January 23, 2020

MEMORANDUM

To: Melissa Bland and John Weingold, Cambria Community Services District

From: Gus Yates, Senior Hydrologist

Re: Water Reclamation Facility Project: Potential Impacts of Project Operation on Pools and Flow in San Simeon Creek and Lagoon

Cambria Community Services District (District) plans to operate its Water Reclamation Facility (WRF) during dry years to supplement water supplies available for municipal use. The WRF would extract, treat and reinject groundwater in the lower San Simeon Creek basin in such a way that the groundwater balance would become more negative. This shift in the water balance would tend to decrease existing groundwater outflow to the lower end of San Simeon Creek and the San Simeon Creek lagoon. To offset this potential impact, the project includes a discharge of 100 gallons per minute (gpm) of water directly into the creek to offset any reduction in groundwater discharge. Concerns have been raised regarding the adequacy of this mitigation measure.

This memorandum evaluates the potential impacts of WRF operation and the adequacy of the mitigation discharge. Three approaches are used to address the issue: interpretation of previous groundwater modeling studies, correlation of basic data time series, and analysis of estimated changes in the groundwater balance.

SOURCES OF INFORMATION

A groundwater flow model of the San Simeon basin was developed in 2007 for the Water Master Plan environmental impact report (Yates, 2007). The proposed project at that time was a seawater desalination facility rather than the WRF, but creek and lagoon impacts were simulated and discussed. In 2014, a new model was developed to simulate the WRF, which was being operated at that time as an emergency water supply. The model inherited many features of the 2007 model but included finer grid spacing and capabilities to simulate solute transport and seawater intrusion (CDM Smith, 2014). A tracer test was conducted in 2014 (CDM Smith, 2017) to measure the travel time of groundwater from the injection well to wells SS-1 and SS-2.

The District regularly monitors numerous elements of the groundwater, water supply and wastewater disposal systems, including groundwater production and levels at numerous wells, wastewater percolation, San Simeon Creek pools, and WRF pumping and injection.

These data were compiled into monthly time series for 2005-2018 and inspected for correlations.

PROJECT DESCRIPTION AND ASSUMPTIONS

The WRF project is located at the lower end of the San Simeon Creek groundwater basin, about two miles north of Cambria (**Figure 1**). It consists of a groundwater production well, advanced water treatment plant (AWTP) and an injection well. The production well (well 9P7) is located in the middle of four ponds that are used on a rotational basis for percolating recycled water from an off-site municipal wastewater treatment plant. A nearby well (9P4) is used by a neighboring landowner (Clyde Warren) to irrigate cropland north of the site under the terms of a legal settlement signed in 2006. The District operates three municipal wells (SS-1, SS-2 and SS-3) about 2,000 feet upstream of the wastewater disposal area. The recycled water injection well (RIW) is located approximately midway between the percolation pond area and the municipal well field.

Flow in San Simeon Creek is seasonally intermittent. At the lower end of the basin, flow typically stops in late spring or early summer and does not reappear until wet weather returns the following winter (usually November or December). However, groundwater flow down the basin discharges into the creek channel and lagoon near the road and pedestrian bridges at the downstream end of the percolation pond area. Two perennial pools known as the "Van Gordon Pool" and the "Red Legged Pool" are located in the creek channel approximately 300 and 500 feet upstream of the pedestrian bridge, respectively.

Under predevelopment conditions, groundwater discharge to the creek and lagoon would have been sustained by drainage of groundwater storage farther up the basin. Now, the municipal well field (and irrigation wells upstream of the well field) intercept much of that drainage, and discharge to the lagoon is sustained in large part by wastewater percolated at the ponds that reemerges as seepage into the creek and lagoon.

The pumping and injection rates assumed here are from the project description in the subsequent environmental impact report (SEIR) (Michael Baker International, 2016) and subsequent changes in the permit terms and conditions. They differ somewhat from rates assumed in the 2014 modeling study and recommended in the 2017 tracer test report. For example, the modeling study assumed a 9P7 pumping rate of 710 gallons per minute (gpm), an injection rate of 485 gpm and an increase in well field pumping of 227 gpm. The actual capacity of well 9P7 is 630 gpm, which was the rate assumed in the SEIR. The corresponding injection rate was 452 gpm. The subsequent tracer study recommended an injection rate of 400 gpm to ensure adequate subsurface residence time, and the Regional Water Quality Control Board later incorporated this rate in the terms of the permit. In this analysis, the mitigation discharge to the lagoon is assumed to remain at 100 gpm while all other flows are scaled to match the reduction in injection rate from 452 to 400 gpm. The resulting estimate of 9P7 pumping is 581 gpm. The increase in well field pumping when the project is operating was not stated in the SEIR and is assumed here to equal 47 percent of the injection well rate (which is the percentage in the 2014 modeling study).

A key difference between the SEIR project description and the 2014 modeling study is the duration of project operation. The SEIR assumes 6 months of operation but acknowledges that the District might extend that if conditions warrant. The modeling study simulated 15 months of operation. It is reasonable to assume that operation might need to continue for up to 18 months. This is because it will be particularly essential in dry years when San Simeon Creek does not flow at all or flow is too meager to fully replenish the basin. A statistical analysis of 120 years of San Luis Obispo rainfall (which is correlated with San Simeon Creek flow) indicated that the recurrence interval of one year with incomplete basin recharge is about 25 years (Yates and Van Konynenburg, 1998). This is sufficiently frequent to include in project planning analysis. Thus, if the project commences operation in mid-summer, continues through one winter with little or no stream flow and through the following dry season until stream flow resumes, it would be in operation for about 18 months. The recurrence interval of two successive years with incomplete basin recharge was estimated at 730 years, which is too infrequent to be worth considering in project design.

MODELING APPROACH

Groundwater flow models are rigorous quantitative analysis tools that can provide estimates of groundwater levels and flow at any location in the flow system at any time. They can also simulate hypothetical future conditions under various management alternatives. The 2007 and 2014 modeling reports both included results relevant to this evaluation of lagoon impacts. The 2007 model showed that groundwater discharges to the creek and lagoon were the first flows to be impacted by lowered groundwater levels in the percolation pond area. Subsurface outflow (or seawater intrusion) via deeper pathways was less affected because a change in water level near the percolation ponds resulted in a relatively small change in the overall gradient from there to the ocean. The 2007 model estimated that about 25% of total outflow was by deep flow paths directly to the ocean. It also estimated that about 30% of the groundwater discharge to the creek and lagoon was downstream of the pedestrian bridge. However, there were no data to calibrate or confirm these partitioning percentages. Conversely, excess recharge manifested primarily as additional discharge to the creek and lagoon, with only a slight increase in subsurface outflow.

The 2014 modeling report included several figures documenting simulation results relevant to lagoon inflow impacts. Three of them are reproduced for inclusion in this memorandum. **Figure 2** shows contours of simulated groundwater levels after one year of continuous project operation. **Figure 3** shows elements of the lower-basin groundwater balance throughout the 15-month simulation. **Figure 4** shows a hydrograph of simulated water levels in well 16D1. The contours show that after one year of pumping, well 9P7 developed a cone of depression that was the low point of the entire flow system. West of 9P7 the flow direction had reversed from seaward to landward. Farther inland, the water-level mound associated with the injection well appeared to send water about equally toward 9P7 and production wells SS-1 and SS-2. The cone of depression and the mound both deviated from the regional water-level gradient by roughly 5 feet. Among other things, these contours imply that prolonged project operation is likely to result in seawater intrusion.

The monthly simulated groundwater flows (Figure 3) show that groundwater storage was being depleted throughout the simulation. The rate was relatively small and steady during the winter and spring (months 4-10 of the simulation) but high in summer. The high summer depletion resulted from assumed irrigation pumping by Clyde Warren. The 2006 settlement agreement allows him to pump up to 183.5 acre-feet per year (AFY), which is the assumption in the model. In reality, his pumping in recent years has been much less: 0-43 AFY during 2012-2018 (average = 14.5 AFY). CCSD has agreed not to pump from well 9P7 when Warren is pumping from 9P4, so the effects would not be additive. By including both wells pumping concurrently, the 2014 model overstated the water balance impact in months 11-15 of the simulation. Nevertheless, the model confirmed that at higher rates of pumping, seawater intrusion would likely commence.

Simulated shallow groundwater elevations next to the lagoon in the 2014 model were stable at around 6 feet (NAVD88) during simulation months 4-10, then declined at 1.5 feet per month during months 11-15 as a result of the Warren irrigation pumping (Figure 4).

The 2014 modeling results indicate that the project might be able to operate for 12-15 months without substantially lowering groundwater levels near the pools and upper end of the lagoon as long as Warren pumping is negligible.

Subsequent modeling showed that lagoon elevation would likely decline by about 6 feet over a two-year period with no San Simeon Creek flow, and that mitigation discharges of 50 or 100 gpm would raise the lagoon level by 1.5 or 3.0 feet, respectively (CDM Smith 2015). This suggests that the mitigation discharge could be adjusted in an adaptive management approach to compensate for uncertainty in the predicted effect of WRF operation on lagoon inflow or elevation.

DATA CORRELATION APPROACH

Time series plots of groundwater levels, pumping and wastewater percolation during 2005-2018 were prepared to identify possible correlations between water levels in well 16D1 and factors that might influence those water levels. These are shown in **Figure 5**. Three patterns are noticeable in the 16D1 hydrograph. The first is a steady gradual decline in dry-season water level of about 1 foot per 7 years throughout the 2004-2018 period. The only other variable with a similar pattern is wastewater percolation, and a decrease in percolation could logically result in lower water levels at 16D1. The cumulative decrease of about 2 feet in the 16D1 water level was probably associated with a similar decline in pool elevation in the creek. **Table 1** shows surveyed water elevations, creek bed elevations and pool water depths at the pools. Unfortunately, the surveys were done by different people at different times, so the locations do not exactly coincide. Nevertheless, the estimated pool elevations of 4.8 to 5.4 feet in fall 2017 are essentially equal to the groundwater elevation in nearby well 16D1 (within the range of uncertainty of the pool elevations). These data confirm the expected link between pool elevations and nearby groundwater levels.

Table 1. San Simeon Creek Pool Elevations

Location	February 2012 Water Surface Elevation (ft NAVD88)	Thalweg Elevation from Creek Survey (ft NAVD88)	Fall 2017	
			Water Depth (ft)	Estimated Water Surface Elevation (ft NAVD88)
Van Gordon Pool	5.56	3.98	0.8	4.78
Red Legged Pool	5.64	4.43	1	5.43
Creek flowing?	Yes	n.a.	No	No

The 16D1 hydrograph shows that the pools have probably sustained a decline of about 2 feet over the past 14 years. In 2017, the pools were only about 1 foot deep during the dry season. Therefore, continued decline from the current cause or additional decline from new project effects would likely dry the pools up within the foreseeable future, with or without additional decline associated with SRF operation.

Stream flow entering the lagoon would be a more sensitive indicator of impacts than groundwater levels. The water level fluctuations in the pools and 16D1 are over a small range and are hence difficult to accurately correlate with flow. The District did monitor flow at the pedestrian bridge during 2004 and 2005, and the data are shown in **Figure 6**. The dry season started a month later in 2005 compared to 2004, but lagoon inflow averaged about 0.45 cfs in both years. This flow could be compared with current dry-season flows to confirm whether the decline in water levels corresponds to a decline in flow.

The second pattern noticeable in the 16D1 hydrograph is that water levels are generally slightly higher when there is flow in San Simeon Creek, as would be expected if groundwater and surface water are hydraulically coupled. Water levels in well 11C1—located at the upper end of the basin—are included in Figure 5 to indicate periods when San Simeon Creek is flowing (a rapid rise followed by sustained high water levels).

The third pattern evident in the 16D1 hydrograph is a slight increase in water-level variability during periods when 9P7 was pumping to supply the WRF project. This could have resulted from intermittent operation of the 100 gpm mitigation discharge to the creek near 16D1. If that is the cause, it would further confirm the presence of hydraulic connection.

Water levels in well 16D1 generally exhibit much less variation than water levels in 9P2 and 9P7, even though the wells are only about 1,400 feet apart. Well 9P2 is near 9P7 and is not currently active. Its depth is not known. Well 9P7 is relatively shallow, with a screened interval 30-70 feet below the ground surface. Well 9P2 shows much larger seasonal variation in water levels than well 9P7, for example from 2005 through 2014. Those fluctuations correlate with the presence or absence of flow in San Simeon Creek and also with pumping from 9P4 and 9P7. It can be inferred that the depth interval tapped by well 9P2 is hydraulically more connected to either or both of those influencing factors than to the percolation ponds. In contrast, the water level in 9P7 tends to remain relatively constant, suggesting that it is more strongly influenced by the percolation ponds. The conspicuous water-level fluctuations in 9P7 water levels in 2015 and 2016 correlated with pumping from the well itself, as would be expected.

The rates and durations of Warren pumping and WRF pumping from 9P7 in recent years have been too small to detect effects on water levels at 16D1. Warren pumping was seasonal, with maximum monthly rates of about 6 acre-feet per month (AF/mo) lasting only 3-4 months. This was only 7 percent of the planned 9P7 pumping rate under full-time WRF operation (but 20 percent of the net WRF impact on the local groundwater balance in summer months, as discussed below). WRF operation in 2015 and 2016 was only 40 hours per week for periods of 2-4 months. This corresponds to about 23 percent of full-time project operation. Drawdown spreads radially outward from a pumping well at a gradual rate that is moderated by storage depletion in the aquifer. Thus, drawdown would take some time to arrive at well 16D1, and it is not surprising that neither Warren pumping nor WRF operation produced measurable drawdown at well 16D1.

WATER BALANCE APPROACH

The water balance approach assumes that over a sufficiently long period of time, changes in pumping and recharge in the lower basin area will be balanced by a change in groundwater discharge to the creek and lagoon. This conservatively ignores changes in subsurface outflow to the ocean, which previous modeling indicated might absorb about 25 percent of the change in the water balance (Yates 2007). It also conservatively assumes that water levels have equilibrated to the change in pumping and recharge so that storage change is zero. The 2014 model achieved near-steady-state water levels (at well 16D1) during months 4-10 of project operation (winter months). However, that period was still associated with gradual depletion of storage. Thus, the water balance approach tends to overestimate impacts on groundwater discharge to the creek and lagoon, but the amount by which the impact is overestimated is unknown.

During WRF operation, the effect of pumping at well 9P7 on the water balance is partially offset by percolation of microfiltration reject water and flow from the injection well water-table mound. Impacts on creek/lagoon inflow are further offset by the mitigation discharge. However, the overall effect of WRF operation on the water balance depends on assumptions regarding the no-project scenario. At one extreme, the WRF can be seen as simply allowing San Simeon well field pumping and wastewater percolation to continue at their normal (non-drought) rates. This is the assumption explicitly made in modeling by CDM Smith (2015) for an evaluation of lagoon impacts. It is unrealistic to some extent because CCSD would presumably not opt to turn on the expensive WRF project if it could obtain the same amount of well field production with and without the project. A more realistic assumption would be that well field production and hence wastewater percolation would have to gradually decrease under the no-project scenario because of the reverse-gradient constraint in water levels between the percolation pond area and the well field. Under that assumption, the extreme case would be that all well field pumping made possible by WRF operation is pumping that would not otherwise occur, and that wastewater percolation would increase by the fraction of pumped water that becomes wastewater under normal municipal use.

The net effect of WRF operation on the groundwater balance and creek/lagoon inflow under these book-end assumptions are shown in the tables below. **Table 2** shows the change in the groundwater balance in the percolation pond region and in lagoon inflow if well field pumping and municipal wastewater percolation are assumed not to change with WRF operation.

Under this assumption, pumping 9P7 at 78 AF/mo makes the groundwater balance more negative by 47 AF/mo. The 100-gpm mitigation discharge offsets only about one-fourth of this effect (13 AF/mo). Therefore, inflow to the creek and lagoon could decrease by 33 AF/mo (equivalent to 247 gpm). That impact would be reduced to the extent that subsurface outflow to the ocean also decreases. Assuming that outflow equals 25 percent of total outflow (per the 2007 model), then the remaining impact on creek and lagoon inflow would be only 75 percent of the values shown in the table, or 25 AF/mo, or 185 gpm.

Table 2. WRF Effects on Groundwater Balance and Creek/Lagoon Inflow: Pumping and Percolation the Same as No-Action Scenario

Flow Change	Gallons per Minute	Acre-Feet per Month	Notes
Project pumping from 9P7	-581	-78	From 2016 EIR Table 3-3. This is the capacity of well 9P7.
Increased wastewater percolation			Assume increased water supply from San Simeon well field does not replace Santa Rosa pumping. Assume increase in SS-1 and SS-2 pumping equals 94% of the injection rate (this is the proportion in the 2014 modeling study). Assume injection rate of 400 gpm.
Summer	34	5	Wastewater flow is 70 percent of CCSD water use in mid-summer (2009-2018 average). Also add microfiltration reject water (= 5.9% of 9P7 pumping)
Winter	34	5	Wastewater flow is estimated at 98 percent of CCSD water use in winter (excluding wet weather infiltration and inflow). Also add microfiltration reject water (= 5.9% of 9P7 pumping)
Inflow from injection well mound	200	27	Assume half of the injection rate
Net change in groundwater balance			
Summer	-347	-47	
Winter	-347	-47	
Mitigation discharge to creek/lagoon	100	13	From project description.
Net change in creek/lagoon inflow			
Summer	-247	-33	
Winter	-247	-33	

Water balance effects under the opposite assumption are shown in **Table 3**. The well field pumping enabled by WRF operation (equal to 94 percent of the RIW injection rate) is assumed to be pumping that would not otherwise occur. This increase in water supply would increase wastewater generation by a corresponding amount that varies seasonally due to seasonal changes in indoor versus outdoor water use. This additional input of wastewater percolation has a positive effect on the groundwater balance relative to the no-action scenario. The net change in the groundwater balance would range from a decrease of 11 AF/mo in summer to an increase of 3 AF/mo in winter. The 100-gpm mitigation discharge would more than offset the summer decrease such that net inflow to the lagoon would increase by 2 AF/mo in summer and 16 AF/mo in winter (equivalent to 16 and 122 gpm, respectively). Again, the changes in lagoon inflow would be reduced to the extent that subsurface outflow to the ocean absorbs 25 percent of the change in total outflow. In that case, the net change in creek and lagoon inflow would be an increase of 1.5-12 AF/mo, equivalent to 12-92 gpm.

Table 3. WRF Effects on Groundwater Balance and Creek/Lagoon Inflow: Pumping and Percolation are Additional to No-Action Scenario

Flow Change	Gallons per Minute	Acre-Feet per Month	Notes
Project pumping from 9P7	-581	-78	From 2016 EIR Table 3-3. This is the capacity of well 9P7.
Increased wastewater percolation			Assume increased water supply from San Simeon well field does not replace Santa Rosa pumping. Assume increase in SS-1 and SS-2 pumping equals 94% of the injection rate (this is the proportion in the 2014 modeling study). Assume injection rate of 400 gpm.
Summer	297	40	Wastewater flow is 70 percent of CCSD water use in mid-summer (2009-2018 average). Also add microfiltration reject water (= 5.9% of 9P7 pumping)
Winter	403	54	Wastewater flow is estimated at 98 percent of CCSD water use in winter (excluding wet weather infiltration and inflow). Also add microfiltration reject water (= 5.9% of 9P7 pumping)
Inflow from injection well mound	200	27	Assume half of the injection rate
Net change in groundwater balance			
Summer	-84	-11	
Winter	22	3	
Mitigation discharge to creek/lagoon	100	13	From project description.
Net change in creek/lagoon inflow			
Summer	16	2	
Winter	122	16	

COMPARISON WITH PREVIOUS STUDIES

Differences in water balance assumptions between this report and previous modeling studies are listed in **Table 4**. The RIW injection rate is assumed to be 400 gpm as opposed to 454-485 gpm in the prior studies. The smaller rate was recommended as a conclusion of the tracer study (CDM Smith, 2018) and is now the maximum permitted rate. Similarly, the present analysis assumes that Well 9P7 pumps at 581 gpm, which is its actual capacity. The previous studies had higher rates up to 710 gpm. The previous studies assumed that well field pumping (454 gpm) and municipal wastewater percolation (373 gpm) would be at the same rates with or without WRF operation. The present analysis compares that assumption with the opposite assumption that WRF operation allows well field pumping to increase by 94 percent of the RIW injection rate, and municipal wastewater percolation to increase as the normal wastewater fraction of municipal use. The current permit from the RWQCB for WRF operation does not restrict pumping at Wells SS-1 and SS-2 to a percentage of the injection rate, but it notes that each well has a pumping capacity of about 400 gpm. The previous modeling studies assumed a large amount of irrigation pumping by Mr. Warren, which strongly influence simulated water levels and lagoon inflow. The present analysis simply presents a change in water balance that would be on top of other existing water balance flows, such as well field pumping and pumping by Mr. Warren.

Table 4. Comparison of Water Balance Assumptions among Studies

Project Component	2014 Modeling Study[a]	SEIR Appendix E-6[b]	This study
Well 9P7 pumping rate (gpm)	710	630	581
Injection well rate (gpm)	485	454	400
Well field pumping rate (SS-1 plus SS-2) (gpm)	454	454	Increase of 376 gpm
Increase in municipal wastewater percolation (gpm)	0	0	Tested 1) no change and 2) increase of 297-403 gpm (seasonal)
Change in subsurface outflow to ocean	Approx. -14 gpm as of month 10[c]	Not stated	Tested 0% and 25% of total outflow
WRF operation start month	late summer	June or July	July
WRF operation duration (months)	15	6	Up to 18 months
Clyde Warren pumping (AFY)	195	195	no change from existing (about 15 AFY)
Mitigation discharge to lagoon (gpm)	100	Tested 0, 50, 100 gpm	100

Notes:

[a] CDM Smith (2014)

[b] CDM Smith (2015)

[c] This was the difference in ocean outflow from month 1 to month 10 of the simulation, before Warren pumping in summer reversed the outflow to inflow.

CONCLUSIONS

The foregoing data analysis and review of modeling results support the following conclusions:

- Available data and models are not sufficient to confidently conclude that the 100-gpm mitigation discharge to San Simeon Creek will fully offset flow depletion caused by WRF operation over prolonged periods (up to 18 months
- The adequacy of the 100-gpm mitigation discharge to offset the flow depletion depends substantially on assumptions about municipal wastewater percolation. If WRF operation is accompanied by an increase in wastewater percolation, the 100-gpm mitigation discharge appears to be adequate. If there would be no increase in wastewater percolation, it might not be.
- The rates and durations of pumping by Clyde Warren and by WRF operation in recent years have been too small to detect an impact on groundwater levels at well 16D1. Pumping at higher rates over longer periods could produce a measurable effect.
- Groundwater at well 16D1 and surface water in nearby creek pools appear to be hydraulically connected.
- Dry-season water levels in well 16D1—and probably also in the creek pools—have declined steadily over the past 14 years, by a total of about 2 feet. The only variable that appears correlated with this pattern is the long-term decrease in wastewater percolation volumes.
- The creek pools and lagoon inflow are as vulnerable to irrigation pumping effects as WRF operation effects. Pumping for both purposes occurs near the center of the percolation pond area and would be expected to have similar impacts on groundwater discharge to the creek and lagoon. Irrigation pumping by Mr. Warren has been small in recent years, but he is allowed to pump up to 183.5 AFY, which is similar in magnitude to the net water balance impact of full-time WRF operation. Previous modeling showed a very large effect of Warren pumping on water levels near the lagoon and the lagoon water balance (CDM Smith 2014, 2015).

RECOMMENDATIONS

The following actions are recommended to improve the ability to detect impacts on creek/lagoon inflow and ensure that WRF operation does not significantly reduce the inflows:

- Monitor dry season stream flow entering the lagoon near the campground bridge monthly. Current hydrologic monitoring in that area includes only water levels (in ponds and wells 16D1 and MW-4).
- Install a staff plate at the Van Gordon Pool and Red Legged Pool so that water levels are tied to NAVD88, not simply recorded as water depth.
- Use an adaptive management approach during future project operation. That is, monitor creek flow, pond levels and groundwater levels biweekly for signs of pumping-related depletion. If depletion is detected, increase the mitigation flow to the creek. Although pumping to supply the mitigation will eventually increase the rate of streamflow depletion, the mitigation discharge will stay ahead of that effect because it is not subjected to the delays and attenuation associated with flow through the aquifer.
- Conduct a field study of WRF operation and effects to confirm the timing and magnitude of effects on creek pools and the lagoon and to test locations and rates of mitigation discharge. The accuracy of previous modeling work and the present analysis is limited by uncertainty regarding the three-dimensional pattern of hydraulic connections between the percolation ponds, 9P7 and the creek/lagoon. An appropriate test design might be as follows:
  - Conduct the test in a relatively dry year, based on relatively early recession of flow in San Simeon Creek.
  - Operate the WRF at the design rates (400 gpm of injection), beginning in June or July.
  - Initially forego the mitigation discharge until frequently monitored pool and lagoon levels, groundwater levels in 16D1 and MW-4, and lagoon inflow exhibit a change in trend that indicates project effects have arrived. Then start the mitigation discharge.
  - Compare pool levels and creek flow with the mitigation discharge switched from the head of the lagoon to the creek channel near the upper (“red legged”) pool.
  - Continue the test until San Simeon Creek through-flow resumes in winter.

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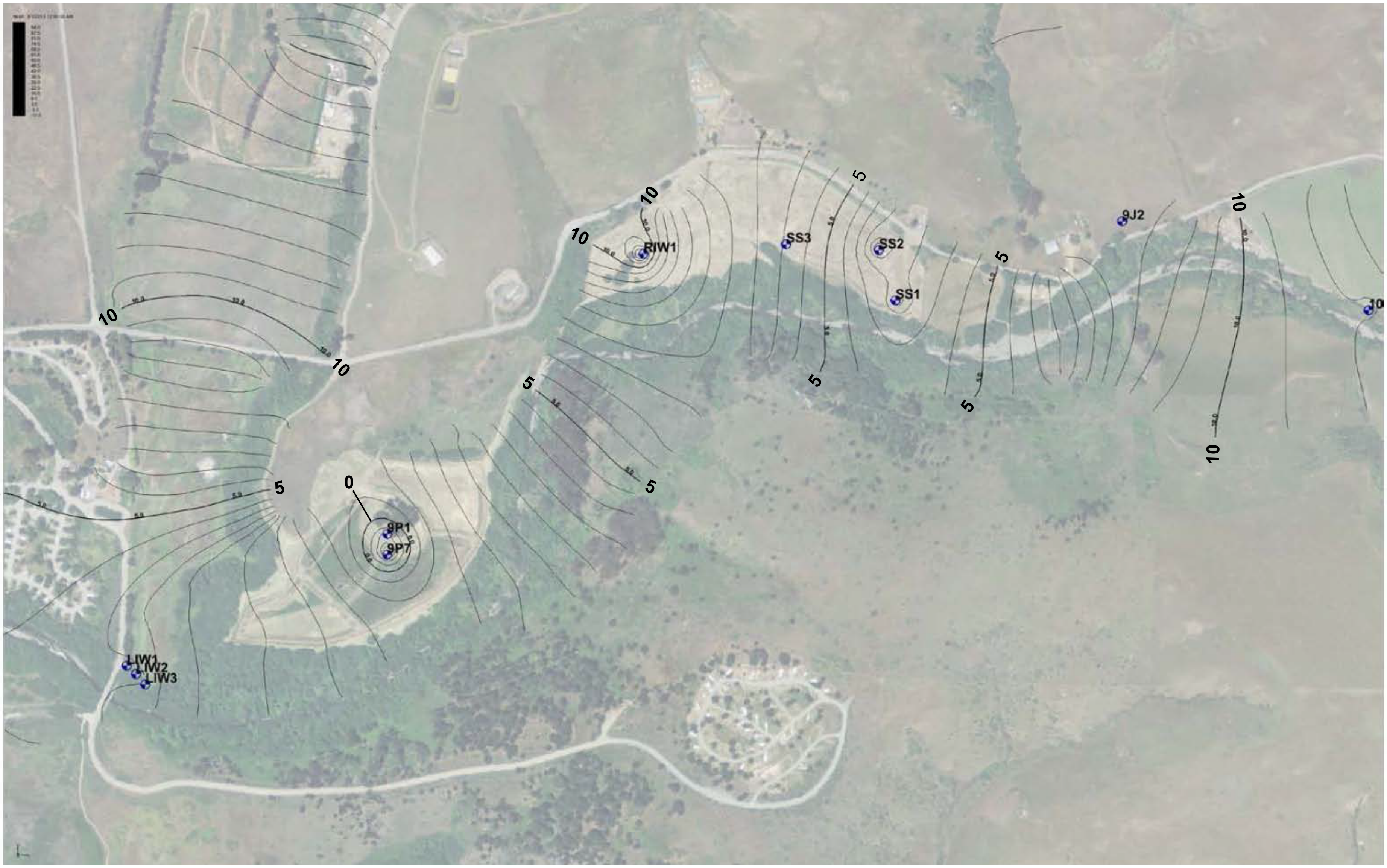
TODD GROUNDWATER

Figure 1
Location Map



Source: CDM Smith (2014), Figure 6-13

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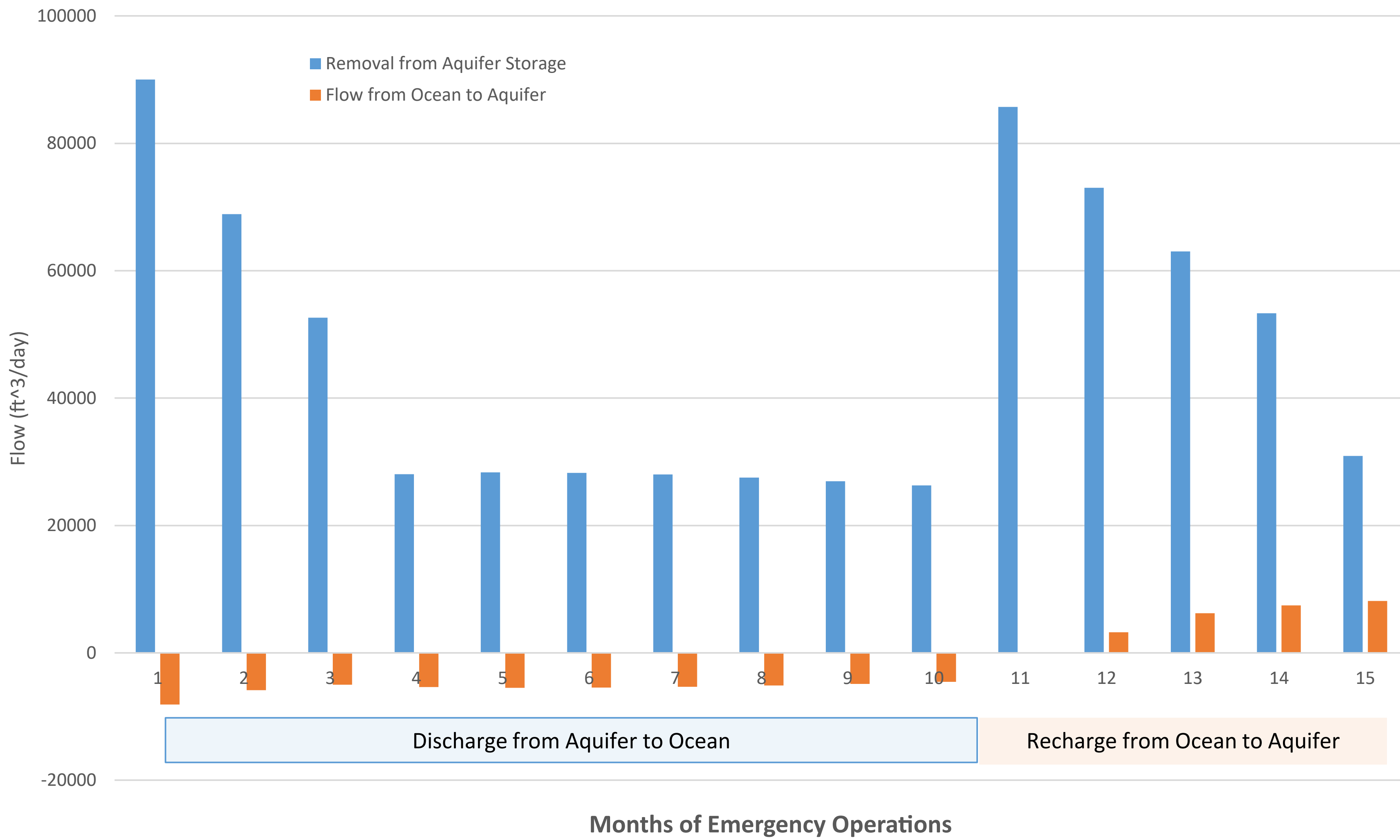
TODD GROUNDWATER

Figure 2
Simulated Groundwater Elevations After One Year of Operation



Source: CDM Smith (2014), Figure 6-16

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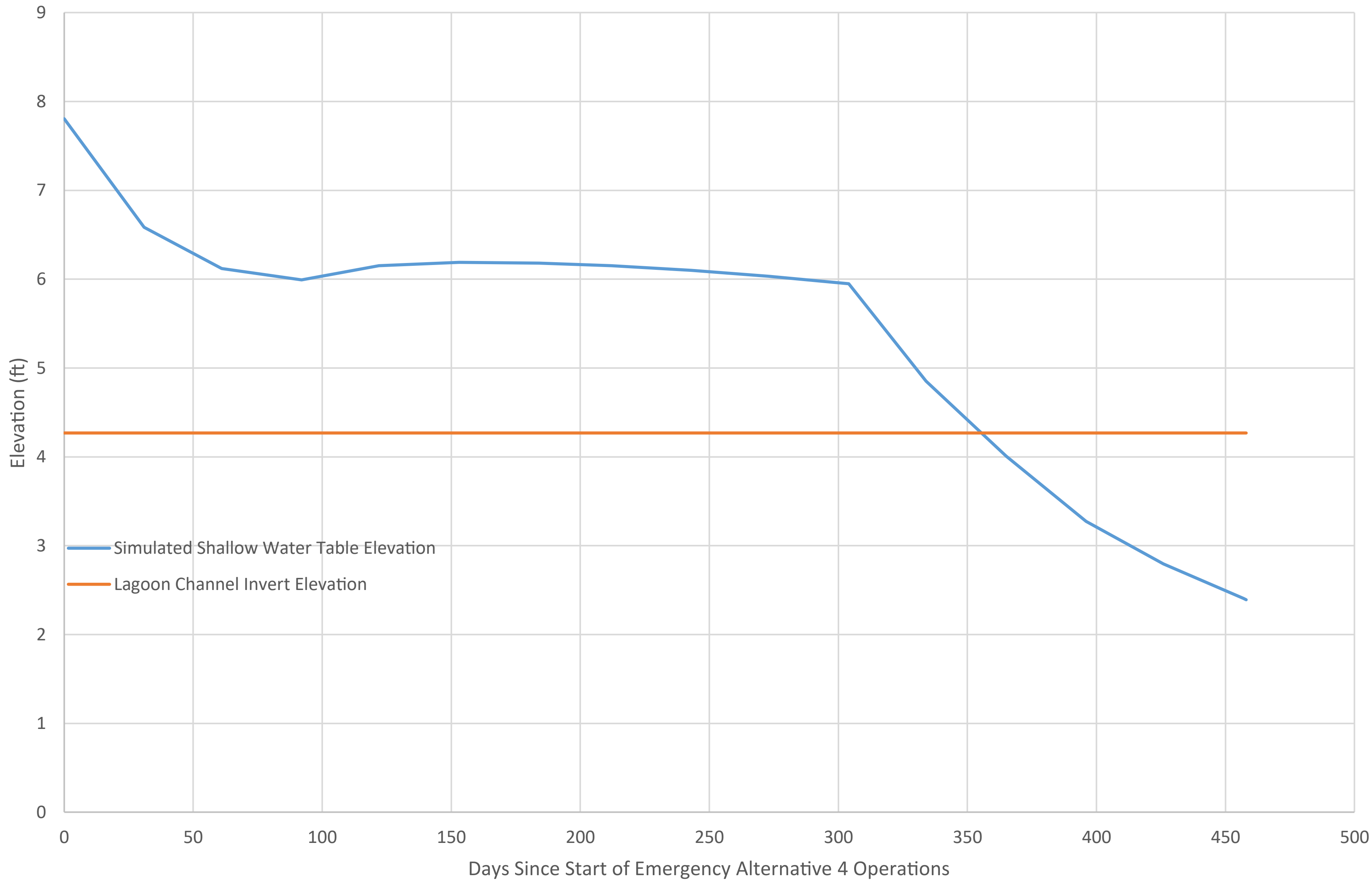
TODD GROUNDWATER

Figure 3
Simulated Groundwater Storage and Flow for 15 Months of Project Operations



Source: CDM Smith (2014), Figure 6-15

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Figure 4
Simulated Water Levels at Well 16D1

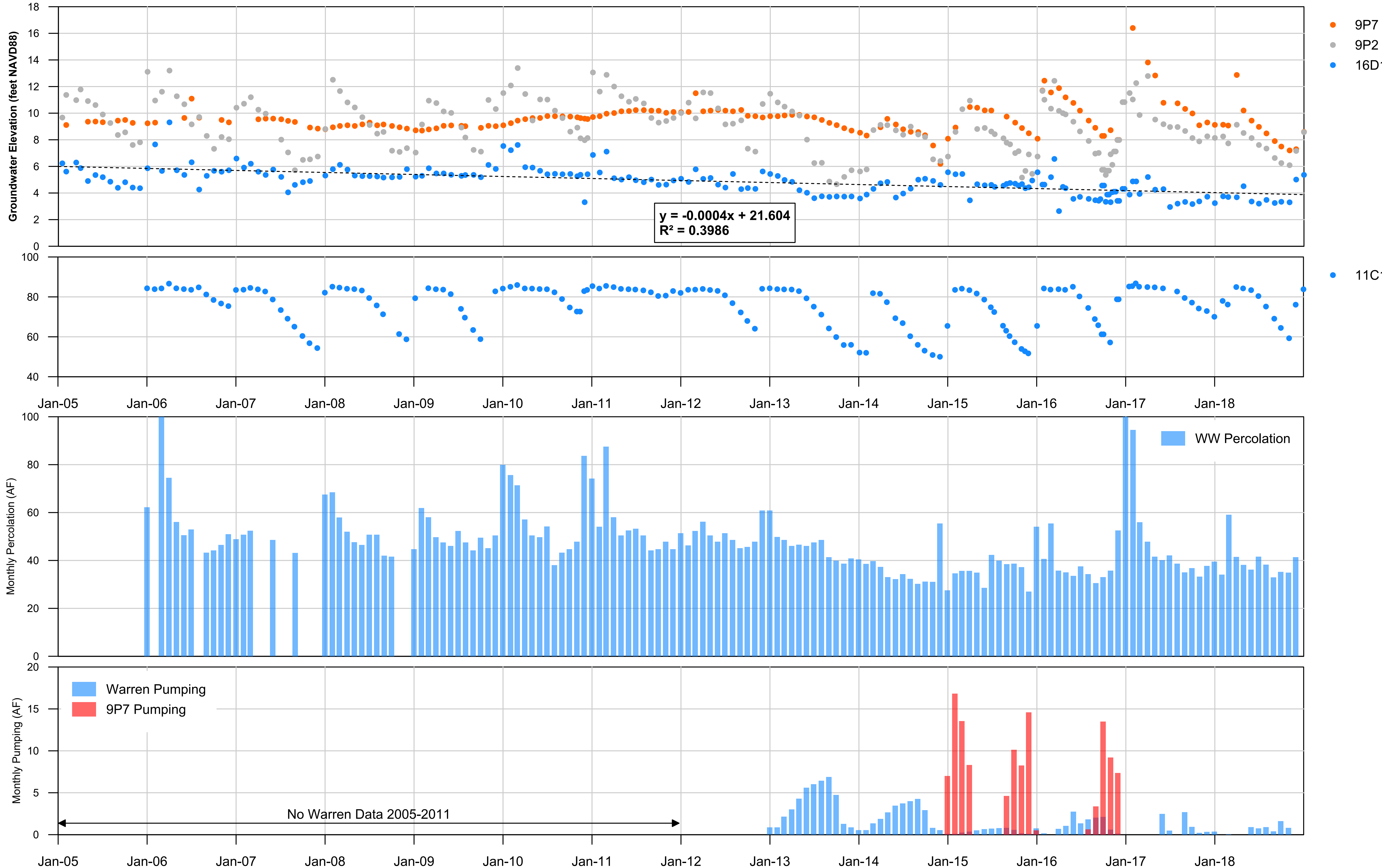

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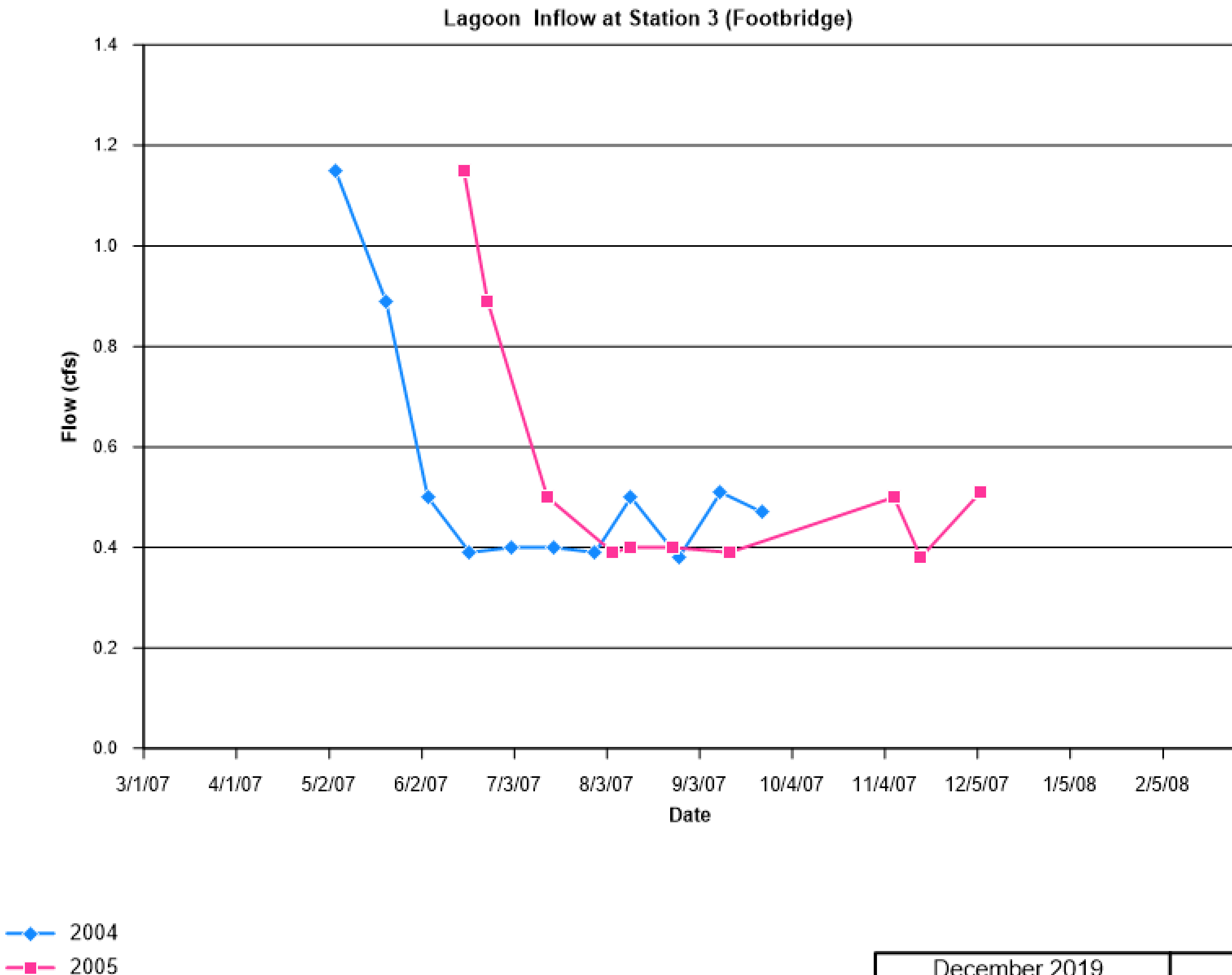
Figure 5
Groundwater Levels, Pumping and Wastewater Percolation 2005-2018



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TODD GROUNDWATER

Figure 6
Measured Dry-Season Flow in San Simeon Creek Upstream of the Lagoon