Site Characterization and Remediation Report 715 Plum Street Olympia, Washington

Prepared for
McDonald's Corporation
October 23, 1992

Prepared by
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Project 0510-003.01

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EXECUTIVE SUMMARY

At the request of the McDonald's Corporation (McDonald's), EMCON Northwest, Inc., conducted site characterization and remediation activities on property located at 715 Plum Street in Olympia, Washington.

During the early phases of construction of a McDonald's restaurant on the property, hydrocarbon-like odors were detected by the excavation contractor. At McDonald's request, EMCON personnel visited the site on June 3, 1991, to collect soil and water samples for quantitative chemical analysis.

Analytical data for soil and water samples collected during this visit indicated that concentrations of petroleum hydrocarbons in soil and water samples exceeded the Model Toxics Control Act (MTCA)[1] Method A Cleanup Levels for soil and ground water.

Based on this information, EMCON proposed exploratory drilling and installation of ground water monitoring wells to better characterize subsurface soil and ground water quality beneath the site. Five ground water monitoring wells were installed in July 1991. Soil samples collected during advancement of the soil borings were submitted for quantitative chemical analysis. Ground water samples were also collected for analysis following well installation.

To provide further information regarding subsurface soil quality, 12 exploratory test pits were excavated during July 1991. Soil samples collected from each test pit were also submitted for chemical analysis.

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[1] Chapter 173-340 WAC, "The Model Toxics Control Act Cleanup Regulation; Method A Cleanup Levels." Amended February 1991.

A remediation plan was developed based on reported concentrations of petroleum hydrocarbons in soil and ground water samples collected during the activities performed in July 1991.

Approximately 3,000 cubic yards of soil containing petroleum hydrocarbons were excavated and removed from the site. Soil samples were collected from the excavation sidewalls to confirm that soil containing petroleum hydrocarbons had been removed. Excavated soil was hauled to a nearby property owned by West Star Corporation (West Star), the former owner of the 715 Plum Street site. Under agreement with McDonald's, West Star assumed ownership of the soil and also assumed responsibility for its remediation.

Ground water remediation was performed by extracting water from the open excavation. Extracted water was pumped by three submersible pumps, at a cumulative flow rate of approximately 20 gallons per minute, into a clarifier tank to remove suspended solids from the water. A submersible pump was used to pump the water from the clarifier tank into a 20-foot-tall air-stripping tower fitted with a centrifugal blower. Volatile fuel hydrocarbons were removed from the water as it passed through the air-stripping tower. The effluent from the air-stripping tower flowed into a transfer tank fitted with a centrifugal pump. Water was pumped from the transfer tank through two 1,000 pound carbon-filled canisters where semivolatile fuel hydrocarbons were removed. With the approval of the City of Olympia and the Washington State Department of Ecology, treated water was discharged to the storm sewer system located adjacent to the site.

Ground water samples collected from sampling ports within the treatment system and from the excavation were submitted for quantitative chemical analysis to monitor system performance and compliance with discharge requirements.

Following approximately nine weeks of pumping, during which time approximately 1.9 million gallons of water were treated and discharged to the storm sewer system, the system was deactivated and dismantled to allow construction of the restaurant. Analytical data indicated that concentrations of petroleum hydrocarbons in ground water remained in excess of the MTCA Method A Cleanup Levels for ground water.

Construction activities resumed at the site in early November 1991. Dewatering of trenches surrounding the building footings was required to begin construction. Consequently, a temporary treatment system was reinstalled during November 1991 to treat water removed by the excavation contractor during dewatering. This temporary treatment system consisted of four 1,000 pound carbon-filled canisters plumbed in series. The treated water was discharged to the storm sewer.

Late in the construction phase, EMCON returned to the site to install additional ground water monitoring wells as replacements for wells destroyed during construction. Prior to paving the site, underground piping and well manholes were also installed for potential use in a long-term ground water treatment system.

Ground water samples collected on February 24, 1992, indicated that concentrations of petroleum hydrocarbons in a sample collected from MW-8D exceeded MTCA Method A Cleanup Levels for ground water. The concentrations, however, were not high enough to warrant installation of a long-term recovery/treatment system, and quarterly ground water monitoring was initiated. Quarterly ground water sampling has been performed in February, May, and August 1992. Construction of the restaurant was completed during February 1992.

1 INTRODUCTION

1.1 Background

McDonald's provided background information regarding this site in the form of previous consultant's reports. Additional background information was gathered from a title search performed at EMCON's request. The site is located at 715 Plum Street in Olympia, Washington (Figure 1).

1.1.1 Title Search

A title search performed by First America Title Insurance Company indicated that the property was purchased by McDonald's in December 1990 from West Star. The title search reported that Gas-n-Save of Washington, Inc., purchased the property from Maxwell Oil Company, Inc., in February 1983. The name of the company was changed to West Star Corporation in July 1987. The title search also reported that the property was purchased by Maxwell Oil Company in 1968. A copy of the title search report is included in Appendix A.

The site is known to have been used as a bulk heating oil storage facility. Four aboveground storage tanks are visible in 1977 and 1984 aerial photographs. The aerial photographs were obtained by EMCON from the Washington State Department of Natural Resources.

1.1.2 Previous Reports

Three previous reports prepared for the site were provided by McDonald's. The earliest report, dated October 20, 1989, prepared for McDonald's by Groundwater Technology, Inc. (GTI), described the findings of an environmental assessment conducted earlier in the same month. The report identified petroleum hydrocarbons in soil samples collected from each of four exploratory soil borings. A hydrocarbon sheen was also reported on ground water in soil boring SB-2 at this time. The boring locations are shown on the site plan included in the GTI report; a copy of the report is included in Appendix A.

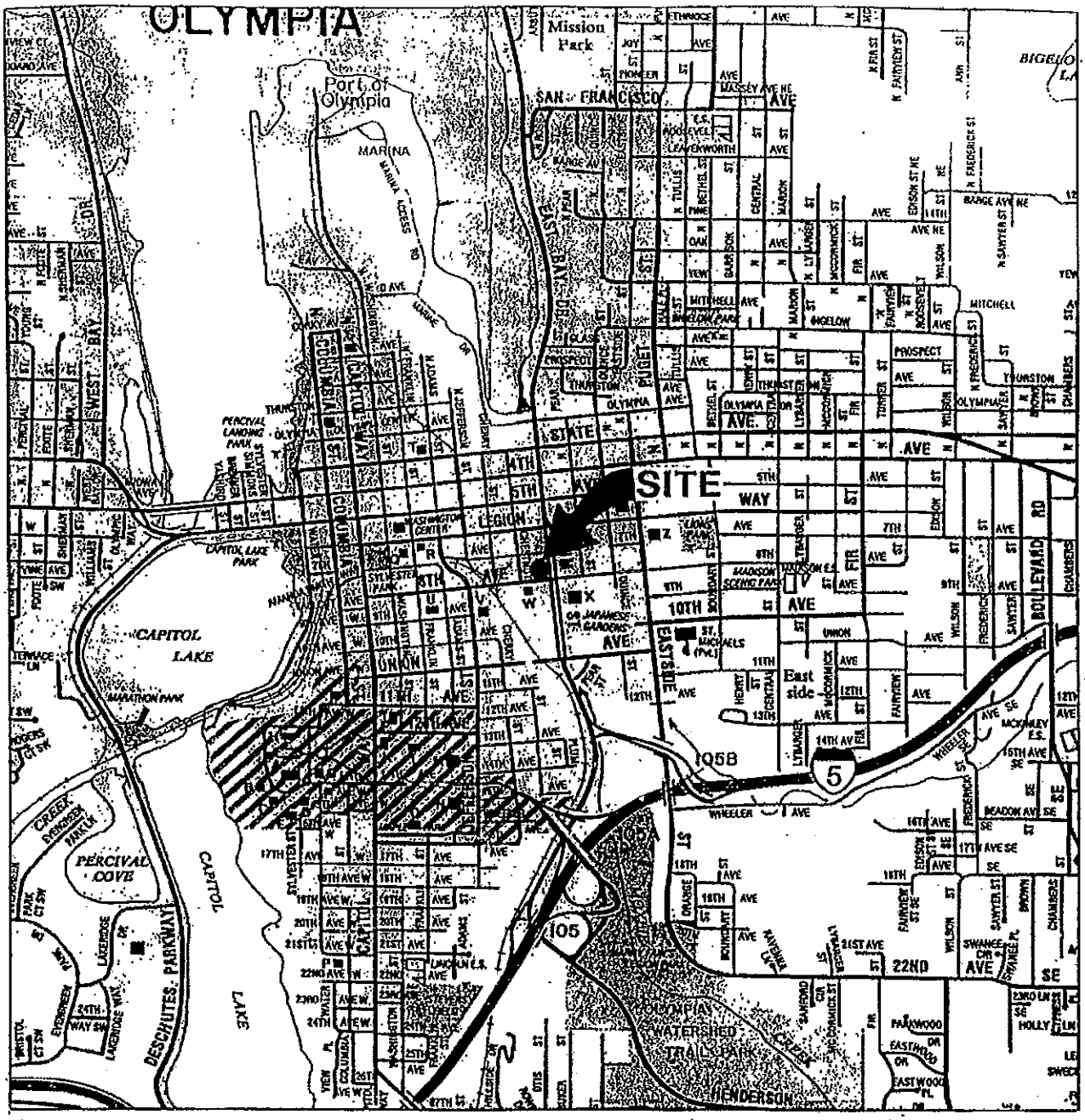

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Figure 1

McDONALD'S CORPORATION
OLYMPIA SITE

SITE LOCATION MAP

The GTI report was followed by a summary letter, dated October 26, 1989, which stated that "...the laboratory analyses indicate the areas of soils with hydrocarbon concentrations greater than 200 ppm are limited areally because only the soil sample from boring SB-2 had a TPH concentration over 200 ppm." The summary letter went on to recommend that "areas of obvious surficial soil contamination be removed and that soils in the immediate vicinity of boring SB-2 be excavated down to the peat layer (approximately 4 to 5 feet below grade)."

A second investigation was performed by Parametrix, Inc. (Parametrix), at the request of West Star. A Soil Quality Assessment/Remediation report prepared by Parametrix, dated January 22, 1990, indicated the scope of work was based on recommendations presented in the GTI report.

The scope of work performed by Parametrix included directing excavation of an area approximately 15 feet wide by 30 feet long. The location of the excavation was based on information contained in the GTI report and on discussions with West Star.

An unknown volume of soil was excavated and stockpiled at the site at the direction of Parametrix. Five soil samples representing the north, southwest, east, and west sidewalls of the excavation and a three-part composite sample representing soil removed from the excavation were submitted to Spectra Laboratories, Inc. (Spectra), of Fife, Washington, for quantitative chemical analysis.

A petroleum sheen was reported on the water seeping into the excavation. In an attempt to assess the extent of the sheen, Parametrix excavated Test Hole No. 1 approximately 15 feet east of the original excavation. Test Hole No. 1 revealed two abandoned steel pipes assumed by Parametrix to be "fuel feeder lines." Beneath the two steel pipes, a cast iron drain elbow and a drain tee fitting were exposed. A soft fibrous pipe was found to extend from the drain tee and terminate in gravel. A sample of petroleum product collected from the drain elbow was submitted to Spectra for analysis. Following removal of the product, an unknown volume of visually stained soil was removed from the vicinity of the drain elbow and tee, and the excavation was backfilled.

Laboratory analysis of the petroleum product sample collected from the drain tee indicated that the sample contained a concentration of 269,530 parts per million (ppm) hydrocarbons, as reported by EPA Method 8015 Modified. Reported concentrations of petroleum hydrocarbons in the soil

samples collected from excavation sidewalls did not exceed Ecology's proposed cleanup levels.

During a second Parametrix visit to the site, conducted at the request of West Star, soil samples were collected from three exploratory test pits located east, north, and south of Test Hole No. 1 (East Testhole, North Testhole, and South Testhole, respectively). A three-part composite soil sample was collected from soil previously removed from Test Hole No. 1. The soil had been stockpiled during the first Parametrix visit to the site. The samples were submitted to Spectra for quantitative chemical analysis. Results of the analyses indicated that concentrations of petroleum hydrocarbons in the stockpile sample exceeded "Ecology's Cleanup Guideline of 200 ppm."

Parametrix visited the site again on May 22, 1991. This visit was performed at the request of McDonald's, and the findings were detailed in a letter report addressed to Ms. Jacquelyn Davis, dated June 9, 1991. The findings indicated petroleum hydrocarbons were detected in subsurface soil and in samples of water collected from open trenches at the site. Petroleum hydrocarbon concentrations in soil samples collected from three locations at the site exceeded Ecology's cleanup standards.

2 SITE CHARACTERIZATION

During the early stages of construction, while driving foundation support pilings, petroleum hydrocarbon-like odors were reported to McDonald's by the contractor. On June 3, 1991, at the request of McDonald's, EMCON personnel visited the site and collected soil and water samples. The findings of this initial site visit are discussed in the following sections.

2.1 Soil Sample Collection

Eleven soil samples (S-1 through S-11) were collected from shallow exploratory trenches excavated during this visit. The exploratory trenches were excavated under the direction of an EMCON geologist at the locations shown on Figure 2.

Generally, subsurface soil consisted of sand, silt, gravel, and rubble (FILL) to a depth of approximately 4 feet below ground surface. The fill is underlain by peat.

Soil samples were submitted to Columbia Analytical Services, Inc., (CAS) of Bothell, Washington, for quantitative chemical analysis. The samples were analyzed for total recoverable petroleum hydrocarbons (TPH-IR) by EPA Method 418.1. Three samples (S-4, S-5, and S-7) were also analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020, volatile fuel hydrocarbons (TPH as gasoline) by EPA Methods 5030/8015 Modified, and semivolatile fuel hydrocarbons (TPH as diesel or other hydrocarbons) by EPA Methods 3550/8015 Modified. Two samples (S-4 and S-7), were also analyzed for benzene by the Toxicity Characteristic Leaching Procedure (TCLP).

In summary, soil samples S-4 and S-7 contained concentrations of BTEX, TPH as gasoline, and TPH as diesel which exceeded the MTCA Method A Cleanup Level for soil. Soil samples S-5, S-8, S-10, S-11, and S-12 contained concentrations of TPH-IR which exceeded MTCA Method A Cleanup Levels for soil.

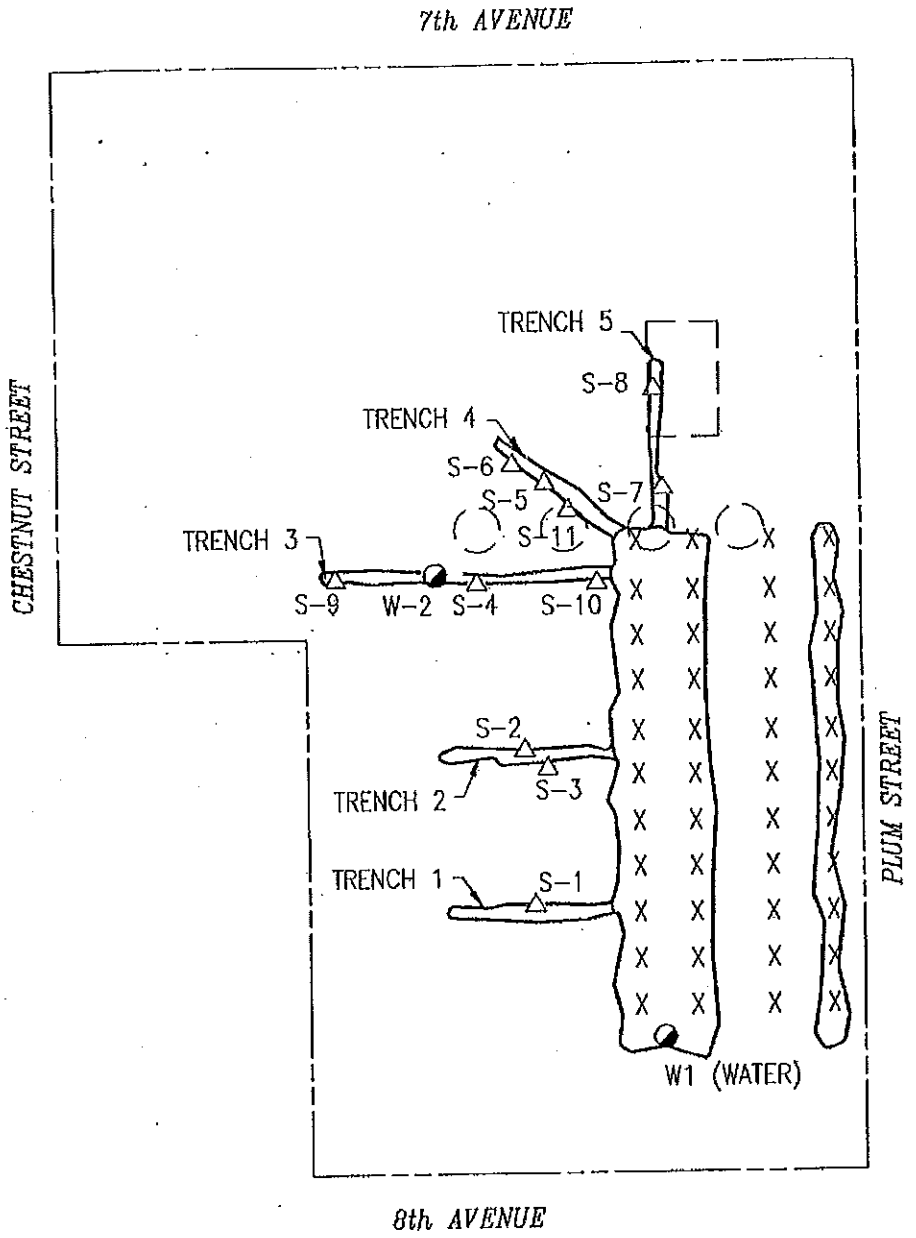

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Figure 2
MC DONALD'S CORPORATION
OLYMPIA SITE
SITE PLAN & INITIAL SOIL AND WATER SAMPLE LOCATIONS

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MTCA Method A Cleanup Levels were referenced for comparative purposes. The MTCA Method A Cleanup Levels do not necessarily apply to this site. Method A Cleanup Levels have been developed for specific purposes and are intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or those sites with relatively few hazardous substances. The Method A Cleanup Levels may not be appropriate for defining cleanup levels at other sites. For these reasons, the Method A Cleanup Levels should not be automatically used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the Method A Cleanup Levels do not necessarily trigger requirements for cleanup action under the Model Toxics Control Act[1].

EPA Method 418.1 (TPH-IR) analysis was performed to provide general information regarding petroleum hydrocarbon concentrations in soil. Possible interference resulting from the presence of organic material (peat) in the samples when analyzing by EPA Method 418.1, may mean reported concentrations of petroleum hydrocarbons are biased high. For this reason, the reported results from a TPH-IR analysis may not be as representative of soil quality as reported concentrations from a volatile or semivolatile fuel hydrocarbon analysis (EPA Methods 5030/8015 Modified or 3550/8015 Modified). The analytical results are presented in Table 1. Copies of the analytical reports are included in Appendix B.

2.2 Initial Water Samples

During this visit two samples of water (W-1 and W-2) standing in open excavations were collected from the locations shown in Figure 2. Although these water samples do not represent ground water as defined by Ecology (Chapter 173-340 WAC, "The Model Toxics Control Act Cleanup Regulation, Definitions and Usage," amended February 1991), they were collected to provide a general indication of ground water quality at the site.

The water samples were submitted to CAS for BTEX and TPH as gasoline analyses. In summary, the reported concentrations of BTEX and TPH as gasoline exceeded MTCA Method A Cleanup Levels for ground water. MTCA Method A Cleanup Levels for ground water were used for comparative purposes only. Analytical results are summarized in Table 2. Copies of the analytical laboratory reports are presented in Appendix B.

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[1] Chapter 173-340 WAC, "The Model Toxics Control Act Cleanup Regulation, Method A Cleanup Levels." Amended February 1991.

Table 1

Summary of Analytical Data - Soil
McDonald's — Olympia, Washington
Initial Site Visit Samples

Sample I.D.	Collection Date	Benzene[1] (mg/kg)	Toluene[1] (mg/kg)	Ethylbenzene[1] (mg/kg)	Total Xylenes[1] (mg/kg)	TPH as Gasoline[2] (mg/kg)	TPH as Diesel[3] (mg/kg)	TPH as Oil[3] (mg/kg)	TPH-IR[4] (mg/kg)	TCLP for Benzene[5] (mg/l)
S-1	6/3/91	–	–	–	–	–	–	–	ND	–
S-2	6/3/91	–	–	–	–	–	–	–	ND	–
S-3	6/3/91	–	–	–	–	–	–	–	–	–
S-4	6/3/91	73.4	519	209	1,710	5,340	2,200	ND	2,400	0.19
S-5	6/3/91	ND	ND	ND	ND	ND	ND	ND	ND	–
S-6	6/3/91	–	–	–	–	–	–	–	ND	–
S-7	6/3/91	15.7	33.7	78.9	476	1,940	3,000	ND	5,630	0.02
S-8	6/3/91	–	–	–	–	–	–	–	ND	–
S-9	6/3/91	–	–	–	–	–	–	–	360	–
S-10	6/3/91	–	–	–	–	–	–	–	430	–
S-11	6/3/91	–	–	–	–	–	–	–	1,560	–
MTCA[6] Method A Cleanup Level - Soil		0.5	40	20	20	100	200	200	200	

NOTE: ND Indicates analyte not detected at or above Method Reporting Limit
– Indicates analysis not performed on this sample
Shading indicates concentrations exceed MTCA Method A Cleanup Levels

[1] Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020
[2] Volatile fuel hydrocarbons (TPH as Gasoline) by EPA Method 5030/8020
[3] Semivolatile fuel hydrocarbons (TPH as Diesel or Other Hydrocarbon) by EPA Method 3550/8015 Modified
[4] Total petroleum hydrocarbons (TPH-IR) by EPA Method 418.1
[5] Toxicity Characteristic Leaching Procedure (TCLP) by EPA Method 1311
[6] Chapter 173-340 WAC, "The Model Toxics Control Act Cleanup Regulations, Method A Cleanup Limits." Amended February 1991. Caution on misusing Method A tables. Method A tables have been developed for specific purposes. They are intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or those sites with relatively few hazardous substances. The tables may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in these tables should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in these tables do not necessarily trigger requirements for cleanup action under this chapter.

Table 2

Summary of Analytical Data — Water
McDonald's — Olympia, Washington
Initial Site Visit Samples

Sample I.D.	Collection Date	Benzene[1] (µg/l)	Toluene[1] (µg/l)	Ethylbenzene[1] (µg/l)	Total Xylenes[1] (µg/l)	TPH as Gasoline[2] (µg/l)
W-1	6/3/91	ND	ND	ND	ND	ND
W-2	6/3/91	1,000	920	820	4,300	12,000
MTCA[3] Method A Cleanup Level - Ground Water		5	40	30	20	1,000

NOTE: ND Indicates analyte not detected at or above Method Reporting Limit

[1] Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020

[2] Volatile fuel hydrocarbons (TPH as Gasoline) by EPA Method 5030/8015 Modified

[3] Chapter 173-340 WAC, "The Model Toxics Control Act Cleanup Regulations, Method A Cleanup Limits." Amended February 1991. Caution on misusing Method A tables. Method A tables have been developed for specific purposes. They are intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or those sites with relatively few hazardous substances. The tables may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in these tables should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in these tables do not necessarily trigger requirements for cleanup action under this chapter.

2.3 Department of Ecology Notification

Based on reported concentrations of petroleum hydrocarbons for soil and water samples collected June 3, 1991, EMCON, on behalf of McDonald's, notified Ecology of a petroleum hydrocarbon release at the site on July 31, 1991. A copy of this correspondence is included in Appendix C.

2.4 Utility Locating and Geophysical Survey

Prior to drilling, EMCON contracted Locating, Inc., of Issaquah, Washington, to provide utility locating services at the site. No underground utilities were identified in the vicinity of the proposed soil boring locations.

2.5 Geophysical Survey

At EMCON's request, a geophysical site survey was performed prior to drilling. Ground penetrating radar (GPR) and electromagnetic (EM) locating systems were used to conduct the survey. Geo-Recon International conducted the geophysical survey in an effort to locate any unidentified underground storage tanks or structures. A Geo-Recon report, dated June 26, 1991, indicated that two "anomalies" were identified using the EM equipment, and these were further investigated using the GPR equipment.

Although neither anomaly was positively identified, the report indicated that Anomaly #1, located in the west central portion of the site, may have been a sump or a buried 55-gallon drum. No hypothesis was presented for the identity of Anomaly #2, located in the northeastern corner of the site. The report also stated that no objects had been identified that were indicative of underground storage tanks. A copy of the Geo-Recon report is included in Appendix A.

2.6 Monitoring Well Installation

On June 26, 1991, EMCON personnel directed drilling and installation of five ground water monitoring wells at the site. Drilling and well installation services were provided by Geoboring and Development, Inc., of Puyallup, Washington. Each boring was advanced using 4.25-inch-I.D., hollow-stem auger drilling equipment. Borings MW-1, MW-2, MW-3, MW-4, and MW-5 were advanced to a maximum depth of 10.5 feet below ground surface. The boring locations are shown on Figure 3.

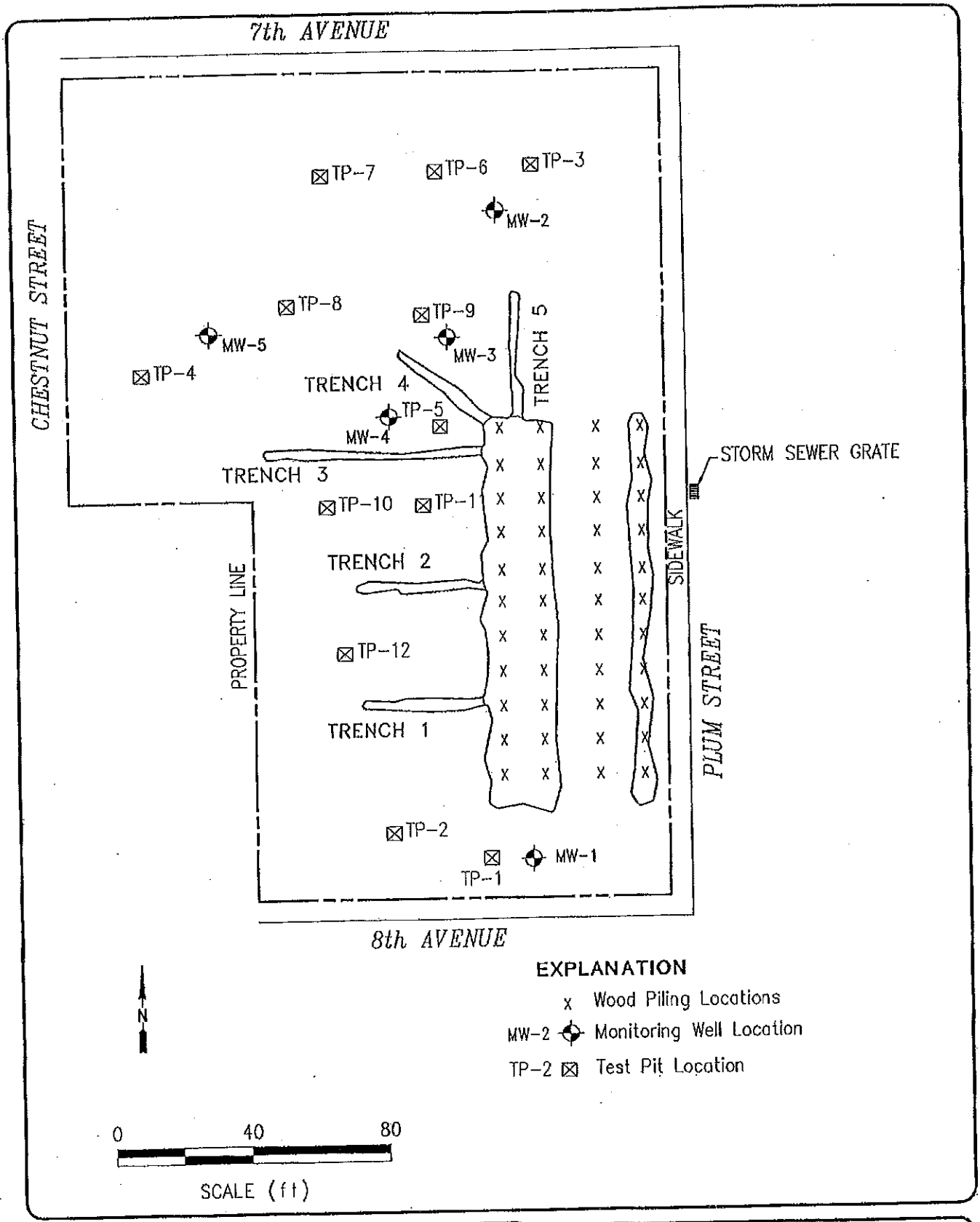

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Figure 3
McDONALD'S CORPORATION
OLYMPIA SITE
MONITORING WELL AND TEST PIT LOCATIONS

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Well construction materials consisted of 2-inch-diameter Schedule 40, .010-inch, factory-slotted well screen and blank riser pipe. A filter pack of Colorado Silica Sand was placed around the screened interval concurrent with withdrawal of the auger and extended from the base of the boring to approximately 1 foot above the top of the screened interval. A well seal of bentonite chips was placed in the boring from the top of the filter pack to within approximately 2 feet of the ground surface. Once in place, the chips were hydrated, using water supplied by the driller. The wells were completed at the surface with a flush-mounted locking steel monument cemented in place over each well head.

2.6.1 Soil Sample Collection and Analysis

Soil samples were collected using a 2.5-inch-I.D. split-spoon sampler driven with a 140-pound hammer free falling approximately 30 inches. The samples were collected at approximately 2.5-foot intervals. Blow counts (the number of hammer blows per 6 inches of split spoon advancement) were recorded on an EMCON boring log form. Blow counts were recorded to provide an indication of relative soil density. Information regarding soil type, color, grain size, moisture content of the soil and monitoring well construction details were also recorded on the boring log form. Copies of the boring logs are included in Appendix D.

Soil samples collected from the borings were submitted to CAS for quantitative chemical analysis. The samples were analyzed for BTEX, TPH as gasoline, TPH as diesel or other petroleum hydrocarbons, and total lead by EPA Method 7421. Results of these analyses are presented in Table 3. Copies of the analytical laboratory reports are included in Appendix B.

In summary, concentrations of petroleum hydrocarbons in selected soil samples collected from borings MW-2, MW-3, MW-4, and MW-5 exceeded the MTCA Method A Cleanup Levels for soil.

2.6.2 Ground Water Sample Collection and Analysis

Following installation, each well was developed using a disposable teflon bailer attached to disposable polypropylene bailing line. Development was performed to remove fine grained material from around the well screen and to improve ground water flow to the well screen. Following development, ground water samples were collected from each well on June 27, 1991.

Prior to sample collection, each well was purged to ensure a sample representative of ground water quality beneath the site. A measurement of

Table 3

Summary of Analytical Data — Soil
McDonald's — Olympia, Washington
Monitoring Wells MW-1 through MW-5

Sample I.D.	Collection Date	Benzene[1] (mg/kg)	Toluene[1] (mg/kg)	Ethylbenzene[1] (mg/kg)	Total Xylenes[1] (mg/kg)	TPH as Gasoline[2] (mg/kg)	TPH as Diesel[3] (mg/kg)	TPH as Oil[3] (mg/kg)	TPH-IR[4] (mg/kg)	Total Lead[5] (mg/kg)
MW-1,S-1	6/26/91	ND	ND	ND	ND	ND	ND	50	82	ND
MW-1,S-2	6/26/91	ND	0.05	ND	ND	ND	ND	ND	51	ND
MW-1,S-3	6/26/91	ND	ND	ND	ND	ND	ND	ND	45	ND
MW-1,S-4	6/26/91	ND	ND	ND	ND	ND	ND	150	62	ND
MW-1,S-5	6/26/91	ND	ND	ND	ND	ND	ND	ND	73	ND
MW-1,S-6	6/26/91	ND	ND	ND	ND	ND	ND	180	74	ND
MW-2,S-1	6/26/91	ND	0.08	ND	ND	ND	29	100	100	ND
MW-2,S-2	6/26/91	*<0.5	*<0.5	*<0.5	*<0.5	**<100	300	1,160	1,690	ND
MW-2,S-3	6/26/91	*<0.5	*<0.5	*<0.5	*<0.5	**<50	100	1,000	730	ND
MW-2,S-4	6/26/91	ND	ND	ND	ND	ND	70	440	449	ND
MW-3,S-1	6/26/91	ND	ND	ND	ND	ND	ND	ND	26	ND
MW-3,S-2	6/26/91	ND	ND	ND	ND	*2	60	ND	150	ND
MW-3,S-3	6/26/91	*<0.5	*<0.5	*<0.5	*<0.5	*<10	ND	1,300	1,200	ND
MW-3,S-4	6/26/91	*<0.5	*<0.5	*<0.5	*<0.5	*<10	ND	1,300	3,000	ND
MW-4,S-1	6/26/91	0.05	0.11	0.15	2.32	**47	150	ND	95	ND
MW-4,S-2	6/26/91	ND	0.18	0.26	5.58	**330	350	40	450	ND
MW-4,S-3	6/26/91	0.29	0.33	1.39	17.1	*390	260	50	440	ND

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Table 3

Summary of Analytical Data - Soil
(Continued)

Sample I.D.	Collection Date	Benzene[1] (mg/kg)	Toluene[1] (mg/kg)	Ethylbenzene[1] (mg/kg)	Total Xylenes[1] (mg/kg)	TPH as Gasoline[2] (mg/kg)	TPH as Diesel[3] (mg/kg)	TPH as Oil[3] (mg/kg)	TPH-IR[4] (mg/kg)	Total Lead[5] (mg/kg)
MW-5,S-2	6/26/91	ND	ND	ND	ND	ND	ND	ND	68	ND
MW-5,S-3	6/26/91	ND	0.07	ND	ND	ND	ND	40	120	21
MW-5,S-4	6/26/91	ND	ND	ND	ND	ND	ND	670	450	ND
MTCA[6] Method A Cleanup Level - Soil		.5	40	20	20	100	200	200	200	250

NOTE: ND Indicates analyte not detected at or above Method Reporting Limit
-- Indicates analysis not performed on this sample
* "Elevated MRL because of the low percent solids in the sample received." As reported by Columbia Analytical Services, Inc.
** "This value is high because of the presence of diesel in the weathered gasoline area of the chromatogram, and because the method mandates that the diesel in this part of the chromatogram be quantified as gasoline." As reported by Columbia Analytical Services, Inc.
Shading indicates concentrations exceed MTCA Method A Cleanup Levels for soil

[1] Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020
[2] Volatile fuel hydrocarbons (TPH as Gasoline) by EPA Method 5030/8015 Modified
[3] Semivolatile fuel hydrocarbons (TPH as Diesel or Oil) by EPA Method 3550/8015 Modified
[4] Total petroleum hydrocarbons (TPH-IR) by EPA Method 418.1
[5] Total Lead by EPA Method 6010
[6] Chapter 173-340 WAC, "The Model Toxics Control Act Cleanup Regulations, Method A Cleanup Limits." Amended February 1991. Caution on misusing Method A tables. Method A tables have been developed for specific purposes. They are intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or those sites with relatively few hazardous substances. The tables may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in these tables should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in these tables do not necessarily trigger requirements for cleanup action under this chapter.

depth to water was used to calculate the volume of water standing in the well casing (pore volume). A minimum of three pore volumes were removed from each well before collecting a sample. Measurements of pH, specific conductance, and temperature were recorded on EMCON's Field Sampling Data Sheet, following removal of each pore volume. Upon stabilization of the field readings (less than 10 percent change between consecutive readings), a ground water sample was collected.

Each sample was stored in a laboratory-prepared glass container and placed in an iced cooler for transport under standard chain-of-custody protocol to CAS for quantitative chemical analysis. The samples were analyzed for BTEX, TPH as gasoline, TPH as diesel or other hydrocarbons, and total lead. Results of these analyses are presented in Table 4. Copies of the analytical laboratory reports are included in Appendix B.

In general, depth to water in ground water monitoring wells MW-1 through MW-5 ranged from a maximum depth of 1.3 feet below ground surface to flowing at monitoring wells MW-2 and MW-4. Additionally, water levels in the excavation and in the monitoring wells appeared to be tidally influenced. Although a tidal study was not performed during this phase of work, observed water level changes in the excavation indicated as much as 1 foot of fluctuation between high and low tides.

Ground water flow direction was interpreted to be generally northward towards Budd Inlet, based on local topography. Wells MW-1 through MW-5 were damaged or destroyed before relative elevations could be measured, therefore, no piezometric surface map was prepared.

In summary, the reported concentrations of benzene in the ground water samples collected from monitoring wells MW-3 and MW-4 exceeded the MTCA Method A Cleanup Level for ground water. Additionally, the reported concentrations of toluene, ethylbenzene, total xylenes, and TPH as gasoline for the ground water sample collected from MW-4 exceeded MTCA Method A Cleanup Levels for ground water. Reported concentrations of total lead exceeded the MTCA Method A Cleanup Level for the samples collected from MW-1, MW-2, MW-3, and MW-4.

2.7 Exploratory Test Pit Excavation

On July 10, 1992, EMCON personnel directed excavation of 12 exploratory test pits at the site to better define the distribution of petroleum hydrocarbons in subsurface soil. Excavation services were provided by Sunix, Inc. (Sunix), the earthwork subcontractor involved in construction at the site. The test pits were advanced using a rubber tire backhoe to

maximum depths of approximately 15 feet below ground surface. Locations of the exploratory test pits are presented in Figure 3.

EMCON personnel observed subsurface soil conditions and recorded information regarding soil type, color, grain size, and moisture content on EMCON's Test Pit Log form. Field screening of selected soil samples for the presence of volatile organic vapors was also performed using a flame ionization detector (FID). The accuracy of the FID readings was diminished, due to organic interference from a peat bed exposed near the base of each test pit.

Soil samples were collected from each test pit for quantitative chemical analysis. The samples were submitted to CAS for analysis of BTEX, TPH as gasoline, TPH as diesel or other hydrocarbons, and TPH-IR. The samples collected from test pits TP-3, TP-6, and TP-7 were also submitted for analysis of volatile organic compounds by EPA Method 8240. In summary, the concentration of total xylenes, TPH as gasoline, and TPH-IR in the soil sample collected from test pit TP-5 exceeded MTCA Method A Cleanup Levels for soil. Additionally, the concentration of TPH-IR exceeded the MTCA Method A Cleanup Level for soil in the samples collected from test pits TP-4, TP-6, and TP-7. The results of the analyses are presented in Table 5. Copies of the analytical reports are included in Appendix B.

Table 4

Summary of Analytical Data — Ground Water
McDonald's — Olympia, Washington
MW-1 through MW-5

Sample I.D.	Collection Date	Well I.D.	Benzene[1] (µg/l)	Toluene[1] (µg/l)	Ethylbenzene[1] (µg/l)	Total Xylenes[1] (µg/l)	TPH as Gasoline[2] (µg/l)	TPH as Diesel[3] (µg/l)	TPH as Oil[3] (µg/l)	TPH-IR[4] (µg/l)	Total Lead[5] (µg/l)
MW-1	6/24/91	MW-1	ND	ND	ND	ND	ND	ND	ND	500	35
MW-2	6/24/91	MW-2	ND	ND	ND	ND	ND	ND	ND	ND	45
MW-3	6/24/91	MW-3	13.6	0.9	2.0	7.0	100	130	ND	ND	89
MW-4	6/24/91	MW-4	11.8	41	56	350	2,100	590	ND	1,400	39
MW-5	6/24/91	MW-5	ND	ND	ND	ND	ND	ND	ND	ND	7
MW-6	6/24/91	MW-4 (Duplicate)	9.4	31.8	41.4	266	1,700	320	ND	900	50
MTCA[6] Method A Cleanup Level - Ground Water			5	40	30	20	1,000	1,000	1,000	1,000	5

NOTES: ND Indicates analyte not detected at or above Method Reporting Limit
– Indicates analysis not performed on this sample
Shading Indicates concentrations exceed MTCA Method A Cleanup Levels for Ground Water

[1] Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020
[2] Volatile fuel hydrocarbons (TPH as Gasoline) by epa Method 5030/8015 Modified
[3] Semivolatile fuel hydrocarbons (TPH as Diesel or Oil) by EPA Method 3550/8015 Modified
[4] Total petroleum hydrocarbons (TPH-IR) by EPA Method 418.1
[5] Total Lead by EPA Method 7421
[6] Chapter 173-340 WAC, "The Model Toxics Control Act Cleanup Regulations, Method A Cleanup Limits." Amended February 1991. Caution on misusing Method A tables. Method A tables have been developed for specific purposes. They are intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or those sites with relatively few hazardous substances. The tables may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in these tables should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in these tables do not necessarily trigger requirements for cleanup action under this chapter.

3 SOIL REMEDIATION

Excavation and removal of soil at the site was based on laboratory data for soil samples collected during drilling and excavation of exploratory test pits.

Remediation options considered for soil removed from the site included disposal at the Thurston County Landfill; asphalt incorporation at Woodworth and Company, Inc., in Tacoma, Washington; on-site incineration of the soil; and bioremediation.

3.1 Soil Stockpile Site

Prior to selecting a remediation alternative for hydrocarbon impacted soil, McDonald's and West Star reached an agreement that provided a piece of property, owned by West Star and located near the 715 Plum Street site, to be used for stockpiling soil. The site is located at the corner of Martin and Marvin Ways, in Olympia, Washington.

On August 14, 1991, an EMCON geologist met with Sunix equipment operators at the Martin and Marvin Ways site, to excavate exploratory test pits. Six test pits were advanced, using a track-mounted excavator, to a maximum depth of approximately 8.75 feet below ground surface. The test pit locations are shown on Figure 4.

In general, subsurface soil consisted of approximately 1 to 2 feet of silty soil, underlain by sandy gravel and gravelly sand to the maximum depth excavated. A PID was used during excavation to field screen for the presence of volatile hydrocarbon vapors. PID readings and soil descriptions were recorded on EMCON's Test Pit Log form. The Test Pit Logs are included in Appendix D.

Soil samples were collected from each of the exploratory test pits to characterize subsurface soil quality at the Martin and Marvin Ways site, prior to delivery of soil from the 715 Plum Street site. The samples were submitted to CAS for TPH-IR, BTEX, and TPH as gasoline analyses.

Table 5

Summary of Analytical Data — Soil
McDonald's — Olympia, Washington
Exploratory Test Pits TP-1 through TP-12

Sample I.D.	Collection Date	Benzene[1] (mg/kg)	Toluene[1] (mg/kg)	Ethylbenzene[1] (mg/kg)	Total Xylenes[1] (mg/kg)	TPH as Gasoline[2] (mg/kg)	TPH as Diesel[3] (mg/kg)	TPH as Oil[3] (mg/kg)	TPH-IR[4] (mg/kg)
TP-1	7/10/92	ND	ND	ND	ND	ND	ND	ND	48
TP-2	7/10/92	ND	ND	ND	ND	ND	ND	ND	ND
TP-3	7/10/92	ND	ND	ND	ND	ND	ND	ND	110
TP-4	7/10/92	ND	ND	ND	ND	ND	ND	ND	380
TP-5	7/10/92	*<0.5	5.8	5.7	39	480	160	ND	380
TP-6	7/10/92	ND	ND	0.86	ND	64	33	ND	460
TP-7	7/10/92	ND	ND	ND	ND	ND	ND	140	1,200
TP-8	7/10/92	ND	ND	ND	ND	ND	ND	ND	47
TP-9	7/10/92	ND	ND	ND	ND	ND	ND	ND	ND
TP-10	7/10/92	ND	ND	ND	ND	ND	ND	ND	49
TP-11	7/10/92	ND	ND	ND	ND	ND	ND	ND	26
TP-12	7/10/92	ND	ND	ND	ND	ND	ND	ND	29
MTCA[5] Method A Cleanup Level - Soil		.5	40	20	20	100	200	200	200

NOTE: ND Indicates analyte not detected at or above Method Reporting Limit
– Indicates analysis not performed on this sample
Shading indicates concentrations exceed MTCA Method A Cleanup Levels for soil

[1] Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020
[2] Volatile fuel hydrocarbons (TPH as Gasoline) by EPA Method 5030/8015 Modified
[3] Semivolatile fuel hydrocarbons (TPH as Diesel or Oil) by EPA Method 3540/8015 Modified
[4] Total petroleum hydrocarbons (TPH-IR) by EPA Method 418.1
[5] Chapter 173-340 WAC, "The Model Toxics Control Act Cleanup Regulations, Method A Cleanup Limits." Amended February 1991. Caution on misusing Method A tables. Method A tables have been developed for specific purposes. They are intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or those sites with relatively few hazardous substances. The tables may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in these tables should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in these tables do not necessarily trigger requirements for cleanup action under this chapter.

In summary, BTEX and TPH as gasoline concentrations in the soil samples submitted for analysis did not meet or exceed the Method Reporting Limit (results reported as ND ["Not detected at or above the Method Reporting Limit]). Reported concentrations of TPH-IR in the samples ranged from ND to 178 mg/kg (the mg/kg units approximate parts per million [ppm]). The analytical data are presented in Table 6. A copy of the analytical report is included in Appendix B.

3.2 Soil Excavation

Excavation of soil containing petroleum hydrocarbons began on August 14, 1991. Excavation was performed initially by Sunix under the direction of an EMCON geologist. A PID was used to field screen soil during excavation to monitor subsurface soil quality and to determine the required limits of excavation.

Excavation continued on August 15, 1991. Approximately two hours after beginning excavation, the operator for Sunix complained of mild nausea. PID readings taken in the breathing space of the trackhoe cab exceeded the action level of 20 ppm stated in EMCON's Site Safety and Operations Plan. The operator indicated the he did not possess a respirator and that he had not completed the 40-Hour training course required by the Washington Industrial Safety and Health Act (WISHA) for working with hazardous materials. Consequently, the EMCON field geologist stopped work at the site until a qualified equipment operator could be located.

On Monday August 19, 1991, excavation continued using an operator employed by Bighaus Petroleum and Environmental, Inc., of Wilsonville, Oregon. Excavation of soil was completed on August 23, 1991. Following receipt of the analytical data for soil samples collected from exploratory test pits, soil was hauled to the Martin and Marvin Ways stockpile site between August 20 and August 23, 1991.

Soil samples were collected from the excavation sidewalls to confirm that soil containing petroleum hydrocarbons at concentrations exceeding the MTCA Method A Cleanup Levels for soil had been removed. The samples were submitted to CAS for analysis of BTEX, TPH as gasoline, and TPH as diesel or other. The results of these analyses are presented in Table 7.

In summary, analytical data for soil samples collected from the excavation sidewalls indicated concentrations of petroleum hydrocarbons had been reduced to below MTCA Method A Cleanup Levels for soil with the exception of three soil samples collected from the southeast corner of the excavation. Analysis of soil samples SE-16, SE-17, and SE-18, collected

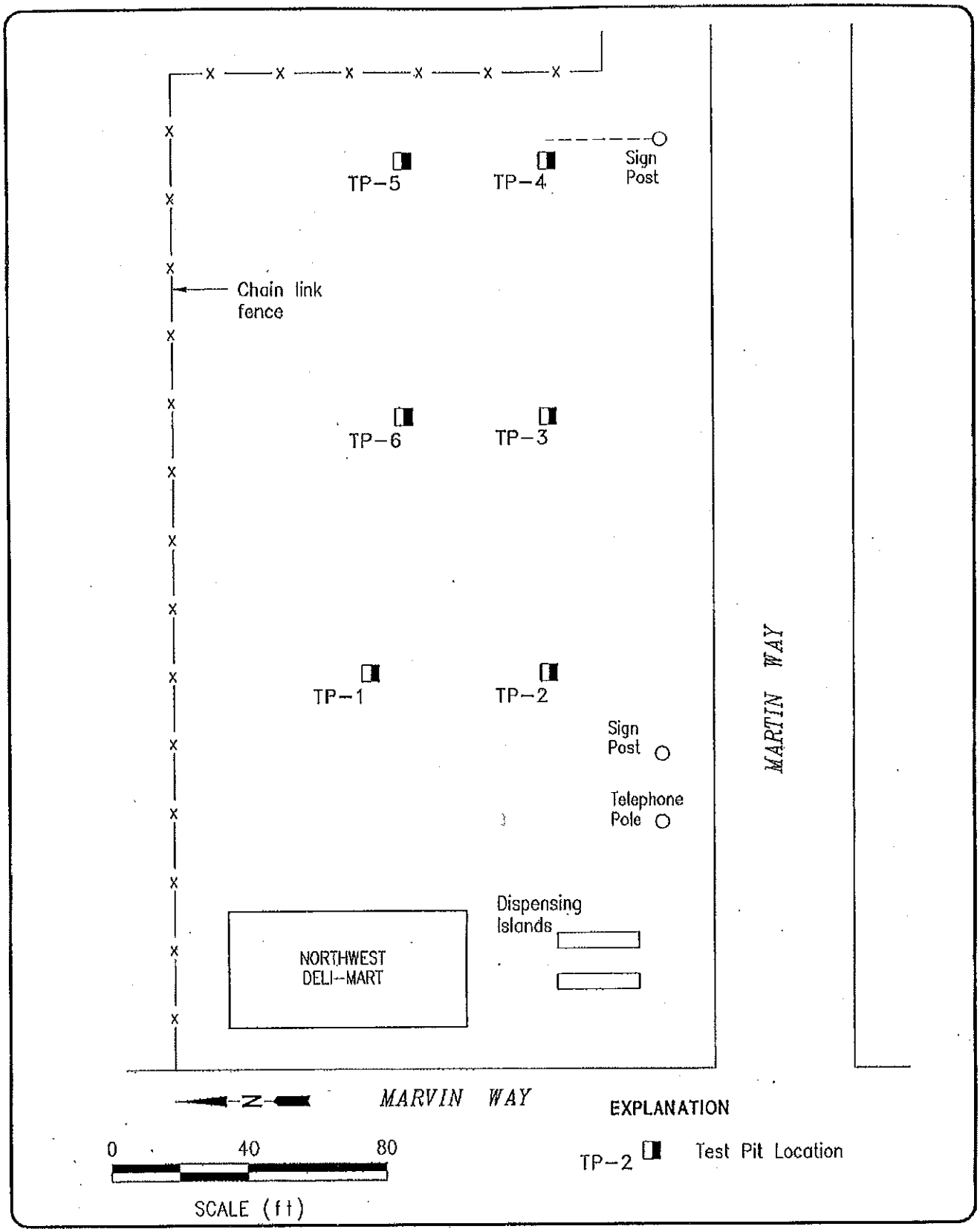

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Figure 4
McDONALD'S CORPORATION
OLYMPIA SITE

MARTIN AND MARVIN WAY STOCKPILE SITE AND EXPLORATORY TEST PIT LOCATIONS

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Table 6

Summary of Analytical Data - Soil
McDonald's - Olympia, Washington
Martin and Marvin Ways Stockpile Site

Sample I.D.	Collection Date	Benzene[1] (mg/kg)	Toluene[1] (mg/kg)	Ethylbenzene[1] (mg/kg)	Total Xylenes[1] (mg/kg)	TPH as Gasoline[2] (mg/kg)	TPH-IR[3] (mg/kg)
TP-1	8/14/91	ND	ND	ND	ND	ND	51
TP-2	8/14/91	ND	ND	ND	ND	ND	41
TP-3	8/14/91	ND	ND	ND	ND	ND	ND
TP-4	8/14/91	ND	ND	ND	ND	ND	178
TP-5	8/14/91	ND	ND	ND	ND	ND	33
TP-6	8/14/91	ND	ND	ND	ND	ND	42
MTCA Method A Cleanup Level - Soil		.5	40	20	20	100	200

NOTE: ND Indicates analyte not detected at or above Method Reporting Limit
-- Indicates analysis not performed on this sample

[1] Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020
[2] Volatile fuel hydrocarbons (TPH as Gasoline) by EPA Method 5030/8015 Modified
[3] Total petroleum hydrocarbons (TPH-IR) by EPA Method 418.1
[4] Chapter 173-340 WAC, "The Model Toxics Control Act Cleanup Regulations, Method A Cleanup Limits." Amended February 1991. Caution on misusing Method A tables. Method A tables have been developed for specific purposes. They are intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or those sites with relatively few hazardous substances. The tables may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in these tables should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in these tables do not necessarily trigger requirements for cleanup action under this chapter.

Table 7

Summary of Analytical Data - Soil
McDonald's - Olympia, Washington
Excavation Confirmation Samples

Sample I.D.	Date Collected	Benzene[1] (mg/kg)	Toluene[1] (mg/kg)	Ethylbenzene[1] (mg/kg)	Total Xylenes[1] (mg/kg)	TPH as Gasoline[2] (mg/kg)	TPH as Diesel[3] (mg/kg)	TPH as Other[3] (mg/kg)	TPH-IR[4] (mg/kg)
West Edge	8/15/91	0.91	1.45	3.50	14.1	1,730*	6,660	1,260	5,770
WDT-1	8/20/91	ND	ND	ND	ND	3	ND	ND	--
NE-11	8/21/91	ND	ND	ND	ND	4	54	96	--
NE-10	8/22/91	ND	ND	ND	ND	5	ND	ND	--
NE-12	8/22/91	ND	ND	ND	ND	ND	ND	ND	--
NW-13	8/22/91	ND	ND	ND	ND	ND	ND	ND	--
NW-14	8/22/91	ND	ND	ND	ND	ND	ND	ND	--
NW-15	8/23/91	ND	ND	ND	ND	ND	33	ND	--
SE-16	8/26/91	ND	ND	ND	ND	5	1,460	ND	--
SE-17	8/26/91	ND	ND	ND	ND	74*	210	ND	--
SE-18	8/26/91	ND	ND	ND	0.09	220*	2,760	40	--
S-19	8/26/91	ND	ND	ND	ND	9*	ND	ND	--
SW-20	8/26/91	ND	ND	ND	ND	5*	ND	ND	--
SW-21	8/26/91	ND	ND	ND	ND	4*	40	80	--
MTCA Method A Cleanup Level - Soil		.5	40	20	20	100	200	200	200

NOTE: ND Indicates analyte not detected at or above Method Reporting Limit
-- Indicates analysis not performed on this sample
* Indicates "The fuel fingerprint chromatogram does not match gasoline product, but more closely matches mineral spirits or highly weathered gasoline." As reported by Columbia Analytical Services, Inc.
Shading indicates concentration exceeds MTCA Method A Cleanup Levels for soil

[1] Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020
[2] Volatile fuel hydrocarbons (TPH as Gasoline) by EPA Method 5030/8015 Modified
[3] Semivolatile fuel hydrocarbons (TPH as Diesel or Other) by EPA Method 3550/8015 Modified
[4] Total Petroleum Hydrocarbons (TPH-IR) by EPA Method 418.1

August 26, 1992, indicated that TPH as diesel was present at concentrations of 1,460, 210, and 2,760 mg/kg, respectively. In addition, TPH as gasoline was reported at a concentration of 220 mg/kg in sample SE-18. Further excavation in the vicinity of these samples was limited by their proximity to a power pole and to the existing sidewalk. Sample locations are shown on Figure 5. Copies of the analytical laboratory reports are included in Appendix A.

Approximately 3,000 cubic yards of soil were excavated from the 715 Plum Street site and stockpiled at the Martin and Marvin Ways site.

Soil was placed on 10-mil thick plastic sheeting and covered each night with plastic sheeting to prevent downward migration of water through the stockpile and into subsurface soil. Stockpiling of soil was performed using a rubber tire backhoe. A small trackhoe was later moved onto the site to build a taller stockpile, thereby reducing the area of the stockpile.

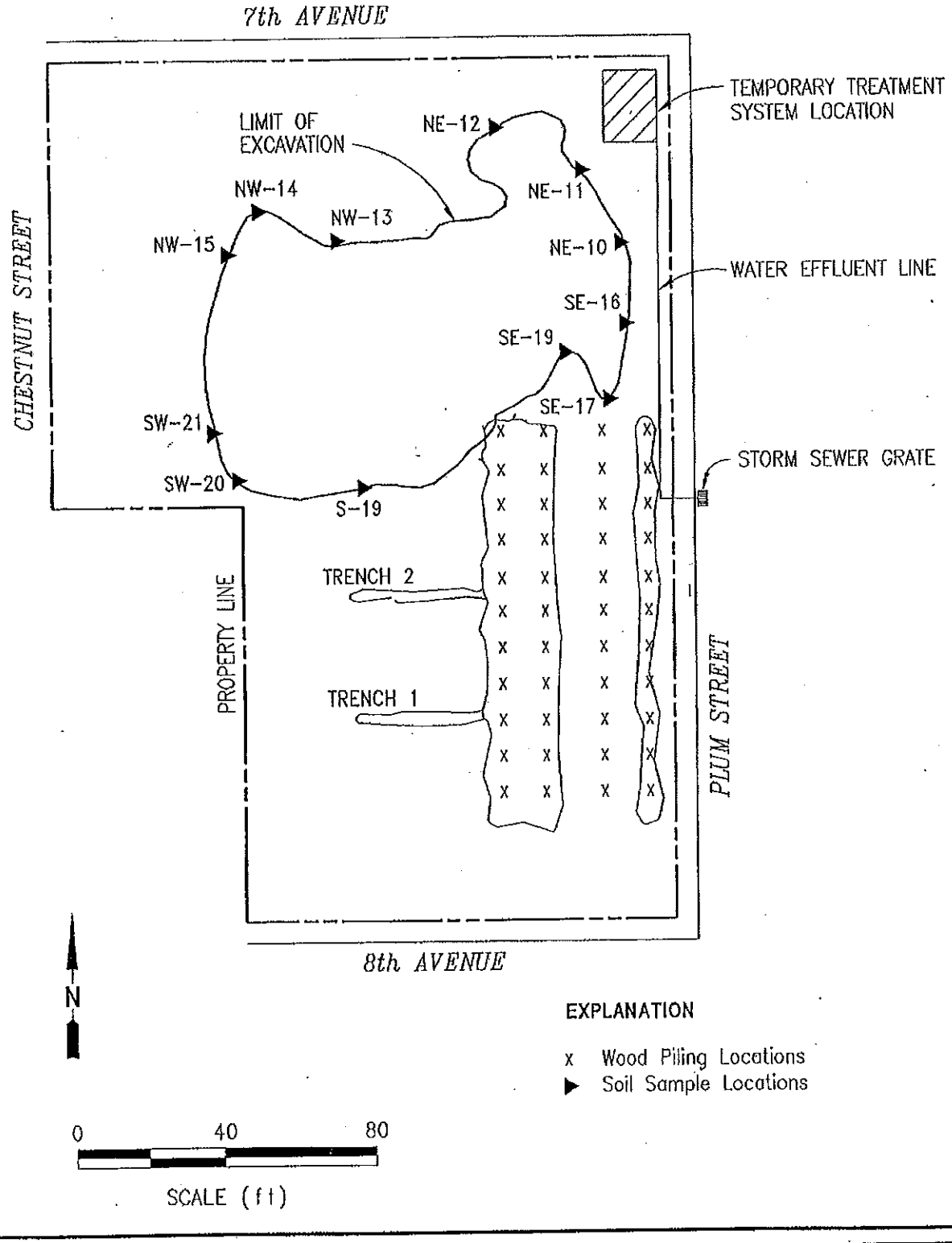

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Figure 5
McDONALD'S CORPORATION
OLYMPIA SITE

LIMITS OF EXCAVATION AND SOIL SAMPLE LOCATIONS

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4 GROUND WATER REMEDIATION

Following completion of excavation activities, a ground water remediation system was designed and installed at the site. The system was designed to remove volatile and semivolatile fuel hydrocarbons from water recovered from an open excavation.

4.1 Permit Acquisition

Before activating the ground water recovery/treatment system, authorization was required from the City of Olympia and the Olympic Air Pollution Control Authority was required. On behalf of McDonald's, EMCON contacted the necessary parties and obtained permission to operate the system.

4.1.1 Discharge Permit Acquisition

Before activating a ground water recovery/treatment system at the site, EMCON contacted the City of Olympia and Ecology to inquire about receiving a one-time permit for discharge of treated water to the sanitary sewer system. The City of Olympia indicated that the sanitary sewer system would be unable to accept treated water under the conditions of their National Pollutant Discharge Elimination System (NPDES) Permit. Discharge of treated water to the storm sewer system, however, was acceptable to the city.

In a July 31, 1991, letter to the City of Olympia, EMCON described the proposed ground water recovery/treatment system and requested permission to discharge treated water to the storm sewer system. An August 8, 1991 letter from the City of Olympia granted permission to discharge treated water to the storm sewer and set specific requirements for monitoring during system operation. The specific conditions included daily monitoring of the storm sewer outfall at Budd Inlet, compliance with water quality criteria, and notification to the city if pumping exceeded three weeks or 500,000 gallons. Copies of these correspondences are included in Appendix C.

4.1.2 Olympic Air Pollution Control Authority Registration

In a July 25, 1991, letter to the Olympic Air Pollution Control Authority (OAPCA), EMCON registered the proposed ground water recovery/treatment system. The letter described the components of the system and estimated the daily volatile organic compound (VOC) emissions. A copy of this correspondence is included in Appendix C.

4.2 Ground Water Recovery/Treatment System Design

Based on analytical data for ground water samples collected from ground water monitoring wells and from water samples collected from open trenches at the site, EMCON designed a temporary ground water recovery/treatment system. The system was designed to remove volatile and semivolatile fuel hydrocarbons from water recovered from an open excavation.

The system was constructed at the northeast corner of the site (Figure 5). On behalf of McDonald's, EMCON acquired a Special Use permit from the City of Olympia to partially obstruct the sidewalk on the east side of the site during operation of the system.

The system consisted of three submersible sump pumps placed in the open excavation to transfer water into a 1,000-gallon, baffled clarifier tank where suspended solids settled out of the water. Water was pumped from the clarifier tank, via a submersible pump, to a 12-inch-diameter, 20-foot-tall, air-stripping tower filled with plastic diffusion packing. Water entered the tower, at the top and flowed downwards through the packing in the tower. A centrifugal blower plumbed to the base of the tower forced air upwards through the falling column of water, thereby stripping volatile hydrocarbons from the water by volatilization. Air emissions from the tower discharged directly to the atmosphere. Water flowed from the base of the tower to a transfer tank and was then pumped via centrifugal pump through sediment filters and into two 1,000 pound carbon-filled canisters. Semivolatile fuel hydrocarbons were removed from the water by adsorption to the activated carbon grains as the water flowed through the canisters. Treated water gravity flowed through above-ground piping from the second carbon canister to a storm sewer drain at the eastern edge of the site. A schematic of the recovery/treatment system is presented in Figure 6.

4.3 Ground Water Recovery/Treatment System Operation

The ground water recovery/treatment system was constructed between August 6 and August 14, 1991. The system was activated for a brief period on August 15 to collect samples of the system effluent. The effluent samples were submitted to CAS for quantitative chemical analyses for BTEX and TPH as gasoline. Results of the analyses were reported via telephone conversation with Mr. Mark Blosser of the City of Olympia on August 19, 1991. System operation was approved by Mr. Blosser at that time. Mr. Blosser also indicated that daily outfall observations would not be required on weekends, providing the outfall appeared clean during week day visits.

The storm sewer system adjacent to the site consists of a segment of Moxlie Creek which has been routed through culverts under this portion of the city. The culvert daylights at Budd Inlet approximately a half mile north of the site. Daily observations of the discharge to Budd Inlet, required by the City of Olympia during operation of the system, were performed by EMCON personnel. The observations were recorded on daily field report forms. Copies of the daily reports are included in Appendix E.

4.3.1 System Performance Monitoring

On August 23 and 24, 1991, the ground water recovery/treatment system was activated. The cumulative pumping rate at system startup was measured at approximately 20 gallons per minute.

Following activation of the ground water recovery/treatment system, water samples were collected on a regular basis to ensure that discharge standards were being met and to monitor the effectiveness of the system. Water samples were collected on September 6 and September 18, 1991, from three sampling ports within the system. The samples were labelled 1, 2, and 3 and were collected from the influent to the air stripping tower, the effluent from the air stripping tower (influent to the carbon canister), and the carbon canister effluent, respectively. The samples were submitted to CAS for BTEX, TPH as gasoline, and TPH as diesel or other hydrocarbons analyses.

A review of analytical data for the samples collected on September 6, 1991, indicated that the carbon canister was not effectively removing semivolatile fuel hydrocarbons from the water. Inspection of the carbon canister revealed that an intake pipe within the canister had been broken, and, consequently, the water was short-circuiting through the canister. The pipe

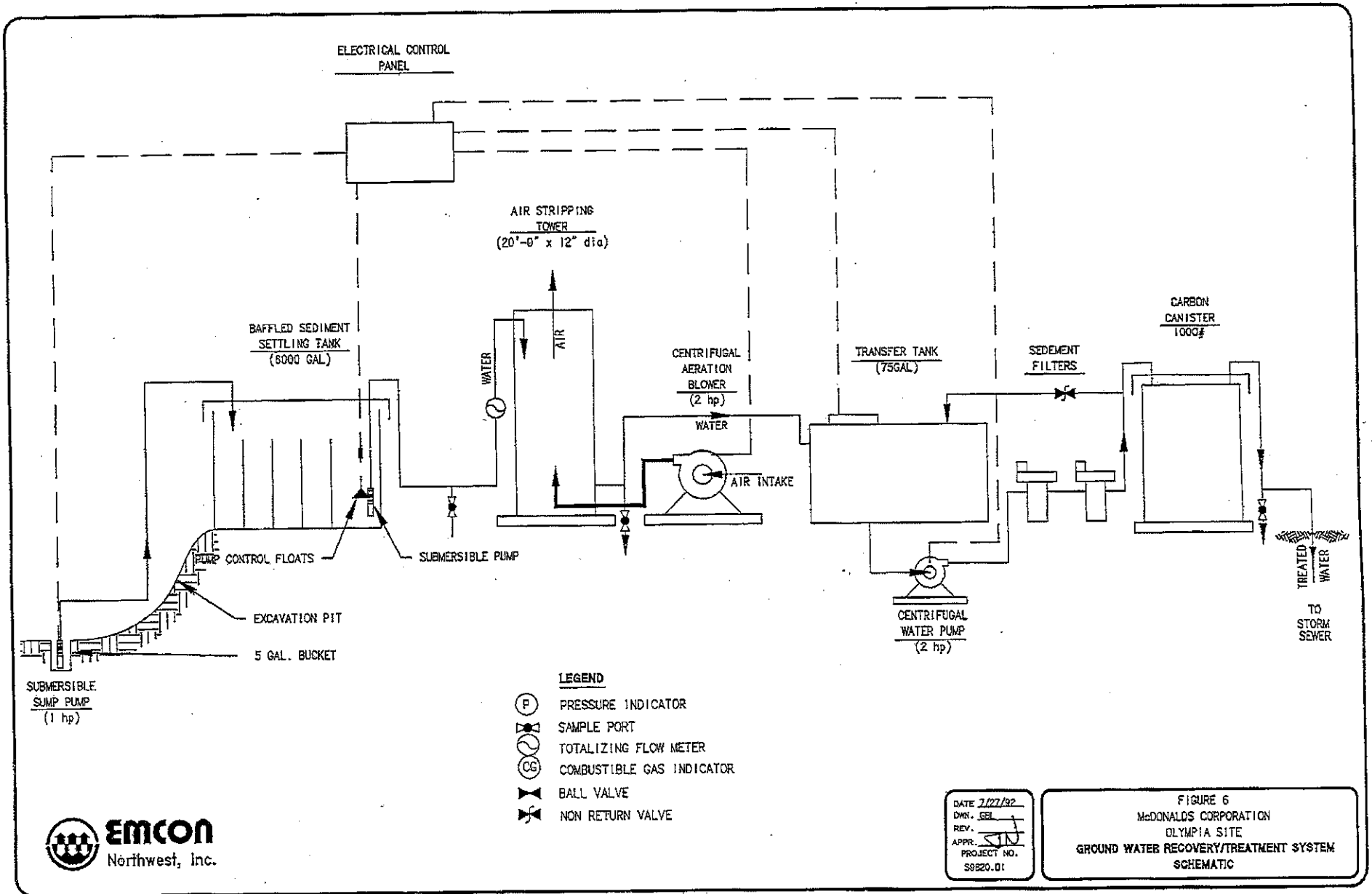

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FIGURE 6
McDONALDS CORPORATION
OLYMPIA SITE
GROUND WATER RECOVERY/TREATMENT SYSTEM SCHEMATIC

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was repaired on September 17, 1991, and a second set of water samples was collected on September 18, 1991.

Analytical data for the samples collected on September 18, 1991, indicated the repairs had been effective, and TPH as diesel concentrations in the system effluent were reduced by the carbon canister from 270 µg/l (µg/l units approximate parts per billion [ppb]) to ND. An air effluent sample was collected on September 9, 1991, in order to comply with OAPCA requirements. Analytical data for the air sample indicated BTEX and volatile hydrocarbons did not meet or exceed the method reporting units. A summary of the water samples collected from the system is presented in Table 8. Copies of the analytical laboratory reports are included in Appendix B.

4.3.2 Excavation Water Grab Samples

Following approximately one week of system operation, EMCON personnel collected water samples from six locations within the excavation. The samples were labelled S-1 through S-6 and were submitted to CAS for BTEX, TPH as gasoline, and TPH as diesel analyses. Reported concentrations of TPH as diesel exceeded MTCA Method A Cleanup Levels for ground water in samples S-1 and S-6. Concentrations of total xylenes exceeded MTCA Method A Cleanup Levels for ground water in samples S-4 and S-6.

On September 27, 1991, McDonald's was informed by telephone of the analytical data for this sampling event. Continued operation of the system was also recommended to McDonald's at this time.

A second set of water samples was collected from the excavation of October 3, 1991. The samples were labelled 1 through 7 and were submitted to CAS for BTEX, TPH as gasoline, and TPH as diesel analyses. Analytical data from this sampling event indicated that the concentrations of petroleum hydrocarbons in water within the excavation remained above MTCA Method A Cleanup Levels for ground water.

Following receipt of analytical data for the excavation water samples collected in October 1991, EMCON proposed installation of a long-term treatment system to address remaining petroleum hydrocarbons. Installation of a long-term system was proposed in order to allow McDonald's to continue with construction at the site. Consequently, the short-term system was deactivated and dismantled after approximately nine weeks of operation. During system operation, approximately 1.9 million

Table 8

Summary of Analytical Data - Water
McDonald's - Olympia, Washington
Treatment System Monitoring Samples

Sample I.D.	Date	Location	Benzene[1] (µg/l)	Toluene[1] (µg/l)	Ethylbenzene[1] (µg/l)	Total Xylenes[1] (µg/l)	TPH as Gasoline[2] (µg/l)	TPH as Diesel[3] (µg/l)	TPH as Other[3] (µg/l)
Treatment System Samples - Collected From Sample Ports Within System									
Effluent	8/15/91	C	ND	ND	ND	ND	ND	740	ND
1	9/6/91	A	0.7	ND	1	7	60	645	ND
2	9/6/91	B	ND	ND	ND	ND	ND	554	ND
3	9/6/91	C	ND	ND	ND	ND	ND	549	ND
1	9/18/91	A	0.7	ND	ND	11	70	270	ND
2	9/18/91	B	ND	ND	ND	ND	ND	270	ND
3	9/18/91	C	ND	2	1	8	ND	ND	ND
INFLUENT	11/22/91		6.9	40	58	391	2,270	ND	ND
EFFLUENT	11/22/91		3.9	25	33	231	1,120	ND	ND
Excavation Water - Grab Samples									
NW	9/11/91		4.1	6.1	5.3	22	240	640	ND
SW	9/11/91		1.0	1.4	3.0	13	230	2,070	920
SE	9/11/91		ND	ND	ND	ND	ND	1,780	250
N	9/11/91		3.6	6.3	5.7	27	320	310	ND
S-1	9/26/91		ND	ND	ND	1	67	1,570	400
S-2	9/26/91		2.0	3	1	13	89	350	120
S-3	9/26/91		0.9	1	ND	9	81	440	120
S-4	9/26/91		2.0	4	3	26	140	410	ND
S-5	9/26/91		ND	ND	ND	2	51	260	ND
S-6	9/26/91		2.7	7	4	29	187	1,220	ND
1	10/3/91		ND	ND	ND	4	85	1,100	ND
2	10/3/91		17.9	49	25	135	1,250	2,790	610
3	10/3/91		43.0	85	32	184	1,030	270	ND
4	10/3/91		1.5	2	2	16	88	120	ND
5	10/3/91		ND	ND	ND	ND	ND	1,790	210
6	10/3/91		12.9	77	30	193	957	1,520	220
7	10/3/91		3.7	9	8	50	341	490	ND
MTCA Method A Cleanup Level - Ground Water			5	40	30	20	1,000	1,000	1,000

Table 8

Summary of Analytical Data - Water
(Continued)

NOTES: ND indicates analyte not detected at or above Method Reporting Limit
A Indicates sample collected from influent to air stripper
B Indicates sample collected from air stripper effluent/influent to carbon filtration system
C Indicates sample collected from carbon filtration system effluent
Shading indicates reported concnetrations meets or exceeds MTCA Method A Cleanup Level for ground water

[1] Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020
[2] Volatile fuel hydrocarbons (TPH as Gasoline) by EPA Method 5030/8015 Modified
[3] Semivolatile fuel hydrocarbons (TPH as Diesel or Other) by EPA Method 3550/8015 Modifed
[4] Chapter 173-340 WAC, "The Model Toxics Control Act Cleanup Regulations, Method A Cleanup Limits." Amended February 1991. Caution on misusing Method A tables. Method A tables have been developed for specific purposes. They are intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or those sites with relatively few hazardous substances. The tables may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in these tables should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in these tables do not necessarily trigger requirements for cleanup action under this chapter.

gallons of water were recovered, treated, and discharged to the storm sewer system.

4.4 Temporary Ground Water Treatment System

Following deactivation of the recovery/treatment system, construction resumed at the site. In order to pour piling caps for the building footings, the contractor required dewatering of the piling trenches. Based on water quality data for the site, water removed by the contractor required treatment. Additionally, a pumping rate significantly higher than the previous rate was required in order to dewater the trenches. Consequently, a temporary treatment system consisting of four 1,000-pound carbon-filled canisters, plumbed in series in groups of two, was installed in the northwest corner of the site.

The system was designed to handle pumping rates of approximately 60 to 80 gallons per minute. The system was operated as needed during construction by Lugo Construction, Inc. Treated water was discharged to the storm sewer system adjacent to the site. The system was operated intermittently from October 28 to November 25, 1991.

Analytical data for system influent and effluent samples collected November 22, 1992, are summarized in Table 8. Copies of the analytical data are presented in Appendix B.

5 ADDITIONAL GROUND WATER MONITORING WELL INSTALLATION

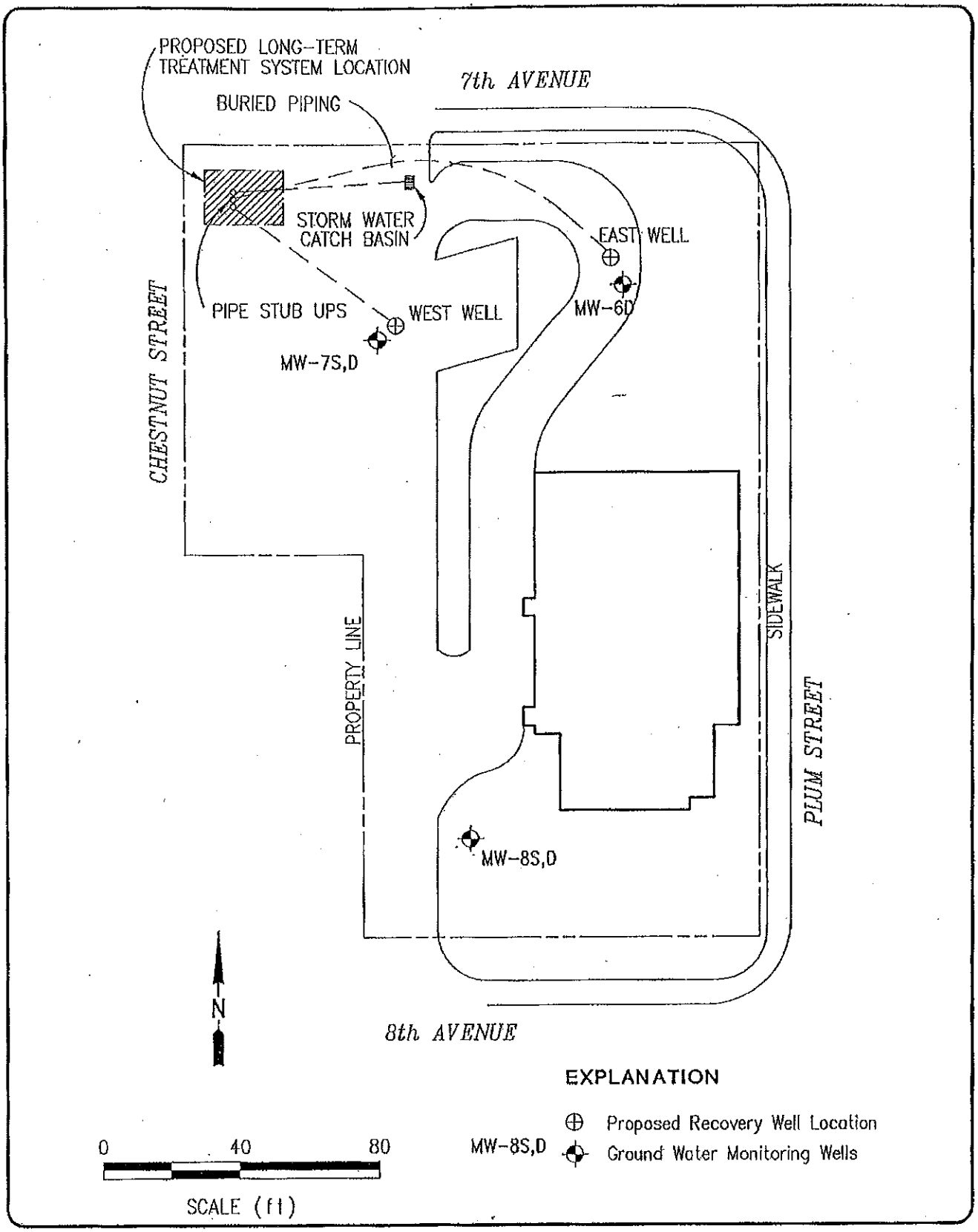
Construction at the site commenced immediately upon completion of the ground water recovery/treatment program. As construction of the new building neared completion, EMCON recommended installation of three double-completion ground water monitoring wells. The well locations proposed were compatible with the proposed landscape and building plan. Additionally, these proposed wells were to serve as replacements for monitoring wells MW-1 through MW-5 which were damaged or destroyed during construction activities.

5.1 Well Installation

During December 1991 and January 1992, an EMCON geologist directed drilling and installation of three double-completion ground water monitoring wells at the site. Drilling services were provided by Tacoma Pump and Drilling, Inc. of Graham, Washington. Double completion wells were recommended to evaluate the vertical gradient across the peat unit underlying the site.

A double-completion well consists of two 2-inch-diameter ground water monitoring wells screened at different elevations within the same boring. Constructing wells in this manner allows measurement of static ground water elevations from different elevations within the same water bearing unit or between different water bearing units, in this case from above and below the peat. The difference between the two measurements divided by the vertical distance between the mid point of each screened interval is defined as the vertical gradient. A positive vertical gradient would indicate the potential for an upward component of ground water flow; a negative vertical gradient would indicate the potential for a downward component of flow.

Three wells designated MW-6S and D, MW-7S and D, and MW-8S and D were installed at locations presented in Figure 7. Each well was constructed using 2-inch-diameter 0.010 inch factory slotted well screen and blank riser pipe. Well construction procedures followed those described in Section 2.6. The shallow wells were screened above the peat from



EMCON Northwest, Inc.

DATE 7-27-92
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APPR. SN
PROJECT NO. 0510-003.01

Figure 7
McDONALD'S CORPORATION
OLYMPIA SITE
LONG-TERM TREATMENT SYSTEM AND WELL LOCATIONS

1= 40 10-19-92 D:\0510\003\01C04

approximately 4 to 6 feet below ground surface, and the deep wells were screened below the peat from approximately 15 to 20 feet below ground surface. Subsurface soil descriptions and well construction details were recorded on a boring log form, copies of which are included in Appendix D. The peat unit was encountered during drilling at approximately 6.5-to 8-feet below ground surface and ranged from approximately 5 to 8 feet in thickness.

5.2 Well Elevation Survey

Following installation of the three double-completion wells, EMCON personnel surveyed the vertical elevation of each of the well casings relative to an on-site datum. Top of casing elevations were measured to the nearest 0.01 foot. Survey data were then used in conjunction with water level measurements collected during ground water sampling to calculate the horizontal and vertical gradient.

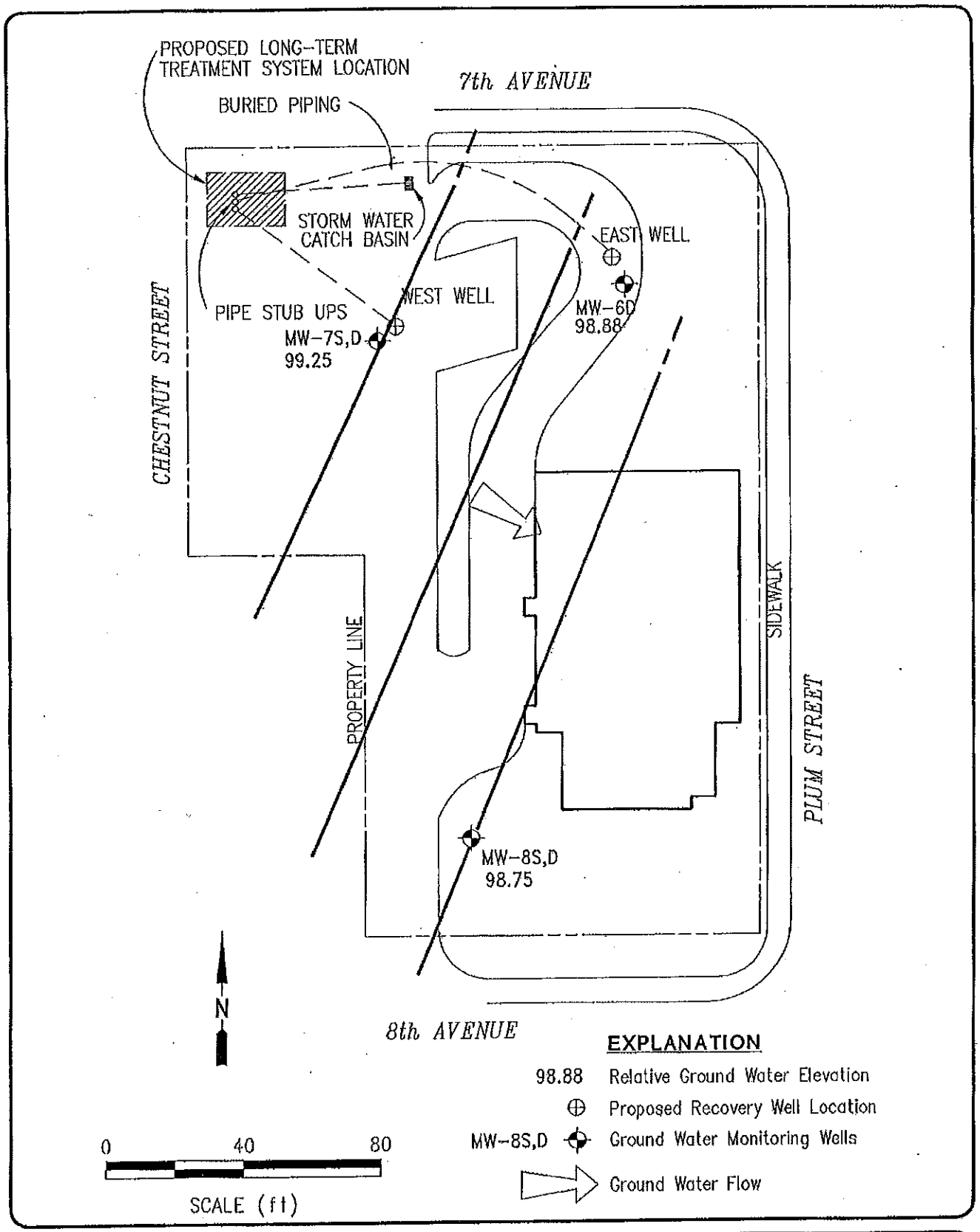
5.2.1 Vertical Gradient Measurement

Relative top of casing elevations were used in conjunction with depth to water measurements to calculate the vertical gradient across the peat unit underlying the site. An upward vertical gradient of .36 was measured at well pair MW-7S and D, and an upward vertical gradient of .03 was measured at well pair MW-8S and D.

5.2.2 Horizontal Gradient Measurement

Top of casing elevations and water level measurements were also used to calculate horizontal gradient in the unit below the peat. Damage to monitoring well MW-6S during construction prevented calculation of a gradient in the water-bearing unit beneath the peat.

Water level data for wells MW-6D, MW-7D, and MW-8D were used to prepare the potentiometric surface map presented in Figure 8. Based on data gathered on February 24, 1992, ground water flow in the water-bearing unit located beneath the peat was generally to the south-southeast.



EMCON Northwest, Inc.

DATE 7-27-92
DWN. KM
REV.
APPR. SN
PROJECT NO.
0510-003.01

Figure 8
McDONALD'S CORPORATION
OLYMPIA SITE
WATER TABLE ELEVATION AND GROUND WATER FLOW DIRECTION. LOWER WATER BEARING UNIT

1= 40 12-3-92 0510\003\01C06

5.3 Potential Long-Term Recovery/Treatment System Preparation

In order to avoid trenching and excavating at the site after completion of construction activities, EMCON personnel installed underground piping for the long-term ground water recovery/treatment system, prior to final grading of the site. Underground piping was placed in trenches connecting two proposed recovery well locations to a proposed treatment system location in the northwest corner of the site. Manholes were placed at the proposed recovery well locations. The proposed treatment system location and the manholes were placed in locations compatible with the proposed landscaping and construction plan. The proposed recovery well locations and underground piping layout are shown on Figure 7.

5.4 Tidal Study

Field observation of water levels in open excavation at the site indicated considerable tidal influence existed. To measure the tidal effect beneath the site, EMCON personnel installed pressure transducers in monitoring wells MW-7S and MW-7D. The transducers measured the height of water in the well on a pre-programmed interval of one reading every 20 minutes. Pressure readings were collected using automatic data-recording equipment which converted readings to feet of water.

Water level readings were recorded for approximately 36 hours during the study. When graphed against time, however, the data did not support field observations and proved inconclusive in confirming tidal influences beneath the site.

6 QUARTERLY GROUND WATER MONITORING

Following deactivation of the ground water recovery/treatment system in February 1992, EMCON began quarterly collection of ground water samples. To date, quarterly sampling events have been performed in February, May, and August 1992.

February Sampling Event
Analytical data for ground water samples collected in February 1992 indicated the concentration of TPH as diesel in the ground water sample collected from monitoring well MW-8D (1,060 μg/l) exceeded the MTCA Method A Cleanup Level for ground water. No other analyte was reported at concentrations meeting or exceeding MTCA Method A Cleanup Levels for any sample collected during this sampling event.

May Sampling Event
Analytical data for ground water samples collected in May 1992 again indicated the concentration of TPH as diesel in the ground water sample collected from monitoring well MW-8D (1,550 μg/l) exceeded the MTCA Method A Cleanup Level for ground water. No other analyte was detected at concentrations meeting or exceeding MTCA Method A Cleanup Levels for any ground water samples collected during this event.

August Sampling Event
EMCON personnel collected ground water samples from five ground water monitoring wells on August 7, 1992. As a result of laboratory error, the data for this sampling round could not be considered valid because of the lack of appropriate QA/QC documentation. However, examination of the chromatograms for the ground water sample collected from MW-8 D indicated the presence of a compound which could not be identified using WTPH-G or WTPH-D analyses.

On August 17, 1992, EMCON personnel again collected ground water samples from five ground water monitoring wells. A duplicate sample collected from MW-8 D was submitted for analysis of volatile and semivolatile organic compounds by EPA Methods 8240 and 8270, respectively.

A review of the analytical data from the samples collected August 17, 1992, indicated that concentrations of petroleum hydrocarbons did not exceed MTCA Method A Cleanup Levels for ground water. Results of the volatile organic compound analysis confirmed the presence of toluene detected by the WTPH-G/BTEX analysis. Reported concentrations of Bis(2-ethylhexyl) Phalate and methylene chloride are likely the result of laboratory contamination. Several unknown compounds were also identified in this sample, but at relatively low estimated concentrations. A summary of the analytical data for each quarterly sampling event is presented in Table 9.

Table 9

Summary of Analytical Data - Ground Water
McDonald's - Olympia, Washington
Quarterly Sampling Events

Sample I.D.	Well I.D.	Sample Collection Date	Benzene[1] (µg/l)	Toluene[1] (µg/l)	Ethylbenzene[1] (µg/l)	Total Xylenes[1] (µg/l)	TPH as Gasoline[2] (µg/l)	TPH as Diesel[3] (µg/l)	TPH as Other[3] (µg/l)
MCD-0224-01	MW-6D	2/24/92	ND	ND	ND	ND	ND	ND	ND
MCD-0224-03	MW-7S	2/24/92	ND	ND	ND	1	ND	ND	ND
MCD-0224-04	MW-7D	2/24/92	ND	ND	ND	ND	ND	ND	ND
MCD-0224-56	MW-7D (Duplicate)	2/24/92	ND	ND	ND	ND	ND	ND	ND
MCD-0224-05	MW-8S	2/24/92	ND	ND	ND	ND	ND	347*	ND
MCD-0224-055	MW-8S (Duplicate)	2/24/92	ND	ND	ND	ND	ND	349*	ND
MCD-0224-06	MW-8D	2/24/92	ND	ND	ND	ND	ND	1,060*	ND
UNO-0527-01	MW-6D	5/27/92	ND	ND	ND	ND	ND	ND	ND
UNO-0527-02	MW-7D	5/27/92	ND	ND	ND	ND	ND	ND	ND
UNO-0527-03	MW-7S	5/27/92	ND	ND	ND	ND	ND	--	--
UNO-0527-04	MW-8D	5/27/92	ND	12	ND	ND	ND	460*	ND
UNO-0527-05	MW-8S	5/27/92	ND	6	ND	3	220	1,550*	ND
UNO-0527-06	MW-6D (Duplicate)	5/27/92	ND	ND	ND	ND	ND	ND	ND
MCD 0817-01	MW-7S	8/17/92	ND	ND	ND	ND	ND	ND	ND
MCD-0817-02	MW-7D	8/17/92	ND	ND	ND	ND	ND	ND	ND
MCD-0817-03	MW-6D	8/17/92	ND	ND	ND	ND	ND	ND	ND
MCD-0817-04	MW-8S	8/17/92	ND	33	ND	ND	80*	350**	ND
MCD-0817-05	MW-8D	8/17/92	ND	2	ND	ND	ND	150**	ND
MCD-0817-06	MW-8S (Duplicate)	8/17/92	--	--	--	--	--	--	--
MTCA Method A Cleanup Level - Ground Water			5	40	30	20	1,000	1,000	1,000

Table 9

Summary of Analytical Data - Ground Water
(Continued)

General Notes:

ND Indicates analyte not detected at or above Method Reporting Limit
-- Indicates analysis not performed on this sample
Shading indicates reported concentrations exceeds MTCA Method A Cleanup Level for ground water

February Sampling Event Notes:

* Indicates "This chromatogram does not resemble diesel, but since a portion elutes in the diesel range, it is quantified as diesel" as reported by Columbia Analytical Services, Inc.

[1] Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020
[2] Volatile fuel hydrocarbons (TPH as Gasoline) by EPA Method 5030/8015 Modified
[3] Semivolatile fuel hydrocarbons (TPH as Diesel or Other) by EPA Method 3550/8015 Modified

May Sampling Event Notes:

* Indicates "This sample does not resemble diesel" As reported by Columbia Analytical Services, Inc.

[1] Benzene, toluene, ethylbenzene,and total xylenes (BTEX) by EPA Method 8020
[2] TPH as gasoline by Ecology Method WTPH-G
[3] TPH as diesel or other by Ecology Method WTPH-D

August Sampling Event Notes:

* Indicates "The presence of gasoline was not confirmed by the characteristic TPH gasoline fingerprint" as reported by Columbia Analytical Services, Inc.
** Indicates "The presence of diesel was not confirmed by the characteristinc TPH diesel fingerprint" as reported by Columbia Analytical Services, Inc.

[1] Benzene, toluene, ethylbenzene,and total xylenes (BTEX) by EPA Method 8020
[2] TPH as gasoline by Ecology Method WTPH-G
[3] TPH as diesel or other by Ecology Method WTPH-D

7 CONCLUSIONS

Based on ground water quality data available at this time, we recommend continuation of quarterly ground water sampling events. Although concentrations of TPH as diesel in ground water samples collected from monitoring well MW-8D exceeded MTCA Method A Cleanup Levels in February 1992, we do not recommend installation of a long-term ground water recovery/treatment system.

Based on analytical data for the August 1992 quarterly sampling event, we anticipate that quarterly sampling will be discontinued in 1993.

Following receipt of Ecology approval, the sampling program will be discontinued and the monitoring wells will be abandoned.

8 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.

The purpose of a geologic/hydrogeologic study is to reasonably characterize existing site conditions based on the geology/hydrogeology of the area. In performing such a study, it is understood that a balance must be struck between a reasonable inquiry into the site conditions and an exhaustive analysis of each conceivable environmental characteristic. The following paragraphs discuss the assumptions and parameters under which such an opinion is rendered.

No investigation is thorough enough to describe all geologic/ hydrogeologic conditions of interest at a given site. If conditions have not been identified during the study, such a finding should not therefore be construed as a guarantee of the absence of such conditions at the site, but rather as the result of the services performed within the scope, limitations, and cost of the work performed.

We are unable to report on or accurately predict events that may change the site conditions after the described services are performed, whether occurring naturally or caused by external forces. We assume no responsibility for conditions we were not authorized to evaluate, or conditions not generally recognized as predictable when services were performed.

Geologic/hydrogeologic conditions may exist at the site that cannot be identified solely by visual observation. Where subsurface exploratory work was performed, our professional opinions are based in part on interpretation of data from discrete sampling locations that may not represent actual conditions at unsampled locations.