

APPENDIX I

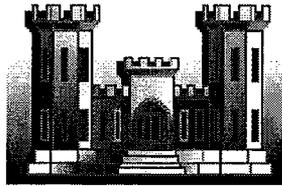
Groundwater Monitoring Report August 2002

Source: SOTA, 2002 (tables and figures only)

GROUNDWATER MONITORING REPORT

AUGUST 2002

POL HILL, HAMILTON ARMY AIRFIELD NOVATO, CALIFORNIA



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EXECUTIVE SUMMARY

This report summarizes the results of the August 2002 groundwater sampling event that was completed as part of the groundwater monitoring program at the Petroleum, Oil, and Lubricant (POL) Hill site, Hamilton Army Airfield (HAAF), Novato, California. The HAAF groundwater monitoring program is being conducted under contract with the United States Army Corps of Engineers (USACE), Sacramento District. The purpose of the groundwater monitoring program at the POL Hill site is to confirm the natural attenuation process of known petroleum hydrocarbon contamination in groundwater.

During this event, groundwater samples were collected from nine monitoring wells, and analyzed for total petroleum hydrocarbons (TPH) both as extractable and as purgeable. The samples were additionally analyzed for methane, ferrous iron, sulfate, total alkalinity as indicated by calcium carbonate, oxidation/reduction potential (Eh), dissolved oxygen (DO), pH, and turbidity, and temperature were measured in the field.

The August 2002 groundwater sampling data indicate that TPH concentrations exceeded the site-specific General Services Administration Phase I Residential Cleanup Goals (RCG) of 1,200 µg/L for diesel and 600 µg/L for gasoline in only one well (PL-MW-101). Extractable TPH was detected in three wells (PL-MW-101, PL-MW-104, and MW-POLA-121), and purgeable TPH was detected in two wells (PL-MW-101 and PL-MW-104). Concentrations of both extractable and purgeable TPH were lower than levels detected in the previous events in February 2002 and September 2001.

Groundwater flow near the site of former AST-2 was generally directed towards the north at a relatively steep hydraulic gradient of approximately 0.16 feet/foot. In the northern portion of the site, groundwater flow was apparently directed towards the north but at a much shallower gradient (approximately 0.04 feet/foot). Compared to measurements made in September 2001, static water levels dropped in all nine wells, from 0.68 to 10.32 feet, which is typical during the dry season.

The decrease of extractable and purgeable TPH concentrations in groundwater over the period from September 2001 to August 2002 is correlates directly with the decrease in groundwater elevations at the site and the indicators of natural attenuation. These results suggest that a decrease of residual soil contamination dissolution near the capillary fringe resulting from the drop in the water table and/or the degrading of dissolved TPH in groundwater through natural attenuation processes may be occurring during the dry season. Based on the recent results, the TPH plume appears relatively stable in the area of the former aboveground storage tank (AST-2) and geochemical parameters indicate that natural attenuation is occurring at the site.

5.0 CONCLUSIONS

The following conclusions are based upon interpretation of the analytical data and field measurements collected during the August 2002 groundwater monitoring event:

- Groundwater flow near former AST-2 was apparently directed towards the north at a relatively steep hydraulic gradient of approximately 0.16 feet/foot. In the northern portion of the site, groundwater flow was estimated to flow towards the north at a much shallower gradient (approximately 0.037 feet/foot). Compared to measurements made in February 2002, static water levels, in all nine wells dropped from 0.68 (PL-MW-101) to 10.32 (MW-POLA-121) feet. This general drop in the water table reflects the result of lack of local precipitation during the dry season.
- The TPH plume near former AST-2 is relatively stable. TPH extractable and purgeable concentrations exceeded the GSA Phase I Residential Cleanup Goal of 1,200 $\mu\text{g/L}$ for diesel and 600 $\mu\text{g/L}$ for gasoline in only one well (PL-MW-101). Extractable TPH was detected in three wells (PL-MW-101, PL-MW-104, and MW-POLA-121). Purgeable TPH was detected in two wells (PL-MW-101 and PL-MW-104). Concentrations of extractable and purgeable TPH in all nine wells were lower than the detections in the previous events. The decrease of extractable and purgeable TPH concentrations in groundwater correlates directly with the decrease in groundwater elevations at the site and the indicators of natural attenuation over the period from September 2001 to August 2002.
- Currently, geochemical parameters indicate that natural attenuation, including the intrinsic biodegradation processes (anaerobic/aerobic), are occurring at the site. The anaerobic indicator of methane and aerobic indicators of DO and Eh in groundwater support that biodegradation processes are occurring at the site, although the reduction rate of the Total Petroleum Hydrocarbons is continues to be slow.
- Historical groundwater geochemical parameters reported data from 1997 to 1999 also indicate that natural attenuation is occurring at the site, including intrinsic biodegradation processes were occurring at the site.

The results of the POL Hill Monitoring Program in August 2002 sampling event were generally consistent with September 2001 and February 2002 groundwater monitoring data (SOTA, 2001b, 2002) as well as historical groundwater monitoring data (IT, 1999).

Table 1
Monitoring Well Construction Details
 POL Hill, Hamilton Army Airfield, Novato, California

Well No.	Date Completed	Total Drilled Depth (ft. bgs)	Total Well Depth (ft. bgs)	Borehole Diameter (in.)	Casing Diameter (in.)	Screen Interval (ft.)	Filter Pack Interval (ft.)	Bentonite Seal Interval (ft.)	Grout Seal Interval (ft.)	PVC Stickup (ft.)	Steel Monument Stickup (ft.)
PL-MW-101	01/31/1991	53.0	49.8	8	4	29.8-49.3	24.8-53.0	19.8-24.8	0-19.8	2.3	2.5
PL-MW-103	01/31/1991	27.0	27.0	8	4	11.5-26.5	8.5-27.0	3.5-8.5	0-3.5	2.5	2.7
PL-MW-104	01/31/1991	42.8	42.8	8	4	27.8-42.3	22.8-42.8	17.8-22.8	0-17.8	2.45	2.7
PL-MW-106	01/23/1991	18.0	18.0	8	4	7.8-17.3	5.8-18.0	3.8-5.8	0-3.8	2.2	2.4
PL-MW-107	01/23/1991	17.3	17.3	10	4	7.2-16.7	4.3-17.3	2.1-4.3	0-2.1	2.55	2.75
PL-MW-114	08/18/1992	27.8	27.5	8	4	12.0-27.0	7.0-27.8	5.0-7.0	0-5.0	2.23	2.5
PL-MW-115	08/21/1992 *	28.0	28.0	8	4	17.5-27.5	12.5-28.0	7.0-12.5	0-7.0	1.84	2.1
	7/1/2000 **	33.1	33.1	8	4	22.6-32.6	17.6-33.1	12.1-17.6	0-12.1	-0.47 #	NA
PL-MW-116	03/02/1994	35.0	22.5	8.5	4	11.3-21.3	9.0-22.5	7.2-9.0	0-7.2	2.15	NA
MW-POLA-121	01/31/1997	33.6	32.67	8.63	4	7.0-32.0	6.0-33.6	3.0-6.0	0-3.0	2.4	3.4

Note:

All data are extracted from POL Hill Monitoring Well Installation Data Records.

*: Well construction details for PL-MW-115 were obtained from the original well installation specification.

was included in a residential reuse plan and the ground level of the well was elevated for the construction of a roadway which required adjusting some of the data pertaining to well. The adjustments were made only at the top of the casings from an addition of fill to what was the existing ground level. Therefore, the new top of casing as it is today is 26.94 ft versus the old top of casing of 24.41 ft prior to the reuse.

#: The PVC casing is now 0.47 ft below ground surface.

NA - Not Available

Table 2
Monitoring Well Water Level Measurements
 POL Hill, Hamilton Army Airfield, Novato, California

Well No.	Date Measured	Casing Elevation ^a	Depth to Groundwater	Free product Thickness	Groundwater Elevation	Change in Elevation
		(Feet, MSL)	(Feet, MSL)	(Feet, MSL)	(Feet, MSL)	(Feet)
PL-MW-101	08/01/2002	49.46	25.14	0.0	24.32	-0.68
	02/25/2002		24.46	0.0	25.00	1.05
	09/26/2001		25.51	0.0	23.95	-1.21
	03/27/1997		24.30	0.0	25.16	-0.21
	02/28/1997		24.09	0.0	25.37	NA
PL-MW-103	08/01/2002	17.35	5.29	0.0	12.06	-1.58
	02/25/2002		3.71	0.0	13.64	1.20
	09/26/2001		4.91	0.0	12.44	2.11
	03/27/1997		7.02	0.0	10.33	-0.94
	02/27/1997		6.08	0.0	11.27	NA
PL-MW-104	08/01/2002	27.28	20.46	0.0	6.82	-3.93
	02/25/2002		16.53	0.0	10.75	4.98
	09/26/2001		21.51	0.0	5.77	-2.11
	03/26/1997		19.40	0.0	7.88	-0.20
	02/28/1997		19.20	0.0	8.08	NA
PL-MW-106	08/01/2002	6.56	6.90	0.0	-0.34	-3.58
	02/25/2002		3.32	0.0	3.24	4.53
	09/26/2001		7.85	0.0	-1.29	-3.40
	03/25/1997		4.45	0.0	2.11	-0.45
	02/26/1997		4.00	0.0	2.56	NA
PL-MW-107	08/01/2002	7.11	7.99	0.0	-0.88	-4.08
	02/25/2002		3.91	0.0	3.20	5.30
	09/26/2001		9.21	0.0	-2.10	-4.01
	03/25/1997		5.20	0.0	1.91	-0.64
	02/26/1997		4.56	0.0	2.55	NA
PL-MW-114	08/01/2002	22.86	3.76	0.0	19.10	-0.26
	02/25/2002		3.50	0.0	19.36	0.47
	09/26/2001		3.97	0.0	18.89	2.13
	03/25/1997		6.10	0.0	16.76	-1.43
	02/28/1997		4.67	0.0	18.19	NA
PL-MW-115	08/01/2002	26.94	7.95	0.0	18.99	-0.47
	02/25/2002		7.48	0.0	19.46	0.42
	09/26/2001		7.90	0.0	19.04	-1.42
	03/26/1997		6.48	0.0	20.46	-0.20
	02/28/1997		6.28	0.0	20.66	NA
PL-MW-116	08/01/2002	18.00	15.97	0.0	2.03	-4.80
	02/25/2002		11.17	0.0	6.83	5.95
	09/26/2001		17.12	0.0	0.88	-2.89
	03/26/1997		14.23	0.0	3.77	-0.97
	02/27/1997		13.26	0.0	4.74	NA
MW-POLA-121	08/01/2002	51.66	19.55	0.0	32.11	-10.32
	02/25/2002		9.23	0.0	42.43	12.05
	09/26/2001		21.28	0.0	30.38	-1.87
	03/26/1997		19.41	0.0	32.25	-5.45
	02/28/1997		13.96	0.0	37.70	NA

Note:

Historical data are extracted from IT report (IT, 1999)

MSL - Relative to Mean Sea Level

NA - Not Available

^a: Top of Casing elevation obtained from 2001 topographic survey. TOC is used as the reference point for groundwater elevation

Table 3
Groundwater Organic and Geochemical Parameters Summary
 (August 1 - 2, 2002)
 POL Hill, Hamilton Army Airfield, Novato, California

Well	TPH Extractable (EPA 8015M) (ug/L)	TPH Purgeable (EPA 8015M) (ug/L)	Dissolved Oxygen (EPA 360.1) (mg/L)	Redox (ASTM 1498) (mv)	Ferrous Iron (SM 3500) (mg/L)	Methane (RSK 175) (mg/L)	Sulfate (EPA 300.0) (mg/L)	Total Alkalinity as CaCO ₃ (EPA 310.1) (mg/L)	pH (EPA 150.1) (pH Unit)	Turbidity (EPA 180.1) (NTU)	Field Temperature (°C)
PL-MW-101	2700	2600	6.6	450	ND (<0.10)	0.11	69	490J	7.39	4.5	18.5
PL-MW-103	ND (<250)	ND (<50)	3.7	330	ND (<0.10)	ND (<0.01)	110	240J	6.95	12.0	18.8
QC-1 a	ND (<250)	ND (<50)	3.9	480	ND (<0.10)	ND (<0.01)	110	250J	6.99	9.1	18.8
PL-MW-104	490	78	7.2	520	ND (<0.10)	0.050	9.1	500J	7.16	4.8	18.0
PL-MW-106	ND (<250)	ND (<50)	7.5	500	ND (<0.10)	ND (<0.01)	100	470J	7.36	6.9	19.2
PL-MW-107	ND (<250)	ND (<50)	7.1	470	ND (<0.10)	ND (<0.01)	210	720J	8.25	37.0	19.2
PL-MW-114	ND (<250)	ND (<50)	8.0	520	ND (<0.10)	ND (<0.01)	95	270J	7.06	5.1	21.2
PL-MW-115	ND (<250)	ND (<50)	4.2	530	ND (<0.10)	ND (<0.01)	140	270J	7.29	ND (<1.0)	23.5
PL-MW-116	ND (<250)	ND (<50)	6.8	540	ND (<0.10)	ND (<0.01)	32	160J	7.16	12.0	19.2
MW-POLA-121	360	ND (<50)	6.9	540	ND (<0.10)	ND (<0.01)	20	240J	7.20	110.0	18.2

Notes:

ug/L - Micrograms per liter

mg/L - Milligrams per liter

mv - Millivolts

°C - Degrees Celsius

NTU - Nephelometric Turbidity Units

ND - Not detected above practical quantitation limit (practical quantitation limit is in parenthesis)

J Estimated

^a Field duplicate for PL-MW-116

Table 4
Historical Groundwater Organic Chemical Data Summary
 POL Hill, Hamilton Army Airfield, Novato, California

Well	Monitoring Event Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Total TPH ^a (µg/L)	TPH-P ^b (µg/L)	TPH-E ^c (µg/L)
PL-MW-101	Jul-92	6	10	110	290	(d)	(d)	(d)
	Aug-92	6	4.3	94	260	(d)	(d)	(d)
	Mar-94	<5	<5	129	405	5350	(e)	5350
	Feb-97	<10	<10	78	140	11400	4800	6600
	Mar-97	<1	<1	77	120	8500	4600	3900
	Apr-98	<1	<1	46	52	4800	2700	2100
	Jul-98	<1	<1	42	34	3900	2300	1600
	Oct-98	<1	<1	39	47	7600	2900	4700
	Jan-99	NA	NA	NA	NA	9700	4400	5300
	Sep-01	NA	NA	NA	NA	6200	3300	2900
	Feb-02	NA	NA	NA	NA	16000	6200	9800
Aug-02	NA	NA	NA	NA	5300	2600	2700	
PL-MW-103	Jul-92	<1	<1.5	<1.4	<1.4	(d)	(d)	(d)
	Aug-92	<1	<1.5	<1.4	<1.4	(d)	(d)	(d)
	Mar-94	<0.5	<0.5	<0.5	<0.5	417	(e)	417
	Feb-97	<1	<1	<1	<1	110	<50	110
	Mar-97	<1	<1	<1	<1	<50	<50	<50
	Apr-98	<1	<1	<1	<1	200	(e)	200
	Jul-98	<1	<1	<1	<1	76	76	<50
	Oct-98	<1	<1	<1	<1	<50	<50	<50
	Jan-99	NA	NA	NA	NA	<50	<50	<50
	Sep-01	NA	NA	NA	NA	320	<50	320
	Feb-02	NA	NA	NA	NA	570	<50	570
Aug-02	NA	NA	NA	NA	<250	<50	<250	
PL-MW-104	Jul-92	<1	<1.5	<1.4	<1.4	(d)	(d)	(d)
	Aug-92	<1	<1.5	<1.4	<1.4	(d)	(d)	(d)
	Mar-94	<0.5	<0.5	<0.5	<0.5	464	(e)	464
	Feb-97	<1	<1	<1	<1	400	130	270
	Mar-97	<1	<1	<1	<1	410	180	230
	Apr-98	<1	<1	<1	<1	287	67	220
	Jul-98	<1	<1	<1	<1	<50	<50	<50
	Oct-98	<1	<1	<1	<1	263	83	180
	Jan-99	NA	NA	NA	NA	370	200	170
	Sep-01	NA	NA	NA	NA	655	95	560
	Feb-02	NA	NA	NA	NA	890	110	780
Aug-02	NA	NA	NA	NA	568	78	490	
PL-MW-106	Jul-92	NA	NA	NA	NA	NA	NA	NA
	Aug-92	NA	NA	NA	NA	NA	NA	NA
	Mar-94	NA	NA	NA	NA	NA	NA	NA
	Feb-97	<1	<1	<1	<1	<50	<50	<50
	Mar-97	<1	<1	<1	<1	<50	<50	<50
	Apr-98	<1	<1	<1	<1	<50	<50	<50

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 POL Hill, Hamilton Army Airfield, Novato, California

Well	Monitoring Event Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Total TPH ^a (µg/L)	TPH-P ^b (µg/L)	TPH-E ^c (µg/L)
PL-MW-106	Jul-98	NA	NA	NA	NA	NA	NA	NA
	Sep-98	<1	<1	<1	<1	<50	<50	<50
	Jan-99	NA	NA	NA	NA	NA	NA	NA
	Sep-01	NA	NA	NA	NA	<250	<50	<250
	Feb-02	NA	NA	NA	NA	<250	<50	<250
	Aug-02	NA	NA	NA	NA	<250	<50	<250
PL-MW-107	Jul-92	NA	NA	NA	NA	NA	NA	NA
	Aug-92	NA	NA	NA	NA	NA	NA	NA
	Mar-94	NA	NA	NA	NA	NA	NA	NA
	Feb-97	<1	<1	<1	<1	<50	<50	<50
	Mar-97	<1	<1	<1	<1	<50	<50	<50
	Apr-98	<1	<1	<1	<1	<50	<50	<50
	Jul-98	<1	<1	<1	<1	<50	<50	<50
	Sep-98	<1	<1	<1	<1	<50	<50	<50
	Jan-99	NA	NA	NA	NA	NA	NA	NA
	Sep-01	NA	NA	NA	NA	<250	<50	<250
	Feb-02	NA	NA	NA	NA	<250	<50	<250
Aug-02	NA	NA	NA	NA	<250	<50	<250	
PL-MW-114	Jul-92	<1.1	<1.5	<1.4	<1.4	(d)	(d)	(d)
	Aug-92	<1.1	<1.5	<1.4	<1.4	(d)	(d)	(d)
	Mar-94	<0.5	<0.5	<0.5	<0.5	355	(e)	355
	Feb-97	<1	<1	<1	<1	<50	<50	<50
	Mar-97	<1	<1	<1	<1	<50	<50	<50
	Apr-98	<1	<1	<1	<1	<50	<50	<50
	Jul-98	<1	<1	<1	<1	<50	<50	<50
	Oct-98	<1	<1	<1	<1	<50	<50	<50
	Jan-99	NA	NA	NA	NA	<50	<50	<50
	Sep-01	NA	NA	NA	NA	<250	<50	<250
	Feb-02	NA	NA	NA	NA	570	<50	570
Aug-02	NA	NA	NA	NA	<250	<50	<250	
PL-MW-115	Jul-92	<1.1	<1.5	<1.4	<1.4	(d)	(d)	(d)
	Aug-92	<1.1	<1.5	<1.4	<1.4	(d)	(d)	(d)
	Mar-94	<0.5	<0.5	<0.5	<0.5	803	(e)	803
	Feb-97	<1	<1	<1	<1	140	<50	140
	Mar-97	<1	<1	<1	<1	<50	<50	<50
	Apr-98	<1	<1	<1	<1	100	<50	100
	Jul-98	<1	<1	<1	<1	<50	<50	<50
	Oct-98	<1	<1	<1	<1	<50	<50	<50
	Jan-99	NA	NA	NA	NA	<50	<50	<50
	Sep-01	NA	NA	NA	NA	<250	<50	<250
	Feb-02	NA	NA	NA	NA	250	<50	250
Aug-02	NA	NA	NA	NA	<250	<50	<250	

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 POL Hill, Hamilton Army Airfield, Novato, California

Well	Monitoring Event Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Total TPH ^a (µg/L)	TPH-P ^b (µg/L)	TPH-E ^c (µg/L)
PL-MW-116	Jul-92	NA	NA	NA	NA	NA	NA	NA
	Aug-92	NA	NA	NA	NA	NA	NA	NA
	Mar-94	NA	NA	NA	NA	NA	NA	NA
	Feb-97	<1	<1	<1	<1	<50	<50	<50
	Mar-97	<1	<1	<1	<1	<50	<50	<50
	Apr-98	<1	<1	<1	<1	<50	<50	<50
	Jul-98	NA	NA	NA	NA	NA	NA	NA
	Sep-98	<1	<1	<1	<1	<50	<50	<50
	Jan-99	NA	NA	NA	NA	<50	<50	<50
	Sep-01	NA	NA	NA	NA	<250	<50	<250
	Feb-02	NA	NA	NA	NA	330 (f)	<50	330 (f)
Aug-02	NA	NA	NA	NA	<250	<50	<250	
MW-POLA-121	Jul-92	NS (g)	NS	NS	NS	NS	NS	NS
	Aug-92	NS	NS	NS	NS	NS	NS	NS
	Mar-94	NS	NS	NS	NS	NS	NS	NS
	Feb-97	2.7	<1	7.3	7.7	1060	480	580
	Mar-97	4.6	<1	10	13	1360	630	730
	Apr-98	<1	<1	<1	<1	100	<50	100
	Jul-98	<1	<1	<1	<1	<50	<50	<50
	Oct-98	<1	<1	<1	<1	<50	<50	<50
	Jan-99	NA	NA	NA	NA	54	54	<50
	Sep-01	NA	NA	NA	NA	640	<50	640
	Feb-02	NA	NA	NA	NA	530	<50	530
	Aug-02	NA	NA	NA	NA	360	<50	360

Notes:

Historical data are extracted from IT report (IT, 1999)
 All detected analytes are shown in bold

NA - Not analyzed

NS - Not sampled

^a Total petroleum hydrocarbons (extractable and purgeable). The extractable and purgeable hydrocarbons results were added together and followed the IT's method to provide an estimate of the residual hydrocarbon contamination.

^b Total petroleum hydrocarbons measured as purgeable

^c Total petroleum hydrocarbons measured as extractable

(d) Total petroleum hydrocarbons were quantified using EPA Method 418.1. These results were not considered equivalent to the EPA Method 8015M results obtained from the March 1994 and later monitoring events. The data were not available in IT report

(e) no associated result

(f) Result from duplicate sample

(g) not sampled, well was not installed until January 1997

Table 5
Historical Groundwater Geochemical Parameters Summary
 POL Hill, Hamilton Army Airfield, Novato, California
 (March/April 1998 through August 2002)

Well NO.	Date Sampled	Dissolved Oxygen (mg/L)	Redox (mv)	Ferrous Iron (mg/L)	Methane (mg/L)	Sulfate (mg/L)	Total Sulfide (mg/L)	Nitrate (mg/L)	Total Alkalinity as CaCO ₃ (mg/L)	pH	Turbidity (NTU)	Temperature (°C)
PL-MW-101	March/April 1998	0.50	-225.6	0.07	2.8	53	ND (<0.05)	ND (<0.05)	516	6.96	NA	19.4
	Sept/Oct 1998	0.82	-228.8	0.22	3.2	53	0.36	ND (<0.05)	544	6.94	NA	21.2
	September 2001	3.10	550	ND (<0.10)	2.8 ^a /1.1J ^b	70	NA	NA	470	7.34	12.0	17.5
	February 2002	5.50	330	ND (<0.10)	1.0	75	NA	NA	490	7.42	15.0	18.0
	August 2002	6.60	450	ND (<0.10)	0.1	69	NA	NA	490J	7.39	4.5	18.5
PL-MW-103	March/April 1998	0.70	121.1	ND (<0.05)	0.0039	69	ND (<0.05)	0.24	205	6.87	NA	16.8
	Sept/Oct 1998	2.85	79.9	0.29	0.010	109	0.01	ND (<0.05)	240	6.94	NA	22.2
	September 2001	1.40	540	ND (<0.10)	ND (<1.0)/ND (<0.005)	120	NA	NA	250	6.92	3.0	19.8
	February 2002	1.70	230	ND (<0.10)	ND (<0.01)	100	NA	NA	210	7.24	17.0	15.5
	August 2002	3.70	330	ND (<0.10)	ND (<0.01)	110	NA	NA	240J	7	12	18.8
PL-MW-104	March/April 1998	0.60	24.6	0.01	0.04	10	ND (<0.05)	ND	509	6.78	NA	18.7
	Sept/Oct 1998	1.94	-50.2	0.01	0.15	8	ND (<0.05)	ND (<0.05)	556	6.77	NA	25.4
	September 2001	3.80	550	ND (<0.10)	ND (<1.0)/ND (<0.005)	110	NA	NA	470	7.46	11.0	17.9
	February 2002	6.40	230	ND (<0.10)	0.069	8.2	NA	NA	510	7.28	5.7	16.8
	August 2002	7.20	520	ND (<0.10)	0.05	9.1	NA	NA	500J	7.16	4.8	18
PL-MW-106	March/April 1998	5.20	217.7	ND (<0.05)	0.0028	105	ND (<0.05)	0.09	493	7.30	NA	16.6
	Sept/Oct 1998	2.12	131.3	ND (<0.05)	0.0046	107	0.03	0.088	514	7.24	NA	25.5
	September 2001	3.70	560	ND (<0.10)	ND (<1.0)/ND (<0.005)	9	NA	NA	510	7.15	5.2	18.5
	February 2002	6.70	360	ND (<0.10)	ND (<0.01)	110	NA	NA	480	7.53	14.0	14.3
	August 2002	7.50	500	ND (<0.10)	ND (<0.01)	100	NA	NA	470J	7.36	6.9	19.2
PL-MW-107	March/April 1998	6.50	174.0	0.01	ND (<0.002)	261	ND (<0.05)	0.1	749	8.05	NA	19.7
	Sept/Oct 1998	7.99	285.2	ND (<0.05)	ND (<0.002)	210	0.12	0.06	756	8.12	NA	22.5
	September 2001	3.50	510	ND (<0.10)	ND (<1.0)/ND (<0.005)	190	NA	NA	720	8.46	150.0	20.4
	February 2002	8.10	330	ND (<0.10)	ND (<0.01)	260	NA	NA	720	8.3	18.0	15.9
	August 2002	7.10	470	ND (<0.10)	ND (<0.01)	210	NA	NA	720J	8.25	37	19.2
PL-MW-114	March/April 1998	1.40	179.0	0.01	ND (<0.002)	49	ND (<0.05)	0.06	176	7.40	NA	17.7
	Sept/Oct 1998	1.52	225.6	ND (<0.05)	0.13	78	ND (<0.05)	0.055	227	7.06	NA	20.7
	September 2001	3.60	530	ND (<0.10)	ND (<1.0)/ND (<0.005)	120	NA	NA	290	7.12	8.7	19.8
	February 2002	5.10	390	ND (<0.10)	ND (<0.01)	150	NA	NA	240	7.17	9.0	14.9
	August 2002	8.00	520	ND (<0.10)	ND (<0.01)	95	NA	NA	270J	7.06	5.1	21.2

Table 5
Historical Groundwater Geochemical Parameters Summary
 POL Hill, Hamilton Army Airfield, Novato, California
 (March/April 1998 through August 2002)

Well NO.	Date Sampled	Dissolved Oxygen (mg/L)	Redox (mv)	Ferrous Iron (mg/L)	Methane (mg/L)	Sulfate (mg/L)	Total Sulfide (mg/L)	Nitrate (mg/L)	Total Alkalinity as CaCO ₃ (mg/L)	pH	Turbidity (NTU)	Temperature (°C)
PL-MW-115	March/April 1998	1.00	144.5	0.02	0.058/0.062	132/130	ND (<0.05)	ND (<0.05)/ND (<0.05)	300/301	7.35	NA	17.0
	Sept/Oct 1998	2.10	10.6	ND (<0.05)	0.052/0.051	137/148	0.01	ND (<0.05)/ND (<0.05)	281/283	7.09	NA	21.2
	September 2001	1.30	530	ND (<0.10)	ND (<1.0)/ND (<0.005)	130	NA	NA	280	7.19	1.1	19.6
	February 2002	2.60	420	ND (<0.10)	ND (<0.01)	120	NA	NA	280	7.35	3.0	17.9
	August 2002	4.20	530	ND (<0.10)	ND (<0.01)	140			270J	7.29	ND (<1.0)	23.5
PL-MW-116	March/April 1998	6.70	197.4	ND (<0.05)	ND (<0.002)	26	ND (<0.05)	1.3	165	6.94	NA	17.3
	Sept/Oct 1998	6.11	285.5	0.01	ND (<0.002)	29	0.04	0.98	166	6.96	NA	22.2
	September 2001	2.80	520	ND (<0.10)	ND (<1.0)/ND (<0.005)	38	NA	NA	160	7.16	23.0	19.4
	February 2002	6.50	430	ND (<0.10)	ND (<0.01)	32	NA	NA	170	7.2	26.0	16.2
	August 2002	6.80	540	ND (<0.10)	ND (<0.01)	32			160J	7.16	12	19.2
MW-POLA-121	March/April 1998	0.60	11.5	ND (<0.05)	0.12	15	ND (<0.05)	ND (<0.05)	128	6.42	NA	17.9
	Sept/Oct 1998	1.91	-61.5	2.88	0.6	13	0.06	ND (<0.05)	404	6.81	NA	22.8
	September 2001	3.10	530	ND (<0.10)	ND (<1.0)/ND (<0.005)	16	NA	NA	290	7.04	12.0	18.4
	February 2002	7.10	410	ND (<0.10)	ND (<0.01)	24	NA	NA	160	7.34	8.5	18.6
	August 2002	6.90	540	ND (<0.10)	ND (<0.01)	20			240J	7.2	110	18.2

Notes:

Historical data are extracted from IT report (IT, 1999)

ND - Not detected above practical quantitation limit (practical quantitation limit is in parenthesis)

NA - Not analyzed

^a Analyzed by ASTM D3416M

^b Analyzed by method RSK 175

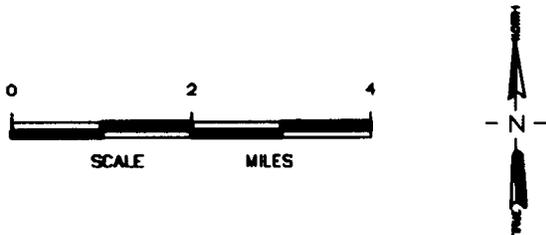
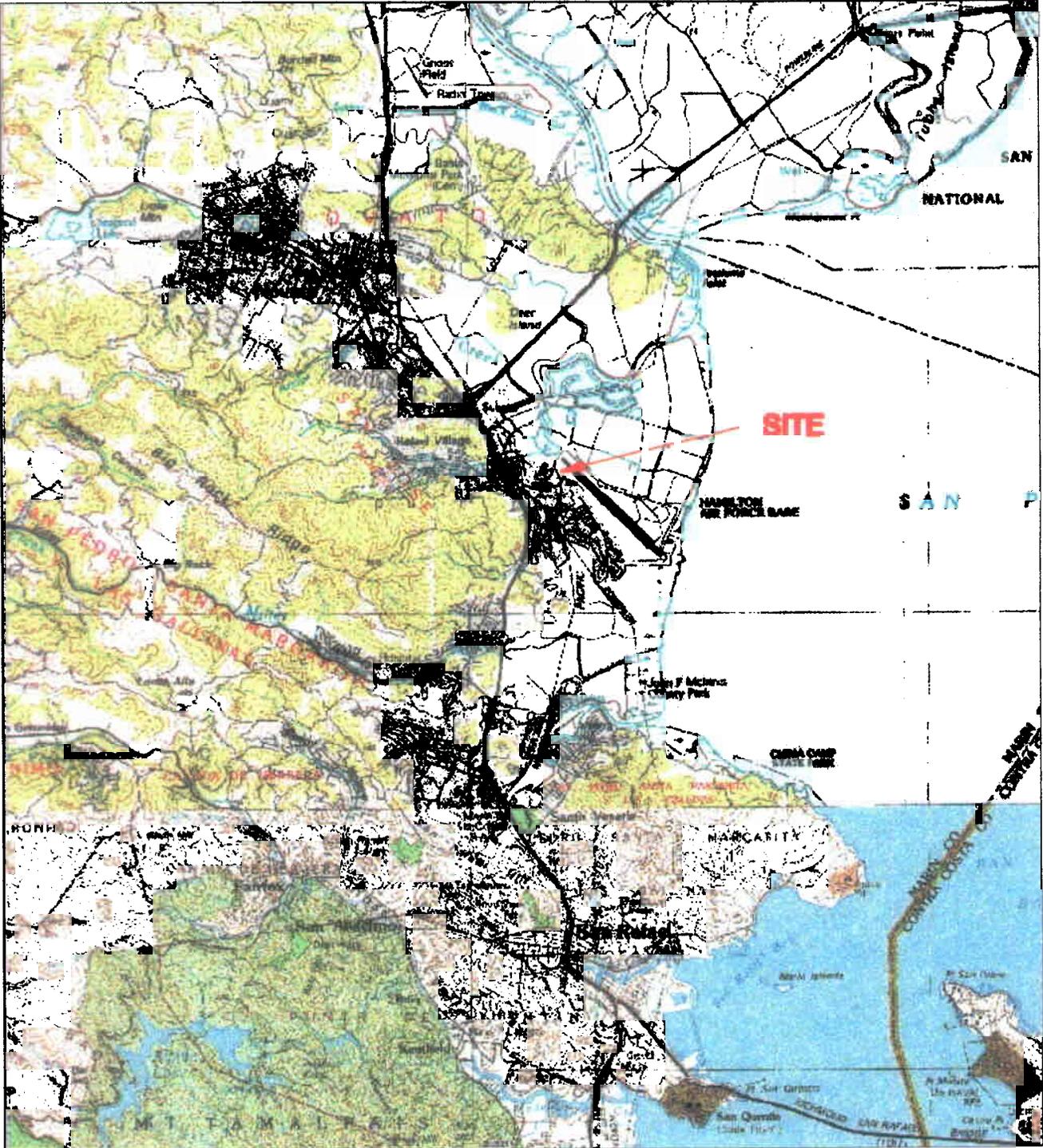
J Estimated

mg/L - Milligrams per liter

mv - Millivolts

NTU - Nephelometric Turbidity Units

°C - Degrees Celsius

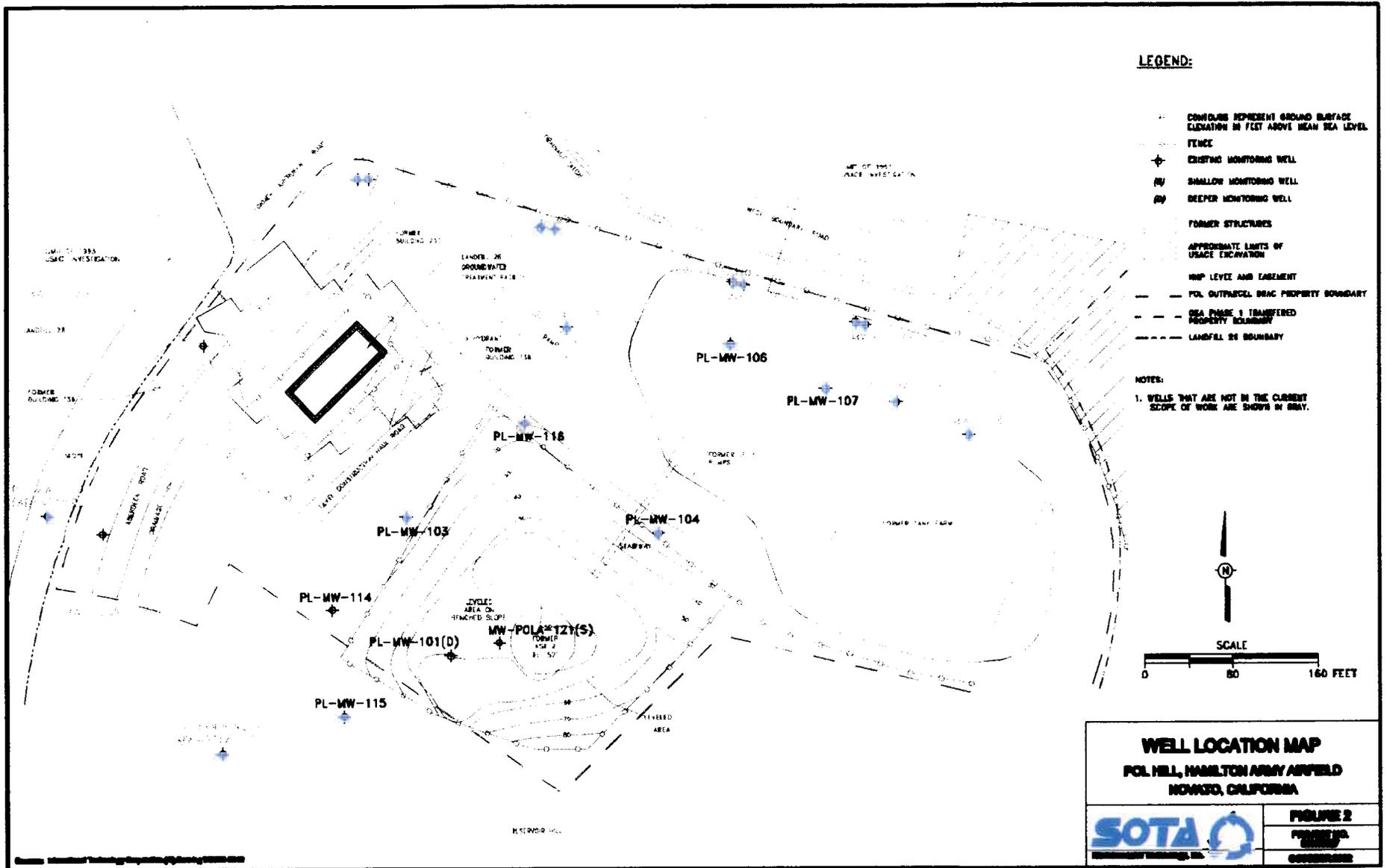


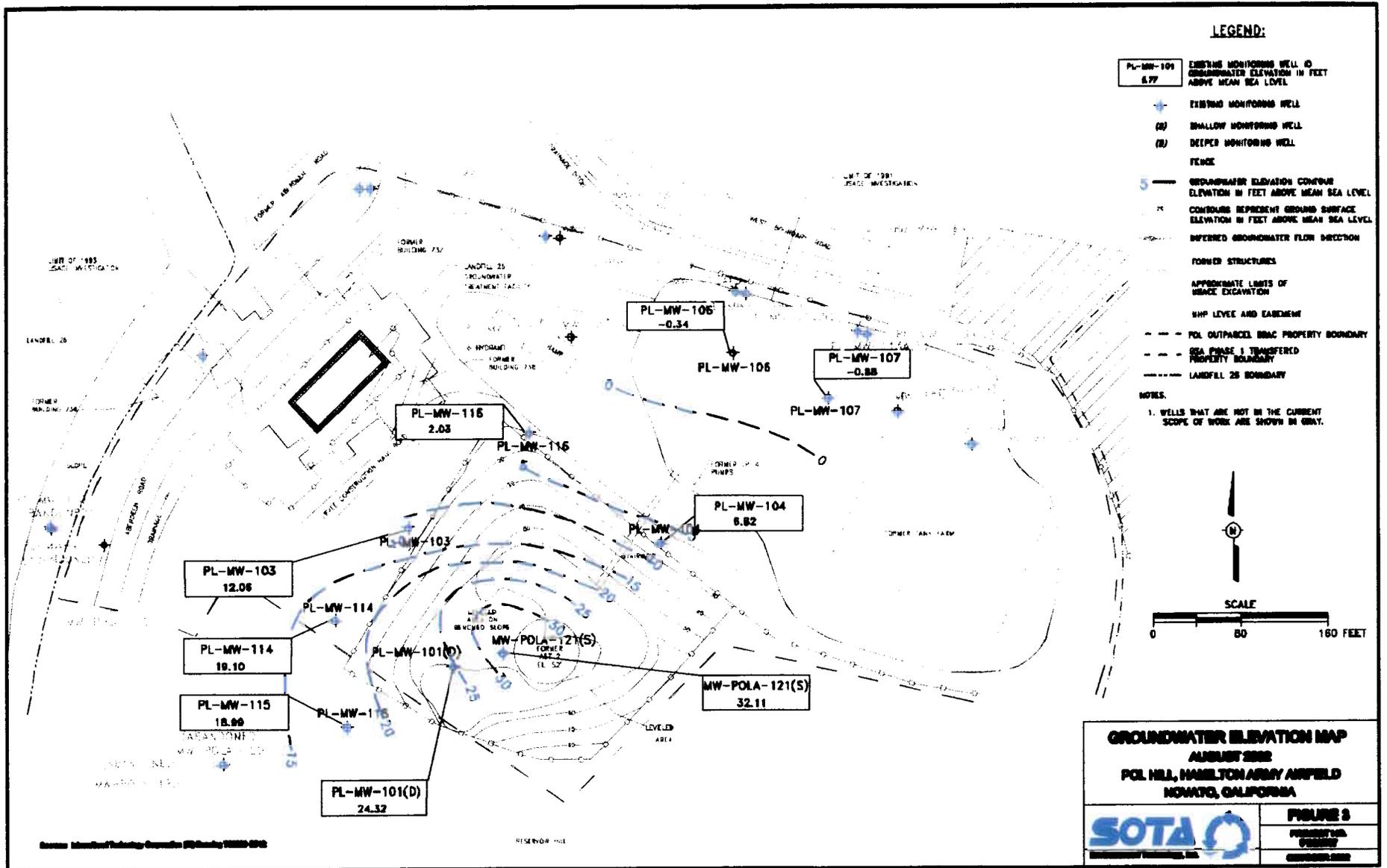
SITE MAP
POL HILL, HAMILTON ARMY AIRFIELD
NOVATO, CALIFORNIA

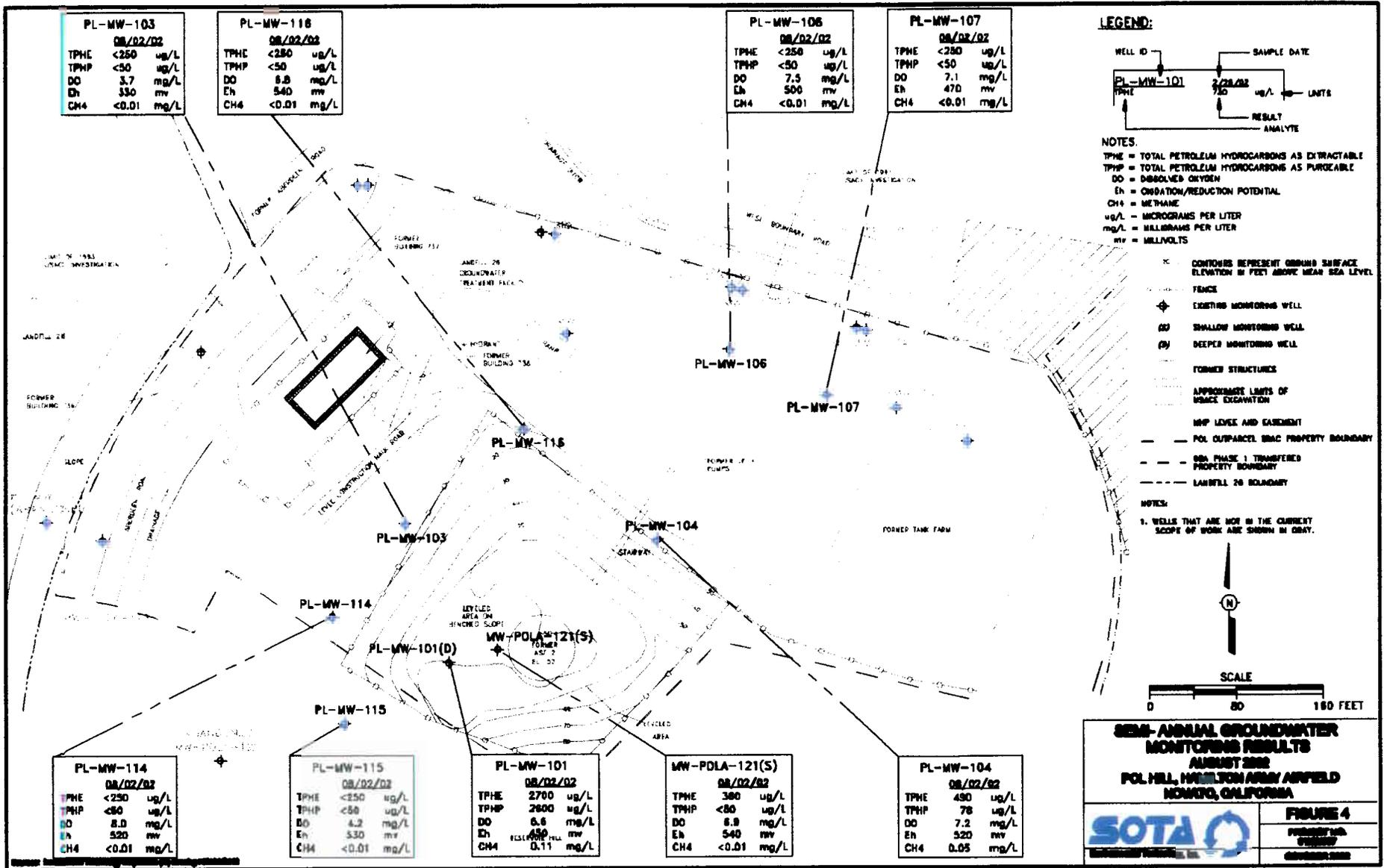


FIGURE 1
PROJECT NO.
00-0000
OCTOBER 1998

SOURCE: USGS 30X60 MINUTE QUADRANGLE Topographic Map - 01 Jul 1983







PL-MW-103	
08/02/02	
TPHE	<250 ug/L
TPHP	<50 ug/L
DO	3.7 mg/L
EH	330 mv
CH4	<0.01 mg/L

PL-MW-116	
08/02/02	
TPHE	<250 ug/L
TPHP	<50 ug/L
DO	8.8 mg/L
EH	540 mv
CH4	<0.01 mg/L

PL-MW-106	
08/02/02	
TPHE	<250 ug/L
TPHP	<50 ug/L
DO	7.5 mg/L
EH	500 mv
CH4	<0.01 mg/L

PL-MW-107	
08/02/02	
TPHE	<250 ug/L
TPHP	<50 ug/L
DO	7.1 mg/L
EH	470 mv
CH4	<0.01 mg/L

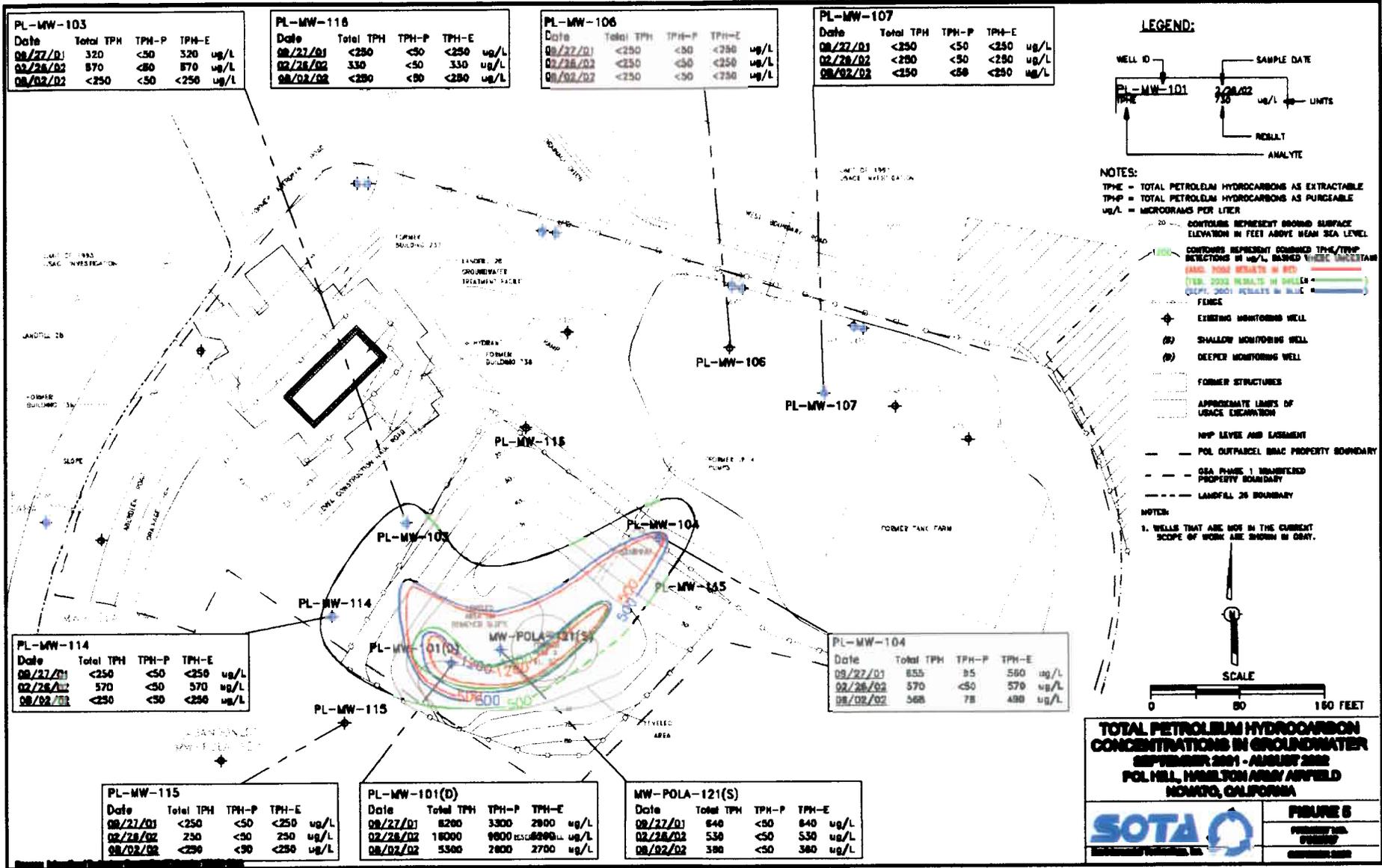
PL-MW-114	
08/02/02	
TPHE	<250 ug/L
TPHP	<50 ug/L
DO	8.0 mg/L
EH	520 mv
CH4	<0.01 mg/L

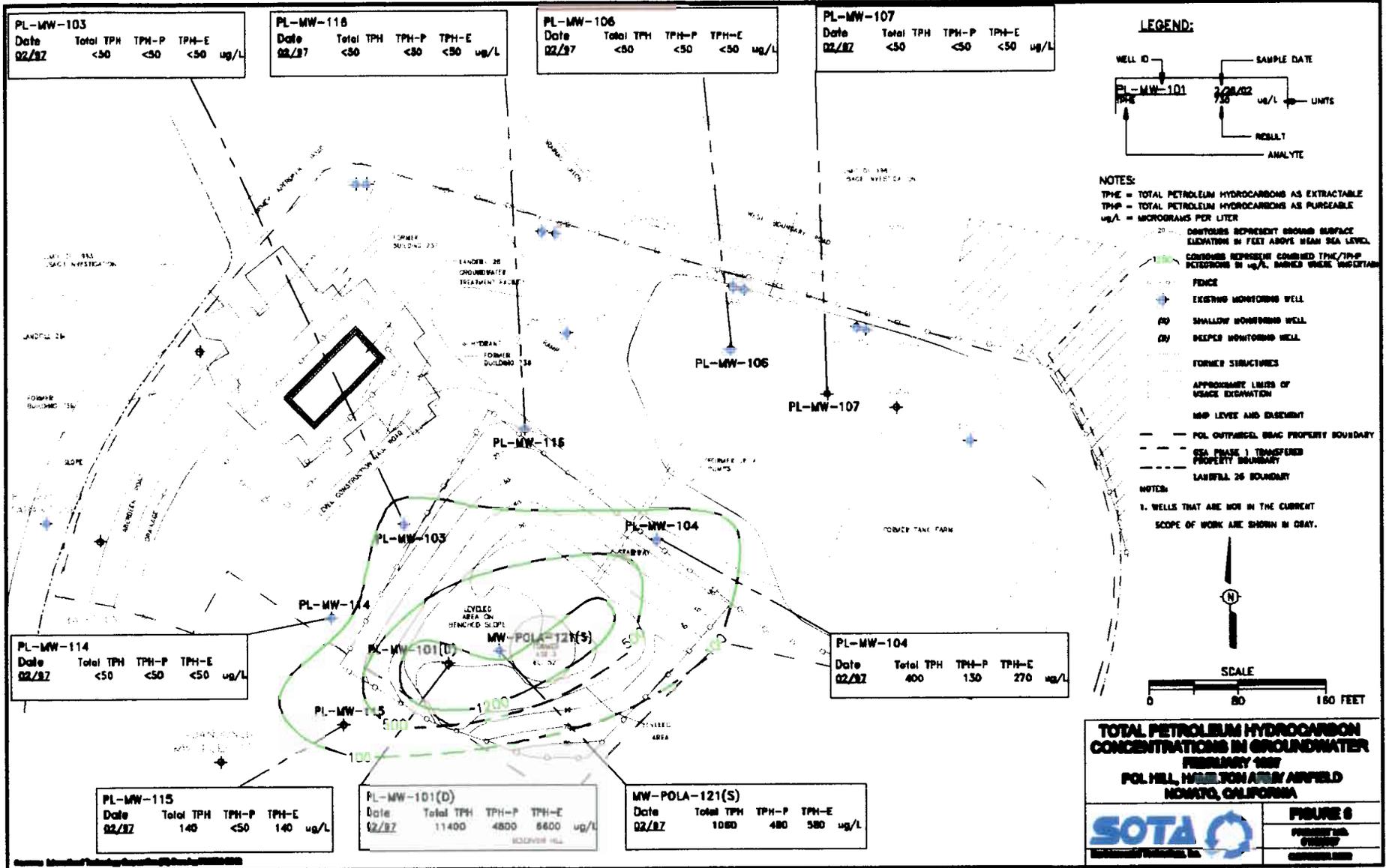
PL-MW-115	
08/02/02	
TPHE	<250 ug/L
TPHP	<50 ug/L
DO	4.2 mg/L
EH	530 mv
CH4	<0.01 mg/L

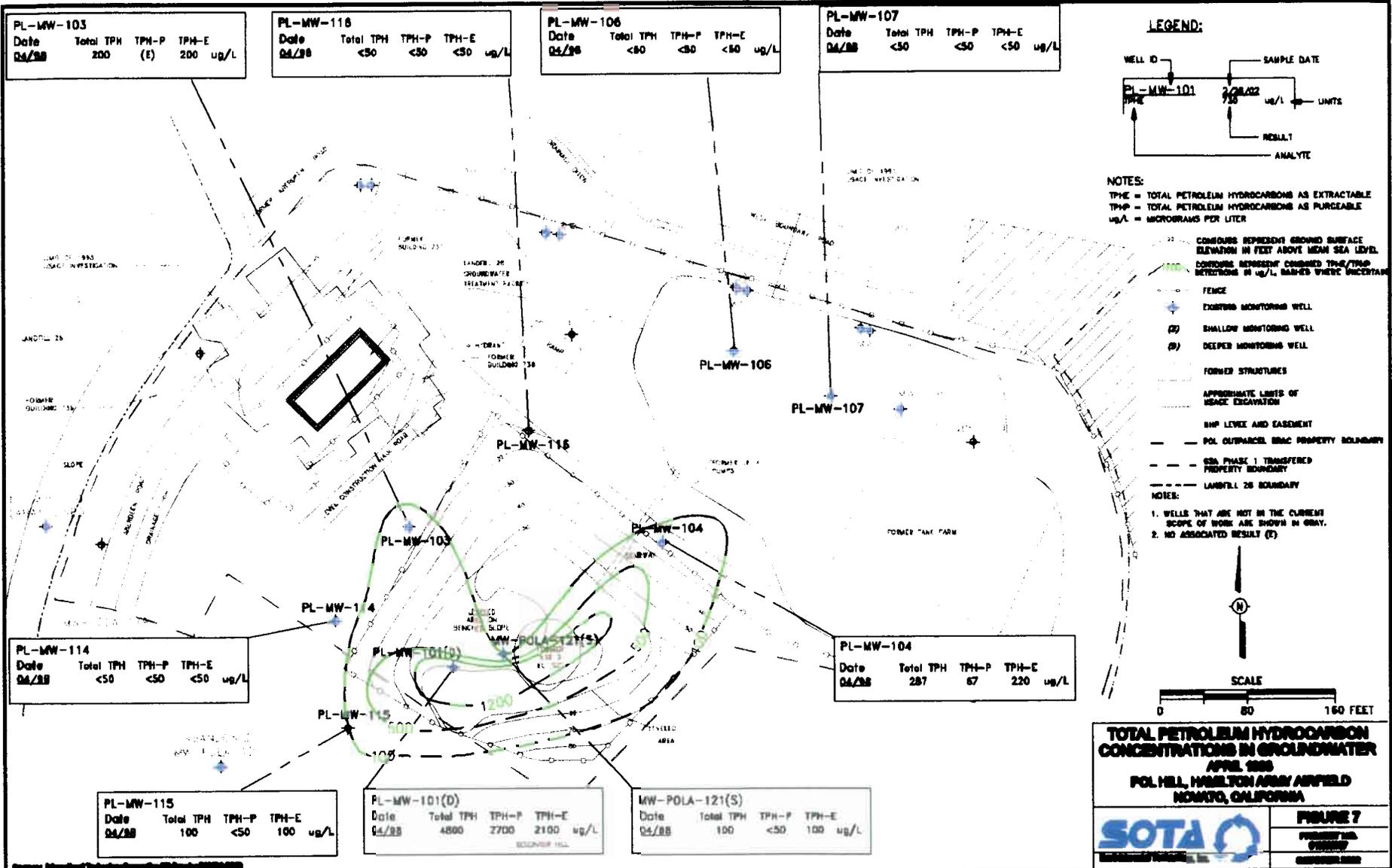
PL-MW-101	
08/02/02	
TPHE	2700 ug/L
TPHP	2600 ug/L
DO	6.6 mg/L
EH	450 mv
CH4	0.11 mg/L

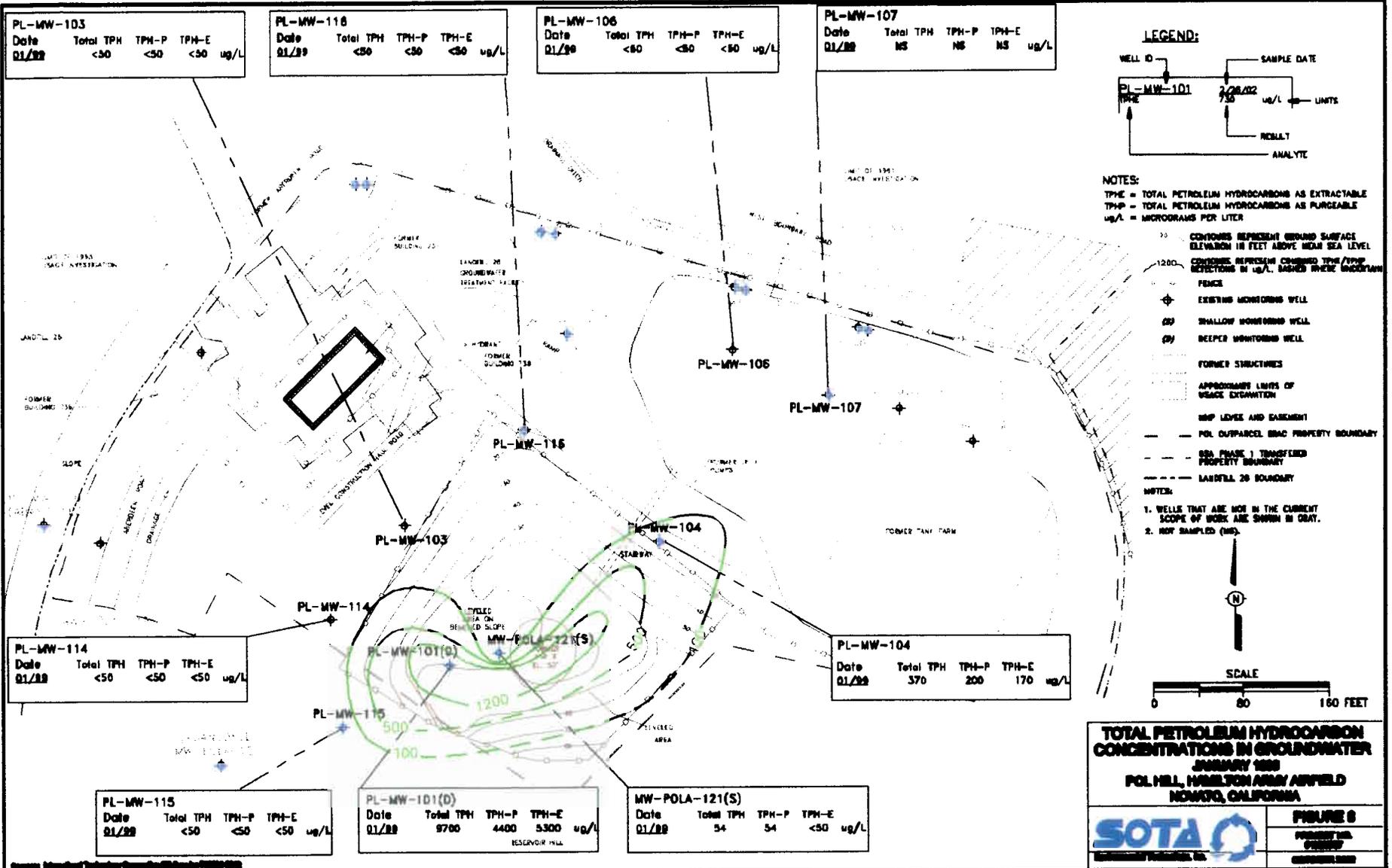
MW-POLA-121(S)	
08/02/02	
TPHE	300 ug/L
TPHP	<50 ug/L
DO	6.9 mg/L
EH	540 mv
CH4	<0.01 mg/L

PL-MW-104	
08/02/02	
TPHE	490 ug/L
TPHP	78 ug/L
DO	7.2 mg/L
EH	520 mv
CH4	0.05 mg/L

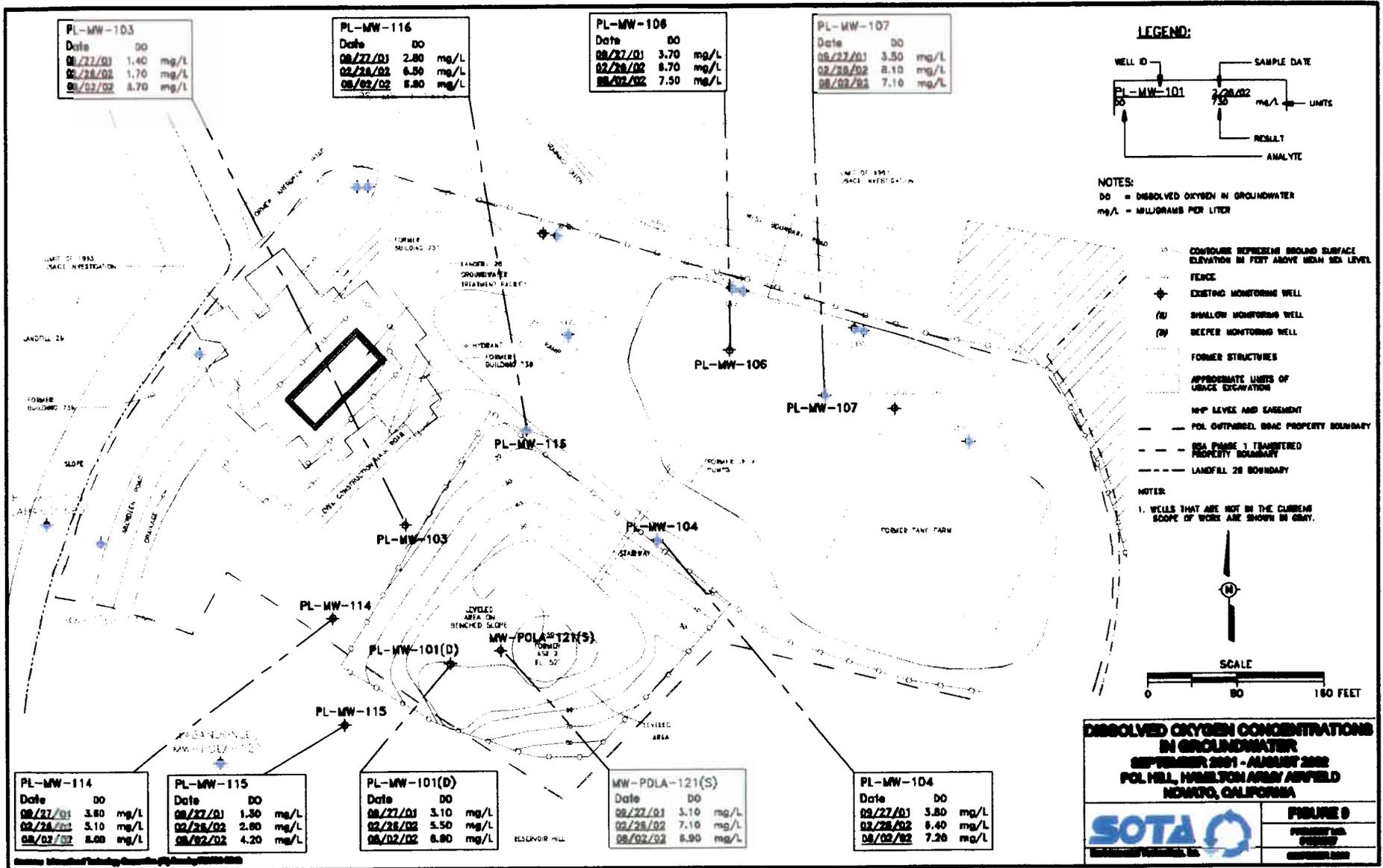


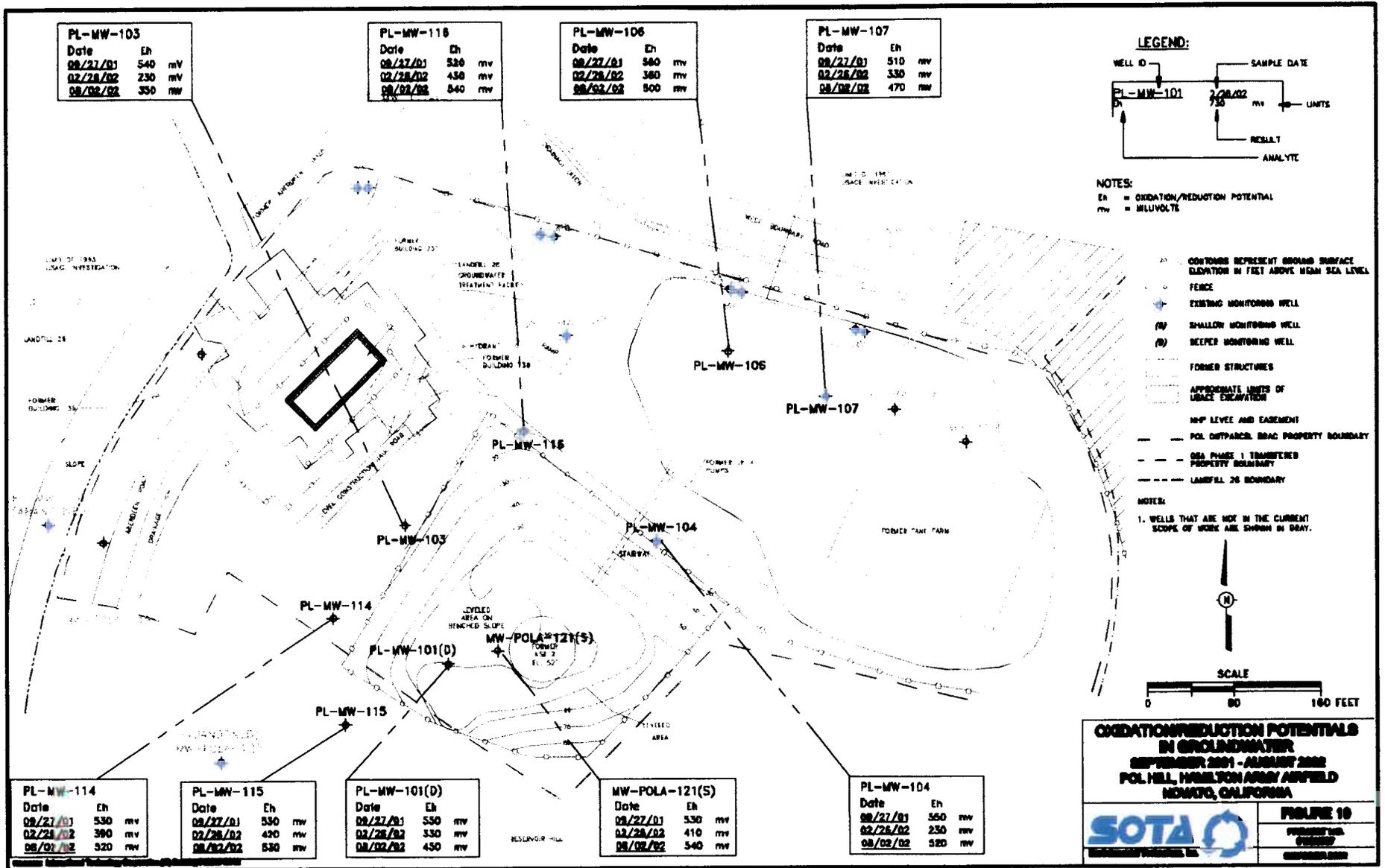






Source: International Technology Corporation, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025





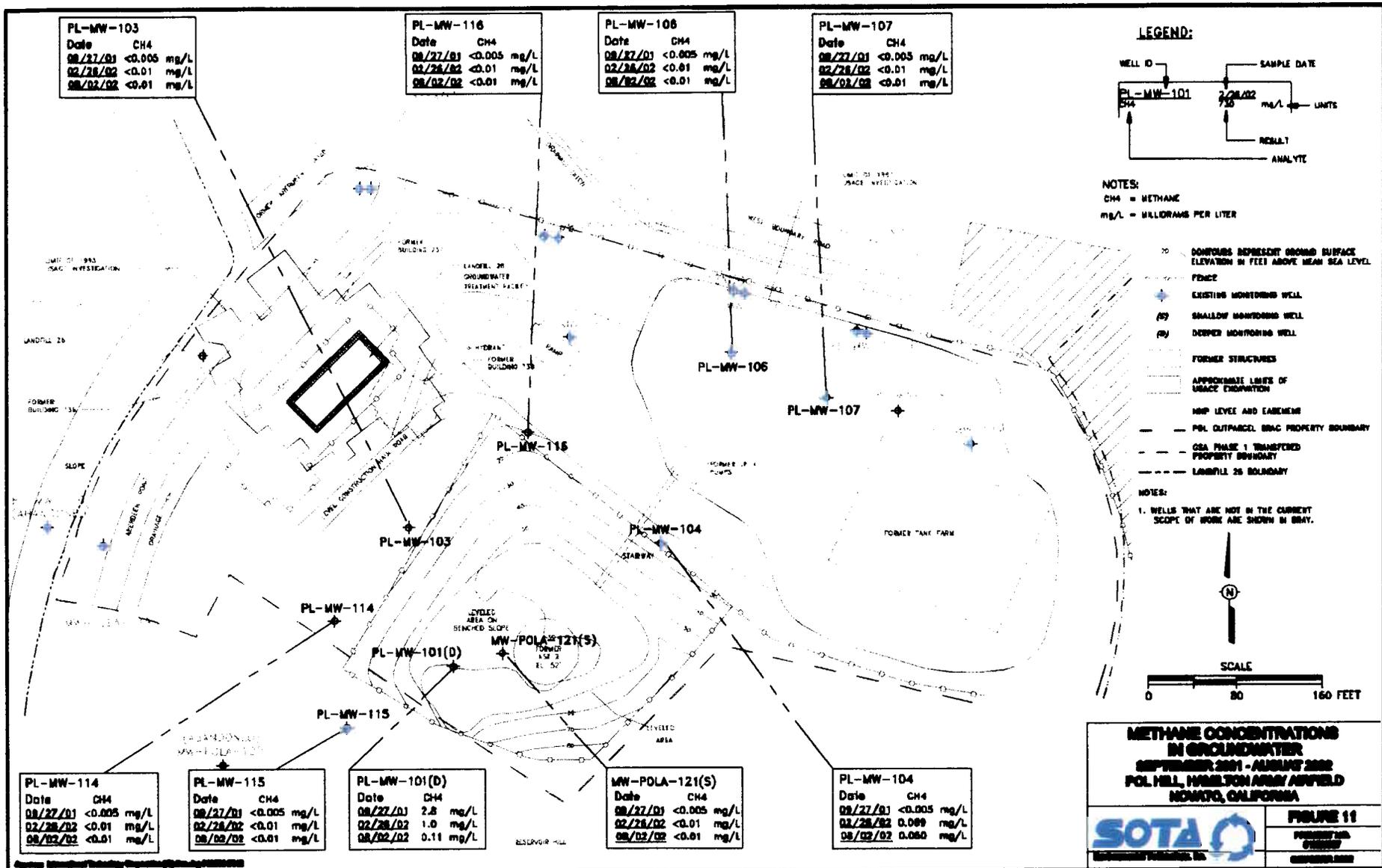


FIGURE 11
PREPARED BY
SOTA