LSS
Legacy Site Services LLC

December 1, 2006

Mr. Matt McClincy
Oregon Department of Environmental Quality
Northwest Region
2020 Southwest 4th Avenue, Suite 400
Portland, Oregon 97201-4987

Subject: Former Arkema Portland Plant
Responses to DEQ Comments on the Upland Remedial Investigation Report, Lots 3 & 4 and Tract A
ECSI No. 398

Dear Matt,

This letter is a follow up to our 19 September 2006 meeting with the Oregon Department of Environmental Quality (DEQ) and to DEQ's written comments on our *Upland Remedial Investigation Report, Lots 3 & 4 and Tract A – Revision 1* (RI), prepared by Environmental Resources Management (ERM) for Legacy Site Services LLC (LSS), agent for Arkema Inc. (Arkema). This letter sets forth our understanding of agreements reached between LSS and DEQ in our 19 September meeting and LSS's response to each of DEQ's written comments sent to us by letter dated 5 June 2006. DEQ's comments are shown below in italic font, followed by LSS's response.

The December 2005 Upland Remedial Investigation Report Lots 3 & 4 and Tract A-Revision 1 prepared by ERM for Arkema, Inc. for the former Portland Plant is accepted by the Oregon Department of Environmental Quality (DEQ) pending the re-submittal of some figures. The document addressed the majority of DEQ comments on the initial draft Remedial Investigation (RI) report. DEQ review of the revised RI report identified a number of comments, but it is DEQ's preference that Arkema address these in subsequent documents rather than require an additional revision of the RI.

The RI is incomplete in that the following outstanding RI elements need to be completed for the Arkema site and approved by DEQ. These are to be submitted as addendums to the revised RI.

- *Upland human health risk assessment (for Lots 1, 2, 3, 4 and Tract A)*
- *Upland ecological risk assessment*
  Preliminary hot spot evaluation and identification
- *Joint source control strategy (JSCS) screening evaluation*

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Evaluations in support of the upland human health and ecological risk assessments for Lots 1, 2, 3, 4 and Tract A are in progress, and the risk assessments will be completed as part of the upland Remedial Investigation/Feasibility Study (RI/FS) process. The *Draft Upland Hot Spot Evaluation, Revision 2* was prepared by ERM for LSS and submitted to DEQ in May 2006. LSS has received DEQ's comments (dated 19 June 2006) on the draft report, and a revised Hot Spot Evaluation incorporating DEQ's comments will be submitted in mid-2007.

Draft JSCS screening tables were prepared for LSS by Integral Consulting, Inc. and were submitted to DEQ in April 2006. LSS has received comments from DEQ on the draft screening tables, and based on discussions with DEQ during our meeting on 19 September 2006, LSS will prepare a technical memorandum (TM) identifying what, if any, (in addition to the over 350 figures submitted as part of the revised draft EE/CA), text and figures may be useful and add value to support the tables. **It is anticipated that a meeting between LSS and DEQ following** receipt of the TM will be necessary in order to finalize the scope of the presentation effort.

1. *The revised RI did not address this DEQ comment -*
"Information from the Upland RI and the Phase II Groundwater and Sediment Investigation Report needs to be integrated and presented in such a manner that the relationships between in-water and upland data are clear. It is requested that figures summarizing this relationship be presented in the Source Control Evaluation (SCE) as an appendix to the RI. The RI and the SCE need to provide a holistic picture for each of the plumes. The plumes should be displayed in both plan view and cross-sections. The cross sections should begin at the source locations (disposal ponds, trenches, etc.) using soil data from borings and also known disposal areas and excavated materials; then extending into groundwater; and finally continuing into the river (sediments and groundwater). By utilizing cross sections in this manner, continuity of each plume can easily be seen from its origin (source) into the soil, its migration through the groundwater zones, and finally into the river. The cross sections should be drawn along a direction which is based on groundwater gradients for water driven contaminants, or sloping stratigraphy for DNAPL flows, as appropriate. As presented, some of the cross sections provide a disjointed picture of the plumes [one example is the perchlorate plume which clearly goes to the dock area (#1), but is presently shown as disconnected (partially because the data is presented in two reports – the Upland RI and the Phase II sediments report)]."

Arkema's December 1, 2005 response to this comment indicated that the above comment would be addressed in the forth coming Engineering Evaluation/Cost Analysis (EE/CA) Work Plan. This comment was clearly not addressed in the September 2005 Draft EE/CA Work Plan and no figures were provided with the JSCS screening recently submitted to DEQ. Without figures illustrating media of concern, the JSCS screening is of virtually no value and not worth DEQ's time to review the screening conducted. DEQ will require that the requested figures be provided either as an addendum to the RI or as part of the JSCS screening. I will be contacting you in the next few days to discuss the submittal of these figures and the deficiencies in the JSCS screening.

In accordance with LSS's December 2005 response to this comment, the revised Draft EE/CA Work Plan (dated July 2006) contained over 350 figures depicting groundwater, surface water, soil, and sediment conditions at the site in plan and cross-section. It appears that DEQ interpreted the statements made in our December 2005 response letter as referring to the September 2005 (first draft) of the EE/CA Work Plan, rather than to the then forthcoming revised draft EE/CA Work Plan dated July 2006. As discussed with DEQ during our meeting on 19 September 2006, LSS will submit a TM identifying what, if any, (in addition to the over 350 figures in the revised Draft EE/CA Work Plan), text and figures may be useful and add value to support the JSCS data screening tables submitted to DEQ in April 2006. It is LSS's intent for this TM to clearly focus any additional figure presentations to avoid any duplicative and/or non-meaningful efforts.

LSS respectfully disagrees with the assertion that "DNAPL flows" exist at the site. As documented in the April 2006 *Draft Acid Plant Area DNAPL Sampling Report*, monochlorobenzene (MCB) DNAPL exists in thin sand lenses which appear to "pinch out" moving away from the former Manufactured Pesticide Residue (MPR) Pond (source area) towards the river. Mobile DNAPL is not observed near the top of bank – rather, DNAPL, to the extent present, exists as residual, non-mobile product. These findings are consistent with the expectation that migration of DNAPL would have stabilized due to the age of release of the MCB at the site.

2. *Page ES-8, second Paragraph – Application of DEQ's Contaminated Aquifer Policy requires, among other things, a demonstration that "the owner or operator did not cause, contributed to or exacerbate the release of hazardous substances". The RI data collected in the vicinity of the former Ammonia Plant was from one-time groundwater samples (push probes) and is not sufficient to conclude that Arkema's site operations did not contribute to the ammonia groundwater plume. DEQ requires that groundwater data forming the basis for regulatory decisions or compliance be representative of groundwater conditions and reproducible. DEQ generally requires that groundwater samples be collected from a properly constructed, developed, etc. monitoring well and be sampled a minimum of four consecutive quarters to establish contamination trends.*

Comment noted. Based on discussions during our meeting on 20 June 2006, it is our understanding that DEQ will not require LSS to conduct additional ammonia investigations to support the RI/FS process. As a result, LSS does not plan to collect additional groundwater data related to the former Ammonia Plant at this time. However, we understand that well point sampling data confirming the existing Geoprobe data points may be necessary in the future if LSS desires to apply the Contaminated Aquifer Policy.

3. *Page 5-3, Section 5.1.4 Preliminary Screening Levels – As noted in this section, the preliminary screening level values used to discus the relative concentrations of hazardous substances detected at the site are incomplete as they do not take into account fate and transport (i.e., leaching to groundwater), upland ecological receptors, aquatic receptors and all exposure pathways such as volatilization to indoor air. While DEQ acknowledges that the risk and potential threat posed by hazardous substances detected at the site will be evaluated in the upland human health and ecological risk assessment, and the JSCS screening, the RI discussion presents an incomplete picture of the problem which will change substantially (i.e., higher risk and larger problem) once all of the relevant exposure pathways and receptors are considered. The risk assessments, JSCS screening and hot spot analysis will need to include updated figures.*

As previously indicated, a TM providing identifying what, if any, (in addition to the over 350 figures submitted as part of the EE/CA), text and figures may be useful and add value to support the tables will be submitted to DEQ. Relevant exposure pathways and receptors for the site will be further evaluated in the forthcoming upland human health and ecological risk assessments, including additional figures, as appropriate.

4. *Page 5-12, Section 5.2.1.3.2, Volatile Organic Compounds – The conceptual site model (CSM) presented does not address the origin and distribution of most of the volatile organic compounds (VOCs) detected. A CSM needs to be developed for chloroform, 1,2-dichlorobenzene, 1,3-dichlorobenzene 1,4-dichlorobenzene, tetrachloroethene, 1,1,1-trichloroethane, and acetone.*

Per our meeting on 19 September 2006, at the request of DEQ, plan view and cross-sectional figures depicting the distribution of acetone, carbon tetrachloride, chloroform, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, tetrachloroethene, 1,1,1-trichloroethane, and trichloroethene in site groundwater are attached. The figures provide the most recent data collected for each constituent, extending from the uplands into the Willamette River. The data are also summarized in attached Table 1.

As described in the *Revised Draft EE/CA Work Plan* (Integral 2006), there is no known use at the site of carbon tetrachloride, chloroform, tetrachloroethene and trichloroethene. Chloroform may have been produced from alkaline reactions with chloral.

5. *Page 5-20, Section 5.2.2, Dense Non-Aqueous Phase Liquid, second paragraph – The characterization of the DNAPL present in the shallow vadose zone soils in the former MCB Recovery Unit area misrepresents the situation. The DNAPL present has been visually observed and is present not inferred. Its distribution certainly can be inferred based on field or lab data. Further, DEQ would not characterize the DNAPL distribution as a small area.*

Additional data related to the distribution of MCB DNAPL downgradient of the former Acid Plant have been collected and are presented in the April 2006 *Draft Acid Plant Area DNAPL Sampling Report*. These data were collected after submittal of the revised RI in December 2005. Based on these recent data, LSS does not believe that characterization of the DNAPL

area as "small" is inaccurate. The aerial extent of the DNAPL-impacted area constitutes a relatively small area (approximately 0.7 acres) compared to the size of the Arkema site.

6. *Page 6-4, Section 6.2.1, River Bank Soil – This section notes that DDT residuals in portions of the fill have been addressed as part of the ongoing IRMS for the upland portion of the Arkema Site. While DEQ agrees that there have been a number of individual IRMs in the Acid Plant area to address DDT in fill and near surface soils. The RI overstates the completeness and adequacy of these efforts. Additional remedial measures will be required.*

Section 6.2.1 states that DDT residuals in the fill area have been addressed as part of the upland IRMs. A surface cover has been placed over this area to prevent infiltration and erosion of shallow surface soils. This section does not discuss the completeness nor the adequacy of the IRMs performed. These judgments will be made in the upland FS where a permanent remedy that will address residual DDT in shallow fill soils at the Site will be evaluated.

7. *Page 6-9, Section 6.2.3, Old Caustic Tank Farm – Figures depicting the elevated pH groundwater plume and associated metals plumes (e.g., arsenic) need to be included in the hot spot evaluation, JSCS screening and FS.*

Figure 4-3 in the revised EE/CA presents pH and arsenic values for the upland and in-water data points. Arsenic was evaluated in the draft preliminary hot spot evaluation. It will be evaluated in future hot spot, JSCS and FS deliverables as appropriate. pH will be considered in future hot spot deliverables, however, LSS notes that elevated and depressed pH values which have been observed in the former Chlorate Plant Area and the former Acid Plant Area are, in part, due to remedial actions carried out in these two areas (e.g., persulfate and calcium polysulfide injections). These pH effects are expected to be localized and temporary. Trends in pH observed during the post calcium polysulfide injection sampling in 2005 and 2006 support this observation.

8. *Page 6-13, Section 6.5, Preliminary Exposure Model – Add terrestrial ecological receptors to the list of potential receptors.*

Comment noted. Potential risks to terrestrial ecological receptors will be assessed in the upland ecological risk assessment.

9. *Page 7-2, Section 7.1, Soil Removal Interim Remedial Measure, First Bullet – Clarify that the limitations included those imposed by the operating facility and associated infrastructure.*

Comment noted. During the Soil Removal IRM conducted in 2000 and 2001, while the plant was still operational, DDT-contaminated soil was removed from the Acid Plant Area to the extent possible without compromising the facility's structures and utilities.

10. *Page 7-2, Section 7.1, Soil Removal Interim Remedial Measure – Note that the USEPA Region IX PRG for DDT has subsequently been changed and the current value is....*

Comment noted. The current Region IX PRG (October 2004) for DDT, based on the direct contact exposure pathway for industrial soil, is 7 mg/kg.

11. *Page 7-2, Section 7.1, Soil Removal Interim Remedial Measure, Last Paragraph – Since the main water supply line for the operating facility was located in the DDT disposal pond trench, DEQ's recollection was that the trench excavation (Area A) did not go to 12 feet along the length of the trench. Please update and resubmit Figure 7-1.*

Comment noted. The text on Page 7-2 of the revised upland RI is incorrect. The southernmost approximately 40 feet of the manufacturing process residue (MPR) trench (located closest to the MPR Pond) was excavated to 8 feet and the remainder of the trench, extending toward Plant North, was excavated to 7 feet (see attached Figure 1). As noted, the excavation depth was limited in this area due to the location of the facility's main water supply line. Figure 7-1 in the revised upland RI does not state depths of excavation and is therefore accurate as included.

12. *Page 10, Section 10 Summary of Remedial Investigation Findings and Conclusion – The lateral extent of DDT and related metabolites were generally defined using USEPA Region IX PRGs. This does not adequately define the lateral nature and extent. Site soils that exceed McDonald Probable Effect Concentrations (PECs) and could possibly be transported to the Willamette River (now or in the future) need to be identified. Also, the ecological risk assessment may identify additional delineation data gaps.*

To define the lateral nature and extent of DDT and related metabolites, the upland RI presents analytical data in tabular and graphic format. Comparison to PRGs was provided to allow assessment of the results against one potential applicable or relevant and appropriate requirement (ARAR). PRGs are USEPA-derived preliminary goals for *upland soil* and therefore are applicable. The concentration of DDD, DDE, and DDT in site soils with the potential for transport to the river were compared to the MacDonald PECs and other sediment quality and screening values in the JSCS screening data tables submitted to ODEQ in April 2006. **However, PECs are preliminary screening values for *sediment*** concentrations and therefore not appropriate to use as a direct comparison to upland soil concentrations. Even if an erodable soil pathway to the river was complete, the resulting sediment concentrations would be expected to be several orders of magnitude less than the upland soil concentration. A source control evaluation to assess erodable soils will be performed for the site and will address this transport pathway.

13. *Page 10-5, Section 10.2.1 Chlorate Plant Area Soil – The concentration at which hexavalent chromium in vadose zone soil could leach to groundwater at levels posing a risk, or impact the beneficial use of groundwater, needs to be considered before DEQ can agree that horizontal and vertical extent of chromium-impacted soil has been adequately determined.*

Comprehensive soil sampling for chromium and hexavalent chromium was performed in and around the known source area (i.e., former Chlorate Cell Room). Samples were collected from a variety of depths and locations, including areas immediately adjacent to locations which future groundwater sampling demonstrated to contain the highest groundwater concentrations (e.g., MWA-36). Therefore, LSS believes the extent of hexavalent chromium in soil has been adequately delineated. The potential risks associated with these residual hexavalent chromium concentrations in vadose zone soils at the site will be assessed in the upland human health and ecological risk assessments.

14. *Page 10-7, Section 10.3, Riverbank Soil – While DEQ does not necessarily disagree with statement about the limited extent of SVOCs and lead in the riverbank, there is limited data on which to draw such a conclusion. The position would be better supported by clarifying the history of filling between the No. 1 and No. 2 docks. Additional riverbank soil data will be necessary to confirm this conclusion.*

A discussion of fill history in the former Acid Plant area is included in *Revised Draft EE/CA Work Plan*. Fill was placed in the Acid Plant area bordering the Willamette River after DDT manufacturing ceased. It appears that the bank adjacent to the Acid Plant area has been filled out toward the Willamette River approximately 200 ft since the 1950s. Fill thickness ranges from a few feet in the former DDT manufacturing area to approximately 25 ft along the riverbank. The sources of the fill material included the City of Portland, private excavation contractors, and Arkema. Fill materials included clean soil, asphalt, concrete, metal piping, and miscellaneous materials from spent chlorine cells. It is currently anticipated that additional riverbank soil samples outside the dock areas will be collected as part of the upland ecological risk assessment.

15. *Page 10-8. Section 10.5 Ammonia Plant - Application of DEQ's Contaminated Aquifer Policy requires, among other things, a demonstration that "the owner or operator did not cause, contributed to or exacerbate the release of hazardous substances". Per DEQ's previous comments, the RI data is not sufficient to conclude that Arkema's site operations did not contribute to the ammonia groundwater plume.*

Comment noted. As described above in the response to Comment 2, LSS does not plan to collect additional groundwater data related to the former Ammonia Plant at this time. However, if needed, additional groundwater data may be collected from this area in the future.

16. *Figures 5-1a, 5-4a, and 5-5a. We do not agree with the figures, which limit the extent of DDT in upland soil in the eastern portion of the site. It is DEQ's position that very high concentrations of DDT are randomly distributed in the fill between the former DDT pond/overflow trench and the riverbank. This interpretation is supported by the thin-layer chromatography field data. Please update and resubmit these figures.*

Based on discussions during our meeting on 19 September 2006 DEQ has withdrawn this comment.

17. *Figure 5-20, Chlorobenzene Concentrations in Groundwater Intermediate Zone – The distribution of the chlorobenzene identified is too limited and not consistent with the CSM. This figure needs to be revised to show the chlorobenzene plume extending up gradient of the MCB recovery unit. Please update and resubmit this figure.*

Based on discussions during our meeting on 19 September 2006 DEQ has withdrawn this comment.

18. *Figure 6-3, Revised Conceptual Model Schematic Acid Plant Area – DNAPL needs to be added to the intermediate groundwater zone as illustrated on Figure 5-13 which shows the extend of DNAPL on Cross-Section E-E'. Please update and resubmit this figure.*

Membrane interface probe (MIP) data collected from direct-push boring MIP/INT-5 indicated residual MCB DNAPL present above a thin silt lens imbedded within the intermediate groundwater zone beneath the former MPR Pond. Figures depicting the CSM in the FS and other forthcoming reports will reflect this observation. However, it should be noted that MCB DNAPL was not observed within the intermediate groundwater zone in downgradient borings MWA-8i, MWA-9i, MWA-13d, MIP/INT-4, MIP/INT-7, MIP/INT-9, MIP/INT-10, MIP/INT-11, or MIP/INT-12, although DNAPL was observed within the shallow groundwater zone at these locations. These observations indicate that the extent of MCB DNAPL within the intermediate zone is likely limited.

Sincerely,

Todd Slater
Legacy Site Services LLC

attachments

cc: Tom Grainger, DEQ NWR
Dan Hafley, DEQ NWR
Claudia Powers, Ater Wynne
Erik Ipsen, ERM
Larry Patterson, ERM
David Livermore, Integral

Table 1
Selected Volatile Organic Compound Concentrations in Groundwater
Remedial Investigation
Arkema, Inc.
Portland Orego n

Location	Sample Date	Acetone (ug/l)	Carbon tetrachloride (ug/l)	Chloroform (ug/l)	1,2-Dichlorobenzene (ug/l)	1,3-Dichlorobenzene (ug/l)	1,4-Dichlorobenzene (ug/l)	Tetrachloroethene (ug/l)	1,1,1-Trichloroethane (ug/l)	Trichloroethene (ug/l)
Upland Groundwater Samples										
B-55	2/19/1999	NA	ND(< 62)	240	ND(< 62)	ND(< 62)	ND(< 62)	ND(< 62)	94	ND(< 62)
B-56	2/19/1999	NA	ND(< 0.5)	9.7	ND(< 0.5)	ND(< 0.5)	0.8	9.7	6.3	ND(< 0.5)
B-59	8/3/1999	330	ND(< 0.5)	ND(< 0.5)	ND(< 0.1)	ND(< 0.1)	ND(< 0.1)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
B-60	7/18/2000	49	ND(< 0.5)	17	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	70	ND(< 0.5)	3.7
B-61	7/17/2000	NA	ND(< 25)	550	ND(< 25)	ND(< 25)	45	45	ND(< 25)	ND(< 25)
B-64	7/17/2000	NA	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)
B-65	5/2/2001	NA	ND(< 10)	ND(< 10)	ND(< 10)	ND(< 10)	ND(< 10)	ND(< 10)	ND(< 10)	ND(< 10)
B-67	5/2/2001	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	0.91
MWA-1	4/29/1999	61	ND(< 0.5)	ND(< 4.3)	5.6	0.2	11	14	ND(< 0.5)	10
MWA-2	3/29/2006	ND(< 85.5)	ND(< 3.5)	29 J	ND(< 2.0)	ND(< 3.0)	ND(< 3.0)	7.5 J	ND(< 2.5)	ND(< 2.5)
MWA-3	3/29/2006	ND(< 8.55)	29	442	ND(< 0.2)	ND(< 0.3)	ND(< 0.3)	29.8	ND(< 0.25)	4.35 J
MWA-4	1/13/2006	ND(< 117)	ND(< 7.0)	31.5	ND(< 4.30)	ND(< 6.60)	ND(< 9.35)	8 J	ND(< 4.30)	ND(< 12.0)
MWA-5	1/16/2006	ND(< 2.34)	ND(< 0.140)	ND(< 0.143)	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	ND(< 0.109)	ND(< 0.0859)	ND(< 0.241)
MWA-6r	8/5/2006	ND (<46.8)	ND (<2.80)	3.6 J	ND (<1.72)		ND (<3.74)	17.4	ND (<1.72)	14.0
MWA-7	6/4/2003	NA	ND(< 0.140)	ND(< 0.143)	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	ND(< 0.109)	ND(< 0.0859)	ND(< 0.241)
MWA-8i	3/29/2006	ND(< 1.71)	ND(< 0.070)	ND(< 0.070)	0.26 J	ND(< 0.060)	ND(< 0.060)	ND(< 0.060)	ND(< 0.050)	0.21 J
MWA-9i	3/29/2006	ND(< 342)	ND(< 14.0)	38 J	ND(< 8.0)	ND(< 12.0)	ND(< 12.0)	ND(< 12.0)	ND(< 10.0)	ND(< 10.0)
MWA-10i	11/22/2005	244 J	ND(< 14.0)	ND(< 14.3)	ND(< 8.59)	ND(< 13.2)	ND(< 18.7)	ND(< 10.9)	ND(< 8.59)	ND(< 24.1)
MWA-11i	8/1/2005	ND(< 2.34)	ND(< 0.140)	ND(< 0.143)	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	ND(< 0.109)	ND(< 0.0859)	ND(< 0.241)
MWA-12i	6/3/2003		ND(< 0.140)	ND(< 0.143)	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	ND(< 0.109)	ND(< 0.0859)	ND(< 0.241)
MWA-13d	6/9/2003	ND(< 2.34)	ND(< 0.140)	ND(< 0.143)	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	ND(< 0.109)	ND(< 0.0859)	ND(< 0.241)
MWA-14i	11/21/2005	ND(< 2.34)	ND(< 0.140)	ND(< 0.143)	0.1 J	ND(< 0.132)	ND(< 0.187)	ND(< 0.109)	ND(< 0.0859)	ND(< 0.241)
MWA-15r	3/30/2006	ND(< 1710)	ND(< 70.0)	ND(< 70.0)	ND(< 40.0)	ND(< 60.0)	ND(< 60.0)	ND(< 60.0)	ND(< 50.0)	ND(< 50.0)
MWA-16i	8/2/2005	26.8	ND(< 0.140)	ND(< 0.143)	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	ND(< 0.109)	ND(< 0.0859)	ND(< 0.241)
MWA-17si	1/13/2006	ND(< 2340)	ND(< 140)	760	ND(< 85.9)	ND(< 132)	ND(< 187)	ND(< 109)	ND(< 85.9)	ND(< 241)
MWA-18	8/3/2005	ND(< 2.34)	ND(< 0.140)	0.26 J	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	1.12	ND(< 0.0859)	ND(< 0.241)
MWA-19	8/3/2005	ND(< 2.34)	ND(< 0.140)	0.35 J	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	13.3	ND(< 0.0859)	2.62
MWA-20	8/4/2005	ND(< 23.4)	ND(< 1.40)	ND(< 1.43)	ND(< 0.859)	ND(< 1.32)	ND(< 1.87)	ND(< 1.09)	ND(< 0.859)	ND(< 2.41)
MWA-21b	4/12/2002	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
MWA-22	8/1/2005	ND(< 117)	ND(< 7.0)	ND(< 7.15)	ND(< 4.30)	ND(< 6.60)	ND(< 9.35)	ND(< 5.45)	ND(< 4.30)	ND(< 12.0)
MWA-23	4/5/2002	NA	ND(< 0.5)	ND(< 0.5)	1.2	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
MWA-24	11/15/2001	170	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)
MWA-25	4/9/2002	NA	ND(< 0.5)	290	0.94	ND(< 0.5)	ND(< 0.5)	1.3	ND(< 0.5)	ND(< 0.5)
MWA-26	4/5/2002	NA	ND(< 0.5)	0.66	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
MWA-27	4/9/2002	NA	ND(< 0.5)	240	0.64	ND(< 0.5)	ND(< 0.5)	0.59	ND(< 0.5)	ND(< 0.5)
MWA-28i(d)	4/9/2002	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
MWA-29	4/8/2002	NA	ND(< 0.5)	ND(< 2.3)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
MWA-30	8/3/2005	34.2	ND(< 0.140)	2.13	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	ND(< 0.109)	ND(< 0.0859)	ND(< 0.241)
MWA-31i(d)	4/8/2002	NA	ND(< 0.5)	71	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
MWA-32i	8/3/2005	ND(< 2.34)	ND(< 0.140)	126	0.31 J	ND(< 0.132)	ND(< 0.187)	0.83	ND(< 0.0859)	ND(< 0.241)
MWA-33	6/5/2003	ND(< 2.34)	ND(< 0.140)	ND(< 0.8)	2.13	ND(< 0.132)	ND(< 0.187)	ND(< 0.109)	ND(< 0.0859)	ND(< 0.241)
MWA-34i	8/3/2005	ND(< 23.4)	ND(< 1.40)	8.0	ND(< 0.859)	ND(< 1.32)	ND(< 1.87)	2.3 J	ND(< 0.859)	ND(< 2.41)
MWA-42	8/2/2005	13.9 J	ND(< 0.140)	1.28	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	3.1	ND(< 0.0859)	0.86
MWA-44	8/3/2005	ND(< 11.7)	ND(< 0.70)	5.4	ND(< 0.430)	ND(< 0.660)	ND(< 0.935)	4.25	ND(< 0.430)	ND(< 1.20)
MWA-45	8/3/2005	ND(< 2.34)	ND(< 0.140)	12	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	3.49	ND(< 0.0859)	0.34 J
MWA-46	8/4/2005	ND(< 2.34)	ND(< 0.140)	0.19 J	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	4.52	ND(< 0.0859)	0.61
MWA-49i	8/3/2005	ND(< 11.7)	ND(< 0.70)	597	ND(< 0.430)	ND(< 0.660)	ND(< 0.935)	ND(< 0.545)	ND(< 0.430)	ND(< 1.20)
MWA-51i	8/3/2005	ND(< 11.7)	ND(< 0.70)	4.65	ND(< 0.430)	ND(< 0.660)	ND(< 0.935)	ND(< 0.545)	ND(< 0.430)	ND(< 1.20)

Table 1
Selected Volatile Organic Compound Concentrations in Groundwater
Remedial Investigation
Arkema, Inc.
Portland Orego n

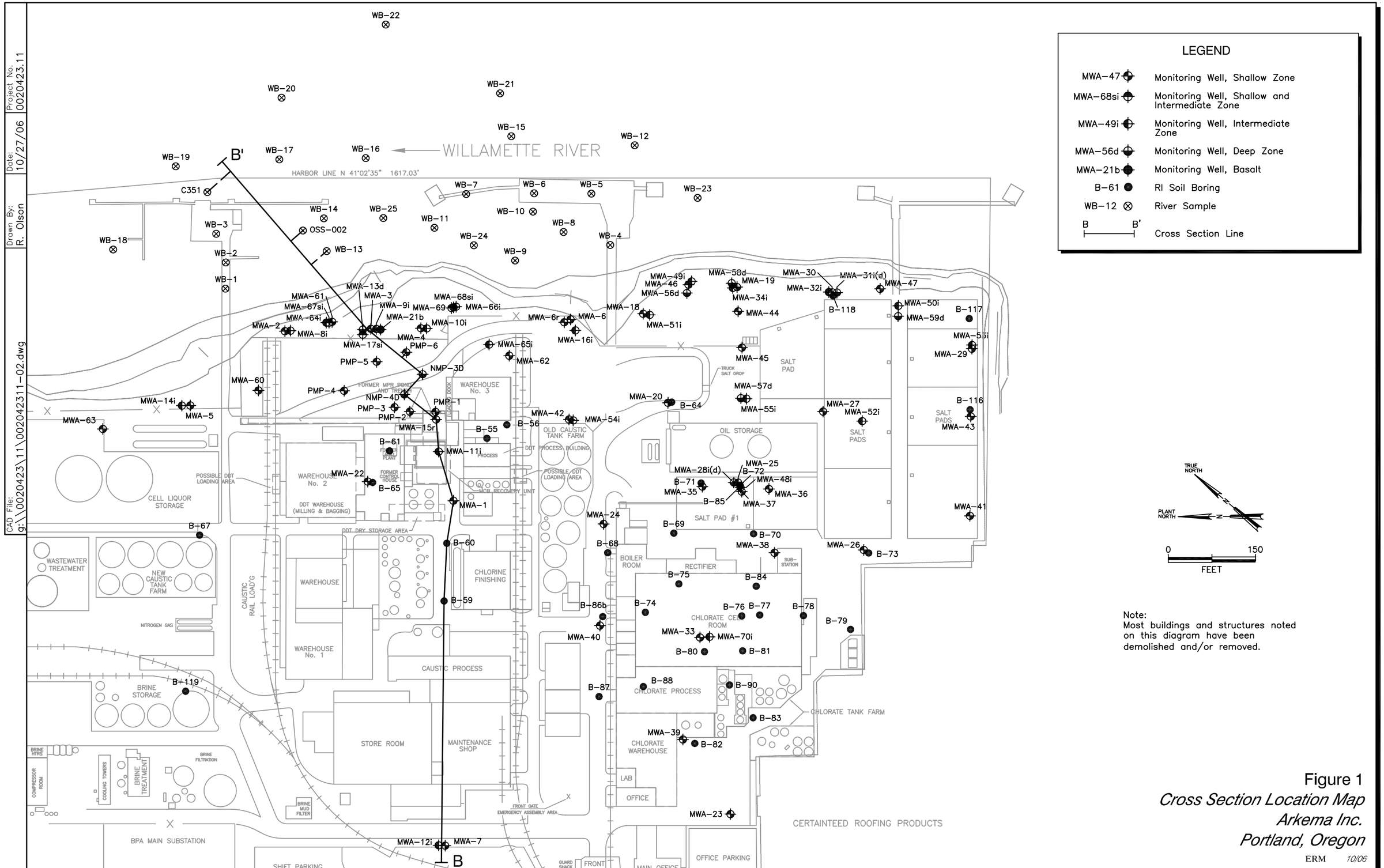
Location	Sample Date	Acetone (ug/l)	Carbon tetrachloride (ug/l)	Chloroform (ug/l)	1,2-Dichlorobenzene (ug/l)	1,3-Dichlorobenzene (ug/l)	1,4-Dichlorobenzene (ug/l)	Tetrachloroethene (ug/l)	1,1,1-Trichloroethane (ug/l)	Trichloroethene (ug/l)
MWA-55i	8/3/2005	ND(< 2.34)	ND(< 0.140)	89.6	0.13 J	ND(< 0.132)	ND(< 0.187)	0.81	0.1 J	0.31 J
MWA-60	1/16/2006	5.94 J	ND(< 0.140)	7.5	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	0.74	0.24 J	1.52
MWA-61	1/13/2006	ND(< 1170)	240 J	5690	ND(< 43.0)	ND(< 66.0)	ND(< 93.5)	1720	ND(< 43.0)	295
MWA-62	1/16/2006	ND(< 2.34)	ND(< 0.140)	3.79	ND(< 0.0859)	ND(< 0.132)	ND(< 0.187)	15.3	ND(< 0.0859)	1.21
MWA-63	11/21/2005	ND(< 4.68)	0.88 J	269	ND(< 0.172)	ND(< 0.264)	ND(< 0.374)	329	ND(< 0.172)	99.3
MWA-64i	8/1/2005	ND(< 46.8)	ND(< 2.80)	5.0 J	ND(< 1.72)	ND(< 2.64)	ND(< 3.74)	153	ND(< 1.72)	ND(< 4.82)
MWA-65i	8/2/2005	ND(< 117)	ND(< 7.0)	ND(< 7.15)	ND(< 4.30)	ND(< 6.60)	ND(< 9.35)	ND(< 5.45)	ND(< 4.30)	ND(< 12.0)
MWA-66i	8/2/2005	ND(< 234)	ND(< 14.0)	25 J	ND(< 8.59)	ND(< 13.2)	ND(< 18.7)	ND(< 10.9)	ND(< 8.59)	ND(< 24.1)
MWA-67si	1/13/2006	ND(< 4680)	1720	2040	ND(< 172)	ND(< 264)	ND(< 374)	2380	ND(< 172)	ND(< 482)
MWA-68si	1/13/2006	ND(< 234)	ND(< 14.0)	129	13.0 J	ND(< 13.2)	ND(< 18.7)	19.0 J	ND(< 8.59)	ND(< 24.1)
MWA-69	1/16/2006	13.8 J	ND(< 0.140)	4.21	0.7	ND(< 0.132)	2.9	1.52	ND(< 0.0859)	3.44
MWA-70i	4/19/2006	ND(< 7.6)	ND(< 0.76)	3.7	ND(< 0.52)	ND(< 0.64)	ND(< 0.64)	ND(< 0.80)	ND(< 0.64)	ND(< 0.64)
NMP-1D	3/2/2004	ND(< 2940)	ND(< 528)	ND(< 520)	ND(< 548)	ND(< 468)	ND(< 498)	ND(< 50)	ND(< 532)	ND(< 446)
NMP-2D	3/2/2004	ND(< 2940)	ND(< 528)	ND(< 520)	ND(< 548)	ND(< 468)	ND(< 498)	ND(< 50)	ND(< 532)	ND(< 446)
NMP-3D	3/30/2006	ND(< 85.5)	ND(< 3.50)	108	ND(< 2.0)	ND(< 3.0)	7.0 J	ND(< 3.0)	ND(< 2.50)	ND(< 2.50)
NMP-4D	3/30/2006	ND(< 342)	ND(< 14.0)	560	ND(< 8.0)	ND(< 12.0)	32 J	ND(< 12.0)	ND(< 10.0)	ND(< 10.0)
NMP-5D	3/2/2004	ND(< 1470)	ND(< 264)	ND(< 260)	ND(< 274)	ND(< 234)	ND(< 249)	ND(< 250)	ND(< 266)	ND(< 223)
PMP-1	3/2/2004	ND(< 1470)	ND(< 264)	ND(< 260)	ND(< 274)	ND(< 234)	ND(< 249)	ND(< 250)	ND(< 266)	ND(< 223)
PMP-2	3/2/2004	ND(< 58.8)	ND(< 10.6)	166	ND(< 11.0)	43.6	42.4	ND(< 10.0)	ND(< 10.6)	ND(< 8.92)
PMP-3	3/2/2004	55.8	ND(< 0.264)	41.3	3.29	ND(< 0.234)	6.59	5.79	ND(< 0.266)	ND(< 0.223)
PMP-4	3/29/2006	ND(< 1.71)	ND(< 0.070)	1.74	ND(< 0.040)	ND(< 0.060)	ND(< 0.060)	0.14 J	ND(< 0.050)	ND(< 0.050)
PMP-5	3/29/2006	ND(< 1.71)	2.15	58.6	ND(< 0.040)	ND(< 0.060)	ND(< 0.060)	8.87	0.17 J	0.26 J
PMP-6	3/29/2006	54.6	ND(< 0.70)	45.7	ND(< 0.40)	ND(< 0.60)	ND(< 0.60)	2.2	2.5	ND(< 0.50)
In-Water Groundwater Samples										
WB-1 S	6/4/2002	NA	ND(< 13)	ND(< 13)	ND(< 13)	ND(< 13)	ND(< 13)	ND(< 13)	ND(< 13)	ND(< 13)
WB-1 D	6/4/2002	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-10 S	3/5/2003	1300	ND(< 0.5)	38	15	1	49	23	ND(< 0.5)	16
WB-10 D	3/6/2003	NA	ND(< 1.3)	125	ND(< 1.3)	ND(< 1.3)	ND(< 1.3)	6.6	ND(< 1.3)	5.1
WB-11 S	3/7/2003	NA	ND(< 50)	ND(< 85)	ND(< 50)	ND(< 50)	ND(< 50)	ND(< 50)	ND(< 50)	ND(< 50)
WB-11 D	3/7/2003	NA	ND(< 50)	ND(< 50)	ND(< 50)	ND(< 50)	ND(< 50)	ND(< 50)	ND(< 50)	ND(< 50)
WB-12	2/20/2003	NA	ND(< 0.5)	430	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-13 S	2/26/2003	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-13 D	2/26/2003	NA	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	400	ND(< 25)	25
WB-14 S	2/27/2003	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	0.86	ND(< 0.5)	ND(< 0.5)
WB-14 D	2/27/2003	NA	ND(< 13)	ND(< 13)	ND(< 13)	ND(< 13)	ND(< 13)	250	ND(< 13)	190
WB-15	2/17/2003	NA	ND(< 0.5)	2.2	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-16 S	2/19/2003	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-18 S	2/25/2003	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-18 D	2/26/2003	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	1.2
WB-19 S	2/25/2003	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-2 S	6/4/2002	NA	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)	ND(< 2.5)
WB-2 D	6/4/2002	NA	ND(< 1)	ND(< 1)	ND(< 1)	ND(< 1)	ND(< 1)	ND(< 1)	ND(< 1)	ND(< 1)
WB-20 S	2/24/2003	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-21 S	2/20/2003	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-21 D	2/20/2003	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-22 S	2/21/2003	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-23 S	2/18/2003	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-23 D	2/18/2003	NA	ND(< 1)	610	ND(< 1)	ND(< 1)	ND(< 1)	ND(< 1)	ND(< 1)	ND(< 1)
WB-25 S	3/10/2003	NA	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	45

Table 1
Selected Volatile Organic Compound Concentrations in Groundwater
Remedial Investigation
Arkema, Inc.
Portland Orego n

Location	Sample Date	Acetone (ug/l)	Carbon tetrachloride (ug/l)	Chloroform (ug/l)	1,2-Dichlorobenzene (ug/l)	1,3-Dichlorobenzene (ug/l)	1,4-Dichlorobenzene (ug/l)	Tetrachloroethene (ug/l)	1,1,1-Trichloroethane (ug/l)	Trichloroethene (ug/l)
WB-25 D	3/10/2003	NA	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)
WB-3 S	6/5/2002	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-3 D	6/6/2002	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-4 S	6/10/2002	NA	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	1.5	ND(< 0.5)	ND(< 0.5)
WB-4 D	6/10/2002	NA	ND(< 1)	270	ND(< 1)	ND(< 1)	ND(< 1)	1	ND(< 1)	ND(< 1)
WB-5 S	6/11/2002	NA	ND(< 10)	ND(< 5)	ND(< 5)	ND(< 5)	ND(< 5)	ND(< 5)	ND(< 5)	ND(< 5)
WB-5 D	6/11/2002	NA	ND(< 1)	6.4	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)
WB-7 S	6/12/2002	NA	ND(< 50)	54	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)	ND(< 25)
WB-8 S	2/28/2003	NA	ND(< 5)	ND(< 5)	ND(< 5)	ND(< 5)	ND(< 5)	ND(< 5)	ND(< 5)	ND(< 5)
WB-8 D	2/28/2003	NA	ND(< 0.5)	490	ND(< 0.5)	ND(< 0.5)	ND(< 0.5)	1.4	ND(< 0.5)	ND(< 0.5)
WB-9 S	3/4/2003	NA	ND(< 13)	150	110	ND(< 13)	150	ND(< 13)	ND(< 13)	55
WB-9 D	3/4/2003	NA	ND(< 5)	25	ND(< 5)	ND(< 5)	ND(< 5)	5.5	ND(< 5)	ND(< 5)

Notes:

J = Estimated Value
ND = Not Detected
NA = Not Applicable / Not Tested
ug/L = micrograms per liter
Dates and results shown are the most recent sampling data available for each point



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

Figure 1
Cross Section Location Map
Arkema Inc.
Portland, Oregon

ERM 10/06

Project No. 0020423.11
Date: 10/27/06
Drawn By: R. Olson
CAD File: g:\0020423\11\002042311-02.dwg

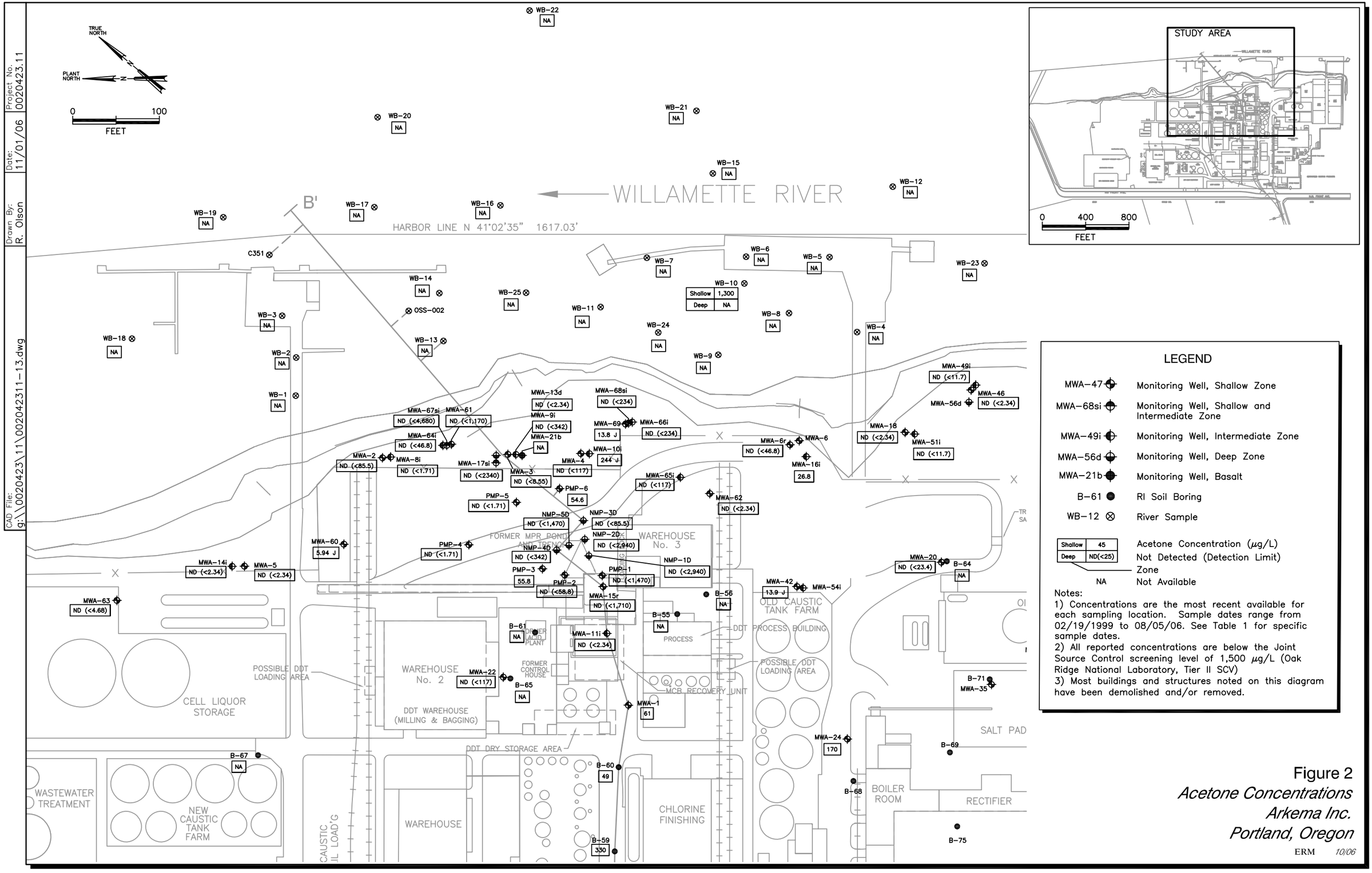
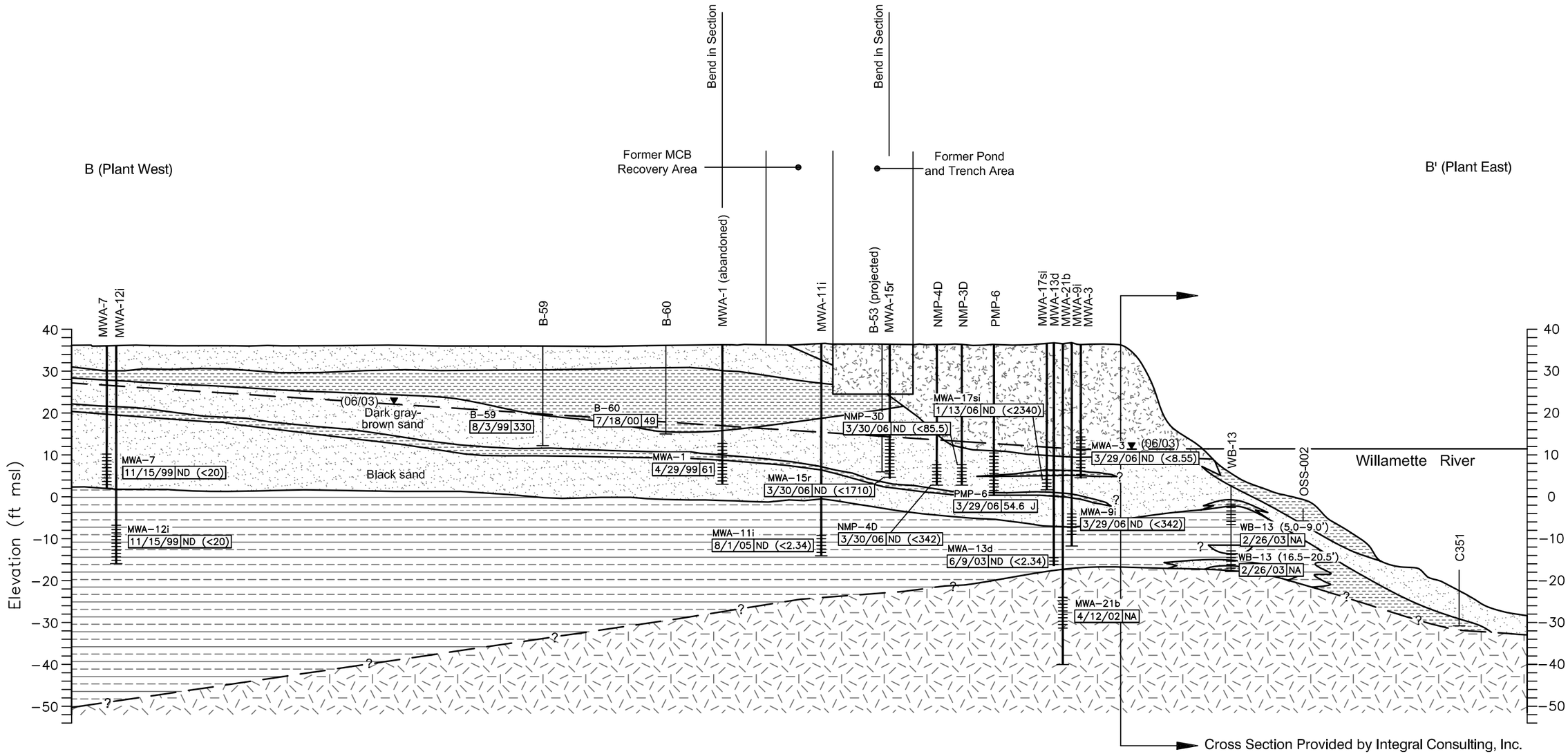


Figure 2
Acetone Concentrations
Arkema Inc.
Portland, Oregon

ERM 10/06

CAD File: g:\0020423\11\002042311-04.dwg
Drawn By: R. Olson
Date: 11/01/06
Project No. 0020423.11



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 — Soil 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)
NA Not Applicable/Reported

MWA-3 — Well ID
3/29/06 4.35 — Acetone Concentration (µg/L)
Sampling Date

All reported concentrations are below the Joint Source Control screening level of 1,500 µg/L (Oak Ridge National Laboratory, Tier II SCV)

Note: Concentrations are the most recent available for each sampling location. Sample dates range from 02/19/99 to 08/05/06.

(Vertical Exaggeration = 4X)

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

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

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

ERM 10/06

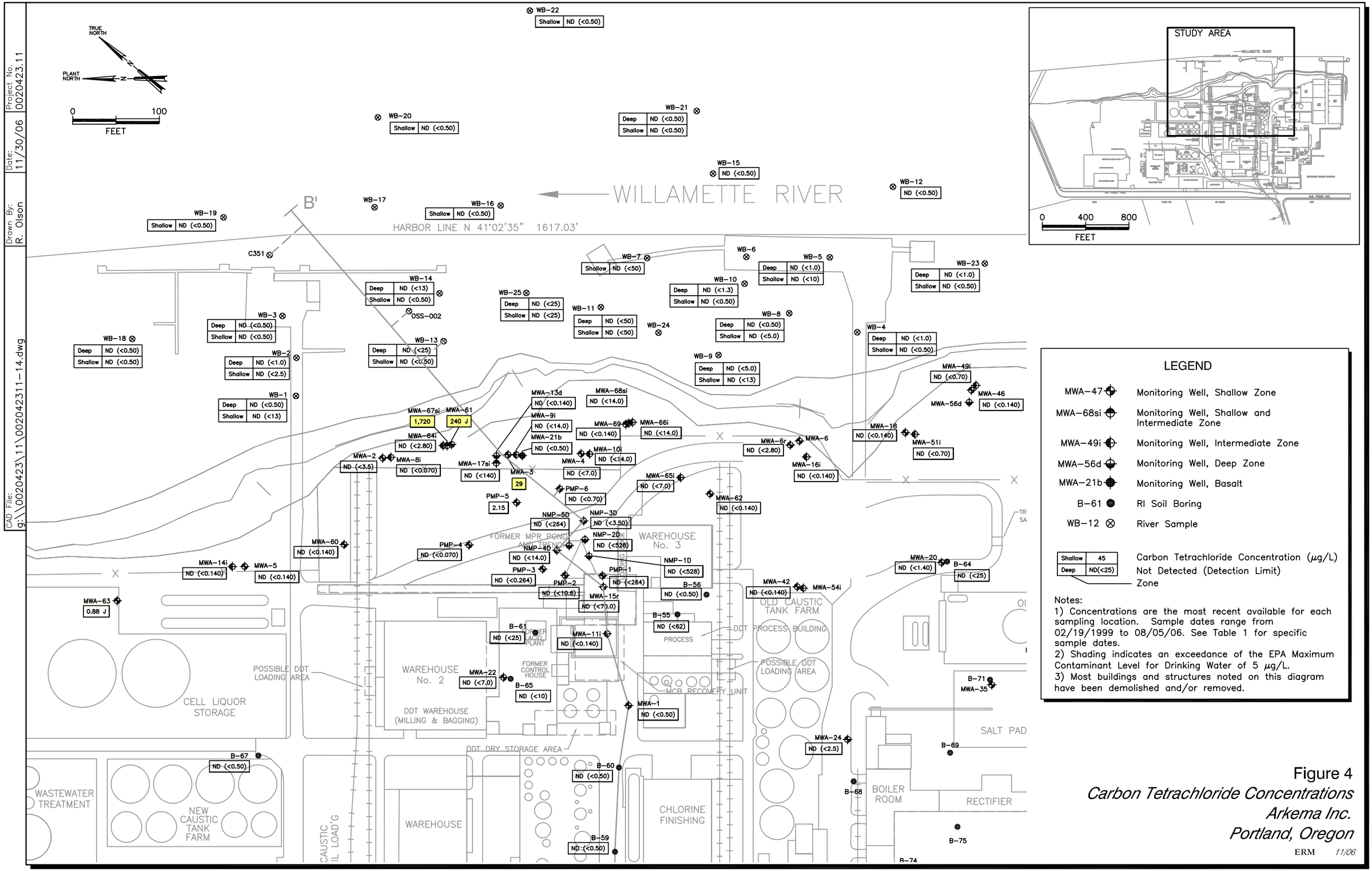
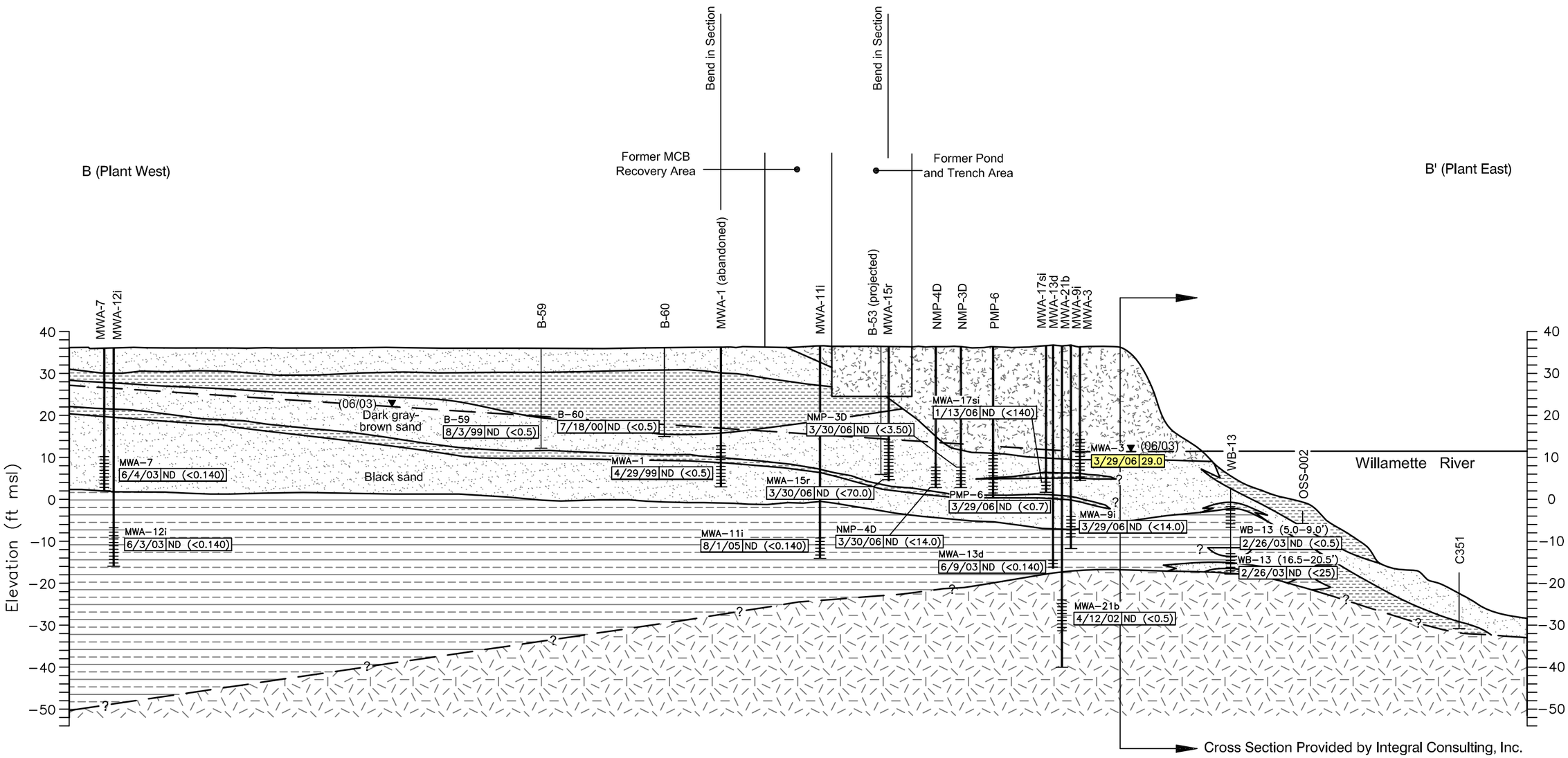


Figure 4
Carbon Tetrachloride Concentrations
Arkema Inc.
Portland, Oregon

ERM 11/06

CAD File: g:\\0020423\11\002042311-05.dwg
Drawn By: R. Olson
Date: 11/30/06
Project No. 0020423.11



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 — Soil 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)
NA — Not Applicable/Reported

MWA-3 — Well ID
3/29/06 29.0 — Carbon Tetrachloride Concentration (μg/L); Sampling Date

Shading indicates an exceedance of the EPA Maximum Contaminant Level for Drinking Water of 5 μg/L

Note: Concentrations are the most recent available for each sampling location. Sample dates range from 02/19/99 to 08/05/06.

(Vertical Exaggeration = 4X)

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

25 — 0 — 100 — APPROX. HORIZONTAL SCALE IN FEET 1" = 100'

Figure 5
Cross Section B-B'
Carbon Tetrachloride Concentrations
Arkema Inc.
Portland, Oregon

ERM 11/06

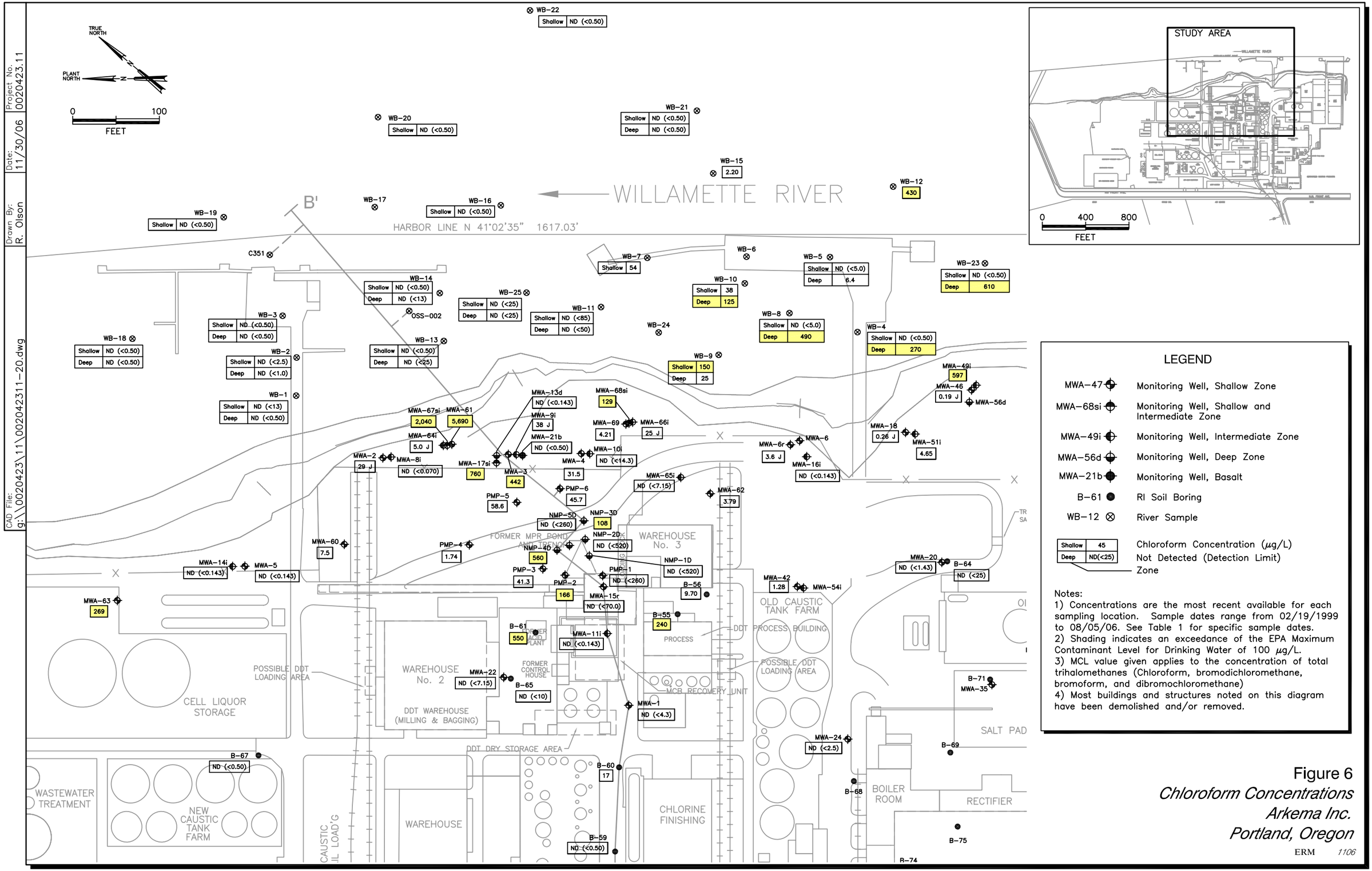
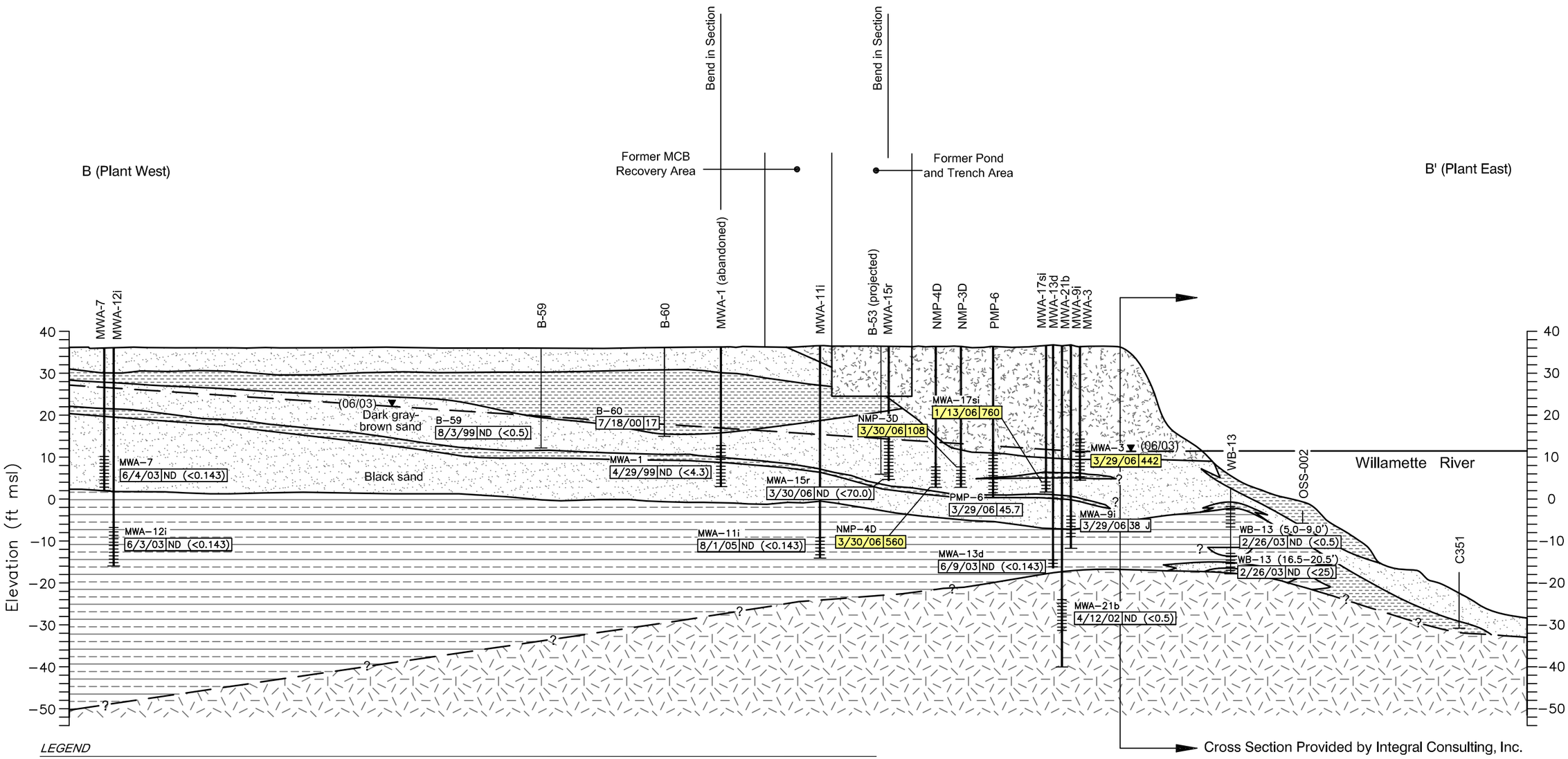


Figure 6
Chloroform Concentrations
Arkema Inc.
Portland, Oregon

ERM 1106

CAD File: g:\0020423\11\002042311-11.dwg
Drawn By: R. Olson
Date: 11/30/06
Project No. 0020423.11



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 — Soil 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)
NA — Not Applicable/Reported

MWA-3 — Well ID
3/29/06 41.3 — Chloroform Concentration (µg/L)
Sampling Date

Shading indicates an exceedance of the EPA Maximum Contaminant Level for Drinking Water of 100 µg/L

MCL value given applies to the concentration of total trihalomethanes (Chloroform, bromodichloromethane, bromoform, and dibromochloromethane)

Note: Concentrations are the most recent available for each sampling location. Sample dates range from 02/19/99 to 08/05/06.

(Vertical Exaggeration = 4X)

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

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

Figure 7
Cross Section B-B'
Chloroform Concentrations
Arkema Inc.
Portland, Oregon

ERM 11/06

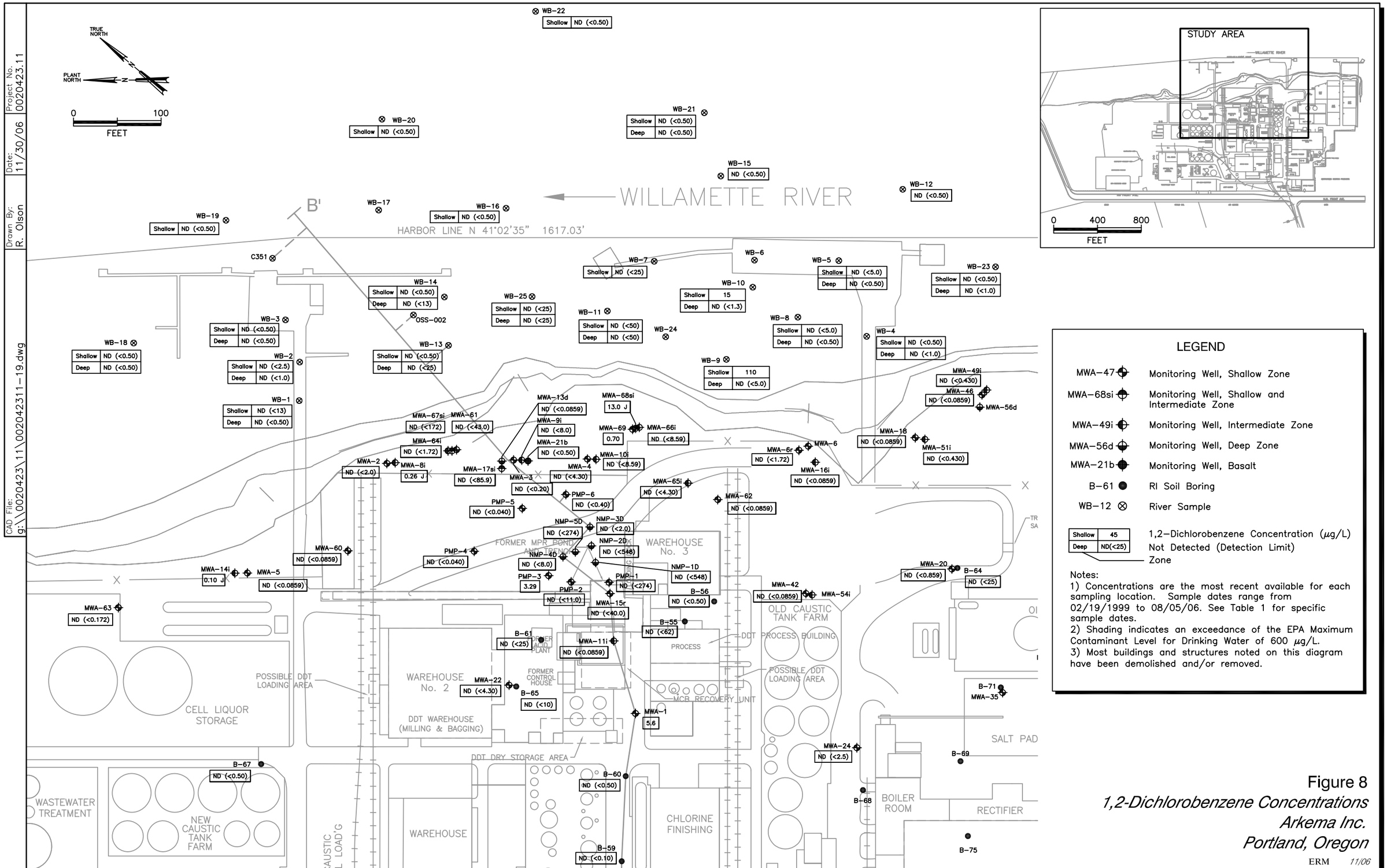


Figure 8

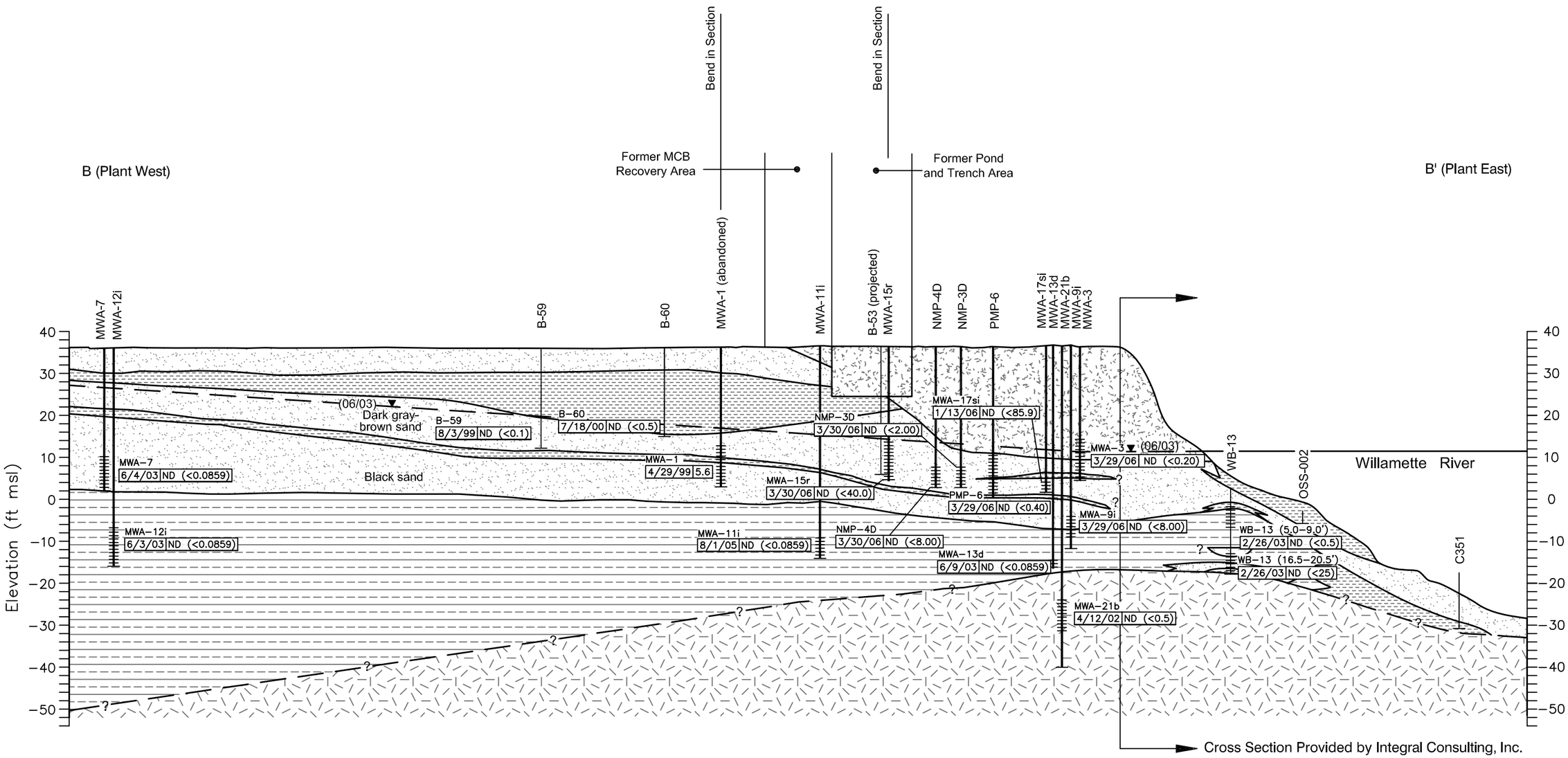
1,2-Dichlorobenzene Concentrations

Arkema Inc.

Portland, Oregon

ERM 11/06

CAD File: g:\0020423\11\002042311-10.dwg
Drawn By: R. Olson
Date: 11/30/06
Project No. 0020423.11



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 — Soil 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)
NA — Not Applicable/Reported

MWA-3 — Well ID
3/29/06 — Sampling Date
4.35 — 1,2-Dichlorobenzene Concentration (μg/L)

All reported concentrations are below the EPA Maximum Contaminant Level for Drinking Water of 600 μg/L

Note: Concentrations are the most recent available for each sampling location. Sample dates range from 02/19/99 to 08/05/06.

(Vertical Exaggeration = 4X)

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

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

Figure 9
Cross Section B-B'
1,2-Dichlorobenzene Concentrations
Arkema Inc.
Portland, Oregon

ERM 11/06

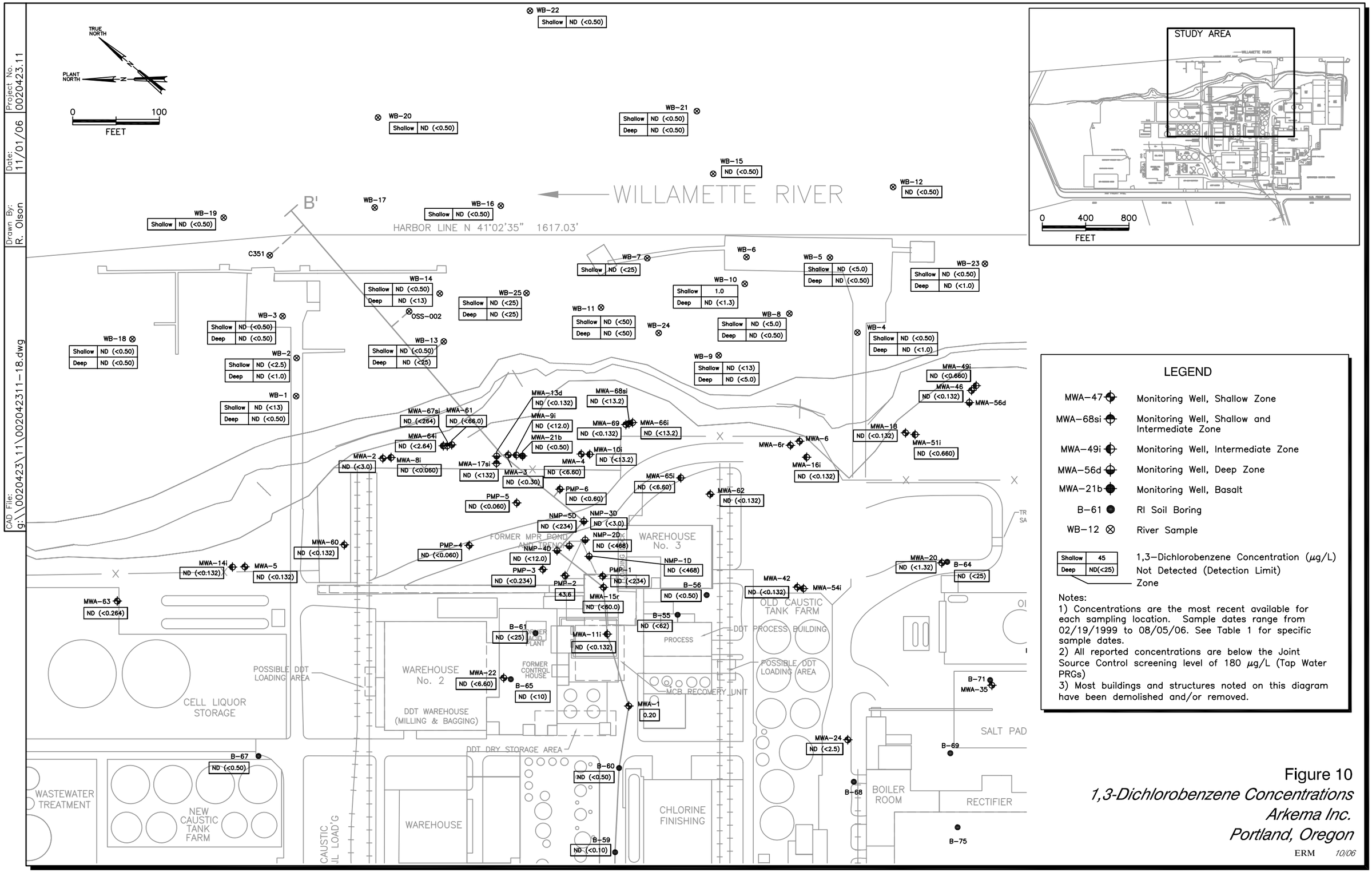


Figure 10

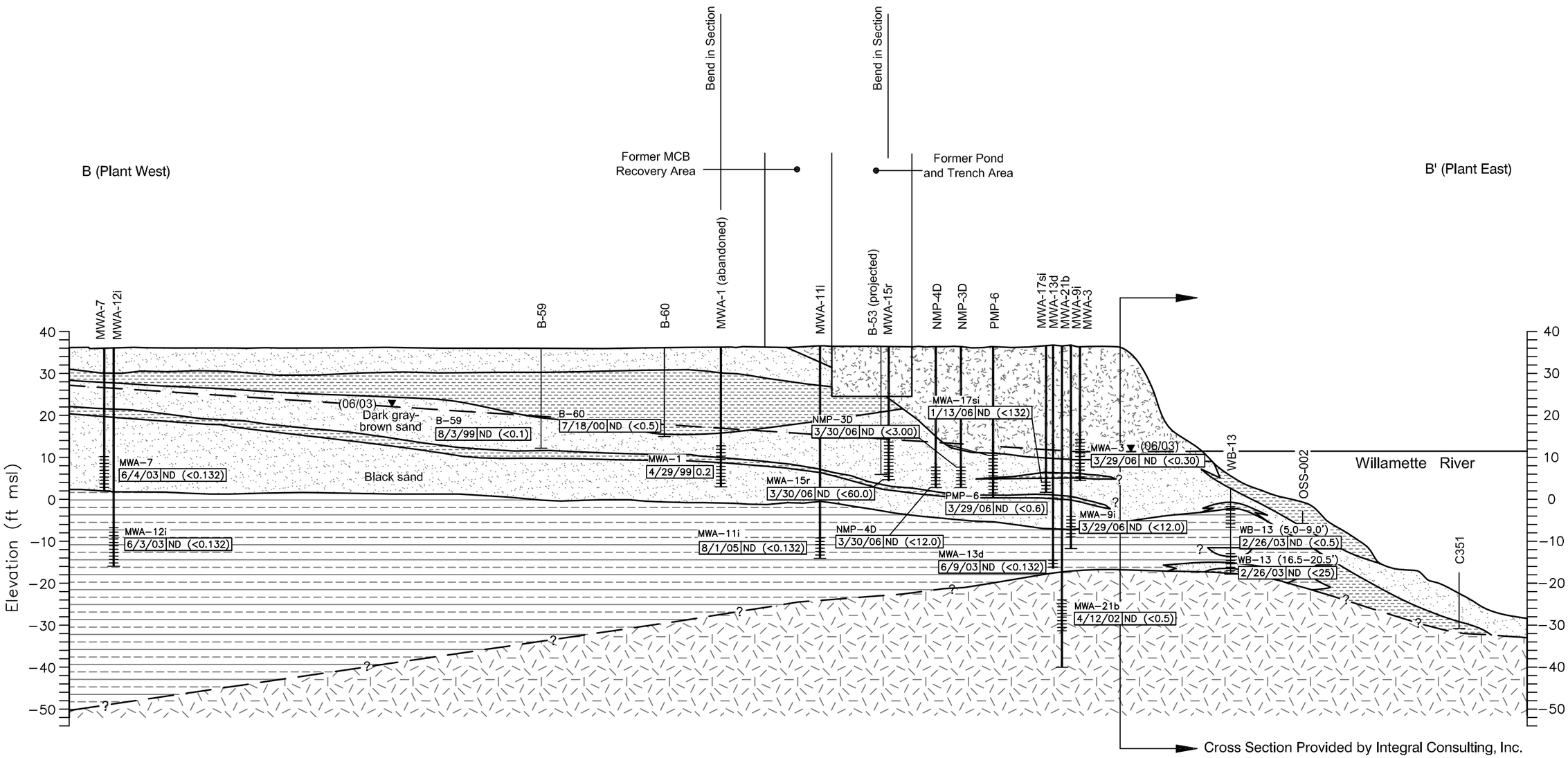
1,3-Dichlorobenzene Concentrations

Arkema Inc.

Portland, Oregon

ERM *10/06*

CAD File: g:\0020423\11\002042311-09.dwg
Drawn By: R. Olson
Date: 11/01/06
Project No. 0020423.11



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 — Soil 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)
NA — Not Applicable/Reported

MWA-3 — Well ID
3/29/06 — Sampling Date
4.35 — 1,3-Dichlorobenzene Concentration (μg/L)

All reported concentrations are below the Joint Source Control screening level of 180 μg/L (Tap Water PRGs)

Note: Concentrations are the most recent available for each sampling location. Sample dates range from 02/19/99 to 08/05/06.

(Vertical Exaggeration = 4X)

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

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

Figure 11
Cross Section B-B'
1,3-Dichlorobenzene Concentrations
Arkema Inc.
Portland, Oregon

ERM 10/06

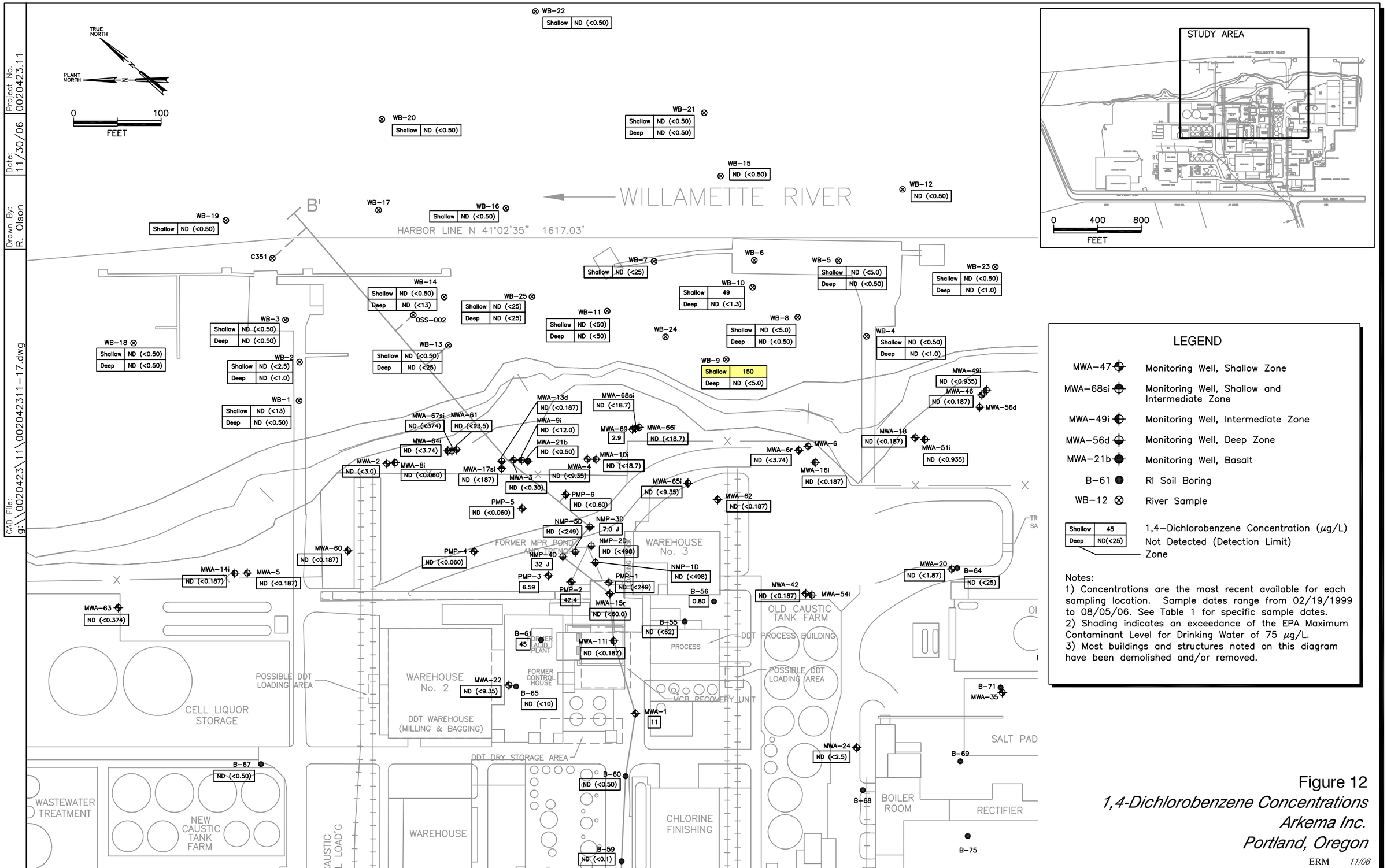


Figure 12

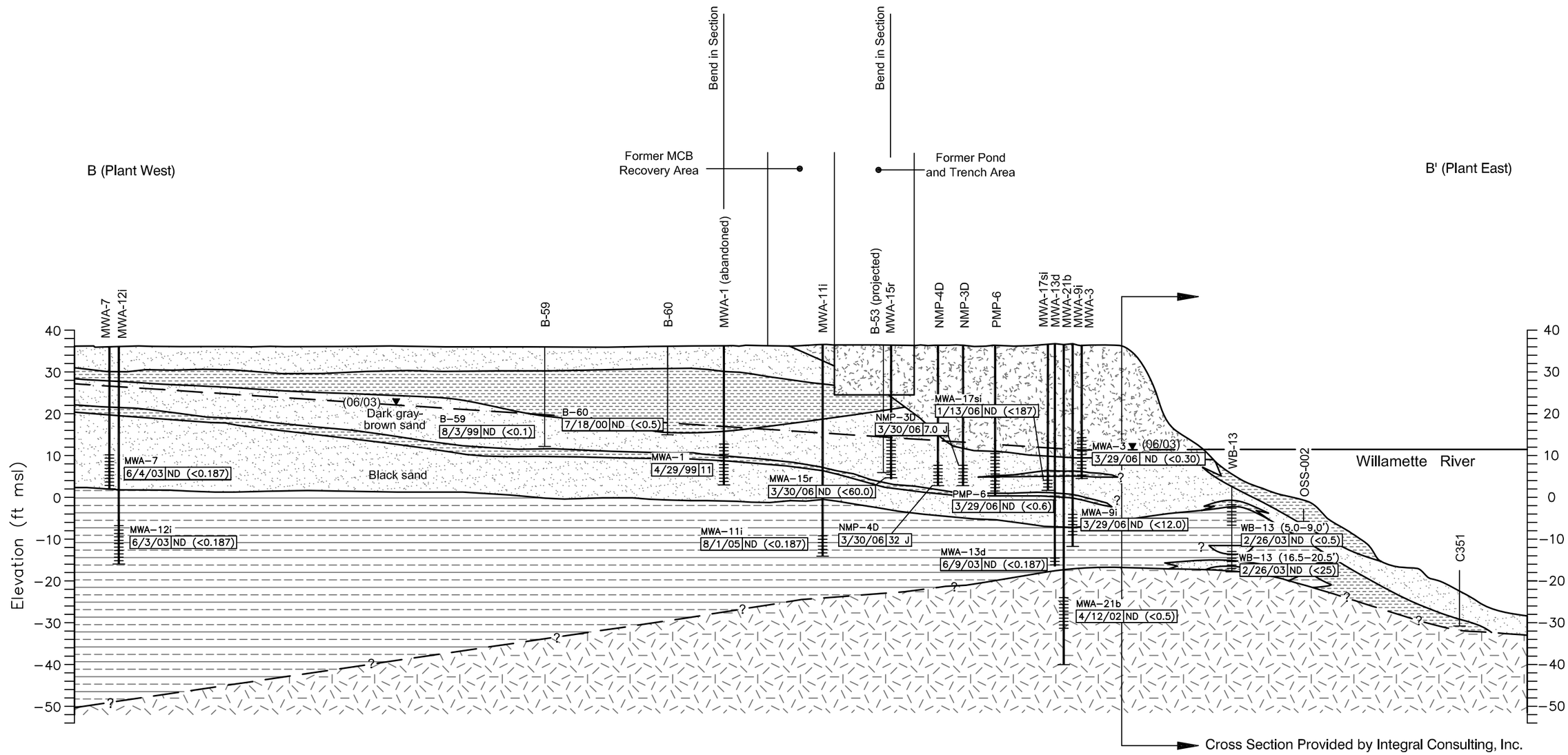
1,4-Dichlorobenzene Concentrations

Arkema Inc.

Portland, Oregon

ERM *11/06*

CAD File: g:\0020423\11\002042311-08.dwg
Drawn By: R. Olson
Date: 11/30/06
Project No. 0020423.11



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 — Soil 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)
NA — Not Applicable/Reported

MWA-3 — Well ID
3/29/06 — Sampling Date
4.35 — 1,4-Dichlorobenzene Concentration (μg/L)

All reported concentrations are below the EPA Maximum Contaminant Level for Drinking Water of 75 μg/L

Note: Concentrations are the most recent available for each sampling location. Sample dates range from 02/19/99 to 08/05/06.

(Vertical Exaggeration = 4X)

APPROX. VERTICAL SCALE IN FEET
1" = 25'

APPROX. HORIZONTAL SCALE IN FEET
1" = 100'

Figure 13
Cross Section B-B'
1,4-Dichlorobenzene Concentrations
Arkema Inc.
Portland, Oregon

ERM 11/06

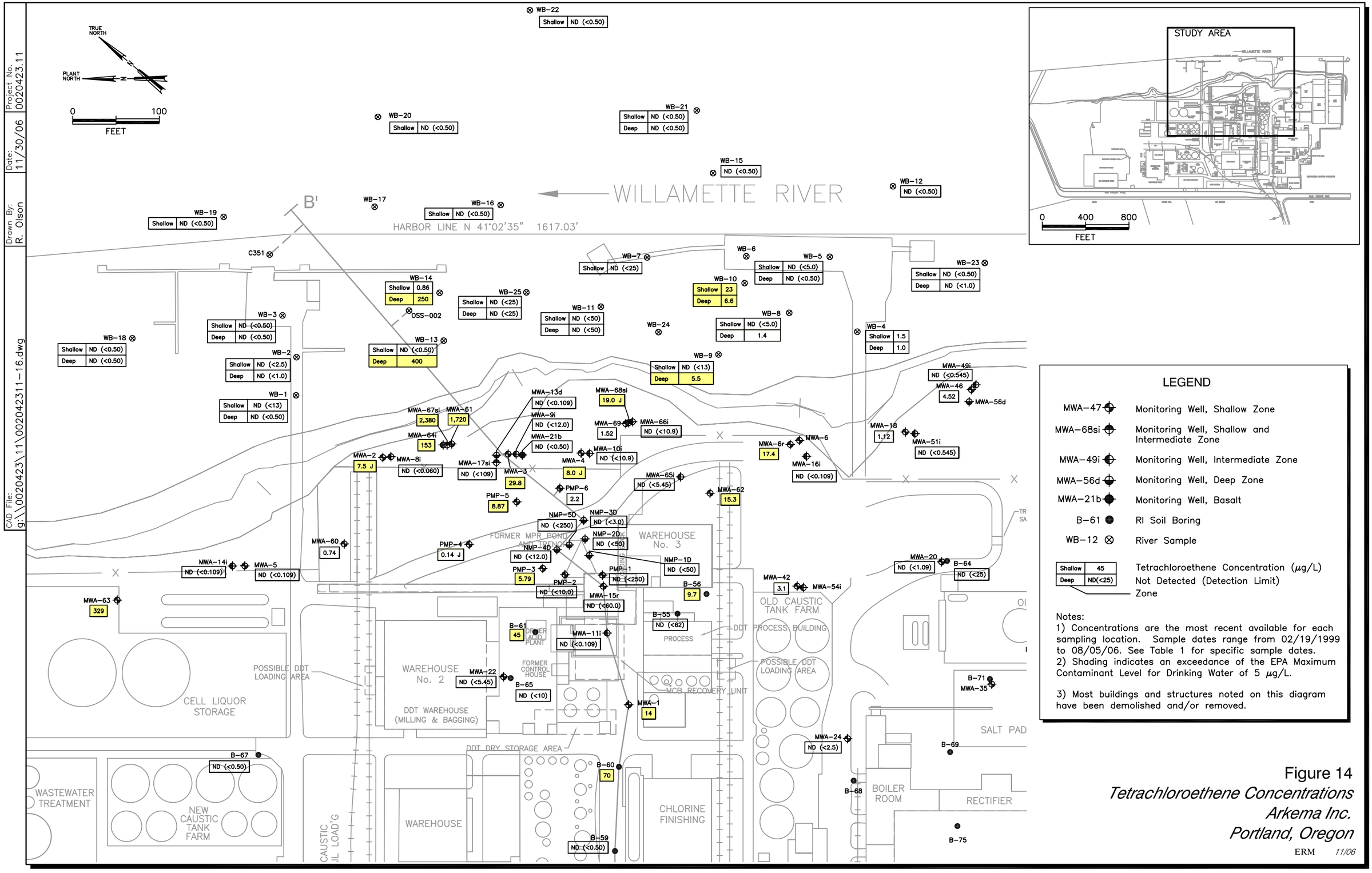
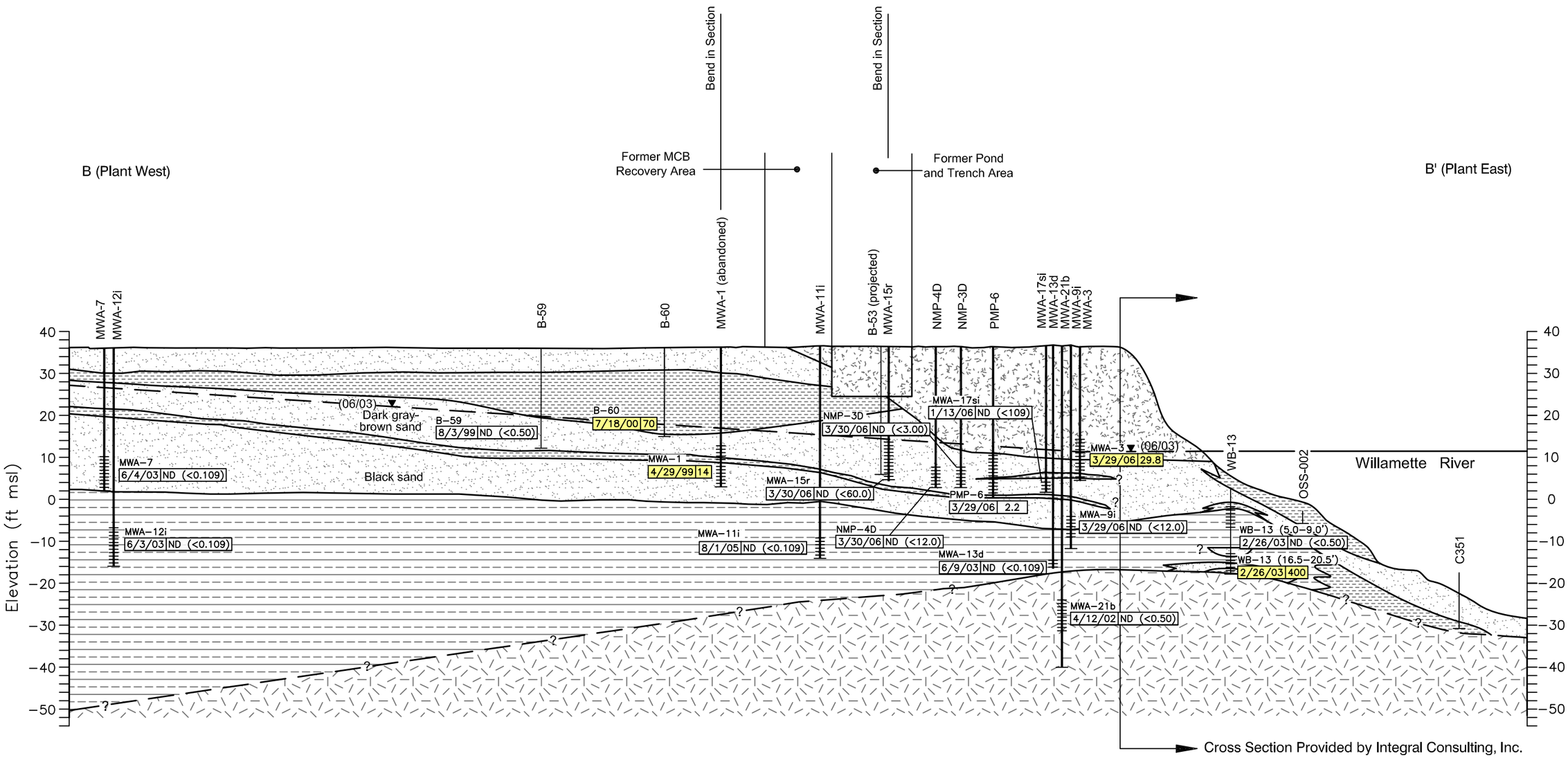


Figure 14

Tetrachloroethene Concentrations
Arkema Inc.
Portland, Oregon

ERM 11/06

CAD File: g:\\0020423\11\002042311-07.dwg
Drawn By: R. Olson
Date: 11/30/06
Project No. 0020423.11



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 — Soil 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)
NA — Not Applicable/Reported

MWA-3 — Well ID
3/29/06 4.35 — Tetrachloroethene Concentration (µg/L); Sampling Date

Shading indicates an exceedance of the EPA Maximum Contaminant Level for Drinking Water of 5 µg/L

Note: Concentrations are the most recent available for each sampling location. Sample dates range from 02/19/99 to 08/05/06.

(Vertical Exaggeration = 4X)

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

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

Figure 15
Cross Section B-B'
Tetrachloroethene Concentrations
Arkema Inc.
Portland, Oregon

ERM 11/06

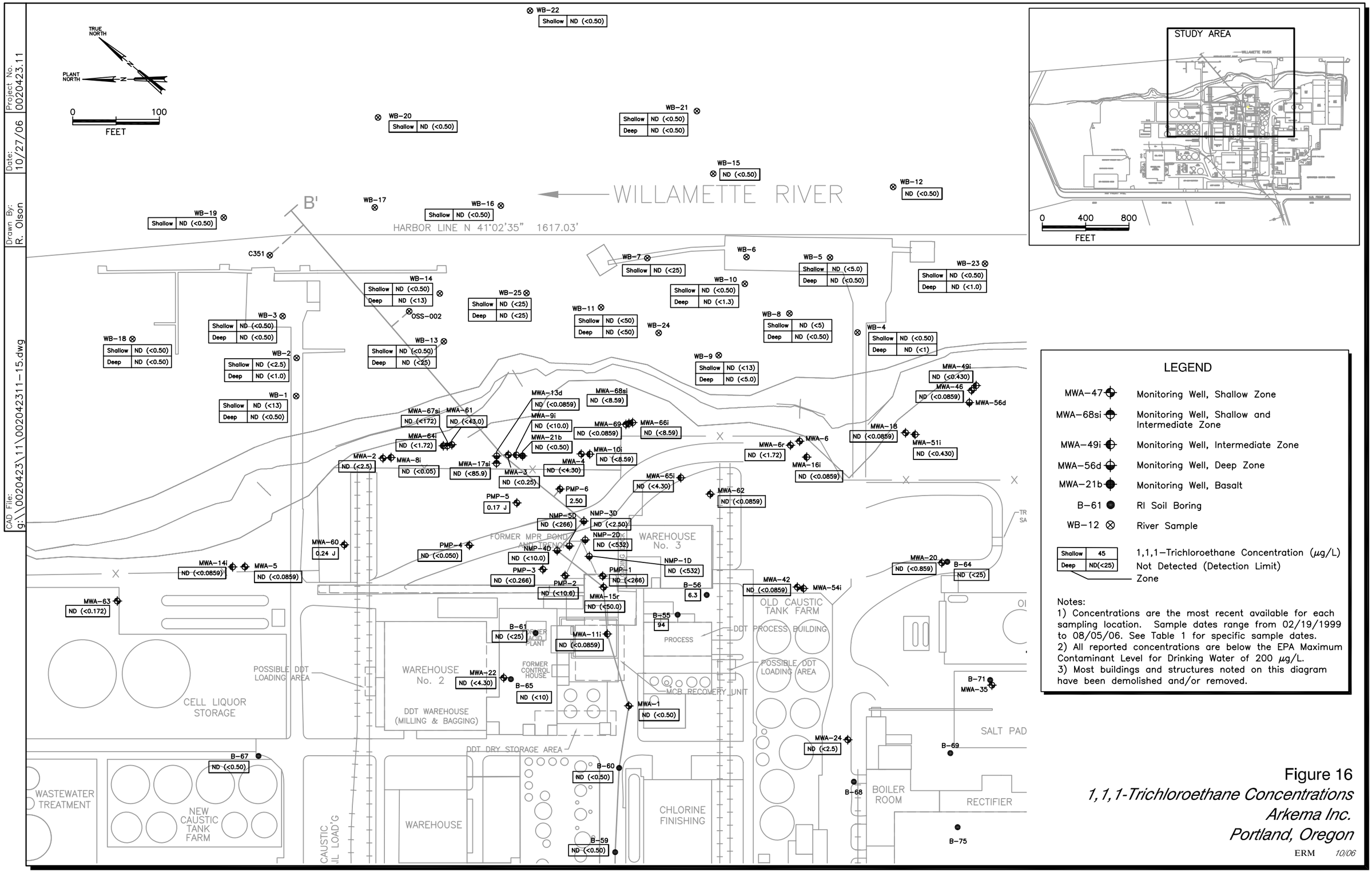


Figure 16

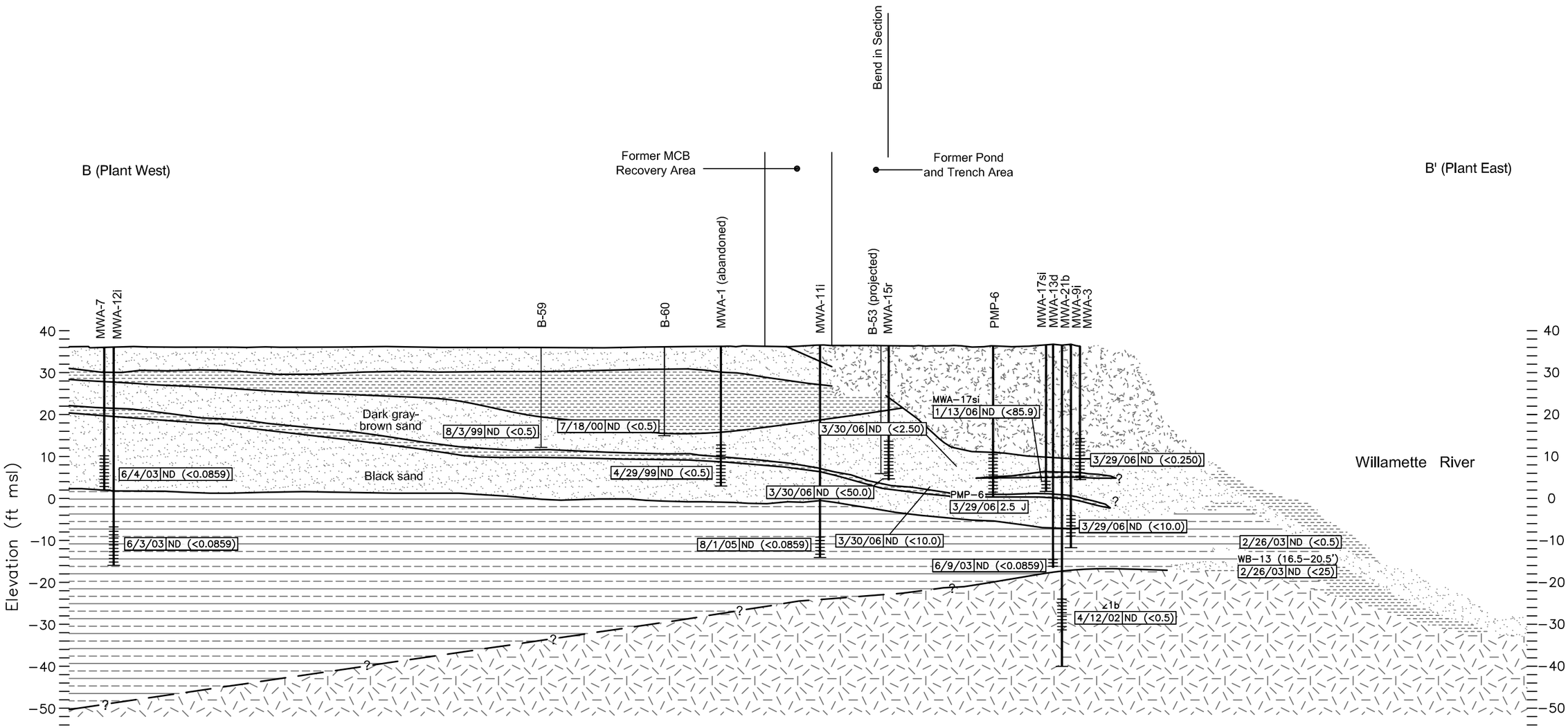
1,1,1-Trichloroethane Concentrations

Arkema Inc.

Portland, Oregon

ERM *10/06*

CAD File: g:\0020423\11\002042311-06.dwg
Drawn By: R. Olson
Date: 11/30/06
Project No. 0020423.11



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 — Soil 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)
NA Not Applicable/Reported

MWA-3 — Well ID
3/29/06 4.35 — 1,1,1-Trichlorethane Concentration (µg/L)
Sampling Date

All reported concentrations are below the EPA Maximum Contaminant Level for Drinking Water of 200 µg/L

Note: Concentrations are the most recent available for each sampling location. Sample dates range from 02/19/99 to 08/05/06.

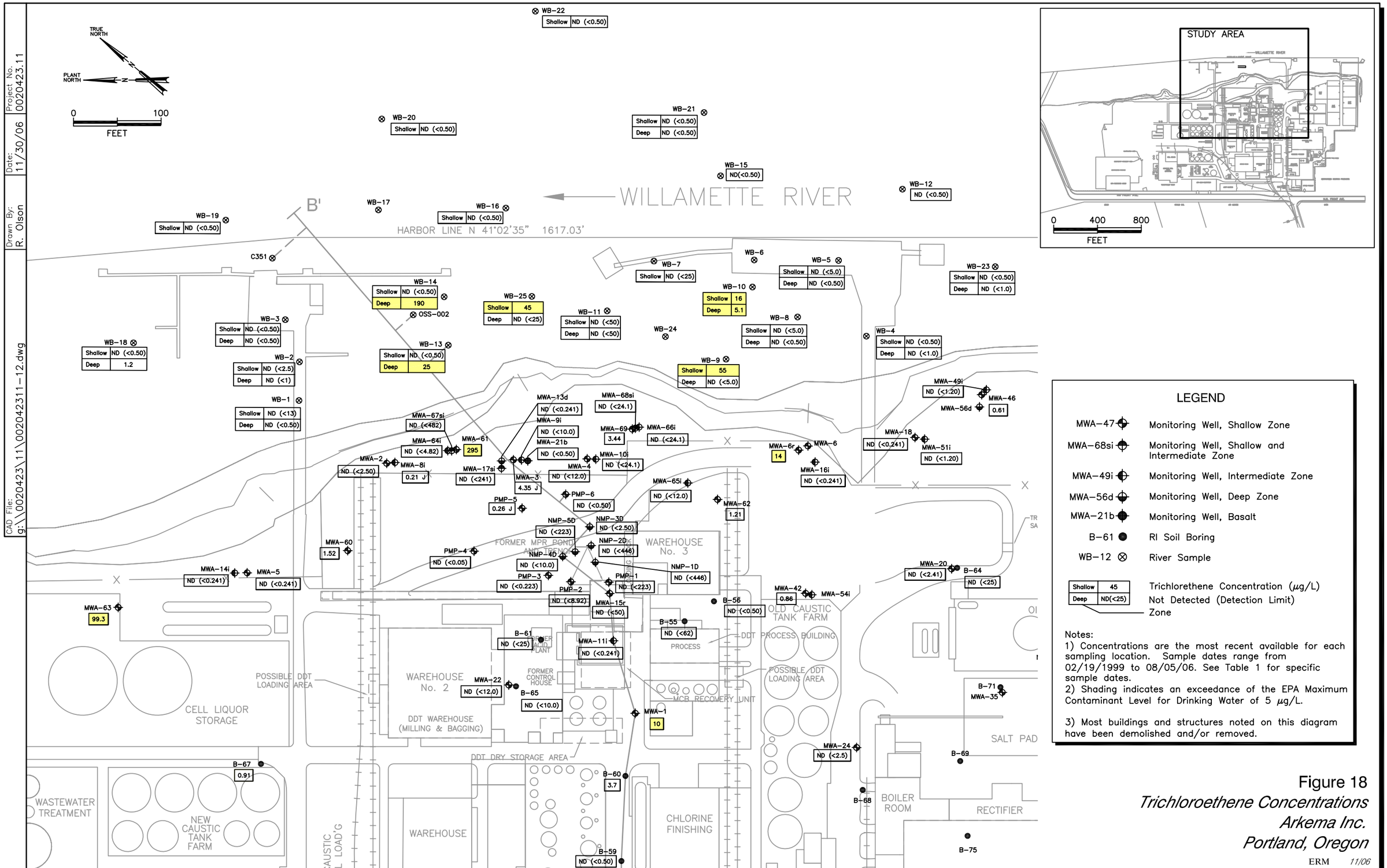
(Vertical Exaggeration = 4X)

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

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

Figure 17
Cross Section B-B'
1,1,1-Trichloroethane Concentrations
Arkema Inc.
Portland, Oregon

ERM 11/06



LEGEND

MWA-47	Monitoring Well, Shallow Zone
MWA-68si	Monitoring Well, Shallow and Intermediate Zone
MWA-49i	Monitoring Well, Intermediate Zone
MWA-56d	Monitoring Well, Deep Zone
MWA-21b	Monitoring Well, Basalt
B-61	RI Soil Boring
WB-12	River Sample

Shallow	45
Deep	ND(<25)

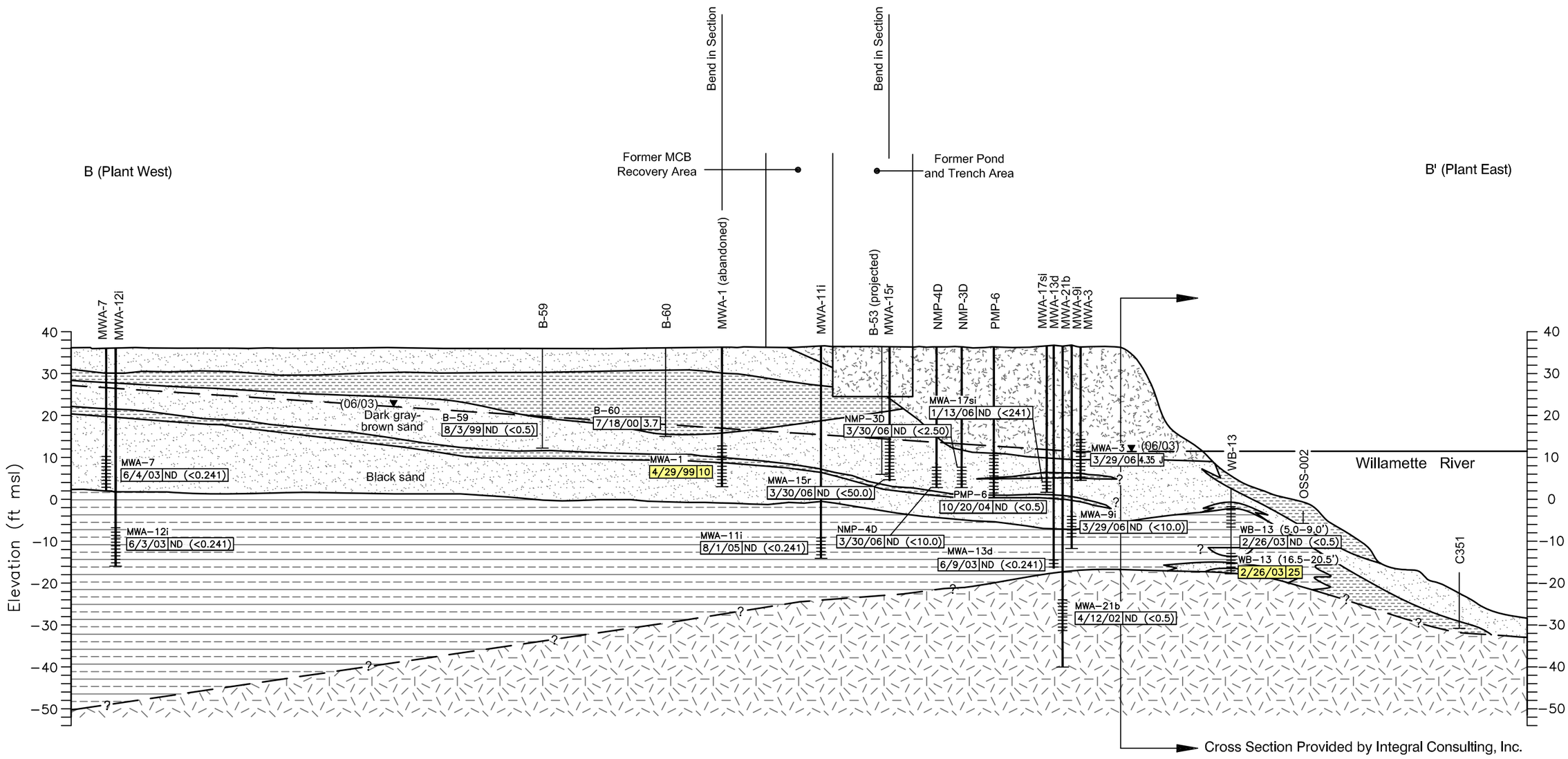
Trichlorethene Concentration (µg/L)
Not Detected (Detection Limit)
Zone

Notes:
1) Concentrations are the most recent available for each sampling location. Sample dates range from 02/19/1999 to 08/05/06. See Table 1 for specific sample dates.
2) Shading indicates an exceedance of the EPA Maximum Contaminant Level for Drinking Water of 5 µg/L.

3) Most buildings and structures noted on this diagram have been demolished and/or removed.

Figure 18
Trichloroethene Concentrations
Arkema Inc.
Portland, Oregon

ERM 11/06



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 — Soil 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)
NA Not Applicable/Reported

MWA-3 — Well ID
3/29/06 4.35 — Trichloroethene Concentration (µg/L)
Sampling Date

Shading indicates an exceedance of the EPA Maximum Contaminant Level for Drinking Water of 5 µg/L

Note: Concentrations are the most recent available for each sampling location. Sample dates range from 02/19/99 to 08/05/06.

(Vertical Exaggeration = 4X)

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

25 — 0 — 100 — APPROX. HORIZONTAL SCALE IN FEET 1" = 100'

Figure 19
Cross Section B-B'
Trichloroethene Concentrations
Arkema Inc.
Portland, Oregon

ERM 11/06

Oregon
Theodore Kulongoski, Governor

Department of Environmental Quality
Northwest Region Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5263
FAX (503) 229-6945
TTY (503) 229-5471

December 15, 2006

Todd Slater
Legacy Site Services LLC
486 Thomas Jones Way
Exton, Pennsylvania 19341

Re: Former Arkema Portland Plant
Arkema Responses to DEQ RI Comments
ECSI No. 398

Dear Mr. Slater:

Review of Arkema's December 1, 2006 letter which responds to the Department of Environmental Quality (DEQ) June 5, 2006 comment letter on the *Upland Remedial investigation Report, Lots 3 & 4 and Tract A – Revision I,* necessitates the following revisions and clarifications.

1. The plan view figures prepared for acetone, carbon tetrachloride, chloroform, 1,2-dichlorobenzene, 1-3-dichlorobenzene, 1,4-dichlorobenzene, tetrachloroethene, 1,1,1-trichloroethane and trichloroethene did not include available Lower Willamette Group in-water data (LWG). Please update these figures to include the LWG sediment, groundwater and transition zone pore water data.

2. The cross-sectional figures prepared for acetone, carbon tetrachloride, chloroform, 1,2-dichlorobenzene, 1-3-dichlorobenzene, 1,4-dichlorobenzene, tetrachloroethene, 1,1,1-trichloroethane and trichloroethene were not drawn through the monitoring well MWA-61 and MWA-67si locations. The unanticipated high levels of volatile organic compounds (VOC) detected in these two monitoring wells was the basis for DEQ's June 5, 2006 request that Arkema prepare additional summary figures of the VOC distribution to help illustrate the VOC distribution and potential source areas. DEQ requests that Arkema prepare new cross-sectional figures that illustrate the stratigraphy and VOC distribution upland and in-water at the MWA-61 and MWA-67si location. Relevant in-water data should be presented in the figures, and where the section alignment does not cross a relevant the in-water data point the in-water data should be projected onto the cross-section.

DEQ-DC1

3. In addition to the assessment of the potential risks associated with hexavalent chromium in the Chlorate Plant soils (Arkema response # 13 to DEQ RI comments) the pending hot spot analysis and upland feasibility study will need to evaluate potential impacts to the beneficial use of groundwater from hexavalent chromium in vadose zone soils and potential remedial alternatives.

Per our December 13, 2006 discussions, DEQ requests that Arkema provide updated plan view and cross-sectional summary VOC figures by January 12, 2007. Please call me at (503) 229-5538 if you have any questions.

Sincerely,

Matt McClincy
Project Manager
Portland Harbor Section

cc: Claudia Powers, Ater Wynne
Larry Patterson, ERM
Erik Ipsen, ERM
David Livermore, Integral

DEQ-DC1