CH2MHill, "Technical Memorandum No. 6, January 2007 Groundwater Monitoring Event, Eastern Santa Clara Subbasin Groundwater Study, Santa Clarita, California" (August 2007)

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

REPLY TO
ATTENTION OF

August 20, 2007

Military, International
and Interagency Services Branch

Mr. Jose Diaz
Department of Toxic Substances Control
1011 N. Grandview Avenue
Glendale, CA 91201

Subject: Technical Memorandum No. 6, Eastern Santa Clara Subbasin Groundwater Study

Dear Mr. Diaz:

1. Attached for your review and record are the results of US Army Corps of Engineers groundwater sampling, and piezometric surface measurements from January 2007. This technical memorandum also presents hydrographs and concentration trends over time of perchlorate, trichloroethene (TCE), and tetrachloroethene (PCE) data collected since January 2003. This Technical Memorandum is to serve as a data repository and to facilitate decision-making.

Thank you for your continuing support of the US Army Corps of Engineers' Eastern Santa Clara Subbasin Groundwater Study. Please contact me at (213)452-3989, should you have any comments or questions.

Kathleen Anderson
Senior Project Manager
Military/Interagency and
International Services

Enclosure
Technical Memorandum No. 6, January 2007 Groundwater Monitoring Event, Eastern Santa Clara Subbasin Groundwater Study

Copies: Tommy Waldup – U.S. Army Corps of Engineers/Sacramento
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Kerry Breyer – City of Santa Clarita

Technical Memorandum No. 6 January 2007 Groundwater Monitoring Event Eastern Santa Clara Subbasin Groundwater Study Santa Clarita, California

Prepared for

United States Army Corps of Engineers

Los Angeles District
Southern Pacific Division

August 2007

Prepared by

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Technical Memorandum No. 6
January 2007 Groundwater Monitoring Event
Eastern Santa Clara Subbasin Groundwater Study
Santa Clarita, California

PREPARED FOR: Kathy Anderson/USACE-Los Angeles
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Yueh Chuang/CH2M HILL

DATE: August 16, 2007

Introduction

This Technical Memorandum No. 6 presents data and information obtained during the January 2007 groundwater monitoring event for the Eastern Santa Clara Subbasin Groundwater Study (project). This technical memorandum also presents hydrographs and concentration trends over time of perchlorate, trichloroethene (TCE), and tetrachloroethene (PCE) data collected since January 2003. The study area includes the Former Whittaker Corporation Bermite Facility (Site) in Santa Clarita, California, and adjacent areas of the Santa Clarita Valley; see Attachment A for a map of the study area and monitoring well locations. The scope of work of the project includes an evaluation of the nature and extent of the regional groundwater impact from perchlorate in the study area. The work is performed under contract to the U.S. Army Corps of Engineers (USACE), with Castaic Lake Water Agency as the nonfederal sponsor. The California Department of Toxic Substances Control is the lead regulatory agency.

The purpose of this technical memorandum is to convey relevant data and information to the project stakeholders to facilitate decision making. Data for monitoring wells installed by others (parties other than the USACE) are not covered under this technical memorandum.

Related Project Documents

Prior to the January 2007 groundwater monitoring event, USACE completed remedial investigations in two major phases between October 2002 and April 2004, and three rounds of groundwater sampling in July 2004, October 2005, and August 2006. The results of the two individual phases, the groundwater sampling, and the combined findings and recommendations, of the project were published by CH2M HILL under separate covers:

- *Remedial Investigation Technical Memorandum No. 1, Eastern Santa Clara Subbasin Groundwater Study, Santa Clarita, California*, prepared for USACE. May 7, 2003.

- *Technical Memorandum No. 2, Eastern Santa Clara Subbasin Groundwater Study, Santa Clarita, California*, prepared for USACE. December 22, 2003.
- *Technical Memorandum No. 3, Eastern Santa Clara Subbasin Groundwater Study, Santa Clarita, California*, prepared for USACE. January 5, 2005.
- *Draft Final Conceptual Hydrogeology Technical Memorandum, Eastern Santa Clara Subbasin Groundwater Study, Santa Clarita, California*, prepared for USACE. January 19, 2005.
- *Technical Memorandum No. 4, Eastern Santa Clara Subbasin Groundwater Study, Santa Clarita, California*, prepared for USACE. November 27, 2006.
- *Technical Memorandum No. 5, Eastern Santa Clara Subbasin Groundwater Study, Santa Clarita, California*, prepared for USACE. March 12, 2007.

January 2007 Groundwater Monitoring Activities

The field activities completed are summarized in the following table.

Event Date	Wells Monitored	Comment
January 2007	• Alluvium wells (AL-1, AL-3, AL-4A/B, AL-6, and AL-9A/B) • Saugus wells (MP-1A, MP-1, MP-2, MP-3, MP-4, MP-5, CW-1A/B/C, and SG1-HSU3C)	Collected water level/piezometric surface elevation data; tested groundwater samples for perchlorate and volatile organic compounds (VOCs) only[a]
Note: [a] See Attachment C for list of parameters.		

The groundwater elevations measured at each of the monitoring wells are tabulated in Attachment B. The list of parameters tested during the January 2007 sampling event is provided in Attachment C and the detected concentrations are provided in Attachment D. The data have been validated in accordance with procedures detailed in the project-specific *Draft Final Quality Assurance Project Plan, dated October 2002*.

Hydrographs and Time Series Charts

Hydrographs of water levels/piezometric surface elevations collected during all USACE groundwater monitoring events for the Quaternary Alluvium and Saugus Formation hydrostratigraphic units (HSUs) SI, SIII, SV, and SVII are presented in Attachment E. Perchlorate, TCE, and PCE concentration time series charts for the same five HSUs are presented in Attachment F. Based on the project findings, perchlorate, TCE, and PCE were identified as three key contaminants of interest. Concentrations that are below the laboratory quantitation limits (U-flagged values) and estimated concentrations (J-flagged values) are labeled on each plot. The pertinent regulatory action levels are Notification Level (NL) of 6 micrograms per liter (µg/L) for perchlorate and Maximum Contaminant Level (MCL) of 5 µg/L for PCE and TCE.

Quaternary Alluvium and HSU SI

Groundwater levels within the Quaternary Alluvium and HSU SI are strongly influenced by precipitation events, and do not appear to respond to groundwater pumping. Following the

higher than average precipitation experienced during the winter of 2005, groundwater levels increased in the Quaternary Alluvium and HSU SI by as much as 34 and 16 feet, respectively. Groundwater elevations have since remained at these higher levels.

Carbon disulfide was detected in all monitoring wells completed in the Quaternary Alluvium in January 2007, below the NL of 160 µg/L. The concentrations ranged from 0.67to 26 µg/L, with the highest concentration detected in AL-1 (26 µg/L). Previous monitoring events had infrequent detections of carbon disulfide. Perchlorate, PCE, and TCE concentration trends observed within the Quaternary Alluvium and HSU SI are discussed below:

Quaternary Alluvium

Perchlorate concentrations within the Quaternary Alluvium have generally decreased over time, in particular after the elevated precipitation experienced in 2005. In more recent sampling events, with the exception of AL-4B (>10 µg/L), perchlorate previously detected at concentrations much greater than the NL of 6 µg/L, are now close to or below the NL. PCE and TCE concentrations within the Quaternary Alluvium are generally below their MCL of 5 µg/L. PCE and TCE concentrations increased in the January 2007 sampling event as compared to the previous August 2006 sampling event; however, as noted, the PCE and TCE concentrations continue to be at or below their MCL.

HSU SI

Within HSU SI, perchlorate concentrations in monitoring wells that are located outside the core of the perchlorate plume (CW-1A, MP-5_01, and MP-5_02) are consistently below the NL of 6 µg/L. However, perchlorate concentrations within the core of the perchlorate plume remain at relatively high levels. In MP-1_01, concentrations increased more than two-fold from July 2004 (21.4 µg/L) to August 2006 (54.5 µg/L), and then decreased to 42.2 µg/L in January 2007. Perchlorate concentrations in MP-1A have ranged from approximately 19 to 25 µg/L since 2003. PCE and TCE concentrations within HSU SI are generally below their MCL of 5 µg/L. However, the PCE concentration in MP-1A increased above its MCL to 7.6 µg/L for the first time in January 2007; this follows an increasing trend since July 2004.

HSUs SIII, SV, and SVII

Groundwater levels within HSUs SIII, SV, and SVII are influenced by groundwater pumping in the study area. Monitoring wells completed within HSU SIII that are located closer to the Site show less of a response to pumping because of the greater distance from production wells.

Perchlorate, PCE, and TCE concentration trends observed within HSUs SIII, SV, and SVII are discussed below:

HSU SIII

- **MP-2_01 (multiport monitoring well location near known source area)** – Perchlorate and TCE concentrations are significantly greater than their regulatory action levels. However, perchlorate concentrations observed in the most recent sampling events, August 2006 (7,960 µg/L) and January 2007 (5,370 µg/L), are significantly less than those observed previously (64,500 to 47,400 µg/L). PCE and TCE concentrations exhibit

similar trends; PCE and TCE concentrations are 1.2 and 330 µg/L in January 2007, down from their previous higher ranges of 6 to 13 and 1,800 to 2,600 µg/L, respectively.

- **MP-2_02 and MP-2_03 (multiport monitoring well location near known source area) –** Perchlorate, PCE, and TCE concentrations in MP-2_02 and MP-2_03 have significantly decreased since the first sampling event in January 2003; their concentrations are currently either non-detect or below their respective regulatory action levels. As discussed in the *Draft Final Conceptual Hydrogeology Technical Memorandum*, dated January 19, 2005, the initial concentrations are related to the multiport well construction process and not representative of actual groundwater quality.
- **MP-1_02 and MP-1_03 (multiport monitoring well location within the core of the perchlorate plume) –** Perchlorate concentrations are greater than its NL in these two multiport wells. However, similar to MP-2_01, perchlorate concentrations exhibit a decreasing trend. The perchlorate concentrations in MP-01_02 and MP01_03 are 82.1 and 12 µg/L in January 2007, down from the previous higher ranges of 95 to 114 µg/L and 17 to 30 µg/L, respectively. PCE and TCE concentrations are consistently non-detect.
- **CW-1B and CW-1C (singly-screened monitoring well cluster location outside the core of the perchlorate plume) –** Perchlorate, PCE, and TCE concentrations in CW-1B are consistently below their regulatory action levels. Perchlorate concentrations in CW-1C first exceeded the NL in April 2004 (6.5 µg/L), and remain slightly above 10 µg/L since October 2005. PCE and TCE concentrations in CW-1C are consistently below their MCL of 5 µg/L.
- **MW-4_01 and MW-4_02 (upgradient multiport monitoring well location) –** Perchlorate concentrations are consistently below the NL, and PCE and TCE concentrations are consistently non-detect.
- **MW-5_03 and MW-5_04 (currently the farthest downgradient multiport monitoring well location) –** Perchlorate and TCE concentrations are detected above their regulatory action levels since MW-5_03 was constructed; they remain fairly constant since the first few sampling events, with concentrations of approximately 12 and 14 µg/L, respectively. Although still above their regulatory action levels, perchlorate and TCE concentrations in MW-5_04 have decreased over the last few sampling events from their maximum concentrations of 14.5 and 15 µg/L, respectively. PCE concentrations in both multiport wells consistently remain at 0.5 µg/L or below.

HSU SV and SVII

Perchlorate, PCE, and TCE concentrations are generally not detected within HSU SV and SVII. As discussed in the *Draft Final Conceptual Hydrogeology Technical Memorandum*, dated January 19, 2005, concentrations observed in MP-2_04, MP-2_05, and MP-2_06 are related to the multiport well construction process and not representative of actual groundwater quality. Perchlorate, PCE, and TCE concentrations in MP-2_04 and MP-2_05 are currently either non-detected or below their respective regulatory action levels. However, although perchlorate, PCE, and TCE concentrations in MP-2_06 have decreased since its construction, they continue to be greater than their respective regulatory action levels.

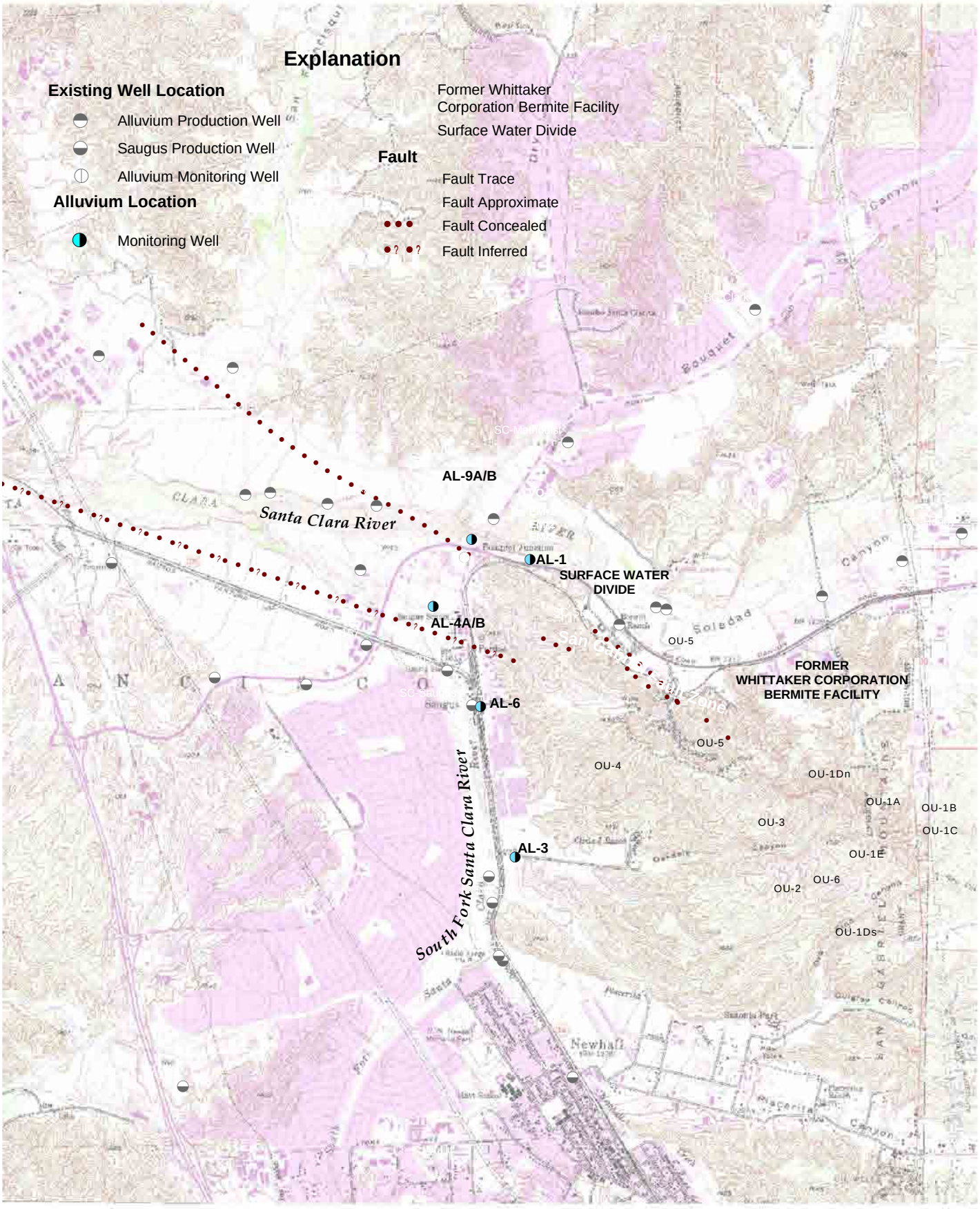
List of Attachments

The following attachments presenting the data and information are provided:

- A - Monitoring Well Locations

- B – January 2007 Piezometric Surface Elevations
- C – January 2007 List of Parameters Tested
- D – January 2007 Analytical Results
- E – Hydrographs
- F – Time Series Charts

Attachment A
Monitoring Well Locations



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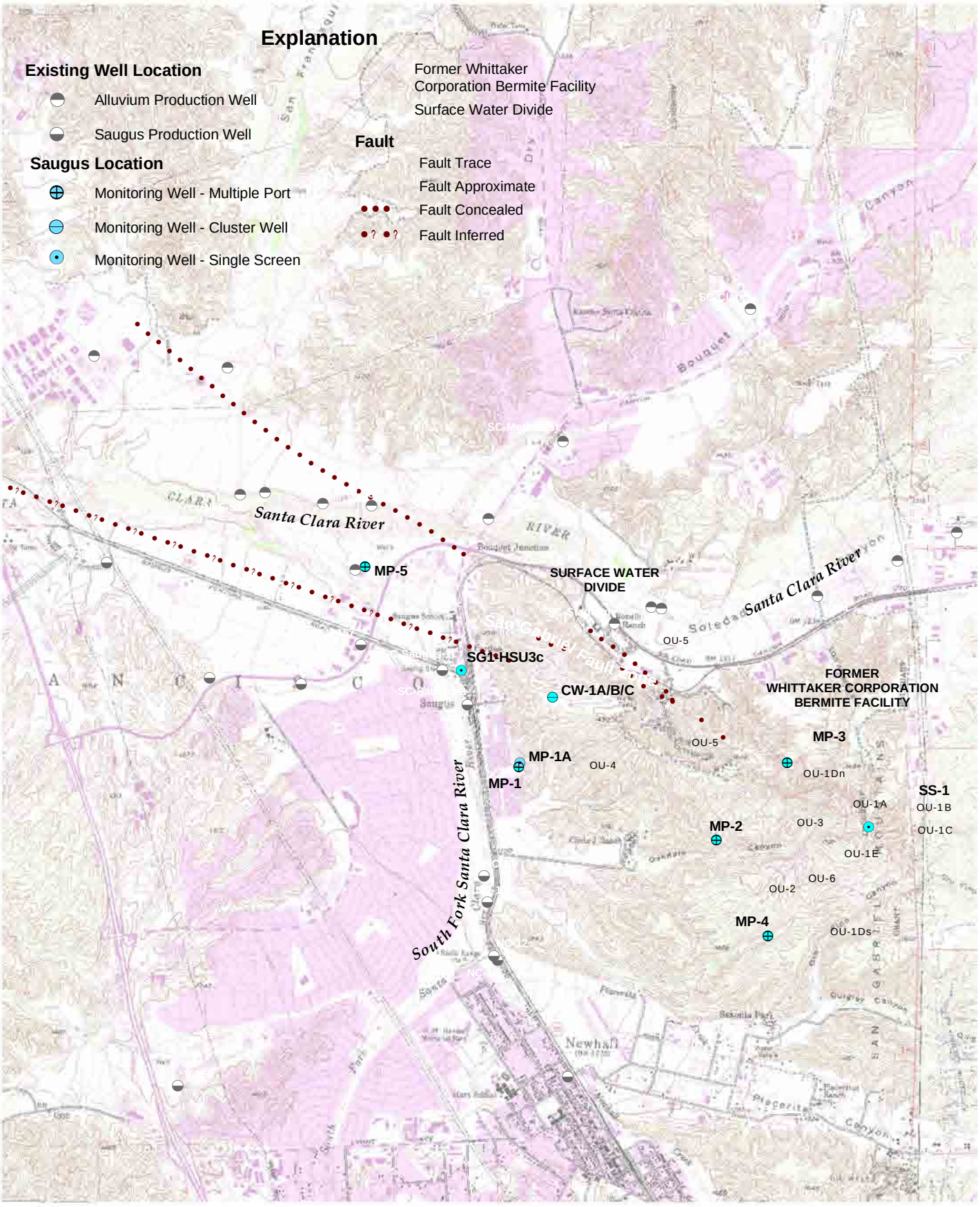
0 3,500 7,000 Feet

Figure A-1
Alluvium Monitoring Well Locations
Santa Clarita, California

SCO \\GALT\GIS2\SNTA_CLRTA\PLOTS\CONCEPTUALHYDROGEOLOGYREPORT\FIGURE_A-1_ALLUVIUMLOCATIONS.MXD 12/21/2004 11:00: DHOFER



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0 3,500 7,000 Feet

Figure A-2
Saugus Formation
Monitoring Well Locations
Santa Clarita, California

Attachment B
January 2007 Piezometric Surface Elevations

Table B-1
Alluvium Monitoring Well Piezometric Surface Elevations
January 2007
Eastern Santa Clara Subbasin Groundwater Study

Well Designation	Screen Elevation (ft msl)	Date Piezometric Surface Elevation (ft msl)
		1/29/2007
AL-1	1116.48 - 1136.48	1155.32
AL-3	1083.58 - 1103.58	1109.92
AL-4A	1089.93 - 1099.93	1115.43
AL-4B	1061.16 - 1071.16	1114.66
AL-6	1085.33 - 1105.33	1111.17
AL-9A	1091.72 - 1111.72	1138.14
AL-9B	1053.65 - 1063.65	1139.58

Notes:
ft msl = feet, (elevation relative to) mean sea level

Table B-2
Saugus Formation Monitoring Well Piezometric Surface Elevations
January 2007
Eastern Santa Clara Subbasin Groundwater Study

Well Designation	Screen Number	MP Port / Screen Elevation (ft msl)	Date
			Piezometric Surface Elevation (ft msl)
			1/29/2007
MP-1	A	1032.26 - 1042.26	1111.36
	1	934.74	1110.06
	2	784.74	1098.93
	3	644.74	1098.04
	4	428.74	1092.94
	5	343.74	1091.47
	6	192.74	1097.27
	7	12.74	1080.32
	8	-47.26	1079.94
	9	-233.26	1079.53
	10	-363.26	1085.67
			1/29/2007
MP-2	1	1101.30	1116.66
	2	897.30	1100.43
	3	827.30	1101.00
	4	657.30	1102.31
	5	336.30	1090.54
	6	201.30	1081.10
			1/29/2007
MP-3	1	1259.98	1325.94
	2	1175.98	1311.91
	3	996.98	1289.03
	4	828.98	1267.82
			1/29/2007
MP-4	1	1021.73	1101.34
	2	826.73	1111.88
	3	484.73	1082.84
	4	308.73	1218.01
	5	208.73	1219.23
			1/29/2007
MP-5	1	719.03	1104.50
	2	564.03	1109.79
	3	339.03	1072.32
	4	169.03	1072.03
			1/29/2007
CW-1	A	1075.87 - 1095.87	1111.72
	B	948.43 - 958.43	1111.21
	C	816.64 - 826.64	-
			1/29/2007
SG1-HSU3c		720-740	1083.84

Notes:
ft msl = feet, (elevation relative to) mean sea level

Attachment C
January 2007 List of Parameters Tested

TABLE C-1
Volatile Organic Compounds and Perchlorate

Parameter	Uses/Decisions
Target Compound List (TCL) Volatile Organic Compounds	
Acetone	Same for ALL parameters: • Establish nature and extent of contamination • Establish exceedances with respect to federal and state drinking water standards, and state action levels, if any • Evaluate groundwater remedial alternatives
Benzene	
Bromodichloromethane	
Bromoform	
Bromomethane	
Carbon disulfide	
Carbon tetrachloride	
Chlorobenzene	
Chloroethane	
Chloroform	
Chloromethane	
Cyclohexane	
Dibromochloromethane	
1,2-Dibromoethane (EDB)	
1,2-Dichlorobenzene	
1,3-Dichlorobenzene	
1,4-Dichlorobenzene	
1,1-Dichloroethane	
1,2-Dichloroethane	
1,1-Dichloroethylene	
cis-1,2-Dichloroethylene	
trans-1,2-Dichloroethylene	
Dichloromethane (Methylene chloride)	
1,2-Dichloropropane	
cis-1,3-Dichloropropene	
trans-1,3-Dichloropropene	
Ethylbenzene	
2-Hexanone	
Isopropylbenzene	
Methyl acetate	
Methyl ethyl ketone (2-Butanone)	
Methyl isobutyl ketone (MIBK) (4-Methyl-2-pentanone)	
Methylcyclohexane	
Styrene	
1,1,2,2-Tetrachloroethane	
Tetrachloroethylene (PCE)	
Toluene	

TABLE C-1
Volatile Organic Compounds and Perchlorate

Parameter	Uses/Decisions
1,2,4-Trichlorobenzene	
1,1,1-Trichloroethane	
1,1,2-Trichloroethane	
Trichloroethylene (TCE)	
Trichlorofluoromethane	
1,1,2-Trichloro-1,2,2-trifluoroethane	
Vinyl chloride	
Xylene(s)	
Oxidizers	
Perchlorate	

Attachment D
January 2007 Analytical Results

Table D-1
Analytical Results for Perchlorate and Organics
January 2007 Sampling Event
Eastern Santa Clara Subbasin Groundwater Study

Parameter	Regulatory Action Levels						Analytical Results											
	CA Primary MCL	USEPA Primary MCL	CA Secondary MCL	USEPA Secondary MCL	CA OEHHA PHG	CA DHS NL	AL01 02/01/2007 Primary Sample		AL03 02/01/2007 Primary Sample		AL03 02/01/2007 Field Duplicate		AL04A 02/01/2007 Primary Sample		AL04B 02/01/2007 Primary Sample		AL04B 02/01/2007 USACE QA Sample	
Oxidizers																		
Perchlorate					6	6	7.0		8.0		7.9		3.9		11.1		10.8	
Volatile Organic Compounds																		
Acetone							10	U	10	U	10	U	10	U	10	U	NT	
Benzene	1	5			0.15		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	NT	
Bromodichloromethane	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	NT	
Carbon Disulfide						160	26		2.5		2.6		4.9		9.5		NT	
Carbon Tetrachloride	0.5	5			0.1		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	NT	
Chloroform	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.22	J	0.5	U	NT	
Cis-1,2-Dichloroethene	6	70					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	NT	
Methyl Tert-Butyl Ether (MTBE)	13		5		13		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	NT	
Methylene Chloride	5	5			4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	NT	
Tetrachloroethene (PCE)	5	5			0.06		5.1		3.7		3.2		3.2		3.6		NT	
Toluene	150	1,000			150		0.5	U	0.5	U	0.5	U	0.18	J	0.2	J	NT	
1,2,3-Trichlorobenzene							0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	NT	
Trichloroethene (TCE)	5	5			0.8		1.3		1.3		0.5	U	1.1		1.3		NT	

NOTES:

Units in **microgram per liter (µg/L)**, unless otherwise noted.

Analytes listed on this table have 1 or more samples with concentrations reported above their quantitation limits.

CA = California
DHS = Department of Health Services
MCL = Maximum Contaminant Level
NL = Notification Level (for toxicity)
NT = Not tested
OEHHA = Office of Environmental Health Hazard Assessment
PHG = Public Health Goal (for Drinking Water)
QA = Quality Assurance
USACE = U.S. Army Corps of Engineers
USEPA = U.S. Environmental Protection Agency

(1) CA Primary MCL for total trihalomethanes
(bromodichloromethane, bromoform, dibromochloromethane, and chloroform).

(2) USEPA Primary MCL for total trihalomethanes
(bromodichloromethane, bromoform, dibromochloromethane, and chloroform).

Data Qualifiers:
J = Analyte positively identified; the reported concentration is approximate
U = Analyte not detected above quantitation limit
B = Analyte was found in a method blank, as well as in the sample
E = Analyte value exceeds linear range

Table D-1
Analytical Results for Perchlorate and Organics
January 2007 Sampling Event
Eastern Santa Clara Subbasin Groundwater Study

Parameter	Regulatory Action Levels						Analytical Results											
	CA Primary MCL	USEPA Primary MCL	CA Secondary MCL	USEPA Secondary MCL	CA OEHHA PHG	CA DHS NL	AL06 02/01/2007 Primary Sample		AL09A 02/01/2007 Primary Sample		AL09B 02/01/2007 Primary Sample		CW01A 08/21/2006 Primary Sample		CW01B 2/01/2007 Primary Sample		CW01C 02/01/2007 Primary Sample	
Oxidizers																		
Perchlorate					6	6	4.3	J	1	J	4.2		2	J	3	U	10.2	
Volatile Organic Compounds																		
Acetone							10	U	10	U	10	U	10	U	10	U	10	U
Benzene	1	5			0.15		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromodichloromethane	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Carbon Disulfide						160	0.67		7.2		6		0.5	U	0.5	U	0.5	U
Carbon Tetrachloride	0.5	5			0.1		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Chloroform	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Cis-1,2-Dichloroethene	6	70					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methyl Tert-Butyl Ether (MTBE)	13		5		13		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methylene Chloride	5	5			4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Tetrachloroethene (PCE)	5	5			0.06		1.4		3		2.3		0.5	U	0.5	U	0.5	U
Toluene	150	1,000			150		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-Trichlorobenzene							0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichloroethene (TCE)	5	5			0.8		0.45	J	0.9		0.83		0.5	U	0.5	U	0.5	U

NOTES:

Units in **microgram per liter (µg/L)**, unless otherwise noted.

Analytes listed on this table have 1 or more samples with concentrations reported above their quantitation limits.

CA = California
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(1) CA Primary MCL for total trihalomethanes
(bromodichloromethane, bromoform, dibromochloromethane, and chloroform).

(2) USEPA Primary MCL for total trihalomethanes
(bromodichloromethane, bromoform, dibromochloromethane, and chloroform).

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Table D-1
Analytical Results for Perchlorate and Organics
January 2007 Sampling Event
Eastern Santa Clara Subbasin Groundwater Study

Parameter	Regulatory Action Levels						Analytical Results											
	CA Primary MCL	USEPA Primary MCL	CA Secondary MCL	USEPA Secondary MCL	CA OEHHA PHG	CA DHS NL	MP01A 2/01/2007 Primary Sample		MP01A 02/03/2007 USACE QA Sample		MP01_01 01/30/2007 Primary Sample		MP01_02 01/30/2007 Primary Sample		MP01_02 01/30/2007 Field Duplicate		MP01_03 01/30/2007 Primary Sample	
Oxidizers																		
Perchlorate					6	6	25.2		25.2		42.2		80.8		82.1		12	
Volatile Organic Compounds																		
Acetone							10	U	10	U	10	U	10	U	10	U	10	U
Benzene	1	5			0.15		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromodichloromethane	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Carbon Disulfide						160	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Carbon Tetrachloride	0.5	5			0.1		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Chloroform	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Cis-1,2-Dichloroethene	6	70					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methyl Tert-Butyl Ether (MTBE)	13		5		13		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methylene Chloride	5	5			4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Tetrachloroethene (PCE)	5	5			0.06		7.6		0.5	U	0.36	J	0.5	U	0.5	U	0.5	U
Toluene	150	1,000			150		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-Trichlorobenzene							0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichloroethene (TCE)	5	5			0.8		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

NOTES:

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Analytes listed on this table have 1 or more samples with concentrations reported above their quantitation limits.

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(1) CA Primary MCL for total trihalomethanes
(bromodichloromethane, bromoform, dibromochloromethane, and chloroform).

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Table D-1
Analytical Results for Perchlorate and Organics
January 2007 Sampling Event
Eastern Santa Clara Subbasin Groundwater Study

Parameter	Regulatory Action Levels						Analytical Results									
	CA Primary MCL	USEPA Primary MCL	CA Secondary MCL	USEPA Secondary MCL	CA OEHHA PHG	CA DHS NL	MP01_04 01/30/2007 Primary Sample		MP01_05 01/30/2007 Primary Sample		MP01_06 01/30/2007 Primary Sample		MP01_07 01/30/2007 Primary Sample		MP01_08 01/30/2007 Primary Sample	
Oxidizers																
Perchlorate					6	6	0.81	J	3	U	3	U	3	U	3	U
Volatile Organic Compounds																
Acetone							10	U	10	U	10	U	10	U	10	U
Benzene	1	5			0.15		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromodichloromethane	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Carbon Disulfide						160	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Carbon Tetrachloride	0.5	5			0.1		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Chloroform	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Cis-1,2-Dichloroethene	6	70					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methyl Tert-Butyl Ether (MTBE)	13		5		13		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methylene Chloride	5	5			4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Tetrachloroethene (PCE)	5	5			0.06		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Toluene	150	1,000			150		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-Trichlorobenzene							0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichloroethene (TCE)	5	5			0.8		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

NOTES:

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Analytical Results for Perchlorate and Organics
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Eastern Santa Clara Subbasin Groundwater Study

Parameter	Regulatory Action Levels						Analytical Results											
	CA Primary MCL	USEPA Primary MCL	CA Secondary MCL	USEPA Secondary MCL	CA OEHHA PHG	CA DHS NL	MP01_09 01/30/2007 Primary Sample		MP01_10 01/30/2007 Primary Sample		MP02_01 02/01/2007 Primary Sample		MP02_02 02/01/2007 Primary Sample		MP02_02 02/01/2007 Field Duplicate		MP02_03 02/01/2007 Primary Sample	
Oxidizers																		
Perchlorate					6	6	3	U	3	U	5370		3.2		2.9	J	3	U
Volatile Organic Compounds																		
Acetone							10	U	10	U	10	U	10	U	10	U	10	U
Benzene	1	5			0.15		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromodichloromethane	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Carbon Disulfide						160	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.89	
Carbon Tetrachloride	0.5	5			0.1		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Chloroform	100 (1)	80 (2)					0.5	U	0.5	U	0.24	J	0.5	U	0.5	U	0.5	U
Cis-1,2-Dichloroethene	6	70					0.5	U	0.5	U	0.73		0.5	U	0.5	U	0.59	
Methyl Tert-Butyl Ether (MTBE)	13		5		13		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methylene Chloride	5	5			4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Tetrachloroethene (PCE)	5	5			0.06		0.5	U	0.5	U	1.2		0.5	U	0.5	U	0.5	U
Toluene	150	1,000			150		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-Trichlorobenzene							0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichloroethene (TCE)	5	5			0.8		0.5	U	0.5	U	330		0.94		1		4.3	

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January 2007 Sampling Event
Eastern Santa Clara Subbasin Groundwater Study

Parameter	Regulatory Action Levels						Analytical Results											
	CA Primary MCL	USEPA Primary MCL	CA Secondary MCL	USEPA Secondary MCL	CA OEHHA PHG	CA DHS NL	MP02_04 02/01/2007 Primary Sample		MP02_05 02/01/2007 Primary Sample		MP02_06 02/01/2007 Primary Sample		MP03_01 01/31/2007 Primary Sample		MP03_02 01/31/2007 Primary Sample		MP03_03 01/31/2007 Primary Sample	
Oxidizers																		
Perchlorate					6	6	3	U	3	U	16.2		3	U	3	U	3	U
Volatile Organic Compounds																		
Acetone							10	U	10	U	10	U	10	U	10	U	8.5	J
Benzene	1	5			0.15		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.30	J
Bromodichloromethane	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Carbon Disulfide						160	0.5	U	0.59		2.4		0.48	J	0.38	J	1.2	
Carbon Tetrachloride	0.5	5			0.1		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Chloroform	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	1.5	
Cis-1,2-Dichloroethene	6	70					0.5	U	0.5	U	1.5		0.5	U	0.5	U	0.5	U
Methyl Tert-Butyl Ether (MTBE)	13		5		13		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methylene Chloride	5	5			4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	10	
Tetrachloroethene (PCE)	5	5			0.06		0.5	U	0.5	U	1		0.5	U	0.5	U	0.5	U
Toluene	150	1,000			150		0.5	U	0.5	U	0.21	J	0.5	U	0.24	J	0.25	J
1,2,3-Trichlorobenzene							0.5	U	0.5	U	0.39	BJ	0.5	U	0.5	U	0.5	U
Trichloroethene (TCE)	5	5			0.8		0.5	U	0.57		170		0.5	U	0.5	U	0.5	U

NOTES:

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January 2007 Sampling Event
Eastern Santa Clara Subbasin Groundwater Study

Parameter	Regulatory Action Levels						Analytical Results											
	CA Primary MCL	USEPA Primary MCL	CA Secondary MCL	USEPA Secondary MCL	CA OEHHA PHG	CA DHS NL	MP03_04 01/31/2007 Primary Sample		MP04_01 01/31/2007 Primary Sample		MP04_02 01/31/2007 Primary Sample		MP04_03 01/31/2007 Primary Sample		MP04_04 01/31/2007 Primary Sample		MP04_05 01/31/2007 Primary Sample	
Oxidizers																		
Perchlorate					6	6	6	U	0.58	J	0.64	J	3	U	3	U	3	U
Volatile Organic Compounds																		
Acetone							10	U	10	U	10	U	10	U	10	U	10	U
Benzene	1	5			0.15		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromodichloromethane	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Carbon Disulfide						160	0.5		0.22	J	0.5	U	0.52		0.5	U	0.5	U
Carbon Tetrachloride	0.5	5			0.1		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Chloroform	100 (1)	80 (2)					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Cis-1,2-Dichloroethene	6	70					0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methyl Tert-Butyl Ether (MTBE)	13		5		13		0.20	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methylene Chloride	5	5			4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Tetrachloroethene (PCE)	5	5			0.06		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Toluene	150	1,000			150		0.30	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-Trichlorobenzene							0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichloroethene (TCE)	5	5			0.8		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

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January 2007 Sampling Event
Eastern Santa Clara Subbasin Groundwater Study

Parameter	Regulatory Action Levels						Analytical Results											
	CA Primary MCL	USEPA Primary MCL	CA Secondary MCL	USEPA Secondary MCL	CA OEHHA PHG	CA DHS NL	MP05_01 01/31/2007 Primary Sample		MP05_02 01/31/2007 Primary Sample		MP05_03 01/31/2007 Primary Sample		MP05_03 1/31/2007 USACE QA Sample		MP05_04 01/31/2007 Primary Sample		HS3C_01 01/31/2007 Primary Sample	
Oxidizers																		
Perchlorate					6	6	3		3.2		11.6		11.9		9.4		40.4	
Volatile Organic Compounds																		
Acetone							10	U	10	U	10	U	NT		10	U	10	U
Benzene	1	5			0.15		0.5	U	0.5	U	0.5	U	NT		0.5	U	0.5	U
Bromodichloromethane	100 (1)	80 (2)					0.5	U	0.35	J	0.5	U	NT		0.5	U	0.5	U
Carbon Disulfide						160	0.5	U	0.5	U	0.5	U	NT		0.5	U	0.43	J
Carbon Tetrachloride	0.5	5			0.1		0.5	U	0.5	U	0.5	U	NT		0.45	J	0.5	U
Chloroform	100 (1)	80 (2)					0.3	J	1.6		0.83		NT		0.61		0.5	U
Cis-1,2-Dichloroethene	6	70					0.5	U	0.5	U	0.18	J	NT		0.5	U	0.5	U
Methyl Tert-Butyl Ether (MTBE)	13		5		13		0.5	U	0.5	U	0.5	U	NT		0.5	U	0.5	U
Methylene Chloride	5	5			4		0.5	U	0.5	U	0.5	U	NT		0.5	U	0.5	U
Tetrachloroethene (PCE)	5	5			0.06		0.36	J	0.5	U	0.44	J	NT		0.42	J	0.5	U
Toluene	150	1,000			150		0.5	U	0.5	U	0.5	U	NT		0.5	U	0.5	U
1,2,3-Trichlorobenzene							0.5	U	0.5	U	0.5	U	NT		0.5	U	0.5	U
Trichloroethene (TCE)	5	5			0.8		0.87		4.3		12		NT		6.6	U	0.5	U

NOTES:

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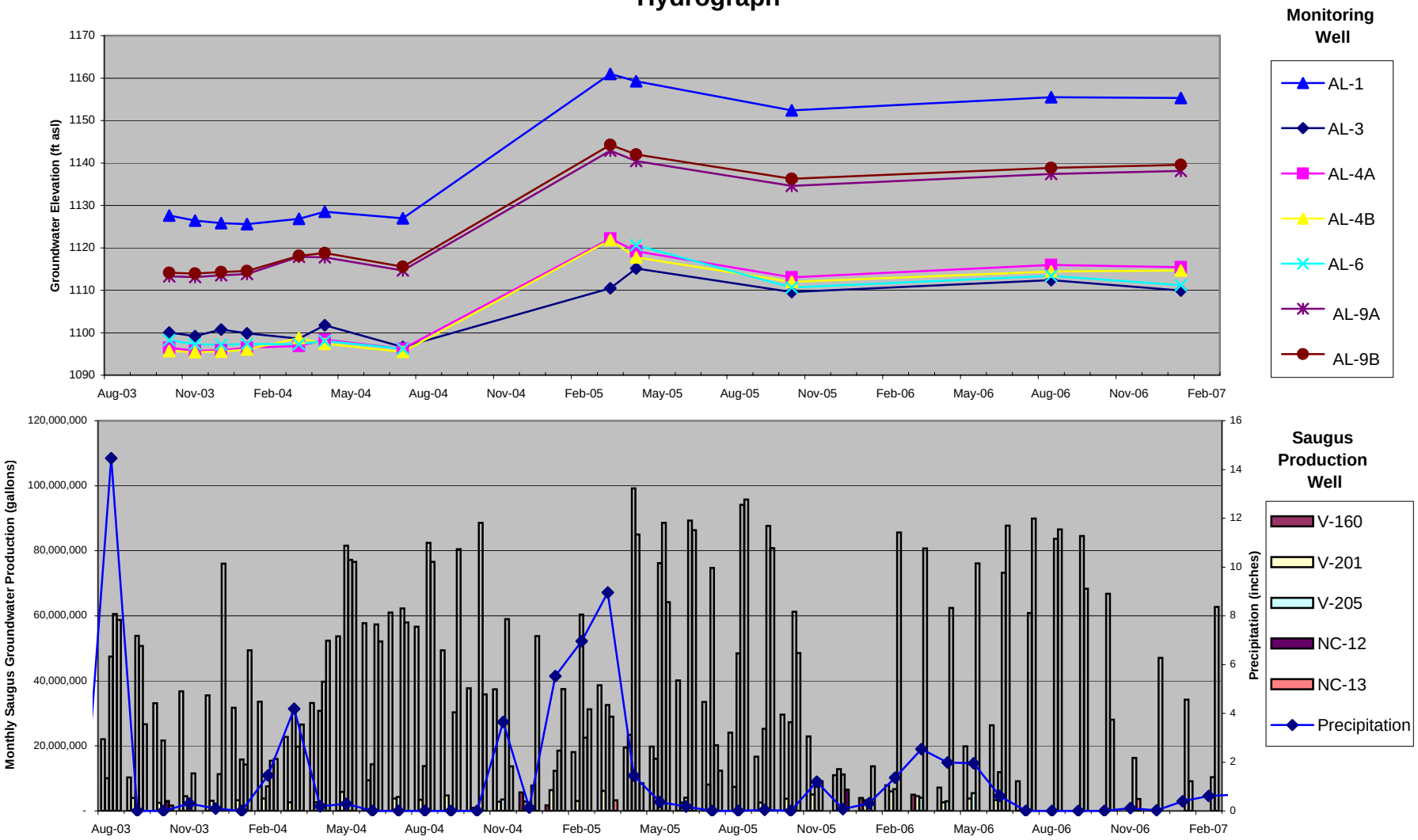
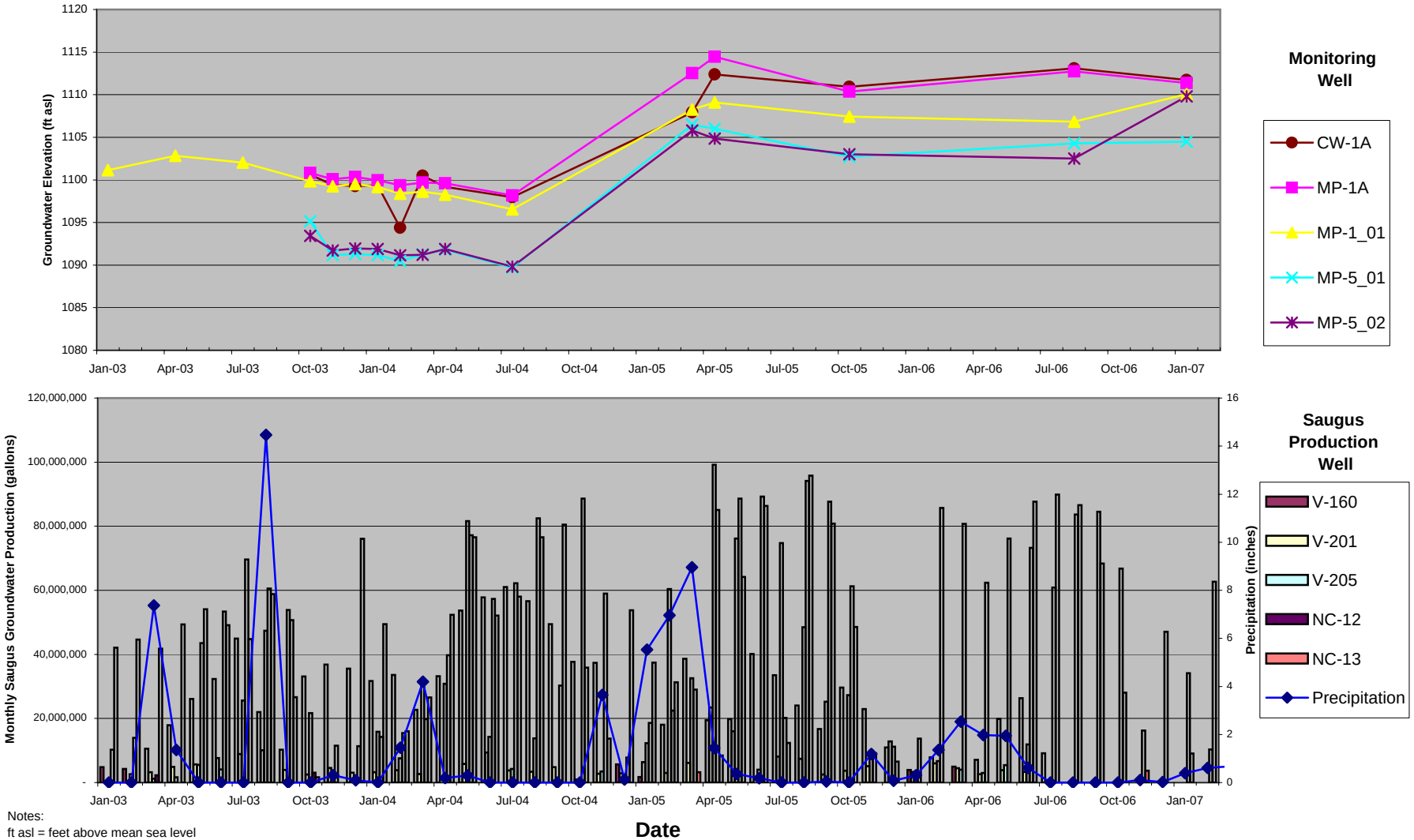
Attachment E
Hydrographs

Quaternary Alluvium Hydrograph



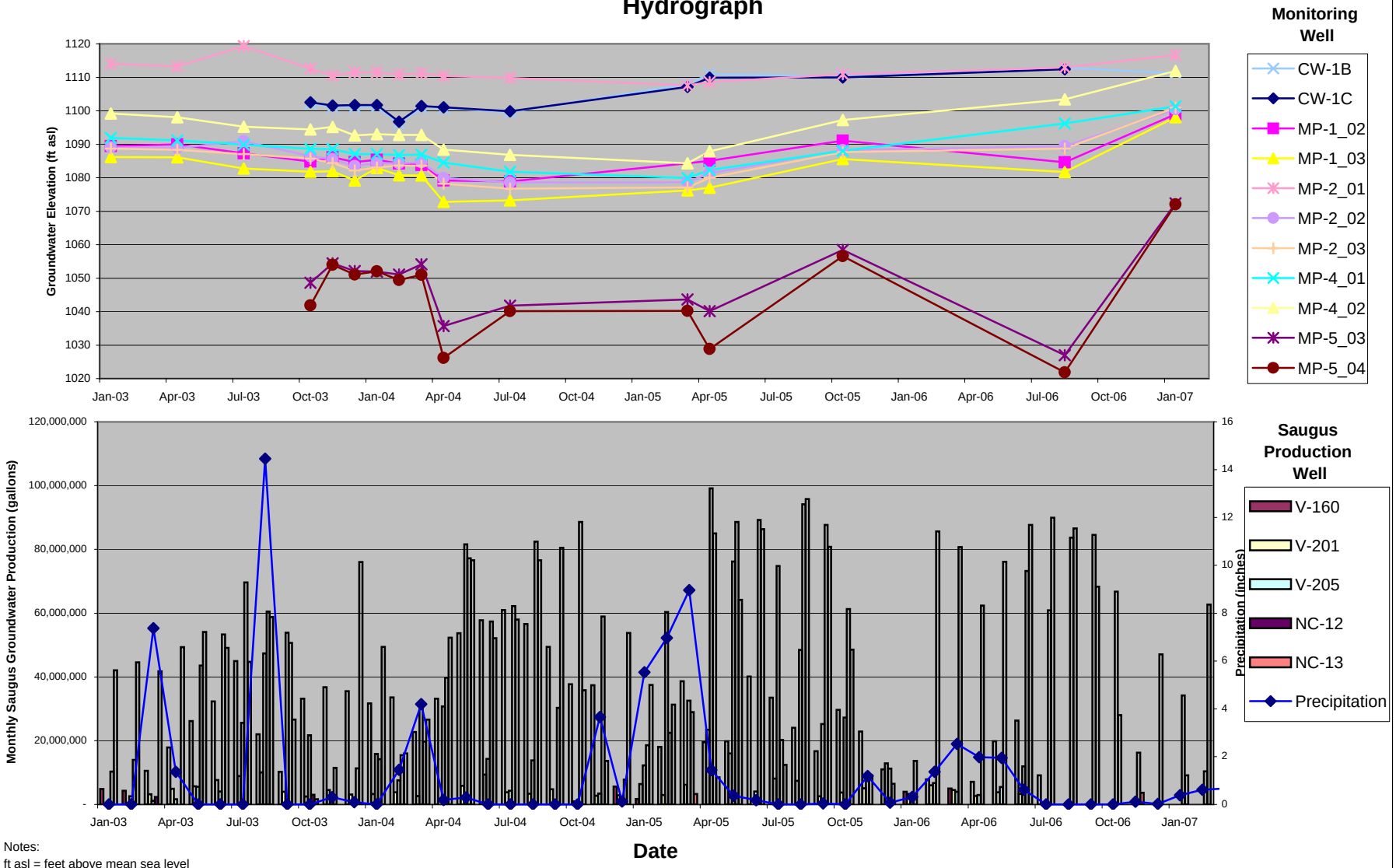
Notes:
ft asl = feet above mean sea level
Unable to obtain Valencia production data from Jun-06 to Jan-07

HSU SI
Hydrograph



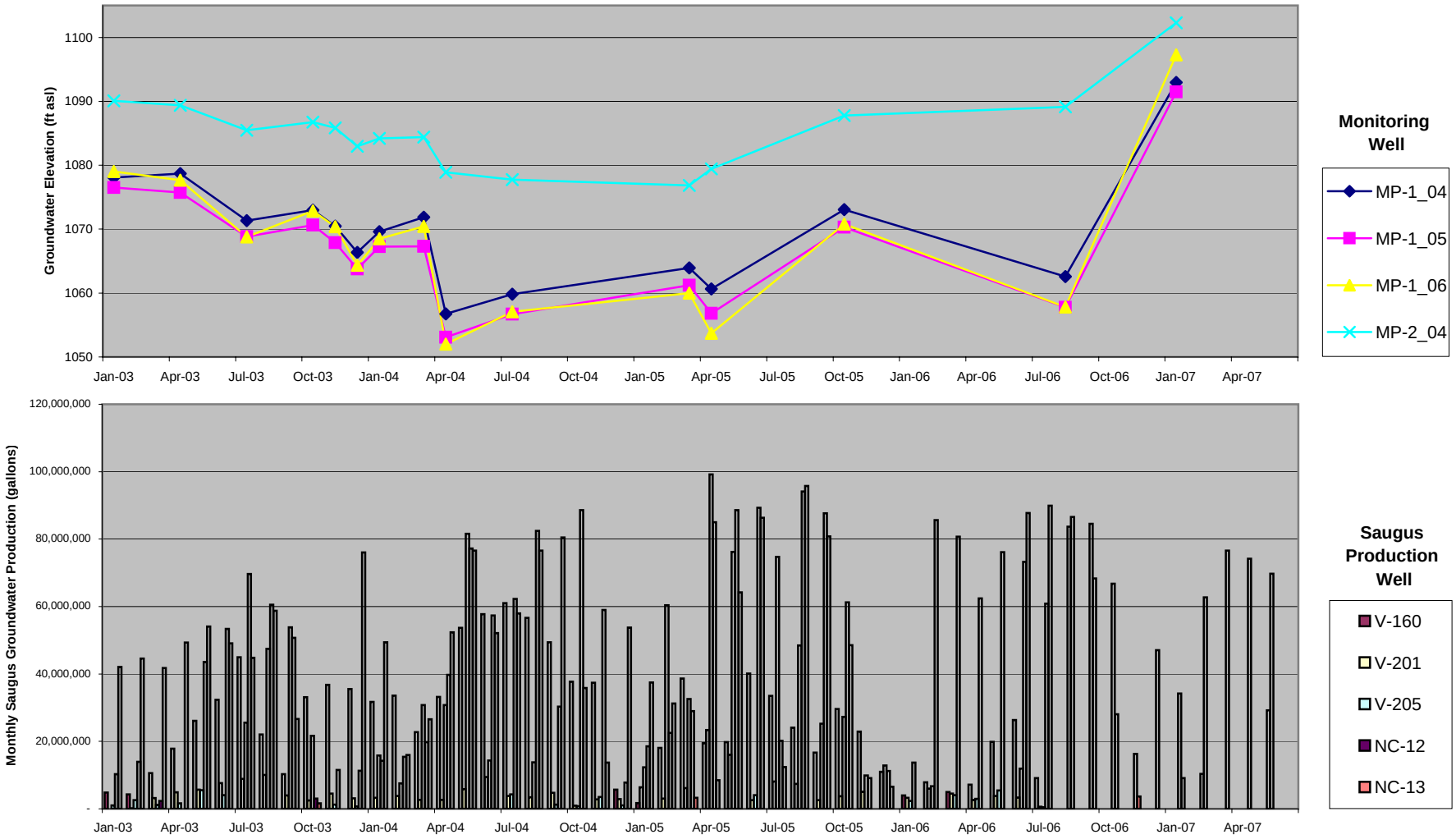
Notes:
ft asl = feet above mean sea level
Unable to obtain Valencia production data from Jun-06 to Jan-07

HSU SIII
Hydrograph



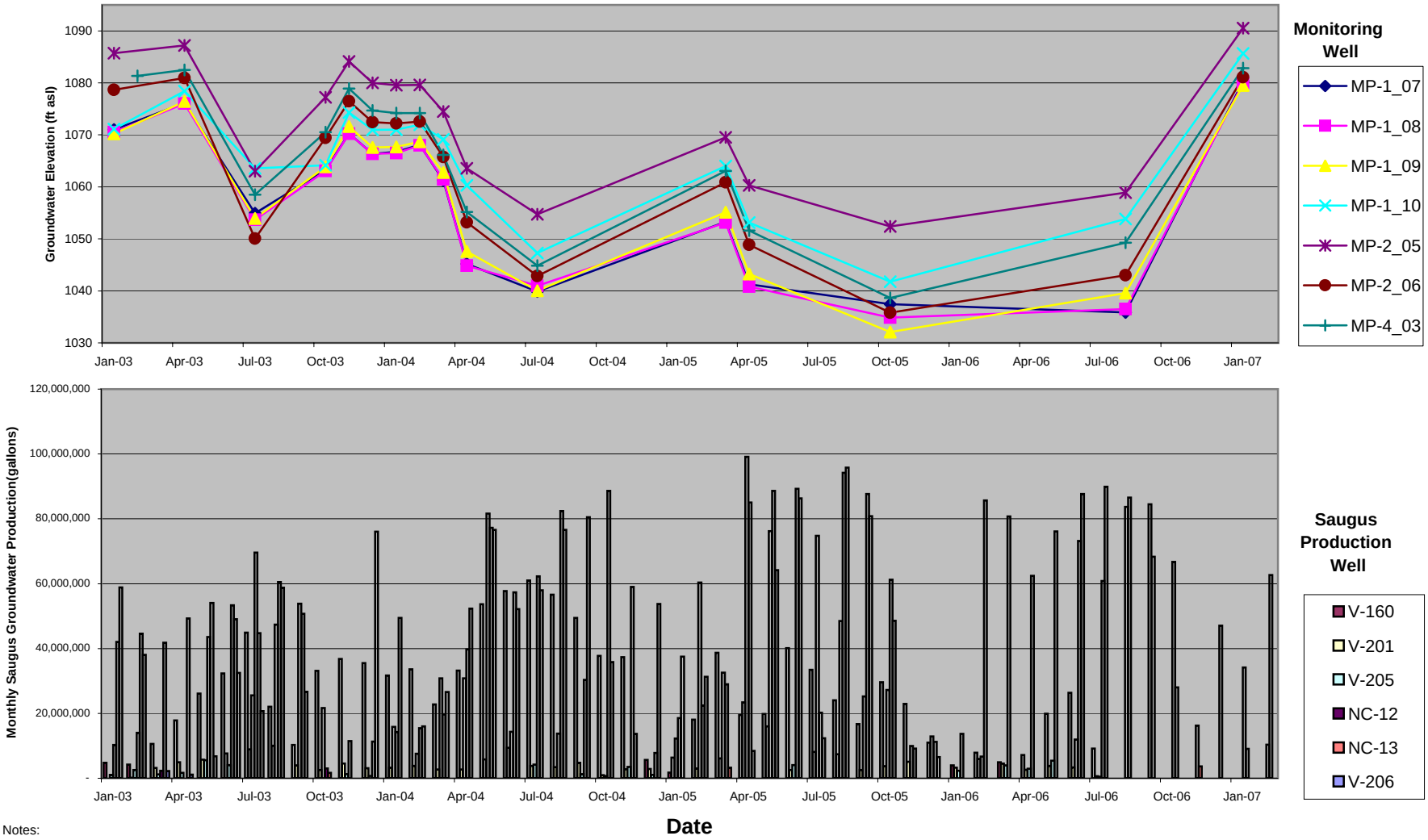
Notes:
ft asl = feet above mean sea level
Unable to obtain Valencia production data from Jun-06 to Jan-07

HSU SV
Hydrograph



Notes:
ft asl = feet above mean sea level
Unable to obtain Valencia production data from Jun-06 to Jan-07

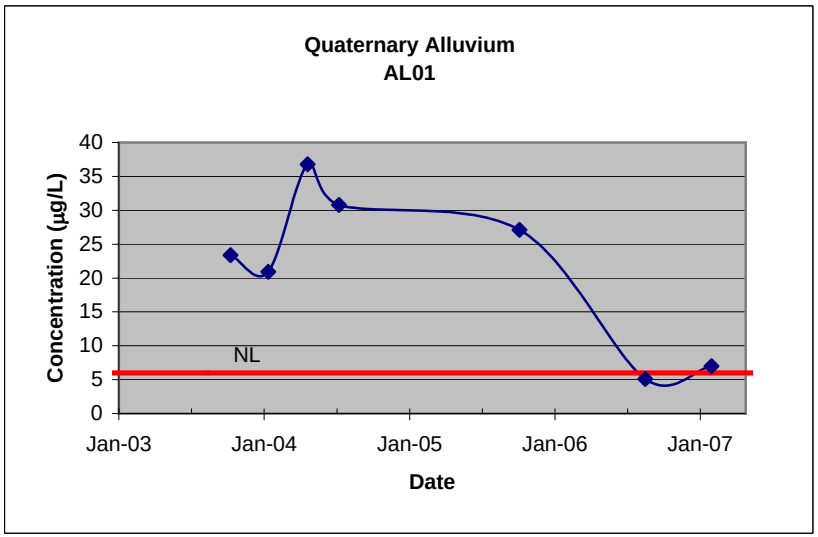
HSU SVII
Hydrograph

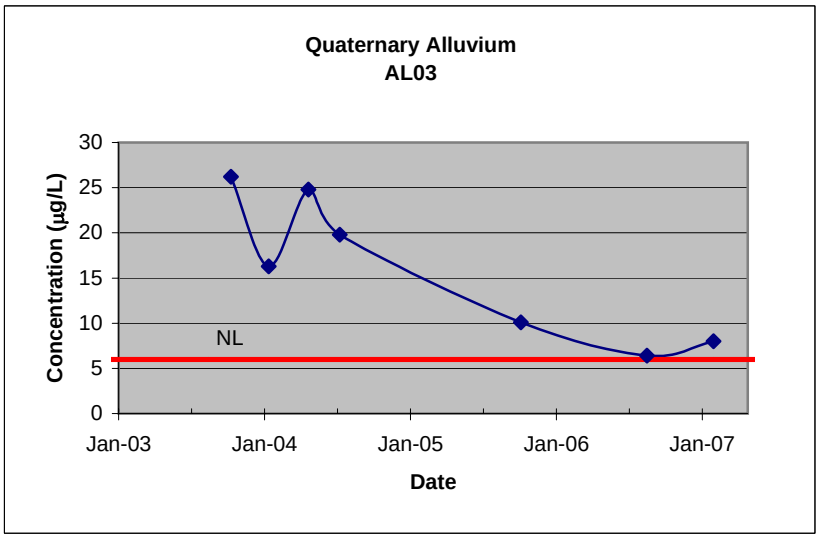


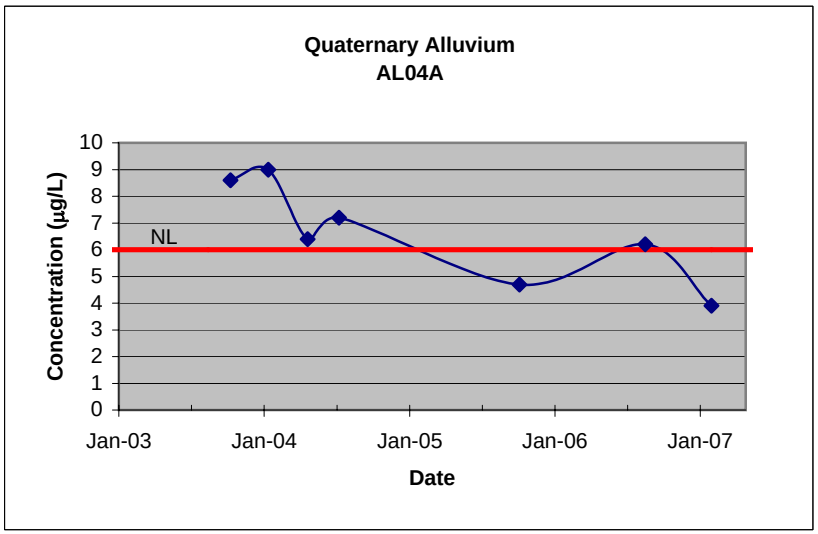
Notes:
ft asl = feet above mean sea leve
Unable to obtain Valencia production data from Jul-06 to Jan-07l

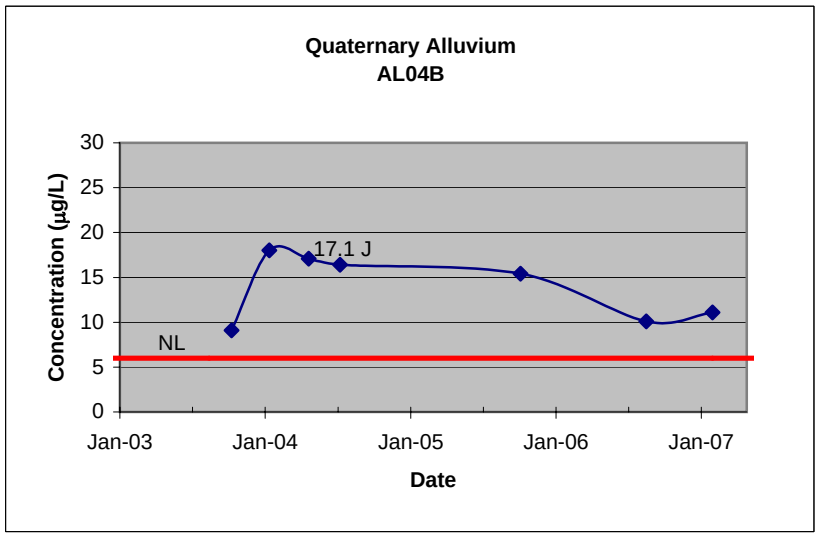
Attachment F
Time Series Charts

Quaternary Alluvium
Perchlorate Time Series Plots



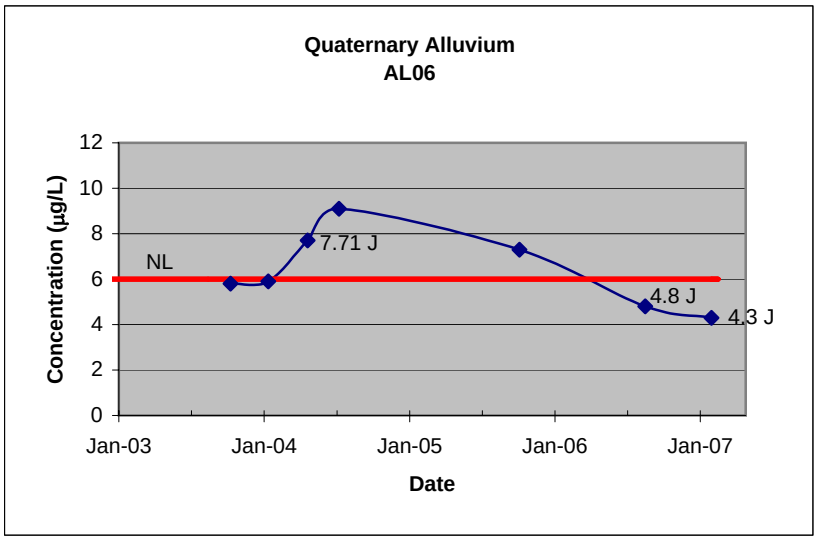


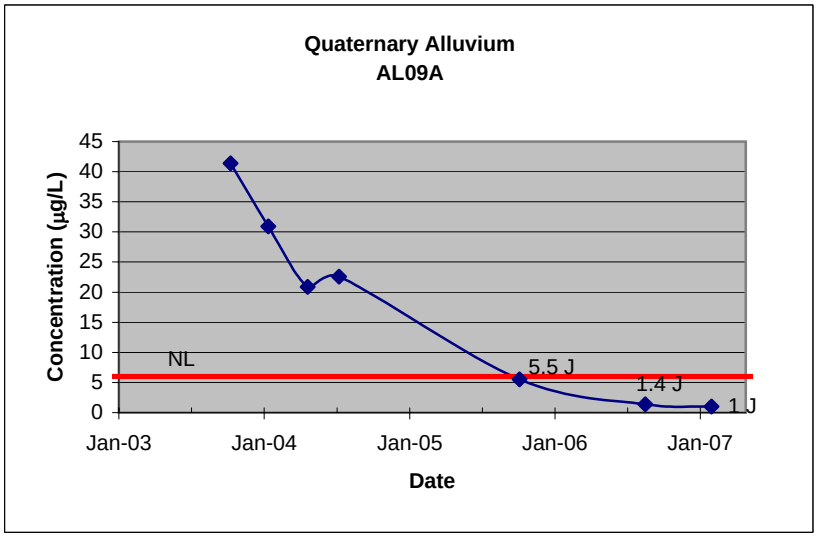


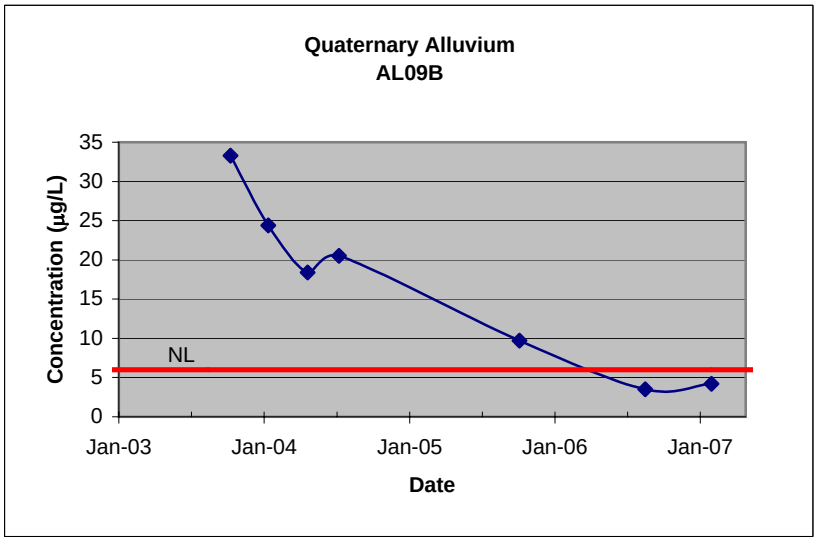


NL = Notification Level (for toxicity)

Quaternary Alluvium
Perchlorate Time Series Plots

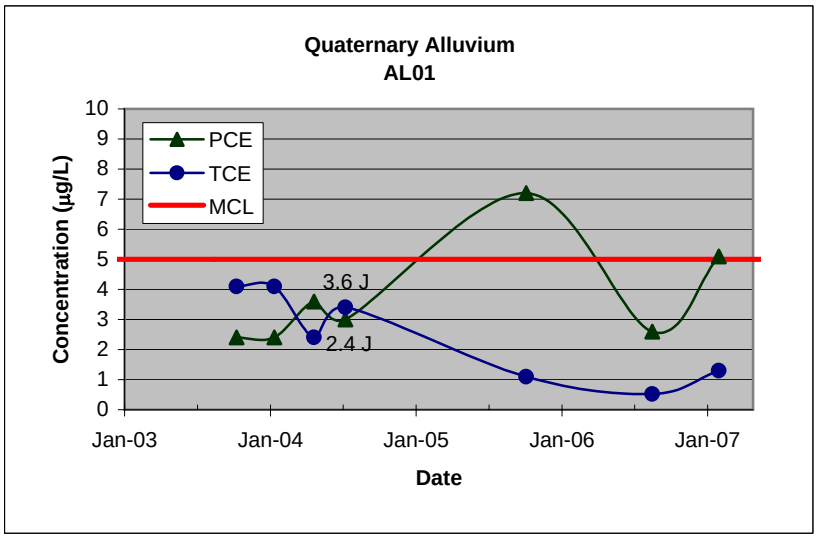


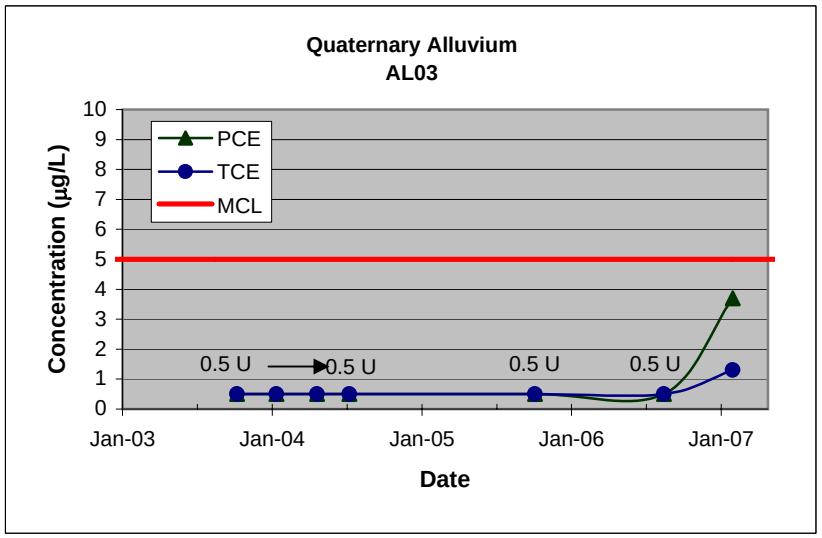


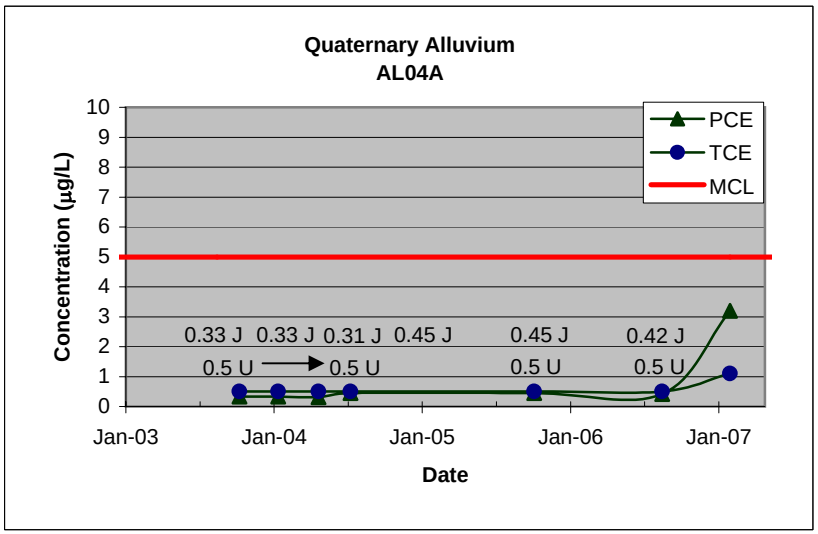


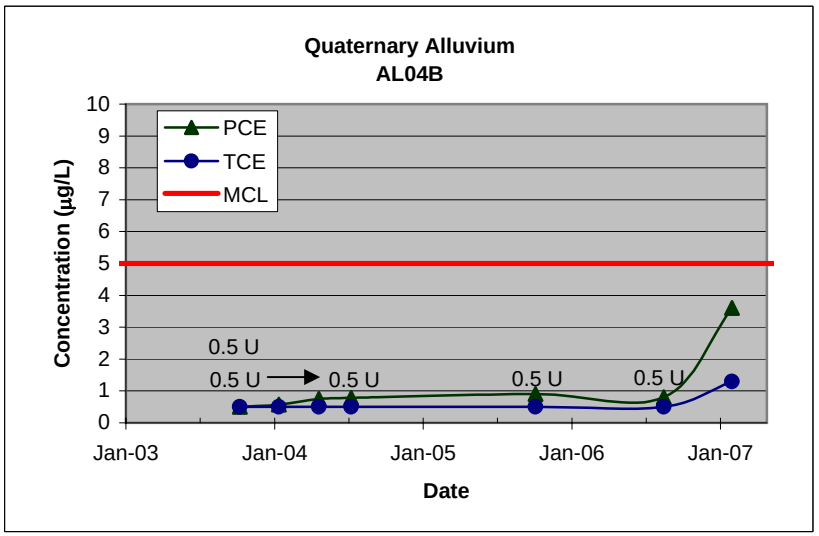
NL = Notification Level (for toxicity)

Quaternary Alluvium
PCE and TCE Time Series Plots



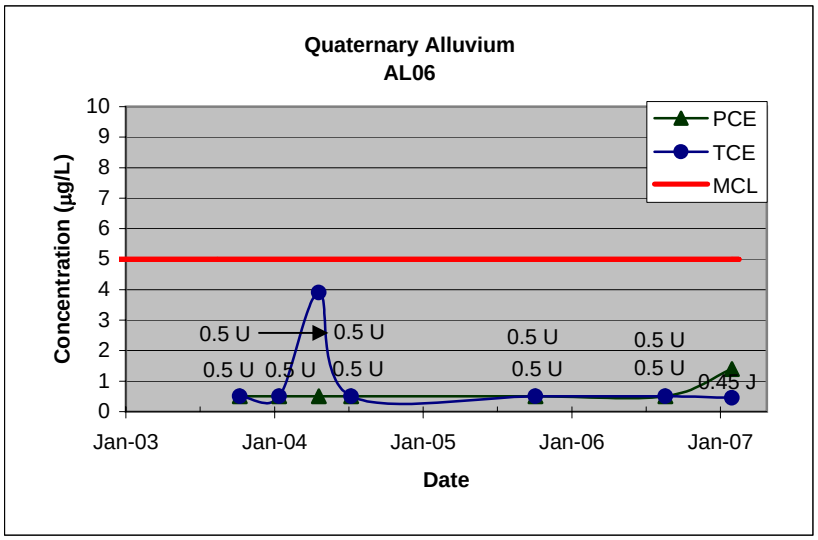


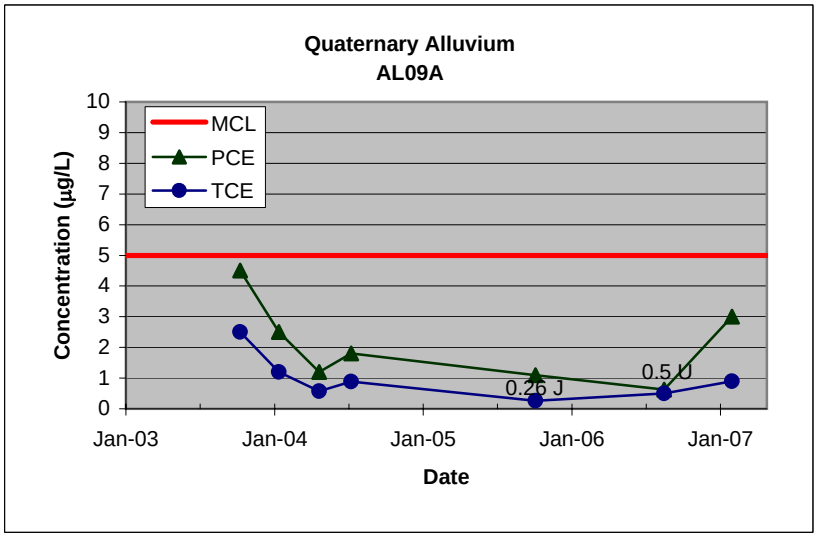


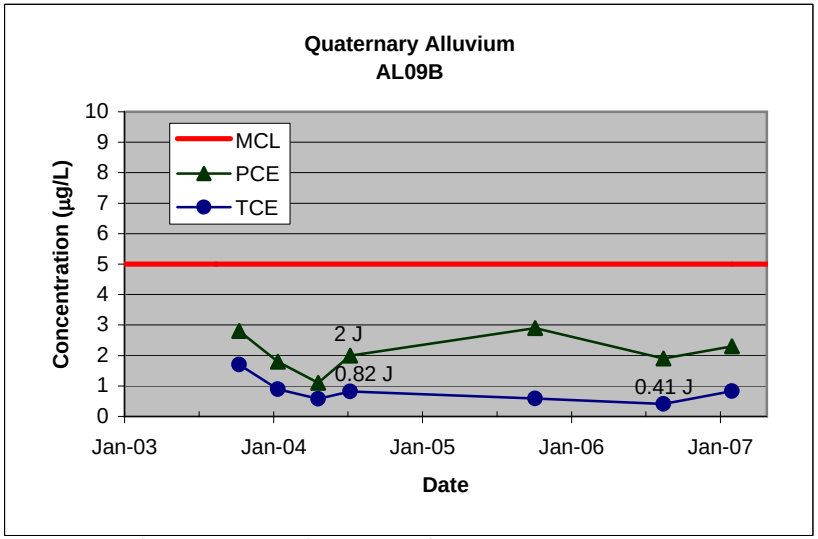


MCL= Maximum Contaminant Level

Quaternary Alluvium
PCE and TCE Time Series Plots

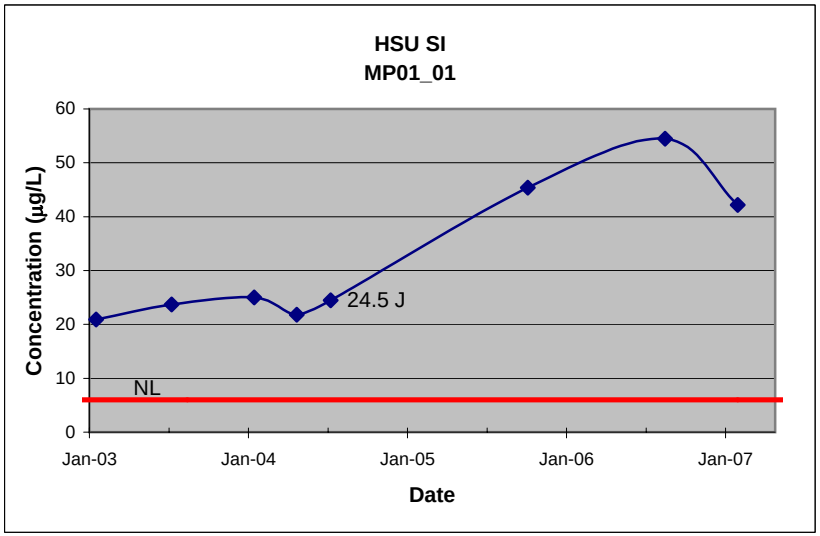


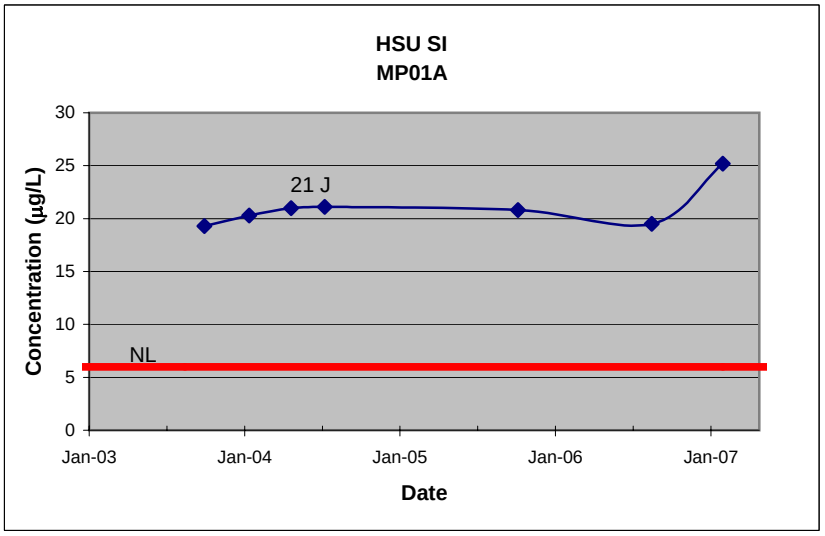


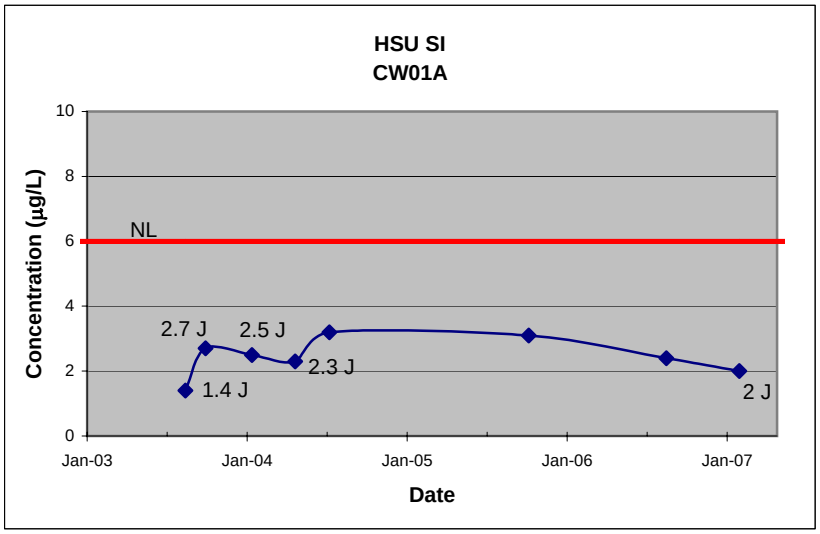


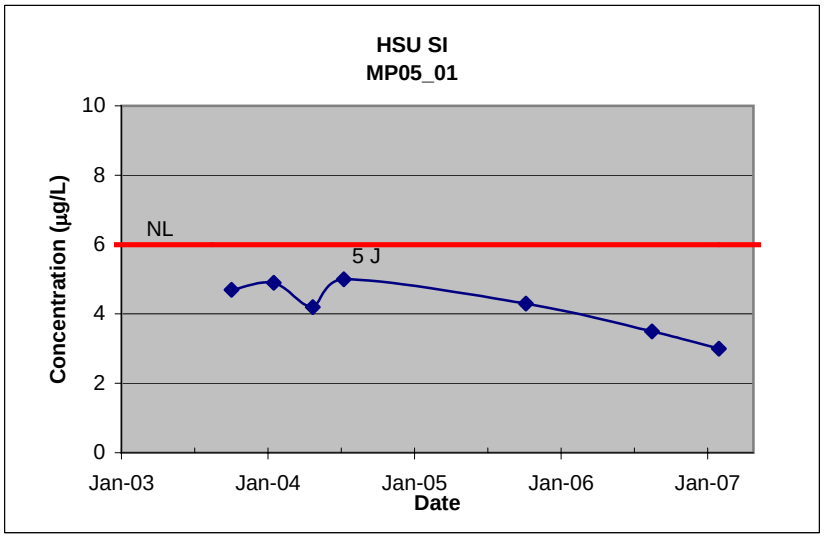
MCL= Maximum Contaminant Level

HSU SI
Perchlorate Time Series Plots



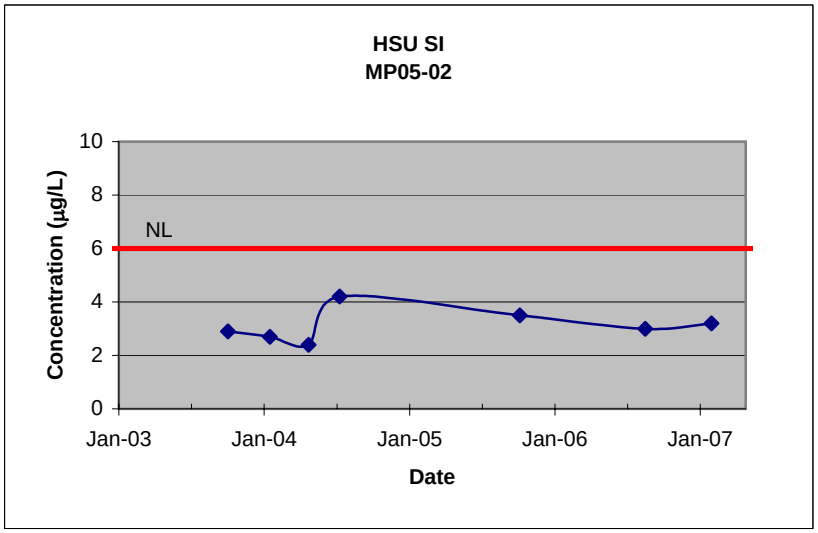






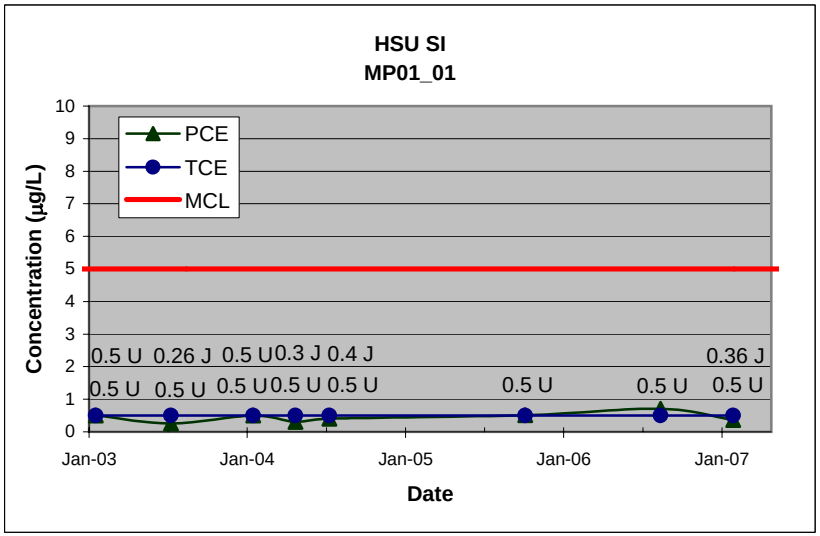
NL = Notification Level (for toxicity)

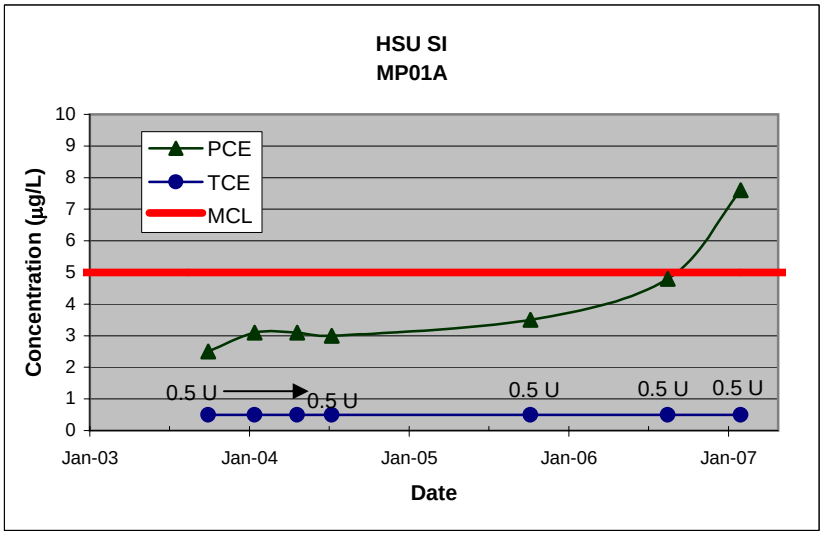
HSU SI
Perchlorate Time Series Plots

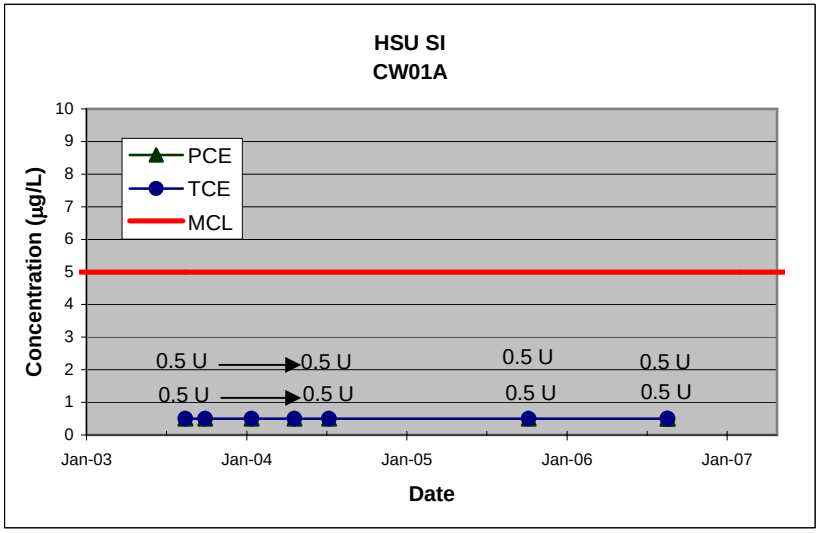


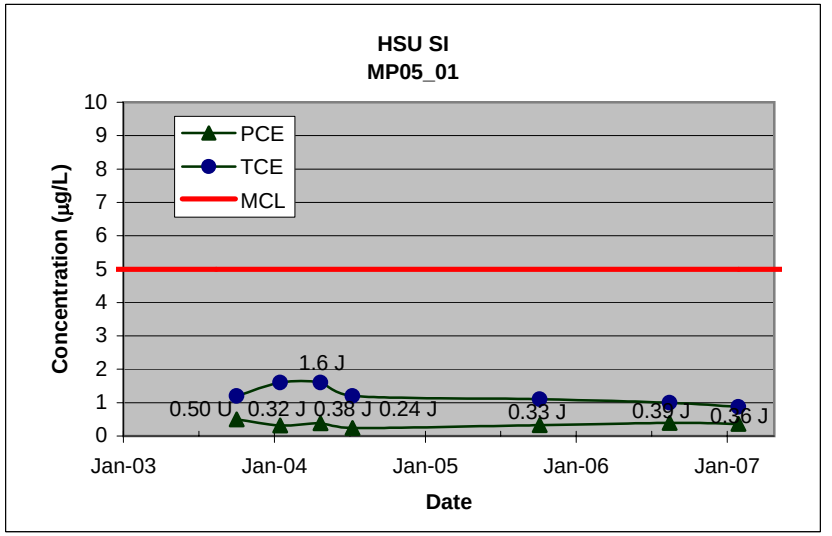
NL = Notification Level (for toxicity)

HSU SI
PCE and TCE Time Series Plots



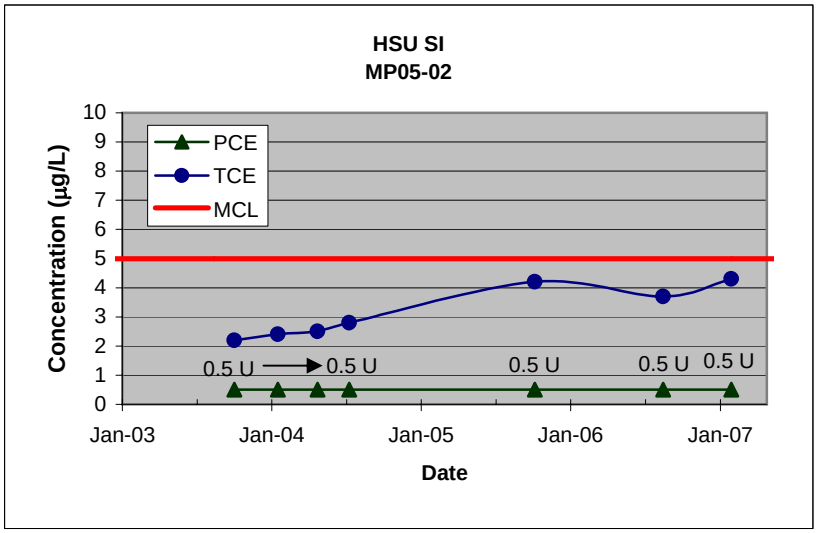






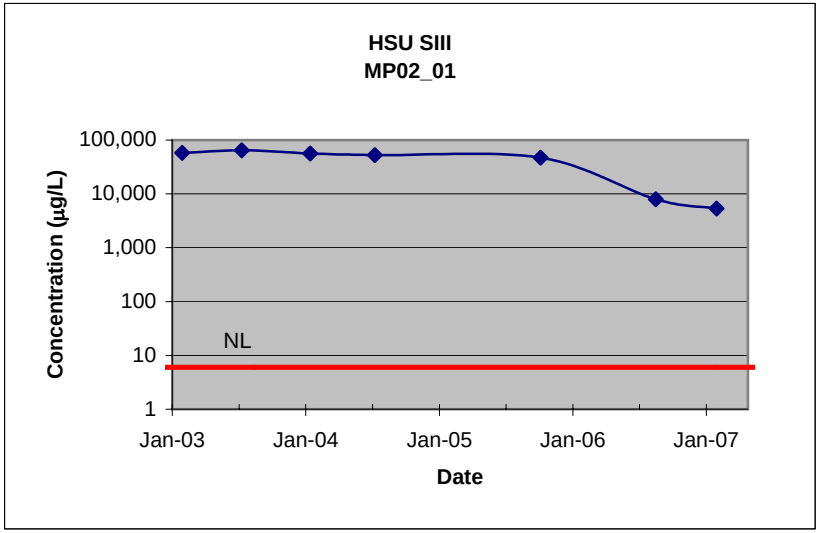
MCL= Maximum Contaminant Level

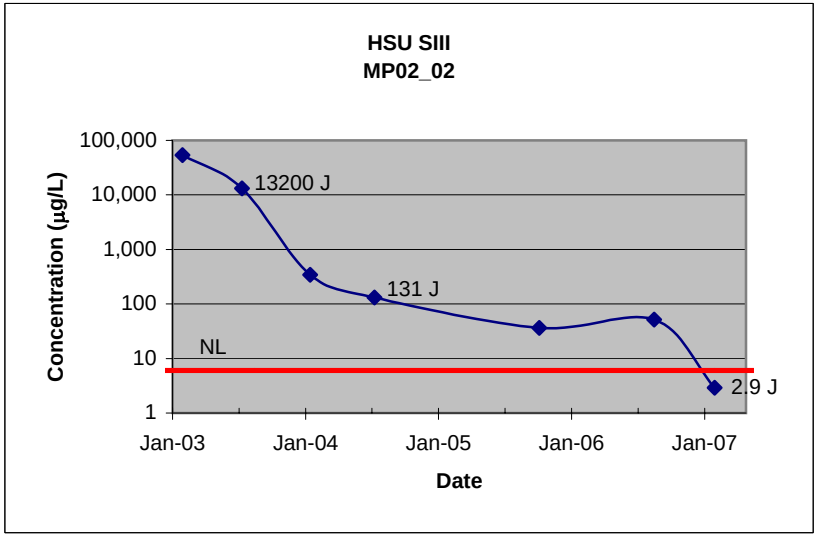
HSU SI
PCE and TCE Time Series Plots

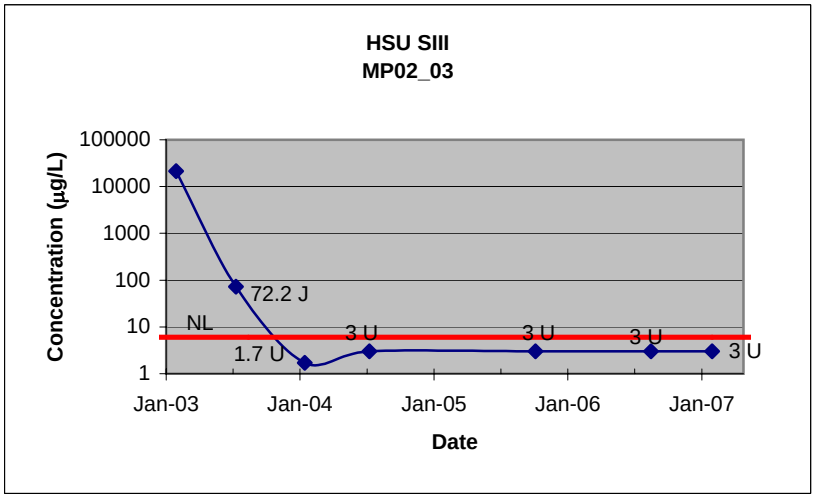


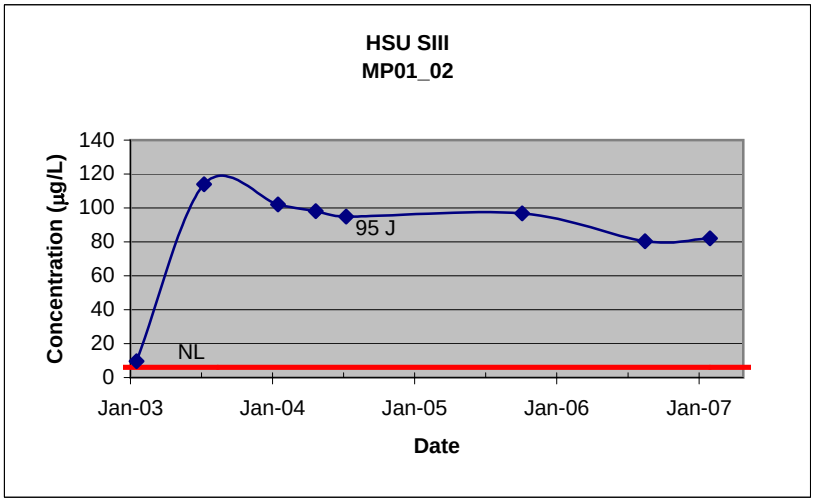
MCL= Maximum Contaminant Level

HSU SIII
Perchlorate Time Series Plots



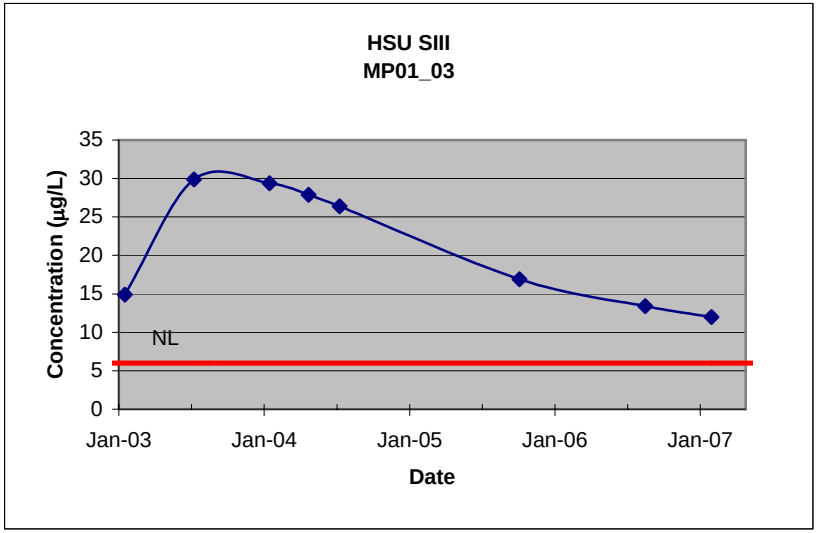


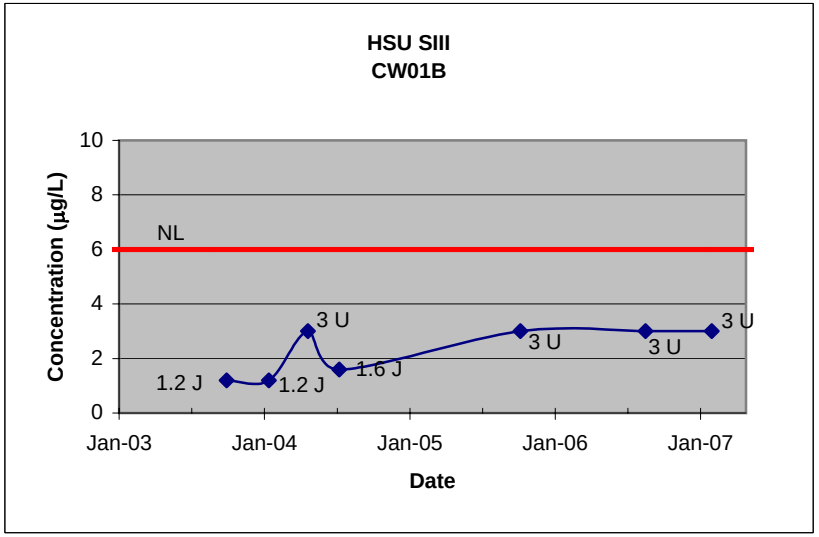


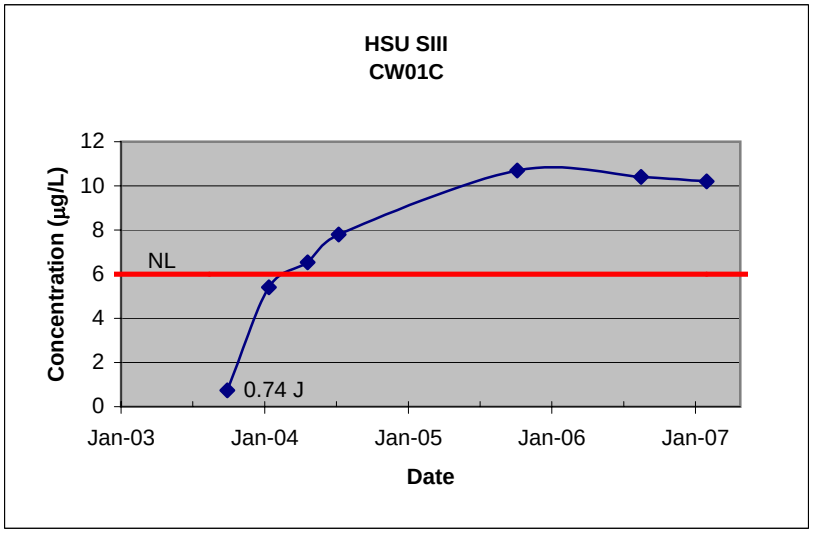


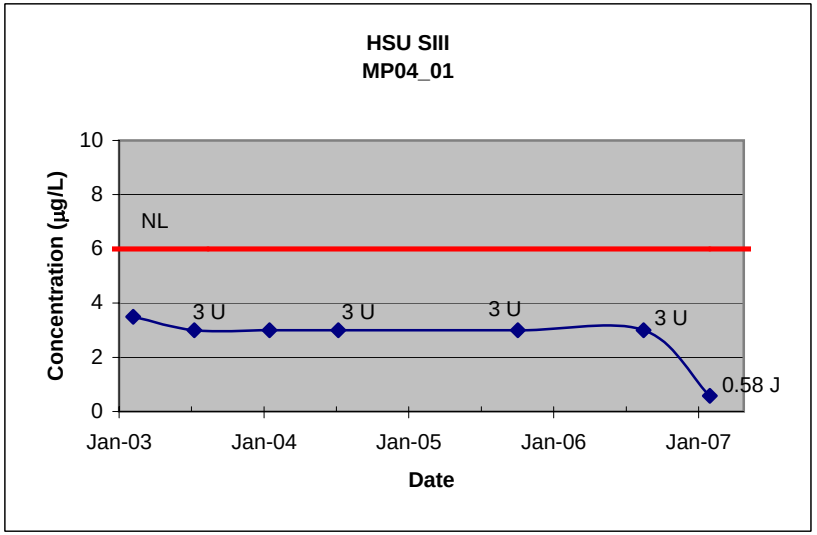
NL = Notification Level (for toxicity)

HSU SIII
Perchlorate Time Series Plots



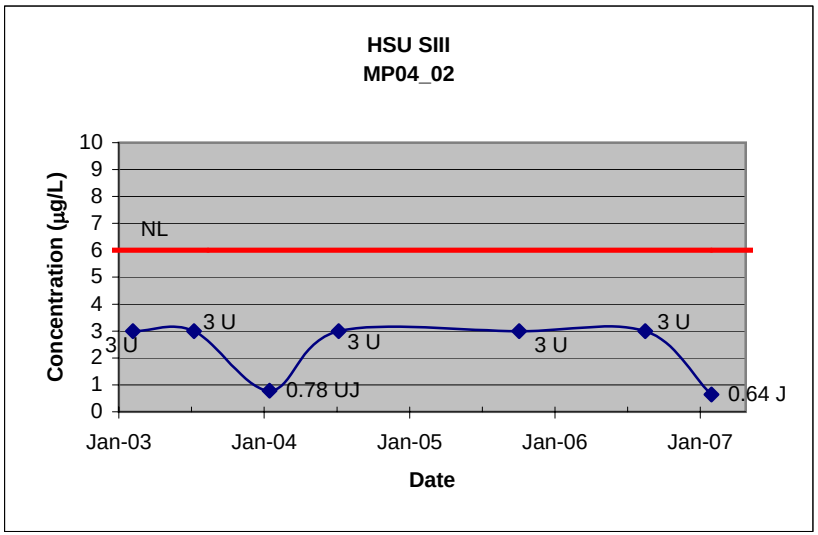


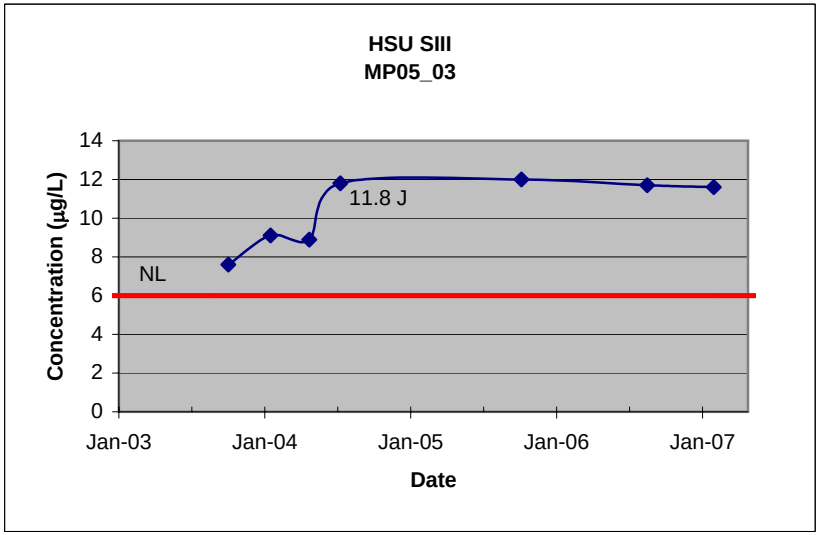


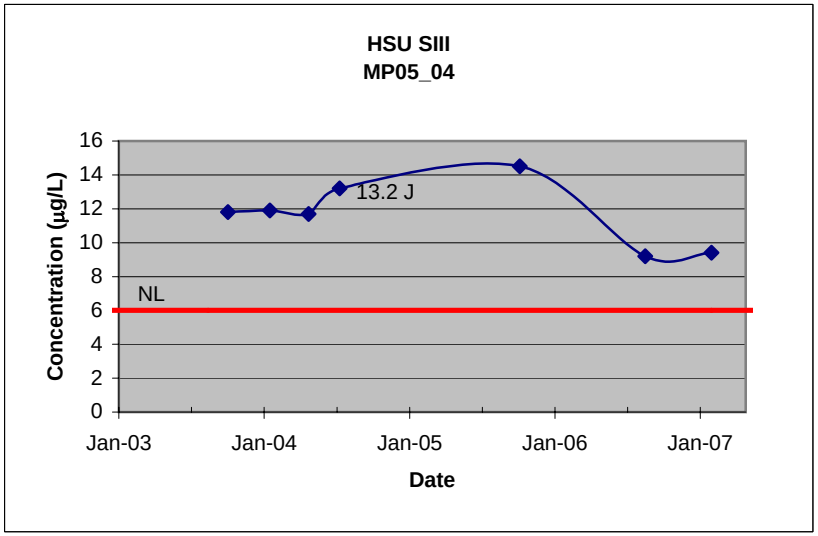


NL = Notification Level (for toxicity)

HSU SIII
Perchlorate Time Series Plots

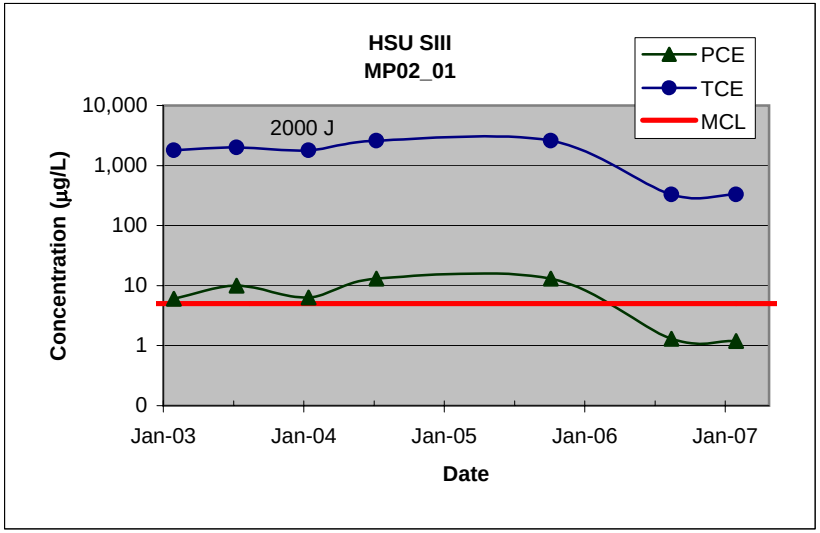


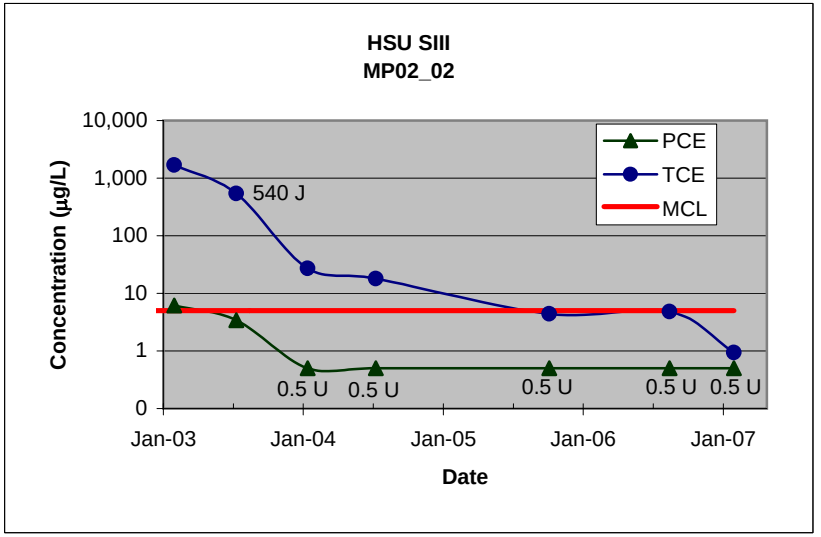


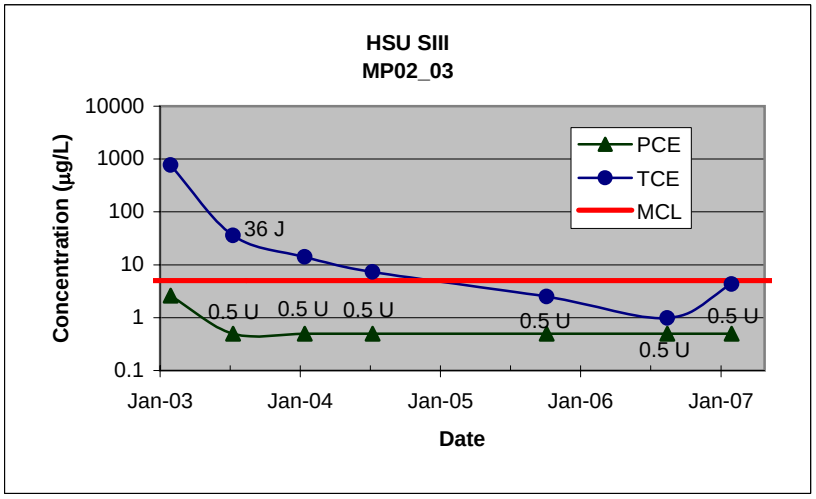


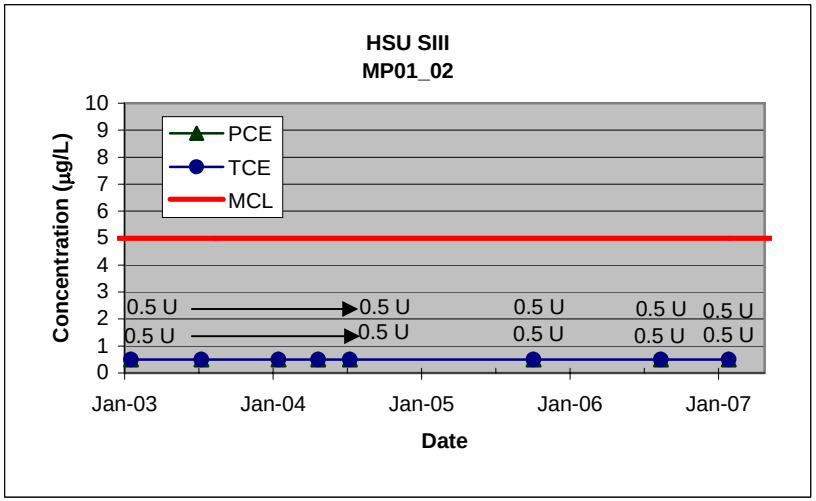
NL = Notification Level (for toxicity)

HSU SIII
PCE and TCE Time Series Plots



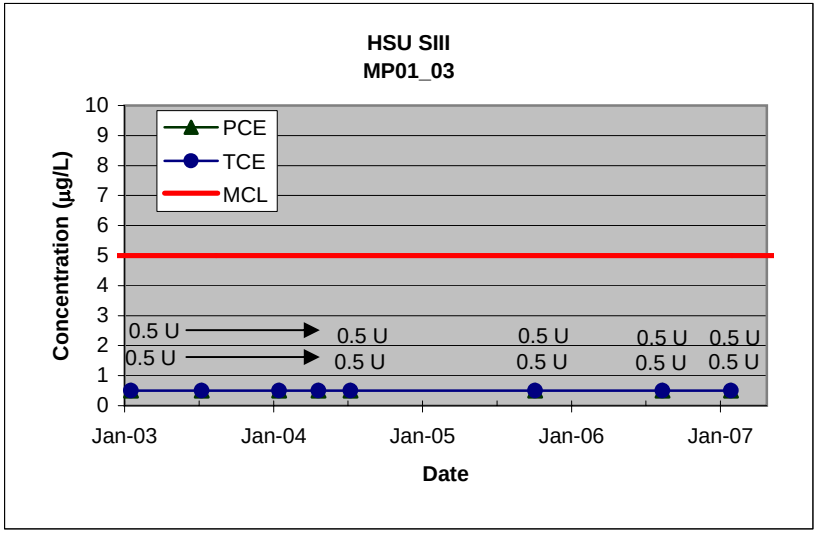


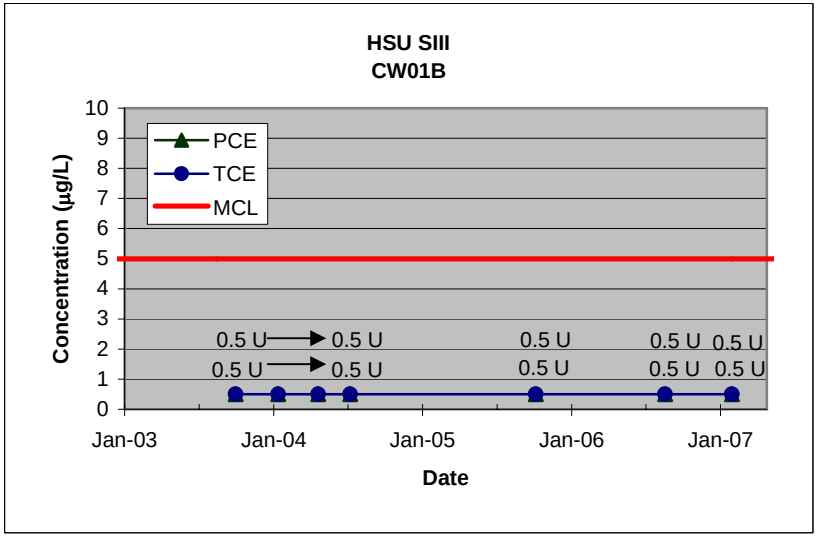


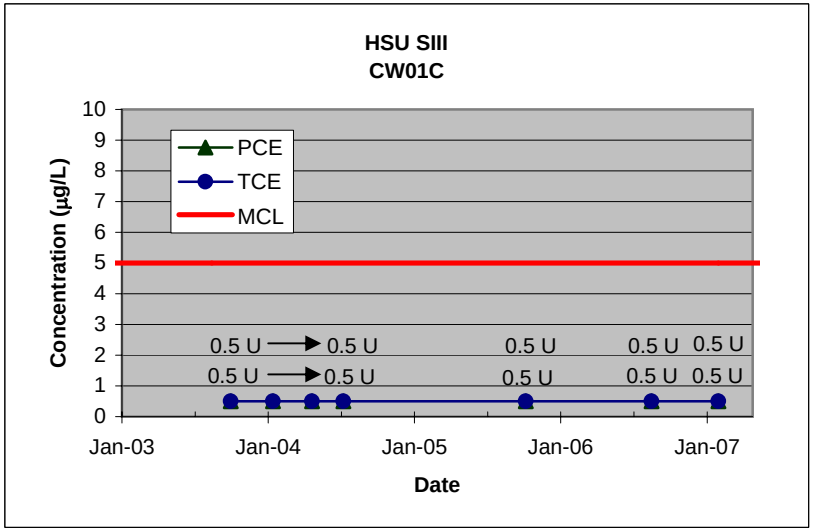


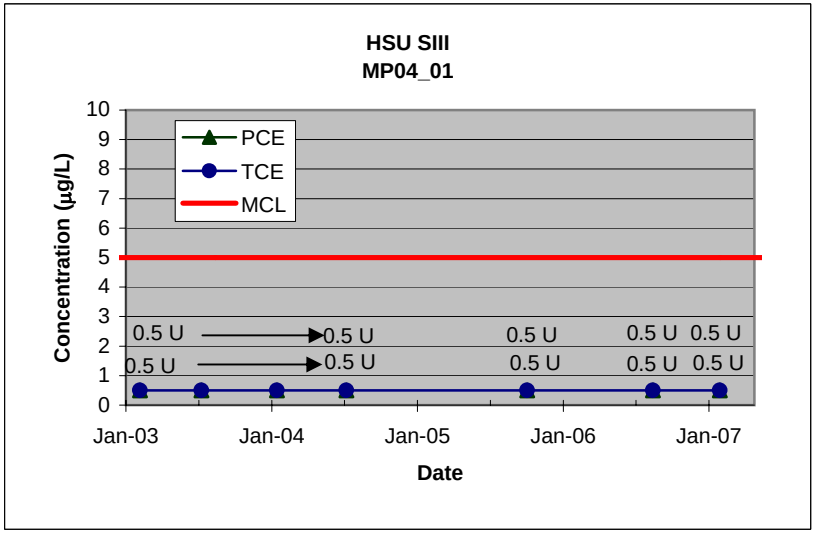
MCL= Maximum Contaminant Level

HSU SIII
PCE and TCE Time Series Plots



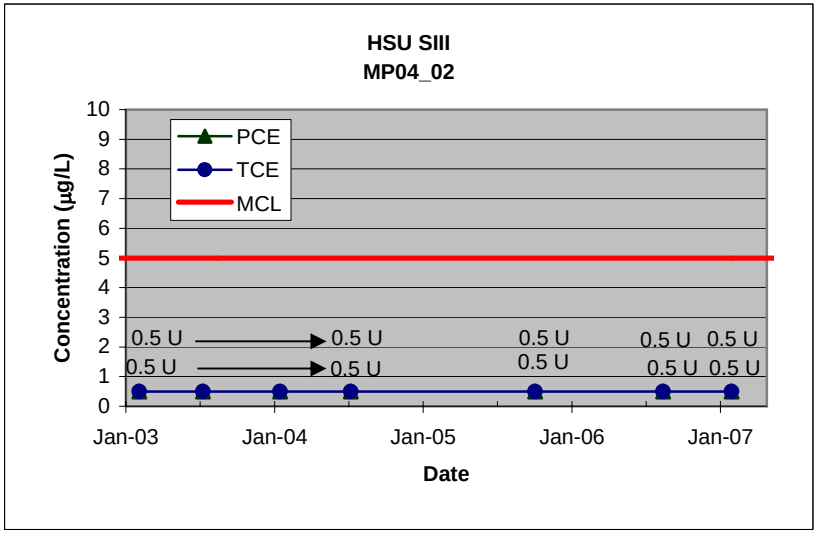


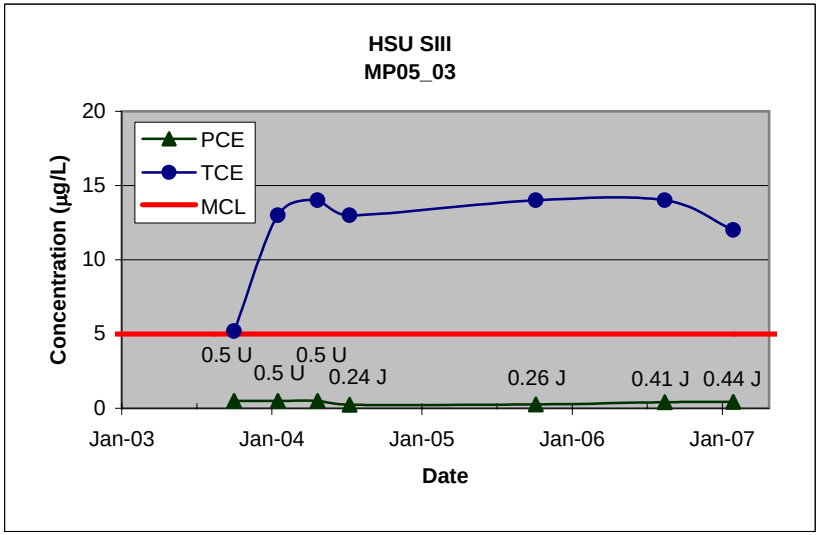


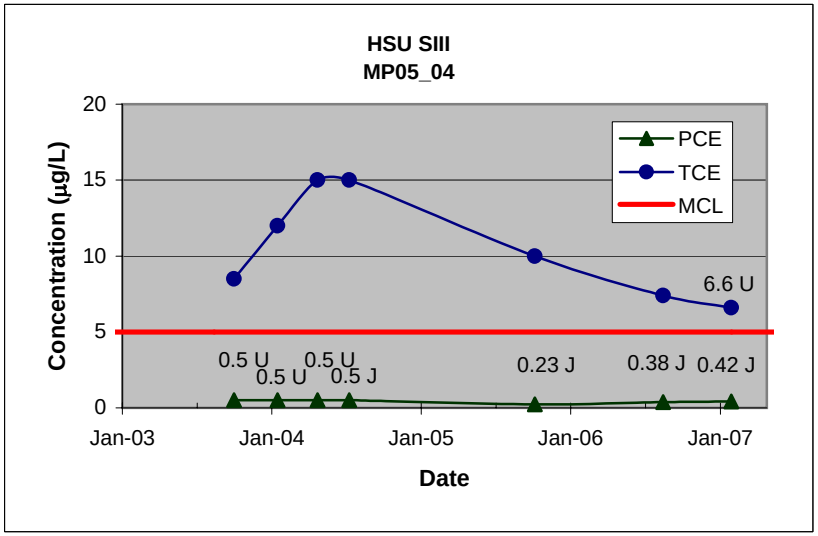


MCL= Maximum Contaminant Level

HSU SIII
PCE and TCE Time Series Plots

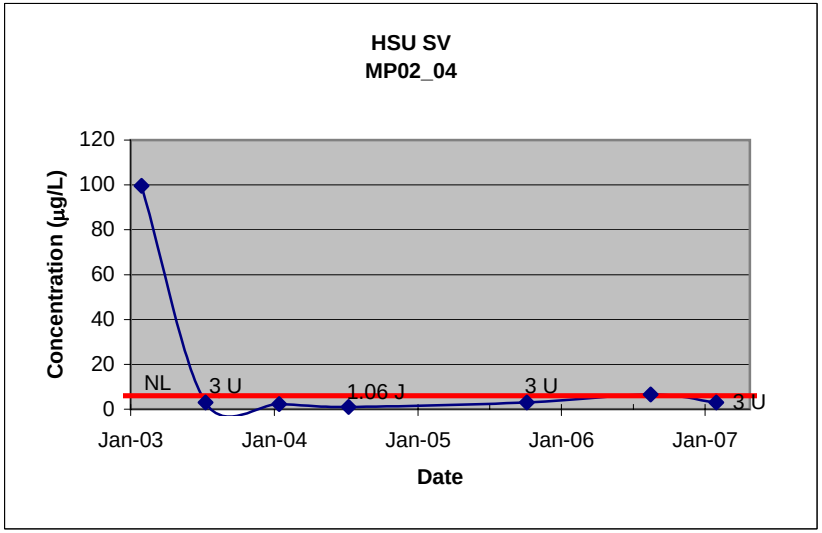


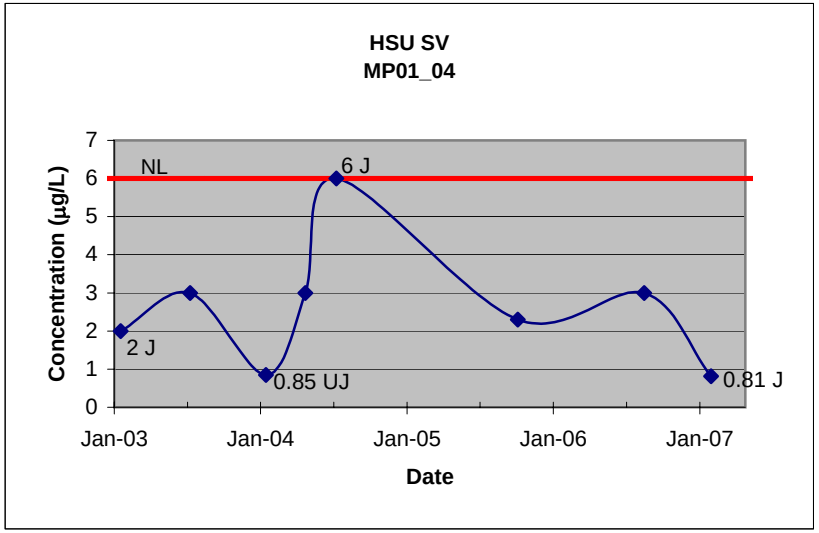


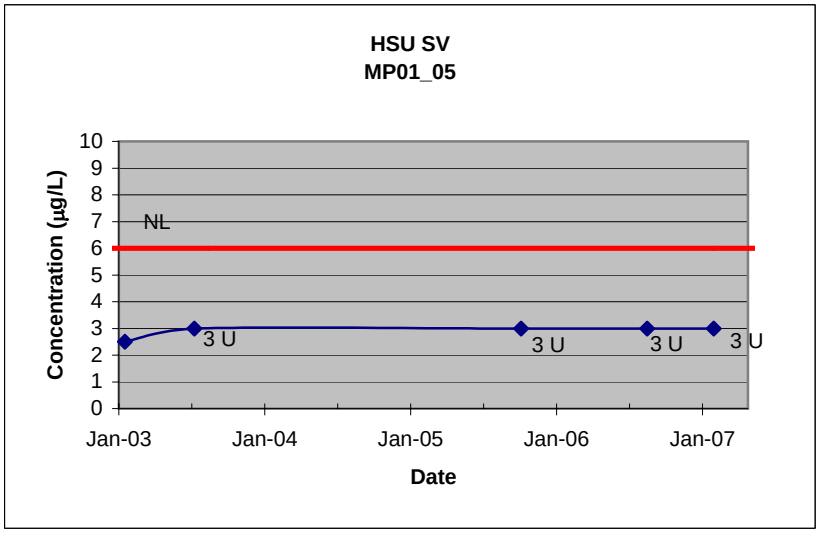


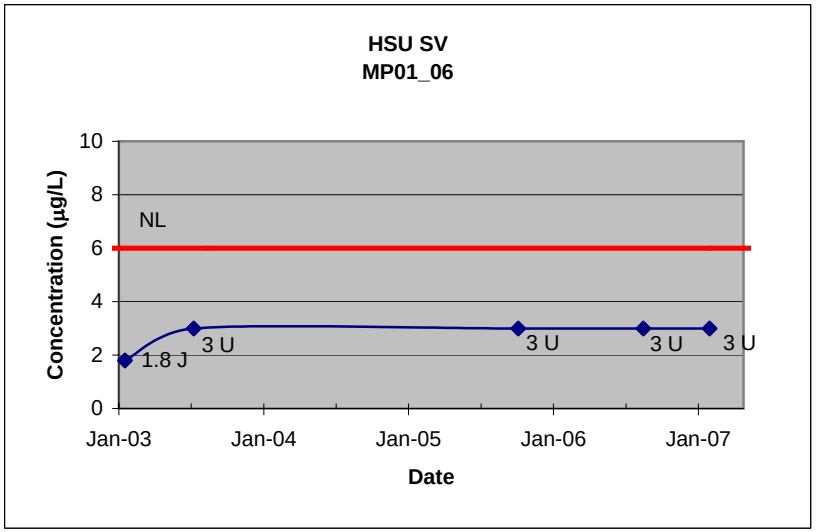
MCL= Maximum Contaminant Level

HSU SV
Perchlorate Time Series Plots



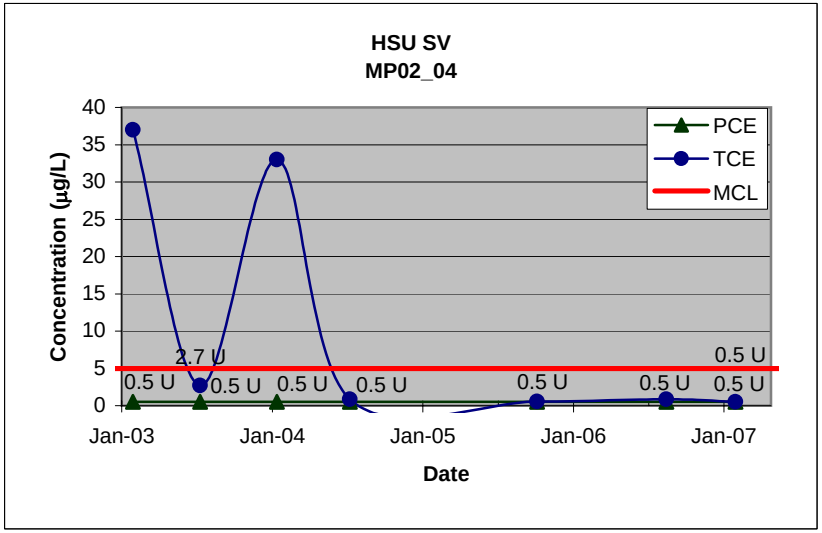


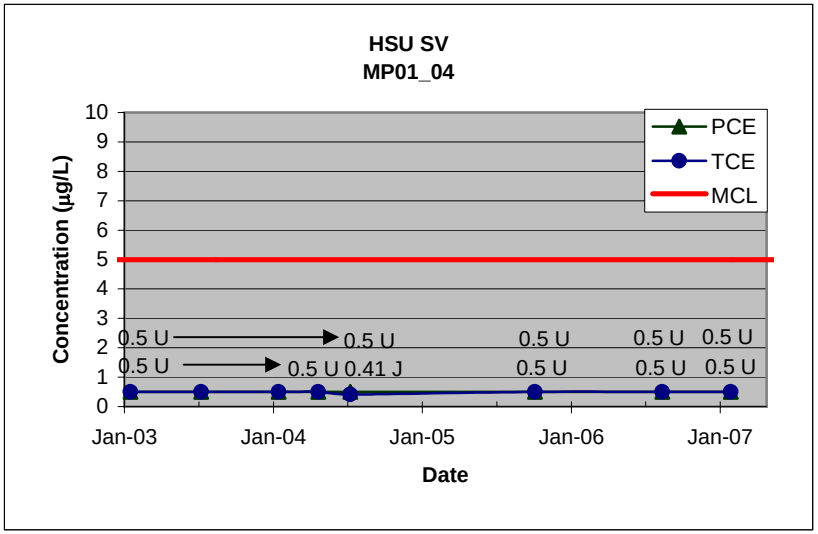


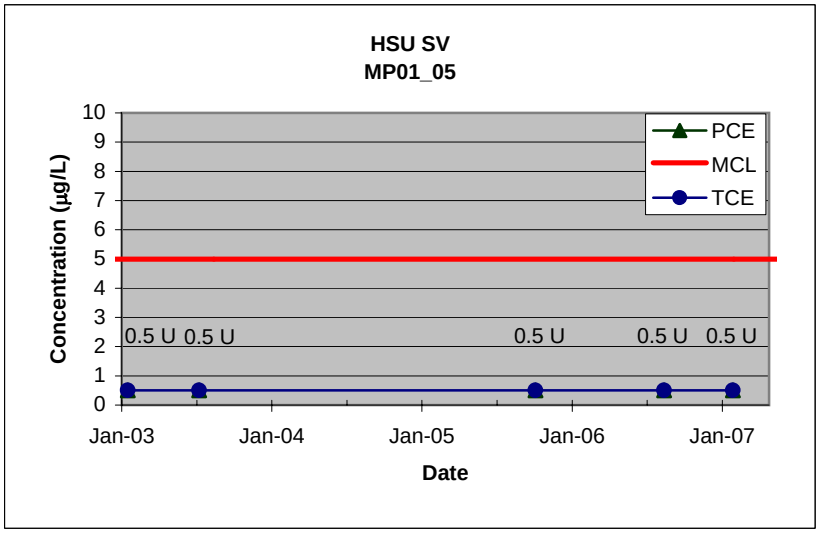


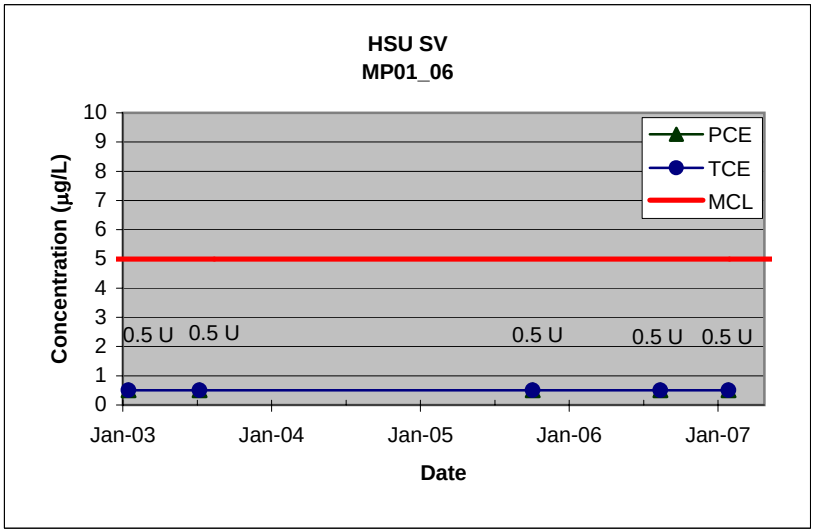
NL = Notification Level (for toxicity)

HSU SV
Perchlorate Time Series Plots



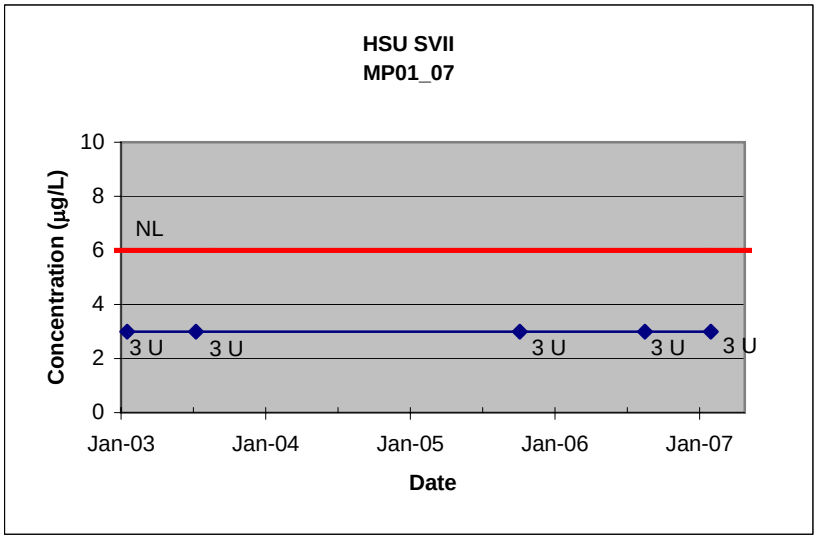


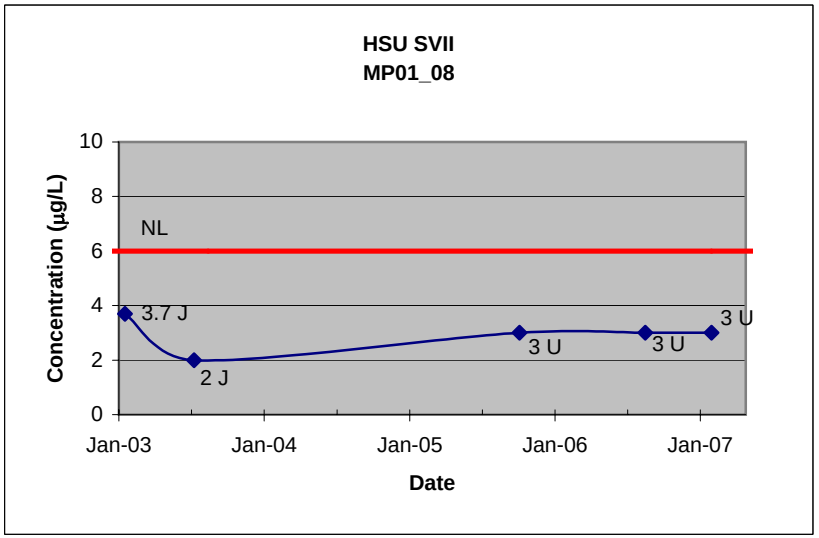


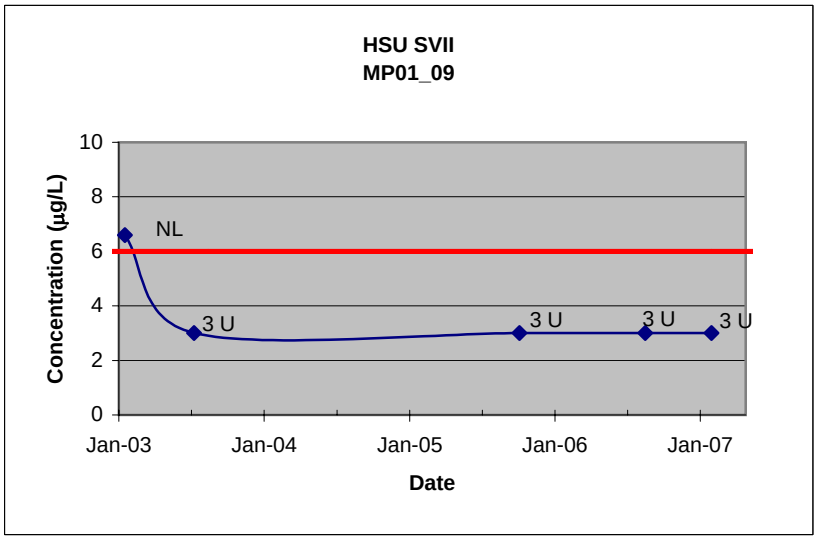


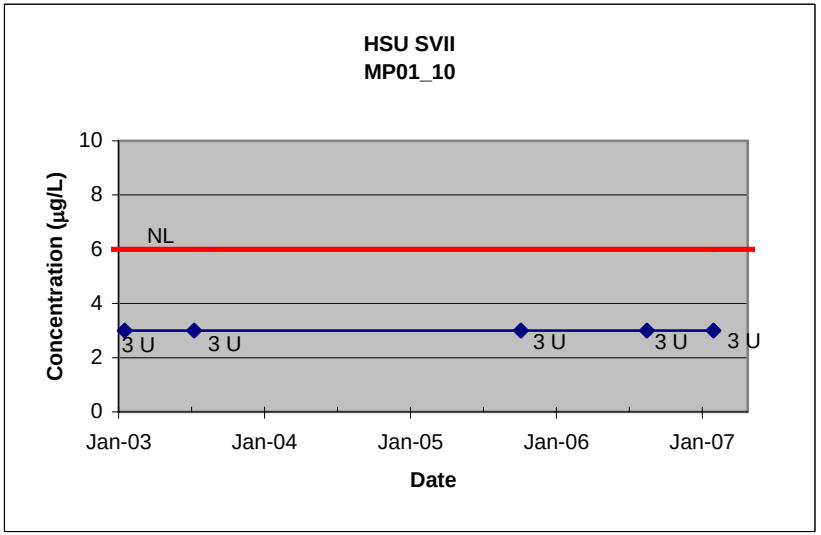
MCL= Maximum Contaminant Level

HSU SVII
Perchlorate Time Series Plots



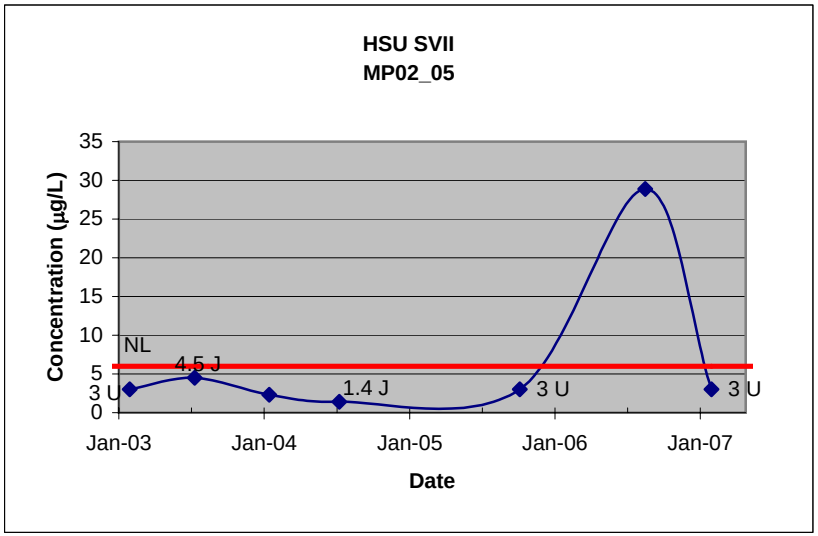


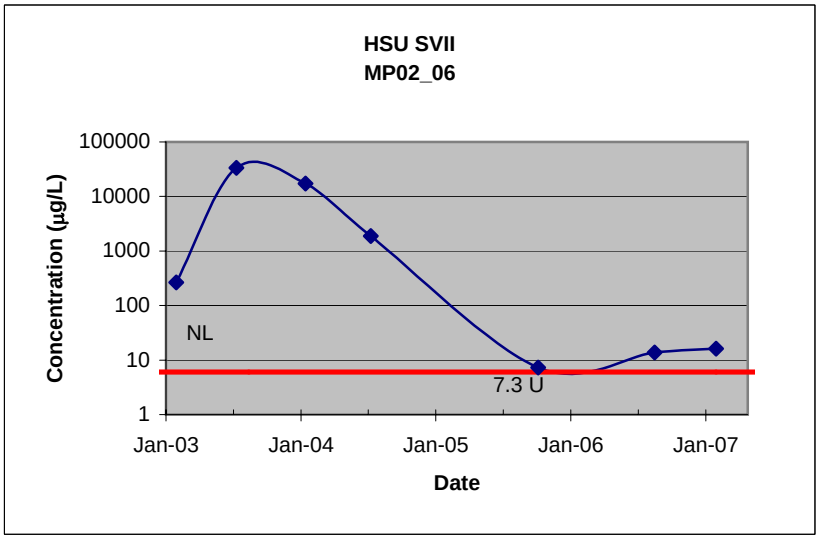


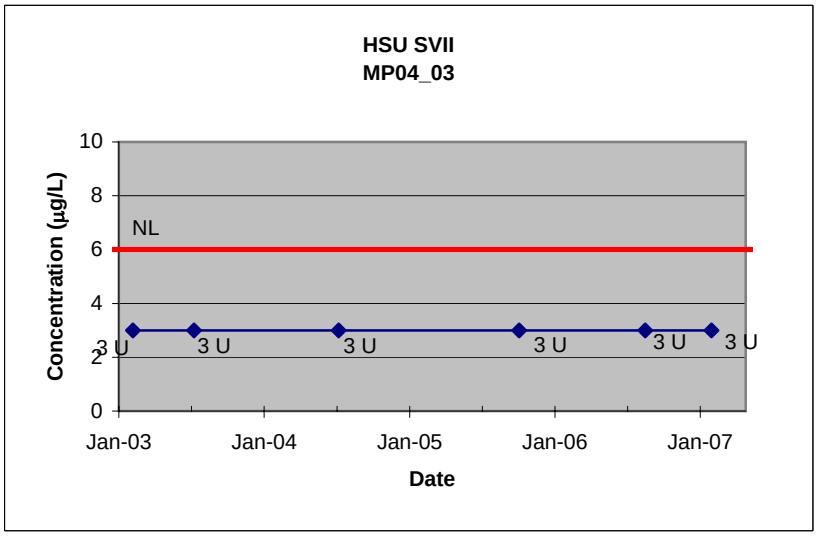


NL = Notification Level (for toxicity)

HSU SVII
Perchlorate Time Series Plots

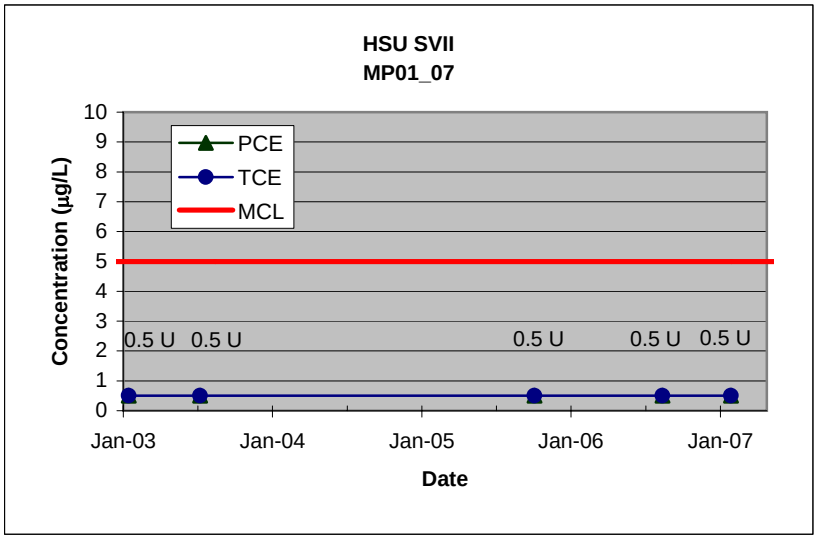


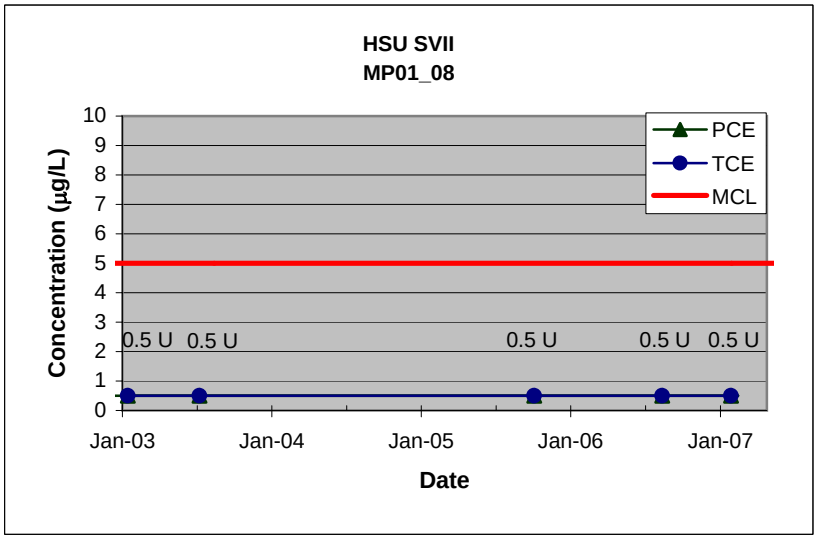


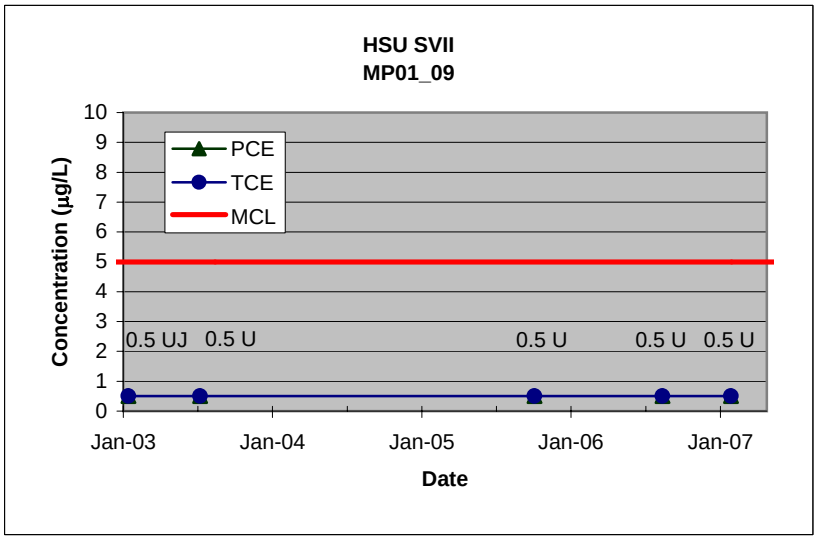


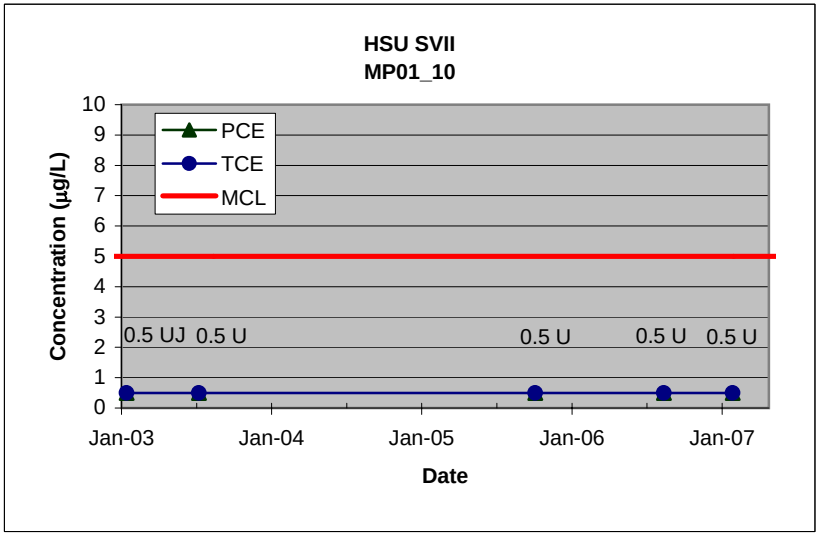
NL = Notification Level (for toxicity)

HSU SVII
PCE and TCE Time Series Plots



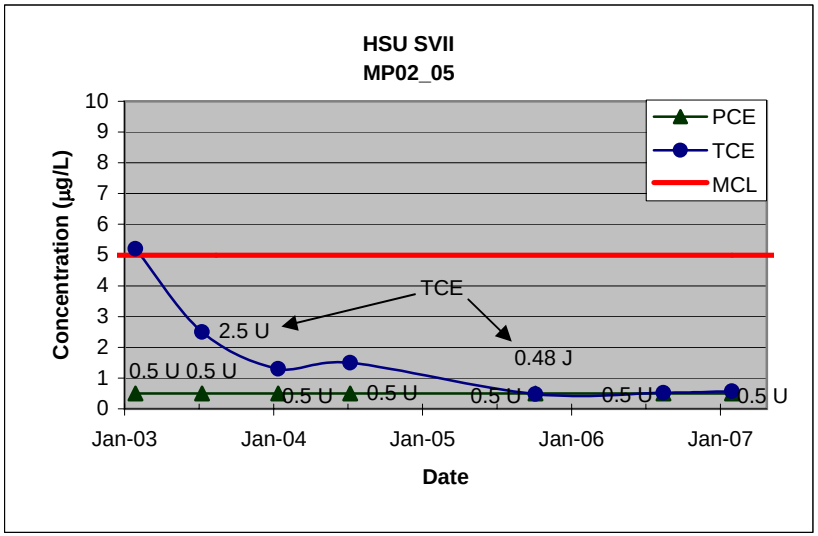


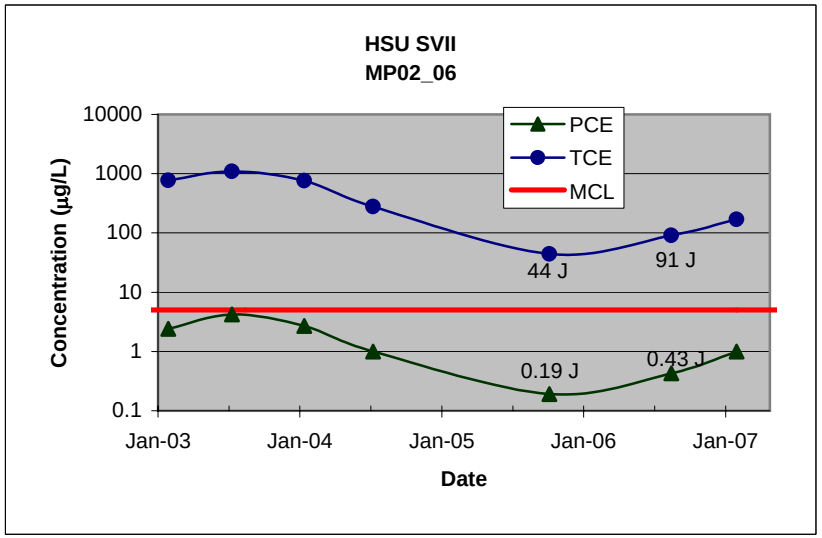


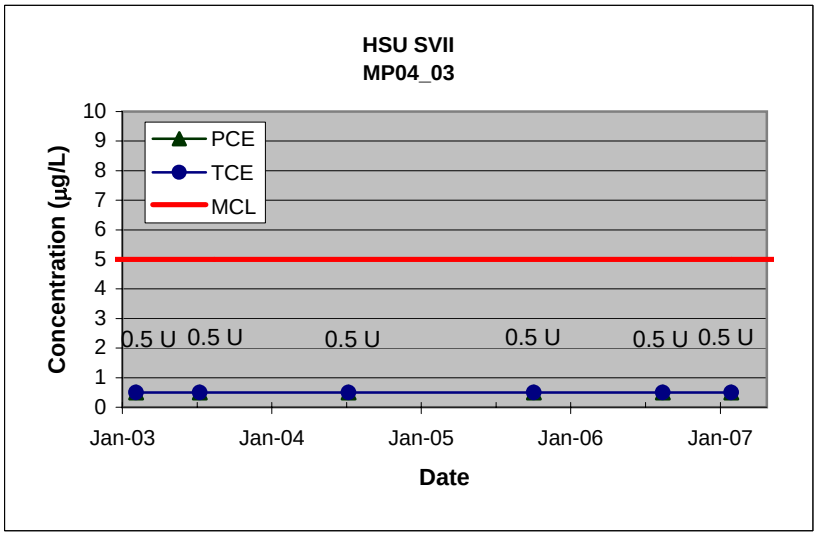


MCL= Maximum Contaminant Level

HSU SVII
PCE and TCE Time Series Plots







MCL= Maximum Contaminant Level