City of Newport Beach
Water Quality/Coastal Tidelands Committee Minutes

DRAFT

Date: July 11, 2013
Time: 3:00 p.m.
Location: Newport Coast Conference Room, 2nd Floor, Bay E

1. **Welcome/Self Introductions**
   Committee Members present:
   Chairwoman/Council Member Nancy Gardner
   Vice Chairman/Council Member Mike Henn
   Lou Denger, Member
   Carl Cassidy, Member
   Laird Hayes, Member
   Tom Houston, Member
   George Robertson, Member

   Guests present:
   Jack Skinner, SPON
   Jim Mosher, resident
   Darrel Ferguson
   Monica Mazur, resident

   Staff present:
   John Kappeler, Water Quality Manager
   Becky Rodstein, Public Works Management Assistant

   The agenda for the Water Quality/Coastal Tidelands Committee was posted at 2:35 pm on July 3, 2013, in the binder located in the entrance of the Council Chambers at 100 Civic Center Drive.

2. **Approval of Previous Meeting's Minutes**
   The minutes from both the May 9th and June 13th, 2013 meetings were approved.

3. **Old Business**
   A. **Bay and Ocean Bacteriological Test Results**
   Monica Mazur reviewed recent water quality test results within Newport Bay and along the ocean shoreline. A discussion ensued regarding the bacterial standards and numbers for the Arches storm drain area.

   B. **John Kappeler** gave an update on Committee goals and priorities.
   - Log booms
     - Monitoring the log boom in front of Newport Aquatic Center and after storm events.
     - Log boom was moved because of the dredging project.
     - Log booms are designed for storm events; removing the most trash during storm events.
     - OCTA grant might pay for additional log booms, so think about where we would like to place more.
     - **Nancy Gardner** asked about the work done on Delhi Channel, is there still one there? **John Kappeler** said it was still there. She then asked

about the San Diego Creek log boom. **Jack Skinner** said that storm and tides often move the booms making it less effective.
    - We could rebuild booms that already exist.
- Street sweeping being considered for expansion.
    - Nancy Gardener will ask the City Manager to bring this to the City Council.

ACTION: Nancy Gardner will work with City Manager Kiff to add expanded street sweeping and bring the item to a Council Meeting for discussion and eventually a vote. **Nancy Gardner** asked if everyone could bring in their goals so they can be updated and discussed together at the next meeting.

4. **New Business**

Darrel Ferguson had a question about Little Corona Beach and Buck Gully regarding the increased runoff in the area.

- Possibly due to increased development.
- The gabion structures installed two years ago help.
- Dry-weather runoff averages 300 gallons/minute.
- The following questions were asked by **Darrel Ferguson** and answered by **Nancy Gardner**:
- Is there any sediment that goes though? No
- Is there a max? The area is the focus for the Smart Irrigation program. But there is a ground water rise affecting increased runoff.
- Is it built out? Yes
    - **John Kappeler** added that 1,000 Irrigation controllers were given out and 52,000 nozzles installed to reduce runoff.
- The restrooms, do they affect the runoff? No.
    - **John Kappeler** added that there is a flow meter being installed to get better data.

Lou Denger shared some data from 2010 on the San Joaquin Marsh

- A recap of the history: 1944 a well was installed in the San Joaquin Marsh for agriculture, which led to farming. A treatment plant was built in 1966 and farming declined by 1972. The Irvine Company sold part of the Marsh to the Irvine Ranch Water District (IRWD).
- Ponds can be controlled by pumping water in and out. Typical flow is 4 million gallons a day.
- **Nancy Gardner** asked when IRWD sends water there, is it just for vegetation? Yes, the water needs to be run through the system to maintain the vegetation.
- Dept of Fish and Game requires IRWD to have an agreement to show maintenance activities including equipment, emergency response, public use, species mapping, etc.
- There is a half million dollar landscape contract to take care of the plants.
- 122 acres are for mitigation.
- Water Quality Monitoring program:
    - Routine monitoring
    - Performance monitoring
    - Impact monitoring (future testing, still in development)
- Water Quality Data
    - 2007-2010
    - Nitrogen is 7 ½, 2 ½ going out.
    - Pounds removed

- 2007 – 52,000
- 2008 – 68,000
- 2009 – 49,000
- 2010 – 44,000

The numbers change because of natural water going in and out.

- 2010 they started looking at the selenium and the species in the marsh. Average was 26 coming in, 19 going out. The dominate species in selenite.
- **John Kappeler** asked how much it costs per year to monitor. Around $50,000.
- **Jack Skinner** added that the original plan was going to release treated wastewater into the bay. IRWD agreed to run creek water and run it into the bay. Marked improvement because the creek water goes to the ponds, taking out selenium and nitrates. **Lou Denger** added that in the summer months, the flow goes through the watershed, and the nitrate level has gone down considerably.

5. **Public Comments on Non-Agenda Items**

Jim Mosher went to the Zoning Administrator meeting; there were comments about improving interactions with Costa Mesa about water quality issues. Costa Mesa Sanitary district, which oversees sewer and trash collection, has been trying to set up a meeting with Newport Beach, without response.

The California Coastal Commission heard the application to remove fire rings. Jim told the Council on Tuesday that it was giving the City a bad name by being the only coastal City to do so, which might mean there are other motives for removal. The letters that were sent to the Coastal Commission to support the removal included a health issue that was overlooked: improper sanitary facilities. This is a pervasive problem at all of our beaches.

Carl Cassidy noted the biggest problem on the Island is the never-ending negotiations of the eelgrass situation. **Nancy Gardner** says we are doing testing, and just approved the contract. The process is underway. Is there a timeline to start dredging? Next year and there is buy in for expanded dredging. **Mike Henn** clarifies that it is not an issue of funding, Council is ready to fund, but we are waiting for approval.

Tom Houston brought up the $4.32 charge and noticed that the signs have been removed. **Nancy Gardner** said the response was "the local representatives put the signs up too soon." They are still going to put the signs up. Tom wanted to thank Council and Staff for a timely response. **Nancy Gardner** also noted that Council had the Newport Bay Conservancy write a supporting letter. Tom also wanted to thank Jack for the pictures showing the improvements of the bay.

Nancy Gardner shared that the movie "Reckless Moment" 1949, shows the Newport Bay.

6. **Topics for Future Agendas**

(a) Prop 84 ASBS Grant Program
(b) Big Canyon Project
(c) Rhine Channel Project Wrap Up
(d) Senate Bill - SB 1447
(e) Marine Protected Areas (MPAs)
(f) Eelgrass Program
(g) Trash Project for Storm Flows
(h) Biofilm Research Project

(i) Newport Bay Copper Project – Final Report
(j) Harbor Commission Copper Project
(k) Orange County Coastal Regional Sediment Management Plan
(l) Santa Ana Regional Water Quality Board – Natural Source Exclusion

Set Next Meeting Date
The next meeting date was set for August 8, 2013, at 3 PM in the **Newport Coast Conference Room, 2nd Floor, Bay E.**

7. **Adjournment**
The meeting was adjourned at 4:15 pm.

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Chairwoman / Nancy Gardner

Health Care Agency / Environmental Health Newport Bay Bacteriological Monitoring Program
Total Coliform (TC), Fecal Coliform, Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		3/11/13	3/18/13	3/25/13	4/3/13	4/8/13	4/17/13	4/22/13	4/29/13	5/6/13	5/13/13	5/20/13	5/28/13	6/3/13	6/10/13	6/17/13	6/24/13	7/1/13	7/8/13
NEWPORT BAY (Lower Bay)			RAIN								RAIN									
BNB09	43rd Street Beach	TC	70	20	70	>3800	30	>80	100	30	>40000	20	<10	>30	>70	40	<10	70	870	350
		FC	10	10	<10	300	10	<10	60	10	11000	20	<10	20	50	<10	<10	<10	<10	<10
		ENT	<2	<2	218	20	8	10	98	10	400	4	<2	20	6	6	<2	6	20	<2
BNB10	38th Street Beach	TC	30	<10	10	30	30	20	20	270	11000	60	20	>190	>50	<10	<10	70	>1020	>900
		FC	<10	<10	<10	<10	<10	<10	<10	10	1870	<10	<10	10	10	<10	<10	<10	80	<10
		ENT	6	2	2	6	<2	2	2	<2	140	<2	10	20	20	<2	<2	2	74	<2
BNB11	33rd Street Channel	TC	20	80	100	30	10	40	30	95	1620	70	30	30	>10	<10	20	20	>490	>700
		FC	<10	30	<10	<10	<10	<10	<10	<10	250	<10	<10	10	<10	<10	<10	10	<10	80
		ENT	<2	20	8	<2	4	<2	4	<2	50	36	170	6	<2	<2	<2	6	24	2000
BNB32	Lido Yacht Club Beach	TC	50	10	<10	<10	>50	<10	<10	80	30	20	<10	<10	<10	100	<10	10	>20	<10
		FC	<10	20	<10	<10	<10	<10	<10	30	<10	<10	10	<10	<10	160	<10	<10	10	<10
		ENT	<2	2	<2	4	<2	<2	<2	<2	20	<2	2	4	4	2	<2	<2	32	4
BNB07	Via Genoa Beach	TC	20	70	<10	10	>70	<10	30	10	40	<10	<10	30	>10	80	<10	50	>390	<10
		FC	10	20	<10	<10	20	<10	<10	<10	10	<10	<10	70	<10	40	<10	20	10	<10
		ENT	2	20	4	2	20	2	2	2	<2	2	<2	<2	2	22	<2	34	6	<2
BNB35	Newport Blvd. Bridge	TC	120	>40000	170	>40000	330	>1030	240	8000	40000	<10	5000	>880	680	80	>950	2200	>500	>1310
		FC	<10	95	60	900	<10	310	20	50	12000	<10	200	220	60	<10	140	390	70	<10
		ENT	2	150	20	800	8	140	44	110	8200	2	20	110	4	2	98	600	240	20
BNB12	Rhine Channel	TC	30	70	<10	60	30	20	30	60	4400	40	530	>80	2000	500	30	80	>650	<10
		FC	<10	10	<10	<10	20	<10	<10	<10	490	<10	<10	<10	580	<10	<10	<10	10	<10
		ENT	2	<2	<2	8	<2	<2	<2	8	140	<2	62	2	34	<2	<2	<2	24	<2
BNB14	19th Street Beach	TC	>110	<10	10	40	>20	<10	<10	10	80	10	<10	10	10	10	<10	20	10	30
		FC	10	<10	<10	30	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10
		ENT	<2	2	<2	>2	8	2	2	<2	2	4	<2	6	<2	<2	<2	<2	2	<2
BNB15	15th Street Beach	TC	20	<10	<10	580	10	95	110	30	480	20	<10	<10	>60	<10	30	40	60	10
		FC	<10	<10	<10	140	<10	80	95	20	130	<10	<10	<10	20	<10	<10	<10	20	<10
		ENT	2	140	<2	<2	4	2	8	<2	110	8	<2	<2	6	<2	<2	<2	20	<2
BNB17	10th Street Beach	TC	50	10	<10	50	>10	<10	30	<10	10	<10	<10	10	20	<10	<10	10	10	<10
		FC	<10	<10	<10	20	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10
		ENT	4	<2	<2	<2	4	<2	<2	4	4	<2	<10	<2	8	<2	<2	4	<2	2
BNB18	Alvarado/ Bay Isle Beach	TC	110	10	10	<10	>320	<10	10	<10	40	<10	<10	30	20	20	<10	10	>10	<10
		FC	<10	<10	10	<10	360	<10	<10	<10	<10	<10	<10	20	<10	<10	<10	<10	<10	<10
		ENT	2	<2	<2	4	26	2	4	2	8	<2	4	10	10	2	2	4	6	<2
BNB22	N Street Beach	TC	<10	<10	<10	20	10	<10	<10	<10	10	20	10	<10	>40	<10	50	20	10	<10
		FC	<10	10	<10	30	<10	10	<10	<10	<10	10	<10	20	40	<10	<10	<10	<10	<10
		ENT	<2	<2	<2	2	2	2	<2	<2	<2	<2	2	2	32	<2	<2	<2	8	<2
BNB31	Garnet Avenue Beach	TC	180	10	10	460	>10	<10	10	>20	30	>10	10	>20	20	>180	20	10	>20	450
		FC	<10	<10	10	410	<10	<10	10	10	<10	<10	<10	<10	<10	<10	<10	10	<10	30
		ENT	2	20	<2	20	2	<2	22	10	2	2	2	<2	4	32	2	4	<2	6
BNB03	Ruby Avenue Beach	TC	100	<10	10	30	>70	<10	10	10	120	30	20	>70	560	<10	<10	80	>10	60
		FC	<10	10	<10	<10	10	<10	<10	<10	30	<10	<10	70	520	<10	<10	10	20	20
		ENT	6	<2	2	<2	52	<2	6	10	10	<2	2	<2	8	<2	<2	2	4	2
BNB20	Sapphire Avenue Beach	TC	10	40	10	30	>10	<10	10	100	30	<10	<10	<10	10	<10	>10	>770	>20	>10
		FC	<10	40	10	10	<10	<10	10	20	20	10	<10	<10	10	<10	<10	720	10	<10
		ENT	4	<2	4	<2	4	10	2	4	<2	<2	<2	4	4	<2	<2	36	<2	<2
BNB34	Grand Canal	TC	20	380	<10	20	20	30	10	10	450	40	120	190	>170	50	260	160	>140	380
		FC	10	260	<10	20	20	<10	<10	<10	50	30	50	150	80	30	100	100	10	20
		ENT	<2	20	2	42	4	4	8	<2	64	6	20	22	20	<2	56	52	8	10
BNB21	Abalone Avenue Beach	TC	160	30	80	100	100	>140	100	20	100	>60	80	>170	>120	<10	10	<10	>80	80
		FC	70	30	50	130	40	80	100	<10	50	30	80	95	100	30	<10	<10	80	30
		ENT	4	<2	10	72	24	68	28	2	10	24	26	20	26	6	20	<2	20	6
BNB01	Park Avenue Beach	TC	50	20	40	20	10	20	30	10	>580	30	10	50	>110	10	<10	900	>70	30
		FC	<10	<10	10	<10	<10	<10	10	<10	40	<10	<10	<10	<10	<10	<10	<10	<10	<10
		ENT	<2	<2	<2	<2	<2	<2	2	2	42	<2	<2	<2	8	<2	<2	8	8	<2
BNB02	Onyx Avenue Beach	TC	190	10	<10	10	160	10	70	40	270	30	10	20	>40	10	<10	95	130	20
		FC	10	<10	<10	<10	95	<10	10	30	20	10	<10	10	<10	10	<10	<10	<10	<10
		ENT	6	<2	4	10	120	10	20	2	26	2	2	10	20	2	20	10	10	6
BNB29	Promontory Point Channel	TC	20	10	<10	<10	<10	<10	40	<10	50	<10	<10	10	>10	<10	20	>50	10	<10
		FC	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10
		ENT	<2	<2	<2	<2	<2	<2	<2	<2	10	<2	<2	<2	4	<2	<2	6	2	<2
BNB33	Bayside Drive Beach	TC	20	150	30	>270	>260	10	60	60	6000	>900	>80	>180	>150	10	>80	2000	>250	>30
		FC	20	60	<10	60	160	10	10	60	510	760	110	120	40	<10	40	220	20	10
		ENT	<2	20	<2	42	40	<2	10	42	2000	26	10	20	20	4	22	140	22	2
BNB23	Rocky Point Beach	TC	<10	<10	<10	20	<10	20	>10	<10	10	50	<10	<10	<10	<10	<10	>20	20	10
		FC	<10	<10	<10	10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
		ENT	<2	<2	<2	10	<2	<2	4	4	<2	2	4	<2	<2	2	2	10	<2	<2

NS - NOT SAMPLED
LA - LAB ACCIDENT
Cw/(o)C- CONFLUENT GROWTH
WITH(OUT) COLIFORMS
TNTC - TOO NUMEROUS TO COUNT

SINGLE SAMPLE STANDARDS:
Total Coliforms - 10,000 organisms per 100 milliliters sample.
Fecal Coliforms - 400 organisms per 100 milliliters sample.
Enterococci - 104 organisms per 100 milliliters sample.
Fecal:Total Ratio - >1000 total coliforms if ratio exceeds 0.1.

New Data
Single Sample Standard Violation.
Long-term Posting Location.
Creek/Drain Sample Location.
Rain Influenced Data.

30-DAY LOG MEAN STANDARDS (of five weekly samples)
Total Coliforms - 1,000 organisms per 100 milliliters sample.
Fecal Coliforms - 200 organisms per 100 milliliters sample.
Enterococci - 35 organisms per 100 milliliters sample.

Health Care Agency / Environmental Health Newport Bay Bacteriological Monitoring Program
Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		3/11/13	3/18/13	3/25/13	4/3/13	4/8/13	4/17/13	4/22/13	4/29/13	5/6/13	5/13/13	5/20/13	5/28/13	6/3/13	6/10/13	6/17/13	6/24/13	7/1/13	7/8/13
NEWPORT BAY (Upper Bay)			RAIN								RAIN									
BNB24	Newport Dunes - Middle	TC	>1220	70	80	>70	>10	<10	20	<10	110	80	10	<10	>40	10	>10	140	220	50
		FC	70	10	40	30	30	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	10	<10
		ENT	24	6	4	6	2	<2	<2	,2	20	<2	<2	<2	10	4	<2	20	4	<2
BNB24	Newport Dunes - West	TC	>1480	>180	80	400	40	<10	>10	20	80	40	20	<10	>10	10	50	160	160	20
		FC	60	95	40	260	<10	<10	<10	10	<10	10	<10	20	<10	<10	<10	<10	80	<10
		ENT	20	62	4	24	2	<2	<2	<2	20	<2	4	<2	2	<2	<2	6	34	<2
BNB24	Newport Dunes - East	TC	>840	40	290	10	<10	<10	<10	<10	80	150	<10	>10	>10	20	>10	350	610	510
		FC	80	10	200	<10	10	30	<10	<10	40	<10	<10	10	<10	<10	<10	70	10	<10
		ENT	20	30	38	2	6	<2	2	2	10	4	<2	<2	10	2	<2	10	2	6
BNB24	Newport Dunes - North	TC	>700	>60	20	40	>325	>30	10	80	130	150	10	>60	<10	10	>50	740	40	>80
		FC	100	80	10	10	180	<10	<10	10	20	10	10	<10	<10	<10	<10	160	<10	>40
		ENT	4	6	10	6	60	<2	<2	6	36	4	<2	<2	2	<2	8	10	<2	10
BNB25	Vaughn's Launch	TC	>380	NS	20	NS	>40	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		FC	30	NS	10	NS	10	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		ENT	6	NS	10	NS	220	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BNB26	Ski Zone	TC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		FC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		ENT	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BNB28	North Star Beach	TC	>500	60	10	<10	10	100	>10	<10	>430	100	10	>10	10	<10	<10	10	10	20
		FC	20	<10	<10	<10	10	<10	<10	<10	80	<10	<10	<10	10	<10	<10	<10	10	<10
		ENT	8	28	8	4	4	8	2	<2	130	38	2	2	6	<2	<2	2	10	2
BNB30	De Anza	TC	260	60	10	<10	10	40	>10	30	170	30	<10	10	>10	<10	10	40	>30	260
		FC	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	20	10
		ENT	<2	30	<2	10	2	<2	8	6	4	<2	<2	6	20	<2	<2	4	8	44
BNB05	Bayshore Beach	TC	70	80	20	<10	10	20	40	10	40	40	20	10	50	<10	20	20	100	380
		FC	10	20	<10	10	10	20	<10	10	20	<10	<10	10	<10	<10	<10	<10	100	10
		ENT	4	38	2	<2	<2	28	4	<2	4	10	2	2	10	2	<2	2	24	10
NEWPORT BAY TRIBUTARIES																				
CNBCD	San Diego Creek - Campus Dr.	TC	>17000	>2400	>680	>1900	NS	>270	>150	>240	>7800	3200	>460	>100	>210	>280	>710	>700	>800	>250
		FC	400	60	60	330	NS	30	40	50	2600	20	70	60	200	95	420	40	30	50
		ENT	10	48	26	400	NS	50	54	28	3200	70	26	48	88	20	120	20	34	24
CNBSA	Santa Ana Delhi Channel	TC	>11000	>1170	>4100	>3600	NS	>4000	>3000	>530	40000	55000	41000	>1800	>3000	>2100	>3600	>3600	>4900	>4100
		FC	380	80	360	320	NS	170	400	350	40000	430	2600	200	390	200	220	290	170	210
		ENT	378	100	150	210	NS	140	600	110	40000	74	206	190	400	180	228	242	190	<2
CNBBC	Big Canyon Creek	TC	>440	>520	>490	>500	>480	>880	>260	>380	12000	4200	4400	>510	>600	>760	>340	150	>740	>430
		FC	80	70	80	10	160	380	40	10	4000	200	40	10	20	10	80	<10	10	<10
		ENT	58	150	60	38	48	224	56	36	6400	248	200	66	74	60	54	4	160	190
CNBND	Backbay Drive Pipe	TC	>1380	>750	>910	>190	>660	>6200	2000	19000	7800	4400	NS	NS	NS	NS	NS	NS	NS	NS
		FC	60	10	70	<10	80	860	80	5000	1700	100	NS	NS	NS	NS	NS	NS	NS	NS
		ENT	120	40	120	44	400	600	600	6800	3400	2000	NS	NS	NS	NS	NS	NS	NS	NS
NEWPORT SLOUGH																				
BNS01	Lancaster Street &	TC	NS	NS	NS	>120	>50	10	>50	>70	>1130	>20	>70	>120	>20	>10	10	>30	50	20
	61st Street	FC	NS	NS	NS	10	<10	<10	10	<10	80	10	<10	20	<10	<10	<10	10	<10	<10
		ENT	NS	NS	NS	4	42	6	10	8	44	20	10	20	10	10	4	<2	6	4
BNSO2	Lancaster Street &	TC	NS	NS	NS	40	95	30	10	30	4000	10	>50	30	>100	50	<10	>10	80	20
	Canal Street	FC	NS	NS	NS	30	10	<10	40	20	100	10	<10	<10	10	10	<10	<10	<10	10
		ENT	NS	NS	NS	10	4	4	8	8	10	4	32	10	10	10	<2	10	24	2

NS - NOT SAMPLED
LA - LAB ACCIDENT
Cw/(o)C- CONFLUENT GROWTH
WITH(OUT) COLIFORMS
TNTC - TOO NUMEROUS TO COUNT

SINGLE SAMPLE STANDARDS:
Total Coliforms - 10,000 organisms per 100 milliliters sample.
Fecal Coliforms - 400 organisms per 100 milliliters sample.
Enterococci - 104 organisms per 100 milliliters sample.
Fecal:Total Ratio - >1000 total coliforms if ratio exceeds 0.1.

New Data
Single Sample Standard Violation.
Long-term Posting Location.
Creek/Drain Sample Location.
Rain Influenced Data.

30-DAY LOG MEAN STANDARDS (of five weekly samples)
Total Coliforms - 1,000 organisms per 100 milliliters sample.
Fecal Coliforms - 200 organisms per 100 milliliters sample.
Enterococci - 35 organisms per 100 milliliters sample.

OCSD Bacteriological n Monitoring Program
Total Coliform (TC), ecal Coliform (FC),
Enterococcus (ENT) Colony Forming Units/100 ml Sample

DATE		2/26	2/27	3/5	3/6	3/12	3/13	3/19	3/20	3/26	3/27	4/2	4/3	4/9	4/10	4/16	4/17	4/23	4/24	4/30	5/1	5/7	5/8	5/14	5/15	5/21	5/22	5/28	5/29	6/4	6/5	6/11	6/12	6/18	6/19	6/25	6/26	7/1	7/2
Location/Tide																						RAIN	RAIN																
Bolsa Chica	TC	<17	NS	33	NS	17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	3200	NS	<17	NS	<17	NS	<17	NS	67	NS	<17	NS	<17	NS	<17	NS	17	NS
Beach	FC	17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	150	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	17	NS	<17	NS
39N	ENT	6	NS	2	NS	8	NS	<2	NS	10	NS	2	NS	4	NS	<2	NS	<2	NS	10	NS	6	NS	<2	NS	2	NS	6	NS	10	NS	<2	NS	<2	NS	8	NS	24	NS
Bolsa Chica	TC	<17	NS	<17	NS	17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	CWS	NS	17	NS	33	NS	100	NS	<17	NS	<17	NS	<17	NS	17	NS	67	NS
Reserve	FC	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	3600	NS	<17	NS	17	NS	170	NS	50	NS	<17	NS	<17	NS	120	NS	50	NS
33N	ENT	6	NS	<2	NS	6	NS	4	NS	40	NS	2	NS	4	NS	2	NS	8	NS	8	NS	28	NS	<2	NS	2	NS	34	NS	20	NS	10	NS	10	NS	20	NS	14	NS
Bluffs	TC	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	17	NS	<17	NS	<17	NS	CWS	NS	33	NS	17	NS	<17	NS	17	NS	<17	NS	<17	NS	17	NS	33	NS
27N	FC	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	3900	NS	17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	50	NS
	ENT	12	NS	6	NS	2	NS	<2	NS	2	NS	18	NS	58	NS	12	NS	6	NS	6	NS	34	NS	4	NS	6	NS	<2	NS	14	NS	2	NS	2	NS	8	NS	22	NS
17th Street	TC	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	CWS	NS	170	NS	17	NS	>20	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS
21N	FC	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	17	NS	<17	NS	<17	NS	17	NS	<17	NS	5400	NS	120	NS	17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS
	ENT	4	NS	8	NS	<2	NS	<2	NS	6	NS	12	NS	48	NS	<2	NS	2	NS	10	NS	122	NS	130	NS	14	NS	14	NS	26	NS	2	NS	2	NS	<2	NS	34	NS
Jacks Snack	TC	<17	NS	17	NS	<17	NS	17	NS	67	NS	<17	NS	17	NS	<17	NS	<17	NS	17	NS	CWS	NS	<17	NS	17	NS	<17	NS	17	NS	<17	NS	<17	NS	17	NS	<17	NS
Bar	FC	<17	NS	<17	NS	<17	NS	<17	NS	33	NS	<17	NS	17	NS	17	NS	<17	NS	<17	NS	5100	NS	<17	NS	17	NS	<17	NS	17	NS	<17	NS	<17	NS	33	NS	<17	NS
15N	ENT	<2	NS	2	NS	<2	NS	<2	NS	14	NS	6	NS	8	NS	2	NS	4	NS	2	NS	46	NS	<2	NS	16	NS	4	NS	28	NS	2	NS	4	NS	12	NS	<2	NS
Beach Blvd.	TC	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	CWS	NS	<17	NS	17	NS	<17	NS	<17	NS	33	NS	17	NS	33	NS	17	NS
12N	FC	<17	NS	<17	NS	17	NS	17	NS	<17	NS	17	NS	17	NS	<17	NS	17	NS	<17	NS	4700	NS	<17	NS	17	NS	<17	NS	<17	NS	17	NS	17	NS	<17	NS	<17	NS
	ENT	2	NS	6	NS	2	NS	<2	NS	8	NS	<2	NS	2	NS	2	NS	6	NS	2	NS	24	NS	<2	NS	12	NS	2	NS	32	NS	6	NS	6	NS	16	NS	4	NS
SCE Plant	TC	960	<17	<17	<17	<17	17	<17	<17	17	50	<17	<17	17	<17	<17	<17	33	17	17	<17	CWS	13000	<17	17	<17	<17	<17	<17	33	<17	<17	17	<17	<17	67	33	17	120
9N	FC	500	<17	<17	<17	<17	33	<17	<17	<17	67	<17	33	33	<17	<17	<17	17	17	<17	<17	980	3600	<17	<17	<17	<17	17	<17	120	33	33	<17	17	<17	120	<17	<17	67
	ENT	122	2	4	<2	<2	24	<2	2	12	52	8	4	6	10	<2	<2	<2	8	2	<2	28	28	<2	12	4	22	4	6	14	<2	14	10	8	<2	28	16	<2	32
Magnolia	TC	960	<17	<17	100	<17	33	17	33	180	83	<17	<17	50	17	<17	<17	<17	<17	<17	17	4200	15000	<17	17	<17	33	<17	<17	<17	<17	17	17	17	170	83	67	33	<17
Street	FC	500	<17	<17	33	<17	50	<17	<17	100	67	<17	<17	<17	<17	<17	17	<17	33	<17	17	370	2900	<17	<17	<17	17	17	17	33	<17	<17	<17	33	120	83	120	<17	<17
6N	ENT	122	4	6	16	<2	20	2	198	34	54	<2	<2	6	16	2	64	2	12	2	2	16	48	<2	2	2	12	8	2	18	6	14	12	16	70	66	20	<2	4
Brookhurst	TC	1400	2300	17	17	<17	17	<17	<17	17	<17	<17	<17	100	17	17	17	17	<17	<17	17	1500	6400	50	17	<17	100	TNTC	<17	17	17	200	150	50	<17	<17	<17	<17	33
3N	FC	1000	2800	<17	17	17	<17	<17	33	<17	<17	<17	<17	<17	67	<17	<17	<17	<17	17	<17	130	1500	<17	<17	<17	17	9800	<17	17	<17	<17	170	<17	<17	17	<17	17	17
	ENT	210	304	6	2	2	12	<2	8	4	2	4	<2	4	22	<2	<2	8	<2	8	2	4	<2	<2	2	<2	14	320	34	14	16	6	2	6	28	16	2	4	12
Santa Ana	TC	<17	50	67	33	17	67	33	33	<17	17	<17	<17	120	17	<17	<17	<17	<17	<17	33	4800	2900	<17	17	<17	<17	2300	<17	<17	<17	200	33	<17	33	<17	<17	17	<17
River Mouth	FC	33	150	100	<17	<17	17	<17	33	<17	<17	<17	<17	17	17	<17	<17	<17	<17	<17	33	200	280	<17	17	<17	<17	1100	<17	<17	<17	<17	17	<17	<17	<17	<17	50	<17
0	ENT	2	10	8	2	4	12	6	4	<2	2	<2	2	6	10	<2	<2	<2	2	4	6	6	6	<2	6	2	8	32	2	2	8	6	34	2	8	<2	2	6	<2
Orange	TC	NS	17	NS	17	NS	83	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	33	NS	<17	NS	<17
Street	FC	NS	17	NS	<17	NS	100	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17
3S	ENT	NS	12	NS	4	NS	14	NS	<2	NS	2	NS	<2	NS	8	NS	<2	NS	<2	NS	<2	NS	<2	NS	4	NS	6	NS	8	NS	<2	NS	<2	NS	4	NS	<2	NS	<2
52nd/53rd	TC	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	33	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	33	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17
Street	FC	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17
6S	ENT	NS	4	NS	<2	NS	2	NS	<2	NS	<2	NS	<2	NS	6	NS	<2	NS	<2	NS	<2	NS	<2	NS	<2	NS	18	NS	12	NS	2	NS	<2	NS	8	NS	2	NS	<2
38th Street	TC	NS	33	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17
9S	FC	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	17	NS	<17	NS	33	NS	<17	NS	17
	ENT	NS	4	NS	<2	NS	2	NS	<2	NS	2	NS	<2	NS	4	NS	2	NS	6	NS	<2	NS	<2	NS	2	NS	8	NS	10	NS	6	NS	<2	NS	4	NS	<2	NS	<2
15th/16th	TC	NS	<17	NS	<17	NS	<17	NS	<17	NS	33	NS	<17	NS	33	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	33	NS	<17	NS	<17	NS	33	NS	<17	NS	<17
Street	FC	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	17	NS	<17	NS	<17	NS	33	NS	<17	NS	<17
15S	ENT	NS	2	NS	4	NS	52	NS	<2	NS	<2	NS	<2	NS	4	NS	<2	NS	<2	NS	<2	NS	<2	NS	4	NS	4	NS	4	NS	2	NS	2	NS	2	NS	2	NS	2	NS	<2
Balboa Pier	TC	NS	17	NS	17	NS	50	NS	<17	NS	<17	NS	<17	NS	<17	NS	33	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	17	NS	17	NS	<17
21S	FC	NS	17	NS	17	NS	33	NS	<17	NS	<17	NS	<17	NS	<17	NS	33	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17
	ENT	NS	14	NS	10	NS	2	NS	2	NS	4	NS	<2	NS	2	NS	2	NS	6	NS	4	NS	<2	NS	<2	NS	2	NS	20	NS	<2	NS	<2	NS	2	NS	2	NS	<2
The Wedge	TC	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17
27S	FC	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17
	ENT	NS	<2	NS	<2	NS	2	NS	<2	NS	<2	NS	6	NS	2	NS	<2	NS	6	NS	<2	NS	<2	NS	14	NS	<2	NS	6	NS	8	NS	<2	NS	2	NS	<2	NS	4
Corona Del	TC	NS	<17	NS	<17	NS	17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	83	NS	<17	NS	33	NS	67	NS	67	NS	17	NS	<17	NS	<17	NS	17
Mar Beach	FC	NS	<17	NS	17	NS	<17	NS	17	NS	17	NS	<17	NS	<17	NS	<17	NS	17	NS	17	NS	50	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	17	NS	<17	NS	17
29S	ENT	NS	4	NS	6	NS	6	NS	<2	NS	132	NS	<2	NS	<2	NS	2	NS	6	NS	<2	NS	<2	NS	<2	NS	42	NS	12	NS	14	NS	<2	NS	<2	NS	<2	NS	4
Crystal Cove	TC	NS	<17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	17	NS	<17	NS	17	NS	<17	NS	<17	NS	<17	NS	700
39S	FC	NS	<17	NS	<17	NS	33	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	<17	NS	780
	ENT	NS	<2	NS	<2	NS	<2	NS	<2	NS	<2	NS	<2	NS	<2	NS	<2	NS	<2	NS	<2	NS	<2	NS	<2	NS	<2	NS	2	NS	<2	NS	2	NS	2	NS	<2	NS	>400

SPRING TIDES
NEW DATA
SINGLE SAMPLE STANDARD VIOLATION
N/S NO SAMPLE / NO DATA
CWOS CONFULENT GROWTH WITHOUT SHEEN
CWS CONFULENT GROWTH WITH SHEEN
CWB CONFULENT GROWTH WITH BLUE (FECAL INDICATOR)

NAC Log Boom Presentation

by John Kappeler

July 11, 2013

Water Quality/Coastal Tidelands Committee

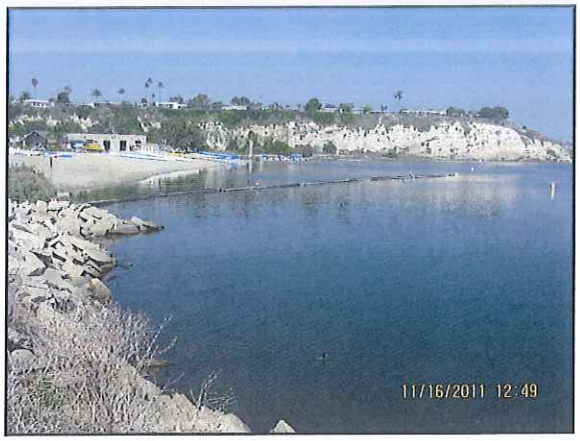

01/10/2013 09:05

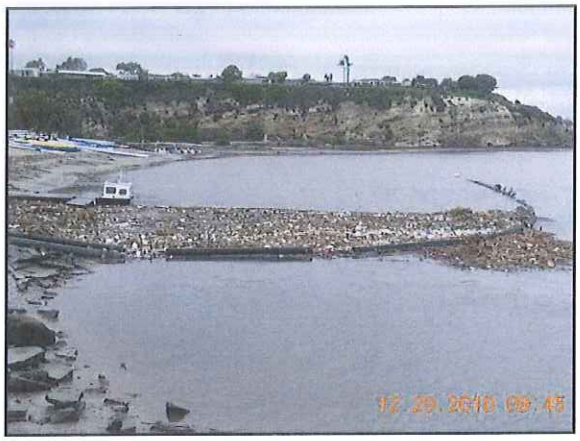

01/05/2011 08:39

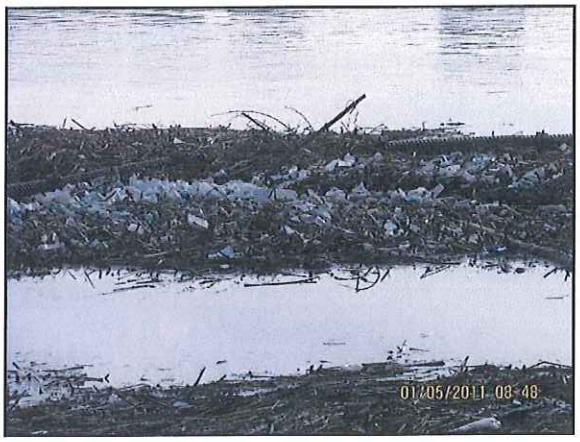

01/31/2013 14:13


01/05/2011 13:15


08/24/2011 09:35







Debris Removed

Fiscal Year	Tons	Rain Fall
03/04	80	6"
04/05	380	15"
05/06	0	7.71"
06/07	0	3.20"
07/08	0	9.35"
08/09	8	8.45"
09/10	0	14.25"
10/11	90	18.87"
11/12	20	7.35"
12/13	0	5.67"

San Joaquin Marsh
Ownership and Land Use History

- **1995** Irvine Ranch Water District purchased the remaining Irvine Company holdings in the San Joaquin marsh.
- **1996** The San Joaquin Marsh Enhancement Plan EIR was certified by the City of Irvine, and became the underlying document for restoring the San Joaquin Marsh.
- **1997** The duck ponds were transformed into structured wetland ponds consisting of 6 irregular shaped ponds and two pump stations.
- **1997** Riparian habitat restoration (43 acres) – North section (Zone 11) of the San Joaquin Marsh. Restoration consisted of site grading, irrigation and plant install.
- **1998** Michelson / Carlson Berm constructed – Construction consisted of grading, irrigation and landscape install
- **2000** Riparian / Upland habitat restoration (24 acres) – Duck pond area (Zone 10) of the San Joaquin Marsh. Restoration consisted of irrigation and plant install.
- **2001** Creek and Marsh pump station upgrades (5 cfs to 10-12 cfs).
- **2005** Carlson Marsh – flow control and structure improvements

San Joaquin Marsh
Presentation Outline

- Ownership and Land Use History
- San Joaquin Marsh Maps (1995, 2002, 2010)
- Operation and Maintenance
  - System Flow Patterns
  - Land Area
  - Fish and Game Agreement
  - Landscape Contract
  - Costs
- Water Quality Monitoring Program
  - Routine
  - Performance
  - Impact
- Water Quality Data
  - Nutrients
  - Bacteriological
  - Selenium
  - Metals
  - Sediment / Tissue – Future focus
- Comments and Questions

San Joaquin Marsh
Ownership and Land Use History

- **1944** Irvine Company drilled a well in the San Joaquin Marsh adjacent to the "Old" San Diego Creek channel and distributed the water through an extensive network of low-pressure unreinforced concrete irrigation lines.
- **1952** The Joaquin Marsh was actively irrigated and farmed producing seasonal truck crops such as lima beans, peppers, tomatoes, and sugar beets.
- **1965** The "Old" San Diego Creek channel was cut off and a levee was constructed roughly paralleling the present alignment of Harvard Avenue, which confined San Diego Creek along the southeastern boundary of the San Joaquin Marsh.
- **1966** Construction began on the Michelson Water Reclamation Plant. The remainder of the San Joaquin Marsh was still actively farmed.
- **1970** Campus Drive extension built, separating the San Joaquin Marsh into two parcels. Currently the ownership of the marsh is divided between Irvine Ranch Water District 378 acres and the University of California Irvine 202 acres.
- **1972** Farming activities started to decline and by 1972, the Irvine Company leased portions of the San Joaquin Marsh to several duck clubs. By 1973, networks of duck ponds and a levee system were in place.
- **1988** The last remaining duck club ceased operation and the City of Irvine assumed management of the ponds.
- **1990** Irvine Ranch Water District assumed the maintenance and operation of the ponds.
- **1993** Audubon Society (Sea and Sage) established on site. Educational programs and general bird watching activities scheduled through out the year.

San Joaquin Marsh
WQ Monitoring Program

- Routine Monitoring
  - D.O.
  - Flow
  - pH and Conductivity
  - Turbidity
  - Site Inspection
- Performance Monitoring (Water)
  - Nutrients
  - Solids
  - Bacteriological
  - Metals
  - Selenium species
  - Pesticides
  - Pyretheroids
- Impact Monitoring (Sediment/Tissue)
  - Total Phosphorus
  - Metals
  - Solids
  - Pesticides
  - Pyrethroids
  - PCBs
  - Bioassessment

San Joaquin Marsh
Operation and Maintenance

- **System Flow Patterns**
  - 4.0 MGD Influent
  - 5.2 MGD Effluent (with internal recirculation)
- **Land Area(325 acres)**
  - 122 ac mitigation
- **Fish and Agreement (O&M Program)**
  - Permitted routine maintenance activities and conditions
  - Weed and vector control guidelines
  - Emergency procedures and policies
  - Equipment list and uses
  - Public use
  - Sensitive species management
  - BMP's
- **Landscape Contract**
  - Competitive bid process
  - Three year contract

San Joaquin Marsh
WQ Data

2007-2010	Location	Minimum	Maximum	Average	Median	% / kg Removal	2007 LBS Removed	2008 LBS Removed	2009 LBS Removed	2010 LBS Removed
TN (mg/l)	Inlet	2.0	16.8	7.5	7.1		51,676	67,856	48,914	41,012
	Outlet	0.2	7.5	2.1	1.8	72.0				
Ortho-P (mg/l)	Inlet	0.0	7.5	0.3	0.1		470	621	409	526
	Outlet	0.0	0.4	0.1	0.1	65.9				
Total Coliform (MPN)	Inlet	100	160000	9791	3000					
	Outlet	37	140000	2843	500	0.3				
Enterococcus (MPN)	Inlet	11	14136	884	220					
	Outlet	27	1300	219	128	0.4				
E. Coli (MPN)	Inlet	11	1100	240	94					
	Outlet	13	1300	175	70	0.1				

San Joaquin Marsh
Operation and Maintenance

- **Operation and Maintenance Costs (2010)**

		%
Electricity (@ 10cfs)	$164,902.87	29.9
Pump Maintenance	$4,500.00	0.8
Structures Maintenance	$3,250.00	0.6
Field Instruments Maintenance Service Contracts	$2,500.00	0.5
Pond Seeding (Carbon Source)	$0.00	0.0
Landscape Maintenance	$234,500.00	42.5
Marsh Operations Support Labor	$60,300.00	10.9
Laboratory Support Labor	$37,200.00	6.7
Monitoring Support Labor	$7,441.00	1.3
Environmental Compliance Support Labor	$4,680.00	0.8
Contract Lab Services	$9,250.00	1.7
Miscellaneous	$23,500.00	4.3
Total	**$552,027**	

San Joaquin Marsh
WQ Data

2010	Location	Minimum	Maximum	Average	Median	% Removal	LBS Removed
Se Dissolved (ug/l)	Inlet	9.7	32.3	25.8	27.5		
Target 5 ug/l	Outlet	14.1	26.6	19.0	18.5	26.4	24.7
Selenomethyanine	Inlet	<0.5	<0.5	<0.5	<0.5		
(ug/l)	Outlet	<0.5	<0.5	<0.5	<0.5		
Selenite	Inlet	1.1	3.6	2.1	2.3		
(ug/l)	Outlet	1.5	7.0	4.7	5.2		
Selenate	Inlet	7.9	29.5	20.3	21.1		
(ug/l)	Outlet	2.6	15.1	9.1	7.9		
Selenocyanate	Inlet	1.3	2.6	2.0	2.0		
(ug/l)	Outlet	2.1	2.1	2.1	2.1		
Methyl Selenenic							
acid	Inlet	<0.5	<0.5	<0.5	<0.5		
(ug/l)	Outlet	<0.5	<0.5	<0.5	<0.5		

Estimated:
20% (4.9 lbs) - Plant material uptake
30% (7.4 lbs) - Volatized as Dimethylselenide
50% (12.4 lbs) - Accumulation in sediment

San Joaquin Marsh
WQ Data

2002-2010	Location	Minimum	Maximum	Average	Median
As (ug/l-D)	Inlet	3.8	7.5	5.6	5.6
	Outlet	4.9	8.0	6.4	6.4
Cd (ug/l-D)	Inlet	0.1	0.3	0.2	0.2
	Outlet	0.1	0.3	0.2	0.2
Cr (ug/l-D)	Inlet	0.5	2.2	1.4	1.4
	Outlet	0.8	1.3	1.0	1.0
					0.2
Cu (ug/l-D)	Inlet	3.4	9.5	6.5	6.5
Target 13 ug/l	Outlet	3.8	8.8	6.3	6.3
Mn (ug/l-D)	Inlet	19.4	42.0	30.7	30.7
	Outlet	47.3	49.5	48.4	48.4
Ni (ug/l-D)	Inlet	2.1	4.1	3.1	3.1
	Outlet	2.7	3.7	3.2	3.2
Pb (ug/l-D)	Inlet	0.3	0.5	0.4	0.4
Target 10 ug/l	Outlet	0.3	0.5	0.4	0.4
Zn (ug/l-D)	Inlet	4.3	9.1	6.7	6.7
	Outlet	5.8	7.4	6.6	6.6
Hg (ng/l)	Inlet	<0.05	<0.05	<0.05	<0.05
	Outlet	<0.05	<0.05	<0.05	<0.05

San Joaquin Marsh
Future Monitoring Focus

- Sediment
  - Metals
  - Pesticides
  - Pyrethroids
  - % Solids
  - Phosphorus, Total
- Tissue (Fish, Bird, Invertebrate, and Plant)
  - Metals
  - Pesticides
- Bioassessment

Improvements to water quality may be reflected in improvements to the benthic community. Benthic macroinvertebrates reside in aquatic habitats for periods ranging from a month to several years and have varying sensitivities to physical, biological, and chemical disturbances. Assessing the macroinvertebrate community structure provides a realistic, long-term measure of habitat health and ecological response. Utilizing taxa specific tolerance values and community species composition, numerical biometric indices are calculated allowing for comparison of relative habitat health between monitoring sites.

San Joaquin Marsh

Comments and Questions