Appendix M

Evaluation of 709-721 Alexander Avenue Hydraulic Data

Appendix M

Evaluation of 709-721 Alexander Avenue Hydraulic Data

Table of Contents

List of Figures
(Following Text)

List of Tables
(Following Text)

List of Attachment

1.0 Introduction

This Appendix presents the hydraulic data collected at the 709/721 Alexander Avenue properties in Tacoma, Washington as part of the 709/721 Alexander Investigation, which is presented in the Work Plan - 709/721 Alexander Investigation (CRA, 2004).

The investigation included one (1) 72-hour hydraulic monitoring event for the purpose of collecting data to interpret Site hydraulic conditions and determine groundwater flow directions. During the event, hydraulic monitoring was conducted via pressure transducers connected to data loggers that were programmed to record pressures at five-minute intervals. The 72-hour hydraulic monitoring event was initiated on July 23, 2004 at 00:00 Pacific Daylight Time (PDT) and completed on July 26, 2004 at 00:00 PDT.

The primary purpose of this appendix is to present the hydraulic data collected as part of this investigation. To the extent possible, the hydraulic data reduction methodology presented in Appendix I is applied to interpret this set of hydraulic data.

This Appendix is organized as follows:

- Section 1.0 - Introduction: Presents the overview of this appendix and rationale for the hydraulic monitoring event;
- Section 2.0 - Methodology: Presents an overview of the applicable data reduction methodology from Appendix I; and
- Section 3.0 - Results: Presents the exceptions to the methodology in Appendix I and the results of the Freshwater Equivalent Head (FEH) contours from the pressure data collected during the hydraulic monitoring event.

2.0 Methodology

A review of the applicable data reduction methodology is presented here, in the event that sufficient and appropriate data exist to apply the methodology. The results of the 709/721 Alexander Avenue Investigation are presented in Section 3.0, along with a conclusion on whether or not the methodology may be applied to the hydraulic data collected as part of this Investigation.

The applicable data reduction methodology was presented in Appendix I, as follows:

- Section 2.0 - Procedure for Computing Average Pressure for 72-Hour Hydraulic Monitoring Events: Presented the calculation methodology applied to compute a single mean pressure or water level over a 72-hour monitoring period following the methodology presented by Serfes (1991);
- Section 3.0 - Transducer Data Reduction Methodology: Presented the transducer installation configurations (i.e., Types 1, 2, and 3) employed for the two (2) 72-hour hydraulic monitoring events, and the associated transformation methodology that needs to be applied to the data recorded at each of three configuration types in order to determine the formation pressure exerted at the midpoint of the upland monitoring well screen (Type 1) or at the elevation of the transducer (Types 2 and 3); and
- Section 8.0 - Calculation Methodology for Freshwater Equivalent Head, Environmental Head, and Velocity Vectors: Presented the methodology applied to convert formation pressures at the monitoring well screen midpoints to FEH, as defined by Lusczynski (1961). The FEHs are applied to interpret horizontal groundwater flow directions that account for the variable groundwater density.

3.0 Results

The data collected as part of the investigation were reviewed with respect to the sufficiency to apply the methodology outlined in Section 2.0. From this review, it was determined that the data are sufficient to apply the methodology with some exceptions/variances from Appendix I, as follows:

- Section 3.0: No conductivity profile data were collected as part of the investigation. However, groundwater samples were collected and submitted to a laboratory for measurement of specific gravity. Therefore, the lab-reported specific gravity will be assumed constant for the water within the well casing. The constant density assumption will be applied to compute the incremental pressure from the transducer position to the midpoint of the well screen; and
- Section 7.0: Since there is no 3-D density distribution corresponding to the period of the investigation, the Environmental Head (ENV) is not calculated. Therefore, pressure adjustments for vertical offsets of the screen midpoints to the zone grouping plane elevations are calculated as incremental pressures. The lab-reported specific gravities for each monitoring well location are applied for the incremental pressure calculation. The adjusted Serfes (1991) mean pressures at the zone grouping planes are then applied to compute FEHs at the corresponding zone grouping planes for each location. The FEHs at

the zone grouping planes are subsequently contoured in order to make inferences about horizontal groundwater flow directions.

Figure 1 presents the hydraulic monitoring network for the 709/721 Alexander Investigation. The zone grouping planes presented in Section 8.0 of Appendix I were applied for the 25-foot Zone and the 50-foot Zone. A zone grouping plane was established for the 15-foot Zone, with a corresponding elevation of 0 ft National Geodetic Vertical Datum (NGVD). Screened intervals of the monitoring wells relative to the zone grouping planes are presented on Figure 2. The corresponding elevations for each zone grouping plane are summarized below.

Zone Grouping Plane	*Corresponding Zone Grouping Reference Elevation*
15-foot Zone	0 ft NGVD
25-foot Zone	-10 ft NGVD
50-foot Zone	-35 ft NGVD

Hydrographs presenting the transducer pressure measurements and corresponding manual groundwater level measurements (converted to pressure) are provided in Attachment 1 to this Appendix. In addition, the Hylebos Waterway (Waterway) surface water elevation is presented on each hydrograph. For wells that exhibit a fluctuation in the observed pressure, the timing and amplitude of the pressure fluctuation is related to the fluctuating surface water elevation in the Waterway. In fact, over the monitoring period, the amplitude of the Waterway fluctuation increased from approximately 10.5 feet on July 23, 2004 to approximately 14 feet on July 28, 2004. In general, a corresponding increase in the measured pressure responses is observed. For example, at location MW20-25, located approximately 60 feet inland from the approximate Waterway shoreline (see Figure 1), the measured pressure difference increased from approximately 1.5 pounds per square inch (psi) on July 23, 2004 to approximately 3.0 psi on July 28, 2004 (see Figure 1-12 of Attachment 1). Similarly, an increase in the measured pressure response is apparent at locations 6A-24.5, 6A-50, MW15A, MW20-25, MW20-50, 721-MW10-25, 721-MW10-50, 721-MW5-25, 721-MW5-50, 721-MW6-25, 721-MW6-50, 721-MW9-25, and 721-MW9-50 (see Figures 1-5, 1-6, 1-9, 1-12, 1-13, A1-17, 1-18, 1-20, 1-21, 1-23, 1-24, 1-28, and 1-29, respectively, of Attachment 1).

A review of the measured pressures over time indicates that little to no variation in pressure is observed in the 15-foot zone (see Figures 1-3, 1-4, 1-7, 1-8, 1-9, 1-10, 1-11, 1-14, 1-15, 1-16, 1-19, 1-22, 1-25, 1-26, and 1-27 of Attachment 1). Based on the elevation of this zone (approximate average elevation of 0 ft NGVD), this zone likely corresponds to placed fill over the tideflat. The tideflat unit is assumed to form an aquitard layer which limits the hydraulic connection between the overlying fill unit and the underlying fluvial deltaic deposit. A review of borehole logs of wells in this zone grouping indicate a thin silt layer, between 0.1 and 0.2 feet in thickness, at approximately 0 ft NGVD in about half of the examined logs. For example, a silt layer was observed at MW7, MW14, and 721-MW7-15. The layer may be continuous, but due to the minimal thickness, it may not have been observed during logging at all locations. Further, the lack of fluctuations in water levels at this location may be to due to the phreatic surface occurring within the 15-foot Zone wells. The 15-foot Zone wells are generally screened from 8 ft NGVD to -4 ft NGVD (see Figure 2), and the surface water elevations in the Waterway ranged from approximately 6.5 ft NGVD to -7.8 ft NGVD during this monitoring event. Therefore, the water table is located within the screened intervals of the 15-foot Zone, and sometimes below. Researchers have noted that the signal amplitude of tidally-forced fluctuations is highly damped at the water table surface (Erskine, 1991; and Millham and Howes, 1995). Gregg (1966) indicates that this relates to the different mechanism in unconfined versus confined conditions: movement of tidal water into and out of the unconfined aquifer versus the propagation of tidal fluctuations through compression and expansion in a confined aquifer.

The hydraulic data from this investigation are summarized in Table 1. For each monitoring well location, the screened interval, transducer elevation, measured specific gravity, unadjusted Serfes (1991) mean pressure (i.e., pressure at the transducer position), transducer installation type, incremental pressure (for Type 1 locations), the adjusted Serfes (1991) mean pressure, and corresponding FEH at the zone grouping plane is presented. For each zone, the corresponding Serfes (1991) mean Waterway elevation is calculated and converted to FEH for application in the contouring.

The Serfes (1991) mean FEH contours for the 15-foot, 25-foot, and 50-foot Zones are presented on Figure 3, Figure 4, and Figure 5, respectively. The contours for each horizontal zone grouping plane are generated using linear kriging with linear drift as implemented in Surfer, Version 8.05, Surface Mapping System (Golden Software, Inc., 2002).

In the 15-foot zone (see Figure 3), groundwater generally flows Plant East across the 709/721 Alexander Avenue properties towards the Waterway.

In the 25-foot zone (see to Figure 4), there is a localized groundwater high at monitoring well location 3-25. A review of the measured pressures over time at this monitoring well location indicates that there is little variation in the measured pressures, exhibiting only minor fluctuations at high tide (see Figure 1-1 of Attachment 1). This minimal fluctuation in measured pressures suggests that well location 3-25 is hydraulically isolated from the formation (i.e., possibly screened within a low permeability soil layer that does not respond hydraulically as quickly as the bulk of the formation). A review of the lithology at this location did not conclusively indicate the presence of a lower permeability soil layer that would cause hydraulic isolation from the formation at 3-25. However, the water level response observed at 3-25 (see Figure 1-1 of Attachment 1) clearly indicates that this well does not respond to water level fluctuations in the same manner as the remaining 25-foot zone wells. Therefore, the FEH at 3-25 was removed from the contouring process. The resulting contours with the FEH at monitoring well location 3-25 removed are presented on Figure 4a. A review of the FEH contours on Figure 4a indicates that groundwater generally flows towards the Waterway. The FEHs at monitoring well locations 721-MW9-25, 721-MW5-25, and 721-MW6-25 are similar, but show a low hydraulic gradient oriented in the plant east direction.

Finally, Figure 5 presents the 50-foot zone grouping plane FEH contours. The FEH contours for the 50-foot zone indicate that groundwater generally flows towards the Waterway, although there appears to be a groundwater high centered about monitoring well locations 721-MW9-50 and 721-MW5-50. There is also a localized high FEH at monitoring well location 3-50. The measured pressures over time at 3-50 show essentially no fluctuation (see Figure 1-2 of Attachment 1), and therefore, this location also appears to be hydraulically isolated from the formation. Similar to well location 3-25, a review of lithology at this well location does not indicate the presence of a lower permeability soil layer at the screened interval that would hydraulically isolate 3-50 from the formation.

However, a review of records of the estimated hydraulic conductivity at 3-50 location indicates that the hydraulic conductivity has declined over time. As part of the Corrective Action Monitoring Program (CAMP) for the Site, wells included in the CAMP are slug tested on a biennial basis to ensure that the hydraulic conductivity of the well does not decrease by 50 percent or more compared to a baseline hydraulic conductivity determined from previous slug tests. In the event that the hydraulic conductivity decreases by 50 percent or more, the well is redeveloped and another slug test performed. The development records for 3-50 indicate that the well was slug tested on September 23, 2005 and that the estimated hydraulic conductivity had decreased by more than 50 percent compared to the baseline hydraulic conductivity established for 3-50. Therefore, 3-50 was redeveloped on October 26, 2005. Following redevelopment, a second slug test was completed on December 1, 2005, and the estimated hydraulic conductivity was still more than 50 percent lower than the baseline value. Also, measurements of well depth prior to hydraulic monitoring in 2006 indicated that the well bottom was nearly 2 feet above the top of the screened interval. The nature and timing of the blockage of the monitoring well are uncertain.

Based on the measured depth of 3-50 being 2 feet above the screened interval and the reduction in the baseline hydraulic conductivity established for 3-50, it is likely that the water column within the well is not in direct hydraulic communication with the formation. Therefore, it is believed that it is appropriate to remove 3-50 from contouring due to the lack of hydraulic response at this location to the tidal fluctuations in the Waterway. The resulting contours with the FEH at monitoring well 3-50 removed are presented in Figure 5a. A review of the contours on Figure 5a indicates that groundwater at this depth generally flows towards the Waterway. The FEHs at monitoring well locations 6A-50, MW20-50, 721-MW6-50, and 721-MW10-50 are similar, but show a low hydraulic gradient oriented in the plant east direction.

4.0 References

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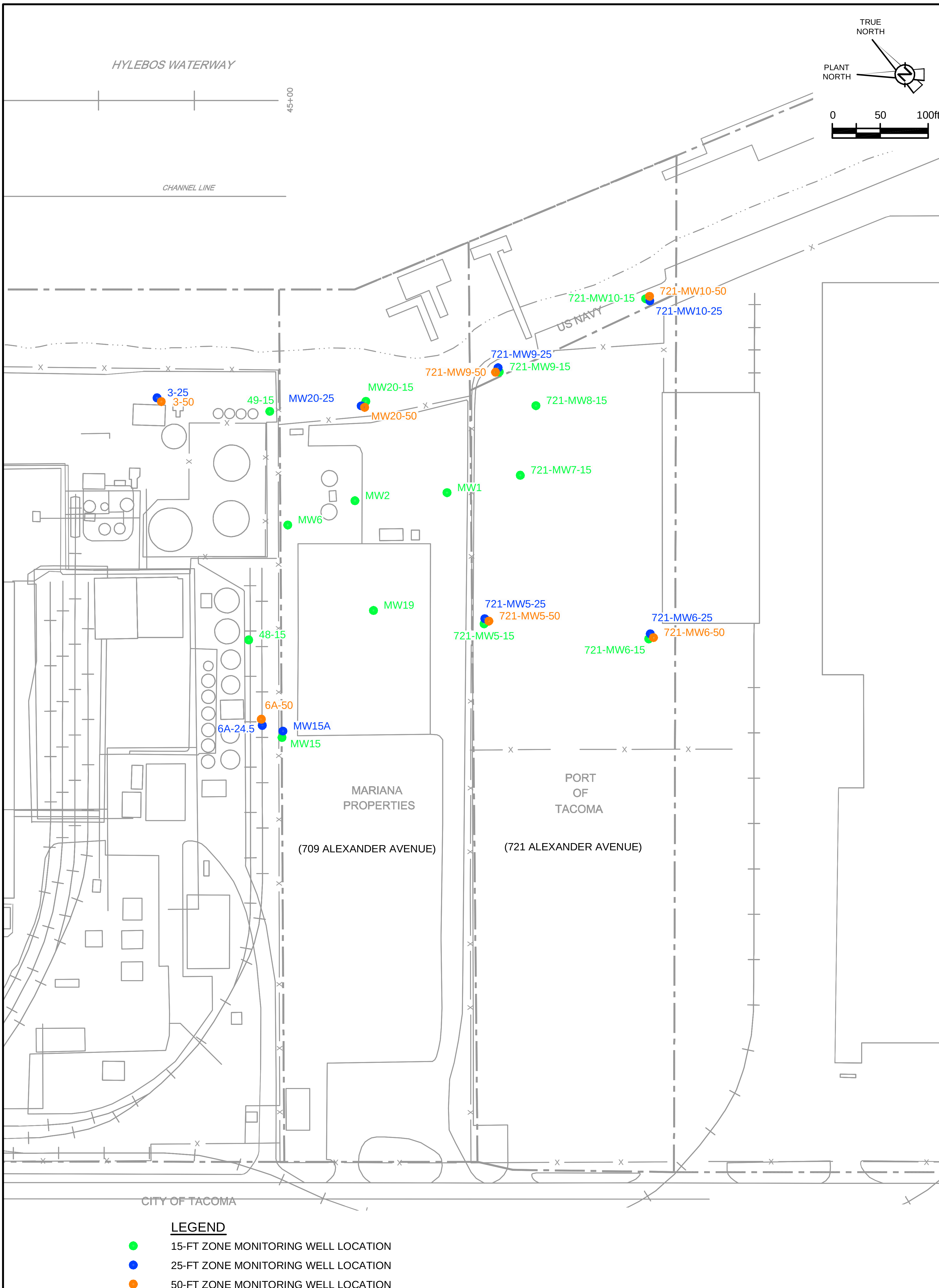

figure 1

HYDRAULIC MONITORING NETWORK -
709/721 ALEXANDER AVENUE INVESTIGATION
SITE CHARACTERIZATION
Occidental Chemical Corporation - Tacoma, Washington

CRA

07843-A9711(083)GN-WA011 DEC 14/2007

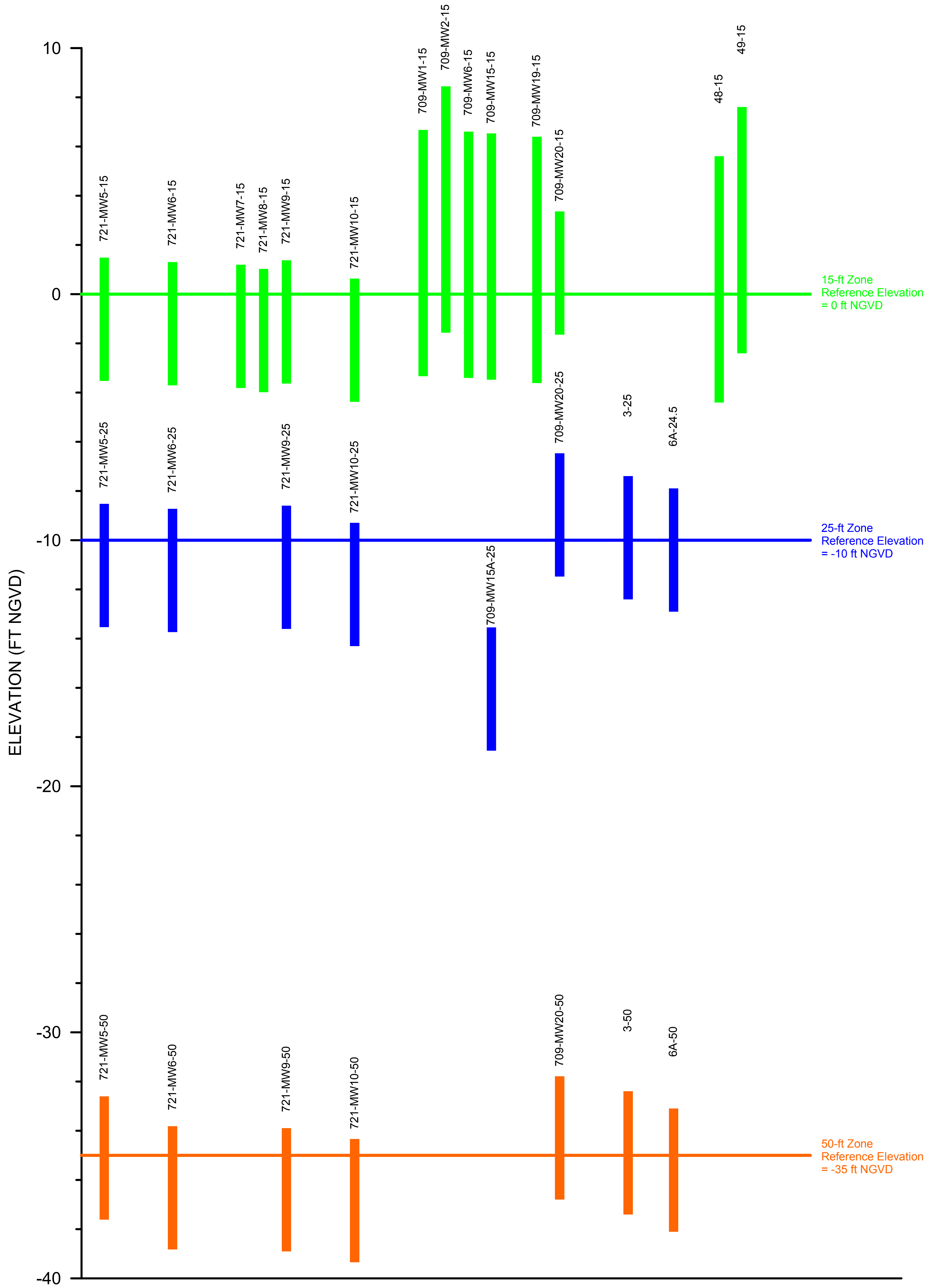

figure 2

WELL SCREENS BY ZONE
709/721 ALEXANDER AVENUE INVESTIGATION
SITE CHARACTERIZATION
Occidental Chemical Corporation - Tacoma, Washington

CRA

007843-A9711(83)GN-WA-HYD (N:\HEG\007843\characterization\Interim Deliverables\Report 83 Section5.1\DEC2007\Grapher\figureG.2.grf) DEC 14/2007

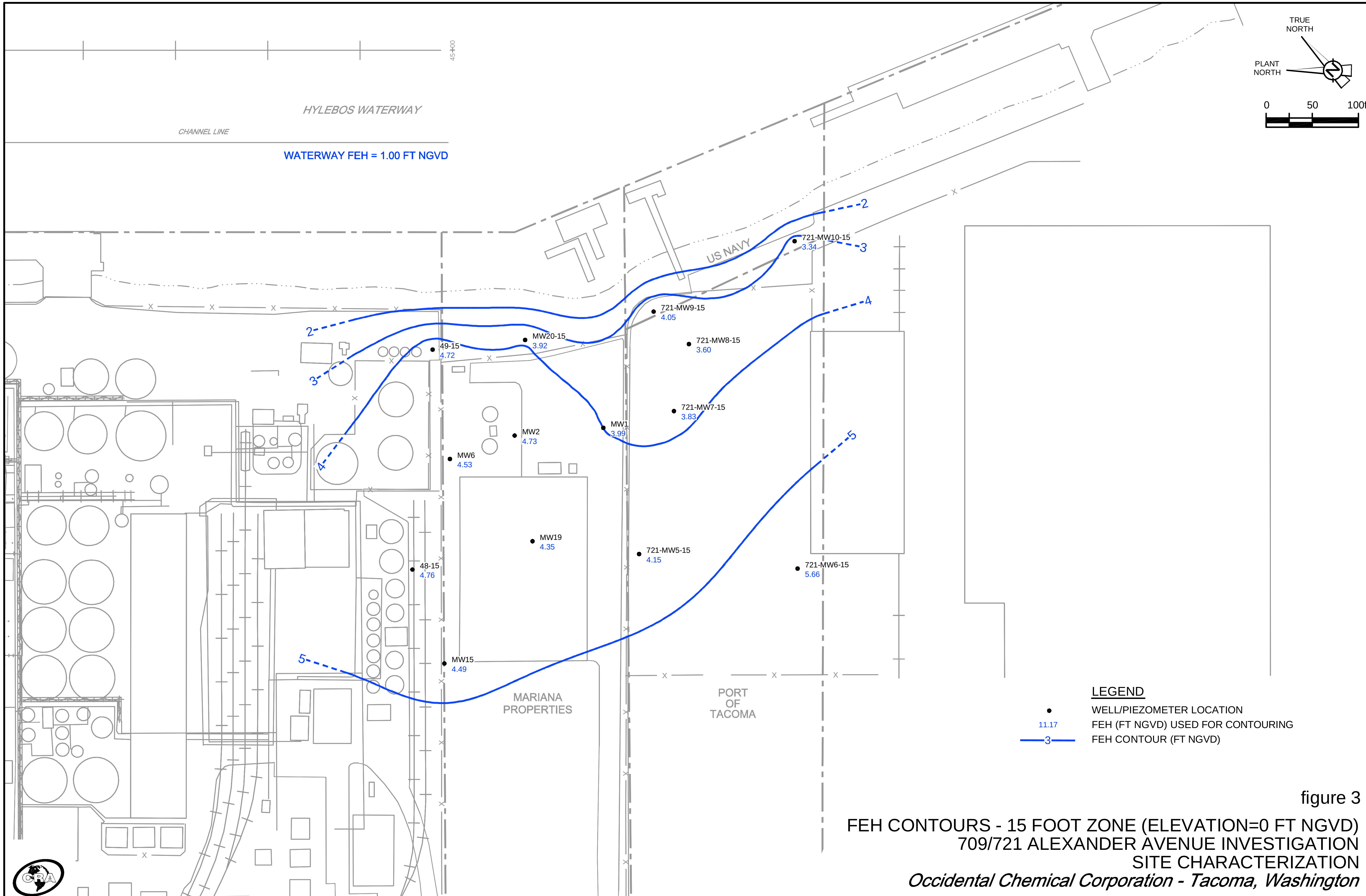

figure 3

FEH CONTOURS - 15 FOOT ZONE (ELEVATION=0 FT NGVD)
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SITE CHARACTERIZATION
Occidental Chemical Corporation - Tacoma, Washington

07843-A9711(083)GN-WA013 DEC 14/2007

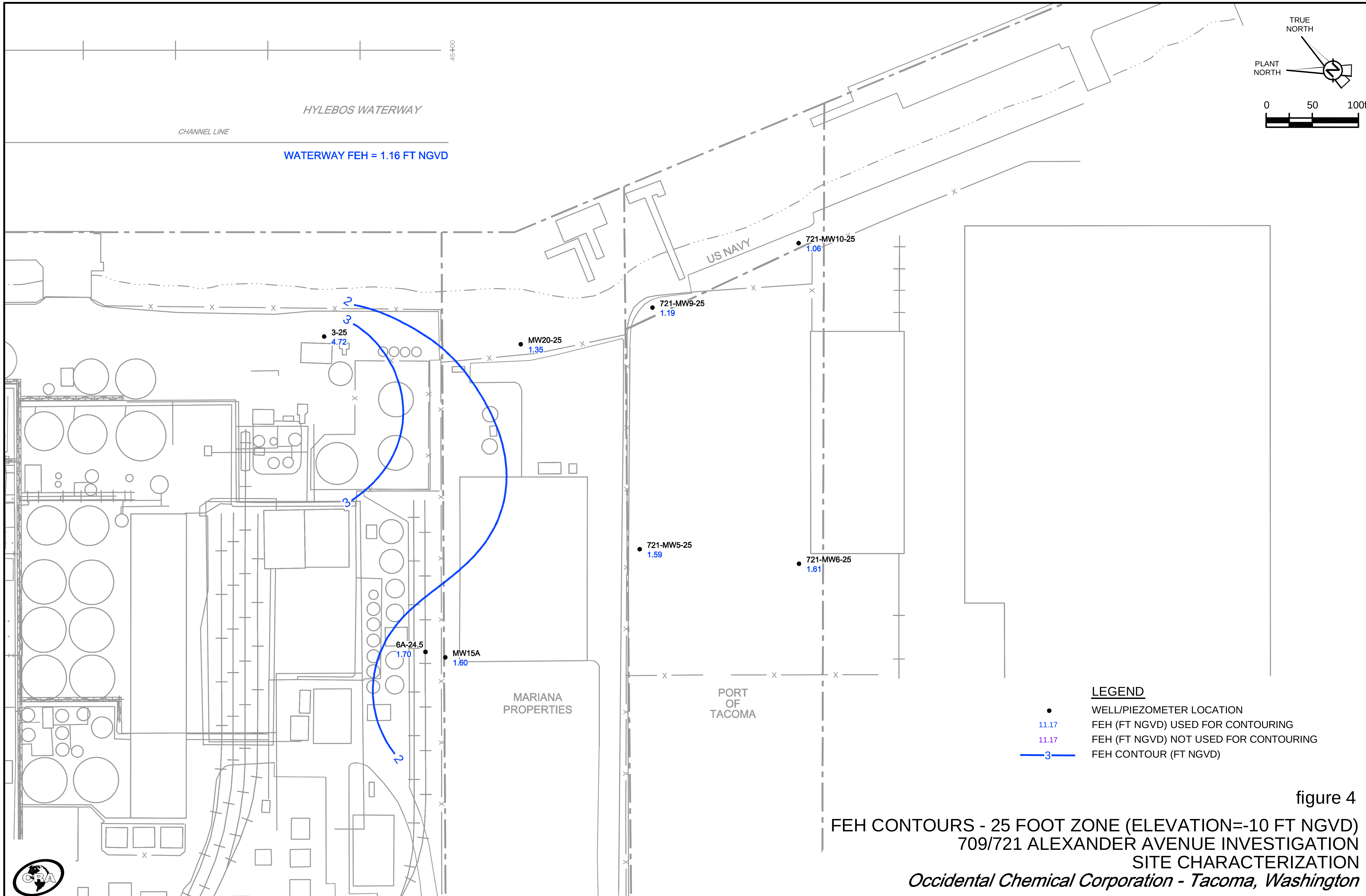

figure 4

FEH CONTOURS - 25 FOOT ZONE (ELEVATION=-10 FT NGVD)
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SITE CHARACTERIZATION
Occidental Chemical Corporation - Tacoma, Washington

07843-A9711(083)GN-WA014 DEC 14/2007

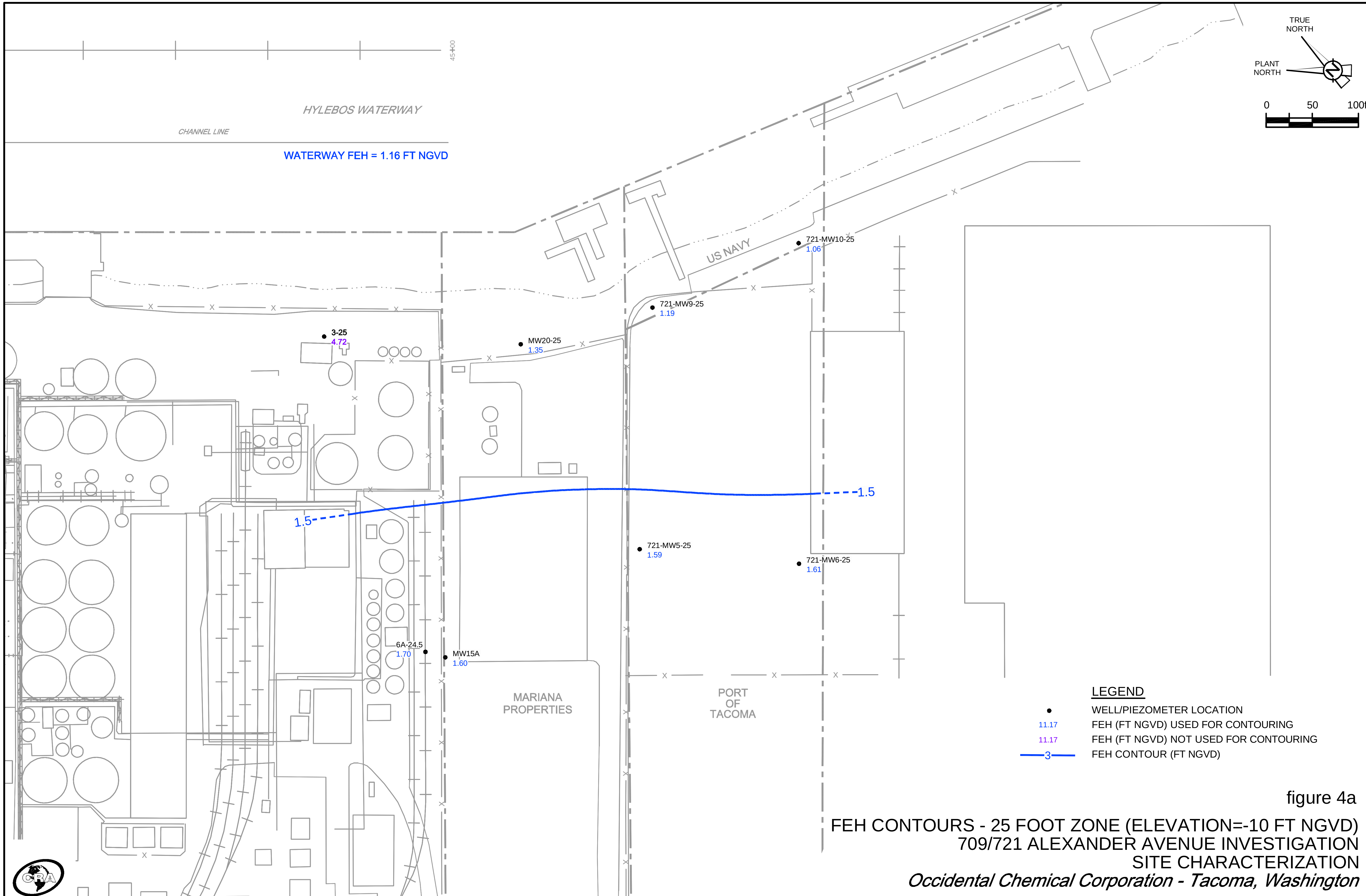

figure 4a

FEH CONTOURS - 25 FOOT ZONE (ELEVATION=-10 FT NGVD)
709/721 ALEXANDER AVENUE INVESTIGATION
SITE CHARACTERIZATION
Occidental Chemical Corporation - Tacoma, Washington

07843-A9711(083)GN-WA028 DEC 14/2007

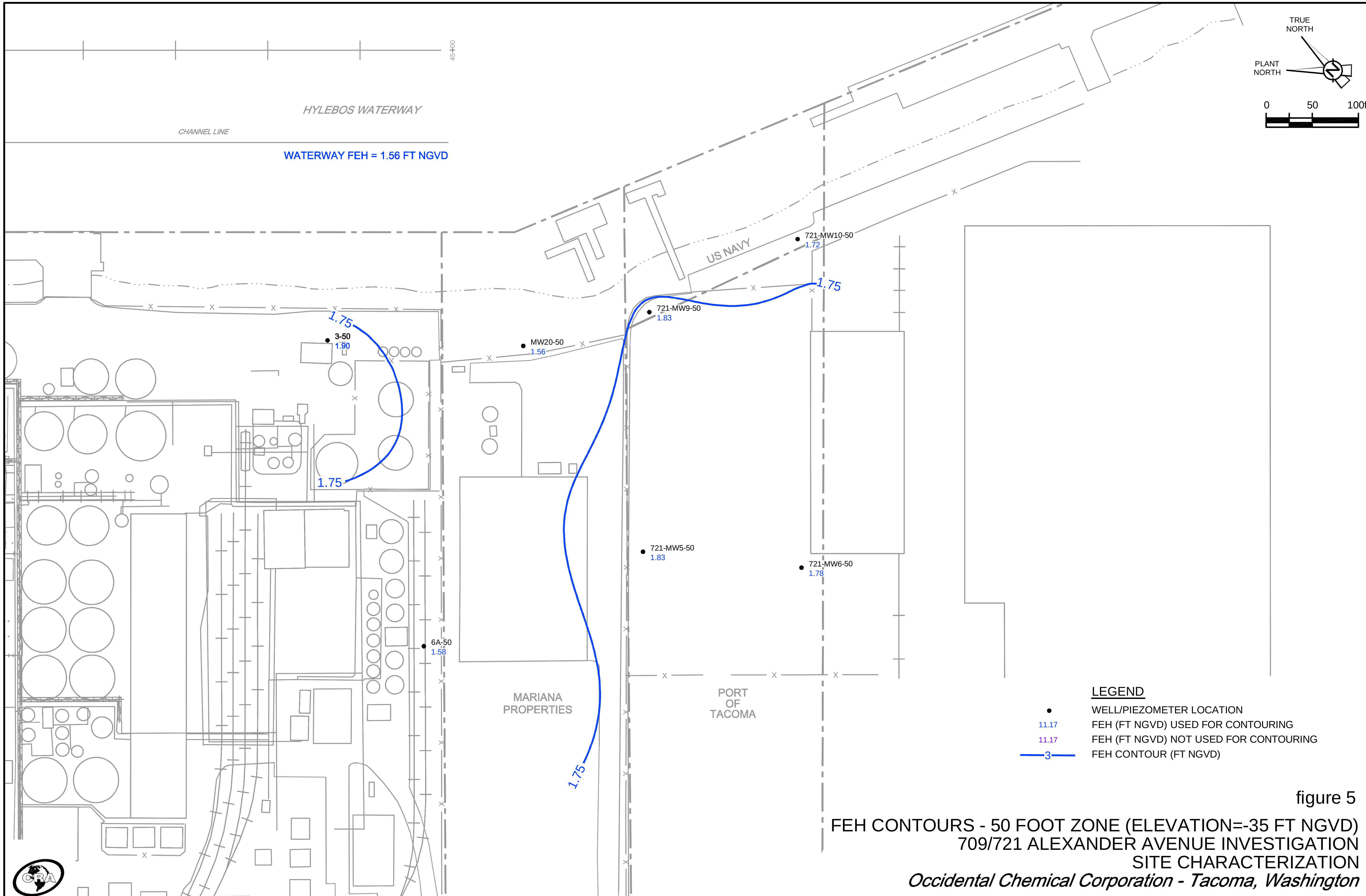

figure 5

FEH CONTOURS - 50 FOOT ZONE (ELEVATION=-35 FT NGVD)
709/721 ALEXANDER AVENUE INVESTIGATION
SITE CHARACTERIZATION
Occidental Chemical Corporation - Tacoma, Washington

07843-A9711(083)GN-WA029 DEC 14/2007

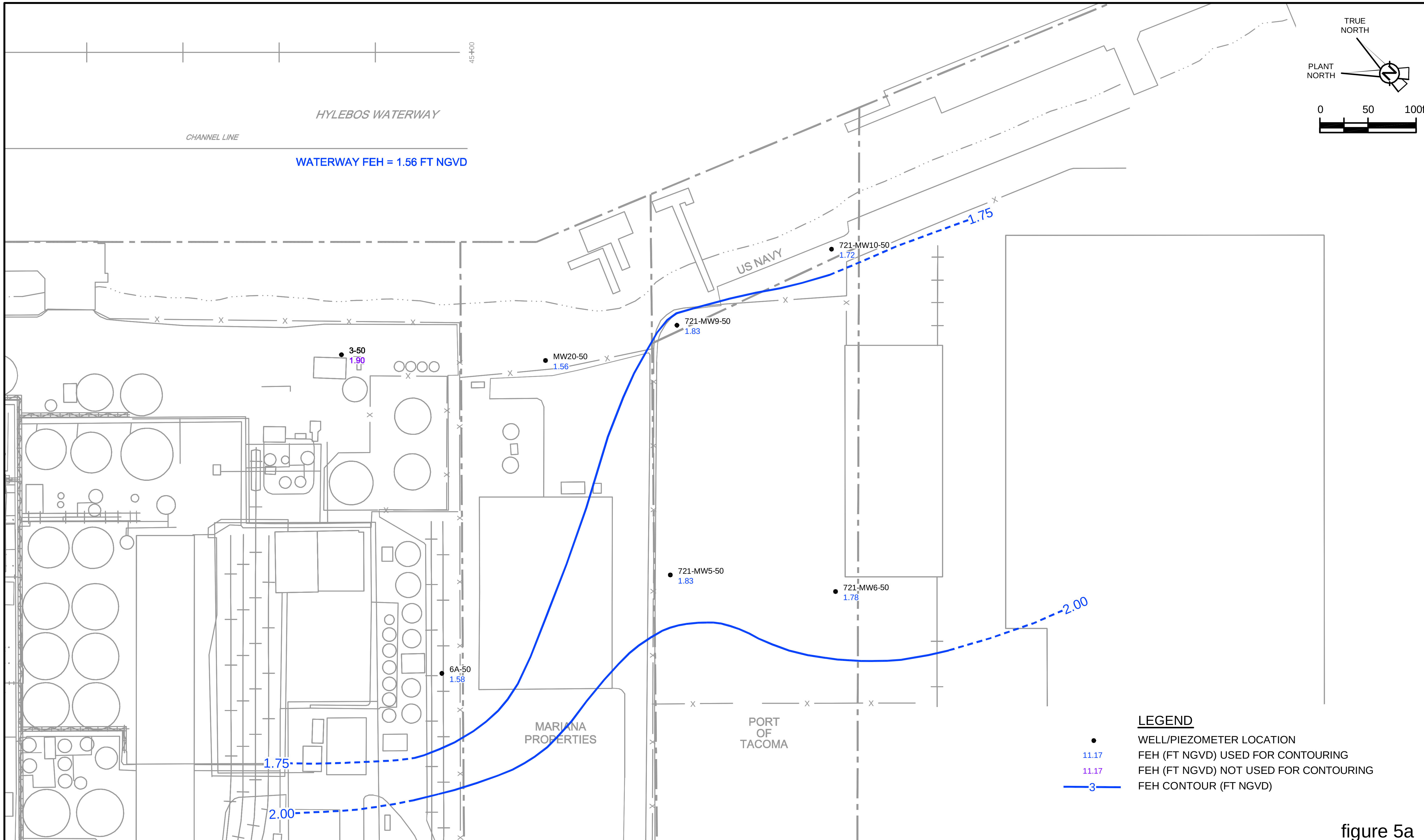

figure 5a

FEH CONTOURS - 50 FOOT ZONE (ELEVATION=-35 FT NGVD)
709/721 ALEXANDER AVENUE INVESTIGATION
SITE CHARACTERIZATION
Occidental Chemical Corporation - Tacoma, Washington

07843-A9711(083)GN-WA015 DEC 14/2007

TABLE 1

SUMMARY OF HYDRAULIC DATA
709/721 ALEXANDER INVESTIGATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Well ID	Screen Top Elevation (ft NGVD [2])	Screen Bottom Elevation (ft NGVD)	Mid-Screen Elevation (ft NGVD)	Transducer Elevation (ft NGVD)	Transducer Type	Specific Gravity --	Serfes(1991) Mean Pressure at Transducer (psi [3])	Incremental Pressure to Mid-Point of Well Screen (psi)	Incremental Pressure to Zone Grouping Plane (psi)	Adjusted Pressure at Zone Grouping Plane (psi)	FEH at Zone Grouping Plane (ft NGVD)
15-ft Zone											
48-15	5.60	-4.40	0.60	0.14	Type 2	1.033	2.00	--	0.06	2.06	4.76
49-15	7.60	-2.40	2.60	-1.13	Type 2	1.007	2.54	--	-0.49	2.05	4.72
MW1	6.67	-3.33	1.67	-2.96	Type 2	1.002	3.01	--	-1.28	1.73	3.99
MW2	8.44	-1.56	3.44	-1.56	Type 2	1.005	2.73	--	-0.68	2.05	4.73
MW6	6.60	-3.40	1.60	1.93	Type 2	1.005	1.12	--	0.84	1.96	4.53
MW15	6.53	-3.47	1.53	-1.89	Type 2	1.009	2.77	--	-0.82	1.95	4.49
MW19	6.39	-3.61	1.39	-0.38	Type 2	1.002	2.05	--	-0.17	1.88	4.35
MW20	3.36	-1.64	0.86	-1.40	Type 2	1.003	2.31	--	-0.61	1.70	3.92
721-MW5	1.48	-3.52	-1.02	-2.02	Type 2	1.009	2.68	--	-0.88	1.80	4.15
721-MW6	1.30	-3.70	-1.20	-3.70	Type 2	1.002	4.06	--	-1.61	2.45	5.66
721-MW7	1.19	-3.81	-1.31	-3.47	Type 2	1.005	3.17	--	-1.51	1.66	3.83
721-MW8	1.02	-3.98	-1.48	-3.98	Type 2	1.004	3.29	--	-1.73	1.56	3.60
721-MW9	1.37	-3.63	-1.13	-3.63	Type 2	1.003	3.33	--	-1.58	1.75	4.05
721-MW10	0.63	-4.37	-1.87	-0.05	Type 2	1.011	1.47	--	-0.02	1.45	3.34
Waterway											1.00[1]
25-ft Zone											
3-25	-7.40	-12.40	-9.90	-5.93	Type 1	1.004	4.61	1.73	0.04	6.38	4.72
6A-24.5	-7.90	-12.90	-10.40	-11.35	Type 2	1.011	5.66	--	-0.59	5.07	1.70
MW15A	-13.55	-18.55	-16.05	-18.03	Type 2	1.011	8.55	--	-3.52	5.03	1.62
MW20-25	-6.47	-11.47	-8.97	-10.58	Type 2	1.003	5.17	--	-0.25	4.92	1.35
721-MW5-25	-8.53	-13.53	-11.03	-9.84	Type 2	1.004	4.95	--	0.07	5.02	1.59
721-MW6-25	-8.73	-13.73	-11.23	-13.73	Type 2	1.003	6.65	--	-1.62	5.03	1.61
721-MW9-25	-8.60	-13.60	-11.10	-12.15	Type 2	1.004	5.78	--	-0.93	4.85	1.19
721-MW10-25	-9.30	-14.30	-11.80	-14.25	Type 2	1.003	6.64	--	-1.85	4.79	1.06
Waterway											1.16[1]
50-ft Zone											
3-50	-32.40	-37.40	-34.90	-9.03	Type 1	1.007	4.66	11.28	0.04	15.99	1.90
6A-50	-33.10	-38.10	-35.60	-10.49	Type 1	1.002	5.21	10.90	-0.26	15.85	1.58
MW20-50	-31.79	-36.79	-34.29	-19.29	Type 1	1.003	9.01	6.52	0.31	15.84	1.56
721-MW5-50	-32.61	-37.61	-35.11	-12.00	Type 1	1.005	5.94	10.06	-0.05	15.95	1.83
721-MW6-50	-33.82	-38.82	-36.32	-13.45	Type 1	1.006	6.54	9.97	-0.58	15.93	1.78
721-MW9-50	-33.90	-38.90	-36.40	-23.94	Type 1	1.012	11.11	5.46	-0.61	15.96	1.83
721-MW10-50	-34.34	-39.34	-36.84	-9.41	Type 1	1.010	4.71	12.00	-0.81	15.91	1.72
Waterway											1.56[1]

Notes:
[1] Waterway FEH is based on Serfes (1991) mean elevation of 0.98 ft NGVD. [2] NGVD: National Geodetic Vertical Datum [3] PSI: Pounds per Square Inch

Attachment 1

Measured Pressure Hydrographs

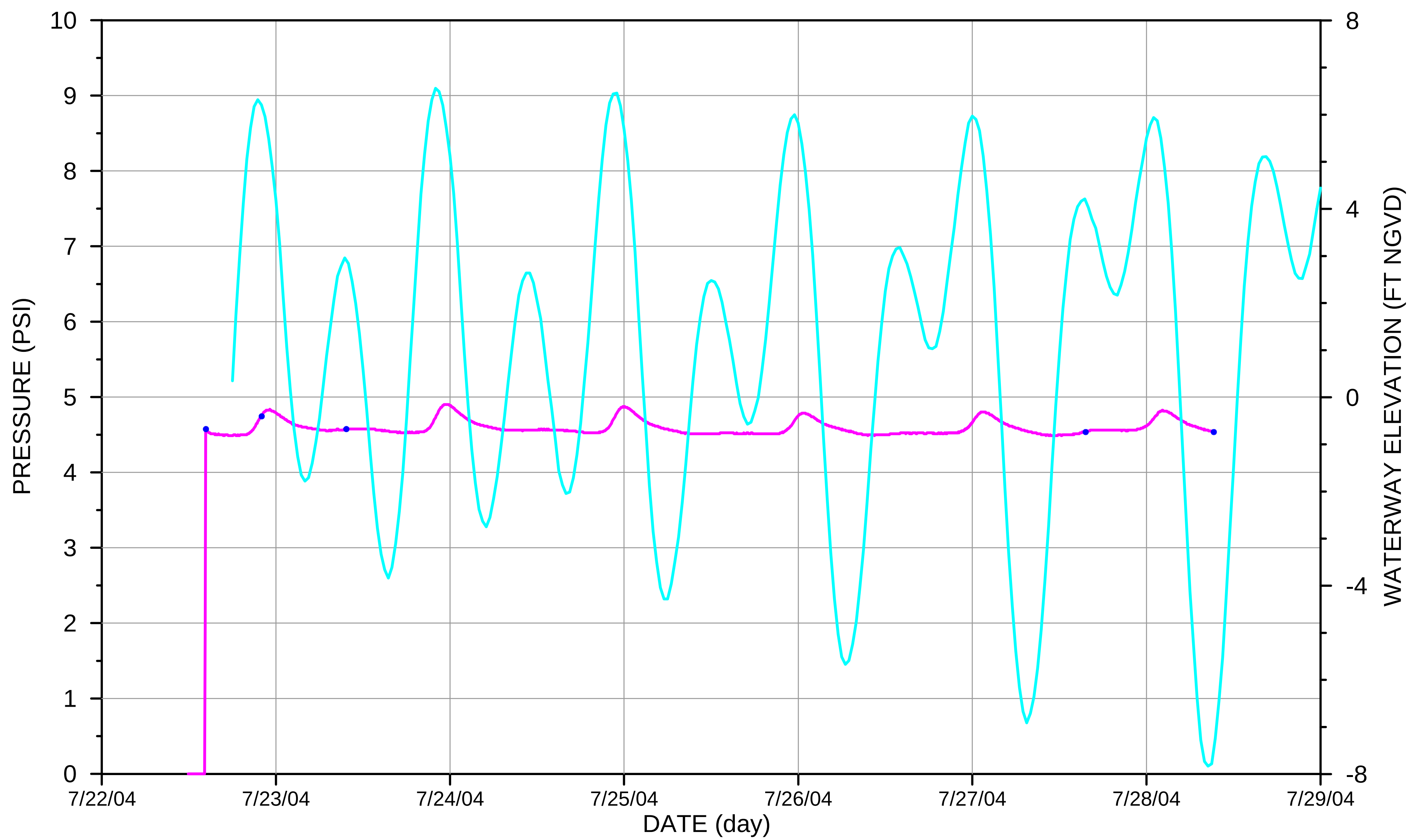

figure 1-1

3-25 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

I

Occidental Chemical Corporation, Tacoma, Washington

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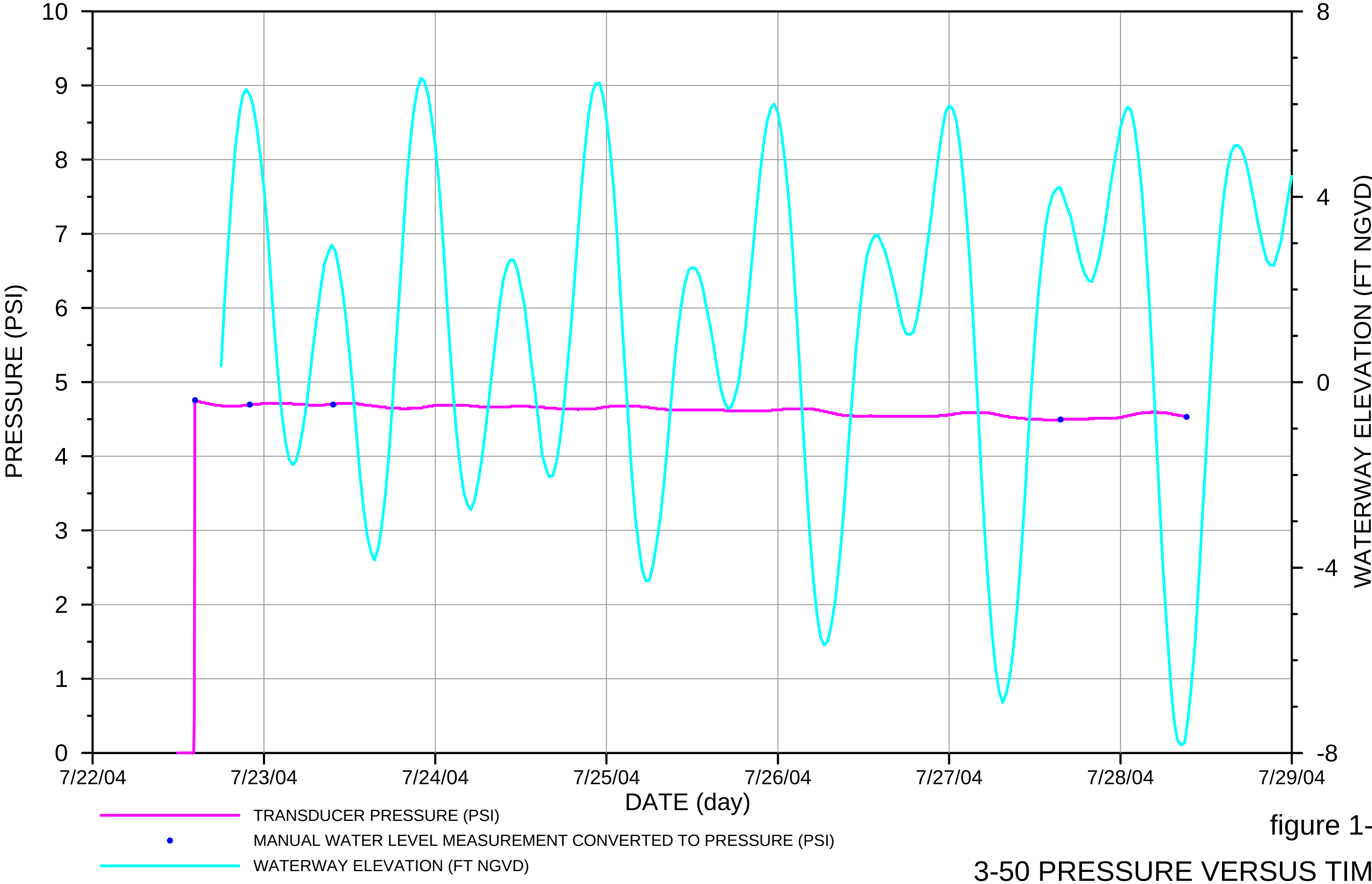

figure 1-2

3-50 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

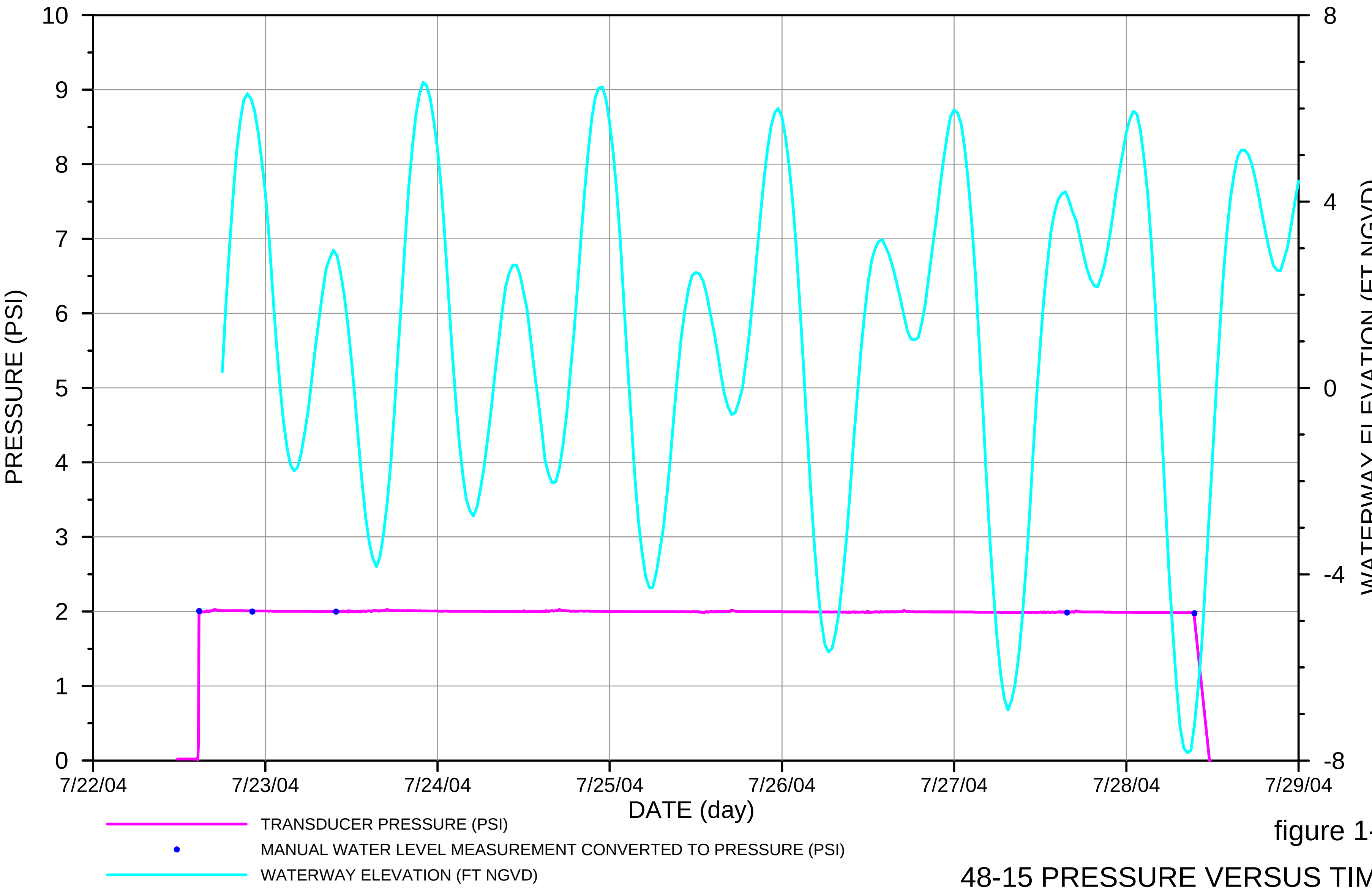

figure 1-3

48-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

CRA

Occidental Chemical Corporation, Tacoma, Washington

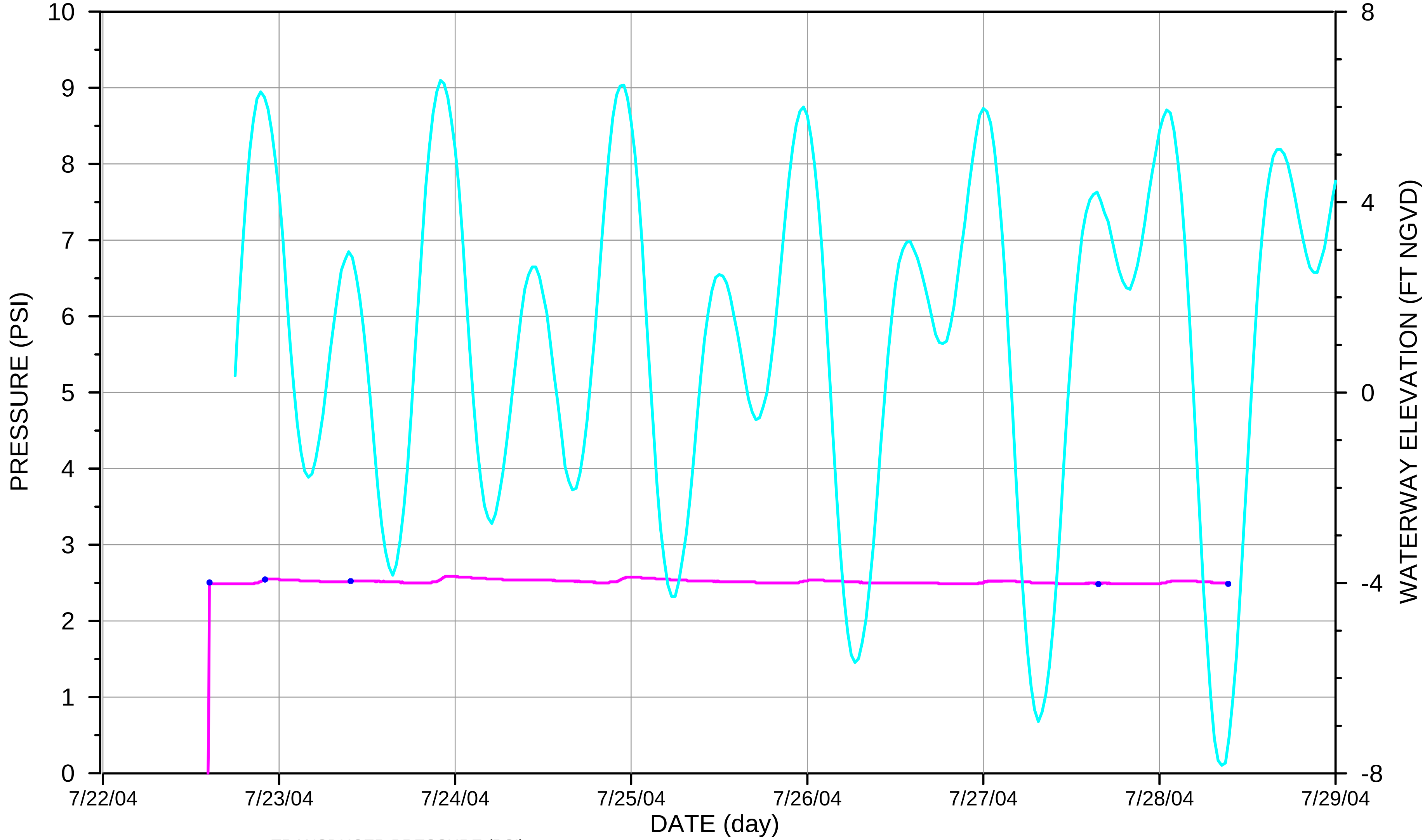

figure 1-4

49-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

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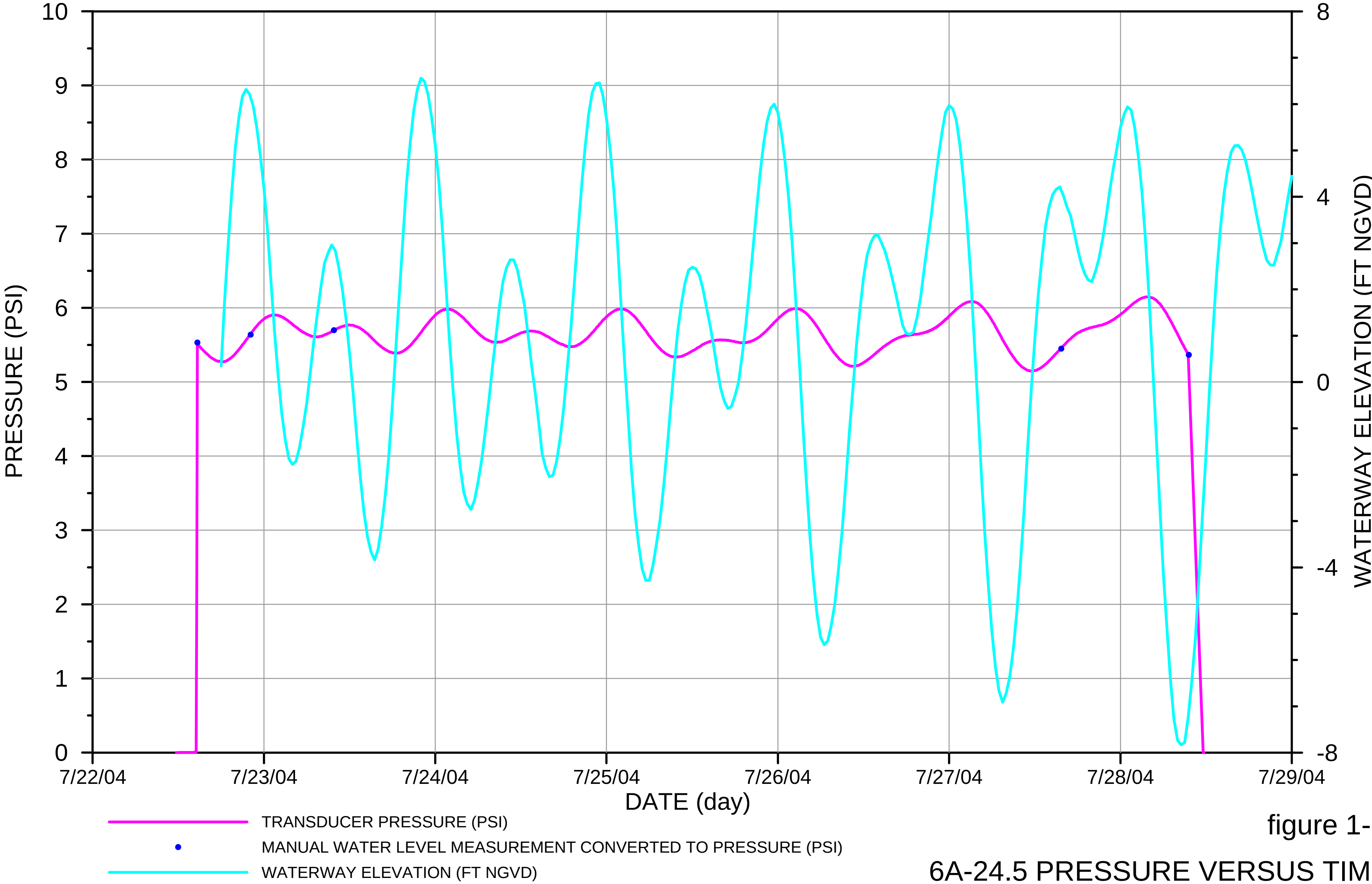

figure 1-5

6A-24.5 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

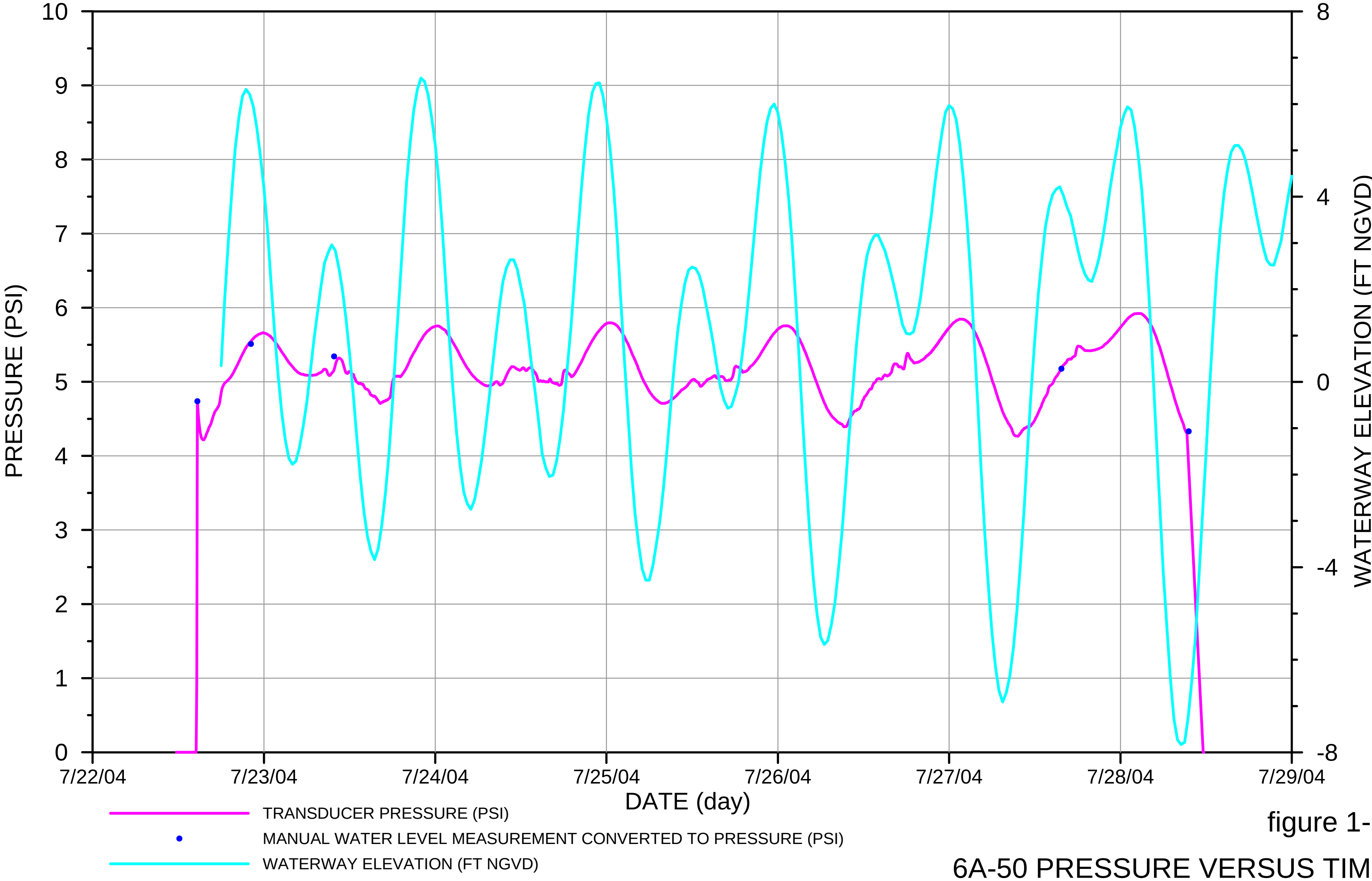

figure 1-6

6A-50 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

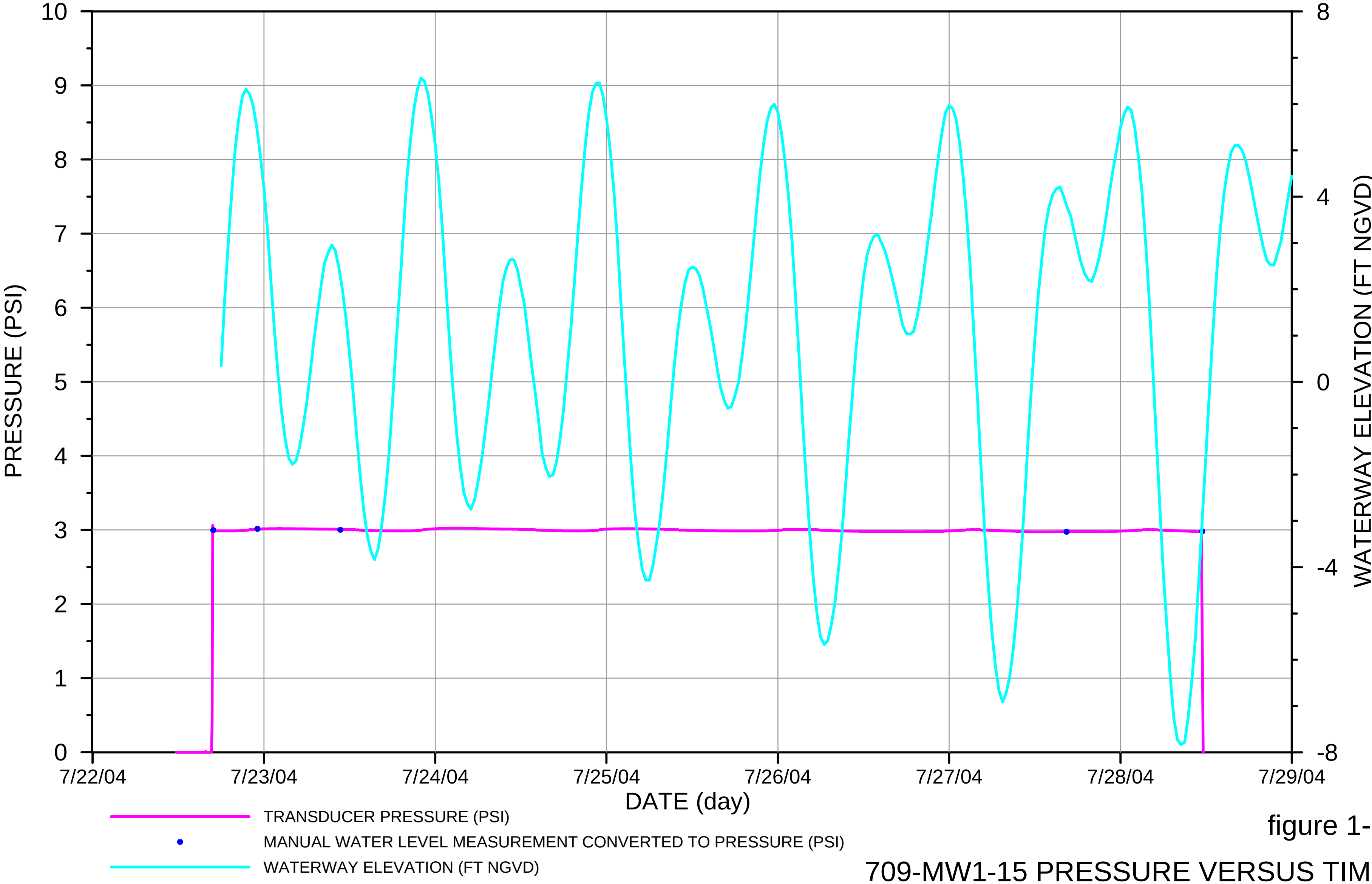

figure 1-7

709-MW1-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\709-MW1-15_p.grf) JUN 19/2007

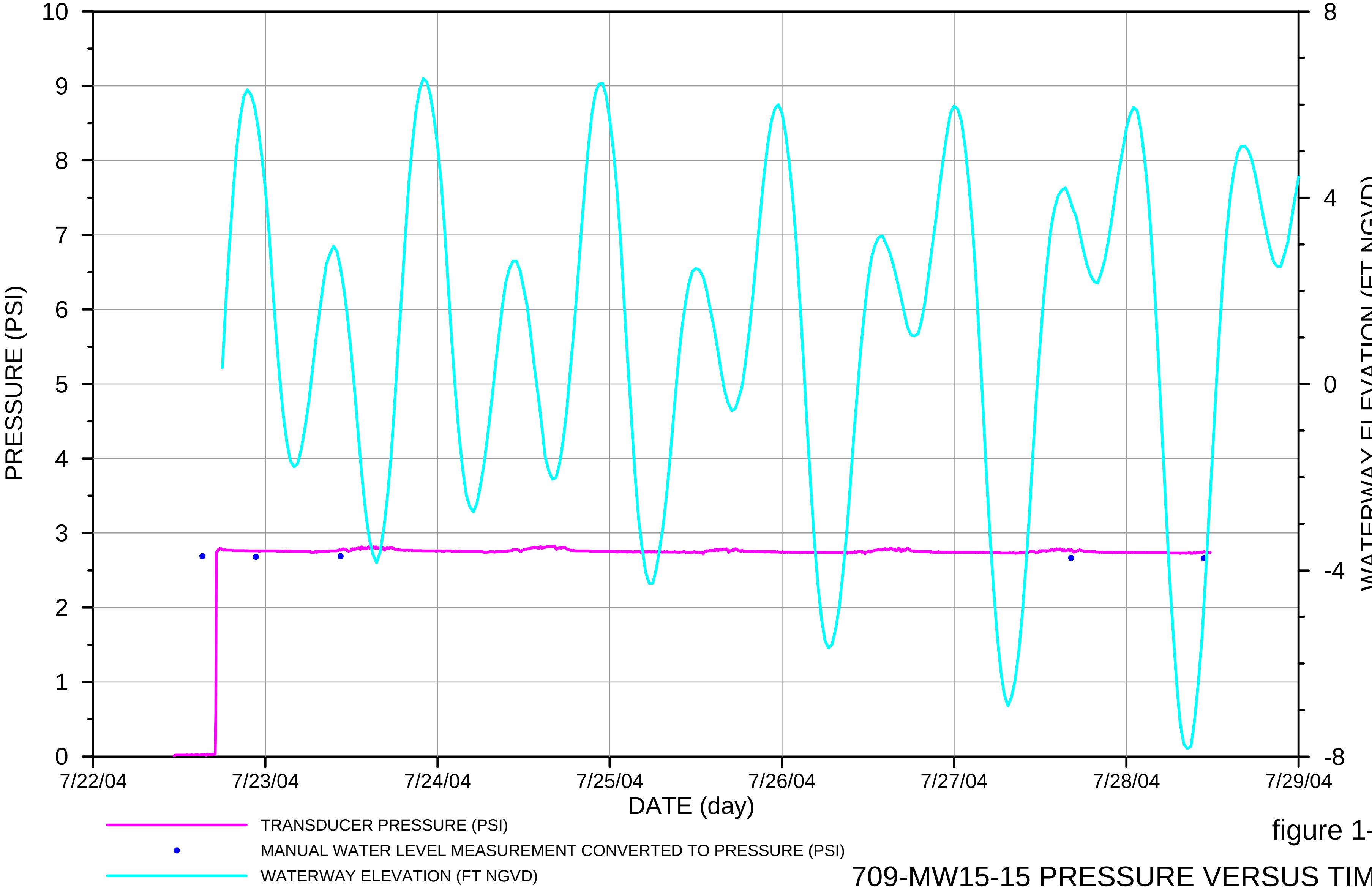

figure 1-8

709-MW15-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\709-MW15-15_p.grf) JUN 19/2007

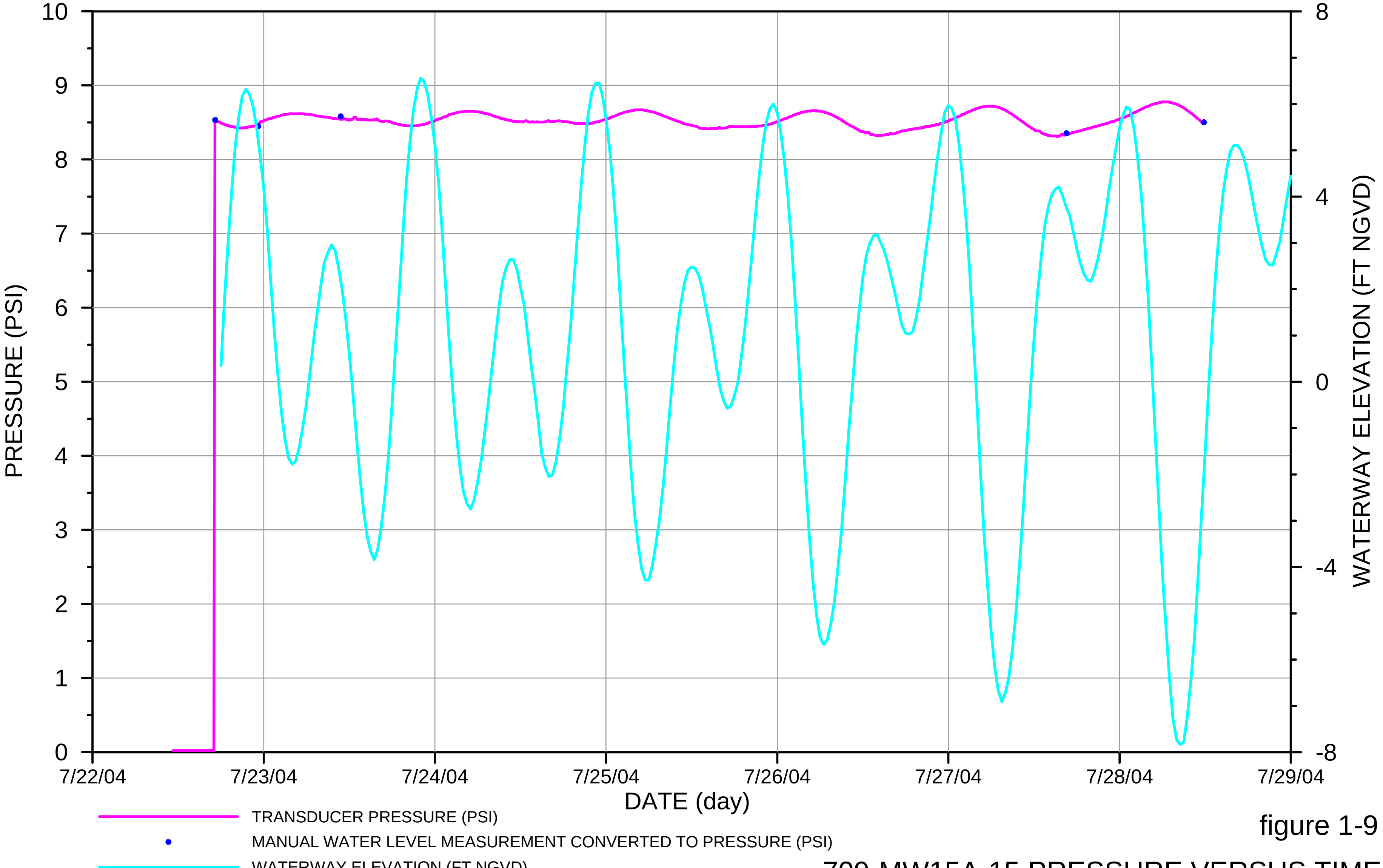

figure 1-9

709-MW15A-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

CRA

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\709-MW15A-15_p.grf) JUN 19/2007

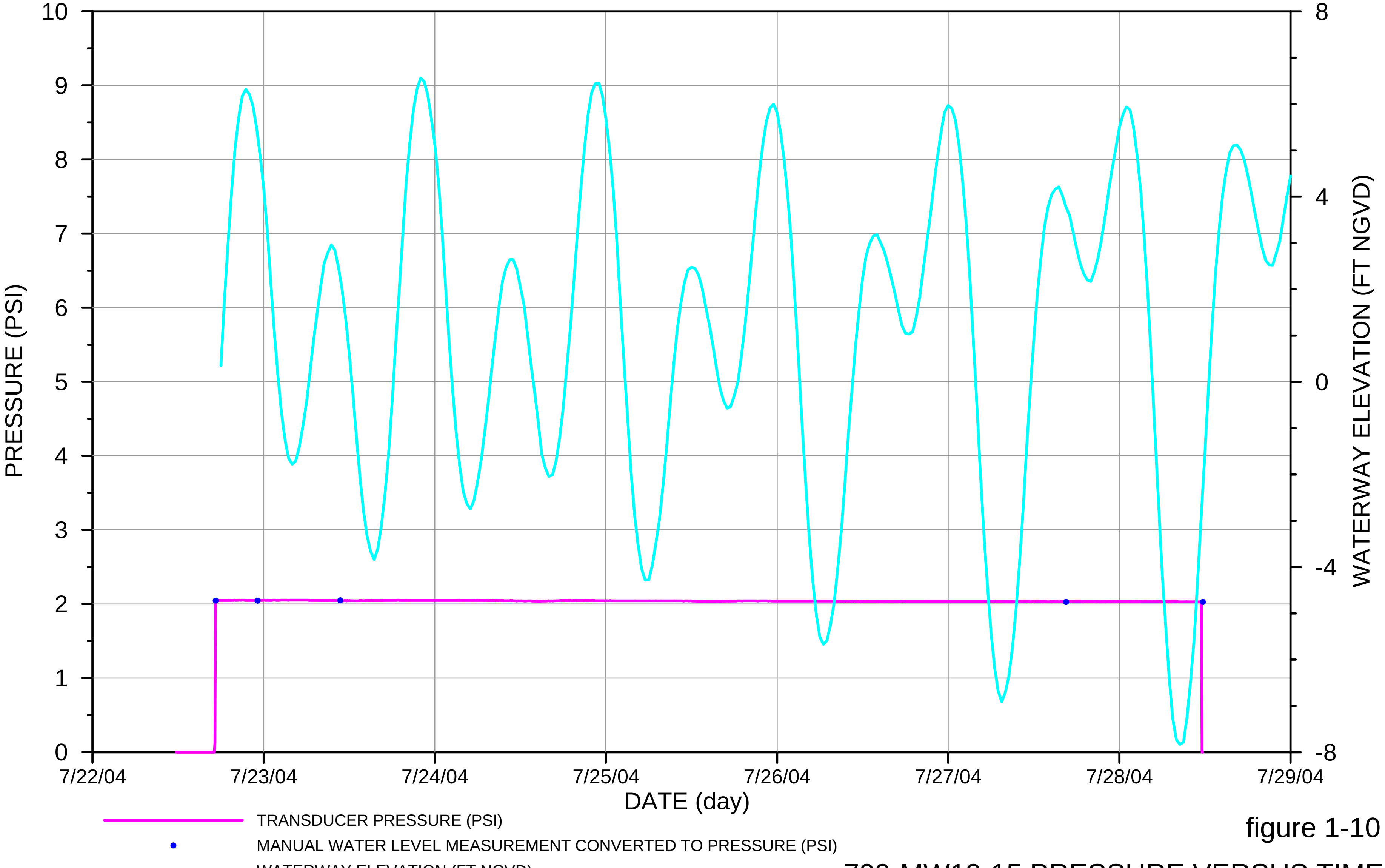

figure 1-10

709-MW19-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\709-MW19-15_p.grf) JUN 19/2007

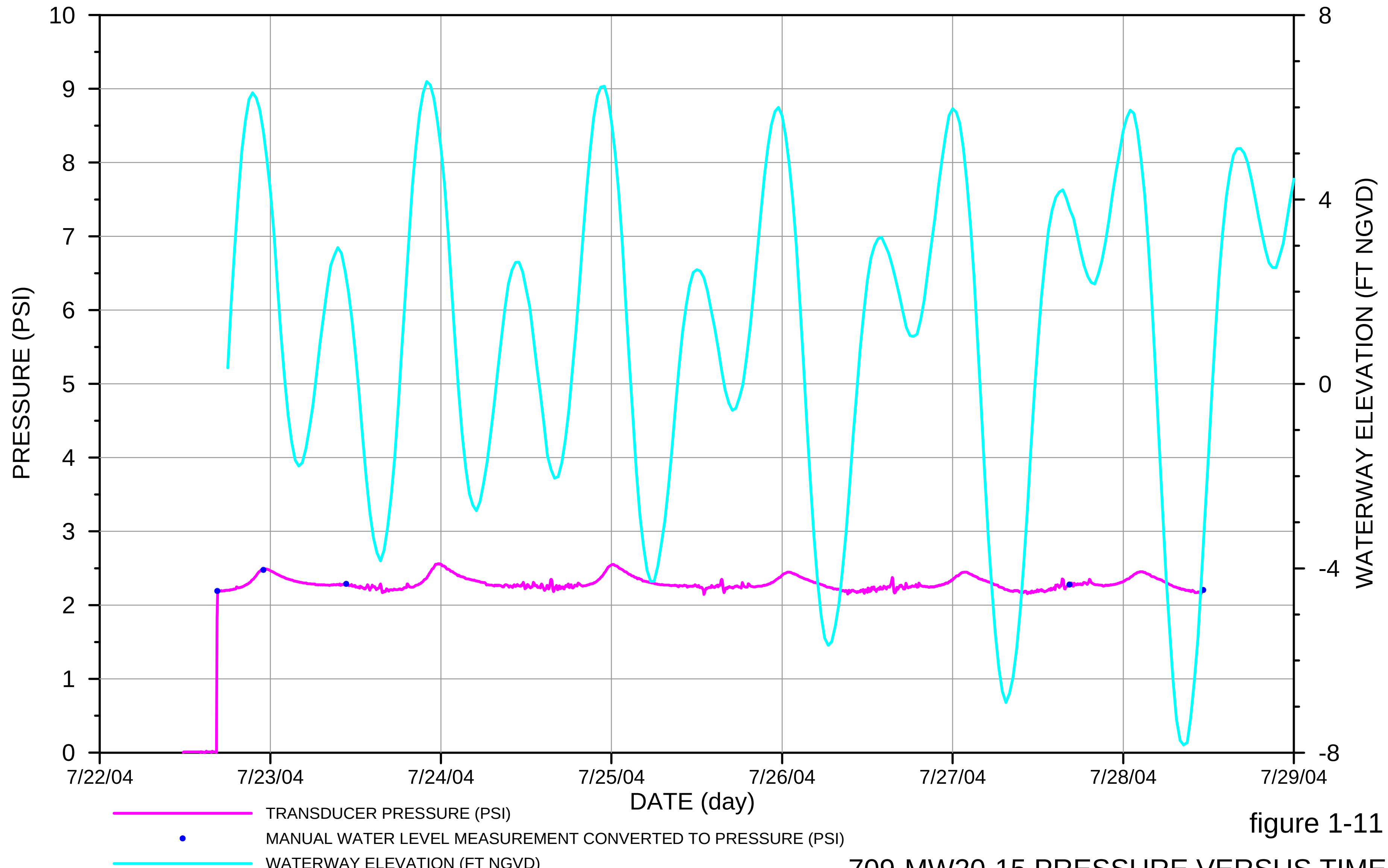

figure 1-11

709-MW20-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\709-MW20-15_p.grf) JUN 19/2007

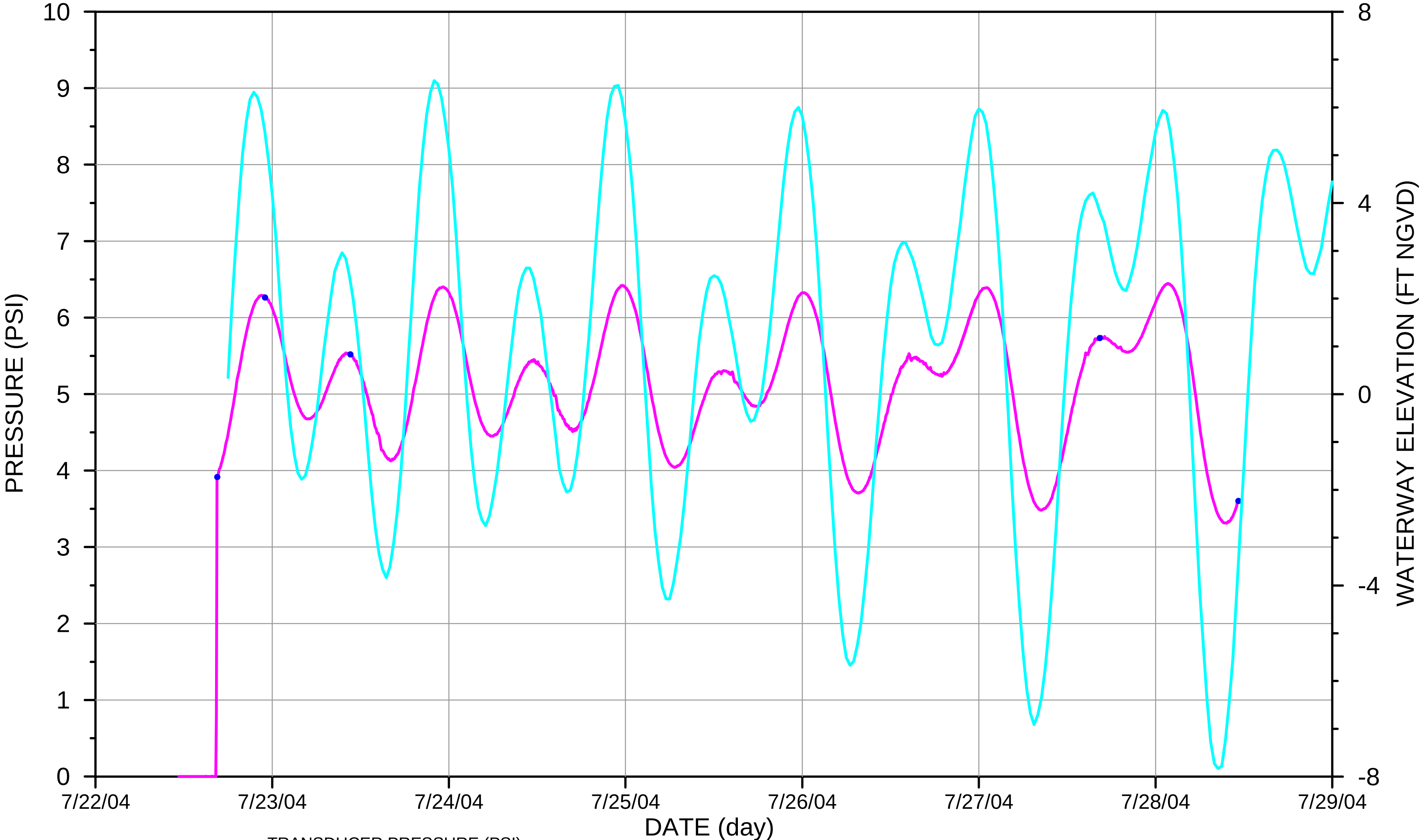

figure 1-12

709-MW20-25 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\709-MW20-25_p.grf) JUN 19/2007

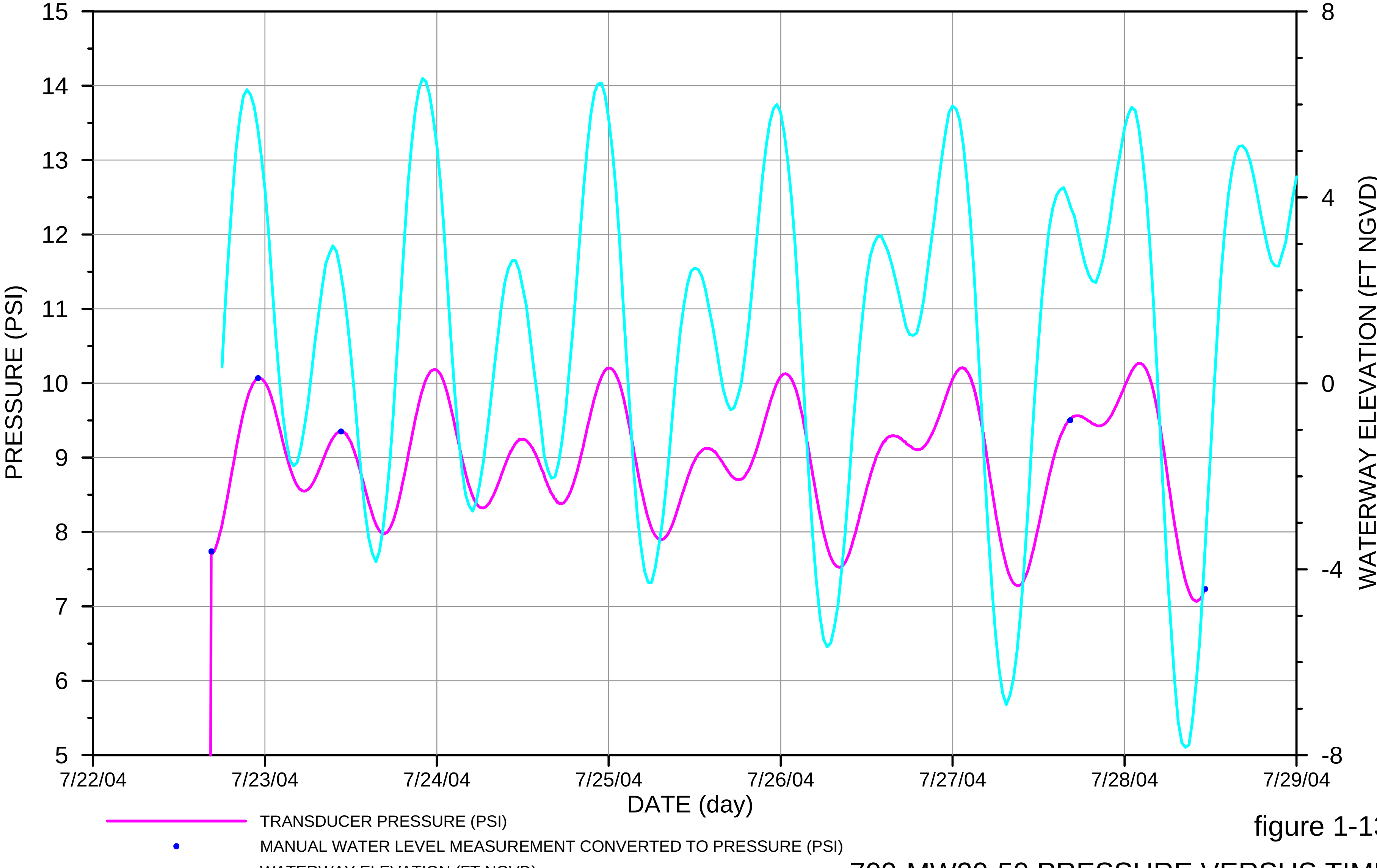

figure 1-13

709-MW20-50 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\709-MW20-50_p.grf) JUN 19/2007

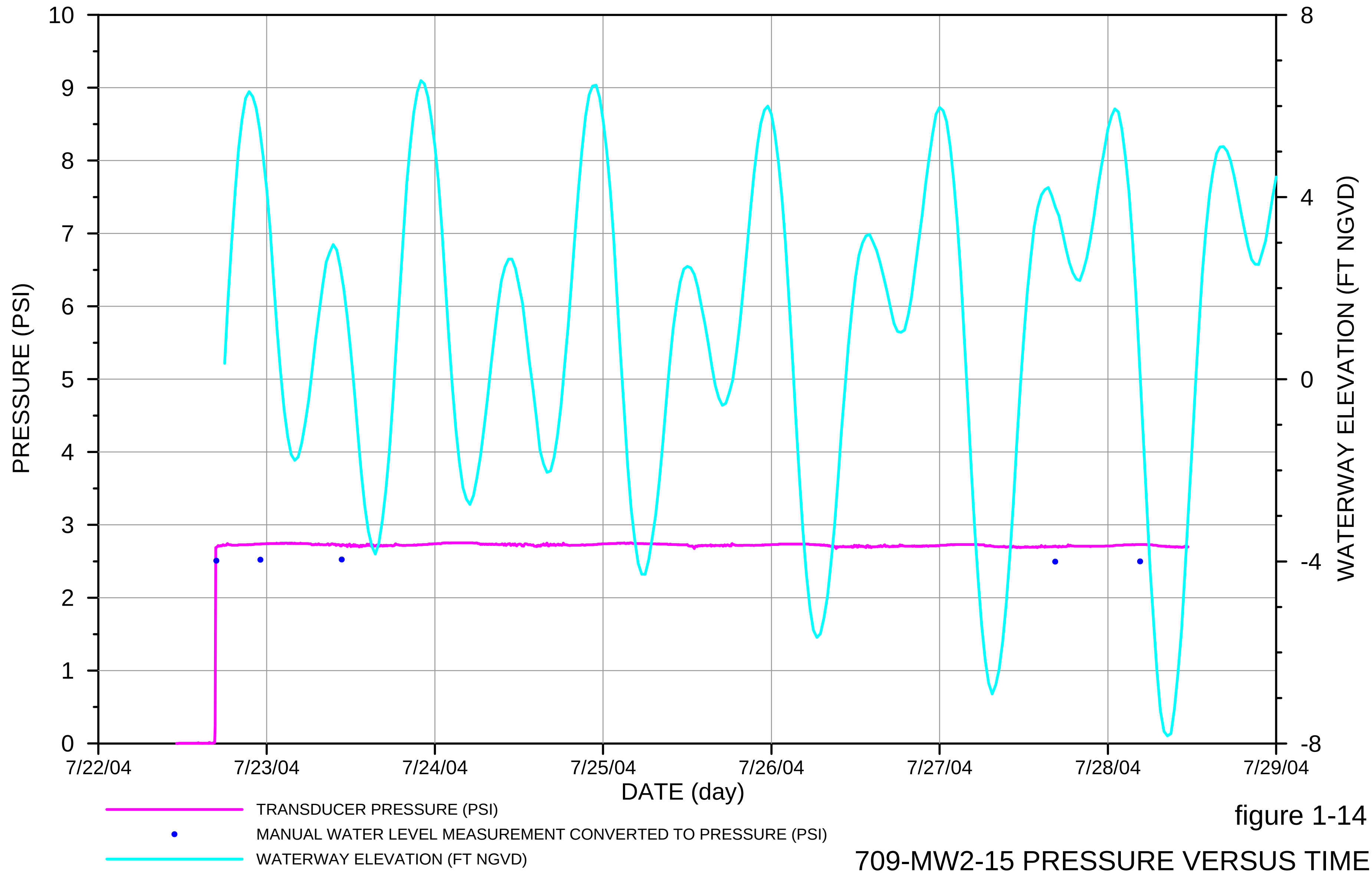

figure 1-14

709-MW2-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

CRA

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\709-MW2-15_p.grf) JUN 19/2007

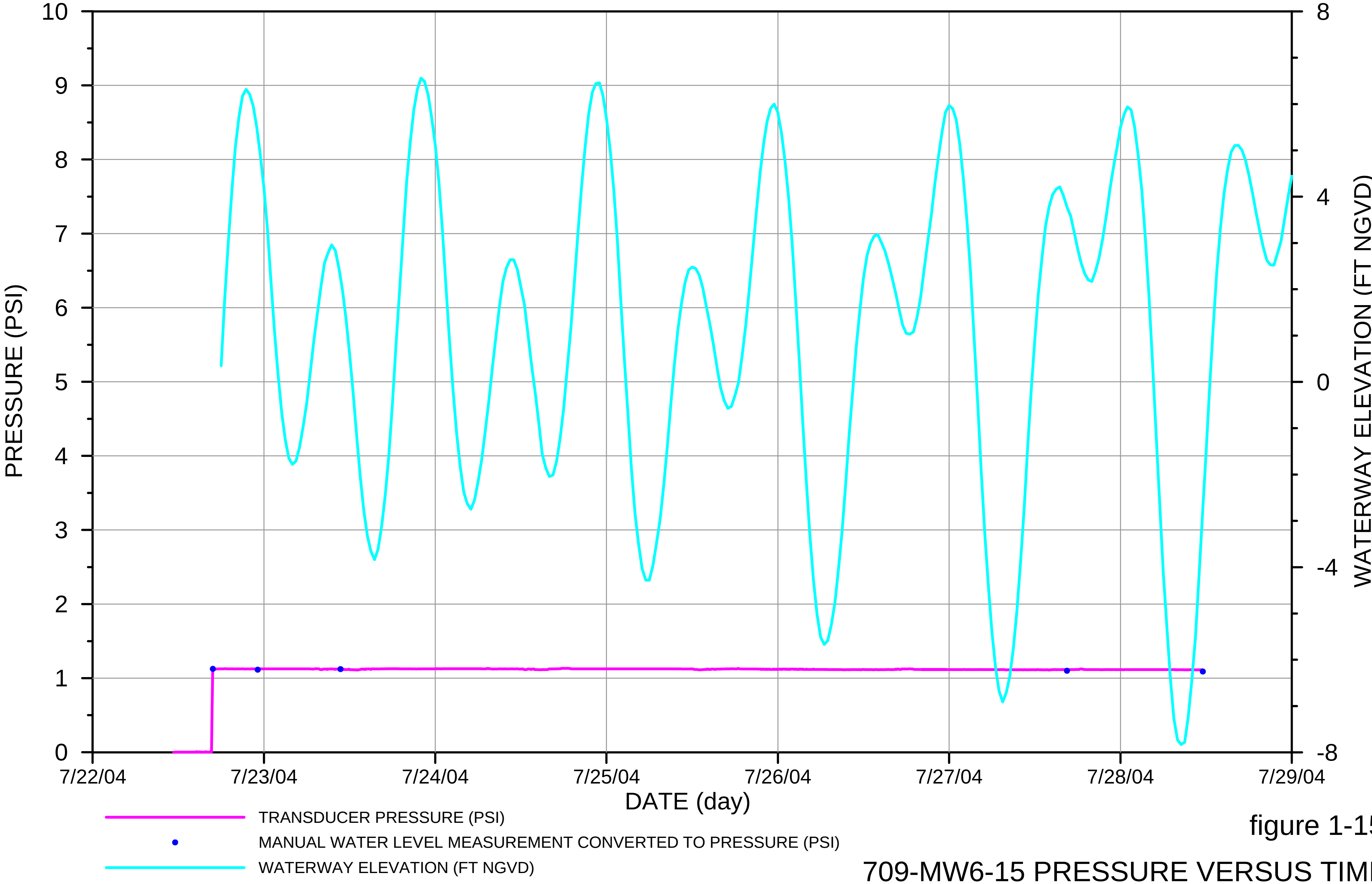

figure 1-15

709-MW6-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

CRA

Occidental Chemical Corporation, Tacoma, Washington

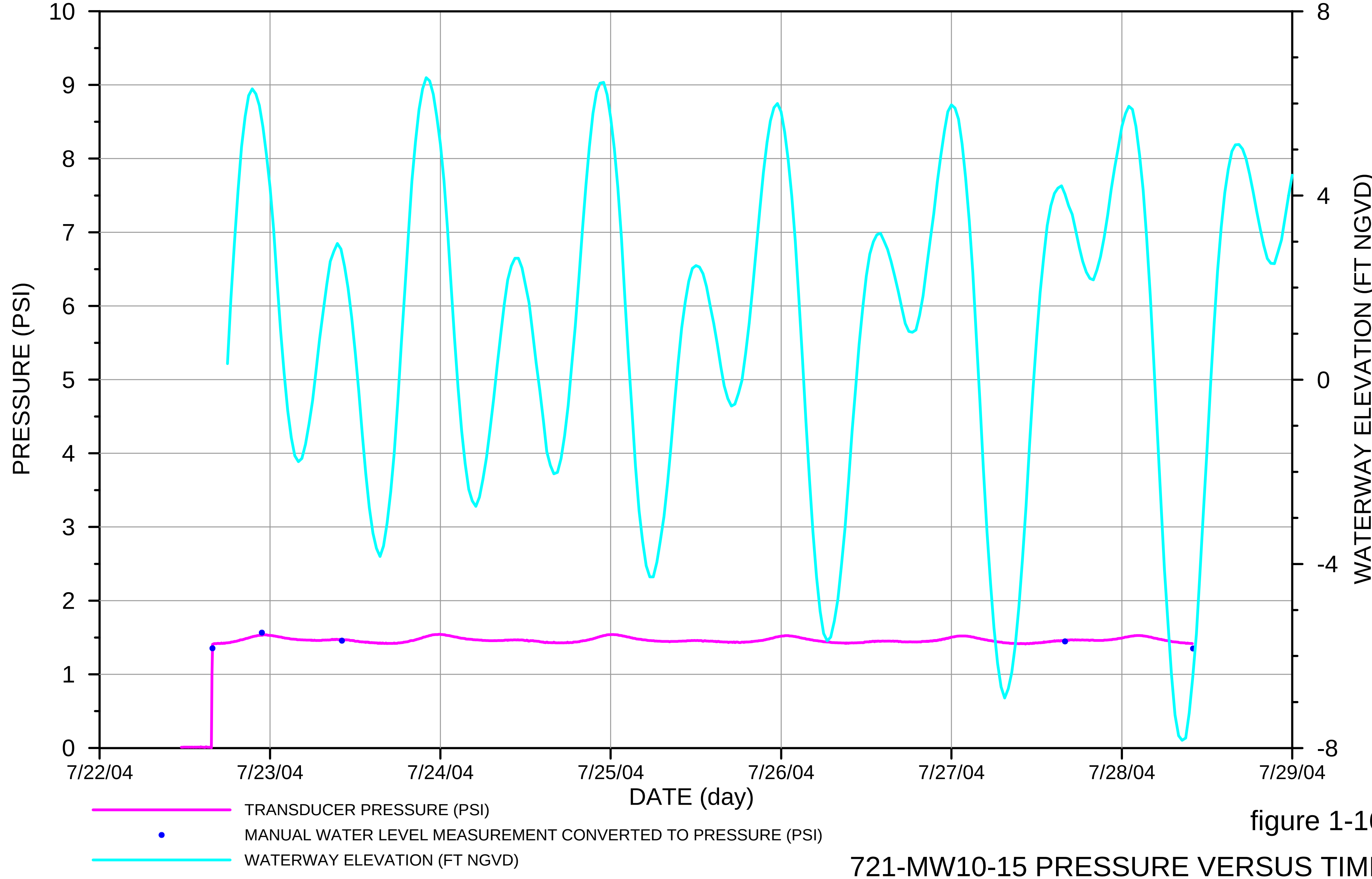

figure 1-16

721-MW10-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

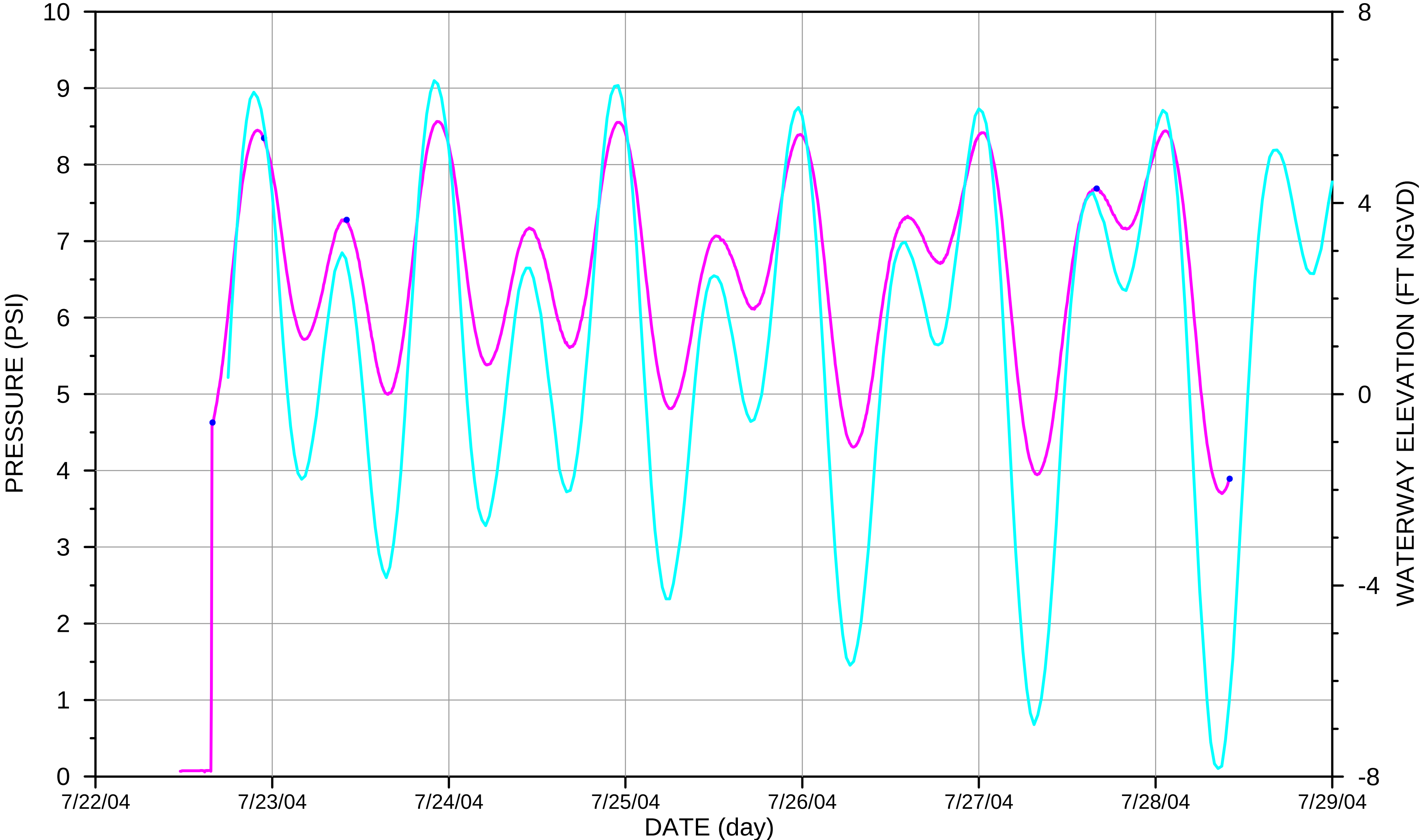

figure 1-17

721-MW10-25 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

CRA

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\721-MW10-25_p.grf) JUN 19/2007

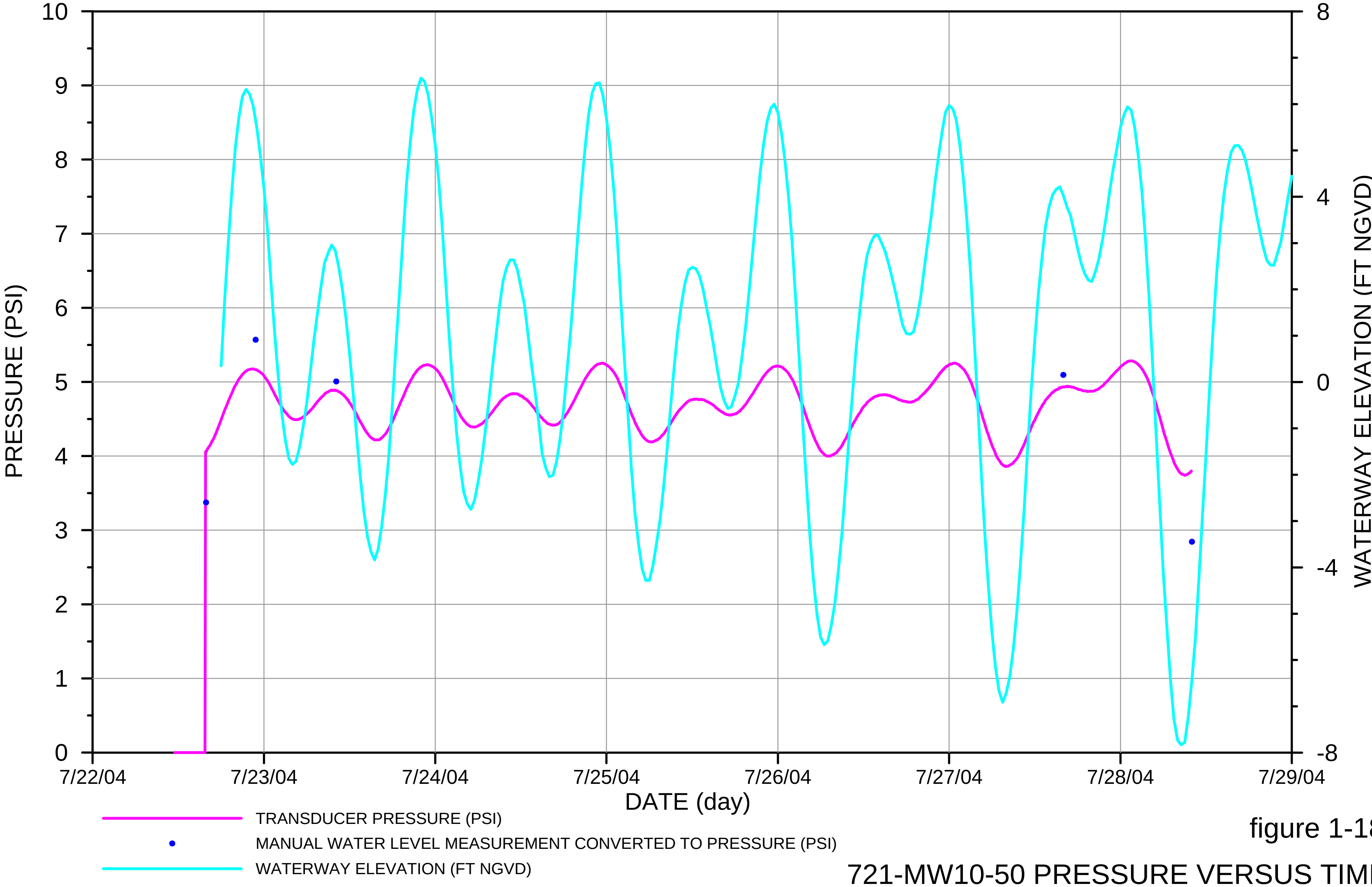

figure 1-18

721-MW10-50 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

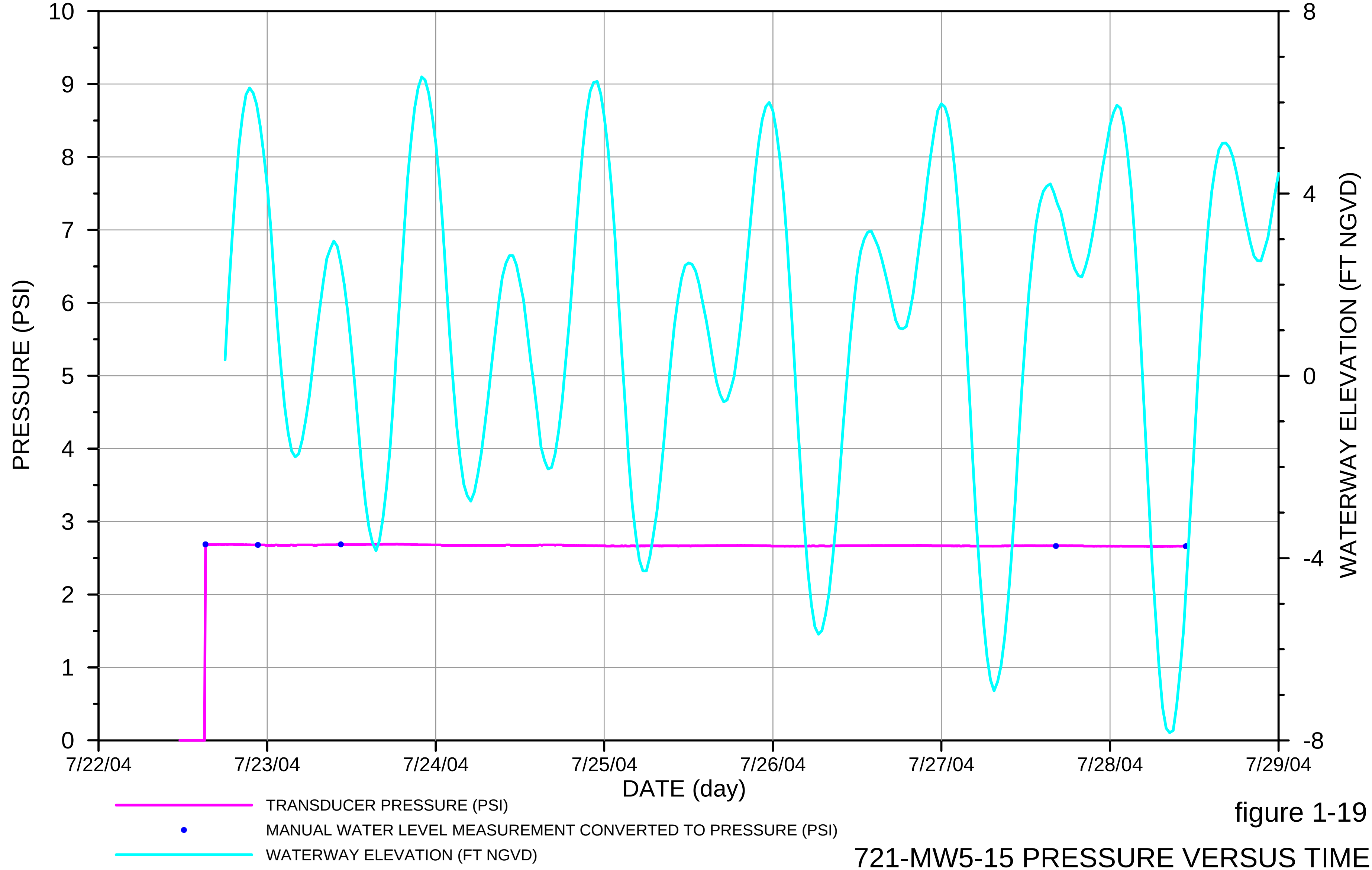

figure 1-19

721-MW5-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\721-MW5-15_p.grf) JUN 19/2007

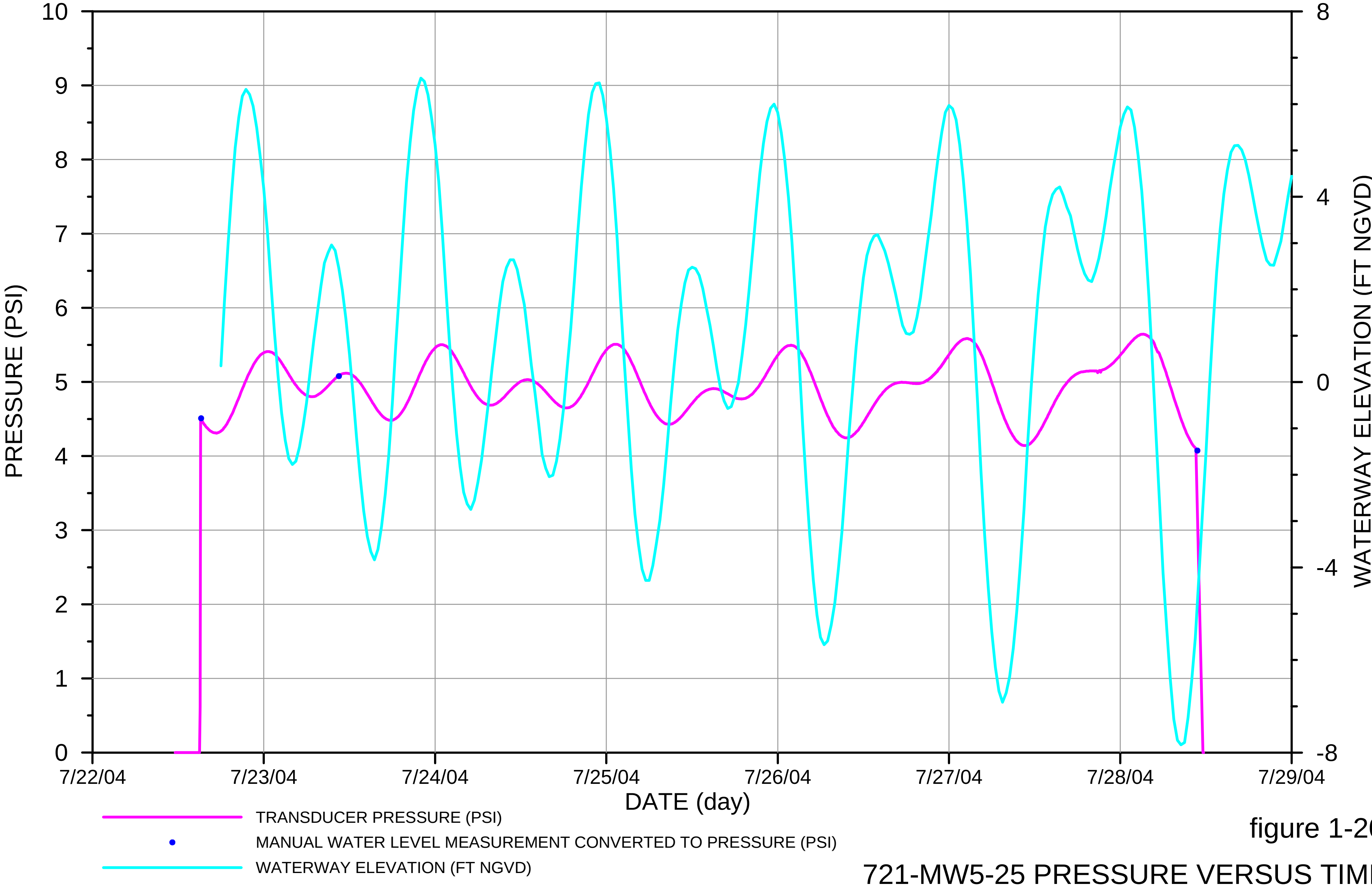

figure 1-20

721-MW5-25 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

CRA

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\721-MW5-25_p.grf) JUN 19/2007

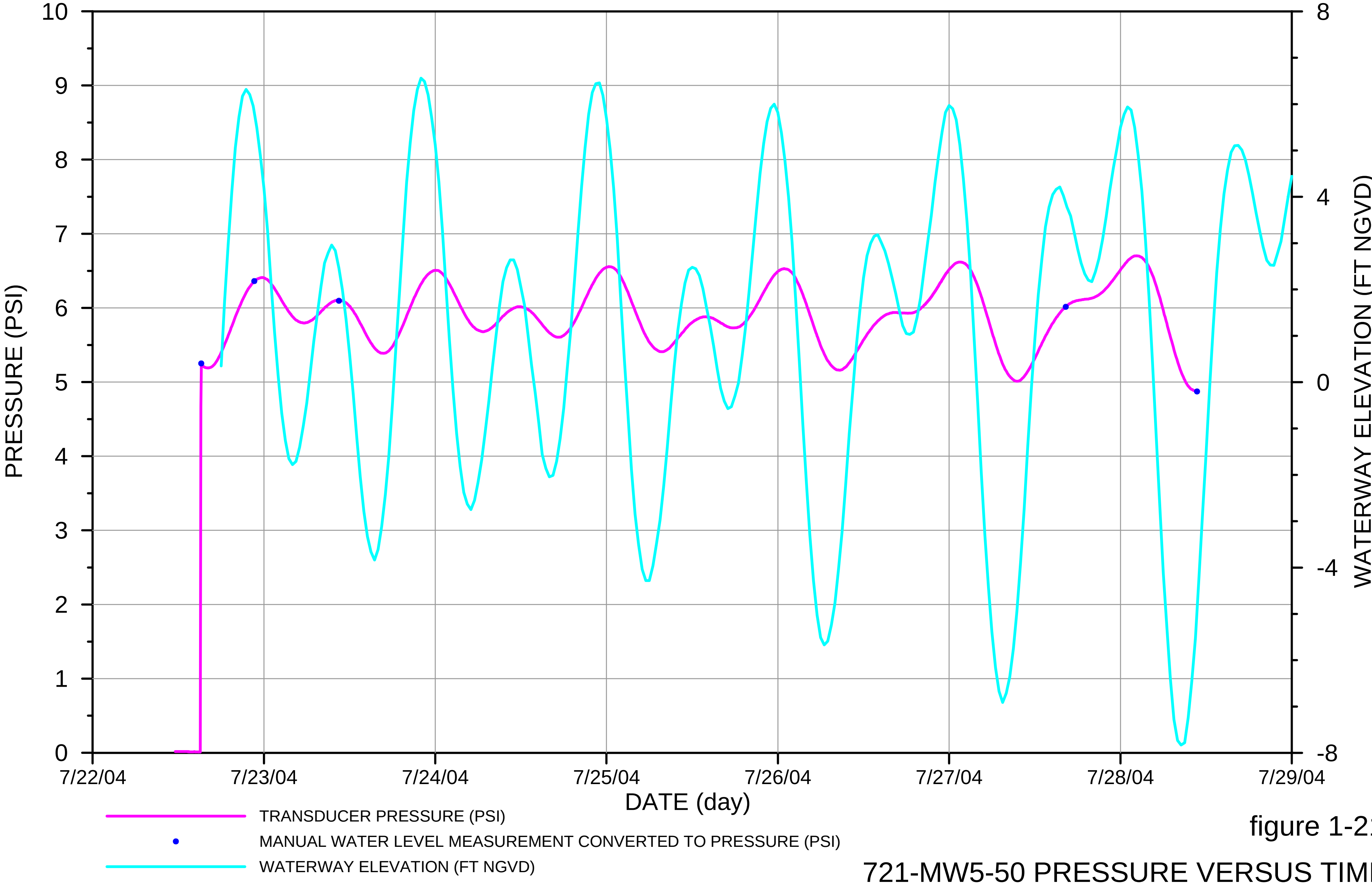

figure 1-21

721-MW5-50 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

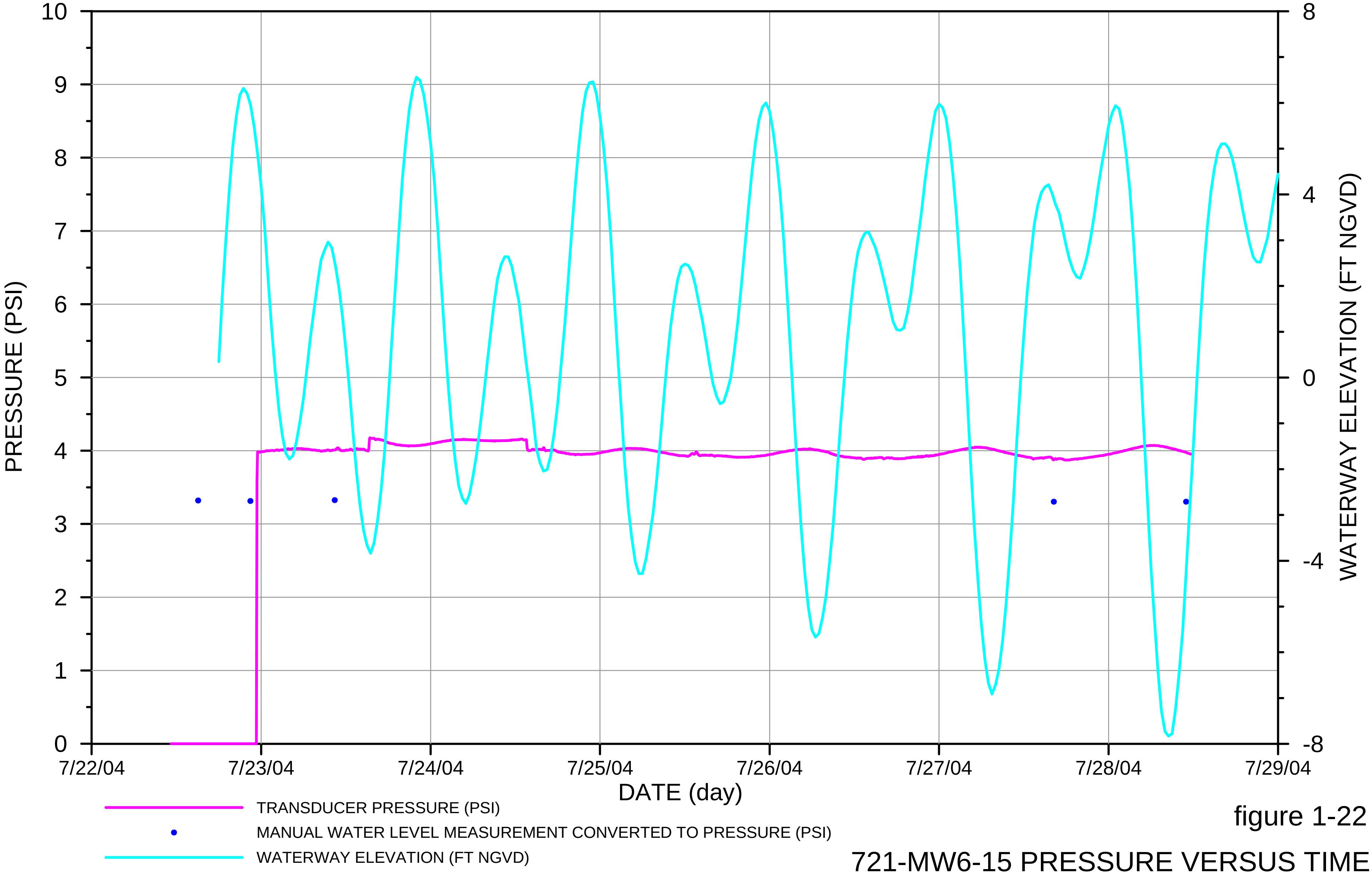

figure 1-22

721-MW6-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

INTERIM DATA REPORT

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\721-MW6-15_p.grf) JUN 19/2007

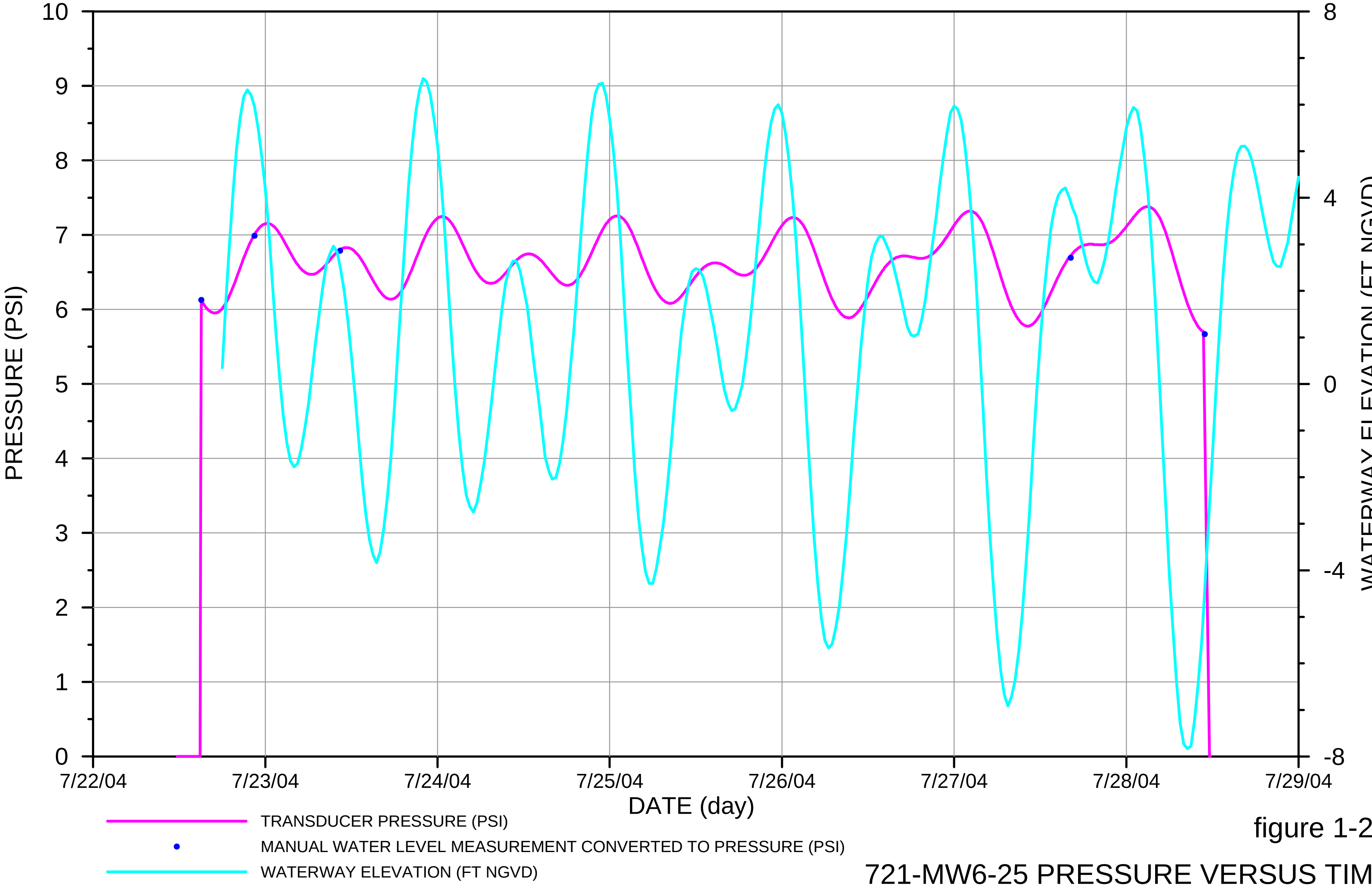

figure 1-23

721-MW6-25 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\721-MW6-25_p.grf) JUN 19/2007

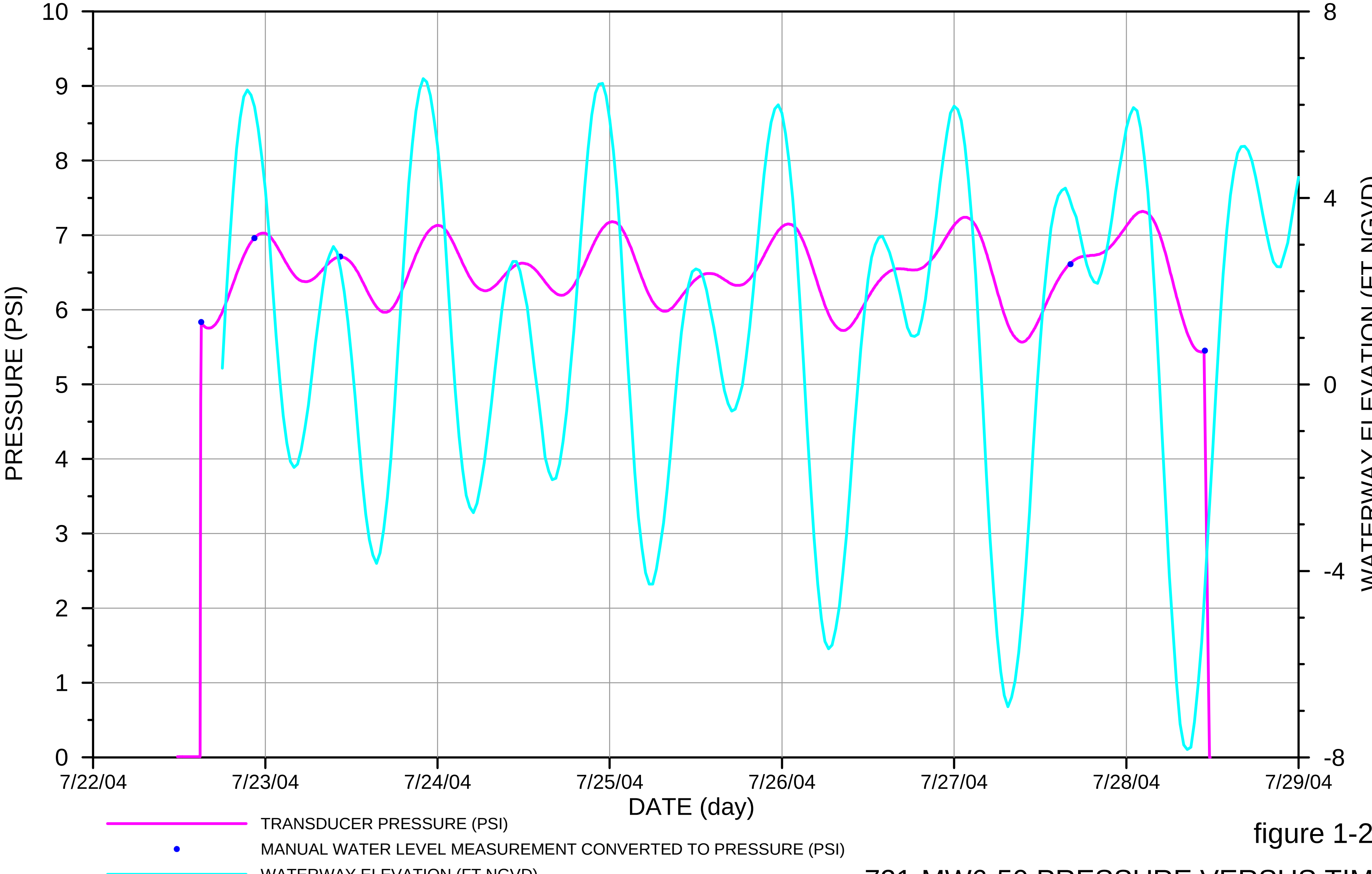

figure 1-24

721-MW6-50 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\721-MW6-50_p.grf) JUN 19/2007

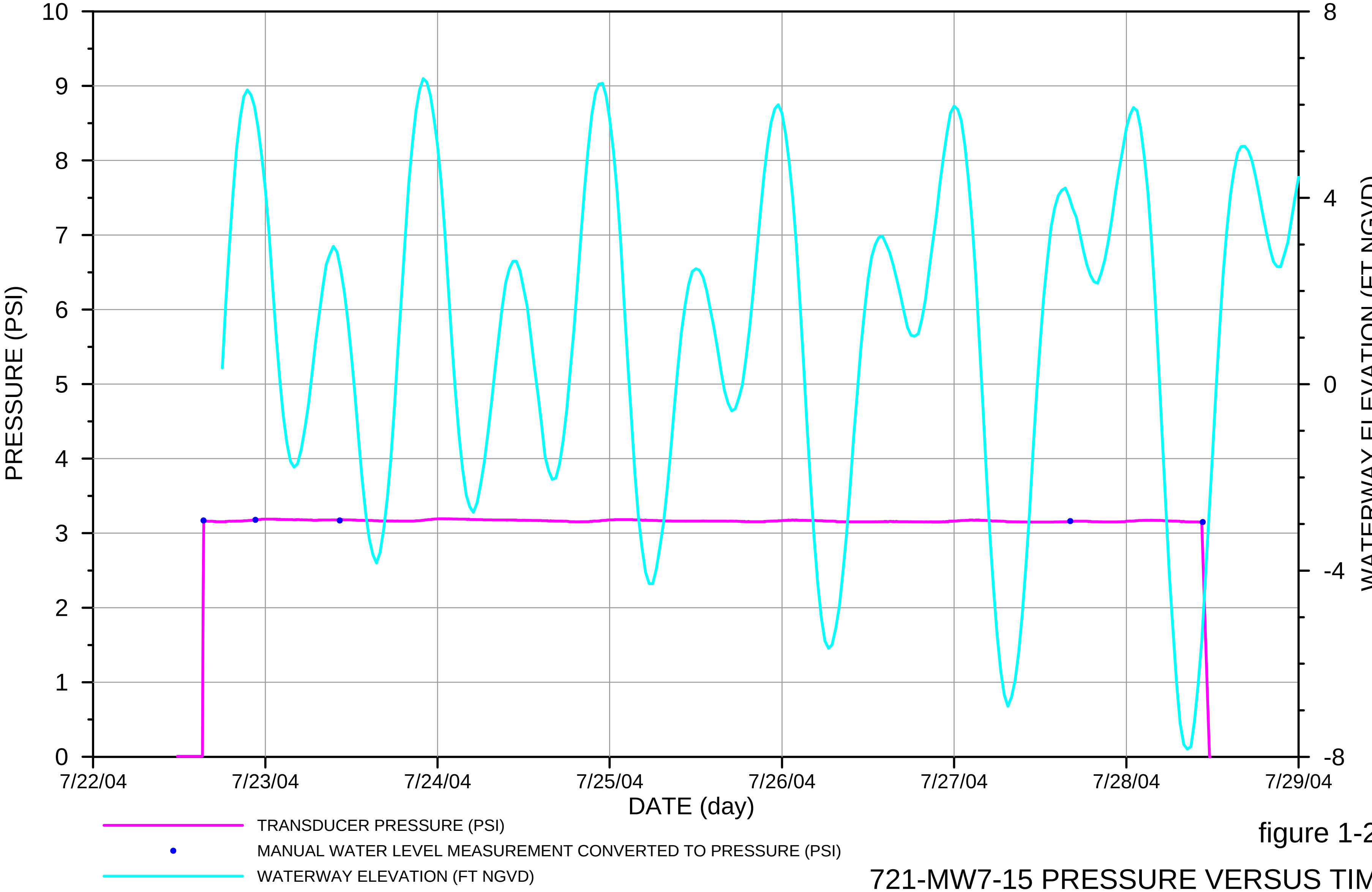

figure 1-25

721-MW7-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

CRA

Occidental Chemical Corporation, Tacoma, Washington

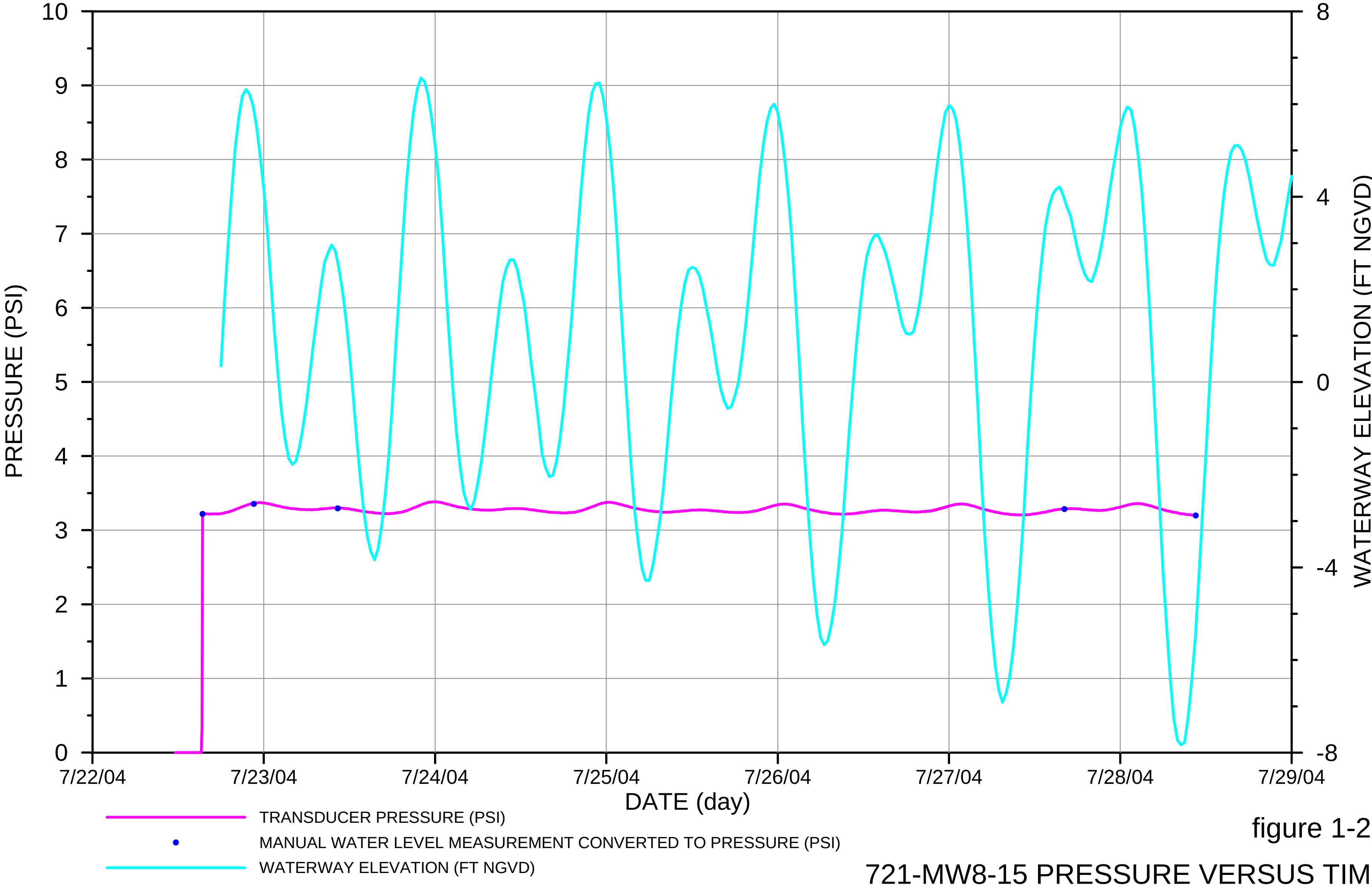

figure 1-26

721-MW8-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

CRA

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\721-MW8-15_p.grf) JUN 19/2007

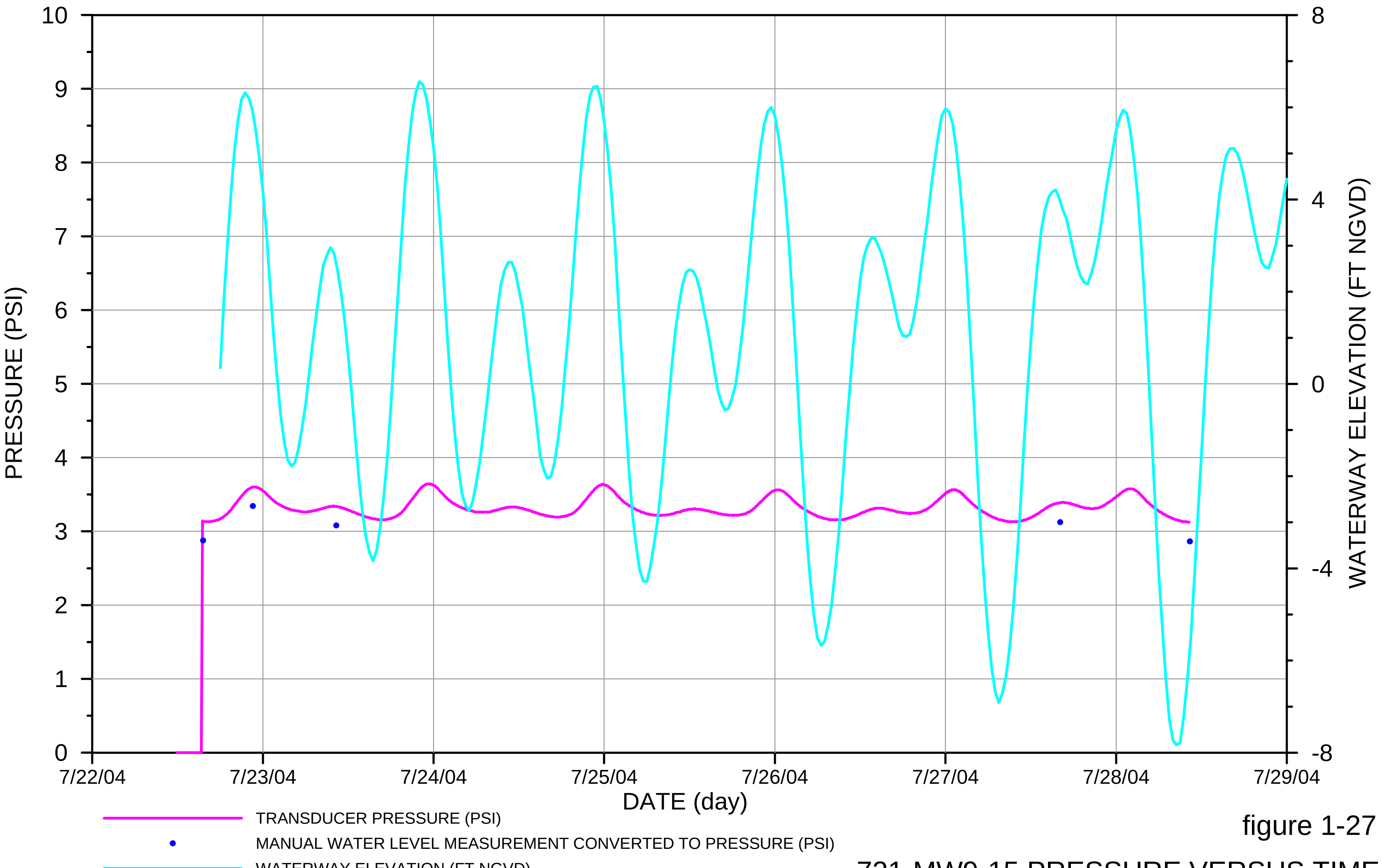

figure 1-27

721-MW9-15 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\721-MW9-15_p.grf) JUN 19/2007

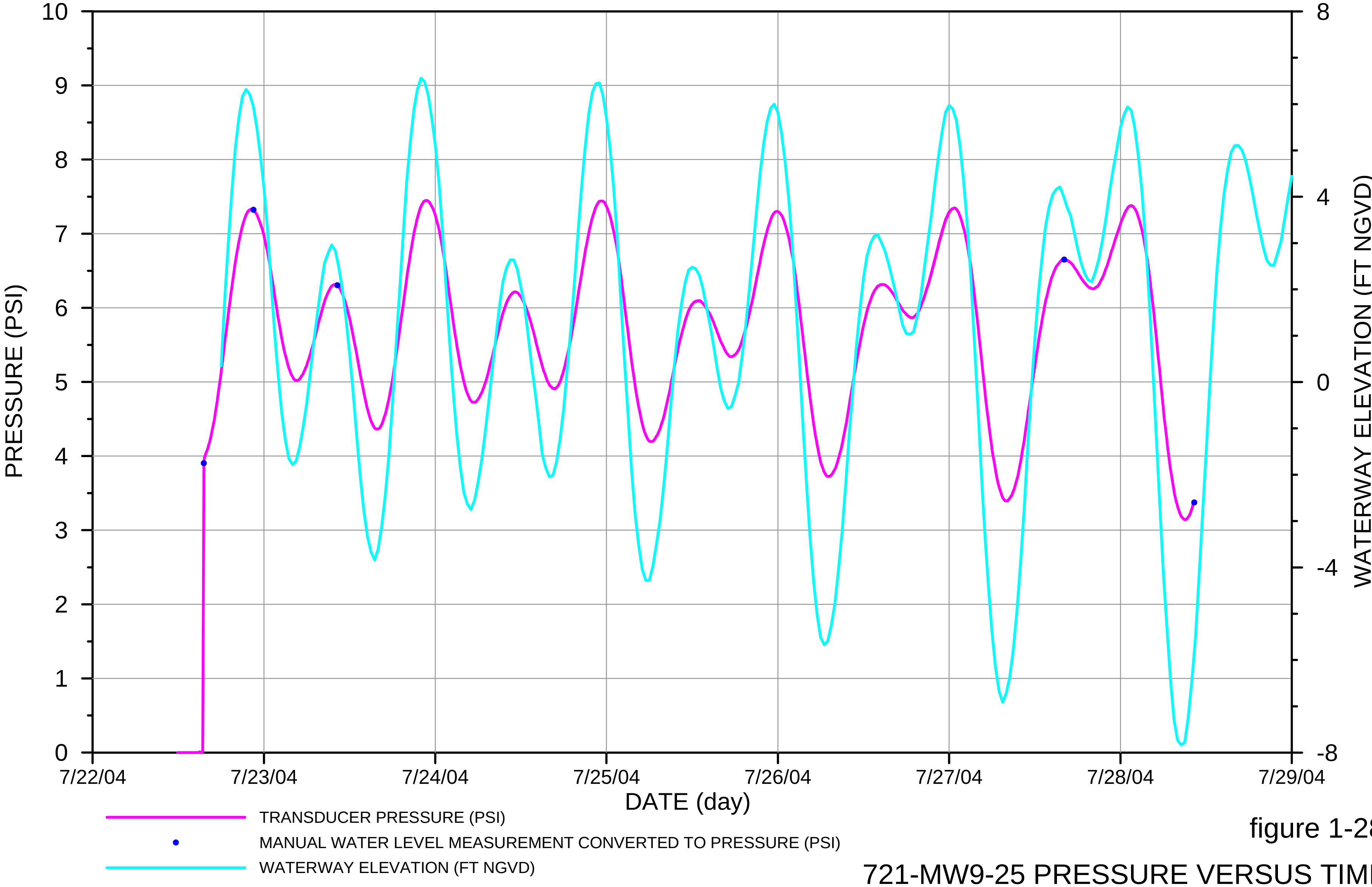

figure 1-28

721-MW9-25 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\721-MW9-25_p.grf) JUN 19/2007

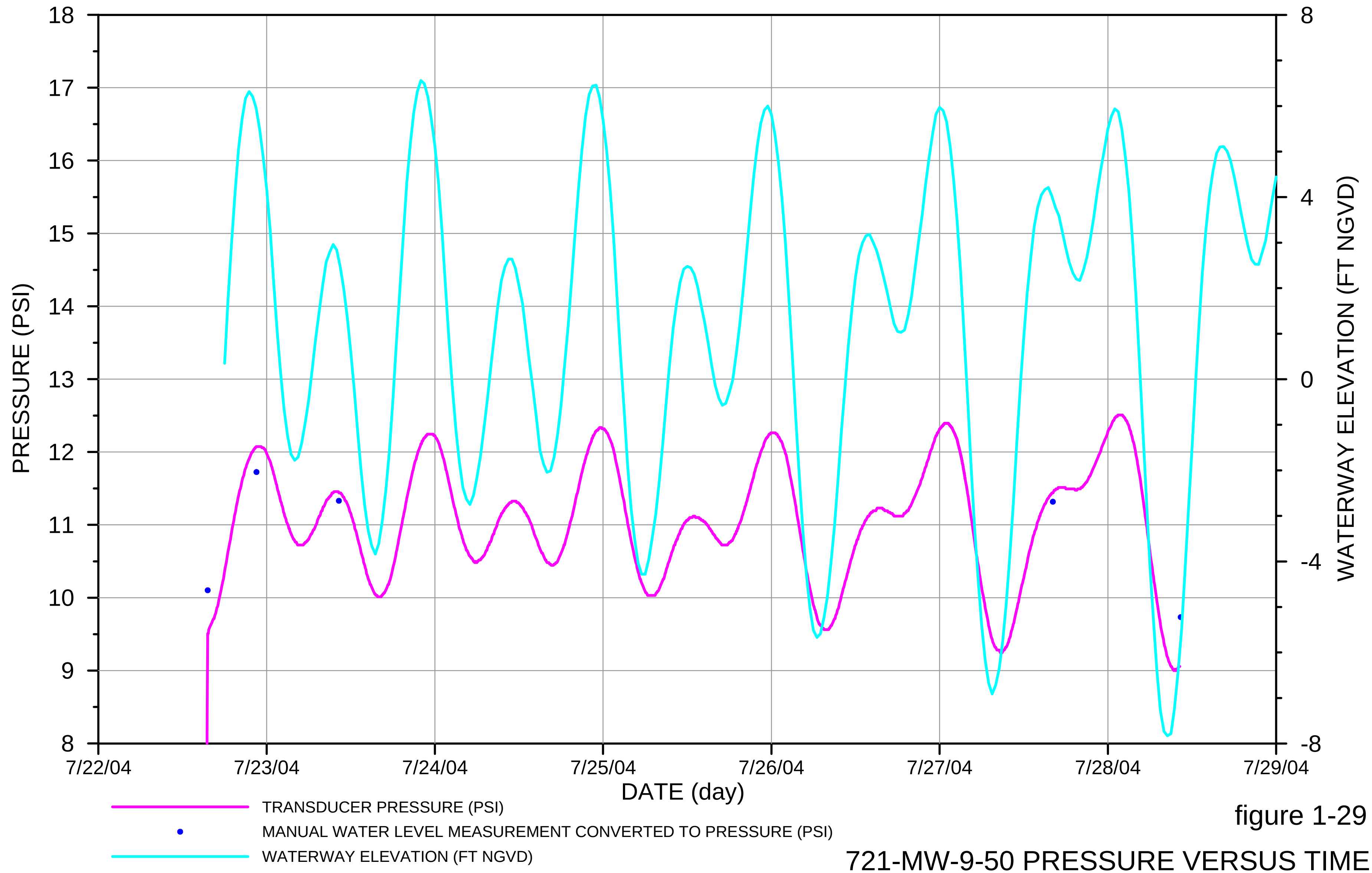

figure 1-29

721-MW-9-50 PRESSURE VERSUS TIME

PRESENTATION OF HYDRAULIC DATA FROM 709/721 ALEXANDER INVESTIGATION

Occidental Chemical Corporation, Tacoma, Washington

07843-A9711(83)GN-WA-HYD (N:\HEG\07843\Characterization\InterimDeliverables\Report83 Section 5.2\Pressure Graphs\721-mw9-50_p.grf) JUN 19/2007