Lower Duwamish Waterway Group

Port of Seattle / City of Seattle / King County / The Boeing Company

Lower Duwamish Waterway Remedial Investigation

APPENDIX G:
GROUNDWATER PATHWAY ASSESSMENT

ATTACHMENT G-2. FIGURES AND MAPS

For submittal to

The U.S. Environmental Protection Agency
Region 10
Seattle, WA

The Washington State Department of Ecology
Northwest Field Office
Bellevue, WA

July 3, 2003

Prepared by: Windward environmental LLC

200 West Mercer Street, Suite 401 ♦ Seattle, Washington ♦ 98119

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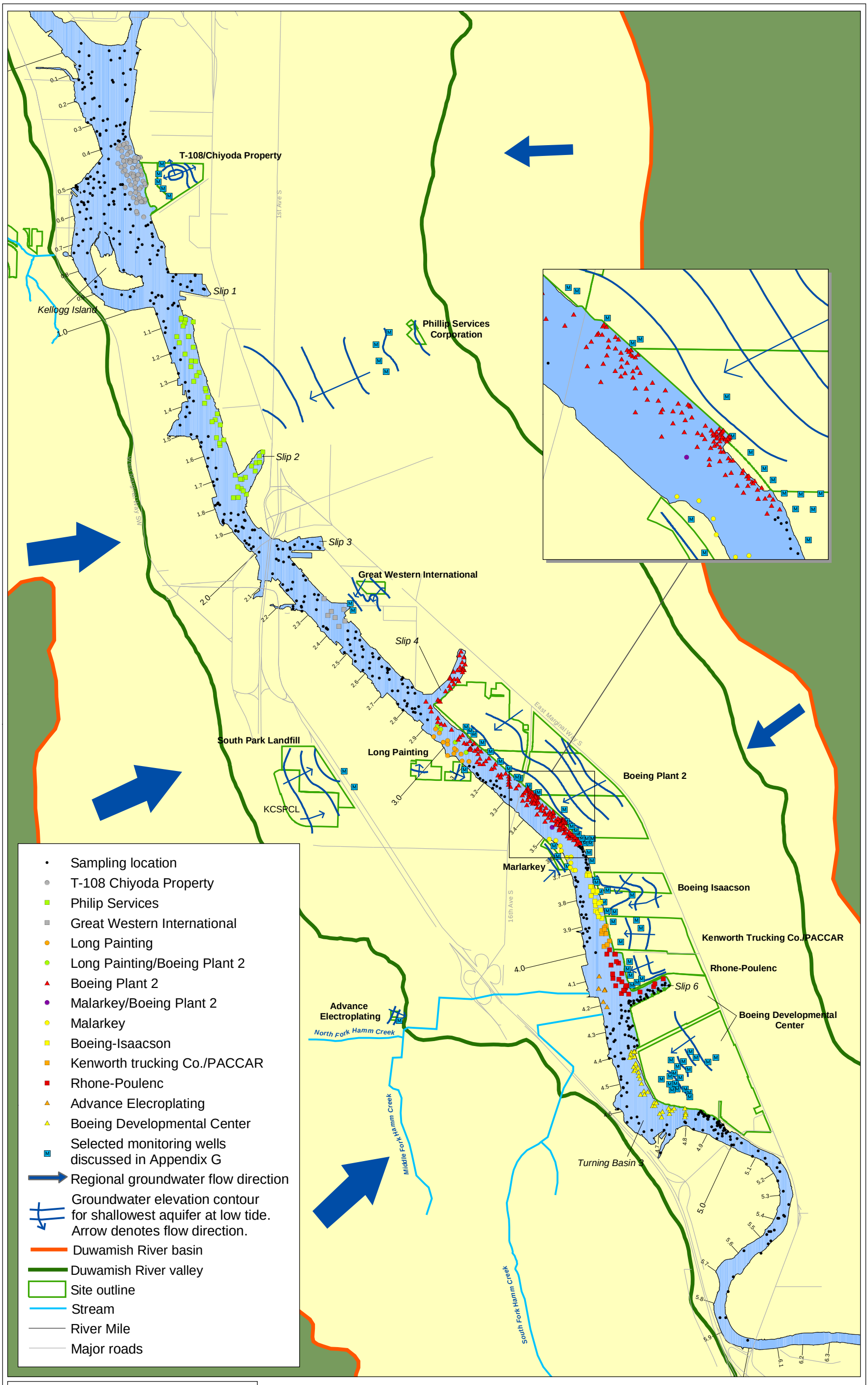


Map G-1. Groundwater flow contours and sediment samples associated with ground water sites

Prepared by RAC 1/21/03 Map 551

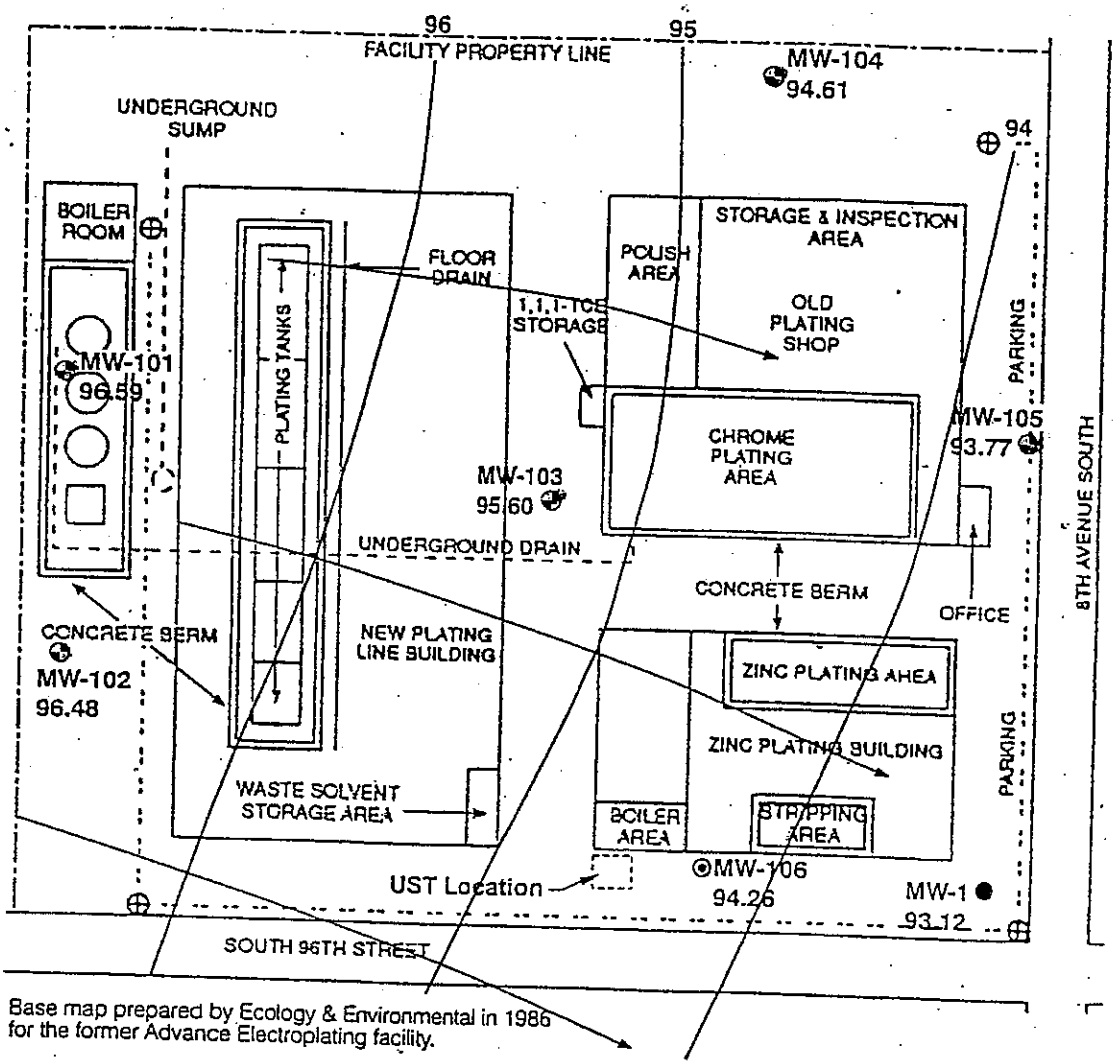
W:\Projects\00-08-06_Duwamish_RI\data\gis\RI to EPA

Advance Electroplating (G.1)

Figure 4. *Well locations (Brincefield 2002)*
Figure a. *Well monitoring results for inorganics (Cutler 1999)*
Figure b. *Well monitoring results for inorganics (except Ni and Zn) (Cutler 1999)*
Figure c. *Well monitoring results for organics (Cutler 1999)*
Figure d. *Well monitoring results for organics (excluding trichloroethene) (Cutler 1999)*

Site and Exploration Plan

DRAFT



Base map prepared by Ecology & Environmental in 1986 for the former Advance Electroplating facility.

0 40 80

Approximate Scale in Feet

Typical gradient .3
approx. 2'/125'
or 0.016

Exploration Location and Number:

- ● MW-1 Existing Monitoring Well
- ◔ MW-101 Proposed Monitoring Well
- ⊙ HC-1 Proposed Hydro-punch
- -- -- Storm Drain
- ⊕ Catchment Basin

N

Figure 4: Well Locations

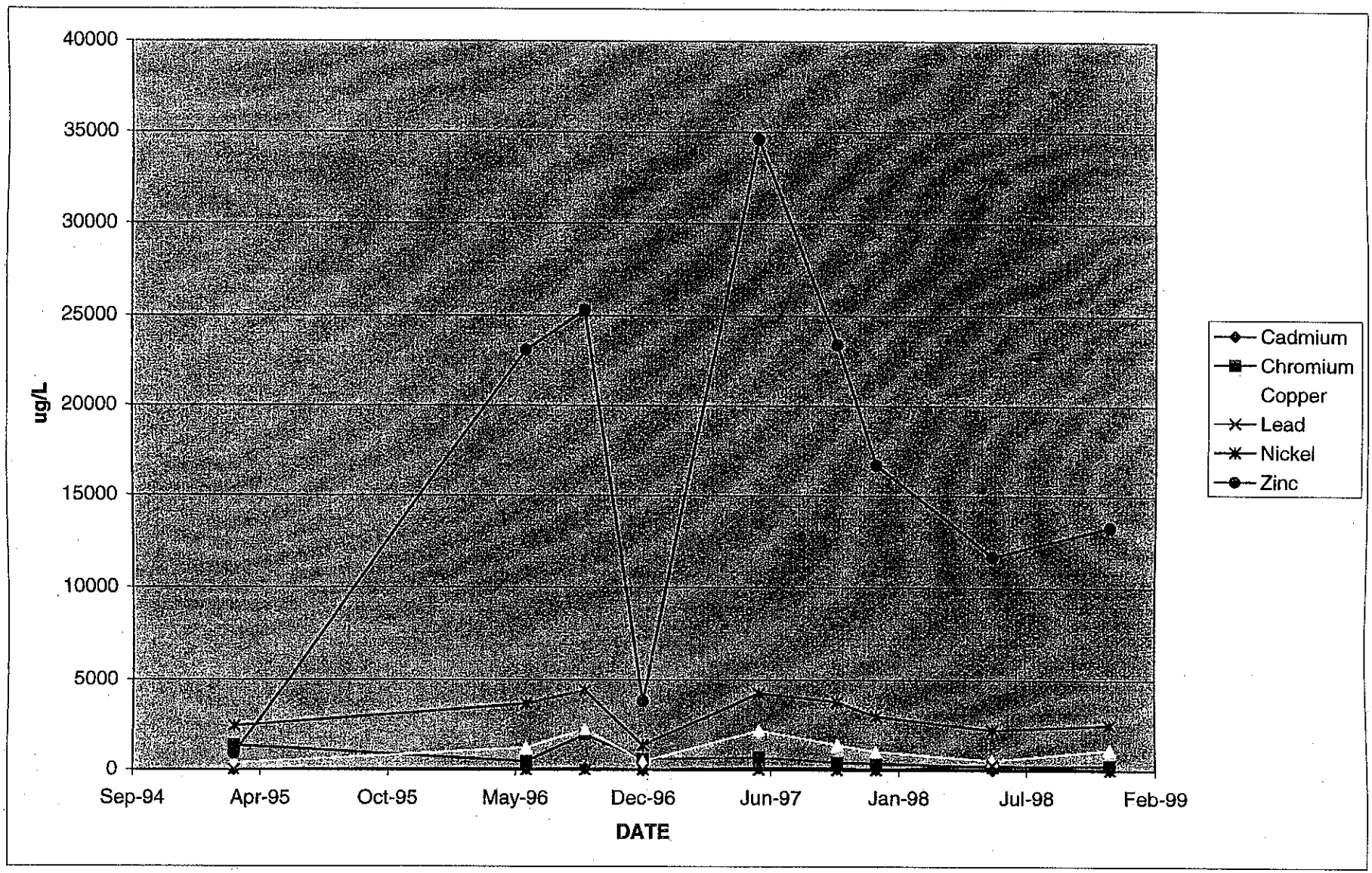
HARTCROWSER

J-7359 5/00

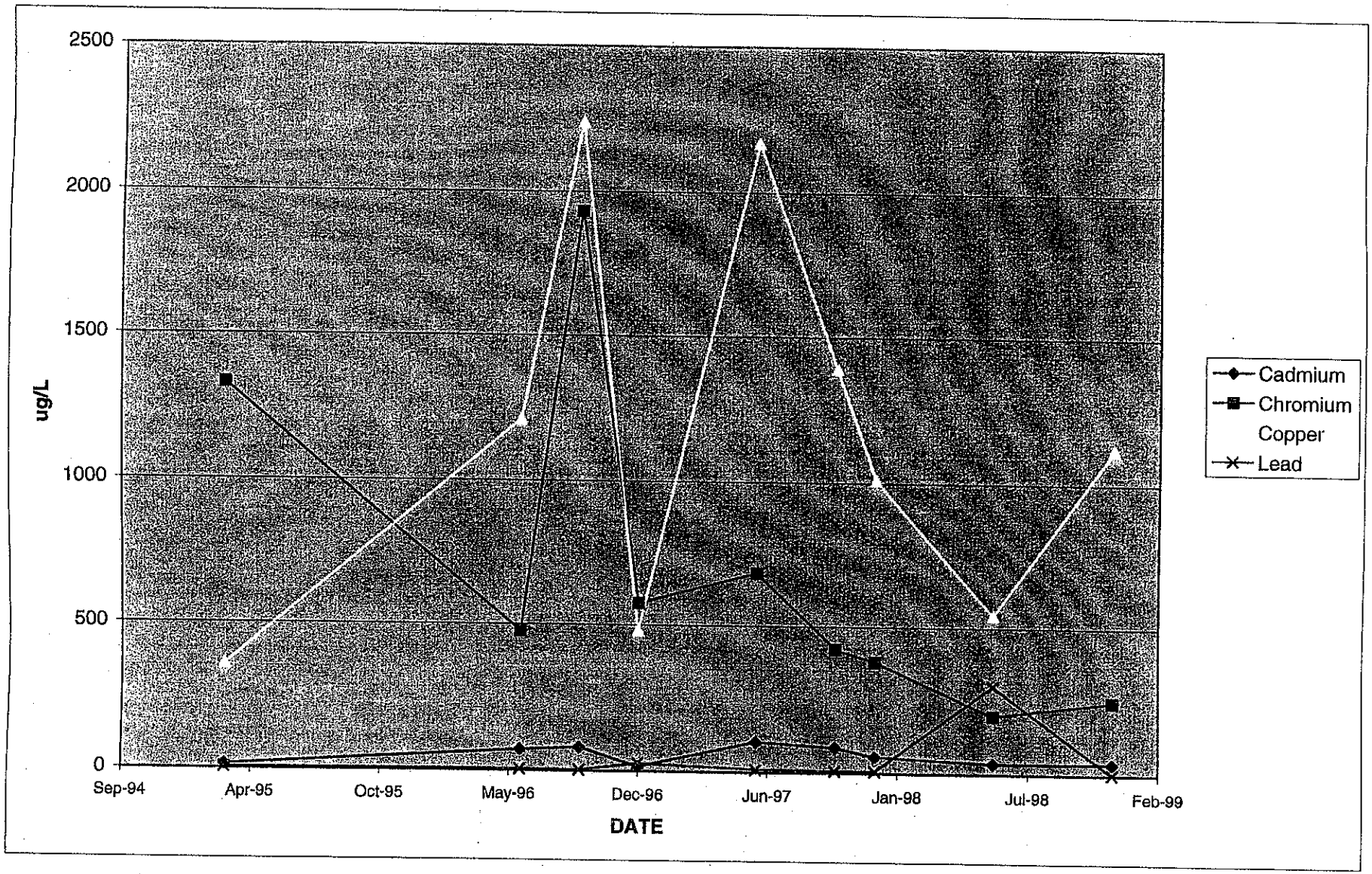
Figure 2

DJH13-29-001\7359\..\J-59A.cdr

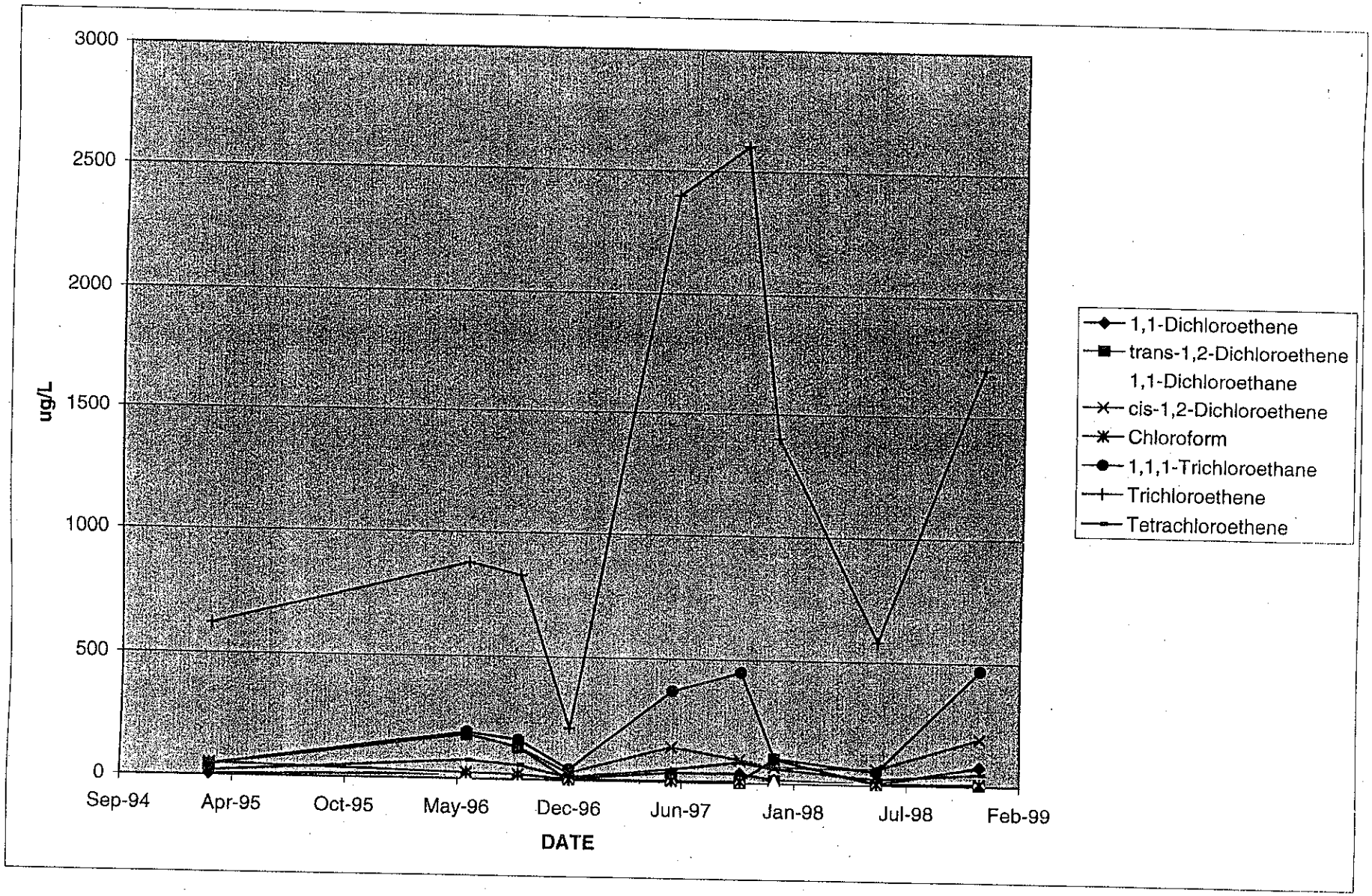
Advance Electroplating
8th Ave. S. and S. 96th St.
Monitoring Well Results for Inorganics



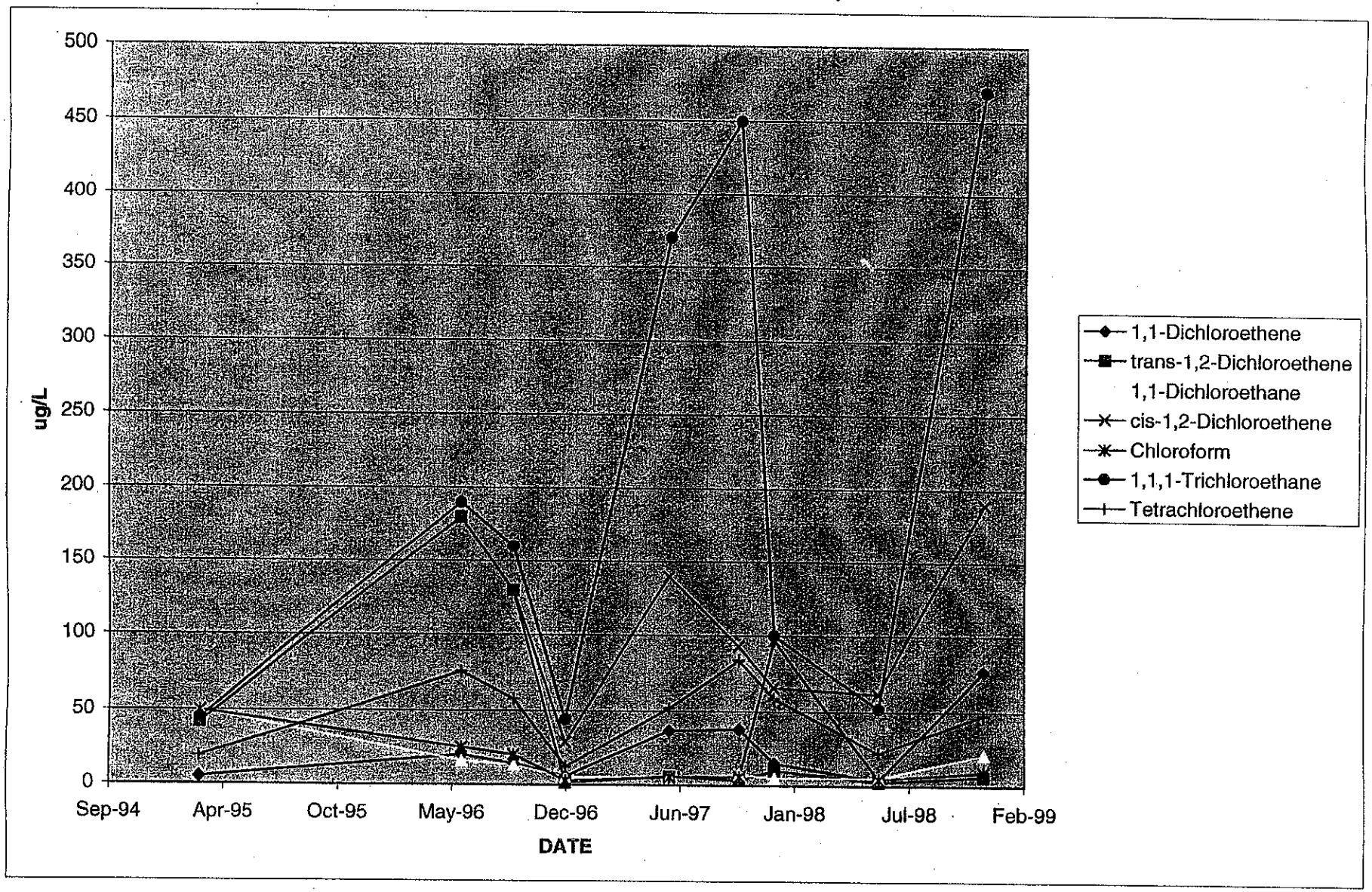
Advance Electroplating
8th Ave. S. and S. 96th St.
Monitoring Well Results for Inorganics
(except Ni and Zn)



Advance Electroplating
8th Ave. S. and S. 96th St.
Monitoring Well Results for Organics

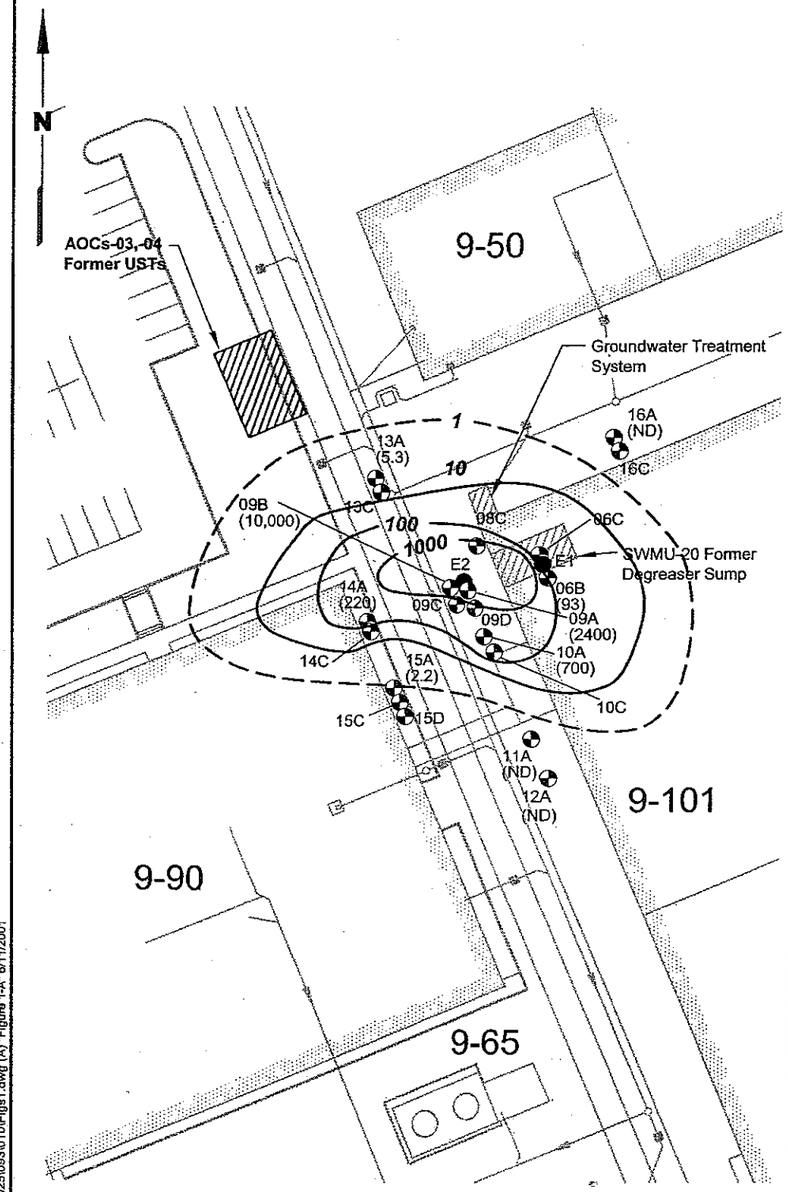


Advance Electroplating
8th Ave. S. and S. 96th St.
Monitoring Well Results for Organics
(excluding Trichloroethene)

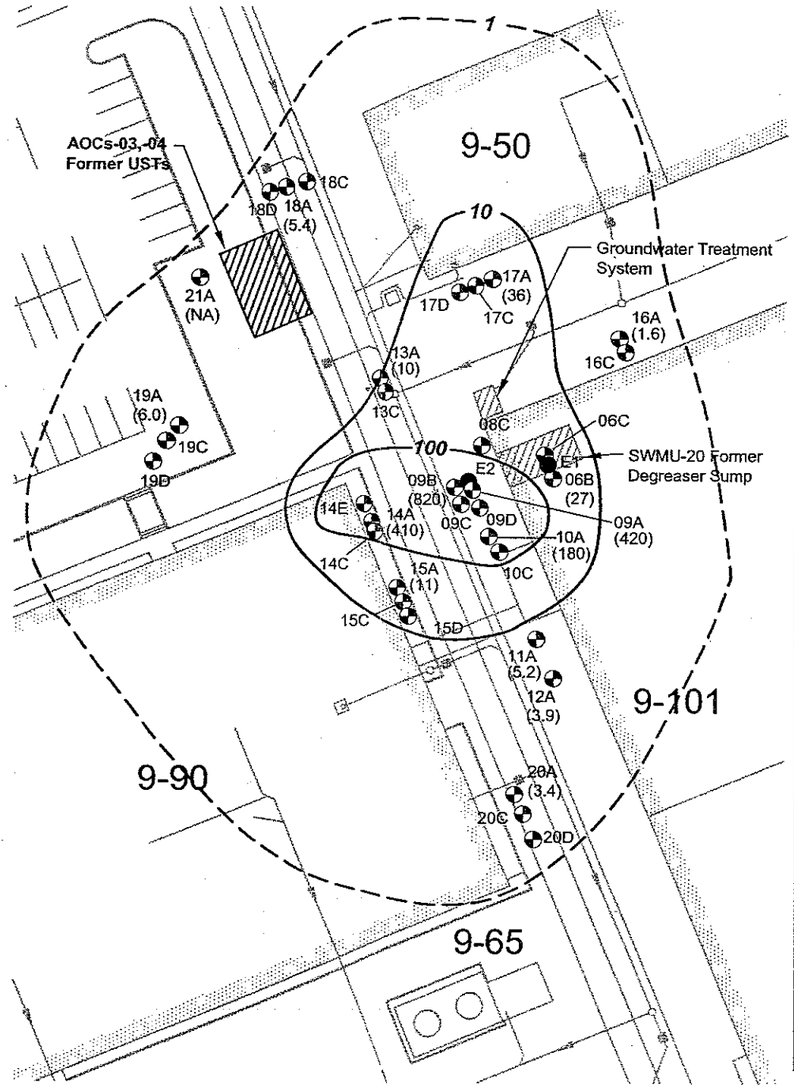


Boeing Developmental Center (G.2)

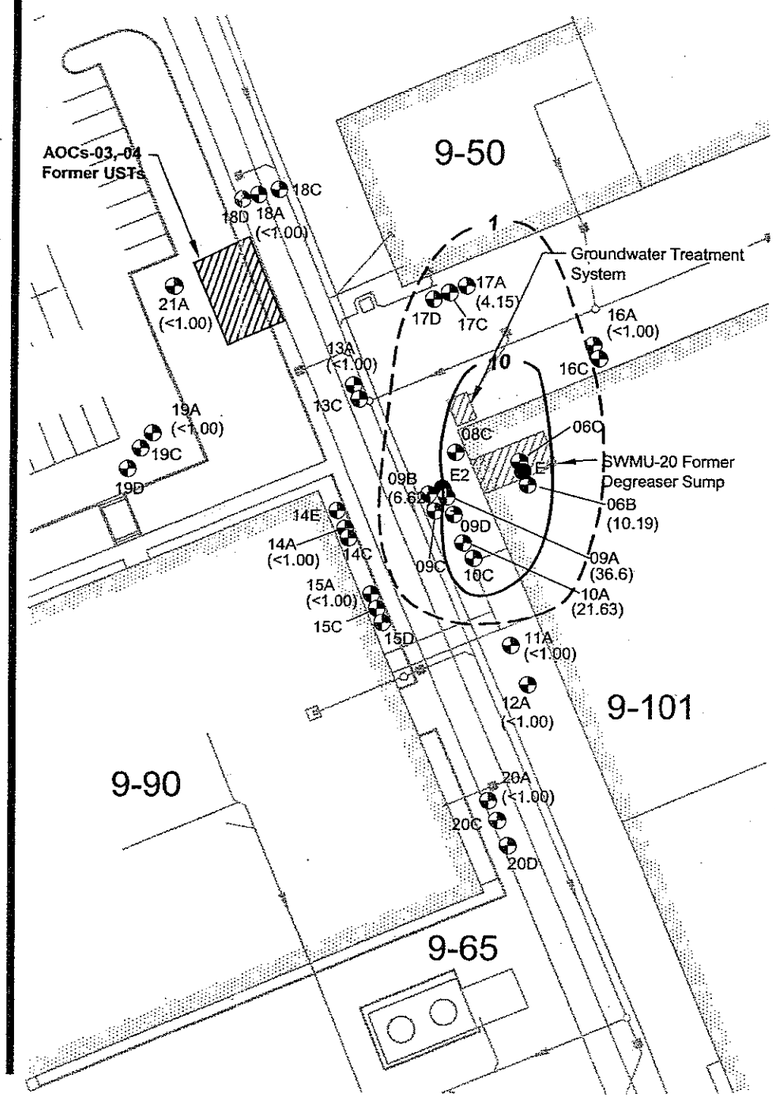
Figure 1a. August 1989, January 1994, and December 2000- PCE, A horizon groundwater (Landau 2001)
Figure 1c. August 1989, January 1994, and December 2000- PCE, C horizon groundwater (Landau 2001)
Figure 4. Cross section locations (Landau 2001)
Figure 5. Cross section A-A' (Landau 2001)
Figure 6. Cross section B-B' (Landau 2001)
Figure 7. Facility-wide groundwater elevation contours, June 2002 (Landau 2001)
Figure 8. Facility-wide groundwater elevation contours, June 2001 (Landau 2001)
Figure 9. SWMU and AOC locations (Landau 2001)



August 1989



January 1994



December 2000

Notes

1. (µg/L) = micrograms per liter.
2. "A" horizon extends from 6.5 to 21.5 ft. below ground surface.
3. ND = not detected
4. NA = not analyzed
5. Isopleths are representative of the A Horizon with consideration of the concentration reported in the two B Horizon wells

Legend

- Monitoring Well Locations
- Groundwater Extraction Well Locations
- (1.06) Reported PCE Concentrations (µg/L)
- —10— Estimated PCE Concentration Isopleth (µg/L)

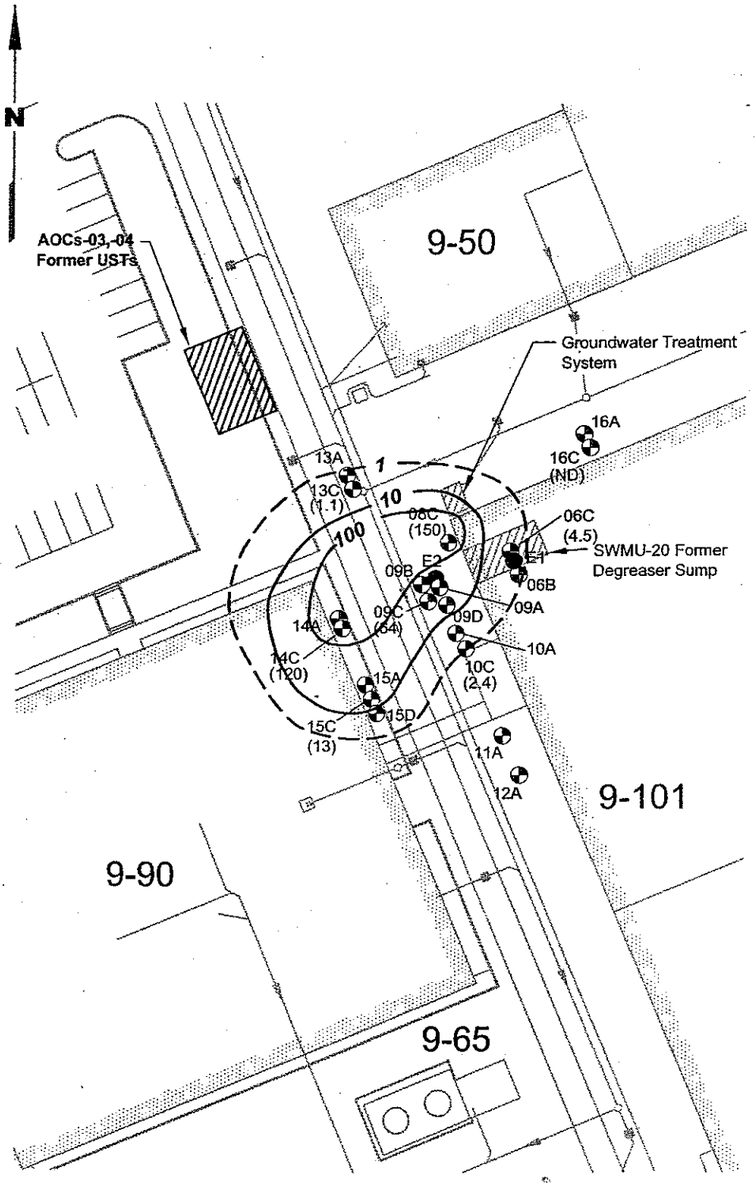
0 60 120
Scale in Feet

Adapted from: Boeing Facilities; Duane Hartman and Associates, 2001

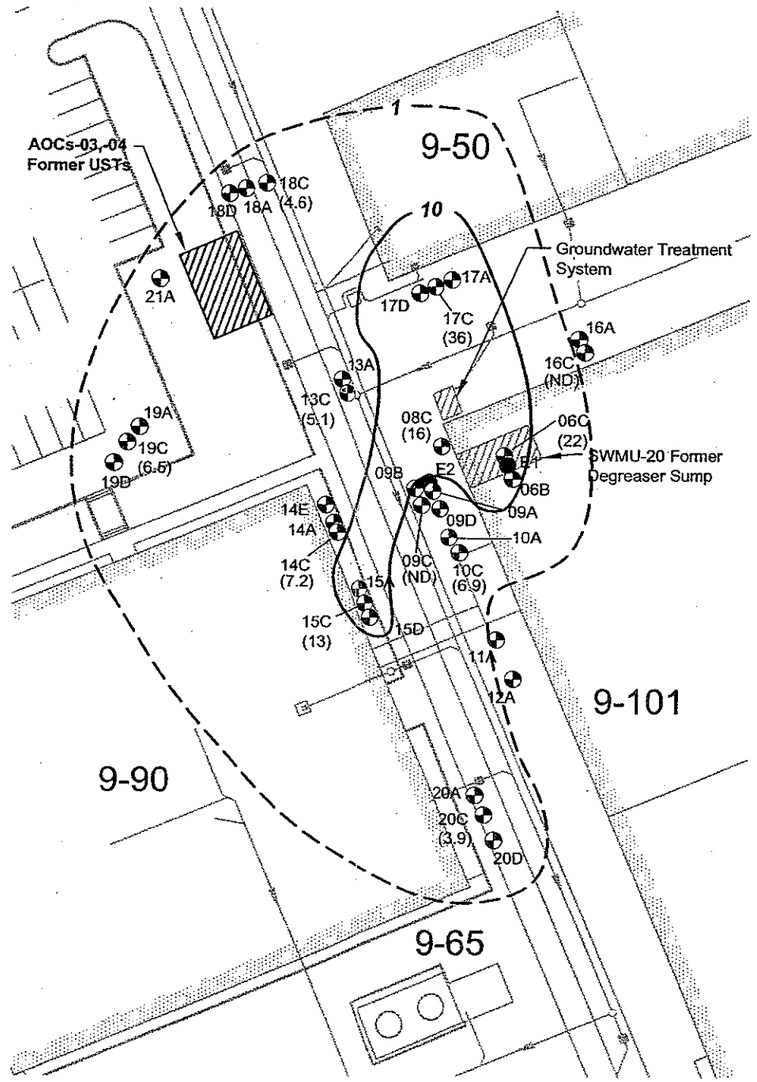
Landau Associates

Boeing Developmental Center Tukwila, Washington	**August 1989, January 1994, and December 2000 - PCE A Horizon Groundwater**	Figure 1-A

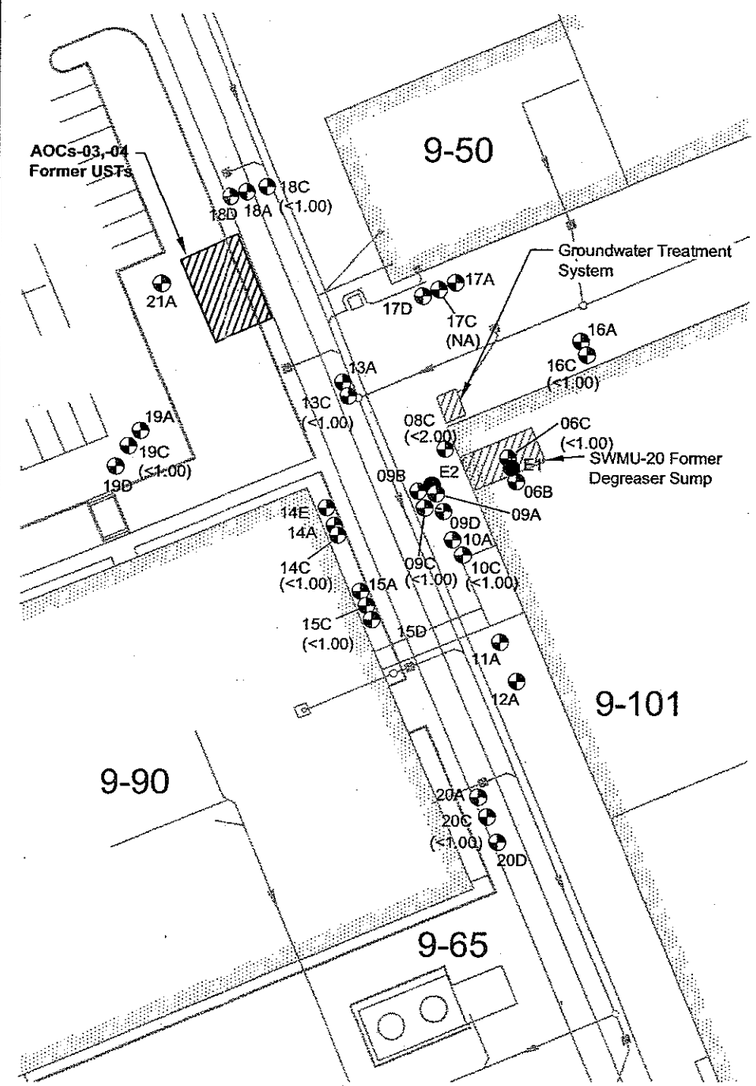
Boeing/Developmental Center | T:\025\093\010\Figs1.dwg (A) "Figure 1-A" 6/11/2001



August 1989



January 1994



December 2000

0 60 120
Scale in Feet

Legend

- Monitoring Well Locations
- Groundwater Extraction Well Locations
- (1.06) Reported PCE Concentrations (µg/L)
- —10— Estimated PCE Concentration Isopleth (µg/L)

Notes

1. (µg/L) = micrograms per liter.
2. "C" horizon extends from 23.5 to 40.5 ft. below ground surface.
3. ND = not detected

Adapted from: Boeing Facilities; Duane Hartman and Associates, 2001

Landau Associates

Boeing Developmental Center Tukwila, Washington	**August 1989, January 1994, and December 2000 - PCE C Horizon Groundwater**	Figure 1-C

Boeing/Developmental Center | T:\025\093\010\Figs1.dwg (A) "Figure 1-C" 6/11/2001

N

C'

MW-B1B

MW-B2

MW-B4

MW-B6

MW-G3

MW-G1

SLIP NO. 6

EAST MARGINAL WAY SOUTH

A'

DC-MW-2

B-1

9-04

DC-MW-4
(Abandoned)

9-77

9-51

9-08

DC-9-52-3

B-2

DC-9-52-2

9-52

A

OB-3

DC-MW-5

9-12

9-53

9-55

7-444

9-99

BDC-05-3

67-9

67-10

B-1-85
(Abandoned)

9-98

9-50

DC-9-50-18D(R)

67-2

55-8

B'

DC-9-50-17D

DC-MW-9-101-13C

9-94

B

DC-9-90-14E

DC-9-90-19D

DC-MW-9-101-15D

9-101

9-96

9-90

DC-9-90-20D

C

9-120

9-140

Military
Flight
Center

Parking

DUWAMISH

RIVER

DUWAMISH

Legend

- Monitoring Well Location
- Soil Boring Location
- A A' Cross Section Location

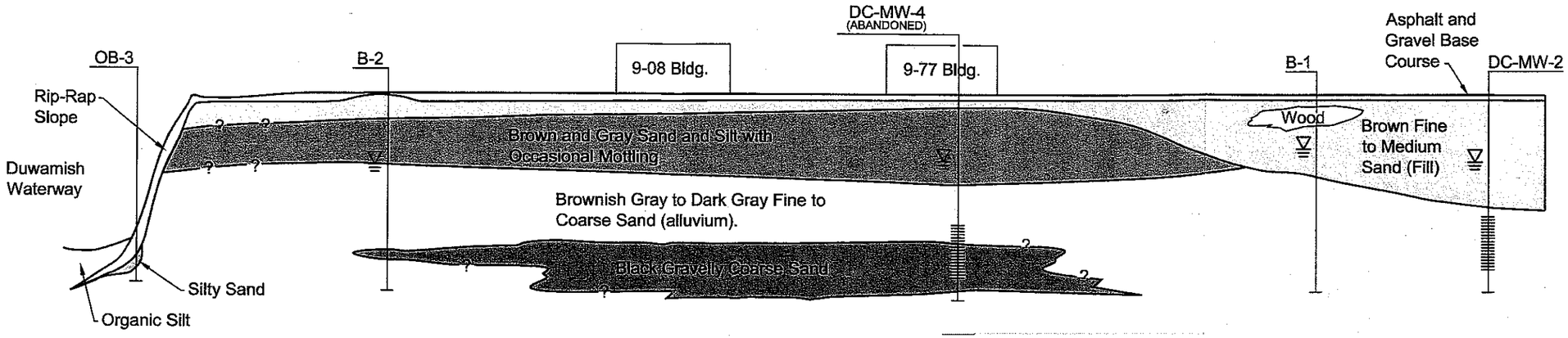
0 400 800

Approximate Scale in Feet

Boeing/Developmental Center/GW Report | T:\025\093\041\GW Report\Fig4.dwg (A) *Figure 4* 8/24/2001

Landau Associates

Boeing Developmental Center Tukwila, Washington	**Cross Section Locations**	Figure 4



Legend:

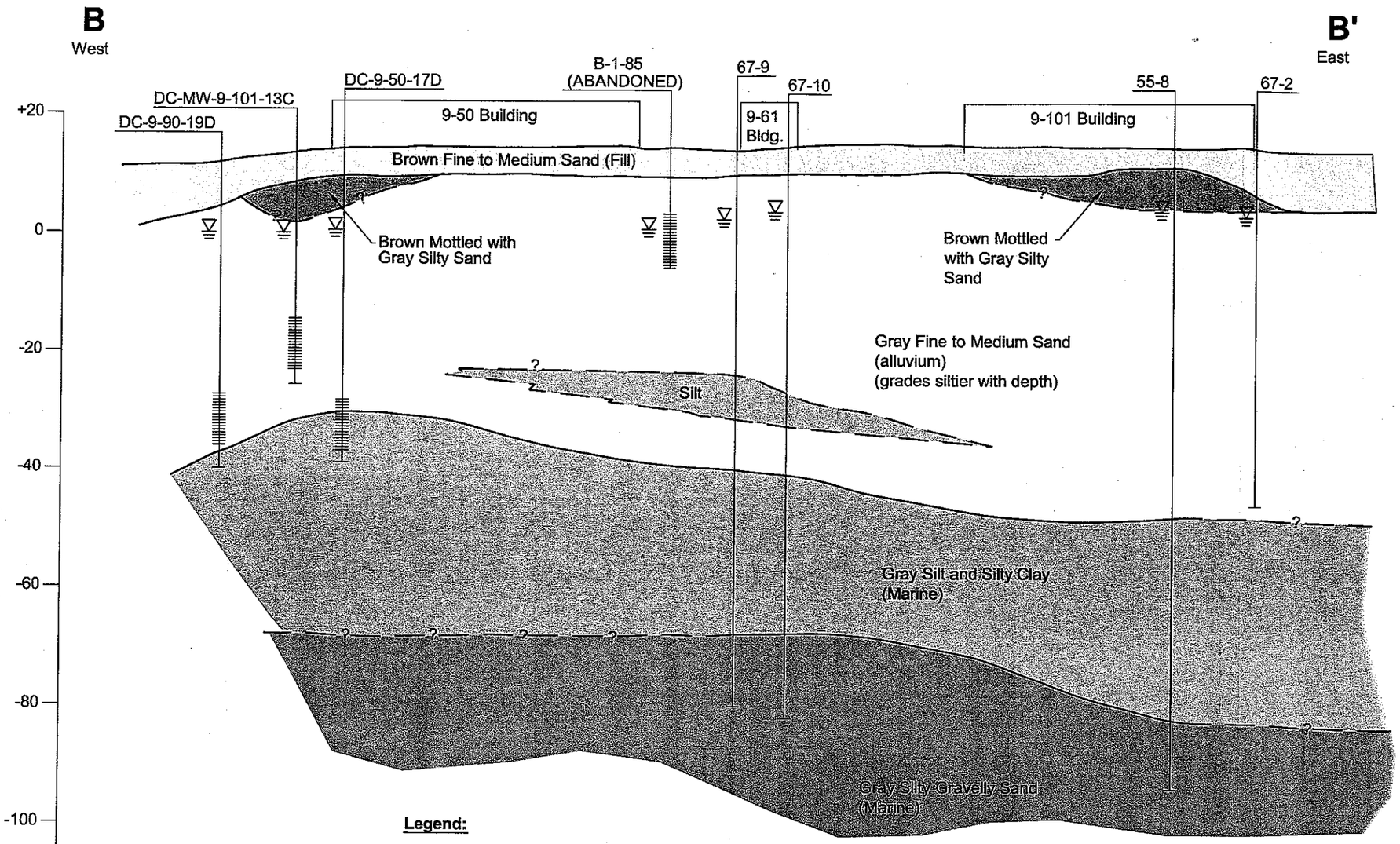
- Approximate Geologic Contact
- Well Screen Interval
- Bottom of Borehole
- Groundwater Elevation

Note:
Groundwater elevations measured at time of drilling.

Boeing/Developmental Center/GW Report | T:\025\093041\GW Report\Fig5_6_7.DWG (A) "Figure 5" 8/24/2001

Landau Associates

Boeing Developmental Center Tukwila, Washington	**Cross Section A-A'**	Figure 5



Legend:

- Approximate Geologic Contact
- Well Screen Interval
- Bottom of Borehole
- Approximate Groundwater Elevation

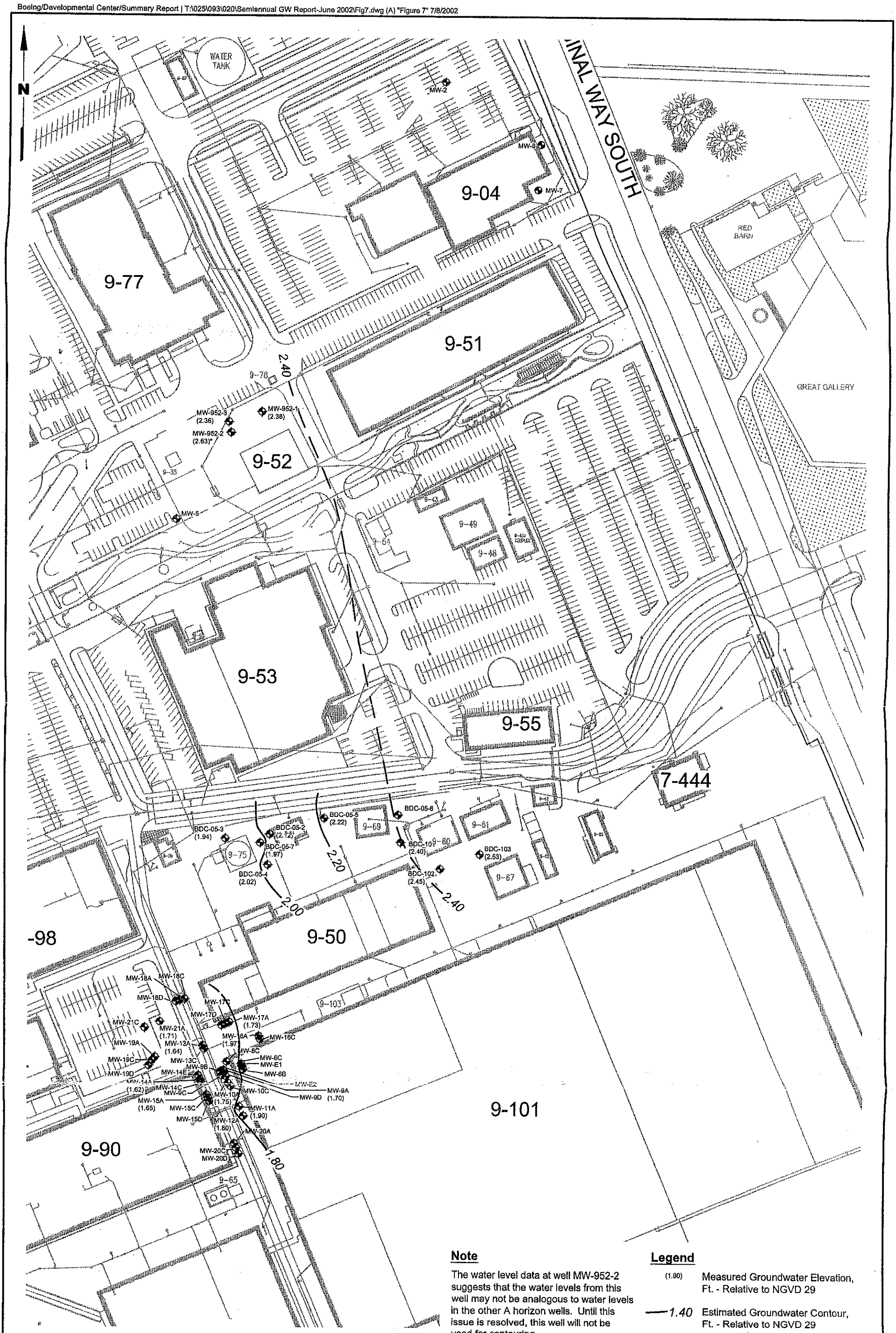
Note:
Groundwater elevations at wells MW-13C, MW-17D, and MW-19D measured in December 2000. Groundwater elevations at all other locations measured at time of drilling.

0 150 300
Horiz. Scale: 1"=150'
Vert. Scale: 1"=20'

Boeing/Developmental Center/GW Report | T:\025\093\041\GW Report\Fig5_6_7.DWG (A) "Figure 6" 8/24/2001

Landau Associates

Boeing Developmental Center Tukwila, Washington	**Cross Section B-B'**	Figure 6



Note

The water level data at well MW-952-2 suggests that the water levels from this well may not be analogous to water levels in the other A horizon wells. Until this issue is resolved, this well will not be used for contouring.

Legend

(1.90) Measured Groundwater Elevation, Ft. - Relative to NGVD 29

—1.40 Estimated Groundwater Contour, Ft. - Relative to NGVD 29

0 150 300

Scale in Feet

LANDAU ASSOCIATES

Boeing Developmental Center
Tukwila, Washington

Facility-Wide Groundwater Elevation Contours-June 2002

Figure 7

N

WATER TANK

RED BARN

GREAT GALLERY

9-04

9-77

9-51

9-52

9-53

9-55

9-50

9-101

9-90

9-75

9-78

9-35

9-07

9-69

9-61

9-60

9-67

9-49

9-48

9-54

9-43

9-42

9-65

9-62

9-59

9-47

9-51A

7-444

MW-2 (2.84)

MW-8 (2.69)

MW-9

MW-7 (2.84)

MW-952-1 (2.23)

MW-952-3 (2.21)

MW-952-2 (2.52)*

MW-5

BDC-05-5 (2.07)

BDC-05-3 (1.85)

BDC-05-2 (1.99)

BDC-05-7 (1.89)

BDC-05-4 (1.90)

BDC-101 (2.17)

BDC-102 (2.21)

BDC-103 (2.30)

MW-18A (1.69)

MW-18C

MW-18D

MW-17C

MW-17D

MW-17A

MW-21C

MW-21A (1.68)

MW-16A (1.44)

MW-16C

MW-19A (1.61)

MW-13A (1.55)

MW-8C

MW-19C

MW-13C

MW-6C

MW-E1

MW-19D

MW-9B

MW-14E

MW-6B

MW-14A (1.47)

MW-14C

MW-E2

MW-9C

MW-10C

MW-9A

MW-10A (1.17)

MW-9D (0.88)

MW-15A (1.51)

MW-15C

MW-11A (1.53)

MW-15D

MW-12A (1.48)

MW-20A (1.71)

MW-20C

MW-20D

2.60

2.40

2.20

2.00

1.80

1.60

1.40

0 400' 800'

Scale in Feet

Note

* MW-952-2 groundwater elevation not evaluated for contours. This well has historically had higher groundwater elevations, than surrounding wells.

Legend

(1.90) Measured Groundwater Elevation, Ft.-Relative to NGVD29

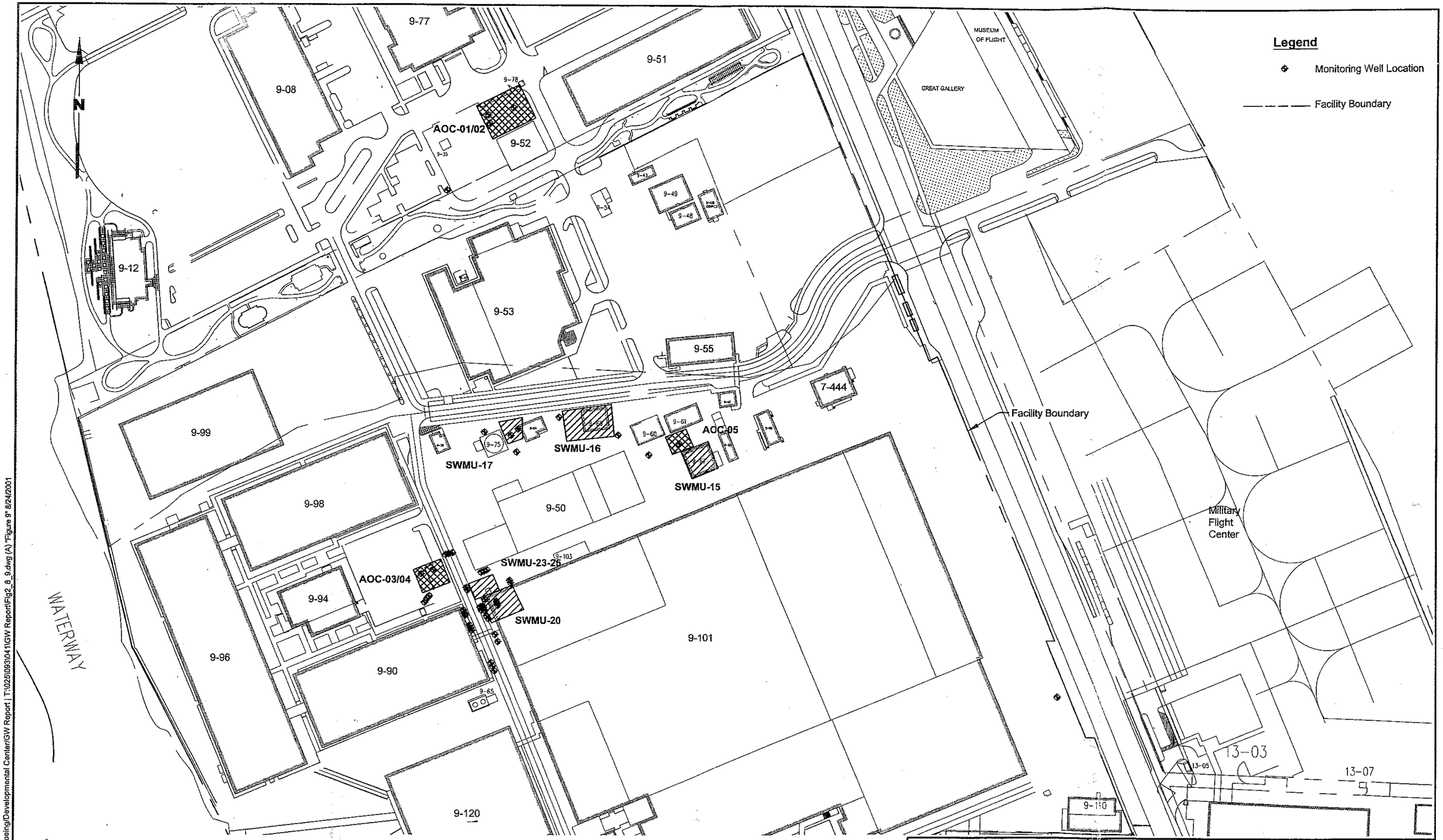
1.40 — Estimated Groundwater Contour, Ft.-Relative to NGVD29

Landau Associates

Boeing Developmental Center
Tukwila, Washington

Facility-Wide Groundwater Elevation Contours-June 2001

Figure 8



Landau Associates

Boeing Developmental Center Tukwila, Washington	**SWMU & AOC Locations**	Figure 9

Boeing/Developmental Center/GW Report | T:\025\093\041\GW Report\Fig2_8_9.dwg (A) "Figure 9" 8/24/2001

Boeing Isaacson (G.3)

Figure 4. *Geologic cross-section A-A' (ERM and Exponent 2000)*
Figure 5. *Dissolved arsenic concentrations detected in groundwater and surface water samples, Boeing Isaacson property, Seattle, Washington (ERM and Exponent 2000)*
Figure 7. *Mean groundwater elevations, Boeing Isaacson property, Seattle, Washington (ERM and Exponent 2000)*
Figure 8. *Groundwater elevations- high tide, 28 August 2000, Boeing Isaacson property, Seattle, Washington (ERM and Exponent 2000)*
Figure 9. *Groundwater elevations- low tide, 28 August 2000, Boeing Isaacson property, Seattle, Washington (ERM and Exponent 2000)*
Figure 10. *Arsenic concentrations in Duwamish River shallow sediment, Boeing Isaacson property, Seattle, Washington (ERM and Exponent 2000)*

CAD File: G:\4108\04\41080408.dwg
Drawn By: N. GREER
Date: 11/01/00
Project No. 4108.04

A

A'

I-104(s) (Offset 20' West)
PZ-7 (Offset 45' West)
I-203(s) (Offset 30' East)
I-205(s) (Offset 40' West)
PZ-8 (Offset 45' West)
I-206(s) (Offset 15' East)

Fill (SP and Slag)
Fill (SM)
Fill (ML and SM)
Fill (ML, SP and SM)
Fill (SM and Slag)
Fill (SP, GP, Bricks, and Slag)
Fill (ML, SM, and SP)
?

Native Soil
(SP, SP-SM, SM and ML)

Elevation (Feet amsl)
30
20
10
0
-10
-20
-30
-40

Range in Groundwater Elevations Measured 25 Through 30 August 2000

LEGEND

Geologic Contact, Dashed Where Inferred

Screened Interval

Vertical Exaggeration – 10X

10'
Vertical Scale
0
100'
Horizontal Scale

Modified from GeoEngineers (1997).

Figure 4
Geologic Cross Section A-A'
Boeing Isaacson Property
Seattle, Washington

ERM 09/00

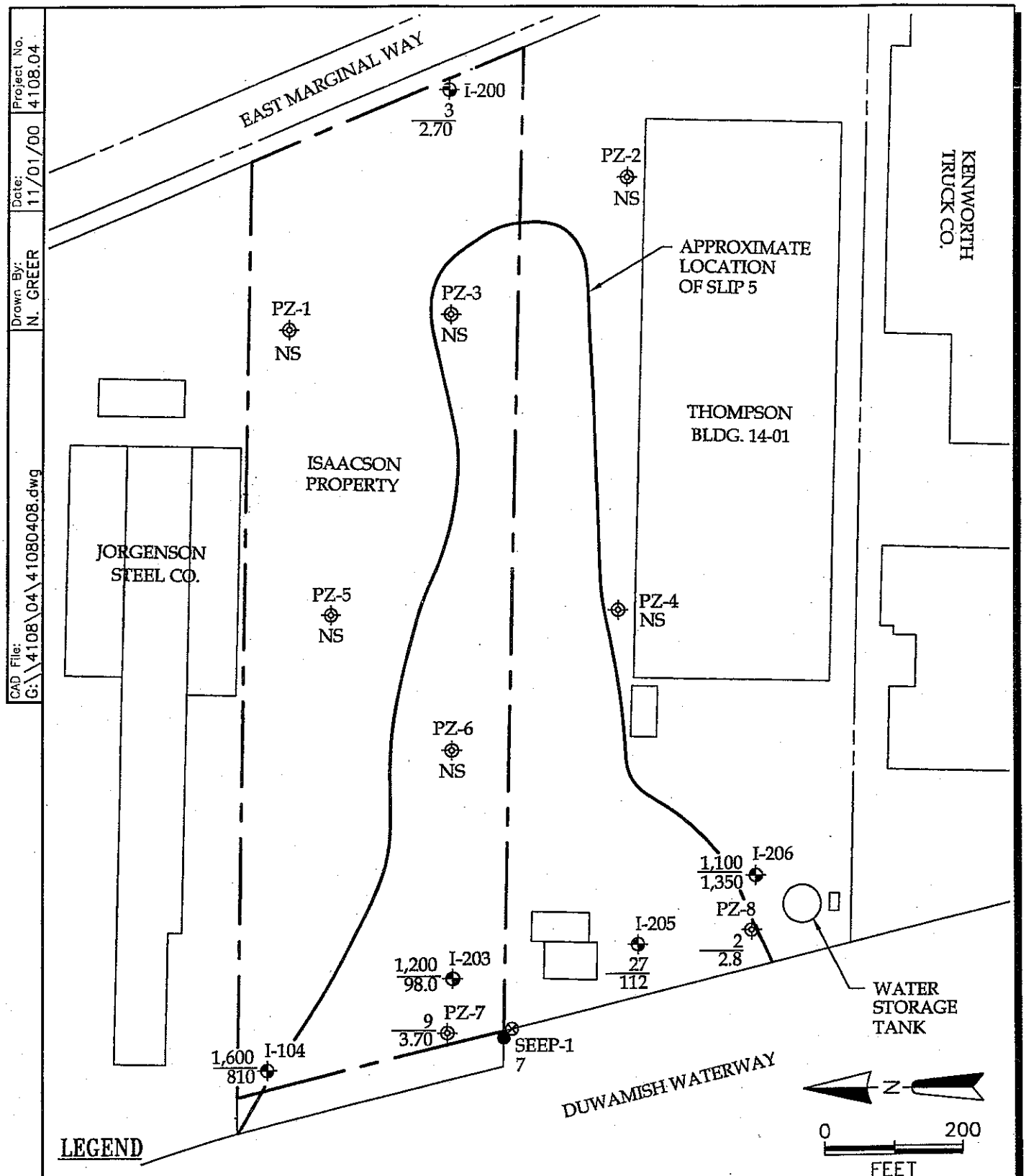


Figure 5
Dissolved Arsenic Concentrations Detected in Groundwater and Surface Water Samples
Boeing Isaacson Property
Seattle, Washington

ERM 09/00

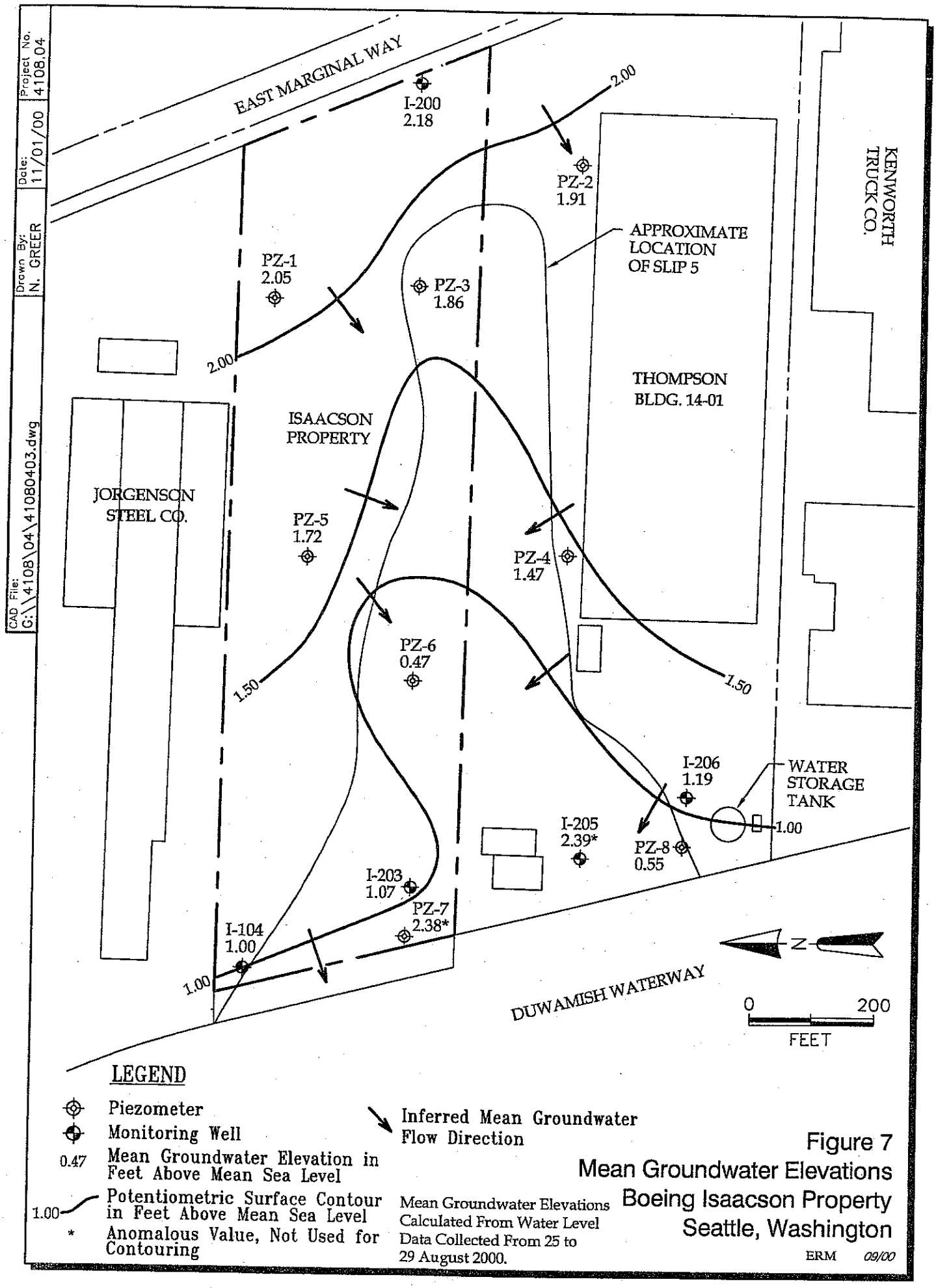
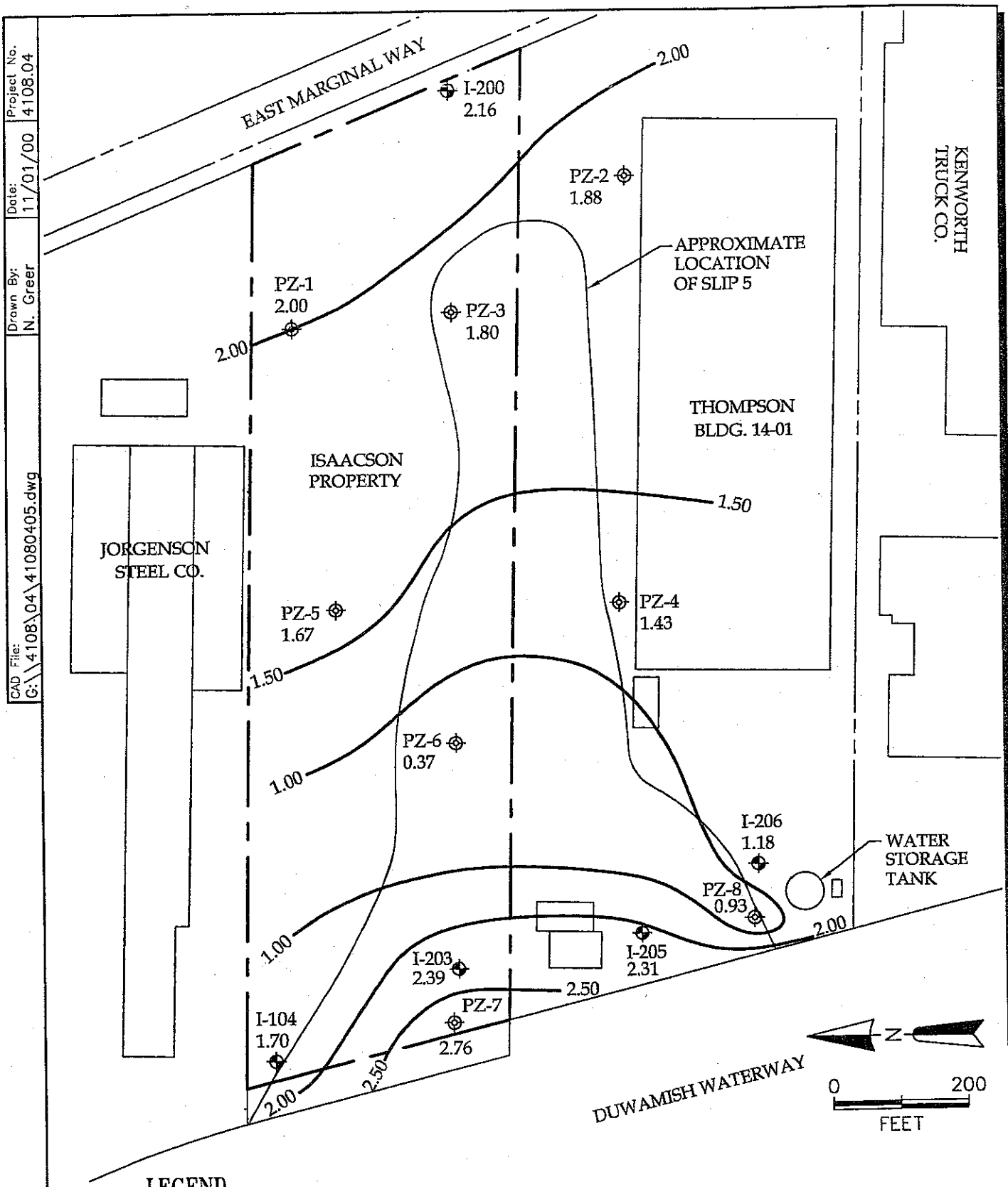


Figure 7
Mean Groundwater Elevations
Boeing Isaacson Property
Seattle, Washington

ERM 09/00



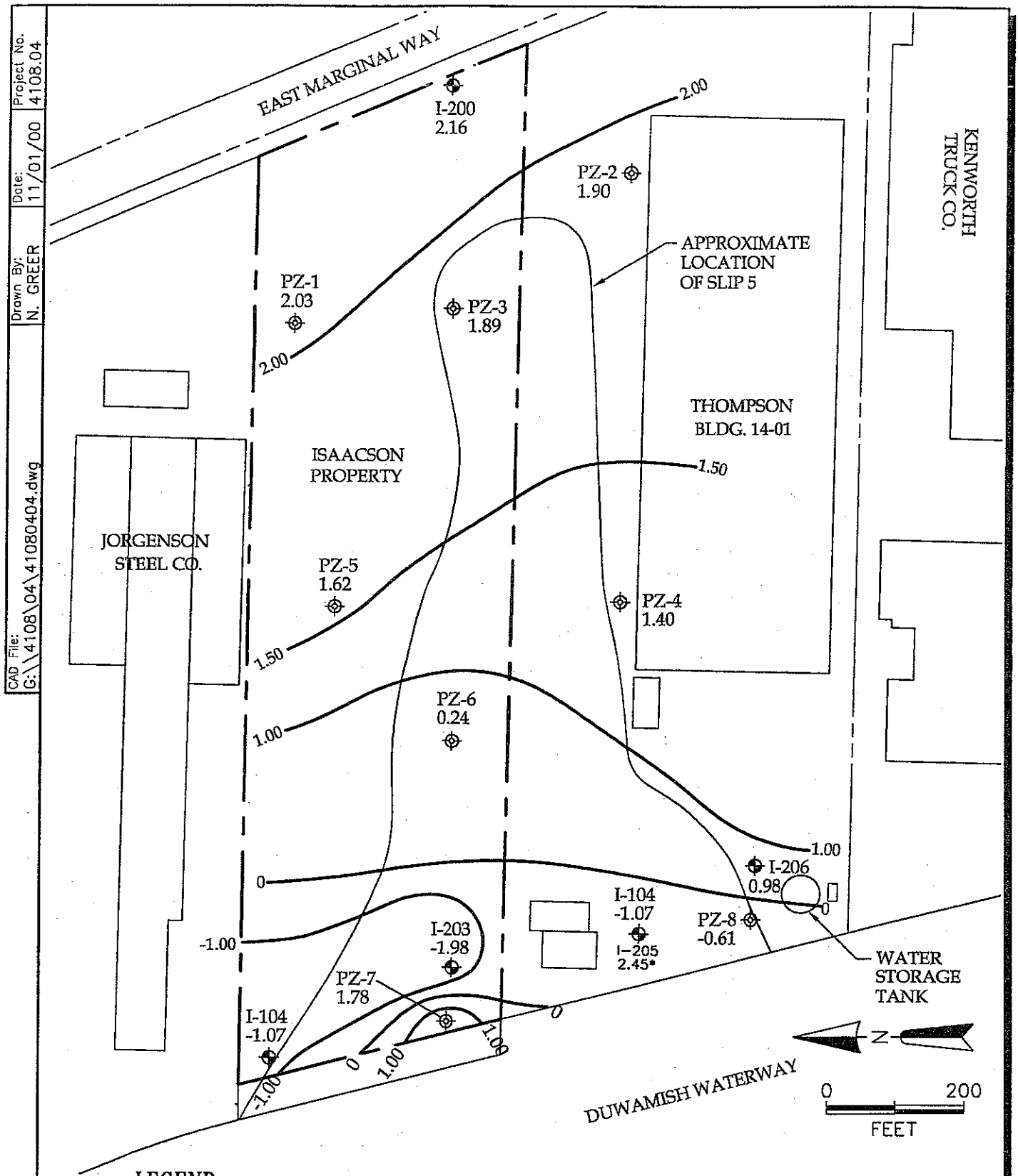
LEGEND

- Piezometer
- Monitoring Well
- 1.70 Groundwater Elevation in Feet Above Mean Sea Level
- 1.00 Potentiometric Surface Contour in Feet Above Mean Sea Level

Water Levels Measured at 17:45 28 August 2000.

Figure 8
Groundwater Elevations-
High Tide 28 August 2000
Boeing Isaacson Property
Seattle, Washington

ERM 09/00



LEGEND

- Piezometer
- Monitoring Well
- 0.24 Groundwater Elevation in Feet Above Mean Sea Level
- 1.00 Potentiometric Surface Contour in Feet Above Mean Sea Level
- * Anomalous Value, Not Used for Contouring

Water Levels Measured at 11:00 28 August 2000.

Figure 9
Groundwater Elevations-
Low Tide 28 August 2000
Boeing Isaacson Property
Seattle, Washington

ERM 09/00

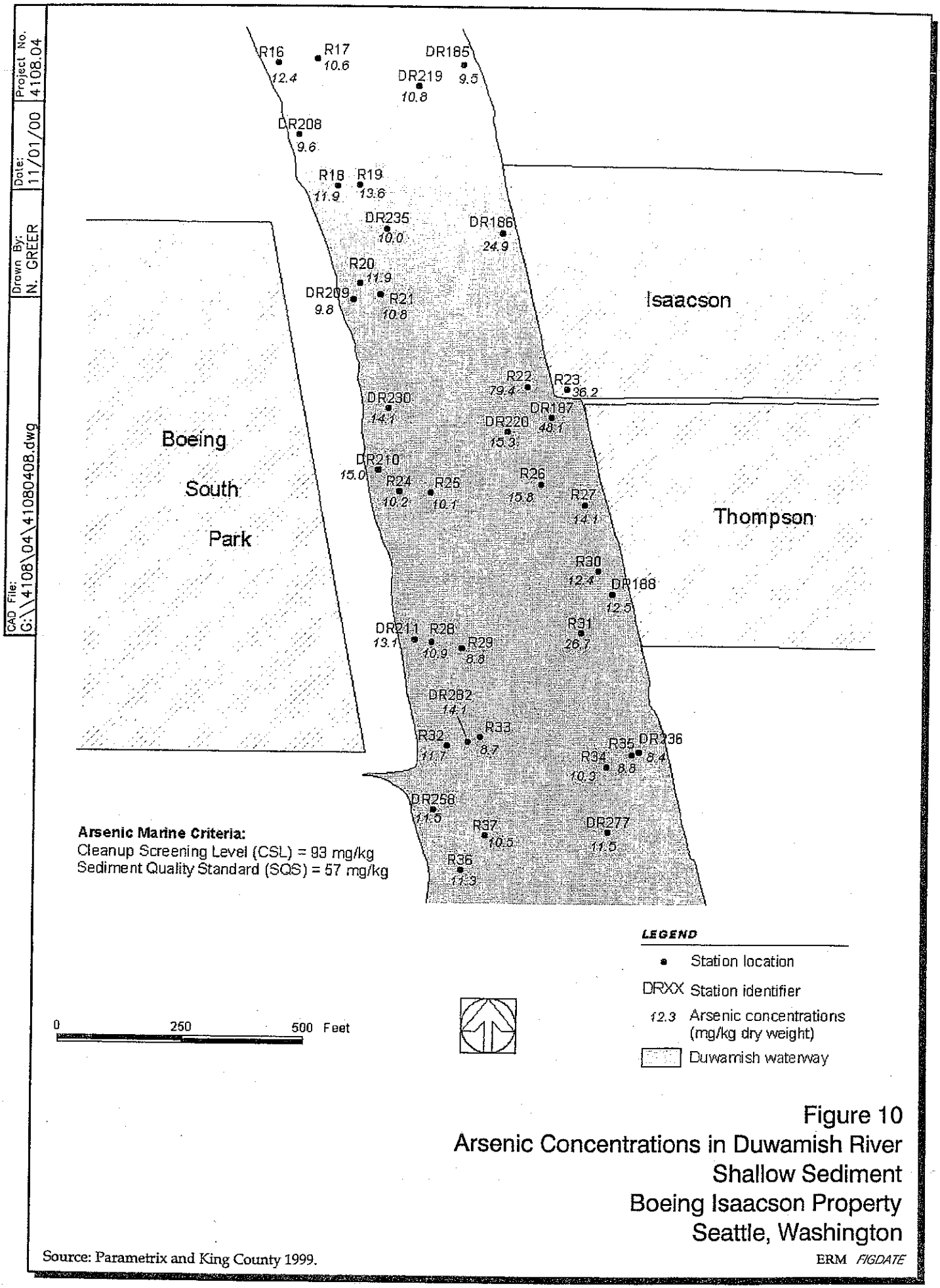


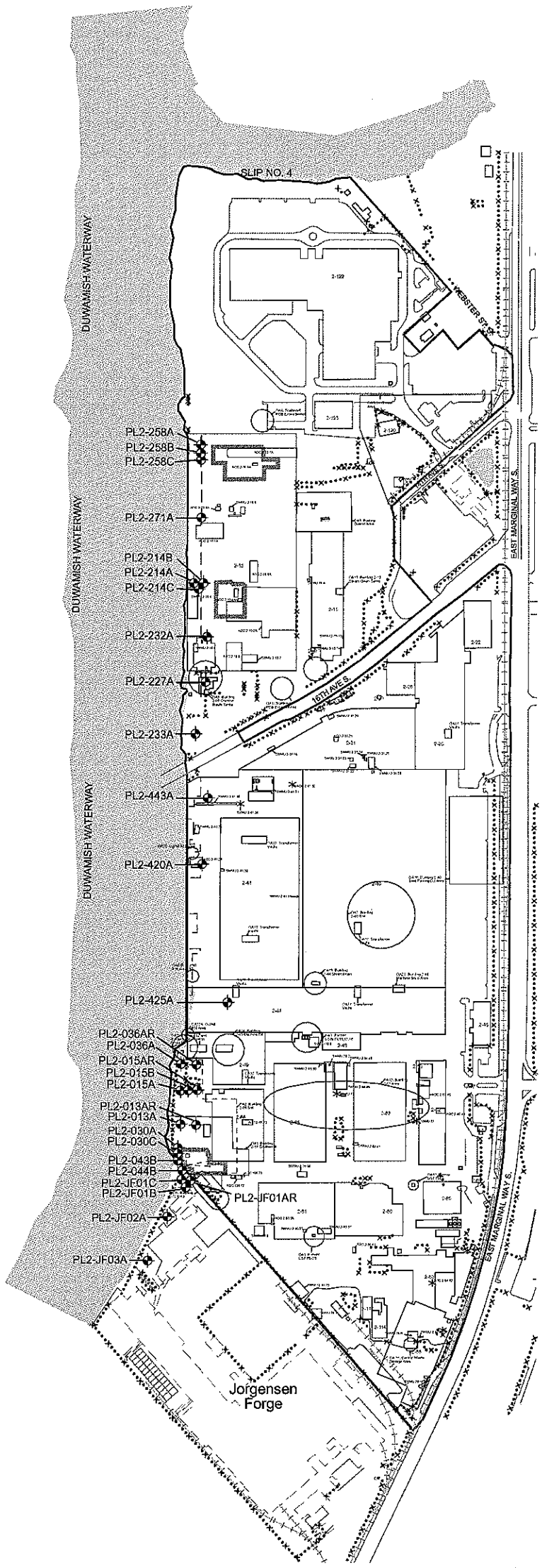
Figure 10
Arsenic Concentrations in Duwamish River Shallow Sediment
Boeing Isaacson Property
Seattle, Washington

Source: Parametrix and King County 1999.

ERM *FIGDATE*

Boeing Plant 2 (G.4)

Figure 1.	*Shoreline well locations (Weston 2002b)*
Figure 1a.	*Boeing Plant 2 historical and RFI soil, groundwater, seep, and sediment sample locations (Weston 1998)*
Figure 1b.	*Boeing Plant 2 historical and RFI soil, groundwater, seep, and sediment sample locations (Weston 1998)*
Figure 1.	*Trichloroethene and vinyl chloride in A-horizon wells at Boeing Plant 2 quarterly groundwater monitoring in 2001/2002 (Weston Solutions 2002b)*
Figure 2.	*Trichloroethene and vinyl chloride in A-horizon wells at Boeing Plant 2 quarterly groundwater monitoring in 2001/2002 (Weston Solutions 2002b)*
Figure 3.	*Arsenic and copper in A-horizon wells at Boeing Plant 2 quarterly groundwater monitoring in 2001/2002 (Weston Solutions 2002b)*
Figure 4.	*Arsenic and copper in A-horizon wells at Boeing Plant 2 quarterly groundwater monitoring in 2001/2002 (Weston Solutions 2002b)*
Figure 5.	*Thallium and selenium in A-horizon wells at Boeing Plant 2 quarterly groundwater monitoring in 2001/2002 (Weston Solutions 2002b)*
Figure 6.	*Nickel and zinc in A-horizon wells at Boeing Plant 2 quarterly groundwater monitoring in 2001/2002 (Weston Solutions 2002b)*
Figure 15.	*Mean groundwater elevation contour map for "A" level monitoring wells, August 1995 (Weston 1996)*



PLANT NORTH 45° GW

0 275 550

Scale in Feet

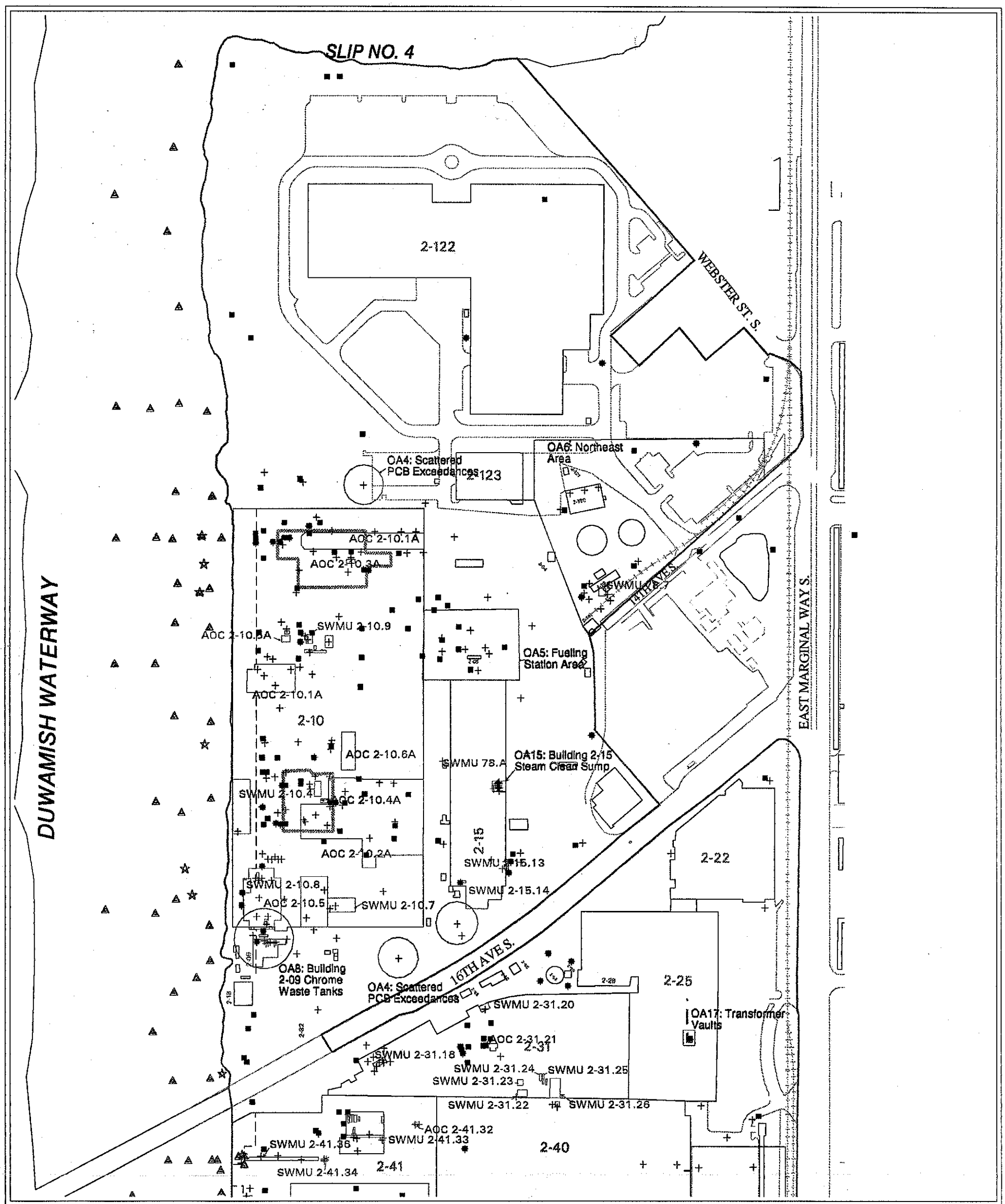
WESTON® MANAGERS DESIGNERS/CONSULTANTS

- Monitoring Well
- Sheet Piles
- SWMU/AOC
- OA

Boeing Plant 2— Shoreline Monitoring Well Locations

Figure **1**

02-0134 Fig1.ai

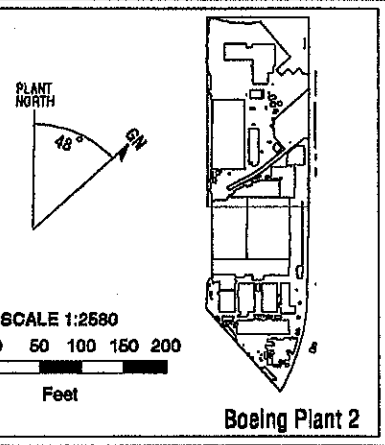


BASEMAP EXPLANATION

- Facility Boundary
- SWMU/AOC
- Building
- Former Boeing Building
- Non-Boeing Building
- Sheet Pile Alignment
- Other Area
- Other Area

SYMBOL EXPLANATION

- + Soil sample location
- ■ Groundwater sample location
- ☆ Seep sample location
- ▲ Sediment sample location



NOTES

WESTON MANAGERS DESIGNERS/CONSULTANTS

DATE: July 02, 1997 6:06 PM
JOB NUMBER: 03709-034-300-3920-00
LEAD GIS ANALYST: K. Palmer
VIEW FILE: allsitesbiganno.view
CHECKED BY: KAP
APPROVED BY: KAP

Boeing Plant 2 Historical and RFI Soil, Groundwater, Seep, and Sediment Sample Locations

Map 1a

REAP 20003237
BVL

SWMU 2-31.22
SWMU 2-31.26
AOC 2-41.32
SWMU 2-41.33
SWMU 2-41.36
SWMU 2-41.34
2-41
2-40
SWMU 2-41.35
OA17: Transformer Vaults
OA20: Outfall #23 Area
AOC 2-41.29
SWMU 2-41.30
OA18: Building 2-40 East Parking Lot Area
SWMU 2-41.31
OA7: Building 2-40 Soil
2-41
OA17: Transformer Vaults
OA17: Transformer Vaults
2-40
OA22B: Outfall #15 Area
OA13: Building 2-44 Steam Drain
OA21: Building 2-44 Machine Shop Area
OA17: Transformer Vaults
2-44
OA17: Transformer Vaults
OA22A: Outfall #14 Area
OA14: Building 2-49 Machine Pit
OA9: Former USTs PL16,17,18
2-51
SWMU 78.6
SWMU 78.C
SWMU 2-64.48
2-49
SWMU 2-65.50
OA17: Transformer Vaults
OA19: Outfall #12 and Building 2-49 Stretch Press Pit
OA12: Building 2-63 Area
AOC 2-66.53
SWMU 2-64.49
SWMU 77
AOC 2-62.45
OA2: Building 2-66 Soil
2-65
2-63
AOC 2-62.43
AOC 2-66.52
SWMU 77
2-66
OA1: Building 2-66 Southwest
SWMU 2-63.47
2-62
SWMU 2-70.55
AOC 108.73
OA10: Former UST PL20
AOC 108.72
OA11: Building 2-72 Area
2-80
AOC 2-80.58
SWMU 2-80.57
SWMU 2-80.56
SWMU 78.5+
AOC 2-86.63
OA3: Former UST PL-23
SWMU 39
2-86
2-83
SWMU 2-91.70
AOC 2-84.62
SWMU 78.1
2-87
SWMU 79
SWMU 2-87.65
SWMU 78.B
SWMU 79
OA 16: Central Waste Storage Area
SWMU 2-89.68
2-69
SWMU 79
Jorgensen Forge Company
DUWAMISH WATERWAY
EAST MARGINAL WAY

BASEMAP EXPLANATION

- Facility Boundary
- SWMU/AOC
- Building
- Former Boeing Building
- Non-Boeing Building
- Sheet Pile Alignment
- Other Area
- Other Area

SYMBOL EXPLANATION

- + Soil sample location
- ■ Groundwater sample location
- ☆ Seep sample location
- ▲ Sediment sample location

PLANT NORTH
48°
SCALE 1:2580
50 0 50 100 150 200
Feet
Boeing Plant 2

NOTES

WESTON MANAGERS DESIGNERS/CONSULTANTS

DATE: July 02, 1997 6:07 PM
JOB NUMBER: 03709-034-300-3920-00
LEAD GIS ANALYST: K. Palmer
VIEW FILE: allstnsbiganno.view
CHECKED BY: KAR
APPROVED BY: KAR

Boeing Plant 2 Historical and RFI Soil, Groundwater, Seep, and Sediment Sample Locations

Map 1b

REAP 20003238
BVL

Lower Duwamish Waterway

PL2-JF03A
PL2-JF02A
PL2-JF01A
PL2-JF01B
PL2-JF01C
PL2-044B
PL2-008A
PL2-008B
PL2-033A
PL2-009A
PL2-009B
PL2-009C
PL2-013AR
PL2-017A
PL2-003A
PL2-029A
PL2-043B
PL2-030C
PL2-030A
PL2-018A
PL2-014A
PL2-015A
PL2-015B
PL2-037A
PL2-036A
PL2-015AR
PL2-036AR
PL2-038A
PL2-006A
PL2-016A
PL2-021A
PL2-021B
PL2-021C
PL2-001A
PL2-005A
PL2-005B
PL2-005C
PL2-027A
PL2-011A
PL2-012A
PL2-026A
PL2-026C
PL2-026B
PL2-028A
PL2-028B
PL2-019A
PL2-024A
PL2-020A
PL2-032A
PL2-018A
PL2-023A
PL2-025A
PL2-033AR
PL2-022A
PL2-002C
PL2-002B
PL2-002A
PL2-425A
PL2-039A
PL2-332A
PL2-321A
PL2-310A
PL2-311A
PL2-410A
PL2-325A
PL2-325B
PL2-330A
PL2-330B
PL2-331A
PL2-331B
PL2-329A
PL2-329B
PL2-315B
PL2-315A
PL2-327A
PL2-327B
PL2-328A
PL2-328B
PL2-316A
PL2-316B
PL2-314A
PL2-312A
PL2-326A
PL2-326B
PL2-317A
PL2-317AR
PL2-304A
PL2-305A
PL2-302A
PL2-301A
PL2-303A
PL2-120A
PL2-318A
PL2-320A
PL2-319A
PL2-103A

SWMU 78.5
SWMU 78.6
SWMU 78
SWMU 77B
SWMU 77A
SWMU 79'

AOC 108.72
AOC 108.72
AOC 108.73
AOC 2-66.52
AOC 2-66.1A
AOC 2-66.53
AOC 2-80.58
SWMU 2-80.56
SWMU 2-80.57
SWMU 2-70.55
AOC 2-86.63
SWMU 2-63.47
SWMU 2-65.50
SWMU 2-64.49
SWMU 2-64.48
AOC 2-62.45
SWMUS 2-62.45
AOC 2-62.45
AOC 2-62.45
AOC 2-62.45
SWMU 2-62.43

2-49
2-44
2-81
2-80
2-48
2-61
2-57
2-47
2-45

Source: Weston 2002.

Plant N

0 70 140

Scale in Feet

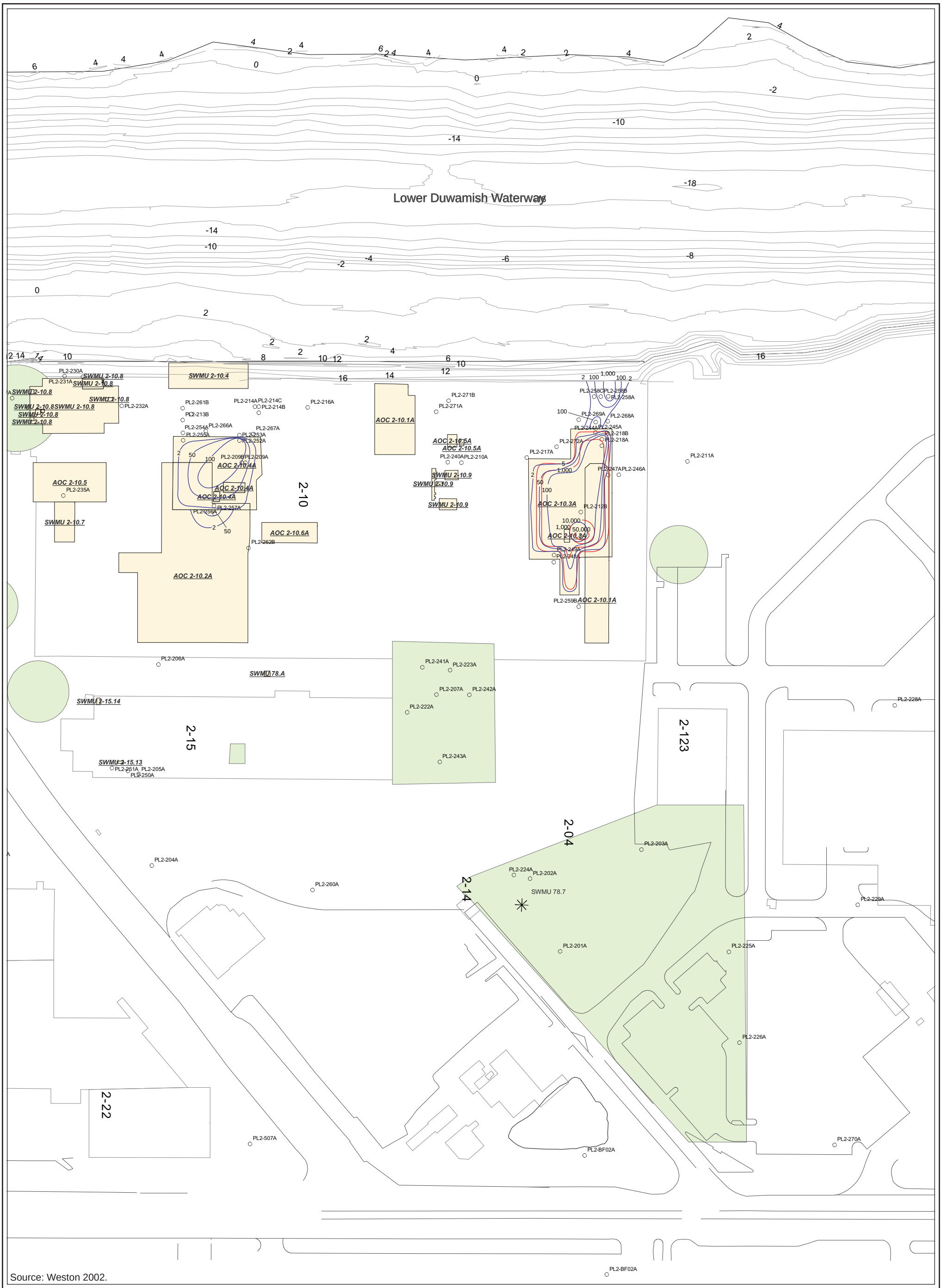
EXPLANATION

- Building
- Groundwater Sample
- Bathymetry
- SWMU
- OA/OAC
- Trichloroethene
- Vinyl Chloride

Trichloroethene and Vinyl Chloride in A-Horizon Wells at Boeing Plant 2 Quarterly Groundwater Monitoring in 2001/2002

Figure **1**

03-0046 Fig1.ai Date: 22 JAN 03



Source: Weston 2002.

Plant N

0 70 140

Scale in Feet

EXPLANATION

- Building
- Groundwater Sample
- Bathymetry
- SWMU
- OA/OAC
- Trichloroethene
- Vinyl Chloride

Trichloroethene and Vinyl Chloride in A-Horizon Wells at Boeing Plant 2 Quarterly Groundwater Monitoring in 2001/2002

Figure **2**

03-0046 Fig2.ai

Date: 22 JAN 03

Lower Duwamish Waterway

AOC 2-66.1A
AOC 108.72
AOC 108.72
AOC 108.73
AOC 2-66.52
AOC 2-66.53
AOC 2-80.58
SWMU 2-80.56
SWMU 2-80.57
SWMU 2-70.55
AOC 2-86.63
SWMU 2-63.47
SWMU 2-65.50
SWMU 2-64.49
SWMU 2-64.48
SWMU 2-62.43
AOC 2-62.45
SWMUS 2-62.45
AOC 2-62.45
AOC 2-62.45
AOC 2-62.45

SWMU 78.5
SWMU 78.6
SWMU 78
SWMU 77B
SWMU 77A
SWMU 79'

2-80
2-81
2-49
2-44
2-48
2-61
2-62
2-57
2-47
2-45

Source: Weston 2002.

Plant N

0 70 140

Scale in Feet

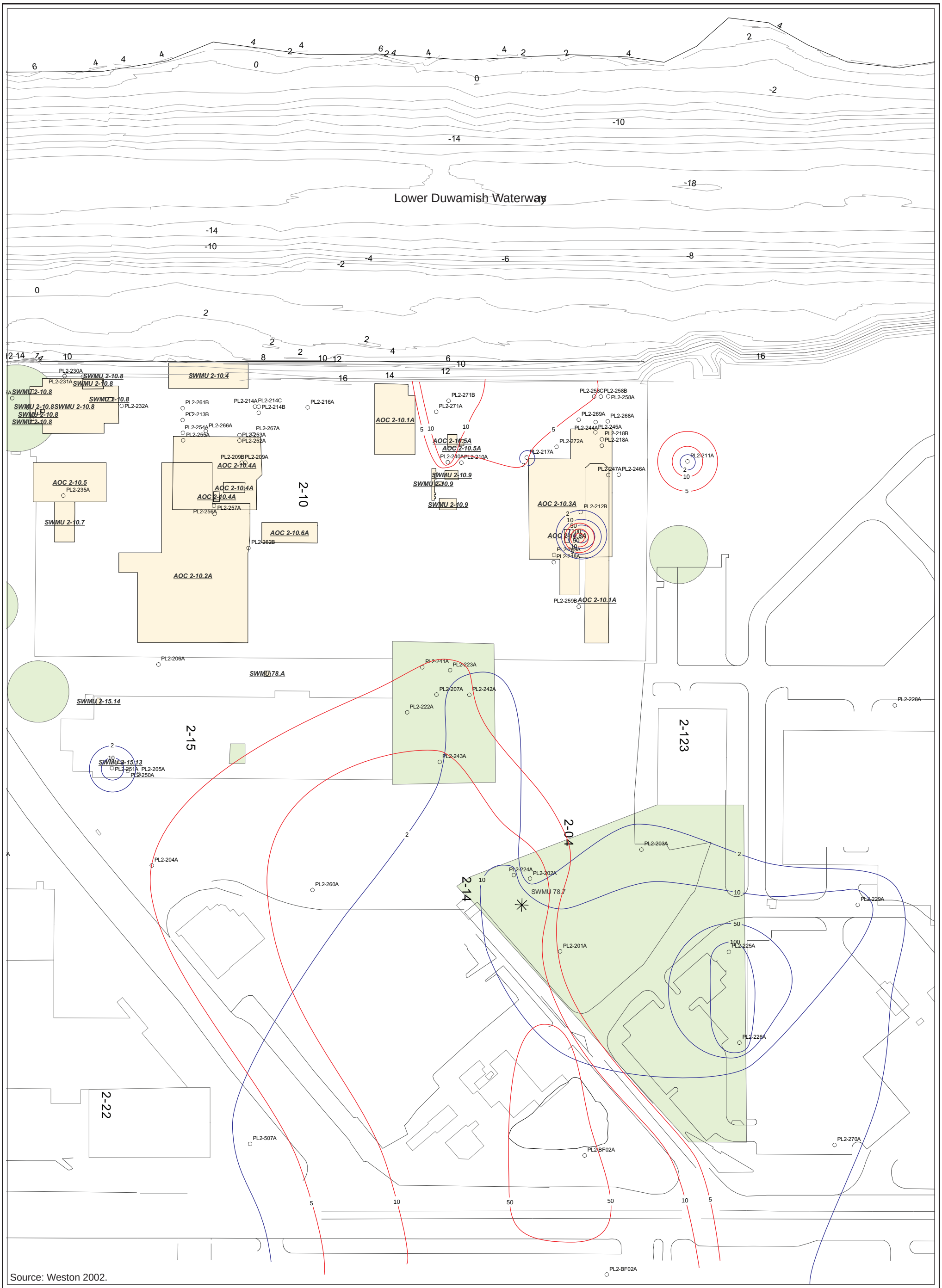
EXPLANATION

- Building
- Groundwater Sample
- Bathymetry
- SWMU
- OA/OAC
- Arsenic
- Copper

Arsenic and Copper in A-Horizon Wells at Boeing Plant 2 Quarterly Groundwater Monitoring in 2001/2002

Figure **3**

03-0046 Fig3.ai Date: 22 JAN 03



Source: Weston 2002.

Plant N

0 70 140

Scale in Feet

EXPLANATION

- Building
- Groundwater Sample
- Bathymetry
- SWMU
- OA/OAC
- Arsenic
- Copper

Arsenic and Copper in A-Horizon Wells at Boeing Plant 2 Quarterly Groundwater Monitoring in 2001/2002

Figure **4**

03-0046 Fig4.ai Date: 22 JAN 03

Lower Duwamish Waterway

PL2-JF03A
PL2-JF02A
PL2-JF01A
PL2-JF01C
PL2-JF01B
PL2-003A
PL2-029A
PL2-043B
PL2-030C
PL2-030A
PL2-044B
PL2-008C
PL2-008A
PL2-008B
PL2-034A
PL2-035A
PL2-010A
PL2-007A
PL2-009C
PL2-009B
PL2-009A
PL2-013A
PL2-013AR
PL2-014A
PL2-015A
PL2-015B
PL2-037A
PL2-036A
PL2-015AR
PL2-036AR
PL2-038A
PL2-017A
AOC 2-66.1A
PL2-006A
PL2-016A
PL2-021A
PL2-021B
PL2-021C
PL2-001A
PL2-004A
PL2-005C
PL2-005A
PL2-005B
PL2-027A
PL2-011A
PL2-012A
PL2-019A
PL2-024A
PL2-020A
PL2-026A
PL2-026C
PL2-026B
PL2-028A
PL2-028B
AOC 2-66.53
PL2-425A
PL2-032A
PL2-033A
PL2-033AR
PL2-018A
PL2-025A
PL2-023A
AOC 108.72
AOC 108.72
AOC 108.73
PL2-022A
PL2-002C
PL2-002B
PL2-002A
AOC 2-66.52
PL2-039A
SWMU 78.5
AOC 2-80.58
PL2-325A
PL2-325B
PL2-332A
PL2-321A
PL2-310A
PL2-410A
PL2-311A
SWMU 78.6
SWMU 2-70.55
PL2-317A
SWMU 2-80.56
PL2-304A
PL2-305A
SWMU 2-80.57
PL2-317AR
PL2-330A
PL2-330B
PL2-331A
PL2-331B
PL2-329A
PL2-329B
SWMU 77B
SWMU 2-65.50
SWMU 78
PL2-315B
PL2-315A
SWMU 2-64.49
SWMU 2-64.48
PL2-302A
AOC 2-86.63
PL2-301A
PL2-303A
SWMU 2-63.47
PL2-120A
PL2-328A
PL2-328B
PL2-327A
PL2-327B
PL2-318A
SWMU 77A
PL2-316B
PL2-314A
PL2-316C
PL2-316A
AOC 2-62.45
SWMUS 2-62.45
AOC 2-62.45
AOC 2-62.45
AOC 2-62.45
PL2-312A
SWMU 2-62.43
PL2-326A
PL2-326B
SWMU 79'
PL2-103A
PL2-320A
PL2-319A
2-81
2-80
2-61
2-62
2-57
2-47
2-49
2-48
2-45
2-44

Source: Weston 2002.

Plant N

0 70 140

Scale in Feet

EXPLANATION

- Building
- Groundwater Sample
- Bathymetry
- SWMU
- OA/OAC
- Thalium
- Selenium

Thalium and Selenium in A-Horizon Wells at Boeing Plant 2 Quarterly Groundwater Monitoring in 2001/2002

Figure **5**

03-0046 Fig5.ai Date: 22 JAN 03

Lower Duwamish Waterway

AOC 2-66.1A
AOC 108.72
AOC 108.72
AOC 108.73
AOC 2-66.52
AOC 2-66.53
AOC 2-80.58
SWMU 2-80.56
SWMU 2-80.57
SWMU 2-70.55
AOC 2-86.63
SWMU 2-63.47
SWMU 2-65.50
SWMU 2-64.49
SWMU 2-64.48
SWMU 2-62.43
AOC 2-62.45
SWMUS 2-62.45
AOC 2-62.45
AOC 2-62.45
AOC 2-62.45

SWMU 78.5
SWMU 78.6
SWMU 78
SWMU 77A
SWMU 77B
SWMU 79'

2-80
2-81
2-49
2-44
2-48
2-62
2-47
2-57
2-61
2-45

Source: Weston 2002.

Plant N

0 70 140
Scale in Feet

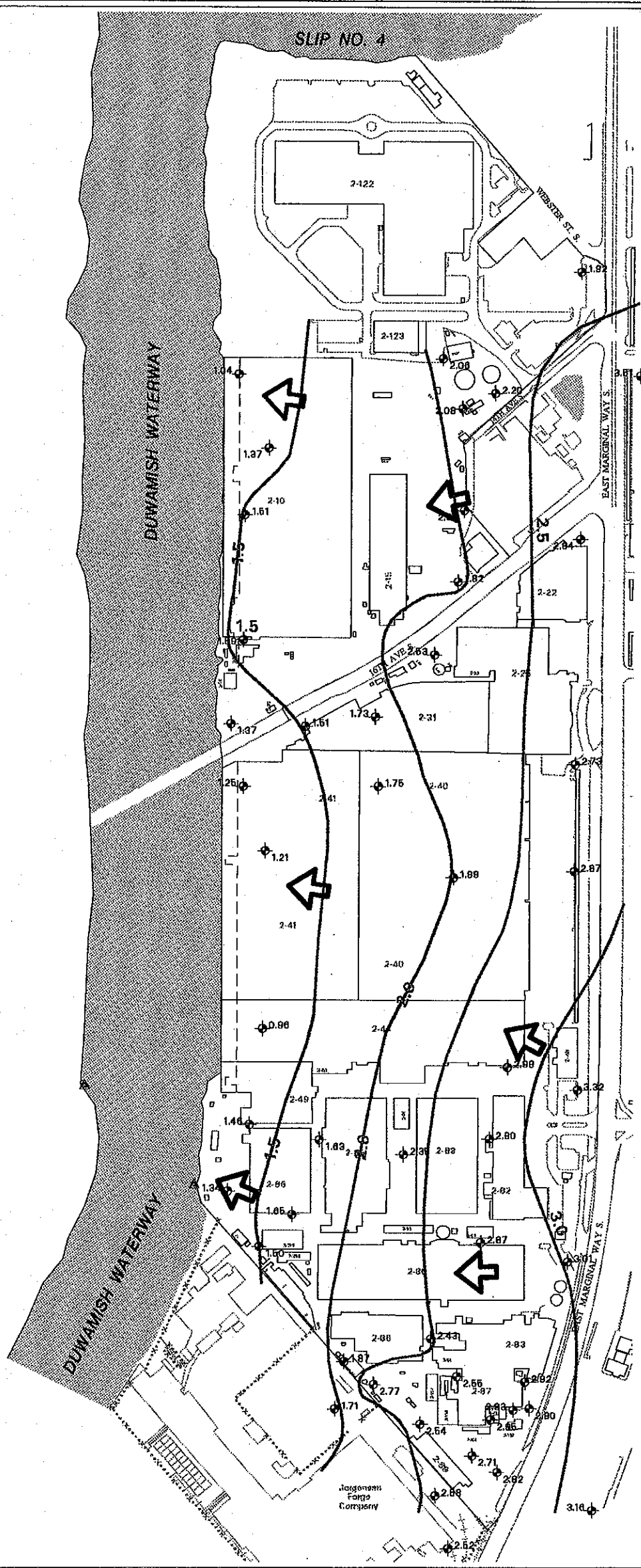
EXPLANATION

- Building
- Groundwater Sample
- Bathymetry
- SWMU
- OA/OAC
- Zinc
- Nickel

Nickel and Zinc in A-Horizon Wells at Boeing Plant 2
Quarterly Groundwater Monitoring in 2001/2002

Figure
6

03-0046 Fig6.ai Date: 22 JAN 03

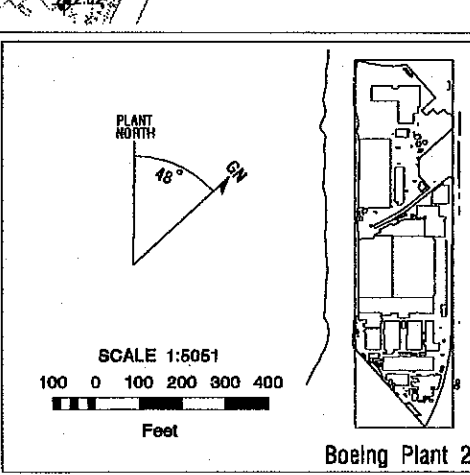


BASEMAP EXPLANATION

- Facility Boundary
- Road
- Building
- Former Boeing Building
- Non-Boeing Building
- Bulkhead

SYMBOL EXPLANATION

- Monitoring well
- Tide Gauge
- Groundwater Flow Direction
- 3.98 Groundwater Elevation, NGVD
- 4.0 Groundwater Elevation Contour



NOTES

1) Groundwater elevations based on August 7-10, 1995 Phase 1C tidal study.
2) Water level elevations (feet NGVD 29) reflect mean values recorded from August 7-10.
4) Contour interval - 0.5 ft.

WESTON DESIGNERS/CONSULTANTS

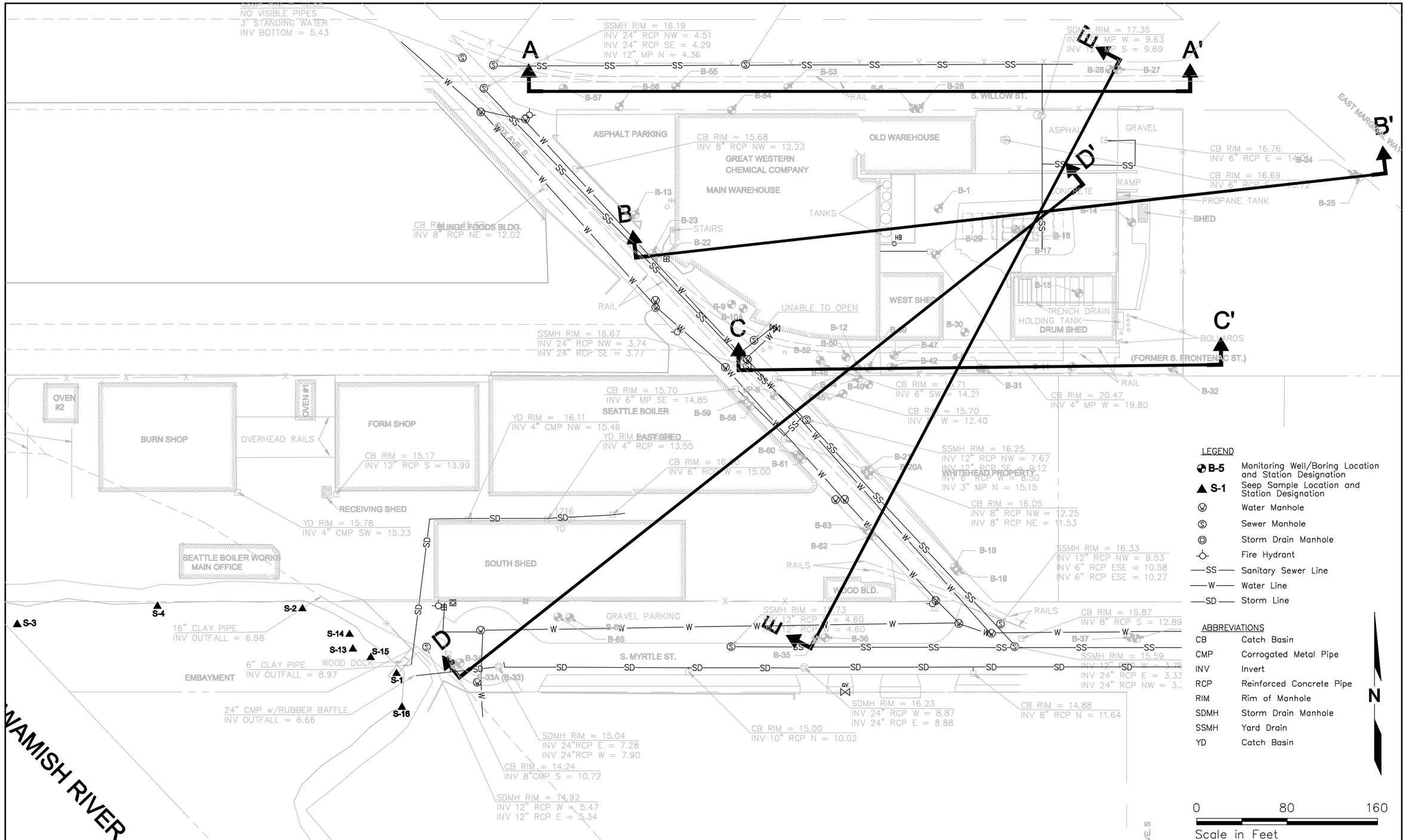
DATE: January 22, 1996 10:02 AM
JOB NUMBER: 03709-034-300-3350-00
LEAD GIS ANALYST: K. Palmer
VIEW FILE: meanelev.view
CHECKED BY:
APPROVED BY:

Mean Groundwater Elevation Contour Map for "A" Level Monitoring Wells August 1995

MAP 15

Great Western Chemical (G.5)

Figure 2.12. Cross section locations (Terra Vac and Floyd & Snider 2000)
Figure 2.16. Cross section D-D' (Terra Vac and Floyd & Snider 2000)
Figure 2.20. Potentiometric map, low tide first water bearing zone (Terra Vac and Floyd & Snider 2000)
Figure 2.21. Potentiometric map, high tide first water bearing zone (Terra Vac and Floyd & Snider 2000)
Figure 2.22. Potentiometric map, low tide second water bearing zone (Terra Vac and Floyd & Snider 2000)
Figure 2.23. Potentiometric map, high tide second water bearing zone (Terra Vac and Floyd & Snider 2000)
Figure 4.3. Surface water, sediment, and mussel sample stations (Terra Vac and Floyd & Snider 2000)
Figure 5-1. Tetrachloroethene contours in first water bearing zone,1999 sampling event (Terra Vac and Floyd & Snider 2000)
Figure 5-2. Tetrachloroethene contours in second water bearing zone,1999 sampling event (Terra Vac and Floyd & Snider 2000)
Figure 5-3. Trichloroethene contours in first water bearing zone,1999 sampling event (Terra Vac and Floyd & Snider 2000)
Figure 5-4. Trichloroethene contours in second water bearing zone,1999 sampling event (Terra Vac and Floyd & Snider 2000)
Figure 5-5. 1,2-dichloroethene (total) contours in first water bearing zone,1999 sampling event (Terra Vac and Floyd & Snider 2000)
Figure 5-6. 1,2-dichloroethene (total) contours in second water bearing zone,1999 sampling event (Terra Vac and Floyd & Snider 2000)
Figure 5-7. Vinyl chloride contours in first water bearing zone,1999 sampling event (Terra Vac and Floyd & Snider 2000)
Figure 5-8. Vinyl chloride contours in second water bearing zone,1999 sampling event (Terra Vac and Floyd & Snider 2000)



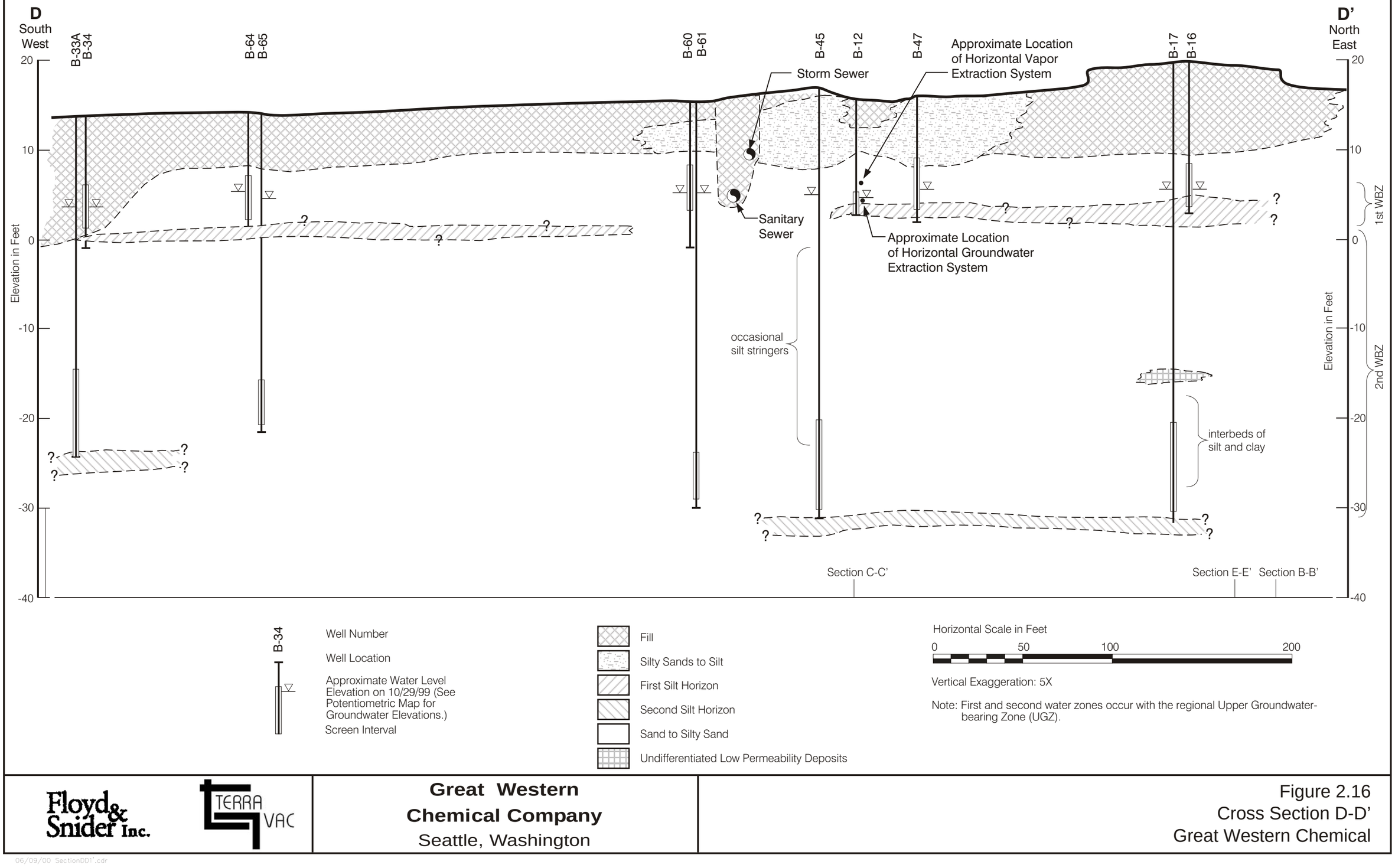
Floyd&Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 2.12
Cross Section Locations
Great Western Chemical

DATE: 10/25/00 1:31pm
DWG NAME: G:\project\clients\FLOYD~#5\gwcc\final\gwc0028.dwg



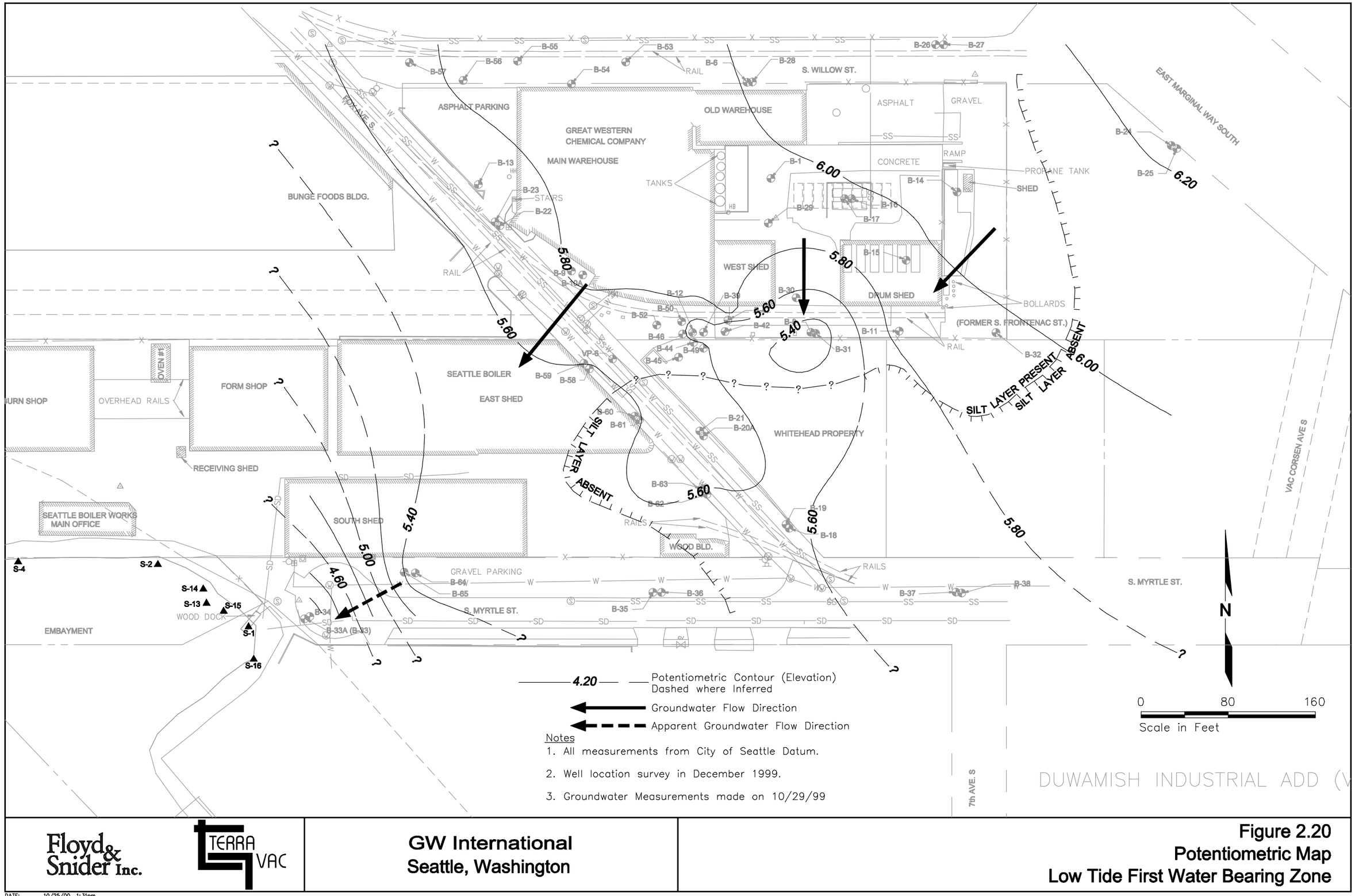
Floyd & Snider Inc.

TERRA VAC

Great Western Chemical Company
Seattle, Washington

Figure 2.16
Cross Section D-D'
Great Western Chemical

06/09/00 SectionDD1'.cdr



Notes

1. All measurements from City of Seattle Datum.
2. Well location survey in December 1999.
3. Groundwater Measurements made on 10/29/99

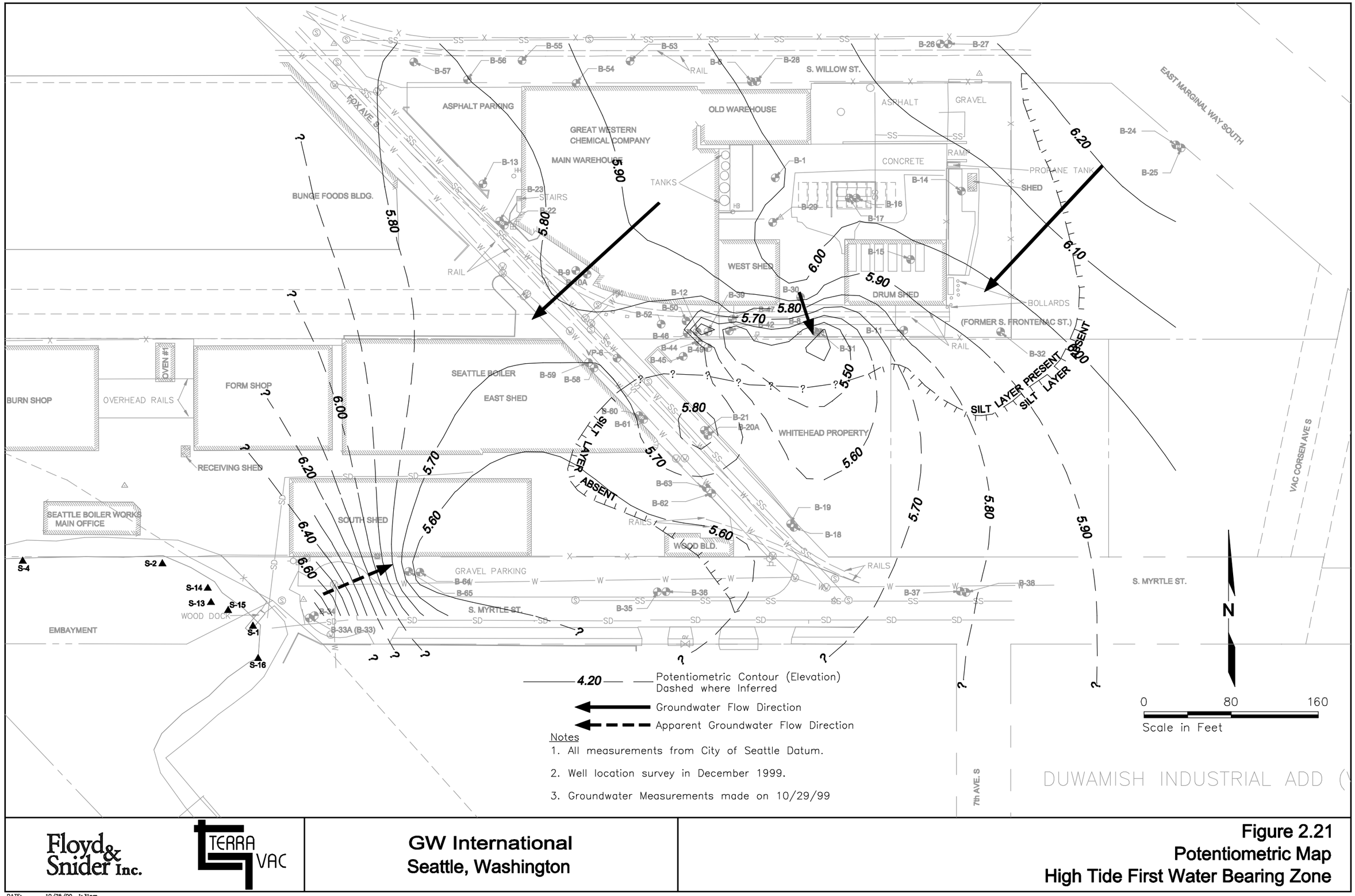
Floyd & Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 2.20
Potentiometric Map
Low Tide First Water Bearing Zone

DATE: 10/25/00 1:31pm
DWG NAME: G:\project\clients\FLOYD~~S\gwcc\final\gwc0030.dwg



Notes

1. All measurements from City of Seattle Datum.
2. Well location survey in December 1999.
3. Groundwater Measurements made on 10/29/99

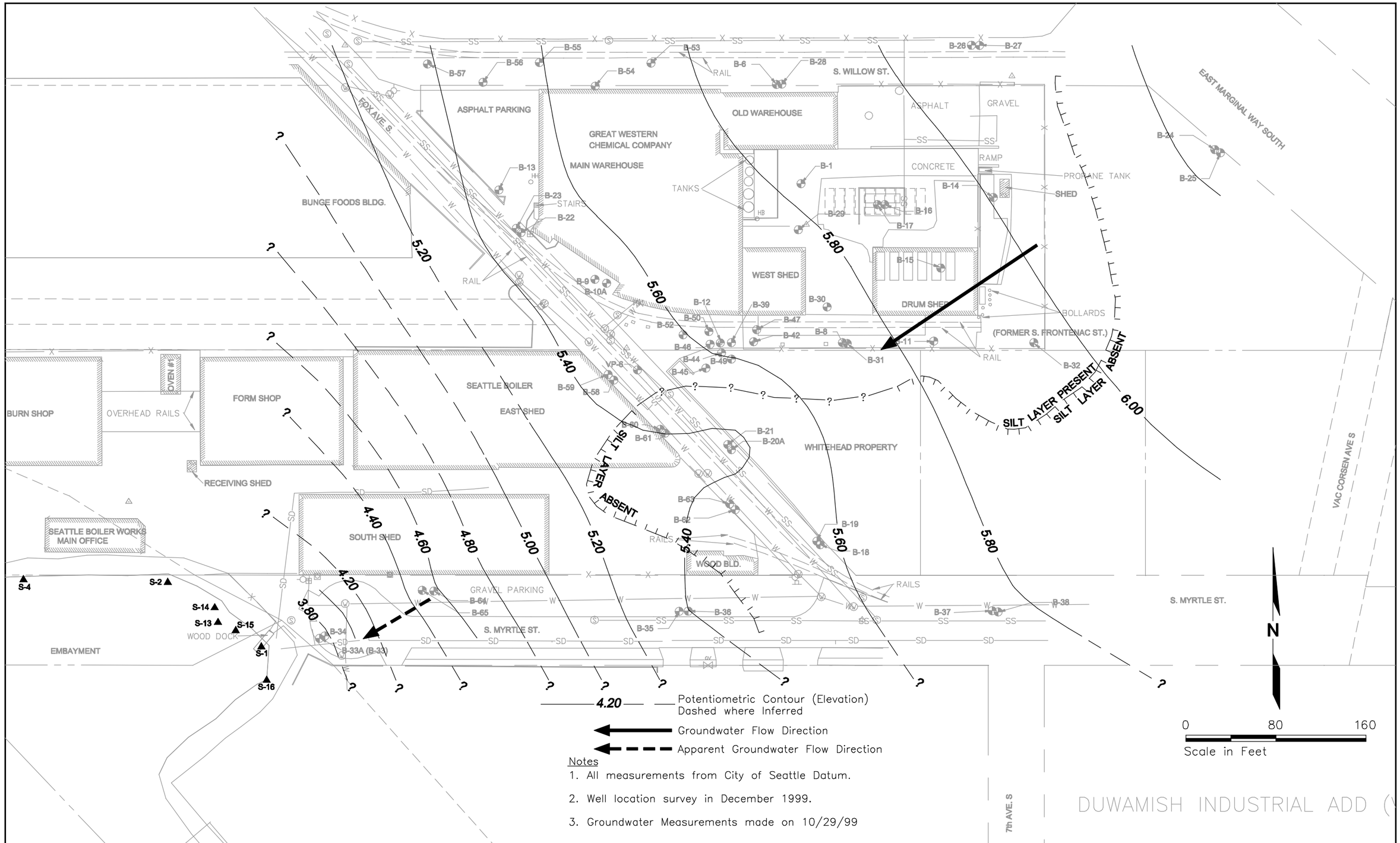
Floyd & Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 2.21
Potentiometric Map
High Tide First Water Bearing Zone

DATE: 10/25/00 1:31pm
DWG NAME: G:\project\clients\FLOYD~#5\gwcc\final\gwc0031.dwg



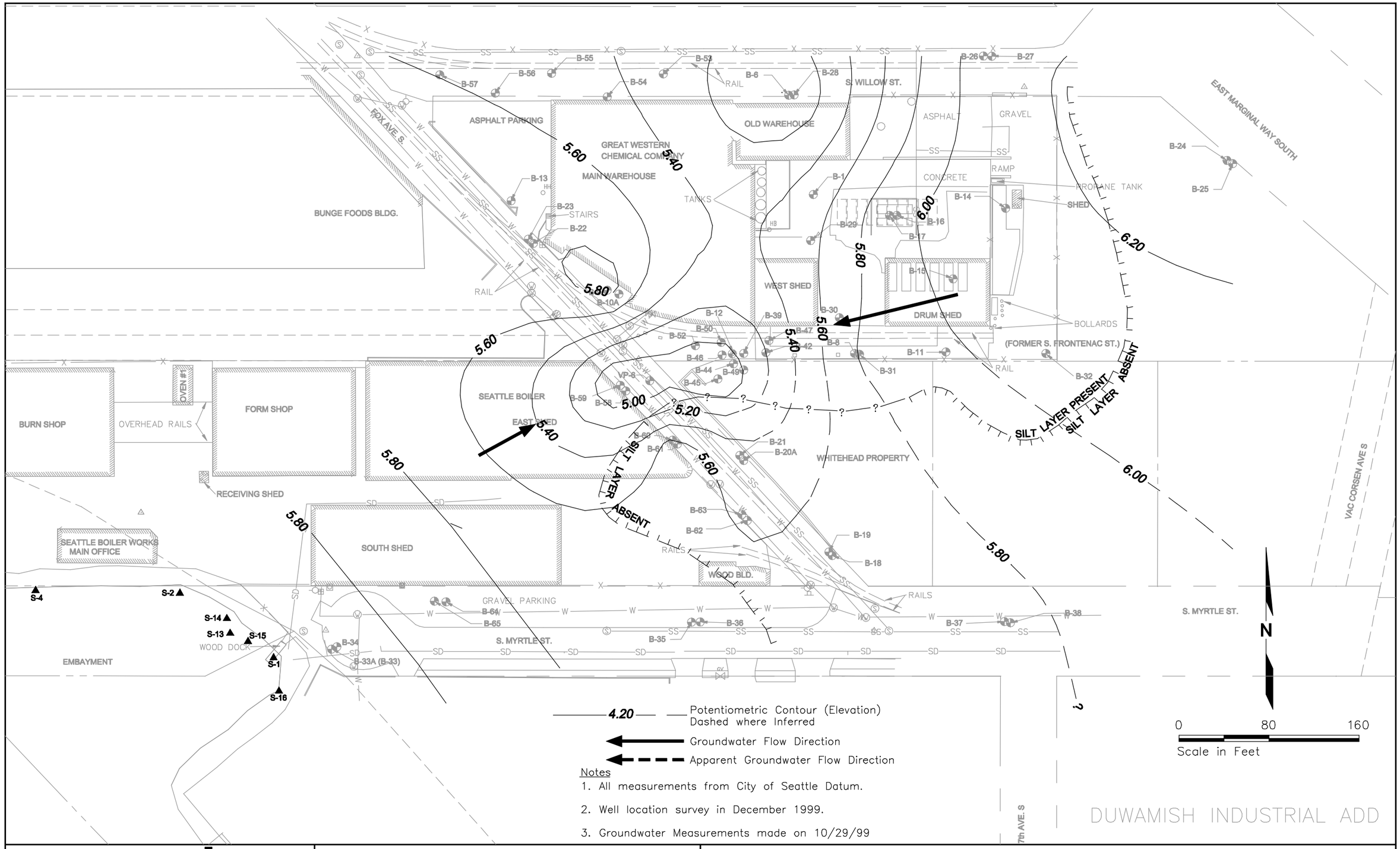
Floyd & Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 2.22
Potentiometric Map
Low Tide Second Water Bearing Zone

DATE: 10/25/00 1:32pm
DWG NAME: G:\project\clients\FLOYD~05\gwcc\final\gwc0032.dwg



Notes

1. All measurements from City of Seattle Datum.
2. Well location survey in December 1999.
3. Groundwater Measurements made on 10/29/99

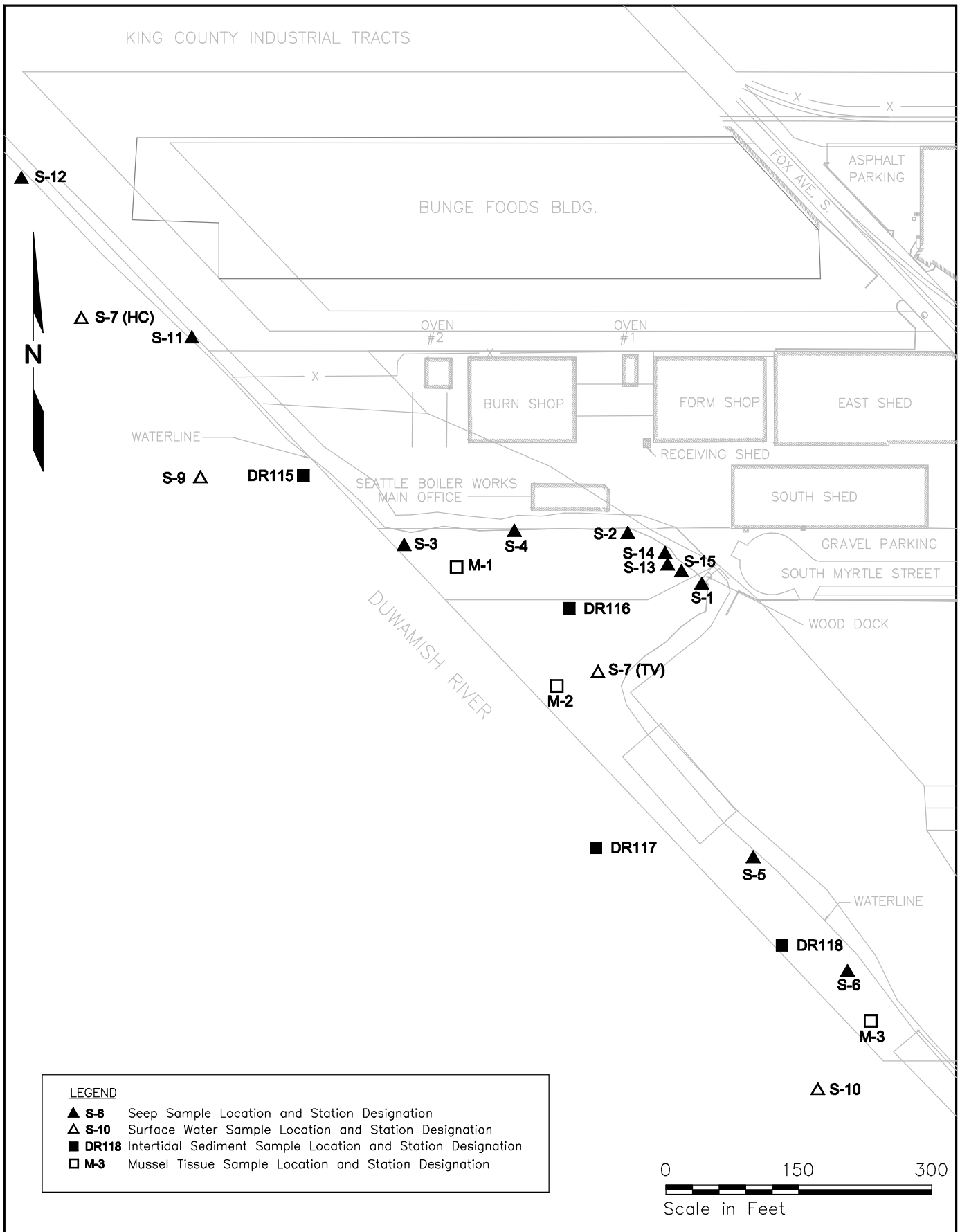
Floyd & Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 2.23
Potentiometric Map
High Tide Second Water Bearing Zone

DATE: 10/25/00 1:32pm
DWG NAME: G:\project\clients\FLOYD~#5\gwcc\final\gwc0033.dwg



Floyd & Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 4.3

Surface Water, Sediment, and Mussel Sample Stations

DATE: 10/25/00 1:47pm
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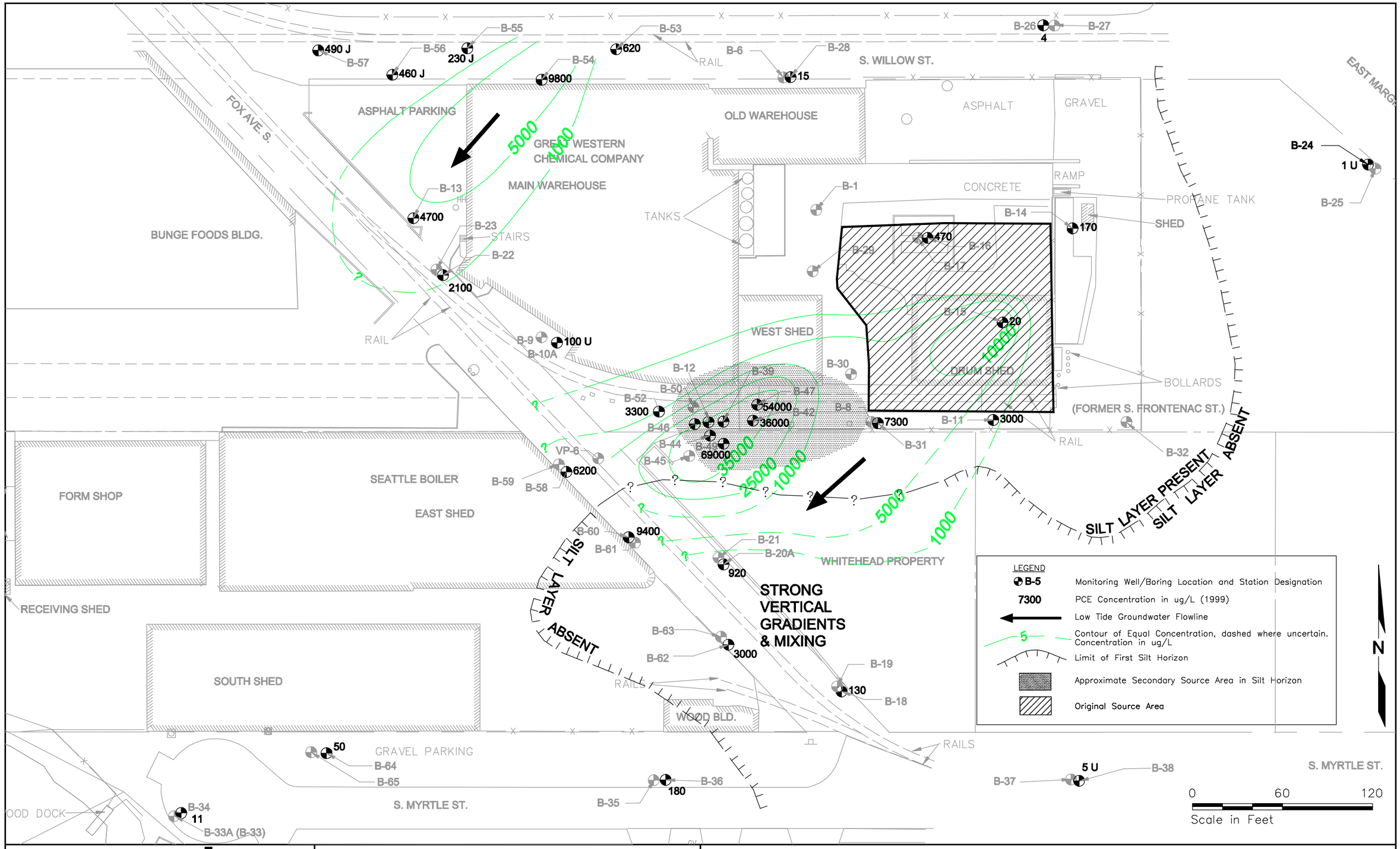


Floyd & Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 5.1
Tetrachloroethene Contours in 1st Water Bearing Zone
1999 Sampling Event

DATE: 10/25/00 1:30pm
DWG NAME: G:\project\clients\FLOYD~~05\gwcc\final\gwc0009.dwg

B-55 B-53 B-26 4 U B-27
B-57 B-56 B-54 RAIL B-6 B-28 S. WILLOW ST.
1 U
FOX AVE. S. ASPHALT PARKING OLD WAREHOUSE ASPHALT GRAVEL
GREAT WESTERN CHEMICAL COMPANY
MAIN WAREHOUSE
B-24 1 U
B-25
B-13 HH B-1 CONCRETE RAMP PROPANE TANK
TANKS B-14 SHED
BUNGE FOODS BLDG. B-23 STAIRS B-22 1 U B-16
17 B-29 B-17
B-15
2 WEST SHED
B-9 B-10A RAIL
B-12 B-30
B-50 B-47 DRUM SHED BOLLARDS
B-52 B-42 (FORMER S. FRONTENAC ST.)
B-8 B-11
B-46 410 B-31 RAIL
B-44 B-32
VP-6 B-45 1400
5 U B-59 B-58 SEATTLE BOILER
FORM SHOP
FIRST SHED
B-60 B-61 200 B-21 B-20A 250 U WHITEHEAD PROPERTY
SILT LAYER ABSENT
STRONG VERTICAL GRADIENTS & MIXING
RECEIVING SHED
B-63 100 U B-62
SOUTH SHED
RAILS B-19 64 B-18
WOOD BLD.
100 UJ B-64 B-65 GRAVEL PARKING RAILS
100 U B-36 B-35
S. MYRTLE ST.
OOD DOCK 130 B-34 B-33A (B-33)
B-37 1 U B-38
S. MYRTLE ST.
SILT LAYER PRESENT
SILT LAYER ABSENT
EAST MARG

LEGEND
B-5 Monitoring Well/Boring Location and Station Designation
7300 PCE Concentration in ug/L (1999)
Low Tide Groundwater Flowline
5 Contour of Equal Concentration, dashed where uncertain. Concentration in ug/L
Limit of First Silt Horizon
Approximate Secondary Source Area in Silt Horizon
Original Source Area
1 Location of wells with screens in 1st WBZ
2 Location of wells with screens in 2nd WBZ

N

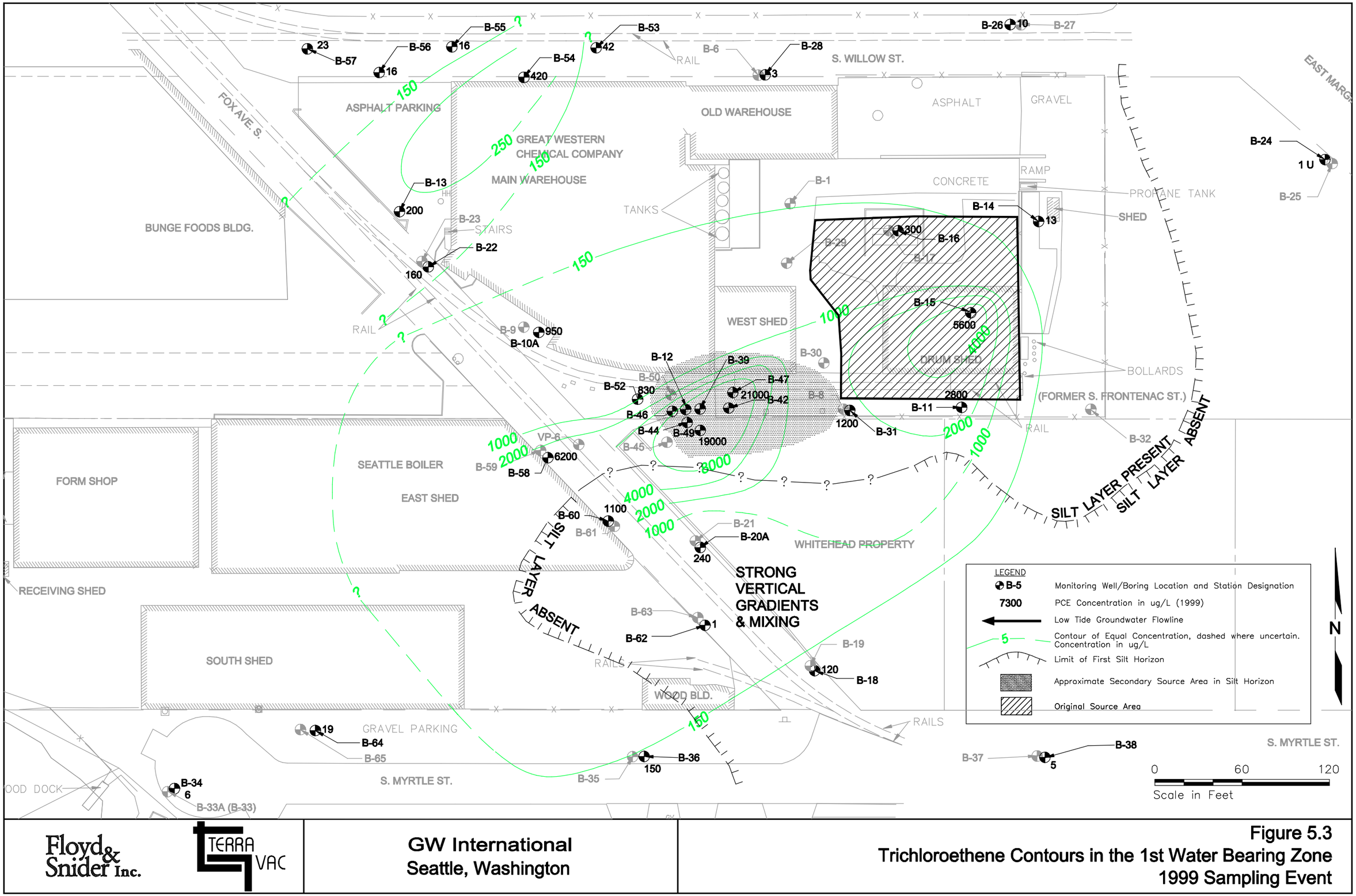
0 60 120
Scale in Feet

Floyd & Snider Inc. TERRA VAC

GW International
Seattle, Washington

Figure 5.2
Tetrachloroethene Contours in the 2nd Water Bearing Zone
1999 Sampling Event

DATE: 10/25/00 1:30pm
DWG NAME: G:\project\clients\FLOYD~#5\gwcc\final\gwc0010.dwg



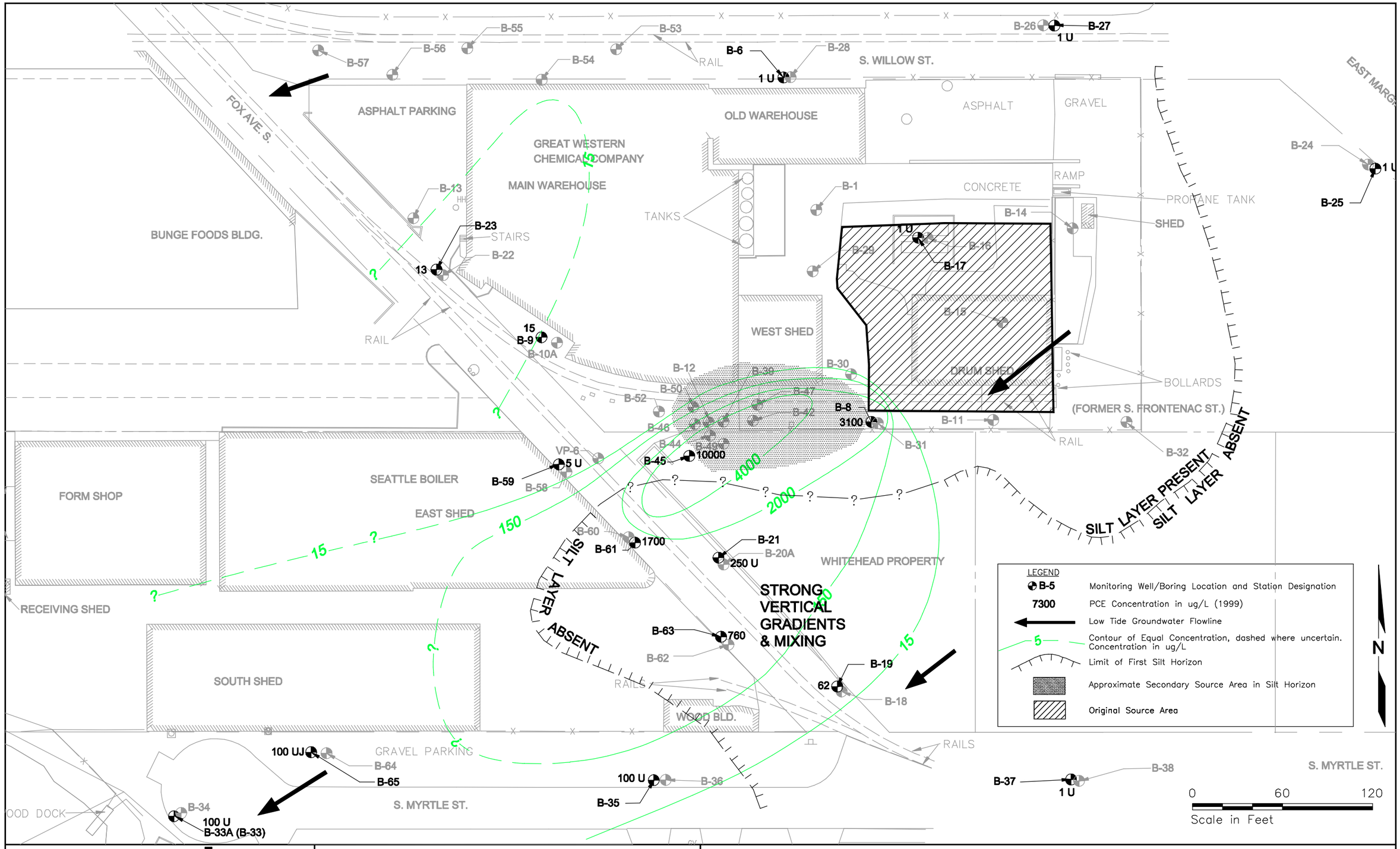
Floyd & Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 5.3
Trichloroethene Contours in the 1st Water Bearing Zone
1999 Sampling Event

DATE: 10/25/00 1:30pm
DWG NAME: G:\project\clients\FLOYD~#5\gwcc\final\gwc0011.dwg



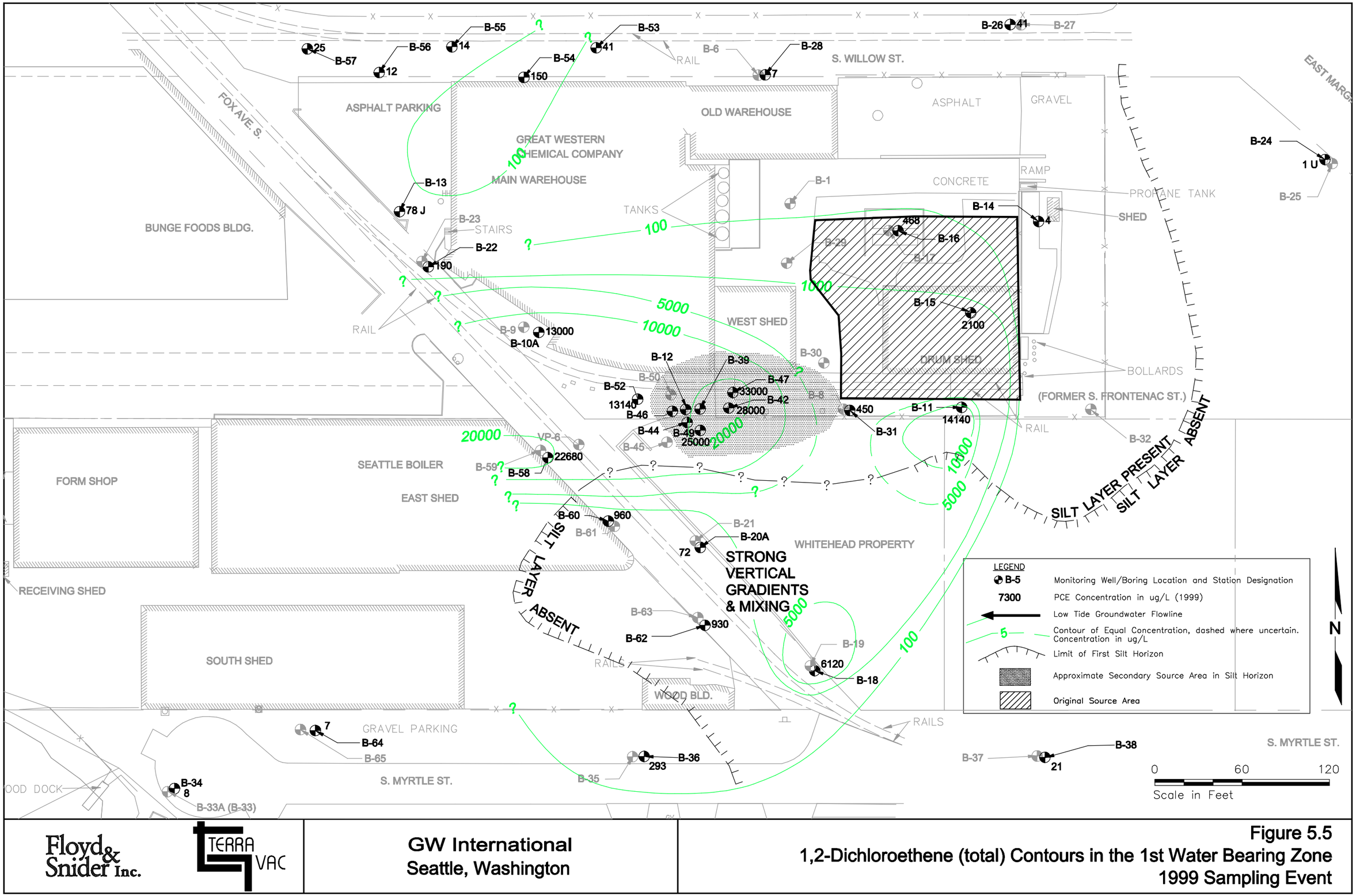
Floyd & Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 5.4
Trichloroethene Contours in the 2nd Water Bearing Zone
1999 Sampling Event

DATE: 10/25/00 1:30pm
DWG NAME: G:\project\clients\FLOYD~#5\gwcc\final\gwc0012.dwg



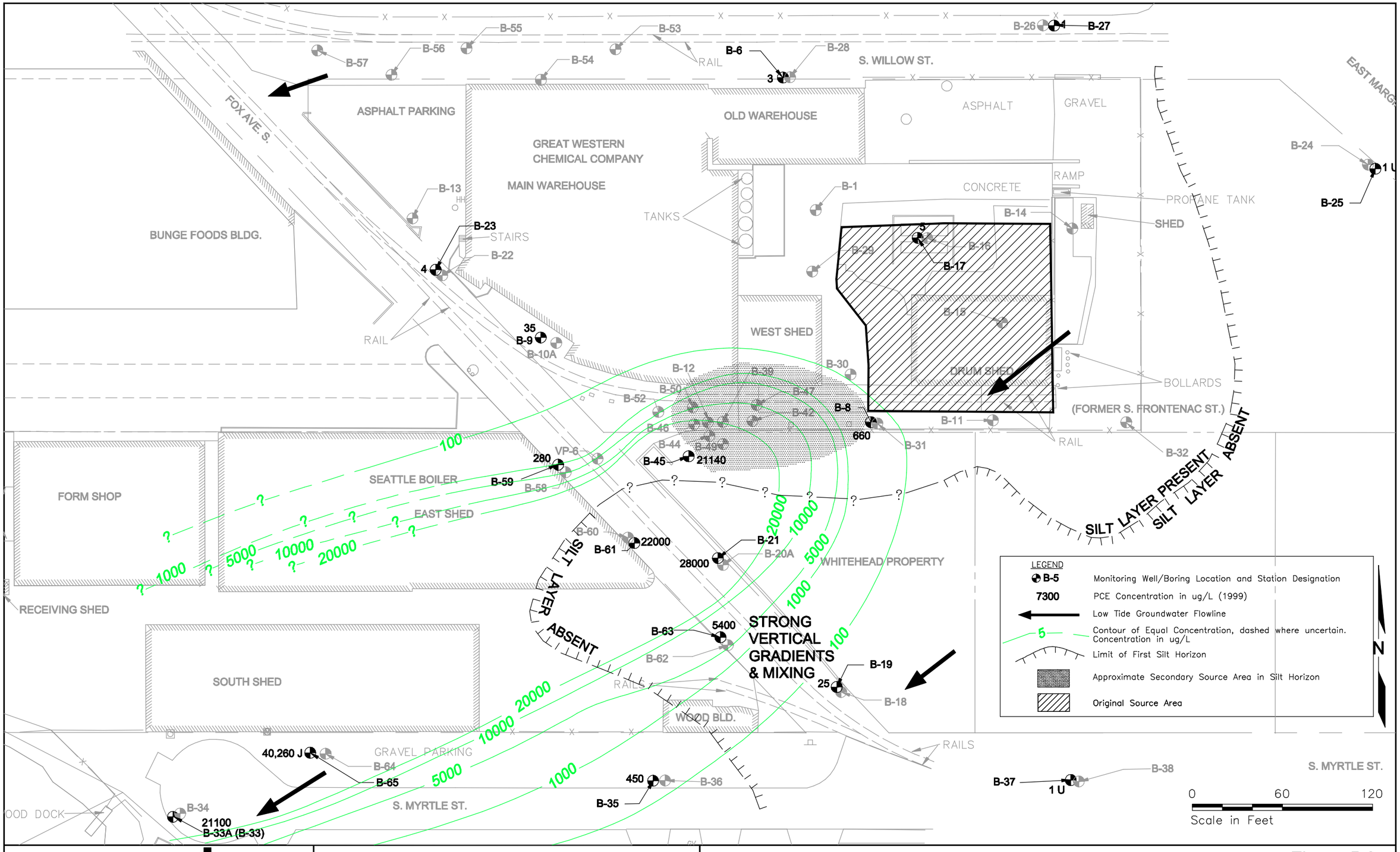
Floyd & Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 5.5
1,2-Dichloroethene (total) Contours in the 1st Water Bearing Zone
1999 Sampling Event

DATE: 10/25/00 1:30pm
DWG NAME: G:\project\clients\FLOYD~#5\gwcc\final\gwc0013.dwg



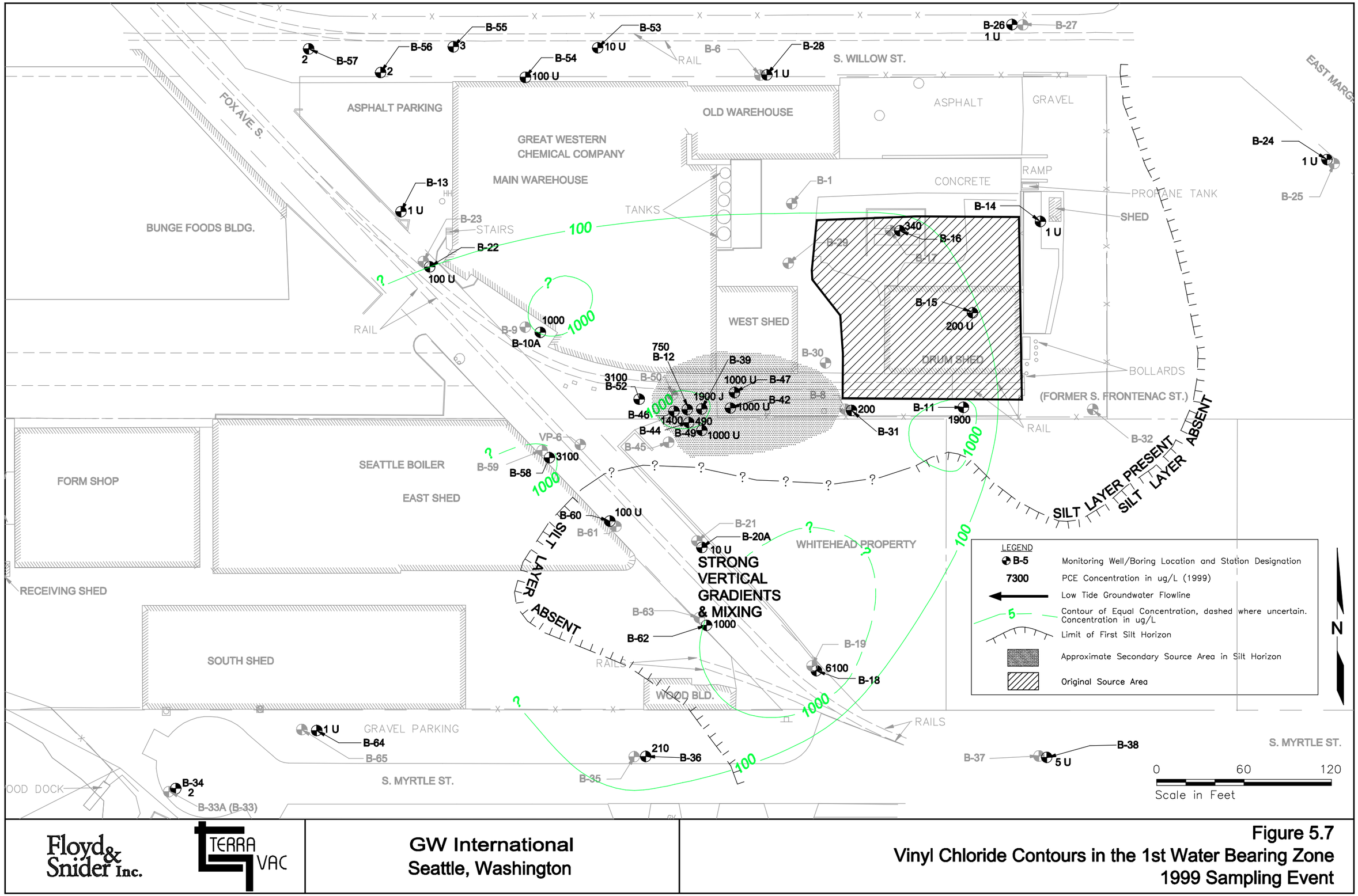
Floyd & Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 5.6
1,2-Dichloroethene (total) Contours in the 2nd Water Bearing Zone
1999 Sampling Event

DATE: 10/25/00 1:30pm
DWG NAME: G:\project\clients\FLOYD~#5\gwcc\final\gwc0014.dwg



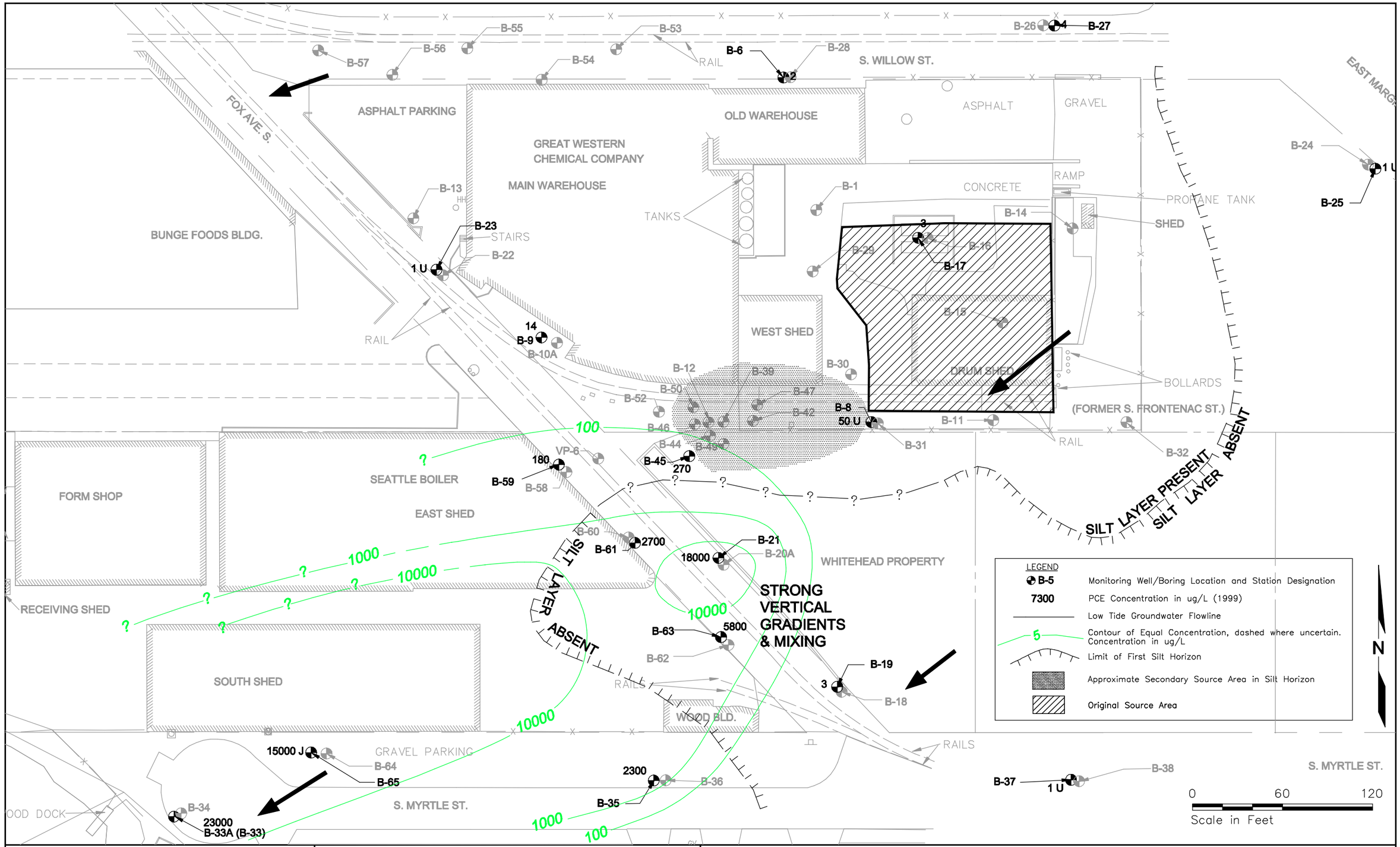
Floyd & Snider Inc.

TERRA VAC

GW International
Seattle, Washington

Figure 5.7
Vinyl Chloride Contours in the 1st Water Bearing Zone
1999 Sampling Event

DATE: 10/25/00 1:30pm
DWG NAME: G:\project\clients\FLOYD~#5\gwcc\final\gwc0015.dwg



Floyd & Snider Inc.

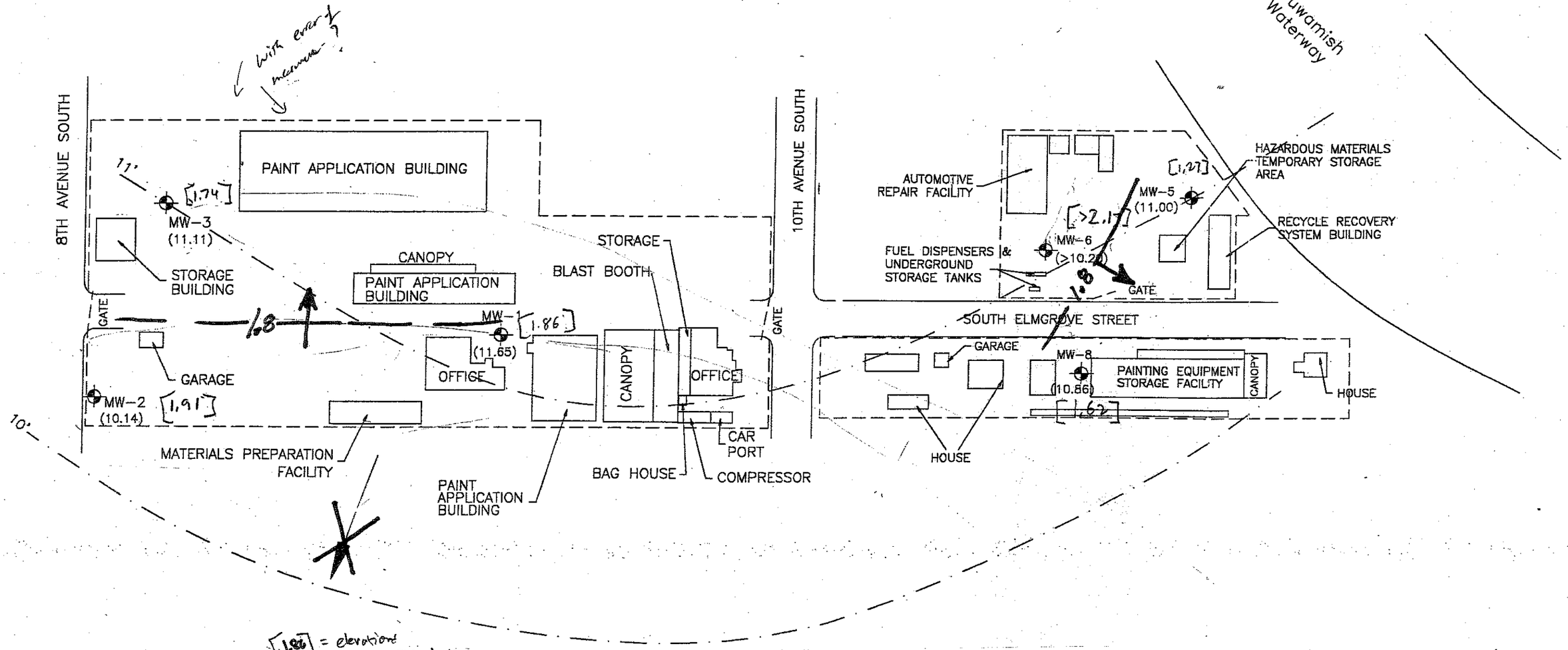
TERRA VAC

GW International
Seattle, Washington

Figure 5.8
Vinyl Chloride Contours in the 2nd Water Bearing Zone
1999 Sampling Event

DATE: 10/25/00 1:30pm
DWG NAME: G:\project\clients\FLOYD~#5\gwcc\final\gwc0016.dwg

Long Painting (G.6)



LEGEND

- MW-2 / 10.14 — Monitoring well number and groundwater level depth
- Groundwater flow direction
- Groundwater flow contour line
- Approximate Long Painting property boundary

Note: Edits were made to the flow direction on this figure by LDWG (January 2, 2003) based on groundwater elevation data indicated by top of casing (TOC) elevations in brackets. These handwritten TOC elevations were on the copy of this figure obtained from Ecology by LDWG.

0 100 200

APPROXIMATE DRAWING SCALE: 1"= 100'

KLEINFELDER

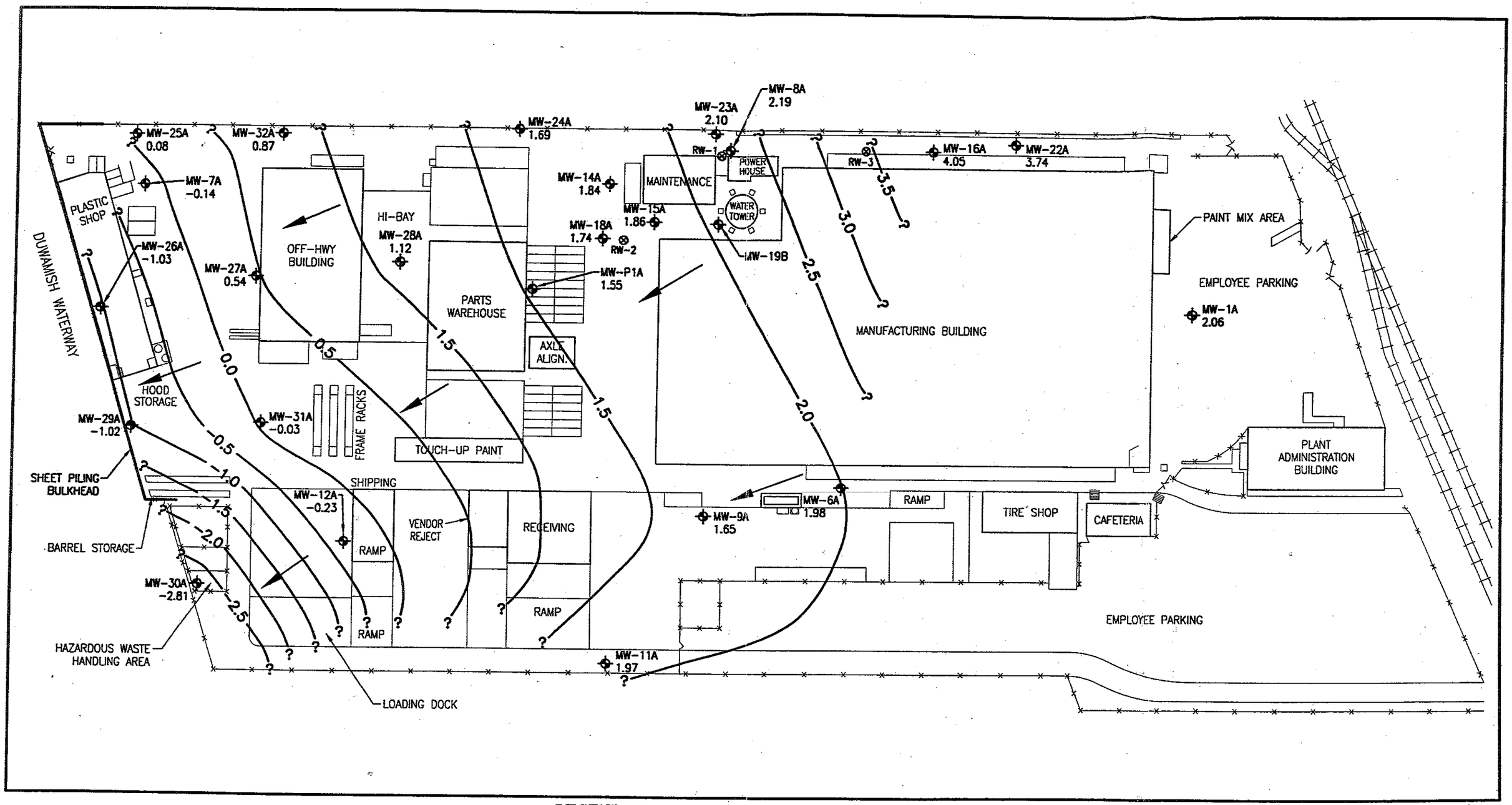
Long Painting Inc.
8025 10th Avenue South
Seattle, WA
Project: 60-2046-01
August 2000

Site Plan and Groundwater Flow Diagram

FIGURE 2

Malarkey Asphalt (G.7)

Figure 3.1. Soil removal grids and sampling locations (Onsite 2000)
Figure 4. Groundwater elevation contour map, April 29,1998 (SECOR 1998)
Figure 6. Alternative 3: Surface remediation, soil excavation, cap and cap repair areas (SECOR 1998)



LEGEND

MW-11A 1.97 — EXISTING MONITORING WELL LOCATION AND WATER LEVEL ELEVATION (FEET ABOVE MSL)

RW-3 — EXTRACTION WELL

2.0 — APPROXIMATE POTENTIOMETRIC SURFACE ELEVATION CONTOUR BASED ON MEASUREMENTS TAKEN AT LOW TIDE ON DATE 25 APRIL 1997. CONTOURS TRIANGULATED USING IRREGULAR NETWORK USING pc-TIN 3.40 (FEET ABOVE MSL)

ESTIMATED GROUNDWATER FLOW DIRECTION

CONTOUR INTERVAL = 0.5 FEET

N

0 60 120

APPROXIMATE SCALE IN FEET

NOTES:

1) ALL LOCATIONS ARE APPROXIMATE.
2) BASE DRAWING PROVIDED BY PACCAR INCORPORATED.
3) WATER LEVELS MEASURED BY KENNEDY/JENKS CONSULTANTS ON 25 APRIL 1997.

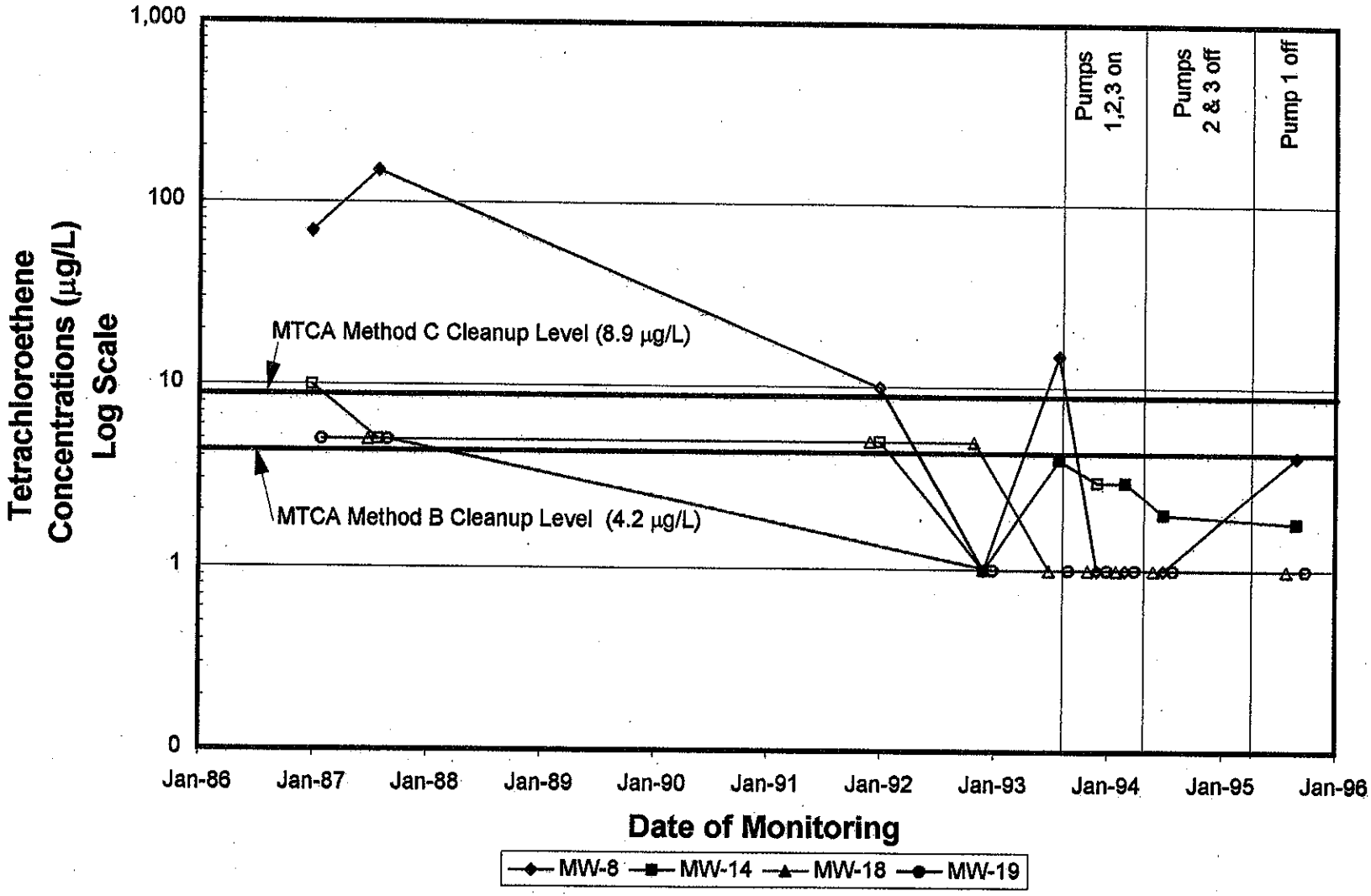
Kennedy/Jenks Consultants

KENWORTH TRUCK COMPANY
SEATTLE, WA

POTENTIOMETRIC SURFACE CONTOUR MAP

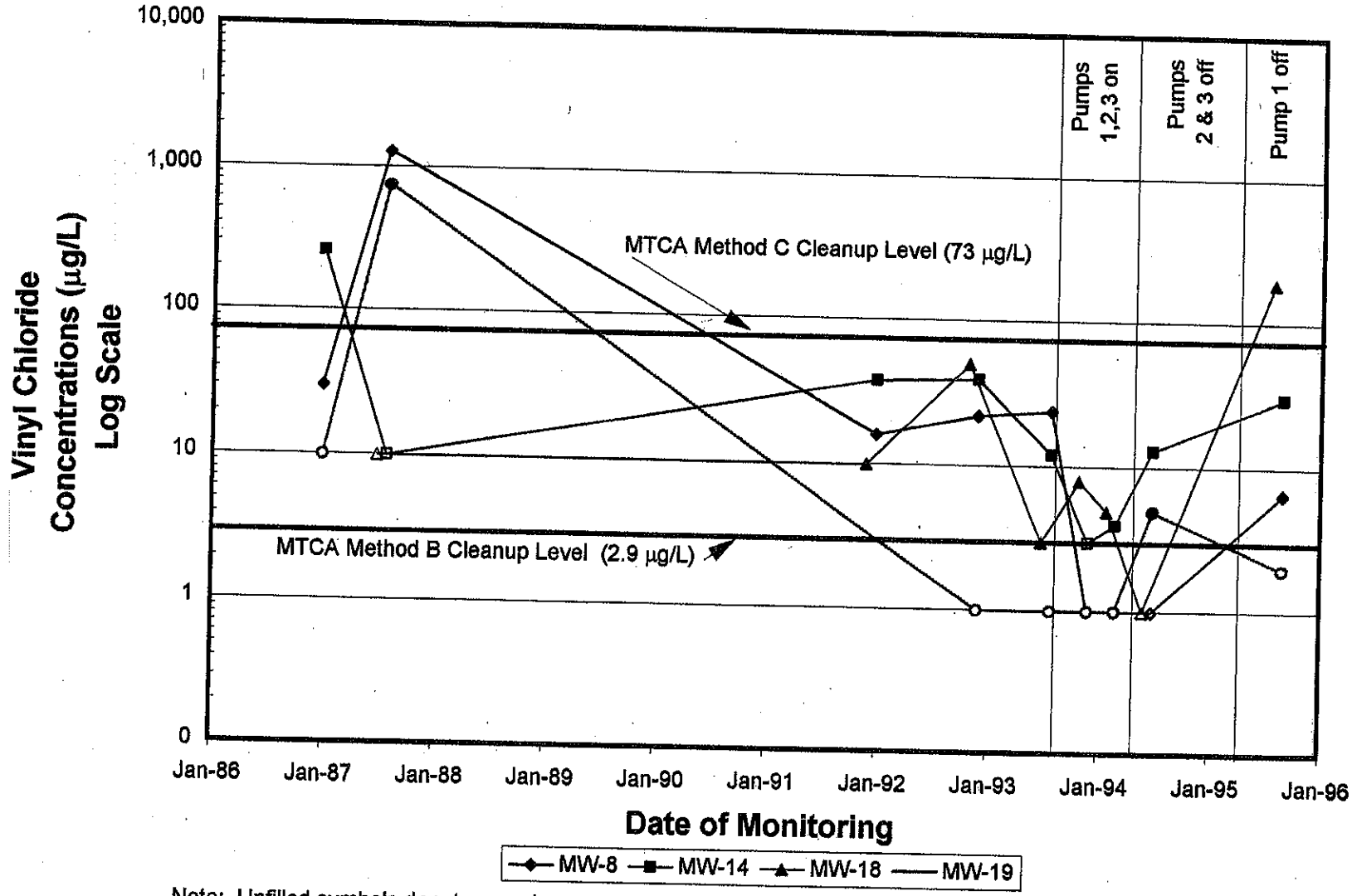
996032.00/P9SK003

FIGURE C-7
GROUNDWATER MONITORING RESULTS
TETRACHLOROETHENE (µg/L) - LOG SCALE
KENWORTH TRUCK COMPANY- NORTH FIRE AISLE



Note: Unfilled symbols denote sample concentrations below method detection limits. Monitoring dates have been shifted to enhance data presentation. Refer to Table C-1 for analyte concentrations and actual sampling dates.

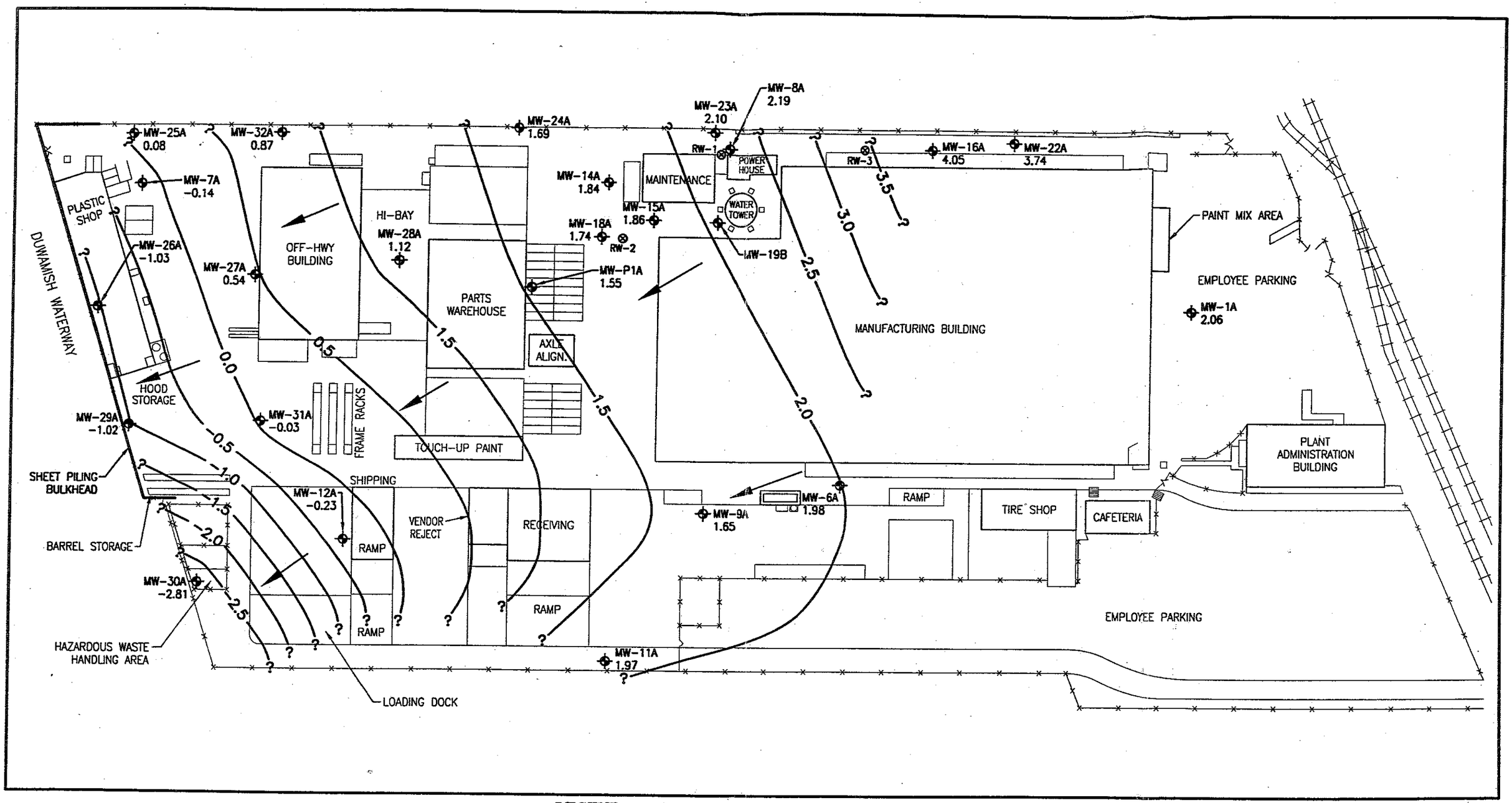
FIGURE C-8
GROUNDWATER MONITORING RESULTS
VINYL CHLORIDE (µg/L) - LOG SCALE
KENWORTH TRUCK COMPANY- NORTH FIRE AISLE



Note: Unfilled symbols denote sample concentrations below method detection limits. Monitoring dates have been shifted to enhance data presentation. Refer to Table C-1 for analyte concentrations and actual sampling dates.

PACCAR (G.8)

Figure a. *Potentiometric surface contour map (Kennedy/Jenks 1999)*
Figure C-7. *Groundwater monitoring results, tetrachloroethene, Kenworth Truck Company, north fire aisle (Kennedy/Jenks 1996)*
Figure C-8. *Groundwater monitoring results, vinyl chloride, Kenworth Truck Company, north fire aisle (Kennedy/Jenks 1996)*



NOTES:

1) ALL LOCATIONS ARE APPROXIMATE.
2) BASE DRAWING PROVIDED BY PACCAR INCORPORATED.
3) WATER LEVELS MEASURED BY KENNEDY/JENKS CONSULTANTS ON 25 APRIL 1997.

LEGEND

MW-11A 1.97 — EXISTING MONITORING WELL LOCATION AND WATER LEVEL ELEVATION (FEET ABOVE MSL)

RW-3 — EXTRACTION WELL

2.0 — APPROXIMATE POTENTIOMETRIC SURFACE ELEVATION CONTOUR BASED ON MEASUREMENTS TAKEN AT LOW TIDE ON DATE 25 APRIL 1997. CONTOURS TRIANGULATED USING IRREGULAR NETWORK USING pc-TIN 3.4D (FEET ABOVE MSL)

ESTIMATED GROUNDWATER FLOW DIRECTION

CONTOUR INTERVAL = 0.5 FEET

N

0 60 120

APPROXIMATE SCALE IN FEET

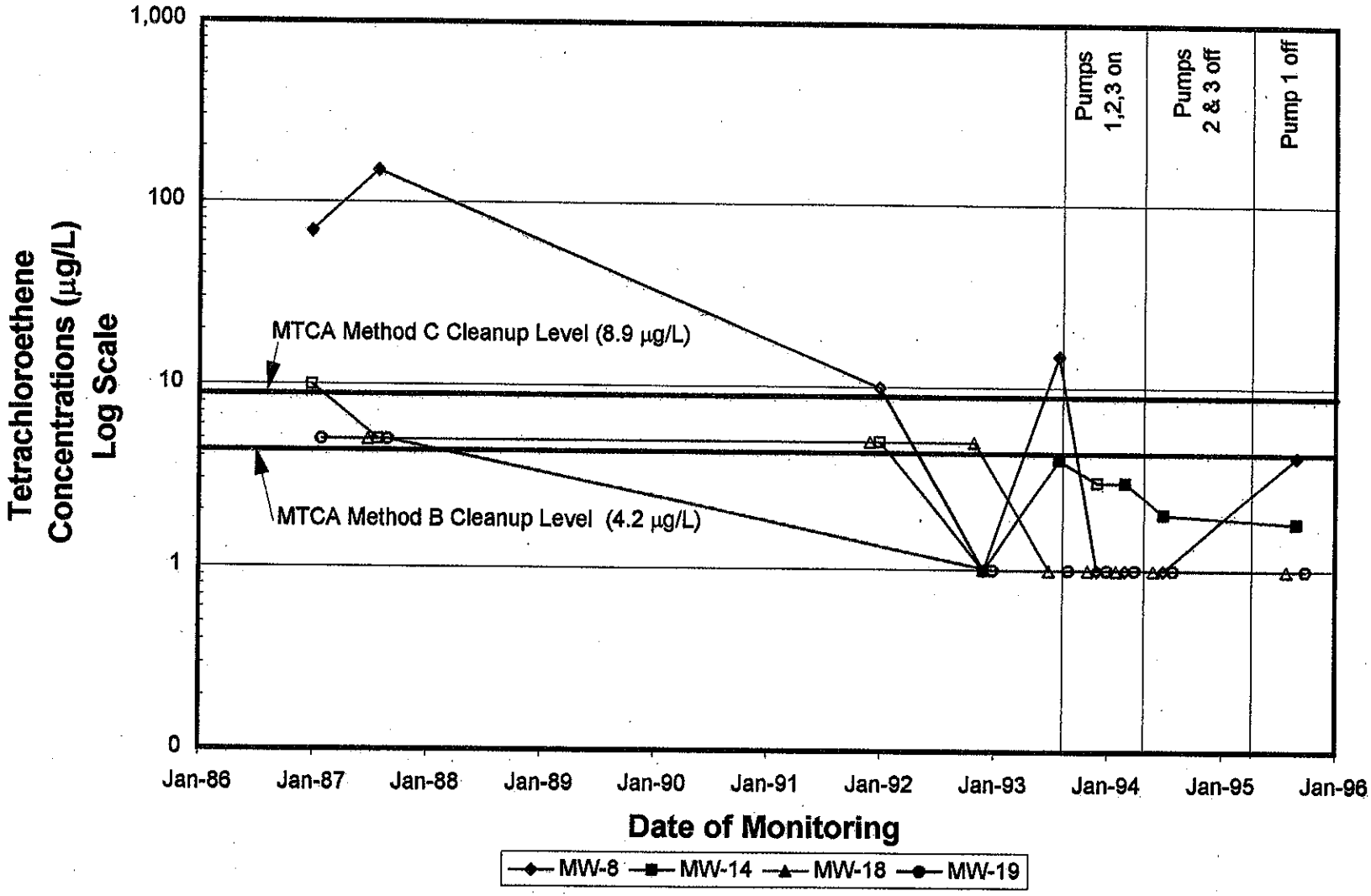
Kennedy/Jenks Consultants

KENWORTH TRUCK COMPANY
SEATTLE, WA

POTENTIOMETRIC SURFACE CONTOUR MAP

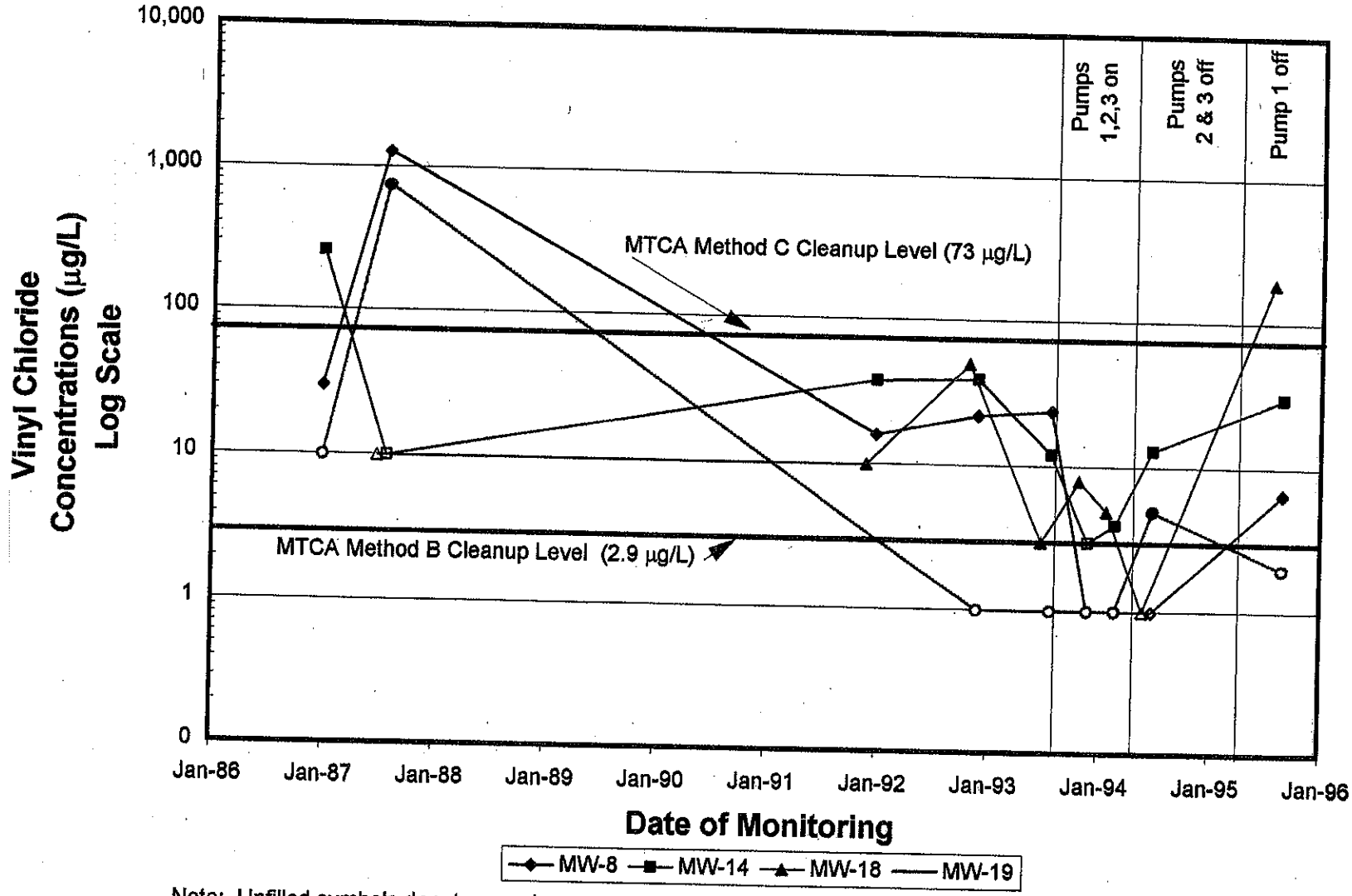
996032.00/P9SK003

FIGURE C-7
GROUNDWATER MONITORING RESULTS
TETRACHLOROETHENE (µg/L) - LOG SCALE
KENWORTH TRUCK COMPANY- NORTH FIRE AISLE



Note: Unfilled symbols denote sample concentrations below method detection limits. Monitoring dates have been shifted to enhance data presentation. Refer to Table C-1 for analyte concentrations and actual sampling dates.

FIGURE C-8
GROUNDWATER MONITORING RESULTS
VINYL CHLORIDE (µg/L) - LOG SCALE
KENWORTH TRUCK COMPANY- NORTH FIRE AISLE



Note: Unfilled symbols denote sample concentrations below method detection limits. Monitoring dates have been shifted to enhance data presentation. Refer to Table C-1 for analyte concentrations and actual sampling dates.

Philip Services Corporation (G.9)

Figure 2. *Groundwater elevations, June 24, 2002: shallow aquifer (wells screened through the water table) Georgetown Facility (PSC 2002a)*
Figure 3. *Groundwater elevations, June 24, 2002: intermediate aquifer (wells screened through the water table) Georgetown Facility (PSC 2002a)*
Figure 4. *Department to Ecology, Site locations near PSC facilities (PSC 2002a)*
Figure 5. *On-site and off-site groundwater concentrations trichloroethene (PSC 2002a)*
Figure 6. *On-site and off-site groundwater concentrations cis-1,2-dichloroethene (PSC 2002a)*
Figure 7. *On-site and off-site groundwater concentrations vinyl chloride (PSC 2002a)*
Figure 8. *Vertical cross-section groundwater concentrations (PSC 2002a)*

PSC
GEORGETOWN
FACILITY

S. Bennett St.
S. Brandon St.
S. Lucile St.
S. Findlay St.
S. Orcas St.
S. Mead St.
S. Fidalgo St.
S. Fidalgo St
S Homer St.
Padilla Pl S.

Utah Ave. S
1st Ave. S
2nd Ave. S.
3rd Ave. S.
4th Ave. S.
5th Ave. S.
6th Ave S.
7th Ave S.
8th Ave. S.
Maynard Ave S.
Denver Ave S.
Airport Way S.
Ohio Ave S.
E. Marginal Way S.

CG-143-WT
-1.19

CG-142-WT
-1.78

CG-141-WT
-2.20

CG-140-WT
-2.40

CG-138-WT
-0.97

CG-137-WT
-1.53

CG-136-WT
-0.80

CG-134-WT

CG-130-WT
0.65

CG-131-WT
0.54

CG-129-WT
1.16

CG-128-WT
1.24

CG-127-WT
1.11

CG-132-WT
0.75

CG-115-WT
1.19

CG-122-WT
1.85

CG-126-WT
1.59

11-S-1
2.60

1-S-1
2.75

105-S-1
2.39

10-S-1
2.86

104-S-1
2.33

113-S-1
2.28

9-S-1
2.57

8-S-1

6-S-1

7-S-1

2-S-1
2.86

112-S-1
2.38

103-S-1
2.53

5-S-1

CG-124-WT
2.38

102-S-1
2.87

CG-3
3.48

101-S-1
4.07

CG-106-WT
3.71

CG-107-WT
3.07

-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
3
3.5

Legend

Shallow Aquifer Monitoring Well with Water Level (feet)

Water Elevation Contour

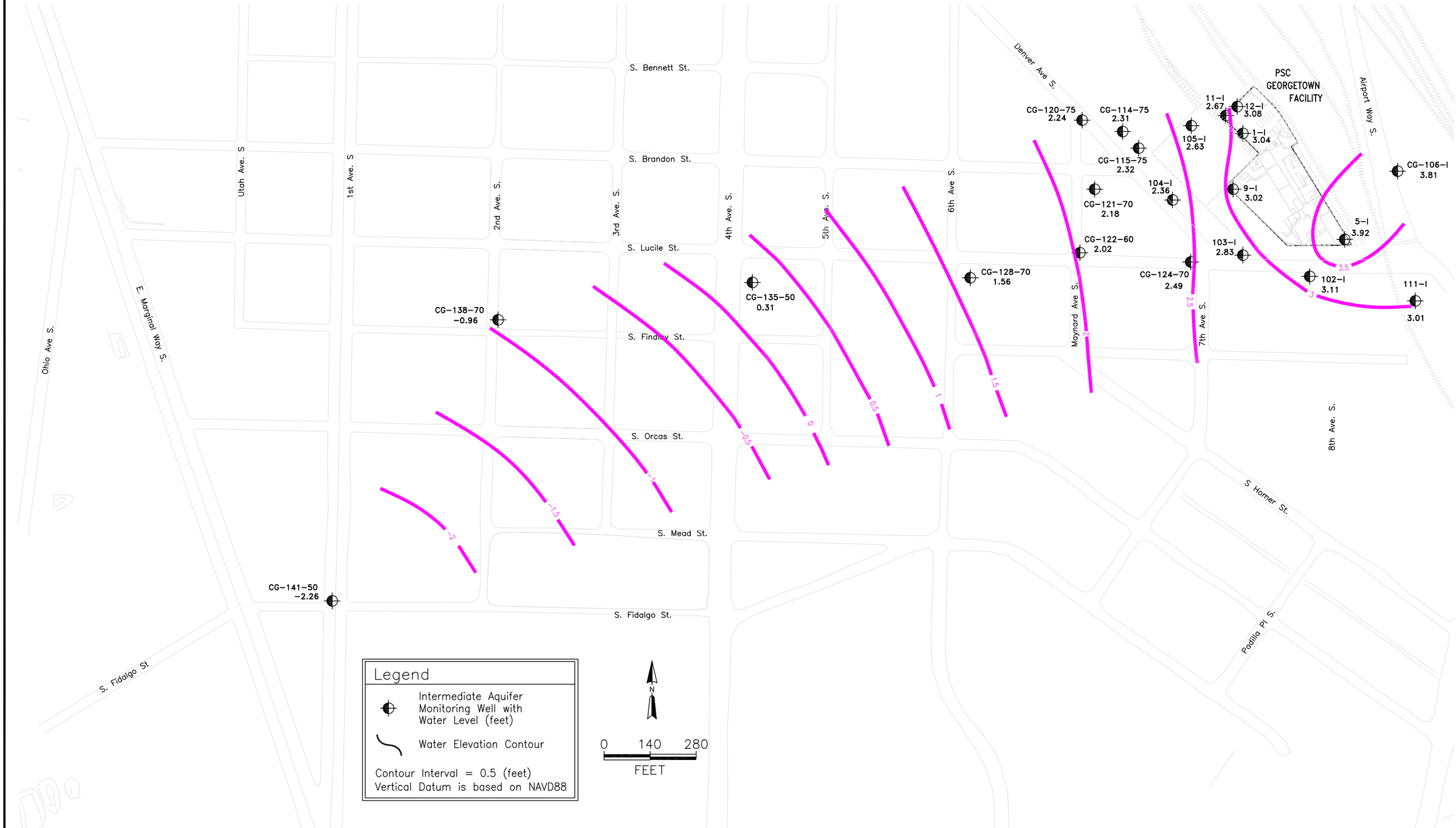
Contour Interval = 0.5 (feet)
Vertical Datum is based on NAVD88

N

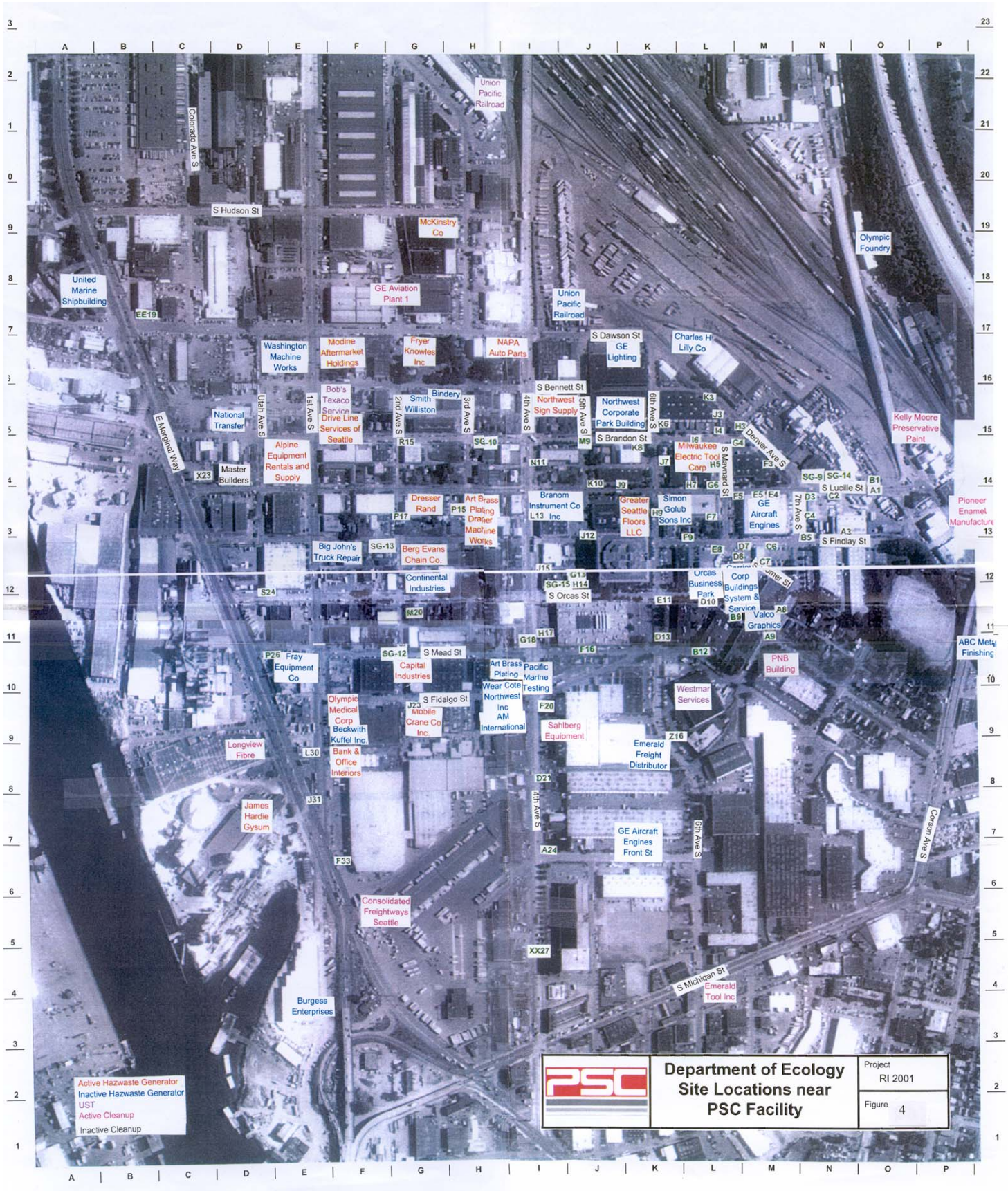
0 140 280
FEET

TITLE:
Groundwater Elevations, June 24, 2002
Shallow Aquifer (Wells screened through the water table)
Georgetown Facility

DWN: dtb	DES.:	PROJECT NO.: 2Q02	
CHKD:	APPD:		
DATE: 8/8/02	REV.:	FIGURE NO.: 2	



PSC	TITLE: Groundwater Elevations, June 24, 2002 Intermediate Aquifer (Wells screened from ~40 and 70 feet bgs) Georgetown Facility	DWN: dtb	DES.:	PROJECT NO.: 2Q02
		CHKD:	APPD:	FIGURE NO.: 3
		DATE: 8/8/02	REV.:	



PSC

Department of Ecology Site Locations near PSC Facility

Project: RI 2001

Figure: 4

Figure 5
On-Site and Off-Site Groundwater Concentrations
Trichloroethene

Concentrations in ug/L

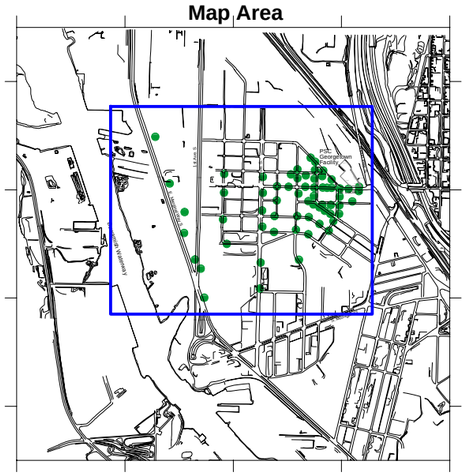
Groundwater Cleanup Criteria

MCL: 5 ug/L

MTCA Method B Level: 3.98 ug/L

28000
1000
500
100
5
3.98

Map Area



Groundwater Sampling Locations:

● Direct Push, 1998-2002

Note:

Data are maximum concentration at a sampling location regardless of depth

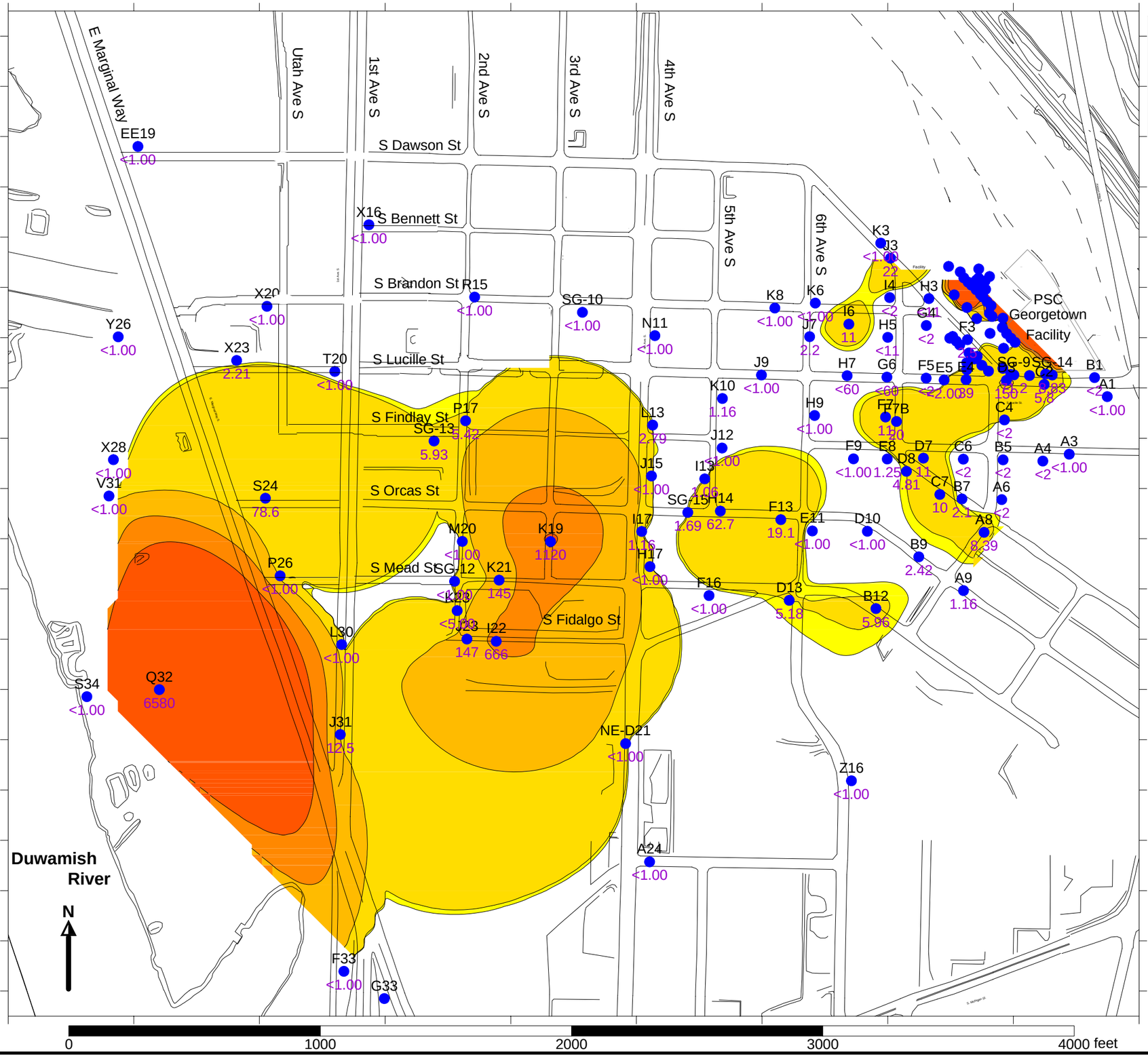
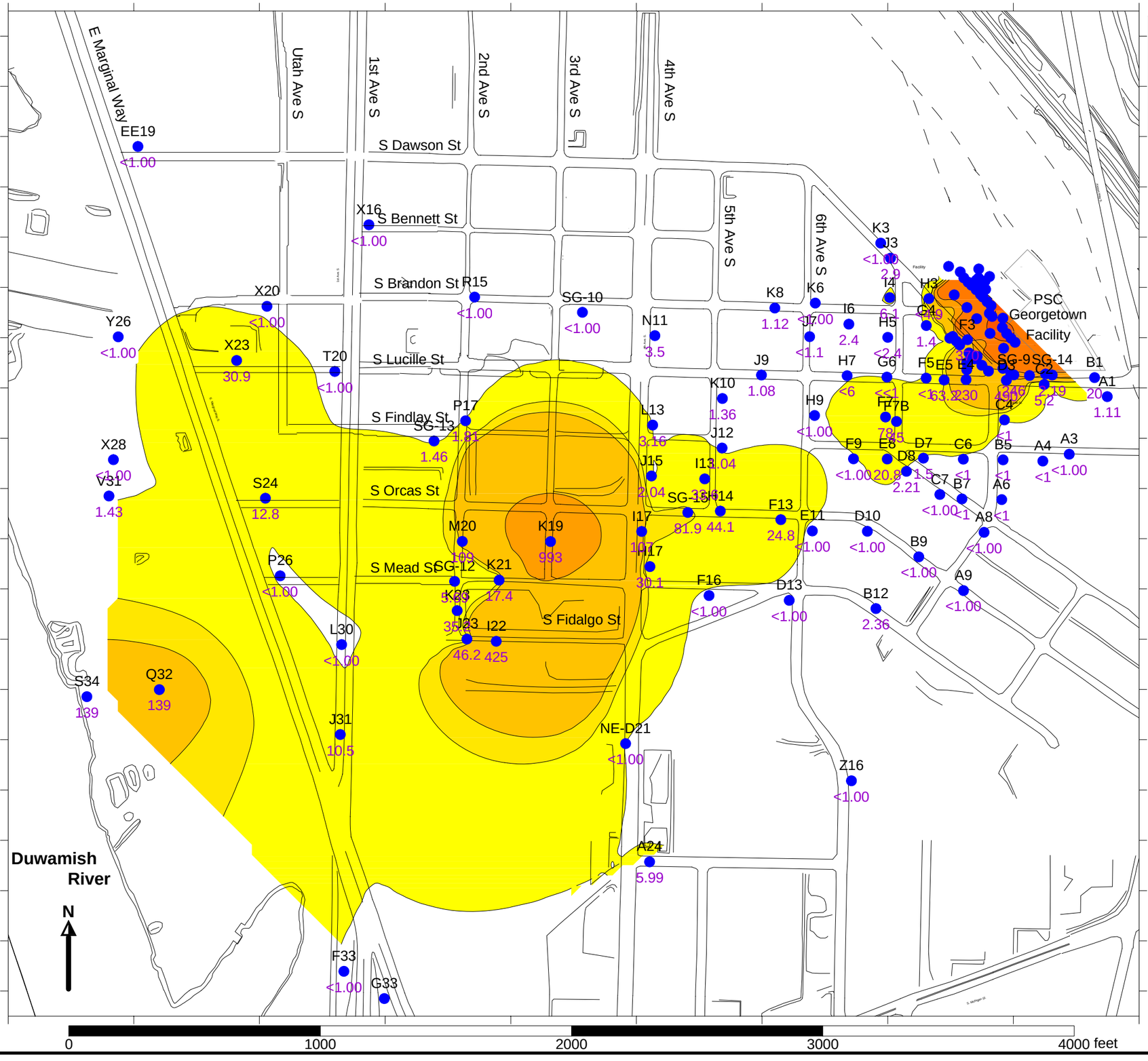


Figure 6
On-Site and Off-Site Groundwater Concentrations
cis-1,2-Dichloroethene



Concentrations in ug/L

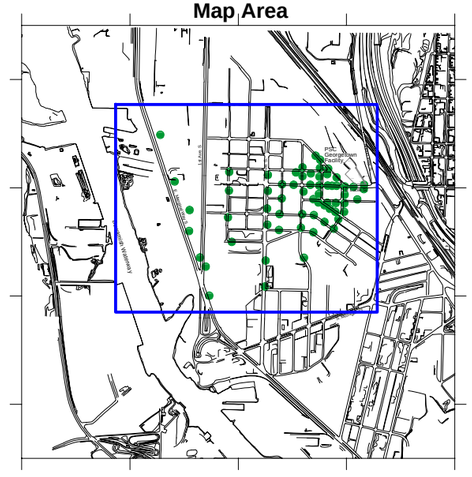
40000
10000
1000
500
100
70
5

Groundwater Cleanup Criteria

MCL: 70 ug/L

MTCA Method B Level: 80 ug/L

Map Area



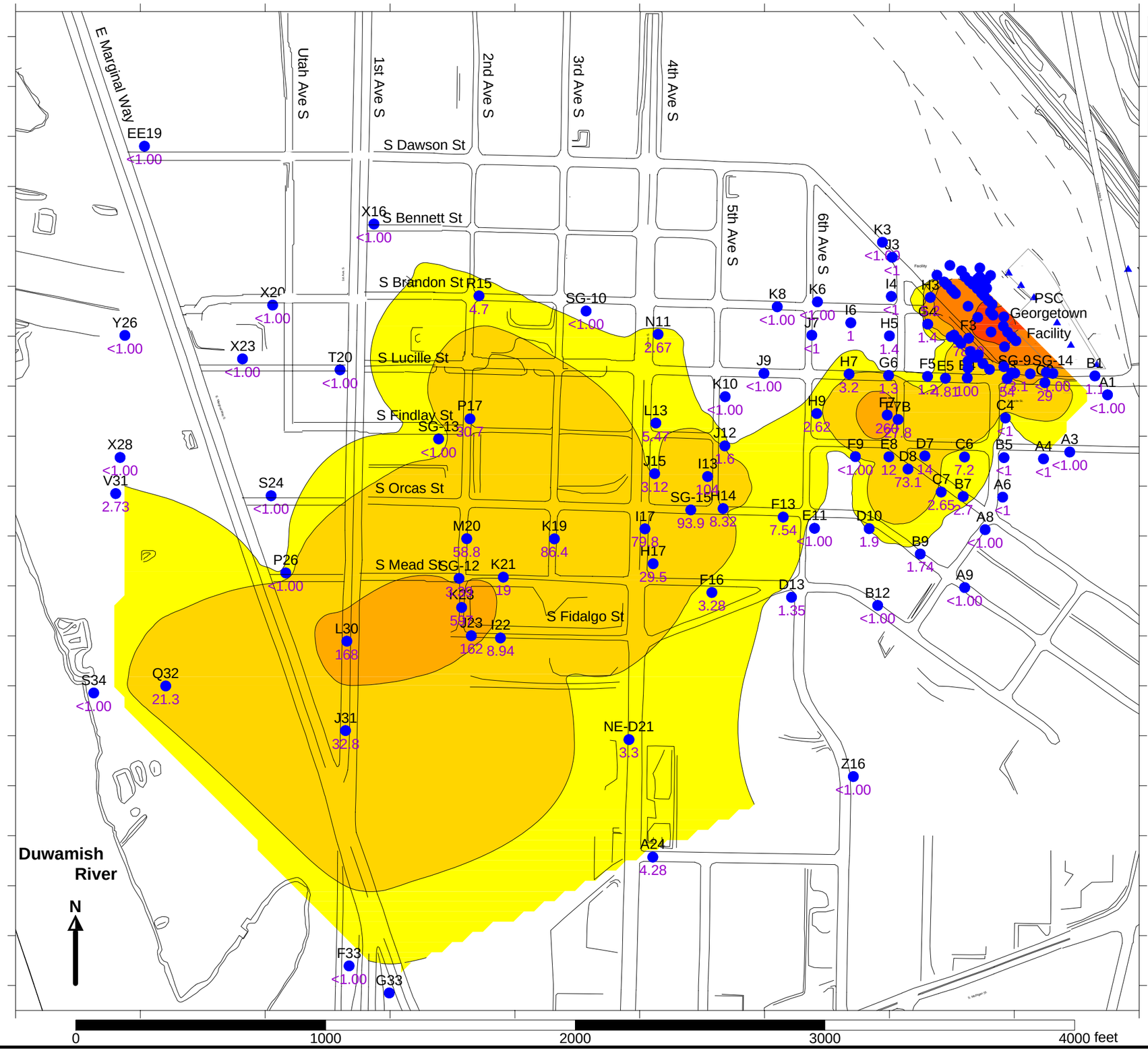
Groundwater Sampling Locations:

- Direct Push, 1998-2002

Note:

Data are maximum concentration at a sampling location regardless of depth

Figure 7
On-Site and Off-Site Groundwater Concentrations
Vinyl Chloride



Concentrations in ug/L

55000
10000
1000
100
10
2

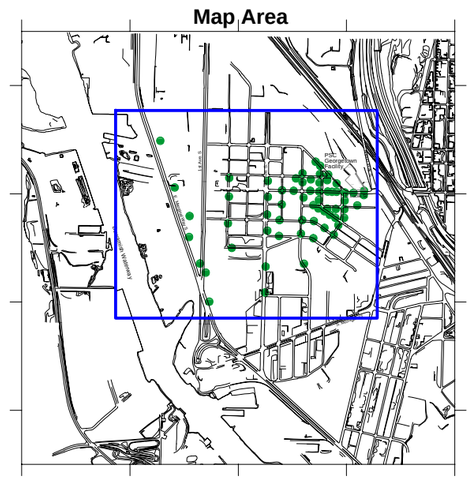
Groundwater Cleanup Criteria

MCL: 2 ug/L

MTCA Method B Level: 0.023 ug/L*

*Risk-based level below PQL (1 ug/L)

Map Area



Groundwater Sampling Locations:

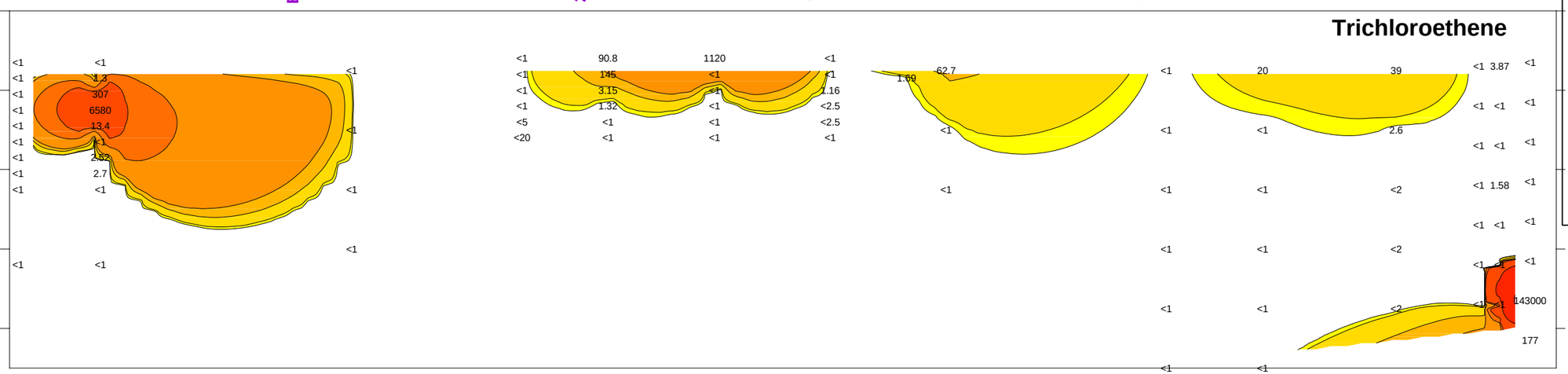
- Direct Push, 1998-2002

Note:

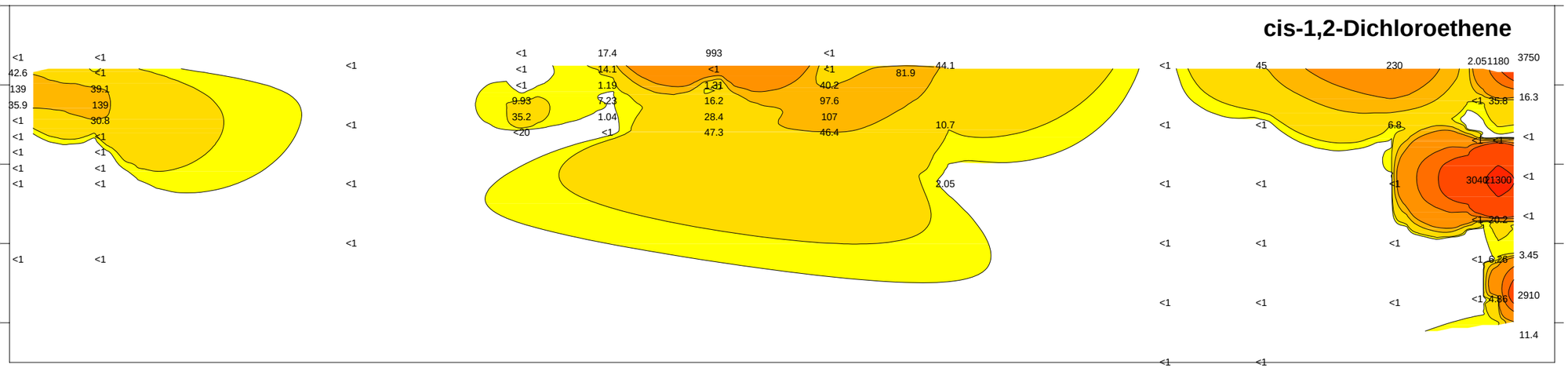
Data are maximum concentration at a sampling location regardless of depth

Duwamish Waterway | S34 | Q32 | E Marginal Way | L30 | K23 | SG-12 | 2nd Ave S | K21 | K19 | 3rd Ave S | 4th Ave S | I17 | SG-15 | H14 | 5th Ave S | 6th Ave S | F9 | F7B | E4 | Denver Ave S | D1 | SA-D7 | D22

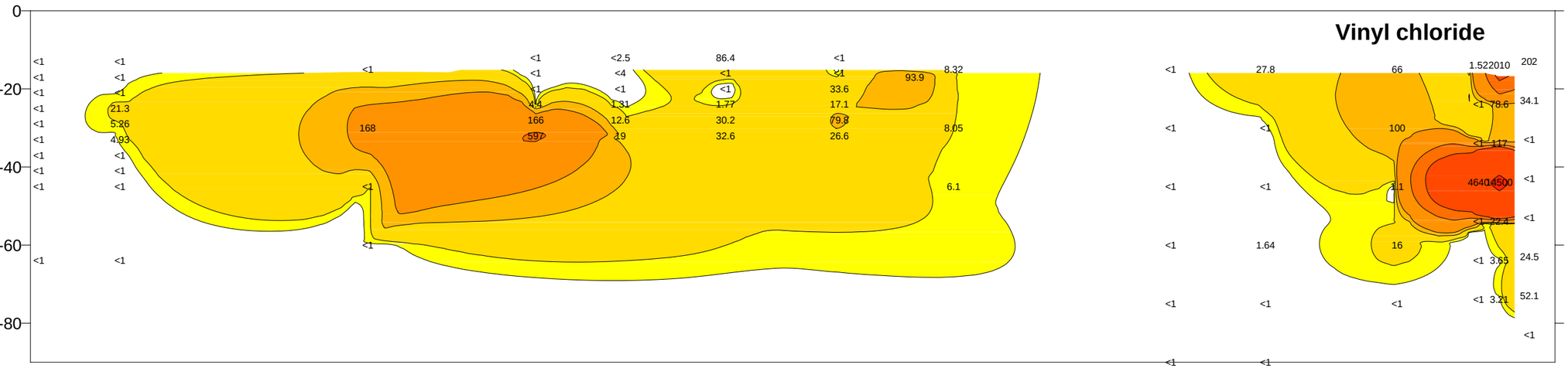
Trichloroethene



cis-1,2-Dichloroethene



Vinyl chloride



0 500 1000 1500 2000 feet

Concentrations in ug/L

65000
10000
1000
500
100
50
10
5

Figure 8
Vertical Cross-Section Groundwater Concentrations

Rhône-Poulenc (G.10)

Figure 2-2. Locations of round 3 groundwater sampling wells and seep and surface water sampling (Rhône Poulenc 1996)
Figure 3. Potentiometric map (GeoEngineers 2002)
Figure 4-1. Upper aquifer toluene concentration contour map for Round 3 groundwater data (Rhône-Poulenc 1995)
Figure 4-2. Cross-section C-C' of vertical extent of toluene contamination – Round 3 (Rhône-Poulenc 1995)
Figure 4-3. Cross-section D-D' of vertical extent of toluene contamination – Round 3 (Rhône-Poulenc 1995)
Figure 6. Toluene concentrations- Round 15 upper aquifer, upper interval wells (GeoEngineers 2002)
Figure 7. Toluene concentrations- Round 15 upper aquifer, intermediate and lower interval wells (GeoEngineers 2002)
Figure 12a. Upper aquifer-upper interval: toluene concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 12b. Upper aquifer-upper interval: toluene concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 12c. Upper aquifer-upper interval: toluene concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 13. Upper aquifer-intermediate interval: toluene concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 14. Upper aquifer-intermediate and lower intervals: toluene concentration *vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)*
Figure 15a. Upper aquifer-upper interval: arsenic concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 15b. Upper aquifer-upper interval: arsenic concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 16a. Upper aquifer-intermediate interval: arsenic concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 16b. Upper aquifer-intermediate interval: arsenic concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 17a. Upper aquifer-upper interval: copper concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 17b. Upper aquifer-upper interval: copper concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 17c. Upper aquifer-upper interval: copper concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 18. Upper aquifer-intermediate interval: copper concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 19a. Upper aquifer-intermediate and lower intervals: copper concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)
Figure 19b. Upper aquifer-intermediate and lower intervals: copper concentration vs. time- Round 15 groundwater monitoring (GeoEngineers 2002)

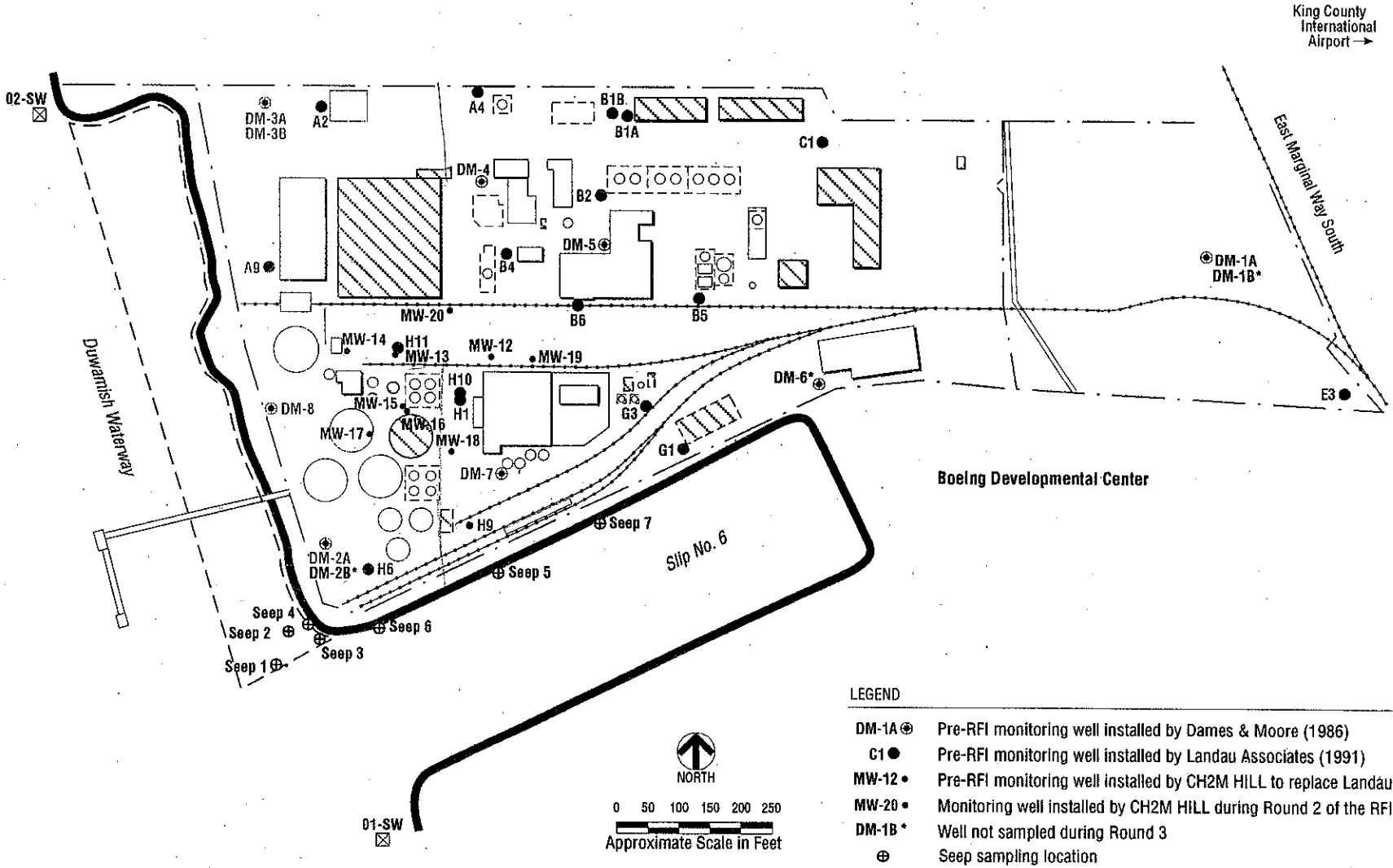
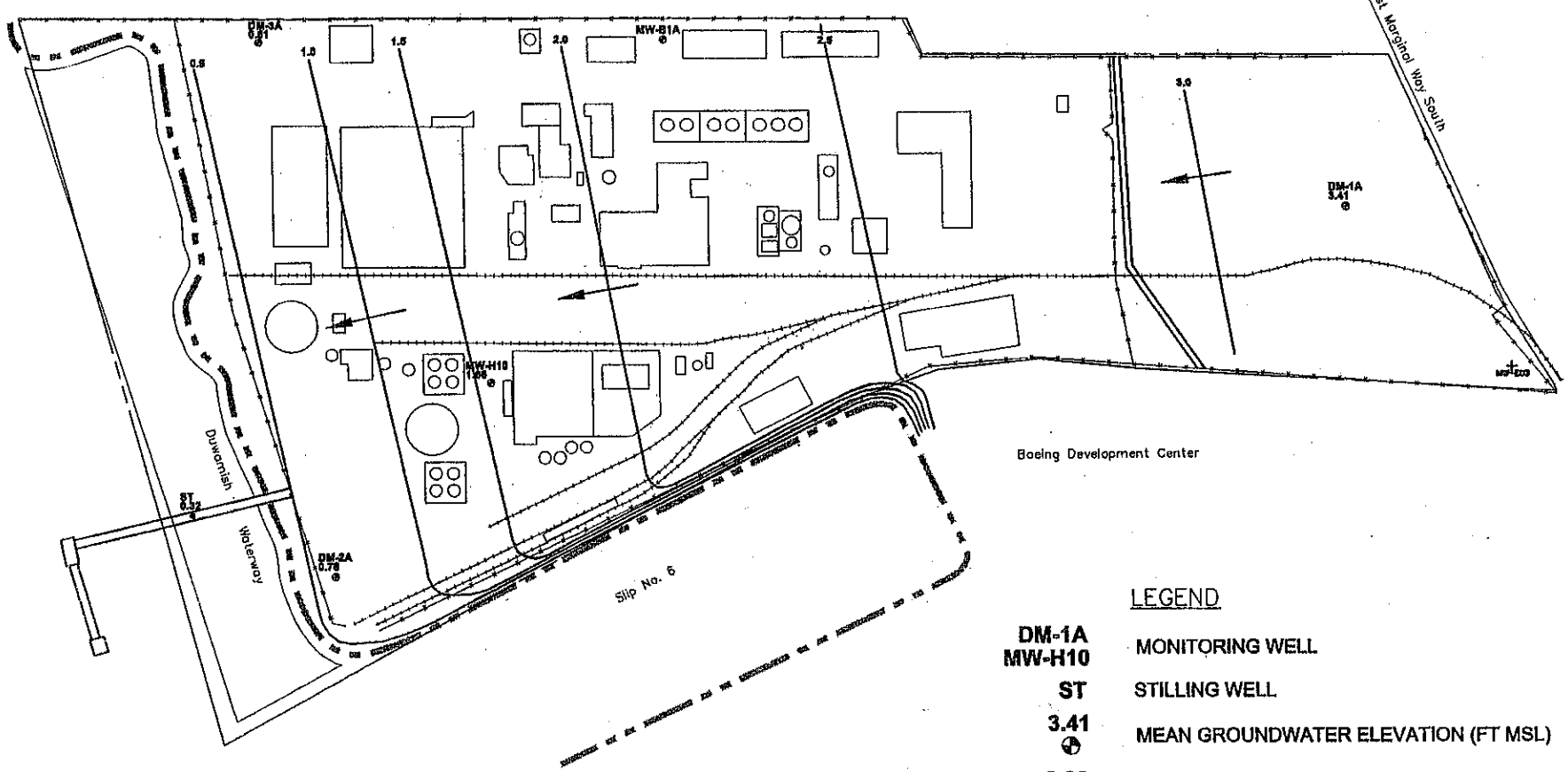


Figure 2-2
Locations of Round 3 Groundwater Sampling Wells and Seep and Surface Water Sampling

SEAT\P:\8574002\00\CAD\857400200J.DWG BPP:HLA 04/23/02



LEGEND

DM-1A MW-H10	MONITORING WELL
ST	STILLING WELL
3.41	MEAN GROUNDWATER ELEVATION (FT MSL)
0.32	MEAN SURFACE WATER ELEVATION (FT MSL)
0.5	MEAN GROUNDWATER ELEVATION CONTOUR – Contour Interval is 0.5 ft.
	INFERRED DIRECTION OF GROUNDWATER FLOW

N

0 200 400

SCALE IN FEET

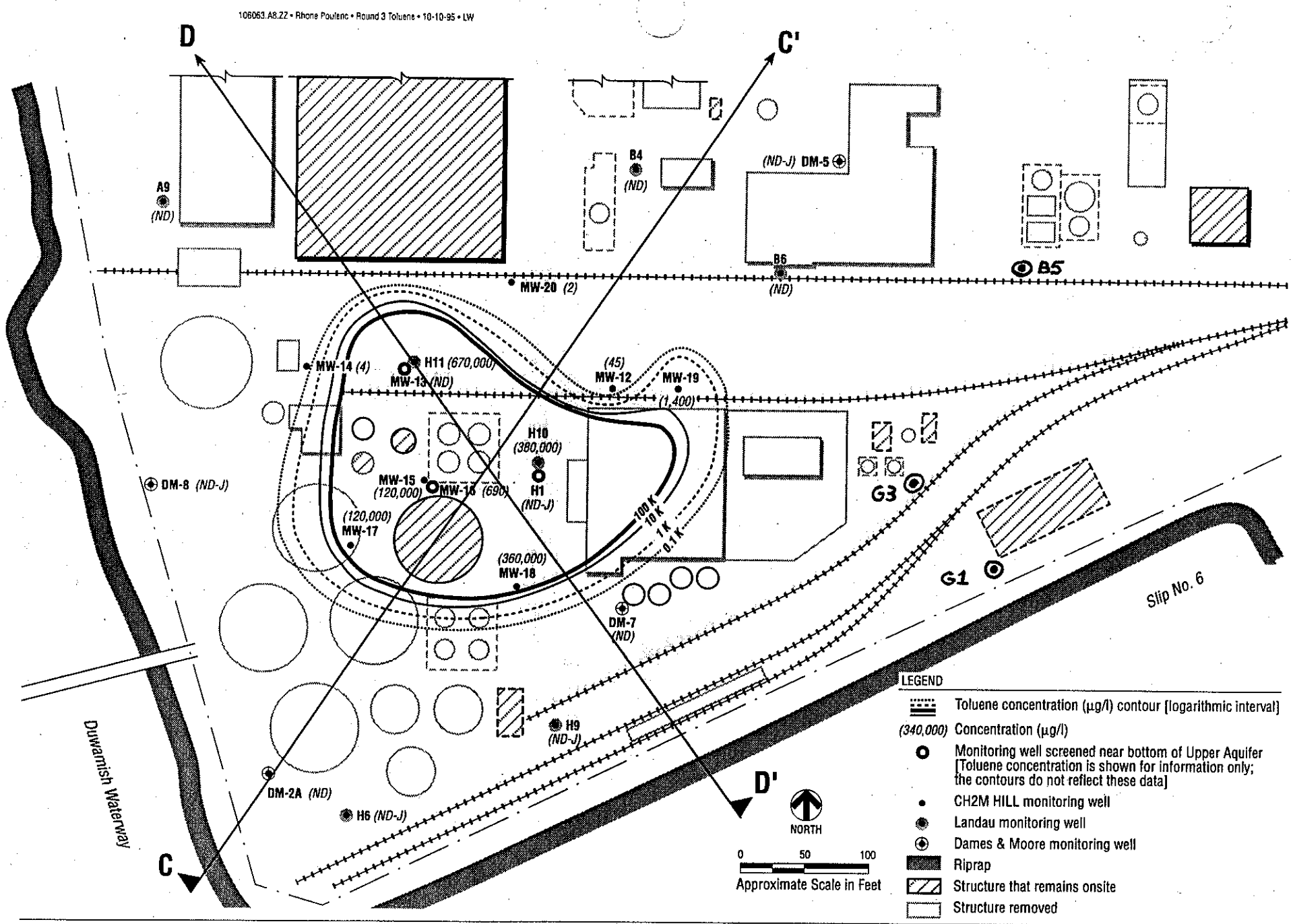
Note: Mean groundwater and surface water elevations derived using methods described in Serfes (1991); mean elevations calculated for continuous monitoring period between January 31, 1994 and February 3, 1994.

Reference: Drawing entitled "Mean Groundwater Elevation Contour Map Upper Aquifer (1/31/94-2/3/94)" Figure 3, dated 05/30/00, by AGI Technologies.

GeoEngineers

MEAN GROUNDWATER ELEVATION CONTOURS
UPPER AQUIFER (1/31/94-2/3/94)

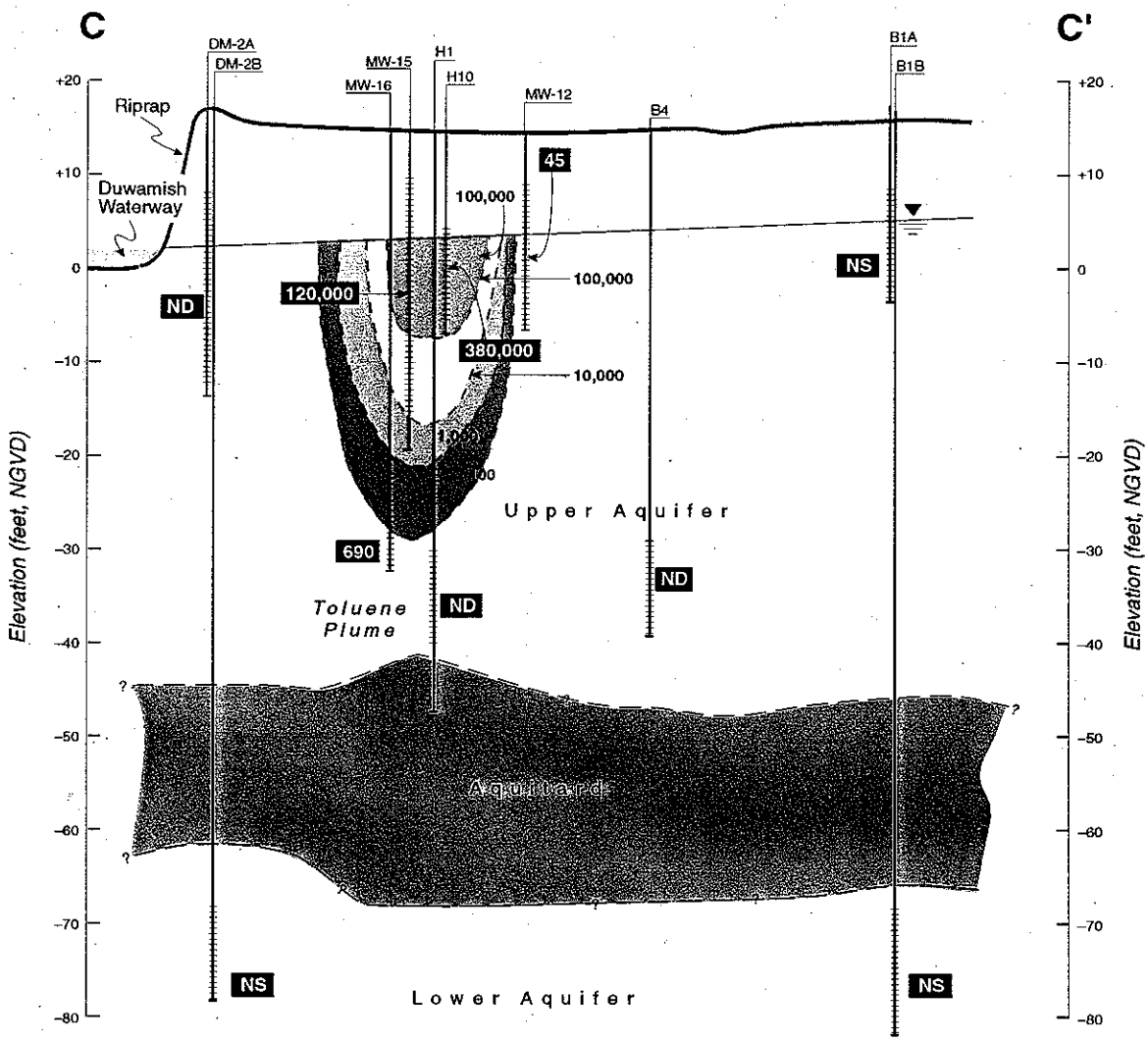
FIGURE 3



ND = not detected
J = J-qualified result

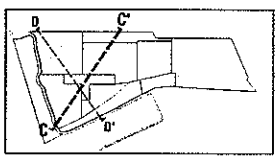
Figure 4-1

Upper Aquifer Toluene Concentration Contour Map for Round 3 Groundwater Data



LEGEND

Vertical Scale: 1" = 20'
Horizontal Scale: 1" = 250'



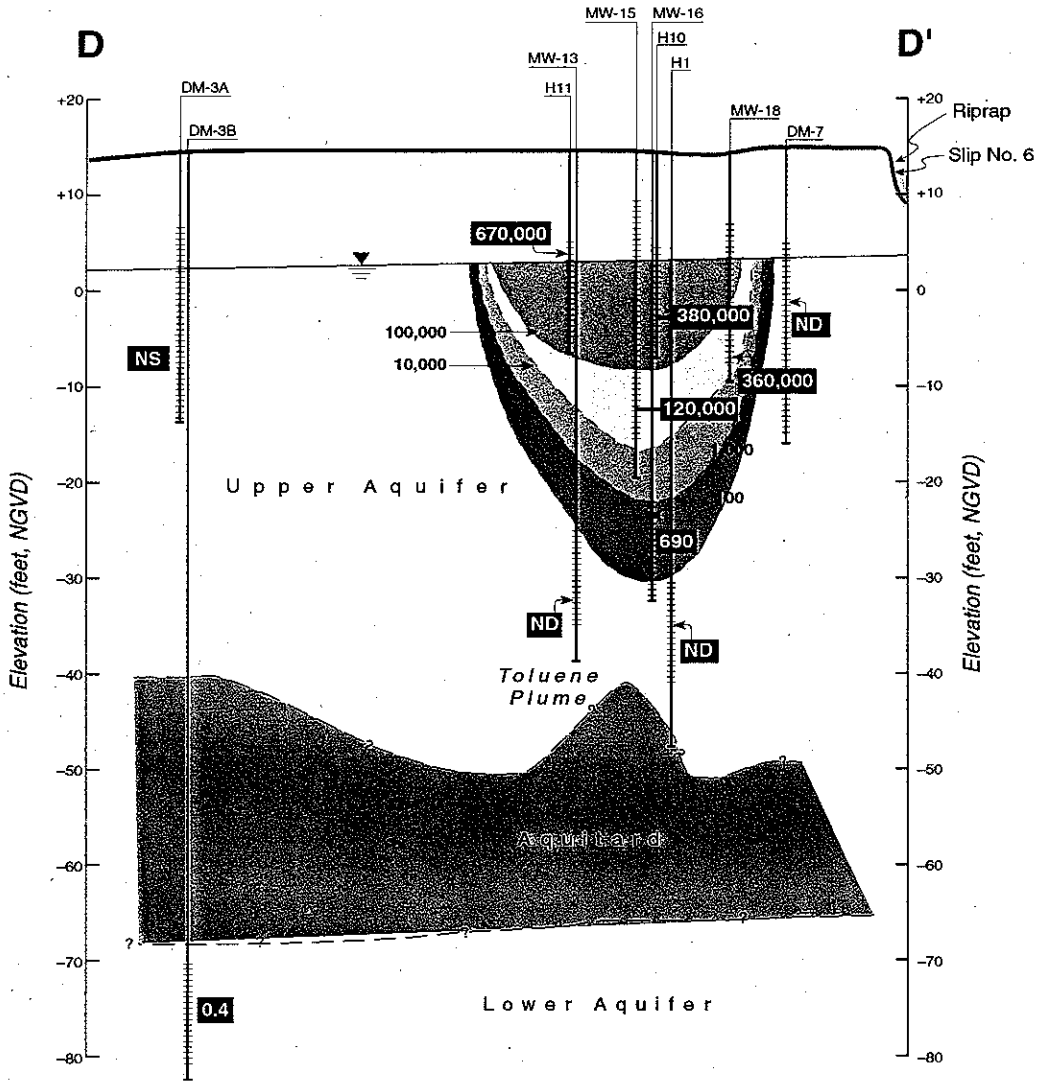
- H10 — Monitoring well
- Low-permeability layer
- Screened interval for monitoring well
- General water-table elevation
- 4,000 — Toluene concentration (µg/l)
- NS — Not sampled for toluene
- ND — Not detected
- Area with 100,000 µg/l toluene or greater
- Area with 10,000 to 99,999 µg/l toluene
- Area with 1,000 to 9,999 µg/l toluene
- Area with 100 to 999 µg/l toluene

NOTES: *Groundwater elevations are based on the averages of four water-level measurements taken on February 4, 1994.*

RFI HydroPunch and soil boring data are not shown.

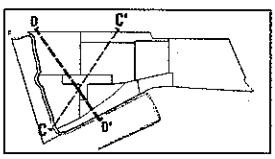
Figure 4-2

Cross-Section C–C' of Vertical Extent of Toluene Contamination – Round 3



106063.A8.ZZ • Rhone Poulenc 44-03/D-D' Toluene • 1-22-96 • LW • JH

Vertical Scale: 1" = 20'
Horizontal Scale: 1" = 250'



LEGEND

- H10 — Monitoring well
- Low-permeability layer
- Screened interval for monitoring well
- General water-table elevation
- 4,000 — Toluene concentration (µg/l)
- NS — Not sampled for toluene
- ND — Not detected
- Area with 100,000 µg/l toluene or greater
- Area with 10,000 to 99,999 µg/l toluene
- Area with 1,000 to 9,999 µg/l toluene
- Area with 100 to 999 µg/l toluene

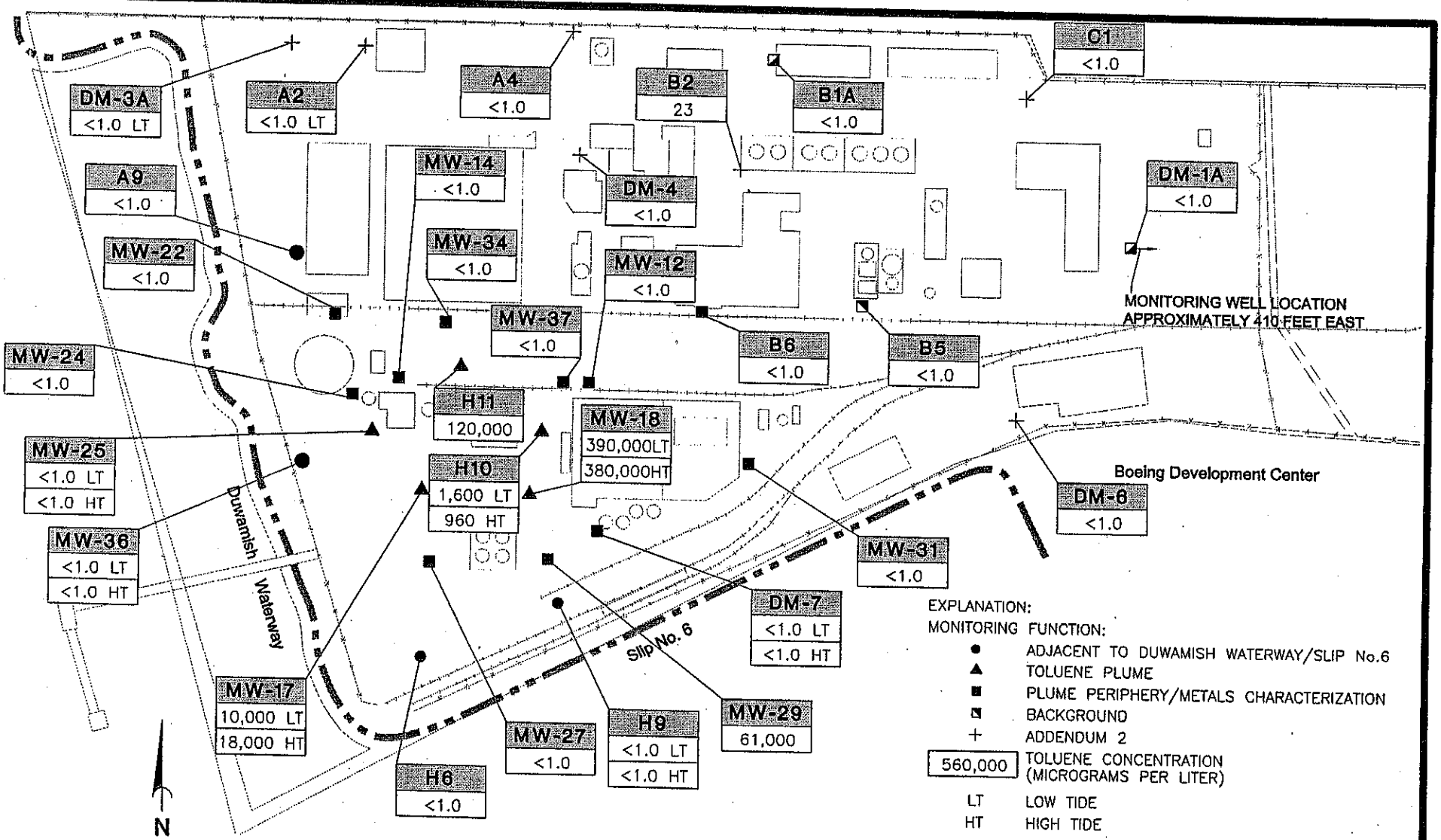
NOTES: Groundwater elevations are based on the averages of four water-level measurements taken on February 4, 1994.

RFI HydroPunch and soil boring data are not shown.

Figure 4-3

Cross-Section D–D' of Vertical Extent of Toluene Contamination – Round 3

SEAT\P:\8574002\00\CAD\857400200C.DWG BPP:HLA 04/23/02



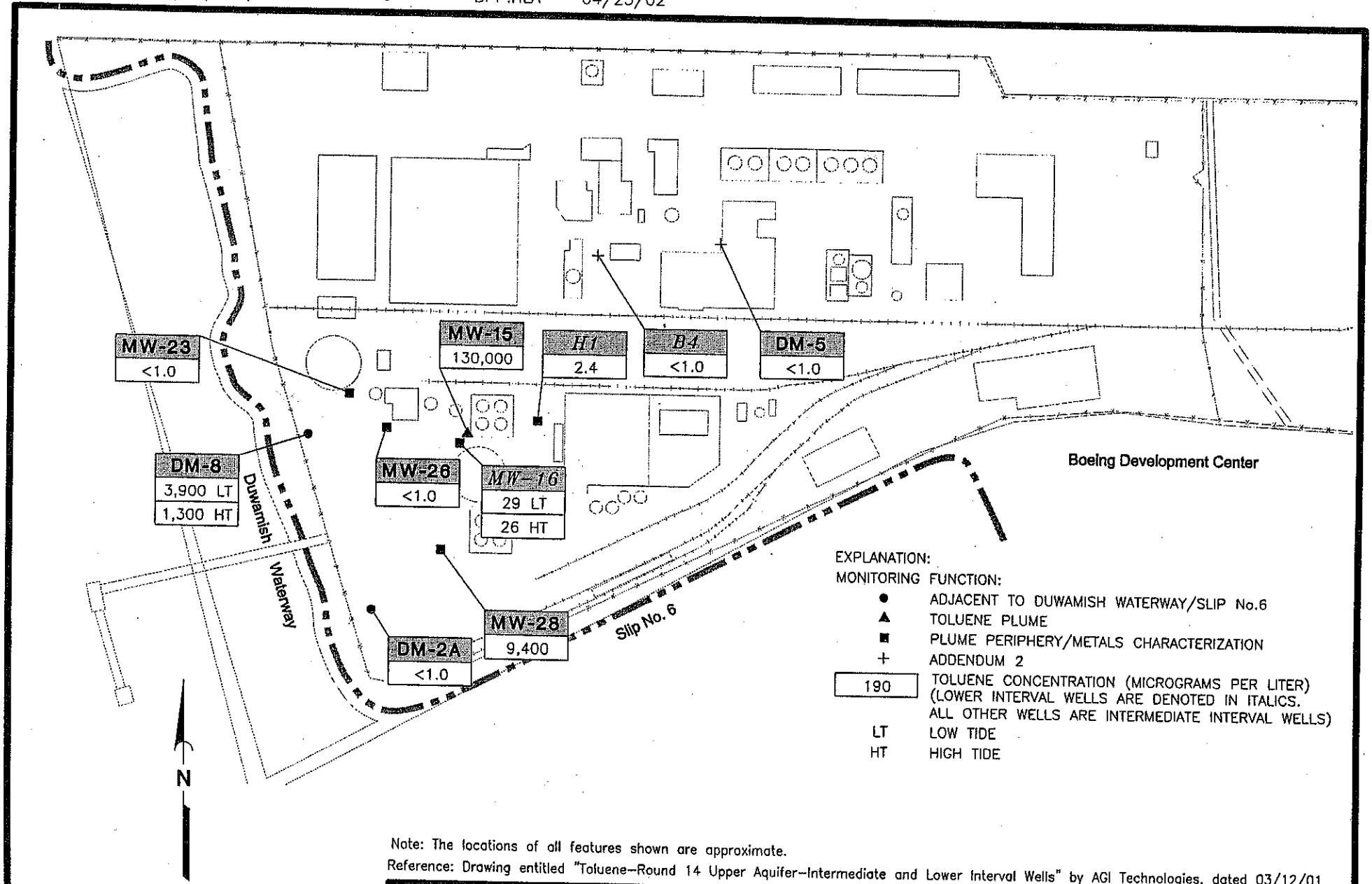
Note: The locations of all features shown are approximate.
Reference: Drawing entitled "Facility-Specific Sampling Conditions-Round 14" by AGI Technologies, dated 03/12/01.

GeoEngineers

TOLUENE CONCENTRATIONS - ROUND 15
UPPER AQUIFER - UPPER INTERVAL WELLS

FIGURE 6

SEAT\P:\8574002\00\CAD\857400200D.DWG BPP:HLA 04/23/02



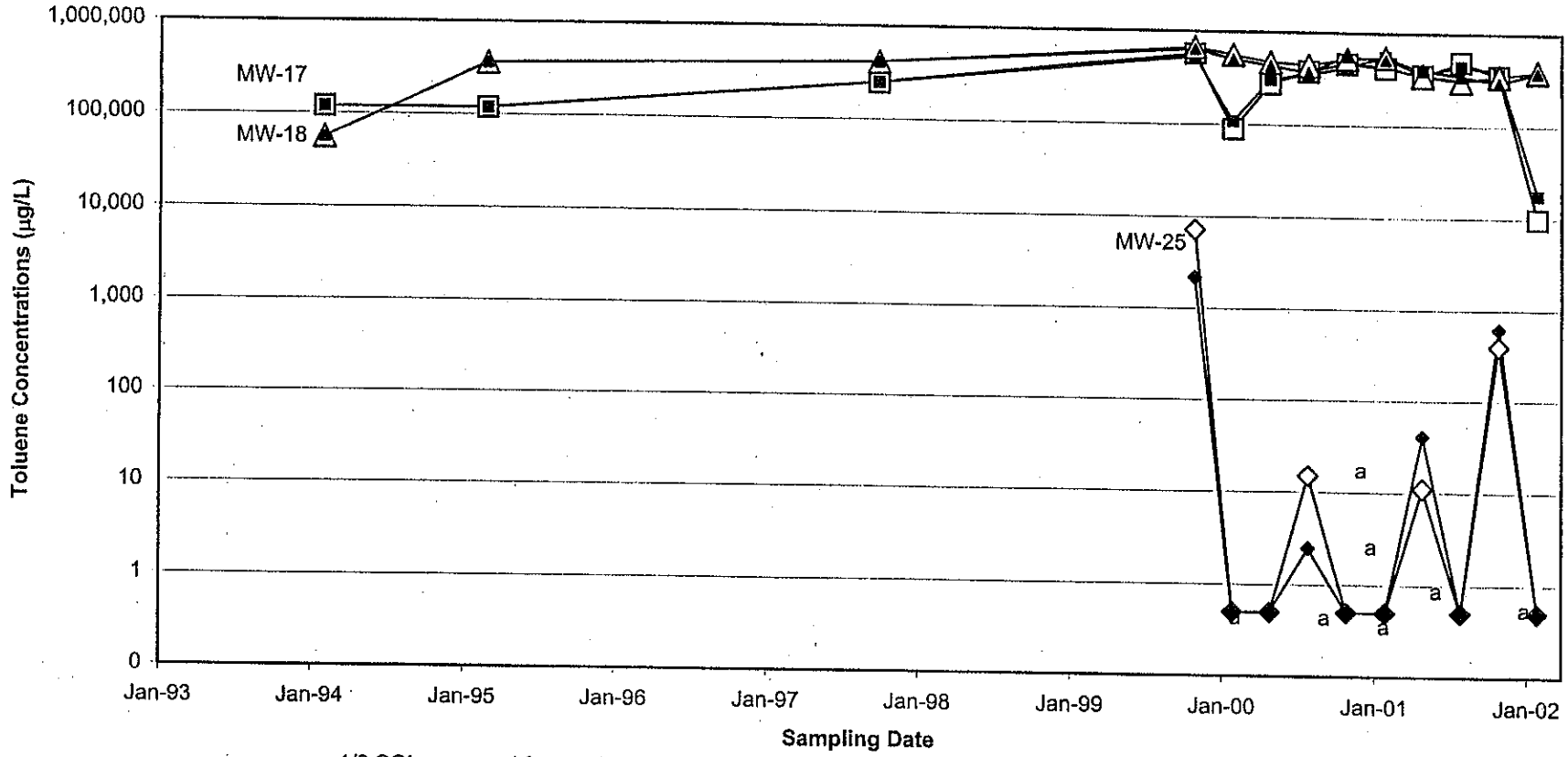
Note: The locations of all features shown are approximate.

Reference: Drawing entitled "Toluene–Round 14 Upper Aquifer–Intermediate and Lower Interval Wells" by AGI Technologies, dated 03/12/01.

GeoEngineers

TOLUENE CONCENTRATIONS - ROUND 15
UPPER AQUIFER - INTERMEDIATE AND LOWER INTERVAL WELLS

FIGURE 7



a = 1/2 SQL was used for results reported as ND.
LT = samples collected during low tide.
HT = samples collected during high tide.

Note:
Low and high tide sampling commenced Nov-99.

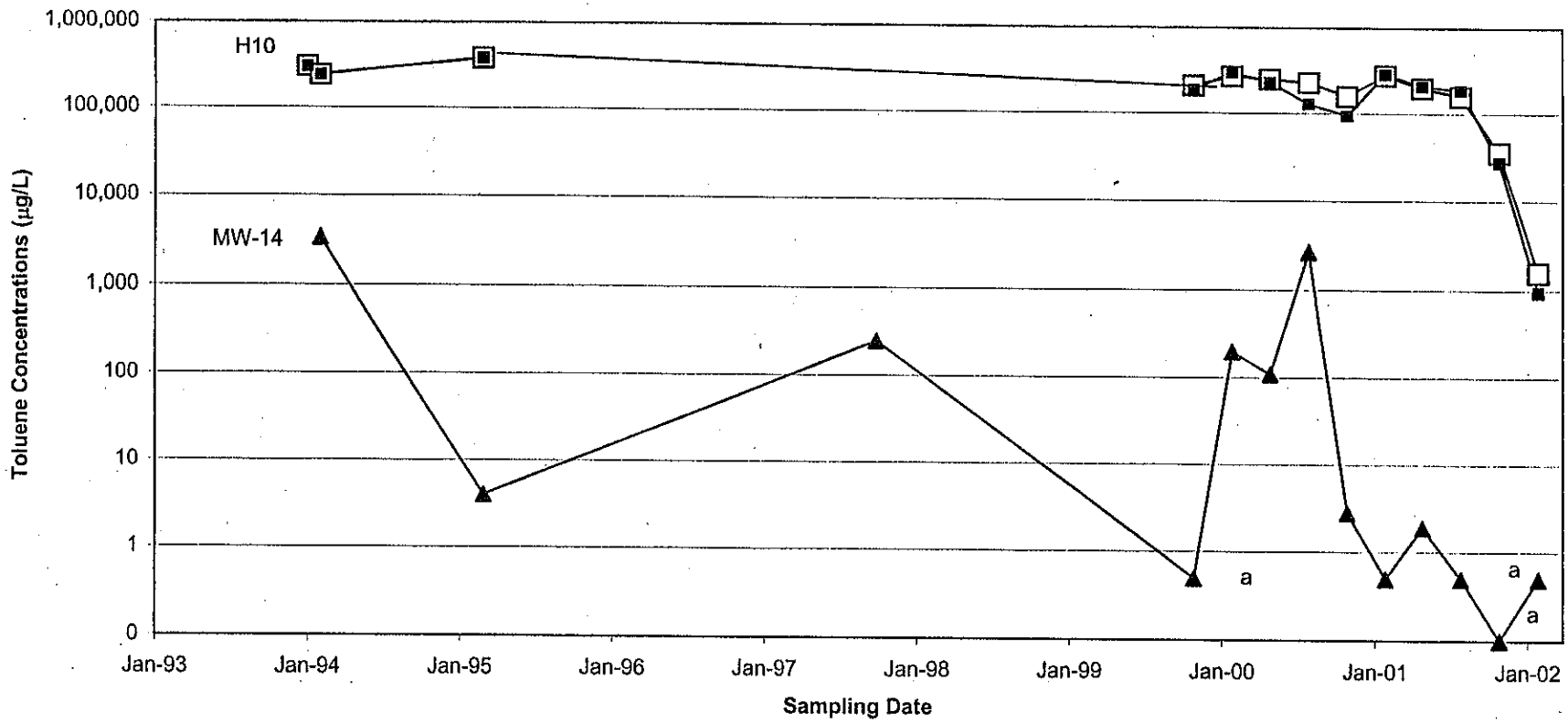
- MW-17 LT (Well in Toluene Plume)
- MW-18 LT (Well in Toluene Plume)
- MW-25 LT (Well in Toluene Plume)
- MW-17 HT (Well in Toluene Plume)
- MW-18 HT (Well in Toluene Plume)
- MW-25 HT (Well in Toluene Plume)

Upper Aquifer - Upper Interval
Toluene Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
12a

GeoEngineers

857400200/Figs12-14(toluene).xls,12a



a = 1/2 SQL was used for results reported as ND.
LT = samples collected during low tide.
HT = samples collected during high tide.

Note:
Low and high tide sampling commenced Nov-99.

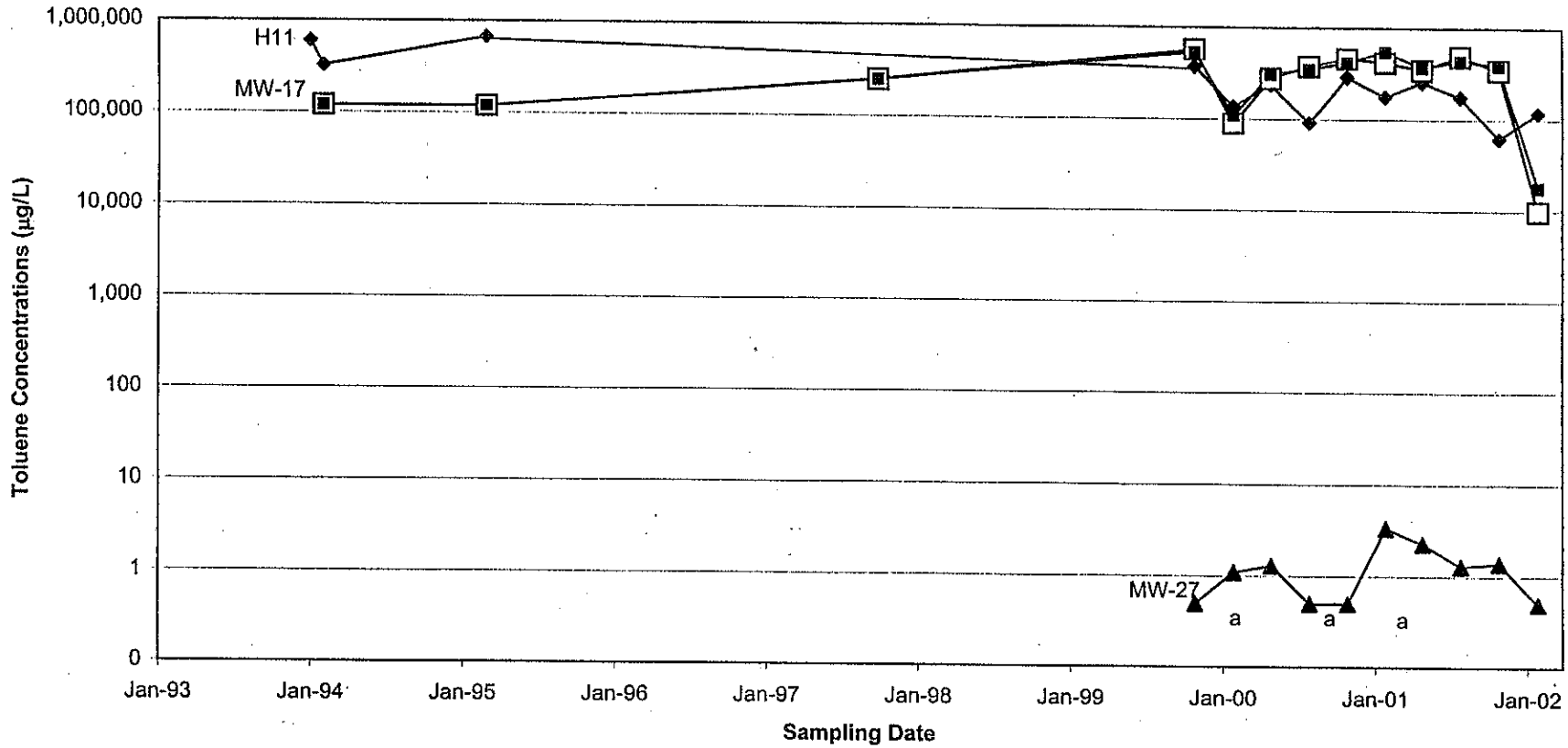
H10 LT (Well in Toluene Plume)
H10 HT (Well in Toluene Plume)
MW-14 (Well Peripheral to Plume)

Upper Aquifer - Upper Interval
Toluene Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
12b

GeoEngineers

857400200/Figs12-14(toluene).xls,12b



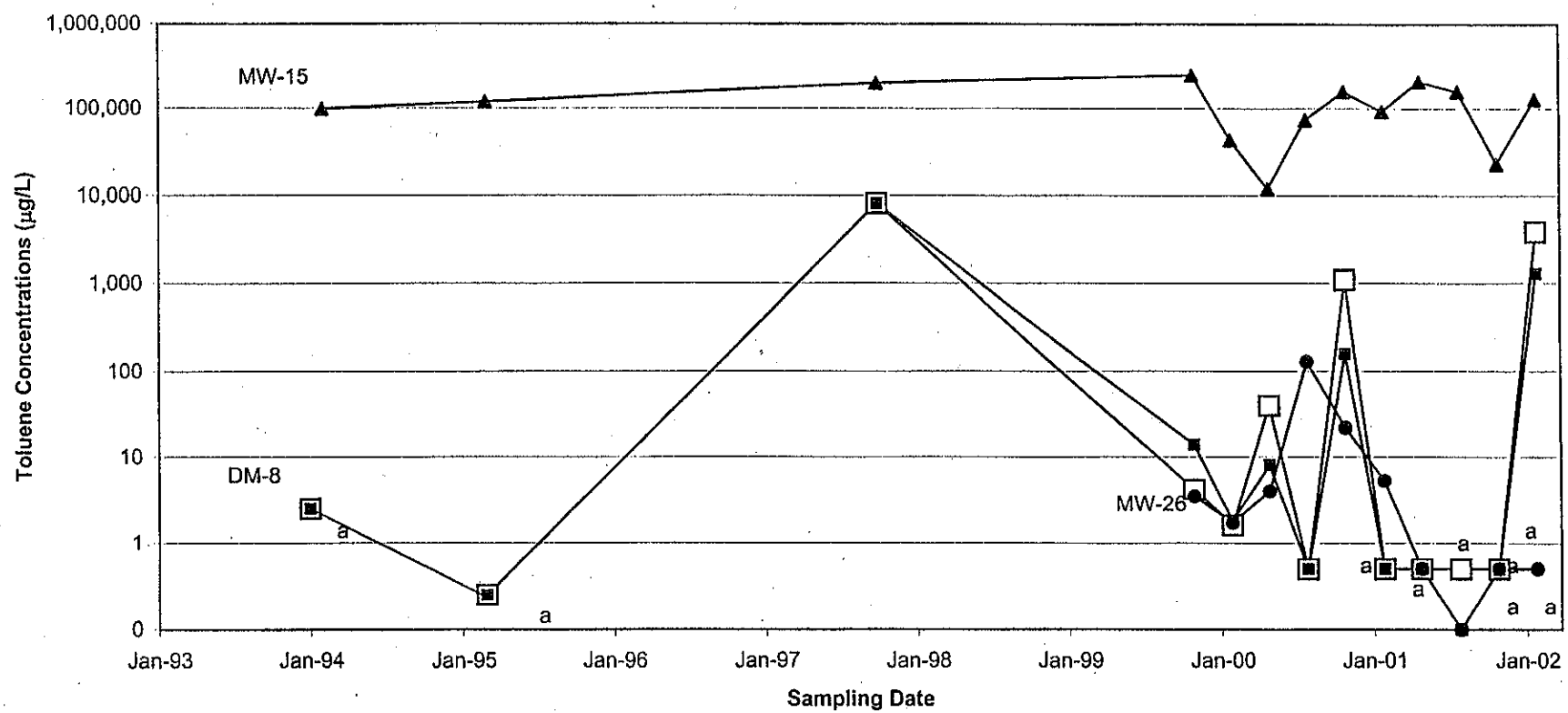
a = 1/2 SQL was used for results reported as ND.
LT = samples collected during low tide.
HT = samples collected during high tide.

Note:
Low and high tide sampling commenced Nov-99.

H11 (Well in Toluene Plume)
MW-17 LT (Well in Toluene Plume)
MW-17 HT (Well in Toluene Plume)
MW-27(Well Peripheral to Plume)

Upper Aquifer - Upper Interval
Toluene Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
12c



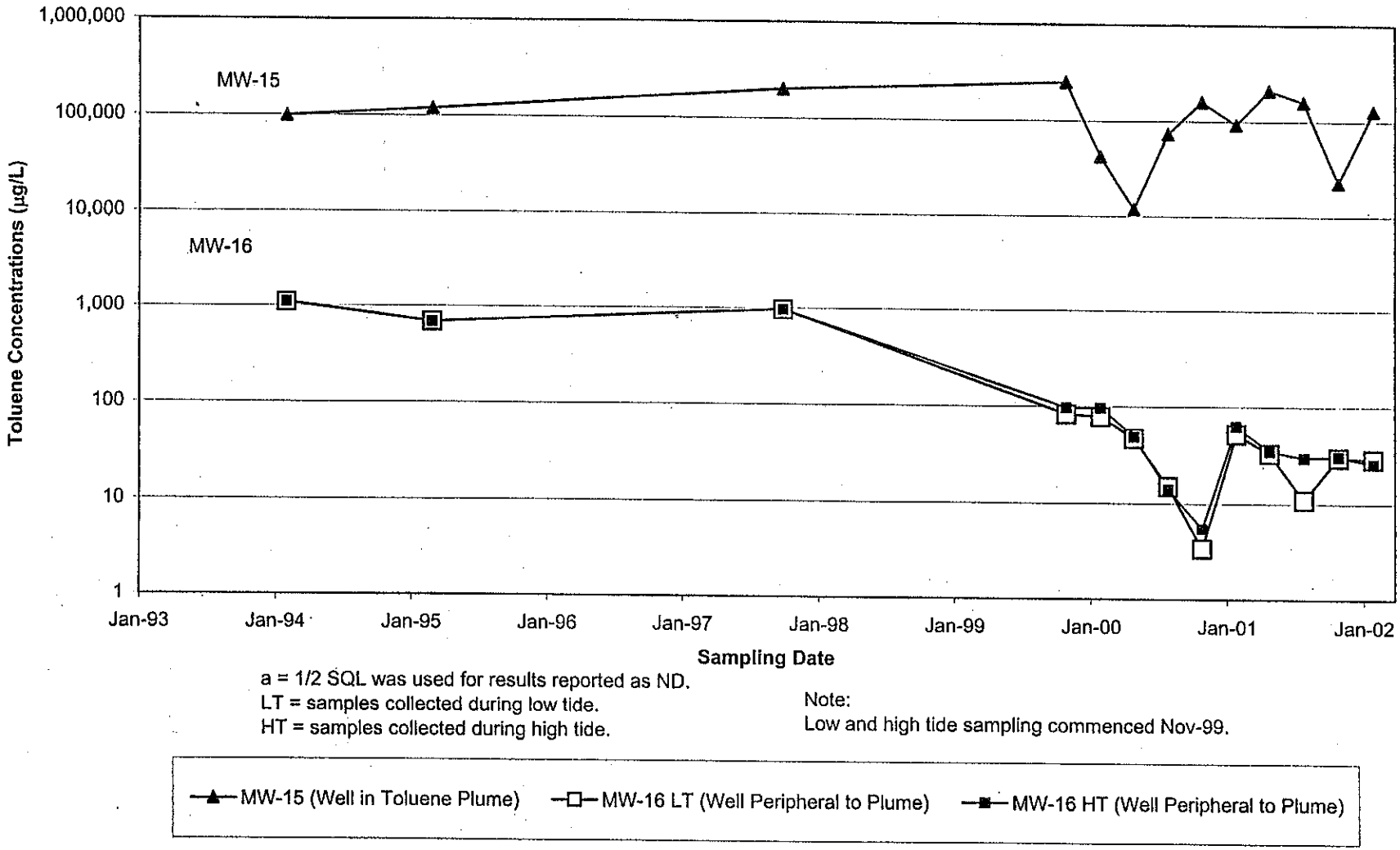
a = 1/2 SQL was used for results reported as ND.
LT = samples collected during low tide.
HT = samples collected during high tide.

Note:
Low and high tide sampling commenced Nov-99.

MW-15 (Well in Toluene Plume)
DM-8 LT (Well adjacent to the Duwamish Waterway)
DM-8 HT (Well adjacent to the Duwamish Waterway)
MW-26 (Well Peripheral to Plume)

Upper Aquifer - Intermediate Interval
Toluene Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
13

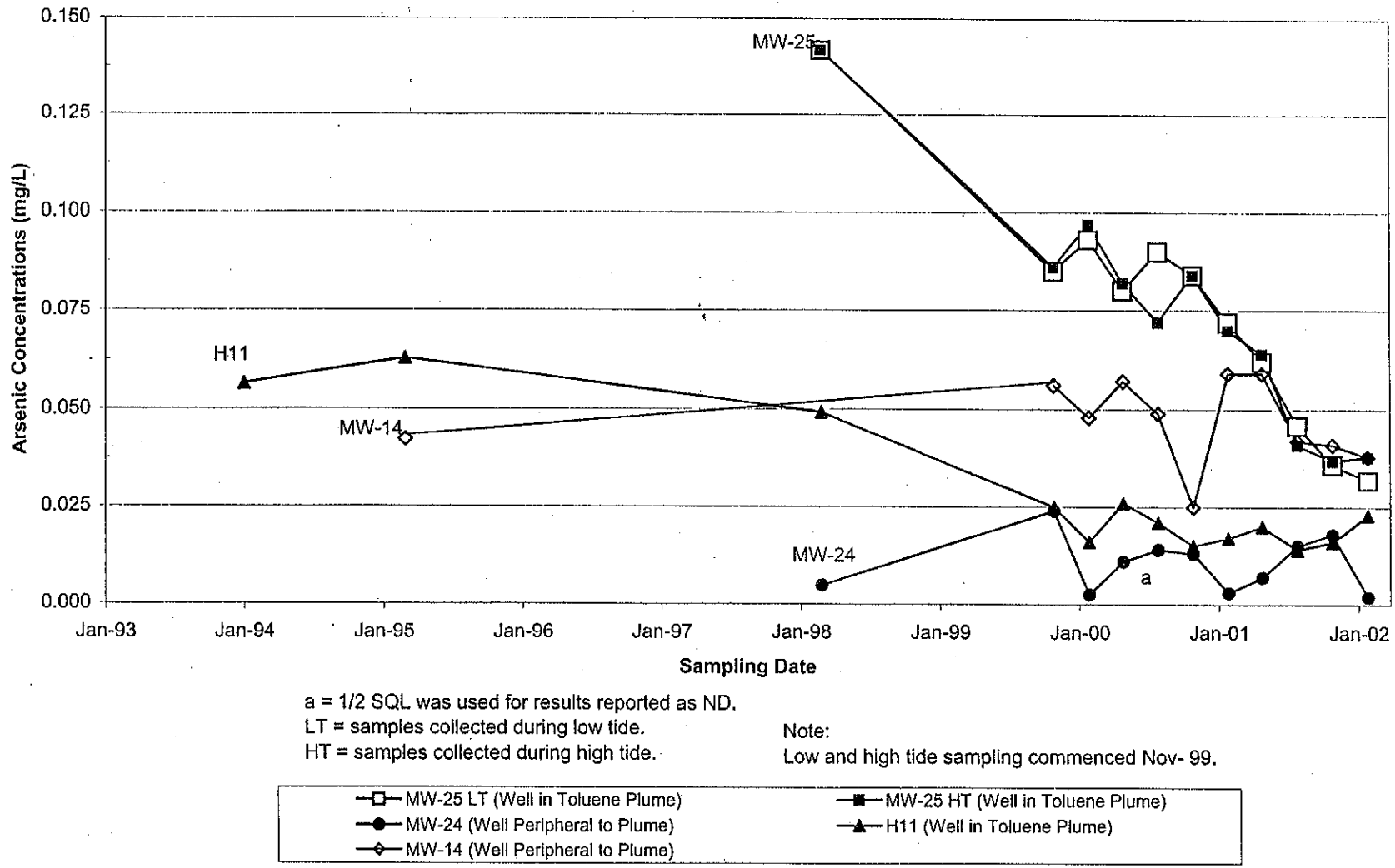


Upper Aquifer - Intermediate and Lower Intervals
Toluene Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
14

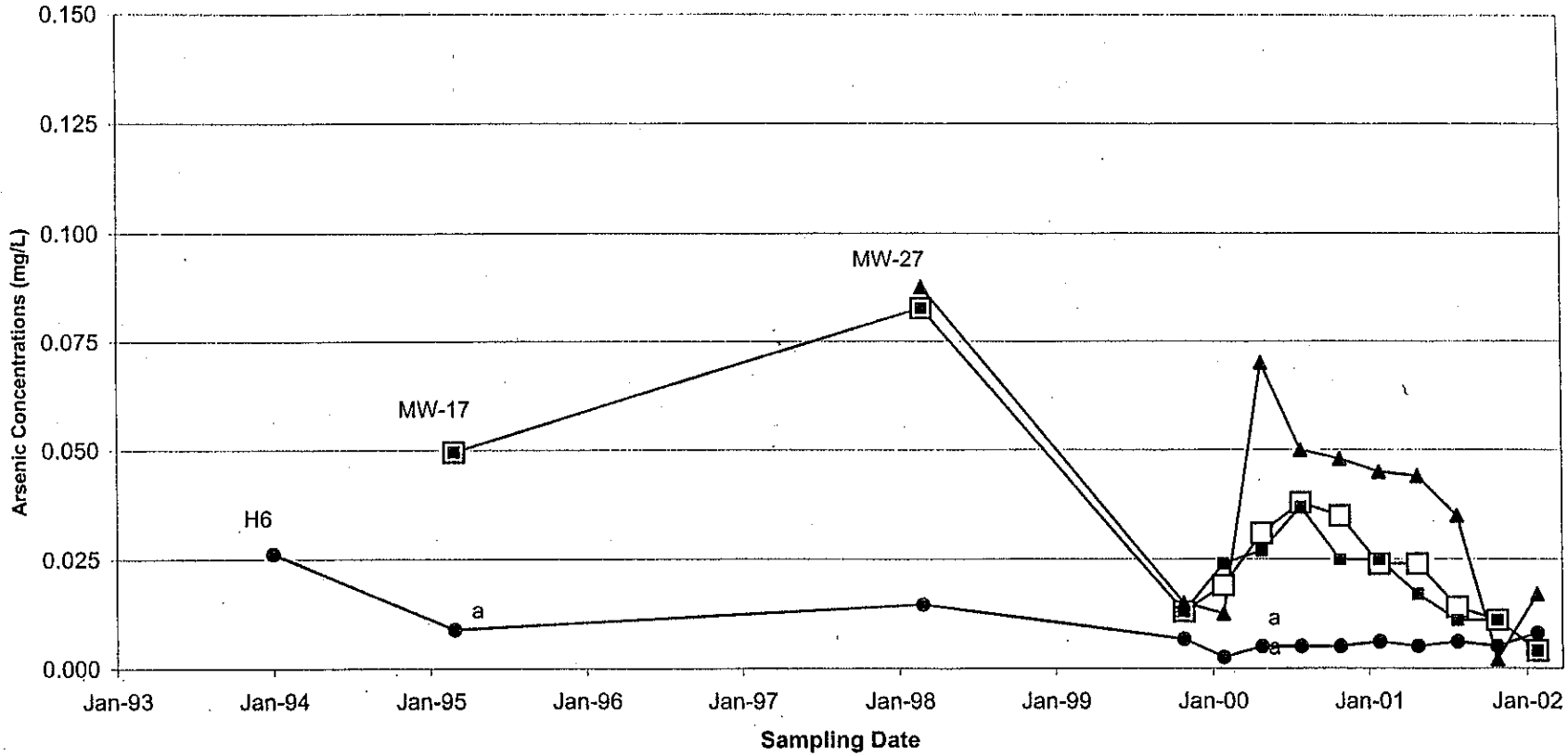
GeoEngineers

857400200/Figs12-14(toluene).xls,14



Upper Aquifer - Upper Interval
Arsenic Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
15a



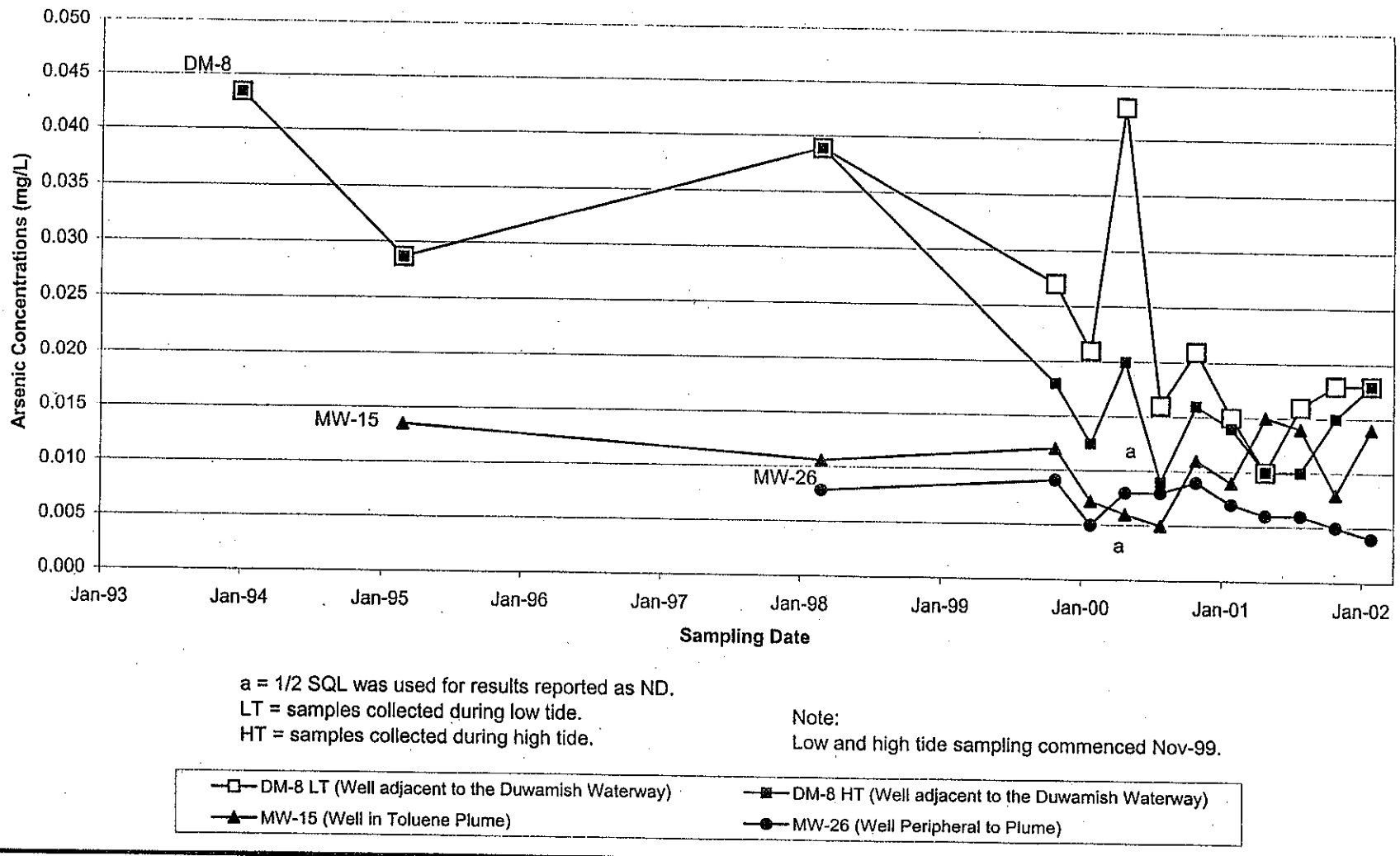
a = 1/2 SQL was used for results reported as ND.
LT = samples collected during low tide.
HT = samples collected during high tide.

Note:
Low and high tide sampling commenced Nov-99.

MW-17 LT (Well in Toluene Plume)
MW-17 HT (Well in Toluene Plume)
MW-27 (Well Peripheral to Plume)
H6 (Well Adjacent to Duwamish Waterway)

Upper Aquifer - Upper Interval
Arsenic Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
15b

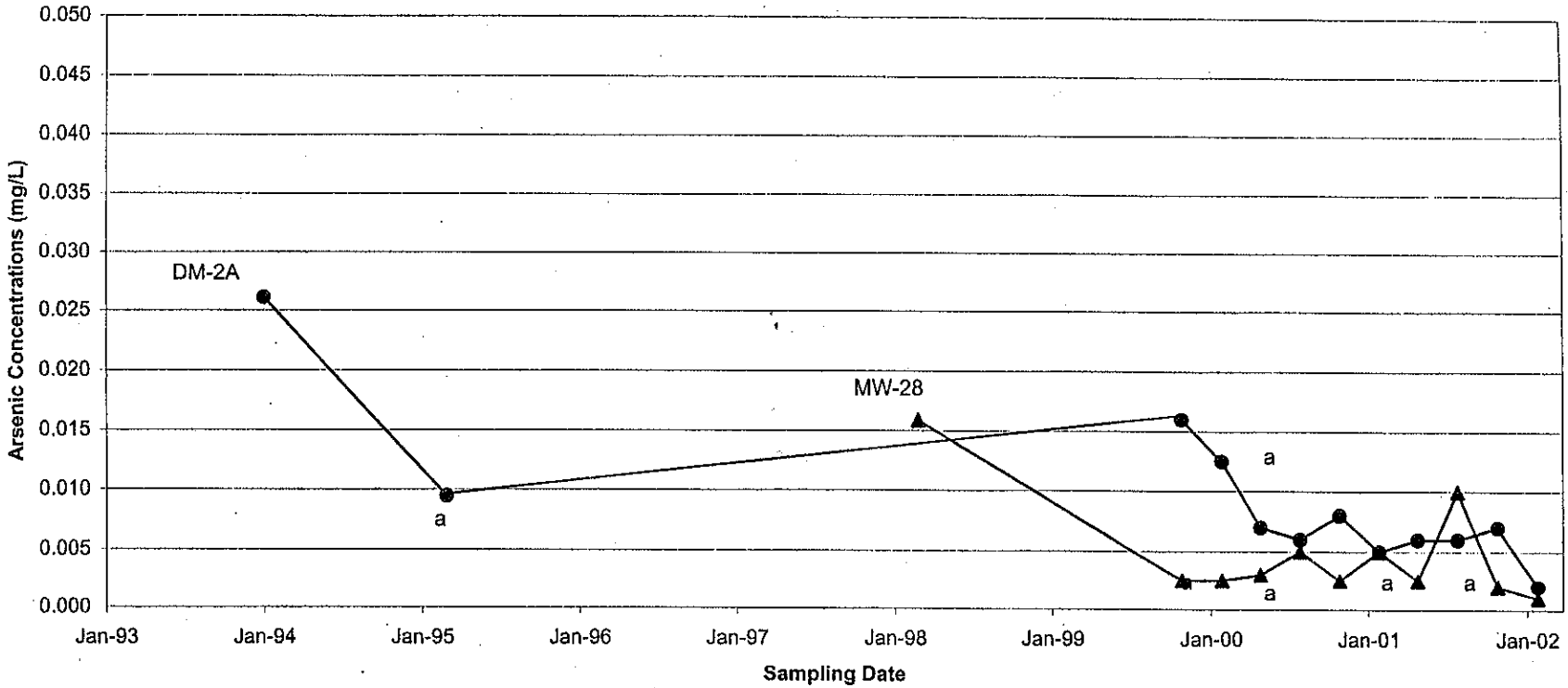


Upper Aquifer - Intermediate Interval
Arsenic Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
16a

GeoEngineers

857400200/Figs15-16(arsenic).xls,16a



a = 1/2 SQL was used for results reported as ND.
LT = samples collected during low tide.
HT = samples collected during high tide.

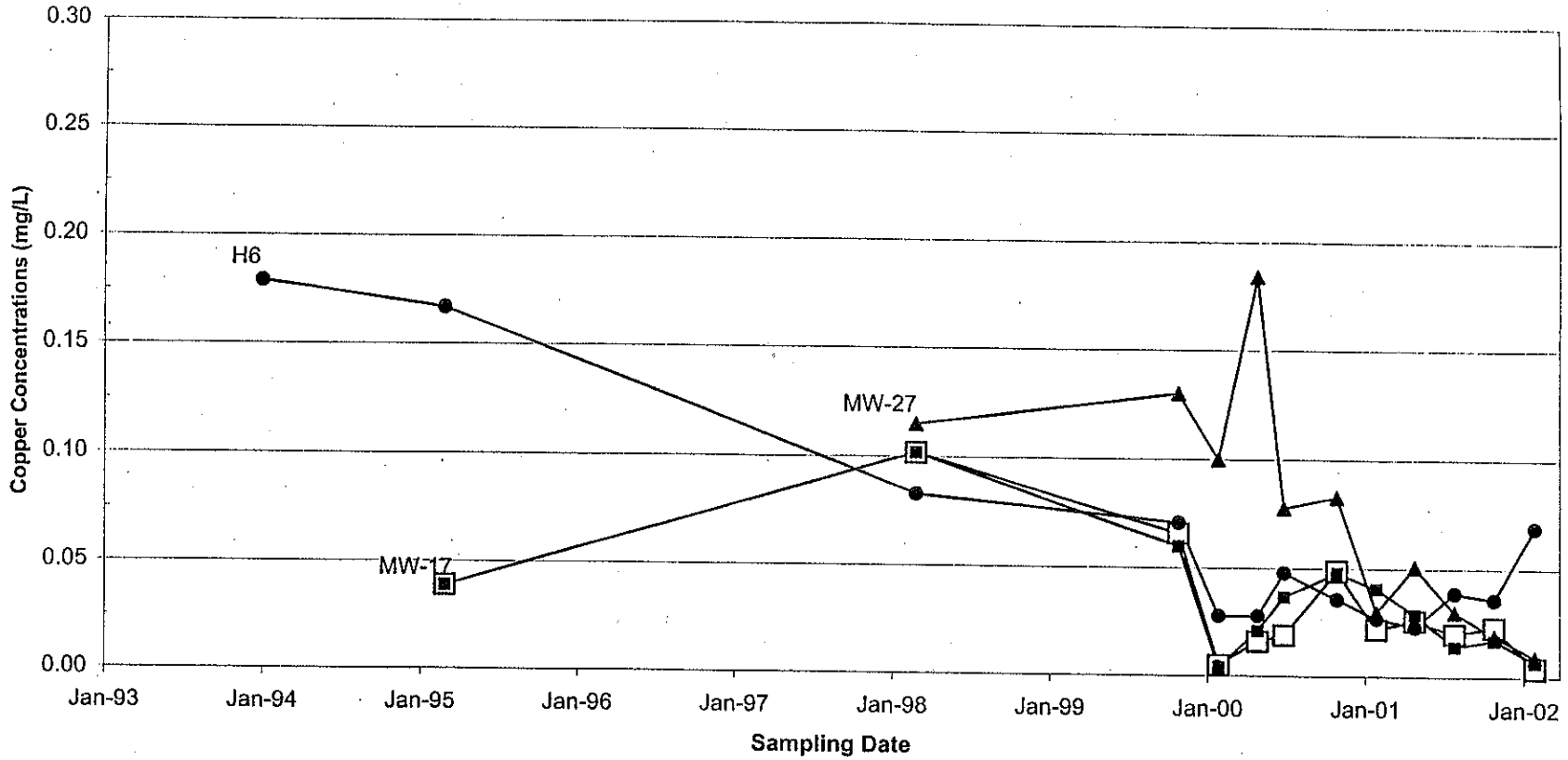
Note:
Low and high tide sampling commenced Nov-99.

MW-28 (Well Peripheral to Plume)

DM-2A (Well adjacent to the Duwamish Waterway)

Upper Aquifer - Intermediate Interval
Arsenic Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
16b



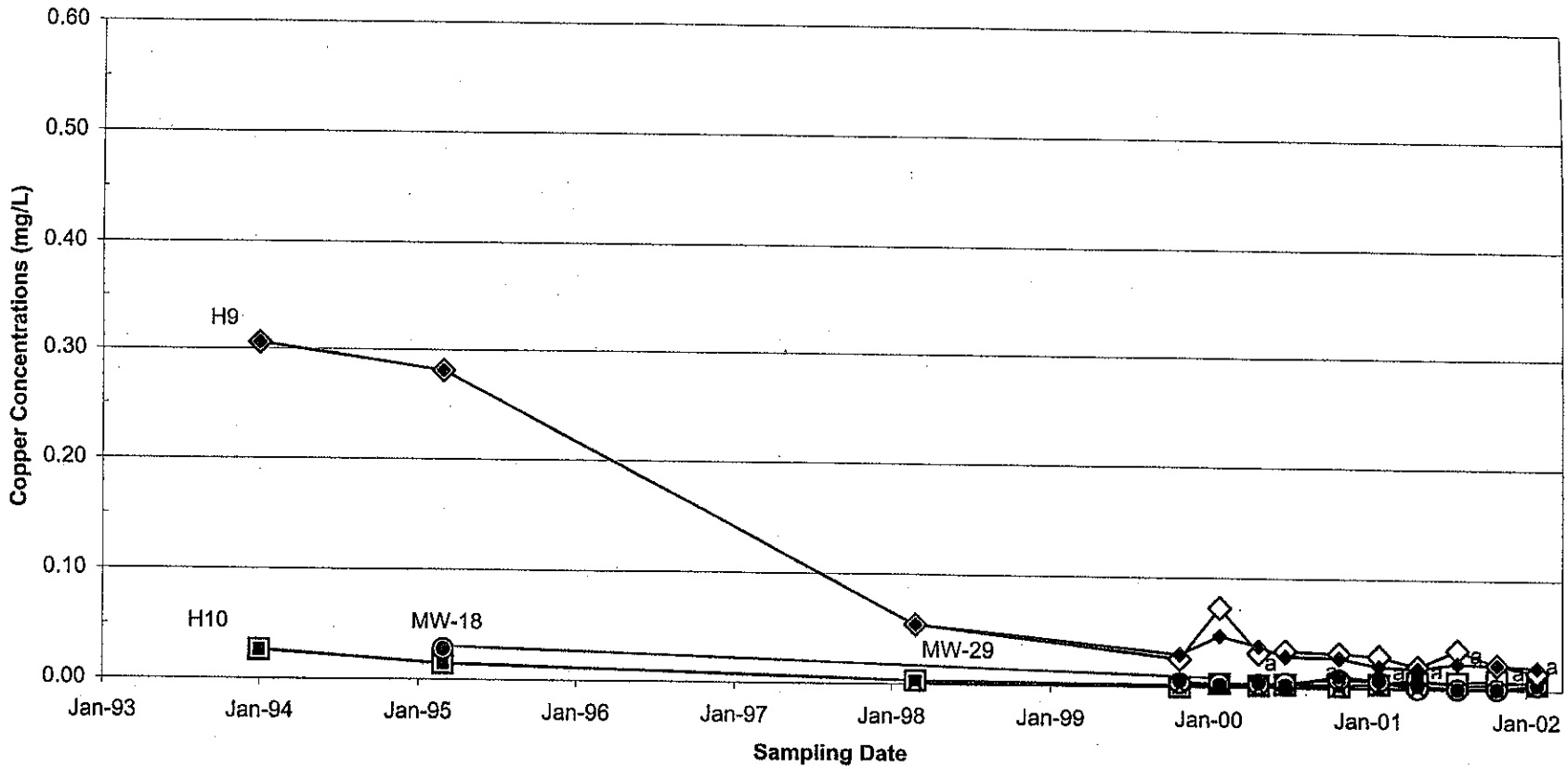
a = 1/2 SQL was used for results reported as ND.
LT = samples collected during low tide.
HT = samples collected during high tide.

Note:
Low and high tide sampling commenced Nov-99.

MW-17 LT (Well in Toluene Plume)
MW-17 HT (Well in Toluene Plume)
MW-27 (Well Peripheral to Plume)
H6 (Well Adjacent to Duwamish Waterway)

Upper Aquifer - Upper Interval
Copper Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
17a



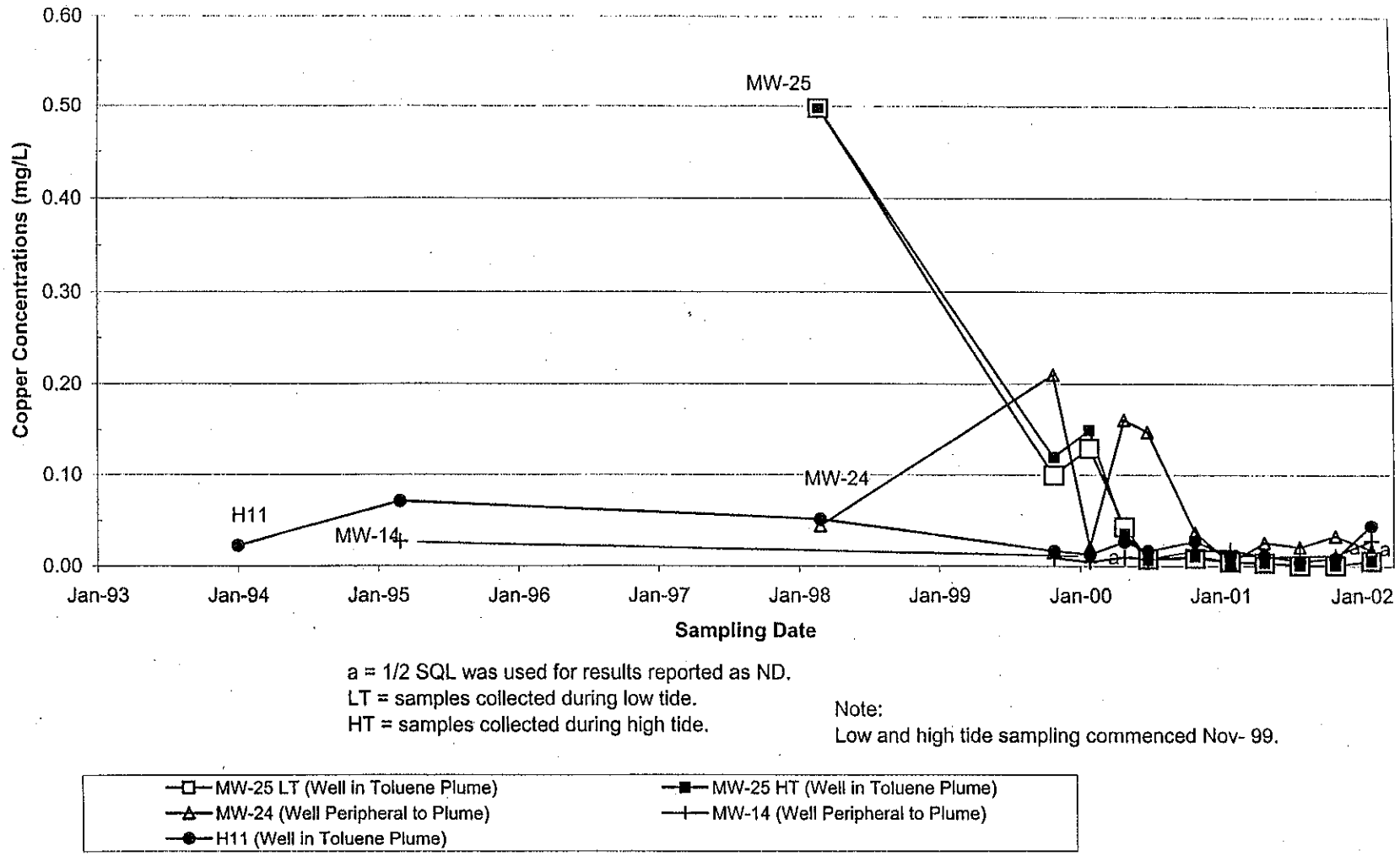
a = 1/2 SQL was used for results reported as ND.
LT = samples collected during low tide.
HT = samples collected during high tide.

Note:
Low and high tide sampling commenced Nov-99.

- H10 LT (Well in Toluene Plume)
- MW-18 LT (Well in Toluene Plume)
- MW-29 (Well Peripheral to Plume)
- H9 HT (Well Adjacent to Duwamish Waterway)
- H10 HT (Well in Toluene Plume)
- MW-18 HT (Well in Toluene Plume)
- H9 LT (Well Adjacent to Duwamish Waterway)

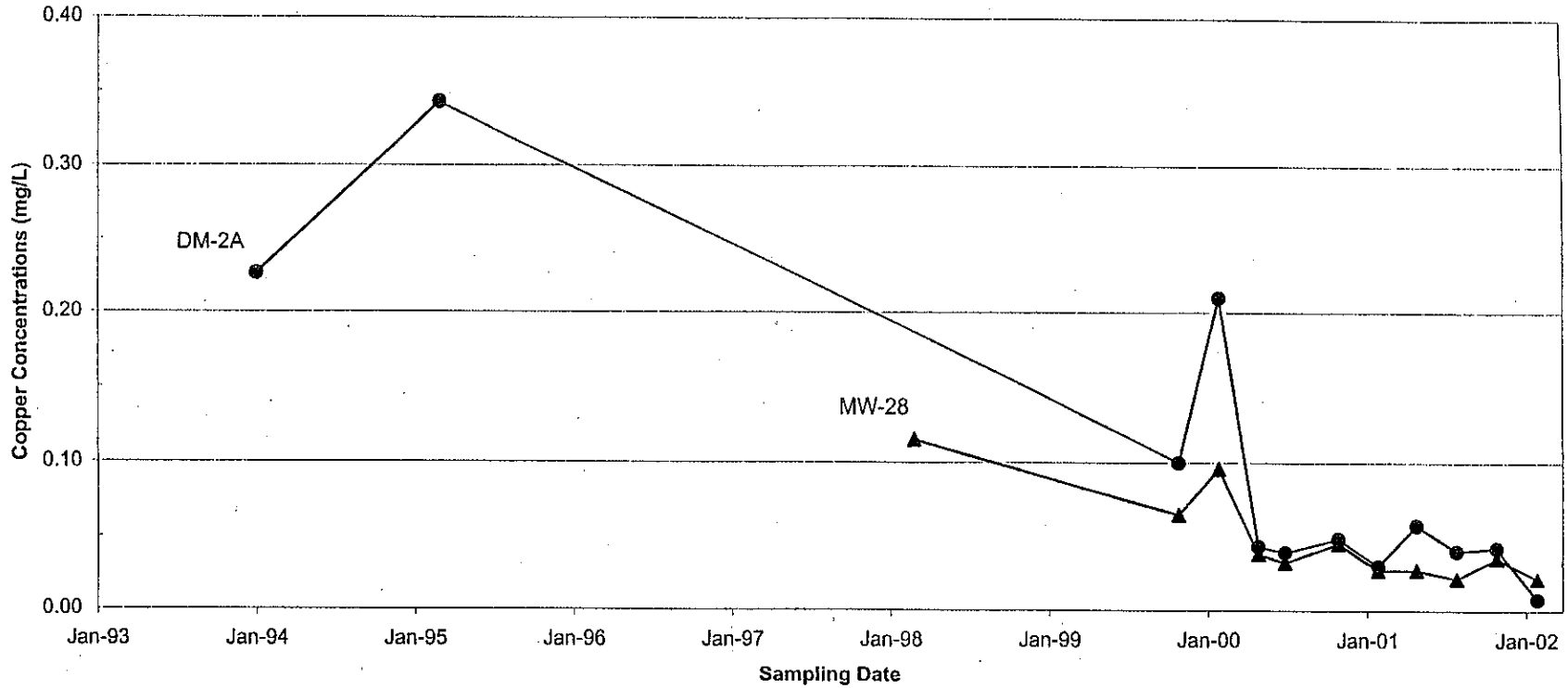
Upper Aquifer - Upper Interval
Copper Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
17b



Upper Aquifer - Upper Interval
Copper Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
17c



a = 1/2 SQL was used for results reported as ND.
LT = samples collected during low tide.
HT = samples collected during high tide.

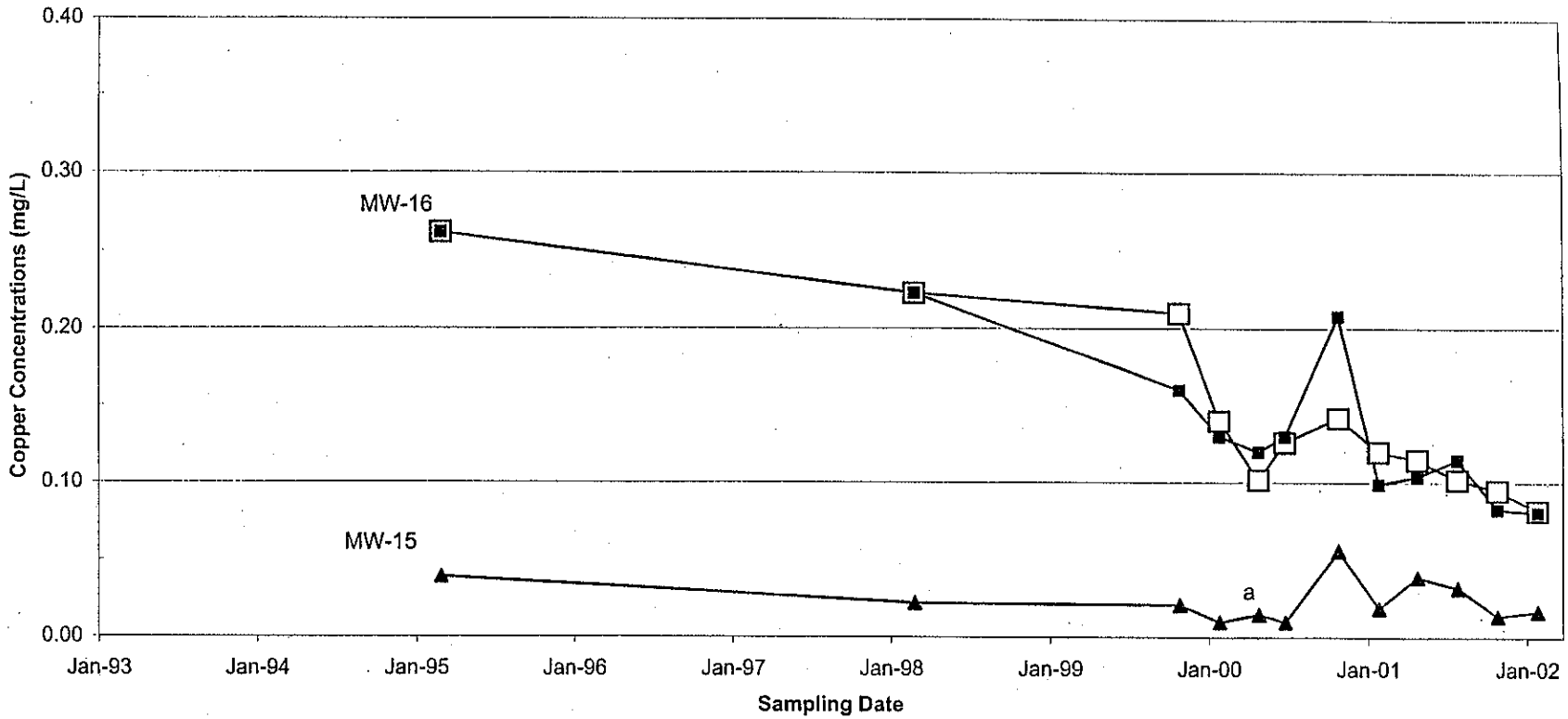
Note:
Low and high tide sampling commenced Nov-99.

MW-28 (Well Peripheral to Plume)
DM-2A (Well adjacent to the Duwamish Waterway)

Upper Aquifer - Intermediate Interval
Copper Concentrations vs Time

Round 15 Ground Water Monitoring

FIGURE
18



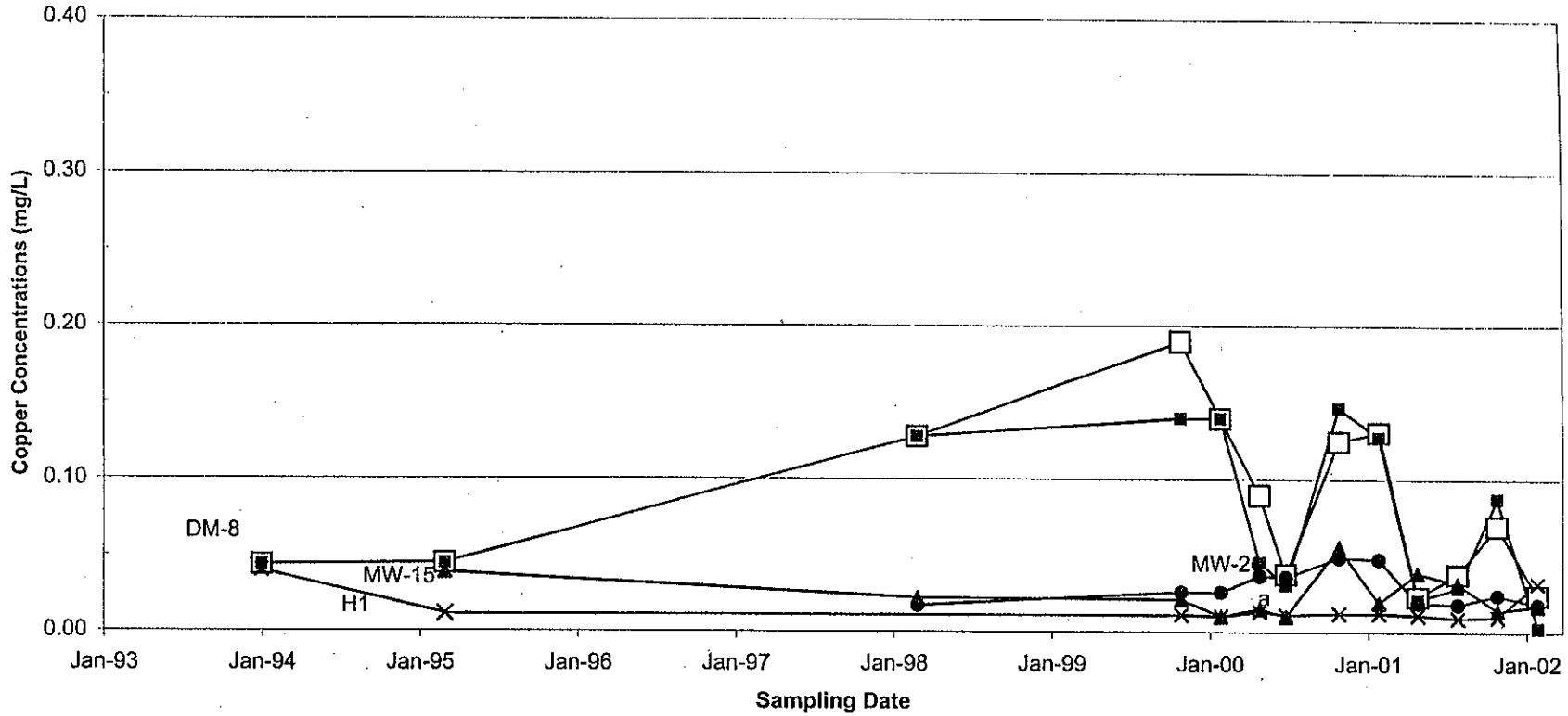
a = 1/2 SQL was used for results reported as ND.
LT = samples collected during low tide.
HT = samples collected during high tide.

Note:
Low and high tide sampling commenced Nov-99.

MW-16 LT (Well Peripheral to Plume)
MW-16 HT (Well Peripheral to Plume)
MW-15 (Well in Toluene Plume)

Upper Aquifer - Intermediate and Lower Intervals
Copper Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
19a



a = 1/2 SQL was used for results reported as ND.
LT = samples collected during low tide.
HT = samples collected during high tide.

Note:
Low and high tide sampling commenced Nov-99.

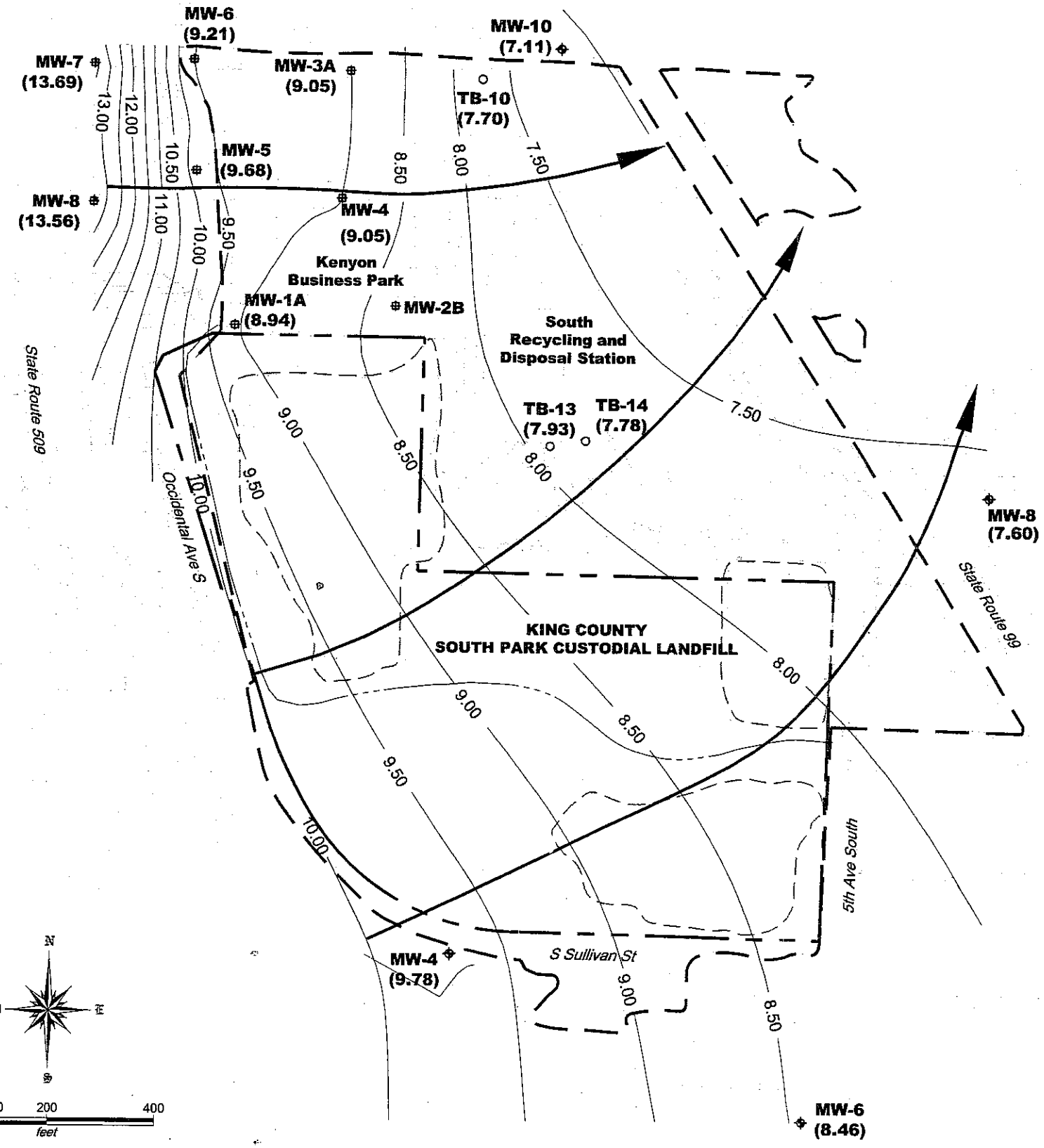
DM-8 LT (Well adjacent to the Duwamish Waterway)
DM-8 HT (Well adjacent to the Duwamish Waterway)
MW-15 (Well in Toluene Plume)
MW-26 (Well Peripheral to Plume)
H1 (Well Peripheral to Plume)

Upper Aquifer - Intermediate and Lower Intervals
Copper Concentrations vs Time
Round 15 Ground Water Monitoring

FIGURE
19b

South Park Landfill (G.11)

Figure 3-5. Groundwater flow direction map – 3/20/99 (King County 2000)
Figure 3-6. Groundwater flow direction map – 10/14/99 (King County 2000)



LEGEND

- Landfill Boundary (Approximate, based on Air photo interpretation and soil borings).
- King County Property Line
- Ditch (Approximate, based on basemap and air photo).
- Ground Water Elevation Contours
- Ground Water Flow Direction

- ○ Piezometers Installed by City of Seattle in 1989 (TB-10) and 1992 (TB-13, 14)
- ◆ Monitoring Wells Installed by AESI in December 1998 - 4 Locations
- ⊕ Monitoring Wells Installed in Kenyon Business Park - 8 Locations

(7.60) Ground Water Elevation (ft-NAVD88) taken on April 20, 1999

REFERENCE: BASE MAP AND TOPOGRAPHY DERIVED FROM A VARIETY OF SOURCES AND SHOULD BE FIELD VERIFIED.

REFERENCE: BASE MAP AND TOPOGRAPHY BY DEGROSS AERIAL MAPPING, 5/7/97

PROJECT NO. VB9741G

FIGURE NO. 3-5

Ground Water Flow Direction Map - 4/20/99

South Park Custodial Landfill
KING COUNTY, WASHINGTON

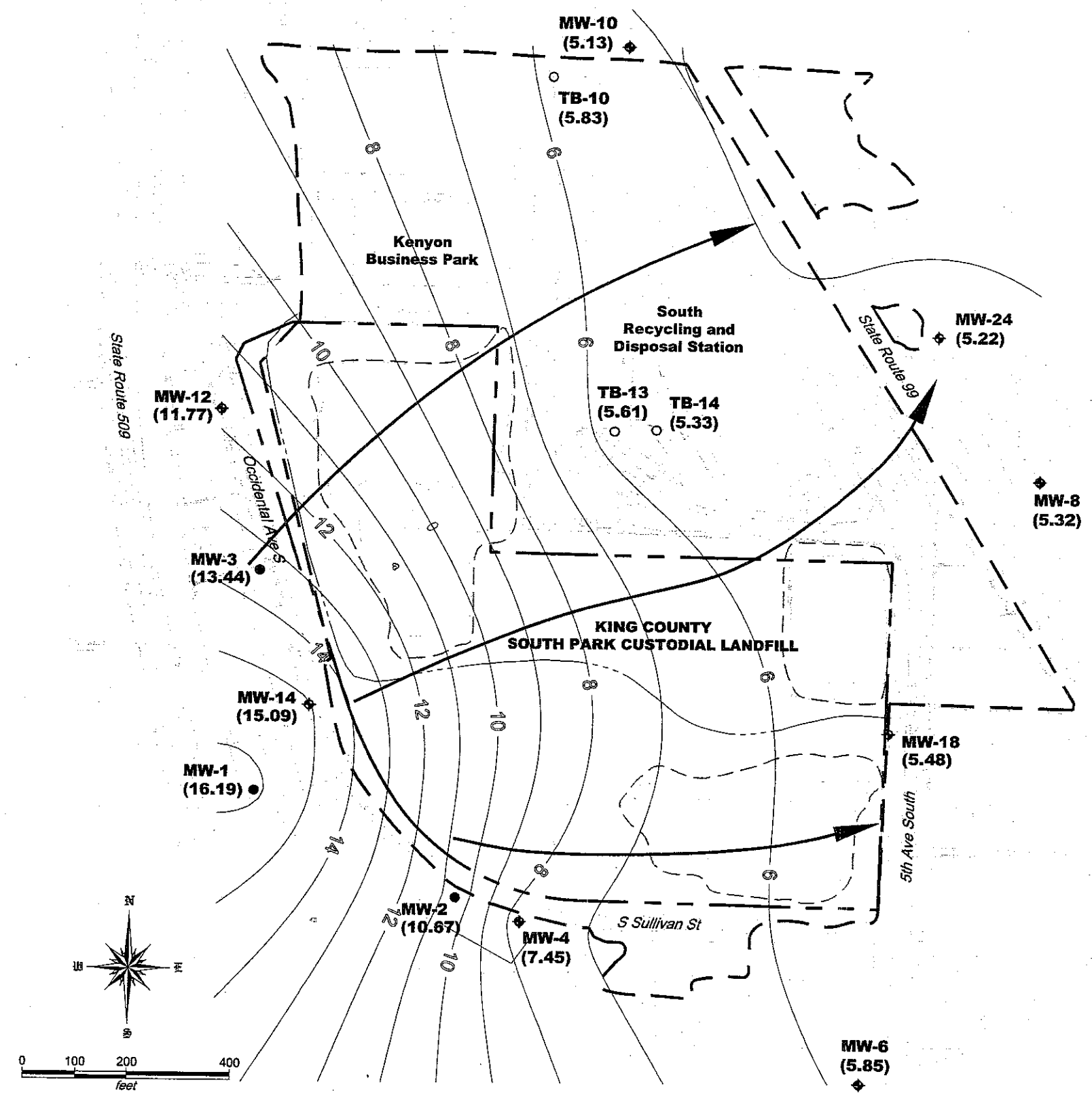
Prepared for King County
Solid Waste Division,
Source: King County 2000

DATE: 05/07/99

DESIGNED/DWN: JJS/BLB

ASSOCIATED EARTH SCIENCES, INC

vb97741b-31.dwg xrefs vb97461-13d.dwg 05/07/99 1:1



LEGEND

- Landfill Boundary (Approximate, based on Air photo interpretation and soil borings).
- King County Property Line
- Ditch (Approximate, based on basemap and air photo).
- Ground Water Elevation Contours
- Ground Water Flow Direction

- ● Monitoring Wells Installed by GeoEngineers in October 1991
- ○ Piezometers Installed by City of Seattle in 1989 (TB-10) and 1992 (TB-13, 14)
- ◆ Monitoring Wells Installed by AESI in December 1998 & September 1999

(5.32) Ground Water Elevation (ft-NAVD88) taken on October 14, 1999

1 foot contour intervals

REFERENCE: BASE MAP AND TOPOGRAPHY DERIVED FROM A VARIETY OF SOURCES AND SHOULD BE FIELD VERIFIED.

REFERENCE: BASE MAP AND TOPOGRAPHY BY DEGROSS AERIAL MAPPING, 5/7/97

Ground Water Flow Direction Map - 10/14/99

South Park Custodial Landfill
KING COUNTY, WASHINGTON

PROJECT NO. VB9741G
FIGURE NO. 3-6

DATE: 10/21/99
DESIGNED/DWN: JJS/HXT

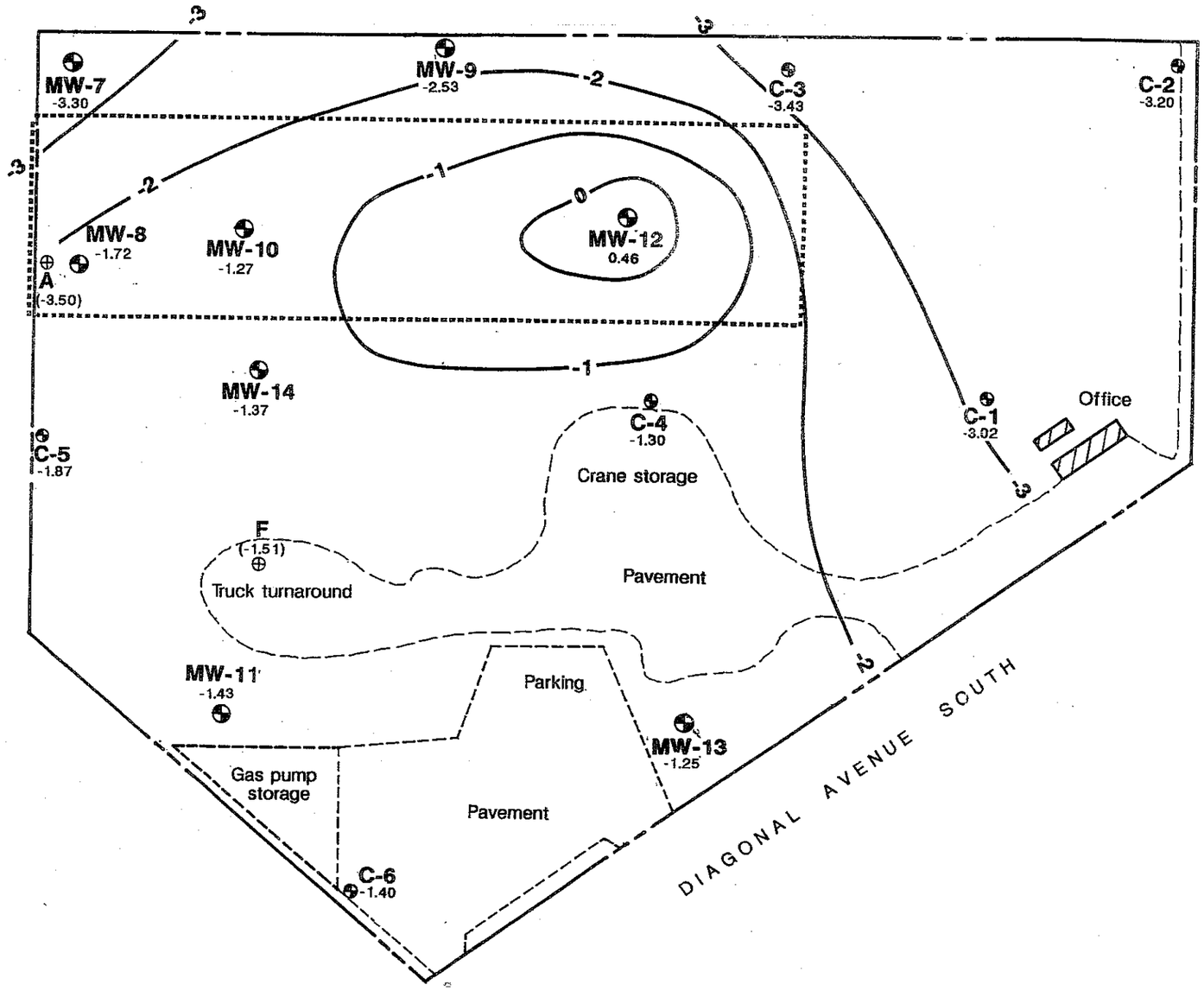
ASSOCIATED EARTH SCIENCES, INC

Prepared for King County
Solid Waste Division,
Source: King County 2000

vb9741b-3d.dwg xrefs vb97461-13d.dwg 10/21/99 1:1

T-108/Chiyoda (G.12)

Figure 3. Groundwater elevation contour map, November 6, 1991 (AGI 1992)
Figure 4. Groundwater elevation contour map, January 17-18, 1992 (AGI 1992)
Plate 1. . Location map (Dames & Moore 1981)



LEGEND

- **MW-13** (-1.25) — AGI monitoring well number, approximate location, and groundwater elevation in feet on 11/6/91
- **C-6** (-1.40) — PEG monitoring well number, approximate location, and groundwater elevation in feet on 11/6/91
- **F** (-1.51) — D & M monitoring well number, approximate location, and groundwater elevation in feet (not contoured) on 11/6/91
- -3 — Groundwater elevation contour in feet (temporary benchmark elevation =8.35 feet, City of Seattle Datum)
- Approximate boundary of sludge and spoils disposal area

N

0 50 100

Scale in Feet

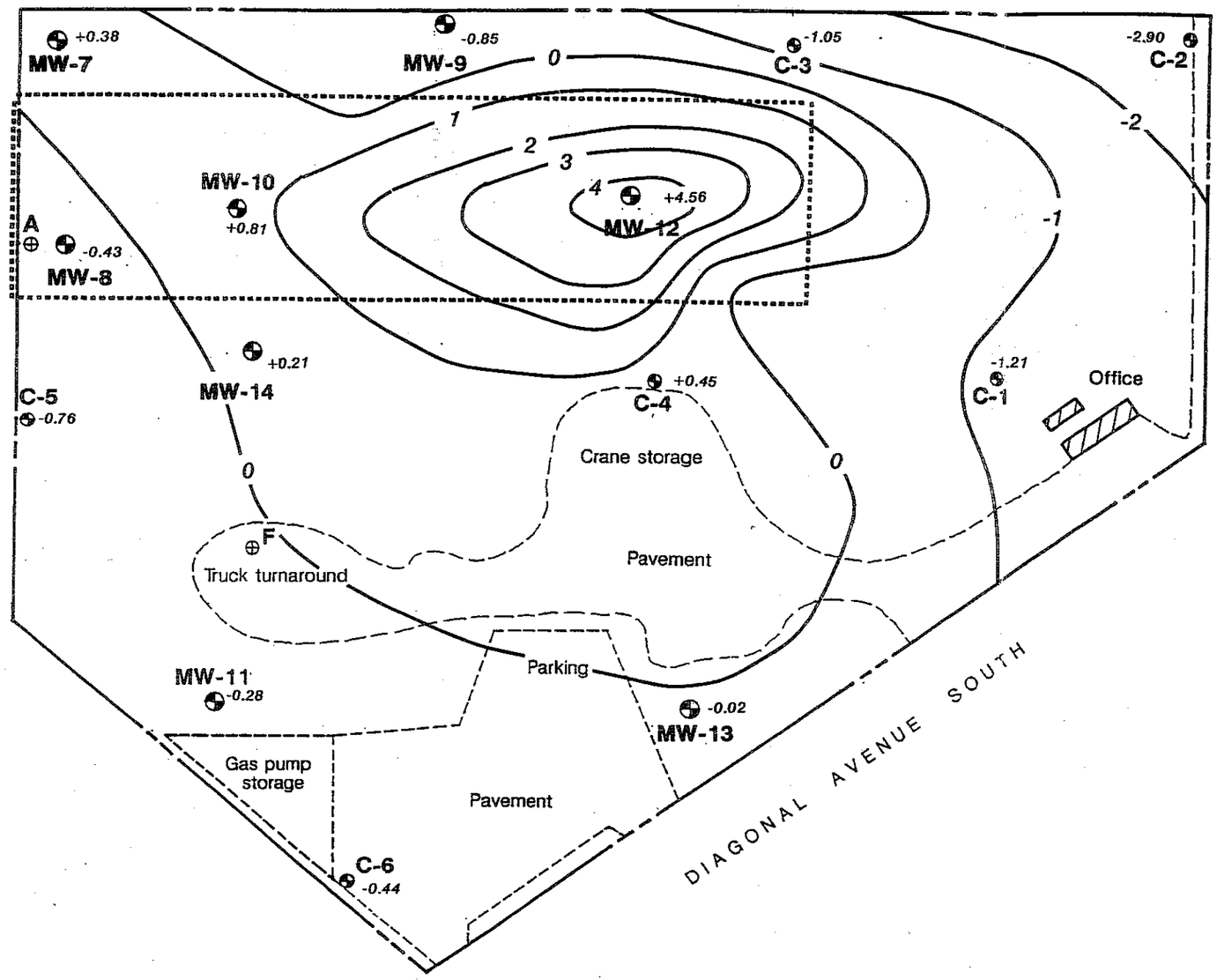
Reference: Undated drawing titled "Groundwater Contour Map" by Pacific Environmental Group, Inc.

Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Groundwater Elevation Contour Map
November 6, 1991
Chevron/Site 64534097
Seattle, Washington

FIGURE **3**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,582.022	MCT	VPL	2 Oct 91	CEG	7 Jan. 92



LEGEND

MW-13 +0.38	AGI monitoring well number, approximate location, and groundwater elevation in feet on 1/17 through 1/18/92
C-6 -1.05	PEG monitoring well number, approximate location, and groundwater elevation in feet on 1/17 through 1/18/92
F	D & M monitoring well number, approximate location, and groundwater elevation in feet (not contoured) on 1/17 through 1/18/92
-2	Groundwater elevation contour in feet (temporary benchmark elevation =8.35 feet, City of Seattle Datum)
----------	Approximate boundary of sludge disposal area

N

0 50 100

Scale in Feet

Reference: Updated drawing titled" Groundwater Contour Map" by Pacific Environmental Group, Inc.

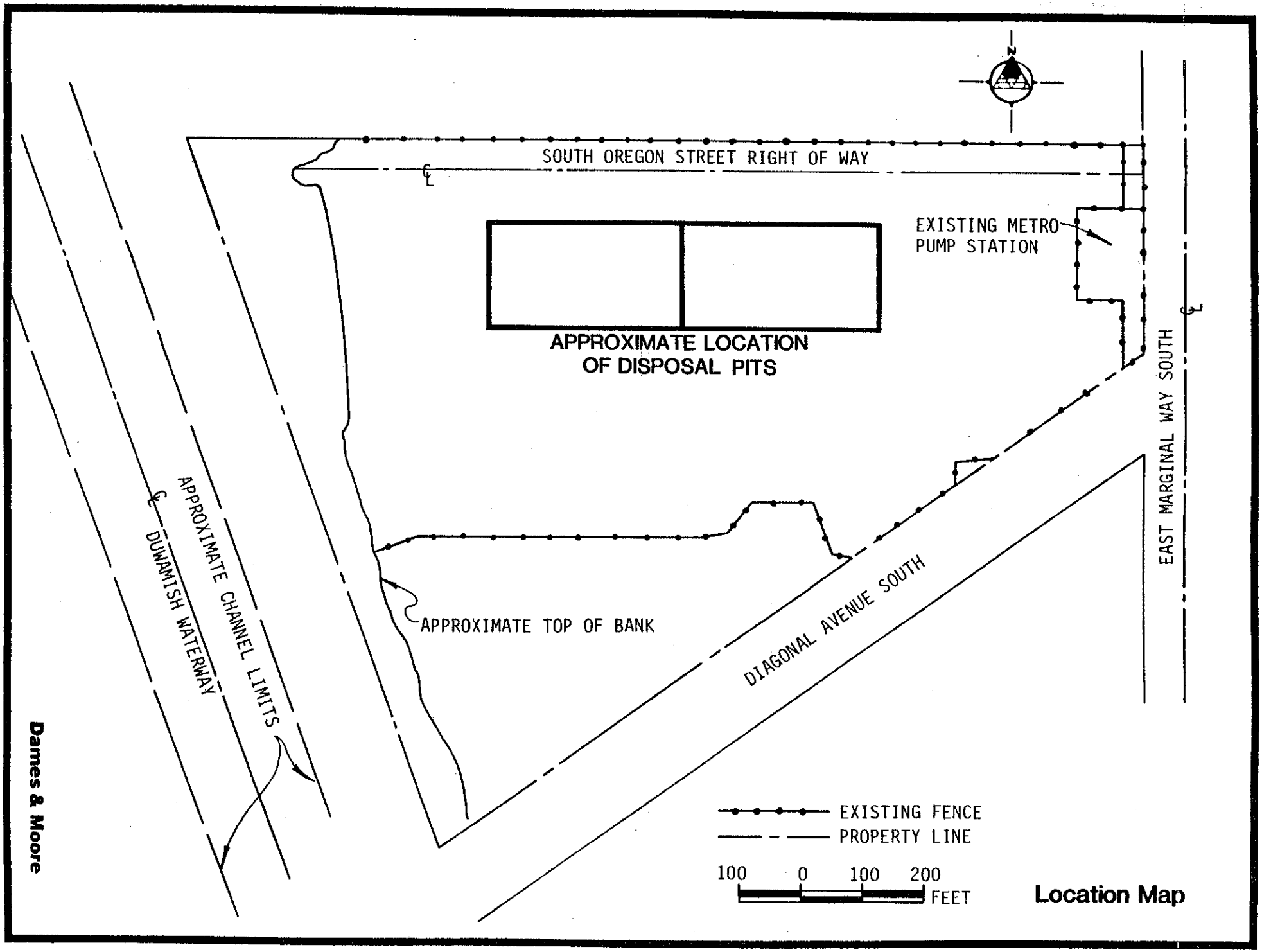
Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Groundwater Elevation Contour Map
January 17 - 18, 1992
Chevron/Site 64534097
Seattle, Washington

FIGURE 4

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,582.022	SLB	GLC	10 Aug 92		

547301



Dames & Moore

Plate 1