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Second Explanation of Significant Differences for the June 10, 1994, Record of Decision for the Final Remedial Action of the Groundwater and Sediments Operable Unit Teledyne Wah Chang Superfund Site Albany, Oregon

1. Introduction

Site Name and Address
Teledyne Wah Chang Albany
1600 Old Salem Road, NE
Albany, Oregon
97321-4548

Identification of Lead and Support Agencies

The United States Environmental Protection Agency (EPA) is the lead agency for this Superfund site. The Oregon Department of Environmental Quality (DEQ) is the support agency for this Superfund site.

Statutory Citation for an Explanation of Significant Differences

This Explanation of Significant Differences (ESD) applies to the remedial actions performed under the Final Record of Decision (ROD) for the Groundwater and Sediments Operable Unit (OU2) for Teledyne Wah Chang (Wah Chang) signed June 10, 1994.

This ESD is prepared in accordance with Section 117(c) of the "Comprehensive 1980 Environmental Response, Compensation, and Liability Act (CERCLA; Superfund) " and Section 300.435(c)(2)(i) of the "National Oil and Hazardous Substances Pollution Contingency Plan (NCP)." An ESD is required when there is a significant change in the remedial action (RA) that does not fundamentally alter the remedy selected in the ROD with respect to scope, performance or cost. It is EPA's policy to prepare an ESD prior to implementation of a secondary technology (*Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents, EPA 540-R098-031, 1999*).

Circumstances Prompting the Present Change to the Selected Groundwater Remedy in the ROD

New information indicated that high concentrations of chlorinated volatile organic compounds (CVOCs) in groundwater will delay the achievement of cleanup levels using the current Groundwater Extraction and Treatment System (GETS). An enhancement to the GETS is needed to meet the goals set forth in the ROD.

As specified in Section 10.1.1 of the ROD – Selected Remedy – Groundwater Extraction and Containment, remedial action objectives (RAOs) include: Reducing site-related contaminated groundwater to below applicable or relevant and appropriate requirements (ARARS) or other risk based levels; Preventing contaminated groundwater above ARARS and other risk based

levels from migrating off-site; and Preventing contaminated groundwater from discharging into nearby surface water. The last RAO was modified through a 1996 ESD.

Based on EPA's concern that RAOs may not be met within the Acid Sump Area and that the groundwater hot spot in the vicinity of extraction well FW-6 was not adequately hydraulically contained, EPA required that an additional extraction well (FW-8) be installed during the fall of 2007 in an area with a higher sustainable yield than FW-6. However, the installation of FW-8 was unable to be completed. During drilling a hard, potentially non-ferrous metallic object was encountered at a depth of 10 feet below ground surface (ft bgs) in the FW-8 borehole. After the object was encountered, a sheen/solvent odor was observed on the drill fluids, and the photoionization detector (PID) readings in ambient air rose significantly. The boring was immediately sealed with concrete, leaving the object in place. A sample of the drill fluids indicated a 1,1,1-trichloroethane (TCA) concentration of 1,420 milligrams per liter (mg/L). The observed TCA concentration was found to be above 10 percent of the respective solubility limit and is considered by EPA to be indicative of the presence of a non-aqueous phase liquid (NAPL). Therefore, the current GETS alone will not remediate high groundwater CVOC concentrations effected by NAPL in the timeframe set out in the ROD.

Subsequent investigations were conducted by Wah Chang to define the nature and extent of potential NAPL and dissolved phase CVOCs in the Acid Sump Source Area. Results of these investigations are summarized in the Design Investigation and Remedy Selection Report (Geosyntec Consultants March 2009). In general, the results indicated a dissolved phase TCA and trichloroethylene (TCE) plume approximately 1 acre in size. This 1 acre groundwater plume will not be remediated by GETS alone in the cleanup time frame specified in the ROD. Therefore in addition to the GETS, a secondary technology consisting of Enhanced In-situ Bioaugmentation (EISB) is necessary to meet RAOs.

Public Access to the ESD

This ESD will become part of the Wah Chang administrative record in accordance with NCP 300.435. This ESD will be available to the public at the following locations:

EPA Region 10
1200 Sixth Avenue
Records Center 7th Floor
Seattle, WA
Hours: Monday through Friday 8:30 am - 4:30 pm

Albany Public Library
2450 14th Ave. SE
Albany, OR 97322
Hours: M-W 10-8; Th, Fri 10-6; Sat 10-5; Sunday 1-5

2. Background

Site Background

The Teledyne Wah Chang Albany (Wah Chang) Superfund site is located in Millersburg, Oregon, adjacent to the city of Albany. The facility covers approximately 225 acres near the Willamette River (Figure 1). The Wah Chang facility is divided into the Main Plant (90 acres), which consists of the Fabrication Area and Extraction Area, the Solids Area (20 acres), and the Farm Ponds Area (115 acres).

Wah Chang is an active operating facility which manufactures zirconium and other non-ferrous metals. The manufacturing operation consists of numerous production facilities used for the extraction and refining of zirconium and hafnium from zircon sands, with a small amount of tantalum, columbium, titanium and vanadium also being produced. The plant also has a number of waste treatment and storage facilities and several on-site ponds that were, or presently are, being used for the storage of liquid and solid wastes.

The processing of the zircon sands generates sludge, wastewater, and solid and radioactive wastes. These wastes are managed under Wah Chang's Waste Program. The facility's central wastewater treatment system consists of a continuous chemical precipitation and clarification system. Effluent water is discharged from the treatment plant to Truax Creek under a National Pollutant Discharge Elimination System (NPDES) wastewater discharge permit. Precipitated metals and lime solids are removed in a clarifier by settling and then dewatering in the Sludge Treatment System. Solid waste is disposed at a public landfill or a hazardous waste material storage and/or treatment facility.

Groundwater Contamination

The nature and extent of groundwater contamination is documented in the Remedial Investigation / Feasibility Study (RI /FS) Report, dated March 1993. Contaminants of concern (COCs) include:

- Benzene
- 1,2-Dichloroethane (1,2-DCA)
- 1,1-Dichloroethene (1,1-DCE)
- Methyl isobutyl ketone (MIBK)
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethene (PCE)
- 1,1,1-Trichloroethane (1,1,1-TCA)
- 1,1,2-Trichloroethane (1,1,2-TCA)
- Trichloroethene (TCE)

- Vinyl Chloride (VC)
- Hexachlorobenzene
- Bis(2-ethylhexyl)phthalate
- Beryllium
- Copper
- Manganese
- Uranium
- Total polychlorinated biphenyls (PCBs)
- Radium-226
- Radium-228
- Ammonium
- Fluoride

Main Plant

Manufacturing of zirconium and other non-ferrous metals is done in the Extraction Area and Fabrication Area of the main plant. Zircon sands are processed into a zirconium sponge in the Extraction Area and then fabricated into metal ingots in the Fabrication Area. There are two primary contaminant sources in the Extraction Area, a chlorinated volatile organic compounds (CVOCs) source present in the South Extraction Area (SEA), and an inorganic/pH source present in the Feed Makeup Area. A third low-level source associated with the former V-2 Pond was remediated in 1989.

Contaminant source areas in the Fabrication Area include: the Acid Sump-Thermite Building, the Ammonium Sulfate Storage-Material Recycle, and the Arc Melting-Dumpmaster. Soil and/or groundwater contamination in these areas resulted from use of cleaning solvents containing TCA, PCE, and/or TCE. In general, residual PCE, TCE, and TCA were carried down through the soil column by infiltrating rainfall and entered the Linn Gravel aquifer. Natural groundwater flow patterns have promoted the spreading and commingling of contaminant plumes that formed downgradient of each source over time. Degradation of these parent compounds has resulted in the formation of 1,2-DCA, 1,1,-DCE, and VC.

A historical aboveground storage tank (AST) failure is the primary source of ammonia present in groundwater at the Ammonium Sulfate Storage-Material Recycle Area, while a historical spill of pickling acid (hydrofluoric and nitric acids) is the primary source of fluoride and nitrate present in groundwater at the Acid Sump-Thermite Building Area.

Solids Area

Contaminant sources in the Solids Area included the lime solids formerly stored in the Lower River Solids Ponds (LRSP) and Schmidt Lake, and leaching of dissolved-phase constituents

from the Magnesium Resource Recovery Pile (MRRP) and Chlorinator Residue Pile (CRP). The solid materials present in these waste management areas were likely sources of CVOCs and metals found in groundwater. Although no data are available for the composition of wastewater treated in the settling ponds, seepage from the ponds may contain ammonia, sulfate, total dissolved solids, and metals, and may also contain organic material that exerts a significant oxygen demand, creating an anaerobic groundwater environment beneath and immediately downgradient of the ponds. The solids stored in the LRSP, Schmidt Lake, MRRP, and CRP were removed between 1979 and 1991. Groundwater monitoring performed between 1999 and 2007 for site-related CVOCs and trace metals has not detected concentrations above ROD standards, indicating that the removal was effective at eliminating these groundwater contaminant sources.

Farm Ponds

The primary source of contaminants in the Farm Ponds was wastewater used to slurry the solids from the Central Wastewater Treatment System to the Farm Ponds Area. This wastewater contained small amounts of dissolved solvent used in the Main Plant Area. The solids were not considered to be a significant source of CVOCs.

Groundwater Remedial Action Objectives (RAOs) and Selected Remedy

Section 7.4 of the ROD specified the following RAOs for groundwater:

- Prevent people from drinking groundwater containing contaminant levels above federal and state drinking water standards.
- Prevent contaminated groundwater above federal and state drinking water standards from leaving the TWCA property boundary.
- Reduce the concentrations of TWCA-related organic, inorganic, or radionuclide compounds in groundwater to concentrations below federal or state drinking water standards or other risk-based levels.
- Prevent groundwater containing TWCA-related organic, inorganic, or radionuclide compounds above federal or state standards from discharging into nearby surface waters.

In addition, the selected remedy in the ROD set out in Section 10.1 states the following:

- Remediation of groundwater via groundwater extraction at areas on the site where groundwater contaminant concentrations result in an excess cancer risk of 10^{-4} and/or substantially exceed a non-cancer hazard index (HI) of 1 for worker exposure (hot spot areas). Extraction will continue throughout the Main Plant until contaminant concentrations in groundwater are reduced to below Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs), non-zero maximum contaminant level goals (MCLGs), or cancer risk levels of 10^{-6} and a non-cancer risk HI < 1 for worker exposure, or until EPA in consultation with DEQ determines that continued groundwater extraction would not be expected to result in additional cost effective reduction in contaminant concentrations at the Site. Wah Chang estimated that reduction of CVOCs to remedial goals would be achieved in a 15-year time frame from the signing of the ROD.

- Extracted groundwater will be treated at the Wah Chang waste water treatment plant. Pretreatment of groundwater will comply with Clean Water Act (CWA) requirements prior to discharge to Truax Creek.
- Contaminated groundwater in exceedance of SDWA MCLs, non zero MCLs, or cancer risk levels of 10^{-6} and non-cancer risk HI > 1 for residential use shall be prevented from migrating off the plant site, or beyond the current boundary of the groundwater contaminant plume at the Farm Ponds Area.

Explanation of Significant Differences (ESD 1996)

During the preparation of the Scope of Work (SOW) for implementation of the groundwater remedy, certain changes were made to the selected remedy and outlined in an Explanation of Significant Differences (ESD) issued October 8, 1996 (EPA 1996). Among other things, the 1996 ESD provided an explanation of the modification of the requirement for groundwater extraction and containment at and outside the plant boundaries on the northern and western perimeters, subject to certain conditions.

Groundwater Extraction and Treatment System (GETS)

Beginning in 2001, in order to meet the selected remedy in the 1994 ROD and as modified in the 1996 ESD, a pump-and-treat remediation system was put in place at the Wah Chang facility. The work took place over multiple years. All individual wells were brought online between 2002 and 2003. The groundwater extraction and treatment system (GETS) consists of seven extraction wells (identified FW-1 though FW-7) at the Fabrication Area, and six extraction wells (identified EW-1 through EW-6) at the Extraction Area. However, one well (FW-6) was not implemented because testing performed in January 2001 revealed a sustainable yield of less than 0.1 gallon per minute (gpm). The low yields present in the vicinity of this well were attributable to the Linn Gravels' nominal saturated thickness and the potentially lower permeability of Recent Alluvium straddling the creek banks.

In the Fabrication Area, extracted groundwater was initially treated at the wellhead using granular activated carbon (GAC) to remove CVOCs prior to discharge to Wah Chang's Central Wastewater Treatment System (CWTS). In March 2006, EPA approved a modification to extracted groundwater treatment in the Fabrication Area; treatment was changed from the GAC treatment units to Wah Chang's process water cooling towers, which function similarly to an air stripping tower. This allowed the wells to discharge at higher yields and increase hydraulic capture of contaminated groundwater. This process would improve the ability of the remedy to meet cleanup levels in the time frame set forth in the ROD.

3. Basis for Implementing Enhanced In-Situ Bioremediation (EISB) as a Secondary Technology to the Selected Remedy

Due to the presence of high concentrations of CVOCs in the Acid Sump Area, which are indicative of the presence of NAPL, EPA has determined that a secondary remedial technology is necessary to meet the groundwater RAOs, identified in Section 7.4 of the ROD. EPA has determined that GETS is not sufficiently effective at treating groundwater with high CVOC

concentrations that resulted from source zone NAPL CVOCs. Therefore, the selected remedy needs to be supplemented by Enhanced In-Situ Bioremediation (EISB).

EISB is indicated as an appropriate secondary technology in the Acid Sump Area for the following reasons:

- CVOCs exist as dissolved phase constituents over a considerable area within the Linn Gravels. These CVOCs can be broken down by bacterial action, once that action is stimulated by the injection of emulsified vegetable oil.
- The hydrogeologic conditions in the Linn Gravel are conducive to substrate delivery because the gravel is sufficiently porous to allow the emulsified oil to be transported throughout the contaminated saturated soils.
- With the addition of a pH buffer, geochemical conditions within the Linn Gravels will be appropriate for microbial growth. After the growth of the bacteria, the chemistry of the treatment zone will be conducive to the destruction by bacteria of the CVOCs.
- Groundwater extraction, alone, is not effective due to the limited saturated thickness of the Linn Gravels. When the gravels are thin and have limited upgradient recharge, an extraction well will pump at a low rate before drawing the water down and dewatering the area. The reduced pumping results in a reduced area of cleanup for the well. The proposed technique of flushing emulsified vegetable oil and other enhancements through the contaminated soils should result in destruction of the dissolved CVOCs wherever they occur, allowing additional CVOCs to enter the dissolved phase.

4. Basis for the Current Change in the ROD

Information collected and developed since the 1996 ROD that is pertinent to this ESD is contained in a new Administrative Record for the Site. The primary documents referenced in this ESD include, but are not limited to:

- Third Five Year Review, prepared by EPA, January 2008.
- Wah Chang Monitoring Well Geologic Logs, TMW-1 through TMW-9, prepared by CH2M Hill, 2007.
- Acid Sump Area Subsurface Soil and Groundwater Investigation Results, prepared by CH2M Hill, February 2008.
- Acid Sump Area Soil and Groundwater Focused Feasibility Study and Treatability Study Work Plan, prepared by Geosyntech, June 2008.
- Letter from EPA to Wah Chang, Re: Acid Sump Area Subsurface Soil and Groundwater Investigation Results, Teledyne/Wah Chang Superfund Site, Albany, Oregon, June 30, 2008.
- Letter from EPA to Wah Chang, Re: Acid Sump Area Soil and Groundwater Feasibility Study and Treatability Study Work Plan, October 17, 2008.
- Fabrication Area Groundwater Year 2008 Remedial Action Progress Report, prepared by GSI, March 2009.

- Draft Final Design Investigation and Remedy Selection Report, prepared by Geosyntech, March 2009.
- Letter from EPA to Wah Chang, Re: Acid Sump Area Design and Remedy Selection, and Work Plan, April 30, 2009.
- Electronic transmission from DEQ to EPA documenting DEQ concurance with the application of EISB in the acid sump area, June 17, 2009.

5. Description of Significant Differences

Implementation of the Enhanced In-situ Bioaugmentation (EISB) for the Groundwater OU

Pursuant to Section 10.1 of the ROD, if groundwater cleanup levels cannot be achieved, then the potential responsible party (PRP) shall conduct periodic re-evaluations of remedial technologies for groundwater restoration. Based on the evaluation of the current remedy, EPA has determined that groundwater extraction alone cannot achieve ROD cleanup levels in the Acid Sump Area within the 15-year time frame and that groundwater extraction and treatment alone in source areas where NAPL is potentially present is technically infeasible for achieving the cleanup goals specified in the ROD.

The decision to modify Section 10.1.1 of the ROD has been made at the discretion of the EPA in consultation and concurrence with the DEQ. Based on information presented in this ESD, EPA and DEQ have concluded that EISB can be used as a secondary technology to help achieve RAOs in the Main Plant Area.

A Work Plan for the implementation of the remedy change in the Acid Sump Area or other areas of the site that are relevant and applicable will need to be approved by EPA prior to the start of any field work. The Work Plan will contain details regarding performance objectives and metrics, and compliance monitoring. EPA requires that the plan state that an evaluation of the remedy will be conducted annually after commencing operation. The review will document the effectiveness of the remedy's progress towards achieving RAOs, and an update on costs. If EPA determines that the remedy is ineffective, does not result in RAOs being met in accordance with the ROD, and/or is not protective of human health and the environment, then EPA will direct the use of In-Situ Chemical Oxidation (ISCO) or another appropriate technology, and will require Wah Chang to perform additional source characterization to assess the extent of any residual or recalcitrant source material in the Acid Sump Area. Furthermore, if determined necessary by EPA, Wah Chang will be directed to implement source removal or other measures in the Acid Sump Area. Should EPA determine that EISB is effective in the Acid Sump area, then this technology may be considered at other areas of the site as appropriate, contingent upon approval of the respective Work Plan(s) for those areas.

Expected Outcome

The application of EISB is expected to reduce dissolved CVOC concentrations in groundwater and saturated soils to levels that will meet the cleanup time frame in the ROD at identified source areas within the Main Plant Area.

6. Affirmation of Statutory Determinations

The EPA and DEQ believe the remedy for the Teledyne Wah Chang Superfund Site, as modified by this ESD, satisfies CERCLA §121 and remains protective of human health and the environment, complies with federal and state requirements identified in the ROD as applicable or relevant and appropriate to the remedial action at the time of the final ROD, and is cost-effective.

7. Administrative Record Availability to the Public

This Explanation of Significant Differences has resulted in a specific Administrative Record being created. The record is available in the EPA Region 10 Records Center located at 1200 Sixth Avenue, Seattle, Washington, and at the information repository located at the Albany Public Library, 2450 14th Ave. SE, Albany, Oregon.

The EPA will send out a notification by mail, as well as a published notice in accordance with requirements set out in NCP §300.435(c)(2)(i).

8. Authorizing Signature

Linda Anderson-Carnahan for

Daniel D. Opalski, Director
Office of Environmental Cleanup, Region 10
U.S. Environmental Protection Agency

6/19/09
Date

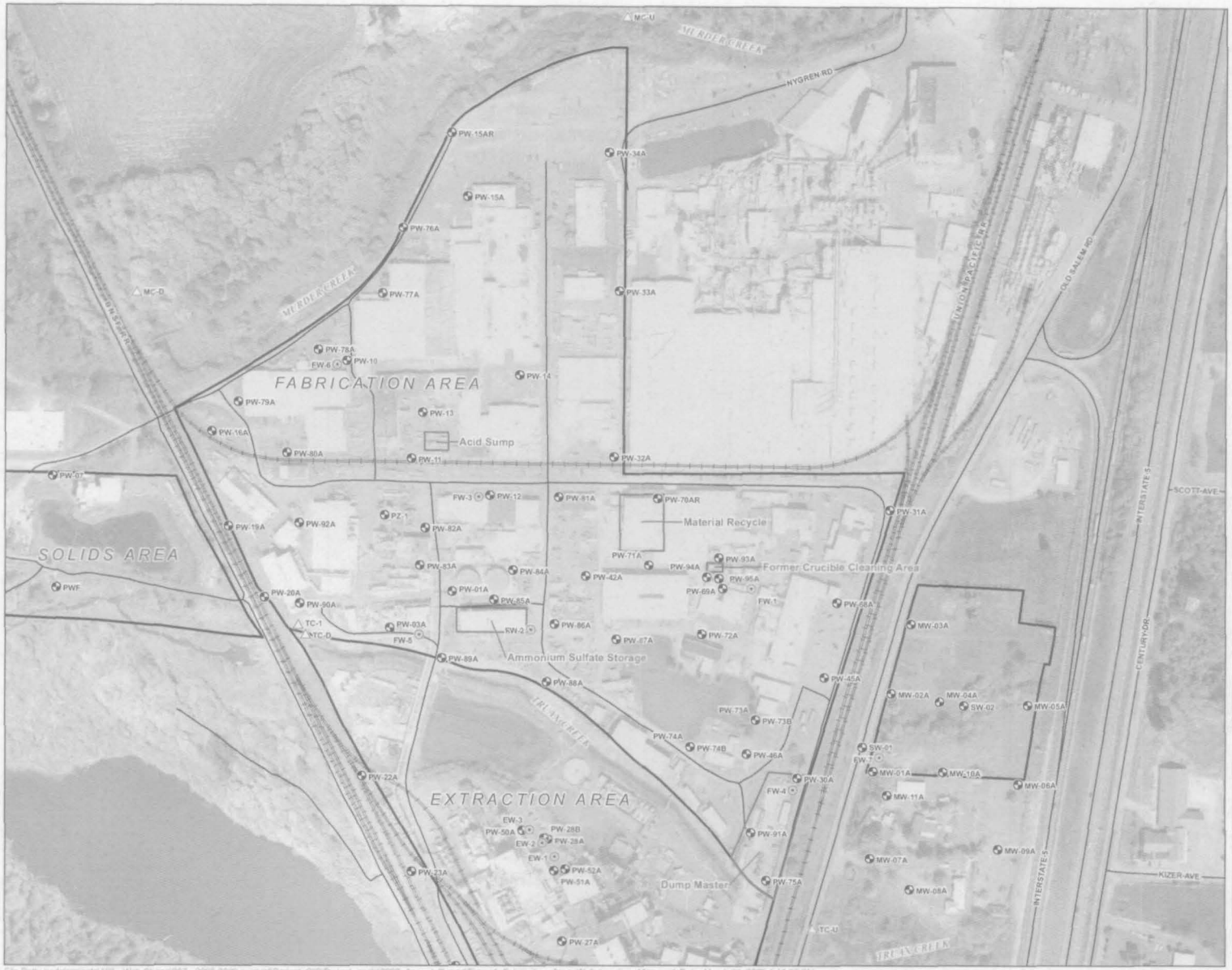

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FIGURE 1.
Site Location Map

LEGEND

- Monitoring Well
- Extraction Well
- Surface Water Sample Location
- Roads
- Railroad

N

Scale
1:3,000

0 125 250 375 500
Feet

MAP NOTES:
Projection: Oregon State Plane North Zone
Datum: North American Datum of 1983
Date: March 24, 2009
Data Sources: Wah Chang, City of Albany GIS