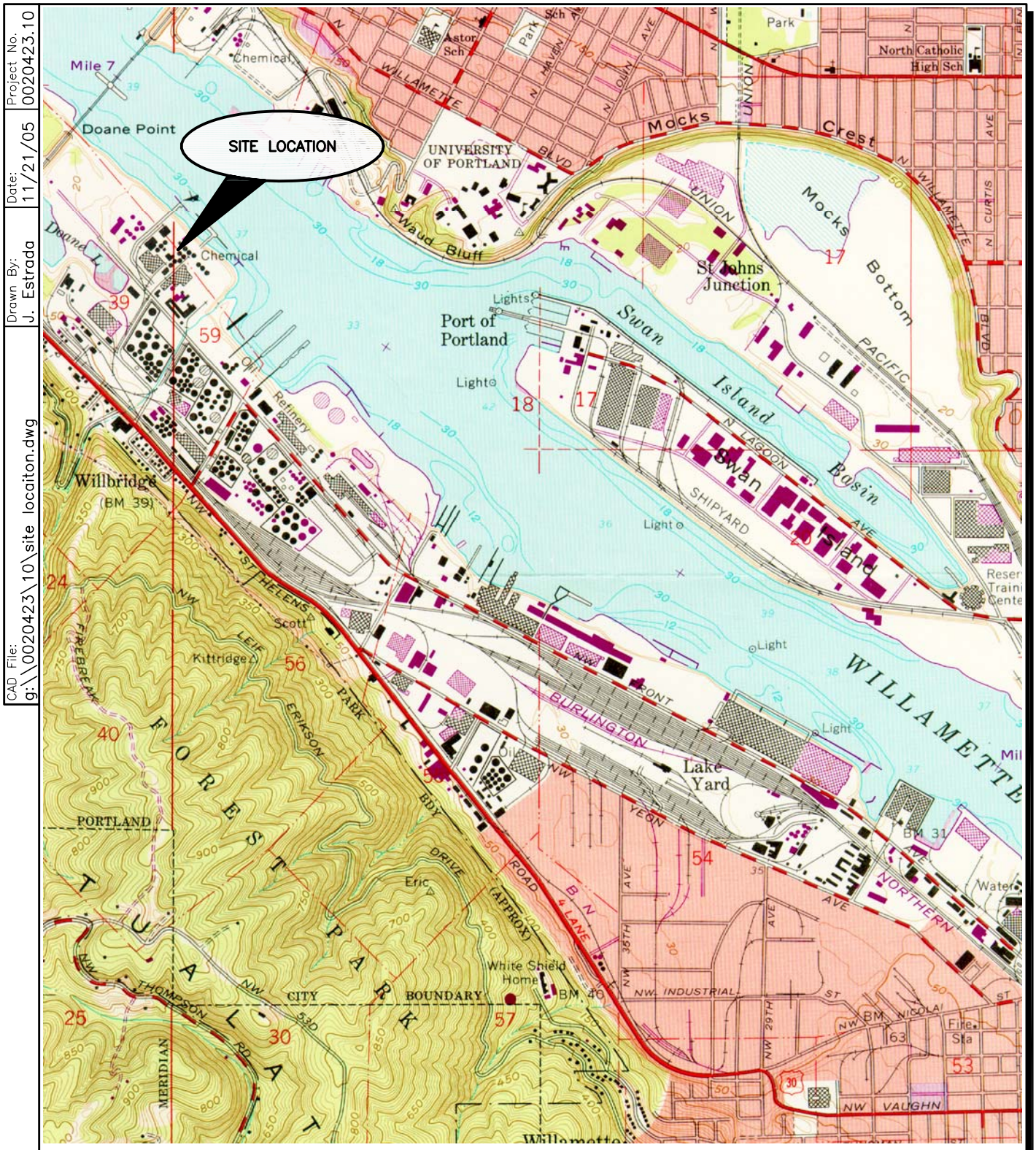
Figures



SCALE 1: 24,000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

N

References:
U.S.G.S. 7.5 Minute Series (Topographic Portland, Oregon–Washington)
Dated: 1961; Photorevised 1970 and 1977

Figure 1-1
Site Location Map
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: g:\...\0020423\10\004\2042310-05.dwg
Drawn By: J. Estrada
Date: 11/21/05
Project No. 0020423.10

WILLAMETTE RIVER

HARBOR LINE N 41°02'35" 1617.03'

APPROXIMATE TOP OF BANK

MEAN HIGH WATER LINE BASED ON ELEVATION OF 18.1' C.O.P.

TRACT A
95,593.50 SF
2.19 AC

LOT 1
283,190.52 SF
6.50 AC

LOT 2
348,027.67 SF
7.99 AC

LOT 3
619,450.97 SF
14.22 AC

LOT 4
1,079,518.98 SF
24.78 AC

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
GATE
CONTRACTOR GATE
EMERGENCY ASSEMBLY AREA
CONTRACTOR PARKING
BPA SUBSTATION ANNEX
CONSTRUCTION
CELL LIQUOR STORAGE
WASTEWATER TREATMENT
NEW CAUSTIC TANK FARM
NITROGEN GAS
CELL REPAIR
BRINE STORAGE
CHLORINE CELL ROOM (DIAMOND)
BRINE HTNG
COMPRESSOR ROOM
COOLING TOWERS
BRINE TREATMENT
BRINE FILTRATION
TRANSFORMER YARDS
BPA MAIN SUBSTATION
CAUSTIC RAIL LOAD'G
WAREHOUSE No. 2
WAREHOUSE No. 3
DRYER ROOM
FORMER ACID PLANT
FORMER CHLORINE ROOM
PROCESS
OLD CAUSTIC TANK FARM
WAREHOUSE
WAREHOUSE No. 1
CAUSTIC PROCESS
CHLORINE FINISHING
STORE ROOM
MAINTENANCE SHOP
BRINE MUD FILTER
SHIFT PARKING
FRONT GATE EMERGENCY ASSEMBLY AREA
GUARD SHACK
FRONT GATE
TRUCK SALT DROP
SALT PAD
SALT PADS
SALT PADS
OIL STORAGE
SALT PAD #1
BOILER ROOM
RECTIFIER
SUB-STATION
CHLORATE CELL ROOM
CHLORATE PROCESS
CHLORATE WAREHOUSE
LAB
OFFICE
MAIN OFFICE
OFFICE PARKING
CERTAINTEED ROOFING PRODUCTS
HEAD BLOCK

N.W. FRONT AVE.

ESCO
GOULD INC.
AIR LIQUIDE
GATX

LEGEND

APPROXIMATE LOT BOUNDARIES

TRUE NORTH
PLANT NORTH
0 200
FEET

Note:
Most buildings and structures noted on this diagram have been demolished and/or removed.

Figure 1-2
Site Layout Map
Arkema Inc.
Portland, Oregon
ERM 11/05

CAD File: g:\0020423\10\004\2042310-06.dwg | Drawn By: J. Estrada | Date: 11/21/05 | Project No. 0020423.10

WILLAMETTE RIVER

HARBOR LINE N 41°02'35" 1617.03'

TRUE NORTH

PLANT NORTH

0 150

FEET

MEAN HIGH WATER LINE BASED ON ELEVATION OF 18.1' C.O.P.

APPROXIMATE TOP OF BANK

TRACT A
95,593.50 SF
2.19 AC

Former Ammonia Plant Area

Acid Plant Area

Old Caustic Tank Farm

Salt Pads

Chlorate Plant Area

LOT 3
619,450.97 SF
14.22 AC

LOT 4
1,079,518.98 SF
24.78 AC

BPA Main Substation

PUMP HOUSE

No. 2 DOCK

No. 1 DOCK

PUMP HOUSE

WAREHOUSE No. 3

LOADING DOCK

OLD CAUSTIC TANK FARM

TRUCK SALT DROP

SALT PAD

SALT PADS

SALT PADS

OIL STORAGE

SALT PAD #1

WAREHOUSE No. 2

FORMER ACID CONTROL HOUSE

PROCESS

CELL LIQUOR STORAGE

WASTEWATER TREATMENT

NEW CAUSTIC TANK FARM

CONSTRUCTION

NITROGEN GAS

CAUSTIC RAIL LOAD'G

WAREHOUSE

CHLORINE FINISHING

WAREHOUSE No. 1

CAUSTIC PROCESS

STORE ROOM

MAINTENANCE SHOP

ROOM

RECTIFIER

STATION

CHLORATE CELL ROOM

CHLORATE PROCESS

CHLORATE WAREHOUSE

LAB

OFFICE

CELL REPAIR

BRINE STORAGE

CHLORINE CELL ROOM (DIAMOND)

BRINE HTRS

COMPRESSOR ROOM

COOLING TOWERS

BRINE TREATMENT

BRINE FILTRATION

BRINE MUD FILTER

TRANSFORMER YARDS

FRONT GATE EMERGENCY ASSEMBLY AREA

GUARD SHACK

FRONT GATE

MAIN OFFICE

OFFICE PARKING

SHIFT PARKING

CERTAINTEED ROOFING PRODUCTS

N.W. FRONT AVE.

GOULD INC.

AIR LIQUIDE

GATX

LEGEND

APPROXIMATE LOT BOUNDARIES

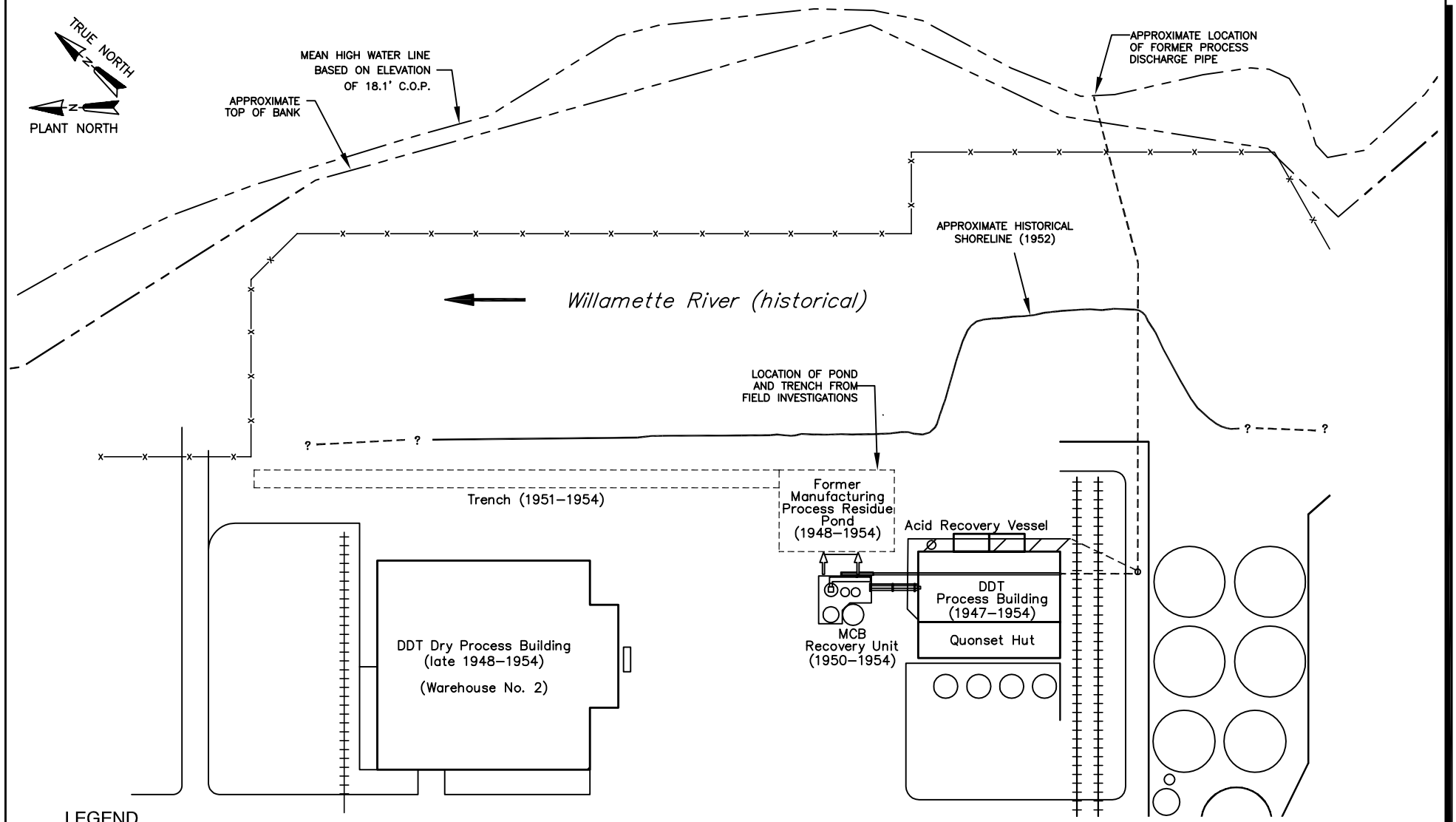
AREA OF INVESTIGATION

Note:
Most buildings and structures noted on this diagram have been demolished and/or removed.

Figure 1-3
Map of Areas of Investigation
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File:	Drawn By:	Date:	Project No.
g:\\0020423\10\002042310-07.dwg	J. Estrada	11/21/05	0020423.10



LEGEND

--- Sewer Pipelines (approximate)

⇦ Discharge to Pond

Notes:
1. All dates are approximate.
2. Most buildings and structures noted on this diagram have been demolished and/or removed.

0 40 80
Approx. Scale (feet)

Figure 1-4

Historical DDT Manufacturing Operations (1947-1954)

Arkema Inc.

Portland, Oregon

ERM 11/05

CAD File: g:_0020423\10\0020423310-08.dwg
Drawn By: J. Estrada
Date: 11/21/05
Project No. 0020423.10

LEGEND

Concrete Pad

1T Former Transformer Location

TRUE NORTH

PLANT NORTH

No. 2 DOCK

DOCK

PUMP HOUSE

52T

TRUCK SALT DROP

SALT PAD

WAREHOUSE No. 3

LOADING DOCK

OLD CAUSTIC TANK FARM

OIL STORAGE

FORMER ACID PLANT

FORMER CONTROL HOUSE

PROCESS

WAREHOUSE No. 2

CELL LIQUOR STORAGE

49T

48T

SALT PAD #1

110CB

550CB

40T

11X

130CB

11CT

610CB

9CAP

580CB

58T

SUB STATION

90CB

BOILER ROOM

RECTIFIER

16T

46T

47T

WAREHOUSE

CHLORINE FINISHING

CAUSTIC RAIL LOAD'G

WASTEWATER TREATMENT

NEW CAUSTIC TANK FARM

CONSTRUCTION

NITROGEN GAS

CHLORATE CELL ROOM

WAREHOUSE No. 1

CAUSTIC PROCESS

54T

1T

CHLORATE PROCESS

BRINE STORAGE

50T

51T

CELL REPAIR

STORE ROOM

MAINTENANCE SHOP

CHLORATE WAREHOUSE

BRINE HTRS

COMPRESSOR ROOM

COOLING TOWERS

BRINE TREATMENT

BRINE FILTRATION

CHLORINE CELL ROOM (DIAMOND)

LAB

OFFICE

BRINE MUD FILTER

3AT

3BT

6T

20T

55T

17T

18T

19T

FRONT GATE EMERGENCY ASSEMBLY AREA

0 120 FEET

630CB

57T

24TC

25TC

22R,S,LTC

21R,S,LTC

260CB

TRANSFORMER PADS

56T

44T

250CB

240CB

230CB

23R,X,LTC

21–22X

620CB

BPA MAIN SUBSTATION

SHIFT PARKING

GUARD SHACK

FRONT GATE

Figure 1-5

Former Transformer Location Map

Arkema Inc.

Portland, Oregon

ERM *11/05*

CAD File: g:\0020423\10\004\2042310-09.dwg
Drawn By: J. Estrada
Date: 11/21/05
Project No. 0020423.10

WILLAMETTE RIVER

HARBOR LINE N 41°02'35" 1617.03'

MEAN HIGH WATER LINE
BASED ON ELEVATION
OF 18.1' C.O.P.

APPROXIMATE
TOP OF BANK

TRACT A
95,593.50 SF
2.19 AC

LOT 3
619,450.97 SF
14.22 AC

LOT 4
1,079,518.98 SF
24.78 AC

TRUE NORTH
PLANT NORTH
0 150
FEET

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
MH 1
MH 2
MH 3
MH 4
MH 5
MH 6
MH 7
MH 8
MH 9
MH 10
MH 11
WAREHOUSE No. 3
LOADING DOCK
FORMER ACID PLANT
FORMER CONTROL HOUSE
PROCESS
OLD CAUSTIC TANK FARM
TRUCK SALT DROP
SALT PAD
SALT PADS
OIL STORAGE
SALT PAD #1
CELL LIQUOR STORAGE
WAREHOUSE No. 2
WASTEWATER TREATMENT
NEW CAUSTIC TANK FARM
CONSTRUCTION
CAUSTIC RAIL LOADING
WAREHOUSE
CHLORINE FINISHING
BOILER ROOM
RECTIFIER
SUB-STATION
CHLORATE CELL ROOM
NITROGEN GAS
WAREHOUSE No. 1
CAUSTIC PROCESS
GATE
BRINE STORAGE
CELL REPAIR
CHLORATE PROCESS
BRINE HTRS
COMPRESSOR ROOM
COOLING TOWERS
BRINE TREATMENT
BRINE FILTRATION
CHLORINE CELL ROOM (DIAMOND)
STORE ROOM
MAINTENANCE SHOP
CHLORATE WAREHOUSE
LAB
OFFICE
BRINE MUD FILTER
FRONT GATE EMERGENCY ASSEMBLY AREA
CERTAINTEED ROOFING PRODUCTS
TRANSFORMER YARDS
BPA MAIN SUBSTATION
SHIFT PARKING
GUARD SHACK
FRONT GATE
MAIN OFFICE
OFFICE PARKING
N.W. FRONT
GOULD INC.
AIR LIQUIDE
GATX

LEGEND
Approximate Lot Boundaries
Indust, Sewer, Drain, Manhole
MH 1 Manhole #1

Note:
Most buildings and structures noted on this diagram have been demolished and/or removed.

Figure 1-6
Storm Water System Layout
Arkema Inc.
Portland, Oregon
ERM 11/05

CAD File:	Drawn By:	Date:	Project No.
g:\\0020423\10\002042310-10.dwg	J. Estrada	11/22/05	0020423.10

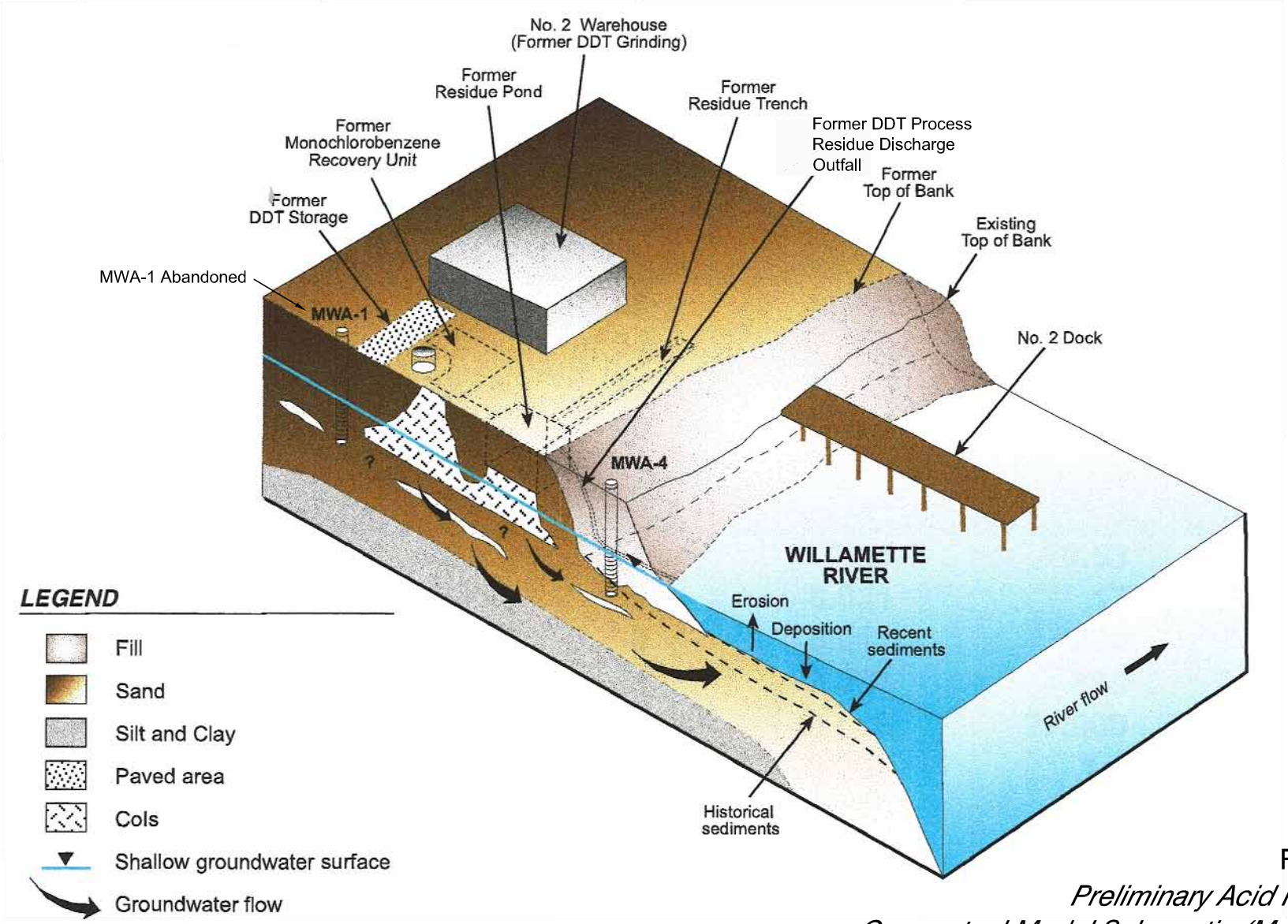


Figure 2-1

Preliminary Acid Plant Area

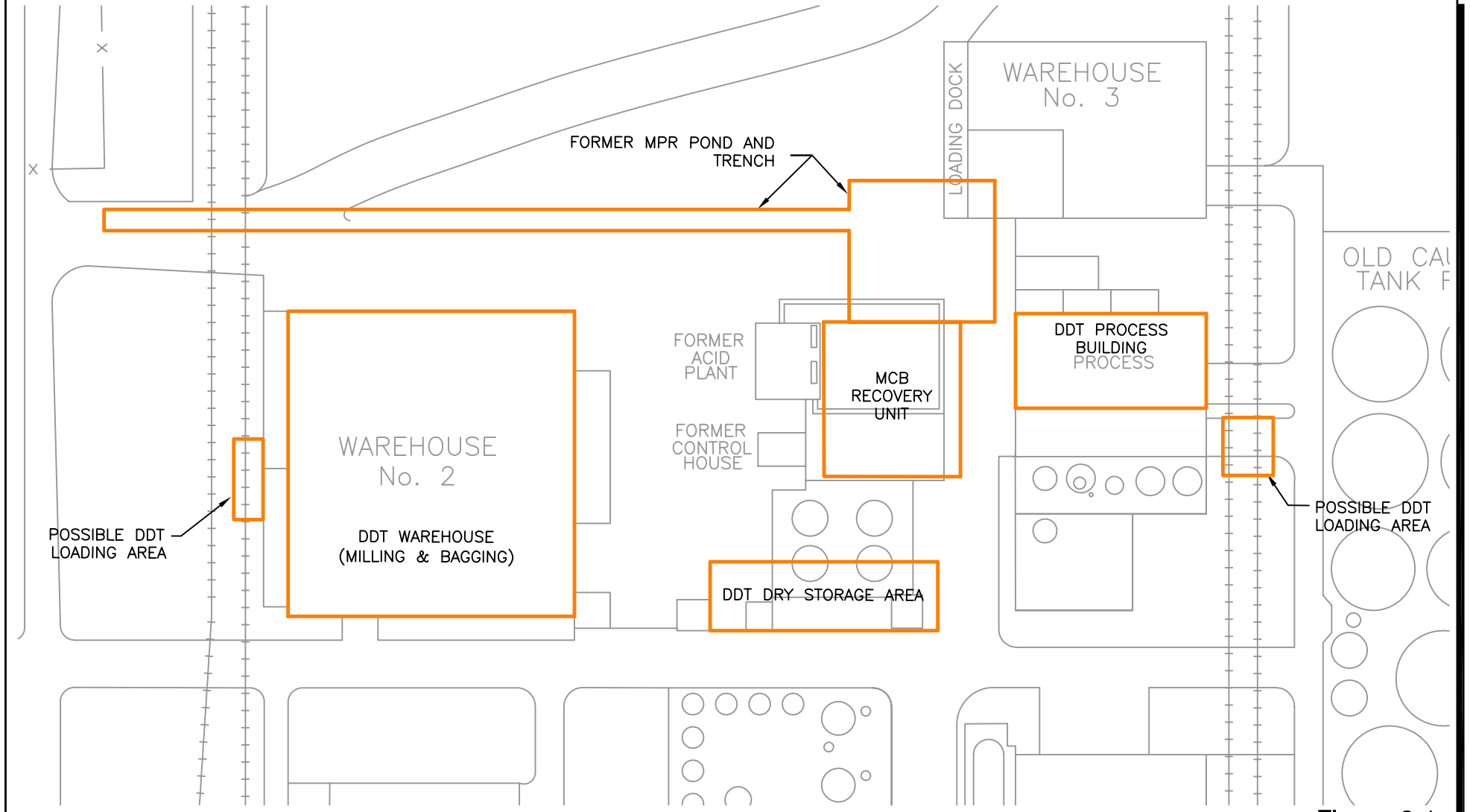
Conceptual Model Schematic (March 1998)

Arkema, Inc.

Portland, Oregon

ERM 11/05

CAD File:	Drawn By:	Date:	Project No.
g:\\0020423\10\002042310-77.dwg	J. Estrada	11/21/05	0020423.10

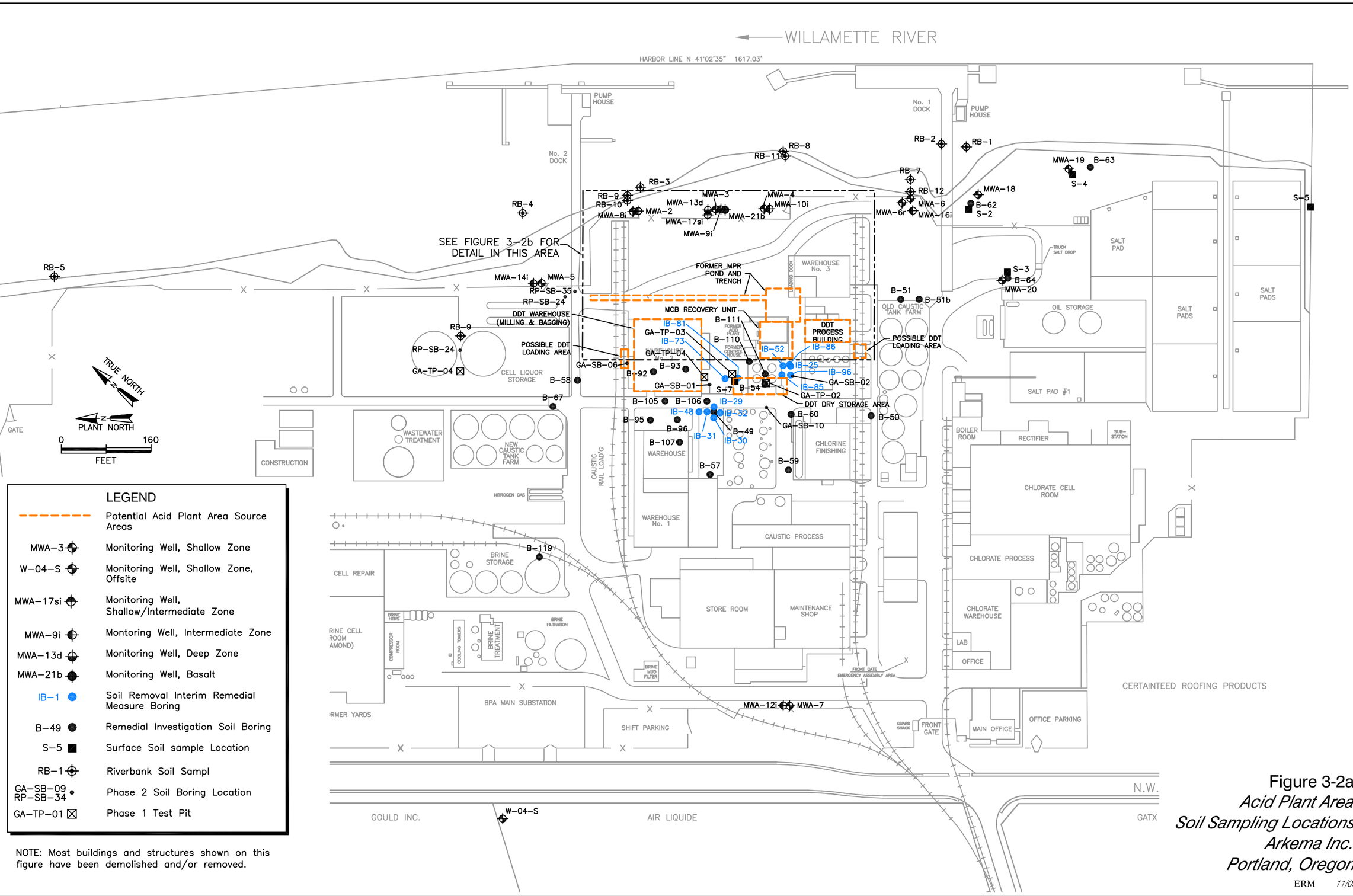


NOTE:
Most buildings and structures shown on this figure have been demolished and/or removed.

Figure 3-1
Acid Plant Area
Potential Source Areas
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/27/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\002042310-78.dwg



LEGEND

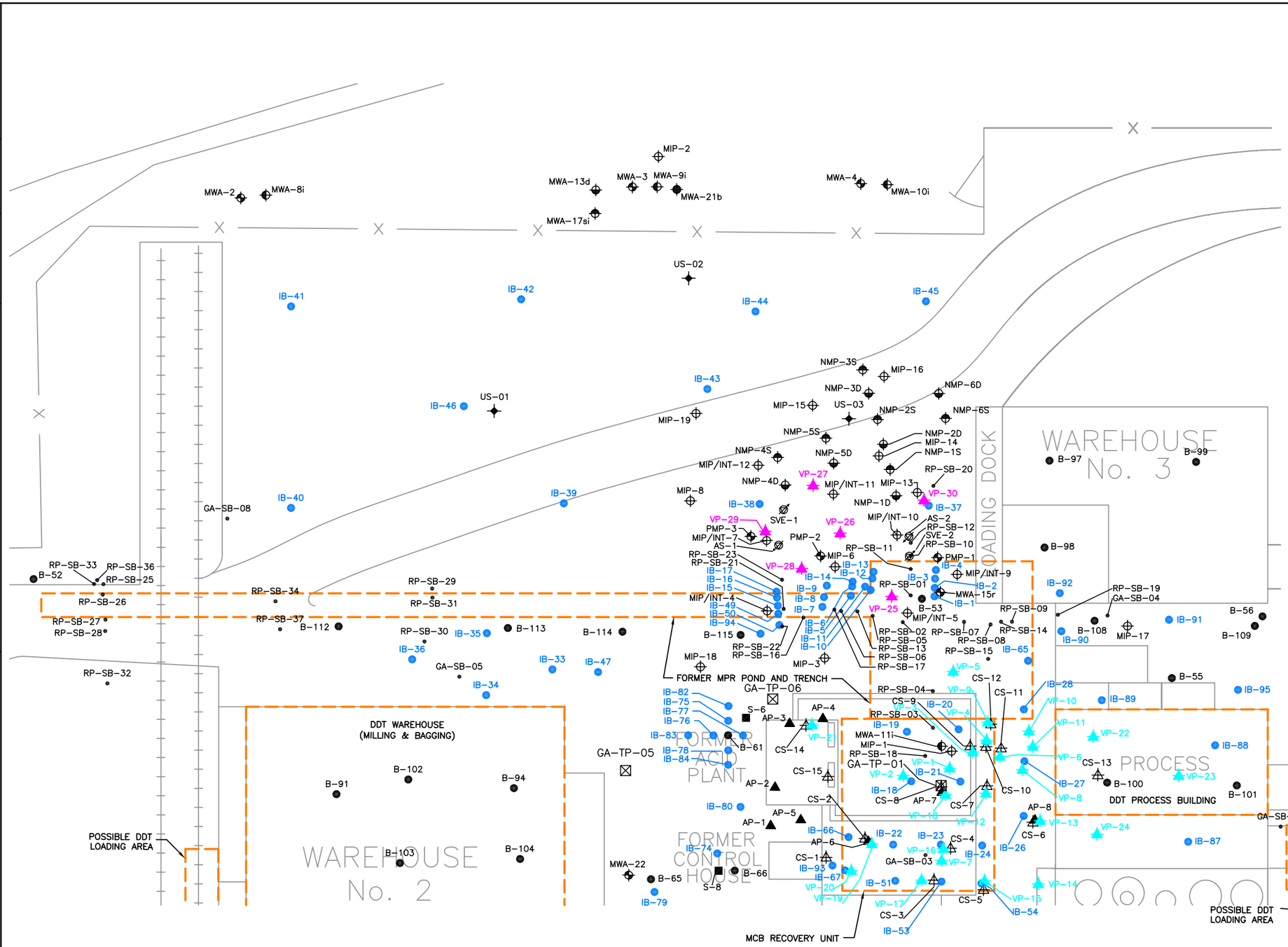
- Potential Acid Plant Area Source Areas
- MWA-3 — Monitoring Well, Shallow Zone
- W-04-S — Monitoring Well, Shallow Zone, Offsite
- MWA-17si — Monitoring Well, Shallow/Intermediate Zone
- MWA-9i — Montoring Well, Intermediate Zone
- MWA-13d — Monitoring Well, Deep Zone
- MWA-21b — Monitoring Well, Basalt
- IB-1 — Soil Removal Interim Remedial Measure Boring
- B-49 — Remedial Investigation Soil Boring
- S-5 — Surface Soil sample Location
- RB-1 — Riverbank Soil Sampl
- GA-SB-09 / RP-SB-34 — Phase 2 Soil Boring Location
- GA-TP-01 — Phase 1 Test Pit

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

Figure 3-2a
Acid Plant Area
Soil Sampling Locations
Arkema Inc.
Portland, Oregon

ERM 11/05

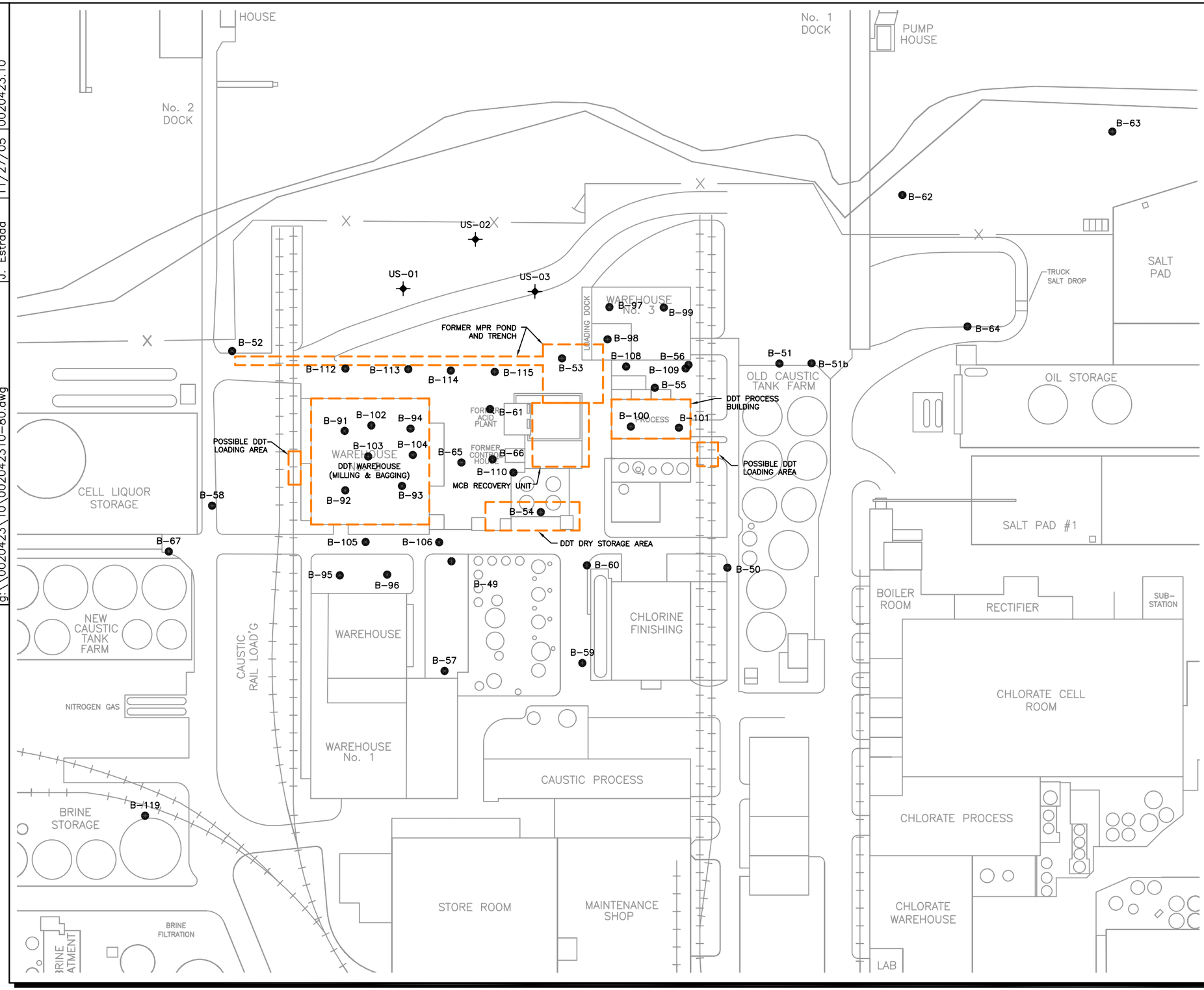
Project No. 0020423.10
Date: 11/27/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423-10-79.dwg



NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

Figure 3-2b
Acid Plant Area
Soil Sampling Locations
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10
Date: 11/27/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\002042310-80.dwg



LEGEND

- Potential Acid Plant Area Source Areas
- B-49 — Remedial Investigation Soil Boring
- US-1 — Unpaved Area Soil Boring

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 100
FEET

Figure 3-3
Acid Plant Area
Soil Sampling Boring Locations
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10
Date: 11/27/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102-81.dwg

LEGEND

- Potential Acid Plant Area Source Areas
- IB–1 Soil Removal Interim Remedial Measure Boring

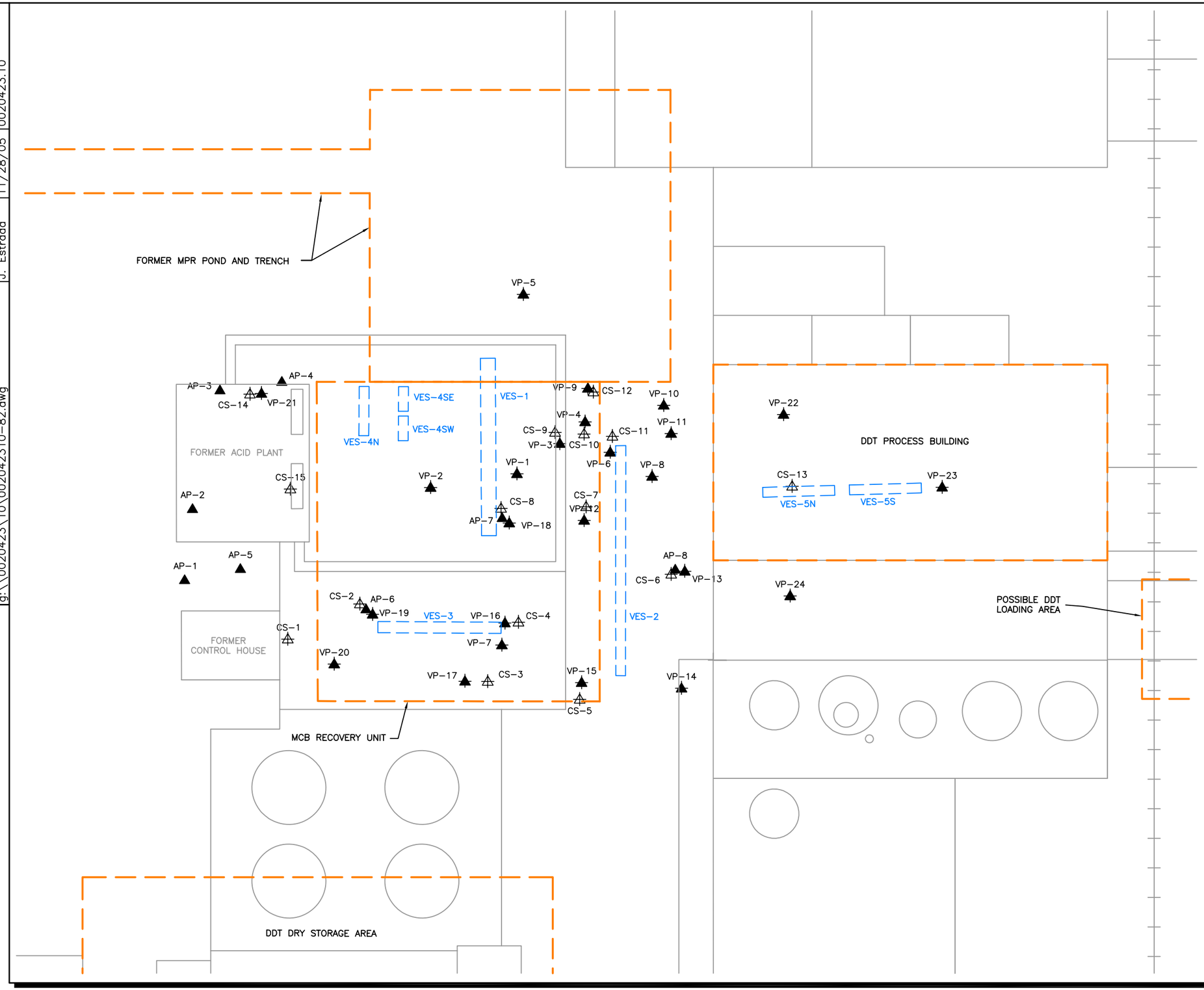
NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 40
FEET

IB–41 IB–42 IB–44 IB–45 IB–43 IB–46 IB–40 IB–39 IB–38 IB–37
IB–11 IB–14 IB–6 IB–17 IB–16 IB–9 IB–8 IB–15 IB–7 IB–49 IB–94 IB–50 IB–5 IB–13 IB–12 IB–10 IB–4 IB–3 IB–2 IB–1
IB–35 IB–36 IB–33 IB–47 IB–34
FORMER MPR POND AND TRENCH
IB–82 IB–75 IB–76 IB–83 IB–77 IB–78 IB–84
FORMER ACID PLANT
IB–80
IB–19 IB–20 IB–18 IB–21
IB–66 IB–23 IB–24 IB–22
FORMER CONTROL HOUSE
IB–74
IB–93 IB–67 IB–53 IB–54 IB–51
IB–79
MCB RECOVERY UNIT
IB–86 IB–25 IB–52
IB–81 IB–73 IB–85 IB–96
DDT DRY STORAGE AREA
IB–29 IB–31 IB–48 IB–32 IB–30
POSSIBLE DDT LOADING AREA
WAREHOUSE No. 2
DDT WAREHOUSE (MILLING & BAGGING)
LOADING DOCK
WAREHOUSE No. 3
IB–92 IB–91 IB–90 IB–65 IB–28 IB–89 IB–95 IB–88 IB–27
PROCESS
DDT PROCESS BUILDING
IB–26 IB–87
POSSIBLE DDT LOADING AREA

Figure 3-4
Acid Plant Area
Soil Removal IRM Borings
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10
Date: 11/28/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\002042310-82.dwg



LEGEND

- Potential Acid Plant Area Source Areas
- VP-23 — VES Vapor Monitoring Point (June 2000 to December 2001)
- AP-7 — VES Hand Auger Boring (June/July 2001)
- CS-13 — VES Confirmation Soil Boring (May 2003)
- VES-1 — Location of Horizontal Vapor Extraction Well and Trench

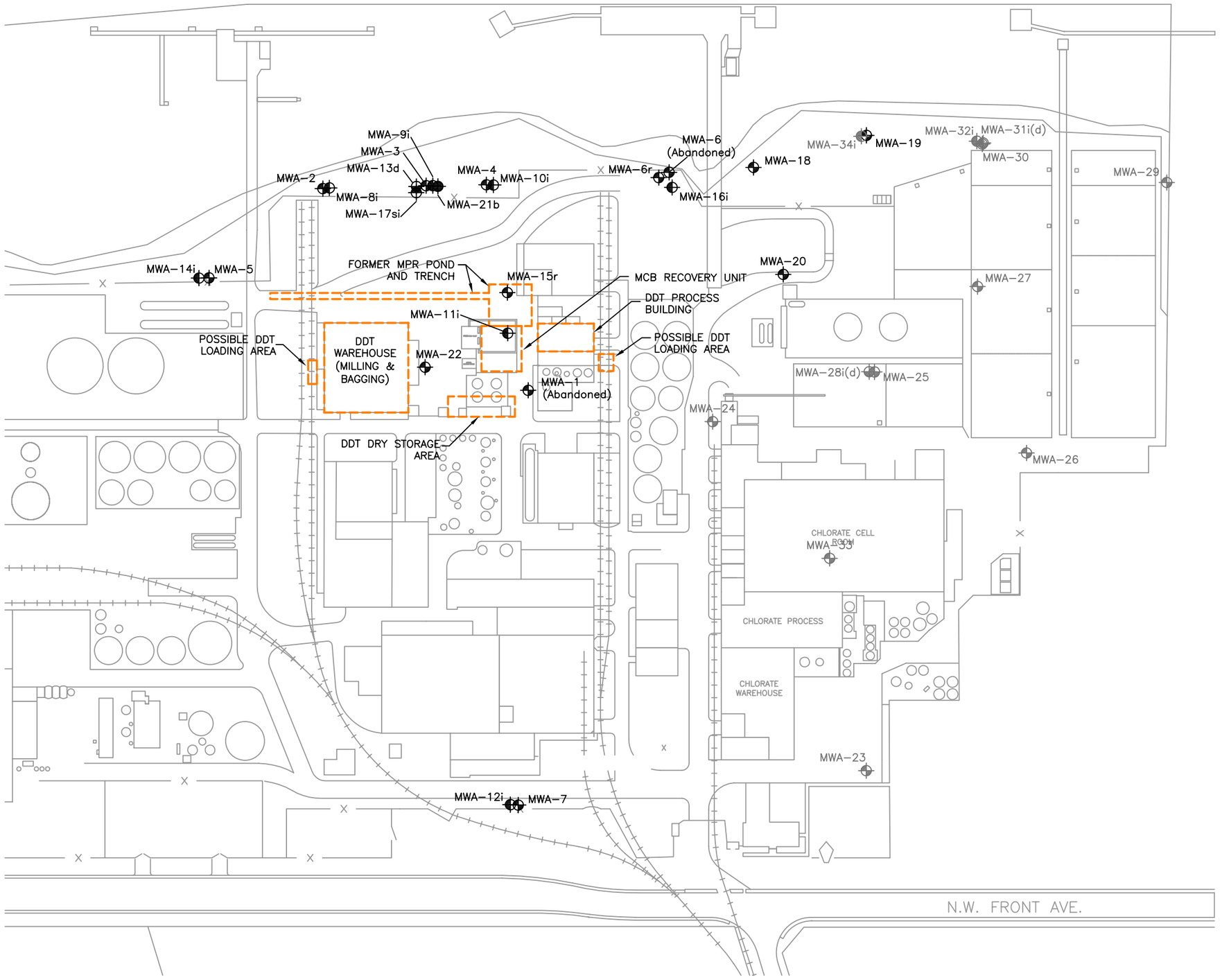
NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 20
FEET

Figure 3-5
Acid Plant Area
VES Boring Locations
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/28/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423\0042310-83.dwg



LEGEND

- Potential Acid Plant Area Source Areas
- MWA-3 — Monitoring Well, Shallow Zone
- MWA-17si — Monitoring Well, Shallow/Intermediate Zone
- MWA-9i — Montoring Well, Intermediate Zone
- MWA-13d — Monitoring Well, Deep Zone
- MWA-21b — Monitoring Well, Basalt

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 150
FEET

Figure 3-6
Acid Plant Area
Monitoring Well Boring Locations
Arkema Inc.
Portland, Oregon

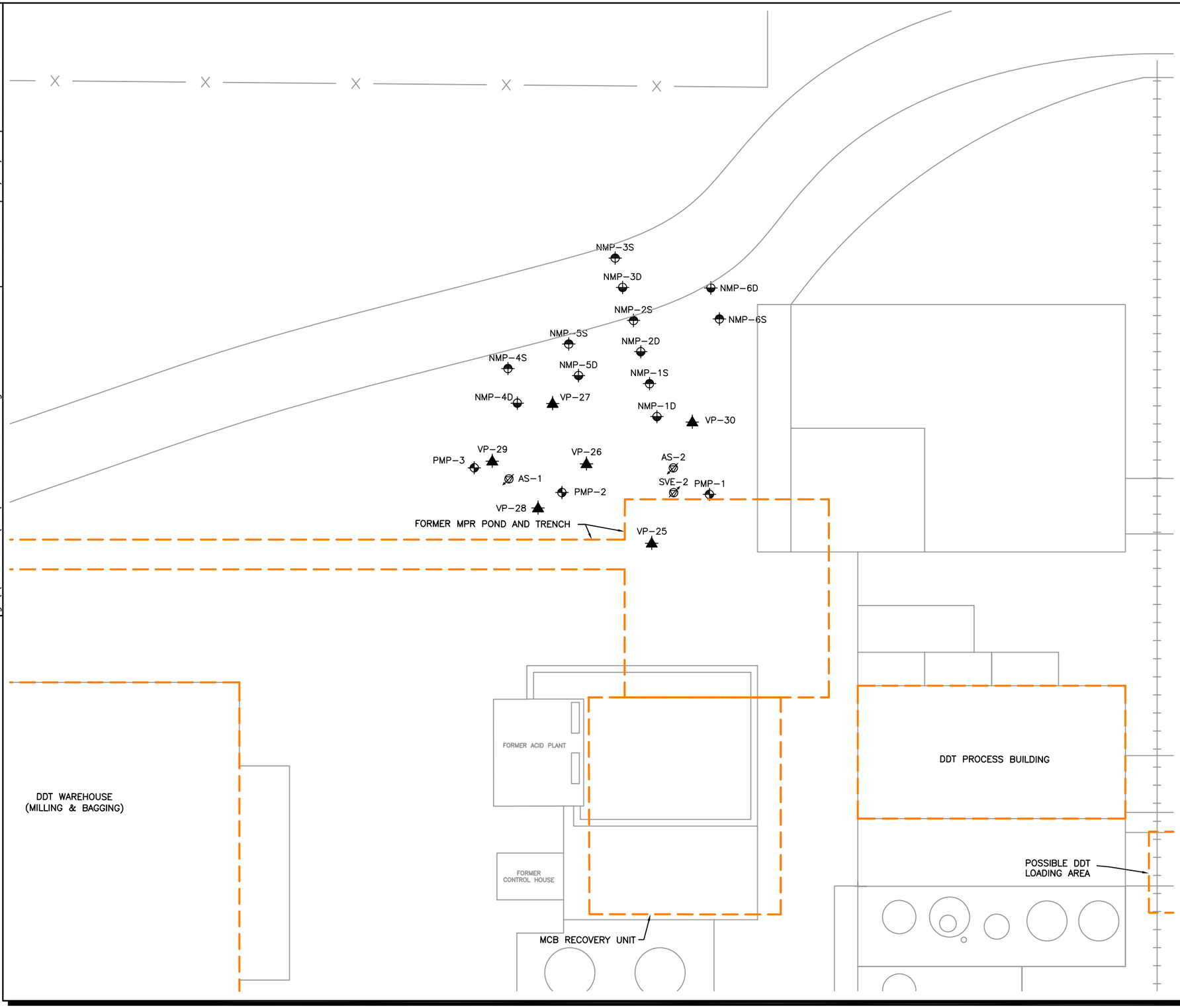
ERM 11/05

Project No. 0020423.10

Date: 11/28/05

Drawn By: J. Estrada

CAD File: g:\0020423\10\0020423\10-84.dwg



LEGEND

- Potential Acid Plant Area Source Areas
- NMP-4S, NMP-4D — Monitoring Well, Persulfate Pilot Study
- PMP-1 — Monitoring Well, DNAPL Pilot Study
- VP-30 — DNAPL Pilot Study Vapor Monitoring
- AS-1 — DNAPL Pilot Study Air Sparging Well
- SVE-1 — DNAPL Pilot Study Soil Vapor Extraction Well

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH

PLANT NORTH

0 30

FEET

Figure 3-7

Acid Plant Area In Situ Persulfate Oxidation and DNAPL Pilot Study Borings

Arkema Inc.

Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/28/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423 10-85.dwg

WILLAMETTE RIVER

HARBOR LINE N 41°02'35" 1617.03'

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
S-4
S-2
S-5
S-3
TRUCK SALT DROP
SALT PAD
SALT PADS
SALT PADS
FORMER MPR POND AND TRENCH
WAREHOUSE No. 3
LOADING DOCK
OLD CAUSTIC TANK FARM
OIL STORAGE
S-6
FORMER ACID PLANT
MCB RECOVERY UNIT
DDT PROCESS BUILDING
POSSIBLE DDT LOADING AREA
DDT WAREHOUSE (MILLING & BAGGING)
WAREHOUSE No. 2
POSSIBLE DDT LOADING AREA
S-8
FORMER CONTROL HOUSE
S-7
CELL LIQUOR STORAGE
SALT PAD #1
DDT DRY STORAGE AREA
BOILER ROOM
RECTIFIER
SUB-STATION
NEW CAUSTIC TANK FARM
CAUSTIC RAIL LOAD'G
WAREHOUSE
CHLORINE FINISHING

LEGEND

- Potential Acid Plant Area Source Areas
- S-5 ■ Surface Soil Sample Location

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 100
FEET

Figure 3-8
Surface Soil Sample Locations
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10
Date: 11/28/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102310-86.dwg

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
MWA-19
MWA-18
MWA-6 (Abandoned)
MWA-6r
MWA-16i
MWA-2
MWA-8i
MWA-3
MWA-9i
MWA-13d
MWA-17si
MWA-21b
MWA-4
MWA-10i
NMP-2S
NMP-2D
NMP-5S
NMP-5D
NMP-4S
MIP/INT-12
NMP-4D
MIP-8
MIP/INT-11
MIP/INT-7
MIP/INT-4
NMP-3S
NMP-3D
NMP-6D
NMP-6S
NMP-1S
NMP-1D
MIP-13
MIP/INT-10
PMP-1
MIP/INT-9
MIP/INT-5
MIP-6
WAREHOUSE No. 3
LOADING DOCK
TRUCK SALT DROP
SALT PAD
B-64
MWA-20
MWA-14i
MWA-5
PMP-3
PMP-2
MWA-15r
B-56
B-55
MIP-18
FORMER MPR POND AND TRENCH
OLD CAUSTIC TANK FARM
OIL STORAGE
POSSIBLE DDT LOADING AREA
DDT WAREHOUSE (MILLING & BAGGING) WAREHOUSE No. 2
B-61
FORMER ACID PLANT
MWA-11i
MCB RECOVERY UNIT
DDT PROCESS BUILDING
POSSIBLE DDT LOADING AREA
MWA-22
FORMER CONTROL HOUSE
B-65
MWA-1 (Abandoned)
DDT DRY STORAGE AREA
CELL LIQUOR STORAGE
B-67
B-60
CHLORINE FINISHING
B-59
SALT PAD #1
BOILER ROOM
RECTIFIER
SUB-STATION
NEW CAUSTIC TANK FARM
CAUSTIC RAIL LOAD'G
WAREHOUSE
WAREHOUSE No. 1
CAUSTIC PROCESS
CHLORATE CELL ROOM

LEGEND

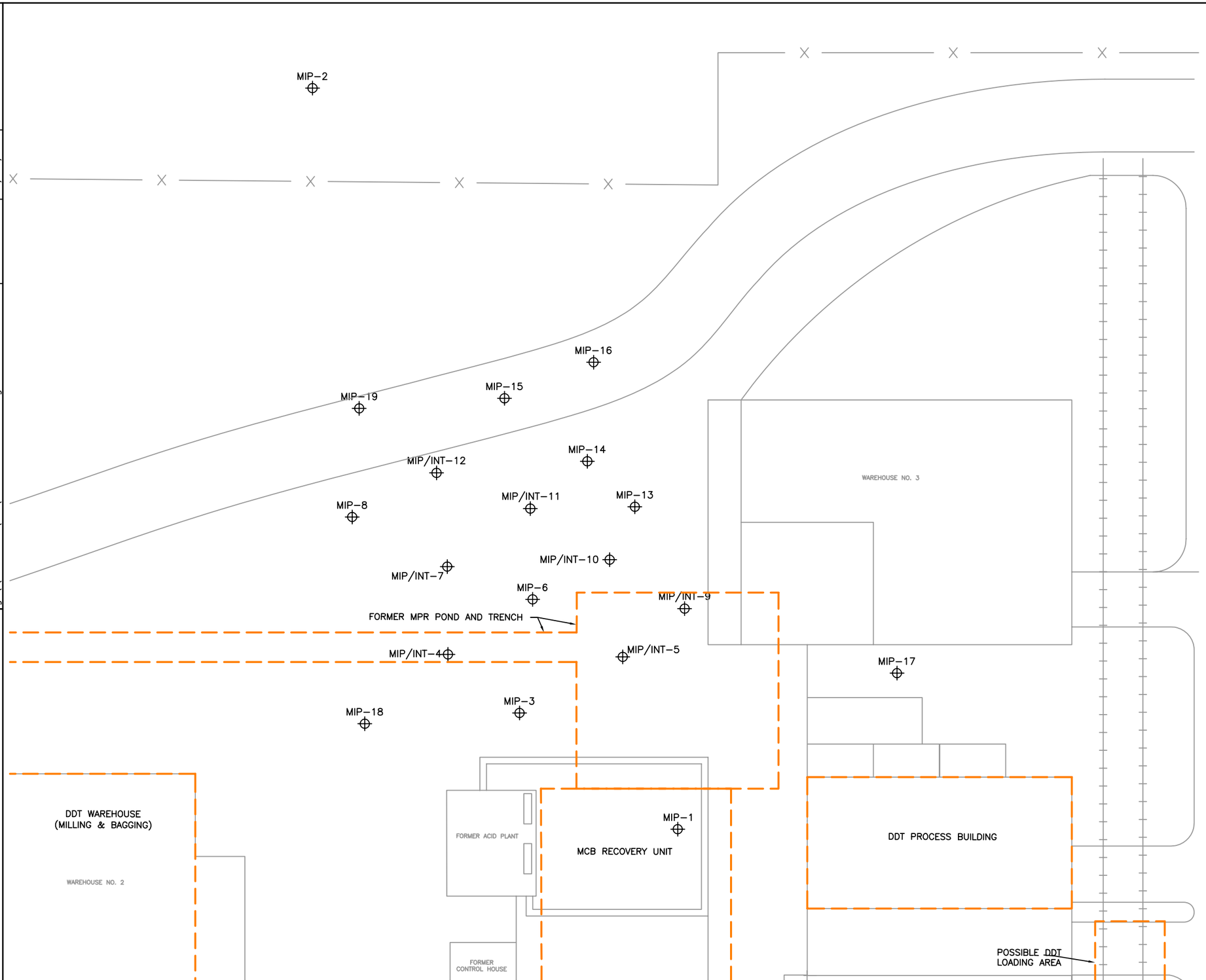
- Potential Acid Plant Area Source Areas
- MWA-3 — Monitoring Well, Shallow Zone
- MWA-17si — Monitoring Well, Shallow/Intermediate Zone
- MWA-9i — Montoring Well, Intermediate Zone
- MWA-13d — Monitoring Well, Deep Zone
- MWA-21b — Monitoring Well, Basalt
- NMP-4S, NMP-4D — Persulfate Pilot Study Performance Monitoring Well
- PMP-1 — DNAPL Pilot Study Performance Monitoring Well
- MIP-2 — DNAPL Investigation Grab Groundwater Sample Point
- B-49 — RI Grab Groundwater Sample Point

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 100
FEET

Figure 3-9
Acid Plant Area
Groundwater Sampling Locations
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10
Date: 11/28/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102310-87.dwg



LEGEND

- Potential Acid Plant Area Source Areas
- MIP-2: Cone Penetrometer Membrane Interface Probe Boring
- MIP/INT-7: Cone Penetrometer Membrane Interface Probe Boring and Associated Intermediate Zone Direct-Push Boring Location

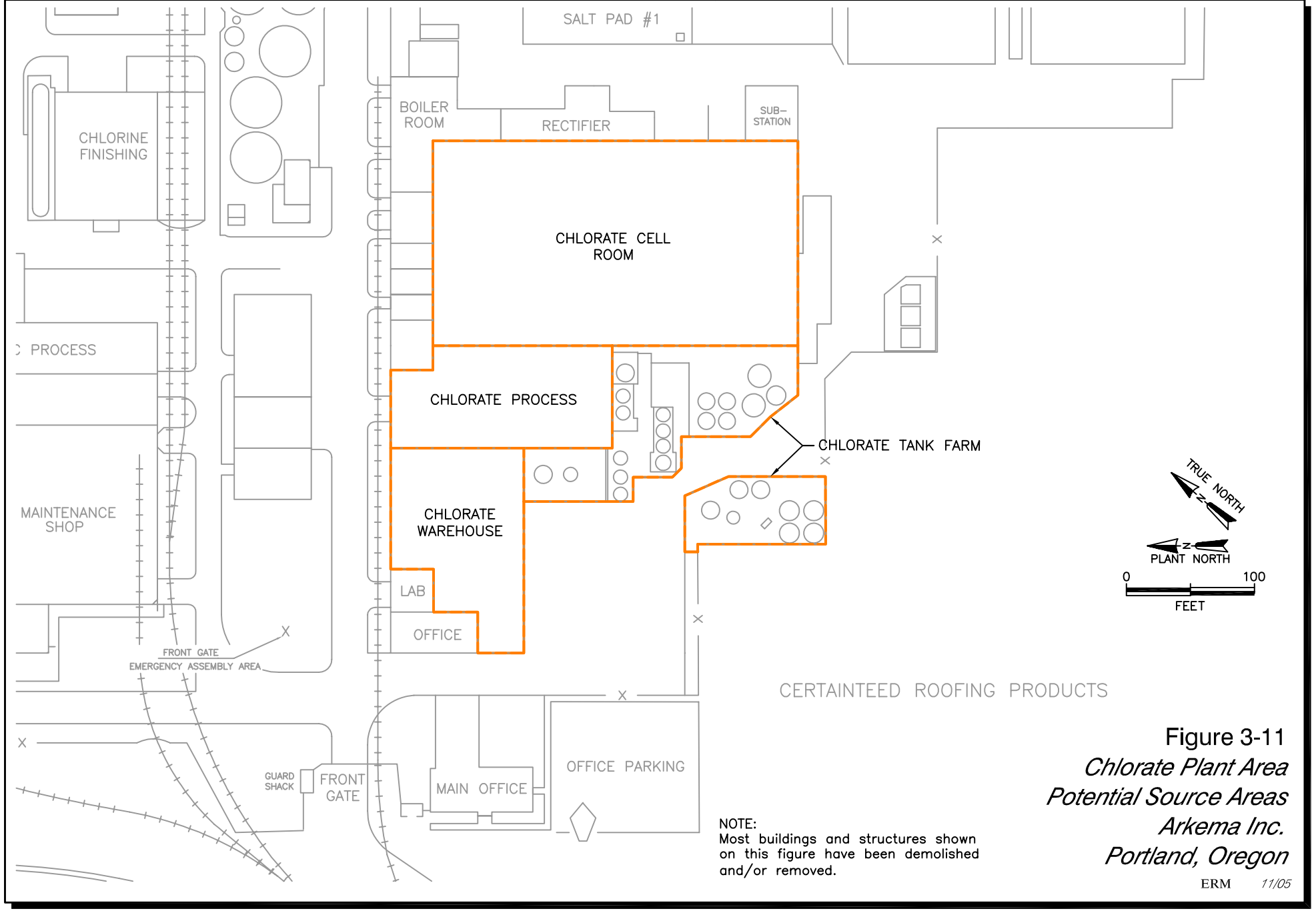
NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 30
FEET

Figure 3-10
Acid Plant Area
DNAPL Investigation Boring Locations
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File:	Drawn By:	Date:	Project No.
g:\\0020423\10\002042310-77.dwg	J. Estrada	11/28/05	0020423.10

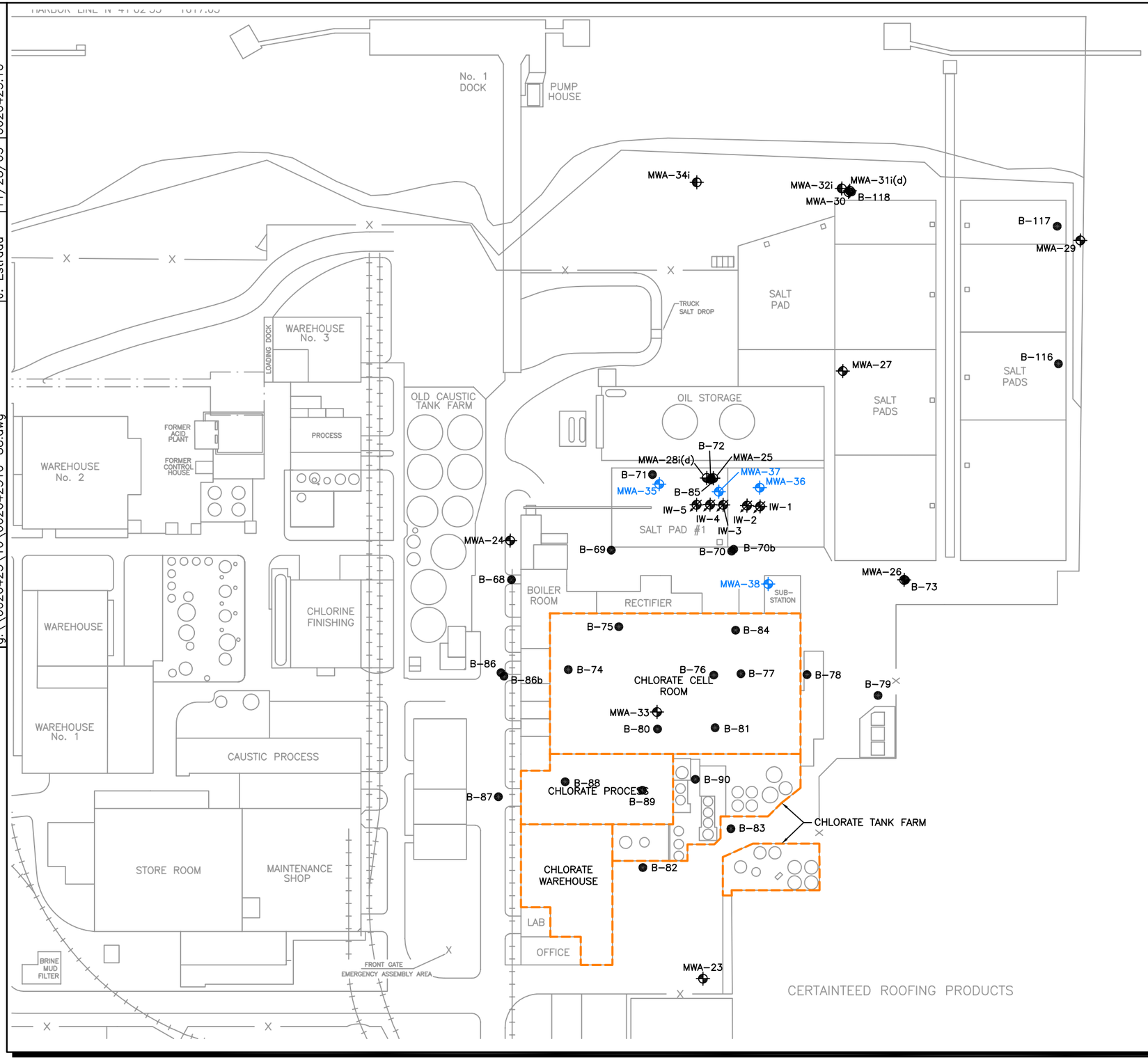


NOTE:
Most buildings and structures shown on this figure have been demolished and/or removed.

Figure 3-11
Chlorate Plant Area
Potential Source Areas
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/28/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\002042310-88.dwg



LEGEND

- Potential Chlorate Plant Area Source Areas
- MWA-23 — Chlorate Plant Area Monitoring Well, Shallow Zone
- MWA-32i — Chlorate Plant Area Montoring Well, Intermediate Zone
- MWA-31i(d) — Chlorate Plant Area Monitoring Well, Deep Zone
- IW-1 — Hexavalent Chromium Pilot Study Injection Well
- MWA-38 — Hexavalent Chromium Pilot Study Performance Monitoring Well
- B-71 — Chlorate Plant Area Remedial Investigation Soil Boring

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 120
FEET

Figure 3-12
Chlorate Plant Area
Soil and Groundwater Sampling Locations
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10

Date: 11/28/05

Drawn By: J. Estrada

CAD File: g:\0020423\10\0020423-10-02042310-89.dwg

PEN-N
PEN-B2
PEN-W
PEN-B5
PEN-B1
PEN-B3
PEN-E
PEN-B4
PEN-S
PENN-3-6
P-ROW-4
P-ROW-3
P-ROW-2
P-ROW-1
P-ROW-5
P-ROW-6
P-ROW-7
P-ROW-8
0 10 FEET

PD41-BE
PD41-SE
PD41-BW
PD41-SW
BPA-17
BPA-12
BPA-8
BPA-7
BPA-4
BPA-1
PENN-5-6, ND
PD72-BE
PD72-SE
PD72-BW
PD72-SW
BPA-18
BPA-13
BPA-9
BPA-5
BPA-2
PD31&32B
PD31&32S
PD72-BE
PD72-SE
PD72-BW
PD72-SW
PD97-S
PD97-B
PD97-S(DUP)
BPA-19
PENN-6-6
BPA-21
BPA MAIN SUBSTATION
BPA-15
BPA-14
BPA-10
BPA-3
BPA-23
BPA-6
BPA-16
BPA-11
BPA-24
BPA-22
BPA-20
PENN-1-6
PENN-4-6
DRIVEWAY
DRIVEWAY
PENN-2-6
0 30 FEET

LEGEND

- March 2002 BPA Soil Samples
- June 2002 Arkema Soil Samples
- September 2002 Soil Sample
- October 2002 Right-of-Way Soil Samples
- PEN-B — Sample From Base of Excavation (4 ft bgs)
- PEN-N,-E,-S,-W — Composite of Four Samples From Excavation Sidewalls (0, 1.5, 3 ft bgs)
- Extent of Soil Removal (Depth=4')
- Former Concrete Pads (Removed) and Soil Sample Number After Removal

NOTE: A number of buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH

PLANT NORTH

Figure 3-13
Soil Sample Locations
BPA Main Substation
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/23/05
Drawn By: R. Olson
CAD File: g:\0020423\10\0020423102-51.dwg

B'
C'
D'
A'
A
B
C
D

MWA-2
MWA-8i
MWA-13d
MWA-3
MWA-21b
MWA-4
MWA-10i
MWA-17si
MWA-9i
MWA-6r
MWA-16i
MWA-18
MWA-34i
MWA-19
MWA-32i
MWA-31i(d)
MWA-30
B-118
MWA-29
NMP-3D
NMP-4D
MWA-14i
MWA-5
MWA-20
MWA-27
FORMER MPR POND AND TRENCH
B-53
MWA-15r
MWA-11i
DDT PROCESS BUILDING
POSSIBLE DDT LOADING AREA
MCB RECOVERY UNIT
MWA-22
MWA-1 (ABANDONED)
POSSIBLE DDT LOADING AREA
DDT DRY STORAGE AREA
MWA-24
B-60
B-59
MWA-28i(d)
MWA-35
MWA-25
B-72
MWA-36
MWA-37
B-70
MWA-38
MWA-26
B-73
B-76
MWA-33
B-81
B-79
B-90
B-83
CHLORATE TANK FARM
MWA-23
MWA-12i
MWA-7

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
WAREHOUSE No. 3
LOADING DOCK
FORMER ACID PLANT
PROCESS
FORMER CONTROL HOUSE
OLD CAUSTIC TANK FARM
SALT PAD
TRUCK SALT DROP
SALT PADS
SALT PADS
OIL STORAGE
SALT PAD #1
CELL LIQUOR STORAGE
WAREHOUSE No. 2
DDT WAREHOUSE (MILLING & BAGGING)
NEW CAUSTIC TANK FARM
CAUSTIC RAIL LOAD'G
WAREHOUSE
WAREHOUSE No. 1
CHLORINE FINISHING
NITROGEN GAS
CAUSTIC PROCESS
BRINE STORAGE
BRINE FILTRATION
BRINE TREATMENT
BRINE MUD FILTER
STORE ROOM
MAINTENANCE SHOP
PA MAIN SUBSTATION
SHIFT PARKING
FRONT GATE EMERGENCY ASSEMBLY AREA
GUARD SHACK
FRONT GATE
BOILER ROOM
RECTIFIER
SUB-STATION
CHLORATE CELL ROOM
CHLORATE PROCESS
CHLORATE WAREHOUSE
LAB
OFFICE
MAIN OFFICE
OFFICE PARKING
CERTAINTEED ROOFING PRODUCTS

Approximate Upland Extent of Fill Material

TRUE NORTH
PLANT NORTH
0
120
FEET

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Shallow Zone
- Montoring Well, Intermediate Zone
- Monitoring Well, Deep Zone
- Monitoring Well, Upper Portion Shallow Zone
- Monitoring Well, Lower Portion Shallow Zone
- Soil Boring
- NMP-3D: Persulfate Pilot Study Monitoring Point
- A — A': Cross Section Line

Figure 4-1
Cross Section Location Map
Arkema Inc.
Portland, Oregon
ERM 11/05

CAD File: G:_0020423\10\0020423l0-17.dwg | Drawn By: J. Estrada | Date: 11/23/05 | Project No. 0020423.10

A (Plant North)

A' (Plant South)

MWA-14i
MWA-5
Bend in Section
MWA-2
MWA-8i
MWA-13d
MWA-17si
MWA-3
MWA-9i
MWA-21b
MWA-4
MWA-10i
Bend in Section
MWA-6r
Bend in Section
MWA-16i
Bend in Section
MWA-18
Bend in Section
MWA-34i
MWA-19
MWA-32i
MWA-30
B-118
MWA-31l(d)
MWA-29

Elevation (ft msl)

40
30
20
10
0
−10
−20
−30
−40
−50

(06/03)

Fill

Dark gray-brown sand

Black sand

Dark gray-brown sand

Black sand

Dark gray-brown sand

Dark gray-brown sand

?

LEGEND

- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- Basalt

B-59 — Geoprobe® boring number

MWA-1 — Well number

Cased interval

Screen interval

Shallow-zone groundwater surface (approximate); June 2003

Inferred soil or geologic contact (queried where uncertain)

(Vertical Exaggeration = 5X)

0

VERTICAL SCALE IN FEET
1" = 20'

20

0 100

HORIZONTAL SCALE IN FEET
1" = 100'

Figure 4-2
Cross Section A-A'
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: g:\0020423\10\002042310-18.dwg | Drawn By: J. Estrada | Date: 11/23/05 | Project No. 0020423.10

B (Plant West)

B' (Plant East)

Bend in Section

Bend in Section

Former MCB Recovery Area

Former Pond and Trench Area

MWA-7
MWA-12i
B-59
B-60
MWA-1 (abandoned)
MWA-11i
B-53 (projected)
MWA-15r
NMP-4D
NMP-3D
MWA-17si
MWA-13d
MWA-21b
MWA-9i
MWA-3

Dock 2

(06/03)

Dark gray-brown sand

Black sand

(06/03)

Willamette River

Elevation (ft msl)

40
30
20
10
0
−10
−20
−30
−40
−50

?

LEGEND

- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- Basalt

B-59 — Geoprobe® boring number

MWA-1 — Well number

Cased interval

Screen interval

Shallow-zone groundwater surface (approximate); June 2003; Based on monitoring well data only

Inferred soil or geologic contact (queried where uncertain)

Stratigraphy Beneath River Provided by Exponent

(Vertical Exaggeration = 4X)

0

APPROX. VERTICAL SCALE IN FEET 1" = 25'

25

0 100

APPROX. HORIZONTAL SCALE IN FEET 1" = 100'

Figure 4-3
Cross Section B-B'
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: g:\0020423\10\002042310-19.dwg
Drawn By: J. Estrada
Date: 11/23/05
Project No. 0020423.10

C (Plant West)

C' (Plant East)

Chlorate Cell Room

Salt Pad

MWA-23
B-83 (projected)
B-90
B-81 (projected)
MWA-33
B-76 (projected)
B-70 (projected)
B-85
MWA-28I(d)
MWA-25
B-72
MWA-34i
MWA-19

Approximate Elevation (ft MSL)

40
30
20
10
0
-10
-20

(06/03)
(06/03)
(06/03)

Willamette River

LEGEND

- Concrete or asphalt
- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- MWA-30, B-74 — Well or boring I.D. number
- Soil Boring with groundwater sample interval
- Monitoring well with screen casing
- Inferred soil contact (queried where uncertain)
- Shallow-zone groundwater surface (June 2003); dashed and open symbol where approximate; based on monitoring well data only

Stratigraphy Beneath River Provided by Exponent, Inc.

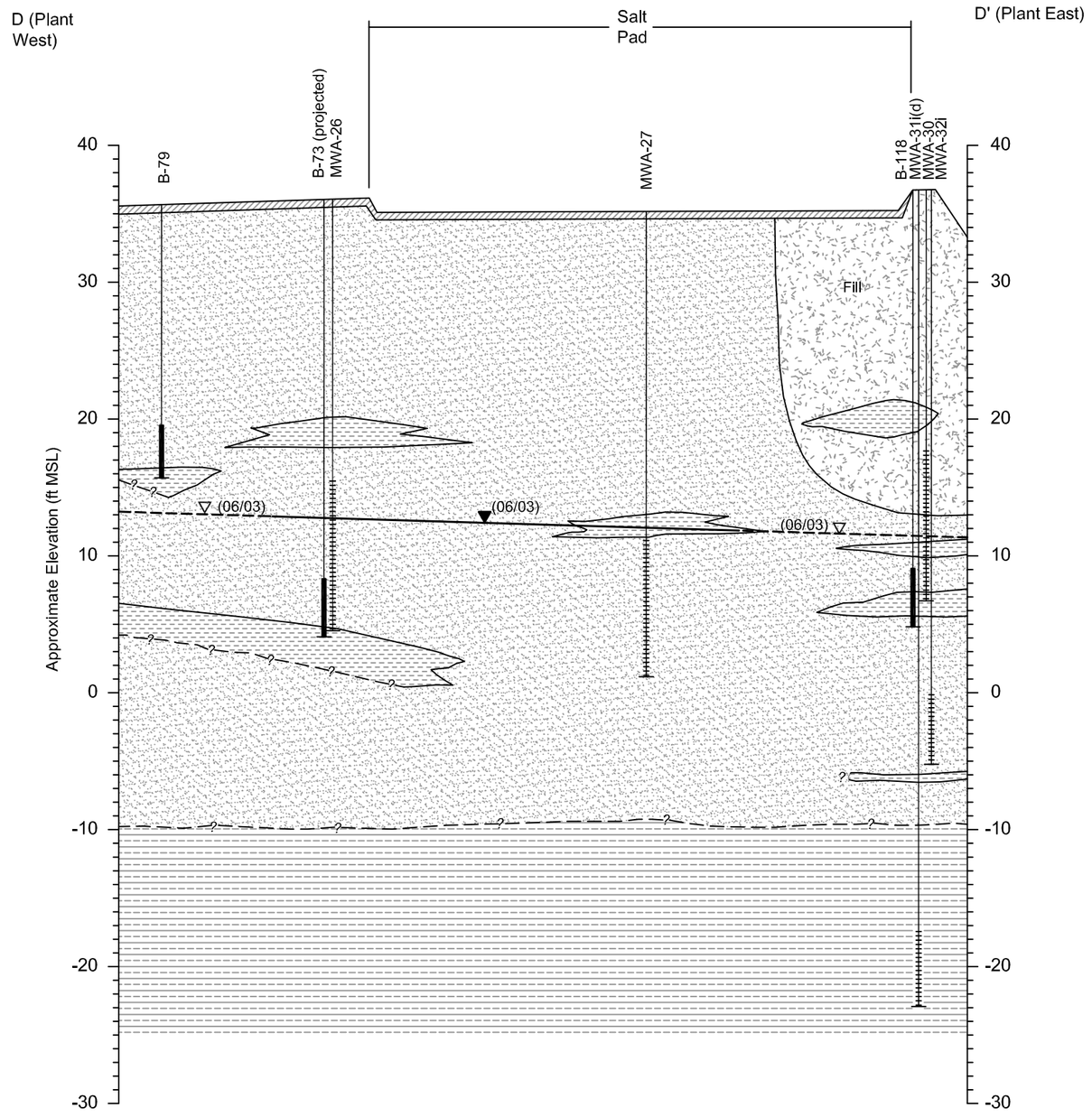
(Vertical Exaggeration = 10X)

0
VERTICAL SCALE IN FEET 1" = 10'
10
0
100
HORIZONTAL SCALE IN FEET 1" = 100'

Figure 4-4
Cross Section C-C'
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: g:\0020423\10\002042310-20.dwg
Drawn By: J. Estrada
Date: 11/23/05
Project No. 0020423.10



LEGEND

- Concrete or asphalt
- Fill with debris
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- MWA-30, B-74 — Well or boring I.D. number
- Boring with groundwater sample interval
- Monitoring well with screen casing interval
- Inferred soil contact (queried where uncertain)
- Shallow-zone groundwater surface (June 2003); dashed and open symbol where approximate; based on monitoring well data only

(Vertical Exaggeration = 10X)

0
APPROX. VERTICAL SCALE IN FEET
1" = 10'
10

0 100
APPROX. HORIZONTAL SCALE IN FEET
1" = 100'

Figure 4-5
Cross Section D-D'
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/23/05
Drawn By: J. Estrada
Job File: G:\0020423\10\002042310-21.dwg

June1999

September 1999

November 1999

March 2000

March 2001

June 2001

November 2001

April 2002

June 2003

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Intermediate Zone
- Monitoring Well, Deep Zone
- 14.0 — Groundwater Elevation Contour; Dashed Where Inferred
- 14.21 — Groundwater Elevation (ft amsl)
- Direction of Groundwater Flow
- Approximate Limits of Former Acid Plant Area
- Willamette River Bank

0 100 FEET

Note:
Most buildings and structures noted on this diagram have been demolished and/or removed.

Figure 4-6
Acid Plant Area
Shallow-Zone Groundwater Elevation Maps
From June 1999 to June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/23/05
Drawn By: J. Estrada
Job File: G:\0020423.10\002042310-22.dwg

June1999

September 1999

November 1999

March 2000

March 2001

June 2001

November 2001

April 2002

June 2003

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Intermediate Zone
- Monitoring Well, Deep Zone
- 10.0 — Groundwater Elevation Contour; Dashed Where Inferred
- 9.76 — Groundwater Elevation (ft amsl)
- Direction of Groundwater Flow
- Approximate Limits of Former Acid Plant Area
- Willamette River Bank

0 100 FEET

Note:
Most buildings and structures noted on this diagram have been demolished and/or removed.

0 120 FEET

Figure 4-7
Acid Plant Area
Intermediate-Zone Groundwater Elevation Maps
From June 1999 to June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-13.dwg	R. Olson	09/15/05	0020423.10

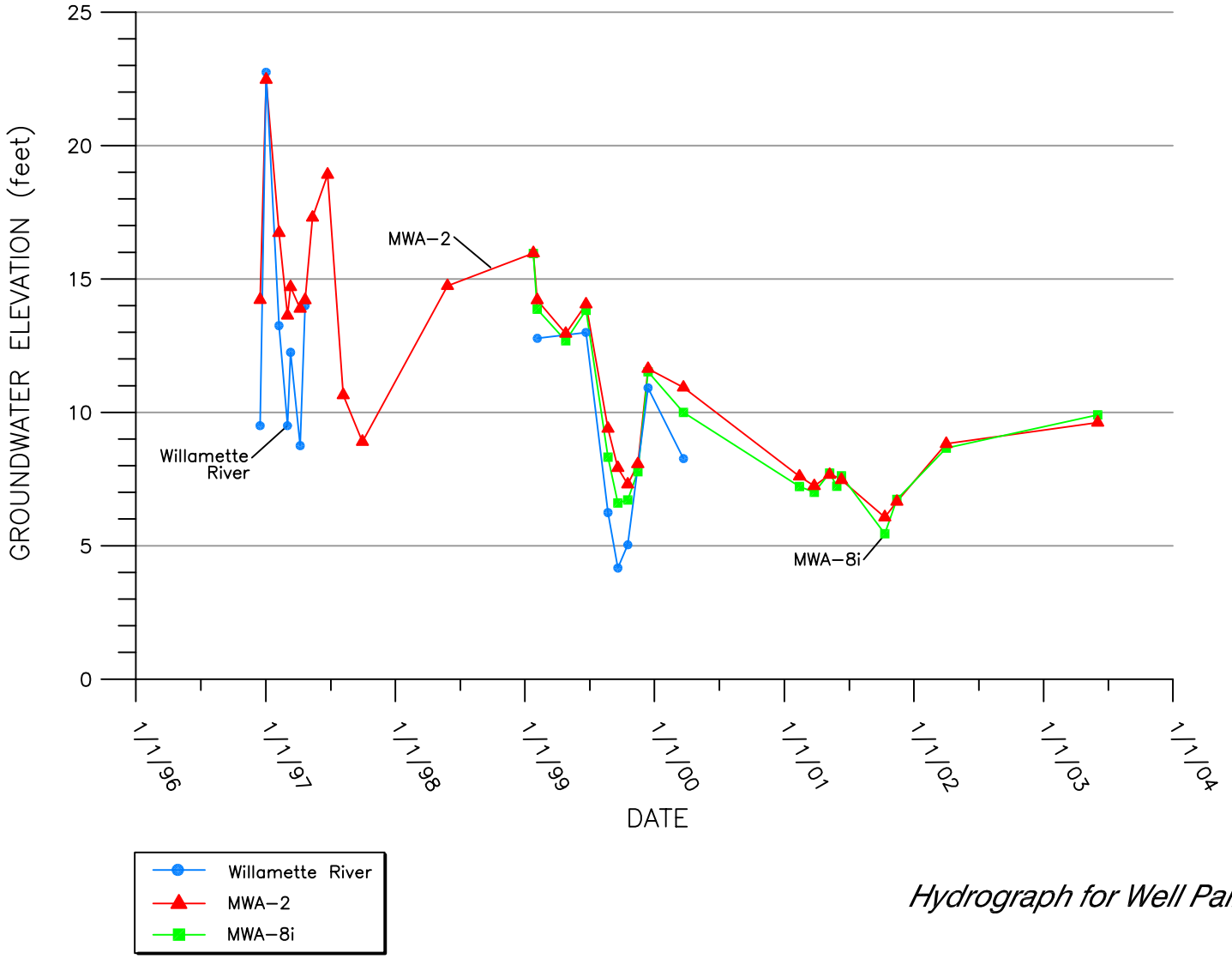


Figure 4-8

Hydrograph for Well Pair MWA-2/MWA-8i

Arkema Inc.

Portland, Oregon

ERM 09/05

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-13.dwg	R. Olson	09/15/05	0020423.10

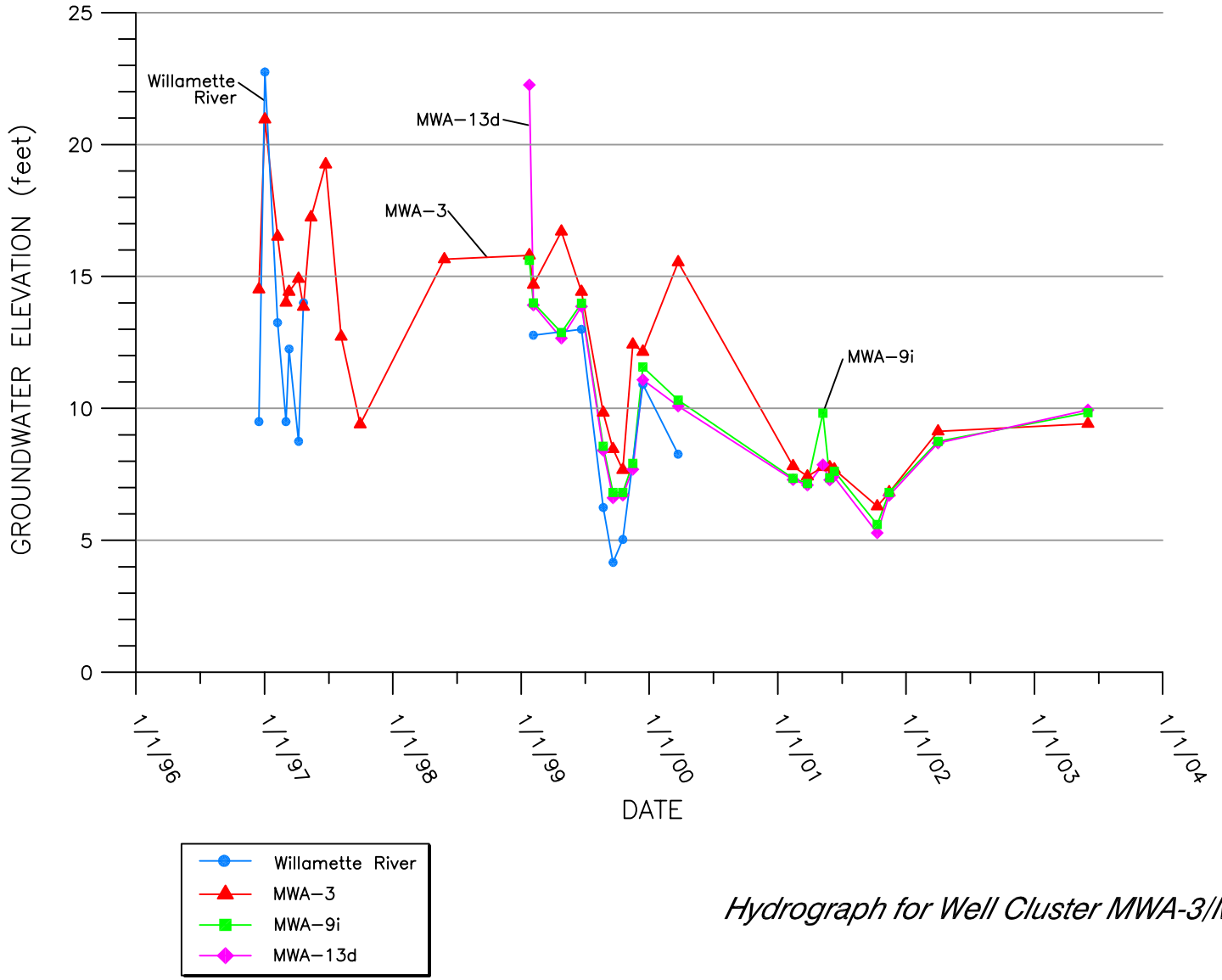


Figure 4-9

Hydrograph for Well Cluster MWA-3/MWA-9i/MWA-13d

Arkema Inc.

Portland, Oregon

ERM 09/05

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-13.dwg	R. Olson	09/15/05	0020423.10

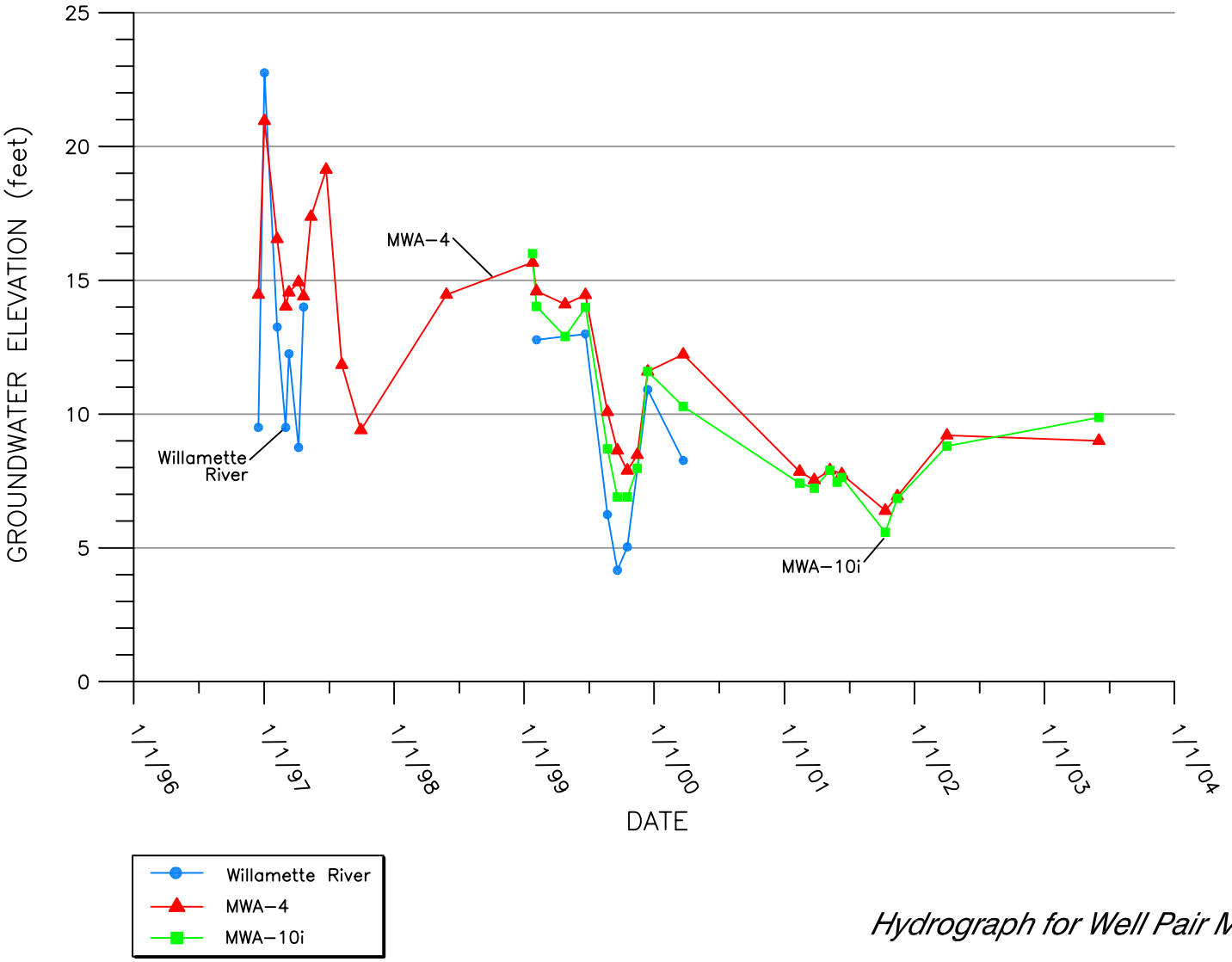


Figure 4-10

Hydrograph for Well Pair MWA-4/MWA-10i

Arkema Inc.

Portland, Oregon

ERM 09/05

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-13.dwg	R. Olson	09/15/05	0020423.10

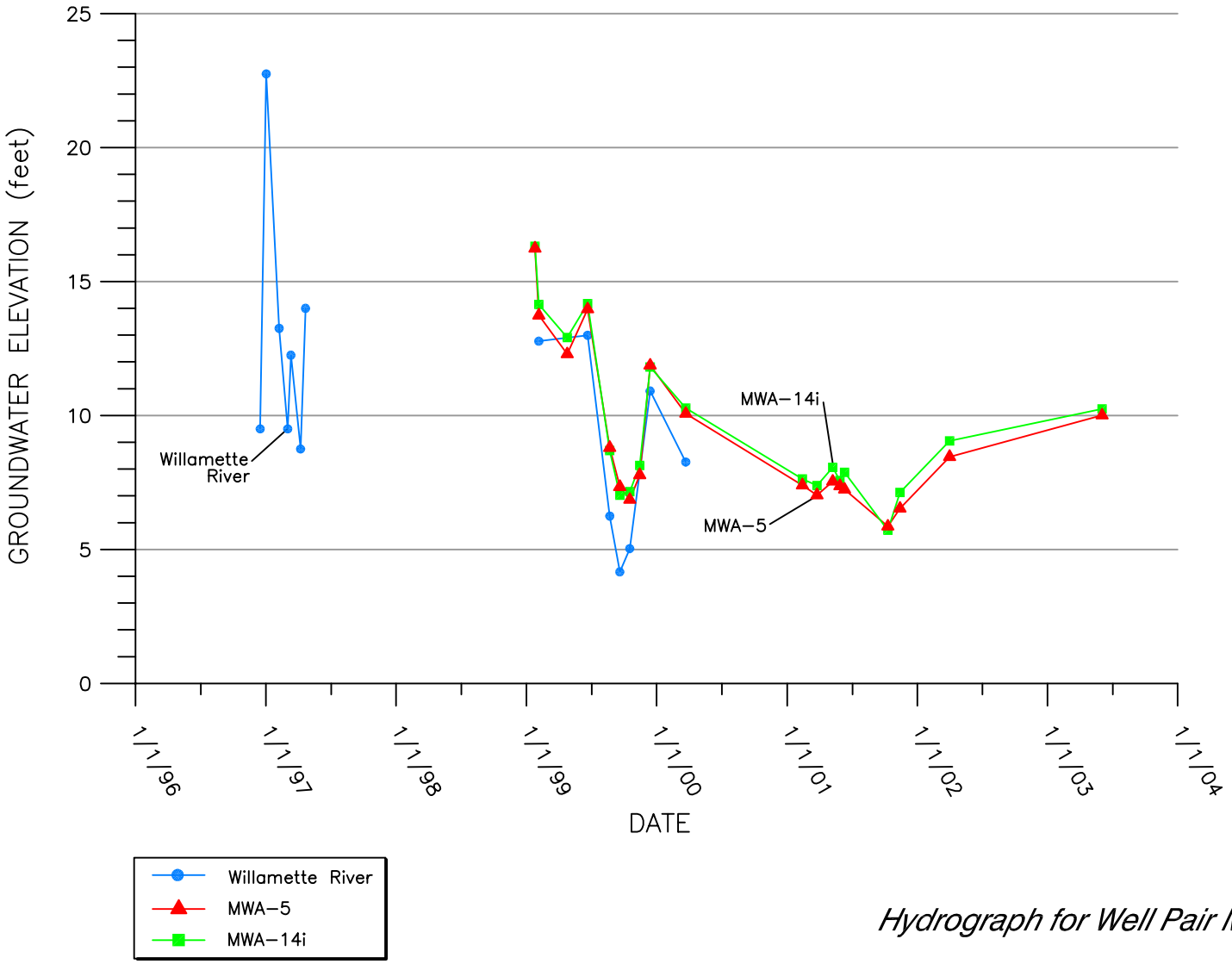


Figure 4-11

Hydrograph for Well Pair MWA-5/MWA-14i

Arkema Inc.

Portland, Oregon

ERM 09/05

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-13.dwg	R. Olson	09/15/05	0020423.10

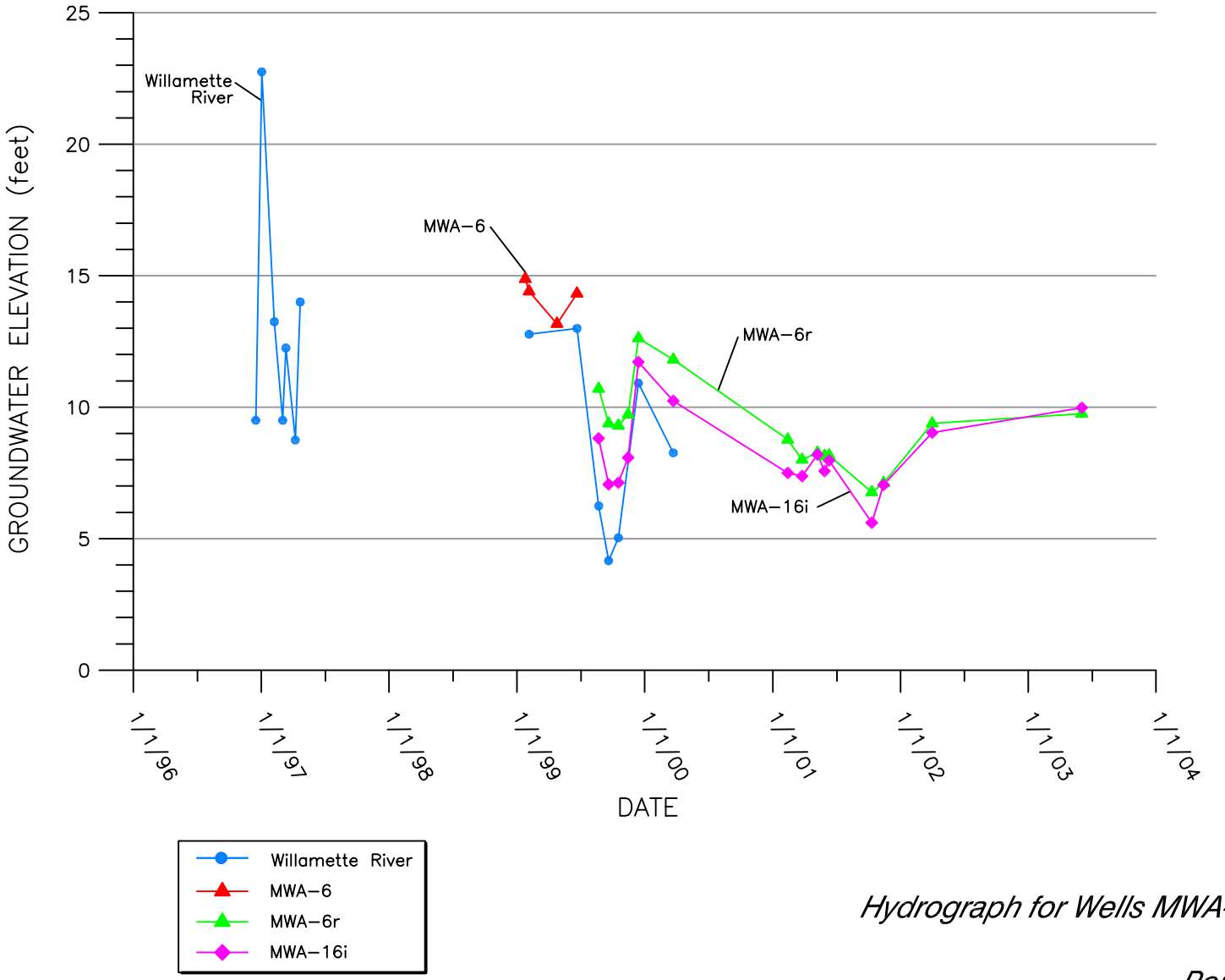


Figure 4-12

Hydrograph for Wells MWA-6/6r/MWA-16i

Arkema Inc.

Portland, Oregon

ERM 09/05

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-13.dwg	R. Olson	09/15/05	0020423.10

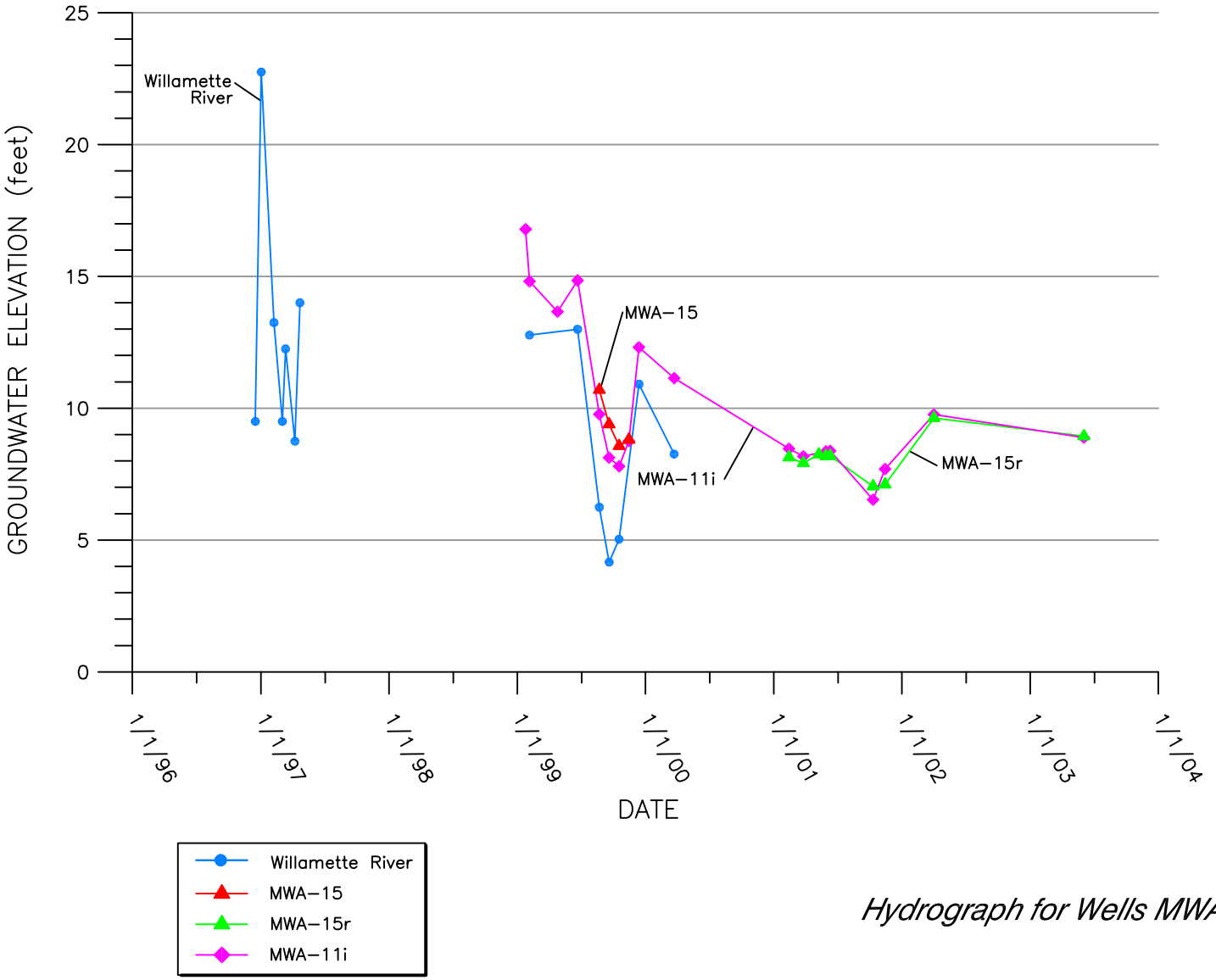


Figure 4-13

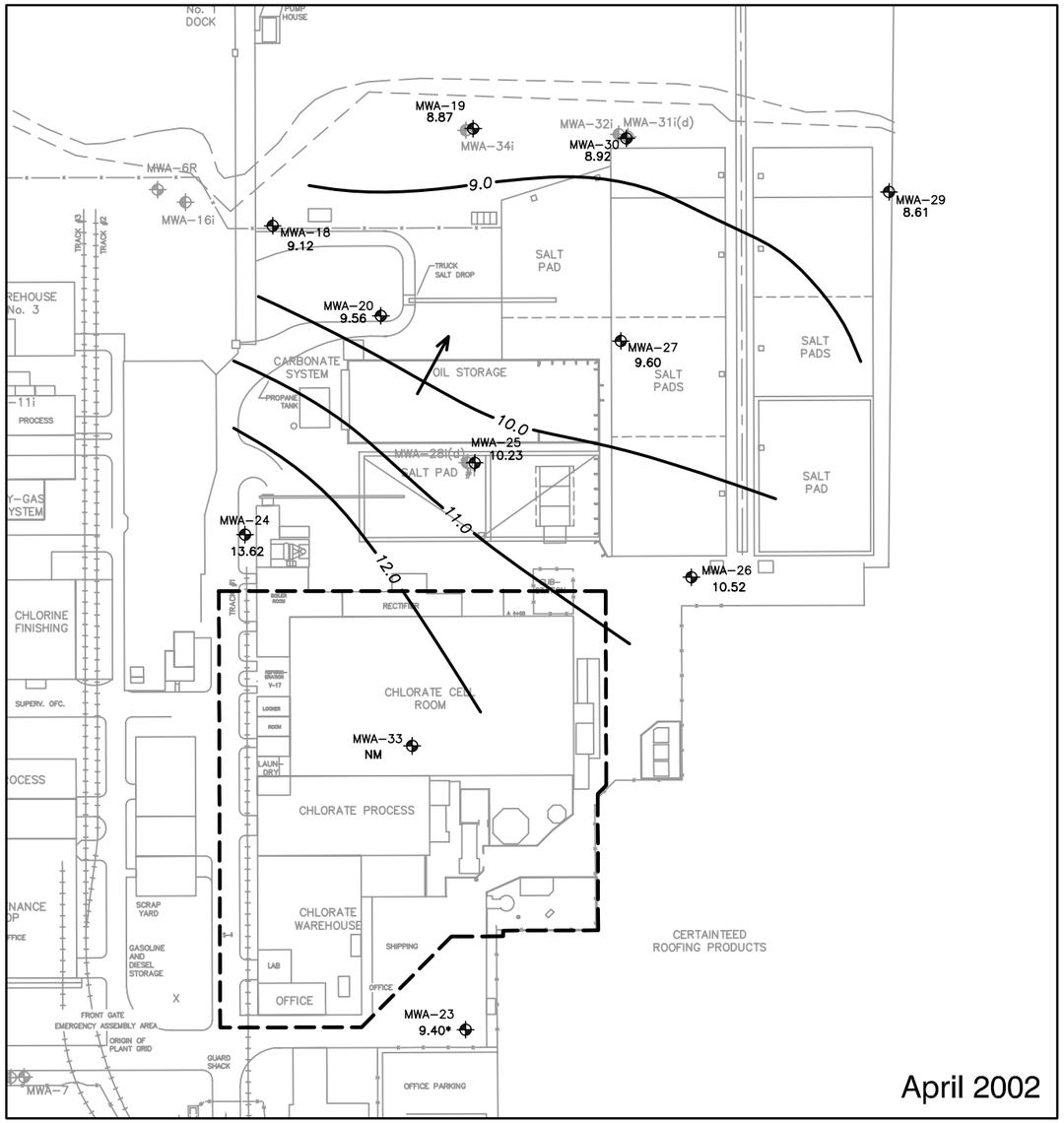
Hydrograph for Wells MWA-15/15r/MWA-11i

Arkema Inc.

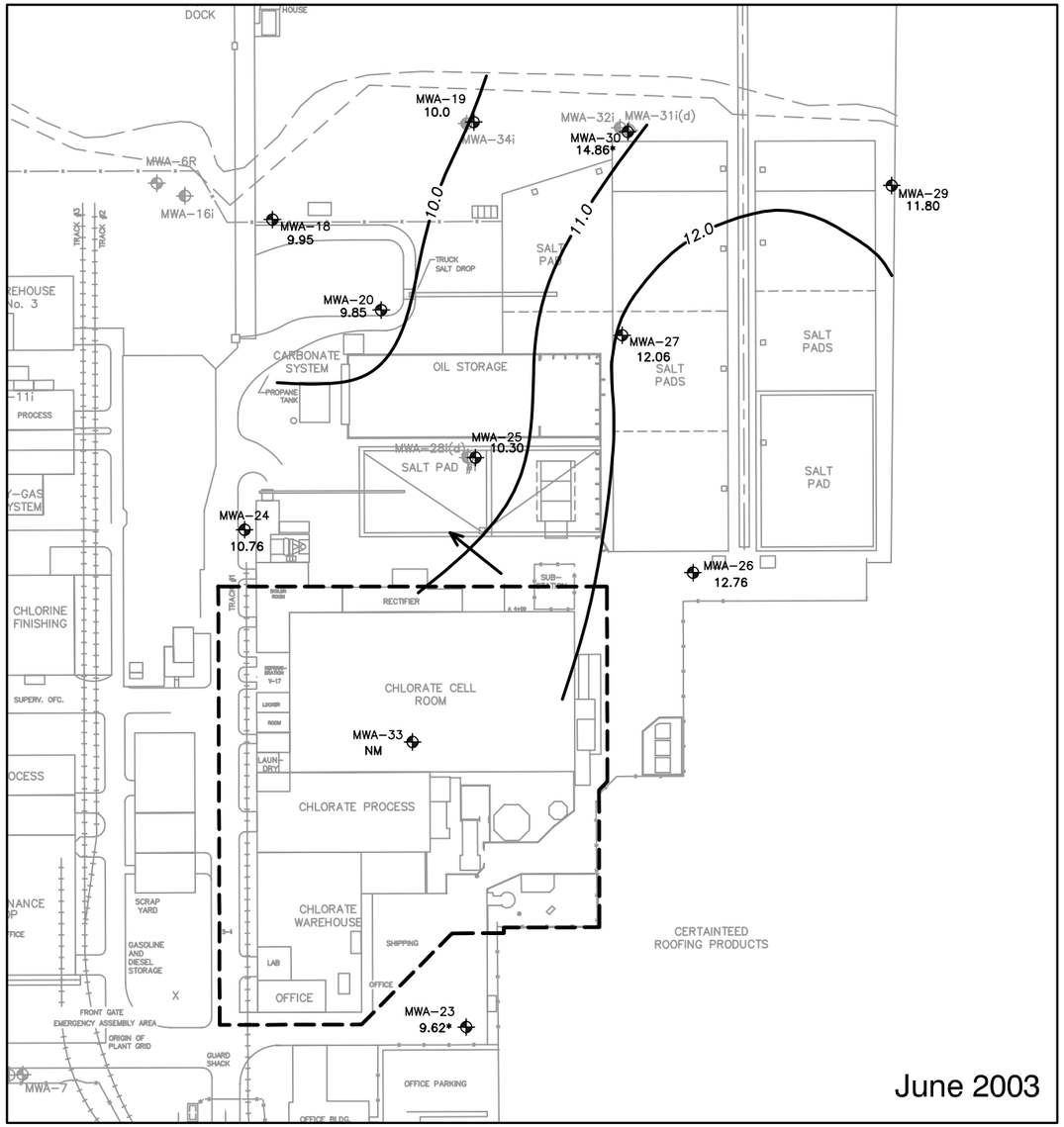
Portland, Oregon

ERM 09/05

CAD File: G:\0020423\10\0020423l0-14.dwg
Drawn By: R. Olson
Date: 11/23/05
Project No. 0020423.10



April 2002



June 2003

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Intermediate Zone
- Monitoring Well, Deep Zone
- 10.0 — Groundwater Elevation Contour; Dashed Where Inferred
- 9.76 — Groundwater Elevation (ft amsl)
- * — Anamolous Data, Not Used for Contouring
- NM — Not Measured
- Direction of Groundwater Flow
- Willamette River Bank
- Limits of Chlorate Plant Area

Note:
Most buildings and structures noted on this diagram have been demolished and/or removed.

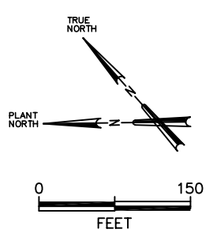
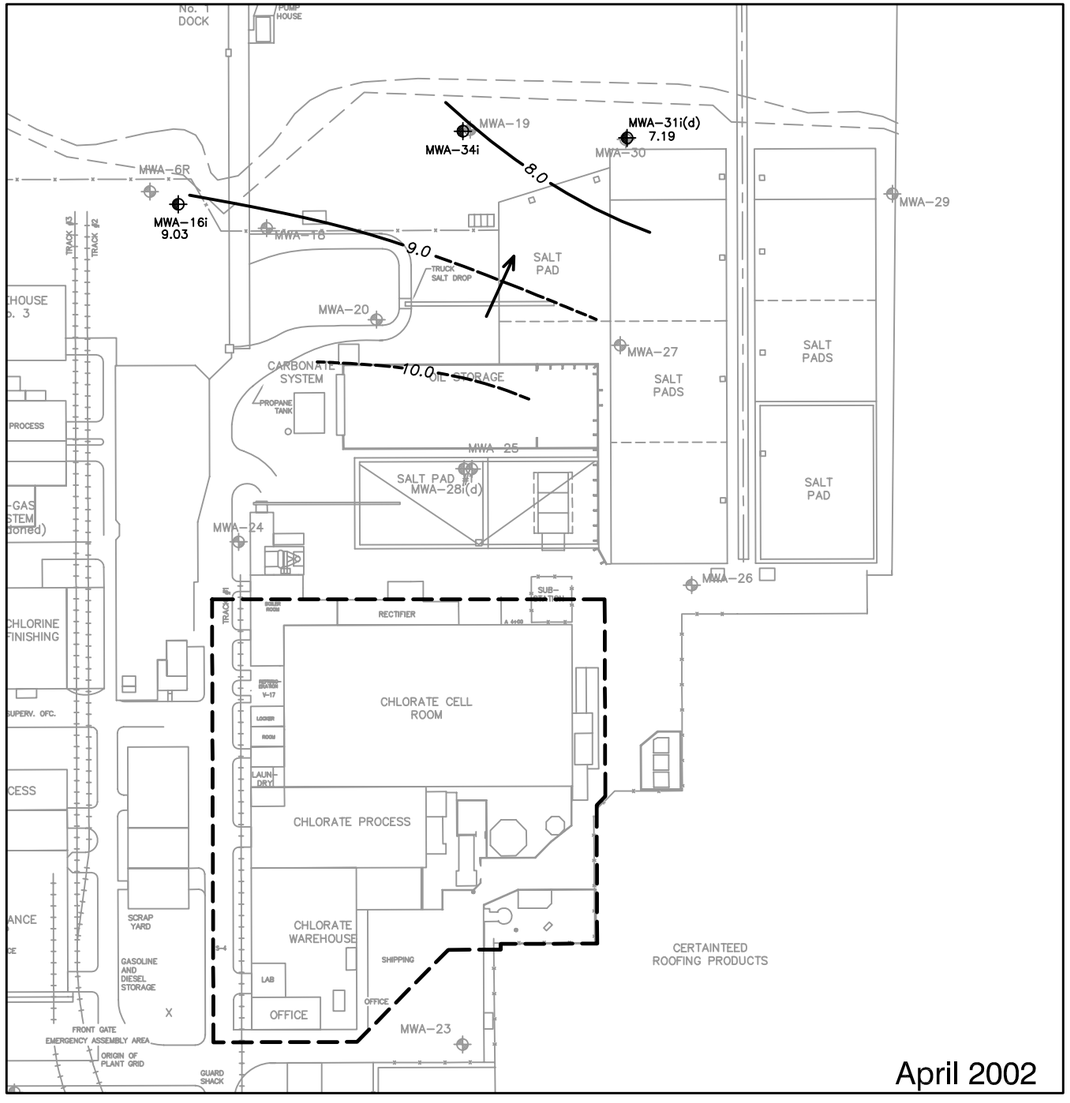


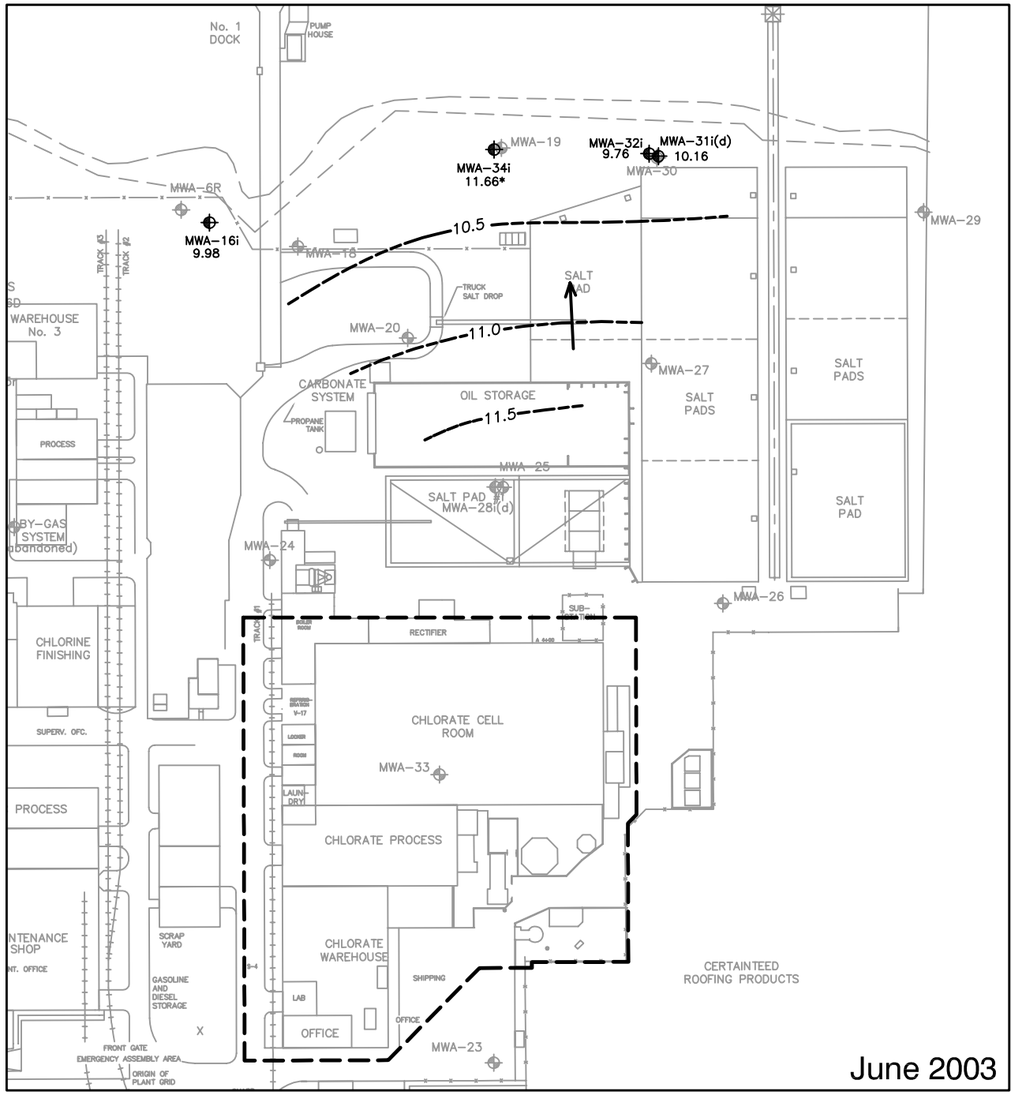
Figure 4-14
Chlorate Plant Area
Shallow-Zone Groundwater Elevation Maps
For April 2002 and June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: G:_0020423\10\0020423l0-15.dwg
Drawn By: R. Olson
Date: 11/23/05
Project No. 0020423.10



April 2002



June 2003

Note:
Most buildings and structures noted on this diagram have been demolished and/or removed.

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Intermediate Zone
- 9.76 Groundwater Elevation (ft amsl)
- * Anamolous Data; Not Used for Contouring
- NM Not Measured
- 10.0 Groundwater Elevation Contour; Dashed Where Inferred
- Direction of Groundwater Flow
- Willamette River Bank
- Limits of Chlorate Plant Area

TRUE NORTH
PLANT NORTH
0 150
FEET

Figure 4-15
Chlorate Plant Area
Intermediate-Zone Groundwater Elevation Maps
For April 2002 and June 2003
Arkema Inc.
Portland, Oregon
ERM 11/05

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-13.dwg	R. Olson	09/15/05	0020423.10

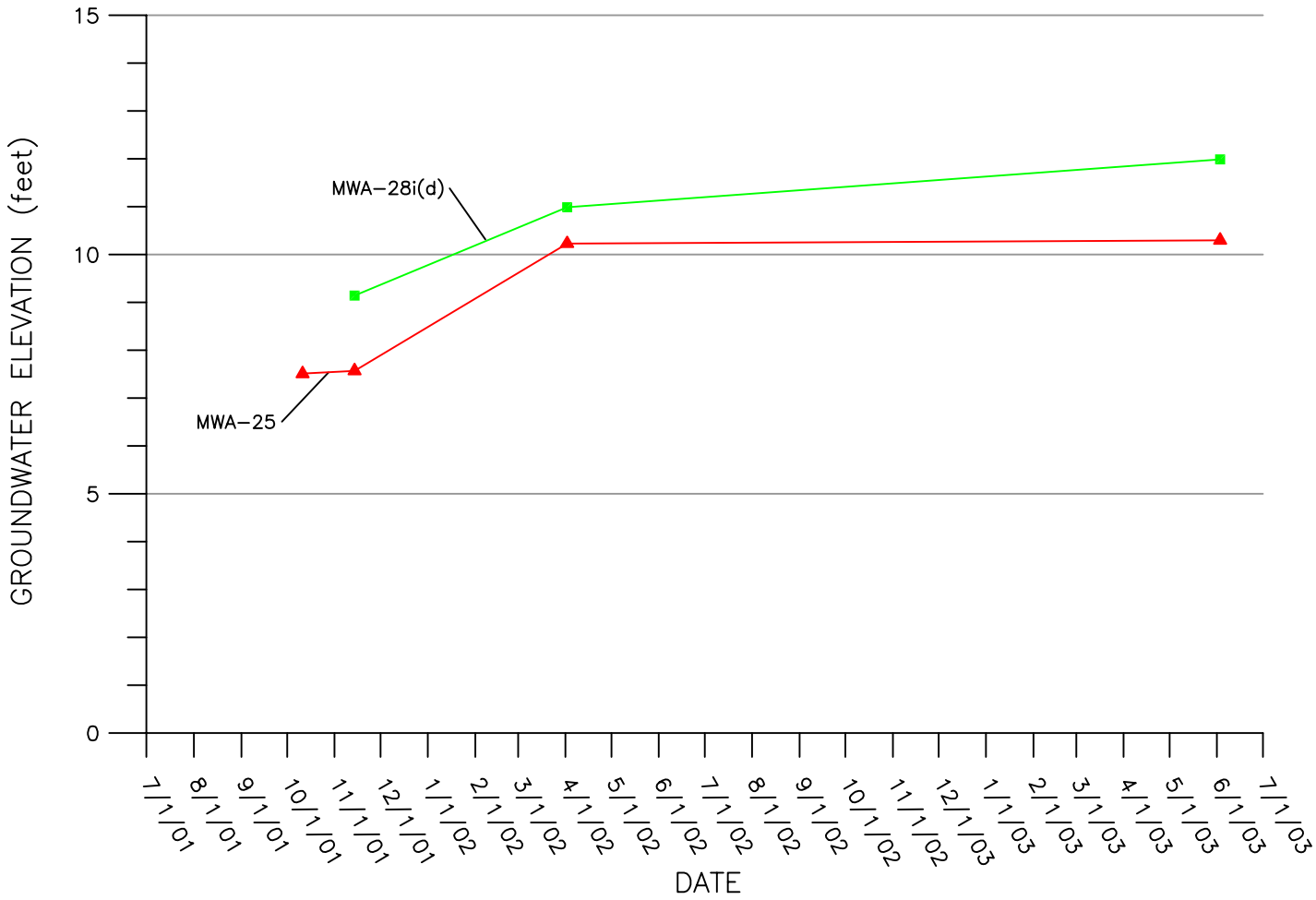


Figure 4-16

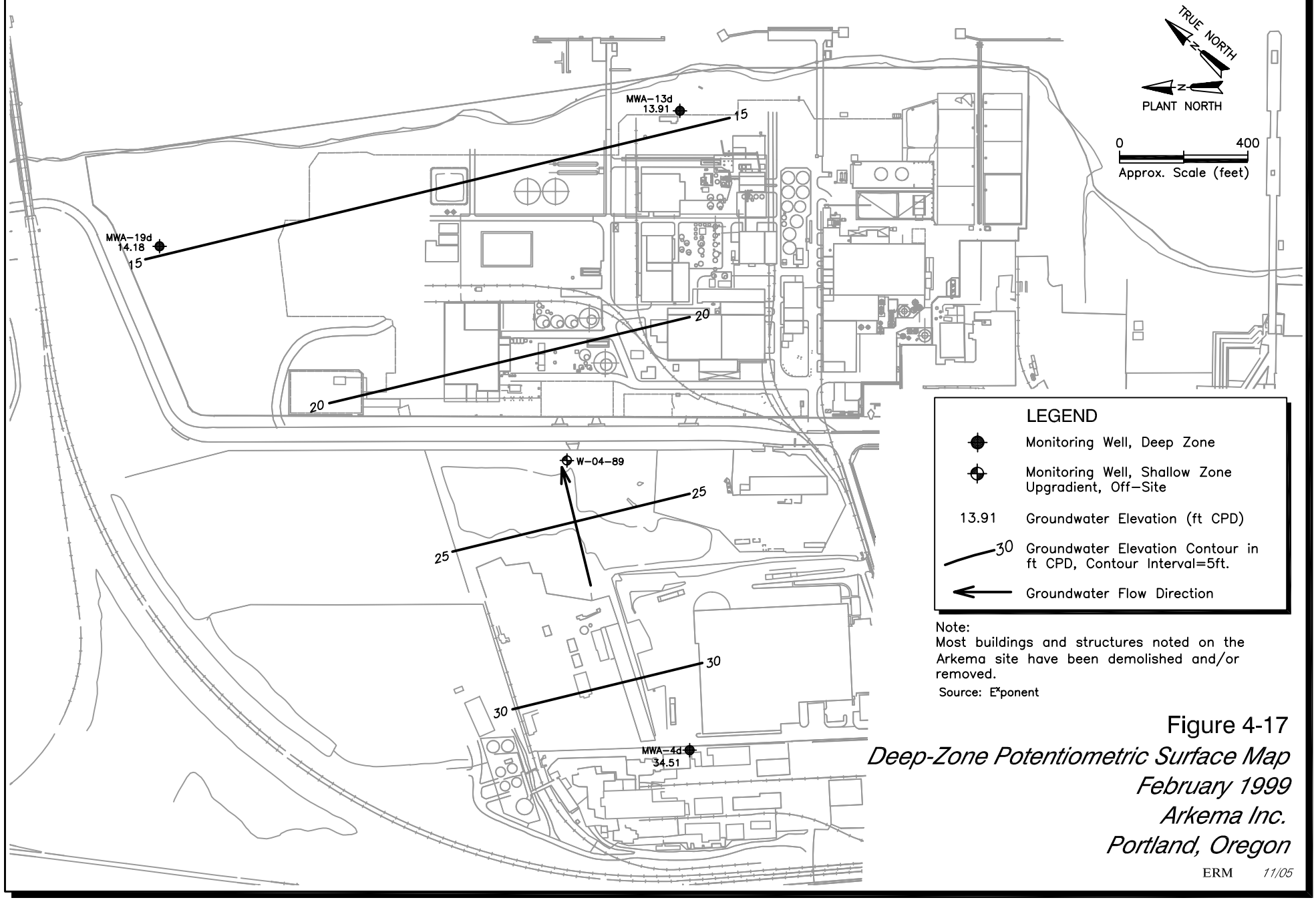
Hydrograph for Well Pair MWA-25/MWA-28i(d)

Arkema Inc.

Portland, Oregon

ERM 09/05

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-16.dwg	J. Estrada	11/23/05	0020423.10



Note:
Most buildings and structures noted on the Arkema site have been demolished and/or removed.

Source: E*ponent

Figure 4-17

Deep-Zone Potentiometric Surface Map
February 1999
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File:	Drawn By:	Date:	Project No.
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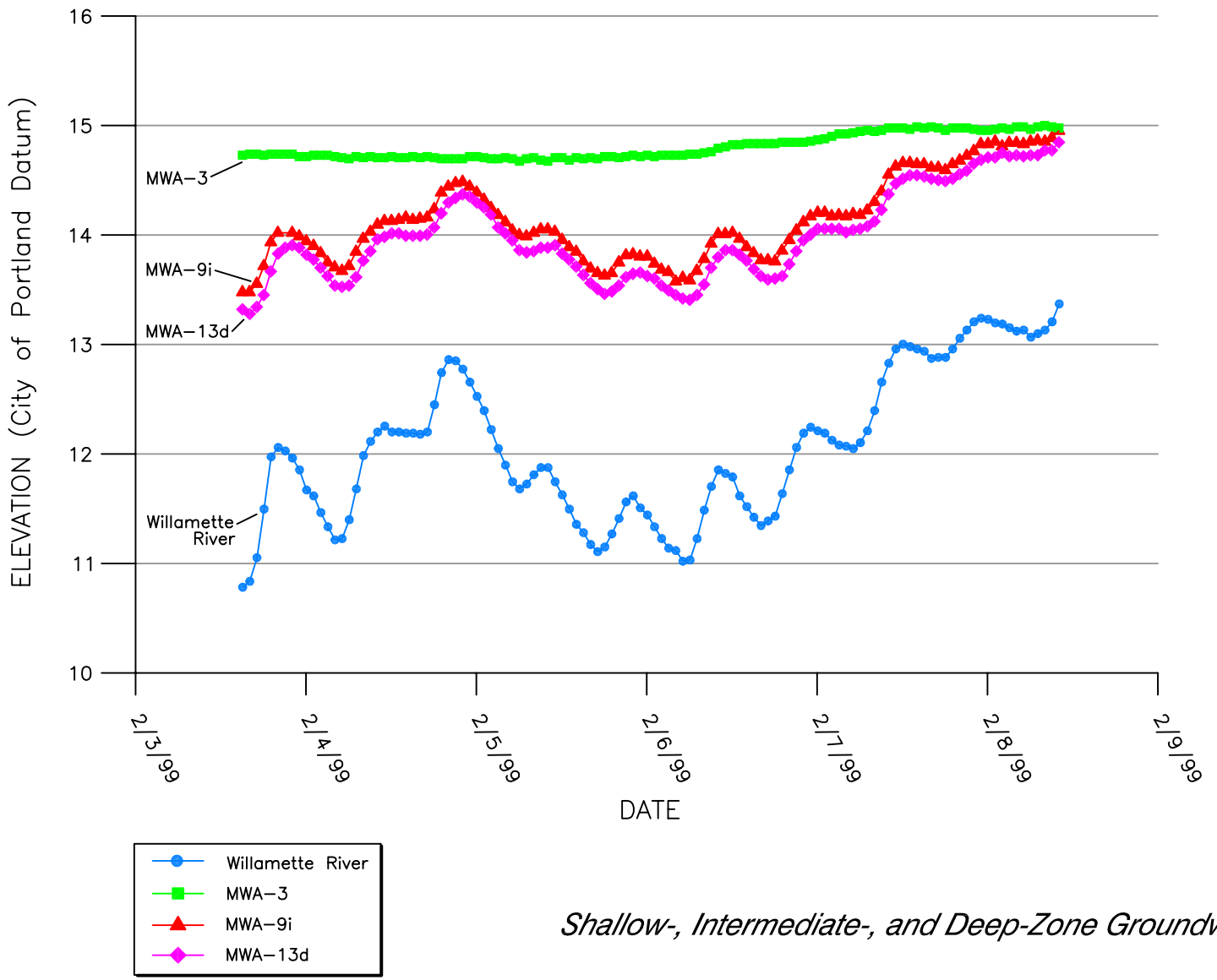


Figure 4-18

Shallow-, Intermediate-, and Deep-Zone Groundwater Hydrograph
February 1999
Arkema Inc.
Portland, Oregon

ERM 09/05

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-12.dwg	R. Olson	09/15/05	0020423.10

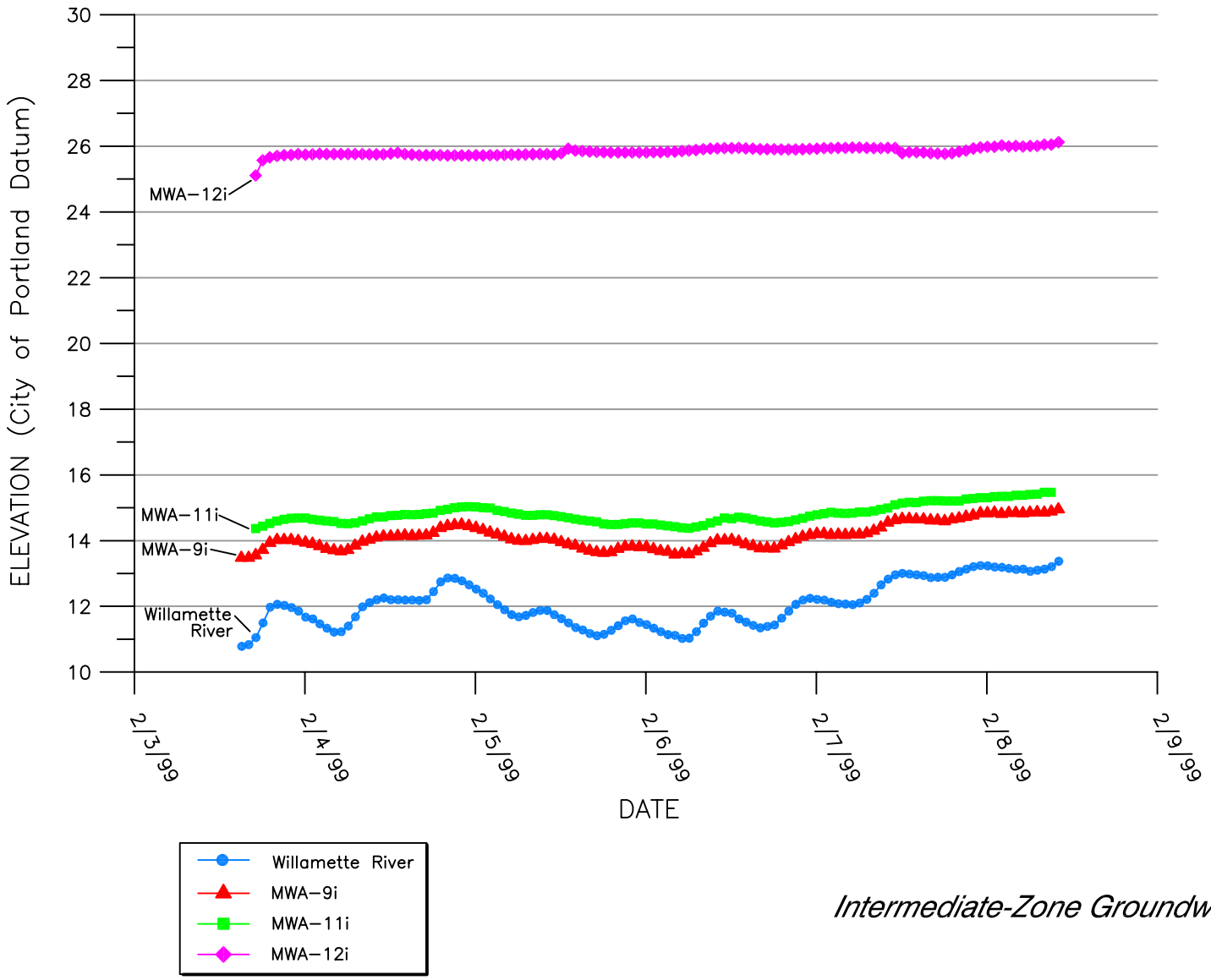
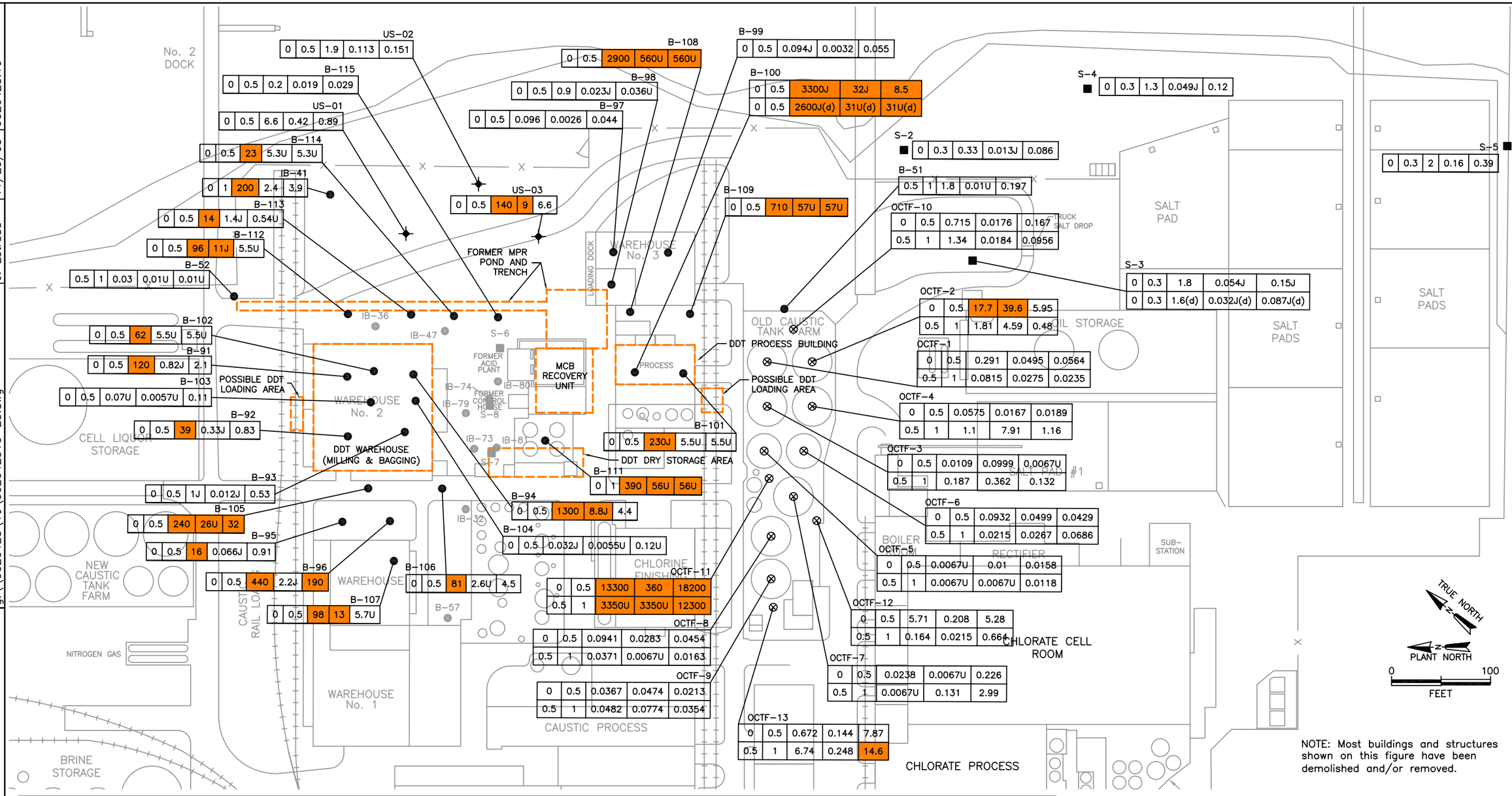


Figure 4-19

Intermediate-Zone Groundwater Hydrograph
February 1999
Arkema Inc.
Portland, Oregon

ERM 09/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423I0-25.dwg



NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- IB-41 ● Soil Removal IRM Soil Boring Location
- B-112 ● RI Soil Boring Location
- OCTF-10 ⊗ Old Caustic Tank Farm Soil Boring Location
- US-03 ✦ Unpaved Area Soil Boring Location
- S-4 ■ Surface Soil Sample Location

Note: Grayed sample locations indicates soil at this location was removed as part of the soil removal IRM.

0 | 0.5 | 140 | 9 | 6.6

- 0 — Upper Depth (ft bgs)
- 0.5 — Lower Depth (ft bgs)
- 6.6 — 4–4'–DDE Concentration (mg/kg)
- 9 — 4–4'–DDD Concentration (mg/kg)
- 140 — 4–4'–DDT Concentration (mg/kg)

Indicates concentration above screening levels (Source: USEPA Region 9 PRG).
DDT – 7 mg/kg
DDD – 10 mg/kg
DDE – 7 mg/kg

(d) = Duplicate Sample Result
J = Estimated Concentration
U = Undetected at the Detection Limit Shown

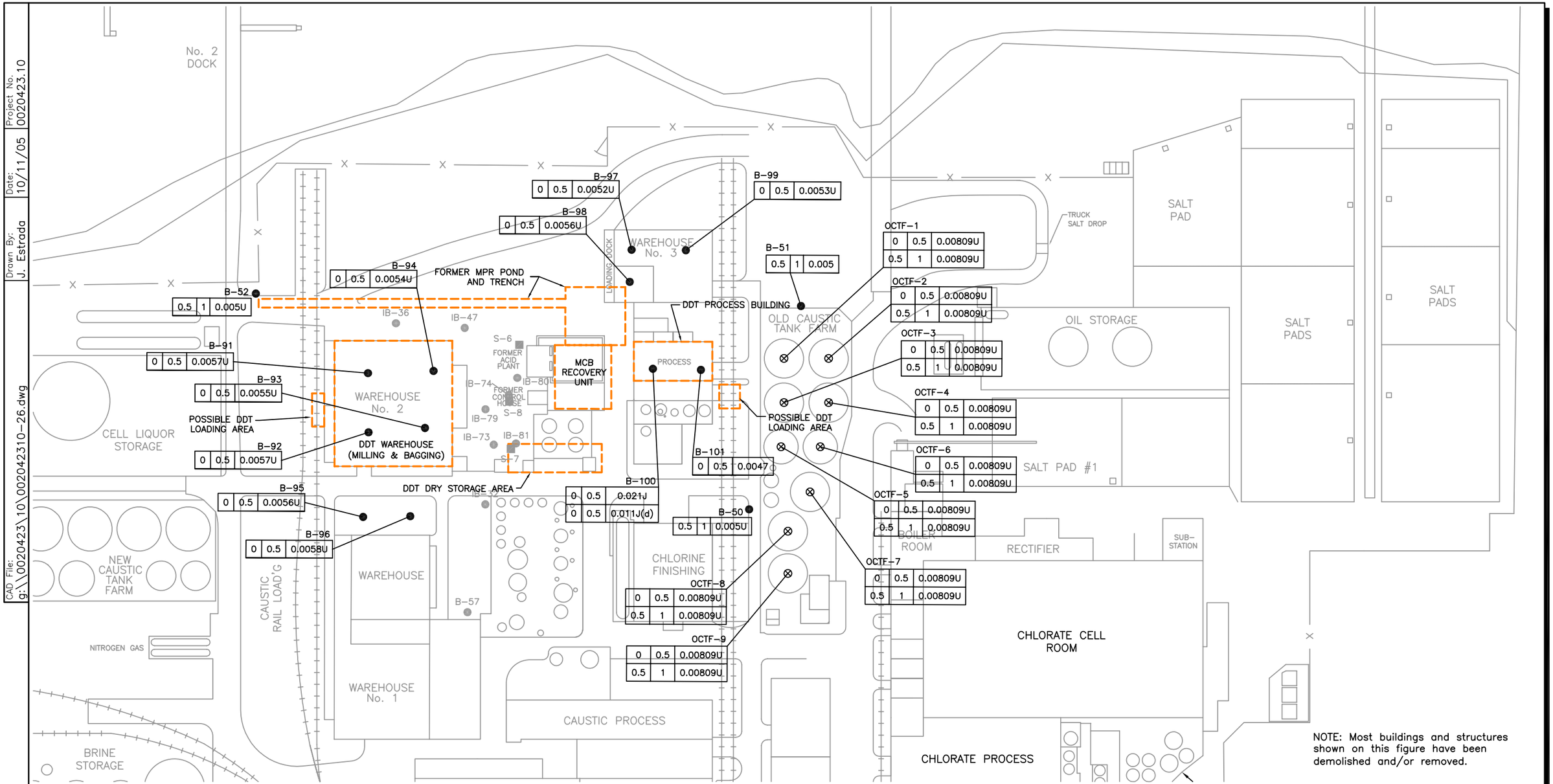
Figure 5-1

DDT, DDD, and DDE Concentrations in Surface Soil (0-1 foot bgs)
Arkema Inc.
Portland, Oregon

ERM 11/05

Figure 5-1a
Sample Locations with Concentrations Above DDT Screening Levels in Soil (0-1 foot bgs)
Arkema Inc.
Portland, Oregon

ERM *11/05*



NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

IB-41 ●	Soil Removal IRM Soil Boring Location
B-112 ●	RI Soil Boring Location
US-03 ✦	Unpaved Area Soil Boring Location
S-4 ■	Surface Soil Sample Location

Note: Grayed sample locations indicates soil at this location was removed as part of the soil removal IRM.

All sample concentrations were below the preliminary screening level of 530 mg/kg (USEPA Region 9 PRG).

0 | 0.5 | 0.0047

Upper Depth (ft bgs)
Lower Depth (ft bgs)
Chlorobenzene Concentration (mg/kg)

(d) = Duplicate Sample Result
J = Estimated Concentration
U = Undetected at the Detection Limit Shown

TRUE NORTH
PLANT NORTH
0 100
FEET

Figure 5-2
Chlorobenzene Concentrations in Soil (0-1 foot bgs)
Arkema Inc.
Portland, Oregon

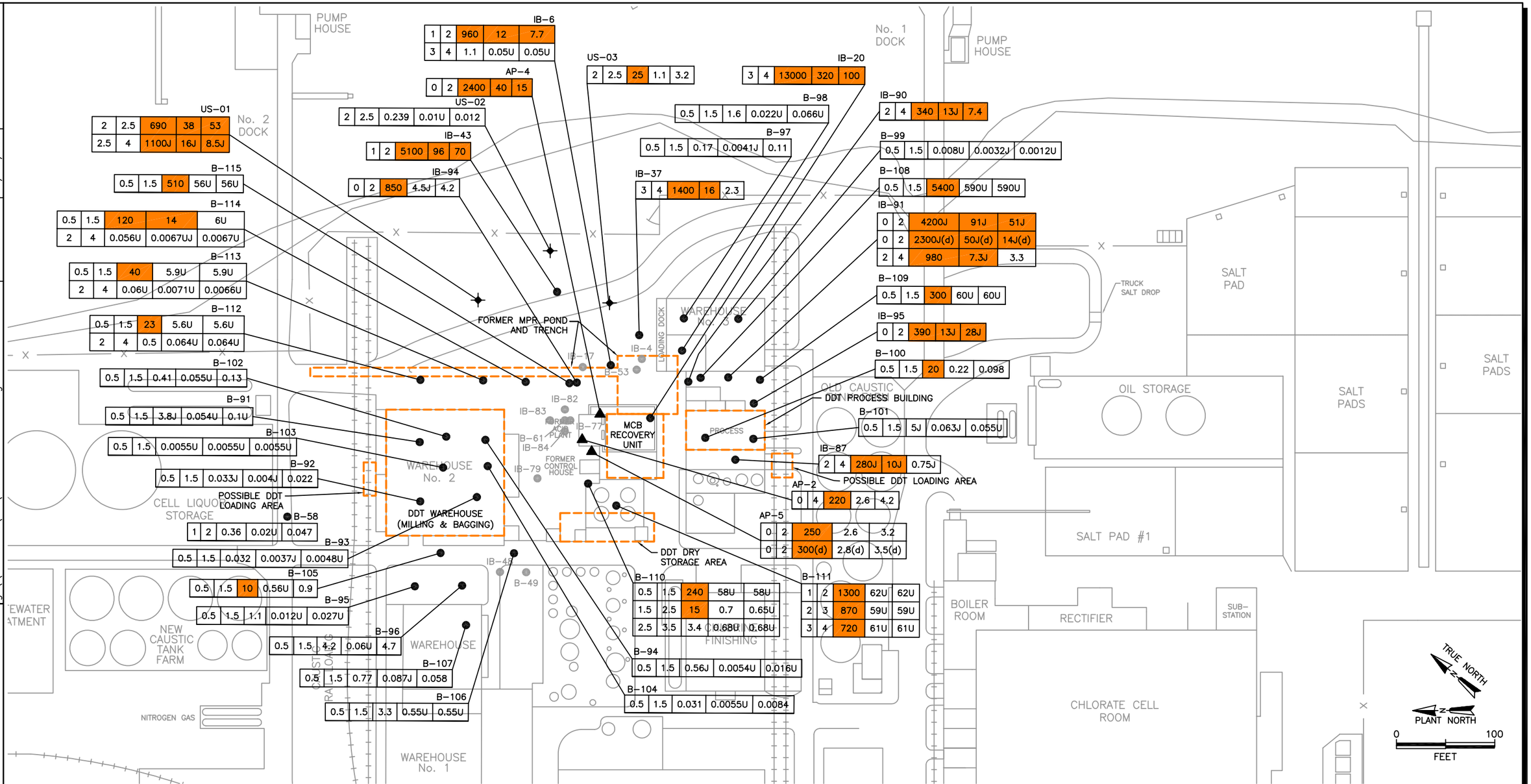
ERM 10/05

Project No. 0020423.10
Date: 10/11/05
Drawn By: J. Estrada
CAD File: g:\\0020423\10\002042310-26.dwg

Figure 5-3
Metals Concentrations in Soil (0-1 foot bgs)
Arkema Inc.
Portland, Oregon

ERM *11/05*

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423310-29.dwg



LEGEND

- IB-41● Soil Removal IRM Soil Boring Location
- B-112● RI Soil Boring Location
- US-03✦ Unpaved Area Soil Boring Location
- S-4■ Surface Soil Sample Location

Note: Grayed sample locations indicates soil at this location was removed as part of the soil removal IRM.

Upper Depth (ft bgs)	Lower Depth (ft bgs)	4-4'-DDE Concentration (mg/kg)	4-4'-DDD Concentration (mg/kg)	4-4'-DDT Concentration (mg/kg)
3	4	1400	16	2.3

Indicates concentration above screening levels (USEPA Region 9 PRGs).
DDT – 7 mg/kg
DDD – 10 mg/kg
DDE – 7 mg/kg

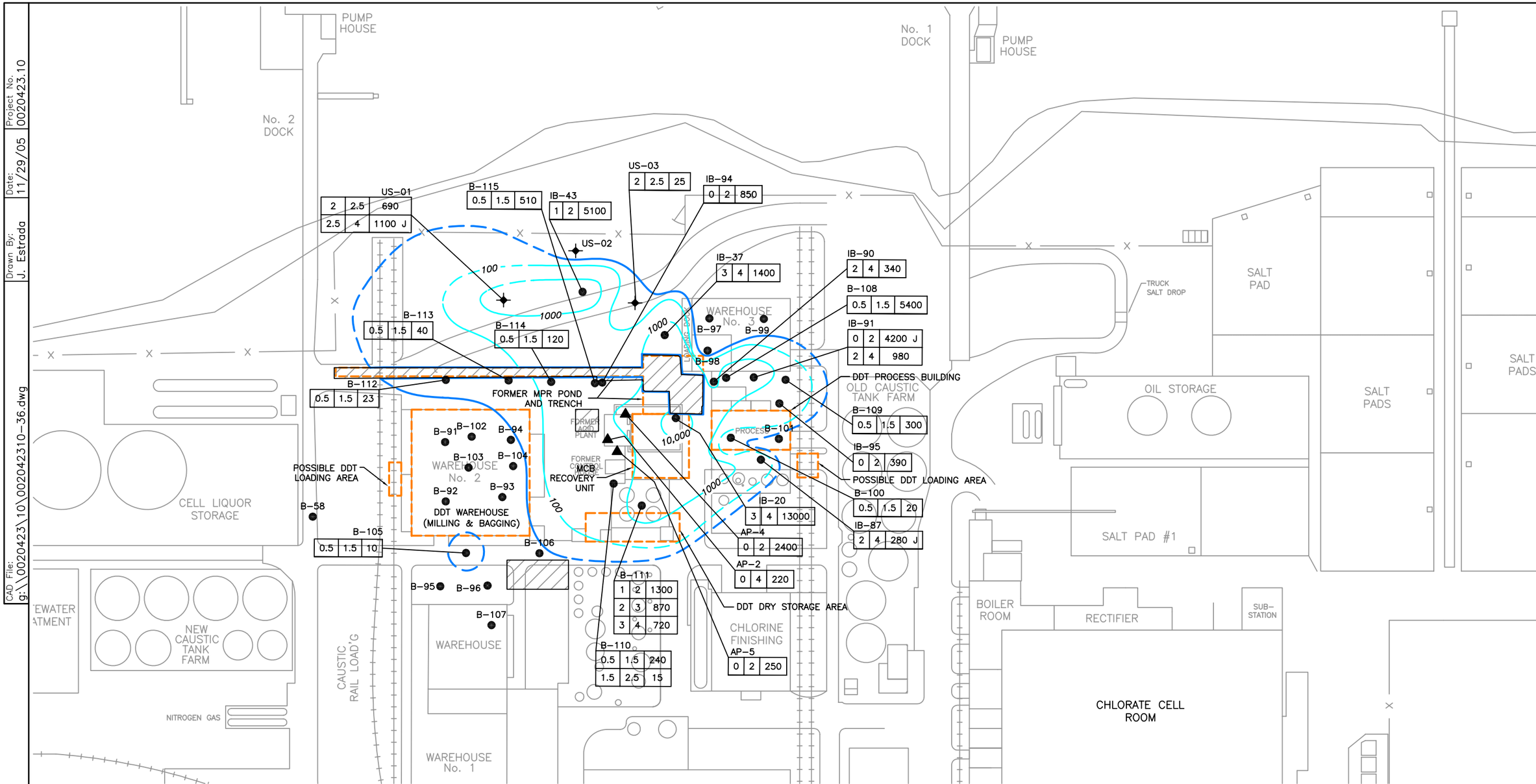
(d) = Duplicate Sample Result
J = Estimated Concentration
U = Undetected at the Detection Limit Shown

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

Figure 5-4

DDT, DDD, and DDE Concentrations in Soil (1-4 feet bgs)
Arkema Inc.
Portland, Oregon

ERM 11/05



LEGEND

IB-41	Soil Removal IRM Soil Boring Location
B-112	RI Soil Boring Location
US-03	Unpaved Area Soil Boring Location
S-4	Surface Soil Sample Location

Note: Locations without concentration indicated contained DDT below 7 mg/kg.

0.5 | 1.5 | 100 — Upper Depth (ft bgs); Lower Depth (ft bgs); 4-4'-DDT Concentration (mg/kg)

7 mg/kg – DDT Screening Level Contour (USEPA Region 9 PRG)

DDT Concentration Contour

Area of Soil Removal

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH

PLANT NORTH

0 100 FEET

Figure 5-4a

Sample Locations wtih Concentrations Above DDT Screening Levels in Soil (1-4 feet bgs)

Arkema Inc.

Portland, Oregon

ERM 11/05

Project No. 0020423.10

Date: 11/29/05

Drawn By: J. Estrada

CAD File: g:\\0020423\10\002042310-36.dwg

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\...\0020423\10\0020423\310-30.dwg

IB-46					
6	7	6500	68	29

IB-39				
4	5	61	0.37U	2.2

B-115				
4	6	41	8.3U	8.3U
6	8	500	89U	89U
6	8	550(d)	84U(d)	84U(d)

MWA-8i					
36	36.3	5800	210	59

VP-21				
6	8	2000	200	83U
14	16	2	0.21J	0.067U

MWA-11i				
6	8	31000	430	23
26	28	230	22	2.4
28	30	2.72	1.57	0.084

IB-44				
4	5	55	19	1.3

VP-22				
8	10	1200	140	74U
14	16	0.15	0.018	0.0067U

IB-89				
6	8	9000	240J	63
8	10	700	48J	2.5

B-55					
6	7	297	36	1U
12	13	2.8	0.289	0.021

MWA-18					
5	6.5	38	1.2	5.5
10	11.5	3.6	0.21J	1.5
15	16.5	7.4	0.6	12

MWA-19					
10	11.5	0.04	0.005U	0.007
15	16.5	1	0.015	0.094

MWA-30					
29.5	30	0.038U	1.5	0.075

B-62					
4	5	3.8	0.078	0.36

B-114				
4	6	0.47J	0.065U	0.065U
6	8	0.0073U	0.0073U	0.0073U
6	8	0.0071U(d)	0.0071U(d)	0.0071U(d)

B-113				
4	6	2.5J	0.66UJ	0.66UJ
6	8	0.045U	0.042J	0.041J
6	8	0.059U(d)	0.011U(d)	0.009J(d)

B-112				
4	6	2.1	0.68U	0.68U
6	8	0.11U	0.077	0.0072U

B-56					
4	5	454	4.9	3.2
19	20	0.01U	0.01U	0.01U

IB-95					
4	6	270	5.6J	1.2J

MWA-20					
5	6.5	0.028	0.005U	0.005U
10	11.5	0.3J	0.072J	0.041J
10	11.5	0.033J(d)	0.014J(d)	0.016J(d)
15	16.5	0.014	0.005U	0.005U

IB-88					
6	8	460	14J	1.2J
8	10	2.1	0.028	0.0071J

B-52					
5	5.5	0.048	0.01U	0.01U

AP-3					
8	10	2600J	120J	71UJ

B-51					
5	5.5	2.4	0.075	0.423

B-61					
7	8	33J	1U	0.19J
11	12	400J	32J	3J
21	22	21J	1.2J	0.18J

B-101					
12	14	0.014U	0.0012U	0.0012U
12	14	0.79J(d)	0.0086(d)	0.0024U(d)

AP-2					
4	6	130J	3.3J	2.5J

VP-23					
8	10	1700	670U	670U
14	16	55	9.2	7.1U

B-58					
4	5	2.1	0.13	0.1

B-100					
8	10	1500J	54J	20U
12	14	390	19	0.7U

B-104					
12	14	0.093	0.01	0.018

VP-24					
6	8	100	42J	13
14	16	9.2	1.1	0.7U

B-65					
12	14	760	15J	3.8

B-50					
5	5.5	0.012U	0.012U	0.018

B-66					
4	6	84	2.1	0.86
12	14	49	1.6J	0.65

IB-27					
5	6	6300	230	8.3

B-96					
8	10	0.18	0.0096J	0.0049J

IB-86					
8	10	16	2.4	0.5

B-57					
4	5	8.4	0.19	12

B-110					
3.5	4.5	0.59	0.066U	0.066U

IB-93					
8	10	6900	200J	16

B-111					
7	8	7.0	0.67U	0.67U

IB-25					
4	5	0.87	0.05U	0.05U
8	9	3900	160U	86

B-49					
7	8	0.135J	0.015U	0.015U
7	8	0.299J(d)	0.012U(d)	0.011J(d)

B-54					
4	5	21	0.26	1.3
9	10	6.1	0.7	0.096

IB-85					
8	10	500	8.8J	2

HOUSE
No. 2 DOCK
FORMER MPR POND AND TRENCH
WAREHOUSE No. 3
LOADING DOCK
IB-4
B-17
B-53
IB-82
IB-83
IB-77
B-61 AREA
AC PLANT
IB-84
FORMER CONTROL HOUSE
IB-78
WAREHOUSE No. 2
CELL LIQUOR STORAGE
POSSIBLE DDT LOADING AREA
DDT WAREHOUSE (MILLING & BAGGING)
DDT DRY STORAGE AREA
PROCESS
MCB RECOVERY UNIT
DDT PROCESS BUILDING
OLD CAUSTIC TANK FARM
POSSIBLE DDT LOADING AREA
TRUCK SALT DROP
SALT PAD
OIL STORAGE
SALT PADS
SALT PADS
SALT PAD #1
'EWATER ATMENT
NEW CAUSTIC TANK FARM
CAUSTIC RAIL LOAD'G
WAREHOUSE
B-48
B-49
CHLORINE FINISHING
BOILER ROOM
RECTIFIER
SUB-STATION
CHLORATE CELL ROOM
NITROGEN GAS
WAREHOUSE No. 1
CAUSTIC PROCESS
TRUE NORTH
PLANT NORTH
0
100
FEET

LEGEND

MWA-18 Monitoring Well, Shallow Zone
MWA-8i Monitoring Well, Intermediate Zone
IB-41 Soil Removal IRM Soil Boring Location
B-112 RI Soil Boring Location
US-03 Unpaved Area Soil Boring Location
S-4 Surface Soil Sample Location
VP-23 DNAPL Pilot Study Vapor Monitoring Point

Note: Grayed sample locations indicates soil at this location was removed as part of the soil removal IRM.

4	5	84	0.19	12

4 = Upper Depth (ft bgs)
5 = Lower Depth (ft bgs)
84 = 4–4'–DDE Concentration (mg/kg)
0.19 = 4–4'–DDD Concentration (mg/kg)
12 = 4–4'–DDT Concentration (mg/kg)

Indicates concentration above screening levels (USEPA Region 9 PRGs).
DDT – 7 mg/kg
DDD – 10 mg/kg
DDE – 7 mg/kg

(d) = Duplicate Sample Result
J = Estimated Concentration
U = Undetected at the Detection Limit Shown

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

Figure 5-5

DDT, DDD, and DDE Concentrations in Soil (>4 feet bgs)
Arkema Inc.
Portland, Oregon

ERM 11/05

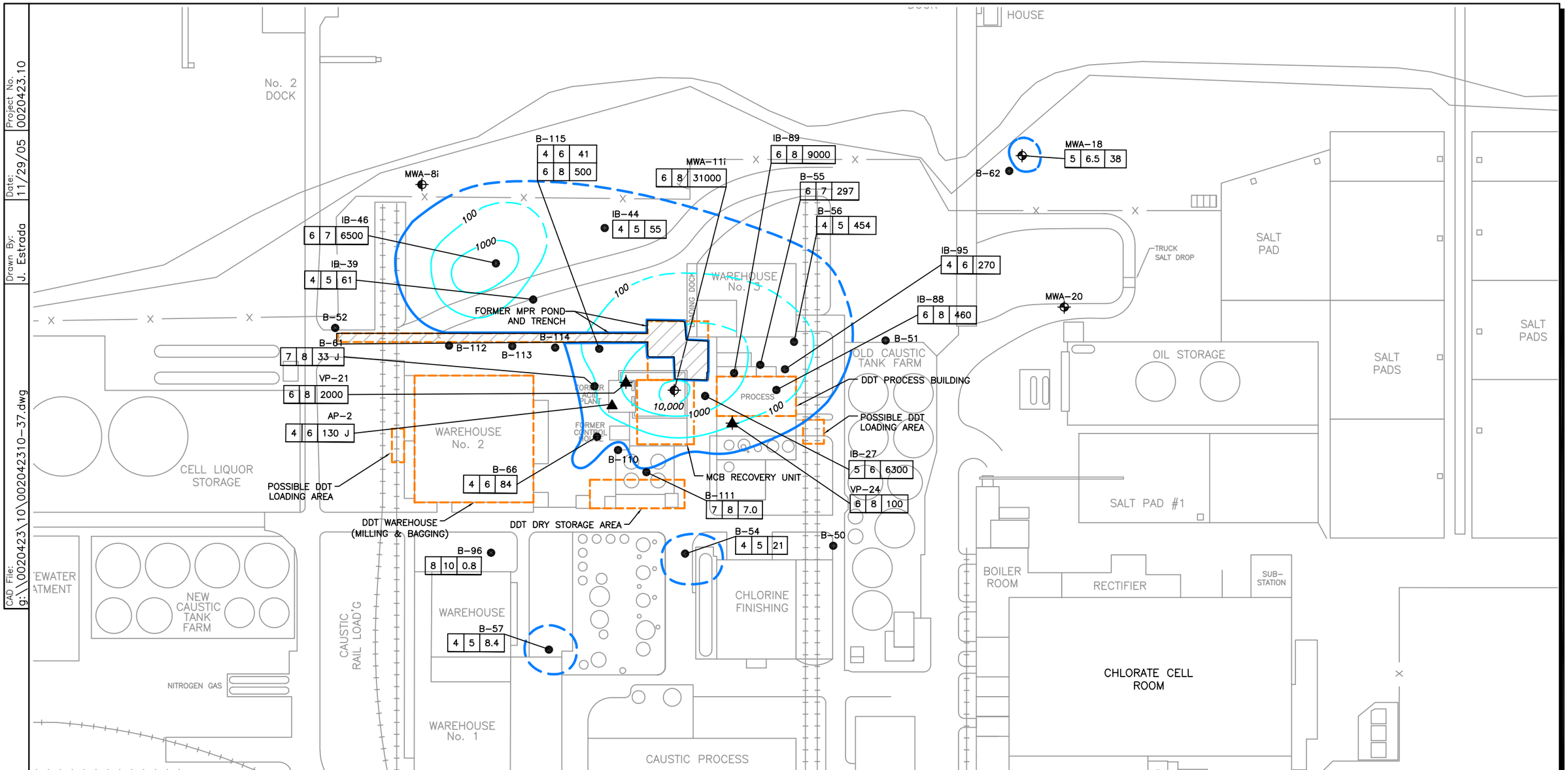


Figure 5-5a

Sample Locations with Concentrations Above DDT Screening Levels in Soil (4-8 feet bgs)

Arkema Inc.

Portland, Oregon

ERM 11/05

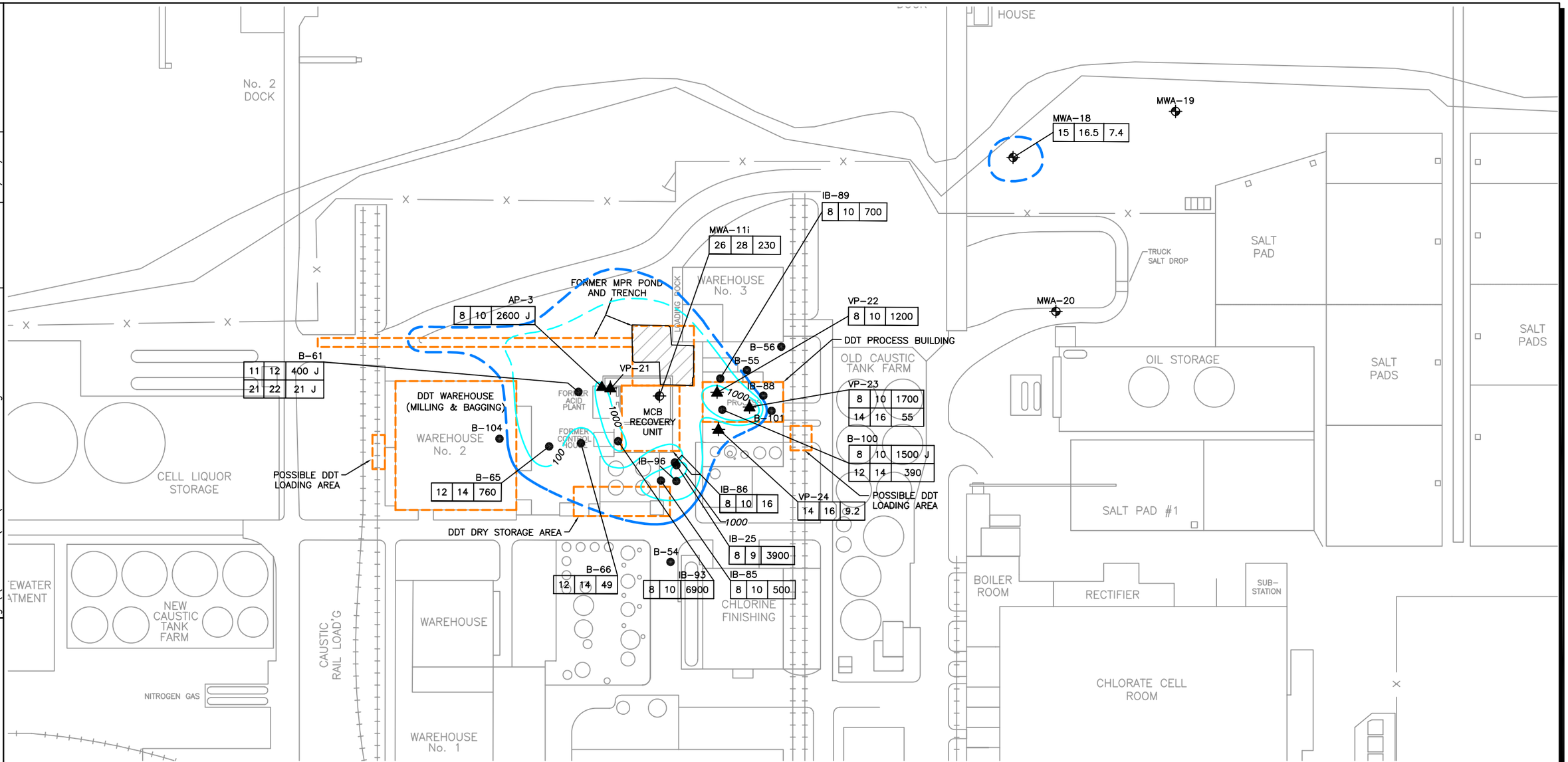
Project No. 0020423.10

Date: 11/29/05

Drawn By: J. Estrada

CAD File: g:\\0020423\10\002042310-37.dwg

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102-38.dwg



LEGEND

- MWA-18 — Monitoring Well, Shallow Zone
- MWA-8i — Monitoring Well, Intermediate Zone
- IB-41 — Soil Removal IRM Soil Boring Location
- B-112 — RI Soil Boring Location
- US-03 — Unpaved Area Soil Boring Location
- S-4 — Surface Soil Sample Location
- VP-23 — DNAPL Pilot Study Vapor Monitoring Point

Note: Locations without concentration indicated contained DDT below 7 mg/kg.

Upper Depth (ft bgs)	Lower Depth (ft bgs)	4-4'-DDT Concentration (mg/kg)
12	14	760

J = Estimated Concentration

7 mg/kg – DDT Screening Level Contour (USEPA Region 9 PRG)

DDT Concentration Contour

Area of Soil Removal

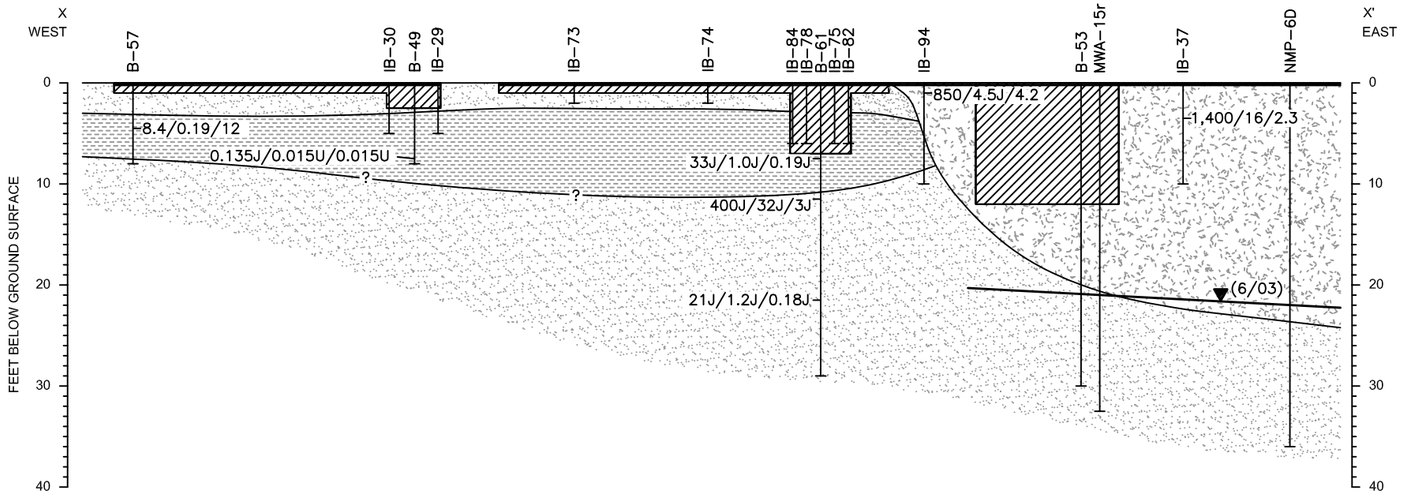
NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

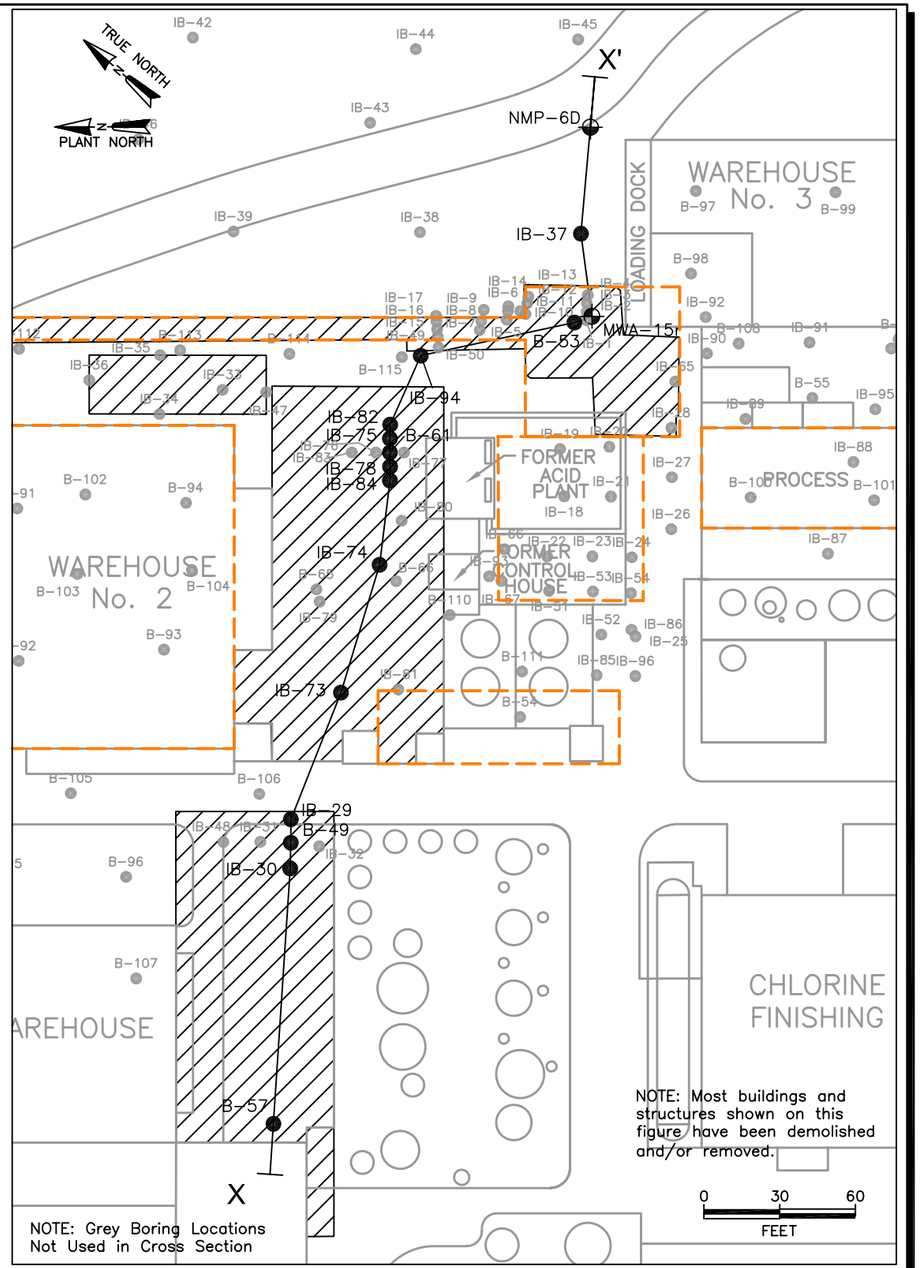
TRUE NORTH
PLANT NORTH
0 100
FEET

Figure 5-5b
Samples with Concentrations Above DDT Screening Levels in Soil (8 feet bgs to water table)
Arkema Inc.
Portland, Oregon

ERM 11/05

Drawn By: R. Olson
Date: 11/29/05
Project No. 0020423.10
CAD File: G:\0020423\10\002042310-52.dwg





LEGEND

	Fill with debris
	Sand with varying amounts of silt
	Silt with varying amounts of fine sand
B-74	Boring I.D. number
	Soil Boring
	Inferred soil contact (queried where uncertain)
	Shallow-zone groundwater surface (June 2003); dashed and open symbol where approximate; based on monitoring well data only
	Soil removed during Soil Removal IRM
	Area paved/capped during Soil Removal IRM
0.135J/0.015U/0.015U	DDT/DDD/DDE Concentration
NA	Not Analyzed
J	Estimated Concentrations
U	Constituent Not Detected at Detection Limit Shown

(Vertical Exaggeration = 4X)

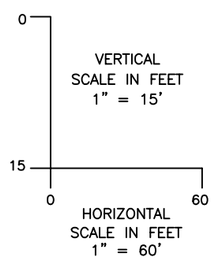


Figure 5-6

DDT, DDD, and DDE Concentrations in Soil
Cross Section X-X'
Arkema Inc.
Portland, Oregon

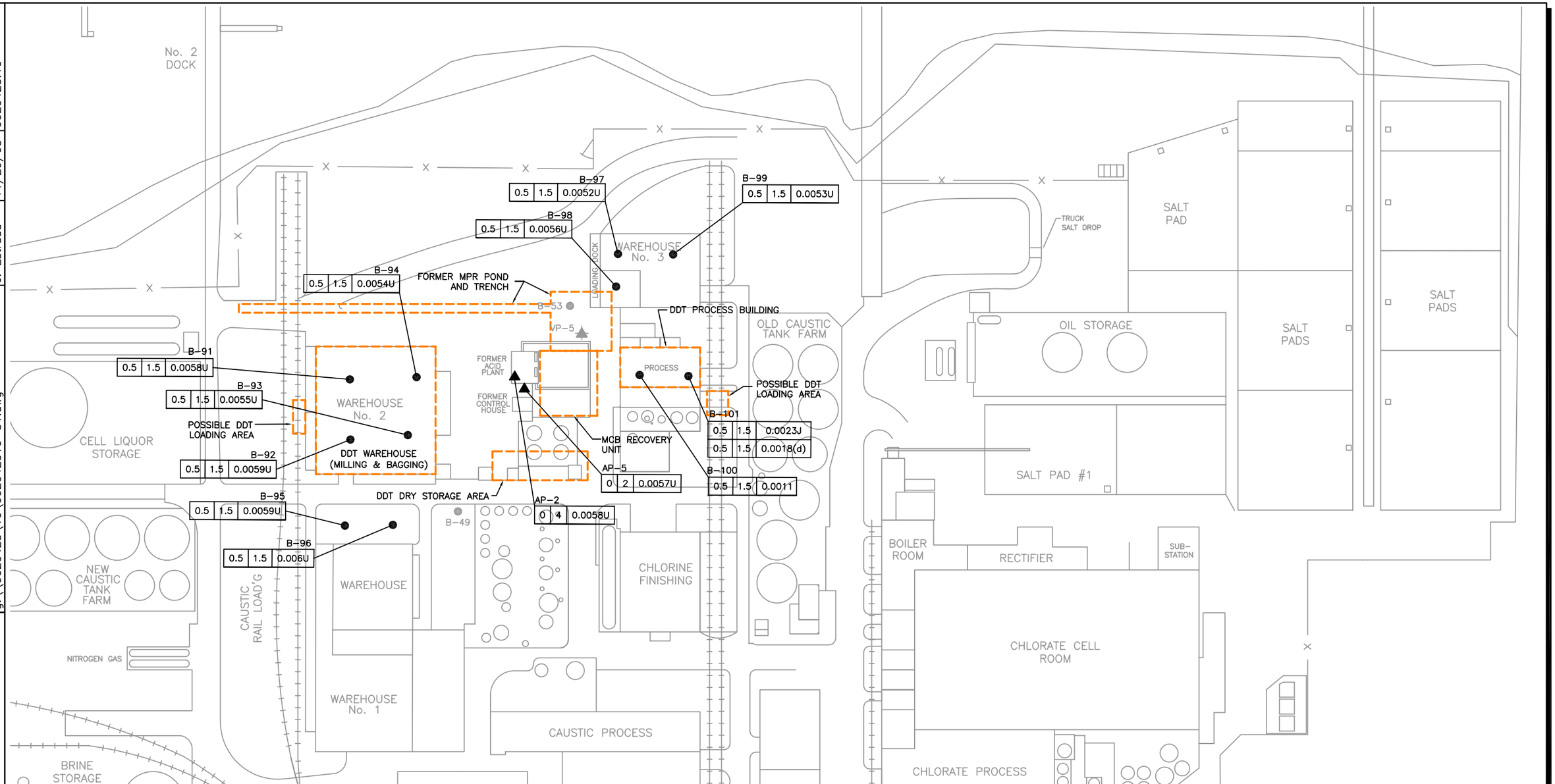
ERM 11/05

Project No. 0020423.10

Date: 11/29/05

Drawn By: J. Estrada

CAD File: g:\0020423\10\0020423 10-31.dwg



LEGEND

IB-41 ●	Soil Removal IRM Soil Boring Location
B-112 ●	RI Soil Boring Location
S-4 ■	Surface Soil Sample Location
AP-2 ▲	VES Hand Auger Soil Boring Location
VP-5 ▲	DNAPL Pilot Study Vapor Monitoring Point

Note: Grayed sample locations indicates soil at this location was removed as part of the soil removal IRM.

All sample concentrations were below the preliminary screening levels of 530 mg/kg (USEPA Region 9 PRG).

0 | 0.5 | 0.0047

- Upper Depth (ft bgs)
- Lower Depth (ft bgs)
- Chlorobenzene Concentration (mg/kg)

(d) = Duplicate Sample Result
J = Estimated Concentration
U = Undetected at the Detection Limit Shown

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH

PLANT NORTH

0 100

FEET

Figure 5-7

Chlorobenzene Concentrations in Soil (1-4 feet bgs)

Arkema Inc.

Portland, Oregon

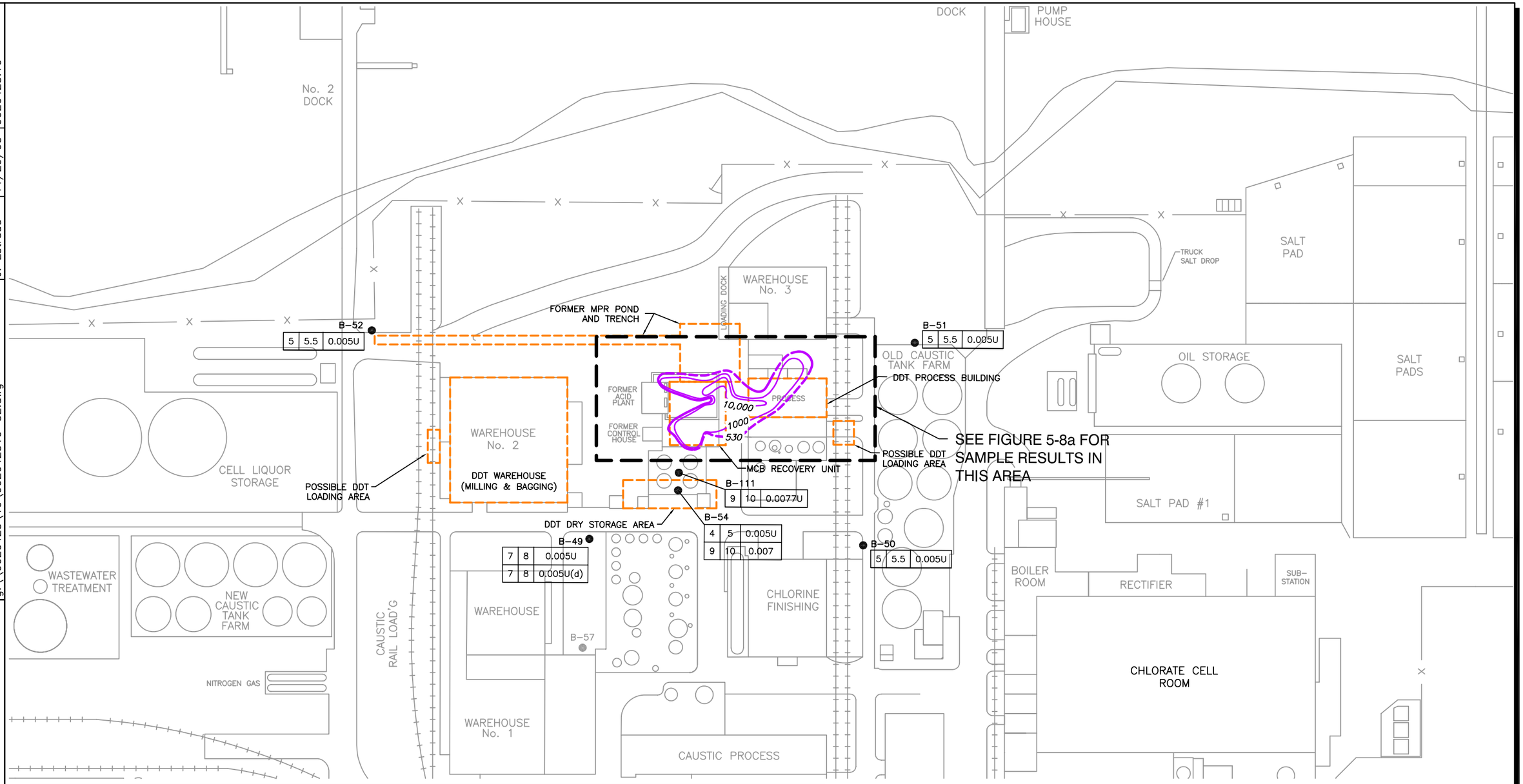
ERM 11/05

Project No. 0020423.10

Date: 11/29/05

Drawn By: J. Estrada

CAD File: g:\0020423\10\0020423\10-32.dwg



LEGEND

- MWA-30 — Monitoring Well, Shallow Zone
- MWA-8i — Monitoring Well, Intermediate Zone
- B-112 — RI Soil Boring Location
- Chlorobenzene 530 mg/kg Concentration Contour; Dashed Where Inferred
- 1000 — Chlorobenzene Concentration Contour Above Screening Level (530 mg/kg)

0 | 0.5 | 0.0047

- Upper Depth (ft bgs)
- Lower Depth (ft bgs)
- Chlorobenzene Concentration (mg/kg)

Indicates concentration above screening level of 530 mg/kg (USEPA Region 9 PRG).

(d) = Duplicate Sample Result
J = Estimated Concentration
U = Undetected at the Detection Limit Shown

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 100
FEET

Figure 5-8

Chlorobenzene Concentrations in Soil
(4 feet bgs to water table)
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\002042310-33.dwg

HARBOR LINE N 41°02'35" 1617.03'

MEAN HIGH WATER LINE BASED ON ELEVATION OF 16.1' C.O.P.

APPROXIMATE TOP OF BANK

RB-6	0	0.3	0.064	0.026 J	0.011 J
	0.3	1.9	0.36	0.028	0.071

RB-5	0	0.3	0.034	0.01 U	0.023
	0.3	0.8	0.064	0.01 U	0.058

RB-4	0	0.3	0.41	0.01 U	0.034
	0.3	1.1	2.6	0.018	0.028

RB-9	0	0.5	95	1.1 J	1.6

RB-8	0	0.5	21	1.7	2.4

RB-11	0	0.5	52	0.5 J	2.7

RB-3	0	0.3	2.4 J	0.084 J	0.15 J
	0.3	1	2	0.075	0.11

RB-10	0	0.5	120	0.53 J	3.5

RB-2	0	0.3	0.7	0.1	0.13
	0.3	0.7	1.3	0.36	0.31

RB-7	0	0.5	2.3	0.094	0.81

RB-12	0	0.5	7.1	0.77 J	2.9
	0	0.5	6.2 (d)	0.25 J (d)	3.1 (d)

RB-1	0	0.3	0.32	0.066	0.073
	0.3	0.7	0.59	0.096	0.1

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
WAREHOUSE No. 3
LOADING DOCK
FORMER MPR POND AND TRENCH
DDT PROCESS BUILDING
OLD CAUSTIC TANK FARM
FORMER ACID PLANT
FORMER CONTROL HOUSE
PROCESS
WAREHOUSE No. 2
DDT WAREHOUSE (MILLING & BAGGING)
POSSIBLE DDT LOADING AREA
MCB RECOVERY UNIT
POSSIBLE DDT LOADING AREA
DDT DRY STORAGE AREA
CELL LIQUOR STORAGE
GATE
WASTEWATER TREATMENT
NEW CAUSTIC TANK FARM
CONSTRUCTION
NITROGEN GAS
CAUSTIC RAIL LOAD'G
WAREHOUSE
CHLORINE FINISHING
BOILER ROOM
WAREHOUSE No. 1
CAUSTIC PROCESS
CONTRACTOR GATE
BRINE STORAGE
CELL REPAIR
CHLORA

LEGEND

RB-1 Riverbank Sample Location

Indicates Concentration Above Screening Levels (Probable effect concentration, MacDonald et al., 2000)

DDT – 0.0629 mg/kg
DDD – 0.028 mg/kg
DDE – 0.0313 mg/kg

0	0.5	95	1.1J	1.6

- Upper Depth (ft bgs)
- Lower Depth (ft bgs)
- 4–4'–DDE Concentration (mg/kg)
- 4–4'–DDD Concentration (mg/kg)
- 4–4'–DDT Concentration (mg/kg)

(d) = Duplicate Sample Result
J = Estimated Concentration

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 120
FEET

Figure 5-9
DDT, DDD, and DDE Concentrations in Riverbank and Beach Soil
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423103-39.dwg

WILLAMETTE RIVER

HARBOR LINE N 41°02'35" 1617.03'

MEAN HIGH WATER LINE BASED ON ELEVATION OF 18.1' C.O.P.

APPROXIMATE TOP OF BANK

RB-1						
0	0.3	0.011T	0.017JT	0.16JT	0.025T	0.022JT
0.3	0.7	0.031JT	0.052JT	0.28JT	0.048JT	0.059JT

RB-2						
0	0.3	0.029JT	0.028JT	0.28JT	0.038JT	0.027JT
0.3	0.7	0.07JT	0.05JT	0.41JT	0.081JT	0.069JT

RB-8						
0	0.5	1.8	0.8	0.3U	1.9	1

RB-11						
0	0.5	0.3U	0.3U	0.4	0.3U	0.3U

RB-7						
0	0.5	2U	2U	2U	2U	2U

RB-9						
0	0.5	0.3U	0.3U	0.3U	0.3U	0.3U

RB-3						
0	0.3	0.012T	0.014JT	0.02UJT	0.016JT	0.018JT
0.3	1	0.01UT	0.01JT	0.82JT	0.012JT	0.012JT

RB-4						
0	0.3	0.01UT	0.0065JT	0.02UJT	0.01UT	0.007JT
0.3	1.1	0.019T	0.014T	0.02UJT	0.026T	0.012JT

RB-12						
0	0.5	0.3U	0.3U	0.3U	0.3U	0.3U
0	0.5	0.3U	0.3U	0.3U	0.3U	0.3U

RB-10						
0	0.5	0.3U	0.3U	0.3U	0.3U	0.3U

RB-6						
0	0.3	0.013JT	0.034JT	0.12JT	0.017JT	0.041JT
0.3	1.9	0.05JT	0.069JT	0.07JT	0.065JT	0.076JT

RB-5							
0	0.3	0.014JT	0.012JT	0.02UT	0.015JT	0.014JT
0.3	0.8	0.01UT	0.007JT	0.02UT	0.01UT	0.007JT

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
CELL LIQUOR STORAGE
WAREHOUSE No. 2
DDT WAREHOUSE (MILLING & BAGGING)
POSSIBLE DDT LOADING AREA
FORMER MPR POND AND TRENCH
FORMER ACID PLANT
FORMER CONTROL HOUSE
DDT PROCESS BUILDING
PROCESS
MCB RECOVERY UNIT
POSSIBLE DDT LOADING AREA
DDT DRY STORAGE AREA
WAREHOUSE No. 3
LOADING DOCK
OLD CAUSTIC TANK FARM
BOILER ROOM
CHLORINE FINISHING
CONSTRUCTION
WASTEWATER TREATMENT
NEW CAUSTIC TANK FARM
NITROGEN GAS
CAUSTIC RAIL LOAD'G
WAREHOUSE
WAREHOUSE No. 1
CAUSTIC PROCESS
GATE
TRUE NORTH
PLANT NORTH
0 120
FEET

RB-1 ⊕ Riverbank Sample Location

(d) = Duplicate Sample Result
J = Estimated Concentration
T = Value reported is less than the laboratory detection limit
U = Undetected at the detection limit shown

LEGEND

0	0.5	0.3U	0.3U	0.3U	0.3U	0.3U

Upper Depth (ft bgs)
Lower Depth (ft bgs)
Indeno[1,2,3–cd] pyrene
Chrysene
bis[2–Ethylhexyl] phthalate
Benzo[ghi]perylene
Benz[a]anthracene

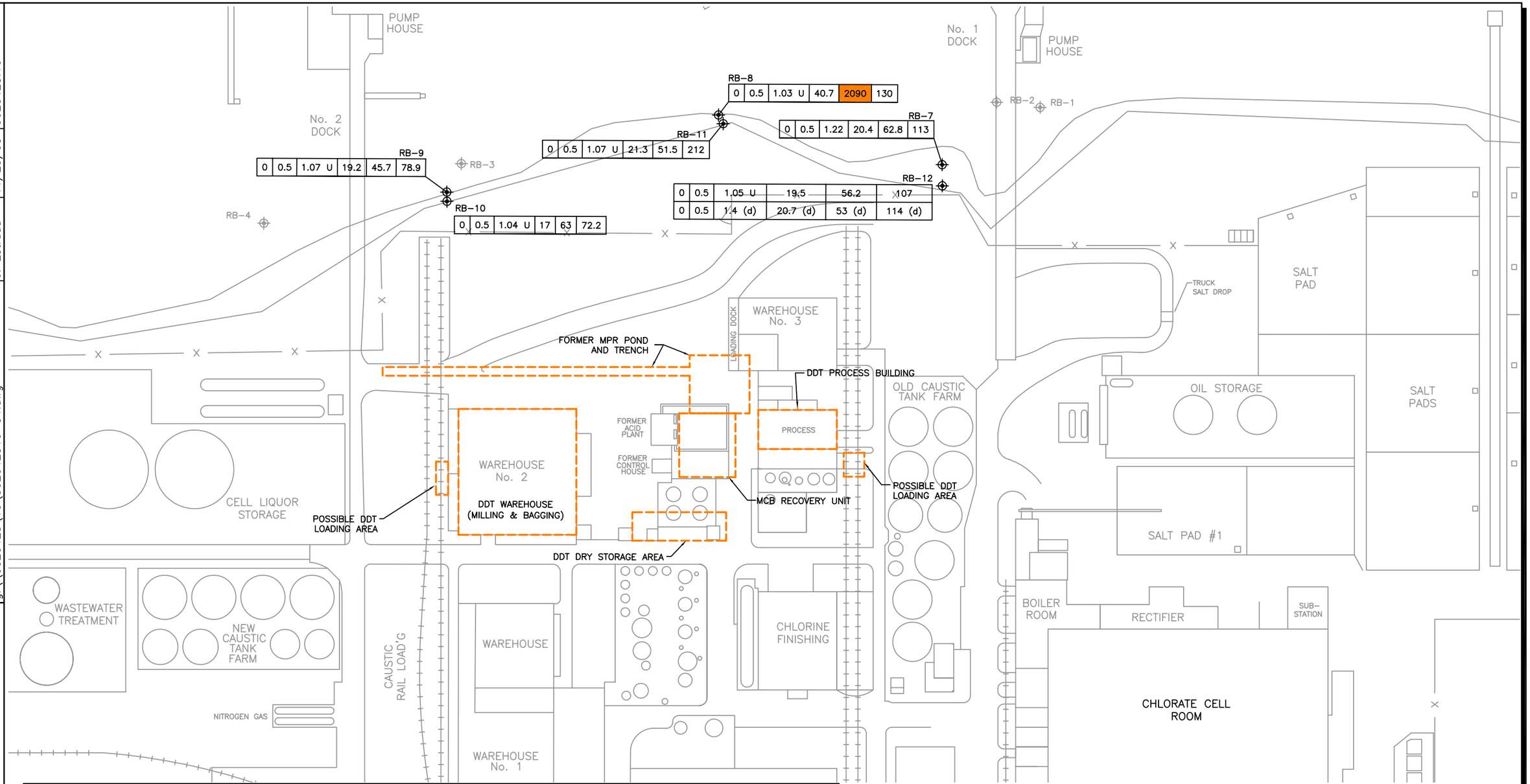
Indicates Concentration Above Screening Levels (Multiple sources, see Table 5–3)
Indeno[1,2,3–cd] pyrene – 0.1 mg/kg
Chrysene – 1.29 mg/kg
bis[2–Ethylhexyl] phthalate – 0.75 mg/kg
Benzo[ghi]perylene – 0.3 mg/kg
Benz[a]anthracene – 1.05 mg/kg

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

Figure 5-10
SVOC Concentrations in Riverbank and Beach Soil
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\002042310-34.dwg



LEGEND

RB-1 Riverbank Sample Location

Indicates concentration above screening levels (Probable effect concentration, MacDonald et al., 2002)
- Cadmium – 4.98 mg/kg
- Chromium – 111 mg/kg
- Lead – 128 mg/kg
- Zinc – 459 mg/kg

Upper Depth (ft bgs)	Lower Depth (ft bgs)	Cadmium Concentration (mg/kg)	Chromium Concentration (mg/kg)	Lead Concentration (mg/kg)	Zinc Concentration (mg/kg)
0	1	1.08U	85.7	47.9	394J

(d) = Duplicate Sample Result
U = Undetected at the Detection Limit Shown

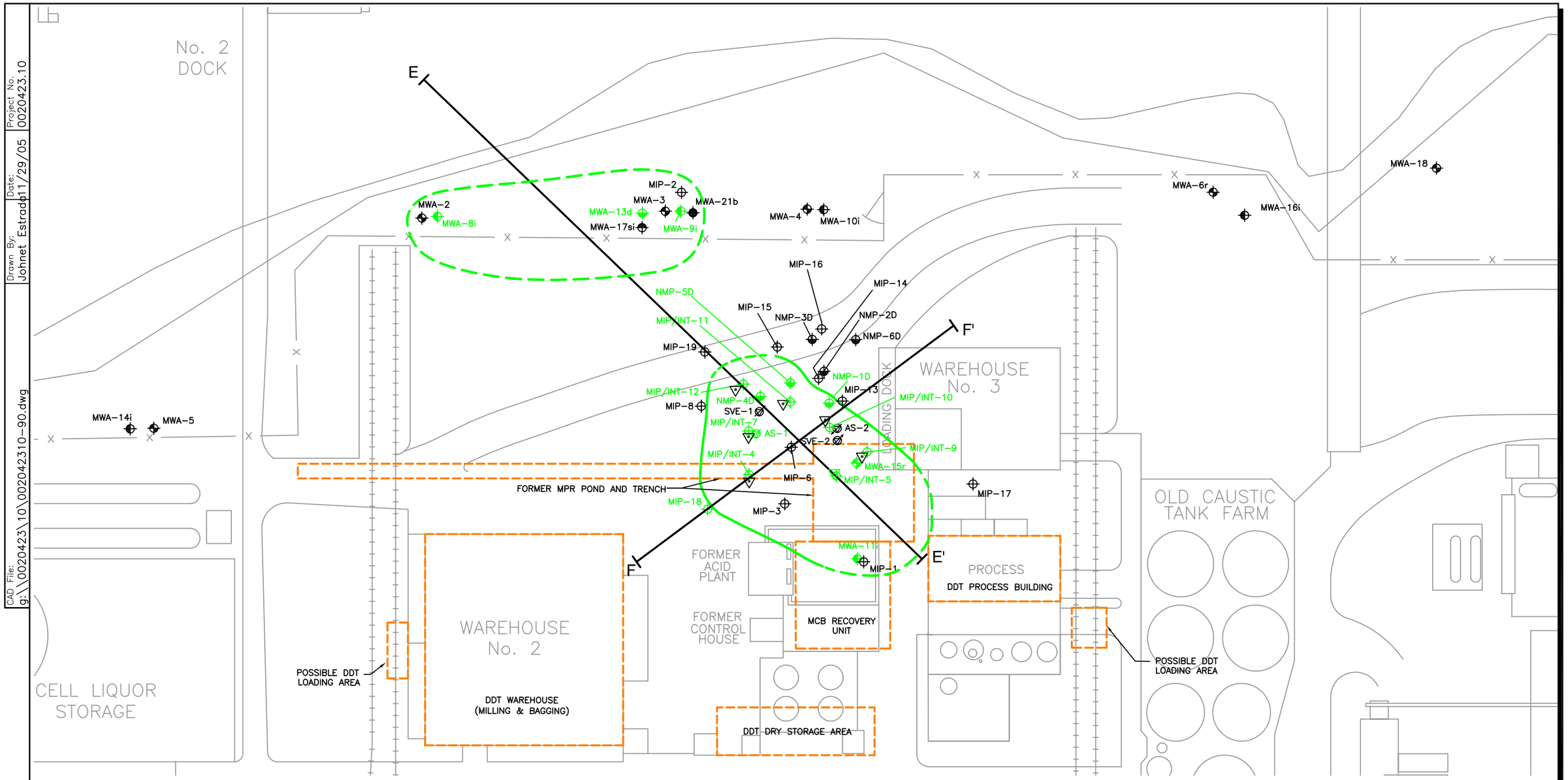
NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 100
FEET

Figure 5-11
Metals Concentrations in Riverbank and Beach Soil
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: Johnet Estrada
CAD File: g:\0020423.10\0020423310-90.dwg



NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Shallow–Intermediate Zone
- Monitoring Well, Intermediate Zone
- Monitoring Well, Lower Portion Shallow Zone
- Monitoring Well, Deep Zone
- DNAPL Delineation Boring – Intermediate Zone
- CPT/MIP Boring
- Soil Vapor Extraction Well
- Air Sparge Well
- MPR — Manufacturing Process Residue
- Approximate Extent of Residual DNAPL in the Shallow Groundwater Zone: Dashed Where Inferred

Notes: Green symbol indicates residual DNAPL was detected. DNAPL only observed at shallow zone depths in MWA–8i, MWA–9i, MWA–11i, and MWA–13d.

TRUE NORTH
PLANT NORTH
0 60
FEET

Figure 5-12
Extent of DNAPL in the Shallow Zone
Arkema Inc.
Portland, Oregon
ERM 11/05

CAD File: g:\0020423\10\0020423102-70.dwg
Drawn By: JSE/RLO
Date: 11/01/05
Project No. 0020423.10

E (North)

E' (South)

Former MPR Pond

MWA-2
MWA-8i (33.8')
MWA-13d (34.8')
MWA-9i (34.8')
MWA-21b (34.3')
NMP-4D (33.9')
MIP/INT-12 (34.1')
MIP-19 (34.4')
MIP-6 (34.4')
MIP/INT-5 (34.2')
MIP-1 (34.7')

Elevation (feet amsl)

35 30 25 20 15 10 5 0 -5 -10 -15 -20 -25 -30 -35 -40 -45

LEGEND

- Fill
- Clay, Silt, and Fine Sand
- Silt
- Sand, Silty Sand
- Basalt

ND Not Detected
MPR Manufacturing Process Residue
(34.8') Ground Level Elevation in Feet Above Mean Sea Level

- Water Table
- Well Screen Interval
- Residual DNAPL Observed and Approximate Extent of Residual DNAPL
- Direct-Push Sample Interval

Note: MWA-2,-8i,-9i,13d, and -21b are projected onto the cross section

(Vertical Exaggeration = 4X)

0
VERTICAL SCALE IN FEET 1" = 10'
10
0 HORIZONTAL SCALE IN FEET 40
1" = 40'

Figure 5-13
Extent of DNAPL
Cross Section E-E'
DNAPL Investigation
Arkema Inc.
Portland, Oregon

ERM 11/05

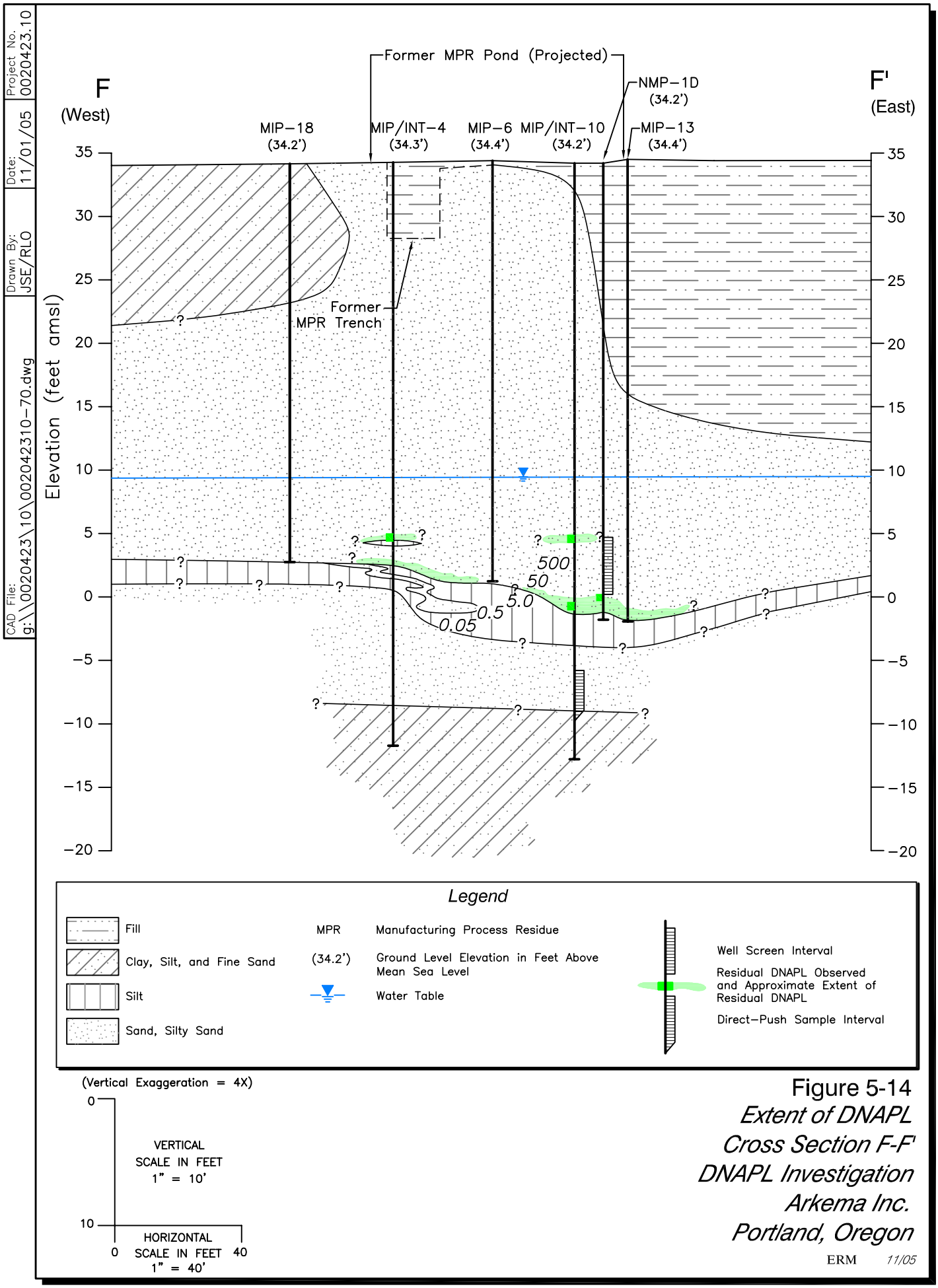


Figure 5-14

Extent of DNAPL

Cross Section F-F'

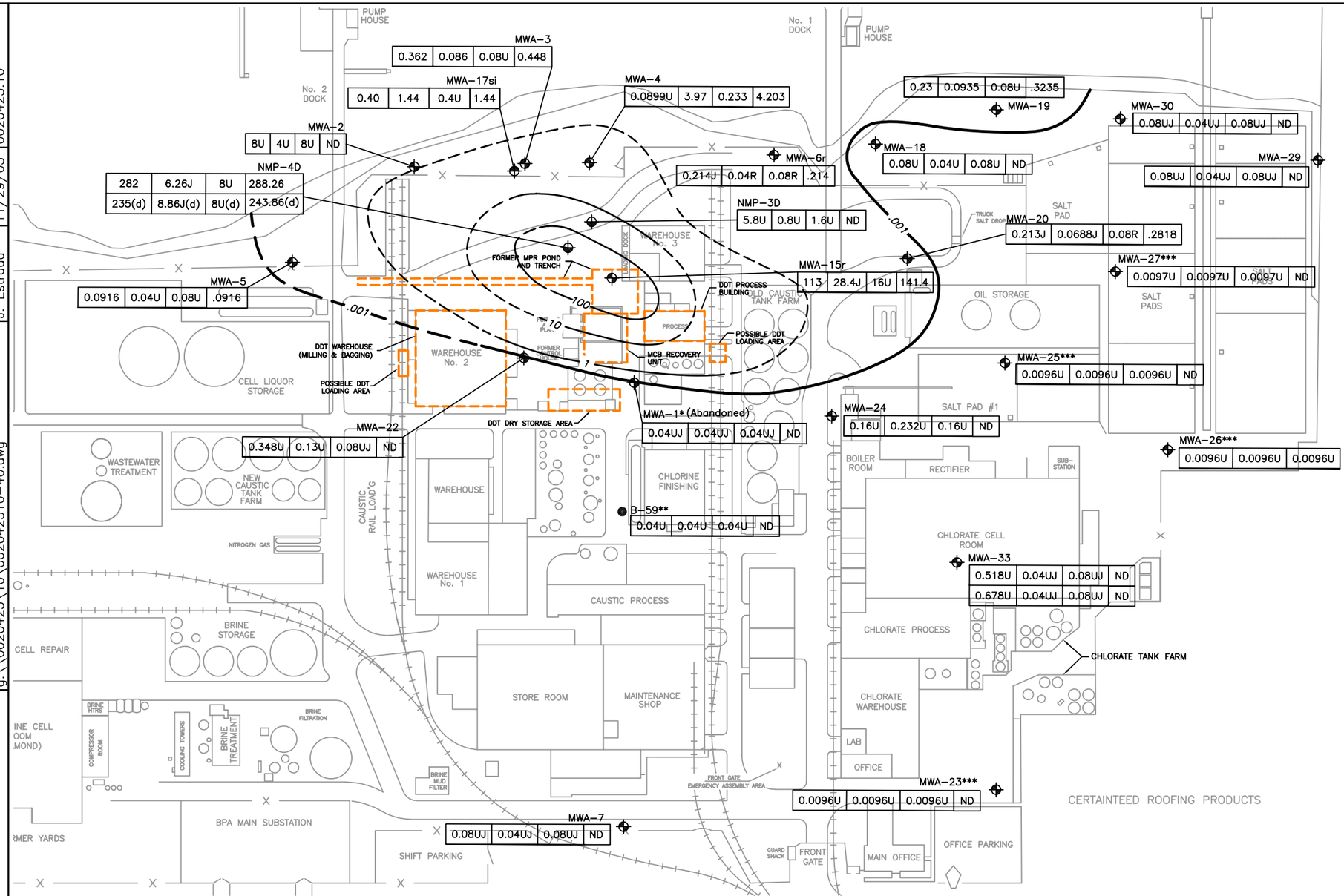
DNAPL Investigation

Arkema Inc.

Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423l0-40.dwg



NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Shallow–Intermediate Zone
- Monitoring Well, Persulfate Pilot Study
- RI Soil Boring Groundwater Grab Sample

Note: The preliminary screening level for total DDT, DDD, and DDE is 0.001 µg/L (USEPA 2004 NRWQC, Freshwater, Chronic).

0.04U | 0.04U | 0.04U | ND
- Total (Sum) of DDT, DDD, DDE
- 4–4'–DDE Concentration (µg/L)
- 4–4'–DDD Concentration (µg/L)
- 4–4'–DDT Concentration (µg/L)

100 — Isoconcentration Contour; Total DDT, DDD, DDE

(d) = Duplicate Sample Result
J = Estimated Concentration
R = Rejected based on data validation
T = Value reported is less than the laboratory detection limit
U = Undetected at the detection limit shown
ND = Not Detected
* = Sampled in 4/99. Not used for contouring
** = Sampled in 8/99. Not used for contouring
*** = Sampled in 4/02. Not used for countouring
Data from June 2003 Used for Contouring

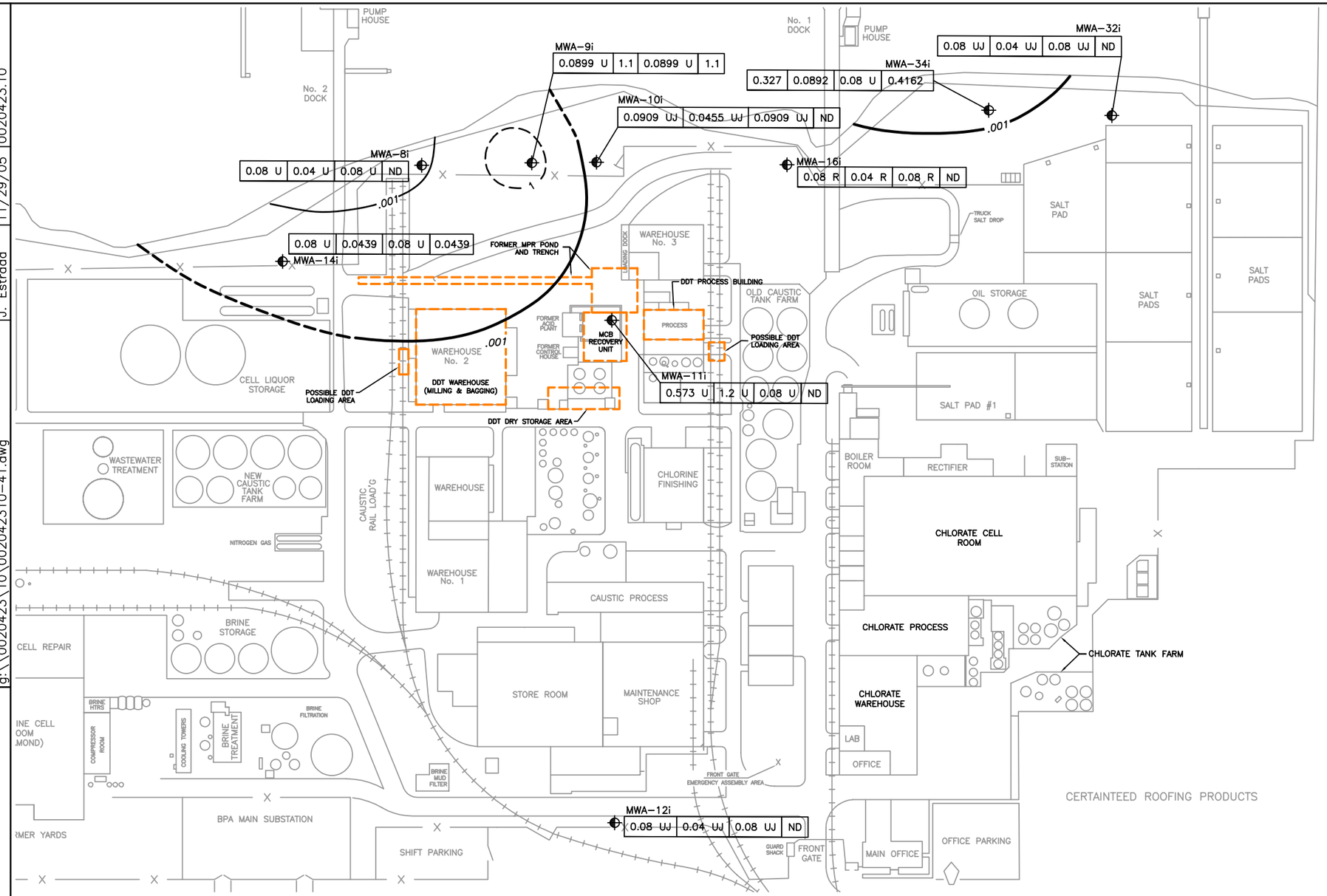
MWA–2 and NMP–3D not used for contouring due to elevated detection limits.

Figure 5-15

DDT, DDD, and DDE Concentrations in Groundwater
Shallow Zone - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423 10-41.dwg



NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Intermediate Zone

Note: The preliminary screening level for total DDT, DDD, and DDE is 0.001 µg/L (USEPA 2004 NRWQC, Freshwater, Chronic).

0.04U | 0.04U | 0.04U | ND

- Total (Sum) of DDT, DDD, DDE
- 4-4'-DDE Concentration (µg/L)
- 4-4'-DDD Concentration (µg/L)
- 4-4'-DDT Concentration (µg/L)

100 — Isoconcentration Contour; Total DDT, DDD, DDE

(d) = Duplicate Sample Result
ND = Not Detected
J = Estimated Concentration
U = Undetected at the detection limit shown
R = Rejected Result

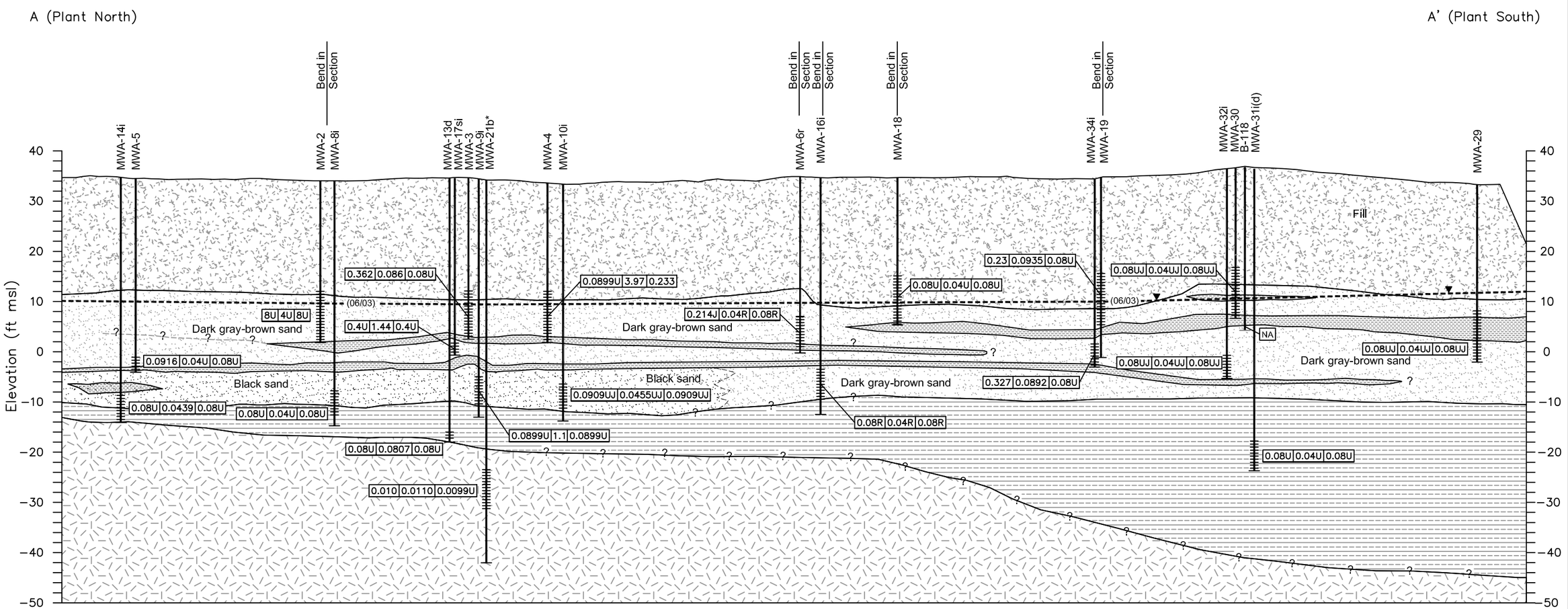
Figure 5-16

DDT, DDD, and DDE Concentrations in Groundwater
Intermediate Zone - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: G:_0020423\10\0020423I0-53.dwg | Drawn By: JSE/RLO | Date: 11/28/05 | Project No. 0020423.10

A (Plant North) — A' (Plant South)



LEGEND

- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- Basalt

B-118 — Geoprobe® boring number

MWA-2 — Well number

- Cased interval
- Screen interval

--▼-- Shallow-zone groundwater surface (approximate); June 2003

———— Inferred soil or geologic contact (queried where uncertain)

0.0916 | 0.04U | 0.08U

- 4-4'-DDE Concentration (µg/L)
- 4-4'-DDD Concentration (µg/L)
- 4-4'-DDT Concentration (µg/L)

J = Estimated Concentration
R = Rejected
U = Undetected at the detection limit shown
NA = Not Analyzed
* = Sampled in 4/02

Note: Cross section location shown on Figure 4-1

(Vertical Exaggeration = 5X)

VERTICAL SCALE IN FEET 1" = 20'

HORIZONTAL SCALE IN FEET 1" = 100'

Figure 5-17

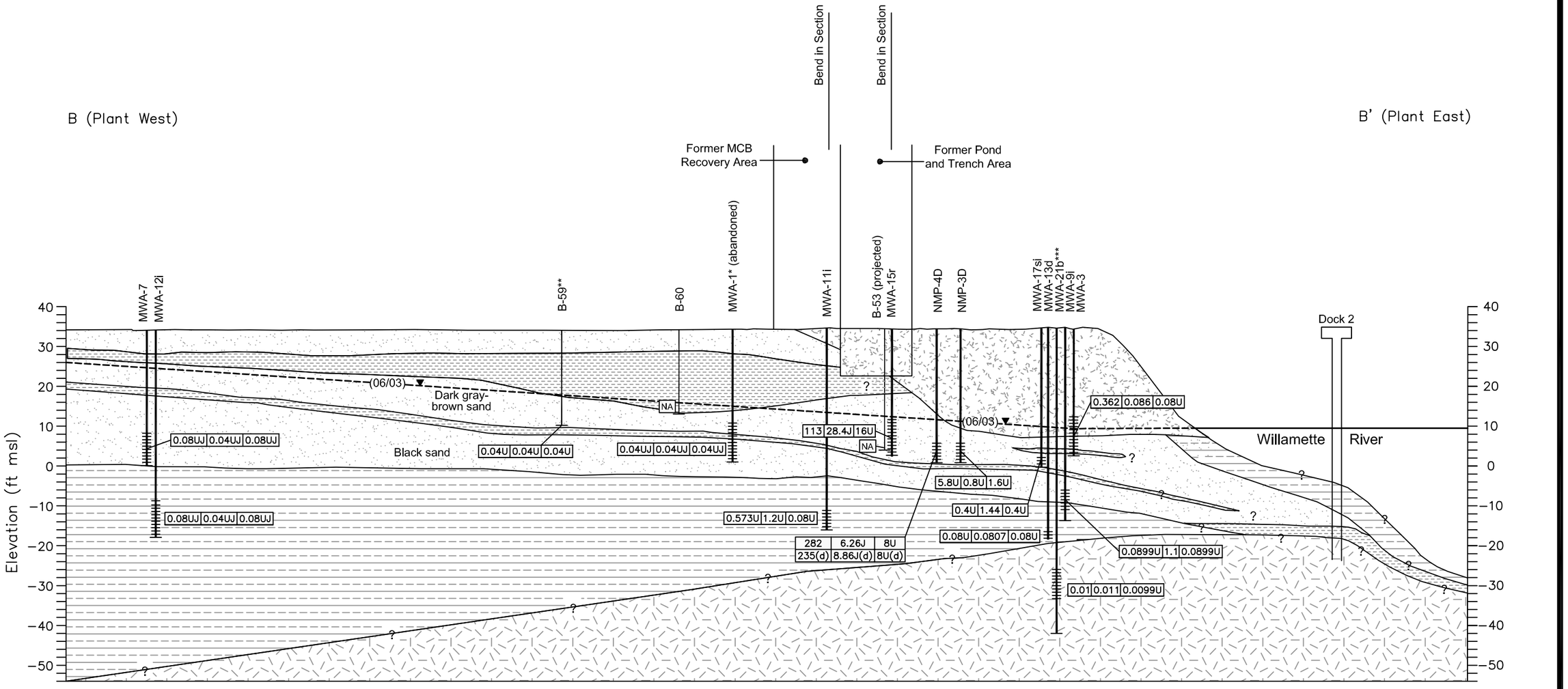
DDT, DDD, and DDE Concentrations in Groundwater
Cross Section A-A' - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: g:\0020423\10\002042310-55.dwg | Drawn By: JSE/RLO | Date: 11/28/05 | Project No. 0020423.10

B (Plant West)

B' (Plant East)



(Vertical Exaggeration = 4X)

0

APPROX. VERTICAL SCALE IN FEET 1" = 25'

25

0 100

APPROX. HORIZONTAL SCALE IN FEET 1" = 100'

LEGEND

- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- Basalt

B-59 — Geoprobe boring number

MWA-1 — Well number

Cased interval

Screen interval

Shallow-zone groundwater surface (approximate); June 2003. Based of Monitoring, Well data only.

Inferred soil or geologic contact (queried where uncertain)

Stratigraphy Beneath River Provided by Exponent

Note: Cross section location shown on Figure 4-1.

0.04U	0.04U	0.04U

0.04U — 4-4'-DDE Concentration (µg/L)

0.04U — 4-4'-DDD Concentration (µg/L)

0.04U — 4-4'-DDT Concentration (µg/L)

(d) = Duplicate Sample Result
J = Estimated Concentration
U = Undetected at the detection limit shown
NA = Not Analyzed
* = Sampled in 4/99
** = Sampled in 8/99
*** = Sampled in 4/02

Figure 5-18

DDT, DDD, and DDE Concentrations in Groundwater
Cross Section B-B' - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423\0-42.dwg

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
MWA-17si 73,200
MWA-3 176
MWA-4 646
MWA-2 13,700
NMP-3D 127000D
NMP-4D 185,000(D)
MWA-6r 2,620
MWA-19 0.64U
MWA-18 3.06U
MWA-30 0.5U***
MWA-29 0.5U***
10,000
100,000
FORMER MPR POND AND TRENCH
WAREHOUSE No. 3
LOADING DK.
MWA-20 215
TRUCK SALT DROP
SALT PAD
MWA-27 0.5U***
SALT PADS
MWA-5 23.1
MWA-15r 13,300
DDT PROCESS BUILDING
OLD CAUSTIC TANK FARM
OIL STORAGE
DDT WAREHOUSE (MILLING & BAGGING)
FORMER ACID PLANT
MCB RECOVERY UNIT
PROCESS
1000
POSSIBLE DDT LOADING AREA
FORMER CONTROL HOUSE
WAREHOUSE No. 2
100
50
MWA-25 0.72***
CELL LIQUOR STORAGE
MWA-22 128
MWA-1 10,000*
POSSIBLE DDT LOADING AREA
SALT PAD #1
DDT DRY STORAGE AREA
MWA-24 2.5U**
MWA-26 0.5U***
BOILER ROOM
RECTIFIER
SUB-STATION
WASTEWATER TREATMENT
NEW CAUSTIC TANK FARM
CAUSTIC RAIL LOAD'G
WAREHOUSE
CHLORINE FINISHING
CHLORATE CELL ROOM
MWA-33 2.51U
NITROGEN GAS
WAREHOUSE No. 1
CAUSTIC PROCESS
BRINE STORAGE
CHLORATE PROCESS
CELL REPAIR
STORE ROOM
MAINTENANCE SHOP
CHLORATE WAREHOUSE
BRINE HTRS
COMPRESSOR ROOM
COOLING TOWERS
BRINE TREATMENT
BRINE FILTRATION
LAB
OFFICE
BRINE MUD FILTER
FRONT GATE EMERGENCY ASSEMBLY AREA
MWA-23 1.4***
CERTAINTEED ROOFING PRODUCTS
MWA-7 0.500U
BPA MAIN SUBSTATION
SHIFT PARKING
GUARD SHACK
FRONT GATE
MAIN OFFICE
OFFICE PARKING

TRUE NORTH
PLANT NORTH
0 150
FEET

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Shallow–Intermediate Zone
- Monitoring Well, Persulfate Pilot Study
- RI Soil Boring Groundwater Grab Sample

Note: The preliminary screening level for chlorobenzene is 50 µg/L (ODEQ 2004 Water Quality Guidance Values, Freshwater).

0.50 Chlorobenzene Concentration, µg/L, June 2003

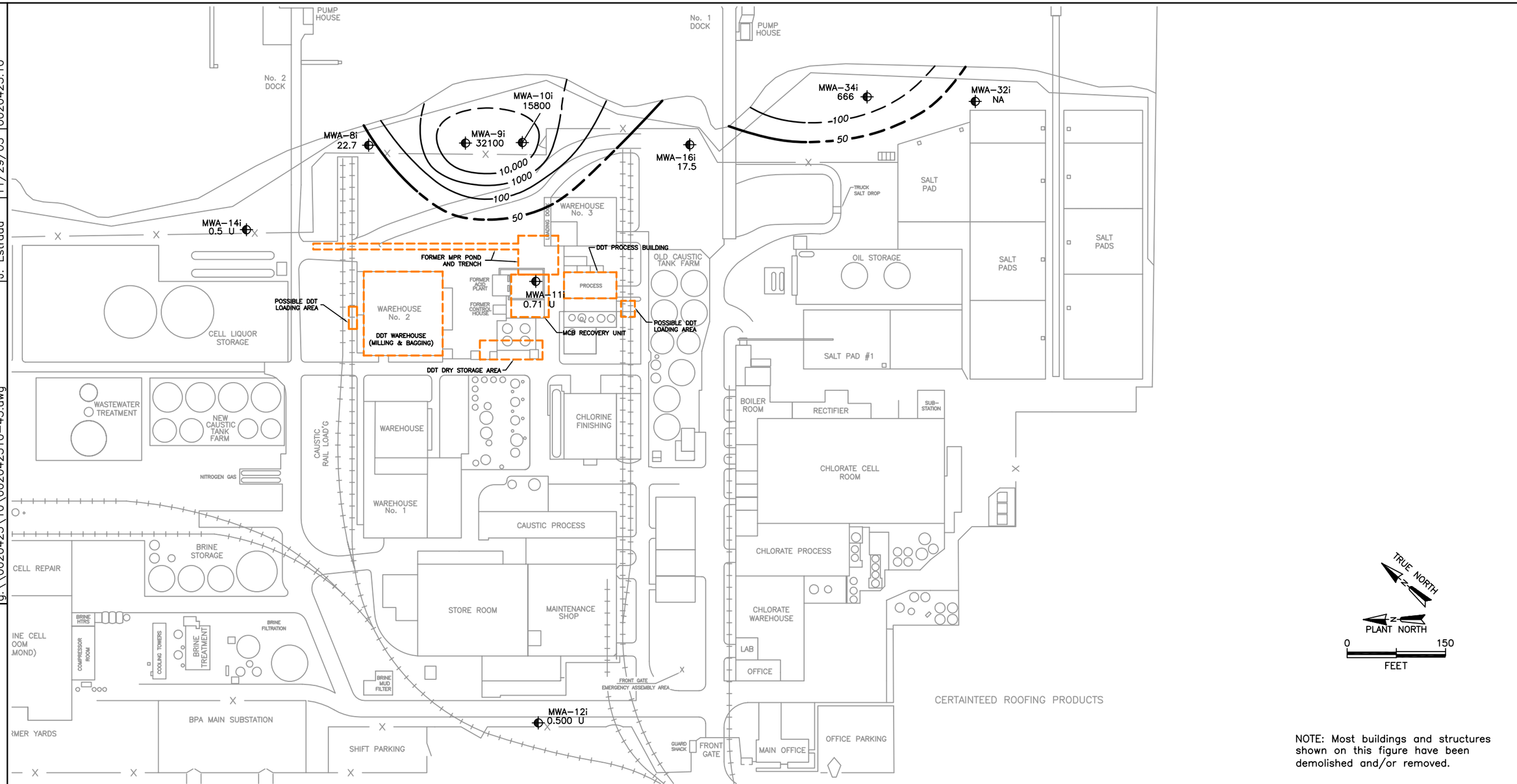
100 Chlorobenzene Concentration Contour, µg/L; Dashed Where Inferred

(d) = Duplicate Sample Result
D = The reported result is from a dilution.
U = Undetected at the detection limit shown
* = Sampled in April 1999. Data not used for contouring.
** = Sampled in November 2001. Data not used for contouring.
*** = Sampled in April 2002. Data not used for contouring.

MWA–17si used for contouring riverbank area down gradient of Former MPR Pond. MWA–2, MWA–3, and MWA–4 not used for contouring.

Figure 5-19
Chlorobenzene Concentrations in Groundwater Shallow Zone - June 2003
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423103.dwg



NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Intermediate Zone
- 0.50 — Chlorobenzene Concentration, µg/L, June 2003
- 100 — Chlorobenzene Concentration Contour, µg/L; Dashed Where Inferred

Note: The preliminary screening level for chlorobenzene is 50 µg/L (ODEQ 2004 Water Quality Guidance Values, Freshwater).

(d) = Duplicate sample result
NA = Not Analyzed
U = Undetected at the detection limit shown

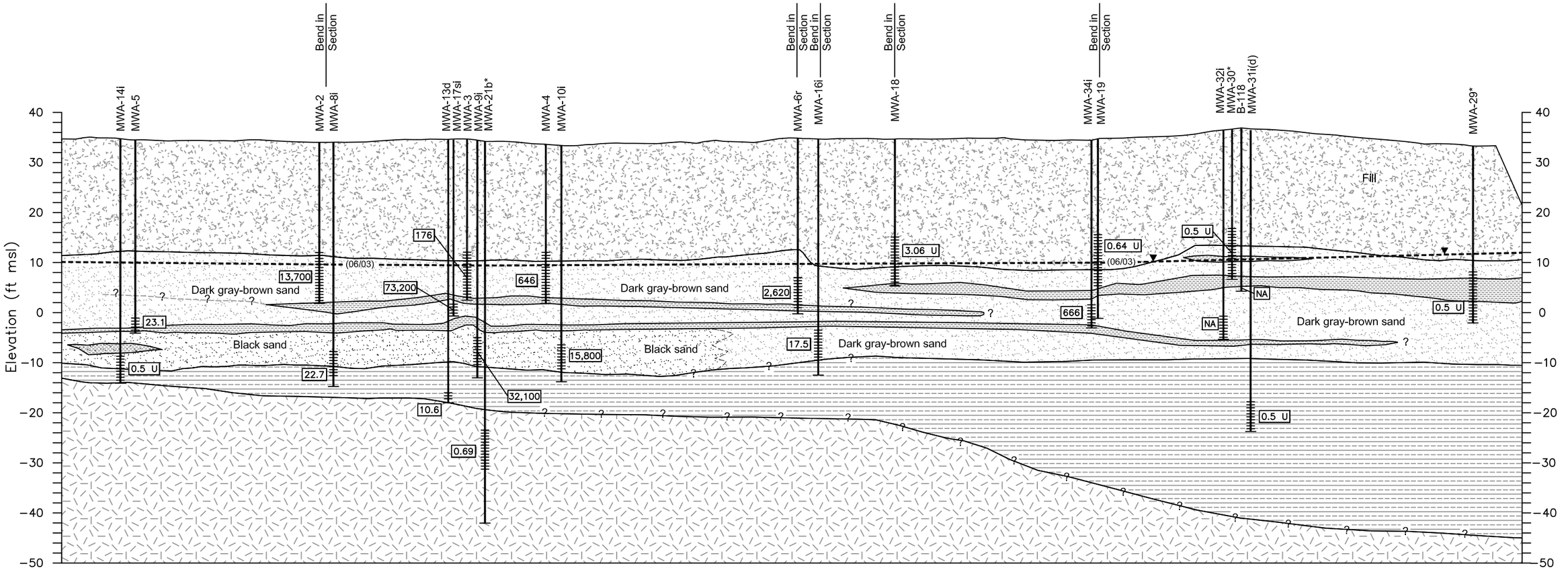
Figure 5-20

Chlorobenzene Concentrations in Groundwater
Intermediate Zone - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: G:_0020423\10\0020423310-56.dwg | Drawn By: JSE/RLO | Date: 11/28/05 | Project No. 0020423.10

A (Plant North) — A' (Plant South)



LEGEND

- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- Basalt

B-59 — Geoprobe® boring number

MWA-1 — Well number

- Cased interval
- Screen interval

--▼-- Shallow-zone groundwater surface (approximate); June 2003

——— Inferred soil or geologic contact (queried where uncertain)

17.5 Chlorobenzene Concentration, µg/L

U = Undetected at the detection limit shown
NA = Not Analyzed
* = 4/02 Sample Results

(Vertical Exaggeration = 5X)

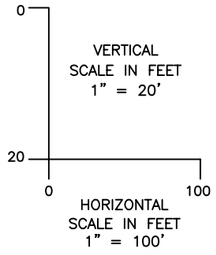


Figure 5-21

Chlorobenzene Concentrations in Groundwater
Cross Section A-A' - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: g:\0020423\10\002042310-57.dwg
Drawn By: JSE/RLO
Date: 11/28/05
Project No. 0020423.10

B (Plant West)

B' (Plant East)

Bend in Section

Bend in Section

Former MCB Recovery Area

Former Pond and Trench Area

MWA-7
MWA-12i
B-59
B-60
MWA-1 (abandoned)*
MWA-11i
B-53 (projected)
MWA-15r
NMP-4D
NMP-3D
MWA-17si
MWA-13d
MWA-21b**
MWA-9i
MWA-3

Dock 2

Elevation (ft msl)

40
30
20
10
0
−10
−20
−30
−40
−50

(06/03)

Dark gray-brown sand

Black sand

0.5U
0.5U
0.5U
NA
10,000
NA
13,300
176
(06/03)
185,000D
127,000D
73,200
32,100
0.71U
10.6
0.69

Willamette River

?

(Vertical Exaggeration = 4X)

0
APPROX. VERTICAL SCALE IN FEET
1" = 25'
25

0
100
APPROX. HORIZONTAL SCALE IN FEET
1" = 100'

LEGEND

- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- Basalt

B-59 — Geoprobe boring number

MWA-1 — Well number

Cased interval

Screen interval

Shallow-zone groundwater surface (approximate); June 2003

Inferred soil or geologic contact (queried where uncertain)

Stratigraphy Beneath River Provided by Exponent

0.71U Chlorobenzene Concentration, µg/L

D = The reported result is from a dilution
U = Undetected at the detection limit shown
* = 4/99 Sample Result
** = 4/02 Sample Result

Note: Cross section location shown on Figure 4-1.

Figure 5-22
Chlorobenzene Concentrations in Groundwater
Cross Section B-B' - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-71.dwg	J. Estrada	11/30/05	0020423.10

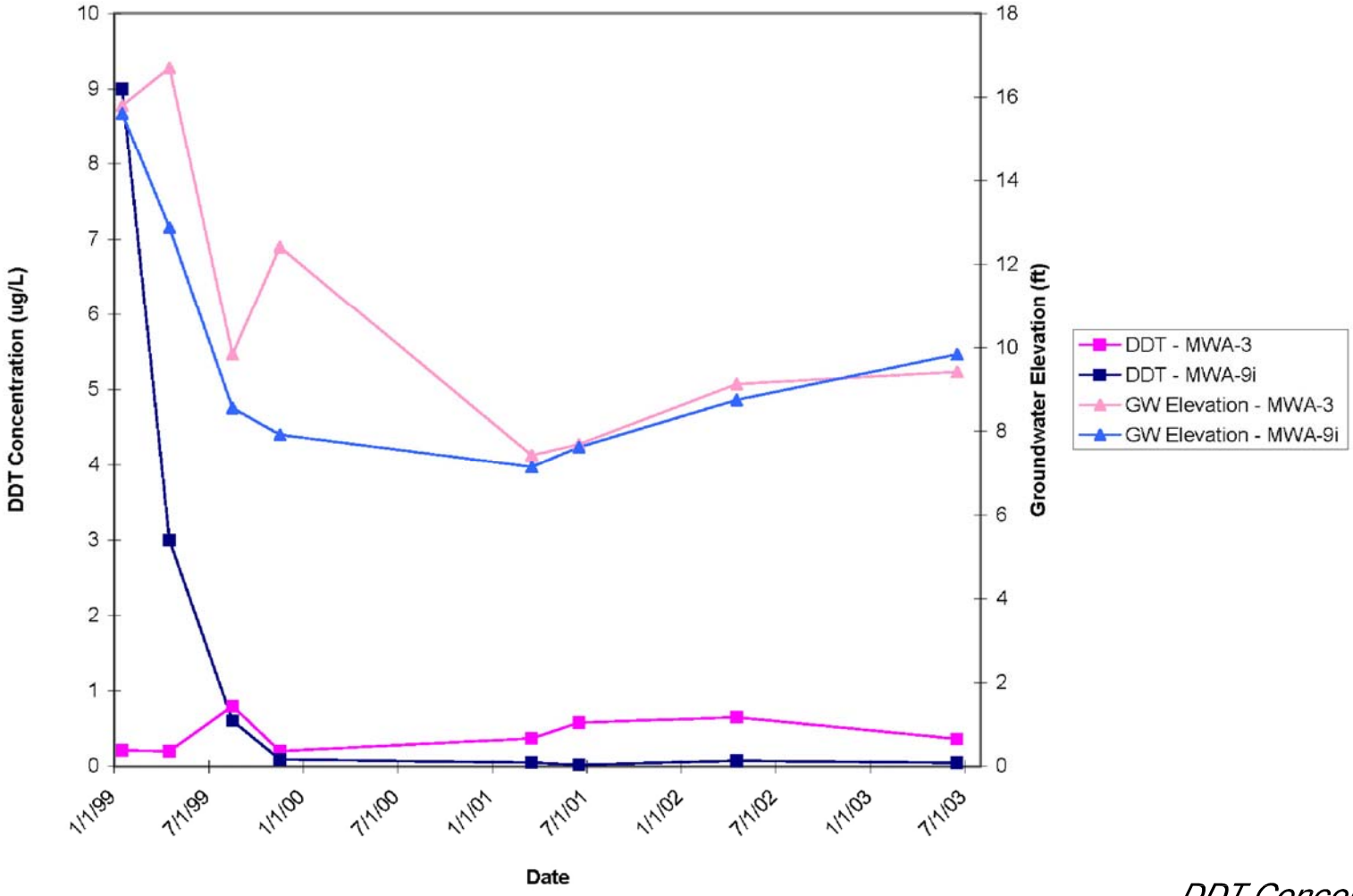


Figure 5-23a

DDT Concentrations and Groundwater Elevations for MWA-3 and MWA-9i

Arkema Inc.

Portland, Oregon

ERM 11/05

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-71.dwg	J. Estrada	10/30/05	0020423.10

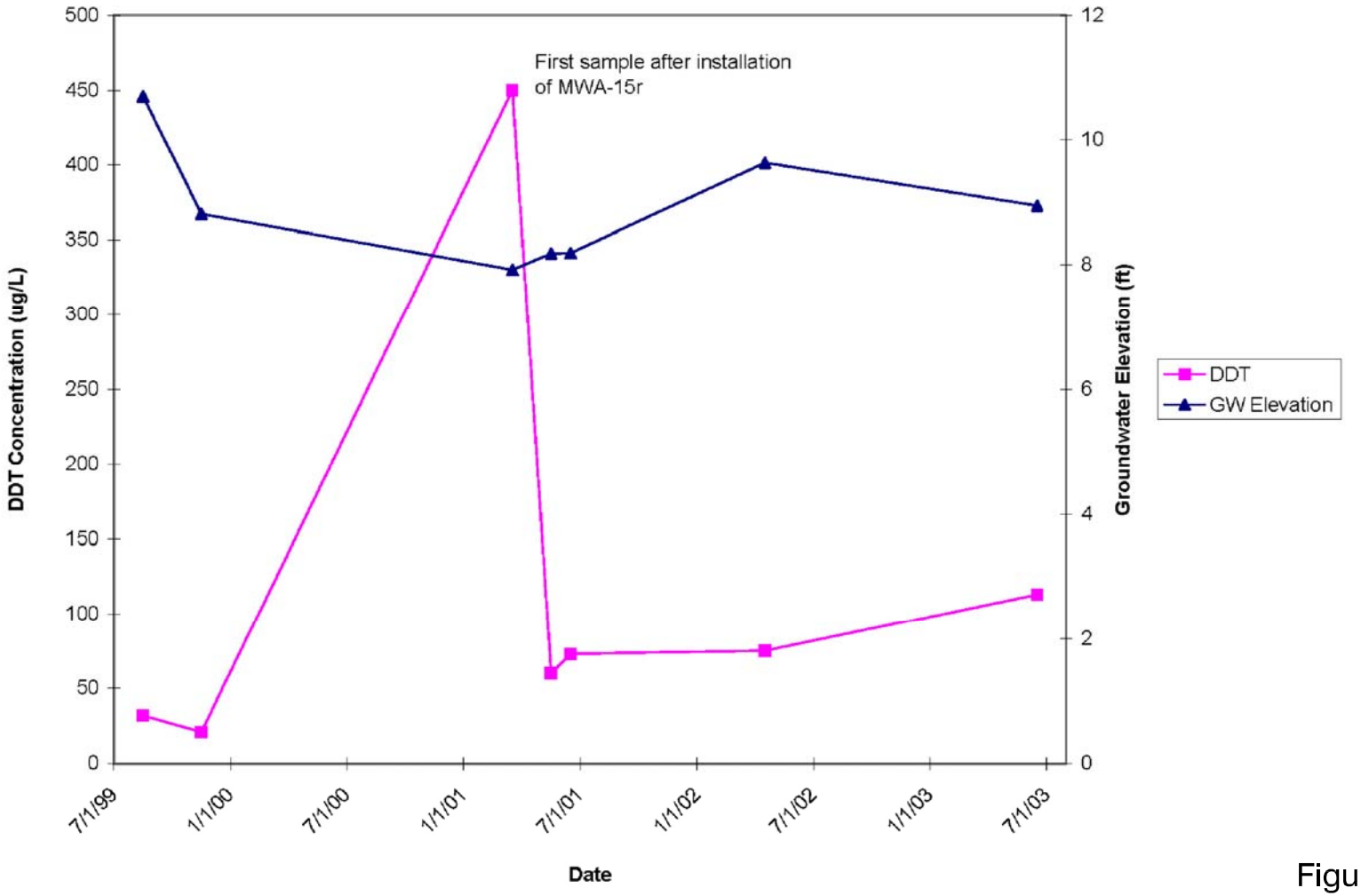


Figure 5-23b

DDT Concentrations and Groundwater Elevations for MWA-15/MWA-15r

Arkema Inc.

Portland, Oregon

ERM *10/05*

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-71.dwg	J. Estrada	10/30/05	0020423.10

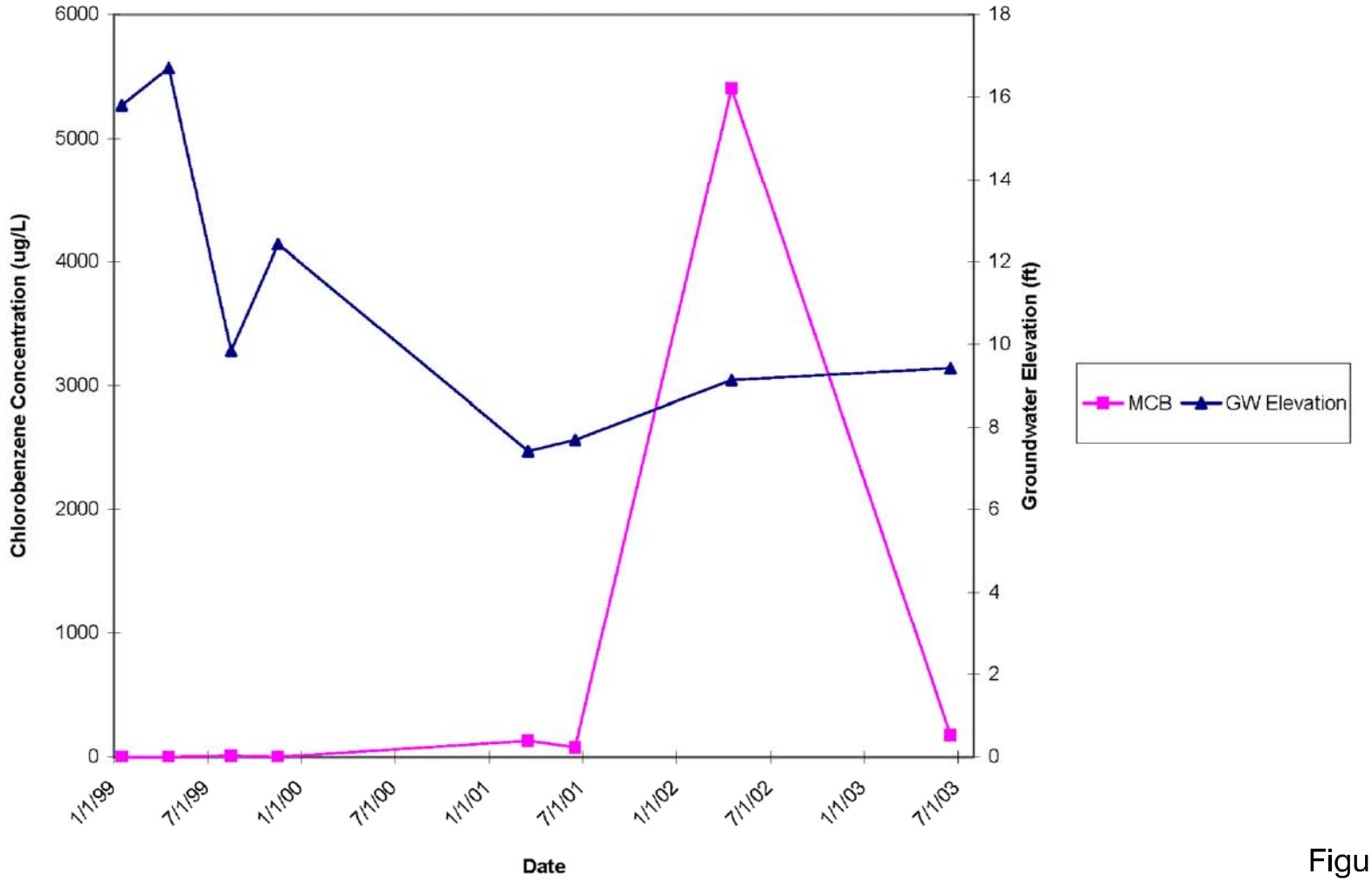


Figure 5-23c

Chlorobenzene Concentrations and Groundwater Elevations for MWA-3

Arkema Inc.

Portland, Oregon

ERM *10/05*

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-71.dwg	J. Estrada	10/30/05	0020423.10

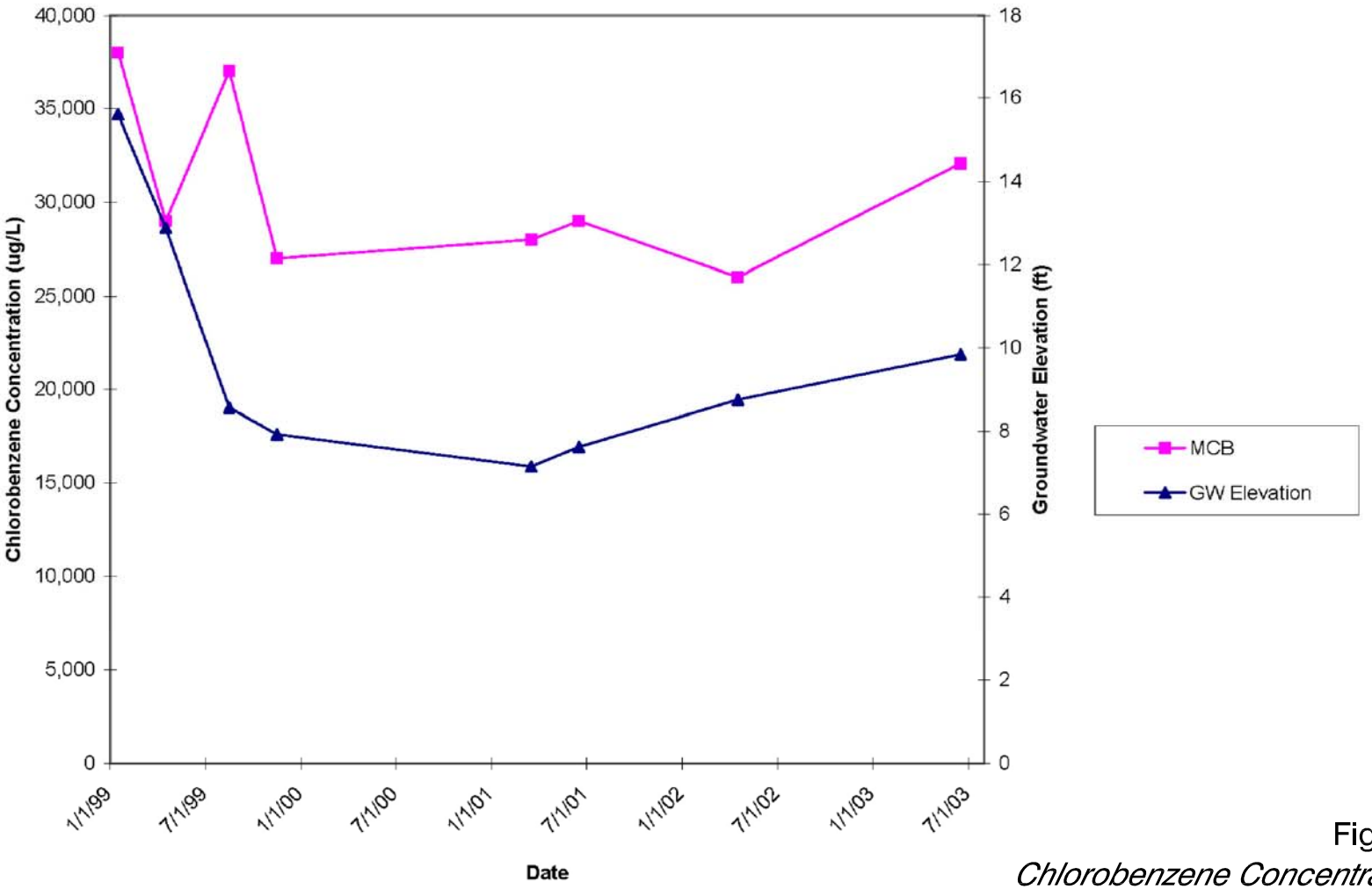


Figure 5-23d

Chlorobenzene Concentrations and Groundwater Elevations for MWA-9i

Arkema Inc.

Portland, Oregon

ERM *10/05*

CAD File:	Drawn By:	Date:	Project No.
G:\\0020423\10\002042310-71.dwg	J. Estrada	10/30/05	0020423.10

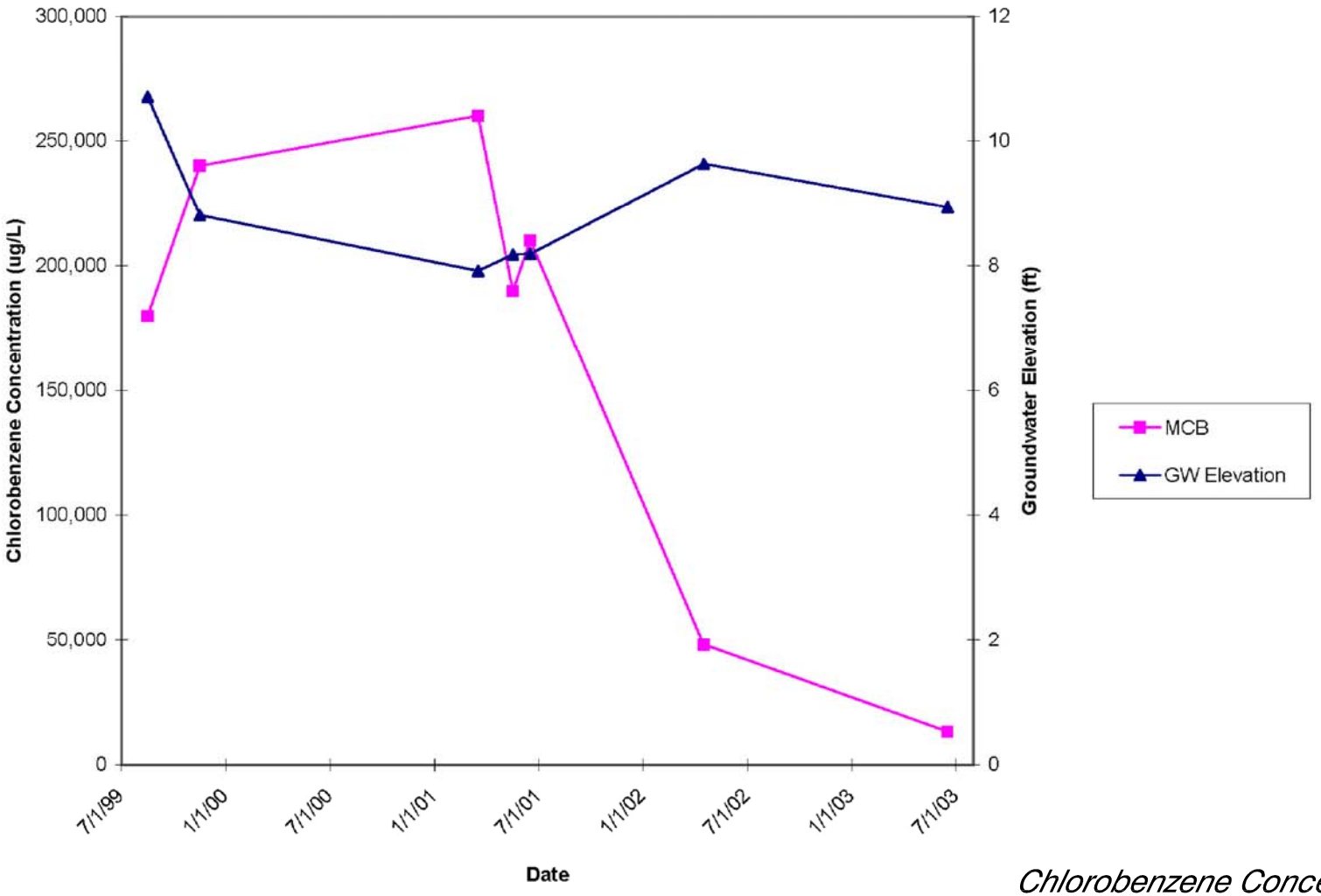


Figure 5-23e

Chlorobenzene Concentrations and Groundwater Elevations for MWA-15/MWA-15r

Arkema Inc.

Portland, Oregon

ERM *10/05*

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102310-54.dwg

OLD CAUSTIC TANK FARM
OIL STORAGE
SALT PADS
PROCESS
SALT PAD #1
BOILER ROOM
RECTIFIER
SUB-STATION
CHLORINE FINISHING
CHLORATE CELL ROOM
CAUSTIC PROCESS
CHLORATE PROCESS
MAINTENANCE SHOP
CHLORATE WAREHOUSE
LAB
OM

	Upper Depth (ft bgs)	Lower Depth (ft bgs)	Total Chromium Concentration (mg/kg)
B-71	0	4	13J
B-72	0	4	20 J
	0	4	15 J (d)
B-73	0	4	21 J
B-74	0	4	110 J
B-75	0	4	59 J
B-76	2	4	29 J
B-77	2	4	79 J
B-78	0	4	31 J
B-79	0	4	31 J
B-80	0	4	40 J
B-81	0	4	36 J
B-82	0	4	14 J
B-83	0	4	120 J
B-86	0	4	18 J
	0	4	17 J (d)
B-87	0	4	17 J
B-88	0	4	180 J
B-90	2	4	75 J

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

B-112 ● RI Soil Boring Location

(d) = Duplicate Sample Result
J = Estimated Concentration

All sample concentrations were below the preliminary screening level for total chromium (450 mg/kg; USEPA Region 9 PRG).

TRUE NORTH
PLANT NORTH
0 80
FEET

Figure 5-24
Total Chromium Concentrations in Soil (0-4 feet bgs)
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423310-58.dwg

OLD CAUSTIC TANK FARM
OIL STORAGE
SALT PADS
PROCESS
SALT PAD #1
BOILER ROOM
RECTIFIER
SUB-STATION
CHLORINE FINISHING
CHLORATE CELL ROOM
CAUSTIC PROCESS
CHLORATE PROCESS
OM
MAINTENANCE SHOP
CHLORATE WAREHOUSE
LAB

8	12	20 J	1.6 U
16	20	15 J	–

B-71

12	16	20 J	–
24	28	25 J	–
32	36	220 J	–

B-72

4	6	77 J	–
8	10	69 J	9.7 J
12	14	220 J	–
16	18	85 J	–
20	22	110 J	–
20	22	130 J (d)	–
24	28	290 J	–

B-75

4	6	73 J	–
8	10	35 J	30 J
12	14	28 J	–
16	18	34 J	–
20	22	150 J	–
24	26	100 J	–
28	32	110 J	–

B-84

8	12	13 J	–
16	20	15 J	–

B-73

6	8	240 J	–
10	12	570 J	–
14	16	190 J	–
16	20	220 J	–

B-74

4	6	52 J	–
8	10	670 J	–
12	14	1100 J	–
16	18	150 J	–
18	22	120 J	–

B-76

4	6	30 J	–
8	10	21 J	–
12	14	9.5 J	–
16	18	36 J	–
20	24	130 J	–

B-78

4	8	21 J	–
12	16	28 J	–

B-86

B-77

8	12	21 J	–
16	20	15 J	–

B-79

4	6	76 J	–
4	6	61 J (d)	–
8	10	220 J	16 J
12	14	93 J	–
16	20	780 J	–

B-80

8	12	140 J	–
16	20	260 J	–

B-81

4	6	120 J	–
8	10	170 J	69 J
12	16	410 J	–
18	20	100 J	–
22	24	130 J	–

4	8	23 J	–
12	16	10 J	–

B-87

6	8	190 J	–
10	12	1600 J	–
14	16	52 J	–
18	20	21 J	–
22	24	32 J	–

B-88

8	12	160 J	–

B-83

8	12	14 J	–

B-82

4	6	75 J	–
8	10	300 J	–
12	14	120 J	–
16	18	49 J	–
20	24	33 J	–

B-90

LEGEND

B-112 ● RI Soil Boring Location

(d) = Duplicate Sample Result
J = Estimated Concentration
"–" = Not Analyzed

Indicates concentration above screening levels for total Chromium (450 mg/kg; USEPA Region 9 PRG) or Hexavalent Chromium (64 mg/kg; USEPA Region 9 PRG).

6	8	190	–

Upper Depth (ft bgs)
Lower Depth (ft bgs)
Hexavalent Chromium Concentration (mg/kg)
Total Chromium Concentration (mg/kg)

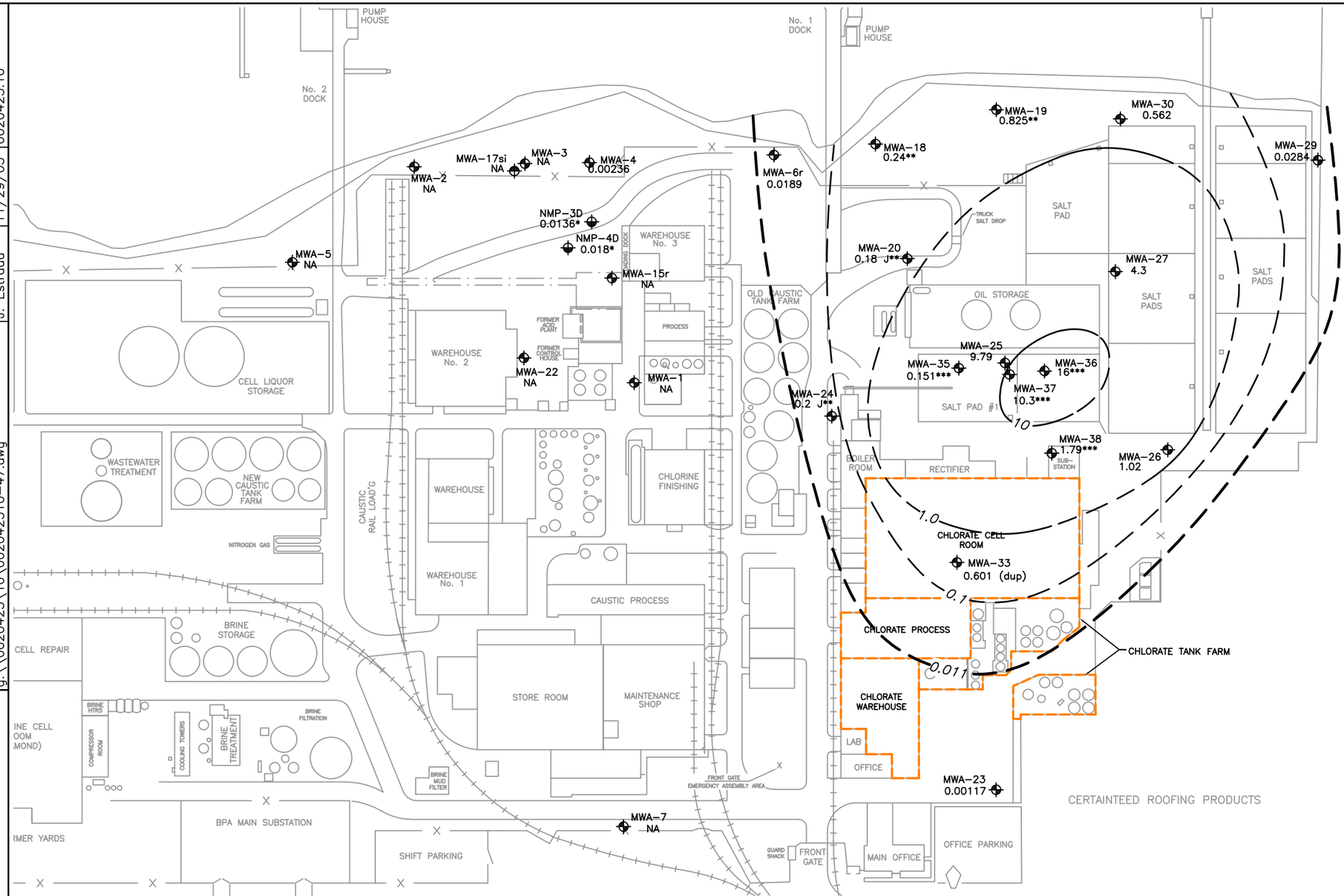
NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 80
FEET

Figure 5-25
Total and Hexavalent Chromium Concentrations in Soil (>4 feet bgs)
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102042310-47.dwg



NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Shallow–Intermediate Zone
- Monitoring Well, Persulfate Pilot Study
- 9.79 — Total Chromium Concentration, mg/L
- 1 — Total Chromium Concentration Contour, mg/L; Dashed Where Inferred
- 0.011 — Preliminary Screening Level for Chromium Contour, mg/L; Dashed Where Inferred

J = Estimated
NA = Not Analyzed
* = Sampled in June 2001; Data Not Used for Contouring
** = Sampled in April 2002; Data Not Used for Contouring
*** = Sampled in December 2003

Note: Preliminary screening level for chromium is 0.011 mg/L (USEPA Region 9 PRG).

Figure 5-26
Total Chromium Concentrations in Groundwater
Shallow Zone - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102042310-48.dwg

MWA-8i NA
MWA-9i NA
MWA-10i NA
MWA-14i NA
MWA-16i 0.992
MWA-34i 0.142
MWA-32i 0.238
MWA-11i NA
MWA-12i NA
0.1
0.011
PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
CELL LIQUOR STORAGE
WAREHOUSE No. 2
WAREHOUSE No. 3
LOADING DOCK
FORMER ACID PLANT
FORMER CONTROL HOUSE
PROCESS
OLD CAUSTIC TANK FARM
TRUCK SALT DROP
SALT PAD
SALT PADS
OIL STORAGE
SALT PAD #1
WASTEWATER TREATMENT
NEW CAUSTIC TANK FARM
NITROGEN GAS
CAUSTIC RAIL LOAD'G
WAREHOUSE No. 1
WAREHOUSE
CHLORINE FINISHING
BOILER ROOM
RECTIFIER
SUB-STATION
CHLORATE CELL ROOM
CHLORATE PROCESS
CHLORATE TANK FARM
CHLORATE WAREHOUSE
LAB
OFFICE
CAUSTIC PROCESS
BRINE STORAGE
CELL REPAIR
INE CELL OOM MOND)
BRINE HTRS
COMPRESSOR ROOM
COOLING TOWERS
BRINE TREATMENT
BRINE FILTRATION
BRINE MUD FILTER
STORE ROOM
MAINTENANCE SHOP
FRONT GATE EMERGENCY ASSEMBLY AREA
BPA MAIN SUBSTATION
MER YARDS
SHIFT PARKING
GUARD SHACK
FRONT GATE
MAIN OFFICE
OFFICE PARKING
CERTAINTEED ROOFING PRODUCTS
N.W. FRONT AVE.

TRUE NORTH
PLANT NORTH
0 150
FEET

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Intermediate Zone
- 0.50 Total Chromium Concentration, mg/L
- 1 Total Chromium Concentration Contour, mg/L; Dashed Where Inferred
- 0.011 Preliminary Screening Level for Chromium Contour, mg/L; Dashed Where Inferred

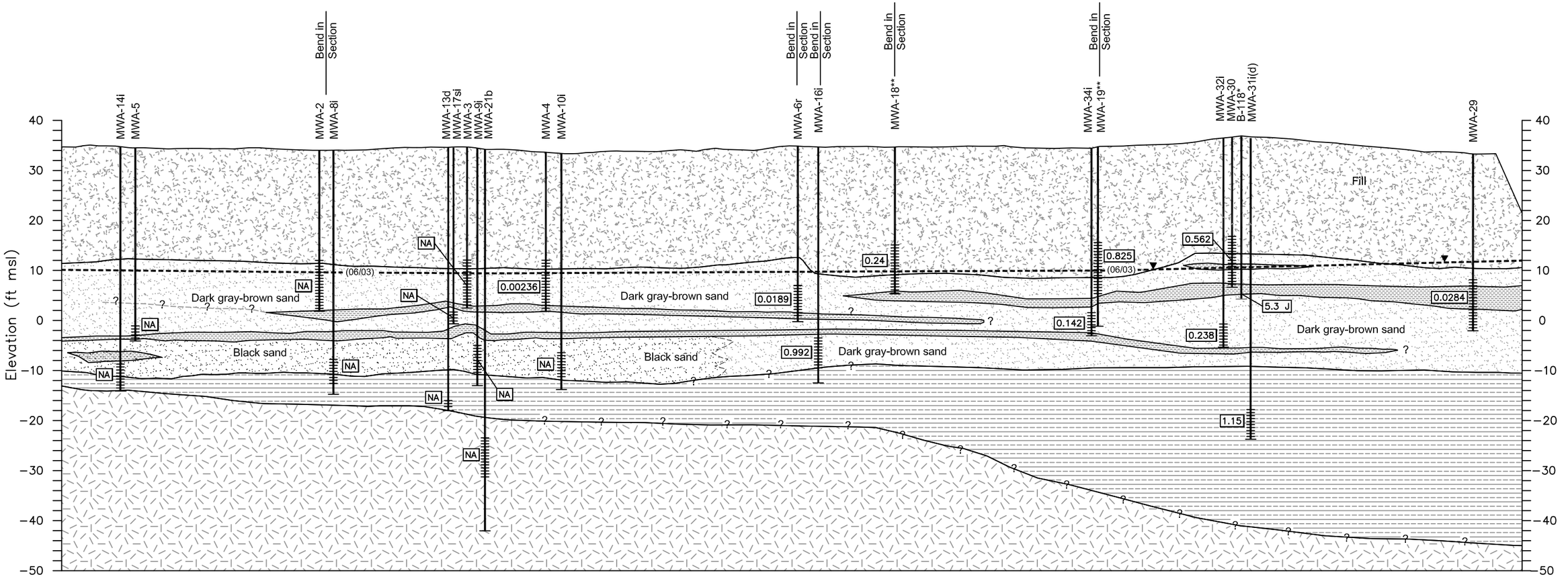
NA = Not Analyzed
U = Undetected at the Detection Limit Shown

Note: Preliminary screening level for chromium is 0.011 mg/L (USEPA Region 9 PRG).

Figure 5-27
Total Chromium Concentrations in Groundwater
Intermediate Zone - June 2003
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10 | Date: 11/28/05 | Drawn By: JSE/RLO | CAD File: G:\0020423\10\0020423102-62.dwg

A (Plant North) — A' (Plant South)



LEGEND

- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- Basalt

B-59 — Geoprobe® boring number

MWA-1 — Well number

Cased interval

Screen interval

Shallow-zone groundwater surface (approximate); June 2003

Inferred soil or geologic contact (queried where uncertain)

4.6 Total Chromium Concentration, mg/L

J = Estimated
NA = Not Analyzed
* = Sampled December 2001
** = Sample April 2002

Location of Cross Section Shown on Figure 4-1

(Vertical Exaggeration = 5X)

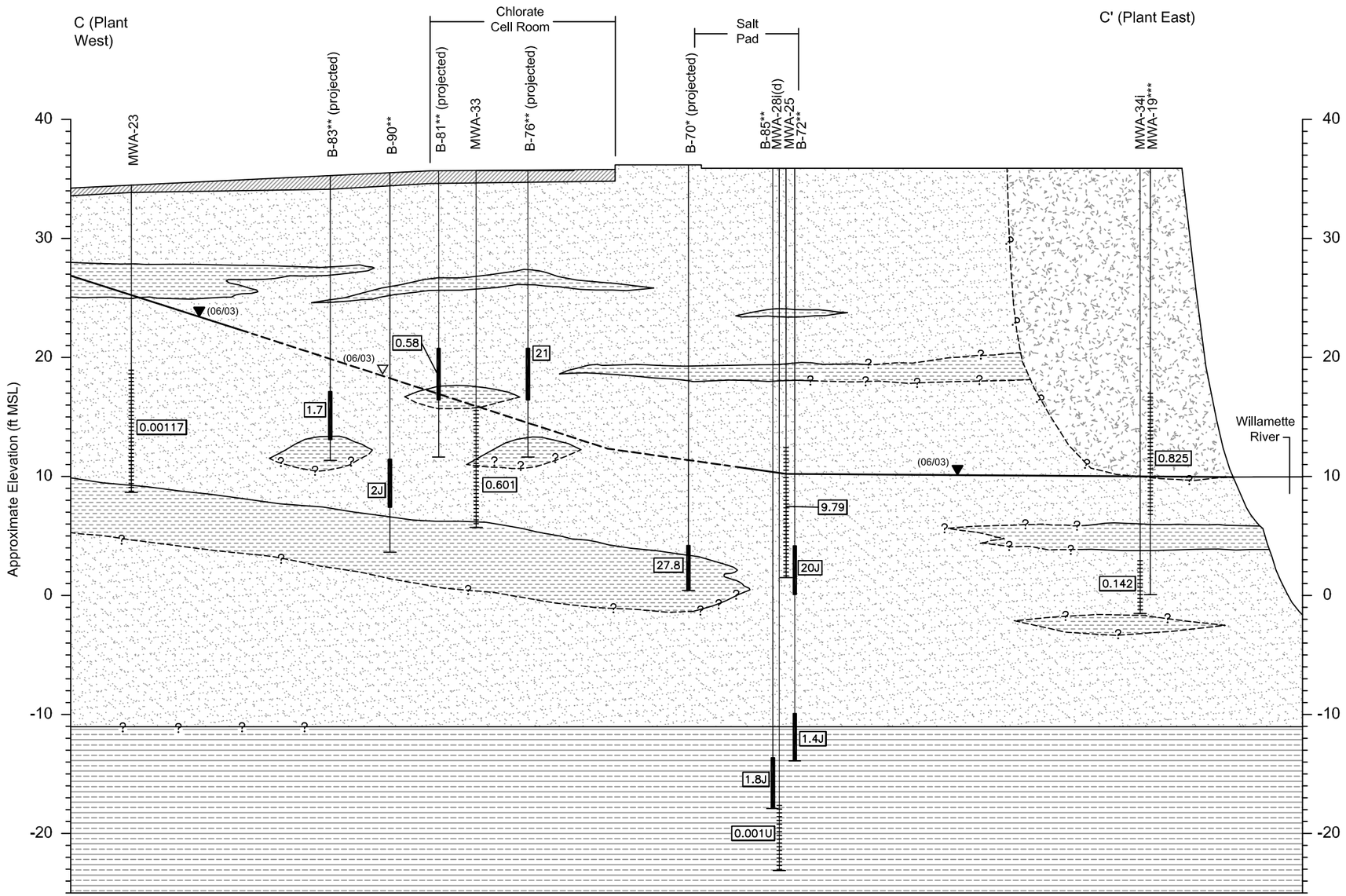
VERTICAL SCALE IN FEET
1" = 20'

HORIZONTAL SCALE IN FEET
1" = 100'

Figure 5-28
Total Chromium Concentrations in Groundwater
Cross Section A-A' - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: g:_0020423\10\0020423102-63.dwg
Drawn By: JSE/RLO
Date: 11/28/05
Project No. 0020423.10



LEGEND

- Concrete or asphalt
- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- MW-30, B-74 — Well or boring I.D. number
- Soil Boring with groundwater sample interval
- Monitoring well with screen casing
- Inferred soil contact (queried where uncertain)
- Shallow-zone groundwater surface (June 2003); dashed and open symbol where approximate; based on monitoring well data only
- 1.7 — Total Chromium Concentration, mg/L

J = Estimated
U = Undetected at the detection limit shown
* = Sampled May 2001
** = Sampled Sept/Oct/Nov 2001
*** = Sample April 2002

Note: Cross section location shown on Figure 4-1.

(Vertical Exaggeration = 10X)

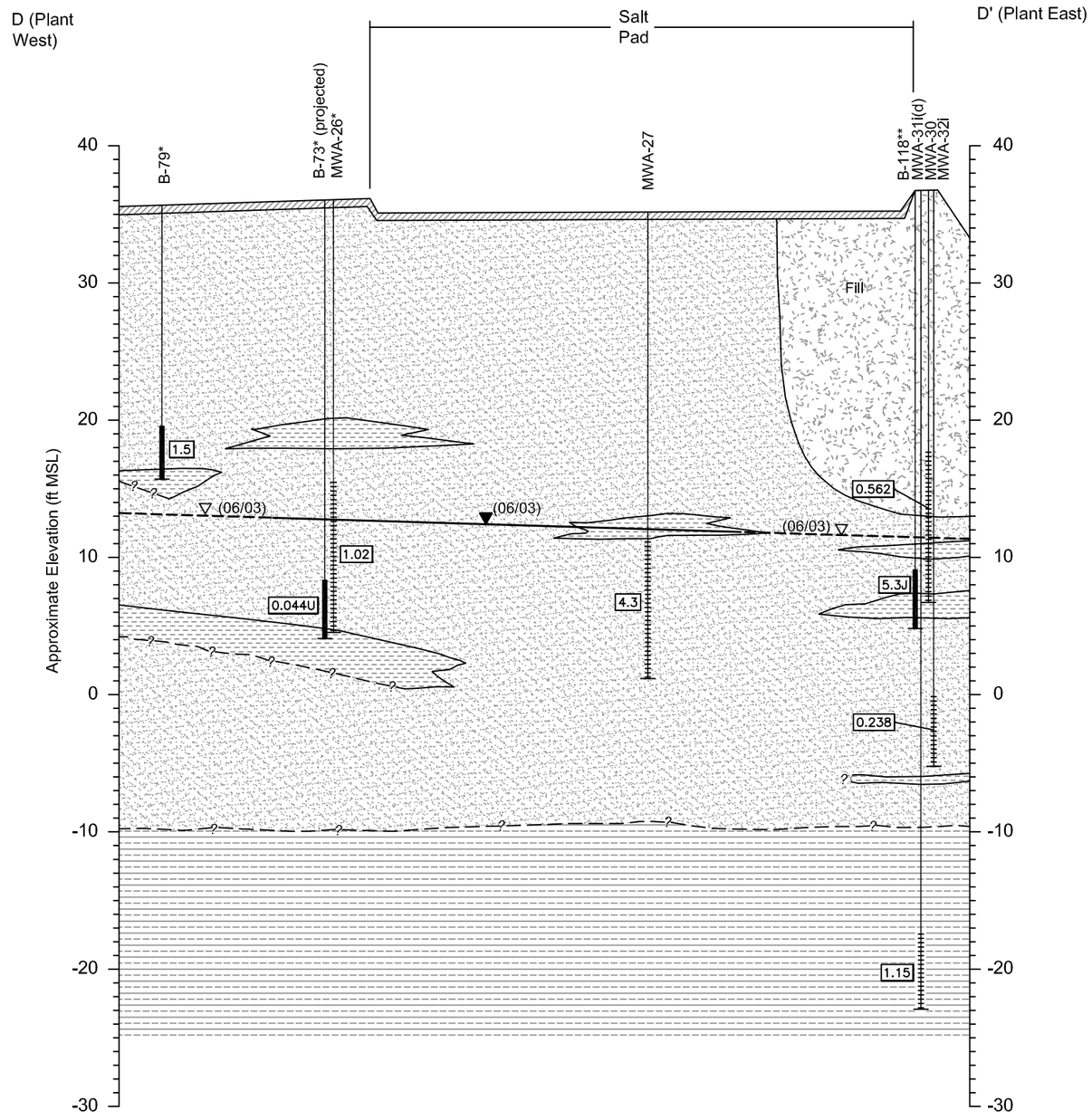
VERTICAL SCALE IN FEET
1" = 10'

HORIZONTAL SCALE IN FEET
1" = 100'

Figure 5-29
Total Chromium Concentrations in Groundwater
Cross Section C-C' - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: g:\0020423\10\0020423102-64.dwg
Drawn By: JSE/RLO
Date: 11/28/05
Project No. 0020423.10



LEGEND

- Concrete or asphalt
- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- MW-30, B-74 — Well or boring I.D. number
- Boring with groundwater sample interval
- Monitoring well with screen casing interval
- Inferred soil contact (queried where uncertain)
- Shallow-zone groundwater surface (June 2003); dashed and open symbol where approximate; based on monitoring well data only
- 1.5 — Total Chromium Concentration, mg/L

J = Estimated
U = Undetected at the detection limit shown
* = Sampled September 2001
** = Sampled December 2001

Note: Cross section location shown on Figure 4-1.

(Vertical Exaggeration = 10X)

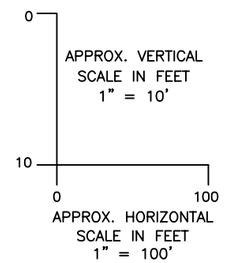
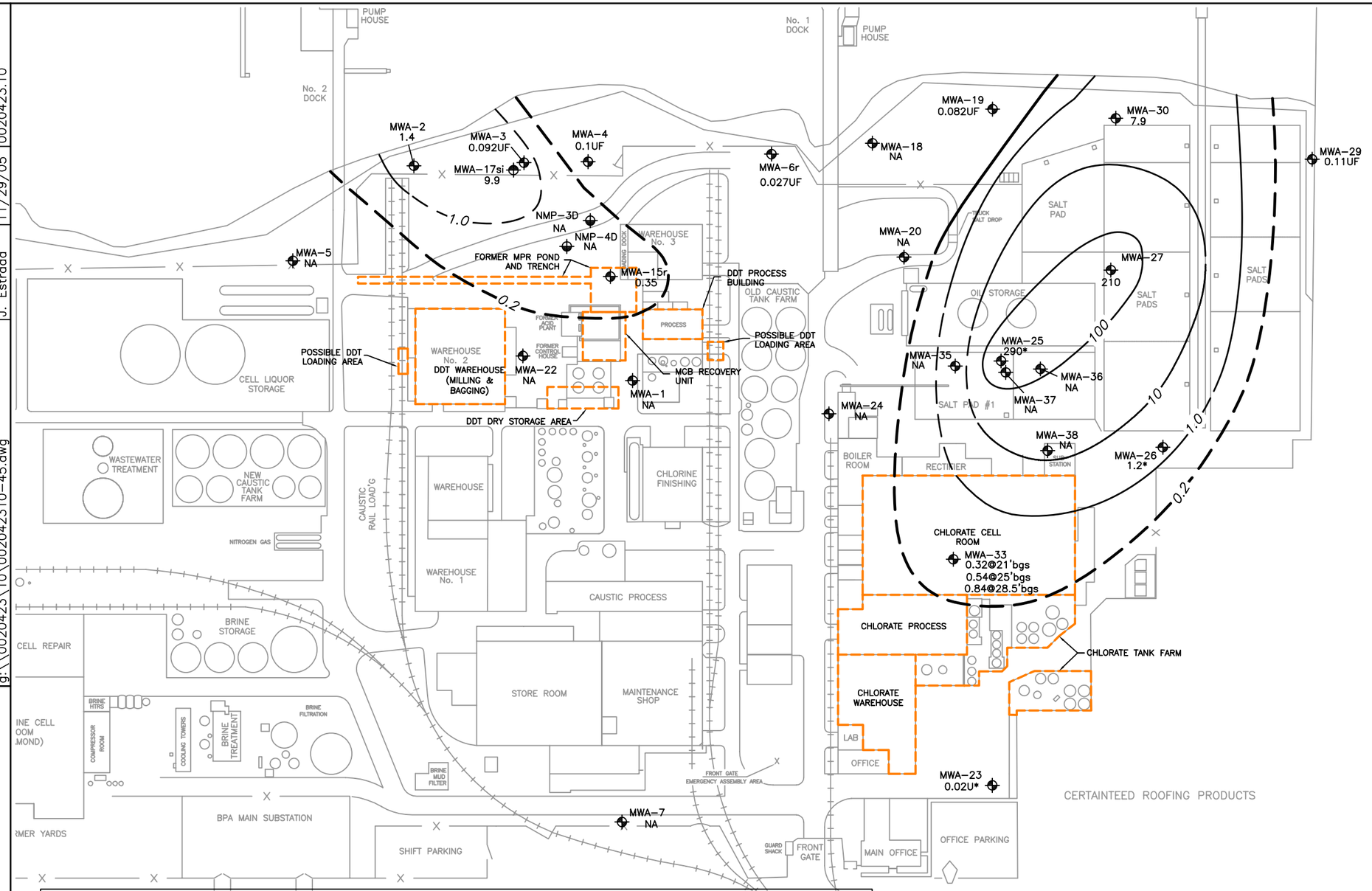


Figure 5-30
Total Chromium Concentrations in Groundwater
Cross Section D-D' - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423105.dwg



LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Shallow–Intermediate Zone
- Monitoring Well, Persulfate Pilot Study Lower Portion Shallow Zone
- 0.113 Perchlorate Concentration, mg/L
- 10 Perchlorate Concentration Contour, mg/L; Dashed Where Inferred
- 0.2 Preliminary Screening Level for Perchlorate Contour, mg/L; Dashed Where Inferred

bgs = Below Ground Surface
NA = Not Analyzed
F = Field Quality Control Criteria Not Met
U = Undetected at the Detection Limit Shown
* Sampled in July 2003

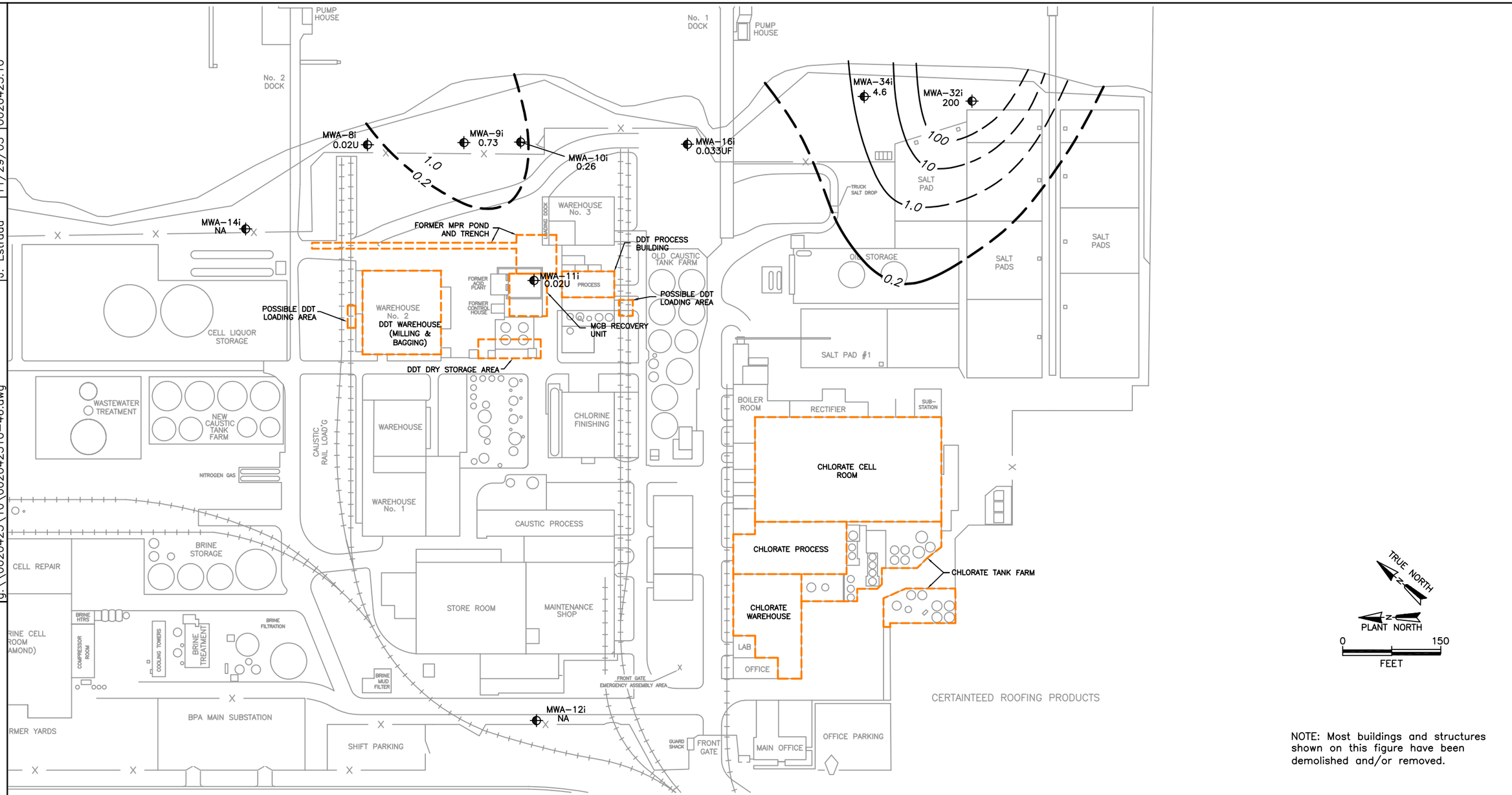
Note: Preliminary screening level for perchlorate is 0.2 mg/L (ODEQ Calculated SLV).

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

Figure 5-31
Perchlorate Concentrations in Groundwater
Shallow Zone - June and July 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102042310-46.dwg



NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Intermediate Zone
- 0.26 — Perchlorate Concentration, mg/L
- 10 — Perchlorate Concentration Contour, mg/L; Dashed Where Inferred
- 0.2 — Preliminary Screening Level for Perchlorate Contour, mg/L; Dashed Where Inferred

NA = Not Analyzed
U = Undetected at the Detection Limit Shown
(d) = Duplicate Sample Result
F = Field Quality Control Criteria Not Met
* = Sampled in July 2003

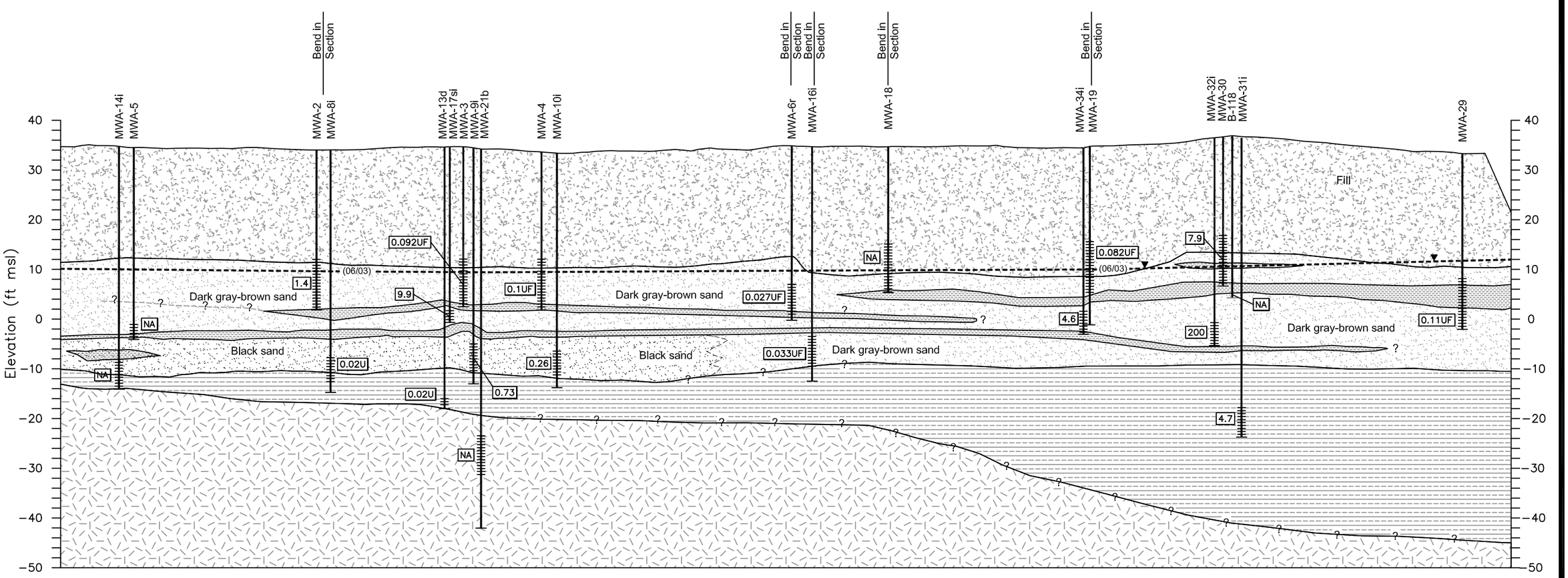
Note: Preliminary screening level for perchlorate is 0.2 mg/L (ODEQ Calculated SLV).

Figure 5-32
Perchlorate Concentrations in Groundwater
Intermediate Zone - June and July 2003
Arkema Inc.
Portland, Oregon
ERM 11/05

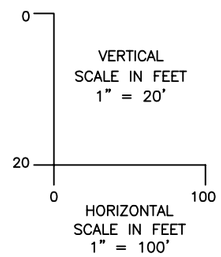
Project No. 0020423.10
Date: 11/28/05
Drawn By: JSE/RLO
CAD File: G:\0020423\10\0020423310-59.dwg

A (Plant North)

A' (Plant South)



(Vertical Exaggeration = 5X)



LEGEND

- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- Basalt

B-59 — Geoprobe® boring number

MWA-1 — Well number

- Cased interval
- Screen interval

--▼-- Shallow-zone groundwater surface (approximate); June 2003

——— Inferred soil or geologic contact (queried where uncertain)

4.6 Perchlorate Concentration, mg/L

F = Field quality control criteria not met
U = Undetected at the detection limit shown
NA = Not Analyzed

Location of Cross Section
Shown on Figure 4-1

Figure 5-33

Perchlorate Concentrations in Groundwater
Cross Section A-A' - June and July 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/28/05
Drawn By: JSE/RLO
CAD File: g:\0020423\10\002042310-60.dwg

C (Plant West)

C' (Plant East)

Chlorate Cell Room

Salt Pad

MWA-23*
B-83 (projected)
B-90
B-81 (projected)
MWA-33
B-76 (projected)
B-70 (projected)
B-85
MWA-28i(d)
MWA-25*
B-72
MWA-34i
MWA-19

Approximate Elevation (ft MSL)

40
30
20
10
0
-10
-20

(06/03)
(06/03)
(06/03)

NA
NA
NA
NA
NA
NA
NA

0.02 U
0.32 @ 21' bgs
0.54 @ 25' bgs
0.84 @ 28.5' bgs
290
0.082 UF
4.6
0.02 U

Willamette River

LEGEND

- Concrete or asphalt
- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- MW-30, B-74 — Well or boring I.D. number
- Soil Boring with groundwater sample interval
- Monitoring well with screen casing
- Inferred soil contact (queried where uncertain)
- Shallow-zone groundwater surface (June 2003); dashed and open symbol where approximate; based on monitoring well data only
- 4.6 — Perchlorate Concentration, mg/L

U = Undetected at the detection limit shown
NA = Not Analyzed
* = Sampled July 2003

Note: Cross section location shown on Figure 4-1.

(Vertical Exaggeration = 10X)

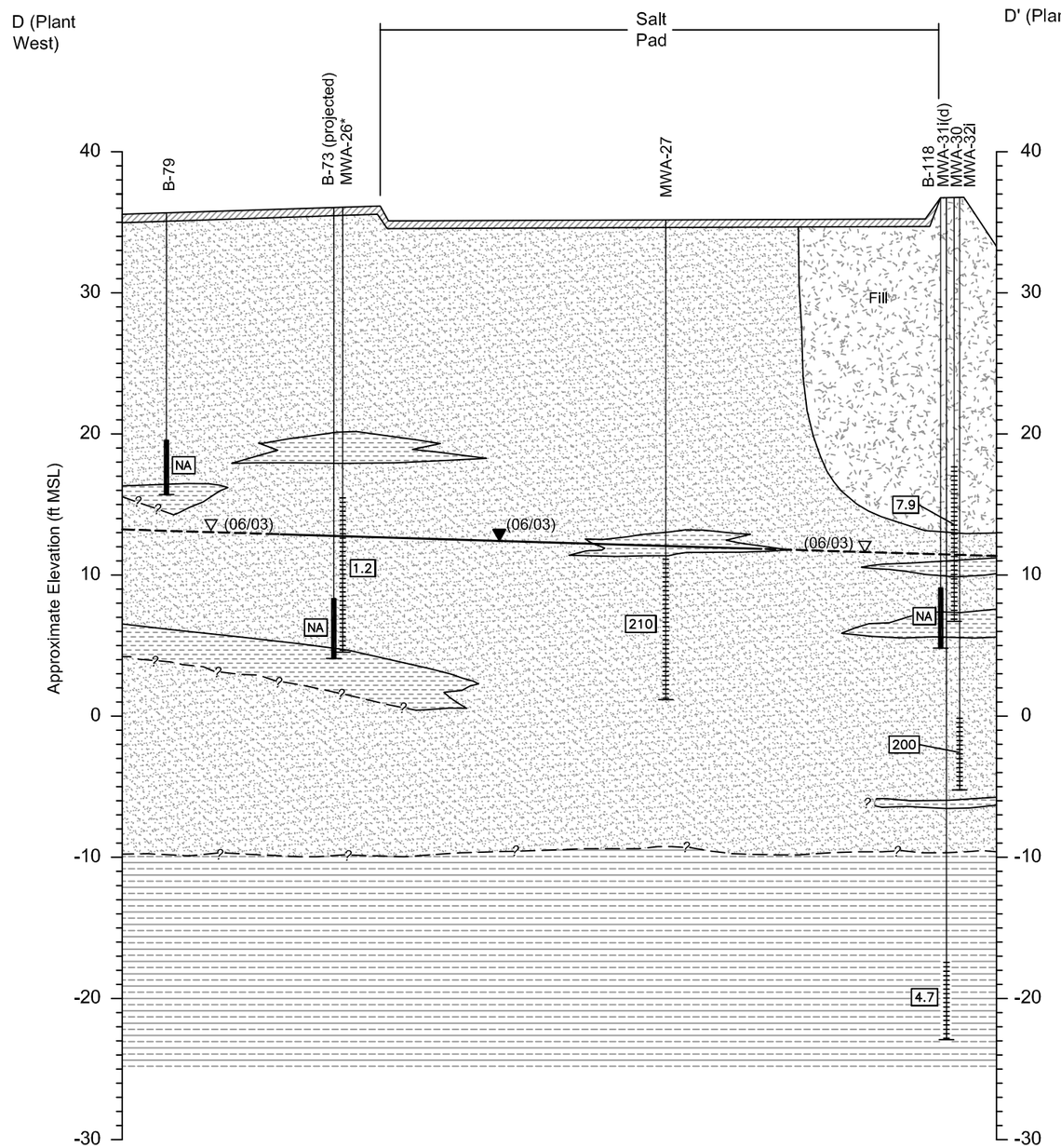
VERTICAL SCALE IN FEET
1" = 10'

HORIZONTAL SCALE IN FEET
1" = 100'

Figure 5-34
Perchlorate Concentrations in Groundwater
Cross Section C-C' - June and July 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: g:\0020423\10\002042310-61.dwg
Drawn By: JSE/RLO
Date: 11/28/05
Project No. 0020423.10



LEGEND

- Concrete or asphalt
- Fill
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- MW-30, B-74 — Well or boring I.D. number
- Boring with groundwater sample interval
- Monitoring well with screen casing interval
- Inferred soil contact (queried where uncertain)
- Shallow-zone groundwater surface (June 2003); dashed and open symbol where approximate; based on monitoring well data only
- 4.6 — Perchlorate Concentration, mg/L

NA = Not Analyzed
* = Sampled July 2003

Note: Cross section location shown on Figure 4-1.

(Vertical Exaggeration = 10X)

0
APPROX. VERTICAL SCALE IN FEET
1" = 10'

10
0 100
APPROX. HORIZONTAL SCALE IN FEET
1" = 100'

Figure 5-35
Perchlorate Concentrations in Groundwater
Cross Section D-D' - June and July 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423l0-49.dwg

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
MWA-3 107
MWA-17si 1,970
MWA-2 981
MWA-4 234
MWA-6r 1850
MWA-18 1410
MWA-19 5180
MWA-30 164,000
MWA-29 11,700
NMP-3D 2,260
NMP-4D 2,150 (dup)
MWA-5 859
MWA-15r 388
MWA-20 1500
MWA-27 9360
WAREHOUSE No. 3
LOADING DOCK
TRUCK SALT DROP
SALT PAD
SALT PADS
OLD CAUSTIC TANK FARM
OIL STORAGE
FORMER ACID PLANT
FORMER CONTROL HOUSE
PROCESS
WAREHOUSE No. 2
MWA-22 6,210
MWA-1 961 J*
CELL LIQUOR STORAGE
MWA-25 2,980
MWA-35 NA
MWA-36 NA
MWA-37 NA
SALT PAD #1
MWA-24 583
MWA-38 NA
MWA-26 632
BOILER ROOM
RECTIFIER
SUB-STATION
WASTEWATER TREATMENT
NEW CAUSTIC TANK FARM
CAUSTIC RAIL LOADING
WAREHOUSE
CHLORINE FINISHING
CHLORATE CELL ROOM
MWA-33 198
NITROGEN GAS
WAREHOUSE No. 1
CAUSTIC PROCESS
BRINE STORAGE
CHLORATE PROCESS
CELL REPAIR
STORE ROOM
MAINTENANCE SHOP
CHLORATE WAREHOUSE
BRINE HTRS
COMPRESSOR ROOM
COOLING TOWERS
BRINE TREATMENT
BRINE FILTRATION
LAB
OFFICE
MWA-23 43.4
BRINE MUD FILTER
FRONT GATE EMERGENCY ASSEMBLY AREA
CERTAINTEED ROOFING PRODUCTS
MWA-7 175
BPA MAIN SUBSTATION
SHIFT PARKING
GUARD SHACK
FRONT GATE
MAIN OFFICE
OFFICE PARKING

100,000
10,000
1,000
230

TRUE NORTH
PLANT NORTH
0 150
FEET

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Shallow–Intermediate Zone
- Monitoring Well, Persulfate Pilot Study

198 Chloride Concentration, mg/L

1,000 Total Chloride Concentration Contour, mg/L; Dashed Where Inferred

230 Preliminary Screening Level for Chloride Contour, mg/L; Dashed Where Inferred

J = Estimated
NA = Not Analyzed
* = Sampled in April 1999; Data Not Used for Contouring

Note: Preliminary screening level for chloride is 230 mg/L (USEPA 2004 NRWQC, Freshwater).

MWA–3 Not used for contouring.

Figure 5-36
Chloride Concentrations in Groundwater
Shallow Zone - June 2003
Arkema Inc.
Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102-50.dwg

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
MWA-8i 2380
MWA-9i 2860
MWA-10i 1240
MWA-16 2180
MWA-34i 3040
MWA-32i 31,000
10,000
MWA-14i 1720
1,000
230
WAREHOUSE No. 3
LOADING DOCK
TRUCK SALT DROP
SALT PAD
SALT PADS
OLD CAUSTIC TANK FARM
OIL STORAGE
FORMER ACID PLANT
FORMER CONTROL HOUSE
MWA-11i 550
PROCESS
WAREHOUSE No. 2
CELL LIQUOR STORAGE
SALT PAD #1
WASTEWATER TREATMENT
NEW CAUSTIC TANK FARM
CAUSTIC RAIL LOAD'G
WAREHOUSE
CHLORINE FINISHING
BOILER ROOM
RECTIFIER
SUB-STATION
CHLORATE CELL ROOM
NITROGEN GAS
WAREHOUSE No. 1
CAUSTIC PROCESS
BRINE STORAGE
CELL REPAIR
STORE ROOM
MAINTENANCE SHOP
CHLORATE PROCESS
CHLORATE WAREHOUSE
BRINE HTRS
COMPRESSOR ROOM
COOLING TOWERS
BRINE TREATMENT
BRINE FILTRATION
LAB
OFFICE
BRINE MUD FILTER
FRONT GATE EMERGENCY ASSEMBLY AREA
CERTAINTEED ROOFING PRODUCTS
MWA-12i 14.5
BPA MAIN SUBSTATION
SHIFT PARKING
GUARD SHACK
FRONT GATE
MAIN OFFICE
OFFICE PARKING
N.W. FRONT AVE.

TRUE NORTH
PLANT NORTH
0 150
FEET

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Intermediate Zone
- 550 — Chloride Concentration, mg/L
- 1,000 — Total Chloride Concentration Contour, mg/L; Dashed Where Inferred
- 230 — Preliminary Screening Level for Chloride Contour, mg/L; Dashed Where Inferred
- (d) = Duplicate Sample, mg/L

Note: Preliminary screening level for chloride is 230 mg/L (USEPA 2004 NRWQC, Freshwater).

Figure 5-37
Chloride Concentrations in Groundwater Intermediate Zone - June 2003
Arkema Inc.
Portland, Oregon
ERM 11/05

Drawn By: J. Estrada | Date: 11/29/05 | Project No. 0020423.10

CAD File: g:\0020423\10\0020423310-65.dwg

No. 2 DOCK

WAREHOUSE No. 3

LOADING DOCK

PROCESS

FORMER ACID PLANT

FORMER CONTROL HOUSE

WAREHOUSE No. 2

CELL LIQUOR STORAGE

NEW CAUSTIC TANK FARM

CAUSTIC RAIL LOAD'G

WAREHOUSE

WAREHOUSE No. 1

NITROGEN GAS

BRINE STORAGE

CHLORINE FINISHING

CAUSTIC PROCESS

OLD CAUSTIC TANK FARM

TRUCK SALT DROP

SALT PAD

SALT PADS

SALT PADS

OIL STORAGE

SALT PAD #1

BOILER ROOM

RECTIFIER

SUB-STATION

CHLORATE CELL ROOM

CHLORATE PROCESS

OCTF-1

0	0.5	7.62	2840	4750
0.5	1	5 U	1470	3620

OCTF-2

0	0.5	–	661	3600
0.5	1	–	25 U	573

OCTF-3

0	0.5	115	1790	2550
0.5	1	219	2150	2340

OCTF-4

0	0.5	–	749	3450
0.5	1	–	650	2860

OCTF-5

0	0.5	–	1910	3210
0.5	1	–	652	1320

OCTF-6

0	0.5	–	805	3460
0.5	1	–	246	873

OCTF-7

0	0.5	–	777	770
0.5	1	–	25 U	63.5

OCTF-8

0	0.5	–	25 U	50 U
0.5	1	–	25 U	56

OCTF-9

0	0.5	5 U	514	1580
0.5	1	5.27	817	3480

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

OCTF-2 ⊗ Old Caustic Tank Farm Soil Sample Location

U = Undetected at the Detection Limit Shown
"–" = Not Analyzed

Upper Depth (ft bgs)	Lower Depth (ft bgs)	Volatile Range Organic (mg/kg)	Diesel Range Organic (mg/kg)	Heavy-Oil Range Organic (mg/kg)
0.5	1	5.27	817	3480

All sample concentrations were below the preliminary screening levels (ODEQ 2003 Risk-Based Concentrations) for volatile-range (13,000 mg/kg), diesel-range (23,000 mg/kg), and residual-range organics (23,000 mg/kg).

TRUE NORTH

PLANT NORTH

0 100

FEET

Figure 5-38

Total Petroleum Hydrocarbons in OCTF Soil - January 2004 (0-1 foot bgs) Arkema Inc. Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102\0020423102-67.dwg

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
MWA-17si 4.5 | 1.6 | 6.45
MWA-3 6.4 | 0.93 | 0.75
MWA-2 5.4 | 1.83 | 2.48
MWA-4 6.5 | 0.96 | 1.61
NMP-4D 4.4 | 1.86 | 9.25
NMP-3D 3.4 | 1.81 | 8.04
MWA-15r 6.6 | 0.95 | 2.64
MWA-5 6.6 | 0.67 | 3.19
MWA-6r 7.7 | – | 7.14
MWA-18 6.0 | 0.93 | 3.96
MWA-19 6.0 | 0.97 | 13.95
MWA-30 6.1 | – | >99.9
MWA-29 7.1 | – | 32.10
MWA-20 7.4 | – | 5.39
MWA-27 7.6 | – | 29.80
MWA-25 9.4 | 0.29 | 17.51
MWA-24 12.6 | – | 9.48
MWA-26 7.5 | – | 3.01
MWA-22 11.8 | 0.32 | 20.78
MWA-33
10.9 | 2.55 | 2.29 @ 21'
10.2 | 10.74 | 2.79 @ 25'
10.7 | 1.60 | 2.67 @ 28.5'
MWA-23 8.2 | – | 0.85
MWA-7 8.0 | – | 1.64
MWA-1 (Abandoned)
WAREHOUSE No. 3
LOADING DOCK
TRUCK SALT DROP
SALT PAD
SALT PADS
OIL STORAGE
SALT PAD #1
DDT PROCESS BUILDING
FORMER MPR POND AND TRENCH
FORMER ACID PLANT
FORMER CONTROL HOUSE
PROCESS
MCB RECOVERY UNIT
POSSIBLE DDT LOADING AREA
WAREHOUSE No. 2
DDT WAREHOUSE (MILLING & BAGGING)
POSSIBLE DDT LOADING AREA
OLD CAUSTIC TANK FARM
CELL LIQUOR STORAGE
DDT DRY STORAGE AREA
WASTEWATER TREATMENT
NEW CAUSTIC TANK FARM
NITROGEN GAS
CAUSTIC RAIL LOAD'G
WAREHOUSE
CHLORINE FINISHING
WAREHOUSE No. 1
CAUSTIC PROCESS
BOILER ROOM
RECTIFIER
SUB-STATION
CHLORATE CELL ROOM
CHLORATE PROCESS
CHLORATE WAREHOUSE
LAB
OFFICE
BRINE STORAGE
CELL REPAIR
BRINE HTRS
COMPRESSOR ROOM
COOLING TOWERS
BRINE TREATMENT
BRINE FILTRATION
BRINE MUD FILTER
STORE ROOM
MAINTENANCE SHOP
FRONT GATE EMERGENCY ASSEMBLY AREA
BPA MAIN SUBSTATION
SHIFT PARKING
GUARD SHACK
FRONT GATE
MAIN OFFICE
OFFICE PARKING
CERTAINTEED ROOFING PRODUCTS

TRUE NORTH
PLANT NORTH
0 150
FEET

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Shallow–Intermediate Zone
- Monitoring Well, Shallow Zone, Persulfate Pilot Study

6.6 | 0.67 | 3.19
- 3.19 — Specific Conductance in Millisiemens per centimeter (mS/cm)
- 0.67 — Disolved Oxygen (mg/L)
- 6.6 — pH

"–" = Not measured due to probe malfunction

Figure 5-39

pH, Dissolved Oxygen, and Specific Conductance Measurements in Groundwater Shallow Zone - June 2003

Arkema Inc.

Portland, Oregon

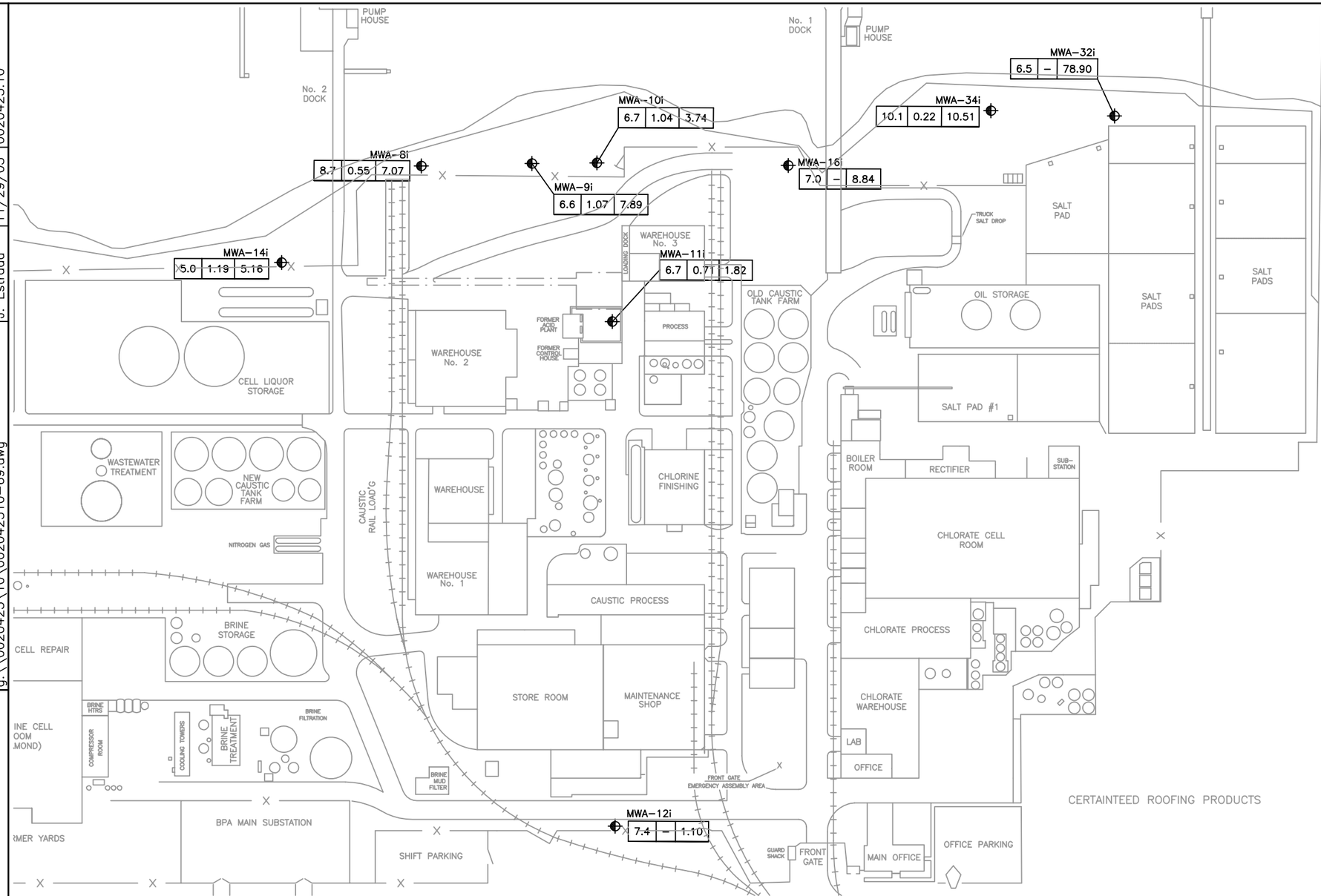
ERM 11/05

Project No. 0020423.10

Date: 11/29/05

Drawn By: J. Estrada

CAD File: g:\0020423\10\0020423-69.dwg



NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

LEGEND

Monitoring Well, Intermediate Zone

5.0	1.19	5.16

- 5.16 — Specific Conductance in Millisiemens per centimeter (mS/cm)
- 1.19 — Disolved Oxygen (mg/L)
- 5.0 — pH

"–" = Not measured due to probe malfunction

Figure 5-40

pH, Dissolved Oxygen, and Specific Conductance Measurements in Groundwater Intermediate Zone - June 2003

Arkema Inc.

Portland, Oregon

ERM 11/05

Project No. 0020423.10

Date: 11/29/05

Drawn By: J. Estrada

CAD File: g:\0020423\10\0020423310-66.dwg

LEGEND

Concrete Pad

1T Former Transformer Location

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH

PLANT NORTH

0 120

FEET

No. 2 DOCK

WAREHOUSE No. 3

LOADING DOCK

OLD CAUSTIC TANK FARM

52T

TRUCK SALT DROP

SALT PAD

OIL STORAGE

SALT PAD #1

11 OCB

55 OCB

13 OCB

61 OCB

9CAP

11X

40T

11CT

58 OCB

58T

SUB STATION

90CB

BOILER ROOM

RECTIFIER

CHLORATE CELL ROOM

CHLORATE PROCESS

CHLORA

CHLORATE WAREHOUSE

LAB

OFFICE

CERTAINTE

WAREHOUSE No. 2

FORMER ACID PLANT

FORMER CONTROL HOUSE

PROCESS

49T

48T

CELL LIQUOR STORAGE

16T

CAUSTIC RAIL LOAD'G

WAREHOUSE

46T

47T

CHLORINE FINISHING

WAREHOUSE No. 1

CAUSTIC PROCESS

54T

1T

STORE ROOM

MAINTENANCE SHOP

3AT

3BT

6T

20T

55T

17T

18T

19T

FRONT GATE EMERGENCY ASSEMBLY AREA

CONSTRUCTION

WASTEWATER TREATMENT

NEW CAUSTIC TANK FARM

NITROGEN GAS

ACTOR GATE

Y AREA

63 OCB

CELL REPAIR

50T

51T

BRINE STORAGE

CHLORINE CELL ROOM (DIAMOND)

BRINE HTRS

COMPRESSOR ROOM

COOLING TOWERS

BRINE TREATMENT

BRINE FILTRATION

57T

BRINE MUD FILTER

24TC

25TC

22R,S,LTC

21R,S,LTC

26 OCB

56T

44T

25 OCB

24 OCB

23 OCB

23R,X,LTC

21–22X

62 OCB

BPA MAIN SUBSTATION

SHIFT PARKING

Figure 5-41

Former Transformer Pad Concrete Sample Locations

Arkema Inc.

Portland, Oregon

ERM 11/05

Project No. 0020423.10
Date: 11/29/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\002042310-68.dwg

PEN-N
2.4 (0 ft bgs)
0.32 (1.5 ft bgs)
0.42 (3 ft bgs)

PEN-W
2.5 (0 ft bgs)
0.67 (1.5 ft bgs)
0.23 (3 ft bgs)

PEN-B2
0.16

PEN-B5
0.15

PEN-B1
0.31

PEN-B3
1.4

PEN-E
4.5 (0 ft bgs)
1.7 (1.5 ft bgs)
1.2 (3 ft bgs)

PEN-B4
0.17

PEN-S
4.4 (0 ft bgs)
2.7 (1.5 ft bgs)
0.16 (3 ft bgs)

PENN-3-6
ND

P-ROW-4
0.88

P-ROW-3
0.86

P-ROW-2
0.26

P-ROW-1
0.18

P-ROW-5
0.91

P-ROW-6
0.58

P-ROW-7
ND

P-ROW-8
ND

0 10
FEET

PD41-BE, ND
PD41-SE, 0.13 (Aroclor 1260)
PD41-BW, ND
PD41-SW, ND

BPA-17
ND

BPA-12
ND

BPA-8
ND

BPA-7
ND

BPA-4
ND

BPA-1
ND

PENN-5-6, ND
PENN-5-18, ND

PD72-BE, ND
PD72-SE, ND
PD72-BW, ND
PD72-SW, ND

BPA-18
ND

BPA-13
ND

BPA-9
ND

BPA-5
ND

BPA-2
ND

PD31&32B, 1.7 (Aroclor 1248)
PD31&32S, 4.6 (Aroclor 1248)

PD72-BE, ND
PD72-SE, ND
PD72-BW, ND
PD72-SW, ND

PD97-S, 1.16 (Aroclor 1260)
PD97-B, ND
PD97-S(DUP) 0.17
(Aroclor 1260)

BPA-19
0.67J (Aroclor 1248)

PENN-6-6, ND
PENN-6-18, ND

BPA MAIN SUBSTATION

BPA-21
0.42 (Aroclor 1248)

BPA-15
ND

BPA-14
ND

BPA-10
ND

BPA-6
ND

BPA-3
ND

BPA-23
0.32J (Aroclor 1248)

BPA-16
ND

BPA-11
ND

BPA-24
6.3J (Aroclor 1248)

BPA-22
0.15 (Aroclor 1248)

BPA-20 (Aroclor 1248)
8.5

PENN-4-6
ND

DRIVEWAY

DRIVEWAY

PENN-1-6
ND

PENN-2-6
ND

0 30
FEET

LEGEND

⊕	March 2002 BPA Soil Samples	0.16	PCB Concentrations in millgram per kilogram (mg/kg)
⊗	June 2002 Arkema Soil Samples	ND	Not Detected
⊙	September 2002 Soil Sample	▭	Extent of Soil Removal (Depth=4')
⊠	October 2002 Right-of-Way Soil Samples	▨	Former Concrete Pads (Removed) and Soil Sample Number After Removal
PEN-B	Sample From Base of Excavation (4 ft bgs)		
PEN-N,-E,-S,-W	Composite of Four Samples From Excavation Sidewalls (0, 1.5, 3 ft bgs)		

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH

Figure 5-42
PCB Concentrations in Soil
BPA Substation
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10
Date: 12/01/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102310-91.dwg

WILLAMETTE RIVER

HARBOR LINE N 41°02'35" 1617.03'

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
MWA-9i
MWA-3
MWA-13d
MWA-21b
MWA-2
MWA-8i
MWA-4
MWA-10i
MWA-17si
MWA-6 (Abandoned)
MWA-6r
MWA-16i
MWA-18
MWA-34i
MWA-19
MWA-32i
MWA-31i(d)
MWA-30
MWA-29
MWA-14i
MWA-5
FORMER MPR POND AND TRENCH
MWA-15r
WAREHOUSE No. 3
MCB RECOVERY UNIT
DDT PROCESS BUILDING
MWA-20
TRUCK SALT DROP
SALT PAD
MWA-27
SALT PADS
SALT PADS
MWA-11i
OLD CAUSTIC TANK FARM
OIL STORAGE
FORMER ACID PLANT
PROCESS
POSSIBLE DDT LOADING AREA
POSSIBLE DDT LOADING AREA
WAREHOUSE No. 2
DDT WAREHOUSE (MILLING & BAGGING)
MWA-22
MWA-35
MWA-25
MWA-36
MWA-28i(d)
MWA-37
SALT PAD #1
CELL LIQUOR STORAGE
MWA-1 (Abandoned)
MWA-24
DDT DRY STORAGE AREA
MWA-38
MWA-26
BOILER ROOM
RECTIFIER
SUB-STATION
WASTEWATER TREATMENT
NEW CAUSTIC TANK FARM
CAUSTIC RAIL LOAD'G
WAREHOUSE
CHLORINE FINISHING
NITROGEN GAS
CHLORATE CELL ROOM
MWA-33
WAREHOUSE No. 1
CAUSTIC PROCESS
CHLORATE PROCESS
CHLORATE TANK FARM
BRINE STORAGE
CHLORATE WAREHOUSE
STONE ROOM
MAINTENANCE SHOP
LAB
OFFICE
BRINE HTRS
COMPRESSOR ROOM
COOLING TOWERS
BRINE TREATMENT
BRINE FILTRATION
BRINE MUD FILTER
FRONT GATE EMERGENCY ASSEMBLY AREA
MWA-23
CERTAINTEED ROOFING PRODUCTS
BPA MAIN SUBSTATION
MWA-12i
MWA-7
SHIFT PARKING
GUARD SHACK
FRONT GATE
MAIN OFFICE
OFFICE PARKING
N.W. FRONT AVE.
OULD INC.
AIR LIQUIDE
GATX

.001
0.2
230
50
0.011

LEGEND

- Potential Source Areas
- MWA–3 — Monitoring Well, Shallow Zone
- MWA–17si — Monitoring Well, Shallow/Intermediate Zone
- MWA–9i — Montoring Well, Intermediate Zone
- MWA–13d — Monitoring Well, Deep Zone
- MWA–21b — Monitoring Well, Basalt
- 0.001 — Preliminary Screening Level for Total DDT, DDD, and DDE Contour, µg/L, Based on June 2003 data; Dashed Where Inferred
- 50 — Preliminary Screening Level for Chlorobenzene, µg/L, Based on June 2003 data; Dashed Where Inferred
- 0.011 — Preliminary Screening Level for Chromium, mg/L, Based on June 2003 data; Dashed Where Inferred
- 0.2 — Preliminary Screening Level for Perchlorate, mg/L, Based on June 2003 data; Dashed Where Inferred
- 230 — Preliminary Screening Level for Chlroride, mg/L, Based on June 2003 data; Dashed Where Inferred

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 150
FEET

Figure 6-1
Extent of Primary COIs in Shallow-Zone Groundwater
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10
Date: 12/01/05
Drawn By: J. Estrada
CAD File: g:\0020423\10\0020423102310-92.dwg

WILLAMETTE RIVER

HARBOR LINE N 41°02'35" 1617.03'

PUMP HOUSE
No. 2 DOCK
No. 1 DOCK
PUMP HOUSE
MWA-9i
MWA-3
MWA-21b
MWA-13d
MWA-8i
MWA-2
MWA-4
MWA-10i
MWA-17si
MWA-6r
MWA-6 (Abandoned)
MWA-16i
MWA-18
MWA-19
MWA-34i
MWA-32i
MWA-31i(d)
MWA-30
MWA-29
0.2
50
.001
MWA-14i
MWA-5
FORMER MPR POND AND TRENCH
MCB RECOVERY UNIT
DDT PROCESS BUILDING
WAREHOUSE No. 3
LOADING DOCK
MWA-15r
OLD CAUSTIC TANK FARM
MWA-20
SALT PAD
TRUCK SALT DROP
MWA-27
SALT PADS
OIL STORAGE
0.011
230
FORMER ACID PLANT
MWA-11i
FORMER CONTROL HOUSE
PROCESS
POSSIBLE DDT LOADING AREA
POSSIBLE DDT LOADING AREA
CELL LIQUOR STORAGE
WAREHOUSE No. 2
MWA-122
DDT WAREHOUSE (MILLING & BAGGING)
MWA-1 (Abandoned)
MWA-35
MWA-25
MWA-36
MWA-37
MWA-28i(d)
SALT PAD #1
DDT DRY STORAGE AREA
MWA-24
MWA-38
MWA-26
BOILER ROOM
RECTIFIER
SUB-STATION
WASTEWATER TREATMENT
NEW CAUSTIC TANK FARM
CAUSTIC RAIL LOAD'G
WAREHOUSE
CHLORINE FINISHING
CHLORATE CELL ROOM
MWA-33
NITROGEN GAS
WAREHOUSE No. 1
CAUSTIC PROCESS
CHLORATE PROCESS
CHLORATE TANK FARM
BRINE STORAGE
STORE ROOM
MAINTENANCE SHOP
CHLORATE WAREHOUSE
LAB
OFFICE
BRINE HTRS
COMPRESSOR ROOM
COOLING TOWERS
BRINE TREATMENT
BRINE FILTRATION
BRINE MUD FILTER
FRONT GATE EMERGENCY ASSEMBLY AREA
MWA-23
CERTAINTEED ROOFING PRODUCTS
BPA MAIN SUBSTATION
MWA-12i
MWA-7
SHIFT PARKING
GUARD SHACK
FRONT GATE
MAIN OFFICE
OFFICE PARKING
N.W. FRONT AVE.
OULD INC.
AIR LIQUIDE
GATX

LEGEND

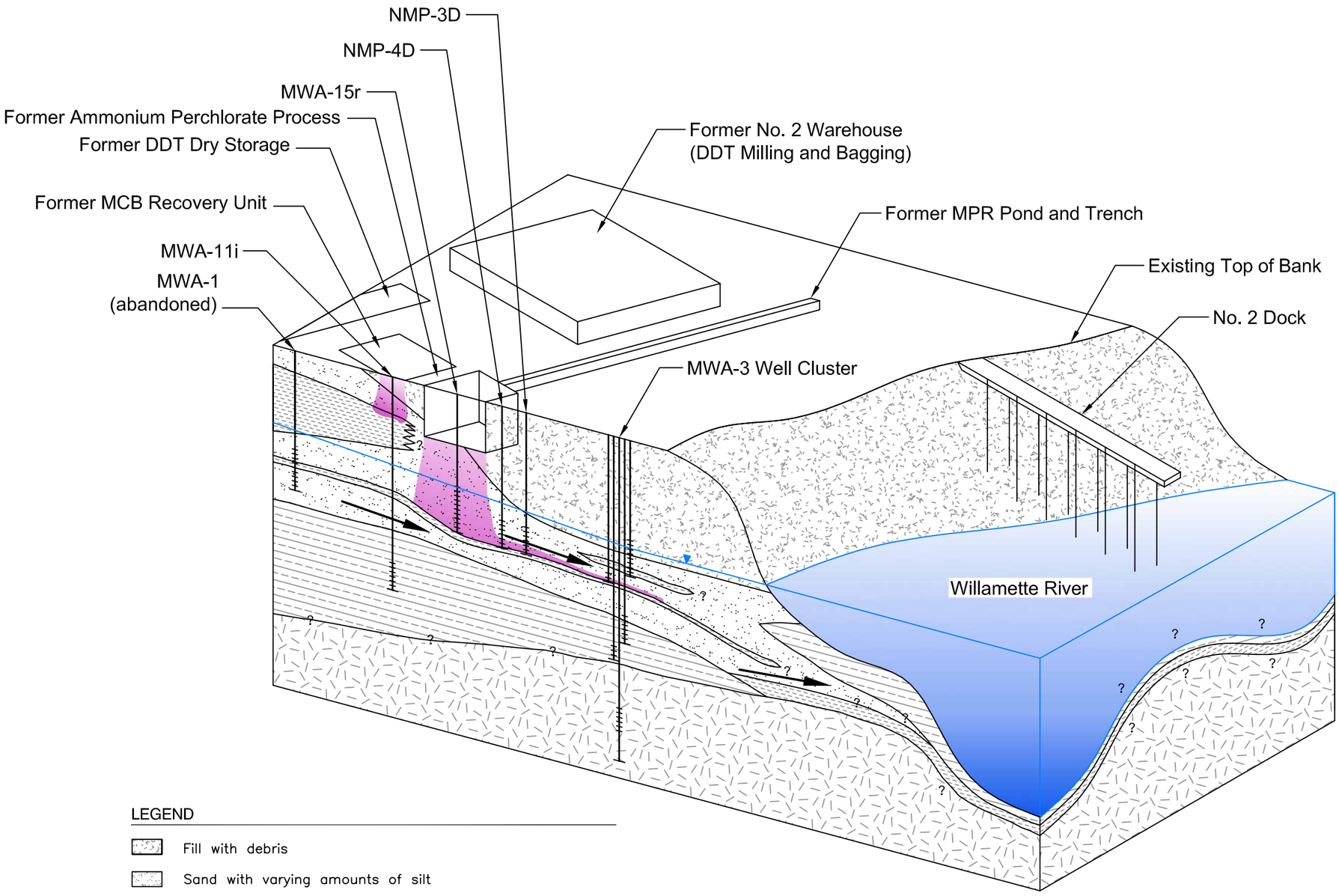
- Potential Source Areas
- MWA–3 — Monitoring Well, Shallow Zone
- MWA–17si — Monitoring Well, Shallow/Intermediate Zone
- MWA–9i — Montoring Well, Intermediate Zone
- MWA–13d — Monitoring Well, Deep Zone
- MWA–21b — Monitoring Well, Basalt
- 0.001 — Preliminary Screening Level for Total DDT, DDD, and DDE Contour, µg/L, Based on June 2003 data; Dashed Where Inferred
- 50 — Preliminary Screening Level for Chlorobenzene, µg/L, Based on June 2003 data; Dashed Where Inferred
- 0.011 — Preliminary Screening Level for Chromium, mg/L, Based on June 2003 data; Dashed Where Inferred
- 0.2 — Preliminary Screening Level for Perchlorate, mg/L, Based on June 2003 data; Dashed Where Inferred
- 230 — Preliminary Screening Level for Chlroride, mg/L, Based on June 2003 data; Dashed Where Inferred

NOTE: Most buildings and structures shown on this figure have been demolished and/or removed.

TRUE NORTH
PLANT NORTH
0 150
FEET

Figure 6-2
Extent of Primary COIs in Intermediate-Zone Groundwater
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10
Date: 11/09/05
Drawn By: JFK/JSE
CAD File: g:\0020423\10\002042310-74.dwg

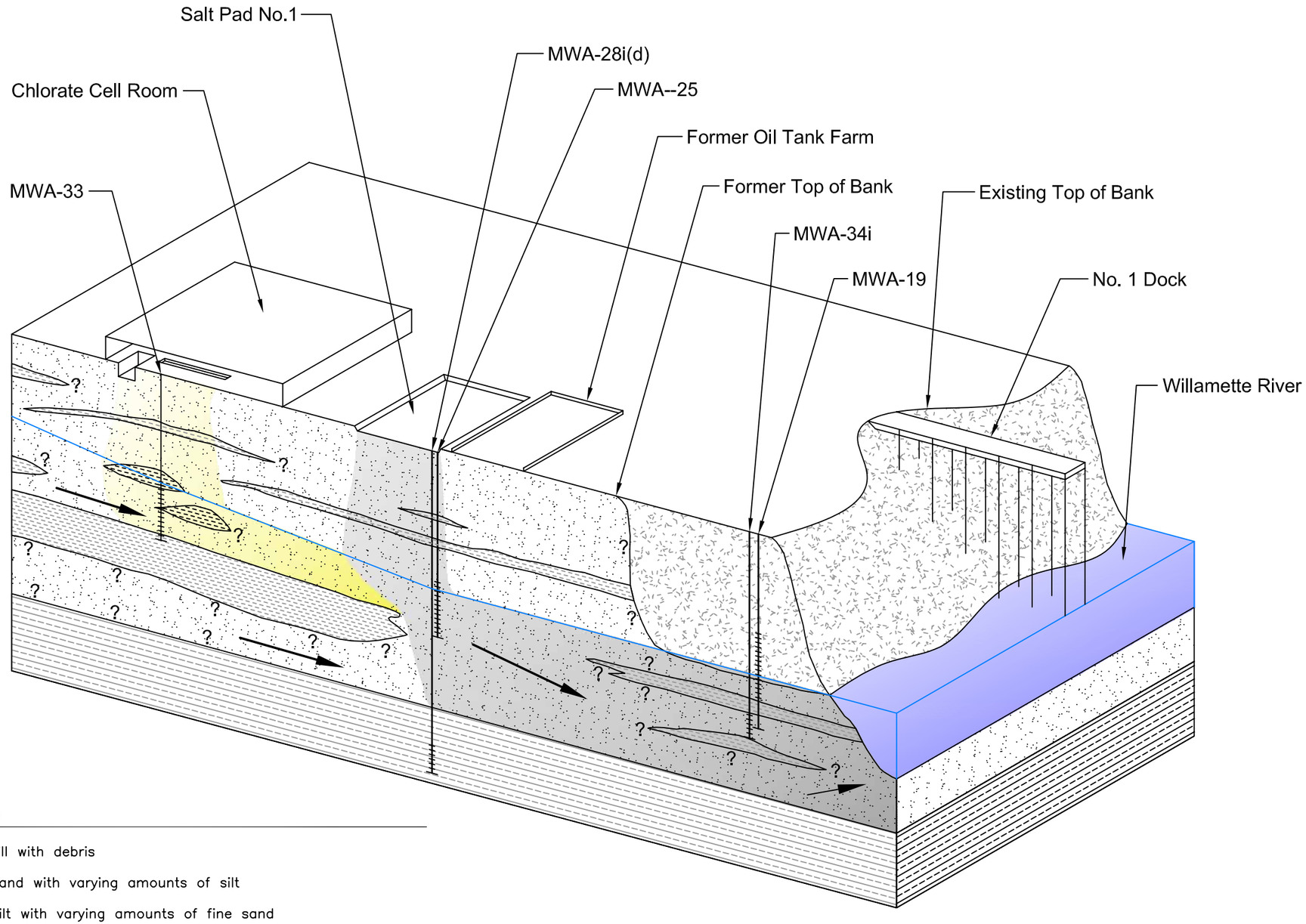


LEGEND

- Fill with debris
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- Basalt
- Conceptual Pathway for Historic Release of MCB and DDT
- Groundwater Flow Direction

Figure 6-3
Revised Conceptual Model Schematic
Acid Plant Area
Arkema Inc.
Portland, Oregon
ERM 11/05

Project No. 0020423.10
Date: 11/09/05
Drawn By: JFK/JSE
CAD File: g:\0020423\10\002042310-73.dwg



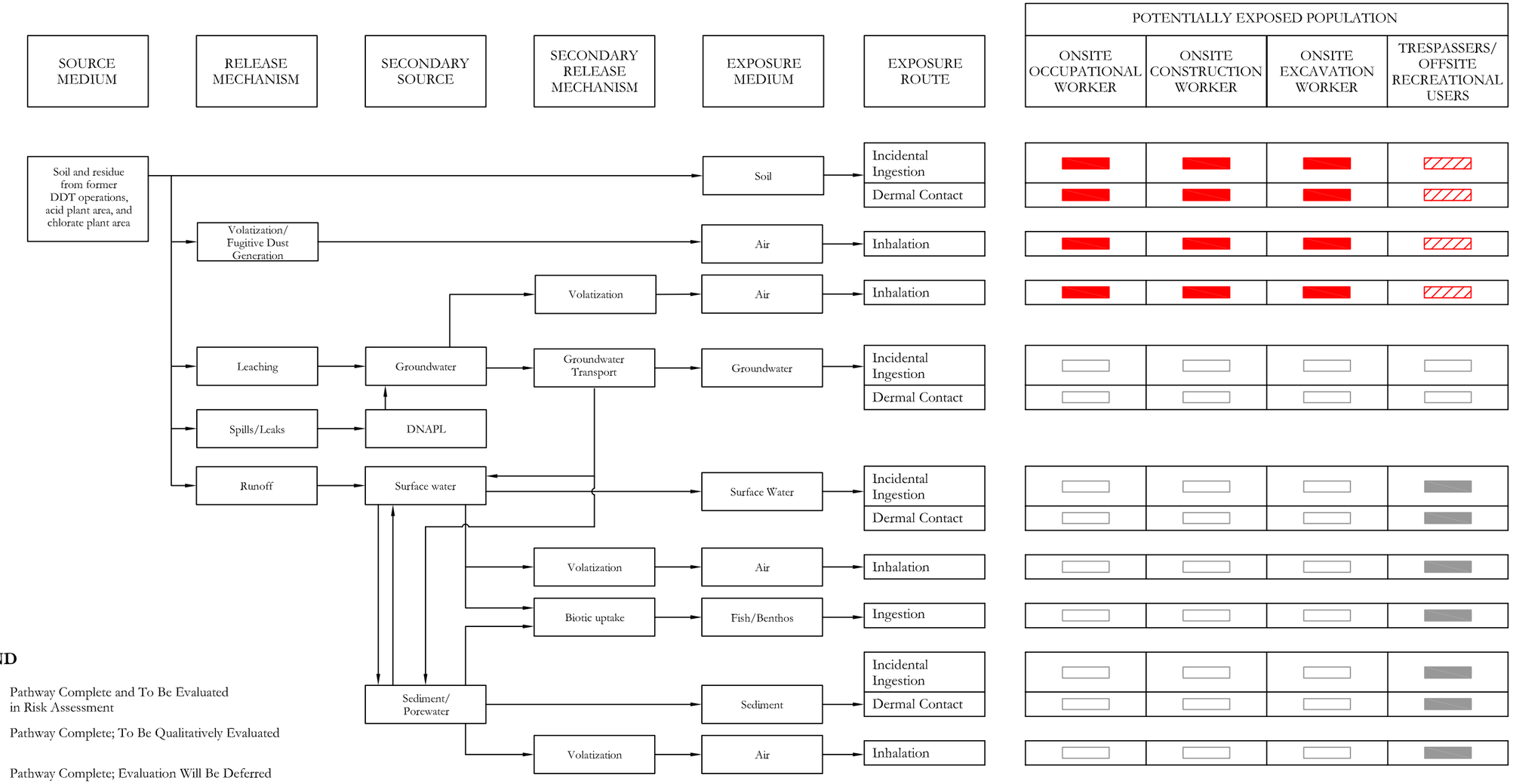
LEGEND

- Fill with debris
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- Basalt
- Conceptual Pathway for Historic Release of Hexavalent Chromium and Perchlorate
- Conceptual Pathway for Historic Release of Chloride
- Groundwater Flow Direction

Figure 6-4
Conceptual Model Schematic
Chlorate Plant Area
Arkema Inc.
Portland, Oregon

ERM 11/05

CAD File: g:_0020423\10\0020423310-75.dwg
Drawn By: JFK/JSE
Date: 11/10/05
Project No. 0020423.10



LEGEND

- Pathway Complete and To Be Evaluated in Risk Assessment
- Pathway Complete; To Be Qualitatively Evaluated
- Pathway Complete; Evaluation Will Be Deferred
- Pathway Incomplete

NOTES

- Beneficial use of groundwater is recharge of surface water (no expected drinking water use).
- For onsite occupational workers, volatization from soil and groundwater will consider both ambient and indoor air exposures.
- For onsite construction workers, volatization from soil and groundwater will consider ambient air exposures.
- For onsite excavation workers, volatization from soil and groundwater will consider excavation air exposures.
- Incidental ingestion and dermal contact with groundwater are not complete pathways due to depth of groundwater (>20 ft. bgs).

Figure 6-5
Conceptual Site Model for Risk Assessments
Arkema Inc.
Portland, Oregon
ERM 11/05

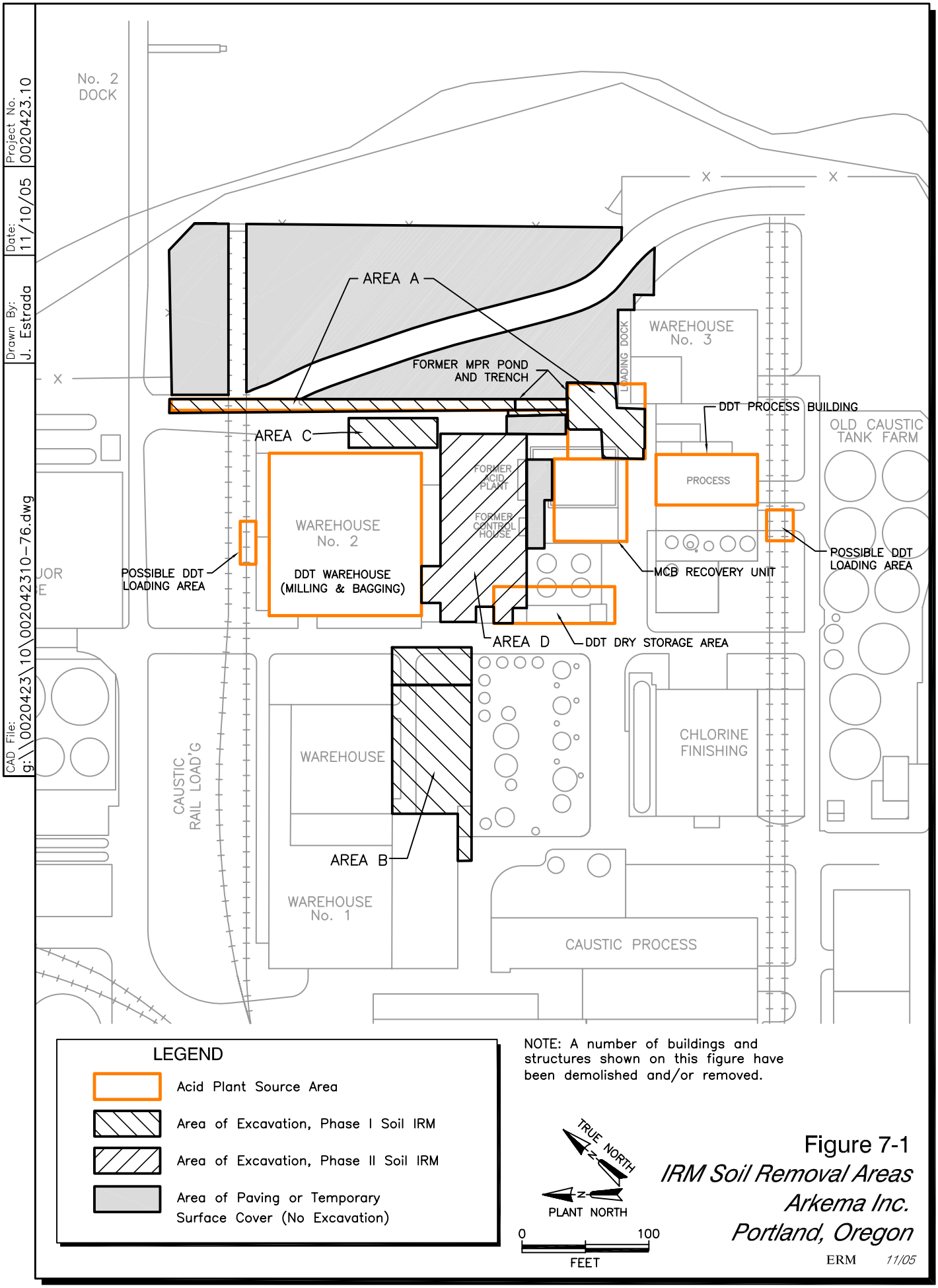


Figure 7-1
IRM Soil Removal Areas
Arkema Inc.
Portland, Oregon

ERM 11/05