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Description:	Petition to Amend the High Desert Power Plant - DRAFT - Scope of Work for a Transition Zone Water Balance Study of Alto Sub-basin to Evaluate the Potential Impacts of Using Recycled Water from the VVWRA Treatment Plant
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DRAFT

Scope of Work for a Transition Zone Water Balance Study of Alto Sub-basin to Evaluate the Potential Impacts of Using Recycled Water from the VVWRA Treatment Plant

In its "Order After March 16 Prehearing Conference" (TN 210804), issued on March 22, 2016, the HPPP Committee directed the parties to address "[w]hat needs to be done to obtain a water balance calculation from MWA?" The goal of the Alto Transition Zone Sub-basin Water Balance Study is to determine the amount of wastewater that can be diverted to other uses rather than discharged to the Mojave River from Victor Valley Wastewater Reclamation Authority's (VVWRA) Shay Road Plant that will have a less than significant impact on environmental and public trust resources in the Transition Zone.

Proposed Scope of Work

Transition Zone Water Balance Study should include the following tasks:

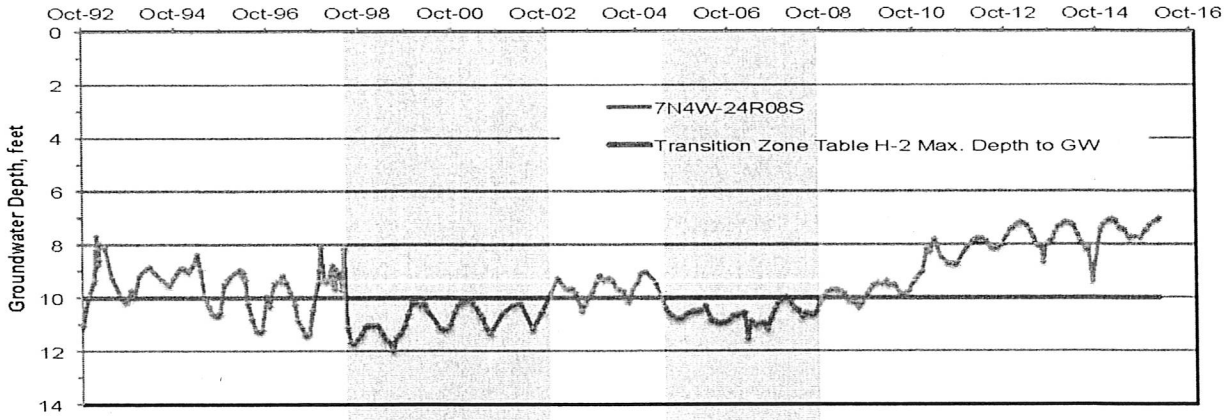
a. Delineate the hydrologic boundaries of the study area and produce a map that shows the boundaries of the Alto Subarea and Transition Zone, identifies critical hydraulic structures and physical features that control inflow and outflow (e.g. VVWRA's pont of discharge, percolation ponds, other sources of discharge to the Transition Zone, alluvial and fault systems, etc.), and provides an overlay of township-range-section boundaries.
b. Identify, quantify and report on the inflows and outflows, including intra-basin exchanges, natural recharge, surface water transpiration, evapotranspiration by plants, extraction by pumping, rates of consumptive use, rates of return flows, and flows between area of interest and surface water features such as rivers, lakes, and rates of discharge at points of interest such as the VVWRA Shay Road and Victorville Water District's Industrial Wastewater Treatment Plants (IWTP) at the Southern California Logistics Airport.
c. Evaluate, quantify and report on inflow and outflow from the VVWRA Shay Road Plant wastewater treatment..
d. Identify, quantify and report on inflow and outflow from IWTP.
e. Evaluate, quantify and report on the historic flows (dating back to at least 1993-1994, the first annual report by the Watermaster) in Mojave River base flow as measured at the USGS Lower Narrows gauge (USGS No. 10261500) and determine its potential impacts to water balance calculations and groundwater levels in the Transition Zone.

f. Identify, quantify and report on status of upper Alto Sub-area planned changes in wastewater disposal and the effects on outflow from VVWRA's Shay Road Plant, for example the sub-regional treatment plants and the City of Victorville plan to leaving VVWRA.
g. Evaluate, quantify and report on the annual changes in Transition Zone water balance and the annual change in the water table elevation at the indicator wells defined in Exhibit H of the Judgment (dating back to at least 1993-1994, the first annual report by the Watermaster). Graph and describe the relationship between annual change in water balance and Transition Zone water table elevation at the indicator wells.
h. Evaluate, quantify and report on the relationship between annual change in the overall Alto Subarea groundwater storage and change in water table elevation at the indicator wells defined in Exhibit H of the Judgment.
i. Evaluate, quantify and report on what effect changes in water table elevation in the Transition Zone have on: (1) maintaining surface water flows, (2) maintaining Alto Sub-areas obligation to Centro Sub-area, (3) the width and length of the wetted channel, and (4) maintaining riparian habitat and wildlife in the Mojave River.
j. Identify and report on existing water resource and riparian habitat studies related to the Transition Zone, including water management policies, existing and proposed recharge projects, projected future water demand and consumption, and other relevant hydrologic and biologic documents.
k. Identify and report on additional data needs and potential data sources or studies needed to evaluate the impacts of diverting VVWRA wastewater away from the Mojave River.
l. Identify, evaluate and report on changes that have occurred in the water management, water production and consumptions, wastewater facilities and wastewater management, groundwater recharge, and change in groundwater storage since previous studies were conducted that provide information on the potential impacts to future Transition Zone water balances and water uses.
m. Identify, evaluate and report on: (1) method(s) of water balance analysis, (2) method(s) of correlating changes in water balance to fluctuations in groundwater levels, (3) the hydrologic parameters and their sensitivity to changes that cause variations in water balance and groundwater levels, (4) methods for measuring and monitoring future changes in the water balance and groundwater levels, (5) the degree of accuracy needed in measurements and calculations, (6) recommendations for water balance and groundwater thresholds needed to ensure that Transition Zone riparian habitat and wildlife

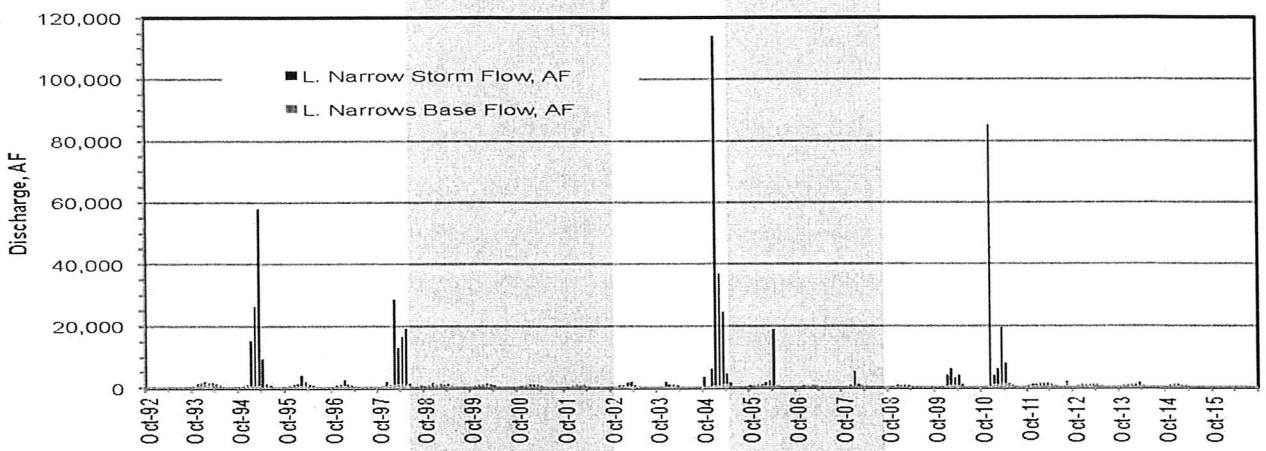
are protected, and (7) actions that need to be taken if the thresholds are exceeded.

Exhibit 2

Depth to Shallow GW Near VVWRA
7N5W-24R08S @ 49.2'



Lower Narrows Base and Storm Flow



Historic Annual Discharge
Base Flow at Narrows & VVWRA Discharge

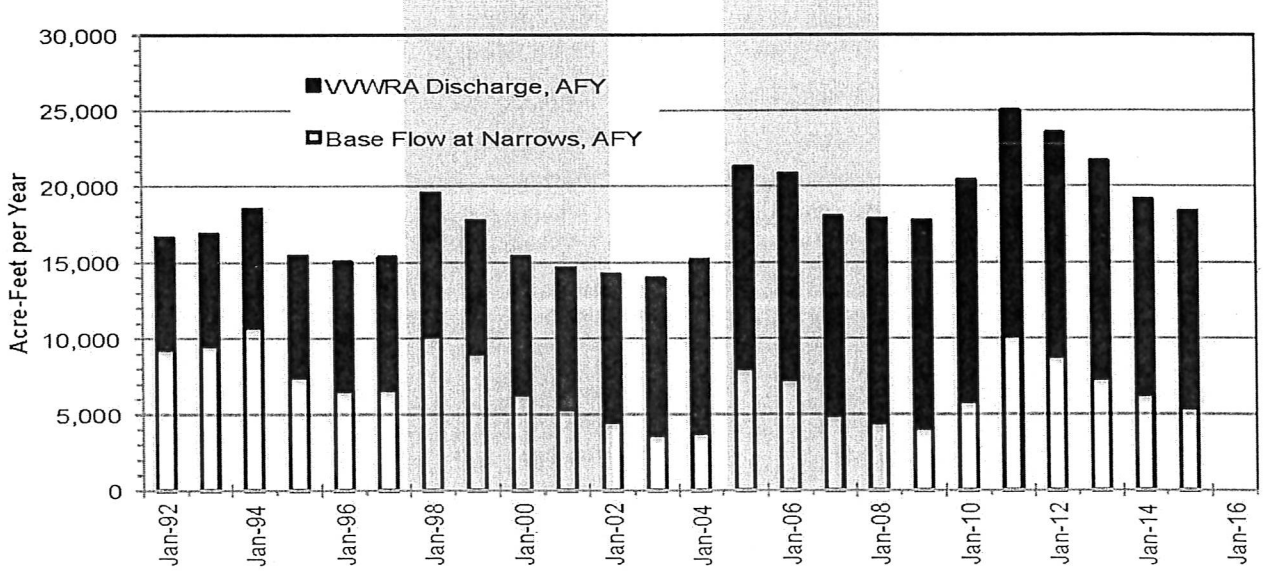


Exhibit 3

Table 1
Alto Subarea Historic Flows to Alto Transition Zone
Annual Base Flow and Storm Flow at Lower Narrows Gauge, and VVWRA Discharge
(Acre-feet per Year)

Year	Base Flow	VVWRA Discharge	Total Base Flow + VVWRA	VVWRA to Total, %	5-Year Average, %	Storm Flow
1982-83	24,195	3,428	27,623	12.4%		
1983-84	24,312	3,932	28,244	13.9%		
1984-85	20,161	4,134	24,295	17.0%		
1985-86	14,790	4,286	19,076	22.5%		
1986-87	14,191	4,601	18,792	24.5%	18.1%	
1987-88	15,268	5,484	20,752	26.4%	20.9%	
1988-89	11,487	6,330	17,817	35.5%	25.2%	
1989-90	8,027	6,941	14,968	46.4%	31.1%	
1990-91	8,714	7,276	15,990	45.5%	35.7%	
1991-92	9,257	7,387	16,644	44.4%	39.6%	
1992-93	9,552	7,331	16,883	43.4%	43.0%	
1993-94	10,766	7,753	18,519	41.9%	44.3%	147
1994-95	7,472	7,949	15,421	51.5%	45.3%	105,807
1995-96	6,552	8,475	15,027	56.4%	47.5%	4,630
1996-97	6,619	8,705	15,324	56.8%	50.0%	1,592
1997-98	10,162	9,353	19,515	47.9%	50.9%	73,355
1998-99	8,970	8,744	17,714	49.4%	52.4%	328
1999-00	6,322	9,006	15,328	58.8%	53.8%	668
2000-01	5,345	9,286	14,631	63.5%	55.3%	273
2001-02	4,515	9,689	14,204	68.2%	57.5%	35
2002-03	3,648	10,281	13,929	73.8%	62.7%	2,594
2003-04	3,783	11,392	15,175	75.1%	67.9%	1,601
2004-05	8,016	13,246	21,262	62.3%	68.6%	184,574
2005-06	7,261	13,542	20,803	65.1%	68.9%	19,991
2006-07	4,942	13,067	18,009	72.6%	69.8%	0
2007-08	4,421	13,385	17,806	75.2%	70.0%	4,734
2008-09	4,093	13,609	17,702	76.9%	70.4%	267
2009-10	5,849	14,525	20,374	71.3%	72.2%	13,317
2010-11	10,149	14,825	24,974	59.4%	71.1%	116,202
2011-12	8,829	14,674	23,503	62.4%	69.0%	675
2012-13	7,325	14,310	21,635	66.1%	67.2%	0
2013-14	6,227	12,898	19,125	67.4%	65.3%	563
2014-15*	5,418	12,926	18,344	70.5%	65.2%	0
Total Flow 1983-2015	306,638	312,770	619,408		Total Flow 2005 to 2015	340,323
Total Flow 1996-2015	121,894	227,463	349,357		Average Storm Flow 2005 to 2015	30,938
Total Flow 2005-2015	72,530	151,007	223,537			

TZ groundwater depth > 10 feet in shaded years

Exhibit 4

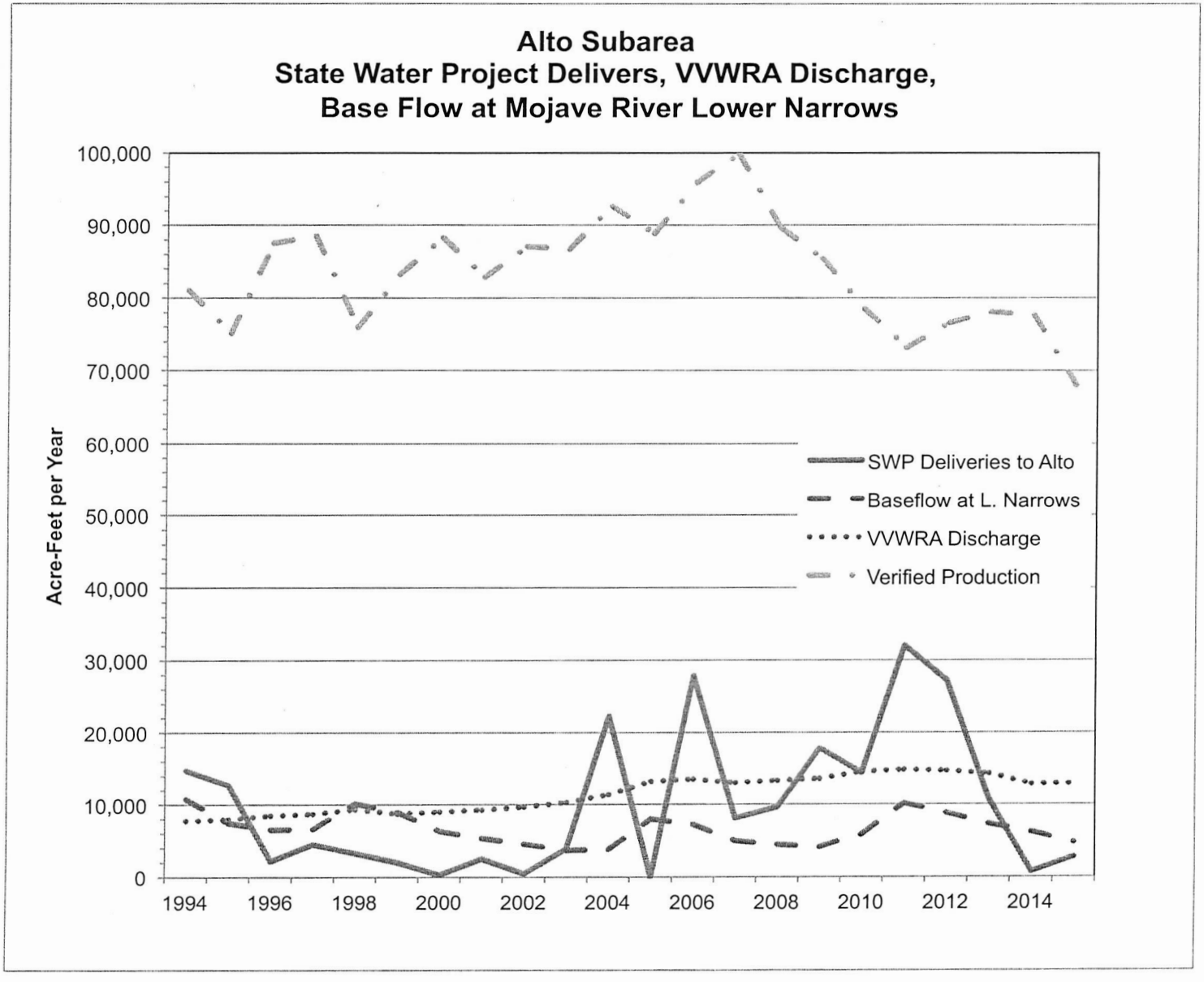

Alto Subarea
State Water Project Delivers, VVWRA Discharge,
Base Flow at Mojave River Lower Narrows
Acre-Feet per Year
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
SWP Deliveries to Alto
Baseflow at L. Narrows
VVWRA Discharge
Verified Production

Exhibit 5

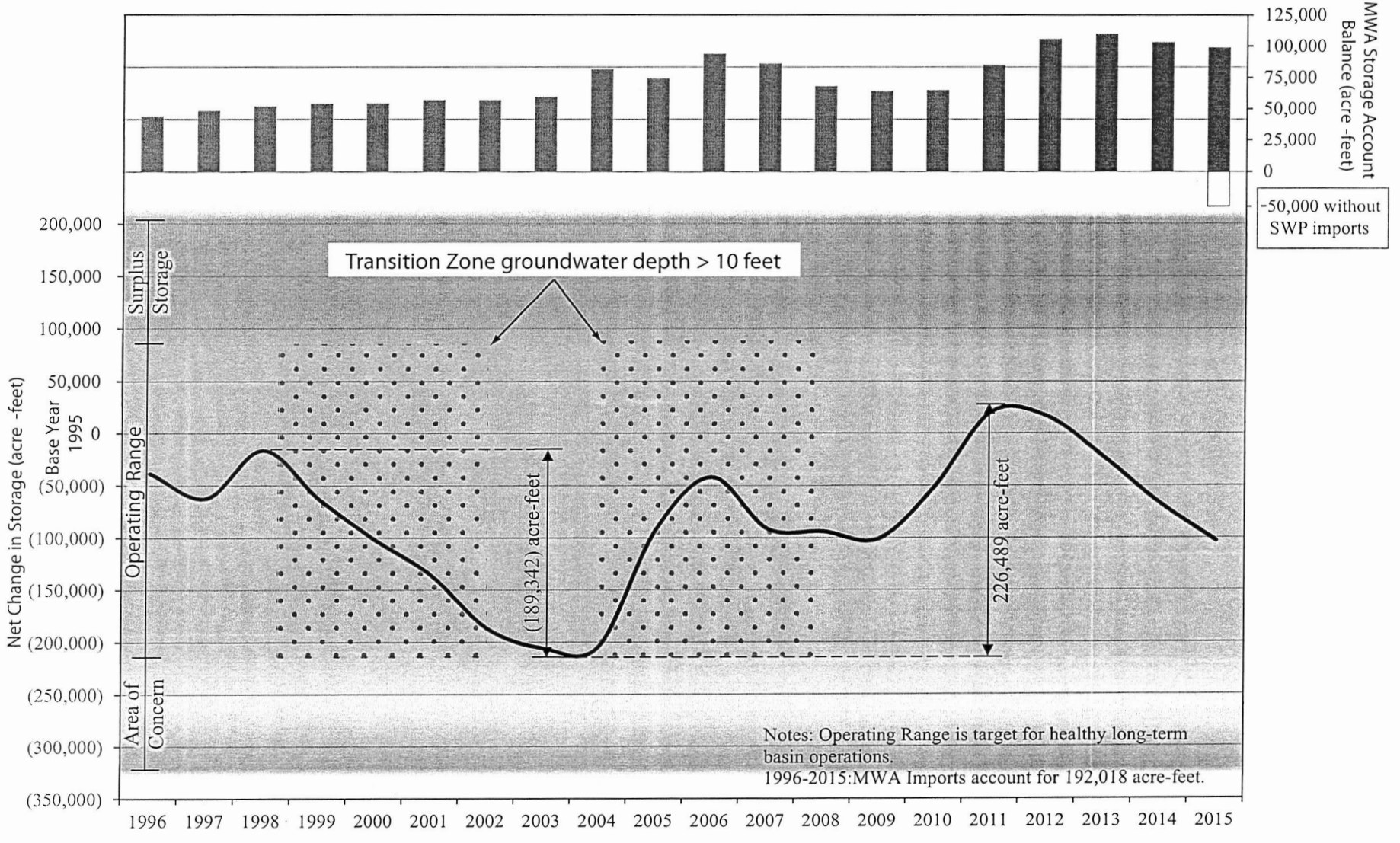
Table 2
Alto Subarea Historic State Water Project Deliveries
(Acre-feet per Year)

	Water Year	State Water Project Deliveries, AFY	Verified Production, AFY	SWP Deliveries as % Production	Average Verified Production, AFY
1st	1993-94*	14,750	81,050	18.2%	
2nd	1994-95*	12,750	75,103	17.0%	83,062
3rd	1995-96	2,175	87,574	2.5%	
4th	1996-97	4,500	88,522	5.1%	
5th	1997-98	3,253	75,942	4.3%	
6th	1998-99	2,003	83,278	2.4%	82,590
7th	1999-00	283	88,311	0.3%	
8th	2000-01	2,508	82,828	3.0%	
9th	2001-02	446	87,082	0.5%	
10th	2002-03	3,840	86,739	4.4%	88,833
11th	2003-04*	22,249	92,677	24.0%	
12th	2004-05	4	88,853	0.0%	
13th	2005-06*	27,855	95,890	29.0%	93,583
14th	2006-07	8,129	99,923	8.1%	
15th	2007-08	9,644	89,665	10.8%	
16th	2008-09*	17,802	85,477	20.8%	
17th	2009-10	14,394	78,493	18.3%	
18th	2010-11*	32,022	73,201	43.7%	
19th	2011-12*	27,171	76,512	35.5%	76,775
20th	2012-13	10,769	78,110	13.8%	
21st	2013-14	688	77,631	0.9%	
22nd	2014-15**	2,710	68,002	4.0%	
		219,945	= AF SWP Delivered 1994-2015		
		192,445	= AF SWP Delivered 1996-2015		
		151,188	= AF SWP Delivered 2005-2015		

* Annual SWP import exceeded VVWRA annual discharge to TZ
** Doesn't' include 1,631 AF delivered to SCLA power plant
TZ groundwater depth > 10 feet in shaded years

Exhibit 6

Alto Subarea
Net Change in Storage and MWA Storage Account Balance
Water Years 1996 through 2015



Operating range based on lowest amount in storage of -205,635af, during which the basin was considered to be healthy, plus a supply of 5 average annual consumptive uses, with an average annual consumptive use equating to 57,737 af from 1996 through present. Surplus Storage and Area of Concern each represent 2 average annual consumptive uses.
Source: Consumptive Use for 1996-2011 per Robert C. Wagner, Watermaster Engineer. Consumptive Use for 2012-2015 based on analysis of individual producers, Robert C. Wagner, Watermaster Engineer, 2016.

Modified after Figure 3-17 in 22nd Annual Report of Mojave Basin Area Watermaster, May 1, 2016

BEFORE THE
ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION
OF THE STATE OF CALIFORNIA

Petition to Amend the HIGH DESERT POWER PLANT	Docket No. 97-AFC-01C

STATE OF CALIFORNIA
DEPARTMENT OF FISH AND WILDLIFE
STATUS CONFERENCE STATEMENT

INTRODUCTION

In response to the Committee's *Notice of August 11, 2016 Committee Status Conference and Related Orders* (TN #212263) (Committee's Notice), the California Department of Fish and Wildlife (CDFW) files this Status Conference Statement (Statement) regarding the Petition to Amend the High Desert Power Project (HDPP).

CDFW joined HDPP and California Energy Commission (CEC) staff in reaching a *temporary* proposal for operation of the HDPP to take advantage of the current water year availability to contract for a large amount of water imported by the State Water Project (SWP) (Temporary Operation). The CEC adopted the proposed Temporary Operation conditions for the HDPP at its June 14, 2016 meeting. CDFW agreed to the conditions in the Temporary Operation to allow time for further study of the hydrologic conditions in the portion of the Mojave River Basin in which HDPP is located, in addition to allowing for HDPP to more fully utilize SWP water in this water year. CDFW previously submitted testimony regarding the importance of treated wastewater discharge to the Transition Zone in the Alto Subarea of the adjudicated Mojave River Groundwater Basin (TN #s 210554, 210565). Treated wastewater is water native to the area that is pumped, utilized, and then ideally would be returned to the basin with some of the water supporting base flow. The hydrologic study that needs to be done in advance of further diversion of water away from the Transition Zone is not a general, basin wide survey or regional study, but an analysis of hydrologic conditions in and around HDPP and the Transition Zone near where the HDPP is located.

CDFW did not intend or state that the conditions in the Temporary Operation, specifically the interim "Loading Sequence" should become a part of Soil &Water -1, as proposed by HDPP in its filing of July 22, 2016 *Summary of Relief Requested* (TN # 212397). SWP water should be purchased and used first, through direct use or injection. All other supplies and methods, such as percolation of SWP water or the use of some amount of recycled water should be additive or a back-up supply when insufficient SWP is not available. HDPP built its power plant in an overdrafted adjudicated groundwater basin and knew that fact at the time it requested a certification from the CEC to operate. HDPP agreed to import SWP water to service the project

and not use native groundwater to the detriment of the already impacted groundwater basin. Any change in the original certification conditions should be seen through the lens of the known conditions upon construction of HDPP and the continued struggle to recover the groundwater basin in which HDPP is located.

BACKGROUND INFORMATION REGARDING TRANSITION ZONE HYDROLOGIC CONDITIONS

A central issue for CDFW related to use of recycled wastewater at HDPP is the impacts to biological resources that might occur from changes in groundwater levels and surface water flows as a result of the re-direction of Victor Valley Wastewater Reclamation Authority's (VVWRA) shay road treatment plant discharges of wastewater away from the Transition Zone. CDFW desires to maintain the groundwater levels and the surface flows in the Transition Zone so that the riparian habitat and the wildlife that depends on it will be sustained. The issue at hand is how much VVWRA wastewater can be redirected to the HDPP without causing the depth to groundwater in the Transition Zone to increase to a level (i.e. groundwater drops) that adversely impacts riparian vegetation such that the riparian vegetation is no longer healthy and reproducing in a manner that sustains the existing wildlife and habitat. CDFW recognizes that Table H-2 in the Judgment provides for a 10-foot maximum depth below surface to groundwater, however CDFW wishes to emphasize that consistent with information from Lines, 1999 (quoted and fully cited below), in order to have a healthy, reproducing Cottonwood/Willow riparian habitat, the depth to ground water needs to be less than 10 feet (i.e. groundwater higher) during parts of the year.

The Transition Zone of the Alto Subarea is a section of the Mojave River that functions as a "water bridge" to allow both surface water and groundwater from the Alto Subarea to flow downstream supplying water to the Centro Subarea and other downstream Subareas. The groundwater in the Transition Zone fulfills three primary objectives in the Judgment After Trial of the Mojave River Basin Adjudication, January 10, 1996 (Judgment) that include:

- Maintain groundwater level standards in the area of a key well along the River to assure that the water needs of endangered and other species, riparian habitat and public trust resource in the Mojave Basin Area are protected.

- Maintain groundwater storage within an "operational range" to provide for healthy long-term basin operations (22nd Annual Report of Watermaster, May 1, 2016).

- Maintain minimum water levels in the Transition Zone for the purpose of prioritizing recharge within the Alto Subarea. The relative stability of near river water levels and water levels in the Transition Zone indicate hydrologic stability in the relationship between Alto and the downstream Subareas and helps the Alto meet its Subarea Obligation (Exhibit G of the Judgment, and 22nd Annual Report of Watermaster, May 1, 2016).

In the 2003 URS report on the hydrologeology of the Transition Zone (2003a) (internet links to the report are in footnote 2 below), the ability of the Transition Zone to function as a *"water bridge"* was said to be"*... controlled mainly by regional precipitation patterns, subsurface hydrogeologic conditions, and balanced water use (sources equal sinks)...* (page 80), and *"...that movement of water through the TZ depends on the demand not exceeding the supply, but also on the fullness of each aquifer"* (page 94). Keeping the Transition Zone aquifers "full" serves to both facilitate transfer of water from the Alto to Centro Subareas and to maintain riparian habitat and the wildlife.

The movement and storage of surface water and groundwater in the upper Alto Subarea and the Transition Zone appears to be rather simple, but the data show that the relationships are complex between groundwater production, river base flow, collection and discharge from a regional sewer system, and natural and State Water Project water recharge. Since the start of the Judgment in 1996, the depth to groundwater in the key well for protecting biological resources in the Transition Zone, state well number 07N05W24R08, has increased more than the Judgment's 10 foot (i.e. groundwater levels dropped) threshold during two multi-year periods (Exhibit 2). Analysis of the hydrologic conditions both natural and man-made that caused Transition Zone groundwater levels to drop and rise found that:

- The depth to groundwater was greater than 10 feet for two multi-year periods following two major storm events in the late 1990s and early 2000s, even though the sum of base flow and VVWRA discharge temporarily increased and generally exceeded 15,000 acre-feet-per-year (Exhibits 2 and 3).

- From 2002 to 2004, the years between the two mulit-year periods of low groundwater levels, the depth to groundwater levels decreased temporarily above the 10-foot depth threshold (i.e. groundwater levels rose) even though the sum of base flow and VVWRA discharge were at historic lows and were below 15,000 acre-feet-per-year (Exhibits 2 and 3).

- In late 2008 the depth to groundwater started to decrease with groundwater levels remaining above the 10-foot depth threshold (i.e. groundwater levels rose) even in years where the base flow and VVWRA discharge were equal to values that occurred when the depths to groundwater was greater than 10 feet (Exhibits 2 and 3).

- VVWRA has discharged to the Transition Zone since the early 1980s with discharge reaching a maximum in water year 2010-11 at 14,825 acre-feet (Exhibits 3 and 4).

- At the same time as VVWRA discharge increased, base flow at the Lower Narrows has decreased at least until water year 2004-05 when base flow began to stabilize at around 5,000 acre-feet-per-year with temporary higher values following major storm events (Exhibits 3 and 4).

- The wastewater collected by VVWRA would have contributed to groundwater recharge in the upper Alto Subarea area; instead the water is redirected by the regional sewer system to discharge into the Transition Zone downstream of the Lower Narrows river

gauge. Over the last 10 years (2005 to 2015), VVWRA has discharged a cumulative total of approximately 151,000 acre-feet of wastewater to the Transition Zone (Exhibit 3).

- The annual volume of State Water Project water imported to the Alto Subarea was generally a small percentage of the annual verified production in that area and less than the VVWRA Transition Zone discharge until water year 2003-04 when imports began to rise (Exhibits 4 and 5).

- Over the last 10 years (2005 to 2015), imports of State Water Project water have cumulatively totaled approximately 151,000 acre-feet, which is equivalent to the sum of the wastewater discharged by VVWRA to the Transition Zone during the same 10 years (Exhibit 5).

- The groundwater storage in the Alto Subarea decreased from 1998 to a low in 2004 (Exhibit 6). After 2004, Alto storage increased and reached a high in 2011 and has since decreased about 125,000 acre-feet. The 2015 Mojave Water Agency storage account balance was approximately 100,000 acre-feet. Without the import of 151,000 acre-feet of State Water Project water, Alto Subarea storage in 2015 would likely be below the healthy operating range.

Changes in the Transition Zone groundwater levels are the result of complex interactions between inflows and outflows of surface water and groundwater. Determining how much wastewater can be used by the High Desert Power Project without lowering groundwater levels below the appropriate threshold of significant adverse impacts to riparian vegetation in the Transition Zone requires that all of the inflow and outflow components of a water balance be used.[1]

CDFW'S RESPONSES TO THE QUESTIONS PRESENTED IN THE COMMITTEE'S NOTICE.

Committee's Question

What categories of questions (other than those outlined above) should be asked?

CDFW Response

CDFW did not identify any categories of questions beyond those that the Committee mentioned in the Committee's Notice.

[1] As mentioned earlier in CDFW's Statement, the Judgement provides for a 10'maximum depth to groundwater, however CDFW believes a lower depth to groundwater (i.e. higher groundwater depth) during part of the year is required to sustain a healthy, reproducing riparian ecosystem.

Committee's Question

What is the definition of the "water balance calculation" that has been discussed? What information will it provide that is in addition to that provided in the Annual Report of the Mojave Bain Area Watermaster?

CDFW Response

Exhibit 1 to this Statement is a proposed scope of work for a Transition Zone water balance study. The study would determine and evaluate the relationship between potential changes to VVWRA's discharge and that change's effect on groundwater levels, and also study and evaluate the relationship between annual changes in groundwater storage with changes in shallow groundwater depth in the Transition Zone. URS described in two reports on the hydrogeology and recharge potential of the Transition Zone the components of a water budget (2003a, 2003b).[2] The URS water budget combined inflow and outflow from 1994 to 2001 into a single long-term annual average, but didn't relate the water balance to groundwater levels. The water budget developed by URS can be used as a template for updating a series of Transition Zone annual water balances. Details of the water balance components are discussed in Appendix B of the Phase II report (URS, 2003b). Appendix F of the URS Phase II study evaluated the length of flow with flow rate, but did not evaluate the relationship between the surface water level in the Transition Zone and the underlying groundwater level, and in fact no such study has been done to date.

The water balance should account annually for all surface water and groundwater inflows and outflows to the Alto Subarea Transition Zone. Annual outflows would be subtracted from annual inflows, which produces a positive or negative water balance. The difference between inflows and outflow is also related to the change in groundwater storage. When the change in annual water balance is positive there is more water in storage and groundwater levels should rise. When the change balance is negative groundwater levels fall. The year-to-year changes in the water balance can then be compared to changes in seasonal peak groundwater levels in an existing indicator well in the Transition Zone.

The water balance study being proposed in Exhibit 1 differs from the water budget calculations done for the Annual Reports of the Mojave Basin Area Watermaster because those Annual Reports are focused on calculating either the Alto Subarea obligation to the Centro Subarea, or the water balance of the entire Alto Subarea. A subarea obligation calculation is done annually and the accounting does include base flow and VVWRA discharges (entered under the category of "other flows"). However, the Watermaster Annual Reports focus on inflow and outflow at the surface and base flow levels. And, while the Watermaster Annual Reports contain graphs that report the depth of the groundwater in the Transition Zone, there is no evaluation of the cause or relationship of any change of those groundwater depths in the Transition Zone.

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[2] Reports available at MWA web site: 2003a - https://www.mojavewater.org/files/TransitionZonePhaseI-Report_2.pdf ; 2003b - https://www.mojavewater.org/files/TransitionZonePhaseII-Report_2.pdf

Committee's Question

What question about project impacts will it answer and how will it answer those questions?

CDFW Response

The purpose of a water balance study for the Transition Zone is to determine and evaluate the relationship between potential changes in VVWRA discharges and that change's effect on groundwater levels, and also study and evaluate the relationship between annual changes in groundwater storage with changes in shallow groundwater depth in the Transition Zone. Changes in groundwater storage in the Transition Zone are due to complex interactions of a number of hydrologic parameters. A simple relationship between base flow and VVWRA discharge no longer exists. Historic changes in groundwater depth at Well H-2, State Well No. 07N05W24R08, an indicator well located in the Transition Zone and referenced in Exhibit H of the Judgment (Well H-2), haven't followed a consistent trend with changes in base flow or VVWRA discharge. This suggests that a more comprehensive understanding of what causes changes in groundwater level is needed.

The fundamental calculation is that a change in the water balance, i.e. a change in the difference between inflows and outflow, is related to a change in stored groundwater, which is directly related to the groundwater level. A positive change in the water balance results in an increase in groundwater level. This occurs even when the absolute value of the water balance is negative. In other words, if the water balance becomes less negative, then groundwater levels should rise. If the water balance becomes more negative, then groundwater levels should fall. However, it should be remembered that problems could occur when local pumping impacts overprint the regional condition expressed in a basin water balance. The historic water level data from Well H-2 show seasonal fluctuations of approximately 1 to 2 feet, but the large fluctuation such as those found elsewhere in the Transition Zone monitoring wells haven't occurred at Well H-2.

As mentioned above, one goal of a Transition Zone water balance study is to calculate the relationship between changes in VVWRA discharges to the Transition Zone and changes in groundwater level in that area. For example, determining that a change in the water balance of 1,000 acre-feet-per-year, positive or negative, results in a change in groundwater level of a specific amount, positive or negative, can be used to estimate how much impact to the groundwater level might occur with the diversion of VVWRA wastewater to HDPP. Although the water balance calculation is done after-the-fact, because the most critical data needed aren't available until the Annual Report of the Watermaster is produced, it can still be used to make an estimate of how much VVWRA wastewater might be diverted annually while still maintaining groundwater levels high enough to ensure that adverse impacts to riparian vegetation in the Transition Zone due to the consumption of treated wastewater by HDPP are less than significant.[3] One potential condition of HDPP certification for operation would be to require that whenever the depth to groundwater at Well H-2 falls below a certain threshold, HDPP would

[3] See Lines, G.C., 1999, USGS Water Resources Investigations Report 99-4112 at: http://pubs.usgs.gov/wri/1999/4112/report.pdf

need to cease its use of treated wastewater until either the depth to groundwater increases to the required threshold, or the water balance can be re-evaluated to determine what rate of diversion of treated wastewater would cause less than significant impacts to the riparian vegetation in the Transition Zone. To assist with such a re-evaluation, vegetation monitoring to document the long term health and reproductive viability of the riparian vegetation within the Transition Zone would be helpful. The Judgement provides a 10-foot to groundwater threshold, so this should be considered the maximum. However as CDFW mentioned earlier, the depth to groundwater should be less than 10 feet (i.e. groundwater higher than threshold in Judgment) during certain times of the year to ensure the long term viability and health of the riparian habitat in the Transition Zone.

Committee's Question

The parties shall also include proposed schedules for the remaining proceedings in the case.

CDFW Response

CDFW believes the water balance study proposed in Exhibit 1 of this Statement will provide critical information to help determine the appropriate amount of VVWRA wastewater that may be diverted to HDPP without significantly impacting riparian vegetation in the Transition Zone. Accordingly, CDFW proposes that any hearings or other proceedings by the CEC be held only after completion of the water balance study along with sufficient time to assess the results. CDFW conservatively estimates it would take up to 12 months to complete the water balance study, which would include administrative actions such as securing funding and contracting for the work.

Committee's Question

Petitioner shall, and CDFW may, include in its Status Conference Statement any response to the Staff's Issues Report.

CDFW Response

CDFW is not responding to the Staff's Issues Report (TN #212535) in this Statement. However, CDFW provides the responses below to some of the questions posed by the Committee in the Committee's Notice. CDFW recognizes that it is responding to some of the same questions posed by the Committee that CEC Staff also responded to. To be clear, although CEC Staff and CDFW are providing responses to some of the same questions posed by the Committee, CDFW is providing these responses without having sufficiently considered Staff's Issues Report. Therefore, CDFW's responses below should not be considered a response to Staff's Issues Report.

CDFW'S RESPONSES TO SOME OF THE ADDITIONAL QUESTIONS POSED BY THE COMMITTEE IN THE COMMITTEE'S NOTICE.

Recycled Water

Committee's Question

How would the re-direction of recycled water from the Transition Zone to HDPP affect the riparian habitat in the Transition Zone?

CDFW Response

VVWRA recycled water/wastewater is an input to the water balance of the Transition Zone. The wastewater provides both surface water flow and recharge to the groundwater system in the Transition Zone. The Mojave River in the Transition Zone supports a variety of riparian vegetation and wildlife. See CDFW testimony of Alisa Ellsworth (TN#210554) for a description of current riparian vegetation and wildlife in the Transition Zone area.

Several studies have been conducted on the relationship between native vegetation and hydrologic condition along the Mojave River (Lines, 1996, 1999, and Lines and Bilhorn, 1996)[4]. Lines (1999) concluded in his study of cottonwoods, willows and mesquite trees of the Mojave River that:

> *Cottonwoods, willows, and mesquite tree along the Mojave River mainly rely on ground water for their perennial sustained supply of water. They utilize ground water that has moved upward from the water table into the capillary fringe and into unsaturated soil near the land surface. Most precipitation that falls on the land surface is lost by evaporation and by transpiration of shallow-rooted xeric plants.*
>
> *Mortality was as high as 39 percent in healthy and reproducing cottonwood-willow woodlands, but higher mortality (50 to 100 percent) was common where water-table depth was greater than about 7 feet.*
>
> *Cottonwoods and willow, although stressed, can probably survive where water-table depths ranges from about 7 to 10 ft during spring and where there may be water table declines of several tens of feet owing to pumping during summer and autumn. These trees, such as those growing in the Lower Narrows study site, rely heavily on soil moisture left behind as the water table declines during summer and autumn. However, mortality is extremely high (95 to 100 percent) where*

[4] **Lines, G.C., 1996**, USGS Water Resources Investigations Report 95-4189 at: https://pubs.er.usgs.gov/publication/wri954189 ; **Lines, G.C., 1999**, USGS Water Resources Investigations Report 99-4112 at: http://pubs.usgs.gov/wri/1999/4112/report.pdf ; **Lines. G.C. and Bilhorn, T.W., 1996**, USGS Water Resources Investigations Report 96-4241 at: http://pubs.usgs.gov/wri/1996/4241/report.pdf

water-table declines greater than about 5 ft are sustained for more than a few months.

Comparison of data from the three mesquite bosque study sites indicates that mortality increased with increasing water-table depth; whereas LAI, canopy height, live-canopy density, and live-crown volume decreased with increasing water-table depth. At a healthy and reproducing mesquite bosque, where water-table depth ranged from about 8 to 11 ft, mortality was 20 percent. Where the water table had been lowered more than about 10 feet by pumping morality was extremely high (80 to 90 percent).

In absence of seasonal water-table fluctuations caused by pumping, reproduction will occur in cottonwood-willow woodlands where the water-table depth during spring is less than 5 ft. Likewise, reproduction in established mesquite bosques will probably occur if the water-table depth during spring is less than about 8 ft and there is no significant seasonal or long-tem water-table declines caused by pumping.

Redirection of VVWRA wastewater that would have been discharged to the Mojave River away from the river will result in a decrease of inflow to the Transition Zone. A reduction in inflow without an equal reduction in outflow or additional inflows to make up for the loss of inflow will result in a reduction in the amount of water in storage in the Transition Zone groundwater system. A reduction in storage will cause groundwater levels in the Transition Zone to decline and thereby increase the depth to shallow groundwater below the riparian vegetation in the Transition Zone. At the present time, the depth to shallow groundwater at the key well H-2, State Well No. 07N05W24R08S, required by the Judgment is slightly greater than 7 feet with seasonal drops of up to approximately 2.5 feet (i.e. depth to groundwater seasonally drops to 9.5') (Exhibit 2). This places the mequite bosque in the 20+ mortality range. An increase in depth of a few feet could increase mortality to 80 to 90 percent. For a report and map of the distribution and water use of riparian vegetation along the Mojave River at the time of the Judgment see Lines and Bilhorn, 1996 (USGS WRI 96-4241).

The basic question that's not been answered is what change in shallow groundwater elevation in the Transition Zone occurs as a result of an increase or decrease in VVWRA discharge of wasterwater to the Mojave River? Without answering that question, it should be assumed that sustained redirection of VVWRA discharge away from the river will likely have a negative impact on the riparian habitat and wildlife of the Transition Zone.

Committee's Question

What role does the current discharge of recycled water play in maintaining Mojave River flows and the health of the riparian habitat in the Transition Zone with the current and uncertain future base flow conditions?

CDFW Response

Discharge by VVWRA's Shay Road Plant, or any other wastewater plant, to the Mojave River augments surface water flows and provides recharge to the groundwater system in the Transition Zone. The wastewater collected by VVWRA in the upper Alto Subarea would have recharged the upper basin if it had been discharged there instead of being piped to the Shay Road Plant and discharged to the Mojave River below the Lower Narrows. Some of that redirected wastewater recharge in the upper Alto Subarea would have become or at least supported the discharge of base flow to the Mojave River. The relationship between increasing VVWRA discharge and decreasing base flow to the Transition Zone was evident prior to 2004 (Exhibits 3 and 4). With the post 2004 increase in the importation of State Water Project water to the Alto Subarea, the decrease in base flow slowed and today it is approximately 5,000 acre-feet-per-year or temporarily greater from storm flows. This condition however depends on continued imports of State Water Project water to match in the long-term loss of recharge resulting from the VVWRA discharges at the Shay Road Plant.

As discussed above, discharge of wastewater to the Transition Zone is important for maintaining surface water flows and groundwater levels in the Transition Zone. A drop in groundwater levels of a few feet from the current levels could result in plant mortality increasing to 80 to 90 percent, which will have a significant negative impact on the riparian habitat and its wildlife within the Transition Zone.

Groundwater

Committee's Question

What type of analysis is needed for the Energy Commission to assess whether impacts on base flow to the Mojave River in the Transition Zone are caused when HDPP pumps groundwater?

CDFW Response

It is our understanding that as part of the 2000 decision the CEC previously conducted a study on the potential impacts of HDPP pumping on flows in the Mojave River. That study should probably be repeated, but with updated information about the hydrologic conditions of the Alto Subarea and changes in the points and methods of recharge and extraction, as needed. This would include determining what amount of State Water Project water imports would be assumed as the baseline, worst-case, and best-case scenario for HDPP operations. In general, increased storage of groundwater results in increased groundwater elevation, which can result in increased groundwater discharge to river base flow. Reductions in groundwater storage would have the opposite effect on elevation, which would result in a reduction in base flow. Recent increases in Alto Subarea groundwater storage appear to be in part the result of recharging due to State Water Project water imports (Exhibits 4, 5 and 6).

Committee's Question

What action is the MWA required to take that affects base flows in the Mojave River at the Transition Zone?

CDFW Response

The Judgment doesn't require MWA to take any specific actions to change or maintain base flow. MWA does take actions to maintain groundwater storage, and subarea obligations by the importing of State Water Project water for use as replacement water, supplemental water, or make-up water. If MWA imports water to the Alto Subarea and infiltrates or injects that water into the groundwater aquifers, that action will increase groundwater storage, which theoretically will support higher groundwater levels. Higher groundwater elevations should cause more groundwater to discharge to the river, which contributes to base flow. If water isn't imported, the opposite can occur, resulting in a reduction in base flow.

The influence on base flow from a reduction in Alto Subarea groundwater storage was observed in the change in base flow before and after 2004. From 1998 to 2004 the volume of groundwater in storage in the Alto Subarea declined 189,342 acre-feet (Exhibit 6). This decline corresponded with a steady decline in base flow at the Lower Narrows from 10,162 to 3,783 acre-feet-per-year (Exhibits 3 and 4). Starting in 2004 the amount of groundwater stored in the Alto Subarea began to rise, reaching a high in 2011 at 226,489 acre-feet above the 2004 low (Exhibit 6). This increase in storage corresponded with importing 151,198 acre-feet State Water Project water between 2005 and 2015 (Exhibits 4 and 5). In fact, these imports made up approximately 79 percent of the 192,018 acre-feet imported since 1996 (total from footnote in Exhibit 6). As storage in the Alto Subarea increased, the reduction in base flow slowed where today the annual flow is approximately 5,000 acre-feet (Exhibits 3 and 4). Note that the temporary peaks in base flow are associated with major storm events (Exhibit 2).

Committee's Question

What information is available about the effect of these MWA actions on base flow to the Mojave River in the Transition Zone?

CDFW Response

There is no specific study of the relationship between surface flow, baseflow, and groundwater depth in the Transition Zone. The Annual Reports of the Mojave Basin Area Watermaster provide basic information on the annual production, water transfers, storage agreements, Free Production Allowance, Production Safe Yield, storm flows and base flows at USGS gauge stations, VVWRA discharges, State Water Project imports, precipitation, subarea storage, groundwater level hydrographs for selected wells, and a discussion of the overall hydrologic condition of each subarea. The Annual Reports provide various water accountings as required by the Judgment, such as the subarea obligations, replacement water and make up water purchases, water transfers, and subarea hydrological inventories based on long-term natural water supply, outflow, and consumptive use. In addition, the results of special technical studies

such as periodic re-calculation of consumptive use are included. Unfortunately, the information provided for the Alto Subarea in the Annual Reports combines information of the western, eastern and Transition Zones (see Figures 3-10, 3-11 and 3-12 in the annual report for maps of boundaries).

Two technical reports on the hydrogeology of the Transition Zone were produced by URS, Inc. in 2003 as part of an evaluation of a potential Mojave River Transition Zone Recharge Project. The Phase I report (URS, 2003a) described the *"interrelationship of hydrogeologic conditions governing the TZ water bridge concept". "Phase I also entails evaluating the potential for artificial recharge programs based on these interrelating hydrogeologic concepts".* The second report Phase II (URS, 2003b) described the *"...supply and demand in the Transition Zone..." and assessed of "...current and future water supply and demand conditions..." and estimates of "...the market for imported water and viability of recharge projects....".* These two reports contain detailed information on the hydrogeologic conditions of the Transition Zone as well as analysis of the long-term average annual water balance from 1994 to 2001 (see Tables 4 in 2003a, Appendix B in 2003b for discussions on the water budget) and an aerial photo evaluation of the river length versus losing flow rate below the Lower Narrows (see Appendix F in 2003b). These two reports, however, do not evaluate the relationship between surface flow, base flow and groundwater depth in the Transition Zone.

Committee's Question

Are there Conditions of Certification that the Energy Commission can impose that will ensure that base flow to the Mojave River in the Transition Zone will not decrease at any time as a result of the project's use of groundwater?

CDFW Response

As noted above, base flow into the Transition Zone is the result of a complex set of hydrologic conditions that historically have varied. In theory, the amount of base flow is the result of a basin's water balance, which controls the elevation of groundwater relative to the river. If the amount of water inflow to a groundwater basin exceed outflow, groundwater levels rise and that in turn can allow for greater and more sustained discharge to the river. The location of pumping discharge and recharge can also have a significant impact on the timing and location of groundwater that enters the river and influences any increases to base flow, and where water leaves a river to groundwater causing a reduction in base flow. Storm flows and precipitation events provide additional recharge to aquifers, which can result in temporarily increases in base flow.

CDFW believes that a Condition of Certification that would allow HDPP to use a limited amount of recycled water should include a requirement that such use of recycled water stop if the depth to groundwater in the Transition Zone increases above (i.e. groundwater falls) an appropriate threshold, which should be no greater than 10 feet.[5] When the Transition Zone groundwater level again rises above the threshold, some use of recycled water by HDPP could resume. After some time, the water balance can be re-evaluated to determine what rate of diversion of treated

[5] See footnote 1.

wastewater would cause less than significant impacts to the riparian vegetation in the Transition Zone. To assist with such a re-evaluation, vegetation monitoring to document the long term health and reproductive viability of the riparian vegetation within the Transition Zone would be helpful.

CONCLUSION

CDFW appreciates the Committee's actions in issuing the *Notice of August 11, 2016 Committee Status Conference and Related Orders,* convening the Status Conference, and asking important and thoughtful questions regarding the potential impacts to public trust resources from various water supply sources sought to be utilized by HDPP. CDFW believes that a water balance study, similar to the one proposed by CDFW in this filing, needs to be done before any action should be taken to allow the HDPP to permanently utilize treated wastewater as a source of water for its operation. CDFW is willing to assist the Committee, to the extent it has staff and funds available, to assist the Committee in the design or implementation of this important water balance study.

Respectfully submitted,

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