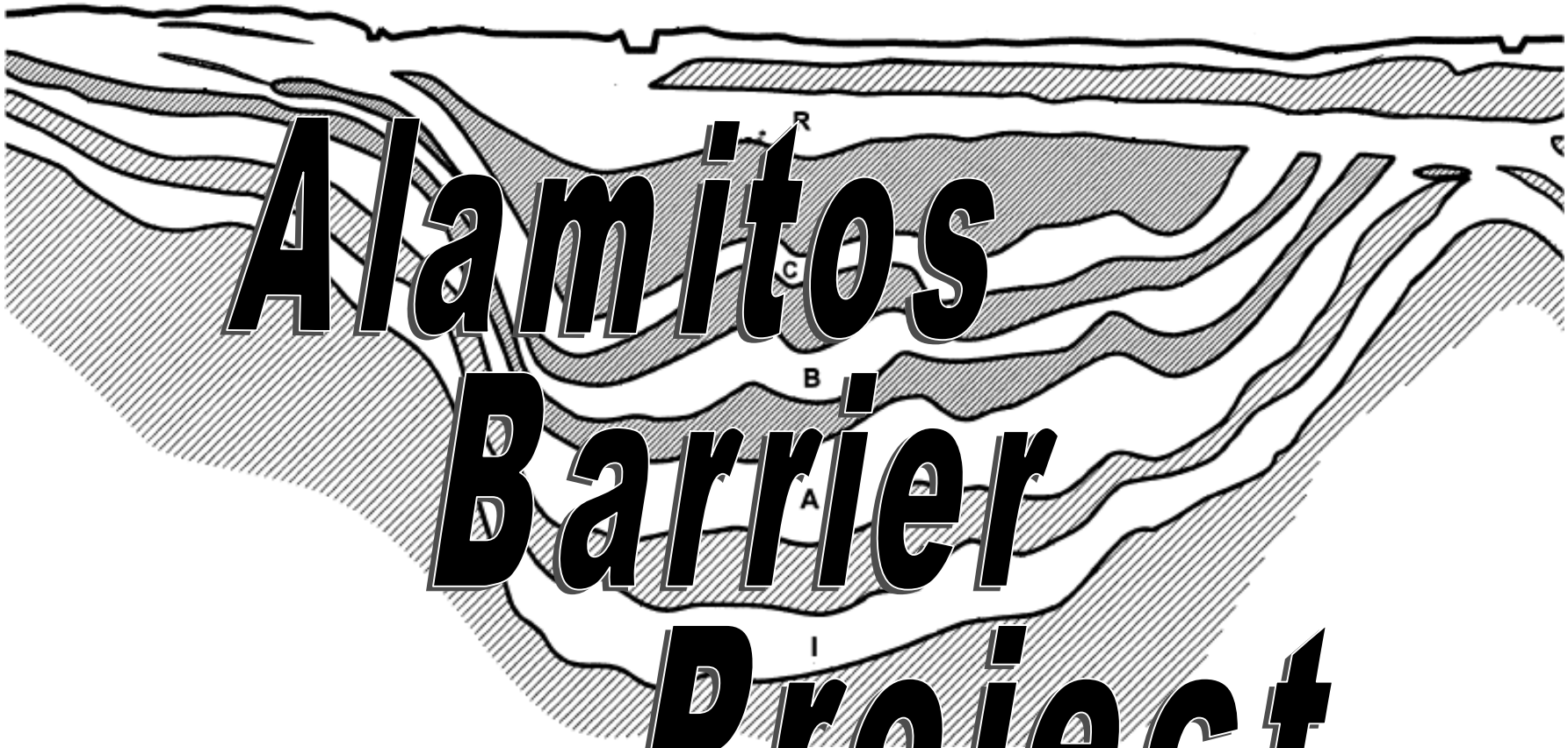

Alamitos Barrier Project

Alamitos Barrier Project

Annual report on the control of seawater intrusion

2023 - 2024

Member Agencies:

Orange County Water District

Water Replenishment District of Southern California

Long Beach Utilities

Golden State Water Company

Los Angeles County Flood Control District

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Joint Management Committee

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INTRODUCTION

The Alamitos Barrier Project (ABP) was designed and constructed to protect the groundwater supplies of the Central/Orange County Basin of the Coastal Plain from the intrusion of seawater through the Alamitos Gap area. The project facilities are located near the Los Angeles-Orange County border about two miles inland from the terminus of the San Gabriel River. The original facilities included injection wells to form a freshwater pressure ridge and extraction wells to form a saltwater trough. The freshwater pressure ridge has proven to be historically effective, whereas the saltwater trough has not. As a result, the extraction wells are currently not in operation. A map showing the supply pipeline, injection wells, extraction wells, and observation wells is shown on *Appendix A-12*.

Los Angeles County Public Works (Public Works) operates and maintains the ABP and its associated facilities under the direction and approval of the Joint Management Committee (JMC), acting on behalf of the Los Angeles County Flood Control District (LACFCD) and the Orange County Water District (OCWD).

This report summarizes design and construction issues, operation and maintenance activities, hydrogeologic effects, chloride concentrations, and project costs for Fiscal Year (FY) 2023-24 (i.e., July 1, 2023, through June 30, 2024).

SUMMARY

During FY 2023-24, a total of 6,040 acre-feet (AF) of water was injected into the ABP (an average rate of 8.3 cubic feet per second (cfs)). Of this total, OCWD purchased 2,114 AF (35 percent) and the Water Replenishment District of Southern California (WRD) purchased 3,926 AF (65 percent). This total injected amount was 435 AF less than FY 2022-23 and was 308 AF less than the average injection of 6,348 AF for the previous five fiscal years. The ABP experienced three partial shutdowns that impacted the north-south alignment, which occurred from September 8, 2023, to September 21, 2023, September 29, 2023, to October 9, 2023, and March 28, 2024, to April 10, 2024, respectively. These shutdowns are detailed in the Injection Operation section of this report and *Table 3* (Page 8).

The total costs associated with the ABP in FY 2023-24 are summarized below:

- Total Cost in FY 2023-24: $12,002,324.
  - Injection Water costs: $8,357,201 (OCWD: $2,926,513; WRD: $5,430,688)
  - Total Operations and Maintenance Costs (not including liability insurance): $3,564,593.
    - Injection-related costs: $2,910,620 (OCWD: $1,018,717; LACFCD: $1,891,903).
      - Equivalent cost per AF of water injected: $481.85.
    - Extraction-related costs: $2,386 (LACFCD only).
    - Projects and Studies: $651,586 (LACFCD Unit 15 Project).
  - Liability Insurance cost: $80,530 (OCWD: $ $40,265; LACFCD $40,265).

During this reporting period, groundwater levels along the ABP alignment were generally near or above protective elevations throughout all aquifer zones, except some portions of the A and I Zones where injection wells are screened across 4 zones and it is difficult to control injection into a specific zone. Compared to the last reporting period, groundwater levels west of the San Gabriel River decreased in the C and B Zones and increased in the R and I Zones. East of the San Gabriel River, ground water elevations increased in

all Zones, except for the R Zone, which remained unchanged.

West of the San Gabriel River, chloride concentrations slightly decreased in the R, A, and I Zones, while the C and B Zones experienced an increase in chlorides. East of the San Gabriel River, chloride concentrations increased in the I Zone, decreased in the R and B Zones, and remained unchanged in the C and A Zones. Detailed analyses of the reporting period's groundwater elevations and chloride concentrations are provided in the "Hydrogeologic Effects" and "Chlorides" sections of the report.

It is imperative that the ABP operate consistently and continuously to prevent seawater intrusion. The JMC will continue to ensure that the ABP is operated and maintained efficiently, economically, and continuously protects the region's groundwater supplies.

PROJECTS AND STUDIES

Capital improvement projects and studies during this reporting period are briefly summarized below. The general location of each project is identified on the map in *Appendix A-12*.

Table 1. Capital Improvement Projects and Contracts

Project Title	Description	Board Award Date	Contractor	Final Contract Amount	Field Acceptance
ABP Unit 15 Replacement Wells	Construction of 5 new injection wells and 2 nested observation wells	11/16/2021	Environmental Construction, Inc.	$7,743,556	9/4/2023

Note: For a full history of improvement projects and contracts on record, please contact Public Works.

ABP Unit 15 Replacement Wells (Total Estimated Cost: $9,542,979)

This project constructed five new injection wells and two new observation wells to replace and supplement existing ABP facilities located within the Cities of Long Beach and Seal Beach. Five injection wells were constructed to replace four existing injection wells and to provide increased protection against seawater intrusion. The two new observation wells were constructed to provide Public Works with additional groundwater elevation and chloride concentration data to enable more efficient operation of the ABP. In October 2019, LACFCD was awarded grant funding in the amount of $4,191,693 from the State Water Resources Control Board, Proposition 1 Groundwater Grant to construct these wells. The total estimated cost of the project is $9,542,979, which includes design, construction, and project management costs. Project construction began in May 2022 and was completed September 2023. In September 2021, LACFCD and LADWP entered into a 5-year License Agreement for the newly constructed injection and observation wells located on the Haynes Generating Station, which is owned by the City of Los Angeles Department of Water and Power (LADWP). LACFCD and LADWP will continue working towards a 30-year license agreement for all ABP facilities located within the Haynes Generating Station.

The ABP Unit 15 Project included the following:

- Destruction of injection wells 33W (C,B,A,I), 34F(A), 34H(A), and 34H(I).
- Construction of new injection wells 33W2(C,B), 33W2(A,I) 34F2(A), 34H2(A), and 34H2(I).
- Construction of new internodal observation wells 34FG (A,I) and 34G2H2 (C,B,A,I).

Observation Well Modifications

Observation wells along portions of the ABP alignment commonly experience artesian conditions due to continuous injection of freshwater via injection wells. As a result, it can be difficult to perform routine operational activities at the observation wells such as measuring groundwater levels and collecting chloride samples. In addition, flooding of the observation well vaults can occur if the well cap cannot sufficiently withstand the well casing pressure, or if the well cap is improperly installed. Currently, to perform chloride sampling at artesian observation wells, LACPW must coordinate a shutdown of nearby injection wells to allow water levels to subside. This creates an unfavorable condition where saltwater intrusion could occur due to the reduction in groundwater levels and exhausts manpower and resources.

To remedy this issue, LACPW prepared a plan to retrofit an artesian observation well to allow chloride sampling activities to be performed without the need to remove the well caps or shutdown nearby injection wells. The design replaced the traditional observation well cap with a PVC blind flange with stainless steel Swagelok tube connectors to collect water samples. The design included attaching poly-flo tubing to each Swagelok tube connector which had a length that corresponded to the desired sampling depth inside the well casing. This design utilizes the artesian conditions within the well to produce a water sample through the poly-flo tubing by connecting to the Swagelok fitting. The wells that have been modified for this reporting period are listed in the Table 2 below:

Table 2. Summary of Observation Well Modifications

34HJ2 (C)	34HJ2 (B)	34JL (C)	34JL (B)	34JL (A)	34JL (I)
34LS (A)	34LS (I)	34S0.1 (R)	34S0.1 (C)	34S0.1 (A)	34S0.1 (I)
34T0.1 (C)	34T0.1 (B)	34T0.1 (I)	34VZ (A)	34VZ (I)	34Y0.1 (R)
34Y0.1 (A)	34Y0.1 (I)	35E0.1 (A)	35E0.1 (I)		

Updated Title-22 Engineering Report and Added Tracer Study

To address the new ABP Unit 15 injection wells and the new inland injection well at the Leo Vander Lans Advanced Water Treatment Facility (LVL AWTF), the Water Replenishment District was tasked with submitting an updated Title 22 Engineering Report to the State Water Resources Control Board Division of Drinking Water and the Los Angeles Regional Water Quality Control Board. In November 2022, WRD submitted the updated Title 22 Engineering Report, which included a workplan for an added tracer study for the ABP and the inland injection well at the LVL AWTF.

In January 2024, WRD and LACPW worked together to perform the tracer study. This involved adding fluorescein dye into three ABP injection wells [34E(I), 34F(I), and 34F2 (A)], and sampling for tracer arrival at four down gradient observation wells [34F5(A), 34F5(I), 34FG(A), and 34FG(I)]. A successful added tracer study will result in detecting the fluorescein dye at the selected observation wells to determine the travel velocities of recycled water within the groundwater basin. The results of this study are anticipated in 2025.

INJECTION OPERATIONS

The total amount of water injected into the ABP during FY 2023-24 was 6,040 AF. Of this total, approximately 4,221 AF (70 percent) was recycled water and 1,819 AF (30 percent) was imported water. The maximum monthly injection during this reporting period was 581 AF (23 percent imported, and 77 percent recycled) which occurred in August 2023. The minimum monthly injection of 402 AF (30 percent imported, and 70 percent recycled) occurred in April 2024, and was directly related to the partial shutdown ABP shutdown that occurred in late March and April 2024. This partial shutdown was necessary to conduct chloride sampling at artesian observation wells and to retrofit select casings at observation wells 34HJ2 and 34T0.1. There were two preceding partial shutdowns that both occurred in September 2023. The first partial shutdown was required to conduct chloride sampling at artesian observation wells and to retrofit select casings at observation wells 34HJ, 34HJ2, and 34T0.1. The second partial shutdown was necessary to repair a leak at injection well 34V. All ABP injection well shutdowns that occurred during FY 2023-24 are summarized in *Table 3*.

Table 3. Summary of ABP Shutdowns

Shutdown	Startup	Duration (days)	Impacted Portion of ABP	# of Wells	Reason
9/8/2023	9/21/2023	13	34F (I) - 35F (I)	35	Chloride sampling at artesian observation wells; modify observation well 34HJ, 34HJ2, & 34T0.1
9/29/2023	10/9/2023	10	34N (C/B) - 35H2 (A)	27	Point C valve closure to address leaking at injection well 34V (A)
3/28/2024	4/10/2024	13	34F (I) - 34Z2 (I)	32	Chloride sampling at artesian observation wells; modify observation wells 34HJ2, & 34T0.1

Notes:
* Routine and/or minor shutdowns of individual wells are not listed here but are included in Figure 3.

Since completion of the LVL AWTF expansion in 2014, the LVL AWTF has operated intermittently between 2.5 and 6.0 million gallons per day (MGD). Further details regarding LVL AWTF operations can be found in the *Recycled Water Operations* section of this report.

The injection volumes and costs for FY 2022-23 and FY 2023-24 are shown in *Table 4*. The representative unit costs included in *Table 4* for imported and recycled water were calculated by WRD. *Table 4* shows that the volume of water injected into the ABP during FY 2023-24 decreased by 434.6 AF (6.7 percent) from the previous year. The decrease in injection was a direct result of ongoing projects that occurred during the reporting period, which required injection wells to be taken offline. Another potential reason for the reduced injection volume could be related to the above average rainfall received since FY 2022-23, which contributed to the overall increase in groundwater levels.

TABLE 4. INJECTION OPERATIONS

	Imported Water Injections			Recycled Water Injections			Total Injections		
	FY22-23	FY23-24	Percent Change From Previous Year	FY22-23	FY23-24	Percent Change From Previous Year	FY22-23	FY23-24	Percent Change From Previous Year
VOLUME OF WATER INJECTED IN ACRE-FEET									
OCWD[1]	794.3	625.7	-21.2%	1,619.6	1,488.4	-8.1%	2,413.9	2,114.1	-12.4%
WRD[2]	1,363.2	1,193.4	-12.5%	2,698.0	2,733.0	1.3%	4,061.2	3,926.4	-3.3%
TOTAL	2,157.5	1,819.1	-15.7%	4,317.6	4,221.4	-2.2%	6,475.1	6,040.5	-6.7%
AVERAGE INJECTION RATE IN CFS									
OCWD[1]	1.10	0.86	-21.2%	2.24	2.06	-8.1%	3.34	2.92	-12.4%
WRD[2]	1.88	1.65	-12.5%	3.73	3.78	1.3%	5.61	5.42	-3.3%
TOTAL	2.98	2.51	-15.7%	5.96	5.83	-2.2%	8.94	8.34	-6.7%
COST OF WATER PURCHASED									
OCWD[1]	$1,049,515	$866,398	-17.4%	$2,138,471	$2,060,115	-3.7%	$3,187,986	$2,926,513	-8.2%
WRD[2]	$1,805,804	$1,651,829	-8.5%	$3,568,757	$3,778,858	5.9%	$5,374,561	$5,430,688	1.0%
TOTAL	$2,855,318	$2,518,228	-11.8%	$5,707,228	$5,838,973	2.3%	$8,562,547	$8,357,201	-2.4%
UNIT COST OF WATER PER ACRE-FOOT[3]									
JULY - DEC	$1,301.42	$1,360.84	4.6%	$1,301.42	$1,360.84	4.6%			
JAN - JUN	$1,348.65	$1,407.80	4.4%	$1,348.65	$1,407.80	4.4%			

[1] Orange County Water District (OCWD)

[2] Water Replenishment District of Southern California (WRD)

[3] The Unit Cost of ***Imported Water*** Per Acre-Foot is the sum of the Metropolitan Water District's wholesale rate at LB-07A (managed by Long Beach Water Department) , the $5 Administrative Surcharge, Readiness-To-Serve (RTS) costs, and Capacity costs (using total volume plus penalties). This amount is greater than what is shown on monthly invoices because Capacity costs are not typically known or accounted for at the time of those invoices. Based on the agreement between the OCWD and the WRD, the representative Unit Cost of ***Recycled Water*** Per Acre-Foot is equal to that of the imported water and is shown in the calculations by the WRD.

FIGURE 1 - MONTHLY AMOUNT OF WATER INJECTED

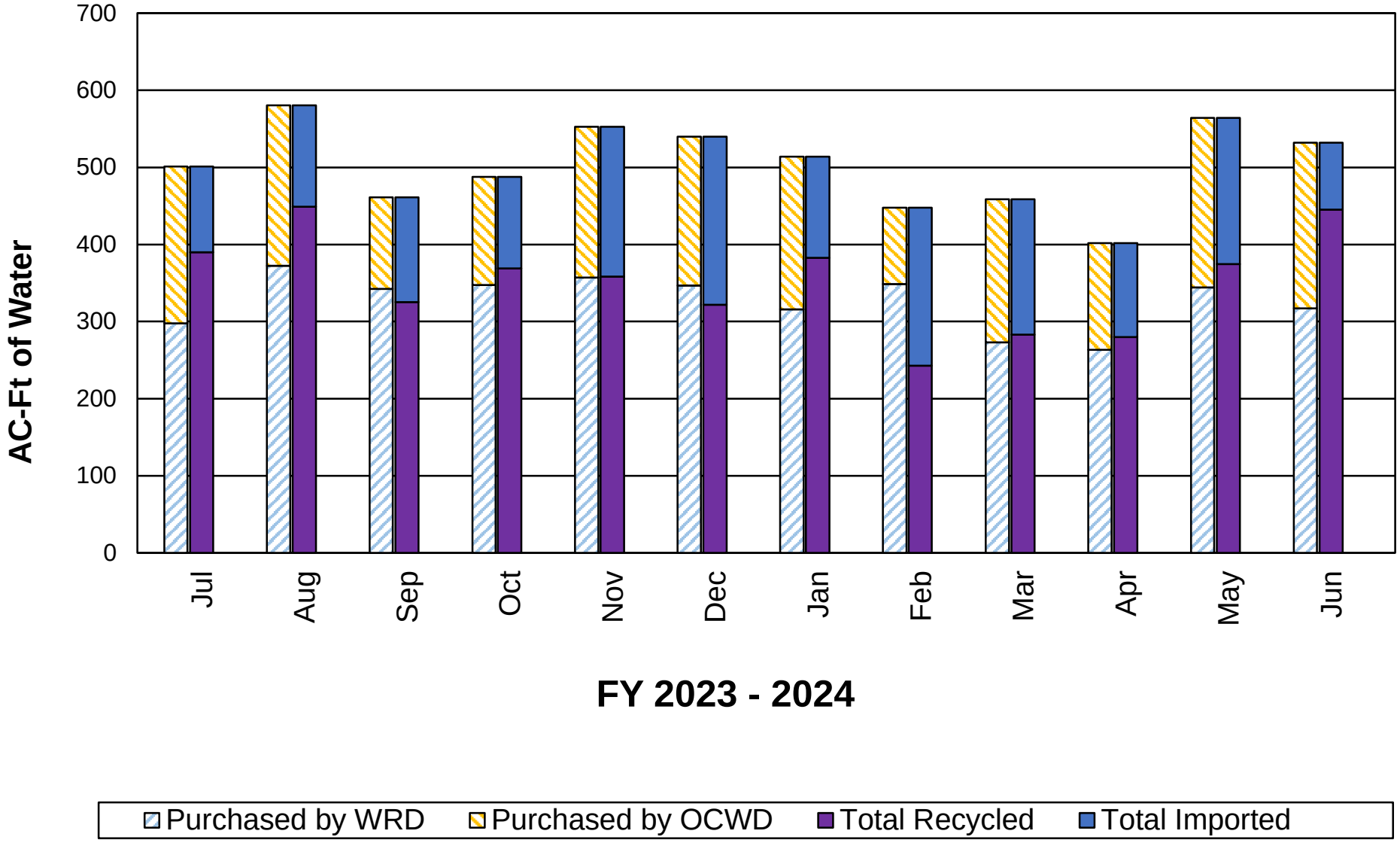
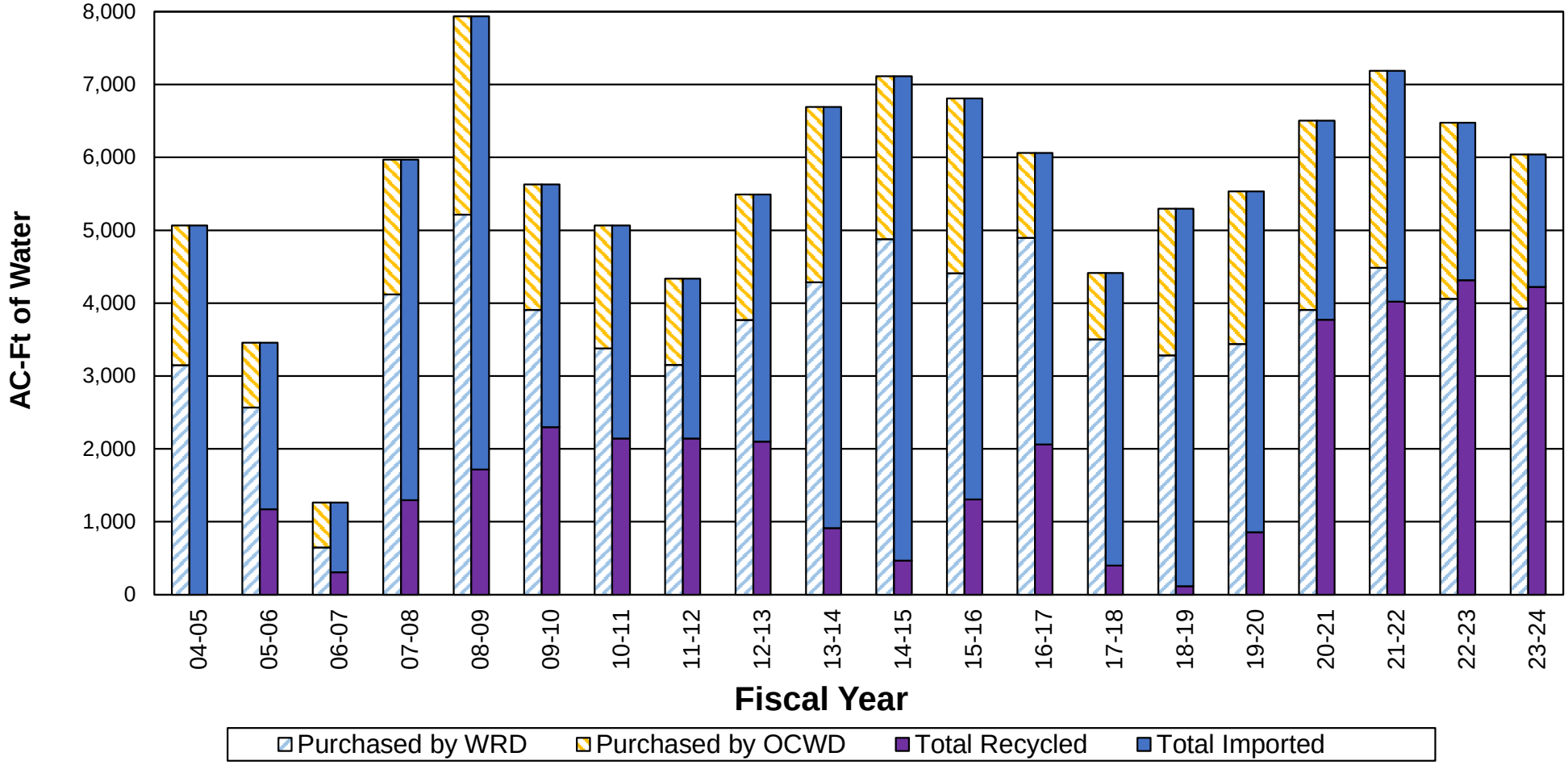


FIGURE 2 - ANNUAL AMOUNT OF WATER INJECTED



RECYCLED WATER OPERATIONS

The LVL AWTF was constructed in 2005 to provide up to 3 million gallons per day (MGD) of advanced treated recycled water to inject at the ABP. The LVL AWTF treatment train consists of Micro-Filtration (MF), Reverse Osmosis (RO), and Ultra-Violet light (UV) disinfection. An expansion project completed in 2014 increased the plant capacity to 8 MGD by adding a recovery MF system and a third stage RO system. The Long Beach Water Reclamation Plant (LBWRP) owned by the Los Angeles County Sanitation Districts (LACSAN) provides recycled water to Long Beach Water Department (LBWD), who in turn provides recycled water to the LVL for advanced treatment.

The LVL AWTF was authorized to deliver up to 3 MGD for injection at the ABP under Regional Water Quality Control Board (RWQCB) Order No. R4-2005-0061 with the condition that the 10-year running average of recycled water contribution does not exceed 50 percent. In conjunction with completion of the plant expansion project, the LVL AWTF was authorized under RWQCB Order No. R4-2014-0111 to inject up to 8 MGD of advanced treated recycled water with no limitation on the percent recycled water contribution running average.

During the reporting period, the LVL AWTF provided a total of 4,221 AF of advanced treated recycled water to the ABP at rates between 2.5 MGD and 6.0 MGD. The volume of advanced treated recycled water represented 70 percent of the total amount of water injected into the ABP. It should be noted that the average percentage of advanced treated recycled water supplied by the LVL AWTF over the past four years was 62.7 percent.

WRD continues to make significant improvements at the LVL AWTF and the supply of advanced treated recycled water has greatly increased over the past four years. However, fifty (50) plant shutdowns occurred during the reporting period, with most of the shutdowns being of short duration (19 were due to Southern California Edison Power outages or planned shutdowns).

MAINTENANCE

Typical well maintenance at the ABP includes injection well redevelopments and observation well cleanouts. The purpose of injection well redevelopments is to remove accumulated sediments and microbiological build-up within the well casings to restore each well's ability to operate at its maximum injection capacity. Each of the 61 injection well casings are routinely redeveloped once every two years. During FY 2023-24, Public Works completed redevelopment activities at 24 well casings, as listed in *Table 5* below:

Table 5. Injection Well Redevelopment Program

33G (A,I)	33J (A,I)	33L (A,I)	33N (A,I)	33Q (A,I)	33Q1 (C,B)
33S (A,I)	33S1 (C,B)	33T (A,I)	33U (A,I)	33U3 (C,B)	33V (A,I)
33W2 (C,B)	33W2 (A,I)	33X (C,B,A,I)	33Y (C,B,A,I)	33Z (C,B,A,I)	34E (C,B)
34E (I)	34F (I)	34F2 (A)	34G (A)	34H2 (A)	34H2 (I)

Observation well cleanouts are performed on an as-needed basis to clean out accumulated sediments within the well casings. Public Works staff performing observation well cleanouts typically rotate between the ABP, Dominguez Gap Barrier Project, and West Coast Basin Barrier Project. During FY 2023-24, Public Works completed cleanout activities at 4 well casings, as listed in *Table 6* below:

Table 6. Observation Well Clean-out Program

33UV (A)	33S 18 (C)	33T 29 (A)	33Z 11 (I)		

The operating status of each injection and extraction well during FY 2023-24 is depicted in *Figure 3* (Page 16). The ABP was in operation throughout the entire reporting period, except for two partial shutdowns that occurred in September 2023 and another partial shutdown in March 2024. The first shutdown in September 2023 was necessary to perform the Fall 2023 chloride sampling event at artesian observation wells and to modify select observation well casings. The second shutdown in September 2023 was necessary to repair a leak at injection well 34V. The March 2024 shutdown was required

to perform the Spring 2024 chloride sampling event at artesian observation wells and to continue efforts with the observation well modification project.

Wells West of the San Gabriel River

Injection Wells 33W2 (C,B) & (A,I) were completed and put into operation in June 2023 as part of the ABP Unit 15 Project. Injection flow rates were gradually increased at these wells based on operational needs to meet protective groundwater elevations and reduce high chloride concentrations.

Injection Well 33S1 is currently functioning at a reduced flow rate due to concerns regarding potential surface leakage.

Wells East of the San Gabriel River

Injection Wells 34F2 (A), 34H2(A), and 34H2(I) were completed and put into operation in June 2023 as part of the ABP Unit 15 Project. Injection flow rates were gradually increased at these wells based on operational needs to meet protective groundwater elevations and reduce high chloride concentrations.

Injection well 34G(A) has historically experienced surface leakage issues. The area around the well was grouted in 2000 and 2004 to prevent surface leakage, which seemed to resolve the issue until 2016. In July 2016, a packer was installed due to reoccurring surface leakage. The goal of the packer was to direct the water below the poor casing welds, which were suspected of being the cause of the surface leakage. The well was turned off in 2019 due to reoccurring surface leakage. However, injection was resumed in December 2021 at a reduced rate and no signs of surface leakage have since been reported. Public works has plans to repair injection well 34G(A) in late 2024 by installing a 6-inch PVC casing within the existing 12-inch stainless steel casing.

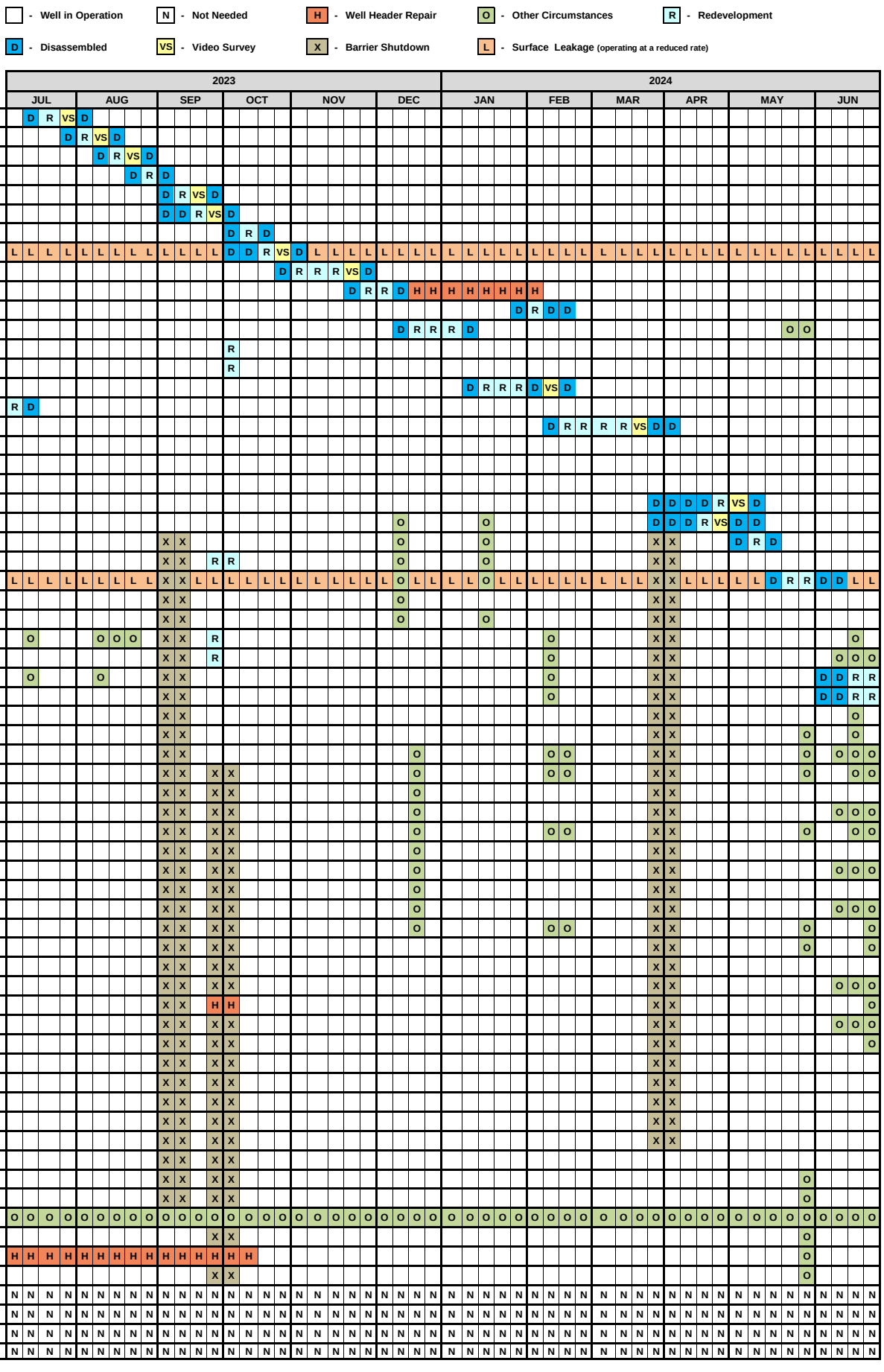
To perform redevelopment at injection well 34V, Public Works staff typically turns off approximately 23 nearby injection wells to reduce ground water levels. Public Works plans to modify injection well 34V with permanent equipment at the wellhead and inside

the well, to allow it to be redeveloped without disassembly. Work activities at injection well 34V are scheduled for early 2025. A similar wellhead modification was successfully completed at injection well 34S in May 2023.

Injection well 35G (A) was constructed in 1991 and injected into the A and I Zone until 2013, when a redevelopment swab became lodged at a depth of 100-feet in the blank section between the A and I Zone perforations. As a result, the well was still operational, but could only inject into the A Zone. On February 25, 2020, this well was turned off due to the vault filling up with water. The Seawater Barriers Condition Assessment revealed that this well is plugged with sediment which is covering most of the perforations. This well is currently inoperable.

Observation well 35K1, located on the property of the Orange County Sanitation District (OCSD) in the City of Seal Beach is slated to be destroyed in October 2024, to accommodate the construction of a new pump station. Once the new Seal Beach Pump Station is completed, OCSD plans to construct a replacement observation well.

Figure 3 - Injection and Extraction Well Operating Status

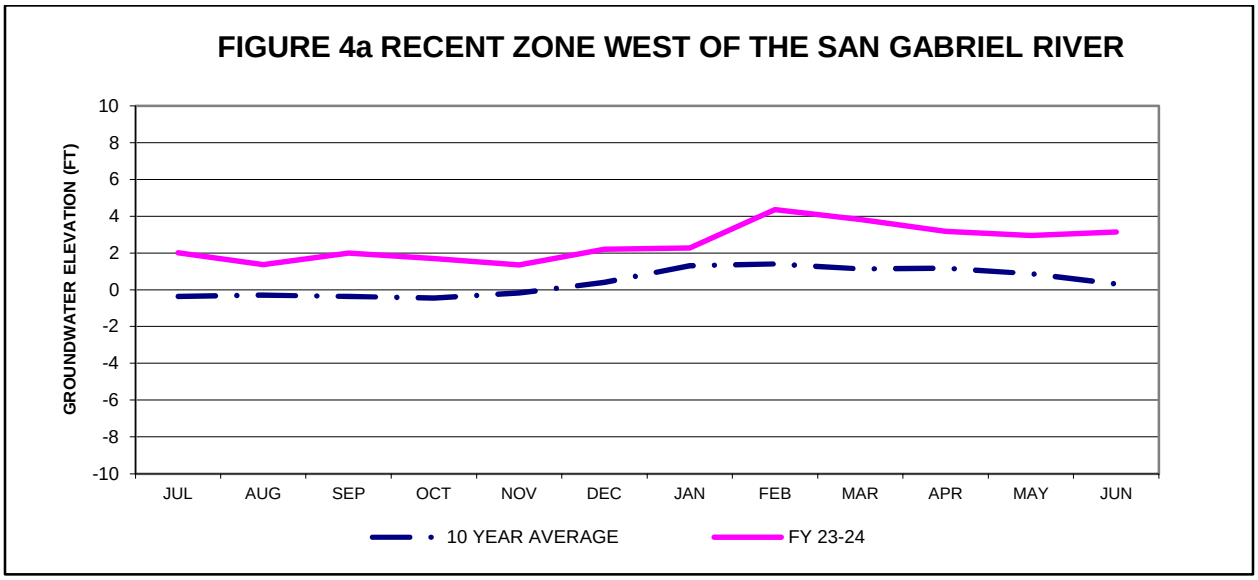


*Extraction Well

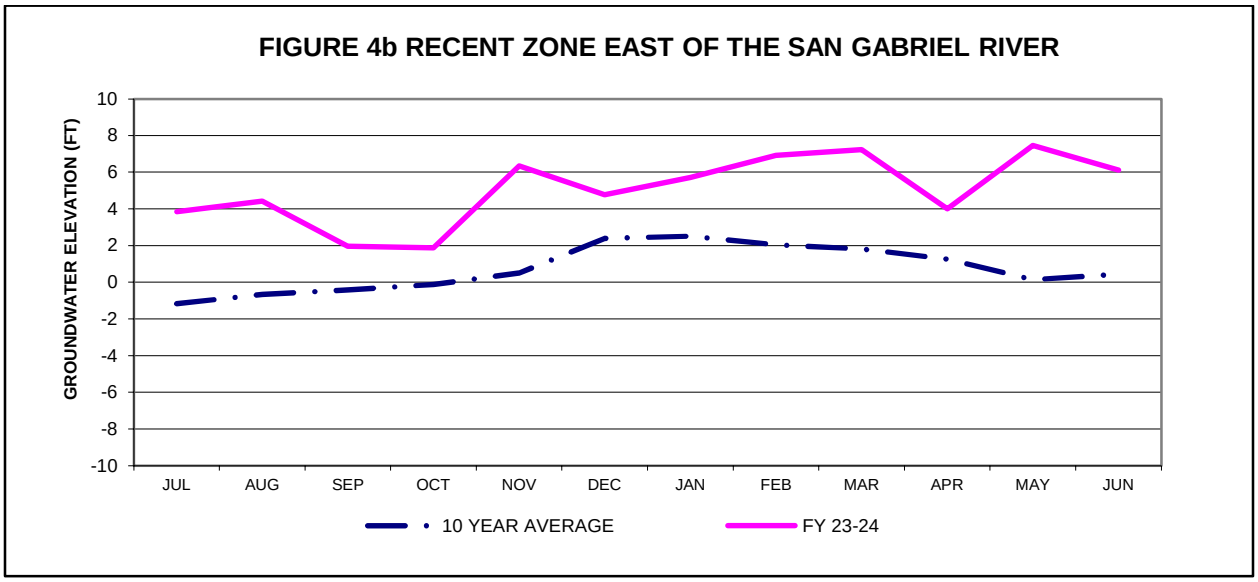
HYDROGEOLOGIC EFFECTS

Figures 4a through 8b (pages 18-22) show the average monthly groundwater elevation during FY 2023-24 relative to the average groundwater elevation of the 10 preceding years (FY 2013-14 to FY 2022-23) in the vicinity of the ABP alignment in the R, C, B, A, and I Zones, respectively. Two graphs were created for each aquifer to account for changes in groundwater elevation trends along two portions of the ABP alignment: wells west of the San Gabriel River and wells east of the San Gabriel River. It is important to note that the 10-year average does not represent a groundwater elevation goal, nor does it specifically reflect the performance of the ABP, but is simply included for comparison purposes. The graph includes all available semi-monthly, monthly, semi-annual, and annual data for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP. As a result, semi-monthly values are "weighted" more heavily than the annuals in the calculation of the monthly average. Also, the months of September 2023 and March 2023 consistently have lower values than preceding and succeeding months since semi-annual and annual water levels are measured during these months.

As shown in the graphs, groundwater elevations along the entire ABP were generally above the 10-year average. However, during the month of September 2023 there were notable decreases in groundwater levels in most zones due to two partial shutdowns on the ABP. Groundwater elevations west of the San Gabriel River were generally above the 10-year average, except in the C Zone in the month of October 2023, the B Zone in the month of February 2024, and the I Zone in the month of September 2023. These lower groundwater levels were associated with the partial shutdowns at the ABP. Groundwater elevations east of the San Gabriel River were also generally above the 10-year average, except in the I Zone in the month of September 2023, which coincided with a partial shutdown of the ABP.



Note: The graph includes all available semi-monthly, monthly, semi-annual, and annual data for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP



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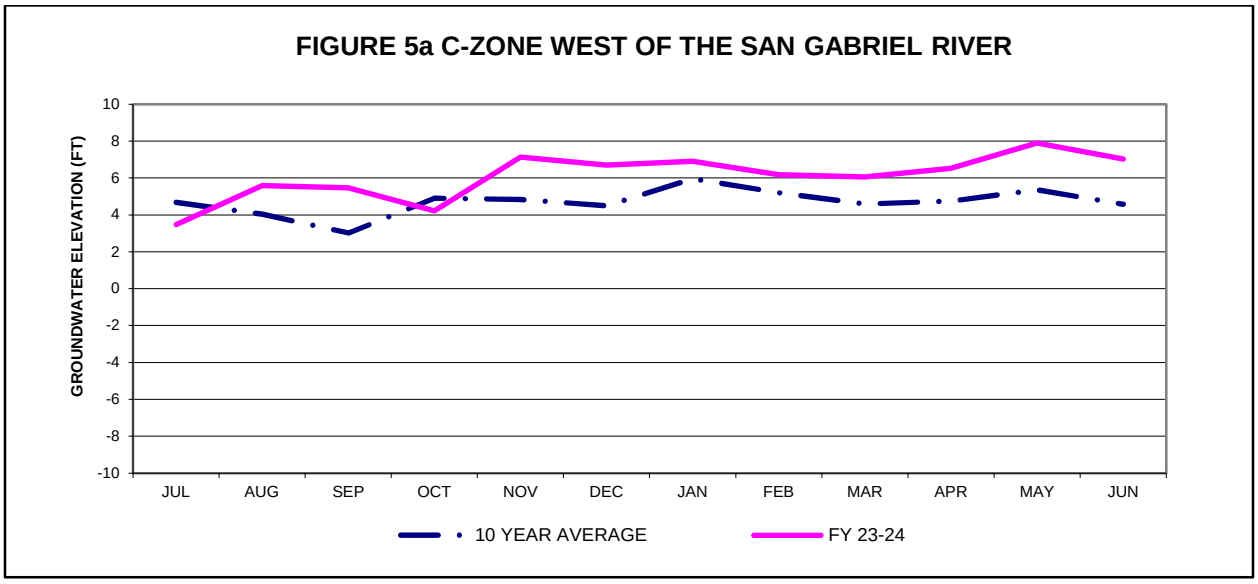

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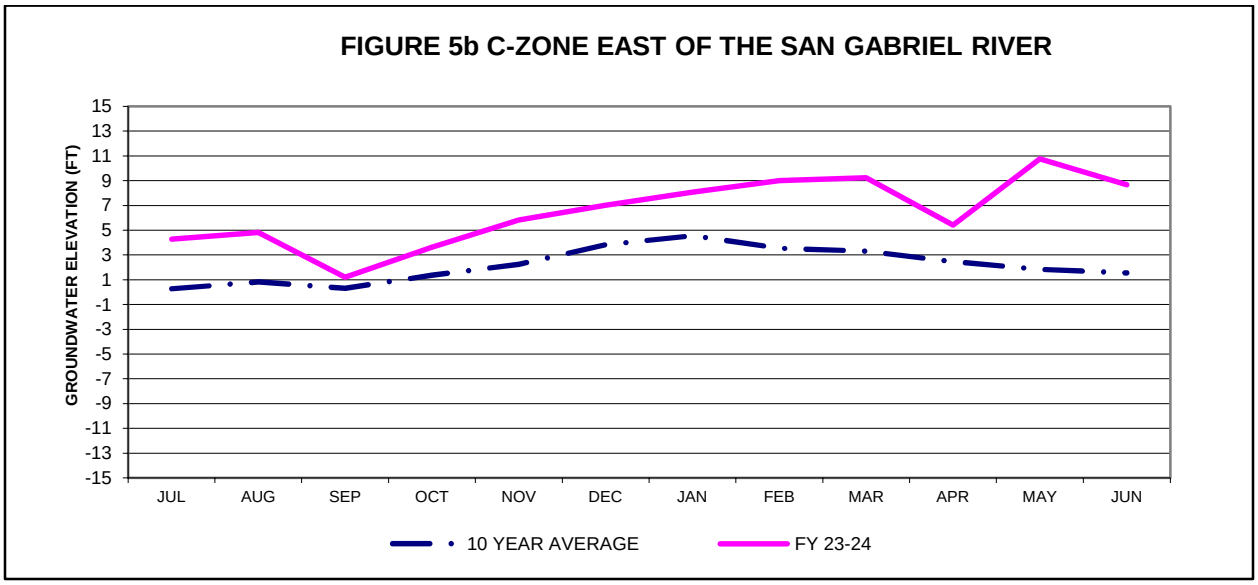

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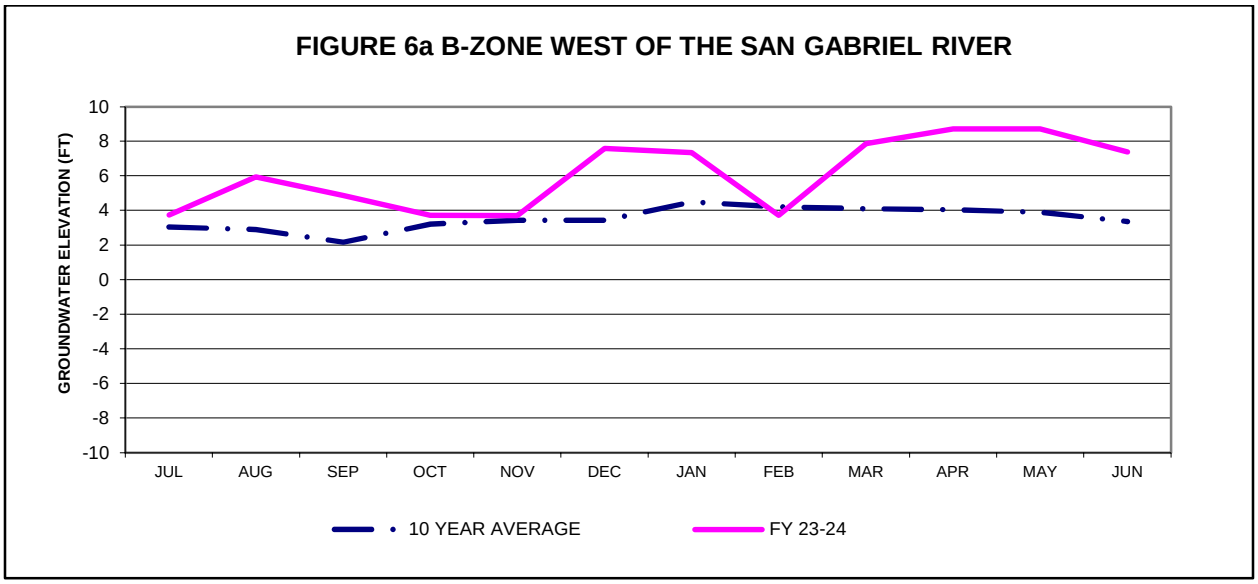

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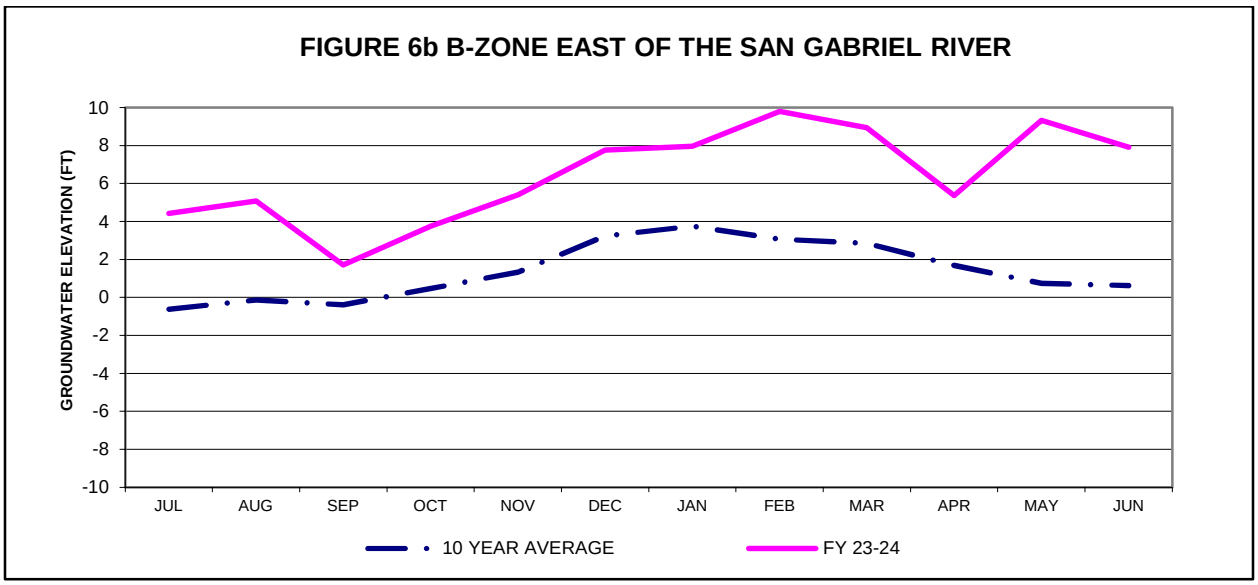

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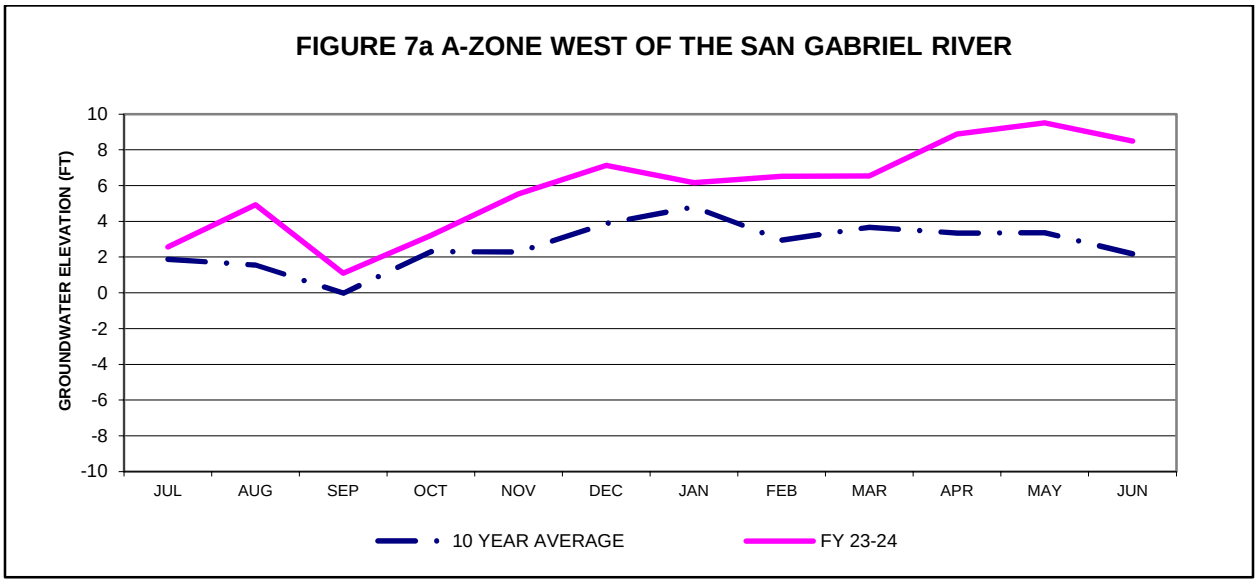

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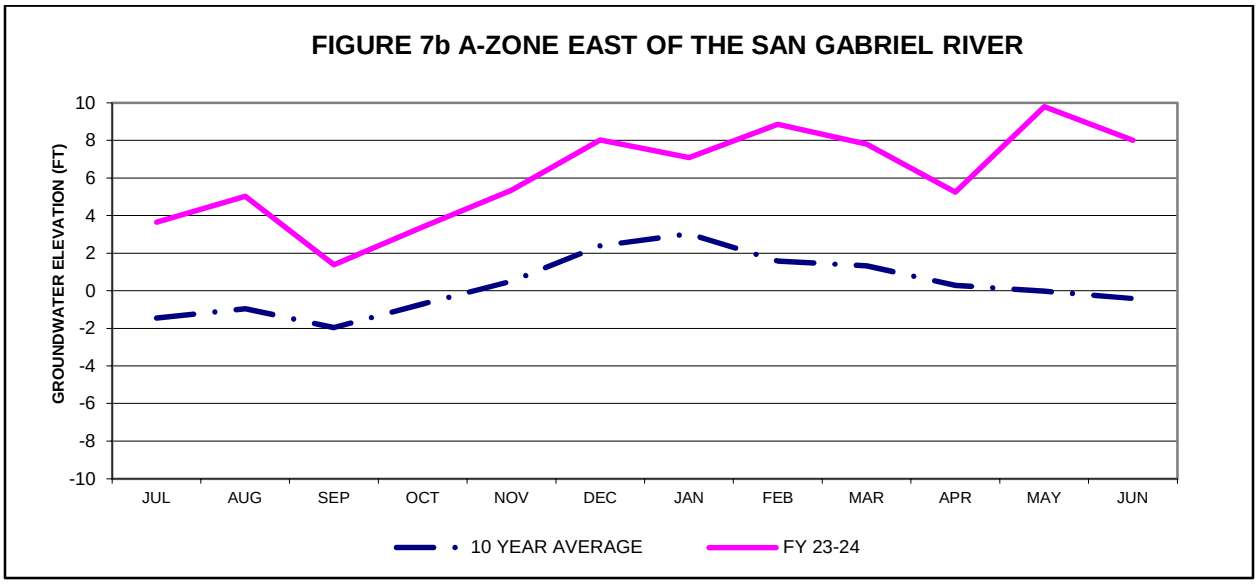
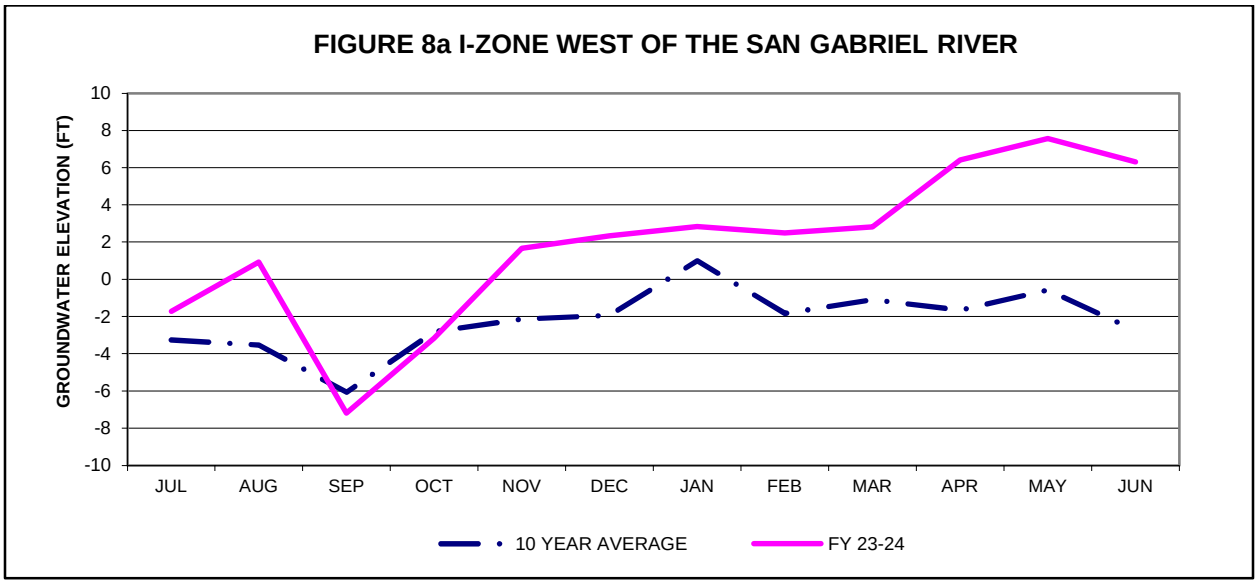
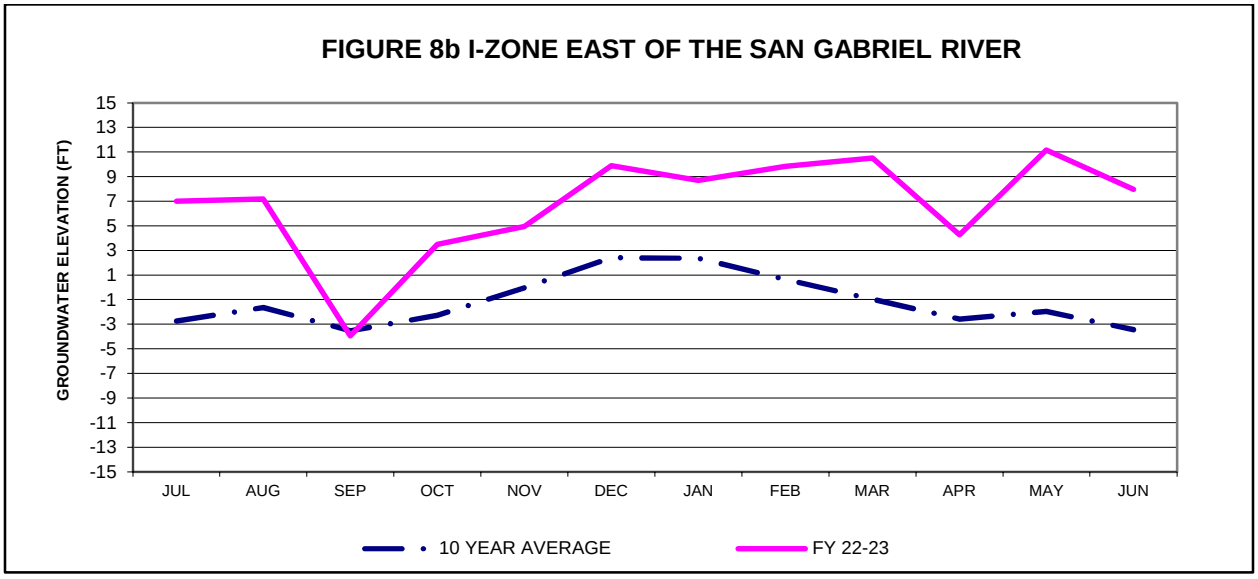


Note: The graph includes all available semi-monthly, monthly, semi-annual, and annual data for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP



Note: The graph includes all available semi-monthly, monthly, semi-annual, and annual data for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP



Note: The graph includes all available semi-monthly, monthly, semi-annual, and annual data for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP

Groundwater elevation contours for the R, C, B, A, and I Zones have been prepared from data collected in Spring 2024 and are included in *Appendices A-1.1, 2.1, 3.1, 4.1, and 5.1*. In general, the contours show that the groundwater levels were the highest near the ABP alignment, and typically decrease moving landward. The general shapes of each contour are similar to the previous year and some similar groundwater mounds are seen around certain injection wells. Groundwater elevations near injection wells that are screened across all four zones (i.e., 33X, 33Y, and 33Z), tend to over inject into the shallower C and B Zones, while under injecting into the deeper A and I Zones. This can be observed near observation wells 33XY and 33YZ where groundwater elevations are above protective elevations in the C, B, and A Zones, but below protective elevations in the I Zone.

Contours of changes in groundwater elevations for the R, C, B, A, and I Zones between Spring 2023 and Spring 2024 are shown in *Appendices A-1.2, 2.2, 3.2, 4.2, and 5.2*. The data set is based on available data from Spring 2023, which was then subtracted from the corresponding and available data from Spring 2024 (shown in *Appendices A-1.3, 2.3, 3.3, 4.3, and 5.3*). These contours clearly identify increases and decreases in groundwater elevations from one reporting period to the next. Below is a summary and discussion of groundwater levels within each aquifer zone along the ABP alignment.

- <u>R Zone:</u>
    - Groundwater elevations west of the San Gabriel River were observed to be between 2.7 to 6.0 feet. Groundwater elevations east of the San Gabriel River ranged from 2.8 to 9.0 feet.
    - Compared to last year, groundwater elevations west of the San Gabriel River increased by approximately 1.0 foot, except for observation well 33U'0.5, which had an increase of 2.2 feet. East of the San Gabriel River, there were increases in groundwater elevations of up to 2 feet.

- C Zone:
    - Groundwater elevations west of the San Gabriel River were between 3 and 10 feet. East of the San Gabriel River, groundwater elevations were consistently above 10 feet, with the highest groundwater elevation recorded at observation well 34S0.1, at 12.2. feet. Groundwater levels were above the protective elevation by an average of 6 feet.
    - Compared to last year, groundwater elevations west of the San Gabriel River generally decreased by 3 to 6 feet, mainly due to lower injection rates. East of the San Gabriel River groundwater elevations generally increased by up to 2.5 feet, except for observation wells 34L'1 and 34LS, which decreased by less than 1 foot.

- B Zone:
    - Groundwater elevations west of the San Gabriel River were generally between 3.7 and 11.9 feet with the highest groundwater elevation at observation well 33YZ. East of the San Gabriel River, groundwater elevations ranged from 4.5 to 10.8 feet. Groundwater elevations were found to be at least 2.8 feet above the protective elevation, except at observation well 35J1, where it was 1.3 feet below the protective elevation.
    - Compared to last year, groundwater elevations west of the San Gabriel River decreased by 2.0 feet. East of the San Gabriel River, groundwater elevations increased by no more than 2.0 feet at observation wells 34HJ2, 34JL, and 35J1. Groundwater level decreases by no more than 2.0 feet were observed at observation wells 34DG and 34LS.

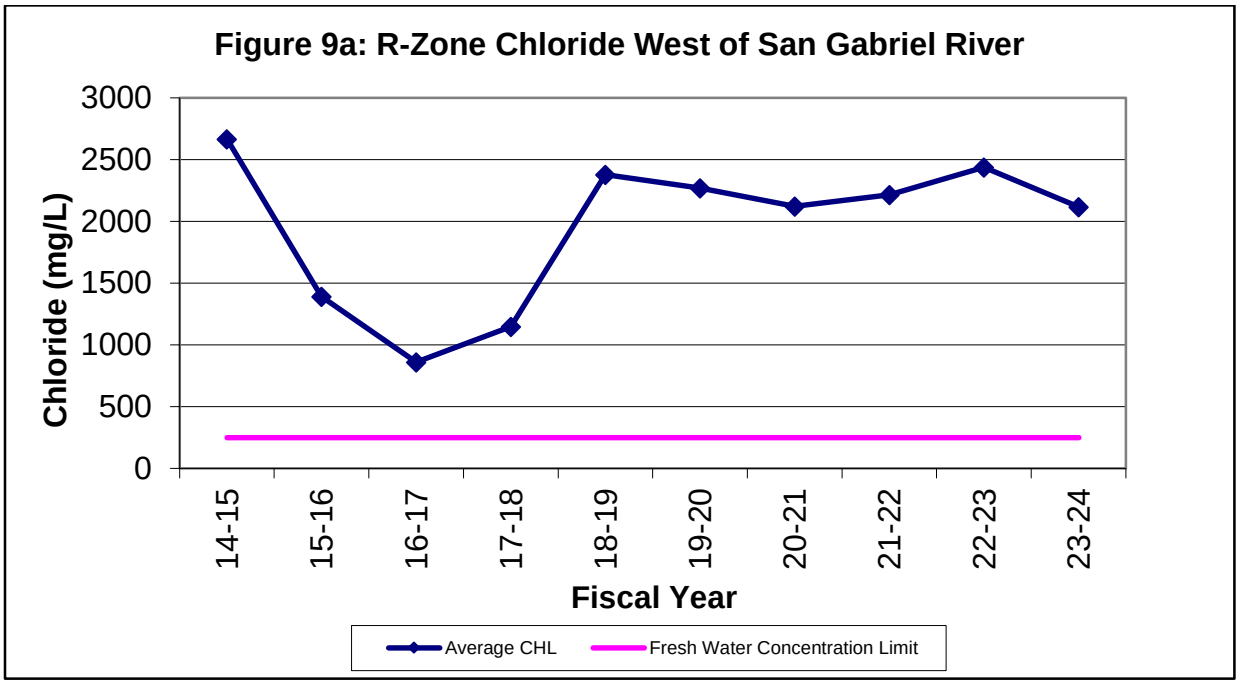
- A Zone:
    - Groundwater elevations west of the San Gabriel River were observed to be 8 to 12 feet between observation wells 33GJ and 33YZ. Groundwater elevations east of the San Gabriel River were between 5 and 13 feet. Generally, groundwater elevations at internodal wells were above the protective elevation, except for observation well 35J1, which was less than 1 foot below its respective protective elevation.
    - Compared to last year, groundwater elevations west of the San Gabriel River remained relatively constant, with changes varying up to 2 feet. East of the San Gabriel River, groundwater elevations generally increased by 2 to 4 feet, likely due to unusually low groundwater elevations in 2023 resulting from injection wells being offline in support of the ABP Unit 15 project.

- I Zone:
    - Groundwater elevations west of the San Gabriel River were observed to be between 4 and 11 feet. Groundwater elevations east of the San Gabriel River were between 4 and 15.5 feet. Groundwater levels were above protective elevations except between observation wells 33WX and 34DG, where observation well 33WX had the largest deficit of 3.4 feet below its respective protective elevation.
    - Compared to last year, groundwater elevations generally decreased by no more than 2 feet between observation wells 33GJ and 33UV. This is likely a result of lower injection rates in the vicinity since groundwater elevations were above their respective protective elevation. Groundwater elevations between observation wells 33WX and 35E0.1 had increases between 0.6 and 14.6 feet. The large increase in groundwater elevation is likely due to unusually low groundwater elevations in 2023 resulting from injection wells being offline in support of the ABP Unit 15 project.

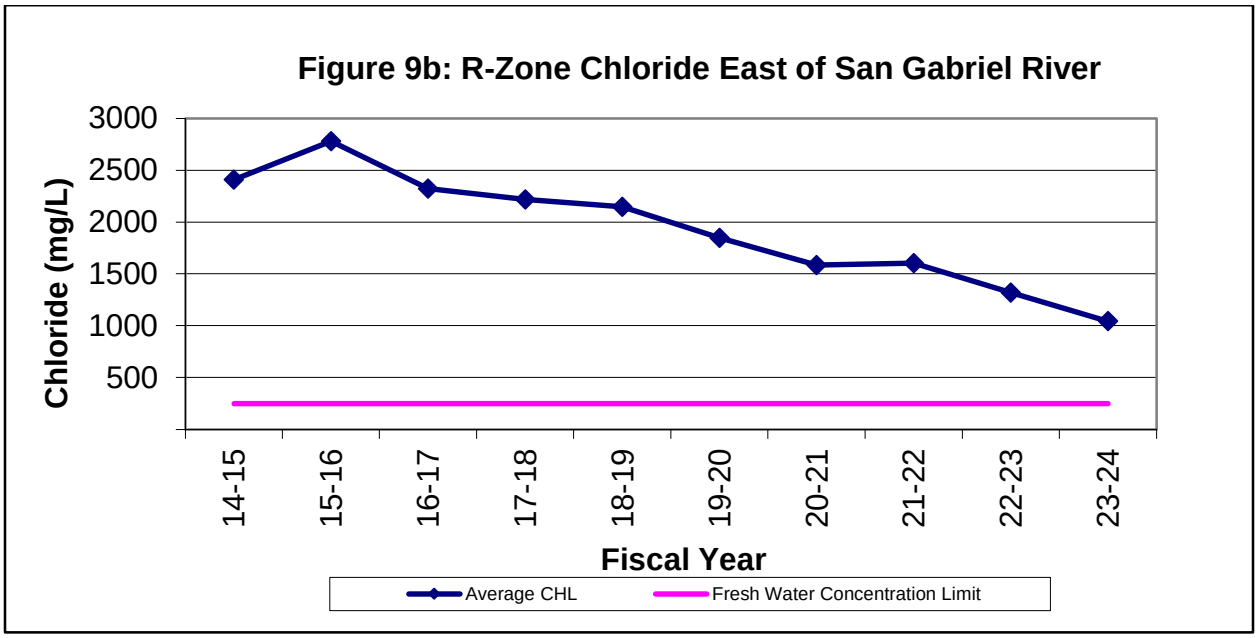
Graphs showing the average, maximum and minimum groundwater elevations at each internodal observation well throughout FY 2023-24 are included in *Appendices A-13 through A-16*. As shown in the graphs for the C and B Zones, the average groundwater elevations were above protective elevation at all wells along the ABP alignment. For the A and I Zones, the average groundwater elevations were below the protective elevation for some of the wells along the ABP alignment. This is most likely due to operational changes related ABP maintenance and projects, such as a chloride sampling events and the Observation Well Modifications.

CHLORIDES

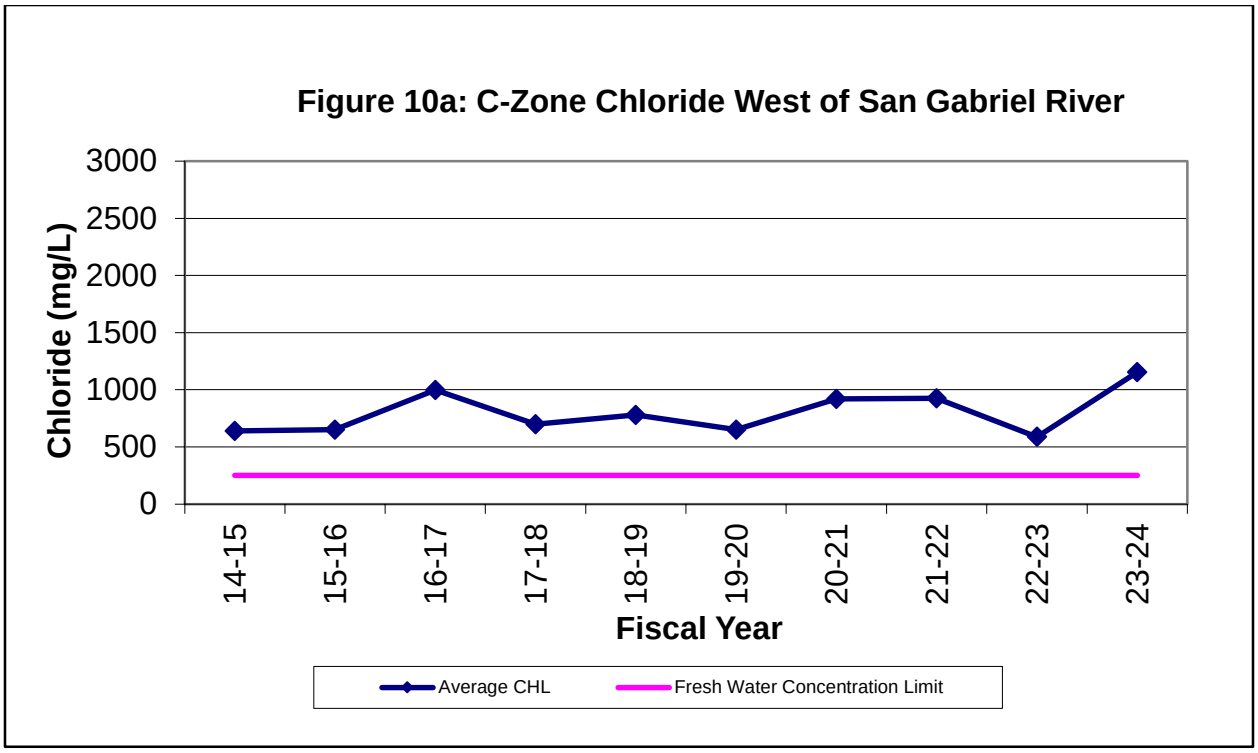
Figures 9a through 13b (pp. 28-32) show the last 10 years of chloride concentrations in each individual aquifer zone. The graphs plot the average of every maximum value measured at each observation well during each sampling event within the target area throughout FY 2023-24. The data includes all available information from the annual and semi-annual chloride sampling events for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP. As a result, the semi-annual values are "weighted" more heavily than the annuals in the calculation of the annual average. Two sets of graphs were created for each aquifer to account for changes in chloride concentration trends in the areas to the west and east of the San Gabriel River, respectively. In each figure, the average of the maximum chloride concentrations per well per event over the last 10 fiscal years (including FY 2023-24) is shown with respect to the freshwater condition (250 milligrams per liter (mg/L)).



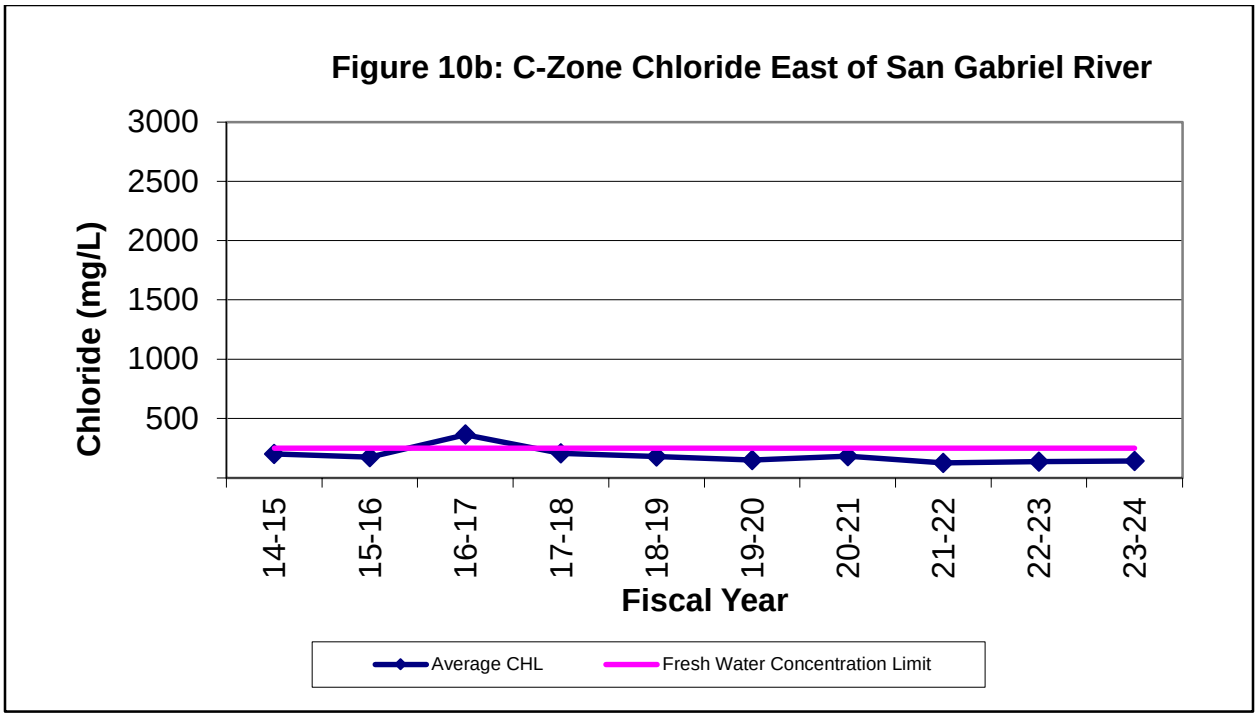
Note: The data includes all available information from the annual and semi-annual chloride sampling events for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP.



Note: The data includes all available information from the annual and semi-annual chloride sampling events for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP.



Note: The data includes all available information from the annual and semi-annual chloride sampling events for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP.



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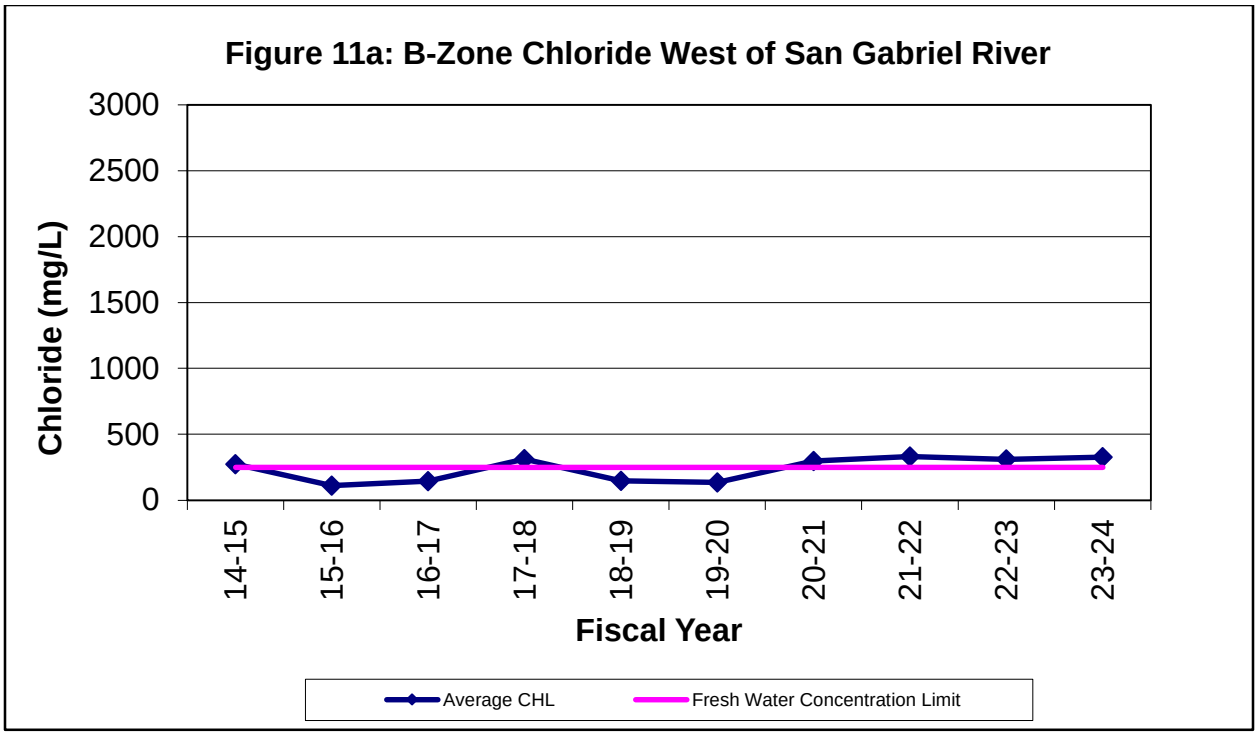

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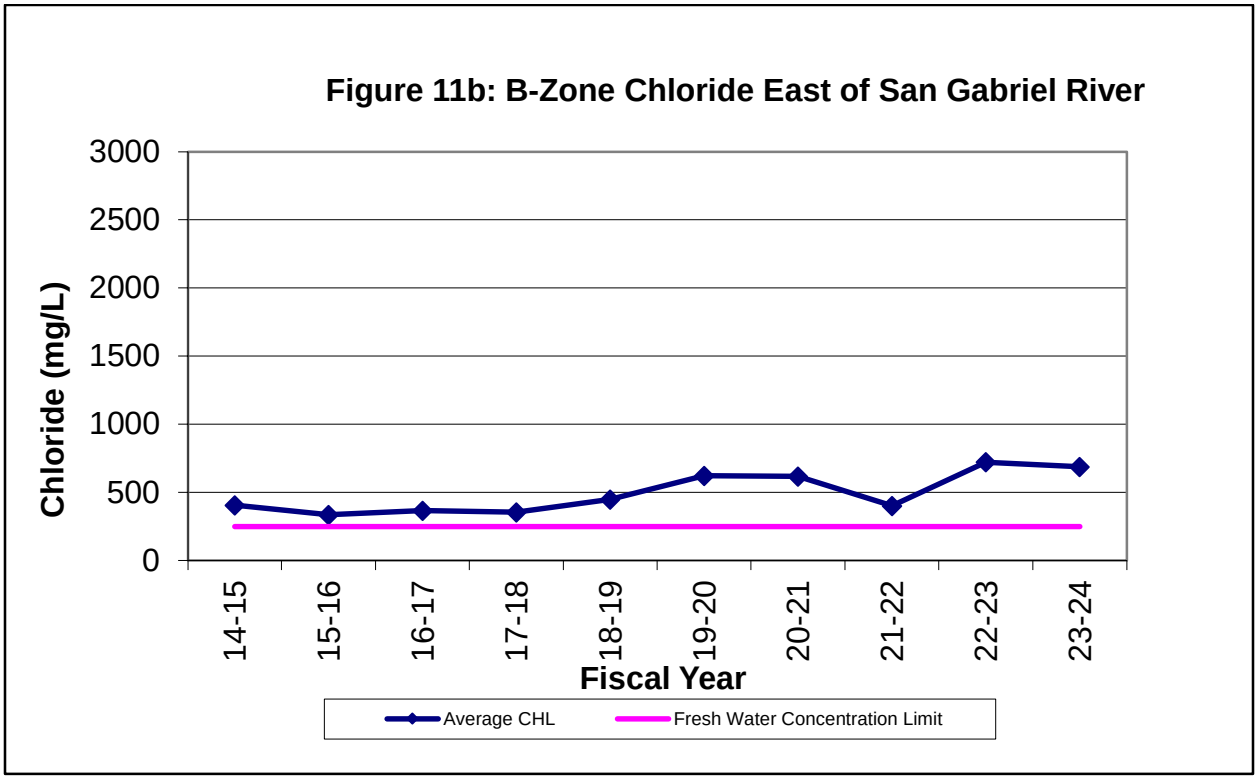
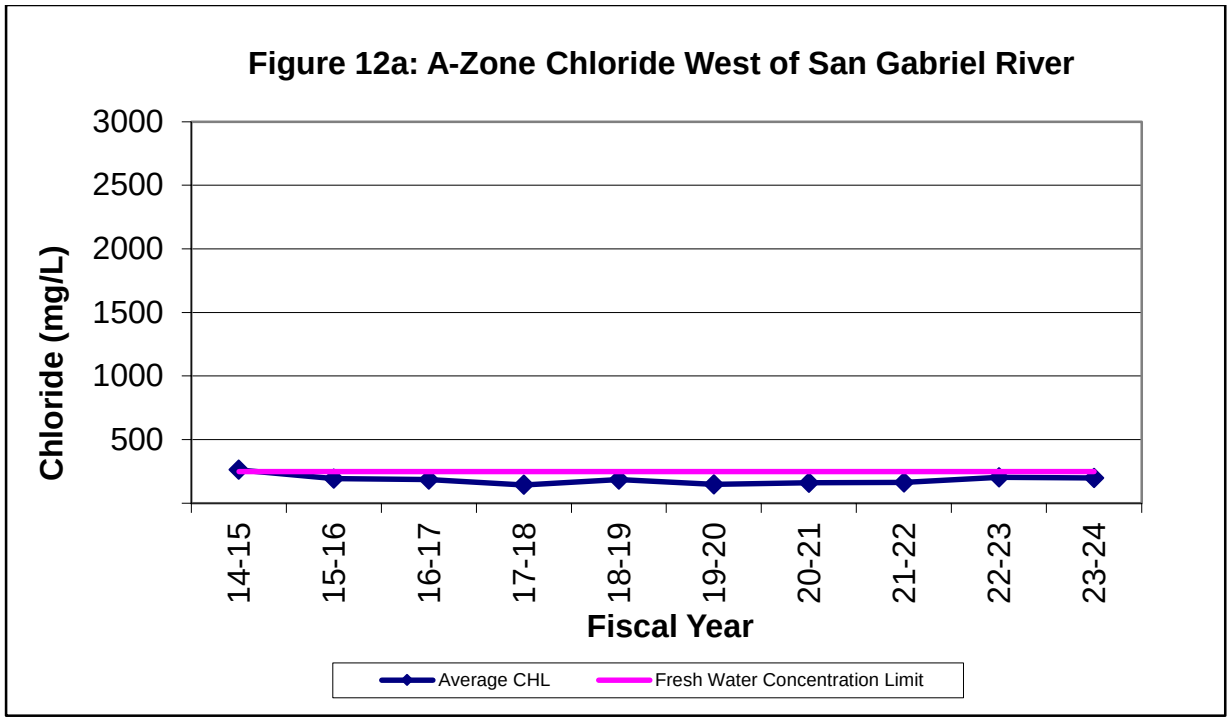
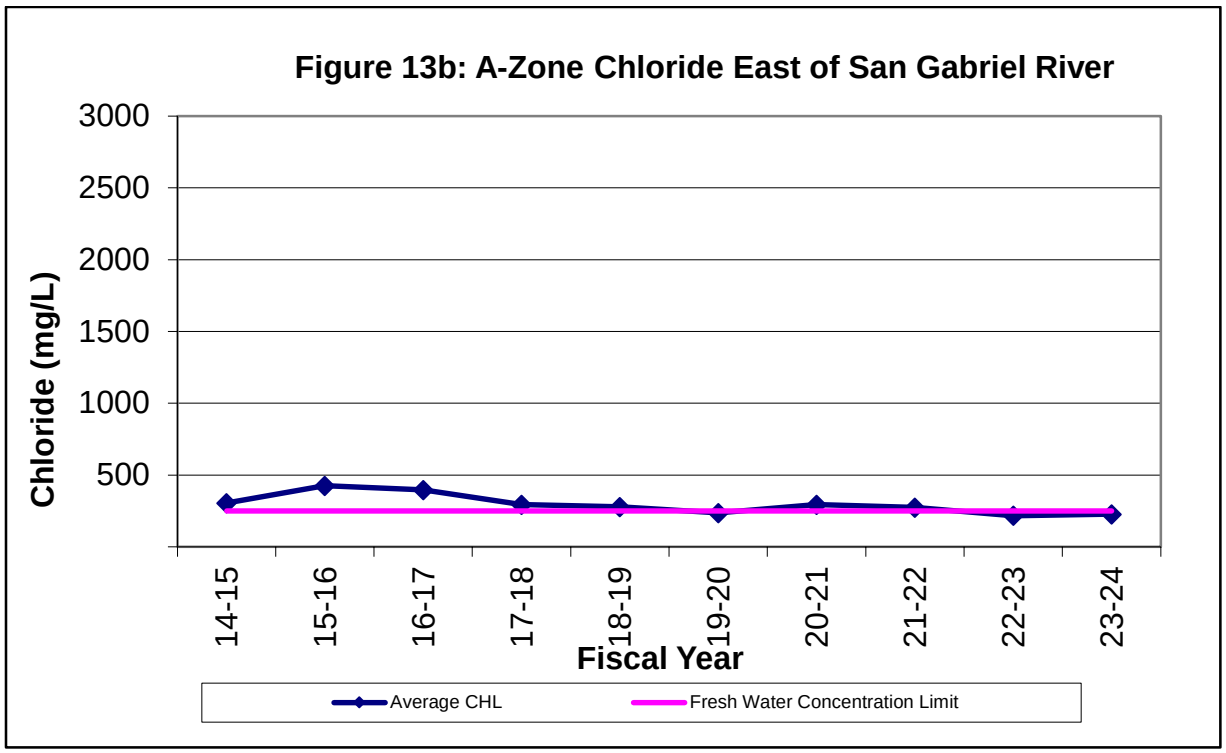


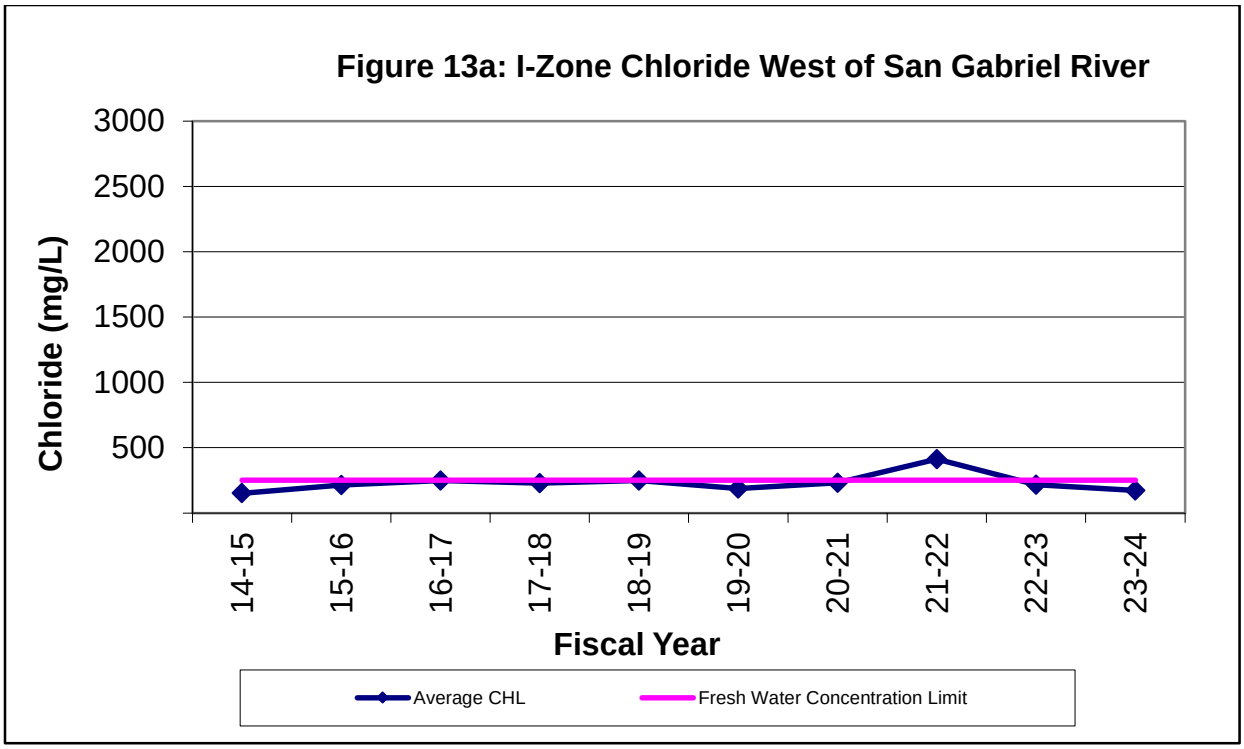
Note: The data includes all available information from the annual and semi-annual chloride sampling events for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP.



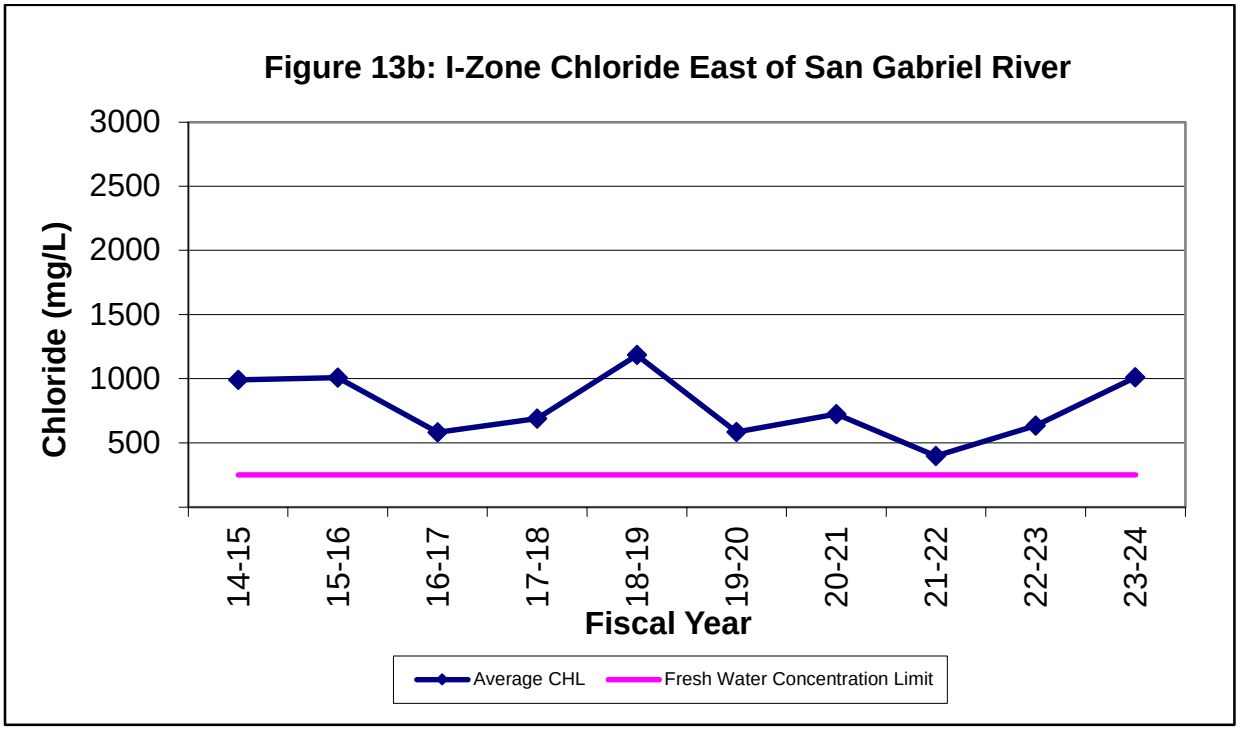
Note: The data includes all available information from the annual and semi-annual chloride sampling events for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP.



Note: The data includes all available information from the annual and semi-annual chloride sampling events for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP.



Note: The data includes all available information from the annual and semi-annual chloride sampling events for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP.



Note: The data includes all available information from the annual and semi-annual chloride sampling events for wells within the ABP alignment and landward for approximately 2,000 feet from the ABP.

West of the San Gabriel River, the average maximum chloride concentrations in FY 2023-24 increased in the C Zone by 568 mg/L and slightly increased in the B Zone by 17 mg/L. The average maximum chloride concentrations decreased in the R, A, and I Zones by 321 mg/L, 5 mg/L, and 44 mg/L, respectively.

East of the San Gabriel River, the average maximum chloride concentrations in FY 2023-24 increased in the C and A Zones. A large increase in the average maximum chloride concentrations was observed in the I Zone in the amount of 379 mg/L. Chlorides decreased in the R and B zones in the amounts of 275 mg/L and 35 mg/L, respectively.

Chloride concentration contour maps for the R, C, B, A, and I Zones were prepared from data collected in Spring 2024 and are included in *Appendices A-6.1, A-7.1, A-8.1, A-9.1, and A-10.1*, respectively. The I Zone chloride concentration map (*Appendix A-10.1*) was further analyzed and interpreted by OCWD Hydrogeologists as it pertains to chlorides east of the San Gabriel River. The chloride contour maps are based on the maximum chloride concentration measured at each observation well. Chloride data was gathered from observation wells located within the immediate vicinity of the ABP and does not represent conditions for the entire groundwater basin protected by the ABP. Wells with chloride concentrations of 250 mg/L or less were considered fresh. The chloride measurements used in this report were taken during the semi-annual sampling event between March and April 2024, and the annual event in February and March 2024.

Contours of **changes** in chloride concentration for the R, C, B, A, and I Zones between Spring 2023 and Spring 2024 are shown in Appendices A-6.2, A-7.2, A-8.2, A-9.2, and A-10.2. The data set is based on available data for Spring 2023, which was then subtracted from the corresponding data for Spring 2024. These contours very clearly identify areas where chloride concentrations increased and decreased between these two reporting periods.

The chloride concentration contours for FY 2023-24 are similar in shape and pattern to those of the previous year. The current contours and the corresponding chloride

concentration cross-section (*Appendix A-11*) for this reporting period indicate that intrusion of seawater across the ABP continued to be controlled west of the San Gabriel River. East of the San Gabriel River, several areas recorded elevated chloride concentrations indicating possible seawater intrusion.

- R Zone:
  - Chloride concentrations remained elevated landward and seaward of the ABP.
  - Chloride concentrations along the ABP alignment remained relatively unchanged, except for observation wells 33Z'1 and 34S0.1. Observation well 33Z'1 showed a decrease in chloride concentration of 700 mg/L, while observation well 34S0.1 experienced a significant increase of over 2,900 mg/L.

- C Zone:
  - Chloride concentrations along the ABP alignment remained below 250 mg/L. West of the San Gabriel River, persistent high chloride concentrations remained north of the ABP alignment near observation wells 33T4, 33T13, and 33U11.
  - Compared to the last reporting period, chloride concentrations remained relatively unchanged along the ABP alignment, except for a significant decrease of 350 mg/L at observation well 34L'1.

- B Zone:
  - Chloride concentrations along the ABP alignment remained below 250 mg/L, with the exceptions of observation wells 34JL and 35J1, which had chloride concentrations of 270 mg/L and 650 mg/L, respectively. Persistent high chloride concentrations remained east of the ABP alignment near observation wells 34V3 and 34U8.

- Compared to the last reporting period chloride concentrations remained consistent along the ABP alignment, except for an increase of 190 mg/L at observation well 34JL and a decrease of 120 mg/L at observation well 35J1. A significant increase in chloride concentration was measured east of the ABP alignment at observation well 34V3, where chloride concentrations rose by 4,500 mg/L.

- A Zone:
  - West of the San Gabriel River, chloride concentrations along the ABP alignment were below 250 mg/L, except for observation wells 33ST and 33Z'1, which had chloride concentrations of 640 and 760 mg/L, respectively. East of the San Gabriel River, chloride concentrations along the ABP alignment remained below 250 mg/L, except for observation wells 34DG and 34HJ, which had chloride concentrations of 430 and 1,400 mg/L, respectively.
  - West of the San Gabriel River, chloride concentrations along the ABP alignment remained unchanged except for observation well 33ST, which had an increase of 571 mg/L. East of the San Gabriel River, chloride concentrations along the ABP alignment increased significantly at observation well 34HJ by over 1,300 mg/L. However, chloride concentrations decreased by approximately 500 mg/L at observation wells 35H11 and 35H12.

- I Zone:
    - West of the San Gabriel River, chloride concentrations along the ABP alignment remained below 250 mg/L. East of the San Gabriel River, elevated chloride concentrations were observed along the ABP alignment at observation wells 34JL, 34S0.1, and 35E0.1, which had chloride concentrations of 12,000, 3,200, and 1,100 mg/L, respectively.
    - West of the San Gabriel River, chloride concentrations along the ABP alignment remained unchanged, except for observation well 33XY, which decreased by 800 mg/L. East of the San Gabriel River, observation wells 34JL and 34S0.1 experienced an increase in chloride concentrations of at least 2,000 mg/L. Conversely, observation well 35E0.1 showed a decrease in chloride concentration of 2,100 mg/L.

West of the San Gabriel River, high chloride concentrations persisted in the R, C, and I Zones north of the ABP alignment. The elevated chloride levels in these areas potentially may be attributed to residual seawater from previous intrusions. Additionally, elevated chloride concentrations at observation well 33ST in the A Zone may stem from nearby injection wells being offline for routine redevelopment maintenance and/or injection well 33U being temporarily offline for a few months due to wellhead repairs.

East of the San Gabriel River, high chloride levels were evident near observation wells 34U8 and 34V3 in the B Zone, as well as at well 34HJ in the A Zone, and 34JL and 34S0.1 in the I Zone. These elevated concentrations may represent residual chlorides that have remained following the completion of OCWD's Unit 14 Project, or they may be a result of the partial ABP shutdown related to ABP Unit 15 project drilling operations. The addition of OCWD's Unit 14 Project, which helped fill in gaps east of the San Gabriel River, and Public Works' ABP Unit 15 Project, which replaced existing injection wells, will aid in raising groundwater elevations to protective elevations to prevent seawater intrusion.

BARRIER PROJECT COSTS

This section of the report is divided into four parts: Water Costs, Services and Supplies Costs (operation and maintenance), Fixed Assets Costs (capital outlay), and Budget. Under the terms of the 1964 Cooperative Agreement between LACFCD and OCWD, fixed assets are typically divided into facilities paid for by the LACFCD, facilities paid for by the OCWD, and joint facilities paid for by both agencies, depending on their location. Under the same agreement, water costs are divided between the LACFCD (whose portion is paid by the WRD per a separate agreement) and the OCWD. The total cost of the ABP in FY 2023-24 was $12,002,324 which can be broken down as follows: water costs of $8,357,201, Operation and Maintenance costs of $3,564,593 and joint liability insurance cost of $80,530.

WATER COSTS

During FY 2023-24, 6,040 AF of water was injected at an estimated total cost of $8,357,201, as shown in *Table 7*. The monthly unit water cost (dollars per AF) from July 2023 to June 2024 varied periodically as shown above in *Table 4*. The monthly quantity of water injected and total water costs paid by each agency are shown below in *Table 7*.

TABLE 7. QUANTITY OF WATER INJECTED AND COSTS

MONTH	VOLUME BY WRD (AF)	VOLUME BY OCWD (AF)	TOTAL VOLUME (AF)
Jul-23	297.7	203.4	501.1
Aug-23	372.3	208.2	580.5
Sep-23	342.4	118.6	461.0
Oct-23	347.3	140.3	487.6
Nov-23	356.9	195.5	552.4
Dec-23	347.0	192.8	539.8
Jan-24	316.2	197.8	514.0
Feb-24	348.5	99.1	447.6
Mar-24	272.9	185.5	458.4
Apr-24	263.4	138.4	401.8
May-24	344.6	219.6	564.2
Jun-24	317.2	214.9	532.1
TOTAL INJECTED (AF)	**3,926.4**	**2,114.1**	**6,040.5**
TOTAL COST ($) [From Tbl. 3]	**$5,430,688**	**$2,926,513**	**$8,357,201**

OPERATIONS AND MAINTENANCE COSTS

A total of $3,564,593 was spent on Operations and Maintenance during FY 2023-24. Pursuant to the 1964 Cooperative Agreement, the OCWD pays a percentage of the applicable services and supplies costs for injection operations proportional to the percentage of the total amount of injection water paid for by the OCWD. The distribution of FY 2023-24 services and supplies costs is summarized in *Table 8*.

TABLE 8. DISTRIBUTION OF SERVICES AND SUPPLIES COSTS FOR INJECTION AND EXTRACTION ACTIVITIES

ITEM	LACFCD	OCWD	TOTAL
Service & Supplies of Injection Facilities (including Observation Wells)	$1,891,903	$1,018,717	$2,910,620[1]
Service & Supplies of Extraction Facilities	$2,386	$0	$2,386[2]
Projects & Studies	$651,587	$0	$651,586[3]
SUBTOTAL	**$2,545,876**	**$1,018,717**	**$3,564,593**
Liability Insurance	$40,265	$40,265	80,530
TOTAL	**$2,586,141**	**$1,058,982**	**$3,645,123**

The values in Table 8 come from the ABP FY 2023-24 Costs (see *Appendix A-17*):

[1] The sum of Items 1, 2, 3, 7, 8, 9, 10, 11, 12, and 13. OCWD is responsible for 35.0% of all costs for these items per the agreement.

[2] The sum of Items 4, 5, and 6; OCWD is not responsible for any portion of the cost for these items.

[3] The sum of Item 14. LACFCD is responsible for 100% of costs associated with Alamitos Barrier Project Unit 15 Well Replacement Project.

The yearly cost of the services and supplies (including special programs but excluding water and extraction costs) for the last 10 years of ABP operations are shown in *Table 9*.

TABLE 9. COSTS OF SERVICES AND SUPPLIES FOR INJECTION

Fiscal Year	Volume of Water Injected (AF)	Total Cost	Cost Per AF Injected
2014-15	7,113.1	$1,678,123	$235.92
2015-16	6,807.7	$2,237,637	$328.69
2016-17	6,060.0	$1,650,686	$272.39
2017-18	4,414.1	$2,138,420	$484.45
2018-19	5,295.2	$2,293,529	$433.13
2019-20	5,536.9	$2,467,543	$445.65
2020-21	6,500.9	$2,649,077	$407.49
2021-22	7,187.8	$2,482,543	$345.38
2022-23	6,475.1	$2,841,291	$438.80
2023-24	6,040.5	$2,910,620	$481.85

The costs of the services and supplies for extraction operations for the last 10 years, including electrical costs, are shown in *Table 10*.

TABLE 10. COSTS OF SERVICES AND SUPPLIES FOR EXTRACTION

Fiscal Year	Volume of Water Extracted (AF)	Total Cost	Cost Per AF Extracted
2014-15	0.0	$13,714	N/A
2015-16	0.0	$6,961	N/A
2016-17	0.0	$1,510	N/A
2017-18	0.0	$1,538	N/A
2018-19	0.0	$1,556	N/A
2019-20	0.0	$1,512	N/A
2020-21	0.0	$1,132	N/A
2021-22	0.0	$2,847	N/A
2022-23	0.0	$912	N/A
2023-24	0.0	$2,386	N/A

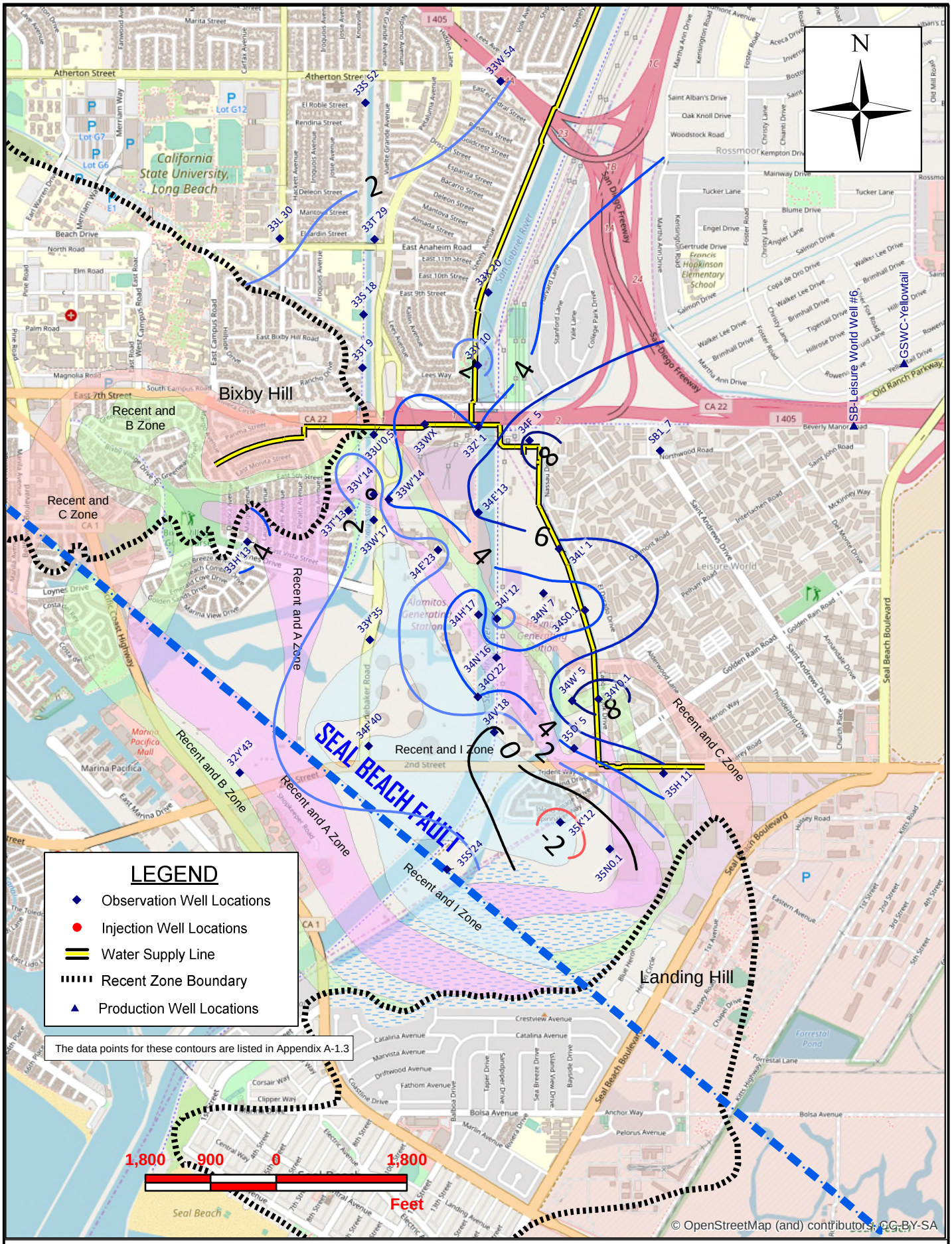
FIXED ASSETS

During Fiscal Year 2023-24, LACFCD commissioned five injection wells and two observation wells constructed under the ABP Unit 15 Project.

BUDGET

The FY 2025-26 budget for the cost of ABP Supplies and Services is $3,080,000. A breakdown of this amount, along with past expenditures per category, is shown in *Appendix A-18*.

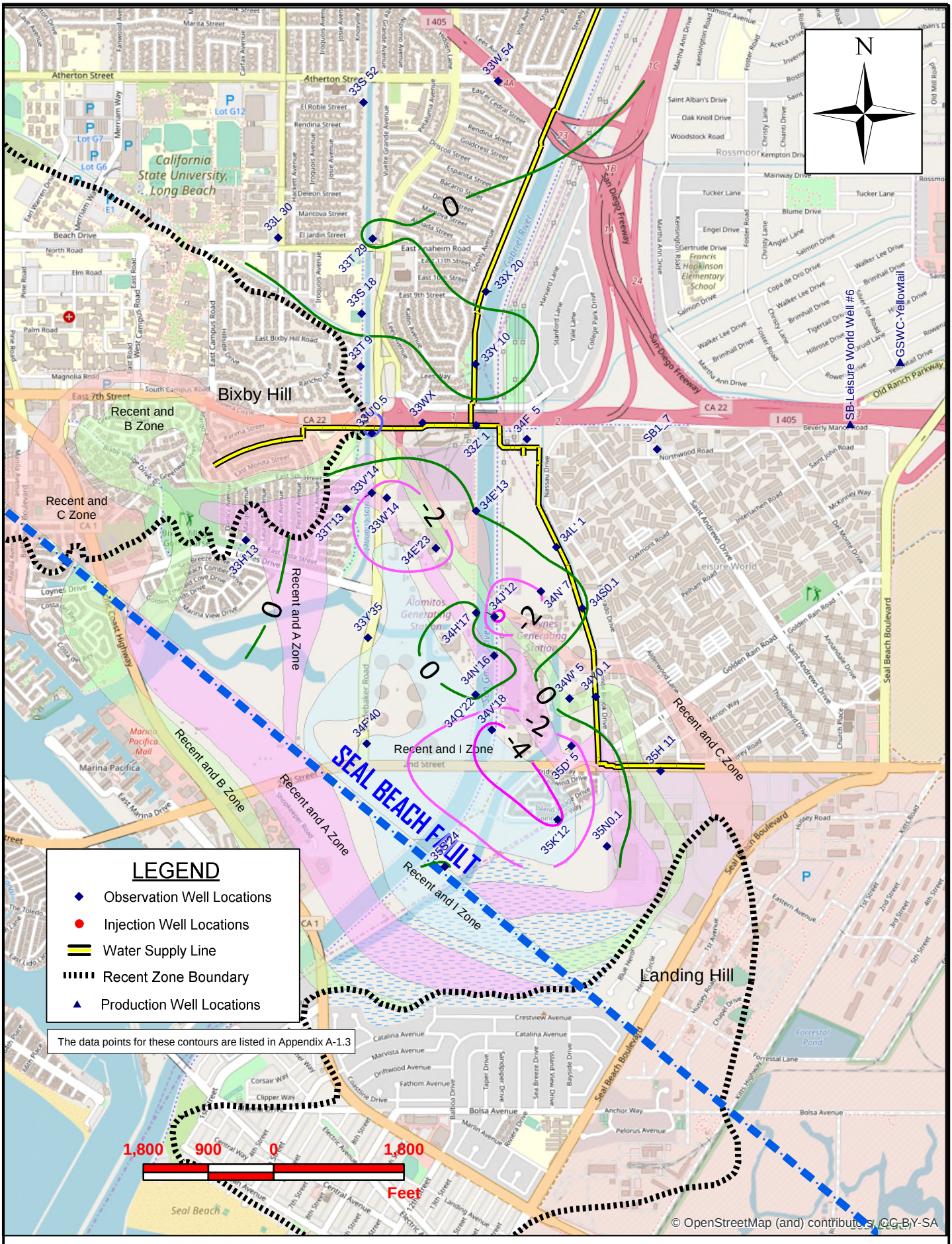
APPENDIX



Alamitos Barrier Project
R Zone Groundwater Elevation (ft) Contours, Spring 2024

A-1.1

R zone GW.srf



Alamitos Barrier Project
R Zone Change in Elevation (ft), Spring 2023 to Spring 2024

A-1.2

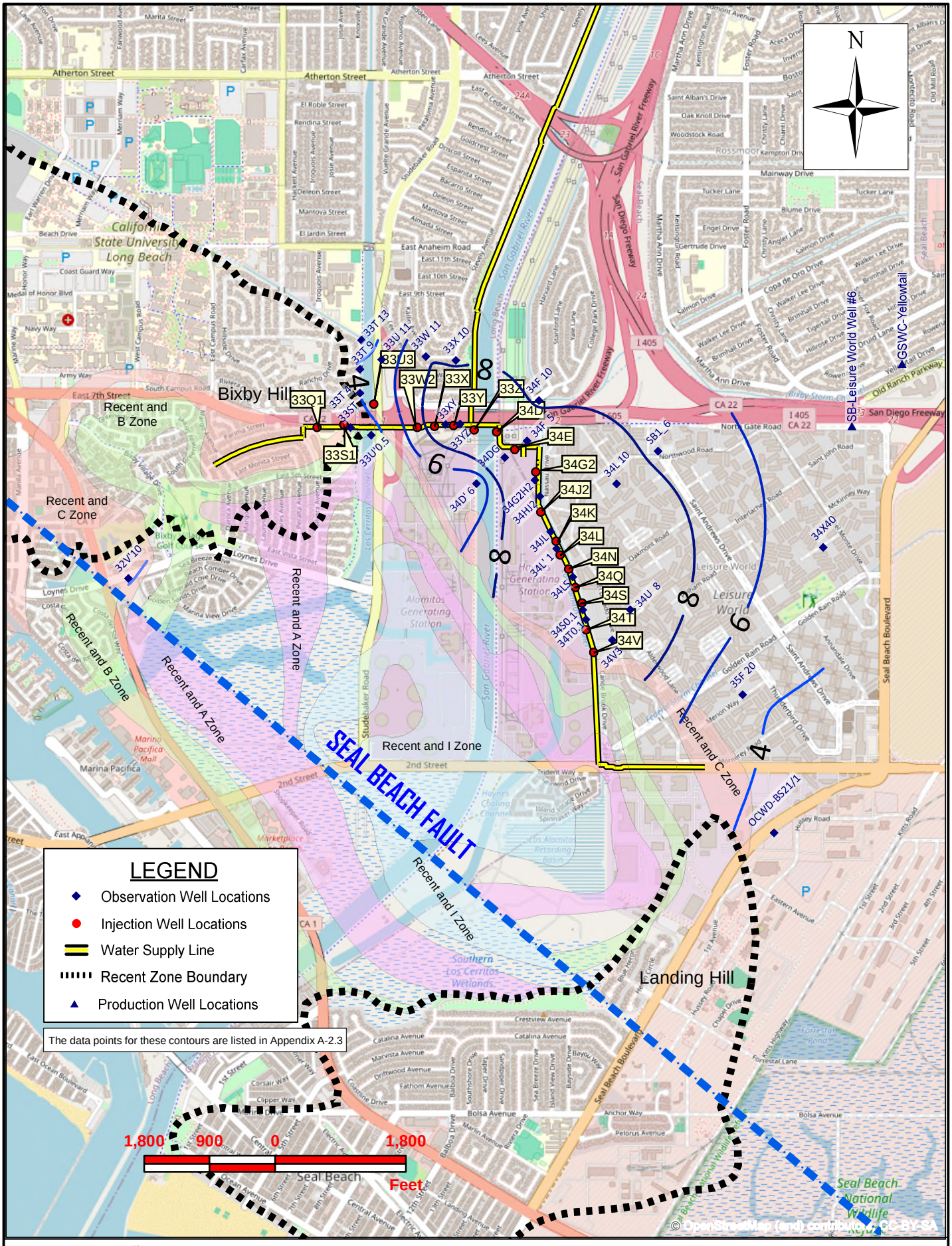
R zone GW.srf

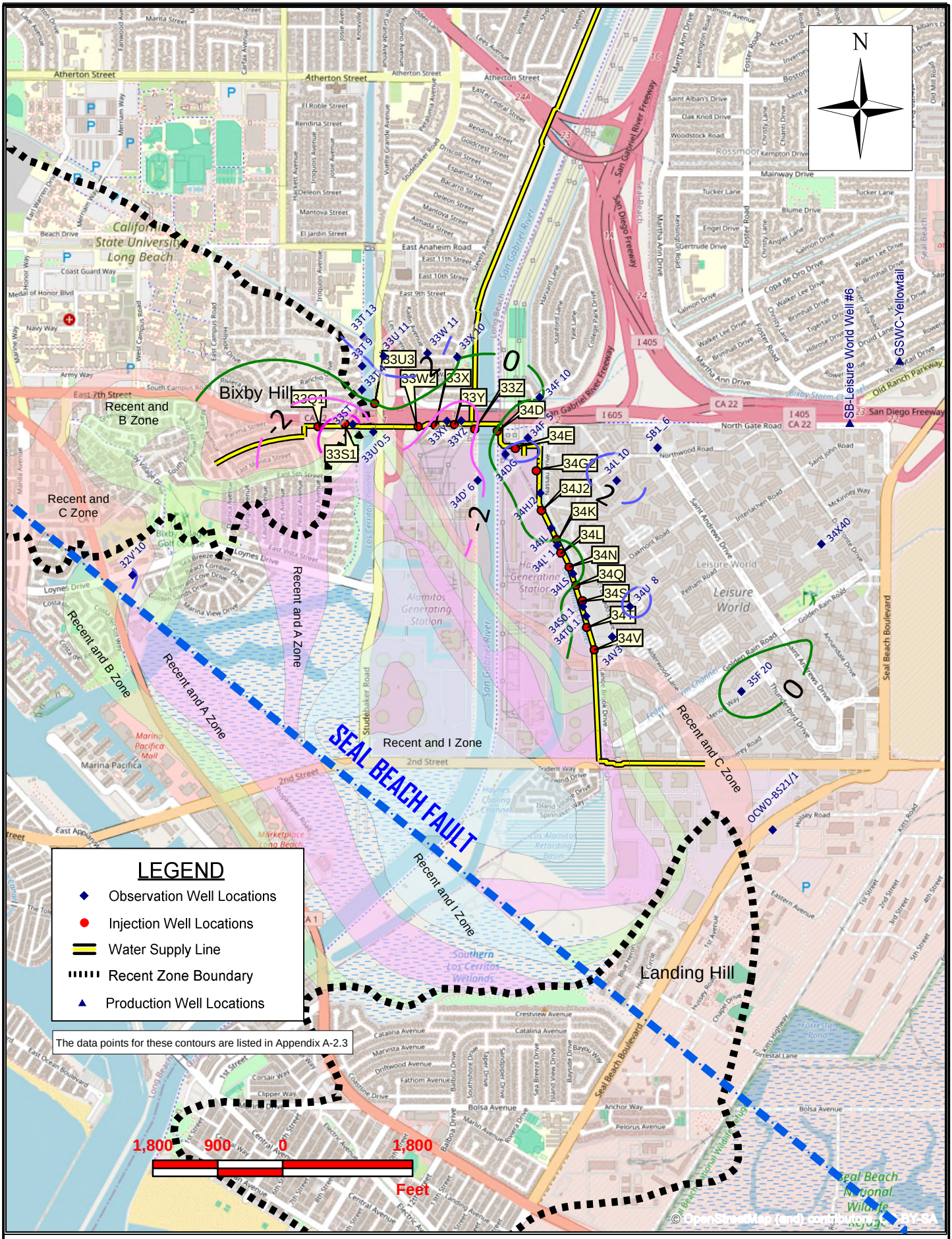
ALAMITOS BARRIER PROJECT
R-Zone
Groundwater Elevation Data for Contours and Tables

POINT	PROJ	FCD	AQUIFER	DATE	FY 23-24 ELEV	P.E.[1]	Δ[2]	FY 22-23 ELEV2	CHANGE IN ELEV
1	32Y'43	493WW	R	20230919	2.4				
2	33H'13	493YY	RA	20240320	4.6			3.6	1.0
3	33L 30	491G	R	20230907	1.7			1.9	-0.2
4	33S 18	492AH	R	20230907	2.8			3.6	-0.8
5	33S 52	491J	R	20230907	0.2			1.0	-0.8
6	33T 29	491D	R	20230907	3.2			2.0	1.2
7	33T 9	492CV	R	20240319	2.6			2.5	0.1
8	33T'13	492AU	R	20230918	2.9			4.5	-1.6
9	33U'0.5	492CB	R	20240319	2.7			0.5	2.2
11	33V'14	492HH	R	20240319	-0.7			1.4	-2.1
13	33W 54	501C	R	20230919	1.9			2.5	-0.6
14	33W'14	492AT	R	20230919	4.7			8.5	-3.8
15	33W'17	493PP	R	20230919	0.8				
16	33WX	502AZ	R	20240305	6.0			4.3	1.7
17	33X 20	502L	R	20240319	3.5			3.0	0.5
18	33Y 10	502BA	R	20230919	1.1			2.9	-1.8
19	33Y'35	493AB	R	20230919	1.1			1.6	-0.5
20	33Z' 1	502AU	R	20240319	3.9			3.0	0.9
21	34E'13	503AU	R	20240318	6.3			6.2	0.1
22	34E'23	503X	R	20230919	1.1			3.9	-2.8
23	34F 5	502BT	R	20240319	8.6			7.1	1.5
24	34F'40	483J	R	20230919	0.8			2.5	-1.7
25	34H'17	503Y	R	20240318	5.8			5.1	0.7
26	34J'12	503U	R	20230919	0.8			5.6	-4.8
27	34L' 1	503P	R	20240305	5.7			4.7	1.0
28	34N' 7	503AE	R	20240318	3.5			5.5	-2.0
29	34N'16	503W	R	20240319	5.0			4.1	0.9
30	34Q'22	503T	R	20240318	4.0			3.5	0.5
31	34S0.1	503BT	R	20240404	2.8			3.0	-0.2
32	34V'18	503V	R	20230919	-0.7			4.3	-5.0
33	34W' 5	503AH	R	20240320	8.0			6.4	1.6
34	34Y0.1	503CK	R	20240305	9.0			7.2	1.8
35	35D' 5	503AL	R	20230912	4.2			6.7	-2.5
36	35H 11	514F	R	20240304	5.7			4.0	1.7
37	35K'12	504R	R	20230914	-3.1			1.2	-4.3
38	35N0.1	504M	R	20230914	-1.3			-0.9	-0.4
39	35S'24	504K	R	20240319	4.1			3.9	0.2
40	SB1_7		R	20240310	7.2			6.1	1.1
				AVG=	3.2		AVG=	3.8	

[1] P.E. represents the protective elevations calcuated for internodal wells.

[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.


N
LEGEND
Observation Well Locations
Injection Well Locations
Water Supply Line
Recent Zone Boundary
Production Well Locations
The data points for these contours are listed in Appendix A-2.3
Recent and B Zone
Recent and C Zone
Recent and A Zone
Recent and I Zone
SEAL BEACH FAULT
Bixby Hill
Landing Hill
33Q1
33S1
33T 13
33T 9
33T 4
33S 1
33U 11
33U'0.5
33U3
33W2
33W 11
33X 10
33X
33Y
33Z
33AA
34F 10
34F 5
34DF
34E
34DG
34G2
34G2H2
34HI2
34D' 6
34J2
34K
34L
34L 10
34L' 1
34LS
34N
34Q
34S
34T
34S0.1
34T0.1
34V
34V3
34U 8
34X4D
35F 20
32V'10
SB1_6
SB-Leisure World Well #6
GSWC-Yellowtail
OCWD-BS21/1
1,800
900
0
1,800
Feet
Seal Beach
Alamitos Barrier Project
C Zone Groundwater Elevation (ft) Contours, Spring 2024
A-2.1
C zone GW.srf



Alamitos Barrier Project
C Zone Change in Elevation (ft), Spring 2023 to Spring 2024

A-2.2

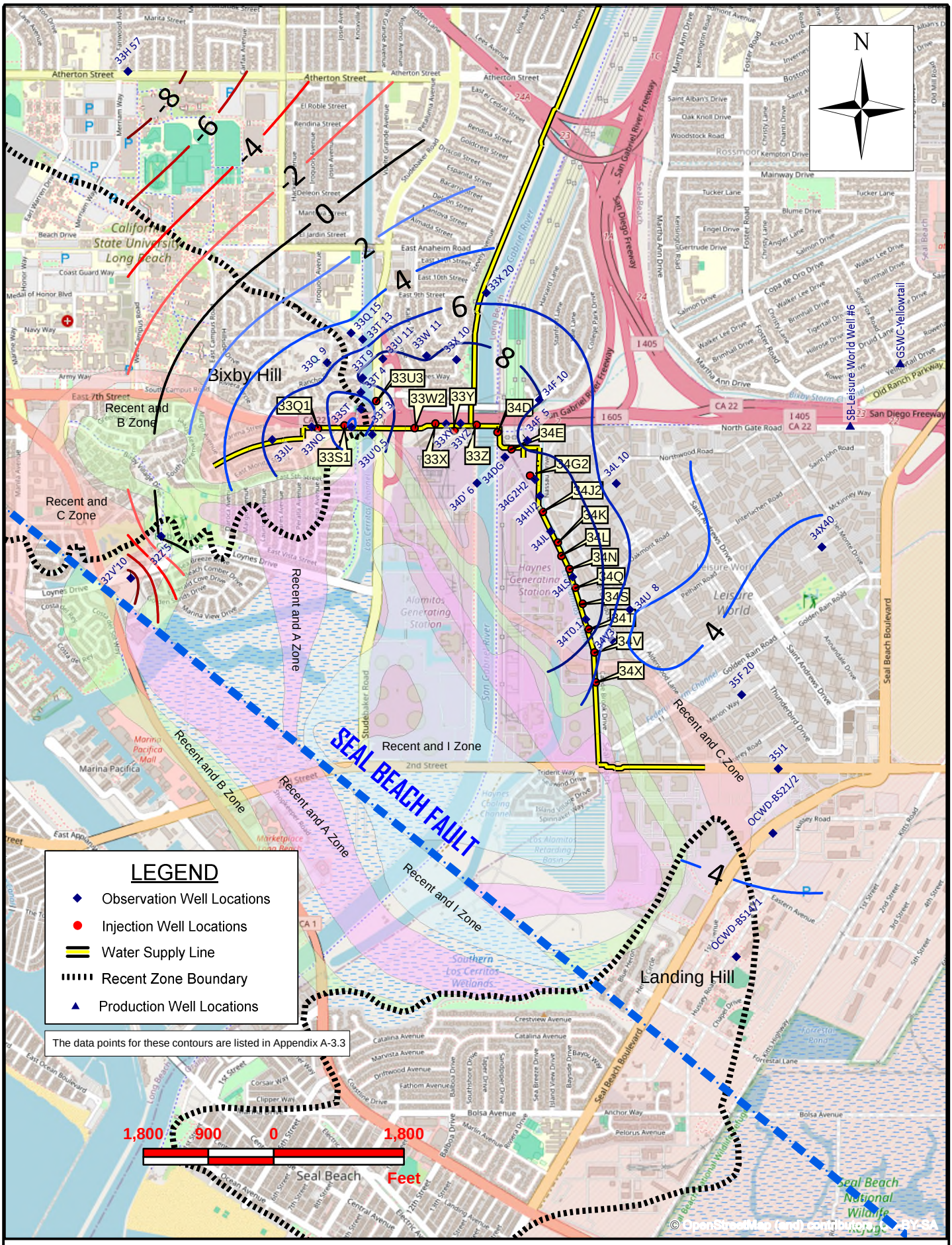
C zone GW.srf

ALAMITOS BARRIER PROJECT
C-Zone
Groundwater Elevation Data for Contours and Tables

POINT	PROJ	FCD	AQUIFER	DATE	FY 23-24 ELEV	P.E.[1]	Δ[2]	FY 22-23 ELEV	CHANGE IN ELEV
1	32V'10	483H	C	20240320	2.0			-0.1	2.1
2	33ST	492BK	CB	20240327	3.3	0.9	2.5	9.1	-5.8
3	33T 13	492AC	C	20240415	2.8			0.0	2.8
4	33T 4	492CT	C	20240319	4.0			2.7	1.3
5	33T 9	492CU	C	20240319	4.4			2.9	1.5
6	33U 11	492AL	C	20240416	4.8			2.2	2.6
7	33U'0.5	492CA	C	20240411	3.1			3.9	-0.8
8	33W 11	502R	C	20240416	7.9			3.7	4.2
9	33X 10	502BB	C	20240319	7.7			7.6	0.1
10	33XY	502BL	C	20240305	10.1	5.4	4.7	13.1	-2.9
11	33YZ	502AB	C	20240305	10.2	5.4	4.8	13.7	-3.5
12	34D' 6	502BF	C	20240326	4.1			6.8	-2.7
13	34DG	502X	C	20240305	12.0	5.4	6.6	9.5	2.4
14	34F 5	502BU	C	20240319	10.5			8.5	2.0
15	34F 10	502AP	C	20240411	7.5			7.6	-0.1
16	34G2H2	502CQ	C	20240305	11.0	3.8	7.2		
17	34HJ2	502CH	C	20240305	10.8	4.2	6.6	9.8	0.9
18	34JL	503AR	C	20240305	11.5	4.2	7.3	9.9	1.6
19	34L' 1	503N	C	20240305	10.0	4.8	5.2	10.8	-0.8
20	34L 10	502AK	C	20240319	10.2			7.9	2.3
21	34LS	503BF	C	20240305	10.8	4.5	6.3	11.5	-0.6
22	34S0.1	503BU	C	20240305	12.2	3.7	8.5	10.8	1.4
23	34T0.1	503AB	C	20240305	10.7	3.6	7.1	10.7	0.0
24	34U 8	513D	C	20240319	10.0			7.7	2.3
25	34V3	503CB	C	20240319	10.2			9.1	1.2
26	34X40	513R	C	20240410	4.8			4.9	-0.1
27	35F 20	513L	C	20240411	4.3			4.7	-0.4
28	SB1_6		C	20240317	7.2			5.5	1.7
29	OCWD-BS21/1		C	20240325	3.5			1.6	1.9
				AVG=	7.6		AVG=	7.0	

[1] P.E. represents the protective elevations calcuated for internodal wells.

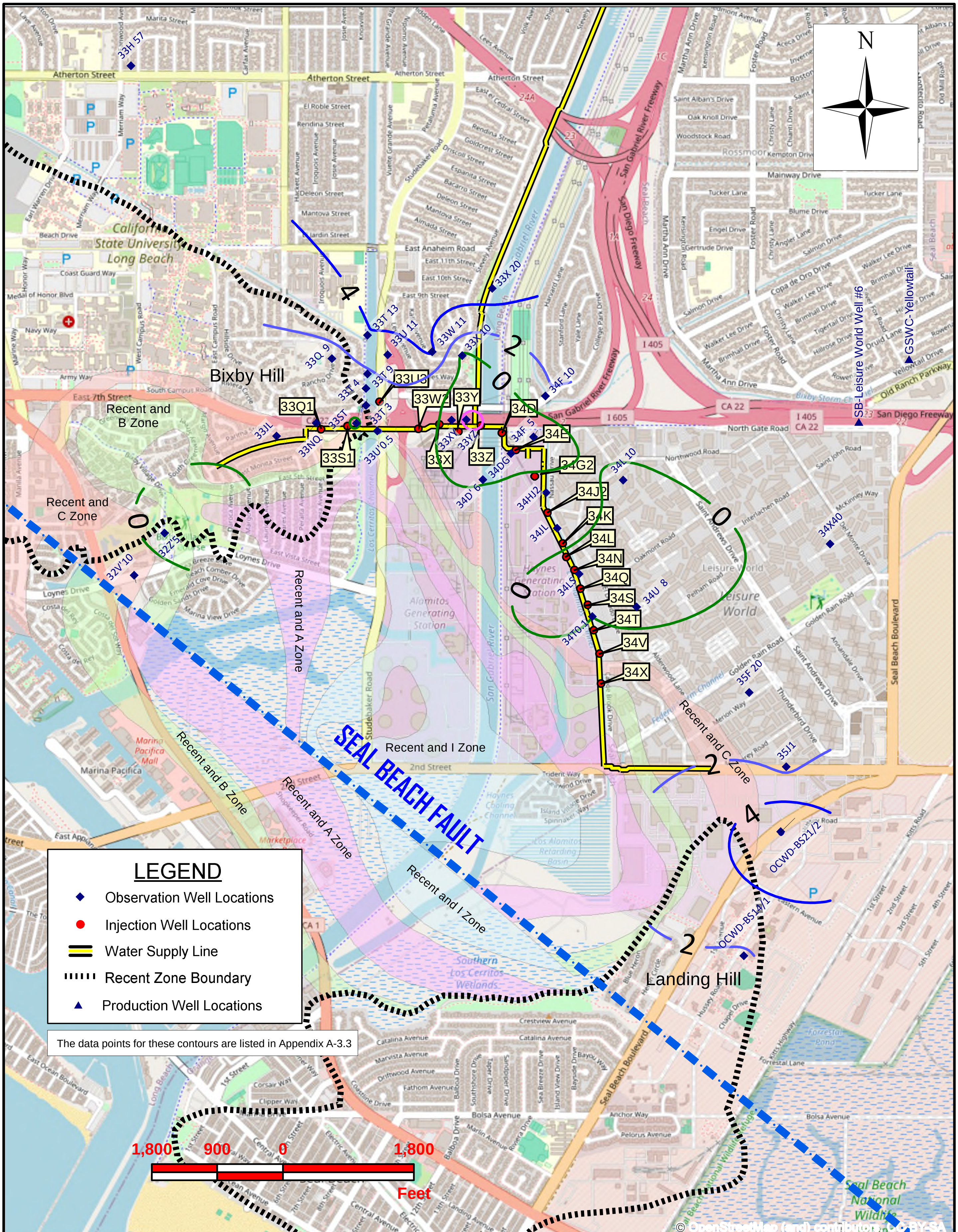
[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.



Alamitos Barrier Project
B Zone Groundwater Elevation (ft) Contours: Fall 2024

A-3.1

B zone GW.srf



Alamitos Barrier Project

B Zone Change in Elevation (ft), Spring 2023 to Spring 2024

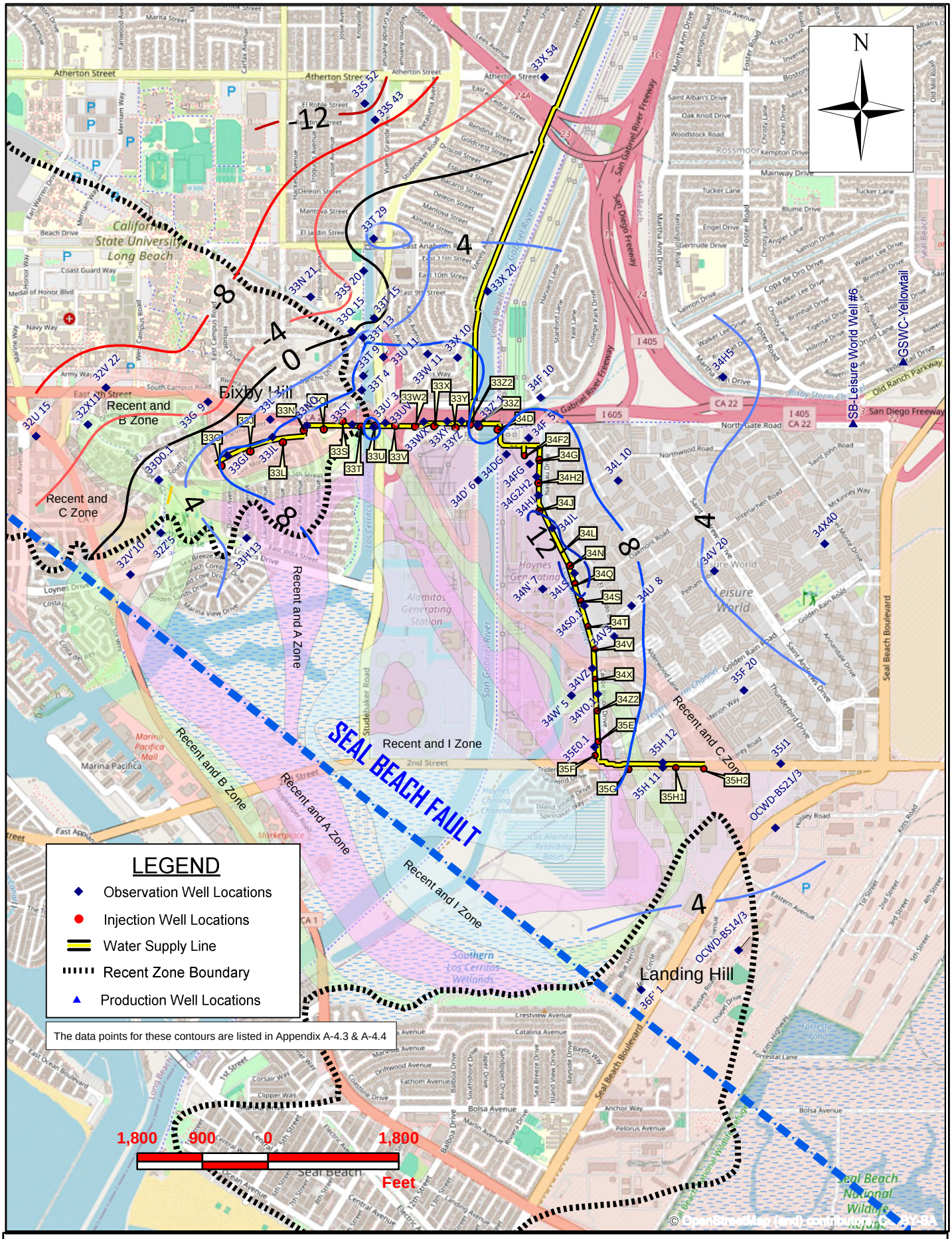
A-3.2

B zone GW.srf

ALAMITOS BARRIER PROJECT
B-Zone
Groundwater Elevation Data for Contours and Tables

POINT	PROJ	FCD	AQUIFER	DATE	FY 23-24 ELEV	P.E.[1]	Δ[2]	FY 22-23 ELEV	CHANGE IN ELEV
1	32V'10	483G	B	20240320	-9.0			-9.9	0.9
2	32Z'5	482W	BA	20230907	0.3			0.9	-0.6
3	33H 57	481	B	20240319	-10.1			-14.4	4.3
4	33JL	492BQ	B	20240408	6.5	0.8	5.7	6.2	0.3
5	33NQ	492BN	B	20240327	7.9	0.7	7.3	6.1	1.8
6	33Q 9	492CM	B	20240422	5.7			4.6	1.1
7	33Q 15	492AN	B	20230907	4.5				
8	33ST	492BK	CB	20240411	3.7	0.9	2.8	4.0	-0.4
9	33T 3	492CL	B	20240411	4.1			3.2	0.9
10	33T 4	492CS	B	20240411	6.5			5.1	1.4
11	33T 9	492YY	B	20240415	8.6			6.8	1.8
12	33T 13	492AB	B	20240415	4.6			0.7	3.9
13	33U 11	492AK	B	20240416	8.9			6.1	2.8
14	33U'0.5	492BZ	B	20240417	6.9			4.8	2.1
15	33W 11	502S	B	20240416	7.7			3.5	4.2
16	33X 10	502BC	B	20240319	9.0			9.3	-0.3
17	33X 20	502K	B	20240417	5.5			0.5	5.0
18	33XY	502BM	B	20240411	11.2	6.3	4.9	11.8	-0.7
19	33YZ	502AC	B	20240411	11.9	7.1	4.8	14.4	-2.5
20	34D' 6	502BG	B	20240422	10.5			10.6	-0.1
21	34DG	502Y	B	20240411	10.8	6.6	4.2	11.3	-0.5
22	34F 5	502BS	B	20240402	6.7			8.8	-2.1
23	34F 10	502AQ	B	20240411	8.1			6.2	1.9
24	34G2H2	502CR	B	20240411	11.0	5.8	5.2		
25	34HJ2	502CJ	B	20240305	10.7	5.9	4.8	9.8	0.8
26	34JL	503AQ	B	20240305	11.5	5.3	6.2	9.9	1.6
27	34L 10	502AL	B	20240417	4.7			5.0	-0.3
28	34LS	503BE	B	20240213	10.3	5.4	5.0	12.4	-2.0
29	34T0.1	503AC	B	20240305	10.7	6.1	4.7	10.7	0.0
30	34U 8	513E	B	20240319	4.2			4.5	-0.3
31	34V3	503CC	B	20240319	4.5				
32	34X40	513Q	B	20240410	4.2			3.9	0.3
33	35F 20	513K	B	20240417	4.9			4.1	0.8
34	35J1	514M	B	20240411	4.5	5.8	-1.3	2.9	1.6
35	OCWD-BS14/1		B	20240325	3.0			1.2	1.8
36	OCWD-BS21/2		B	20240325	4.7			-1.4	6.1
				AVG=	6.1		AVG=	4.8	

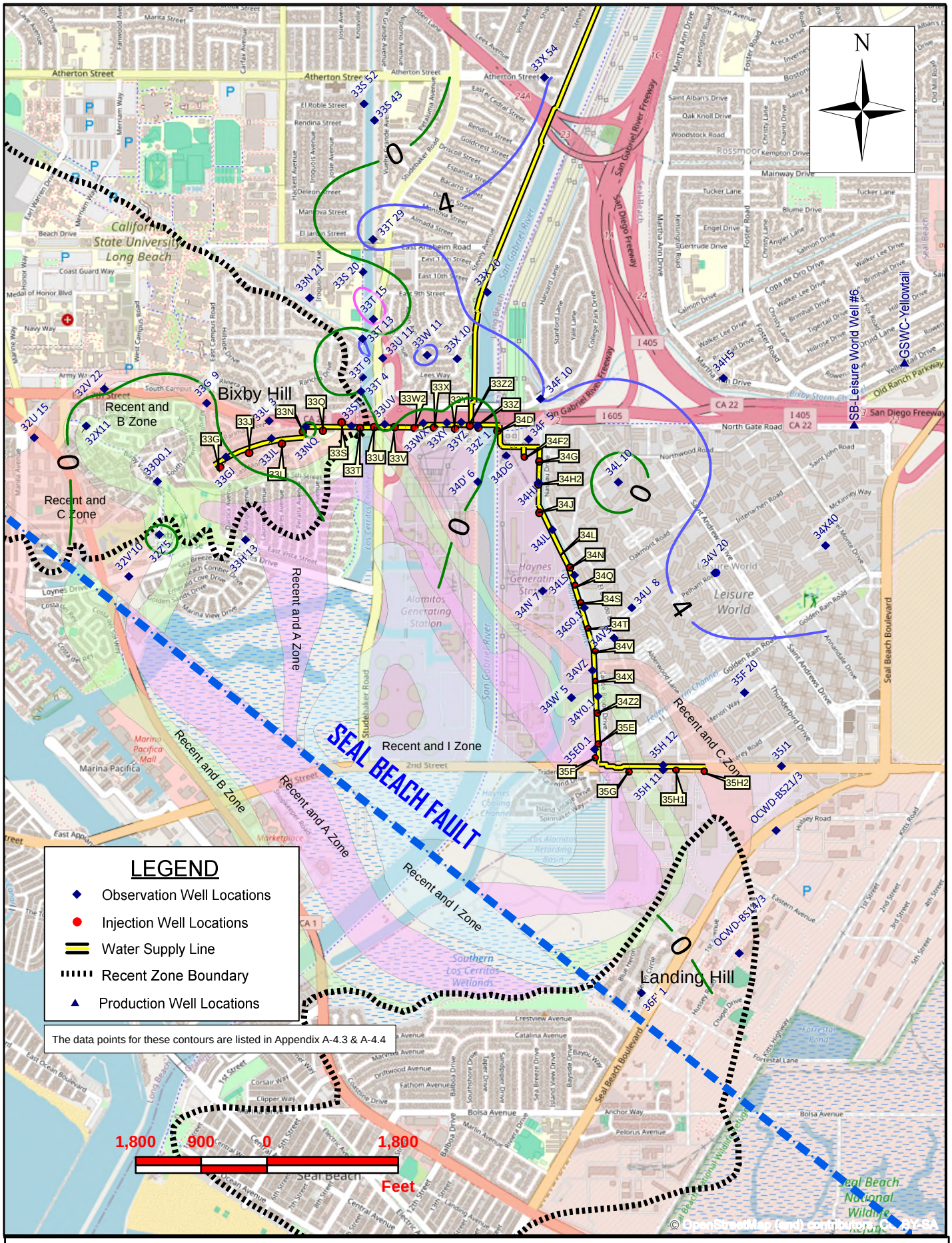
[1] P.E. represents the protective elevations calcuated for internodal wells.
[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.



Alamitos Barrier Project
A Zone Groundwater Elevation (ft) Contours: Spring 2024

A-4.1

A zone GW.srf



Alamitos Barrier Project
A Zone Change in Elevation (ft), Fall 2023 to Fall 2024

A-4.2

A zone GW.srf

ALAMITOS BARRIER PROJECT
A-Zone
Groundwater Elevation Data for Contours and Tables (Page 1 of 2)

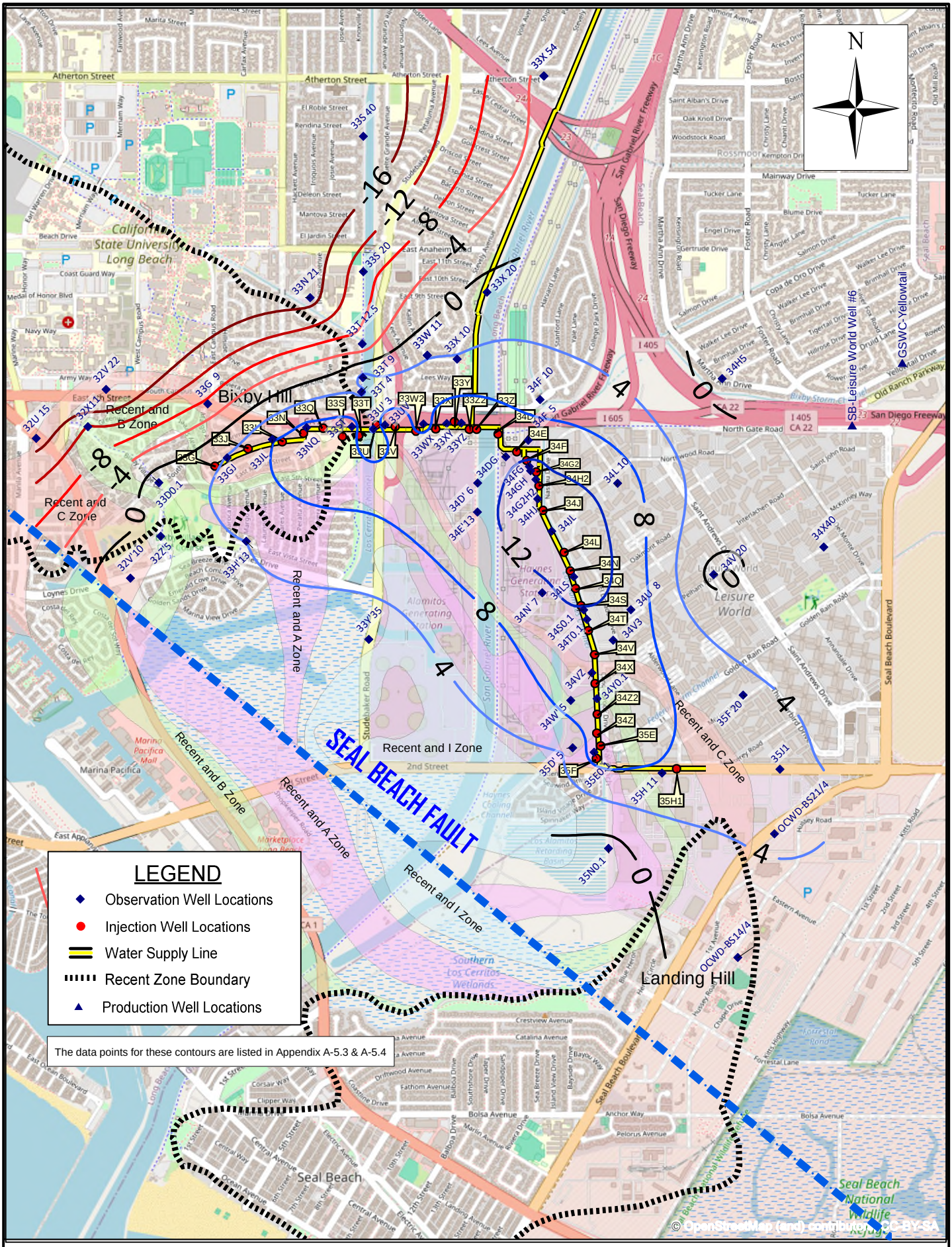
POINT	PROJ	FCD	BA	DATE	FY 23-24 ELEV	P.E.[1]	Δ[2]	FY 22-23 ELEV2	CHANGE IN ELEV
1	32U 15	482M	A	20230907	-7.4			-4.5	-2.9
2	32V 22	482P	A	20230907	-5.5			-5.2	-0.3
3	32V'10	483F	A	20240320	2.4			1.2	1.2
4	32X11	482S	A	20240318	-4.6			-6.3	1.7
5	32Z'5	482W	BA	20230907	0.3			0.9	-0.6
6	33D0.1	482U	AI	20240318	2.4			-0.2	2.6
7	33G 9	482F	A	20230907	1.0			-7.8	8.8
8	33GJ	482X	A	20240305	9.5	1.4	8.1	9.2	0.3
9	33H'13	493YY	RA	20240320	4.6			3.6	1.0
10	33JL	492BW	AI	20240327	8.0	3.1	4.9	9.2	-1.2
11	33L 3	492	A	20230905	7.2			11.3	-4.1
12	33N 21	492BU	A	20230912	-5.1			-2.6	-2.5
13	33NQ	492BP	AI	20240305	9.1	3.6	5.5	8.8	0.3
14	33Q 15	492AM	A	20230907	-1.5				
15	33S 20	492BR	A	20230907	-2.9			0.3	-3.2
16	33S 43	491E	A	20230907	-8.9			-5.0	-3.9
17	33S 52	491H	A	20230907	-13.7			-9.8	-3.9
18	33ST	492BL	A	20240327	10.5	2.8	7.7	11.8	-1.3
19	33T 13	492ZZ	A	20240415	7.6			3.3	4.3
20	33T 15	492SS	A	20230907	-1.6			4.7	-6.3
21	33T 29	491C	A	20230907	5.8			-0.8	6.6
22	33T 4	492CR	A	20240319	8.0			8.1	-0.1
23	33T 9	492TT	A	20240415	9.4			6.6	2.8
24	33U 11	492AJ	A	20240416	10.2			6.2	4.0
25	33U' 3	492WW	A	20230918	5.9				
26	33UV	492BH	A	20240305	10.7	4.0	6.7	10.3	0.4
27	33W 11	502T	A	20240416	8.8			3.9	4.9
28	33WX	502AF	A	20240408	11.6	7.6	3.9	13.0	-1.4
29	33X 10	502BD	A	20240422	9.0			6.7	2.3
30	33X 20	502J	A	20240417	5.8			0.5	5.3
31	33X 54	501	AI	20240319	-2.8			-6.7	3.9
32	33XY	502BN	A	20240213	11.8	8.0	3.8	11.8	0.0
33	33YZ	502AD	A	20240408	11.3	8.7	2.6	13.3	-2.0
34	33Z' 1	502G	A	20240422	4.0			6.7	-2.7
35	34D' 6	502BH	A	20240318	10.8			11.0	-0.2
36	34DG	502Z	A	20240305	11.2	8.5	2.7	9.5	1.7
37	34F 5	502BR	A	20240513	10.8			6.8	4.0
38	34F 10	502AR	A	20240411	7.3			3.3	4.0
39	34FG	502CN	A	20240305	10.6	8.3	2.3		
40	34G2H2	502CS	A	20240305	11.7	8.1	3.7		
41	34H5	512E	A	20240418	4.7			-1.6	6.3

[1] P.E. represents the protective elevations calcuated for internodal wells.
[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.

ALAMITOS BARRIER PROJECT
A-Zone
Groundwater Elevation Data for Contours and Tables (Page 2 of 2)

POINT	PROJ	FCD	AQUIFER	DATE	FY 23-24 ELEV	P.E.[1]	Δ[2]	FY 22-23 ELEV2	CHANGE IN ELEV
42	34HJ	502BX	A	20240305	11.8	8.6	3.2	8.0	3.8
43	34JL	503AP	A	20240305	12.2	7.8	4.5	9.9	2.3
44	34L 10	502AM	A	20240410	5.2			7.9	-2.7
45	34LS	503BD	A	20240305	12.9	7.7	5.2	9.1	3.8
46	34N' 7	503AF	A	20240318	9.5			9.1	0.4
47	34S0.1	503BV	A	20240305	12.0	6.7	5.3	9.6	2.3
48	34U 8	513F	A	20240319	8.8			7.7	1.1
49	34V 20	513B	A	20240401	3.3			-4.9	8.2
50	34V3	503CD	A	20240319	9.2			9.1	0.1
51	34VZ	503BH	A	20240304	10.8	4.4	6.4	8.5	2.3
52	34W' 5	503AJ	A	20240320	10.2			8.1	2.1
53	34X40	513P	A	20240410	2.8			-1.7	4.5
54	34Y0.1	503CL	A	20240305	10.2	2.8	7.4	7.2	2.9
55	35E0.1	503BK	A	20240304	10.7	2.4	8.4	8.8	1.9
56	35F 20	513J	A	20240411	4.8			3.3	1.5
57	35H 11	514G	A	20240304	6.3	3.8	2.5	2.5	3.8
58	35H 12	514D	A	20240304	4.9	3.8	1.1	2.2	2.7
59	35J1	514L	A	20240304	5.4	6.2	-0.8	2.9	2.5
60	36F' 1	505D	A	20230918	1.5			5.5	-4.0
61	OCWD-BS14/3		A	20240325	3.3			0.5	2.8
62	OCWD-BS21/3		A	20240325	4.6			1.6	3.0
				AVG=	5.6		AVG=	4.2	

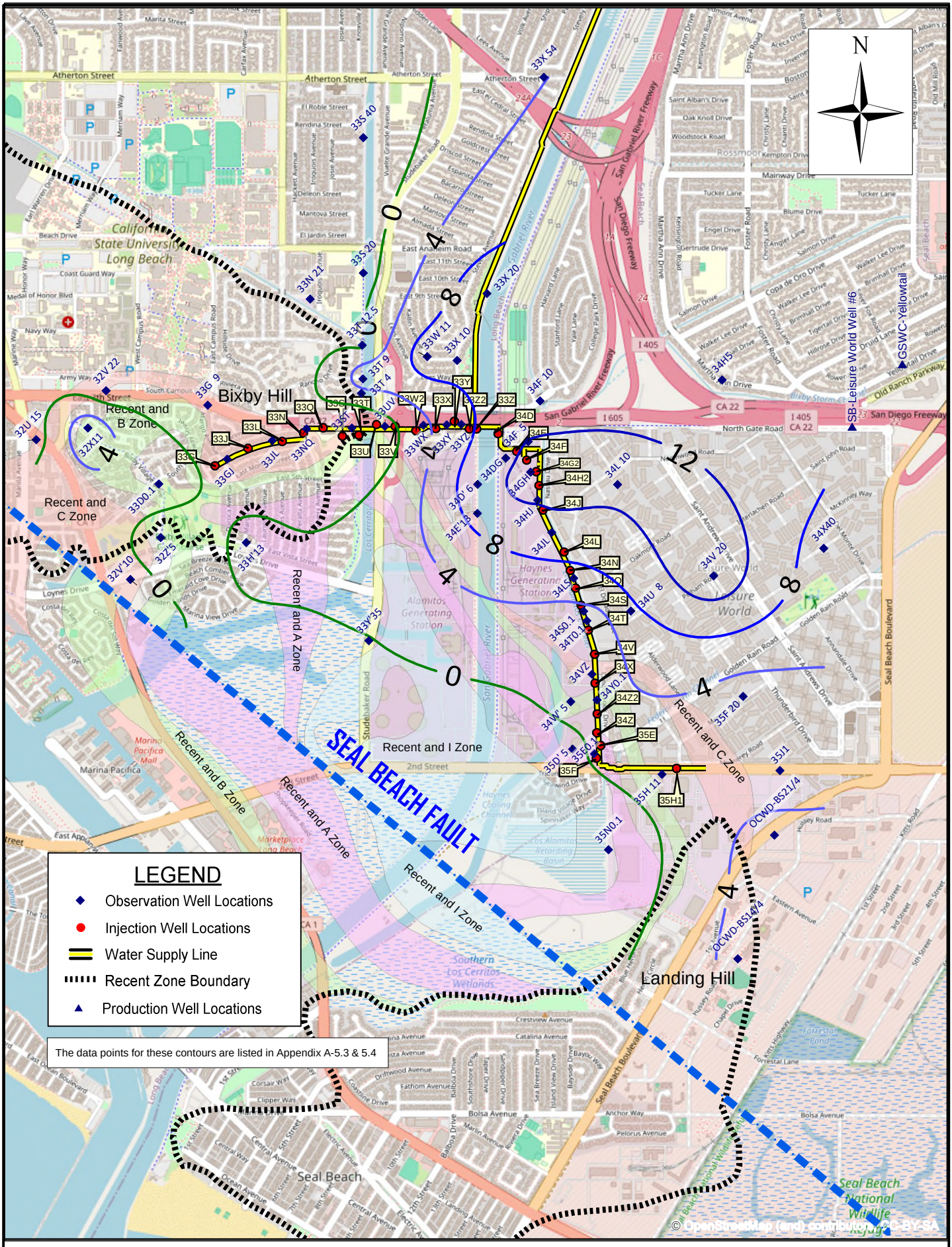
[1] P.E. represents the protective elevations calcuated for internodal wells.
[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.



Alamitos Barrier Project
I Zone Groundwater Elevation (ft) Contours, Fall 2024

A-5.1

I zone GW.srf



Alamitos Barrier Project
I Zone: Change in Elevation (ft), Fall 2023 to Fall 2024

A-5.2

I zone GW.srf

ALAMITOS BARRIER PROJECT
I-Zone
Groundwater Elevation Data for Contours and Tables (Page 1 of 2)

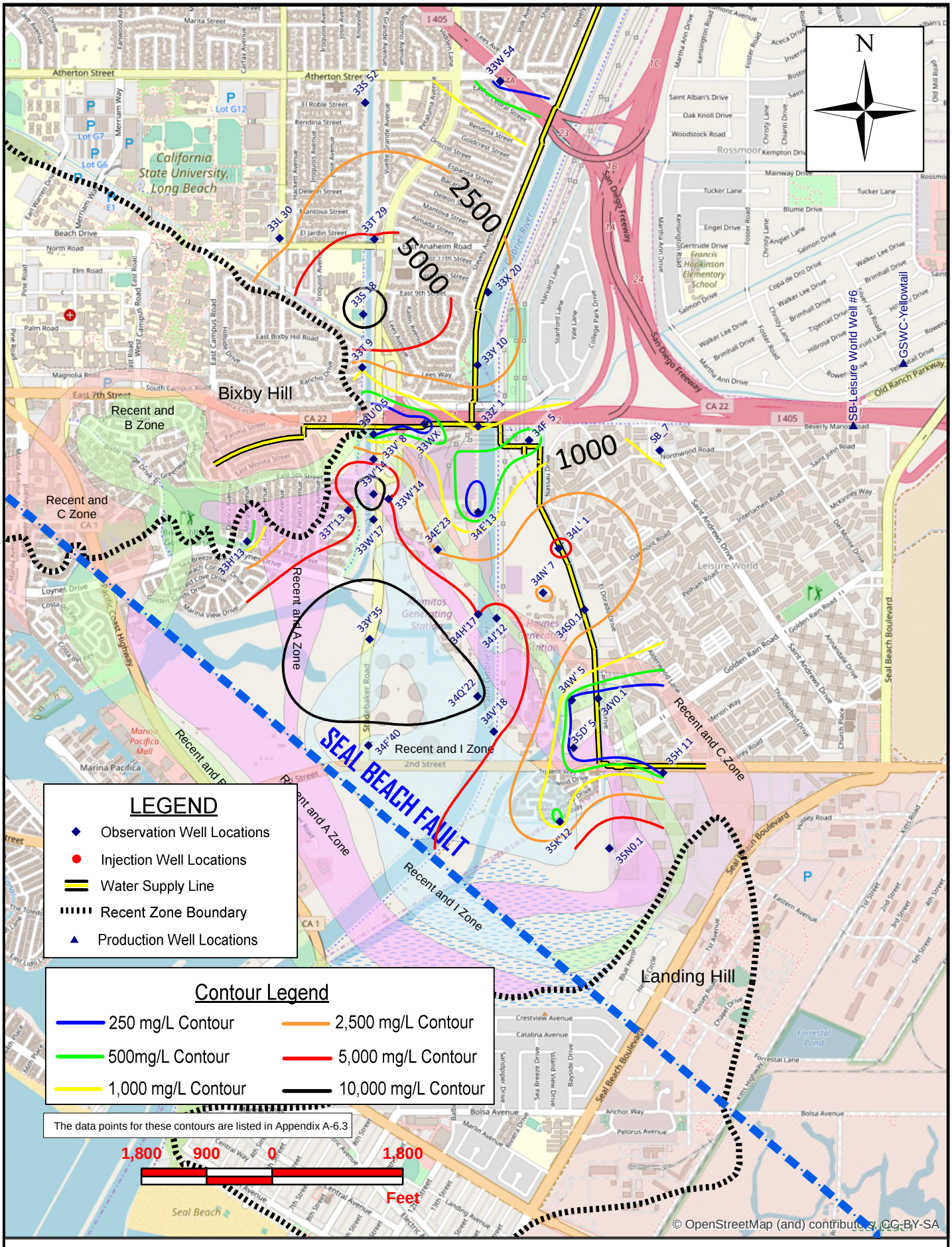
POINT	PROJ	FCD	AQUIFER	DATE	FY 23-24 ELEV	P.E.[1]	Δ[2]	FY 22-23 ELEV2	CHANGE IN ELEV
1	32U 15	482L	I	20230907	-18.0			-16.6	-1.4
2	32V 22	482N	I	20230907	-22.6			-19.8	-2.8
3	32V'10	483E	I	20240320	3.5			2.0	1.5
4	32X11	482R	I	20240327	-11.7			-18.9	7.2
5	32Z'5	482V	I	20230907	0.0			2.8	-2.8
6	33D0.1	482U	AI	20240318	2.4			-0.2	2.6
7	33G 9	482G	I	20230907	-7.2			4.4	-11.6
8	33GJ	482Y	I	20240327	4.3	2.6	1.7	5.4	-1.1
9	33H'13	493XX	I	20240320	4.0			3.4	0.6
10	33JL	492BW	AI	20240305	7.8	3.1	4.7	9.0	-1.2
11	33N 21	492BV	I	20230912	-17.6			-15.4	-2.2
12	33NQ	492BP	AI	20240408	8.9	3.6	5.3	8.8	0.1
13	33S 20	492BS	I	20230907	-9.2			-7.8	-1.4
14	33S 40	491F	I	20230907	-21.0			-18.0	-3.0
15	33ST	492BM	I	20240408	9.8	4.2	5.6	13.2	-3.4
16	33T 4	492CQ	I	20240411	3.4			1.2	2.2
17	33T 9	492XX	I	20240415	5.2			-1.9	7.1
18	33T 12.5	492BT	I	20230907	-6.6			-6.0	-0.6
19	33U' 3	492QQ	I	20230918	2.9				
20	33UV	492BJ	I	20240305	10.7	6.1	4.6	12.3	-1.6
21	33W 11	502U	I	20240416	3.7			-6.7	10.4
22	33WX	502AG	I	20240305	7.0	10.4	-3.4	4.1	2.9
23	33X 10	502BE	I	20240422	4.3			-4.2	8.5
24	33X 20	502H	I	20240417	1.6			-8.9	10.5
25	33X 54	501	AI	20240319	-2.8			-6.7	3.9
26	33XY	502BP	I	20240411	10.2	11.0	-0.8	4.0	6.2
27	33Y'35	493ZZ	I	20230919	0.9			1.0	-0.1
28	33YZ	502AE	I	20240411	10.6	11.1	-0.5	3.7	6.9
29	34D' 6	502BI	I	20240326	10.4			-0.3	10.7
30	34DG	502AA	I	20240411	11.0	11.1	-0.1	0.4	10.6
31	34E'13	503AT	I	20240422	11.0			1.7	9.3
32	34F 5	502BQ	I	20240319	10.4			-1.8	12.2
33	34F 10	502AS	I	20240411	6.2			-3.2	9.4
34	34FG	502CP	I	20240411	12.6	11.3	1.3		
35	34G2H2	502CT	I	20240411	12.0	11.0	1.0		
36	34GH	502BV	I	20240305	14.0	10.5	3.5	-0.6	14.6
37	34H5	512D	I	20240418	-1.6			-11.7	10.1

[1] P.E. represents the protective elevations calcuated for internodal wells.
[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.

ALAMITOS BARRIER PROJECT
I-Zone
Groundwater Elevation Data for Contours and Tables (Page 2 of 2)

POINT	PROJ	FCD	AQUIFER	DATE	FY 23-24 ELEV	P.E.[1]	Δ[2]	FY 22-23 ELEV	CHANGE IN ELEV
38	34HJ	502BW	I	20240305	13.8	11.0	2.8	1.6	12.2
39	34JL	503AN	I	20240305	14.6	10.5	4.1	3.8	10.8
40	34L 10	502AN	I	20240319	10.2			-2.1	12.3
41	34LS	503BC	I	20240305	15.4	9.5	5.9	9.1	6.3
42	34N' 7	503AG	I	20240326	10.1				
43	34S0.1	503BW	I	20240305	11.7	8.1	3.6	8.5	3.2
44	34T0.1	503AD	I	20240305	11.2	8.4	2.8	10.3	0.9
45	34U 8	513G	I	20240319	10.0			2.8	7.2
46	34V3	503CE	I	20240319	10.2				
47	34V 20	513C	I	20240401	-1.4			-16.3	14.9
48	34VZ	503BG	I	20240304	10.8	6.7	4.1	8.5	2.3
49	34W' 5	503AK	I	20240320	9.6			7.5	2.1
50	34X40	513N	I	20240410	3.8			-2.4	6.2
51	34Y0.1	503CM	I	20240305	10.7	4.9	5.8	7.2	3.5
52	35D' 5	503AM	I	20230912	4.3			6.9	-2.6
53	35E0.1	503BJ	I	20240304	10.1	3.0	7.1	8.8	1.3
54	35F 20	513H	I	20240411	4.8			2.8	2.0
55	35H 11	514H	I	20240408	7.5	5.5	2.0	5.3	2.2
56	35J1	513M	I	20240411	4.2	4.8	-0.6	3.6	0.6
57	35N0.1	504N	I	20230914	-1.5			2.5	-4.0
58	OCWD-BS14/4		I	20240325	1.7			-3.4	5.1
59	OCWD-BS21/4		I	20240325	4.6			-1.6	6.2
				AVG=	4.2		AVG=	-0.1	

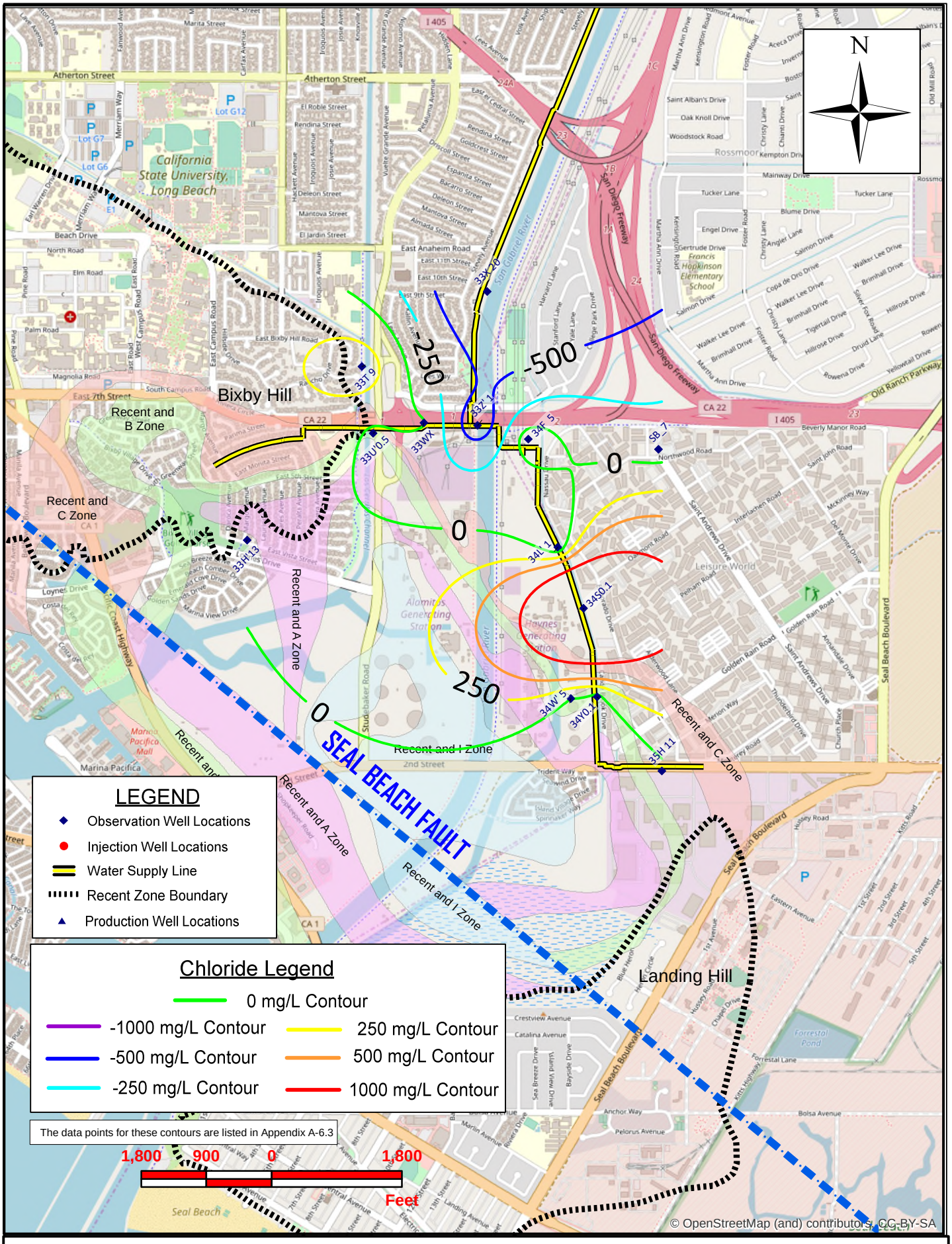
[1] P.E. represents the protective elevations calcuated for internodal wells.
[2] Δ (+/-) represents how much groundwater level is above/below respective P.E.



Alamitos Barrier Project
R Zone Chloride Concentration (mg/L) Contours, Spring 2024

A-6.1

R zone CL.srf



Alamitos Barrier Project
R Zone Change in Chloride Concentration, Spring 2023 to Spring 2024

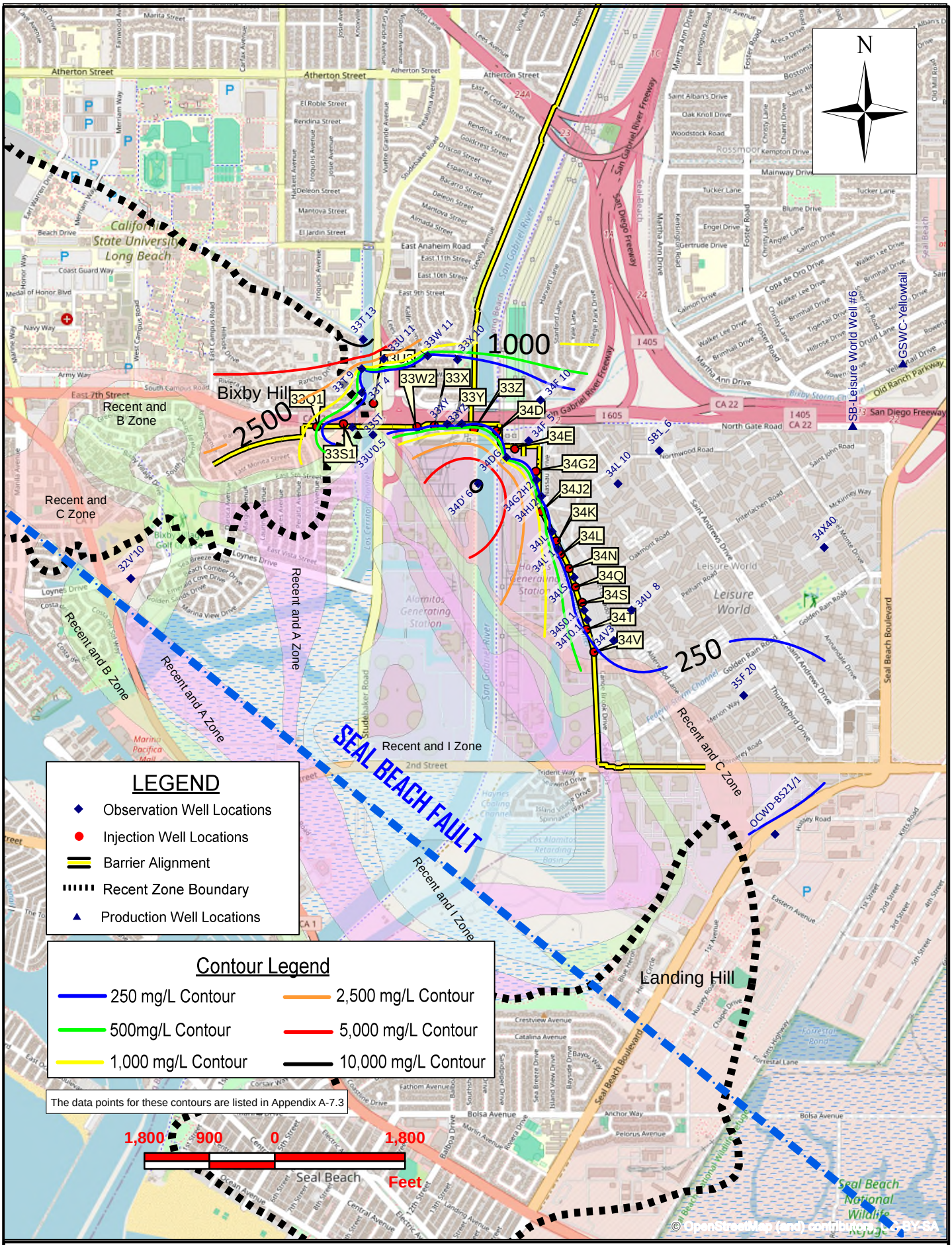
A-6.2

R zone CL.srf

ALAMITOS BARRIER PROJECT
R-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	AQUIFER	DATE	Sampling Depths and Chloride Data						For Contours	MAX CHLORIDE FY22-23	Change in Chloride (FY23-24 - FY22-23)
					ELEV 1 (ft)	CHL 1 (mg/L)	ELEV 2 (ft)	CHL 2 (mg/L)	ELEV 3 (ft)	CHL 3 (mg/L)	MAX CHL. 23-24		
1	33H'13	493YY	RA	20240320	-18	280	-38	280	-58	280	280	270	10
2	33L 30	491G	R	20230301	-50	1,700					1,700		
3	33S 18	492AH	R	20230309	-67	13,000					13,000		
4	33S 52	491J	R	20230309	-54	1,800					1,800		
5	33T 9	492CV	R	20240415	-21	1,100					1,100	680	420
6	33T'13	492AU	R	20230228	-41	2,700	-51	2,800			2,800		
7	33T 29	491D	R	20230309	-56	5,200					5,200		
8	**33U'0.5**	**492CB**	**R**	**20240411**	**-15**	**160**					**160**	**210**	**-50**
9	33V' 8	492BY	RA	20230302	-24	3,400	-48	3,100			3,400		
10	33V'14	492JJ	R	20230302	-67	19,000					19,000		
11	33W 54	501C	R	20230302	-33	120	-53	140			140		
12	33W'14	492AT	R	20230328	-46	3,800	-66	5,000			5,000		
13	33W'17	493PP	R	20230313	-41	7,400	-51	1,400			7,400		
14	33W 54	501C	R	20230302	-33	120	-53	140			140		
15	**33WX**	**502AZ**	**R**	**20240417**	**-45**	**25**					**25**	**7**	**18**
16	33X 20	502L	R	20240417	-68	3,000					3,000	3,900	-900
17	33Y 10	502BA	R	20230302	-58	780	-83	3,700			3,700		
18	33Y'35	493AB	R	20230228	-36	20,000					20,000		
19	33Z' 1	502AU	R	20240326	-46	1,000	-56	1,100			1,100	1,800	-700
20	34E'13	503AU	R	20230307	-19	62	-52	63			63		
21	34E'23	503X	R	20230328	-43	2,200					2,200		
22	34F 5	502BT	R	20240328	-136	64	-146	63	-156	220	220	76	144
23	34F'40	483J	R	20230302	-40	7,200					7,200		
24	34H'17	503Y	R	20230302	-46	4,900					4,900		
25	34J'12	503U	R	20230404	-28	6,600	-36	6,800			6,800		
26	**34L' 1**	**503P**	**R**	**20240328**	**-57**	**5,700**					**5,700**	**5,900**	**-200**
27	34N' 7	503AE	R	20230313	-51	1,300	-61	1,400	80	2,000	2,000		
28	34Q'22	503T	R	20230302	-42	8,300	-57	11,000			11,000		
29	**34S0.1**	**503BT**	**R**	**20240404**	**-59**	**3,200**	**-69**	**2,800**			**3,200**	**270**	**2,930**
30	34V'18	503V	R	20230404	-48	5,600					5,600		
31	34W' 5	503AH	R	20240320	-51	73					73	72	1
32	**34Y0.1**	**503CK**	**R**	**20240409**	**-60**	**68**	**-70**	**81**			**81**	**150**	**-69**
33	35D' 5	503AL	R	20230228	-57	68					68		
34	**35H 11**	**514F**	**R**	**20240411**	**-42**	**130**	**-65**	**130**			**130**	**170**	**-40**
35	35K'12	504R	R	20230313	-44	290	-54	170			290		
36	35N0.1	504M	R	20230301	-38	9,600	-62	9,500			9,600		
37	SB_7		R	20240502		750					750	860	-110

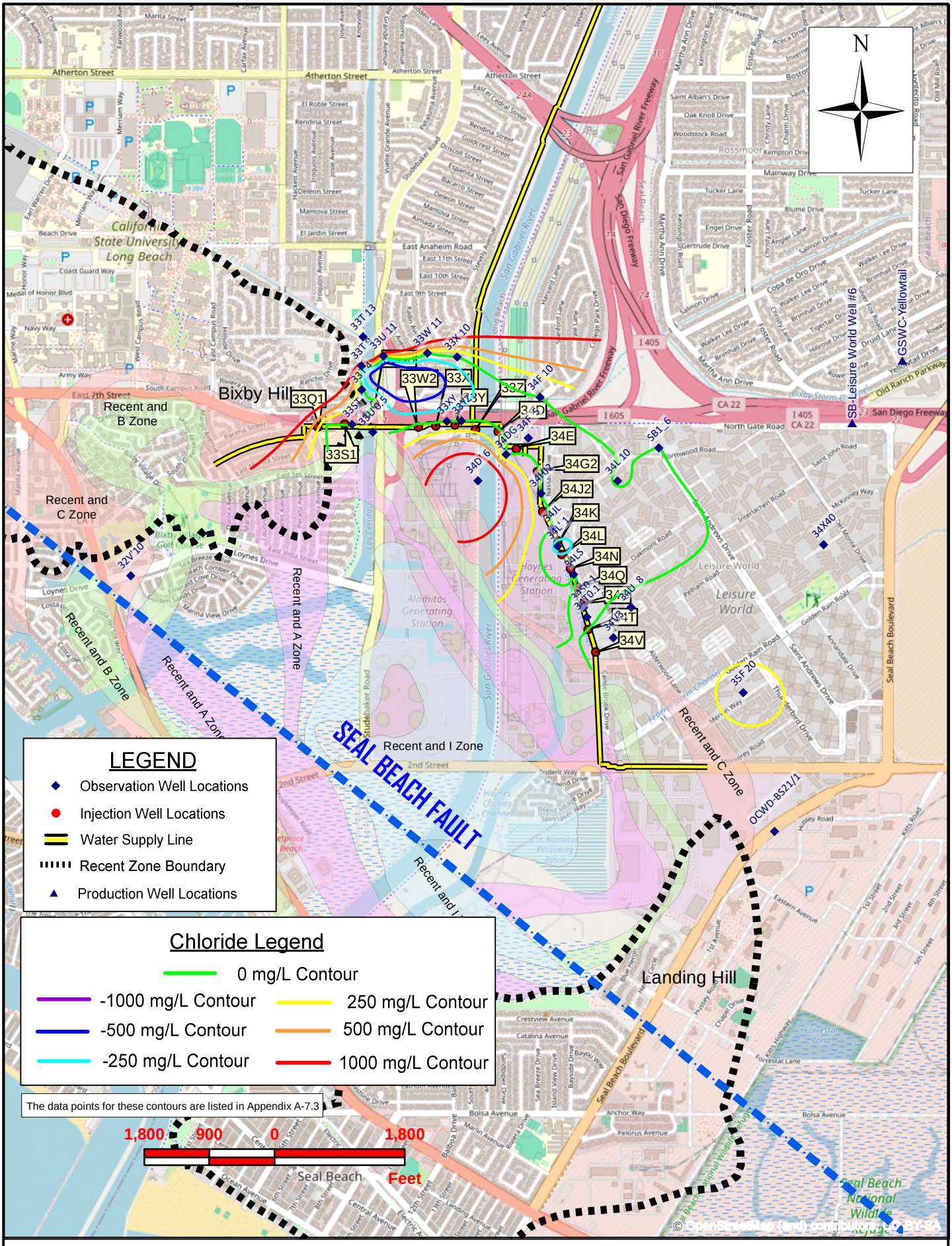
Internodal Wells in **BOLD** and used for A-11 Barrier Cross Section



Alamitos Barrier Project
C Zone Chloride Concentration (mg/L) Contours, Spring 2024

A-7.1

C zone CL.srf



Alamitos Barrier Project
C Zone Change in Chloride Concentration, Spring 2023 to Spring 2024

A-7.2

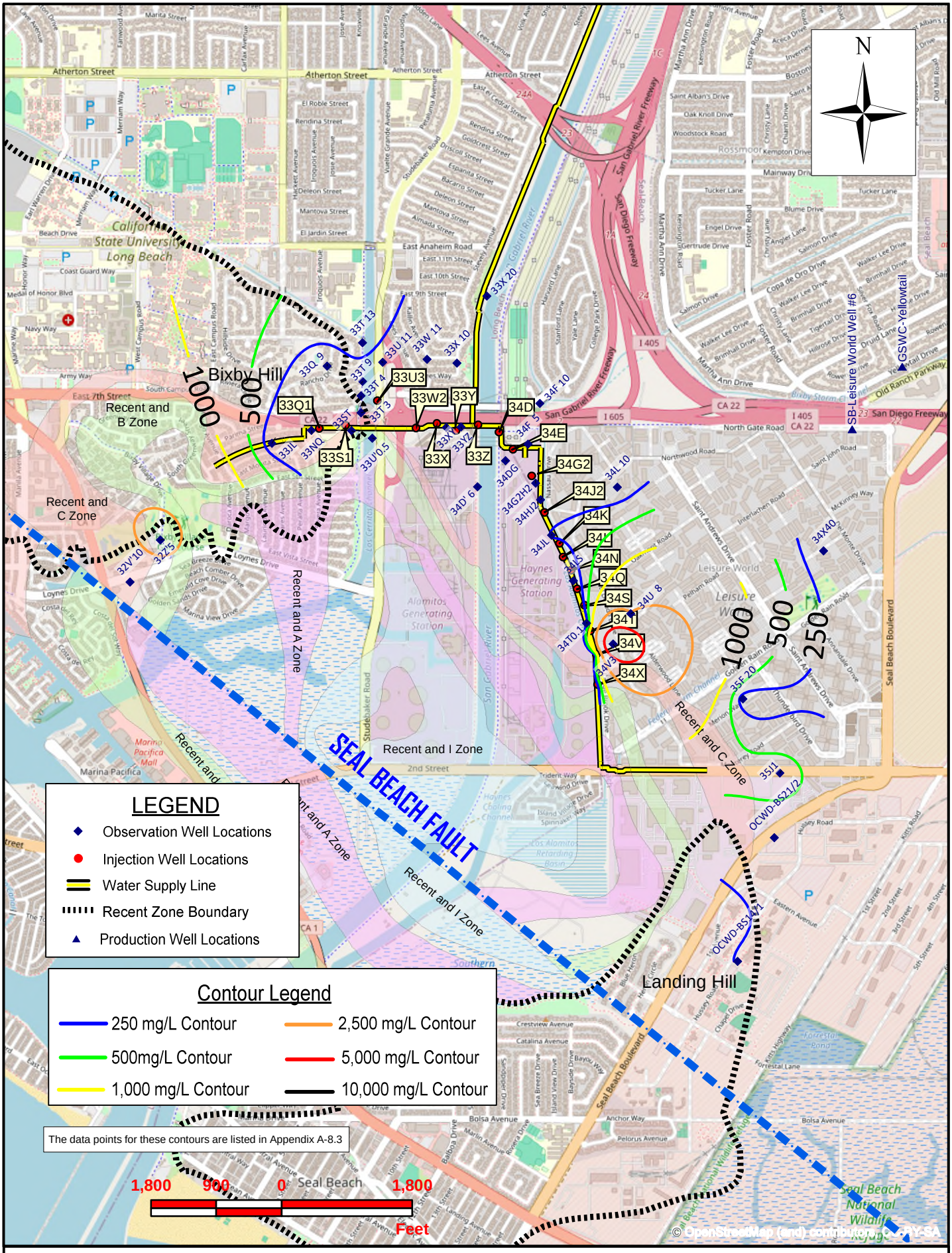
C zone CL.srf

ALAMITOS BARRIER PROJECT
C-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	AQUIFER	DATE	Sampling Depths and Chloride Data						For Contours	MAX CHLORIDE FY22-23	Change in Chloride (FY23-24 - FY22-23)
					ELEV 1 (ft)	CHL 1 (mg/L)	ELEV 2 (ft)	CHL 2 (mg/L)	ELEV 3 (ft)	CHL 3 (mg/L)	MAX CHL. 23-24		
1	32V'10	483H	C	20240320	-37	450					450	590	-140
2	**33ST**	**492BK**	**CB**	**20240327**	**-25**	**65**					**65**	**57**	**8**
3	33T 4	492CT	C	20240415	-56	430					430	330	100
4	33T 9	492CU	C	20240415	-129	150	-144	160			160	160	0
5	33T 13	492AC	C	20240415	-199	13,000					13,000	1,900	11,100
6	**33U'0.5**	**492CA**	**C**	**20240411**	**-39**	**74**					**74**	**90**	**-16**
7	33U 11	492AL	C	20240416	-188	1,600					1,600	1,600	0
8	33W 11	502R	C	20240416	-183	98	-216	82			98	90	8
9	33X 10	502BB	C	20240321	-190	75	-215	87			87	97	-10
10	**33XY**	**502BL**	**C**	**20240424**	**-194**	**68**	**-210**	**69**			**69**	**63**	**6**
11	**33YZ**	**502AB**	**C**	**20240424**	**-195**	**64**	**-210**	**64**			**64**	**79**	**-15**
12	34D' 6	502BF	C	20240326	-125	11,000					11,000	8,600	2,400
13	**34DG**	**502X**	**C**	**20240328**	**-190**	**60**	**-205**	**61**			**61**	**68**	**-7**
14	34F 5	502BU	C	20240402	-191	62	-201	61	-211	61	62	67	-5
15	34F 10	502AP	C	20240411	-211	76					76	80	-4
16	**34G2H2**	**502CQ**	**C**	**20240404**	**-190**	**81**	**-205**	**77**	**-220**	**77**	**81**		
17	**34HJ2**	**502CH**	**C**	**20240408**	**-148**	**76**	**-158**	**76**			**76**	**110**	**-34**
18	**34JL**	**503AR**	**C**	**20240408**	**-160**	**83**					**83**	**87**	**-4**
19	**34L' 1**	**503N**	**C**	**20240328**	**-162**	**110**					**110**	**460**	**-350**
20	34L 10	502AK	C	20240410	-166	120					120	96	24
21	**34LS**	**503BF**	**C**	**20240409**	**-133**	**72**	**-151**	**72**	**-163**	**75**	**75**	**72**	**3**
22	**34S0.1**	**503BU**	**C**	**20240404**	**-129**	**64**	**-139**	**65**			**65**	**89**	**-24**
23	**34T0.1**	**503AB**	**C**	**20240409**	**-134**	**120**					**120**	**130**	**-10**
24	34U 8	513D	C	20240401	-150	130	-165	81			130	88	42
25	34V3	503CB	C	20240401	-168	110					110	78	32
26	34X40	513R	C	20240410	-85	78	-101	79			79	70	9
27	35F 20	513L	C	20240411	-70	500	-78	470	-85	290	500	160	340
28	SB1_6		C	20240502		92					92	97	-5
29	OCWD-BS21/1		C	20240229		225					225	202	23
30	33Q1	DP1									50	50	n/a
31	33U3	DP2									50	50	n/a
32	33W2	DP3									50	50	n/a
33	34D	DP4									50	50	n/a

DP = Dummy Point with an assumed chloride concentration of 50 mg/L placed at wells that were injecting into this zone during this reporting period.

Internodal Wells in **BOLD** and used for A-11 Barrier Cross Section



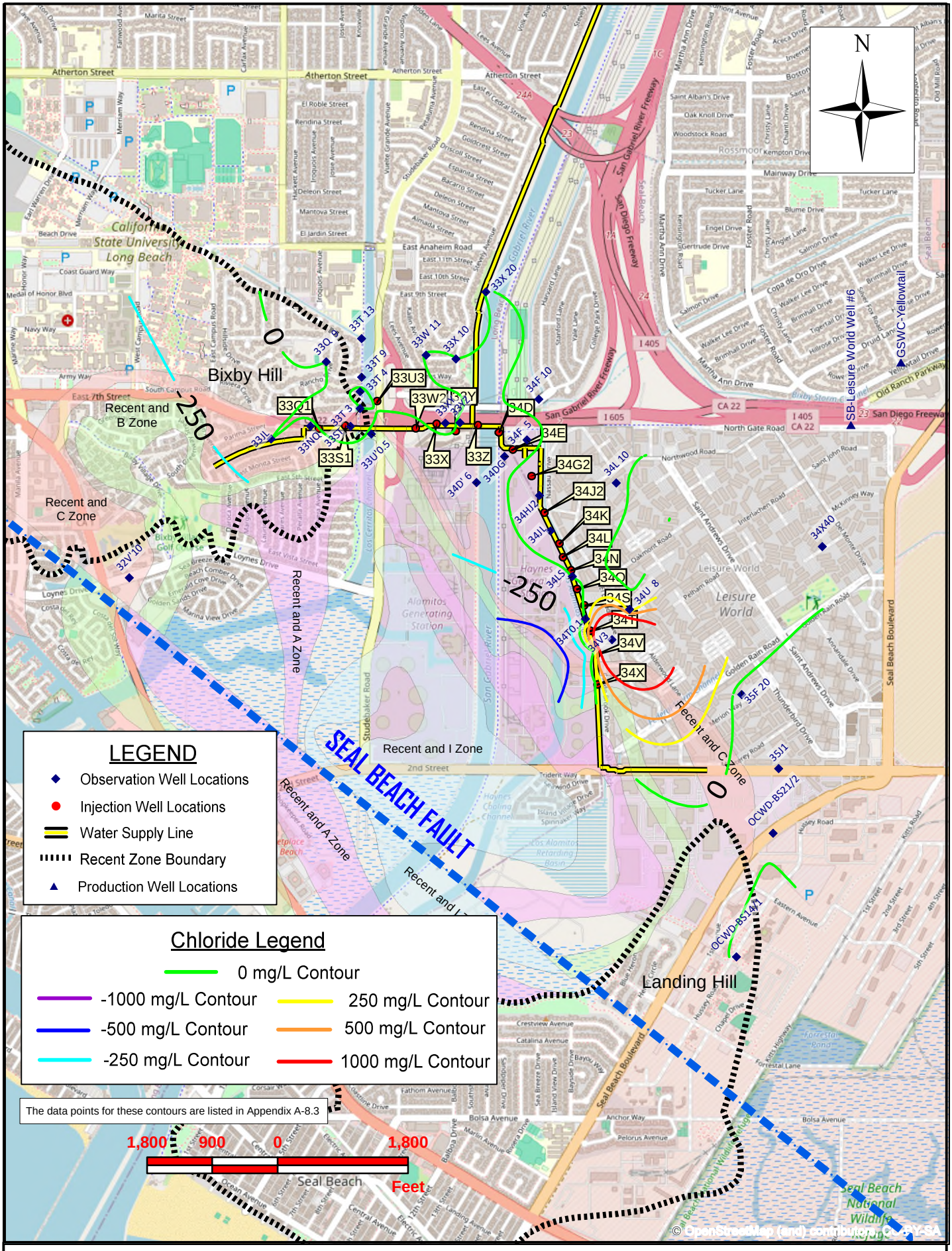
Public Works
LOS ANGELES COUNTY

ORANGE COUNTY WATER DISTRICT

Alamitos Barrier Project
B Zone Chloride Concentration (mg/L) Contours, Spring 2024

A-8.1

B zone CL.srf

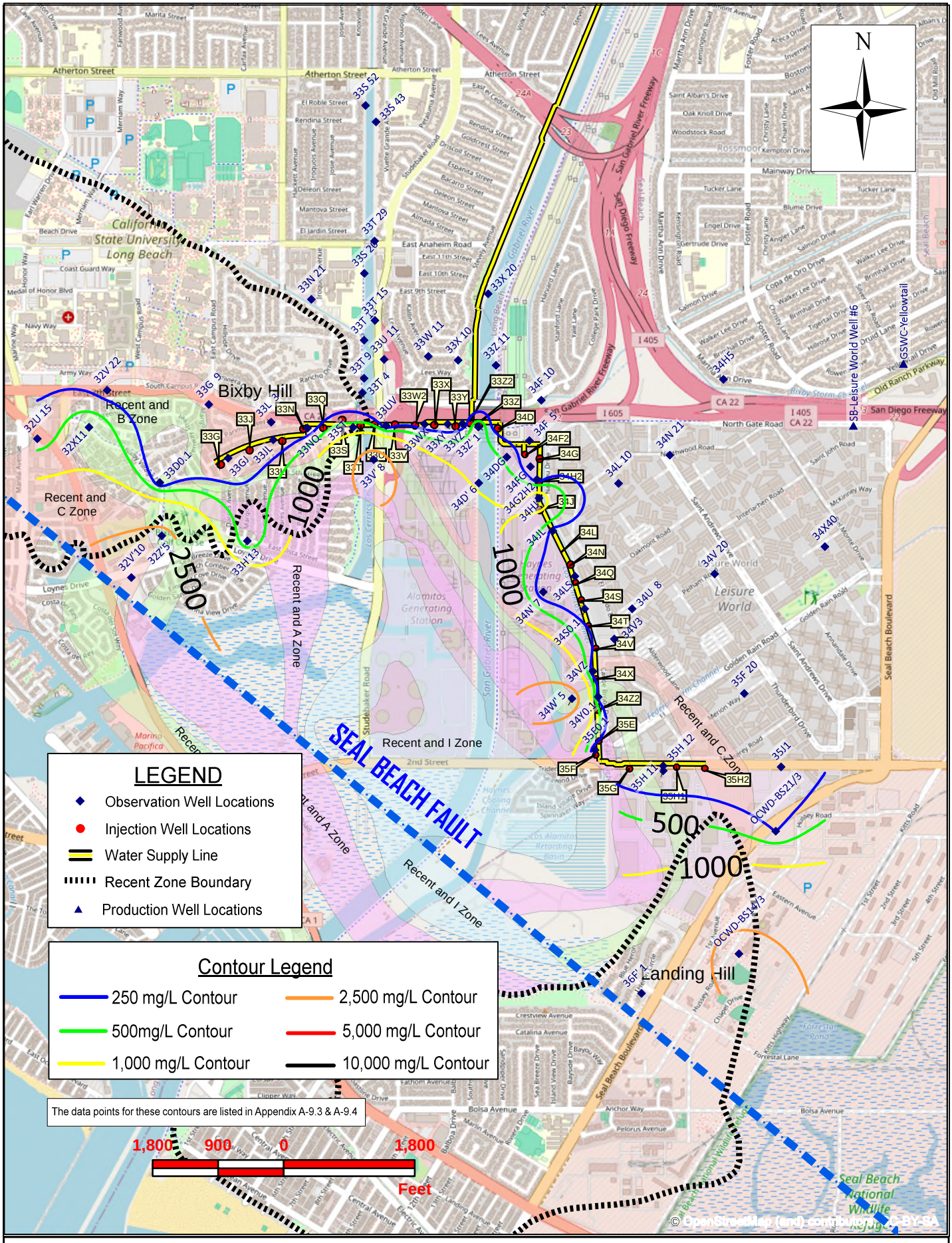

N
LEGEND
Observation Well Locations
Injection Well Locations
Water Supply Line
Recent Zone Boundary
Production Well Locations
Chloride Legend
0 mg/L Contour
-1000 mg/L Contour
250 mg/L Contour
-500 mg/L Contour
500 mg/L Contour
-250 mg/L Contour
1000 mg/L Contour
The data points for these contours are listed in Appendix A-8.3
1,800 900 0 1,800
Feet
Bixby Hill
Landing Hill
Recent and B Zone
Recent and C Zone
Recent and A Zone
Recent and I Zone
SEAL BEACH FAULT
Alamitos Barrier Project
B Zone Change in Chloride Concentration, Spring 2023 to Spring 2024
A-8.2
B zone CL.srf

ALAMITOS BARRIER PROJECT
B-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	AQUIFER	DATE	Sampling Depths and Chloride Data						For Contours	MAX CHLORIDE FY22-23	Change in Chloride (FY23-24 - FY22-23)
					ELEV 1 (ft)	CHL 1 (mg/L)	ELEV 2 (ft)	CHL 2 (mg/L)	ELEV 3 (ft)	CHL 3 (mg/L)	MAX CHL. 23-24		
1	32V'10	483G	B	20240320	-72	1,400					1,400	2,400	-1,000
2	32Z'5	482W	BA	20230301	-20	680	-30	1,000	70	3,000	3,000		
3	**33JL**	**492BQ**	**B**	**20240327**	**3**	**110**	**-7**	**100**			**110**	**110**	**0**
4	**33NQ**	**492BN**	**B**	**20240327**	**-3**	**71**	**-14**	**69**			**71**	**76**	**-5**
5	33Q 9	492CM	B	20230301	-85	72	-95	74	140	85	85		
6	**33ST**	**492BK**	**CB**	**20240327**	**-25**	**65**					**65**	**21**	**44**
7	33T 3	492CL	B	20230301	-40	85	-57	86	85	84	86		
8	33T 4	492CS	B	20240415	-91	58					58	65	-7
9	33T 9	492YY	B	20240415	-163	190					190	170	20
10	33T 13	492AB	B	20240415	-254	390					390	140	250
11	**33U'0.5**	**492BZ**	**B**	**20240411**	**-57**	**64**					**64**	**73**	**-9**
12	33W 11	502S	B	20240416	-241	87	-269	88			88	94	-6
13	33X 10	502BC	B	20230307	-275	75					75	75	0
14	33X 20	502K	B	20240417	-266	78					78	79	-1
15	**33XY**	**502BM**	**B**	**20240424**	**-244**	**77**					**77**	**66**	**11**
16	**33YZ**	**502AC**	**B**	**20240424**	**-214**	**71**	**-263**	**70**			**71**	**75**	**-4**
17	34D' 6	502BG	B	20240326	-180	67	-194	66			67	82	-15
18	**34DG**	**502Y**	**B**	**20240328**	**-232**	**69**	**-257**	**70**			**70**	**76**	**-6**
19	34F 5	502BS	B	20240402	-231	63	-260	65			65	72	-7
20	34F 10	502AQ	B	20240411	-269	77					77	73	4
21	**34G2H2**	**502CR**	**B**	**20240404**	**-190**	**66**					**66**		
22	**34HJ2**	**502CJ**	**B**	**20240408**	**-203**	**86**	**-215**	**94**	**-228**	**86**	**94**	**71**	**23**
23	**34JL**	**503AQ**	**B**	**20240408**	**-195**	**100**	**-211**	**270**			**270**	**80**	**190**
24	34L 10	502AL	B	20240410	-224	83	-249	98			98	93	5
25	**34LS**	**503BE**	**B**	**20240409**	**-188**	**66**					**66**	**57**	**9**
26	**34T0.1**	**503AC**	**B**	**20240409**	**-174**	**86**	**-207**	**86**	**-239**	**88**	**88**	**51**	**37**
27	34U 8	513E	B	20240401	-225	2,600					2,600	2,500	100
28	34V3	503CC	B	20240401	-208	8,500					8,500	4,500	4,000
29	34X40	513Q	B	20240410	-137	74					74	24	50
30	35F 20	513K	B	20240411	-115	130					130	240	-110
31	**35J1**	**514M**	**B**	**20240430**	**-128**	**480**	**-143**	**650**	**-148**	**490**	**650**	**770**	**-120**
32	OCWD-BS14/1		B	20240229		257					257	244	13
33	OCWD-BS21/2		B	20240229		293					293	296	-3
34	34D	DP1									50	50	
35	34V	DP2									50	50	
36	34X	DP3									50	50	

DP = Dummy Point with an assumed chloride concentration of 50 mg/L placed at wells that were injecting into this zone during this reporting period.

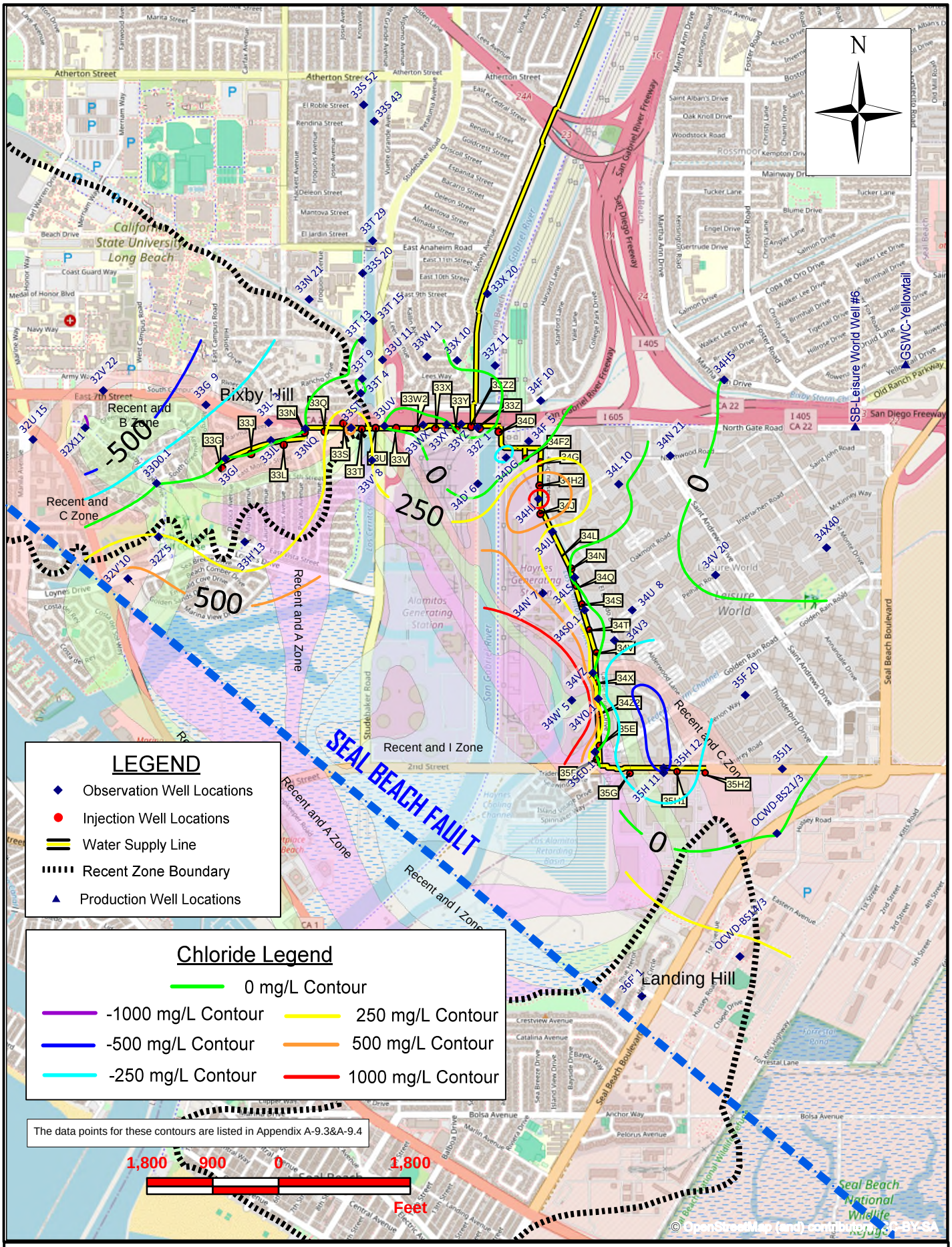
Internodal Wells in **BOLD** and used for A-11 Barrier Cross Section



Alamitos Barrier Project
A Zone Chloride Concentration (mg/L) Contours, Spring 2024

A-9.1

A zone CL.srf



ALAMITOS BARRIER PROJECT
A-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	AQUIFER	DATE	Sampling Depths and Chloride Data						For Contours	MAX CHLORIDE FY22-23	Change in Chloride (FY23-24 - FY22-23)
					ELEV 1 (ft)	CHL 1 (mg/L)	ELEV 2 (ft)	CHL 2 (mg/L)	ELEV 3 (ft)	CHL 3 (mg/L)	MAX CHL. 23-24		
1	32U 15	482M	A	20230227	-17	290					290		
2	32V 22	482P	A	20230228	-11	130					130		
3	32V'10	483F	A	20240320	-90	3,400	-105	76			3,400	2,800	600
4	32X11	482S	A	20240327	-9	230	-24	780			780	1,800	-1,020
5	32Z'5	482W	BA	20230301	-20	680	-30	1,000	70	3,000	3,000		
6	33D0.1	482U	AI	20240327	-24	82	-49	82	-74	82	82	86	-4
7	33G 9	482F	A	20230301	-3	100	-23	100			100		
8	**33GJ**	**482X**	**A**	**20240327**	**-35**	**67**					**67**	**61**	**6**
9	33H'13	493YY	RA	20240320	-18	280	-38	280	-58	280	280	270	10
10	**33JL**	**492BW**	**AI**	**20240327**	**-41**	**56**	**-79**	**55**	**-116**	**58**	**58**	**67**	**-9**
11	33L 3	492	A	20230302	-60	76					76		
12	33N 21	492BU	A	20230313	-305	130	-330	140	355	150	150		
13	**33NQ**	**492BP**	**AI**	**20240327**	**-48**	**60**	**-92**	**60**	**-136**	**59**	**60**	**74**	**-14**
14	33S 20	492BR	A	20230309	-317	140	-336	200	364	210	210		
15	33S 43	491E	A	20230309	-333	120	-344	120			120		
16	33S 52	491H	A	20230309	-284	190	-289				190		
17	**33ST**	**492BL**	**A**	**20240327**	**-65**	**53**	**-86**	**52**	**-100**	**640**	**640**	**69**	**571**
18	33T 13	492ZZ	A	20240415	-128	100					100	85	15
19	33T 15	492SS	A	20230309	-334	160					160		
20	33T 29	491C	A	20230309	-350	100					100		
21	33T 4	492CR	A	20240415	-146	63	-166	62	-186	62	63	73	-10
22	33T 9	492TT	A	20240415	-262	89					89	86	3
23	33U 11	492AJ	A	20240416	-348	250					250	81	169
24	**33UV**	**492BH**	**A**	**20240424**	**-106**	**77**	**-131**	**78**	**-155**	**77**	**78**	**93**	**-15**
25	33V' 8	492BY	RA	20230302	-24	3,400	-48	3,100			3,400		
26	33W 11	502T	A	20240416	-321	67	-349	69	-376	110	110		
27	**33WX**	**502AF**	**A**	**20240424**	**-258**	**66**	**-281**	**83**	**-297**	**84**	**84**	**88**	**-4**
28	33X 10	502BD	A	20240321	-320	64	-340	59	-356	60	64	76	-12
29	33X 20	502J	A	20230321	-353	89					89		
30	**33XY**	**502BN**	**A**	**20240424**	**-278**	**56**	**-296**	**60**	**-311**	**60**	**60**	**67**	**-7**
31	**33YZ**	**502AD**	**A**	**20240424**	**-296**	**76**	**-327**	**82**			**82**	**55**	**27**
32	**33Z' 1**	**502G**	**A**	**20240326**	**-320**	**760**					**760**	**640**	**120**
33	33Z 11	502V	A	20230404	-321	69	-346	68			69		
34	34D' 6	502BH	A	20240326	-270	800	-303	890	-335	890	890	1,100	-210
35	**34DG**	**502Z**	**A**	**20240402**	**-292**	**360**	**-324**	**430**			**430**	**760**	**-330**
36	34F 5	502BR	A	20240402	-297	140	-322	140	-347	140	140	360	-220
37	34F 10	502AR	A	20240411	-311	61	-326	61			61	75	-14
38	**34FG**	**502CN**	**A**	**20240402**	**-291**	**75**	**-306**	**76**	**-321**	**76**	**76**		
39	**34G2H2**	**502CS**	**A**	**20240404**	**-283**	**93**	**-298**	**95**	**-313**	**98**	**98**		
40	34H5	512E	A	20240418	-298	95	-313	96	-328	93	96	95	1
41	**34HJ**	**502BX**	**A**	**20240403**	**-310**	**120**	**-321**	**720**	**-331**	**1,400**	**1,400**	**82**	**1,318**
42	**34JL**	**503AP**	**A**	**20240408**	**-262**	**90**	**-288**	**110**	**-308**	**160**	**160**	**71**	**89**
43	34L 10	502AM	A	20240410	-310	92	-330	90	-354	90	92	80	12
44	**34LS**	**503BD**	**A**	**20240409**	**-238**	**59**	**-283**	**63**			**63**	**100**	**-37**
45	34N 21	512B	A	20230314	-328	120	-354	170			170		
46	34N' 7	503AF	A	20230314	-106	93	-144	83	186	89	93		

DP = Dummy Point with an assumed chloride concentration of 50 mg/L placed at wells that were injecting into this zone during this reporting period.

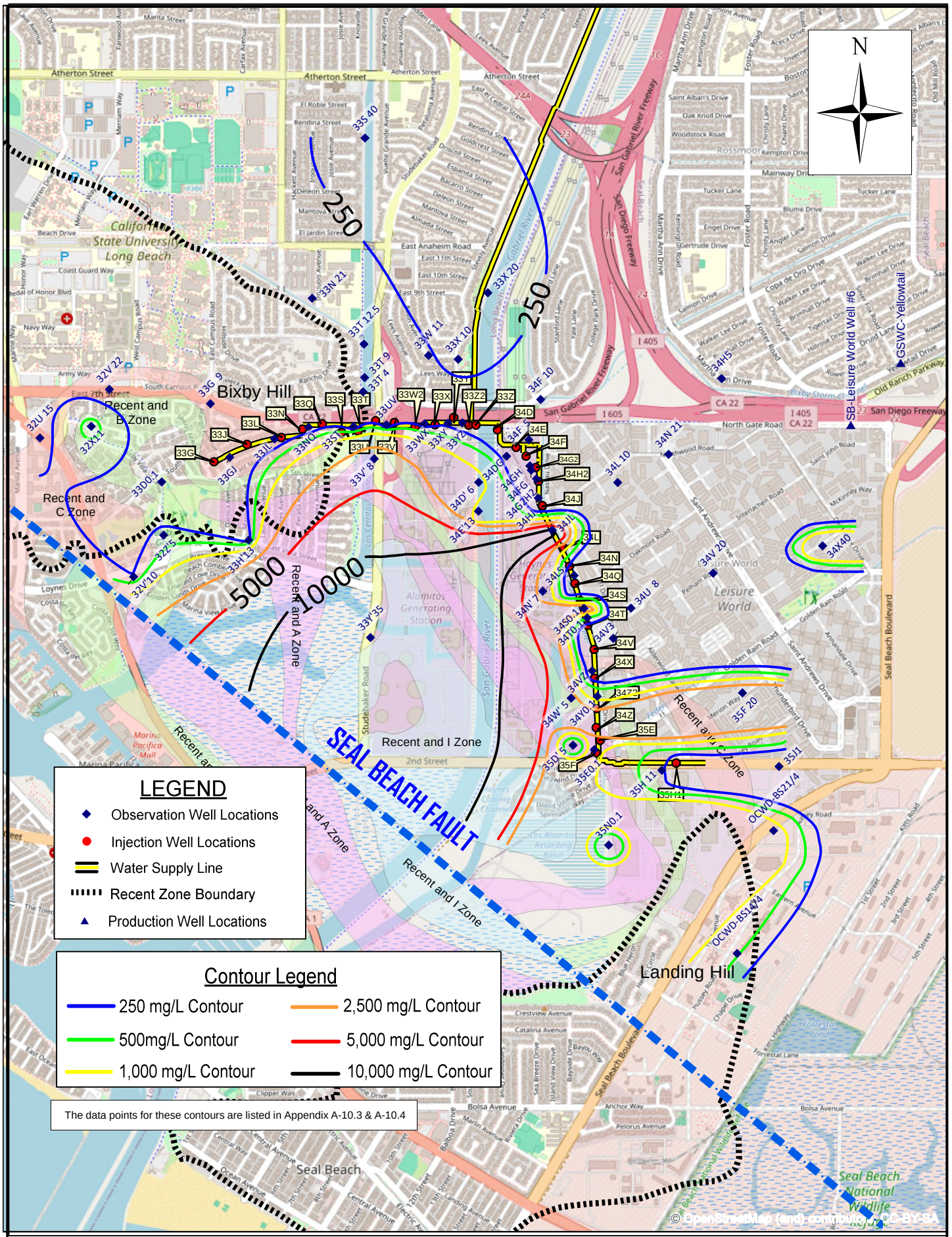
Internodal Wells in **BOLD** and used for A-11 Barrier Cross Section

ALAMITOS BARRIER PROJECT
A-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	AQUIFER	DATE	Sampling Depths and Chloride Data						For Contours	MAX CHLORIDE FY21-22	Change in Chloride (FY22-23 - FY21-22)
					ELEV 1 (ft)	CHL 1 (mg/L)	ELEV 2 (ft)	CHL 2 (mg/L)	ELEV 3 (ft)	CHL 3 (mg/L)	MAX CHL. 22-23		
47	**34S0.1**	**503BV**	**A**	**20240404**	**-239**	**82**	**-249**	**73**	**-256**	**110**	**110**	**85**	**25**
48	34U 8	513F	A	20240401	-280	78	-310	100			100	96	4
48	34V3	503CD	A	20240401	-263	75					75	140	-65
49	34V 20	513B	A	20240401	-234	150	-265	150	-292	150	150	150	0
49	**34VZ**	**503BH**	**A**	**20240403**	**-146**	**70**	**-156**	**70**			**70**	**2,000**	**-1,930**
50	34W' 5	503AJ	A	20240320	-81	75	-101	3,400	-119	350	3,400	200	3,200
50	34X40	513P	A	20240410	-202	52	-232	160			160	700	-540
51	**34Y0.1**	**503CL**	**A**	**20240409**	**-107**	**95**					**95**	**120**	**-25**
51	**35E0.1**	**503BK**	**A**	**20240403**	**-74**	**61**					**61**	**110**	**-49**
52	35F 20	513J	A	20240411	-129	90	-158	89			90	300	-210
52	**35H 11**	**514G**	**A**	**20240411**	**-123**	**88**	**-146**	**88**			**88**	**140**	**-52**
53	**35H 12**	**514D**	**A**	**20240430**	**-137**	**220**					**220**	**2,780**	**-2,560**
53	**35J1**	**514L**	**A**	**20240430**	**-193**	**64**	**-208**	**65**	**-228**	**73**	**73**	**294**	**-221**
54	36F' 1	505D	A	20230403	-99	1,100					1,100		
54	OCWD-BS14/3		A	20240229		3,100					3,100		
55	OCWD-BS21/3		A	20240229		245					245		
56	34D	DP1									50	50	n/a
57	35H2	DP2									50	50	n/a

DP = Dummy Point with an assumed chloride concentration of 50 mg/L placed at wells that were injecting into this zone during this reporting period.

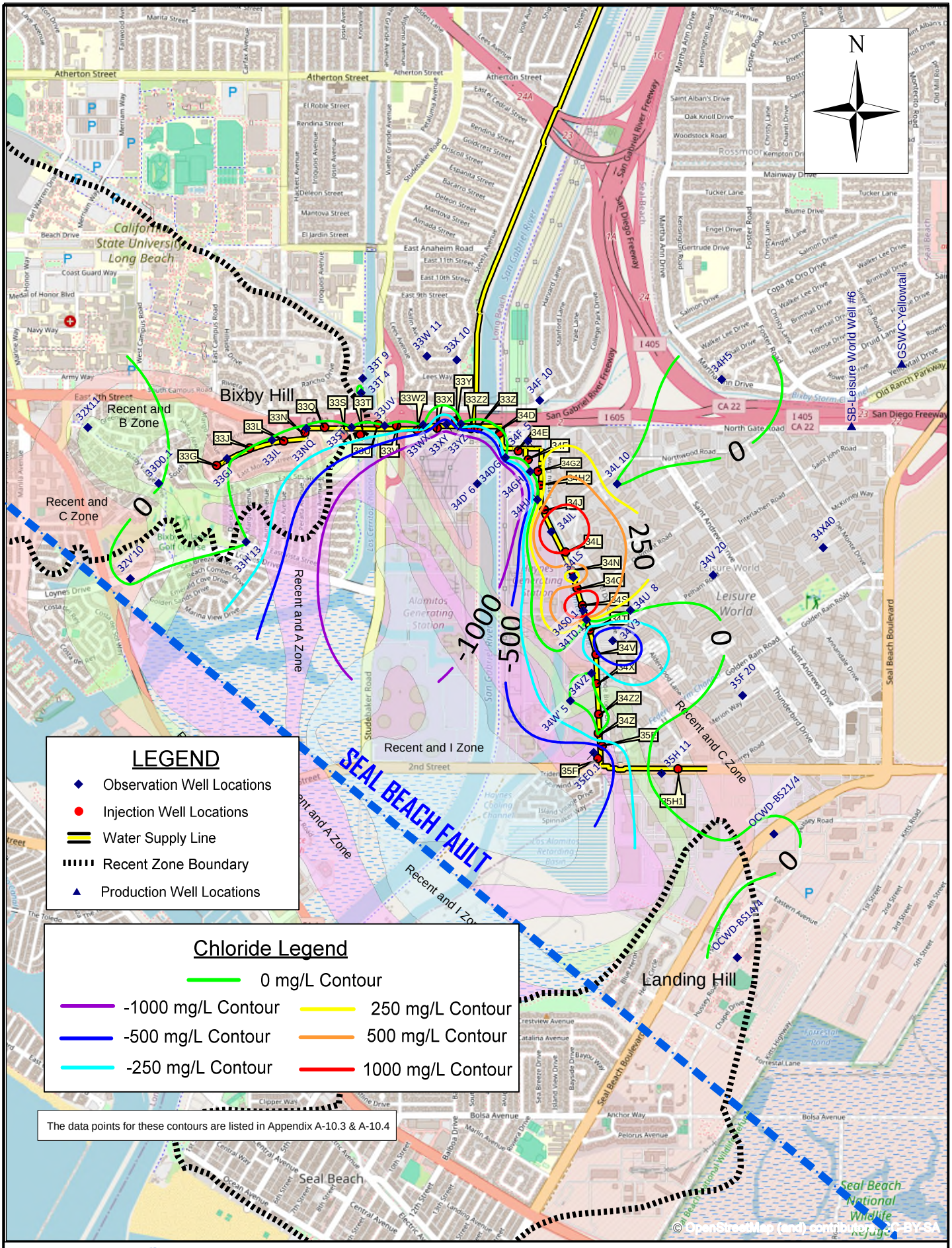
Internodal Wells in **BOLD** and used for A-11 Barrier Cross Section



Alamitos Barrier Project
I Zone Chloride Concentration (mg/L) Contours, Spring 2024

A-10.1

I zone CL.srf



Alamitos Barrier Project
I Zone Change in Chloride Concentration, Fall 2023 to Fall 2024

A-10.2

I zone CL.srf

ALAMITOS BARRIER PROJECT
I-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	AQUIFER	DATE	Sampling Depths and Chloride Data						For Contours	MAX CHLORIDE FY22-23	Change in Chloride (FY23-24 - FY22-23)
					ELEV 1 (ft)	CHL 1 (mg/L)	ELEV 2 (ft)	CHL 2 (mg/L)	ELEV 3 (ft)	CHL 3 (mg/L)	MAX CHL. 23-24		
1	32U 15	482L	I	20230227	-74	160					160		
2	32V 22	482N	I	20230228	-51	51					51		
3	32V'10	483E	I	20240320	-140	250	-152	250	-165	270	270	260	10
4	32X11	482R	I	20240327	-51	610	-61	50			610	750	-140
5	32Z'5	482V	I	20230301	-68	240	-83	370	-98	360	370		
6	33D0.1	482U	AI	20240327	-24	82	-49	82	-74	82	82	86	-4
7	33G 9	482G	I	20230301	-34	67	-68	77	-78	95	95		
8	**33GJ**	**482Y**	**I**	**20240327**	**-75**	**64**	**-95**	**61**			**64**	**60**	**4**
9	33H'13	493XX	I	20240320	-89	150					150	140	10
10	**33JL**	**492BW**	**AI**	**20240327**	**-41**	**56**	**-79**	**55**	**-116**	**58**	**58**	**67**	**-9**
11	33N 21	492BV	I	20230313	-457	65	-468	65			65		
12	**33NQ**	**492BP**	**AI**	**20240327**	**-48**	**60**	**-92**	**60**	**-136**	**59**	**60**	**74**	**-14**
13	33S 40	491F	I	20230313	-470	440					440		
14	**33ST**	**492BM**	**I**	**20240327**	**-130**	**57**	**-148**	**58**	**-163**	**62**	**62**	**68**	**-6**
15	33T 4	492CQ	I	20240415	-277	62	-292	62			62	70	-8
16	33T 9	492XX	I	20240415	-364	71					71	70	1
17	33T 12.5	492BT	I	20230313	-423	91	-438	91	-443		91		
18	**33UV**	**492BJ**	**I**	**20240424**	**-209**	**75**	**-228**	**76**	**-246**	**78**	**78**	**77**	**1**
19	33V' 8	492BX	I	20230302	-109	4,000	-130	4,000			4,000		
20	33W 11	502U	I	20240416	-423	86	-446	150	-468	200	200	200	0
21	**33WX**	**502AG**	**I**	**20240417**	**-374**	**110**	**-391**	**120**	**-405**	**110**	**120**	**90**	**30**
22	33X 10	502BE	I	20240326	-420	490	-440	300	-460	200	490	380	110
23	33X 20	502H	I	20231101	-442	480					480		
24	**33XY**	**502BP**	**I**	**20240417**	**-403**	**93**	**-417**	**120**	**-431**	**200**	**200**	**1,000**	**-800**
25	33Y'35	493ZZ	I	20230228	-67	21,000					21,000		
26	**33YZ**	**502AE**	**I**	**20240424**	**-402**	**70**	**-433**	**69**			**70**	**77**	**-7**
27	34D' 6	502BI	I	20240326	-400	1,200	-410	1,200	-418	1,400	1,400	8,200	-6,800
28	**34DG**	**502AA**	**I**	**20240402**	**-402**	**70**	**-432**	**69**			**70**	**71**	**-1**
29	34E'13	503AT	I	20230307	-289	940	-308	850			940		
30	34F 5	502BQ	I	20240402	-411	71	-426	71	-441	70	71	57	14
31	34F 10	502AS	I	20240411	-416	64	-442	76			76	75	1
32	**34FG**	**502CP**	**I**	**20240402**	**-412**	**82**	**-427**	**81**	**-442**	**82**	**82**		
33	**34GH**	**502BV**	**I**	**20240402**	**-411**	**68**	**-427**	**67**	**-437**	**68**	**68**	**82**	**-14**
34	**34G2H2**	**502CT**	**I**	**20240404**	**-408**	**97**	**-428**	**93**			**97**		
35	34H5	512D	I	20240418	-408	190	-423	180	-443	180	190	250	-60
36	**34HJ**	**502BW**	**I**	**20240403**	**-407**	**130**	**-417**	**130**	**-427**	**130**	**130**	**77**	**53**
37	**34JL**	**503AN**	**I**	**20240408**	**-382**	**8,000**	**-403**	**12,000**			**12,000**	**10,000**	**2,000**
38	34L 10	502AN	I	20240410	-404	95	-426	96			96	110	-14
39	**34LS**	**503BC**	**I**	**20240409**	**-338**	**100**	**-368**	**90**			**100**	**100**	**0**
40	34N 21	512C	I	20230314	-423	94	-448	91			94		

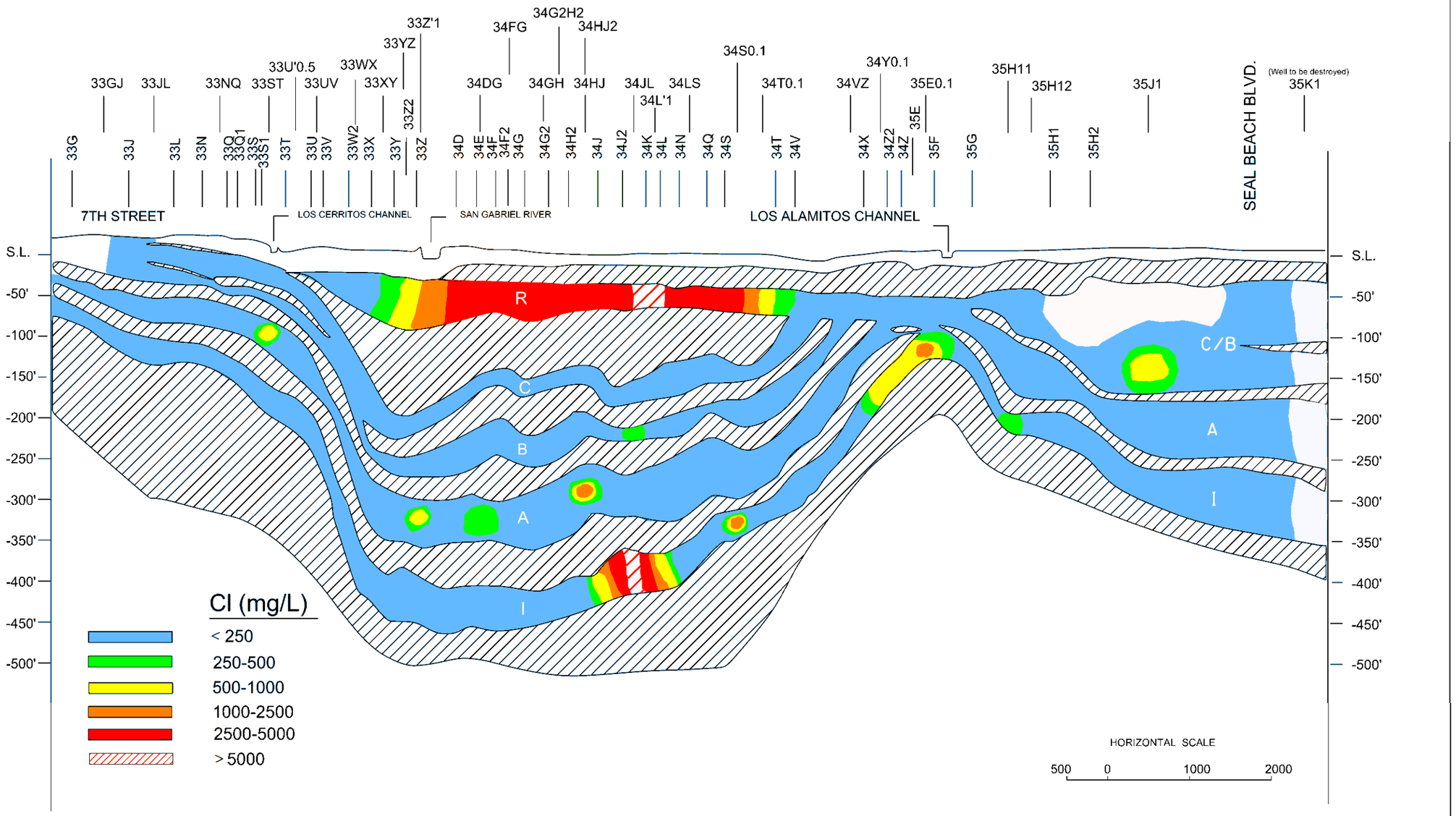
ALAMITOS BARRIER PROJECT
I-ZONE CHLORIDE CONCENTRATIONS
Chloride Data Used for Contours and Cross-Section

No.	PROJ	FCD	AQUIFER	DATE	Sampling Depths and Chloride Data						For Contours	MAX CHLORIDE FY22-23	Change in Chloride (FY23-24 - FY22-23)
					ELEV 1 (ft)	CHL 1 (mg/L)	ELEV 2 (ft)	CHL 2 (mg/L)	ELEV 3 (ft)	CHL 3 (mg/L)	MAX CHL. 23-24		
41	34N' 7	503AG	I	20230427	-221	92	-254	1,600	-274	1,900	1,900		
42	**34S0.1**	**503BW**	**I**	**20240404**	**-306**	**630**	**-310**	**3,200**			**3,200**	**950**	**2,250**
43	**34T0.1**	**503AD**	**I**	**20240409**	**-289**	**59**	**-312**	**67**	**-334**	**84**	**84**	**150**	**-66**
44	34U 8	513G	I	20240401	-360	130	-375	160			160	110	50
45	34V 20	513C	I	20240401	-386	150					150	91	59
46	34V3	503CE	I	20240401	-328	79					79	1,100	-1,021
47	**34VZ**	**503BG**	**I**	**20240403**	**-214**	**78**	**-224**	**80**			**80**	**70**	**10**
48	34W' 5	503AK	I	20240320	-156	2,700					2,700	2,700	0
49	34X40	513N	I	20240410	-331	1,000	-346	1,100			1,100	990	110
50	**34Y0.1**	**503CM**	**I**	**20230427**	**-175**	**70**	**-185**	**730**			**730**		
51	35D' 5	503AM	I	20230228	-89	560					560	2,000	-1,440
52	**35E0.1**	**503BJ**	**I**	**20240403**	**-114**	**1,100**					**1,100**	**3,200**	**-2,100**
53	35F 20	513H	I	20240411	-235	3,100	-245	3,200	-255	3,300	3,300	120	3,180
54	**35H 11**	**514H**	**I**	**20240411**	**-203**	**290**					**290**	**120**	**170**
55	**35J1**	**513M**	**I**	**20231121**	**-261**	**110**	**-271**	**100**	**-281**	**110**	**110**		
56	35N0.1	504N	I	20230301	-71	330					330	445	-115
57	OCWD-BS14/4		I	20240229		516					516	1,200	-684
58	OCWD-BS21/4		I	20240229		**1,160**					1,160		
59	34D	DP1									50	50	n/a
60	34X	DP2									50	50	n/a

DP = Dummy Point with an assumed chloride concentration of 50 mg/L placed at wells that were injecting into this zone during this reporting period.

Internodal Wells in **BOLD** and used for A-11 Barrier Cross Section

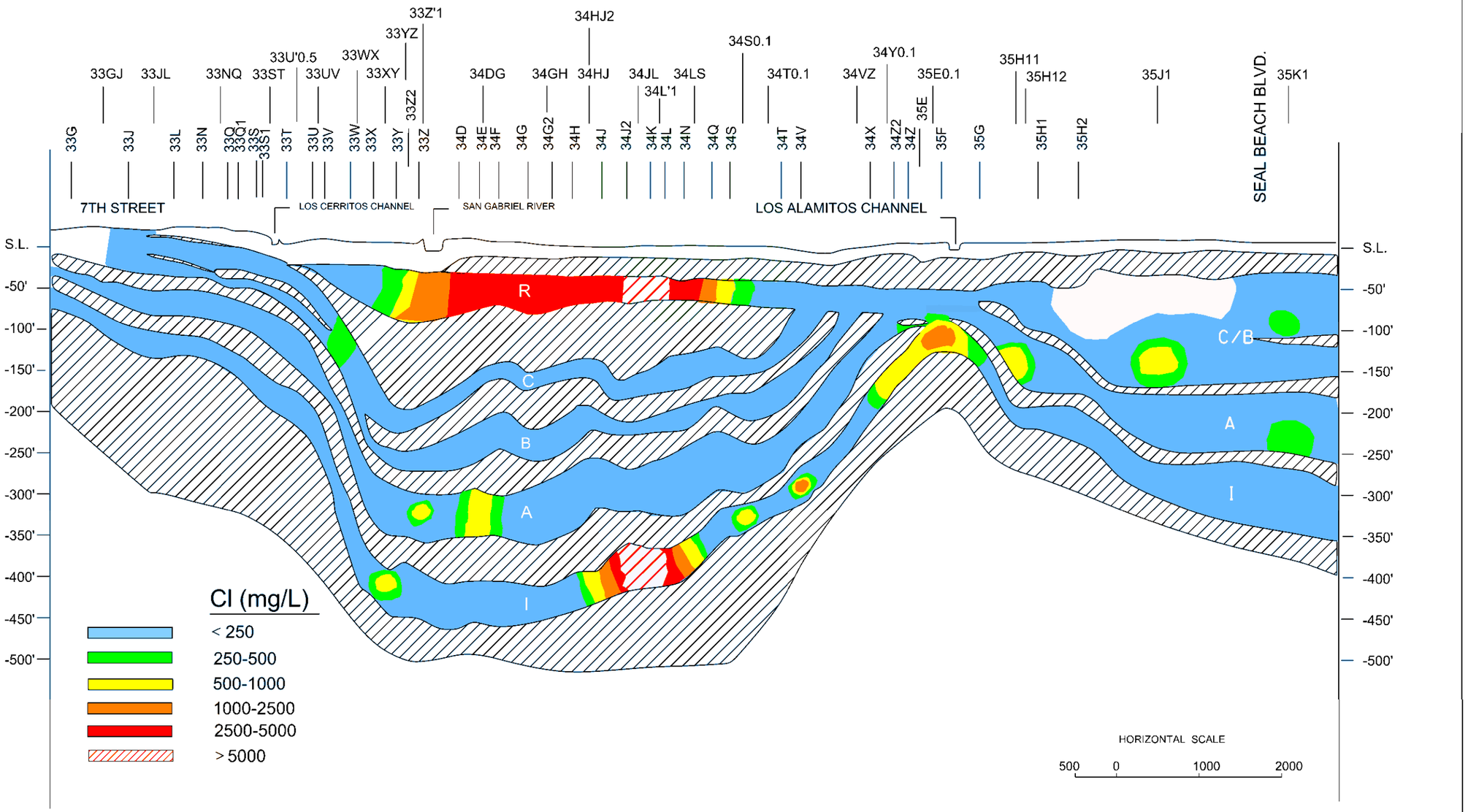
ALAMITOS BARRIER PROJECT
CHLORIDE CROSS-SECTION
Spring 2024



A-11.1

Note: The data points used to create this cross section are listed in the Appendix; A-6.3, 7.3, 8.3, 9.3, 9.4, 10.3, & 10.4

ALAMITOS BARRIER PROJECT
CHLORIDE CROSS-SECTION
SPRING 2023



A-11.2

Note: The data points used to create this cross section are listed in the Appendix; A-6.3, 7.3, 8.3, 9.3, 9.4, 10.3, & 10.4

ALAMITOS BARRIER PROJECT
Overview Map

Public Works
LOS ANGELES COUNTY

N

POINT A

POINT B

POINT C

POINT D

Leo J. Vander Lans Water Treatment Facility

LONG BEACH
LOS ANGELES COUNTY

LOS ALAMITOS
ORANGE COUNTY

SEAL BEACH
ORANGE COUNTY

SEAL BEACH FAULT

Added Tracer Study:
Fluorescein dye added at selected observation wells for detection

ABP Unit 15 Project:
Construct 5 injection wells and 2 observation wells

Observation Well Modifications:
Outfit observation wells to address artesian conditions

33W110
33U170
33H 57
33S52
33W54
33X54
33S43
33S40
33T29
33L30
33S20
33L23
33N21
33S18
33T15
33Q15
33T13
33T12.5
33U11
33W11
33X10
33Y10
33Z11
33X20
34H25
33Q9
33T9
33U3
33Y
33Q
33S
33T4
33T3
33U
33W2
33Z
34D
34F10
34F
34G
34G2
34G2H2
34HJ
34HJ2
34J2
34J
34JL
34K
34L1
34L
34N
34S
34S0.1
34T0.1
34T
34V3
34V
34X
34VZ
34W'5
34Y0.1
34Z2
34Z
35E
35D'5
35E0.1
35G
35F
35H11
35H2
35H12
35H1
35J1
35K1
35K12
35N0.1
35F20
34X40
34V20
34U8
34N21
34L10
34Q'22
34S'22P
34S'16
34V'18
34F'40
34K'47
34J'12
34N'16
34H'17
34H'17P
34H'18P
34E'23
34E'13
34D'6
34FG
34DG
33Y'35
33V'15P
33W'17
33W'14
33V'22
33V'14
33V'8
33T'13
33D0.1
33D'22
33V'46
32V'10
32Z'5
32Y'43
32V22
32X11
32U15
33G9
33G
33GJ
33J
33JL
33L3
33L
33N
33NC
33T
33U'0.5
33U'3
33V
33X
33XY
33Z2
33Z1
33Q1
33S1
PZ-1
PZ-2
PZ-3
PZ-6
PZ-7
PZ-8
PZ-9
33H'13
33V46
33V'10
33D'22
33Y'35
33V'32
34S'24
34K'47
34F'40
34Q'22
34S'16
34V'18
34W'17
34E'23
34H'17
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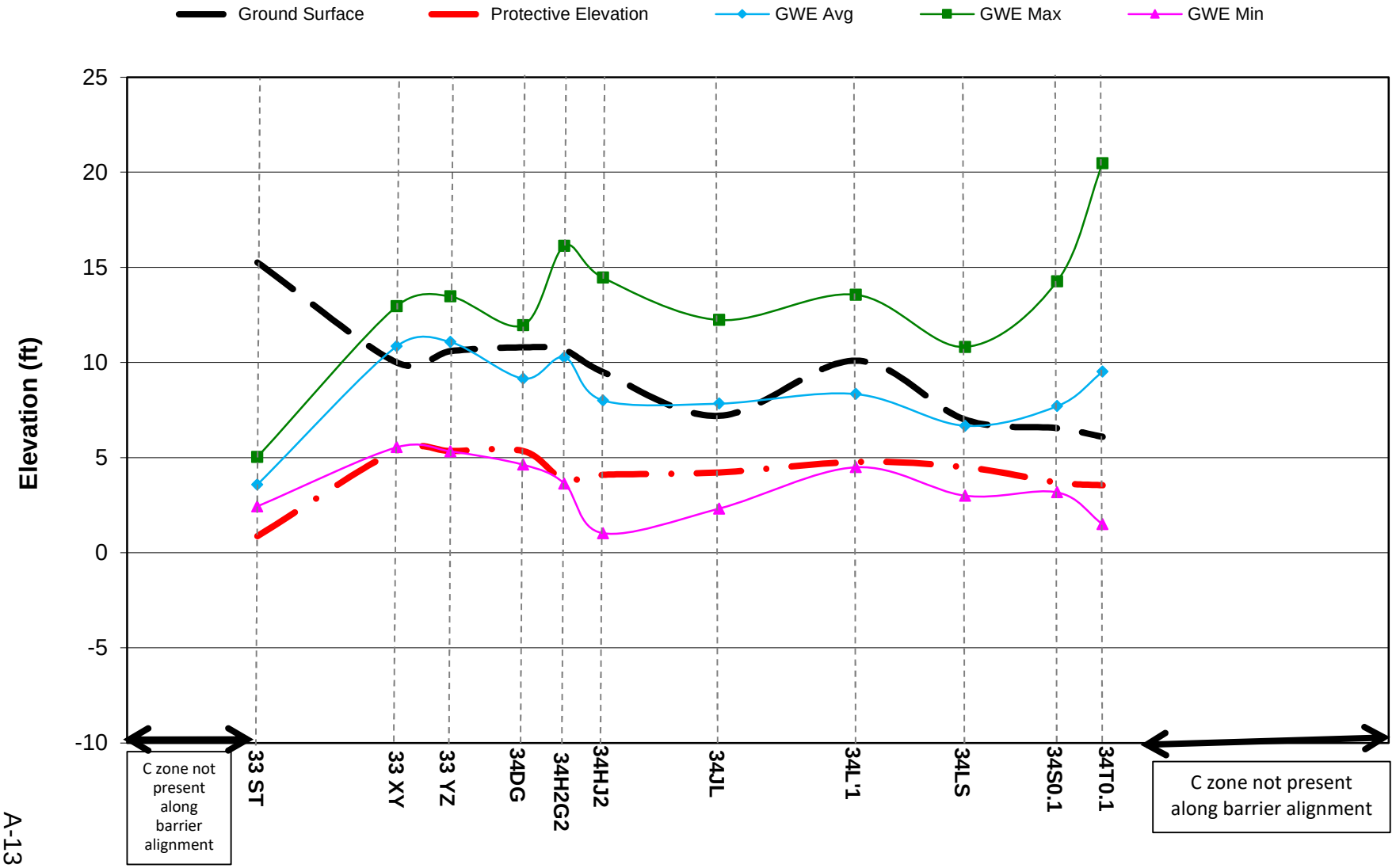
34H'18P
34J'12
34N'16
34N'7
34L'1
34FG
34DG
34D'6
34E'13
33V'15P
33V'22
33W'14
33W'17
33T'13
33V'8
33V'14
33D0.1
33D'22
32V'10
32Z'5
32Y'43
32V22
32X11
32U15
33G9
33G
33GJ
33J
33JL
33L3
33L
33N
33NC
33T
33U'0.5
33U'3
33V
33X
33XY
33Z2
33Z1
33Q1
33S1
PZ-1
PZ-2
PZ-3
PZ-6
PZ-7
PZ-8
PZ-9
33H'13
33V46
33V'10
33D'22
33Y'35
33V'32
34S'24
34K'47
34F'40
34Q'22
34S'16
34V'18
34W'17
34E'23
34H'17
34H'17P
34H'18P
34J'12
34N'16
34N'7
34L'1
34FG
34DG
34D'6
34E'13

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

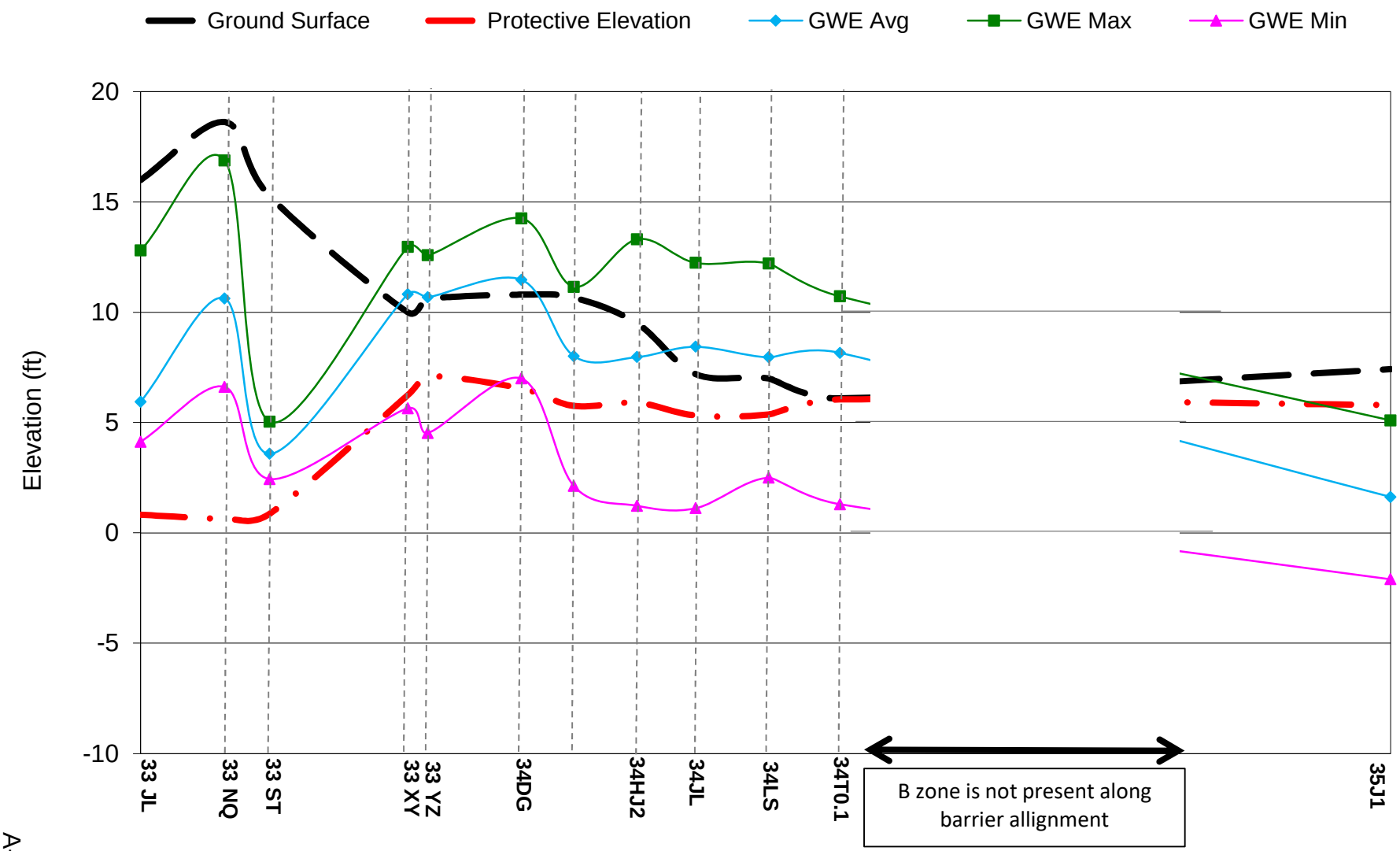
0 3,000 6,000 Feet

Legend
- Alamitos_Observation_Wells
- Alamitos_Injection_Wells
- Alamitos Water Supply Line

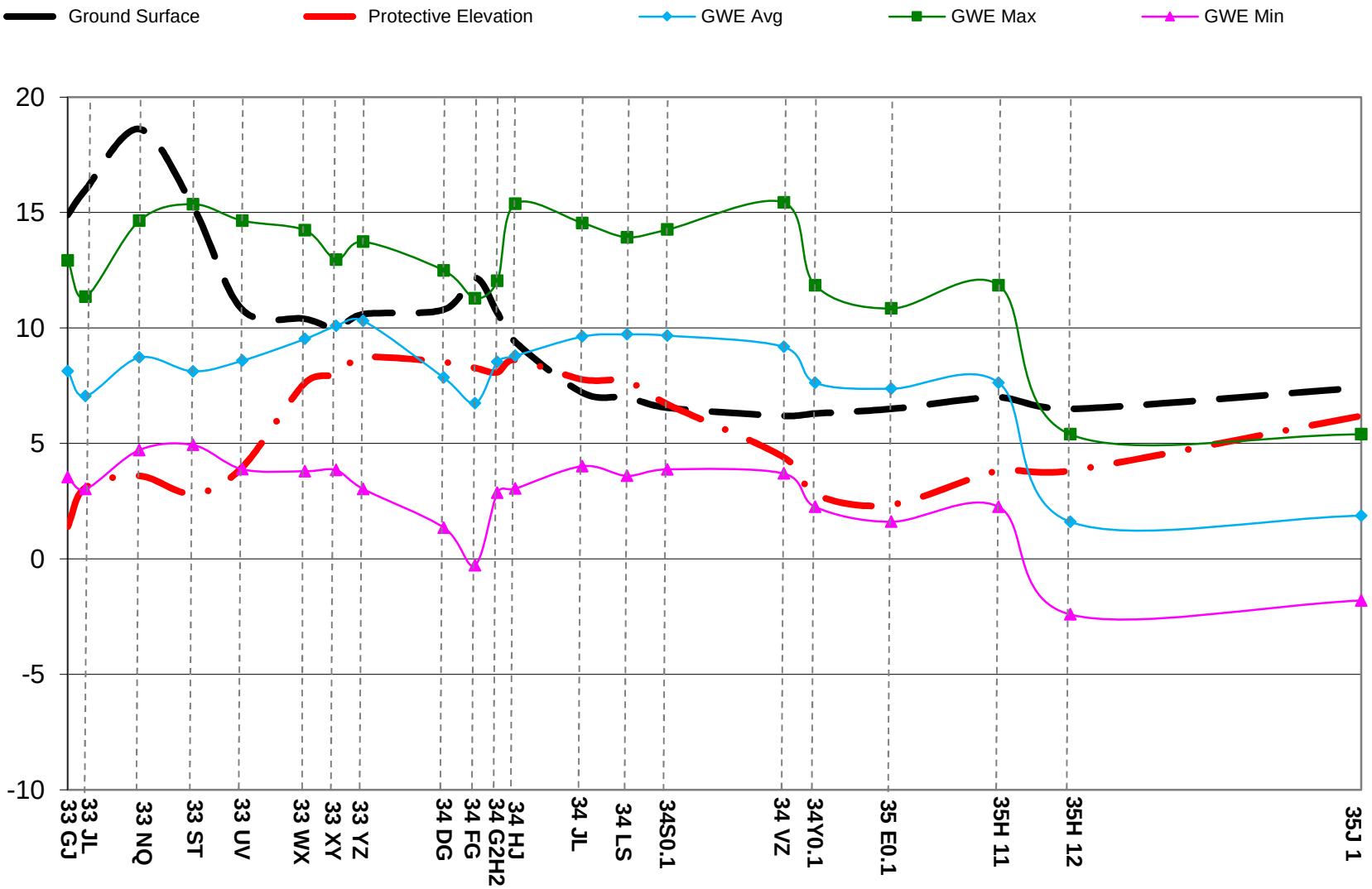
C Zone - Groundwater Elevation (GWE) Along the ABP FY23-24



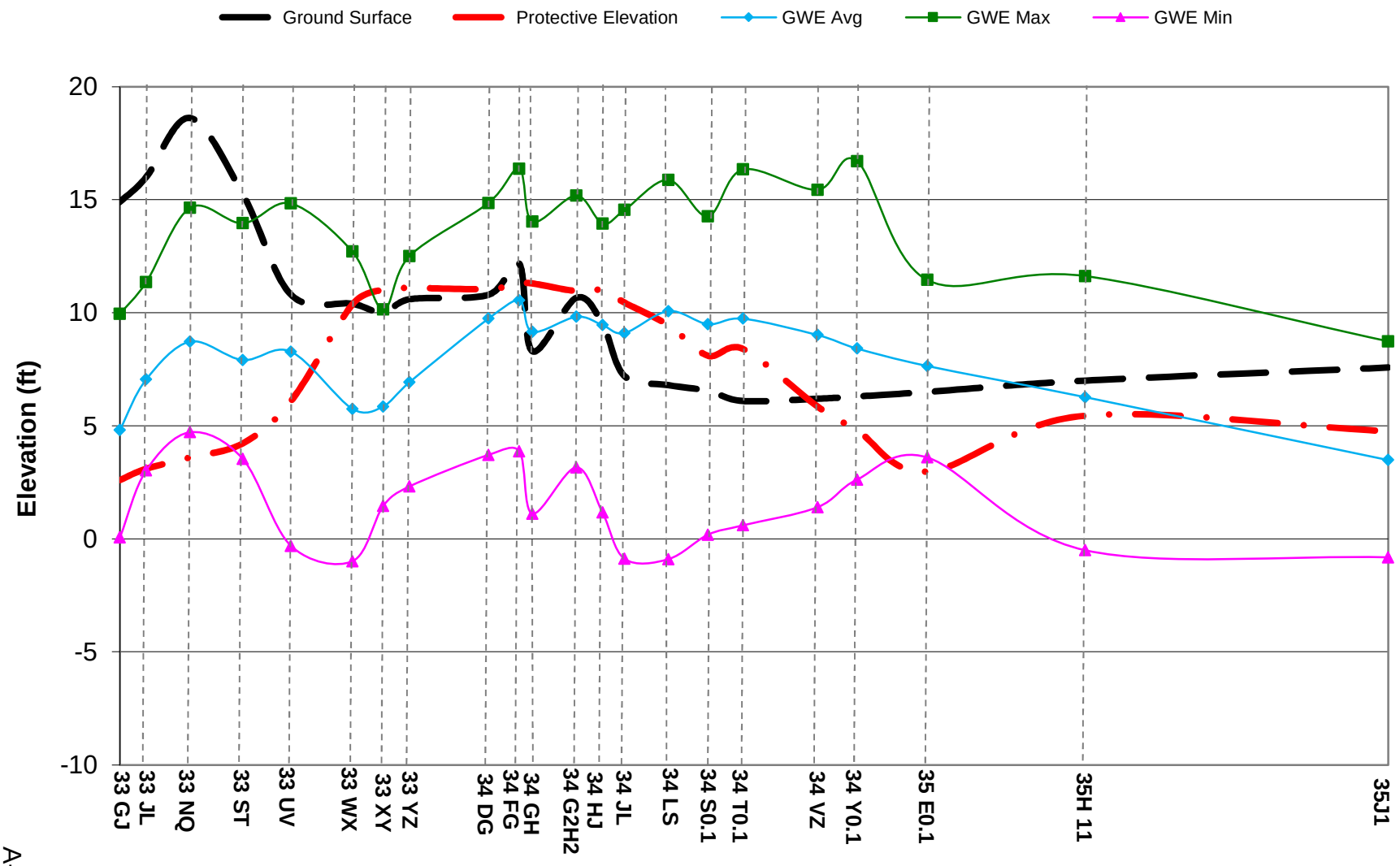
B Zone - Groundwater Elevation (GWE) Along the ABP FY23-24



A Zone - Groundwater Elevation (GWE) Along the ABP FY23-24



I Zone - Groundwater Elevation (GWE) Along the ABP FY23-24



ABP EXPENDITURES
FY 2023-24

ITEM NO.	DESCRIPTION	PROJECT NO.	DESCRIPTION	SERVICES AND SUPPLIES ($)	FY 2023-24 BUDGET ($)	BUDGET (%) FY 22-23	LADPW SHARE ($)	LACPW BUDGET ($) FY 23-24	LACPW BUDGET (%) FY 23-24	OCWD SHARE ($) 35.0%	OCWD BUDGET ($) FY 23-24	OCWD BUDGET (%) FY 23-24
1.	Analysis and direction of injection operations	H0321550	BARRIER PROJECT OPERATION GENERAL PCA (ABP PORTION)	148,988.34								
		H0321551	ANALYSIS & DIRECTION OF INJECTION OPERATIONS (ABP)	69,321.14								
			Subtotal #1	**218,309.48**	250,000	87.3%	**141,901.16**	150,000	94.6%	**76,408.32**	100,000	76.4%
2.	Maintenance and repair of injection wells	F5064011	INJECTION WELL MAINTENANCE DRILLERS (ABP)	29,831.57								
		F6004011	INJECTION WELLS MAINTENANCE SWMD (ABP)	211,809.50								
		F6980080F	MAINT ENGR - BARRIER PROJ SWMD-Management (ABP Portion)	13,382.71								
		H0321911	ALAMITOS BARRIER PROJECT TELEMETRY MAINTENANCE	88,528.39								
		HF01511000	LEED Telemtry Maintenance Contract (ABP Portion)	29,632.52								
		HF01524002*	ABP 34G WELL MODIFICATION (LACFCD COST ONLY)	3,596.39								
		H0321569	ALAMITOS BARRIER PROJECT (INJECTION WELLS)	109,420.67								
			Subtotal #2	**486,201.75**	525,000	92.6%	**316,031.14**	315,000	100.3%	**170,170.61**	210,000	81.0%
3.	Operations of injection wells	F6004000	RECHARGE OPER U/S - ABP	104,163.85								
			Subtotal #3	**104,163.85**	75,000	138.9%	**67,706.50**	45,000	150.5%	**36,457.35**	30,000	121.5%
4.	Analysis and direction of extraction operations (No cost to OCWD)											
			Subtotal #4	**0.00**	0	0.0%	**0.00**	0.0	0.0	**0.00**	0.0	0.0
5.	Maintenance, and repair of extraction wells (No cost to OCWD)			0.00								
			Subtotal #5	**0.00**	5,000	0.0%	**0.00**	5,000	0.0%	**0.00**	0.0	0.0
6.	Operation of extraction wells (No cost to OCWD)	F6000090	NON-LABOR EXP BARRIER (ALMT)	2,386.28								
			Subtotal #6	**2,386.28**	0	0.0%	**2,386.28**	5,000	47.7%	**0.00**	0.0	0.0
7.	Maintenance and repair of distribution system	F6004012	MAINTENANCE PRS - ABP	125,567.63								
		F6004014F	ABP Locate & Mark Barrier Proj. U/grd. Lines	44,406.43								
		H0321016	Seawater Barriers Administrative Support	64,688.89								
		H0321569	ALAMITOS BARRIER PROJECT (DISTRIBUTION SYSTEM)	65,652.40								
		F6004010	MAINT AIR/VAC-BLWOFF U/S - ABP	16,075.55								
		F6001907	CRANE INSPECTION AT PRS - ABP	97.17								
		HF01511000	LEED Telemtry Maintenance Contract (ABP Portion)	18,688.00								
			Subtotal #7	**335,176.08**	475,000	70.6%	**217,864.45**	285,000	76.4%	**117,311.63**	190,000	61.7%
8.	Observation Well Maintenance	F5064044	OBSERVATION WELL CLEANOUT (ABP)	68,008.60								
		HF01511000	LEED Telemtry Maintenance Contract (ABP Portion)	16,343.29								
		H0321569	ALAMITOS BARRIER PROJECT (OBSERVATION WELL)	43,768.27								
			Subtotal #8	**128,120.16**	200,000	64.1%	**83,278.10**	120,000	69.4%	**44,842.06**	80,000	56.1%
9.	Collection of Groundwater Data	H0321552	ABP COLLECTION OF GW DATA	142,484.51								
			OCPW Permit No. FE23-0117	565.00								
			Seal Beach Permit No. DPW04883	1,782.00								
			Seal Beach Permit No. DPW04923	792.00								
			Seal Beach Permit No. DPW04995	792.00								
			Subtotal #9	**146,415.51**	180,000	81.3%	**95,170.08**	108,000	88.1%	**51,245.43**	72,000	71.2%
10	Yard Maintenance	FFM34107	Facility Maintenance Alamitos Yd F107	21,854.17								
		F6003123	BUILDING MAINTENANCE NONRESI	26,975.07								
			Subtotal #10	**48,829.24**	80,000	61.0%	**31,739.00**	48,000	66.1%	**17,090.23**	32,000	53.4%
11.	Well Redevelopment	F4047149	Redevelop injection well 34F (I) - ABP	29,578.06								
		F4047150	Redevelop injection well 34G (A) - ABP	77,518.45								
		F4047157	Redevelop injection well 34J (A,I) - ABP	32,253.25								
		F4047211	Redevelop injection well 33Y - ABP	12,337.16								
		F4047266	Redevelop injection well 33G - ABP	34,479.49								
		F4047267	Redevelop injection well 33J - ABP	26,479.91								
		F4047268	Redevelop injection well 33L - ABP	36,953.35								
		F4047269	Redevelop injection well 33N - ABP	19,046.36								
		F4047277	Redevelop injection well 33Q - ABP	26,588.00								
		F4047278	Redevelop injection well 33Q1 - ABP	12,981.28								
		F4047303	Redevelop injection well 34H2(A) - ABP	7,126.83								
		F4047304	Redevelop injection well 34H2(I) - ABP	5,179.41								
		F4047305	Redevelop injection well 34F2 - ABP	5,903.89								
		F4047306	Redevelop injection well 34S (C/B) - ABP	2,049.66								
		F4047307	Redevelop injection well 34S (A) - ABP	1,264.50								
		F4047308	Redevelop injection well 34S (I) - ABP	1,041.05								
		F4047309	Redevelop injection well 33W2(C/B) - ABP	4,003.19								
		F4047310	Redevelop injection well 33W2(A/I) - ABP	3,331.92								
		F4047311	Redevelop injection well 33S(A/I) - ABP	30,577.85								
		F4047312	Redevelop injection well 33S1(C/B) - ABP	16,142.99								
		F4047313	Redevelop injection well 33T(A,I) - ABP	41,928.40								
		F4047314	Redevelop injection well 33U (A.I) - ABP	54,823.47								
		F4047318	Redevelop injection well 33V (A,I) - ABP	48,572.01								
		F4047319	Redevelop injection well 33U3 (C,B) - ABP	35,691.31								
		F4047321	Redevelop injection well 33X(CBA) - ABP	64,439.48								
		F4047328	Redevelop injection well 33Z (C,B,A,I) - ABP	64,565.24								
		F4047329	Redevelop injection well 34E (C,B) - ABP	34,160.43								
		F4047330	Redevelop injection well 34E (I) - ABP	21,452.69								
		H0321850	Layne Redevelopment Services (Video Survey)	13,300.00								
		H0321554	ABP WELL REDEVELOPMENT PROGRAM ENGINEERING STAFF	279,012.81								
		H0321565	ABP NPDES MONITORING & REPORT INJECTION WELL REDEVELOPMENT	53,651.65								
		F5064022	ABP INJECTION WELL REDEVELOPMENT DRILLER & MAINTENANCE	124,967.12								
		F5009760F	DRILL EQPT-MAINT&TEST (ABP Portion)	132,043.94								
		F6001904	CONDUCT QUARTERLY INSPECTION MECHANCAL EQUIPMENT	292.43								
		F6001920	CONDUCT QUARTERLY INSPECTION MECHANCAL EQUIPMENT	1,313.38								
		F7001907	QUARTERLY INSPECTION OF 2	1,886.25								
			OCPW Permit No. FE23-0116	665.00								
		AD23-2027	26C-0014D-23-2027(F5009760F) PO FOR BOOM TRUCK REPAIR (ABP portion)	232.11								
			Subtotal #11	**1,357,834.31**	1,200,000	113.2%	**882,592.30**	720,000	122.6%	**475,242.01**	480,000	99.0%
12.	Processing of data and preparation of reports	H0321553	ABP DATA PROJECTS & PREPERATION OF REPORTS	55,291.53								
			Subtotal #12	**55,291.53**	60,000	92.2%	**35,939.49**	36,000	99.8%	**19,352.04**	24,000	80.6%
13.	Reclaim Water Program	H0321556	ABP RECLAIMED WATER SUPPLY	30,278.81								
		F6060749	ABP RECYCLED WATER REPAIR & MAINTENANCE DUE TO LVL SHUTDOWNS									
			Subtotal #13	**30,278.81**	30,000	100.9%	**19,681.23**	18,000	109.3%	**10,597.58**	12,000	88.3%
14	Projects & Studies	EF02620001	Alamitos Barrier Project Unit 15 Replacement Injection	651,586.63								
			Subtotal #14	**651,586.63**	-	0.0%	**651,586.63**	-	0.0%	**0.00**	-	0.0%
15.	ABP Liabilty Insurance Premiums paid separately by	N/A	ABP General Liability Coverage FY 23-24 (CRC Group)	80,530.00								
			Subtotal #15	**80,530.00**	80,000	100.7%	**40,265.00**	40,000	100.7%	**40,265.00**	40,000	100.7%
			TOTAL	**3,645,123.62**	**3,160,000.00**	115.4%	**2,586,141.37**	1,895,000.00	136.5%	**1,058,982.25**	1,270,000.00	83.4%

NOTES:

1. OCWD share represents 35.0 % of the total costs in all Items except for 4, 5, and 6. The percentage is based on amount of overall barrier injection water provided to the Orange County portion of the ABP during this fiscal year.

2. Per Agreement No. 8458 between the LACFCD and the OCWD, all costs included in Items 4, 5, and 6 are not reimburseable with respect to OCWD.

3. OCWD will not be responsible for Item 14, Alamitos Barrier Project Unit 15 Replacement Injection project.

4. Per Agreement No. 8458 between the LACFCD and the OCWD, the cost of liability insurance (item 15) shall be split equally among the Parties.

5. OCWD FY23-24 Budget totals $1,144,000 ($572,000).

Total Operation and Maintenance Cost (not including insurance premium)	$	3,564,993.62
Orange County Share of Operation and Maintenance Cost (not including insurance premium)	$	1,018,717.25
Less: Los Angeles County's Share of the FY23-24 Liability Insurance	$	40,265.00
Less: Permit fee paid by OCWD	$	4,556.00
Less: Advance Deposit Paid by OCWD*	$	572,000.00
BALANCE DUE FROM ORANGE COUNTY WATER DISTRICT	**$**	**401,856.25**

ABP FY 2025-26 Operation and Maintenance Budget

JMC Item No.	Budget Item Description	Fiscal Year	TOTAL (LACFCD & OCWD) Budget	TOTAL (LACFCD & OCWD) Actual	LACFCD Budget	LACFCD Actual	OCWD Budget	OCWD Actual
01	Injection Operations (Analysis and Direction)	2021-22	$ 200,000	$ 179,967	$ 120,000	$ 112,263	$ 80,000	$ 67,704
		2022-23	$ 250,000	$ 187,786	$ 150,000	$ 117,780	$ 100,000	$ 70,006
		2023-24	$ 250,000	$ 218,309	$ 150,000	$ 141,901	$ 100,000	$ 76,408
		2024-25	$ 250,000		$ 150,000		$ 100,000	
		2025-26	*$ 250,000*		*$ 150,000*		*$ 100,000*	
02	Injection Well Maintenance and Repair	2021-22	$ 550,000	$ 380,342	$ 330,000	$ 237,257	$ 220,000	$ 143,085
		2022-23	$ 450,000	$ 495,523	$ 270,000	$ 310,793	$ 180,000	$ 184,729
		2023-24	$ 500,000	$ 486,434	$ 300,000	$ 316,182	$ 200,000	$ 170,252
		2024-25	$ 525,000		$ 315,000		$ 210,000	
		2025-26	*$ 525,000*		*$ 315,000*		*$ 210,000*	
03	Operations of Injection	2021-22	$ 70,000	$ 56,847	$ 42,000	$ 35,461	$ 28,000	$ 21,386
		2022-23	$ 75,000	$ 64,234	$ 45,000	$ 40,288	$ 30,000	$ 23,946
		2023-24	$ 75,000	$ 104,164	$ 45,000	$ 67,707	$ 30,000	$ 36,457
		2024-25	$ 75,000		$ 45,000		$ 30,000	
		2025-26	*$ 75,000*		*$ 45,000*		*$ 30,000*	
04	Extraction Operations (Analysis and Direction)	2021-22	$ -	$ -	$ -	$ -	$ -	$ -
		2022-23	$ -	$ -	$ -	$ -	$ -	$ -
		2023-24	$ -	$ -	$ -	$ -	$ -	$ -
		2024-25	$ -		$ -		$ -	
		2025-26	*$ -*		*$ -*		*$ -*	
05	Extraction Well Maintenance, Repair, and Redevelopment	2021-22	$ 10,000	$ -	$ 10,000	$ -	$ -	$ -
		2022-23	$ 10,000	$ -	$ 10,000	$ -	$ -	$ -
		2023-24	$ 5,000	$ -	$ 5,000	$ -	$ -	$ -
		2024-25	$ 5,000		$ 5,000		$ -	
		2025-26	*$ 5,000*		*$ 5,000*		*$ -*	
06	Extraction Well Operations	2021-22	$ 5,000	$ 2,847	$ 5,000	$ 2,847	$ -	$ -
		2022-23	$ 5,000	$ 912	$ 5,000	$ 912	$ -	$ -
		2023-24	$ 5,000	$ 2,386	$ 5,000	$ 2,386	$ -	$ -
		2024-25	$ -		$ -		$ -	
		2025-26	*$ -*		*$ -*		*$ -*	
07	ABP Supply line and Vaults (Maintenance and Repair)	2021-22	$ 375,000	$ 381,185	$ 225,000	$ 237,783	$ 150,000	$ 143,402
		2022-23	$ 400,000	$ 433,476	$ 240,000	$ 271,877	$ 160,000	$ 161,599
		2023-24	$ 450,000	$ 335,176	$ 270,000	$ 217,864	$ 180,000	$ 117,312
		2024-25	$ 475,000		$ 285,000		$ 190,000	
		2025-26	*$ 475,000*		*$ 285,000*		*$ 190,000*	
08	Observation Well Maintenance	2021-22	$ 150,000	$ 99,438	$ 90,000	$ 62,030	$ 60,000	$ 37,409
		2022-23	$ 200,000	$ 96,691	$ 120,000	$ 60,645	$ 80,000	$ 36,046
		2023-24	$ 200,000	$ 128,120	$ 120,000	$ 83,278	$ 80,000	$ 44,842
		2024-25	$ 200,000		$ 120,000		$ 80,000	
		2025-26	*$ 185,000*		*$ 111,000*		*$ 74,000*	
09	Groundwater Data Collection	2021-22	$ 200,000	$ 127,304	$ 120,000	$ 79,412	$ 80,000	$ 47,892
		2022-23	$ 200,000	$ 179,600	$ 120,000	$ 112,646	$ 80,000	$ 66,955
		2023-24	$ 180,000	$ 146,416	$ 108,000	$ 95,170	$ 72,000	$ 51,245
		2024-25	$ 180,000		$ 108,000		$ 72,000	
		2025-26	*$ 180,000*		*$ 108,000*		*$ 72,000*	
10	Yard Maintenance	2021-22	$ 75,000	$ 53,717	$ 65,000	$ 33,509	$ 10,000	$ 20,208
		2022-23	$ 50,000	$ 71,863	$ 30,000	$ 45,073	$ 20,000	$ 26,790
		2023-24	$ 75,000	$ 48,829	$ 55,000	$ 31,739	$ 20,000	$ 17,090
		2024-25	$ 80,000		$ 57,500		$ 22,500	
		2025-26	*$ 80,000*		*$ 57,500*		*$ 22,500*	
11	Injection Well Redevelopment	2021-22	$ 1,000,000	$ 1,073,814	$ 600,000	$ 669,845	$ 400,000	$ 403,969
		2022-23	$ 1,000,000	$ 1,249,732	$ 600,000	$ 783,835	$ 400,000	$ 465,897
		2023-24	$ 1,000,000	$ 1,357,602	$ 600,000	$ 882,441	$ 400,000	$ 475,161
		2024-25	$ 1,200,000		$ 720,000		$ 480,000	
		2025-26	*$ 1,300,000*		*$ 780,000*		*$ 520,000*	
12	Processing Data and Report Preparation	2021-22	$ 70,000	$ 33,643	$ 42,000	$ 20,986	$ 28,000	$ 12,656
		2022-23	$ 70,000	$ 46,450	$ 42,000	$ 29,134	$ 28,000	$ 17,317
		2023-24	$ 60,000	$ 55,292	$ 36,000	$ 35,939	$ 24,000	$ 19,352
		2024-25	$ 60,000		$ 36,000		$ 24,000	
		2025-26	*$ 60,000*		*$ 36,000*		*$ 24,000*	
13	Recycled Water Program Oversight	2021-22	$ 30,000	$ 17,205	$ 18,000	$ 10,733	$ 12,000	$ 6,473
		2022-23	$ 30,000	$ 10,106	$ 18,000	$ 6,339	$ 12,000	$ 3,768
		2023-24	$ 30,000	$ 30,279	$ 18,000	$ 19,681	$ 12,000	$ 10,598
		2024-25	$ 30,000		$ 18,000		$ 12,000	
		2025-26	*$ 30,000*		*$ 18,000*		*$ 12,000*	
14	Projects and Studies	2021-22	$ 63,000	$ 599,178	$ 55,000	$ 563,636	$ 8,000	$ 35,542
		2022-23	$ 65,000	$ 1,389,643	$ 39,000	$ 1,364,537	$ 26,000	*$ 25,105*
		2023-24	$ 65,000	$ 651,587	$ 39,000	$ 651,587	$ 26,000	$ -
		2024-25	$ -		$ -		$ -	
		2025-26	*$ -*		*$ -*		*$ -*	
15	ABP Liability Insurance	2021-22	$ 80,000	$ 76,234	$ 40,000	$ 38,117	$ 40,000	$ 38,117
		2022-23	$ 80,000	$ 76,352	$ 40,000	$ 38,176	$ 40,000	$ 38,176
		2023-24	$ 85,000	$ 80,530	$ 42,500	$ 40,265	$ 42,500	$ 40,265
		2024-25	$ 85,000		$ 42,500		$ 42,500	
		2025-26	*$ 100,000*		*$ 50,000*		*$ 50,000*	
Total ABP Expenditure		2021-22	$ 2,878,000	$ 3,081,722	$ 1,762,000	$ 2,103,880	$ 1,116,000	$ 977,841
		2022-23	$ 2,885,000	$ 4,302,370	$ 1,729,000	$ 3,182,035	$ 1,156,000	$ 1,120,334
		2023-24	$ 2,980,000	$ 3,645,124	$ 1,793,500	$ 2,586,141	$ 1,186,500	$ 1,058,982
		2024-25[1]	$ 3,165,000		$ 1,902,000		$ 1,263,000	
		2025-26	*$ 3,265,000*		*$ 1,960,500*		*$ 1,304,500*	
ABP Operations and Maintenance [Item 16-Item 15]		2021-22	$ 2,798,000	$ 3,005,488	$ 1,722,000	$ 2,065,763	$ 1,076,000	$ 939,724
		2022-23	$ 2,805,000	$ 4,226,018	$ 1,689,000	$ 3,143,859	$ 1,116,000	$ 1,082,158
		2023-24	$ 2,895,000	$ 3,564,594	$ 1,751,000	$ 2,545,876	$ 1,144,000	$ 1,018,717
		2024-25[1]	$ 3,080,000		$ 1,859,500		$ 1,220,500	
		2025-26	*$ 3,165,000*		*$ 1,910,500*		*$ 1,254,500*	

[1] *Corrected budget figure for record purposes*

Volume of Water (ac-ft)

	Fiscal Year	TOTAL Budget	TOTAL Actual	WRD (LACFCD PORTION) Budget	WRD (LACFCD PORTION) Actual	OCWD Budget	OCWD Actual
Volume of Water (AC-FEET)	2021-22	7,000	7,188	4,200	2,704	2,800	4,484
	2022-23	7,500	6,475	4,500	2,414	3,000	4,061
	2023-24	8,000	6,041	4,800	3,926	3,200	2,114
	2024-25	8,000		4,800		3,200	
	2025-26	*8,000*		*4,800*		*3,200*	