March 2010

IRVINE RANCH WATER DISTRICT

Wells 21 and 22
Preliminary Design Report

VOLUME 2

GEOSCIENCE

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Appendices

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APPENDIX A

WATER QUALITY TESTING RESULTS

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IRWD WELL 21
WATER QUALITY TESTING RESULTS

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 26-Nov-2008

Analytical Report: Page 1 of 9
Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A8K1120

Received on Ice (Y/N): Yes Temp: 2 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A8K1120-01	IRWD Well 21 - Rehab Diane Smith	Water	11/12/08 09:30	Diane Smith	11/12/08 14:20	Diane Smith

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Laboratory Reference Number
A8K1120-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 21 - Rehab Diane Smith	Water	11/12/08 09:30	11/12/08 14:20

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	500	3.0	mg/L	SM 3120B	11/24/08 12:32	lmt	
Calcium	140	1.0	mg/L	EPA 200.7	11/24/08 12:32	lmt	
Magnesium	36	1.0	mg/L	EPA 200.7	11/24/08 12:32	lmt	
Sodium	57	1.0	mg/L	EPA 200.7	11/24/08 12:32	lmt	
Potassium	2.3	1.0	mg/L	EPA 200.7	11/24/08 12:32	lmt	
Total Cations	12.4	0.05	me/L	Calculation			
Anions							
Total Alkalinity	220	3.0	mg/L	SM 2320B	11/19/08 18:50	je	
Hydroxide	ND	3.0	mg/L	SM 2320B	11/19/08 18:50	je	
Carbonate	ND	3.0	mg/L	SM 2320B	11/19/08 18:50	je	
Bicarbonate	270	3.0	mg/L	SM 2320B	11/19/08 18:50	je	
Chloride	130	1.0	mg/L	EPA 300.0	11/13/08 03:25	SWC	
Sulfate	180	0.50	mg/L	EPA 300.0	11/13/08 03:25	SWC	
Fluoride	0.3	0.1	mg/L	SM 4500F C	11/14/08 10:30	tdl	
Nitrate	67	1.0	mg/L	EPA 300.0	11/13/08 03:25	SWC	
Total Anions	12.91	0.05	me/L	Calculation			
Aggregate Properties							
pH	7.4	1.0	pH Units	SM 4500H+ B	11/12/08 19:00	sbd	
Specific Conductance	1200	1.0	umhos/cm	SM 2510 B	11/12/08 19:00	sbd	
Solids							
Total Dissolved Solids	740	20	mg/L	SM 2540C	11/17/08 21.27	srp	

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Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 21 - Rehab Diane Smith	Water	11/12/08 09:30	11/12/08 14:20

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Color	ND	3.0	Color Units	SM 2120B	11/12/08 20:30	jkn	
Odor	ND	1.0	T.O.N.*	SM 2150	11/12/08 20:30	jkn	
Turbidity	0.37	0.20	NTU	SM 2130 B	11/12/08 20:30	jkn	
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	11/13/08 17:42	kam	
General Inorganics							
Cyanide	ND	100	ug/L	SM 4500CN E	11/21/08 15:38	ctl	
Perchlorate	4.3	4.0	ug/L	EPA 314.0	11/14/08 23:43	SS	
Nutrients							
Nitrite as N	ND	100	ug/L	SM 4500NO2 B	11/13/08 17:30	acc	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	11/24/08 12:33	lmt	
Antimony	ND	6.0	ug/L	EPA 200.8	11/20/08 18:29	ap	
Arsenic	ND	2.0	ug/L	EPA 200.8	11/20/08 18:29	ap	
Barium	ND	100	ug/L	EPA 200.8	11/20/08 18:29	ap	
Beryllium	ND	1.0	ug/L	EPA 200.8	11/20/08 18:29	ap	
Boron	140	100	ug/L	EPA 200.7	11/24/08 12:33	lmt	
Cadmium	ND	1.0	ug/L	EPA 200.8	11/20/08 18:29	ap	
Total Chromium	8.2	1.0	ug/L	EPA 200.8	11/14/08 11:59	krv	
Hexavalent Chromium	ND	1.0	ug/L	EPA 218.6	11/13/08 18:37	aa	N_pLab
Copper	ND	50	ug/L	EPA 200.8	11/20/08 18:29	ap	
Iron	ND	100	ug/L	EPA 200.7	11/24/08 12:33	lmt	
Lead	ND	5.0	ug/L	EPA 200.8	11/20/08 18:29	ap	
Manganese	ND	20	ug/L	EPA 200.8	11/20/08 18:29	ap	
Mercury	ND	1.0	ug/L	EPA 200.8	11/20/08 18:29	ap	
Nickel	ND	10	ug/L	EPA 200.8	11/20/08 18:29	ap	
Selenium	ND	5.0	ug/L	EPA 200.8	11/20/08 18:29	ap	

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Laboratory Reference Number
A8K1120-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 21 - Rehab Diane Smith	Water	11/12/08 09:30	11/12/08 14:20

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Total Silica	24	5.0	mg/L	EPA 200.7	11/24/08 12:32	lmt	
Silver	ND	10	ug/L	EPA 200.8	11/20/08 18:29	ap	
Thallium	ND	1.0	ug/L	EPA 200.8	11/20/08 18:29	ap	
Vanadium	3.2	3.0	ug/L	EPA 200.8	11/14/08 11:59	krv	
Zinc	ND	50	ug/L	EPA 200.8	11/20/08 18:29	ap	
EDB and DBCP by EPA 504							
Ethylene dibromide	ND	0.020	ug/L	EPA 504.1	11/20/08 17:00	kos	
Dibromochloropropane	ND	0.010	ug/L	EPA 504.1	11/20/08 17:00	kos	
Nitrogen-Phosphorus Pesticides by EPA 507							
Alachlor	ND	1.0	ug/L	EPA 507	11/17/08 15:59	kos	
Atrazine	ND	0.50	ug/L	EPA 507	11/17/08 15:59	kos	
Molinate	ND	2.0	ug/L	EPA 507	11/17/08 15:59	kos	
Simazine	ND	1.0	ug/L	EPA 507	11/17/08 15:59	kos	
Thiobencarb	ND	1.0	ug/L	EPA 507	11/17/08 15:59	kos	
Surrogate 1,3-Dimethyl-2-Nitrobenzene	92.4	% 70-130		EPA 507	11/17/08 15:59	kos	
Organochlorine Pesticides and PCBs by EPA 508							
Aldrin	ND	0.075	ug/L	EPA 508	11/18/08 01:31	CYA	
Chlordane	ND	0.10	ug/L	EPA 508	11/18/08 01:31	CYA	
Dieldrin	ND	0.020	ug/L	EPA 508	11/18/08 01:31	CYA	
Endrin	ND	0.10	ug/L	EPA 508	11/18/08 01:31	CYA	
Heptachlor	ND	0.010	ug/L	EPA 508	11/18/08 01:31	CYA	
Heptachlor Epoxide	ND	0.010	ug/L	EPA 508	11/18/08 01:31	CYA	
Hexachlorobenzene	ND	0.50	ug/L	EPA 508	11/18/08 01:31	CYA	
Hexachlorocyclopentadiene	ND	1.0	ug/L	EPA 508	11/18/08 01:31	CYA	
Lindane	ND	0.20	ug/L	EPA 508	11/18/08 01:31	CYA	
Methoxychlor	ND	10	ug/L	EPA 508	11/18/08 01:31	CYA	
Polychlorinated Biphenyls (Total PCB's)	ND	0.50	ug/L	EPA 508	11/18/08 01:31	CYA	

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Laboratory Reference Number
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Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 21 - Rehab Diane Smith	Water	11/12/08 09:30	11/12/08 14:20

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Organochlorine Pesticides and PCBs by EPA 508							
Propachlor	ND	0.50	ug/L	EPA 508	11/18/08 01:31	CYA	
Toxaphene	ND	1.0	ug/L	EPA 508	11/18/08 01:31	CYA	
Surrogate: Decachlorobiphenyl	76.2	% 70-130		EPA 508	11/18/08 01:31	CYA	
Chlorinated Herbicides by EPA 515.3							
2,4,5-TP Silvex	ND	1.0	ug/L	EPA 515.3	11/19/08 08:48	CYA	
2,4-D	ND	10	ug/L	EPA 515.3	11/19/08 08:48	CYA	
Bentazon	ND	2.0	ug/L	EPA 515.3	11/19/08 08:48	CYA	
Dalapon	ND	10	ug/L	EPA 515.3	11/19/08 08:48	CYA	
Dicamba	ND	1.5	ug/L	EPA 515.3	11/19/08 08:48	CYA	
Dinoseb	ND	2.0	ug/L	EPA 515.3	11/19/08 08:48	CYA	
Pentachlorophenol	ND	0.20	ug/L	EPA 515.3	11/19/08 08:48	CYA	
Pichloram	ND	1.0	ug/L	EPA 515.3	11/19/08 08:48	CYA	
Surrogate: DCAA	101	% 70-130		EPA 515.3	11/19/08 08:48	CYA	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	

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IRWD Well 21 - Rehab Diane Smith	Water	11/12/08 09:30	11/12/08 14:20

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
2-Butanone(MEK-EPA 8260)	ND	5.0	ug/L	EPA 524.2	11/14/08 16:33	jes	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	11/14/08 16:33	jes	
Benzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Bis(2-chloroethyl)ether (Non-NELAP)	ND	5.0	ug/L	EPA 524.2	11/14/08 16:33	jes	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Bromoform	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Bromomethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Chloroethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Chloroform	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Chloromethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	11/14/08 16:33	jes	

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IRWD Well 21 - Rehab Diane Smith	Water	11/12/08 09:30	11/12/08 14:20

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Naphthalene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Styrene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Toluene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	11/14/08 16:33	jes	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	11/14/08 16:33	jes	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	11/14/08 16:33	jes	
Surrogate: 1,2-Dichloroethane-d4	113	% 50-150		EPA 524.2	11/14/08 16:33	jes	
Surrogate: Bromofluorobenzene	106	% 50-150		EPA 524.2	11/14/08 16:33	jes	
Surrogate: Toluene-d8	96.8	% 50-150		EPA 524.2	11/14/08 16:33	jes	
1,2,3-TCP by Purge & Trap GC/MS							
1,2,3-Trichloropropane	ND	0.005	ug/L	CA DHS-SRL	11/17/08 16:58	jes	

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Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 21 - Rehab Diane Smith	Water	11/12/08 09:30	11/12/08 14:20

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Semivolatile Organic Compounds by EPA 525.2							
Benzo(a)pyrene	ND	0.10	ug/L	EPA 525.2	11/21/08 15:26	KOS	
DEH-Adipate	ND	5.0	ug/L	EPA 525.2	11/21/08 15:26	KOS	
DEH-Phthalate	ND	3.0	ug/L	EPA 525.2	11/21/08 15:26	KOS	
Surrogate: 4-Terphenyl-d14	121	% 70-130		EPA 525.2	11/21/08 15:26	KOS	
Endothall by EPA 548.1							
Endothall	ND	45	ug/L	EPA 548.1	11/19/08 15:24	KOS	

* NELAP does not offer accreditation for this analyte/method/matrix combination

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Notes and Definitions

pH: Regulatory 15 minute holding time exceeded A8K1120-01

N_pLab Sample preserved at lab.

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

Lorenzo Rodriguez FOR

☒ Hsin-Yi Lee, Project Manager
☐ Allison Mackenzie, General Manager
☐ Lawrence J. Chrystal, Laboratory Director

cc:

ESB_Short_.Report

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906
6100 Quail Valley Court Riverside, CA 92507
(951) 653-3351 • FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody & Sample Information Record

Babcock's

Client: RBF Consulting
Contact: Barker Meserlian
Fax No.
Phone No. (949) 472-3413
email: bmeserlian@rbf.com
Project Name: IRWD Well Rehab
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
Project Location: Diane Smith
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience
Signature: Diane Smith

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Total # of Containers	Routine	Resample	Special	Silica	Title 22	CA Vinyls	Matrix	Notes
IRWD Well 21 Title 22	11/12/08	0930														X	X	X	GW	See Attached Small amount Gas in discharge

Matrix: DW = Drinking Water, WW = Waste Water, GW = Ground Water, S = Soil, SG = Sludge, L = Liquid, M = Miscellaneous

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith / Geoscience	11/20/08 1420	[signature]	Glenn Eng / ESB

(For Lab Use Only) Sample Integrity Upon Receipt
Sample(s) Submitted on Ice? Yes No Temperature 2 °C
Custody Seal(s) Intact? Yes No NA
Sample(s) Intact? Yes No ☐ Cooler Blank

Lab Notes

Lab No. A8K1120 AB

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NOV 12 2008

Rev. 6/07

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Environmental Laboratories est. 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975

Received on Ice (Y/N): Yes Temp: 2 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A9A0975-01	IRWD Well 22 Title 22	Water	01/13/09 08:00	Diane Smith	01/13/09 11:35	Diane Smith

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Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975

Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	430	3.0	mg/L	SM 3120B	01/20/09 17:31	lmt	
Calcium	120	1.0	mg/L	EPA 200.7	01/20/09 17:31	lmt	
Magnesium	32	1.0	mg/L	EPA 200.7	01/20/09 17:31	lmt	
Sodium	57	1.0	mg/L	EPA 200.7	01/20/09 17:31	lmt	
Potassium	2.2	1.0	mg/L	EPA 200.7	01/20/09 17:31	lmt	
Total Cations	11.2	0.05	me/L	Calculation			
Anions							
Total Alkalinity	200	3.0	mg/L	SM 2320B	01/13/09 14:40	adb	
Hydroxide	ND	3.0	mg/L	SM 2320B	01/13/09 14:40	adb	
Carbonate	ND	3.0	mg/L	SM 2320B	01/13/09 14:40	adb	
Bicarbonate	240	3.0	mg/L	SM 2320B	01/13/09 14:40	adb	
Chloride	120	1.0	mg/L	EPA 300.0	01/13/09 21:19	SWC	
Sulfate	170	0.50	mg/L	EPA 300.0	01/13/09 21:19	SWC	
Fluoride	0.2	0.1	mg/L	SM 4500F C	01/15/09 07:00	tdl	
Nitrate	50	1.0	mg/L	EPA 300.0	01/13/09 21:19	SWC	
Total Anions	11.74	0.05	me/L	Calculation			
Aggregate Properties							
pH	7.5	1.0	pH Units	SM 4500H+ B	01/13/09 20:40	ara	
Specific Conductance	1100	1.0	umhos/cm	SM 2510 B	01/13/09 20:40	ara	
Solids							
Total Dissolved Solids	650	20	mg/L	SM 2540C	01/14/09 18:51	jkn	

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Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Color	ND	3.0	Color Units	SM 2120B	01/13/09 19:59	jkn	
Odor	ND	1.0	T.O.N.*	SM 2150	01/13/09 19:59	jkn	
Turbidity	0.26	0.20	NTU	SM 2130 B	01/13/09 19:59	jkn	
Surfactants							
MBAS	0.05	0.05	mg/L	SM 5540C	01/13/09 14:20	ara	
General Inorganics							
Cyanide	ND	100	ug/L	SM 4500CN E	01/16/09 18:27	ctl	
Perchlorate	ND	4.0	ug/L	EPA 314.0	01/19/09 13:28	SS	
Nutrients							
Nitrite as N	ND	100	ug/L	SM 4500NO2 B	01/13/09 16:10	kam	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	01/20/09 17:31	lmt	
Antimony	ND	6.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Arsenic	ND	2.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Barium	ND	100	ug/L	EPA 200.8	01/14/09 16:40	krv	
Beryllium	ND	1.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Boron	110	100	ug/L	EPA 200.7	01/20/09 17:31	lmt	
Cadmium	ND	1.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Total Chromium	2.6	1.0	ug/L	EPA 200.8	01/21/09 13:48	krv	
Hexavalent Chromium	ND	1.0	ug/L	EPA 218.6	01/20/09 21:44	sbd	N_pLab
Copper	ND	50	ug/L	EPA 200.8	01/14/09 16:40	krv	
Iron	ND	100	ug/L	EPA 200.7	01/20/09 17:31	lmt	
Lead	ND	5.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Manganese	ND	20	ug/L	EPA 200.8	01/14/09 16:40	krv	
Mercury	ND	1.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Nickel	ND	10	ug/L	EPA 200.8	01/14/09 16:40	krv	
Selenium	ND	5.0	ug/L	EPA 200.8	01/14/09 16:40	krv	

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Irvine, CA 92618

Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Total Silica	26	5.0	mg/L	EPA 200.7	01/20/09 17:31	lmt	
Silver	ND	10	ug/L	EPA 200.8	01/14/09 16:40	krv	
Thallium	ND	1.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Vanadium	ND	3.0	ug/L	EPA 200.8	01/21/09 13:48	krv	
Zinc	ND	50	ug/L	EPA 200.8	01/14/09 17:33	krv	
EDB and DBCP by EPA 504							
Ethylene dibromide	ND	0.020	ug/L	EPA 504.1	01/16/09 00:32	cth	
Dibromochloropropane	ND	0.010	ug/L	EPA 504.1	01/16/09 00:32	cth	
Nitrogen-Phosphorus Pesticides by EPA 507							
Alachlor	ND	1.0	ug/L	EPA 507	01/21/09 17:46	kos	
Atrazine	ND	0.50	ug/L	EPA 507	01/21/09 17:46	kos	
Molinate	ND	2.0	ug/L	EPA 507	01/21/09 17:46	kos	
Simazine	ND	1.0	ug/L	EPA 507	01/21/09 17:46	kos	
Thiobencarb	ND	1.0	ug/L	EPA 507	01/21/09 17:46	kos	
Surrogate: 1,3-Dimethyl-2-Nitrobenzene	90.4	% 70-130		EPA 507	01/21/09 17:46	kos	
Organochlorine Pesticides and PCBs by EPA 508							
4,4'-DDE	ND	0.80	ug/L	EPA 508	01/22/09 03:20	CYA	
Aldrin	ND	0.075	ug/L	EPA 508	01/22/09 03:20	CYA	
Chlordane	ND	0.10	ug/L	EPA 508	01/22/09 03:20	CYA	
Dieldrin	ND	0.020	ug/L	EPA 508	01/22/09 03:20	CYA	
Endrin	ND	0.10	ug/L	EPA 508	01/22/09 03:20	CYA	
Heptachlor	ND	0.010	ug/L	EPA 508	01/22/09 03:20	CYA	
Heptachlor Epoxide	ND	0.010	ug/L	EPA 508	01/22/09 03:20	CYA	
Hexachlorobenzene	ND	0.50	ug/L	EPA 508	01/22/09 03:20	CYA	
Hexachlorocyclopentadiene	ND	1.0	ug/L	EPA 508	01/22/09 03:20	CYA	
Lindane	ND	0.20	ug/L	EPA 508	01/22/09 03:20	CYA	
Methoxychlor	ND	10	ug/L	EPA 508	01/22/09 03:20	CYA	

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Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Organochlorine Pesticides and PCBs by EPA 508							
Polychlorinated Biphenyls (Total PCB's)	ND	0.50	ug/L	EPA 508	01/22/09 03:20	CYA	
Propachlor	ND	0.50	ug/L	EPA 508	01/22/09 03:20	CYA	
Toxaphene	ND	1.0	ug/L	EPA 508	01/22/09 03:20	CYA	
Surrogate: Decachlorobiphenyl	81.9	% 70-130		EPA 508	01/22/09 03:20	CYA	
Chlorinated Herbicides by EPA 515.3							
2,4,5-TP Silvex	ND	1.0	ug/L	EPA 515.3	01/20/09 23:08	CYA	
2,4-D	ND	10	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Bentazon	ND	2.0	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Dalapon	ND	10	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Dicamba	ND	1.5	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Dinoseb	ND	2.0	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Pentachlorophenol	ND	0.20	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Pichloram	ND	1.0	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Surrogate: DCAA	99.6	% 70-130		EPA 515.3	01/20/09 23:08	CYA	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	

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Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
2-Butanone(MEK-EPA 8260)	ND	5.0	ug/L	EPA 524.2	01/16/09 23:31	eec	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	01/16/09 23:31	eec	
Benzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bis(2-chloroethyl)ether (Non-NELAP)	ND	5.0	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bromoform	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bromomethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Chloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Chloroform	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Chloromethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	

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Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975

Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	01/16/09 23:31	eec	
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Naphthalene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Styrene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Toluene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	01/16/09 23:31	eec	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	01/16/09 23:31	eec	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Surrogate: 1,2-Dichloroethane-d4	104	% 50-150		EPA 524.2	01/16/09 23:31	eec	
Surrogate: Bromofluorobenzene	96.5	% 50-150		EPA 524.2	01/16/09 23:31	eec	
Surrogate: Toluene-d8	98.3	% 50-150		EPA 524.2	01/16/09 23:31	eec	
1,2,3-TCP by Purge & Trap GC/MS							
1,2,3-Trichloropropane	ND	0.005	ug/L	CA DHS-SRL	01/14/09 13:31	jes	

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Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975

Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Semivolatile Organic Compounds by EPA 525.2							
Benzo(a)pyrene	ND	0.10	ug/L	EPA 525.2	01/19/09 21:21	KOS	
DEH-Adipate	ND	5.0	ug/L	EPA 525.2	01/19/09 21:21	KOS	
DEH-Phthalate	ND	3.0	ug/L	EPA 525.2	01/19/09 21:21	KOS	
Surrogate: 4-Terphenyl-d14	88.6	% 70-130		EPA 525.2	01/19/09 21:21	KOS	
Endothall by EPA 548.1							
Endothall	ND	45	ug/L	EPA 548.1	01/20/09 05:29	KOS	

* NELAP does not offer accreditation for this analyte/method/matrix combination

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Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975

Received on Ice (Y/N): Yes Temp: 2 °C

Notes and Definitions

pH: Regulatory 15 minute holding time exceeded A9A0975-01

N_pLab Sample preserved at lab.

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

Lorenzo Rodriguez FOR

☒ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

ESB_Short_.Report

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

6100 Quail Valley Court Riverside, CA 92507
(951) 653-3351 • FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Barkev Meserlian
Fax No.
Phone No. (949) 472-3413
email: bmeserlian@rbf.com
Project Name: IRWD Wells 21 + 22 Rehab
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
Project Location: Well 22 - 1251 Mitchell Tustin
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience Support Svcs
Signature: Diane Smith

DW = Drinking Water
WW = Waste Water
GW = Ground Water
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Total # of Containers	Routine	Resample	Special	Title 22	Calif Uranium	Silica	Selenium	Matrix	Notes
IRWD Well 22 Title 22	1/13/09	8:00AM														✓	✓	✓	✓	GW	1) See attached list for analyses
																					2) Gas bubble in water created effervescence in VOAs

TB Rec'd

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith/Geoscience	1/13/09 11:35AM	Angie Brown	Angie Brown/ESB

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? (Yes) No
Custody Seal(s) Intact? Yes No (NA)
Sample(s) Intact? (Yes) No

Temperature 2 °C
☐ Cooler Blank

Lab Notes

Lab No. A9A0975

Page 1 of 1

JAN 13 2009

Rev 6/07

IRVINE RANCH WATER DISTRICT
Rehabilitation of Wells 21 and 22

Table 1
Proposed Water Quality Tests for Well 21

Test	Sampling	Tentative Schedule	No. of Samples
1- Full Title 22	Last hour of the Constant Discharge Test	Mid/Late October	1 [1]
1.1- Silica	Last hour of the Constant Discharge Test	Mid/Late October	
1.2- Selenium	Last hour of the Constant Discharge Test	Mid/Late October (Between October 13 and 24 for Well 22 [1])	
2- General Mineral and Physical (two zones)	Towards the end of the Zone Isolation Tests	Mid/Late October	2
2.1-VOC EPA 524.2	Towards the end of the Zone Isolation Tests	Mid/Late October	
Total			3 [1]

[1] Based on OCSD permit Requirements, Selenium must be sampled between October 13 and October 24. If these dates do not coincide with the Constant Discharge Test, a separate sample will be sent to Babcock for Selenium testing only, in which case the total samples for Well 21 will be 4

Table 2
Proposed Water Quality Tests for Well 22

Test	Sampling	Tentative Schedule	No. of Samples
1- Full Title 22	Last hour of the Constant Discharge Test	Late November/ Early December	1
1.1- Silica	Last hour of the Constant Discharge Test	Late November/ Early December	
1.2- Selenium	Last hour of the Constant Discharge Test	Late November/ Early December	
2- General Mineral and Physical (two zones)	Towards the end of the Zone Isolation Tests	Late November/ Early December	2
2.1-VOC EPA 524.2 Add TOC + perchlorate	Towards the end of the Zone Isolation Tests	Late November/ Early December	
Total			3

1/13/09

JAN 13 2009 AGA0975AB

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

RBF Consulting - Irvine
14725 Alton Pkwy.
Irvine, CA 92618

Project: RBF-IRWD Rehab Constant Discharg
Project Number: IRWD Wells 21+22 Rehab/Well 22-12
Project Manager: Barkev Meserlian

Received: 01/13/09 11:35
Received on Ice (Y/N): Yes Temperature: 2°C

Reported: 1/16/2009
Work Order A9A0974

Submitted By: Diane Smith

The information provided below is an integral part of this report. This information must be included with all numeric and/or narrative results associated with this report.

Lab Number	Sample Name	SampleType	Sampled	Sampled By
A9A0974-01	IRWD Well 22 Tittle 22	---ROUTINE---	01/13/09 08:00	Diane Smith

The following information should be used as guidance in the interpretation of the micobiological results included in this report. It applies only to the sample results contained in this report.

If the sample result is Absent : The sample was found to be negative for Coliform Bacteria and therefore meets the Federal and State requirements for drinking water.

If the sample result is **PRESENT** : The sample was found to be positive for Coliform Bacteria and therefore DOES NOT meet the Federal and State requirements for drinking water.

Heterotropic Plate Count (enumeration) : If the HPC is greater than 200, the sample may not meet your city's requirement for new line connections. Please consult the appropriate agency for interpretation of the HPC.

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

RBF Consulting - Irvine
14725 Alton Pkwy.
Irvine, CA 92618

Project: RBF-IRWD Rehab Constant Discharg
Project Number: IRWD Wells 21+22 Rehab/Well 22-12
Project Manager: Barkev Meserlian

Received: 01/13/09 11:35
Received on Ice (Y/N): Yes Temperature: 2°C

Reported: 1/16/2009
Work Order A9A0974

Submitted By: Diane Smith

Date and Time Work Order Started / Analyst: 1/13/09 13:15 dpk

LAB #	A9A0974-01	-	-	-	-	-	
SAMPLE ID	IRWD Well 22 Tittle 22	-	-	-	-	-	
MMOMUG - Presence/Absence - SM 9223 B (Water)							
Total Coliform	Absent	-	-	-	-	-	----
E. coli	Absent	-	-	-	-	-	----
Heterotrophic Plate Count - SM 9215 B (Water)							
Heterotrophic Plate Count	170	-	-	-	-	-	CFU/mL

☑ Carol Kase
Manager, Microbiology Department

☐ Allison Mackenzie
General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

E.S. Babcock & Sons, Inc.

cc:

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

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Contact: Barkev Meserlian
Fax No.
Phone No. (949) 472-3413
email: bmeserlian@rbf.com
Project Name: IRWD Wells 21 & 22 Rehab
Project Location: Well 22 - 1251 Mitchell Tustin
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience Support Svcs
Signature: Diane Smith

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Total # of Containers	Routine	Resample	Special	Title 22	Calif Unreg	Silica	Selenium	Matrix	Notes
IRWD Well 22 Title 22	1/13/09	8:00AM														✓	✓	✓	✓	GW	1) See attached list for analyses
																					2) Gas bubble in water created effervescence in VOAs

Matrix: DW = Drinking Water, WW = Waste Water, GW = Ground Water, S = Soil, SG = Sludge, L = Liquid, M = Miscellaneous

TB Rec'd

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith/Geoscience	1/13/09 11:35am	Angie Brown	Angie Brown/ESB

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? (Yes) No Temperature
Custody Seal(s) Intact? Yes No (NA) 2 °C
Sample(s) Intact? (Yes) No ☐ Cooler Blank

Lab Notes

Lab No. A9A0974 L6

Page 1 of 1
JAN 13 2009
Rev. 6/07

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est. 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 17-Dec-2008

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0198

Received on Ice (Y/N): Yes Temp: 2 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A8L0198-01	IRWD Well 21 Zone 2	Water	12/01/08 19:45	Diane Smith	12/02/08 11:37	Diane Smith

The following samples were split from an unpreserved container at the laboratory after submittal and then preserved.
Federal guidelines (40CFR Parts 136 and 141) instruct preservation be performed on a separate container collected at site:

A8L0198-01

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 17-Dec-2008

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0198
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A8L0198-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 21 Zone 2	Water	12/01/08 19:45	12/02/08 11:37

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	520	3.0	mg/L	SM 3120B	12/09/08 15:17	lmt	
Calcium	140	1.0	mg/L	EPA 200.7	12/09/08 15:17	lmt	
Magnesium	38	1.0	mg/L	EPA 200.7	12/09/08 15:17	lmt	
Sodium	58	1.0	mg/L	EPA 200.7	12/09/08 15:17	lmt	
Potassium	2.3	1.0	mg/L	EPA 200.7	12/09/08 15:17	lmt	
Anions							
Total Alkalinity	220	3.0	mg/L	SM 2320B	12/10/08 15:00	je	
Hydroxide	ND	3.0	mg/L	SM 2320B	12/10/08 15:00	je	
Carbonate	ND	3.0	mg/L	SM 2320B	12/10/08 15:00	je	
Bicarbonate	270	3.0	mg/L	SM 2320B	12/10/08 15:00	je	
Chloride	130	1.0	mg/L	EPA 300.0	12/02/08 21:40	SBD	
Sulfate	180	0.50	mg/L	EPA 300.0	12/02/08 21:40	SBD	
Nitrate	66	1.0	mg/L	EPA 300.0	12/02/08 21:40	SBD	
Aggregate Properties							
pH	7.4	1.0	pH Units	SM 4500H+ B	12/02/08 21:10	ara	
Specific Conductance	1200	1.0	umhos/cm	SM 2510 B	12/02/08 21:10	ara	
Solids							
Total Dissolved Solids	730	20	mg/L	SM 2540C	12/04/08 14:26	jkn	
Aggregate Organic Compounds							
Total Organic Carbon	0.35	0.30	mg/L	SM 5310B	12/09/08 16:51	krv	

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Environmental Laboratories est 1906

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Contact: Barkev Meserlian
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Irvine, CA 92618

Report Date: 17-Dec-2008

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0198
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A8L0198-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 21 Zone 2	Water	12/01/08 19:45	12/02/08 11:37

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Color	ND	3.0	Color Units	SM 2120B	12/02/08 21:57	jkn	N-COT
Odor	ND	1.0	T.O.N.*	SM 2150	12/02/08 21:57	jkn	
Turbidity	7.5	0.20	NTU	SM 2130 B	12/02/08 21:57	jkn	
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	12/02/08 14:50	kam	
General Inorganics							
Perchlorate	ND	4.0	ug/L	EPA 314.0	12/09/08 12:48	SS	
Metals and Metalloids							
Copper	ND	50	ug/L	EPA 200.7	12/09/08 15:17	lmt	
Iron	590	100	ug/L	EPA 200.7	12/16/08 11:18	lmt	
Manganese	ND	20	ug/L	EPA 200.7	12/09/08 15:18	lmt	
Zinc	ND	50	ug/L	EPA 200.7	12/09/08 15:18	lmt	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 17-Dec-2008

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0198

Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number

A8L0198-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 21 Zone 2	Water	12/01/08 19:45	12/02/08 11:37

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
2-Butanone(MEK-EPA 8260)	ND	5.0	ug/L	EPA 524.2	12/11/08 00:42	jes	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	12/11/08 00:42	jes	
Benzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Bis(2-chloroethyl)ether (Non-NELAP)	ND	5.0	ug/L	EPA 524.2	12/11/08 00:42	jes	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Bromoform	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Bromomethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Chloroethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Chloroform	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Chloromethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	12/11/08 00:42	jes	

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Report Date: 17-Dec-2008

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0198
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A8L0198-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 21 Zone 2	Water	12/01/08 19:45	12/02/08 11:37

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Naphthalene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Styrene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Toluene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	12/11/08 00:42	jes	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	12/11/08 00:42	jes	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	12/11/08 00:42	jes	
Surrogate: 1,2-Dichloroethane-d4	101	% 50-150		EPA 524.2	12/11/08 00:42	jes	
Surrogate: Bromofluorobenzene	106	% 50-150		EPA 524.2	12/11/08 00:42	jes	
Surrogate: Toluene-d8	96.3	% 50-150		EPA 524.2	12/11/08 00:42	jes	

* NELAP does not offer accreditation for this analyte/method/matrix combination

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 17-Dec-2008

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0198

Received on Ice (Y/N): Yes Temp: 2 °C

Notes and Definitions

pH: Regulatory 15 minute holding time exceeded A8L0198-01

N-COT Color reported as True Color.

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☑ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

ESB_Short_.Report

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

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Contact: Barkev Meserlian
Fax No.
Phone No. (949) 472-3413
email: bmeserlian@rbf.com
Project Name: IRWD Well 21 & 22 Rehab
Turn Around Time: (Routine) *72 Hour Rush *48 Hour Rush *24 Hour Rush
Project Location: Well 21 Zone 2
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience
Signature: Diane Smith

Matrix: DW = Drinking Water; WW = Waste Water; GW = Ground Water; S = Soil; SG = Sludge; L = Liquid; M = Miscellaneous

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Travel Blank	Total # of Containers	Routine	Resample	Special	General Minerals	General Phys	Metals	524.2	TOC	Perchlorate	Travel Blank	Matrix	Notes
IRWD Well 21 Zone 2	12/1/08	1945	1		3	1							6				✓	✓	✓	✓	✓	✓	✓	GW	Gas in discharged water (CO_2?)

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith/GEOSCIENCE	12/02/08 11:37	Angie Brown	Angie Brown/ESB

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? (Yes) No
Custody Seal(s) Intact? Yes No (NA)
Sample(s) Intact? (Yes) No
Temperature 2 °C
☐ Cooler Blank

Lab Notes
OK to split

Lab No. A8L0198 AB

Page 1 of 1

DEC - 2 2008

Rev. 6/07

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 10-Dec-2008

Analytical Report: Page 1 of 3
Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0196

Received on Ice (Y/N): Yes Temp: 1 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A8L0196-01	Well 21 Zone 1 (Ref. WO#A8K1279-01)	Water	11/13/08 18:10	Diane Smith	11/14/08 11:55	Diane Smith

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Report Date: 10-Dec-2008

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0196

Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number

A8L0196-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Well 21 Zone 1 (Ref. WO#A8K1279-01)	Water	11/13/08 18:10	11/14/08 11:55

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
General Inorganics							
Perchlorate	ND	4.0	ug/L	EPA 314.0	12/08/08 20:11	SS	

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Irvine, CA 92618

Report Date: 10-Dec-2008

Analytical Report: Page 3 of 3
Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0196

Received on Ice (Y/N): Yes Temp: 1 °C

Notes and Definitions

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☒ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 10-Dec-2008

Analytical Report: Page 1 of 3
Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0178

Received on Ice (Y/N): Yes Temp: 1 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

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Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A8L0178-01	Well 21 Zone 1 (Ref. WO#A8K1279-01)	Water	11/13/08 18:10	Diane Smith	11/14/08 11:55	Diane Smith

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 10-Dec-2008

Analytical Report: Page 2 of 3
Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0178

Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number

A8L0178-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Well 21 Zone 1 (Ref. WO#A8K1279-01)	Water	11/13/08 18:10	11/14/08 11:55

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Aggregate Organic Compounds							
Total Organic Carbon	ND	0.30	mg/L	SM 5310B	12/09/08 16:51	krv	

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Client Name: RBF Consulting - Irvine
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Report Date: 10-Dec-2008

Analytical Report: Page 3 of 3
Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A8L0178

Received on Ice (Y/N): Yes Temp: 1 °C

Notes and Definitions

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

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☒ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

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Client Name: RBF Consulting - Irvine
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Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 10-Dec-2008

Analytical Report: Page 1 of 3
Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A8L0177

Received on Ice (Y/N): Yes Temp: 2 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

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Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A8L0177-01	IRWD Well 21 - Rehab Diane S. (Ref. WO#A8K1120-01)	Water	11/12/08 09:30	Diane Smith	11/12/08 14:20	Diane Smith

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 10-Dec-2008

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A8L0177
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A8L0177-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 21 - Rehab Diane S. (Ref. WO#A8K1120-01)	Water	11/12/08 09:30	11/12/08 14:20

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Aggregate Organic Compounds							
Total Organic Carbon	ND	0.30	mg/L	SM 5310B	12/09/08 16:51	krv	

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 10-Dec-2008

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A8L0177
Received on Ice (Y/N): Yes Temp: 2 °C

Notes and Definitions

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

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Approval

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☒ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

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AMENDED

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 01-Dec-2008

Project Name: RBF-IRWD Rehab Zone Isol
Project Number: IRWD Rehab Zone Isolation

Work Order Number: A8K1279
Received on Ice (Y/N): Yes Temp: 1 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A8K1279-01	Well 21 Zone 1	Water	11/13/08 18:10	Diane Smith	11/14/08 11:55	Diane Smith

Included in this Data Package please find an amended report for the laboratory number referenced below.
Laboratory Number: A8K1279-01

Reason for Amendment:
Due to login entry error, the original report presented an incorrect sample ID for the above laboratory number. The sample ID was updated from "IRWD Well 21 & 22 Rehab Zone 1" to "Well 21 Zone 1". Analytical data herein is unchanged from the original that was issued on 26-Nov-2008.

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AMENDED

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 01-Dec-2008

Project Name: RBF-IRWD Rehab Zone Isol
Project Number: IRWD Rehab Zone Isolation

Work Order Number: A8K1279
Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A8K1279-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Well 21 Zone 1	Water	11/13/08 18:10	11/14/08 11:55

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	510	3.0	mg/L	SM 3120B	11/24/08 14:29	lmt	
Calcium	140	1.0	mg/L	EPA 200.7	11/24/08 14:29	lmt	
Magnesium	37	1.0	mg/L	EPA 200.7	11/24/08 14:29	lmt	
Sodium	58	1.0	mg/L	EPA 200.7	11/24/08 14:29	lmt	
Potassium	2.2	1.0	mg/L	EPA 200.7	11/24/08 14:29	lmt	
Anions							
Total Alkalinity	220	3.0	mg/L	SM 2320B	11/24/08 17:50	je	
Hydroxide	ND	3.0	mg/L	SM 2320B	11/24/08 17:50	je	
Carbonate	ND	3.0	mg/L	SM 2320B	11/24/08 17:50	je	
Bicarbonate	270	3.0	mg/L	SM 2320B	11/24/08 17:50	je	
Chloride	140	1.0	mg/L	EPA 300.0	11/14/08 21:23	SBD	
Sulfate	190	0.50	mg/L	EPA 300.0	11/14/08 21:23	SBD	
Nitrate	72	1.0	mg/L	EPA 300.0	11/14/08 21:23	SBD	
Aggregate Properties							
pH	7.3	1.0	pH Units	SM 4500H+ B	11/14/08 18:15	acc	
Specific Conductance	1200	1.0	umhos/cm	SM 2510 B	11/14/08 18:15	acc	
Solids							
Total Dissolved Solids	740	20	mg/L	SM 2540C	11/19/08 19:07	srp	
General Physical							
Color	ND	3.0	Color Units	SM 2120B	11/14/08 19:20	jkn	
Odor	ND	1.0	T.O.N.*	SM 2150	11/14/08 19:20	jkn	
Turbidity	0.65	0.20	NTU	SM 2130 B	11/14/08 19:20	jkn	

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Irvine, CA 92618

Report Date: 01-Dec-2008

Project Name: RBF-IRWD Rehab Zone Isol
Project Number: IRWD Rehab Zone Isolation

Work Order Number: A8K1279
Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A8K1279-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Well 21 Zone 1	Water	11/13/08 18:10	11/14/08 11:55

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	11/14/08 17:07	kam	
Metals and Metalloids							
Copper	ND	50	ug/L	EPA 200.7	11/24/08 14:29	lmt	
Iron	ND	100	ug/L	EPA 200.7	11/24/08 14:29	lmt	
Manganese	ND	20	ug/L	EPA 200.7	11/24/08 14:29	lmt	
Zinc	ND	50	ug/L	EPA 200.7	11/24/08 14:29	lmt	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
2-Butanone(MEK-EPA 8260)	ND	5.0	ug/L	EPA 524.2	11/18/08 05:10	eec	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	

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Report Date: 01-Dec-2008

Project Name: RBF-IRWD Rehab Zone Isol
Project Number: IRWD Rehab Zone Isolation

Work Order Number: A8K1279
Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A8K1279-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Well 21 Zone 1	Water	11/13/08 18:10	11/14/08 11:55

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	11/18/08 05:10	eec	
Benzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Bis(2-chloroethyl)ether (Non-NELAP)	ND	5.0	ug/L	EPA 524.2	11/18/08 05:10	eec	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Bromoform	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Bromomethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Chloroethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Chloroform	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Chloromethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	11/18/08 05:10	eec	
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Naphthalene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	

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Client Name: RBF Consulting - Irvine
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Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 01-Dec-2008

Analytical Report: Page 5 of 6
Project Name: RBF-IRWD Rehab Zone Isol
Project Number: IRWD Rehab Zone Isolation

Work Order Number: A8K1279

Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A8K1279-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Well 21 Zone 1	Water	11/13/08 18:10	11/14/08 11:55

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Styrene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Toluene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	11/18/08 05:10	eec	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	11/18/08 05:10	eec	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	11/18/08 05:10	eec	
Surrogate: 1,2-Dichloroethane-d4	97.5	% 50-150		EPA 524.2	11/18/08 05:10	eec	
Surrogate: Bromofluorobenzene	97.4	% 50-150		EPA 524.2	11/18/08 05:10	eec	
Surrogate: Toluene-d8	99.1	% 50-150		EPA 524.2	11/18/08 05:10	eec	

* NELAP does not offer accreditation for this analyte/method/matrix combination

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AMENDED

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 01-Dec-2008

Analytical Report: Page 6 of 6
Project Name: RBF-IRWD Rehab Zone Isol
Project Number: IRWD Rehab Zone Isolation

Work Order Number: A8K1279

Received on Ice (Y/N): Yes Temp: 1 °C

Notes and Definitions

pH: Regulatory 15 minute holding time exceeded (A8K1279-01)

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☒ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

ESB_Short_Ammend.Report

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906
6100 Quail Valley Court Riverside, CA 92507
(951) 653-3351 • FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Barbara Messerlian
Fax No.
Phone No.
email: bmesserlian@rbf.com
Project Name: IRWD Well 21 & 22 Rehab
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
Project Location: ~~West~~ IRWD Well 21
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience
Signature: Diane Smith

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Total # of Containers	Routine	Resample	Special	Gen Min	Gen Plus Metals	524.2	Travel Blank	Matrix	Notes
Well 21 Zone 1	11/13/08	1810hrs	1		3	1						6	✓			✓	✓	✓	✓	GW	TB Rec'd

Matrix: DW = Drinking Water, WW = Waste Water, GW = Ground Water, S = Soil, SG = Sludge, L = Liquid, M = Miscellaneous

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith/Geoscience	11/14/08 11:55AM	Angie Brown	Angie Brown/ESB

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? (Yes) No
Custody Seal(s) Intact? Yes No (NA)
Sample(s) Intact? (Yes) No
Temperature 1 °C
☐ Cooler Blank

Lab Notes

Lab No. A8K1279AB

Page 1 of 1

NOV 14 2008

Rev. 6/07

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Analytical Report: Page 1 of 2
Project Name: RBF-IRWD Rehab Constant
Project Number: [none]
Work Order Number: A8K1122

Report Date: 08-Dec-2008

Received on Ice Yes Temp: 2 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A8K1122-01	IRWD Well 21 - Rehab Diane Smith	Water	11/12/08 09:30	Diane Smith	11/12/08 14:20	Diane Smith

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name:	RBF Consulting - Irvine	Analytical Report:	Page 2 of 2
Contact:	Barkev Meserlian	Project Name:	RBF-IRWD Rehab Constant
Address:	14725 Alton Pkwy. Irvine, CA 92618	Project Number:	[none]
		Work Order Number:	**A8K1122**
Report Date:	08-Dec-2008	Received on Ice	Yes Temp: 2 °C

Approval

Babcock Laboratories certify that the information presented as part of this report meets the minimum quality standards in the analytical methods, if referenced. Exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☒ Project Manager ☐ Allison Mackenzie General Manager ☐ Lawrence J. Chrystal Laboratory Director

cc:

TRUESDAIL LABORATORIES, INC.

EXCELLENCE IN INDEPENDENT TESTING

Established 1931

14201 FRANKLIN AVENUE
TUSTIN, CALIFORNIA 92780-7008
(714) 730-6239 · FAX (714) 730-6462
www.truesdail.com

REPORT

Client: **E.S. Babcock & Sons, Inc.**
6100 Quail Valley Court
Riverside, CA 92507
Attention: Hsin-Yi Lee

Report Date: November 28, 2008
Date Received: November 14, 2008
Laboratory No: **979844**

Sample: Water
Project No: **A8K1122**
Investigation: **Gross Alpha Activity**

Analytical Results

Sample ID	Analysis	Method	Activity pCi/L	Two Sigma Error	MDA	Date Analyzed
A8K1122-01	Alpha	SM7110C	1.37	+/- 0.96	1.48	11/24/08

Gross Alpha results are based on a Uranium calibration curve.

QC Results

Batch ID	Analysis	Method	Activity pCi/L	Two Sigma Error	True Value	Recovery %
08C-11-L	Alpha	SM7110C	29.4	+/- 3.10	29.2	101

Respectfully submitted,
TRUESDAIL LABORATORIES, IN

Rossina Tomova, Project Manager
Radiochemistry Group

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from Truesdail Laboratories.

SUBCONTRACT ORDER

E.S. Babcock & Sons, Inc.

A8K1122

SENDING LABORATORY:

E.S. Babcock & Sons, Inc.
P. O. Box 432
Riverside, CA 92502-0432
Phone: (951) 653-3351
Fax: (951) 653-1662
Project Manager: Hsin-Yi Lee

RECEIVING LABORATORY:

Truesdail Laboratories - Subcontract
14201 Franklin Avenue
Tustin, CA 92780
Phone :(714) 730-6239
Fax: (714) 730-6462

Copy/Relog from A8K1120.
Client: RBF Consulting
Sampler: Diane Smith

Analysis	Due	Expires Regulatory Days Past Date Sampled	Laboratory ID	Comments
Sample ID: A8K1122-01	**Water**	**Sampled:11/12/08 09:30**	**1 RWD Well 21 - Rehab Diane Smith**	***Proj.No.:*** **RBF - Warner Springs CDF Well**
Radio-Gross Alpha	12/12/08 17:00	05/11/09 09:30		
Containers Supplied:				
Quart Poly - HNO3 (A)				

All Containers Intact: _____ Yes _____ No Samples Preserved Properly: _____ Yes _____ No

Samples Received at _____ oC Sample Lables / COC Agree: _____ Yes _____ No Custody Seals Present: _____ Yes _____ No

An acknowledgement of sample receipt is requested. Please reply to slozon@babcocklabs.com or Fax to 951-653-1662. Thank You

Released By	Date	Received By	Date
Sharon Lozon	11-13-08	T. Li	11/14/08 10:00

NORTH COAST
LABORATORIES LTD.

November 24, 2008

Edward S. Babcock & Sons, Inc
P.O. Box 432
Riverside, CA 92502-0432

Attn: Hsin-Yi Lee

RE: A8K1122

Order No.: 0811371
Invoice No.: 78689
PO No.: A8K1122
ELAP No.1247-Expires June 2010

SAMPLE IDENTIFICATION

Fraction	Client Sample Description
01A	A8K1122-01
01B	A8K1122-01
01C	A8K1122-01

ND = Not Detected at the Reporting Limit

Limit = Reporting Limit

All solid results are expressed on a wet-weight basis unless otherwise noted.

REPORT CERTIFIED BY

Laboratory Supervisor(s) | QA Unit | Jesse G. Chaney, Jr. Laboratory Director

5680 West End Road • Arcata California 95521-9202 • 707-822-4649 • FAX 707-822-6831

Printed on Recycled Paper

CLIENT: Edward S. Babcock & Sons, Inc
Project: A8K1122
Lab Order: 0811371

CASE NARRATIVE

EPA 549.2:
Diquat strongly adsorbs to soil particles that are suspended in water. The strong chemical bonds make the herbicide chemically inactive. When bound with soil particles, the extraction procedure for method EPA 549.2 is ineffective at isolating the bound diquat. Any reported diquat represents the dissolved analyte in the water that has not been bound to the soil particles.

EPA 547:
The samples for glyphosate analysis were poured off and frozen upon receipt at North Coast Laboratories. The holding time is extended to eighteen months when samples are frozen.

NORTH COAST LABORATORIES
5680 West End Road • Arcata, California 95521-9202 • 707-822-4649 • FAX 707-822-6831

Printed

Date: 24-Nov-2008
WorkOrder: 0811371

ANALYTICAL REPORT

Client Sample ID: A8K1122-01 **Received:** 11/14/08 **Collected:** 11/12/08 09:30
Lab ID: 0811371-01A

Test Name: EPA 549.2 **Reference:** EPA 549.2

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Diquat (dissolved)	ND	0.40	µg/L	1.0	11/17/08	11/17/08

Client Sample ID: A8K1122-01 **Received:** 11/14/08 **Collected:** 11/12/08 09:30
Lab ID: 0811371-01B

Test Name: Glyphosate **Reference:** EPA 547

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Glyphosate	ND	10	µg/L	1.0	11/18/08	11/19/08

Client Sample ID: A8K1122-01 **Received:** 11/14/08 **Collected:** 11/12/08 09:30
Lab ID: 0811371-01C

Test Name: N-methyl -carbamoyloximes and carbamates **Reference:** EPA 531.1

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Aldicarb Sulfoxide	ND	3.0	µg/L	1.0	11/19/08	11/20/08
Aldicarb Sulfone	ND	4.0	µg/L	1.0	11/19/08	11/20/08
Oxamyl	ND	5.0	µg/L	1.0	11/19/08	11/20/08
Methomyl	ND	2.0	µg/L	1.0	11/19/08	11/20/08
3-OH-Carbofuran	ND	3.0	µg/L	1.0	11/19/08	11/20/08
Aldicarb	ND	3.0	µg/L	1.0	11/19/08	11/20/08
Propoxur	ND	5.0	µg/L	1.0	11/19/08	11/20/08
Carbofuran	ND	5.0	µg/L	1.0	11/19/08	11/20/08
Carbaryl	ND	5.0	µg/L	1.0	11/19/08	11/20/08
Methiocarb	ND	5.0	µg/L	1.0	11/19/08	11/20/08
Surrogate: BDMC	95.4	76.8-114	% Rec	1.0	11/19/08	11/20/08

NORTH COAST LABORATORIES
5680 West End Road • Arcata, California 95521-9202 • 707-822-4649 • FAX 707-822-6831
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0811371

SUBCONTRACT ORDER

E.S. Babcock & Sons, Inc.

A8K1122

SENDING LABORATORY:

E.S. Babcock & Sons, Inc.
P. O. Box 432
Riverside, CA 92502-0432
Phone: (951) 653-3351
Fax: (951) 653-1662
Project Manager: Hsin-Yi Lee

RECEIVING LABORATORY:

North Coast Labs - Subcontract
5680 West End Road
Arcata, CA 95521
Phone :(707) 822-4649
Fax: (707) 822-6831

Copy/Relog from A8K1120.
Client: RBF Consulting
Sampler: Diane Smith

Analysis	Due	Expires Regulatory Days Past Date Sampled	Laboratory ID	Comments
Sample ID: A8K1122-01	**Water**	**Sampled:11/12/08 09:30**	**1 RWD Well 21 - Rehab Diane Smith**	***Proj.No.:*** **RBF - Warner Springs CDF Well**
549-Diquat	11/21/08 17:00	11/19/08 09:30	1 X 1L Plastic	
547	11/21/08 17:00	11/26/08 09:30	2 X 40 ml VOA's	
531	11/21/08 17:00	12/10/08 09:30	2 X 40 ml VOA's pres. w/MCAA	
Containers Supplied:				
Quart Poly - Unpres (D)	Voa Vial -Unpres (F)	Voa Vial -Unpres (G)	Voa Vial MCAA, Na2S2O3	Voa Vial MCAA, Na2S2O3

All Containers Intact: X Yes ____ No Samples Preserved Properly: X Yes ____ No

Samples Received at 5.2 oC Sample Lables / COC Agree: X Yes ____ No Custody Seals Present: ____ Yes ____ No

An acknowledgement of sample receipt is requested. Please reply to slozon@babcocklabs.com or Fax to 951-653-1662. Thank You.

Released By	Date	Received By	Date
Sharon Lozon	11-13-08	Laura Hill	11/14/08 14:00

Page 1 of 1

Pace Analytical Services, Inc.
1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

www.pacelabs.com

Report Prepared for:

Cathy Iijima
Edward S. Babcock & Sons, Inc.
6100 Quail Valley Court
Riverside CA 92507

REPORT OF LABORATORY ANALYSIS FOR 2,3,7,8-TCDD

Report Summary:

This report contains results of one drinking water sample analyzed to determine 2,3,7,8-TCDD content. This sample was analyzed according to Method 1613 by High Resolution Gas Chromatography/High Resolution Mass Spectrometry.

Report Prepared Date:

November 24, 2008

Report Information:

Pace Project #: 1084583
Sample Receipt Date: 11/14/2008
Client Project #: A8K1122
Client Sub PO #: N/A
State Cert #: 01155CA

Invoicing & Reporting Options:

The report provided has been invoiced as a Level 2 Drinking Water Report. If an upgrade of this report package is requested, an additional charge may be applied.

Please review the attached invoice for accuracy and forward any questions to Nate Habte, your Pace Project Manager.

This report has been reviewed and prepared by:

For Nate Habte

Nate Habte, Project Manager
(612) 607-6407
(612) 607-6444 (fax)
natnael.habte@pacelabs.com

ACCREDITED IN ACCORDANCE WITH nelac

Report of Laboratory Analysis

This report should not be reproduced, except in full, without the written consent of Pace Analytical Services, Inc.

The results relate only to the samples included in this report.

1148

SUBCONTRACT ORDER

E.S. Babcock & Sons, Inc.

A8K1122

1084583

SENDING LABORATORY:

E.S. Babcock & Sons, Inc.
P. O. Box 432
Riverside, CA 92502-0432
Phone: (951) 653-3351
Fax: (951) 653-1662
Project Manager: Hsin-Yi Lee

RECEIVING LABORATORY:

Pace Analytical - Subcontract
1700 Elm Street SE, Suite 200
Minneapolis, MN 55414
Phone :(612) 607-6383
Fax: 9612) 607-6444

Copy/Relog from A8K1120.
Client: RBF Consulting
Sampler: Diane Smith

Analysis	Due	Expires Regulatory Days Past Date Sampled	Laboratory ID	Comments
Sample ID: A8K1122-01	**Water**	**Sampled:11/12/08 09:30**	**1 RWD Well 21 - Rehab Diane Smith**	001 ***Proj.No.:*** **RBF - Warner Springs CDF Well**
Dioxin	12/12/08 17:00	12/10/08 09:30		
Containers Supplied: 1L Amber- Unpres. (C)				

All Containers Intact: X Yes ____ No Samples Preserved Properly: X Yes ____ No

Samples Received at 1.8 oC Sample Lables / COC Agree: X Yes ____ No Custody Seals Present: X Yes ____ No

An acknowledgement of sample receipt is requested. Please reply to slozon@babcocklabs.com or Fax to 951-653-1662. Thank You.

Released By	Date	Received By	Date
Sharon Lozon	11-13-08	Pace	11/14/08 0982

Page 1 of 1

Sample Condition Upon Receipt

Pace Analytical

Client Name: ES Babcock Project # 1084583

Courier: ☐ Fed Ex ☒ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 1Z578X9014714 1657

Optional
Proj. Due Date:
Proj. Name:

Custody Seal on Cooler/Box Present: ☐ yes ☒ no Seals intact: ☐ yes ☒ no

Packing Material: ☐ Bubble Wrap ☒ Bubble Bags ☐ None ☐ Other _____ Temp Blank: Yes ____ No ☒

Thermometer Used ~~80940042~~, 179425 Type of Ice: Wet Blue None ☐ Samples on ice, cooling process has begun

Cooler Temperature 1.8°C Biological Tissue is Frozen: Yes No

Date and Initials of person examining contents: 11/14/08

Temp should be above freezing to 6°C

Comments:

Chain of Custody Present:	☒Yes	☐No	☐N/A	1.	
Chain of Custody Filled Out:	☒Yes	☐No	☐N/A	2.	
Chain of Custody Relinquished:	☒Yes	☐No	☐N/A	3.	
Sampler Name & Signature on COC:	☐Yes	☒No	☐N/A	4.	
Samples Arrived within Hold Time:	☒Yes	☐No	☐N/A	5.	
Short Hold Time Analysis (<72hr):	☐Yes	☒No	☐N/A	6.	
Rush Turn Around Time Requested:	☐Yes	☒No	☐N/A	7.	
Sufficient Volume:	☒Yes	☐No	☐N/A	8.	
Correct Containers Used:	☒Yes	☐No	☐N/A	9.	
-Pace Containers Used:	☐Yes	☒No	☐N/A		
Containers Intact:	☒Yes	☐No	☐N/A	10.	
Filtered volume received for Dissolved tests	☐Yes	☐No	☒N/A	11.	
Sample Labels match COC:	☒Yes	☐No	☐N/A	12.	
-Includes date/time/ID/Analysis Matrix: WT					
All containers needing acid/base preservation have been checked. Noncompliance are noted in 13.	☐Yes	☐No	☒N/A	13.	
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes	☐No	☒N/A		
Exceptions: VOA,Coliform, TOC, Oil and Grease, WI-DRO (water)	☐Yes	☒No		Initial when completed	Lot # of added preservative
Samples checked for dechlorination:	☐Yes	☐No	☒N/A	14.	
Headspace in VOA Vials (>6mm):	☐Yes	☐No	☒N/A	15.	
Trip Blank Present:	☐Yes	☐No	☒N/A	16.	
Trip Blank Custody Seals Present	☐Yes	☐No	☒N/A		
Pace Trip Blank Lot # (if purchased): _____					

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: Hsin-Yi Lee Date/Time: 11/14/08

Comments/ Resolution: — DW
— No state form required

Project Manager Review: NAH Date: 11/17/08

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Pace Analytical™

Pace AnalyticalServices, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612-607-6444

Drinking Water Analysis Results
2,3,7,8-TCDD -- USEPA Method 1613B

Sample ID.....A8K1122-01
Client.....Edward S. Babcock & Sons, Inc.
Lab Sample ID.....1084583001

Date Collected.....11/12/2008
Date Received.....11/14/2008
Date Extracted.....11/18/2008

	Sample A8K1122-01	Method Blank	Lab Spike	Lab Spike Dup
[2,3,7,8-TCDD]	**ND**	ND	--	--
RL	5 pg/L	5 pg/L	--	--
2,3,7,8-TCDD Recovery	--	--	102%	108%
Spike Recovery Limit	--	--	73-146%	73-146%
RPD			5.8%	
IS Recovery	**72%**	73%	82%	83%
IS Recovery Limits	31-137%	31-137%	25-141%	25-141%
CS Recovery	**85%**	78%	83%	89%
CS Recovery Limits	42-164%	42-164%	37-158%	37-158%
Filename	D81120A13	D81119C12	D81119C08	D81119C10
Analysis Date	11/20/2008	11/20/2008	11/19/2008	11/20/2008
Analysis Time	12:28	00:37	23:36	00:07
Analyst	SMT	SMT	SMT	SMT
Volume	0.950L	0.927L	0.923L	0.936L
Dilution	NA	NA	NA	NA
ICAL Date	09/16/2008	09/12/2008	09/12/2008	09/12/2008
CCAL Filename	D81120A05	D81119C06	D81119C06	D81119C06

! = Outside the Control Limits
ND = Not Detected
RL = Reporting Limit
Limits = Control Limits from Method 1613 (10/94 Revision), Tables 6A and 7A
RPD = Relative Percent Difference of Lab Spike Recoveries
IS = Internal Standard [2,3,7,8-TCDD-$^{13}C_{12}$]
CS = Cleanup Standard [2,3,7,8-TCDD-$^{37}Cl_4$]

Analyst: _____

Project No.....1084583

DATE: November 28, 2008

CLIENT: EDWARD S. BABCOCK & SONS, INC.
P.O. BOX 432
RIVERSIDE, CA 92502-0432

ATTENTION: Hsin-Yi Lee

REFERENCE: A8K1122

REPORT NO: 125312

SUBJECT: ANALYSIS OF WATER SAMPLE FOR ASBESTOS BY TEM

ACCREDITED: California Department of Health Services (ELAP-1119)

The water was UV-ozone treated to remove any microbial contamination as prescribed by the method since the sample arrived after the 48-hour holding time.

The date and times of collection, receipt, ozonation, filtration, and analysis are as follows:

SAMPLE NO: A8K1122-01

COLLECTED: 11/12/08 at 0930 by Diane Smith

RECEIVED: 11/14/08 at 1230

OZONATED: 11/14/08 at 1400-1700

FILTERED: 11/14/08 at 1716

ANALYZED: 11/24/08

The sample was analyzed for fibers >10 μm in length to conform with the drinking water document, EPA 600 94 134, 100.2. This regulation calls for an MCL (maximum contaminant level) of 7 MFL and an analytical sensitivity level of 0.2 MFL.

No asbestos structures >10μm in length were detected. The analytical sensitivity of 0.2 MFL was reached.

The results of the analysis and the detection limit are summarized on the following pages.

Respectfully submitted,
EMS LABORATORIES, INC.

B. M. Kolk
Laboratory Director

BMK/ah

NOTE: The results of the analysis are based upon the samples submitted to the laboratory. No representation is made regarding the sampling area other than that implied by the analytical results for the immediate vicinity of the samples analyzed as calculated from the data presented with those samples.

This report, from a NIST laboratory through NVLAP, must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

This report shall not be reproduced, except in full, without the written approval of EMS Laboratories, Inc.

Any deviation or exclusion from the test method is noted in this cover letter.

Unless otherwise noted in this cover letter, the samples were received properly packaged, clearly identified and intact.

ANALYSIS OF WATER BY TEM (EPA-600 R 94 134) EPA 100.2

LAB NO: 125312
CLIENT: E.S. Babcock & Sons, Inc.
11/24/2008

Laboratory I.D.	Client I.D.	FILTER MEDIA DATA Type	Diameter mm	Effective Area mm^2	No. of G.O.	Analyzed Area, mm^2	Sample Volume (ml)
125312-1	A8K1122-01*	PC	47	1017	6	0.093	100

* FOR FIBERS > 10um ONLY

INDIVIDUAL ANALYTICAL RESULTS

Laboratory I.D.	Client I.D.	No. of Asbestos Str	Str >5um	Str >10um	Detection Limit (MF/L)	CONCENTRATION (MFL) Str	Str >5um	Str >10um
125312-1	A8K1122-01*	-	-	N.D.	0.2	-	-	N.D.

* FOR FIBERS > 10um ONLY

The analysis was carried out to the approved TEM method. This laboratory is in compliance with the quality specified by the method.

BMKolk
Authorized Signature

TEM 7A (1994)

125319

SUBCONTRACT ORDER

E.S. Babcock & Sons, Inc.

A8K1122

SENDING LABORATORY:

E.S. Babcock & Sons, Inc.
P. O. Box 432
Riverside, CA 92502-0432
Phone: (951) 653-3351
Fax: (951) 653-1662
Project Manager: Hsin-Yi Lee

RECEIVING LABORATORY:

EMS Laboratories
117 W. Bellevue Drive
Pasadena, CA 91105
Phone :(626) 568-4065
Fax: (626) 796-5282

Copy/Relog from A8K1120.
Client: RBF Consulting
Sampler: Diane Smith

Analysis	Due	Expires Regulatory Days Past Date Sampled	Laboratory ID	Comments
Sample ID: A8K1122-01	**Water**	**Sampled:11/12/08 09:30**	**1 RWD Well 21 - Rehab Diane Smith**	***Proj.No.:*RBF - Warner Springs CDF Well**
Asbestos	12/12/08 17:00	05/11/09 09:30		
Containers Supplied:				
Quart Poly - Unpres (B)				

All Containers Intact: ✔ Yes ____ No Samples Preserved Properly: ____ Yes ____ No

Samples Received at 15 oC Sample Lables / COC Agree: ✔ Yes ____ No Custody Seals Present: ____ Yes ✔ No

An acknowledgement of sample receipt is requested. Please reply to slozon@babcocklabs.com or Fax to 951-653-1662. Thank You.

Released By	Date	Received By	Date
Sharon Lozon	11-13-08	Meagan Tong	11/14/08@12:30

Released By Date Received By Date

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est.1906

6100 Quail Valley Court Riverside, CA 92507
(951) 653-3351 • FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Barker Meredian
Fax No.
Phone No. (949) 472 3413
email: bmeserlian@rbf.com
Project Name: 1 RWD Well Rehab
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
Project Location: Diane Smith
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience
Signature: Diane Smith

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Total # of Containers	Routine	Resample	Special	Silica	Title 22	CH Metals						Matrix	Notes
1 RWD Well 21 Title 22	11/12/08	0930														X	X	X						GW	See Attached
																									Small amount
																									Gas in discharge

DW = Drinking Water
WW = Waste Water
GW = Ground Water
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith / Geoscience	11/20/08 1420	[signature]	Edmund/TSB

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? Yes No Temperature 2 °C
Custody Seal(s) Intact? Yes No NA
Sample(s) Intact? Yes No ☐ Cooler Blank

Lab Notes

Lab No. ~~A8K1120~~ A8K1122 AB

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NOV 12 2008

Rev. 6/07

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Environmental Laboratories est 1906

RBF Consulting - Irvine
14725 Alton Pkwy.
Irvine, CA 92618

Project: RBF-IRWD Rehab Constant Discharg
Project Number: IRWD Rehab Constant Discharge Tes
Project Manager: Barkev Meserlian

Received: 11/12/08 14:20
Received on Ice (Y/N): Yes Temperature: 2°C

Reported: 11/17/2008
Work Order A8K1105

Submitted By: Diane Smith

The information provided below is an integral part of this report. This information must be included with all numeric and/or narrative results associated with this report.

Lab Number	Sample Name	SampleType	Sampled	Sampled By
A8K1105-01	IRWD Well 21 Title 22		11/12/08 09:30	Diane Smith

The following information should be used as guidance in the interpretation of the micobiological results included in this report. It applies only to the sample results contained in this report.

If the sample result is Absent : The sample was found to be negative for Coliform Bacteria and therefore meets the Federal and State requirements for drinking water.

If the sample result is **PRESENT** : The sample was found to be positive for Coliform Bacteria and therefore DOES NOT meet the Federal and State requirements for drinking water.

Heterotropic Plate Count (enumeration) : If the HPC is greater than 200, the sample may not meet your city's requirement for new line connections. Please consult the appropriate agency for interpretation of the HPC.

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RBF Consulting - Irvine
14725 Alton Pkwy.
Irvine, CA 92618

Project: RBF-IRWD Rehab Constant Discharg
Project Number: IRWD Rehab Constant Discharge Tes
Project Manager: Barkev Meserlian

Received: 11/12/08 14:20
Received on Ice (Y/N): Yes Temperature: 2°C

Reported: 11/17/2008
Work Order A8K1105

Submitted By: Diane Smith

Date and Time Work Order Started / Analyst: 11/12/08 17:20 dpk

LAB #	A8K1105-01	-	-	-	-	-	
SAMPLE ID	IRWD Well 21 Title 22	-	-	-	-	-	
MMOMUG - Presence/Absence - SM 9223 B (Water)							
Total Coliform	Absent	-	-	-	-	-	----
E. coli	Absent	-	-	-	-	-	----
Heterotrophic Plate Count - SM 9215 B (Water)							
Heterotrophic Plate Count	130	-	-	-	-	-	CFU/mL

☑ Carol Kase
Manager, Microbiology Department

☐ Allison Mackenzie
General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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cc:

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

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(951) 653-3351 • FAX (951) 653-1662
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Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Barker Meserlian
Fax No.
Phone No. (949) 472-3413
email: bmeserlian@rbf.com
Project Name: IRWD Well Rehab
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
Project Location: Diane Smith
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience
Signature: Diane Smith

Matrix: DW = Drinking Water; WW = Waste Water; GW = Ground Water; S = Soil; SG = Sludge; L = Liquid; M = Miscellaneous

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Total # of Containers	Routine	Resample	Special	Silica	Title 22	CA Vinegar	Matrix	Notes
IRWD Well 21 Title 22	11/12/08	0930														X	X	X	GW	See Attached Small amount Gas in discharge

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith / Geoscience	11/12/08 1420		Glenn Ng / ESB

(For Lab Use Only) Sample Integrity Upon Receipt
Sample(s) Submitted on Ice? Yes No Temperature 2 °C
Custody Seal(s) Intact? Yes No NA
Sample(s) Intact? Yes No ☐ Cooler Blank

Lab Notes

Lab No. 081105RB

ENT'D NOV 12 2008

Page ___ of ___

Rev. 6/07

E.S.BABCOCK&Sons,Inc.
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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 29-Oct-2008

Analytical Report: Page 1 of 3
Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A8J1663

Received on Ice (Y/N): Yes Temp: 10 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A8J1663-01	IRWD Well Rehab Well 21 OCSD Discharge	Water	10/16/08 14:38	Diane Smith	10/16/08 17:35	Diane Smith

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 29-Oct-2008

Analytical Report: Page 2 of 3
Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A8J1663

Received on Ice (Y/N): Yes Temp: 10 °C

Laboratory Reference Number
A8J1663-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well Rehab Well 21 OCSD Discharge	Water	10/16/08 14:38	10/16/08 17:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Selenium	ND	5.0	ug/L	EPA 200.8	10/28/08 10:21	krv	

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 29-Oct-2008

Analytical Report: Page 3 of 3
Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A8J1663

Received on Ice (Y/N): Yes Temp: 10 °C

Notes and Definitions

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☒ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

ESB_Short_.Report

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Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Barkev Meserlian
Fax No.
Phone No. (949) 472-3413
email: bmeserlian@rbf.com
Project Name: IRWD Well Rehab
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
Project Location: Well 21
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Date Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: GEOSCIENCE
Signature: Diane Smith

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Total # of Containers	Routine	Resample	Special	Selenium	Matrix	Notes
Well 21 - OCSD Discharge	10/16/08	1438				✓						1	✓			✓	GW	

DW = Drinking Water
WW = Waste Water
GW = Ground Water
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith / GEOSCIENCE	10/16/08 5:35PM	[signature]	Elizabeth Madridejos

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? Yes No
Custody Seal(s) Intact? Yes No NA
Sample(s) Intact? Yes No

Temperature 10 °C
☐ Cooler Blank

Lab Notes

Lab No. A851663 AG

Page 1 of 1

Rev. 6/07

OCT 17 2008

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297

Received on Ice (Y/N): Yes Temp: 1 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A9A1297-01	IRWD Well 22 Zone 1 (474-990 ft.)	Water	01/14/09 17:15	Diane Smith	01/15/09 11:25	Diane Smith

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297
Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1297-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 1 (474-990 ft.)	Water	01/14/09 17:15	01/15/09 11:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	410	3.0	mg/L	SM 3120B	01/23/09 17:37	lmt	
Calcium	110	1.0	mg/L	EPA 200.7	01/23/09 17:37	lmt	
Magnesium	30	1.0	mg/L	EPA 200.7	01/23/09 17:37	lmt	
Sodium	54	1.0	mg/L	EPA 200.7	01/23/09 17:37	lmt	
Potassium	2.0	1.0	mg/L	EPA 200.7	01/23/09 17:37	lmt	
Anions							
Total Alkalinity	190	3.0	mg/L	SM 2320B	01/21/09 19:45	je	
Hydroxide	ND	3.0	mg/L	SM 2320B	01/21/09 19:45	je	
Carbonate	ND	3.0	mg/L	SM 2320B	01/21/09 19:45	je	
Bicarbonate	240	3.0	mg/L	SM 2320B	01/21/09 19:45	je	
Chloride	120	1.0	mg/L	EPA 300.0	01/15/09 22:28	SBD	
Sulfate	160	0.50	mg/L	EPA 300.0	01/15/09 22:28	SBD	
Nitrate	49	1.0	mg/L	EPA 300.0	01/15/09 22:28	SBD	
Aggregate Properties							
pH	7.5	1.0	pH Units	SM 4500H+ B	01/15/09 22:45	ara	
Specific Conductance	1000	1.0	umhos/cm	SM 2510 B	01/15/09 22:45	ara	
Solids							
Total Dissolved Solids	760	20	mg/L	SM 2540C	01/19/09 20:12	kam	
Aggregate Organic Compounds							
Total Organic Carbon	ND	0.30	mg/L	SM 5310B	01/19/09 15:42	krv	

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297

Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1297-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 1 (474-990 ft.)	Water	01/14/09 17:15	01/15/09 11:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Color	ND	3.0	Color Units	SM 2120B	01/15/09 20:06	jkn	
Odor	ND	1.0	T.O.N.*	SM 2150	01/15/09 20:06	jkn	
Turbidity	0.25	0.20	NTU	SM 2130 B	01/15/09 20:06	jkn	
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	01/15/09 16:41	ara	
General Inorganics							
Perchlorate	ND	4.0	ug/L	EPA 314.0	01/19/09 15:36	SS	
Metals and Metalloids							
Copper	ND	50	ug/L	EPA 200.7	01/23/09 17:37	lmt	
Iron	ND	100	ug/L	EPA 200.7	01/23/09 17:37	lmt	
Manganese	ND	20	ug/L	EPA 200.7	01/23/09 17:37	lmt	
Zinc	ND	50	ug/L	EPA 200.7	01/23/09 17:37	lmt	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	

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Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297

Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1297-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 1 (474-990 ft.)	Water	01/14/09 17:15	01/15/09 11:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
2-Butanone(MEK-EPA 8260)	ND	5.0	ug/L	EPA 524.2	01/17/09 07:22	eec	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	01/17/09 07:22	eec	
Benzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bis(2-chloroethyl)ether (Non-NELAP)	ND	5.0	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bromoform	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bromomethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Chloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Chloroform	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Chloromethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	01/17/09 07:22	eec	

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est. 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297
Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1297-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 1 (474-990 ft.)	Water	01/14/09 17:15	01/15/09 11:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Naphthalene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Styrene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Toluene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	01/17/09 07:22	eec	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	01/17/09 07:22	eec	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Surrogate: 1,2-Dichloroethane-d4	104	% 50-150		EPA 524.2	01/17/09 07:22	eec	
Surrogate: Bromofluorobenzene	95.3	% 50-150		EPA 524.2	01/17/09 07:22	eec	
Surrogate: Toluene-d8	96.8	% 50-150		EPA 524.2	01/17/09 07:22	eec	

* NELAP does not offer accreditation for this analyte/method/matrix combination

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297

Received on Ice (Y/N): Yes Temp: 1 °C

Notes and Definitions

pH: Regulatory 15 minute holding time exceeded A9A1297-01

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☑ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

ESB_Short_.Report

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

6100 Quail Valley Court Riverside, CA 92507
(951) 653-3351 • FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Borken Meserlian
Fax No.
Phone No. (949) 472-3413
email: bmeserlian@rbf.com
Project Name: IRWD Well Rehab
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
Project Location: IRWD Well 22 - 1251 Mitchell
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience Support Services
Signature: Diane Smith

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Travel blank	Total # of Containers	Routine	Resample	Special	Gen. Mineral	Gen. Physical	Perchlorate 314.0	VOCs 524.2	TOC	Metals/Inorganics	Travel blank			Matrix	Notes
IRWD Well 22 Zone 1 (474-990ft)	1/14/09	5:15pm	1	3	3	1						1	9	✓			✓	✓	✓	✓	✓	✓	✓			GW	1) Discharge has some gas bubbles
																											2) See attached list

Matrix: DW = Drinking Water, WW = Waste Water, GW = Ground Water, S = Soil, SG = Sludge, L = Liquid, M = Miscellaneous

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith / Geoscience	1/15/09 11:25	[signature]	Elizabeth Mendoza

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? Yes No Temperature 1 °C
Custody Seal(s) Intact? Yes No NA
Sample(s) Intact? Yes No ☐ Cooler Blank

Lab Notes

Lab No. A9A1297 AB

Page 1 of 1

JAN 15 2009

Rev. 6/07

IRVINE RANCH WATER DISTRICT
Rehabilitation of Wells 21 and 22

Table 1
Proposed Water Quality Tests for Well 21

Test	Sampling	Tentative Schedule	No. of Samples
1- Full Title 22	Last hour of the Constant Discharge Test	Mid/Late October	1 [1]
1.1- Silica	Last hour of the Constant Discharge Test	Mid/Late October	
1.2- Selenium	Last hour of the Constant Discharge Test	Mid/Late October (Between October 13 and 24 for Well 22 [1])	
2- General Mineral and Physical (two zones)	Towards the end of the Zone Isolation Tests	Mid/Late October	2
2.1-VOC EPA 524.2	Towards the end of the Zone Isolation Tests	Mid/Late October	
Total			3 [1]

[1] Based on OCSD permit Requirements, Selenium must be sampled between October 13 and October 24. If these dates do not coincide with the Constant Discharge Test, a separate sample will be sent to Babcock for Selenium testing only, in which case the total samples for Well 21 will be 4

Table 2
Proposed Water Quality Tests for Well 22

Test	Sampling	Tentative Schedule	No. of Samples
1- Full Title 22	Last hour of the Constant Discharge Test	Late November/ Early December	1
1.1- Silica	Last hour of the Constant Discharge Test	Late November/ Early December	
1.2- Selenium	Last hour of the Constant Discharge Test	Late November/ Early December	
2- General Mineral and Physical (two zones)	Towards the end of the Zone Isolation Tests	Late November/ Early December	2
2.1-VOC EPA 524.2 TOC and Perchlorate	Towards the end of the Zone Isolation Tests	Late November/ Early December	
Total			3

A9A1297 AB

H:\Pdata\10106006\Admin\Permits\OCSD\Water Quality Tests Schedule.xls

9/16/2008

JAN 15 2009

IRWD WELL 22
WATER QUALITY TESTING RESULTS

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est. 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975

Received on Ice (Y/N): Yes Temp: 2 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A9A0975-01	IRWD Well 22 Title 22	Water	01/13/09 08:00	Diane Smith	01/13/09 11:35	Diane Smith

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975

Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	430	3.0	mg/L	SM 3120B	01/20/09 17:31	lmt	
Calcium	120	1.0	mg/L	EPA 200.7	01/20/09 17:31	lmt	
Magnesium	32	1.0	mg/L	EPA 200.7	01/20/09 17:31	lmt	
Sodium	57	1.0	mg/L	EPA 200.7	01/20/09 17:31	lmt	
Potassium	2.2	1.0	mg/L	EPA 200.7	01/20/09 17:31	lmt	
Total Cations	11.2	0.05	me/L	Calculation			
Anions							
Total Alkalinity	200	3.0	mg/L	SM 2320B	01/13/09 14:40	adb	
Hydroxide	ND	3.0	mg/L	SM 2320B	01/13/09 14:40	adb	
Carbonate	ND	3.0	mg/L	SM 2320B	01/13/09 14:40	adb	
Bicarbonate	240	3.0	mg/L	SM 2320B	01/13/09 14:40	adb	
Chloride	120	1.0	mg/L	EPA 300.0	01/13/09 21:19	SWC	
Sulfate	170	0.50	mg/L	EPA 300.0	01/13/09 21:19	SWC	
Fluoride	0.2	0.1	mg/L	SM 4500F C	01/15/09 07:00	tdl	
Nitrate	50	1.0	mg/L	EPA 300.0	01/13/09 21:19	SWC	
Total Anions	11.74	0.05	me/L	Calculation			
Aggregate Properties							
pH	7.5	1.0	pH Units	SM 4500H+ B	01/13/09 20:40	ara	
Specific Conductance	1100	1.0	umhos/cm	SM 2510 B	01/13/09 20:40	ara	
Solids							
Total Dissolved Solids	650	20	mg/L	SM 2540C	01/14/09 18:51	jkn	

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Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Color	ND	3.0	Color Units	SM 2120B	01/13/09 19:59	jkn	
Odor	ND	1.0	T.O.N.*	SM 2150	01/13/09 19:59	jkn	
Turbidity	0.26	0.20	NTU	SM 2130 B	01/13/09 19:59	jkn	
Surfactants							
MBAS	0.05	0.05	mg/L	SM 5540C	01/13/09 14:20	ara	
General Inorganics							
Cyanide	ND	100	ug/L	SM 4500CN E	01/16/09 18:27	ctl	
Perchlorate	ND	4.0	ug/L	EPA 314.0	01/19/09 13:28	SS	
Nutrients							
Nitrite as N	ND	100	ug/L	SM 4500NO2 B	01/13/09 16:10	kam	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	01/20/09 17:31	lmt	
Antimony	ND	6.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Arsenic	ND	2.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Barium	ND	100	ug/L	EPA 200.8	01/14/09 16:40	krv	
Beryllium	ND	1.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Boron	110	100	ug/L	EPA 200.7	01/20/09 17:31	lmt	
Cadmium	ND	1.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Total Chromium	2.6	1.0	ug/L	EPA 200.8	01/21/09 13:48	krv	
Hexavalent Chromium	ND	1.0	ug/L	EPA 218.6	01/20/09 21:44	sbd	N_pLab
Copper	ND	50	ug/L	EPA 200.8	01/14/09 16:40	krv	
Iron	ND	100	ug/L	EPA 200.7	01/20/09 17:31	lmt	
Lead	ND	5.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Manganese	ND	20	ug/L	EPA 200.8	01/14/09 16:40	krv	
Mercury	ND	1.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Nickel	ND	10	ug/L	EPA 200.8	01/14/09 16:40	krv	
Selenium	ND	5.0	ug/L	EPA 200.8	01/14/09 16:40	krv	

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Total Silica	26	5.0	mg/L	EPA 200.7	01/20/09 17:31	lmt	
Silver	ND	10	ug/L	EPA 200.8	01/14/09 16:40	krv	
Thallium	ND	1.0	ug/L	EPA 200.8	01/14/09 16:40	krv	
Vanadium	ND	3.0	ug/L	EPA 200.8	01/21/09 13:48	krv	
Zinc	ND	50	ug/L	EPA 200.8	01/14/09 17:33	krv	
EDB and DBCP by EPA 504							
Ethylene dibromide	ND	0.020	ug/L	EPA 504.1	01/16/09 00:32	cth	
Dibromochloropropane	ND	0.010	ug/L	EPA 504.1	01/16/09 00:32	cth	
Nitrogen-Phosphorus Pesticides by EPA 507							
Alachlor	ND	1.0	ug/L	EPA 507	01/21/09 17:46	kos	
Atrazine	ND	0.50	ug/L	EPA 507	01/21/09 17:46	kos	
Molinate	ND	2.0	ug/L	EPA 507	01/21/09 17:46	kos	
Simazine	ND	1.0	ug/L	EPA 507	01/21/09 17:46	kos	
Thiobencarb	ND	1.0	ug/L	EPA 507	01/21/09 17:46	kos	
Surrogate: 1,3-Dimethyl-2-Nitrobenzene	90.4	% 70-130		EPA 507	01/21/09 17:46	kos	
Organochlorine Pesticides and PCBs by EPA 508							
4,4'-DDE	ND	0.80	ug/L	EPA 508	01/22/09 03:20	CYA	
Aldrin	ND	0.075	ug/L	EPA 508	01/22/09 03:20	CYA	
Chlordane	ND	0.10	ug/L	EPA 508	01/22/09 03:20	CYA	
Dieldrin	ND	0.020	ug/L	EPA 508	01/22/09 03:20	CYA	
Endrin	ND	0.10	ug/L	EPA 508	01/22/09 03:20	CYA	
Heptachlor	ND	0.010	ug/L	EPA 508	01/22/09 03:20	CYA	
Heptachlor Epoxide	ND	0.010	ug/L	EPA 508	01/22/09 03:20	CYA	
Hexachlorobenzene	ND	0.50	ug/L	EPA 508	01/22/09 03:20	CYA	
Hexachlorocyclopentadiene	ND	1.0	ug/L	EPA 508	01/22/09 03:20	CYA	
Lindane	ND	0.20	ug/L	EPA 508	01/22/09 03:20	CYA	
Methoxychlor	ND	10	ug/L	EPA 508	01/22/09 03:20	CYA	

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Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Organochlorine Pesticides and PCBs by EPA 508							
Polychlorinated Biphenyls (Total PCB's)	ND	0.50	ug/L	EPA 508	01/22/09 03:20	CYA	
Propachlor	ND	0.50	ug/L	EPA 508	01/22/09 03:20	CYA	
Toxaphene	ND	1.0	ug/L	EPA 508	01/22/09 03:20	CYA	
Surrogate: Decachlorobiphenyl	81.9	% 70-130		EPA 508	01/22/09 03:20	CYA	
Chlorinated Herbicides by EPA 515.3							
2,4,5-TP Silvex	ND	1.0	ug/L	EPA 515.3	01/20/09 23:08	CYA	
2,4-D	ND	10	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Bentazon	ND	2.0	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Dalapon	ND	10	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Dicamba	ND	1.5	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Dinoseb	ND	2.0	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Pentachlorophenol	ND	0.20	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Pichloram	ND	1.0	ug/L	EPA 515.3	01/20/09 23:08	CYA	
Surrogate: DCAA	99.6	% 70-130		EPA 515.3	01/20/09 23:08	CYA	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975
Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
2-Butanone(MEK-EPA 8260)	ND	5.0	ug/L	EPA 524.2	01/16/09 23:31	eec	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	01/16/09 23:31	eec	
Benzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bis(2-chloroethyl)ether (Non-NELAP)	ND	5.0	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bromoform	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Bromomethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Chloroethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Chloroform	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Chloromethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975

Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	01/16/09 23:31	eec	
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Naphthalene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Styrene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Toluene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	01/16/09 23:31	eec	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	01/16/09 23:31	eec	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	01/16/09 23:31	eec	
Surrogate: 1,2-Dichloroethane-d4	104	% 50-150		EPA 524.2	01/16/09 23:31	eec	
Surrogate: Bromofluorobenzene	96.5	% 50-150		EPA 524.2	01/16/09 23:31	eec	
Surrogate: Toluene-d8	98.3	% 50-150		EPA 524.2	01/16/09 23:31	eec	
1,2,3-TCP by Purge & Trap GC/MS							
1,2,3-Trichloropropane	ND	0.005	ug/L	CA DHS-SRL	01/14/09 13:31	jes	

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975

Received on Ice (Y/N): Yes Temp: 2 °C

Laboratory Reference Number
A9A0975-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Title 22	Water	01/13/09 08:00	01/13/09 11:35

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Semivolatile Organic Compounds by EPA 525.2							
Benzo(a)pyrene	ND	0.10	ug/L	EPA 525.2	01/19/09 21:21	KOS	
DEH-Adipate	ND	5.0	ug/L	EPA 525.2	01/19/09 21:21	KOS	
DEH-Phthalate	ND	3.0	ug/L	EPA 525.2	01/19/09 21:21	KOS	
Surrogate: 4-Terphenyl-d14	88.6	% 70-130		EPA 525.2	01/19/09 21:21	KOS	
Endothall by EPA 548.1							
Endothall	ND	45	ug/L	EPA 548.1	01/20/09 05:29	KOS	

* NELAP does not offer accreditation for this analyte/method/matrix combination

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Environmental Laboratories est. 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 26-Jan-2009

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A9A0975

Received on Ice (Y/N): Yes Temp: 2 °C

Notes and Definitions

pH: Regulatory 15 minute holding time exceeded A9A0975-01

N_pLab Sample preserved at lab.

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

Lorenzo Rodriguez FOR

☒ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

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Environmental Laboratories est 1906

6100 Quail Valley Court Riverside, CA 92507
(951) 653-3351 • FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Barkev Meserlian
Fax No.
Phone No. (949) 472-3413
email: bmeserlian@rbf.com
Project Name: IRWD Wells 21 + 22 Rehab
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
Project Location: Well 22 - 1251 Mitchell Tustin
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience Support Svcs
Signature: Diane Smith

DW = Drinking Water
WW = Waste Water
GW = Ground Water
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Total # of Containers	Routine	Resample	Special	Title 22	Calif Uranium	Silica	Selenium	Matrix	Notes
IRWD Well 22 Title 22	1/13/09	8:00AM														✓	✓	✓	✓	GW	1) See attached list for analyses
																					2) Gas bubble in water created effervescence in VOAs

TB Rec'd

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith/Geoscience	1/13/09 11:35AM	Angie Brown	Angie Brown/ESB

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? (Yes) No
Custody Seal(s) Intact? Yes No (NA)
Sample(s) Intact? (Yes) No

Temperature 2 °C
☐ Cooler Blank

Lab Notes

Lab No. A9A0975

Page 1 of 1

JAN 13 2009

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IRVINE RANCH WATER DISTRICT
Rehabilitation of Wells 21 and 22

Table 1
Proposed Water Quality Tests for Well 21

Test	Sampling	Tentative Schedule	No. of Samples
1- Full Title 22	Last hour of the Constant Discharge Test	Mid/Late October	1 [1]
1.1- Silica	Last hour of the Constant Discharge Test	Mid/Late October	
1.2- Selenium	Last hour of the Constant Discharge Test	Mid/Late October (Between October 13 and 24 for Well 22 [1])	
2- General Mineral and Physical (two zones)	Towards the end of the Zone Isolation Tests	Mid/Late October	2
2.1-VOC EPA 524.2	Towards the end of the Zone Isolation Tests	Mid/Late October	
Total			3 [1]

[1] Based on OCSD permit Requirements, Selenium must be sampled between October 13 and October 24. If these dates do not coincide with the Constant Discharge Test, a separate sample will be sent to Babcock for Selenium testing only, in which case the total samples for Well 21 will be 4

Table 2
Proposed Water Quality Tests for Well 22

Test	Sampling	Tentative Schedule	No. of Samples
1- Full Title 22	Last hour of the Constant Discharge Test	Late November/ Early December	1
1.1- Silica	Last hour of the Constant Discharge Test	Late November/ Early December	
1.2- Selenium	Last hour of the Constant Discharge Test	Late November/ Early December	
2- General Mineral and Physical (two zones)	Towards the end of the Zone Isolation Tests	Late November/ Early December	2
2.1-VOC EPA 524.2 Add TOC + perchlorate	Towards the end of the Zone Isolation Tests	Late November/ Early December	
Total			3

1/13/09

JAN 13 2009 AGA0975AB

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 31-Oct-2008

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A8J2218
Received on Ice (Y/N): Yes Temp: 12 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A8J2218-01	IRWD Well Rehab Well 22 Sewer Discharge	Water	10/24/08 13:40	Diane Smith	10/24/08 15:24	Diane Smith

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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 31-Oct-2008

Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A8J2218

Received on Ice (Y/N): Yes Temp: 12 °C

Laboratory Reference Number
A8J2218-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well Rehab Well 22 Sewer Discharge	Water	10/24/08 13:40	10/24/08 15:24

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Selenium	ND	5.0	ug/L	EPA 200.8	10/29/08 16:20	ap	

E.S.BABCOCK&Sons,Inc.
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Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 31-Oct-2008

Analytical Report: Page 3 of 3
Project Name: RBF-IRWD Rehab Constant D
Project Number: IRWD Rehab Constant Discha

Work Order Number: A8J2218

Received on Ice (Y/N): Yes Temp: 12 °C

Notes and Definitions

ND:	Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)
NR:	Not Reported
RDL:	Reportable Detection Limit
MDL:	Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☒ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

ESB_Short_.Report

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Environmental Laboratories est. 1906
6100 Quail Valley Court Riverside, CA 92507
(951) 653-3351 • FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Barlow Meserlian
Fax No.
Phone No.
email: bmeserlian@rbf.com
Project Name: IRWD Well Rehab
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
Project Location: Well 22
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: GEOSCIENCE
Signature: Diane Smith

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Total # of Containers	Routine	Resample	Special	50/ppm nitr	Matrix	Notes
Well 22-Sewer Discharge	10/24/08	1340				✓						1	✓			✓	GW	

Matrix: DW = Drinking Water; WW = Waste Water; GW = Ground Water; S = Soil; SG = Sludge; L = Liquid; M = Miscellaneous

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith / Geoscience	10/24/08 1529 hrs	[signature]	[signature]

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? Yes No Temperature 12 °C
Custody Seal(s) Intact? Yes No NA
Sample(s) Intact? Yes No ☐ Cooler Blank

Lab Notes

Lab No. ABJ2218 AG

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Rev. 6/07

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RBF Consulting - Irvine
14725 Alton Pkwy.
Irvine, CA 92618

Project: RBF-IRWD Rehab Constant Discharg
Project Number: IRWD Wells 21+22 Rehab/Well 22-12
Project Manager: Barkev Meserlian

Received: 01/13/09 11:35
Received on Ice (Y/N): Yes Temperature: 2°C

Reported: 1/16/2009
Work Order A9A0974

Submitted By: Diane Smith

The information provided below is an integral part of this report. This information must be included with all numeric and/or narrative results associated with this report.

Lab Number	Sample Name	SampleType	Sampled	Sampled By
A9A0974-01	IRWD Well 22 Tittle 22	---ROUTINE---	01/13/09 08:00	Diane Smith

The following information should be used as guidance in the interpretation of the micobiological results included in this report. It applies only to the sample results contained in this report.

If the sample result is Absent : The sample was found to be negative for Coliform Bacteria and therefore meets the Federal and State requirements for drinking water.

If the sample result is **PRESENT** : The sample was found to be positive for Coliform Bacteria and therefore DOES NOT meet the Federal and State requirements for drinking water.

Heterotropic Plate Count (enumeration) : If the HPC is greater than 200, the sample may not meet your city's requirement for new line connections. Please consult the appropriate agency for interpretation of the HPC.

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RBF Consulting - Irvine
14725 Alton Pkwy.
Irvine, CA 92618

Project: RBF-IRWD Rehab Constant Discharg
Project Number: IRWD Wells 21+22 Rehab/Well 22-12
Project Manager: Barkev Meserlian

Received: 01/13/09 11:35
Received on Ice (Y/N): Yes Temperature: 2°C

Reported: 1/16/2009
Work Order A9A0974

Submitted By: Diane Smith

Date and Time Work Order Started / Analyst: 1/13/09 13:15 dpk

LAB #	A9A0974-01	-	-	-	-	-	
SAMPLE ID	IRWD Well 22 Tittle 22	-	-	-	-	-	
MMOMUG - Presence/Absence - SM 9223 B (Water)							
Total Coliform	Absent	-	-	-	-	-	----
E. coli	Absent	-	-	-	-	-	----
Heterotrophic Plate Count - SM 9215 B (Water)							
Heterotrophic Plate Count	170	-	-	-	-	-	CFU/mL

☑ Carol Kase
Manager, Microbiology Department

☐ Allison Mackenzie
General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

E.S. Babcock & Sons, Inc.

cc:

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

6100 Quail Valley Court Riverside, CA 92507
(951) 653-3351 • FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Barkev Meserlian
Fax No.
Phone No. (949) 472-3413
email: bmeserlian@rbf.com
Project Name: IRWD Wells 21 & 22 Rehab
Project Location: Well 22 - 1251 Mitchell Tustin
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience Support Svcs
Signature: Diane Smith

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Total # of Containers	Routine	Resample	Special	Title 22	Calif Unreg	Silica	Selenium	Matrix	Notes
IRWD Well 22 Title 22	1/13/09	8:00AM														✓	✓	✓	✓	GW	1) See attached list for analyses
																					2) Gas bubble in water created effervescence in VOAs

Matrix: DW = Drinking Water, WW = Waste Water, GW = Ground Water, S = Soil, SG = Sludge, L = Liquid, M = Miscellaneous

TB Rec'd

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith/Geoscience	1/13/09 11:35am	Angie Brown	Angie Brown/ESB

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? (Yes) No Temperature
Custody Seal(s) Intact? Yes No (NA) 2 °C
Sample(s) Intact? (Yes) No ☐ Cooler Blank

Lab Notes

Lab No. A9A0974 L6

Page 1 of 1
JAN 13 2009
Rev. 6/07

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Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297

Received on Ice (Y/N): Yes Temp: 1 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A9A1297-01	IRWD Well 22 Zone 1 (474-990 ft.)	Water	01/14/09 17:15	Diane Smith	01/15/09 11:25	Diane Smith

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est. 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297
Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1297-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 1 (474-990 ft.)	Water	01/14/09 17:15	01/15/09 11:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	410	3.0	mg/L	SM 3120B	01/23/09 17:37	lmt	
Calcium	110	1.0	mg/L	EPA 200.7	01/23/09 17:37	lmt	
Magnesium	30	1.0	mg/L	EPA 200.7	01/23/09 17:37	lmt	
Sodium	54	1.0	mg/L	EPA 200.7	01/23/09 17:37	lmt	
Potassium	2.0	1.0	mg/L	EPA 200.7	01/23/09 17:37	lmt	
Anions							
Total Alkalinity	190	3.0	mg/L	SM 2320B	01/21/09 19:45	je	
Hydroxide	ND	3.0	mg/L	SM 2320B	01/21/09 19:45	je	
Carbonate	ND	3.0	mg/L	SM 2320B	01/21/09 19:45	je	
Bicarbonate	240	3.0	mg/L	SM 2320B	01/21/09 19:45	je	
Chloride	120	1.0	mg/L	EPA 300.0	01/15/09 22:28	SBD	
Sulfate	160	0.50	mg/L	EPA 300.0	01/15/09 22:28	SBD	
Nitrate	49	1.0	mg/L	EPA 300.0	01/15/09 22:28	SBD	
Aggregate Properties							
pH	7.5	1.0	pH Units	SM 4500H+ B	01/15/09 22:45	ara	
Specific Conductance	1000	1.0	umhos/cm	SM 2510 B	01/15/09 22:45	ara	
Solids							
Total Dissolved Solids	760	20	mg/L	SM 2540C	01/19/09 20:12	kam	
Aggregate Organic Compounds							
Total Organic Carbon	ND	0.30	mg/L	SM 5310B	01/19/09 15:42	krv	

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297

Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1297-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 1 (474-990 ft.)	Water	01/14/09 17:15	01/15/09 11:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Color	ND	3.0	Color Units	SM 2120B	01/15/09 20:06	jkn	
Odor	ND	1.0	T.O.N.*	SM 2150	01/15/09 20:06	jkn	
Turbidity	0.25	0.20	NTU	SM 2130 B	01/15/09 20:06	jkn	
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	01/15/09 16:41	ara	
General Inorganics							
Perchlorate	ND	4.0	ug/L	EPA 314.0	01/19/09 15:36	SS	
Metals and Metalloids							
Copper	ND	50	ug/L	EPA 200.7	01/23/09 17:37	lmt	
Iron	ND	100	ug/L	EPA 200.7	01/23/09 17:37	lmt	
Manganese	ND	20	ug/L	EPA 200.7	01/23/09 17:37	lmt	
Zinc	ND	50	ug/L	EPA 200.7	01/23/09 17:37	lmt	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297

Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1297-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 1 (474-990 ft.)	Water	01/14/09 17:15	01/15/09 11:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
2-Butanone(MEK-EPA 8260)	ND	5.0	ug/L	EPA 524.2	01/17/09 07:22	eec	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	01/17/09 07:22	eec	
Benzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bis(2-chloroethyl)ether (Non-NELAP)	ND	5.0	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bromoform	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Bromomethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Chloroethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Chloroform	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Chloromethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	01/17/09 07:22	eec	

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est. 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297
Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1297-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 1 (474-990 ft.)	Water	01/14/09 17:15	01/15/09 11:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Naphthalene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Styrene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Toluene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	01/17/09 07:22	eec	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	01/17/09 07:22	eec	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	01/17/09 07:22	eec	
Surrogate: 1,2-Dichloroethane-d4	104	% 50-150		EPA 524.2	01/17/09 07:22	eec	
Surrogate: Bromofluorobenzene	95.3	% 50-150		EPA 524.2	01/17/09 07:22	eec	
Surrogate: Toluene-d8	96.8	% 50-150		EPA 524.2	01/17/09 07:22	eec	

* NELAP does not offer accreditation for this analyte/method/matrix combination

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 28-Jan-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1297

Received on Ice (Y/N): Yes Temp: 1 °C

Notes and Definitions

pH: Regulatory 15 minute holding time exceeded A9A1297-01

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☑ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

ESB_Short_.Report

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

6100 Quail Valley Court Riverside, CA 92507
(951) 653-3351 • FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Borken Meserlian
Fax No.
Phone No. (949) 472-3413
email: bmeserlian@rbf.com
Project Name: IRWD Well Rehab
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
Project Location: IRWD Well 22 - 1251 Mitchell
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience Support Services
Signature: Diane Smith

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Travel blank	Total # of Containers	Routine	Resample	Special	Gen. Mineral	Gen. Physical	Perchlorate 314.0	VOCs 524.2	TOC	Metals/Inorganics	Travel blank			Matrix	Notes
IRWD Well 22 Zone 1 (474-990ft)	1/14/09	5:15pm	1	3	3	1						1	9	✓			✓	✓	✓	✓	✓	✓	✓			GW	1) Discharge has some gas bubbles
																											2) See attached list

Matrix: DW = Drinking Water, WW = Waste Water, GW = Ground Water, S = Soil, SG = Sludge, L = Liquid, M = Miscellaneous

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith / Geoscience	1/15/09 11:25	[signature]	Elizabeth Mendoza

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? Yes No Temperature 1 °C
Custody Seal(s) Intact? Yes No NA
Sample(s) Intact? Yes No ☐ Cooler Blank

Lab Notes

Lab No. A9A1297 AB

Page 1 of 1

JAN 15 2009

Rev. 6/07

IRVINE RANCH WATER DISTRICT
Rehabilitation of Wells 21 and 22

Table 1
Proposed Water Quality Tests for Well 21

Test	Sampling	Tentative Schedule	No. of Samples
1- Full Title 22	Last hour of the Constant Discharge Test	Mid/Late October	1 [1]
1.1- Silica	Last hour of the Constant Discharge Test	Mid/Late October	
1.2- Selenium	Last hour of the Constant Discharge Test	Mid/Late October (Between October 13 and 24 for Well 22 [1])	
2- General Mineral and Physical (two zones)	Towards the end of the Zone Isolation Tests	Mid/Late October	2
2.1-VOC EPA 524.2	Towards the end of the Zone Isolation Tests	Mid/Late October	
Total			3 [1]

[1] Based on OCSD permit Requirements, Selenium must be sampled between October 13 and October 24. If these dates do not coincide with the Constant Discharge Test, a separate sample will be sent to Babcock for Selenium testing only, in which case the total samples for Well 21 will be 4

Table 2
Proposed Water Quality Tests for Well 22

Test	Sampling	Tentative Schedule	No. of Samples
1- Full Title 22	Last hour of the Constant Discharge Test	Late November/ Early December	1
1.1- Silica	Last hour of the Constant Discharge Test	Late November/ Early December	
1.2- Selenium	Last hour of the Constant Discharge Test	Late November/ Early December	
2- General Mineral and Physical (two zones)	Towards the end of the Zone Isolation Tests	Late November/ Early December	2
2.1-VOC EPA 524.2 TOC and Perchlorate	Towards the end of the Zone Isolation Tests	Late November/ Early December	
Total			3

A9A1297 AB

H:\Pdata\10106006\Admin\Permits\OCSD\Water Quality Tests Schedule.xls

9/16/2008

JAN 15 2009

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Analytical Report: Page 1 of 1
Project Name: RBF-IRWD Rehab Constant
Project Number: IRWD Rehab Constant Disch
Work Order Number: A9A0976

Report Date: 30-Jan-2009

Received on Ice Yes Temp: 2 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A9A0976-01	IRWD Well 22 Title 22	Water	01/13/09 08:00	Diane Smith	01/13/09 11:35	Diane Smith

Approval

Babcock Laboratories certify that the information presented as part of this report meets the minimum quality standards in the analytical methods, if referenced. Exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☒ Project Manager ☐ Allison Mackenzie General Manager ☐ Lawrence J. Chrystal Laboratory Director

cc:

DATE: January 23, 2009

CLIENT: EDWARD S. BABCOCK & SONS, INC.
P.O. BOX 432
RIVERSIDE, CA 92502-0432

ATTENTION: Hsin-Yi Lee

REFERENCE: A9A0976

REPORT NO: 126525

SUBJECT: ANALYSIS OF WATER SAMPLE FOR ASBESTOS BY TEM

ACCREDITED: California Department of Health Services (ELAP-1119)

The water was UV-ozone treated to remove any microbial contamination as prescribed by the method since the sample arrived after the 48-hour holding time.

The date and time of collection, receipt, ozonation, filtration, and analysis are as follows:

SAMPLE NO: A9A0976-01

COLLECTED: 1/13/09 at 0800 by Diane Smith

RECEIVED: 1/15/09 at 1025

OZONATED: 1/15/09 at 1040-1340

FILTERED: 1/15/09 at 1358

ANALYZED: 1/23/09

The sample was analyzed for fibers >10 μm in length to conform with the drinking water document, EPA 600 94 134, 100.2. This regulation calls for an MCL (maximum contaminant level) of 7 MFL and an analytical sensitivity level of 0.2 MFL.

No asbestos structures >10μm in length were detected. The analytical sensitivity of 0.2 MFL was reached.

The results of the analysis and the detection limit are summarized on the following pages.

Respectfully submitted,
EMS LABORATORIES, INC.

B. M. Kolk
Laboratory Director

BMK/ah

NOTE: The results of the analysis are based upon the samples submitted to the laboratory. No representation is made regarding the sampling area other than that implied by the analytical results for the immediate vicinity of the samples analyzed as calculated from the data presented with those samples.

This report, from a NIST laboratory through NVLAP, must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

This report shall not be reproduced, except in full, without the written approval of EMS Laboratories, Inc.

Any deviation or exclusion from the test method is noted in this cover letter.

Unless otherwise noted in this cover letter, the samples were received properly packaged, clearly identified and intact.

ANALYSIS OF WATER BY TEM (EPA-600 R 94 134) EPA 100.2

LAB NO: 126525
CLIENT: E.S. Babcock & Sons, Inc.
1/23/2009

Laboratory I.D.	Client I.D.	FILTER MEDIA DATA Type	Diameter mm	Effective Area mm^2	No. of G.O.	Analyzed Area, mm^2	Sample Volume (ml)
126525-1	A9A0976-01*	PC	47	1017	10	0.093	60

* FOR FIBERS > 10um ONLY

ANALYTICAL RESULTS

Laboratory I.D.	Client I.D.	No. of Asbestos Str. All Sizes	5-9.9um	>10um	Detection Limit (MFL)	CONCENTRATION (MFL) All Sizes	5-9.9um	>10um
126525-1	A9A0976-01*	N.D.	N.D.	N.D.	0.2	N.D.	N.D.	N.D.

* FOR FIBERS > 10um ONLY

The analysis was carried out to the approved TEM method. This laboratory is in compliance with the quality specified by the method.

Authorized Signature

PC - Polycarbonate
MCE - Mixed cellulose ester
G.O. - Grid Openings
Str - Structures
MFL - Millions of fibers per liter

TEM-7A (2009Rev.)

SUBCONTRACT ORDER 126525

E.S. Babcock & Sons, Inc.

A9A0976

SENDING LABORATORY:

E.S. Babcock & Sons, Inc.
P. O. Box 432
Riverside, CA 92502-0432
Phone: (951) 653-3351
Fax: (951) 653-1662
Project Manager: Hsin-Yi Lee

RECEIVING LABORATORY:

EMS Laboratories
117 W. Bellevue Drive
Pasadena, CA 91105
Phone :(626) 568-4065
Fax: (626) 796-5282

Copy/Relog from A9A0975.
Client: RBF Consulting - Irvine
Sampler: Diane Smith

Analysis	Due	Expires Regulatory Days Past Date Sampled	Laboratory ID	Comments
Sample ID: A9A0976-01	**Water**	**Sampled:01/13/09 08:00**	**IRWD Well 22 Title 22**	***Proj.No.:*** **IRWD Rehab Constant Discharge Test**
Asbestos	02/10/09 17:00	07/12/09 08:00		
Containers Supplied:				
Quart Poly - Unpres (B)				

All Containers Intact: X Yes ____ No Samples Preserved Properly: X Yes ____ No

Samples Received at 5 oC Sample Lables / COC Agree: X Yes ____ No Custody Seals Present: ____ Yes X No

An acknowledgement of sample receipt is requested. Please reply to slozon@babcocklabs.com or Fax to 951-653-1662. Thank You.

Released By	Date	Received By	Date
Sharon Lozon	1-13-09	[illegible]	1-15-09 10:25

Page 1 of 1

NORTH COAST
LABORATORIES LTD.

January 21, 2009

Edward S. Babcock & Sons, Inc
P.O. Box 432
Riverside, CA 92502-0432

Attn: Hsin-Yi Lee

RE: A9A0976

Order No.: 0901212
Invoice No.: 79777
PO No.: A9A0976
ELAP No.1247-Expires June 2010

SAMPLE IDENTIFICATION

Fraction	Client Sample Description
01A	A9A0976-01
01B	A9A0976-01
01D	A9A0976-01

ND = Not Detected at the Reporting Limit

Limit = Reporting Limit

All solid results are expressed on a wet-weight basis unless otherwise noted.

REPORT CERTIFIED BY

Laboratory Supervisor(s)

QA Unit

Jesse G. Chaney, Jr.
Laboratory Director

5680 West End Road • Arcata California 95521-9202 • 707-822-4649 • FAX 707-822-6831

Printed on Recycled Paper

CLIENT: Edward S. Babcock & Sons, Inc
Project: A9A0976
Lab Order: 0901212

CASE NARRATIVE

EPA 531.1:
The laboratory control sample duplicate (LCSD) recovery was below the lower acceptance limit for BDMC (surrogate). The relative percent difference (RPD) for the laboratory control samples was above the acceptance limit for BDMC. The RPDs were within acceptance limits for all other analytes and BDMC was within acceptance limits for the analytical samples.

EPA 547:
The samples for glyphosate analysis were poured off and frozen upon receipt at North Coast Laboratories. The holding time is extended to eighteen months when samples are frozen.

EPA 549.2:
Diquat strongly adsorbs to soil particles that are suspended in water. The strong chemical bonds make the herbicide chemically inactive. When bound with soil particles, the extraction procedure for method EPA 549.2 is ineffective at isolating the bound diquat. Any reported diquat represents the dissolved analyte in the water that has not been bound to the soil particles.

NORTH COAST LABORATORIES
5680 West End Road • Arcata, California 95521-9202 • 707-822-4649 • FAX 707-822-6831
Printed on Recycled Paper

Date: 20-Jan-2009
WorkOrder: 0901212

ANALYTICAL REPORT

Client Sample ID: A9A0976-01 **Received:** 1/14/09 **Collected:** 1/13/09 08:00
Lab ID: 0901212-01A

Test Name: EPA 549.2 **Reference:** EPA 549.2

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Diquat (dissolved)	ND	0.40	µg/L	1.0	1/14/09	1/16/09

Client Sample ID: A9A0976-01 **Received:** 1/14/09 **Collected:** 1/13/09 08:00
Lab ID: 0901212-01B

Test Name: Glyphosate **Reference:** EPA 547

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Glyphosate	ND	10	µg/L	1.0	1/16/09	1/15/09

Client Sample ID: A9A0976-01 **Received:** 1/14/09 **Collected:** 1/13/09 08:00
Lab ID: 0901212-01D

Test Name: N-methyl -carbamoyloximes and carbamates **Reference:** EPA 531.1

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Aldicarb Sulfoxide	ND	3.0	µg/L	1.0	1/16/09	1/17/09
Aldicarb Sulfone	ND	4.0	µg/L	1.0	1/16/09	1/17/09
Oxamyl	ND	5.0	µg/L	1.0	1/16/09	1/17/09
Methomyl	ND	2.0	µg/L	1.0	1/16/09	1/17/09
3-OH-Carbofuran	ND	3.0	µg/L	1.0	1/16/09	1/17/09
Aldicarb	ND	3.0	µg/L	1.0	1/16/09	1/17/09
Propoxur	ND	5.0	µg/L	1.0	1/16/09	1/17/09
Carbofuran	ND	5.0	µg/L	1.0	1/16/09	1/17/09
Carbaryl	ND	5.0	µg/L	1.0	1/16/09	1/17/09
Methiocarb	ND	5.0	µg/L	1.0	1/16/09	1/17/09
Surrogate: BDMC	98.6	76.8-114	% Rec	1.0	1/16/09	1/17/09

NORTH COAST LABORATORIES
5680 West End Road • Arcata, California 95521-9202 • 707-822-4649 • FAX 707-822-6831
Printed on Recycled Paper

SUBCONTRACT ORDER

E.S. Babcock & Sons, Inc.

A9A0976

0901212

SENDING LABORATORY:

E.S. Babcock & Sons, Inc.
P. O. Box 432
Riverside, CA 92502-0432
Phone: (951) 653-3351
Fax: (951) 653-1662
Project Manager: Hsin-Yi Lee

RECEIVING LABORATORY:

North Coast Labs - Subcontract
5680 West End Road
Arcata, CA 95521
Phone :(707) 822-4649
Fax: (707) 822-6831

Copy/Relog from A9A0975.
Client: RBF Consulting - Irvine
Sampler: Diane Smith

Analysis	Due	Expires Regulatory Days Past Date Sampled	Laboratory ID	Comments
Sample ID: A9A0976-01	**Water**	**Sampled:01/13/09 08:00**	**IRWD Well 22 Title 22**	***Proj.No.:*IRWD Rehab Constant Discharge Test**
549-Diquat	01/22/09 17:00	01/20/09 08:00		
547 RC	02/10/09 17:00	01/27/09 08:00		
531 ✓ 1/14	02/10/09 17:00	02/10/09 08:00		
Containers Supplied:				
Quart Poly - Unpres (D)	Voa Vial -Unpres (E)	Voa Vial -Unpres (F)	Voa Vial MCAA, Na2S2O3	Voa Vial MCAA, Na2S2O3

All Containers Intact: X Yes ____ No Samples Preserved Properly: X Yes ____ No

Samples Received at 0.8 oC Sample Lables / COC Agree: ____ Yes X No Custody Seals Present: ____ Yes ✓ No

An acknowledgement of sample receipt is requested. Please reply to slozon@babcocklabs.com or Fax to 951-653-1662. Thank You.

Released By	Date	Received By	Date
Sharon Lozon	1-13-09	[signature]	1/14/09 1045
			0.8°C
Released By	Date	Received By	Date

Pace Analytical Services, Inc.
1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

www.pacelabs.com

Report Prepared for:

Cathy Iijima
Edward S. Babcock & Sons, Inc.
6100 Quail Valley Court
Riverside CA 92507

REPORT OF LABORATORY ANALYSIS FOR 2,3,7,8-TCDD

Report Summary:

This report contains results of one drinking water sample analyzed to determine 2,3,7,8-TCDD content. This sample was analyzed according to Method 1613 by High Resolution Gas Chromatography/High Resolution Mass Spectrometry.

Report Prepared Date:

January 22, 2009

Report Information:

Pace Project #: 1087647
Sample Receipt Date: 01/14/2009
Client Project #: A9A0976
Client Sub PO #: N/A
State Cert #: 01155CA

Invoicing & Reporting Options:

The report provided has been invoiced as a Level 2 Drinking Water Report. If an upgrade of this report package is requested, an additional charge may be applied.

Please review the attached invoice for accuracy and forward any questions to Nate Habte, your Pace Project Manager.

This report has been reviewed and prepared by:

For Nate Habte

Nate Habte, Project Manager
(612) 607-6407
(612) 607-6444 (fax)
natnael.habte@pacelabs.com

ACCREDITED IN ACCORDANCE WITH nelac

Report of Laboratory Analysis

This report should not be reproduced, except in full, without the written consent of Pace Analytical Services, Inc.

The results relate only to tbe samples included in this report.

1146

SUBCONTRACT ORDER

E.S. Babcock & Sons, Inc.

A9A0976

1087647

SENDING LABORATORY:

E.S. Babcock & Sons, Inc.
P. O. Box 432
Riverside, CA 92502-0432
Phone: (951) 653-3351
Fax: (951) 653-1662
Project Manager: Hsin-Yi Lee

RECEIVING LABORATORY:

Pace Analytical - Subcontract
1700 Elm Street SE, Suite 200
Minneapolis, MN 55414
Phone :(612) 607-6383
Fax: 9612) 607-6444

Copy/Relog from A9A0975.
Client: RBF Consulting - Irvine
Sampler: Diane Smith

Analysis	Due	Expires Regulatory Days Past Date Sampled	Laboratory ID	Comments
Sample ID: A9A0976-01	**Water**	**Sampled:01/13/09 08:00**	**IRWD Well 22 Title 22**	***Proj.No.:*** **IRWD Rehab Constant Discharge Test**
Dioxin	02/10/09 17:00	02/10/09 08:00		
Containers Supplied: 1L Amber- Unpres. (C)				

DLW, no state form required, as per Hsin-Yi Lee 1/16/09 NH @17:30

All Containers Intact: ✓ Yes ____ No Samples Preserved Properly: ✓ Yes ____ No

Samples Received at 4.4 °C Sample Lables / COC Agree: ✓ Yes ____ No Custody Seals Present: ✓ Yes ____ No

An acknowledgement of sample receipt is requested. Please reply to slozon@babcocklabs.com or Fax to 951-653-1662. Thank You.

Released By	Date	Received By	Date
Sharon Lozon	1-13-09	Pace	1/14/09 0940

Sample Condition Upon Receipt

Pace Analytical

Client Name: Es back Project # 1687647

Courier: ☐ Fed Ex ☒ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 1Z5781X9014753499 6

Optional
Proj. Due Date:
Proj. Name:

Custody Seal on Cooler/Box Present: ☐ yes ☒ no Seals intact: ☐ yes ☒ no

Packing Material: ☐ Bubble Wrap ☒ Bubble Bags ☐ None ☐ Other _____ Temp Blank: Yes ____ No X

Thermometer Used 36944042, 179425 Type of Ice: Wet (Blue) None ☐ Samples on Ice, cooling process has begun

Cooler Temperature 4.4 1149 Biological Tissue is Frozen: Yes No

Date and Initials of person examining contents: 1/14/09

Temp should be above freezing to 6°C Comments:

Chain of Custody Present: 4.4	☒Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☒Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☒Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☐Yes ☒No ☐N/A	4.
Samples Arrived within Hold Time:	☒Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☒No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☒No ☐N/A	7.
Sufficient Volume:	☒Yes ☐No ☐N/A	8.
Correct Containers Used:	☒Yes ☐No ☐N/A	9.
-Pace Containers Used:	☐Yes ☒No ☐N/A	
Containers Intact:	☒Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☒N/A	11.
Sample Labels match COC:	☒Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: WT		
All containers needing acid/base preservation have been checked. Noncompliance are noted in 13.	☐Yes ☐No ☒N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☒N/A	
Exceptions: VOA,Coliform, TOC, Oil and Grease, WI-DRO (water)	☐Yes ☒No	Initial when completed / Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☒N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☒N/A	15.
Trip Blank Present:	☐Yes ☐No ☒N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☒N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: NAH Date: 1/14/09

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

1/14/09

Pace AnalyticalServices, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612-607-6444

Drinking Water Analysis Results
2,3,7,8-TCDD -- USEPA Method 1613B

Sample ID.....A9A0976-01
Client.....Edward S. Babcock & Sons, Inc.
Lab Sample ID.....1087647001

Date Collected.....01/13/2009
Date Received.....01/14/2009
Date Extracted.....01/20/2009

	Sample A9A0976-01	Method Blank	Lab Spike	Lab Spike Dup
[2,3,7,8-TCDD]	**ND**	ND	--	--
RL	5 pg/L	5 pg/L	--	--
2,3,7,8-TCDD Recovery	--	--	100%	101%
Spike Recovery Limit	--	--	73-146%	73-146%
RPD			0.5%	
IS Recovery	**80%**	58%	65%	51%
IS Recovery Limits	31-137%	31-137%	25-141%	25-141%
CS Recovery	**81%**	91%	85%	86%
CS Recovery Limits	42-164%	42-164%	37-158%	37-158%
Filename	R90122A03	P90121C_12	P90121C_07	P90121C_08
Analysis Date	01/22/2009	01/21/2009	01/21/2009	01/21/2009
Analysis Time	09:43	23:30	21:14	21:41
Analyst	JB		BAL	BAL
Volume	0.955L	0.905L	0.891L	0.894L
Dilution	NA	NA	NA	NA
ICAL Date	12/31/2008	07/01/2008	07/01/2008	07/01/2008
CCAL Filename	R90122A01	P90121C_02	P90121C_02	P90121C_02

! = Outside the Control Limits
ND = Not Detected
RL = Reporting Limit
Limits = Control Limits from Method 1613 (10/94 Revision), Tables 6A and 7A
RPD = Relative Percent Difference of Lab Spike Recoveries
IS = Internal Standard [2,3,7,8-TCDD-$^{13}C_{12}$]
CS = Cleanup Standard [2,3,7,8-TCDD-$^{37}Cl_4$]

Analyst: Julie Brenner

Project No.....1087647

TRUESDAIL LABORATORIES, INC.

EXCELLENCE IN INDEPENDENT TESTING

Established 1931

14201 FRANKLIN AVENUE
TUSTIN, CALIFORNIA 92780-7008
(714) 730-6239 · FAX (714) 730-6462
www.truesdail.com

REPORT

Client: **E.S. Babcock & Sons, Inc.**
6100 Quail Valley Court
Riverside, CA 92507
Attention: Hsin-Yi Lee

Report Date: January 22, 2009
Date Received: January 14, 2009
Laboratory No: **981117**

Sample: Water
Project No: **A9A0976**
Investigation: **Gross Alpha Activity**

Analytical Results

Sample ID	Analysis	Method	Activity pCi/L	Two Sigma Error	MDA	Date Analyzed
A9A0976-01	Alpha	SM7110C	1.49	+/- 0.98	1.53	01/19/09

Gross Alpha results are based on a Uranium calibration curve.

QC Results

Batch ID	Analysis	Method	Activity pCi/L	Two Sigma Error	True Value	Recovery %
09C-01-E	Alpha	SM7110C	31.1	+/- 3.22	29.2	107

Respectfully submitted,
TRUESDAIL LABORATORIES, INC

Rossina Tomova, Project Manager
Radiochemistry Group

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from Truesdail Laboratories.

981117

SUBCONTRACT ORDER

E.S. Babcock & Sons, Inc.

A9A0976

Rec'd 01/14/09
s3d 981117

SENDING LABORATORY:

E.S. Babcock & Sons, Inc.
P. O. Box 432
Riverside. CA 92502-0432
Phone: (951) 653-3351
Fax: (951) 653-1662
Project Manager: Hsin-Yi Lee

RECEIVING LABORATORY:

Truesdail Laboratories - Subcontract
14201 Franklin Avenue
Tustin, CA 92780
Phone :(714) 730-6239
Fax: (714) 730-6462

Copy/Relog from A9A0975.
Client: RBF Consulting - Irvine
Sampler: Diane Smith

Analysis	Due	Expires Regulatory Days Past Date Sampled	Laboratory ID	Comments
Sample ID: A9A0976-01	**Water**	**Sampled:01/13/09 08:00**	**IRWD Well 22 Title 22**	***Proj.No.:*** **IRWD Rehab Constant Discharge Test**
Radio-Gross Alpha	02/10/09 17:00	07/12/09 08:00		
Containers Supplied:				
Quart Poly - HNO3 (A)				

Sample Condition
See Form A

All Containers Intact: _____ Yes _____ No Samples Preserved Properly: _____ Yes _____ No

Samples Received at _____ oC Sample Lables / COC Agree: _____ Yes _____ No Custody Seals Present: _____ Yes _____ No

An acknowledgement of sample receipt is requested. Please reply to slozon@babcocklabs.com or Fax to 951-653-1662. Thank You.

Released By	Date	Received By	Date
Sharon Lozon	1-13-09	H.L. T.L.	1-14-09 1010

Page 1 of 1

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906
6100 Quail Valley Court Riverside, CA 92507
(951) 653-3351 • FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Barken Meserlian
Fax No.
Phone No. (949) 472-3413
email: bmeserlian@rbf.com
Project Name: IRWD Wells 21 + 22 Rehab
Project Location: Well 22 - 1251 Mitchell Tustin
Turn Around Time: Routine *72 Hour Rush *48 Hour Rush *24 Hour Rush
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience Support Svcs
Signature: Diane Smith

Matrix: DW = Drinking Water, WW = Waste Water, GW = Ground Water, S = Soil, SG = Sludge, L = Liquid, M = Miscellaneous

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Total # of Containers	Routine	Resample	Special	Title 22	Calif Uranium	Silica	Selenium	Matrix	Notes
IRWD Well 22 Title 22	1/13/09	8:00AM														✓	✓	✓	✓	GW	1) See attached list for analyses
																					2) Gas bubble in water created effervescence in VOAs

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith/Geoscience	1/13/09 11:35am	Angie Brown	Angie Brown/ESB

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? (Yes) No
Custody Seal(s) Intact? Yes No (NA)
Sample(s) Intact? (Yes) No
Temperature 2 °C
☐ Cooler Blank

Lab Notes

Lab No. A9A0976 AB

Page 1 of 1

JAN 13 2009

Rev. 6/07

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est. 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 02-Feb-2009

Analytical Report: Page 1 of 6
Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1617

Received on Ice (Y/N): Yes Temp: 1 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A9A1617-01	IRWD Well 22 Zone 2 (872'-970')	Water	01/19/09 17:00	Diane Smith	01/20/09 11:15	Diane Smith

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 02-Feb-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1617
Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1617-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 2 (872'-970')	Water	01/19/09 17:00	01/20/09 11:15

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	440	3.0	mg/L	SM 3120B	01/29/09 14:52	lmt	
Calcium	120	1.0	mg/L	EPA 200.7	01/29/09 14:52	lmt	
Magnesium	34	1.0	mg/L	EPA 200.7	01/29/09 14:52	lmt	
Sodium	57	1.0	mg/L	EPA 200.7	01/29/09 14:52	lmt	
Potassium	2.1	1.0	mg/L	EPA 200.7	01/29/09 14:52	lmt	
Anions							
Total Alkalinity	210	3.0	mg/L	SM 2320B	01/26/09 21:08	je	
Hydroxide	ND	3.0	mg/L	SM 2320B	01/26/09 21:08	je	
Carbonate	ND	3.0	mg/L	SM 2320B	01/26/09 21:08	je	
Bicarbonate	250	3.0	mg/L	SM 2320B	01/26/09 21:08	je	
Chloride	110	1.0	mg/L	EPA 300.0	01/20/09 22:40	SBD	
Sulfate	160	0.50	mg/L	EPA 300.0	01/20/09 22:40	SBD	
Nitrate	54	1.0	mg/L	EPA 300.0	01/20/09 22:40	SBD	
Aggregate Properties							
pH	7.4	1.0	pH Units	SM 4500H+ B	01/20/09 20:41	ara	
Specific Conductance	1100	1.0	umhos/cm	SM 2510 B	01/20/09 20:41	ara	
Solids							
Total Dissolved Solids	710	20	mg/L	SM 2540C	01/22/09 09:46	jma	
Aggregate Organic Compounds							
Total Organic Carbon	ND	0.30	mg/L	SM 5310B	01/29/09 09:51	krv	

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 02-Feb-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1617

Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1617-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 2 (872'-970')	Water	01/19/09 17:00	01/20/09 11:15

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
General Physical							
Color	ND	3.0	Color Units	SM 2120B	01/20/09 19:41	jkn	
Odor	ND	1.0	T.O.N.*	SM 2150	01/20/09 19:41	jkn	
Turbidity	0.83	0.20	NTU	SM 2130 B	01/20/09 19:41	jkn	
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	01/20/09 15:30	ara	
General Inorganics							
Perchlorate	ND	4.0	ug/L	EPA 314.0	01/22/09 02:27	AA	
Metals and Metalloids							
Copper	ND	50	ug/L	EPA 200.7	01/29/09 14:53	lmt	
Iron	ND	100	ug/L	EPA 200.7	01/29/09 14:53	lmt	
Manganese	ND	20	ug/L	EPA 200.7	01/29/09 14:53	lmt	
Zinc	ND	50	ug/L	EPA 200.7	01/29/09 14:53	lmt	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	

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Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 02-Feb-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1617
Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1617-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 2 (872'-970')	Water	01/19/09 17:00	01/20/09 11:15

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
2-Butanone(MEK-EPA 8260)	ND	5.0	ug/L	EPA 524.2	01/28/09 15:24	jes	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	01/28/09 15:24	jes	
Benzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Bis(2-chloroethyl)ether (Non-NELAP)	ND	5.0	ug/L	EPA 524.2	01/28/09 15:24	jes	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Bromoform	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Bromomethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Chloroethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Chloroform	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Chloromethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	01/28/09 15:24	jes	

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est. 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 02-Feb-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1617
Received on Ice (Y/N): Yes Temp: 1 °C

Laboratory Reference Number
A9A1617-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
IRWD Well 22 Zone 2 (872'-970')	Water	01/19/09 17:00	01/20/09 11:15

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Naphthalene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Styrene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Toluene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	01/28/09 15:24	jes	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	01/28/09 15:24	jes	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	01/28/09 15:24	jes	
Surrogate: 1,2-Dichloroethane-d4	112	% 50-150		EPA 524.2	01/28/09 15:24	jes	
Surrogate: Bromofluorobenzene	98.9	% 50-150		EPA 524.2	01/28/09 15:24	jes	
Surrogate: Toluene-d8	95.7	% 50-150		EPA 524.2	01/28/09 15:24	jes	

* NELAP does not offer accreditation for this analyte/method/matrix combination

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

Client Name: RBF Consulting - Irvine
Contact: Barkev Meserlian
Address: 14725 Alton Pkwy.
Irvine, CA 92618

Report Date: 02-Feb-2009

Project Name: RBF-IRWD Rehab Zone Isola
Project Number: IRWD Rehab Zone Isolation T

Work Order Number: A9A1617

Received on Ice (Y/N): Yes Temp: 1 °C

Notes and Definitions

pH: Regulatory 15 minute holding time exceeded A9A1617-01

ND: Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit

MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☒ Hsin-Yi Lee
Project Manager

☐ Allison Mackenzie
General Manager

☐ Lawrence J. Chrystal
Laboratory Director

cc:

ESB_Short_.Report

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Environmental Laboratories est 1906

6100 Quail Valley Court Riverside, CA 92507
(951) 653-3351 • FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody & Sample Information Record

Client: RBF Consulting
Contact: Barker Meseddion
Fax No.
Phone No. (949) 472-3413
email: bmeseddion@rbf.com
Project Name: IRWD Well Rehab
Project Location: Well 22 - 125 Mitchell Tustin, CA
Turn Around Time: (Routine) *72 Hour Rush *48 Hour Rush *24 Hour Rush
*Lab TAT Approval: By: *Additional Charges Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Diane Smith
Employer: Geoscience Support Svcs
Signature: Diane Smith

Sample ID	Date	Time	Unpreserved	H_2SO_4	HCl	HNO_3	$Na_2S_2O_3$	NaOH	NaOH/Zn Acetate	NH_4Cl	MCAA	Travel Blank	Total # of Containers	Routine	Resample	Special	Gen Mineral	Gen Physical	Metals	Perchlorate	TOC	SO_4, Z				Matrix	Notes
IRWD Well 22 Zone 2 ~~(821'-970')~~ (812'-970')	1/19/09	5:00PM	1	3	3	1						1	9	✓			✓	✓	✓	✓	✓	✓				GW	1) Small amount of gas in discharge 2) See Attached

TB Rec'd

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (sign)	Print Name / Company
Diane Smith	Diane Smith / Geoscience	1/20/09 1115	[signature]	[signature]

(For Lab Use Only) Sample Integrity Upon Receipt

Sample(s) Submitted on Ice? Yes No Temperature
Custody Seal(s) Intact? Yes No NA °C
Sample(s) Intact? Yes No ☐ Cooler Blank

Lab Notes

Lab No. A9A1617AB

Page 1 of 1

JAN 20 2009

Rev. 6/07

IRVINE RANCH WATER DISTRICT
Rehabilitation of Wells 21 and 22

Table 1
Proposed Water Quality Tests for Well 21

Test	Sampling	Tentative Schedule	No. of Samples
1- Full Title 22	Last hour of the Constant Discharge Test	Mid/Late October	1 [1]
1.1- Silica	Last hour of the Constant Discharge Test	Mid/Late October	
1.2- Selenium	Last hour of the Constant Discharge Test	Mid/Late October (Between October 13 and 24 for Well 22 [1])	
2- General Mineral and Physical (two zones)	Towards the end of the Zone Isolation Tests	Mid/Late October	2
2.1-VOC EPA 524.2	Towards the end of the Zone Isolation Tests	Mid/Late October	
Total			**3 [1]**

[1] Based on OCSD permit Requirements, Selenium must be sampled between October 13 and October 24. If these dates do not coincide with the Constant Discharge Test, a separate sample will be sent to Babcock for Selenium testing only, in which case the total samples for Well 21 will be 4

Table 2
Proposed Water Quality Tests for Well 22

Test	Sampling	Tentative Schedule	No. of Samples
1- Full Title 22	Last hour of the Constant Discharge Test	Late November/ Early December	1
1.1- Silica	Last hour of the Constant Discharge Test	Late November/ Early December	
1.2- Selenium	Last hour of the Constant Discharge Test	Late November/ Early December	
2- General Mineral and Physical (two zones)	Towards the end of the Zone Isolation Tests	Late November/ Early December	2
2.1-VOC EPA 524.2 plus TOC perchlorate	Towards the end of the Zone Isolation Tests	Late November/ Early December	
Total			**3**

1/19/09

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APPENDIX B

MCAS TREATMENT PLANT SITE EVALUATION (FROM MAY 2009 WELLS 21 AND 22 DRAFT PDR)

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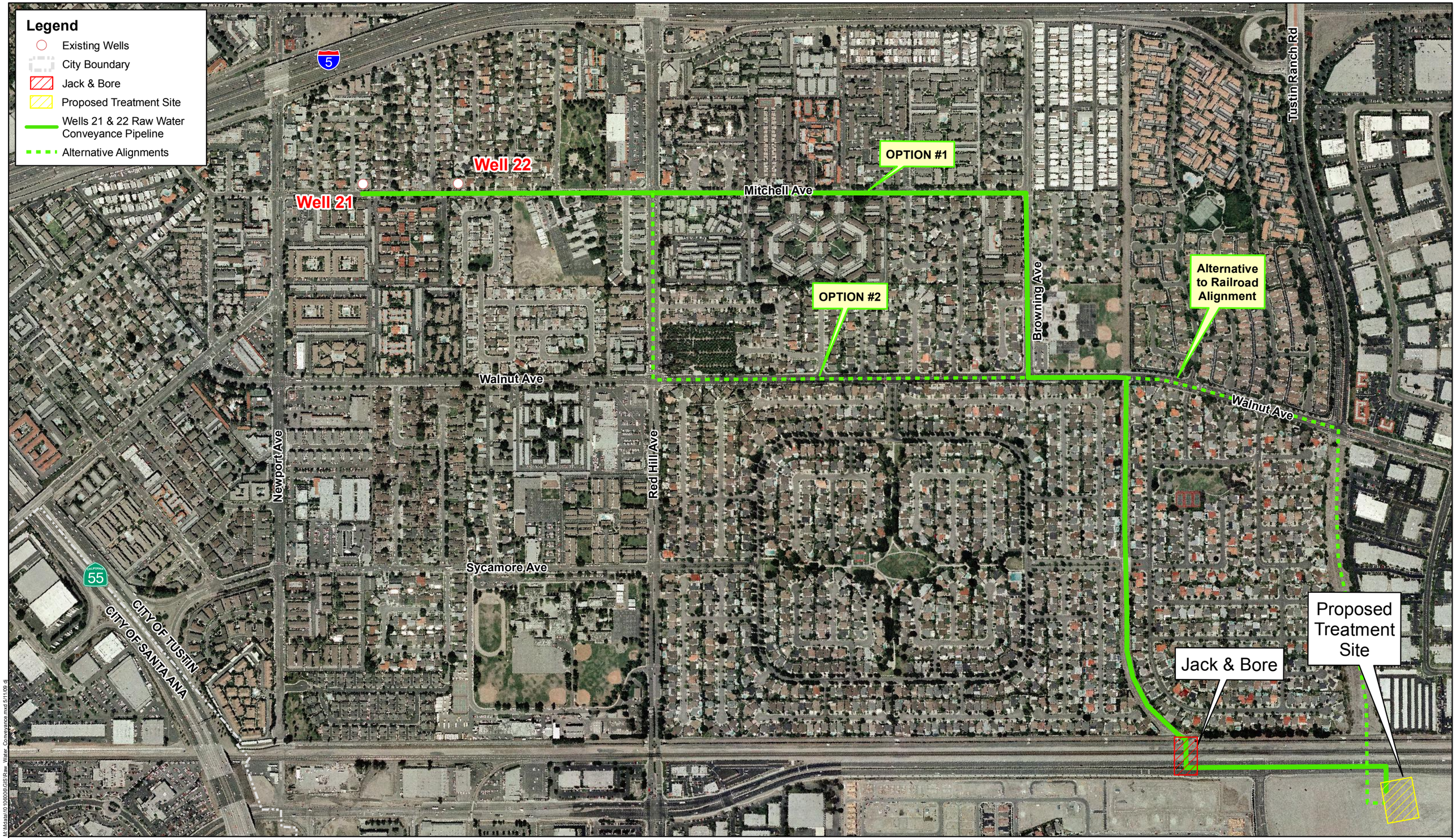


RBF CONSULTING GIS

Source: ESRI Online

0 500 1,000 Feet

IRVINE RANCH WATER DISTRICT

IRWD Wells 21& 22

Figure 4-13: Raw Water Conveyance Pipeline

M:\Mdata\1010606\GIS\Finished_Water_Transmission.mxd 4/1/09 dj

RBF CONSULTING GIS

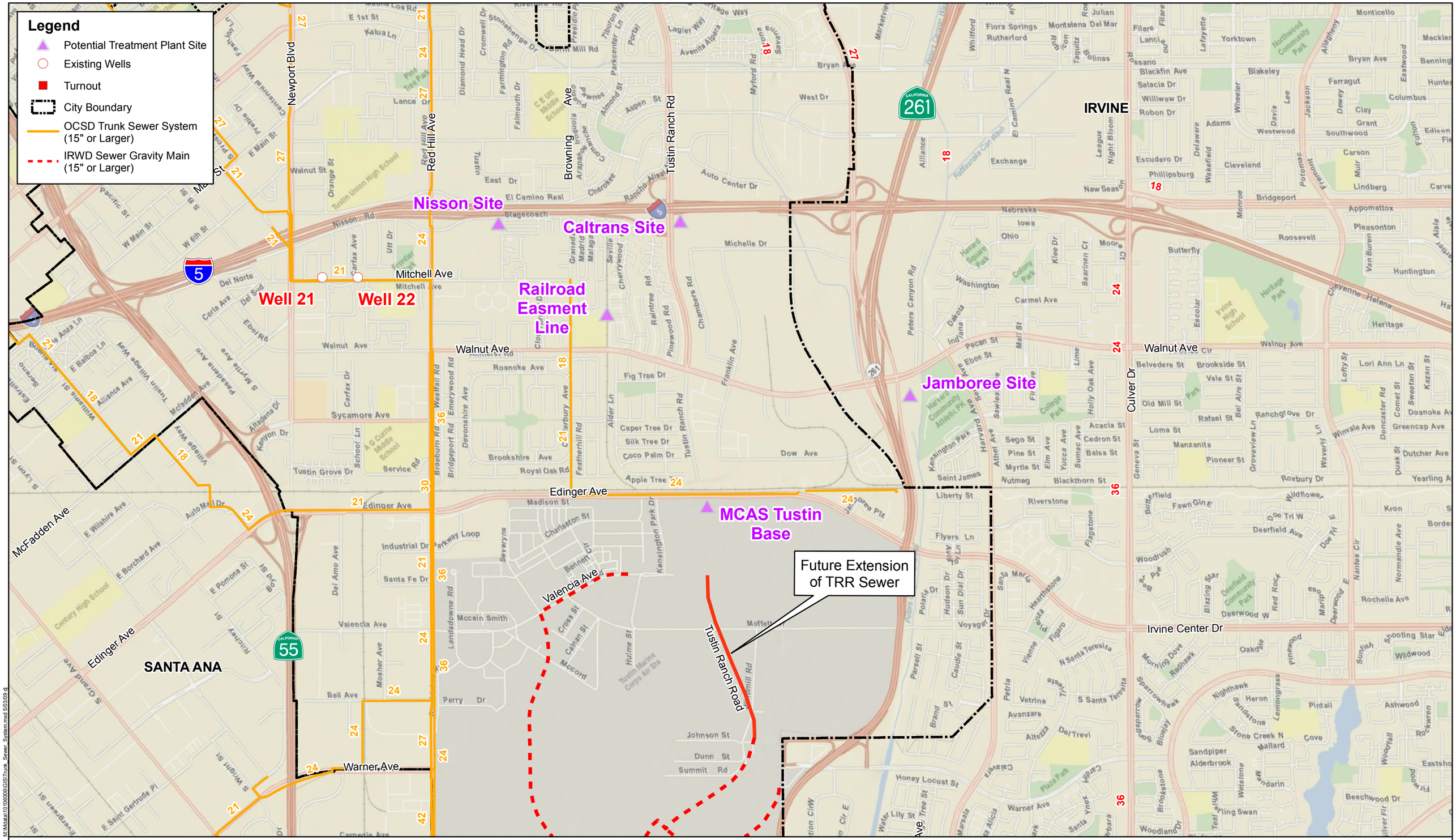
0 500 1,000 Feet

Source: ESRI Online

IRVINE RANCH WATER DISTRICT

IRWD Wells 21& 22

Figure 4-16: Finished Water Transmission Pipeline

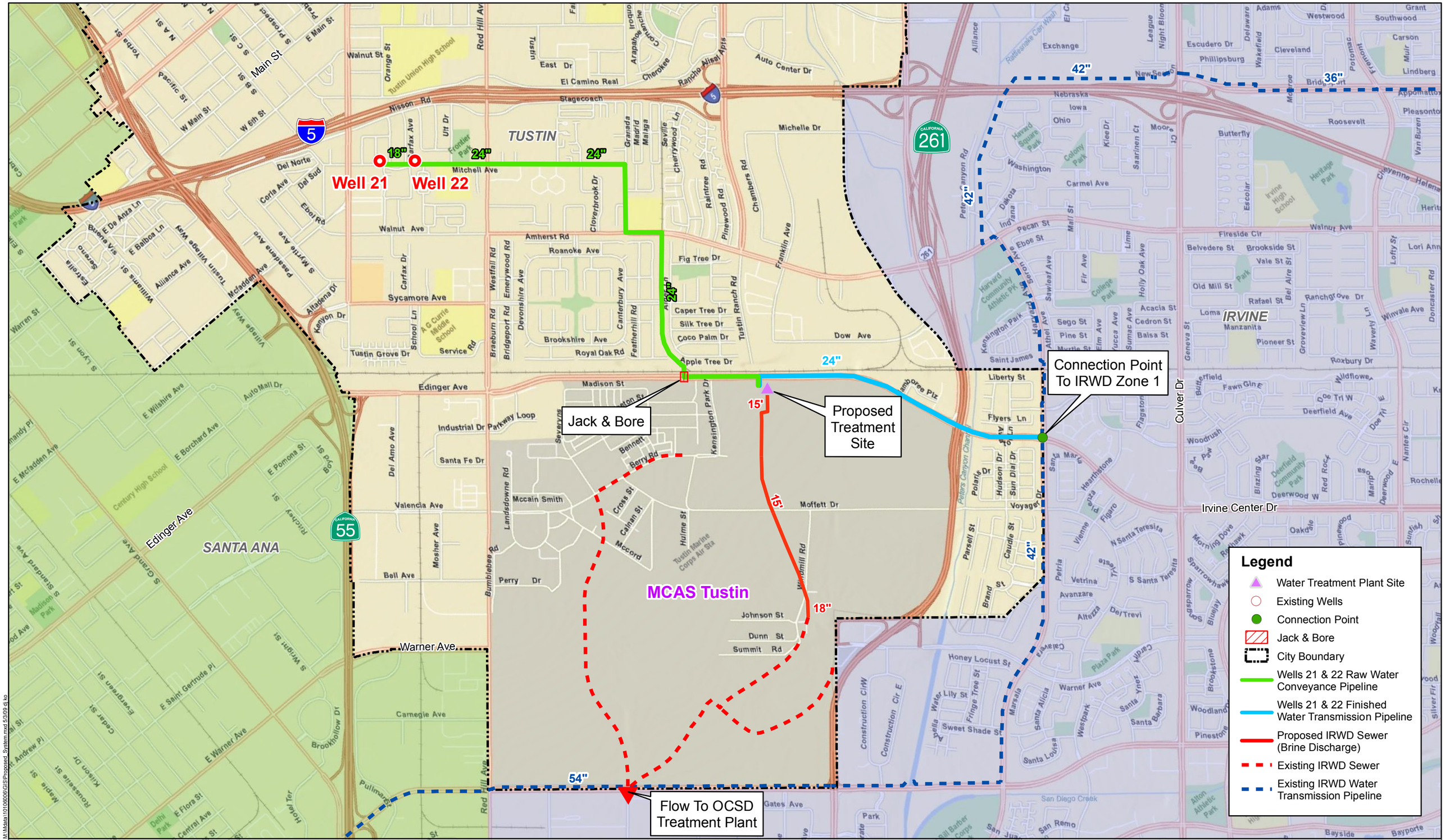


Source: ESRI Online

0 0.5 1 Miles

IRWD Wells 21& 22

Figure 4-18: Trunk Sewer System

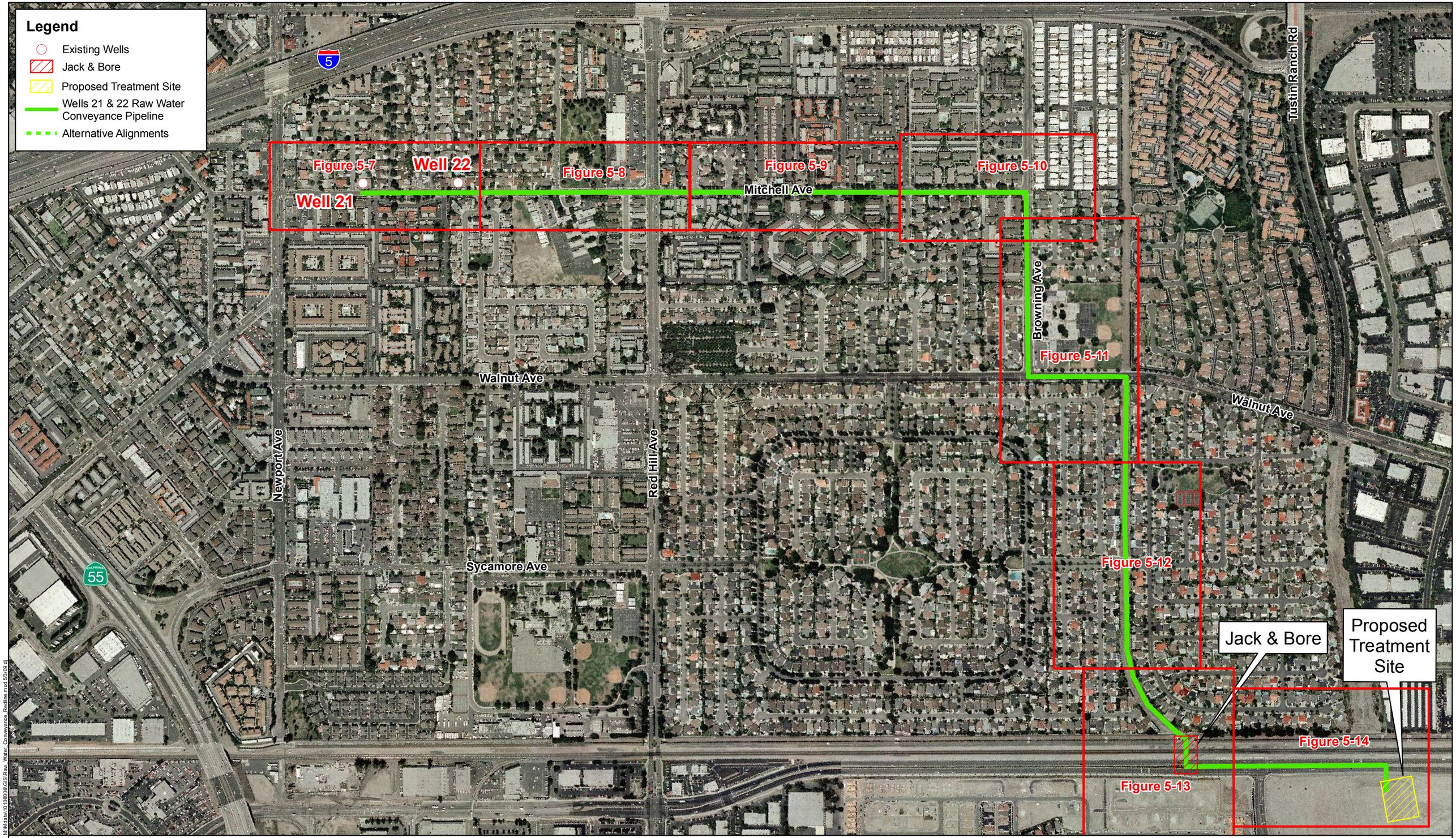


Source: ESRI Online

0 0.5 1
Miles

IRWD Wells 21 & 22

Figure 4-19: Proposed System (Base Project)



RBF CONSULTING GIS

Source: ESRI Online

0 500 1,000 Feet

IRVINE RANCH WATER DISTRICT

IRWD Wells 21& 22

Figure 5-6: Raw Water Conveyance Pipeline

M:\Mdata\10106006\GIS\Raw_Water_Conveyance_Redline.mxd 5/3/09 dj

100 0 100 200 300

SCALE: 1"=100'

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WELLS 21 AND 22

RAW WATER CONVEYENCE PIPELINE
MITCHELL AVENUE-1

FIGURE

5-7

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 PDR REPORT\6006-EXB-5-7.DWG DDT 5/5/09 4:38 pm

100 0 100 200 300

SCALE: 1"=100'

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WELLS 21 AND 22

RAW WATER CONVEYENCE
PIPELINE
MITCHELL AVENUE

FIGURE

5-8

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 PDR REPORT\6006-EXB-5-2.DWG DDT 5/5/09 4:44 pm

100 0 100 200 300

SCALE: 1"=100'

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WELLS 21 AND 22

RAW WATER CONVEYENCE PIPELINE
MITCHELL AVENUE

FIGURE
5-9

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 PDR REPORT\6006-EXB-5-9.DWG DDT 5/5/09 4:17 pm

100 0 100 200 300

SCALE: 1"=100'

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WELLS 21 AND 22

RAW WATER CONVEYENCE PIPELINE
MITCHELL/BROWNING AVENUE

FIGURE
5-10

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 PDR REPORT\6006-EXB-5-10.DWG DDT 5/5/09 4:20 pm

100 0 100 200 300

SCALE: 1"=100'

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WELLS 21 AND 22

RAW WATER CONVEYENCE PIPELINE
BROWNING / WALNUT AVENUE

FIGURE
5-11

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 PDR REPORT\6006-EXB-5-11.DWG DDT 5/5/08 4:25 pm

100 0 100 200 300

SCALE: 1"=100'

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WELLS 21 AND 22

RAW WATER CONVEYENCE
PIPELINE
RAILROAD EASEMENT

FIGURE
5-12

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 PDR REPORT\6006-EXB-5-12.DWG DDT 5/5/09 4:50 pm

100 0 100 200 300

SCALE: 1"=100'

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WELLS 21 AND 22

RAW WATER CONVEYENCE PIPELINE
R/R ESM'T/ EDINGER AVE.

FIGURE
5-13

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 POR REPORT\6006-EXB-5-13.DWG DDT 5/5/09 4:54 pm

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 PDR REPORT\6006-FIG-5-14.DWG JABDI 5/12/09 8:21 am

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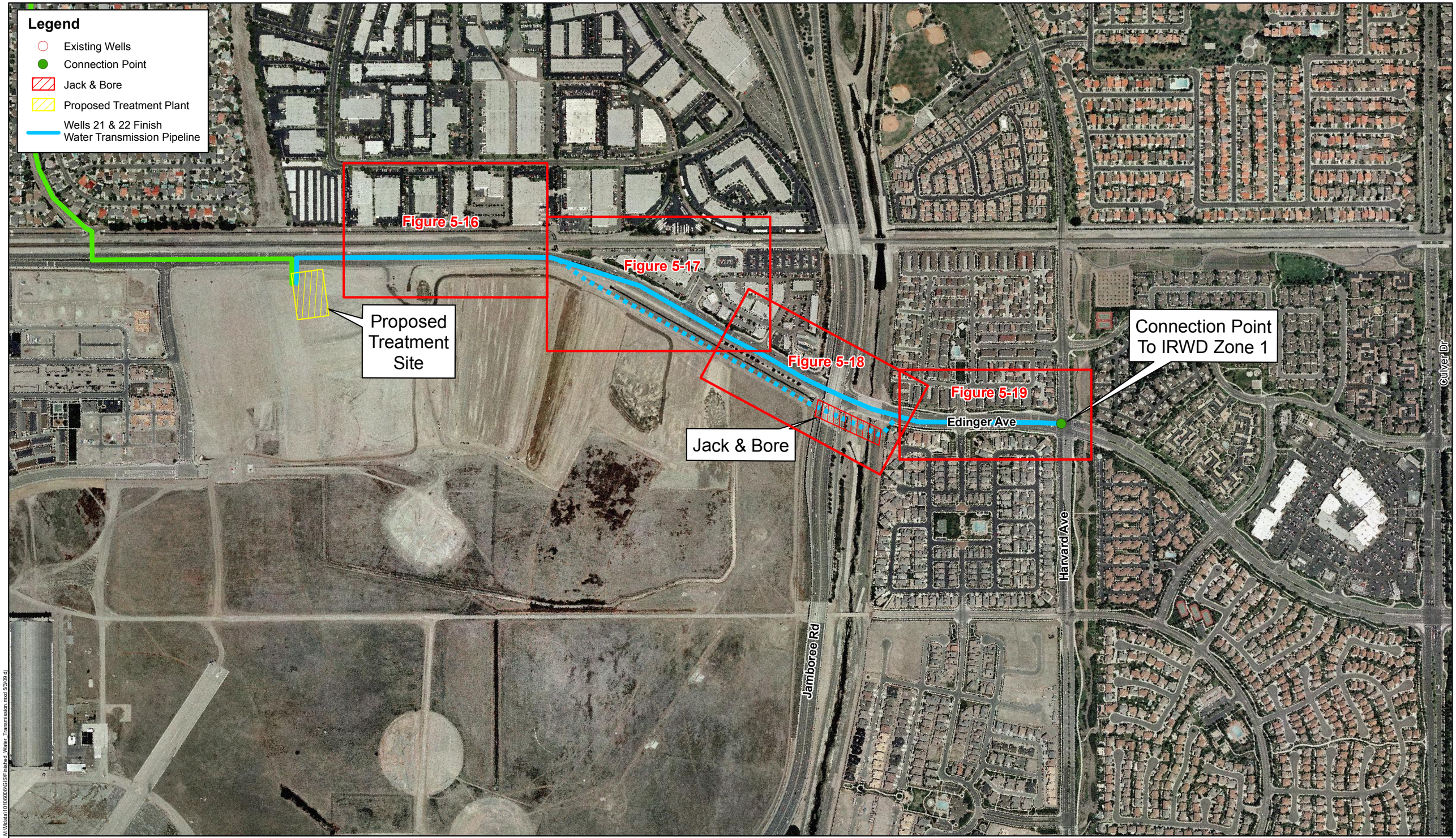
WELLS 21 AND 22

RAW WATER CONVEYENCE
PIPELINE
EDINGER AVENUE

FIGURE
5-14



M:\Mdata\1010606\GIS\Finished_Water_Transmission.mxd 5/3/09 dj

RBF CONSULTING GIS

Source: ESRI Online

0 500 1,000 Feet

IRVINE RANCH WATER DISTRICT

IRWD Wells 21& 22

Figure 5-15: Finished Water Transmission Pipeline

100 0 100 200 300

SCALE: 1"=100'

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WELLS 21 AND 22

FINISHED WATER CONVEYENCE PIPELINE
EDINGER AVENUE

FIGURE

5-16

H:\PDATA\101060\06\CADD\WATER\EXHIBITS\WELLS 21-22 PDR REPORT\6006-EX8-5-16.DWG DDT 5/6/09 8:25 am

100 0 100 200 300

SCALE: 1"=100'

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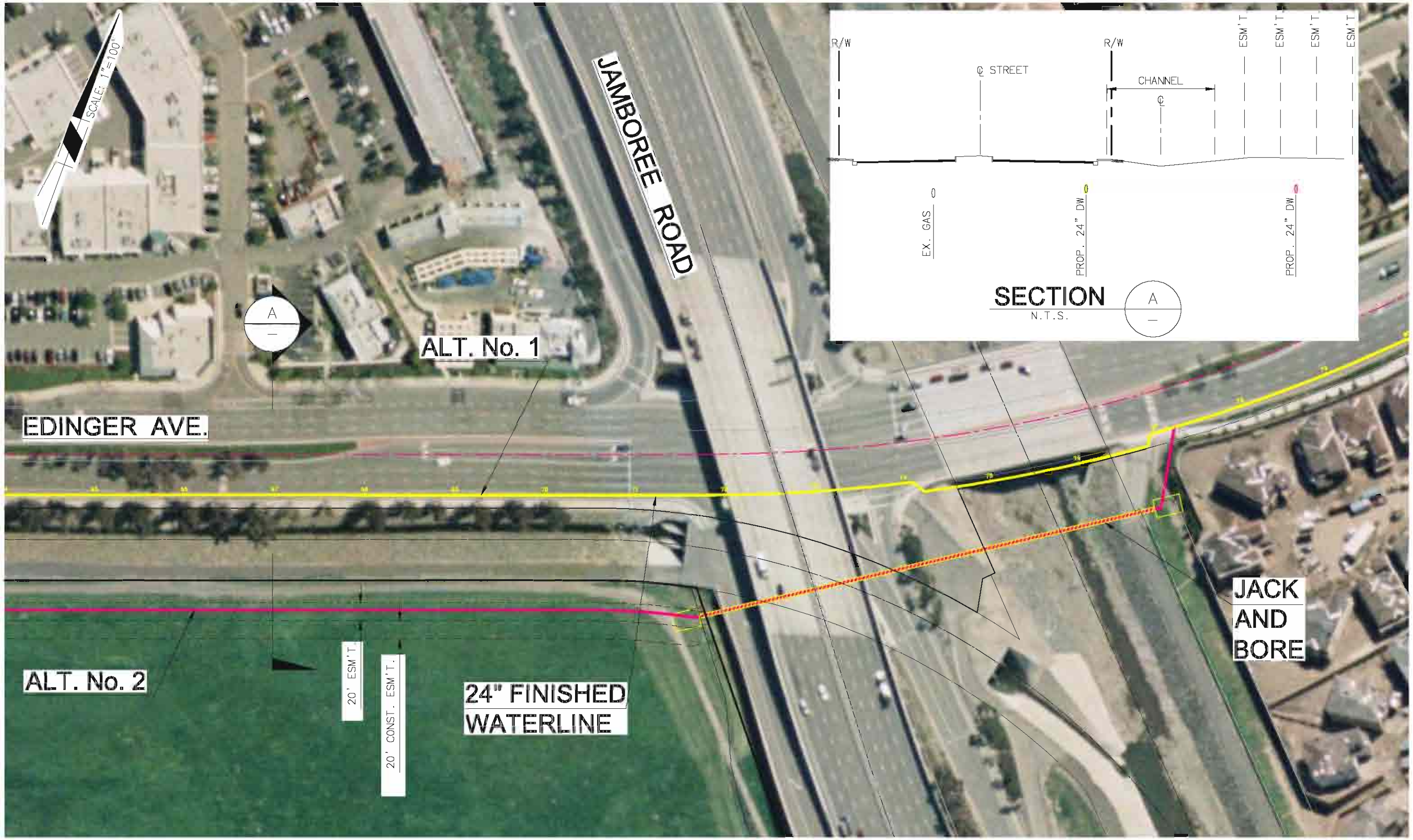
WELLS 21 AND 22

FINISHED WATER CONVEYENCE PIPELINE
EDINGER AVENUE

FIGURE
5-17

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 PDR REPORT\6006-EXB-5-17.DWG DDT 5/6/09 8:29 am



100 0 100 200 300

SCALE: 1"=100'

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WELLS 21 AND 22

FINISHED WATER CONVEYENCE PIPELINE
EDINGER AVENUE

FIGURE

5-18

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 PDR REPORT\6006-EXB-5-18.DWG DDT 5/5/09 4:34 pm

100 0 100 200 300

SCALE: 1"=100'

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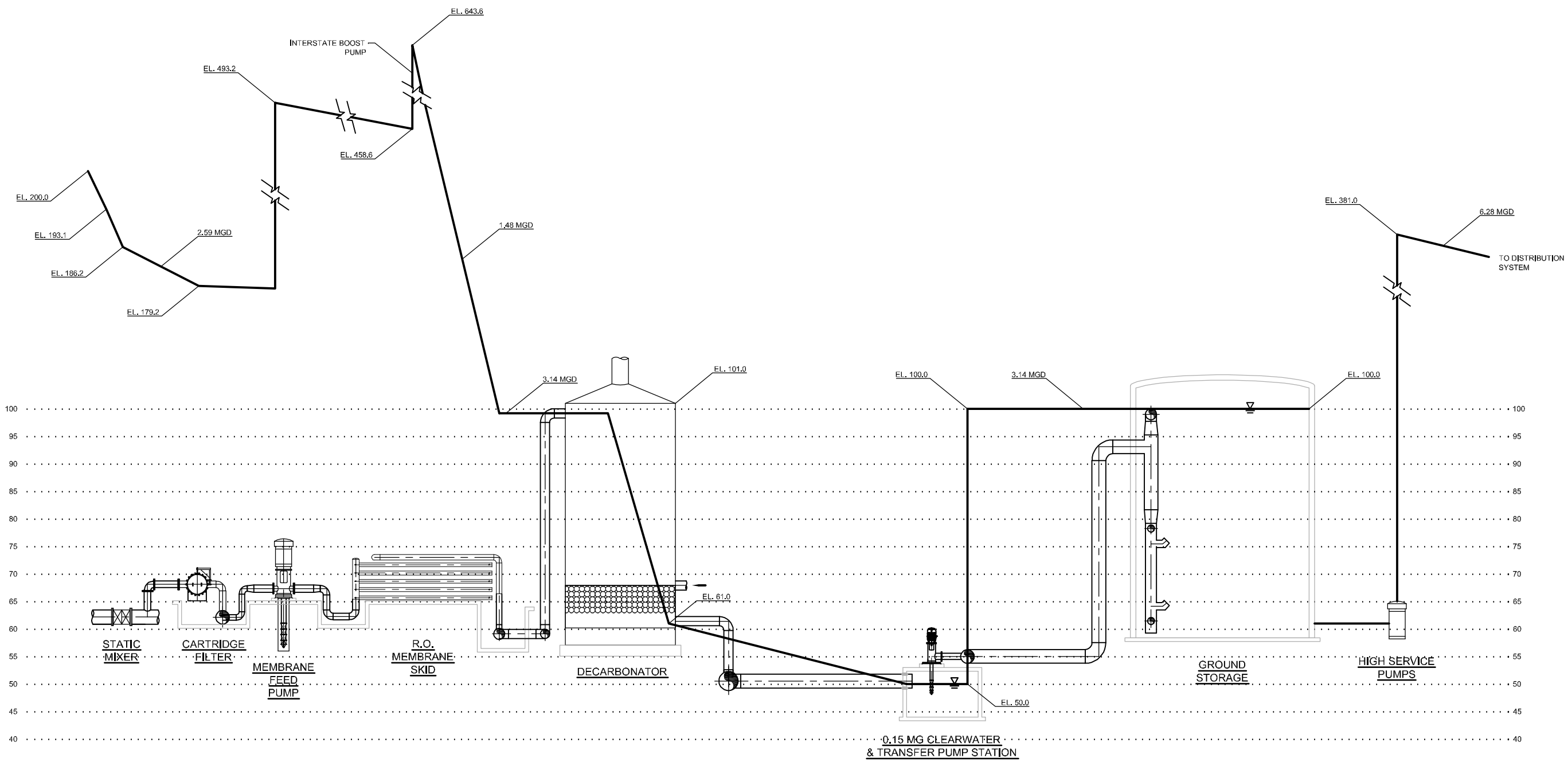
WELLS 21 AND 22

24" WATER
TRANSMISSION MAIN

FIGURE
5-19

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 PDR REPORT\6006-EXB-5-19.DWG DDT 5/6/09 8:36 am



HYDRAULIC PROFILE

FIGURE 5-24

20-IRWD5-09F5-24.AI

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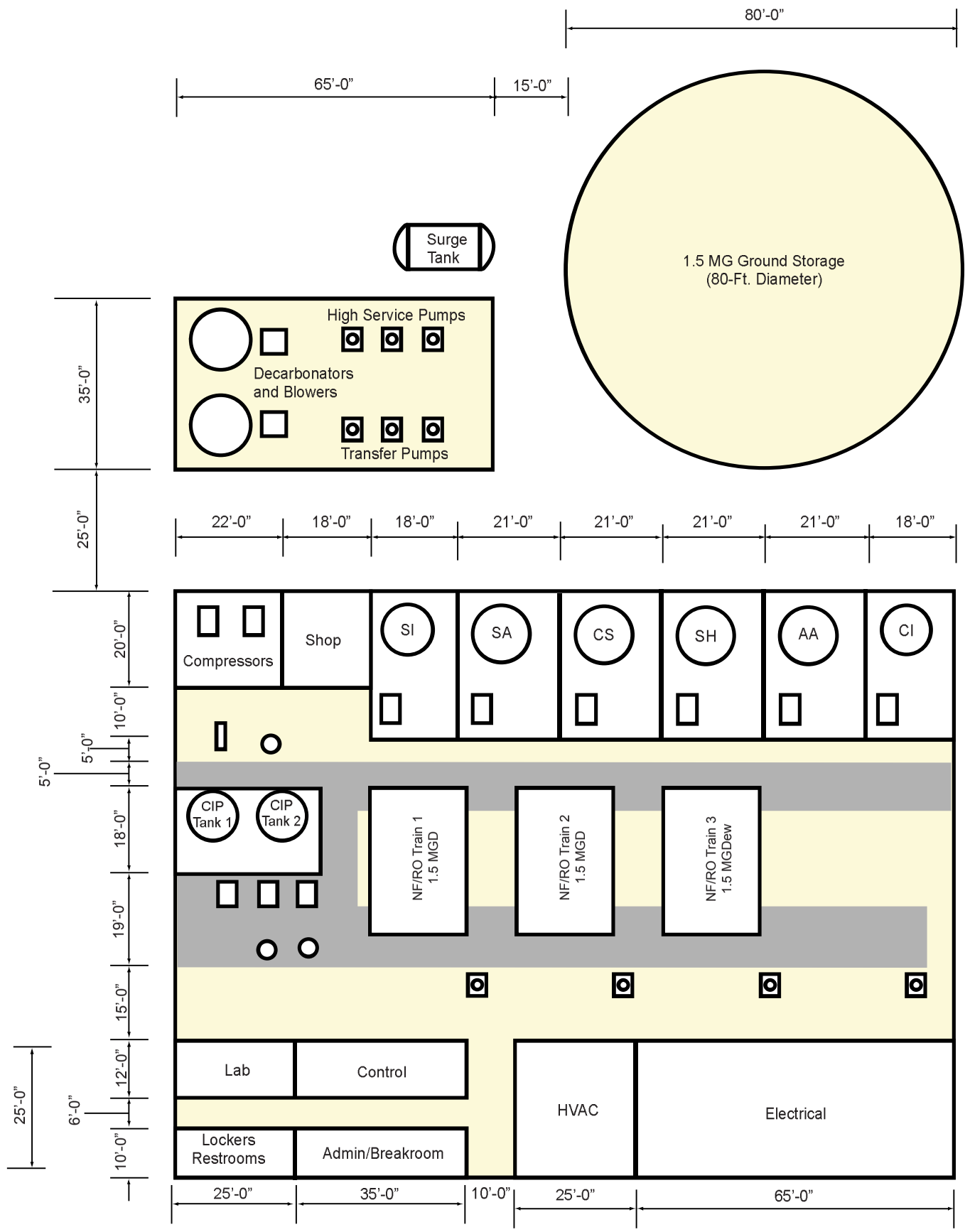
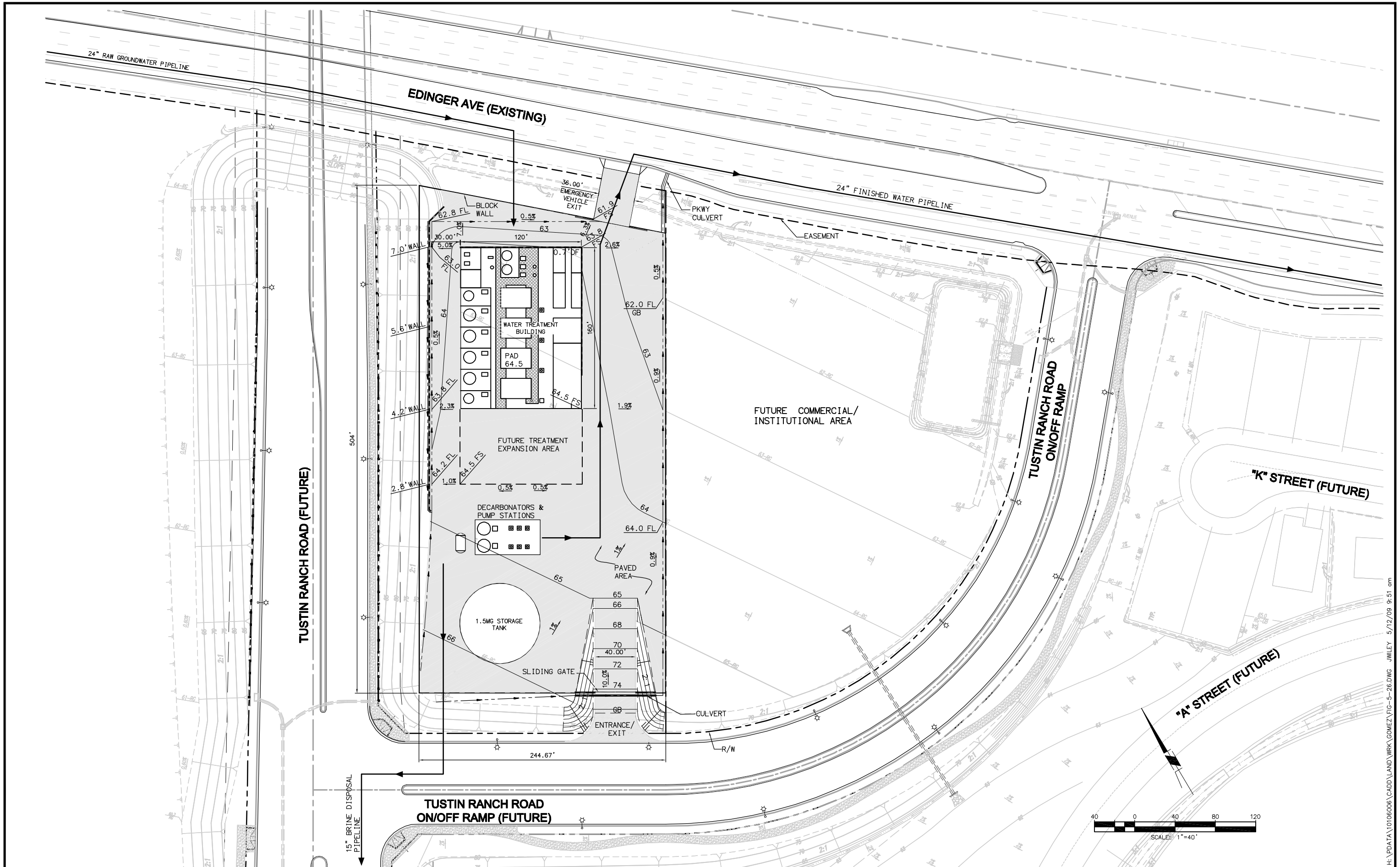
IRVINE RANCH WATER DISTRICT



SITE LAYOUT

FIGURE 5-25



No.	DATE	REVISIONS	APPROVED

DESIGNED: JW
DRAWN: JA
CHECKED: CM

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IRVINE RANCH WATER DISTRICT

DATE
PRINCIPAL ENGINEER
STEVEN L. MALLOY RCE 31926

IRVINE RANCH WATER DISTRICT
WELLS 21 & 22
TREATMENT FACILITY

TREATMENT FACILITIES
SITE PLAN

FIGURE
5-26

PLAN
1"=500'

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WELLS 21 AND 22

PROPOSED BRINE DISPOSAL PIPELINE

FIGURE
5-27

H:\PDATA\10106006\CADD\WATER\EXHIBITS\WELLS 21-22 FOR REPORT\60106-FIG-5-27.DWG JWILEY 5/12/09 10:26 am

Wells 21 and 22 Site Location Detail

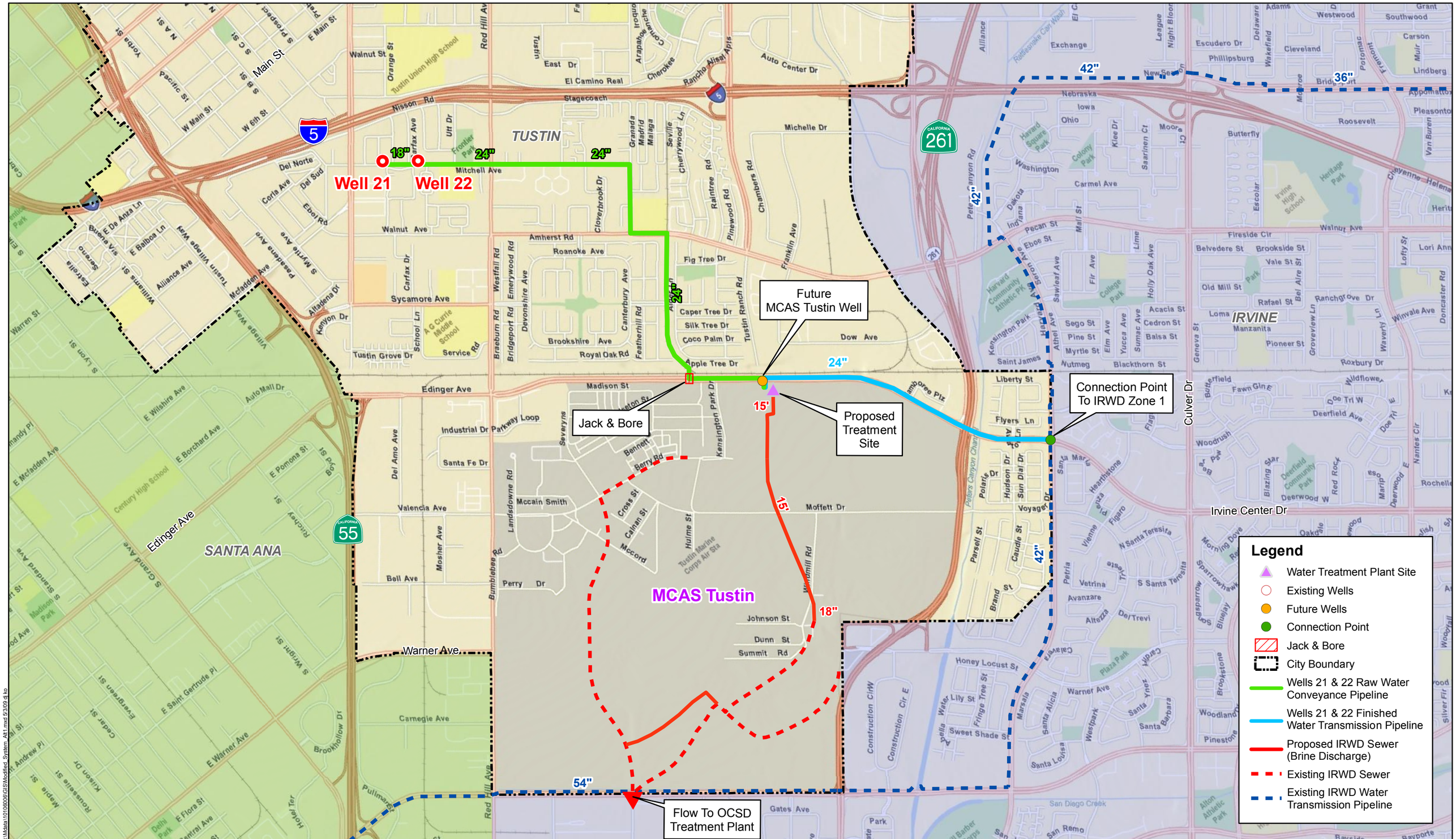
not to scale

5/5/09 JN10-106006-15975 MAS

WELL 21 AND WELL 22

Proposed System

Figure 5-29



M:\Mdata\10106006\GIS\Modified_System_Alt1.mxd 5/3/09 dj ko

RBF CONSULTING GIS

Source: ESRI Online

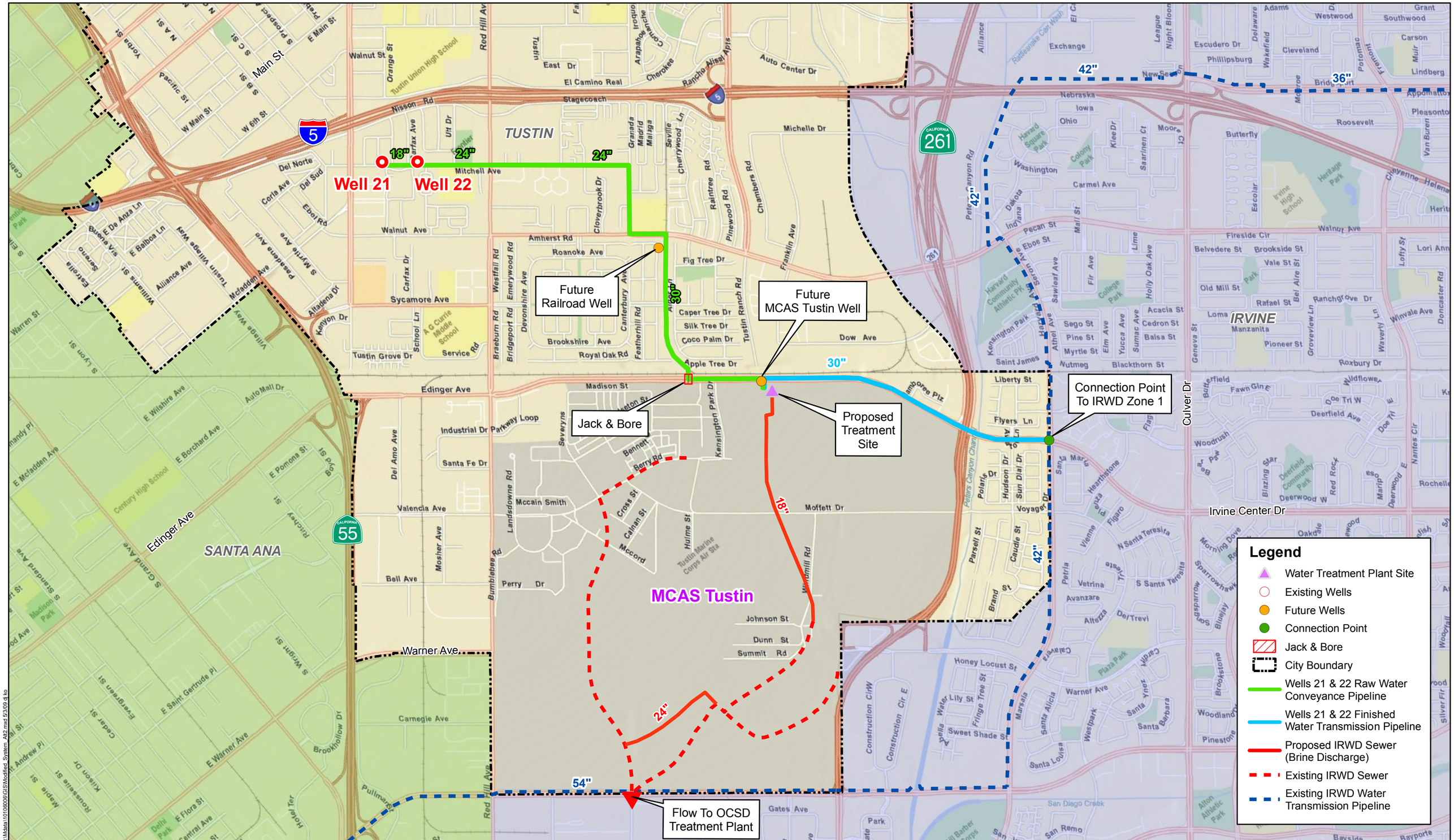
0 0.5 1
Miles

IRVINE RANCH WATER DISTRICT

IRWD Wells 21 & 22

Figure 5-30: Modified System

ALTERNATIVE 1



RBF CONSULTING GIS

Source: ESRI Online

0 0.5 1
Miles

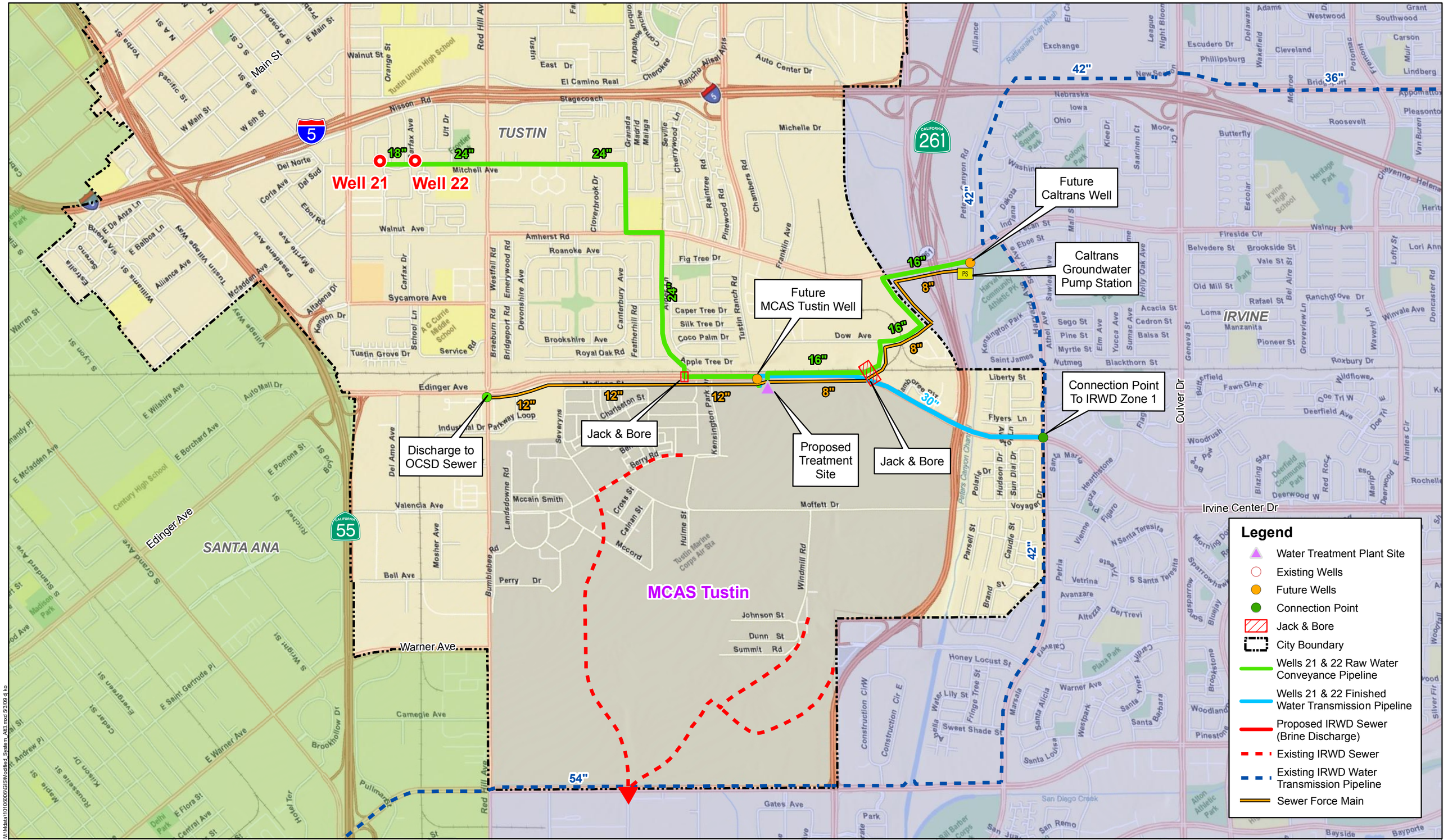
IRVINE RANCH WATER DISTRICT

IRWD Wells 21 & 22

Figure 5-31: Modified System

ALTERNATIVE 2

K:\Mdata\10106006\GIS\Modified_System_Alt2.mxd 5/3/09 dj ko



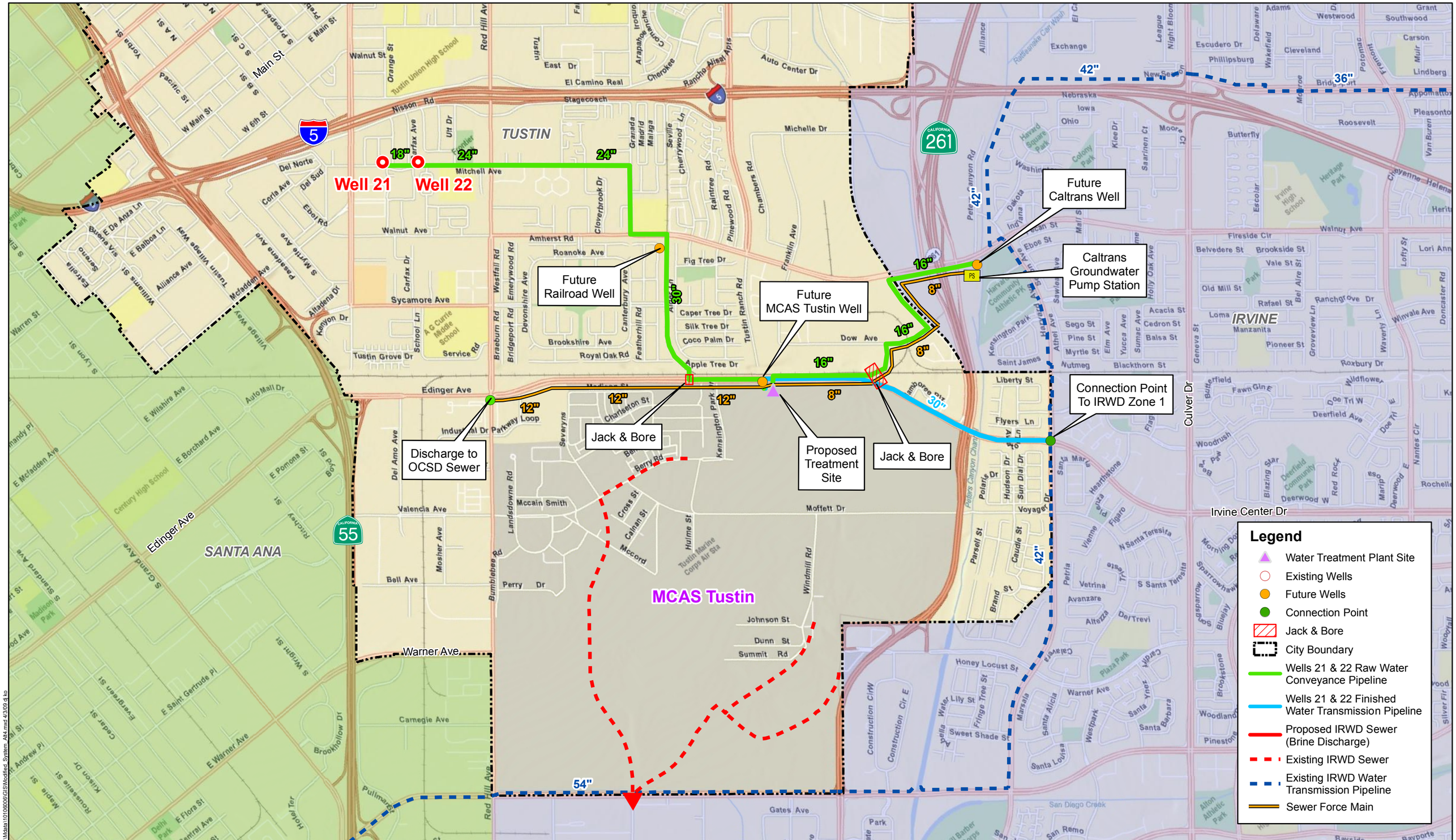
Source: ESRI Online

0 0.5 1
Miles

IRWD Wells 21 & 22

Figure 5-32: Modified System

ALTERNATIVE 3



RBF CONSULTING GIS

Source: ESRI Online

0 0.5 1
Miles

IRVINE RANCH WATER DISTRICT

IRWD Wells 21 & 22

Figure 5-33: Modified System

ALTERNATIVE 4

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APPENDIX C

DETAILED COST ESTIMATES

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TABLE 6-2
IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 PRELIMINARY DESIGN REPORT
ESTIMATE OF CAPITAL COSTS - BASE PROJECT

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
1	**Wells 21 and 22 Wellhead Equipping**				
	Well 21				
1.1	***General*** [2,3]				***$81,500***
1.1.1	Mobilization/Demobilization	1	LS	$65,000	$65,000
1.1.2	Bonding and Insurance	1	LS	$16,500	$16,500
1.2	***Site Work***				***$160,950***
1.2.1	Excavation and Clearing	1	LS	$8,000	$8,000
1.2.2	Site Paving Materials	6800	SF	$5.50	$37,400
1.2.3	Concrete Swales for Site Drainage	300	LF	$40	$12,000
1.2.4	Concrete Driveway	15	CY	$550	$8,250
1.2.6	Manway	1	EA	$2,500	$2,500
1.2.7	Switchgear and Transformer Concrete Pads	1	LS	$3,500	$3,500
1.2.8	Concrete Well Block[6]	1	LS	$6,500	$6,500
1.2.9	Discharge Piping Concrete Pad	7	CY	$400	$2,800
1.2.10	Electrical Building w/HVAC	200	SF	$400	$80,000
1.3	***Mechanical*** [4,5]				***$633,300***
1.3.1	400 HP Submersible Pump and Motor Equipment	1	EA	$350,000	$350,000
1.3.2	270 ft of 12-Inch steel well pump column piping	270	LF	$200	$54,000
1.3.3	18-Inch Steel Discharge Head and Wellhead Piping	1	LS	$12,500	$12,500
1.3.4	12-Inch Steel Pump to Waste Piping/Manholes	1	LS	$15,000	$15,000
1.3.5	24-Inch C-905 PVC Well Discharge Piping to Untreated Water Transmission Line in Mitchell Ave	50	LF	$180	$9,000
1.3.6	12-Inch Steel Well Pump to Waste Piping	60	LF	$110	$6,600
1.3.7	12-Inch Double Check Assembly	1	EA	$14,000	$14,000
1.3.8	Pump to Waste Storm Drain Connection	1	EA	$15,000	$15,000
1.3.9	18-Inch Motor Operated Isolation Valve	1	EA	$19,500	$19,500
1.3.10	12-Inch Motor Operated Isolation Valve	1	EA	$12,500	$12,500
1.3.11	8-Inch Well Isolation Valve	1	EA	$4,200	$4,200
1.3.12	18-Inch Magnetic Flow Meter	1	EA	$20,000	$20,000
1.3.13	8-Inch Well Pressure Relief Valve	1	EA	$13,500	$13,500
1.3.14	3-Inch Well Anti-Surge Air Relief/Vacuum Assembly	1	EA	$5,000	$5,000
1.3.15	3-Inch Well Air Relief/Vacuum Assembly	1	EA	$2,500	$2,500
1.3.16	Bladder Type Surge Tank Assembly (Assumed 500 Gal)	1	EA	$60,000	$60,000
1.3.17	Miscellaneous Couplings, Taps etc	1	LS	$20,000	$20,000
1.4	***Electrical***				***$750,100***
1.4.1	Electric Utility Connection fee	1	LS	$3,000	$3,000
1.4.2	400HP 18-pulse VFD	1	EA	$250,000	$250,000
1.4.3	4160V Metered Switchboard	1	EA	$200,000	$200,000
1.4.4	120/208V 3 phase lighting panel	1	EA	$2,200	$2,200
1.4.5	4160V-120/208V 3 phase dry type transformer	1	EA	$40,000	$40,000
1.4.6	Concrete pad (for Utility transformer)	1	EA	$7,000	$7,000
1.4.7	Conduit and Wire	1	LS	$100,000	$100,000
1.4.8	Lighting	1	LS	$12,000	$12,000
1.4.9	Ground Rod System	1	EA	$900	$900
1.4.10	Receptacles, switches, junction boxes, etc.	1	LS	$5,000	$5,000
1.4.11	Instrumentation	1	LS	$10,000	$10,000
1.4.12	Control Panel, including PLC, UPS, etc.	1	EA	$90,000	$90,000
1.4.13	PLC Programming	1	LS	$30,000	$30,000
	Subtotal Well 21 - Wellhead Equipping				**$1,625,850**

TABLE 6-2
IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 PRELIMINARY DESIGN REPORT
ESTIMATE OF CAPITAL COSTS - BASE PROJECT

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
	Well 22				
1.5	***General*** [2]				***$57,000***
1.5.1	Mobilization/Demobilization	1	LS	$45,000	$45,000
1.5.2	Bonding and Insurance	1	LS	$12,000	$12,000
1.6	***Site Work***				***$152,700***
1.6.1	Excavation and Clearing	1	LS	$8,000	$8,000
1.6.2	Site Paving Materials	6800	SF	$5.50	$37,400
1.6.3	Concrete Swales for Site Drainage	300	LF	$40	$12,000
1.6.4	Manway	1	EA	$2,500	$2,500
1.6.5	Switchgear and Transformer Concrete Pads	1	LS	$3,500	$3,500
1.6.6	Concrete Well Block	1	LS	$6,500	$6,500
1.6.7	Discharge Piping Concrete Pad	7	CY	$400	$2,800
1.6.8	Electrical Building w/HVAC	200	SF	$400	$80,000
1.7	***Mechanical*** [4,5]				***$515,200***
1.7.1	250 HP Submersible Pump and Motor Equipment	1	EA	$235,000	$235,000
1.7.2	460 ft of 10-Inch EL&C steel well pump column piping	460	LF	$190	$87,400
1.7.3	12-Inch Steel Discharge Head and Wellhead Piping	1	LS	$6,500	$6,500
1.7.4	10-Inch Steel Pump to Waste Piping	1	LS	$3,000	$3,000
1.7.5	16-Inch Steel/PVC Well Discharge Piping to Untreated Water Transmission Line in Mitchell Ave	100	LF	$120	$12,000
1.7.6	16-Inch PVC Well Pump to Waste Piping to Storm Drain Connection/Manhole	1	LS	$17,500	$17,500
1.7.7	10-Inch Double Check Assembly	1	EA	$12,500	$12,500
1.7.8	Pump to Waste Storm Drain Connection	1	EA	$10,000	$10,000
1.7.9	12-Inch Motor Operated Isolation Valve	1	EA	$12,500	$12,500
1.7.10	10-Inch Motor Operated Isolation Valve	1	EA	$11,000	$11,000
1.7.11	6-Inch Well Isolation Valve	1	EA	$3,500	$3,500
1.7.12	12-Inch Magnetic Flow Meter	1	EA	$14,000	$14,000
1.7.13	6-Inch Well Pressure Relief Valve	1	EA	$8,500	$8,500
1.7.14	3-Inch Well Anti-Surge Air Relief/Vacuum Assembly	1	EA	$5,000	$5,000
1.7.15	2-Inch Well Air Relief/Vacuum Assembly	1	EA	$1,800	$1,800
1.7.16	Bladder Type Surge Tank Assembly (Assumed 500 Gal)	1	EA	$60,000	$60,000
1.7.17	Miscellaneous Couplings, Taps etc	1	LS	$15,000	$15,000
1.8	***Electrical***				***$417,900***
1.8.1	Electric Utility Connection fee	1	LS	3,000.00	$3,000
1.8.2	MCC w/ 30 kVA TX, panelboard, and Manual transfer switch	1	EA	65,000.00	$65,000
1.8.3	250HP 18-pulse VFD w/ Multilin 369 relay	1	EA	70,000.00	$70,000
1.8.4	480V Metered Switchboard, 600 Ampere	1	EA	35,000.00	$35,000
1.8.5	Concrete pad (for Utility transformer)	1	EA	7,000.00	$7,000
1.8.6	Conduit and Wire	1	LS	90,000.00	$90,000
1.8.7	Lighting	1	LS	12,000.00	$12,000
1.8.8	Ground Rod System	1	EA	900.00	$900
1.8.9	Receptacles, switches, junction boxes, etc.	1	LS	5,000.00	$5,000
1.8.10	Instrumentation	1	LS	10,000.00	$10,000
1.8.11	Control Panel, including PLC, UPS, etc.	1	EA	90,000.00	$90,000
1.8.12	PLC Programming	1	LS	30,000.00	$30,000
	Subtotal Well 22 - Wellhead Equipping				**$1,142,800**
	ITEM NO. 1 TOTAL				**$2,770,000**
2	**Untreated Groundwater Conveyance Piping**				
2.1	***General*** [2,3]				***$107,500***
2.1.1	Mobilization/Demobilization	1	LS	$85,000	$85,000
2.1.2	Bonding and Insurance	1	LS	$22,500	$22,500
2.2	***Pipeline Construction*** [7,8,9]				***$1,724,250***
2.2.1	16-Inch PVC Untreated Water Transmission Line from Well 22 to Well 21	700	LF	$130	$91,000
2.2.2	Demolition of Francis Mutual Pipeline from Well 22 to Well 21	700	LF	$40	$28,000
2.2.3	24-Inch PVC Untreated Water Transmission Line from Well 21 to Newport Ave/Mitchell Ave Intersection	1,300	LF	$165	$214,500
2.2.4	24-Inch PVC Untreated Water Transmission Line from Newport Ave/Mitchell Ave to Sycamore Ave	2,650	LF	$190	$503,500
2.2.5	24-Inch PVC Untreated Water Transmission Line from Newport Ave/Sycamore Ave. to School Lane	1,350	LF	$165	$222,750
2.2.6	24-Inch PVC Untreated Water Transmission Line from School Lane/Sycamore Ave to TUSD Bus Depot	1,150	LF	$165	$189,750
2.2.7	24-Inch Stl Carrier w/42-Inch Casing Pipe for Jack and Bore Crossing of RR/Flood Channel at Edinger Ave	300	LF	$1,500	$450,000
2.2.8	24-Inch Untreated Water Transmission Line from Jack and Bore to Treatment Plant Site	150	LF	$165	$24,750
2.3	***Pipeline Appurtenances***				***$249,600***
2.3.1	16-Inch Isolation Valves	2	EA	$10,000	$20,000
2.3.2	24-Inch Isolation Valves	5	EA	$22,000	$110,000
2.3.3	Blow Off Assembly	4	EA	$8,500	$34,000
2.3.4	Air/Vac Assembly	4	EA	$10,000	$40,000
	ITEM NO 2 TOTAL - UNTREATED GROUNDWATER CONVEYANCE PIPING				**$2,080,000**

TABLE 6-2
IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 PRELIMINARY DESIGN REPORT
ESTIMATE OF CAPITAL COSTS - BASE PROJECT

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
3	**4.4 MGD Water Treatment Plant**				
3.1	***General*** [2,3]				***$1,045,000***
3.1.1	Mobilization/Demobilization	1	LS	$835,000	$835,000
3.1.2	Bonding and Insurance	1	LS	$210,000	$210,000
3.2	***Land Acquisition***	1	LS	$4,300,000	***$4,300,000***
3.3	***Treatment Plant*** [6]				***$11,208,000***
3.3.1	Cartridge Filters	3	EA	$100,000	$300,000
3.3.2	Static Mixers	3	EA	$3,500	$10,500
3.3.3	RO Feed Pumps	3	EA	$275,000	$825,000
3.3.4	RO System - Primary	4,400,000	GPD	$1.25	$5,500,000
3.3.5	Decarbonators	2	EA	$200,000	$400,000
3.3.6	Air Compressors	2	EA	$25,000	$50,000
3.3.7	Clearwell	150,000	GAL	$1.50	$225,000
3.3.8	Finished Water Pumps	3	EA	$150,000	$450,000
3.3.9	Surge Tank	1	EA	$75,000	$75,000
3.3.10	Scale Inhibitor Storage and Feed System	1	EA	$100,000	$100,000
3.3.11	Sulfuric Acid Storage and Feed System	1	EA	$250,000	$250,000
3.3.12	Caustic Soda Storage and Feed System	1	EA	$200,000	$200,000
3.3.13	Ammonia Storage and Feed System	1	EA	$250,000	$250,000
3.3.14	Corrosion Inhibitor Storage and Feed System	1	EA	$100,000	$100,000
3.3.15	Sodium Hypochlorite Storage and Feed System	1	EA	$250,000	$250,000
3.3.16	Building, Non-Process Area	1,750	SF	$250	$437,500
3.3.17	Building, Process/Chemical Storage Area	11,900	SF	$150	$1,785,000
3.4	***Electrical, Instrumentation and Control*** [10]	1	LS	$2,802,000	***$2,802,000***
3.5	***Site Work*** [11,12]				***$1,507,500***
3.5.1	Sitework[11]	1	LS	$560,400	$560,400
3.5.2	Site Mechanical[12]	1	LS	$697,100	$697,100
3.5.3	Building Demolition	1	LS	$250,000	$250,000
	ITEM NO 3 TOTAL - MEMBRANE TREATMENT FACILITY				**$20,860,000**
4	**Product Water Pipeline**				
4.1	***General*** [2,3]				***$160,000***
4.1.1	Mobilization/Demobilization	1	LS	$130,000	$130,000
4.1.2	Bonding and Insurance	1	LS	$30,000	$30,000
4.2	***Pipeline Construction*** [7,8,9]				***$2,961,000***
4.2.1	24-Inch Product Water Transmission Line from Treatment Plant to Edinger Bridge	11,000	LF	$220	$2,420,000
4.2.2	20-Inch Edinger Bridge Crossing	300	LF	$850	$255,000
4.2.3	24-Inch Product Water Transmission Line from Edinger Bridge to Harvard Ave Connection	1,300	LF	$220	$286,000
4.3	***Pipeline Appurtenances***				***$191,750***
4.3.1	24-Inch Isolation Valves	6	EA	$20,000	$120,000
4.3.2	Air/Vac Assembly	3	EA	$10,000	$30,000
4.3.3	Blow Off Assembly	3	EA	$8,500	$25,500
4.3.4	Cathodic Protection Testing Stations	25	EA	$650	$16,250
	ITEM NO 4 TOTAL - PRODUCT WATER PIPELINE				**$3,310,000**

TABLE 6-2
IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 PRELIMINARY DESIGN REPORT
ESTIMATE OF CAPITAL COSTS - BASE PROJECT

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
5	**Brine Disposal Pipeline[9]**				
5.1	***General[2,3]***				***$38,000***
5.1.1	Mobilization/Demobilization	1	LS	$30,500	$30,500
5.1.2	Bonding and Insurance	1	LS	$7,500	$7,500
5.2	***Construction of New Brine Disposal Facilities***				***$755,000***
5.2.1	10-Inch Brine Disposal Force Main From Treatment Site to Red Hill Ave/Warner Ave Intersection	7,150	LF	$100	$715,000
5.2.2	10-Inch Brine Disposal Connection Manhole	1	LS	$40,000	$40,000
	ITEM NO 5 TOTAL - BRINE DISPOSAL PIPELINE				**$793,000**
	Subtotal Items 1-5				$29,810,000
	Contingencies @ 20%				$5,960,000
	Preliminary Design[15]				$1,052,000
	Engineering[14]				$4,313,500
6	**District Costs[13]**				
6.1	***Pre-Construction Phase***				***$682,789***
6.2	***Construction Phase***				***$1,160,587***
6.3	***Other Direct Costs***				***$64,575***
	ITEM NO 6 TOTAL - DISTRICT COSTS				**$1,910,000**
	TOTAL ESTIMATE OF CAPITAL COST				**$43,050,000**

Notes:

1 Capital cost are Class 4 Estimates as defined by AACEI with estimated -15% to +30 range of accuracy
2 Includes Mobilization and Demobilization estimated at approximately 4% of total construction costs
3 Includes Bonding and insurance assumed at approximately 1% of total construction costs
4 Mechanical equipment based on preliminary design in Section 5 of this report
5 Includes all on-site well equipment and off-site piping to Untreated Water Conveyance Pipeline connection in Mitchell Ave
6 Assumes RO membrane treatment facility
7 Breakdown of Pipeline construction costs elements given in Appendix B
8 Pipeline construction includes traffic control and pavement replacement, where applicable
9 Assumes Sewer Trench section per IRWD standard drawing and specifications
10 Electrical assumed at 25% of total treatment plant
11 Site Work includes general site improvements assumed at 5% of total treatment plant cost
12 Site Mechanical included in site work and assumed at 20% of total treatment plant cost (minus RO System and Building cost)
13 Based on Cost Breakdown Prepared by DDB Engineering for the April 2009 Request for Title XVI Funding
14 Engineering (preliminary design plus engineering) estimated at 15% of total construction cost including contingencies
15 Based on Budget for preparation and completion of Preliminary Design Report

TABLE 6-3
IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 PRELIMINARY DESIGN REPORT
ESTIMATE OF CAPITAL COSTS - ALTERNATIVE PROJECT

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
1	**Wells 21 and 22 Wellhead Equipping**				
	Well 21				
1.1	***General*** [2,3]				***$81,500***
1.1.1	Mobilization/Demobilization	1	LS	$65,000	$65,000
1.1.2	Bonding and Insurance	1	LS	$16,500	$16,500
1.2	***Site Work***				***$160,950***
1.2.1	Excavation and Clearing	1	LS	$8,000	$8,000
1.2.2	Site Paving Materials	6800	SF	$5.50	$37,400
1.2.3	Concrete Swales for Site Drainage	300	LF	$40	$12,000
1.2.4	Concrete Driveway	15	CY	$550	$8,250
1.2.6	Manway	1	EA	$2,500	$2,500
1.2.7	Switchgear and Transformer Concrete Pads	1	LS	$3,500	$3,500
1.2.8	Concrete Well Block[6]	1	LS	$6,500	$6,500
1.2.9	Discharge Piping Concrete Pad	7	CY	$400	$2,800
1.2.10	Electrical Building w/HVAC	200	SF	$400	$80,000
1.3	***Mechanical*** [4,5]				***$633,300***
1.3.1	400 HP Submersible Pump and Motor Equipment	1	EA	$350,000	$350,000
1.3.2	270 ft of 12-Inch steel well pump column piping	270	LF	$200	$54,000
1.3.3	18-Inch Steel Discharge Head and Wellhead Piping	1	LS	$12,500	$12,500
1.3.4	12-Inch Steel Pump to Waste Piping/Manholes	1	LS	$15,000	$15,000
1.3.5	24-Inch C-905 PVC Well Discharge Piping to Untreated Water Transmission Line in Mitchell Ave	50	LF	$180	$9,000
1.3.6	12-Inch Steel Well Pump to Waste Piping	60	LF	$110	$6,600
1.3.7	12-Inch Double Check Assembly	1	EA	$14,000	$14,000
1.3.8	Pump to Waste Storm Drain Connection	1	EA	$15,000	$15,000
1.3.9	18-Inch Motor Operated Isolation Valve	1	EA	$19,500	$19,500
1.3.10	12-Inch Motor Operated Isolation Valve	1	EA	$12,500	$12,500
1.3.11	8-Inch Well Isolation Valve	1	EA	$4,200	$4,200
1.3.12	18-Inch Magnetic Flow Meter	1	EA	$20,000	$20,000
1.3.13	8-Inch Well Pressure Relief Valve	1	EA	$13,500	$13,500
1.3.14	3-Inch Well Anti-Surge Air Relief/Vacuum Assembly	1	EA	$5,000	$5,000
1.3.15	3-Inch Well Air Relief/Vacuum Assembly	1	EA	$2,500	$2,500
1.3.16	Bladder Type Surge Tank Assembly (Assumed 500 Gal)	1	EA	$60,000	$60,000
1.3.17	Miscellaneous Couplings, Taps etc	1	LS	$20,000	$20,000
1.4	***Electrical***				***$750,100***
1.4.1	Electric Utility Connection fee	1	LS	$3,000	$3,000
1.4.2	400HP 18-pulse VFD	1	EA	$250,000	$250,000
1.4.3	4160V Metered Switchboard	1	EA	$200,000	$200,000
1.4.4	120/208V 3 phase lighting panel	1	EA	$2,200	$2,200
1.4.5	4160V-120/208V 3 phase dry type transformer	1	EA	$40,000	$40,000
1.4.6	Concrete pad (for Utility transformer)	1	EA	$7,000	$7,000
1.4.7	Conduit and Wire	1	LS	$100,000	$100,000
1.4.8	Lighting	1	LS	$12,000	$12,000
1.4.9	Ground Rod System	1	EA	$900	$900
1.4.10	Receptacles, switches, junction boxes, etc.	1	LS	$5,000	$5,000
1.4.11	Instrumentation	1	LS	$10,000	$10,000
1.4.12	Control Panel, including PLC, UPS, etc.	1	EA	$90,000	$90,000
1.4.13	PLC Programming	1	LS	$30,000	$30,000
	Subtotal Well 21 - Wellhead Equipping				**$1,625,850**

TABLE 6-3
IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 PRELIMINARY DESIGN REPORT
ESTIMATE OF CAPITAL COSTS - ALTERNATIVE PROJECT

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
	Well 22				
1.5	***General*** [2]				***$57,000***
1.5.1	Mobilization/Demobilization	1	LS	$45,000	$45,000
1.5.2	Bonding and Insurance	1	LS	$12,000	$12,000
1.6	***Site Work***				***$152,700***
1.6.1	Excavation and Clearing	1	LS	$8,000	$8,000
1.6.2	Site Paving Materials	6800	SF	$5.50	$37,400
1.6.3	Concrete Swales for Site Drainage	300	LF	$40	$12,000
1.6.4	Manway	1	EA	$2,500	$2,500
1.6.5	Switchgear and Transformer Concrete Pads	1	LS	$3,500	$3,500
1.6.6	Concrete Well Block	1	LS	$6,500	$6,500
1.6.7	Discharge Piping Concrete Pad	7	CY	$400	$2,800
1.6.8	Electrical Building w/HVAC	200	SF	$400	$80,000
1.7	***Mechanical*** [4,5]				***$515,200***
1.7.1	250 HP Submersible Pump and Motor Equipment	1	EA	$235,000	$235,000
1.7.2	460 ft of 10-Inch EL&C steel well pump column piping	460	LF	$190	$87,400
1.7.3	12-Inch Steel Discharge Head and Wellhead Piping	1	LS	$6,500	$6,500
1.7.4	10-Inch Steel Pump to Waste Piping	1	LS	$3,000	$3,000
1.7.5	16-Inch Steel/PVC Well Discharge Piping to Untreated Water Transmission Line in Mitchell Ave	100	LF	$120	$12,000
1.7.6	16-Inch PVC Well Pump to Waste Piping to Storm Drain Connection/Manhole	1	LS	$17,500	$17,500
1.7.7	10-Inch Double Check Assembly	1	EA	$12,500	$12,500
1.7.8	Pump to Waste Storm Drain Connection	1	EA	$10,000	$10,000
1.7.9	12-Inch Motor Operated Isolation Valve	1	EA	$12,500	$12,500
1.7.10	10-Inch Motor Operated Isolation Valve	1	EA	$11,000	$11,000
1.7.11	6-Inch Well Isolation Valve	1	EA	$3,500	$3,500
1.7.12	12-Inch Magnetic Flow Meter	1	EA	$14,000	$14,000
1.7.13	6-Inch Well Pressure Relief Valve	1	EA	$8,500	$8,500
1.7.14	3-Inch Well Anti-Surge Air Relief/Vacuum Assembly	1	EA	$5,000	$5,000
1.7.15	2-Inch Well Air Relief/Vacuum Assembly	1	EA	$1,800	$1,800
1.3.16	Bladder Type Surge Tank Assembly (Assumed 500 Gal)	1	EA	$60,000	$60,000
1.7.17	Miscellaneous Couplings, Taps etc	1	LS	$15,000	$15,000
1.8	***Electrical***				***$417,900***
1.8.1	Electric Utility Connection fee	1	LS	3,000.00	$3,000
1.8.2	MCC w/ 30 kVA TX, panelboard, and Manual transfer switch	1	EA	65,000.00	$65,000
1.8.3	250HP 18-pulse VFD w/ Multilin 369 relay	1	EA	70,000.00	$70,000
1.8.4	480V Metered Switchboard, 600 Ampere	1	EA	35,000.00	$35,000
1.8.5	Concrete pad (for Utility transformer)	1	EA	7,000.00	$7,000
1.8.6	Conduit and Wire	1	LS	90,000.00	$90,000
1.8.7	Lighting	1	LS	12,000.00	$12,000
1.8.8	Ground Rod System	1	EA	900.00	$900
1.8.9	Receptacles, switches, junction boxes, etc.	1	LS	5,000.00	$5,000
1.8.10	Instrumentation	1	LS	10,000.00	$10,000
1.8.11	Control Panel, including PLC, UPS, etc.	1	EA	90,000.00	$90,000
1.8.12	PLC Programming	1	LS	30,000.00	$30,000
	Subtotal Well 22 - Wellhead Equipping				**$1,142,800**
	ITEM NO. 1 TOTAL				**$2,770,000**
2	**Untreated Groundwater Conveyance Piping**				
2.1	***General*** [2,3]				***$107,500***
2.1.1	Mobilization/Demobilization	1	LS	$85,000	$85,000
2.1.2	Bonding and Insurance	1	LS	$22,500	$22,500
2.2	***Pipeline Construction*** [7,8,9]				***$1,724,250***
2.2.1	16-Inch PVC Untreated Water Transmission Line from Well 22 to Well 21	700	LF	$130	$91,000
2.2.2	Demolition of Francis Mutual Pipeline from Well 22 to Well 21	700	LF	$40	$28,000
2.2.3	24-Inch PVC Untreated Water Transmission Line from Well 21 to Newport Ave/Mitchell Ave Intersection	1,300	LF	$165	$214,500
2.2.4	24-Inch PVC Untreated Water Transmission Line from Newport Ave/Mitchell Ave to Sycamore Ave	2,650	LF	$190	$503,500
2.2.5	24-Inch PVC Untreated Water Transmission Line from Newport Ave/Sycamore Ave. to School Lane	1,350	LF	$165	$222,750
2.2.6	24-Inch PVC Untreated Water Transmission Line from School Lane/Sycamore Ave to TUSD Bus Depot	1,150	LF	$165	$189,750
2.2.7	24-Inch Stl Carrier w/42-Inch Casing Pipe for Jack and Bore Crossing of RR/Flood Channel at Edinger Ave	300	LF	$1,500	$450,000
2.2.8	24-Inch Untreated Water Transmission Line from Jack and Bore to Treatment Plant Site	150	LF	$165	$24,750
2.3	***Pipeline Appurtenances***				***$249,600***
2.3.1	16-Inch Isolation Valves	2	EA	$10,000	$20,000
2.3.2	24-Inch Isolation Valves	5	EA	$22,000	$110,000
2.3.3	Blow Off Assembly	4	EA	$8,500	$34,000
2.3.4	Air/Vac Assembly	4	EA	$10,000	$40,000
	ITEM NO 2 TOTAL - UNTREATED GROUNDWATER CONVEYANCE PIPING				**$2,080,000**

TABLE 6-3
IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 PRELIMINARY DESIGN REPORT
ESTIMATE OF CAPITAL COSTS - ALTERNATIVE PROJECT

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
3	**4.4 MGD Water Treatment Plant**				
3.1	***General*** [2,3]				***$1,045,000***
3.1.1	Mobilization/Demobilization	1	LS	$835,000	$835,000
3.1.2	Bonding and Insurance	1	LS	$210,000	$210,000
3.2	***Land Acquisition***	1	LS	$4,300,000	***$4,300,000***
3.3	***Treatment Plant*** [6]				***$11,208,000***
3.3.1	Cartridge Filters	3	EA	$100,000	$300,000
3.3.2	Static Mixers	3	EA	$3,500	$10,500
3.3.3	RO Feed Pumps	3	EA	$275,000	$825,000
3.3.4	RO System - Primary	4,400,000	GPD	$1.25	$5,500,000
3.3.5	Decarbonators	2	EA	$200,000	$400,000
3.3.6	Air Compressors	2	EA	$25,000	$50,000
3.3.7	Clearwell	150,000	GAL	$1.50	$225,000
3.3.8	Finished Water Pumps	3	EA	$150,000	$450,000
3.3.9	Surge Tank	1	EA	$75,000	$75,000
3.3.10	Scale Inhibitor Storage and Feed System	1	EA	$100,000	$100,000
3.3.11	Sulfuric Acid Storage and Feed System	1	EA	$250,000	$250,000
3.3.12	Caustic Soda Storage and Feed System	1	EA	$200,000	$200,000
3.3.13	Ammonia Storage and Feed System	1	EA	$250,000	$250,000
3.3.14	Corrosion Inhibitor Storage and Feed System	1	EA	$100,000	$100,000
3.3.15	Sodium Hypochlorite Storage and Feed System	1	EA	$250,000	$250,000
3.3.16	Building, Non-Process Area	1,750	SF	$250	$437,500
3.3.17	Building, Process/Chemical Storage Area	11,900	SF	$150	$1,785,000
3.4	***Electrical, Instrumentation and Control*** [10]	1	LS	$2,802,000	***$2,802,000***
3.5	***Site Work*** [11,12]				***$1,507,500***
3.5.1	Sitework[11]	1	LS	$560,400	$560,400
3.5.2	Site Mechanical[12]	1	LS	$697,100	$697,100
3.5.3	Building Demolition	1	LS	$250,000	$250,000
	ITEM NO 3 TOTAL - MEMBRANE TREATMENT FACILITY				**$20,860,000**
4	**Product Water Pipeline**				
4.1	***General*** [2,3]				***$215,000***
4.1.1	Mobilization/Demobilization	1	LS	$175,000	$175,000
4.1.2	Bonding and Insurance	1	LS	$40,000	$40,000
4.2	***Pipeline Construction*** [7,8,9]				***$3,945,000***
4.2.1	30-Inch Product Water Transmission Line from Treatment Plant to Edinger Bridge	11,000	LF	$300	$3,300,000
4.2.2	20-Inch Edinger Bridge Crossing	300	LF	$850	$255,000
4.2.3	30-Inch Product Water Transmission Line from Edinger Bridge to Harvard Ave Connection	1,300	LF	$300	$390,000
4.3	***Pipeline Appurtenances***				***$236,750***
4.3.1	30-Inch Isolation Valves	6	EA	$27,500	$165,000
4.3.2	Air/Vac Assembly	3	EA	$10,000	$30,000
4.3.3	Blow Off Assembly	3	EA	$8,500	$25,500
4.3.4	Cathodic Protection Testing Stations	25	EA	$650	$16,250
	ITEM NO 4 TOTAL - PRODUCT WATER PIPELINE				**$4,400,000**

TABLE 6-3
IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 PRELIMINARY DESIGN REPORT
ESTIMATE OF CAPITAL COSTS - ALTERNATIVE PROJECT

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
5	**Brine Disposal Pipeline[9]**				
5.1	***General[2,3]***				***$38,000***
5.1.1	Mobilization/Demobilization	1	LS	$30,500	$30,500
5.1.2	Bonding and Insurance	1	LS	$7,500	$7,500
5.2	***Construction of New Brine Disposal Facilities***				***$755,000***
5.2.1	10-Inch Brine Disposal Force Main From Treatment Site to Red Hill Ave/Warner Ave Intersection	7,150	LF	$100	$715,000
5.2.2	10-Inch Brine Disposal Connection Manhole	1	LS	$40,000	$40,000
	ITEM NO 5 TOTAL - BRINE DISPOSAL PIPELINE				**$793,000**
	Subtotal Items 1-5				$30,900,000
	Contingencies @ 20%				$6,180,000
	Preliminary Design[15]				$1,052,000
	Engineering[14]				$4,510,000
6	**District Costs[13]**				
6.1	***Pre-Construction Phase***				***$682,789***
6.1.1	Design Engineer Procurement	1	LS	$10,498	$10,498
6.1.2	Environmental Studies	1	LS	$61,225	$61,225
6.1.3	Project Design	1	LS	$600,000	$600,000
6.1.4	Bid Phase	1	LS	$11,066	$11,066
6.2	***Construction Phase***				***$1,160,587***
6.2.1	Construction Management	1	LS	$1,100,000	$1,100,000
6.2.2	Startup Services	1	LS	$32,550	$32,550
6.2.3	Contract Closeout	1	LS	$28,037	$28,037
6.3	***Other Direct Costs***				***$64,575***
6.3.1	Travel	1	LS	$7,625	$7,325
6.3.2	Equipment	1	LS	$34,000	$34,000
6.3.3	Supplies and Materials	1	LS	$23,250	$23,250
	ITEM NO 6 TOTAL - DISTRICT COSTS				**$1,910,000**
	TOTAL ESTIMATE OF CAPITAL COST				**$44,550,000**

Notes:

1 Capital cost are Class 4 Estimates as defined by AACEI with estimated -15% to +30 range of accuracy
2 Includes Mobilization and Demobilization estimated at approximately 4% of total construction costs
3 Includes Bonding and insurance assumed at approximately 1% of total construction costs
4 Mechanical equipment based on preliminary design in Section 5 of this report
5 Includes all on-site well equipment and off-site piping to Untreated Water Conveyance Pipeline connection in Mitchell Ave
6 Assumes RO membrane treatment facility
7 Breakdown of Pipeline construction costs elements given in Appendix B
8 Pipeline construction includes traffic control and pavement replacement, where applicable
9 Assumes Sewer Trench section per IRWD standard drawing and specifications
10 Electrical assumed at 25% of total treatment plant
11 Site Work includes general site improvements assumed at 5% of total treatment plant cost
12 Site Mechanical included in site work and assumed at 20% of total treatment plant cost (minus RO System and Building cost)
13 Based on Cost Breakdown Prepared by DDB Engineering for the April 2009 Request for Title XVI Funding
14 Engineering (preliminary design plus engineering) estimated at 15% of total construction cost including contingencies
15 Based on budget for preparation and completion of the Preliminary Design Report

APPENDIX D

CHRONOLOGY OF EVENTS (WELL REHABILITATION)

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Chronology of Rehabilitation and Testing

19-Sep-08	Bakersfield Well & Pump Company of Bakersfield, California (BW&P) began mobilization of equipment to IRWD Well No. 21 site.
22-Sep-08	BW&P personnel began installing sound panels around perimeter of location to ensure noise ordinances were maintained.
23-Sep-08	BW&P personnel continued to install sound barrier poles. Two 21,000 gallon (gal) Baker Tank containers were delivered to the site for the purpose of temporarily holding fluids generated during the rehabilitation process, prior to discharge to the sewer system. BW&P updated their construction schedule with options to meet the Christmas deadline.
26-Sep-08	BW&P personnel completed installation of sound barriers and continued mobilizing equipment before securing the site for the weekend.
29-Sep-08	BW&P began initial well rehabilitation by brushing the 20-inch diameter casing in three passes with 20-inch diameter nylon bristled brush. BW&P personnel finished brushing 20-inch casing. Due to brush incompatibility with 16-inch casing, crew was delayed waiting for the appropriate diameter of brush. BW&P personnel began welding 18-inch diameter pipe to connect the two Baker tanks. The final length of discharge piping will connect the Baker tanks to sewer lateral via the onsite 5 ft diameter manhole.
30-Sep-08	BW&P personnel continued to weld the discharge piping to connect the Baker tanks and continued brushing the 20-inch portion of the well.
1-Oct-08	BW&P personnel completed brushing 16-inch diameter portion of the

casing in four passes. BW&P personnel continued to install 12-inch diameter discharge line from the well to the first Baker Tank (to be used during pump development and test pumping). Site was dampened for dust control.

2-Oct-08 BW&P personnel began bailing out approximately 7 ft of sediment and pipe scale and sediment that was generated by the brushing. Several pieces of a float plate were removed in addition to large diameter washers and nuts (possibly from flanged drill pipe). McCall's Meter personnel were onsite to certify the accuracy of the 4-inch flowmeter at three flow rates: 88 gpm, 143 gpm and 250 gpm.

3-Oct-08 BW&P personnel began airlifting within the screened interval beginning at the top (298 ft bgs) and moving downward in 10 foot increments. Fluids generated during airlifting were pumped into the onsite Baker tanks before flowing by gravity to the sewer manhole. BW&P personnel secured site for the weekend.

6-Oct-08 BW&P personnel continued airlifting within the screened interval in 10 foot sections from 298 to 433 ft bgs. GEOSCIENCE collected noise level measurements. The level of gravel in the feed tube was monitored and recorded to be 27 feet below reference point, bRP (i.e., the top of gravel feed tube). Each interval is being swabbed 12 to 15 times before airlifting.

7-Oct-08 BW&P personnel continued airlifting and swabbing within the screened intervals of the well from 433 to 571 ft bgs.

8-Oct-08 BW&P personnel continued airlifting and swabbing within the screened interval of the well from 571 to 696 ft bgs. Some intervals were very muddy initially, but cleared readily.

9-Oct-08 BW&P personnel continued airlifting and swabbing within the screened interval of the well from 696 to 831 ft bgs. The interval 819 to 829 ft was extremely muddy.

10-Oct-08 BW&P personnel continued airlifting and swabbing within the screened interval of the well from 831 to 869 ft bgs and 930 to 985 ft.

The upper portion of each screened interval was very muddy and did not clear readily with swabbing. BW&P personnel secured site for the weekend.

13-Oct-08 BW&P personnel resumed airlifting and swabbing within the screened interval of the well from 975 to 1,035 ft bgs. The material removed appeared to be bentonite drilling mud and was as much as 3% sand and 40% silt and clay. Each 10 ft interval was swabbed 30-40 times to remove the maximum amount of sediment.

14-Oct-08 BW&P personnel continued airlifting and swabbing within the screened interval of the well from 1,035 to the bottom of the screened interval at 1,060 ft. The interval was extremely muddy with high sand content and thick drilling mud. The top of the fill material was tagged at 1,065 ft bgs with the swabbing tool. BW&P began swabbing and airlifting from bottom of screened interval upward, starting from 1,060 ft and continuing to 930 ft bgs before pulling the tool up to 869 ft before securing the site for the night. The upward pass was much cleaner than the downward pass had been.

15-Oct-08 BW&P personnel continued swabbing and airlifting within the screened interval of the well moving upward from 870 to 610 ft bgs.

16-Oct-08 BW&P personnel continued swabbing and airlifting from 610 to 310 ft bgs. GEOSCIENCE personnel collected the selenium sample from the discharge for submittal to E.S. Babcock & Sons Inc. in Riverside, California.

17-Oct-08 BW&P personnel completed initial development after a total of approximately 72 hours of airlifting and swabbing. The remaining sediment was bailed from the bottom of the well before securing site for the weekend.

20-Oct-08 Pacific Surveys of Claremont, California performed a downhole “dual cam” video survey to document the condition of the well following brushing, airlifting and swabbing. The video survey showed the well

casing and screen to be clean and in good condition with minimal staining to the stainless steel casing where tubercles had been removed. A large amount of suspended debris was observed in the water column above the uppermost screen. Fill material (i.e., sediment) at the bottom of the well was minimal at approximately 2 ft thick.

21-Oct-08 BW&P personnel cut down the well casing to just above ground level and began installation of the vertical turbine test pump. A 24 inch long by 14-inch OD inflatable packer (manufactured by "Plug-It" and rated for 250 psi) was installed on the 10-inch pump column approximately 6.5 feet above the pump bowl assembly. Connectors were tightened using Permatex® to assist in sealing.

22-Oct-08 The packer was tested by inflating it in the top of the well casing and maintaining pressure for a period of time before continuing with installation of the test pump and packer assembly. An electronic recording device connected to the 12-inch flowmeter was installed.

23-Oct-08 BW&P personnel completed installation of a total of 600 feet of pump column and began assembling discharge piping.

24-Oct-08 BW&P personnel completed installation of discharge piping, gear drive and diesel engine. Minimal final development by pumping began to ensure the pump and engine was in proper working order. BW&P personnel secured site for the weekend.

27-Oct-08 BW&P personnel began final re-development by pumping at 258 gpm and gradually increased. The flowmeter was certified at three flow rates, 1,500, 2,000 and 2,500 gpm by McCall's Meters to be accurate within 5% of the indicated amount. Hours later the sand content increased to a maximum of 1,267 ppm, resulting in the well being pumped at a reduced rate and without surging until the sand content diminished.

28-Oct-08 Development pumping continued with a maximum short-term discharge rate of 2,030 gpm with approximately 38 ft of drawdown. Light surging (once per event) was conducted during the second half of the day until the maximum discharge rate was reached. Sand

concentrations within the first five minutes after surging ranged from 32 ppm diminishing to less than 21 ppm throughout the day.

29-Oct-08 Development pumping continued with a maximum short-term discharge rate of 3,220 gpm with approximately 52 ft of drawdown. Light surging (one to two times per event) was conducted throughout the day until the maximum discharge rate was reached. Sand concentrations within the first five minutes after surging ranged from 10 ppm at the lower rates, to 22 ppm at the higher rates.

30-Oct-08 Development pumping continued with a maximum short-term discharge rate of 3,318 gpm. Moderate surging (twice per event) was conducted throughout the day until the maximum discharge rate was reached. Sand concentrations within the first five minutes after surging ranged from 5 ppm at the lower rates to 16 ppm at the higher rates.

31-Oct-08 Development pumping continued with a maximum discharge rate of 3,490 gpm. Moderate surging (3 times per event) was conducted throughout the day. The sand content within the first five minutes after surging ranged from 8 ppm to 16 ppm throughout the day, declining in the last several hours. BW&P personnel secured the site early due to the engine overheating and as a courtesy to the neighbors as it was Halloween. BW&P arranged for another test engine to be delivered in the next week.

3-Nov-08 BW&P personnel mobilized and installed the new test engine.

4-Nov-08 Development pumping was delayed due to rain, as Orange County Sanitation Department (OCSD) would not allow discharge to the sewer.

5-Nov-08 BW&P personnel resumed development pumping with a maximum short-term discharge rate of 3,665 gpm with 47 ft of drawdown. Heavy surging (5 times per event) was conducted throughout the day. The

sand content within the first five minutes after surging ranged from 6 to 11 ppm throughout the day.

6-Nov-08 Development pumping continued with a maximum short-term discharge rate of 3,636 gpm with 44 ft of drawdown. Heavy surging (5 times per event) was conducted throughout the day. The sand content within the first five minutes after surging ranged from 6 to 12 ppm throughout the day, declining slightly during the second half of the day.

7-Nov-08 Development pumping was considered complete after a total of 60 hours of pumping had been achieved with minimal sand content in the first five minutes following aggressive surging. A maximum short-term pumping rate of 3,700 gpm was achieved with a maximum of 43 ft of drawdown. Heavy surging (5 to 10 times per event) was conducted throughout the day. The sand content within the first five minutes after surging ranged from minimal amounts (i.e. trace) to a maximum of 7 ppm. BW&P personnel secured site for the weekend.

10-Nov-08. BW&P personnel performed a step drawdown pumping test that consisted of pumping the well at three different rates of discharge. Step 1 averaged 1,417 gpm for duration of 60 minutes. Step 2 averaged 2,545 gpm for a duration of 120 minutes. Step 3 averaged 3,583 gpm for 240 minutes.

11-Nov-08 BW&P personnel began a constant rate pumping test at 10:00 AM at a targeted discharge rate of 3,200 gpm. The water level was monitored in IRWD Well No. 22 (observation well) during the constant rate testing to provide observation and interference data.

12-Nov-08 The constant rate test was completed at 10:30 AM after 24.5 hours of pumping at an average discharge rate of 3,170 gpm. Recovering water levels in the well were monitored and recorded for 4 hours. In the final hours of the constant rate test GEOSCIENCE personnel collected

	Title 22 and California Unregulated samples that were delivered to E.S. Babcock & Sons, Inc. for water quality analysis. GEOSCIENCE personnel also completed several silt density index (SDI) tests.
13-Nov-08	BW&P began zone isolation testing by inflating the packer at 526 to 528 ft bgs to seal off the upper screened interval and pump only from the screened intervals below the packer (screens located from 539 to 749, 819 to 869 and 930 to 1,060 ft bgs). Once the packer was inflated the water level above the packer rose 5 ft while the water level below the packer fell 58 ft. Zone 1 was pumped initially at 225 gpm, increasing to 440 gpm as the zone developed. At the end of the testing, GEOSCIENCE personnel collected water quality samples for general mineral and physical properties, VOCs, metals, TOC and perchlorate.
14-Nov-08	BW&P personnel began lowering the test pump to place the packer in Zone 2 (screens located from 819 to 869 and 930 to 1,060 ft bgs). GEOSCIENCE personnel delivered Zone 1 water quality samples to E.S. Babcock & Sons, Inc. for analysis. BW&P personnel secured site for the weekend.
17-Nov-08	BW&P personnel continued lowering the test pump and packer for Zone 2 isolation testing. Installation was delayed due to excess column length. A shorter section of column pipe was delivered.
18-Nov-08	BW&P personnel completed installation of the test pump and packer into the well for Zone 2 isolation testing
19-Nov-08	The Zone 2 Isolation test was delayed due to malfunctioning packer (packer would not inflate). BW&P personnel began removing the test pump from the well to replace the packer.
20-Nov-08	BW&P personnel continued removing the test pump from the well to replace the packer.
21-Nov-08	BW&P personnel continued removing the test pump from the well and secured site for the weekend.

24-Nov-08	BW&P personnel finished removing the test pump from the well and inspected the packer before beginning installation of a replacement packer on the test pump. The first packer was sent to Bakersfield for further testing.
25-Nov-08	BW&P personnel continued installation of the replacement packer on the test pump.
26-Nov-08	BW&P personnel completed re-installation of the test pump with a new packer. The packer was placed at 766 to 768 ft bgs with the pump intake at approximately 778 ft bgs.
27-Nov-08	Site was secured for the Thanksgiving holiday weekend as the Zone 2 isolation test was not started as it felt that the work would not be completed in time to meet the laboratory's schedule and the potential for exceeding the shorter holding times.
1-Dec-08	BW&P began Zone 2 isolated packer test pumping. Zone 2 (screens located from 819 to 869 and 930 to 1,060 ft bgs) was pumped at a discharge rate of approximately 90 gpm, increasing to 236 gpm as the zone developed. At the end of the test GEOSCIENCE personnel collected water quality samples and delivered them to E.S. Babcock & Sons, Inc. for analysis. Heavy rainfall had occurred during the holiday weekend creating deep mud at the site and slippery conditions.
2-Dec-08	BW&P personnel began removing the test pump and packer from within the well.
3-Dec-08	BW&P personnel continued removing the test pump and packer from within the well.
4-Dec-08	BW&P personnel completed removing the test pump and packer from within the well and secured site for the weekend.
8-Dec-08	Pacific Surveys performed a final video survey to document the post-rehabilitation condition of the well. The video survey showed the well casing and screen to be clean and in good condition. Fill material (i.e., sediment) was found at 1,050 ft, equaling approximately 30 ft of

	material.
9-Dec-08	BW&P personnel began site clean-up and demobilization of equipment.
10-Dec-08	BW&P personnel continued site clean-up and demobilization of equipment.
11-Dec-08	BW&P personnel continued site clean-up and demobilization of equipment.
15-Dec-08	BW&P personnel continued site clean-up and demobilization of equipment including dismantling the sound barriers. Heavy rainfall began.
16-Dec-08	BW&P personnel continued site clean-up, dismantling of the sound barriers and demobilization of equipment. Heavy rain continued.
17-Dec-08	BW&P personnel removed the remaining sound barrier poles and continued site clean-up and demobilization of equipment. Heavy rain continued.
18-Dec-08	BW&P personnel completed site clean-up and demobilization of equipment with the exception of the Baker tanks. Heavy rainfall created deep mud at the site requiring the Baker tanks to remain on site until the ground dried out. The site was secured for the holiday.
12-Jan-09	The two Baker tanks were removed from the site.
29-Jan-09	BW&P personnel returned to the site with the 50 ton pump rig to bail the fill material from the bottom of the well. After removing only 2 ft of fill material, the transmission on the rig failed with the bailer suspended in the well. BW&P personnel secured the rig and tied off the cable attached to the bailer while waiting for a mechanic. Over the next week the transmission was removed from the rig and was repaired and replaced.

10-Feb-09	BW&P personnel returned to the site and finished bailing the 30 ft of fill material. The materials removed were fine sand and silt with approximatley 5% fine Colorado Silica sand.
11-Feb-09	The bottom of the well was tagged with the bailer and the remaining fill was removed. The pump rig was taken to Bakersfield for repairs as welds holding safety covers on had become broken.
13-Feb-09	BW&P personnel returned to the site and bailed the remaining 3 ft of fill material from the well before adjusting the pH to 5.0 units and disinfecting the well. A total of 15 gallons of NW-410 was injected through a tremie at 100 ft intervals before being mixed in the water column using the bailer. Once the pH was adjusted to 5.0 units, a total of 15 gallons of 12.5% sodium hypochlorite was injected into the well, also at 100 ft intervals through a tremie pipe. The chlorine concentration was measured at 82 mg/L and 86 mg/L using a field kit. Rain began to fall heavily.
16-Mar-09	BW&P personnel returned to the site to level the ground surface.

APPENDIX E

SURVEY REPORTS (WELL VIDEO)

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Pacific Surveys

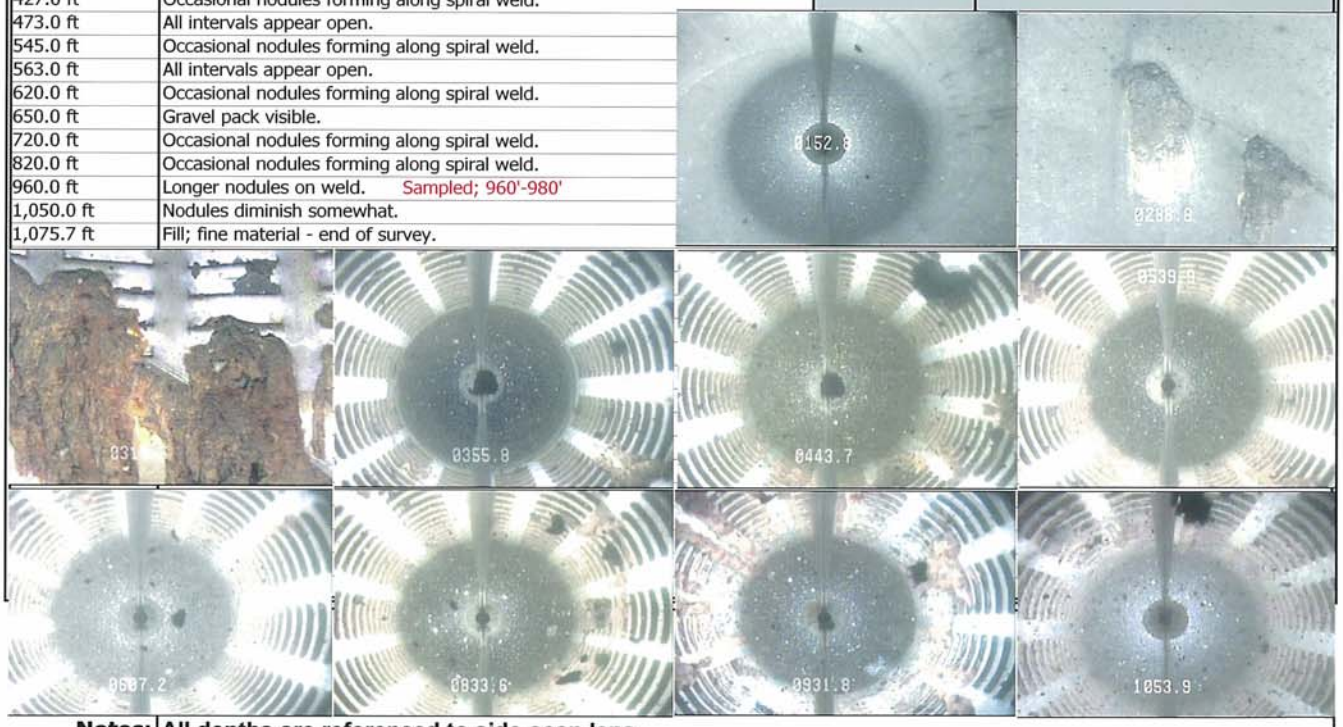
a full service geophysical well logging company

Video Survey Report

Company:	RBF Consulting		**Date:**	17-Jan-08	
Well:	IRWD Well 21		**Run No.**	One	**Truck** PS-3
Field:	Tustin		**Job Ticket:**	13663	
State:	California		**Total Depth:**	1,076 ft	
			Water Level:	77 ft	
Location:	14232 Debusk		**Operator:**	Trad	
Zero Datum:	Top of CSG	**Tool Zero:**	Side-Scan		
Reason for Survey:	General Inspection				

Depth	Remarks
0.0 ft	Start survey at top of casing (17" AGS)
10.0 ft	Light corrosion and flaking.
32.0 ft	Casing color turns grayish (possible Manganese).
76.6 ft	SWL; cloudy.
78.0 ft	Water clearing; precipitate at joint.
266.6 ft	Top of camera port.
277.0 ft	Bottom of camera port.
298.8 ft	Top of perfs. Sampled; 290'-340'
300.0 ft	All perfs appear open; Occasional nodules formig along spiral weld.
320.0 ft	Nodules diminish somewhat.
325.0 ft	Occasional nodules forming along spiral weld.
370.0 ft	All intervals appear open.
427.0 ft	Occasional nodules forming along spiral weld.
473.0 ft	All intervals appear open.
545.0 ft	Occasional nodules forming along spiral weld.
563.0 ft	All intervals appear open.
620.0 ft	Occasional nodules forming along spiral weld.
650.0 ft	Gravel pack visible.
720.0 ft	Occasional nodules forming along spiral weld.
820.0 ft	Occasional nodules forming along spiral weld.
960.0 ft	Longer nodules on weld. Sampled; 960'-980'
1,050.0 ft	Nodules diminish somewhat.
1,075.7 ft	Fill; fine material - end of survey.

Perforation:	
Stainless	298.80 ft to 509.60ft
Ful-Flo	539.90 ft to 750.80ft
Louvers	821.10 ft to 871.40ft
	931.70 ft to 1,062.10ft
Casing Size	
Steel	
20.00 in	0.00 ft to 290.00ft
Stainless	
16.00 in	290.00 ft to 1,075.70ft



Notes: **All depths are referenced to side-scan lens.**

800.919.7555
909.625.6262

4456 via st. ambrose
claremont ca 91711
www.pacificsurveys.com

fax: 909.399.3180

Pacific Surveys

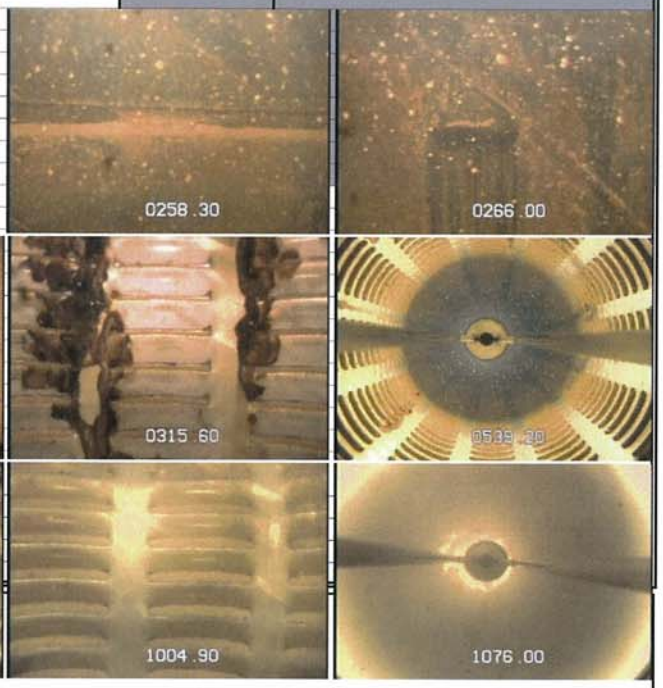
a full service geophysical well logging company

Video Survey Report

Company:	Bakersfield Well & Pump	**Date:**	20-Oct-08
Well:	IRWD Well 21	**Run No.**	Two **Truck** PS-4
Field:	Tustin	**Job Ticket:**	14250
State:	California	**Total Depth:**	1,077 ft
		Water Level:	79 ft
Location:	14232 Debusk	**Oil on Water:**	None **Amount:** 0"
	GPS N33°44'4" W117°49'24"	**Operator:**	Nelson-Ridder
Zero Datum:	Top of CSG **Tool Zero:**	Side-Scan	
Reason for Survey:	General Inspection		

Depth	Remarks
0.0 ft	Begin survey at top of casing
78.9 ft	SWL: Water cloudy
258.3 ft	Float plate
266.0 ft	Top of camera tube: bottom of camera tube 276.4 ft
279.4 ft	Casing reduction
298.4 ft	Top of perfs: appear open
350.0 ft	All perfs appear open
450.1 ft	All perfs appear open
508.9 ft	End of perfs
539.1 ft	Top of perfs: appear open
700.0 ft	All perfs appear open
749.6 ft	End of perfs
820.0 ft	Top of perfs: appear open
870.0 ft	End of perfs
930.2 ft	Top of perfs: appear to be mostly plugged
1,005.0 ft	All perfs appear plugged fine material
1,060.4 ft	End of perfs
1,077.1 ft	Top of fill: end survey

Perforation:	
Stainless	298.40 ft to 508.90ft
Ful-Flo	539.10 ft to 749.60ft
Louvers	820.00 ft to 870.00ft
	930.20 ft to 1,060.40ft
Casing Size	
Steel	
20.00 in	0.00 ft to 279.40ft
Stainless	
16.00 in	279.40 ft to 1,077.10ft



Notes: **All depths are referenced to side-scan lens.**

800.919.7555
909.625.6262

4456 via st. ambrose
claremont ca 91711
www.pacificsurveys.com

fax: 909.399.3180

Pacific Surveys

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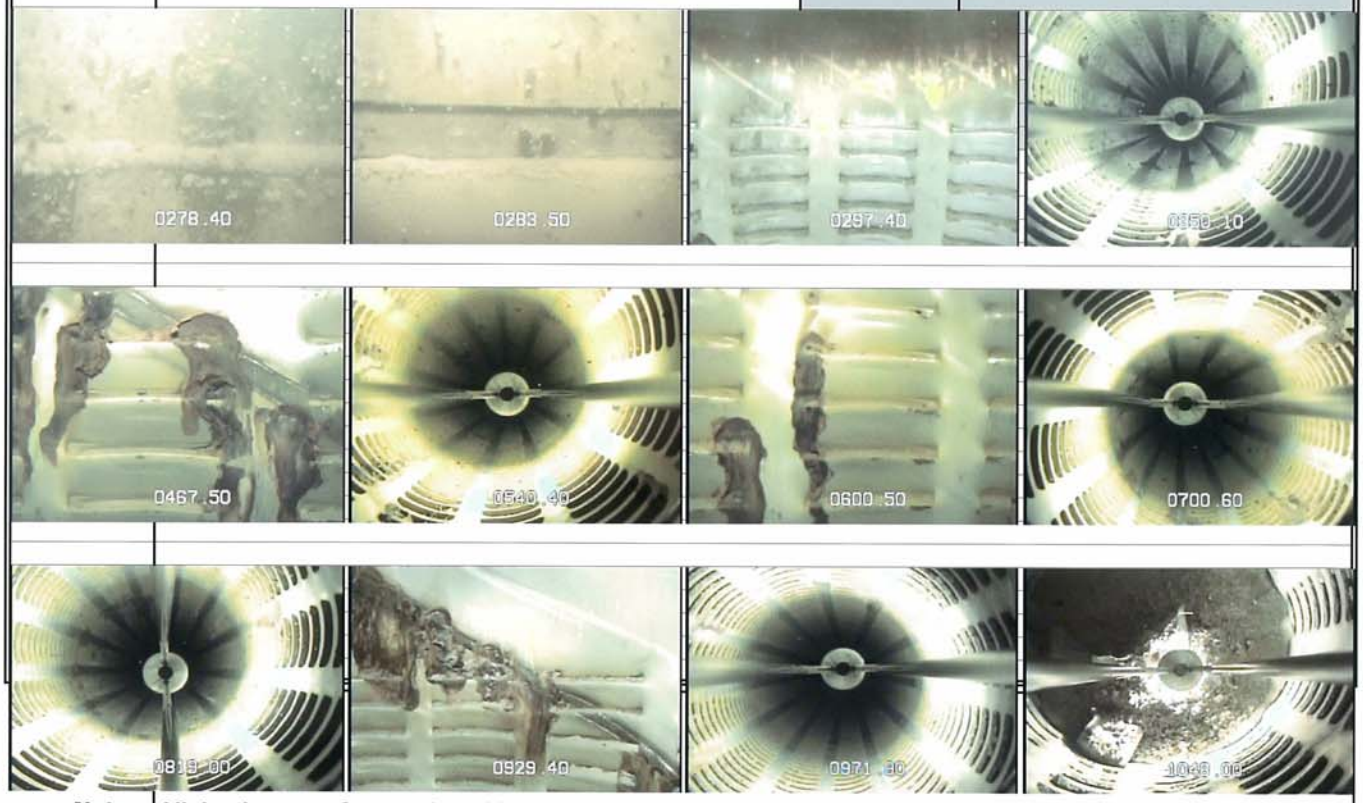
Video Survey Report

Company:	Bakersfield Well & Pump	**Date:**	08-Dec-08
Well:	IRWD Well 21	**Run No.**	Three **Truck** PS-4
Field:	Tustin	**Job Ticket:**	14344
State:	California	**Total Depth:**	1,050 ft
		Water Level:	92 ft
Location:	14232 Debusk	**Oil on Water:**	None **Amount:** 0"
		Operator:	Nelson
Zero Datum:	Top of CSG **Tool Zero:**	Side-Scan	
Reason for Survey:	General Inspection		

Depth	Remarks
0.0 ft	Begin survey at top of casing
92.1 ft	SWL: Water cloudy
257.4 ft	Float plate
266.0 ft	Top of camera tube: bottom of camera tube 276.4 ft
279.4 ft	Casing reduction
283.5 ft	Float plate
296.6 ft	Staining on casing wall
297.4 ft	Top of perfs: appear open. Bottom is at 508.9 ft
538.2 ft	Top of perfs: appear open. Bottom is at 748.8 ft
819.0 ft	Top of perfs: appear open. Bottom is at 869.2 ft
929.4 ft	Top of perfs: appear open fine material setting on louvers.
971.7 ft	Perfs appear open with fine material on louvers
1,050.0 ft	Fill: still in perfs. End survey

Perforation:	
Stainless	298.40 ft to 508.90ft
Ful-Flo	539.10 ft to 749.60ft
Louvers	820.00 ft to 870.00ft
	930.20 ft to 1,060.40ft
Casing Size	
Steel	
20.00 in	0.00 ft to 279.40ft
Stainless	
16.00 in	279.40 ft to 1,050.00ft



Notes: **All depths are referenced to side-scan lens. Downview lens is 5" below side-scan.**

800.919.7555
909.625.6262

4456 via st. ambrose
claremont ca 91711
www.pacificsurveys.com

fax: 909.399.3180

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APPENDIX F

DR. TRUTTMAN'S REPORT

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LTEC Leo Truttmann Environmental Consulting

Tel: (909) 964 2167 – e-mail: leo.truttmann@rcc.edu

January 29, 2008

Tom Harder
Geoscience
Claremont, CA 91711

Concerning: Scale Analysis of Well 21 and 22

The following analysis was performed on scale taken from Well 21 and Well 22 from IRWD. Five scale samples were taken from various depths by Pacific Surveys on January 17th, 2008. The scale samples were tested for their chemical nature concerning well plugging and corrosion potential. In addition the video surveys were reviewed.

Summary

The chemical test showed that the scale is made mainly of iron hydroxides and iron oxides. In all samples, except one, the iron hydroxide/-oxides present are the majority of the solid scale material. The rest of the scale matter consists most likely of some form of silicates (sand or clays). The vast majority of the scale in both wells, as seen in the videos, was found either on top of the casing were there was copper bearing casing or along the welds in the stainless steel part of the well casing. This leads to the conclusion that the scale is mainly the result of casing corrosion.

In one sample from Well 22 the amount of clay and sand material (which is not dissolvable in acids) is much higher. This sample had different properties than the iron corrosion material found in the other four samples and appeared to be some form of drilling mud still left over from the drilling of the well.

Scale analysis

Two scale samples were taken from Well 21 and three samples from Well 22. The sampler was placed at the bottom of each of the intervals and pulled upwards for about 20 to 50 ft. A special container below the scraper allowed collecting the material in order to bring it up to the surface. Both samples taken at around 290 ft produced much more material than the three samples taken at lower depths.

Microscopic analysis and visual inspection

Scale samples were analyzed under a microscope with a magnification of 430. The following table summarizes the observation of the visible and microscopic inspection:

Scale sample: Observation

Well 21

290 – 340 ft
- large amount of collected scale
- orange-brown scale with some dark parts; sheet like appearance
- scale can easily be crushed between fingers
- small orange-brown particles; particles have sharp edges, some needle like structures visible under the microscope

960 – 980 ft
- smaller amount collected
- orange-brown scale with some dark parts; sheet like appearance
- scale can easily be crushed between fingers
- small orange-brown particles; particles have sharp edges, some needle like structures visible under the microscope; some white (transparent) particles visible under microscope, which tend to be of a larger size than iron particles

Well 22

290 – 320 ft
- large amount of collected scale
- orange-brown scale with some dark parts; sheet like appearance
- scale can easily be crushed between fingers
- small orange-brown particles; particles have sharp edges, some needle like structures visible under the microscope

480 – 530 ft
- smaller amount collected
- beige brown material, very muddy appearance, few solid particles present in sample
- scale is very viscous
- Under the microscope: lots of transparent particles (large particles with round edges); some orange brown and dark brown smaller particles.

925 – 955 ft
- smaller amount collected
- orange-brown scale with some dark parts; sheet like appearance
- scale can easily be crushed between fingers
- small orange-brown particles; particles have sharp edges, some needle like structures visible under the microscope; some white (transparent) particles visible under microscope, which tend to be of a larger size than iron particles

Except the sample from 480 – 530 ft, the samples were similar in texture and appearance. Under the microscope all of the four samples showed similar small particulate matter. In all four samples, some needle like structures were observed, which indicate the presence of iron

bacteria. The observation of small crystalline solids, which show a brown to yellow color, indicates that the majority of the scale material is inorganic iron hydroxide/-oxide. The layered structure with some darker material below the surface indicates that the scale is the product of corrosion, most likely facilitated by bacterial action.

The scale sample from 480 – 530 ft in Well 22 is different: It seems like the majority of the material is mud or some sort of clay. Here the most reasonable interpretation is that the material is the result of insufficient developing after drilling and that some drilling mud is still left over in that zone.

Chemical analysis

The scale samples were analyzed qualitatively for major inorganic components. All fours samples were dissolved in concentrated hydrochloric acid (6 M). In each case about 0.8 g of scale material were dissolved in 6 ml of 6 M hydrochloric acid. Most of the scale was dissolved in each case, but some solid particles remained after 5 days in the acid solution. The solids were filtered and dried at a temperature of about 150°C for 3 hours.

The five samples showed more or less the same results. The exception being how much scale material did not dissolve in acid.

The moment when the hydrochloric acid was added to the sample only a few bubbles formed right at the beginning in each sample. This means that no or almost no carbonate scale is present. The other observation was that no rotten egg smell developed, which indicates that no metal sulfides are present. This is also a good sign that there are no reducing conditions present in the wells.

After filtering the dissolved acid phase from the insoluble scale, the acid solution was neutralized. In all cases large amounts of red brown iron hydroxide precipitation was formed. Qualitative test were also performed for manganese, calcium, magnesium and barium. In all cases the qualitative tests were negative for those metals. Due to the fact that the test are not very precise, we can assume that no or only insignificant amounts of these metals are present in the scale.

From the table below we see that the fraction of material which does not dissolve in acid is generally less than 30%, with the exception of the 480 – 530 ft sample which had 60% of the material not dissolving. The solids, which did not dissolve in concentrated hydrochloric acid, are most likely silicates. Generally scales such as metal sulfides, metal carbonates, and metal hydroxides do dissolve in strong acids; silicates, however, are almost impossible to dissolve in strong acids, with the exception of hydro fluoric acid.

After drying, the material had a grey appearance. This leads to the conclusion that the left over material are most likely silicates (clay and sand material). The material which dissolves in strong acids is mostly iron hydroxides and iron oxides, or in other words products of casing corrosion. The sample taken at 480 – 530 ft in Well 22 seems to have a lot of clays and sand like material.

The following table show the percentage of scale material which did not dissolve in strong hydrochloric acid:

Well #	Scale depth [ft]	Percentage of insoluble scale
21	290 – 340	16%
21	960 – 980	24%
22	290 - 320	17%
22	480 - 530	**60%**
22	925 - 955	30%

Discussion

The video surveys from January 17th, 2008 show two wells with some scale. The scale is found above the perforated zone, where we have copper bearing casing and mostly along the welding seams in the perforated zone, which is made of stainless steel. The perforations otherwise seemed open or very little plugged. In Well 22 from depths below 450 ft it seems that some soft brown material is present on top of the perforations.

Visual and microscopic analysis indicates that the majority of scale is oxidized iron material. Qualitative chemical test support this fact that in four out of five cases most of the scale is iron hydroxide or iron oxide. The fifth sample taken from Well 22 at depths of 480 – 530 ft is different. It contains some iron hydroxides, but the percentage is much lower. The majority of the muddy material in this sample seems to be some form of sand or clays, very likely left over drilling mud.

Conclusions and Recommendations

The corrosion and scale buildup in Well 21 and Well 22 seems not very aggressive, considering the time the well has been inactive. The analysis of the scale shows that the iron scale buildup is mostly the product of casing corrosion and unlikely the product of oxidation and precipitation of iron dissolved in the aquifer water. Therefore we can assume that little

or no iron scale has been formed in the gravel pack. The video show very nicely the benefits of stainless steel casing versus less corrosion resistant material. In the stainless steel zone, with the exception of the welding seems, no or very little corrosion occurred in the last 10 to 15 years.

Based on the fact that the scale did not dissolve rapidly in even very strong acid, it is not recommended to perform acid treatment. Mechanical treatment such as wire brushing and swabbing is probably sufficient to improve the well performance.

If you have further questions concerning this report, feel free to contact me at (909) 964 2167. Thank you for the opportunity to assist you in this project.

Sincerely,

Leo Truttmann, PhD
Principal Scientist

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APPENDIX G

NOTES FOR WELL REHABILITATION, REDEVELOPMENT AND TESTING

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(949) 472-3742

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1800 E. California Avenue • Bakersfield, CA 93307 • 805/324-6026

FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD | REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SLIPPED
								FT. CUT OFF	PRESENT LENGTH	
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMULATIVE TON MI. OR TRIPS		

DAY TOUR

FOOTAGE FROM	TO	DRLD RMLD CORED	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC.-SEC. / PV/YP / GELS / WL-CC/S / SOLIDS %

NIGHT TOUR

FOOTAGE FROM	TO	DRLD RMLD CORED	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. DAY TOUR 7:30 A.M. 5:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO
		Gary Cunningham			

DEVIATION RECORD DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:30		9:30		Wait on Sound poles
9:30		10:30		try to back truck in on site, would not fit thru gate
10:30		1:00		Unload poles from street
1:00		5:00		Drill holes & set poles

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC.-SEC. / PV/YP / GELS / WL-CC/S / SOLIDS %

Mon- 9-22-08

4838

777 714 5142

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FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD | REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT

SIZE | NO. LINES | FT. SLIPPED | FT. CUT OFF | PRESENT LENGTH | TON MI. OR TRIPS SINCE LAST CUT | CUMULATIVE TON MI. OR TRIPS

FOOTAGE FROM	TO	DRILLED IN CORE	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

DEVIATION RECORD DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

CREW SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DAY TOUR

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS

BIT RECORD: BIT NO. | SIZE

MUD RECORD: TIME | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | PV/YP | GELS | WL-CC'S | SOILDS %

FOOTAGE FROM	TO	DRILLED IN CORE	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM
				WELL #21								

TOTAL FT. DAY TOUR 7:00 A.M. 5:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

DEVIATION RECORD DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

CREW SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO
	G. Cunningham	10		
	F. Hildmann			

NIGHT TOUR

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:00	7:30			Service Equipt Not starting anything.
7:30-	11:30			Drill hole's Set Poles
11:30-	1:30			Get baker tanks on site
1:30	5:00			Resume drilling hole for Pannels
				Weather: Clear skys, Sunny
				Temp mid 80's

BIT RECORD: BIT NO. | SIZE

MUD RECORD: TIME | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | PV/YP | GELS | WL-CC'S | SOILDS %

WES - 9-23-08

4838

949 4'12 3'12

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FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD | REEL NO.

SIZE | NO. LINES | FT. SLIPPED

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKD. TO CSG. HD.	SET AT

FT. CUT OFF | PRESENT LENGTH | TON MI. OR TRIPS SINCE LAST CUT | CUMULATIVE TON MI. OR TRIPS

FOOTAGE FROM	TO	DRLD RMLD CORED	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. | DAY TOUR P.M. A.M. | NIGHT TOUR P.M. A.M. | INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

DAY TOUR

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS

BIT RECORD: BIT NO. | SIZE

MUD RECORD: TYPE | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | pH | GELS | WL-CC'S | SOLIDS %

FOOTAGE FROM	TO	DRLD RMLD CORED	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. | DAY TOUR 7:00 A.M. | NIGHT TOUR 5:00 P.M. | INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO
		G. Cunningham	10		

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

NIGHT TOUR

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:00		11:30		Paulus engineering on site #22 leveling & back-filling, full off well 22 go 2 well #21 Level site & Clean up.
11:30	- 3:30			B.W.P backing sound pannels in well site 21 unload w/ Crane, TAKE Extra poles to well #22 w/ Extra pannels & unload
3:30	- 5:00			unload set up to install pannel

BIT RECORD: BIT NO. | SIZE

MUD RECORD: TYPE | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | pH | GELS | WL-CC'S | SOLIDS %

Wed - 9-24-08 well sites 21-22

4838

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FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD | REEL NO.

LAST CASING TUBING OR LINER

SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SLIPPED
							FT. CUT OFF	REMENT LENGTH	
							TON MI. OR TRIPS SINCE LAST CUT		
							CUMLATIVE TON MI. OR TRIPS		

FOOTAGE FROM	TO	DR. D RM. R CORE. C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD

DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

DAY TOUR

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC./SEC. / PV/YP / GELS / W.L./CC / SOILDS %

FOOTAGE FROM	TO	DR. D RM. R CORE. C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM
				Well #21								

TOTAL FT. DAY TOUR 7:00 A.M. P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO
		G. Cunningham	10		

DEVIATION RECORD

DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

NIGHT TOUR

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:00	9:00			Set Sound Pannels
9:00	10:30			Spot 2 baker TANKS, IN Well Site 22
10:30	5:00			Set pannels
				[redacted]
				Weather Con. Sunny Clear
				Skys (hot) temp: Hi 80s to low 90s

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC./SEC. / PV/YP / GELS / W.L./CC / SOILDS %

Jus 9-25-08

4838

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FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD | REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT

SIZE | NO. LINES | FT. SLIPPED | FT. CUT OFF | PRESENT LENGTH | TON MI. OR TRIPS SINCE LAST CUT | CUMULATIVE TON MI. OR TRIPS

DAY TOUR

FOOTAGE FROM	TO	DRLD RMLR CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS. CREW SOC. SEC. NO. NAME HRS. INITIAL YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC./SEC. / PV/YP / GELS / WL-CC 9 / SOLIDS %

NIGHT TOUR

FOOTAGE FROM	TO	DRLD RMLR CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. DAY TOUR 7:00 A.M. 5:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS. CREW SOC. SEC. NO. NAME HRS. INITIAL YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

E. Cunningham

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:00		7:30		Service Equipt
7:30	-	4:30		Finish Sound Pannels Put Soft pannels up at entrence
				Weather Clear Skys Temp 90°
4:30	-	5:00		meet Diane Smith

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC./SEC. / PV/YP / GELS / WL-CC/9 / SOLIDS %

Fri 9-26-08

4838

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FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD | REAL NO.

LAST CASING TUBING OR LINER

SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKD. TO CSG. HD.	SET AT

SIZE | NO. LINKS | PT. SLIPPED | FT. CUT OFF | PRESENT LENGTH | TON MI. OR TRIPS SINCE LAST CUT | CUMLATIVE TON MI. OR TRIPS

DAY TOUR

FOOTAGE FROM	TO	DRILL CORED	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. | NIGHT TOUR P.M. A.M. | INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS

BIT RECORD: BIT NO. | SIZE

MUD RECORD: TIME | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | PV/YP | GELS | WL-CC'S | SOILDS %

NIGHT TOUR

FOOTAGE FROM	TO	DRILL CORED	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM
				Well 21-22								

TOTAL FT. | DAY TOUR A.M. P.M. | INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO
		E. Cunningham			

DEVIATION RECORD DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:00	5:00			Work on Well Site #22
				Drill sound pole holes
				Start setting poles
				Rig up Cable tool, rig
				Start brushing 20"
				run 3 passes switch
				over to 16" brush run
				to reducer brush to tight
				Weather con Cloudy w/ some
				rain showers

BIT RECORD: BIT NO. | SIZE

MUD RECORD: TIME | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | PV/YP | GELS | WL-CC'S | SOILDS %

Con 9-29-08

4838

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FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD | REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SUPPED
								FT. CUT OFF	PRESENT LENGTH	
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMLATIVE TON MI. OR TRIPS		

DAY TOUR

FOOTAGE FROM	TO	DRILL TIME OR REC.	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS. CREW SOC. SEC. NO. NAME HRS. INITIAL YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC./SEC. / PV/YP / GELS / WL-CC'S / SOILDS %

NIGHT TOUR

FOOTAGE FROM	TO	DRILL TIME OR REC.	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM
				Well #21-22								

TOTAL FT. DAY TOUR 7:00 A.M. 5:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS. CREW SOC. SEC. NO. NAME HRS. INITIAL YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

G. Cunningham

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:00	10:30			Finish discharge to top of baker tank on Well #21
10:30	5:00			Finish drilling & Setting pannel poles, Start Adding pannels.
				Weather Con.: Sunny, dry warm Hi 80s to mid 90s

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC./SEC. / PV/YP / GELS / WL-CC'S / SOILDS %

Well 22

9-30-08

4838

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FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD | REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SLIPPED
								FT. CUT OFF		PRESENT LENGTH
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMULATIVE TON MI. OR TRIPS		

DAY TOUR

FOOTAGE FROM	TO	HOLD RMLR CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.	CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC. SEC. / PV / YP / GEL / WL CC'S / SOLIDS %

NIGHT TOUR

FOOTAGE FROM	TO	HOLD RMLR CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. DAY TOUR 7:00 A.M. 5:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.	CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO
			G. Cunningham			

DEVIATION RECORD	DEPTH	DEV.	DIR	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:00	7:30			Services Equipt
7:30	8:30			unload 16" brush, air lifting tank & pump.
8:30	11:30			Brush well #21 w/16"
11:30	12:00			Put 16 3/4 brush on ran in to 320' would not go. Pull out change over to 16" brush
12:30	5:00			brush well w/16"
7:30-5:00				well #22 set pannels

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC. SEC. / PV / YP / GEL / WL CC'S / SOLIDS %

Weather Sunny & Clear Skys

Temp: mid 90s

Wed 10-1-08

4838

BAKERSFIELD WELL & PUMP CO. - A DIVISION OF ZIM INDUSTRIES, INC. Job # 08-113

1600 E. California Avenue • Bakersfield, CA 93307 • 805/324-8026

FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD | REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SLIPPED
								FT. CUT OFF	PRESENT LENGTH	
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMULATIVE TON MI. OR TRIPS		

DAY TOUR

FOOTAGE FROM	TO	DRLD RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	R.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC.-SEC. / PV/YP / GELS / WL-CC'S / SOLIDS %

NIGHT TOUR

FOOTAGE FROM	TO	DRLD RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM
				Wells #21-22								

TOTAL FT. DAY TOUR 7:00 A.M. 5:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO
		G. Cunningham			

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:00		7:30		Service Equipt
7:30		8:30		Bail out well #21 pull out
				parts of Float plate
8:30		11:00		Rig down Cable tool rig set up
				discharge for Meter test
11:00		3:00		Run TEST
3:00		5:00		Clean up street
				Well #22 Continue to set bonnets
				Weather Con. Sunny Patchy
				Clouds temp: Lo 80s

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC.-SEC. / PV/YP / GELS / WL-CC'S / SOLIDS %

Thus 10-2-07

4838

BAKERSFIELD WELL & PUMP CO. - A DIVISION OF ZIM INDUSTRIES, INC. Job # 08-113

1600 E. California Avenue • Bakersfield, CA 93307 • 805/324-6026

FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT

SIZE | NO LINES | FT. SLIPPED
FT. CUT OFF | PRESENT LENGTH
TON MI. OR TRIPS SINCE LAST CUT
CUMULATIVE TON MI. OR TRIPS

FOOTAGE FROM	TO	DRLD RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

DAY TOUR

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC.-SEC. / PV/YP / GELS / WL-CC'S / SOILDS %

FOOTAGE FROM	TO	DRLD RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM
				Well #21-22								

TOTAL FT. DAY TOUR A.M. 5:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO
		G. Cunningham			

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

NIGHT TOUR

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:00	7:30			Service Equipt well #22
7:30	8:30			Finish hanging soft pannels across gate. Crew @ well #21 rigging up pump rig
8:30	9:30			rig up cable tool rig on well 22
9:30	5:00			Brush well #22 Crew on #21 run in swabb Start swabbing f/top of perfs Weather mid 70's sunny clear skys

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC.-SEC. / PV/YP / GELS / WL-CC'S / SOILDS %

10-7-08

4838

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC. Johnt 08-113

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9661

FIELD OR DIST.	COUNTY	STATE	WIRE LINE RECORD REEL NO

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SLIPPED
								FT. CUT OFF	PRESENT LENGTH	
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMLATIVE TON MI. OR TRIPS		

NIGHT TOUR

FOOTAGE FROM	TO	DR.D RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.	CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
				(949) 472-3942

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC			
PV/YP	/	/	/
GELS	/	/	/
WL-CCS			
SOILDS %			

DAY TOUR

FOOTAGE FROM	TO	DR.D RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. DAY TOUR 7:00 A.M. 5:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.	CREW	SOC. SEC NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
7:00		7:30		Service rig
7:30		3:00		Run 2 passes w/ 16" brush
				brush F/ top - bottom F/
				bottom to Top.
3:00 -		5:00		Bail out 22' OF Fill
				Crew on well #2
				Swabbing & Air lifting
				weather con Clear skyes
				Temp mid 80's to low 90's

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC.			
PV/YP	/	/	/
GELS	/	/	/
WL-CCS			
SOILDS %			

Mon 10-6-08

№ 3537

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC. Job # 08-713

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9661

FIELD OR DIST.	COUNTY	STATE	WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT

SIZE	NO LINES	PT. SLIPPED
FT. CUT OFF	PRESENT LENGTH	
TON MI. OR TRIPS SINCE LAST CUT		
CUMLATIVE TON MI. OR TRIPS		

NIGHT TOUR

FOOTAGE FROM	FOOTAGE TO	DR.D RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	PUMP NO. G.P.M.	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	TOTAL GPM

TOTAL	FT.	NIGHT TOUR	P.M.	A.M.	INJURED ON THIS TOUR
WT. OF STRING	LBS.	CREW	SOC SEC. NO.	NAME	HRS. / INITIAL / YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TIME LOG TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
				10-7-08

BIT RECORD		
BIT NO.		
SIZE		
MUD RECORD		
TIME		
WEIGHT		
PRESSURE GRADIENT		
V SC.-SEC.		
PV/YP	/	/
GELS	/	/
WL-CCS		
SOILDS %		

DAY TOUR

FOOTAGE FROM	FOOTAGE TO	DR.D RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	TOTAL GPM

TOTAL	FT.	DAY TOUR 7:00	A.M. 1:00	P.M.	INJURED ON THIS TOUR
WT. OF STRING	LBS.	CREW	SOC. SEC. NO	NAME G.Cunningham	HRS. / INITIAL / YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TIME LOG TO	ELAPSED TIME	CODE NO	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:00	7:30			Service rig
7:30 -	11:00			Finish bailing out well Pull 4" Plate off bottom
11:00 -	1:00			Rig down Clean up site.
				Weather Con. Very warm Sunny Clear skys

BIT RECORD		
BIT NO.		
SIZE		
MUD RECORD		
TIME		
WEIGHT		
PRESSURE GRADIENT		
VISC.-SEC		
PV/YP	/	/
GELS	/	/
WL-CCS		
SOILDS %		

10-7-08

№ 3538

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC.

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9661

FIELD OR DIST.	COUNTY	STATE	WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SLIPPED
								FT. CUT OFF	PRESENT LENGTH	
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMLATIVE TON MI. OR TRIPS		

NIGHT TOUR

FOOTAGE FROM	TO	DR..D RM..R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR _____ P.M. _____ A.M. INJURED ON THIS TOUR

WT. OF STRING LBS. CREW SOC. SEC. NO. NAME HRS. INITIAL YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES	BIT RECORD		
					BIT NO.		
					SIZE		
					MUD RECORD		
					TIME		
					WEIGHT		
					PRESSURE GRADIENT		
					VISC.-SEC.		
					PV/YP	/	/
					GELS	/	/
					WL-CC'S		
				10-8-08	SOILDS %		

DAY TOUR

FOOTAGE FROM	TO	DR..D RM..R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM
				Well #21								

TOTAL FT. DAY TOUR 7:00 A.M. 5:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS. CREW SOC. SEC. NO. NAME HRS. INITIAL YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES	BIT RECORD		
7:00	7:30			Service Equipt	BIT NO.		
					SIZE		
7:30	5:00			Swabb & air lift F/433-	MUD RECORD		
				to 960'	TIME		
					WEIGHT		
				Weather con: Sunny Clear	PRESSURE GRADIENT		
				Skys warm	VISC.-SEC.		
					PV/YP	/	/
					GELS	/	/
					WL-CC'S		
					SOILDS %		

№ 3401

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC.

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9661

FIELD OR DIST.	COUNTY	STATE	WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SLIPPED
								FT. CUT OFF	PRESENT LENGTH	
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMLATIVE TON MI. OR TRIPS		

NIGHT TOUR

FOOTAGE FROM	TO	DR..D RM..R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL	FT.	NIGHT TOUR	P.M.	A.M.	INJURED ON THIS TOUR

WT. OF STRING	LBS.	CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
				10-9-08

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC.			
PV/YP	/	/	/
GELS	/	/	/
WL-CC'S			
SOILDS %			

DAY TOUR

FOOTAGE FROM	TO	DR..D RM..R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM
				Well #21								

TOTAL	FT.	DAY TOUR 7:00	A.M. 5:00	P.M.	INJURED ON THIS TOUR

WT. OF STRING	LBS.	CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
7:00	7:30			Service up
7:30	2:00			Swabb & Air lift From 1696 - 831 (1696 - 716 very muddy)
2:00	5:00			(Rig repair) Chain broken on drawworks engine
				No Gravel movement in 4"
				Weather: Clear Skys sunny
				Temp: 60 80s

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC.			
PV/YP	/	/	/
GELS	/	/	/
WL-CC'S			
SOILDS %			

№ 3402

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC.

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9661

FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT

SIZE | NO LINES | FT. SLIPPED
FT. CUT OFF | PRESENT LENGTH
TON MI. OR TRIPS SINCE LAST CUT
CUMLATIVE TON MI. OR TRIPS

NIGHT TOUR

FOOTAGE FROM	TO	DR.D RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
				Fri 10-10-08

BIT RECORD: BIT NO. | SIZE

MUD RECORD: TIME | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | PV/YP | GELS | WL-CC'S | SOILDS %

DAY TOUR

FOOTAGE FROM	TO	DR.D RM. R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM
				Well # 21								

TOTAL FT. DAY TOUR 7:00 A.M. 5:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO
		G. Cunningham			

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
7:00	7:30			Service Rig
7:30	5:00			Swabb 3 Air lift from 831' – 985' discharge water very (Dirty) muddy. Spending extra time to clean up
				Weather: Patchy Clouds, Sunny Hi's mid 70s

BIT RECORD: BIT NO. | SIZE

MUD RECORD: TIME | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | PV/YP | GELS | WL-CC'S | SOILDS %

№ 3403

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC. Job# 08-113 IRWA

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9661

FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR	NO JOINTS	FEET	RKB TO CSG HD	SET AT

SIZE | NO LINES | FT. SLIPPED
FT CUT OFF | PRESENT LENGTH
TON MI. OR TRIPS SINCE LAST CUT
CUMLATIVE TON MI. OR TRIPS

NIGHT TOUR

FOOTAGE FROM	TO	DR. D RM..R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT | NIGHT TOUR P.M. A.M. | INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC SEC NO	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR	TVD	HORZ DISP

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
				949-472-3742
				Tues 10-14-08

BIT RECORD: BIT NO | SIZE

MUD RECORD: TIME | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | PV/YP | GELS | WL-CC'S | SOILDS %

DAY TOUR

FOOTAGE FROM	TO	DR..D RM..R CORE C	CORE NO	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M	TOTAL GPM
				Well #21								

TOTAL FT | DAY TOUR 7:00 A.M. 5:00 P.M. | INJURED ON THIS TOUR

WT OF STRING LBS

CREW	SOC SEC NO	NAME	HRS.	INITIAL	YES OR NO
		G. Cunningham			

DEVIATION RECORD	DEPTH	DEV	DIR	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
7:00	7:30			Service up fuel Compressor
7:30	11:00			Finish Swabb & Air lift to 1062' Tagg Fill @ 1065'
11:00	5:00			Swabb & Air lift From 1062' up to 930' - Pull up to Next Interval @ 870' Weather: Sunny Clear Skys Temp Mid 80's

BIT RECORD: BIT NO | SIZE

MUD RECORD: TIME | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | PV/YP | GELS | WL-CC'S | SOILDS %

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC. Job# 08-113 IRWD.

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9661

FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SLIPPED
								FT. CUT OFF	PRESENT LENGTH	
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMLATIVE TON MI. OR TRIPS		

NIGHT TOUR

FOOTAGE FROM	TO	DR.D RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS. CREW SOC. SEC. NO. NAME HRS. INITIAL YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
				949-472-3742
				WED 10-15-08

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC.-SEC. / PV/YP / GELS / WL-CC'S / SOILDS %

DAY TOUR

FOOTAGE FROM	TO	DR.D RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM
				Well #21								

TOTAL FT. DAY TOUR A.M. P.M. INJURED ON THIS TOUR

WT. OF STRING LBS. CREW SOC. SEC. NO. NAME HRS. INITIAL YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7:00	7:30			Service Equpt.
7:30	5:00			Swabb & Air lift from 870' to 10' Water Cloudy to Clean 10-15 min Avg. Sand content 0.5 to trace

G Cunningham

BIT RECORD: BIT NO. / SIZE

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / VISC.-SEC. / PV/YP / GELS / WL-CC'S / SOILDS %

No. 3406

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC. Job # 08-113 IEWD

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9661

FIELD OR DIST.	COUNTY	STATE	WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SLIPPED
								FT. CUT OFF	PRESENT LENGTH	
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMLATIVE TON MI. OR TRIPS		

NIGHT TOUR

FOOTAGE FROM	FOOTAGE TO	DR.D RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
				949-472-3742
				Thrusday
				10-16-08
				↓

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC.			
PV/YP	/	/	/
GELS	/	/	/
WL-CC'S			
SOILDS %			

DAY TOUR

FOOTAGE FROM	FOOTAGE TO	DR.D RM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	TOTAL GPM
				Well #21								

TOTAL FT. DAY TOUR 7:00 A.M. 5:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
7:00	7:30			Service Equipt.
7:30	5:00			Swabb & Air Lift From 610
				-310' discharge water clean
				after 5-10 min sand content
				0 to trace of sand.
				Weather Cond. Sunny Clear
				Skys Temp Hi 80s
				METER Reading @ 004270

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC.			
PV/YP	/	/	/
GELS	/	/	/
WL-CC'S			
SOILDS %			

Nº 3407

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC. Job# 08-113 IRWP

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9661

FIELD OR DIST.	COUNTY	STATE	WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SLIPPED
								FT. CUT OFF	PRESENT LENGTH	
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMLATIVE TON MI. OR TRIPS		

NIGHT TOUR

FOOTAGE FROM	TO	DR..D RM..R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.	CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
				FRi
				10-17-08

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC.			
PV/YP	/	/	/
GELS	/	/	/
WL-CC'S			
SOILDS %			

DAY TOUR

FOOTAGE FROM	TO	DR..D RM..R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. DAY TOUR 7:00 A.M. 4:00 P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.	CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO
			Glunningh			

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
7:00	7:30			Service Equipt
7:30	8:00			Swabb 3 Air lift from
				310-299 discharge semi
				Cloudy to Clear (No Sand)
8:00	4:00			Pull air line trip out hole start
				rigging down, after bail
				ing well out. Run water
				hose in well for video

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC.			
PV/YP	/	/	/
GELS	/	/	/
WL-CC'S			
SOILDS %			

№ 3408

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC. Job # 08-113 Lewis

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9661

FIELD OR DIST.	COUNTY	STATE	WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT

SIZE	NO. LINES	FT. SLIPPED
FT. CUT OFF	PRESENT LENGTH	
TON MI. OR TRIPS SINCE LAST CUT		
CUMULATIVE TON MI. OR TRIPS		

NIGHT TOUR

FOOTAGE FROM	FOOTAGE TO	DR. D RM. R CORE. C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	TOTAL GPM

TOTAL	FT.	NIGHT TOUR	P.M.	A.M.	INJURED ON THIS TOUR
WT. OF STRING	LBS.	CREW	SOC. SEC. NO.	NAME	HRS. / INITIAL / YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TIME LOG TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
				949-472-3742
				10-20-08

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC.			
PV/YP	/	/	/
GELS	/	/	/
WL-CC'S			
SOILDS %			

DAY TOUR

FOOTAGE FROM	FOOTAGE TO	DR. D RM. R CORE C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	TOTAL GPM

TOTAL	FT.	DAY TOUR 7:00	A.M. 5:00	P.M.	INJURED ON THIS TOUR
WT. OF STRING	LBS.	CREW	SOC. SEC. NO.	NAME	HRS. / INITIAL / YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TIME LOG TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
7:00	1:30			Set up for Viedo Well #21
				Unload pump pipe Well #21
1:30	5:00			Rig up on Well #22
				Weather Clear Skys Warm
				temp: mid to hi 80's

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC.			
PV/YP	/	/	/
GELS	/	/	/
WL-CC'S			
SOILDS %			

№ 3409

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC.

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9661

FIELD OR DIST. | COUNTY | STATE | WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB TO CSG. HD	SET AT	SIZE	NO. LINES	FT. SLIPPED
								FT. CUT OFF	PRESENT LENGTH	
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMULATIVE TON MI. OR TRIPS		

NIGHT TOUR

FOOTAGE FROM	TO	DR.D RM.R CORE.D	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	D.R.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS
7	500	9½		10-22-08 IRWD well #
	½ hour lunch			Set up Rig, installed hoses
				& Packer, Inflated Packer
				& checked for leak's on Packer
				& fitting, Installed 335' of
				pump.
				J. Crosby

BIT RECORD: BIT NO. | SIZE

MUD RECORD: TIME | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | PV/YP | GELS | WL-CC'S | SOILDS %

DAY TOUR

FOOTAGE FROM	TO	DR.D RM.R CORE.D	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	S.P.M.	PUMP NO. LINER SIZE	S.P.M.	TOTAL GPM

TOTAL FT. DAY TOUR A.M. P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	D.R.	TVD	HORZ. DISP.

TIME LOG FROM	TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMARKS

BIT RECORD: BIT NO. | SIZE

MUD RECORD: TIME | WEIGHT | PRESSURE GRADIENT | VISC.-SEC. | PV/YP | GELS | WL-CC'S | SOILDS %

№ 3411

BAKERSFIELD WELL & PUMP CO., - A DIVISION OF ZIM INDUSTRIES, INC.

7212 Fruitvale Avenue • Bakersfield, CA 93308 • 661/393-9861

FIELD OR DIST.	COUNTY	STATE	WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER	SIZE	MAKE	WT. & GR.	NO. JOINTS	FEET	RKB. TO CSG. HD.	SET AT	SIZE	NO LINES	FT. SLIPPED
								FT. CUT OFF	PRESENT LENGTH	
								TON MI. OR TRIPS SINCE LAST CUT		
								CUMLATIVE TON MI. OR TRIPS		

NIGHT TOUR

FOOTAGE FROM	FOOTAGE TO	DR. D RM. R CORE.C	CORE NO	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	TOTAL GPM

TOTAL FT. NIGHT TOUR P.M. A.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TIME LOG TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES
				12-23-08 IRWD Well #21
7	1200	[illegible]		Continued to install pump
12	1230	[illegible]		Lunch
12 30				Finished installing pump, center
1230	600	5½		of Packer set at 526
				Started installing discharge,
				aligned pump.
				J. Graham

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC.			
PV/YP	/	/	/
GELS	/	/	/
WL-CC'S			
SOILDS %			

DAY TOUR

FOOTAGE FROM	FOOTAGE TO	DR. D RM. R CORE.C	CORE NO	FORMATION (SHOW CORE RECOVERY)	ROTARY RPM	WT. ON BIT 1000	PUMP PRESS	PUMP NO. LINER SIZE	PUMP NO. S.P.M	PUMP NO. LINER SIZE	PUMP NO. S.P.M.	TOTAL GPM

TOTAL FT. DAY TOUR A.M. P.M. INJURED ON THIS TOUR

WT. OF STRING LBS.

CREW	SOC. SEC. NO.	NAME	HRS.	INITIAL	YES OR NO

DEVIATION RECORD	DEPTH	DEV.	DIR.	TVD	HORZ. DISP.

TIME LOG FROM	TIME LOG TO	ELAPSED TIME	CODE NO.	DETAILS OF OPERATING IN SEQUENCE AND REMAKES

BIT RECORD			
BIT NO.			
SIZE			
MUD RECORD			
TIME			
WEIGHT			
PRESSURE GRADIENT			
VISC.-SEC.			
PV/YP	/	/	/
GELS	/	/	/
WL-CC'S			
SOILDS %			

№ 3412

t/m #2 & 8808

BAKERSFIELD WELL AND PUMP COMPANY
PUMPING DEVELOPMENT RECORD

SHEET NO. 1

CLIENT: I.R.W.D

WELL NAME/NUMBER: 21

JOB NO. 08-113

DATE: 10-24-08

PUMPER: Tommy Henderson

MEASURING DEVICE: Sounder

DISCHARGE PIPE DIA.: 12" inches

INITIAL FLOW METER READING: 071365.2 gals

STATIC WATER LEVEL: 79.35 ft brp

REF. POINT. ELEVATION: .25 ft above ground level

TIME 2:30 AM__ PM__	PRESSURE (psi)	PUMPING RATE (gpm)	PUMPING LEVEL (ft brp)	DRAWDOWN (ft)	SPECIFIC CAPACITY (gpm/ft ddn)	NUMBER OF SURGES	PUMP SPEED (rpm)	5 MIN SAND (ppm)	5-20 MIN SAND (ppm)	Turbidity/TSS (NTU/ppm)	REMARKS
3:00	6psi	760	90.40	11.05	68.77	Ø	825	8.44	.704	TSS 125	Dirty Brown TSS 18 after 15 min
3:30	" "	750	91.35	12.00	62.50	Ø	825	Ø	Ø	TSS 11	clear
4:00	8psi TQ	891	96.00	16.65	53.51	Ø	900	7.39	.003	TSS 9	clear
4:30	" "	885	96.50	17.15	51.62	Ø	900	Ø	Ø	TSS 7	clear

FINAL FLOW METER READING: _____ gals

TOTAL PUMPED VOLUME: _____ gals

#2 000089

BAKERSFIELD WELL AND PUMP COMPANY
PUMPING DEVELOPMENT RECORD

SHEET NO. 2 | DATE: 10-27-08

CLIENT: I.R.W.D. | PUMPER: Tommy Henderson

WELL NAME/NUMBER: 21 | MEASURING DEVICE: Sounde

JOB NO. 08-113 | DISCHARGE PIPE DIA.: 12" inches

INITIAL FLOW METER READING: 071462.35 gals | STATIC WATER LEVEL: 79.93 ft brp | REF. POINT. ELEVATION: .25 ft above ground level

TIME 8:00 AM ✓ PM__	PRESSURE (psi)	PUMPING RATE (gpm)	PUMPING LEVEL (ft brp)	DRAWDOWN (ft)	SPECIFIC CAPACITY (gpm/ft ddn)	NUMBER OF SURGES	PUMP SPEED (rpm)	5 MIN SAND (ppm)	5-20 MIN SAND (ppm)	Turbidity/TSS (NTU/ppm)	REMARKS	Flow METER #2
8:30	5psi.	258	83.50	3.57	72.26	Ø	725	10.56	7.04	TSS 97	Lite Brown	Start 000089
9:00	5psi. ↑Q	670	91.02	11.09	60.41	Ø	825	2.11	.704	TSS 15	clear	9:02 000153
9:40	5psi. ↑Q	1066	99.71	19.78	53.89	Ø	950	3.16	1.05	TSS 11	clear	9:39 000151.8
10:00	8psi. ↑Q	1560	109.12	29.19	53.44	Ø	1,100	10.56	3.52	TSS 16	clear	
											Flow Meter Testing	
11:35	15psi.	3,136	141.77	61.84	50.71	Ø	1775	15.84	5.28		clear	12:00 000353
12:40	8psi. ↓Q	2,474	127.93	48.00	51.54	Ø	1500	2.11	45.93	TSS 44	Lite Brown	12:08 gravel at 7"
1:20	6psi. ↓Q	570	98.62	18.69	30.49	1	800	1267.2	176.0	TSS 348	Dirty Brown	1:10 000460
1:55	" "	591	97.48	17.55	33.67	Ø	800	N/R		20/35 min	Sand: 190.08 ppm	TSS 18
		N/R				Ø	800	N/R.		35/40 min	158.40	
2:15	6psi. "	591	97.15	17.22	34.32	Ø	800	126.72			TSS 11	clear
2:30	6psi. "	600	97.00	17.07	35.14	Ø	800	105.60	Ø	70/75 min	80/90 min 95.04	2:10 000488
2:50	" "	526	96.30	16.37	32.13	1	800	390.72		TSS 13	clear 10/15=	12.67 ppm
	6psi.					Ø	800	Ø	Ø	20/25 min sand:	10.56 ppm	3:00 pm 000511.5
3:10	6psi.	526	96.23	16.30	32.26	Ø	800	Ø	Ø	28/33 min sand:	10.56 ppm	clear
3:21	6 psi.	526	95.95	16.02	32.83	Ø	800	Ø	Ø	39/44 min sand:	10.56 ppm	clear
4:00	6psi.	518	95.73	15.80	32.76	1	800	105.6	21.12	TSS 23	25/30 min 8.44 ppm	clear 31/36 sand: 8.44 pp
4:30	6psi.	528	95.95	16.02	32.95	Ø	800			37/42 4.22 ppm		clear 4:22 000549

FINAL FLOW METER READING: _____ gals F/m #2 4:30pm 000552.5 TOTAL PUMPED VOLUME: _____ gals

HOURS PUMPED THIS DAY: 5.5 | TOTAL HOURS PUMPED TO DATE: 7.5

F/m 12" -12-629

BAKERSFIELD WELL AND PUMP COMPANY
PUMPING DEVELOPMENT RECORD

SHEET NO. 3

CLIENT: I.R.W.D.

FAXH

WELL NAME/NUMBER: 21'

909-920-0403

JOB NO. GB-113

DATE: 10-28-08

PUMPER: Tommy Henderson

MEASURING DEVICE: Sounder

DISCHARGE PIPE DIA.: 12" inches

F/m #1

INITIAL FLOW METER READING: 071957.5 gals

STATIC WATER LEVEL: 84.62 ft brp

REF. POINT. ELEVATION: 1.25 ft above ground level

TIME 8:00 AM ✓ PM	PRESSURE (psi)	PUMPING RATE (gpm)	PUMPING LEVEL (ft brp)	DRAWDOWN (ft)	SPECIFIC CAPACITY (gpm/ft ddn)	NUMBER OF SURGES	PUMP SPEED (rpm)	5 MIN SAND (ppm)	5-20 MIN SAND (ppm)	Turbidity/TSS (NTU/ppm)	REMARKS Start up Color/WATER, F/m # 2 000552.5	
8:30	6psi "	560	93.05	8.43	66.42	Q	800	63.36	3.52	TSS 63	Lt. Brown	
9:00	6psi "	555	94.00	9.38	59.16	1	800	42.24	.704	TSS 14	clear	9:00am 000582.0
9:30	6psi. ↑Q	850	98.90	14.28	59.52	Q	925	5.28	1.40	TSS 10	clear	
10:05	6psi ↑Q	1,320	106.63	22.01	59.97	Q	1,025	52.80	3.52	TSS 27	Lt. Brown	10:00 000642
10:35	6psi ↑Q	1,560	111.37	26.75	58.31	Q	1,150	19.00	10.91	TSS 17	clear	
11:00	8psi. ↑Q	1,945	118.18	33.56	57.95	Q	1,325	52.80	35.20	TSS 26	clear	11:00 000746
12:20	6psi. ↓Q	938	103.53	18.91	49.60	1	900	21.12	3.87	TSS 16	clear	12:00 000791.5
1:00	6psi. "	945	103.05	18.43	51.27	1	900	21.12	3.87	TSS 14	clear	1:00 000833
1:30	6psi. "	940	103.35	18.73	50.18	1	900	15.48	3.25	TSS 14	clear	
1:55	6psi. ↑Q	1,350	109.30	24.64	54.78	1	1,100	12.67	2.81	TSS 22	clear	2:00 000898.0
2:30	6psi ..	1,310	109.93	25.31	51.73	1	1,100	21.12	3.52	TSS 24	clear	
3:05	6psi "	1,310	110.18	25.56	51.23	1	1,100	15.84	1.76	TSS 24	clear	3:00 000970
3:35	8psi. ↑Q	2,000	120.75	36.13	55.35	1	1,325	31.68	3.52	TSS 47	cloudy, clear	(in 5 mins)
4:05	8psi. "	2,025	122.10	37.48	54.02	1	1,325	21.12	3.52	TSS 33	cloudy, clear	" ") 4:00 001079
4:30	8psi	2,030	122.65	38.03	53.37	Q	1,325	Q	Q	TSS 19	clear	4:30 1125.1

FINAL FLOW METER READING: _____ gals

TOTAL PUMPED VOLUME: _____ gals

HOURS PUMPED THIS DAY: 8.5

TOTAL HOURS PUMPED TO DATE: 16.0

92-12-6

BAKERSFIELD WELL AND PUMP COMPANY
PUMPING DEVELOPMENT RECORD

SHEET NO. 4

CLIENT: I.R.W.D.

WELL NAME/NUMBER: # 21

JOB NO. 08-113

DATE: 10-29-08

PUMPER: Tommy Henderson

MEASURING DEVICE: Sounder

DISCHARGE PIPE DIA.: 12 inches

INITIAL FLOW METER READING: 072440.3 gals

STATIC WATER LEVEL: 86.40 ft brp

REF. POINT. ELEVATION: 1.25 ft above ground level

TIME 8:00 AM ✓ PM	PRESSURE (psi)	PUMPING RATE (gpm)	PUMPING LEVEL (ft brp)	DRAWDOWN (ft)	SPECIFIC CAPACITY (gpm/ft ddn)	NUMBER OF SURGES	PUMP SPEED (rpm)	5 MIN SAND (ppm)	5-20 MIN SAND (ppm)	Turbidity/TSS (NTU/ppm)	REMARKS	F/m #2 Hz Reading
8:30	PSI 6	815	97.83	11.43	71.30	0	900	7.39	.352	TSS 54	Lt Brown	8:00AM 01125
8:55	PSI 6 ↑Q	1,145	103.71	17.31	66.14	1	1000	7.39	.352	TSS 12	Clear	9:00AM 01176
9:25	PSI 6 "	1,140	104.57	18.17	62.74	2	1,000	10.56	3.87	TSS 15	Clear	
9:55	PSI 6 ↑Q	1,590	111.70	25.30	62.84	1	1,175	9.50	.704	TSS 14	Clear	
10:25	PSI 6 "	1,585	112.88	26.48	59.85	2	1,175	10.56	.352	TSS 45	Clear	10:00AM 01253.3
10:55	PSI 8 ↑Q	1,975	119.62	33.22	59.45	1	1,350	10.56	.352	TSS 09	Clear	
11:35	PSI 8 "	2,025	121.32	34.92	57.98	2	1,350	15.84	1.76	TSS 14	Clear	11:00AM 01368.9
12:00	P.S.I. 10 ↑Q	2,600	129.48	43.08	60.35	1	1,550	22.17	3.52	TSS 25	Clear	12:00 01485
12:30	P.S.I. 10 "	2,695	131.62	45.22	59.59	2	1,575	22.17	3.52	TSS 31	Clear	
1:00	P.S.I. 10 ↑Q	2,950	135.73	49.33	59.80	1	1,725	11.61	3.52	TSS 166	Lt Brown cin water	1:00 01639
1:35	P.S.I. 10 "	2,985	136.43	50.03	59.66	2	1,725	11.61	3.16	TSS 122	Lt Brown cin water	
2:05	P.S.I. 10 "	2,950	136.10	49.70	59.35	2	1,700	10.56	1.76	TSS 42	Lt Brown, Cloudy	2:00pm 01799
2:35	P.S.I. 10 ↑Q	3,110	138.10	51.70	60.15	2	1750	20.06	1.76	TSS 159	Cloudy, Lt Brown	
3:30	P.S.I. 10 ↑Q	3,190	136.60	50.20	63.54	2	1800	15.84	2.11	TSS 108	Cloudy, Lt Brown	3:00pm 01896.0
4:05	P.S.I. 10 ↑Q	3,220	138.37	51.97	61.95	2	1800	15.84	1.40	TSS 143	Cloudy, Lt Brown	4:00pm 02062
4:30	P.S.I. 10 "	3,218	139.42	53.02	60.69	0	1825	20+30	Sand: 2.11	TSS 72	Cloudy	4:30pm 02135

FINAL FLOW METER READING: _____ gals

HOURS PUMPED THIS DAY: 8.5

TOTAL PUMPED VOLUME: _____ gals

TOTAL HOURS PUMPED TO DATE: 24.5

Im #2 002138

BAKERSFIELD WELL AND PUMP COMPANY
PUMPING DEVELOPMENT RECORD

SHEET NO. 5

CLIENT: I.R.W.D.

WELL NAME/NUMBER: 21

JOB NO. 08-113

DATE: 10-30-08

PUMPER: Tommy Henderson

MEASURING DEVICE: Sounder

DISCHARGE PIPE DIA.: 12" inches

REF. POINT. ELEVATION: .25 ft above ground level

INITIAL FLOW METER READING: 073501.7 gals STATIC WATER LEVEL: 90.05 ft brp

TIME 8:30 AM ✓ PM	PRESSURE (psi)	PUMPING RATE (gpm)	PUMPING LEVEL (ft brp)	DRAWDOWN (ft)	SPECIFIC CAPACITY (gpm/ft ddn)	NUMBER OF SURGES	PUMP SPEED (rpm)	5 MIN SAND (ppm)	5-20 MIN SAND (ppm)	Turbidity/TSS (NTU/ppm)	REMARKS Start-up @2138
8:55	psi. ↑	1,140	104.64	14.59	78.13	0	1,000	3.16	.352	TSS 64	Lite Brown
9:30	" "	1,110	105.50	15.45	71.84	2	1,000	5.28	.704	TSS 11	clear 9:30 @2495
9:55	8psi. ↑Q	1,560	111.64	21.59	72.25	2	1,150	5.28	.704	TSS 12	clear
10:25	" "	1,568	112.72	22.67	69.17	2	1,150	5.28	1.40	TSS 14	clear
@10:55	8psi. ↑Q	2,130	120.00	29.95	71.11	2	1,325	7.39	.704	TSS 21	clear, air water) 10:30 @2275
11:20	8psi "	2,150	120.93	30.88	69.62	2	1,325	9.50	.352	TSS 15	clear, air water)
3:50	8psi ↑Q	2,500	121.50	31.45	79.45	2	1,500	8.44	.704	TSS 24	clear, air water) cloudy
4:30	10psi ↑Q	3,318	131.95	41.90	79.18	0	1850	15.84	.352	TSS 27	cloudy (air water) 4:30: @25088

Harris Diamond [illegible]

TOTAL PUMPED VOLUME: TOTAL: 29.0 hrs

BAKERSFIELD WE AND PUMP COMPANY
PUMPING DEVELOPMENT RECORD

SHEET NO. 6

CLIENT: I.R.W.D. FAX # 909-920-0403

WELL NAME/NUMBER: # 21

JOB NO. 08-113

DATE: 10-31-08

PUMPER: Tommy Henderson

MEASURING DEVICE: Sounder

DISCHARGE PIPE DIA.: 12" Inches

INITIAL FLOW METER READING: 073891.2 gals STATIC WATER LEVEL: 89.50 ft brp

REF. POINT. ELEVATION: .25 ft above ground level

TIME 8:30 AM ✓ PM__	PRESSURE (psi)	PUMPING RATE (gpm)	PUMPING LEVEL (ft brp)	DRAWDOWN (ft)	SPECIFIC CAPACITY (gpm/ft ddn)	NUMBER OF SURGES	PUMP SPEED (rpm)	5 MIN SAND (ppm)	5-20 MIN SAND (ppm)	Turbidity/TSS (NTU/ppm)	REMARKS
											F/M #2 Reading's Hourly
9:00	6psi.	2,130	114.75	25.25	84.35	0	1,325	3.16	.352	TSS 83	Lt Brown, Clear,
9:30	8psi. ↑Q	2,554	121.63	32.13	79.49	3	1,500	8.44	.704	TSS 37	Cloudy, 9:30am 02633.0
10:05	10psi. ↑Q	3,165	130.50	41.00	77.19	3	1,750	10.56	3.16	TSS 135	Lt Brown, cloudy,
10:35	10psi ↑Q	3,386	134.80	45.30	74.75	3	1,850	10.56	3.52	TSS 71	Cloudy. 10:30am 02792.0
11:05	10psi "	3,460	135.00	45.50	74.72	3	1825	12.67	3.52	TSS 39	cloudy,
11:30	10psi. "	3,490				3	1,825	15.84	4.57	TSS 62	cloudy, 11:30am 02958
12:30	10psi.	3,390	134.05	44.55	76.09	3	1850	10.56	3.52	TSS 105	Lt Brown 12:30 0 3232.5
1:00	10psi	3,390	135.25	45.75	74.09	3	1850	12.67	3.52	TSS 161	Lt Brown
1:25	10psi	N/R	"	N/R	"	3	1850	12.67	0	TSS 26	Lt Brown, 1:30 0 3148.5
2:00		N/R		"		3	1850	12.67		TSS 35	Cloudy,
3:00	10psi ↓Q	3,196	131.05	41.55	76.91	3	1,750	10.56	3.52	TSS 58	Cloudy 2:30 0 3242.1

FINAL FLOW METER READING: _____ gals

HOURS PUMPED THIS DAY: 6.5

TOTAL PUMPED VOLUME: _____ gals

TOTAL HOURS PUMPED TO DATE: 35.5

Im # 2 #03293

BAKERSFIELD WELL & PUMP COMPANY
PUMPING DEVELOPMENT RECORD

SHEET NO. 7

CLIENT: J.R.W.D.

WELL NAME/NUMBER: #21

JOB NO. 08-113

DATE: 11-05-08

PUMPER: Tommy Henderson

MEASURING DEVICE: Sounder

DISCHARGE PIPE DIA.: 12" inches

REF. POINT. ELEVATION: 1.25 ft above ground level

INITIAL FLOW METER READING: 074703.2 gals STATIC WATER LEVEL: 90.35 ft brp

TIME 8:00 AM✓ PM__	PRESSURE (psi)	PUMPING RATE (gpm)	PUMPING LEVEL (ft brp)	DRAWDOWN (ft)	SPECIFIC CAPACITY (gpm/ft ddn)	NUMBER OF SURGES	PUMP SPEED (rpm)	5 MIN SAND (ppm)	5-20 MIN SAND (ppm)	Turbidity/TSS (NTU/ppm)	REMARKS
8:25	PSI 6	1,320	106.08	15.73	83.91	Q	1,100	6.33	1.05	TSS 34	Lite Brown, Turb = 15.4 NTU
8:55	PSI 6 ↑Q	2,145	115.92	25.57	83.88	5	1,475	7.39	1.05	TSS 18	Clear,
9:30	PSI. 8 ↑Q	2,955	125.60	35.25	83.82	5	1,700	8.44	.352	TSS 36	Clear,
10:05	PSI. 10 ↑Q	3,535	133.15	42.80	82.59	5	1,900	9.50	.352	TSS 147	Lite Brown, Cloudy,
10:40	PSI. 10 ↑Q	3,558	136.20	45.85	77.60	5	1,950	10.56	1.76	TSS 87	Lite Brown,
11:05	" "	3,455	134.05	43.70	79.05	5	1,900	9.50	N/R	TSS 92	Lite Brown,
11:50	PSI 10 ↑Q	3,635	136.08	45.73	79.48	5	1,975	9.50	.352	TSS 109	Cloudy.
12:25	PSI " "	3,665	137.15	46.80	78.32	5	1,975	9.50	.352	TSS 99	Cloudy
1:05	PSI. " "	3,643	137.18	46.83	77.78	5	1,975	7.39	.352	TSS 85	Cloudy Lite Brown, Turb = 5.2 NTU
2:20	PSI. " "	3,640	142.37	52.02	69.97	5	1,975	7.39	.352	NTU 36.5	Cloudy Little Brown, 5-10 Sand, T.R.
2:55	PSI "	3,595	136.85	46.50	77.31	5	1,975	7.39	.352	NTU 57.9	Lite Brown, 5-10 Sand, T.R.
3:35	PSI 10 "	3,600	137.10	46.75	77.00	5	1,975	7.39	.352	NTU 83.1	Lite Brown 5-10 Sand 1.05 ppm 15/20 T.R.
4:30	PSI. 10 "	3,625	138.25	47.90	75.67	5	1,975	8.44	T.R.	NTU 86.3	Lite Brown, 5-10 Sand, T.05 ppm

FINAL FLOW METER READING: _____ gals

HOURS PUMPED THIS DAY: _____

TOTAL PUMPED VOLUME: _____ gals

TOTAL HOURS PUMPED TO DATE: _____

BAKERSFIELD WEL ND PUMP COMPANY
PUMPING DEVELOPMENT RECORD

SHEET NO. 8

CLIENT: I.R.W.D.

WELL NAME/NUMBER: #21

JOB NO. 08-113

DATE: 11-06-08

PUMPER: Tommy Henderson

MEASURING DEVICE: Sounder

DISCHARGE PIPE DIA.: 12" inches

INITIAL FLOW METER READING: 075838.9 gals

STATIC WATER LEVEL: 94.80 ft brp

REF. POINT. ELEVATION: .25 ft above ground level

TIME 8:00 AM ✓ PM	PRESSURE (psi)	PUMPING RATE (gpm)	PUMPING LEVEL (ft brp)	DRAWDOWN (ft)	SPECIFIC CAPACITY (gpm/ft ddn)	NUMBER OF SURGES	PUMP SPEED (rpm)	5 MIN SAND (ppm)	5-20 MIN SAND (ppm)	Turbidity/TSS (NTU/ppm)	REMARKS
8:25	8psi	1,481	111.50	16.70	88.67	Ø	1,175	2.11	.352	31.7 N.T.U.	Lit Brown, after 1min 8.42
8:55	" "	1,469	113.17	18.37	79.94	Ø	1,175	Ø	20/25 Sand: Ø		clear NTU 2.27
9:55	8psi. ↑Q	2,475	123.75	28.95	85.49	5	1,525	6.33	.352	N.T.U. 3.49	clear,
10:35	10psi ↑Q	3,150	130.00	35.20	89.48	5	1,750	10.56	1.76	N.T.U. 14.0	Little Cloudy
11:10	10psi ↑Q	3,550	134.60	39.80	89.19	5	1,900	10.56	1.76	N.T.U. 57.7	cloudy, after 5min N.T.U. 43.0
11:50	"	3,635	136.55	41.75	87.06	5	1,975	11.61	2.46	N.T.U. 42.2	cloudy, Little Brown Color.
12:25	10psi	3,531	135.50	40.70	86.77	5	1,900	11.61	3.16	N.T.U 18.6	cloudy, Lit Brown Color,
1:00	10psi.	3,525	136.08	41.28	85.39	5	1,900	8.44	.704	N.T.U 36.5	cloudy, Lit Brown in color, (NTU 29.9 after 1 min 20 mins N.T.U 20.0
1:35	↑Q	3,610	137.44	42.64	84.66	5	1975	8.44	15/20 Ø	N.T.U 27.4	cloudy. 5/10 Sand: 2.11ppm 10/15 2.11ppm
2:15	10psi. "	3,625	137.85	43.05	84.20	5	1,975	8.44	10/20 1.05ppm	N.T.U. 24.6	Clear, 5/10 Sand: 1.05ppm
3:10	10psi "	3,588	139.25	44.45	80.70	5	1,975	8.44	N/R	N.T.U 29.6	cloudy, 5/10 Sand: N/R N.T.U. 6.24 40 min
3:45	10psi. " "	3,636	139.05	44.25	82.17	5	1,975	8.44	.352	N.T.U. 24.6	cloudy, clear after 20 mins N.T.U 17.6
4:30	10psi.	3,625	138.92	44.12	82.16	5	1975	7.39	.352	N.T.U 18.6	cloudy, NTU after 20 mins 14.2

FINAL FLOW METER READING: _____ gals

HOURS PUMPED THIS DAY: 8.5

TOTAL PUMPED VOLUME: _____ gals

Nov 07 08 12:03p The Mail Exchange

1/M 4 2 8035 19.1

BAKERSFIELD WEL ID PUMP COMPANY
PUMPING DEVELOPMENT RECORD

FAX 1-909-920-0403

SHEET NO. 9 DATE: 11-07-08

CLIENT: #21 PUMPER: Tommy Henderson

WELL NAME/NUMBER: I.R.W.D. MEASURING DEVICE: Sounder

JOB NO. 08-113 DISCHARGE PIPE DIA.: 12 inches

INITIAL FLOW METER READING: 077068.7 gals STATIC WATER LEVEL: 94.92 ft brp REF. POINT. ELEVATION: 125 ft above ground level

TIME 8:00 AM ✓ PM__	PRESSURE (psi)	PUMPING RATE (gpm)	PUMPING LEVEL (ft brp)	DRAWDOWN (ft)	SPECIFIC CAPACITY (gpm/ft ddn)	NUMBER OF SURGES	PUMP SPEED (rpm)	5 MIN SAND (ppm)	5-20 MIN SAND (ppm)	Turbidity/TSS (NTU/ppm)	REMARKS
8:30	PSI 12	3,700	130.33	35.41	104.49	Ø	1,975	4.22	1.40	14.2	Clear, NTU after 5min 19.1
9:35	PSI 12	3648	132.80	37.88	96.30	5	1,975	5.28	Ø	18.2 (20) 12.3	Clear, after 5min 14.1 NTU 5/10 = 1.05ppm 10/15 T.R.
10:15	" "	3,660	133.60	38.68	94.62	5	1,975	7.39	Ø	48.1 (20) 12.3	Cloudy, 5/10 1.05ppm 10/15 T.R.
10:55	" "	3,629	135.00	40.08	90.53	5	1,975	6.33	Ø	37.6 (20) 7.97	Cloudy, 5min NTU: 19.4 5/10 1.05ppm after 15min water: clear
11:25	12PSI. "	3,650	136.00	41.08	88.85	5	1,975	4.22	Ø	27.4 (20)	Cloudy, 5/10 sand: 1.05ppm 10/15 Ø
12:00	" "	3,625	136.50	41.58	87.18	5	1,975	5.28	Ø	25.9 (20) 13.4	Clear, 5/10 1.05ppm 10/15 Ø ppm
12:35	12PSI "	3,614	136.85	41.93	86.19	5	1,975	6.33	Ø	180 (20) 14.0	Clear 5/10 1.05ppm 10/15 Ø
1:35	12PSI "	3,611	136.52	41.60	86.80	10	1975	5.28	Ø	30.5 (20)	Cloudy, 5/10 Sand: 2.11ppm 10/15 sand: Ø
after 15min NTU 16.0		22min NTU: 11.9		after 38min NTU: 3.97		Ø	"	Ø	Ø		20/25 Sand: T.R after 40min water, clear
1:45	12PSI	3,603	137.10	42.18	85.41	Ø	"	Ø	Ø	Ø	clear
2:00	12PSI	3.550	138.22	43.30	81.98	Ø	1975	Ø	Ø		clear after 40min 2.12 NTU.
3:00	12PSI	3,630	136.39	41.47	87.54	Ø	1,975	3.16		32.4	Light Brown, 5min NTU 21.9
10min NTU: 17.9		5/10 sand: 1.05ppm		15min NTU	5.54	Ø	1,975			15/20 sand: 1.05	20/25 sand: Ø ppm
20/25 NTU.											
3:30		3,612	138.40	43.48	83.07	Ø	1975	Ø	Ø		Clear NTU. 2.18 50min

FINAL FLOW METER READING: _____ gals TOTAL PUMPED VOLUME: _____ gals

HOURS PUMPED THIS DAY: 7.5 TOTAL HOURS PUMPED TO DATE: 60.0

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APPENDIX H

DETAILS OF PUMPING TESTS AND ZONE ISOLATION TESTS

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GEOSCIENCE Support Services, Inc.
TEL: (909) 451-6650
FAX: (909) 451-6638

PUMPING TEST DATA

Test Date: November 10, 2008

Well Name/Number: IRWD Well No. 21

Circle Well Type: Pumping Observation (r = ft)
Circle Test Type: Step Drawdown Constant Rate Recovery Development
Static Water Level Depth: 94.20 ft bgs Reference Point Elevation: + 0.25 ft above ground surface

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [kgal]	Remarks and Other Data
8:00 AM	0	0	94.45	-	-	-	6,596.0	Pump on.
8:01 AM	1	1	106.15	11.70	-	0	-	Clear.
8:02 AM	2	2	106.47	12.02	-	0	-	
8:03 AM	3	3	107.17	12.72	-	0	-	14.3 NTU
8:04 AM	4	4	107.32	12.87	-	0	-	
8:05 AM	5	5	107.65	13.20	-	1	-	
8:07 AM	7	7	107.90	13.45	-	0	6,606.1	
8:09 AM	9	9	108.18	13.73	-	tr	-	
8:11 AM	11	11	108.62	14.17	-	0	-	
8:15 AM	15	15	108.98	14.53	1,475	0	6,617.9	
8:20 AM	20	20	109.35	14.90	-	0	-	1.12 NTU
8:25 AM	25	25	109.52	15.07	1,390	0	6,631.8	
8:30 AM	30	30	110.10	15.65	-	0	-	
8:35 AM	35	35	110.36	15.91	-	0	-	
8:40 AM	40	40	110.67	16.22	1,413	0	6,653.0	Temp=20.1ºC, pH=7.9, TDS=648 mg/L
8:45 AM	45	45	110.82	16.37	1,400	0	6,660.0	0.78 NTU
8:50 AM	50	50	111.02	16.57	1,400	0	6,667.0	
9:00 AM	60	60	111.28	16.83	1,400	0	6,681.0	Q_1 = 1,417 gpm, $SpecCap_1$ = 84 gpm/ft
9:01 AM	1	61	-	-	2,000	0	6,683.0	
9:02 AM	2	62	118.70	24.25	3,000	0	6,686.0	
9:03 AM	3	63	119.58	25.13	2,500	0	6,688.5	
9:04 AM	4	64	120.06	25.61	2,500	0	6,691.0	4.35 NTU
9:05 AM	5	65	120.20	25.75	2,500	1.1	6,693.5	
9:07 AM	7	67	120.52	26.07	-	0	-	
9:09 AM	9	69	121.07	26.62	2,575	0	6,703.8	
9:11 AM	11	71	121.45	27.00	-	0	-	
9:15 AM	15	75	121.87	27.42	2,533	0	6,719.0	Temp=20.2ºC, pH=7.9, TDS=646 mg/L
9:20 AM	20	80	122.24	27.79	2,600	0	6,732.0	1.47 NTU
9:25 AM	25	85	122.82	28.37	2,860	1	6,746.3	
9:30 AM	30	90	123.15	28.70	2,220	0	6,757.4	
9:35 AM	35	95	123.47	29.02	2,520	0	6,770.0	
9:40 AM	40	100	123.80	29.35	2,600	0	6,783.0	
9:45 AM	45	105	124.03	29.58	2,560	0	6,795.8	
9:50 AM	50	110	124.28	29.83	2,540	0	6,808.5	
10:00 AM	60	120	124.68	30.23	2,550	0	6,834.0	
10:10 AM	70	130	125.08	30.63	2,600	0	6,860.0	

GEOSCIENCE Support Services, Inc.
TEL: (909) 451-6650
FAX: (909) 451-6638

PUMPING TEST DATA

Test Date: November 10, 2008

Well Name/Number: IRWD Well No. 21

Circle Well Type: (Pumping) Observation (r = ft)

Circle Test Type: (Step Drawdown) Constant Rate Recovery Development

Static Water Level Depth: 94.20 ft bgs Reference Point Elevation: + 0.25 ft above ground surface

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [kgal]	Remarks and Other Data
10:20 AM	80	140	125.48	31.03	2,740	0	6,887.4	
10:30 AM	90	150	125.82	31.37	2,410	0	6,911.5	
10:40 AM	100	160	126.02	31.57	2,420	0	6,935.7	
11:00 AM	120	180	126.38	31.93	2,535	0	6,986.4	Q_2 = 2,545 gpm, $SpecCap_2$ = 80 gpm/ft
11:01 AM	1	181	131.27	36.82	3,600	0	6,990.0	
11:02 AM	2	182	131.60	37.15	-	0	-	
11:03 AM	3	183	132.00	37.55	3,500	tr	6,997.0	
11:04 AM	4	184	132.25	37.80	3,500	0	7,000.5	
11:05 AM	5	185	132.40	37.95	3,500	0	7,004.0	
11:07 AM	7	187	132.73	38.28	-	0	-	
11:09 AM	9	189	133.08	38.63	3,500	0	7,018.0	
11:11 AM	11	191	133.37	38.92	-	0	-	
11:16 AM	16	196	133.53	39.08	3,429	0	7,042.0	
11:20 AM	20	200	133.90	39.45	3,500	0	7,056.0	
11:25 AM	25	205	134.17	39.72	-	0	-	
11:30 AM	30	210	-	-	-	0	-	
11:35 AM	35	215	-	-	-	0	-	
11:42 AM	42	222	136.02	41.57	-	0	-	
11:45 AM	45	225	136.25	41.80	3,560	0	7,145.0	
11:50 AM	50	230	136.45	42.00	3,800	0	7,164.0	
12:00 PM	60	240	136.82	42.37	3,600	0	7,200.0	
12:10 PM	70	250	137.18	42.73	3,600	0	7,236.0	
12:20 PM	80	260	137.48	43.03	3,600	0	7,272.0	
12:32 PM	92	272	138.05	43.60	3,600	0	7,315.1	
12:43 PM	103	283	138.27	43.82	3,600	0	7,355.0	
1:00 PM	120	300	138.45	44.00	3,600	0	7,415.6	
1:30 PM	150	330	139.20	44.75	3,600	0	7,523.7	Temp=21.2ºC, pH=8.1, TDS=770 mg/L
2:00 PM	180	360	139.72	45.27	3,600	0	7,631.1	2.52 NTU
2:30 PM	210	390	140.28	45.83	3,600	0	7,738.6	
3:00 PM	240	420	140.68	46.23	3,600	0	7,846.4	Pump off.
								Q_3 = 3,583 gpm, $SpecCap_3$ = 78 gpm/ft

GEOSCIENCE Support Services, Inc.
Ground Water Resources Development
TEL: (909) 451-6650
FAX: (909) 451-6638

PUMPING TEST DATA

Test Date: November 11 - 12, 2008

Well Name/Number: IRWD Well No. 21

Circle Well Type: Pumping Observation (r = ft)

Circle Test Type: Step Drawdown Constant Rate Recovery Development

Static Water Level Depth: 96.90 ft bgs Reference Point Elevation: + 0.25 ft above ground surface

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [kgal]	Remarks and Other Data
10:00 AM	0	0	97.15	-	-	-	7,848.5	Pump on.
10:02 AM	2	2	119.48	22.33	3,500	tr	7,855.5	Clear. Small gas bubbles.
10:04 AM	4	4	121.10	23.95	3,250	tr	7,862.0	
10:06 AM	6	6	122.37	25.22	3,500	tr	7,869.0	4.78 NTU
10:08 AM	8	8	123.10	25.95	3,250	0	7,875.5	
10:10 AM	10	10	123.77	26.62	3,250	1.1	7,882.0	2.80 NTU
10:15 AM	15	15	125.25	28.10	3,300	0.8	7,898.5	2.18 NTU
10:20 AM	20	20	126.22	29.07	3,300	0	7,915.0	2.01 NTU
10:25 AM	25	25	126.98	29.83	3,300	0	7,931.5	1.50 NTU
10:30 AM	30	30	127.65	30.50	3,300	0	7,948.0	1.14 NTU
10:40 AM	40	40	128.80	31.65	3,200	0	7,980.0	
10:50 AM	50	50	129.60	32.45	3,300	0	8,013.0	
11:00 AM	60	60	130.38	33.23	3,100	0	8,044.0	
11:15 AM	75	75	131.42	34.27	3,233	0	8,092.5	Temp=20.8ºC, pH=7.8, TDS=787 mg/L
11:30 AM	90	90	132.02	34.87	3,133	0	8,139.5	0.94 NTU
11:45 AM	105	105	132.70	35.55	3,200	0	8,187.5	
12:00 PM	120	120	133.18	36.03	3,200	0	8,235.5	
12:30 PM	150	150	133.98	36.83	3,183	0	8,331.0	
1:00 PM	180	180	134.05	36.90	3,183	0	8,426.5	
1:30 PM	210	210	135.33	38.18	3,183	0	8,522.0	Temp=21.1ºC, pH=7.6, TDS=779 mg/L
2:00 PM	240	240	135.80	38.65	3,183	0	8,617.5	0.76 NTU
2:30 PM	270	270	136.22	39.07	3,167	0	8,712.5	
3:00 PM	300	300	136.60	39.45	3,167	0	8,807.5	0.50 NTU
3:30 PM	330	330	137.08	39.93	3,167	0	8,902.5	
4:00 PM	360	360	137.50	40.35	3,167	0	8,997.5	
4:30 PM	390	390	137.83	40.68	3,183	0	9,093.0	
5:00 PM	420	420	138.03	40.88	3,150	0	9,187.5	
5:30 PM	450	450	138.25	41.10	3,170	0	9,282.6	
6:00 PM	480	480	138.45	41.30	3,163	0	9,377.5	
6:30 PM	510	510	138.75	41.60	3,160	0	9,472.3	
7:00 PM	540	540	138.89	41.74	3,160	0	9,567.1	
7:30 PM	570	570	139.21	42.06	3,167	0	9,662.1	
8:00 PM	600	600	139.44	42.29	3,170	0	9,757.2	
8:30 PM	630	630	139.57	42.42	3,177	0	9,852.5	Temp=21.1ºC, pH=7.7, TDS=770 mg/L
9:00 PM	660	660	139.77	42.62	3,167	0	9,947.5	0.82 NTU
9:30 PM	690	690	139.92	42.77	3,170	0	10,042.6	
10:00 PM	720	720	140.12	42.97	3,160	0	10,137.4	

GEOSCIENCE Support Services, Inc.
Ground Water Resources Development
TEL: (909) 451-6650
FAX: (909) 451-6638

PUMPING TEST DATA

Test Date: November 11 - 12, 2008

Well Name/Number: IRWD Well No. 21

Circle Well Type: Pumping Observation (r = ft)

Circle Test Type: Step Drawdown Constant Rate Recovery Development

Static Water Level Depth: 96.90 ft bgs Reference Point Elevation: + 0.25 ft above ground surface

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [kgal]	Remarks and Other Data
10:30 PM	750	750	140.30	43.15	3,163	0	10,232.3	
11:00 PM	780	780	140.40	43.25	3,157	0	10,327.0	
11:30 PM	810	810	140.61	43.46	3,167	0	10,422.0	
12:00 AM	840	840	140.74	43.59	3,173	0	10,517.2	
1:00 AM	900	900	141.00	43.85	3,173	tr	10,707.6	
2:00 AM	960	960	141.28	44.13	3,172	0	10,897.9	
3:00 AM	1,020	1,020	141.46	44.31	3,168	0	11,088.0	
4:00 AM	1,080	1,080	141.68	44.53	3,160	0	11,277.6	
5:00 AM	1,140	1,140	141.91	44.76	3,157	0	11,467.0	
6:00 AM	1,200	1,200	142.90	45.75	3,165	0	11,656.9	
7:00 AM	1,260	1,260	142.28	45.13	3,158	0	11,846.4	
8:00 AM	1,320	1,320	142.40	45.25	3,158	0	12,035.9	
9:00 AM	1,380	1,380	142.65	45.50	3,202	0	12,228.0	0.35 NTU
9:30 AM	1,410	1,410	142.70	45.55	2,930	0	12,315.9	Collected WQ samples, SDI meas.
10:02 AM	1,442	1,442	142.80	45.65	3,253	0	12,420.0	
10:30 AM	1,470	1,470	142.87	45.72	3,143	0	12,508.0	Pump off.
								Average Q = 3,170 gpm
								Specific Capacity = 69 gpm/ft

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TEL: (909) 451-6650
FAX: (909) 451-6638

PUMPING TEST DATA

Test Date: November 12, 2008

Well Name/Number: IRWD Well No. 21

Circle Well Type: Pumping Observation (r = ft)

Circle Test Type: Step Drawdown Constant Rate Recovery Development

Static Water Level Depth: 96.90 ft bgs Reference Point Elevation: + 0.25 ft above ground surface

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [kgal]	Remarks and Other Data
10:30 AM	0	1,470	-	-	-	-	-	Pump off.
10:32 AM	2	1,472	121.50	24.35	-	-	-	Recovery measurements begin.
10:34 AM	4	1,474	119.80	22.65	-	-	-	
10:36 AM	6	1,476	118.72	21.57	-	-	-	
10:38 AM	8	1,478	117.86	20.71	-	-	-	
10:40 AM	10	1,480	117.14	19.99	-	-	-	
10:45 AM	15	1,485	115.82	18.67	-	-	-	
10:50 AM	20	1,490	114.77	17.62	-	-	-	
10:55 AM	25	1,495	114.00	16.85	-	-	-	
11:00 AM	30	1,500	113.19	16.04	-	-	-	
11:10 AM	40	1,510	111.80	14.65	-	-	-	
11:20 AM	50	1,520	111.34	14.19	-	-	-	
11:30 AM	60	1,530	110.34	13.19	-	-	-	
11:45 AM	75	1,545	109.50	12.35	-	-	-	
12:00 PM	90	1,560	108.98	11.83	-	-	-	
12:15 PM	105	1,575	108.26	11.11	-	-	-	
12:30 PM	120	1,590	107.80	10.65	-	-	-	
1:00 PM	150	1,620	106.95	9.80	-	-	-	
1:30 PM	180	1,650	106.10	8.95	-	-	-	
2:00 PM	210	1,680	105.68	8.53	-	-	-	
2:30 PM	240	1,710	105.30	8.15	-	-	-	

GEOSCIENCE Support Services, Inc.
Ground Water Resources Development
TEL: (909) 451-6650
FAX: (909) 451-6638

PUMPING TEST DATA

Test Date: November 11 - 12, 2008

Well Name/Number: IRWD Well No. 22 (Observation well)

Circle Well Type: Pumping Observation (r = 684 ft)

Circle Test Type: Step Drawdown Constant Rate Recovery Development

Static Water Level Depth: 101.90 ft bgs Reference Point Elevation: + 2.0 ft above ground surface

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [kgal]	Remarks and Other Data
8:45 AM	-	-	103.90	-	-	-	-	Background measurement.
11:45 AM	105	105	110.00	-	-	-	-	Well 21 pump on @ 10:00 AM.
12::35 AM	155	155	111.46	7.56	-	-	-	
2:00 AM	240	240	113.25	9.35	-	-	-	
3:15 AM	315	315	114.33	10.43	-	-	-	
5:15 AM	435	435	115.43	11.53	-	-	-	
5:30 AM	1,170	1,170	120.27	16.37	-	-	-	
8:30 AM	1,350	1,350	120.46	16.56	-	-	-	
8:35 AM	1,355	1,355	121.00	17.10	-	-	-	
9:00 AM	1,380	1,380	121.13	17.23	-	-	-	
9:20 AM	1,400	1,400	121.15	17.25	-	-	-	
9:25 AM	1,405	1,405	121.20	17.30	-	-	-	
9:30 AM	1,410	1,410	121.20	17.30	-	-	-	
9:35 AM	1,415	1,415	121.22	17.32	-	-	-	
9:40 AM	1,420	1,420	121.25	17.35	-	-	-	
9:45 AM	1,425	1,425	121.25	17.35	-	-	-	
9:50 AM	1,430	1,430	121.27	17.37	-	-	-	
9:55 AM	1,435	1,435	121.25	17.35	-	-	-	
10:00 AM	1,440	1,440	121.30	17.40	-	-	-	
10:05 AM	1,445	1,445	121.30	17.40	-	-	-	
10:10 AM	1,450	1,450	121.32	17.42	-	-	-	
10:15 AM	1,455	1,455	121.35	17.45	-	-	-	
10:20 AM	1,460	1,460	121.39	17.49	-	-	-	
10:25 AM	1,465	1,465	121.39	17.49	-	-	-	
10:30 AM	1,470	1,470	121.40	17.50	-	-	-	Well 21 pump off.
10:35 AM	1,475	1,475	121.20	17.30	-	-	-	
10:40 AM	1,480	1,480	120.80	16.90	-	-	-	
10:45 AM	1,485	1,485	120.35	16.45	-	-	-	
10:50 AM	1,490	1,490	119.86	15.96	-	-	-	
10:55 AM	1,495	1,495	119.47	15.57	-	-	-	
11:00 AM	1,500	1,500	119.11	15.21	-	-	-	
11:05 AM	1,505	1,505	118.80	14.90	-	-	-	
11:10 AM	1,510	1,510	118.45	14.55	-	-	-	
11:15 AM	1,515	1,515	118.20	14.30	-	-	-	
11:20 AM	1,520	1,520	117.90	14.00	-	-	-	
11:25 AM	1,525	1,525	117.62	13.72	-	-	-	

GEOSCIENCE Support Services, Inc.
Ground Water Resources Development
TEL: (909) 451-6650
FAX: (909) 451-6638

PUMPING TEST DATA

Test Date: November 11 - 12, 2008

Well Name/Number: IRWD Well No. 22 (Observation well)

Circle Well Type: Pumping Observation (r = 684 ft)

Circle Test Type: Step Drawdown Constant Rate Recovery Development

Static Water Level Depth: 101.90 ft bgs Reference Point Elevation: + 2.0 ft above ground surface

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [kgal]	Remarks and Other Data
11:30 AM	1,530	1,530	117.40	13.50	-	-	-	
11:35 AM	1,535	1,535	117.15	13.25	-	-	-	

GEOSCIENCE Support Services, Inc.
Ground Water Resources Development
TEL: (909) 451-6650
FAX: (909) 451-6638

PUMPING TEST DATA

Test Date: November 13, 2008 — Packer set at 526-528 ft

Well Name/Number: IRWD Well No. 21 — Zone 1 Test Interval = 539-1,060 ft bgs

Circle Well Type: Pumping Observation (r = ft) — Pump Intake = 538 ft bgs

Circle Test Type: Step Drawdown Constant Rate Recovery Zone 1 Isolation Test

Static Water Level Depth: 156.29 ft below pac Reference Point Elevation: + 0.25 ft above ground surface

Time of Day	Elapsed Time [min]	Pressure Below Packer [psi]	Depth to Water Below Packer [ft]	Draw-down Below Packer [ft]	Pumping Rate [gpm]	Totalizer [kgal]	Depth to Water Above Packer [ft bRP]	Remarks and Other Data
8:08 AM	-	*185*	*98.45*	-	-	12,511.5	99.82	Packer deflated.
8:18 AM	-	*185*	*98.45*	-	-	-	99.80	
8:44 AM	-	*185*	*98.45*	-	-	-	99.79	
9:30 AM	-	-	-	-	-	-	-	Packer inflated to 220 psi.
9:33 AM	-	-	-	-	-	-	95.62	
10:12 AM	-	170	133.10	-	-	-	94.73	
10:38 AM	-	160	156.20	-	-	-	94.42	
11:00 AM	-	160	156.20	-	-	-	94.37	Packer pressure increased to 240 psi.
11:15 AM	-	160	156.20	-	-	-	94.24	Water level stable below packer.
11:20 AM	-	-	-	-	-	-	-	Pump on. Cloudy, but no sand.
12:26 PM	0	-	-	-	-	-	-	Water to surface.
11:28 AM	2	-	-	-	-	-	-	Increased flow rate.
11:29 AM	3	-	-	-	-	-	94.06	Cloudy, but no sand.
11:32 AM	6	141	200.09	43.89	-	-	94.06	Increased flow rate.
11:34 AM	8	141	200.09	43.89	-	-	94.05	47 NTU
11:36 AM	10	141	200.09	43.89	-	-	94.04	22.0ºC, pH = 8.2, TDS = 784 mg/L
11:41 AM	15	149	181.61	25.41	-	12,511.5	94.05	Clearing. Increased flow rate.
11:46 AM	20	145	190.85	34.65	300	12,513.0	94.05	
11:51 AM	25	143	195.47	39.27	260	12,514.3	94.04	10.5 NTU
11:56 AM	30	142	197.78	41.58	240	12,515.5	94.05	2.18 NTU
12:06 PM	40	149	181.61	25.41	190	12,517.4	94.04	Increased flow rate.
12:16 PM	50	149	181.61	25.41	270	12,520.1	93.98	21.8ºC, pH = 7.8, TDS = 782 mg/L
12:26 PM	60	149	181.61	25.41	250	12,522.6	93.97	1.16 NTU. Packer pressure = 240 psi
12:41 PM	75	148	183.92	27.72	227	12,526.0	93.95	
12:57 PM	91	148	183.92	27.72	225	12,529.6	93.94	
1:01 PM	95	148	183.92	27.72	-	12,532.5	93.92	Increased flow rate.
1:16 PM	110	143	195.47	39.27	367	12,538.0	93.90	21.6ºC, pH = 7.8, TDS = 776 mg/L
1:46 PM	140	142	197.78	41.58	360	12,548.8	93.91	0.90 NTU
2:16 PM	170	141	200.09	43.89	357	12,559.5	93.89	
2:46 PM	200	140	202.40	46.20	350	12,570.0	93.87	0.70 NTU
3:16 PM	230	140	202.40	46.20	333	12,580.0	93.86	
3:46 PM	260	140	202.40	46.20	347	12,590.4	93.84	21.3ºC, pH = 7.9, TDS = 783 mg/L
4:16 PM	290	140	202.40	46.20	343	12,600.7	93.83	Increased flow rate.
4:46 PM	320	138	207.02	50.82	397	12,612.6	93.81	Increased flow rate.
5:16 PM	350	138	207.02	50.82	423	12,625.3	93.80	

GEOSCIENCE Support Services, Inc.
Ground Water Resources Development
TEL: (909) 451-6650
FAX: (909) 451-6638

PUMPING TEST DATA

Test Date: November 13, 2008 — Packer set at 526-528 ft
Well Name/Number: IRWD Well No. 21 — Zone 1 Test Interval = 539-1,060 ft bgs
Circle Well Type: Pumping Observation (r = ft) — Pump Intake = 538 ft bgs
Circle Test Type: Step Drawdown Constant Rate Recovery Zone 1 Isolation Test
Static Water Level Depth: 156.29 ft below pac Reference Point Elevation: + 0.25 ft above ground surface

Time of Day	Elapsed Time	Pressure Below Packer	Depth to Water Below Packer	Draw-down Below Packer	Pumping Rate	Totalizer	Depth to Water Above Packer	Remarks and Other Data
5:46 PM	380	137	209.33	53.13	417	12,637.8	93.78	0.68 NTU, Spec Cap = 8 gpm/ft
6:26 PM	420	137	209.33	53.13	440	12,651.0	93.77	Collected WQ samples. Pump off.
6:36 PM	430	143	195.47	39.27	-	-	-	Packer remained inflated.
6:41 PM	435	155	167.75	11.55	-	-	92.83	Monitored recovering water levels.
6:46 PM	440	157	163.13	6.93	-	-	92.73	
6:51 PM	445	159	158.51	2.31	-	-	92.67	
6:55 PM	450	-	-	-	-	-	-	Packer deflated from 6:55 to 7:05PM.
7:11 PM	465	185	98.45	-	-	-	98.41	
7:16 PM	470	185	98.45	-	-	-	98.50	
7:26 PM	480	185	98.45	-	-	-	98.54	
7:40 PM	-	-	-	-	-	-	-	Secured site.

GEOSCIENCE Support Services, Inc.
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TEL: (909) 451-6650
FAX: (909) 451-6638

PUMPING TEST DATA

Test Date: November 13, 2008 — Packer set at 766-768 ft

Well Name/Number: IRWD Well No. 21 — Zone 2 Test Interval = 819-1,060 ft bgs

Circle Well Type: Pumping Observation (r = ft) — Pump Intake = 778 ft bgs

Circle Test Type: Step Drawdown Constant Rate Recovery Zone 2 Isolation Test

Static Water Level Depth: 156.29 ft below pac Reference Point Elevation: + 0.25 ft above ground surface

Time of Day	Elapsed Time [min]	Pressure Below Packer [psi]	Depth to Water Below Packer [ft]	Draw-down Below Packer [ft]	Pumping Rate [gpm]	Totalizer [kgal]	Depth to Water Above Packer [ft bRP]	Remarks and Other Data
8:25 AM	-	-	-	-	-	-	93.75	Packer deflated.
9:28 AM	-	289	93.71	-	-	-	93.74	
9:30 AM	-	289	93.71	-	-	-	-	Packer inflated to 355 psi.
9:45 AM	-	260	160.70	-	-	-	93.20	
9:50 AM	-	256	169.94	-	-	-	93.10	BWP re-attached gear drive & engine.
10:17 AM	-	-	-	-	-	-	93.15	10:00 AM Well 22 = 102.3 ft
11:17 AM	-	-	-	-	-	-	93.00	
12:30 PM	-	-	-	-	-	-	92.95	
1:20 PM	-	-	-	-	-	-	92.95	Packer inflated to 360 psi.
1:25 PM	-	250	183.80	-	-	-	-	1:25PM Well 22 = 102.75 ft.
1:30 PM	0	250	183.80	-	-	12,650.9	-	Pump on.
1:32 PM	2	244	197.66	13.86	-	-	93.00	
1:34 PM	4	246	193.04	9.24	-	-	93.04	
1:36 PM	6	245	195.35	11.55	-	-	92.98	
1:38 PM	8	245	195.35	11.55	-	-	92.98	
1:42 PM	12	246	193.04	9.24	-	-	-	
1:45 PM	15	247	190.73	6.93	-	-	-	No water to surface. Pump off.
1:50 PM	-	290	91.40	-92.40	-	-	-	Checked lateral. Monitored recovery.
2:00 PM	-	260	160.70	-23.10	-	-	-	
2:05 PM	-	254	174.56	-9.24	-	-	92.97	
2:10 PM	-	250	183.80	0.00	-	-	-	Packer pressure remains at 360 psi.
2:15 PM	0	250	183.80	0.00	-	12,650.9	-	Pump on.
2:17 PM	2	235	218.45	34.65	-	-	92.95	
2:19 PM	4	240	206.90	23.10	-	-	92.95	Increased engine rpm.
2:20 PM	5	240	206.90	23.10	-	-	-	Water to surface at 5 min..
2:21 PM	6	240	206.90	23.10	~ 90	-	92.95	Discharge lt. brown, cloudy.
2:23 PM	8	241	204.59	20.79	~ 90	-	92.92	
2:25 PM	10	241	204.59	20.79	~ 90	-	92.95	Increase flow slightly.
2:28 PM	13	235	218.45	34.65	~ 90	-	-	
2:30 PM	15	235	218.45	34.65	~ 90	-	92.90	Increase flow slightly, lt brown.
2:35 PM	20	230	230.00	46.20	~140	12,651.6	92.89	Discharge lt brown, cloudy.
2:40 PM	25	230	230.00	46.20	160	12,652.4	92.90	
2:45 PM	30	230	230.00	46.20	120	12,653.0	92.89	
2:55 PM	40	229	232.31	48.51	100	12,654.0	92.88	
3:05 PM	50	229	232.31	48.51	140	12,655.4	92.88	

GEOSCIENCE Support Services, Inc.
Ground Water Resources Development
TEL: (909) 451-6650
FAX: (909) 451-6638

PUMPING TEST DATA

Test Date: November 13, 2008 — Packer set at 766-768 ft

Well Name/Number: IRWD Well No. 21 — Zone 2 Test Interval = 819-1,060 ft bgs

Circle Well Type: Pumping Observation (r = ft) — Pump Intake = 778 ft bgs

Circle Test Type: Step Drawdown Constant Rate Recovery Zone 2 Isolation Test

Static Water Level Depth: 156.29 ft below pac Reference Point Elevation: + 0.25 ft above ground surface

Time of Day	Elapsed Time	Pressure Below Packer	Depth to Water Below Packer	Draw-down Below Packer	Pumping Rate	Totalizer	Depth to Water Above Packer	Remarks and Other Data
3:15 PM	60	229	232.31	48.51	110	12,656.5	92.870	Increase flow slightly
3:30 PM	75	225	241.55	57.75	133	12,658.5	92.87	Clearing
3:45 PM	90	225	241.55	57.75	133	12,660.5	92.85	Very .sl. cloudy. Well 22 = 102.03 ft
4:00 PM	105	225	241.55	57.75	167	12,663.0	92.85	Clear, with small gas bubbles
4:10 PM	115	225	241.55	57.75	-	-	-	Increase flow, clear.
4:15 PM	120	222	248.48	64.68	167	12,665.5	92.81	Very sl.cloudy.
4:30 PM	135	222	248.48	64.68	167	12,668.0	92.81	Very sl.cloudy, increase flow.
4:45 PM	150	212	271.58	87.78	240	12,671.6	92.80	Very sl.cloudy.
5:15 PM	180	211	273.89	90.09	230	12,678.5	92.80	26.5 NTU, Well 22 = 102.00 ft,
5:45 PM	210	211	273.89	90.09	233	12685.5	92.79	20.9°C, TDS = 653 mg/L, 26.5 NTU
6:15 PM	240	211	273.89	90.09	220	12692.1	92.78	14.9 NTU, Well 22 = 102.0 ft
6:45 PM	270	211	273.89	90.09	230	12,699.0	92.78	pH = 7.5, TDS = 655 mg/L, 20.5°C
7:15 PM	300	210	276.20	92.40	227	12,705.8	92.77	Well 22 = 102.0, 20.9°C, pH = 7.5
7:45 PM	330	210	276.20	92.40	220	12,712.4	92.77	TDS = 653 mg/L, 10.7 NTU
7:56 PM	341	210	276.20	92.40	236	12,715.0	92.77	Collect WQ samples. Shut off pump.
8:05 PM	350	250	183.80	-	-	-	92.77	Recovery meas. Spec Cap = 3 gpm/ft.
8:07 PM	352	260	160.70	-		-	-	Deflated Packer.
8:15 PM	360	282	109.88	-		-	93.42	Monitored recovering water levels.
8:20 PM	365	289	93.71	-		-	93.53	
8:30 PM	375	289	93.71	-		-	93.53	Secured site.

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APPENDIX I

PHOTOGRAPHS

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Sound barriers viewed from Mitchell Avenue, Tustin, California.

Baker tanks connected in series and connected to the temporary OCSD sewer manhole.

New nylon bristle brush installed in top of 20 inch diameter casing.

Fragments of cast iron float plate bailed from well.

Large diameter nuts and washers (likely from flanged drill pipe) bailed from bottom of well.

Installation and adjustment of centralizers for downhole video camera.

Installation of the test pump.

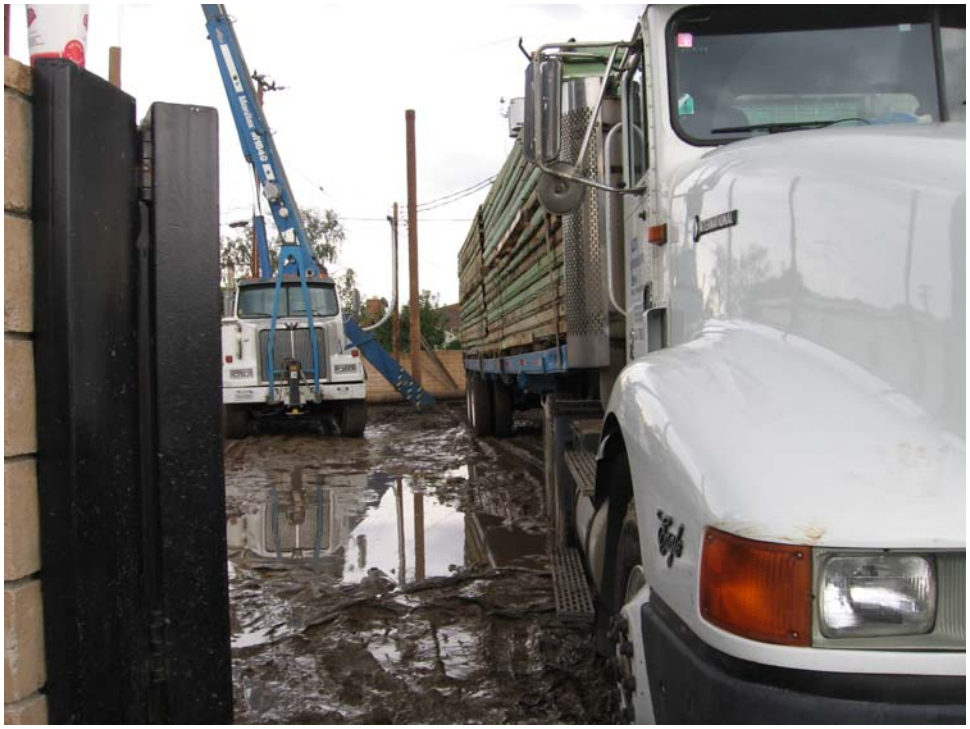
Test engine connected to gear drive during final development and test pumping.

14-inch outside diameter (OD) inflatable packer (deflated) with airline connections.

Inflatable packer prior to installation in well (deflated).

Pitot tube and manometer used to certify the flowmeter.

Assembled silt density index (SDI) test kit.



Removing sound barrier panels.

Bailing sediment from bottom of well at completion of work.

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APPENDIX J

DWR WELL COMPLETION REPORT

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ORIGINAL
File with DWR

IRWD 22 21

Page 1 of 3

Owner's Well No. (21) 21

Date Work Began Feb.21 1992, Ended April 29 1992

Local Permit Agency

Permit No. Permit Date

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 491201

IRWD 21

DWR USE ONLY — DO NOT FILL IN
05S10A W1/6Q05
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER
RS says "4"

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	50	brown clay
50	60	choc.brn.clay,slightly moist 10% grav.
60	70	lite orange/brown sticky clay " "
70	90	dark gray gravel (rock fragments)
90	100	lite oran.brown sticky clay,gravel
100	110	lite olive grn/tan clay,10% fine sand
110	120	lite oran.brn. sticky clay,mod.plastic
120	130	drk.gray,gravel,rock frag./cobbles
130	140	tan/brn.stick clay,gravel,drk gray
140	150	clay/grav.drk.gray 10-15% gravel
		subangular to brown sticky slite plastic
150	160	drk gray gravel,round.frag.cobbles
160	170	gravel w/minor sand/cobbles,coarse sand
170	180	same, subang.coarse sand
180	190	drk. gray sticky clay,olv.grn/brwn
190	200	altern.olv.grn/brn.clay/gray mud
200	210	lite oran./brn. clay,sticky mod.plastic
210	220	same
220	230	gray/brn/gravel,ang/round rock frag.
230	240	multi color.gravel,clay,oran.brwn
		soft sticky clay
240	260	clay with lite olv/brwn fine sand
260	270	drk gray clay,fine sand, gravel
270	290	sandy clay,brn./gravel
290	310	predom.blue/gray clay; gravel
310	330	drk. green angular gravel,cobbles
330	350	sand med/coarse grain, gravel
350	360	tan brn. sticky clay,some fine sand
360	370	sand/some gravel,tan brown
370	390	tan brn.sticky plastic clay

TOTAL DEPTH OF BORING ~~1050~~ 1120 (Feet) continued next page

TOTAL DEPTH OF COMPLETED WELL ~~990~~ 1080 (Feet)

WELL OWNER

Name IRVINE RANCH WATER DIST.

Mailing Address 18802 Bardeen Ave.

Irvine, Calif. 92716
CITY STATE ZIP

WELL LOCATION

Address Mitchell and Debusk 600' WEST OF WELL #22

City Tustin

County Orange

APN Book ___ Page ___ Parcel ___

Township ___ Range ___ Section ___

Latitude ___ DEG MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH

NORTH

Debusk

Well #21

0

Mitchell

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY

___ Domestic

X Public

___ Irrigation

___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD Reverse FLUID Water

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 104-109' (Ft.) & DATE MEASURED 4-20-29,1992

ESTIMATED YIELD* 3000 (GPM) & TEST TYPE Pump

TEST LENGTH 48 (Hrs.) TOTAL DRAWDOWN 47.3 (Ft.) = SC of 63

* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	60	42	X				A-53/B	35-1/4	3/8	
+2	290	34	X				.2% copper	20"	3/8	
290	~~970~~ 1080	28"	X	X			stainless	16"	5/16"	.060
~~970~~	~~990~~	28"	X				stainless	16"	5/16"	
1060	1080									

LOUVERS

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	250	X			
250	990			X	8 x 16

ATTACHMENTS (✓)

___ Geologic Log

X Well Construction Diagram

___ Geophysical Log(s)

___ Soil/Water Chemical Analyses

___ Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME BEYLIK DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

591 S. Walnut St. -La Habra, Calif. 90631
ADDRESS CITY STATE ZIP

Signed T. Caldwell
WELL DRILLER/AUTHORIZED REPRESENTATIVE

May 29,1992
DATE SIGNED

306291 C57 & C61
C-57 LICENSE NUMBER

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

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APPENDIX K

NEARBY WELLS DATA

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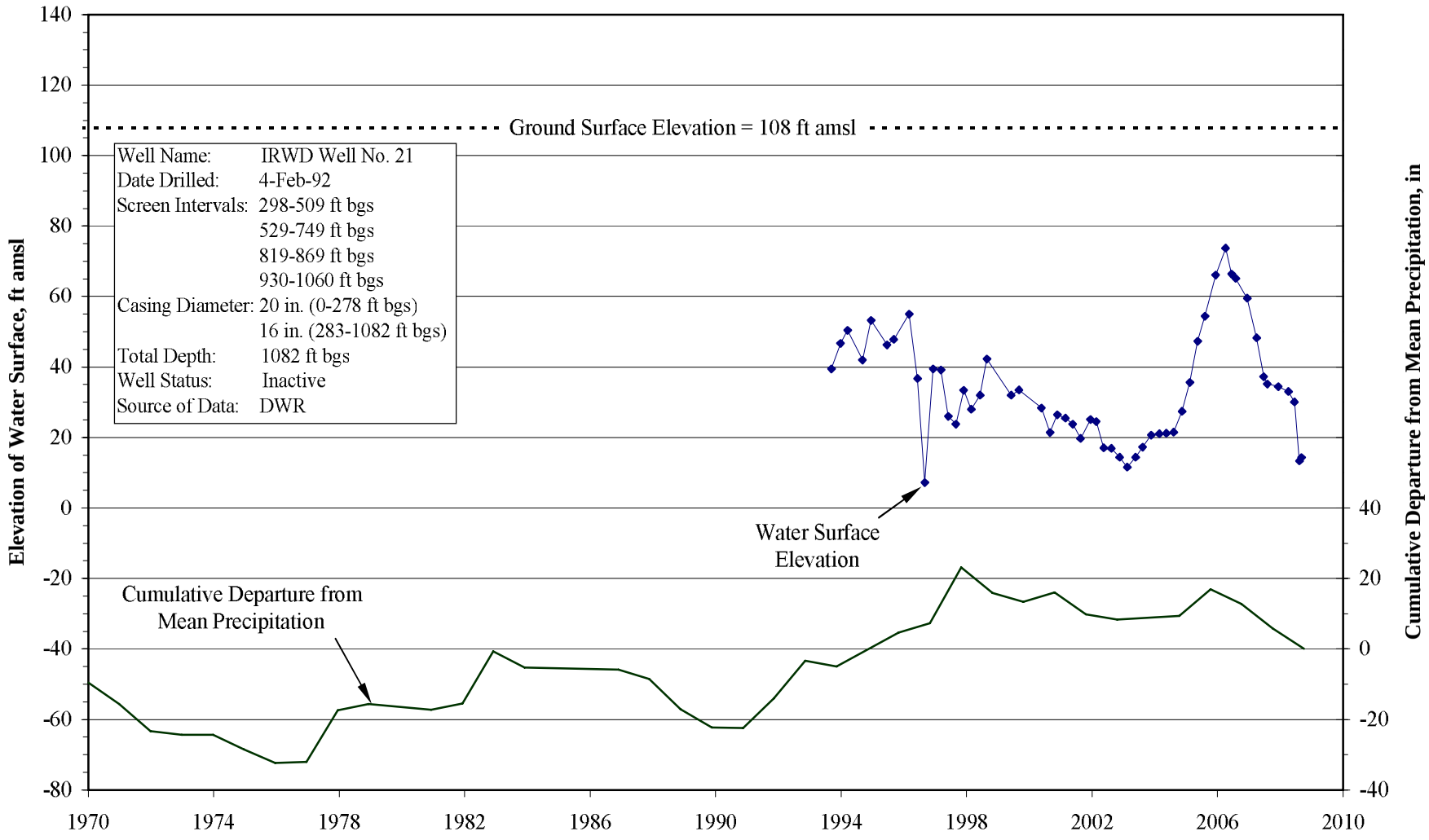
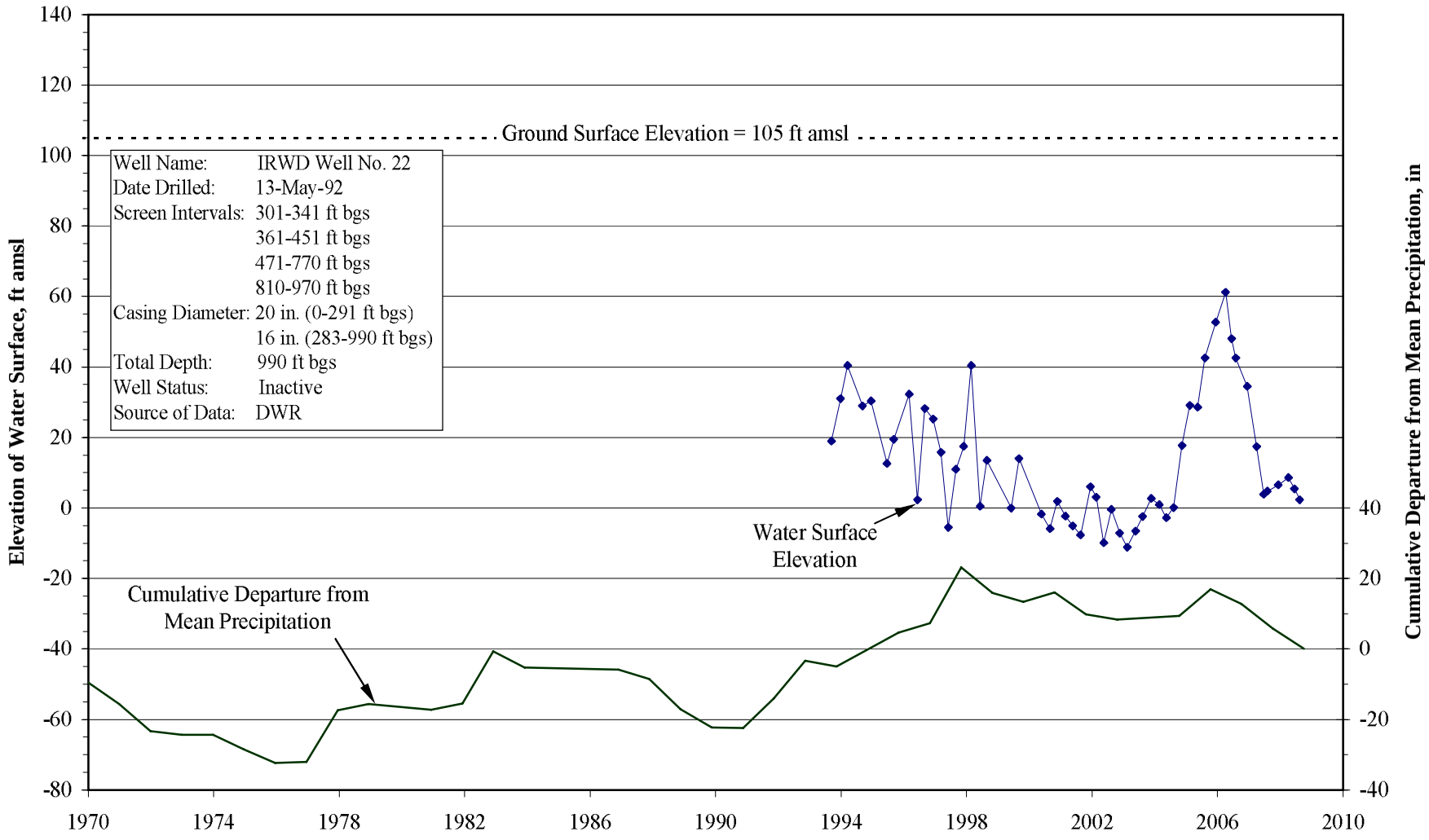
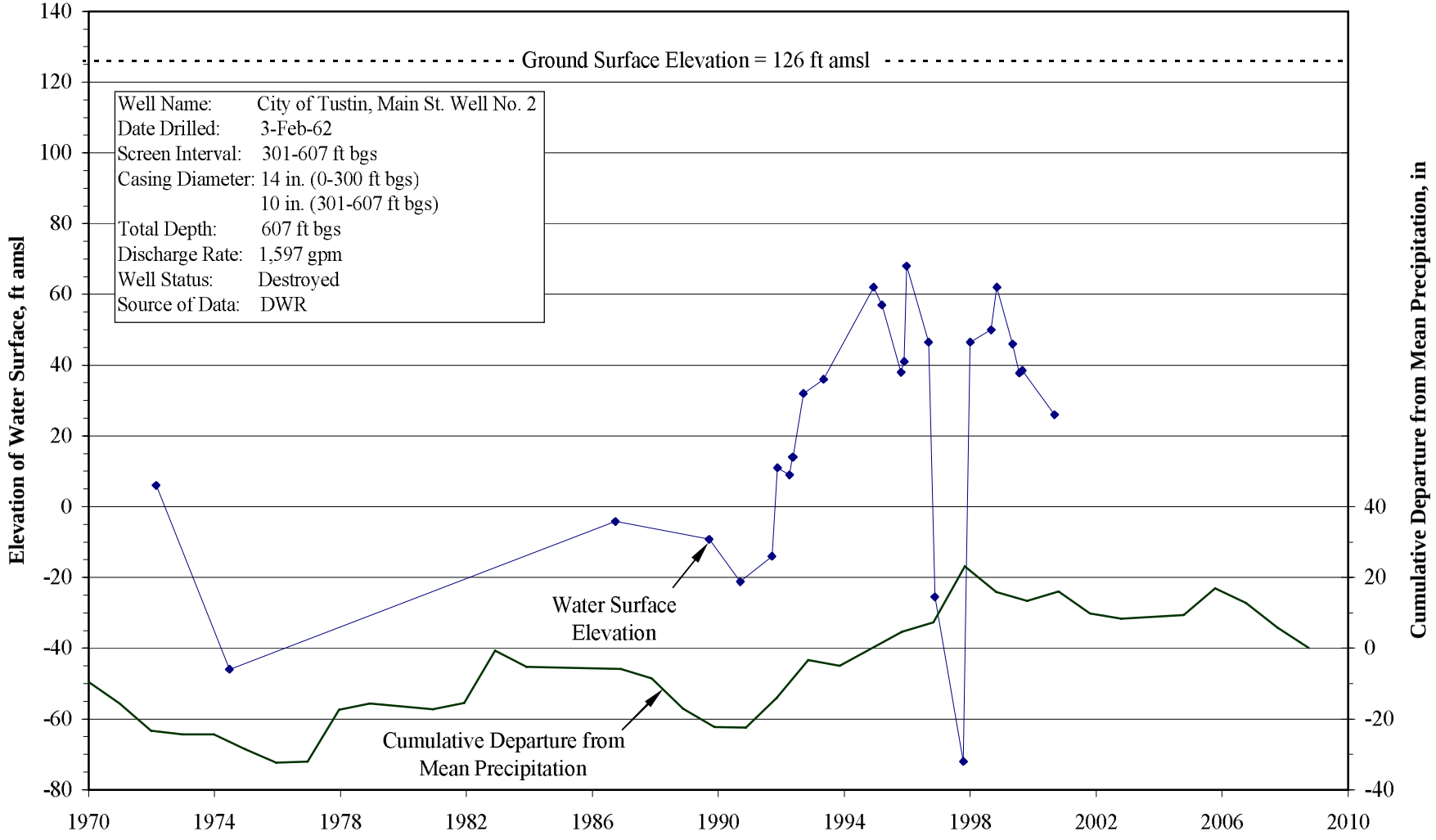
IRWD Well No. 21
Hydrograph



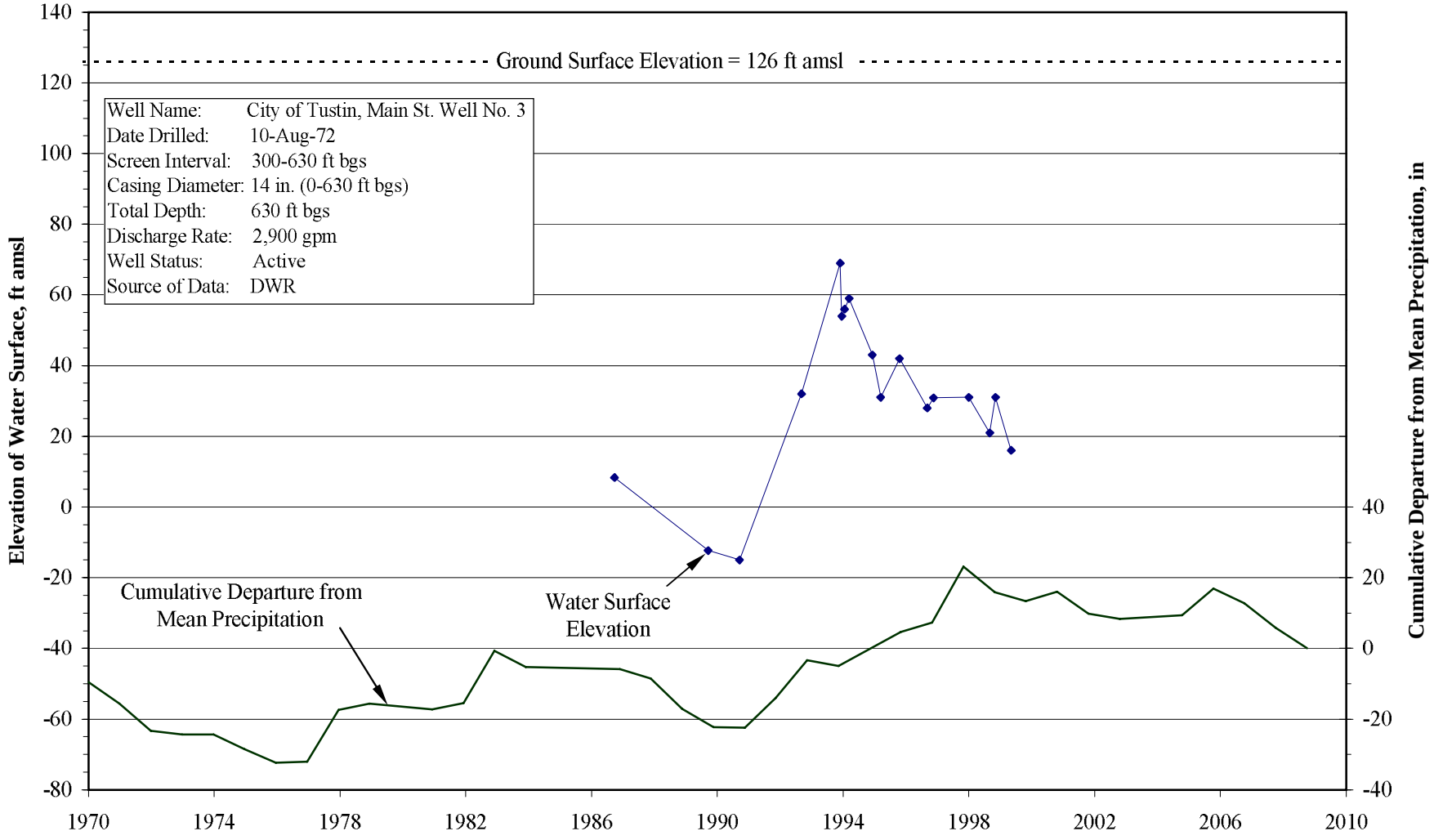
IRWD Well No. 22
Hydrograph



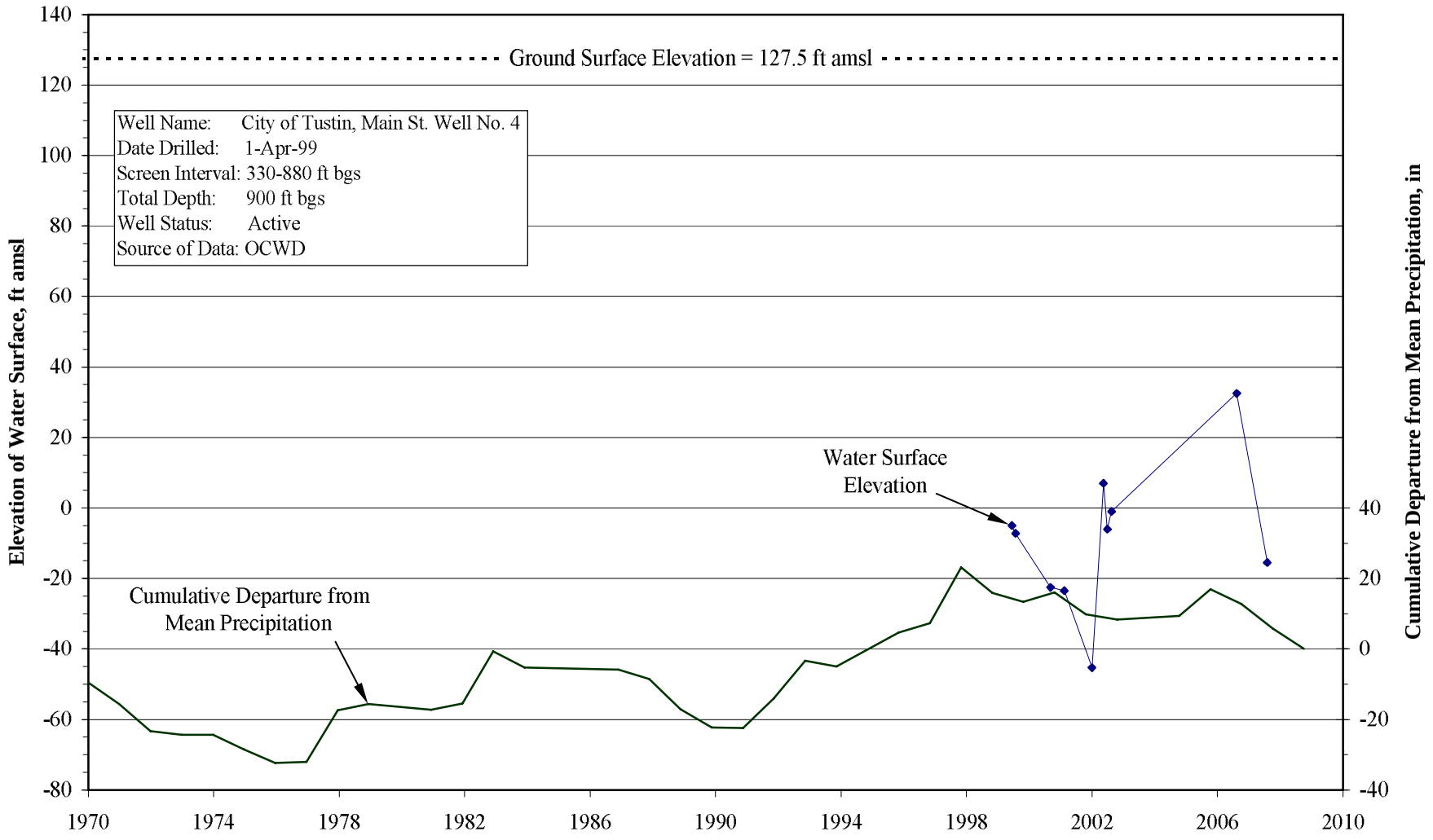
City of Tustin, Main St. Well No. 2
Hydrograph



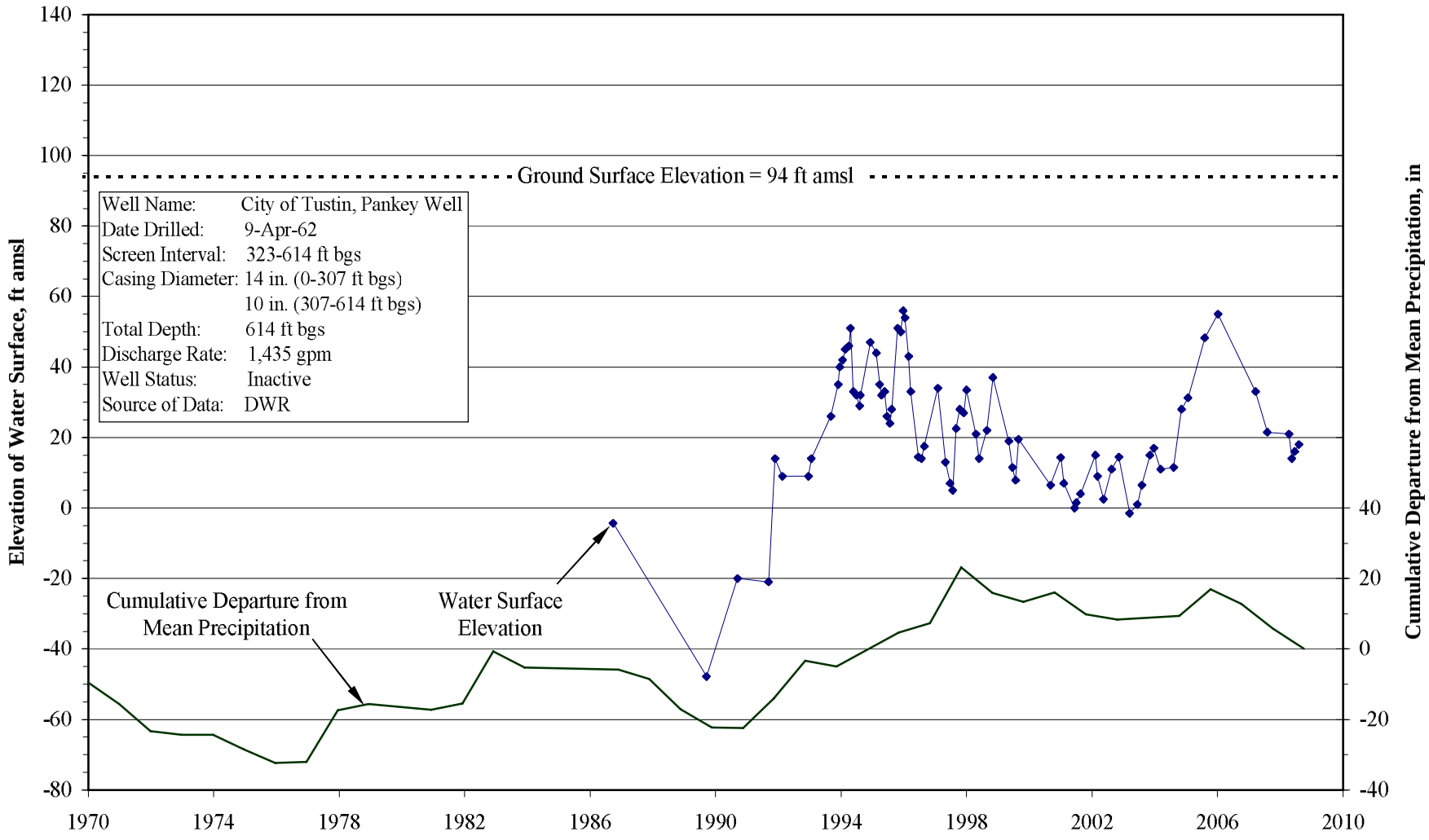
City of Tustin, Main St. Well No. 3
Hydrograph



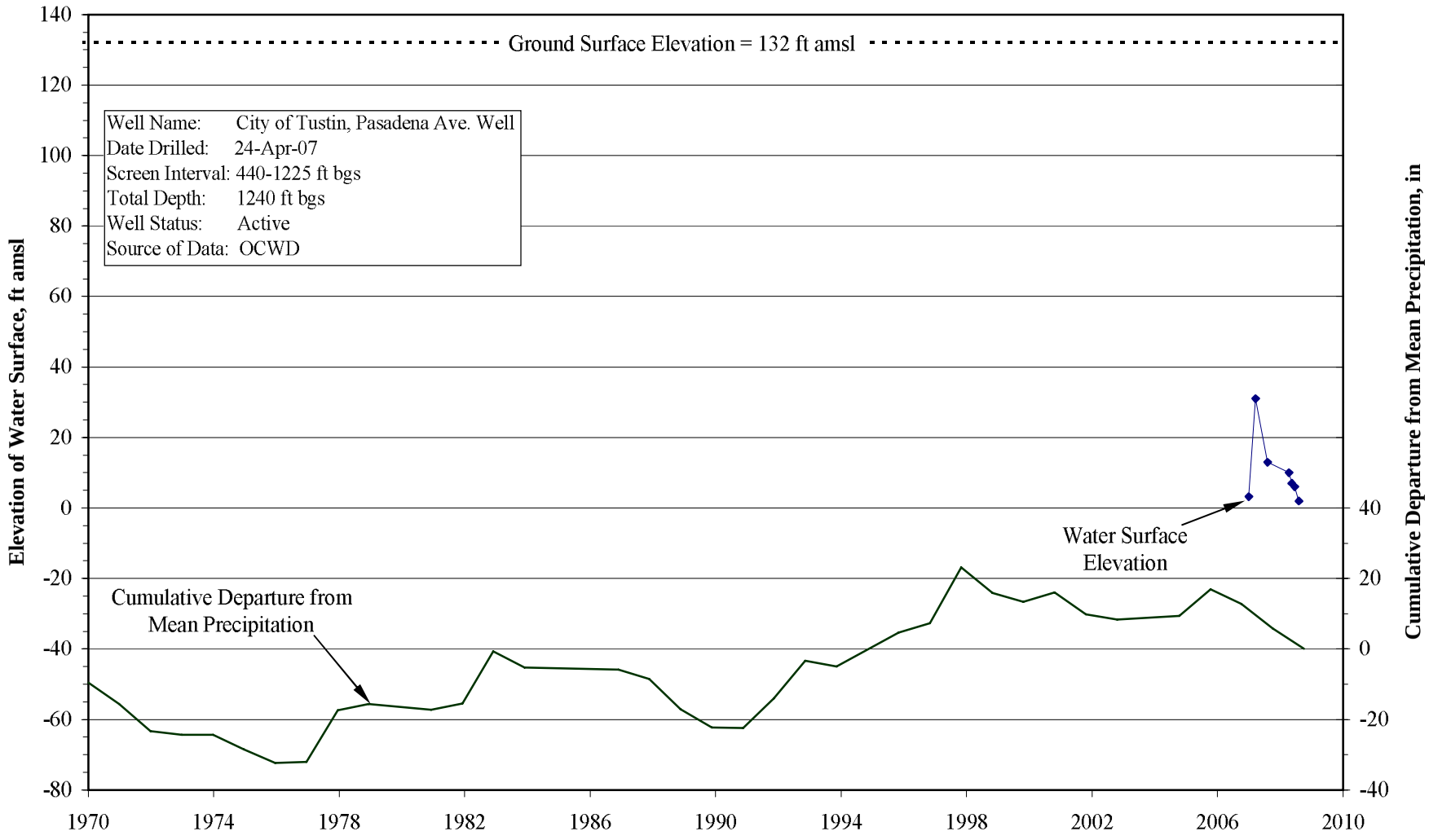
City of Tustin, Main St. Well No. 4
Hydrograph



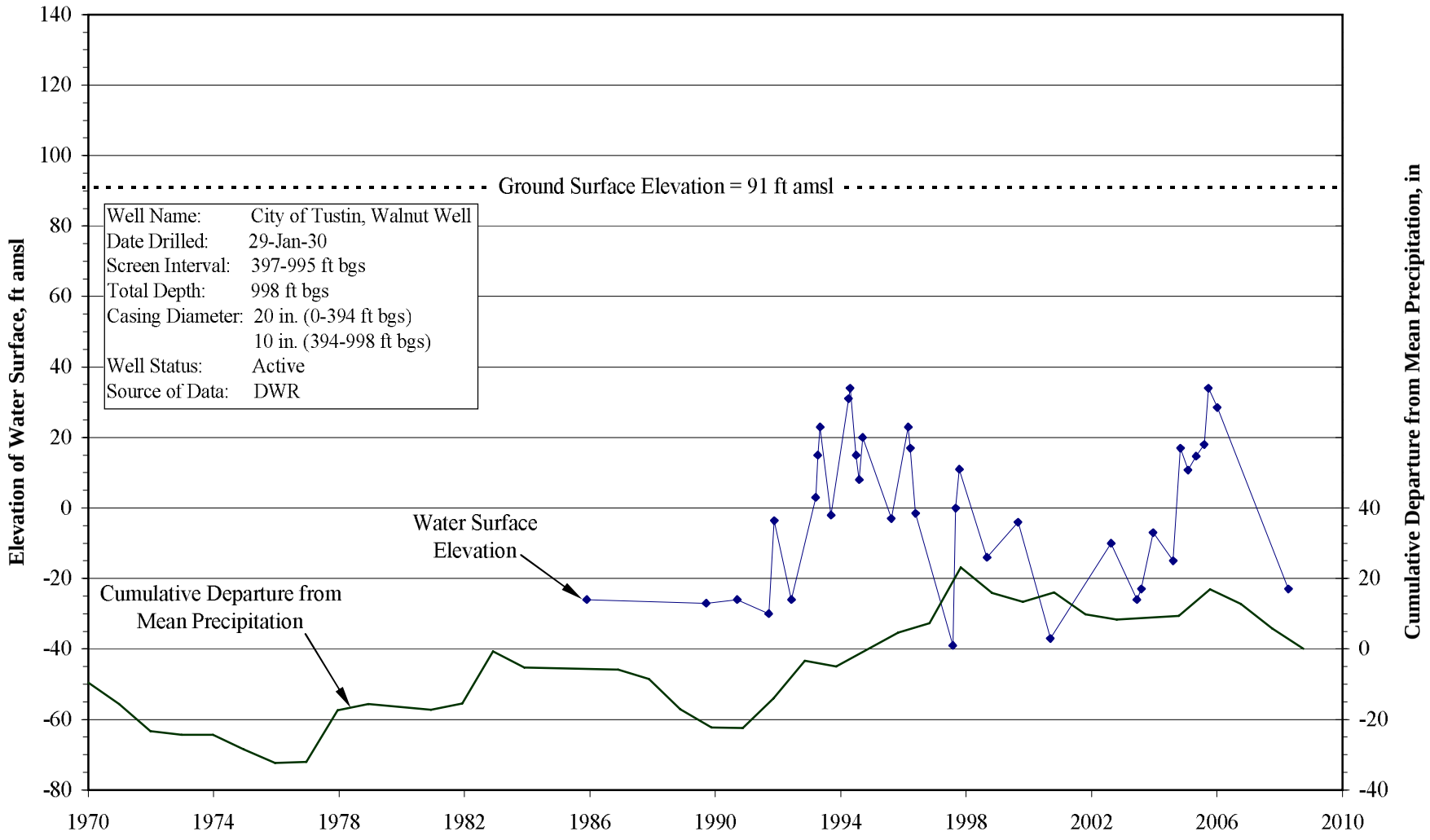
City of Tustin, Pankey Well
Hydrograph



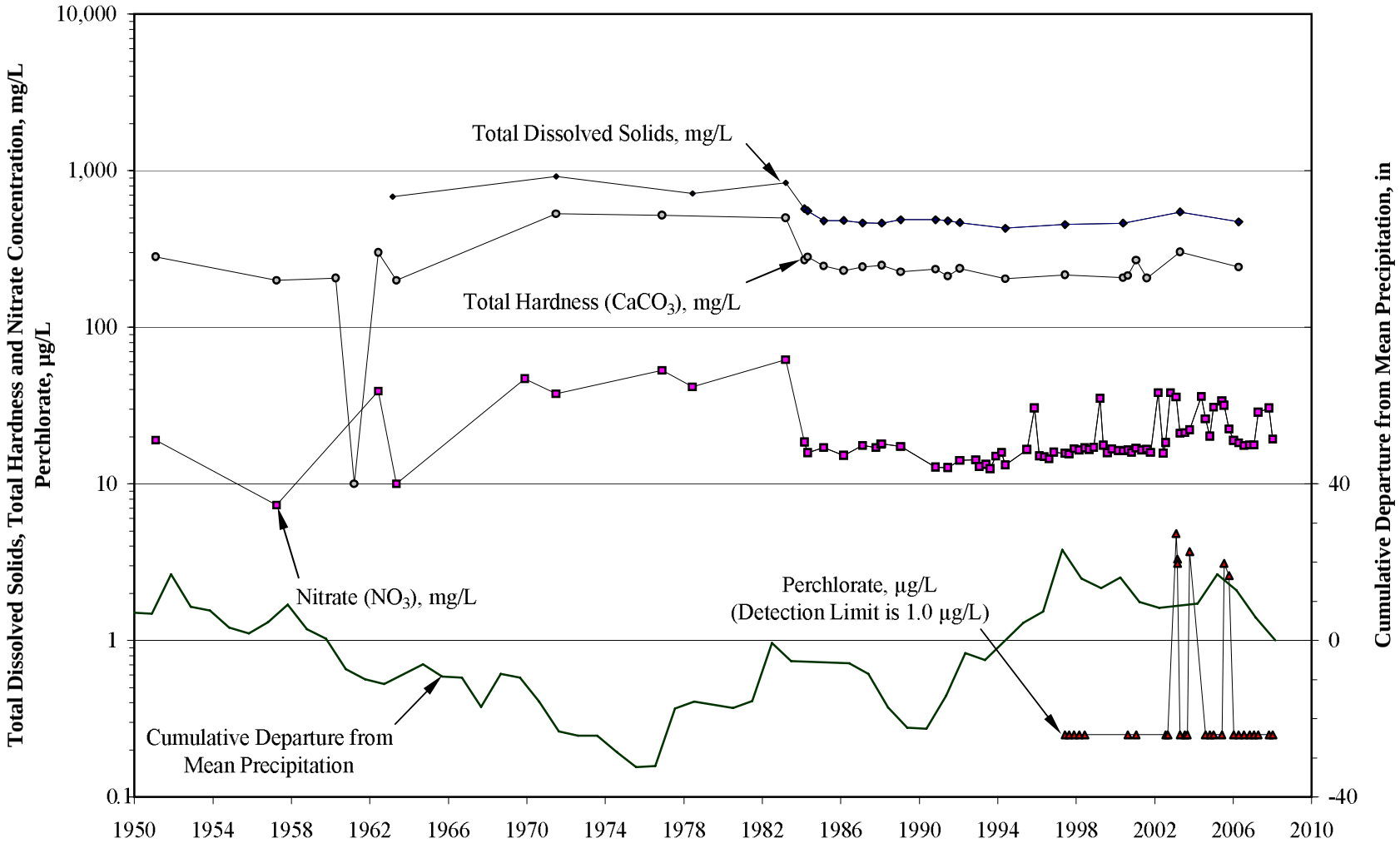
City of Tustin, Pasadena Ave. Well
Hydrograph



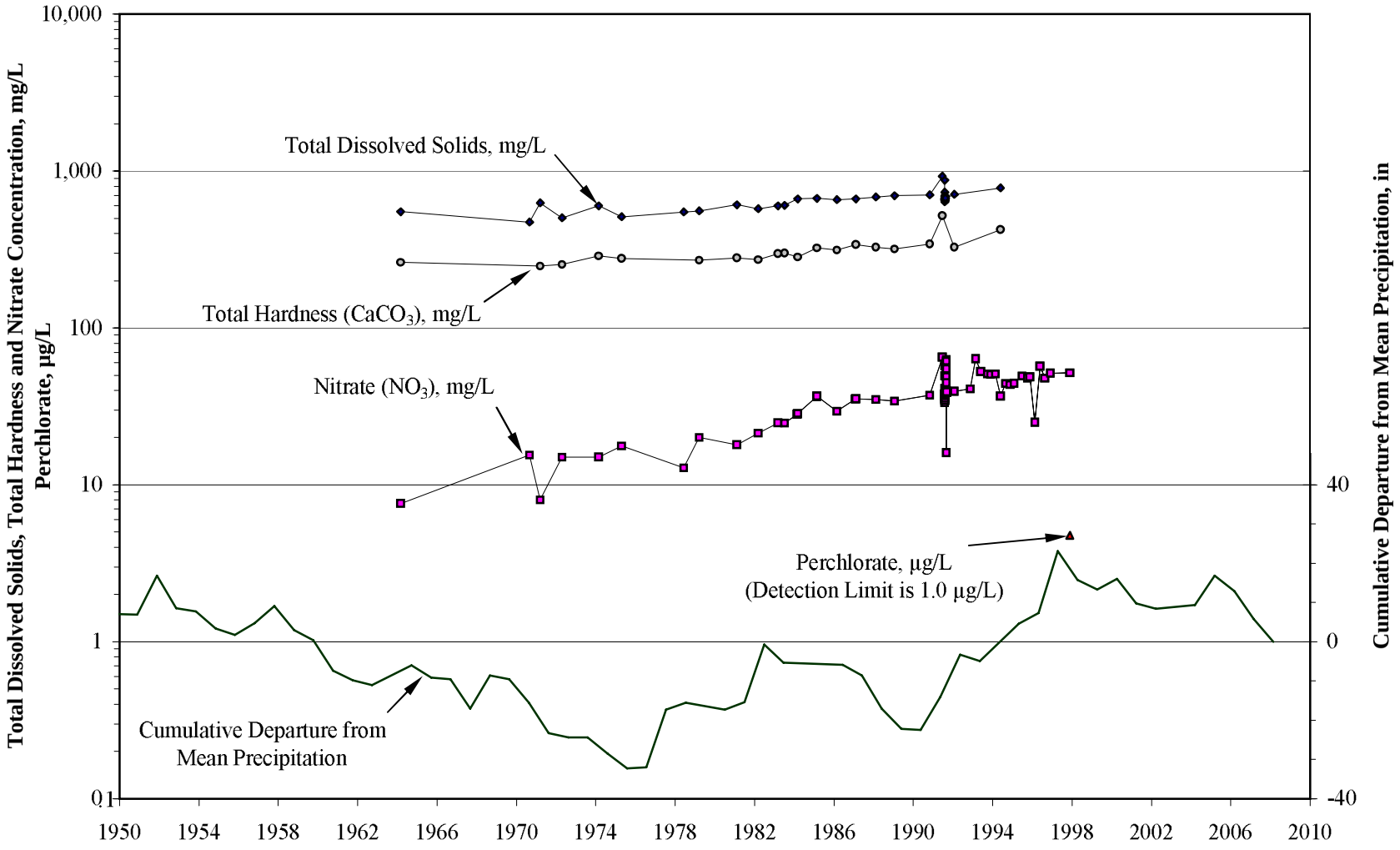
City of Tustin, Walnut Well
Hydrograph



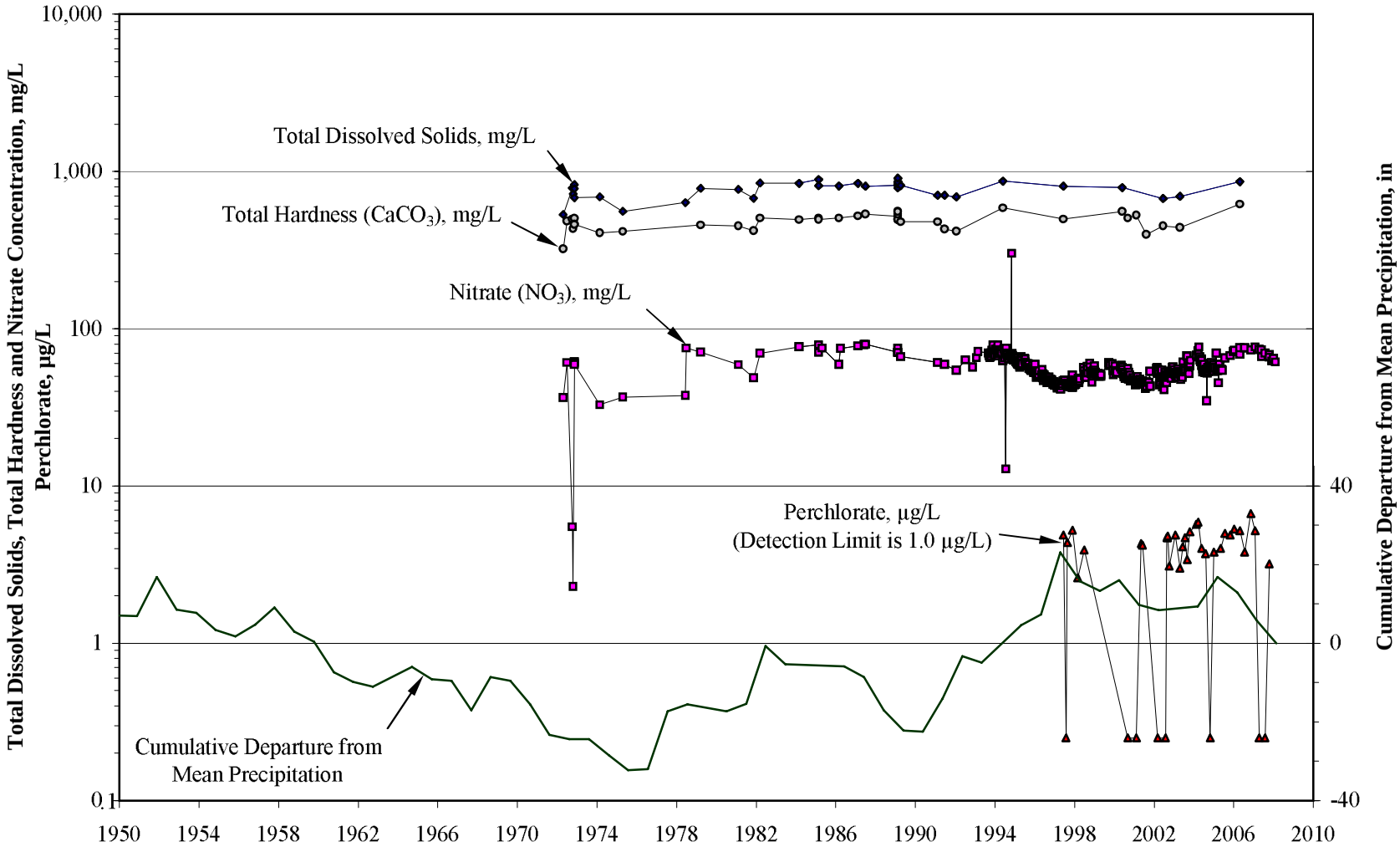
City of Tustin, Walnut Well
TDS, Total Hardness, Nitrate and Perchlorate Levels



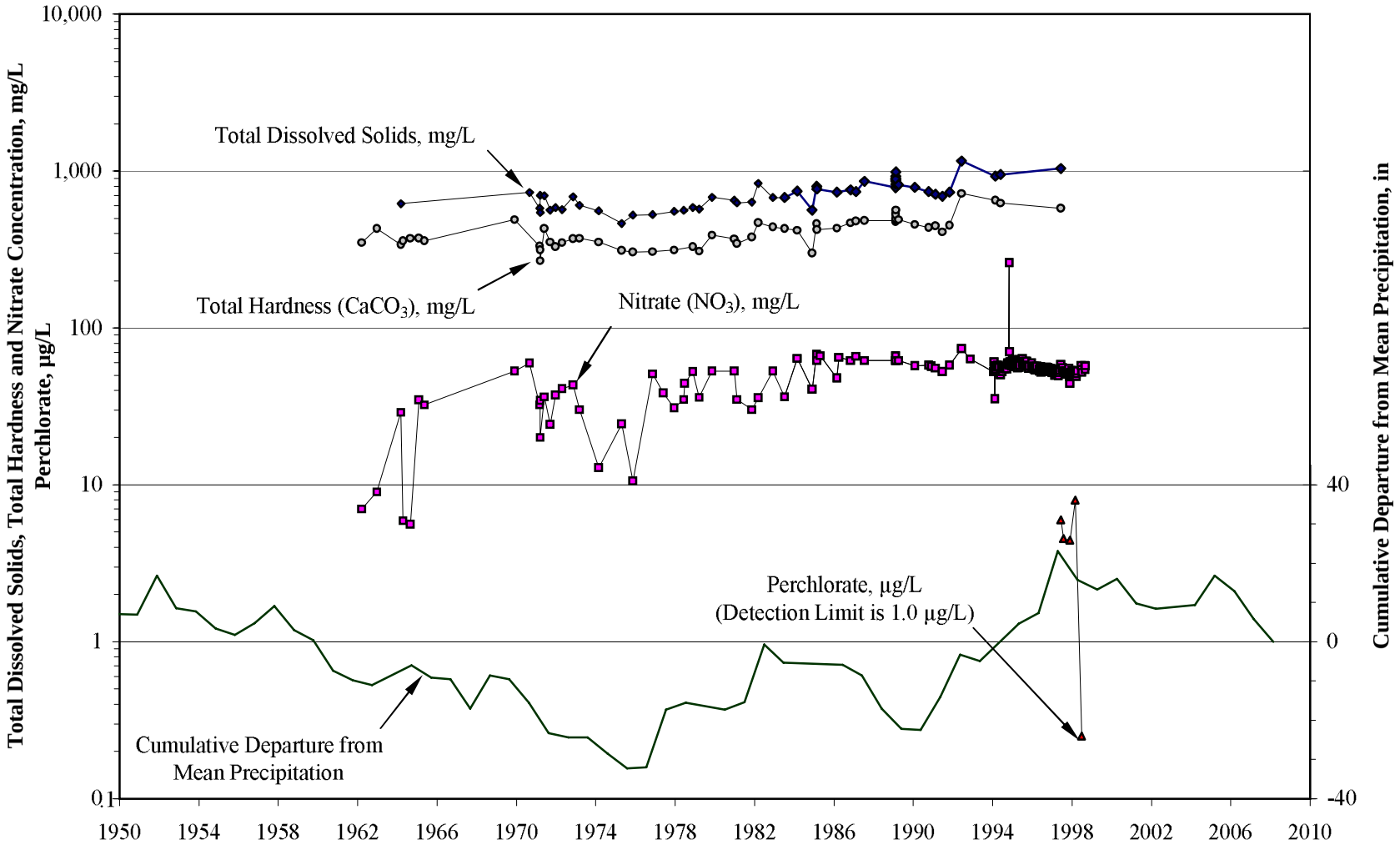
City of Tustin, Pankey Well
TDS, Total Hardness, Nitrate and Perchlorate Levels



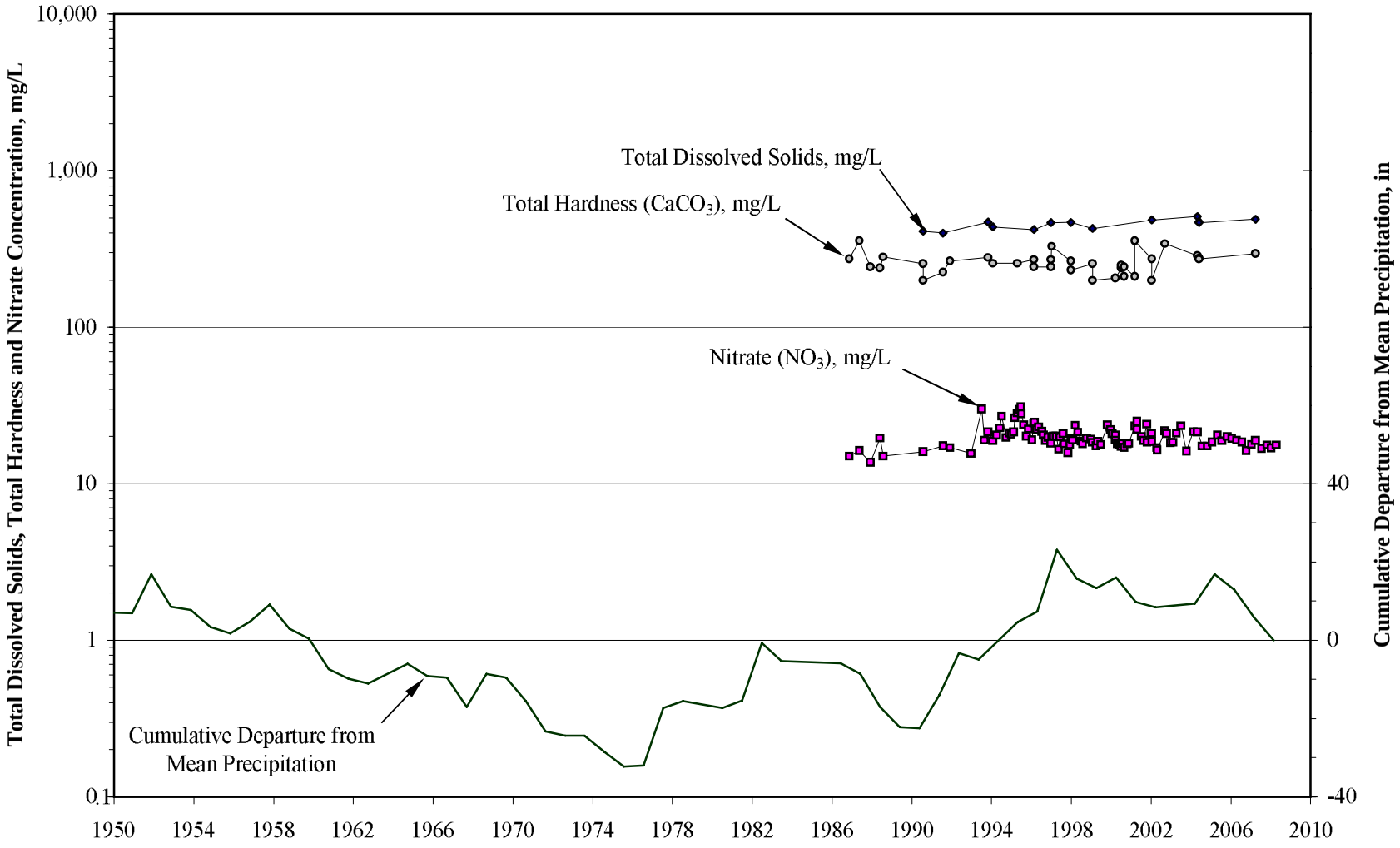
City of Tustin, Main St. Well No. 3
TDS, Total Hardness, Nitrate and Perchlorate Levels



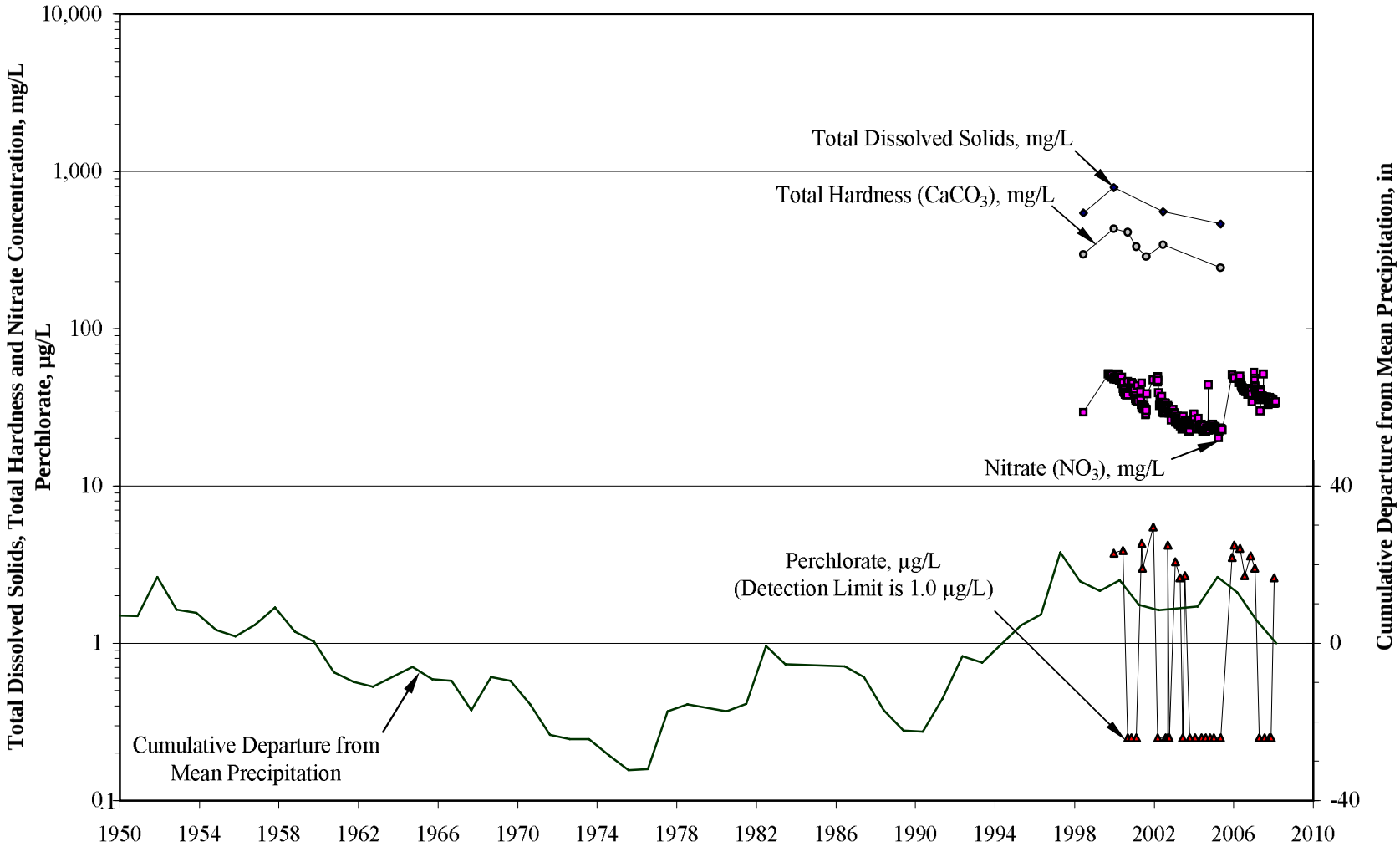
City of Tustin, Main St. Well No. 2
TDS, Total Hardness, Nitrate and Perchlorate Levels



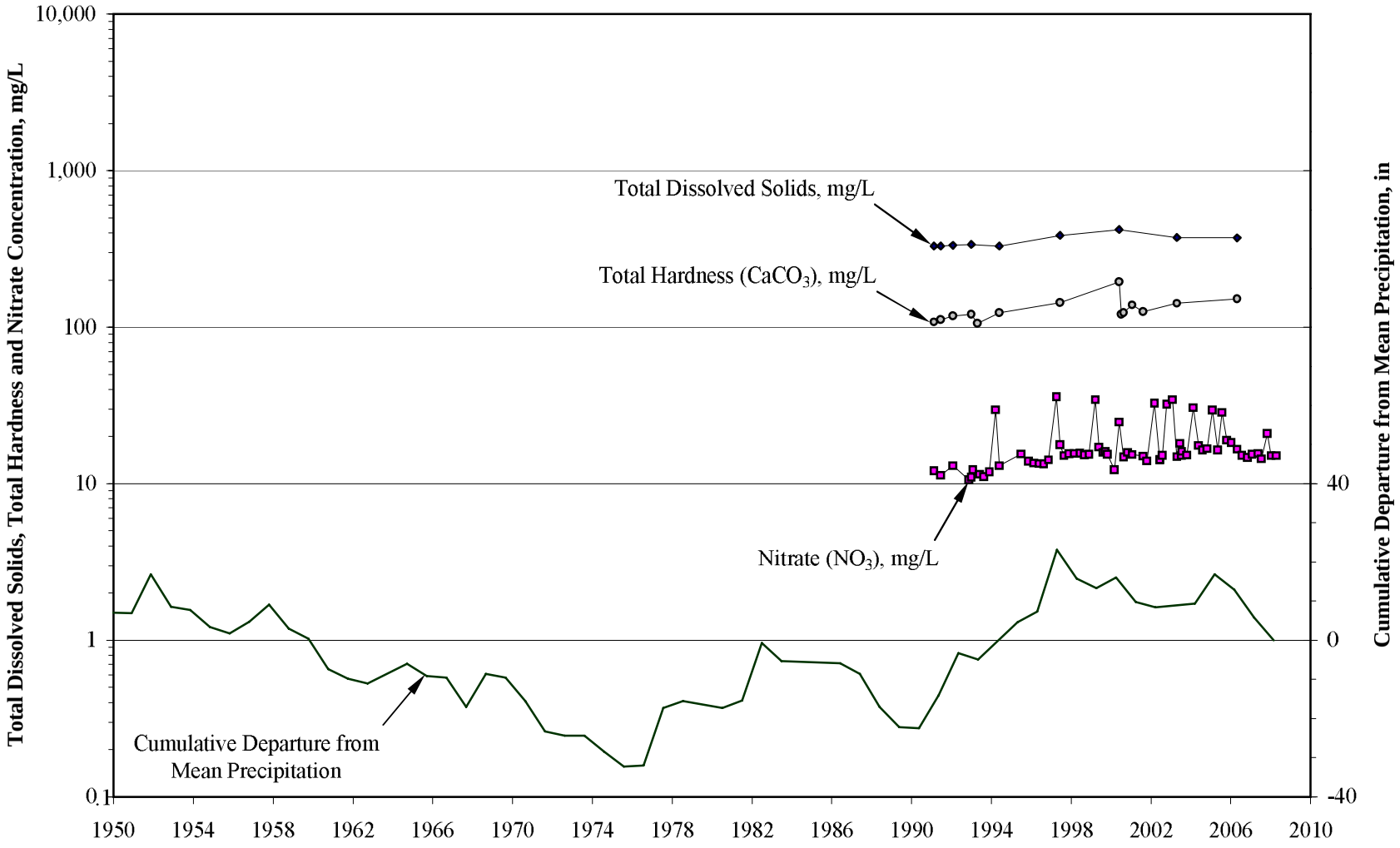
City of Santa Ana, Well No. 31
TDS, Total Hardness and Nitrate Levels



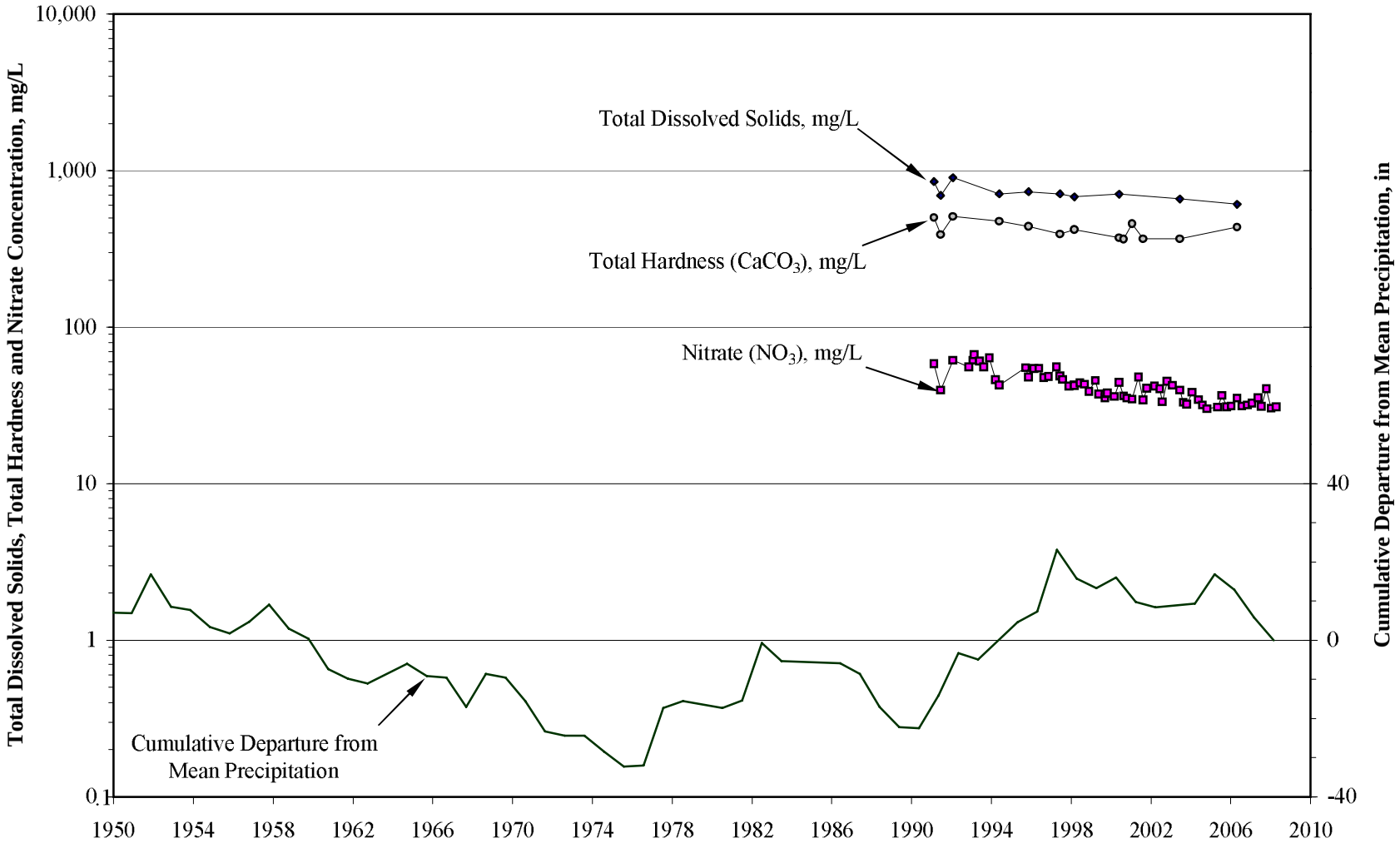
City of Tustin, Main St. Well No. 4
TDS, Total Harness, Nitrate and Perchlorate Levels



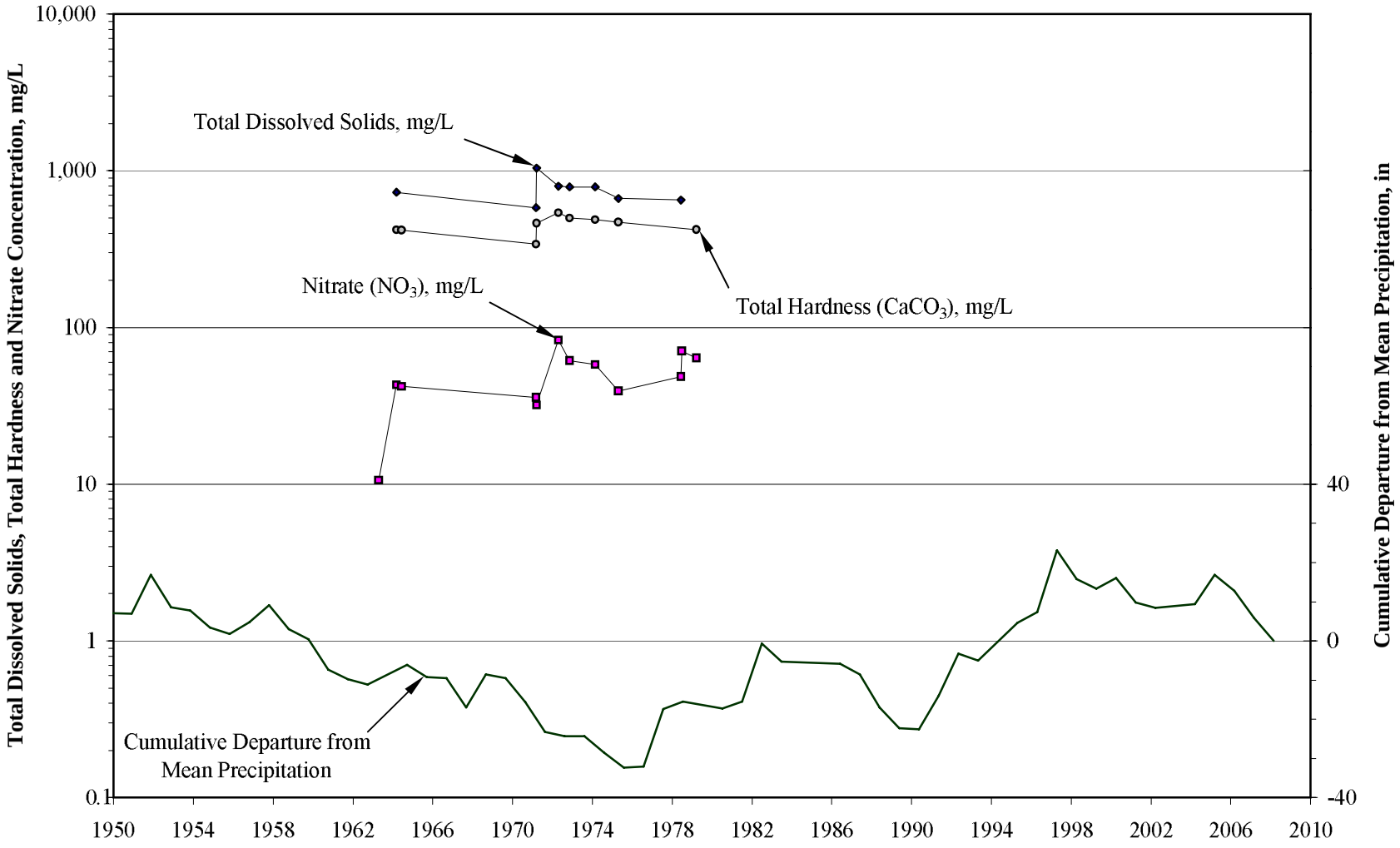
City of Tustin, Columbus Well
TDS, Total Hardness and Nitrate Levels



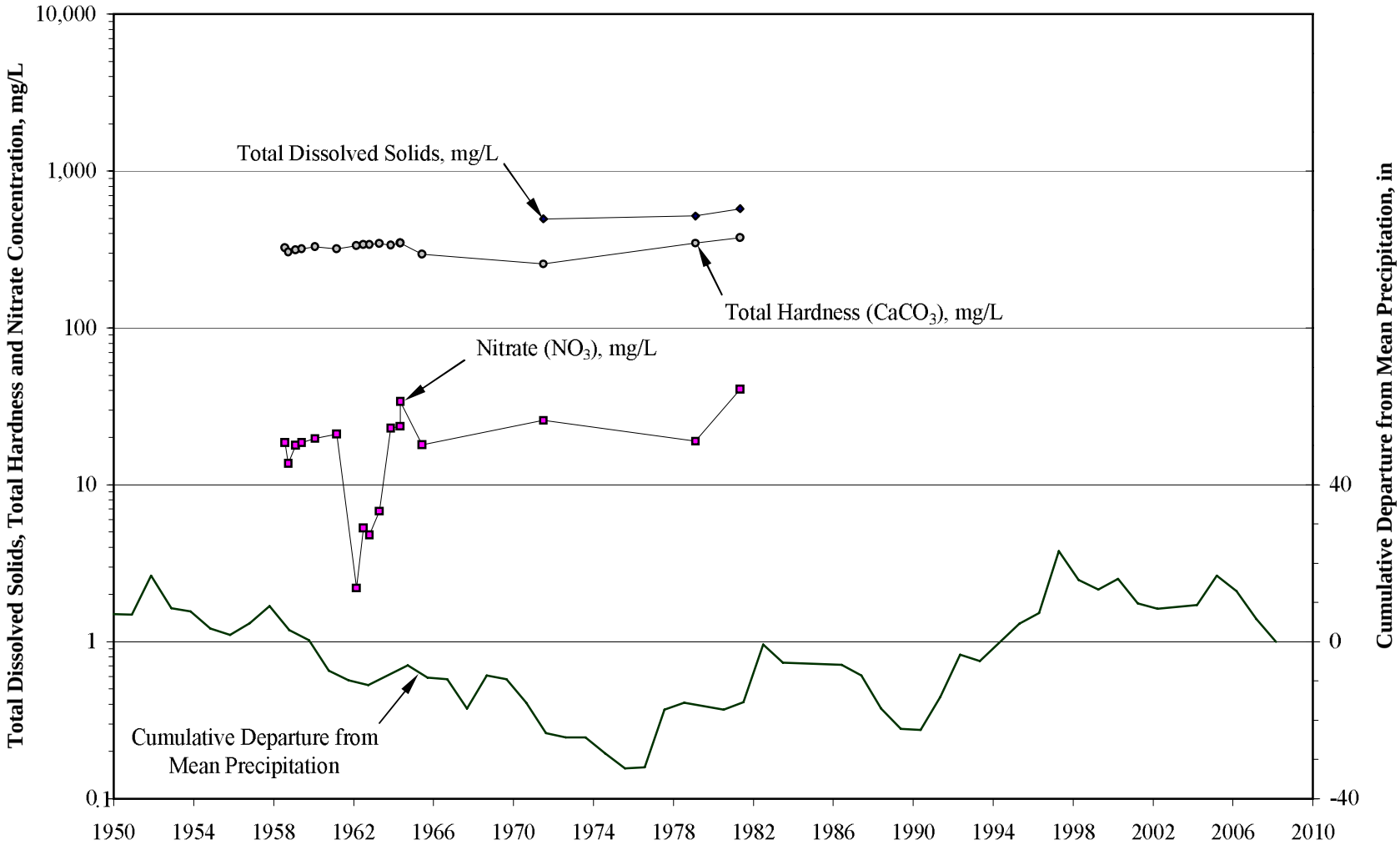
City of Tustin, Bene Well
TDS, Total Hardness and Nitrate Levels



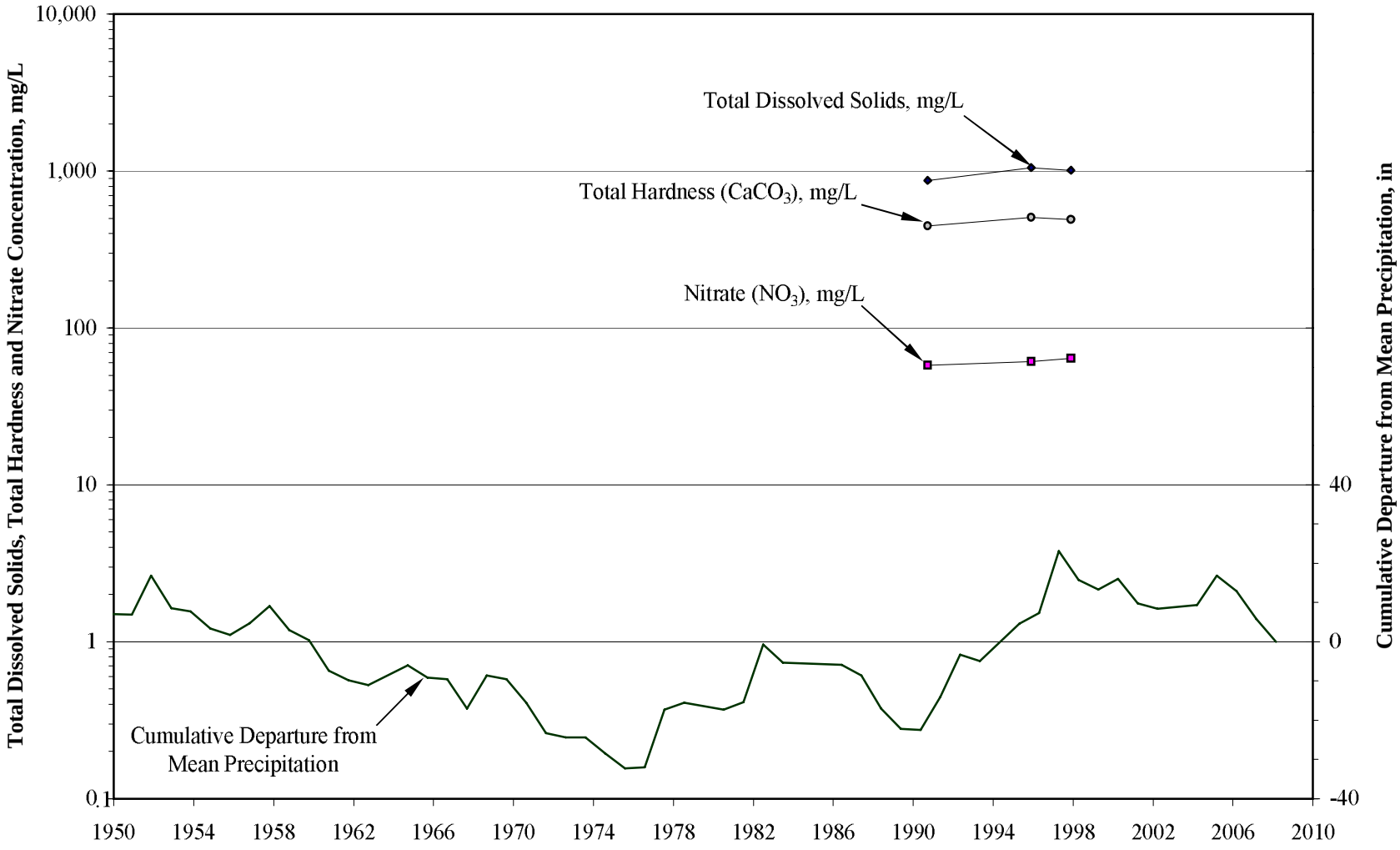
City of Tustin, Main St. Well No. 1
TDS, Total Hardness and Nitrate Levels



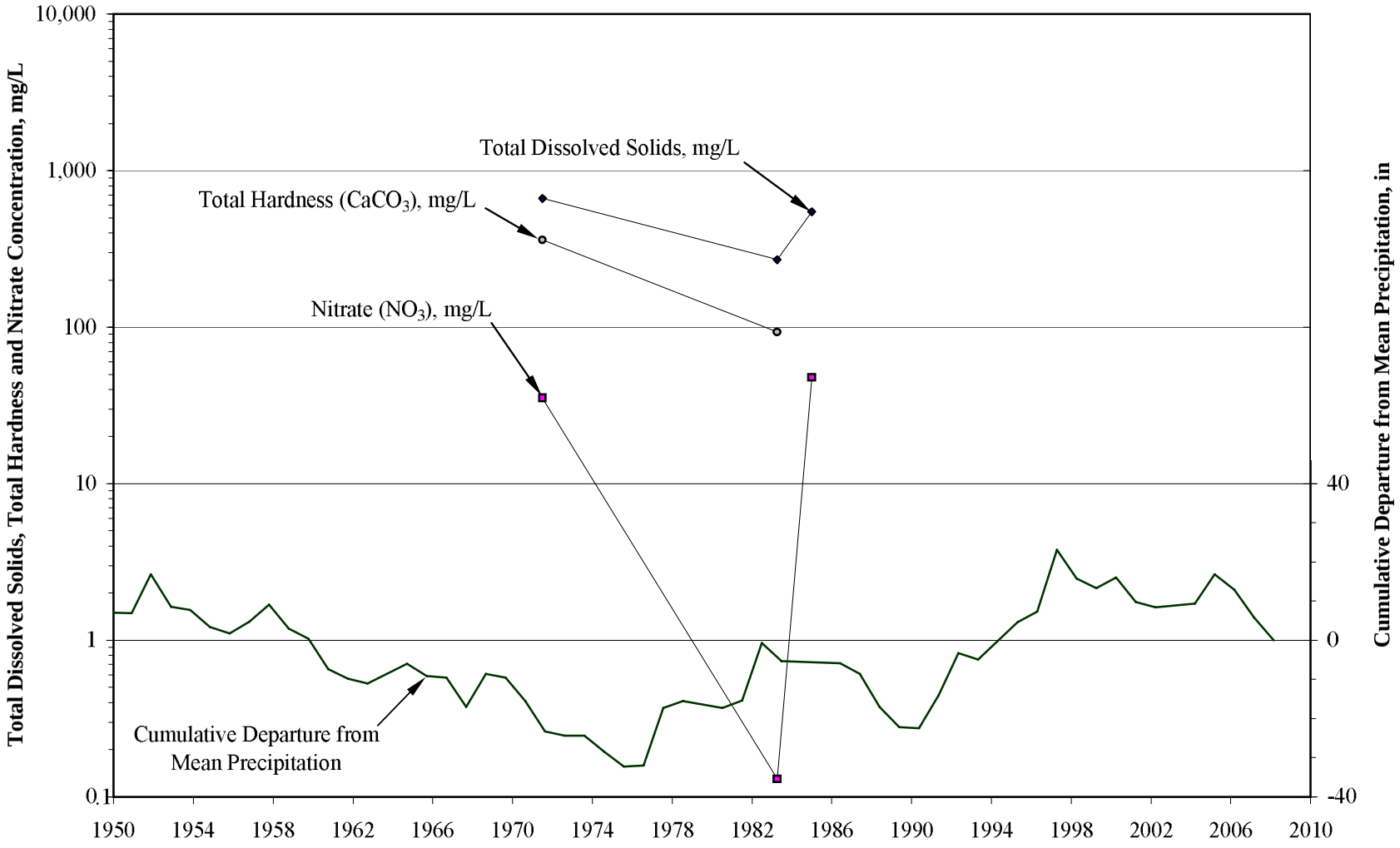
Francis Mutual Water Company Well W-9559
TDS, Total Hardness and Nitrate Levels



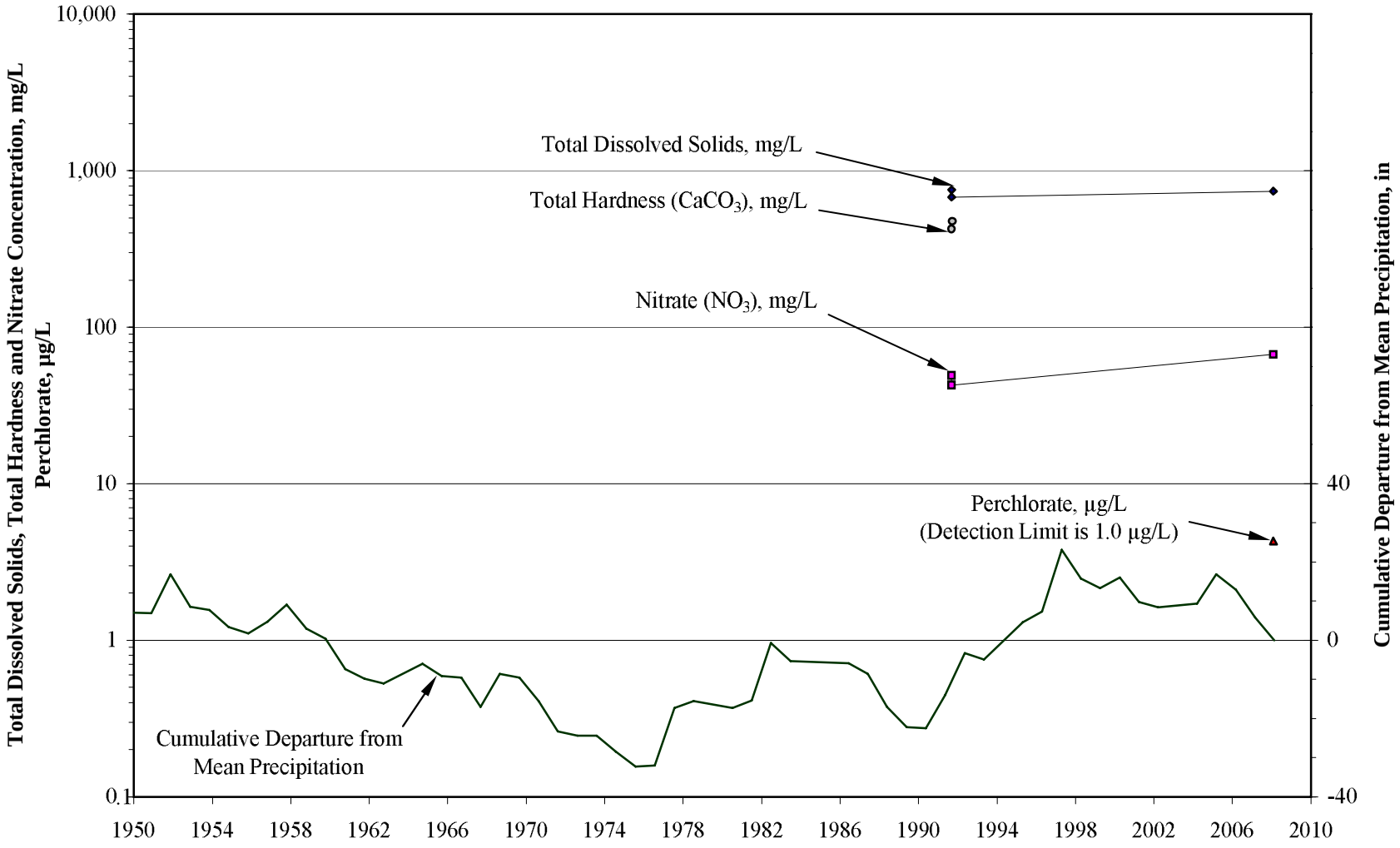
IRWD Well No. 72
TDS, Total Hardness and Nitrate Levels



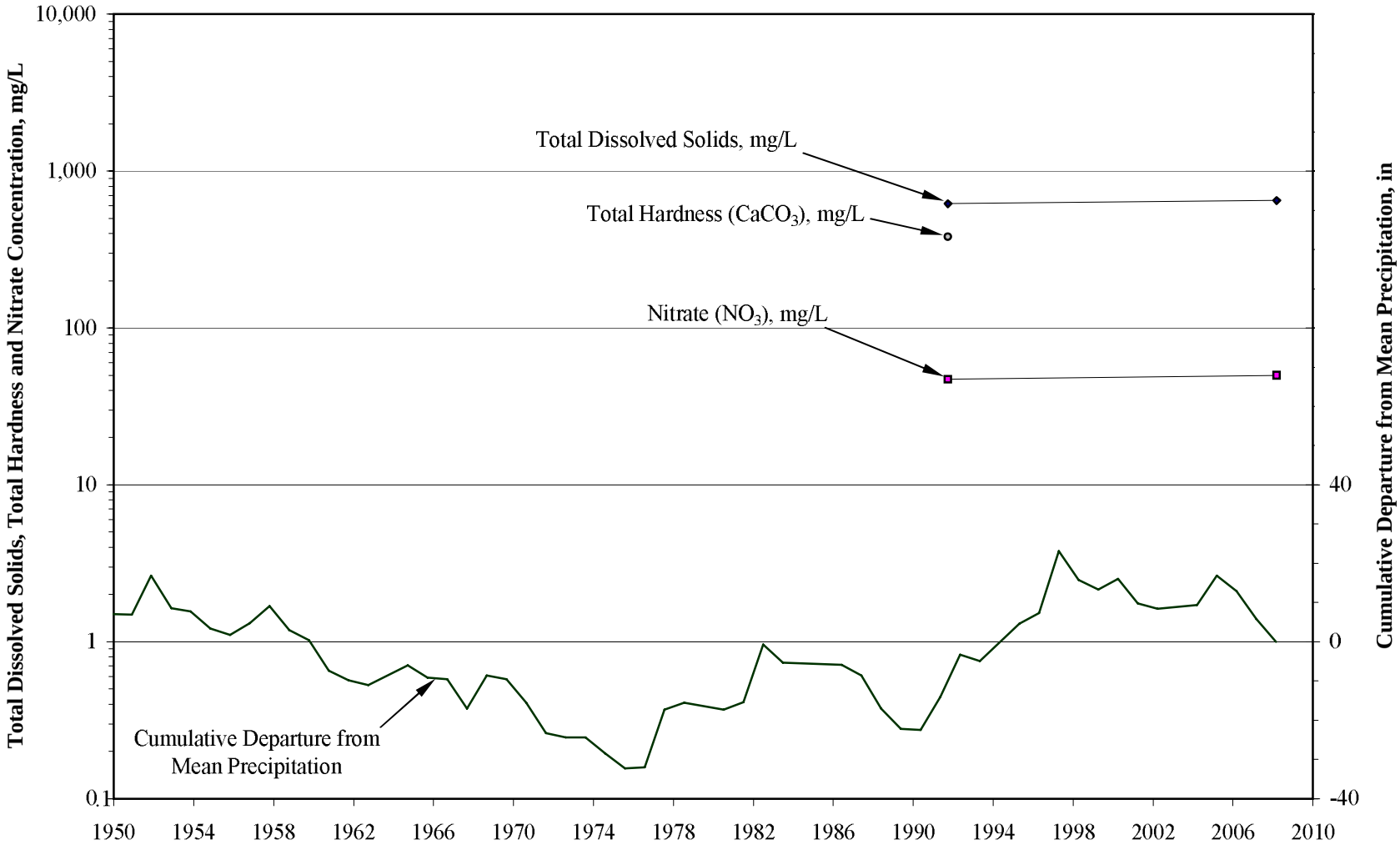
Francis Mutual Water Company Well W-9561
TDS, Total Hardness and Nitrate Levels



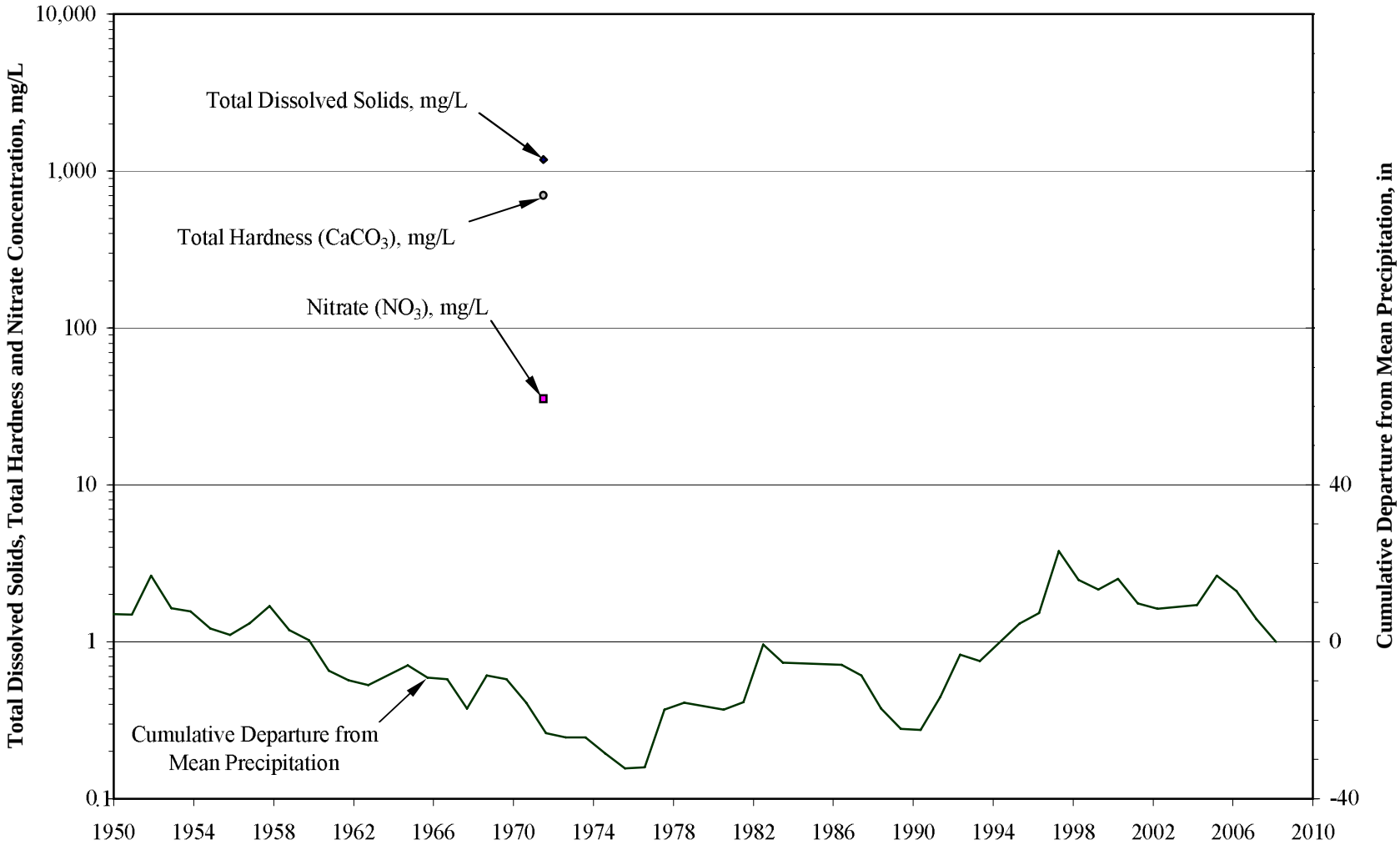
IRWD Well No. 21
TDS, Total Hardness, Nitrate and Perchlorate Levels



IRWD Well No. 22
TDS, Total Hardness, and Nitrate Levels



IRWD Well W-1838
TDS, Total Hardness and Nitrate Levels



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APPENDIX L

EXPANDED EVALUATION FOR BLENDING OF WELLS 21 AND 22

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Technical Memorandum

Expanded Evaluation for Blending Wells 21 and 22 with Dyer Road Well Field Water

December, 2009

Prepared for:

Irvine Ranch Water District
15600 Sand Canyon Avenue
Irvine, CA 92618

Prepared by:

RBF Consulting
14725 Alton Parkway
Irvine, CA 92618

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Executive Summary

This Technical Memorandum (TM) is prepared to provide an expanded evaluation of a blending system considered for IRWD's Wells 21 and 22. This evaluation begins by describing the modifications made to the blending system discussed in the Draft *Wells 21 and 22 Preliminary Design Report* (Draft PDR), and describing the measures taken to update the District's Zone 1 hydraulic model. Upon completing this model update, the District's model was run to address the hydraulic and design considerations related to the modified blending system. The following conclusions were determined based on the hydraulic model results:

- Hydraulic model scenarios developed for the blending system assume the additional supplies from Wells 21 and 22 will be transferred to Zone 3. As a result, the impact of adding Wells 21 and 22 to the Zone 1 system is minimal during average-day demand conditions, where only a portion of the DRWF is in operation. This impact is magnified if these additional supplies are not transferred to Zone 3. However, the District will only have to reduce the number of active DRWF wells mitigate this impact.
- Since all DRWF wells are assumed to be operating during max-day demand conditions, the addition of Wells 21 and 22 blending system to the Zone 1 distribution system is estimated to (1) increase losses through the DRWF transmission pipeline, (2) increase the Zone 1 system hydraulic grade line, and as result, (3) reduce the flow-capacity of DRWF wells.
- Hydraulic model results show that six (6) DRWF wells experience flow-capacity losses larger than 500 gpm during existing maximum day demand conditions (Wells 1, 3, 7, 14, 16, 18), without blending. In addition to the pumping upgrades required for these six wells, the implementation of the Wells 21 and 22 blending system is estimated to require further upgrades to at-least three other DRWF wells (Wells 5, 10, and 13) to minimize the impact of the blending system.

The cost impacts of the Wells 21 and 22 blending system on the DRWF, which is estimated at approximately $1.9 Million in this TM, is based on the upgrading cost of Wells 5, 10, and 13 only, and does not take into account any additional impacts on the DRWF wells as a result of the improvements proposed at the DRWF. The cost of the blended water is estimated to be less than that of imported water, but costs remain high, with a preliminary estimated capital cost to construct the blending station at greater than $20.4 million.

Section 1—Introduction

1.1 Background

The Draft PDR, prepared by RBF Consulting (RBF) in May 2009, describes the quality and capacity of Wells 21 and 22 (**Table 1**), and evaluates alternative means to utilize the wells as potable supply sources to the Irvine Ranch Water District Zone 1 system. The alternatives evaluated for Wells 21 and 22 in the Draft PDR included (1) membrane and ion exchange treatment, (2) blending with imported water supplied through the East Orange County Feeder No.2 (EOCF#2), and (3) blending with local groundwater supplied through the District's Dyer Road Well Field.

Table 1: Wells 21 and 22 Water Quality and Capacity

Wells	Capacity (gpm)	Water Quality (mg/L)		
		Hardness	TDS	Nitrate as NO_3
Well 21	3,300	500	740	67
Well 22	1,600	430	650	50
IRWD WQ Targets	-	150 to 180 mg/L	300 to 420 mg/L	36 mg/L

Due to the high-TDS Colorado River and State Water Project mix delivered from the Diemer Plant through the EOCF#2 (Table 2, **Figure 1**), blending Wells 21 and 22 with imported water supplies proved to require large amounts of Zone 1 water to meet the District's TDS and hardness targets (**Figure 2**). Although the blending of Wells 21 and 22 with local water supplies proved possible (**Figure 3**), several disadvantages associated with this concept and the proposed blending system shown in **Figure 4**, include:

1. Variations in blend source: Blending Wells 21 and 22 with DRWF water would make them dependent on DRWF operation, which reduces the overall supply capacity and reliability to the District. The treatment option provides greater supply reliability over the blending option.

2. Hydraulic and Water Quality Issues: This includes impacts on velocities and headlosses through the 42-inch Harvard Avenue transmission pipeline, pumping performance of DRWF wells, and potential overall increases in TDS, hardness, and nitrate levels in the distribution system,

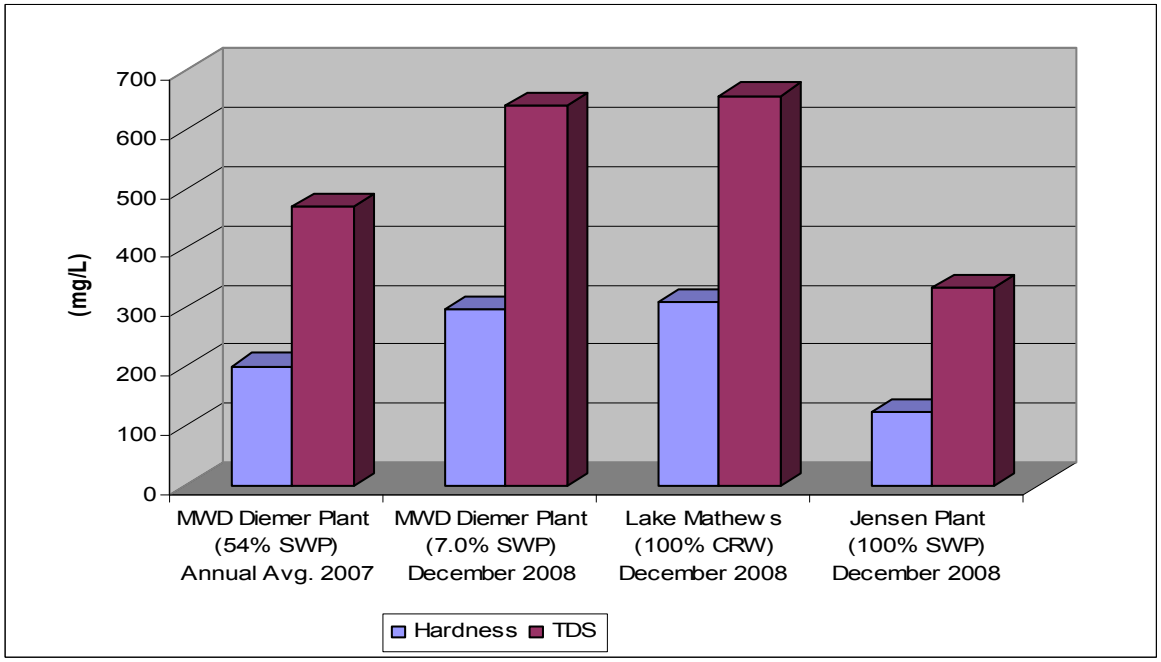
3. Blending Site Issues: The proposed blending system may have to be phased to meet the schedule of the Marine Corp Air Station – Tustin (MCAS Tustin) redevelopment project.

Table 2: MWDSC Water – Diemer Plant Water Quality

Constituents	Unit	Diemer Plant [1]	
		Year 2007 Average (54% SWP)	Dec. 2008 Average (7% SWP)
Total Hardness	mg/L	201	296
Nitrate as NO_3	mg/L	2.2	1.2
TDS	mg/L	469	639

[1] Based on MWDSC's 2008 Annual Drinking Water Quality Report

Figure 1: MWDSC – Hardness & TDS



1.2 Objective

The objective of this study is to expand on the Draft PDR blending evaluation by determining the impacts of a modified blending system (**Figure 5**) on the performance of DRWF wells, and estimating the cost of constructing and maintaining such a blending system. The purpose of this Technical Memorandum is to describe the results of the District's hydraulic model update and analysis,

IRVINE RANCH WATER DISTRICT
Wells 21 and 22 Blending Evaluation

Figure 2
Blending of Wells 21 and 22 with Imported MWDSC Water (7% SWP + 93% CRW)

Well 21 [1]	
Q (gpm)	3,300
TDS (mg/L)	740
Hardness (mg/L)	500
Nitrate-NO_3 (mg/L)	67.0

Well 22 [2]	
Q (gpm)	1,600
TDS (mg/L)	650
Hardness (mg/L)	430
Nitrate-NO_3 (mg/L)	50.0

OC 58 (54% SWP Water) [3]	
Q (gpm)	4,500
Q (cfs)	10
TDS (mg/L)	639
Hardness (mg/L)	296
Nitrate as N (mg/L)	-
Nitrate NO_3 (mg/L)	1.2

IRWD Zone 1 [4]	
Q (gpm)	21,000
TDS (mg/L)	268
Hardness (mg/L)	86
Nitrate NO_3 (mg/L)	0.85

Wells 21 and 22 Water	
Q (gpm)	4,900
TDS (mg/L)	711
Hardness (mg/L)	477
Nitrate-NO_3 (mg/L)	61.4

Blended Water		IRWD Targets
Q (gpm)	30,400	-
TDS (mg/L)	394	420
Hardness (mg/L)	180	180
Nitrate-NO_3 (mg/L)	11	36.0

[1] Based on water quality results of the Well 21 composite sample, which was collected during the Well 21 constant-rate pumping test (November 2008).
[2] Based on water quality results of the Well 22 composite sample, which was collected during the Well 22 constant-rate pumping test (January 2009).
[3] Based on Diemer Water Treatment Plant Effluent Water Quality, December 2008
[4] Based on 2009 water quality data (average of January and February 2009)

IRVINE RANCH WATER DISTRICT
Wells 21 and 22 Blending Evaluation

Figure 3
Blending of Wells 21 and 22 with DRWF Zone 1 Water

Well 21 [1]	
Q (gpm)	3,300
TDS (mg/L)	740
Hardness (mg/L)	500
Nitrate-NO_3 (mg/L)	67.0

Well 22 [2]	
Q (gpm)	1,600
TDS (mg/L)	650
Hardness (mg/L)	430
Nitrate-NO_3 (mg/L)	50.0

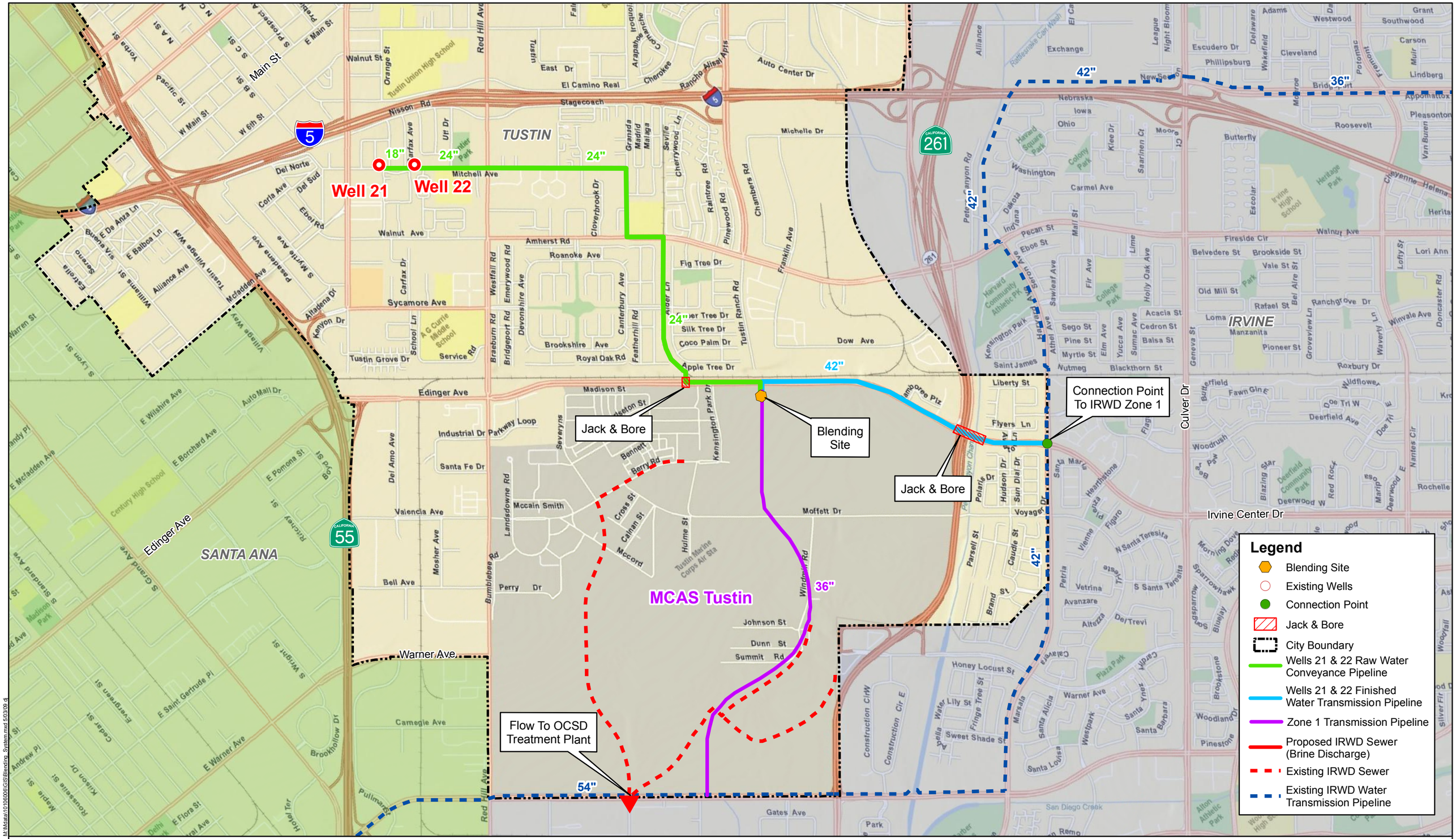
OC 58 (7% SWP Water) [3]	
Q (gpm)	0
Q (cfs)	0
TDS (mg/L)	639
Hardness (mg/L)	296
Nitrate as N (mg/L)	-
Nitrate NO_3 (mg/L)	1.2

IRWD Zone 1 [4]	
Q (gpm)	15,500
TDS (mg/L)	268
Hardness (mg/L)	86
Nitrate NO_3 (mg/L)	0.85

Wells 21 and 22 Water	
Q (gpm)	4,900
TDS (mg/L)	711
Hardness (mg/L)	477
Nitrate-NO_3 (mg/L)	61.4

Blended Water		IRWD Targets
Q (gpm)	20,400	-
TDS (mg/L)	374	420
Hardness (mg/L)	180	180
Nitrate-NO_3 (mg/L)	15	36.0

[1] Based on water quality results of the Well 21 composite sample, which was collected during the Well 21 constant-rate pumping test (November 2008).
[2] Based on water quality results of the Well 22 composite sample, which was collected during the Well 22 constant-rate pumping test (January 2009).
[3] Based on Diemer Water Treatment Plant Effluent Water Quality, December 2008
[4] Based on 2009 water quality data (average of January and February 2009)



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0 0.5 1 Mile

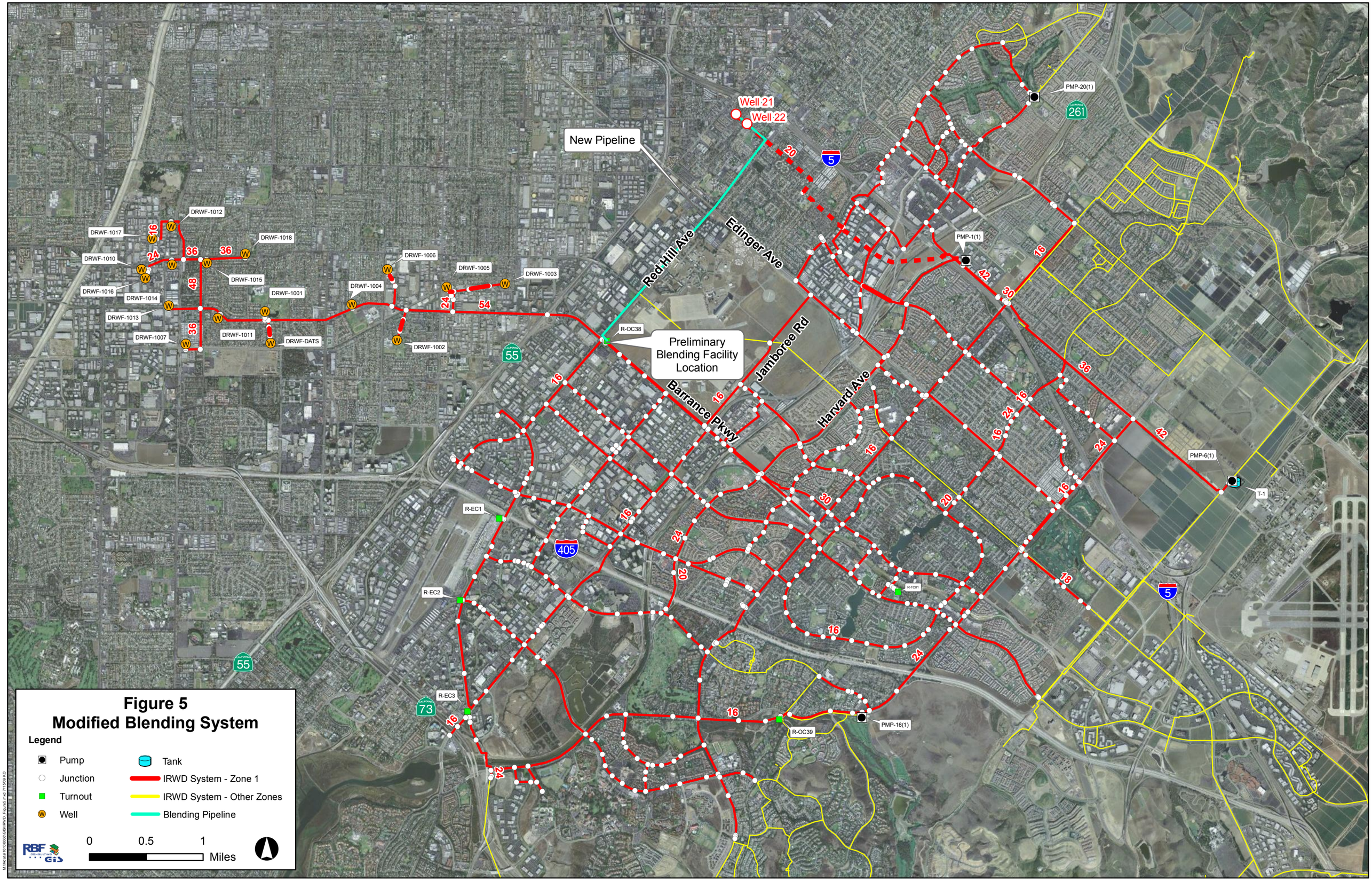
Source: ESRI Online

IRVINE RANCH WATER DISTRICT

Wells 21& 22 PDR

Blending System

Figure 4


Well 21
Well 22
New Pipeline
Red Hill Ave
Edinger Ave
Jamboree Rd
Harvard Ave
Barrance Pkwy
Preliminary Blending Facility Location
R-OC38
R-EC1
R-EC2
R-EC3
R-OC39
R-TC01
PMP-20(1)
PMP-1(1)
PMP-6(1)
T-1
PMP-16(1)
DRWF-1012
DRWF-1017
DRWF-1018
DRWF-1010
DRWF-1015
DRWF-1006
DRWF-1005
DRWF-1003
DRWF-1016
DRWF-1014
DRWF-1001
DRWF-1004
DRWF-1013
DRWF-1011
DRWF-DATS
DRWF-1007
DRWF-1002
Figure 5
Modified Blending System
Legend
Pump
Junction
Turnout
Well
Tank
IRWD System - Zone 1
IRWD System - Other Zones
Blending Pipeline
0
0.5
1
Miles

Section 2— Hydraulic Model Update

2.1 Background

RBF identified hydraulic model discrepancies during the preparation of the Draft PDR, and updated the District's Zone 1 hydraulic model for this TM. The hydraulic model update incorporated pump curves, revised groundwater levels at the DRWF, modified the Zone 1 demands and boundary conditions based on recent SCADA information provided by the District, and adjusted well operation based on Average-Day Demand (ADD) and Max-Day Demand (MDD) scenarios. Actual SCADA data and groundwater levels recorded during the IRWD's five-month summer period (May to September 2008) were used in this analysis to depict worst-case conditions.

2.2 DRWF Pump Curves

The DRWF pump curves previously incorporated in the District's hydraulic model were based on 1-point and 3-point curves. The estimated capacities associated with these curves are summarized in **Table 3**. This table also compares the "previous" well design capacities with the new actual capacities determined based on pump curves and Edison test results provided by District staff for this TM (**Attachment A**).

2.3 Groundwater Levels

Table 4 summarizes the revised groundwater levels used in the hydraulic model analysis. The revised groundwater levels were estimated based on IRWD and Orange County Water District (OCWD) data provided herein (**Attachment B)**. **Figure 6** shows a schematic profile of the water levels for each of the DRWF wells. Average groundwater pumping levels were used for ADD scenarios. Maximum pumping levels were used on MDD scenarios. The pumping level at the DATS system was set at 33.33 feet in the hydraulic model, which is the high water level at DATS's final product clearwell.

2.4 Zone 1 Demands and Boundary Conditions

Zone 1 boundary conditions, as depicted in **Figure 7**, were determined based on discussions with District staff. The Zone 1 boundary conditions are represented

Table 3: DRWF Well Design Capacities – Hydraulic Model

Well	Estimated Capacity [1]			Design Capacity [2]		Difference	
	Pump Curve	Q (gpm)	Head (ft)	Q (gpm)	Head (ft)	Q (gpm)	Head (ft)
DRWF #1	3-point	2,917	430	2,250	430	(667)	0
DRWF #2	1-point	2,693	500	2,000	550	(693)	50
DRWF #3	1-point	2,917	450	3,500	370	583	(80)
DRWF #4	1-point	2,550	500	2,250	424	(300)	(76)
DRWF #5	1-point	1,346	300	2,400	490	1,054	190
DRWF #6	3-point	3,567	448	3,500	424	(67)	(24)
DRWF #7	3-point	1,122	400	1,800	500	678	100
DRWF #10	1-point	2,873	500	2,750	470	(123)	(30)
DRWF #11	3-point	2,693	470	2,400	552	(293)	82
DRWF #12	1-point	1,970	477	2,000	525	30	48
DRWF #13	3-point	2,913	360	2,250	525	(663)	165
DRWF #14	3-point	3,150	540	3,300	540	150	0
DRWF #15	3-point	2,240	440	2,400	520	160	80
DRWF #16	1-point	3,142	500	2,500	500	(642)	0
DRWF #17	1-point	2,693	523	2,400	529	(293)	6
DRWF #18	3-point	2,542	381	2,260	480	(282)	99
DATS	1-point	5,386	580	5,670	320	284	(260)
Total		**46,715**	**-**	**45,630**	**-**	**(1,085)**	**-**

[1] Capacities included in hydraulic model prior to update hydraulic model update

[2] Based on IRWD Pump Curves

Table 4
Groundwater Pumping Level Summary [1]

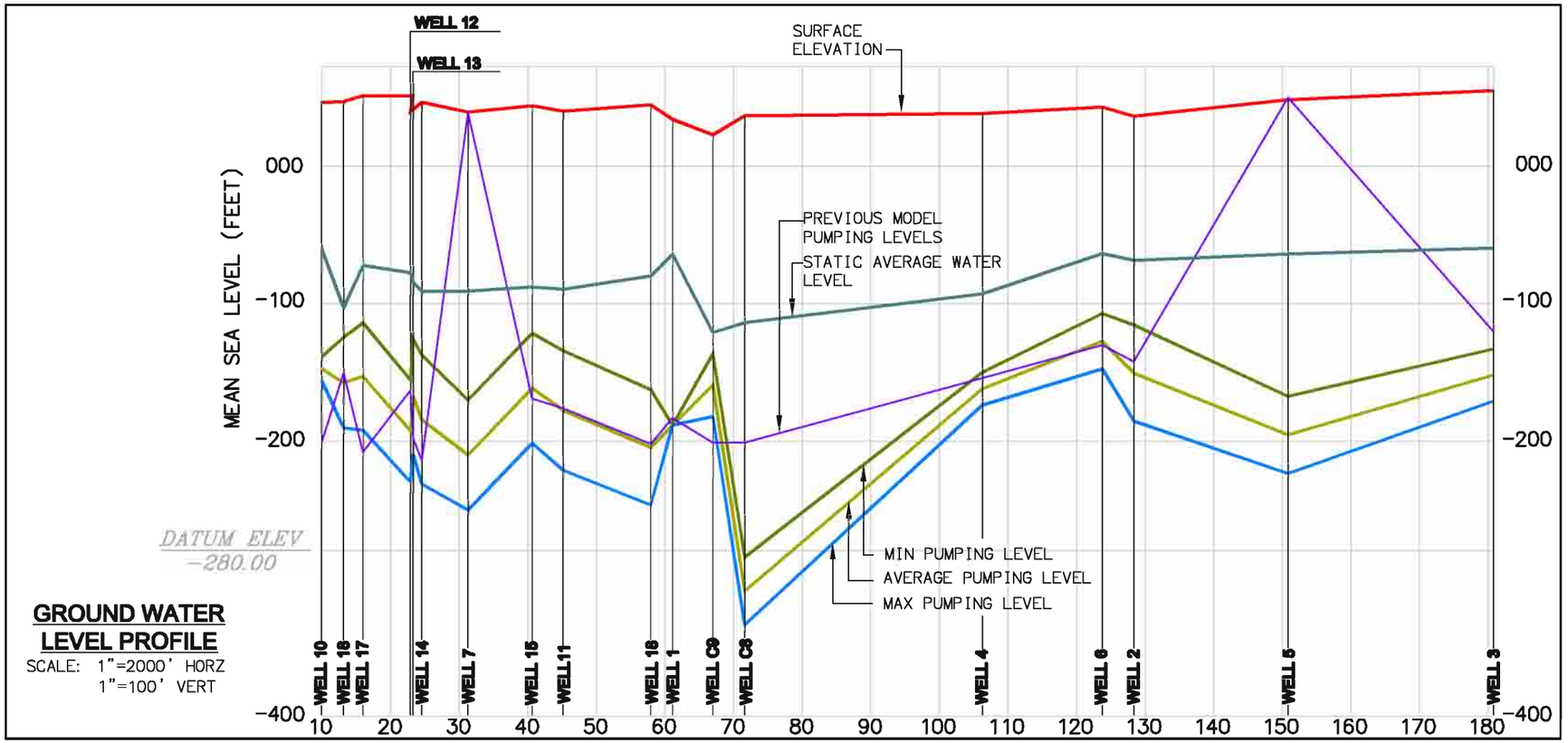
Well ID	Surface Elevation	Static Water Level (bgs)			Static Water Elevation (msl)			Pumping Levels (msl)			Previous Model Pumping Levels
		Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	
DRWF1	34.1	96.2	98.1	100.0	-62.1	-64.0	-65.9	-188.6	-188.6	-188.6	-183.0
DRWF2	36.5	91.0	105.0	126.0	-54.5	-68.5	-89.5	-115.5	-150.5	-185.5	-142.0
DRWF3	55.0	103.3	114.5	122.3	-48.3	-59.5	-67.3	-133.0	-152.0	-171.0	-120.0
DRWF4	38.4	126.0	131.2	137.8	-87.6	-92.8	-99.4	-150.1	-161.9	-173.7	-154.0
DRWF5	48.3	101.3	112.3	129.4	-53.0	-64.0	-81.1	-167.4	-195.5	-223.6	50.0
DRWF6	43.2	94.2	106.8	114.3	-51.0	-63.6	-71.1	-107.2	-127.3	-147.4	-130.0
DRWF7	39.5	108.3	130.4	148.4	-68.8	-90.9	-108.9	-170.1	-210.2	-250.3	39.0
DRWF8	36.8	134.2	150.6	158.8	-97.4	-113.8	-122.0	-284.6	-309.2	-333.8	-201 [2]
DRWF9	23.0	128.8	144.0	151.6	-105.8	-121.0	-128.6	-136.4	-159.2	-182.0	
DRWF10	46.5	102.0	106.3	110.6	-55.5	-59.8	-64.1	-138.7	-147.3	-155.9	-201.0
DRWF11	40.2	105.5	129.7	149.0	-65.3	-89.5	-108.8	-134.3	-177.8	-221.3	-176.0
DRWF12	51.1	120.0	135.8	162.0	-68.9	-84.7	-110.9	-125.5	-167.4	-209.3	-198.0
DRWF13	39.8	104.0	117.3	141.0	-64.2	-77.5	-101.2	-155.7	-192.7	-229.7	-163.0
DRWF14	46.6	104.0	137.6	174.0	-57.4	-91.0	-127.4	-137.4	-184.4	-231.4	-214.0
DRWF15	44.0	101.0	131.8	174.1	-57.0	-87.8	-130.1	-121.4	-161.4	-201.4	-169.0
DRWF16	47.0	144.0	150.0	177.0	-97.0	-103.0	-130.0	-124.5	-157.5	-190.5	-150.0
DRWF17	51.5	109.0	123.7	148.0	-57.5	-72.2	-96.5	-114.0	-153.0	-192.0	-208.0
DRWF18	44.9	99.0	124.8	143.0	-54.1	-79.9	-98.1	-162.6	-204.6	-246.6	-202.0

bgs = below ground surface

msl = mean sea level

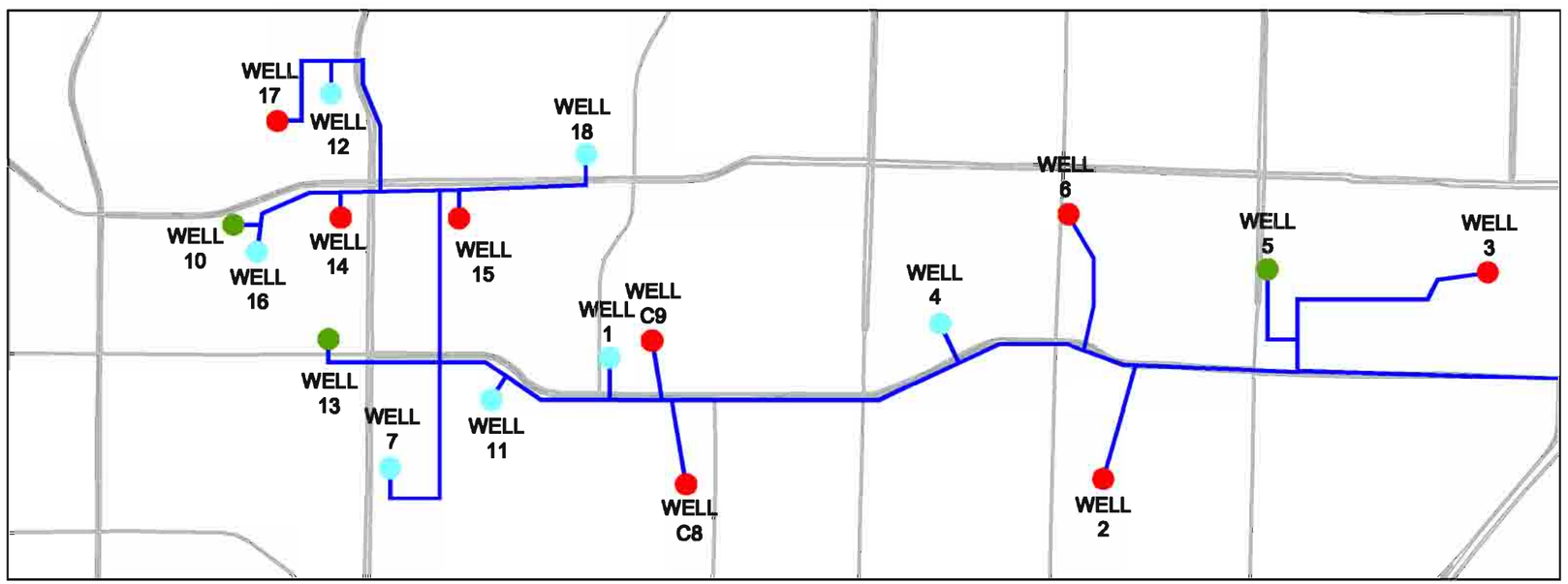
[1] Based on IRWD Well Monitoring Data (November 2007 to September 2008)

[2] The DATS wells are represented by single source of supply in the hydraulic model. The DATS pumping level allocated to the model for this TM is based on the HWL of the final water product clearwell (33.33 feet)



GROUND WATER LEVEL PROFILE

SCALE: 1"=2000' HORZ
1"=100' VERT



PLAN

SCALE: 1"=2000'

LEGEND

- STATIC AVERAGE WATER LEVEL
- PREVIOUS MODEL PUMPING LEVELS
- MIN PUMPING LEVEL
- AVERAGE PUMPING LEVEL
- MAX PUMPING LEVEL
- DRWF WELL TO REMAIN
- DRWF WELL TO BE UPGRADED
- DRWF WELL TO BE UPGRADED DUE TO BLENDING OF WELLS 21 AND 22

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
14725 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-2027
949.472.3505 ▪ FAX 949.472.8373 ▪ www.RBF.com

IRWD WELLS 21&22 BLENDING ALTERNATIVE

DYER ROAD WELL FIELD GROUND WATER LEVELS

FIGURE 6

H:\PDATA\1010006\CADD\WATER\EXHIBITS\BLENDING ANALYSIS\6006-FIGURE-6.DWG BMESERLIAN 2/22/10 5:31 pm

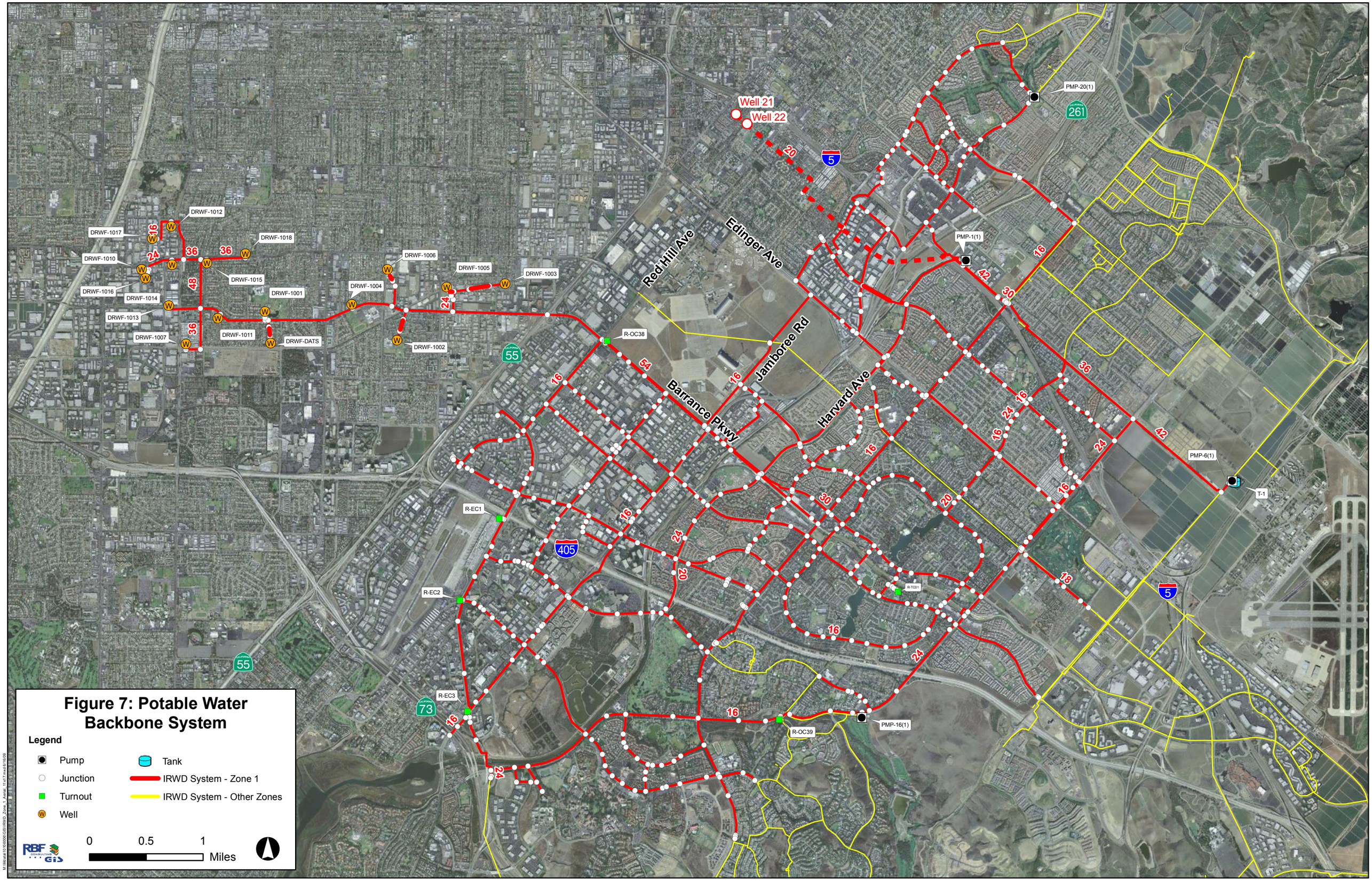


Figure 7: Potable Water Backbone System

Legend

- Pump
- Junction
- Turnout
- Well
- Tank
- IRWD System - Zone 1
- IRWD System - Other Zones

0 0.5 1 Miles

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by the following facilities that supply to or out of the Zone 1 potable water distribution system:

- Supply To Zone 1 System
  - Groundwater Supply: DRWF, DATS
  - Imported Water supply: OC-38, OC-39

- Flows Transferred from Zone 1 to other Zones
  - Zone 1 to Zone 3 Pumping:
    - Sand Canyon Pump Station (B6)
    - Turtle Rock Pump Station (B16)
    - Tustin Pump Station (B20)
  - Zone 1 to 1R Pressure Regulation
    - Bay View Pressure Reducing Valve

A graphical representation of the boundary conditions to IRWD's Zone 1 system is shown in **Figure 8**. Flows associated with each boundary condition were estimated for ADD and MDD based on the 400-day SCADA information provided by the District. The boundary conditions for ADD and MDD scenarios are summarized in **Tables 5** and **6,** respectively. The Zone 1 demand calculation shown in these tables estimate the average water demand during the District's five-month summer season at approximately16,000 gallons per minute (gpm), and the Zone 1 MDD at approximately 18,400 gpm[1]. Water demands incorporated in model nodes were multiplied by an overall factor to depict these exact conditions for the blending evaluation. A summary of the SCADA data provided for each boundary condition is provided in **Attachment C**.

2.5 Well Operation

To meet the demands of Zone 1, and the flow-through demand to Zone 1R[2] and Zone 3, all DRWF wells are assumed to be operating during MDD conditions. Since the District does not need to operate all wells during ADD conditions, two groups of wells are rotated on a weekly basis. The two groups of wells analyzed for ADD conditions, which are shown in **Table 7**, were based on the District's well operation/sequence plan provided to RBF by IRWD operations staff.

[1] The max-day demand (MDD) scenario used for this TM is accounts for the Zone 1 system demand during maximum pumping from DRWF.

[2] Zone 1 water is supplied to Zone 1R (Zone 1 Reduced) via a pressure reducing station.

IRVINE RANCH WATER DISTRICT
BLENDING OF WELLS 21 AND 22

FIGURE 8
ZONE 1 BOUNDARY CONDITIONS
SCHEMATIC

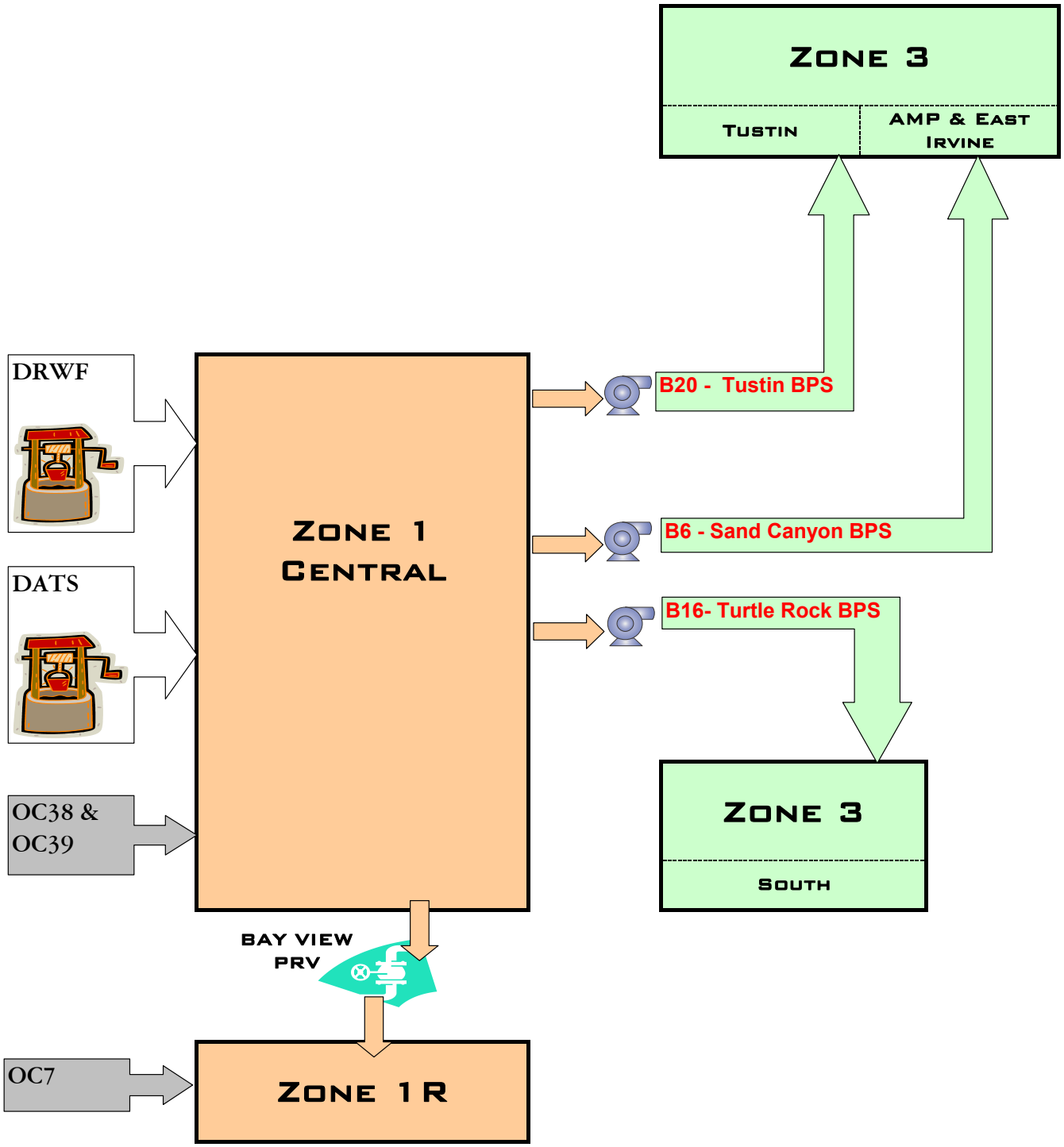


Table 5: ADD Boundary Conditions – Summer Season

Source	ADD (gpm)	
	(cfs)	(gpm)
Supply to Zone 1		
DRWF	53	23,675
OC-7 (to Zone 1R)	-	-
OC-38	0	4
OC-39	0	58
Subtotal	**53**	**23,737**
Supply to Upper Zones		
Zone 1 to 3 BPS - Sand Canyon	6	2,736
Zone 1 to 3 BPS - Tustin	1	617
Zone 1 to 3 BPS - Turtle Rock	7	3,253
Bay View PRV	3	1,130
Subtotal	**17**	**7,736**
Zone 1 Demand	**36**	**16,001**

Table 6: MDD Boundary Condition – July 12, 2008[1]

Source	MDD (gpm)	
	(cfs)	(gpm)
Supply to Zone 1		
DRWF	84	37,631
OC-7 (to Zone 1R)	-	-
OC-38	0	4
OC-39	0	63
Subtotal	**84**	**37,698**
Supply to Upper Zones		
Zone 1 to 3 BPS - Sand Canyon	22	9,729
Zone 1 to 3 BPS - Tustin	6	2,606
Zone 1 to 3 BPS - Turtle Rock	12	5,173
Bay View PRV	4	1,797
Subtotal	**43**	**19,305**
Zone 1 Demand	**41**	**18,393**

[1] Day within which maximum DRWF pumping occurred (From May 13 2008 to June 16, 2009)

Table 7: Active DRWF Wells during ADD and MDD Scenarios

Well	Scenario		
	ADD-Group 1	ADD- Group 2	MDD
DRWF1	-	√	√
DRWF2	√	-	√
DRWF3	-	-	√
DRWF4	√	√	√
DRWF5	√	-	√
DRWF6	-	-	√
DRWF7	-	√	√
DRWF8 (DATS)	√	√	√
DRWF9 (DATS)	√	√	√
DRWF10	√	√	√
DRWF11	-	-	√
DRWF12	√	-	√
DRWF13	-	√	√
DRWF14	√	√	√
DRWF15	√	√	√
DRWF16	-	-	√
DRWF17	√	√	√
DRWF18	-	√	√
Total Design Capacity (gpm)	**25,170**	**27,330**	**45,630**
Total DRWF Supply (gpm)	**23,678**	**23,678**	**37,632**

Section 3—Hydraulic Model Analysis and Results

A hydraulic model of the system was run using MWH Soft H2OMap Water software. The purpose of the hydraulic analysis model was to determine the required facility sizes and identify the impacts on DRWF facilities and pumping. The hydraulic model was updated to simulate operation of the existing (or Baseline) system, and the Blending System, which includes supplies from Wells 21 and 22.

3.1 Hydraulic Model Scenarios and Assumptions

- **Table 8** identifies the different hydraulic model scenarios run for each of the evaluated systems (Baseline vs. Blending). Two ADD scenarios were run for each system to evaluate DRWF pumping performance utilizing the two different well groups. Since all wells were assumed to be on during MDD scenario, only one scenario was run for each of the Baseline and Blending systems.

Table 8: Hydraulic Model Scenarios

System	Wells 21 and 22 Supplies	Scenario	DRWF Supply (gpm)	Groundwater Pumping Levels
Existing/ Baseline System	None	ADD-Group 1	23,678	Average
		ADD- Group 2	23,678	Average
		MDD	37,632	Maximum
Blending System	Pumped to Zone 3	ADD-Group 1	23,678	Average
		ADD- Group 2	23,678	Average
		MDD	34,329	Maximum

- All scenarios developed for the blending system assume the additional supply from Wells 21 and 22 will be transferred to Zone 3 via the Sand Canyon Zone 1 to 3 Booster Pump Station. Although the impact of Wells 21 and 22 on DRWF pumping will be magnified if the 4,900 gpm is not transferred to Zone 3, the District will only have to reduce the number of active DRWF wells operating to mitigate this impact.

- As later indicated in Section 4 of this report, the headloss across the blending station is estimated to range between 20 to 30 feet. The hydraulic model scenarios listed above account for this headloss by reducing the size of the pipe that represents the blending station in the model.

3.2 Hydraulic Model Analysis and Results

3.2.1 Baseline System:

Hydraulic model runs of the baseline system indicate that several DRWF wells operate at reduced capacities during ADD and MDD conditions. The operating capacities of these Wells during ADD and MDD conditions are compared to their design capacities in **Tables 9 and 10** (Flow and Head, respectively). The DRWF wells experiencing the largest capacity loss between design and actual operating conditions (assume larger than 500 gpm) include Well Nos. 1, 3, 7, 14, 16, and 18. The combined loss in flow-capacity from these wells is estimated at approximately 5,900 gpm during MDD conditions, which accounts for approximately 73-percent of the total losses occurred in the Baseline System[3]. It should be noted that since the operating conditions and the associated head losses of these wells are not driven by the blending of Wells 21 and 22, the cost of upgrading these wells is excluded from the cost estimate prepared for the blending system.

The results/conclusions of the "baseline" hydraulic model runs can be summarized as follows:

- Total loss in DRWF flow-capacity from design points to actual conditions is estimated to range between 1,280 gpm to 3,490 gpm at ADD conditions, and 8,100 gpm at MDD conditions.
- Pumping capacities are most impacted at MDD conditions, when all of the DRWF wells are assumed to be active.
- Average Total Dynamic Head (TDH) variation from design point at the DRWF Wells ranges between 25 to 51 feet during ADD, and 57 feet at MDD.
- Maximum TDH differential is exhibited by Well 3 at MDD conditions, which is estimated at 145 feet.
- The DATS pumping system, in addition to Well No. 2, did not show any capacity reduction during MDD Conditions.

[3] DRWF wells experiencing larger than 300 gpm flow-capacity loss include wells 1, 3, 5, 7, 10, 13, 14, 16, and 18, which account for 89-percent of the total flow capacity loss during MDD conditions.

BLENDING OF WELLS 21 AND 22

Table 9
HYDRAULIC MODEL RESULTS
Baseline System - Flows

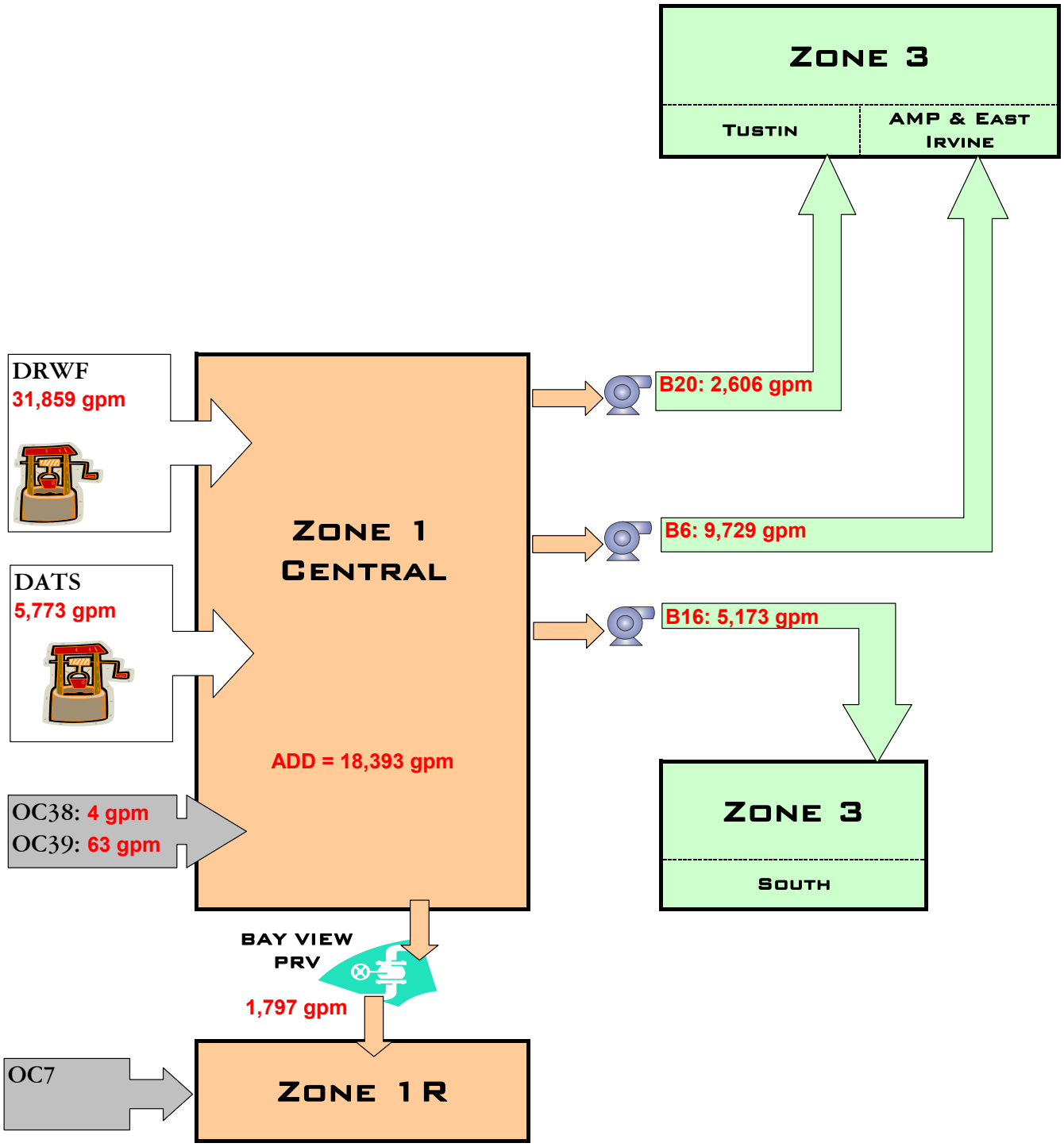
Well	Estimated Capacity		Flow (gpm)					
			Baseline System					
	Q (gpm)	Head (ft)	ADD-Group 1	Difference (Δ)	ADD-Group 2	Difference (Δ)	MDD	Difference (Δ)
DRWF #1	2,250	430	0	0	1,193	(1,057)	1,286	(964)
DRWF #2	2,000	550	2,261	261	0	0	2,140	140
DRWF #3	3,500	370	0	0	0	0	1,286	(2,214)
DRWF #4	2,250	424	1,974	(276)	1,992	(258)	2,006	(244)
DRWF #5	2,400	490	2,005	(395)	0	0	1,940	(460)
DRWF #6	3,500	424	0	0	0	0	3,230	(270)
DRWF #7	1,800	500	0	0	1,285	(515)	1,088	(712)
DRWF #10	2,750	470	2,262	(488)	2,295	(455)	2,330	(420)
DRWF #11	2,400	552	0	0	0	0	2,315	(85)
DRWF #12	2,000	525	1,960	(40)	0	0	1,857	(143)
DRWF #13	2,250	525	0	0	2,048	(202)	1,864	(386)
DRWF #14	3,300	540	3,006	(294)	3,037	(263)	2,795	(505)
DRWF #15	2,400	520	2,356	(44)	2,366	(34)	2,228	(172)
DRWF #16	2,500	500	0	0	0	0	1,851	(649)
DRWF #17	2,400	525	2,396	(4)	2,408	8	2,252	(148)
DRWF #18	2,260	480	0	0	1,545	(715)	1,390	(870)
DATS	5,670	320	5,458	(212)	5,509	(161)	5,773	103
Subtotal 16 DRWF Wells	**39,960**	**-**	**18,220**	**(1,280)**	**18,169**	**(3,491)**	**31,859**	**(8,101)**
Subtotal DATS	**5,670**	**-**	**5,458**	**(212)**	**5,509**	**(161)**	**5,773**	**103**
TOTAL	**45,630**	**-**	**23,678**	**(1,492)**	**23,678**	**(3,652)**	**37,632**	**(7,998)**

Table 10
HYDRAULIC MODEL RESULTS
Baseline System - Head

Well	Estimated Capacity		TDH (feet)					
			Baseline System					
	Q (gpm)	Head (ft)	ADD-Group 1	Difference (Δ)	ADD-Group 2	Difference (Δ)	MDD	Difference (Δ)
DRWF #1	2,250	430	-	-	553	123	540	110
DRWF #2	2,000	550	515	(36)	-	-	531	(19)
DRWF #3	3,500	370	-	-	-	-	515	145
DRWF #4	2,250	424	527	103	524	100	522	98
DRWF #5	2,400	490	559	69	-	-	568	78
DRWF #6	3,500	424	-	-	-	-	495	71
DRWF #7	1,800	500	-	-	575	75	602	102
DRWF #10	2,750	470	516	46	514	44	511	41
DRWF #11	2,400	552	-	-	-	-	573	21
DRWF #12	2,000	525	536	11	-	-	563	38
DRWF #13	2,250	525	-	-	-	-	582	57
DRWF #14	3,300	540	553	13	550	10	568	28
DRWF #15	2,400	520	529	9	527	7	554	34
DRWF #16	2,500	500	-	-	-	-	546	46
DRWF #17	2,400	525	526	1	523	(2)	550	25
DRWF #18	2,260	480	-	-	570	90	583	103
DATS	5,670	320	333	13	331	11	318	(2)
Minimum	**-**	**-**	**-**	**(36)**	**-**	**(2)**	**-**	**(19)**
Average	**-**	**-**	**-**	**25**	**-**	**51**	**-**	**57**
Maximum	**-**	**-**	**-**	**103**	**-**	**123**	**-**	**145**

IRVINE RANCH WATER DISTRICT
BLENDING OF WELLS 21 AND 22

Figure 9
Baseline System at MDD
Zone 1 Boundary Conditions Schematic



3.2.2 Blending System:

The results of the hydraulic model runs of the blending system indicate that DRWF wells will not be impacted by the additional supplies from Wells 21 and 22 during ADD conditions. This is due to the fact that the flows introduced to the Zone 1 system from Wells 21 and 22 are assumed to be pumped to Zone 3 with little increases to headlosses in the transmission main (See **Figure 10** for boundary conditions). At MDD conditions, the additional supplies from Wells 21 and 22 seem to further reduce the capacities of each DRWF well as the increased flowrates increase the losses and the required TDH.

Tables 11 and **12** compare the operating capacities of the DRWF Wells during blending, with (1) the operating capacities observed for the Baseline System, and (2) the design capacity of each DRWF well. Flow-capacity losses in excess of 500 gpm include the following wells:

- Well No.1 – Baseline and Blending Systems
- Well No.3 – Baseline and Blending Systems
- Well No.5 – Blending System Only
- Well No.7 – Baseline and Blending Systems
- Well No.10 – Blending System Only
- Well No.13 – Blending System Only
- Well No.14 – Baseline and Blending Systems
- Well No.16 – Baseline and Blending Systems
- Well No.18 – Baseline and Blending Systems

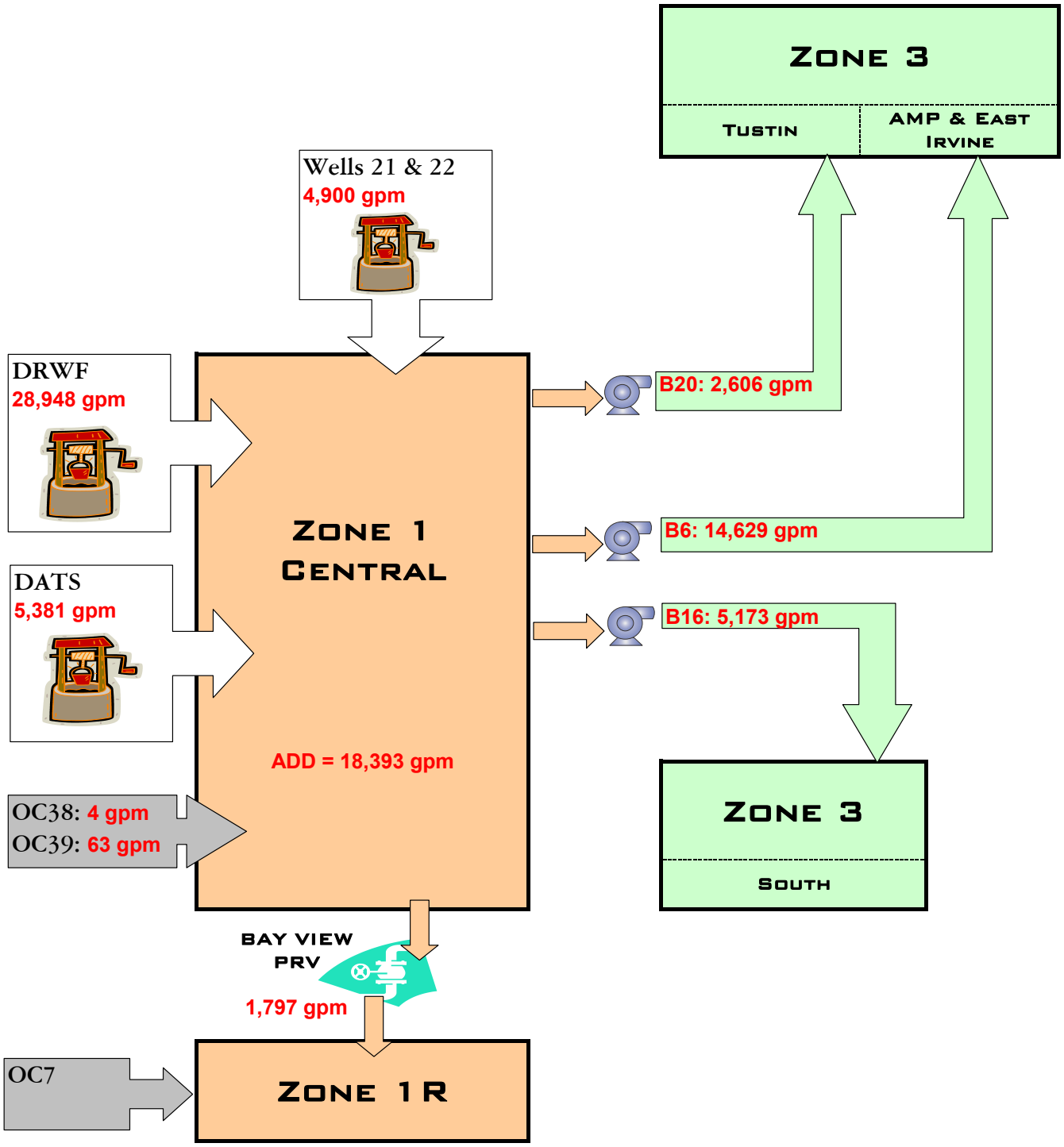
The results/conclusions of the “blending” hydraulic model runs can be summarized as follows:

- Total loss in DRWF flow-capacity from design rate to predicted model rate is estimated to range between 1,000 gpm to 3,490 gpm during ADD conditions and 11,000 gpm during MDD conditions.

- As is the case with the Baseline system, pumping capacities are most impacted at MDD conditions, when all of the DRWF wells are assumed to be active.

IRVINE RANCH WATER DISTRICT
BLENDING OF WELLS 21 AND 22

Figure 10
Blending System at MDD
Zone 1 Boundary Conditions Schematic



BLENDING OF WELLS 21 AND 22

Table 11
Hydraulic Model Results
Blending System - Flow

Well	Estimated Capacity			Flow (gpm)								
				Blending System								
	Q (gpm)	Q (cfs)	Head (ft)	ADD-Group 1	Δ (from Design)	Δ (from Baseline)	ADD-Group 2	Δ (from Design)	Δ (from Baseline)	MDD	Δ (from Design)	Δ (from Baseline)
DRWF #1	2,250	5	430	0	0	0	1,193	(1,057)	0	1,152	(1,098)	(134)
DRWF #2	2,000	4	550	2,261	261	0	0	0	0	2,001	1	(140)
DRWF #3	3,500	8	370	0	0	0	0	0	0	1,004	(2,496)	(283)
DRWF #4	2,250	5	424	1,974	0	0	1,992	(258)	0	1,788	(462)	(218)
DRWF #5	2,400	5	490	2,005	(395)	0	0	0	0	1,781	(619)	(158)
DRWF #6	3,500	8	424	0	0	0	0	0	0	3,054	(446)	(176)
DRWF #7	1,800	4	500	0	0	0	1,285	(515)	0	951	(849)	(137)
DRWF #10	2,750	6	470	2,262	(488)	0	2,295	(455)	0	2,062	(688)	(268)
DRWF #11	2,400	5	552	0	0	0	0	0	0	2,212	(188)	(103)
DRWF #12	2,000	4	525	1,960	(40)	0	0	0	0	1,788	(212)	(68)
DRWF #13	2,250	5	525	0	0	0	2,048	(202)	0	1,623	(627)	(241)
DRWF #14	3,300	7	540	3,006	(294)	0	3,037	(263)	0	2,627	(674)	(168)
DRWF #15	2,400	5	520	2,356	(44)	0	2,366	(34)	0	2,136	(264)	(92)
DRWF #16	2,500	6	500	0	0	0	0	0	0	1,452	(1,048)	(399)
DRWF #17	2,400	5	525	2,396	(4)	0	2,408	8	0	2,146	(254)	(106)
DRWF #18	2,260	5	480	0	0	0	1,545	(715)	0	1,171	(1,089)	(219)
DATS	5,670	13	320	5,458	(212)	0	5,509	(161)	0	5,381	(289)	(393)
Subtotal 16 DRWF Wells	**39,960**	**89.0**	**-**	**18,220**	**(1,004)**	**0**	**18,169**	**(3,491)**	**0**	**28,948**	**(11,012)**	**(2,910)**
Subtotal DATS	**5,670**		**-**	**5,458**	**(212)**	**0**	**5,509**	**(161)**	**0**	**5,381**	**(289)**	**(393)**
TOTAL	**45,630**		**-**	**23,678**	**(1,216)**	**0**	**23,678**	**(3,652)**	**0**	**34,329**	**(11,301)**	**(3,303)**

Table 12
Hydraulic Model Results
Blending System - Head

Well	Estimated Capacity			TDH (feet)								
				Blending System								
	Q (gpm)	Q (cfs)	Head (ft)	ADD-Group 1	Δ (from Design)	Δ (from Baseline)	ADD-Group 2	Δ (from Design)	Δ (from Baseline)	MDD	Δ (from Design)	Δ (from Baseline)
DRWF #1	2,250	5	430	695	-	-	553	123	0	559	129	19
DRWF #2	2,000	4	550	515	(36)	0	680	-	0	551	1	20
DRWF #3	3,500	8	370	610	-	-	610	-	0	535	165	20
DRWF #4	2,250	5	424	527	103	0	524	100	0	541	117	19
DRWF #5	2,400	5	490	559	69	0	760	-	0	587	97	20
DRWF #6	3,500	8	424	760	-	-	760	-	0	514	90	19
DRWF #7	1,800	4	500	750	-	-	575	75	0	621	121	19
DRWF #10	2,750	6	470	516	46	0	514	44	0	529	59	18
DRWF #11	2,400	5	552	850	-	-	850	-	0	592	40	19
DRWF #12	2,000	4	525	536	11	0	864	-	0	582	57	18
DRWF #13	2,250	5	525	677	-	-	558	-	0	600	75	19
DRWF #14	3,300	7	540	553	13	0	550	10	0	586	46	18
DRWF #15	2,400	5	520	529	9	0	527	7	0	573	53	18
DRWF #16	2,500	6	500	680	-	-	680	-	0	564	64	18
DRWF #17	2,400	5	525	526	1	0	523	(2)	0	568	43	18
DRWF #18	2,260	5	480	700	-	-	570	90	0	601	121	18
DATS	5,670	13	320	333	13	0	331	11	0	336	16	19
Minimum	**-**	**4.0**	**-**	**-**	**(36)**	**0**	**-**	**(2)**	**0**	**-**	**1**	**18**
Average	**-**	**5.6**	**-**	**-**	**27**	**0**	**-**	**56**	**0**	**-**	**80**	**19**
Maximum	**-**	**7.8**	**-**	**-**	**103**	**0**	**-**	**123**	**0**	**-**	**165**	**20**

- Average overall TDH Variation from design points of DRWF Wells ranges between 27 to 56 feet during ADD conditions, and 80 feet during MDD conditions. **Figure 11** shows the difference in Hydraulic Grade Line (HGL) between the Baseline and Blending Systems.

- Impacts on DRWF wells are expected to be less during MDD conditions if only one of the new two wells (Wells 21 and 22) is operating.

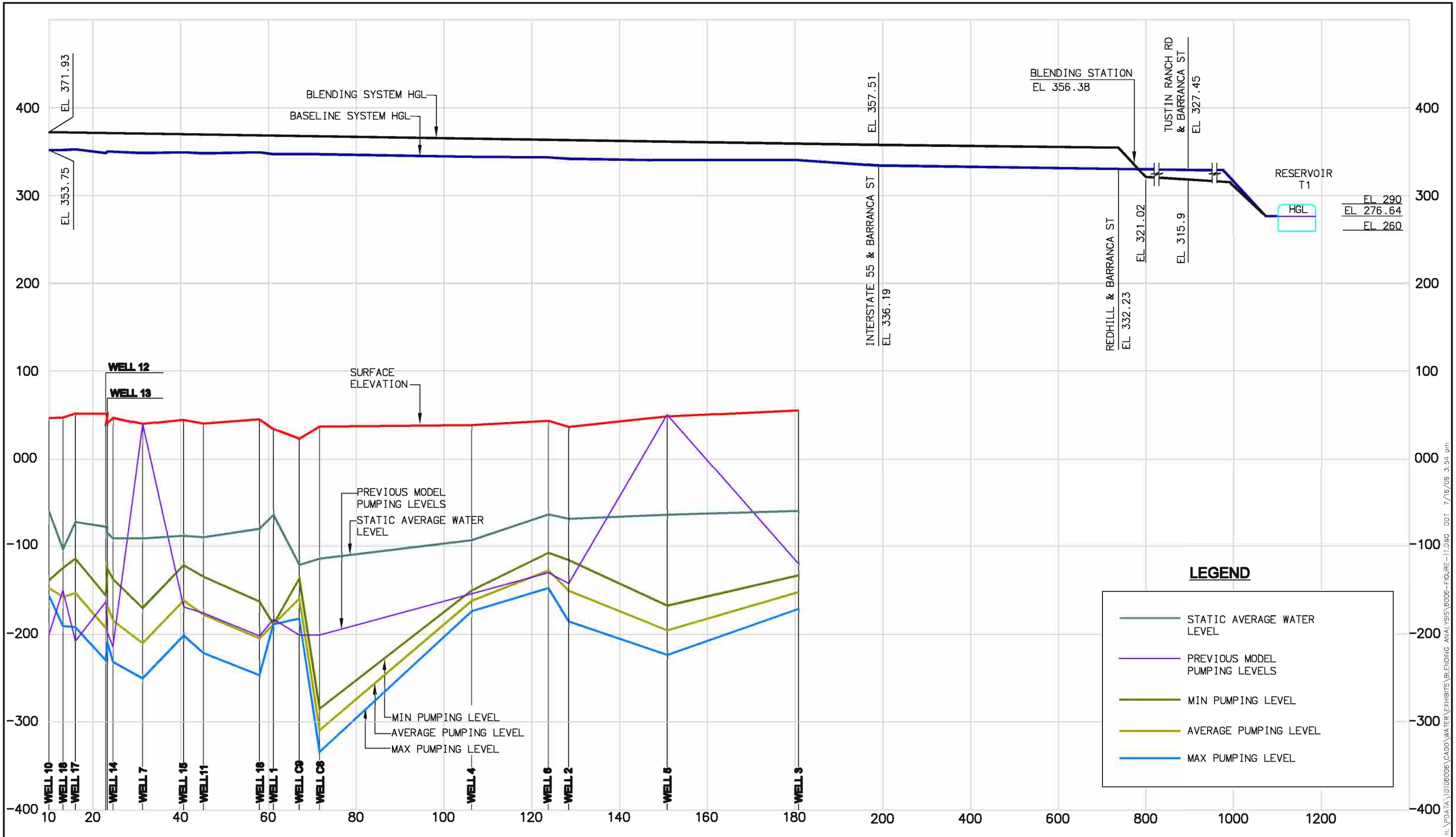
- Maximum TDH variation from design point to operating point is exhibited by Well 3 at MDD conditions, which is estimated at 165 feet.

- Well Nos. 2 did not show any capacity reduction during MDD Conditions.

- In addition to the pumping upgrades required to six of the DRWF wells during baseline conditions, the implementation of the Wells 21 and 22 blending system will require further upgrades to Wells 5, 10, and 13. The cost impacts of the Wells 21 and 22 blending system on the DRWF is based on the upgrading cost of these three wells.

- Due to energy considerations associated with the upgrade of Well 14 (needs a 700 hp motor), it is recommended that other wells be upgraded in lieu of this well (See **Table 13**). Also, due to the low utilization planned for Well 3, which is the highest color of the untreated DRWF wells, upgrading Well 3 may not be cost-effective for the District. The wells recommended for upgrade are shown in **Figure 6**.

It should be noted that the improvements recommended to the DRWF wells are estimated based on hydraulic model results only. Should the District decide to move forward with implementing the blending system, it is recommended that a more thorough investigation of the well pumps be performed during the preliminary design phase to determine the exact requirements for upgrading each well.



HYDRAULIC GROUND WATER LEVEL PROFILE

SCALE: 1"=2000' HORZ
1"=100' VERT

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IRWD WELLS 21&22 BLENDING ALTERNATIVE

HYDRAULIC GRADE LINE

FIGURE 11

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BLENDING ANALYSIS
HYDRAULIC MODEL RESULTS

Table 13
DRWF Upgrades

Well	Existing Capacity		Recommended Improvements					Existing Brake Horsepower (HP)	New Motor (HP)
	Existing Design Flow (gpm)	Existing Design Head (ft)	Existing Design Flow (gpm)	Add'l Head (ft)	New Head (ft)	Assumed Efficiency	New Brake Horsepower (HP)		
DRWF #1	2,250	430	2,250	129	559	80%	397	400	450
DRWF #2	2,000	550	-	-	-	-	-	400	-
DRWF #3	3,500	370	3,500	165	535	80%	591	400	700
DRWF #4	2,250	424	2,250	117	541	80%	384	400	450
DRWF #5	2,400	490	2,400	97	587	80%	445	400	500
DRWF #6	3,500	424	-	-	-	-	-	400	-
DRWF #7	1,800	500	1,800	121	621	80%	353	300	400
DRWF #10	2,750	470	2,750	59	529	80%	459	400	550
DRWF #11	2,400	552	2,400	40	592	80%	448	400	500
DRWF #12	2,000	525	2,000	57	582	80%	367	400	450
DRWF #13	2,250	525	2,250	75	600	80%	426	400	500
DRWF #14	3,300	540	3,300	46	586	80%	611	600	700
DRWF #15	2,400	520	-	-	-	-	-	400	-
DRWF #16	2,500	500	2,500	64	564	80%	445	400	500
DRWF #17	2,400	525	2,400	43	568	80%	430	400	500
DRWF #18	2,260	480	2,260	121	601	80%	429	400	500
DATS	5,670	320	-	-	-	-	-	2 x 300	-

Not recommended for upgarde

Recommended for upgrade in lieu of Well No.14

Section 4—Blending System

4.1 Blending Concept

As indicated in the schematic diagram shown in Figure 3, at least 15,500 gpm of DRWF water will be necessary to blend-down Wells 21 and 22 TDS, hardness, and nitrate levels to meet the District's water quality goals for these constituents, with hardness controlling. The District's 2008/09 and 2009/10 pumping plans indicate that the required flow for blending will be available on a year-round basis (**Figure 12**). Based on this, the utilization of Wells 21 and 22 is assumed to be at 90-percent for this TM, which calculates to annual production of 7,114 acre-feet per year from Wells 21 and 22 (**Table 14**).

Table 14: Annual Production from Wells 21 and 22

Project ID	Instantaneous Well Water Flow (gpm)	Yearly Well Utilization (%)	Raw Water Flow (gal/yr)	Raw Water Flow (AFY)
Wells 21/22 Blending Station	4,900	90%	2,317,896,000	7,114

As shown in the schematic layout of the blending system (**Figure 13),** the main components of the blending system will consist of the following:

- Equipping Wells 21 and 22,
- Constructing a new pipeline from Wells 21 and 22 to the blending facility/ station,
- Constructing a blending station near the existing 54-inch transmission pipeline in the Barranca Parkway, and
- Furnishing the necessary control and monitoring equipment to ensure adequate blending of constituents is performed under all demand conditions per the California Department of Public Health (CDPH) requirements.

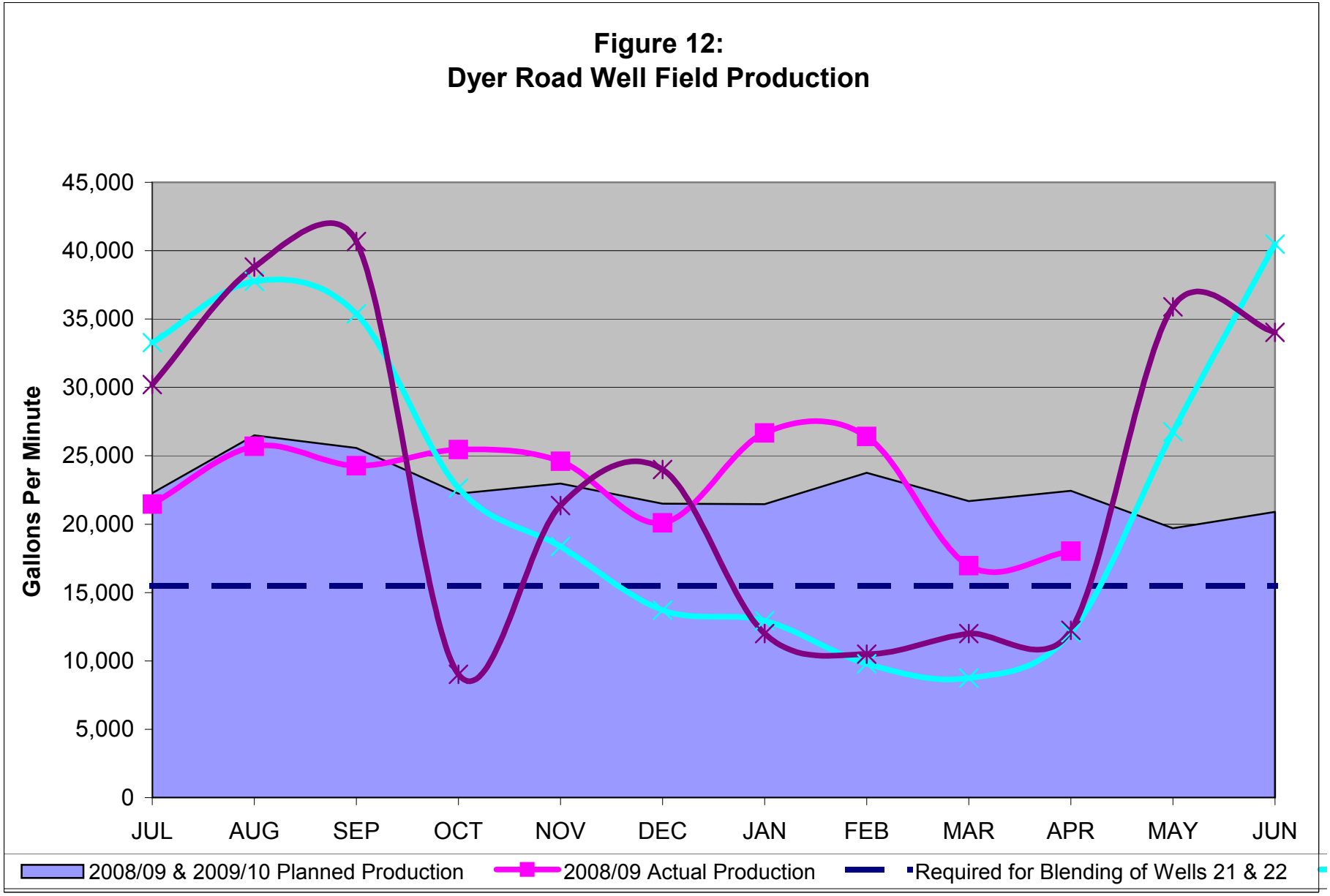


Figure 12:
Dyer Road Well Field Production
Gallons Per Minute
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
2008/09 & 2009/10 Planned Production
2008/09 Actual Production
Required for Blending of Wells 21 & 22

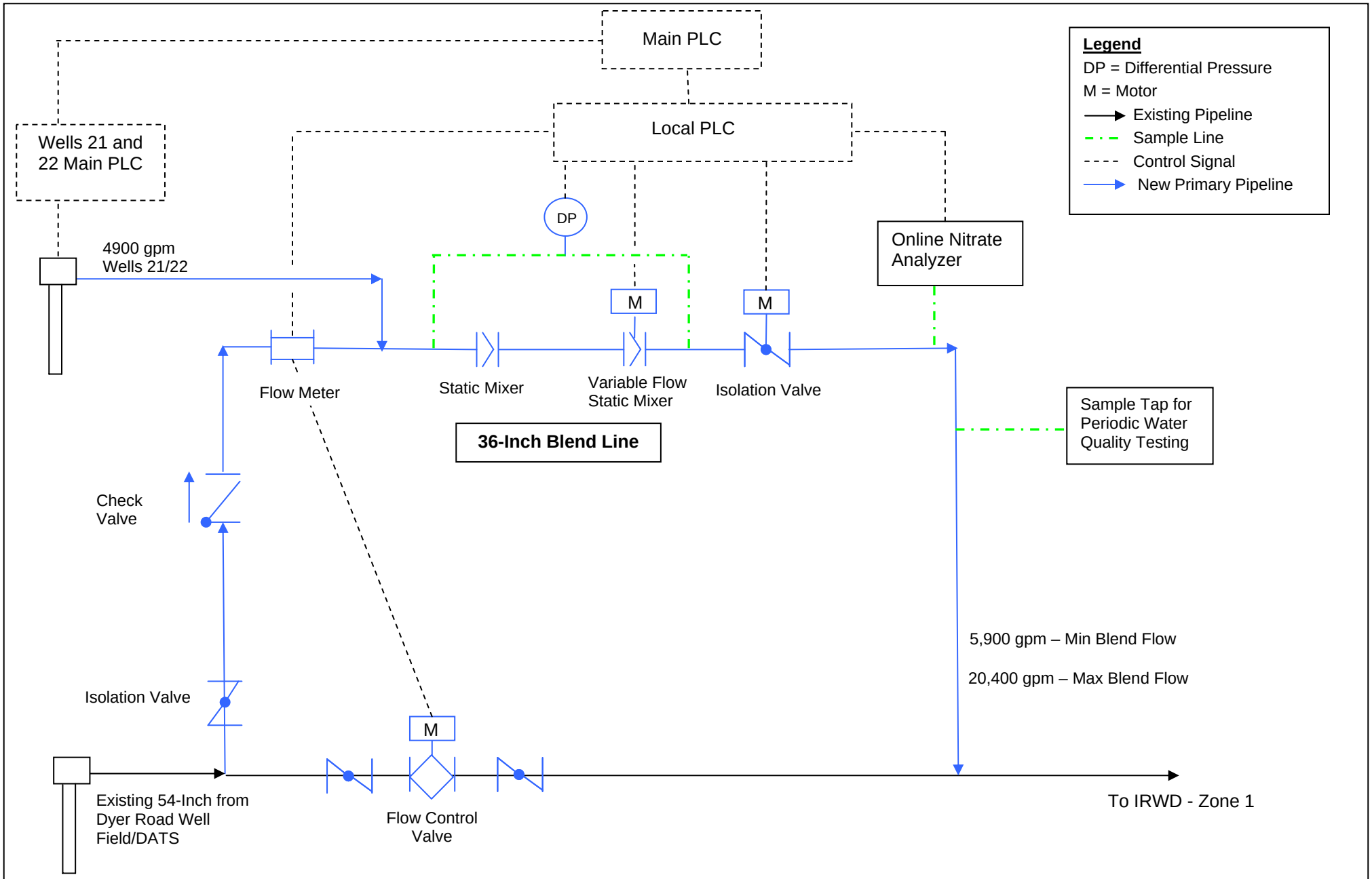


FIGURE 13:
PRELIMINARY BLENDING STATION SCHEMATIC

4.2 CDPH Requirements

RBF met with CDPH personnel on June 24, 2009 to discuss potential requirements for implementing the Wells 21 and 22 blending system. The requirements discussed at the meeting and in subsequent correspondence include the following:

- Maximum concentration target for nitrate to ensure compliance is 36 mg/L, or 80-percent of the Maximum Contaminant Level (45 mg/L). Assuming nitrate levels in Wells 21 and 22 and in DRWF increase to 80 mg/L, and 4 mg/L, respectively, the nitrate level in the blend water would be estimated at 22 mg/L (**Table 15**)

- IRWD has a current blending permit for blending of color and perchlorate from the DRWF. CDPH calls for the Wells 21 and 22 blending facility to consider the parameters of this permit.

- The blending facility will have to include an on-line analyzer for Nitrate downstream of the Wells 21 and 22 blending facility.

- TDS and hardness can be grab samples.

- CDPH's permit for the blending facility will require implementing a program for all sampling and monthly reporting. CDPH permitting would also require a range of triggers to be identified for alarms and controls for all constituents of concern, in particular nitrate.

- CDPH considers the blending concept for Wells 21 and 22 a valid form of treatment, and requests that the design plans be reviewed for final determination. Pipe lengths between the static mixers, and between the static mixer and the downstream sampling tape will be critical design points.

- CDPH prefers blending facilities to be above ground for easy operations and maintenance. However, constructing these facilities in a vault is not prohibited.

IRVINE RANCH WATER DISTRICT
BLENDING OF WELLS 21 AND 22

TABLE 15
ESTIMATED NITRATE LEVEL IN BLEND WATER

Source	Flow (gpm)	Nitrates as NO_3 (mg/L)				IRWD Target Level (mg/L)	MCL (mg/L)
		2008/2009 WQ Results			Assumed Future Level		
Well 21	3,300	67			80	36	45
Well 22	1,600	50			80		
Wells 21 and 22	4,900	61.4			80		
		Min.	**Avg.**	**Max.**			
Zone 1 System (Year 2007)	15,500	0.46	0.98	3.61	4		
Blend Water	**20,400**	**15.11**	**15.50**	**17.50**			
		Min.	**Avg.**	**Max.**			
Zone 1 System (Year 2008)	15,500	0.51	0.75	1.04			
Blend Water	**20,400**	**15.15**	**15.33**	**15.55**			
		Min.	**Avg.**	**Max.**			
Zone 1 System (Year 2009)	15,500	0.83	0.85	0.88			
Blend Water	**20,400**	**15.39**	**15.41**	**15.43**	**22**		

4.3 Blending Station Layout

To minimize the cost of conveying water from Wells 21 and 22 to the blending station, it is recommended that the blending station be located in the vicinity of the intersection of Red Hill Avenue and Barranca Parkway (**Figure 14**). As shown in **Figure 15**, the blending station is proposed to consist of the following main components:

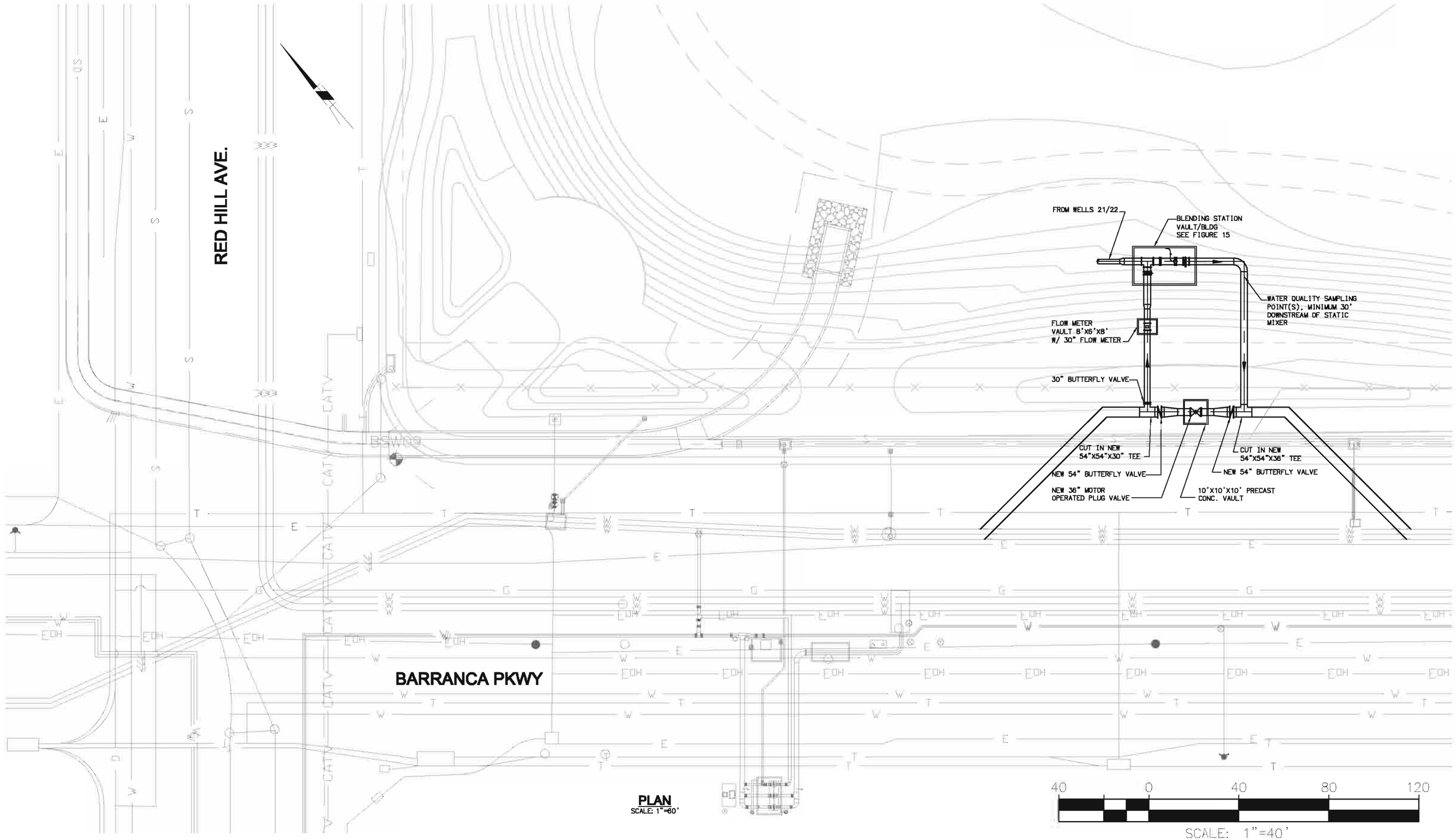
- Building: This TM assumes a building will be constructed to house the piping, static mixers, and valves shown in Figure 15. The building is estimated to be approximately 16-feet wide by 27-feet long.

- Piping: The transmission pipeline (and appurtenances) conveying flows from Wells 21 and 22 to the blending station will be 24-inch in diameter. The velocity in this pipeline is estimated at 3.5 feet per second during maximum flow from Wells 21 and 22. The effluent pipeline conveying blended flows between 5,900 and 20,400 gpm through the blending station and back to the 54-inch transmission pipeline in Barranca is proposed to be 36-inch in diameter. Velocities in the 36-inch blend pipe are calculated to range between 1.9 and 6.4 fps. The material of the blend station piping will be steel.

- Static Mixers: Two static mixers are proposed for the blend station. The downstream mixer is proposed to be a variable flow static mixer that automatically provides constant head loss and mixing over a range of flow rates. The installation of the variable-flow static mixer eliminates the need to construct a smaller bypass pipeline within the blend station to convey and mix low flows.

- Valves: The blending system is proposed to include a 36-inch butterfly valve downstream of the static mixers for flow isolation, a 36-inch double door check valve on the pipeline conveying DRWF water to the blend station, and a 36-inch motor-operated plug valve on the main 54-inch transmission pipeline in Barranca Parkway to control the amount of DRWF flow diverted through the blend station.

Total minor losses expected from the blend station are estimated to range between 20 to 30 feet, depending on the flow rate (supply) from Wells 21 and 22.



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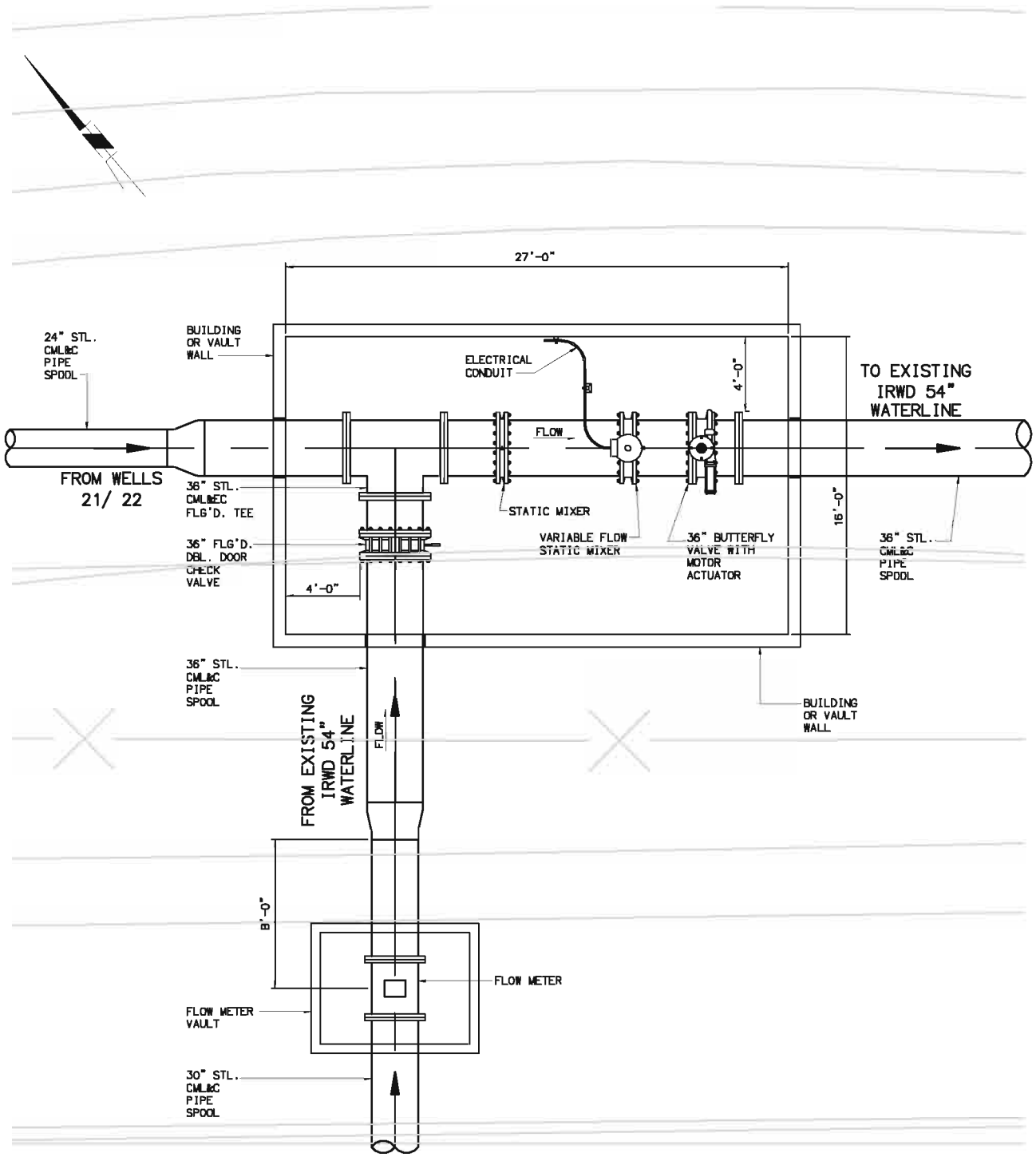
IRWD WELLS 21/22

PRELIMINARY LAYOUT OF BLENDING STATION

FIGURE

14



PLAN VIEW
SCALE: 1/8"=1'-0"

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WELLS 21 AND 22

BLENDING STATION

FIGURE
15

Section 5—Cost Evaluation

5.1 Capital Cost

A summary of the estimated capital costs for the Blending System is shown in **Table 16**. A more detailed breakdown of these costs is provided in **Attachment D.**

Table 16: Blending Station Cost Summary

Cost Item	Estimated Cost
Blending Station	$3,830,000
Wells 21/22 Wellhead Equipping	$2,980,000
Wells 21/22 Disinfection System	$645,050
Raw Water Conveyance Pipeline	$4,740,000
Dyer Road Well field Upgrades (Wells 5, 10, 13)	$1,506,000
Subtotal Construction Cost	**$13,700,000**
Contingencies @ 25%	$3,430,000
Engineering	$2,570,000
District Costs	$730,000
Total Estimated Capital Cost	**$20,430,000**

5.2 Estimate of Annual Water Cost

Annual water costs are estimated for this TM under two funding scenarios:

- Scenario 1: Excludes any grant funding (**Table 17**)
- Scenario 2: Includes Title XVI funding (**Table 18**)

Annual water costs take into account the additional energy costs for upgrading Wells 5, 10, and 13, which were estimated based on an assumed utilization rate for each well. These utilization rates are based on the well sequencing plan provided to RBF by IRWD operations staff. The annual cost also considers the additional energy costs for pumping groundwater supplies from Wells 21 and 22 to Zone 3. As shown in **Table 19,** the additional energy cost for pumping and extra 4,900 gpm to Zone 3 is estimated to range between $280,000 and $299,000 (Assume $290,000). The $280,000 estimate was calculated taking into account the varying pump efficiencies and TDHs during summer and winter seasons. The $299,000 estimate is based on an average year-round pump efficiency of 75%, and TDH of 295 feet.

Table 17: Summary of Annual Water Cost (2009 Dollars) - Scenario 1

Annual Costs Items	Annual Cost Blending Station Project
Estimate of Capital Cost	**$20,430,000**
1. Annual Capital Cost [2]	$1,294,045
2. Annual Project O & M Costs	
2.1 Wells 21/22 Pumping/Chemical Costs [3],[8]	$752,500
2.2 DRWF - Additional Pumping Energy Costs [4]	$222,000
2.3 Zone 1 to 3 - Additional Pumping Energy Costs	$290,000
2.4 System O&M[5]	$100,000
2.5 Other O & M Costs [6]	$65,000
4. Replenishment Assessment Cost ($/AF)	$249
5. MWD Local Resource Program ($/AF)	$0
Subtotal	**$2,723,545**
Water Production, (AFY)[7]	**7,114**
Unit Cost ($/AF) [1]	**$632**

Table 18: Summary of Annual Water Cost (2009 Dollars) - Scenario 2

Annual Costs Items	Annual Cost Blending Station Project
Estimate of Capital Cost	$20,430,000
Maximum BOR Title XVI Grant Funding (25%)	$5,100,000
Total Subsidized Capital Cost	**$15,330,000**
1. Annual Capital Cost [2]	$971,009
2. Annual Project O & M Costs	
2.1 Wells 21/22 Pumping Energy Costs [3]	$752,500
2.2 DRWF - Additional Pumping Energy Costs [4]	$222,000
2.3 Zone 1 to 3 - Additional Pumping Energy Costs	$290,000
2.4 System O&M[5]	$100,000
2.5 Other O & M Costs [6]	$65,000
4. Replenishment Assessment Cost ($/AF)	$249
5. MWD Local Resource Program ($/AF)	$0
Subtotal	**$2,400,509**
Water Production, (AFY)[7]	**7,114**
Unit Cost ($/AF) [1]	**$586**

[1] Unit Cost of Water is for 2009 cost assumptions

[2] Based on 25 year loan at 4%

[3] Based on $0.125/kwh and 75% overall pump/motor efficiencies. (Wells 21/22)

[4] Accounts for Wells upgraded due to Blending System Impacts only (Wells 4, 5, 10, 11, 12, &13)

[5] Includes Operator Labor Cost

[6] Based on 5% of annual capital cost (unsubsidized), for routine maintenance items

[7] Based on 90% well utilization

[8] Based on $0.70/lb NaOCl and $0.32/lb NH3. Based on 90% well utilization

Table 19: Summary of Zone 1 to 3 Pumping Costs

System	5 Summer Months (MDD)			7 Winter Months (ADD)			Total Cost per Year
	Flow Rate (gpm)	Average Pump Efficiency	Summer Cost	Flow Rate (gpm)	Average Pump Efficiency	Winter Cost	
Baseline System	9,729	76%	$248,000	2,736	57%	$155,000	$403,000
Blending System	14,629	80%	$331,000	7,636	66%	$352,000	$683,000
Difference	**4,900**	**3%**	**$83,000**	**4,900**	**9%**	**$197,000**	**$280,000**
Average [1]	**4,900**	**75%**	**$174,000**	**4,900**	**75%**	**$125,000**	**$299,000**

[1] Calculated based on an average year-round efficiency of 75-percent, and an average TDH of 295 feet

5.3 Blending System Costs vs. Imported Water Costs

The cost of imported water used in the Draft PDR cost evaluation was based on rates estimated by IRWD's financial department. Since then, new rates have been provided by the Municipal Water District of Orange County (MWDOC). **Table 20** compares the rates used in the Draft PDR with the new rates used for this TM. A comparison of funding Scenario 1 and Scenario 2 blending costs and the new imported water rates is provided in **Tables 21** and **22**, and graphically shown in **Figures 16** and **17**.

Table 20: Imported Water Rates

Year	IRWD Finance Dept. Est.		MWDOC Rates as of June 18, 2009			
	Rate	% Increase	Tier 1		Tier 2	
			Rate	% Increase	Rate	% Increase
2009	$604		-			
2010	$729	20.7%	$708	-	$818	-
2011	$817	12.1%	$860	21.5%	$934	14.3%
2012	$898	9.9%	$903	5.0%	$981	5.0%
2013	$961	7.0%	$948	5.0%	$1,029	5.0%
2014	$990	3.0%	$995	5.0%	$1,081	5.0%
2015	$1,020	3.0%	$1,044	5.0%	$1,135	5.0%
2016	$1,050	2.9%	$1,097	5.0%	$1,191	5.0%
2017	$1,082	3.0%	$1,151	5.0%	$1,250	5.0%
2018	$1,114	3.0%	$1,208	5.0%	$1,313	5.0%
2019	$1,148	3.1%	$1,268	5.0%	$1,378	5.0%
2020	$1,182	3.0%	$1,331	5.0%	$1,447	5.0%

Table 21: Import Water Cost vs. Wells 21/22 Blending Water Costs – Scenario 1

Year	Imported Water Cost - Tier 1 ($/AF)[1]	Imported Water Cost - Tier 2 ($/AF)[1]	Blending Water Cost Scenario 1 ($/AF)[2,3,4]
2009	$579	$695	$632
2010	$708	$818	$641
2011	$860	$934	$664
2012	$903	$981	$688
2013	$948	$1,029	$712
2014	$995	$1,081	$738
2015	$1,044	$1,135	$766
2016	$1,097	$1,191	$794
2017	$1,151	$1,250	$824
2018	$1,208	$1,313	$856
2019	$1,268	$1,378	$889
2020	$1,331	$1,447	$924
2021	$1,398	$1,519	$960
2022	$1,468	$1,595	$998
2023	$1,541	$1,675	$1,038
2024	$1,618	$1,758	$1,081
2025	$1,699	$1,846	$1,125
2026	$1,784	$1,938	$1,171
2027	$1,873	$2,035	$1,220
2028	$1,967	$2,137	$1,271

1 Assumes 5% escalation after 2020

2 Calculated based on project cost estimates and assumed well utilization of 90%

3 Assumes an average annual inflation rate on O&M costs of 2%

4 Assumes an average annual escalation on OCWD Replenishment Assessment rates of 5% after 2010

Table 22: Import Water Cost vs. Wells 21/22 Blending Water Costs – Scenario 2

Year	Imported Water Cost - Tier 1 ($/AF)[1]	Imported Water Cost - Tier 2 ($/AF)[1]	Blending Water Cost Scenario 2 ($/AF)[2,3,4]
2009	$579	$695	$586
2010	$708	$818	$596
2011	$860	$934	$619
2012	$903	$981	$642
2013	$948	$1,029	$667
2014	$995	$1,081	$693
2015	$1,044	$1,135	$720
2016	$1,097	$1,191	$749
2017	$1,151	$1,250	$779
2018	$1,208	$1,313	$810
2019	$1,268	$1,378	$843
2020	$1,331	$1,447	$878
2021	$1,398	$1,519	$915
2022	$1,468	$1,595	$953
2023	$1,541	$1,675	$993
2024	$1,618	$1,758	$1,035
2025	$1,699	$1,846	$1,079
2026	$1,784	$1,938	$1,126
2027	$1,873	$2,035	$1,174
2028	$1,967	$2,137	$1,226

1 Assumes 5% escalation after 2020

2 Calculated based on project cost estimates and assumed well utilization of 90%

3 Assumes an average annual inflation rate on O&M costs of 2%

4 Assumes an average annual escalation on OCWD Replenishment Assessment rates of 5% after 2010

Figure 16: Cost of Water Comparison
Imported Water (MWDOC) vs. Wells 21/22 Blending Costs
Cost Scenario 1 - No Subsidies

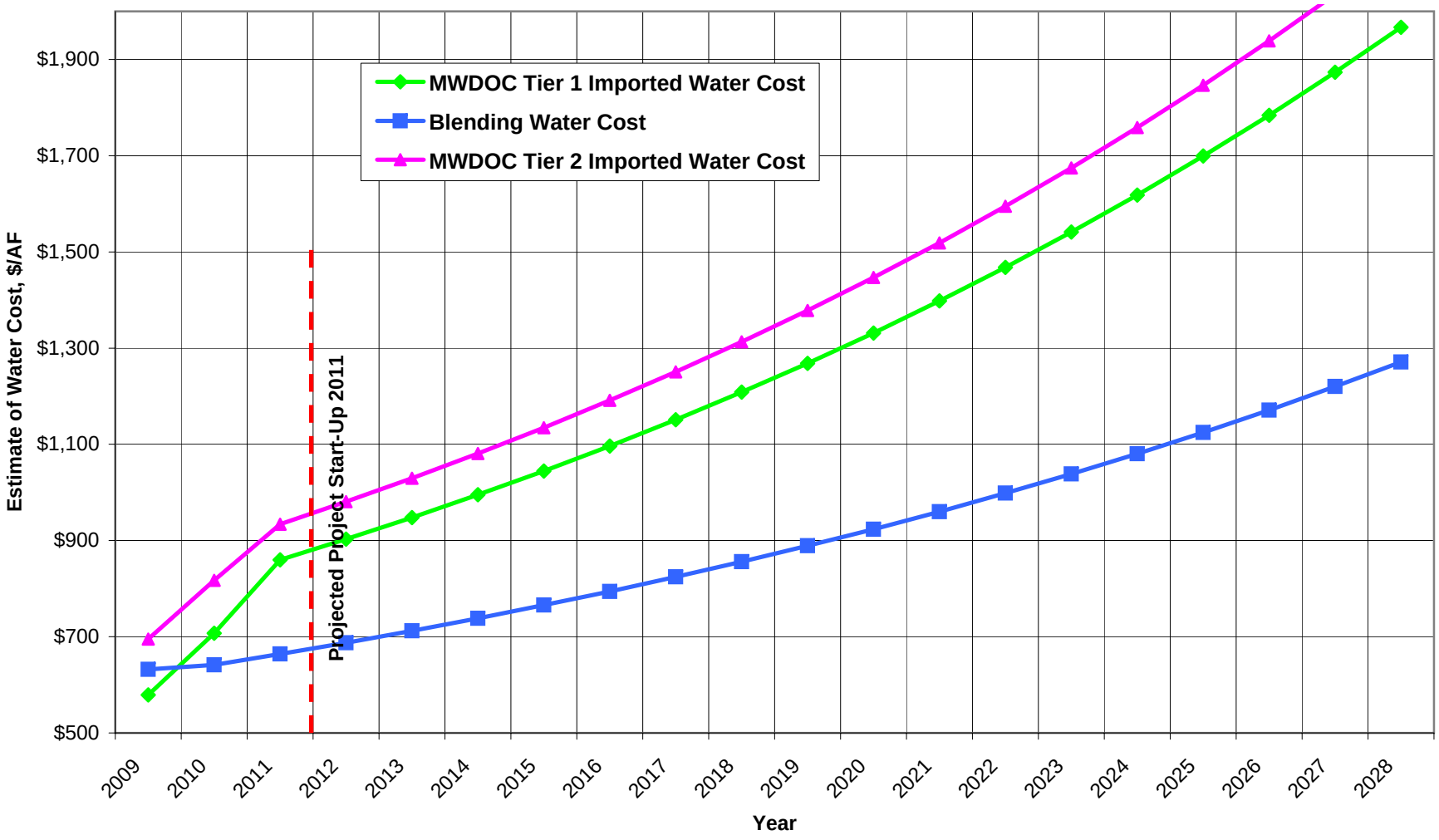
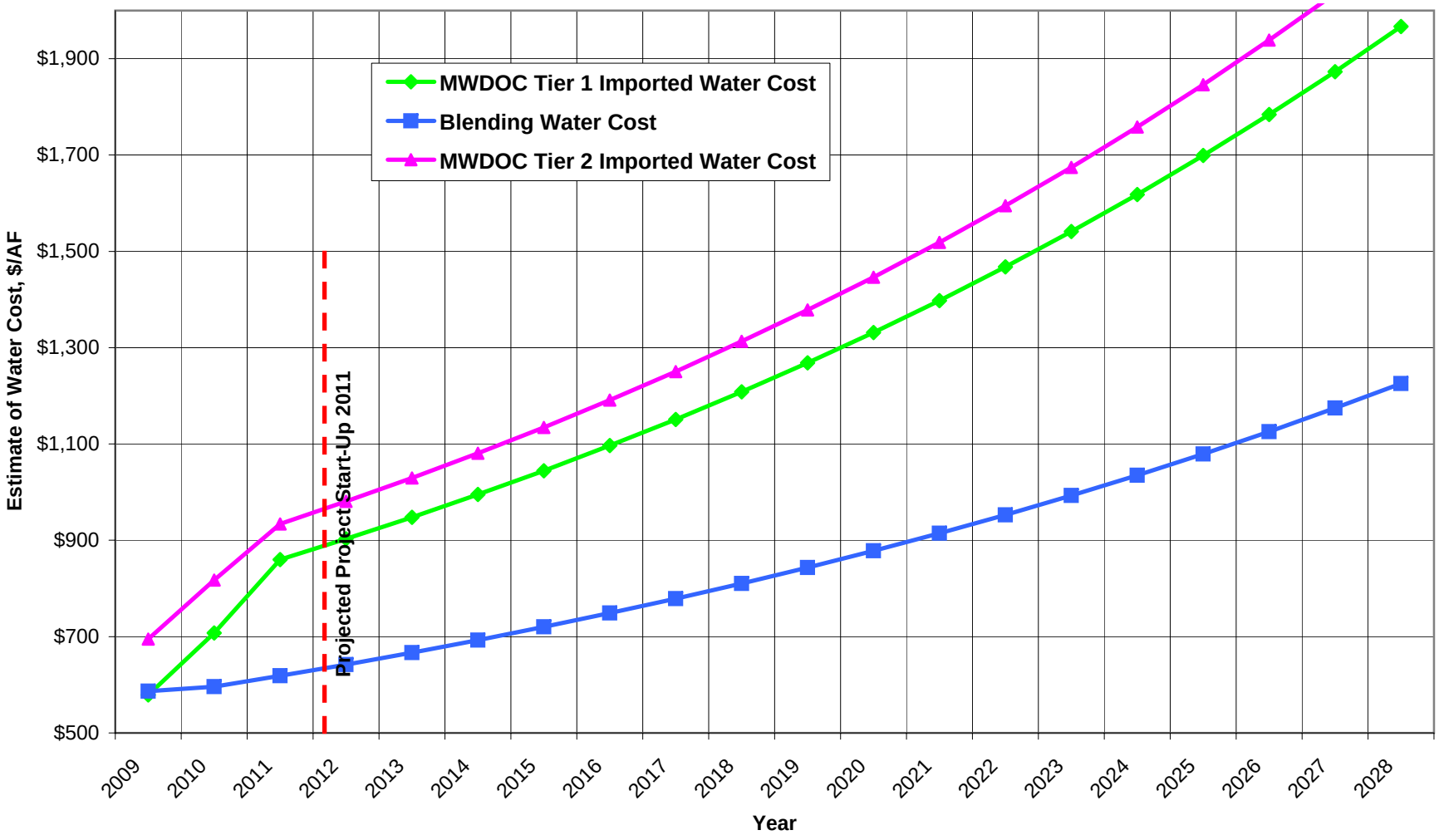


Figure 17: Cost of Water Comparison
Imported Water (MWDOC) vs. Wells 21/22 Blending Costs
Cost Scenario 2 - Includes Title XVI Funding



ATTACHMENT A

RBF CONSULTING

FFT Industries
Goulds Pumps
IRVINE RANCH: PRODUCT WATER PUMP

Goulds Turbine Pump Selection ver: 6.04
01/23/01

PUMP DATA SHEET
Goulds Turbine 60 Hz

Selection file: (untitled)
Catalog: TURB60.MPC v 1.6.2

Curve: E6414FAPCO

gn Point: Flow: 2670 US gpm
Head: 320 ft

Fluid: Water
Temperature: 60 °F
SG: 1
Viscosity: 1.122 cP
Vapor pressure: 0.2568 psi_a
Atm pressure: 14.7 psi_a

Pump: TURBINE - 1800
Speed: 1770 rpm
Size: 14FHC; (5 stages)
Dia: 8.75 in

Limits: Temperature: --- °F
Pressure: 450 psi_g
Sphere size: 1.5 in
Power: --- bhp

NPSHa: --- ft

Specific Speed: Ns: 4000
Nss: ---

Dimensions: Suction: --- in
Discharge: --- in

Piping: System: ---
Suction: --- in
Discharge: --- in

Vertical Turbine: Bowl Dia: 14 in
Thrust K Factor: 17
Max Lateral: 1 in

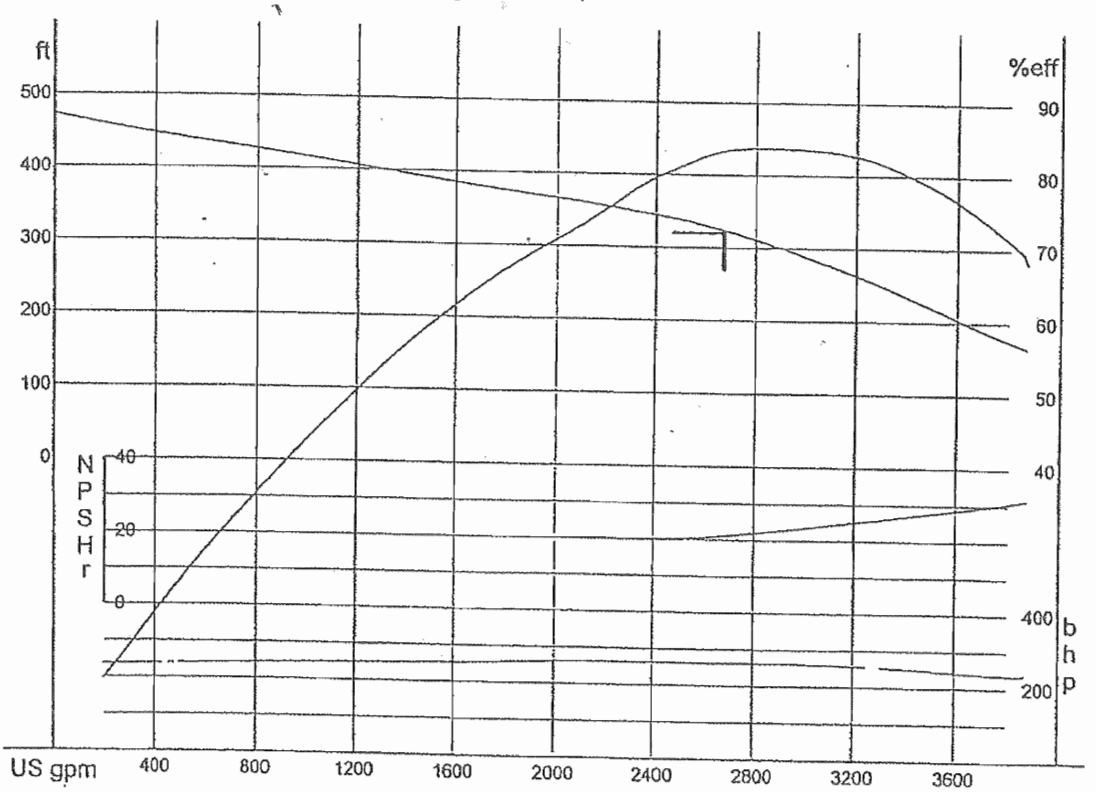
TOTAL PUMP THRUST = 5440 LBS.

Suction Sizes-10",12" Discharge Sizes-10",12"

--- Data Point ---
Flow: 2670 US gpm
Head: 323 ft
Eff: 82.8%
Power: 262 bhp
NPSHr: 21.1 ft

-- Design Curve --
Shutoff Head: 473 ft
Shutoff dP: 205 psi
Min Flow: - US gpm
BEP: 83.7% eff
@ 2920 US gpm
NOL Pwr: 263 bhp
@ 2219 US gpm

-- Max Curve --
Max Pwr: 414 bhp
@ 3599 US gpm



--- PERFORMANCE EVALUATION ---

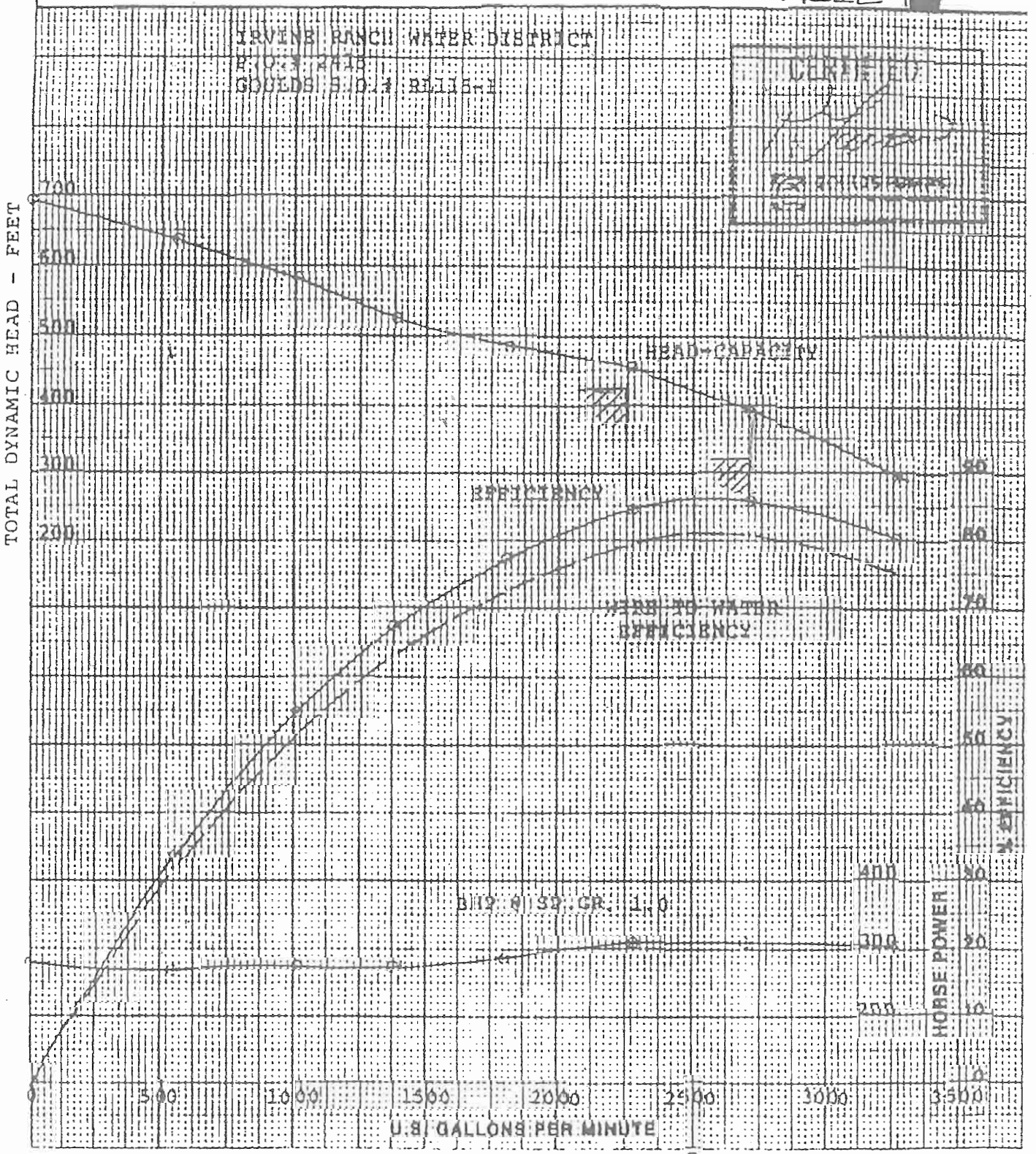
Flow US gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Motor kW	Hrs/yr	Cost /kWh
3204	1770	261	82.1	256	25.1				
2670	1770	323	82.8	262	21.1				
2136	1770	359	73.7	262	20				
1602	1770	385	61.2	253	20				
1068	1770	413	44.4	247	20				

WEU-1

NON-AERATED WATER. NO GUARANTEE IS MADE EXCEPT FOR THE RATED POINT.

NOTE: NO FRICTION LOSSES ARE INCLUDED

WELL 1



PERFORMANCE 5 STAGE

IMPELLER CLOSED

9.87" DIA.

GOULDS PUMPS
VERTICAL PRODUCTS DIVISION

14 HMC — MODEL

AS RUN 1790 — R.P.M

CURVE SHEET NO. T-88-232

DATE 8/25/88 BY P.L.

Turbine 60 Hz

DARRELL HOEFER

Search Criteria:
Flow: 2000 US gpm
Head: 550 ft

Fluid: Water
Temperature: 60 °F
SG: 1
Viscosity: 1.105 cP
Vapor pressure: 0.2563 psi a
Atm pressure: 14.7 psi a

Motor: 400 hp
Speed: 1800
Frame: 5008
Standard: NEMA
Enclosure: WPI
Sizing criteria: Max Power on Design Curve

Catalog: Goulds Lineshaft 60HZ vers 2.34

Pump: 16BHC (4 stages)
Type: Lineshaft
Synch speed: 1800 rpm
Speed: 1770 rpm
Dia: 11.625 in
Curve no.: E6416BBPCI

Pump Notes for Standard Sizes:
Discharge Sizes-8",10",12"

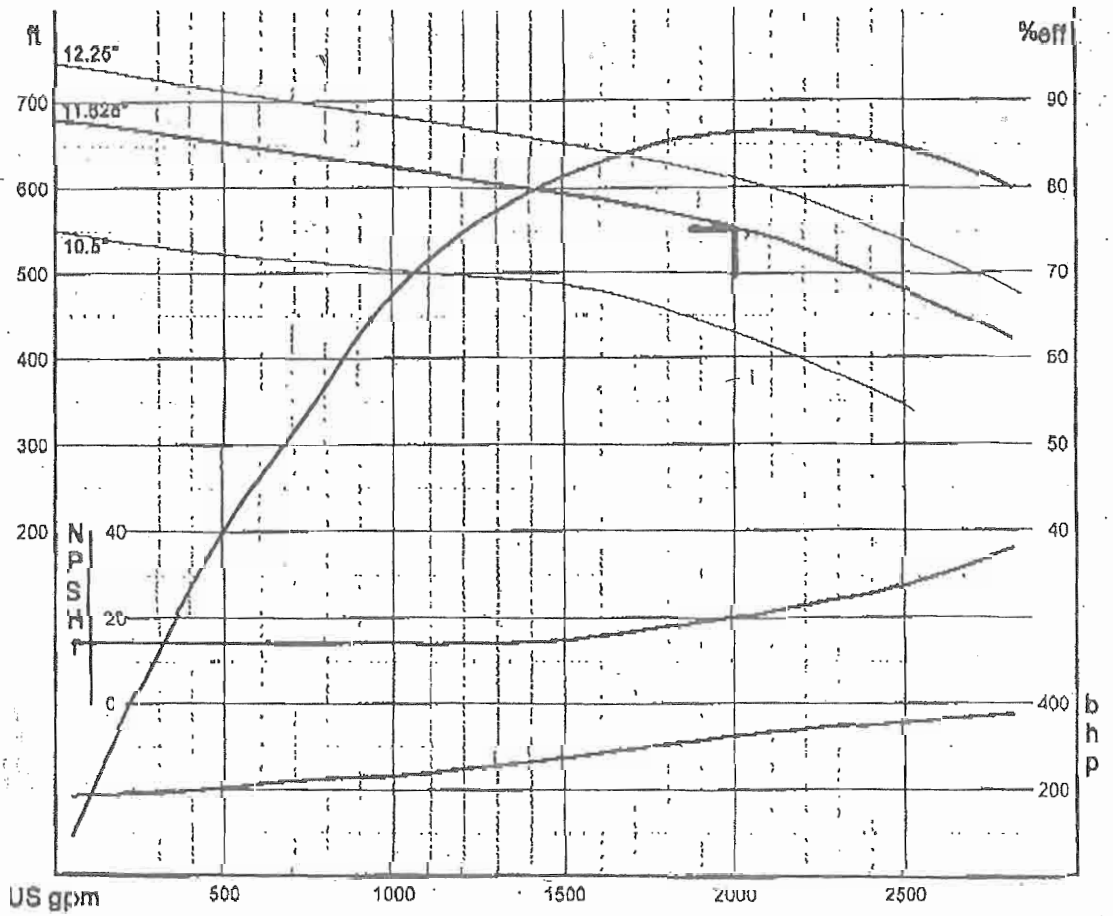
Vertical Turbine:
Bowl size: 16.13 in
Max lateral: 0.88 in
Thrust K factor: 14.1 lb/ft

Pump Limits for Standard Construction:
Pressure: 325 psi g
Sphere size: 0.75 in

— Data Point —
Flow: 2000 US gpm
Head: 551 ft
Eff: 85.9%
Power: 323 bhp
NPSHr: 20.1 ft

– Design Curve –
Shutoff Head: 677 ft
Shutoff dP: 293 psi
Min Flow: --- US gpm
BEP: 86.3% eff
@ 2096 US gpm
NOL Pwr: 373 bhp
@ 2815 US gpm

– Max Curve –
Max Pwr: 422 bhp
@ 2843 US gpm



Performance Evaluation:

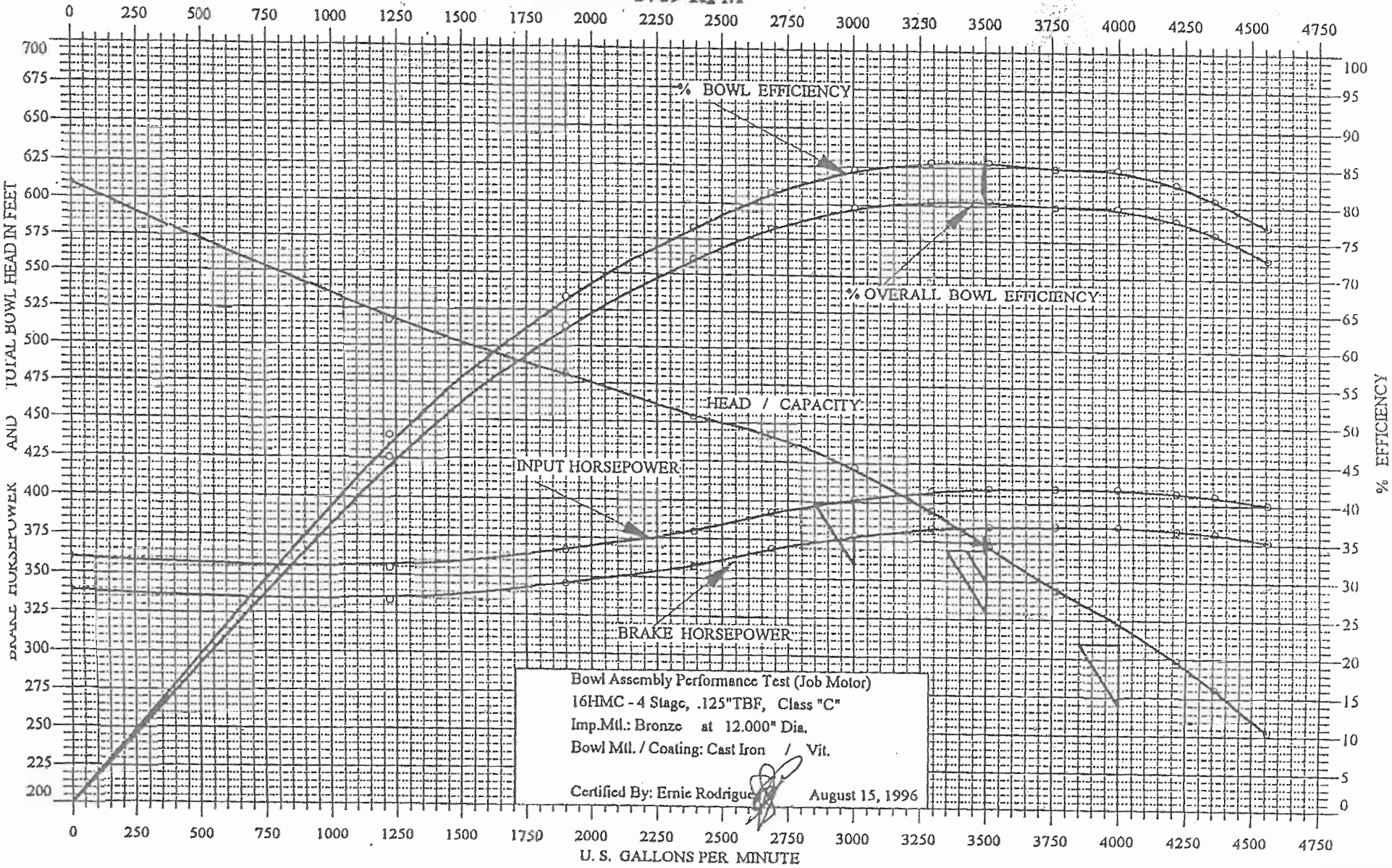
Flow US gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Motor kW	Hrs/yr	Cost /kWh
2400	1770	495	85	352	25.6				
2000	1770	551	85.9	323	20.1				
1600	1770	584	82.6	285	15.7				
1200	1770	608	74.2	247	14				
800	1770	632	56.5	225	14				

Turbine Pump Selection vers 7.1a

FEB. 3. 2005 3:49PM NO. 1494 P. 2/2

DYER RD WELL - 3

Johnston Pu. Company
Brookshire, Texas
Customer:Beylik Drilling, Inc.
Job #:96JA2170 TC #: 07896 Rev.#:0
Tag Item #: Dryer Road Well #3
1789 RPM



SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

Confidential/Proprietary Information

June 5, 2008

Goulds 14 HMC 5 STAGE
2250 GPM @ 424'

LANCE GINEST
IRVINE RANCH WATER
P.O. BOX 57000
IRVINE, CA, 92619

HYDRAULIC TEST RESULTS, Plant: DYER WELL 4
Location: 1000 W HEMLOCK HP: 400
Cust #: 0-000-7097 Serv. Acct. #: 000-7719-96
Meter: V349N-3440 Pump Ref.#: 8299

In accordance with your request, a test was made on your turbine well pump on June 3, 2008. If you have any questions regarding the results which follow, please contact CORY BUTNER at (909)820-5112.

Equipment

Pump: JOHNS No: N/A
Motor: US No: CK0900849

RESULTS	Test 1	Test 2	Test 3
Discharge Pressure, PSI	130.0	140.0	154.0
Standing Water Level, Feet	144.8	144.8	144.8
Drawdown, Feet	35.2	33.5	30.9
Discharge Head, Feet	300.3	323.4	355.7
Pumping Water Level, Feet	180.0	178.3	175.7
Total Head, Feet	480.3	501.7	531.4
Capacity, GPM	2,262.0	2,133.0	1,945.0
GPM per Foot Drawdown	64.3	63.7	62.9
Acre Feet Pumped in 24 Hours	9.998	9.428	8.597
kW Input to Motor	279.0	280.0	275.0
HP Input to Motor	374.1	375.5	368.8
Motor Load (%)	88.7	89.0	87.4
Measured Speed of Pump, RPM	1,787		
kWh per Acre Foot	670	713	768
Overall Plant Efficiency (%)	73.3	72.0	70.8
Customer Meter, GPM	2,285.0	2,184.0	

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge.

DAN L. JOHNSON
Manager
Hydraulic Services

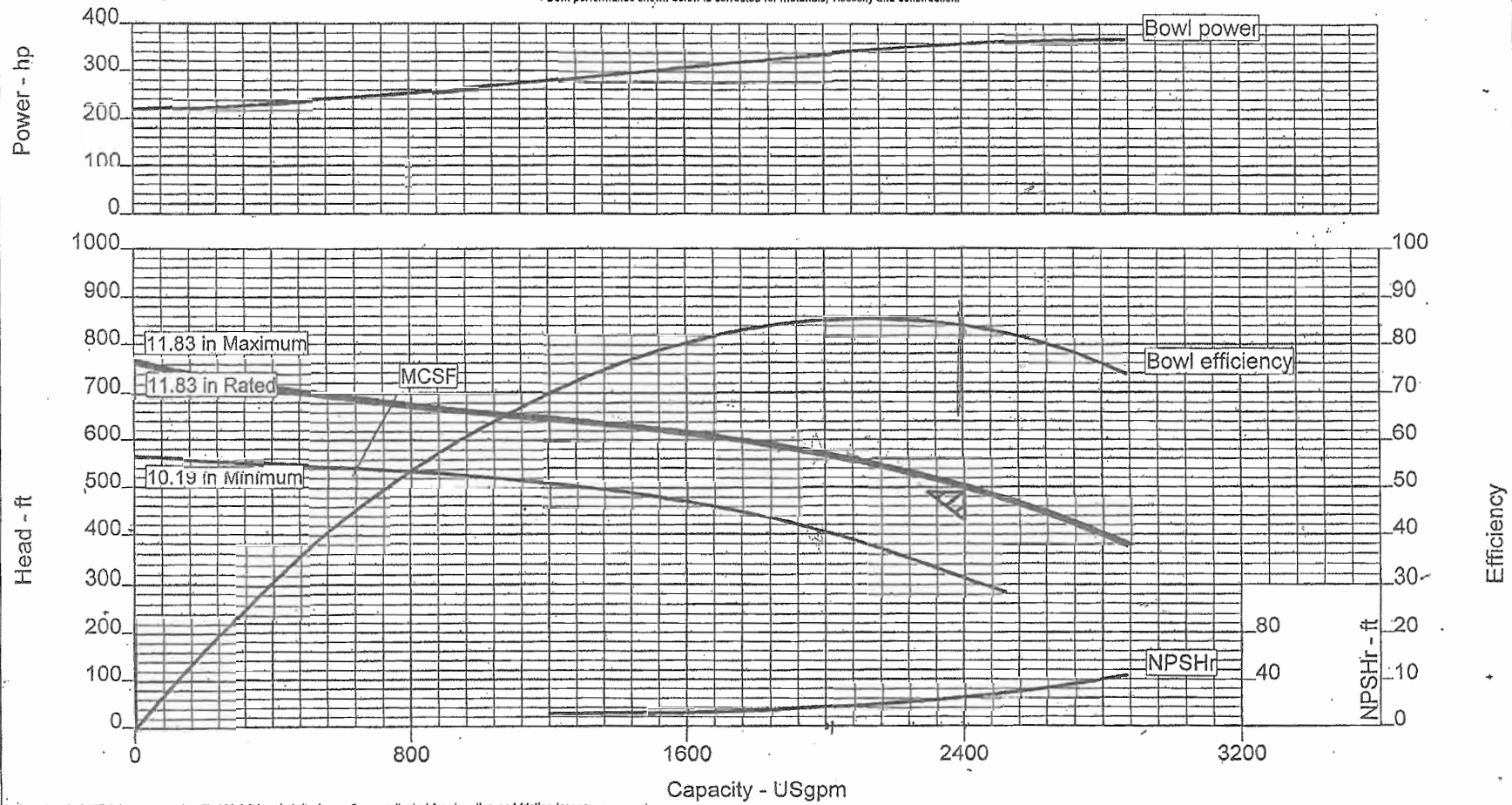
300 N. Pepper Ave.
Rialto, CA 92376

Dyer Rd well-5

Customer	:	FLOWSERVE Pump Division		Pump size & type	: 15EMM
Item number	: IRWD DYER WELL 5			Based on curve no.	: EC-2377
Service	:			Number of stages	: 5
Vendor reference	: 9999-W0000	Capacity	: 2400.0 USgpm	Specific gravity	: 1.000
Date	: July 8, 2008	Head	: 490.00 ft	Pump speed	: 1775 rpm

CURVES ARE APPROXIMATE, PUMP IS GUARANTEED FOR ONE SET OF CONDITIONS, CAPACITY, HEAD, AND EFFICIENCY.

Bowl performance shown below is corrected for materials, viscosity and construction.

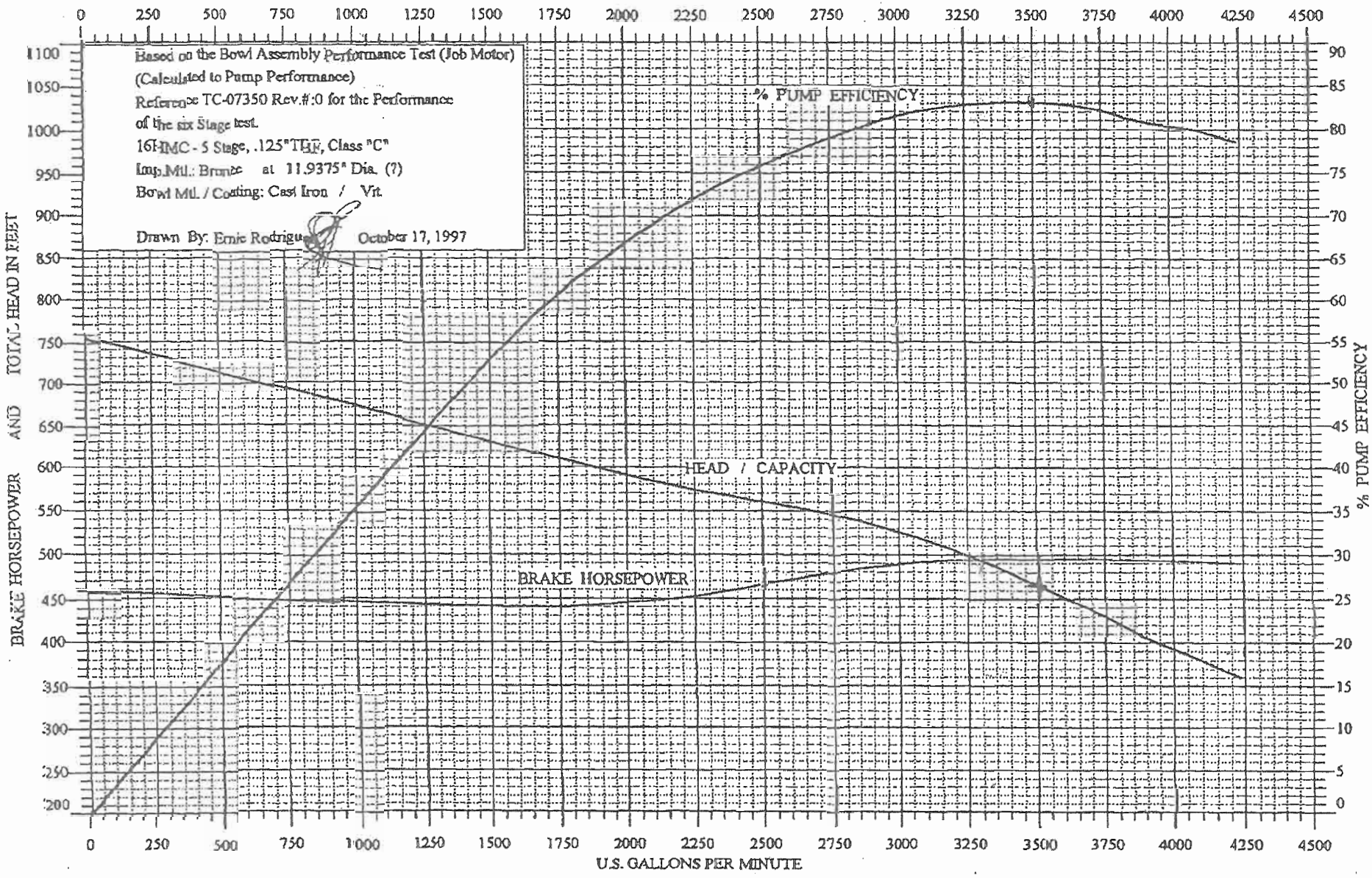


Bowl head of 497.8 ft corresponds with 490.0 ft head at discharge flange adjusted for elevation and friction losses.

WinPROS+ V3.3.2

(5 Stages)

Johnston Pump Company
Brookshire, Texas
Customer: Schuler Engineering Company
Job #: 93JB1382 Pump "A" PD-0969 Rev.#:0
Deepwell Water Pump, Irvine Ranch
1780 RPM



FILE NO. 203 10/21 97 09:05 ID:JOHNSTON PUMP 281 354 8000 PAGE 2

SOUTHERN CALIFORNIA
EDISON®
An EDISON INTERNATIONAL® Company

Confidential / Proprietary Information

June 15, 2007

Gould 14 RJMC 7 STAGE
~~1800~~ 1800 GPM @ 500'

LANCE GINEST
IRVINE RANCH WATER DISTRICT
P.O. BOX 57000
IRVINE, CA 92619

HYDRAULIC TEST RESULTS, Plant: DYER WELL #7
Location: 3232 1/2 GREENVILLE ST HP: 300
Cust. #: 0-000-7097 Serv. Acct. #: 018-2883-44
Meter: V349E-004066 Pump Ref #: 29379

In accordance with your request, a test was made on your submersible well pump on June 14, 2007. If you have any questions regarding the results which follow, please contact CORY BUTNER at (909)820-5112.

EQUIPMENT

Pump Mfg.: N/A No.: N/A
Motor Mfg.: HITAT No.: N/A

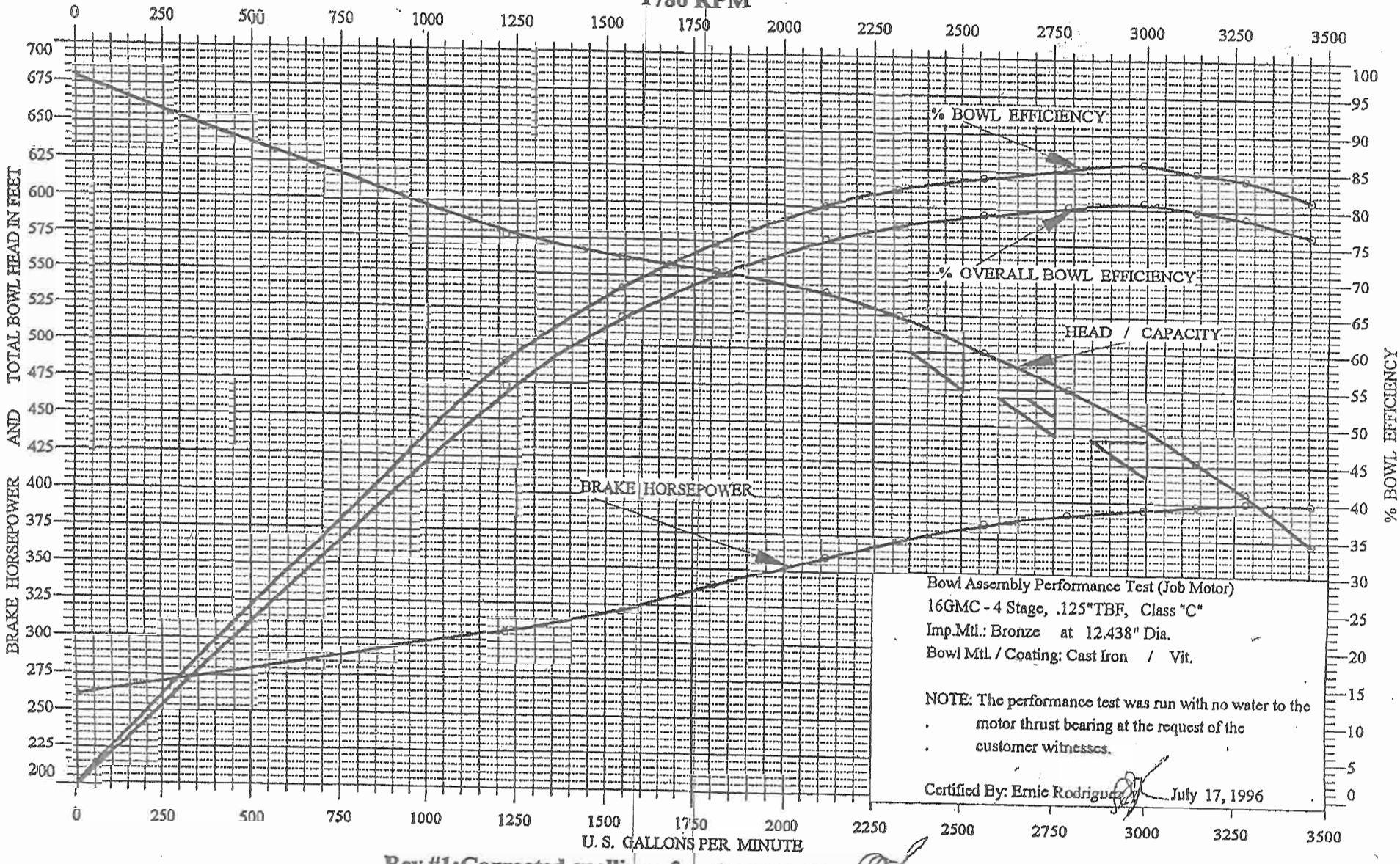
RESULTS	Test 1	Test 2	Test 3
Discharge Pressure, PSI	123.9	139.0	155.0
Standing Water Level, Feet	181.5	181.5	181.5
Drawdown, Feet	57.5	52.1	46.4
Discharge Head, Feet	286.2	321.1	358.1
Pumping Water Level, Feet	239.0	233.6	227.9
Total Head, Feet	525.2	554.7	586.0
Capacity, GPM	1,529.0	1,381.0	1,209.0
GPM per Foot Drawdown	26.6	26.5	26.1
Acre Feet Pumped in 24 Hours	6.758	6.104	5.344
kW Input to Motor	224.8	220.1	214.1
HP Input to Motor	301.5	295.2	287.1
Motor Load (%)	93.5	91.5	89.0
kWh per Acre Foot	798	866	962
Overall Plant Efficiency (%)	67.3	65.5	62.3
Customer Meter, GPM	1,574	1,426	

Due to an inadequate water measurement test location, the GPM flow and the resulting overall plant efficiency should be considered approximate, rather than actual. Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge.

DAN L. JOHNSON
Manager
Hydraulic Services

300 N. Pepper Ave.
Rialto, CA 92376

Johnston Pump Company
Brookshire, Texas
Customer: Beylik Drilling, Inc.
Job #:96JA2169 Pump "A" TC #:07863 Rev. #:1
Tag Item #: Dryer Road Well #10
1780 RPM



Rev.#1: Corrected spelling of customer name. ERR 7/29/96

Irvine Ranch Water District
Well 11 Replacement Bowl Assembly -2003

PUMP DATA SHEET

Turbine 60 Hz

03/28/03

DYER RD WELL-11

Selection list: ---

Search Criteria:
Flow: 2400 US gpm
Head: 550 ft
Tolerance: --- % of head

Fluid: Water
Temperature: 60 °F
SG: 1
Viscosity: 1.105 cP
Vapor pressure: 0.2563 psi a
Atm pressure: 14.7 psi a

IPSHa: --- ft

Advanced Criteria:
Preferred Operating Area: ---
Secondary Operating Point: ---
Max temperature: --- °F
Max suction pressure: --- psi g
Max sphere size: --- in
Max power: --- bhp
Max suction specific speed: --- (Nss)
Min trim: --- % of max diameter
Min head rise: --- % to shutoff

Warnings: See the second page for a description of the warnings associated with this pump.

Curve Corrections: none

Catalog: Goulds Lineshaft 60Hz vers 2.03

Pump: 14RHMC (7 stages)
Type: Lineshaft
Synch speed: 1800 rpm
Speed: 1770 rpm
Dia: 9.625 in
Curve no.: E6414RMPCO

Specific Speeds
Ns: 3100 Nss: ---

Dimensions:
Suction: --- in Discharge: --- in

Vertical Turbine:
Bowl size: 13.25 in
Max lateral: 1 in
Thrust K factor: 16 lb/ft

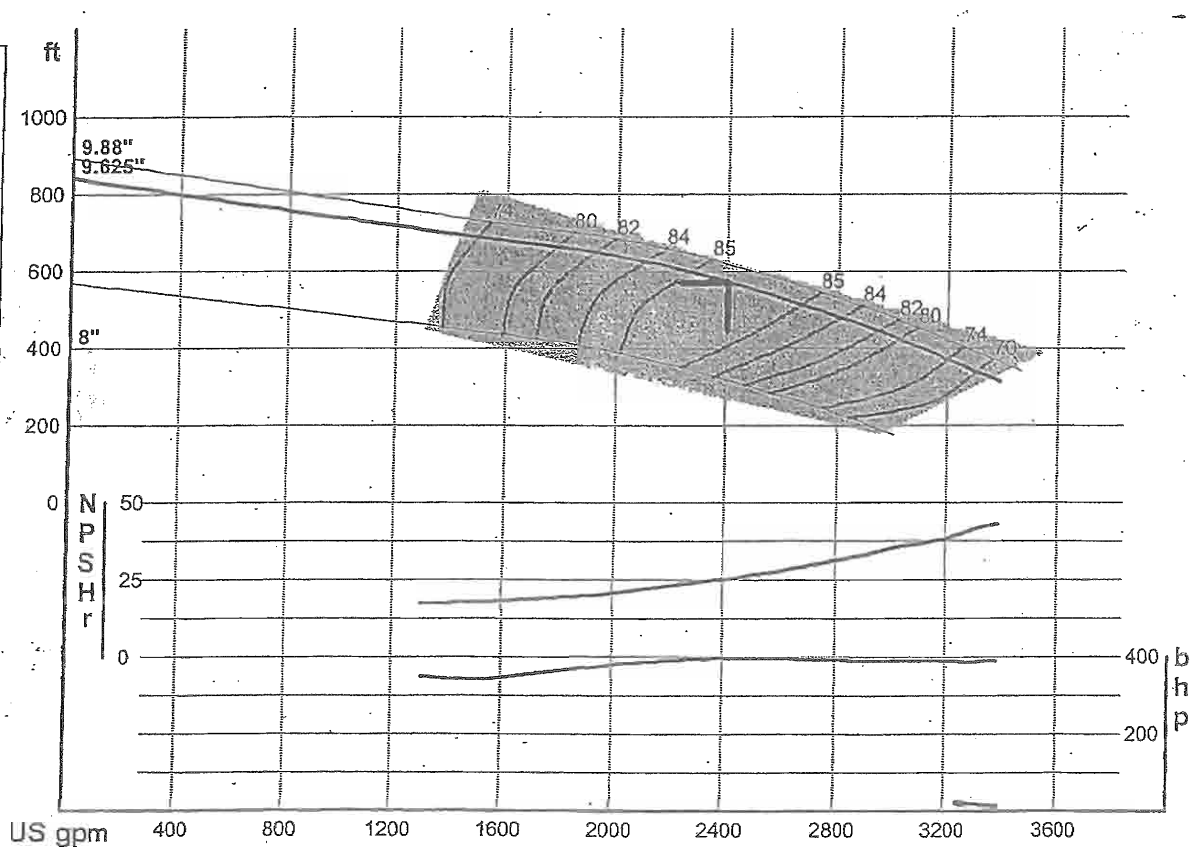
Pump Limits:
Temperature: 120 °F
Pressure: 325 psi g
Sphere size: 1.18 in
Power: --- bhp

Motor: 400 hp
Speed: 1800
Frame: 5008
Standard: NEMA
Enclosure: WPI
Sizing criteria: Max Power on Design Curve

---- Data Point ----
Flow: 2400 US gpm
Head: 552 ft
Eff: 85.1%
Power: 392 bhp
NPSHr: 24.5 ft

-- Design Curve --
Shutoff Head: 819 ft
Shutoff dP: 354 psi
Min Flow: --- US gpm
BEP: 85.1% eff @ 2447 US gpm
OL Pwr: 393 bhp @ 2447 US gpm

-- Max Curve --
Max Pwr: 438 bhp @ 3457 US gpm

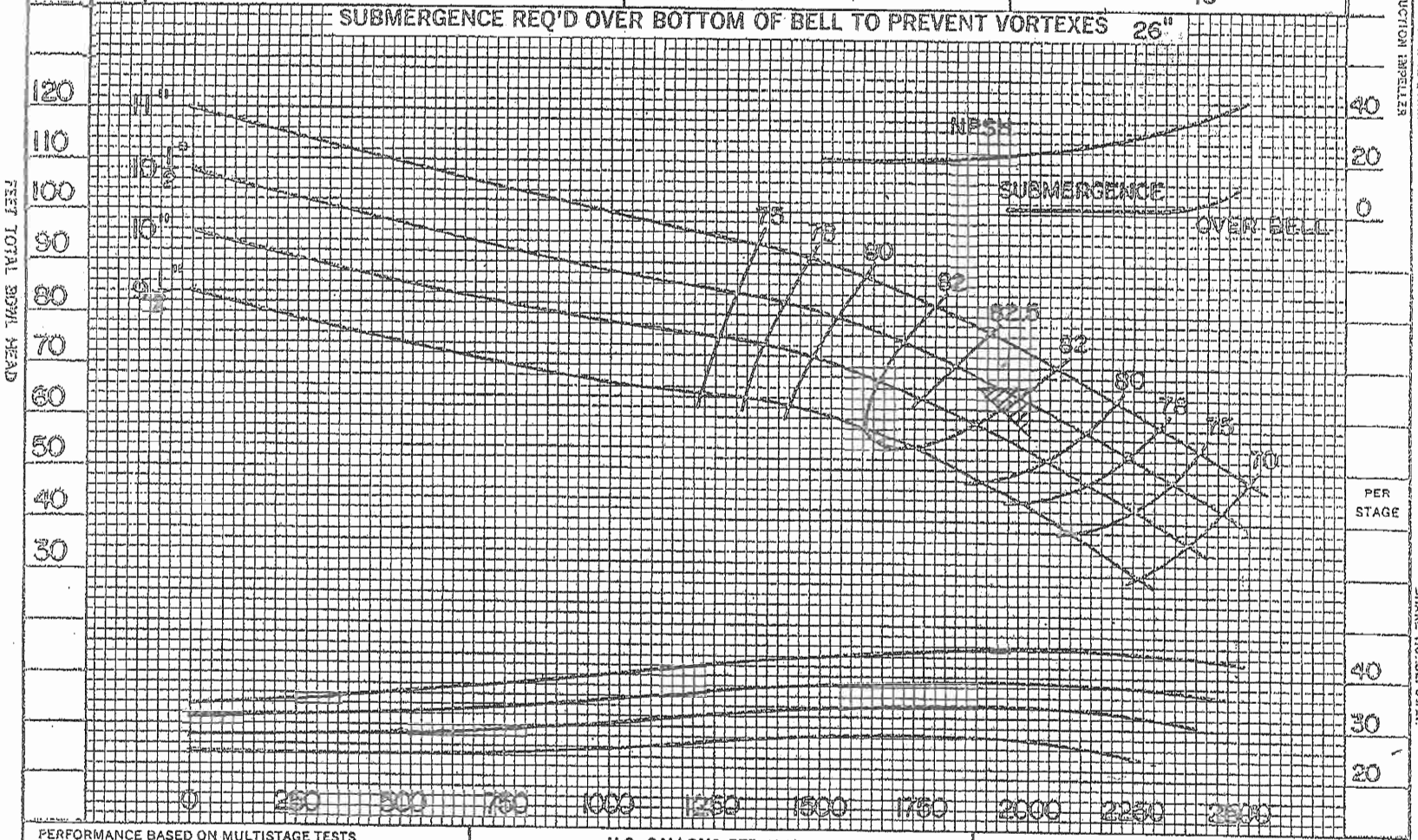


Irvine Ranch Water District Well 12
2000 gpm @ 525 ft tdh 325 bhp
8 stages GPC 10458

General Pump Company
159 N. Acacia St.
San Dimas, CA 91773

PER STAGE	IMP. DIAM. EXIT	IMPELLER PART NO. 2958 / IMPELLER PATTERN NO. 2927	THRUST CONSTANT 17 / WR² 2.12 LB. FT²/STAGE	PUMP SHAFT DIAM. 1 15/16" INCHES

SUBMERGENCE REQ'D OVER BOTTOM OF BELL TO PREVENT VORTEXES 26"



PERFORMANCE BASED ON MULTISTAGE TESTS
PUMPING CLEAR COLD WATER SP. GR. 1.0
FOR 1 STAGE MULTIPLY HEAD & EFF. BY .95
FOR 2 STAGES MULTIPLY HD. & EFF. BY .98
DATE 2-8-78

Johnston Pump Company
Glendora, California 91740
ESTABLISHED 1909

14 CC TURBINE PUMP
IMPELLER – BRONZE
1770 RPM
BOWL – CAST IRON VIT. ENAMELED
CURVE SHEET NO. EC-2522

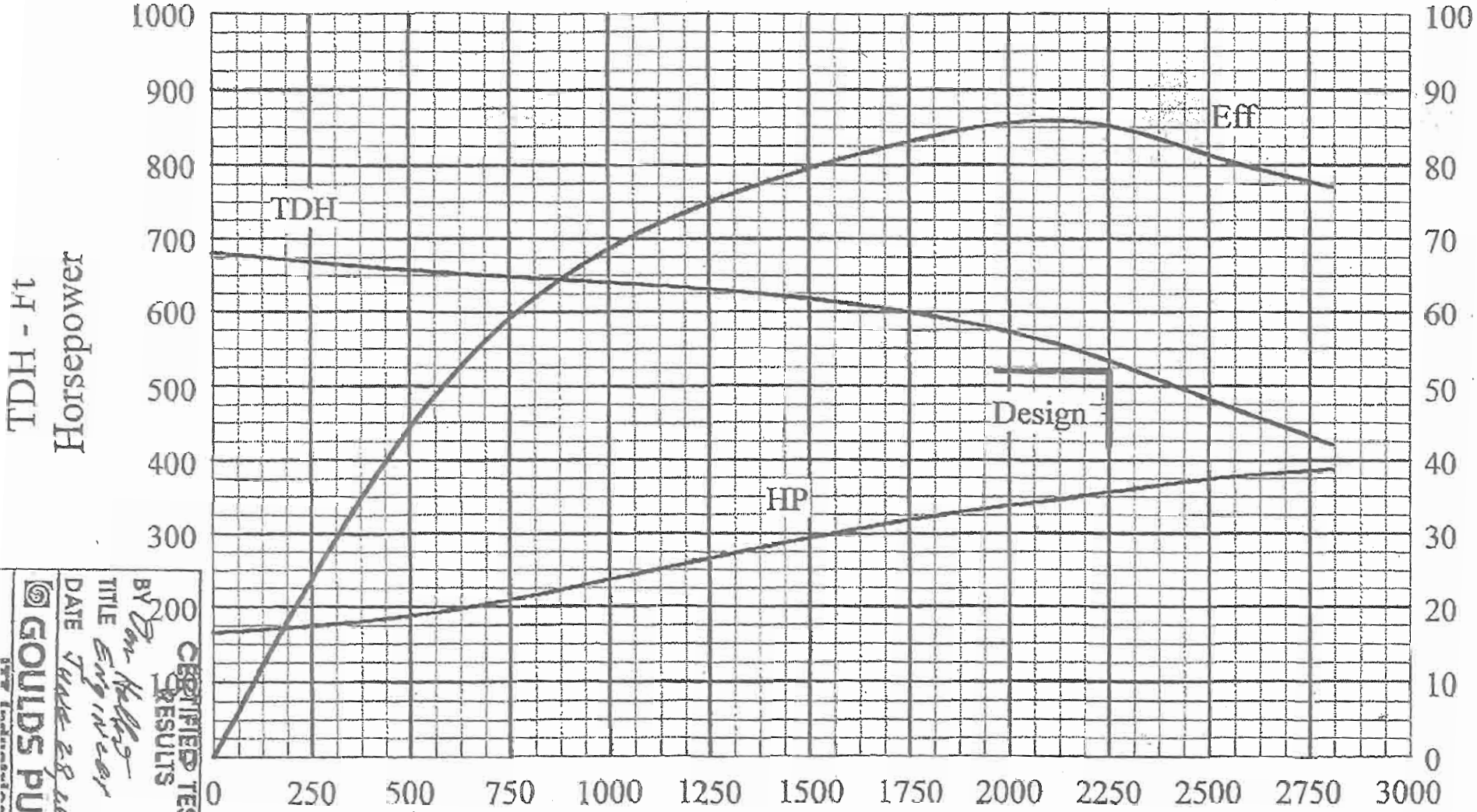
JP 1124

07-25-07

Section 13 PAGE 173 June 5, 1978

M H

ITT - Goulds Pumps
Turbine Operations



CERTIFIED TEST RESULTS
BY
TITLE
DATE
GOULDS PUMPS

SO: 439772
Model: 16BHC/4

Imp Dia: 11.69 in/12.25 in
Speed: 1770 RPM

PUMP

A Sterling Company

1441 Peerless Way
Montebello, CA 90640-6310

Box 7026
Indianapolis, IN 46207-7026

Guaranteed at designated point only and is contingent on:

1. Proper and adequate flow to pump suction.
2. Proper submergence and NPSH available.
3. Fluid free of gas, air and abrasive matter.
4. Impeller with proper lateral adjustment

16 HxB	
IMPELLER	RPM
2617216	1775
BOWL	STAGES
2622922	6
COLUMN	

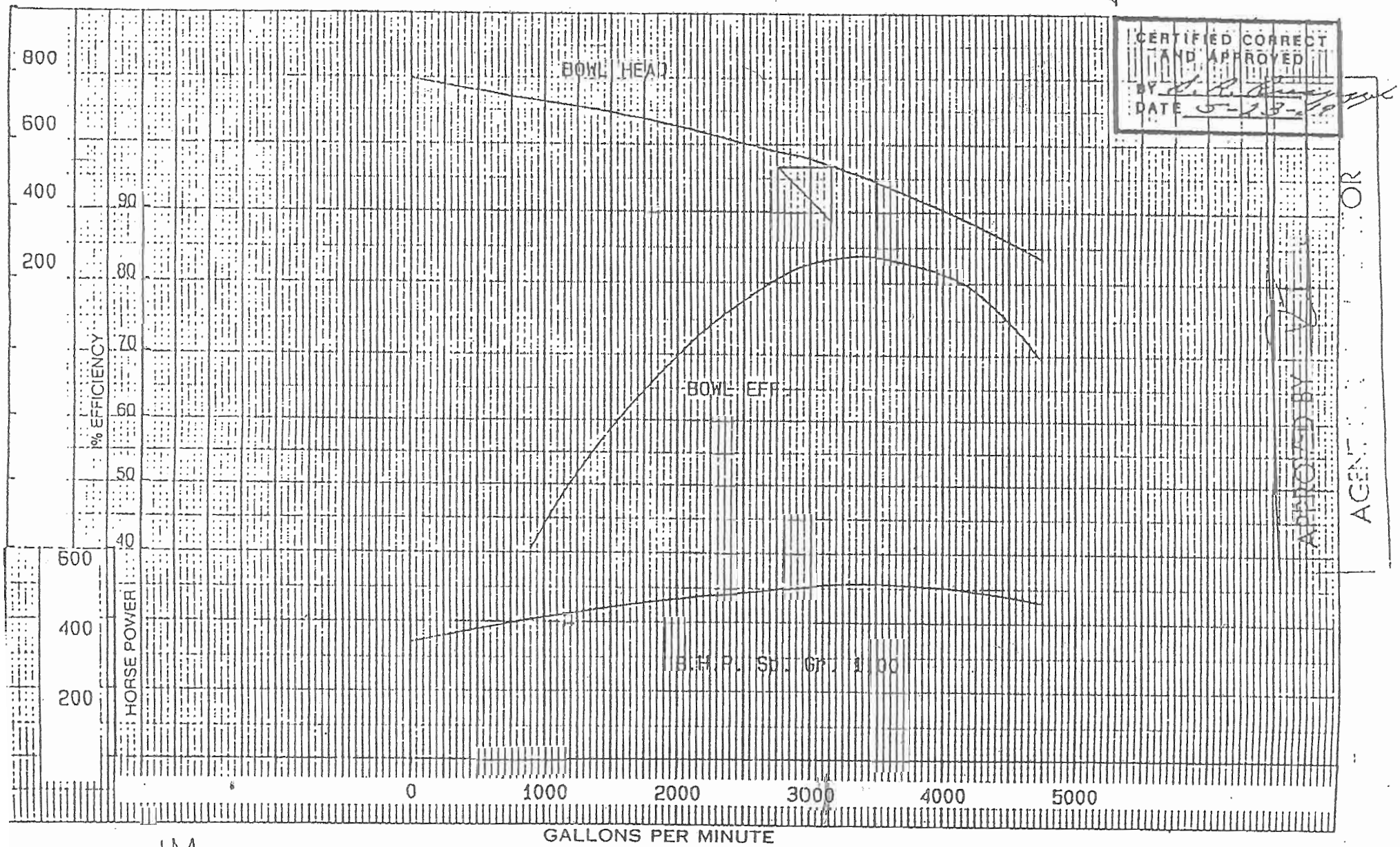
PASCAL & LUDWIG ENG'RS.

DRWF No. 14

WELL SITE 14

Tested at 1195 rpm
& Adjusted to 1775 rpm

CERTIFIED CORRECT AND APPROVED
BY [illegible]
DATE 5-23-89



APPROVED BY

AGENT OR

PLOTTED BY JM FROM TEST NO. 62299 DATE 5/23/89 S/O NO. 71882 EV CURVE & PUMP NO. 249767

FORM E 1 REV (9 88)

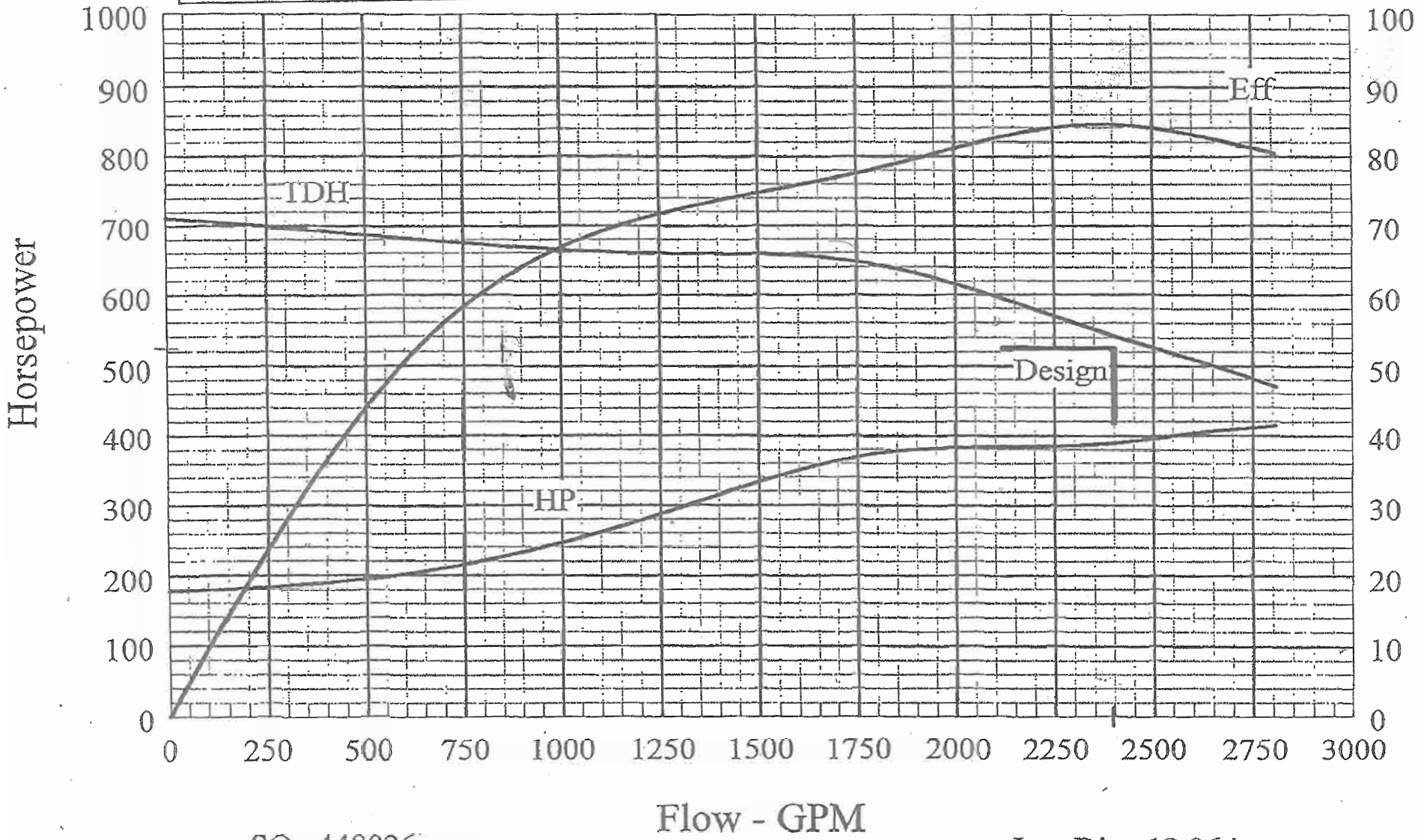
DYER RD WEM-10

RESULTS
BY Jimmy Deraggio
TITLE Engineer
DATE 3/14/2002

GOULDS PUMPS
ITT Industries

Time: Wed Mar 13 14:05:24 2002

ITT - Goulds Pumps
Turbine Operations



SO: 448026
Model: 16BHC/4

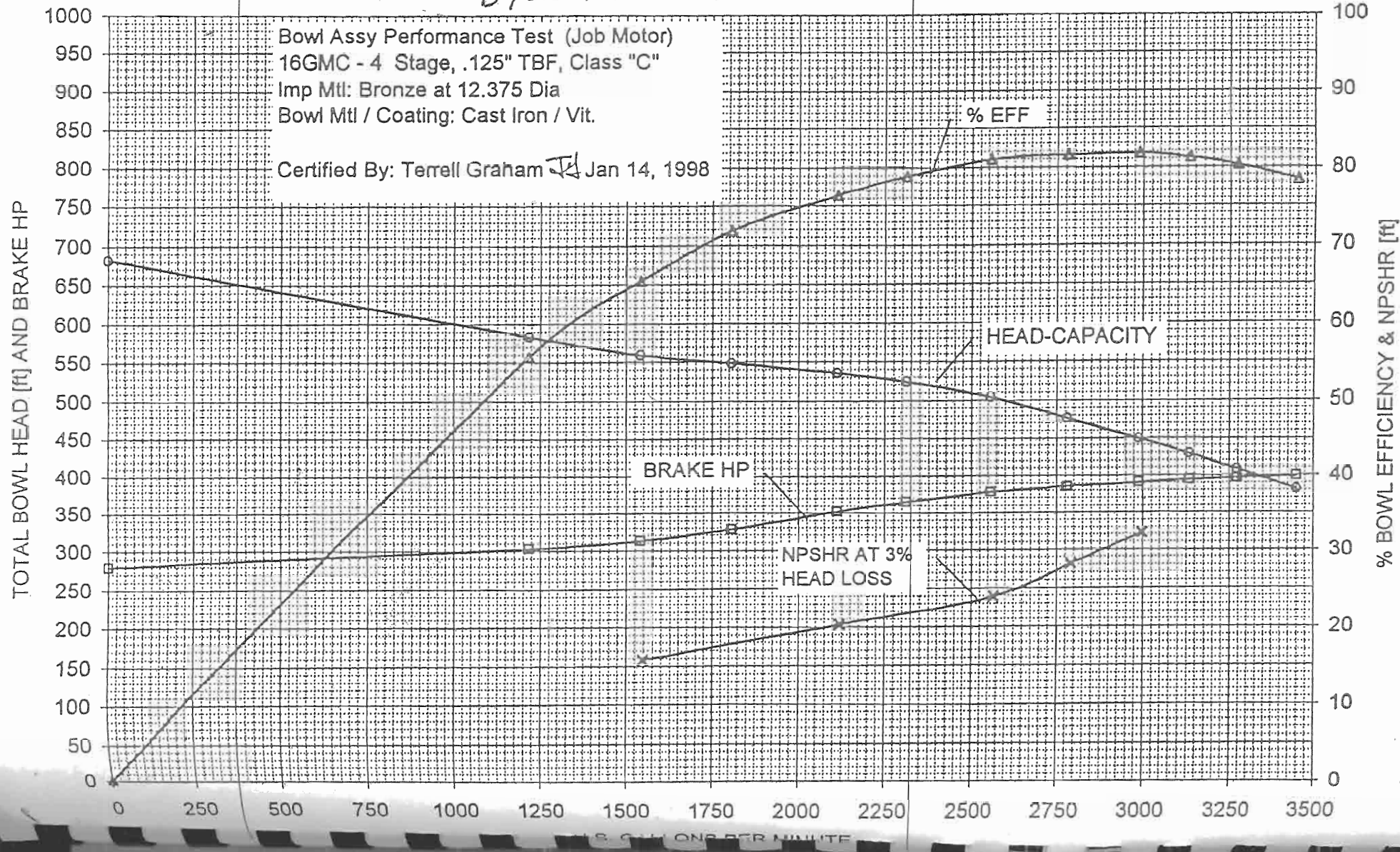
Imp Dia: 12.06 in
Speed: 1770 RPM

MAR. 13. 2002 2:12PM 1-800-453-4749 NO. 2562 P. 2/2

Johnston Pump Company
Brookshire, Texas
Customer: Beylik Drilling, Inc
Job # 97JW2640 TC #: 8254 REV: 2
1780 rpm

400 HP

DYER RD. WELL-16



DYER RD. WELL-17

PUMP DATA SHEET Turbine 60 Hz

Company: IRWD
Customer:
Name: Dyer Road Well 17 Proposed
Date: 03/13/06
Order No:

Pump:

Size: 14RHMC (7 stages)
Type: Lineshaft
Synch speed: 1800 rpm
Speed: 1770 rpm
Dia: 9.5 in
Curve: E6414RMPCO
Specific Speeds: Ns: 3100
Pump Notes for Standard Sizes:
Suction Size-10" Discharge Sizes-10",12"
Vertical Turbine:
Bowl size: 14 in
Max lateral: 1 in
Thrust K factor: 16 lb/ft

Pump Limits for Standard Construction:

Temperature: 120 °F
Pressure: 330 psi g
Sphere size: 1.18 in

Search Criteria:

Flow: 2400 US gpm
Head: 525 ft

Fluid:

Water
SG: 1
Viscosity: 1.105 cP
Temperature: 60 °F
Vapor pressure: 0.2563 psi a
Atm pressure: 14.7 psi a
NPSHa: --- ft

Motor:

Standard: NEMA
Size: 400 hp
Speed: 1800

Sizing criteria: Max Power on Design Curve

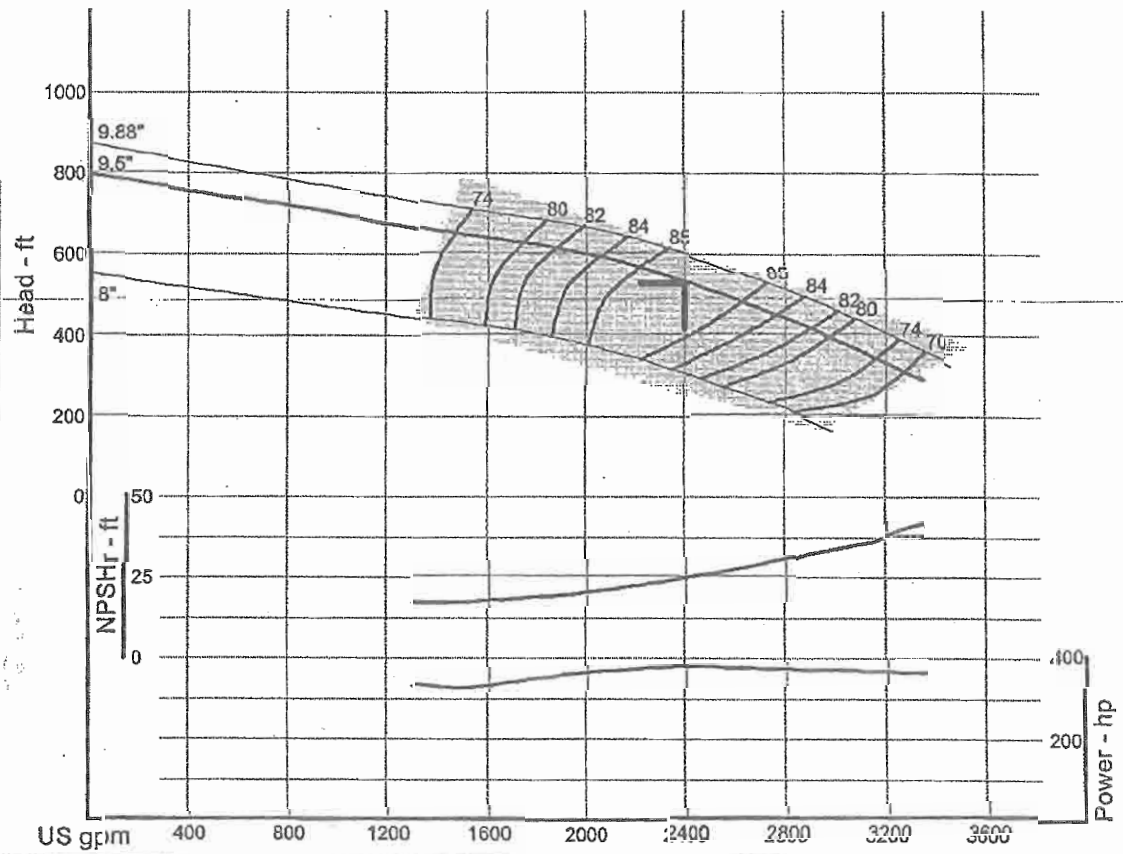
Warning List:

Pump shutoff dP exceeds limit for the pump.

--- Data Point ---
Flow: 2540 US gpm
Head: 499 ft
Eff: 85%
Power: 375 hp
NPSHr: 26.5 ft

-- Design Curve --
Shutoff Head: 794 ft
Shutoff dP: 343 psi
Min Flow: --- US gpm
BEP: 85.1% eff
@ 2413 US gpm
NOL Pwr: 377 hp
@ 2413 US gpm

-- Max Curve --
Max Pwr: 438 hp
@ 3457 US gpm



Performance Evaluation

Flow US gpm	Speed rpm	Head ft	Pump %eff	Power hp	NPSHr ft
2880	1770	418	82.3	368	31.9
2400	1770	529	85.1	376	24.5
1920	1770	606	82.4	356	19.4
1440	1770	650	72.5	325	16.9
960	1770	—	—	—	—

SOUTHERN CALIFORNIA
EDISON®
An EDISON INTERNATIONAL® Company

Confidential/Proprietary Information

May 2, 2008

WELL-18
Goulds RJMC 6 STAGE.

LANCE GINEST
IRVINE RANCH WATER DISTRICT
P.O. BOX 57000
IRVINE, CA 92619

HYDRAULIC TEST RESULTS, Plant: DYER WELL #18
Location: 2302 S. RAITT HP: 400
Cust #: 0-000-7097 Serv. Acct. #: 000-2936-11
Meter: V349N-5159 Pump Ref.#: 8298

In accordance with your request, a test was made on your turbine well pump on April 30, 2008. If you have any questions regarding the results which follow, please contact CORY BUTNER at (909)820-5112.

Equipment

Pump: N/A No: N/A
Motor: US No: CK0900849

RESULTS	Test 1	Test 2	Test 3
Discharge Pressure, PSI	110.0	140.0	155.0
Standing Water Level, Feet	143.7	143.7	143.7
Drawdown, Feet	84.5	73.5	61.9
Discharge Head, Feet	254.1	323.4	358.1
Pumping Water Level, Feet	228.2	217.2	205.6
Total Head, Feet	482.3	540.6	563.7
Capacity, GPM	2,258.0	1,927.0	1,620.0
GPM per Foot Drawdown	26.7	26.2	26.2
Acre Feet Pumped in 24 Hours	9.980	8.517	7.160
kW Input to Motor	269.0	261.0	246.0
HP Input to Motor	360.7	350.0	329.9
Motor Load (%)	83.9	81.4	76.7
Measured Speed of Pump, RPM	1,787		
kWh per Acre Foot	647	736	825
Overall Plant Efficiency (%)	76.2	75.2	69.9
Customer Meter, GPM	2,176.0	1,882.0	

Test 1 is the normal operation of this pump at the time of the above test(s). The other results were obtained by throttling the discharge.

DAN L. JOHNSON
Manager
Hydraulic Services

300 N. Pepper Ave.
Rialto, CA 92376

ATTACHMENT B

RBF CONSULTING

IRWD WELL MONITORING FORM - WEST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LEVEL SCADA (IN OFFICE)	WATER LEVEL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME
DRWF 1 34.1'	THORNTON PARK	N/A	N/A	N/A	1415	W: 000336 D: 750880	0	04405
DRWF 2 36.5'	ALTON & BRADFORD	-95	-88.7	98.1	09:30	W: 000461 D: 906272	0	04457
DRWF 3 55.0'	EMMETT E/O HALLADAY	-98	-99	103.3	10:54	4290234	0	11898
DRWF 4 38.4'	N/o SADDLE-BACK HS	-126	N/A	Sounding Pipe Plugged	1400	W: 001611 D: 733340	0	00416
DRWF 5 48.3'	CYPRESS W/o ORANGE	-105	-106	106.1	11:20	6263489	0	16164
DRWF 6 43.2'	GARNSEY N/o DYER ROAD	-97	-99	99.7	11:20	8806693	0	080311
DRWF 7 39.5'	GREENVILLE N/o ALTON	-109	108	108.3	1320 1/24	3284488	0	24094
DATS C-8 36.8'	SEGERSTROM E/o BEAR		346	140.2	1445	7319644	7.0	22105
DATS C-9 23.0'	THORNTON PK (SE CORNER)		173.1	134.2	1410	2977357	5.3	42153
DRWF 10 46.5'	WARNER W/o SUSAN	-121	110.6	No [illegible] power	1400 1/24	11761030	0	55884
DRWF 11 40.2'	SEGERSTROM W/o TOWNSEND	-99	102	105.5	1429 1/24	W: 109464 D: 146450	0	59697
DRWF 12 51.1'	HARVARD W/o FAIRVIEW	-111	121.1	119.8	1330 1/28	W: 307 D: 241660	0	2502
DRWF 13 39.8'	SEGERSTROM W/o FAIRVIEW	-107	106.2	107.9	1215 1/30	W: 1809 D: 655833	0	3570
DRWF 14 46.6'	WARNER W/o FAIRVIEW	-109	111.9	112	1415 1/24	W: 2558 D: 443908	0	10824
DRWF 15 44.0'	WARNER E/o GREENVILLE	-106	113.6	111.2	1350 1/28	581364	0	58100
DRWF 16 47.0'	BEHIND 2500 S. SUSAN ST.	-188	190	190.8	1350 1/24	512541	6.7	44543
DRWF 17 51.5'	2110 ANNE ST. S/o HARVARD	-113	114	114.7	1230 1/30	7895538	0	38734
DRWF 18 44.9'	WARNER W/o RAITT	-101	106.5	107.6	1/28 1410	W: 471 D: 690368	0	3785

Rev. 3/06

NAME Willis DATE 1/31/08

IRWD WELL MONITORING FORM - EAST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LVL SCADA (IN OFFICE)	WATER LVL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME
IRWD 51 @ 39'	PULLMAN & DAIMLER	N/A	N/A	78	1315 1130	N/A	N/A	N/A
IRWD 72 109.0'	WICKSHIRE E/o BROWNING		—	NO ACCESS	1345	W 0 D-8662922	0	7605
IRWD 76 132.3	YALE & 5 FWY		300	300+ HARD WATER SOUNDING	24000 1131	24312 161281	443 gpm	68413
IRWD 77 109.6	ESCOLAR IRVINE HS		220.7		1015 1131	6553 387128	9286	85618
IRWD 78 60.5'	WARNER & CULVER		240	43.5	1315		0	41896
IRWD 106	HARVARD & BARRANCA	N/A	~~N/A~~	101.5	0900	N/A	N/A	N/A
IRWD 107 112'	CULVER & 5 FWY		256.6	76.2	1200	35476 2738	0	8035
IRWD 109	IRVINE & JAMBOREE	N/A	N/A	62.5	1230	N/A	N/A	N/A
IRWD 110 169.7	WALNUT & 5 FWY		382.3	208.7	0930	2309 ~~6~~2642024	1414 gpm	8537
IRWD 111	S/O TRABUCO N/O MARINE WAY	N/A	N/A	116.5	1345 1131	N/A	N/A	N/A
IRWD 112	BRYAN & MYFORD	N/A	N/A 47.5	~~47.5~~	1215 1131	N/A	N/A	N/A
IRWD ET-2	CULVER & IRVINE CENTER		210	102.5	1300	3998 496112093	405.7	8746
IRWD 115	5 FWY & PETER'S CYN WASH	N/A	N/A	NO ACCESS	1400	W 24025 D 2264953	0	N/A 104
ET-1 128.4'	JEFFREY & IRVINE CENTER		2339	125	0915 1131	W 3674 D 5894931	870 gpm 546	10974
TIC 91 51.0'	BARRANCA W/o RED HILL	N/A	N/A	87.7	0830	N/A	N/A	N/A

Rev. 3/06

NAME _____ DATE _____

IRWD WELL MONITORING FORM - WEST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LEVEL SCADA (IN OFFICE)	WATER LEVEL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME
DRWF 1 34.1'	THORNTON PARK	N/A	N/A	N/A	1010	W: 484 D: 758701	GPM 2900	4440.9
DRWF 2 36.5'	ALTON & BRADFORD		-84.3	90.83	0844	W: 528 D: 913434	Θ	4490.4
DRWF 3 55.0'	EMMETT E/O HALLADAY		-101	104.62	08:10	W 57250 D 4290702	Θ	11901.3
DRWF 4 38.4'	N/o SADDLE-BACK HS		-127.3	94.17	0916	W: 1759 D: 739759	Θ	445.4
DRWF 5 48.3'	CYPRESS W/o ORANGE		-101	101.28	0830	W 49964 D 6264112	-.06	16104.6
DRWF 6 43.2'	GARNSEY N/o DYER ROAD		-093.4	94.18	0901	W 922 D 8807583	-0.01	8037.4
DRWF 7 39.5'	GREENVILLE N/o ALTON		-111	111.20	1020	W NOT CONNECTED D 3289488	-.05	24094.3
DATS C-8 36.8'	SEGERSTROM E/o BEAR	-346	-346	134.24	0941	W 1900K D 7474560	GPM 3146.1	22342.4
DATS C-9 23.0'	THORNTON PK (SE CORNER)	-168.71	-118	128.77	0930	W 14K D 3071667	GPM 2426.6	42944.9
DRWF 10 46.5'	WARNER W/o SUSAN		97	101.9	1440	W: 57889 D: 1189706	Θ	56414
DRWF 11 40.2'	SEGERSTROM W/o TOWNSEND		-104 ~~104.6~~	106.04 ~~104.2~~ ~~102.4~~	1215 ~~15~~	W: 110552 D: 146452	Θ	59702.7
DRWF 12 * 51.1'	HARVARD W/o FAIRVIEW		-102.1	COULD NOT SOUND BLOCKED	1102	W: 338 D: 625377	Θ	2506.7
DRWF 13 39.8'	SEGERSTROM W/o FAIRVIEW		-103.0	104.75	1143	W: 1864 D: 661975	Θ	3599.5
DRWF 14 46.6'	WARNER W/o FAIRVIEW		104.6	104.2	1500	W: 2663 D: 451506	Θ	10852.7
DRWF 15 44.0'	WARNER E/o GREENVILLE		-103.4	101.01	1032	W 222 D 586861	-0.04	58124.2
DRWF 16 47.0'	BEHIND 2500 S. SUSAN ST.		-185	184.85	1330	W 52K D 648335	6.9	44716.8
DRWF 17 51.5'	2110 ANNE ST. S/o HARVARD		-109	109.32	1113	W 1291 D 7896327	Θ	38738.49
DRWF 18 44.9'	WARNER W/o RAITT		-098.5	99.62	1046	W: 536 D: 692425	Θ	3796.6

Rev. 3/06

NAME DILLHOEFER / MILLER DATE 3/3,4,5/08

IRWD WELL MONITORING FORM - EAST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LVL SCADA (IN OFFICE)	WATER LVL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME
IRWD 51 @ 39'	PULLMAN & DAIMLER	N/A	N/A	72.52	1342	N/A	N/A	N/A
IRWD 72 109.0'	WICKSHIRE E/o BROWNING		WELL CAP LOCKED	N/A	1235	D862922	0	7605 5
IRWD 76 132.3	YALE & 5 FWY		-.268	265.70	0945	W 24436 D177025	312	7590 6
IRWD 77 109.6	ESCOLAR IRVINE HS		-204	197.84	0930	W 67026 D443881	6PM 689.6	9355 4
IRWD 78 60.5'	WARNER & CULVER		-.42	50.62	1340	W 1434140 D834145	-0.04	41896 7
IRWD 106	HARVARD & BARRANCA	N/A	N/A	97.81	1320	N/A	N/A	N/A
IRWD 107 112'	CULVER & 5 FWY		-84.4	84.31	1047	W 37120 D3426	0	8039 9
IRWD 109	IRVINE & JAMBOREE	N/A	N/A	71.04	1246	N/A	N/A	N/A
IRWD 110 169.7	WALNUT & 5 FWY		-151.6	111.47	1002	W 103195 D690504	0	9284 8
IRWD 111	S/O TRABUCO N/O MARINE WAY	N/A	N/A	123.25	1440	N/A	N/A	N/A
IRWD 112	BRYAN & MYFORD	N/A	N/A	56.41	1301	N/A	N/A	N/A
IRWD ET-2	CULVER & IRVINE CENTER		-109.5	110.18	1034	W 4025 D5402624	6PM 911.4	9555 5
IRWD 115	5 FWY & PETER'S CYN WASH	N/A	N/A -300	N/A	1100	W 24036 D257542	650.6	N/A 104 9
ET-1 128.4'	JEFFREY & IRVINE CENTER		-235	124.66	1021	W 3698 D6340037	50 867.2	11787 7
TIC 91 51.0'	BARRANCA W/o RED HILL	N/A	N/A	85.36	1331	N/A	N/A	N/A

Rev. 3/06

NAME DILL HOEFER DATE 3/3,4,5/08

WELL # 72 WELL CAP ON DID NOT HAVE KEY FOR LOCK

IRWD WELL MONITORING FORM - WEST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LEVEL SCADA (IN OFFICE)	WATER LEVEL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME
DRWF 1 34.1'	THORNTON PARK	N/A	N/A	N/A	9:45	W: 702 D: 124184	4.6	5250
DRWF 2 36.5'	ALTON & BRADFORD	191.7	185.0	189.1	10:15	W: 000684 D: 051511	5.5	5416
DRWF 3 55.0'	EMMETT E/O HALLADAY	112.2	Ø	115.7	9:30	4290702	Ø	11901
DRWF 4 38.4'	N/o SADDLE-BACK HS	—	171.5	137.8	10:30	W: 1880 D: 162558	Ø	1317
DRWF 5 48.3'	CYPRESS W/o ORANGE	under construction (-264)			9.48	6268217 BPass: 50239	Ø	—
DRWF 6 43.2'	GARNSEY N/o DYER ROAD	104.8	105.8	106.2	10.00	8807583 BPass: 922	Ø	8037
DRWF 7 39.5'	GREENVILLE N/o ALTON	-246.94	-244	-244.9	12.00	3353529	6.75	21478
DATS C-8 36.8'	SEGERSTROM E/o BEAR	-346	-346	151.1	11.15	7886405 BPass: 1900	7.2	24526
DATS C-9 23.0'	THORNTON PK (SE CORNER)	-182	-132	144.0	11.00	3389323 BPATS: 16	6.00	45128
DRWF 10 46.5'	WARNER W/o SUSAN	214.1	195	198.1	10.15	R12289456 W 51982	5.4	58184
DRWF 11 40.2'	SEGERSTROM W/o TOWNSEND	—	-214	-211.8	10.30	W: 652 D: 284719	6.00	60327
DRWF 12 51.1'	HARVARD W/o FAIRVIEW	211.6	209.1	215.6	9:40	W: 000487 D: 151916	4.4	3440
DRWF 13 39.8'	SEGERSTROM W/o FAIRVIEW	—	234	236.8	11.00	W: 2075 D: 126582	5.0	4326
DRWF 14 46.6'	WARNER W/o FAIRVIEW	—	234.9	234.0	10:30	W: 111831 D: 281827	5.8	11558
DRWF 15 44.0'	WARNER E/o GREENVILLE	-219.62	-205.3	-214.1	10.15	802712	6	59111
DRWF 16 47.0'	BEHIND 2500 S. SUSAN ST.	-177.15	-172	-172.3	12:59	833747	Ø	44832
DRWF 17 51.5'	2110 ANNE ST. S/o HARVARD	-205.4	209	212.2		8038641 W: 1302	3.4	19741
DRWF 18 44.9'	WARNER W/o RAITT	-244.5	-242.5	-245.3	9:56	W: 762 D: 783071	4.3	47.59

Rev. 3/06

NAME B PHAM & BILL WESSON DATE 6/2,3 & 4/2008

IRWD WELL MONITORING FORM - EAST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LVL SCADA (IN OFFICE)	WATER LVL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME
IRWD 51 @ 39'	PULLMAN & DAIMLER	N/A	N/A	93.6	1.30	N/A	N/A	N/A
IRWD 72 109.0'	WICKSHIRE E/o BROWNING		-110	133.3	1.00	428726	0.9	7605
IRWD 76 132.3	YALE & 5 FWY			273.8	1:00	218855	330gpm	
IRWD 77 109.6	ESCOLAR IRVINE HS		-211.9	-203.1	09:45	528386	1.5	11390
IRWD 78 60.5'	WARNER & CULVER		-191	-200.3	08:19	898330	1.1	41896
IRWD 106	HARVARD & BARRANCA	N/A	N/A	sounder stuck		N/A	N/A	N/A
IRWD 107 112'	CULVER & 5 FWY			87.9	11	3431	0	
IRWD 109	IRVINE & JAMBOREE	N/A	N/A	74.3	16:23	N/A	N/A	N/A
IRWD 110 169.7	WALNUT & 5 FWY		N/A	175.4	12:30	805533	1074gpm	
IRWD 111	S/O TRABUCO N/O MARINE WAY	N/A	N/A	124.2	09:24	N/A	N/A	N/A
IRWD 112	BRYAN & MYFORD	N/A	N/A	83.2	10:45	N/A	N/A	N/A
IRWD ET-2	CULVER & IRVINE CENTER			170.4	10:20	657556822	885gpm	
IRWD 115	5 FWY & PETER'S CYN WASH	N/A	N/A	N/A	10:55	N/A	686.5gpm	N/A
ET-1 128.4'	JEFFREY & IRVINE CENTER			130.6	9:45	743936073		
TIC 91 51.0'	BARRANCA W/o RED HILL	N/A	N/A	99.9	12:30	N/A	N/A	N/A

Rev. 3/06

NAME B. PHAM DON G. BILL W. DATE 6/2, 3 & 4/2008

106 1000gpm

R-5380 875gpm → 975gpm

~~[illegible]~~ 166.8

IRWD WELL MONITORING FORM - WEST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LEVEL SCADA (IN OFFICE)	WATER LEVEL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME	
DRWF 1 34.1'	THORNTON PARK	N/A	N/A	N/A	09:30	W: 907 D: 324523	NA.	NA.	9/1
DRWF 2 36.5'	ALTON & BRADFORD	199.3	118.8	126	10:15	W: 1050 D: 2934 54	⊖	6639	9/1
DRWF 3 55.0'	EMMETT E/O HALLADAY	119	118	122.3	09:25	W: 57475 D: 4297288	⊖	11957	9/1
DRWF 4 38.4'	N/o SADDLE-BACK HS	209.9	209.8	173.1	10:40	W: 3401 D: 504546	5.5	3115	9/1
DRWF 5 48.3'	CYPRESS W/o ORANGE	252	246	247.5	09:35	W: 51033 D: 6321103	5.25	16104	9/1
DRWF 6 43.2'	GARNSEY N/o DYER ROAD	114.8	113.8	114.3	10:30	W: 1195 D: 8821250	⊖	8097	9/1
DRWF 7 39.5'	GREENVILLE N/o ALTON	151.4	149	148.4	11:55	W: 55740 D: 3438732	⊖	25033	9/1
DATS C-8 36.8'	SEGERSTROM E/o BEAR	346	346	157	11:00	W: 1900 D: 8297739	6.91	26737	9/1
DATS C-9 23.0'	THORNTON PK (SE CORNER)	192.42	184.4	151	10:50	W: 491 D: 3703703	5.2	43339	9/1
DRWF 10 46.5'	WARNER W/o SUSAN	215.9	194	196.5	10:32	W: 51985 D: 12731875	5.8	NA	9/1
DRWF 11 40.2'	SEGERSTROM W/o TOWNSEND	152.6	149	145.9	11:30	W: 1394 D: 416074	⊖	61007	9/1
DRWF 12 51.1'	HARVARD W/o FAIRVIEW	164.6	157	162	10:02	W: 741 D: 417157	⊖	5058	9/1
DRWF 13 39.8'	SEGERSTROM W/o FAIRVIEW	234.3	227.1	229.8	11:25	W: 3052 D: 467034	5.7	6152	9/1
DRWF 14 46.6'	WARNER W/o FAIRVIEW	233.8	227.8	226.8	10:50	W: 1677 D: 781150	NA	13246	9/1
DRWF 15 44.0'	WARNER E/o GREENVILLE	208.5	202.2	201.2	NA	W: 1897 D: 227170	6.39	NA	9/1
DRWF 16 47.0'	BEHIND 2500 S. SUSAN ST.	229.8	225	224.9	11:00	W: 172 D: 1124167	5.7	45715	9/1
DRWF 17 51.5'	2110 ANNE ST. S/o HARVARD	200.7	200.2	201.2	10:15	W: 1398 D: 8345601	4.91	41719	9/1
DRWF 18 44.9'	WARNER W/o RAITT	146.9	142.8	143.9	09:42	W: 1167 D: 168455	NA	NA	9/1

Rev. 3/06

NAME Ken P, Todd C, Bryan C DATE 9-2-08

IRWD WELL MONITORING FORM - EAST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LVL SCADA (IN OFFICE)	WATER LVL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME
IRWD 51 @ 39'	PULLMAN & DAIMLER	N/A	N/A	94.1	1455	N/A	N/A	N/A
IRWD 72 109.0'	WICKSHIRE E/o BROWNING	106	106	138.2	11:00	1959	434 GPM	7605
IRWD 76 132.3	YALE & 5 FWY	305	305	290.9	12:55	258089	415 GPM	11550
IRWD 77 109.6	ESCOLAR IRVINE HS	253.7	253.7	248.1	12:20	617513	830 GPM	13459
IRWD 78 60.5'	WARNER & CULVER	~~[illegible]~~ 186	186	* 99'	13:30	648458	1.1 CFS	41896
IRWD 106	HARVARD & BARRANCA	N/A	N/A	Sounder stuck	15:40	N/A 183785	N/A	N/A
IRWD 107 112'	CULVER & 5 FWY	211.9	211.9	92.3	12:45	3484	Ø	8039
IRWD 109	IRVINE & JAMBOREE	N/A	N/A	78.5	15:00	N/A	N/A	N/A
IRWD 110 169.7	WALNUT & 5 FWY	209.6	209	187.5	12:45	972298	1.89	13561
IRWD 111	S/O TRABUCO N/O MARINE WAY	N/A	N/A	125.9	14:30	N/A	N/A	N/A
IRWD 112	BRYAN & MYFORD	N/A	N/A	66.4	14:00	N/A	N/A	N/A
IRWD ET-2	CULVER & IRVINE CENTER	123.8	123.8	122.Ø	13:15	773236302	864 GPM	13873
IRWD 115	5 FWY & PETER'S CYN WASH	N/A	N/A	N/A	13:45		800 GPM	N/A
ET-1 128.4'	JEFFREY & IRVINE CENTER	242.5	242	21.Ø	12:15	855966903	1.86	15959
TIC 91 51.0'	BARRANCA W/o RED HILL	N/A	N/A	105.0	1445	N/A	N/A	N/A

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NAME _____ DATE _____

* Well 78 starts sounding @ 99', But in intermitten Rounds till 120'

IRWD WELL MONITORING FORM - WEST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LEVEL SCADA (IN OFFICE)	WATER LEVEL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME
DRWF 1 34.1'	THORNTON PARK	N/A	N/A	N/A	10:05	W: 278 D: 722463	Ø	427
DRWF 2 36.5'	ALTON & BRADFORD	179.1	179.1	183.8	10:45	W: D: 859690	6	4237
DRWF 3 55.0'	EMMETT E/O HALLADAY	116	116	120.3	10:00	4289257	Ø	11893
DRWF 4 38.4'	N/o SADDLE-BACK HS	163.0	162.0	128.0	12:00	W: D: 684801	Ø	185
DRWF 5 48.3'	CYPRESS W/o ORANGE	240	240	240.4	10:20	6151021	5.2	16104
DRWF 6 43.2'	GARNSEY N/o DYER ROAD	112.8	112.8	113.2	11:30	8806693	Ø	8034
DRWF 7 39.5'	GREENVILLE N/o ALTON	139	138.4	139	14:00	3289488	Ø	24094
DATS C-8 36.8'	SEGERSTROM E/o BEAR	346	346	154.8	9:50	7041844	3084gpm	22094
DATS C-9 23.0'	THORNTON PK (SE CORNER)	187	187	147.5	10:00	2737792	2420gpm	40693
DRWF 10 46.5'	WARNER W/o SUSAN	184	186.3	184	13:15	5106 11579609	6.2	55045
DRWF 11 40.2'	SEGERSTROM W/o TOWNSEND	142	142.7	142	14:30	W: 5426 D: 81612	Ø	59697
DRWF 12 51.1'	HARVARD W/o FAIRVIEW	NA	NA	NA	—	W: D: 2291114	Ø	2298
DRWF 13 39.8'	SEGERSTROM W/o FAIRVIEW	142.4	140.5	140.2	8:30	W: 1698 D: 622864	Ø	3411
DRWF 14 46.6'	WARNER W/o FAIRVIEW	147.9	147.5	147.9	13:40	W: 2350 D: 378258	Ø	10582
DRWF 15 44.0'	WARNER E/o GREENVILLE	141.8	141.8	140.8	14:15	183 556114	Ø	57091
DRWF 16 47.0'	BEHIND 2500 S. SUSAN ST.	213	213	212.8	13:30	34 428729	6.1	43761
DRWF 17 51.5'	2110 ANNE ST. S/o HARVARD	190	190	190	13:00	29 7824816	10.20	38344
DRWF 18 44.9'	WARNER W/o RAITT	134	134	135.9	14:00	W: 42 D: 658615	Ø	3606

Rev. 3/06

NAME B.C / K.P DATE 11-28-07

IRWD WELL MONITORING FORM - EAST SIDE

	WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LVL SCADA (IN OFFICE)	WATER LVL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME
	IRWD 51 @ 39'	PULLMAN & DAIMLER	N/A	N/A	92.3	15:30	N/A	N/A	N/A
B	IRWD 72 109.0'	WICKSHIRE E/o BROWNING	—	—	96.3	9:00	862922	Ø	7605
B	IRWD 76 132.3	YALE & 5 FWY	N/A	UNDER	REPAIR				
B	IRWD 77 109.6	ESCOLAR IRVINE HS	129.2	129.2	202.8	9:30	342511	710 GPM	7108
	IRWD 78 60.5'	WARNER & CULVER		240	51.8	09:20	490171	Ø	41896
	IRWD 106	HARVARD & BARRANCA	N/A	N/A	—	09:35	N/A 170364	N/A Ø	N/A
B	IRWD 107 112'	CULVER & 5 FWY	91.4	91.4	267	8:30	3260	Ø	8035
	IRWD 109	IRVINE & JAMBOREE	N/A	N/A			N/A	N/A	N/A
B	IRWD 110 169.7	WALNUT & 5 FWY	344.5	344.5	174.3	10:00	534553	1219 GPM	7037
	IRWD 111	S/O TRABUCO N/O MARINE WAY	N/A	N/A			N/A	N/A	N/A
	IRWD 112	BRYAN & MYFORD	N/A	N/A	59.6	12:40	N/A 934132	N/A	N/A
	IRWD ET-2	CULVER & IRVINE CENTER	190	190	109.6	13:30	3522 41273517	924 gpm	7245
	IRWD 115	5 FWY & PETER'S CYN WASH	N/A	N/A	N/A	13:10	23976 163807	680 gpm	N/A 104
	ET-1 128.4'	JEFFREY & IRVINE CENTER	232.3	232.3	123.5	13:40	3628 512672281	850 gpm	9310
	TIC 91 51.0'	BARRANCA W/o RED HILL	N/A	N/A	106.7	15:00	N/A	N/A	N/A

Rev. 3/06

NAME B.C / K.P DATE 11-28-07

IRWD WELL MONITORING FORM - WEST SIDE

WELL NAME GROUNDING TUBE ELEV	LOCATION	WATER LEVEL SCADA (IN OFFICE)	WATER LEVEL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME	
DRWF 1 34.1'	THORNTON PARK	N/A -262.4	N/A	N/A	09:50	W: 000725 D: 22925	4	5905.9	6/30
DRWF 2 36.5'	ALTON & BRADFORD	-202.48	-196.8	-201.0	14:05	W: 849 D: 178564			7/1
DRWF 3 55.0'	EMMETT E/O HALLADAY	-195	-195	-207	07:40	W: 57380 D: 4291509	4.5 TO WASTE		7/1
DRWF 4 38.4'	N/o SADDLE-BACK HS	NO DATA	NA	-190.6	08:10	W: 2115 D: 284628	5		7/1
DRWF 5 48.3'	CYPRESS W/o ORANGE	OFF LINE							
DRWF 6 43.2'	GARNSEY N/o DYER ROAD	-168.45	-170	-170.5	08:00	W: 1112 D: 8807583	9.0 WASTE		7/1
DRWF 7 39.5'	GREENVILLE N/o ALTON	-254	-254	-254.4	09:30	3427282	6.6	24996	6/30
DATS C-8 36.8'	SEGERSTROM E/o BEAR			-158.8	13:15	W: 99 D: 8016739			7/1
DATS C-9 23.0'	THORNTON PK (SE CORNER)		-140	-151.6	13:30	W: 491 D: 3489635			
DRWF 10 46.5'	WARNER W/o SUSAN	-223.44	-205	-207	08:50	W: 51985 D: 12420088	5.5		7/1
DRWF 11 40.2'	SEGERSTROM W/o TOWNSEND	-224	-224	-222.5	09:45	W: D: 404055		609411	6/30
DRWF 12 51.1'	HARVARD W/o FAIRVIEW	-226.47	-217.2	-224.1	08:30	W: 544 D: 258375	4.4		7/1
DRWF 13 39.8'	SEGERSTROM W/o FAIRVIEW	-173.8	-173.8	-173.5	14:15	W: 2204 D: 236005		4939	6/30
DRWF 14 46.6'	WARNER W/o FAIRVIEW	-178.65	-174.8	-174.1	14:40	W: 112750 D: 398122			6/30
DRWF 15 44.0'	WARNER E/o GREENVILLE	-182.15	-176	-174.1	14:50	W: 0362 D: 942649			6/30
DRWF 16 47.0'	BEHIND 2500 S. SUSAN ST.	-177	-177	-181.4	13:30	909614		45307	6/30
DRWF 17 51.5'	2110 ANNE ST. S/o HARVARD	-218.16	-218	-218.6	08:40	W: 1314 D: 8135615	4.3		7/1
DRWF 18 44.9'	WARNER W/o RAITT	-257.18	-255.5	-255.5	15:05	W: 860 D: 87390	4.2		6/30

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NAME _____ DATE _____

IRWD WELL MONITORING FORM - EAST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LVL SCADA (IN OFFICE)	WATER LVL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME	
IRWD 51 @ 39'	PULLMAN & DAIMLER	N/A	N/A	99.3	11:00	N/A	N/A	N/A	7/2
IRWD 72 109.0'	WICKSHIRE E/o BROWNING		110	135.6	12:00	605052	0.9	7605	7/2
IRWD 76 132.3	YALE & 5 FWY	-277.24	279.8	277.8	13:40	W. 255118 D: 233007			7/2
IRWD 77 109.6	ESCOLAR IRVINE HS	-215.38	216.9	209.0	13:50	W. 68433 D: 557250			7/2
IRWD 78 60.5'	WARNER & CULVER	-0	188	196.8	14:05	W. 328920 D: 585119			7/3
IRWD 106	HARVARD & BARRANCA	N/A	N/A	NA →		N/A	N/A	N/A	7/3
IRWD 107 112'	CULVER & 5 FWY	-90.28	90.4	90.5	14:05	3433			7/2
IRWD 109	IRVINE & JAMBOREE	N/A	N/A	-74.6	12:15	N/A	N/A	N/A	7/2
IRWD 110 169.7	WALNUT & 5 FWY	260	260	178.8	13:20				7/2
IRWD 111	S/O TRABUCO N/O MARINE WAY	N/A	N/A	-125	13:30	N/A	N/A	N/A	7/2
IRWD 112	BRYAN & MYFORD	N/A	N/A	-75.6	12:30	N/A	N/A	N/A	7/2
IRWD ET-2	CULVER & IRVINE CENTER	-122	119	118.8	14:20	W. 4033 D: 694788095			7/3
IRWD 115	5 FWY & PETER'S CYN WASH	N/A	N/A	NA	14:15	W: 25283 D: 367299	.68	N/A	7/2
ET-1 128.4'	JEFFREY & IRVINE CENTER	-240		77.7	14:00	778478567	1.8	14586	6/30
TIC 91 51.0'	BARRANCA W/o RED HILL	N/A	N/A	106.2	10:30	N/A	N/A	N/A	7/2

Rev. 3/06

NAME Todd Colvin DATE 7/7/8

IRWD WELL MONITORING FORM - WEST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LEVEL SCADA (IN OFFICE)	WATER LEVEL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME
DRWF 1 34.1'	THORNTON PARK	N/A	N/A	N/A	1425	W: 959 D: 362471	0	6639
DRWF 2 36.5'	ALTON & BRADFORD	195.5	189.6	?	1320	W: 1174 D: 363042	6.0	6977
DRWF 3 55.0'	EMMETT E/O HALLADAY	117.3	117.0	121.2	1355	W. 57475 D: 4297288	0	11958
DRWF 4 38.4'	N/o SADDLE-BACK HS	132.9	134.1	136.9	1300	W: 3877 D: 576493	0	3483
DRWF 5 48.3'	CYPRESS W/o ORANGE	129.9	130.0	129.4	1340	W. 51038 D. 6356645	0	16105
DRWF 6 43.2'	GARNSEY N/o DYER ROAD	113.1	112.9	113.3	0800	W. 1197 D-8821250	0	8097
DRWF 7 39.5'	GREENVILLE N/o ALTON	145.7	145.0	144.9	1105	W: 55740 D: 3438732	0	25033
DATS C-8 36.8'	SEGERSTROM E/o BEAR	346.0	346.0	158.0	1010	W. ? D. 8421840	6.9	27404
DATS C-9 23.0'	THORNTON PK (SE CORNER)	189.8	140.0	150.8	1025	W: 494 D. 3797850	5.2	48006
DRWF 10 46.5'	WARNER W/o SUSAN	208.7	186.0	188.7 ~~186.0~~	1530	W. 51990 D. 12875120	6.5	61046.00
DRWF 11 40.2'	SEGERSTROM W/o TOWNSEND	146.9	147.0	144.8	0830	W: 1394 D: 416074	0	61007
DRWF 12 51.1'	HARVARD W/o FAIRVIEW	147.4	144.3	148.3	1435	W: 827 D: 457397	0	5298
DRWF 13 39.8'	SEGERSTROM W/o FAIRVIEW	146.4	141.5	143.3	1510	W: 3294 D: 550795	0	6579
DRWF 14 46.6'	WARNER W/o FAIRVIEW	152.9	150.2	149.1	1500	W: 2175 D: 899478	0	13732
DRWF 15 44.0'	WARNER E/o GREENVILLE	203.0	198.1	197.0	1050	W: 2736 D. 355446	6.4 ~~6.6~~	61586
DRWF 16 47.0'	BEHIND 2500 S. SUSAN ST.	147.0	143.0	143.7	1520	W. 179 D. 1151638	0	45715
DRWF 17 51.5'	2110 ANNE ST. S/o HARVARD	146.0	148.0	148.2	1450	W. 1408 D. 8443435	0	42293.00
DRWF 18 44.9'	WARNER W/o RAITT	138.7	141.5	142.4	1035	W: 1197 D: 196597	0	6058

Rev. 3/06

NAME Mike Miller DATE 9-30-08

IRWD WELL MONITORING FORM - EAST SIDE

WELL NAME SOUNDING TUBE ELEV	LOCATION	WATER LVL SCADA (IN OFFICE)	WATER LVL TRANSDUCER (IN FIELD)	DEPTH TO TOP OF OIL/WATER (FEET)	TIME OF FIELD READINGS	FLOW METER TOTALIZER READING(S)	FLOW RATE (CFS)	RUN TIME
IRWD 51 @ 39'	PULLMAN & DAIMLER	N/A	N/A	-95.8	8:45	N/A	N/A	N/A
IRWD 72 109.0'	WICKSHIRE E/o BROWNING	-097	-097	-097.2	9:30	83847	0	7605
IRWD 76 132.3	YALE & 5 FWY	-305	-305	-302	10:00	272640	1	12217
IRWD 77 109.6	ESCOLAR IRVINE HS	-243	-243	-233	9:50	640156	1.75	13981.7
IRWD 78 60.5'	WARNER & CULVER	-039	-039	-051	10:15	1732605	0	41896.8
IRWD 106	HARVARD & BARRANCA	N/A	N/A	-114	2:30	N/A	N/A	N/A
IRWD 107 112'	CULVER & 5 FWY	-200	-199.1	-199.1	—	off	off	off
IRWD 109	IRVINE & JAMBOREE	N/A	N/A	-077.1	12:45	N/A	N/A	N/A
IRWD 110 169.7	WALNUT & 5 FWY	—	—	-095.5	9:40	—	—	—
IRWD 111 ?	S/O TRABUCO N/O MARINE WAY	N/A	N/A	-126	1:30	N/A	N/A	N/A
IRWD 112 ?	BRYAN & MYFORD	N/A	N/A	-062	2:00	N/A	N/A	N/A
IRWD ET-2	CULVER & IRVINE CENTER	-50	-50	-50.6	10:30	789560551	0	141860.0
IRWD 115	5 FWY & PETER'S CYN WASH	N/A	N/A	-300	8:30	457248	1.75	N/A
ET-1 128.4'	JEFFREY & IRVINE CENTER	-073.5	-073.5	-073.5	10:45	872827690	0	16456
TIC 91 51.0'	BARRANCA W/o RED HILL	N/A	N/A	-105.1	9:00	N/A	N/A	N/A

Rev. 3/06

NAME Michael Pytlinski DATE 9/30/08

ATTACHMENT C

RBF CONSULTING

Table C-1
DRWF - Flow
Boundary Conditions

Month	Flow (gpm) ADD	MDD	PHD	Total Month (gpd)	Total Month (AF)
May-08	30,597	33,095	34,376	**837,135,454**	**2,569**
Jun-08	31,546	33,886	35,314	**1,362,787,107**	**4,182**
Jul-08	24,977	37,631	38,160	**1,079,008,146**	**3,311**
Aug-08	23,765	28,246	30,660	**1,053,273,760**	**3,232**
Sep-08	21,002	27,260	29,493	**907,268,463**	**2,784**
Oct-08	29,862	33,386	36,458	**1,326,326,043**	**4,070**
Nov-08	24,071	29,898	30,592	**1,039,885,609**	**3,191**
Dec-08	20,647	28,667	33,393	**922,789,992**	**2,832**
Jan-09	24,393	27,966	28,510	**1,088,912,657**	**3,342**
Feb-09	20,846	28,536	33,119	**900,562,404**	**2,764**
Mar-09	16,147	25,383	31,508	**719,139,304**	**2,207**
Apr-09	17,030	20,785	22,711	**735,707,594**	**2,258**
May-09	21,056	23,722	28,312	**935,472,850**	**2,871**
Jun-09	12,785	29,681	34,129	**552,308,385**	**1,695**
Summer Average	**23,675**			**-**	**2,949**
Summer Max	**-**	**37,631**	**38,160**	**-**	**-**
Winter Average	**20,523**	**-**	**-**	**-**	**2,766**
Winter Max	**-**	**33,386**	**36,458**	**-**	**-**

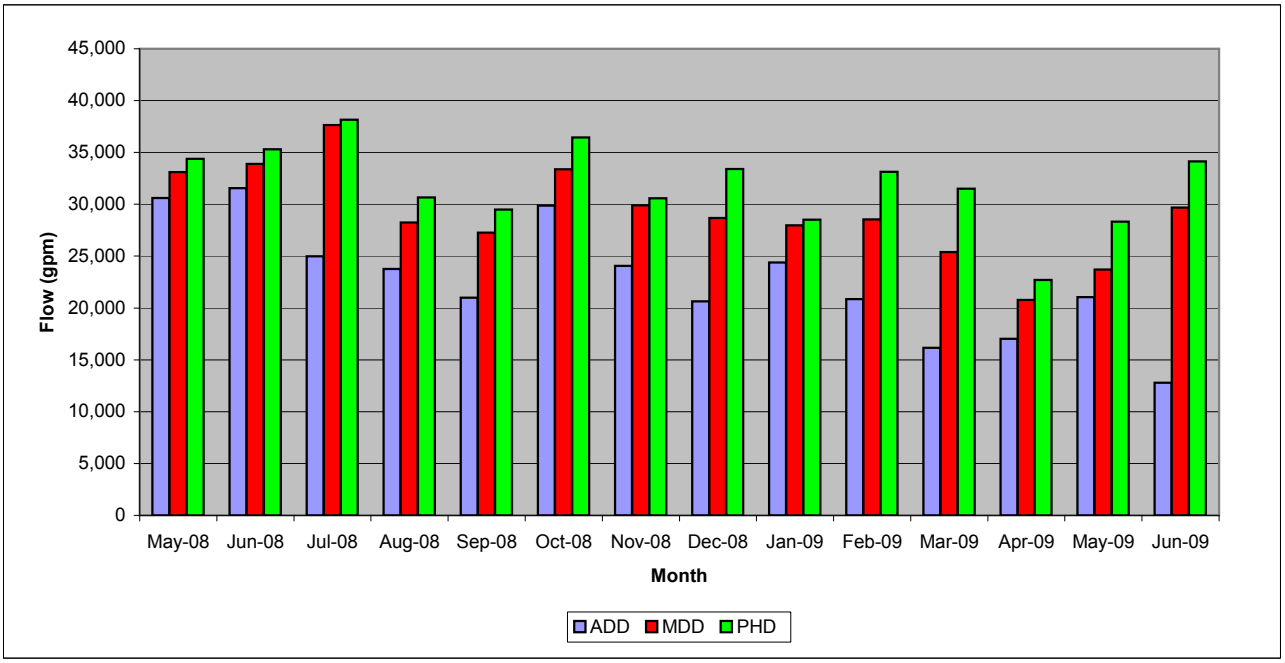


Table C-2
OC-7
Boundary Conditions

Month	Flow (gpm) ADD	MDD	PHD	Total Month (gpd)	Total Month
May-08	29	90	1,041	**800,623**	**2**
Jun-08	88	496	2,545	**3,782,290**	**12**
Jul-08	37	80	803	**1,581,318**	**5**
Aug-08	86	315	1,414	**3,712,273**	**11**
Sep-08	11	23	247	**476,388**	**1**
Oct-08	6	19	323	**279,531**	**1**
Nov-08	0	1	27	**5,925**	**0**
Dec-08	0	0	0	**0**	**0**
Jan-09	0	0	0	**0**	**0**
Feb-09	51	258	265	**2,221,170**	**7**
Mar-09	0	0	0	**0**	**0**
Apr-09	0	2	54	**3,232**	**0**
May-09	0	0	0	**0**	**0**
Jun-09	2	19	189	**88,330**	**0**
Summer Average	**36**			**-**	**5**
Summer Max	**-**	**496**	**2,545**	**-**	**-**
Winter Average	**9**	**-**	**-**	**-**	**1**
Winter Max	**-**	**258**	**323**	**-**	**-**

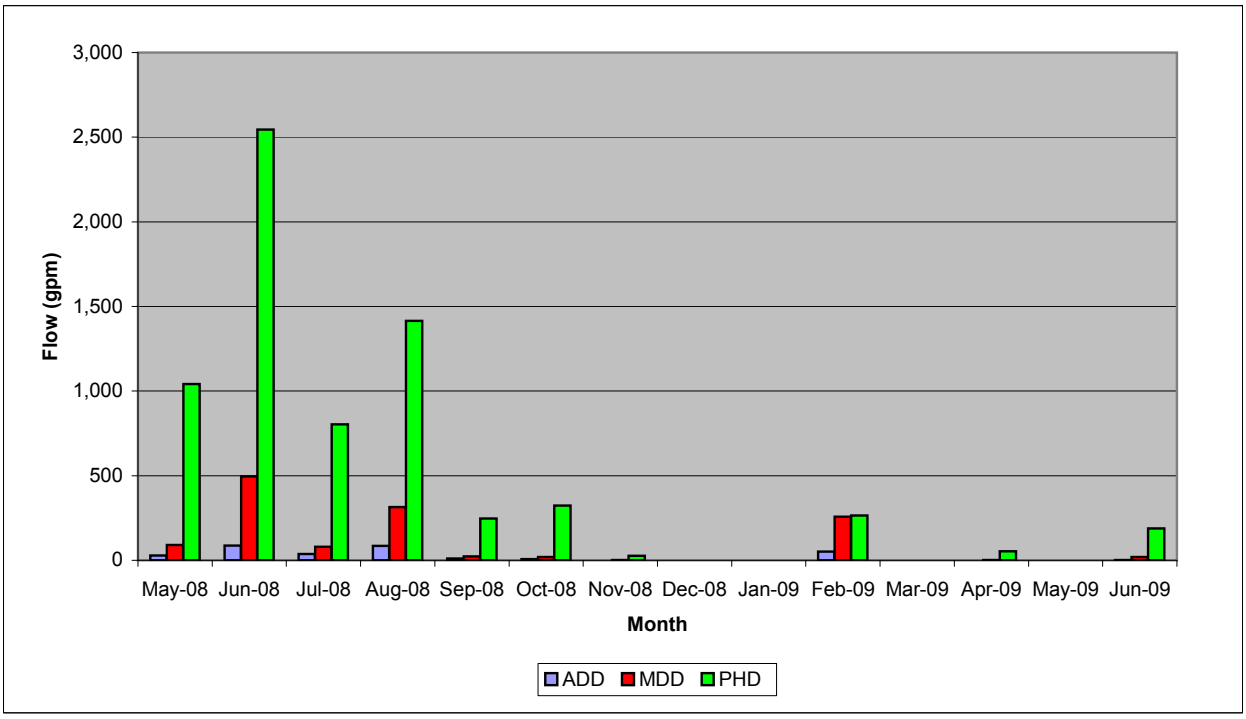


Table C-3
OC-38
Boundary Conditions

Month	Flow (gpm) ADD	MDD	PHD	Total Month (gpd)	Total Month
May-08	4	4	4	**120,107**	**0**
Jun-08	4	4	4	**193,895**	**1**
Jul-08	5	13	211	**206,821**	**1**
Aug-08	4	4	4	**200,358**	**1**
Sep-08	4	4	4	**192,548**	**1**
Oct-08	5	34	709	**242,637**	**1**
Nov-08	4	4	4	**193,895**	**1**
Dec-08	4	4	4	**200,358**	**1**
Jan-09	4	4	4	**200,358**	**1**
Feb-09	4	4	4	**180,968**	**1**
Mar-09	4	4	4	**200,088**	**1**
Apr-09	4	4	4	**187,701**	**1**
May-09	4	4	4	**198,203**	**1**
Jun-09	2	4	4	**103,141**	**0**
Summer Average	**4**	**6**	**34**	**-**	**1**
Summer Max	**-**	**13**	**211**	**-**	**-**
Winter Average	**4**	**-**	**-**	**-**	**1**
Winter Max	**-**	**34**	**709**	**-**	**-**

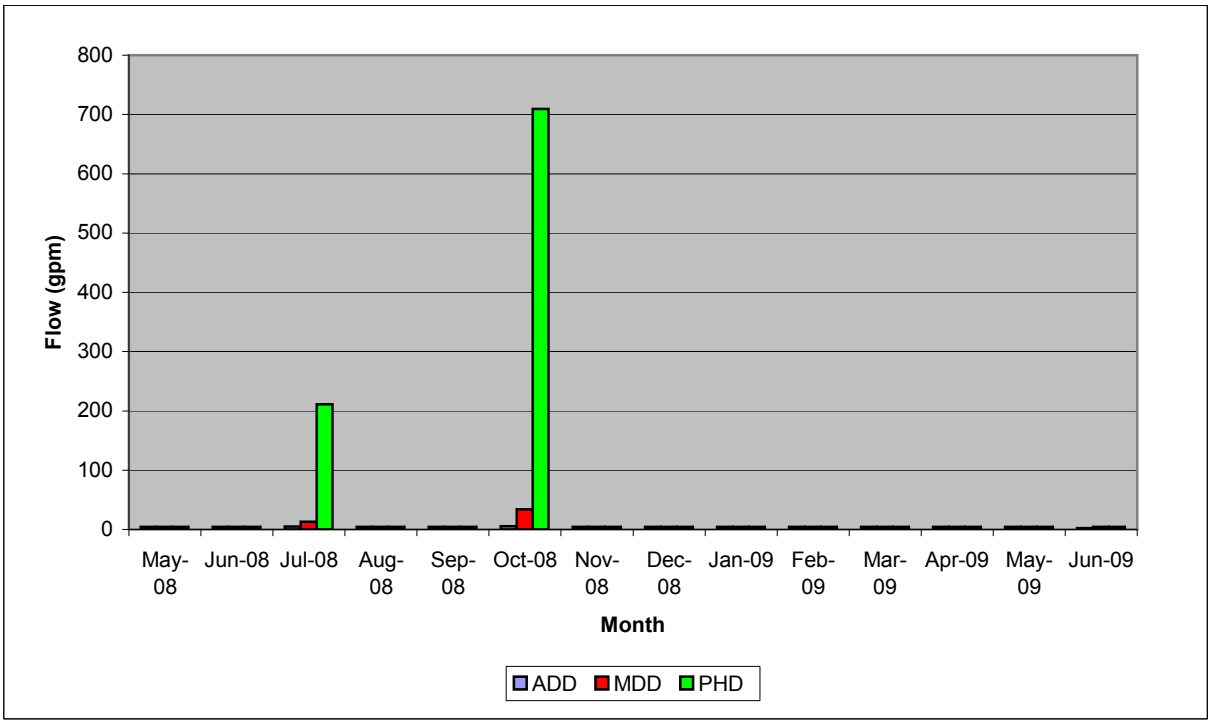


Table C-4
OC-39
Boundary Conditions

Month	Flow (gpm) ADD	MDD	PHD	Total Month (gpd)	Total Month
May-08	51	58	63	**1,395,502**	**4**
Jun-08	53	71	76	**2,301,421**	**7**
Jul-08	64	70	72	**2,749,263**	**8**
Aug-08	65	71	76	**2,920,806**	**9**
Sep-08	64	68	72	**2,757,612**	**8**
Oct-08	496	6,190	11,185	**21,540,070**	**66**
Nov-08	57	64	67	**2,478,619**	**8**
Dec-08	48	56	94	**2,126,377**	**7**
Jan-09	48	54	58	**2,137,149**	**7**
Feb-09	48	60	85	**2,071,979**	**6**
Mar-09	58	79	90	**2,584,722**	**8**
Apr-09	64	91	94	**2,755,726**	**8**
May-09	74	81	81	**3,284,089**	**10**
Jun-09	35	69	72	**1,500,528**	**5**
Summer Average	**58**	**70**	**73**	**-**	**7**
Summer Max	**-**	**81**	**81**	**-**	**-**
Winter Average	**54**	**-**	**-**	**-**	**7**
Winter Max	**-**	**6,190**	**11,185**	**-**	**-**

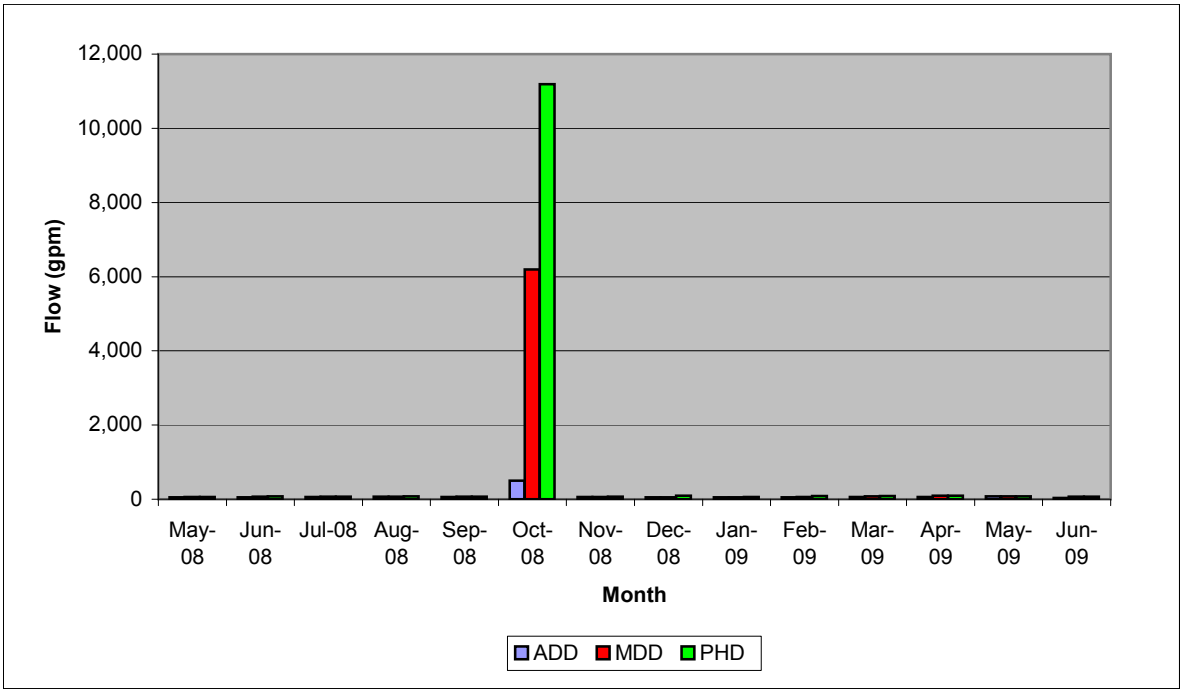


Table C-5
Zone 1 to 3 Pump Station - Sand Canyon
Boundary Conditions

Month	Flow (gpm) ADD	MDD	PHD	Total Month (gpd)	Total Month (AF)
May-08	5,617	8,558	8,932	**153,675,442**	**472**
Jun-08	6,003	8,439	11,118	**259,343,130**	**796**
Jul-08	2,115	9,729	10,574	**91,379,275**	**280**
Aug-08	1,532	3,877	8,977	**66,506,103**	**204**
Sep-08	1,071	3,496	7,231	**46,258,395**	**142**
Oct-08	6,971	9,635	10,785	**306,088,146**	**939**
Nov-08	4,490	7,451	9,017	**193,953,806**	**595**
Dec-08	4,484	7,927	9,466	**201,429,249**	**618**
Jan-09	6,211	8,948	11,319	**278,957,181**	**856**
Feb-09	5,035	9,003	11,122	**217,505,262**	**668**
Mar-09	1,555	6,602	7,648	**67,518,395**	**207**
Apr-09	230	293	1,463	**9,931,441**	**30**
May-09	1,283	2,021	4,075	**56,375,921**	**173**
Jun-09	1,534	5,306	7,679	**66,262,658**	**203**
Summer Average	**2,736**			**-**	**324**
Summer Max	**-**	**9,729**	**11,118**	**-**	**-**
Winter Average	**3,667**	**-**	**-**	**-**	**496**
Winter Max	**-**	**9,635**	**11,319**	**-**	**-**

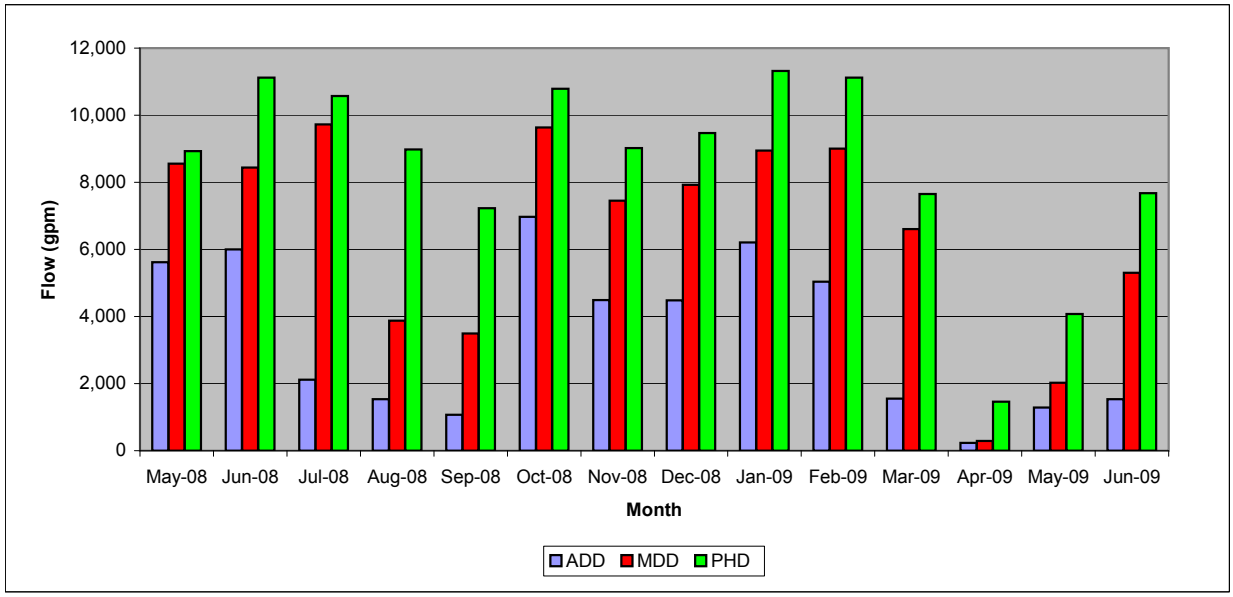


Table C-6
Zone 1 to 3 Pump Station - Tustin
Boundary Conditions

Month	Flow (gpm) ADD	MDD	PHD	Total Month (gpd)	Total Month
May-08	1,511	2,570	2,895	**41,328,087**	**127**
Jun-08	1,482	2,635	3,694	**64,018,059**	**196**
Jul-08	616	2,606	2,671	**26,596,140**	**82**
Aug-08	82	1,234	2,590	**3,560,927**	**11**
Sep-08	174	1,724	2,895	**7,519,069**	**23**
Oct-08	1,476	2,596	3,478	**64,830,801**	**199**
Nov-08	1,607	2,486	2,680	**69,443,606**	**213**
Dec-08	1,154	2,521	3,474	**49,859,717**	**153**
Jan-09	1,543	2,464	2,594	**68,016,596**	**209**
Feb-09	1,177	2,377	2,563	**50,849,926**	**156**
Mar-09	407	2,401	2,666	**17,599,701**	**54**
Apr-09	0	1	4	**1,616**	**0**
May-09	0	0	4	**539**	**0**
Jun-09	453	2,344	2,890	**19,582,543**	**60**
Summer Average	**617**	**1,873**	**2,520**	**-**	**71**
Summer Max	**-**	**2,635**	**3,694**	**-**	**-**
Winter Average	**982**	**-**	**-**	**-**	**131**
Winter Max	**-**	**2,596**	**3,478**	**-**	**-**

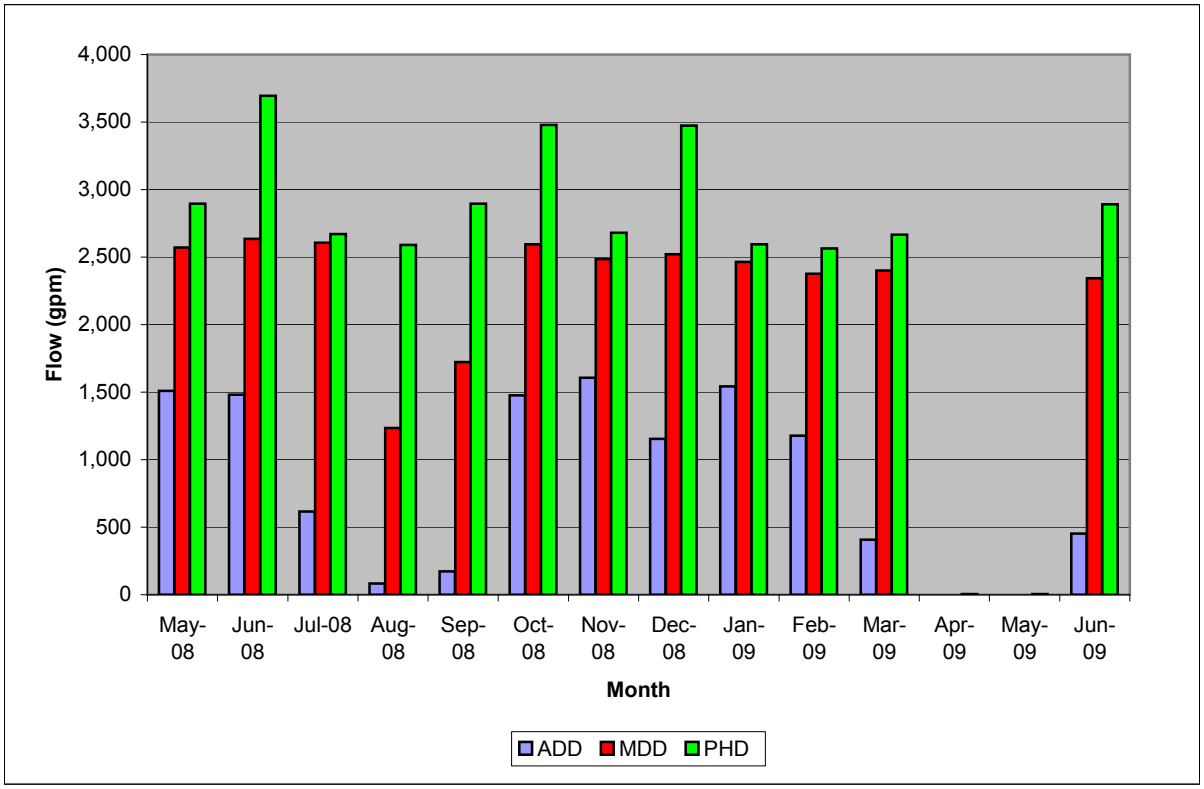
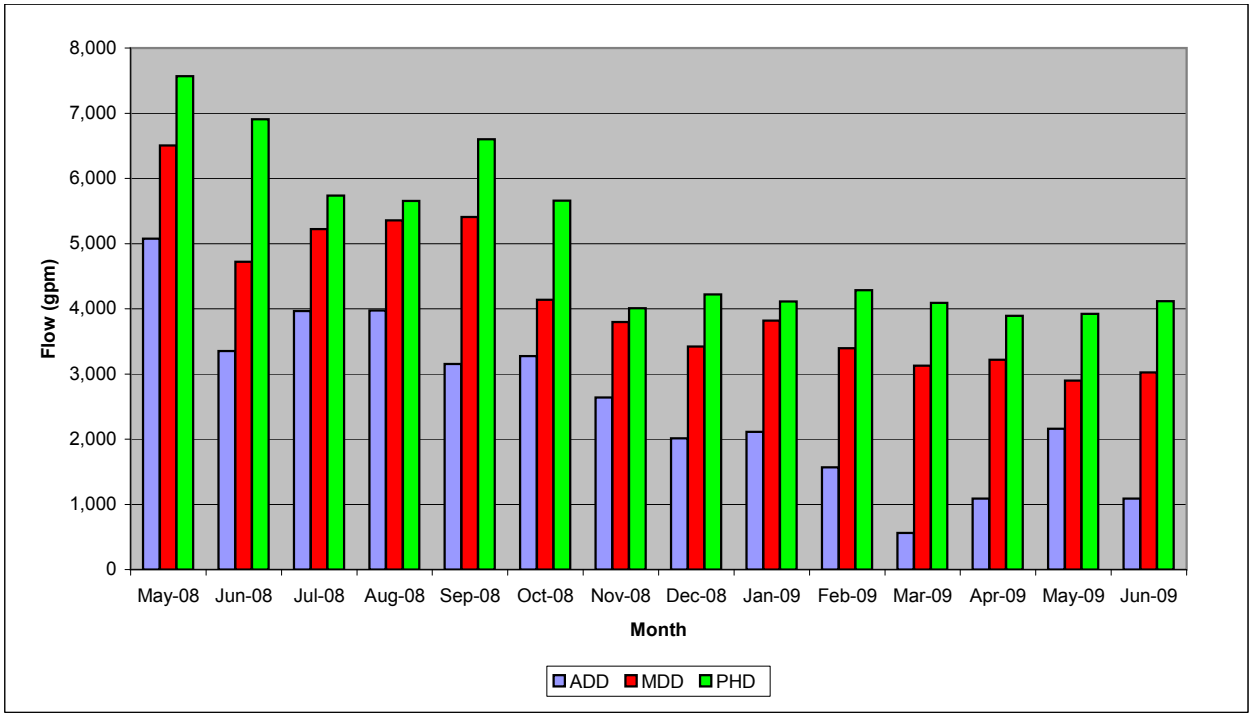


Table C-7
Zone 1 to 3 Pump Station - Turtle Rock
Boundary Conditions

Month	Flow (gpm) ADD	MDD	PHD	Total Month (gpd)	Total Month
May-08	5,076	6,504	7,567	**138,892,329**	**426**
Jun-08	3,350	4,722	6,907	**144,733,941**	**444**
Jul-08	3,965	5,223	5,736	**171,283,492**	**526**
Aug-08	3,972	5,357	5,655	**177,108,408**	**544**
Sep-08	3,155	5,407	6,602	**136,294,949**	**418**
Oct-08	3,275	4,137	5,660	**145,285,194**	**446**
Nov-08	2,638	3,795	4,008	**113,948,063**	**350**
Dec-08	2,011	3,422	4,219	**91,361,232**	**280**
Jan-09	2,112	3,818	4,111	**95,824,846**	**294**
Feb-09	1,568	3,395	4,286	**67,734,372**	**208**
Mar-09	562	3,126	4,089	**24,290,680**	**75**
Apr-09	1,088	3,220	3,891	**46,995,463**	**144**
May-09	2,162	2,901	3,923	**96,131,846**	**295**
Jun-09	1,089	3,025	4,116	**47,057,402**	**144**
Summer Average	**3,253**	**4,734**	**5,787**	**-**	**400**
Summer Max	**-**	**6,504**	**7,567**	**-**	**-**
Winter Average	**1,663**	**-**	**-**	**-**	**225**
Winter Max	**-**	**4,137**	**5,660**	**-**	**-**



ATTACHMENT D

RBF CONSULTING

IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 ZONE 1 BLENDING STATION ALTERNATIVE
ATTACHMENT D: ESTIMATE OF CAPITAL COSTS

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
1	**Barranca/Red Hill Zone 1 Blending Station**				
	General [2,3]				
	Mobilization/Demobilization	1	LS	$154,000	$154,000
	Bonding and Insurance	1	LS	$39,000	$39,000
	Land Acquisition (1/2 acre)	21800	SF	$33	$719,400
	Site Work				
	Site Grading	1	LS	$20,000	$20,000
	Site Paving Materials	15000	SF	$5.50	$82,500
	Site Access and Perimeter Improvements	1	LS	$150,000	$150,000
	Flow Meter Vault	1	LS	$25,000	$25,000
	Blending Station Building @ corner of Barranca Ave and Red Hill Ave on MCAS site	1000	SF	$350	$350,000
	Mechanical [4]				
	36-Inch Motor Operated Plug Valve	1	EA	$200,000	$200,000
	54-Inch Butterfly Valve	2	EA	$90,000	$180,000
	Plug Valve Vault in Barranca	1	EA	$150,000	$150,000
	Cut In 54 x 54 x 36-Inch Tee	1	EA	$25,000	$25,000
	30-Inch Steel Bypass Piping from DRWF 54" to Blend Station	100	LF	$400	$40,000
	54-Inch Steel Bypass Piping from Existing DRWF 54" Pipeline	550	LF	$720	$396,000
	54-Inch Butterfly Valve	1	EA	$90,000	$90,000
	36-Inch Manually Operated Butterfly Valve	1	EA	$40,000	$40,000
	36-Inch Check Valve	2	EA	$35,000	$70,000
	30-Inch Magnetic Flow Meter	1	EA	$55,000	$55,000
	Flow Meter Vault	1	EA	$30,000	$30,000
	4-Inch Air and Vacuum Release Valve	2	EA	$6,500	$13,000
	36-Inch Variable Flow Static Mixer System	1	EA	$100,000	$100,000
	36-Inch Motor Operated Butterfly Valve	1	EA	$40,000	$40,000
	On-Line Nitrate Analyzer	1	EA	$17,500	$17,500
	36-Inch Discharge Piping to DRWF	100	LF	$450	$45,000
	Miscellaneous Couplings, Taps and Fittings	1	LS	$125,000	$125,000
	Emergency Back-up power	1	LS	$45,000	$45,000
	Electrical, Control and Instrumentation[9]	1	EA	$631,000	$631,000
	Item No 1 Total				**$3,830,000**
2	**Wells 21 and 22 Wellhead Equipping**				
	Well 21				
	General [2,3]				***$87,500***
	Mobilization/Demobilization	1	LS	$70,000	$70,000
	Bonding and Insurance	1	LS	$17,500	$17,500
	Site Work				***$160,950***
	Excavation and Clearing	1	LS	$8,000	$8,000
	Site Paving Materials	6800	SF	$5.50	$37,400
	Concrete Swales for Site Drainage	300	LF	$40	$12,000
	Concrete Driveway	15	CY	$550	$8,250
	Manway	1	EA	$2,500	$2,500
	Switchgear and Transformer Concrete Pads	1	LS	$3,500	$3,500

IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 ZONE 1 BLENDING STATION ALTERNATIVE
ATTACHMENT D: ESTIMATE OF CAPITAL COSTS

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
	Concrete Well Block	1	LS	$6,500	$6,500
	Discharge Piping Concrete Pad	7	CY	$400	$2,800
	Electrical Building w/HVAC	200	SF	$400	$80,000
	Mechanical [5]				***$726,550***
	500 HP Pump and Motor Equipment	1	EA	$450,000	$450,000
	270 ft of 12-Inch plain steel well pump column piping	270	LF	$200	$54,000
	18-Inch Steel Discharge Head and Wellhead Piping	1	LS	$12,500	$12,500
	12-Inch Steel Pump to Waste Piping	1	LS	$3,500	$3,500
	18-Inch C-905 Well Discharge Piping to Untreated Water Transmission Line in Mitchell Ave	110	LF	$125	$13,750
	12-Inch Steel Well Pump to Waste Piping	60	LF	$110	$6,600
	12-Inch Double Check Assembly	1	EA	$14,000	$14,000
	Pump to Waste Storm Drain Connection	1	EA	$15,000	$15,000
	18-Inch Motor Operated Isolation Valve	1	EA	$19,500	$19,500
	12-Inch Motor Operated Isolation Valve	1	EA	$12,500	$12,500
	8-Inch Well Isolation Valve	1	EA	$4,200	$4,200
	18-Inch Magnetic Flow Meter	1	EA	$20,000	$20,000
	8-Inch Well Pressure Relief Valve	1	EA	$13,500	$13,500
	3-Inch Well Anti-Surge Air Relief/Vacuum Assembly	1	EA	$5,000	$5,000
	3-Inch Well Air Relief/Vacuum Assembly	1	EA	$2,500	$2,500
	Bladder Type Surge Tank Assembly (Assumed 500 Gal)	1	EA	$60,000	$60,000
	Miscellaneous Couplings, Taps etc	1	LS	$20,000	$20,000
	Electrical				***$750,100***
	Electric Utility Connection fee	1	LS	$3,000	$3,000
	400HP 18-pulse VFD	1	EA	$250,000	$250,000
	4160V Metered Switchboard	1	EA	$200,000	$200,000
	120/208V 3 phase lighting panel	1	EA	$2,200	$2,200
	4160V-120/208V 3 phase dry type transformer	1	EA	$40,000	$40,000
	Concrete pad (for Utility transformer)	1	EA	$7,000	$7,000
	Conduit and Wire	1	LS	$100,000	$100,000
	Lighting	1	LS	$12,000	$12,000
	Ground Rod System	1	EA	$900	$900
	Receptacles, switches, junction boxes, etc.	1	LS	$5,000	$5,000
	Instrumentation	1	LS	$10,000	$10,000
	Control Panel, including PLC, UPS, etc.	1	EA	$90,000	$90,000
	PLC Programming	1	LS	$30,000	$30,000
	Subtotal Well 21 - Wellhead Equipping				**$1,725,100**
	Well 22				
	General [2,3]				***$63,000***
	Mobilization/Demobilization	1	LS	$50,000	$50,000
	Bonding and Insurance	1	LS	$13,000	$13,000
	Site Work				***$152,700***
	Excavation and Clearing	1	LS	$8,000	$8,000
	Site Paving Materials	6800	SF	$5.50	$37,400
	Concrete Swales for Site Drainage	300	LF	$40	$12,000
	Manway	1	EA	$2,500	$2,500

IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 ZONE 1 BLENDING STATION ALTERNATIVE
ATTACHMENT D: ESTIMATE OF CAPITAL COSTS

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
	Switchgear and Transformer Concrete Pads	1	LS	$3,500	$3,500
	Concrete Well Block	1	LS	$6,500	$6,500
	Discharge Piping Concrete Pad	7	CY	$400	$2,800
	Electrical Building w/HVAC	200	SF	$400	$80,000
	Mechanical [5]				***$620,300***
	350 HP Pump and Motor Equipment	1	EA	$350,000	$350,000
	460 ft of 10-Inch plain steel well pump column piping	460	LF	$190	$87,400
	12-Inch Steel Discharge Head and Wellhead Piping	1	LS	$6,500	$6,500
	10-Inch Steel Pump to Waste Piping	1	LS	$3,000	$3,000
	12-Inch Steel Well Discharge Piping to Untreated Water Transmission Line in Mitchell Ave	105	LF	$120	$12,600
	10-Inch Steel Well Pump to Waste Piping to Storm Drain Connection	70	LF	$100	$7,000
	10-Inch Double Check Assembly	1	EA	$12,500	$12,500
	Pump to Waste Storm Drain Connection	1	EA	$10,000	$10,000
	12-Inch Motor Operated Isolation Valve	1	EA	$12,500	$12,500
	10-Inch Motor Operated Isolation Valve	1	EA	$11,000	$11,000
	6-Inch Well Isolation Valve	1	EA	$3,500	$3,500
	12-Inch Magnetic Flow Meter	1	EA	$14,000	$14,000
	6-Inch Well Pressure Relief Valve	1	EA	$8,500	$8,500
	3-Inch Well Anti-Surge Air Relief/Vacuum Assembly	1	EA	$5,000	$5,000
	2-Inch Well Air Relief/Vacuum Assembly	1	EA	$1,800	$1,800
	Bladder Type Surge Tank Assembly (Assumed 500 Gal)	1	EA	$60,000	$60,000
	Miscellaneous Couplings, Taps etc	1	LS	$15,000	$15,000
	Electrical				***$417,900***
	Electric Utility Connection fee	1	LS	3,000.00	$3,000
	MCC w/ 30 kVA TX, panel board, and Manual transfer switch	1	EA	65,000.00	$65,000
	250HP 18-pulse VFD w/ Multilin 369 relay	1	EA	70,000.00	$70,000
	480V Metered Switchboard, 600 Ampere	1	EA	35,000.00	$35,000
	Concrete pad (for Utility transformer)	1	EA	7,000.00	$7,000
	Conduit and Wire	1	LS	90,000.00	$90,000
	Lighting	1	LS	12,000.00	$12,000
	Ground Rod System	1	EA	900.00	$900
	Receptacles, switches, junction boxes, etc.	1	LS	5,000.00	$5,000
	Instrumentation	1	LS	10,000.00	$10,000
	Control Panel, including PLC, UPS, etc.	1	EA	90,000.00	$90,000
	PLC Programming	1	LS	30,000.00	$30,000
	Subtotal Well 22 - Wellhead Equipping				**$1,253,900**
	ITEM NO 2 TOTAL				**$2,980,000**
3	**Wells 21 and 22 Chloramination Disinfection System**				
	General [2,3]				
	Mobilization/Demobilization	1	LS	$25,000	$25,000
	Bonding and Insurance	1	LS	$6,500	$6,500
	Building and Site Work				
	20' x 40' Disinfection Building (Masonry)	800	SF	$300	$240,000
	HVAC	1	LS	$20,000	$20,000
	4" Drain Pipe	150	LF	$25	$3,750

IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 ZONE 1 BLENDING STATION ALTERNATIVE
ATTACHMENT D: ESTIMATE OF CAPITAL COSTS

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
	Chlorine System				
	On Site Hypochlorite Generation Package	1	LS	$135,000	$135,000
	2,000 Gallon NaOCl Storage & Containment	1	EA	$30,000	$30,000
	Meters, Pumps, Valves and Piping Assembly	1	LS	$25,000	$25,000
	Chem Feed Piping to Connection	1	LS	$3,000	$3,000
	Static Mixer	1	EA	$3,500	$3,500
	Ammonia System				
	1,000 gallon NH3 Storage and Containment	1	LS	$25,000	$25,000
	Metering Pumps, Valves and Piping Assembly	1	LS	$35,000	$35,000
	Chem Feed Piping to Connection	1	LS	$3,000	$3,000
	Static Mixer	1	EA	$3,500	$3,500
	Analyzers	1	LS	$35,000	$35,000
	Electrical, Control and Instrumentation	1	LS	$50,000	$50,000
	Eye Wash & Shower Assembly	1	EA	$1,800	$1,800
	ITEM NO 3 TOTAL				**$645,050**
4	**Untreated Groundwater Conveyance Piping**				
	General [2,3]				
	Mobilization/Demobilization	1	LS	$190,000	$190,000
	Bonding and Insurance	1	LS	$48,000	$48,000
	Pipeline Construction [7,8]				
	18-Inch PVC Untreated Water Transmission Line from Well 21 to Well 22	700	LF	$150	$105,000
	Demolition of Francis Mutual Pipeline from Well 21 to Well 22	700	LF	$30	$21,000
	24-Inch PVC Untreated Water Transmission Line from Well 22 to Red Hill Ave/Mitchell Ave Intersection	1,400	LF	$180	$252,000
	Demolition of Francis Mutual Pipeline from Well 22 to Red Hill Ave/Mitchell Ave Intersection	1,400	LF	$30	$42,000
	24-Inch PVC Untreated Water Transmission Line from Red Hill Ave/Mitchell Ave to Barranca Pkwy	12,000	LF	$250	$3,000,000
	Major Intersection Utility Relocations	3	EA	$150,000	$450,000
	24-Inch Carrier w/42-Inch Casing Pipe for Jack and Bore Crossing for Railroad at Edinger Ave	300	LF	$1,500	$450,000
	Pipeline Appurtenances				
	18-Inch Isolation Valves	1	EA	$30,000	$30,000
	24-Inch Isolation Valves	2	EA	$40,000	$80,000
	Blow Off Assembly	2	EA	$8,500	$17,000
	Air/Vac Assembly	4	EA	$10,000	$40,000
	Cathodic Protection Testing Stations	24	EA	$650	$15,600
	ITEM NO 4 TOTAL				**$4,740,000**
5	**Dyer Road Well field Upgrades**[6]				
	General [2,3]				
	Mobilization/Demobilization	1	LS	$70,000	$70,000
	Bonding and Insurance	1	LS	$20,000	$20,000
	Mechanical Improvements				
	Install Additional Pump Stage for Increased TDH requirements	3	EA	$30,000	$90,000
	Install New Motors for Increased Horsepower requirements	3	EA	$150,000	$450,000
	Surge Protection Upgrades[10]	16	EA	$40,000	$640,000
	Electrical Upgrades[9]	1	LS	$236,000	$236,000
	ITEM NO 5 TOTAL				**$1,506,000**

IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 ZONE 1 BLENDING STATION ALTERNATIVE
ATTACHMENT D: ESTIMATE OF CAPITAL COSTS

Item No.	Item Description	Quantity	Unit	Unit Price[1]	Total Price[1]
	Subtotal Items 1-5				**$13,701,050**
	Contingencies @ 25%				**$3,430,000**
	Engineering [11]				**$2,570,000**
6	**District Costs**				
	Pre-Construction Phase				***$269,000***
	Design Engineer Procurement	1	LS	$4,000	$4,000
	Environmental Studies	1	LS	$21,000	$21,000
	Project Design	1	LS	$240,000	$240,000
	Bid Phase	1	LS	$4,000	$4,000
	Construction Phase				***$429,000***
	Construction Management	1	LS	$408,000	$408,000
	Startup Services	1	LS	$11,000	$11,000
	Contract Closeout	1	LS	$10,000	$10,000
	Other Direct Costs				***$27,325***
	Travel	1	LS	$3,000	$7,325
	Equipment	1	LS	$12,000	$12,000
	Supplies and Materials	1	LS	$8,000	$8,000
	ITEM NO 6 TOTAL - DISTRICT COSTS				**$730,000**
	TOTAL ESTIMATE OF CAPITAL COST				**$20,430,000**

Notes:

1 Capital cost are Class 5 Estimates as defined by AACEI for concept level screening

2 Includes Mobilization and Demobilization estimated at approximately 4% of total construction costs
3 Includes Bonding and insurance assumed at approximately 1% of total construction costs
4 Mechanical equipment based on preliminary blending station design and includes all on-site equipment and piping to and from DRWF 54-Inch Pipeline
5 Includes all on-site well equipment as defined in Wells 21 and 22 PDR and off-site piping to Untreated Water Conveyance Pipeline connection in Mitchell Ave
6 Upgrades based on results of Hydraulic Model Impacts to Dyer Road Well Field

7 Pipeline construction includes traffic control and pavement replacement, where applicable
8 Assumes Trench section per IRWD standards

9 Electrical assumed at 20% of construction cost
10 Assumes each well site will require a new 500 gallon bladder type surge tank and associated piping/instruments
11 Assumes 15% of Construction Cost for Consultant costs for Design, Bid Phase, Construction Management, Start-up Services, Contract Close-out, Direct Costs, and Environmental Compliance

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APPENDIX M

HYDRAULIC CALCULATIONS

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WELL 21 - MINOR HEAD LOSS CALCULATION

Low Flow Pumps

NO.	FITTING DESCRIPTION [1]	Quantity	Unit K	Total K	Diameter (in.)
1	Pump Strainer	1	5.5	5.5	16
2	Pump Loss	1	1	1	16
3	90 Degree Discharge Head	1	1	1	18
4	Tee - Inline Flow	2	0.6	1.2	18
5	Check Valve	1	2.5	2.5	18
6	45 Degree Elbow	2	0.25	0.5	24
6	90 Degree Elbow	3	0.75	2.25	18
7	Flow Meter - Mag	1	0.05	0.05	18
8	Butterfly Valve - 150lb [3]	1	0.35	0.35	18
9	90 Degree Elbow	9	0.75	6.75	24

Q (gpm)	0	300	600	900	1200	1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5100	5400
Q (cfs)	0.0	0.7	1.3	2.0	2.7	3.3	4.0	4.7	5.3	6.0	6.7	7.4	8.0	8.7	9.4	10.0	10.7	11.4	12.0
	0.00	0.02	0.08	0.18	0.31	0.49	0.70	0.96	1.25	1.59	1.96	2.37	2.82	3.31	3.84	4.40	5.01	5.66	6.34
	0.00	0.00	0.01	0.03	0.06	0.09	0.13	0.17	0.23	0.29	0.36	0.43	0.51	0.60	0.70	0.80	0.91	1.03	1.15
	0.00	0.00	0.01	0.02	0.04	0.06	0.08	0.11	0.14	0.18	0.22	0.27	0.32	0.38	0.44	0.50	0.57	0.64	0.72
	0.00	0.00	0.01	0.02	0.04	0.07	0.10	0.13	0.17	0.22	0.27	0.32	0.38	0.45	0.52	0.60	0.68	0.77	0.86
	0.00	0.01	0.02	0.05	0.09	0.14	0.20	0.27	0.36	0.45	0.56	0.67	0.80	0.94	1.09	1.25	1.42	1.60	1.80
	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11
	0.00	0.00	0.02	0.04	0.08	0.12	0.18	0.24	0.32	0.40	0.50	0.60	0.72	0.84	0.98	1.12	1.28	1.44	1.62
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.04
	0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.11	0.13	0.15	0.17	0.20	0.22	0.25
	0.00	0.19	0.26	0.33	0.41	0.51	0.61	0.72	0.84	0.97	1.12	1.27	1.43	1.59	1.77	1.96	2.16	2.37	2.58

TOTAL HEADLOSS DUE TO FITTINGS, VALVES AND OTHER (ft) =	0.0	0.2	0.4	0.7	1.1	1.6	2.2	2.9	3.6	4.5	5.5	6.5	7.7	8.9	10.3	11.7	13.3	14.9	16.7

Well 21
HYDRAULIC CALCULATIONS

$Z_1+P_1/\gamma+V_1^2/2g+M=Z_2+P_2/\gamma+V_2^2/2g+H_L$

$H_L = (Z_2-Z_1)+H_f+H_m$	Total Headloss
$H_f = \frac{10.44*L*(Q)^{1.85}}{(C^{1.85})*(D^{4.86})}$	Friction Loss
$H_m = K(V^2/2g)$	Minor Loss

TP = Treatment Plant

Static Lift

Well 21. Z_1=	111	feet	
TP Elev. $Z_{2\ (well\ site)}$ =	86	feet	
Static Lift. Z_w =	-25	feet	
Static Water Level w/interf (low)	45	feet	(95- 50 + 0)
Static Water Level w/interf(med)	97	feet	97
Static Water Level w/interf (high)	141	feet	(95 + 30 + 16)
Specific Capacity (low)	57	gpm/ft	
Specific Capacity (typ)	67	gpm/ft	
Specific Capacity (max)	77	gpm/ft	

Assumes 30 additional feet of static drop and 50 feet of static rise w/interference from 0 to 16 feet (7 ft typ)

Pipe/Well Data

Pump Column ID (A)	16	inches	
Well Discharge Pipe ID (B)	18	inches	
Untreated Conveyance PL (C)	24	inches	
Pipe Area (A)	1.40	sf	
Pipe Area (B)	1.77	sf	
Pipe Area (C)	3.14	sf	
Straight Pipe Length (A) =	270	feet	Pump column and above grade discharge
Straight Pipe Length (B) =	600	feet	
Straight Pipe Length (C) =	6,900	feet	
Orifice Plate Bore Size	8.0	in	Number of 102.6 serves to negate orfice pressure drop to 0
Common Pipe Length	10000	feet	
Common Pipe Diamter	24	in	

200

Hazen Williams C

Max C	150
Typ C	130
Min C	110

Well 21 - PUMP TO TREATMENT PLANT SYSTEM CURVE

		Pipe Loss (ft)				Static Lift												
Flow, gpm	$V^2/2g$	Minor/Fittings Losses	Friction Loss, Max	Friction Loss, Typ.	Friction Loss, Min	Low Static Water Level, ft bgs	Static Water Level Typ, ft bgs	High Static Water Level, ft bgs	Low Estimated Drawdown, ft	Typ Estimated Drawdown, ft	High Estimated Drawdown, ft	Well/TP Elevation Difference, ft	Low Inlet Head @ TP, psi	Typ Inlet Head @ TP, psi	High Inlet Head @ TP, psi	Low TDH, ft	Typ TDH, ft	HighTDH, ft
0	0.00	0.00	0.00	0.00	0.00	141.0	97.0	45.0	0.0	0.0	0.0	-25.0	40.0	50.0	60.0	112.4	187.5	254.6
300	0.00	0.23	2.76	2.02	1.55	141.0	97.0	45.0	3.9	4.5	5.3	-25.0	40.0	50.0	60.0	118.1	194.2	262.9
600	0.01	0.43	3.74	2.75	2.11	141.0	97.0	45.0	7.8	9.0	10.5	-25.0	40.0	50.0	60.0	122.7	199.6	269.3
900	0.02	0.72	4.91	3.61	2.77	141.0	97.0	45.0	11.7	13.4	15.8	-25.0	40.0	50.0	60.0	127.6	205.3	276.0
1200	0.04	1.11	6.26	4.60	3.53	141.0	97.0	45.0	15.6	17.9	21.1	-25.0	40.0	50.0	60.0	132.6	211.1	283.0
1500	0.06	1.59	7.78	5.71	4.38	141.0	97.0	45.0	19.5	22.4	26.3	-25.0	40.0	50.0	60.0	137.9	217.2	290.3
1800	0.08	2.17	9.47	6.95	5.33	141.0	97.0	45.0	23.4	26.9	31.6	-25.0	40.0	50.0	60.0	143.3	223.5	297.8
2100	0.11	2.85	11.32	8.31	6.38	141.0	97.0	45.0	27.3	31.3	36.8	-25.0	40.0	50.0	60.0	148.9	230.0	305.6
2400	0.14	3.63	13.34	9.79	7.51	141.0	97.0	45.0	31.2	35.8	42.1	-25.0	40.0	50.0	60.0	154.7	236.7	313.7
2700	0.18	4.50	15.51	11.39	8.74	141.0	97.0	45.0	35.1	40.3	47.4	-25.0	40.0	50.0	60.0	160.7	243.7	322.0
3000	0.22	5.46	17.84	13.10	10.05	141.0	97.0	45.0	39.0	44.8	52.6	-25.0	40.0	50.0	60.0	166.9	250.8	330.5
3300	0.27	6.53	20.33	14.92	11.45	141.0	97.0	45.0	42.9	49.3	57.9	-25.0	40.0	50.0	60.0	173.2	258.2	339.3
3600	0.32	7.68	22.97	16.86	12.94	141.0	97.0	45.0	46.8	53.7	63.2	-25.0	40.0	50.0	60.0	179.8	265.8	348.4
3900	0.38	8.94	25.76	18.91	14.51	141.0	97.0	45.0	50.6	58.2	68.4	-25.0	40.0	50.0	60.0	186.5	273.6	357.7
4200	0.44	10.29	28.70	21.07	16.17	141.0	97.0	45.0	54.5	62.7	73.7	-25.0	40.0	50.0	60.0	193.4	281.5	367.3
4500	0.50	11.74	31.79	23.34	17.91	141.0	97.0	45.0	58.4	67.2	78.9	-25.0	40.0	50.0	60.0	200.5	289.7	377.1
4800	0.57	13.29	35.03	25.72	19.74	141.0	97.0	45.0	62.3	71.6	84.2	-25.0	40.0	50.0	60.0	207.8	298.1	387.1
5100	0.64	14.93	38.42	28.20	21.64	141.0	97.0	45.0	66.2	76.1	89.5	-25.0	40.0	50.0	60.0	215.2	306.8	397.4
5400	0.72	16.67	41.95	30.79	23.63	141.0	97.0	45.0	70.1	80.6	94.7	-25.0	40.0	50.0	60.0	222.8	315.6	407.9
5700	0.80	18.50	45.62	33.49	25.70	141.0	97.0	45.0	74.0	85.1	100.0	-25.0	40.0	50.0	60.0	230.6	324.6	418.7

PUMP DESIGN INFO

PUMP MODEL	Flowserve 16EMH
Speed (rpm)	1800

18.5 68.70127371

Pump Curve RPM 1800

Flow Rate (gpm)	Total Head (ft)
0	470
500	450
1000	420
1500	405
2000	390
2500	375
3000	358
3500	325
4000	270
4500	195

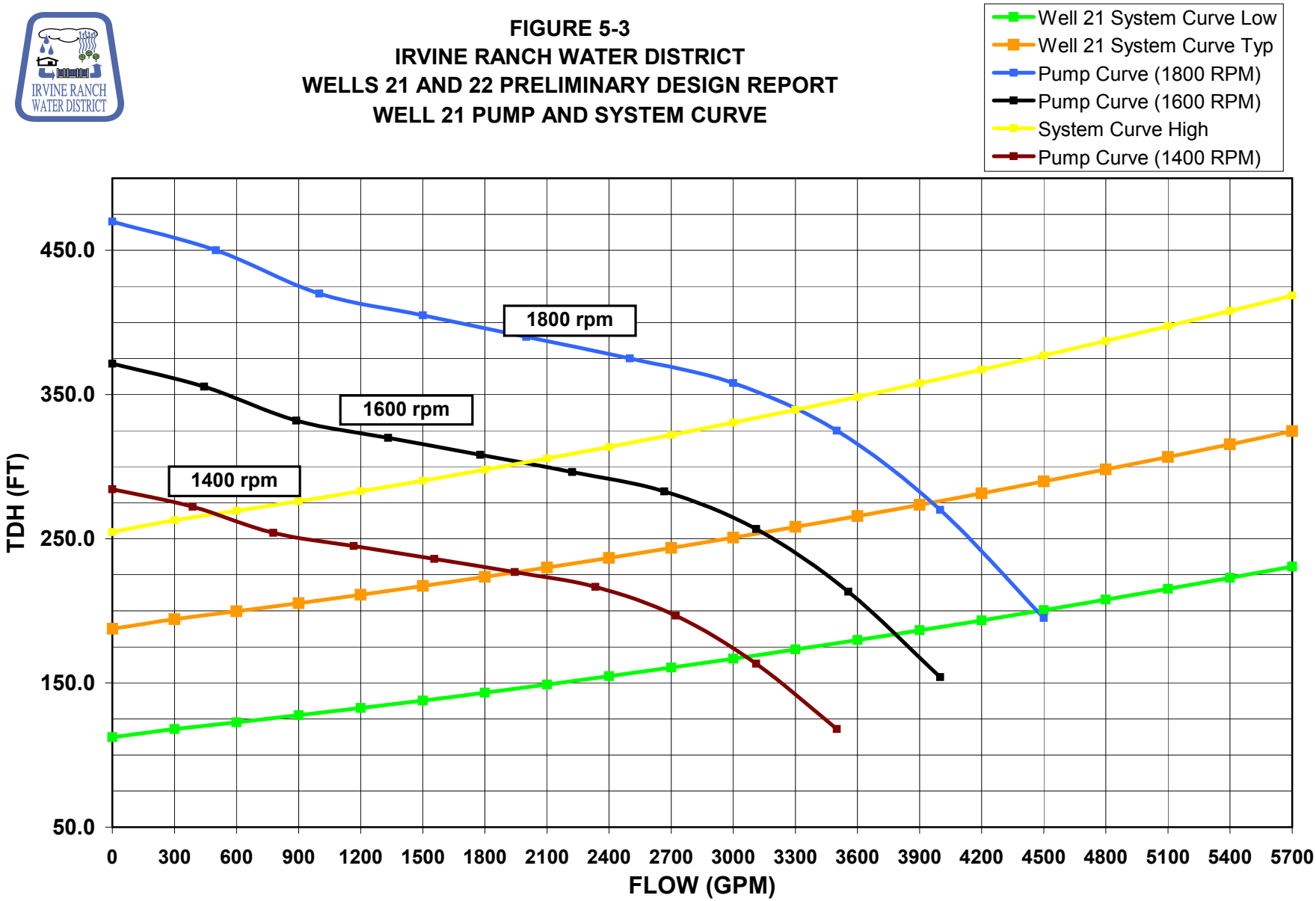
Pump Curve RPM 1600

Flow Rate (gpm)	Total Head (ft)
0	371
444	356
889	332
1333	320
1778	308
2222	296
2667	283
3111	257
3556	213
4000	154

Pump Curve RPM 1400

Flow Rate (gpm)	Total Head (ft)
0	284
389	272
778	254
1167	245
1556	236
1944	227
2333	217
2722	197
3111	163
3500	118

FIGURE 5-3
IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 PRELIMINARY DESIGN REPORT
WELL 21 PUMP AND SYSTEM CURVE



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WELL 22 - MINOR HEAD LOSS CALCULATION

Low Flow Pumps

NO.	FITTING DESCRIPTION [1]	Quantity	Unit K	Total K	Diameter (in.)
1	Pump Strainer	1	5.5	5.5	12
2	Pump Loss	1	1	1	12
3	90 Degree Discharge Head	1	1	1	12
4	Tee - Inline Flow	3	0.6	1.8	12
5	Check Valve	1	2.5	2.5	12
6	90 Degree Elbow	2	0.75	1.5	12
7	Flow Meter - Mag	1	0.05	0.05	12
8	Butterfly Valve - 150lb [3]	1	0.35	0.35	12
9	90 Degree Elbow	9	0.75	6.75	24

Q (gpm)	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400
Q (cfs)	0.0	0.4	0.9	1.3	1.8	2.2	2.7	3.1	3.6	4.0	4.5	4.9	5.3
	0.00	0.03	0.11	0.25	0.44	0.69	0.99	1.35	1.76	2.23	2.75	3.33	3.96
	0.00	0.00	0.02	0.04	0.08	0.12	0.18	0.24	0.32	0.40	0.50	0.60	0.72
	0.00	0.00	0.02	0.04	0.08	0.12	0.18	0.24	0.32	0.40	0.50	0.60	0.72
	0.00	0.01	0.04	0.08	0.14	0.22	0.32	0.44	0.58	0.73	0.90	1.09	1.30
	0.00	0.01	0.05	0.11	0.20	0.31	0.45	0.61	0.80	1.01	1.25	1.51	1.80
	0.00	0.01	0.03	0.07	0.12	0.19	0.27	0.37	0.48	0.61	0.75	0.91	1.08
	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.04
	0.00	0.00	0.01	0.02	0.03	0.04	0.06	0.09	0.11	0.14	0.17	0.21	0.25
	0.00	0.65	0.72	0.80	0.89	0.97	1.07	1.16	1.27	1.37	1.48	1.59	1.71

TOTAL HEADLOSS DUE TO FITTINGS, VALVES AND OTHER (ft) =	0.0	0.7	1.0	1.4	2.0	2.7	3.6	4.6	5.8	7.0	8.5	10.1	11.8

Well 22
HYDRAULIC CALCULATIONS

$Z_1+P_1/\gamma+V_1^2/2g+M=Z_2+P_2/\gamma+V_2^2/2g+H_L$

$H_L = (Z_2-Z_1)+H_f+H_m$	Total Headloss
$H_f = \frac{10.44*L*(Q)^{1.85}}{(C^{1.85})*(D^{4.86})}$	Friction Loss
$H_m = K(V^2/2g)$	Minor Loss

TP = Treatment Plant

Static Lift

Well 21. Z_1=	108	feet		
TP Elev. $Z_{2\ (well\ site)}$ =	86	feet		
Static Lift. Z_w =	-22	feet		
Static Water Level w/interf (low)	79	ft bgs	129-50	
Static Water Level w/interf(med)	154	ft bgs	129 + 25 (int)	Assumes 30 additional feet of static drop and 50 feet of static rise
Static Water Level w/interf (high)	210	ft bgs		
Specific Capacity (low)	14.5	gpm/ft		
Specific Capacity (typ)	21	gpm/ft		
Specific Capacity (max)	27.5	gpm/ft		

Pipe/Well Data

Pump Column ID (A)	10	inches	
Well Discharge Pipe ID (B)	16	inches	
Untreated Conveyance PL (C)	24	inches	
Pipe Area (A)	0.55	sf	
Pipe Area (B)	1.40	sf	
Pipe Area (C)	3.14	sf	
Straight Pipe Length (A) =	460	feet	Pump column and above grade discharge
Straight Pipe Length (B) =	200	feet	
Straight Pipe Length (C) =	6,900	feet	
Orifice Plate Bore Size	8.0	in	Number of 102.6 serves to negate orfice pressure drop to 0
Common Pipe Length	10000	feet	
Common Pipe Diamter	24	in	

Hazen Williams C

Max C	150
Typ C	130
Min C	110

Well 22 - PUMP TO TREATMENT PLANT SYSTEM CURVE

	Pipe Loss (ft)						Static Lift				TP	TDH						
Flow, gpm	$V^2/2g$	Minor/Fittings Losses	Friction Loss, Max	Friction Loss, Typ.	Friction Loss, Min	Low Static Water Level, ft bgs	Static Water Level Typ, ft bgs	High Static Water Level, ft bgs	Low Estimated Drawdown, ft	Typ Estimated Drawdown, ft	High Estimated Drawdown, ft	Well/TP Elevation Difference, ft	Low Inlet Head @ TP, psi	Typ Inlet Head @ TP, psi	High Inlet Head @ TP, psi	Low TDH, ft	Typ TDH, ft	HighTDH, ft
0	0.00	0.00	0.00	0.00	0.00	210.00	154.0	79.0	0.0	0.0	0.0	-22.0	40.0	50.0	60.0	149.4	247.5	306.6
200	0.00	0.72	2.65	1.94	1.49	210.00	154.0	79.0	7.3	9.5	13.8	-22.0	40.0	50.0	60.0	158.9	259.7	323.8
400	0.01	1.00	3.71	2.73	2.09	210.00	154.0	79.0	14.5	19.0	27.6	-22.0	40.0	50.0	60.0	167.0	270.3	338.9
600	0.01	1.43	5.12	3.76	2.88	210.00	154.0	79.0	21.8	28.6	41.4	-22.0	40.0	50.0	60.0	175.5	281.3	354.5
800	0.03	2.01	6.84	5.02	3.86	210.00	154.0	79.0	29.1	38.1	55.2	-22.0	40.0	50.0	60.0	184.4	292.6	370.6
1000	0.04	2.73	8.88	6.52	5.00	210.00	154.0	79.0	36.4	47.6	69.0	-22.0	40.0	50.0	60.0	193.5	304.4	387.2
1200	0.06	3.59	11.21	8.23	6.32	210.00	154.0	79.0	43.6	57.1	82.8	-22.0	40.0	50.0	60.0	202.9	316.5	404.2
1400	0.08	4.60	13.84	10.16	7.80	210.00	154.0	79.0	50.9	66.7	96.6	-22.0	40.0	50.0	60.0	212.7	328.9	421.6
1600	0.10	5.75	16.76	12.30	9.44	210.00	154.0	79.0	58.2	76.2	110.3	-22.0	40.0	50.0	60.0	222.8	341.7	439.5
1800	0.13	7.05	19.96	14.65	11.24	210.00	154.0	79.0	65.5	85.7	124.1	-22.0	40.0	50.0	60.0	233.1	354.9	457.7
2000	0.16	8.49	23.43	17.20	13.20	210.00	154.0	79.0	72.7	95.2	137.9	-22.0	40.0	50.0	60.0	243.8	368.4	476.4
2200	0.19	10.08	27.17	19.95	15.31	210.00	154.0	79.0	80.0	104.8	151.7	-22.0	40.0	50.0	60.0	254.8	382.3	495.6
2400	0.23	11.81	31.19	22.90	17.57	210.00	154.0	79.0	87.3	114.3	165.5	-22.0	40.0	50.0	60.0	266.1	396.5	515.1

PUMP DESIGN INFO

PUMP MODEL	Flowserve 12ENL
Speed (rpm)	1800

Pump Curve RPM 1800

Flow Rate (gpm)	Total Head (ft)
0	748
200	710
400	660
600	620
800	590
1000	570
1200	535
1400	490
1600	440
1800	390
2000	330
2200	245
2400	160

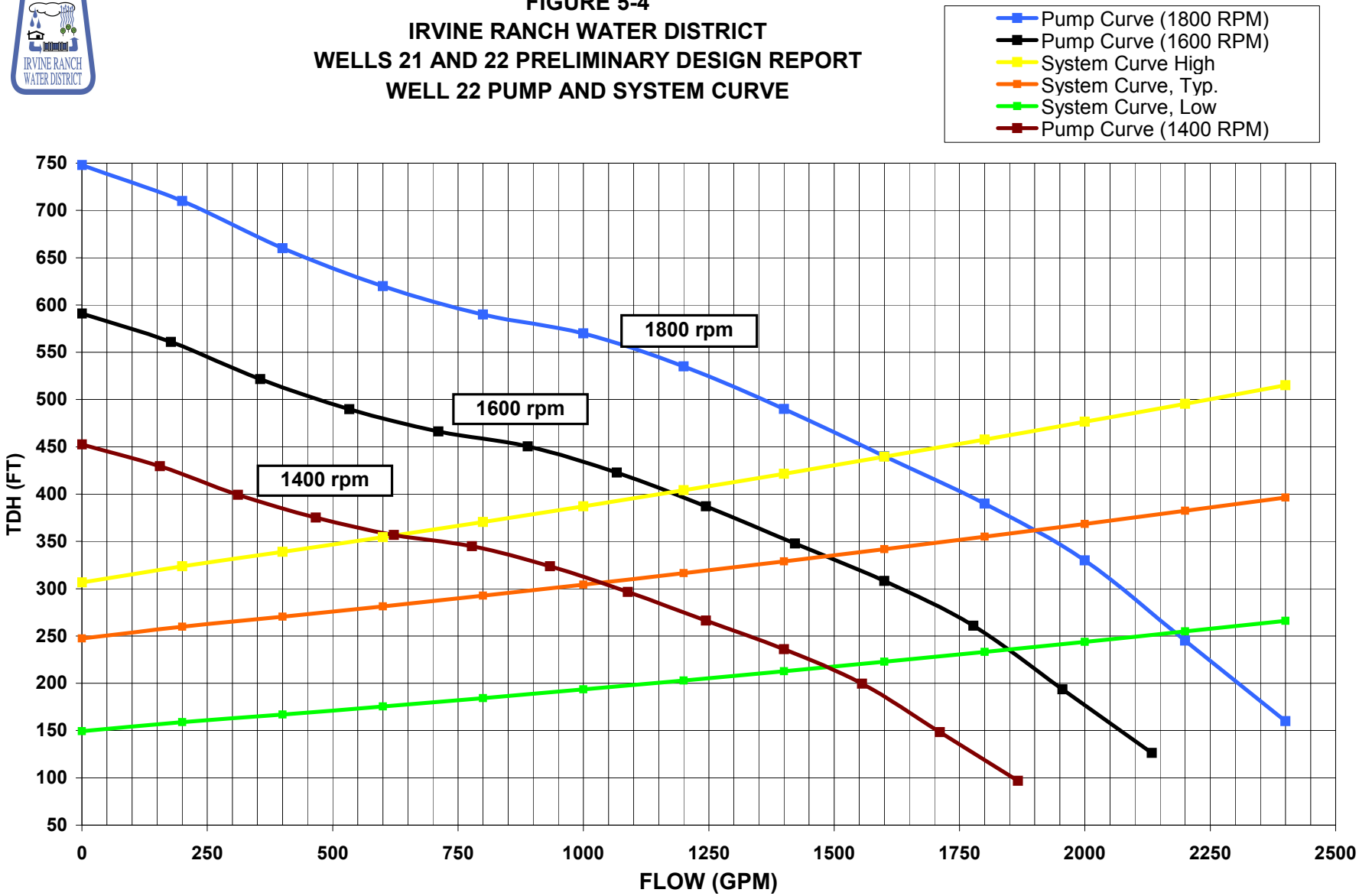
Pump Curve RPM 1600

Flow Rate (gpm)	Total Head (ft)
0	591
178	561
356	521
533	490
711	466
889	450
1067	423
1244	387
1422	348
1600	308
1778	261
1956	194
2133	126

Pump Curve RPM 1400

Flow Rate (gpm)	Total Head (ft)
0	452
156	430
311	399
467	375
622	357
778	345
933	324
1089	296
1244	266
1400	236
1556	200
1711	148
1867	97

FIGURE 5-4
IRVINE RANCH WATER DISTRICT
WELLS 21 AND 22 PRELIMINARY DESIGN REPORT
WELL 22 PUMP AND SYSTEM CURVE



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APPENDIX N

PRELIMINARY ENVIRONMENTAL EVALUATION

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IRWD WELLS 21 AND 22
PRELIMINARY DESIGN REPORT
APPENDIX N

ISSUES ANALYSIS CHECKLIST

Land Use

General Plan Designation	Low Density Residential; PCCB (Planned Community Commercial/ Business) - Pacific Center East Specific Plan
General Plan Update in Process	☐ Yes ☒ No ☐ See Notes
If so, anticipated adoption date	N/A
Zoning Designation	R1 (Single Family Residential); PC (Planned Community) Pacific Center East Specific Plan
Application/Development Fees	☒ Yes ☐ No ☐ See Notes
Required Setbacks	☒ Yes ☐ No ☒ See Notes
GPA Likely Required	☐ Yes ☒ No ☐ See Notes
Zone Change Likely Required	☐ Yes ☒ No ☐ See Notes
Likely CEQA Documentation for GPA or ZC	☐ EIR ☐ MND ☒ See Notes
Military Review Required	☐ Yes ☒ No ☐ See Notes
Biological Resources	
CNDDB Search Results	☒ See Notes
Designated Area of Critical Habitat	☐ Yes ☒ No ☐ See Notes
Within Designated HCP	☒ Yes ☐ No ☒ See Notes
Within Designated ACEC	☐ Yes ☒ No ☐ See Notes
Within Designated DWMA	☐ Yes ☒ No ☐ See Notes
Protocol Surveys Required	☐ Yes ☒ No ☐ See Notes
Species of Concern	N/A
Seasonal Limitations for Surveys	☐ Yes ☒ No ☒ See Notes
Incidental Take Permit Required (Federal? State?)	☐ Yes ☒ No ☐ See Notes
Mitigation Acreage Required	☐ Yes ☒ No ☒ See Notes
Consultation Required (USFWS? CDFG?)	☒ Yes ☐ No ☒ See Notes
Streambed Alteration Permit Required	☒ Yes ☐ No ☒ See Notes
Local Biological Resource Studies Required	☒ Yes ☐ No ☒ See Notes
Cultural, Archeological & Historical Resources	
Cultural Resources Expected On/Near Site	☐ Yes ☒ No ☒ See Notes
State Historic Preservation Office (SHPO) Consultation Req'd?	☐ Yes ☒ No ☐ See Notes
Visual Resources	
Proximate to Sensitive Viewshed	☐ Yes ☒ No ☒ See Notes
Noise & Vibration	
Construction Hours Limitations Expected	☒ Yes ☐ No ☒ See Notes
Agricultural, Soils, Geology & Paleontological	
Seismic Zone	Seismic Zone 4
Proximate Faults	☒ Yes ☐ No ☒ See Notes
Geological Hazards	☒ Yes ☐ No ☒ See Notes

Paleontological Resources Expected On/Near Site?	☐ Yes ☒ No ☒ See Notes
Williamson Act Enrollment	☐ Yes ☒ No ☐ See Notes
Special/Unique Designation for Agricultural or Mineral Resources	☐ Yes ☒ No ☒ See Notes
Atypical Construction Limitations	☐ Yes ☒ No ☒ See Notes
Water Resources	
FEMA or County Flood Zones	☒ Yes ☐ No ☒ See Notes
Local Flood-Related Limitations	☒ Yes ☐ No ☒ See Notes
Water Quality Requirements Exceeding SWPP BMPs	☐ Yes ☒ No ☐ See Notes
U.S. Army Corps of Engineers Jurisdictional Waters? (404 Permit Required)	☐ Yes ☒ No ☒ See Notes
RWQCB Water Quality (401 Permit Required)	☐ Yes ☒ No ☒ See Notes
Traffic	
Known Traffic Circulation Issues at Present	☐ Yes ☒ No ☐ See Notes
Traffic Studies Required	☒ Yes ☐ No ☒ See Notes
Ingress/Egress Limitations	☐ Yes ☒ No ☒ See Notes
Hazardous Materials/Wastes	
Hazardous Materials/Wastes Likely	☐ Yes ☒ No ☒ See Notes
Socioeconomic & Environmental Justice	
Census Tracts w/EJ Pop. >50 percent minorities/low income	☐ Yes ☒ No ☐ See Notes
Census Tracts w/EJ Pop. percent > local average	☐ Yes ☒ No ☐ See Notes
Air Quality	
Local Air Quality Management District (AQMD)	South Coast Air Quality Management District
Attainment?	☐ Yes ☐ No ☒ See Notes
Atypical Air Quality Regulations	☐ Yes ☒ No ☒ See Notes

NOTES:

LAND USE

General Plan Designation

Relevant Documents:

- City of Tustin Community Development Department, *City of Tustin General Plan*, June 2008.
- City of Tustin Community Development Department, *City of Tustin General Plan Land Use Map*, November 2008.

City of Tustin Land Use Element

Based on the *City of Tustin General Plan Land Use Map*, the land use designation for the well sites is LDR (Low Density Residential). The land use designation for the proposed treatment facility site is PCCB (Planned Community Commercial/Business). The roadway alignment in which the transmission pipelines are proposed do not have a specific land use designation.

The LDR land use allows detached single family dwellings and accessory buildings with building heights generally not exceeding 30 feet. The treatment facility is located within the Regional Center designation of the Pacific Center East Specific Plan which allows for a variety of land uses including hotels, commercial, and office uses. The Pacific Center East Specific Plan governs the land use types and density of this land use designation.

The City's Land Use Element includes the following policies related to the proposed project:

- **Policy 8.1:** Encourage within economic capabilities, a wide range of accessible public facilities and community services including fire and police protection, flood control and drainage, educational, cultural and recreational opportunities and other governmental and municipal services.

- **Policy 8.2:** Define needs and deficiencies that are within the City, and introduce priority projects into the City's budget process.

- **Policy 8.8:** Maintain and improve, where necessary, the City's infrastructure and facilities.

Zoning Designation

Governing Documents:

- Article 9, Chapter 2 of the City of Tustin Municipal Code (*Zoning*), revised January 2009.

- City of Tustin, *Pacific Center East Specific Plan*, December 1990.

The well sites are within the City's R1 (Single Family Residential) zoning designation. Under Article 9, Chapter 2, Part 9271, of the City of Tustin Municipal Code (Specific Provisions), public utility buildings and uses are conditionally permitted uses within R1 districts and are subject to a minimum front yard setback of 25 feet. Article 4, Chapter 8, Part 4802 of the Municipal Code states that a permit is required for the construction of wells. The wells would be permitted in the R1 zoning district with a conditional use permit. Under Article 9, Chapter 2, Part 9271, of the Municipal Code, public utility distribution and transmission underground facilities for water are allowed in all districts without height limitation or without obtaining a use permit. Therefore, a use permit would not be required for the proposed groundwater pipelines running from the well sites to Mitchell Avenue. The groundwater transmission pipelines would be located within roadway right-of-way, which does not have a zoning designation.

The proposed treatment facility is in an area zoned PC (Planned Community) Pacific Center East Specific Plan. The Pacific Center East Specific Plan designates this site as Regional Center, which provides opportunities for hotels, commercial, and office uses. Article 9, Chapter 2, Part 9244, of the Municipal Code states the following provisions outlined for the PC District. The PC District shall also be subject to the other provisions of Chapter 2, except that where conflict in regulations occur, the regulations specified in this Section or in the Development Plan or plans approved pursuant to this section shall apply. The Pacific Center East Specific Plan requires a 35 foot setback from Edinger Avenue and a 5 foot setback between parcels. The Pacific Center East Specific Plan does not specify the permission of facilities such as the proposed treatment facility in the Regional Center designation. Therefore, approval of the proposed use would be subject to determination by the Community Development Director.

Application/Development Fees

Article 7, Chapter 2, of the Municipal Code, states that a permit must be obtained prior to disturbance in, over, along, across, or through any roadway. The permit application must include the location and extent of work to be performed, materials used, and other relevant information, and must be filed no less than 48 hours before work is proposed. The permit must be kept at the project site and all work shall be performed in accordance with all applicable laws, rules, and regulations of the City and any other public agency.

Article 7, Chapter 2, Part 7232, of the Municipal Code, contains regulations regarding issuance fees and deposits. Each permit application must be accompanied by an issuance fee of one dollar. The issuance fee is required for the purpose of defraying the cost of processing the application for a permit. No permit issuance fee shall be required of any public agency entitled to exemption. If the United States, this State, this or any other county, any municipal corporation, school district or other public agency files with the Commissioner a written guarantee of payment of all costs for which it may become liable to the City, then no deposit for costs are required from such person.

Article 4, Chapter 8, Part 4802, of the Municipal Code includes application fees with respect to well construction permit fees. Each application must be accompanied by a fee which shall be *established by the Board of Supervisors.* Fifty percent (50%) of the

fee shall be returned to the applicant should the permit be denied or if the permit is cancelled within sixty (60) days after issuance and no work has been done. A permit shall remain in effect for one year from date of issuance.

Required Setbacks

Refer to Article 9, Chapter 2, Part 9223 (b), of the City of Tustin Municipal Code (*Zoning*), and the Pacific Center East Specific Plan designation, referenced above.

Other Development Standards

Article 7, Chapter 2, Part 7233, of the Municipal Code includes construction standards. These standards state that the applicant must perform all work in accordance with the plans and specifications referred to in the permit. All work to be performed in, upon or across highways shall be in accordance with and conform to the County standards established by County Ordinance No. 612.

Article 7, Chapter 2, Part 7253, of the Municipal Code prescribes performance of work standards regarding traffic obstruction, traveling public, and pipeline location during construction activities (applies to proposed transmission pipelines). Trenching for installation across any intersecting roadway open to traffic shall be progressive, and not more than half of the width of a traveled way can be disturbed at one time. Barricades, red lights and warning signs, together with flagmen are required during construction activities to ensure the safety of the traveling public. All pipes and conduits laid parallel to the roadway must be placed at least five feet from the edge of the pavement or graded traveled roadway. The shallowest portion of any pipeline or other facility shall be installed no less than thirty inches below the roadway surface.

Article 9, Chapter 3, Part 9321 of the Municipal Code, states requirements pertaining to initial application review/environmental assessment. All applications filed with the Community Development Department in compliance with the Subdivision Code shall be reviewed for completeness, referred to any public agency that may be affected or have interest in the proposed project, and reviewed as required by the California Environmental Quality Act (CEQA).
Additionally, the project would be required to obtain an encroachment permit for construction of underground transmission pipelines across the Tustin Unified School District property.

GPA Likely Required: No

Zone Change Likely Required: No

Likely CEQA Documentation for GPA or ZC: No GPA or ZC required. The CEQA environmental document would be prepared to allow approval by other State and local agencies having jurisdiction over one or more aspects of the project.

Military Review Required: No

BIOLOGICAL RESOURCES

California Natural Diversity Data Base Search Results

The U.S. Fish and Wildlife Service's (USFWS) list of Federally threatened or endangered species and California Natural Diversity Data Base (CNDDB) were reviewed to determine the potential for various Federally- and/or State-listed special status species to occur on-site. CNDDB is a database tool for identifying reported occurrence of individual species and rare natural communities. The absence of occurrence information does not mean that a species is not present, as species specific surveys may not have been conducted in the area. The CNDDB is a computerized inventory that gives general occurrence information; it does not provide exact locations of occurrences.

A CNDDB search was conducted for the Tustin United States Geological Society (USGS) 7.5 Minute Series Topographic Quadrangle. This resource provides baseline data regarding species occurrences within and adjacent to the subject site. According to the CNDDB search, suitable habitat for the endangered light-footed clapper rail (*Rallus longirostris levipes*), the federally threatened coastal California gnatcatcher (*Polioptila californica californica*), and the endangered least Bells vireo (*Vireo bellii pusillus*), exists in the project area.

Light-Footed Clapper Rail *(Rallus longirostris levipes*)

The light-footed clapper rail is a year-round resident (non-migratory). It inhabits coastal salt and freshwater marshes containing cordgrass, cattails or tules, and rushes. Its population declines were due to habitat loss of floodplain river areas and tidal estuaries. It was listed as federally Endangered in 1970, State Endangered in 1971. Chances for rangewide recovery are minimal given limited remaining habitat and availability for habitat restoration. Current management is focused on sustaining remaining populations by maintaining and enhancing habitat, and controlling predators.

California Gnatcatcher (*Polioptila californica californica*)

The California gnatcatcher is a year-round resident (non-migratory). It primarily inhabits coastal sage scrub. Population declines were due to urban and agricultural development. It was listed as Federally Threatened in 1993 and is a State Species of Special Concern. The species was driving force for the development of the Natural Communities Conservation Program (NCCP) in southern California.

Least Bell's Vireo (*Vireo bellii pusillus*)

The least Bell's vireo is a Spring and Summer breeding resident, migrating south for Fall and Winter. It primarily inhabits riparian woodlands, scrub, and thickets for breeding. Population declines due to urban and agricultural development, habitat alteration, and brood parasitism by the brown-headed cowbird. The vireo was listed as Federally Endangered in 1986, State Endangered in 1980.

Although the above-mentioned Threatened or Endangered species occur within the project vicinity, such wildlife species are not expected to occur on the project site because the impact area would be limited to areas that were previously graded, and habitat for these species is not present within the project site. It should be noted that the project proposes the rehabilitation of two wells on two previously disturbed vacant residential lots. The proposed treatment site would also be located on in a previously disturbed lot in an urbanized area. Additionally, the proposed pipelines would generally be located within roadway or utility rights-of-way. As a result, the proposed project is not anticipated to disturb critical sensitive habitat and would not impact any Threatened or Endangered species.

Section 7 or Section 10 of the United States Endangered Species Act

The Federal Endangered Species Act provides legislation to protect Federally-listed plant and animal species. It provides legal protection, requires definition of critical habitat, and development of recovery plans for plant and animal species in danger of extinction. Threats to critical habitat areas can be addressed by acquisition, development reviews or establishment of mitigation and enhancement measures.

Impacts to listed species resulting from the implementation of a project would require the responsible agency to consult the USFWS. Formal consultations must take place with the USFWS pursuant to Section 10 of the Endangered Species Act, with the USFWS then making a determination as to the extent of impact to a particular species. If the USFWS determines that impacts to a species would likely occur, alternatives and measures to avoid or reduce impacts must be identified. As stated above, the proposed project would occur on previously disturbed lots and roadway rights-of-way in an urbanized area. As the project would not disturb critical habitat and there is a low likelihood of the presence of threatened or endangered species, the project would not require consultation with the USFWS.

Natural Community Conservation Planning Program/Habitat Conservation Plan

The Federal Endangered Species Act and the California Endangered Species Act were created to prevent plant and animal species from becoming rare, endangered or threatened with extinction.

In 1991 Assembly Bill 2172 (the Natural Community Conservation Planning Act) authorized the California Department of Fish and Game (CDFG) to enter into agreements with any person, for the purpose of preparing and implementing an NCCP. The act also provided the regulatory framework for the preparation of conservation guidelines for the development and implementation of NCCPs. In addition, the act also authorized NCCPs to be undertaken by local, state or federal agencies independently or in cooperation with other persons.

On March 30, 1993, the California gnatcatcher was listed as a “threatened species” under the provisions of the Federal Endangered Species Act. The listing of the gnatcatcher under the Special 4(d) Rule also allowed for interim loss of coastal sage scrub habitat and incidental take of California gnatcatcher during the preparation of the NCCP programs under specific circumstances.

As a result, the interim loss of coastal sage scrub habitat could be granted if the loss of coastal sage scrub habitat was performed as part of a lawful activity, the loss did not exceed five percent of the total known occurrence of coastal sage scrub habitat, and did not preclude the preparation of an effective NCCP program reserve system design.

Central-Coastal and Southern NCCP Subregions

The County of Orange established two distinct study areas; the Central-Coastal NCCP Subregion and Southern NCCP Subregion. The Central-Coastal Subregional NCCP is one of eleven NCCP subregions that has been initiated within the five-county Southern California area and includes a Central Subarea and a Coastal Subarea. The proposed project is located in the Coastal Subarea.

Orange County Central-Coastal Natural Community Conservation Subregional Plan

The Central-Coastal subregional NCCP was approved in July 1996 and establishes a 37,380 acre reserve system in a 208,000 acre planning area. The plan protects significant areas of 12 major habitat types and covers 39 sensitive plant and animal species. Reserve lands are managed and monitored by The Nature Reserve of Orange County.

The Nature Reserve of Orange County was created in December of 1996 as the nonprofit corporation to administer the reserve system with regularly scheduled meetings occurring each quarter. A technical advisory committee created by the Nature Reserve of Orange County is headed by the Nature Conservancy. The technical advisory committee includes nine technical members/scientists responsible for assisting in establishing the long-term monitoring requirements for the management of the reserve system and reviewing proposed adaptive management programs and/or any project affecting the reserve system.

The NCCP/HCP also includes an executed Implementing Agreement which defines and establishes the roles and responsibilities of all participating landowners, the County and cities with the County and all other signatories to the agreement. The approval of the NCCP/HCP established the following:

1. *Habitat Reserve System (Nature Reserve of Orange County)*: The establishment of a 38,000 acre habitat reserve system includes all habitats found in the County of Orange. The Reserve currently includes approximately 18,831 acres of coastal sage scrub; 7,300 acres of chaparral; 6,100 acres of grassland; 1,800 acres of riparian; 950 acres of woodland; 200 acres of forest; and significant portions of six other native habitat types.

2. *Species and Habitat Covered Under the Approved NCCP/HCP*: The focus of the NCCP/HCP Reserve System is to protect designated “target species”: California gnatcatcher, coastal cactus wren and orange-throated whiptail lizard. However, the program also provides regulatory coverage of 35 species (9 plant and 28 animal species), conditional coverage of 7 animal species, and coverage of oak woodlands, Tecate cypress forest, cliff and rock, and chaparral (Coastal Subarea only) habitats.

3. *Coastal Sage Scrub Take Authorization*: 7,395 acres of coastal sage scrub "take authorization" (removal) was established without regard to whether this habitat is occupied by the California gnatcatcher or other covered species inside and outside of the habitat reserve system. All participating landowners received a 10(a) Permit from the USFWS that authorized the removal and/or disturbance of specific coastal sage scrub acreage amounts and subsequent take of the California gnatcatcher as well as covered and conditionally covered species. The permit also authorized the removal of other specific habitat types within the Coastal and Central subareas of the reserve system.

4. *"Mutual Assurances" Provisions*: Mutual Assurances provisions are contained within the Implementing Agreement guaranteeing that the state and federal resource agencies shall not seek additional mitigation resulting from impacts to coastal sage scrub and other covered habitats and covered species authorized to be removed in accordance with a lawfully approved activity.

5. *Adaptive Management Programs*: The approved NCCP/HCP requires the preparation of adaptive management programs addressing annual biological resources monitoring; restoration and enhancement; short and long-term fire management; grazing management; public access and recreation use; and interim management of privately-owned lands prior to their transfer to the public reserve manager.

6. *Funding for Reserve Creation and Habitat Management*: An endowment in the amount of approximately $10,000,000 was created through commitments from the Transportation Corridor Agencies, Irvine Ranch Water District, Chandis - Sherman Properties, Metropolitan Water District, Santiago County Water District, Southern California Edison, and the County of Orange (using federal pass-through funds). The endowment is to be used on a "non-wasting" basis. That is, the principal would be protected and only interest earned from this endowment may be used in accordance with a budget approved by the nonprofit corporation for management and acquisition of reserve system lands.

7. *Nonprofit Corporation*: The approved NCCP/HCP also provided the foundation for the creation of a nonprofit corporation, the entity responsible for the administration of the reserve system including properties owned and operated by a number of public agencies as well as those properties currently owned by private landowners but scheduled to be dedicated to a public agency for inclusion into the reserve system.

Protocol Surveys Required/Seasonal Limitations

The proposed project would occur on previously disturbed lots and roadway rights-of-way in an urbanized area. The project would not disturb critical habitat and there is a low likelihood of the presence of threatened or endangered species on-site. Therefore, the project would not require protocol surveys.

Streambed Alteration Permit Likely Required

The 24-inch finish water pipeline would convey water from the proposed treatment site to the proposed connection point at the existing 42-inch transmission main in Harvard Avenue. This will require crossing the Peters Canyon Channel near Edinger Avenue. The crossing may be accomplished with the jack and bore method in order to avoid any modifications to the streambed. Jack and bore activities would also take place beneath the Santa Fe Channel, north of Edinger Avenue. For jack and bore activities where no work will be done within (and no fill will be placed within) the drainage, a U.S. Army Corps of Engineers (Corps) 404 and Regional Water Quality Control Board (RWQCB) 401 are not required. However, a 1602 Agreement from the CDFG would be required. Although the use of directional boring for the pipeline construction minimizes potential impacts to the creek, it does not eliminate all potential substantial adverse effects to the channel and associated fish and wildlife. There is the possibility that directional boring operations could fail causing frac-out (drilling muds to be deposited on and within the channel's alluvium), resulting in degraded spawning and foraging habitats. In addition, the pipe could interfere with the natural subsurface flow of the stream, causing more water to be at the surface than would otherwise occur, which could favor some exotic invasive species over native fish and wildlife. For these reasons, the CDFG requires a 1602 application package be submitted for jack and bore activities.

Local Biological Studies Required

The project would not disturb threatened or listed species. There are no habitats or sensitive natural communities present on-site. As a result the project would not require biological studies or coordination with the USFWS. As stated above, coordination with the CDFG would be necessary to obtain a 1602 Agreement.

City of Tustin Conservation/Open Space/Recreation Element

A substantial portion of the City's natural open space and biological habitat has been replaced with urban development. The Conservation/Open Space/Recreation Element includes policies reflecting conservation efforts of local biological resources. The following may apply to the proposed project:

- **Policy 7.3:** Require development proposals in areas expected to contain important plant and animal communities to include biological assessments.

- **Implementation Program 25 (Biological Resource Restoration):** Assist the County of Orange in development of plans and programs for restoration efforts in areas of unique riparian habitat.

- **Implementation Program 28 (Protection of Biological Resources):** Biological resources in the City will be protected by requiring development project proponents to perform biological surveys in areas known or suspected to contain significant biological resources.

CULTURAL, ARCHAEOLOGICAL, AND HISTORICAL RESOURCES

The subject site is located in an area historically occupied by the Gabrieleno and the Juaneño Native Americans. No historic structures are present and no paleontological resources are known to exist in the project area. According to Figure VI-9 of the Orange County General Plan, the project does not occur within an area of general sensitivity for paleontological resources. Additionally, Figure VI-10 of the Orange County General Plan, the project does not occur within an area of general sensitivity for prehistoric archaeology.

No known on-site cultural, archaeological, or historic resources are known to exist. Due to the limited amount of surface disturbance, potential impacts to cultural, archaeological, and paleontological resources are considered minor. The project site and pipeline alignments would be located in previously disturbed urban areas and within roadway rights-of-way. As a result, the area has been extensively altered to accommodate the existing development. Therefore, implementation of the proposed project would not result in a substantial adverse change in the significance of a cultural, archaeological, or historical resource.

As stated above, no archaeological sites are known to exist either within the project site or within the project vicinity. Although implementation of the proposed project would result in some soil disturbance associated with the excavation of trenches to accommodate the wells, pipelines, and treatment facility, no significant activity is proposed to previously undisturbed sites. Although implementation of the proposed project would result in some soil disturbance associated with the implementation of the proposed project, significant excavation is not anticipated and it is unlikely that any resources or materials would be encountered.

City of Tustin Conservation/Open Space/Recreation Element

The Conservation/Open Space/Recreation Element of the General Plan discusses cultural resources within the City as primarily historical resources. The General Plan identifies MCAS hangars as listed on the National Register of Historic Places. Prior to the closing of MCAS Tustin, historic resource surveying of the facility was conducted. It was concluded that two historic districts containing World War II structures existed at the former MCAS. Any environmental impacts of the reuse plan for MCAS will need to address the disposition of these resources. The proposed project would not affect the historic structures within the MCAS site and is not located within any areas of historical significance within the City. The following policy within the General Plan relates to preservation of historic structures, and may apply to the proposed project:

- **Policy 12.3:** Development adjacent to a place, structure or object found to be of historic significance should be designed so that the uses permitted and the architectural design will protect the visual setting of the historical site.

VISUAL RESOURCES

City of Tustin Land Use Element

The City's Land Use Element includes the following policies related to visual qualities within the City:

- **Policy 6.9**: Upgrade the visual quality of edge conditions between industrial and residential uses through street tree planting and on-site landscaping.

- **Policy 9.9**: Site buildings and align roadways to maximize public visual exposure to the north-south Peters Canyon ridgeline, the redwood/cedar grove, the knoll and major tree stands.

The well facilities are located within residential uses in the western portion of the City; the treatment site is proposed within the developed western portion of the City; and the transmission pipelines would be located underground, beneath roadway uses. The project site is not located within, or on the edge of, an industrial use. Therefore, Policy 6.9 does not apply to the project. The Land Use Element identifies important viewsheds in East Tustin, including the Peters Canyon ridgeline, the redwood/cedar grove, the knoll, and major tree stands. As the project components are located within the western and southern portions of the City, the proposed project would not obstruct views or important viewsheds within East Tustin.

Other policies within the Land Use Element relating to visual resources include open space, recreational facilities, and hillside development limitations. The proposed project is not located within or near open space, recreational facilities, or hillside areas. Therefore, these policies would not apply to the proposed project.

City of Tustin Conservation/Open Space/Recreation Element

The Conservation/Open Space/Recreation Element states that public views toward ridgelines, inland mountains, should be preserved to the greatest extent possible. The Element identifies unique and visually prominent natural features within the City. These include the cedar/redwood grove in the northeasterly portion of East Tustin, and the Peters Canyon ridgeline in East Tustin. As previously stated, project components would be located within the western and southern portions of the City and would not obstruct views to these identified natural features in East Tustin.

The City's Conservation/Open Space/Recreation Element includes the following policies and implementation program related to visual qualities within the City:

- **Policy 8.16:** Site buildings and align roadways to maximize public visual exposure to natural features.

- **Policy 12.3:** Development adjacent to a place, structure or object found to be of historic significance should be designed so that the uses permitted and the architectural design will protect the visual setting of the historical site.

- **Implementation Program 35 (Protect Scenic Views and Resources):** Through the Hillside Review process, monitor and limit development of Peters Canyon Ridgeline consistent with the requirements of the East Tustin Specific Plan, Grading and Excavation Code and Grading Manual.

The proposed project would consist of supply facilities (wells), underground transmission pipelines, and a treatment facility. The project does not include buildings that would obstruct public viewsheds and would not affect structures of historic significance. Therefore, these policies and implementation program relating to visual resources would not apply to the proposed project.

Scenic Highways

The project site is not located in proximity to a designated State Scenic Highway. The closest State designated scenic highway is State Route 91, located approximately 10 miles northeast of the subject site. As a result, the proposed project would not impact State and County designated scenic highways.

Proximate to Sensitive Viewshed

The subject site is located within a developed, residential area of the City. Identified or potential viewsheds and public resources are not located within the project vicinity. Views to ridgelines and mountains located in, and beyond, East Tustin are not afforded from the project site. There are no State or County designated scenic highways within proximity of the subject site. Additionally, proposed project components would not block views of any surrounding landscapes or other objects.

Development on the subject site would be visible from the surrounding residential, institutional, and roadway uses. Surrounding residential uses would be highly sensitive to the proposed project. The well sites are currently gated and enclosed with concrete block walls. However, surrounding residential uses would be highly aware of construction of the project. Upon completion of construction, views of the project site from adjoining residents would be similar to existing conditions.

The treatment facility would likely be visible to travelers along Edinger Avenue during construction and operation of the project. Views to the treatment facility site from residential uses across the railroad tracks and the Santa Fe Channel to the north would be blocked by the existing concrete wall located at the residential property line. These residents would be moderately sensitive to construction of the proposed treatment facility.

The proposed transmission pipelines would be located beneath roadway uses. Surrounding residential and institutional uses, and travelers along affected roadways would have direct views of construction of the pipelines. However, upon completion of construction, proposed underground transmission pipelines would not be visible.

NOISE & VIBRATION

RBF conducted ambient noise measurements at the Well 21 and Well 22 sites in September 2008. Short-term (10-minute) measurements were conducted on September 3, 2008. The Well 21 site reported a daytime ambient noise level of 47.3 dBA; and the Well 22 site reported a daytime ambient noise level of 69.1 dBA. Long-term (24-hour) noise measurements were also conducted at the well sites. For long-term conditions, the Well 21 site reported an ambient noise level of 64.4 dBA (September 9-10, 2008); and the Well 22 site reported an ambient noise level of 51.4 dBA (September 3-4, 2008). Sensitive noise receptors include residential uses and school facilities located directly adjacent to the project site.

RBF also conducted ambient noise measurements at an existing operating well site (Well 14) located on Browning Avenue near Mitchell Avenue. The short-term measurement conducted on September 3, 2008 reported a daytime ambient noise level of 48.4 dBA, and the long-term measurement conducted on September 10-11, 2008 reported an ambient noise level of 51.4 dBA. Based on the ambient noise measurement at the existing Well 14, noise associated with the operation of Well 21 and Well 22 is anticipated to be low.

Construction Noise

Short-term construction noise typically occurs from construction and transportation related activities. Article 4, Chapter 6, Part 4617, of the City's Municipal Code permits construction noise between 7:00 AM and 6:00 PM, Monday through Friday, and 9:00 AM and 5:00 PM on Saturdays. Construction is not permitted on Sundays and federal holidays. Well 21 and Well 22 are located in residential lots (Noise Zone 1), immediately adjacent to residential uses. The nearest sensitive receptors to the treatment facility site would be the adjacent residents to the north. Although concrete block walls exist between the well sites and treatment facility site and the adjacent residential uses, high levels of construction noise are expected to be experienced at the surrounding residents. The transmission pipelines would be located within the roadway right-of-way. Potential construction noise impacts associated with the pipelines may be experienced at residential uses along Mitchell Avenue, Newport Avenue, Sycamore Avenue, and School Lane. Jack and bore activities would take place at the Tustin Unified School District school bus parking lot and the railroad tracks, and possibly along Edinger Avenue, crossing Peters Canyon Channel. Sensitive receptors at these locations include the residential uses adjacent to the north of the Santa Fe Channel and to the east of Peters Canyon Channel, and occupants of the Jeane Thorman Elementary School to the north of the Santa Fe Channel near the treatment facility. These residents and institutional users are anticipated to experience high levels of construction noise from jack and bore activities. Consultation with the Tustin Unified School District on allowable construction hours and phasing during disturbance of the Support Services Facility bus parking lot would be required.

Operational Noise

Operation of Well 21, Well 22, and the treatment facility would create additional noise sources in the area that may affect the surrounding residential and institutional uses. Site enclosure would reduce operational noise levels and reduce impacts to surrounding

residents. Operation of the transmission pipelines, including the crossing at Peters Canyon Channel, would not result in additional noise sources.

The exterior noise level standards of Article 4, Chapter 6, Part 4614 (Exterior Noise Standards) are applicable to all property within a designated noise zone. Noise-sensitive uses identified in the Noise Element include residential, parks, schools, libraries, churches, and hospitals. Table 1 identifies the City's exterior noise level standards.

Table 1
Exterior Noise Level Standards

Noise Zone	Noise Level	Time Period
1 (all residential properties)	55 dBA	7:00 a.m. – 10:00 p.m.
	50 dBA	10:00 p.m. – 7:00 a.m.
2 (all commercial properties)	60 dBA	any time
3 (all industrial properties)	70 dBA	any time
4 (all special properties such as hospitals, convalescent homes, public and institutional schools, libraries, and churches)	55 dBA	any time
5 (all mixed use properties)	60 dBA	any time
Source: Article 4, Chapter 6, Part 4614, City of Tustin Municipal Code.		

Article 4, Chapter 6, Part 4614 (b) of the Code states that no person shall create any noise or allow the creation of any noise at any location within the incorporated areas of the City on property owned, leased, occupied or otherwise controlled by such person which causes the noise level, when measured on any other property to exceed:

1) *The noise standard for a cumulative period of more than thirty (30) minutes in any hour; or*
2) *The noise standard plus five (5) db(A) for a cumulative period of more than fifteen (15) minutes in any hour; or*
3) *The noise standard plus ten (10) dB(A) for a cumulative period of more than five (5) minutes in any hour; or*
4) *The noise standard plus fifteen (15) dB(A) for a cumulative period of more than one (1) minute in any hour; or*
5) *The noise standard plus twenty (20) dB(A) for any period of time.*

The interior noise level standards of Article 4, Chapter 6, Part 4615 (Interior Noise Standards) are applicable to all property within a designated noise zone. Table 2 identifies the City's interior noise level standards. The Code states that no person shall create any noise or allow the creation of any noise at any location within the incorporated areas of the City on property owned, leased, occupied or otherwise controlled by such person which causes the noise level, when measured within any other dwelling unit on any residential property or mixed use property, to exceed:

1) *The interior noise standard for a cumulative period of more than five (5) minutes in any hour; or*

2) *The interior noise plus five (5) dB(A) for a cumulative period of more than one (1) minute in any hour; or*
3) *The interior noise standard plus ten (10) dB(A) for any period of time.*

Table 2
Interior Noise Level Standards

Noise Zone	Noise Level	Time Period
1 (all residential properties)	55 dBA	7:00 a.m. – 10:00 p.m.
	45 dBA	10:00 p.m. – 7:00 a.m.
5 (residential uses only)	55 dBA	7:00 a.m. – 10:00 p.m.
	45 dBA	10:00 p.m. – 7:00 a.m.
Source: Article 4, Chapter 6, Part 4615, City of Tustin Municipal Code.		

City of Tustin Noise Element

The Noise Element identifies transportation noise sources as the primary sources of noise affecting the quality of life in the City. Noise from John Wayne Airport causes annoyance among residents; however, the City has little control over airport operations. Many residential neighborhoods are located adjacent to heavily traveled arterials, freeways, and railroads. Noise from construction activities also causes annoyance to residents. A large portion of the City is affected by various sources of noise. The following policies are related to noise impacts that may apply to the project:

- **Policy 1.9:** Encourage, where feasible, noise mitigation measures, such as noise barriers and realignments, in the design and construction of new roadway projects in the Tustin Planning Area.

- **Policy 2.3:** Use noise/land use compatibility standards as a guide for future planning and development.

- **Policy 3.2:** Minimize the impacts of construction noise on adjacent land uses through limiting the permitted hours of activity.

- **Implementation Program 9 (Noise Ordinance Enforcement):** The City will enforce its Noise Ordinance to reduce excessive noise from site-specific sources, such as construction activity mechanical equipment, landscaping maintenance, loud music, truck traffic, loading and unloading activities, and other sources.

Additional policies within the Noise Element are related to transportation noise sources (i.e., railroad, John Wayne Airport, and freeway), commercial, and industrial noise sources which do not apply to the proposed project.

AGRICULTURAL, SOILS, GEOLOGIC, AND PALEONTOLOGICAL RESOURCES

Seismic zone. The subject site is located within Seismic Zone 4. Sites under this designation have a one in ten chance that an earthquake with an active peak acceleration level of 0.04g (4/10 the acceleration of gravity) will occur within the next fifty years.

Proximate Faults. The subject site is approximately thirteen miles south of the Elsinore Fault and approximately forty miles southwest of the San Andreas Fault. The El Modena Fault traverses the northern section of the City; however, it is not considered an active fault.

Slope. The Well 21 site has an elevation of 112 feet above mean sea level (msl), the Well 22 site has an elevation of 108 feet above msl, and the treatment facility site has an elevation of 87 feet above msl. Elevations of the roadway alignment where the transmission pipelines would be placed ranges from 108 feet above msl to 53 feet above msl. Each portion of the subject site is generally flat.

Geological Hazards

San Andreas Fault Zone. Identified as a Special Studies Zone by the State Geologist under the provisions of the Public Resources Code, the San Andreas fault zone is one of the most seismically active faults in North America. The fault zone is also important from a botanical and geological standpoint. The geological features along the fault have national significance due to the extraordinary preservation of the fault trace in the arid climate. Much of the fault zone already has been given agricultural preserve status. Due to the distance between the San Andreas Fault and the subject site, it is not anticipated that the subject site would be affected by fault activity.

Ground Motion

Ground motions (10 percent probability of being exceeded in 50 years) are expressed as a fraction of the acceleration due to gravity (g). Three values of ground motion are shown, peak ground acceleration (Pga), spectral acceleration (Sa) at short (0.2 second) and moderately long (1.0 second) periods. Pga is typically expressed as a fraction of the acceleration due to gravity. Ground motion values are also modified by the local site soil conditions. Each ground motion value is shown for three different site conditions: firm rock (conditions on the boundary between site categories B and C as defined by the building code), soft rock (site category C) and alluvium (site category D).

The primary seismic risks associated with the property are ground motion as a result of shaking. Based on the California Geological Survey's *Probabilistic Seismic Hazards Assessment* (2003), there is a 30 to 40 percent probability of exceedance at the subject site over a 50-year period. Refer to Table 3 (Subject Site Ground Motion) for site specific ground acceleration.

Table 3
Subject Site Ground Motion

Ground Motion	Firm Rock	Soft Rock	Alluvium
Pga	0.332	0.346	0.379
Sa 0.2 sec	0.798	0.838	0.915
Sa 1.0 sec	0.303	0.378	.0465
Note: National Earthquakes Hazard Reduction Program (NEHRP) Soil Corrections were used to calculate Soft Rock and Alluvium. Ground Motion values were interpolated from a grid (0.05 degree spacing) of calculated values. Interpolated ground motion may not equal values calculated for a specific site, therefore these values are not intended for design or analysis.			
Source: California Geological Survey, *Probabilistic Seismic Hazard Mapping Ground Motion Page*, 2008. http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamap.asp			

Secondary seismic risks that may be associated with the subject site include the interaction of ground shaking with existing subsurface conditions and may include liquefaction, seismically induced settlement, and collapsible soils. Liquefaction is a phenomenon that may occur as a result of earthquake shaking at locations where loose sandy soils are present and groundwater levels are shallow.

Seismically induced settlement occurs when earthquake shaking causes densification of relatively loose sediments. Sediments that are sufficiently loose are subject to such densification, which can cause surface settlement and damage to surface and near-surface structures. Collapsible soils occur when relatively low density materials shrink in volume when water is added, and/or are subjected to great weight such as from a building or road fill. The process of collapse with the addition of water is also known as hydrocompaction. Limited settlement from seismic activity may occur at the subject site. A geotechnical investigation should be conducted to evaluate the potential for liquefaction, seismically induced settlement, and collapsible soils beneath the subject site. Standard design and construction techniques can then be used to mitigate the potential for damage due to seismically induced settlement. Typical mitigation may include removal and re-compaction of loose soils.

Soils on the project area include Metz loamy sand (at the well sites), Chino silty clay loam, drained (at the treatment facility site), and Mocho loam, Omni clay, drained, Chino silty clay loam, drained, Chino silty clay loam, and Omni clay (within the proposed pipeline alignment). These soils generally have slow to very slow runoff potential and slight to no erosion hazard. On-site soils have a very low to low potential for soil expansion. All locations (components) of the proposed project are more than 60 to 80 inches to the underlying water table. Expansive soils are more responsive to changes in water content than other types. The higher the clay content, the more the soil will swell when wetted and shrink when drying. Soil erosion by wind or water runoff is dependent of soil type and its consolidation, vegetative cover, slope, and the runoff velocity.

The Conservation/Open Space/Recreation Element identifies areas within the City that are susceptible to liquefaction or potential bedrock landslides. When development is proposed within these areas, studies shall be performed as directed by the City to determine the potential for hazards and the amount of development which is supportable on the site. According to Figure COSR-1, Hazard Planning Areas, of the General Plan,

the Well 21 and Well 22 sites, and roadway alignment affected by the proposed transmission pipelines are not located in an area subject to liquefaction or landslides. However, the proposed treatment facility site is located within an area of high liquefaction potential. The potential jack and bore location crossing Peters Canyon Channel at Edinger Avenue (as well as the alternative crossing at Moffett Drive) is located within the 100-year flood zone.

Paleontological Resources

Paleontological Sites. According to the General Plan, paleontological features are generally most affected by earthmoving and subsequent urban development. The City has very detailed standards and requirements for grading designed to protect sensitive topographic, soil, paleontologic, and archaeologic resources. The Tustin Grading Manual sets forth appropriate measures to protect the earth by controlling erosion, sedimentation, and storm damage. Preservation of sensitive locations is a high priority for the City during any project review. Additionally, prior to development, a records search and/or a field survey would be conducted. Identified areas require a licensed paleontologist or archaeologist to be present on the site to observe grading or other earthwork. According to Figure COSR-2, Important Natural Resources, of the General Plan, areas of potential paleontologic sensitivity are concentrated in the Peters Canyon area located in the northeast portion of the City, approximately four miles from the subject site. Therefore, there are no known paleontological resources in the vicinity of the subject site, and these resources are not expected to be uncovered during construction activities.

Williamson Act Enrollment

The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use for ten years. The contract automatically renews each year for a ten-year term. In return, landowners receive property tax assessments, which are much lower than normal because they are based upon farming and open space uses as opposed to full market value. Local governments receive an annual subvention of forgone property tax revenues from the State.

The proposed project is not located in or near an area of agricultural production, and is not enrolled in a Williamson Act Contract. The well sites are currently located within a residential area of the City. The treatment facility site would be located in the Pacific Center East Specific Plan District. Transmission pipelines would be located within roadway right-of-way. No agricultural land would be affected by project implementation.

Special/Unique Designation for Agricultural or Mineral Resources

The City does not include any land zoned for agricultural use other than that within the R-A (Residential Agricultural District) zoning district. The following uses are allowed the within the R-A district under Article 9, Chapter 2, Part 9221 of the Municipal Code:

1. *Single family dwelling*
    a) *Maximum height: 30 feet*

   b) *Minimum building site: 7,200 square feet*
   c) *Minimum lot width at property line: 60 feet or 40 feet required in cul-de-sacs*
   d) *Maximum lot coverage: 40 percent*
   e) *Minimum front yard setback: 20 feet*
   f) *Minimum side yard setback: Corner lot line: 10 feet, Interior lot line: 5 feet*
   g) *Minimum rear yard setback: 5 feet with not less than 1,000 square feet, open space on rear 1/3 of lot*
   h) *Minimum lot area per family unit: 7,200 square feet*

2. *Light farming, except commercial dairies, commercial kennels, commercial rabbit, fox, goat or hog farms, or commercial chicken or poultry ranches.*
   a) *Maximum height: 30 feet*
   b) *Minimum building site: 7,200 square feet*
3. *Accessory uses normally incidental to a single family dwelling or light farming. This is not to be construed as permitting any commercial use.*
4. *Crop and tree farming*
5. *Home occupations in accordance with this Chapter. (Ord. No. 330, Sec. 2a)*
6. *Large family day care homes, caring for seven (7) to twelve (12) children subject to the standards contained in the R-1 District regulations, Section 9223a.6. (Ord. No. 911, Sec. 1, 5-21-84)*

There are no components of the proposed project located in an R-A zoned area of the City. Therefore, these development standards do not apply to the proposed project.

The City does not specify any special or unique designations for mineral resources. The only mineral resource identified within the City is Mercury-Barite which is deposited in Red Hill, located approximately 2 miles northeast of the subject site. However, this resource is not utilized, and the proposed project would not impact Red Hill.

Atypical Construction Limitations

Project structures must be designed to comply with the California Building Code (CBC) and the Uniform Building Code (UBC) Zone 4 requirements since the project is located in a seismically active area. The CBC and UBC are considered to be standard safeguards against major structural failures and loss of life. The goals of the codes are to provide structures that will: (1) resist minor earthquakes without damage; (2) resist moderate earthquakes without structural damage but with some non-structural damage; and (3) resist major earthquakes without collapse but with some structural and non-structural damage. The UBC bases seismic design on minimum lateral seismic forces (“ground shaking”). The UBC requirements operate on the principle that providing appropriate foundations, among other aspects, helps to protect buildings from failure during earthquakes.

City of Tustin Conservation/Open Space/Recreation Element

The Conservation/Open Space/Recreation Element of the General Plan contains several policies relating to agriculture, soils, geology, and paleontologic resources. Of these policies, the following may apply to the proposed project:

- **Policy 9.2:** Minimize and eliminate the adverse impact of resource production activities, where possible.

- **Policy 12.2:** Retain and protect significant areas of archaeological, paleontological, or historical value for education and scientific purposes.

- **Policy 13.1:** Require a site inspection by certified archaeologists or paleontologists for new development in designated sensitive areas.

- **Policy 13.2:** Require mitigation measures where development will affect archaeological or paleontological resources.

- **Implementation Program 7 (Paved Roads):** The City will study whether to adopt an ordinance restricting outdoor storage of fine particulate matter, requiring liners for truck beds and covering of loads, and controlling construction activities and emissions from unpaved areas, and paving areas used for vehicle maneuvering or areas otherwise identified by the Air Resources Board (implements measures BCM-01 and BCM-03 of the 1997 AQMP).

- **Implementation Program 15 (Public Building Energy Conservation):** Ensure that energy saving devices are installed on new public buildings and when retrofitting existing public buildings.

- **Implementation Program 19 (Grading Regulations):** Amend the City Grading and Excavation Code and Grading Manual to require: a) landscaping plans to be prepared and revegetation to occur as early as feasible as part of grading activity; b) review of development plans for sensitive siting and grading treatments, particularly within designated hillside areas; and c) preparation of erosion control plans with grading which identify location of interim drainage facilities, diverters and siltation areas.

- **Implementation Program 30 (Preserve Archaeologic and Paleontologic Resources):** Preserve archaeologic and paleontologic resources within the City by: a) requiring developers to perform archaeological and paleontological surveys prior to grading in areas known or suspected to contain such resources; and b) enforcing provisions of the California Environmental Quality Act regarding preservation or salvage of significant historic, archaeological and paleontological sites discovered during construction activities.

WATER RESOURCES

The most prominent water feature in the City is Peters Canyon Channel, located along the eastern boundary of the City. Peters Canyon Channel is located at the potential jack and bore location which proposes a transmission pipeline beneath the channel at Edinger Avenue to connect at Harvard Avenue. Several mitigation measures were adopted for Peters Canyon as part of the East Tustin Specific Plan. These measures continue to reflect City policy.

The 1990 Groundwater Management Plan for Orange County outlines several water conservation goals. The City is participating in several programs to improve basin management and decrease reliance upon imported water. According to Figure COSR-1, Hazard Planning Areas, of the General Plan, much of the central area of the City to the north of Interstate 5 is within the 500-year floodplain. Areas within the 100-year flood plain are located within the southeastern portion of the City near Peters Canyon Channel. As previously stated, the well sites, treatment facility, and transmission pipeline alignment are not located within a floodplain. However, the jack and bore location at Edinger Avenue across Peters Canyon Channel is within the 100-year floodplain.

Local Flood-Related Limitations

The City's average annual rainfall is approximately 12.84 inches and mostly occurs in the winter months. According to the County of Orange General Plan, a large portion of northern Orange County is underlain by a groundwater basin, which is primarily supplied by the Santa Ana River watershed. Additional streams providing water supply to the basin include Santiago Creek, San Diego Creek, San Juan Creek, and Aliso Creek. Local water resources are made up of a combination of groundwater and imported supplies from the Colorado River and water from northern California. The nearest basin to the subject site is the Haster Basin, located approximately 6 miles to the west.

The Santa Ana River watershed is the most extensive in Orange County. Western Orange County has historically experienced flooding from the Santa Ana River. Despite numerous improvements to the Santa Ana River Channel and several flood control facilities, the floodplain remains the same and can expect to be subject to sporadic flooding occurrences. The subject site is not anticipated to experience flood hazards from the Santa Ana River due to distance. However, part of the proposed project is located within the Peters Canyon Channel floodplain, which is much smaller in size compared to that of the Santa Ana River. Areas designated within the 100-year storm flood area have not flooded within the last 10 years and are less susceptible to flooding due to more recent storm drain and flood control improvements. Improvements to the Peters Canyon Channel is planned to accommodate a 100-year storm. Flood control will also be improved through the use of detention basins. The proposed pipeline alignment at the crossing of Peters Canyon Channel at Edinger Avenue (or the alternative at Moffett Drive) is within the Peters Canyon floodplain. Upon completion of construction, risk of flooding at the project site from Peters Canyon Channel is expected to be very low.

Article 4, Chapter 9, Part 4902 of the Municipal Code includes regulations regarding urban runoff. New development and significant redevelopment should be in accordance

with the Drainage Area Management Plan and any conditions and requirements established by the City which would reduce or eliminate pollutants in storm water runoff from the project site. Article 9, Chapter 8, Part 9804 of the Municipal Code addresses provisions for flood hazard reduction. Standards of construction include anchoring to prevent flotation, collapse, or lateral movement, and usage of flood-resistant construction materials and utility equipment. Additionally, encroachments, including fill, new construction, substantial improvements, and other development should be prohibited within floodways.

Regulatory Policies. For projects over an acre in disturbance, RWQCB requires that a Storm Water Pollution Prevention Plan (SWPPP) be prepared to address surface water quality.

Additionally, the City participates in the federal National Pollution Discharge Elimination System (NPDES) to prevent storm water from entering the storm drain system. This program is implemented through several permits issued to local jurisdictions by the RWQCB. Co-Permittee requirements, implemented by the City Public Works and Community Development Departments include the following that may apply to the project:

- Inspecting construction sites to ensure pollutants such as dirt and debris are contained on-site;
- Inspecting commercial and industrial sites to ensure chemicals or other contaminants are not spilling or draining into the storm drain system;
- Reviewing new development and significant redevelopment projects to ensure best management practices for preventing water pollution are used;
- Educating residents and business owners about stormwater issues;
- Prohibiting unauthorized connections to or discharges into the storm drain system; and,
- Maintaining the storm drain system by street sweeping, catch basin stenciling, and drainage facility inspection, cleaning, and maintenance.

Sedimentation and Erosion

Soil type, amount of disturbance and slopes are key aspects to analyzing potential sedimentation and erosion issues. The project's soil types and descriptions are listed in the previous Agriculture, Soils, Geologic, and Paleontological section. As described in the NRCS Soil Survey, the project's soil types have slow to very slow runoff, and slight to no erosion hazard.

FEMA or County Flood Zones

The well sites, treatment facility, and proposed transmission pipeline alignment are within Zone X which corresponds to areas outside of the one-percent annual chance floodplain with average depths of less than one foot or with drainages areas less than one square mile; and areas protected by levees from one percent annual chance of flood. The interior of Peters Canyon Channel is designated as Zone A (No Base Flood

Elevations Determined); jack and bore activities would potentially take place beneath the channel.

Water Quality Requirements Exceeding SWPPP BMPs

The Santa Ana RWQCB regulates stormwater discharge in the area of the subject site. Construction activities disturbing more than one acre of ground require coverage under the California General Stormwater Permit for Construction Activities. A SWPPP and implementation of Best Management Practices (BMPs) are required for permitted construction activities. Local stormwater regulations are consistent with and do not exceed Statewide regulations.

401/404 Permit Required

Peters Canyon Channel is located to the east of the subject site (east of MCAS), the Santa Fe Channel is located along Edinger Avenue to the north of MCAS, and the Santa Ana River is located approximately 5 miles west of the subject site.

The recent "Rapanos" Supreme Court decision specifies that isolated ephemeral drainages, or other isolated wetlands, small swales, and ditches that are generally characterized by low volume, infrequent, and low flow must establish a "significant nexus" with a navigable water body for these water bodies to be considered under the jurisdiction of the Corps. Pursuant to this ruling, the Peters Canyon Channel near the subject site is likely non-jurisdictional. However, the decision of Federal jurisdictional applicability over these water is at the discretion of the Corps and is decided on a "case-by-case" basis. Therefore, consultation with the Corps is recommended prior to implementing actions that would impact drainages onto the subject site from the Caliente Range.

According to information from the USFWS National Wetlands Inventory, jurisdictional waters of the U.S. do not occur within the subject site. Peters Canyon Channel is noted as riverine, as is the Santa Fe Channel along Edinger Avenue. Since there are no jurisdictional waters noted within the proposed developed area of the subject site, Section 401 and 404 permits would not be necessary. It should be noted that a wetlands delineation survey was not performed as part of this assessment.

In California, any alteration of wetlands generally requires review and approval from the CDFG and the Corps. The Corps also consults with other Federal agencies on wetland permits, including the USFWS, the Environmental Protection Agency, and the National Marine Fisheries Service. In the Coastal Zone, additional special standards governing development in and around wetlands are contained in the California Coastal Act, which is administered by the California Coastal Commission, the County, and local cities that lie in the Coastal Zone.

Conservation/Open Space/Recreation Element

The Conservation/Open Space/Recreation Element contains policies regarding air quality in the City. The following policies may relate to the proposed project:

- **Policy 5.1:** Local drainage courses, channels, and creeks should be improved to protect vegetation and wildlife habitat wherever possible.

- **Policy 5.2:** Protect groundwater resources from depletion and sources of pollution.

- **Policy 5.3:** Conserve imported water by requiring water conservation techniques, water conserving appliances, and drought-resistant landscaping.

- **Policy 5.5:** Protect water quality by responsible agency support of enforcement of water quality standards for water imported into the County, and to preserve the quality of water in the groundwater basin and streams.

- **Policy 5.6:** Coordinate water quality and supply programs with all responsible water agencies, and cooperate and participate in plan preparation and programs.

- **Policy 8.2:** Control erosion during and following construction through proper grading techniques, vegetation replanting, and the installation of proper drainage control improvements.

- **Policy 8.3:** Encourage the practice of proper soil management techniques to reduce erosion, sedimentation, and other soil-related problems.

- **Policy 8.5:** Review applications for building and grading permits, and applications for subdivision for adjacency to, threats from, and impacts on geological hazards arising from seismic events, landslides, or other geologic hazards such as expansive soils and subsidence areas.

- **Implementation Program 24 (Water Quality):** Promote improved water quality by the following methods: a) support the Santa Ana Watershed Protection Authority Programs; b) support the Regional Water Quality Control Board Programs and the National Pollution Discharge Elimination System stormwater permit regulations; c) support the efforts of the Orange County Water District to monitor the Santa Ana River water quality; d) enforce the State Department of Health Services well construction standards; e) provide assistance and information to the Federal Environmental Protection Agency, the State Department of Health Services, and Orange County Health Department enforcement program during investigation, regulation and enforcement of water pollution restrictions; f) provide information to industrial operations within the City on methods to reduce or eliminate water contamination; g) work with the Orange County Water District, if financially feasible, to construct facilities adjacent to existing water wells to purify well water and increase production and use of local water; and h) develop local ordinances to regulate the dumping of pollutants into ground water.

TRAFFIC

Regional access to the subject site is provided from I-5, SR-55, and SR-261. Primary access to Well 21 and Well 22 is by Mitchell Avenue; access to the treatment facility site is by Edinger Avenue; access to the jack and bore locations is by School Lane and Edinger Avenue; and access to the transmission pipelines is by Mitchell Avenue, Newport Avenue, Sycamore Avenue, School Lane, and Edinger Avenue.

Traffic Studies Required

A Traffic Control Plan would need to be prepared to analyze construction traffic related impacts. The City has established the acceptable Level of Service (LOS) on most roads as “D” or better. Due to the significant amount of regional traffic on the designated Smart Streets (Irvine Boulevard, Edinger Avenue, and Jamboree Road south of Irvine Boulevard) LOS "E" is the recommended standard for these facilities, consistent with Congestion Management Plan (CMP) guidelines. A Traffic Control Plan should be prepared for construction activities and approved prior to commencement of construction. The Traffic Control Plan would detail lane closures and detours, outline staging activities, show traffic control devices, signage plans, parking restrictions, and pedestrian/bicycle routes. The potential jack and bore location crossing Peters Canyon Channel at Edinger Avenue is expected to result in significant temporary traffic impacts and involve extensive construction efforts. For this reason, the alternatives of crossing Peters Canyon Channel along the bridges at Edinger Avenue and Moffett Drive are being considered. Moffett Drive experiences a significantly lower traffic volume than Edinger Avenue and the channel is narrower at this location, requiring less extensive construction efforts. Both the crossing at Edinger Avenue and Moffett Drive would connect to the existing system at Harvard Avenue.

No measures are anticipated to be required for operational activities, as the project is not anticipated to result in exceedances of the LOS or design capacity for the surrounding roadways.

Ingress/Egress Limitations

Caltrans has oversight and traffic control authority on State highways. Oversize loads require special traffic control and usually require that permits be obtained from potentially affected jurisdictions. Since loads would be delivered using State highways, permits would be required from Caltrans. Additional permits from and coordination with the California Highway Patrol would be required.

The following is a list of requirements for legal, un-permitted vehicles to operate in California. Permits are required to operate vehicles in excess of the following limits.

- Maximum allowable vehicle width: 102 inches (some exceptions apply).
- Maximum allowable vehicle height is 14 feet.
- Maximum allowable lengths (California Legal) for vehicles that can travel through California are as follows (some exceptions apply):
  - Single vehicle: 40 feet
  - Combination 65 feet

- Trailer: not specified
- KPRA (kingpin-to-rear-axle): 40 feet
- Doubles: 75 feet for combination of vehicles consisting of a truck tractor and two trailers, provided neither trailer length exceeds 28 feet 6 inches.
- Doubles: 65 feet for combination of vehicle consisting of a truck tractor and two trailers, if one trailer length exceeds 28 feet 6 inches.

- Maximum allowable lengths (Surface Transportation Assistance Act National Network) for vehicles that are limited to the National Network and Terminal Access routes are as follows:
  - Combination: Unlimited
  - Maximum Trailer: 53 feet
  - KPRA: Unlimited if trailer is no more than 48 feet.
  - KPRA: 40 feet if trailer is more than 48 feet.
  - Doubles: Unlimited for combination of vehicles consisting of a truck tractor and two trailers, but neither trailer length can exceed 28 feet 6 inches.

- Maximum allowable weights are as follows:
  - Gross combination: 80,000 pounds
  - Single-axle weight: 20,000 pounds
  - Tandem axle with a four-foot spread: 34,000 pounds.

City of Tustin Circulation Element

According to the Circulation Element, Newport Avenue is designated as a Modified Major roadway (six- to eight-lane divided roadway); Sycamore Avenue is a Primary (four -lane undivided roadway); and Edinger Avenue is a Major roadway (six- to eight-lane divided roadway). Edinger Avenue contains a Class I bikeway. Construction activities associated with the proposed project may temporarily interfere with bikeway operations along Edinger Avenue. Construction activities may also temporarily impact pedestrian access along sidewalks. Impacts to bikeways and pedestrian circulation would cease upon completion of construction. Operation of the proposed project would not affect bikeway, pedestrian, or transit operations in the project area.

The Circulation Element contains several policies regarding transportation issues within the City. The following circulation policies may apply to the proposed project:

- **Policy 1.10:** Require that proposals for major new developments include a future traffic impact analysis which identifies measures to mitigate any identified project impacts.

- **Policy 1.16:** Continue to require dedication of right-of-way and construction of required public improvements on streets adjacent to construction projects at the developer's expense.

- **Policy 2.1:** Provide primary truck routes and describe such routes on selected arterial streets to minimize the impacts of truck traffic on residential areas.
- **Policy 6.14:** Require new development to dedicate land and fund improvement of bicycle, pedestrian and equestrian facilities, where deemed necessary to meet

public needs arising in conjunction with development.

- **Policy 8.1:** Develop a transportation improvement fee program which will enable circulation improvements to be funded by new development.

- **Implementation Program 3 (Dedication/Improvements):** The City shall:

    - Establish setback lines for future right-of-way to protect ultimate roadway integrity.
    - As part of development review, continue to require dedication of necessary right-of-way and improvement of streets at developer's expense pursuant to the Tustin City Code.

HAZARDOUS MATERIALS/WASTES

MCAS Background

The Tustin MCAS was first commissioned in 1942, with Navy Lighter Than Air (LTA) Blimps. In 1985, the MCAS mission was to train and support helicopter squadrons. MCAS closed in July 1999. Past waste management disposal operations have resulted in contamination of surface water, groundwater, and soils. Contaminants include jet fuel, aviation gas, oil, solvents, battery acids, and hydraulic oil. Cleanup efforts at 16 sites have resulted in 4 sites requiring no further action and 12 sites requiring further investigation, or have remedial action underway.

The military created a team to organize and implement a Base Closure and Realignment Act Base Cleanup Plan (BCP). The purpose of the BCP is to summarize the status of current environmental restoration and associated environmental compliance programs in support of base closure and to provide a means of integrating all on-going site activities. The BCP will integrate and coordinate activities under the Installation Restoration Program, the Resource Conservation Recovery Act, and other compliance programs. The BCP's goal is to identify all sites of potential contamination, investigate those with the potential to affect human health and the environment, and remediate all sites as necessary to meet applicable Federal, State, and local standards.

Hazardous Materials/Wastes Likely

<u>Envirostor</u>

The Well 21 and Well 22 sites are currently vacant with minimal vegetation within a residential area. Based on the review of government environmental databases (i.e., Department of Toxic Substance Control's [DTSC] Envirostor), no recognized environmental conditions (RECs) were identified on the well sites or within the roadway alignment. Additionally, the proposed treatment facility site address was searched, and no potential RECs were identified in connection with the property.

A search of surrounding properties revealed several portions of the adjacent MCAS site listed in Envirostor. Past documentation is available from 1991 to 2009, and includes PEAs, monitoring reports, remedial action plans, operations and maintenance reports, technical workplans, environmental assessments, land use restrictions and implementation workplans. Future activities planned for the MCAS site include operations and maintenance plans and reports, remedial action completion reports, design/implementation workplan, fact sheets, and record of decision (activities scheduled through 2013). According to Envirostor, potential areas of concern are located toward the center and western portion of the MCAS; the nearest area being approximately 0.50 miles from the transmission pipelines proposed beneath Edinger Avenue. Due to distance, potential MCAS areas of concern are not anticipated to affect the proposed transmission lines. However, in the event that trenching during construction to lay the proposed transmission pipelines under Edinger Avenue has the potential to encounter groundwater, appropriate safety measures would be required to ensure workers safety.

<u>Geotracker</u>

Additionally, a search of the State Water Resources Control Board Geotracker website did not yield any hazardous materials cleanup sites on the Well 21 and Well 22 sites or within the roadway alignment. The proposed treatment facility site address of 1221 Edinger Avenue was searched and resulted in one regulatory listing. Geotracker reports a gasoline leak to soil only from an underground storage tank (UST). The property reported case closure and receipt of a No Further Action letter on January 31, 1992.Also, the adjacent MCAS site was listed within the results of the Geotracker search and was listed as military UST sites, military UST cleanup sites, and a cleanup program site. According to Geotracker, most incidents have been declared as case closed. However, there are some that remain open for site assessment, remediation, or verification monitoring. The nearest area of concern to the proposed transmission pipelines proposed beneath Edinger Avenue is approximately 0.50 miles south. Therefore, the probability of contamination at the location of the proposed treatment facility is anticipated to be low due to distance. However, in the event that trenching during construction to lay the proposed transmission pipelines under Edinger Avenue has the potential to encounter groundwater, appropriate safety measures would be required to ensure workers safety.

City of Tustin Public Safety Element

The Public Safety Element of the General Plan identifies hazardous and toxic materials transported on the freeways, railroads, or underground pipelines as the greatest hazards to the City. The Atchison-Topeka and Santa Fe Railroad is located approximately 215 feet north of the MCAS site. City regulations governing the siting of facilities which handle hazardous materials are the main regulatory means of controlling hazardous materials in the City. The City has also implemented educational programs that inform the public of their responsibilities. The City also supports the efforts of other agencies responsible for regulating the use of hazardous materials.

According to the Public Safety Element of the General Plan, the City is subject to both urban and wildland fire hazards. The northeast part of the City is most susceptible to wildland fires while the southwest area is most susceptible to urban fires. No project components are located within these areas of most concern. The following policies contained in the Public Safety Element may apply to the proposed project:

- **Policy 4.4:** Cooperate fully with other local, State, and federal agencies to efficiently regulate the management of hazardous material and hazardous waste.

- **Policy 4.5:** Establish regulations requiring land uses involved in the production, storage, transportation, handling, or disposal of hazardous materials to be located a safe distance from other land uses that may be adversely affected by such activities.

- **Policy 4.13:** Support efforts to enforce State "right to know" laws, which outline the public's right to information about local toxics producers.

- **Policy 4.15:** Coordinate with the County of Orange in the implementation of the National Pollution Discharge Elimination System Permits (NPDES) regulations.

- **Policy 5.4:** Enforce building code requirements that assure adequate fire protection.

SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE

The Well 21 and Well 22 sites are located in within a developed, residential area of the City. The proposed treatment facility is located within a developed commercial/industrial area of the City. The groundwater transmission pipelines are proposed beneath existing roadways within the City.

City of Tustin Housing Element

Population and Housing. It is anticipated that the vast majority of the construction workforce for the proposed project would commute to the site rather than relocate. The operational workforce for the facility would be expected to be relatively small, and it is likely that some of these workers would be current residents of the local area. Therefore, impacts to population are expected to be minimal, and the proposed project would not induce substantial growth. Increased demands on the local housing supply are expected to be negligible.

The Housing Element identifies housing programs with the goal of meeting the identified housing needs of the City. Housing needs resulting from household overcrowding, deterioration of existing units, and unaffordable housing are identified in the Housing Element. The Housing Element includes strategies and programs that focus on housing affordability, rehabilitating substandard housing, meeting the existing demand for new housing, and conserving the existing affordable housing stock. State and Federal standards for rental housing overpayment are based on an income-to-housing cost ratio of 30 percent and above. Households paying more than 30 percent of their income have less income left for other necessities. According to the Housing Element, 44 percent of the City's lower income households (households earning less than 80 percent of the County median) are currently overpaying for housing. To create further housing opportunities, the City provides the issuance of tax-exempt bonds for the development of affordable housing through a Joint Powers Authority with the California Statewide Communities Development Authority, Low-Income Tax Credits, California Housing Finance Agency financing programs, and the Density Bonus Ordinance.

Article 9, Chapter 1, of the Municipal Code includes incentives for the development of affordable housing. Incentives include density bonuses, reduction of site development standards, modification of zoning code requirements, or modification of architectural design requirements.

The proposed project does not include any housing, or would convert existing housing to another use. Strategies and programs within the Housing Element, or incentives for development of affordable housing, would not directly apply to the proposed project.

Public Services and Schools. No significant impacts are expected on local public services during construction or operation of the proposed facilities. Current police, fire, and medical facilities should be sufficient to handle emergencies at the site. The use of proper safety procedures at the facilities would minimize the demands on local emergency services. Increases in the local population due to the proposed project are anticipated to be negligible, as the project would not induce an increase in population. No significant impacts are expected on local public services and schools.

The Housing Element of the General Plan contains several policies relating to housing issues within the City. However, these policies do not apply to the proposed project, as no housing is proposed, nor will the project affect or relocate existing housing.

AIR QUALITY

South Coast Air Quality Management District/Attainment

The subject site is located in the within the South Coast Air Quality Management District (SCAQMD) and the South Coast Air Basin (Basin).

The Federal Clean Air Act established Federal air quality standards known as the National Ambient Air Quality Standards. These standards identify levels of air quality for "criteria" pollutants (Ozone [O_3], Carbon Monoxide [CO], Nitrogen Oxides [NO_X], Sulfur Oxides [SO_X], Particulate Matter [PM_{10}], Fine Particulate Matter [$PM_{2.5}$], and Lead [Pb]) that are considered the maximum levels of ambient (background) air pollutants considered safe, with an adequate margin of safety, to protect the public health and welfare. Under the Federal Clean Air Act, the pollutants classified as nonattainment (exceeding acceptable thresholds) include O_3, PM_{10}, and $PM_{2.5}$.

Similar to the EPA, the California Air Resources Board designates areas within California as either attainment or nonattainment for each criteria pollutant based on whether the California Ambient Air Quality Standards have been achieved. Under the California Clean Air Act, areas are designated as nonattainment for a pollutant if air quality data shows that a state standard for the pollutant was violated at least once during the previous three calendar years. Highly irregular or infrequent events are not considered violations of a state standard, and are not used as a basis for designating areas as nonattainment. Under the California Clean Air Act, the Basin is designated as a nonattainment area for O_3, PM_{10}, and $PM_{2.5}$.

Atypical air quality regulations

For the purpose of meeting Federal requirements, impact significance is related to conformance with State Implementation Plan (SIP) and with the National Ambient Air Quality Standards (NAAQS). Air quality impacts would be significant if they exceeded these standards or contribute to non-conformance.

For the purpose of meeting State requirements under CEQA, the SCAQMD has published thresholds of significance for air quality in their CEQA Guidelines.

SCAQMD Thresholds of Significance

Under CEQA, the SCAQMD is an expert commenting agency on air quality within its jurisdiction or impacting its jurisdiction. Under the Federal Clean Air Act, the SCAQMD has adopted federal attainment plans for O_3 and PM_{10}. The SCAQMD reviews projects to ensure that they would not: (1) cause or contribute to any new violation of any air quality standard; (2) increase the frequency or severity of any existing violation of any air quality standard; or (3) delay timely attainment of any air quality standard or any required interim emission reductions or other milestones of any federal attainment plan.

The *CEQA Air Quality Handbook* also provides significance thresholds for both construction and operation of projects within the SCAQMD jurisdictional boundaries. If the SCAQMD thresholds are exceeded, a potentially significant impact could result. However, ultimately the lead agency determines the thresholds of significance for

impacts. If a project proposes development in excess of the established thresholds, as outlined in Table 4, South Coast Air Quality Management District Emission Thresholds, a significant air quality impact may occur and additional analysis is warranted to fully assess the significance of impacts.

Table 4
South Coast Air Quality Management District Emissions Thresholds

Phase	Pollutant (lbs/day)					
	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Construction	75	100	550	150	150	55
Operational	55	55	550	150	150	55
Source: South Coast Air Quality Management District, *CEQA Air Quality Handbook,* November 1993.						

Construction emissions associated with the proposed project would result from the use of off-road diesel equipment, fugitive dust, and architectural coatings. As a result, the project would be required to incorporate mitigation to reduce its impacts. Mitigation for a construction project of this nature would include the use of standard mitigation for construction activities, listed below.

Operation of the proposed project is not anticipated to result in significant emissions. It is our understanding that the proposed facilities would be electrically supplied and would not include any backup generators. Therefore, no operational permits would by required from the SCAQMD.

Standard Mitigation for Construction:

- Construction equipment vehicles shall be controlled by maintaining equipment engines in good condition and in proper tune per manufacturer's specifications.
- Limit on-site vehicle speed to 15 miles per hour.
- Water material excavated or graded sufficiently to prevent excessive amounts of dust. Water at least twice daily with complete coverage, preferably in the late morning and after work is done for the day.
- Water or securely cover material transported on-site or off-site sufficiently to prevent generating excessive amounts of dust.
- Minimize area disturbed by clearing, grading, earth moving, or excavation operations so as to prevent generating excessive amounts of dust.
- Indicate these control techniques in project specifications. Compliance with the measure will be subject to periodic site inspections by the City.
- Prevent visible dust from the project from emanating beyond the property line, to the maximum extent feasible.
- Apply nontoxic chemical soil stabilizers according to manufacturers' specifications to all inactive construction areas (previously graded areas inactive for ten days or more).

- Trucks transporting soil, sand, cut or fill materials, and/or construction debris to or from the site shall be tarped from the point of origin.
- Contractors shall use high-pressure-low-volume (HPLV) paint applicators with a minimum transfer efficiency of at least 50 percent;
- Use required coatings and solvents with a VOC content lower than required under Rule 1113;
- Construct/build with materials that do not require painting; and
- Use pre-painted construction materials.

SCAQMD Contact Info

Address:
21865 Copley Drive
Diamond Bar, CA 91765

Phone: (909) 396-2000
www.aqmd.gov

City of Tustin Conservation/Open Space/Recreation Element

While air quality is not a mandatory General Plan Element, the SCAQMP now contains specific guidance for air quality to be addressed in the General Plan. The City of Tustin has included an Air Quality sub-element in the Conservation/Open Space/Recreation Element. The purpose of the sub-element is to reduce current and projected emissions through stationary source control measures; mobile source, transportation and land use control measures; and energy conservation measures. The Conservation/Open Space/Recreation Element contains policies regarding air quality in the City. The following policies may relate to the proposed project:

- **Policy 1.6:** Cooperate and participate in regional air quality management plans, programs, and enforcement measures.
- **Policy 2.8:** Manage non-residential parking supply to discourage auto use, while ensuring that economic development goals will not be sacrificed.
- **Policy 2.13:** Integrate air quality planning with the land use and transportation process.
- **Policy 3.1:** Adopt incentives, regulations, and/or procedures to minimize particulate emissions from paved and unpaved roads, agricultural uses, parking lots, and building construction.
- **Policy 4.1:** Promote energy conservation in all sectors of the City including residential, commercial, and industrial.

- **Policy 4.1:** Promote energy conservation in all sectors of the City including residential, commercial, and industrial.

References

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City of Tustin, *MCAS Tustin Addendum to the FEIR*, April 2006.

City of Tustin, *City of Tustin General Plan*, June 2008.

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City of Tustin, *Pacific Center East Specific Plan*, December 1990.

County of Orange Environmental Management Agency, *Central and Coastal Subregion Natural Community Conservation Plan/Habitat Conservation Plan*, July 17, 1996.

County of Orange, *General Plan*, September 13, 2005.

Federal Emergency Management Agency, *Flood Insurance Rate Map Orange County, California and Incorporated Areas, Panel 227 of 550, Map Number 06059C0277H*, map revised February 18, 2004.

RBF Consulting, *IRWD Wells 21 and 22-Project Summary Technical Memorandum*, March 26, 2009.

South Coast Air Quality Management District, *CEQA Air Quality Handbook*, April 2003.

State Water Resources Control Board, *Geotracker Database*, accessed February 2010.
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United States Fish and Wildlife Service, *National Wetlands Inventory Google Earth Data*, accessed April 2009.
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APPENDIX O

WELLS 21 AND 22 DWSAP REPORTS

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Drinking Water Source Assessment

Water System

Irvine Ranch Water District

Orange County

Water Source

WELL 21 - PENDING

Assessment Date

May, 2009

California Department of Health Services
Drinking Water Field Operations Branch
GEOSCIENCE Support Services, Inc.

TurboSWAP ID.	**XL**
System No.	**3010092**
Source No.	**066**
PS Code	**3010092-066**

Assessment Summary

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange
System Name Irvine Ranch Water District **System No.** 3010092
Source Name WELL 21 - PENDING **Source No.** 066 **PS Code** 3010092-066

Completed by Diane Smith **Date** May, 2009

According to DHS records, this Source is Groundwater. This Assessment was done using the Default Groundwater System Method.

Description of System and Source

The Irvine Ranch Water District water system is located in Orange County and serves the City of Irvine and portions of Costa Mesa, Lake Forest, Newport Beach, Orange, Tustin and unincorporated areas of Orange County. There are approximately 95,865 service connections serving a population of 330,000.

WELL 21, the subject of this assessment, was constructed in 1992 and rehabilitated in 2008. It is 1,080 feet deep and is estimated to produce approximately 3,300 gallons per minute. The principal recharge area is the Coastal Plain of Orange County Groundwater Basin. General land use on the vicinity of the well includes municipal, residential and commercial activities. The protection zones and recharge areas extend into parks, commercial areas and residential areas.

Assessment Procedures

The assessment of the source, WELL 21, was conducted by GEOSCIENCE Support Services, Inc. under the Drinking Water Source Assessment and Protection (DWSAP) program.

The groundwater protection zones were calculated using the U.S. Environmental Protection Agency Well Head Protection Model (WHPA). The WHPA was run 10 years into the future to assess the two-, five- and ten-year protection zones.

Horizontal flow direction in the area of the source well was estimated to be west-southwest. The estimate is based on a 2007 ground water contour map from the Orange County Water District.

The following sources of information were used in the assessment: EPA, State, County and USGS databases and knowledge and records maintained by the water system personnel.

Contents of this Assessment

Yes ☒	No ☐	Assessment Summary
Yes ☒	No ☐	Vulnerability Summary
Yes ☒	No ☐	Source Location Form
Yes ☒	No ☐	Delineation of Water Protection Zones
Yes ☒	No ☐	Physical Barrier Effectiveness Checklist
Yes ☒	No ☐	Source Data Sheet
Yes ☒	No ☐	Inventory of Possible Contaminating Activities
Yes ☒	No ☐	Vulnerability Ranking
Yes ☒	No ☐	Assessment Map

Comments

The physical barrier effectiveness was calculated to be 80, which indicates High effectiveness.

Vulnerability Summary

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 21 - PENDING **Source No.** 066 **PS Code** 3010092-066

Completed by Diane Smith **Date** May, 2009

THE FOLLOWING INFORMATION MUST BE INCLUDED IN THE SYSTEM CONSUMER CONFIDENCE REPORT

A source water assessment was conducted for the **WELL 21 - PENDING**

of the **Irvine Ranch Water District** water system in **May, 2009** .

The source is considered most vulnerable to the following activities not associated with any detected contaminants:

Historic gas stations
Underground storage tanks - Confirmed leaking tanks

Discussion of Vulnerability

Potentially contaminating activities (PCAs) were screened for in Zone A, B5, and B10. A source is considered vulnerable to all PCAs that have a vulnerability score of 8 or higher and/or PCAs that have a contaminant in source water potentially associated with their activity. The source is considered potentially vulnerable to 19 PCAs (see page 11, "Vulnerbility Ranking", of the report).

A copy of the complete assessment may be viewed at:

Irvine Ranch Water District
15600 Sand Canyon Ave.
Irvine, CA 92618

You may request a summary of the assessment be sent to you by contacting:

Cindy Beck
Regulatory Compliance Manager
949-453-5832
949-476-1187 (fax)
beck@irwd.com

Delineation of Water Protection Zones

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 21 - PENDING **Source No.** 066 **PS Code** 3010092-066

Completed by Diane Smith **Date** May, 2009

Method Used to Delineate Protection Zones

1. Calculated Fixed Radius
2. Modified Calculated Fixed Radius (Attach documentation for direction of ground water flow.)

X 3. More Detailed Methods

4. Arbitrary Fixed Radius (For use only by or permission of DHS)

Description of Protection Zones

U. S. Environmental Protection Agency Well Head Protection Model (WHPA). WHPA was run 10 years into the future to assess the two-, five-, and ten-year protection zones.

Physical Barrier Effectiveness (PBE)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 21 - PENDING **Source No.** 066 **PS Code** 3010092-066

Completed by Diane Smith **Date** May, 2009

Parameter		Possible Points	This Source	Score
Type of Aquifer				
Confinement				
1. Unconfined, Semi-confined, Fractured Rock, Unknown Aquifer		0		
2. Confined		50	X	50
Pathways of Contamination (All Aquifers)				
Presence of Abandoned or Improperly Destroyed Wells				
1. Present within Zone A (2 year TOT distance)	Yes	0		
	No	5	X	5
	Unknown	0		
2. Present within Zone B5 (2 -5 year TOT distance)	Yes	0		
	No	3	X	3
	Unknown	0		
3. Present within Zone B10 (5-10 year TOT distance)	Yes	0		
	No	2	X	2
	Unknown	0		
Hydraulic Head (Confined Aquifers)				
What is the relationship in the hydraulic head between the confined aquifer and the overlying unconfined aquifer? (i.e. does the well flow under artesian conditions?)				
1. Head in confined aquifer is higher than head in unconfined aquifer under all conditions.		20		
2. Head in confined aquifer is higher than head in unconfined aquifer under static conditions.		10		
3. Head in confined aquifer is lower than or same as head in unconfined aquifer under static conditions.		0		
4. Unknown		0	X	0
Well Construction (All Aquifers)				
Sanitary Seal (Annular Seal) Depth	None of less than 20 feet	0		
248 feet	Between 20 and 50 feet	6		
	50 feet or greater	10	X	10
	Unknown	0		
Surface Seal (concrete cap)	Not present or improperly constructed	0		
	Watertight, slopes away from well at least 2' laterally in all directions	4	X	4
	Unknown	0		

Physical Barrier Effectiveness (PBE)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 21 - PENDING **Source No.** 066 **PS Code** 3010092-066

Completed by Diane Smith **Date** May, 2009

Parameter		Possible Points	This Source	Score
Well Construction (All Aquifers)--continued				
Flooding potential at well site	Subject to localized flooding (i.e. in low area or unsealed pit or vault) or within 100 year flood plain	0		
	Not subject to flooding	1	X	1
	Unknown	0		
Security at well site	Not secure	0		
	Secure	5	X	5
	Unknown	0		

Score	Effectiveness
0 to 35	Low
36 to 69	Moderate
70 to 100	High

Maximum Score = 100

Score 80

Effectiveness High

Inventory of Possible Contaminating Activities (PCA Inventory)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 21 - PENDING **Source No.** 066 **PS Code** 3010092-066

Completed by Diane Smith **Date** May, 2009

PCA (Risk Ranking)	PCA in Zone A	PCA in Zone B5	PCA in Zone B10	*	Comments
Commercial/Industrial Activities					
Automobile - Body shops (H)	N	N	Y		
Automobile - Car washes (M)	Y	N	Y		
Automobile - Gas stations (VH)	N	Y	Y		
Automobile - Repair shops (H)	Y	N	Y		
Boat services/repair/refinishing (H)	N	N	N		
Chemical/petroleum pipelines (H)	N	N	N		
Chemical/petroleum processing/storage (VH)	N	N	N		
Dry cleaners (VH)	N	Y	Y		
Electrical/electronic manufacturing (H)	N	N	Y		
Fleet/truck/bus terminals (H)	N	N	N		
Furniture repair/manufacturing (H)	N	N	N		
Home manufacturing (H)	N	N	N		
Junk/scrap/salvage yards (H)	N	N	N		
Machine shops (H)	N	N	Y		
Metal plating/ finishing/fabricating (VH)	N	N	N		
Photo processing/printing (H)	Y	N	Y		
Plastics/synthetics producers (VH)	N	N	Y		
Research laboratories (H)	N	N	Y		
Wood preserving/treating (H)	N	N	N		
Wood/pulp/paper processing and mills (H)	N	N	N		
Lumber processing and manufacturing (H)	N	N	N		
Sewer collection systems (H in Zone A, otherwise L)	Y	Y	Y		
Parking lots/malls [>50 spaces] (M)	Y	Y	Y		
Cement/concrete plants (M)	N	N	N		
Food processing (M)	N	N	N		
Funeral services/graveyards (M)	N	N	N		
Hardware/lumber/parts stores (M)	N	N	Y		
Appliance/Electronic Repair (L)	N	N	Y		
Office buildings/complexes (L)	N	N	Y		
Rental Yards (L)	N	N	Y		
RV/mini storage (L)	N	N	Y		

Y = Yes N = No U = Unknown
*** = A contaminant potentially associated with this activity has been detected in the water supply.**

Inventory of Possible Contaminating Activities (PCA Inventory)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 21 - PENDING **Source No.** 066 **PS Code** 3010092-066

Completed by Diane Smith **Date** May, 2009

PCA (Risk Ranking)	PCA in Zone A	PCA in Zone B5	PCA in Zone B10	*	Comments
Residential/Municipal Activities					
Airports - Maintenance/fueling areas (VH)	N	N	N		
Landfills/dumps (VH)	N	N	N		
Railroad yards/maintenance/fueling areas (H)	N	N	N		
Septic systems - high density [>1/acre] (VH in Zone A, otherwise M)	N	N	N		
Sewer collection systems (H in Zone A, otherwise L)	**Y**	**Y**	**Y**		
Utility stations - maintenance areas (H)	N	N	N		
Wastewater treatment plants (VH in Zone A, otherwise H)	N	N	N		
Drinking water treatment plants (M)	N	N	N		
Golf courses (M)	N	N	N		
Housing - high density [>1 house/0.5 acres] (M)	**Y**	**Y**	**Y**		
Motor pools (M)	N	N	**Y**		
Parks (M)	N	**Y**	N		
Waste transfer/recycling stations (M)	**U**	**U**	**U**		
Apartments and condominiums (L)	**Y**	**Y**	**Y**		
Campgrounds/Recreational areas (L)	N	N	N		
Fire stations (L)	N	N	N		
RV Parks (L)	N	**Y**	**Y**		
Schools (L)	N	**Y**	**Y**		
Hotels, Motels (L)	N	**Y**	**Y**		
Other Activities					
NPDES/WDR permitted discharges (H)	N	N	N		
Underground Injection of Commercial/Industrial Discharges (VH)	N	N	N		
Historic gas stations (VH)	**Y**	N	**Y**		
Historic waste dumps/landfills (VH)	N	N	N		
Illegal activities/unauthorized dumping (H)	**U**	**U**	**U**		
Injection wells/dry wells/ sumps (VH)	N	N	N		
Known Contaminant Plumes (VH)	N	N	N		
Military installations (VH)	N	N	N		
Mining operations - Historic (VH)	N	N	N		

Y = Yes N = No U = Unknown
*** = A contaminant potentially associated with this activity has been detected in the water supply.**

Inventory of Possible Contaminating Activities (PCA Inventory)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 21 - PENDING **Source No.** 066 **PS Code** 3010092-066

Completed by Diane Smith **Date** May, 2009

PCA (Risk Ranking)	PCA in Zone A	PCA in Zone B5	PCA in Zone B10	*	Comments
Other Activities					
Mining operations - Active (VH)	N	N	N		
Mining - Sand/Gravel (H)	N	N	N		
Wells - Oil, Gas, Geothermal (H)	N	N	N		
Salt Water Intrusion (H)	N	N	N		
Recreational area - surface water source (H)	N	N	N		
Underground storage tanks - Confirmed leaking tanks (VH)	**Y**	**Y**	**Y**		
Underground storage tanks - Decommissioned - inactive tanks (L)	**Y**	**Y**	**Y**		
Underground storage tanks - Non-regulated tanks [tanks smaller than regulatory limit] (H)	**U**	**U**	**U**		
Underground storage tanks - Not yet upgraded or registered tanks (H)	**U**	**U**	**U**		
Underground storage tanks - Upgraded and/or registered - active tanks (L)	**U**	**U**	**U**		
Above ground storage tanks (M)	N	N	N		
Wells - Water supply (M)	**Y**	N	N		
Construction/demolition staging areas (M)	N	N	N		
Contractor or government agency equipment storage yards (M)	N	N	N		
Dredging (M)	N	N	N		
Transportation corridors - Freeways/state highways (M)	**Y**	**Y**	**Y**		
Transportation corridors - Railroads (M)	N	N	N		
Transportation corridors - Historic railroad right-of-ways (M)	N	N	N		
Transportation corridors - Road Right-of-ways [herbicide use areas] (M)	**U**	**U**	**U**		
Transportation corridors - Roads/Streets (L)	**Y**	**Y**	**Y**		
Hospitals (M)	N	N	N		
Storm Drain Discharge Points (M)	N	N	N		
Storm Water Detention Facilities (M)	N	N	N		
Artificial Recharge Projects - Injection wells [potable water] (L)	N	N	N		
Artificial Recharge Projects - Injection wells [non-potable water] (M)	N	N	N		

Y = Yes N = No U = Unknown
*** = A contaminant potentially associated with this activity has been detected in the water supply.**

Inventory of Possible Contaminating Activities (PCA Inventory)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 21 - PENDING **Source No.** 066 **PS Code** 3010092-066

Completed by Diane Smith **Date** May, 2009

PCA (Risk Ranking)	PCA in Zone A	PCA in Zone B5	PCA in Zone B10	*	Comments
Other Activities					
Artificial Recharge Projects - Spreading Basins [potable water] (L)	N	N	N		
Artificial Recharge Projects - Spreading Basins [non-potable water] (M)	N	N	N		
Medical/dental offices/clinics (L)	**Y**	N	**Y**		
Veterinary offices/clinics (L)	**Y**	N	N		
Surface water - streams/lakes/rivers (L)	N	N	N		
Wells - monitoring, test holes (L)	N	N	N		

Y = Yes N = No U = Unknown
*** = A contaminant potentially associated with this activity has been detected in the water supply.**

Vulnerability Ranking

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 21 - PENDING **Source No.** 066 **PS Code** 3010092-066

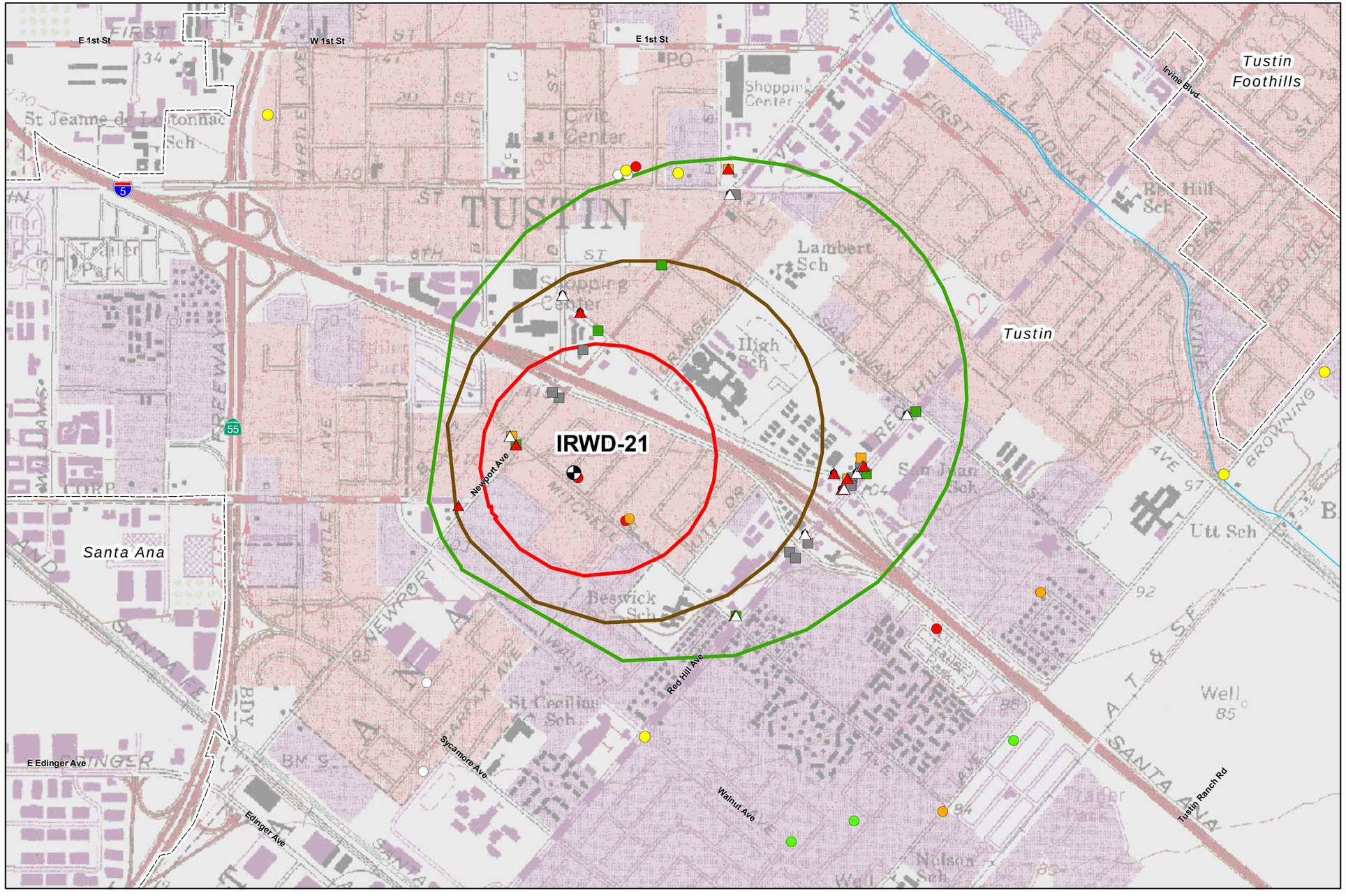
Completed by Diane Smith **Date** May, 2009

Zone	PCA (Risk Ranking)	*	PCA Risk Points	Zone Points	PBE Points	Vulnerability Score
A	Historic gas stations (VH)		7	5	1	13
A	Underground storage tanks - Confirmed leaking tanks (VH)		7	5	1	13
A	Automobile - Repair shops (H)		5	5	1	11
A	Photo processing/printing (H)		5	5	1	11
A	Sewer collection systems (H in Zone A, otherwise L)		5	5	1	11
A	Sewer collection systems (H in Zone A, otherwise L)		5	5	1	11
B5	Automobile - Gas stations (VH)		7	3	1	11
B5	Dry cleaners (VH)		7	3	1	11
B5	Underground storage tanks - Confirmed leaking tanks (VH)		7	3	1	11
A	Automobile - Car washes (M)		3	5	1	9
A	Housing - high density [>1 house/0.5 acres] (M)		3	5	1	9
A	Parking lots/malls [>50 spaces] (M)		3	5	1	9
A	Transportation corridors - Freeways/state highways (M)		3	5	1	9
A	Wells - Water supply (M)		3	5	1	9
B10	Automobile - Gas stations (VH)		7	1	1	9
B10	Dry cleaners (VH)		7	1	1	9
B10	Historic gas stations (VH)		7	1	1	9
B10	Plastics/synthetics producers (VH)		7	1	1	9
B10	Underground storage tanks - Confirmed leaking tanks (VH)		7	1	1	9

*** = A contaminant potentially associated with this activity has been detected in the water supply.**

RBF CONSULTING /
IRVINE RANCH WATER DISTRICT

DRINKING WATER SOURCE ASSESSMENT AND PROTECTION (DWSAP) DOCUMENTS FOR IRWD WELL NO. 21



T.5 S

R.9 W.

24-Apr-09

Prepared by: DWB

Map Projection: State Plane, Zone 6 (1983)

NORTH

0 500 1,000 Feet

GEOSCIENCE

GEOSCIENCE Support Services, Inc.
P.O. Box 220, Claremont, CA 91711
Tel: (909) 451-6650 Fax: (909) 451-6638
www.gssiwater.com

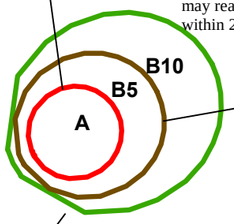
IRWD WELL NO. 21 GROUND WATER PROTECTION ZONES

EXPLANATION

IRWD Well No. 21

Zone A: A contaminant release within this zone may reach the well within 2 years.

Zone B5: A contaminant release within this zone may reach the well within 2 - 5 years.



Zone B10: A contaminant release within this zone may reach the well within 5 - 10 years.

Other Well Classification

- Active
- Inactive
- Abandoned
- Destroyed
- Other or Unknown

Leaking Underground Storage Tank (LUST) Classification

- Case Closed
- Remediation
- Site Assessment

Underground Storage Tank (UST) Classification

- Active
- Unknown

Source of storage tank data: EDR, 2009.

City Boundary

Figure 1

GIS_proj/rbf_irwd_well21_DWSAP_4-09/0_Fig_1_Well_21_dwsap_4-09.mxd

WELL DATA SHEET
IRWD Well No. 21

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.
** Indicates items required for Source Water Assessment*
*** Indicates additional items required for assessments and Ground Water Rule*

	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
DATA SHEET GENERAL INFORMATION		
System Name	Irvine Ranch Water District	Actual
System Number	3010092	Actual
Source of Information *(well log, DHS/County files, system, etc)*	DWR well log; IRWD; GEOSCIENCE Support Services, Inc.	Actual
Organization Collecting Information *(DHS, County, System, other)*	RBF Consulting; IRWD; GEOSCIENCE Support Services, Inc.	Actual
Date Information Collected/Updated	Apr-09	Actual
WELL IDENTIFICATION		
* Well Number or Name	IRWD Well No. 21	Actual
* DHS Source Identification Number (**FRDS ID No.**)	3010092-066	Actual
DWR Well Log on File? ("YES" or "NO")	Yes	Actual
State Well Number (from DWR)	05S09W16Q05S	Actual
Well Status (Active, Standby, Inactive)	Inactive	Actual
WELL LOCATION		
Latitude	33.734522	Actual
Longitude	-117.822275	Actual
Ground Surface Elevation (ft above Mean Sea Level)	108	Actual
Street Address	14232 Debusk Lane	Actual
Nearest Cross Street	Mitchell Ave.	Actual
City	Tustin	Actual
County	Orange	Actual
* Neighborhood/Surrounding Area *(see Note 1)*	Re; Mu; Co	Actual
Site plan on file? ("YES" or "NO")	Yes	Actual
DWR Ground Water Basin	Coastal Plain of Orange County	Actual
DWR Ground Water Sub-basin	Main Basin	Actual
SANITARY CONDITIONS		
** Distance to closest Sewer Line, Sewage Disposal, Septic Tank (ft)	56	Actual
Distance to Active Wells (ft)	684	Actual
Distance to Abandoned Wells (ft)	N/A	Actual
Distance to Surface Water (ft)	>2,500	Actual
** Size of controlled area around well (square feet)	6,800	Actual
* Type of access control to well site *(fencing, building, etc)*	Block wall	Actual
* Surface Seal? (Concrete slab)("YES", "NO" or "UNKNOWN")	Yes	Estimated
* Dimensions of concrete slab: Length(ft)/ Width(ft)/ Thick(in)	6 x 6 x 24	Estimated
* Within 100 year flood plain? ("YES", "NO" or "UNKNOWN")	No	Actual
* Drainage away from well? ("YES" or "NO")	Yes	Actual
ENCLOSURE/HOUSING		
Enclosure Type *(building, vault, none, etc.)*	None	Actual
Floor material	None	Actual
Located in Pit? ("YES" or "NO")	No	Actual
Pit depth (feet) (if applicable)	N/A	Actual

WELL DATA SHEET
IRWD Well No. 21

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.
** Indicates items required for Source Water Assessment*
*** Indicates additional items required for assessments and Ground Water Rule*

WELL CONSTRUCTION		
Date drilled	21-Feb-92	Actual
Drilling Method	Reverse Circ. Rotary	Actual
Depth of Bore Hole (feet below ground surface)	1,120	Actual
Casing Beginning Depth/Ending Depth(ft below surface); 2nd Casing Beginning Depth/Ending Depth; 3rd Casing, etc.	0-290; 290-1,080	Actual
Casing Diameter (inches); 2nd Casing Diameter; 3rd Casing, etc.	20 ID; 16 ID	Actual
Casing Material; 2nd Casing Material; 3rd Casing, etc.	Mild steel; Stainless Steel	Actual
	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
WELL CONSTRUCTION (continued)		
Conductor casing used? ("YES", "NO" or "UNKNOWN") *(See Note 2)*	Yes	Actual
Conductor casing removed? ("YES", "NO" or "UNKNOWN")	No	Actual
* Depth to highest perforations/screens (ft below surface) (or "UNKNOWN")	298	Actual
Screened Interval Beginning Depth/Ending Depth (ft below surface); 2nd Screened Interval Beg. Depth/Ending Depth; 3rd Screened Interval, etc.	298-509; 539-749; 819-869; 930-1,060	Actual
* Total length of screened interval (ft) *(default = 10% pump capacity in gpm)* (or "UNKNOWN")	601	Actual
* Annular Seal?("YES", "NO" or "UNKNOWN") *(See Note 3)*	YES	Actual
* Depth of Annular Seal (ft)	0-248	Actual
Material of Annular Seal *(cement grout, bentonite, etc.)*	10 sk cement grout	Actual
Gravel pack, Depth to top (ft below ground surface)	248	Actual
Total length of gravel pack (ft)	862	Actual
AQUIFER		
* Aquifer Materials *(list all that apply: sand, silt, clay, gravel, rock, fractured rock)*	Gravel, Sand, Clay	Actual
* Effective porosity (decimal percent) *(default = 0.2)* (or "UNKNOWN")	0.2	Default
* Confining layer (Impervious Strata) above aquifer? ("YES", "NO" or "UNKNOWN")	Yes	Actual
Thickness of confining layer, if known (ft)	29.3; 21; 42; 30; 27	Actual
Depth to confining layer, if known (ft below ground)	30; 103; 177; 232; 265	Actual
* Static water level (ft below ground surface)	97	Actual
Static water level measurement: Date/Method	11-Nov-08 / Electric Sounder	Actual
Pumping water level (ft below ground surface)	143	Actual
Pumping water level measurement: Date/Method	12-Nov-08 / Electric Sounder	Actual
WELL PRODUCTION		
Well Yield (gpm)	3,300	Actual
Well Yield Based On (i.e., pump test, etc.)	Pumping Test	Actual
Date measured	10-Nov-08	Actual
Is the well metered? ("YES" or "NO")	Yes	Estimated
Production (gallons per year)	1.5×10^9	Estimated
Frequency of Use (hours/year)	7,920	Estimated
Typical pumping duration (hours/day)	21	Estimated

WELL DATA SHEET
IRWD Well No. 21

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.
** Indicates items required for Source Water Assessment*
*** Indicates additional items required for assessments and Ground Water Rule*

PUMP		
Make	TBD	Estimated
Type	Submersible	Estimated
Size (hp)	350	Estimated
* Capacity (gpm)	3,300	Estimated
Depth to suction intake (ft below ground surface)	270	Estimated
Lubrication Type	N/A	Estimated
Type of Power: *(i.e., electric, diesel, etc.)*	Electric	Estimated
Auxiliary power available? ("YES" or "NO")	No	Estimated
Operation controlled by: *(i.e., level in tank, pressure, etc.)*	System	Estimated
Pump to Waste capability? ("YES" or "NO")	Yes	Estimated
Discharges to: *(i.e., distribution system, storage, etc.)*	Treatment Facility	Estimated

REMARKS AND DEFECTS (use additional sheets as necessary)

NOTES

1. Neighborhood/Surrounding Area (list all that apply): A= Agricultural, Ru = Rural, Re = Residential, Co = Commercial,
   I = Industrial, Mu = Municipal, P = Pristine, O = Other
2. Conductor Casing - Oversized casing used to stabilize bore hole during well construction. Should be removed during installation of annular seal.
3. Annular Seal - Seal of grout in the space between the well casing and the wall of the drilled hole. Sometimes called "sanitary seal".

Please Note:
The information on this Well Data Sheet is considered confidential. To allow the information to be included in the permit report, or made available subject to a public information act request, the waiver clause below has to to be signed and dated by the owner (public water system). In lieu of this signature, the WDS has to be retained in a confidential file, or the information shown in the shaded rows has to be "blacked out."

I/We, *(Name)*_____,
certify that I/We am/are the present owners of the well described on this well data sheet. I/We have reviewed the information presented on this well data sheet and I/We take no exception to having the information inlcuded in the Department of Health Services' Engineering Report. I/We understand that by including the well data sheet in the Engineering Report, it will be part of a public document that can be reviewed and copied subject to the public information act request.

_____ _____
(Signature) (Date)

Drinking Water Source Assessment

Water System

Irvine Ranch Water District

Orange County

Water Source

WELL 22 - PENDING

Assessment Date

May, 2009

California Department of Health Services
Drinking Water Field Operations Branch
GEOSCIENCE Support Services, Inc.

TurboSWAP ID.	**XL**
System No.	**3010092**
Source No.	**067**
PS Code	**3010092-067**

Assessment Summary

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange
System Name Irvine Ranch Water District **System No.** 3010092
Source Name WELL 22 - PENDING **Source No.** 067 **PS Code** 3010092-067

Completed by Diane Smith **Date** May, 2009

According to DHS records, this Source is Groundwater. This Assessment was done using the Default Groundwater System Method.

Description of System and Source

The Irvine Ranch Water District water system is located in Orange County and serves the City of Irvine and portions of Costa Mesa, Lake Forest, Newport Beach, Orange, Tustin and unincorporated areas of Orange County. There are approximately 95,865 service connections serving a population of 330,000.

WELL 22, the subject of this assessment, was constructed in 1992 and rehabilitated in 2008-2009. It is 990 feet deep and is estimated to produce approximately 1,600 gallons per minute. The principal recharge area is the Coastal Plain of Orange County Groundwater Basin. General land use on the vicinity of the well includes municipal, residential and commercial activities. The protection zones and recharge areas extend into parks, commercial areas and residential areas.

Assessment Procedures

The assessment of the source, WELL 22, was conducted by GEOSCIENCE Support Services, Inc. under the Drinking Water Source Assessment and Protection (DWSAP) program.

The groundwater protection zones were calculated using the U.S. Environmental Protection Agency Well Head Protection Model (WHPA). The WHPA was run 10 years into the future to assess the two-, five- and ten-year protection zones.

Horizontal flow direction in the area of the source well was estimated to be west-southwest. The estimate is based on system personnel knowledge and a 2007 ground water contour map from the Orange County Water District.

The following sources of information were used in the assessment: EPA, State, County and USGS databases and knowledge and records maintained by the water system personnel.

Contents of this Assessment

Yes ☒	No ☐	Assessment Summary
Yes ☒	No ☐	Vulnerability Summary
Yes ☒	No ☐	Source Location Form
Yes ☒	No ☐	Delineation of Water Protection Zones
Yes ☒	No ☐	Physical Barrier Effectiveness Checklist
Yes ☒	No ☐	Source Data Sheet
Yes ☒	No ☐	Inventory of Possible Contaminating Activities
Yes ☒	No ☐	Vulnerability Ranking
Yes ☒	No ☐	Assessment Map

Comments

The physical barrier effectiveness was calculated to be 80, which indicates High effectiveness.

Vulnerability Summary

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange
System Name Irvine Ranch Water District **System No.** 3010092
Source Name WELL 22 - PENDING **Source No.** 067 **PS Code** 3010092-067

Completed by Diane Smith **Date** May, 2009

THE FOLLOWING INFORMATION MUST BE INCLUDED IN THE SYSTEM CONSUMER CONFIDENCE REPORT

A source water assessment was conducted for the **WELL 22 - PENDING**

of the **Irvine Ranch Water District** water system in **May, 2009** .

The source is considered most vulnerable to the following activities not associated with any detected contaminants:

Sewer collection systems
Automobile - Gas stations

Discussion of Vulnerability

Potentially contaminating activities (PCAs) were screened for in Zone A, B5, and B10. A source is considered vulnerable to all PCAs that have a vulnerability score of 8 or higher and/or PCAs that have a contaminant in source water potentially associated with their activity. The source is considered potentially vulnerable to 10 PCAs (see page 11, "Vulnerabilityl Ranking", of this report).

A copy of the complete assessment may be viewed at:

Irvine Ranch Water District
15600 Sand Canyon Ave.
Irvine, CA 92618

You may request a summary of the assessment be sent to you by contacting:

Cindy Beck
Regulatory Compliance Manager
949-453-5832
949-476-1187 (fax)
beck@irwd.com

Delineation of Water Protection Zones

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 22 - PENDING **Source No.** 067 **PS Code** 3010092-067

Completed by Diane Smith **Date** May, 2009

Method Used to Delineate Protection Zones

1. Calculated Fixed Radius
2. Modified Calculated Fixed Radius (Attach documentation for direction of ground water flow.)

X 3. More Detailed Methods

4. Arbitrary Fixed Radius (For use only by or permission of DHS)

Description of Protection Zones

U.S. Environmnetal Protection Agency Well Head Protection Model (WHPA). WHPA was run 10 years into the future to assess the two-, five-, and ten-year protection zones.

Physical Barrier Effectiveness (PBE)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 22 - PENDING **Source No.** 067 **PS Code** 3010092-067

Completed by Diane Smith **Date** May, 2009

Parameter		Possible Points	This Source	Score
Type of Aquifer				
Confinement				
1. Unconfined, Semi-confined, Fractured Rock, Unknown Aquifer		0		
2. Confined		50	X	50
Pathways of Contamination (All Aquifers)				
Presence of Abandoned or Improperly Destroyed Wells				
1. Present within Zone A (2 year TOT distance)	Yes	0		
	No	5	X	5
	Unknown	0		
2. Present within Zone B5 (2 -5 year TOT distance)	Yes	0		
	No	3	X	3
	Unknown	0		
3. Present within Zone B10 (5-10 year TOT distance)	Yes	0		
	No	2	X	2
	Unknown	0		
Hydraulic Head (Confined Aquifers)				
What is the relationship in the hydraulic head between the confined aquifer and the overlying unconfined aquifer? (i.e. does the well flow under artesian conditions?)				
1. Head in confined aquifer is higher than head in unconfined aquifer under all conditions.		20		
2. Head in confined aquifer is higher than head in unconfined aquifer under static conditions.		10		
3. Head in confined aquifer is lower than or same as head in unconfined aquifer under static conditions.		0		
4. Unknown		0	X	0
Well Construction (All Aquifers)				
Sanitary Seal (Annular Seal) Depth	None of less than 20 feet	0		
252 feet	Between 20 and 50 feet	6		
	50 feet or greater	10	X	10
	Unknown	0		
Surface Seal (concrete cap)	Not present or improperly constructed	0		
	Watertight, slopes away from well at least 2' laterally in all directions	4	X	4
	Unknown	0		

Physical Barrier Effectiveness (PBE)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 22 - PENDING **Source No.** 067 **PS Code** 3010092-067

Completed by Diane Smith **Date** May, 2009

Parameter		Possible Points	This Source	Score
Well Construction (All Aquifers)--continued				
Flooding potential at well site	Subject to localized flooding (i.e. in low area or unsealed pit or vault) or within 100 year flood plain	0		
	Not subject to flooding	1	X	1
	Unknown	0		
Security at well site	Not secure	0		
	Secure	5	X	5
	Unknown	0		

Score	Effectiveness
0 to 35	Low
36 to 69	Moderate
70 to 100	High

Maximum Score = 100

Score 80

Effectiveness High

Inventory of Possible Contaminating Activities (PCA Inventory)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 22 - PENDING **Source No.** 067 **PS Code** 3010092-067

Completed by Diane Smith **Date** May, 2009

PCA (Risk Ranking)	PCA in Zone A	PCA in Zone B5	PCA in Zone B10	*	Comments
Commercial/Industrial Activities					
Automobile - Body shops (H)	N	N	N		
Automobile - Car washes (M)	N	**Y**	**Y**		
Automobile - Gas stations (VH)	N	**Y**	**Y**		
Automobile - Repair shops (H)	N	N	**Y**		
Boat services/repair/refinishing (H)	N	N	N		
Chemical/petroleum pipelines (H)	N	N	N		
Chemical/petroleum processing/storage (VH)	N	N	N		
Dry cleaners (VH)	N	N	**Y**		
Electrical/electronic manufacturing (H)	N	N	N		
Fleet/truck/bus terminals (H)	N	N	N		
Furniture repair/manufacturing (H)	N	N	N		
Home manufacturing (H)	N	N	N		
Junk/scrap/salvage yards (H)	N	N	N		
Machine shops (H)	N	N	N		
Metal plating/ finishing/fabricating (VH)	N	N	N		
Photo processing/printing (H)	N	N	**Y**		
Plastics/synthetics producers (VH)	N	N	N		
Research laboratories (H)	N	N	N		
Wood preserving/treating (H)	N	N	N		
Wood/pulp/paper processing and mills (H)	N	N	N		
Lumber processing and manufacturing (H)	N	N	N		
Sewer collection systems (H in Zone A, otherwise L)	**Y**	**Y**	**Y**		
Parking lots/malls [>50 spaces] (M)	N	**Y**	**Y**		
Cement/concrete plants (M)	N	N	N		
Food processing (M)	N	N	N		
Funeral services/graveyards (M)	N	N	N		
Hardware/lumber/parts stores (M)	N	N	**Y**		
Appliance/Electronic Repair (L)	N	N	**Y**		
Office buildings/complexes (L)	N	N	**Y**		
Rental Yards (L)	N	N	**Y**		
RV/mini storage (L)	N	N	**Y**		

Y = Yes N = No U = Unknown
*** = A contaminant potentially associated with this activity has been detected in the water supply.**

Inventory of Possible Contaminating Activities (PCA Inventory)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 22 - PENDING **Source No.** 067 **PS Code** 3010092-067

Completed by Diane Smith **Date** May, 2009

PCA (Risk Ranking)	PCA in Zone A	PCA in Zone B5	PCA in Zone B10	*	Comments
Residential/Municipal Activities					
Airports - Maintenance/fueling areas (VH)	N	N	N		
Landfills/dumps (VH)	N	N	N		
Railroad yards/maintenance/fueling areas (H)	N	N	N		
Septic systems - high density [>1/acre] (VH in Zone A, otherwise M)	N	N	N		
Sewer collection systems (H in Zone A, otherwise L)	**Y**	**Y**	**Y**		
Utility stations - maintenance areas (H)	N	N	N		
Wastewater treatment plants (VH in Zone A, otherwise H)	N	N	N		
Drinking water treatment plants (M)	N	N	N		
Golf courses (M)	N	N	N		
Housing - high density [>1 house/0.5 acres] (M)	**Y**	**Y**	**Y**		
Motor pools (M)	N	N	**Y**		
Parks (M)	**Y**	**Y**	N		
Waste transfer/recycling stations (M)	N	N	N		
Apartments and condominiums (L)	**Y**	**Y**	**Y**		
Campgrounds/Recreational areas (L)	N	N	N		
Fire stations (L)	N	N	N		
RV Parks (L)	N	N	N		
Schools (L)	**Y**	**Y**	**Y**		
Hotels, Motels (L)	N	N	**Y**		
Other Activities					
NPDES/WDR permitted discharges (H)	N	N	N		
Underground Injection of Commercial/Industrial Discharges (VH)	N	N	N		
Historic gas stations (VH)	N	N	**Y**		
Historic waste dumps/landfills (VH)	N	N	N		
Illegal activities/unauthorized dumping (H)	**U**	**U**	**U**		
Injection wells/dry wells/ sumps (VH)	N	N	N		
Known Contaminant Plumes (VH)	N	N	N		
Military installations (VH)	N	N	N		
Mining operations - Historic (VH)	N	N	N		

Y = Yes N = No U = Unknown
*** = A contaminant potentially associated with this activity has been detected in the water supply.**

Inventory of Possible Contaminating Activities (PCA Inventory)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange
System Name Irvine Ranch Water District **System No.** 3010092
Source Name WELL 22 - PENDING **Source No.** 067 **PS Code** 3010092-067

Completed by Diane Smith **Date** May, 2009

PCA (Risk Ranking)	PCA in Zone A	PCA in Zone B5	PCA in Zone B10	*	Comments
Other Activities					
Mining operations - Active (VH)	N	N	N		
Mining - Sand/Gravel (H)	N	N	N		
Wells - Oil, Gas, Geothermal (H)	N	N	N		
Salt Water Intrusion (H)	N	N	N		
Recreational area - surface water source (H)	N	N	N		
Underground storage tanks - Confirmed leaking tanks (VH)	N	N	**Y**		
Underground storage tanks - Decommissioned - inactive tanks (L)	**Y**	**Y**	**Y**		
Underground storage tanks - Non-regulated tanks [tanks smaller than regulatory limit] (H)	**U**	**U**	**U**		
Underground storage tanks - Not yet upgraded or registered tanks (H)	**U**	**U**	**U**		
Underground storage tanks - Upgraded and/or registered - active tanks (L)	**U**	**U**	**U**		
Above ground storage tanks (M)	N	N	N		
Wells - Water supply (M)	**Y**	N	N		
Construction/demolition staging areas (M)	N	N	N		
Contractor or government agency equipment storage yards (M)	N	N	N		
Dredging (M)	N	N	N		
Transportation corridors - Freeways/state highways (M)	N	**Y**	**Y**		
Transportation corridors - Railroads (M)	N	N	N		
Transportation corridors - Historic railroad right-of-ways (M)	N	N	N		
Transportation corridors - Road Right-of-ways [herbicide use areas] (M)	**U**	**U**	**U**		
Transportation corridors - Roads/Streets (L)	**Y**	**Y**	**Y**		
Hospitals (M)	N	N	N		
Storm Drain Discharge Points (M)	N	N	N		
Storm Water Detention Facilities (M)	N	N	N		
Artificial Recharge Projects - Injection wells [potable water] (L)	N	N	N		
Artificial Recharge Projects - Injection wells [non-potable water] (M)	N	N	N		

Y = Yes N = No U = Unknown
*** = A contaminant potentially associated with this activity has been detected in the water supply.**

Inventory of Possible Contaminating Activities (PCA Inventory)

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 22 - PENDING **Source No.** 067 **PS Code** 3010092-067

Completed by Diane Smith **Date** May, 2009

PCA (Risk Ranking)	PCA in Zone A	PCA in Zone B5	PCA in Zone B10	*	Comments
Other Activities					
Artificial Recharge Projects - Spreading Basins [potable water] (L)	N	N	N		
Artificial Recharge Projects - Spreading Basins [non-potable water] (M)	N	N	N		
Medical/dental offices/clinics (L)	N	N	**Y**		
Veterinary offices/clinics (L)	N	**Y**	N		
Surface water - streams/lakes/rivers (L)	N	N	N		
Wells - monitoring, test holes (L)	N	N	N		

Y = Yes N = No U = Unknown
*** = A contaminant potentially associated with this activity has been detected in the water supply.**

Vulnerability Ranking

Assessment By GEOSCIENCE Support Services, Inc. **ID.** XL **County** Orange

System Name Irvine Ranch Water District **System No.** 3010092

Source Name WELL 22 - PENDING **Source No.** 067 **PS Code** 3010092-067

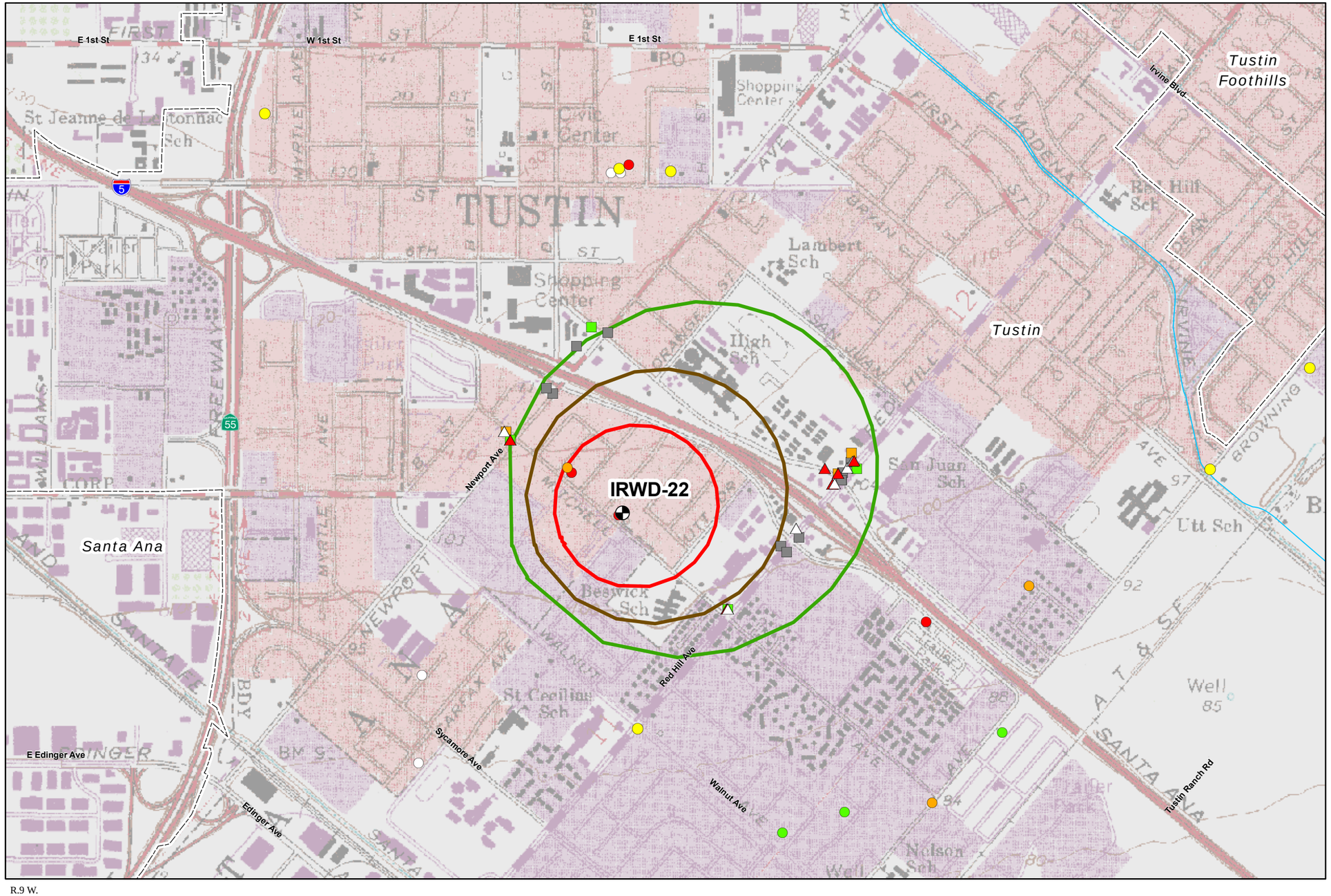
Completed by Diane Smith **Date** May, 2009

Zone	PCA (Risk Ranking)	*	PCA Risk Points	Zone Points	PBE Points	Vulnerability Score
A	Sewer collection systems (H in Zone A, otherwise L)		5	5	1	11
A	Sewer collection systems (H in Zone A, otherwise L)		5	5	1	11
B5	Automobile - Gas stations (VH)		7	3	1	11
A	Housing - high density [>1 house/0.5 acres] (M)		3	5	1	9
A	Parks (M)		3	5	1	9
A	Wells - Water supply (M)		3	5	1	9
B10	Automobile - Gas stations (VH)		7	1	1	9
B10	Dry cleaners (VH)		7	1	1	9
B10	Historic gas stations (VH)		7	1	1	9
B10	Underground storage tanks - Confirmed leaking tanks (VH)		7	1	1	9

*** = A contaminant potentially associated with this activity has been detected in the water supply.**

RBF CONSULTING /
IRVINE RANCH WATER DISTRICT

DRINKING WATER SOURCE ASSESSMENT AND PROTECTION (DWSAP) DOCUMENTS FOR IRWD WELL NO. 22



T.5 S

R.9 W.

24-Apr-09

Prepared by: DWB

Map Projection: State Plane, Zone 6 (1983)

NORTH

0 500 1,000 Feet

GEOSCIENCE

GEOSCIENCE Support Services, Inc.
P.O. Box 220, Claremont, CA 91711
Tel: (909) 451-6650 Fax: (909) 451-6638
www.gssiwater.com

IRWD WELL NO. 22 GROUND WATER PROTECTION ZONES

EXPLANATION

IRWD Well No. 22

Zone A: A contaminant release within this zone may reach the well within 2 years.

Zone B5: A contaminant release within this zone may reach the well within 2 - 5 years.

Zone B10: A contaminant release within this zone may reach the well within 5 - 10 years.

Other Well Classification

- Active
- Inactive
- Abandoned
- Destroyed
- Other or Unknown

Leaking Underground Storage Tank (LUST) Classification

- Case Closed
- Remediation
- Site Assessment

Underground Storage Tank (UST) Classification

- Active
- Unknown

Source of storage tank data: EDR, 2009.

City Boundary

Figure 1

GIS_proj/rbf_irwd_well22_DWSAP_4-09/0_Fig_1_Well_22_dwsap_4-09.mxd

WELL DATA SHEET
IRWD Well No. 22

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.
** Indicates items required for Source Water Assessment*
*** Indicates additional items required for assessments and Ground Water Rule*

	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
DATA SHEET GENERAL INFORMATION		
System Name	Irvine Ranch Water District	Actual
System Number	3010092	Actual
Source of Information *(well log, DHS/County files, system, etc)*	DWR well log; GEOSCIENCE Support Services, Inc.	Actual
Organization Collecting Information *(DHS, County, System, other)*	RBF Consulting; IRWD; GEOSCIENCE Support Services, Inc.	Actual
Date Information Collected/Updated	Apr-09	Actual
WELL IDENTIFICATION		
* Well Number or Name	IRWD Well No. 22	Actual
* DHS Source Identification Number (**FRDS ID No.**)	3010092-067	Actual
DWR Well Log on File? ("YES" or "NO")	Yes	Actual
State Well Number (from DWR)	05S09W16Q04S	Actual
Well Status (Active, Standby, Inactive)	Inactive	Actual
WELL LOCATION		
Latitude	33.733336	Actual
Longitude	-117.820531	Actual
Ground Surface Elevation (ft above Mean Sea Level)	106	Actual
Street Address	1251 Mitchell Ave.	Actual
Nearest Cross Street	Carfax Ave.	Actual
City	Tustin	Actual
County	Orange	Actual
* Neighborhood/Surrounding Area *(see Note 1)*	Re; Mu; Co	Actual
Site plan on file? ("YES" or "NO")	Yes	Actual
DWR Ground Water Basin	Coastal Plain of Oragne County	Actual
DWR Ground Water Sub-basin	Main Basin	Actual
SANITARY CONDITIONS		
** Distance to closest Sewer Line, Sewage Disposal, Septic Tank (ft)	75	Actual
Distance to Active Wells (ft)	684	Actual
Distance to Abandoned Wells (ft)	N/A	Actual
Distance to Surface Water (ft)	>2500	Actual
** Size of controlled area around well (square feet)	7500	Actual
* Type of access control to well site *(fencing, building, etc)*	Block wall	Actual
* Surface Seal? (Concrete slab)("YES", "NO" or "UNKNOWN")	Yes	Estimated
* Dimensions of concrete slab: Length(ft)/ Width(ft)/ Thick(in)	6 x 6 x 24	Estimated
* Within 100 year flood plain? ("YES", "NO" or "UNKNOWN")	No	Actual
* Drainage away from well? ("YES" or "NO")	Yes	Actual
ENCLOSURE/HOUSING		
Enclosure Type *(building, vault, none, etc.)*	None	Actual
Floor material	None	Actual
Located in Pit? ("YES" or "NO")	No	Actual
Pit depth (feet) (if applicable)	N/A	Actual

WELL DATA SHEET
IRWD Well No. 22

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WELL CONSTRUCTION		
Date drilled	13-May-92	Actual
Drilling Method	Reverse Circ. Rotary	Actual
Depth of Bore Hole (feet below ground surface)	1,050	Actual
Casing Beginning Depth/Ending Depth(ft below surface); 2nd Casing Beginning Depth/Ending Depth; 3rd Casing, etc.	0-290; 290-990	Actual
Casing Diameter (inches); 2nd Casing Diameter; 3rd Casing, etc.	20 ID; 16 ID	Actual
Casing Material; 2nd Casing Material; 3rd Casing, etc.	Mild Steel; Stainless Steel	Actual
	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
WELL CONSTRUCTION (continued)		
Conductor casing used? ("YES", "NO" or "UNKNOWN") *(See Note 2)*	Yes	Actual
Conductor casing removed? ("YES", "NO" or "UNKNOWN")	No	Actual
* Depth to highest perforations/screens (ft below surface) (or "UNKNOWN")	301	Actual
Screened Interval Beginning Depth/Ending Depth (ft below surface); 2nd Screened Interval Beg. Depth/Ending Depth; 3rd Screened Interval, etc.	301-341; 361-451; 471-770; 810-970	Actual
* Total length of screened interval (ft) *(default = 10% pump capacity in gpm)* (or "UNKNOWN")	589	Actual
* Annular Seal?("YES", "NO" or "UNKNOWN") *(See Note 3)*	YES	Actual
* Depth of Annular Seal (ft)	0-252	Actual
Material of Annular Seal *(cement grout, bentonite, etc.)*	10 sk cement grout	Actual
Gravel pack, Depth to top (ft below ground surface)	252	Actual
Total length of gravel pack (ft)	776	Actual
AQUIFER		
* Aquifer Materials *(list all that apply: sand, silt, clay, gravel, rock, fractured rock)*	Gravel, Sand, Clay	Actual
* Effective porosity (decimal percent) *(default = 0.2)* (or "UNKNOWN")	0.2	Default
* Confining layer (Impervious Strata) above aquifer? ("YES", "NO" or "UNKNOWN")	Yes	Actual
Thickness of confining layer, if known (ft)	25; 58; 50; 70	Actual
Depth to confining layer, if known (ft below ground)	78; 105; 168; 228	Actual
* Static water level (ft below ground surface)	129	Actual
Static water level measurement: Date/Method	12-Jan-09 / Electric Sounder	Actual
Pumping water level (ft below ground surface)	215	Actual
Pumping water level measurement: Date/Method	13-Jan-09 / Electric Sounder	Actual
WELL PRODUCTION		
Well Yield (gpm)	1,600	Actual
Well Yield Based On (i.e., pump test, etc.)	Pumping Test	Actual
Date measured	9-Jan-09	Actual
Is the well metered? ("YES" or "NO")	Yes	Estimated
Production (gallons per year)	7.60×10^8	Estimated
Frequency of Use (hours/year)	7,920	Estimated
Typical pumping duration (hours/day)	21	Estimated

WELL DATA SHEET
IRWD Well No. 22

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** Indicates items required for Source Water Assessment*
*** Indicates additional items required for assessments and Ground Water Rule*

PUMP		
Make	TBD	Estimated
Type	Submersible	Estimated
Size (hp)	250	Estimated
* Capacity (gpm)	1,600	Estimated
Depth to suction intake (ft below ground surface)	460	Estimated
Lubrication Type	N/A	Estimated
Type of Power: *(i.e., electric, diesel, etc.)*	Electric	Estimated
Auxiliary power available? ("YES" or "NO")	No	Estimated
Operation controlled by: *(i.e., level in tank, pressure, etc.)*	System	Estimated
Pump to Waste capability? ("YES" or "NO")	Yes	Estimated
Discharges to: *(i.e., distribution system, storage, etc.)*	Treatment Facility	Estimated

REMARKS AND DEFECTS (use additional sheets as necessary)

NOTES

1. Neighborhood/Surrounding Area (list all that apply): A= Agricultural, Ru = Rural, Re = Residential, Co = Commercial,
   I = Industrial, Mu = Municipal, P = Pristine, O = Other
2. Conductor Casing - Oversized casing used to stabilize bore hole during well construction. Should be removed during installation of annular seal.
3. Annular Seal - Seal of grout in the space between the well casing and the wall of the drilled hole. Sometimes called "sanitary seal".

Please Note:
The information on this Well Data Sheet is considered confidential. To allow the information to be included in the permit report, or made available subject to a public information act request, the waiver clause below has to to be signed and dated by the owner (public water system). In lieu of this signature, the WDS has to be retained in a confidential file, or the information shown in the shaded rows has to be "blacked out."

I/We, *(Name)*_____,
certify that I/We am/are the present owners of the well described on this well data sheet. I/We have reviewed the information presented on this well data sheet and I/We take no exception to having the information inlcuded in the Department of Health Services' Engineering Report. I/We understand that by including the well data sheet in the Engineering Report, it will be part of a public document that can be reviewed and copied subject to the public information act request.

_____ _____
(Signature) (Date)

APPENDIX P

HYDRAUNATICS MODEL RESULTS

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BOOSTER PUMP

RO program licensed to:					
Calculation created by:	W. James				
Project name:	IRWD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	111.1	psi	Booster pump pressure:	80.0	psi
Feed pressure:	82.1	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	0.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.51		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

Stage	Perm. Flow	Flow/Vessel Feed	Flow/Vessel Conc	Flux	Beta	Conc.&Throt. Pressures		Element Type	Elem. No.	Array
	gpm	gpm	gpm	gfd		psi	psi			
1-1	686.3	50.3	21.7	14.7	1.13	54.7	0.0	ESNA1-LF	168	24x7
1-2	339.7	43.4	15.1	14.6	1.19	111.1	0.0	ESPA2	84	12x7

	Raw water		Feed water		Permeate		Concentrate	
Ion	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3
Ca	133.0	331.7	133.0	331.7	5.346	13.3	856.4	2135.6
Mg	35.0	144.0	35.0	144.0	1.407	5.8	225.4	927.4
Na	57.0	123.9	57.0	123.9	10.915	23.7	318.1	691.6
K	2.3	2.9	2.3	2.9	0.662	0.8	11.6	14.8
NH4	2.5	6.9	2.5	6.9	0.720	2.0	12.6	35.0
Ba	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
Sr	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
CO3	0.5	0.8	0.2	0.3	0.000	0.0	1.1	1.8
HCO3	260.0	213.1	231.5	189.7	15.893	13.0	1453.0	1190.9
SO4	177.0	184.4	200.0	208.3	3.788	3.9	1311.6	1366.2
Cl	127.0	179.1	127.0	179.1	14.367	20.3	765.3	1079.3
F	0.3	0.8	0.3	0.8	0.082	0.2	1.5	4.0
NO3	61.0	49.2	61.0	49.2	10.224	8.2	348.7	281.2
B	0.00		0.00		0.000		0.00	
SiO2	24.7		24.7		2.61		149.9	
TDS	880.3		874.4		66.0		5455.1	
pH	7.4		7.0		5.9		7.7	

	Raw water	Feed water	Concentrate
CaSO4 / Ksp * 100:	7%	8%	81%
SrSO4 / Ksp * 100:	0%	0%	0%
BaSO4 / Ksp * 100:	0%	0%	0%
SiO2 saturation:	19%	19%	115%
Langelier Saturation Index	0.23	-0.22	2.06
Stiff & Davis Saturation Index	0.23	-0.22	1.78
Ionic strength	0.02	0.02	0.12
Osmotic pressure	6.3 psi	6.1 psi	37.8 psi

These calculations are based on nominal element & component performance when operated on a feed water of acceptable quality.
NO GUARANTEE OF SYSTEM PERFORMANCE IS EXPRESSED OR IMPLIED unless provided in writing by Hydranautics.
Hydranautics (USA) Ph:(760)901-2500 Fax:(760)901-2578 info@hydranautics.com
Hydranautics (Europe) Ph: 31 5465 88355 Fax: 31 5465 73288

BOOSTER PUMP

RO program licensed to:					
Calculation created by:	W. James				
Project name:	IRWD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	111.1	psi	Booster pump pressure:	80.0	psi
Feed pressure:	82.1	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	0.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.51		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

Stage	Perm. Flow gpm	Flow/Vessel Feed gpm	Flow/Vessel Conc gpm	Flux gfd	Beta	Conc.&Throt. Pressures psi	Conc.&Throt. Pressures psi	Element Type	Elem. No.	Array
1-1	686.3	50.3	21.7	14.7	1.13	54.7	0.0	ESNA1-LF	168	24x7
1-2	339.7	43.4	15.1	14.6	1.19	111.1	0.0	ESPA2	84	12x7

Stg	Elem no.	Feed pres psi	Pres drop psi	Perm flow gpm	Perm Flux gfd	Beta	Perm sal TDS	Conc osm pres	Concentrate saturation levels CaSO4	SrSO4	BaSO4	SiO2	Lang.
1-1	1	82.1	6.0	5.2	18.6	1.10	51.2	6.8	9	0	0	21	-0.1
1-1	2	76.0	5.2	4.7	17.0	1.10	55.2	7.5	10	0	0	23	0.0
1-1	3	70.9	4.4	4.4	15.7	1.10	60.3	8.4	12	0	0	26	0.2
1-1	4	66.5	3.8	4.0	14.4	1.11	66.0	9.3	13	0	0	29	0.3
1-1	5	62.7	3.2	3.7	13.3	1.12	72.4	10.4	16	0	0	32	0.5
1-1	6	59.5	2.7	3.4	12.3	1.12	79.6	11.7	18	0	0	36	0.6
1-1	7	56.9	2.2	3.1	11.3	1.13	87.7	13.2	21	0	0	40	0.8
1-2	1	131.6	4.9	4.8	17.4	1.11	81.1	16.0	25	0	0	45	1.0
1-2	2	126.7	4.1	4.5	16.3	1.10	76.5	18.1	29	0	0	51	1.1
1-2	3	122.6	3.5	4.3	15.3	1.13	72.9	20.6	35	0	0	58	1.3
1-2	4	119.1	2.9	4.0	14.4	1.14	70.2	23.7	42	0	0	67	1.5
1-2	5	116.3	2.3	3.7	13.5	1.15	68.3	27.7	50	0	0	79	1.6
1-2	6	113.9	1.8	3.5	12.4	1.16	67.2	32.7	62	0	0	93	1.9
1-2	7	112.1	1.4	3.1	11.3	1.18	67.0	39.2	78	0	0	111	2.1

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Calculation created by:	W. James				
Project name:	IRWD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	111.1	psi	Booster pump pressure:	80.0	psi
Feed pressure:	82.1	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	0.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.51		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

****
**** THE FOLLOWING PARAMETERS EXCEED RECOMMENDED DESIGN LIMITS: ***
****

Concentrate saturation of SiO2 too high (115%)
Concentrate Langelier Saturation Index too high (2.06)

The following are recommended general guidelines for designing a reverse osmosis system using Hydranautics membrane elements. Please consult Hydranautics for specific recommendations for operation beyond the specified guidelines.

Feed and Concentrate flow rate limits

Element diameter	Maximum feed flow rate	Minimum concentrate rate
8.0 inches	75 gpm (283.9 lpm)	12 gpm (45.4 lpm)
8.0 inches(Full Fit)	75 gpm (283.9 lpm)	30 gpm (113.6 lpm)

Concentrate polarization factor (beta) should not exceed 1.2 for standard elements

Saturation limits for sparingly soluble salts in concentrate

Soluble salt	Saturation
BaSO4	6000%
CaSO4	230%
SrSO4	800%
SiO2	100%

Langelier Saturation Index for concentrate should not exceed 1.8

The above saturation limits only apply when using effective scale inhibitor.
Without scale inhibitor, concentrate saturation should not exceed 100%.

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BOOSTER PUMP

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Calculation created by:	W. James				
Project name:	IRWD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	136.2	psi	Booster pump pressure:	95.0	psi
Feed pressure:	107.2	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	5.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.51		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

Stage	Perm. Flow	Flow/Vessel Feed	Flow/Vessel Conc	Flux	Beta	Conc.&Throt. Pressures		Element Type	Elem. No.	Array
	gpm	gpm	gpm	gfd		psi	psi			
1-1	689.8	50.3	21.6	14.8	1.14	79.4	0.0	ESNA1-LF	168	24x7
1-2	336.2	43.1	15.1	14.4	1.20	150.6	0.0	ESPA2	84	12x7

	Raw water		Feed water		Permeate		Concentrate	
Ion	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3
Ca	133.0	331.7	133.0	331.7	7.848	19.6	842.2	2100.2
Mg	35.0	144.0	35.0	144.0	2.065	8.5	221.6	912.1
Na	57.0	123.9	57.0	123.9	15.405	33.5	292.7	636.3
K	2.3	2.9	2.3	2.9	0.911	1.2	10.2	13.0
NH4	2.5	6.9	2.5	6.9	0.990	2.7	11.1	30.7
Ba	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
Sr	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
CO3	0.5	0.8	0.2	0.3	0.000	0.0	1.1	1.8
HCO3	260.0	213.1	231.5	189.7	23.016	18.9	1412.6	1157.9
SO4	177.0	184.4	200.0	208.3	5.580	5.8	1301.4	1355.7
Cl	127.0	179.1	127.0	179.1	20.508	28.9	730.5	1030.3
F	0.3	0.8	0.3	0.8	0.110	0.3	1.4	3.6
NO3	61.0	49.2	61.0	49.2	14.359	11.6	325.3	262.3
B	0.00		0.00		0.000		0.00	
SiO2	24.7		24.7		3.75		143.4	
TDS	880.3		874.4		94.5		5293.4	
pH	7.4		7.0		6.0		7.8	

	Raw water	Feed water	Concentrate
CaSO4 / Ksp * 100:	7%	8%	80%
SrSO4 / Ksp * 100:	0%	0%	0%
BaSO4 / Ksp * 100:	0%	0%	0%
SiO2 saturation:	19%	19%	110%
Langelier Saturation Index	0.23	-0.22	2.12
Stiff & Davis Saturation Index	0.23	-0.22	1.84
Ionic strength	0.02	0.02	0.12
Osmotic pressure	6.3 psi	6.1 psi	36.4 psi

These calculations are based on nominal element & component performance when operated on a feed water of acceptable quality.
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Calculation created by:	W. James				
Project name:	IRWD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	136.2	psi	Booster pump pressure:	95.0	psi
Feed pressure:	107.2	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	5.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.51		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

Stage	Perm. Flow gpm	Flow/Vessel Feed gpm	Flow/Vessel Conc gpm	Flux gfd	Beta	Conc.&Throt. Pressures psi	Conc.&Throt. Pressures psi	Element Type	Elem. No.	Array
1-1	689.8	50.3	21.6	14.8	1.14	79.4	0.0	ESNA1-LF	168	24x7
1-2	336.2	43.1	15.1	14.4	1.20	150.6	0.0	ESPA2	84	12x7

Stg	Elem no.	Feed pres psi	Pres drop psi	Perm flow gpm	Perm Flux gfd	Beta	Perm sal TDS	Conc osm pres	Concentrate saturation levels CaSO4	SrSO4	BaSO4	SiO2	Lang.
1-1	1	107.2	6.1	4.8	17.4	1.09	80.8	6.7	9	0	0	21	-0.1
1-1	2	101.1	5.2	4.5	16.4	1.10	85.6	7.4	10	0	0	23	0.0
1-1	3	95.9	4.5	4.3	15.4	1.11	91.9	8.1	11	0	0	25	0.1
1-1	4	91.4	3.9	4.1	14.6	1.11	98.9	9.0	13	0	0	28	0.3
1-1	5	87.5	3.3	3.8	13.8	1.12	106.8	10.1	15	0	0	31	0.4
1-1	6	84.3	2.7	3.6	13.1	1.13	115.7	11.3	18	0	0	34	0.6
1-1	7	81.5	2.2	3.5	12.4	1.14	125.7	12.9	22	0	0	39	0.7
1-2	1	171.3	4.9	4.6	16.4	1.10	116.8	15.9	25	0	0	43	1.0
1-2	2	166.4	4.1	4.3	15.5	1.10	110.5	17.9	29	0	0	49	1.1
1-2	3	162.3	3.5	4.1	14.9	1.12	105.5	20.3	34	0	0	55	1.3
1-2	4	158.8	2.9	4.0	14.2	1.13	101.7	23.4	41	0	0	64	1.4
1-2	5	155.9	2.4	3.8	13.6	1.15	98.8	27.2	49	0	0	74	1.6
1-2	6	153.5	1.9	3.6	12.8	1.17	97.1	32.2	61	0	0	88	1.8
1-2	7	151.6	1.5	3.3	12.0	1.19	96.5	38.9	78	0	0	106	2.1

These calculations are based on nominal element & component performance when operated on a feed water of acceptable quality.
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RO program licensed to:					
Calculation created by:	W. James				
Project name:	IRWD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	136.2	psi	Booster pump pressure:	95.0	psi
Feed pressure:	107.2	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	5.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.51		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

****
**** THE FOLLOWING PARAMETERS EXCEED RECOMMENDED DESIGN LIMITS: ***
****

Concentrate saturation of SiO2 too high (110%)
Concentrate Langelier Saturation Index too high (2.12)

The following are recommended general guidelines for designing a reverse osmosis system using Hydranautics membrane elements. Please consult Hydranautics for specific recommendations for operation beyond the specified guidelines.

Feed and Concentrate flow rate limits

Element diameter	Maximum feed flow rate	Minimum concentrate rate
8.0 inches	75 gpm (283.9 lpm)	12 gpm (45.4 lpm)
8.0 inches(Full Fit)	75 gpm (283.9 lpm)	30 gpm (113.6 lpm)

Concentrate polarization factor (beta) should not exceed 1.2 for standard elements

Saturation limits for sparingly soluble salts in concentrate

Soluble salt	Saturation
BaSO4	6000%
CaSO4	230%
SrSO4	800%
SiO2	100%

Langelier Saturation Index for concentrate should not exceed 1.8

The above saturation limits only apply when using effective scale inhibitor.
Without scale inhibitor, concentrate saturation should not exceed 100%.

These calculations are based on nominal element & component performance when operated on a feed water of acceptable quality.
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RO program licensed to:					
Calculation created by:	W. James				
Project name:	IWRD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	153.7	psi	Booster pump pressure:	40.0	psi
Feed pressure:	124.7	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	0.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.50		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

Stage	Perm. Flow	Flow/Vessel Feed	Flow/Vessel Conc	Flux	Beta	Conc.&Throt. Pressures		Element Type	Elem. No.	Array
	gpm	gpm	gpm	gfd		psi	psi			
1-1	691.3	50.3	21.5	14.8	1.15	96.8	0.0	ESPA2	168	24x7
1-2	334.7	43.0	15.1	14.3	1.18	113.4	0.0	ESPA2	84	12x7

	Raw water		Feed water		Permeate		Concentrate	
Ion	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3
Ca	133.0	331.7	133.0	331.7	0.891	2.2	881.6	2198.6
Mg	35.0	144.0	35.0	144.0	0.234	1.0	232.0	954.8
Na	65.3	142.0	65.3	142.0	2.083	4.5	423.5	920.7
K	2.3	2.9	2.3	2.9	0.092	0.1	14.8	19.0
NH4	2.5	6.9	2.5	6.9	0.099	0.3	16.1	44.7
Ba	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
Sr	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
CO3	0.5	0.8	0.2	0.3	0.000	0.0	1.1	1.8
HCO3	260.0	213.1	231.5	189.7	3.627	3.0	1522.5	1248.0
SO4	177.0	184.4	199.9	208.3	0.440	0.5	1330.5	1385.9
Cl	127.0	179.1	127.0	179.1	1.111	1.6	840.4	1185.3
F	0.3	0.8	0.3	0.8	0.005	0.0	2.0	5.2
NO3	61.0	49.2	61.0	49.2	3.838	3.1	384.9	310.4
B	0.00		0.00		0.000		0.00	
SiO2	24.7		24.7		0.26		163.2	
TDS	888.6		882.7		12.7		5812.6	
pH	7.4		7.0		5.3		7.9	

	Raw water	Feed water	Concentrate
CaSO4 / Ksp * 100:	7%	8%	81%
SrSO4 / Ksp * 100:	0%	0%	0%
BaSO4 / Ksp * 100:	0%	0%	0%
SiO2 saturation:	19%	19%	126%
Langelier Saturation Index	0.23	-0.22	2.23
Stiff & Davis Saturation Index	0.23	-0.23	1.93
Ionic strength	0.02	0.02	0.13
Osmotic pressure	6.4 psi	6.3 psi	41.2 psi

These calculations are based on nominal element & component performance when operated on a feed water of acceptable quality.
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RO program licensed to:					
Calculation created by:	W. James				
Project name:	IWRD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	153.7	psi	Booster pump pressure:	40.0	psi
Feed pressure:	124.7	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	0.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.50		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

Stage	Perm. Flow gpm	Flow/Vessel Feed gpm	Flow/Vessel Conc gpm	Flux gfd	Beta	Conc.&Throt. Pressures psi	Conc.&Throt. Pressures psi	Element Type	Elem. No.	Array
1-1	691.3	50.3	21.5	14.8	1.15	96.8	0.0	ESPA2	168	24x7
1-2	334.7	43.0	15.1	14.3	1.18	113.4	0.0	ESPA2	84	12x7

Stg	Elem no.	Feed pres psi	Pres drop psi	Perm flow gpm	Perm Flux gfd	Beta	Perm sal TDS	Conc osm pres	Concentrate saturation levels CaSO4	SrSO4	BaSO4	SiO2	Lang.
1-1	1	124.7	6.1	4.8	17.3	1.09	4.0	6.9	9	0	0	21	-0.1
1-1	2	118.6	5.2	4.5	16.4	1.10	4.0	7.7	10	0	0	23	0.0
1-1	3	113.4	4.5	4.3	15.5	1.11	4.3	8.6	11	0	0	26	0.2
1-1	4	108.8	3.9	4.1	14.7	1.11	4.7	9.7	13	0	0	29	0.3
1-1	5	105.0	3.2	3.9	14.0	1.12	5.2	11.0	15	0	0	33	0.5
1-1	6	101.7	2.7	3.7	13.3	1.13	5.8	12.6	18	0	0	38	0.6
1-1	7	99.0	2.2	3.5	12.6	1.15	6.6	14.6	22	0	0	44	0.8
1-2	1	133.8	4.8	4.8	17.3	1.11	6.7	16.5	25	0	0	50	1.0
1-2	2	129.0	4.0	4.5	16.3	1.10	7.2	18.7	30	0	0	57	1.1
1-2	3	125.0	3.4	4.3	15.4	1.13	7.9	21.4	35	0	0	65	1.3
1-2	4	121.6	2.8	4.0	14.4	1.14	8.7	24.8	42	0	0	75	1.5
1-2	5	118.8	2.2	3.7	13.4	1.15	9.8	29.0	52	0	0	88	1.7
1-2	6	116.6	1.8	3.4	12.4	1.17	11.3	34.5	64	0	0	104	1.9
1-2	7	114.8	1.4	3.1	11.2	1.18	13.3	41.5	81	0	0	126	2.1

These calculations are based on nominal element & component performance when operated on a feed water of acceptable quality.
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Hydranautics (Europe) Ph: 31 5465 88355 Fax: 31 5465 73288

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RO program licensed to:					
Calculation created by:	W. James				
Project name:	IWRD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	153.7	psi	Booster pump pressure:	40.0	psi
Feed pressure:	124.7	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	0.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.50		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

****
**** THE FOLLOWING PARAMETERS EXCEED RECOMMENDED DESIGN LIMITS: ***
****

Concentrate saturation of SiO2 too high (126%)
Concentrate Langelier Saturation Index too high (2.23)

The following are recommended general guidelines for designing a reverse osmosis system using Hydranautics membrane elements. Please consult Hydranautics for specific recommendations for operation beyond the specified guidelines.

Feed and Concentrate flow rate limits

Element diameter	Maximum feed flow rate	Minimum concentrate rate
8.0 inches	75 gpm (283.9 lpm)	12 gpm (45.4 lpm)
8.0 inches(Full Fit)	75 gpm (283.9 lpm)	30 gpm (113.6 lpm)

Concentrate polarization factor (beta) should not exceed 1.2 for standard elements

Saturation limits for sparingly soluble salts in concentrate

Soluble salt	Saturation
BaSO4	6000%
CaSO4	230%
SrSO4	800%
SiO2	100%

Langelier Saturation Index for concentrate should not exceed 1.8

The above saturation limits only apply when using effective scale inhibitor.
Without scale inhibitor, concentrate saturation should not exceed 100%.

These calculations are based on nominal element & component performance when operated on a feed water of acceptable quality.
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RO program licensed to:					
Calculation created by:	W. James				
Project name:	IWRD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	196.4	psi	Booster pump pressure:	40.0	psi
Feed pressure:	167.4	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	5.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.50		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

Stage	Perm. Flow	Flow/Vessel Feed	Flow/Vessel Conc	Flux	Beta	Conc.&Throt. Pressures		Element Type	Elem. No.	Array
	gpm	gpm	gpm	gfd		psi	psi			
1-1	689.8	50.3	21.6	14.8	1.15	139.2	0.0	ESPA2	168	24x7
1-2	336.2	43.1	15.1	14.4	1.20	155.3	0.0	ESPA2	84	12x7

	Raw water		Feed water		Permeate		Concentrate	
Ion	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3
Ca	133.0	331.7	133.0	331.7	1.292	3.2	879.3	2192.9
Mg	35.0	144.0	35.0	144.0	0.340	1.4	231.4	952.3
Na	65.3	142.0	65.3	142.0	3.011	6.5	418.3	909.3
K	2.3	2.9	2.3	2.9	0.132	0.2	14.6	18.7
NH4	2.5	6.9	2.5	6.9	0.144	0.4	15.9	44.0
Ba	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
Sr	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
CO3	0.5	0.8	0.2	0.3	0.000	0.0	1.1	1.8
HCO3	260.0	213.1	231.5	189.7	5.279	4.3	1513.2	1240.3
SO4	177.0	184.4	199.9	208.3	0.643	0.7	1329.3	1384.7
Cl	127.0	179.1	127.0	179.1	1.622	2.3	837.5	1181.2
F	0.3	0.8	0.3	0.8	0.008	0.0	2.0	5.2
NO3	61.0	49.2	61.0	49.2	5.491	4.4	375.5	302.9
B	0.00		0.00		0.000		0.00	
SiO2	24.7		24.7		0.38		162.5	
TDS	888.6		882.7		18.3		5780.6	
pH	7.4		7.0		5.4		7.9	

	Raw water	Feed water	Concentrate
CaSO4 / Ksp * 100:	7%	8%	81%
SrSO4 / Ksp * 100:	0%	0%	0%
BaSO4 / Ksp * 100:	0%	0%	0%
SiO2 saturation:	19%	19%	125%
Langelier Saturation Index	0.23	-0.22	2.23
Stiff & Davis Saturation Index	0.23	-0.23	1.93
Ionic strength	0.02	0.02	0.13
Osmotic pressure	6.4 psi	6.3 psi	40.9 psi

These calculations are based on nominal element & component performance when operated on a feed water of acceptable quality.
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Hydranautics (Europe) Ph: 31 5465 88355 Fax: 31 5465 73288

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RO program licensed to:					
Calculation created by:	W. James				
Project name:	IWRD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	196.4	psi	Booster pump pressure:	40.0	psi
Feed pressure:	167.4	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	5.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.50		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

Stage	Perm. Flow gpm	Flow/Vessel Feed gpm	Flow/Vessel Conc gpm	Flux gfd	Beta	Conc.&Throt. Pressures psi	Conc.&Throt. Pressures psi	Element Type	Elem. No.	Array
1-1	689.8	50.3	21.6	14.8	1.15	139.2	0.0	ESPA2	168	24x7
1-2	336.2	43.1	15.1	14.4	1.20	155.3	0.0	ESPA2	84	12x7

Stg	Elem no.	Feed pres psi	Pres drop psi	Perm flow gpm	Perm Flux gfd	Beta	Perm sal TDS	Conc osm pres	Concentrate saturation levels CaSO4	SrSO4	BaSO4	SiO2	Lang.
1-1	1	167.4	6.1	4.6	16.5	1.09	6.3	6.9	9	0	0	21	-0.1
1-1	2	161.3	5.3	4.4	15.8	1.10	6.2	7.6	10	0	0	23	0.0
1-1	3	156.0	4.6	4.2	15.2	1.10	6.6	8.5	11	0	0	26	0.2
1-1	4	151.4	3.9	4.1	14.7	1.11	7.1	9.5	13	0	0	29	0.3
1-1	5	147.5	3.3	3.9	14.2	1.12	7.8	10.8	15	0	0	33	0.5
1-1	6	144.2	2.7	3.8	13.7	1.13	8.6	12.4	18	0	0	38	0.6
1-1	7	141.4	2.2	3.7	13.2	1.15	9.7	14.5	22	0	0	44	0.8
1-2	1	176.2	4.9	4.6	16.5	1.11	10.0	16.3	25	0	0	49	1.0
1-2	2	171.3	4.1	4.4	15.8	1.10	10.7	18.4	29	0	0	56	1.1
1-2	3	167.2	3.5	4.2	15.1	1.12	11.6	20.9	34	0	0	63	1.3
1-2	4	163.7	2.9	4.0	14.4	1.14	12.8	24.1	41	0	0	73	1.5
1-2	5	160.9	2.3	3.8	13.8	1.15	14.4	28.2	50	0	0	85	1.6
1-2	6	158.5	1.8	3.6	13.0	1.17	16.5	33.6	63	0	0	102	1.9
1-2	7	156.7	1.4	3.4	12.1	1.20	19.3	41.0	81	0	0	124	2.1

These calculations are based on nominal element & component performance when operated on a feed water of acceptable quality.
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RO program licensed to:					
Calculation created by:	W. James				
Project name:	IWRD Wells 21 & 22		Permeate flow:	1026.00	gpm
HP Pump flow:	1207.1	gpm	Raw water flow:	1207.1	gpm
Recommended pump press.:	196.4	psi	Booster pump pressure:	40.0	psi
Feed pressure:	167.4	psi	Permeate recovery:	85.0	%
Feedwater Temperature:	20.0	C(68F)			
Feed water pH:	7.0		Element age:	5.0	years
Chem dose, ppm (100%):	23.4	H2SO4	Flux decline % per year:	7.0	
Acidified feed CO2:	37.50		Salt passage increase, %/yr:	10.0	
Average flux rate:	14.7	gfd	Feed type:	Well Water	

****
**** THE FOLLOWING PARAMETERS EXCEED RECOMMENDED DESIGN LIMITS: ***
****

Concentrate saturation of SiO2 too high (125%)
Concentrate Langelier Saturation Index too high (2.23)

The following are recommended general guidelines for designing a reverse osmosis system using Hydranautics membrane elements. Please consult Hydranautics for specific recommendations for operation beyond the specified guidelines.

Feed and Concentrate flow rate limits

Element diameter	Maximum feed flow rate	Minimum concentrate rate
8.0 inches	75 gpm (283.9 lpm)	12 gpm (45.4 lpm)
8.0 inches(Full Fit)	75 gpm (283.9 lpm)	30 gpm (113.6 lpm)

Concentrate polarization factor (beta) should not exceed 1.2 for standard elements

Saturation limits for sparingly soluble salts in concentrate

Soluble salt	Saturation
BaSO4	6000%
CaSO4	230%
SrSO4	800%
SiO2	100%

Langelier Saturation Index for concentrate should not exceed 1.8

The above saturation limits only apply when using effective scale inhibitor.
Without scale inhibitor, concentrate saturation should not exceed 100%.

These calculations are based on nominal element & component performance when operated on a feed water of acceptable quality.
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APPENDIX Q

GARNT FUNDING – POTENTIAL FUNDING SOURCES IDENTIFICATION

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Appendix Q – Potential Funding Sources

Several potential funding sources have been identified with available programs for which the Wells 21 and 22 Project may be eligible. These programs have an open, competitive application process and funding may be available as grants and/or loans:

1. Safe Drinking Water Revolving Fund (SDWSRF) administered by the California Department of Public Health (CDPH) (includes federal economic stimulus funding under the American Recovery and Reinvestment Act (ARRA) of 2009)

2. Proposition 84 "Safe Drinking Water, Water Quality and Supply, Flood control, River and Coastal Protection Act of 2006" administered by CDPH (Chapter 2 for safe drinking water and water quality projects)

3. Proposition 82 "New Local Water Supply Construction Loans" administered by California Department of Water Resources (DWR)

4. California Infrastructure State Revolving Fund Loan Program administered by the California Infrastructure and Economic Development Bank (I-Bank)

5. Bureau of Reclamation (BOR) Challenge Grants: Water Marketing and Efficiency Grants for ARRA of 2009

6. BOR Title XVI Water Reclamation and Reuse Program under the ARRA of 2009

7. Department of Commerce Economic Development Administration (EDA) Recovery Act Funding

Details of all identified potential funding sources, including specific procedures, contacts, and deadlines, are described below:

6.1.1 CDPH Safe Drinking Water State Revolving Fund

6.1.1.1 Procedure

Two-step procedure: Online pre-application (step 1) followed by full application (step 2) if "short-listed" and invited to submit.

Pre-application required information, submitted online.

General Information:

1. General information

2. Economic recovery project information

3. Unique project title

4. Applicant water system

5. Applicant contact

6. Service area disadvantaged communities

7. Consolidation

System Improvements:

1. Funding

2. Problem description

3. Project description

If a project is selected, an application will be mailed; only water systems that receive an application via the mail from CDPH are eligible for ARRA funding; the application packet is expected to consist of the cover letter and the following attachments:

(1) Application Guidelines and Instructions

(2A) SRF Construction Loan Application

(2B) Applicant Checklist for ARRA Funding

(3) ARRA Applicant Engineering Report Format

(4A) Federal Cross-Cutter Notice 2009

(4B) List of Federal Cross-Cutters

(5A) Environmental Review Unit (ERU) Federal Cross-Cutter Checklist

(5B) ERU Worksheet for CEQA/NEPA Determination

(5C) ERU ARRA Environmental Information Form

(6) Technical, Managerial and Financial (TMF) Assessment Forms and Criteria for Community Water Systems (CWS) and Non-Community Water Systems (NCWS)

(7A) CPDH Drinking Water Program District Map

(7B) ERU District Map

(8) Uniform Relocation Act

(9) SDWSRF Enhancing Project Impact Document

(10) Guidelines for Green Infrastructure Improvement Components

(11) Other Requirements under ARRA

(12) Proposition 218

(13) Sample Resolution for Submission of Application

(14) Sample Resolution for Funding Agreement

6.1.1.2 Deadline

Pre-application deadline February 27, 2009 for ARRA funding

(Note: The pre-application was submitted on February 26, 2009.)

Pre-application period for normal SDWSRF should reopen in Summer 2009 for non-ARRA funding.

6.1.1.3 Contact

CDPH Drinking Water Program field offices

916-449-5600

sdwsrf@dhs.ca.gov

6.1.2 Proposition 84, Chapter 2 “Small Community Infrastructure Improvements for Chemical and Nitrate Contaminants” and “Public Water Systems – Prevention and Reduction of Groundwater Contamination”

6.1.2.1 Procedure

Two-step procedure: Online pre-application (step 1) followed by full application (step 2) if “short-listed” and invited to submit. Specific eligibility requirements and application guidelines for the pre-application and full application are in the draft/review stage. It is anticipated that the requirements will be similar to the SDWSRF application procedures.

It should be noted that the “Small Community” program may not apply to the Wells 21 and 22 Project because its focus is on small, disadvantaged communities. Perhaps if the project serves only a specific limited area of the IRWD service area, the “Small Community” program may be possible.

6.1.2.2 Deadline

Pre-application period will be announced later in 2009.

6.1.2.3 Contact

CDPH Division of Drinking Water and Environmental Management

(916) 449-5600

prop84@cdph.ca.gov

6.1.3 Proposition 82 New Local Water Supply Construction Loans

6.1.3.1 Procedure

Four (4) copies of the preliminary application, only parts A & B, must be submitted to DWR Division of Planning and Local Assistance, Loans and Grants Program, P.O. Box 942836, Sacramento, CA 94236-0001, Attention: David Rolph.

Preliminary application required information

(A) Organizational, financial and legal information

(B) Project description required to establish eligibility.

If a project is eligible, a notification will be provided to submit the following information

(C) Engineering and hydrology feasibility

(D) Economic justification

(E) State-wide interest

(F) Critical need

(G) Environmental documentation

6.1.3.2 Deadline
Continuously accepting applications.

6.1.3.3 Contact:
David Rolph

916-651-9635

drolph@water.ca.gov

6.1.4 Bank Infrastructure State Revolving Fund Loan Program

6.1.4.1 Procedures
Mail completed preliminary application to California Infrastructure and Economic Development Bank, Attn: Diane Cummings, ISRF Program Manager, 1001 I Street, 19th Floor, Sacramento, CA 95814.

Preliminary application required information:

- Applicant information
- General project information
- Specific project information
- Source of payment and need for financing
- Public benefit information

Applicants with approved preliminary application will be invited to submit a loan application.

6.1.4.2 Deadline

Continuously accepting preliminary applications.

6.1.4.3 Contact

Diane Cummings, Manager

980 9th Street, 9th floor

Sacramento, CA 95814

916-324-4805

FAX: 916-322-6314

dcummings@ibank.ca.gov

6.1.5 BOR Challenge Grants: Water Marketing and Efficiency Grants for the ARRA of 2009

6.1.5.1 Procedures

Complete package must be submitted through grants.gov

Funding package required information:

- Cover page
- Assurances
- Title page
- Table of contents
- Technical proposal
- Description of performance measures
- Description of potential environmental impacts
- Required permits and approvals
- Funding plan and commitment letters
- Official resolution
- Project budget proposal

6.1.5.2 Deadline

Application deadline is May 22, 2009 at 4:00 pm Mountain Time.

6.1.5.3 Contact:
Stephanie Bartlett

303-445-2025

sbartlett@usbr.gov

6.1.6 BOR Title XVI Funding - Water Reclamation and Reuse Program under the ARRA of 2009

6.1.6.1 Procedure:
Funding application package was submitted on April 7, 2009, via electronic mail at mrocha@usbr.gov.

Funding application package required information:

- Title information
- Executive summary
- Activity description
- Project schedule and cost estimate

6.1.6.2 Deadline
Application deadline was April 7, 2009 at 4:00 pm Mountain Time.

(Note: The application was submitted on April 7, 2009.)

6.1.6.3 Contact
Roseann Gonzales, Director

BOR Policy and Program Services

303-445-2780

6.1.7 Economic Development Administration (EDA) Recovery Act Funding

6.1.7.1 Procedure
Application process through grants.gov

Preliminary application required information:

- Application for Federal Assistance (Form SF-424)

- Certifications Regarding Lobbying (Form CD-511)
- Budget Information—Construction Programs (Form SF-424C)
- Assurances—Construction Programs (Form SF-424D)
- Application for Investment Assistance (Form ED-900)

If selected for further consideration, the following information may be requested:

- A copy of the region's Comprehensive Economic Development Strategy (CEDS) or alternate EDA-approved planning document.
- Letters of commitment to document non-EDA public funding.
- A U.S. Geological Survey (USGS) map of the project site.
- Letters of commitment from private beneficiaries of the project.
- Comments from the metropolitan area review/clearinghouse agency if the project is located in a metropolitan statistical area (MSA).
- A legal opinion and other documentation, as necessary, verifying the applicant's responses to questions regarding project ownership, operation, maintenance, and management.
- An engineering report.
- An environmental narrative.
- Documented approval from the appropriate State Historic Preservation Officer (SHPO).

6.1.7.2 Deadline:
Application deadline is June 30, 2010.

6.1.7.3 Contact:
Jamie Lipsey

202-482-3467

jlipsey@eda.doc.gov

6.1.8 Recommendations

With exception of the two applications that were submitted in 2009, the majority of the grant funding sources indicated herein are considered low probability for award to IRWD for this project either because the Wells 21 and 22 project does not coincide with the guidelines for selection or due to the fact that the District's service area is not considered to be a "disadvantaged community." The following are options that may be viable for the project and would be recommended for pursuit should the District decide to target additional outside funding:

- Proposition 84 Grant Funds—The guidelines for this program have not been published as of yet. The guidelines are set to be released summer 2009, and will be reviewed for applicability to the Wells 21 and 22 project.

- Proposition 82 New Construction Loans—Prop 82 offers low interest loans for construction projects.

SUMMARY OF POTENTIAL FUNDING PROGRAMS FOR IRVINE RANCH WATER DISTRICT WELLS 21 AND 22 PROJECT

Funding Program	Funding Source	Approximate Total Funds Available	Maximum Funds	Proposal Due Date	Website	Eligible Project Types	Comments
STATE FUNDING PROGRAMS							
California Department of Public Health							
Safe Drinking Water State Revolving Fund	**American Recovery and Reinvestment Act (ARRA)**	$160 million	Varies	Febuary 27, 2009	http://www.cdph.ca.gov/services/funding/Pages/SRF.aspx	The Safe Drinking Water State Revolving Fund (SDWSRF) program goals reflect both federal and state legislative intent to provide funding to correct Public Water Systems (PWS) deficiencies based upon a prioritized funding system	Universal pre-application for the Wells 21 & 22 Project has been submitted.
Pubic Water Systems - Small Community Infrastructure Improvements for Chemical and Nitrate Contaminants	**Proposition 84, Chapter 2**	$180 million	Varies	Pre-application period will be announced later in 2009	http://www.cdph.ca.gov/services/funding/Pages/Prop84.aspx	Small community drinking water system infrastructure improvements and related actions to meet safe drinking water standards. Priority shall be given to projects that address chemical and nitrate contaminants, other health hazards and by whether the community is disadvantaged or severely disadvantaged. Special consideration shall be given to small communities with limited financial resources. Eligible recipients include public agencies and incorporated mutual water companies that serve disadvantaged communities. CDPH may make grants for the purpose of financing feasibility studies and to meet the eligibility requirements for a construction grant.	Because this program applies to small and disadvantaged communities, the Wells 21 & 22 Project would only be eligible if it serves only a small and disadvantaged area of IRWD.
Public Water Systems - Prevention and Reduction of Groundwater Contamination	**Proposition 84**	$60 million	Varies	Pre-application period will be announced later in 2009	http://www.cdph.ca.gov/services/funding/Pages/Prop84.aspx	Projects for facilities sized to serve no more than the 20-year demand projected by affected public water system(s) in an Urban Water Management Plan or the 20-year demand projected in a planning document such as a Groundwater Management Plan, Cleanup and Abatement Plan, or similar document. If an applicant does not have an Urban Water Management Plan or comparable document, the eligible project costs are limited to facilities sized to serve no more than 10% above existing maximum day demand(s) of affected public water systems. A pipeline used to consolidate or interconnect water systems shall be sized to meet the needs of, and be consistent with, the current specifications of the resulting water system.	Project eligibility and guidelines to be posted April/May 2009, draft information provided.
California Department of Water Resources							
New Local Water Supply Construction Loans	**Proposition 82**	$20 million	Up to $5 million per eligible project	Continuous	http://www.grantsloans.water.ca.gov/loans/construction.cfm	Projects such as a canals, dams, reservoirs, groundwater extraction facilities or other construction or improvements	
California Infrastructure & Economic Development Bank							
Infrastructure State Revolving Fund Loan Program (SRF Program)	**California Infrastructure & Economic Development Bank (I-Bank)**	$48.4 million in tax-exempt revenue bonds	$250K to $10 million	Ongoing, applications continuously accepted	http://www.ibank.ca.gov/	Eligible project categories include city streets, county highways, state highways, drainage, water supply and flood control, educational facilities, environmental mitigation measures, parks and recreational facilities, port facilities, public transit, sewage collection and treatment, solid waste collection and disposal, water treatment and distribution, defense conversion, public safety facilities, and power and communications facilities.	

SUMMARY OF POTENTIAL FUNDING PROGRAMS FOR IRVINE RANCH WATER DISTRICT WELLS 21 AND 22 PROJECT

Funding Program	Funding Source	Approximate Total Funds Available	Maximum Funds	Proposal Due Date	Website	Eligible Project Types	Comments
FEDERAL FUNDING PROGRAMS							
U.S. Bureau of Reclamation							
Water For America Initiative: Challenge Grants: Water Marketing and Efficiency Grants	**Department of the Interior, Bureau of Reclamation, Denver Office**	$40 million	Up to $5,000,000 per agreement.	May 22, 2009	http://www.usbr.gov/wfa/	Eligible projects include: water banks and water markets, new technologies for improved water management (controls), canal lining, and measuring devices. Irrigation and/or water districts, tribal water authorities, State governmental entities with water management authority, and other entities with water delivery authority located in the Western United States are eligible.	As a part of the American Recovery and Reinvestment Act of 2009 (Recovery Act), Reclamation has issued a second Funding Opportunity Announcement (FOA) for Water Marketing and Efficiency Grants. http://www.grants.gov/search/search.do;jsessionid=gg3VJnVKQnF1shy2GV7RTR0ybFMSsD1q8hDJfZ1Nb1txG3LD9pd8!-946553661?oppId=45930&flag2006=false&mode=VIEW
Title XVI Funding - Water Reclamation and Reuse Program under the American Recovery and Reinvestment Act of 2009	**Department of the Interior, Bureau of Reclamation**	$126 million	varies	April 7, 2009	http://www.usbr.gov/wfa/		
Economic Development Administration							
EDA Recovery Act Funding	Economic Development Administration	N/A	N/A	June 30, 2010	http://www.eda.gov/InvestmentsGrants/FFON.xml	Under this federal funding opportunity (FFO) announcement, EDA is soliciting applications for the EDA American Recovery Program under the auspices of PWEDA. Specifically, the FFO pertains to applications for funding under EDA's Public Works and Economic Adjustment Assistance programs only. Under this FFO, EDA will give priority consideration to those applications that will significantly benefit regions "that have experienced sudden and severe economic dislocation and job loss due to corporate restructuring," as stipulated under the Recovery Act. EDA provides financial assistance to distressed communities in both urban and rural regions. Such distress may exist in a variety of forms, including high levels of unemployment, low income levels, large concentrations of low-income families, significant declines in per capita income, large numbers (or high rates) of business failures, sudden major layoffs or plant closures, trade impacts, military base closures, natural or other major disasters, depletion of natural resources, reduced tax bases, or substantial loss of population because of the lack of employment opportunities. EDA's experience has shown that regional economic development to help alleviate these conditions is effected primarily through investments and decisions made by the private sector.	CFDA Number(s): 11.300 -- Grants for Public Works and Economic Development Facilities http://www07.grants.gov/search/synopsis.do;jsessionid=c3QVJnch8CL7phrsYxqTqyRS8JjdGmyrsFjm4yQYCbBykpPP1pCN!654441123