PORSF
11.3.18.1 V13

EMCON
15055 SW Sequoia Parkway • Suite 140 • Portland, Oregon 97224 • (503) 624-7200 • Fax (503) 620-7658

August 31, 1995
Project 41051-001.001

Mr. Andrew Holbrook
GATX Terminals Corporation
P.O. Box 1207
Vancouver, Washington 98666-1207

Re: Subsurface Investigation at GATX Tank Storage Facility, 11400 NW St. Helens Road, Portland, Oregon 97070.

Dear Mr. Holbrook:

This report describes field activities and analytical results from a subsurface investigation at the above facility (see Figure 1). The purpose of the investigation was to characterize the nature of a diesel release and assess groundwater flow beneath the site. Work was completed consistent with EMCON's May 31, 1995, scope of work and July 13, 1995, change of scope.

WELL INSTALLATION AND SOIL SAMPLING

On July 13 and 14, 1995, EMCON supervised the drilling and sampling of four soil borings (see Figure 2). The borings were near the source of the diesel release (B-1), approximately 60 feet north and south of the release (B-2 and B-3) and hydraulically upgradient of it (B-4). Drilling services were provided by Cascade Drilling of Portland, Oregon (see Appendix A for field methods and drilling procedures).

Each boring was advanced approximately 6 feet below the first significant water-bearing unit, using either a 4.25-inch or a 6.25-inch (inside diameter) hollow-stem auger. Boring depths ranged from 30.5 feet to 31.5 feet below ground surface (bgs).

Soil samples were collected continuously or at selected intervals, using split-spoon samplers. Each sample was logged and a representative portion was screened for organic vapors using headspace analysis (see Appendix A). A flame ionization detector (FID) measured the concentration of organic vapors accumulated in the headspace of the container holding a specific soil sample. The FID readings were recorded on the boring logs (see Appendix B).

USEPA SF
1288942

Eight soil samples were submitted to Columbia Analytical Services (CAS) of Kelso, Washington, for analysis. The laboratory analyzed for total petroleum hydrocarbons (TPH) as diesel or oil using Oregon Department of Environmental Quality (DEQ) Method TPH-418.1M. One soil sample, MW1-11, was submitted to the CAS Environmental Technologies Laboratory in Bothell, Washington, for biological parameter analysis. Two soil samples were submitted to Squire Associates of Lake Oswego, Oregon, for grain size analyses. Results are summarized in Tables 1 and 2.

The four borings (B-1 through B-4) were completed as monitoring wells (MW-1 through MW-4). MW-1 through MW-3 were constructed of 4-inch-diameter PVC well screen and casing materials. Monitoring well MW-4 was constructed of 2-inch-diameter polyvinyl chloride (PVC) well screen and casing materials. The annular space from the bottom of the boring to 1 to 2 feet above the screened interval was filled with silica sand filter pack. The annular space above the filter pack was sealed with hydrated bentonite chips, to approximately 1.5 feet bgs. A temporary aboveground vault box was placed over the well casings at the surface. After construction, each well was developed by surging for approximately 30 minutes. See Appendix B for copies of boring logs and monitoring well construction details.

GROUNDWATER SAMPLING

On July 18, 1995, monitoring well MW-4 was purged and sampled. Samples were not collected from wells MW-1 through MW-3 because of nonaqueous-phase hydrocarbons in the wells (9 feet in MW-1, 9 feet in MW-2 and 0.5 feet in MW-3).

Before sampling, the depth to water in MW-4 was measured and approximately three well casing volumes were purged. Temperature, conductivity, and pH were measured during purging with a portable electronic meter and recorded on field sampling data sheets. After the well was purged, samples were collected with disposable polyethylene bailers and discharged into laboratory-prepared sample containers, using a nonaerating bottom-emptying device attached to the bailer. Sampling procedures are further described in Appendix A. The samples were placed on ice and transported, consistent with EMCON chain-of-custody procedures, to the CAS laboratory in Kelso, Washington. Copies of laboratory reports and chain-of-custody records are provided in Appendix C.

Groundwater from monitoring well MW-4 was analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) by U.S. Environmental Protection Agency (USEPA) Method 5030A/8020 and TPH by USEPA Method 418.1.

SITE SURVEYING

On August 4, 1995, boring locations and elevations were surveyed by EMCON field personnel. Horizontal locations were surveyed to 0.1 foot and vertical elevations (ground surface and top of well casings) were surveyed to 0.01 foot. Surveyed elevations are relative to a chosen benchmark at the site (see Figure 2).

RESULTS

Site Geology and Hydrogeology

A general description of the site geology and hydrogeology was developed from the data obtained during this investigation. Unconsolidated sediments encountered during drilling were fairly uniform. They consisted of approximately 5 feet of sand and gravel fill underlain to the bottom of each boring with alternating beds of brown and gray silty fine to medium sands and gray-brown silts (alluvium). Small (less than 6 inches) zones of gravel were encountered in MW-1 at 15 and 26 feet bgs (see Appendix C for detailed lithologic descriptions). Groundwater was encountered between 22.3 and 25.0 feet bgs during drilling.

Groundwater and nonaqueous-phase hydrocarbon elevation data were collected on the following dates:

- July 13 and 14, 1995
- July 18, 1995
- July 26, 1995

Nonaqueous-phase hydrocarbons were measured in each well except MW-4. The hydrocarbon thickness increased approximately 9 feet in well MW-1 from mid to late July and remained fairly consistent in MW-2 and MW-3 (see Table 3). The depth to water, corrected for the effects of free-phase hydrocarbons, shows groundwater flow at the site is southeast toward the Willamette River (see Figure 3).

Soil Quality

Of the eight soil samples analyzed, six had detectable amounts of TPH (see Table 1). At least one soil sample from borings B-1 (MW-1), B-2 (MW-2), and B-3 (MW-3) contained

TPH concentrations greater than 6,000 milligrams per kilogram (mg/kg). Soil samples collected from upgradient boring B-4 (MW-4) did not contain detectable TPH.

Bioparameter testing of the soil sample from B-1 (MW-1) showed the presence of diesel-degrading bacteria and environmental conditions conducive to bioremediation at the site. However, the data indicate that the system is nutrient-limited (e.g., nitrogen) and that biostimulation (e.g., nitrogen injection) would be required to accelerate diesel degradation.

Groundwater Quality

Groundwater collected from MW-4 did not contain detectable BTEX compounds or TPH (see Table 4). Nonaqueous-phase hydrocarbons were measured in each of the other wells and, as such, were not sampled.

RECOMMENDATIONS

On the basis of the data collected during this investigation, EMCON recommends the following for the next phase of work:

- Begin nonaqueous-phase hydrocarbon recovery from monitoring wells MW-1 and MW-2. That can be accomplished either by using an automated system or by daily hand bailing. Recovery should be combined with monitoring of the diesel seepage behind the sorbent booms, to identify any changes.

- Based on conservative estimates, up to 500 gallons a day per well of hydrocarbons may be recovered over a 3-month period. This will require significant storage capacity during recovery. If possible, EMCON recommends using existing on-site tanks for temporary storage.

- The northern and southern extents of the release have not been evaluated. One day of drilling using a Geoprobe™-equipped drill rig is proposed to evaluate the extent of diesel impacts. EMCON has found the Geoprobe to be cost effective compared with traditional hollow-stem drilling and sampling. Soil samples and a one-time water sample should be collected from each Geoprobe boring if there is no field evidence of contamination.

- After nonaqueous-phase recovery has reduced the diesel in the wells, a field test is recommended to evaluate the most efficient procedures for enhancing natural biological degradation and product recovery. A short groundwater recovery test under natural and vacuum conditions and small-scale bioventing and nutrient injection tests could be done.

Please call if you have any questions or need additional information.

Sincerely,

EMCON

Elizabeth Ruddy
Engineer

Tim Browning, R.G.
Senior Project Geologist

Attachments: Limitations
Tables 1, 2, 3, and 4
Figures 1, 2, and 3
Appendices A, B, and C

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

Table 1

GATX Tank Storage
Summary of Soil Sample Analysis
(mg/kg)

Sample Name	Boring	Date of Sampling	Depth (ft)	TPH-418.1M
MW1-8	B-1	7/13/95	8	6,100
MW1-15.5	B-1	7/13/95	15.5	75,000
MW2-15.5	B-2	7/14/95	15.5	8,400
MW2-30.5	B-2	7/14/95	30.5	2,000
MW3-15.5	B-3	7/14/95	15.5	11,000
MW3-30.5	B-3	7/14/95	30.5	32
MW4-10.5	B-4	7/14/95	10.5	ND
MW4-20.5	B-4	7/14/95	20.5	ND
MRL				25

NOTE:
MRL = method reporting limit.
ND = not detected at or above the method reporting limit.

Table 2

GATX Tank Storage
Summary of Soil Sample Bioparameter Analyses

Sample Name	Boring	Date Sampled	Depth (feet)	pH	Moisture (%)	Total Volatile Solids (%)
MW1-11	MW-1	7/13/95	11	3.7	15.9	2

Sample Name	Boring	Date Sampled	Ammonia-N (mg/kg)	Nitrate-N (mg/kg)	Phosphate-P (mg/kg)	Diesel Degraders (mpn/g)	Total Heterotrophs (cfu/g)
MW1-11	MW-1	7/13/95	0.5	0.2	1.9	1.6×10^3	3.6×10^3

Table 3

GATX Tank Storage
Groundwater Elevations

Well Number	Date Measured	Top of Casing Elevation (ft)[a]	Depth to Product (ft)	Depth to Groundwater (ft)	Depth to Bottom (ft)	Groundwater Elevation (ft)[b]
MW-1	7/18/95	94.80	16.60	16.83	26.17	77.99
	7/26/95		14.54	23.24		72.43
MW-2	7/18/95	95.61	15.87	26.87	29.02	69.84
	7/26/95		15.54	24.75		71.78
MW-3	7/18/95	96.06	14.84	15.25	30.40	80.85
	7/26/95		14.95	15.75		80.39
MW-4	7/18/95	99.74	—	19.86	28.37	79.88
	7/26/95		—	19.88		79.86

NOTE:
"—" = no floating product present.
[a] Relative to benchmark located at the northeast corner of the street light between MW-1 and MW-3. Benchmark was assumed to be 100 feet above sea level.
[b] Groundwater elevations were adjusted for the presence of floating product using the following equation: well casing elevation - (product thickness X specific gravity (0.9) + depth to product).

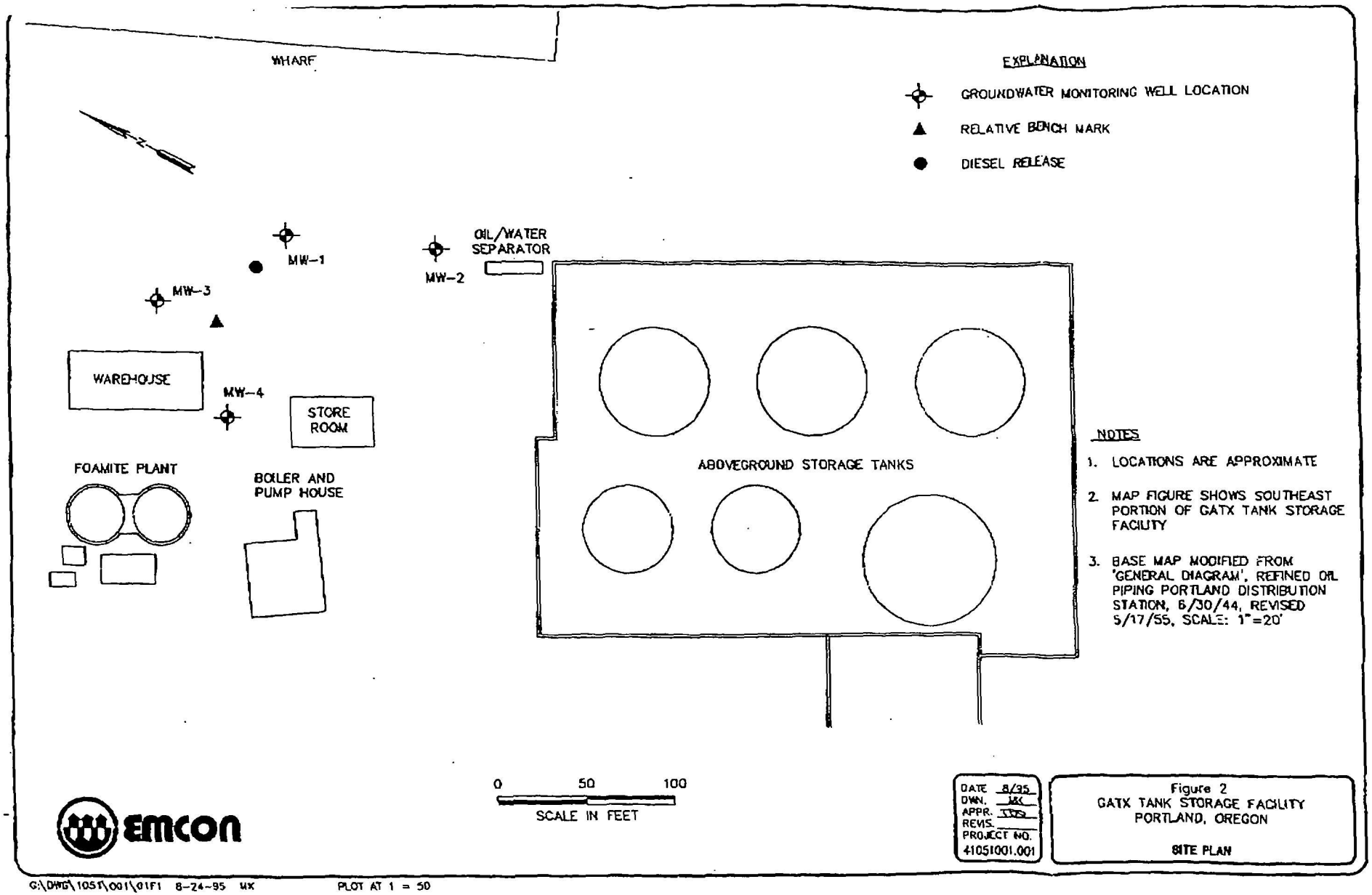
f(x)?

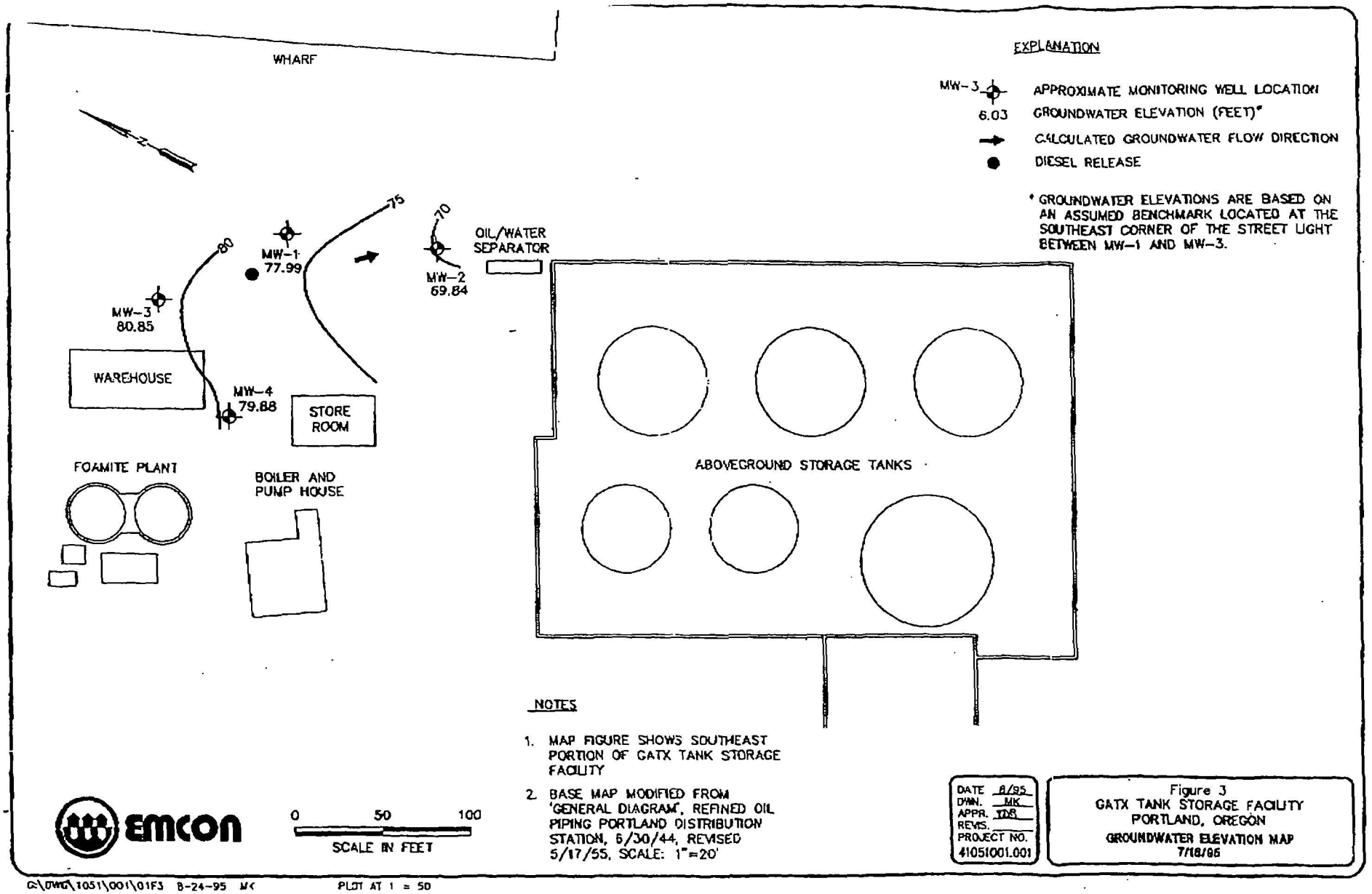
Table 4

GATX Tank Storage
Groundwater Analytical Results
(mg/l)

Sample Name	Well	Date Collected	BTEX and TPH-G by USEPA Method 8020/8015				TPH by USEPA Method 418.1
			Benzene	Toluene	Ethylbenzene	Total Xylenes	
MW4-071895	MW-4	7/18/95	ND	ND	ND	ND	ND
MRL			0.5	1	1	1	500
DEQ			5	1000	700	10,000	—

NOTE:
ND = not detected at or above the method reporting limit.
— = not analyzed or not applicable.
MRL = method reporting limit.
DEQ = DEQ groundwater cleanup level.


WHARF
EXPLANATION
GROUNDWATER MONITORING WELL LOCATION
RELATIVE BENCH MARK
DIESEL RELEASE
MW-1
MW-2
MW-3
MW-4
OIL/WATER SEPARATOR
WAREHOUSE
STORE ROOM
FOAMITE PLANT
BOILER AND PUMP HOUSE
ABOVEGROUND STORAGE TANKS
NOTES
1. LOCATIONS ARE APPROXIMATE
2. MAP FIGURE SHOWS SOUTHEAST PORTION OF GATX TANK STORAGE FACILITY
3. BASE MAP MODIFIED FROM 'GENERAL DIAGRAM', REFINED OIL PIPING PORTLAND DISTRIBUTION STATION, 6/30/44, REVISED 5/17/55, SCALE: 1"=20'
0 50 100
SCALE IN FEET
EMCON
DATE 8/95
DWN. MK
APPR.
REVIS.
PROJECT NO. 41051001.001
Figure 2
GATX TANK STORAGE FACILITY
PORTLAND, OREGON
SITE PLAN
G:\DWG\1051\001\01F1 8-24-95 MK
PLOT AT 1 = 50


WHARF
EXPLANATION
MW-3 APPROXIMATE MONITORING WELL LOCATION
6.03 GROUNDWATER ELEVATION (FEET)*
CALCULATED GROUNDWATER FLOW DIRECTION
DIESEL RELEASE
* GROUNDWATER ELEVATIONS ARE BASED ON AN ASSUMED BENCHMARK LOCATED AT THE SOUTHEAST CORNER OF THE STREET LIGHT BETWEEN MW-1 AND MW-3.
75
70
80
MW-1
77.99
MW-2
69.84
OIL/WATER SEPARATOR
MW-3
80.85
WAREHOUSE
MW-4
79.88
STORE ROOM
FOAMITE PLANT
BOILER AND PUMP HOUSE
ABOVEGROUND STORAGE TANKS
NOTES
1. MAP FIGURE SHOWS SOUTHEAST PORTION OF GATX TANK STORAGE FACILITY
2. BASE MAP MODIFIED FROM 'GENERAL DIAGRAM', REFINED OIL PIPING PORTLAND DISTRIBUTION STATION, 6/30/44, REVISED 5/17/55, SCALE: 1"=20'
emcon
0 50 100
SCALE IN FEET
DATE 8/95
DWN. MK
APPR. TDS
REVS.
PROJECT NO. 41051001.001
Figure 3
GATX TANK STORAGE FACILITY
PORTLAND, OREGON
GROUNDWATER ELEVATION MAP
7/18/95
G:\DWG\1051\001\01F3 8-24-95 MK
PLOT AT 1 = 50