CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION
(SDRWQCB)

SUPPLEMENTAL ENVIRONMENTAL PROJECT APPLICATION FORM

Project Requested by South Orange County Wastewater Authority

Name of Project Aliso Creek Runoff Recovery and Reuse Project

Date of Request April 1, 2009

Point of Contact Mr. Brennon Flahive

Phone (949) 234-5419 E-mail: bflahive@socwa.com

Project Summary: This project would collect about 0.8 Million gallons per day of abandoned urban runoff from Aliso Creek, treat the water through a reverse osmosis treatment process and combined the water with Title 22 Recycled Water for use as recycled water for irrigation uses. The urban water would be collected approximately 1.5 miles from the confluence of Aliso Creek and the Pacific Ocean and treated through a package filtration process located at the South Orange County Wastewater Authority's Coastal Treatment Plant (CTP). The effluent would be mixed with the CTP recycled water effluent and as a result the total dissolved solids content would be lowered thereby enhancing the recycled water quality and reducing the amount of urban runoff that reaches the Pacific Ocean.

The Life Cycle Cost for Project:

The Life Cycled Cost for the first five years of operation is projected to be 1.5 million dollars. The total capital costs associated with the treatment system is projected to be $ 600,000.

Project Water Body: Aliso Creek and the Pacific Ocean.

Project Proposed Start Date and Time Line:

The proposed project start date is 09/01/09

The plant is anticipated to begin operations by 01/01/2010

Organization Sponsoring Project: South Coast Water District

Name of Project Manager: Ms. Mary Anne Skorpanich Phone (714) 955-0601

Designated Project Trustee:

Orange County Public Works Department – Watersheds Department

Statement of Project Trustee ability/authority to receive and disburse funds:
The Orange County Watersheds Department has extensive experience with managing construction projects of this magnitude.

DETAILED PROJECT INFORMATION

1. PROPOSAL DESCRIPTION: The SCWD would install a small pump and protective fish screen in Aliso Creek, adjacent to the Coastal Treatment Plant that would safely divert about 0.8 million gallons per day of dry weather runoff to the proposed treatment facility. The agency will install a filtration process on the Coastal Treatment Plant site capable of providing reverse osmosis treatment for up to 0.8 MGD of creek flow and mix the product water with the recycled water produced by the CTP Advanced Wastewater Treatment facility for recycled water irrigation use.

2. PROBLEM STATEMENT: This project attempts to meet the State Water Board's recently adopted Water Recycling Policy, which states "we strongly encourage local and regional water agencies to move toward clean, abundant, local water by emphasizing appropriate water recycling and the use of storm water (including dry weather urban run-off)." The project will improve local recycled water through addition of treated urban runoff as a local water supply source. Further, the use of a local water supply source reduces the need for imported water supplies, which have a greater carbon footprint due to the energy required to move water across the State.

3. HOW WILL THE PROJECT BENFEFIT WATER QUALITY AND BENEFICIAL USES?

This urban runoff capture project would safely reduce the dry weather stream flow that reaches the Pacific Ocean and improve the ocean water quality. One of the project goals is to lower the dry weather flow in Aliso Creek. The project will help to support conditions that allow the Aliso Beach sand-berm to form during dry weather by lowering the flow levels. When the berm is present, it prevents the urban runoff in Aliso Creek from directly flowing into the ocean. The lower creek flow migrates under ground to the ocean thereby receiving natural filtration and enhancing the beneficial uses of Aliso Beach. The creek water filtered through the reverse osmosis facility will have a low mineral content and when mixed with recycled water it will produce a better recycled water product supporting continued recycled water uses among customers for that water.

4. HOW WILL THE SUCCESS OF THIS PROJECT BE MEASURED?

The success of this project would be directly related to the volume of urban runoff diverted from flowing directly to the Pacific Ocean and put to beneficial reuse.

5. DETAILED WORK PLAN

Please See the Attached Detailed Work Plan for More Information:

I certify that the information provided in this application is an accurate and complete report of the costs, scope of work and expectations of this proposed project I am submitting to the SDRWQCB.

SIGNATURE [signature] ***Date*** 4/21/09

South Coast Water District
PO Box 30205
Laguna Niguel, CA 92607-0205

Aliso Creek Urban Runoff Recovery, Reuse, and Conservation Project

Aliso Creek Hydrologic Conditions, Project Plans, and Adaptive Management

June 2008

Prepared by

eGIS
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Aliso Creek Hydrologic Conditions, Project Plans, and Adaptive Management

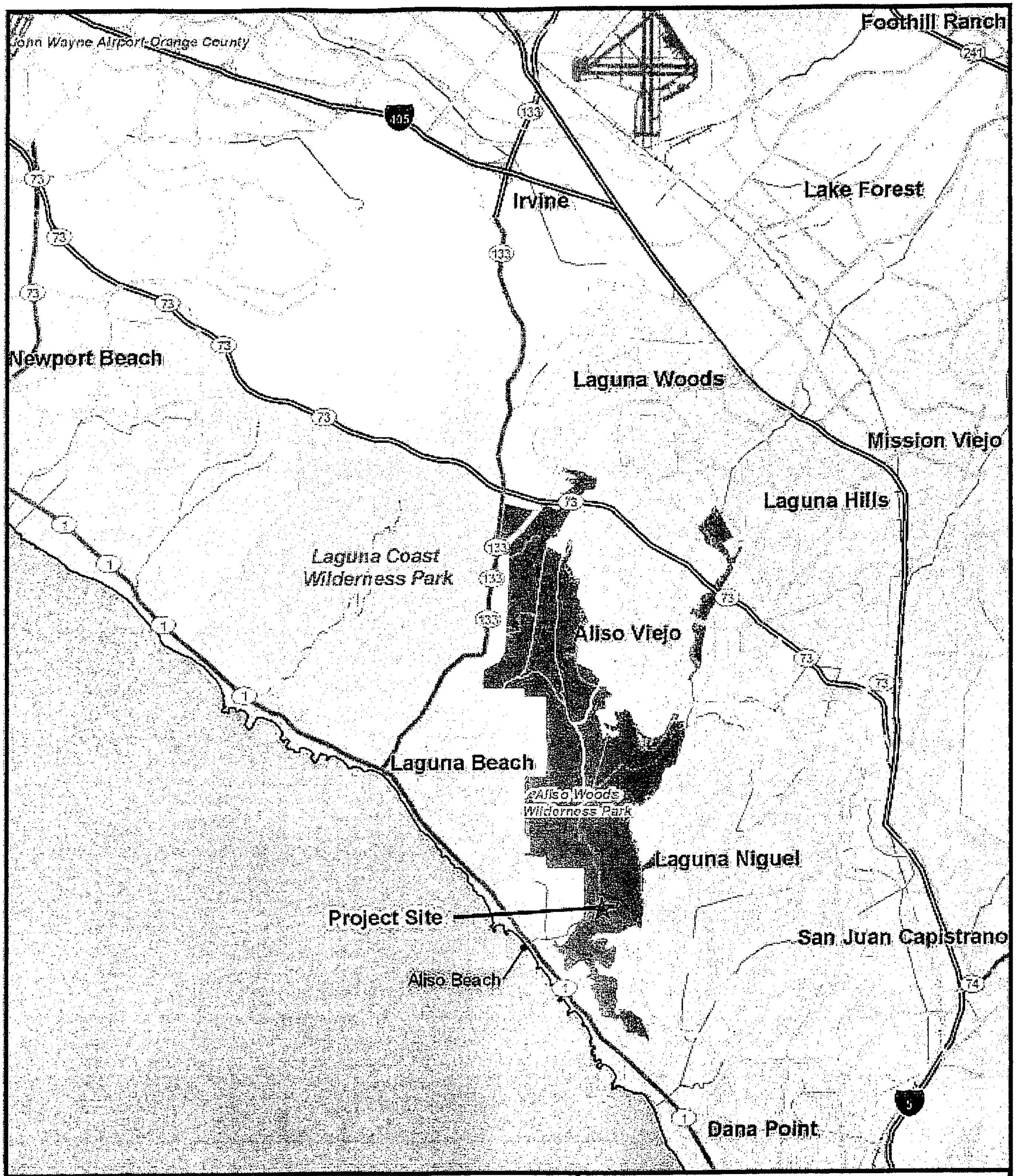
1.0 INTRODUCTION

South Coast Water District (SCWD or "District") proposes to capture and reuse approximately 800,000 gallons per day (gpd) of urban runoff in Aliso Creek in Laguna Beach, California (Figures 1-1 and 1-2). The recovered urban runoff collected by the Aliso Creek urban runoff recovery, reuse and conservation project ("Project") will be treated and reused by combining the water with recycled water produced at the Advanced Wastewater Treatment (AWT) System at the Coastal Treatment Plant. There will be an improvement to the water quality of the combined supply, making the AWT recycled water more usable as well as increasing the overall recycled water supply for South Laguna, Dana Point, and Capistrano Beach. Downstream improvements in water quality are expected at Aliso Beach County Park because a portion of the urban runoff will be removed from Aliso Creek and constituents removed from the runoff water will be discharged in the Coastal Treatment Plant outfall, approximately 6,700 feet offshore at a depth of approximately 170 feet. Removal of a portion of the urban runoff will also help to reduce excessive stream flow from urbanized areas and return stream flows in lower Aliso Creek to more natural levels.

This report on Aliso Creek Hydrologic Conditions, Project Plans, and Adaptive Management was prepared to provide information needed by the California Department of Fish and Game (CDFG) to complete their review of the Project as outlined in an e-mail of January 24, 2008 from Mr. Matt Chirdon (copy in Appendix A). In summary, the CDFG requires information on:

- The diversion structures or equipment needed for the diversion.
- Purpose, use, quantity, and season of diversion.
- Operating conditions and standards.
- Historic and current stream flows near the point of diversion.
- Instream flow conditions with diversion.
- Adaptive management plans.
- Maintenance, monitoring, and reporting.
- Streambed Alteration Agreement and CEQA documentation

The following sections provide information regarding each of these issues.



LEGEND

Proposed Project Site

0 1.25 2.5 Miles

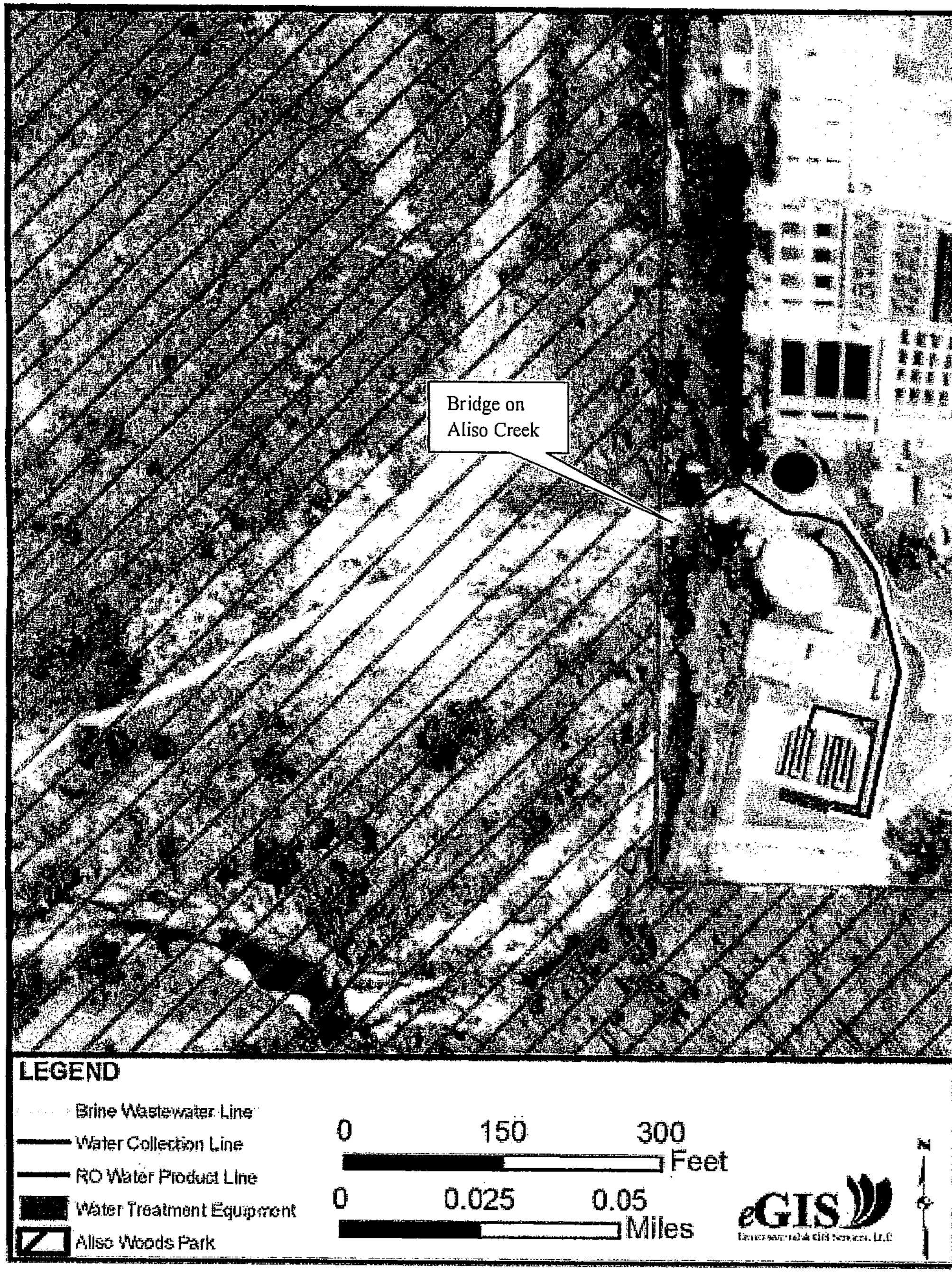
eGIS

Aliso Creek Inital Study

South Coast Water District

Figure 1-1

Project Vicinity Map



Aliso Creek Inital Study

South Coast Water District

Figure 1-2

Aerial View of Project Location and Site Arrangement

2.0 PROJECT DESCRIPTION

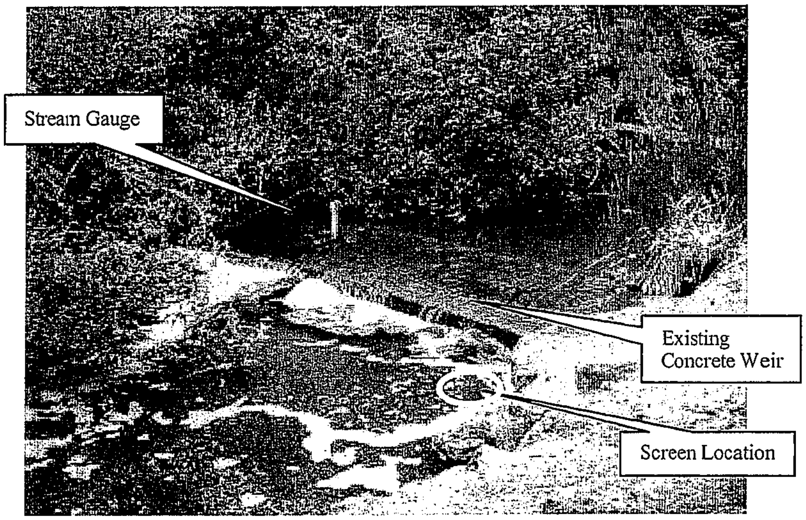
2.1 PROJECT LOCATION AND SETTING

The Project will be located adjacent to Aliso Creek inland from the Pacific Coast Highway in the City of Laguna Beach, California (Figure 1-1). The Project is within the Aliso Creek Watershed downstream of the Aliso and Wood Canyons Wilderness Park and approximately 1.5 miles from the confluence of the creek with the Pacific Ocean at Aliso Beach County Park. Aliso Beach County Park is a popular beach destination and water sport location.

The Coastal Treatment Plant is located within the Aliso and Wood Canyons Wilderness Park. The Aliso Creek Inn and Golf Course is located adjacent to Aliso Creek between Pacific Coast Highway and AWT system at the Coastal Treatment Plant.

2.2 RUNOFF WATER RECOVERY, TREATMENT, AND REUSE

This Project proposes to use a portion of abandoned urban runoff water recovered from Aliso Creek and treated with a reverse osmosis (RO) and a filtration package system to provide a low total dissolved solids/salts (TDS) addition to existing recycled water supplies. Concentrated effluent from the RO system and backwash from the filtration package will be discharged in the ocean outfall for the Coastal Treatment Plant.



Runoff Recovery

The water intake equipment will be located next to the existing concrete weir near the bridge that provides access to the Coastal Treatment Plant as illustrated in Figure 2-1. Urban runoff water will be recovered from Aliso Creek using a self-priming centrifugal pump with a self-cleaning intake screen mounted next to the existing concrete apron. The stream banks at this location are protected from erosion by concrete and rip-rap. The water intake pump will be secured by bolts to the existing concrete apron and will not require alteration of the streambed.

A 7.5 horsepower float controlled self-priming centrifugal pump will deliver water to the treatment facility via a 4" PVC pipeline. The pump suction screen will be approximately 16" high by 24" diameter, Figure 2-2). The suction screen will prevent unwanted material from passing into the pump.

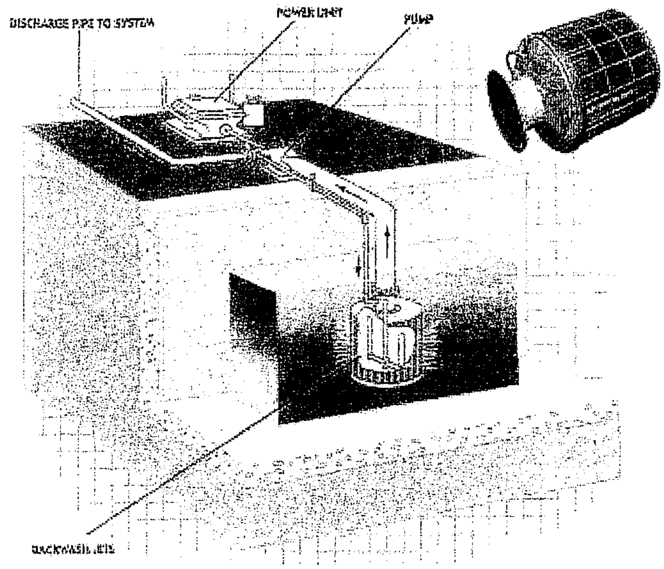


Figure 2-2. Drawing of Self-Cleaning Pump Suction Screen

Recovered Water Treatment Process
Water treatment equipment will be located on an existing asphalt pad adjacent to the AWT disinfection system as illustrated in Figure 2-3. The treatment equipment will consist of a package treatment plant installation (Clear Creek System, or equivalent), including:

- Multimedia filter with approximately four tanks 48" in diameter and 60" high;
- Organoclay filters with two tanks 48" in diameter and 72" high;
- Reverse osmosis (RO) treatment system; and,
- Control panels.

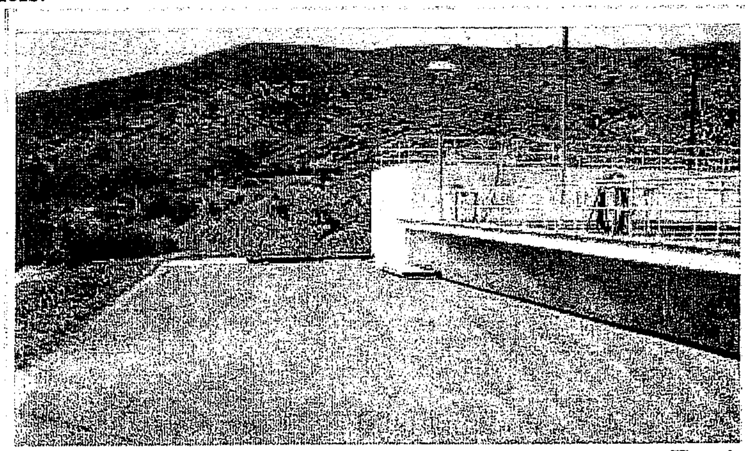


Figure 2-3. Existing Asphalt Area for Water Treatment Equipment

The water collection, treatment and use cycle for the Project is illustrated in Figure 2-4. The water will be filtered through four 48" diameter dual media (sand and anthracite) pressure filters, operating in parallel. Water enters the top of each filter vessel and flows, under pressure, through media

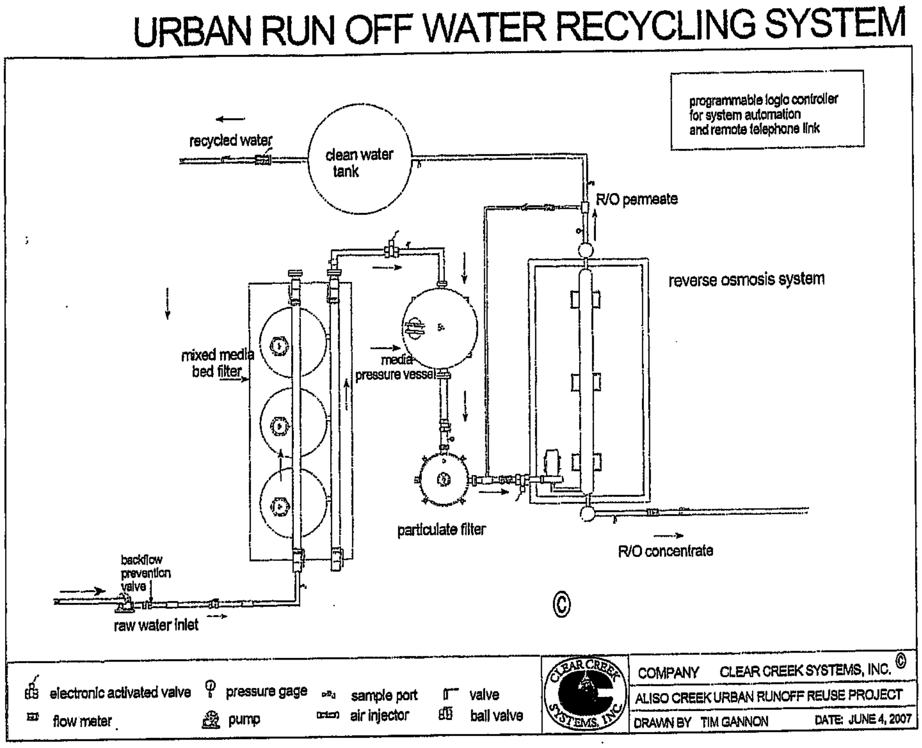


Figure 2-4. Typical Water Collection and Treatment Process

where solid particulate and suspended organic and inorganic solids are removed. The filters operate at 11 gallons per minute (gpm) per square foot of filter surface for a designed rate of 600 gpm. Filters are backwashed periodically to remove trapped materials, using water from the potable water system. The backwash is discharged to the backwash waste tank where the water is conveyed to the headworks of the Coastal Treatment Plant. The water will then flow through a reverse osmosis unit using two banks of low energy reverse osmosis membranes to optimize energy efficiency. Aliso Creek urban runoff water has total dissolved solids (TDS) of approximately 2300 mg/l. The recovered water is anticipated to have approximately 200 mg/l of dissolved solids and a 60% to 75% recovery rate. Figure 2-5 is a photograph of a similar package treatment system.

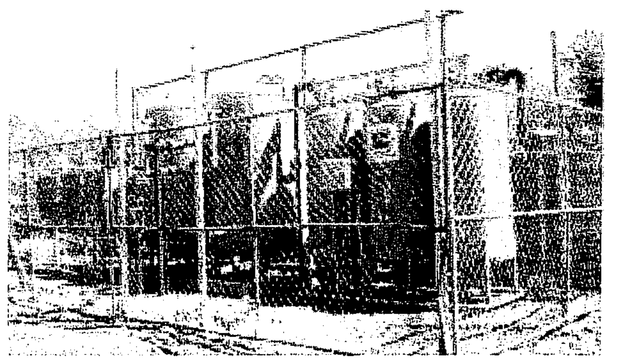


Figure 2-5. Photograph of Similar Package Treatment System Installation

The water exits the treatment system and is delivered by pipeline to the adjacent AWT disinfection system where it is blended with the secondary treated effluent entering the AWT from the Coastal Treatment Plant. The end product water will be stored for use in the recycled water system and delivered in accordance with all requirements of the SCWD's existing DHS permits for the delivery and use of recycled water.

The by-product of the packaged treatment system will be water with a high TDS (brine) that will be directed to the ocean outfall utilized by the Coastal Treatment Plant. Approximately 300,000 gpd will be discharged to the existing outfall. This will represent 0.5% to 0.8% of the total flow volume in the outfall. The brine will be of the same or better constituency as the water entering the outfall from the Coastal Treatment Plant secondary treatment process. There will be no increase in nutrient loads going into the ocean from this Project. Nutrient loads which would have otherwise entered the ocean via Aliso Creek will be delivered to the ocean via the Coastal Treatment Plant ocean outfall, approximately 6700 to 7900 feet offshore.

2.3 EXPECTED PROJECT BENEFITS

The Project has three expected benefits. The first benefit would be to increase and improve an alternative water supply (recycled, tertiary treated water) by lowering the salts (total dissolved solids) in the recycled water supply and improving the quantity and quality of recycled water delivered by SCWD recycled water customers. The SCWD's wholesale water providers, Municipal Water District of Orange County (MWDOC) and Metropolitan Water District (MWD) have encouraged the development of alternative local water supply sources within the area served by SCWD. The Project would allow the SCWD to serve more recycled water to customers. The Project is also consistent with public policy as determined by the California Legislature, which declares that the use of potable domestic water for non-potable uses is a waste where a recycled water supply is available.[1]

The second benefit would be to improve Aliso Creek beach and recreation areas in the surrounding ocean environment by reducing the polluting impact of abandoned urban runoff in these areas. Up to 800,000 gpd, or approximately 1.23 cubic feet per second (cfs), of dry season urban runoff will be intercepted and removed from Aliso Creek.[2] This will remove a portion of the warm nutrient-rich and bacteria laden runoff presently flowing into the tidal zone near the mouth of Aliso Creek, improving beach conditions and the surrounding ocean water quality.

The third benefit would be a reduction in the low water flows of Aliso Creek to bring it closer to historical levels that existed before urbanization in upstream areas caused an increase in flows. Historically the creek had much lower flows during the rainy seasons and little or no flow during summer months (see Section 3.2, below). The historic conditions allowed the formation of beach sand barriers and formation of pooled areas where the endangered tidewater goby (*Eucyclogobius newberryi*) was found (Goldberg, 1977; Swift et al. 1989). It is believed that the extensive and costly erosion of the lower reaches of Aliso Creek watershed is the direct result of development induced elevated flow rates from upstream areas (USACOE 1999). These higher flow rates are also responsible for

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[1] Cal. Water Code Section 13550 et seq.
[2] Orange County RDMD has measured flows at the Coastal Treatment Plant at 9 cfs and higher on average (equivalent to 5,800,000 gallons per day minimum average).

transporting bacteria and other contaminates to the ocean receiving waters and destruction of the favorable former wetland/tide pool habitat of the tidewater goby. Aliso Creek is included in the South Coast Recovery Unit of the recovery plan for the goby (USFWS 2005). Reintroduction of gobies to unoccupied habitat is one of four primary tasks recommended for recovery of the goby in the South Coast Recovery Unit (USFWS 2005). Because no permanent alterations to the habitat in Aliso Creek lagoon have taken place since the 1970's when the goby was last recorded, this area is considered by the US Fish and Wildlife Service (USFWS) to be one of the most promising locations for reintroduction of a goby population in southern California outside of Marine Corps Base Camp Pendleton (USFWS 2006).

3.0 DIVERSION CHARACTERISTICS

3.1 PURPOSE, USE, QUANTITY, AND SEASON OF DIVERSION

Purpose and Use

SCWD proposes to capture and reuse urban runoff water in Aliso Creek. The recovered urban runoff will be treated and reused by combining the recovered water with recycled water produced at the AWT System at the Coastal Treatment Plant as an additional source of water supply. There will be an improvement to the water quality of the combined supply, making the recycled water more usable as well as increasing the overall recycled water supply. Downstream improvements in water quality are expected at Aliso Beach County Park because a portion of the urban runoff will be removed from Aliso Creek and constituents removed from the runoff water will be discharged in the Coastal Treatment Plant outfall, approximately 6700 to 7900 feet offshore. Diverting a portion of the urban runoff will help to reduce excessive stream flow from urbanized areas and return stream flows to more natural and historic levels.

Quantity

Approximately 800,000 gpd (1.23 cfs) of urban runoff will be diverted to the treatment facility. Following filtration and reverse osmosis, approximately 500,000 gpd will be delivered to the AWT system for addition to the recycled water and 300,000 gpd of "brine" from the reverse osmosis system will be disposed of in the ocean outfall.

Season of Diversion

The Project will operate year-round, however water will not be recovered from Aliso Creek during high flows or during very low flows (see Section 3.2.3, below). Although the system is capable of operating year-round, the demand for recycled water is seasonal and the diversion of urban runoff water from Aliso Creek will depend on recycled water demand. Table 3-1 shows the recycle water demand for January 2007 to April 2008 (16 months) along with the amount of recovered urban runoff water that would be needed to supplement the recycle water to produce water with approximately 800 mg/l TDS.

Table 3-1. Recycle water demand for January 2007 to April 2008

Month	Recycle Ave gpd	Proposed Diversion gpd	Proposed Diversion Ave cfs
Jan	696000	208800	0.52
Feb	532000	159600	0.39
Mar	540000	162000	0.40
Apr	671000	201300	0.50
May	1127000	338100	0.84
Jun	1359000	407700	1.01
Jul	1261000	378300	0.94
Aug	1594000	478200	1.18
Sep	1424000	427200	1.06
Oct	1028000	308400	0.76
Nov	674000	202200	0.50
Dec	555000	166500	0.41
Jan	570000	171000	0.42
Feb	487000	146100	0.36
Mar	902000	270600	0.67
Apr	768000	230400	0.57

As shown in Table 3-1, recycled water demand is highest in May through October during the hottest and driest months when water for landscape irrigation is needed. Demand is much lower during November through April. Based on these 16 months of data on recycle water demand, the average amount of urban runoff water recovered from Aliso Creek would be approximately 0.70 cfs.

3.2 HISTORIC, CURRENT, AND PROPOSED DIVERTED STREAM FLOWS

The Aliso Creek watershed is located in Southern Orange County, and encompasses a drainage area of approximately 36 square miles. The watershed extends 19 miles from the foothills of the Santa Ana Mountains to the Pacific Ocean south of Laguna Beach, and includes the tributaries of Wood Canyon, Sulphur Creek, Aliso Hills Channel, Dairy Fork, Munger Creek, and English Canyon. Residential developments within the watershed include portions of Lake Forest, Laguna Beach, Foothill Ranch, Portola Hills, Mission Viejo, Laguna Hills, Aliso Viejo, and Laguna Niguel. The majority of the watershed is urbanized with residential development of up to 18 units per acre.

Because high turbidity precludes water diversions during storm events, low flow periods are most likely to be affected by the diversion of water from Aliso Creek.

3.2.1 Historic Stream Flows (Upper Aliso Creek)

The stream flow gauge at Jeronimo Road provides the longest data record for Aliso Creek: 1932-present. The US Geological Survey (USGS) stream gage data on Aliso Creek at Jeronimo Road were analyzed by US Army Corps of Engineers (USACOE, 1999a) to characterize the changes in the low flow condition (Figure 3-1). From 1950 to 1970, the lowest flows were "consistently near zero" (USACOE 1999b). In an Environmental Impact Study prepared for Aliso Water Management Agency, stream flow in Aliso Creek was characterized as "not significant and generally amounts to a trickle quantity" (Jones & Stokes, Boyle Engineering 1972). Trends in the data clearly show an increase in the magnitude of the low flows within the Aliso Creek watershed, especially since the mid-1970's.

Figure 3-1 shows a graph of time series *cumulative flow data* from the Aliso Creek stream flow gauge at Jeronimo Road with recent high-flow (flood) years indicated (USACOE 1999a). The cumulative flow by definition is always increasing over time. Of interest is the rate at which the cumulative flows increase, indicated by the slope of the line. Cumulative flow contributions from low-flow conditions correspond to the segments of the line with a relatively mild gradual slope, whereas the sharp increases in slope correspond to high-flow years. Aside from the high-flow years, the slope remains relatively flat indicating little or no flows from the mid-1940s through the late 1970s. Beginning in the late 1970s, the slope for non-flood years becomes noticeably steeper, indicating an increase in low-flows from the earlier time period. The time period showing the increase in low-flows corresponds to years of increased urbanization in the Aliso Creek watershed.

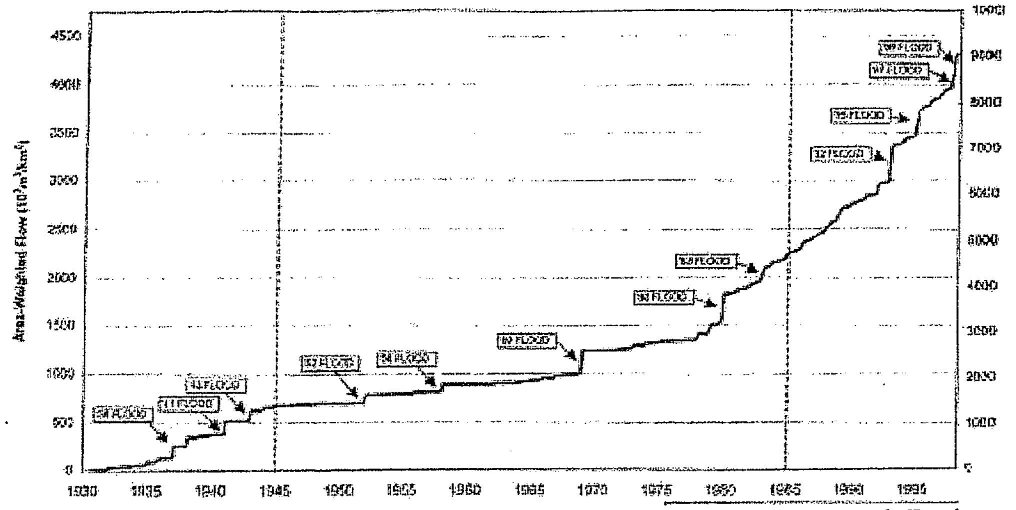


Figure 3-1. Total Cumulative Area-Weighted Flow Volume for Aliso Creek Drainage at Jeronimo Gauge (1930-1998). (Source: USACOE 1999a)

3.2.2 Historic Stream Flows (Lower Aliso Creek)

Historically, stream flows in lower Aliso Creek during summer months or dry periods have been documented as having little or no flow. In one of the last observations of the tidewater goby in lower Aliso Creek, S. Goldberg (1977) documented his 1974 collecting conditions as:

> "The mouth of Aliso Creek forms a lagoon which is closed from the ocean most of the time by the beach sand. It periodically fills and opens, at which time the 1.2-1.5m of water that accumulated drains into the ocean."

As noted in the Aliso and Wood Canyons Wilderness Park Aliso Creek Resource Management Plan (LSA Associates, 2006), Aliso Creek was once an intermittent stream before the region became heavily urbanized, and now flows year-round through the eastern and southern sections of the Park, augmented in recent years by significant increases in upstream urban runoff. Presently, the year-round flows at the mouth of Aliso Creek are always too high to allow formation of a lagoon behind a berm of beach sand as described by Goldberg, above.

Stream flow data summarized in Figures 3-2, 3-3, and 3-4 illustrate the flows observed from 1973 to 1979, 1982 to 1987, and 2004 to 2006. These data were collected at three slightly different locations, but all were between the Coastal Treatment Plant and Pacific Coast Highway, a distance of approximately one mile. The complete data set for each of the monitored periods is provided in Appendix B Historical Flow Data.

Similar to the continuously monitored section of Aliso Creek at Jeronimo (Figure 3-1), the lower Aliso Creek monitored by Orange County from 1973 to 1979 had very low flows of approximately 1 to 2 cfs throughout the year (Figure 3-2), with many recorded flows of 0.5 cfs or less. The effects of urbanization of the upper reaches of the drainage during the 1980's is evident in the data from continuous monitoring conducted by USGS from 1982 to 1987 (Figure 3-3), when low flows averaged about 4 cfs.

The most recent data, for the period from 2004 to 2006, show how the runoff from urbanized areas has continued to increase. As illustrated in figure 3-4, low flows were generally about 10 cfs from July 2004 to June 2006. For the period July 1 to October 15 in 2004 and 2005, both periods without significant precipitation, the mean daily flows averaged 9.68 and 9.57 cfs, respectively. These recent flows are approximately double the low flows observed from 1982 to 1987, and approximately ten times higher than the flows in the 1970's or earlier.

Figure 3-2. 1973-1979 Stream Flow Data for Aliso Creek (USGS Data)

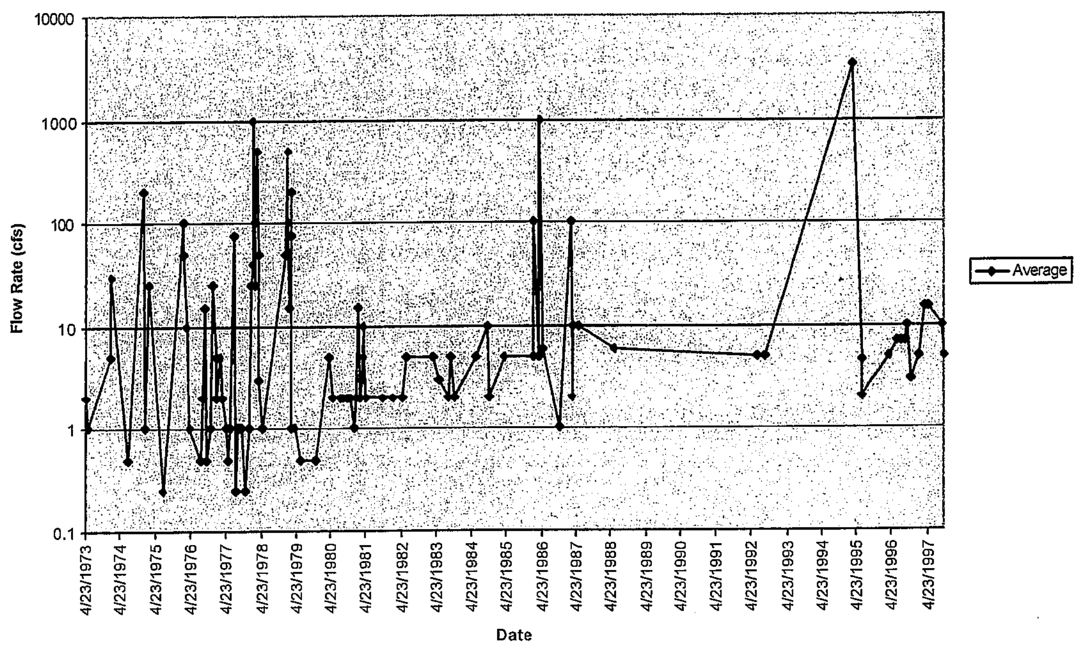


Figure 3-3. 1982-1987 Stream Flow Data for Aliso Creek (USGS Data)

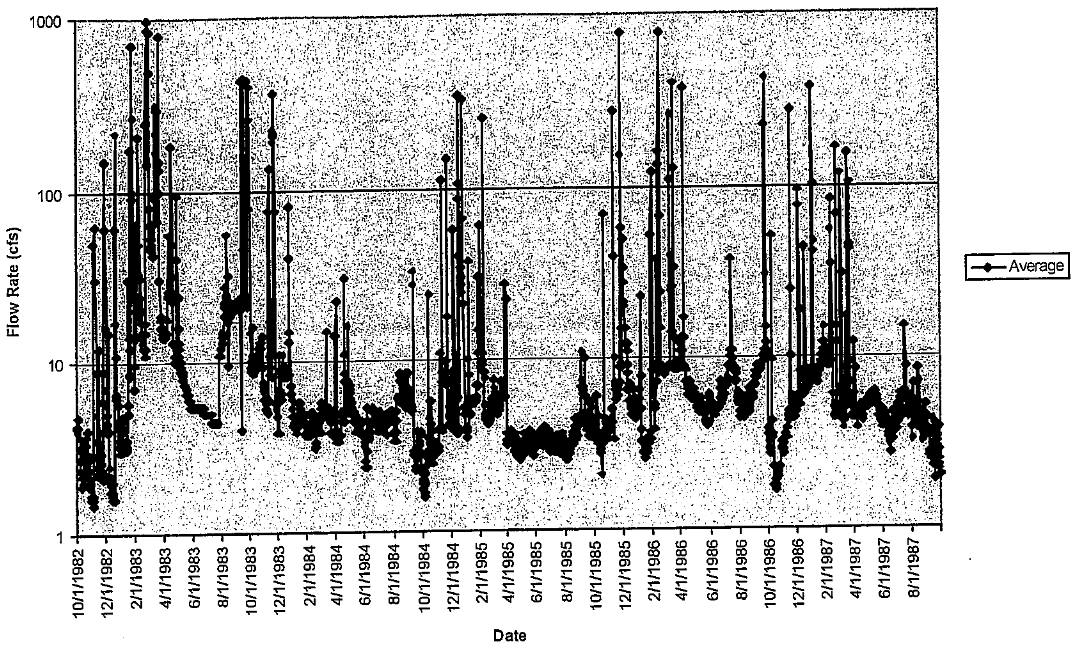
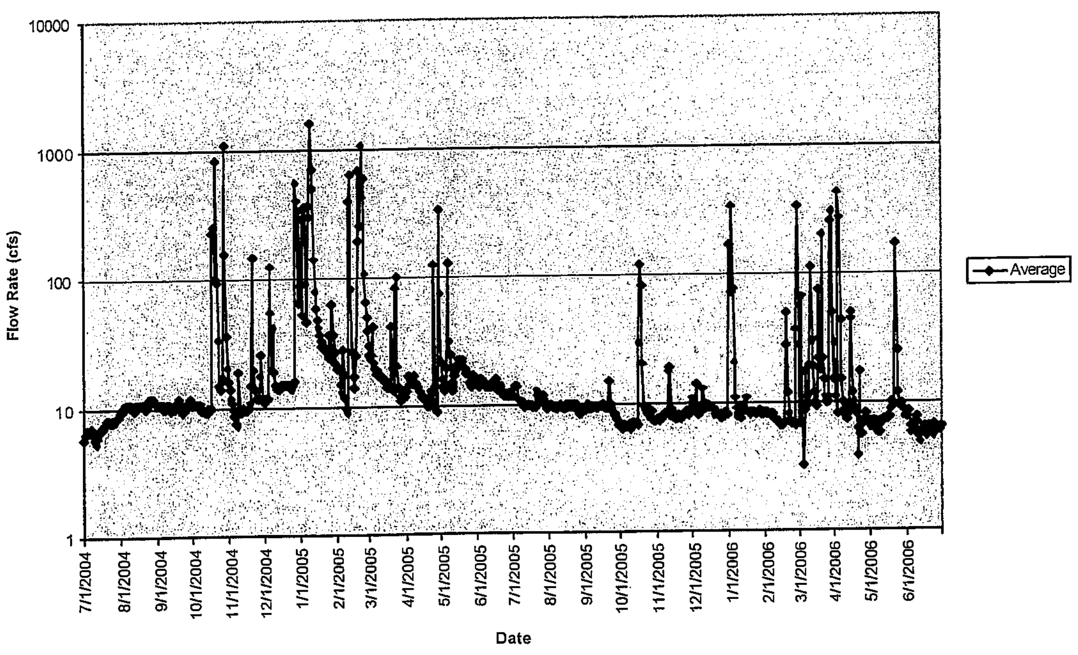


Figure 3-4. 2004-2006 Stream Flow Data for Aliso Creek (OC RDMD Data)



3.2.3 Proposed Diverted Stream Flows

The Project proposes to divert and recover approximately 800,000 gpd (1.23 cfs) of urban runoff which would be sent to the treatment facility to produce recycled water. Figure 3-5 illustrates what the low water flows would be in Aliso Creek with the Project operating and using the 2004 to 2006 data as an expected stream flow. After diversion of 1.23 cfs, the remaining average mean daily flows during the two dry periods mentioned above (July 1 to October 15 for 2004 and 2005), would still be 8.45 and 8.34, respectively.

Operating controls for the diversion pump will be set to stop diversions if the stream flow levels drop below 6 cfs or exceed 20 cfs. The low-flow cutoff of 6 cfs at the point of diversion would maintain a minimum downstream flow of 4.77 cfs which is approximately 2 to 3 times the natural flows experienced in the 1970's (Figure 3-2) and higher than the lowest flows recorded in 2004 to 2006 (3.8 cfs, see Appendix B1). Based on these parameters (i.e. operating between stream flows of 6 cfs and 20 cfs), and using the 2004-2006 flow data, the diversion would have operated approximately 81% of the time, stopping operation for 18 and 133 days for low and high flows, respectively, over the two year period. Using the 2004-2006 flow data, total diversions would be approximately 724 AFY, or approximately 2.8% of the estimated total annual flow of Aliso Creek for 2004-2006.

3.3 INSTREAM FLOW CONDITIONS

3.3.1 Baseline Conditions

Field surveys of conditions at 10 stream transects ("stations') downstream from the proposed diversion were conducted on May 9, 2008, to establish baseline conditions. The proposed diversion location is approximately 1800 meters upstream from the bridge at Pacific Coast Highway and transects were selected at the stream diversion location and at approximate 200 m intervals downstream as illustrated in Figure 3-5. At each of these locations information was collected on the cross-section (depth in inches), water velocity (feet per second), substrate, and proximity of riparian vegetation.

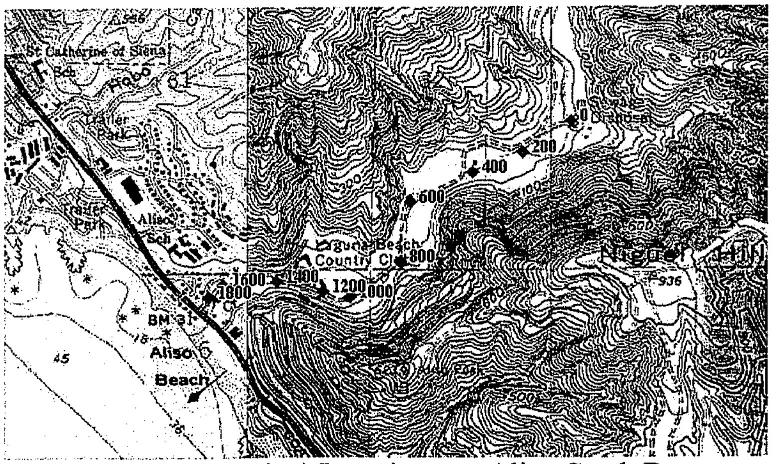


Figure 3-5. Stream Transect (Station) Locations on Aliso Creek Downstream from the Proposed Diversion Site.

Table 3-2 provides a summary of the stream measurements and measured stream flow at the stream monitoring stations. When monitored on May 9, 2008, the average stream flow at nine stations was found to be 7.6 cfs with a range of 6.45 to 8.92. Flows at Station 1800, closest to the ocean near Pacific Coast Highway, could not be measured because waves and tidal action impacted this location. Minor surface runoff flows likely enter Aliso Creek from the adjacent golf course and resort development, but no substantial flows were noted from these sources. Differences in flows noted at the stations was likely due to sampling error resulting from irregularities in the stream bottom not detected in the transect measurements. Overall, the average flow of 7.6 cfs is very similar to flows recorded by OCRDMD in May 2006 (Appendix B-1).

Table 3-2. Stream Measurements and Flow at Stream Monitoring Stations.

Station	Width (ft.)	Average Depth (in.)	Cross Section Area (sq. ft.)	Velocity ft./sec	cfs
0	31	2.13	5.52	1.31	7.26
200	6	9.25	4.62	1.41	6.52
400	15.6	4.45	5.78	1.54	8.92
600	20	22.11	22.11	0.17	6.45
800	14	11.10	12.95	0.49	6.46
1000	11	6.41	5.87	1.23	7.26
1200	14	7.75	9.04	0.98	8.91
1400	16	9.59	12.79	0.61	7.83
1600	48	4.66	18.66	0.47	8.79
1800	36.5	13.36	40.66	(1)	(1)
				Ave	7.60
				Min	6.45
				Max	8.92

(1) Station 1800 was influenced by the tide. No flow measurements could be taken.

3.3.2 With Project Conditions

Using the maximum diversion of 1.23 cfs, changes in depth of the water were calculated for each of the stream transects as shown in Table 3-3 with the assumption that the velocity and stream width remained the same. Using the stream flow data collected on May 9, 2008, the average change in water depth with diversion of 1.23 cfs would be approximately 1.5 inches, with a range of 0.6 to 3.7 inches. For the station with the shallowest average depth (Station 400) the decrease would be 0.6 inches, from an average depth of 4.45 to 3.84 inches. The resulting flows with diversion, averaging 6.41 cfs with a range of 5.22 to 7.69 cfs, are much higher than the lowest flows recorded in 2004 to 2006 (3.8 cfs, see Appendix B1) and are approximately five times higher than the low flows recorded in 1973 to 1979 (see Figure 3.2) before urbanization began to increase runoff. As mentioned previously the system will have a low-flow cutoff of 6 cfs at the point of diversion that would maintain a minimum downstream flow of 4.77 cfs.

At the stream transect locations the reduced water levels resulting from diversion of 1.23 cfs would not create ponding or result in substantial reduction in wetted surface. Several of the stations were located in reaches with concrete or rock rip-rap that limited growth of riparian vegetation. At locations where riparian vegetation was present the reduced depth of water during diversion would not be as low as already occurs and no impacts to vegetation are expected.

Table 3-3. Estimated Change In Water Depth at Measured Stations with a Water Diversion of 1.23 cfs.

Station	Width (ft.)	Existing		With Project		Change in Depth (in)
		cfs	Average Depth (in.)	cfs	Average Depth (in.)	
0	31	7.26	2.13	(1)	(1)	-
200	6	6.52	9.25	5.29	7.50	1.7
400	15.6	8.92	4.45	7.69	3.84	0.6
600	20	6.45	22.11	5.22	18.42	3.7
800	14	6.46	11.10	5.23	9.15	2.0
1000	11	7.26	6.41	6.03	5.35	1.1
1200	14	8.91	7.75	7.68	6.72	1.0
1400	16	7.83	9.59	6.60	8.11	1.5
1600	48	8.79	4.66	7.56	4.02	0.6
1800	36.5	(2)	13.36	(2)	(2)	-

(1) Station "0" is on the weir approximately 8 feet upstream from the pump location. There will be no impacts to stream flow at this location.

(2) Station 1800 was influenced by the tide. No flow measurements could be taken.

3.4 OPERATING CONDITIONS AND STANDARDS

The following operating standards will be employed to meet the CDFG screen criteria for small pumped diversions of less than 40 cfs (CDFG 2008) and the National Marine Fisheries Service (NMFS)- Southwest Region (1996) fish screen criteria (see Appendix C).

Pump Intake Screen Flow Criteria

An approach velocity of less than 0.4 feet per second (FPS) is required to meet the NMFS criteria. The minimum effective screen area in square feet for an active pump intake screen (one with a cleaning system) is calculated by dividing the maximum diverted flow rate in cfs by an approach velocity of 0.4 feet per second (FPS). The proposed active self-cleaning screen system is Model No. CW600 manufactured by Yardney Water Management Systems, Inc. (Yardney 2008). This screen has a height of 16" and a diameter of 24', for a total surface area of 1200 inches (8.33 square feet). Dividing the maximum diverted flow rate of 1.23 cfs by an approach velocity of 0.4 FPS yields a required minimum screen size of 3.05 square feet. The proposed screen of 8.33 square feet exceeds the minimum screen size needed to achieve an approach velocity of less than 0.4 FPS.

Pump Intake Screen Mesh Material

Screen mesh openings shall not exceed 3/32 inch (2.38 mm) for woven wire screens, with a minimum 27% open area. The proposed Model No. CW600 screen has a mesh opening of approximately 1/16 inch (1.58 mm) and has 51.8% open area (M. Hendon, Yardney Water Management Systems, Inc., personal communication). Thus, the screen openings meet the NMFS criteria for maximum opening size and minimum percent open area. The screen mesh material is made of stainless steel and the screen assembly is sufficiently durable to withstand the rigors of the installation site.

Pump Intake Screen Location

When possible, pump intake screens shall be placed in locations with sufficient sweeping velocity to sweep away debris removed from the screen face. Pump intake screens shall be submerged to a depth of at least one screen radius below the minimum water surface, with a minimum of one screen radius clearance between screen surfaces and adjacent natural or constructed features. A clear escape route should exist for fish that approach the intake. Adverse alterations to riverine habitat shall be minimized.

The proposed location of the intake screen will not require any modification of the riverine habitat. The intake screen will be located immediately downstream of the concrete weir at the location illustrated in Figure 3-6. At that location the water is sufficiently deep to allow the minimum clearances described above. Water flowing over the weir provides a steady flow at the screen location so that a sufficient sweeping velocity will be maintained.

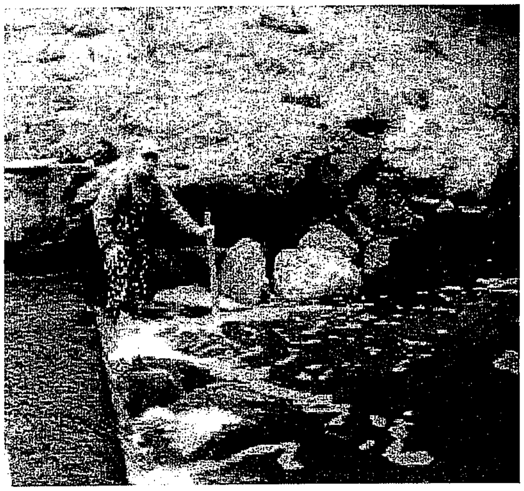


Figure 3-6. Location of Intake Screen.

Pump Intake Screen Protection

The pump intake screens will be manufactured from stainless steel and installed around a metal structure that holds the pump. Based on the flow characteristics and the installation location no trash racks will be needed for protection of the screen and pump installation. Regular inspections will be conducted to evaluate the screen and pump condition and, if additional protection is necessary, the screen unit can be modified to include a trash rack.

4.0 WATER QUALITY

4.1 ALISO CREEK EXISTING WATER QUALITY

Aliso Creek is listed as a Category I (Impaired) Priority Watershed (Aliso-San Onofre, #18070301) in the California Unified Assessment List and the lower portion of Aliso Creek is designated as impaired for bacterial contamination on the Clean Water Act Section 303 (d). In addition, the San Diego Regional Water Quality Control Board (Region 9) has identified Aliso Creek as a target watershed for priority water quality enhancement efforts (County of Orange, 2005). The section of the creek from Aliso Beach to one-mile upstream is designated as impaired for bacterial concentrations under the 1998 Clean Water Act section 303(d). The primary causes of impairment of this watershed are non-point source pollution. Residential and commercial use of fertilizers and pesticides, and pet and waterfowl waste, are most likely the primary contributors to the nutrient and potential storm or toxic impacts and elevated bacteria load. In the Region 9 Basin Plan (SDRWQCB 1994), Aliso Creek is listed with beneficial uses of Warm Freshwater Habitat (WARM), Wild Life Habitat (WILD) and Agricultural Supply (AGR) with a potential beneficial use of Contact Water Recreation (REC-1).

Orange County Resources and Development Management Department (OCRDMD), Watershed and Coastal Resources Division, conducts dry and wet weather monitoring in Aliso Creek at the mouth and occasionally at upstream storm drain outlets. Table 4-1 summarizes the County's dry weather water quality monitoring data for their sample site at Aliso Creek mouth (ACM-1); wet weather data is summarized in Table 4-2 (OCRDMD 2003, 2004, 2005). Figure 4-1 show fecal coliform and REC-1 exceedances in Aliso Creek from January 2001 to July 2006 (SDRWQCB 2006). It is clear from the data that elevated bacteria concentrations have been consistently (i.e., over the entire period of record) and chronically (i.e., during both wet and dry seasons) preventing attainment of recreational uses in these receiving waters.

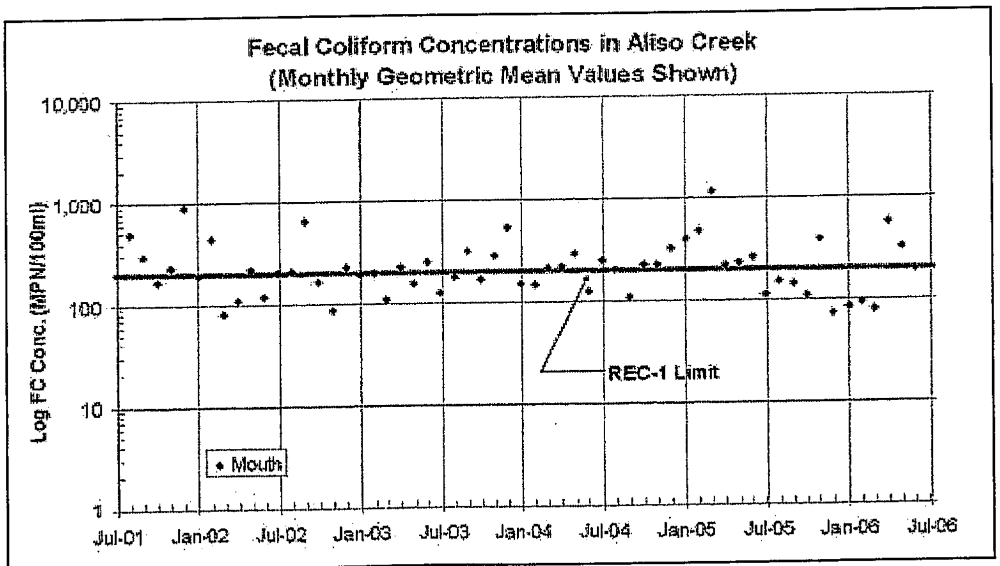


Figure 4-1. Aliso Creek Fecal Coliform Concentrations (Source: SDRWQCB 2006; from Geosyntec 2007)

Table 4-1. Summary of Orange County Aliso Creek Dry Weather Water Quality Monitoring Data (December 2002 - April 2005), ACM-1 Site (from Geosyntec 2007)

Parameter	Units	# of Samples	# ND	Mean*	Min	Max
General						
Specific Conductance	uS	9	0	5,968	2,090	21,200
Hardness as CaCO3	mg/L	7	0	1,794	815	4,312
TSS	mg/L	9	7	7.6	<10	18
Nutrients						
Nitrate as NO3	mg/L	9	1	0.92	<0.1	3.4
Ammonia as N	mg/L	9	6	0.10	<0.05	0.5
Total Kjeldahl Nitrogen	mg/L	9	0	1.04	0.26	2.9
Total Phosphorus as PO4	mg/L	9	0	0.53	0.28	0.83
Orthophosphate as P	mg/L	9	0	0.22	0.049	0.52
OP Pesticides						
Diazinon	ng/L	9	4	32	<5	123
Chlorpyrifos	ng/L	9	9	S.I.D.	<5	<10
Dimethoate	ng/L	7	7	S.I.D.	<5	<10
Malathion	ng/L	7	5	30	<5	162
Metals						
Cadmium, total	ug/L	9	3	1.29	<1	3.3
Cadmium, dissolved	ug/L	8	6	0.79	<1	2.6
Chromium, total	ug/L	9	9	S.I.D.	<1	<8
Chromium, dissolved	ug/L	8	8	S.I.D.	<1	<8
Copper, total	ug/L	9	3	10	<2	37
Copper, dissolved	ug/L	8	5	2.7	<2	6.5
Lead, total	ug/L	9	7	1.3	<1	3.1
Lead, dissolved	ug/L	8	7	1.3	<1	3.8
Nickel, total	ug/L	9	0	19	8.4	39
Nickel, dissolved	ug/L	8	0	19	8.3	35
Silver, total	ug/L	9	9	S.I.D.	<1	<2
Silver, dissolved	ug/L	8	7	1.1	<1	2.6
Zinc, total	ug/L	9	3	18	<10	45
Zinc, dissolved	ug/L	8	1	25	<10	89
Arsenic, total	ug/L	1	0	2.5	2.5	2.5
Arsenic, dissolved	ug/L	1	0	2.3	2.3	2.3
Selenium, dissolved	ug/L	1	0	3.1	3.1	3.1
Selenium, total	ug/L	1	0	3.1	3.1	3.1

S.I.D. = Statistically insufficient data. If all monitoring results for a parameter are below detection, no mean summary statistic value can be reported.

Table 4-2. Summary of Orange County Aliso Creek Wet Weather Water Quality Monitoring Data (December 2002 - April 2005), ACM-1 Site (from Geosyntec 2007)

Parameter	Units	# of Samples	# ND	Mean	Min	Max
General						
Specific Conductance	uS	4	0	4,577	403	12,080
Hardness as CaCO3	mg/L	5	0	879	140	1,886
TSS	mg/L	4	2	225	<10	530
Nutrients						
Nitrate as NO3	mg/L	4	0	0.72	0.68	0.81
Ammonia as N	mg/L	4	2	0.13	<0.05	0.29
Total Kjeldahl Nitrogen	mg/L	4	0	1.2	0.53	2.2
Total Phosphorus as PO4	mg/L	4	0	1.2	0.24	2.8
Orthophosphate as P	mg/L	4	0	0.51	0.08	1.7
OP Pesticides						
Diazinon	ng/L	4	1	66	<5	212
Chlorpyrifos	ng/L	4	4	S.I.D.	<5	<10
Dimethoate	ng/L	3	3	S.I.D.	<5	<5
Malathion	ng/L	3	2	43	<5	125
Metals						
Cadmium, total	ug/L	5	1	2.8	<1	6.2
Cadmium, dissolved	ug/L	4	1	1.0	<0.5	1.9
Chromium, total	ug/L	5	3	13	<1	31
Chromium, dissolved	ug/L	4	4	S.I.D.	<0.5	<8
Copper, total	ug/L	5	0	16	2.3	42
Copper, dissolved	ug/L	4	1	2.5	<2.5	3.7
Lead, total	ug/L	5	3	4.6	<1	11
Lead, dissolved	ug/L	4	4	S.I.D.	<0.5	<2
Nickel, total	ug/L	5	0	28	4.3	43
Nickel, dissolved	ug/L	4	0	17	6.6	37
Silver, total	ug/L	5	5	S.I.D.	<0.5	<2
Silver, dissolved	ug/L	4	4	S.I.D.	<0.5	<2
Zinc, total	ug/L	5	3	53	<10	130
Zinc, dissolved	ug/L	4	2	10	<10	27
Arsenic, total	ug/L	1	0	2.4	2.4	2.4
Selenium, total	ug/L	1	1	S.I.D.	<2	<2

S.I.D. = Statistically insufficient data. If all monitoring results for a parameter are below detection, no mean summary statistic value can be reported.

4.2 ALISO CREEK WATER QUALITY WITH DIVERSION

There will be no significant change to water quality of Aliso Creek resulting from diversion by the project. Removal of 1.23 cfs of flow in the creek will not significantly affect the dissolved oxygen, pH, salinity, TDS, or any other parameter of water remaining in the creek. During low flow periods the overall total load of constituents and bacterial contaminants delivered to the ocean by Aliso Creek will be reduced by approximately 12% because mean daily flows would be reduced from approximately 9.6 cfs to 8.4 cfs (see Section 3.2.3, above).

5.0 ADAPTIVE MANAGEMENT, MAINTENANCE, MONITORING, AND REPORTING.

5.1 ADAPTIVE MANAGEMENT PLANS

Water will not be recovered from Aliso Creek during high flows or during very low flows. The water intake system will have controls and sensors to monitor not only system operations but also external operating parameters. During storm events water will likely be of poor quality with high turbidity and rainfall will reduce the demand for use of recycled water for irrigation. Level sensors will be set to shut down the system if the creek level gets too high. The system will also be programmed to shut off if the influent turbidity reaches a programmable set point. The system controls will be tied into a web based SCADA system.

Adaptive management will consist of:

- Development of a rating curve to calibrate stream stage with stream flow at location of diversion pump.
- Continuous monitoring of stream stage (with float valve) to allow interruption of diversions if stream flow is not within operating standards.
- Programming the control system for low-flow cutoff of 6 cfs stream flow at the point of diversion to allow minimum downstream flow of 4.77 cfs.
- Conducting in-stream inspection at low flow conditions to determine if minimum downstream flows of 4.77 cfs lead to formation of ponds or development of isolated pools. Modify operating standards if operation of the diversion results in formation of ponds or development of isolated pools.
- Conducting annual in-stream measurements at established (see Section 3.4) transect stations to determine if stream conditions have changed as a result of flood flows. Operating standards will be modified if operation of the diversion results in formation of ponds or development of isolated pools.

5.2 MAINTENANCE, MONITORING, AND REPORTING

Inspection and Maintenance Plan

An inspection and maintenance plan for the pump intake screen will be implemented to ensure that the screen is operating as designed. The screen will be inspected monthly and removed annually for maintenance.

Monitoring In-Stream Flow

In-stream flow monitoring will be continuous so that the system can be shut down if flows are too low or too high. The flow level sensor will be located on the concrete weir where the stream cross section will not change and be calibrated annually.

Monitoring Report

An annual monitoring report will be prepared to document stream flow measurements, diverted flow quantities, dates of all diversions, dates and stream flow measurements when diversion was discontinued because of low or high flows, results of stream flow inspections at minimum diversion operating condition (6 gps), and documentation of maintenance that requires in-stream activities.

6.0 STREAMBED ALTERATION AGREEMENT AND CEQA DOCUMENTATION

6.1 STREAMBED ALTERATION AGREEMENT

The CDFG requires notification for any project or activity that will take place in or in the vicinity of a river, stream, lake, or its tributaries. Section 1601 (1603 for private entities) of the Fish and Game Code requires that State or local governmental agencies notify CDFG before they begin any construction project that will: (1) divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake; (2) use materials from a streambed; or (3) result in the disposal or disposition of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake. The proposed Project would result in alterations to the bed and bank of Aliso Creek and would require a Streambed Alteration Agreement from the CDFG pursuant to Section 1601. The CDFG is required to base its decision with respect to a streambed alteration agreement on a CEQA compliance document. As noted below, an Initial Study is being prepared to evaluate the potential for environmental impacts. SCWD will prepare and submit a Streambed Alteration Agreement to the CDFG.

6.2 CEQA DOCUMENTATION

Because the Project has the potential for environmental impacts, this action would constitute a project under the California Environmental Quality Act (CEQA) requiring environmental review by SCWD. SCWD has been determined that the Project is discretionary in nature and is not otherwise exempt from the requirements of CEQA. In accordance with CEQA (Public Resources Code Sections 21 00021 177) and pursuant to Section 15063 of the California Code of Regulations (CCR), the SCWD, acting in the capacity of Lead Agency, will prepare an Initial Study to determine whether the proposed Project would have a significant environmental impact.

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Appendices

Appendix A. E-mail of January 24, 2008 from Mr. Matt Chirdon (CDFG)
Appendix B. Stream Flow Data
Appendix C. National Marine Fisheries Service Juvenile Fish Screen Criteria for Pump Intakes
Appendix D. Yarney Self-Cleaning Pump Suction Screen Specifications

Appendix A.
E-mail of January 24, 2008 from Mr. Matt Chirdon (CDFG)

From: Matthew Chirdon [mailto:MChirdon@dfg.ca.gov]
Sent: Thursday, January 24, 2008 5:34 PM
To: Betty Burnett
Cc: Erinn Wilson
Subject: SCWD Aliso Creek Diversion

Betty:

Thank you for your recent coordination on the proposed SCWD Aliso Creek Diversion Project. The Department has finished reviewing the proposed Project and is issuing these comments for SCWD to evaluate what DFG would be expecting as fundamentals of a complete water right application (provided State Board requests) and public review provided that Project activities constitute a 'project' under CEQA (guidelines section 15378). Department of Fish and Game has drafted these comments based on a cursory review of information supplied during the October 29, 2007 meeting, supplemental flow data on Aliso Creek recorded by County of Orange, and the Department's knowledge of natural resources in Orange County. The Department appreciates the opportunity to comment on the proposed project at this juncture.

The Department currently does not have enough information to determine if the proposed project would be a significant impact on down stream resources, and therefore studies would be needed to determine the significance of the action. However, if sufficient flow is present the diversion of water from Aliso Creek could be achieved without detriment to natural resources.

The following items that I have listed are not an exhaustive list of items expected to be addressed in an environmental review (CEQA/NEPA) as DFG has reviewed proposed project through a natural resources filter only. The items needed to be addressed to provide DFG decision makers information are as follows:

1. ADAPTIVE MANAGEMENT-Development of plan that would involve measurements of defined water quality parameters (DO, pH, Salinity, TDS..etc to be determined by possible impacts, e.g. if seasonal diversion presents high probability for lowered water levels possibility for isolated pools and lowered DO are possible impacts if flows above diversion point are sufficient and downstream flows are not sufficient to support resources that could be attributable to diversion). Adaptive management would need to be in place to deal with possible ramifications of water diversion. Detailed flow rates (avg., min., max.over course of water year), detailed stream measurements (continuous stream width, continous stream depth, max. depth, min. depth, etc.), and qualitative assessments in defined stream reaches compared to baseline studies performed before project diversions along with comparisons to known accepted water quality guidelines for streams of similar order and land use are suggested to determine baseline

conditions and identify areas of concern. Methods suggested are Determining Stream Flows For Fish Life "the Oregon Method" or "Thompson Method"* and Instream Flow Incremental Methodology (IFIM)**. Methods suggested should be evaluated for specific watershed as Thompson method is more slightly better at addressing alluvial streams and IFIM adapted to perennial flows and defined bed and bank. Instream flow requirements should be developed in month or half-month intervals, depending on temporal duration of fish and wildlife life stages.

2. HISTORY-Summary of historical data for both plants, animals, and stream flows (including historical diversions). A good starting point is the Department's Natural Diversity Data Base at the following website to access the Department's Natural Diversity Data Base (NDDB) at http://www.dfg.ca.gov/biogeodata/cnddb/quick_viewer_launch.asp The NDDB gives records of occurrences for special status species that have been documented within specified areas. For an exhaustive NDDB search you may also contact :

Biogeographic Data Branch
1807 13th Street, Suite 202
Sacramento, CA 95811
(916) 322-2493

Detailed map(s) showing location of any known stream gaging stations and known water diversions. Summary of pre-existing water rights or pending claims. If hydrological estimates or gaging data can be obtained, the instream flow requirements shall be compared against the range of naturally occurring stream flows or water surface elevations (i.e. what is needed vs. what is available currently). Orange County data submitted to Department should be compared to ground truth studies at location were County recorded flow and be performed by commonly accepted stream measurement methodology. However, ground truth studies might not be needed if stream sampling methodology developed in adaptive management can accurately quantify streamflow available to be diverted while providing water for resources.

3. Description of Diversion Point-History (permits, construction, useful life span, etc.) and ownership of property at diversion point should be discussed. Additionally, the associated pumps and pipeline sizing should be discussed with supplemental information supplied in maps and tables indicating placement and length of pipeline segments from diversion point. Diversion method should be discussed with pumping rate and horsepower of pumps. Alternatives to proposed diversion point should be discussed and evaluated for feasibility and level of impact.

4. Purpose, Use, Amount, and Season of diversion- Inclusion of parties that would be receiving blended diversion water (if known) on map and proximity of use to flow of creek. Discuss amount and time frame when SCWD is proposing to divert waters. If water would not be used at time of diversion, but stored for later use, time periods when stored water would be used should be discussed. Storage reservoir characteristics should be discussed (approx. capacity).

5. Maintenance, Monitoring, and Reporting- Proposed diversion should have maintenance and monitoring program relating to physical diversion structure and indirect effects from removal of riparian water. SCWD should have plan to monitor effectiveness of diversion screen at limiting entrapment and entrainment as well as indirect effects on diversion of riparian water. Monitoring objectives for evaluating indirect effects of riparian diversion should be determined by results of baseline studies developed to determine instream flow requirements in comment 1.(Adaptive Management) and would change periodically based on temporal duration of fish and wildlife identified in biological assessment. Example: Southwestern Pond Turtle, which are present in Aliso Creek have seasonal habitat requirements. Diversion monitoring would have to leave specific flows to meet their life cycle requirements if suitable habitat is present or probable of occuring during project lifespan or maintenance of pipeline will require tools and techniques that can impact turtle burrows in upland areas. Additionally, some monitoring should be performed during diversion activities to document effects of proposed diversion. Monitoring during diversion activities should be based upon water quality and quantity above and below diversion point (i.e.upstream flow should be accounted for post diversion by comparison to amount allotted and any evaporative loss at downstream sampling point).

6. Operating Standards--DFG has a set of operational standards for small pumped diversion under 40 CFS. These standards were developed with the filter of preventing steelhead, smolt, and larvae from being entrapped and entrained. Although Aliso Creek is a stream identified by NMFS as having 'no observed occurences' of steelhead it is not a negative declaration of 'evidence of no occurrence'. Practically though historic runs of steelhead have not been document. However, fish larvae and small aquatic organisms would possibly be introduced to a significant hazard if proper screen size and approach velocities are not meet by the proposed diversion. Standards that the proposed diversion should meet as a guideline to avoid entrapment and entrainment of aquatic species should meet objectives of DFG screen criteria. If diversion screen criteria need to be adapted to properly meet the nature of Aliso creek the Department would need to approve proposed changes.

http://www.dfg.ca.gov/fish/Resources/Projects/Engin/Engin_ScreenCriteria.asp

http://www.dfg.ca.gov/fish/Resources/Projects/Engin/Engin_ScreenPolicy.asp

7. Streambed Alteration Agreement (SAA)-- water diversions are subject to a SAA notification pursuant to Fish and Game Code (FGC) section 1602. FGC 1602 requires any person, state or local governmental agency, or public utility to notify the Department before beginning any activity that will substantially obstruct or divert the natural flow of a river, stream, or lake. After the notification is submitted it is evaluated for

completeness and applicability with DFG jurisdiction. If project is determined to require SAA applicant and Department staff will work to develop agreement that sets time frame, flow rate range that diversions can occur, and monitoring documentation required during life-span of agreement. The Department's issuance of a SAA may be viewed as a separate project and subject to CEQA. To facilitate our issuance of the Agreement when CEQA applies, the Department as a responsible agency under CEQA may consider the local jurisdiction's (lead agency) document for the project. To minimize additional requirements by the Department under CEQA the document should fully identify the potential impacts to the lake, stream, or riparian resources and provide adequate avoidance, mitigation, and monitoring and reporting commitments for issuance of the agreement. A SAA notification form may be obtained by writing to the Department at the above address, calling (858) 636-3160, or accessing the Department's web site at www.dfg.ca.gov/habcon/1600.

*"Oregon Method" means a methodology to determine instream flow requirements for fish, developed by the OSGC (Thompson, K.E. 1972). Determining streamflows for fish life. pp. 31-50. In Proceedings of the Instream Flow Requirement Workshop, Pacific N.W. River Basins Commission, Portland, OR.

**"IFIM" means Instream Flow Incremental Methodology, a methodology to determine instream flows for fish and other aquatic life, developed by the U.S. Fish and Wildlife Service (Bovee, K.D. 1982). A guide to stream habitat analysis using the instream flow incremental methodology. Information Paper No. 12, U.S. Fish and Wildlife Service, FWS/OBS-82-26, Fort Collins, CO).

Regards,

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Appendix B1.
Aliso Creek stream flow data (cubic feet per second) for 2004-2006 at the Coastal Treatment Plant
(Source: Susan Brodeur, OCRDMD)

2004-2005

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
1	5.9	9.6	11	11	14	11	87	20	25	14	16	14
2	6.5	9.9	11	11	12	12	52	20	23	17	14	15
3	7	10	11	11	11	12	292	20	25	16	13	16
4	6.8	11	11	11	9.8	12	356	15	41	16	14	15
5	6.7	11	10	11	8.8	126	91	13	22	16	20	15
6	7	11	10	11	7.7	56	46	28	20	15	130	15
7	7.1	11	10	10	7.4	20	375	18	18	15	32	14
8	7	11	11	9.6	19	42	306	12	19	17	25	14
9	6.5	11	11	9.6	10	19	1610	9.5	17	15	13	14
10	5.9	10	11	9.5	9.3	15	705	8.9	17	14	14	14
11	5.5	10	10	9.4	9.3	15	497	394	17	14	15	14
12	6.1	9.8	9.7	9.4	9.9	14	141	637	16	13	17	15
13	6.7	10	9.9	9.6	10	14	80	82	16	13	19	14
14	6.8	11	10	9.9	9.7	14	59	27	16	12	21	14
15	7	11	10	10	9.6	15	48	17	15	12	23	15
16	7.1	11	11	10	9.6	15	42	14	14	12	23	14
17	7.3	11	11	233	9.7	15	37	25	14	11	22	16
18	7.5	11	11	251	10	15	33	194	14	11	23	14
19	7.8	11	12	102	11	15	30	685	41	10	22	13
20	8	11	11	845	15	15	29	255	20	10	20	14
21	8.1	10	10	93	148	15	30	1070	13	13	19	14
22	8	11	9.4	34	20	15	29	435	84	11	18	13
23	7.8	11	9.7	15	14	15	27	594	103	10	18	12
24	7.8	11	10	14	12	14	25	109	21	126	17	12
25	8	12	11	16	12	14	24	65	14	14	15	12
26	8.2	12	11	17	12	15	36	50	12	9.3	14	12
27	8.3	12	11	1110	18	16	29	39	11	8.9	16	12
28	8.5	12	12	157	26	561	63	30	13	337	17	12
29	8.7	11	11	36	12	405	36	------	12	75	16	12
30	9	11	11	21	12	65	27	------	12	22	16	13
31	9.3	11	------	16	------	342	22	------	13	------	16	------

2005-2006

Day	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
1	12	9.8	8.9	6.9	7.5	9.2	72	8.4	28	29	7	7.6
2	14	10	9.3	6.5	7.2	8.7	341	8	6.9	11	6.3	8.6
3	14	10	10	6.3	7.2	14	78	8	66	8.2	6.3	8.4
4	14	9.8	9.4	6.7	7.7	9.4	21	8.2	17	433	7.3	6.5
5	14	9.6	9.3	6.8	7.8	8	11	8.3	3.3	268	6.8	5.7
6	11	9.6	9.2	6.7	8.3	9.2	9.1	8.1	8.7	43	6.4	6.5
7	11	9.2	9.7	6.8	8.4	8.6	8.3	7.5	17	15	6	6
8	11	9.5	9.6	6.6	8.4	9	7.9	7.3	11	10	5.8	7
9	10	9.6	9.6	6.4	8.4	13	7.8	7.1	9.5	8.7	5.9	7.8
10	9.9	9.7	9.7	6.8	18	10	7.6	7.1	19	7.9	6.7	7
11	9.7	10	9.3	7.2	19	9	9	7.1	111	7.2	7.2	5.5
12	10	9.6	9.6	7.2	9.2	9.1	9	7.1	30	7.9	7.4	4.8
13	10	9.5	9.5	7.2	8.3	9.2	9.5	7	19	9.1	7.2	5.8
14	10	9.2	9.5	7.2	7.7	9.5	8.8	6.7	12	49	7.4	6
15	10	10	9.6	7	8	9.1	11	6.7	10	44	7.6	5.8
16	10	10	10	30	7.5	9.4	8.6	6.7	9.4	12	7.3	6.5
17	9.8	10	9.7	122	7.6	9.1	8.6	6.9	22	9.9	7.5	5.4
18	10	9.7	9.2	82	8	8.9	8.3	28	31	8.5	8.7	6
19	9.7	10	9.2	21	7.7	8	8.6	50	76	8.8	9.9	6.5
20	9.5	9.6	15	9.7	7.6	8	8.6	12	18	8.1	9.3	6.3
21	9.8	9.6	15	9	7.6	8	8.5	8.3	198	6.2	9.8	5.9
22	13	10	10	8.9	8.1	8	8.4	7.2	22	3.9	169	6
23	12	10	9.4	8.4	8.2	8.1	8	6.8	15	17	25	5.4
24	11	9.9	8.7	8.3	8.5	8.1	8.5	6.8	11	5.6	12	6.7
25	11	9.3	8.3	9	8.7	7.6	8.4	6.8	10	5.6	9.4	5.9
26	12	9	8.4	8.8	8.8	7.9	8.7	6.7	11	6.9	9.4	6.2
27	12	8.8	8.4	7.6	8.3	8.5	8.7	37	10	7.3	9.5	6.2
28	11	8.4	7.8	7.2	9.2	8.3	8.2	333	252	8	9.7	6
29	10	8.9	7.3	7.2	9.9	8.3	8.1	------	305	7.2	8.7	6.1
30	9.4	9.3	6.9	7.2	11	8.1	8.5	------	49	7.2	7.8	6.4
31	9.3	9.2	------	7.2	------	172	8.5	------	15	------	8.6	------

Appendix B2.

Stream Flow in Aliso Creek at USGS Station 11047700 (10/1/82 to 9/30/87), cubic feet per second (Mean).
Source: USGS http://waterdata.usgs.gov/nwis .

1982-10-01	4.3
1982-10-02	4.0
1982-10-03	4.0
1982-10-04	4.0
1982-10-05	4.9
1982-10-06	4.3
1982-10-07	3.7
1982-10-08	3.2
1982-10-09	2.7
1982-10-10	2.7
1982-10-11	2.4
1982-10-12	2.2
1982-10-13	2.2
1982-10-14	1.9
1982-10-15	2.0
1982-10-16	2.9
1982-10-17	2.9
1982-10-18	2.7
1982-10-19	3.4
1982-10-20	3.4
1982-10-21	3.7
1982-10-22	3.7
1982-10-23	2.9
1982-10-24	2.4
1982-10-25	2.2
1982-10-26	4.0
1982-10-27	2.7
1982-10-28	2.0
1982-10-29	2.9
1982-10-30	1.9
1982-10-31	2.4
1982-11-01	1.9
1982-11-02	1.7
1982-11-03	1.6
1982-11-04	1.5
1982-11-05	1.5
1982-11-06	1.7
1982-11-07	1.6
1982-11-08	1.6
1982-11-09	50
1982-11-10	62
1982-11-11	30
1982-11-12	9.0
1982-11-13	5.0
1982-11-14	3.5
1982-11-15	2.9
1982-11-16	2.5
1982-11-17	2.3
1982-11-18	2.2
1982-11-19	12
1982-11-20	6.0
1982-11-21	4.0

1982-11-22	3.0
1982-11-23	2.6
1982-11-24	2.4
1982-11-25	2.3
1982-11-26	2.2
1982-11-27	2.1
1982-11-28	9.0
1982-11-29	6.0
1982-11-30	150
1982-12-01	60
1982-12-02	16
1982-12-03	7.0
1982-12-04	5.7
1982-12-05	5.0
1982-12-06	4.5
1982-12-07	4.0
1982-12-08	15
1982-12-09	4.0
1982-12-10	2.5
1982-12-11	2.2
1982-12-12	2.0
1982-12-13	1.8
1982-12-14	2.2
1982-12-15	2.0
1982-12-16	1.8
1982-12-17	1.7
1982-12-18	1.6
1982-12-19	1.6
1982-12-20	1.6
1982-12-21	1.6
1982-12-22	60
1982-12-23	216
1982-12-24	17
1982-12-25	11
1982-12-26	6.6
1982-12-27	6.2
1982-12-28	5.7
1982-12-29	4.6
1982-12-30	4.3
1982-12-31	3.3
1983-01-01	3.6
1983-01-02	3.0
1983-01-03	3.0
1983-01-04	3.3
1983-01-05	4.6
1983-01-06	4.8
1983-01-07	4.2
1983-01-08	4.0
1983-01-09	3.6
1983-01-10	3.2
1983-01-11	3.4
1983-01-12	3.2

1983-01-13	3.1
1983-01-14	3.1
1983-01-15	3.3
1983-01-16	3.6
1983-01-17	5.1
1983-01-18	5.7
1983-01-19	30
1983-01-20	8.4
1983-01-21	8.7
1983-01-22	12
1983-01-23	175
1983-01-24	14
1983-01-25	100
1983-01-26	90
1983-01-27	709
1983-01-28	58
1983-01-29	265
1983-01-30	14
1983-01-31	9.7
1983-02-01	7.0
1983-02-02	63
1983-02-03	20
1983-02-04	14
1983-02-05	32
1983-02-06	25
1983-02-07	49
1983-02-08	205
1983-02-09	33
1983-02-10	19
1983-02-11	22
1983-02-12	24
1983-02-13	31
1983-02-14	20
1983-02-15	17
1983-02-16	15
1983-02-17	14
1983-02-18	13
1983-02-19	13
1983-02-20	12
1983-02-21	12
1983-02-22	12
1983-02-23	11
1983-02-24	17
1983-02-25	15
1983-02-26	250
1983-02-27	873
1983-02-28	144
1983-03-01	985
1983-03-02	851
1983-03-03	501
1983-03-04	64
1983-03-05	47

1983-03-06	80
1983-03-07	64
1983-03-08	54
1983-03-09	49
1983-03-10	46
1983-03-11	45
1983-03-12	43
1983-03-13	42
1983-03-14	96
1983-03-15	92
1983-03-16	94
1983-03-17	170
1983-03-18	315
1983-03-19	220
1983-03-20	68
1983-03-21	300
1983-03-22	132
1983-03-23	148
1983-03-24	800
1983-03-25	100
1983-03-26	30
1983-03-27	19
1983-03-28	16
1983-03-29	18
1983-03-30	16
1983-03-31	14
1983-04-01	15
1983-04-02	15
1983-04-03	15
1983-04-04	15
1983-04-05	15
1983-04-06	15
1983-04-07	15
1983-04-08	14
1983-04-09	15
1983-04-10	15
1983-04-11	18
1983-04-12	56
1983-04-13	26
1983-04-14	25
1983-04-15	24
1983-04-16	24
1983-04-17	24
1983-04-18	183
1983-04-19	50
1983-04-20	26
1983-04-21	32
1983-04-22	23
1983-04-23	13
1983-04-24	11
1983-04-25	10
1983-04-26	10

1983-04-27	10
1983-04-28	10
1983-04-29	13
1983-04-30	95
1983-05-01	40
1983-05-02	24
1983-05-03	16
1983-05-04	13
1983-05-05	12
1983-05-06	11
1983-05-07	10
1983-05-08	9.5
1983-05-09	9.0
1983-05-10	9.0
1983-05-11	8.5
1983-05-12	8.0
1983-05-13	8.0
1983-05-14	8.0
1983-05-15	7.5
1983-05-16	7.5
1983-05-17	7.0
1983-05-18	7.0
1983-05-19	7.0
1983-05-20	7.0
1983-05-21	6.5
1983-05-22	6.5
1983-05-23	6.5
1983-05-24	6.0
1983-05-25	6.0
1983-05-26	6.0
1983-05-27	6.0
1983-05-28	6.0
1983-05-29	5.5
1983-05-30	5.5
1983-05-31	5.5
1983-06-01	5.5
1983-06-02	5.5
1983-06-03	5.5
1983-06-04	5.5
1983-06-05	5.5
1983-06-06	5.5
1983-06-07	5.5
1983-06-08	5.5
1983-06-09	5.5
1983-06-10	5.5
1983-06-11	5.5
1983-06-12	5.5
1983-06-13	5.5
1983-06-14	5.5
1983-06-15	5.5
1983-06-16	5.5
1983-06-17	5.5

1983-06-18	5.5
1983-06-19	5.5
1983-06-20	5.5
1983-06-21	5.5
1983-06-22	5.5
1983-06-23	5.5
1983-06-24	5.5
1983-06-25	5.5
1983-06-26	5.0
1983-06-27	5.0
1983-06-28	5.0
1983-06-29	5.0
1983-06-30	5.0
1983-07-01	5.0
1983-07-02	5.0
1983-07-03	5.0
1983-07-04	5.0
1983-07-05	5.0
1983-07-06	5.0
1983-07-07	5.0
1983-07-08	5.0
1983-07-09	5.0
1983-07-10	5.0
1983-07-11	4.5
1983-07-12	4.5
1983-07-13	4.5
1983-07-14	4.5
1983-07-15	4.5
1983-07-16	4.5
1983-07-17	4.5
1983-07-18	4.5
1983-07-19	4.5
1983-07-20	4.5
1983-07-21	4.5
1983-07-22	4.5
1983-07-23	4.5
1983-07-24	4.5
1983-07-25	4.5
1983-07-26	4.5
1983-07-27	4.5
1983-07-28	11
1983-07-29	11
1983-07-30	12
1983-07-31	11
1983-08-01	11
1983-08-02	13
1983-08-03	15
1983-08-04	14
1983-08-05	13
1983-08-06	14
1983-08-07	19
1983-08-08	28
1983-08-09	21
1983-08-10	21
1983-08-11	22
1983-08-12	24

1983-08-13	25
1983-08-14	56
1983-08-15	15
1983-08-16	25
1983-08-17	17
1983-08-18	32
1983-08-19	9.6
1983-08-20	22
1983-08-21	20
1983-08-22	19
1983-08-23	19
1983-08-24	20
1983-08-25	20
1983-08-26	21
1983-08-27	20
1983-08-28	20
1983-08-29	20
1983-08-30	20
1983-08-31	20
1983-09-01	21
1983-09-02	22
1983-09-03	21
1983-09-04	21
1983-09-05	21
1983-09-06	23
1983-09-07	23
1983-09-08	23
1983-09-09	22
1983-09-10	21
1983-09-11	21
1983-09-12	20
1983-09-13	23
1983-09-14	4.0
1983-09-15	24
1983-09-16	442
1983-09-17	435
1983-09-18	24
1983-09-19	24
1983-09-20	46
1983-09-21	446
1983-09-22	23
1983-09-23	22
1983-09-24	21
1983-09-25	22
1983-09-26	24
1983-09-27	431
1983-09-28	429
1983-09-29	79
1983-09-30	259
1983-10-01	396
1983-10-02	15
1983-10-03	10
1983-10-04	8.8
1983-10-05	10
1983-10-06	9.5
1983-10-07	16

1983-10-08	11
1983-10-09	9.5
1983-10-10	9.0
1983-10-11	8.6
1983-10-12	9.0
1983-10-13	9.5
1983-10-14	9.5
1983-10-15	9.5
1983-10-16	11
1983-10-17	9.5
1983-10-18	10
1983-10-19	11
1983-10-20	12
1983-10-21	12
1983-10-22	11
1983-10-23	12
1983-10-24	12
1983-10-25	12
1983-10-26	13
1983-10-27	14
1983-10-28	14
1983-10-29	9.5
1983-10-30	7.3
1983-10-31	6.9
1983-11-01	7.7
1983-11-02	6.9
1983-11-03	6.1
1983-11-04	6.1
1983-11-05	5.4
1983-11-06	5.4
1983-11-07	5.4
1983-11-08	5.8
1983-11-09	6.1
1983-11-10	5.1
1983-11-11	76
1983-11-12	135
1983-11-13	17
1983-11-14	11
1983-11-15	9.5
1983-11-16	8.6
1983-11-17	8.1
1983-11-18	22
1983-11-19	11
1983-11-20	191
1983-11-21	227
1983-11-22	212
1983-11-23	204
1983-11-24	360
1983-11-25	75
1983-11-26	5.8
1983-11-27	5.4
1983-11-28	5.4
1983-11-29	5.4
1983-11-30	4.8
1983-12-01	3.9
1983-12-02	3.9

1983-12-03	11
1983-12-04	9.0
1983-12-05	6.9
1983-12-06	6.1
1983-12-07	6.1
1983-12-08	6.5
1983-12-09	8.1
1983-12-10	11
1983-12-11	9.0
1983-12-12	8.6
1983-12-13	8.1
1983-12-14	9.5
1983-12-15	9.5
1983-12-16	9.0
1983-12-17	9.5
1983-12-18	8.6
1983-12-19	8.1
1983-12-20	8.1
1983-12-21	8.1
1983-12-22	8.6
1983-12-23	8.6
1983-12-24	40
1983-12-25	81
1983-12-26	13
1983-12-27	15
1983-12-28	7.3
1983-12-29	6.5
1983-12-30	6.1
1983-12-31	5.4
1984-01-01	4.8
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1986-01-22	2.8
1986-01-23	3.2
1986-01-24	3.2

1986-01-25	3.2
1986-01-26	3.4
1986-01-27	3.4
1986-01-28	3.4
1986-01-29	3.7
1986-01-30	52
1986-01-31	120
1986-02-01	8.6
1986-02-02	3.9
1986-02-03	5.1
1986-02-04	5.4
1986-02-05	5.4
1986-02-06	5.4
1986-02-07	7.3
1986-02-08	38
1986-02-09	9.0
1986-02-10	8.1
1986-02-11	9.5
1986-02-12	9.5
1986-02-13	132
1986-02-14	158
1986-02-15	790
1986-02-16	68
1986-02-17	24
1986-02-18	15
1986-02-19	9.0
1986-02-20	8.8
1986-02-21	8.6
1986-02-22	8.5
1986-02-23	8.3
1986-02-24	8.1
1986-02-25	8.0
1986-02-26	8.2
1986-02-27	8.4
1986-02-28	8.6
1986-03-01	8.7
1986-03-02	8.8
1986-03-03	9.0
1986-03-04	9.0
1986-03-05	9.0
1986-03-06	9.0
1986-03-07	9.0
1986-03-08	109
1986-03-09	9.0
1986-03-10	263
1986-03-11	25
1986-03-12	39
1986-03-13	26
1986-03-14	14
1986-03-15	126
1986-03-16	400
1986-03-17	34
1986-03-18	13
1986-03-19	8.6
1986-03-20	8.6
1986-03-21	9.5

1986-03-22	9.5
1986-03-23	9.0
1986-03-24	9.5
1986-03-25	9.5
1986-03-26	9.0
1986-03-27	8.6
1986-03-28	11
1986-03-29	12
1986-03-30	11
1986-03-31	11
1986-04-01	9.5
1986-04-02	11
1986-04-03	11
1986-04-04	13
1986-04-05	13
1986-04-06	374
1986-04-07	17
1986-04-08	9.0
1986-04-09	9.0
1986-04-10	8.6
1986-04-11	7.3
1986-04-12	6.5
1986-04-13	6.1
1986-04-14	6.9
1986-04-15	6.5
1986-04-16	7.3
1986-04-17	7.3
1986-04-18	6.5
1986-04-19	6.7
1986-04-20	6.9
1986-04-21	5.8
1986-04-22	5.8
1986-04-23	5.8
1986-04-24	6.2
1986-04-25	6.5
1986-04-26	5.9
1986-04-27	5.8
1986-04-28	5.7
1986-04-29	5.8
1986-04-30	5.8
1986-05-01	5.8
1986-05-02	5.8
1986-05-03	5.9
1986-05-04	5.1
1986-05-05	5.3
1986-05-06	5.1
1986-05-07	5.3
1986-05-08	4.8
1986-05-09	5.4
1986-05-10	5.8
1986-05-11	5.1
1986-05-12	4.9
1986-05-13	5.4
1986-05-14	4.9
1986-05-15	5.1
1986-05-16	5.0

1986-05-17	5.1
1986-05-18	4.8
1986-05-19	4.2
1986-05-20	4.8
1986-05-21	4.9
1986-05-22	5.1
1986-05-23	5.3
1986-05-24	4.8
1986-05-25	4.1
1986-05-26	4.8
1986-05-27	5.1
1986-05-28	6.1
1986-05-29	5.8
1986-05-30	5.9
1986-05-31	5.4
1986-06-01	4.3
1986-06-02	5.1
1986-06-03	5.4
1986-06-04	5.1
1986-06-05	5.4
1986-06-06	5.1
1986-06-07	5.1
1986-06-08	4.9
1986-06-09	5.1
1986-06-10	4.6
1986-06-11	4.8
1986-06-12	5.1
1986-06-13	5.1
1986-06-14	5.1
1986-06-15	5.1
1986-06-16	5.1
1986-06-17	5.1
1986-06-18	5.1
1986-06-19	5.1
1986-06-20	5.4
1986-06-21	5.8
1986-06-22	5.4
1986-06-23	6.5
1986-06-24	7.3
1986-06-25	6.1
1986-06-26	6.1
1986-06-27	6.9
1986-06-28	5.8
1986-06-29	6.1
1986-06-30	6.1
1986-07-01	6.9
1986-07-02	6.9
1986-07-03	7.3
1986-07-04	6.9
1986-07-05	6.9
1986-07-06	7.3
1986-07-07	7.7
1986-07-08	9.0
1986-07-09	9.0
1986-07-10	10
1986-07-11	10

1986-07-12	11
1986-07-13	10
1986-07-14	10
1986-07-15	38
1986-07-16	11
1986-07-17	9.9
1986-07-18	9.0
1986-07-19	9.0
1986-07-20	7.3
1986-07-21	8.2
1986-07-22	8.3
1986-07-23	8.4
1986-07-24	8.0
1986-07-25	7.3
1986-07-26	5.8
1986-07-27	5.5
1986-07-28	5.9
1986-07-29	6.3
1986-07-30	5.7
1986-07-31	5.7
1986-08-01	5.8
1986-08-02	6.1
1986-08-03	4.5
1986-08-04	4.9
1986-08-05	5.3
1986-08-06	4.7
1986-08-07	5.1
1986-08-08	4.8
1986-08-09	4.5
1986-08-10	4.5
1986-08-11	4.5
1986-08-12	4.8
1986-08-13	5.1
1986-08-14	5.8
1986-08-15	5.8
1986-08-16	5.1
1986-08-17	4.8
1986-08-18	5.1
1986-08-19	5.4
1986-08-20	4.8
1986-08-21	5.1
1986-08-22	5.4
1986-08-23	6.5
1986-08-24	6.1
1986-08-25	6.1
1986-08-26	6.1
1986-08-27	5.8
1986-08-28	6.1
1986-08-29	6.1
1986-08-30	5.8
1986-08-31	5.8
1986-09-01	6.9
1986-09-02	6.9
1986-09-03	7.7
1986-09-04	8.1
1986-09-05	9.0

1986-09-06	9.0
1986-09-07	8.1
1986-09-08	7.7
1986-09-09	8.1
1986-09-10	8.6
1986-09-11	9.0
1986-09-12	8.6
1986-09-13	8.6
1986-09-14	8.1
1986-09-15	8.6
1986-09-16	9.0
1986-09-17	9.5
1986-09-18	9.5
1986-09-19	10
1986-09-20	10
1986-09-21	9.5
1986-09-22	11
1986-09-23	11
1986-09-24	225
1986-09-25	428
1986-09-26	30
1986-09-27	15
1986-09-28	12
1986-09-29	11
1986-09-30	10
1986-10-01	3.5
1986-10-02	3.8
1986-10-03	3.2
1986-10-04	3.0
1986-10-05	2.7
1986-10-06	2.9
1986-10-07	3.3
1986-10-08	3.4
1986-10-09	3.6
1986-10-10	51
1986-10-11	9.7
1986-10-12	4.3
1986-10-13	2.3
1986-10-14	1.8
1986-10-15	1.7
1986-10-16	1.9
1986-10-17	1.8
1986-10-18	1.9
1986-10-19	1.9
1986-10-20	2.1
1986-10-21	2.0
1986-10-22	2.0
1986-10-23	2.0
1986-10-24	2.0
1986-10-25	2.2
1986-10-26	2.3
1986-10-27	2.3
1986-10-28	2.9
1986-10-29	3.0
1986-10-30	3.2
1986-10-31	3.2

1986-11-01	3.0
1986-11-02	2.7
1986-11-03	2.9
1986-11-04	3.1
1986-11-05	3.4
1986-11-06	3.6
1986-11-07	3.5
1986-11-08	3.4
1986-11-09	3.5
1986-11-10	3.4
1986-11-11	3.9
1986-11-12	4.2
1986-11-13	4.4
1986-11-14	4.6
1986-11-15	4.8
1986-11-16	4.9
1986-11-17	25
1986-11-18	277
1986-11-19	10
1986-11-20	6.0
1986-11-21	5.5
1986-11-22	5.0
1986-11-23	4.5
1986-11-24	4.8
1986-11-25	4.8
1986-11-26	4.5
1986-11-27	4.5
1986-11-28	5.0
1986-11-29	5.0
1986-11-30	4.8
1986-12-01	5.0
1986-12-02	5.5
1986-12-03	6.0
1986-12-04	5.8
1986-12-05	5.7
1986-12-06	95
1986-12-07	76
1986-12-08	19
1986-12-09	8.3
1986-12-10	5.7
1986-12-11	5.3
1986-12-12	6.2
1986-12-13	5.9
1986-12-14	6.0
1986-12-15	6.3
1986-12-16	6.5
1986-12-17	6.1
1986-12-18	6.4
1986-12-19	7.4
1986-12-20	44
1986-12-21	8.4
1986-12-22	7.2
1986-12-23	7.3
1986-12-24	7.9
1986-12-25	6.8
1986-12-26	7.2

1986-12-27	6.5
1986-12-28	6.9
1986-12-29	7.3
1986-12-30	7.2
1986-12-31	7.2
1987-01-01	7.8
1987-01-02	8.5
1987-01-03	7.6
1987-01-04	375
1987-01-05	101
1987-01-06	41
1987-01-07	47
1987-01-08	8.5
1987-01-09	8.2
1987-01-10	8.0
1987-01-11	7.8
1987-01-12	7.8
1987-01-13	7.7
1987-01-14	7.7
1987-01-15	8.3
1987-01-16	7.0
1987-01-17	8.2
1987-01-18	8.2
1987-01-19	8.2
1987-01-20	8.5
1987-01-21	8.8
1987-01-22	9.0
1987-01-23	9.2
1987-01-24	10
1987-01-25	11
1987-01-26	12
1987-01-27	12
1987-01-28	15
1987-01-29	12
1987-01-30	9.7
1987-01-31	9.2
1987-02-01	10
1987-02-02	11
1987-02-03	9.9
1987-02-04	11
1987-02-05	9.6
1987-02-06	9.0
1987-02-07	9.0
1987-02-08	9.0
1987-02-09	10
1987-02-10	55
1987-02-11	11
1987-02-12	9.4
1987-02-13	83
1987-02-14	35
1987-02-15	15
1987-02-16	6.0
1987-02-17	5.0
1987-02-18	4.5
1987-02-19	4.5
1987-02-20	4.5

1987-02-21	5.0
1987-02-22	6.0
1987-02-23	15
1987-02-24	167
1987-02-25	68
1987-02-26	12
1987-02-27	5.0
1987-02-28	4.6
1987-03-01	4.5
1987-03-02	5.1
1987-03-03	4.8
1987-03-04	5.2
1987-03-05	6.6
1987-03-06	117
1987-03-07	30
1987-03-08	4.7
1987-03-09	4.2
1987-03-10	3.9
1987-03-11	4.2
1987-03-12	4.4
1987-03-13	4.3
1987-03-14	5.1
1987-03-15	17
1987-03-16	6.1
1987-03-17	5.1
1987-03-18	5.4
1987-03-19	5.8
1987-03-20	5.6
1987-03-21	152
1987-03-22	45
1987-03-23	9.2
1987-03-24	102
1987-03-25	42
1987-03-26	7.0
1987-03-27	6.0
1987-03-28	5.0
1987-03-29	4.5
1987-03-30	4.5
1987-03-31	4.5
1987-04-01	5.0
1987-04-02	6.0
1987-04-03	12
1987-04-04	8.4
1987-04-05	5.0
1987-04-06	4.8
1987-04-07	4.8
1987-04-08	4.4
1987-04-09	4.5
1987-04-10	3.9
1987-04-11	4.6
1987-04-12	4.5
1987-04-13	4.6
1987-04-14	4.9
1987-04-15	4.4
1987-04-16	4.5
1987-04-17	5.3

1987-04-18	5.0
1987-04-19	5.3
1987-04-20	4.3
1987-04-21	4.5
1987-04-22	4.5
1987-04-23	4.3
1987-04-24	4.8
1987-04-25	5.2
1987-04-26	5.1
1987-04-27	5.3
1987-04-28	5.1
1987-04-29	5.5
1987-04-30	5.3
1987-05-01	5.4
1987-05-02	5.3
1987-05-03	5.0
1987-05-04	5.0
1987-05-05	5.5
1987-05-06	5.5
1987-05-07	5.9
1987-05-08	5.5
1987-05-09	5.7
1987-05-10	5.5
1987-05-11	5.5
1987-05-12	5.8
1987-05-13	6.0
1987-05-14	6.1
1987-05-15	6.0
1987-05-16	6.3
1987-05-17	5.8
1987-05-18	5.2
1987-05-19	5.3
1987-05-20	5.8
1987-05-21	5.5

1987-05-22	5.8
1987-05-23	5.1
1987-05-24	4.4
1987-05-25	4.2
1987-05-26	4.9
1987-05-27	4.5
1987-05-28	4.7
1987-05-29	4.8
1987-05-30	4.8
1987-05-31	4.3
1987-06-01	4.4
1987-06-02	3.9
1987-06-03	3.9
1987-06-04	4.2
1987-06-05	4.4
1987-06-06	4.6
1987-06-07	3.9
1987-06-08	4.2
1987-06-09	3.9
1987-06-10	4.2
1987-06-11	4.2
1987-06-12	3.9
1987-06-13	3.5
1987-06-14	3.4
1987-06-15	3.1
1987-06-16	3.2
1987-06-17	2.7
1987-06-18	3.3
1987-06-19	3.4
1987-06-20	3.5
1987-06-21	3.3
1987-06-22	3.6
1987-06-23	4.0
1987-06-24	4.7

1987-06-25	4.2
1987-06-26	4.0
1987-06-27	4.2
1987-06-28	3.7
1987-06-29	4.1
1987-06-30	4.2
1987-07-01	4.7
1987-07-02	4.5
1987-07-03	5.3
1987-07-04	5.1
1987-07-05	4.3
1987-07-06	4.8
1987-07-07	5.6
1987-07-08	6.0
1987-07-09	5.4
1987-07-10	5.5
1987-07-11	5.7
1987-07-12	4.5
1987-07-13	4.8
1987-07-14	5.7
1987-07-15	6.2
1987-07-16	6.3
1987-07-17	15
1987-07-18	8.7
1987-07-19	5.5
1987-07-20	5.6
1987-07-21	5.7
1987-07-22	4.7
1987-07-23	4.6
1987-07-24	4.4
1987-07-25	5.2
1987-07-26	4.6
1987-07-27	5.2
1987-07-28	5.4

1987-07-29	4.9
1987-07-30	5.8
1987-07-31	4.9
1987-08-01	3.8
1987-08-02	3.3
1987-08-03	3.8
1987-08-04	5.6
1987-08-05	6.9
1987-08-06	4.6
1987-08-07	4.9
1987-08-08	4.1
1987-08-09	3.9
1987-08-10	4.3
1987-08-11	4.3
1987-08-12	3.8
1987-08-13	5.4
1987-08-14	8.4
1987-08-15	7.0
1987-08-16	4.7
1987-08-17	4.5
1987-08-18	4.7
1987-08-19	4.5
1987-08-20	4.7
1987-08-21	4.3
1987-08-22	3.9
1987-08-23	3.2
1987-08-24	3.6
1987-08-25	4.0
1987-08-26	4.0
1987-08-27	4.3
1987-08-28	4.5
1987-08-29	4.4
1987-08-30	5.2
1987-08-31	3.8

1987-09-01	3.6
1987-09-02	3.4
1987-09-03	3.5
1987-09-04	3.7
1987-09-05	2.7
1987-09-06	2.6
1987-09-07	3.6
1987-09-08	3.4
1987-09-09	2.8
1987-09-10	2.5
1987-09-11	2.7
1987-09-12	3.0
1987-09-13	4.2
1987-09-14	3.7
1987-09-15	2.3
1987-09-16	2.5
1987-09-17	2.5
1987-09-18	1.9
1987-09-19	4.0
1987-09-20	2.7
1987-09-21	3.8
1987-09-22	2.3
1987-09-23	2.6
1987-09-24	2.7
1987-09-25	3.8
1987-09-26	2.8
1987-09-27	2.5
1987-09-28	2.3
1987-09-29	2.2
1987-09-30	2.0

Appendix B3.
Stream Flow in Aliso Creek at USGS Station ACJ01 (4/23/73 to 11/13/79), cubic feet per second (Mean).
Source: USGS http://waterdata.usgs.gov/nwis .

4/23/1973	2
5/14/1973	1
5/22/1973	1
1/4/1974	5
1/8/1974	30
7/10/1974	0.5
12/4/1974	200
1/6/1975	1
2/3/1975	25
7/8/1975	0.25
2/6/1976	100
2/10/1976	50
3/3/1976	10
4/7/1976	1
8/4/1976	0.5
9/1/1976	2
9/10/1976	15
10/6/1976	0.5
11/10/1976	1
12/8/1976	25
12/31/1976	5
1/6/1977	2
1/18/1977	2
2/1/1977	5
3/1/1977	2
4/5/1977	1
5/3/1977	0.5
5/31/1977	1
5/9/1977	0.5
5/31/1977	1
7/5/1977	75
8/2/1977	0.25
8/17/1977	1
9/7/1977	1
10/4/1977	1
11/8/1977	0.25
12/6/1977	1
12/27/1977	25
1/6/1978	25
1/17/1978	40
1/19/1978	1000
2/6/1978	25
2/9/1978	100
3/1/1978	500
3/31/1978	50

4/4/1978	3
5/2/1978	1
1/5/1979	50
1/31/1979	500
2/1/1979	100
2/14/1979	15
2/21/1979	75
2/23/1979	200
3/6/1979	1
3/20/1979	100
3/28/1979	500
4/3/1979	1
5/1/1979	10
6/5/1979	0.5
11/13/1979	0.5

Appendix C.
National Marine Fisheries Service Juvenile Fish Screen Criteria for Pump Intakes

National Marine Fisheries Service
Southwest Region

JUVENILE FISH SCREEN CRITERIA FOR PUMP INTAKES

Developed by
National Marine Fisheries Service
Environmental & Technical Services Division
Portland, Oregon
May 9, 1996

ADDENDUM
JUVENILE FISH SCREEN CRITERIA FOR PUMP INTAKES
Developed by
National Marine Fisheries Service
Environmental & Technical Services Division
Portland, Oregon
May 9, 1996

The following criteria serve as an addendum to current National Marine Fisheries Service gravity intake juvenile fish screen criteria. These criteria apply to new pump intake screens and existing inadequate pump intake screens, as determined by fisheries agencies with project jurisdiction.

Definitions used in pump intake screen criteria

Pump intake screens are defined as screening devices attached directly to a pressurized diversion intake pipe.

Effective screen area is calculated by subtracting screen area occluded by structural members from the total screen area.

Screen mesh opening is the narrowest opening in screen mesh.

Approach velocity is the calculated velocity component perpendicular to the screen face.

Sweeping velocity is the flow velocity component parallel to the screen face with the pump turned off.

Active pump intake screens are equipped with a cleaning system with proven cleaning capability, and are cleaned as frequently as necessary to keep the screens clean.

Passive pump intake screens have no cleaning system and should only be used when the debris load is expected to be low, and

1) if a small screen (less than 1 CFS pump) is over-sized to eliminate debris impingement, and
2) where sufficient sweeping velocity exists to eliminate debris build-up on the screen surface, and
3) if the maximum diverted flow is less than .01% of the total minimum streamflow, or
4) the intake is deep in a reservoir, away from the shoreline.

Pump Intake Screen Flow Criteria

The **minimum effective screen area** in square feet for an **active** pump intake screen is calculated by dividing the maximum flow rate in cubic feet per second (CFS) by an approach velocity of **0.4 feet per second (FPS)**. The **minimum effective screen area** in square feet for a **passive** pump intake screen is calculated by dividing the maximum flow rate in CFS by an approach velocity of **0.2 FPS.** Certain site conditions may allow for a waiver of the 0.2 FPS approach velocity criteria and allow a passive screen to be installed using 0.4 FPS as design criteria. These cases will be considered on a site-by-site basis by the fisheries agencies.

If fry-sized salmonids (i.e. less than 60 millimeter fork length) are not ever present at the site and larger juvenile salmonids are present (as determined by agency biologists), approach velocity shall not exceed 0.8 FPS for active pump intake screens, or 0.4 FPS for passive pump intake screens. The allowable flow should be distributed to achieve uniform approach velocity (plus or minus 10%) over the entire screen area. Additional screen area or flow baffling may be required to account for designs with non-uniform approach velocity.

Pump Intake Screen Mesh Material

Screen mesh openings shall not exceed **3/32 inch** (2.38 mm) for woven wire or perforated plate screens, or 0.0689 inch **(1.75 mm)** for profile wire screens, with a minimum **27% open area**. If fry-sized salmonids are never present at the site (by determination of agency biologists) screen mesh openings shall not exceed **1/4 inch** (6.35 mm) for woven wire, perforated plate screens, or profile wire screens, with a minimum of **40% open area.**

Screen mesh material and support structure shall work in tandem to be sufficiently durable to withstand the rigors of the installation site. No gaps greater than 3/32 inch shall exist in any type screen mesh or at points of mesh attachment. Special mesh materials that inhibit aquatic growth may be required at some sites.

Pump Intake Screen Location

When possible, pump intake screens shall be placed in locations with **sufficient sweeping velocity** to sweep away debris removed from the screen face. Pump intake screens **shall be submerged** to a depth of at least one screen radius below the minimum water surface, with a minimum of one screen radius clearance between screen surfaces and adjacent natural or constructed features. A **clear escape route** should exist for fish that approach the intake volitionally or otherwise. For example, if a pump intake is located off of the river (such as in an intake lagoon), a conventional open channel screen should be considered, placed in the channel or at the edge of the river. Intakes in reservoirs should be as deep as practical, to reduce the numbers of juvenile salmonids that approach the intake. Adverse alterations to riverine habitat shall be minimized.

Pump Intake Screen Protection

Pump intake screens **shall be protected** from heavy debris, icing and other conditions that may compromise screen integrity. Protection can be provided by using log booms, trash racks or mechanisms for removing the intake from the river during adverse conditions. An **inspection and maintenance plan** for the pump intake screen is required, to ensure that the screen is operating as designed per these criteria.

Appendix D.
Yarney Self-Cleaning Pump Suction Screen Specifications

YARDNEY WATER MANAGEMENT SYSTEMS, INC.

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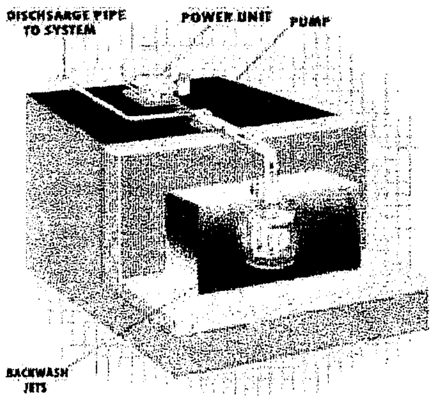
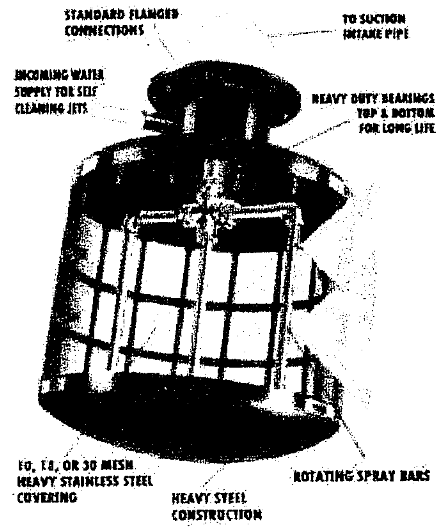


Yardney Self-Cleaning Suction Screen



- Pump suction screens are not orientation sensitive and may be installed vertically, angled, or horizontally.
- Units should be installed in a moving water source to assure that contaminant that is washed off the suction screen is carried aw form the suction line area.

SPECIFICATIONS

MODEL	SERVICE FLOW RATES		FLOW m^3/HR.		SCREEN LENGTH	TOTAL LENGTH	SCREEN DIA.	FLANGE SIZE	RETURN INLET	MIN. PRESS	WEIGHT (lbs.)	SPI (GI
	10&18 MESH	30 MESH	10&18 MESH	30 MESH								
CW200	325	225	73.8	51.1	11"	25"	16"	4"	1 1/2"	35	58	2
CW400	550	400	124.9	90.8	15"	28.8"	16"	6"	1 1/2"	40	62	2
CW600	750	525	170.3	119.2	16"	32.5"	24"	8"	1 1/2"	40	102	2
CW800	950	700	215.7	158.9	18"	34.5"	24"	10"	1 1/2"	45	115	2
CW1000	1350	950	306.5	215.7	23"	39.5"	24"	10"	1 1/2"	50	123	2
CW1400	1650	1200	374.6	272.4	26"	42.5"	24"	12"	1 1/2"	55	131	2
CW1700	1950	1400	442.7	317.8	28"	44.5"	26"	12"	1 1/2"	55	148	2
CW2000	2350	1650	533.5	374.6	32"	48.5"	26"	14"	1 1/2"	60	160	2
CW2400	2600	1800	590.2	408.6	35"	52.5"	30"	16"	1 1/2"	65	223	2