following questions stated in SWRCB APU 90-004 to maintain consistency with State and federal antidegradation policies.

- Whether a reduction in water quality will be spatially localized or limited with respect to the water body; e.g., confined to the mixing zone;
- Whether the proposed discharge of treated effluent will produce minor effects which will not result in a significant reduction of water quality;

- Whether the proposed discharge of treated effluent has been approved in a General Plan, or similar growth and development policy document, and has been adequately subjected to the environmental analysis required in an environmental impact report (EIR) required under the California Environmental Quality Act (CEQA); and
- Whether the proposed Project is consistent with maximum benefit to the people of the State.

The Replenish Big Bear Program seeks to discharge highly treated effluent receiving RO treatment and UV disinfection to the Lake and to Shay Pond. BBARWA has reviewed the NPDES guidance issued by SWRCB in APU 90-004 and believes that the proposed project meets the criteria for a simple antidegradation analysis. The following sections provide the rationale for this determination and an associated level of analysis and information for use by the Regional Water Board in its consideration of state and federal antidegradation requirements in accordance with APU 90-004.

3 APPLICABLE WATER QUALITY STANDARDS

This section summarizes the applicable water quality standards for Stanfield Marsh and the Lake. Stanfield Marsh and the Lake are both waters of U.S., which have several designated beneficial uses. Water quality standard applicable to Shay Pond are discussed in **Section 6**. **Figure 5** shows the proposed discharge location in reference to Stanfield Marsh and Lake.

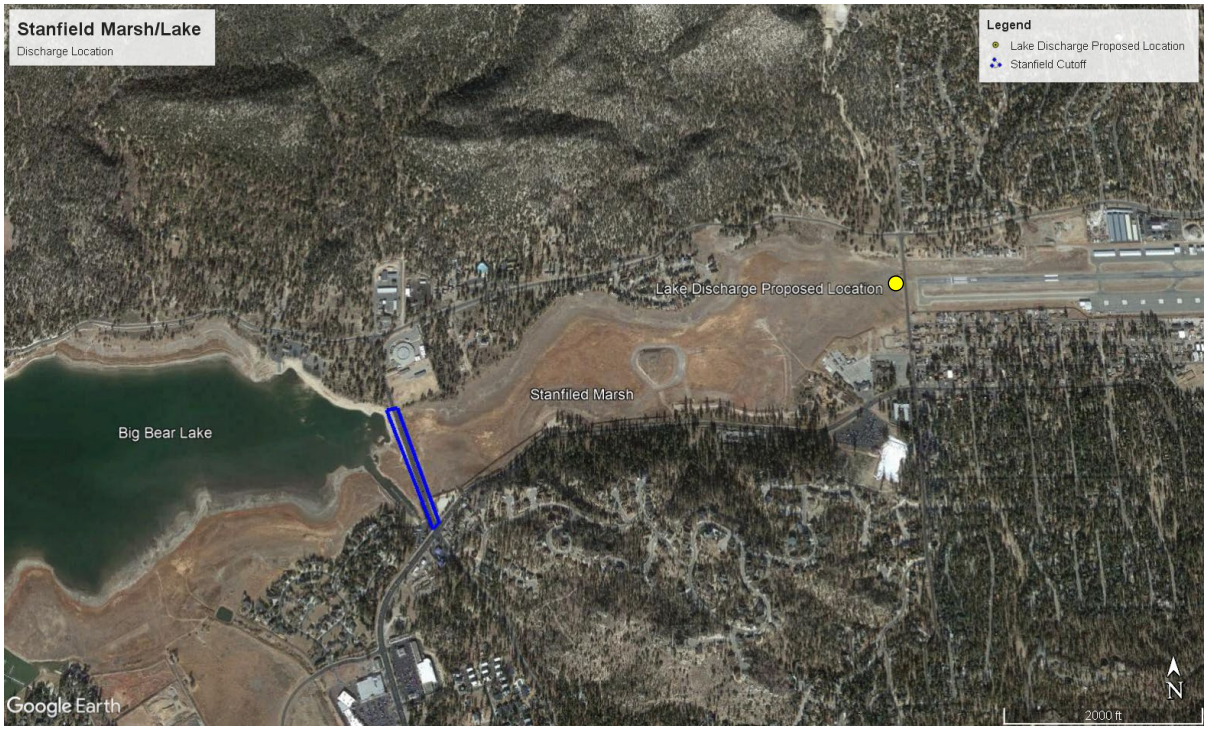


Figure 5. Overview of Lake Discharge Location in Reference to Stanfield Marsh/Lake

3.1 Beneficial Uses

The Basin Plan contains descriptions of the legal, technical, and programmatic bases for water quality regulation in the Santa Ana region. The Basin Plan describes the beneficial uses of major surface waters and their tributaries and the corresponding WQOs put into effect to protect these beneficial uses. **Table 1** shows the designated beneficial uses of the Lake and Stanfield Marsh.

Table 1. Beneficial Uses of Lake and Stanfield Marsh

Beneficial Uses	Big Bear Lake	Stanfield Marsh
AGR - Agricultural Supply	✓	
COLD - Cold Freshwater Habitat	✓	✓
GWR - Groundwater Recharge	✓	
MUN - Municipal and Domestic Supply	✓	✓
RARE - Rare, Threatened, or Endangered Species	✓	✓
REC1 - Water Contact Recreation	✓	✓
REC2 - Non-Contact Water Recreation	✓	✓
SPWN - Spawning, Reproduction, and/or Early Development	✓	
WARM - Warm Freshwater Habitat	✓	
WILD - Wildlife Habitat	✓	✓

3.2 Water Quality Objectives/Water Quality Criteria

To protect the designated beneficial uses, the Regional Water Board applies WQOs contained in the Basin Plan and criteria adopted in the California Toxics Rule (CTR) and the National Toxics Rule (NTR) to the receiving water (i.e., Lake) and downstream receiving waters (i.e., Bear Creek and subsequently Santa Ana River Reach 6). Per the Basin Plan, Stanfield Marsh does not have numeric WQOs. The Lake WQO objectives were used since these are more stringent and the Stanfield Marsh has been mostly dry since 2015.

The Regional Water Board uses these standards to determine if a proposed project will cause or contribute to impairments of the designated beneficial uses. **Table 2** presents the most conservative water quality criteria used to protect the most sensitive beneficial uses that apply to the Lake and downstream receiving waters. The constituents of interest included in **Table 2** are those:

- Included in the Basin Plan;
- Listed in the California 2018 Integrated Report for CWA Section 303(d) list;
- Identified by the Regional Water Board as pollutants of particular concern; and

- Constituents for which a Total Maximum Daily Load (TMDL) exists.

Table 2. Applicable WQOs and/or Criteria for the Lake Discharge

Constituent	Most Stringent WQO or Criterion	Unit	Reference for Most Stringent WQO or Criterion
Ammonia as N	0.46	mg/L	Basin Plan; used Basin Plan Table 4-4 (a)
Boron, Total	0.75	mg/L	Basin Plan(b)
Chloride	10	mg/L	Basin Plan
Fluoride	0.9	mg/L	Basin Plan (c)
Hardness, Total (as CaCO3)	125	mg/L	Basin Plan
Methylene Blue-Activated Substances	0.05	mg/L	Basin Plan (d)
Sodium	20	mg/L	Basin Plan
Sulfate	10	mg/L	Basin Plan
Total Dissolved Solids	**175**	**mg/L**	**Basin Plan**
Total Inorganic Nitrogen	**0.15**	**mg/L-N**	**Basin Plan**
Total Nitrogen	**1**	**mg/L-N**	**Regional Board Input (e)**
Chlorophyll-a	**14**	**µg/L**	**Nutrient TMDL**
Total Phosphorus	**35**	**µg/L-P**	**Nutrient TMDL**
Chlordane	0.00057	µg/L	Lake CWA 303(d) List; CTR
4,4'-DDT	0.00059	µg/L	Lake CWA 303(d) List; CTR
PCBs	0.00017	µg/L	Lake CWA 303(d) List; CTR
Cadmium, Dissolved	2.2	µg/L	Santa Ana River Reach 6 CWA 303(d) List (f)
Copper, Dissolved	8.9	µg/L	Santa Ana River Reach 6 CWA 303(d) List (f)
Lead, Dissolved	2.5	µg/L	Santa Ana River Reach 6 CWA 303(d) List (f)
Mercury	10	ng/L	Lake CWA 303(d) List; Statewide Mercury Provisions
Aluminum	200	µg/L	Title 22 MCL (g)
Specific Conductance	700/1,000	µmhos/cm	AGR Beneficial Use Goal (g)

Notes: Bolded constituents were identified as constituents of interest by the Regional Water Board and were modeled in the Lake Analysis (**Appendix B** & **C** and discussed in **Section 5.3.1.**

a) The total ammonia was estimated using the equation presented in Table 4-4 of the Basin Plan. The Lake wide average pH is 8.28 based on the 2009-2019 TMDL data collected. The Lake water temperature ranges between 35 °F (1.8°C) and 70°F (20.7°C). The average Lake water temperature used is 53°F (11.8°C).
b) Boron concentrations shall not exceed 0.75 mg/L in inland surface waters of the region as a result of controllable water quality factors.

Constituent	Most Stringent WQO or Criterion	Unit	Reference for Most Stringent WQO or Criterion
c) Annual average concentration determined based on daily air temperature between 17.7-21.4 °C. d) MBAS concentrations shall not exceed 0.05mg/L in inland surface waters designated MUN as a result of controllable water quality factors. It is a secondary drinking water standard. e) Value is being considering by the Regional Water Board, as potential target. f) California Toxics Rule (CTR) hardness-based criterion continuous concentration (CCC) calculated using a median total hardness value of 99 mg/L calculated from measurements made in the Santa Ana River, Reach 6, upstream of Seven Oaks Dam, 2000-2006. g) Constituent added as it was detected in the secondary effluent and Lake.			

The Basin Plan contains both numeric and narrative objectives for inland surface waters, which were used to evaluate the Lake discharge. For this analysis, some of the narrative objectives were not evaluated for the following reasons:

- Algae, floatable, oil and grease, solids (suspended and settleable), sulfides, and surfactants were not evaluated because the Basin Plan does not specify numeric limits so these parameters could not be compared;
- Chlorine residual because chlorine will not be used for disinfection at the BBARWA WWTP;
- Chemical oxygen demand , dissolved oxygen, pathogen indicator bacteria, radioactivity material, color, temperature, and taste and odor because these are assumed to be non-conservative constituents (i.e., presumed to be destroyed, consumed, biodegraded or transformed through the treatment process or through Stanfield Marsh). The treatment process includes low- and high-pressure membrane systems capable of producing effluent that meets or exceeds the objectives for inland surface waters for these constituents, to be confirmed with site-specific piloting of the treatment process;
- Nitrate as N since the TN value being considered by the Regional Board is more stringent than the recommended 10 mg/L in Basin Plan; and
- pH because the treatment process maintains a neutral pH between 7 and 8 upstream of the reverse osmosis process, and then become slightly acidic downstream of reverse osmosis. Reverse osmosis chemical post-treatment will be employed to adjust the pH to a neutral level such that the effluent is within the numerical objectives for pH. In general, the pH of inland surface waters shall not be raised above 8.5 or depressed below 6.5 as a result of controllable water quality factors.

3.3 303 (d) Listings

Section 303(d) of the CWA requires states to develop lists of water bodies (or segments of water bodies) that will not attain water quality standards after implementation of minimum required levels of treatment by point-source dischargers (i.e., municipalities and industries). Section 303(d) requires states to develop a TMDL for each of the listed pollutant and water body combinations for which there is impairment. A TMDL is the amount of loading that the water body can receive and still meet water quality standards for that pollutant. The TMDL must include an allocation of allowable loadings for both point and non-point sources, with consideration of background loadings and a margin of safety. NPDES permit limitations for listed pollutants must be consistent with allocations identified in adopted TMDLs.

The U.S. EPA approved the California's 2018 Integrated Report for CWA Sections 305 (b) and 303(d) on June 9, 2021 (SWRCB, 2021). This list represents the most current listing of impaired water bodies in the project area and downstream areas. The Lake is included in the California's 2018 Section 303(d) list of impaired water bodies for mercury, nutrients, noxious aquatic plants, dichlorodiphenyltrichloroethane (DDT), chlordane, and polychlorinated biphenyls (PCBs). The Santa Ana River (SAR) Reach 6, which is located about 17 miles downstream from the Lake, is also listed for cadmium, lead, and copper. The potential water quality impacts of the proposed Lake discharge are discussed in **Section 5.**

Table 3 lists the constituents identified in the 2018 303(d) list for the Lake and SAR Reach 6, and their potential sources and proposed TMDL completion dates.

Table 3. 2018 CWA Section 303(d) Listed Constituents

Pollutant/Stressor	Potential Sources	Proposed TMDL Adoption
Lake		
Mercury	Source Unknown	2007
Nutrients	Construction/Land Development	Completed
Noxious aquatic plants	Source Unknown	Completed
DDT	Source Unknown	2027
Chlordane	Source Unknown	2027
PCBs	Source Unknown	2019
Santa Ana River Reach 6		
Cadmium	Source Unknown	2021
Lead	Source Unknown	2021
Copper	Source Unknown	2021

3.4 Lake Nutrient TMDL

The Big Bear Lake Nutrient Total Maximum Daily Load (Nutrient TMDL) for Dry Hydrologic Conditions (Resolution No. R8-2006-0023) was adopted by the Regional Water Board on April 21, 2006 and became effective on September 25, 2007. The Nutrient TMDL includes targets in the Lake for TP, macrophyte coverage, nuisance aquatic vascular plant species, and chlorophyll-a. **Table 4** shows the Nutrient TMDL targets. TP is the only constituent that would be directly discharged and controlled by BBARWA.

Table 4. Nutrient TMDL Numeric Targets for All Hydrologic Conditions

Indicator	Target Value [a][b]
TP Concentration [c]	Annual average no greater than 35 µg/L
Macrophyte Coverage[d]	30-40% on a total lake area basis
Percentage of Nuisance Aquatic Vascular Plant Species[d][e]	95% eradication on a total area basis of Eurasian Water milfoil and any other invasive aquatic plant species
Chlorophyll-a Concentration[e]	Growing season average no greater than 14 µg/L

Source: Basin Plan

Notes:

a) Targets to be attained no later than 2015 (dry hydrological conditions), 2020 (all other conditions)

b) Compliance date for wet and/or average hydrological conditions may change in response to approved TMDLs for wet/average hydrological conditions.

c) Annual average determined by the following methodology: the nutrient data from both the photic composite and discrete bottom samples are averaged by station number and month; a calendar year average is obtained for each sampling location by averaging the average of each month; and finally, the separate annual averages for each location are averaged to determine the lake-wide average.

d) Calculated as a 5-yr running average based on measurements taken at peak macrophyte growth.

e) Growing season is the period from May 1 through October 31 of each year. The chlorophyll-a data from the photic samples are averaged by station number and month; a growing season average is obtained for each sampling location by averaging the average of each month; and finally, the separate growing season averages for each location are averaged to determine the lake-wide average.

An analysis to demonstrate that the proposed Lake discharge is consistent with the Nutrient TMDL assumptions is provided in Attachment B of the ROWD package**.** This technical memorandum (TM) also discusses a TP offset framework to address the lack of wasteload allocation (WLA) for the proposed Lake discharge by proposing a TP net zero load. The TM also discusses the effects of the Lake discharge and TP Offset Program on chlorophyll-a, the response target, as documented in the Lake Analysis (**Appendix B**) and new model updates (**Appendix C**).

3.5 Statewide Mercury Provisions

On May 2, 2017, the California State Water Resources Control Board (State Water Board) adopted Resolution 2017-0027, which approved "*Part 2 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California—Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions.*" Resolution 2017-0027 established mercury limits to protect the beneficial uses associated with the consumption of fish by both people and wildlife. For lakes and reservoirs, the mercury water column concentration is to be calculated by the permitting authority (i.e., Regional Water Board). The mercury limit for the Lake has not yet been established. However, the State Water Board is also developing a Statewide Mercury Control Program for Reservoirs that are impaired for mercury. The draft "*2017 Amendment to the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California—Mercury TMDL and Implementation Program for Reservoirs,*" proposes to establish WLAs of 10 ng/L for major WWTPs (permitted flow >1 MGD), and a WLA of 20 ng/L for facilities with no "upstream" dischargers. The Statewide Mercury Provisions identified the Lake as one of the 131 impacted reservoirs. For this analysis, the 10 ng/L WLA was considered for evaluation with respect to potential water quality impacts due to the proposed Lake discharge.

3.6 Title 22 Recycled Water Criteria

Per conversations with DDW, the Lake may be designated as a non-restricted recycled water impoundment and the subsequent use of Lake water for snowmaking, landscape irrigation, construction uses, and groundwater recharge would be subject to recycled water regulations. Additional coordination and studies are being conducted to regulate these uses. It is anticipated that a separate WDR permit will be obtained to regulate the Sand Canyon groundwater recharge project. The non-potable recycled water uses for landscape irrigation, construction uses, snowmaking, and nonrestricted impoundment are anticipated to be regulated under the Statewide Water Reclamation Requirements for Recycled Water Use (Oder WQ 2016-0068-DDW).

4 ENVIRONMENTAL SETTING

This section provides additional context to understand the enviromental setting for the Lake discharge.

4.1 Stanfield Marsh

As part of Replenish Big Bear, the proposed project will discharge to the east end of Stanfield Marsh, then flow into the Lake, as shown in **Figure 5**.


Stanfield Marsh in 2016

Stanfield Marsh is a scenic 145-acre nature park that includes a gazebo, walking paths, and two boardwalks that extend out into the marsh, so visitors can observe the wildlife. Stanfield Marsh is home to rare and diverse species of birds, fish, amphibians, and mammals. Rainfall and snowmelt are the only sources of water for Stanfield Marsh, so the water level varies from season to season. During wet periods, Stanfield Marsh is a thriving wildlife preserve. During extended drought conditions, the water level recedes dramatically, the boardwalks extend over dry soil, and presence of wildlife becomes scarce. In the last 15 years, Stanfield Marsh has been less than half full nearly 40 percent of the time.

4.2 Big Bear Lake

Stanfield Marsh is hydrologically connected to the Lake through a set of culverts under Stanfield Cutoff. The Lake is located about 6,743 feet (ft; 2,055 meters) above mean sea level (MSL) in the San Bernardino Mountains in San Bernardino County. Together, Stanfield Marsh and the Lake have a surface area of approximately 3,000 acres, a storage capacity of 73,320 AF, and an average depth of 32 ft. The Lake's sole source of water is currently snowmelt and stormwater runoff, which are highly variable. The Lake has several sources of water loss including evaporation, water extraction for snow making, dam releases for flood control, fishery protection, and water rights discharges.

The Lake was formed following construction of the Bear Valley Dam in 1883-1884 to serve as an irrigation supply for the citrus industry in the downstream Redlands-San Bernardino communities. BBMWD was formed in 1964 to manage and help stabilize the water level in the Lake. Historically, the Lake was operated as a storage reservoir by the Bear Valley Mutual Water Company (Mutual). However, due to the drastic fluctuations in Lake levels, legal negotiations arising from disagreement between Mutual, BBMWD, and the community of Big Bear Valley regarding water rights and management of the Lake, a 1977 Judgment was established. Under the terms of this court judgment, Mutual retains a storage right and ownership of all water inflow into the Lake. BBMWD is required to provide Mutual with up to 65,000 AF of water from the Lake in a 10-year rolling period.

In 1996, an In-Lieu Agreement was executed that allows BBMWD to maintain higher Lake levels by delivering water to Mutual from an alternate source of water. This alternate source of water, referred to as In-Lieu Water, comes mainly from the State Water Project (SWP) through the San Bernardino Valley Municipal Water District (SBVMWD), a State Water Contractor. Under the In-Lieu Agreement, when the Lake level falls more than 6 foot below full, and during some months when the Lake is between 4 and 6 feet below full, SBVMWD delivers SWP water to meet Mutual's needs instead of BBMWD releasing water from the Lake. BBMWD pays SBVMWD an annual fee that is adjusted each year based on property tax values.

Due to variable precipitation and extended drought, the Lake has experienced drastic changes in water levels, which impact its water quality. In December 2018, the Lake reached a historic low of 18'1" below full, which is less than 40% full by volume. **Figure 6** shows the fluctuation in Lake levels between 2000 and 2021.

The Lake is an important resource that provides extensive recreational, economic, ecological, and aesthetic benefits for the local community as well as the larger inland southern California region. The beneficial uses of the Lake and Marsh are presented in **Table 1**.

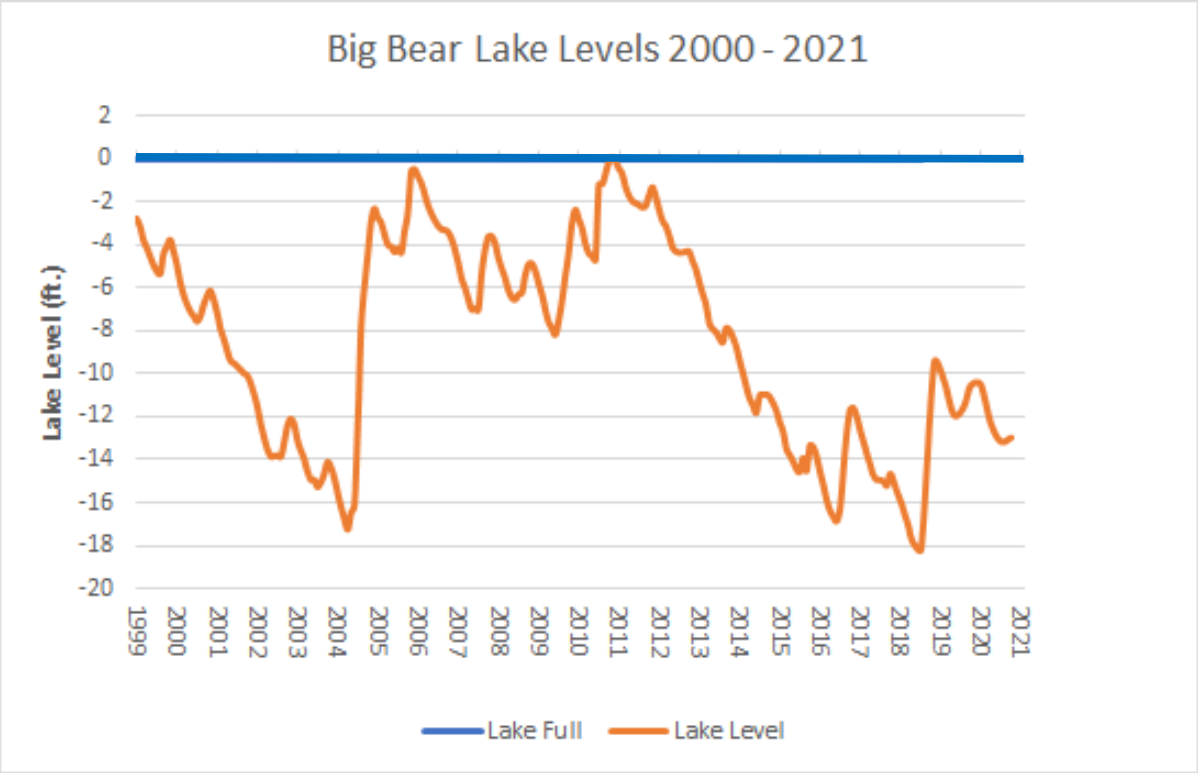


Figure 6. Big Bear Lake Levels: 2000 – 2021

4.3 Santa Ana Watershed

The Lake's dam releases are discharged to Bear Creek, a 17-mile stream, which enters the SAR at Reach 6. The Santa Ana River Watershed comprises portions of San Bernardino, Riverside, Los Angeles, and Orange Counties, covers an area of 2,840 square miles, and is home to over 6 million residents. The Santa Ana River is the major stream draining the watershed—about 100 miles in length from its headwaters near Big Bear to its discharge location in Huntington Beach. **Figure 7** shows the Santa Ana River Watershed, along with the Santa Ana River and its major tributaries.

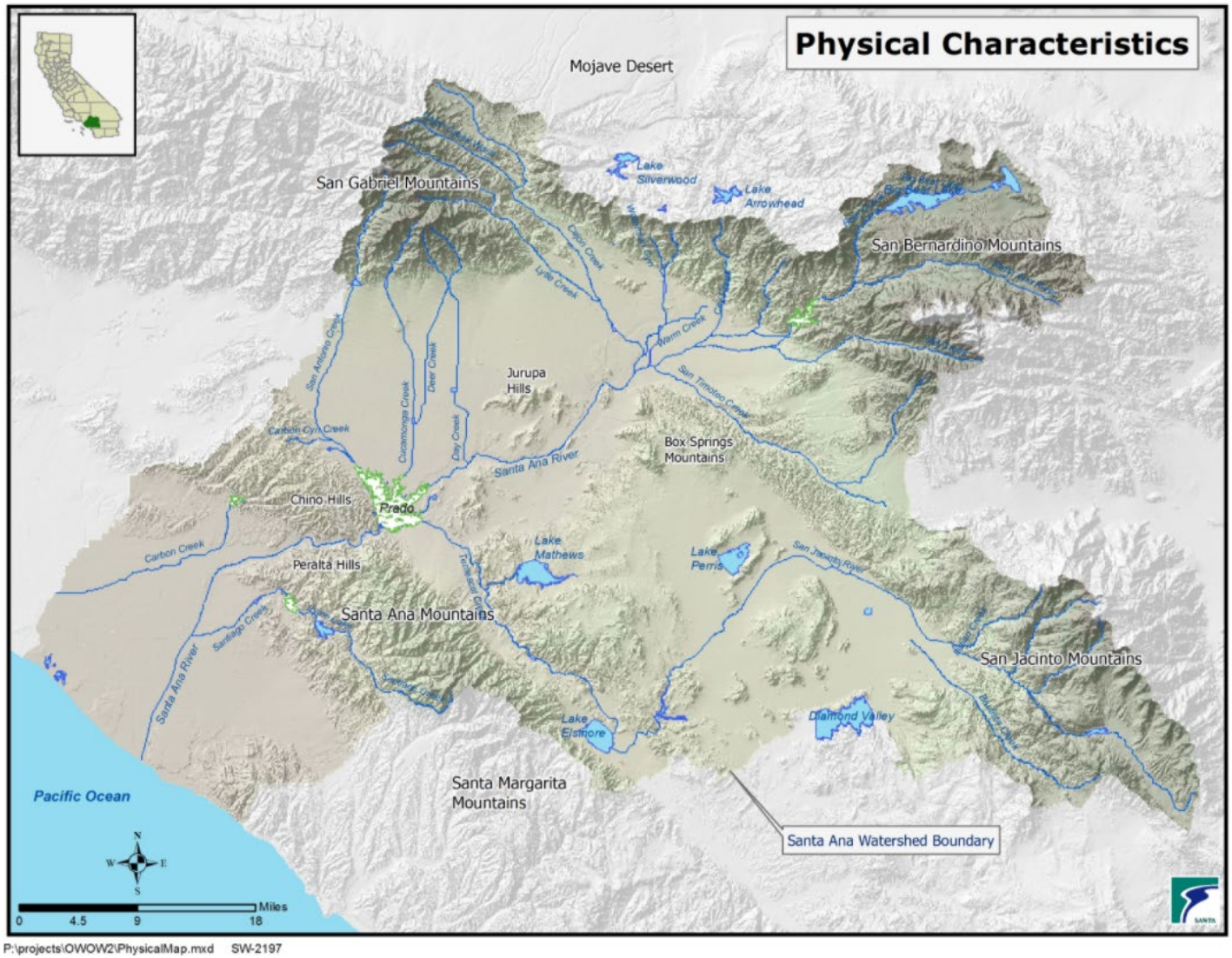


Figure 7. Santa Ana Watershed Map

5 ASSESSMENT OF WATER QUALITY IMPACTS TO BIG BEAR LAKE

This section summarizes the water quality assessment methodology and results for the proposed Lake discharge and potential associated impacts in downstream receiving waters.

5.1 Lake Discharge Project Description

As discussed in **Section 1**, one of the project components of the Replenish Big Bear Program is to discharge to the Lake disinfected, advanced treated effluent that has undergone RO and UV treatment. The Lake discharge is intended to help stabilize Lake levels especially during extended drought periods, assist to maintain the beneficial uses of the Lake, and reduce the in-lieu SWP water demands if higher lake levels allow for additional dam releases. The Lake has experienced record low levels over the last 15 years, forcing BBMWD to close one of their two boat ramps, which reduces the recreational benefit of the Lake.

The projected effluent quality of the proposed discharge is presented in **Table 5** for the constituents of interest in this study (constituents of interest are those listed in **Table 2**). Site-specific pilot testing of the proposed treatment process technologies will be completed in 2023 to establish design criteria and refine final effluent water quality estimates. The values presented in **Table 5** are based on mass balance calculations, vendor provided treatment performance estimates, and industry standard removal rates for RO treatment technology. The secondary effluent data were used as a basis for influent water quality to the advanced treatment train to estimate the projected effluent water quality for the proposed discharge.

Table 5. Projected Effluent Quality of Proposed Discharge and Existing Secondary Effluent Quality

Constituent	BBARWA Secondary Effluent Average Concentrations [a]	Projected Average Effluent Quality of Proposed Discharge	Unit
Ammonia as N	3.15	0.05	mg/L-N
Boron, Total	0.265	0.11	mg/L
Chloride	58	0.60	mg/L
Fluoride	0.41	<0.026[b]	mg/L
Hardness, Total (as CaCO3)	265	3.2	mg/L
Methylene Blue-Activated Substances	0.14	0.0014	mg/L
Sodium	NS	1.9	mg/L
Sulfate	41	0.20	mg/L
Total Dissolved Solids [c]	450	50	mg/L
Total Inorganic Nitrogen [c]	4.40	0.1	mg/L-N
Total Nitrogen [c]	7.80	0.6	mg/L-N
Chlorophyll-a [d]	N/A	N/A	µg/L
Total Phosphorus [c]	2.0	0.03	mg/L-P
Chlordane	<0.17 [e]	<0.17 [b][e]	µg/L
4,4'-DDT	<0.0052 [e]	<0.0052[b] [e]	µg/L
PCBs	<2.5 [e]	<2.5 [b] [e]	µg/L
Cadmium, Total	<0.11	<0.11[b]	µg/L
Copper, Total	14 [f]	0.07	µg/L
Lead, Total	1.3	0.01	µg/L
Mercury, Total	0.76 [g]	<0.5 [b]	ng/L
Aluminum, Total	180	1.3	µg/L
Specific Conductance	755 [e]	18	µmhos/cm

Notes: NS – Not sampled; N/A – Not applicable.

a) The average was estimated using detected values only, unless stated otherwise. NDs were not included due to the limited number of samples. This approach may result in higher averages.
b) The projected effluent quality is anticipated to be below the detection limit. The estimated projected concentration is shows as "<MDL".
c) Values were estimated as part of Draft Treatment Alternatives Analysis TM using BBARWA WWTP average effluent concentrations from weekly and monthly analyses for the 2017 - 2019 calendar years (WSC, 2020).
d) Chlorophyll-a is not a constituent that will be discharged by the BBARWA WWTP.
e) Based on one data point.
f) Values detected below the RL; reported concentration is estimated. Reported as "J-Flag."

Constituent	BBARWA Secondary Effluent Average Concentrations [a]	Projected Average Effluent Quality of Proposed Discharge	Unit
g) On June 18, 2020, BBARWA collected a sample to measure mercury using EPA Method 1631E, which has a reporting limit of 0.5 ng/L. This result is well below the 10 ng/L target described in the Statewide Mercury Control Program for Reservoirs.			

5.2 Selection of Water Quality Constituents

5.2.1 Selection Criteria

As presented in **Section 3**, water quality constituents assessed in this antidegradation analysis were identified based on one or more of the following conditions being satisfied:

1) Constituent has a WQO or criterion applicable to the Lake and/or downstream receiving waters;
2) Constituent for which an adopted TMDL exists;
3) Constituent identified as a pollutant/stressor on the 2018 CWA Section 303(d) list for the Lake or downstream of the proposed discharge; and
4) Constituent is a known water quality concern of the Regional Water Board.

Based on the conditions listed above, 22 constituents of interest were initially identified for evaluation and are presented in **Table 2**. The data available for the secondary effluent, proposed discharge effluent quality, and ambient water quality were assessed to determine the type of analysis needed for a given constituent. The following approach was used:

- No further analysis was needed for constituents reported as non-detect (ND) in the secondary effluent and the Lake. It is anticipated that RO treatment will achieve additional removal of these constituents and thus, will further reduce any water quality impacts potentially associated with these constituents.
- For constituents with detected concentrations in the secondary effluent, the proposed discharge water quality was compared to the ambient water quality and most stringent WQO or criterion.
- For the proposed discharge water quality constituents exceeding the ambient water quality or most stringent WQO or criterion, a mass balance analysis was completed.

- For constituents of greater interest to the Regional Water Board, such as TIN, TN, TP, and chlorophyll-a, the 2D hydrodynamic-water quality model (CE-QUAL-W2) developed by Dr. Anderson was used to evaluate the potential impacts of the proposed Lake discharge. A summary of the Lake Analysis (**Appendix B**) report along with the model updates recently completed to incorporate additional discharge volume scenarios and seasonal variability are presented in this report and in **Appendix C**.

5.2.2 Data Sources

Table 6 shows the water quality data used for the analysis. Per BBARWA's current WDR Permit, BBARWA is required to monitor for biological oxygen demand (BOD), total suspended solids (TSS), pH, dissolved oxygen (DO), TDS, sulfate, chloride, fluoride, nitrate as N, TN, E.coli, and volatile organic compounds (VOCs) in the secondary effluent on a monthly or annual basis. To support the preparation of the proposed project's Report of Waste Discharge (ROWD) and this analysis, water samples of the secondary effluent and Lake were collected and analyzed for priority pollutants. BBARWA collected its samples on November 18, 2021, and BBMWD collected the Lake samples on December 2, 2021. On June 18, 2020, BBARWA also collected a secondary effluent sample to measure mercury using EPA Method 1631E, which has a reporting limit of 0.5 ng/L. **Appendix D** contains the BBARWA, Lake, and Shay Pond (discussed in **Section 6**) water quality data.

As part of the Nutrient TMDL, a variety of constituents, including ammonia as N, total hardness, nitrate as N, nitrite as N, total kjeldahl nitrogen (TKN)[2], TP, and chlorophyll-a are collected at the four TMDL monitoring locations (Station 1 Dam, Station 2 Gilner Point, Station 6 Mid Lake Middle, and Station 9 Stanfield Middle. (See **Figure 2** in **Appendix B**). In the Lake Analysis, TIN[3], TN[4], TP, and chlorophyll-a were evaluated using the Nutrient TMDL data from 2009 through 2019. The average results calculated in the Lake Analysis are presented in **Table 6**.

Ammonia and hardness were not modeled in the Lake Analysis because these were not identified as constituents of interest at the time of the model development. For this analysis, the lake-wide annual average was estimated by averaging the four station annual averages consistent with the Nutrient TMDL approach, which consist of averaging the photic and bottom samples for each sampling date. From 2009 through 2019, about 1,280 and 1,180 data points were collected for ammonia and hardness, respectively, at these locations. The calculations are presented in **Appendix E**.

[2] TKN is the sum of organic nitrogen and ammonia.
[3] TIN is the sum of ammonia, nitrate, and nitrite.
[4] TN is defined as the sum of TKN, nitrite, and nitrate.

BBMWD also has manually recorded specific conductance data since 2001 measured at the first 10 to 15 feet below Lake surface. The specific conductance data was used to evaluate TDS in the Lake Analysis as specific conductance can be converted to TDS using a conversion factor that is dependent on the type of minerals and salts dissolved in the Lake. In August 2019, BBMWD collected TDS samples at the four TMDL monitoring locations to compare TDS and specific conductance results and calculated a conversion factor of 1 mg/L of TDS = 0.642 µmhos/cm, which was used in the Lake Analysis model. The Lake TDS average from this report was converted to µmhos/cm using this convention factor.

Table 6. Summary Statistics for Constituents Evaluated in Secondary Effluent and Big Bear Lake

Constituent	Unit	BBARWA Secondary Effluent [a]				Big Bear Lake[a]			
		No. of Samples	% Non-Detected	Avg.[b]	Max.	No. of Samples	% Non-Detected	Avg.[b]	Max.
Ammonia as N	mg/L	24	29%	3.15	22	1,281	33%	0.063 [c]	0.094
Boron, Total	mg/L	2	0%	0.265	0.270	1	0%	0.054 [d]	0.054 [d]
Chloride	mg/L	25	0%	58	63	1	0%	26	26
Fluoride	mg/L	2	0%	0.41	0.52	1	0%	0.41	0.41
Hardness, Total (as CaCO3)	mg/L	2	0%	265	270	1,176	0%	157 [c]	183
MBAS	mg/L	2	50%	0.14	0.14	1	0%	0.058 [d]	0.058 [d]
Sodium	mg/L	0	NS	NS	NS	1	0%	33	33
Sulfate	mg/L	20	0%	41	44	1	0%	18	18
Total Dissolved Solids	mg/L			450 [e]				251 [f]	
Total Inorganic Nitrogen	mg/L			4.40 [e]				0.049 [f]	
Total Nitrogen	mg/L			7.80 [e]				0.948 [f]	
Chlorophyll-a	µg/L			N/A				9.3 [f]	
Total Phosphorus	mg/L			2.00 [d]				0.037 [f]	
Chlordane	µg/L	1	100%	<0.17	<0.17	1	100%	<0.034	<0.034
4,4'-DDT	µg/L	1	100%	<0.0052	<0.0052	1	100%	<0.001	<0.001
PCBs (Aroclors) [g]	µg/L	1	100%	<2.5	<2.5	1	100%	<0.5	<0.5
Cadmium, Total	µg/L	8	100%	<0.11	<0.11	1	100%	<0.11	<0.11
Copper, Total	µg/L	8	88%	14 [d]	14 [d]	1	100%	<6.5	<6.5
Lead, Total	µg/L	8	75%	1.3	1.8 [d]	1	100%	1.8 [d]	1.8 [d]
Mercury, Total	ng/L	8	100%	0.76 [h]	0.76 [h]	2	50%	270	270
Aluminum, Total	µg/L	2	0	180	250	1	0%	58	58
Specific Conductance	µmhos/cm	1	0	755	755			391 [i]	

Notes: Bolded constituents were identified as constituents of interest by the Santa Ana Regional Water Board and were modeled in the Lake Analysis (**Appendix B** & **C**).

NS – Not sampled; N/A – Not applicable.

a) For constituents with only ND data, the method of detection limit (MDL) is shown as "<MDL."
b) The average was estimated using detected values only, unless stated otherwise. NDs were not included due to the limited number of samples. This approach may result in higher averages. For samples with only one data point, the reported value or "<MDL" is presented.
c) The averages and maximums are for the Lake-wide results and were calculated using Nutrient TMDL 2009-2019 data. See **Appendix E** – for estimates. ND were used and assumed to be "MDL/2".
d) Values detected below the RL; reported concentration is estimated. Reported as "J-Flag."
e) Values were estimated as part of Draft Treatment Alternatives Analysis TM using BBARWA WWTP average effluent concentrations from weekly and monthly analyses for the 2017 - 2019 calendar years (WSC, 2020).
f) TDS average was obtained from the Lake Analysis Table 19, and nutrients and chlorophyll-a from the Lake Analysis Table 22 (**Appendix B**).
g) PCBs are a class of chemicals which include Aroclors 1242, 1254, 1221, 1232, 1248, 1260, and 1016. The aquatic life criteria apply to the sum of the set of seven Aroclors. All results were non-detect.
h) On June 18, 2020, BBARWA collected a sample to measure mercury using EPA Method 1631E, which has a reporting limit of 0.5 ng/L. This result is well below the 10 ng/L target described in the Statewide Mercury Control Program for Reservoirs.
i) The Lake TDS average from the Lake Analysis report was converted to µmhos/cm using a 1 mg/L of TDS = 0.642 µmhos/cm conversion factor.

5.2.3 Selection of Constituents

The simple qualitative analysis described in **Section 5.2.1** was applied to the 22 constituents of interest to determine if additional analysis was required. **Table 7** shows the results of the comparison of the secondary effluent quality, projected effluent quality, ambient water quality, and the most stringent WQO or criterion.

Overall, no constituents exceeded their most stringent WQO or criterion and only boron and TIN exceeded existing, ambient water quality concentrations. For the remainder of the constituents—where the projected effluent quality is below the ambient water quality and the most stringent WQO or criterion—no additional analysis was conducted.

The Lake Analysis evaluated TDS, TIN, TN, TP, and chlorophyll-a, so potential TIN water quality impacts were addressed by the Lake Analysis. For boron, a simple mass balance spreadsheet model was used to evaluate the potential impacts of boron on the Lake with the proposed project due to the limited data available.

With respect to the three trace metals – cadmium, copper, and lead – included in the 2018 303(d) list for Reach 6 of the SAR as impairing the water body segment, projected average concentrations of the three trace metals in the proposed discharge are significantly below the hardness-based CTR chronic criterion calculated for each metal using a median total hardness value of 99 mg/L calculated for Reach 6 (see **Table 2**). Cadmium, copper, and lead concentrations contained in the disinfected, advanced treated effluent proposed for discharge to the Lake are not anticipated to lower water quality in Reach 6 for these trace metals, nor are they anticipated to affect future load or WLA included in an adopted TMDL.

Table 7. Comparison of Most Stringent Water Quality Objective or Criterion to Existing Ambient Lake Water Quality and Projected Effluent Quality of Proposed Discharge

Constituent	Unit	Most Stringent WQO or Criterion	Average Lake Concentration [a] [b]	Projected Average Effluent Quality of Proposed Discharge [c]	Comparison of Projected Effluent Quality to Most Stringent WQO (see table Notes)
Ammonia as N	mg/L	0.46	0.063 [d]	0.05	1
Boron, Total	mg/L	0.75	0.054 [e]	0.11	2
Chloride	mg/L	10	26 [e]	0.60	1
Fluoride	mg/L	0.9	0.41 [e]	<0.026	1
Hardness, Total (as CaCO3)	mg/L	125	157 [d]	3.2	1
MBAS	mg/L	0.05	0.058 [e]	0.0014	1
Sodium	mg/L	20	33 [e]	1.9	1
Sulfate	mg/L	10	18 €	0.20	1
Total Dissolved Solids	mg/L	175	251	50	3
Total Inorganic Nitrogen	mg/L	0.15	0.049	0.1	2,3
Total Nitrogen	mg/L	1	0.948	0.6	3
Chlorophyll-a	µg/L	14	9.3	N/A	3
Total Phosphorus	mg/L	0.035	0.037	0.03	3
Chlordane	µg/L	0.00057	<0.034 [e]	<0.17	4
4,4'-DDT	µg/L	0.00059	<0.001 [e]	<0.0052	4
PCBs	µg/L	0.00017	<0.5 [e]	<2.5	4
Cadmium, Total	µg/L	2.2	<0.11 [e]	<0.11	4
Copper, Total	µg/L	8.9	<6.5 [e]	0.07	1
Lead, Total	µg/L	2.5	1.8 [e]	0.01	1
Mercury, Total	ng/L	10	270	<0.5	1
Aluminum, Total	µg/L	200	58 [e]	1.3	1

Constituent	Unit	Most Stringent WQO or Criterion	Average Lake Concentration [a] [b]	Projected Average Effluent Quality of Proposed Discharge [c]	Comparison of Projected Effluent Quality to Most Stringent WQO (see table Notes)
Specific Conductance	µmhos/cm	700/1,000	391	18	1

Notes: Bolded constituents were identified as constituents of interest by the Regional Water Board and were modeled in the Lake Analysis (**Appendix B** & **C**).
N/A – Not applicable.

a) For constituents with only ND data, the method of detection limit (MDL) is shown as "<MDL."
b) The average was estimated using detected values only, unless stated otherwise. NDs were not included due to the limited number of samples. This approach may result in higher averages. For samples with only one data point, the reported value or "<MDL" is presented.
c) If the projected effluent quality is anticipated to be below the detection limit. The estimated projected concentration is shows as "<MDL".
d) The averages and maximums are for the Lake-wide results and were calculated using Nutrient TMDL 2009-2019 data. See **Appendix E** – for estimates. ND were used and assumed to be "MDL/2".
e) Average is based on one data point.

Blue – Projected effluent quality is below the ambient and most stringent WQO or criterion
Red – Projected effluent quality is above the ambient or most stringent WQO or criterion

1) Projected effluent quality is below the ambient and most stringent WQO or criterion. No degradation anticipated.
2) Projected effluent quality is above the ambient, but below the most stringent WQO or criterion. Further analysis needed to determine impacts on water quality.
3) Impacts evaluated in the Lake Analysis (**Appendix B & C**).
4) Secondary effluent and ambient water quality were ND. No further analysis conducted. It is anticipated that RO will achieve additional removal, resulting in even fewer impacts.

5.3 Water Quality Impacts Assessment

5.3.1 Lake Analysis Model Analysis Results

The Lake Analysis (**Appendix B**) was completed to evaluate the short- and long-term impacts of the Lake discharge on lake level, lake area, TDS, TIN, TN, TP, and chlorophyll-a under three different treatment alternatives:

- Alternative 1: TIN & TP Removal
- Alternative 2: 70% RO (in addition to TIN & TP Removal)
- Alternative 3: 100% RO (in addition to TIN & TP Removal)

These treatment alternatives were evaluated under three hydrologic conditions (i.e., extended drought (5th percentile), median (50th percentile), and prolonged above average rainfall (95th percentile)). The model predicted that Alternative 3 would result in a slight improvement in concentrations of TDS, TIN, TN, TP, and chlorophyll-a as compared to modeled baseline conditions. Informed by the results of this study, the 100% RO treatment alternative was selected as the preferred project and the projected effluent quality of Alternative 3 is the focus of this antidegradation analysis.

Additional refinements to the Lake Analysis were completed in 2022, as documented in **Appendix C**, to investigate the impacts of a higher discharge volume, account for WWTP discharge seasonal variability, and assess the impacts of a TP Offset Program as discussed in **Section 3.4** and Attachment B of the ROWD package. The 50th percentile hydrologic scenario for 2009-2050 was used in the updated analysis (i.e., the median hydrologic condition), as it includes a wide array of runoff conditions. All other hydrologic, meteorological, biological, chemical, and sedimentological factors, variables and conditions were identical to those used in prior simulations of long-term future conditions (Anderson, 2021).

The Lake Analysis report assumed a steady annual flow of 1,920 AFY of disinfected, advanced treated effluent discharged to the Lake that excludes the 80 AFY that could be discharged to Shay Pond. However, the proposed Lake discharge may be higher than previously modeled as it did not account for a 99% total recovery rate of BBARWA effluent and potentially a lower discharge rate to Shay Pond. **Table 8** presents the Lake discharge flow projections that were considered in the Lake Analysis model and in the 2022 update.

Table 8. Initial and Updated Lake Discharge Flow Rate Projections

Lake Analysis Modeled Scenario	RBB Inflow (AFY)	Daily RBB Inflow (MGD)
Baseline (No Project)	0	0
Alternative 3 [(a)]	1,920	1.71
High Flow (99% recovery) [(b)]	2,210	1.57 – 2.18
Mid Flow (90% recovery) [(b)]	2,009	1.42 – 1.98

Notes:

a) Alternative 3 was assessed in the 2021 Lake Analysis and assumed that of the total Replenish Big Bear effluent contribution considered in the Lake Analysis (i.e., 2,000 AFY), 80 AFY would be delivered to Shay Pond. Therefore, only 1,920 AFY would be discharged to the Lake.

b) In the 2022 Lake Analysis update it was assumed that no discharge to Shay Pond would occur and all disinfected, advanced treated effluent would be discharged to the Lake under two different total recovery rates scenarios.

The Lake discharge is expected to vary seasonally, as shown in **Figure 8**, and thus, differs from the earlier "Alternative 3" scenario that assumed a uniform flow rate of 1.71 MGD throughout the year. Inflows to the WWTP are lower in the summer months due to reduced inflow and fewer visitors relative to the winter season.

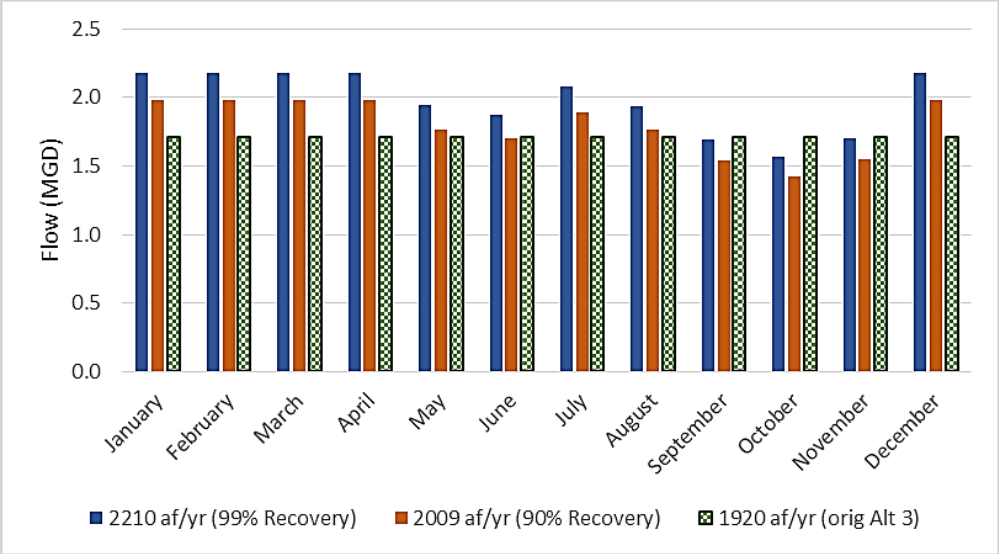


Figure 8. Projected 2040 Monthly BBARWA Discharges to the Lake under Three Inflow Scenarios

Since the Replenish Big Bear Program proposed Lake discharge has not been assigned a WLA for TP in the nutrient TMDL, a TP Offset Program is being proposed to attain a net zero TP contribution to be consistent with the Nutrient TMDL assumptions. A detailed analysis supporting the TP Offset Program is discussed in Attachment B of the ROWD package. In the Lake Analysis model update, the TP offset was modeled as equivalent to a 0 (zero) influent concentration. This approach is a simplification that may hold when considering a whole-lake nutrient budget. However, the Lake dynamics are complex, so projections may not have accounted for these complexities.

5.3.1.1 Lake Discharge Impacts Water Quality

The predicted long-term average water quality in the Lake under the updated modeled operational scenarios (increased and time-varying flows, with and without TP offset) are presented in **Table 9**. For comparison, the previously predicted baseline condition (no project) and Alternative 3 scenario are shown.

Table 9. Predicted Long-term Average Lake Concentrations for TDS, TIN, TN, TP, and Chlorophyll-a Under Different Operational Scenarios

Operational Scenario [a] (All at 50th %tile hydrologic condition)	TDS [b] (mg/L)	TIN [b] (mg/L)	TP [b] (µg/L)	TN [b] (mg/L)	Chlorophyll-a [c] (µg/L)
WQO/(TMDL target)	***175***	***0.15***	***0.15 (35.0)***		***(14.0)***
Baseline (No Project)	195	0.069	47.7	1.15	14.1
Alternative 3 (1920 AFY)	182	0.052	43.3	1.07	14.0
2,210 AFY (99% recovery)	179	0.045	42.3	1.04	13.1
2,009 AFY (90% recovery)	180	0.041	43.4	1.06	12.9
2,210 AFY + TP Offset	179	0.072	39.9	1.00	10.2
2,009 AFY + TP Offset	180	0.040	40.9	1.00	9.5

Notes:

a) The Baseline and Alternative 3 were evaluated in the 2021 Lake Analysis. The other operational scenarios were evaluated in the 2022 Lake Analysis Update and assume no discharge to Shay Pond. The TP Offset scenarios assume a TP Offset Program is implemented.
b) Expressed as annual average concentrations
c) Chlorophyll-a shown as growing season average concentrations

Overall, the predicted long-term average concentrations of TDS, TIN, TN, TP, and chlorophyll-a were lower with the proposed Lake discharge at various rates as compared to the predicted baseline condition, except for TIN under the 2,210 AFY + TP Offset. It is unclear why the model predicted increased TIN under this scenario while all other scenarios showed significantly reduced TIN values relative to the modeled baseline; however, the modeled difference in TIN between the Baseline and 2,210 AFY + TP Offset scenarios is approximately 4%, which is within the range of model variance and is considered statistically insignificant. Therefore, this analysis concludes that projected long-term average concentration of TIN is similar to the modeled baseline condition.

Focusing on chlorophyll-a as the key response target, baseline conditions were predicted to yield a growing season average chlorophyll-a concentration that slightly exceeded (by 0.1 µg/L) the Nutrient TMDL target value of 14 µg/L, while Alternative 3 matched the target value, and increased Lake discharges that varied seasonally (**Figure 8**) yielded values below the modeled baseline condition and the Nutrient TMDL target values. The assumption of a TP Offset Program yielded further reductions in chlorophyll-a. The increased Lake discharge volumes with reduced summer flows and no net TP loading were predicted to yield growing season average chlorophyll-a concentrations as low as 9.5 to 10.2 µg/L, significantly below predicted baseline and TMDL concentrations.

Cumulative distribution functions (CDFs) were prepared to evaluate the inter-annual differences in water quality, as differences are expected to persist. **Figure 9** shows the CDFs for TP, TN, and chlorophyll-a, which show that increased Lake discharges are predicted to lower the annual average TP and TN concentrations and growing season average chlorophyll-a concentrations. However, wide ranges in predicted concentrations remained in place. **Table 10** shows the predicted frequency of exceedance of the Nutrient TMDL targets or potential targets. Overall, the growing season chlorophyll-a average TMDL target (14 µg/L) was predicted to be exceeded about 53% of the time under baseline conditions and exceeded about 41% and 31% of the time at a 2,210 AFY Lake discharge rate with and without TP offset, respectively.

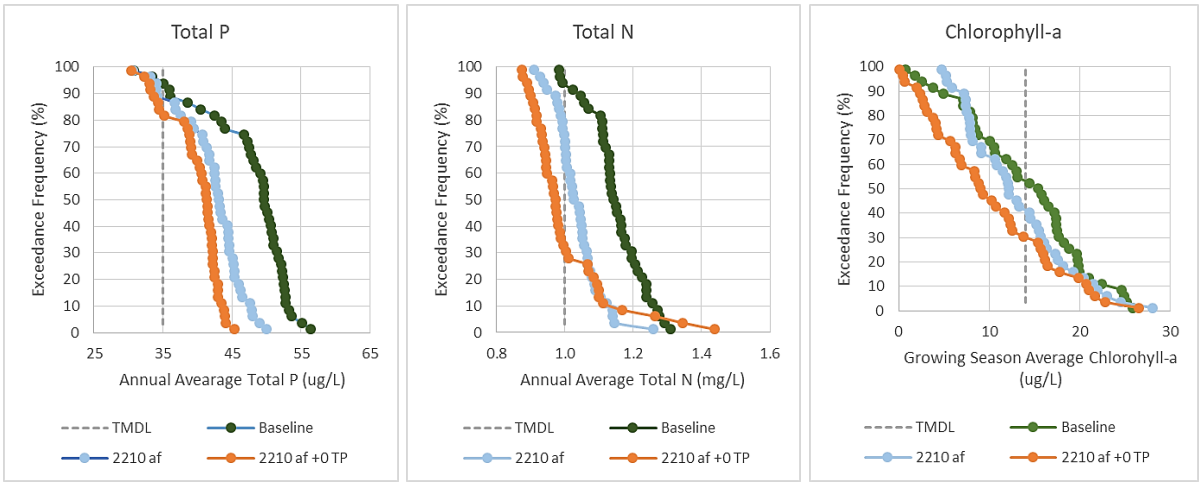


Figure 9. CDFs for Predicted Annual TP and TN Concentrations and Growing Season Average Chlorophyll-a Concentrations for Baseline Condition and at 2,210 AFY Lake Discharge with and without TP Offset

Table 10. Predicted Frequency of Exceeding TMDL Target Under Baseline Conditions and Different Lake Discharge Rates and TP Offset Scenarios (Annual Average or Growing Season Average Basis)

Operational Scenario (All at 50th %tile hydrologic condition)	TP (µg/L)	TN [a] (mg/L)	Chlorophyll-a [b] (µg/L)
WQO/(TMDL target)	***0.15 (35.0)***		***(14.0)***
Baseline (No Project)	94%	91%	53%
Alternative 3 (1920 AFY)	87%	72%	51%
2,210 AFY (99% recovery)	87%	72%	41%
2,009 AFY (90% recovery)	91%	80%	40%
2,210 AFY + TP Offset	82%	30%	31%
2,009 AFY + TP Offset	90%	55%	22%

Notes:
a) Possible target of 1 mg/L, per the Regional Water Board input.
b) Growing season is the period from May 1 through October 31 of each year.

In general, the Lake Analysis demonstrates that the Lake discharge will likely contribute to more frequent attainment of the Nutrient TMDL numeric targets and associated water quality standards, especially when combined with the offset program and actions taken by the TMDL responsible parties to attain the Nutrient TMDL requirements. Additionally, the Lake discharge will increase Lake levels, which will contribute to protection of other beneficial uses and reduce the amount of time critical hydrologic conditions occur in the Lake. A more robust analysis of this Lake discharge on the Nutrient TMDL is provided in Attachment B of the ROWD package.

5.3.1.2 Lake Discharge Impacts on Lake Level, Volume, and Area

The Lake Analysis simulations for the 2009-2019 evaluation period demonstrated that the Replenish Big Bear Program Lake discharge would result in significant increases in predicted lake levels, volumes, and surface areas relative to baseline conditions. Long-term (2009 to 2050) simulations of the proposed Lake discharge under three different hydrologic scenarios indicate that the discharge would be especially beneficial under an "extended drought" scenario where the discharge is predicted to increase the median lake level by more than 10 ft and the median lake area by nearly 600 acres, which in turn would improve recreational access and provide additional Lake habitat as compared to modeled baseline (no project) conditions. The increased lake level and area benefits provided by the Lake discharge would be more modest under the "prolonged above average rainfall" scenario because higher natural inflows would result in higher lake levels. **Table 11** summarizes the projected impacts on Lake level, area, and volume under three hydrologic conditions modeled in the 2021 Lake Analysis.

Table 11. Predicted Lake Level, Area, and Volume under Three Hydrologic Scenarios

Lake Physical Parameter (median values shown)	Scenario	Hydrologic Scenario		
		Extended Drought (5th Percentile)	Median Hydrologic Condition (50th Percentile)	Prolonged Above Average Rainfall (95th Percentile)
Lake Level (ft) (Lake max 6,743 ft)	Baseline	6,722	6,733	6,736
	+Project	6,732 (+10.5)	6,738 (+7.2)	6,740 (+5.2)
Volume (AF)	Baseline	23,400	47,536	54,724
	+Project	45,750 (+22,340)	59,664 (+12,128)	65,204 (+10,480)
Area (acres)	Baseline	1,720	2,328	2,474
	+Project	2,290 (+572)	2,568 (+240)	2,669 (+195)
Notes: Data taken from Table 24 of Lake Analysis report. Assumed a discharge rate of 1,920 AFY. Additional benefit is expected with a higher discharge rate.				

5.3.2 Boron Mass Balance

The projected boron effluent quality of the proposed Lake discharge is anticipated to exceed the Lake ambient water quality (0.054 mg/L – based on one sample collected in December 2021) but remain well below the most stringent criterion of 0.75 mg/L for the protection of sensitive crops. Therefore, the Lake's boron assimilative capacity, defined as the difference between the criterion and the ambient water quality, is 0.694 mg/L (i.e., 0.75 mg/L – 0.054 mg/L).

Due to the limited amount of water quality data available, a simple spreadsheet model was completed to evaluate the contribution of the Lake discharge to boron concentrations in the Lake over time. The calculations are shown in **Appendix F**. The only available data for boron contributions to the Lake from natural inflows is based on boron samples collected in 1972 from several creeks. These data indicated that boron in natural inflows could range between 0.02 and 0.26 mg/L. These results were not used in this analysis due to it high variability, age of the samples, small sample size, and changes in watershed characteristics since the samples were collected.

This analysis did not establish a baseline condition based on ambient water quality; rather, it was assumed that the Lake and natural inflows had a boron concentration of 0 mg/L and the analysis determined the incremental increase of boron in the Lake as result of the Lake discharge.

The 1977-2020 annual inflow and outflow were obtained from the Big Bear Watermaster annual reports and a 43-year simulation was performed based on a repeat of this historic hydrology. The following equations were used to perform the mass balance:

$$Lake\ Storage\ =\ Initial\ Lake\ Storage\ +\ Lake\ Inflows\ -\ Lake\ Outflows$$

$$Lake\ Inflows =\ Lake\ inflows\ from\ precipitation\ and/or\ snowmelt$$

$$Lake\ Outflows\ =\ Spills\ +\ Releases\ +\ Leakage\ +\ Withdrawals\ +\ Evaporation$$

$$Boron\ Mass\ =\ Boron\ in\ Lake\ +\ Boron\ from\ Lake\ Inflow + Boron\ from\ Discharge\ -\ Boron\ from\ Lake\ Outflows$$

$$Boron\ Concentration\ in\ Lake\ (mg/L) = \frac{Boron\ mass\ in\ Lake\ at\ end\ of\ simulation\ year}{Lake\ volume\ at\ end\ \ of\ simulation\ year}$$

Figure 10 shows the projected boron Lake concentrations over the simulation period. The Lake discharge is anticipated to increase boron concentrations over the 44-year simulation, boron is predicted to increase by about 0.065 mg/L. This is less than the 10% assimilative capacity.

The projected incremental increase in boron concentration in the Lake as a result of the project is 0.065 mg/L at the end of the 44-year simulation. The simulation results represent an incremental increase above the current ambient quality, which was 0.054 mg/L based on one sample collected in December 2021. Based on this sample, the estimated total boron concentration in the Lake with the proposed discharge would be below 0.12 mg/L, which is considered safe for agricultural crops like citrus trees that show sensitivity to boron starting at concentrations between 0.5 – 0.75 mg/L (USDA, 1990). The projected boron concentration will remain low compared to the most stringent criterion of 0.75 mg/L which exists in the Basin Plan for the protection of water used to irrigate sensitive crops.

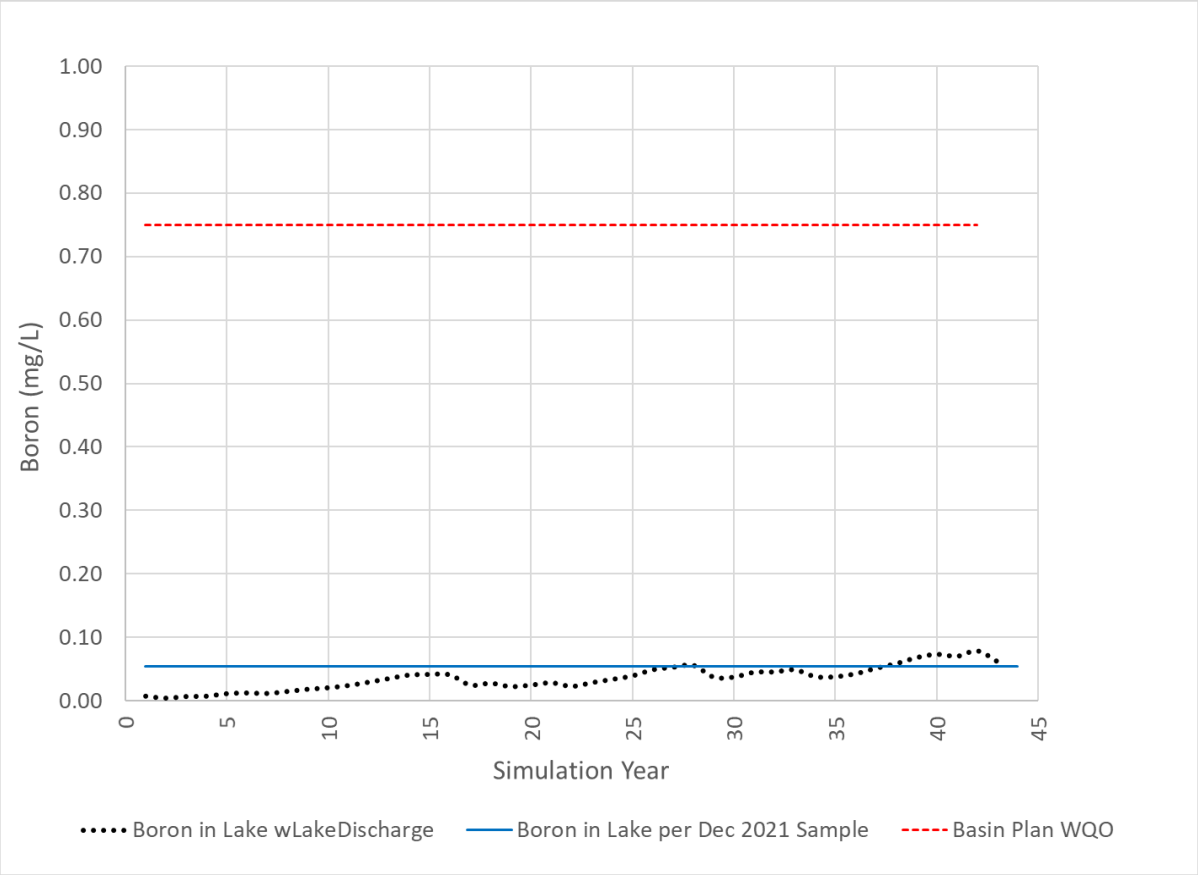


Figure 10. Projected Boron Concentrations with Proposed Lake Discharge

5.4 Summary of Water Quality Impacts

Overall, the Replenish Big Bear Program Lake discharge under most modeled discharge scenarios is anticipated to improve water quality for TDS, TIN, TP, TN, and chlorophyll-a as compared to baseline conditions, and result in similar water quality for total inorganic nitrogen (TIN) as compared to the modeled baseline. In addition, the proposed discharge is projected to contain concentrations of constituents of interest that are similar to or lower than existing ambient water quality and most stringent WQO or criteria for all constituents evaluated except for TIN and boron. For boron, concentrations in the Lake are anticipated to increase compared to baseline conditions but remain well below the most stringent WQO of 0.75 mg/L and the estimated increase is below the U.S. EPA significance threshold of a 10% reduction in available assimilative capacity.

Overall, the Lake Analysis and the 2022 Lake Model Update show that the implementation of the Lake discharge will help improve water quality of the Lake, especially during extended drought and typical (median) conditions. In addition, the proposed Lake discharge will increase lake levels, surface area, and volumes which will help to protect the beneficial uses designated for the Lake.

6 ASSESSMENT OF WATER QUALITY IMPACTS TO SHAY POND

This section describes the proposed Shay Pond discharge component of the Replenish Big Bear Program and presents an antidegradation analysis of the proposed discharge. Currently, it is unknown if Shay Pond and Shay Creek are considered Waters of the U.S. (WOTUS), as the federal regulations that define a WOTUS are currently under review. Regional Water Board input is required to determine the appropriate permitting approach for the proposed discharge to Shay Pond. The necesarry background information to assist the Regional Water Board with this determination is provided in this section.

6.1 Shay Pond Environmental Setting and Project Description

As part of the Replenish Big Bear Program, up to 80 AFY of disinfected, advanced treated effluent is proposed for discharge to Shay Pond. The proposed Shay Pond discharge is intended to replace potable water that is currently discharged to the pond to support the Unarmored Threespine Stickleback (Stickleback) fish, a federal and State listed endangered species.

Shay Pond has a surface area of approximately 10 acres and is located about 1.2 miles southeast of the BBARWA WWTP (**Figure 1**). According to the Bear Valley Basin Groundwater Sustainability Plan (GSP), "*Shay Pond is a natural surface water body at the southern base of an unnamed ridge that separates it from Baldwin Lake (. The nature of this pond is unknown, but it may be fed, in part, from spring flow, surface runoff, and periodically, groundwater intersecting the land surface. Although the pond may have historically been fed from surface water runoff in the ephemeral, upstream segment of Shay Creek, urban development has altered the course of this stream, and it no longer flows into the pond. Surface water exits Shay Pond via the downstream segment of Shay Creek, which flows northwards toward Baldwin Lake and intermittently provides water to Baldwin Lake lake.*" "*Surface water sources to Baldwin Lake are primarily in the form of ephemeral streams with relatively low flow volumes. The only stream where surface water flow periodically has been measured is Shay Creek at its outlet from Shay Pond.*" "*Surface water runoff does not reach Baldwin Lake during most years but percolates into the groundwater system. However, during prolonged precipitation, surface water does flow into Baldwin Lake. All surface water that enters Baldwin Lake is lost to evaporation. The high clay content of the playa sediments prevents vertical migration, and the topographical configuration of the lake prevents outflow from Baldwin Lake*" (TH&Co, 2022). **Figure 11** shows how

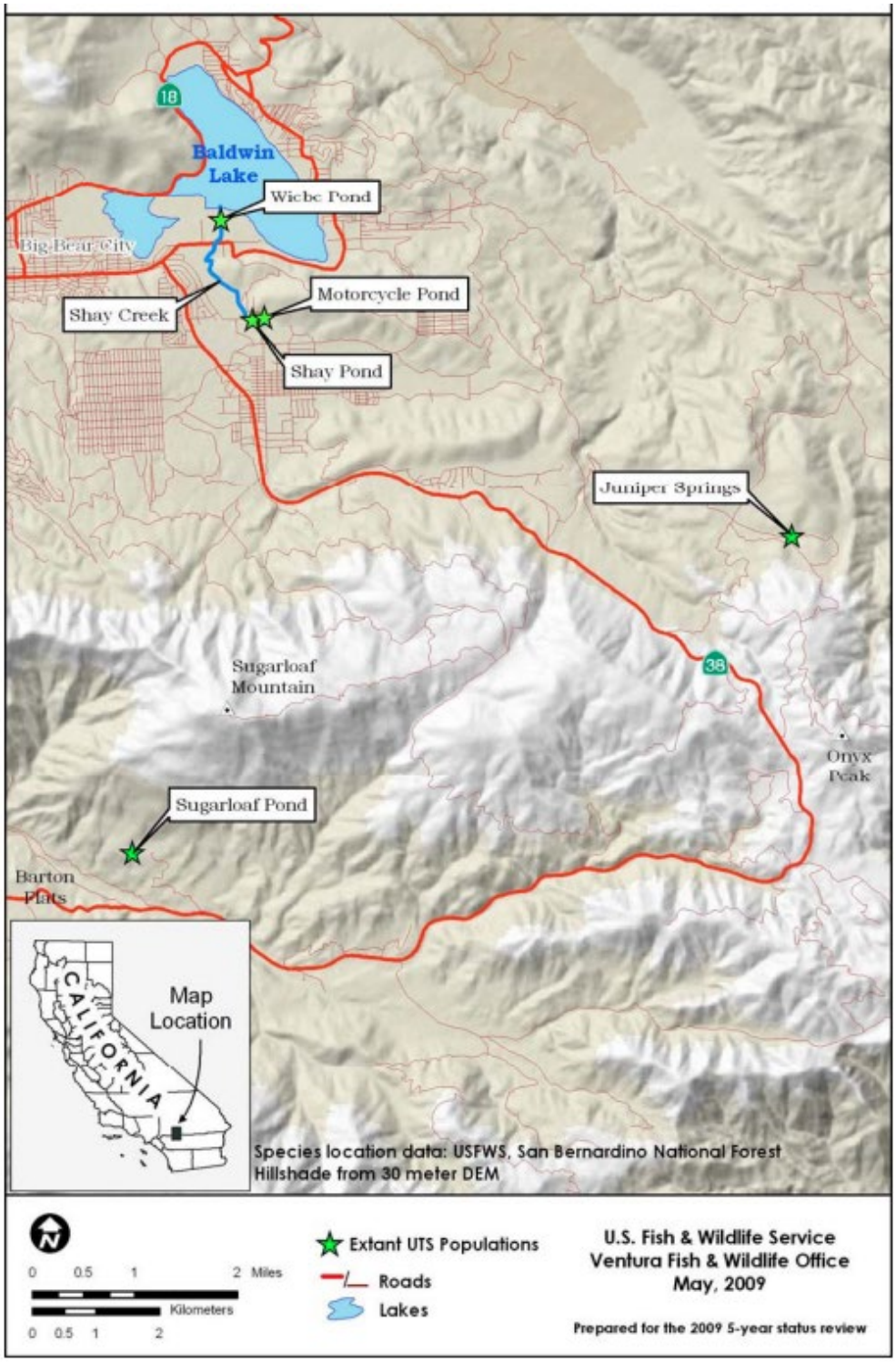
Baldwin Lake, an ephemeral lake, is connected to Shay Pond via Shay Creek. This figure also shows the population of Stickleback fish in the vicinity of Shay Pond.

The population of Stickleback is unique in that it occurs at a high elevation, about 6,700 ft above mean sea level, while all other Stickleback populations inhabit streams below 3,000 ft. In 1985 and 1986, catastrophic mortality of Stickleback in the Valley occurred due to insufficient amounts of water. By the summer of 1990, it was thought that the Stickleback remained in only Shay Pond.

There is a long history of study and group effort regarding the Stickleback in the Shay Creek area. The main stakeholders include the United States Fish and Wildlife Service (USFWS), CDFW, the San Bernardino National Forest (SBNF), BBCCSD, BBLDWP, and BBARWA. Additionally, the Shay Creek Working Group, which includes representatives from the USFWS, CDFW, SBNF, BBCCSD, BBLDWP, and BBARWA, was formed during the process of preparing the USFWS' 2002 Biological Opinion (2002 BO) for the area (Evans, 2002).

The requirements of the 2002 BO state that BBCCSD will provide water to Shay Pond to maintain a minimum 20-gallon-per-minute outflow from Shay Pond. The objective is to maintain a minimum pond water level that will support suitable habitat conditions for the fish. BBCCSD currently meets this requirement by discharging potable water into Shay Pond, but the 2002 BO also states that, should a suitable alternative supply of water be found to be appropriate for the stickleback in the future, BBCCSD may use an 'in-lieu' water supply, which could include the use of tertiary-treated water. The potable water discharged to Shay Pond represents approximately 5% of BBCCSD's customer water demand and could be reserved for potable use instead of discharging to Shay Pond.

The discharge rate needed to maintain the required outflow, accounting for evaoparation and infiltration, has varied from year to year. However, based on the average volume of discharges measured between 2012 and 2020, BBCCSD discharges approximately 50 AFY of potable water to Shay Pond on average. At times, the required discharge has been up to 80 AFY; this maximum volume is used as the basis for the project design and analysis to be conservative. **Figure 12** shows an aerial view of Shay Pond and the proposed discharge location.



(Source: USFWS, 2009)

Figure 11. Population of Stickleback Fish in the Vicinity of Shay Pond

Figure 12. Shay Pond Aerial View

6.2 Applicable Water Quality Standards

Per the Basin Plan, the protection of beneficial uses designated for Shay Creek and Baldwin Lake is primarily provided by narrative water quality objectives. **Table 12** shows the designated beneficial uses of Shay Creek and Baldwin Lake, which are receiving waters for flows from Shay Pond. Baldwin Lake has intermittent beneficial uses as the lake is ephemeral. The water quality objectives used to protect the beneficial uses designated for Shay Creek and, therefore, Shay Pond are presented in **Table 13**, along with ambient Shay Pond water quality, the quality of the current potable water supply to the pond, and the proposed effluent quality of the proposed discharge.

Table 12. Beneficial Uses of Shay Pond Receiving Waters

Beneficial Uses	Shay Creek	Baldwin Lake
COLD – Cold Freshwater Habitat	✓	I
GWR – Groundwater Recharge	✓	
MUN – Municipal and Domestic Supply	✓	I

Beneficial Uses	Shay Creek	Baldwin Lake
RARE – Rare, Threatened, or Endangered Species	✓	I
REC1 – Water Contact Recreation	✓	I
REC2 – Non-Contact Water Recreation	✓	I
SPWN – Spawning, Reproduction, and/or Early Development	✓	
WARM – Warm Freshwater Habitat		I
WILD – Wildlife Habitat	✓	I
Notes: ✓ - Existing or Potential Beneficial Use; I - Intermittent Beneficial Use		

6.3 Assessment of Water Quality Impacts

The water quality data available for Shay Pond are limited, so a detailed water quality assessment using Shay Pond data could not be completed. For this analysis, the existing water quality of potable water supplies near Shay Pond were compared to the projected effluent quality of the proposed Shay Pond discharge to determine if there is a potential for degradation of Shay Pond water quality as a result of the proposed discharge. The water quality collected in Shay Pond as part of the ROWD application is provided as reference. A similar approach as outlined in **Section 5.2.1** was used to determine if the proposed discharge to Shay Pond could contribute to ambient water quality degradation. **Table 13** presents the results of this analysis.

Water quality data for the specific well that discharges to Shay Pond is not available so the data used for this analysis was obtained by compiling and averaging the water quality data from seven drinking water wells near Shay Pond, which is expected to be representative of the quality of groundwater currently discharged to Shay Pond. BBCCSD collected these data in 2020. The projected effluent quality was estimated as described in **Section 5.1** and presented in **Table 5.** As part of the ROWD process, BBCCSD sampled Shay Pond for 156 constituents, of which only 19 analytes were detected.

Overall, the projected effluent quality of the proposed discharge to Shay Pond is better than the current potable water supply for chloride, hardness, sodium, sulfate, TDS, TN, aluminum, and specific conductance. The projected effluent quality of the proposed discharge is expected to be of similar quality as existing potable water supplies for ammonia, fluoride, MBAS, cadmium, copper, and lead. However, additional data may be needed to confirm these findings. Boron may be the only constituent that could be above the existing potable water supply quality. However, the average boron concentration in the disinfected, advanced treated effluent proposed for discharge to the pond is well below the 0.75 mg/L Basin Plan objective for boron for the protection of sensitive agricultural crops, which is not a use of Shay Pond water.

Additional coordination with the CDFW will be conducted to ensure the Stickleback fish are protected.

Table 13. Comparison of Most Stringent Water Quality Objective or Criterion to Current BBCCSD Potable Water Supply Quality and Projected Effluent Quality of Proposed Discharge

Constituent	Units	Reference for Most Stringent WQO or Criterion	Average Quality of Potable Groundwater Supply [a]	Shay Pond Ambient Quality [b]	Projected Effluent Quality of Proposed Discharge	Comparison of Projected Effluent Quality to Most Stringent WQO (See Table Notes)
Ammonia as N	mg/L	1.4 [c]	NS	0.24	0.05	1
Boron	mg/L	0.75	<0.1	0.059	0.11	2
Chloride	mg/L	500	9	7.6	0.60	1
Fluoride	mg/L	0.9	2.1	1.2	<0.026	1
Hardness, Total (as CaCO3)	mg/L	100	209	180	3.2	1
MBAS	mg/L	0.05	<0.1	<0.1	0.0014	1
Sulfate	mg/L	500	39	23	0.20	1
Total Dissolved Solids	mg/L	1000	291	320	50	1
Total Nitrogen	mg/L-N	10	NS	1.2	0.60	1
Cadmium	µg/L	1.5 [d]	<1	<1	<0.11	1
Copper	µg/L	16.6 [d]	<50	<50	0.07	1
Lead	µg/L	3.5 [d]	<5	<5	0.01	1
Aluminum	µg/L	200	<50	120	1.3	1
Specific Conductance	µmhos/cm	700/1000	496	450	18	1

Notes: NS – Not sampled/no data

a) The average groundwater potable water supply was estimated from 7 domestic wells that were tested and are near Shay Pond. NDs were excluded from the average. Constituents with all ND are reported as "<RL." The MDL was not provided.
b) For Shay Pond, only one sample is available. The results are reported. ND are reported as "<MDL."
c) The total ammonia was estimated using the equation presented in Table 4-4 of the Basin Plan. The field temperature on November 17, 2021, was 56 °F (13.3°C) and pH was 7.7.
d) The cadmium, copper, and lead SSO were estimated using a total hardness value of 180 mg/L, based on the sample collected as Shay Pond.

Constituent	Units	Reference for Most Stringent WQO or Criterion	Average Quality of Potable Groundwater Supply [a]	Shay Pond Ambient Quality [b]	Projected Effluent Quality of Proposed Discharge	Comparison of Projected Effluent Quality to Most Stringent WQO (See Table Notes)

Blue – Projected effluent quality is below the ambient and most stringent WQO or criterion
Red – Projected effluent quality is above the ambient or most stringent WQO or criterion

1) Projected effluent quality is below the ambient and most stringent WQO or criterion. No degradation anticipated.
2) Projected effluent quality is above the ambient, but below the most stringent WQO or criterion. Further analysis needed to determine impacts on water quality.

7 EVALUATION OF CONSISTENCY WITH ANTIDEGRADATION POLICY

The guidelines set by the State Water Board for the antidegradation analysis (APU 90-004) provide direction on evaluating the proposed discharges to Stanfield Marsh/ Lake and Shay Pond by focusing on whether and the degree that water quality is lowered, and by considering whether or not the assumed water quality discharge is consistent with the maximum benefit to the people of the State. In developing the antidegradation analysis, the beneficial uses and relevant water quality objectives and commonly used criteria for the Lake and Shay Pond were considered.

7.1 Benefits of Proposed Project

The proposed discharges of disinfected, advanced treated wastewater to Stanfield Marsh and Shay Pond maximize the use of a local sustainable water supply within the Valley region through the surface water discharge of highly treated wastewater produced by BBARWA to directly benefit the community and environment and support the following beneficial uses in the Lake, Stanfield Marsh, and Shay Pond: AGR (Lake only), COLD, GWR (Lake and Pond), MUN, RARE, REC1, REC2, SPWN (Lake and Pond), WARM (Lake and Pond), and WILD (see **Table 1** and **Table 12** for additional details). The proposed Lake and Shay Pond discharges as part of the Replenish Big Bear Program are anticipated to provide the following benefits:

- A new local drought proof water supply will reduce the Valley's vulnerability to drought, both for the community and the environment.
- A new constant source of water supply to Stanfield Marsh that will provide more stable aquatic and riparian habitat for diverse species and more opportunities for the community to realize the educational and recreational benefits of Stanfield Marsh. The marsh has been mostly dry since 2015 but with the project, the 145-acre marsh area will be at least 50% wetted even during dry years.
- Increased Lake levels will provide more wetted shoreline to enhance aquatic and riparian habitat in the Lake.
- Increased lake levels provide increased opportunities and flexibility for BBMWD to conduct lake management activities, such as weed harvesting to control aquatic macrophytes. Such activities are anticipated to enhance the contact and non-contact recreation in the Lake.

- Increased Lake levels will improve Lake access for boats and personal watercraft and allow for continued use of Lake water for snowmaking in the winter, both of which will act to maintain and enhance tourism, the single largest driver of the Big Bear economy.
    - The number of boat permits sold is directly impacted by Lake levels, and it is anticipated that increased levels will result in the sale of additional boat permits and increased rates of associated recreation and tourism, all of which stimulate the local and regional economies.
    - Visitors in the winter are directly tied to weather conditions and the Resorts' ability to facilitate snow activities by extracting Lake water to make snow when Lake levels are high enough.
    - The Transient Occupancy Tax (TOT) is the second largest revenue source for the City of Big Bear Lake, making up approximately 27% of the general-purpose revenues. Revenue from tourists fluctuate depending on the timing and amount of precipitation the region receives and Lake levels.
    - A strengthened tourist economy is expected to provide additional job growth and stability. Project implementation is estimated to create 3 new permanent positions at the WWTP, 242 temporary construction jobs and 480 indirect jobs.
- Higher Lake levels will result in reduced demand on SWP water, which is used in lieu of Lake water to meet Mutual's water needs when Lake levels are low.
- Increased inflow to the Lake will result in the Lake being full more frequently and will provide BBMWD additional flexibility in optimizing Lake releases to provide new downstream benefits to the Santa Ana Watershed, including increased flows in Bear Creek and the Santa Ana River to support habitat and additional downstream capture of surface water for groundwater recharge.
- The Lake discharge provides opportunities to use of a portion of the Lake water for subsequent uses that provide additional potable water supply and recreational benefits through direct and in-lieu groundwater recharge and enhanced snowmaking capabilities (these uses are anticipated to be permitted separately).

- A new source of high-quality water will be discharged to Shay Pond to support 10 acres of habitat for the federally listed Stickleback. The new source of water enables the potable water currently used for this purpose to be stored in the groundwater basin to enhance water supply sustainability.

7.2 Socioeconomic Considerations

As a result of the project benefits described in **Section 7.1**, the proposed project will act to support important economic and social development in the Valley.

The project proponents are voluntarily committing the resources necessary to construct and operate an advanced wastewater treatment facility to discharge disinfected, RO treated effluent of the quality that could be permitted to be discharged to the Lake as a means to achieve the multiple project benefits described above. The commitment of resources by the project proponents to construct, operate, and maintain the proposed treatment facility will result in increased wastewater fees paid by residents and businesses in the Valley. The capital cost of the proposed facilities required for the Lake and Shay Pond discharges is estimated at $56 M (in 2021 dollars) and the annual operations and maintenance (O&M) costs are estimated at $2.4 M (in 2021 dollars). These capital and O&M expenditures are estimated to result in an increase in wastewater fees of approximately $150-$200 per connection per year.

Increased wastewater fees that would be paid by residents and businesses in the Valley with implementation of the proposed project are not without local and regional economic impacts. The estimated increase in wastewater fees would need to be paid by households and businesses out of their existing household incomes or operations budgets, respectively. In effect, additional wastewater fees would be paid out of funds that are currently available for other purposes. With respect to households, future increased wastewater fees would result in less disposable personal income available to a household for the purchase of other goods and services. Similarly, an increase in annual utility costs for a business could result in one or more of the following: increased costs for the goods and/or services it provides and/or decreased reinvestment in the business. With respect to individual households, increases in utility costs have a disproportionate effect on households at the lowest socioeconomic levels.

While the estimated increase in annual wastewater fees with implementation of the proposed project is not estimated to produce substantial and widespread economic impacts in the Valley, a requirement to add additional wastewater treatment beyond the advanced level of treatment included in the proposed project could trigger substantial and widespread socioeconomic impacts. Furthermore, the project proponents believe that the cost of any additional required wastewater treatment would not produce improvements in receiving

water quality that are proportionate with the cost of additional treatment. The benefits of maintaining existing water quality and mass emissions in the Lake and Shay Pond for the constituents analyzed in this antidegradation analysis are not commensurate with the costs of additional wastewater treatment, beyond what is included in the proposed project, should such treatment be recommended. The small decrease in water quality with respect to the constituents considered in this analysis is unlikely to affect beneficial uses of the Lake, Shay Pond, and downstream receiving waters.

7.3 Consistency with Antidegradation Policies

The proposed project, the discharge of disinfected, advanced treated BBARWA effluent to (1) Stanfield Marsh/Big Bear Lake at a discharge rate up to 2,210 AFY and (2) Shay Pond at a discharge rate up to 80 AFY, is determined to comprise best practicable treatment and control and is consistent with federal and State antidegradation policies for the following reasons:

- The proposed discharge to both Stanfield Marsh/Big Bear Lake and Shay Pond will not adversely affect existing or probable beneficial uses of either receiving water or downstream receiving waters, nor will the discharges cause water quality to not meet applicable water quality objectives.
- Overall, the proposed discharge is estimated to improve water quality in the Lake for TDS, TN, TP, and chlorophyll-a, maintain similar water quality for TIN, and have a very minor impact on boron. Future boron concentrations in the Lake are estimated to increase very slightly (i.e., less than 10% of the available assimilative capacity) due to the proposed BBARWA discharge but are estimated to remain well below the 0.75 mg/L Basin Plan objective for boron (see **Table 7** and **Section 5.3.2**). The Lake Analysis shows that projected ambient Lake concentrations of TIN and chlorophyll-a with the proposed discharge will exist below their relevant water quality objective (TIN) or TMDL target (chlorophyll-a). The Lake Analysis also shows that ambient Lake concentration of TDS and TP with the proposed discharge are estimated to exceed the 175 mg/L TDS objective and the 35 µg/L TP TMDL target, respectively. However, the modeled baseline (no project) condition is projected to result in Lake concentrations for TDS, TP, TIN, and chlorophyll-a that exceed those concentrations more often than all modeled BBARWA discharge scenarios. Modeled results for the proposed BBARWA discharge, when combined with a TP Offset Program (see Attachment B of the ROWD package), show the greatest improvements to future, ambient Lake concentrations as compared to the modeled baseline (no project) condition.

- Overall, the proposed BBARWA discharge is estimated to have a very minor impact on Shay Pond water quality and Shay Creek water quality downstream of the pond. The proposed project is estimated to potentially cause a very minor increase in boron concentrations in the pond and downstream in Shay Creek, but concentrations are estimated to remain well below the 0.75 mg/L Basin Plan objective for boron. The disinfected, advanced treated effluent proposed for discharge to the pond is anticipated to lower the concentrations of those constituents listed in **Table 13** as compared to existing ambient concentrations that are largely influenced by the groundwater currently discharged by BBCCSD to the pond to maintain water levels for the endangered Stickleback fish.
- Based on the above, the request to permit a new discharge to both Stanfield Marsh/Big Bear Lake and Shay Pond is consistent with federal and state antidegradation policies in that the minor lowering of water quality for boron in Big Bear Lake (see **Table 7**) and Shay Pond (see **Table 13**) is necessary to accommodate important economic or social development[5], will not unreasonably affect beneficial uses, will not cause further exceedances of applicable water quality objectives, and is consistent with the maximum benefit to the people of the State.
- Based on the above, the request to permit new discharges to Stanfield Marsh/Big Bear Lake and Shay Pond are consistent with the Porter-Cologne Act in that the resulting water quality will constitute the highest water quality that is reasonable, considering all demands placed on the waters, economic and social considerations, and other public interest factors.

The proposed discharge of disinfected, advanced treated BBARWA effluent to Stanfield Marsh/Big Bear Lake and Shay Pond also fully supports California's *Recycled Water Policy* (SWRCB, 2013) in that it would result in an increased use of recycled water from municipal wastewater sources, would incrementally reduce reliance on the vagaries of annual precipitation, and would assist in the sustainable management of surface and groundwater resources.

[5] Maintain and improve recreation and tourism in the Big Bear Lake region which in turn stimulates the local and regional economies.

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