REDACTED VERSION

SITE INSPECTION REPORT
For
LEO MILLER ROAD SITE
Taft, San Patricio/Aransas Counties, Texas

Prepared for
U.S. Environmental Protection Agency Region 6
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Date Prepared:
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FOR
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1 INTRODUCTION

Dynamac Corporation (Dynamac) Superfund Technical Assessment and Response Team (START) was tasked by the U.S. Environmental Protection Agency (EPA), Region 6, under Technical Direction Document (TDD) # TO-0009-08-08-01 (Appendix A), to conduct a Site Inspection (SI) for the Leo Miller Road Site (CERCLIS No. TXN000606818), located northwest of the town of Taft, in Aransas and San Patricio Counties, Texas (TX). The Leo Miller Road Site consists of residences along Leo Miller road and the four Sherwin Alumina Company (SAC) red mud beds (RMB's) located east of Leo Miller Road Site, known by SAC as the "204 Facility". The Leo Miller Road Site is bisected by the Aransas/San Patricio County Line. See Figures 1 and 2 for the location of Leo Miller Road Site (Ref. 4).

The SI is the result of a Preliminary Assessment (PA) conducted by START-3 in October 2007 and submitted to U.S. EPA in January 2008. The purpose of the SI is to assess the potential threats to human health and the environment associated with the wastes found within the RMB's associated with SAC's 204 Facility. The RMB's are located east of the residences along Leo Miller Road, approximately 9 to 10 miles northeast of the SAC plant (Ref. 5, p. 2). Secondly, the SI will provide the documentation necessary to support a decision by the EPA Region 6 Site Assessment Manager (SAM) regarding the need for further action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Superfund Amendments and Reauthorization Act (SARA). The SI has been prepared according to *Guidance for Performing Site Inspections Under CERCLA*, 40 CFR Part 300, Hazard Ranking System Final Rule, and the Hazard Ranking System Guidance Manual (Ref. 1, 2, and 3).

The scope of the SI included the collection and chemical analysis of red mud samples from RMB's 1 and 2, the collection and chemical analysis of indoor dust samples form window ledges (in form of wipe samples) from three residences along Leo Miller Road, the collection and analysis of three water well samples from residential homes located along Leo Miller Road, and the preparation of a SI report according to *Guidance for Performing Site Inspections Under CERCLA*.

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2 SITE DESCRIPTION

The SI will evaluate the four RMB's associated with SAC's 204 Facility, and located east of the residences along Leo Miller Road. The geographical coordinates for the three residences situated along Leo Miller Road and include: 28.00831666º N and 97.21676666 º W (San Patricio County); 28.01511666º N and 97.2124º W (Aransas County); and 28.01838333º N and 97.21031666º W (Aransas County). The geographical coordinates were collected during the EPA/START reconnaissance inspection with a hand-held geographical positioning system (GPS) unit (Ref. 7, pp. 2-4). Leo Miller Road is approximately 1 mile in length and runs in a southwest to northeast direction. Leo Miller Road Site traverses through two counties: San Patricio and Aransas (Figures 1 and 2; Ref. 4). The area is sparsely populated. The Leo Miller Road Site is bounded by rural land and Copano Bay to the north, rural land to the south and by rural agricultural land to the west. State Highway (HWY)-188 bisects the site, and Port Bay is located east of the site.

SAC's 204 Facility consists of four RMB's, which occupy approximately 3,316 acres, with the remainder of the site serving as an active cattle ranch (Ref. 66, p. 5). RMB's 1 and 2 are bordered to the north by State HWY-188, to the east by Port Bay, to the south by rural land, and to the west by Leo Miller Road and rural land; RMB's 3 and 4 are bordered to the north by Copano Bay, to the east by Port Bay, to the south by State HWY-188 and to the west by rural land (Figures 1, 2, and 4; Ref. 4).

The 204 Facility legal description is:

> *Being a 10,643.041 acre tract of land, out of lots 6, 8, & 10. Lots 1 and 3, Section 49, Fifth Subdivision of the Taft Farm Lands, a map of which is recorded in volume 1, pages 46 & 47, of the map of records of Aransas County, Texas and also recorded in Volume 2, Page 39-C of the map records of San Patricio County, Texas, a reprint of same recorded in volume 4, page 47, map records of San Patricio County, Texas and being out of fractional Section 46, Lots 2, 4, 5, 6, 7, and 8, Section 49, all of sections 52, 56, 58, 59, 64 thru 73, 74 thru 78 and portions of Section 81, Sixth Subdivision of the Taft Farm Lands, a map of which is recorded in Volume 1, page 50, Map records of Aransas*

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> *County, Texas and also recorded in Volume 2, page 33-A, of the map records of San Patricio County, Texas and being all of those certain tracts of land, designated as Tracts 1 and 2, as described in volume 137, page 239, of the deeds records of Aransas County, Texas and being all of that certain 945.14 acre tract of land described in volume 502, page 253 of the deed records of San Patricio County, Texas, all situated in and out of said San Patricio and Aransas Counties, Texas* (Ref. 66, p. 2).

The SAC 204 Facility is located on the low coastal plane with elevations ranging from sea level along Port Bay and Copano Bay to approximately 15 feet above sea level in the southwest corner of the property near the intersection of County Road 93 and McCampbell Road (Ref. 66, p. 2). The entire 204 Facility contains several freshwater emergent wetland areas scattered across the property with estuarine and marine wetlands existing along the shore of Port Bay to the east and Copano Bay to the north (Ref. 66, p. 2)

3 OPERATIONAL HISTORY

There is no operational history associated with the residences along Leo Miller Road; however, the operational history of the SAC RMB's will be described in this section.

The property on which the SAC Plant is located was once a part of the 160,000 acre Coleman-Fulton Pasture Company, locally known as the "Taft" Ranch. The Reynolds Metals Company purchased 1,600 acres of the property in 1951 and began the construction of the Sherwin Alumina Plant and its companion, the San Patricio Reduction Plant. Both facilities began operations in 1953. The San Patricio Reduction Plant closed in the early 1980's due to rising energy prices and competitive foreign metals production. The SAC plant is one of only three alumina plants currently operating in the U.S. (Ref. 10, p. 1). An additional 10,643 acres, known as the 204 Facility is located 9-10 miles northeast of the plant site and contains the 3,316 acres of red mud beds that are considered the Leo Miller Road site. The facility is currently owned and operated by Glencoe, a Swiss company. Glencoe purchased the facility from an unidentified company in May 2007, who had purchased it from BPU, Inc. and China MinMetals in 2006. BPU, Inc. and China MinMetals had purchased the facility from Reynolds Metals in 2001 (Ref. 7, p. 2).

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SAC, formerly Reynolds Metals Company-Sherwin Plant, is located on State Highway 361, near Gregory, Texas. The SAC plant has produced alumina at this location in excess of 50 years, beginning in 1953 (Ref. 5, p. 2). The primary function of the Sherwin plant is to exact aluminum oxide (alumina) from bauxite ore using the "Bayer Process". The Sherwin process is a circulating loop of Bayer liquid with side processes such as mud clarification operating parallel to the principal liquor stream. The "Bayer Process" is an endless loop in which a steady flow of "Bayer Liquid" is pumped. The liquor varies in chemical consistency throughout the process and is both the extraction and transport media for the process chemicals. The constant active ingredient of this "liquor" is sodium hydroxide, or caustic soda, in which the aluminum hydrate is first dissolved from a bauxite slurry at high temperature, and then clarified, allowed to cool, and then allowed to precipitate into crystals. The resulting crystals are then washed, filtered, and finished into one of the intermediate or final products. At any time within the "Bayer Process" loop, the circuit may contain up to 150 million gallons of water and Bayer liquor. This solution may contain up to 50,000 metric tons of caustic soda, 50,000 metric tons of aluminum hydrate, together with waste products, impurities, and make-up water. Each day, depending on the established production level, up to 10,000 metric tons of bauxite are added to the circulating liquor stream in order to produce as much as 4,400 metric tons of finished products and 3,600 metric tons (dry weight) of red mud tailings or residue each day (Ref. 8, pp. 2 and 4). The Sherwin plant is capable of producing 1.4 million tons of smelter grade alumina and 300,000 tons of chemical grade alumina hydrate per year.

Bauxite is a naturally occurring earth material, which is surface-mined and is the principal source of aluminum hydrate worldwide. Aluminum hydrate is a feedstock used in the chemical industry to produce a wide range of products, such as Maalox, sandpaper, and water treatment agents. The aluminum hydrate can be further refined to produce aluminum oxide (alumina), which is used as the raw material in aluminum reduction plants to produce aluminum metal (Ref. 9, pp. 1-2). At one point, the SAC plant obtained their bauxite from Australia, Jamaica, Brazil, and Guinea (Ref. 5, p. 4; Ref. 11, p.2). Approximately 1 to 2 tons of red mud is produced per one ton of alumina, depending upon the grade of bauxite. The red mud beds, which store the red mud residue, are located approximately 9 – 10 miles northeast of the SAC plant, on State HWY-188 (Ref. 5, p 2).

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It does not appear that SAC has air permits associated with the red mud beds. SAC does maintain TCEQ general air permit, No. 4971, which deals with the bag house dust system for bauxite and alumina transport systems at the SAC facility. Air Permit No. 4971 does not include stipulations concerning the red mud beds or air quality monitoring at the red mud beds (Ref. 61). TCEQ Air Permit No. 4971 was amended and approved by the TCEQ in October 2007. In addition to the general air permit, SAC has submitted two air amendment applications for Maintenance, Startup, and Shutdown (MSS) activities at the SAC facility in Gregory, TX. These two air permit amendments are currently undergoing administrative review at TCEQ, Austin. Neither MSS air permit amendments have any stipulations related to the red mud bed areas (Ref. 62).

4 WASTE CHARACTERISTICS AND SOURCE EVALUATION

4.1 Waste Characteristics

The waste being generated by SAC plant consists of red mud residue, a name given to bauxite residue that remains after benefication (Bayer Process) (Ref. 66, p. 4). Red mud residue is commonly referred to as “red mud” because of its similarities to red mud (ref. 9, p. 1). The red mud residue disposed within the 204 Facility RMB’s originated from bauxite ores from Jamaica, Haiti, Guyana, Trombetas, Dominican Republic, Weipa (Australia), Ashapura, and Sierra Leone and processed at the SAC plant. Deposition of the red mud residue in the 204 Facility began in 1968 (Ref. 66, p. 4).

The red mud residue is classified as a Class II non-hazardous industrial waste. The red mud residue contains approximately 50% sodium aluminum silicate (zeolite), 35-40% iron oxide, 6 to 9% titanium dioxide, and a number of trace elements associated with the production of aluminum hydrate. The zeolite, physically, is similar to an expansive clay soil (Ref. 9, p.1). When the red mud residue is produced, it is alkaline, containing approximately 6 to 8 grams per liter (g/L) of residual sodium carbonate. The sodium carbonate will eventually weather to sodium bicarbonate (primary component of baking soda). The sodium carbonate fraction is water soluble and can raise the pH of water as high as 10.5. When the red mud residue dries, it becomes dusty if not managed properly (Ref. 9, p. 2). Disposal of red mud and other solid residues commonly takes place by

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spreading layers over a large surface area in order to allow the material to dry. This is in turn followed by rehabilitation of the land (Ref. 5, p. 10).

According to the aluminum producing facilities, the red mud residue is exempt from Resource Conservation and Recovery Act (RCRA) hazardous waste regulations due to the Bevill Amendment. The Bevill amendment excludes "solid waste from the extraction, beneficiation, and processing of ores and minerals" from regulation as a hazardous waste under 40 CFR 261.4 (b) (7) (ii) (C) (Ref. 14, p. 2 and Ref. 66, p. 8). Red mud samples collected in 1980, 1996, and 2006 have been analyzed by both Extraction Procedure (EP) Toxicity test (SW846, Method 1310) and Toxicity Characteristic Leach Procedure (TCLP) test (SW846, Method 1311). Results of the EP toxicity and TCLP toxicity analyses of the collected red mud samples indicate the material does not meet the hazardous waste characteristic for metals at the 204 Facility (Ref. 66, p. 5).

Red mud samples were collected for corrosivity testing in 1973 (tailings) and 1996. Red mud samples collected from RMB's 1 and 2 indicated pH's of 12.3, respectively. Thus, the red mud samples did not meet the hazardous waste characteristic of corrosivity (Ref. 66, p. 8). Anecdotal historic information indicates that red mud disposed in the RMB's may have had a pH greater than 12.5 "at certain times and/or locations" but was primarily due to liquid component, which is recycled to the SAC plant process. It should be noted that the liquid component is no longer returned to the SAC plan; but is allowed to evaporate within the RMB's (Ref. 66, p. 5).

Red mud residue may contain trace amounts of metals such as arsenic, barium, boron, cadmium, chromium, cobalt, gallium, vanadium, scandium, and lead, as well as radionuclides (Ref. 11, pp. 3 and 5). Red mud samples collected in March 2008 by SAC indicated the presence of several trace metals. The average metal concentrations in the 2008 red mud samples are as follows: aluminum: 45,000 mg/kg; arsenic: 27.33 mg/kg; barium: 77.11 mg/kg; cadmium: 27.03 mg/kg; calcium: 30,111 mg/kg; chromium: 638 mg/kg; copper: 62.89 mg/kg; iron: 133,222 mg/kg; lead: 102 mg/kg; manganese: 3,067 mg/kg; mercury: 0.161 mg/kg; nickel: 323 mg/kg; phosphorus: 1,237 mg/kg; selenium: 1.69 mg/kg; sodium: 44,222 mg/kg; uranium: 8.72 mg/kg; vanadium: 446 mg/kg; and zinc:

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229 mg/kg. See Reference 66, p. 10 for a list of all metals and their detected concentrations. The detected metal concentrations were compared to the Texas Commission on Environmental Quality (TCEQ), Texas Risk Reduction Program (TRRP), Tier 1 Residential Soil Protective Concentration Levels (PCLs) for a 30 acre source area and the Texas Specific Background Concentration codified within the TRRP rules (30 Texas Administrative Code [TAC] 350.51(m). Comparison of the red mud metals data with the TCEQ surface and subsurface soil PCLs for protection of groundwater ($^{GW}Soil_{Class\ 3}$) indicted that all red mud metal concentrations were below the PCL concentrations considered to be protective of groundwater (Ref. 66, p. 7).

In 1995, red mud samples were collected by Fugro Environmental, Inc. and grain size was determined. Results for red mud in RMB 1 indicated grain sizes ranging from 2.0 millimeters (mm) to 0.5 micrometers (µm); and for the red mud collected from RMB 2 grain sizes ranged from 1.2 mm to 0.5 µm (Ref. 66, p. 4). In March 2008, Naismith Engineering collected red mud samples from RMB's 1 and 2. Grain size analysis indicated the following: RMB 1 – 2.0 mm to 0.02 µm; RMB 2 - 2.0 mm to 0.02 µm (Ref. 66, p. 4).

As the red mud residue dries and is released into the atmosphere during windy environmental conditions, nuisance conditions may become prevalent. Nuisance conditions are regulated under the Texas Clean Air Act (TCAA) and applicable state and federal rules/regulations and the generating facility must comply with 30 TAC § 101.4. Title 30 of TAC, Chapter 101.4 prohibits nuisance conditions and specifically states that "No person shall discharge from any source whatsoever one or more air contaminants or combinations thereof, in such concentration and of such duration as are or may tend to be injurious to or adversely affect human health or welfare, animal life, vegetation, or property, or as to interfere with the normal use and enjoyment of animal life, vegetation, or property" (Ref. 64, p.1). The TCEQ has investigated the windblown particulate complaints in relation to the Nuisance Laws and have found no evidence to substantiate the alleged complaints (Ref. 12 and Ref. 13). However, one land owner has video documentation of the red dust being blown from the red mud beds toward their residence (Ref. 56).

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According to SAC documentation, red mud dust does not pose a serious health hazard, is not toxic, reactive, or flammable, but can be an irritant and cause discoloration (Ref. 9, p.2). Citizens living along Leo Miller Road Site have claimed that the red mud residue generated during dry conditions has caused skin irritations and respiratory illnesses (such as COPD, bronchitis, lung cancer, bronchial spasms, asthma, siderosis, pneomosicosis), burning in the eyes, skin, nose, and throat, exacerbation of allergies, sinusitis, digestive problems, headaches, nose bleeds, lethargy and fatigue, a persistent cough, hypertension, Alzheimer's and beryllium diseases (Ref. 6, p. 1).

4.2 Source Evaluation

The red mud residue is transported by either pipeline or trucks to RMB's 1 and 2, located approximately 9 to 10 miles northeast of the SAC plant (Ref. 5, p. 1). According SAC representatives, the majority of the red mud is transported, via an underground pipeline, from the SAC manufacturing facility to the RMB's 1 and 2. Subcontracted trucks are occasionally used to transport the red mud residue to RMB's 1 and 2; however, citizens residing in the vicinity of the RMB's have indicated that the trucks transport red mud residue from the SAC facility to RMB's 1 and 2 on a frequency of one truckload per hour, for eight hours a day, seven days a week (Ref. 7, p. 2). RMB 3 is not currently in use and RMB 4 is used for storm water surge detention (Ref. 66, p. 15). During closure and post-closure care activities, municipal wastewater and sewage sludge from the City of Aransas Pass Wastewater Treatment Plant and potable raw water sediments from the San Patricio Municipal Water District will be used to start revegetation of the area (Ref 15, p. 5).

Per the EPA SAM's request, START conducted a search for U.S. Department of Transportation (DoT) regulations concerning the transport of the red mud to the RMB's, via, truck carriers. START was not able to locate any regulations pertaining to the transport of the red mud to the RMB's. No transportation regulations were identified within the Texas DOT statues related to the red mud residue. In addition, TCEQ does not have jurisdiction over public roads and has no air quality permitting authority over emissions from roads since 30 TAC § 116.10(6) are excluded from the Texas Clean Air Act's (TCAA) definition of a "facility" (Ref. 63, p.14; Ref. 65, p. 3).

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The RMB's are referred to as RMB's 1 through 4. RMB's 1 and 2 are separated from RMB's 3 and 4 by State HWY-188. In addition, the Aransas/San Patricio County Line traverses though RMB 1 and RMB 2 (Figures 1 and 2; Ref. 4). The combined size of the four RMB's is approximately 148,800,000 square feet (ft^2) or 3,422.4 acres (Figure 2; Ref. 4). However, since RMB 4 is not being currently used to dispose red mud residue, the square footage of RMB 4 will not be used in the calculation of a potential waste quantity. Thus, the combined waste quantity for RMB's 1 - 3 is 119,290,000 ft^2 or 2,743.7 acres. The RMB's will be evaluated as surface impoundments for the purposes of the SI (Ref. 3, pp. 42-43).

Red Mud Bed (RMB) 1

RMB 1, which is primarily rectangular in shape, is the southern-most RMB and is the oldest of the four RMB's (Figure 2; Ref. 4). RMB 1 is approximately 36,500,000 ft^2 or 837.9 acres in size and is surrounded by an earthen levee (Figure 2, Ref. 4; Ref. 7, Ref. 66, p. 16). RMB 1 was originally constructed in 1968 with the original height of the dike walls being approximately 2 feet. Overtime, RMB 1 has been modified periodically, primarily to increase the dike height to its current minimum elevation of approximately 28 feet National Geodetic Vertical Datum (NGVD) (Ref. 66, p. 3). It was constructed of compacted clayey material with a cut-off trench (key) beneath the dike walls of compacted clayey material to prevent the underflow of red mud residue. These "keys" were approximately 8 to 10 feet wide and extended 10 to 15 feet bgs. According to SAC, the above referenced specification and drawings indicate that borrow material was obtained from inside and outside the beds at a minimum distance of 125 feet from the dike toe to a maximum depth of 5 feet bgs. Boring logs from the area prior to the construction of RMB 1 indicate that native soil was clay and sandy clay with typical characteristics:

- Liquid Limit: 64% - 41.6%
- Plasticity Index: 39.0 -24.5

Field permeability tests were conducted by National Soil Services, Inc, and found to be in the range of $1x10^{-6}$ to $1x10^{-8}$ centimeters per second (cm/sec). A report by Dames & Moore in 1977, evaluated the seepage potential from RMB 1 and concluded that the pH in

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the native soils below RMB 1 was elevated above background to depths of 6.5 feet below the bottom of the RMB, which equated to a permeability of $5.8x10^{-6}$ cm/sec (Ref. 66, p. 3).

As of the end of 2007, approximately 21,874,781 dry metric tons (DMT) of red mud residue has been disposed in RMB 1 (Ref. 66, p. 4). During the SI field activities, START observed a leachate collection system surrounding RMB 1 (Appendix C).

It appears that a portion of RMB 1 has been closed and is no longer in use as a disposal area (Ref. 54, p.4). It is not known if this portion of RMB was closed according to Resource Conservation and Recovery Act (RCRA) regulations, as no TCEQ file information was located or obtained at the TCEQ Region 14 office in Corpus Christi, TX. Because it is not currently known if this portion of RMB 1 was closed according to RCRA regulations, the entire area of RMB 1 was evaluated for potential hazardous waste quantity.

A groundwater monitoring system does exist along the perimeter of RMB 1 (Ref. 15, p. 6). In addition to the disposal of red mud residue, SAC has applied for a permit with the TCEQ to accept municipal wastewater and sewage sludge from the City of Aransas Pass Wastewater Treatment Plant and accumulated potable raw water sediments from the San Patricio Municipal Water District (Ref. 15, p. 5).

Red Mud Bed (RMB) 2

RMB 2, which is rectangular in shape, is located south of State HWY-188 and is adjacent to RMB 1 (Figure 2; Ref. 4). RMB 2 is approximately 52,400,000 ft^2 or 1,202.9 acres in size and is surrounded by an earthen levee (Figure 2; Ref. 4; Ref. 7, Ref. 66, p 16). RMB 2 was originally constructed in 1968 with the original height of the dike walls being approximately 2 feet. Overtime, RMB 2 has been modified periodically, primarily to increase the dike height to its current minimum elevation of approximately 28 feet National Geodetic Vertical Datum (NGVD) (Ref. 66, p. 3). It was constructed of compacted clayey material with a cut-off trench (key) beneath the dike walls of compacted clayey material to prevent the underflow of red mud residue. These “keys” were approximately 8 to 10 feet wide and extended 10 to 15 feet bgs. According to SAC, the above referenced specification and drawings indicate that borrow material was obtained

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from inside and outside the beds at a minimum distance of 125 feet from the dike toe to a maximum depth of 5 feet bgs. Boring logs from the area prior to the construction of RMB 2 indicate that native soil was clay and sandy clay with typical characteristics:

- Liquid Limit: 64% - 41.6%
- Plasticity Index: 39.0 -24.5

Field permeability tests were conducted by National Soil Services, Inc, and found to be in the range of $1x10^{-6}$ to $1x10^{-8}$ centimeters per second (cm/sec). A report by Dames & Moore in 1977, evaluated the seepage potential from RMB 1 and concluded that the pH in the native soils below RMB 1 was elevated above background to depths of 6.5 feet below the bottom of the RMB, which equated to a permeability of $5.8x10^{-6}$ cm/sec (Ref. 66, p. 3).

As of the end of 2007, approximately 16,282,498 DMT of red mud residue has been disposed in RMB 2 (Ref. 66, p. 4). A groundwater monitoring system does exist along the perimeter of RMB 2 (Ref. 15, p. 6).

Red Mud Bed (RMB) 3

RMB 3, which is polygonal in shape, is located north of State HWY-188 and west of Port Bay. It is separated from RMB 4 by Copano Retreat Road (Figure 2; Ref. 4). RMB 3 is approximately 18,000,000 ft^2 or 412.4 acres in size and is surrounded by an earthen levee (Figure 2; Ref. 4; Ref. 7, Ref. 66, p.16). RMB 3 is the smallest of the four RMB's. Investigation into the construction of RMB 3 began in 1973. RMD 3 was originally constructed in 1977. According to SAC construction documents, RMB 3 was constructed in a similar manner to RMB's 1 and 2. A compacted clay key was to be located at the center of the dikes. RMD 3's dikes bottom width was to be 10 feet and depth from 10 to 12 feet bgs. The construction drawings indicate that the borrow areas would be outside the beds. Borrow material was to be taken from the inside RMB 3, with a maximum excavation depth of 5 feet, leaving 5 to 6 feet of clayey material as an in situ liner. The in situ clayey soils satisfied the Texas Water Quality Board (predecessor to the Texas Commission on Environmental Quality (TCEQ) criteria I Technical Guide 4 for the thickness (4 feet) and permeability ($1x10^{-7}$ cm/sec) of liner soils (Ref. 66, p. 3).

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As of the end of 2007, approximately 3,005,179 DMT of red mud residue has been disposed in RMB 3 (Ref. 66, p. 4). At the time of the EPA SI sampling activities, red mud was not being disposed into RMB 3. A groundwater monitoring system does exist along the perimeter of RMB 3 (Ref. 15, p. 6).

Red Mud Bed (RMB) 4

RMB 4, which is polygonal in shape, is located north of State HWY-188 and west of Port Bay (Figure 2; Ref. 4). RMB 4 is approximately 34,340,000 ft^2 or 696.4 acres in size and is surrounded by an earthen levee (Figure 2; Ref. 4; Ref. 7, Ref. 66, p. 16). Investigation into the construction of RMB 4 began in 1973. RMD 4 was originally constructed in 1977 (Ref. 66, p. 3). According to SAC construction documents (Reynolds Metals Company drawing 204-Y-3199), RMB 4 was constructed in a similar manner to RMB's 1, 2, and 3. A compacted clay key was to be located at the center of the dikes. The "key" consisted of compacted clay 10 feet wide to a depth of 6 feet bgs (Ref. 66, p. 4). Soil borings collected in 1979 indicated 14 to 21 feet of stiff silty clay with interbedded silty sands, clayey sand and clay below the overlying strata. It was theorized that seepage would be negligible due to the low permeability soils (Ref. 66, p.3)

As of the end of 2007, only a trace amount of red mud residue has been disposed into RMB 4 (Ref. 66, p. 4). A groundwater monitoring system does exist along the perimeter of RMB 4 (Ref. 15, p. 6). According to SAC representatives, RMB 4 is being used for storm water surge detention (Ref. 66, p. 12). Because it is not currently being used for red mud disposal, it will not be evaluated as a potential source of contamination.

5 SOURCE SAMPLING ACTIVITIES AND ANAYLTICAL RESULTS

5.1 Source Sampling Activities

On May 8, 2008, EPA/START met with representatives of SAC at their facility located in Gregory, Texas. After a brief presentation by SAC representatives, the EPA/START team and SAC representatives proceeded to RMB 1 in order to collect red mud samples. After arriving at the southwest section of RMB 1, EPA/START determined sample locations and collected GPS coordinates with the use of a Garmin Etrex GPS hand-held unit. After the

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collection of the GPS coordinates, EPA/START began to collect the red mud samples designated for RMB 1 according to the site-specific Quality Assurance Sampling Plan (QASP) (Appendix J). EPA/START collected one "wet" mud grab sample (RML1-RM01-G) and two "dry" red mud grab samples (RML1-RM02-G and RML1-RM05-G) (including a duplicate sample) from the southwest section of RMB 1 utilizing dedicated plastic trowels and mixing bowls. Sampling depths for each red mud sample collected at RMB 1 were 0 to 3 inches in depth. The collected red mud was homogenized prior to placement in the sample containers. Split samples were also collected by EPA/START at each sampling location within RMB 1 (Appendices B and G). See Table 1 for Sample ID's, Sampling Times, GPS Coordinates, Sample Descriptions and Analyses for each red mud sample collected at RMB 1 (Appendix B). Appendix C contains photographs of sampling activities at RMB 1.

After collecting the red mud samples from RMB 1, EPA/START was escorted by the SAC representatives to RMB 2. After arriving at RMB 2 and determining sample locations, GPS coordinates were obtained for each sampling location and the designated samples collected according to the site-specific QASP. EPA/START collected one "wet" mud sample (RML-RM03-G) and one "dry" mud sample (RML-RM04-G) from the south-southwest side of RMB 2 utilizing dedicated plastic trowels and mixing bowels. Sampling depths for each red mud sample collected at RMB 2 were 0 to 3 inches in depth. The collected red mud was homogenized prior to placement in the sample containers. Split samples were also collected by EPA/START at each sampling location within RMB 2 (Appendices B and G). See Table 1 for Sample ID's, Sampling Times, GPS Coordinates, Sample Descriptions and Analyses for each red mud sample collected at RMB 2 (Appendix B). Appendix C contains photographs of sampling activities at RMB 2.

5.2 Source Sample Analytical Results

The collected red mud samples were analyzed for TAL Metals/Mercury and Silicon by Accutest Laboratories located in Houston, TX and for grain size by Xenco Laboratories, a subcontractor for Accutest. All received analytical results were validated by a Dynamac chemist. See Appendix D for the completed data validation reports.

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5.2.1 RMB 1 Sample Results

TAL Metals/Silicon "Wet" Mud Sample Results: Chemical analysis of the collected "wet" red mud sample, RML1-RM01-G, indicated the presence of fifteen (15) metals in concentrations exceeding their respective laboratory reporting limits (Table 2). Metals detected include aluminum (58,300 mg/kg); arsenic (58.4 mg/kg); cadmium (41.6 mg/kg); calcium (45,700 mg/kg); chromium (1,090 mg/kg); copper (91.4 mg/kg); iron (214,000 mg/kg); lead (120 mg/kg); manganese (4,160 mg/kg); mercury (0.47 mg/kg); nickel (539 mg/kg); silicon (1,050 mg/kg); sodium (24, 200 mg/kg); vanadium (670 mg/kg); and zinc (495 mg/kg) (Table 2). It should be noted that the detected concentrations of aluminum, manganese, and silicon are estimated concentrations due to out of control Matrix Spike/Matrix Spike Duplicate (MS/MSD) percent recoveries (Appendix D).

TAL Metals/Silicon "Dry" Red Mud Sample Results: Chemical analysis of the collected "dry" red mud samples, RML-RM02-G and RML-RM05-G, indicated the presence of fifteen (15) metals in concentrations exceeding their respective laboratory reporting limits (Table 2). Metals detected include aluminum (57,300 mg/kg); arsenic (51.3 mg/kg); cadmium (33.5 mg/kg); calcium (38,300 mg/kg); chromium (900 mg/kg); copper (72.9 mg/kg); iron (186,000 mg/kg); lead (98.7 mg/kg); manganese (3,440 mg/kg); mercury (0.54 mg/kg); nickel (424 mg/kg); silicon (359 mg/kg); sodium (24, 000 mg/kg); vanadium (644 mg/kg); and zinc (401 mg/kg). It should be noted that the detected concentrations of aluminum, manganese, and silicon are estimated concentrations due to out of control MS/MSD percent recoveries (Appendix D).

With the exception of mercury, the highest detected concentrations were found in the "wet" mud samples. For comparison to the split sample results analyzed by Test America- Corpus Christi for SAC, see Table 7 of Reference 66 (p. 11). Comparison of the TAL metal analytical results to the TCEQ TRRP PCLs for a 30 acre source area did not indicate exceedances of the TRRP PCLs for soils (Ref. 67).

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Particle Size Analysis: Utilizing ASTM D4464, it was determined that the red mud in RMB 1 consisted primarily of silt and clay. The particle size ranges were determined for both the "dry" mud and "wet" mud samples and are summarized below and in Table 3.

- "Wet Mud" (RML1-RM01-G): 20.1 µm - 0.375 µm;
- "Dry Mud" (RML1-RM02-G): 25.0 µm - 0.375µm; and
- "Dry Mud" (RML1-RM05-G): 25.0 µm - 0.375µm (Appendix D, pp. 38-40).

It should be noted that Sample No. RML1-RM05-G was a duplicate sample of RML1-RM02-G.

Particle size analyses conducted by the SAC's procured laboratory of the red mud samples from RMB 1 can be summarized as follows:

- "Wet Mud" (RML1-RM01-G): 138.04 µm - 0.316µm (ASTM D4464, and 2.0 mm – 1.2 µm (ASTM D422); and
- "Dry Mud" (RML1-RM02-G): 1659.587µm – 0.182 µm (ASTM D4464), and 4.75 mm – 1.3 µm (ASTM D422) (Ref. 66, p. 8).

In addition, the particle size by weight percentage was calculated to determine the percentage of particle sizes less than or greater than 5.0µm. For the "wet mud" sample (RML1-RM01-G), it was determined that 56.7% of the particle sizes were less than 5.0 µm and 43.3% of the particle sizes were greater than 5.0 µm (Table 4, Appendix D, p. 38). For the "dry" mud samples (RML01-RM02-G and RML1-RM05-G), it was determined that 51.3% and 70.1%, respectively, were less than 5.0 µm and 48.7% and 29.9%, respectively, were greater than 5.0 µm in size (Table 4, Appendix D, pp. 39 and 40).

5.2.2 RMB 2 Sample Results

TAL Metals/Silicon "Wet" Mud Sample Results: Chemical analysis of the collected "wet" red mud sample, RML2-RM03-G, indicated the presence of fifteen (15) metals in concentrations exceeding their respective laboratory reporting limits (Table 2). Metals detected include aluminum (75,100 mg/kg); arsenic (54.1 mg/kg); cadmium (29.0 mg/kg); calcium (35,300 mg/kg); chromium (797 mg/kg); copper (59.0 mg/kg); iron (195,000 mg/kg); lead (81.7 mg/kg); manganese (3,300 mg/kg); mercury (0.18 mg/kg);

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nickel (383 mg/kg); silicon (428/mg/kg); sodium (33,300 mg/kg); vanadium (741 mg/kg); and zinc (242 mg/kg). It should be noted that the detected concentrations of aluminum, manganese, and silicon are estimated concentrations due to out of control MS/MSD percent recoveries (Appendix D).

TAL Metals/Silicon "Dry" Mud Sample Results: Chemical analysis of the collected "dry" red mud sample, RML2-RM04-G, indicated the presence of fourteen (14) metals in concentrations exceeding their respective laboratory reporting limits (Table 2). Metals detected include aluminum (70,600 mg/kg); arsenic (45.7 mg/kg); cadmium (17.8 mg/kg); calcium (26,500 mg/kg); chromium (689 mg/kg); iron (237,000 mg/kg); lead (71.5 mg/kg); manganese (2,600 mg/kg); mercury (0.10 mg/kg); nickel (233 mg/kg); silicon (930 mg/kg); sodium (33,300 mg/kg); vanadium (642 mg/kg); and zinc (176 mg/kg). It should be noted that the detected concentrations of aluminum, manganese, and silicon are estimated concentrations due to out of control MS/MSD percent recoveries (Appendix D).

With the exception of iron, sodium, and silicon, the highest detected concentrations were found in the "wet" mud samples. For comparison to the split sample results analyzed by Test America- Corpus Christi for SAC, see Table 7 of Reference 66 (p. 11). Comparison of the TAL metal analytical results to the TCEQ TRRP PCLs for a 30 acre source area did not indicate exceedances of the TRRP PCLs for soils (Ref. 67).

Particle Size Analysis: Utilizing ASTM D4464, it was determined that the red mud in RMB 2 consisted primarily of silt and clay particles. The particle size ranges were determined for both the "dry" mud and "wet" mud samples and are summarized below and in Table 4.

- "Wet Mud" (RML2-RM03-G): 53 µm - 0.375 µm; and
- "Dry Mud" (RML1-RM04-G): 53 µm - 0.375µm;

Particle size analyses conducted by SAC's procured laboratory of the red mud samples from RMB 2 can be summarized as follows:

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- "Wet Mud" (RML1-RM01-G): 631 µm - 0.182µm (ASTM D4464, and 4.75 mm – 1.4 µm (ASTM D422); and
- "Dry Mud" (RML1-RM02-G): 1659.587µm – 0.182 µm (ASTM D4464), and 4.75 mm – 1.3 µm (ASTM D422) (Ref. 66, p. 8).

In addition, the particle size by weight percentage was calculated to determine the percentage of particle sizes less than or greater than 5.0µm. For the "wet mud" sample (RML2-RM03-G), it was determined that 33.1% of the particle sizes were less than 5.0 µm and 66.9% of the particle sizes were greater than 5.0 µm (Table 4, Appendix D, p. 41). For the "dry" mud sample (RML1-RM02-G) it was determined that 29.6% of the particle sizes were less than 5.0 µm and 70.4% of the particle sizes were greater than 5.0 µm in size (Table 4, Appendix D, pp. 42).

Based on the source sampling analytical results, the following metal constituents can be associated with RMB's 1 and 2: aluminum, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, silicon, vanadium, and zinc. Even though calcium, iron, and sodium were detected in the red mud samples, they will not be used for evaluation due to their lack of a toxicity/mobility values in the Superfund Chemical Data Matrix (SCDMs) (Ref. 68).

The particle size analyses indicated that the red mud in both RMBs 1 and 2 consists of silt and clay particles. Based on the particle size by weight percent, it appears that the red mud in RMB 1 may contain more clay material and particles less than 5 µm in size than in the red mud found in RMB 2.

6 PATHWAY ASSESSMENTS

6.1 Groundwater Migration Pathway

The Groundwater Migration Pathway assesses the potential for suspected contamination in the underlying subsurface aquifers and takes into account such factors as depth to aquifer, stratigraphy of the underlying subsurface material, and the net precipitation, which comprise the Likelihood of Release; the size of the source(s) being evaluated and the chemical constituents associated with the sources, which comprise the Waste

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Characteristics; and the location of the nearest drinking water well, the number of individuals utilizing groundwater as their drinking water supply, and resource use, which comprise groundwater targets located within a 4-mile radius of the site (Ref. 1; Ref. 2; and Ref. 3). The primary emphasis of the groundwater migration pathway is the identification of drinking water wells.

6.1.1 Groundwater Characteristics

Regional Geology

The SAC Plant and red mud beds are situated within the West Gulf Coastal Plain (WGCP), part of the Coastal Plain physiographic province of Texas. The WGCP province consists of marine sedimentary rocks that dip gently seawards towards the Gulf of Mexico (Ref. 16).

The climate of the region is subtropical and influenced primarily by the Gulf of Mexico. Winters are mild and summers are hot, with high humidity in the northeast and semi-arid to arid conditions in the southwest. The average annual precipitation ranges from 28 inches in the southwest to 58 inches in the northeast and average annual gross lake-surface evaporation ranges from 85 inches in the southwest to 45 inches in the northeast (Ref. 16). According to the Hazard Ranking System; Final Rule, the net precipitation for the site area ranges between 0 to 5 inches (Ref. 2, Table 3-4, and Figure 3-2).

The major groundwater aquifer along the gulf coast is the Gulf Coast aquifer (Ref. 16). In Texas, the Gulf Coast aquifer provides water to all or parts of 54 counties and extends from the Rio Grande River northeastward to the Louisiana-Texas border (Ref. 16). Municipal and irrigation uses account for 90% of the total pumpage from the aquifer. Aransas and San Patricio Counties are underlain by the Gulf Coast aquifer (Ref. 16).

The stratigraphy of the Gulf Coast aquifer consists of a thick sequence of fluvial-deltaic sediments deposited as a wide belt generally trending northeast, parallel to and dipping gently toward the present Gulf coast. The fluvial-deltaic sediments consist of alternating sequences of unconsolidated to partially consolidated silt, clay, and sand (Ref. 17, p. 2).

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The Gulf Coast aquifer has been divided into four (4) units, each of which correlate to different sedimentary formations and have different hydraulic properties. These four units are the Catahoula confining system, the Jasper aquifer, Evangeline Aquifer, and the Chicot aquifer. The Catahoula confining system includes the Frio Formation, the Anahuac Formation and the Catahoula Tuff or Sandstone. The Jasper aquifer overlies the Catahoula confining system and consists of the Oakville Sandstone and Fleming Formation. The upper portion of the Fleming Formation forms the Burkeville confining system. The Burkeville confining system separates the Jasper aquifer from the Evangeline Aquifer. The Evangeline aquifer is made up of water within the Goliad Sand. The youngest and shallowest unit is the Chicot aquifer. The Chicot aquifer is made up of the Willis Sand, the Bentley and Montgomery formations, the Beaumont Clay, and alluvial deposits at the surface. The total sand thickness in all four units ranges from 700 feet in the south to 1,300 feet in the north (Ref. 16).

Site-Specific Geology

The underlying stratigraphy at the red mud bed sites has not been ascertained; however, the stratigraphy at the SAC Plant has been identified and will be used in the evaluation for this SI. The upper 60 feet of sediment at the site has been differentiated into water-bearing and non-water-bearing units as described below. The unsaturated zone at the site consists of 6 to 18 feet of clay and silty clay of the native Beaumont Formation (Unit 1 Clay). Underlying the Unit 1 Clay is 4 to 17 feet of fine- to medium-grained silty sand (Zone A), which is generally continuous across the site. Zone A is underlain by 29 to 51 feet of high plasticity clay and silty clay (Unit 2 Clay). A deeper sand unit (Zone B) underlies the Unit 2 Clay and consists of fine- to medium-grained silty sand. The thickness of the Zone B sand has not been established (Ref. 17, p. 2).

Twenty-six (26) groundwater monitoring wells have been installed in the vicinity of the Red Mud Lagoons since 1968, three of which have been destroyed. Seventeen (17) additional monitoring/test wells were installed in 2002 by Texas A&M Kingsville graduate students around Red Mud Beds 1 and 2 (Ref. 15, p. 2).

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Groundwater data pertaining to Red Mud Beds 1 and 2 indicate total well depths ranging from 14.48 feet below ground surface (bgs) at Well MW-W-14 to 55.96 feet bgs at Well DB-5 (Ref. 15, pp. 10 -11). Well MW-W-14 is located at the intersection of State HWY 188 and Copano Retreat Road, north-northeast of RMB 2, and Well DB-5 is located in between RMB's 1 and 2 (Ref. 15, pp. 18 and 19). The depth to water ranged from 2.82 feet bgs at MW-6 to 27 feet at Well DB-5 (Ref. 15, pp. 10-11). Well MW-6 is located at the northwest corner of RMB 1 (Ref. 15, pp. 18 and 19). According to a groundwater gradient map of RMB's 1 and 2, the shallow groundwater flow appears to trend in several directions: to the northeast towards State HWY-188 and RMB's 3 and 4; to the northwest towards Leo Miller Road Site; and to the east toward Port Bay (Ref. 15, p. 18).

Groundwater data pertaining to RMB 3 indicate total well depths ranging from 19 bgs at Well MW3-2 to 40.5 feet bgs at various wells (Ref. 15, p. 12). Well MW3-2 is located at the southeast corner of RMB 3 (Ref. 15, pp. 17 and 18). The depth to water ranged from 15.79 feet bgs at MW3-4 to 20.66 feet at MW3-7 (Ref. 15, p. 15). Well MW3-4 is located between RMB 3 and Port Bay and MW3-7 is located at the northern corner of RMB 3 (Ref. 15, pp. 17 and 18). According to a groundwater gradient map of RMB 3, the shallow groundwater flow appears to trend toward the west and RMB 4, not towards Port Bay and Copano Bay (Ref. 15, p. 18).

Groundwater data pertaining to RMB 4 indicates total well depths ranging from 13.19 feet bgs at Well MW4-1 to 20.66 feet bgs at MW4-7 (Ref. 15, p. 12). Well MW4-1 is located at the southwest corner of the RMB 4, and MW4-7 is located at the northern corner of RMB 4 (Ref. 15, pp. 17 and 18). The depth to water ranged from 13 feet bgs at MW4-1 and MW4-2 to 19 feet at MW4-5 (Ref. 15, p. 16). According to a groundwater gradient map of RMB 4, the shallow groundwater flow appears to trend toward the west and away from RMB 3, Port Bay and Copano Bay (Ref. 15, p. 18).

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6.1.2 SI Groundwater Sampling Activities

On May 6 - 7, 2008, the EPA/START team collected groundwater samples from three residences located on Leo Miller Road (Figure 4; Table 1; Appendices B and C). The groundwater samples were collected from private, domestic water wells. In addition, one background sample was collected from a private, domestic water well located in Ingleside, TX (Figure 5; Table 1; Appendices B and C). The water wells that were sampled were primarily used for watering the lawns and gardens and the washing of dishes and laundry (Appendices B and F). Two wells on Leo Miller Road and the designated background well located Ingleside, TX are not used as a drinking water source. One private water well, located 111 Leo Miller Road, was used at one time for drinking water; however, the residents at this location have switched to bottled water since their distillation unit has malfunctioned (Appendices B and F). See Table 1 for the Sampling ID's, Sampling Dates, Sampling Times, Sampling Locations, Sampling Descriptions, and Analyses.

Prior to collection of the individual groundwater samples, each private domestic water well was purged until the water quality parameters of pH, conductivity, temperature, dissolved oxygen, turbidity, and salinity stabilized. Purging was completed by allowing the water to drain out of the well tank reservoir and associated piping. See Table 3 for the water quality readings at each well location (Appendix F). Each sample was collected by allowing the water from the well spigot to flow directly into the pre-preserved (nitric acid) sample container, as described in the site-specific QASP (Appendix J). The field blank sample was collected by pouring de-ionized water directly into the sample containers (Appendices B and C).

All groundwater sampling data was entered into the SCRIBE database and chain-of-custody forms were completed (Appendix H). The water samples were packaged and shipped to Accutest laboratories for TAL metal/silicon analyses (Appendix I).

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6.1.3 SI Groundwater Sampling Analytical Results

The collected groundwater samples were analyzed for TAL metals/silicon by Accutest Laboratories located in Houston, TX. A Type IV analytical data package was provided to Dynamac by Accutest Laboratories (Appendix D). The sample results have been compared to the EPA Maximum Contaminant Levels (MCL's), which are comprised of the Primary and Secondary Drinking Water Standards (Ref. 58).

Sample: BKG-GW05-G

TAL metal/silicon analyses of the background sample, BKG-GW05-G, collected from a well located at Residence #4 in Ingleside, TX indicated the presence of aluminum (322 micrograms per liter (µg/L), barium (1,580 µg/L), calcium (26,500 µg/L), magnesium (16,600 µg/L), manganese (20.2 µg/L), potassium (5,870 µg/L), sodium (955,000 µg/L), zinc (41.9 µg/L), and silicon (11,300 µg/L). See Table 4 for the complete list of analytical results pertaining to this sample.

The detected concentration of aluminum was qualified during data validation and may be associated with contamination in the laboratory blank, as the detected concentration in the method blank exceeded the instrument detection limit, but was less than the laboratory reporting limit (Appendix D). The detected concentration of potassium was qualified as an estimate, biased high, due to out of control MS/MSD percent recoveries (Appendix D). The detected concentration of silicon was qualified as an estimate biased low, due to out of control MS/MSD percent recoveries (Appendix D). The detected concentrations of potassium and silicon can be used in the HRS scoring process, but must be used with some caution.

Comparison to the EPA MCL's indicated an exceedance of aluminum; however, aluminum was detected in the laboratory method blank and maybe considered as laboratory contamination (Ref. 58; Table 4; Appendix D).

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Sample: MART-GW01-G

TAL metal/silicon analyses of the residential well sample collected from a well located at Residence #1 indicated the presence of several constituents in concentrations greater than the respective laboratory reporting limits. These constituents include: arsenic (8.7 µg/L), barium (1,100 µg/L), calcium (162,000 µg/L), iron (8,090 µg/L), magnesium (20,200 µg/L), manganese (964 µg/L), potassium (7,260 µg/L), sodium (142,000 µg/L), zinc (398 µg/L), and silicon (11,000 µg/L). See Table 4 for the complete list of analytical results pertaining to this sample.

The detected concentration of potassium was qualified as an estimate, biased high, due to out of control MS/MSD percent recoveries (Appendix D). The detected concentration of silicon was qualified as an estimate, biased low, due to out of control MS and MSD percent recoveries (Appendix D). The detected concentrations of potassium and silicon can be used in the HRS scoring process, but must be used with some caution.

Comparison to the EPA MCL's indicated an exceedance of manganese (Secondary Drinking Water Standard) (Ref. 58; Table 4). No other MCL exceedances were noted

Sample: SAL-GW02-G

TAL metal/silicon analyses of the residential well sample collected from a well located at Residence #2 indicated the presence of several constituents in concentrations greater than the respective laboratory reporting limits. These constituents include: barium (1,350 µg/L), calcium (21,400 µg/L), magnesium (14,100 µg/L), sodium (917,000 µg/L), zinc (74.6 µg/L), and silicon (6,790 µg/L). See Table 4 for the complete list of analytical results pertaining to this sample.

The detected concentration of silicon was qualified as an estimate, biased low, due to out of control MS/MSD percent recoveries (Appendix D). The detected concentration of silicon can be used in the HRS scoring process, but must be used with some caution.

There were no exceedances of the EPA MCL's in the water sample collected from the (b) (6) residential water well (Ref. 58; Table 4).

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Sample: BENN-GW03-G

TAL metal/silicon analyses of the residential well sample collected from a well located at Residence #3 indicated the presence of several constituents in concentrations greater than the respective laboratory reporting limits. These constituents include: barium (950 µg/L), calcium (15,600 µg/L), magnesium (11,200 µg/L), sodium (849,000 µg/L), zinc (27.3 µg/L), and silicon (6,160 µg/L). See Table 4 for the complete list of analytical results pertaining to this sample.

The detected concentration of zinc was qualified during data validation and may be associated with contamination in the laboratory blank, as the detected concentration in the method blank exceeded the instrument detection limit, but was less than the laboratory reporting limit (Appendix D).The detected concentration of silicon was qualified as an estimate, biased low, due to out of control MS/MSD percent recoveries (Appendix D). The detected concentration of silicon can be used in the HRS scoring process, but must be used with some caution. The detected concentration of zinc should not be used in HRS evaluation of this site.

There were no exceedances of the EPA MCL's in the water sample collected from the (b) (6) residential water well (Ref. 58; Table 4).

Sample: BENN-GW04-G (Duplicate)

TAL metal/silicon analyses of the duplicate residential well sample collected from the Residence #3 well indicated the presence of several constituents in concentrations greater than the respective laboratory reporting limits. These constituents include: aluminum (1,180 µg/L), barium (950 µg/L), calcium (17,700 µg/L), magnesium (11,500 µg/L), sodium (836,000 µg/L), zinc (24.4 µg/L), and silicon (7,830 µg/L). See Table 4 for the complete list of analytical results pertaining to this sample.

The detected concentration of zinc was qualified during data validation and may be associated with contamination in the laboratory blank, as the detected concentration in the method blank exceeded the instrument detection limit, but was less than the laboratory reporting limit (Appendix D). The detected concentration of silicon was

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qualified as an estimate, biased low, due to out of control MS/MSD percent recoveries (Appendix D). The detected concentration of silicon can be used in the HRS scoring process, but must be used with some caution. The detected concentration of zinc should not be used in HRS evaluation of this site.

Comparison to the EPA MCL's indicated an exceedance of aluminum; however, aluminum was detected in the laboratory method blank and maybe considered as laboratory contamination (Ref. 58; Table 4; Appendix D).

Sample: SAL-GW06-G

TAL metal/silicon analyses of the field blank sample indicated the presence of one constituent, zinc, in a concentration greater than its respective laboratory report limit. See Table 4 for the complete list of analytical results pertaining to this sample.

However, the detected concentration of zinc was qualified during data validation and may be associated with contamination in the laboratory blank, as the detected concentration in the method blank exceeded the instrument detection limit, but was less than the laboratory reporting limit (Appendix D).

6.1.4 Likelihood of Release

To determine if a release has occurred to the Groundwater Migration Pathway, constituents must be detected in concentrations at least three times greater than the corresponding background sample, be attributable to the source(s) being evaluated, and collected from the same aquifer (Ref. 1, Ref. 2, Ref. 3). According to the groundwater analytical results, there are exceedances greater than three times the background sample for aluminum (BENN-GW04-G), calcium, iron, manganese, and zinc (MART-GW01-G) (Table 4).

The detected concentration of aluminum in BENN-GW04-G should not be used to determine an observed release to the groundwater pathway due to its presence being detected in the method blank, possibly resulting in laboratory contamination (Appendix D).

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The detected concentrations of calcium qualify as a release to the groundwater pathway; however, calcium does not have a toxicity/mobility factor value as assigned by SCDM's (Ref. 68). Therefore a waste characteristic score cannot be achieved using calcium and iron as constituents of concern in the HRS evaluation of the site (Ref. 1, Ref. 2, and Ref. 3).

The detected concentration of iron does qualify for a release to the groundwater pathway; however, iron receives a low toxicity value (1) for the groundwater pathway, as assigned by SCDM's (Ref. 68, pp. A-220).

In summary, manganese and zinc have been detected in concentrations that qualify as an observed release to the Groundwater Migration Pathway (Ref. 1, Ref. 2, and Ref. 3). Both zinc and manganese have been detected in the source (RMB's 1 and 2) samples. Further documentation may be needed to determine if the background well was screened in the aquifer associated with the residential well in which the manganese and zinc were detected. Since the SI field sampling activities have taken place, it has been reported that the occupants living at the residence in which manganese and zinc were detected, have vacated the property and that no one is currently living at that address or using the water well

6.1.5 Groundwater Receptors

In 1997, groundwater use in Aransas and San Patricio Counties accounted for approximately 14.0% and 11.5%, respectively, of the total water use in the counties (Ref. 16, pp. 6-7). This indicates that surface water is the main source of water in both of these counties.

Documentation obtained indicates that most municipal water districts and rural water supply companies in the area (Cities of Taft and Gregory, Rincon WSC, etc.,) obtain their drinking water supplies by purchasing water from the San Patricio Water Supply Company, who in turn purchases potable drinking water from the City of Corpus Christi (Ref. 19; Ref. 20; Ref. 21; and Ref. 22). The City of Corpus Christi obtains drinking water from the Nueces River, a perennial surface water body (Ref. 23).

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Along Leo Miller Road Site, the residents maintain groundwater wells; some of which may be used for drinking water purposes (Ref. 7, p. 4). The residents along Leo Miller Road have requested hook-ups to the Rincon Rural Water Supply Company; however, due to the cost associated with the hook-ups, they have declined to become part of the Rincon Rural Water Supply Company (Ref. 21). The nearest identified drinking water well has been identified at the residence located at 111 Leo Miller Road. According to the residents residing at this location, the well is approximately 280 feet in depth and the residents must "distill" the groundwater before it can be used for drinking (Ref. 7, p. 4). This residence is located approximately 0.5 miles from the northwest corner of RMB 2 (Figure 3; Ref. 4). However, according to a local citizen, the majority of the private domestic water wells in the area are not utilized as a drinking water source, due to the brackish nature of the groundwater. The groundwater wells are used primarily to provide water for bathing, cleaning laundry and dishes, and watering lawns and gardens (Ref. 7, p. 4)

Several rural water companies have been identified in the vicinity of the site; however, only the Rincon Water Supply Company (WSC), Division 1 supplies drinking water to those residents living within the 1 to 2 mile radius, the 2 to 3 mile radius, and the 3 to 4-mile radius (Figure 3; Ref. 4; Ref. 20; Ref. 21; and Ref. 22). The Rincon WSC, Division 1 supplies water to approximately 326 meters (Ref. 22). The service boundary for Rincon WSC, Division 1 includes those residents residing along County Road (CR) 96, CR 98, CR 102; west of CR 89M and east of CR 95C to 95A (Ref. 21). It will be assumed that all 326 meters are located in San Patricio County. The population per household figure for San Patricio County is 2.74 individuals per household (Ref. 57, p. 2). Therefore the total number of individuals obtaining their potable water from Rincon WSC, Division 1 is 893 (326 meters x 2.74 individuals/household = 893.24). The majority of their customers are located between Highway's 136 and 361 (Ref. 21). See Figure 2 for the location of the county roads listed above. The Rincon WSC system (Divisions 1 through 3), supply drinking water to approximately 1,500 meters (Ref. 22). No other water supply systems have been identified within the 4-mile Target Distance Limit (TDL) that obtains drinking water from groundwater wells.

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It will be assumed for purposes of the SI, that all residents within the 4-mile TDL obtain their drinking water from private, domestic water wells, except for those individuals obtaining potable water from Rincon WSC, Division 1. To determine the total number of individuals within the 4-mile TDL obtaining potable water from private domestic water wells several assumptions will be made: 1) the 893 individuals obtaining potable water from Rincon WSC, Division 1 are located in San Patricio County, 2) because the exact service boundaries for the Rincon WSC have not been obtained, the 893 individuals will be divided by 3 in order to obtain the number of individuals per distance ring. Thus, approximately; 298 individuals within the 1 to 2 mile radius, 298 individuals within the 2 to 3 mile radius, and 297 individuals within the 3 to 4-mile radius obtain potable water from Rincon WSC, Division 1, and will not be counted; and 3) the remaining population within the 4-mile TDL will be assumed to obtain potable water from groundwater sources. The number of individuals obtaining drinking water from groundwater wells within the various target distance radii have been obtained from Geographical Information System (GIS) census data and are listed as follows:

- ¼ to ½ mile: 565;
- ½ to 1 mile: 223;
- 1 to 2 miles: 673 – 298 = 375 ;
- 2 to 3 miles: 734 – 298 = 436; and
- 3 to 4 miles: 2,003 – 297 = 1,706 (Figures 2, 3 and 5; Ref. 4; Ref. 21 and Ref. 24).

It should be noted that the actual number of residents utilizing domestic water wells for their drinking water source is not known. There are residents within the 4-mile TDL that purchase bottled water for their drinking water source (Ref. 7, p. 4). In order to determine the actual number of individuals obtaining potable water from private, domestic waters, a comprehensive water well search and inventory will need to be conducted.

Three Wellhead Protection Areas (WPA) have been identified; however, the WPA's do not appear to be located within the 4-mile TDL (Ref. 25).

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Commercial agriculture does occur within the 4-mile radius, with such crops as sorghum grain and cotton being commercially grown as well as cattle ranching; however, due to the brackish nature of the groundwater, irrigation water is not supplied by groundwater sources (Ref. 26; Ref. 27). No other groundwater resource use has been identified within the 4-mile TDL.

6.2 Surface Water Migration Pathway

The Surface Water Migration Pathway (SWMP), overland/flood migration component was not evaluated during the course of the SI, as an overland flow segment has not been identified from the four RMB's to Port or Copano Bays.

6.3 Soil Exposure Pathway

The Soil Exposure Pathway was not evaluated during the course of the SI, due to the distance of the RMB's to the homes on Leo Miller Road (> ¼ mile in distance).

6.4 Air Migration Pathway

The Air Migration Pathway assesses the threat to human health and the environment through the threat of airborne releases of hazardous substances. Criteria to be evaluated include the Likelihood of Release, Waste Characteristics (source types and chemical constituents), and identified Targets within a 4-mile radius (Ref. 1; Ref. 2; and Ref. 3).

6.4.1 Air Pathway Characteristics

The residents on Leo Miller Road Site are located northwest of RMB 1 and 2 (Figures 1 and 2). The annual prevailing wind direction is from the southeast to the northwest, thus, the residents are located downwind of RMB 1 and 2 (Ref. 55, p. 4). According to residents along Leo Miller Road Site, the community experiences large exposures of windblown dust on a regular and continuous basis for at least 8 to 12 months a year. It has been reported that the homes and lawns have become covered in red mud dust during the frequent dust storms (Ref. 6, pp. 2-3). The residents have made several complaints to the TCEQ Corpus Christi office concerning the windblown dust. The

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TCEQ has investigated the windblown particulate complaints and have found no evidence to substantiate the alleged complaints (Ref. 12 and Ref. 13).

One land owner has video graphic documentation of the red dust being blown from the red mud lagoons toward their residence (Ref. 56). The EPA/START team did observe red dust both outside and inside the windows at one residential home located along Leo Miller Road Site (Ref. 7, p. 3). During the sampling activities, the EPA/START team observed red dust coating the exterior surfaces of the residential homes and other structures at the properties visited along Leo Miller Road. In addition, the EPA/START team observed a red mud-like substance in a swimming pool maintained at one of the residences along Leo Miller Road. Red dust was also observed on window sills and counter/table tops inside residential homes located on Leo Miller Road. Based on the video documentation made available to the EPA/START team, it does appear that a suspected air release by direct observation may have occurred at the Leo Miller Road Site (Ref. 1 and Ref. 56).

According to SAC representatives, the video documentation of two dusting occurrences on March 18, 2006 and April 15, 2006 does not prove that these events produced offsite deposition related to the RMB's and corresponding red mud residue. SAC believes that it demonstrates the dusting occurrences are episodic in nature and somewhat unpredictable (Ref. 66, p. 20).

Waste Characteristics

The source being evaluated is a surface impoundment in which the red mud residue is being deposited and the corresponding liquid being allowed to evaporate. RMB's 1 - 3 are surrounded by earthen levees; however, the RMB's are not covered to eliminate airborne migration of red mud residue nor is dust suppression activity occurring within the lagoons (Ref's. 6, pp. 2-3).

Red mud, or bauxite residue, is the industrial waste of bauxite processing for the purpose of extracting alumina. The red mud residue dries to a very fine particulate solid of less than 2.5 microns, with over 50% less than 1 micron in size. The red mud residue

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contains significant amounts of iron (20-50%), aluminum (20-30%), calcium (10-30%), silicon (10-20%), and sodium (Ref. 6, pp. 2-3; and Ref. 9, p. 2). Red mud residue may contain trace amounts of metals such as arsenic, barium, boron, cadmium, chromium, cobalt, gallium, vanadium, scandium, and lead, as well as radionuclide's (Ref. 11, pp. 4 and 5).

Red mud samples collected in March 2008 by SAC indicated the presence of several trace metals. The average metal concentrations in the 2008 red mud samples are as follows: aluminum: 45,000 mg/kg; arsenic: 27.33 mg/kg; barium: 77.11 mg/kg; cadmium: 27.03 mg/kg; calcium: 30,111 mg/kg; chromium: 638 mg/kg; copper: 62.89 mg/kg; iron: 133,222 mg/kg; lead: 102 mg/kg; manganese: 3,067 mg/kg; mercury: 0.161 mg/kg; nickel: 323 mg/kg; phosphorus: 1,237 mg/kg; selenium: 1.69 mg/kg; sodium: 44,222 mg/kg; uranium: 8.72 mg/kg; vanadium: 446 mg/kg; and zinc: 229 mg/kg. See Reference 66, p. 10 for a list of all metals and their detected concentrations.

SAC consultants cite *"The Report to Congress on Special Wastes from Mineral Process"* that only two components of red mud (arsenic and chromium) could pose an exposure risk through particulate inhalation pathway if they are released in a concentration that equals or exceeds the National Ambient Air Quality Standard (PM_{10} – 150 micrograms per cubic meter [$\mu g/M^3$] 24-hour average; $PM_{2.5}$ – 35 $\mu g/M^3$ 24 hour 98th Percentile) (Ref. 66, p. 20). In the report, it states that based on the relatively low concentration of trace metals in the red mud, air borne concentrations at residences within 120 meters of the site would likely be below the levels of concern. According to SAC consultants, the nearest residence to the 204 Facility is 700 meters from RMB 2 (Ref. 66, p.20). Arsenic (45.7 mg/kg to 58.5 mg/kg) and chromium (689 mg/kg to 1,090 mg/kg) were both detected in the red mud samples (Table 4); however, air samples were not collected during the SI field activities to substantiate SAC's above-mentioned claim.

The SAC consultants also cited the U.S. EPA document "*Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites*" (dated February 1985) in

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their assessment of the 204 Facility. This discussion is included in Appendix L of the report.

In 1995, red mud samples were collected by Fugro Environmental, Inc and analyzed for grain size. Results for red mud in RMB 1 indicated grain sizes ranging from 2.0 millimeters (mm) to 0.5 micrometers (µm); and for the red mud collected from RMB 2 grain sizes ranged from 1.2 mm to 0.5 µm (Ref. 66, p. 7). In March 2008, Naismith Engineering collected red mud samples from RMB's 1 and 2. Grain size analysis indicated the following: RMB 1 – 2.0 mm to 0.02 µm; RMB 2 - 2.0 mm to 0.02 µm (Ref. 66, p. 7).

TCEQ collected tape samples of the red mud dust from a residence along Leo Miller Road Site; however, the samples were only analyzed for bauxite using polarized light microscopy (PLM). The TCEQ PLM analysis of the red dust samples contained between 30 to 70% bauxite (Ref. 5, p. 3; Ref. 7, p. 2; Ref. 12, pp. 12-14; and Ref. 13, pp. 13-16).

SI Wipe Sampling Activities

Between May 6 -7, 2008, Dynamac START collected wipe samples from inside window ledges of three residential homes located along Leo Miller Road (Figure 4, Table 1, Appendices B and C). Two background wipe samples were collected from a residence located in Ingleside, TX, which is approximately 8 miles south of the site (Figure 5, Table 1, Appendices B and C). One field blank wipe sample was collected by placing a wetted (de-ionized water) unused sterile gauze pad into a 4 once glass jar. See Table 1 for the Sampling ID's, Sampling Dates, Sampling Times, Sampling Locations, Sampling Descriptions, and Analyses.

The wipe samples were collected according to the procedure outlined in the site-specific QASP submitted to EPA prior to the SI sampling activities (Appendix J). All wipe sampling data was entered into the SCRIBE database and chain-of-custody forms were completed (Appendix H). The wipe samples were packaged and shipped to Accutest laboratories for TAL metal/silicon analyses (Appendix I).

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SI Sampling Results

The collected wipe samples were analyzed for TAL metals/silicon by Accutest Laboratories located in Houston, TX. A Type IV analytical data package was provided to Dynamac by Accutest Laboratories (Appendix D).

Samples: BKG-RD08-G and BKG-RD09-G

TAL metal analysis of the two background wipe samples, BKG-RD08-G and BKG-RD09-G, collected from two inside window ledges located at Residence #4 indicated the presence of aluminum (164 micrograms per wipe [µg/wipe] to 544 µg/wipe); arsenic (0.68 µg/wipe to 0.78 µg/wipe); calcium (1,920 µg/wipe to 4,510 µg/wipe), copper (< 2.5 µg/wipe to 4.4 µg/wipe); iron (850 µg/wipe to 907 µg/wipe); lead (1.2 µg/wipe to 3.2 µg/wipe); manganese (6.1 µg/wipe to 9.9 µg/wipe), potassium (< 500 µg/wipe to 612 µg/wipe); selenium (< 0.50 µg/wipe to 0.56 µg/wipe); sodium (1,050 µg/wipe to 1,440 µg/wipe); and zinc (90.5 µg/wipe to 383 µg/wipe). See Table 5 for the complete list of analytical results pertaining to this sample. There were no data issues related to the analysis of the two background wipe samples (Appendix D).

Samples: MART-RD01-G and MART-RD02-G

TAL metal analysis of the two wipe samples, MART-RD01-G (bedroom)and MART-RD02-G (kitchen area), collected from two inside window ledges located at Residence No. 1 indicated the presence of aluminum (462 µg/wipe [kitchen] to 2,630 µg/wipe [bedroom]); antimony (< 0.50 µg/wipe [kitchen] to 0.88 µg/wipe [bedroom]); arsenic (0.56 µg/wipe [kitchen] to 1.3 µg/wipe [bedroom]); barium (< 20 µg/wipe [kitchen] to 30.9 µg/wipe [bedroom]); cadmium (< 0.40 µg/wipe [kitchen] to 0.50 µg/wipe [bedroom]); calcium (942 µg/wipe [kitchen] to 5,010 µg/wipe [bedroom]); chromium (4.8 µg/wipe [kitchen] to 18.6 µg/wipe [bedroom]; copper (< 2.5 µg/wipe [kitchen] to 5.1 µg/wipe [bedroom]); iron (987 µg/wipe [kitchen] to 3,920 µg/wipe [bedroom]); lead (1.1 µg/wipe [kitchen] to 5.2 µg/wipe [bedroom]); magnesium (<500 µg/wipe [kitchen] to 2,140 µg/wipe [bedroom]); manganese (22.5 µg/wipe [kitchen to 84.9 µg/wipe [bedroom]); nickel (<4.0 µg/wipe to 10.4 µg/wipe [bedroom]); sodium (1,010 µg/wipe [bedroom] to 1,190 µg/wipe [kitchen]); vanadium (< 5.0 µg/wipe [kitchen] to 13.4

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µg/wipe [bedroom]; and zinc (21.4 µg/wipe [kitchen] to 68.2 µg/wipe [bedroom]). See Table 5 for the complete list of analytical results pertaining to this sample. There were no data issues related to the analysis of the two background wipe samples (Appendix D).

With the exception sodium, the highest detected concentrations were situated on the window ledge located in the front bedroom of Residence No.1.

Samples: SAL-RD03-G, SAL-RD04-G, and SAL-RD05-G (Duplicate)

TAL metal analysis of the three wipe samples, SAL-RD03-G (trailer), SAL-RD04-G (Dining Room), and SAL-RD05-G (duplicate of RD04) collected from inside window ledges located at Residence #2 indicated the presence of aluminum (572 µg/wipe [dining room] to 807 µg/wipe [trailer]); antimony (1.1 µg/wipe [trailer] to 2.9 µg/wipe [dining room]); arsenic (0.62 µg/wipe [dining room] to 0.85 µg/wipe [trailer]); barium (< 20 µg/wipe [dining room] to 27.0 µg/wipe [trailer]); cadmium (1.3 µg/wipe [dining room] to 1.8 µg/wipe [trailer]); calcium (838 µg/wipe [trailer] to 1,260 µg/wipe [trailer]); chromium (3.9 µg/wipe [dining room] to 5.2 µg/wipe [trailer]; copper (< 2.5 µg/wipe [trailer] to 2.9 µg/wipe [dining room]); iron (740 µg/wipe [dining room] to 1,220 µg/wipe [trailer]); lead (4.7 µg/wipe [trailer] to 1,410 µg/wipe [dining room]); manganese (16.8 µg/wipe [dining room] to 28.1 µg/wipe [trailer]); selenium (<0.50 µg/wipe [trailer] to 0.56 µg/wipe [dining room]); sodium (<500 µg/wipe [trailer] to 1,160 µg/wipe [dining room]); and zinc (25.6 µg/wipe [dining room] to 160 µg/wipe [trailer]). See Table 5 for the complete list of analytical results pertaining to this sample. There were no data issues related to the analysis of the two background wipe samples (Appendix D).

Based on the wipe sample analytical results for Residence #2, the majority of the highest detected concentrations were located on the inside bedroom window ledge of the Trailer; however, the highest detected concentration (lead) was located on the inside Dining Room window ledge.

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Samples: BENN-RD06-G and BENN-RD06-G

TAL metal analysis of the two wipe samples, BENN-RD06-G and BENN-RD07-G, both collected from two inside window ledges located in the front bedroom at Residence #3 indicated the presence of aluminum (87.5 µg/wipe to 342 µg/wipe); antimony (< 0.50 µg/wipe to 0.57 µg/wipe); arsenic (0.64 µg/wipe to 1.8 µg/wipe); calcium (< 500 µg/wipe to 610 µg/wipe); chromium (< 1.0 µg/wipe to 4.2 µg/wipe); copper (< 2.5 µg/wipe to 3.8 µg/wipe); iron (110 µg/wipe to 881 µg/wipe); lead (0.75 µg/wipe to 1.1 µg/wipe); manganese (2.7 µg/wipe to 19.0 µg/wipe); selenium (0.51 µg/wipe to 0.61 µg/wipe); and zinc (29.1 µg/wipe to 90.5 µg/wipe). See Table 5 for the complete list of analytical results pertaining to this sample. There were no data issues related to the analysis of the two wipe samples (Appendix D).

Based on the wipe sample analytical results, the highest detected concentrations at Residence No. 3 were situated on the front bedroom inside window ledge (BENN-RD070G). This location also contained a window unit air conditioner.

Sample: BK-RD10-G

TAL metal analysis of the field blank wipe sample, BK-RD10-G, indicated the presence of iron (13.2 µg/wipe); lead (3.6 µg/wipe); and zinc (5.9 µg/wipe). See Table 5 for the complete list of analytical results pertaining to this sample. There were no data issues related to the analysis of the two wipe samples (Appendix D).

Likelihood of Release

To determine if a release has occurred to the Air Migration Pathway, constituents must be detected in concentrations at least three times greater than the corresponding background sample(s) and be attributable to the source(s) being evaluated (Ref. 1, Ref. 2, and Ref. 3). According to the wipe sample analytical results, there are exceedances greater than three times the background sample for the following constituents:

- aluminum at Residence #1 bedroom (MART-RD01-G);
- antimony at Residence # bedroom (MART-RD01-G);
- barium at Residence #1 bedroom (MART-RD01-G) and Residence #2 trailer (SAL-RD03-G);

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- cadmium at Residence #1 bedroom (MART-RD01-G) and Residence #2 trailer and dining room (SAL-RD03-G and SAL-RD04-G);
- chromium at Residence #1 bedroom and kitchen areas (MART-RD01-G and MART-RD02-G), Residence #2 trailer and dining area (SAL-RD03-G and SAL-RD04-G), and Residence #3 front bedroom (BENN-RD07-G);
- iron at Residence #1 bedroom (MART-RD01-G);
- lead at Residence #2 dining room (SAL-RD04-G);
- magnesium at Residence #1bedroom (MART-RD01-G),

- manganese at Residence #1 bedroom (MART-RD01-G), and
- nickel at Residence #1 bedroom (MART-RD01—G) (Table 5).

Aluminum, cadmium, chromium, iron, lead, manganese, and nickel were detected in the RMB 1 and 2 samples; however, it is not currently known if the detected concentration of these analytes in the wipe samples pose a health risk to the individuals. residing within the residential homes. Since the completion of the SI field activities in May 2008, it has been reported that two of the three families in which residential dust samples were collected, have vacated the residential homes.

6.4.2 Air Pathway Receptors

The 4-mile radius is rural in nature and appears to be sparsely populated (Figures 1 and 2). The distance to the nearest individual or regularly occupied building (on Leo Miller Road) is approximately 0.5 miles west of RMB's 1 and 2 (Figure 3; Ref. 4). Approximately 75 families have been documented living on CR 4351 and Cr 1177(Ref. 6, p. 2). The total number of individuals residing within the 4-mile TDL, based on Tiger census data for 2000, is 4,198 (Figure 5; Ref. 4; and Ref. 24). The number of potential individuals within the various target distance radii have been obtained using GIS Tiger census data and are listed as follows:

- ¼ to ½ mile radius: 565
- ½ to 1 mile radius: 223
- 1 to 2 mile radius: 673
- 2 to 3 mile radius: 734; and
- 3 to 4 mile radius: 2,003

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See Figure 5 for the population, by distance radii, within the 4-mile TDL (Ref. 4 and Ref. 24).

Several sensitive environments have been potentially identified within the 4-mile TDL. According to the TPWL and the USF&W, several federally and state designated endangered or threatened species exist in both Aransas and San Patricio Counties (Ref's. 45 - 53). See Tables 4 and 5 for a list of these potential endangered and/or threatened species. It must be noted that the listed endangered and/or threatened species have been located within the two aforementioned counties; however, they have not been specifically identified within the 4-mile TDL associated with the Leo Miller Road Site.

Several wetlands have been identified within the 4-mile TDL and include estuarine and marine wetlands, and freshwater emergent wetlands. It is estimated that 550 total acres of wetlands exist within the 4-mile TDL (Figure 3; Ref. 4; Ref. 54, pp. 1-5). The estimated wetland acreage within the various target distance radii have been obtained using GIS data and are listed as follows:

- ¼ to ½ mile radius: 50 acres;
- ½ to 1 mile radius: 100 acres;
- 1 to 2 mile radius: 200 acres;
- 2 to 3 mile radius: 150 acres; and
- 3 to 4 mile radius: 50 acres

Two air resource factors have been documented within the 4-mile TDL. Commercial agriculture does occur within the 4-mile radius, with such crops as sorghum grain and cotton being grown as well as cattle ranching (Ref. 27 and Ref. 28). In addition, Port Bay Hunting and Fishing Lodge, a designated recreation area, is located within the 4-mile TDL (Ref. 35, pp. 2-9).

7 SUMMARY

The Leo Miller Road Site is located in Taft, Aransas/San Patricio Counties, Texas. The Leo Miller Road Site consists of the residences along Leo Miller Road and the four SAC RMBs located east of the residences, in an unincorporated area east of Taft, Texas. The RMBs make up

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the SAC 204 Facility. The area to the west, northwest, north, south and southwest of the RMB's is not heavily populated. Approximately 20 residential structures were observed during the EPA/START team reconnaissance inspection conducted on October 9, 2007.

SI field activities were conducted from May 6 – 8, 2008. During the course of the field activities, Dynamac START collected five source samples (RMB's 1 and 2), four residential water well samples, and eight wipe samples from inside window ledges of four residential homes. Background samples were collected for both the groundwater and wipe samples. Chemical analysis of the red mud samples indicated the presence of the following constituents: aluminum, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, silicon, vanadium, and zinc. Particle size analysis indicates that the red mud in both RMBs 1 and 2 consists primarily of silt and clay. In addition, RMB 1 contained the highest percentage of particles less than 5 µm in size ("dry" mud sample). Chemical analysis of the collected groundwater samples indicated the presence of calcium, iron, manganese, and zinc in concentrations three times greater than the corresponding background sample. Chemical analysis of the wipe samples indicated the presence of aluminum, cadmium, chromium, iron; lead, manganese, and nickel in concentrations three times greater than the background wipe samples.

For SI purposes, three (3) RMB's have been evaluated as surface impoundments. The combined size of the three RMB's is approximately 96,860,000 ft^2 in size: (RMB 1: 36,500,000 ft^2; RMB 2: 52,400,000 ft^2; and RMB 3: 17,960,000 ft^2. According to a SAC document approximately 21,874,781 dry metric tons (DMT) of red mud residue has been disposed in RMB 1; 16,282,498 DMT of red mud residue into RMB 2, and trace amounts into RMB 3. Each RMB is surrounded by an earthen levee and are not covered. Dust suppression activities are not carried out due to the sheer size of each RMB. Documentation provided by SAC indicates that RMB's 1-3 are situated on top of impermeable clay layer or low permeability and a leachate collection system was observed around RMB 1.

The HRS pathway of concern at the site is the Air Migration Pathway. An air observed release by direct observation may be documented based on video graphic evidence of the red dust being blown from primarily RMB 1and migrating towards the residential structures located on Leo

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Miller Road. Chemical analysis of the collected wipe samples from three residences situated on Leo Miller Road indicate the presence of aluminum, cadmium, chromium, iron, lead, manganese, and nickel in concentrations three times greater than the corresponding background wipe samples. There are residents on Leo Miller Road Site that are downwind of RMB's 1 and 2. In addition, several potential sensitive environments (i.e., wetlands, endangered and threatened species) may exist within the 4-mile TDL.

For the Groundwater Migration Pathway, there are residents living within the 4-mile TDL that obtain their drinking water supply from private, domestic water wells; however, the actual number of residents using wells as their drinking water source is not currently known. Chemical analysis of groundwater samples collected during the SI field activities indicate manganese and zinc in concentrations three times greater than the background concentrations in Residence #1 water well. However, the contaminated well is not a drinking water well, thus there are no associated groundwater receptors. In addition, the well is no longer in use as the residents have moved to different location and SAC currently owns the property.

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8 REFERENCE LIST

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2. Federal Register, Part II Environmental Protection. 40 CFR Part 300, Hazard Ranking System; Final Rule. Volume 55, No. 241. Book 2. December 14, 1990. Total Pages: 11

3. U.S. EPA, Office of Solid Waste and Emergency Response. *Hazard Ranking System Guidance Manual.* Publication 9345.1-07, PB92-963377, EPA/540/R-92/026. November 1992. Total Pages: 31.

4. U.S. Geological Survey (USGS). 7.5 Minute Topographic Maps: Aransas Pass, TX (27097-H2), 1977, ; Bayside, TX (28097-A2), 1979; Cranell, TX (28097-B4), 1979; Estes (27097-H1), TX, 1973; Gregory, TX (27098-H3), 1977; Lamar, TX (28097-B1), 1979; Mission Bay, TX (28097-B2), 1980; Rincon Bend, TX (28097-A3), 1979; Rockport (28097-A1), TX, 1979; Sinton East, TX, 1979 (28097-A4); Taft, TX (27097-H4), 1977; and Woodsboro, TX (28097-B3), 1979. Total Pages: 2.

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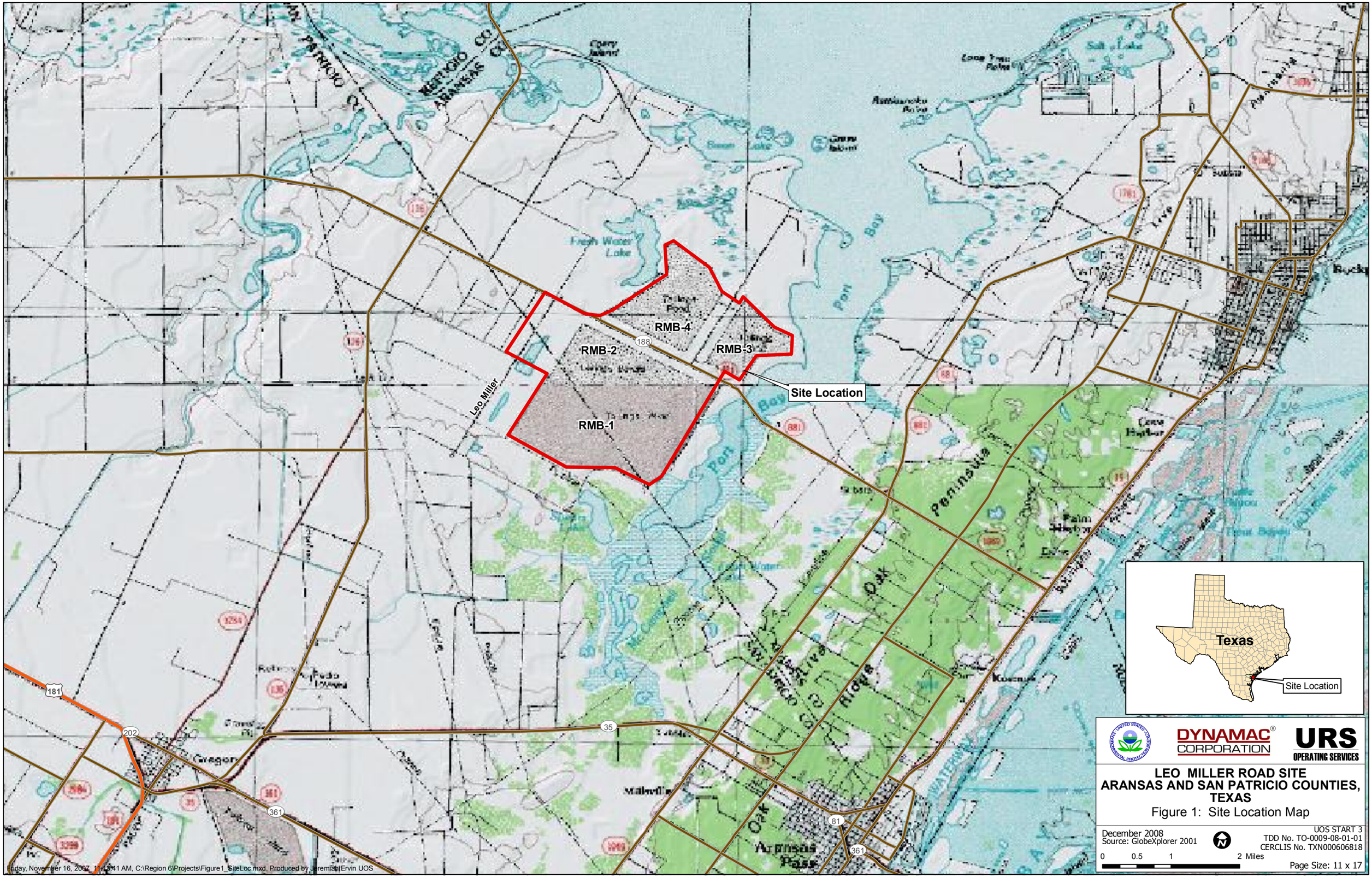
FIGURES


RMB-1
RMB-2
RMB-3
RMB-4
Site Location
Leo Miller
Texas
Site Location
DYNAMAC CORPORATION
URS
OPERATING SERVICES
LEO MILLER ROAD SITE
ARANSAS AND SAN PATRICIO COUNTIES, TEXAS
Figure 1: Site Location Map
December 2008
Source: GlobeXplorer 2001
UOS START 3
TDD No. TO-0009-08-01-01
CERCLIS No. TXN000606818
0 0.5 1 2 Miles
Page Size: 11 x 17
Friday, November 16, 2007 11:12:41 AM, C:\Region 6\Projects\Figure1_SiteLoc.mxd, Produced by Jeremiah Ervin UOS

COPANO BAY
RMB-4 =
29,510,000 Sq. Ft.
RMB-4
BT Residence
NS Residence
DM Residence
RMB-3
RMB-3 =
18,390,000 Sq. Ft.
RMB-2
RMB-1
RMB-2 =
79,550,000 Sq. Ft.
RMB-1 =
48,100,000 Sq. Ft.
PORT BAY
35
188
181
202
361
81
Legend
Residences of Interest
Red Mud Beds
Site Boundary
Highways
Major Roads
Local Roads
DYNAMAC CORPORATION
URS OPERATING SERVICES
LEO MILLER ROAD SITE
ARANSAS AND SAN PATRICO COUNTIES, TEXAS
Figure 2: Site Details Map
December 2008
Source: GlobeXplorer 2001
UOS START 3
TDD No. 07-0801
CERCLIS No. TXN000606818
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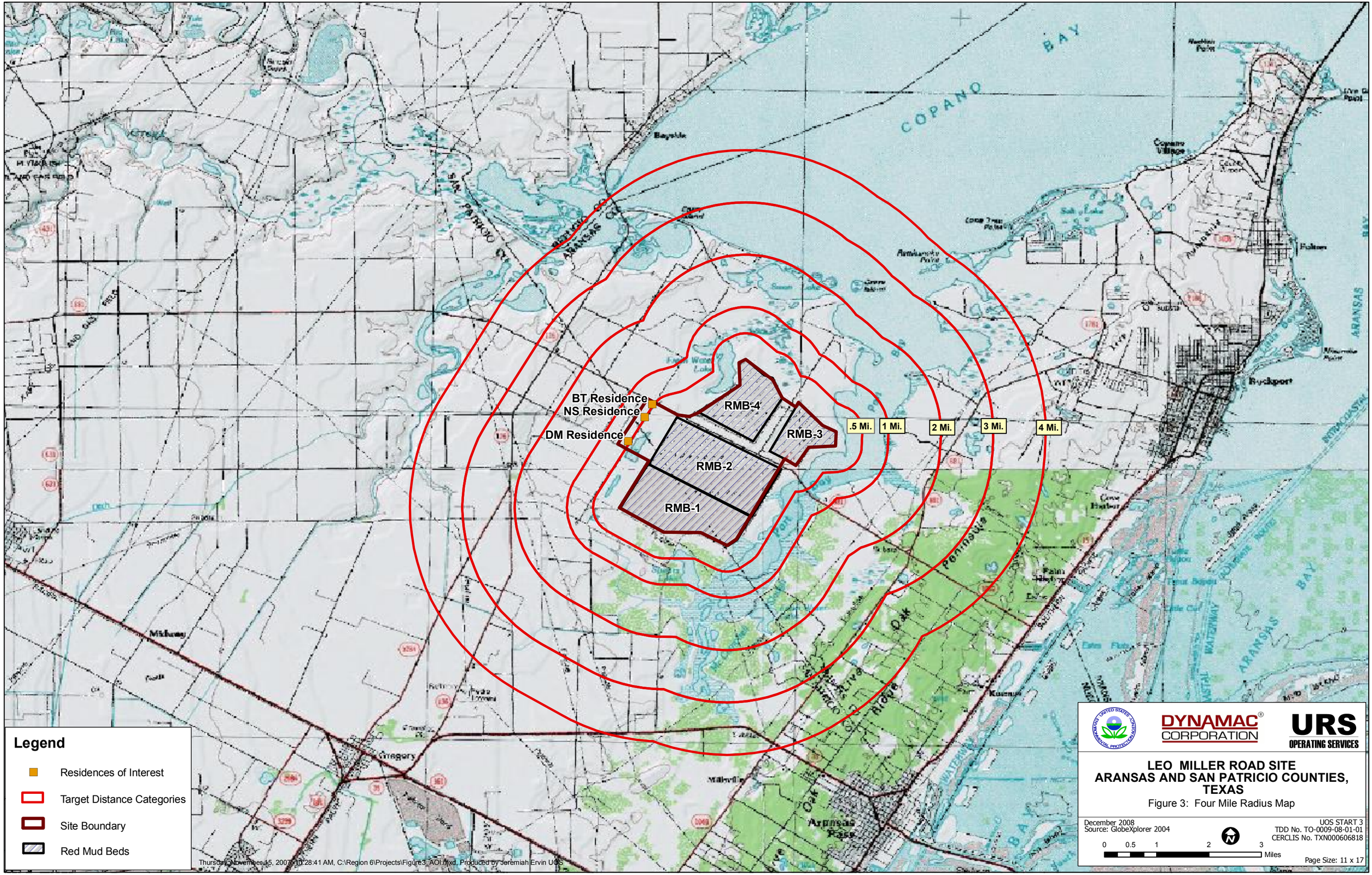
COPANO BAY
BT Residence
NS Residence
DM Residence
RMB-1
RMB-2
RMB-3
RMB-4
.5 Mi.
1 Mi.
2 Mi.
3 Mi.
4 Mi.
Legend
Residences of Interest
Target Distance Categories
Site Boundary
Red Mud Beds
DYNAMAC CORPORATION
URS OPERATING SERVICES
LEO MILLER ROAD SITE
ARANSAS AND SAN PATRICIO COUNTIES, TEXAS
Figure 3: Four Mile Radius Map
December 2008
Source: GlobeXplorer 2004
UOS START 3
TDD No. TO-0009-08-01-01
CERCLIS No. TXN000606818
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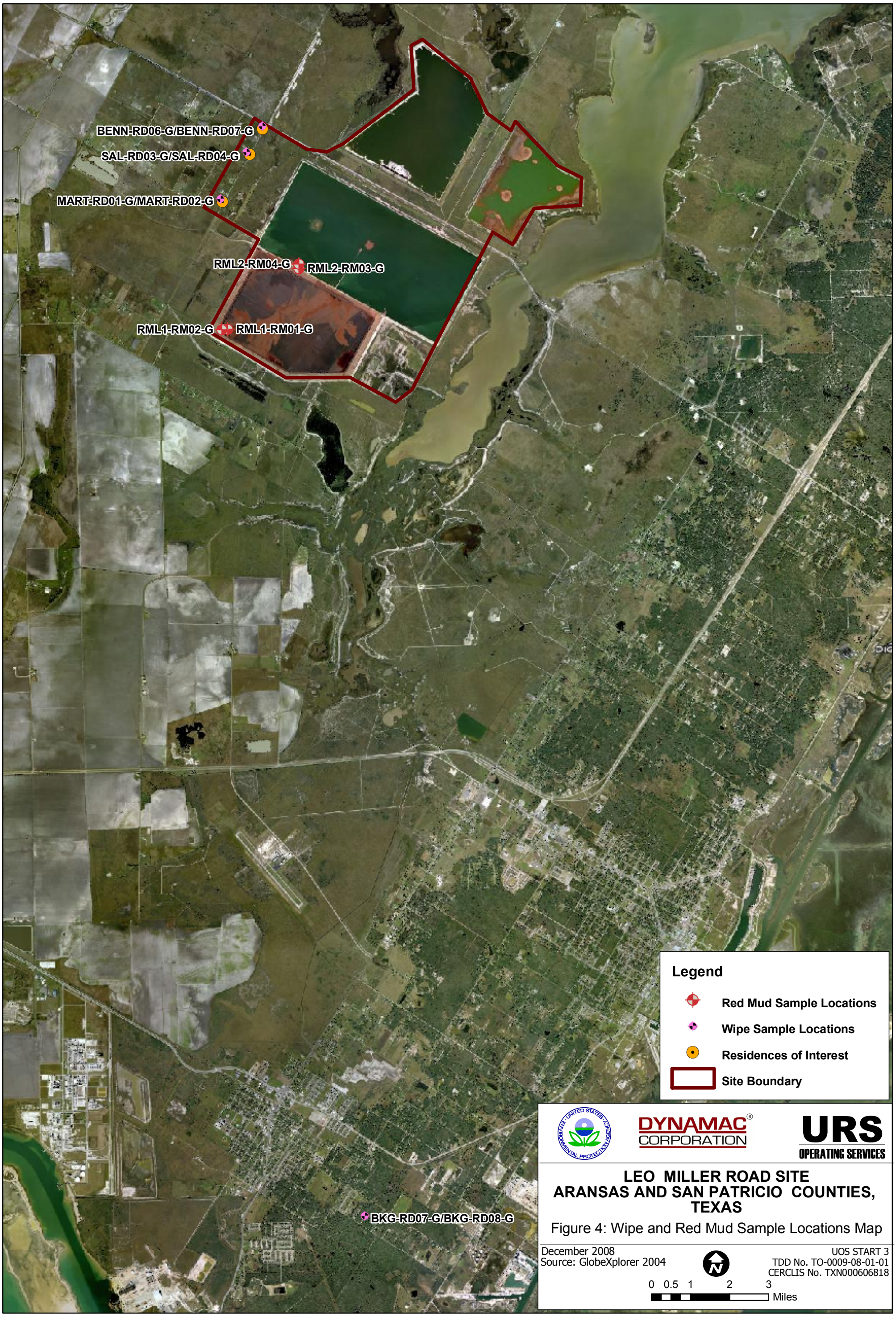

LEO MILLER ROAD SITE
ARANSAS AND SAN PATRICIO COUNTIES, TEXAS

Figure 4: Wipe and Red Mud Sample Locations Map

December 2008
Source: GlobeXplorer 2004

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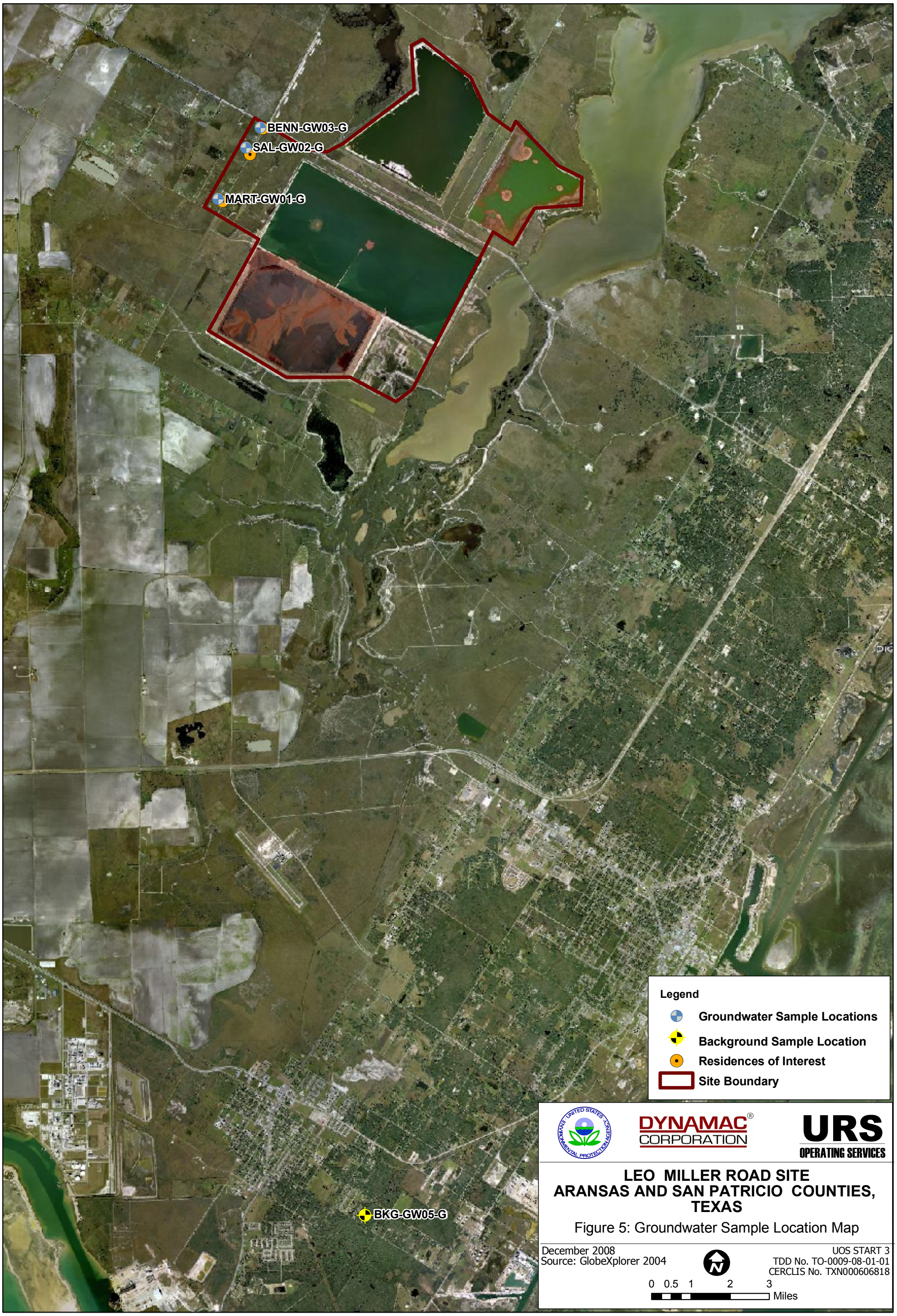

LEO MILLER ROAD SITE
ARANSAS AND SAN PATRICIO COUNTIES, TEXAS

Figure 5: Groundwater Sample Location Map

December 2008
Source: GlobeXplorer 2004

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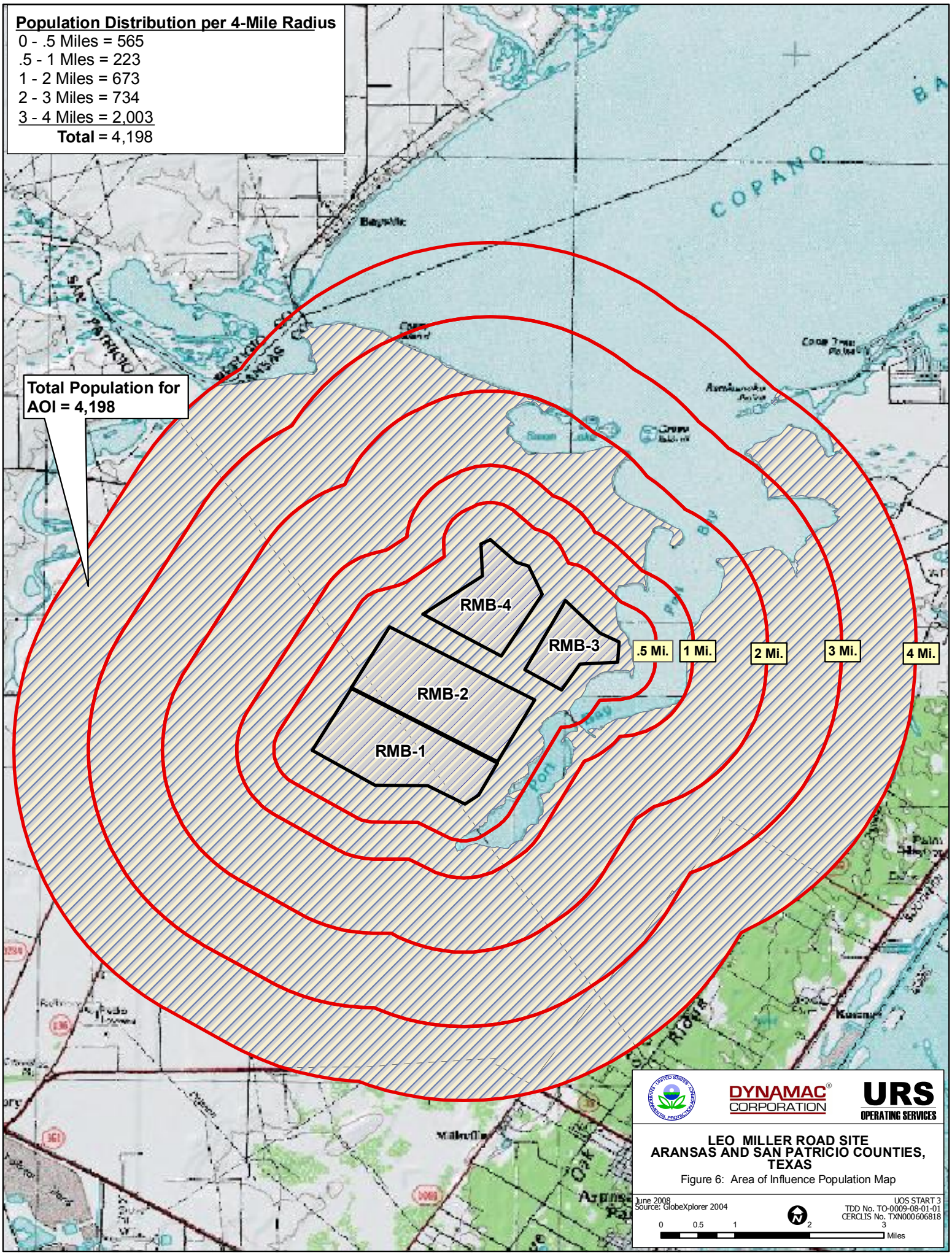
TDD No. TO-0009-08-01-01
CERCLIS No. TXN000606818


Population Distribution per 4-Mile Radius
0 - .5 Miles = 565
.5 - 1 Mles = 223
1 - 2 Miles = 673
2 - 3 Miles = 734
3 - 4 Miles = 2,003
Total = 4,198
Total Population for AOI = 4,198
RMB-4
RMB-3
RMB-2
RMB-1
.5 Mi.
1 Mi.
2 Mi.
3 Mi.
4 Mi.
COPANO
DYNAMAC CORPORATION
URS OPERATING SERVICES
LEO MILLER ROAD SITE
ARANSAS AND SAN PATRICIO COUNTIES, TEXAS
Figure 6: Area of Influence Population Map
June 2008
Source: GlobeXplorer 2004
UOS START 3
TDD No. TO-0009-08-01-01
CERCLIS No. TXN000606818
0 0.5 1 2 3
Miles

TABLES

TABLE 1
LEO MILLER ROAD SAMPLE SUMMARY

SAMPLE ID	SAMPLING DATE	SAMPLING TIME (Hours)	SAMPLE LOCATION	SAMPLE DESCRIPTION	ANALYSIS
RML1-RM01-G	May 8, 2008	1120 - 1150	27.9901 N, 97.2165 W	Wet red mud sample collected from RML 1. Collected near southwest corner of RML 1. The sample was collected with a dedicated plastic trowel and bowl. Sample matrix was homogenized and transferred to 8 oz. wide mouth glass jars. A split sample was also collected and relinquished to Sherwin consultants. The sample matrix was a saturated, reddish-brown, very fine grain size material.	TAL Metals/Mercury, Silicon, and Grain Size
RML1-RM02-G	May 8, 2008	1105 - 1140	27.9900 N, 97.2174 W	Dry red mud sample collected from RML 1. Collected near southwest corner of RML 1. The sample was collected with a dedicated plastic trowel and bowl. Sample matrix was homogenized and transferred to 8 oz. wide mouth glass jars. A split sample was also collected and relinquished to Sherwin consultants. The sample matrix was a slightly moist, reddish-black material with several pieces of clay-like material.	TAL Metals/Mercury Silicon and Grain Size
RML2-RM03-G	May 8, 2008	1220 - 1245	27.9988 N, -97.2050 W	Wet red mud sample collected from RML 2. Collected near south-central section of the RML. The sample was collected with a dedicated plastic trowel and bowl. Sample matrix was homogenized and transferred to 8 oz. wide mouth glass jars. A split sample was also collected and relinquished to Sherwin consultants. The sample matrix was a saturated, reddish-brown, very fine grain size material, with some pieces of clay-like material.	TAL Metals/Mercury Silicon and Grain Size
RML2-RM04-G	May 8, 2008	1255 - 1315	27.9991 N, 97.2050 W	Dry red mud sample collected from RML 1. Collected near south-central section of the RML. The sample was collected with a dedicated plastic trowel and bowl. Sample matrix was homogenized and transferred to 8 oz. wide mouth glass jars. A split sample was also collected and relinquished to Sherwin consultants. The sample matrix was a slightly moist, reddish-black material with several pieces of clay-like material. The sample was designated as the MS/MSD sample for the red mud matrix.	TAL Metals/Mercury Silicon and Grain Size
RML1-RM02-G	May 8, 2008	1105 - 1140	27.9900 N, 97.2174 W	Duplicate sample of RML1-RM02-G. A split sample was not collected for Sherwin Alumina.	TAL Metals/Mercury Silicon and Grain Size

TABLE 1
LEO MILLER ROAD SAMPLE SUMMARY

SAMPLE ID	SAMPLING DATE	SAMPLING TIME (Hours)	SAMPLE LOCATION	SAMPLE DESCRIPTION	ANALYSIS
MART-GW01-G	May 6, 2008	1430 - 1437	28.0085º N, 97.2178º W	Groundwater sample collected from domestic water well. Depth of well: 180 feet below ground surface (bgs); Well Diameter: 6". Purged for approximately 15 minutes. The water sample was collected from spigot on well after detaching water hose. Sample matrix was allowed to directly enter sample container. There was no pre-treatment prior to the collection of the water sample. Water Quality Parameters: pH: 7.6, Temperature: 26ºC, Conductivity: 5.3 mS/cm; DO: 8.0 mg/L; Salinity: 0.3%; Turbidity: 1 NTU; Color: Clear; Odor: None. The sample was designated as the MS/MSD sample for the liquid matrix.	TAL Metals/Mercury and Silicon
SAL-GW02-G	May 6, 2008	1145 - 1147	28.0159º N, 97.2131ºW	Groundwater sample collected from domestic water well. Depth of well: 260 feet bgs, Well Diameter: 2". Purged approximately 21 minutes before collecting sample. The sample was collected directly from spigot on well after detaching water hose. Sample matrix was allowed to directly flow into sample container. There was no pre-treatment prior to the collection of the water sample. Water Quality Parameters: pH: 7.6, Temperature: 25ºC, Conductivity: 5.0 mS/cm; DO: 8.3 mg/L; Salinity: 0.3%; Turbidity: 0 NTU; Color: Clear; Odor: None	TAL Metals/Mercury and Silicon
BENN-GW03-G	May 7, 2008	1410 - 1415	28.0187º N, 97.2110º W	Groundwater sample collected from domestic water well. Depth of well: 297 feet bgs, Well Diameter: 4". Purged for approximately 15 minutes before collecting sample. The sample was collected from spigot in front yard, before water line enters residential home; detached water hose prior to collecting sample. There was no pre-treatment prior to the collection of the water sample. Water Quality Parameters: pH: 7.5, Temperature: 26ºC, Conductivity: 4.4 mS/cm; DO: 8.5 mg/L; Salinity: 0.2%; Turbidity: 0 NTU; Color: Clear; Odor: Sulphur-like.	TAL Metals/Mercury and Silicon
BENN-GW04-G	May 7, 2008	1410 - 1415	28.0187º N, 97.2110º W	Duplicate sample of BENN-GW03-G	TAL Metals/Mercury and Silicon

TABLE 1
LEO MILLER ROAD SAMPLE SUMMARY

SAMPLE ID	SAMPLING DATE	SAMPLING TIME (Hours)	SAMPLE LOCATION	SAMPLE DESCRIPTION	ANALYSIS
BKG-GW05-G	May 6, 2008	1555 - 1556	27.9631º N, 97.1955º W	Groundwater sample collected from domestic water well. Depth of well: 75 feet bgs; Well Diameter: Unknown. Purged well for approximately 15 minutes prior to collecting water sample. The sample was collected from spigot in well house; detached water hose prior to collecting sample. There was no pre-treatment prior to the collection of the water sample. Water Quality Parameters: pH: 7.0, Temperature: 26ºC, Conductivity: 1.8 mS/cm; DO: 8.9 mg/L; Salinity: 0.10%; Turbidity: 1 NTU; Color: Clear; Odor: None. This sample served as the background water sample.	TAL Metals/Mercury and Silicon
SAL-GW06-G	May 6, 2008	1100 - 1105	Not Applicable	Field Blank: sample consisted of de-ionized water	TAL Metals/Mercury and Silicon
MART-RD01-G	May 6, 2008	1345 - 1350	28.0085º N, 97.2178º W	Dust sample collected from the southwest bedroom window sill. Window sill was made of wood. The tan colored paint was cracking. The window sill had not been cleaned prior to sample collection and there was evidence of red dust on the window sill. The dust sample was collected from an area approximately 8 cm x 12 cm with use of a dedicated, pre-packaged wipe. The wipe was moistened with de-ionized water before sample collection. Both vertical and horizontal sweeps of the area sampled were made with the wipe. The wipe was then placed in 4 oz. wide mouth jar and sealed.	TAL Metals
MART-RD02-G	May 6, 2008	1353 - 1355	28.0085º N, 97.2178º W	Dust sample collected from the north kitchen window, adjacent to kitchen table. The window sill was made of wood and painted with light green paint. There was no evidence of cracking paint. There was very little visible red dust on the kitchen window sill and homeowner stated that the window sill had been cleaned within the last week. The dust sample was collected from a pre-measured area approximately 8 cm x 12 cm with use of a dedicated, pre-packaged wipe. The wipe was moistened with de-ionized water before sample collection. Both vertical and horizontal sweeps of the area sampled were made with the wipe. The wipe was then placed in 4 oz. wide mouth jar and sealed.	TAL Metals

TABLE 1
LEO MILLER ROAD SAMPLE SUMMARY

SAMPLE ID	SAMPLING DATE	SAMPLING TIME (Hours)	SAMPLE LOCATION	SAMPLE DESCRIPTION	ANALYSIS
SAL-RD03-G	May 6, 2008	1222- 1225	28.0159º N, 97.2131ºW	Dust sample collected from the south bedroom window of the house trailer. The window sill was made of plastic and painted with white paint. There was visible red dust on the south bedroom window sill. Observation of the window sill indicated that it had not been cleaned in sometime. The dust sample was collected from a pre-measured area approximately 8 cm x 12 cm with use of a dedicated, pre-packaged wipe. The wipe was moistened with de-ionized water before sample collection. Both vertical and horizontal sweeps of the area sampled were made with the wipe. The wipe was then placed in 4 oz. wide mouth jar and sealed.	TAL Metals
SAL-RD04-G	May 6, 2008	1210 -1215	28.0159º N, 97.2131ºW	Dust sample collected from the middle dining room window sill inside the main residential home. The window sill was made of varnished wood. There was visible red dust on the dining room window sill that was designated to be sampled. Observation of the window sill indicated that it had not been cleaned in sometime. The dust sample was collected from a pre-measured area approximately 9 cm x 11 cm with use of a dedicated, pre-packaged wipe. The wipe was moistened with de-ionized water before sample collection. Both vertical and horizontal sweeps of the area sampled were made with the wipe. The wipe was then placed in 4 oz. wide mouth jar and sealed.	TAL Metals
SAL-RD04-G	May 6, 2008	1210 -1215	28.0159º N, 97.2131ºW	Duplicate sample of SAL-RD04-G. Dust sample collected from the middle dining room window sill inside the main residential home. The window sill was made of varnished wood. There was visible red dust on the dining room window sill that was designated to be sampled. Observation of the window sill indicated that it had not been cleaned in sometime. It was collected from an area adjacent to Sample SAL-RD04-G. The dust sample was collected from a pre-measured area approximately 9 cm x 11 cm with use of a dedicated, pre-packaged wipe. The wipe was moistened with de-ionized water before sample collection. Both vertical and horizontal sweeps of the area sampled were made with the wipe. The wipe was then placed in 4 oz. wide mouth jar and sealed.	TAL Metals

TABLE 1
LEO MILLER ROAD SAMPLE SUMMARY

SAMPLE ID	SAMPLING DATE	SAMPLING TIME (Hours)	SAMPLE LOCATION	SAMPLE DESCRIPTION	ANALYSIS
BENN-RD06-G	May 7, 2008	1330 - 1332	28.0187º N, 97.2110ºW	Dust sample collected from the southwest window sill in the southeast bedroom. The window sill was made of wood and painted white. There was very little visible red dust on the south window sill. Observation of the window sill indicated that it had been cleaned within the last week. The dust sample was collected from a pre-measured area approximately 10 cm x 10 cm with use of a dedicated, pre-packaged wipe. The wipe was moistened with de-ionized water before sample collection. Both vertical and horizontal sweeps of the area sampled were made with the wipe. The wipe was then placed in 4 oz. wide mouth jar and sealed.	TAL Metals
BENN-RD07-G	May 7, 2008	1336 - 1338	28.0187º N, -97.2110º W	Dust sample collected from the southeast window sill, below the air conditioning unit, in the southeast bedroom. The window sill was made of wood and painted white. There was visible red dust on the southeast window sill, below the air conditioning unit. The dust sample was collected from a pre-measured area approximately 12 cm x 14 cm with use of a dedicated, pre-packaged wipe. The wipe was moistened with de-ionized water before sample collection. Both vertical and horizontal sweeps of the area sampled were made with the wipe. The wipe was then placed in 4 oz. wide mouth jar and sealed.	TAL Metals
BKG-RD08-G	May 6, 2008	1523 - 1525	27.9631º N, 97.1955º W	Dust sample collected from the south bedroom window sill The window sill was made of wood, metal and plaster. Plaster has eroded, exposing metal which has rusted. There wan no visible evidence of red dust; however, there was visible grayish-brown colored dust on window sill. The dust sample was collected from a pre-measured area approximately 8 cm x 12 cm with use of a dedicated, pre-packaged wipe. The wipe was moistened with de-ionized water before sample collection. Both vertical and horizontal sweeps of the area sampled were made with the wipe. The wipe was then placed in 4 oz. wide mouth jar and sealed. This sample served as a background dust/wipe sample.	TAL Metals

TABLE 1
LEO MILLER ROAD SAMPLE SUMMARY

SAMPLE ID	SAMPLING DATE	SAMPLING TIME (Hours)	SAMPLE LOCATION	SAMPLE DESCRIPTION	ANALYSIS
BKG-RD09-G (Background)	May 6, 2008	1528 - 1530	27.9631º N, 97.1955º W	Dust sample collected from the north bedroom window sill The window sill was made of wood, metal and plaster. Plaster has eroded, exposing metal which has rusted. There wan no visible evidence of red dust; however, there was visible grayish-brown colored dust on window sill and in larger amount than in south bedroom The dust sample was collected from a pre-measured area approximately 8 cm x 12 cm with use of a dedicated, pre-packaged wipe. The wipe was moistened with de-ionized water before sample collection. Both vertical and horizontal sweeps of the area sampled were made with the wipe. The wipe was then placed in 4 oz. wide mouth jar and sealed. This sample also served as a background dust/wipe sample.	TAL Metals
BK-RD10-G	May 6, 2008	1200 - 1201	Not Applicable	Blank wipe sample. The dedicated, pre-packaged wipe was moistened with de-ionized water and placed directly into a 4 oz. wide mouth glass jar and sealed.	TAL Metals

KEY		
BK – Blank	**BKG** - Background	**cm**- centimeters
ºC – degrees Celsius	**G** – Grab	**GW** – Groundwater
mg/L – milligrams per Liter	**mS/cm** – milliSeimans per centimeter	**MS/MSD** – Matrix Spike/Matrix Spike Duplicate
N – North	**RML** – Red Mud Lagoon	**RD** – Red Dust
RM – Red Mud	**TAL** – Target Analyte List	**W** – West

TABLE 2
Red Mud Sampling Results: TAL Metals, Silicon, and Grain Size

Sample Number	RML1-RM01-G	RML1-RM02-G	RML1-RM05-G	RML2-RM03-G	RML2-RM04-G
Lab ID No.	T22120-1	T22120-2	T22120-3	T22120-4	T22120-5
QC Sample	No	No	Duplicate of RML-RM02-G	No	MS/MSD
Date Collected	05/08/08	05/08/08	05/08/08	05/08/08	05/08/08
Dilution Factor	20 (1 for Mercury)	20 (1 for Mercury)	20 (1 for Mercury)	20 (1 for Mercury)	20 (1 for Mercury)
Percent Solids (Accutest)	55.10%	79.50%	78.30%	71.60%	80.80%
Percent Solids (Xencon)*	56.70%	78.10%	81.00%	78.70%	73.70%
TAL Metals/Mercury, Silicon, and /Grain Size	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aluminum	58,300 JH	57,300 JH	56,000 JH	75,100 JH	70,600 JH
Antimony	< 29 JL	< 23 JL	< 18 JL	< 23 JL	< 22 JL
Arsenic	58.4	51.3	47.8	54.1	45.7
Barium	< 580	< 460	< 360	< 450	< 440
Beryllium	< 14	< 12	< 9.0	< 11	< 11
Cadmium	41.6	33.5	33.3	29	17.8
Calcium	45,700	38,300	36,300	35,300	26,500
Chromium	1,090	900	849	797	689
Cobalt	< 140	<120	< 90	< 110	< 110
Copper	91.4	72.9	76.3	59	< 55
Iron	214,000	186,000	182,000	195,000	237,000
Lead	120	98.7	94.8	81.7	71.5
Magnesium	<14,000	< 12,000	< 9000	< 11,000	< 11,000
Manganese	4160 JL	3440 JL	3550 JL	3300 JL	2600 JL
Mercury	0.47	0.54	0.52	0.18	0.1
Nickel	539	424	414	384	233
Potassium	< 14,000	< 12,000	< 9,,000	< 11,000	< 11,000
Selenium	< 29	< 23	< 18	< 23	<,22
Silver	< 29	< 23	< 18	< 23	<,22
Sodium	24,200	24,000	24,400	32,100	33,300
Thallium	< 29	< 23	< 18	< 23	< 22
Vanadium	670	644	596	741	642
Zinc	495	402	394	242	176
Silicon*	782 J+	359 J+	1,050 J+	428 J+	930 J+

KEY

mg/kg - milligrams per kilogram
mm - millimeters
MS/MSD - Matrix Spike/Matrix Spike Duplicate
QC - Quality Control
RM - Red Mud
RML - Red Mud Lagoon
TAL - Target Analyte List
*** -** applicable for only silicon analysis/results
< - less than

DATA QUALIFIERS

JH, J+ - estimated concentration due to out of control MS and MSD percent recoveries, the detected concentration is considered biased high.
JL - estimated concentration due to out of control MS and MSD percent recoveries, the detected concentration is considered biased low.

TABLE 3
Particle Size Range for Red Mud Samples

Sample No.	EPA Sample Results (µm)	SAC Split Sample Results (µm)
RML1-RM01-G (Wet Mud from RMB 1)	0.375 - 20.1*	0.311 - 138.038 *
		0.002 - 1.2**
RML1-RM02-G (Dry Mud from RMB 1)	0.375 - 25.0*	0.182 - 1,659.6*
		1.3 - 4,750**
RML1-RM05-G (Duplicate of RML1-RM02-G)	0.375 - 20.1*	Not Applicable
RML2-RM03-G (Wet Mud from RMB 2)	0.375 - 53.0*	0.182 - 630.957*
		1.4 - 4,700**
RML2-RM04-G (Dry Mud from RMB 2)	0.375 - 53.0*	0.182 - 1659.587*
		3.3 - 4,750**

KEY
***** - ASTM D4464
**** -** ASTM D422
G - Grab sample
SAC - Sherwin Alumina Company
RMB - Red Mud Bed = Red Mud Lagoon
RML - Red Mud Lagoon = Red Mud Bed
µm - micrometers

Appendix D, pp. 38-42

TABLE 4

Particle Size Results by Weight Percent for EPA Red Mud Samples

Sample No.	Particle Size Result (Weight Percent)	
	Greater than 5 µm	Less than 5 µm
RML1-RM01-G (Wet Mud from RMB 1)	43.30%	56.70%
RML1-RM02-G (Dry Mud from RMB 1)	48.71%	51.29%
RML1-RM05-G (Dry Mud from RMB 1)	29.94%	70.06%
RML2-RM03-G (Wet Mud from RMB 1)	66.91%	33.09%
RML2-RM04-G (Dry Mud from RMB 1)	70.43%	29.57%

KEY
G - Grab sample **RMB -** Red Mud Bed = Red Mud Lagoon **RML** - Red Mud Lagoon = Red Mud Bed **µm -** micrometers

Appendix D, pp. 38-42

TABLE 5
Groundwater Quality Parameters from Sampled Residential Water Wells

Sample Number	MART-GW01-G				SAL-GW02-G					BENN-GW03-G				BKG-GW05-G			
Sampling Date	5/6/08				5/6/08					5/7/08				5/6/08			
Purging Interval / Water Quality Parameters	1st PI: 1415 hrs	2nd PI: 1420 hrs	3rd PI: 1425 hrs	4th PI: 1430 hrs	1st PI: 1118 hrs	2nd PI: 1124 hrs	3rd PI: 1129 hrs	4th PI: 1135 hrs	5th PI: 1140 hrs	1st PI: 1355 hrs	2nd PI: 1400 hrs	3rd PI: 1405 hrs	4th PI: 1410 hrs	1st PI: 1540 hrs	2nd PI: 1545 hrs	3rd PI: 1550 hrs	4th PI: 1555 hrs
pH	7.0	7.5	7.5	7.5	7.1	7.7	7.6	7.6	7.6	6.7	7.3	7.4	7.5	7.0	7.0	6.9	7.0
Cond. (mS/cm)	5.5	5.3	5.3	5.4	5.1	5.04	4.99	4.96	5.0	4.3	4.3	4.4	4.4	1.8	1.8	1.7	1.8
Temp. (ºC)	33.0	27.0	26.0	27.0	26.0	24.09	24.8	25.0	24.8	26.0	26.0	26.0	26.0	31.0	27.0	27.0	26.0
DO (mg/L)	6.70	8.10	7.80	7.80	7.8	8.23	8.25	7.86	8.28	8.8	8.5	8.6	8.5	1.0	1.0	1.0	1.0
Turb. (NTUs)	1.00	2.00	9.00	2.00	1.0	0.0	0.0	0.0	0.0	9.00	0.0	0.0	0.0	7.8	8.9	8.7	8.9
Salinity (%)	0.3	0.3	0.3	0.3	0.26	0.26	0.26	0.25	0.26	0.20	0.2	0.2	0.2	0.1	0.1	0.1	0.1
Color	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Odor	None	None	None	None	None	None	None	None	None	Sulfur-like	Sulfur-like	Sulfur-like	Sulfur-like	None	None	None	None

KEY
Cond. - Conductivity
DO - Dissolved Oxygen
G - Grab sample
GW - groundwater
hrs - hours
mS/cm - millisiemens per centimeter
NTU's - Nephelometric Turbidity Units
PI - Purging Interval
Turb. - Turbidity
ºC - Degrees centigrade

TABLE 6
Groundwater Sampling Results: TAL Metals/Mercury and Silicon

Sample Number	EPA MCLs (µg/L)	MART-GW01-G	SAL-GW02-G	BENN-GW03-G	BENN-GW04-G	BKG-GW05-G	SAL-GW06-G
Lab ID No.		T22122-9	T22-122-12	T22-122-1	T22122-2	T22-122-5	T22122-13
QC Sample		MS/MSD	No	No	Duplicate of BENN-GW03-G	No	Field Blank
Date Collected		5/6/08	5/6/08	5/6/08	5/6/08	5/6/08	5/6/08
Dilution Factor		1	1 (5 for Sodium)	1 (5 for Sodium)	1 (5 for Sodium)	1 (5 for Sodium)	1
TAL Metals/Mercury and Silicon		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Aluminum	**50 to 200****	< 200	< 200	< 200	**1,180**	322 UB	< 200
Antimony	**6.0***	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Arsenic	**10.0***	8.7	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Barium	**2000.0***	1,100	1,350	950	950	1,580	< 200
Beryllium	**4.0***	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Cadmium	**5.0***	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Calcium	**NDWS**	**162,000**	21,400	15,600	17,700	26,500	< 5000
Chromium	**100.0***	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Cobalt	**NDWS**	< 50	< 50	< 50	< 50	< 50	< 50
Copper	**1300.0***	< 25	< 25	< 25	< 25	< 25	< 25
Iron	**300****	**8,090**	< 100	< 100	< 100	< 100	< 100
Lead	**15.0***	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Magnesium	**NDWS**	20,200	14,100	11,200	11,500	16,600	< 5,000
Manganese	**50.0****	**964**	< 15	< 15	< 15	20.2	< 15
Mercury	**2.0***	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Nickel	**NDWS**	< 40	< 40	< 40	< 40	< 40	< 40
Potassium	**NDWS**	7,260 JH	< 5,000	< 5,000	< 5,000	5,870 JH	< 5,000
Selenium	**50.0***	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Silver	**100.0****	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Sodium	**NDWS**	142,000	917,000	849,000	836,000	944,000	< 5,000
Thallium	**2.0***	< 10	< 10	< 1 0	< 10	< 10	< 10
Vanadium	**NDWS**	< 50	< 50	< 50	< 50	< 50	< 50
Zinc	**5,000****	**398**	74.6	27.3 UB	24.4 UB	41.9	23.6 UB
Silicon	**NDWS**	11,000 JL	6,790 JL	6,160 JL	7,830 JL	11,300 JL	< 200 R

KEY
G - Grab sample
GW - Groundwater
MCLs - Maximum Contaminant List
MS/MSD - Matrix Spike/Matrix Spike Duplicate
NDWS - No drinking water standard
QC - Quality Control
TAL - Target Analyte List
µg/L - micrograms per liter
< - Less than
***** - Primary Drinking Water Standard
****** - Secondary Drinking Water Standard
Highlight - detected concentration exceed three times the detected background concentration (BCK-GW05)
DATA QUALIFIERS
JH - estimated concentration due to out of control MS and MSD percent recoveries, thus the detected concentration is considered biased high.
JL - estimated concentration due to out of control MS and MSD percent recoveries, thus the detected concentration is considered biased low.
UB - detected concentrations in method blank exceeded the instrument detection limit, but were less than the laboratory reporting limit. The detected concentrations may be the result of laboratory contamination.
R - laboratory reporting limits considered unusable

TABLE 7
Wipe Sampling Results: TAL Metals

Sample Number	BK-RD10-G	MART-RD01-G	MART-RD02-G	SAL-RD03-G	SAL-RD04-G	SAL-RD05-G	BENN-RD06-G	BENN-RD07-G	BKG-RD08-G	BKG-RD09-G
Lab ID No.	T22122-8	T22122-10	T22122-11	T22122-14	T22122-15	T22122-16	T22122-3	T22122-4	T22122-6	T22122-7
QC Sample	No	No	No	No	No	Duplicate	No	No	No	No
Date Collected	5/6/2008	5/6/08	5/6/08	5/6/08	5/6/08	5/6/08	5/7/08	5/7/08	5/7/08	5/7/08
Dilution Factor	1	1	1 (5 for Thallium)	1	1 (5 for Thallium)	1	1	1 (5 for Thallium)	1 (5 for Thallium)	1 (5 for Thallium)
TAL Metals	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe
Aluminum	< 20	**2,630**	462	807	704	572	87.5	342	164	**544**
Antimony	< 0.50	**0.88**	< 0.50	1.1	2.9	1.4	< 0.50	0.57	< 0.50	**< 0.50**
Arsenic	< 0.50	1.3	0.56	0.76	0.85	0.62	0.64	1.8	0.68	**0.78**
Barium	< 20	**30.9**	< 20	**27.0**	< 20	< 20	< 20	< 20	< 20	**< 20**
Beryllium	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	**< 0.50**
Cadmium	< 0.40	**0.5**	< 0.40	**5.2**	**1.8**	**1.3**	< 0.40	< 0.40	< 0.40	**< 0.40**
Calcium	< 500	5,010	942	973	1,260	838	< 500	610	1,920	**4,510**
Chromium	< 1.0	**18.6**	**4.8**	**5.2**	**4.8**	**3.9**	< 1.0	**4.2**	< 1.0	**< 1.0**
Cobalt	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	**< 5.0**
Copper	< 2.5	5.1	< 2.5	< 2.5	2.9	2.5	< 2.5	3.8	< 2.5	**4.4**
Iron	**13.2**	**3,920**	987	1,220	964	740	110	881	850	**907**
Lead	**3.6**	5.2	1.1	4.7	**1,290**	**1,410**	0.75	1.1	1.2	**3.2**
Magnesium	< 500	**2,140**	< 500	< 500	< 500	< 500	< 500	< 500	< 500	**< 500**
Manganese	< 1.5	**84.9**	22.5	28.1	21.0	16.8	2.7	19	6.1	**9.9**
Nickel	< 4.0	**10.4**	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	**< 4.0**
Potassium	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	**612**
Selenium	< 0.50	< 0.50	< 0.50	< 0.50	0.56	< 0.50	0.51	0.61	< 0.50	**0.56**
Silver	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**< 1.0**
Sodium	< 500	1,010	1,190	< 500	1,160	892	< 500	< 500	1,050	**1,440**
Thallium	< 0.50	< 0.50	< 2.5	< 0.50	< 2.5	< 0.50	< 0.50	< 2.5	< 2.5	**< 2.5**
Vanadium	< 5.0	13.4	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	**< 5.0**
Zinc	**5.9**	68.2	21.4	160	54.9	25.6	29.1	41.4	90.5	**383**

KEY

BENN - (b) (6) Residence
BK - Blank
BKG - Background
MART - (b) (6) Residence
NA - Not Analyzed
QC - Quality Control
SAL - (b) (6) Residence
TAL - Target Analyte List
< - Less than
µg - micrograms
Highlight - detected concentrations exceed three times the background concentration (BKG-RD09-G)

APPENDIX A

Copy of the TDD No. TO-0009-08-01-01

EPA
U.S. EPA
Washington, DC 20460

START3
Technical Direction Document

Assessment / Inspection Activities
- CERCLA Funded (0009)
Dynamac Corporation

TDD #: TO-0009-08-01-01
Contract: EP-W-06-077

! = required field

TDD Name:	Leo Miller Road	! Period:	Base Period
! Purpose:	Work Assignment Initiation		
! Priority:	High	! Start Date:	01/28/2008
Overtime:	Yes	! Completion Date:	04/28/2008
! Funding Category:	Removal Support	Invoice Unit:	
! Project/Site Name:	Leo Miller Road		
Project Address:	Leo Miller Road & CR 96	Activity:	Site Inspection (SI)
County:	San Patricio	Work Area Code:	
City, State:	Taft, Texas	Activity Code:	SI
Zip:	78390	EMERGENCY CODE:	
! SSID:	A6B8	FPN:	
CERCLIS:	TXN000606818	Performance Based:	No
Operable Unit:			

Authorized TDD Ceiling:	Cost/Fee	LOE (Hours)
Previous Action(s):	$0.00	0.0
This Action:	$10,000.00	0.0
New Total:	$10,000.00	0.0

Specific Elements

Description of Work:
The contractor shall develop a work plan for the site investigation. The contractor shall utilize the EPA guidance for performing site investigation. All activities shall be coordinated with point of contact Jon Rinehart 214-665-6789 WAM. START shall contact Jon Rinehart after receipt of the TDD.

SFO: 22

Line	DCN	IFMS	Budget / FY	Approp. Code	Budget Org Code	Program Element	Object Class	Site Project	Cost Org Code	Amount
1	PLC022	AAV	07	T	6A00P	302DD2C	2505	A6B8SI00	C001	$10,000.00

Funding Summary:	Funding
Previous:	$0.00
This Action:	$10,000.00
Total:	$10,000.00

Funding Category
Removal Support

Section

: Jon Rinehart **Date:** 01/28/2008
Phone #:

Project Officer: Linda Carter **Date:** 01/28/2008
Contracting Officer: Cora Stanley **Date:** 01/29/2008
Contractor Contact: Debra Pandak **Date:** 01/29/2008

EPA

U.S. EPA
Washington, DC 20460

START3
Technical Direction Document

Assessment / Inspection Activities
- CERCLA Funded (0009)
Dynamac Corporation

TDD #: TO-0009-08-01-01
Amendment#:A
Contract: EP-W-06-077

! = required field

TDD Name:	Leo Miller Road	! Period:	Base Period
! Purpose:	Change Period of Performance, Incremental Funding, Change of WAM		
! Priority:	High	! Start Date:	01/28/2008
Overtime:	Yes	! Completion Date:	08/31/2008
! Funding Category:	Removal Support	Invoice Unit:	
! Project/Site Name:	Leo Miller Road		
Project Address:	Leo Miller Road & CR 96	Activity:	Site Inspection (SI)
County:	San Patricio	Work Area Code:	
City, State:	Taft, Texas	Activity Code:	SI
Zip:	78390	EMERGENCY CODE:	
! SSID:	A6B8	FPN:	
CERCLIS:	TXN000606818	Performance Based:	No
Operable Unit:			

Authorized TDD Ceiling:	Cost/Fee	LOE (Hours)
Previous Action(s):	$10,000.00	0.0
This Action:	$27,580.00	0.0
New Total:	$37,580.00	0.0

Specific Elements

Description of Work:
Amendement A changes the period of performance, provides incremental funding per contractor's cost estimate dated April 11, 2008, and changes the WAM to Bret Kendrick.
The contractor shall develop a work plan for the site investigation. The contractor shall utilize the EPA guidance for performing site investigation. All activities shall be coordinated with point of contact Jon Rinehart 214-665-6789 WAM. START shall contact Jon Rinehart after receipt of the TDD.

SFO: 22

Line	DCN	IFMS	Budget / FY	Approp. Code	Budget Org Code	Program Element	Object Class	Site Project	Cost Org Code	Amount
1	PLC022	AAV	07	T	6A00P	302DD2C	2505	A6B8SI00	C001	$27,580.00

Funding Summary:	Funding
Previous:	$10,000.00
This Action:	$27,580.00
Total:	$37,580.00

Funding Category
Removal Support

Section
: Bret Kendrick — **Date:** 04/14/2008
Phone #:
Project Officer: Linda Carter — **Date:** 04/15/2008
Contracting Officer: Cora Stanley — **Date:** 04/15/2008
Contractor Contact: Debra Pandak — **Date:** 04/15/2008

EPA
U.S. EPA
Washington, DC 20460

START3
Technical Direction Document

Assessment / Inspection Activities
- CERCLA Funded (0009)
Dynamac Corporation

TDD #: TO-0009-08-01-01
Amendment#:B
Contract: EP-W-06-077

! = required field

TDD Name:	Leo Miller Road	! Period:	Base Period
! Purpose:	Change Period of Performance		
! Priority:	High	! Start Date:	01/28/2008
Overtime:	Yes	! Completion Date:	10/03/2008
! Funding Category:	Removal Support	Invoice Unit:	
! Project/Site Name:	Leo Miller Road		
Project Address:	Leo Miller Road & CR 96	Activity:	Site Inspection (SI)
County:	San Patricio	Work Area Code:	
City, State:	Taft, Texas	Activity Code:	SI
Zip:	78390	EMERGENCY CODE:	
! SSID:	A6B8	FPN:	
CERCLIS:	TXN000606818	Performance Based:	No
Operable Unit:			

Authorized TDD Ceiling:	Cost/Fee	LOE (Hours)
Previous Action(s):	$37,580.00	0.0
This Action:	$0.00	0.0
New Total:	$37,580.00	0.0

Specific Elements

Description of Work:
Amendment B Extends the period of performance to October 3, 2008.

Amendement A changes the period of performance, provides incremental funding per contractor's cost estimate dated April 11, 2008, and changes the WAM to Bret Kendrick.
The contractor shall develop a work plan for the site investigation. The contractor shall utilize the EPA guidance for performing site investigation. All activities shall be coordinated with point of contact Jon Rinehart 214-665-6789 WAM. START shall contact Jon Rinehart after receipt of the TDD.

SFO:

Line	DCN	IFMS	Budget / FY	Approp. Code	Budget Org Code	Program Element	Object Class	Site Project	Cost Org Code	Amount
1										$0.00

Funding Summary:	Funding
Previous:	$37,580.00
This Action:	$0.00
Total:	$37,580.00

Funding Category
Removal Support

Section
: Bret Kendrick **Date:** 08/20/2008 **Phone #:**
Project Officer: Linda Carter **Date:** 08/20/2008
Contracting Officer: Cora Stanley **Date:** 08/21/2008
Contractor Contact: Debra Pandak **Date:** 08/21/2008

EPA
U.S. EPA
Washington, DC 20460

START3
Technical Direction Document

Assessment / Inspection Activities
- CERCLA Funded (0009)
Dynamac Corporation

TDD #: TO-0009-08-01-01
Amendment#:C
Contract: EP-W-06-077

! = required field

TDD Name:	Leo Miller Road	! Period:	Base Period
! Purpose:	Change Period of Performance		
! Priority:	High	! Start Date:	01/28/2008
Overtime:	Yes	! Completion Date:	12/31/2008
! Funding Category:	Removal Support	Invoice Unit:	
! Project/Site Name:	Leo Miller Road		
Project Address:	Leo Miller Road & CR 96	Activity:	Site Inspection (SI)
County:	San Patricio	Work Area Code:	
City, State:	Taft, Texas	Activity Code:	SI
Zip:	78390	EMERGENCY CODE:	
! SSID:	A6B8	FPN:	
CERCLIS:	TXN000606818	Performance Based:	No
Operable Unit:			

Authorized TDD Ceiling:	Cost/Fee	LOE (Hours)
Previous Action(s):	$37,580.00	0.0
This Action:	$0.00	0.0
New Total:	$37,580.00	0.0

Specific Elements

Description of Work:
Amendment C extends the period of performance to December 31, 2008 to allow for edits to report. There is no increase to cost/fee.
Amendment B Extends the period of performance to October 3, 2008.
Amendement A changes the period of performance, provides incremental funding per contractor's cost estimate dated April 11, 2008, and changes the WAM to Bret Kendrick.
The contractor shall develop a work plan for the site investigation. The contractor shall utilize the EPA guidance for performing site investigation. All activities shall be coordinated with point of contact Jon Rinehart 214-665-6789 WAM. START shall contact Jon Rinehart after receipt of the TDD.

SFO:

Line	DCN	IFMS	Budget / FY	Approp. Code	Budget Org Code	Program Element	Object Class	Site Project	Cost Org Code	Amount
1										$0.00

Funding Summary:	Funding
Previous:	$37,580.00
This Action:	$0.00
Total:	$37,580.00

Funding Category
Removal Support

Section
: Bret Kendrick **Date:** 09/30/2008 **Phone #:**
Project Officer: Linda Carter **Date:** 09/30/2008
Contracting Officer: Cora Stanley **Date:** 10/01/2008
Contractor Contact: Debra Pandak **Date:** 10/02/2008

APPENDIX B

Copy of Logbook Notes

"Rite in the Rain"®
ALL-WEATHER WRITING PAPER

ALL-WEATHER
ENVIRONMENTAL FIELD BOOK

Name Lea Miller Road SI site

Address Taft, Aransas/San Patricio Counties, TX

Phone TXN000606818

Project TDD# TO-0009-08-01-01
EPA Site Assessment Manager: Brit Fendrick

This book is printed on "Rite in the Rain" All-Weather Writing Paper - A unique paper created to shed water and enhance the written image. It is widely used throughout the world for recording critical field data in all kinds of weather. For best results, use a pencil or an all-weather pen.

Specifications for this book

Page Pattern		Cover Options	
Left Page	Right Page	Polydura Cover	Fabrikoid Cover
Columnar	1/4" Grid	Item No. 550	Item No. 550F

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3	Activities for 5/5/08	
5	Activities for 5/6/08	
22	Activities for 5/7/08	
30	Activities for 5/8/08	
40-45	Sample Summary Chart	
136 to 143	Photo-Documentation Log	

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149 Sampling guidelines (Solids)
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151 PVC Pipe casing tables
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155 Conversions (Concentrations, Volume/Flow or Time, Velocity, Acceleration)
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PAGE	REFERENCE	DATE

Location Leo Miller Road-SI Date 5/5/08

Project / Client Taft, TX TDD# TO-0009-08-01-01

TXN0006-06818

0730hrs START Cowan, Field Team Lead (FTL) arrives at dynamac office to pick up supplies.

0815hrs START Cowan departs Dynamac office to pick up START Biscocho

0840hrs Arrive at ~~START~~ Biscocho's residence.

0845hrs START's Cowan & Biscocho depart Dallas, TX for Portland, TX

1000hrs START's Stop in Italy, TX to ~~pick up~~ fuel Rental Van

1245hrs START's STOP in Navasota, Texas for Lunch

1345hrs START's depart Navasota for Portland, TX.

1630hrs START's arrive at Hotel in Portland & check in.

1845hrs START Cowan receives call from OSC SAM Kendrick. There has been a change in Plans. EPA Kendrick/Cole

Location Leo Miller Rd SI Date 5/5/08

Project / Client Taft, TX; TXN000606818

TDD# TO-0009-08-01-01

Will meet (b) (6) [redacted] at TCEQ Dist. Office at 0700 hrs tomorrow morning to discuss Leo Miller Site with TCEQ officials. Will meet at Ms. (b) (6) [redacted] home after the meeting. SAM Bret Fondrick will contact START when meeting is over.

End of Day

S. Cowan

Location Leo Miller Rd-SI Date 5/6/08

Project / Client Taft, TX, TXN000606818

TDD# TO-0009-08-01-01

0700hrs START Cowan conducts HAS meeting (Attendee: N. Biscocho, Objectives: Collect groundwater + Dust samples from two residences, TBD- Topics Discussed: Site History Site Hazards, operations for day, Level of PPE: Level D Physical Hazards, such as slip/trip/fall, Chemical Hazards: Inorganic Metals, Biological Hazards: insects/spiders near water wells, possible dogs + cats Route to Hospital + Emergency Contacts.

0730hrs START's prepare Van for today's activities.

1000hrs START Cowan receives phone call from EPA SAM Fondrick, instructing START to proceed to (b) (6) [redacted] Residence

1030hrs START arrive at Salinas residence await EPA SAM

SC

Location Leo Miller Rd - SI Date 5/6/08

Project / Client TXN000606818

TDD# TO-0009-08-01-01

+ Ms (b) (6) [redacted] sc

(b) (6) [redacted] Residence: (b) (6) [redacted]

(b) (6) [redacted]

1045hrs Calibrate Horiba U-10 Water Quality Inst. SN: 10134, with Auto Cal Solution, Lot# 6223 sc

pH = 4.00 sc

Cond = 4.49 mS/cm sc

Turbidity: 0.0 NTU sc

DO = 8.68 sc

Temp: 24.1°C sc

Sal = 0.23% sc

1100hrs START Collects Sample # SAL-GW06-G (Blank H2O Water Sample

1105hrs End Sample Time at SAL-GW06-G (Deionized H2O)

1118hrs Begin to Purge (b) (6) [redacted] Water Well sc

See GW log for specific information. sc

1145hrs End Purge Time, Begin Sample Collection Time

sc

Location Leo Miller Rd - SI Date 5/6/08

Project / Client TXN000606818

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for SAL-GW02-G (b) (6) [redacted] Water Well) See GW Log for specific water quality parameters sc

1147hrs End Sampling time at SAL-GW-02-G. pH = 2.5 may need to add additional acid to preserve to pH of 2.0.

1200hrs START collects wipe sample BW-RD10-G (Blank Sample) Use pre wipe to collect. Place in Jar.

1205hrs: Proceed to (b) (6) [redacted] 1st Floor Dining Room. Decide to collect wipe sample from middle window. Window sill is wood with varnish. Cannot use SFC 10 cm x 10 cm template due to size of window sill. Measure an area of 9 cm x 11 cm in which to collect wipe sample SAL-RD04-G.

1206hrs Using clean nitrile gloves, START uses a pre-packaged 15cm x 15cm

sc

Location Lee Miller Rd-SI Date 5/6/08

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TDD# TO-0009-08-01-01

wipe to collect wipe sample from 9 cm X 11cm area. Saturated wipe with deionized H_2O. Collect in vertical motion, followed by horizontal motion. After photographing collected wipe sample, wipe is placed in 4 oz wide-mouth glass jar and capped shut. SC

1210hrs START measures area adjacent to Sample SAL-RD04-G, in order to collect duplicate sample SAL-RD05-G. Area measured is 9 cm X 11 cm. Using new 15cm X 15cm wipe & new gloves START begins to collect wipe sample SAL-RD05-G from middle window sill at (b) (6) [redacted] Residence Dining Room.

1215hrs End Sample Time for SAL-RD05-G collected in same manner as SAL-RD04-G. SC

1216hrs START proceeds upstairs to locate sampling Location SAL-RD03-G. SC

Location Lee Miller Rd-SI Date 5/6/08

Project / Client TXN0006060818

TDD# TO-0009-08-01-01

EPA/START decide that upstairs window sills not adequate to collect wipe sample.

1219hrs Proceed to House Trailer located behind (b) (6) [redacted] Resid. Ms (b) (6) [redacted] mother lives in trailer. Decide to collect Wipe Sample SAL-RD03-G from South bedroom window due to amount of accumulated rod dust. Window sill made of plastic, painted white. Can visibly see rod dust on window sill/ledge. Due to size of window sill/ledge, cannot use SFC Template. Measure area 8 cm X 12 cm = 96 sq cm surface area. SC

1221hrs START Prepares to collect sample SAL-RD03-SI G with new pair of nitrile gloves & 15cm X 15 cm, prepackaged wipe.

1222hrs START begins to collect wipe sample SAL-RD03-G. Collected SC

Location Lee Miller Rd-SI Date 5/6/08

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in same manner as SAL-RD04-6.

1225hrs End Sample time at SAL-RD04-06. Window faces Red Mud Lagoon #2 ~~Site~~ See photo log for photo's taken for sample station SAL-RD03-6. SC

1230hrs START's proceed to front of (b) (6) [redacted] & collect 2 photo's. See Photo log for description of photos. End sampling activities at (b) (6) [redacted] Residence. START places all collected samples in coolers containing ice. Load Equipment

1235hrs START depart site for Lunch

1335hrs START's arrive at (b) (6) [redacted] (b) (6) [redacted] Residence located on (b) (6) [redacted]. EPA SAM Fendrick/Cook have located two wipe sample locations in (b) (6) [redacted] residence, South bedroom & Kitchen.

1340hrs START's prepare for wipe SC

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Sampling in (b) (6) [redacted] South bedroom window sill/Ledge. Window Sill/Ledge is 8cm wide, will not be able to use STC Template measure area 8cm X 12cm near northern section of window sill/ledge. Window sill is wood, w/ light tan, cracking paint

1345hrs START collects wipe sample MART-RD01-G from South bedroom window sill/Ledge. Collect with pre package 15cm X 15cm saturated wipe, from 8cm X 12cm area, collected in same manner as SAL-RD04-G. SC

1350hrs End Sample time for MART-RD01-G. Proceed to (b) (6) [redacted] Kitchen to collect wipe sample MART-RD02-G. See photo log for photo's taken for sample MART-RD01-G

1352hrs ~~window~~ See North Kitchen window, adjacent to Kitchen Table, measured width is SC

Location Leo Miller Rd SI Site Date 5/6/08

Project / Client TMN000606818

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8 cm., not wide enough to use STC 10cm x 10cm Template. Measure 8cm x 12cm area near Northern Section on North Kitchen window. Window sill / ledge is wood, with light green paint, which has peeled off in some locations. ——— SC

1353hrs START Comm collects wipe sample MART-RD02-G, collected with new set of nitrile gloves + new 15cm x 15cm pre-packaged wipe saturated with de-ionized water. Red dust was obtained from Kitchen window sill / ledge, but not in same quantities as in (b) (6) ~~Bath~~ SC South bedroom. Ms. (b) (6) said she had cleaned window sill several days before START arrived to collect samples.

1355hrs End Sample time for MART-RD02-G. Complete wipe sampling at (b) (6) resid. Proceed to van to get equipment SC ~~See Photo log for photos associated with wipe samples~~

Location Leo Miller Rd SI Date 5/6/08

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to purge (b) (6) water well. Is water hose attached to well spigot. Will purge with water hose connected to well spigot. ——— SC

1415hrs Begin purging by turning spigot on well on + collect initial water quality parameters ~~See G~~ SC Initial Water Quality Time: 1415 pH = 7.0 ; cond: 5.5 mS/cm ; Temp: 33°C ; DO = 6.7 mg/L Turbidity: 1.0 NTU Salinity: 0.30 % See Specific Groundwater Well Log for additional H_2O quality parameters during purging.

1430hrs End Purging timout (b) (6) well. Final set of water quality readings prior to collecting water sample MART-GW01-G: Time: 1430 ; pH = 7.5 ; cond: 5.4 mS/cm ; Temp: 27°C ; DO = 7.8 mg/L ; Turb = 1.0 NTU Sal: 0.30 % ——— SC

1434hrs Begin sample collection for MART-GW01-G after detaching

SC

Location Lee Miller Rd SI Site Date 5/6/08

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water hose from spigot. Designate this sample as QA/QC & collect triple volume (3, 1-liter Poly's). Collect by allowing water from well spigot to flow directly into each separate 1-Liter, pre-preserved poly — sc

Water Quality ~~Parameters~~ Parameters at time of sampling: pH=7.6 Cond.: 5.30 mS/cm; Temp: 26 C; Turb: 0 NTUs; DO: 8.0 mg/L; Sal. = 0.30% — sc

1437hrs End Sample time at MART-GW01-G. See PhotoLog for photo's related to gw sampling at (b) (6) [redacted] residence

1440hrs START Loads up rental van with equipment. START will follow MS (b) (6) [redacted] & EPA to background location located in Angelside, TX, ≈ 25 minutes SE of Lee Miller Road. — sc

Location Lee Miller RD SI Site Date 5/6/08

Project / Client TXN000606818

~~TXN~~ TDD# TO-0009-08-01-01

1445hrs All activities concluded at (b) (6) [redacted] Residence. Proceed to Angelside to collect background samples. Get GPS reading for Water Well location before leaving Martinez's 28° 00.513' N & 097° 13.066' W

1510hrs Arrive at Angelside. MS (b) (6) [redacted] father not at home. She talks with neighbor (b) (6) [redacted] who consents to allow EPA/START to collect wipe & groundwater samples. Mr. (b) (6) [redacted] address is (b) (6) [redacted] phone Number: (b) (6) [redacted]. EPA START proceed inside residence to determine wipe sample locations. Decide to collect 1 wipe sample (BFG-RD08-G) from Southbedroom windowsill/Ledge & 2nd sample (BFG-RD09-G) from North bedroom. Residence contains numerous cats & dogs. — sc

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1520 START measures South bedroom window sill/Ledge: 8 cm wide. Will not be able to Use SFC Template Will collect from an area of 8cm x 12cm = 96 cm^2 Window Sill/Ledge is made of metal, wood + plaster. Plaster have eroded from sill, leaving rusted metal. Ledge/sill is painted white, alot of dust on ledge/sill.

1523 START Biscoche collects wipe sample BFG-RD08-6 with pre-packed wipe saturated with de-ionized H_2O. Collected in same manner as previous collected wipe samples.

1525 End Sample time at BFG-RD08-6 Take photo of collected wipe sample See photo Log for description. START proceeds to North bedroom

1527hrs START measures north bedroom window sill/Ledge after decanning rotor w/ deionized water. Window

SC

Location Leo Miller Rd SI Date 5/6/08

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Sill measures 8cm in width. Will have to measure an area 8cm X 12cm = 96 cm^2 to collect wipe sample BFG-RD09-~~0~~ 6. SC

1528hrs After changing gloves START Biscoche collects sample BFG-RD09-6 with pre packaged wipe. Collected in same manner as previous wipe sample Ledge is made of metal wood + plaster; plaster has decayed and fallen off in some locations exposing rusted metal. Appears to be more dust on this window sill/Ledge SC

1530hrs. End Sample Time at BFG-RD09-6. See Photo Log for picture of collected wipe sample. SC

1532hrs START proceeds outside to [redacted] Water Well.

1534 START Biscoche collects photos of North + South Bedroom windows from outside. See Photo Log

SC

Location Lee Miller Rd ST Date 5/6/08

Project / Client TXN000606818

TDD# TO-0009-08-01-01

1535hrs START prepares to purge [redacted] water well. According to Mr [redacted] well is approximately 75' in depth. He did not know the size of well casing or depth to H_2O. He said the well was put in by his father many years ago. The well is only used for watering the lawn. It is not used for drinking, bathing, or washing dishes. Well is located in backyard & is covered with a small wooden shed (See Photo Log)

1540hrs START collects 1st set (initial) water quality parameters & begins to purge well.
Time: 1540hrs; pH: 7.0; cond: 1.8 mS/cm; Temp. 31°C; DO: 7.8 mg/L; Turb: 1NTU & Sal: 0.10% (Disconnect water hose from well spigot).

1545hrs Collect second set of H_2O quality readings. See Specific GW Well Information Sheet for

SC

Location Lee Miller Rd ST Date 5/6/08

Project / Client TXN000606818

TDD# TO-0009-08-01-01

~~1550~~ 2nd set of readings. pH & cond. have stabilized; Temp° & DO have not stabilized

1550hrs Collect 3rd set of water quality reading while purging. pH, Cond, & Temp have stabilized DO has not stabilized. See [redacted] Groundwater Well Info sheet for actual readings. SC

1555hrs Collect 4th set of water quality readings. All readings have stabilized. Have completed purging of [redacted] Well SC

START Biscocho collects SC sample BFG-GW05-G by allowing water to flow directly into 1-Liter, pre-preserved Poly, from well spigot. SC

Water Quality Readings for sample: pH = 7.0; cond.: 1.8 mS/cm; Temp. 26°C; DO: 8.9 mg/L; Sal. = 0.10%; Turb. 1 NTU.

SC

Location Leo Miller Rd SI Date 5/6/08

Project / Client TXN 0006006818

TDD# TO-0009-08-01-01

1556hrs End Sample Time for BKG-GW05-G START shuts off water from well. EPA SAM Kendrick breaks off handel on well spigot but it can still turn on/off H2O.

1605hrs START/EPA depart [redacted] Residence & proceed to Hotel in Portland.

1630hrs START arrives at Hotel. START Cowan & EPA SAM Kendrick & EPA NPL coord. Cont discuss site

EPA requests two additional analyses for the radiumed samples to be collected on 5/8 Grain Size & respirable ~~particulate~~ particulates. START Cowan will conduct START LaPierre about respirable particulates & START Grasczyk about two additional analyses

SC

Location Leo Miller Rd SI Date 5/6/08

Project / Client TXN 0006006818

TDD# TO-0009-08-01-01.

1730hrs EPA/START finish site discussions.

All collected groundwater samples (MART-GW01-G, SAL-GW02-G, & BKG-GW05-G & SAL-GW06-G) & wipe samples (MART-RD01-G, MART-RD02-G, SAL-RD03-G, SAL-RD04-G & SAL-RD05-G BKG-RD08-G & BKG-RD09-G) were placed in sample cooler containing 10 lbs of ice & sealed for night. Sample Cooler placed in START Biscocho's room for overnight safe keeping

Steve Cowan

Location Lee Miller Rd-SI Date 5/7/08

Project / Client TXN000606818

TDD# TO-0009-08-01-01

0830 hrs START Briscoe & Cowan meet to enter sampling data into SCRIBE & prepare samples for shipment on 5/8/08. Begin with collected GW samples.

0900 hrs START Cowan contacts START LaPierre about respirable particulates. It is her opinion that we not collect/analyse rad mud for respirable particles due to possible uneven grain sizes. START LaPierre suggests we analyze for respirable particulates if we do high volume air sampling.

0930 hrs START Cowan informs EPA Fondrick of START LaPierre's recommendations concerning resp. particles

1000 hrs START Cowan instructs START Gracyk to ask Lab about grain size analysis

1115 hrs START conducts brief H&S meeting & proceed to meet EPA for lunch.

Location Lee Miller Rd-SI Date 5/7/08

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1255 hrs START/EPA depart Rest. Proceed to (b) (6) [redacted] Residence & (b) (6) [redacted].

1315 hrs START/EPA arrive at (b) (6) [redacted] Residence. Meet with Mr. (b) (6) [redacted]. EPA Fondrick consults w/ Mr. (b) (6) [redacted] about collecting wipe samples from inside house & collection of water well sample. Mr. (b) (6) [redacted] consents to allow sampling. Ms (b) (6) [redacted] informs EPA/START that she cleans window sills at least once a week.

1320 hrs Inspection of Den Area windows indicates very little presence of dust on window sills. Proceed to South bedroom (b) (6) [redacted]. Keep windows in this room boarded up to eliminate/reduce amount of dust entering room.

1325 hrs START's inspect room for

Location Leo Miller Rd-SI Date 5/7/08

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wipe sampling activities. There was small amount of red dust on Southwest window & alot of red dust in Southeast window containing air conditioning unit. Will collect two ~~air~~ wipe samples from the South bedroom: BENN-RD 06-G from Southwest window sill/Ledge & BENN-RD-07-G from Southeast window sill.

1330hrs START Biscoche begins sample collection at BENN-RD06-G from 10cm X 10cm area on Southwest window sill/ledge. Collected with pre-packaged wipe saturated with deionized H_2O. Collected in same manner as previous wipe samples. Window sill made of wood & painted white. Has a small amount of red dust on wipe

1532hrs End Sample Time at

Location Leo Miller Rd-SI Date 5/7/08

Project / Client TXN000606818

TDD# TO

BENN-RD06-G.

~~1534hrs~~ 1334hrs START measures windows sill located in SE corner of South bed room: 12cm x 14cm, next to air conditioning unit, window sill made of wood & painted white is evidence of red dust on sill.

~~1536hrs~~ 1336hrs START Biscoche, after changing gloves, collects wipe sample BENN-RD07-G from SE window sill, adjacent to air conditioner. Collect with new pre-packed wipe saturated w/ deionized water. Collected in same manner as BENN-RD06-G. Is a large amount of red dust on wipe.

~~1538hrs~~ 1338hrs End Sample Time at BENN-RD07-G. See photo log for photos associated w/

1340hrs Samples BENN-RD06+07-G.

~~1540hrs~~ START: proceed outside to collect ~~DW~~ water sample from [redacted] well.

(b) (6)

Location Lee Miller Rd SI Date 5/7/08

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1342 hrs START Cowan prepares PDR-1000 for deployment due to 20 to 30 mile/hour SSE winds.

~~1350 hr~~ START begins to purge

1355 hr (b) (6) [redacted] water well. Initial Water Quality Parameters: Time: 1355 hrs; pH: 6.7; Cond. 4.3 mS/cm; Temp. 26°C; DO: 8.8 mg/L; Sal.: 0.20%; Turb: 9 NTU

1400 hrs START obtains 2nd set of purged H_2O Quality readings: pH: 7.3; cond. 4.3 mS/cm; Temp. 26°C; DO: 8.5 mg/L; Sal.: 0.20%; Turb. 0 NTU. Cond & Temp have stabilized. DO & pH have not stabilized. Continue to purge.

1405 hrs START obtains 3rd set of purged H_2O Quality readings: pH: 7.4; Cond.: 4.4 mS/cm; Temp: 26°C; DO: 8.6 mg/L; Sal.: 0.20% & Turbid: 0 NTU. pH, Cond. & Temp stabilized, DO has not stab.

Location Lee Miller Rd SI Date 5/7/08

Project / Client TXN000606818

TDD# TO-0009-08-01-01

1410 hrs START obtains 4th set of purged H_2O quality readings: pH: 7.5 cond: 4.4 mS/cm; Temp: 26°; DO: 8.5 mg/L; Sal.: 0.20% Turb 0 NTU. All parameters stabilized will begin to collect water samples BENN-GW03-G & BENN-GW04-G (Duplicate). Collect water directly from ~~well~~ spigot into 1 Liter, pre-preserved poly's, by alternating the filling of the bottles SC

1415 hrs End Sample Time for BENN-GW03-G & BENN-GW04-G SC

PDR reading during air sampling: TWA: 0.063 mg/m³ SC

According to Mr. (b) (6) [redacted], well is approximately 290' bgs 4" diameter casing; Depth to H_2O = 6" & Depth from Intake to Pump = 60ft bgs. The distiller has stopped working

Location Lee Miller Rd SI Date 5/7/08

Project / Client TXN000606818

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The [redacted] (b) (6) purchased bottled H2O for drinking. Use well water to water lawn, do laundry & dishes. See Photo Log for photos taken during GW purging/ Sampling activities

1420hrs START begins to load up sampling equipment

1435hrs STARTs depart site. Proceed to [redacted] (b) (6) Resid. to take additional photos

1440hrs Arrive at [redacted] (b) (6) residence See Photo Log for collected photographs

1445hrs STARTs proceed back to Hotel.

1510hrs STARTs arrive at Hotel Begin to package samples for shipment & enter sample data into SCRIBE.

1700hrs START has completed paperwork & packaged all collected GW samples & wipe samples

Location Lee Miller Road SI Date 5/7/08

Project / Client TXN000606818

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Samples placed in cooler with 20 lbs of Ice. Samples will remain in Ice chest until ready for shipment

1705hrs EPA Fendrick calls START. Will meet at Walmart at 0800 hrs tomorrow & proceed to Sherwin Alumina

End of Day

Steve Cox

Location Leo Miller Rd ST Date 5/8/08

Project / Client TXN000606818

TDD# TO-0009-08-01-01

0700hrs START's Comm / Biscacho have H&S meeting. Topics Discussed: Objectives, collection of red mud samples; Physical Hazards: Equipment Operation, working on top of Berms slip/trip/fall; Chemical Hazards metals + caustic nature & wet red mud; Biological: insects; PPE: Modified D (Tyvek + gloves) when collecting wet red mud. Level D when collecting dry red mud; Air Monitoring: Ludlum 19 for Norm. PDR for particulates. Route to Hospital: Same as previous two days

0715hrs START's begin to load Van for today's operations.

0725hrs START Comm zero's PDR

0735hrs START Collects background radiation reading at Hotel: 5-7uR/h

SC

Location Leo Miller Rd. ST Date 5/8/08

Project / Client TXN000606818

TDD# TO-0009-08-01-01

0745hrs START's depart hotel for Wal Mart.

0750hrs START's arrive at Wal Mart Parking Lot. Awaiting for EPA Fendrick + Cook

Weather: Cloudy / Misty, Little Wind ≅ 73°F

0805hrs EPA Fendrick / Cook arrive at Wal-Mart. Converse with START

0815hrs Depart Hotel for Sherwin

0830hrs Arrive at Sherwin. Meet with Tom Ballou + reprez of Sherwin + Alcoa

0835 Meet representative, Mr. Ballou gives background

Area 10,600 area area

Aquired 1968 Harvard Reeds

~3,316 Ac Area in

Question referred to as 204

Facility

1st Bed 1968-

3rd Bed Early 70's

4th Bed ~~1976~~ 1974

SC

Location Leo Miller Road SI Date 5/8/08

Project / Client TXN000606818

TDD# TO-0009-08-08-01

One of 3 refineries left in country

4th Bed small of Resid 300 tons in SW corner. Used for Savage stormwater storage since 1980.

Normally have large rainfall events

Bed 2 + 3 are about 70% of total

Bed 1: current placement Area

Sand out 30% solids (consistent of Hydrocarbon) Liquids separate & solids are stacked up.

Purchased - 1968

Initial Site Planning: 02/1968

Initial Investigation 03 to 07/1968 (GTL + NSSI)

Bed 1 + 2 Constructed

Red Mud 3300 to 3500 metric tons generated per day

Explain: 24 hrs per day

SC

Location Leo Miller Road, SI Date 5/8/08

Project / Client TXN000606818

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Leachate Collection system is internal in Beds

1015hrs End Meeting

1030hrs Proceed to RML#1

1050hrs Arrive at RML#1 SW corner

1100hrs Proceed to Location RML1-RM02-G (Dry Mud)

PDR Reading: TWA 0.084 mg/m³

Conc.: 0.070 mg/m³

1108 GPS 27°59.401' N

97°13.042 W

1105hrs START Composite Collection

Sample: RML1-RM02-G + RML1-RM05-G (Duplicate)

Collect with plastic dedicated trowel + plastic mixing bowl.

1110hrs End Sample Time

Sample Matrix: Dark reddish brown soil w/ several pieces of clay, is slightly wet

SC

Location Leo Miller Road SF Date 5/8/08

Project / Client TXN000606818

TDD# TO-0009-08-08-01

PDR Reading: TWA: 0.076 mg/m³. Conc: 0.074 mg/m³.

1115hrs Proceed to ~~Station to~~ RML1-RM01-G (~~wet~~ dry) red mud.

1120hrs Begin Sample collection at RML1-RM01-G Collection w/ Red. plastic trowel mixing bowl. Matrix is reddish brown, very fine particle size approximately 40% Liquid.

GPS Coordinates: 27° 59.403' N 97° 12.989' W

1130hrs Proceed to blender to homogenize sample & transfer matrices to sample containers

1140hrs End Sample time at RML1-RM01-G. Collected ~~1 8oz~~ 1, 8oz jar & 1 4oz jar for EPA & 1 8oz & 1 ~~#~~ 4oz jar for Sherwin

Location Leo Miller Road, SF Date 5/8/08

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1150hrs End Sample time for RML1-RM02-G & RML1-RM05-G collected 2 8oz jars & 2 4oz jars for EPA & 1 8oz jar & 1 4oz jar for Sherwin

1205 Proceed to RML2.

1215hrs Arrive at RML2

1220hrs Arrive at Station RML2-RM03-G (wet mud).

GPS: 27° 59.928' N 97° 12.302' W

1245 Conc 0.144 mg/m3

TWA 0.078 mg/m3

End Sample time at RML2-RM03-G. Matrix consisted of reddish mud, with some clay particles

1255 Arrive at location RML2-RM04-G

GPS: 27° 59.944' N; 97° 12.301' W

PDR Reading: Conc. 0.075 mg/m³

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TWA Reading: 0.078 mg/m3

1255hrs Begin to collect sample RML2-GW04-G. Considered "Dry" Mud. Collected same manner as previous samples, collect split sample. Matrix: Reddish mud less water than RML2-RM03-G.

1310hrs End Sample tag on RML-RM04-G. Proceed to homogenize samples RML-RM03-G + RML-RM04-G + place in appropriate sample containers.

1325hrs Begin to separate Split samples from EPA samples. Place labels on Split Sample. Also place custody seals on each split sample.

1335hrs Fill out Split Sample C-O-C form using EPA

Location Leo Miller Road SI Date 5/8/08

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Official Chain of Custody Record.

1340hrs Relinquish split samples to Terrell Smith / NEI. Mr. Smith Signs C-O-C form (Splits).

START Conan provides Mr. Smith w/ white / Yellow copies of split COC.

START ~~Fedex~~ Print / Gold copies.

1345hrs. EPA SAM Fendrick thanks SAC representatives and EPA / START depart site.

1415hrs EPA / START Stop for Lunch.

1500hrs START begins to prepare paperwork + package samples for shipment to Lab. Enter sampling data into Scribe

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1615 hrs C-o-C for 5/8/08 Samples completed. Place approximately 15 pounds of bagged ice in cooler.

1630 hrs Place custody seals on Ice chest & stay Ice chest with tape.

1645 hrs START Load up Sample coolers. Proceed to Fed Ex to drop off samples

1720 hrs Arrive at Fed Ex. START Cover relinquishes two sample coolers to Fed Ex.

1730 hrs START depart Fed Ex. Proceed to Hotel.

1800 hrs STARTS arrive at Hotel Begin to load Van for trip back to Dallas.

SC

Location Leo Miller Road, SI Date 5/8/08

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1830 hrs Finish cleaning up Hotel room (shipping material) & Loading Van. End of Day.

Next page contains Sample Summary.

SC

Location Leo Miller Rd, SI Date

Project / Client TXN000606818

TDD # TO-0009-08-08-01

Sample Summary

Sample ID	Location	Date Time Collected	Matrix	QC Sample	Preservative	C-O-C #	Analysis
SAL-GW06-G	(b) (6) [redacted] Resid.	5/06/08 1100 hrs	Deionized H_2O	No	pH < 2.0 HNO_3	TXN000606818-05/08/08-0001	Total Metals / Mercury
SAL-GW02-G	(b) (6) [redacted] Resid.)	5/06/08 1145 hrs	Groundwater	No	pH < 2.0 HNO_3	TXN000606818-05/08/08-0001	Total Metals / Mercury
BK-RD10-G	Not Applicable	5/06/08 1200 hrs	Dust (Wipe)	Yes, Blank,	Ice	TXN000606818-05/08/08-0001	Total Metals / Mercury / Silicon
SAL-RD04-G	(b) (6) [redacted] (b) (6) [redacted] 1st Floor Dining Area Window Ledge	5/06/08 1210 hrs	Dust (Wipe)	No	Ice	TXN000606818-05/08/08-0001	Total Metals / Mercury / Silicon
SAL-RD05-G	Same as SAL-RD05-G (adjacent)	5/06/08 1215 hrs	Dust (Wipe)	Yes, Duplicate	Ice	TXN000606818-05/08/08-0001	Total Metals / Mercury / Silicon
SAL-RD03-G	(b) (6) [redacted] SW Bedroom Window Ledge	5/06/08 1222 hrs	Dust (Wipe)	No	Ice	TXN000606818-05/08/08/-0001	Total Metals / Mercury / Silicon
MART-RD01-G	(b) (6) [redacted] (b) (6) [redacted] Resid. SW Bedroom Window Ledge	5/06/08 1345 hrs	Dust (Wipe)	No	Ice	TXN000606818-05/08/08/-0001	Total Metals / Mercury / Silicon
MART-RD02-G	(b) (6) [redacted] (b) (6) [redacted] Kitchen Window Ledge	5/06/08 1353 hrs	Dust (Wipe	No	Ice	TXN000606818-05/08/08/-0001	Total Metals / Mercury / Silicon

Location Leo Miller Rd, SI Date

Project / Client TXN000606818

TDD # TO-0009-08-08-01 Sample Summary

Location Leo Miller Rd, SI Date

Project / Client TXN000606818

TDD# TO-0009-08-08-01

Sample Summary (cont'd)

Sample ID	Location	Date / Time Collected	Matrix	QC Sample	Preservative	C-O-C #	Analysis
MART-GW01-G	(b) (6) [redacted] (b) (6) [redacted] Res. water well)	5/06/08 1434 hrs	Groundwater	Yes, MS/MSD	pH < 2.0, HNO_3, Ice	TXN000606816-05/08/08/-0001	Tal Metals/Mercury/Silicon
BFG-RD08-G	(b) (6) [redacted] Res. South Bedroom window Ledge	5/06/08 1523 hrs	Dust (wipe)	No Background ~~wipes~~ for Dust	Ice	TXN000606816-05/08/08/-0001	TAL Metals/Mercury/Silicone
BFG-RD09-G	(b) (6) [redacted] North Bedroom window Ledge	5/06/08 1528 hrs	Dust (wipe)	No Background for Dust	Ice	TXN000606816-05/08/08/-0001	TAL Metals/Mercury/Silicone
BFG-GW05-G	(b) (6) [redacted] water well	5/06/08 1555 hrs	Ground water	No Background for groundwater	pH < 2.0, HNO_3/Ice	TXN000606816-05/08/08/-0001	TAL Metals/Mercury/Silicon
BENN-RD06-G	(b) (6) [redacted] Resid. Southwest window Ledge in Front Bedroom	5/07/08 1330 hrs	Dust (wipe)	No	Ice	TXN000606816-05/08/08/-0001	TAL Metals/Mercury/Silicon
BENN-RD07-G	(b) (6) [redacted] Southeast window Ledge in front Bedroom	5/07/08 1336 hrs	Dust (wipe)	No	Ice	TXN000606816-05/08/08/-0001	TAL Metals/Mercury/Silicon
BENN-GW03-G	(b) (6) [redacted] (b) [redacted] water well	5/07/08 1410 hrs	Groundwater	No	pH < 2.0, HNO_3/Ice	TXN000606816-05/08/08/-0001	TAL Metals/Mercury/Silicon
BENN-GW04-G	Same as BENN-GW03-G	5/07/08 1415 hrs	Groundwater	Yes Duplicate of BENN-GW03-G	pH < 2.0, HNO_3/Ice	TXN000606816-05/08/08/-0001	TAL Metals/Mercury/Silicon

Location Leo Miller Rd, SI Date

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Sample Summary (Cont'd)

Location Leo Miller Road, SI Date

Project / Client TXN000606818

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Sampling Summary (Cont'd)

Sample ID	Location	Date/Time	Matrix	QC Sample	Preservative	C-O-C#	Analysis
RML1-RM02-G ~~(wet)~~ SC	RML#1, SW Corner	5/08/08 ~~1105~~ SC 1105hrs	Red Mud (Wet)	No	Ice	TXN000606818-05/08/08-0002	Total Metals / Mercury / Silicone / Grain Size.
RML1-RM05-G	Same Location as RML1-RM02-G	5/08/08 1110 hrs	Red Mud (Wet)	Yes (Duplicate of RML1-RM02-G)	Ice	TXN000606818-05/08/08/-0002	TAL Metals / Mercury / Silicon / Grain Size
RML1-RM01-G	RML #1, SW Corner	5/08/08 1120hrs	Red Mud (Dry)	No	Ice	TXN000606818-05/08/08/-0002	TAL Metals / Mercury / Silicone / Grain Size
RML2-RM03	RML #2, South-Southwest Section, Wet Area	5/08/08 1220 hrs	Red Mud (Wet)	No	Ice	TXN000606818-05/08/08-0002	TAL Metals / Mercury / Silicon Grain Size
RML2-RM04-G	RML #2, South-Southwest Section Dry Area	5/08/08 1255 hrs	Red Mud (Dry)	Yes MS/MSD	Ice	TXN000606818-05/08/08-0002	TAL Metals / Mercury / Silicon / Grain Size.

Location Leo Miller Rd, SI Date

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Sampling Summary (Cont'd)

Location Leo Miller Rd-SI Date 5/6/08

Project / Client TXN000606818

Photo Log

Date	Photo#	Time	Dir	Description	P/W
5/6/08	1	1110	W	View of [redacted] water well + Pump	NB/SC
5/6/08	2	1117	NW	Purging of [redacted] water well	SC/NB
	3	1118	D	View of Water Quality Instrument	NB/SC
	4	1206	E	View of window sill located in Dining Room of [redacted] Residence. Location of wipe sample SAL-RD04-G.	NB/SC
	5	1206	NE	Measuring Dining Room window sill in [redacted] Residence	NB/SC
	6	1209	NE	START collecting wipe sample SAL-RD04-G from Dining Room window sill.	NB/SC
	7	1210	NE	View of wipe sample SAL-RD04-G after sample collection	NB/SC
	8	1221	SE	View of Window Sill in Salinas Trailer, South bed room. Location of Sample SAL-RD03-G.	NB/SC
	9	1224	SE	START collecting wipe sample SAL-RD03-G from south bedroom in Salinas Trailer	NB/SC
	10	1225	SE	View of wipe sample collected from SAL-RD03-G	NB/SC
	11	1227	SW	View of window (open) in which wipe sample SAL-RD03-G was collected from	NB/SC

SC

Location Leo Miller Rd-SI Date 5/6/08

Project / Client TXN000606818

Photo Log (Cont'd)

Date	Photo#	Time	Dir.	Description	P/W
5/6/08	12	1228	SE	View from [redacted] Trailer South bedroom	SC/NB
5/6/08	13	1231	W	View of Dining Room window (S. Dir) residence in which samples SAL-RD04-G + SAL-RD05-G were collected from	NB/SC
	14	1232	E	View from [redacted] Dining Room window. Looks for RML#2 in background.	SC/NB
	15	1341	E	View of [redacted] South bedroom window sill, location of wipe sample MART-RD01-G	NB/SC
	16	1345	E	View of sample collection at MART-RD01-G	NB/SC
	17	1346	E	View of wipe sample MART-RD01-G	NB/SC
	18	1347	E	View from [redacted] South bedroom window, RML #1 located in background	SC/NB
	19	1350	E	View of [redacted] Kitchen Window sill ledge. Location of sample MART-RD02-G	NB/SC
	20	1353	E	View of START collecting wipe sample, MART-RD02-G	NB/SC
	21	1353	Down wind	View of wipe sample MART-RD02-G after sample collection	NB/SC
	22	1354	E	View from [redacted] Kitchen window. RML #1 located in background	SC/NB
	23	1410	NE	View of [redacted] water well	NB/SC

SC

Location Leo Miller Rd. - SI Date 5/6/08

Project / Client TXN000606818

Photo Log (Cont'd)

Date	Photo#	Time	Dir	Description	P/W
5/6/08	24	1429	SW	View of START purging (b) (6) [redacted] water well, Location of Sample MART-GW01-G	SC/NB
	25	1434	NE	View of START collecting ground water sample MART-GW01-G	SC/NB
	26			View of background residence located (b) (6) [redacted] residence (b) (6) [redacted]	NB/SC
	27	1521	E	View of south bedroom window sill // edge of (b) (6) [redacted] residence i.e. Inside. Location of background wipe sample BFG-RD08-G	NB/SC
	28	1525	NE	View of wipe sample collected at station BFG-RD08-G	SC/NB
	29	1527	NE	View of north bedroom window sill // edge of (b) (6) [redacted] residence. Location of background wipe sample BFG-RD09-G	SC/NB
	30	1529	NE	View of wipe sample collected at station BFG-RD09-G	SC/NB
	31	1534	SW	View of South bedroom window of (b) (6) [redacted] resid. from outside	NB/SC
	32	1534	NW	View of North bedroom window of (b) (6) [redacted] residence, from outside	NB/SC
	33		NW	View of (b) (6) [redacted] domestic water well	SC/NB
	34	1554	NW	START collecting water sample BFG-GW03-G	SC/NB

Location Leo Miller Rd - SI Date 5/7/08

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Photo Log (Cont'd)

Date	Photo#	Time	Dir.	Description	P/W
5/7/08	35	1309	Down	View of red mud in CR 1177.	SC/NB
	36	1328	W	View of window sill in South Bedroom, SWest window, at (b) (6) [redacted] Residence	NB/SC
	37	1329	SW	View of boarded up SWest window in South bedroom of (b) (6) [redacted] Resid.	NB/SC
	38	1332	S	View of START collecting wipe sample BENN-RD06-G	SC/NB
	39	1333	S	View of wipe sample BENN-RD06-G residence of red mud or wipe	SC/NB
	40	1334	E	View of Southeast window sill in South bedroom of (b) (6) [redacted] Residence	SC/NB
	41	1334	E	View of boarded up Southeast window in South bedroom of (b) (6) [redacted] Resid.	SC/NB
	42	1336	SE	View of START collecting wipe sample, BENN-RD07-G	SC/NB
	43	1338	SE	View of wipe sample collected from SE window of South bedroom. There is evidence of red dust on wipe.	SC/NB
	44	1340	W	View of Southeast window of South bedroom from outside residence	SC/NB
	45	1341	N	View of Southwest window of South bedroom	SC/NB
	46	1410	NW	View of START coll. H2O sample BENN-GW03/04-G	SC/NB

Location Leo Miller Rd SI Date 5/ /08

Project / Client TXN000606918

Photo Log (Cont'd)

Date	Photo#	Time	Dir.	Description	P/W
5/7/08	47	1416	SW	View of ~~Leo~~ Bennett Water Well + Distilling unit located inside well shed	~~SC~~ S / NB SC
	48	1418	NW	View of PDR-1000 air monitor being utilized at (b) (6) [redacted] Residence	SC/NB
	49	1442	W	View of Kitchen window at (b) (6) [redacted] Residence	SC/NB
	50	1442	E	View outside (b) (6) [redacted] Kitchen window - Bern of Red Mud Lagoon located in Background	SC/NB
	51	1443	SW	View of ~~S~~ SC (b) (6) [redacted] South bedroom window	SC/NB
5/8/08	52	1045	E	View of red mud and Leachate Runoff System in Red Mud Lagoon #1	NB/SC
	53	1049	SW	View of Leachate collection System in Red Mud Lagoon #1 Berm of RML #1 is in background	NB/SC
	54	1101	NE	START collecting dry red mud sample RML1-RM02-G from RML #1	NB/SC
	55	1101	Down	View of dry red mud collected at RML #1	NB/SC
	56	1117	NE	Collection of wet mud sample RML 1-RM01-G	NB/SC
	57	1117	NE	Location of sample RML1-RM01-G in RML #1.	NB/SC
	58	1119	Down mud	View of wet red mud collected at RML1-RM01-G	NB/SC
	59	1122	NE	View of Red Mud Lagoon #1	NB/SC

Location Leo Miller Rd SI Date 5/8/08

Project / Client TXN000606918

Photo Log (Cont'd)

Date	Photo#	Time	Dir.	Description	P/W
5/8/08	60	1122	SW	Additional view of Red Mud Lagoon #1. Vegetated area with in Red Mud Lagoon 1 in background	NB/SC
	61	1129	Down mud	View of collected wet red mud + dry red mud samples	NB/SC
	62	1129	S	Transferring wet red mud from mixing bowl to sample container	NB/SC
	63	1130	S	close-up of ~~red mud lagoon~~ wet red mud from Red Mud Lagoon #1.	NB/SC
	64	1141	Down mud	View of EPA and split sample containers for Sample #: RML1-RM01-B	NB/SC
	65	1144	North	View of transferring dry red mud from sample # RML1-RM02-B	NB/SC
	66	1145	N	Transferring dry red mud sample matrix to sample containers	NB/SC
	67	1152	Down mud	View of EPA and split sample containers for Sample #: RML1-RM03-B + RML1-RM05-B	NB/SC
	68	1202	E	View of Leachate Collection System in Red Mud Lagoon #1 Southwest Corner	NB/SC
	69	1202	NW	Additional view of Leachate Collection System in Red Mud Lagoon #1, southwest Corner	NB/SC

Location Leo Miller Rd SI Date 5/8/08

Project / Client TXN000606818

Photolog (Cont'd)

Date	Photo#	Time	Dir.	Description	P/W
5/8/08	70	1213	NE	View at Red Mud Lagoon #2, Berm is in background	NB/SC
	71	1223	Down hand	START Collecting sample RML2-RM03-G, wet red mud	NB/SC
	72	1224	NE	Additional view of START Collecting sample # RML2-RM03-G	NB/SC
	73	1225	NE	View of exposed red mud + submerged areas within Red Mud Lagoon # 2.	NB/SC
	74	1228	Down hand	START homogenizing # red mud from sample RML2-RM03-G (wet red mud)	NB/SC
	~~76~~ 75	1229	Down hand	START transferring wet red mud from mixing bowl to sample containers	NB/SC
	76	1246	Down hand	View of EPA/Split sample containers for Sample # RML2-RM03-G.	NB/SC
	77	1256	Down hand	View of START collecting dry red mud samples RML2-RM04-G	NB/SC
	78	1256	NE	Additional View of START collecting dry red mud sample, RML2-RM04-G	NB/SC
	~~79~~	~~1306~~	~~Down hand~~	~~START transferring dry red mud from mixing bowl to sample containers for sample # RML2-RM04-G~~	~~NB/SC~~ SC SC SC

Location Leo Miller Rd - SI Date 5/8/08

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Photolog (Cont'd)

Date	Photo#	Time	Dir.	Description	P/W
~~5/8/08~~	~~80~~				→
5/8/08	79	1302	N	View of dry ~~red~~ red mud sample location RML2-RM04-G. Berm of RML #2 is in background.	NB/SC
	80	1306	Down hand	START transferring dry red mud from mixing bowl to sample container for sample # RML2-RM04-G	NB/SC
	81	1312	Down hand	View of EPA/Split samples collected at Station # RML2-RM04-G.	NB/SC
	82	1335	North	View of Split sample collected from Lagoons 1+2 (G. metals/Mercury/Silica analyses). Samples have been labeled + ~~etc~~ SC Custody seal applied to each container.	NB/SC
	83	1336	North	View of split sample collected from Lagoons 1+2 (Grain Size). Samples ~~have~~ labeled + custody seal applied to each sample container	NB/SC

APPENDIX C

Photomounts

START
DYNAMAC CORPORATION

Logbook Photo #	001
US EPA ID / Task Order Number	TXN 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	West
Date	May 6, 2008
Time	1110
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of water well and pump located at (b) (6) [redacted].

START
DYNAMAC CORPORATION

Logbook Photo #	002
US EPA ID / Task Order Number	TXN 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Northwest
Date	May 6, 2008
Time	1117
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

Purging of water well at (b) (6) [redacted].

START
DYNAMAC CORPORATION

Logbook Photo #	003
US EPA ID / Task Order Number	TXN0000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Downward
Date	May 6, 2008
Time	1118
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of water quality instrument.

START
DYNAMAC CORPORATION

Logbook Photo #	005
US EPA ID / Task Order Number	TXN 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Northeast
Date	May 6, 2008
Time	1206
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of window sill located in the dining room of (b) (6) [redacted] residence. Location of wipe sample SAL-RD04-G.

START
DYNAMAC CORPORATION

Logbook Photo #	005
US EPA ID / Task Order Number	TXN 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Northeast
Date	May 6, 2008
Time	1206
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

Measuring dining room window sill at (b) (6) [redacted] residence.

START
DYNAMAC CORPORATION

Logbook Photo #	006
US EPA ID / Task Order Number	TXN 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Northeast
Date	May 6, 2008
Time	1209
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

START collecting wipe sample SAL-RD04-G from dining room window sill.

START
DYNAMAC CORPORATION

Logbook Photo #	007
US EPA ID / Task Order Number	TXN# 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Northeast
Date	May 6, 2008
Time	1210
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of wipe sample SAL-RD04-G after sample collection.

START
DYNAMAC CORPORATION

Logbook Photo #	008
US EPA ID / Task Order Number	TXN 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Southeast
Date	May 6, 2008
Time	1221
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of trailer window sill in (b) (6) [redacted], south bedroom. Location of Sample SAL-RD-03-G.

START
DYNAMAC CORPORATION

Logbook Photo #	009
US EPA ID / Task Order Number	TXN 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Southeast
Date	May 6, 2008
Time	1224
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

START collecting wipe sample SAL-RD02-G from south bedroom of trailer located at (b) (6) [redacted].

START
DYNAMAC CORPORATION

Logbook Photo #	010
US EPA ID / Task Order Number	TXN 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Southeast
Date	May 6, 2008
Time	1225
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of wipe sample collected from SAL-RD03-G.

START
DYNAMAC CORPORATION

Logbook Photo #	011
US EPA ID / Task Order Number	TXN 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Southwest
Date	May 6, 2008
Time	1227
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of window (open) in which wipe sample SAL-RD03-G was collected from.

START
DYNAMAC CORPORATION

Logbook Photo #	012
US EPA ID / Task Order Number	TXN#000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Southeast
Date	May 6, 2008
Time	1228
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View from trailer's south bedroom located at (b) (6) [redacted].

START
DYNAMAC CORPORATION

Logbook Photo #	013
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	West
Date	May 6, 2008
Time	1231
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of dining room window, at (b) (6) [redacted], in which samples SAL-RD04-G and SAL-RD05-G were collected.

START
DYNAMAC CORPORATION

Logbook Photo #	014
US EPA ID / Task Order Number	TXN# 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	East
Date	May 6, 2008
Time	1232
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View from (b) (6) [redacted] dining room window. Levee for RML #2 in background.

START
DYNAMAC CORPORATION

Logbook Photo #	015
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	East
Date	May 6, 2008
Time	1341
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of (b) (6) [redacted], south bedroom window sill. Location of wipe sample MART-RD01-G.

START
DYNAMAC CORPORATION

Logbook Photo #	016
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	East
Date	May 6, 2008
Time	1345
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of sample collection at MART-RD01-G

START
DYNAMAC CORPORATION

Logbook Photo #	017
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Downward
Date	May 6, 2008
Time	1346
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of wipe sample MART-RD01-G

START
DYNAMAC CORPORATION

Logbook Photo #	018
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	East
Date	May 6, 2008
Time	1347
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View from south bedroom window at (b) (6) [redacted], RML #1 located in background.

START
DYNAMAC CORPORATION

Logbook Photo #	019
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	East
Date	May 6, 2008
Time	1350
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of (b) (6) [redacted]'s kitchen window sill edge. Location of MART-RD02-G.

START
DYNAMAC CORPORATION

Logbook Photo #	020
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	East
Date	May 6, 2008
Time	1353
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of START collecting wipe sample, MART-RD02-G.

START
DYNAMAC CORPORATION

Logbook Photo #	021
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Downward
Date	May 6, 2008
Time	1353
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of wipe sample MART-RD02-G after sample collection.

START
DYNAMAC CORPORATION

Logbook Photo #	022
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	East
Date	May 6, 2008
Time	1354
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View from the (b) (6) [redacted] kitchen window. RML#1 located in the background.

START
DYNAMAC CORPORATION

Logbook Photo #	023
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Northeast
Date	May 6, 2008
Time	1410
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of the water well located at (b) (6) [redacted].

START
DYNAMAC CORPORATION

Logbook Photo #	024
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Southwest
Date	May 6, 2008
Time	1429
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of START purging water well at (b) (6) [redacted]. Location of sample MART-GW01-G.

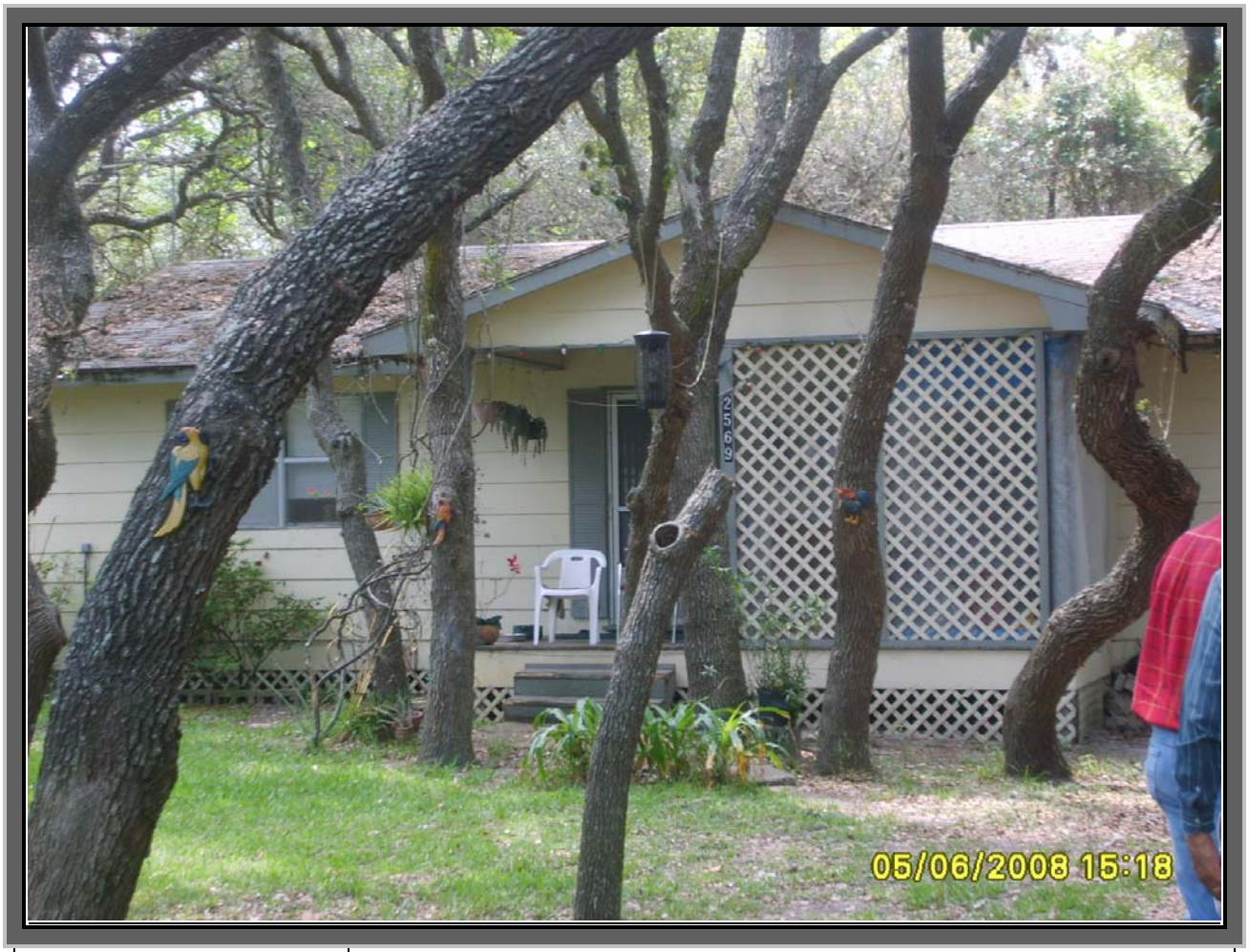
START
DYNAMAC CORPORATION

Logbook Photo #	025
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Northeast
Date	May 6, 2008
Time	1434
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of START collecting groundwater sample. Location of sample MART-GW01-G.

START
DYNAMAC CORPORATION



Logbook Photo #	026
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	
Date	May 6, 2008
Time	1518
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of background residence located at (b) (6) [redacted].

START
DYNAMAC CORPORATION

Logbook Photo #	027
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	East
Date	May 6, 2008
Time	1521
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of South bedroom window sill edge at (b) (6) [redacted] residence in (b) (6) [redacted]. Location of background wipe sample BKG-RD08-G.

START
DYNAMAC CORPORATION

Logbook Photo #	028
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Northeast
Date	May 6, 2008
Time	1525
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of wipe sample collected at station BKG-RD08-G.

START
DYNAMAC CORPORATION

Logbook Photo #	029
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Northeast
Date	May 6, 2008
Time	1527
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of north bedroom windows sill edge at (b) (6) [redacted] residence. Location of background wipe sample BKG-RD09-G.

START
DYNAMAC CORPORATION

Logbook Photo #	030
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Northeast
Date	May 6, 2008
Time	1529
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of wipe sample collected at station BKG-RD09-G.

START
DYNAMAC CORPORATION

Logbook Photo #	031
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Southwest
Date	May 6, 2008
Time	1534
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of south bedroom window of (b) (6) [redacted] residence.

START
DYNAMAC CORPORATION

Logbook Photo #	032
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Northwest
Date	May 6, 2008
Time	1534
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of north bedroom window at (b) (6) [redacted].

START
DYNAMAC CORPORATION

Logbook Photo #	033
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Northwest
Date	May 6, 2008
Time	1552
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of the water well located at (b) (6) [redacted].

START
DYNAMAC CORPORATION

Logbook Photo #	034
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Northwest
Date	May 6, 2008
Time	1554
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

START collecting water sample BKG-GW03-G

START
DYNAMAC CORPORATION

Logbook Photo #	035
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	County Road 1177
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Downward
Date	May 7, 2008
Time	1309
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of red mud in CR 1177.

START
DYNAMAC CORPORATION

Logbook Photo #	036
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Southwest
Date	May 7, 2008
Time	1328
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of window sill in south bedroom, southwest window at (b) (6) [redacted] residence.

START
DYNAMAC CORPORATION

Logbook Photo #	037
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Southwest
Date	May 7, 2008
Time	1329
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of boarded up southwest window at the south bedroom at (b) (6) [redacted] residence.

START
DYNAMAC CORPORATION

Logbook Photo #	038
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	South
Date	May 7, 2008
Time	1332
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of START collecting wipe sample BENN-RD06-G

START
DYNAMAC CORPORATION

Logbook Photo #	039
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	South
Date	May 7, 2008
Time	1333
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of wipe sample BENN-RD06-G. Evidence of red mud on wipe

START
DYNAMAC CORPORATION

Logbook Photo #	040
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	East
Date	May 7, 2008
Time	1334
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of southeast window sill in south bedroom at (b) (6) [redacted] residence.

START
DYNAMAC CORPORATION

Logbook Photo #	041
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	East
Date	May 7, 2008
Time	1334
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of boarded up southeast window in the south bedroom at the (b) (6) [redacted] residence.

START
DYNAMAC CORPORATION

Logbook Photo #	042
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Southeast
Date	May 7, 2008
Time	1336
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of START collecting wipe sample, BENN-RD07-G

START
DYNAMAC CORPORATION

Logbook Photo #	043
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Southeast
Date	May 7, 2008
Time	1336
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of wipe sample collected from the SE window of the south bedroom. There is evidence of red dust on wipe.

START
DYNAMAC CORPORATION

Logbook Photo #	044
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	West
Date	May 7, 2008
Time	1340
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of SE window of the south bedroom at the (b) (6) [redacted] residence.

START
DYNAMAC CORPORATION

Logbook Photo #	045
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	North
Date	May 7, 2008
Time	1341
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of southwest window of south bedroom at the (b) (6) [redacted] residence.

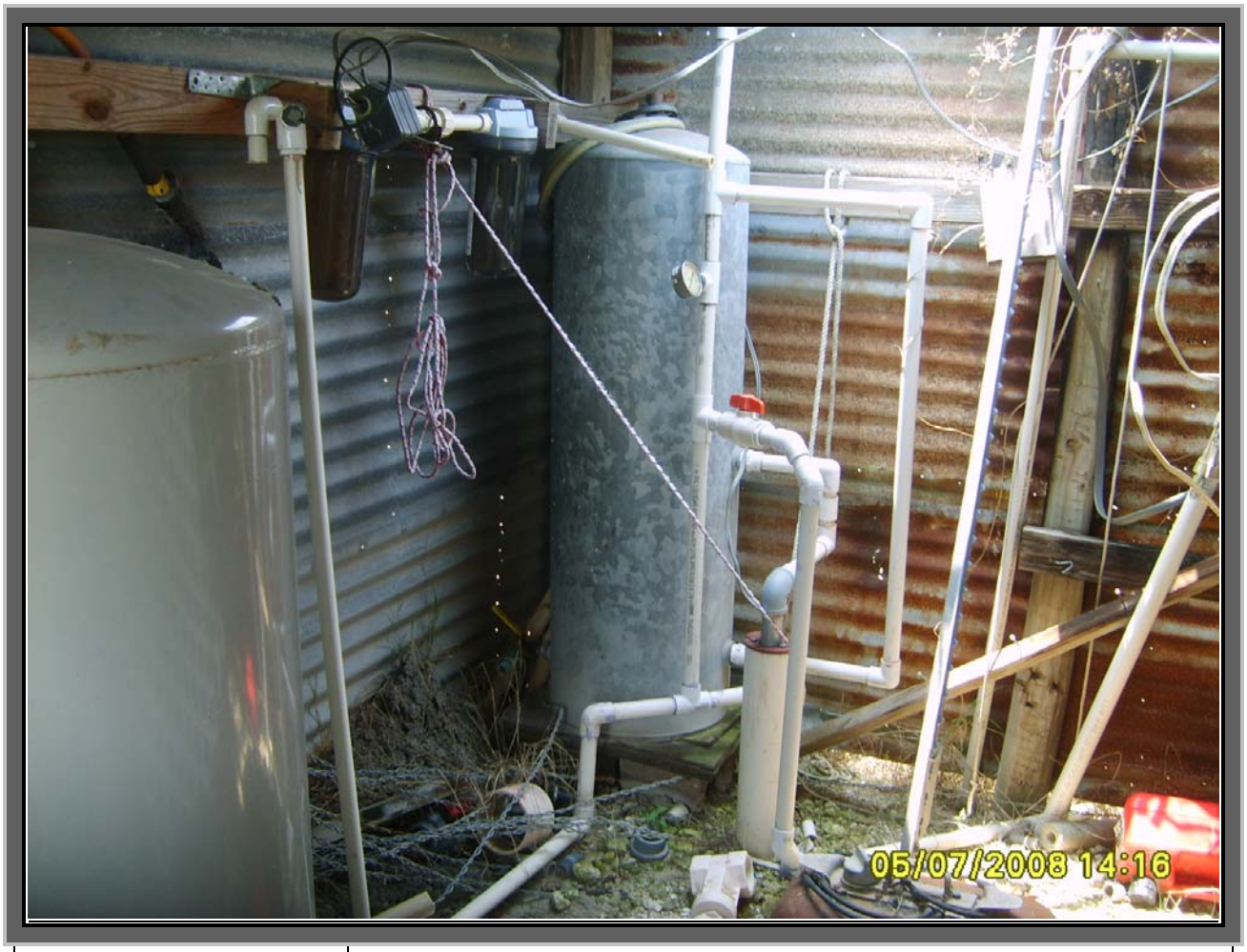
START
DYNAMAC CORPORATION

Logbook Photo #	046
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Northwest
Date	May 7, 2008
Time	1410
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of START collecting water sample BENN-GW03/04-G.

START
DYNAMAC CORPORATION



Logbook Photo #	047
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Southwest
Date	May 7, 2008
Time	1416
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of the water well at (b) (6) [redacted] residence and the distilling unit located inside a well shed.

START
DYNAMAC CORPORATION

Logbook Photo #	048
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	Aransas
Direction/Orientation	Northwest
Date	May 7, 2008
Time	1418
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of PDR-1000 air monitor being utilized at the (b) (6) [redacted] residence.

START
DYNAMAC CORPORATION

Logbook Photo #	049
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	West
Date	May 7, 2008
Time	1442
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of kitchen window at the (b) (6) [redacted] residence.

START
DYNAMAC CORPORATION

Logbook Photo #	050
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	East
Date	May 7, 2008
Time	1442
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View from (b) (6) [redacted] residence kitchen window. Berm of red mud lagoon located in background.

START
DYNAMAC CORPORATION

Logbook Photo #	051
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	(b) (6) [redacted]
City, State	(b) (6) [redacted]
County	San Patricio
Direction/Orientation	Southwest
Date	May 7, 2008
Time	1443
Photographer	S. Cowan (START)
Witness	N. Biscocho (START)

Description:

View of the (b) (6) [redacted] residence south bedroom window.

START
DYNAMAC CORPORATION

Logbook Photo #	052
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	East
Date	May 8, 2008
Time	1045
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of red mud and leachate runoff system in RML#1.

START
DYNAMAC CORPORATION

Logbook Photo #	053
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Southwest
Date	May 8, 2008
Time	1049
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of leachate collection system in RML #1. Berm of RML#1 is in the background.

START
DYNAMAC CORPORATION

Logbook Photo #	054
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Northeast
Date	May 8, 2008
Time	1101
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

START collecting dry red mud sample RML1-RM02-G from RML #1.

START
DYNAMAC CORPORATION

Logbook Photo #	055
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Downward
Date	May 8, 2008
Time	1101
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of dry red mud collected at RML#1.

START
DYNAMAC CORPORATION

Logbook Photo #	056
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Northeast
Date	May 8, 2008
Time	1101
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

Collection of wet mud sample RML1-RM01-G.

START
DYNAMAC CORPORATION

Logbook Photo #	057
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Northeast
Date	May 8, 2008
Time	1117
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

Location of sample RML1-RM01-G in RML#1.

START
DYNAMAC CORPORATION

Logbook Photo #	058
US EPA ID / Task Order Number	TXN 000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Downward
Date	May 8, 2008
Time	1119
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of wet red mud collected from RML1-RM01-G.

START
DYNAMAC CORPORATION

Logbook Photo #	059
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Northeast
Date	May 8, 2008
Time	1122
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of RML#1.

START
DYNAMAC CORPORATION

Logbook Photo #	060
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Southwest
Date	May 8, 2008
Time	1122
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

Additional view of RML#1. Vegetated area within RML#1 in background.

START
DYNAMAC CORPORATION

Logbook Photo #	061
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Downward
Date	May 8, 2008
Time	1129
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of collected wet red mud and dry mud samples.

START
DYNAMAC CORPORATION

Logbook Photo #	062
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	South
Date	May 8, 2008
Time	1129
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

Transferring wet red mud from mixing bowl to sample container.

START
DYNAMAC CORPORATION

Logbook Photo #	063
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	South
Date	May 8, 2008
Time	1130
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

Close-up of wet red-mud from RML#1.

START
DYNAMAC CORPORATION

Logbook Photo #	064
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Downward
Date	May 8, 2008
Time	1141
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of EPA and split sample containers for sample RML1-RM01-G.

START
DYNAMAC CORPORATION

Logbook Photo #	065
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	North
Date	May 8, 2008
Time	1144
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of START homogenizing dry red mud from sample RML1-RM02-G.

START
DYNAMAC CORPORATION

Logbook Photo #	066
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	North
Date	May 8, 2008
Time	1145
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

Transferring dry red mud sample matrix to sample containers.

START
DYNAMAC CORPORATION

Logbook Photo #	067
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Downward
Date	May 8, 2008
Time	1152
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of EPA and split sample containers for sample RML1-RM02-G and the duplicate sample RML-RM05-G.

START
DYNAMAC CORPORATION

Logbook Photo #	068
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	East
Date	May 8, 2008
Time	1202
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of leachate collection system in RML#1, southwest corner.

START
DYNAMAC CORPORATION

Logbook Photo #	069
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #1
City, State	Taft, Texas
County	San Patricio
Direction/Orientation	Northwest
Date	May 8, 2008
Time	1202
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

Additional view of leachate collection system in RML#1, southwest corner.

START
DYNAMAC CORPORATION

Logbook Photo #	070
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	Northeast
Date	May 8, 2008
Time	1213
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of RML #2. Berm is in the background.

START
DYNAMAC CORPORATION

Logbook Photo #	071
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	Downward
Date	May 8, 2008
Time	1213
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

START collecting sample RML2-RM03-G

START
DYNAMAC CORPORATION

Logbook Photo #	072
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	Northeast
Date	May 8, 2008
Time	1224
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

Additional view of START collecting sample RML2-RM03-G.

START
DYNAMAC CORPORATION

Logbook Photo #	073
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	Northeast
Date	May 8, 2008
Time	1225
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of exposed red mud and submerged areas within RML #2.

START
DYNAMAC CORPORATION

Logbook Photo #	074
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	Downward
Date	May 8, 2008
Time	1228
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

START homogenizing red mud from sample RML2-RM03-G (wet red mud)

START
DYNAMAC CORPORATION

Logbook Photo #	075
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	Downward
Date	May 8, 2008
Time	1229
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

START transferring wet red mud from mixing bowl to sample container.

START
DYNAMAC CORPORATION

Logbook Photo #	076
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	Downward
Date	May 8, 2008
Time	1246
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of EPA/Split sample containers for sample RML2-RM03-G

START
DYNAMAC CORPORATION

Logbook Photo #	077
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	Downward
Date	May 8, 2008
Time	1256
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of START collecting dry red mud samples RML2-RM04-G.

START
DYNAMAC CORPORATION

Logbook Photo #	078
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	Northeast
Date	May 8, 2008
Time	1256
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

Additional view of START collecting dry red mud sample, RML2-RM04-G.

START
DYNAMAC CORPORATION

Logbook Photo #	079
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	North
Date	May 8, 2008
Time	1302
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of dry red mud sample location RML2-RM04-G. Berm of RML #2 is in the background.

]

START
DYNAMAC CORPORATION

Logbook Photo #	080
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	Downward
Date	May 8, 2008
Time	1306
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

START transferring dry red mud from mixing bowl to sample container for sample RML2-RM04-G.

START
DYNAMAC CORPORATION

Logbook Photo #	081
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	Downward
Date	May 8, 2008
Time	1312
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of EPA/START samples collected from station RML2-RM04-G

START
DYNAMAC CORPORATION

Logbook Photo #	082
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	North
Date	May 8, 2008
Time	1335
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of split samples collected from Red Mud Lagoons 1 and 2 (T. Metals / Mercury / Silica analyses). Samples have been labeled and custody seal applied to each container.

START
DYNAMAC CORPORATION

Logbook Photo #	083
US EPA ID / Task Order Number	TXN000606818 / TO-0009-08-01-01
Site	Leo Miller Road – SI
Location Address	Sherwin Alumina - Red Mud Lagoon (RML) #2
City, State	Taft, Texas
County	Aransas
Direction/Orientation	North
Date	May 8, 2008
Time	1336
Photographer	N. Biscocho (START)
Witness	S. Cowan (START)

Description:

View of split samples collected from Red Mud Lagoons 1 and 2 (Grain size analyses). Samples have been labeled and custody seal applied to each container.

APPENDIX D

Data Validation Reports for the SI Sampling and Analysis

Contract No. EP-W-06-077
TDD#: TO-0009-08-01-01

Region VI
Superfund Technical Assessment and Response Team
START III

Data Validation Report

July 14, 2008

Submitted to:

U.S. Environmental Protection Agency
Region VI
1445 Ross Street
Suite 1200
Dallas, TX 75202

Dynamac Corporation
1202 Executive Drive West
Richardson, TX 75081

Region VI
Superfund Technical Assessment and Response Team
START III

Data Validation Report
Leo Miller Road Site

Accutest Laboratories
Work Order No. T22120

Prepared for:

U.S. Environmental Protection Agency
Region 6
1445 Ross Street
Suite 1200
Dallas, TX 75202

Under Contract No. EP-W-06-077
TDD #: TO-0009-08-01-01

Reviewed and approved by:

Steve Cowan, Dynamac Corporation

Dynamac Corporation
1202 Executive Drive West
Richardson, TX 75081

DATA VALIDATION REPORT
LEO MILLER ROADSITE
TAFT, SAN PATRICIO/ARANSAS COUNTIES, TEXAS

Accutest Laboratories
Work Order No. T22120

July 14, 2008

INTRODUCTION

Dynamac Corporation (Dynamac) has prepared this data validation report for the U.S. Environmental Protection Agency (U.S. EPA) under the Region VI Superfund Technical Assessment and Response Team (START) contract Technical Direction Document (TDD) No. TO-0009-08-01-01 for the Leo Miller Road Site in Taft, Texas. This report documents the findings of the data validation performed on solid waste samples collected on May 8, 2008, at the Leo Miller Road Site. The samples were analyzed by Accutest Laboratories located in Houston, Texas. The samples were analyzed for the following analyses and methods.

Analysis	U.S. EPA SW-846 Method
Target analyte list (TAL) Metals and Mercury	6010B and 7471A

The data were validated in general accordance with the U.S. EPA "Contract Laboratory Program National Functional Guidance for Superfund Organic Methods Data Review" dated July 2007 and U.S. EPA "Contract Laboratory Program National Functional Guidance for Inorganic Data Review" dated October 2004. The attachment to this report contains a summary of results with hand-written data qualifiers. Below are the results of the data validation.

The following table summarizes the samples for which this data validation is being conducted.

Sample ID	Matrix	Lab Sample ID	Date Collected	Date Analyzed
RML1-RM01-G	Solid	T22120-1	05/08/2008	05/13/2008
RML1-RM02-G	Solid	T22120-2	05/08/2008	05/13/2008
RML1-RM05-G	Solid	T22120-3	05/08/2008	05/13/2008
RML2-RM03-G	Solid	T22120-4	05/08/2008	05/13/2008
RML2-RM04-G	Solid	T22120-5	05/08/2008	05/13/2008

MERCURY BY U.S. EPA SW-846 METHOD 7471A

1. Holding Times

The samples were analyzed within the required holding time limit of 28 days from sample collection.

2. Initial Calibration Verification (ICV)

The initial calibration verification had acceptable results. The recovery was within the control limit of 80 and 120%.

3. Continuing Calibration Verification (CCV)

The continuing calibration verification standards were analyzed at the appropriate frequency and recoveries were within the control limit of 80-120%.

4. Calibration Blanks (ICB, CCB)

Calibration blanks were as analyzed at the appropriate frequency and results were below laboratory reporting limits.

5. Method Blanks (MB)

A method blank was analyzed as required and was free of target compound contamination.

6. Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results

A MS and MSD were prepared and analyzed using a sample from another site. Recoveries of the MS and MSD were within the 75-125% recovery limit. The RPD of the MS/MSD pair was less than the 20% control limit.

7. Sample/Sample Duplicate Results

A sample and sample duplicate were prepared and analyzed using a sample from another site. The RPD of the pair was less than the 20% control limit.

8. Laboratory Control Sample (LCS) Results

The LCS recoveries were within the laboratory-established QC limits of 66-132%.

METALS BY U.S. EPA SW-846 METHOD 6010B

1. Holding Times

The samples were analyzed within the required holding time limit of 180 days from sample collection.

2. Initial Calibration Verification (ICV)

The initial calibration verification had acceptable results. The recoveries were within the control limit of 90 and 110%.

3. Continuing Calibration Verification (CCV)

The continuing calibration verification standards were analyzed at the appropriate frequency and recoveries were within the control limit of 90-110%.

4. Calibration Blanks (ICB, CCB)

Calibration blanks were as analyzed at the appropriate frequency and results were below laboratory reporting limits.

5. Method Blanks (MB)

A method blank was analyzed as required and all concentrations were less than the reporting limits. Calcium and zinc were detected at concentrations above their instrument detection limits but below their reporting limits. No qualifications were required because the sample concentrations were much greater than the blank concentrations.

6. ICP Interference Check Samples (ICS)

Interference check samples were analyzed at the appropriate frequency and results were within the control limits of 80-120% recovery.

7. Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results

A MS and MSD were prepared and analyzed using a sample from another site. Recoveries of the MS and MSD were within the 80-120% recovery limit except as follows: MS recovery of antimony way 49.0%, of manganese was 77.8%. MSD recovery of aluminum was 125.3%, of antimony was 51.8%. Recoveries out of limits were attributed to matrix interference. The RPDs of the MS/MSD pair was less than the 20% control limit.

Reported concentrations and reporting limits of antimony and manganese are considered to be estimates, biased low (JL flag). Reported concentrations of aluminum are considered to be estimates, biased high (JH).

8. Sample/Sample Duplicate Results

A sample and sample duplicate were prepared and analyzed using a sample from another site. The RPDs of the pair were less than the 20% control limit.

9. Laboratory Control Sample (LCS) Results

The LCS recoveries were within the laboratory-established QC limits.

10. Serial Dilution (SD) Results

The serial dilution RPDs were within the 10% QC limits.

11. Miscellaneous Comments

Due to the high concentrations of iron in the samples, 20 fold dilutions of the samples were conducted, resulting in elevated reporting limits.

ATTACHMENT

ACCUTEST RESULTS SUMMARY

Sample Summary

DYNAMAC

Job No: T22120

Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
T22120-1	05/08/08	00:00 JV	05/09/08	SO	Soil	RML1-RM01-G
T22120-2	05/08/08	00:00 JV	05/09/08	SO	Soil	RML1-RM02-G
T22120-3	05/08/08	00:00 JV	05/09/08	SO	Soil	RML1-RM05-G
T22120-4	05/08/08	00:00 JV	05/09/08	SO	Soil	RML2-RM03-G
T22120-5	05/08/08	00:00 JV	05/09/08	SO	Soil	RML2-RM04-G

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

Report of Analysis

Client Sample ID:	RML1-RM01-G		
Lab Sample ID:	T22120-1	Date Sampled:	05/08/08
Matrix:	SO - Soil	Date Received:	05/09/08
		Percent Solids:	55.1
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum [a]	58300 JH	580	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Antimony [a]	< 29 JL	29	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Arsenic [a]	58.4	29	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Barium [a]	< 580	580	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Beryllium [a]	< 14	14	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Cadmium [a]	41.6	14	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Calcium [a]	45700	14000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Chromium [a]	1090	29	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Cobalt [a]	< 140	140	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Copper [a]	91.4	72	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Iron [a]	214000	290	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Lead [a]	120	29	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Magnesium [a]	< 14000	14000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Manganese [a]	4160 JL	43	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Mercury	0.47	0.029	mg/kg	1	05/13/08	05/13/08	FI	SW846 7471A [1]	SW846 7471A [3]
Nickel [a]	539	120	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Potassium [a]	< 14000	14000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Selenium [a]	< 29	29	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Silver [a]	< 29	29	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Sodium [a]	24200	14000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Thallium [a]	< 29	29	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Vanadium [a]	670	140	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Zinc [a]	495	58	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]

(1) Instrument QC Batch: MA3537
(2) Instrument QC Batch: MA3567
(3) Prep QC Batch: MP7938
(4) Prep QC Batch: MP7953

(a) Elevated reporting limit due to dilution required for matrix interference.

DC 7/2/08

RL = Reporting Limit

Report of Analysis

Client Sample ID:	RML1-RM02-G		
Lab Sample ID:	T22120-2	Date Sampled:	05/08/08
Matrix:	SO - Soil	Date Received:	05/09/08
		Percent Solids:	79.5
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum [a]	57300 JH	460	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Antimony [a]	< 23 JL	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Arsenic [a]	51.3	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Barium [a]	< 460	460	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Beryllium [a]	< 12	12	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Cadmium [a]	33.5	12	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Calcium [a]	38300	12000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Chromium [a]	900	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Cobalt [a]	< 120	120	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Copper [a]	72.9	58	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Iron [a]	186000	230	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Lead [a]	98.7	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Magnesium [a]	< 12000	12000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Manganese [a]	3440 JL	35	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Mercury	0.54	0.019	mg/kg	1	05/13/08	05/13/08	FI	SW846 7471A [1]	SW846 7471A [3]
Nickel [a]	424	92	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Potassium [a]	< 12000	12000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Selenium [a]	< 23	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Silver [a]	< 23	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Sodium [a]	24000	12000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Thallium [a]	< 23	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Vanadium [a]	644	120	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Zinc [a]	402	46	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]

(1) Instrument QC Batch: MA3537
(2) Instrument QC Batch: MA3567
(3) Prep QC Batch: MP7938
(4) Prep QC Batch: MP7953

(a) Elevated reporting limit due to dilution required for matrix interference.

Da 7/2/08

RL = Reporting Limit

Report of Analysis

Client Sample ID:	RML1-RM05-G		
Lab Sample ID:	T22120-3	Date Sampled:	05/08/08
Matrix:	SO - Soil	Date Received:	05/09/08
		Percent Solids:	78.3
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed By		Method	Prep Method
Aluminum [a]	56000 JH	360	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Antimony [a]	< 18 JL	18	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Arsenic [a]	47.8	18	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Barium [a]	< 360	360	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Beryllium [a]	< 9.0	9.0	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Cadmium [a]	33.3	9.0	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Calcium [a]	36300	9000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Chromium [a]	849	18	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Cobalt [a]	< 90	90	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Copper [a]	76.3	45	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Iron [a]	182000	180	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Lead [a]	94.8	18	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Magnesium [a]	< 9000	9000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Manganese [a]	3550 JL	27	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Mercury	0.52	0.020	mg/kg	1	05/13/08	05/13/08	FI	SW846 7471A [1]	SW846 7471A [3]
Nickel [a]	414	72	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Potassium [a]	< 9000	9000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Selenium [a]	< 18	18	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Silver [a]	< 18	18	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Sodium [a]	24400	9000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Thallium [a]	< 18	18	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Vanadium [a]	596	90	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Zinc [a]	394	36	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]

(1) Instrument QC Batch: MA3537
(2) Instrument QC Batch: MA3567
(3) Prep QC Batch: MP7938
(4) Prep QC Batch: MP7953

(a) Elevated reporting limit due to dilution required for matrix interference.

Da 7/2/08

RL = Reporting Limit

Report of Analysis

Client Sample ID:	RML2-RM03-G		
Lab Sample ID:	T22120-4	Date Sampled:	05/08/08
Matrix:	SO - Soil	Date Received:	05/09/08
		Percent Solids:	71.6
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum [a]	75100 JH	450	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Antimony [a]	< 23 JL	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Arsenic [a]	54.1	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Barium [a]	< 450	450	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Beryllium [a]	< 11	11	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Cadmium [a]	29.0	11	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Calcium [a]	35300	11000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Chromium [a]	797	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Cobalt [a]	< 110	110	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Copper [a]	59.0	57	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Iron [a]	195000	230	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Lead [a]	81.7	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Magnesium [a]	< 11000	11000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Manganese [a]	3300 JL	34	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Mercury	0.18	0.022	mg/kg	1	05/13/08	05/13/08	FI	SW846 7471A [1]	SW846 7471A [3]
Nickel [a]	384	90	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Potassium [a]	< 11000	11000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Selenium [a]	< 23	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Silver [a]	< 23	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Sodium [a]	32100	11000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Thallium [a]	< 23	23	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Vanadium [a]	741	110	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Zinc [a]	242	45	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]

(1) Instrument QC Batch: MA3537
(2) Instrument QC Batch: MA3567
(3) Prep QC Batch: MP7938
(4) Prep QC Batch: MP7953

(a) Elevated reporting limit due to dilution required for matrix interference.

pc 7/2/08

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	RML2-RM04-G		
Lab Sample ID:	T22120-5	Date Sampled:	05/08/08
Matrix:	SO - Soil	Date Received:	05/09/08
		Percent Solids:	80.8
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum [a]	70600 JP	440	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Antimony [a]	< 22 JL	22	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Arsenic [a]	45.7	22	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Barium [a]	< 440	440	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Beryllium [a]	< 11	11	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Cadmium [a]	17.8	11	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Calcium [a]	26500	11000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Chromium [a]	689	22	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Cobalt [a]	< 110	110	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Copper [a]	< 55	55	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Iron [a]	237000	220	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Lead [a]	71.5	22	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Magnesium [a]	< 11000	11000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Manganese [a]	2600 JL	33	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Mercury	0.10	0.020	mg/kg	1	05/13/08	05/13/08	FI	SW846 7471A [1]	SW846 7471A [3]
Nickel [a]	233	88	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Potassium [a]	< 11000	11000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Selenium [a]	< 22	22	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Silver [a]	< 22	22	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Sodium [a]	33300	11000	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Thallium [a]	< 22	22	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Vanadium [a]	642	110	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]
Zinc [a]	176	44	mg/kg	20	05/15/08	06/01/08	NS	SW846 6010B [2]	SW846 3050B [4]

(1) Instrument QC Batch: MA3537
(2) Instrument QC Batch: MA3567
(3) Prep QC Batch: MP7938
(4) Prep QC Batch: MP7953

(a) Elevated reporting limit due to dilution required for matrix interference.

DA
7/2/08

RL = Reporting Limit

Contract No. EP-W-06-077
TDD#: TO-0009-08-01-01

Region VI
Superfund Technical Assessment and Response Team
START III

Data Validation Report

July 18, 2008

Submitted to:

U.S. Environmental Protection Agency
Region VI
1445 Ross Street
Suite 1200
Dallas, TX 75202

Dynamac Corporation
1202 Executive Drive West
Richardson, TX 75081

Region VI
Superfund Technical Assessment and Response Team
START III

Data Validation Report
Leo Miller Road Site

Accutest Laboratories
Work Order No. T22120
(Silica Analysis)

Prepared for:

U.S. Environmental Protection Agency
Region 6
1445 Ross Street
Suite 1200
Dallas, TX 75202

Under Contract No. EP-W-06-077
TDD #: TO-0009-08-01-01

Reviewed and approved by:

Steve Cowan, Dynamac Corporation

Dynamac Corporation
1202 Executive Drive West
Richardson, TX 75081

DATA VALIDATION REPORT
LEO MILLER ROADSITE
TAFT, SAN PATRICIO/ARANSAS COUNTIES, TX

Accutest Laboratories/Xenco Laboratories
Work Order No. T22120/304697

July 18, 2008

INTRODUCTION

Dynamac Corporation (Dynamac) has prepared this data validation report for the U.S. Environmental Protection Agency (U.S. EPA) under the Region VI Superfund Technical Assessment and Response Team (START) contract Technical Direction Document (TDD) No. TO-0009-08-01-01 for the Leo Miller Road Site in Taft, Texas. This report documents the findings of the data validation performed on solid samples collected on May 8, 2008, at the Leo Miller Road Site. The samples were analyzed by Accutest Laboratories located in Houston, Texas. Accutest subcontracted silica analyses to Xenco Laboratories located in Stafford, Texas. The samples were analyzed for the following analyses and methods.

Analysis	**U.S. EPA SW-846 Method**
Silica	6020A

A QA Level IV data package was requested but was not received from the laboratory. The data were validated in general accordance with the U.S. EPA "Contract Laboratory Program National Functional Guidance for Inorganic Data Review" dated October 2004. The attachment to this report contains a summary of results with hand-written data qualifiers. Below are the results of the data validation.

The following table summarizes the samples for which this data validation is being conducted.

Sample ID	**Matrix**	**Lab Sample ID**	**Date Collected**	**Date Analyzed**
RML1-RM01-G	Solid	T22120-1/304697-001	05/08/2008	05/30/2008
RML1-RM02-G	Solid	T22120-2/304697-002	05/08/2008	05/30/2008
RML1-RM05-G	Solid	T22120-3/304697-003	05/08/2008	05/30/2008
RML2-RM03-G	Solid	T22120-4/304697-004	05/08/2008	05/30/2008
RML2-RM04-G	Solid	T22120-5/304697-005	05/08/2008	05/30/2008

SILICON BY U.S. EPA SW-846 METHOD 6020A

1. Holding Times

The samples were analyzed within the required holding time limit of 180 days from sample collection.

2. Mass Spectra Tuning

The laboratory did not provide data to verify the mass spectra tuning.

3. Initial Calibration Verification (ICV)

ICV results were within QC limits.

4. Continuing Calibration Verification (CCV)

CCVs were analyzed at the appropriate frequency and results were within QC limits.

5. Calibration Blanks (ICB, CCB)

ICB and CCBs were analyzed at the appropriate frequency and results were within QC Limits.

6. Method Blanks (MB)

A method blank was analyzed as required and all concentrations were less than the reporting limits.

7. ICP Interference Check Samples (ICS)

ICS results were within QC limits.

8. Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results

A MS and MSD were prepared and analyzed using a sample from another site. Recoveries of the MS (179%) and the MSD (138) were above the control limits of 70-125%. Results are qualified as estimates, biased high (J+).

9. Sample/Sample Duplicate Results

A sample and sample duplicate were prepared and analyzed using a sample from another site. The RPDs of the pair were less than the 20% control limit.

10. Laboratory Control Sample (LCS) Results

The LCS recoveries were within the laboratory-established QC limits.

11. Serial Dilution (SD) Results

The laboratory did not conduct a SD.

12. Internal Standards

Internal standards met QC requirement for all samples.

13. Miscellaneous Comments

None.

ATTACHMENT

XENCO RESULTS SUMMARY

Certificate of Analytical Results 304697

Accutest Laboratories, Houston, TX

Metals Analysis

Sample Id: **T22120-1** Matrix: SOIL Sample Depth:
Lab Sample Id: **304697-001** Date Collected: May-08-08 00:00 Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: 43.33 Prep Method: 3050B
Date Anal: May-30-08 23:42 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	782	J+ 10.0	15.3	21.00	32.2	mg/kg		1

Analytical Method: **Percent Moisture** % Moist: Prep Method:
Date Anal: Jul-14-08 15:45 Analyst: CRU Date Prep: Tech: CRU
Anal seq: 727974 Prep seq:

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Percent Moisture	TMOIST	43.3					%		

Sample Id: **T22120-2** Matrix: SOIL Sample Depth:
Lab Sample Id: **304697-002** Date Collected: May-08-08 00:00 Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: 21.93 Prep Method: 3050B
Date Anal: May-30-08 23:47 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	359	J+ 10.0	12.8	21.00	26.9	mg/kg		1

Analytical Method: **Percent Moisture** % Moist: Prep Method:
Date Anal: Jul-14-08 15:47 Analyst: CRU Date Prep: Tech: CRU
Anal seq: 727974 Prep seq:

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Percent Moisture	TMOIST	21.9					%		

7/18/8

Certificate of Analytical Results 304697

Accutest Laboratories, Houston, TX

Metals Analysis

Sample Id: **T22120-3** Matrix: SOIL Sample Depth:
Lab Sample Id: **304697-003** Date Collected: May-08-08 00:00 Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: 21.33 Prep Method: 3050B
Date Anal: May-30-08 23:52 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	428	10.0	12.5	21.00	26.2	mg/kg	J+	1

Analytical Method: **Percent Moisture** % Moist: Prep Method:
Date Anal: Jul-14-08 15:48 Analyst: CRU Date Prep: Tech: CRU
Anal seq: 727974 Prep seq:

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Percent Moisture	TMOIST	21.3					%		

Sample Id: **T22120-4** Matrix: SOIL Sample Depth:
Lab Sample Id: **304697-004** Date Collected: May-08-08 00:00 Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: 26.23 Prep Method: 3050B
Date Anal: May-30-08 23:56 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	930	10.0	12.9	21.00	27.1	mg/kg	J+	1

Analytical Method: **Percent Moisture** % Moist: Prep Method:
Date Anal: Jul-14-08 15:49 Analyst: CRU Date Prep: Tech: CRU
Anal seq: 727974 Prep seq:

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Percent Moisture	TMOIST	26.2					%		

Dani Clark 7/18/14

Certificate of Analytical Results 304697

Accutest Laboratories, Houston, TX

Metals Analysis

Sample Id: **T22120-5** Matrix: SOIL Sample Depth:
Lab Sample Id: **304697-005** Date Collected: May-08-08 00:00 Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: 18.96 Prep Method: 3050B
Date Anal: May-31-08 00:20 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	1050 J+	10.0	12.2	21.00	25.7	mg/kg		1

Analytical Method: **Percent Moisture** % Moist: Prep Method:
Date Anal: Jul-14-08 15:50 Analyst: CRU Date Prep: Tech: CRU
Anal seq: 727974 Prep seq:

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Percent Moisture	TMOIST	19.0					%		

Sample Id: **509766-1-BLK** Matrix: SOLID Sample Depth:
Lab Sample Id: **509766-1-BLK** Date Collected: Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: Prep Method: 3050B
Date Anal: May-30-08 22:07 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	U	10.0	10.0	21.00	21.0	mg/kg	U	1

Sample Id: **727974-1-BLK** Matrix: SOLID Sample Depth:
Lab Sample Id: **727974-1-BLK** Date Collected: Date Received: May-28-08 10:20

Analytical Method: **Percent Moisture** % Moist: Prep Method:
Date Anal: Jul-14-08 15:44 Analyst: CRU Date Prep: Tech: CRU
Anal seq: 727974 Prep seq:

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Percent Moisture	TMOIST	U					%	U	

Davi Cc
7/18/8

Analytical Report 304697

for

Accutest Laboratories

Project Manager: Sylvia Garza

Metals Analysis

T22120

03-JUN-08

E84880

4143 Greenbriar Dr., Stafford, TX 77477 Ph:(281) 240-4200 Fax:(281) 240-4280

Texas certification numbers:
Houston, TX T104704215

Florida certification numbers:
Houston, TX E871002 - Miami, FL E86678 - Tampa, FL E86675
Norcross(Atlanta), GA E87429

South Carolina certification numbers:
Norcross(Atlanta), GA 98015

North Carolina certification numbers:
Norcross(Atlanta), GA 483

Houston - Dallas - San Antonio - Austin - Tampa - Miami - Latin America
Midland - Corpus Christi - Atlanta

XENCO Laboratories

03-JUN-08

Project Manager: **Sylvia Garza**
Accutest Laboratories
10165 Harwin Drive, Suite #150
Houston, TX 77036

Reference: XENCO Report No: **304697**
Metals Analysis
Project Address:

Sylvia Garza:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 304697. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 304697 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Carlos Castro
Managing Director, Texas

Recipient of the Prestigious Small Business Administration Award of Excellence in 1994.
Certified and approved by numerous States and Agencies.
A Small Business and Minority Status Company that delivers SERVICE and QUALITY
Houston - Dallas - San Antonio - Austin - Tampa - Miami - Atlanta - Corpus Christi - Latin America

Sample Cross Reference 304697

Accutest Laboratories, Houston, TX

Metals Analysis

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
T22120-1	S	May-08-08 00:00		304697-001
T22120-2	S	May-08-08 00:00		304697-002
T22120-3	S	May-08-08 00:00		304697-003
T22120-4	S	May-08-08 00:00		304697-004
T22120-5	S	May-08-08 00:00		304697-005

Certificate of Analytical Results 304697

Accutest Laboratories, Houston, TX

Metals Analysis

Sample Id: **T22120-1** Matrix: SOIL Sample Depth:
Lab Sample Id: **304697-001** Date Collected: May-08-08 00:00 Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: Prep Method: 3050B
Date Anal: May-30-08 23:42 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	443	10.0	8.70	21.00	18.3	mg/kg		1

Sample Id: **T22120-2** Matrix: SOIL Sample Depth:
Lab Sample Id: **304697-002** Date Collected: May-08-08 00:00 Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: Prep Method: 3050B
Date Anal: May-30-08 23:47 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	280	10.0	10.0	21.00	21.0	mg/kg		1

Sample Id: **T22120-3** Matrix: SOIL Sample Depth:
Lab Sample Id: **304697-003** Date Collected: May-08-08 00:00 Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: Prep Method: 3050B
Date Anal: May-30-08 23:52 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	337	10.0	9.80	21.00	20.6	mg/kg		1

Sample Id: **T22120-4** Matrix: SOIL Sample Depth:
Lab Sample Id: **304697-004** Date Collected: May-08-08 00:00 Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: Prep Method: 3050B
Date Anal: May-30-08 23:56 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	686	10.0	9.52	21.00	20.0	mg/kg		1

Certificate of Analytical Results 304697

Accutest Laboratories, Houston, TX

Metals Analysis

Sample Id: **T22120-5** Matrix: SOIL Sample Depth:
Lab Sample Id: **304697-005** Date Collected: May-08-08 00:00 Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: Prep Method: 3050B
Date Anal: May-31-08 00:20 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	849	10.0	9.90	21.00	20.8	mg/kg		1

Sample Id: **509766-1-BLK** Matrix: SOLID Sample Depth:
Lab Sample Id: **509766-1-BLK** Date Collected: Date Received: May-28-08 10:20

Analytical Method: **Total Metals by SW6020A** % Moist: Prep Method: 3050B
Date Anal: May-30-08 22:07 Analyst: MCH Date Prep: May-29-08 14:43 Tech: MCH
Anal seq: 724106 Prep seq: 509766

Parameter	CAS Number	Result	MQL UnAdj	MQL Adj	MDL UnAdj	SQL	Units	Flag	Dil
Silicon	7440-21-3	U	10.0	10.0	21.00	21.0	mg/kg	U	1

XENCO Laboratories
CHRONOLOGY OF HOLDING TIMES

Analytical Method : Total Metals by SW6020A

Client : Accutest Laboratories

Work Order #: 304697

Project ID: T22120

Field Sample ID	Date Collected	Date Received	Date Extracted	Max Holding Time Extracted (Days)	Time Held Extracted (Days)	Date Analyzed	Max Holding Time Analyzed (Days)	Time Held Analyzed (Days)	Q
T22120-5	May. 8, 2008	May. 28, 2008	May. 29, 2008	180	21	May.31, 2008	180	2	P
T22120-4	May. 8, 2008	May. 28, 2008	May. 29, 2008	180	21	May.30, 2008	180	1	P
T22120-3	May. 8, 2008	May. 28, 2008	May. 29, 2008	180	21	May.30, 2008	180	1	P
T22120-2	May. 8, 2008	May. 28, 2008	May. 29, 2008	180	21	May.30, 2008	180	1	P
T22120-1	May. 8, 2008	May. 28, 2008	May. 29, 2008	180	21	May.30, 2008	180	1	P

F = These samples were analyzed outside the recommended holding time.
P = Samples analyzed within the recommended holding time.

XENCO Laboratories

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL(PQL) and above the SQL(MDL).

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

* Outside XENCO'S scope of NELAC Accreditation

XENCO Laboratories

Analytical Log

Analytical Method:	Total Metals by SW6020A	Batch #:	724106
Project Name:	Metals Analysis	Project ID:	T22120
Client Name:	Accutest Laboratories	WO Number:	304697

Client Sample Id	Lab Sample Id	QC Types
T22120-1	304697-001	SMP
T22120-2	304697-002	SMP
T22120-3	304697-003	SMP
T22120-4	304697-004	SMP
T22120-5	304697-005	SMP
	304700-002 D	MD
	304700-002 S	MS
	304700-002 SD	MSD
	509766-1-BKS	BKS
	509766-1-BLK	BLK

Blank Spike Recovery

Project Name: Metals Analysis

Work Order #: 304697 **Project ID:** T22120

Lab Batch #: 724106 **Sample:** 509766-1-BKS **Matrix:** Solid

Date Analyzed: 05/30/2008 **Date Prepared:** 05/29/2008 **Analyst:** MCH

Reporting Units: mg/kg **Batch #:** 1

Total Metals by SW6020A Analytes	Blank Result [A]	BLANK /BLANK SPIKE RECOVERY STUDY Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Silicon	<10.0	100	104	104	70-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Form 3 - MS / MSD Recoveries

Project Name: Metals Analysis

Work Order # : 304697 **Project ID:** T22120

Lab Batch ID: 724106 **QC- Sample ID:** 304700-002 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 05/30/2008 **Date Prepared:** 05/29/2008 **Analyst:** MCH

Reporting Units: mg/kg

Total Metals by SW6020A	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Silicon	499	119	712	179	119	663	138	26	70-125	30	X

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Sample Duplicate Recovery

XENCO Laboratories

Project Name: Metals Analysis

Work Order #: 304697

Lab Batch #: 724106 **Project ID:** T22120

Date Analyzed: 05/30/2008 **Date Prepared:** 05/29/2008 **Analyst:** MCH

QC- Sample ID: 304700-002 D **Batch #:** 1 **Matrix:** Soil

Reporting Units: mg/kg

Total Metals by SW6020A	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Silicon	499	500	0	30	

Spike Relative Difference RPD 200 * | (B-A)/(B+A) |
All Results are based on MDL and validated for QC purposes.

XENCO Laboratories

Prelogin/Nonconformance Report- Sample Log-In

Client: Accutest

Date/ Time: 5/28/8

Lab ID # : 30469717

Initials:

Sample Receipt Checklist

#1	Temperature of container/ cooler?	Yes	No	N/A	3-0c
#2	Shipping container in good condition?	Yes	No	None	
#3	Samples received on ice?	Yes	No	N/A	Blue/Water
#4	Custody Seals intact on shipping container/ cooler?	Yes	No	N/A	
#5	Custody Seals intact on sample bottles/ container?	Yes	No	N/A	
#6	Chain of Custody present?	Yes	No		
#7	Sample instructions complete of Chain of Custody?	Yes	No		
#8	Any missing/extra samples?	Yes	No		
#9	Chain of Custody signed when relinquished/ received?	Yes	No		
#10	Chain of Custody agrees with sample label(s)?	Yes	No		
#11	Container label(s) legible and intact?	Yes	No		
#12	Sample matrix/ properties agree with Chain of Custody?	Yes	No		
#13	Samples in proper container/ bottle?	Yes	No		
#14	Samples properly preserved?	Yes	No	N/A	
#15	Sample container intact?	Yes	No		
#16	Sufficient sample amount for indicated test(s)?	Yes	No		
#17	All samples received within sufficient hold time?	Yes	No		
#18	Subcontract of sample(s)?	Yes	No	N/A	
#19	VOC samples have zero headspace?	Yes	No	N/A	

Nonconformance Documentation

Contact: _____ Contacted by: _____ Date/ Time: _____

Regarding: _____

Corrective Action Taken:

Check all that Apply:

- ☐ Client understands and would like to proceed with analysis
- ☐ Cooling process had begun shortly after sampling event

SUB COC

ACCUTEST LABORATORIES

10165 Harwin, Suite 150 - Houston, TX 77036 - 713-271-4700 fax: 713-271-4770

Page 1 of 1

FED-EX Tracking #	Bottle Order Control #
Accutest Quote #	Accutest Job # 304697-1

Client / Reporting Information

Company Name: XENCO
Project Contact: Sample Receiving
Address: 4143 Greenbrier Drive
City / State: Stafford, TX 77477
Phone No.: 281-589-0692 Fax No.:
Samplers's Name:

Project Information

Send Report to: sylviag@accutest.com
Bill to: Accutest Laboratories Invoice Attn.:
Address: 10165 Harwin Drive, Suite 150
City / State / Zip: Houston, TX 77036
Phone No.: 713-271-4700/713-271-4770 Fax No.:
Client Purchase Order #: T22120

Matrix Codes: DW - Drinking Water; GW - Ground Water; WW - Wastewater; SO - Soil; SL - Sludge; OI - Oil; LIQ - Other Liquid; SOL - Other Solid

Accutest Sample #	Field ID / Point of Collection	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	ENCORE	NaHSO4	MEOH	NONE	SILICON (6020)	NEED DRY WEIGHT REPORTING	LAB USE ONLY
	T22120-1	5/8/2008		SO	1									X		
	T22120-2	5/8/2008		SO	1									X		
	T22120-3	5/8/2008		SO	1									X		
	T22120-4	5/8/2008		SO	1									X		
	T22120-5	5/8/2008		SO	1									X		

Requested Analyses

Turnaround Time (Business days)

- [ ] 10 Day *STANDARD* — Approved By:/ Date:
- [ ] 5 Day *RUSH*
- [ ] 4 Day *RUSH*
- [ ] 3 Day *EMERGENCY* — ONE WEEK TAT
- [ ] 2 Day *EMERGENCY*
- [ ] 1 Day *EMERGENCY*
- [ ] Other

Real time analytical data available via Lablink

Data Deliverable Information

- [ ] Commercial "A"
- [X] Commercial "B"
- [ ] Reduced Tier 1
- [ ] Full Data Package
- [ ] State Forms
- [ ] EDD Format
- [ ] Other

Commercial "A" = Results Only
Commercial "B" = Results & Standard QC

Comments / Remarks

Need QC with Results

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION, INCLUDING COURIER DELIVERY

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1 D. Williams 5/28/08 10:20		1	2		2
Relinquished by: 3	Date Time:	Received By: 3	Relinquished By: 4	Date Time: 05/28/08 10:20	Received By: 4
Relinquished by: 5	Date Time:	Received By: 5	Custody Seal #	Preserved where applicable ☐	On Ice ☐ Cooler Temp.

PTS Laboratories, Inc.

Accutest Laboratories
PTS File No: 38404

PARTICLE SIZE SUMMARY

(METHODOLOGY: ASTM D422/D4464M)

PROJECT NAME: N/A
PROJECT NO: T22120

Sample ID	Depth, ft.	Mean Grain Size Description (1)	Median Grain Size mm	Particle Size Distribution, wt. percent						Silt & Clay
				Gravel	Sand Size			Silt	Clay	
					Coarse	Medium	Fine			
T22120-1/RML1-RM01-G	N/A	Clay	0.004	0.00	0.00	0.00	0.00	43.30	56.70	100.00
T22120-2/RML1-RM02-G	N/A	Silt	0.005	0.00	0.00	0.00	0.00	48.71	51.29	100.00
T22120-3/RML1-RM05-G	N/A	Clay	0.003	0.00	0.00	0.00	0.00	29.94	70.06	100.00
T22120-4/RML2-RM03-G	N/A	Silt	0.010	0.00	0.00	0.00	0.00	66.91	33.09	100.00
T22120-5/RML2-RM04-G	N/A	Silt	0.013	0.00	0.00	0.00	0.00	70.43	29.57	100.00

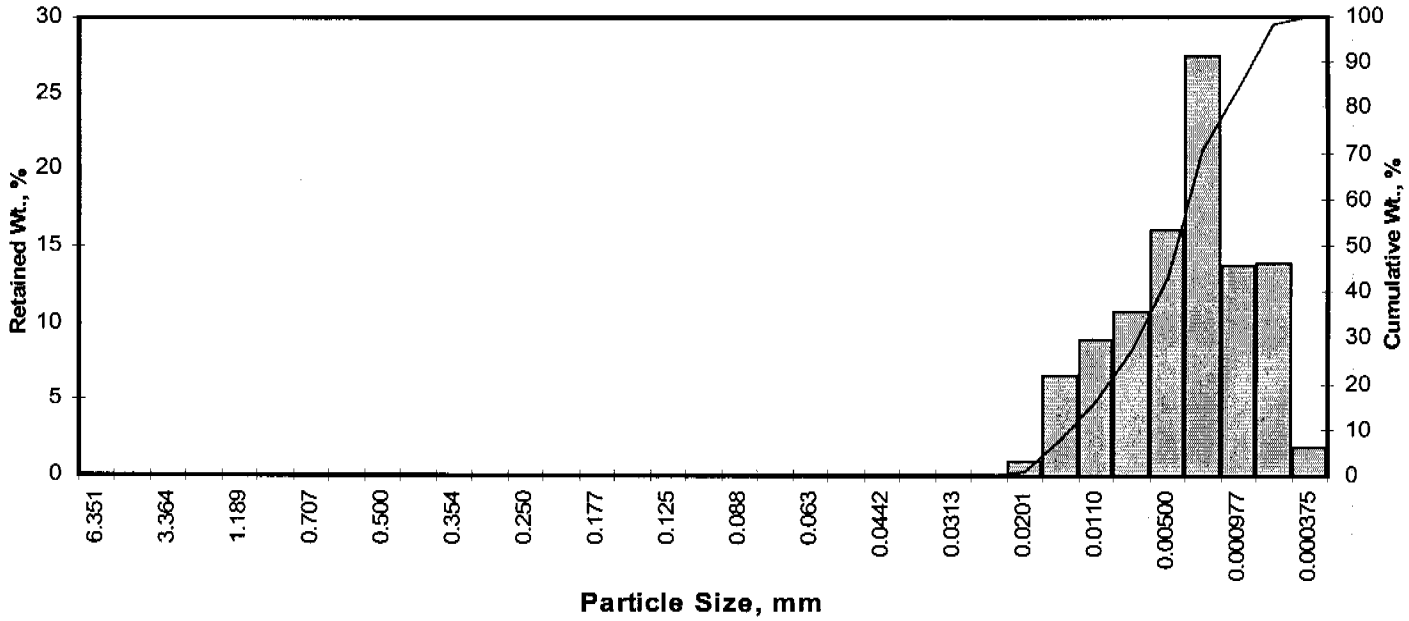
(1) Based on Mean from Trask

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	Accutest Laboratories	**PTS File No:**	38404
Project:	N/A	**Sample ID:**	T22120-1/RML1-RM01-G
Project No:	T22120	**Depth, ft:**	N/A

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00	0.00
0.0139	0.354	1.50	45	0.00	0.00	0.00
0.0117	0.297	1.75	50	0.00	0.00	0.00
0.0098	0.250	2.00	60	0.00	0.00	0.00
0.0083	0.210	2.25	70	0.00	0.00	0.00
0.0070	0.177	2.50	80	0.00	0.00	0.00
0.0059	0.149	2.75	100	0.00	0.00	0.00
0.0049	0.125	3.00	120	0.00	0.00	0.00
0.0041	0.105	3.25	140	0.00	0.00	0.00
0.0035	0.088	3.50	170	0.00	0.00	0.00
0.0029	0.074	3.75	200	0.00	0.00	0.00
0.0025	0.063	4.00	230	0.00	0.00	0.00
0.0021	0.053	4.25	270	0.00	0.00	0.00
0.00174	0.0442	4.50	325	0.00	0.00	0.00
0.00146	0.0372	4.75	400	0.00	0.00	0.00
0.00123	0.0313	5.00	450	0.00	0.00	0.00
0.000986	0.0250	5.32	500	0.00	0.00	0.00
0.000790	0.0201	5.64	635	0.93	0.93	0.93
0.000615	0.0156	6.00		6.62	6.62	7.55
0.000435	0.0110	6.50		8.95	8.95	16.50
0.000308	0.00781	7.00		10.70	10.70	27.20
0.000197	0.00500	7.65		16.10	16.10	43.30
0.000077	0.00195	9.00		27.40	27.40	70.69
0.000038	0.000977	10.00		13.70	13.70	84.39
0.000019	0.000488	11.00		13.80	13.80	98.19
0.000015	0.000375	11.38		1.81	1.81	100.00
TOTALS				**100.00**	**100.00**	**100.00**

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	5.86	0.0007	0.017
10	6.14	0.0006	0.014
16	6.47	0.0004	0.011
25	6.90	0.0003	0.008
40	7.51	0.0002	0.005
50	7.98	0.0002	0.004
60	8.47	0.0001	0.003
75	9.31	0.0001	0.002
84	9.97	0.0000	0.001
90	10.41	0.0000	0.001
95	10.77	0.0000	0.001

Measure	Trask	Inman	Folk-Ward
Median, phi	7.98	7.98	7.98
Median, in.	0.0002	0.0002	0.0002
Median, mm	0.004	0.004	0.004
Mean, phi	7.65	8.22	8.14
Mean, in.	0.0002	0.0001	0.0001
Mean, mm	0.005	0.003	0.004
Sorting	2.311	1.750	1.618
Skewness	0.914	0.140	0.139
Kurtosis	0.253	0.402	0.832
Grain Size Description (ASTM-USCS Scale)		Clay (based on Mean from Trask)	

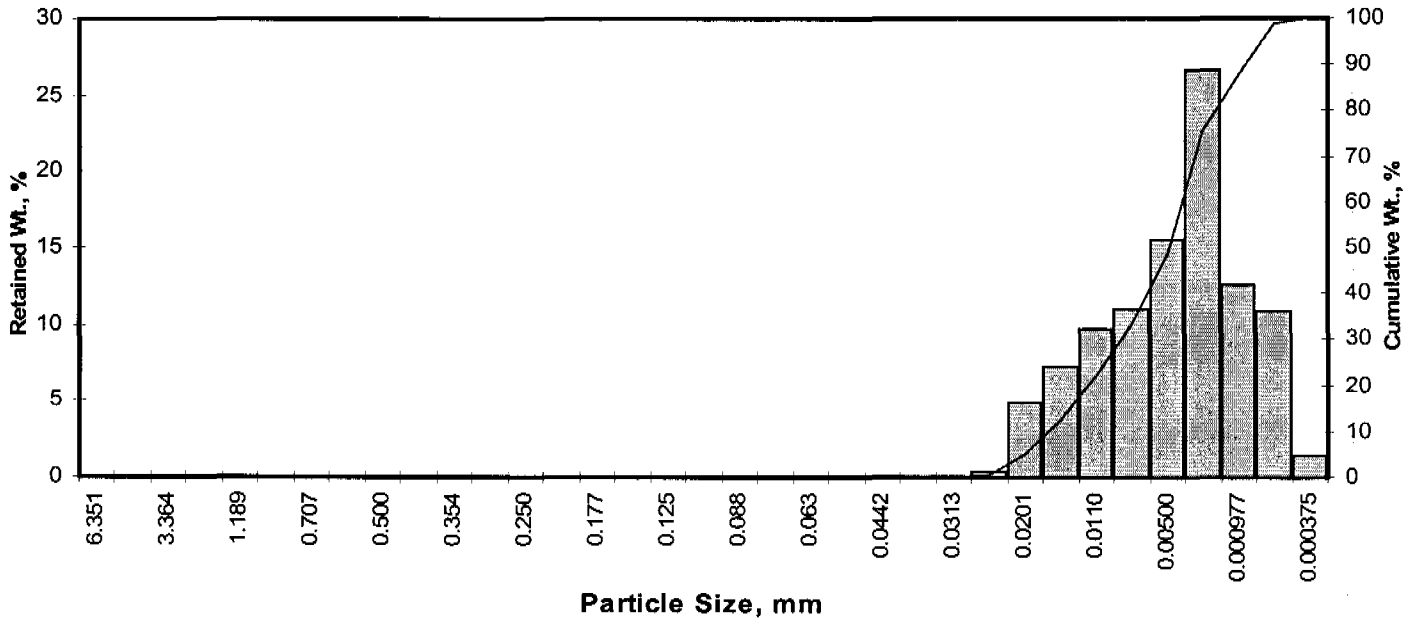
Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	0.00
Silt	>0.005 mm	43.30
Clay	<0.005 mm	56.70
	Total	**100**

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	Accutest Laboratories	**PTS File No:**	38404
Project:	N/A	**Sample ID:**	T22120-2/RML1-RM02-G
Project No:	T22120	**Depth, ft:**	N/A

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00	0.00
0.0139	0.354	1.50	45	0.00	0.00	0.00
0.0117	0.297	1.75	50	0.00	0.00	0.00
0.0098	0.250	2.00	60	0.00	0.00	0.00
0.0083	0.210	2.25	70	0.00	0.00	0.00
0.0070	0.177	2.50	80	0.00	0.00	0.00
0.0059	0.149	2.75	100	0.00	0.00	0.00
0.0049	0.125	3.00	120	0.00	0.00	0.00
0.0041	0.105	3.25	140	0.00	0.00	0.00
0.0035	0.088	3.50	170	0.00	0.00	0.00
0.0029	0.074	3.75	200	0.00	0.00	0.00
0.0025	0.063	4.00	230	0.00	0.00	0.00
0.0021	0.053	4.25	270	0.00	0.00	0.00
0.00174	0.0442	4.50	325	0.00	0.00	0.00
0.00146	0.0372	4.75	400	0.00	0.00	0.00
0.00123	0.0313	5.00	450	0.00	0.00	0.00
0.000986	0.0250	5.32	500	0.40	0.40	0.40
0.000790	0.0201	5.64	635	4.93	4.93	5.33
0.000615	0.0156	6.00		7.19	7.19	12.53
0.000435	0.0110	6.50		9.67	9.67	22.20
0.000308	0.00781	7.00		11.00	11.01	33.21
0.000197	0.00500	7.65		15.50	15.51	48.71
0.000077	0.00195	9.00		26.60	26.61	75.33
0.000038	0.000977	10.00		12.50	12.51	87.83
0.000019	0.000488	11.00		10.80	10.81	98.64
0.000015	0.000375	11.38		1.36	1.36	100.00
TOTALS				**100.00**	**100.00**	**100.00**

Cumulative Weight Percent greater than

Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	5.62	0.0008	0.020
10	5.87	0.0007	0.017
16	6.18	0.0005	0.014
25	6.63	0.0004	0.010
40	7.28	0.0003	0.006
50	7.71	0.0002	0.005
60	8.22	0.0001	0.003
75	8.98	0.0001	0.002
84	9.69	0.0000	0.001
90	10.20	0.0000	0.001
95	10.66	0.0000	0.001

Measure	Trask	Inman	Folk-Ward
Median, phi	7.71	7.71	7.71
Median, in.	0.0002	0.0002	0.0002
Median, mm	0.005	0.005	0.005
Mean, phi	7.37	7.94	7.86
Mean, in.	0.0002	0.0002	0.0002
Mean, mm	0.006	0.004	0.004
Sorting	2.263	1.757	1.643
Skewness	0.936	0.129	0.150
Kurtosis	0.251	0.436	0.878
Grain Size Description (ASTM-USCS Scale)		Silt (based on Mean from Trask)	

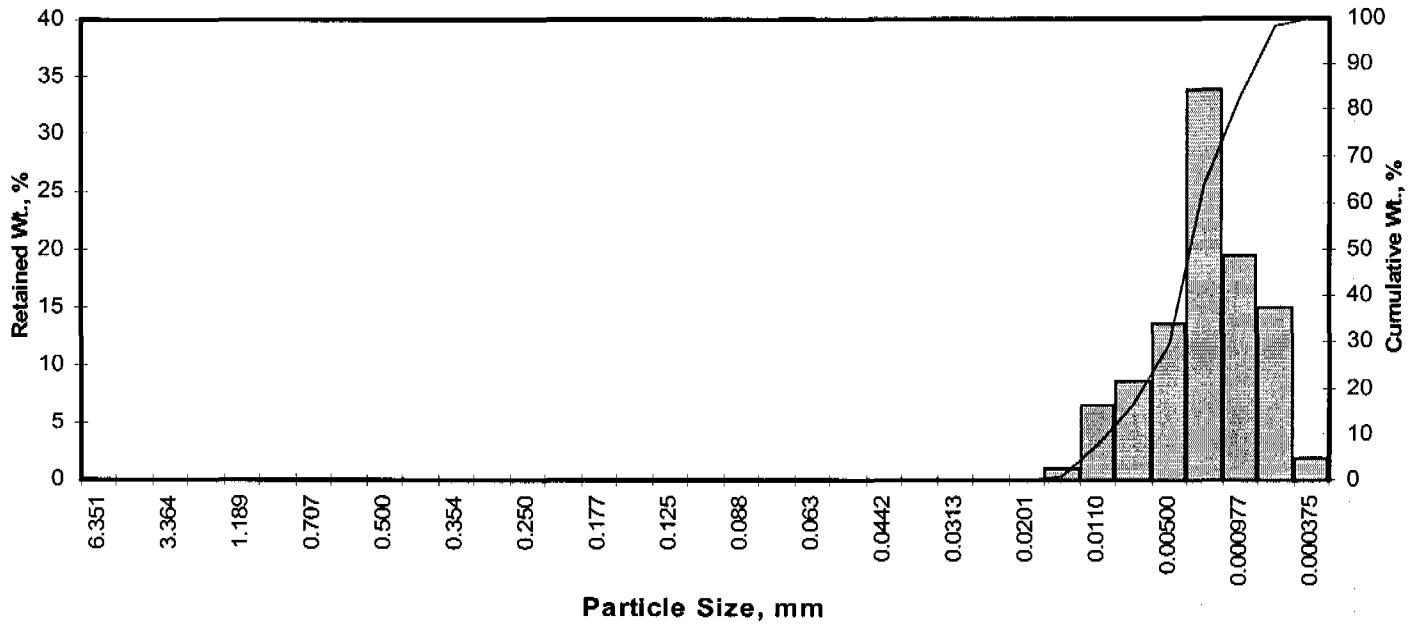
Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	0.00
Silt	>0.005 mm	48.71
Clay	<0.005 mm	51.29
	Total	**100**

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	Accutest Laboratories	**PTS File No:**	38404
Project:	N/A	**Sample ID:**	T22120-3/RML1-RM05-G
Project No:	T22120	**Depth, ft:**	N/A

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00	0.00
0.0139	0.354	1.50	45	0.00	0.00	0.00
0.0117	0.297	1.75	50	0.00	0.00	0.00
0.0098	0.250	2.00	60	0.00	0.00	0.00
0.0083	0.210	2.25	70	0.00	0.00	0.00
0.0070	0.177	2.50	80	0.00	0.00	0.00
0.0059	0.149	2.75	100	0.00	0.00	0.00
0.0049	0.125	3.00	120	0.00	0.00	0.00
0.0041	0.105	3.25	140	0.00	0.00	0.00
0.0035	0.088	3.50	170	0.00	0.00	0.00
0.0029	0.074	3.75	200	0.00	0.00	0.00
0.0025	0.063	4.00	230	0.00	0.00	0.00
0.0021	0.053	4.25	270	0.00	0.00	0.00
0.00174	0.0442	4.50	325	0.00	0.00	0.00
0.00146	0.0372	4.75	400	0.00	0.00	0.00
0.00123	0.0313	5.00	450	0.00	0.00	0.00
0.000986	0.0250	5.32	500	0.00	0.00	0.00
0.000790	0.0201	5.64	635	0.01	0.01	0.01
0.000615	0.0156	6.00		1.04	1.04	1.05
0.000435	0.0110	6.50		6.59	6.59	7.64
0.000308	0.00781	7.00		8.59	8.59	16.24
0.000197	0.00500	7.65		13.70	13.71	29.94
0.000077	0.00195	9.00		33.70	33.71	63.65
0.000038	0.000977	10.00		19.50	19.51	83.16
0.000019	0.000488	11.00		15.00	15.01	98.17
0.000015	0.000375	11.38		1.83	1.83	100.00
TOTALS				**100.00**	**100.00**	**100.00**

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	6.30	0.0005	0.013
10	6.64	0.0004	0.010
16	6.99	0.0003	0.008
25	7.41	0.0002	0.006
40	8.05	0.0001	0.004
50	8.45	0.0001	0.003
60	8.85	0.0001	0.002
75	9.58	0.0001	0.001
84	10.06	0.0000	0.001
90	10.46	0.0000	0.001
95	10.79	0.0000	0.001

Measure	Trask	Inman	Folk-Ward
Median, phi	8.45	8.45	8.45
Median, in.	0.0001	0.0001	0.0001
Median, mm	0.003	0.003	0.003
Mean, phi	8.12	8.52	8.50
Mean, in.	0.0001	0.0001	0.0001
Mean, mm	0.004	0.003	0.003
Sorting	2.121	1.535	1.448
Skewness	0.969	0.046	0.043
Kurtosis	0.245	0.463	0.848
Grain Size Description (ASTM-USCS Scale)		Clay (based on Mean from Trask)	

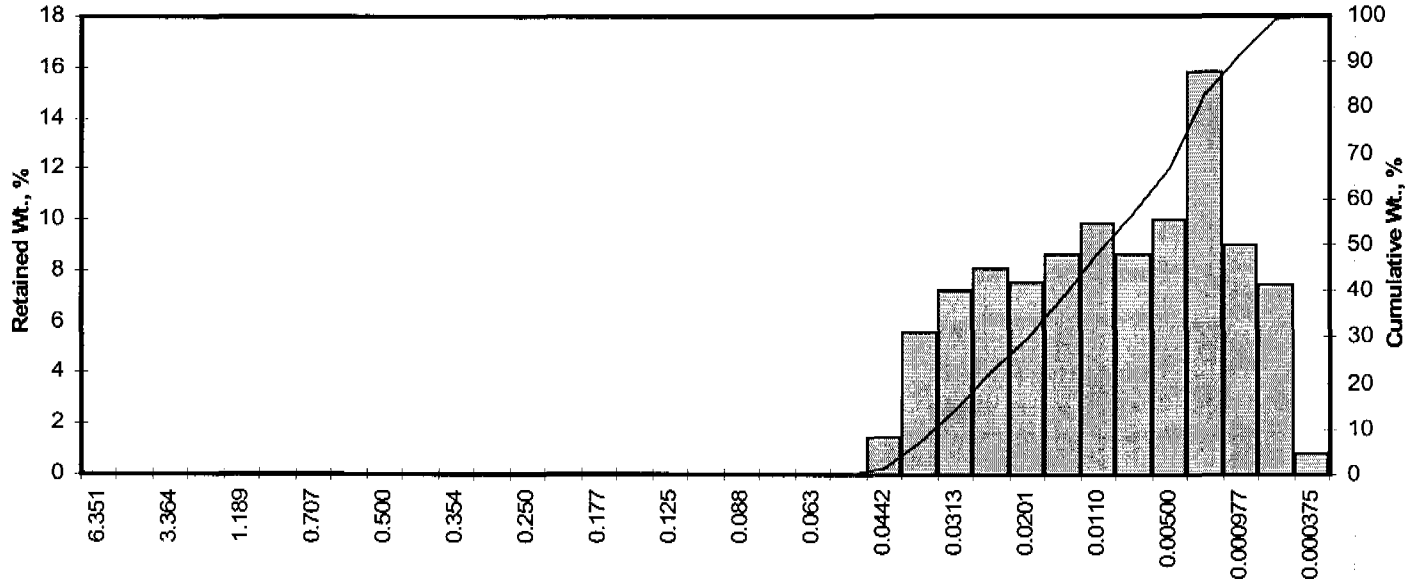
Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	0.00
Silt	>0.005 mm	29.94
Clay	<0.005 mm	70.06
	Total	**100**

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	Accutest Laboratories	**PTS File No:**	38404
Project:	N/A	**Sample ID:**	T22120-4/RML2-RM03-G
Project No:	T22120	**Depth, ft:**	N/A

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00	0.00
0.0139	0.354	1.50	45	0.00	0.00	0.00
0.0117	0.297	1.75	50	0.00	0.00	0.00
0.0098	0.250	2.00	60	0.00	0.00	0.00
0.0083	0.210	2.25	70	0.00	0.00	0.00
0.0070	0.177	2.50	80	0.00	0.00	0.00
0.0059	0.149	2.75	100	0.00	0.00	0.00
0.0049	0.125	3.00	120	0.00	0.00	0.00
0.0041	0.105	3.25	140	0.00	0.00	0.00
0.0035	0.088	3.50	170	0.00	0.00	0.00
0.0029	0.074	3.75	200	0.00	0.00	0.00
0.0025	0.063	4.00	230	0.00	0.00	0.00
0.0021	0.053	4.25	270	0.04	0.04	0.04
0.00174	0.0442	4.50	325	1.45	1.45	1.49
0.00146	0.0372	4.75	400	5.56	5.56	7.05
0.00123	0.0313	5.00	450	7.18	7.18	14.23
0.000986	0.0250	5.32	500	8.06	8.06	22.30
0.000790	0.0201	5.64	635	7.56	7.56	29.86
0.000615	0.0156	6.00		8.57	8.57	38.44
0.000435	0.0110	6.50		9.87	9.88	48.31
0.000308	0.00781	7.00		8.60	8.60	56.92
0.000197	0.00500	7.65		9.99	10.00	66.91
0.000077	0.00195	9.00		15.80	15.81	82.72
0.000038	0.000977	10.00		8.97	8.97	91.70
0.000019	0.000488	11.00		7.41	7.41	99.11
0.000015	0.000375	11.38		0.89	0.89	100.00
TOTALS				**99.90**	**100.00**	**100.00**

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	4.66	0.0016	0.040
10	4.85	0.0014	0.035
16	5.07	0.0012	0.030
25	5.43	0.0009	0.023
40	6.08	0.0006	0.015
50	6.60	0.0004	0.010
60	7.20	0.0003	0.007
75	8.34	0.0001	0.003
84	9.14	0.0001	0.002
90	9.81	0.0000	0.001
95	10.45	0.0000	0.001

Measure	Trask	Inman	Folk-Ward
Median, phi	6.60	6.60	6.60
Median, in.	0.0004	0.0004	0.0004
Median, mm	0.010	0.010	0.010
Mean, phi	6.25	7.11	6.94
Mean, in.	0.0005	0.0003	0.0003
Mean, mm	0.013	0.007	0.008
Sorting	2.736	2.036	1.895
Skewness	0.819	0.250	0.290
Kurtosis	0.299	0.421	0.817
Grain Size Description (ASTM-USCS Scale)		Silt (based on Mean from Trask)	

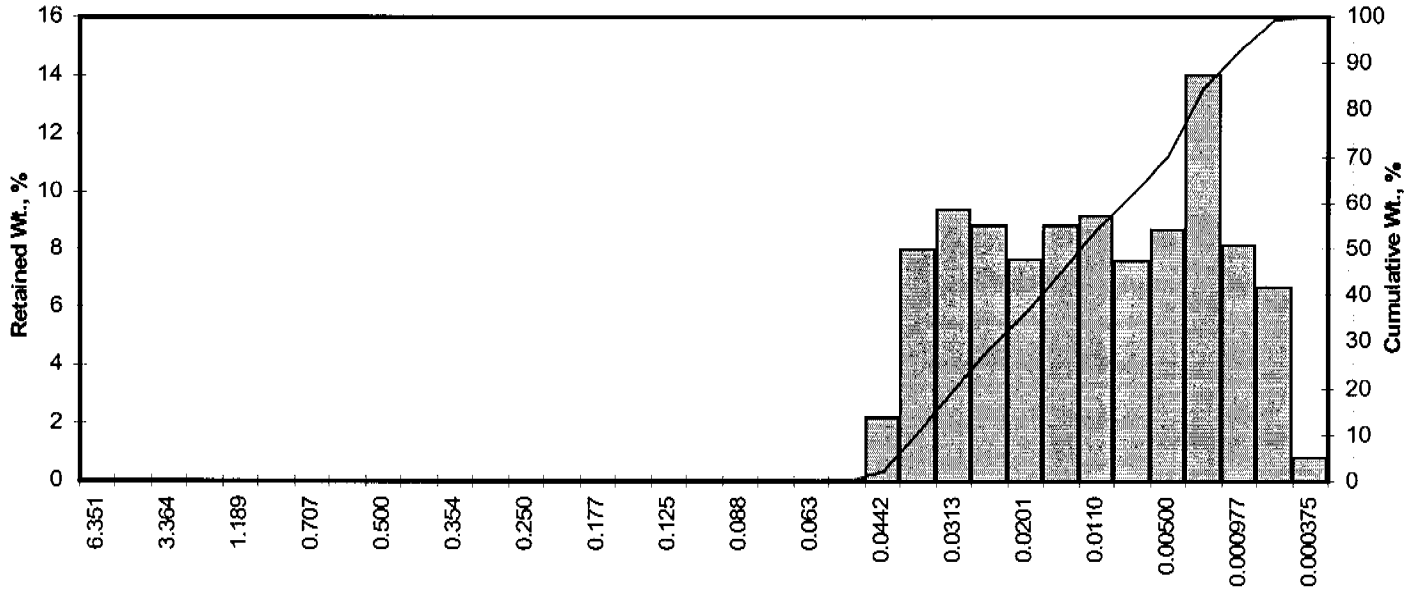
Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	0.00
Silt	>0.005 mm	66.91
Clay	<0.005 mm	33.09
	Total	**100**

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	Accutest Laboratories	**PTS File No:**	38404
Project:	N/A	**Sample ID:**	T22120-5/RML2-RM04-G
Project No:	T22120	**Depth, ft:**	N/A

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00	0.00
0.0139	0.354	1.50	45	0.00	0.00	0.00
0.0117	0.297	1.75	50	0.00	0.00	0.00
0.0098	0.250	2.00	60	0.00	0.00	0.00
0.0083	0.210	2.25	70	0.00	0.00	0.00
0.0070	0.177	2.50	80	0.00	0.00	0.00
0.0059	0.149	2.75	100	0.00	0.00	0.00
0.0049	0.125	3.00	120	0.00	0.00	0.00
0.0041	0.105	3.25	140	0.00	0.00	0.00
0.0035	0.088	3.50	170	0.00	0.00	0.00
0.0029	0.074	3.75	200	0.00	0.00	0.00
0.0025	0.063	4.00	230	0.00	0.00	0.00
0.0021	0.053	4.25	270	0.06	0.05	0.05
0.00174	0.0442	4.50	325	2.19	2.19	2.24
0.00146	0.0372	4.75	400	8.03	8.03	10.27
0.00123	0.0313	5.00	450	9.38	9.38	19.65
0.000986	0.0250	5.32	500	8.82	8.82	28.47
0.000790	0.0201	5.64	635	7.68	7.68	36.15
0.000615	0.0156	6.00		8.85	8.85	44.99
0.000435	0.0110	6.50		9.17	9.17	54.16
0.000308	0.00781	7.00		7.58	7.58	61.74
0.000197	0.00500	7.65		8.69	8.69	70.43
0.000077	0.00195	9.00		14.00	14.00	84.42
0.000038	0.000977	10.00		8.11	8.11	92.53
0.000019	0.000488	11.00		6.67	6.67	99.20
0.000015	0.000375	11.38		0.80	0.80	100.00
TOTALS				**100.00**	**100.00**	**100.00**

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	4.59	0.0016	0.042
10	4.74	0.0015	0.037
16	4.90	0.0013	0.033
25	5.19	0.0011	0.027
40	5.80	0.0007	0.018
50	6.27	0.0005	0.013
60	6.89	0.0003	0.008
75	8.09	0.0001	0.004
84	8.96	0.0001	0.002
90	9.69	0.0000	0.001
95	10.37	0.0000	0.001

Measure	Trask	Inman	Folk-Ward
Median, phi	6.27	6.27	6.27
Median, in.	0.0005	0.0005	0.0005
Median, mm	0.013	0.013	0.013
Mean, phi	6.01	6.93	6.71
Mean, in.	0.0006	0.0003	0.0004
Mean, mm	0.015	0.008	0.010
Sorting	2.726	2.028	1.890
Skewness	0.775	0.324	0.370
Kurtosis	0.327	0.426	0.819
Grain Size Description (ASTM-USCS Scale)		Silt (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	0.00
Silt	>0.005 mm	70.43
Clay	<0.005 mm	29.57
	Total	**100**

SUB COC

38404

10165 Harwin, Suite 150 - Houston, TX 77036 - 713-271-4700 fax: 713-271-4770

FED-EX Tracking #	Bottle Order Control #
Accutest Quote #	Accutest Job #

Client / Reporting Information	Project Information
Company Name: PTS	Send Report to: sylviag@accutest.com
Project Contact: Sample Receiving	Bill to: Accutest Laboratories — Invoice Attn.
Address: 4342 West 12th Street	Address: 10165 Harwin Drive, Suite 150
City: Houston, TX 77055 — State	City: Houston, TX 77036 — State — Zip
Phone No.: 713-680-9467 — Fax No.	Phone No.: 713-271-4700/713-271-4770 — Fax No.
Samplers's Name	Client Purchase Order #: T22120

Requested Analyses: GRAIN SIZE ANALYSIS

Matrix Codes: DW - Drinking Water; GW - Ground Water; WW - Wastewater; SO - Soil; SL - Sludge; OI - Oil; LIQ - Other Liquid; SOL - Other Solid

Accutest Sample #	Field ID / Point of Collection	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	ENCORE	NaHSO4	MEOH	NONE	GRAIN SIZE ANALYSIS										LAB USE ONLY
	T22120-1/RML1-RM01-G	5/8/2008		SO	1									X										
	T22120-2/RML1-RM02-G	5/8/2008		SO	1									X										
	T22120-3/RML1-RM05-G	5/8/2008		SO	1									X										
	T22120-4-RML2-RM03-G	5/8/2008		SO	1									X										
	T22120-5/RML2-RM04-G	5/8/2008		SO	1									X										

Turnaround Time (Business days)

- [ ] 10 Day *STANDARD* — Approved By:/ Date:
- [ ] 5 Day *RUSH*
- [ ] 4 Day *RUSH*
- [ ] 3 Day *EMERGENCY*
- [ ] 2 Day *EMERGENCY*
- [ ] 1 Day *EMERGENCY*
- [ ] Other

Real time analytical data available via Lablink

Data Deliverable Information

- [ ] Commercial "A"
- [XX] Commercial "B"
- [ ] Reduced Tier 1
- [ ] Full Data Package
- [ ] State Forms
- [ ] EDD Format
- [ ] Other

Commercial "A" = Results Only

Commercial "B" = Results & Standard QC

Comments / Remarks

Need QC with Results

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION, INCLUDING COURIER DELIVERY

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1	5/13/8 13:00	Victor Marc	2 Apple Courier	5/13/08 14:00	2
Relinquished by: 3	Date Time:	Received By: 3	Relinquished By: 4	Date Time:	Received By: 4
Relinquished by: 5	Date Time:	Received By: 5	Custody Seal #	Preserved where applicable ☐	On Ice ☐ Cooler Temp.

Contract No. EP-W-06-077
TDD#: TO-0009-08-01-01

Region VI
Superfund Technical Assessment and Response Team
START III

Data Validation Report

July 14, 2008

Submitted to:

U.S. Environmental Protection Agency
Region VI
1445 Ross Street
Suite 1200
Dallas, TX 75202

Dynamac Corporation
1202 Executive Drive West
Richardson, TX 75081

Region VI
Superfund Technical Assessment and Response Team
START III

Data Validation Report
Leo Miller Road Site

Accutest Laboratories
Work Order No. T22122

Prepared for:

U.S. Environmental Protection Agency
Region 6
1445 Ross Street
Suite 1200
Dallas, TX 75202

Under Contract No. EP-W-06-077
TDD #: TO-0009-08-01-01

Reviewed and approved by:

_____
Steve Cowan, Dynamac Corporation

Dynamac Corporation
1202 Executive Drive West
Richardson, TX 75081

DATA VALIDATION REPORT
LEO MILLER ROADSITE
TAFT, SAN PATRICIO/ARANSAS COUNTIES, TEXAS

Accutest Laboratories
Work Order No. T22122

July 14, 2008

INTRODUCTION

Dynamac Corporation (Dynamac) has prepared this data validation report for the U.S. Environmental Protection Agency (U.S. EPA) under the Region VI Superfund Technical Assessment and Response Team (START) contract Technical Direction Document (TDD) No. TO-0009-08-01-01 for the Leo Miller Road Site in Taft, Texas. This report documents the findings of the data validation performed on liquid and dust (wipe) samples collected on May 6 and 7, 2008, at the Leo Miller Road Site. The samples were analyzed by Accutest Laboratories located in Houston, Texas. The samples were analyzed for the following analyses and methods.

Analysis	**U.S. EPA SW-846 Method**
Target analyte list (TAL) Metals in water	6010B, and 7470A
Silicon in water	6010B
Target analyte list (TAL) Metals in dust	6010B

Analysis for silica (silicon) was provided for the water samples but was not conducted on the dust samples. Analysis for mercury was requested for the dust samples but was not provided by the laboratory. The laboratory only provided a single wipe media for collection of the dust samples, thus mercury analysis could not be provided.

The data were validated in general accordance with the U.S. EPA “Contract Laboratory Program National Functional Guidance for Superfund Organic Methods Data Review” dated July 2007 and U.S. EPA “Contract Laboratory Program National Functional Guidance for Inorganic Data Review" dated October 2004. The attachment to this report contains a summary of results with hand-written data qualifiers. Below are the results of the data validation.

The following table summarizes the samples for which this data validation is being conducted.

Sample ID	Matrix	Lab Sample ID	Date Collected	Date Analyzed
BENN-GW03-G	Ground water	T22122-1	05/07/2008	05/16/2008 - 06/11/2008
BENN-GW04-G	Ground water	T22122-2	05/07/2008	05/16/2008 - 06/11/2008
BENN-RD06-G	Wipe	T22122-3	05/07/2008	05/25/2008
BENN-RD07-G	Wipe	T22122-4	05/07/2008	05/25/2008 – 05/28/2008
BKG-GW05-G	Ground water	T22122-5	05/06/2008	05/16/2008 - 06/11/2008
BKG-RD08-G	Wipe	T22122-6	05/06/2008	05/25/2008 – 05/28/2008
BKG-RD09-G	Wipe	T22122-7	05/06/2008	05/25/2008 – 05/28/2008
BK-RD10-G	Wipe	T22122-8	05/06/2008	05/25/2008
MART-GW01-G	Ground water	T22122-9	05/06/2008	05/16/2008 - 06/11/2008
MART-RD01-G	Wipe	T22122-10	05/06/2008	05/25/2008
MART-RD02-G	Wipe	T2212-11	05/06/2008	05/25/2008 – 05/28/2008
SAL-GW02-G	Ground water	T22122-12	05/06/2008	05/16/2008 - 06/12/2008
SAL-GW06-G	Ground water	T22122-13	05/06/2008	05/16/2008 - 06/11/2008
SAL-RD03-G	Wipe	T22122-14	05/06/2008	05/25/2008
SAL-RD04-G	Wipe	T22122-15	05/06/2008	05/25/2008 – 05/28/2008
SAL-RD05-G	Wipe	T22122-16	05/06/2008	05/25/2008

MERCURY IN WATER BY U.S. EPA SW-846 METHOD 7470A

1. Holding Times

The samples were analyzed within the required holding time limit of 28 days from sample collection. Samples were adequately preserved.

2. Initial Calibration Verification (ICV)

The ICV had acceptable results. The recovery was within the control limit of 80 and 120%.

3. Continuing Calibration Verification (CCV)

The CCV standards were analyzed at the appropriate frequency and recoveries were within the control limit of 80-120%.

4. CRQL Check Standard CRI

The CRI standards were analyzed at the appropriate frequency and recoveries were within the control limit of 70-130%.

5. Initial Calibration Blanks (ICB) and Continuing Calibration Blanks (CCB)

Calibration blanks were as analyzed at the appropriate frequency and results were below laboratory reporting limits.

6. Method Blanks (MB)

A MB was analyzed as required and less than the reporting limit.

7. Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results

A MS and MSD were prepared and analyzed at the appropriate frequency. Recoveries of the MS and MSD were within the laboratory % recovery limit. The relative percent difference (RPD) of the MS/MSD pair was less than the laboratory control limit.

8. Sample/Sample Duplicate Results

A sample and sample duplicate were prepared and analyzed at the appropriate frequency. The RPD of the pair was less than the laboratory control limit.

9. Laboratory Control Sample (LCS) Results

The LCS recoveries were within the quality control (QC) limits of 80-120%.

METALS IN WATER BY U.S. EPA SW-846 METHOD 6010B (INCLUDES SILICON)

1. Holding Times

The samples were analyzed within the required holding time limit of 180 days from sample collection.

2. Initial Calibration Verification

The ICV had acceptable results. The recoveries were within the control limit of 90 and 110%.

3. Continuing Calibration Verification

The CCV standards were analyzed at the appropriate frequency and recoveries were within the control limit of 90-110%.

4. CRI Standard

The CRI standards were analyzed at the appropriate frequency and recoveries were within the control limit of 70-130%.

5. Calibration Blanks

Calibration blanks were as analyzed at the appropriate frequency and results were below laboratory reporting limits.

6. Method Blanks

A MB was analyzed as required and all concentrations were less than the reporting limits. Aluminum, barium, calcium, copper, magnesium, manganese and zinc were detected at concentrations above their instrument detection limits but below their reporting limits. Concentrations of aluminum in sample BKG-GW05-G and of zinc in samples BENN-GW03-G, BENN-GW04-G and SAL-GW06-G may be due to laboratory contamination and are qualified “UB”. Barium, calcium, copper, magnesium, manganese and zinc results are not qualified.

7. ICP Interference Check Samples (ICS)

ICSs were analyzed at the appropriate frequency and results were within the control limits of 80-120% recovery.

8. Matrix Spike and Matrix Spike Duplicate Results

A MS and MSD were prepared and analyzed for all metals except silicon at the appropriate frequency. Recoveries of the MS and MSD were within the 80-120%

recovery limit except as follows: MS recovery of potassium was 133.5%, of sodium was 48.8%. MSD recovery of potassium was 133.5%, of sodium was 0.0%. Recoveries out of limits were attributed to matrix interference. The RPDs of the MS/MSD pair was less than the 20% control limit.

A MS and MSD were prepared and analyzed for silicon at the appropriate frequency. Recoveries of the MS (-9.3%) and MSD (0.5%) were outside of the 80-120% QC limits.

Reported concentrations of potassium are considered to be estimates, biased high (J+), reporting limits are not qualified. Sodium concentrations and reporting limits are not qualified due to the high concentration of sodium in the sample (4X rule). Reported concentration of silicon are considered to be estimates, biased low (J-), reporting limits are unusable (R).

9. Sample/Sample Duplicate Results

A sample and sample duplicate were prepared and analyzed at the appropriate frequency. The RPDs of iron, lead and manganese were greater than the 20% control limit; however results are not qualified due to the low concentration of the analytes in the sample.

10. Laboratory Control Sample Results

The LCS recoveries were within the laboratory-established QC limits.

11. Serial Dilution (SD) Results

The SD RPDs were outside the 10% QC limits for aluminum, copper, iron, lead, manganese, potassium, and zinc but are considered to be acceptable due to the low sample concentrations (<50 times the instrument detection limit).

METALS IN DUST (WIPES) BY U.S. EPA SW-846 METHOD 6010B

1. Holding Times

The samples were analyzed within the required holding time limit of 180 days from sample collection.

2. Initial Calibration Verification

The ICV had acceptable results. The recoveries were within the control limit of 90 and 110%.

3. Continuing Calibration Verification

The CCV standards were analyzed at the appropriate frequency and recoveries were within the control limit of 90-110%.

4. CRI Standard

The CRI standards were analyzed at the appropriate frequency and recoveries were within the control limit of 70-130%.

5. Calibration Blanks (ICB and CCB)

Calibration blanks were as analyzed at the appropriate frequency and results were below laboratory reporting limits.

6. Method Blanks

A MB was analyzed as required and all concentrations were less than the reporting limits. Calcium, manganese and zinc were detected at concentrations above their instrument detection limits but below their reporting limits. No qualifications were placed on the usability of the data as the sample concentrations were significantly greater than the blanks.

7. ICP Interference Check Samples

ICSs were analyzed at the appropriate frequency and results were within the control limits of 80-120% recovery.

8. Matrix Spike and Matrix Spike Duplicate Results

No MS/MSD was conducted on field sample, the entire wipe was digested. See the laboratory control samples for accuracy and precision determination.

9. Sample/Sample Duplicate Results

No sample duplicate was conducted on field sample, the entire wipe was digested. See the laboratory control samples for accuracy and precision determination.

10. Laboratory Control Sample Results

The LCS and LCS duplicate (LCSD) recoveries were within the laboratory-established QC limits. RPDs for the LCS/LCSD pair were within QC limits.

11. Serial Dilution Results

SD analysis was not conducted.

ATTACHMENT

ACCUTEST RESULTS SUMMARY

Sample Summary

DYNAMAC

Job No: T22122

Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
T22122-1	05/07/08	00:00 SC	05/09/08	AQ	Ground Water	BENN-GW03-G
T22122-2	05/07/08	00:00 SC	05/09/08	AQ	Ground Water	BENN-GW04-G
T22122-3	05/07/08	00:00 SC	05/09/08	WIPE	Wipe Sample	BENN-RD06-G
T22122-4	05/07/08	00:00 SC	05/09/08	WIPE	Wipe Sample	BENN-RD07-G
T22122-5	05/06/08	00:00 SC	05/09/08	AQ	Ground Water	BKG-GW05-G
T22122-6	05/06/08	00:00 SC	05/09/08	WIPE	Wipe Sample	BKG-RD08-G
T22122-7	05/06/08	00:00 SC	05/09/08	WIPE	Wipe Sample	BKG-RD09-G
T22122-8	05/06/08	00:00 SC	05/09/08	WIPE	Wipe Sample	BK-RD10-G
T22122-9	05/06/08	00:00 SC	05/09/08	AQ	Ground Water	MART-GW01-G
T22122-10	05/06/08	00:00 SC	05/09/08	WIPE	Wipe Sample	MART-RD01-G
T22122-11	05/06/08	00:00 SC	05/09/08	WIPE	Wipe Sample	MART-RD02-G
T22122-12	05/06/08	00:00 SC	05/09/08	AQ	Ground Water	SAL-GW02-G
T22122-13	05/06/08	00:00 SC	05/09/08	AQ	Ground Water	SAL-GW06-G

Sample Summary
(continued)

DYNAMAC

Job No: T22122

Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818

Sample Number	Collected Date	Time By	Received	Matrix Code Type	Client Sample ID
T22122-14	05/06/08	00:00 SC	05/09/08	WIPE Wipe Sample	SAL-RD03-G
T22122-15	05/06/08	00:00 SC	05/09/08	WIPE Wipe Sample	SAL-RD04-G
T22122-16	05/06/08	00:00 SC	05/09/08	WIPE Wipe Sample	SAL-RD05-G

Accutest Laboratories

Report of Analysis

Client Sample ID:	MART-GW01-G		
Lab Sample ID:	T22122-9	Date Sampled:	05/06/08
Matrix:	AQ - Ground Water	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	< 200	200	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Antimony	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Arsenic	8.7	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Barium	1100	200	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Beryllium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Cadmium	< 4.0	4.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Calcium	162000	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Chromium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Cobalt	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Copper	< 25	25	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Iron	8090	100	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Lead	< 3.0	3.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Magnesium	20200	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Manganese	964	15	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Mercury	< 0.20	0.20	ug/l	1	05/16/08	05/16/08	FI	SW846 7470A [1]	SW846 7470A [4]
Nickel	< 40	40	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Potassium	7260 JH	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Selenium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Silicon	11000 JL	200 R	ug/l	1	06/11/08	06/11/08	NS	SW846 6010B [3]	SW846 3010A [6]
Silver	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Sodium	142000	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Thallium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Vanadium	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Zinc	398	20	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]

(1) Instrument QC Batch: MA3541
(2) Instrument QC Batch: MA3561
(3) Instrument QC Batch: MA3581
(4) Prep QC Batch: MP7965
(5) Prep QC Batch: MP8018
(6) Prep QC Batch: MP8074

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	SAL-GW02-G		
Lab Sample ID:	T22122-12	Date Sampled:	05/06/08
Matrix:	AQ - Ground Water	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	< 200	200	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Antimony	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Arsenic	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Barium	1350	200	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Beryllium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Cadmium	< 4.0	4.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Calcium	21400	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Chromium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Cobalt	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Copper	< 25	25	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Iron	< 100	100	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Lead	< 3.0	3.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Magnesium	14100	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Manganese	< 15	15	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Mercury	< 0.20	0.20	ug/l	1	05/16/08	05/16/08	FI	SW846 7470A [1]	SW846 7470A [5]
Nickel	< 40	40	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Potassium	< 5000	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Selenium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Silicon	6790 JL	200 R	ug/l	1	06/11/08	06/11/08	NS	SW846 6010B [3]	SW846 3010A [7]
Silver	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Sodium	917000	25000	ug/l	5	05/27/08	06/12/08	NS	SW846 6010B [4]	SW846 3010A [6]
Thallium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Vanadium	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Zinc	74.6	20	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]

(1) Instrument QC Batch: MA3541
(2) Instrument QC Batch: MA3561
(3) Instrument QC Batch: MA3581
(4) Instrument QC Batch: MA3584
(5) Prep QC Batch: MP7965
(6) Prep QC Batch: MP8018
(7) Prep QC Batch: MP8074

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	BENN-GW03-G		
Lab Sample ID:	T22122-1	Date Sampled:	05/07/08
Matrix:	AQ - Ground Water	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	< 200	200	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Antimony	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Arsenic	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Barium	941	200	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Beryllium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Cadmium	< 4.0	4.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Calcium	15600	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Chromium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Cobalt	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Copper	< 25	25	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Iron	< 100	100	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Lead	< 3.0	3.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Magnesium	11200	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Manganese	< 15	15	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Mercury	< 0.20	0.20	ug/l	1	05/16/08	05/16/08	FI	SW846 7470A [1]	SW846 7470A [5]
Nickel	< 40	40	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Potassium	< 5000	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Selenium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Silicon	6160 JL	200 R	ug/l	1	06/11/08	06/11/08	NS	SW846 6010B [4]	SW846 3010A [7]
Silver	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Sodium	849000	25000	ug/l	5	06/03/08	06/02/08	NS	SW846 6010B [3]	SW846 3010A [6]
Thallium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Vanadium	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Zinc	27.3 UB	20 ~~B~~	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]

(1) Instrument QC Batch: MA3541
(2) Instrument QC Batch: MA3561
(3) Instrument QC Batch: MA3569
(4) Instrument QC Batch: MA3581
(5) Prep QC Batch: MP7965
(6) Prep QC Batch: MP8018
(7) Prep QC Batch: MP8074

JL 2/7/8

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	BENN-GW04-G		
Lab Sample ID:	T22122-2	Date Sampled:	05/07/08
Matrix:	AQ - Ground Water	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	1180	200	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Antimony	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Arsenic	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Barium	950	200	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Beryllium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Cadmium	< 4.0	4.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Calcium	17700	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Chromium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Cobalt	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Copper	< 25	25	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Iron	< 100	100	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Lead	< 3.0	3.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Magnesium	11500	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Manganese	< 15	15	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Mercury	< 0.20	0.20	ug/l	1	05/16/08	05/16/08	FI	SW846 7470A [1]	SW846 7470A [5]
Nickel	< 40	40	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Potassium	< 5000	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Selenium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Silicon	7830 JL	200 R	ug/l	1	06/11/08	06/11/08	NS	SW846 6010B [4]	SW846 3010A [7]
Silver	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Sodium	836000	25000	ug/l	5	05/27/08	06/02/08	NS	SW846 6010B [3]	SW846 3010A [6]
Thallium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Vanadium	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Zinc	24.4 UB	20 B	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]

(1) Instrument QC Batch: MA3541
(2) Instrument QC Batch: MA3561
(3) Instrument QC Batch: MA3569
(4) Instrument QC Batch: MA3581
(5) Prep QC Batch: MP7965
(6) Prep QC Batch: MP8018
(7) Prep QC Batch: MP8074

2/0/r

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	BKG-GW05-G		
Lab Sample ID:	T22122-5	Date Sampled:	05/06/08
Matrix:	AQ - Ground Water	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	322 UB	200 B	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Antimony	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Arsenic	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Barium	1580	200	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Beryllium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Cadmium	< 4.0	4.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Calcium	26500	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Chromium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Cobalt	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Copper	< 25	25	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Iron	< 100	100	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Lead	< 3.0	3.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Magnesium	16600	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Manganese	20.2	15	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Mercury	< 0.20	0.20	ug/l	1	05/16/08	05/16/08	FI	SW846 7470A [1]	SW846 7470A [5]
Nickel	< 40	40	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Potassium	5870 J A	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Selenium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Silicon	11300 JL	200 R	ug/l	1	06/11/08	06/11/08	NS	SW846 6010B [3]	SW846 3010A [7]
Silver	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Sodium	944000	25000	ug/l	5	05/27/08	06/12/08	NS	SW846 6010B [4]	SW846 3010A [6]
Thallium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Vanadium	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]
Zinc	41.9	20	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [6]

(1) Instrument QC Batch: MA3541
(2) Instrument QC Batch: MA3561
(3) Instrument QC Batch: MA3581
(4) Instrument QC Batch: MA3584
(5) Prep QC Batch: MP7965
(6) Prep QC Batch: MP8018
(7) Prep QC Batch: MP8074

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	SAL-GW06-G		
Lab Sample ID:	T22122-13	Date Sampled:	05/06/08
Matrix:	AQ - Ground Water	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	< 200	200	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Antimony	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Arsenic	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Barium	< 200	200	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Beryllium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Cadmium	< 4.0	4.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Calcium	< 5000	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Chromium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Cobalt	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Copper	< 25	25	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Iron	< 100	100	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Lead	< 3.0	3.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Magnesium	< 5000	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Manganese	< 15	15	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Mercury	< 0.20	0.20	ug/l	1	05/16/08	05/16/08	FI	SW846 7470A [1]	SW846 7470A [4]
Nickel	< 40	40	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Potassium	< 5000	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Selenium	< 5.0	5.0	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Silicon	< 200 R	200 R	ug/l	1	06/11/08	06/11/08	NS	SW846 6010B [3]	SW846 3010A [6]
Silver	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Sodium	< 5000	5000	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Thallium	< 10	10	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Vanadium	< 50	50	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]
Zinc	23.6 uB	20	ug/l	1	05/27/08	05/28/08	NS	SW846 6010B [2]	SW846 3010A [5]

(1) Instrument QC Batch: MA3541
(2) Instrument QC Batch: MA3561
(3) Instrument QC Batch: MA3581
(4) Prep QC Batch: MP7965
(5) Prep QC Batch: MP8018
(6) Prep QC Batch: MP8074

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	MART-RD01-G		
Lab Sample ID:	T22122-10	Date Sampled:	05/06/08
Matrix:	WIPE - Wipe Sample	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	2630	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Antimony	0.88	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Arsenic	1.3	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Barium	30.9	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Beryllium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Cadmium	0.50	0.40	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Calcium	5010	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Chromium	18.6	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Cobalt	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Copper	5.1	2.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Iron	3920	10	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Lead	5.2	0.30	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Magnesium	2140	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Manganese	84.9	1.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Nickel	10.4	4.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Potassium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Selenium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Silver	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Sodium	1010	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Thallium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Vanadium	13.4	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Zinc	68.2	2.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]

(1) Instrument QC Batch: MA3557
(2) Prep QC Batch: MP7964

PG 2/11/8

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	MART-RD02-G		
Lab Sample ID:	T22122-11	Date Sampled:	05/06/08
Matrix:	WIPE - Wipe Sample	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	462	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Antimony	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Arsenic	0.56	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Barium	< 20	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Beryllium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Cadmium	< 0.40	0.40	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Calcium	942	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Chromium	4.8	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Cobalt	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Copper	< 2.5	2.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Iron	987	10	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Lead	1.1	0.30	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Magnesium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Manganese	22.5	1.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Nickel	< 4.0	4.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Potassium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Selenium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Silver	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Sodium	1190	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Thallium	< 2.5	2.5	ug/wipe	5	05/16/08	05/28/08	NS	SW846 6010B [2]	SW846 3050B [3]
Vanadium	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Zinc	21.4	2.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]

(1) Instrument QC Batch: MA3557
(2) Instrument QC Batch: MA3561
(3) Prep QC Batch: MP7964

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	SAL-RD03-C		
Lab Sample ID:	T22122-14	Date Sampled:	05/06/08
Matrix:	WIPE - Wipe Sample	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	807	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Antimony	1.1	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Arsenic	0.76	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Barium	27.0	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Beryllium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Cadmium	5.2	0.40	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Calcium	973	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Chromium	5.2	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Cobalt	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Copper	< 2.5	2.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Iron	1220	10	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Lead	4.7	0.30	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Magnesium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Manganese	28.1	1.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Nickel	< 4.0	4.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Potassium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Selenium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Silver	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Sodium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Thallium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Vanadium	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Zinc	160	2.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]

(1) Instrument QC Batch: MA3557
(2) Prep QC Batch: MP7964

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	SAL-RD04-G		
Lab Sample ID:	T22122-15	Date Sampled:	05/06/08
Matrix:	WIPE - Wipe Sample	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	704	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Antimony	2.9	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Arsenic	0.85	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Barium	< 20	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Beryllium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Cadmium	1.8	0.40	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Calcium	1260	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Chromium	4.8	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Cobalt	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Copper	2.9	2.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Iron	964	10	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Lead	1290	0.30	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Magnesium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Manganese	21.0	1.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Nickel	< 4.0	4.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Potassium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Selenium	0.56	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Silver	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Sodium	1160	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Thallium	< 2.5	2.5	ug/wipe	5	05/16/08	05/28/08	NS	SW846 6010B [2]	SW846 3050B [3]
Vanadium	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Zinc	54.9	2.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]

(1) Instrument QC Batch: MA3557
(2) Instrument QC Batch: MA3561
(3) Prep QC Batch: MP7961

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	SAL-RD05-G		
Lab Sample ID:	T22122-16	Date Sampled:	05/06/08
Matrix:	WIPE - Wipe Sample	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	572	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Antimony	1.4	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Arsenic	0.62	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Barium	< 20	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Beryllium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Cadmium	1.3	0.40	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Calcium	838	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Chromium	3.9	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Cobalt	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Copper	2.5	2.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Iron	740	10	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Lead	1410	0.30	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Magnesium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Manganese	16.8	1.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Nickel	< 4.0	4.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Potassium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Selenium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Silver	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Sodium	892	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Thallium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Vanadium	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Zinc	25.6	2.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]

(1) Instrument QC Batch: MA3557
(2) Prep QC Batch: MP7964

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	BENN-RD06-G		
Lab Sample ID:	T22122-3	**Date Sampled:**	05/07/08
Matrix:	WIPE - Wipe Sample	**Date Received:**	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	87.5	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Antimony	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Arsenic	0.64	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Barium	< 20	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Beryllium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Cadmium	< 0.40	0.40	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Calcium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Chromium	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Cobalt	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Copper	< 2.5	2.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Iron	110	10	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Lead	0.75	0.30	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Magnesium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Manganese	2.7	1.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Nickel	< 4.0	4.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Potassium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Selenium	0.51	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Silver	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Sodium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Thallium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Vanadium	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Zinc	29.1	2.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]

(1) Instrument QC Batch: MA3557
(2) Prep QC Batch: MP7964

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	BENN-RD07-G		
Lab Sample ID:	T22122-4	**Date Sampled:**	05/07/08
Matrix:	WIPE - Wipe Sample	**Date Received:**	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	342	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Antimony	0.57	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Arsenic	1.8	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Barium	< 20	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Beryllium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Cadmium	< 0.40	0.40	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Calcium	610	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Chromium	4.2	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Cobalt	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Copper	3.8	2.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Iron	881	10	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Lead	1.1	0.30	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Magnesium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Manganese	19.0	1.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Nickel	< 4.0	4.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Potassium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Selenium	0.61	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Silver	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Sodium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Thallium	< 2.5	2.5	ug/wipe	5	05/16/08	05/28/08	NS	SW846 6010B [2]	SW846 3050B [3]
Vanadium	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Zinc	41.4	2.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]

(1) Instrument QC Batch: MA3557
(2) Instrument QC Batch: MA3561
(3) Prep QC Batch: MP7964

8 2/7/1Y

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	BKG-RD08-G		
Lab Sample ID:	T22122-6	Date Sampled:	05/06/08
Matrix:	WIPE - Wipe Sample	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	164	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Antimony	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Arsenic	0.68	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Barium	< 20	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Beryllium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Cadmium	< 0.40	0.40	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Calcium	1920	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Chromium	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Cobalt	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Copper	< 2.5	2.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Iron	850	10	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Lead	1.2	0.30	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Magnesium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Manganese	6.1	1.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Nickel	< 4.0	4.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Potassium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Selenium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Silver	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Sodium	1050	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Thallium	< 2.5	2.5	ug/wipe	5	05/16/08	05/28/08	NS	SW846 6010B [2]	SW846 3050B [3]
Vanadium	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Zinc	90.5	2.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]

(1) Instrument QC Batch: MA3557
(2) Instrument QC Batch: MA3561
(3) Prep QC Batch: MP7964

8/27/8

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	BKG-RD09-G		
Lab Sample ID:	T22122-7	Date Sampled:	05/06/08
Matrix:	WIPE - Wipe Sample	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	544	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Antimony	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Arsenic	0.78	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Barium	< 20	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Beryllium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Cadmium	< 0.40	0.40	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Calcium	4510	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Chromium	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Cobalt	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Copper	4.4	2.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Iron	907	10	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Lead	3.2	0.30	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Magnesium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Manganese	9.9	1.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Nickel	< 4.0	4.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Potassium	612	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Selenium	0.56	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Silver	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Sodium	1440	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Thallium	< 2.5	2.5	ug/wipe	5	05/16/08	05/28/08	NS	SW846 6010B [2]	SW846 3050B [3]
Vanadium	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]
Zinc	383	2.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [3]

(1) Instrument QC Batch: MA3557
(2) Instrument QC Batch: MA3561
(3) Prep QC Batch: MP7964

gc 2/7/1

RL = Reporting Limit

Accutest Laboratories

Report of Analysis

Client Sample ID:	BK-RD10-G		
Lab Sample ID:	T22122-8	Date Sampled:	05/06/08
Matrix:	WIPE - Wipe Sample	Date Received:	05/09/08
		Percent Solids:	n/a
Project:	Leo Miller Road/SUPERFUND Pre-Remedial/TXN000606818		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Aluminum	< 20	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Antimony	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Arsenic	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Barium	< 20	20	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Beryllium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Cadmium	< 0.40	0.40	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Calcium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Chromium	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Cobalt	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Copper	< 2.5	2.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Iron	13.2	10	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Lead	3.6	0.30	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Magnesium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Manganese	< 1.5	1.5	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Nickel	< 4.0	4.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Potassium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Selenium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Silver	< 1.0	1.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Sodium	< 500	500	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Thallium	< 0.50	0.50	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Vanadium	< 5.0	5.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]
Zinc	5.9	2.0	ug/wipe	1	05/16/08	05/25/08	NS	SW846 6010B [1]	SW846 3050B [2]

(1) Instrument QC Batch: MA3557
(2) Prep QC Batch: MP7964

8/27/Y

RL = Reporting Limit

APPENDIX E

Signed Access Agreements

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TEXAS 75202-2733

CONSENT FOR ACCESS TO PROPERTY

Name of Owner: (b) (6) [redacted]

Address/Description of Property:

(b) (6) [redacted]

I consent to the officers, employees, contractors, and authorize representatives of the United States Environmental Protection Agency (EPA) entering and having continued access to my property for the taking of such soil, water, air and/or other samples as may be determined by the EPA to be necessary.

I recognize that these actions by the EPA are undertaken in accordance with its response and enforcement authorities contained in the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9601 *et seq.*

I certify that I have the authority to grant this permission as the owner or the authorized representative of the owner of the property described above. This written permission is given by me voluntarily with knowledge of my right to refuse and without threats or promises of any kind.

5/6/08
Date

(b) (6) [redacted]
Signature

Owner
Title

(b) (6) [redacted]
Phone Number

Analytical Results

Place a check mark in the appropriate space. Please note that if no selection is made, the EPA will assume that you do not wish to be provided with the analytical results.

(✓) Please provide me with a copy of the analytical results for my property.

( ) I do not wish to receive a copy of the analytical results for my property.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TEXAS 75202-2733

CONSENT FOR ACCESS TO PROPERTY

Name of Owner: (b) (6) [redacted]

Address/Description of Property:

(b) (6) [redacted]

I consent to the officers, employees, contractors, and authorize representatives of the United States Environmental Protection Agency (EPA) entering and having continued access to my property for the taking of such soil, water, air and/or other samples as may be determined by the EPA to be necessary.

I recognize that these actions by the EPA are undertaken in accordance with its response and enforcement authorities contained in the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9601 *et seq.*

I certify that I have the authority to grant this permission as the owner or the authorized representative of the owner of the property described above. This written permission is given by me voluntarily with knowledge of my right to refuse and without threats or promises of any kind.

5/6/08
Date

(b) (6) [redacted]
Signature

Owner
Title

(b) (6) [redacted]
Phone Number

Analytical Results

Place a check mark in the appropriate space. Please note that if no selection is made, the EPA will assume that you do not wish to be provided with the analytical results.

(✓) Please provide me with a copy of the analytical results for my property.

( ) I do not wish to receive a copy of the analytical results for my property.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TEXAS 75202-2733

CONSENT FOR ACCESS TO PROPERTY

Name of Owner: Mr. (b) (6) [redacted]

Address/Description of Property:

(b) (6) [redacted]

Aransas County

I consent to the officers, employees, contractors, and authorize representatives of the United States Environmental Protection Agency (EPA) entering and having continued access to my property for the taking of such soil, water, air and/or other samples as may be determined by the EPA to be necessary.

I recognize that these actions by the EPA are undertaken in accordance with its response and enforcement authorities contained in the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9601 *et seq.*

I certify that I have the authority to grant this permission as the owner or the authorized representative of the owner of the property described above. This written permission is given by me voluntarily with knowledge of my right to refuse and without threats or promises of any kind.

5/7/08
Date

(b) (6) [redacted]
Signature

Owner
Title

(b) (6) [redacted]
Phone Number

Analytical Results

Place a check mark in the appropriate space. Please note that if no selection is made, the EPA will assume that you do not wish to be provided with the analytical results.

(✓) Please provide me with a copy of the analytical results for my property.

( ) I do not wish to receive a copy of the analytical results for my property.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TEXAS 75202-2733

CONSENT FOR ACCESS TO PROPERTY

Name of Owner: (b) (6) [redacted]

Address/Description of Property:

(b) (6) [redacted]

I consent to the officers, employees, contractors, and authorize representatives of the United States Environmental Protection Agency (EPA) entering and having continued access to my property for the taking of such soil, water, air and/or other samples as may be determined by the EPA to be necessary.

I recognize that these actions by the EPA are undertaken in accordance with its response and enforcement authorities contained in the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9601 *et seq.*

I certify that I have the authority to grant this permission as the owner or the authorized representative of the owner of the property described above. This written permission is given by me voluntarily with knowledge of my right to refuse and without threats or promises of any kind.

5/6/08
Date

(b) (6) [redacted]
Signature

Owner
Title

(b) (6) [redacted]
Phone Number

Analytical Results

Place a check mark in the appropriate space. Please note that if no selection is made, the EPA will assume that you do not wish to be provided with the analytical results.

(✓) Please provide me with a copy of the analytical results for my property.

( ) I do not wish to receive a copy of the analytical results for my property.

APPENDIX F

Groundwater Monitoring/Sampling Data Sheets

DYNAMAC CORPORATION

GROUNDWATER WELL SAMPLING

Date: May 6, 2008 **Site Name:** Leo Miller Site - SI **Samplers:** N. Biscocho / S. Cowan

Weather Conditions: Partly Cloudy; winds SSE at 20 – 30 mph; Approx. 80ºF

Sample Location No.	MART-GW-01-G
Sample Location Name	(b) (6) [redacted] Water Well
GPS	28.0085 North Latitude 97.2178 West Longitude

Sample Type	
	Split
	Duplicate
X	QA/QC (triple volume)
	Composite / Grab (circle one)
	Other

Well Information	
Well ID No.	MART-GW-01
Depth to H_2O Level	1 ft. bgs
Depth of Well	180 feet
Well Diameter	6 inches
Other	

PURGE

Time Interval: 1415 to 1430 hours

Conditions	**1st**	**2nd**	**3rd**	**4th**	**5th**
Time	1415	1420	1425	1430	
pH	7.0	7.5	7.5	7.5	
Conductivity (mS/cm)	5.5	5.3	5.3	5.4	
Temperature (°C)	33	27	26	27	
Turbidity (NTU)	1.0	2.0	9.0	2.0	
Dissolved Oxygen (D.O.) (mg/L)	6.7	8.1	7.8	7.8	
Salinity (%)	0.30	0.30	0.30	0.30	
Color	Clear	Clear	Clear	Clear	
Odor	None	None	None	None	
Other					

SAMPLING

Time: 1434 hours

pH	**Conductivity** (mS/cm)	**Temp** (°C)	**Turbidity** (NTU)	**DO** (mg/L)	**Salinity** (%)	**Color**	**Odor**	**Other**
7.6	5.3	26	1.0	8.0	0.3	Clear	None	

Collection Method	- Collected directly from spigot after removing plastic water hose. - Collected into 1-Liter pre-preserved poly.
Monitor Readings	Not Applicable
Comments	Well was sampled last week by Sherwin Alumina contractors.

DYNAMAC CORPORATION

GROUNDWATER WELL SAMPLING

Date: May 6, 2008 **Site Name:** Leo Miller Site - SI **Samplers:** N. Biscocho / S. Cowan

Weather Conditions: Partly cloudy; winds from SSE at 20 to 30 mph; Approx. 80ºF

Sample Location No.	SAL-GW-02-G
Sample Location Name	(b) (6) Residence
GPS	28.0159 North Latitude 97.2133 West Longitude

Sample Type	
	Split
	Duplicate
	QA/QC (triple volume)
	Composite / Grab (circle one)
	Other

Well Information	
Well ID No.	SAL-GW-02
Depth to H_2O Level	Unknown
Depth of Well	260 feet bgs
Well Diameter	2.0 feet bgs
Other	

PURGE

Time Interval: 1118 to 1140 hours

Conditions	**1st**	**2nd**	**3rd**	**4th**	**5th**
Time	1118	1124	1129	1135	1140
pH	7.10	7.70	7.58	7.58	7.62
Conductivity (mS/cm)	5.10	5.04	4.99	4.96	5.0
Temperature (°C)	26	24.09	24.8	25.0	24.8
Turbidity (NTU)	1.0	0.0	0.0	0.0	0.0
Dissolved Oxygen (D.O.) (mg/L)	7.8	8.23	8.25	7.86	8.28
Salinity (%)	0.26	0.26	0.26	0.25	0.26
Color	Clear	Clear	Clear	Clear	Clear
Odor	None	None	None	None	None
Other					

SAMPLING

Time: 1145 to 1147 hours

pH	**Conductivity** (mS/cm)	**Temp** (°C)	**Turbidity** (NTU)	**DO** (mg/L)	**Salinity** (%)	**Color**	**Odor**	**Other**
7.6	5.00	25	0	8.3	0.3	Clear	None	

Collection Method	Collect directly from spigot into 1 Liter, pre-preserved poly.
Monitor Readings	Not Applicable
Comments	None

DYNAMAC CORPORATION

GROUNDWATER WELL SAMPLING

Date: May 7, 2008 **Site Name:** Leo Miller Site - SI **Samplers:** N. Biscocho / S. Cowan

Weather Conditions: Partly Cloudy; Extremely Windy; SSE 20 to 30 mph; Approx. 82ºF

Sample Location No.	BENN-GW-03/4-G
Sample Location Name	(b) (6) Residential Well
GPS	28.0187 North Latitude 97.2109 West Longitude

Sample Type	
	Split
X	Duplicate
	QA/QC (triple volume)
	Composite / Grab (circle one)
	Other

Well Information	
Well ID No.	BENN-GW-03/4
Depth to H_2O Level	0.5 feet bgs
Depth of Well	297 feet bgs
Well Diameter	4 inches
Other	In-take to pump = 60 ft bgs

PURGE

Time Interval: 1355 to 1410 hours

Conditions	**1st**	**2nd**	**3rd**	**4th**	**5th**
Time	1355	1400	1405	1410	
pH	6.7	7.3	7.4	7.5	
Conductivity (mS/cm)	4.3	4.3	4.4	4.4	
Temperature (°C)	26	26	26	26	
Turbidity (NTU)	9.0	0	0	0	
Dissolved Oxygen (D.O.) (mg/L)	8.8	8.5	8.6	8.5	
Salinity (%)	0.2	0.2	0.2	0.2	
Color	Clear	Clear	Clear	Clear	
Odor	Sulfur-like	Sulfur-like	Sulfur-like	Sulfur-like	
Other					

SAMPLING

Time: 1410 to 1415 hours

pH	**Conductivity** (mS/cm)	**Temp** (°C)	**Turbidity** (NTU)	**DO** (mg/L)	**Salinity** (%)	**Color**	**Odor**	**Other**
7.5	4.4	26	0	8.5	0.2	Clear	Sulfur-like	

Collection Method	- Collected directly from spigot into (2) 1-Liter pre-preserved poly. - Alternated sampling containers between regular field sample and field duplicate sample.
Monitor Readings	Not Applicable
Comments	- Distiller does not work. - Water used only for bathing, dishes, and watering lawn. - Water has a sulfur-like or rotten egg smell.

DYNAMAC CORPORATION

GROUNDWATER WELL SAMPLING

Date: May 6, 2008 **Site Name:** Leo Miller Site - SI **Samplers:** N. Biscocho / S. Cowan

Weather Conditions: Partly Cloudy; Approximately 80 ºF

Sample Location No.	BKG-GW-05
Sample Location Name	(b) (6) [redacted] Residence (Ingleside, TX)
GPS	27.9631 North Latitude 97.1955 West Longitude

Sample Type	
	Split
	Duplicate
	QA/QC (triple volume)
	Composite / Grab (circle one)
	Other

Well Information	
Well ID No.	BKG-GW-06
Depth to H_2O Level	75 feet bgs
Depth of Well	75 feet bgs
Well Diameter	Unknown
Other	

PURGE

Time Interval: 1540 to 1555 hours

Conditions	**1st**	**2nd**	**3rd**	**4th**	**5th**
Time	1540	1545	1550	1555	
pH	7.0	7.0	6.9	7.0	
Conductivity (mS/cm)	1.8	1.8	1.7	1.8	
Temperature (°C)	31	27	27	26	
Turbidity (NTU)	1.0	1.0	1.0	1.0	
Dissolved Oxygen (D.O.) (mg/L)	7.8	8.9	8.7	8.9	
Salinity (%)	0.10	0.10	0.10	0.10	
Color	Clear	Clear	Clear	Clear	
Odor	None	None	None	None	
Other					

SAMPLING

Time: 1555 hours

pH	**Conductivity** (mS/cm)	**Temp** (°C)	**Turbidity** (NTU)	**DO** (mg/L)	**Salinity** (%)	**Color**	**Odor**	**Other**
7.0	1.8	26	1.0	8.9	0.10	Clear	None	

Collection Method	Collect directly from spigot into 1 Liter, pre-preserved poly.
Monitor Readings	Not Applicable
Comments	Only used for watering lawns, not actively used.

APPENDIX G

Copy of Split Sample Chain-of-Custody Form

ENVIRONMENTAL PROTECTION AGENCY

OFFICIAL

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME: LeoMac RD-SI TXN000606818
SAMPLERS: *(Signature)*	Steve Cove

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Total Metals (6010C)	Mercury (7471)	Silica (6010C)	Grain Size (ASTM D422)	ASTM D4464M		REMARKS
RML1-RM01-6	5/7/08	1101 1110		✓	Red Mud Lagoon 1, Wet	2	✓	✓	✓	✓			Split Sample
RML1-RM02-6	5/8/08	1110 1110		✓	Red Mud Lagoon 1, Dry	2	✓	✓	✓	✓			Split Sample
RML2-RM03-6	5/8/08	1325 1345		✓	Red Mud Lagoon 2, Wet	2	✓	✓	✓	✓			Split Sample
RML2-RM04-6	5/8/08	1255 1310		✓	Red Mud Lagoon 2, Dry	2	✓	✓	✓	✓			Split Sample

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by : *(Signature)*	Date / Time	Received by: *(Signature)*
Steve Cove	5/8/08 1340	Imad S. Smith			
Relinquished by: *(Signature)*	**Date / Time**	**Received by:** *(Signature)*	**Relinquished by :** *(Signature)*	**Date / Time**	**Received by:** *(Signature)*
Relinquished by: *(Signature)*	**Date / Time**	**Received for Laboratory by:** *(Signature)*	**Date / Time**	**Remarks** Total Metals/Mercury/Silica: 8 oz jar; Grain Size: 4 oz jar	
Shipped by:		**Airbill Number:**			

EPA 7500-53
(11/96)

Distribution: White Accompanies Shipment; Yellow to Coordinator Field Files; Pink to Report; Goldenrod Returns with Warrant

6-20101

APPENDIX H

Copy of EPA Sample Chain-of-Custody Form

Superfund, Pre-Remedial
START-3, Richardson, TX
EPA Contract Number: EP-W-06-077

CHAIN OF CUSTODY RECORD
Site #: TXN000606818
Contact Name: Steve Cowan
Contact Phone: 214.205.6651

No: TXN000606818-05/08/08-0001

Lab: Accutest Labs
Lab Phone: (713) 271-4700

Lab #	Sample #	Location	Analyses	Matrix	Collected	Numb Cont	Container	Preservative	MS/MSD
	BENN-GW03-G	(b) [redacted] Residence	Total Metals/Mercury	Ground Water	5/7/2008	1	1 L poly	HNO3 pH<2	N
	BENN-GW04-G	(b) (6) [redacted]	TAL Metals/Mercury/~~Silica~~ SC	Ground Water	5/7/2008	1	1 L poly	HNO3 pH<2	N
	BENN-RD06-G	(b) [redacted] Residence	TAL Metals/Mercury/Silica	Dust	5/7/2008	1	4 0z. jar	4 C	N
	BENN-RD07-G	(b) (6) [redacted] Residence	TAL Metals/Mercury/Silica	Dust	5/7/2008	1	4 0z. jar	4 C	Y
	BKG-GW05-G	(b) [redacted] Residence	Total Metals/Mercury	Ground Water	5/6/2008	1	1 L poly	HNO3 pH<2	N
	BKG-RD08-G	(b) [redacted] Residence	TAL Metals/Mercury/Silica	Dust	5/6/2008	1	4 0z. jar	4 C	N
	BKG-RD09-G	(b) [redacted] Residence	TAL Metals/Mercury/Silica	Dust	5/6/2008	1	4 0z. jar	4 C	N
	BW-RD10-G	NA	TAL Metals/Mercury/Silica	Dust	5/6/2008	1	4 0z. jar	4 C	N
	MART-GW01-G	(b) (6) [redacted] Residence	Total Metals/Mercury	Ground Water	5/6/2008	3	1 L poly	HNO3 pH<2	Y
	MART-RD01-G	(b) (6) [redacted] Residence	TAL Metals/Mercury/Silica	Dust	5/6/2008	1	4 0z. jar	4 C	N
	MART-RD02-G	(b) (6) [redacted] Residence	TAL Metals/Mercury/Silica	Dust	5/6/2008	1	4 0z. jar	4 C	N
	SAL-GW02-G	(b) [redacted] Residence	Total Metals/Mercury	Ground Water	5/6/2008	1	1 L poly	HNO3 pH<2	N
	SAL-GW06-G	(b) (6) [redacted]	Total Metals/Mercury	Ground Water	5/6/2008	1	1 L poly	HNO3 pH<2	N
	SAL-RD03-G	(b) [redacted] Residence	TAL Metals/Mercury/Silica	Dust	5/6/2008	1	4 0z. jar	4 C	N
	SAL-RD04-G	(b) (6) [redacted] Residence	TAL Metals/Mercury/Silica	Dust	5/6/2008	1	4 0z. jar	4 C	N
	SAL-RD05-G	(b) (6) [redacted] Residence	TAL Metals/Mercury/Silica	Dust	5/6/2008	1	4 0z. jar	4 C	N

Special Instructions: TAT for Preliminary Results: 10 business days upon receipt

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
	Steve Cowan	5/8/08 1800	FedEx								

Superfund, Pre-Remedial
START-3, Richardson, TX
EPA Contract Number: EP-W-06-077

CHAIN OF CUSTODY RECORD
Site #: TXN000606818
Contact Name: Steve Cowan
Contact Phone: 214.205.6651

No: TXN000606818-05/08/08-0002
Cooler #: 2
Lab: Accutest Labs
Lab Phone: (713) 271-4700

Lab #	Sample #	Location	Analyses	Matrix	Collected	Numb Cont	Container	Preservative	MS/MSD
	RML1-RM01-G	Red Mud Lagoon 1	TAL Metals/Mercury/Silica	Solid Waste	5/8/2008	1	8 oz. glaas jar	4 C	N
	RML1-RM01-G	Red Mud Lagoon 1	Grain Size	Solid Waste	5/8/2008	1	4 oz. glass jar	4 C	N
	RML1-RM02-G	Red Mud Lagoon 1	TAL Metals/Mercury/Silica	Solid Waste	5/8/2008	1	8 oz. glaas jar	4 C	N
	RML1-RM02-G	Red Mud Lagoon 1	Grain Size	Solid Waste	5/8/2008	1	4 oz. glass jar	4 C	N
	RML1-RM05-G	Red Mud Lagoon 1	TAL Metals/Mercury/Silica	Solid Waste	5/8/2008	1	8 oz. glaas jar	4 C	N
	RML1-RM05-G	Red Mud Lagoon 1	Grain Size	Solid Waste	5/8/2008	1	4 oz. glass jar	4 C	N
	RML2-RM03-G	Red Mud Lagoon 2	TAL Metals/Mercury/Silica	Solid Waste	5/8/2008	1	8 oz. glaas jar	4 C	N
	RML2-RM03-G	Red Mud Lagoon 2	Grain Size	Solid Waste	5/8/2008	1	4 oz. glass jar	4 C	N
	RML2-RM04-G	Red Mud Lagoon 2	TAL Metals/Mercury/Silica	Solid Waste	5/8/2008	3	8 oz. glaas jar	4 C	Y
	RML2-RM04-G	Red Mud Lagoon 2	Grain Size	Solid Waste	5/8/2008	1	4 oz. glass jar	4 C	N

Special Instructions: TAT for Preliminary Results: 10 Business Days

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
	Steve Cowan	5/8/08 1800	FedEx								

APPENDIX I

Copy of Federal Express Airbills

FedEx Express US Airbill

FedEx Tracking Number 8651 9402 2776

SDA12

Form ID No. 0215 Sender's Copy

1 From *Please print and press hard.*

Date 5/8/08 Sender's FedEx Account Number

Sender's Name Steven Cowan Phone (214) 205 6651

Company Dynamac Corporation

Address 1202 Executive West Dept./Floor/Suite/Room

City Richardson State TX ZIP 75081

2 Your Internal Billing Reference OPTIONAL
First 24 characters will appear on invoice.

3 To

Recipient's Name SAMPLE RECEIVING Phone (713) 271-4700

Company ACCUTEST LABS

Recipient's Address 10165 HARWIN DR STE 150
We cannot deliver to P.O. boxes or P.O. ZIP codes. Dept./Floor/Suite/Room

Address
To request a package be held at a specific FedEx location, print FedEx address here.

City HOUSTON State TX ZIP 77036-1622

0378962526

4a Express Package Service — *Packages up to 150 lbs.*

- [x] FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- [ ] FedEx First Overnight — Earliest next business morning delivery to select locations.* Saturday Delivery NOT available.
- [ ] FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx Express Saver — Third business day.* Saturday Delivery NOT available.

FedEx Envelope rate not available. Minimum charge: One-pound rate. * To most locations.

4b Express Freight Service — *Packages over 150 lbs.*

- [ ] FedEx 1Day Freight* — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

* Call for Confirmation: ** To most locations.

5 Packaging

- [ ] FedEx Envelope*
- [ ] FedEx Pak* — Includes FedEx Small Pak, FedEx Large Pak, and FedEx Sturdy Pak.
- [ ] FedEx Box
- [ ] FedEx Tube
- [x] Other

* Declared value limit $500.

6 Special Handling — Include FedEx address in Section 3.

- [ ] SATURDAY Delivery — NOT Available for FedEx Standard Overnight, FedEx First Overnight, FedEx Express Saver, or FedEx 3Day Freight.
- [ ] HOLD Weekday at FedEx Location — NOT Available for FedEx First Overnight.
- [ ] HOLD Saturday at FedEx Location — Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

Does this shipment contain dangerous goods? One box must be checked.

- [x] No
- [ ] Yes — As per attached Shipper's Declaration.
- [ ] Yes — Shipper's Declaration not required.
- [ ] Dry Ice — Dry ice, 9, UN 1845 _____ x _____ kg
- [ ] Cargo Aircraft Only

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging.

7 Payment *Bill to:* Enter FedEx Acct. No. or Credit Card No. below.

- [ ] Sender — Acct. No. in Section 1 will be billed.
- [x] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

FedEx Acct. No. Credit Card No. 2411-4393-7 Exp. Date

Total Packages	Total Weight	Total Declared Value†
1	50 35 47	$ .00

†Our liability is limited to $100 unless you declare a higher value. See back for details. By using this Airbill you agree to the service conditions on the back of this Airbill and in the current FedEx Service Guide, including terms that limit our liability.

8 Residential Delivery Signature Options If you require a signature, check Direct or Indirect.

- [ ] No Signature Required — Package may be left without obtaining a signature for delivery.
- [ ] Direct Signature — Someone at recipient's address may sign for delivery. *Fee applies.*
- [ ] Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. *Fee applies.*

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APPENDIX J

Copy of Quality Assurance Sampling Plan

QUALITY ASSURANCE SAMPLING PLAN
FOR
LEO MILLER ROAD SITE
TAFT, SAN PATRICIO/ARANSAS COUNTIES, TEXAS

Prepared For

U.S. Environmental Protection Agency Region 6
1445 Ross Ave.
Dallas, Texas 75202

Date Prepared
April 11, 2008

Prepared by

Dynamac Corporation
1202 Executive Drive West
Richardson, Texas 75081

QUALITY ASSURANCE SAMPLING PLAN
FOR
LEO MILLER ROAD SITE
TAFT, SAN PATRICIO/ARANSAS COUNTIES, TEXAS

Date Prepared
April 11, 2008

Reference Numbers

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CERCLIS No:	TXN000606818
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TAFT, SAN PATRICIO/ARANSAS COUNTIES, TEXAS

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1.0 INTRODUCTION

Dynamac Corporation (Dynamac) Superfund Technical Assessment and Response Team (START) has been tasked by the U.S. Environmental Protection Agency (EPA), Region 6, under Technical Direction Document (TDD) # TO-0009-08-01-01, to conduct a Site Inspection (SI) at the Leo Miller Road Site (LMRS) (CERCLIS No. TXN000606818), located near Taft, Aransas/San Patricio Counties, Texas (TX). The SI for the LMRS will also include evaluation of Sherwin Alumina Company (SAC) red mud lagoons (RMLs) located east of the LMRS. The LMRS and the four (4) RML operated by SAC are divided by the Aransas/San Patricio County Lines. See Figures 1 and 2 for the location of LMRS and SAC's four RMLs.

The SI is the result of a Preliminary Assessment (PA) that was completed for the LMRS by EPA in 2008. During the completion of PA it was determined that the LMRS has a potential to be placed on EPA's National Priorities List (NPL) based on identified waste characteristics associated with the SAC RMLs and the targets for the Air and Groundwater Migration Pathways. The focus of this SI will be to screen the LMRS for potential NPL listing by utilizing the criteria set forth in the Hazard Ranking System (HRS) and the Hazard Ranking System Guidance Manual. Secondly, the SI will provide the documentation necessary to support a decision by the EPA Region 6 Site Assessment Manager (SAM) regarding the need for further action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Superfund Amendments and Reauthorization Act (SARA). The SI will be prepared according to *Guidance for Performing Site Investigations Under CERCLA*.

It is anticipated that the field activities associated with the SI will be conducted April 2008. This Quality Assurance Sampling Plan (QASP) is prepared in partial fulfillment of the TDD. This QASP is designed to guide field operations during the collection of waste samples from the RMLs, the collection of dust samples from inside identified residences, the collection of groundwater samples from private water wells located along Leo Miller Road, and describe Quality Assurance measures that will be implemented during the course of the SI field activities.

2.0 OBJECTIVES

The objectives of the SI are: 1) to determine if the red mud inside the RMLs contain heavy metals that can be considered as a CERCLA hazardous substance, pollutant, or contaminant; 2) to determine if the red dust accumulating in the residential structures along Leo Miller Road contains CERCLA hazardous substances, pollutants, and contaminants that can be attributed to the SAC's RMLs; and 3) to determine if potential CERCLA hazardous substances, pollutants, or contaminants attributable to the SAC RMLs have entered the underlying groundwater and migrated towards the residential structures located on Leo Miller Road. To accomplish the above-mentioned objectives, START will collect red mud waste samples from select RMLs, visible red dust inside residential structures located along Leo Miller Road, and groundwater samples from identified water wells located along Leo Miller Road. All samples collected will be shipped to a Dynamac procured laboratory, Acutest, for total metals and mercury analyses.

3.0 BACKGROUND

3.1 Site Location and Description

LMRS is approximately 1 mile in length and runs in a southwest to northeast direction. LMRS traverses through two counties: San Patricio and Aransas (Figures 1 and 2). The area is sparsely populated, as approximately 20 residential homes were observed by the EPA/START reconnaissance team on October 9, 2007. The LMRS is bounded by rural land to the north, by State Highway (HWY)-188 to the northeast and northwest; the SAC RMLs to the east and south; and rural agricultural land to the west. The geographical coordinates for the LMRS are: 28.00831666º N and 97.21676666 º W (San Patricio County); 28.01511666º N and 97.2124º W (Aransas County); and 28.01838333º N and 97.21031666º W (Aransas County). The geographical coordinates were collected during the EPA/START PA reconnaissance inspection with a hand-held geographical positioning system (GPS) unit.

SAC operates four RMLs (identified as RML-1 through RML-4) in the vicinity of the LMRS. RML-1 and RML-2 are bordered to the north by State HWY-188, to the east by Port Bay, to the south by rural land, and to the west by the LMRS and rural land. RML-3 and RML-4 are bordered to the north by Copano Bay, to the east by Port Bay, to the south by RML-1 and RML-2, and to west by the LMRS and rural land (Figures 1, 2, and 4). SAC, formerly Reynolds Metals Company-Sherwin Plant, is located on State Highway 361, near Gregory, Texas.

3.2 Operational History

The SAC facility has produced alumina at this location in Gregory, TX in excess of 50 years, beginning in 1953. The primary function of the Sherwin plant is to exact aluminum oxide (alumina) from bauxite ore using the "Bayer Process". The Sherwin process is a circulating loop of Bayer liquid with side processes such as mud clarification operating parallel to the principal liquor stream. The "Bayer Process" is an endless loop in which a steady flow of "Bayer Liquid" is pumped. The liquor varies in chemical consistency throughout the process and is both the extraction and transport media for the process chemicals. The constant active ingredient of this "liquor" is sodium hydroxide, or caustic soda, in which the aluminum hydrate is first dissolved from bauxite slurry at high temperature, and then clarified, allowed to cool, and then allowed to precipitate into crystals. The resulting crystals are then washed, filtered, and finished into one of the intermediate or final products. At any time within the "Bayer Process" loop, the circuit may contain up to 150 million gallons of water and Bayer liquor. This solution may contain up to 50,000 metric tons of caustic soda, 50,000 metric tons of aluminum hydrate, together with waste products, impurities, and make-up water. Each day, depending on the established production level, up to 10,000 metric tons of bauxite are added to the circulating liquor stream in order to produce as much as 4,400 metric tons of finished products and 3,600 metric tons (dry weight) of red mud tailings or residue each day. The Sherwin plant is capable of producing 1.4 million tons of smelter grade alumina and 300,000 tons of chemical grade alumina hydrate per year.

Bauxite is a naturally occurring earth material, which is surface-mined and is the principal source of aluminum hydrate worldwide. Aluminum hydrate is a feedstock used in the chemical industry to produce a wide range of products, such as Maalox, sandpaper, and water treatment agents. The aluminum hydrate can be further refined to produce aluminum oxide (alumina), which is used as the raw material in Aluminum Reduction plants to produce aluminum metal. At one point, the SAC plant obtained their source of bauxite from Australia, Jamaica, Brazil, and Guinea. Approximately 1 to 2 tons of red mud is produced per one ton of alumina, depending upon the grade of bauxite. The RMLs, which store the red mud residue, are located approximately 9 to 10 miles northeast of the SAC plant, on State HWY-188.

It does not appear that SAC has air permits associated with the RMLs. SAC does maintain Texas Commission on Environmental Quality (TCEQ) general air permit, No. 4971, for the bag house dust system for bauxite and alumina transport systems at the SAC facility. Air Permit No. 4971 does not include stipulations concerning the RMLs or air quality monitoring at the RMLs. TCEQ Air Permit No. 4971 was amended and approved by the TCEQ in October 2007. In addition to the general air permit, SAC submitted two air amendment applications for Maintenance, Startup, and Shutdown (MSS) activities at the SAC facility in Gregory, TX. These two air permit amendments are currently undergoing administrative review at the TCEQ. Neither MSS air permit amendments have any stipulations related to the red mud lagoon areas.

4.0 HRS EVAULATION AND DATA GAPS

This section will address the HRS data (source identification and pathway-specific data) identified during the completion of the PA and data gaps that need to be addressed during the SI.

4.1 Source Evaluation

The RMLs are referred to as RML-1 through RML-4. RML-1 and RML-2 are separated from RML-3 and RML-4 by State HWY-188. In addition, the Aransas/San Patricio County Line traverses though RML-1 and RML-2 (Figures 1 and 2). The combined size of

the four RMLs is approximately 148,800,000 square feet (ft^2) or 3,416 acres (Figure 2). The RMLs will be evaluated as surface impoundments. The red mud residue is transported by either pipeline or trucks, to the RMLs located approximately 9 to 10 miles northeast of the SAC plant. SAC subcontracts to a truck company to transport the red mud residue from the SAC facility. The red mud residue is reportedly transported to the RMLs on a frequency of 1 truckload per hour, for 8 hours a day, seven days a week.

Red Mud Lagoon 1: RML-1 is primarily rectangular in shape, is the southern-most located RML and is the oldest of the four RMLs (Figure 2). This potential source is approximately 48,100,000 ft^2 or 1,104.2 acres in size and is surrounded by an earthen levee (Figure 2). The total depth of RML-1 has not been obtained nor has data been obtained to indicate the annual amount of red mud residue disposed into RML-1. It appears that a portion of RML-1 has been closed and is no longer in use as a disposal area.

Red Mud Lagoon 2: RML-2 is rectangular in shape, is located south of State HWY-188 and is adjacent to RML-1. RML-2 is approximately 52,800,000 ft^2 or 1,212.1 acres in size and is surrounded by an earthen levee (Figure 2). The total depth of RML-2 has not been obtained nor has data been obtained to indicate the annual amount of red mud residue disposed into RML-2.

Red Mud Lagoon 3: RML-3 is polygonal in shape, is located north of State HWY-188 and west of Port Bay. It is separated from RML-4 by Copano Retreat Road. RML-3 is approximately 18,390,000 ft^2 or 422.2 acres in size and is surrounded by an earthen levee (Figure 2). RML-3 is the smallest of the four RMLs. The total depth of RML-3 has not been obtained nor has data been obtained to indicate the annual amount of red mud residue disposed into RML-3.

Red Mud Lagoon 4: RML-4 is polygonal in shape, is located north of State HWY-188 and west of Port Bay. RML-4 is approximately 29,510,000 ft^2 or 677.5 acres in size and is surrounded by an earthen levee (Figure 2). The total depth of RML-4 has not been obtained nor has data been obtained to indicate the annual amount of red mud residue disposed into RML-4.

Waste Characteristics: The waste being generated by SAC plant consists of red mud residue, commonly referred to as "red mud", because it resembles red mud. The red mud residue is classified as a Class II non-hazardous industrial waste. When the red mud residue is produced, it is alkaline, containing approximately 6 to 8 grams per liter (g/L) of residual sodium carbonate. The sodium carbonate will eventually weather to sodium bicarbonate (baking soda). The sodium carbonate fraction is water soluble and can raise the pH of water as high as 10.5. When the red mud residue dries, it becomes dusty if not managed properly. Disposal of red mud and other solid residues commonly takes place by spreading layers over a large surface area in order to allow the material to dry. This is in turn followed by rehabilitation of the land. No documentation has been obtained to indicate that the red mud residue from the SAC RMLs has been analyzed for hazardous constituents, such as heavy metals. Red mud residue may contain trace amounts of metals such as arsenic, barium, boron, cadmium, chromium, cobalt, gallium, vanadium, scandium, and lead, as well as radionuclides.

SAC claims that the red mud dust does not pose a serious health hazard, is not toxic, reactive, or flammable, but can be an irritant and cause discoloration. Citizens living along Leo Miller Road Site claim that the red mud residue generated during dry conditions has caused skin irritations and respiratory illnesses, such as chronic obstructive pulmonary disease (COPD), bronchitis, lung cancer, bronchial spasms, asthma, siderosis, pneomosicosis; burning in the eyes, skin, nose, and throat; exacerbation of allergies; sinusitis; digestive problems; headaches; nose bleeds; lethargy and fatigue; a persistent cough; hypertension; Alzheimer disease and beryllium disease. Beryllium disease is a term to describe the conditions resulting from exposure to beryllium and its compounds or alloys.

Identified Data Gaps: The primary data gap related to sources and waste characteristics is whether the red mud can be classified as a CERCLA hazardous substance, pollutant, or contaminant. This will be addressed by the collection and chemical analysis of red mud samples from the RMLs. Should chemical analysis of the red mud samples indicate the presence of CERCLA hazardous substances, pollutants, or contaminants, the RMLs can be

evaluated as HRS-defined sources. Other data gaps to be addressed include: 1) a determination of the actual waste quantity associated with each RML; 2) documentation of the type of waste containment system in place to limit the migration of CERCLA hazardous substances, pollutants, or contaminants from the source areas.

4.2 Groundwater Migration Pathway Summary

Groundwater Characteristics: The LMRS and RMLs are situated within the West Gulf Coastal Plain (WGCP), part of the Coastal Plain physiographic province of Texas. The WGCP province consists of marine sedimentary rocks that dip gently seawards towards the Gulf of Mexico. The major groundwater aquifer along the gulf coast is the Gulf Coast aquifer. The Gulf Coast aquifer extends from the Rio Grande River northeastward to the Louisiana-Texas border. Aransas and San Patricio Counties are underlain by the Gulf Coast aquifer. The stratigraphy of the Gulf Coast aquifer consists of a thick sequence of fluvial-deltaic sediments deposited as a wide belt generally trending northeast, parallel to and dipping gently toward the present Gulf coast. The fluvial-deltaic sediments consist of alternating sequences of unconsolidated to partially consolidated silt, clay, and sand. The Gulf Coast aquifer has been divided into four (4) units: Catahoula confining system, the Jasper aquifer, Evangeline Aquifer, and the Chicot aquifer. The youngest and shallowest unit is the Chicot aquifer. The Chicot aquifer is made up of the Willis Sand, the Bentley and Montgomery formations, the Beaumont Clay, and alluvial deposits at the surface. The total sand thickness in all four units ranges from 700 feet in the south to 1,300 feet in the north.

Documentation of the underlying stratigraphy at the RML has not been obtained; however, the stratigraphy of the SAC Plant has been documented and will be used in the evaluation for this SI. The upper 60 feet of sediment at the site has been differentiated into water-bearing and non-water-bearing units as described below. The unsaturated zone at the site consists of 6 to 18 feet of clay and silty clay of the native Beaumont Formation (Unit 1 Clay). Underlying the Unit 1 Clay is 4 to 17 feet of fine- to medium-grained silty sand (Zone A), which is generally continuous across the site. Zone A is underlain by 29 to 51 feet of high plasticity clay and silty clay (Unit 2 Clay). A deeper sand unit (Zone B)

underlies the Unit 2 Clay and consists of fine- to medium-grained silty sand. The thickness of the Zone B sand has not been established. Twenty-six (26) groundwater monitoring wells have been installed in the vicinity of the RMLs since 1968, three of which have been destroyed. Seventeen (17) additional monitoring/test wells were installed in 2002 by Texas A&M Kingsville graduate students around RMLs 1 and 2. The total depth of groundwater monitoring wells associated with RML-1 and RML-2 ranges from 14.8 feet to 59.66 feet below ground surface (bgs). According to a groundwater gradient map of RMLs 1 and 2, the shallow groundwater flow appears to trend in several directions: to the northeast towards State HWY-188 and RMLs 3 and 4; to the northwest towards the LMRS; and to the east toward Port Bay. The total depth of groundwater monitoring wells associated with RML-3 ranges from 19 feet to 40.5 feet bgs. According to a groundwater gradient map of RML-3, the shallow groundwater flow appears to trend toward the west and RML-4, not towards Port Bay and Copano Bay. The total depth of groundwater monitoring wells associated with RML-4 ranges from 13.19 feet to 20.66 feet bgs. According to a groundwater gradient map of RML-4, the shallow groundwater flow appears to trend toward the west and away from RML-3, Port Bay and Copano Bay.

Likelihood of Release: Groundwater samples were collected from the monitoring wells associated with RML-1 through RML-4 as part of the groundwater monitoring plan for SAC, by Naismith Engineering. The collected samples were analyzed for groundwater quality parameters such as Total Dissolved Solids (TDS), Nitrate as N, Total Organic Nitrogen, Chloride, Sulfate fluoride, ammonia, mercury, and Hardness as calcium carbonate; total metals such as arsenic, barium, cadmium, chromium, nickel, and vanadium; and polychlorinated biphenyls (PCBs). In summary, the heavy metals aluminum, arsenic, barium, boron, manganese and nickel were detected in concentrations that exceeded the laboratory reporting limits (RLs) for the samples collected from the perimeter of RML-1 and RML-2. The heavy metals, arsenic, barium, boron, and manganese were detected in concentrations that exceeded the laboratory RLs for the samples collected from the perimeter of RMLs 3 and 4. PCBs were not detected in any of the groundwater samples collected along the perimeters of the RMLs. The metal

concentrations detected in the monitoring well samples were compared to the EPA's National Primary Drinking Water Standard, the Maximum Contaminant Levels (MCL) for inorganic constituents (antimony, arsenic, beryllium, cadmium, chromium [total], copper, lead, mercury, and selenium) for possible exceedances. Comparison to the MCLs indicate two exceedances for arsenic (MCL: 10.0 µg/L), in the monitoring well samples. The first exceedance was identified at monitoring well MW-04, which is associated with RML-2. Arsenic was detected in MW-04 at a concentration of 11.0µg/L. The second arsenic MCL exceedance was documented at monitoring well MW-4-2, which is associated with RML-4. Arsenic was detected in MW-4-2 at a concentration of 15.0µg/L. Based on the analytical results of the collected groundwater samples from the perimeter of the RMLs, a potential does exist for suspected groundwater contamination with metals. Groundwater samples have not been collected from the residential water wells identified along Leo Miller Road.

Groundwater Targets: Along Leo Miller Road, the residents maintain groundwater wells; some of which may be used for drinking water purposes. The nearest identified drinking water well is identified at the residence located at 111 Leo Miller Road Site. According to the resident at this location, the well is approximately 280 feet in depth. The resident must "distill" the groundwater before it can be used for drinking. This residence is located approximately 0.5 miles from the northwest corner of RML-2 (Figure 3). However, according to a local citizen, the majority of the private domestic water wells in the area are not used as a drinking water source, due to the brackish nature of the groundwater. The groundwater wells are used primarily to provide water for cleaning laundry and dishes, and watering lawns and gardens. Several rural water companies have been identified in the vicinity of the site; however, only the Rincon Water Supply Company (WSC), Division 1 supplies drinking water to those residents living within the 1 to 2 mile radius, the 2 to 3 mile radius, and the 3 to 4-mile radius (Figure 3). The Rincon WSC, Division 1 supplies water to approximately 326 meters. The service boundary for Rincon WSC, Division 1 includes those residents residing along County Road (CR) 96, CR 98, CR 102; west of CR 89M and east of CR 95C to 95A. No other water supply

systems have been identified within the 4-mile Target Distance Limit (TDL) that obtains drinking water from groundwater wells. It is currently assumed, that all residents within the 4-mile TDL obtain their drinking water from private, domestic water wells, except for those individuals obtaining potable water from Rincon WSC, Division 1. It should be noted that the actual number of residents utilizing domestic water wells for their drinking water source is not known. There are also residents within the 4-mile TDL that purchase bottled water for their drinking water source (Ref. 7, p. 4).

Groundwater Migration Pathway Data Gaps: The primary data gap to be addressed during the SI field activities will be the determination of an observed release of CERCLA hazardous substances, pollutants, or contaminants, attributable to the RMLs, in the residential water wells located along Leo Miller Road.

4.3 Air Migration Pathway

Likelihood of Release: The residents on Leo Miller Road are located northwest of RMLs 1 and 2 (Figures 1 and 2). The annual prevailing wind direction is from the southeast to the northwest, thus, the residents are located downwind of RMLs 1 and 2. It has been reported that the homes and lawns have become covered in red mud dust during the frequent dust storms. One land owner has video graphic documentation of the red dust being blown from the red mud lagoons toward their residence. The EPA/START team observed red dust both outside and inside the windows at one residential home located along the LMRS. Neither air samples nor wipe samples have been collected and analyzed to ascertain if hazardous constituents, such as heavy metals, exist as part of the chemical makeup of the red mud residue or dust. Based on the video graphic documentation made available to the EPA/START team, it does appear that a suspected air release by direct observation may have occurred at the LMRS; however, documentation has not been obtained to indicate that the red mud residue or dust contain hazardous constituents.

Air Pathway Targets: The 4-mile radius is rural in nature and appears to be sparsely populated (Figures 1 and 2). The distance to the nearest individual or regularly occupied building (Leo Miller Road Site) is approximately 0.5 miles west of RMLs 1 and 2 (Figure

3). On Leo Miller Road Site, CR 4351, and CR 1177 approximately 75 families have been documented. The total number of individuals residing within the 4-mile TDL, based on Tiger census data for 2000, is 4,198.

Air Migration Pathway Data Gaps: The primary data gap to be addressed during the SI field activities is to determine if the red mud dust contains CERCLA hazardous substances, pollutants, or contaminants that can be harmful to human health and the environment. This data gap will be addressed with the collection of wipe samples from inside the residential homes located on Leo Miller Road. In addition, if CERCLA hazardous substances, pollutants, or contaminants can be identified in the red mud, an observe release by direct observation may be documented to the Air Migration Pathway. This may be substantiated with the collection of red mud samples from the RMLs and the collection and chemical analysis of the wipe samples collected from inside the residential structures.

5.0 FIELD OPERATIONS

5.1 Concept of Operations

5.1.1 Schedule

Field work will begin the week of May 6, 2008 and is anticipated to require approximately 2 to 3 days to complete. Collected red mud, wipe samples, and groundwater samples will be shipped to a Dynamac procured laboratory, via Federal Express, within 1 to 2 days of sample collection. Acutest will provide the laboratory results (verbal) to START within 10 working days. In addition, Acutest will provide a Level IV analytical data package and Staged Electronic Data Deliverable (SEDD) to START within 20 days of sample receipt by Acutest.

5.1.2 Health and Safety

The LMRS is located north of Corpus Christi, Texas where temperatures and humidity can rise dramatically. Work will be conducted in personal protective equipment (PPE) Level D and C, dependent upon the perceived contaminant threat. Personnel may be physically stressed due to high temperatures during the red mud sample collection activity. Field activities will be conducted in accordance with

EPA ERT Standard Operating Procedures (SOPs), and Dynamac site-specific Health and Safety Plan (HASP).

5.1.3 Site Access and Logistics

Site access to SAC's RMLs and the residential properties along Leo Miller Road will be obtained by the EPA SAM, Bret Kendrick; however, access to designated background sample locations will be obtained during the scheduled field activities.

5.2 Sampling Design

Dynamac START has designed this Quality Assurance Sampling Plan (QASP) to collect red mud from locations in the RMLs, wipe samples inside residential properties, and groundwater samples from identified water wells. Sample locations may be revised in the field due to access issues, lack of red mud dust inside the residential structures, or inoperable water wells. Table 1 presents the anticipated number of red mud, wipe, groundwater, and sediment samples, location descriptions, and laboratory analyses. Dedicated sampling equipment will be used wherever possible in an effort to eliminate any potential cross contamination concerns. All sampling activities will be documented in a logbook and photographically.

5.3 Source Sampling

Samples of the red mud being deposited into the RMLs will be collected by START during the SI field activities in order to determine if the red mud contains CERCLA hazardous substances, pollutants, or contaminants in the form of heavy metals. Should concentrations of heavy metals be detected in the red mud, the RMLs can be defined as a HRS source type.

To determine the chemical composition of the newly generated red mud, biased red mud samples will be collected near the effluent pipe in RML-1 and RML-2. It is proposed that two samples of newly generated red mud be collected from RMLs 1 and 2, which are located nearest to the residents along Leo Miller Road. If newly generated red mud is not being disposed into either RML-01 or RML-2, the newly generated red mud will be collected from RML-3 and RML-4.

To determine the chemical composition of the dry red mud that has been disposed into the RMLs, it is proposed that judgmental, biased dry red mud samples be collected from RML-1 and RML-2. RML-1 and RML-2 were selected for sampling due to their proximity to the LMRS. It is proposed that one dry red mud sample be collected from each RML, for a total of two dry red mud samples. Overall, a total of five red mud samples (including one duplicate sample) will be collected to determine the metals concentration within the dry red mud.

The red mud samples will be collected according to EPA ERT's SOP No. 2012 – *Soil Sampling* and EPA's, *Superfund Representative Sampling Guidance, Volume 4, Waste Sampling* (Appendices A and B). The newly generated red mud samples will be collected either with the use of a plastic trowel or a telescopic dipper with attached beaker. The sample matrix will be transferred to a plastic mixing bowl for homogenization. The dry red mud from the RMLs will be collected with plastic trowels and plastic mixing bowls or the use of a hand auger. The dry red mud will be collected at 0 to 6 inches below the surface of the red mud. The sample locations at each RML will be randomly selected. After homogenization, the sample matrix will be transferred to the pre-labeled sample containers. See Table 1 for the proposed red mud samples and locations. Analytical methods, preservation, and bottle requirements are specified in Table 2.

5.4 Dust Sampling

In order to determine the metals concentrations of the red dust that has accumulated inside the residential homes located on Leo Miller Road, wipe samples will be collected during the SI field activities. START has identified three residential homes on Leo Miller Road in which wipe samples will be collected. These locations include: the residence at 28.00831666º N and 97.21676666 º W, located in San Patricio County; the residence at 28.01511666º N and 97.2124º W, located in Aransas County, and the residence at 28.01838333º N and 97.21031666º W, also located in Aransas County. A background or upwind residential home will be identified and sampled during the SI field activities in order to determine background concentrations of the total metals.

The wipe samples will be collected from inside the window sills of each respective residence. Window sills to be sampled will be those windows that directly face RML-1 and RML-2 (east windows) and have direct contact with the dust being generated at RML-1 and RML-2. Additional wipe samples may be collected from window sills located throughout the residential structures. It is anticipated that a minimum of two wipe samples will be collected per household. A minimum of ten wipe samples (including a duplicate wipe and blank samples) will be collected during the course of the SI field activities.

START will utilize wipe sampling procedures established in EPA's Emergency Response Team (ERT) Standard Operating Procedure (SOP) No. 2011 – Chip, Wipe, and Sweep Sampling (Appendix C). Wipe sampling procedures are summarized as follows: 1) the area to be sampled is measured off (0.5 to 1 square foot area) and photo-documented, 2) a sterile gauze pad is saturated with de-ionized water, 3) a vertical wipe, followed by a horizontal wipe of the area to be sampled, and 4) wipe sample placed in amber-teflon-lined sample container for transport to the laboratory (Appendix C). See Table 1 for the number and wipe sample locations. Analytical methods, preservation, and bottle requirements are specified in Table 2.

5.5 Groundwater Sampling

During the PA reconnaissance inspection, EPA/START identified three residential homes that maintain operable water wells, one of which is used for drinking water purposes. The identified water wells are located at the three residences in which wipe samples will be collected. See Section 5.4 for the groundwater sample locations. Based on historical data, these three well locations are located downgradient of RML-1 and RML-2. One to two upgradient water wells will be identified and sampled in order to determine the background concentrations of total metals in the groundwater.

In order to obtain groundwater samples representative of the sampled aquifer, the identified water wells will be purged prior to sample collection. Prior to purging, water quality parameters, including temperature, conductivity, pH, and dissolved oxygen, will be obtained using a Horiba water quality probe to obtain initial water quality readings.

Because it is anticipated that the designated wells are active water wells, the wells will be allowed to purge for five minutes in order to remove any stagnant water from the well casing. Water quality parameters will be monitored during purging activities and purging activities will be deemed completed when the water quality parameters have stabilized within 0.10 units. If the identified water wells are not currently active, the purging time will be increased to 10 to 15 minutes or until water quality parameters have stabilized. Per well owner's approval, the purged water will be allowed to flow on the ground surface. After purging has been completed, START will collect a sample from the spigot located on the well water reservoir. The water sample will be collected from a point preceding any treatment systems attached to the water well system, where possible. If a treatment system is in place on the well to be sampled, it will be noted in the field logbook.

To collect the groundwater sample after purging, the water will be allowed to flow from the well spigot, directly into pre-cleaned and certified 1-liter high density polyethylene (HDPE) sampling containers (Appendix D). It is anticipated that START will collect a total of six to eight groundwater samples during the scheduled SI field activities. See Table 1 for a list of potential groundwater wells to be sampled. Analytical methods, preservation, and bottle requirements are specified in Table 2.

5.6 Analytical Parameters

All collected red mud, wipe (dust), and groundwater samples will be analyzed by Accutest Laboratories, as arranged by the Dynamac-START chemist, for total metals and mercury using EPA SW-846, Methods 6010C/7471. The requested Turn Around Time (TAT) for the preliminary analytical results will be 10 business days, and the requested TAT for the final analytical data packages and corresponding Staged Electronic Data Deliverable (SEDD) will be 20 business days.

5.7 Sample Preservation

The collected red mud and wipe samples will be preserved to 4º Celsius (ºC) with the addition of bagged ice to the sample shipping coolers. No other preservatives will be utilized for the red mud or wipe samples.

The groundwater samples will be preserved with nitric acid (HNO_3) in order to suspend the metals in the liquid matrix. Nitric acid will be added to the sample container, via a dedicated pipette, in order to preserve the sample to a pH less than 2.0 units.

5.8 Sample Packaging and Shipping

After the samples have been collected, the sampling data (station number, time collected, sampler, GPS coordinates, etc.,) will be entered into a database using the U.S. EPA's SCRIBE Enterprise software. SCRIBE Enterprise will be used to generate sample labels and Chain-of-Custody (COC) forms for the collected samples. In addition, SCRIBE Enterprise will serve as the sampling database for the Leo Miller Road SI.

All samples will be packaged in appropriate sample containers. At a minimum, each sample container will contain a completed custody seal, bubble-wrapped, and placed in an individual plastic baggie. The packaged samples will then be placed into shipping coolers for shipment to Acutest Laboratories. Ice will be placed in the shipping cooler to preserve the collected wipe samples to 4º Celsius during transport to the laboratory. Completed custody seals will be placed on the outside of the shipping cooler in order to maintain the chain of custody of the collected samples.

5.9 Control of Contaminated Materials

Any investigation derived waste (IDW) generated through sampling operations will be contained in accordance with EPA ERT SOP No. 2006 (Appendix E). It is anticipated that IDW will consist of PPE and sampling equipment. If an appropriate disposal facility is not available on site, all IDW will be disposed of at the direction of the EPA SAM. It is anticipated that all sampling equipment will be dedicated. However, if non-dedicated sampling equipment is used, it will be decontaminated prior to use. Basic decontamination will consist of brushing gross particulate off sampling equipment with tap water and/or a scrub brush, followed by washing equipment with a soap solution of Liquinox® or Alconox® and tap water, a rinse in tap water, and a final rinse using distilled or de-ionized water. After decontamination, the equipment will be allowed to gravity drain and air dry.

The equipment will be wrapped in aluminum foil to minimize potential contamination if not immediately used.

6.0 QUALITY CONTROL

6.1 Laboratory Quality Control

Specific QC criteria have been developed to ensure that the Data Quality Objectives (DQOs) established in this QASP are met. The analytical method for sample analysis has been selected on the basis of the required detection limits, known contaminants existing in the study area, and the range of analytes to be determined. Table 2 presents method numbers and reference guidance, sample containers, sample volume requirements, and sample preservatives.

6.2 Field Quality Control

The Horiba Water Quality instrument unit will be calibrated by START prior to use in the field. Parameters to be calibrated include pH, conductivity, dissolved oxygen, salinity, and turbidity. All calibrated readings will be recorded in the field logbook. START will use the Horiba's manufactures instruction manual on the use of the water quality instrument.

All samples will be collected, handled, and preserved as described in EPA ERT SOP's (Appendices B and C).

6.3 Quality Assurance Samples

For Quality Assurance (QA) purposes, matrix spike/matrix spike duplicate (MS/MSD) samples will be collected on a frequency of 5%, per sample matrix. MS/MSD samples measure the performance of the method used, relative to the sample matrix, and the precision of analysis in terms of relative percent difference (RPD). It is anticipated that one MS/MSD sample will be designated for the red mud (solids), wipe (dust), and groundwater (liquids) samples.

Field duplicate samples, which are homogenized aliquots of a single sample used to assess the quality of sampling methods, sample handling, and laboratory procedures, will be

collected on a frequency of 1 per 10 per matrix (10%) (Table 2). It is anticipated that one field duplicate sample will be collected for the red mud, wipe, and groundwater samples during the SI field activities.

One field blank, consisting of preserved de-ionized water, will be collected in order to determine if airborne contamination has influenced the liquid sample matrix during transfer of the sample containers from one location to the next. One wipe blank sample will be collected and submitted to Accutest Laboratories in order to determine the metals concentrations prior to the collection of the red dust from inside the residential homes (Table 2).

6.4 Chain of Custody

After sample collection and identification, all samples will be handled in strict accordance with chain-of-custody protocol. All sampling data will be entered into the U.S. EPA's SCRIBE Enterprise software, which will provide a database of all sample collection data and prepare the necessary Chain-of-Custody forms and sample labels. A chain-of-custody record will be maintained from the time the sample is taken to its final deposition. Every transfer of samples and custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples (or groups of samples) are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal.

The Chain of Custody record should include (at minimum) the following:

- Sample identification number
- Sample information
- Sample location
- Sample date
- Name(s) and signature(s) of sampler(s)
- Signature(s) of any individual(s) with control over samples

7.0 RECONCILIATION WITH DATA QUALITY OBJECTIVES

The solids/groundwater sampling data will be assessed for accuracy, precision, completeness, representativeness, and comparability. Data assessment criteria are presented in the START-3 Generic QAPP, Section 4.0 "Assessment and Oversight" and Section 5.0, "Data Validation and Usability." Generally, data that do not meet the established acceptance criteria are cause for re-sampling and re-analysis. However, in some cases, data that do not meet acceptance criteria are usable with specified limitations. Data that are indicated as usable with limitations will be included in the final report, but will be clearly indicated as having limited usability. Indicators of data limitations include data qualifiers, quantitative evaluations, and narrative statements regarding potential bias. Dynamac-START will conduct the data validation activities on the received Accutest analytical data packages.

8.0 DELIVERABLES AND PROJECT ORGANIZATION

At the completion of field activities and receipt of validated laboratory analytical data, a SI Report will be completed and submitted to the EPA. The report will document all pertinent field and sampling activities, source and pathway specific documentation, and the results of sample laboratory analyses.

The EPA SAM, Bret Kendrick, will provide overall direction for this project and will identify sampling needs, determine the sampling schedule, and coordinate community relations.

The Dynamac START Task Leader (TL), Steve Cowan is the primary contact with the EPA. The START TL is responsible for project team organization, supervision of all project tasks, monitoring, and documenting the quality of all work produced by the project team, determining deviations from the QASP, and assisting with the overall sampling effort. The Dynamac Laboratory QC Coordinator is the primary contact with the analytical laboratory. The analytical results of the samples collected during the removal site assessment will be verified by Ms. Lisa Graczyk, a chemist with Dynamac-START. To facilitate this process, Dynamac-START has requested a Stage 2a SEDD and a Level IV data package from Acutest, the START-procured laboratory.

TABLE 1: SAMPLE COLLECTION SUMMARY

SAMPLE MATRIX	SAMPLE LOCATION	SAMPLE DESCRIPTION	COMPOSITE OR GRAB	SAMPLE ID	ANALYSIS	HRS PATHWAY
Red Mud	Red Mud Lagoon 1	To be collected from Red Mud Lagoon 1 (wet red mud); MS/MSD	Composite	RML1-RM01-C	Total Metals and Mercury	Source Evaluation
Red Mud	Red Mud Lagoon 1	To be collected from Red Mud Lagoon 1 (dry red mud)	Composite	RML1-RM02-C	Total Metals and Mercury	Source Evaluation
Red Mud	Red Mud Lagoon 2	To be collected from Red Mud Lagoon 2 (wet red mud)	Composite	RML2-RM03-C	Total Metals and Mercury	Source Evaluation
Red Mud	Red Mud Lagoon 2	To be collected from Red Mud Lagoon 2 (dry red mud)	Composite	RML2-RM04-C	Total Metals and Mercury	Source Evaluation
Red Mud	Red Mud Lagoon 1	To be collected from Red Mud Lagoon (dry red mud)	Composite	RML1-RM05-C (Duplicate of RML1-02-C)	Total Metals and Mercury	Source Evaluation
Red Dust	(b) (6) Residence	Collected from Window Sill #1	Grab	MART-RD01-G	Total Metals and Mercury	Air Migration
Red Dust	(b) (6) Residence	Collected from Window Sill #2	Grab	MART-RD02-G	Total Metals and Mercury	Air Migration
Red Dust	(b) (6) Residence	Collected from Window Sill #1	Grab	SAL-RD03-G	Total Metals and Mercury	Air Migration
Red Dust	(b) (6) Residence	Collected from Window Sill #2	Grab	SAL-RD04-G	Total Metals and Mercury	Air Migration
Red Dust	(b) (6) Residence	Collected from Window Sill #2	Grab	SAL-RD05-G (Duplicate of SAL-RD03-G)	Total Metals and Mercury	Air Migration
Red Dust	(b) (6) Residence	Collected from Window Sill #1	Grab	BENN-RD06-G	Total Metals and Mercury	Air Migration
Red Dust	(b) (6) Residence	Collected from Window Sill #2	Grab	BENN-RD07-G	Total Metals and Mercury	Air Migration

TABLE 1: SAMPLE COLLECTION SUMMARY

SAMPLE MATRIX	SAMPLE LOCATION	SAMPLE DESCRIPTION	COMPOSITE OR GRAB	SAMPLE ID	ANALYSIS	HRS PATHWAY
Red Dust	Background Residence (TBD)	Collected from Window Sill #1	Grab	BKG-RD08-G	Total Metals and Mercury	Air Migration
Red Dust	Background Residence (TBD)	Collected from Window Sill #2	Grab	BKG-RD09-G	Total Metals and Mercury	Air Migration
Red Dust	Blank	Blank Wipe	Grab	BW-RD10-G	Total Metals and Mercury	Air Migration
Groundwater	(b) (6) Residence	Collected from (b) (6) Water Well	Grab	MART-GW-01-G	Total Metals and Mercury	Groundwater Migration
Groundwater	(b) (6) Residence	Collected from (b) (6) Water Well	Grab	SAL-GW02-G	Total Metals and Mercury	Groundwater Migration
Groundwater	(b) (6) Residence	Collected from (b) (6) Water Well	Grab	BENN-GW03-G	Total Metals and Mercury	Groundwater Migration
Groundwater	(b) (6) Residence	Collected from (b) (6) Water Well	Grab	BENN-GW04-G (Duplicate of BENN-GW03-G	Total Metals and Mercury	Groundwater Migration
Groundwater	Background Residence (TBD)	Collected from Background Water Well	Grab	BKG-GW05-G-	Total Metals and Mercury	Groundwater Migration

KEY:

BENN - (b) (6) Residence

BKG - Background

C - Composite

G - Grab

GW - Groundwater

MART - (b) (6) Residence

RM - Red Mud

RML - Red Mud Lagoon

RD - Red Dust

SAL - (b) (6) Residence

TBD - To Be Determined

TABLE 2: SAMPLING and ANALYSIS SUMMARY

Matrix	Analytical Parameter	Analytical Method	Containers (Number, Size, and Type)	Preservation Requirements	No. of Sampling	No. Field Duplicates	No. MS/MSD Pairs	No. of Equipment Rinsate Samples	No. of Field Blanks	Total Number of Samples to Lab*
Red Mud (Solid)	Total Metals and Mercury	SW-846, Methods 6010C / 7471	2, 8-oz. G wide-mouth jar	Ice, Cool to 4°C	4	1	1	0	0	6
Dust (Solid)	Total Metals and Mercury	SW-846, Methods 6010C / 7471	Sterile gauze, de-ionized water, and amber jars	Ice, Cool to 4°C	8	1	1	0	0	10
Groundwater	Total Metals and Mercury	SW-846, Methods 6010C / 7471	1, 1-liter HDPE	HNO_3, pH < 2.0, Ice, Cool to 4°C	4	1	1	0	1	6

Notes:

*Total number of samples to the laboratory does not include MS/MSD samples. However, please note that MS/MSD or spike/duplicate analysis may require additional sample volume.

°C – Degrees Celsius

G – Glass
HNO3 - Nitric Acid

HDPE - High Density Polyurethane
MS/MSD – Matrix Spike/Matrix Spike Duplicate

No. – Number
Oz - Ounce

APPENDIX A
EPA ERT SOP No. 2012 – Soil Sampling

U. S. EPA ENVIRONMENTAL RESPONSE TEAM

STANDARD OPERATING PROCEDURES

SOIL SAMPLING

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SUPERCEDES: SOP #2012; Revision 0.0; 11/16/94; U.S. EPA Contract 68-C4-0022.

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to describe the procedures for the collection of representative soil samples. Sampling depths are assumed to be those that can be reached without the use of a drill rig, direct-push, or other mechanized equipment (except for a back-hoe). Analysis of soil samples may determine whether concentrations of specific pollutants exceed established action levels, or if the concentrations of pollutants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the actual procedures used should be documented and described in an appropriate site report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (disturbed vs. undisturbed), and the soil type. Near-surface soils may be easily sampled using a spade, trowel, and scoop. Sampling at greater depths may be performed using a hand auger, continuous flight auger, a trier, a split-spoon, or, if required, a backhoe.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Chemical preservation of solids is not generally recommended. Samples should, however, be cooled and protected from sunlight to minimize any potential reaction. The amount of sample to be collected and proper sample container type are discussed in ERT/REAC SOP #2003 Rev. 0.0 08/11/94, *Sample Storage, Preservation and Handling*.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary potential problems associated with soil sampling - cross contamination of samples and improper sample collection. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results.

5.0 EQUIPMENT

Soil sampling equipment includes the following:

- Maps/plot plan
- Safety equipment, as specified in the site-specific Health and Safety Plan
- Survey equipment or global positioning system (GPS) to locate sampling points
- Tape measure
- Survey stakes or flags
- Camera and film
- Stainless steel, plastic, or other appropriate homogenization bucket, bowl or pan
- Appropriate size sample containers
- Ziplock plastic bags
- Logbook
- Labels
- Chain of Custody records and custody seals
- Field data sheets and sample labels
- Cooler(s)
- Ice
- Vermiculite
- Decontamination supplies/equipment
- Canvas or plastic sheet
- Spade or shovel
- Spatula
- Scoop
- Plastic or stainless steel spoons
- Trowel(s)
- Continuous flight (screw) auger
- Bucket auger
- Post hole auger
- Extension rods
- T-handle
- Sampling trier
- Thin wall tube sampler
- Split spoons
- Vehimeyer soil sampler outfit
  - Tubes
  - Points
  - Drive head
  - Drop hammer
  - Puller jack and grip
- Backhoe

6.0 REAGENTS

Reagents are not used for the preservation of soil samples. Decontamination solutions are specified in ERT/REAC SOP #2006 Rev. 0.0 08/11/94, *Sampling Equipment Decontamination*, and the site specific work plan.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies required.

2. Obtain necessary sampling and monitoring equipment.

3. Decontaminate or pre-clean equipment, and ensure that it is in working order.

4. Prepare schedules and coordinate with staff, client, and regulatory agencies, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.

6. Use stakes, flagging, or buoys to identify and mark all sampling locations. Specific site factors, including extent and nature of contaminant, should be considered when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared by the property owner or the On-Scene-Coordinator (OSC) prior to soil sampling; and utility clearance should always be confirmed before beginning work.

7.2 Sample Collection

7.2.1 Surface Soil Samples

Collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. Surface material is removed to the required depth and a stainless steel or plastic scoop is then used to collect the sample.

This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sample team member. A flat, pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. Tools plated with chrome or other materials should not be used. Plating is particularly common with garden implements such as potting trowels.

The following procedure is used to collect surface soil samples:

1. Carefully remove the top layer of soil or debris to the desired sample depth with a pre-cleaned spade.

2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area which came in contact with the spade.

3. If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.2 Sampling at Depth with Augers and Thin Wall Tube Samplers

This system consists of an auger, or a thin-wall tube sampler, a series of extensions, and a "T" handle (Figure 1, Appendix A). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger. If a core sample is to be collected, the auger tip is then replaced with a thin wall tube sampler. The system is then lowered down the borehole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected from the thin wall tube sampler.

Several types of augers are available; these include: bucket type, continuous flight (screw), and post-hole augers. Bucket type augers are better for direct sample recovery because they provide a large volume of sample in a short time. When continuous flight augers are used, the sample can be collected directly from the flights. The continuous flight augers are satisfactory when a composite of the complete soil column is desired. Post-hole augers have limited utility for sample collection as they are designed to cut through fibrous, rooted, swampy soil and cannot be used below a depth of approximately three feet.

The following procedure is used for collecting soil samples with the auger:

1. Attach the auger bit to a drill rod extension, and attach the "T" handle to the drill rod.

2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first three to six inches of surface soil for an area approximately six inches in radius around the drilling location.

3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.

4. After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger, collect the sample after the auger is removed from the hole and proceed to Step 10.

5. Remove auger tip from the extension rods and replace with a pre-cleaned thin wall tube sampler. Install the proper cutting tip.

6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Do not scrape the borehole sides. Avoid hammering the rods as the vibrations may cause the boring walls to collapse.

7. Remove the tube sampler, and unscrew the drill rods.

8. Remove the cutting tip and the core from the device.

9. Discard the top of the core (approximately 1 inch), as this possibly represents material collected before penetration of the layer of concern. Place the remaining core into the appropriate labeled sample container. Sample homogenization is not required.

10. If volatile organic analysis is to be performed, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly.

    When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and follow steps 3 through 11, making sure to decontaminate the auger and tube sampler between samples.

12. Abandon the hole according to applicable state regulations. Generally, shallow holes can simply be backfilled with the removed soil material.

7.2.3 Sampling with a Trier

The system consists of a trier, and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

The following procedure is used to collect soil samples with a sampling trier:

1. Insert the trier (Figure 2, Appendix A) into the material to be sampled at a 0° to 45° angle from horizontal. This orientation minimizes the spillage of sample.

2. Rotate the trier once or twice to cut a core of material.

3. Slowly withdraw the trier, making sure that the slot is facing upward.

4. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.4 Sampling at Depth with a Split Spoon (Barrel) Sampler

Split spoon sampling is generally used to collect undisturbed soil cores of 18 or 24 inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split spoon sampling is performed to gain geologic information, all work should

be performed in accordance with ASTM D1586-98, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils".

The following procedures are used for collecting soil samples with a split spoon:

1. Assemble the sampler by aligning both sides of barrel and then screwing the drive shoe on the bottom and the head piece on top.

2. Place the sampler in a perpendicular position on the sample material.

3. Using a well ring, drive the tube. Do not drive past the bottom of the head piece or compression of the sample will result.

4. Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth.

5. Withdraw the sampler, and open by unscrewing the bit and head and splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2 and 3 1/2 inch diameters. A larger barrel may be necessary to obtain the required sample volume.

6. Without disturbing the core, transfer it to appropriate labeled sample container(s) and seal tightly.

7.2.5 Test Pit/Trench Excavation

A backhoe can be used to remove sections of soil, when detailed examination of soil characteristics are required. This is probably the most expensive sampling method because of the relatively high cost of backhoe operation.

The following procedures are used for collecting soil samples from test pits or trenches:

1. Prior to any excavation with a backhoe, it is important to ensure that all sampling locations are clear of overhead and buried utilities.

2. Review the site specific Health & Safety plan and ensure that all safety precautions including appropriate monitoring equipment are installed as required.

3. Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by OSHA regulations.

4. A shovel is used to remove a one to two inch layer of soil from the vertical face of the pit where sampling is to be done.

5. Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.

6. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7. Abandon the pit or excavation according to applicable state regulations. Generally, shallow excavations can simply be backfilled with the removed soil material.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration

activities must occur prior to sampling/operation, and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OHSA and corporate health and safety procedures, in addition to the procedures specified in the site specific Health & Safety Plan..

12.0 REFERENCES

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U.S. Environmental Protection Agency. 1984 Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. EPA-600/4-84-076.

de Vera, E.R., B.P. Simmons, R.D. Stephen, and D.L. Storm. 1980. Samplers and Sampling Procedures for Hazardous Waste Streams. EPA-600/2-80-018.

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APPENDIX A
Figures
SOP #2012
February 2000

FIGURE 1. Sampling Augers

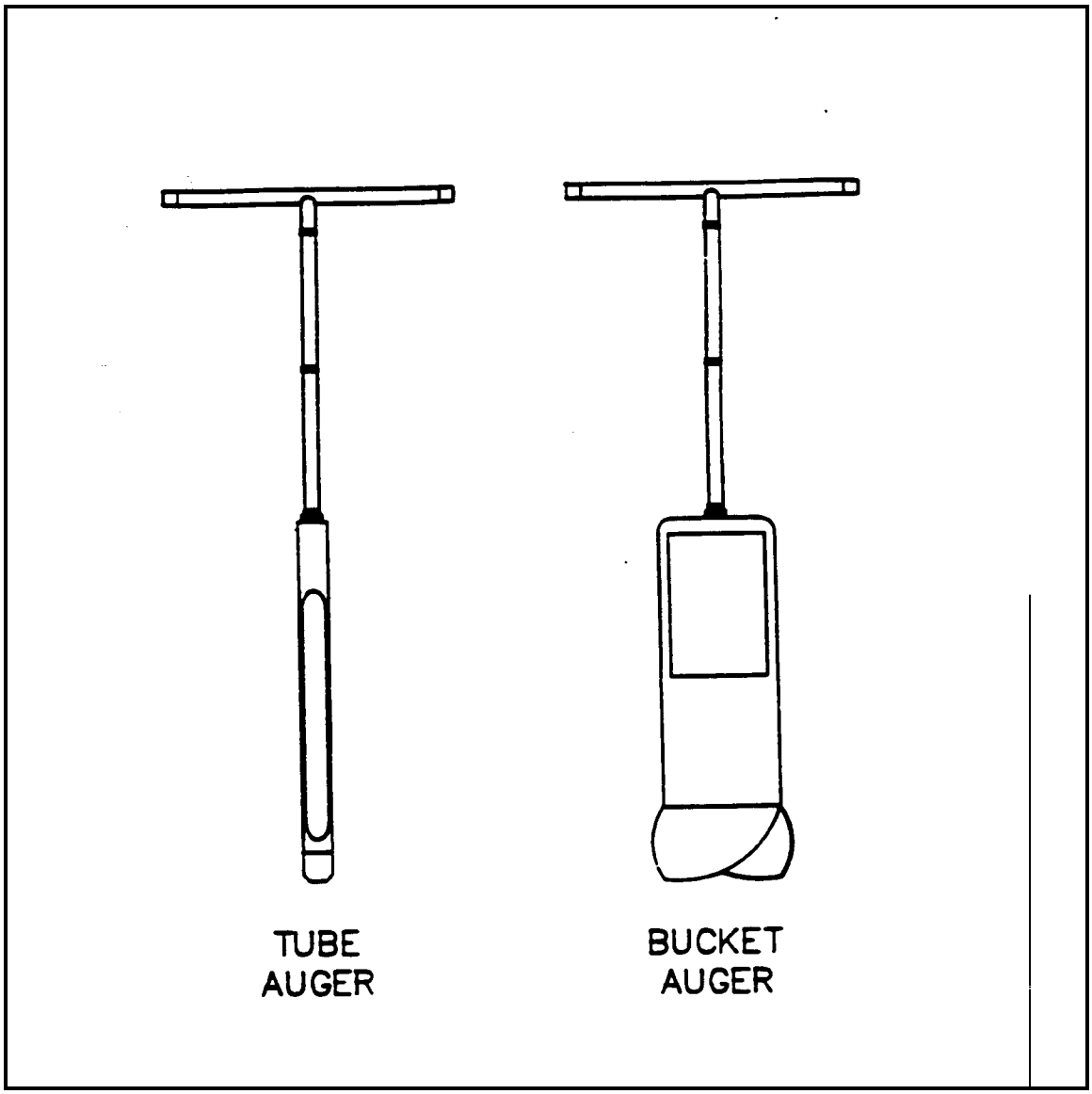
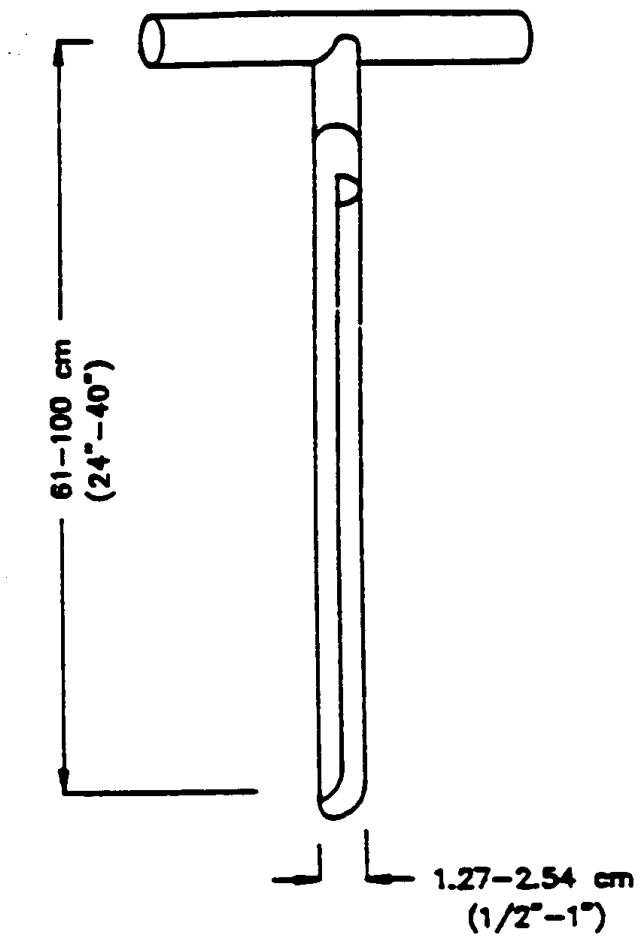


FIGURE 2. Sampling Trier



APPENDIX B
EPA Superfund Representative Sampling Guidance Vol. 4 Waste Sampling

OSWER Directive 9360.4-14
EPA 540/R-95/141
PB96-963207
December 1995

SUPERFUND PROGRAM

REPRESENTATIVE SAMPLING GUIDANCE

VOLUME 4: WASTE

Interim Final

Environmental Response Team

Office of Emergency and Remedial Response
Office of Solid Waste and Emergency Response

U.S. Environmental Protection Agency
Washington, DC 20460

Notice

This document has been reviewed in accordance with U.S. Environmental Protection Agency policy and approved for publication.

The policies and procedures established in this document are intended solely for the guidance of government personnel, for use in the Superfund Program. They are not intended, and cannot be relied upon, to create any rights, substantive or procedural, enforceable by any party in litigation with the United States. The Agency reserves the right to act at variance with these policies and procedures and to change them at any time without public notice.

For more information on Waste Sampling procedures, refer to the *Compendium of ERT Waste Sampling Procedures*, OSWER Directive 9360.4-07, EPA/540/P-91/008. Topics covered in this compendium include: sampling equipment decontamination; drum sampling; tank sampling; chip, wipe, and sweep sampling; and waste pile sampling.

Please note that the procedures in this document should only be used by individuals properly trained and certified under a 40-hour hazardous waste site training course that meets the requirements set forth in 29 CFR 1910.120(e)(3). It should not be used to replace or supersede any information obtained in a 40-hour hazardous waste site training course.

Questions, comments, and recommendations are welcomed regarding the *Superfund Program Representative Sampling Guidance, Volume 4 -- Waste*. Send remarks to:

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1.0 INTRODUCTION

1.1 OBJECTIVE AND SCOPE

This is the fourth volume in a series of guidance documents that assist Superfund Program Site Managers, On-Scene Coordinators (OSCs), Remedial Project Managers (RPMs), and other field staff in obtaining representative samples at Superfund sites. The objective of representative sampling is to ensure that a sample or a group of samples accurately characterizes site conditions. The representative sampling principles discussed in this document are applicable throughout the Superfund Program. The following chapters will help field personnel to assess available information, select an appropriate sampling approach, select and utilize field analytical screening methods and sampling equipment, incorporate suitable types and numbers of quality assurance/quality control (QA/QC) samples, and interpret and present the site analytical data.

As the Superfund Program has developed, the emphasis of this response action has expanded beyond addressing emergency response and short-term cleanups. Each planned response action must consider a variety of sampling objectives, including identifying threat, delineating sources of contamination, and confirming the achievement of clean-up standards. Because many important and potentially costly decisions are based on the sampling data, Site Managers and other field personnel must characterize site conditions accurately. To that end, this document emphasizes the use of cost-effective field analytical screening techniques to characterize the site and aid in the selection of sampling locations.

1.2 CHARACTERISTICS OF WASTE

Waste, in general terms, can include solid, liquid, and sludge material typically generated as a by-product of an industrial process. Assume that containerized wastes comprise high concentrations of hazardous substances, unless clearly indicated otherwise through previous sample analysis or other reliable documentation. Waste samples are often of high concentration and phased (e.g., light liquid, dense liquid, and sludge), an important point to consider when developing a sampling strategy. This document specifically addresses the sampling of wastes typically found in drums, tanks, lab packs, transformers, impoundments, waste piles, and on surfaces.

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) definition for a hazardous substance includes "...any substance designated pursuant to section 311(b)(2)(A) of the Clean Water Act; any element, compound, mixture, solution, or substance designated pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by an Act of Congress); any hazardous air pollutant listed under Section 112 of the Clean Air Act; and any imminently hazardous chemical substance or mixture with respect to which the EPA Administrator has taken action pursuant to Section 7 of the Toxic Substances Control Act. The term does not include petroleum including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance..., and the term does not include natural gas, natural gas liquids, liquified natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas)." Pursuant to 40 CFR 261, Subpart C, a waste is considered hazardous if it exhibits any of the following characteristics: ignitability, corrosivity, reactivity, or toxicity; or if it is a listed hazardous waste under 40 CFR 261.30, Subpart D. Asbestos and "mixed" waste (having radioactive and hazardous waste components), while included in this definition, require specialized sampling methods and techniques and will not be addressed in this document.

1.3 REPRESENTATIVE SAMPLING OBJECTIVES

Representative sampling applies to all phases of a Superfund response action. Representative sampling objectives for waste include:

- Identify the waste, including composition and characteristics, and determine if it is hazardous.

- Determine if there is an imminent or substantial threat to public health or welfare or the environment.
- Determine the need for long-term action.
- Develop containment and control strategies.
- Evaluate appropriate disposal/treatment options.
- Verify treatment goals or clean-up levels.

Determine Hazard and Identify Waste

One of the first objectives during a response action at a site is to determine the presence, identity, and potential threat of any hazardous materials. Use field screening techniques (discussed in Chapter 3) for rapid detection of wastes. Upon confirming the presence of hazardous materials, sample and/or continue screening to identify their compositions and determine their concentrations.

In addition to characterizing the waste sufficiently, conduct compatibility tests to help classify waste by composition and other physical characteristics into compatible waste streams (e.g., acid, base, or oxidizer). This will ensure safer handling, staging, bulking, storage, and transportation of wastes both on and off site.

Establish Threat

Establishing threat to the public or environment is a primary objective during a response action. The data obtained from characterizing the waste will help the Site Manager to determine whether an imminent or substantial threat exists and whether a removal action or other response action is necessary. The type and degree of threat determines the rate at which a response action is taken.

Determine Need for Long-Term Action

Site conditions may establish a long-term threat that is not imminent or substantial. Characterization of the waste can assist the Site Manager in setting a priority for long-term remediation evaluation and response. Waste characterization data are required to evaluate the site under the Hazard Ranking System and to identify sites eligible for inclusion on the National Priorities List (NPL). The NPL is the ranking list of those sites at highest national priority for long-term evaluation and remediation.

Develop Waste Containment and Control Strategies

Once the chemical constituents and threat have been established, many strategies for waste containment and control are available to the Site Manager. Analytical data indicating the presence of chemical hazards are not in themselves sufficient to select a containment or control strategy. Site reconnaissance and historical site research provide information on site conditions and the physical state of the waste sources; waste containment and control strategies are largely determined by this information. For example, site security measures (such as erecting a fence) may be sufficient to stabilize a site containing intact drums of solvents, and overpacking may be sufficient to contain a corroded drum of organophosphate pesticides. Unstable or explosive wastes, such as picric acid, may require immediate removal by demolition experts.

Identify Available Treatment/Disposal Options

The site contaminants should be identified, quantified, and compared to selected action levels. Where regulatory action levels do not exist, site-specific clean-up levels are determined by the EPA Region (often in consultation with the Agency for Toxic Substances and Disease Registry (ATSDR)). If action levels are exceeded, a series of chemical and physical tests may be required to evaluate possible treatment and/or disposal options. Each treatment or disposal method has a corresponding set of waste parameters that must be evaluated, e.g., ash content, British thermal unit (BTU) value, total metals concentration, total organic halides, cyanide, total chlorine and NOx are minimum requirements for incineration. It is important to test for treatment/disposal parameters as early as possible during the site assessment and characterization procedure. Relatively inexpensive tests such as total organic carbon (TOC), BTU, and pH should be considered early in the response action in order to contribute to later treatability studies. The test results will ultimately help to determine the most appropriate treatment or disposal option for meeting regulatory requirements.

Verify Treatment Goals or Clean-up Levels

After treatment or disposal, representative sampling results should either confirm that the response actions

have met the site-specific treatment goals or clean-up levels, or indicate that further treatment or removal is necessary. Refer to the *Representative Sampling Guidance, Volume 1 -- Soil*, OSWER Directive 9360.4-10, for guidelines on soil sample collection and preparation for confirming cleanup.

Sampling to verify cleanup requires careful coordination with demobilization activities. After treatment of one area on a site, verification sampling can begin in that area by using field screening and on-site analysis. Meanwhile, other areas can be treated. Lab confirmation of the screening performed in the treated areas can help ensure accuracy of screening for subsequent areas to meet QA objectives (as discussed in Section 5.2).

1.4 CONCEPTUAL SITE MODEL

A conceptual site model is a useful tool for selecting sampling locations. It helps ensure that sources, pathways, and receptors throughout the site have been considered before sampling locations are chosen. The conceptual model assists the site manager in evaluating the interaction of different site features. Risk assessors use conceptual models to help plan for risk assessment activities. Frequently, a conceptual model is created as a site map (see Figure 1) or it may be developed as a flow diagram which describes potential migration of contaminants to site receptors (see Appendix A).

A conceptual model follows contaminants from their sources, to pathways (e.g., air, surface water), and eventually to the assessment endpoints. Consider the following when creating a conceptual model:

- The state(s) of each contaminant and its potential mobility
- Site topographical features
- Meteorological conditions (e.g., wind direction/speed, average precipitation, temperature, humidity)
- Human/wildlife activities on or near the site

The conceptual site model on the next page is an example created for this document. The model assists in identifying the following site characteristics:

Potential Sources:

Site (waste pile, lagoon); drum dump; sewage plant discharge

Potential Migration Pathways:

Soil -- Leachate from the waste pile or drum dump; soil in direct contact with solids in the waste pile or drum dump

Surface Water -- Liquid waste from the lagoon or sewage plant discharge (into the lake)

Sediments -- Liquid waste from the lagoon or sewage plant discharge (into the lake)

Air -- Release of vapors/particulates from the waste pile, drum dump or lagoon

Potential Exposure Routes:

Ingestion -- Particles from the waste pile or drum dump; liquid from the lagoon or lake (from sewage plant discharge)

Inhalation -- Vapors from the waste pile, drum dump, lagoon, or lake (sewage plant discharge)

Absorption/direct contact -- Contact with the waste pile, drum dump, lagoon, or lake (sewage plant discharge)

Potential Receptors of Concern (and associated potential exposure sources):

Human Population

Residents/Trespassers:

Soil -- Leachate from the drum dump; direct contact with soil from solids in the drum dump

Surface water -- Liquid waste from the lagoon into the river or sewage plant discharge into the lake

Air -- Vapors/particulates from the waste pile, drum dump, lagoon, or lake (sewage plant discharge)

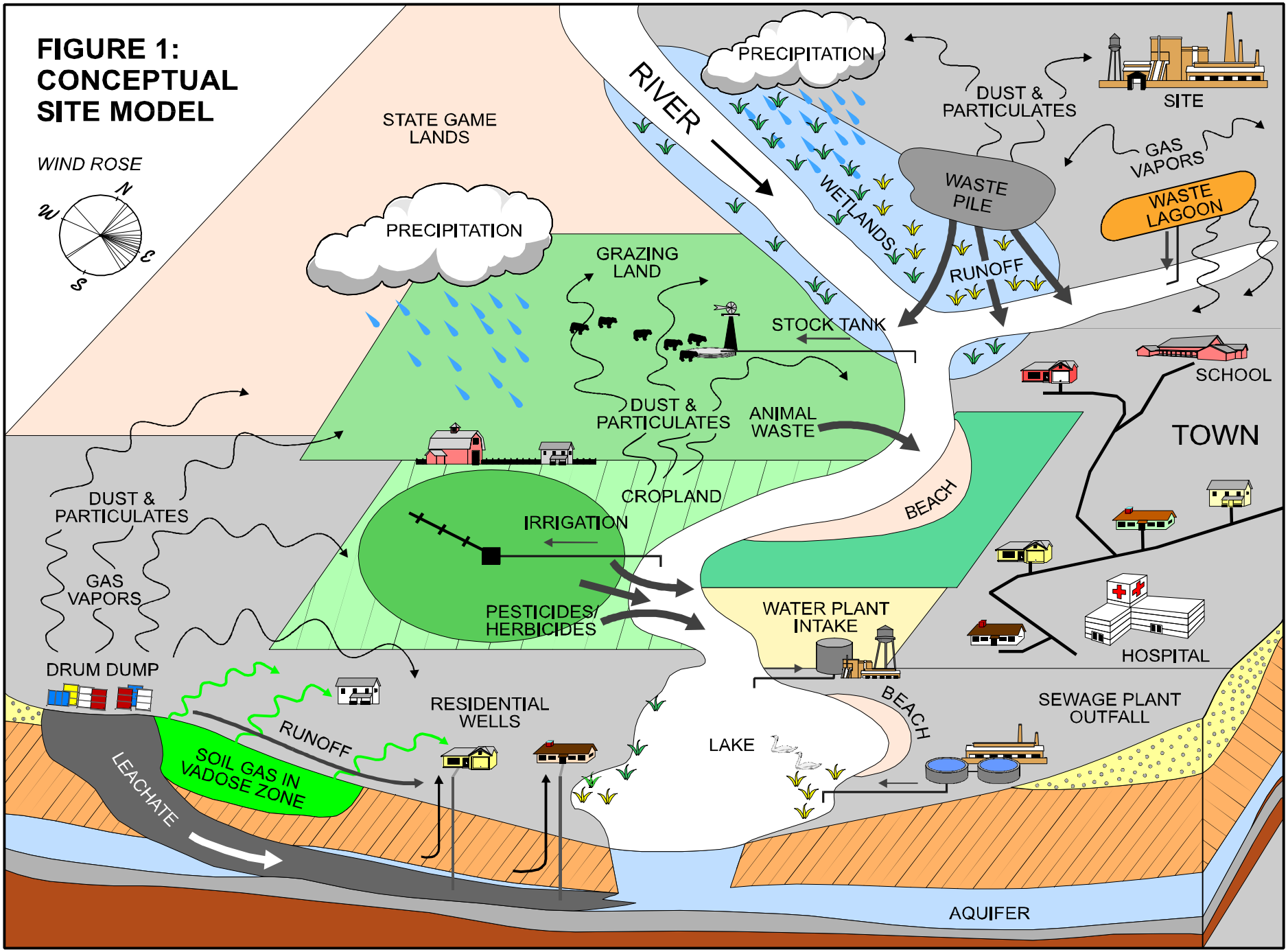


FIGURE 1:
CONCEPTUAL
SITE MODEL
WIND ROSE
N
W
E
S
STATE GAME
LANDS
PRECIPITATION
RIVER
WETLANDS
PRECIPITATION
DUST &
PARTICULATES
SITE
GAS
VAPORS
WASTE
PILE
WASTE
LAGOON
RUNOFF
GRAZING
LAND
STOCK TANK
SCHOOL
TOWN
DUST &
PARTICULATES
ANIMAL
WASTE
CROPLAND
BEACH
DUST &
PARTICULATES
IRRIGATION
GAS
VAPORS
PESTICIDES/
HERBICIDES
WATER PLANT
INTAKE
HOSPITAL
DRUM DUMP
RESIDENTIAL
WELLS
BEACH
SEWAGE PLANT
OUTFALL
RUNOFF
SOIL GAS IN
VADOSE ZONE
LEACHATE
LAKE
AQUIFER

Workers/Trespassers:

Soil -- Leachate from the waste pile; direct contact with soil from solids in the waste pile

Surface water -- Liquid waste in the lagoon or associated with the sewage plant discharge

Air -- Vapors/particulates from the waste pile, drum dump, lagoon, or sewage plant discharge

Biota

Threatened or endangered species or human food chain organisms known to frequent areas near the waste pile, drum dump, lagoon, or lake (sewage plant discharge)

Preliminary site information may provide the identification of the contaminant of concern and the level of the contamination. A sampling plan should be developed based upon the selected receptors of concern and the suspected sources and pathways. The model may assist in the selection of on-site and off-site sampling locations.

1.5 EXAMPLE SITE

An example site presented at the end of each chapter illustrates the development of a representative waste sampling plan that meets Superfund Program objectives for an early action.

2.0 SAMPLING DESIGN

2.1 INTRODUCTION

There is no universal sampling method for characterizing wastes because site characteristics vary widely. The sampling methods and equipment must be suited to the specific sampling situation. A properly developed waste sampling design defines the sampling purpose, protects site worker health and safety, effectively utilizes resources, and minimizes errors. The sampling design will vary according to the type of waste sampled (including type of containers or sources), and the characteristics of the site. When developing a sampling design, consider: prior actions at the site (e.g., sampling practices, compliance inspections); properties and characteristics of the wastes sampled; site waste sources (e.g., impoundments, waste piles, drums); topographic, geologic, hydrologic, and meteorologic conditions of the site; and flora, fauna, and human populations in the area.

Waste material may be liquid, solid, or sludge, and may be contained in drums, tanks, waste piles, surface impoundments, on surfaces (e.g., building structures, floors, equipment), in lab packs, or other sources. Sampling each waste stream may require a variety of sampling techniques, equipment, sample packaging, and sample analyses.

2.2 SAMPLING PLAN

Many site-specific factors are important in the development of a good sampling plan, including: data use and quality assurance objectives; sampling equipment; sampling design; standard operating procedures (SOPs); field analytical screening; analytical method selection; decontamination; sample handling and shipment; and data validation.

The U.S. EPA *Quality Assurance Sampling Plan for Environmental Response* (QASPER) was designed to develop sampling plans for response actions. QASPER is menu-driven software which prompts the user to input background information and to select prescribed parameters for development of a site-specific sampling plan. It also gives the user access to any previously developed site-specific sampling plans.

The following procedures are recommended for developing a thorough waste sampling plan. Many steps can be performed concurrently, and the sequence is flexible.

- Review the history of the site, including regulatory and reported spill history; note current and former locations of buildings, tanks, and process, storage, and disposal areas.

- Perform a site reconnaissance; categorize physical/chemical properties and hazardous characteristics of materials involved.

- Identify topographic, geologic and hydrologic characteristics of the site including surface water, groundwater, and soil characteristics, as well as potential migration pathways and receptors.

- Determine geographic and demographic information, including population size and its proximity to the site (e.g., public health threats, source of drinking water); identify threatened environments (e.g., potentially contaminated wetlands or other sensitive ecosystems).

- Select sampling strategies, considering field analytical screening and statistical applications, when appropriate.

- Determine data quality and quality assurance objectives for field analytical screening, sampling, and analysis. As the extent of contamination becomes quantified, the sampling plan can be modified to better assess sampling objectives throughout the action.

It is recognized that many of these steps (described in detail below) would not be applicable during a classic emergency response because of the lack of advance notice. Emergency response sampling nevertheless requires good documentation of sampling events.

2.2.1 Historical Data Review

The first step in developing a sampling plan is a review of historical site data, examining past and present site operations and disposal practices to provide clues on possible site contamination. Available sources of information include: federal, state and local agencies and officials; federal, state, and local agency files (e.g., site inspection reports and legal actions); deed or title records; current and former facility employees; potentially responsible parties (PRPs); local residents; and facility records or files.

A review of previous sampling information should include sampling locations, matrices, methods of collection and analysis, and relevant contaminant concentrations. Assess the reliability and usefulness of existing analytical data, including those which are not substantiated by documentation or QA/QC controls, but which may still illustrate general site trends.

Collect information that describes specific chemical processes, raw materials used, products and wastes, and waste storage and disposal practices. Review any available site maps, facility blueprints, and historical aerial photographs detailing past and present storage, process, and waste disposal locations. County property and tax records and U.S. Geological Survey (USGS) topographic maps are useful sources of information on the site and its surroundings.

2.2.2 Site Reconnaissance

A site reconnaissance can be conducted at an earlier date or immediately prior to sampling activities. It allows field personnel to assess site conditions, evaluate areas of potential contamination, evaluate potential hazards associated with sampling, and finalize a sampling plan. Site reconnaissance activities include: observing and photographing the site; noting site access routes and potential evacuation routes; noting potential safety hazards; recording label information from drums, tanks, or other containers; mapping process and waste disposal areas such as landfills, impoundments, and effluent pipes; making an inventory of the wastes on site; mapping potential contaminant migration routes such as drainage, streams, and irrigation ditches; noting the condition of animals and/or vegetation; and noting topographic and/or structural features. Field personnel should use appropriate personal protective equipment (PPE) when engaged in any site activities.

2.2.3 Physiographic and Other Factors

Other procedures, such as determining data quality and QA/QC objectives, utilizing field analytical screening techniques, identifying topographic, geologic and hydrologic characteristics, and determining geographic and demographic information are important steps of an overall sampling plan. Field analytical screening techniques and equipment are discussed in Chapter 3; QA objectives are discussed in Chapter 5. Since this document specifically pertains to waste sampling, the remaining procedures listed above will not be addressed in detail here. (Please refer to the *Representative Sampling Guidance, Volume 1 -- Soil,* OSWER Directive 9360.4-10.) The U.S. EPA is currently developing an ecological sampling guidance document that will contain a detailed checklist for collecting ecological data.

2.3 WASTE SAMPLE TYPES

Design sampling procedures to match sampling objectives. The type of sample collected may depend on suspected waste types and characteristics; size and accessibility of waste containers, impoundments and other media; target analytes; and health and safety requirements.

The following section describes and gives examples of the two types of waste samples.

2.3.1 Grab Sample

A *grab* sample is a discrete aliquot collected from one specific sampling location at a specific point in time, and may be considered representative of a homogeneous and stable waste. When obtaining grab samples from containers or from an impoundment having stratified layers, sample each phase or stratum separately; the separate aliquots are representative of their respective stratum. When sampling stratified sources, determine as many properties of the wastes as possible through historical data and site reconnaissance prior to sampling, and use caution because the individual phase components may be more concentrated than the original waste material.

2.3.2 Composite Sample

A *composite* sample is a non-discrete sample composed of two or more equal aliquots collected at various sampling points or times. There are four types of composite samples: *areal, vertical, flow proportional,* and *time.* An *areal composite* is comprised of individual aliquots collected over a defined area (e.g., surface of a waste pile). It is made up of aliquots of equal volume, each collected in an identical manner at the same horizon (depth). A *vertical composite* is composed of individual aliquots collected at different depths but along the same vertical line (e.g., borehole). It is made up of aliquots of equal volume which are collected in an identical manner. A *flow proportional composite* is a sample collected proportional to the flow rate during the compositing period by either a time-varying/constant volume or time-constant/varying volume method. A *time composite* is composed of a varying number of discrete, equal-volume aliquots collected at equal time intervals during the compositing period. (Both flow and time composite samples are appropriate for sampling wastewater or streams.)

By design, composite samples reflect an "average" concentration within the composite area, flow, or interval. Compositing is appropriate when determining the general characteristics or the representativeness of certain sources (e.g., a waste pile or impoundment) when considering methods of treatment or disposal. When compositing samples from a waste stream, note that resulting concentrations are representative of the waste stream's average concentration, but not of discrete areas within the waste stream.

Composite sampling should be performed only on like waste streams. Do not composite dissimilar waste streams or waste sources (e.g., drums with unknown contents or dissimilar materials) because of health and safety risks associated with possible reactions; in addition, the resulting sample will not define or represent the origin of the mixed contaminants. Composite aliquots from tanks, drums, or other containers only after adequate hazardous characterization screening to prevent mixing of incompatible wastes.

A result of sample compositing is the dilution of high concentration aliquots. To compensate for dilution, reduce the applicable detection limits accordingly. If the composite value is to be compared to a selected action level, then the action level must be divided by the number of aliquots that make up the composite in order to determine the appropriate detection limit. For example, if the action level for a particular substance is 40 ppb, a detection limit of 10 ppb should be used when analyzing a 4-aliquot composite.

When compositing waste, four aliquots per sample are recommended because two ounces of each aliquot can be added to an 8-ounce (or larger) jar. Individual aliquots in storage from any "hit" composites can be analyzed later to pinpoint contamination.

2.4 WASTE TYPES

The types of wastes encountered at a site greatly influence the development of the site sampling plan. The number of grab and composite samples, type of screening/sampling equipment used, and analytical methods all depend on the types of wastes present at the site. Waste solids can vary from granular or powdered materials to contaminated structural surfaces or demolition debris. Waste liquids can include solvents, acids, bases, process solutions, and lubricants, among others. Waste sludges have characteristics of both solids and liquids.

Each type of waste may be highly concentrated, consisting of virtually pure industrial products, raw or spent materials, chemicals, or process by-products. Methods for sampling and analyzing vary by waste type, and the sampling plan should specify appropriate sample collection and analysis methods.

Waste samples are often complex mixtures and may be difficult to analyze in the laboratory. Provide the analytical laboratory with as much information as possible to help minimize delays in analysis. The laboratory will find the following information helpful in expediting the analysis of waste samples:

- Whether the sample is pure waste or an environmental sample (e.g., oil as opposed to oily water).
- Viscosity, particle size, or an accurate description of the waste characteristics.
- Qualitative estimate of concentration (i.e., low, medium, high).

- Presence of extreme pH levels (i.e., less than 2 or greater than 12); some analytical methods will not yield successful results on such samples; it may be necessary to consult with a chemist to change the method.

- Presence of chlorinated dioxins, even if the samples are being analyzed for another parameter (e.g., metals). The Occupational Safety and Health Administration (OSHA) specifies special handling facilities for samples contaminated with dioxin; many laboratories are not set up to handle these samples.

- Presence of high concentrations of organic substances, particularly aromatics, in samples to be analyzed for metals (some methods for metals analysis are not compatible with high concentrations of organic materials).

Inform the laboratory in advance about important sample constituents of interest and QA/QC criteria. Waste samples typically must be diluted before analysis, which may prevent detection of these constituents. Also consult with the laboratory on how to prepare subaliquots of non-typical samples.

2.5 WASTE CHARACTERISTICS

Waste characteristics, including homogeneity, physical state, chemical stability, particle size (solids), and viscosity (liquids) are other factors that influence the number and types of samples collected.

2.5.1 Homogeneity

Wastes may be homogeneous or heterogeneous. The solubility, specific gravity, and mechanical mixing ability of the waste can affect its degree of homogeneity. A single grab sample per waste stream may be appropriate for a homogeneous material; however, heterogeneous and unclassified wastes often require more extensive sampling and analysis to ensure that the various phases and concentrations of the waste are represented in the samples. The sampling strategy should reflect the homogeneity, random heterogeneity, or stratification of the waste over space or time.

2.5.2 Physical State

The physical state of waste (i.e., solid, liquid, gas, or multiphasic) will influence the selection of sampling devices and many other aspects of the sampling effort. Variances in each physical state can also affect sampling. For example, free-flowing liquid would require a different sampling approach than a viscous liquid.

Sample containers with wide mouths are best for solid samples, sludges, and liquids with substantial amounts of suspended matter. Bottles with air-tight closures are needed for gas samples or gases adsorbed onto solids or dissolved in liquids.

The sampling strategy will vary if the physical state of the waste is subject to stratification (for example, liquid wastes with differing densities or viscosities, or those with suspended solids), homogenization, or random heterogeneity.

2.5.3 Chemical Stability

Waste materials can differ considerably in their inherent chemical stability. Exposure to the elements (e.g., sunlight, air, rain) and leaching may cause chemical degradation or reaction, thereby creating new compounds. Heterogenous materials may undergo physical separation, resulting in pockets or layers of different compounds. Sampling methods and shipping practices will vary according to the toxicity, ignitability, corrosivity, and reactivity of the waste.

2.5.4 Particle Size (solids)

Waste solids are often made up of materials with different particle sizes. This variation can influence analytical results by introducing either a negative or positive bias. For example, if large pieces of waste material (e.g., slag) are not collected and included with a sample, a negative bias of contaminants may result (analytical results may be lower than what is actually representative). Small particle size can also bias a sample. Some pollutants adsorb more readily onto small particles, so a small-fraction sample may result in a positive bias (analytical results may be higher than what is representative). If it is necessary to sample material that has unusual particle size characteristics, identify an approximate size distribution and consult the laboratory in advance to determine a method for representative analysis of the

irregular materials. Sieving of waste is not usually recommended. If grinding or pulverizing large pieces is desired, make special arrangements with the laboratory.

2.5.5 Viscosity (liquids)

Viscosity is the internal friction of a fluid that produces a resistance to flow. The viscosity of waste liquids often greatly affects the effort required for sample collection and may indirectly determine the volume of sample required. Because viscosity can affect the representativeness of the sample, and can itself be a physical limitation for sampling, a sampling technique suited to the viscosity of the material must be selected. Very viscous materials (greater than 100,000 centipoise (cps)) must be scooped, while low viscosity materials may be aspirated, encapsulated, or poured. To collect a representative sample for viscosity testing, it is important to limit handling and contact time. The sample must be allowed to return to equilibrium before measurement. Without a viscometer, viscosity may be roughly determined by comparison to water (low viscosity), syrup (medium viscosity), and mayonnaise or taffy (high viscosity), as well as to other materials of known viscosity.

Several sampling devices have been designed to sample waste liquids within a specific viscosity range. Weighted bottle samplers, PACS grab samplers, and composite liquid waste samplers (COLIWASAs) are suited for sampling less viscous liquids and become difficult to use in very viscous liquids. The glass thief and bacon bomb sampler are suitable for sampling moderately to highly viscous materials. See Section 3.2 for a discussion of sampling equipment.

2.6 WASTE SOURCES

There are a variety of potential waste sources commonly found at waste sites. The type of waste source affects many aspects of the sampling design, such as sampling approach (e.g., judgmental or random), sampling equipment, and types/numbers of samples (including QA/QC samples). The type of source will also affect many logistical considerations, such as cost, level of effort, and duration of a response action. This section introduces the three categories of waste sources: containerized waste, uncontainerized waste, and surfaces and debris.

2.6.1 Containerized Waste

Containerized waste consists of solids, liquids, or sludges that are found in drums, bulk storage tanks, transformers, and lab packs. Evaluate container label information before making sampling decisions. It may be possible to identify numerous containers of similar material. Wherever possible, use screening techniques to substantiate label information. Screening results should be confirmed with laboratory test results prior to making any treatment or disposal decisions (affirming that screening was effective). Specialized equipment (e.g., forklift, grapple, manlift) may be needed to access drums and tanks safely.

The sampling objective determines which and how many containers need to be sampled. For example, if the objective is to establish threat, it may be most important to sample a few containers having visible leaks or spills. If the objective is to estimate the disposal cost, it may be appropriate to sample each of the largest volume containers to identify the predominant waste streams.

Drums can be of different volumes (typically from 30 to 90 gallons), varied construction (e.g., top bung, side bung, removable top, lined), and be made of a variety of materials (e.g., steel, polyethylene, fiber, combinations). Drums located at a waste site often vary in condition, sometimes showing deterioration, bulging, and/or damage. These physical criteria can be useful in making assumptions about a drum's contents. For example, strong acids, caustics, or other corrosives are typically stored in 30- to 55-gallon polyethylene or polyethylene-lined steel drums with top bung holes. While this is not a fool-proof method of determining drum contents, it gives the investigator an indication prior to sampling of the general types of materials to be encountered.

Bulk storage tanks include tank cars/trucks, vats, storage vessels, and transformers. They range in size from less than 100 gallons to millions of gallons. Like drums, bulk storage tanks are constructed of many different materials and are designed in many configurations.

Lab packs consist of small, individually-labelled containers of laboratory waste or unused reagents. The chemical containers are usually not more than five gallons each, and are often packaged or transported together in a larger Department of

Transportation (DOT) shippable container (these are typically 30- to 55-gallon drums). Be sure to screen lab packs for radioactivity, since radioactive substances (alpha, beta, and gamma emitters) are commonly found in lab packs.

Another type of waste that can be found on site is biological waste, also known as "red bag waste." Note that contaminated biological waste (dressings, syringes, etc.) may not always be found in the required red bag. It should be handled only by personnel specifically trained and authorized to deal with biological waste. If "red bag waste" is encountered at a site, notify the ATSDR, or local health authorities.

2.6.2 Uncontainerized Waste

Uncontainerized waste consists of solids, liquids, and sludges that are found in waste piles and surface impoundments.

Waste piles may be composed of solid wastes such as tank bottom solids, contaminated soil, ash, solidified sludges, or a mixture of liquid and solid chemical wastes. The shape and size of waste piles can vary greatly, depending on the generating process or facility. The sampling plan should take into account the chemical and physical characteristics of the waste pile. For example, contaminants can leach out of the surface layers of a waste pile, resulting in deceptively low or nonrepresentative concentrations at the top. The sampling plan should account for leaching by taking composite samples from various horizons within the pile to determine an "average" concentration.

Surface impoundments include lined and unlined lagoons, ponds, and trenches that contain predominantly liquids and sludges from site processes or surface runoff. The liquids may be homogeneous or stratified, depending on the chemical and physical properties of the wastes. Reactions may occur within the impoundment to alter or degrade the original chemicals. Do not compromise any existing liners when sampling bottom sludges.

2.6.3 Surfaces and Debris

Surfaces and debris require specialized sampling techniques. During a response action, it may be necessary to sample object and structural surfaces for contamination to determine the need for dismantling and eventual disposal. Virtually any surface on the site may have to be sampled, including walls and floors of buildings, process machinery, tanks, vats, air ducts, vehicles, and furniture. There are three methods for sampling surfaces: wipe sampling, chip sampling, and dust sampling. Each method is described further in Section 4.3.6.

Debris can be highly variable and includes demolition rubbish, construction and destruction materials, paint cans, empty 55-gallon drums, battery-casings, shredded automobiles, and other miscellaneous matrices such as process waste, tannery waste, and slag. Debris may be composed of plastic, metal, rubber, paper, concrete, wood, glass, masonry, and municipal waste. It can include contaminated waste sampling articles such as protective disposable clothing (e.g., Tyvek suits), sample collection jars, and disposable sampling equipment (e.g., plastic scoops).

2.7 QUALITY ASSURANCE CONSIDERATIONS

Quality assurance components are defined as follows:

- Precision -- measurement of variability in the data collection process
- Accuracy (bias) -- measurement of bias in the analytical process; the term "bias" throughout this document refers to the QA/QC accuracy measurement
- Completeness -- percentage of sampling measurements which are judged to be valid
- Representativeness -- degree to which sample data accurately and precisely represent the characteristics and concentrations of the waste contaminants
- Comparability -- evaluation of the similarity of conditions (e.g., sample depth, sample homogeneity) under which separate sets of data are produced

To ensure that the analytical samples are representative of site conditions, quality assurance measures must be associated with each sampling and

analysis event. The sampling plan must specify these measures. QA measures include, but are not limited to: laboratory SOPs, sample bottle preparation, equipment decontamination, field blanks, replicate samples, performance evaluation samples, sample preservation and handling, and chain-of-custody requirements (see Chapter 5, Quality Assurance/Quality Control).

2.8 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) state the level of uncertainty that is acceptable for data collection activities and define the certainty of the data necessary to make decisions. When establishing DQOs for a particular project, consider:

- Decision(s) to be made or question(s) to be answered
- Why analytical data are needed and how the results will be used
- Time and resource constraints on data collection
- Descriptions of the analytical data to be collected
- Applicable model or data interpretation method used to arrive at a conclusion
- Detection limits for analytes of concern
- Sampling and analytical error

2.9 FIELD ANALYTICAL SCREENING AND GEOPHYSICAL TECHNIQUES

There are two types of analytical data that can be generated during a response action: field analytical screening data and laboratory analytical data. Field analytical screening instruments and techniques provide real-time or direct (or colorimetric) readings. They include: flame ionization detectors (FIDs), photoionization detectors (PIDs), colorimetric tubes, portable X-ray fluorescence (XRF) units, portable gas chromatography (GC) units, immunoassay tests, and hazard categorization kits. These screening methods can assist with the selection of sample locations or samples to be sent for laboratory analysis by narrowing the possible groups or classes of chemicals. They are effective and economical for gathering large amounts of site data. After an area or group of containers has been characterized using field screening techniques, a subset of samples can be sent for laboratory analysis to substantiate the screening results. Field analytical screening with laboratory confirmation usually generates more analytical data under a limited sampling budget than will sampling with off-site laboratory analysis alone. Whenever possible, use field analytical screening methods which provide detection limits below applicable action levels. If these methods are not available, field analytical screening can still be useful for waste sampling by detecting grossly contaminated areas as well as for on-site health and safety determination. Field analytical screening techniques to support waste sampling are discussed in more detail in Chapter 3.

Geophysical techniques may be utilized during a response action to locate potential buried drums or tanks, buried waste, and disturbed areas. Geophysical techniques include ground penetrating radar (GPR), magnetometry, electromagnetic conductivity (EM), and resistivity surveys. Refer to U.S. EPA *Representative Sampling Guidance, Volume 1 -- Soil,* OSWER Directive 9360.4-10, for a discussion of soil geophysical techniques that are also applicable for waste sampling.

2.10 ANALYTICAL PARAMETERS AND METHODS

Designing a representative waste sampling plan includes selecting analytical parameters and methods. Use data collected during the historical data review (e.g., past site processes, materials stored on site) to select appropriate analytical parameters and methods. If the historical data review reveals little information about the types of waste on site, select analytical parameters by initially characterizing the waste. Use applicable field screening methods and limited laboratory analysis to rule out the presence of high concentrations of certain contaminants, and to narrow the list of analytical parameters. Methods often used for characterization of waste include GC/MS (gas chromatography/mass spectroscopy) screening for tentatively identified compounds (TICs) in the volatile and semivolatile organic fractions, infrared spectroscopy (IR) for organic compounds, inductively coupled plasma (ICP) for inorganic substances, and product comparison. These methods are used to determine chemical percentages in waste samples. After characterization, future sampling and analysis efforts can focus on substances identified above the action level.

2.11 REPRESENTATIVE SAMPLING APPROACHES

Representative sampling approaches appropriate for waste sampling include judgmental, random, systematic grid, systematic random, and transect sampling. A representative sampling plan may use one or a combination of these approaches.

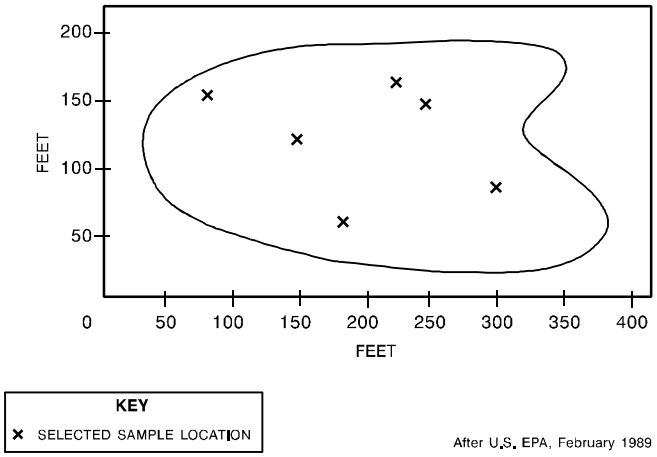
2.11.1 Judgmental Sampling

Judgmental sampling is the biased selection of sampling locations at a site, based on historical information, visual inspection, sampling objectives, and professional judgment. In waste sampling, three distinct situations prevail: 1) selecting locations within a large waste stream such as a waste pile or a stratum in an impoundment; 2) selecting a subset of containerized wastes when all containers cannot be sampled; and 3) sampling both containerized and non-containerized wastes in order to identify worst-case conditions and establish threat. If determining threat, the presence of certain site conditions such as leaking drums, spill areas, and large volume containers will indicate appropriate sampling locations if the source is known to be hazardous. Select drums to sample by existing labelling/markings or by container type, but not by random selection. When establishing threat, screen drums first to select a subset of drums containing hazardous materials or waste to be sent for analysis. This will avoid sampling drums of non-hazardous materials, which is not cost-effective. Judgmental sampling includes no randomization in the sampling strategy, precluding statistical interpretation of the sampling results.

2.11.2 Random Sampling

Random sampling is the arbitrary collection of samples having like contaminants within defined boundaries of the area of concern. Choose random sampling locations using a random selection procedure (e.g., a random number table). (Refer to Ford and Turina, July, 1984, for an example of a random number table.) The arbitrary selection of sampling points ensures that each sampling point is selected independently from all other points, so that all locations within the area of concern have an equal chance of being sampled. Randomization is necessary in order to make probability or confidence statements about the sampling results. The key to interpreting these statements is the assumption that the site or waste stream is homogeneous with respect to the parameters being monitored. The higher the degree of heterogeneity, the less the random sampling approach will adequately characterize true conditions. The use of random sampling on a subset of containers is not appropriate if different waste streams or concentrations might be present. Random sampling of waste piles and impoundments is often appropriate because of their large areal extent and relative homogeneity. Use random sampling to confirm the attainment of treatment levels of contaminated waste. (Refer to U.S. EPA, *Methods for Evaluating the Attainment of Cleanup Standards*, Volume 1 -- *Soils and Solid Media*, EPA/230/02-89/042, pages 5-3 to 5-5 for guidelines on selecting sample coordinates for random sampling.) Figure 2 illustrates a random sampling approach.

Figure 2: Random Sampling

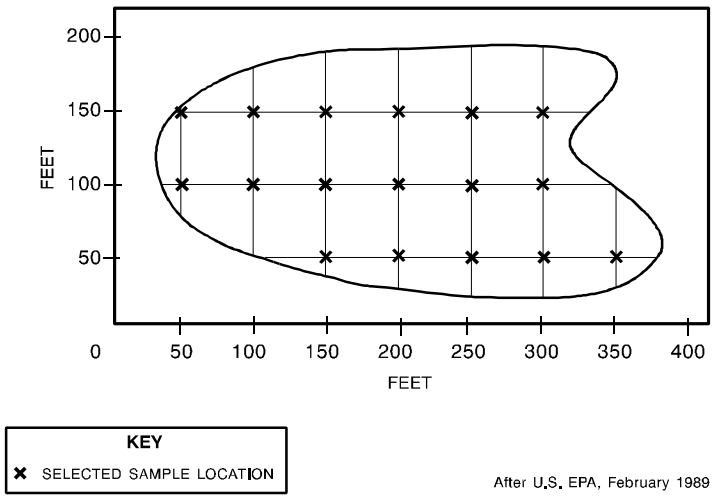


2.11.3 Systematic Grid Sampling

Systematic grid sampling involves subdividing the area of concern by using a square or triangular grid and collecting samples from the nodes (intersections of the grid lines). Select the origin and direction for placement of the grid using an initial random point. From that point, construct a coordinate axis and grid over the source. Generally, the more samples collected (and the smaller the grid spacing), the more reproducible and representative the results. Shorter distances between sampling locations also improve representativeness.

Systematic grid sampling can be used to characterize a waste pile, impoundments, or loose tank bottom solids. Systematic grid sampling is not applicable to sampling individual small containers or drums. (Refer to U.S. EPA, *Methods for Evaluating the Attainment of Cleanup Standards,* Volume 1 -- *Soils and Solid Media*, pages 5-5 to 5-12 for guidelines on selecting sample coordinates for systematic grid sampling.) Figure 3 illustrates a systematic grid sampling approach.

Figure 3: Systematic Grid Sampling



After U.S. EPA, February 1989

2.11.4 Systematic Random Sampling

Systematic random sampling is a useful and flexible design for estimating the average pollutant concentration within grid cells. Subdivide the area of concern using a square or triangular grid (as mentioned above) then collect samples from within each cell using random selection procedures. Systematic random sampling allows for the isolation of cells that may require additional sampling and analysis. Like systematic grid sampling, systematic random sampling can be used to characterize a waste pile, loose tank bottom solids, or impoundments, but not small containers or drums. Figure 4 illustrates a systematic random sampling approach.

2.11.5 Transect Sampling

Transect sampling involves establishing one or more transect lines across a surface. Collect samples at regular intervals along the transect lines at the surface and/or at one or more given depths. The length of the transect line and the number of samples to be collected determine the spacing between sampling points along the transect. Multiple transect lines may be parallel or non-parallel to one another. If the lines are parallel, the sampling objective is similar to systematic grid sampling. The primary benefit of transect sampling versus systematic grid sampling is the ease of establishing and relocating individual transect lines.

Transect sampling is applicable to waste piles or impoundments. Figure 5 illustrates a transect sampling approach.

Figure 4: Systematic Random Sampling

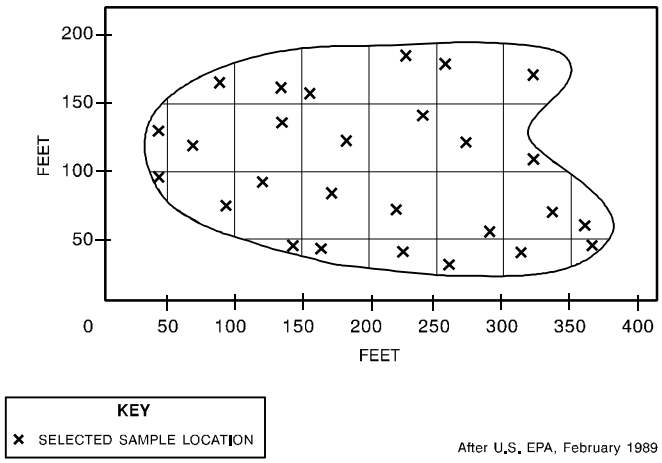


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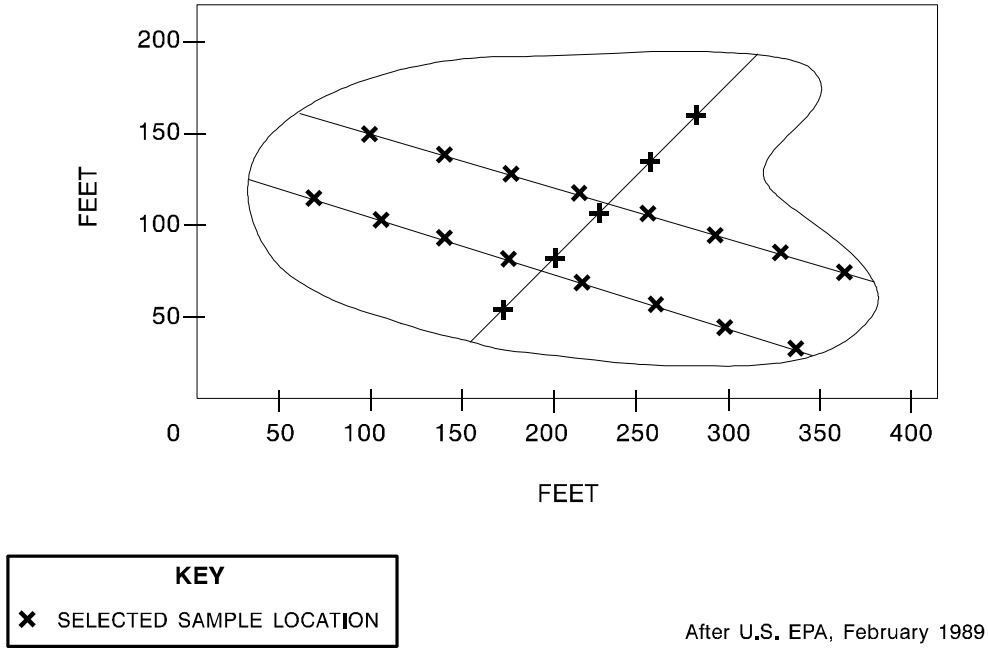
Figure 5: Transect Sampling



After U.S. EPA, February 1989

2.12 SAMPLING LOCATIONS AND NUMBER

The locations and number of samples to be collected must be carefully selected to obtain samples that are truly representative of the material being sampled, as well as of the general site area. The sampling objectives, waste type, container/source type, sampling approach, and other factors determine where and how many samples are collected. For example, a judgmental sampling approach can establish threat or identify the presence of wastes with a few carefully selected samples. A larger number of samples are needed to characterize wastes, and sampling locations should be selected using random, systematic grid, and systematic random sampling techniques. Field screening techniques are valuable for selecting

sampling locations. In situations where there is a very large waste area or numerous containers of potentially different wastes, field screening techniques may identify similar waste streams. These wastes can be segregated into general chemical classes (e.g., strong acids, halogenated solvents) and then samples can be collected for confirmation by laboratory analysis.

Sampling locations which pose a severe chemical or physical hazard to sampling teams (e.g., cylinders of hydrofluoric acid, hydrogen cyanide, or nerve agents) should be avoided or sampled remotely. Sampling cylinders requires specially trained and authorized personnel.

2.13 EXAMPLE SITE

2.13.1 Background

ABC Plating, a multi-purpose specialty plating facility in northern Pennsylvania operating from 1947 to 1982, stored and treated its plating wastes by placing them in a series of unlined and unpermitted impoundments. State RCRA personnel cited the owner/operator for the operation of an unpermitted treatment system and ordered the owner to submit a remediation plan for state approval. Before the state could follow up on the order, the impoundments were partially backfilled with the wastes in place. The facility was later destroyed by a fire of suspicious origin. The owner abandoned the facility and could not be located by enforcement authorities. The state contacted U.S. EPA for an assessment of the site for a possible federally funded response action.

U.S. EPA initiated a removal assessment with the following primary sampling objectives:

- To establish the identities and volumes of hazardous materials present on the site to determine the potential threat to the surrounding population and the environment.

- To develop site stabilization strategies.

After federal funds were obtained and the site was stabilized, EPA addressed two additional objectives:

- To identify treatment and disposal options for the wastes on site.

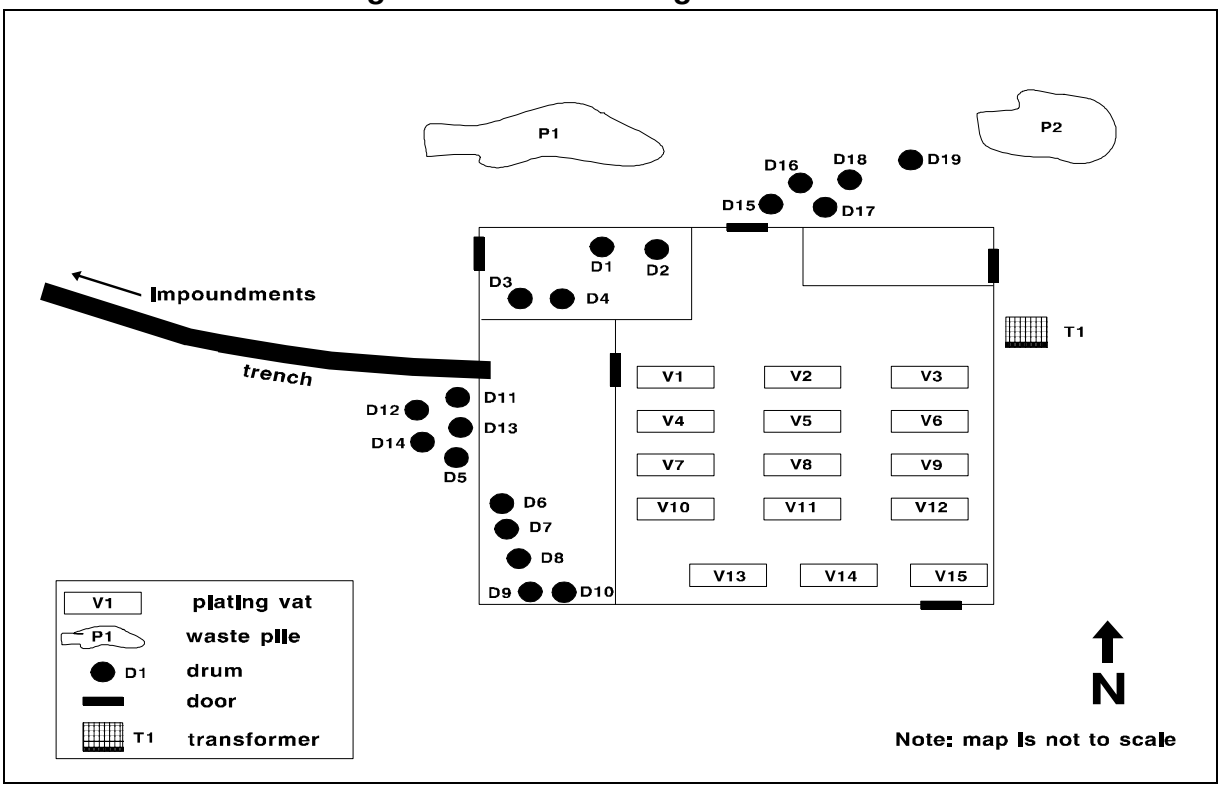
- To verify that established clean-up levels are met.

2.13.2 Site Entry

Within four hours of the initial request for assistance from the state, an EPA On-Scene Coordinator (OSC) and other response personnel mobilized to the site with equipment to perform multi-media sampling. The next day, the OSC met with the township manager, representatives from the county health department and the Pennsylvania Department of Environmental Resources (PA DER), and the township Fire Chief. The OSC reviewed PA DER enforcement reports and aerial photographs which indicated the presence and locations of chromium, copper, and zinc plating process areas. The OSC interviewed local residents and performed a walk-through, donning Level B personal protective equipment (PPE), to survey the general site conditions. A site sketch was generated (Figure 6), indicating the locations and container types of the wastes. A total of nineteen 30- and 55-gallon fiber and metal drums, fifteen 250- to 500- gallon plating vats, two 10- to 15- cubic yard waste piles, a feeder trench leading to two 80 feet x 20 feet x 7 feet partially filled impoundments, and a transformer were located and noted in the site sketch. Some rooms of the building could not be entered because of unsafe structural conditions caused by the fire.

The OSC and PA DER reviewed all available information to formulate a sampling plan for the drums, vats, impoundments, and waste piles. The entry team used a judgmental sampling approach during the initial assessment, first collecting samples from containerized wastes for screening and possible analysis (suspecting that the containerized concentrated material posed the greatest potential hazard).

Figure 6: ABC Plating Site Sketch



2.13.3 Site Inventory

During this phase of the response, a field entry team in Level B personal protective equipment (PPE) inventoried drums, plating vats, waste piles, impoundments, and a transformer found at the site.

Drums

The entry team numbered each drum and noted drum type, size, condition, and label information on a drum inspection log (Figure 7). The chemical properties of constituents listed on labelled drums were researched. Typical hazardous materials used at plating facilities were determined from the references available; these substances include strong acids and bases, heavy metal solutions and solids, and cyanide-bearing compounds.

Vats

The plating vats were inspected, numbered, and noted on the site sketch. An estimate of the volume was documented for each of the vats. All vats were covered with non-reactive polyethylene sheeting to prevent rain water from collecting in them and increasing the waste stream volume.

Waste Piles

The waste piles were inspected and noted on the site sketch. Transects were established along the longest horizontal axis of each pile. The transects were also noted on the site sketch. The samples will be collected and screening will be conducted along each transect.

Impoundments

The OSC determined that the contents of the impoundments posed a potential direct contact hazard to the surrounding population. In preparation for sampling, a transect was established from the entry point of the feeder trench across each impoundment. During site operation, wastes flowed from the feeder trench into the impoundments. Suspended solids were suspected to be present in a gradient decreasing with distance from the feeder trench.

Transformer

The OSC was concerned that the single transformer outside the plating building could contain PCB dielectric fluid. Inspection of the transformer determined that it was disconnected by first responders during the facility fire. The maximum transformer volume, the type of oil used, the date of manufacture, and the manufacturer's name were indicated on the metal plate on the side of the unit, and this information was noted. The unit was not leaking, so it was numbered and noted on the site sketch for future screening or sampling.

Information obtained from the site inventory and data review was used to create a site-specific conceptual model. Sources (e.g., vats, drums), pathways (e.g., vapors from the impoundments, soil under leaking drums), and potential receptors (e.g., local residents) were detailed to assist the selection of sampling approaches, objectives, and locations.

2.13.4 Selecting Analytical Parameters

Analytical parameters were selected based on research of plating chemistry and the initial site screening. Plating facilities generally use either an acid bath or basic cyanide bath to achieve the desired coating on their metal products. Based on the researched information and the measured pH of the liquid wastes on site, the following compounds were suspected to be present:

- Sodium and zinc cyanide salts and sodium hydroxide (highly basic, grey to green color) from zinc plating practices
- Chromic acid and sulfuric acid/sodium sulfate (acidic, yellow or dulled color) from chromium plating practices
- Copper sulfate and sulfuric acid (acidic, blue/green color) from copper plating practices.

During the assessment, liquid vat samples underwent field screening to assist in the selection of analytical parameters. Samples from all highly basic solutions were shipped to a laboratory for analysis of metals and cyanide. Acidic samples were sent for analysis of metals only. The composition of some of the drummed materials was initially unknown. In addition to the plating chemicals listed above, other possible drum contents included various cleaners, oils, fuels, and solvents. Many of the drums still had labels identifying their contents, and field screening was used to confirm content composition. Acids and bases were easily identified with pH paper, which was by far the most useful and inexpensive screening tool.

The waste piles were thought to include plating vat sludge waste. Samples collected from the piles were sent for laboratory metals and cyanide analyses.

Initial samples from impoundment liquids and solids (large-volume unsecured waste streams) were sent for full target analyte list (TAL), hexavalent chromium, pH, and total and amenable cyanide analyses. These analyses were conducted to fully characterize the liquid impoundment wastes for evaluation of the various on-site water treatment system needs. This information was later used to select optimum pH conditions and flocculent type for maximum settling efficiency. A local industrial wastewater treatment facility agreed to accept the liquid wastes if the heavy metal and cyanide levels were within their permit parameters. In addition to evaluating off-site treatment and disposal options, the impoundment bottom samples were characterized using target compound list (TCL), hexavalent chromium, total and amenable cyanide, pH, and total alkalinity analyses to allow evaluation of possible on-site stabilization, solidification and treatment techniques.

Figure 7: Example of a Drum Inspection Log

DRUM INSPECTION LOG

Site: _____
Location: _____

Drum Number: _____ Date: _____
Project Code Number: _____ Time: _____

Type of Contents: _____SOLID _____LIQUID _____SLUDGE _____LAB PACK

Color _____ PID _____
pH _____ CGI _____
FID _____

Amount of Contents: _____Full _____3/4 _____1/2 _____1/4 _____Less than 1"

Drum Size: _____55-gallon _____41-gallon _____30-gallon _____5-gallon

Drum Markings:
_____
_____
_____
_____

Hazard Class Label:
_____

Drum Type: ____17H ____17E ____37M ____Fiber ____Overpack ____Other

Drum Construction: ____Metal ____Poly ____Fiber ____Polylined ____Other

Drum Condition: ____Deteriorated ____Leaking ____Dented ____OK/DOT

Sample Method: _____Pipette _____Trowel _____Other

Sample Number_____ Custody Sheet Number_____

Comments:

LAYER DESCRIPTION

Observations by: _____

3.0 FIELD ANALYTICAL SCREENING AND SAMPLING EQUIPMENT

3.1 INTRODUCTION

Field analytical screening techniques and equipment may provide valuable information for developing sampling strategies. Field analytical screening can determine chemical classes of wastes and in some cases can identify particular substances of concern. Real-time or direct-reading capabilities narrow the possible groups or classes of substances which aids in selecting the appropriate laboratory analytical method. These screening techniques are useful and economical when gathering large amounts of site data. Some of the commonly used screening methods for waste analysis are presented in this chapter in the general order that they would initially be used at a waste site, although site-specific conditions may mandate a different sequence. This chapter focuses on site-screening methods, but the instruments described below have specific health and safety applications as well. Refer to the *Compendium of ERT Waste Sampling Procedures*, OSWER Directive 9360.4-07, for specific information about most of the following techniques or equipment. Refer to Standard Operating Safety Guides for each instrument, and the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH Pub. 85-115) for site entry information.

3.1.1 Combustible Gas Indicator

The combustible gas indicator (CGI) measures the concentration of a flammable vapor or gas in the air, registering the results as a percentage of the lower explosive limit (LEL) of the calibration gas. The CGI is often combined with an oxygen meter; some contemporary models also have built-in compound-specific detectors (e.g., hydrogen sulfide, sulfur dioxide, carbon monoxide, and hydrogen cyanide). CGIs are particularly useful for entry into unknown and/or confined space atmospheres.

There are several factors that must be considered when using a CGI for waste site work. The accuracy of the reading is temperature dependent; the CGI must be calibrated at ambient temperatures. The sensitivity of the CGI is also a function of the physical and chemical properties of the calibration gas versus those of the unknown atmosphere. Oxygen concentrations that are less than or greater than normal may cause erroneous readings. Leaded gasoline vapors, halogens, silicates, and sulfur compounds can decrease sensitivity. As a sample screening tool, the CGI is of limited value because it yields non-qualitative results for flammable vapors.

3.1.2 Radiation Screening Instruments

Screening for ionizing radiation is mandatory for all Superfund assessments, primarily for health and safety reasons. Since gamma rays and X-rays have high penetration capabilities even at extended distances, radiation screening instruments are generally used during the initial site entry. As containerized wastes are opened, alpha and beta radiation which was not detected during the initial walk-through screening may be encountered.

Most of the commonly used radiation screening instruments have gamma or beta/gamma detecting probes. Pure alpha detectors are not commonly used on site because the probes are too fragile and because pure alpha emitters are rare. However, an alpha/beta/gamma probe is suggested for screening wastes in lab packs, research facilities, laboratories, and on military installations where radioactive waste may be present (e.g., Department of Defense (DOD) and Department of Energy (DOE) installations).

3.1.3 Flame Ionization Detector

The flame ionization detector (FID) detects and measures the level of total organic compounds (including methane) in the ambient air or in a container headspace. The FID is used to evaluate existing conditions, identify potential sample locations and extent of contamination, and support health and safety decisions. The FID uses the principle of hydrogen flame ionization for detection and measurement. It is especially effective as an ethane/methane detector when used with an activated charcoal filter because most organic vapors are absorbed as the sample passes through the filter, leaving only ethane and methane to be measured.

The FID operates in one of two modes: the survey mode, or the gas chromatography (GC) mode. In the survey mode, the FID provides an approximate total concentration of all detectable organic vapors and gases measured relative to the calibration gas (usually methane). The GC mode identifies and measures specific components, some with detection limits as low as a few parts per million (ppm), using known standards run concurrently in the field. Since the GC mode requires standards to identify classes of compounds, before sampling it is necessary to have an idea of which compounds might be present on site. Advantages of the FID are that it is portable, relatively rugged, and provides real-time results.

The FID does not respond to inorganic substances. It has positive or negative response factors for each compound depending on the selected calibration gas standard. The FID does not recognize and may be damaged by acids; use pH paper to screen acids. Ambient air temperatures less than 40 degrees Fahrenheit will cause slower responses; relative humidity of greater than 95 percent can cause inaccurate and unstable responses. Low ambient oxygen levels can cause the flame to go out; use a CGI/oxygen meter in conjunction with an FID in confined space applications. Interpretation of readings (especially in the GC mode) requires training and experience with the instrument.

3.1.4 Photoionization Detector

Another portable air monitoring instrument frequently used for field screening is the photoionization detector (PID). Like the FID, the PID provides data for real-time total organic vapor measurements evaluating existing conditions, identifying potential sample locations and extent of contamination, and supporting health and safety decisions. The PID works on the principle of photoionization. Unlike the FID, the PID can be used to detect gross organic, and some inorganic vapors depending on the substance's ionization potential (IP) and the selected probe energy. It is portable and relatively easy to operate and maintain in the field.

The PID detects total concentrations and is not generally used to quantify specific substances. PIDs cannot detect methane; however, methane is an ultraviolet (UV) light absorber, and false negative instrument readings may register in methane-rich environments. The PID cannot detect substances with IPs greater than that of the UV light source. Readings can be affected by high wind speeds, humidity, condensation, dust, power lines, and portable radios. Dust particles and water droplets (humidity) in the sample may collect on the light source and absorb or deflect UV energy, causing erratic responses in PIDs not equipped with dust and moisture filters.

3.1.5 Colorimetric Tubes

Colorimetric indicator tubes (e.g., Dräger, Sensidyne, MSA) provide real-time results in environments where a specific gas or vapor is suspected to be present. In waste sampling, they are useful for situations such as screening drums, where drum labels provide limited information on the contents of only some of the drums.

Colorimetric tubes consist of a glass tube filled with silica gel or a similar material impregnated with an indicator reagent which changes color in the presence of specific contaminants. The tube is attached to an intrinsically safe piston-syringe or bellows-type pump which slowly pulls a measured volume of air through the tube. The contaminant then reacts with the indicator chemical within the tube producing a color change proportional to the concentration of the chemical.

Although the indicator tubes are usually chemical or class specific, interferences can occur. Common interferences are noted in the directions for the specific tube. The tubes have a limited shelf life, and cannot be reused. Results can be misinterpreted due to cross-sensitivity, and there exists a potential for error in reading the end point of color change. Errors result if the limit of the tube has been exceeded (in very concentrated environments). High humidity may reduce tube sensitivity.

3.1.6 Hazard Categorization

Hazard categorization (haz-catting) is performed as an initial screen for hazardous substances to provide identification of the classes/types of substances present in individual waste streams. Haz-catting tests for general chemical characteristics or the presence of specific ions to determine chemical class; it is not compound-specific. The information from haz-catting is useful for determining compatibility of unknown wastes.

Various indicators and wet chemistry tests characterize the wastes according to their chemical/physical properties (e.g., solubility, combustibility), and indicate the presence of sulfides, oxidizers, and cyanide. The haz-catting procedure requires numerous chemical reagents and interpretation of results. Common haz-cat tests include the *char* test for differentiating organic from inorganic substances; *chlorine hot wire* test to detect chlorine in organic solvents; *combustibility* test; *cyanide* test for cyanide salts; *flame* test for identifying cations and some anions; *iodine* crystal test for solvent classification; *oxidizer* test; *sulfide* test; *water solubility* test; and *pH* test.

3.1.7 Immunoassay Tests

Immunoassay tests can be used on site to screen for certain organic compounds such as pentachlorophenol (PCP), PCBs, and pesticides. Immunoassay tests are used for locating and mapping the extent of contamination, and for screening samples in the field prior to laboratory analysis.

Immunoassay tests utilize semi-quantitative, colorimetric methods. Some of the commonly used tests utilize tubes coated with a chemical that specifically binds to the contaminant. These types of tests utilize highly selective antibodies and sensitive enzyme reactions to yield qualitative, semi-quantitative, and quantitative results for a specific compound or for a closely related series of compounds (e.g., PCP, PCBs, and 2,4,D-pesticides). Antibodies can be either coated on the test tube, or attached to microparticulates or reaction well/ plates, depending on the brand. Other types of immunoassay tests utilize enzyme-linked, immunosorbent assays (ELISAs) and magnetic particles to bind to the contaminants.

The concentration range of a sample is determined by comparing the color change of the sample with that of duplicate standards of known concentrations. The color intensity in each tube decreases as the contaminant concentration increases. Photometers are available to "read" and digitally display, print, and store the color difference between the prepared sample and the standards. Since the results are compared to standards, the accuracy achievable is a contaminant range (e.g., greater than 100 ppm but less than 1,000 ppm). Laboratory confirmation is required when using these tests in the semi-quantitative and qualitative modes. Performance evaluation spikes determine the efficiency of the test. Some training is needed to effectively run and interpret immunoassay tests.

3.1.8 X-Ray Fluorescence

Field analytical screening using X-ray fluorescence (XRF) is a cost-effective and time-saving method to detect and classify lead and other heavy metals in wastes. XRF screening provides immediate semi-quantitative results. The principle behind XRF is the detection and measurement of the X-rays released from an atom when it is ionized. The measure of energy released identifies the atom present.

Results of XRF analysis help determine the presence of metals and are often used to assess the extent of soil contamination at a site. For waste sampling, the XRF can be used for screening waste piles and for assessing metals in certain liquids such as paint. XRF use requires a trained operator and may require numerous site-specific calibration samples.

3.1.9 Gas Chromatograph

Although many FIDs are equipped with a GC mode, an independent, portable GC can also be used on site to provide a chromatographic profile of the occurrence and intensity of unknown volatile organic compounds (VOCs). The GC is useful as a screening tool to determine "hot spots," potential interferences, and semi-quantitation of VOCs and semi-volatile organic compounds (semi-VOCs).

Compounds with high response factors, such as benzene and toluene, produce large response peaks at low concentrations, and can mask the presence of compounds with lower response factors. However, recent improvements in GCs, such as pre-concentrator devices for lower concentrations, pre-column detection with back-flush capability for rapid analytical time, and the multi-detector (PID, FID, and electron capture detector (ECD)), all enable better detection of compounds. The GC is highly temperature-sensitive. It requires set-up time, many standards, and operation by trained personnel.

3.2 SAMPLING EQUIPMENT

Representative waste sampling requires an understanding of the capabilities of the sampling equipment, since the use of inappropriate equipment may result in biased samples. Select appropriate sampling equipment based on the sample type and matrix, physical location of the sample point, and other site-specific conditions. Consideration must be given to the compatibility of the waste with the design and composition of the sampling device. Follow SOPs for the proper use and decontamination of sampling equipment. This section provides descriptions of drum opening and sampling equipment descriptions, and other information to assist in selecting appropriate equipment. Refer to the *Compendium of ERT Waste Sampling Procedures*, OSWER Directive 9360.4-07, for expanded guidelines on the use of the equipment discussed below.

3.2.1 Drum Openers

Closed drums need to be opened for sampling. Tools suitable for opening drums include: universal bung wrench, drum deheader, backhoe spike, hydraulic drum opener, and pneumatic bung remover. Each of these devices has specific applications based on the drum type, composition, condition, location, and suspected contents.

Follow ERT SOP #2009 (Drum Sampling) in the *Compendium of ERT Waste Sampling Procedures*, OSWER Directive 9360.4-07, for guidelines on opening drums and the operating instructions for the particular equipment used. Always use non-sparking instruments to open drums and comply with proper health and safety protocols. Note that the use of a non-sparking tool does not completely eliminate the possibility of a spark being produced. Drums should be grounded to decrease the chance of static charges and sparks. Stage drums by suspected compatibility type prior to opening and sampling to decrease the risk of chemical reaction between incompatible substances.

3.2.2 Liquid Samplers

The following samplers are useful for collecting waste liquids from various sources: composite liquid waste sampler (COLIWASA), glass thief, bailer, and bacon bomb. Each has specific applications for use depending on the type and nature of the waste and the type of source.

COLIWASA

The COLIWASA is a tool typically used for sampling stratified liquids in drums and other similar containers. It is a transparent or opaque glass, PVC, or Teflon tube approximately 60 inches in length and 1 inch in diameter. A neoprene stopper at the bottom of the tube can be opened and closed via a rod that passes through the length of the sampler.

The COLIWASA is difficult to decontaminate in the field but is versatile and simple to operate. Because of the relatively high cost of the COLIWASA, COLIWASA-type glass thieves have been developed which utilize neoprene or ground glass stopper mechanisms. Before conducting multiphased sampling, make sure that the physical and chemical properties of the container's contents and phases are understood.

Glass Thief

Another commonly used drum sampling device, the glass thief, is a hollow glass tube 40 to 48 inches in length and commonly 10 mm to 19 mm in diameter. The larger diameter tubes are used to collect more viscous materials. The glass thief is simple to operate, versatile, and disposable, eliminating the need for decontamination.

Conduct the sampling carefully in order to avoid sample spillage. Low viscosity liquids, thin-layered phases, and partially filled containers may be difficult to sample with a hollow glass thief. In those cases, use the COLIWASA-type glass thief, whose stopper mechanism prevents the sample from leaking out of the thief as it is removed from the container.

Bailer

A bailer is used to sample waste liquids in vessels (wells, tanks, or deep containers) where the liquid surface is far below the sampling entry access (i.e., too far for a glass thief or COLIWASA). The bailer consists of a hollow tube (constructed of relatively inert materials such as stainless steel, glass, or Teflon) with a bottom ball-check valve, usually suspended from a wire or rope for sampling. Bailers are good for

sampling VOCs because of the relatively low surface-to-volume ratio which reduces off-gassing.

Most bailers cannot obtain discrete depth or phased samples, so their use is primarily limited to homogeneous liquids or shallow (length of bailer) sampling. As with any sampling device, the construction material should not interfere with the wastes or the desired analytical parameters.

Bacon Bomb

The bacon bomb sampler is used to collect waste liquid samples from various levels within storage tanks or surface impoundments. Storage tank and impoundment wastes are often stratified, and the bacon bomb is useful when a discrete sample is needed from any level in the tank or impoundment. The bacon bomb consists of a cylindrical body with an internal tapered plunger for sampling. A separate line attached to the top of the plunger opens and closes the bottom valve at the desired depth or stratum. A removable top cover attaches the sample line and has a locking mechanism to keep the plunger closed after sampling. The bacon bomb is usually constructed of chrome-plated brass and bronze or stainless steel. A rubber O-ring acts as the plunger sealing surface.

Transfer of the sample to sample containers is sometimes difficult and tends to aerate the sample, resulting in loss of volatile constituents. The bacon bomb sampler can be more difficult to decontaminate than a bailer.

3.2.3 Sludge Samplers

The following devices are useful for sampling waste sludges: Ponar/Ekman dredge, sludge judge, and PACS grab sampler.

Ponar/Ekman Dredge

Ponar/Ekman dredges are clamshell-shaped scoops that are used to extract waste sludge samples from the bottom of impoundments, lakes, or other standing water bodies. The Ponar dredge's jaws are latched open and the unit is slowly lowered to the bottom of the area being sampled. When tension is eased on the lowering cable, the latch releases, and the lifting action of the cable on the lever system closes the dredge around a sample of sludge. The Ekman dredge operates similarly but it closes by using a messenger or depressing a button on the upper end of the handle.

The substrate depth to which both dredges can sample usually does not exceed 4 to 6 inches, and they are not capable of collecting an undisturbed sample. As a result, material in the top inch of sludge cannot be separated from material at lower depths. The sampling action of the dredges causes agitation currents which may temporarily re-suspend some settled solids, especially the fine fraction.

Dredges are normally used from a boat or dock. Because the dredges are heavy, a boom is frequently used to ease the raising and lowering of them. Dredges are not usually effective in sampling hard or stony bottom material. Bottom vegetation will also limit dredge effectiveness.

Sludge Judge

The sludge judge is a long narrow tube with a check valve on the bottom, used primarily to obtain cores of waste sludge, or waste liquids mixed with sludge, from drums, tanks, or similar sources. Sludge judges are useful for determining the physical state of a tank's contents or its volume of settled sludge. The sludge judge is constructed of PVC which can limit its use because of potential interference with the contaminants of concern. The device is difficult to decontaminate and not recommended for use with very thick sludges.

PACS Grab Sampler

The PACS grab sampler is used to collect sludge samples at discrete depths from surface impoundments such as ponds and lagoons and also from certain types of containers. The PACS grab sampler consists of a 1000-ml wide-necked bottle with a control valve which screws on to the end of a 2-meter long handle. Large openings in the bottle facilitate sample collection. The control valve is operated from the top of the handle once the sampler is at the desired depth. Depth of sampling is limited by the length of the pole handle. The device is not useful in very viscous sludges, and it can be difficult to decontaminate.

3.2.4 Solids Samplers

The following devices are used to collect samples from waste piles and other sources of solid waste: scoop/trowel, bucket auger, sampling trier, waste pile sampler, cork screw auger, and split-barrel sampler.

Scoop/Trowel

Scoops or trowels are useful for collecting solid or sludge samples from waste piles. Collection is usually limited to near-surface and depends on the length of the scoop or trowel. These instruments are available in a variety of materials, including stainless steel and plastic. Stainless steel scoops and trowels are appropriate for VOC sample collection but require decontamination between sampling stations. Plastic scoops and trowels are suitable for metal analyses and are disposable, which eliminates the need to decontaminate between sampling stations. Do not use trowels with painted or chromium-plated surfaces, because the paint or plating can chip off into the sample.

Bucket Auger

Bucket augers are typically composed of stainless steel and are used to collect solid or sludge samples from waste piles or surface impoundments. The auger is effective for subsurface sampling, but tends to destroy horizons during sampling, making VOC collection difficult. The bucket auger is therefore not recommended for VOC collection; use a split-barrel sampler instead. Bucket augers can be used for sludge sampling in a surface impoundment, depending on accessibility.

Bucket augers provide uniform sampling diameter and good depth control, and are easy to decontaminate. Their effectiveness is reduced in rocky or hard solids, heavy clays, or very sandy solids.

Sampling Trier

A sampling trier is used to collect powdered or granular materials from bags, fiber or metal drums, sacks, or similar containers. A typical sampling trier is a long tube with a slot which extends almost its entire length. The tip and edges of the tube slot are sharpened so that when rotated after insertion into the material, the trier cuts out a sample core. Sampling triers range from 24 to 40 inches in length and from 1/2 to 1 inch in diameter, and are usually made of stainless steel (or a similar composition) with wooden handles. Triers are relatively easy to use and to decontaminate.

Waste Pile Sampler

The waste pile sampler is essentially a large sampling trier used for sampling large waste piles (with cross-sectional diameters greater than 1 meter). It can also be used for sampling granular or powdered wastes, and material in large bins or barges.

The waste pile sampler is commercially available, but one can be easily and inexpensively fabricated from sheet metal or plastic pipe. The sampler does not collect representative samples when the diameters of the solid particles are greater than one-half the diameter of the tube.

Cork Screw Auger

The cork screw auger is a hand-driven sampler used to sample bulk solid wastes such as waste piles. The auger tip resembles a large drill bit ranging from 3/4 to 1-1/2 inches in diameter. The auger is used for sampling at depth by adding rod extensions. It is effective in soft to hard materials, although saturated waste may be difficult to sample. Decontamination of the auger is relatively easy. The cork screw auger disturbs the waste profile and thus has limited utility for VOC sampling.

Split-Barrel Sampler

The split-barrel sampler (also called a split-spoon sampler) is used to collect waste samples from the bottom of boreholes. The split-barrel sampler consists of a hollow tube with a circular chisel or cutting shoe threaded onto one end and a driving head or collet threaded onto the other end. The sample tube is split lengthwise into two halves to facilitate sample removal and decontamination. A drilling rig is required to use the split-barrel sampler. The sampler is attached to the end of the drilling rod and is driven into the bottom of the borehole with a specially designed, 140-lb. drive hammer. The split-barrel sampler can be used to determine the relative density of the material that is being cored or drilled by counting the number of drive hammer blows it takes to drive the barrel 18 inches below the bottom of the borehole.

The split-barrel sampler is useful for collecting relatively undisturbed waste samples from great depths. Because split-barrel samplers do not disturb the sample, they are suitable for sampling VOCs. They can be used to sample deep into large waste piles, subsurface wastes, or dry lagoon beds, but they are not effective in rocky or very consolidated materials.

3.3 EXAMPLE SITE

After conducting proper site entry procedures (health and safety monitoring), the OSC utilized field screening techniques to the greatest extent possible. This allowed for the rapid collection of information to support the decision-making process and to limit the need for laboratory analysis. All waste streams were screened (as discussed below) to determine which laboratory analyses would be necessary, and to provide a logical basis for selecting a limited number of analytical parameters. All waste streams were also screened for radiation; none was detected.

3.3.1 Drum Screening and Sampling Equipment

Each of the closed drums appeared to be in relatively good condition, showing no signs of internal pressure or other instability, and were opened using a spark-proof bung wrench. Five drums were already open to the elements. After each drum was opened, samples were collected for screening using a glass thief. All drums were screened using haz-catting procedures. All haz-catting information was recorded in the field on a Hazard Categorization Data Sheet (illustrated in Figure 8). The first haz-catting procedure conducted was for pH. Four drums were found to contain strong acids; five drums contained strong bases. Various colorimetric tubes were used in an attempt to identify specific acids; however, all the tubes exhibited positive reactions due to interferences from the presence of similar strong acids. Since cyanide-bearing solutions are typically basic, all basic solutions were screened for the presence of cyanide to prevent the potential generation of hydrogen cyanide gas (HCN) during handling. As a result of screening, three drums containing basic solutions were tentatively determined to contain cyanide. Additional haz-cat screening (PID, FID, solubility, chlorine, and peroxide) was conducted for the ten drums exhibiting relatively neutral pH. From this additional screening, three drums of oil, one drum of halogenated solvents, and one drum of kerosene were tentatively identified. Two drums were suspected to contain rainwater. The screening results were inconclusive for three drums.

The drums containing strong acids and bases were, by definition, RCRA hazardous characteristic wastes. Because of the risks associated with strong acids and bases, there was no need for further data analysis to establish imminent threat. The entry team separated incompatible materials to reduce the risk of a chemical reaction/release.

3.3.2 Plating Vat Screening and Sampling Equipment

Some plating vats were already open; others had large, easy-to-open lids similar to that of a trash dumpster. The vat liquids and bottom solids were screened separately in the same manner as the drums, using a COLIWASA-style glass thief to collect the samples and haz-catting to identify the wastes. The samplers were long enough to reach the bottom of the vats, providing a sample of the entire vertical column of liquid. A hollow glass thief was then used to collect a single grab sample from the bottom solids in each vat.

The vat contents were tentatively identified as strong acids, strong bases, and cyanide bases. Haz-catting results were inconclusive for four vats. No volatile organic compounds were detected using PID and FID instruments.

3.3.3 Waste Pile Screening and Sampling Equipment

The piles contained blue and green solids that were assumed to be bottom solids cleaned from the plating vats. Screening samples from the waste piles were collected using a corkscrew auger and stainless steel trowels (because of the hardened texture of the piles). Waste pile samples were haz-catted in the same manner the samples from drums and vats. However, since haz-cat tests are better suited to liquid matrix waste streams, the two waste piles were difficult to classify into general hazard categories.

Screening results indicated that the wastes were not water reactive, flammable, combustible, or chlorine-bearing; organic compounds were not detected. Results of the cyanide test were positive. Sample

color and other visual signs of contamination were documented as the screening samples were collected.

3.3.4 Impoundment Screening and Sampling Equipment

Screening samples were collected from both surface impoundments. Waste liquids were sampled using a bacon bomb sampler, and waste bottom sludges were sampled using a Ponar dredge. Waste liquid samples were taken from the center of each impoundment at depths of 0 to 2 feet, and 2 feet to bottom. Five waste sludge samples were collected from the bottom of each impoundment at 20 foot intervals along a transect established across each impoundment. A small rowboat with stabilizing lines was moved along the transects to collect screening samples.

Impoundment liquids were screened by haz-catting. The results indicated that impoundment liquids contained water and were slightly acidic, possibly cyanide-bearing, non-flammable, and non-chlorinated. The PID and FID did not detect any organic vapors, suggesting a non-organic wastewater classification. A chemical test kit was used to identify low levels of specific metals in the impoundment liquids. Screening of the bottom sludge had similar results, except for a higher metals content and the positive presence of cyanide.

3.3.5 Transformer Screening and Sampling Equipment

The transformer top was removed using a standard socket wrench. A transformer fluid screening sample was collected using a makeshift sampling device consisting of a clean, 4-oz sampling jar on a string. The transformer was screened for PCBs using a PCB screening kit. A grab sample was collected and the test was performed on site following the directions provided with the kit. The potential interferences listed in the directions were determined not to apply to this sampling event. The test indicated that the transformer contained less than the 50 ppm total PCBs action level (based on a colorimetric interpretation). The sample fluid was placed back into the transformer and the vessel was resealed.

Figure 8: Example of a Hazard Categorization Data Sheet

HAZARD CHARACTERIZATION DATA Page ___ of ___

Site: _____ Date: _____

Sampler(s): _____ Sample ID Number: _____

Phase: All Top Bottom N/A Sample Collected?: Yes No

HAZARD CHARACTERIZATION RESULTS

Soluble: Yes (dissolves/emulsifies in water) Heavier (than water) Lighter (than water)

pH: _____ (if using instrument, round to nearest whole number)

Flammable: Yes No

Chlorine: Yes No

Oxidizer: Yes No

Cyanide: Yes No

Sulfide: Yes No

Other Test A: _____

Other Test B: _____

Action Taken: Overpacked Staged (location _____) Bulked Other _____

Sort Class: _____ (optional--specify 2 character alphanumeric designator to assign user sort class)

SAMPLE DESCRIPTION

Color(s): Colorless White Yellow Blue Red Green Purple Brown Black Other _____

Clarity: Clear Cloudy Turbid (suspended solids) Opaque N/A (if solid)

Viscosity: Water Light Oil Heavy Oil Sludge N/A (if solid)

Impurities: _____

Comments:

_____

_____

_____

Observations by: _____

4.0 FIELD SAMPLE COLLECTION AND PREPARATION

4.1 INTRODUCTION

During a response action, proper field sample collection and preparation is as important as proper sampling equipment selection. Sample collection refers to the physical removal of a portion of waste material from its source for the purpose of either screening or laboratory analysis. Field sample preparation refers to all aspects of sample handling from collection to the time the sample is received by the laboratory. This chapter provides information on sample collection and preparation for various waste types and sources.

4.2 SAMPLE VOLUME

The volume of a sample should be sufficient to perform all required laboratory analyses with an additional amount remaining for analysis of QA/QC samples (including replicate analyses). However, because waste samples are generally of high concentration, sample volumes should be kept to a minimum (to minimize disposal costs). The EPA method description and the laboratory receiving the sample should be consulted for specific volume requirements for each parameter.

Make an initial estimate of the volume or area of waste represented by each sample. When obtaining representative samples from waste which appears to be relatively homogeneous, note the total waste volume in cubic yards or gallons.

4.3 SOURCE SAMPLING

The following sections provide general information on sampling several types of waste sources, including drums, bulk storage tanks, lab packs, surface impoundments, waste piles, surfaces, and debris. For specific sampling information on these waste types, refer to the *Compendium of ERT Waste Sampling Procedures*, OSWER Directive 9360.4-07.

4.3.1 Drum Sampling

Each drum can have different contents and concentrations, so each must be considered a unique waste source. A site-wide representative sampling approach is not appropriate. Screening techniques should be used on the contents of each drum to determine compatibility. This haz-cat information can help determine whether bulking of wastes is technically and economically feasible.

Drums may be sampled in place or staged in rows prior to sampling, depending on their condition and accessibility. If drums are stacked, a forklift or grapple may be needed to move them for sampling. (If drums cannot be safely moved, sample only accessible drums.) When moving drums, document on a site sketch their original locations. Number all drums and record their label information on a drum log sheet (see Chapter 2, Figure 6). Research all label information to determine health and safety precautions, including use of appropriate PPE. It does not necessarily follow that the labels affixed to the drums represent their actual contents. (Drums are often reused without regard to proper rinsing and relabelling procedures.) Further categorization is necessary to determine or confirm drum contents accurately. Be particularly cautious with drums that have crystalline deposits or a precipitate around the bung or lid. Some chemicals form a potentially shock-sensitive, explosive, or reactive phase as they degrade or react over time (e.g., picric acid forms shock-sensitive crystals). Do not move drums in this condition!

Bulging or misshapened drums and those with unknown contents should be opened remotely. Rough handling can trigger reactions which may cause them to rupture. Open unknown or unstable drums remotely. If drums contain a combination of solid, liquid, or sludge wastes, separate sampling of each phase may be necessary using chemically compatible sampling equipment (e.g., COLIWASA or glass thief). Where wastes are stratified, sample the top stratum first to avoid mixing strata. Since each drum may contain a different type of waste, it is usually not

possible to make composites from separate drums until the contents have been screened. As with most containers, drums should be sampled through upper bungs or openings whenever possible. Document contents, physical characteristics (e.g., color, viscosity) and field screening readings (e.g., FID, PID, CGI).

Refer to Section 2.11.1 for a discussion of judgmental sampling as it applies to drum sampling.

4.3.2 Bulk Storage Tank and Transformer Sampling

Bulk storage tank sampling involves many of the procedures and precautions noted for drum sampling. Number and document each tank, noting National Fire Protection Association (NFPA) 704 markings, if present. Document available information on vessel construction, tank location (e.g., in a tank farm), and the presence of any secondary containment. Estimate maximum tank volume using mathematical volume equations ($V=Br^2h$) or tank charts. Measure the content volume using exterior level indicators, if present.

Perform sampling through top hatches whenever possible; avoid using bottom valves because a spill is possible if the valve does not reseal. When there is more than one phase, identify the distinct phases and associated volumes. The objective is to identify volume in gallons (liquids) or cubic yards (solids) to determine the total waste volume that each sample represents. Sample each phase separately, including tank bottom sludges (use a bacon bomb sampler, PACS grab sampler, or a sludge judge). Obtain a sample from each compartment in multicompart-ment tanks.

When sampling specialized tanks or transformers, it may be necessary to use a manlift to gain access. Be certain that transformers are "off-line" and de-energized. Exercise spill control measures and ensure secondary containment is in place around a transformer before opening it. Access a transformer through the top and collect a stratified sample.

4.3.3 Lab Pack Sampling

Initial inspection of lab packs may uncover packing slips listing contents and associated volumes. The packing slips may be affixed to the outside of the drum or under the drum lid. If the labels on individual containers are legible, inventory the containers and repackage them in inert cushioning and absorbent materials in accordance with 49 CFR 100-199. If the label is illegible or missing, the lab pack should be treated as an unknown. Unknowns are generally not manually opened because of the potential health and safety risks (exposure and reactivity). A safer approach is to use remote opening or crushing techniques and collecting the crushed containers and their contents in an absorptive medium, which is then sampled using a representative composite sampling method.

4.3.4 Surface Impoundment Sampling

When sampling a surface impoundment, consider its characteristics, which include size, depth, flow, liquid viscosity, bottom composition and whether a liner is present. The bottom sludges and liquid phases may be homogeneous or stratified.

Surface impoundments are often stratified by depth; each phase should be sampled separately. Transect sampling at various depths (including bottom sludge sampling) is generally recommended. Horizontal concentration gradients in the bottom sludges may be present from the point where liquids enter the impoundment. Vertical gradients may also be present in bottom sludges. The logistics and health and safety concerns of sampling large impoundments usually dictate the use of manlifts, boats, and safety lines. If a liner is present, take care to maintain its integrity.

4.3.5 Waste Pile Sampling

Waste pile sample collection techniques will depend upon the sampling objective. If the objective is to determine threat, grab sampling from the surface using a waste pile sampler or a scoop/trowel might be sufficient. If the objective is to obtain an average concentration value for the entire pile for treatment/disposal estimates, then the sampling should include grab samples or composite aliquots collected from the interior (using a waste pile sampler or an auger) and the surface of the pile. Composite aliquots collected at a given depth from several sides and the top of the pile can be used to obtain an estimate of the average pile concentration. The number of aliquots collected will depend on many site-specific factors,

including the size, composition, and accessibility of the waste pile, as well as on budget considerations.

The surface of a pile continually weathers chemically and physically. Depending on the size of the pile, it may be divided into sections for compositing at various depths. This will define an average concentration for each section of the pile. For large piles (e.g., large impoundment dredge or slag piles), a three-foot depth is generally adequate to reach the more representative materials. Extensive sampling of a pile for both chemical and physical characteristics is conducted during the evaluation of treatment and disposal options. If the pile has been stabilized (e.g., cover, liner), do not collect samples that might breach the integrity of the pile containment.

4.3.6 Surface Sampling

Special situations may present the need to sample surfaces such as floors, walls, or equipment. When sampling surfaces for contamination, choose sampling points based on site history, manufacturing processes, personnel practices, obvious contamination, and available surface area. Where possible, collect comparable media background samples from surfaces unlikely to have been contaminated. This is especially important when sampling for naturally occurring substances such as metals.

Surface sampling includes wipe, chip, and dust sampling. Analytical results for dust sampling are reported in weight/weight; wipe sampling results are reported in weight per unit area. Note that there are very few action levels or health standards reported in weight of contaminant per unit area to assist a Site Manager in decision-making.

The methods of sampling described below are appropriate for surfaces contaminated with non-volatile species of analytes (e.g., PCBs, PCDD, PCDF, metals, pesticides, cyanide). Detection limits are analyte-specific. Determine sample size based upon the detection limit desired, amount of sample requested by the analytical laboratory, and sampling locations and configuration.

Wipe Sampling

Wipe sampling is a method for collecting non-volatile species of analytes from relatively smooth, non-porous surfaces. It is appropriate for sampling walls, floors, ventilation ducts and fans, empty transformers, process equipment, and vehicles. Wipe sampling can be used to confirm cleanup after steam cleaning or decontamination of smooth building walls.

To collect a wipe sample, use a piece of sterile medical gauze soaked in pesticide grade solvent (e.g., hexane, water, methanol, nitric acid). The type of solvent used depends on the target analytes. When requested in advance, analytical laboratories will often prepare the gauze and sample jars. Use caution and maintain proper safety protocols when handling hexane and other solvents.

Several wipe sampling techniques were developed for use in OSHA enforcement and industrial hygiene decision-making to evaluate potential sources of ingestion and direct contact exposures. Most of these techniques recommend a uniform wipe area of at least 100 cm^2, but larger areas may need to be wiped to collect enough sample for the analytical method detection limit. Disposable cardboard templates (or glass or stainless steel templates which can be decontaminated) are recommended to ensure a uniform surface area. Very few approved standards or action levels are available to compare with the wipe sampling results (this supports qualitative rather than quantitative conclusions). Wipe sampling is typically used to determine if decontamination has been effective or to select the type of disposal facility (e.g. hazardous vs. non-hazardous). A blank consisting of a solvent-soaked pad is required for each batch of samples.

Sampling locations are typically judgmental selections. They are chosen because they are areas of highest suspected contamination (for disposal decisions), or areas of suspected direct contact (for exposure and hygiene evaluations).

Chip Sampling

Chip sampling is a method for collecting non-volatile species of analytes from porous surfaces such as cement, brick, or wood. Sample points include floors near process areas, storage tanks, and loading dock areas. Chip sampling is usually performed with a hammer and chisel or with an electric hammer. It is important to ensure that the chipping device does not bias the integrity of the sample. Stainless steel tools allow for easy decontamination and preparation for reuse.

To collect the sample, chip the desired sampling area to a suitable depth (e.g., 1/8 inch). Gather the chips and place them in a sample container using forceps, a small scoop, or a dust pan. Make advance arrangements with the analytical laboratory prior to sampling to determine acceptable preparation and analysis procedures. The laboratory may require special grinding or extraction procedures.

Chip sampling is most often used to determine the necessity or effectiveness of decontamination, or the necessity for demolishing and disposing of a wall or building. As with wipe sampling, existing action levels may not be available for each application. Make appropriate decisions based on precedents and Regional guidelines.

Dust Sampling

Dust sampling is a method for collecting metal and semi-volatile contaminants in residue or dust found on porous or non-porous surfaces. Dust sampling techniques are used where a solvent cannot be used or where too much residue exists for a wipe sample to be easily collected. Dust sampling is used in industry to assess potential exposure of airborne contaminants to workers. For example, dust sampling would be effective in a bagging, processing, or grinding area where powdery contaminants and dust may have accumulated.

To collect a dust sample, select and sweep an appropriate area using a dedicated brush and dust pan. Transfer the sample to a sample container. Dust sampling can also be conducted using a cellulose fiber filter attached to a high-volume pump. Dust/residue is vacuumed onto the filter.

Dust sampling results are reported in mg/kg (weight/weight). The size of the area to be swept is dependent on the sample volume needed for the desired analysis and detection level. Dust sampling is often used to assess potential respiratory, direct contact, and ingestion hazards to workers and the public. It may also be used to determine the need and method for building decontamination.

4.3.7 Debris Sampling

The purpose of sampling waste debris is to select a disposal option. Since debris often consists of irregular pieces of material, it is a difficult matrix to analyze in the laboratory. Provide the laboratory with instructions to guide it in preparing a representative subaliquot of debris samples for analysis.

Currently there are no standardized methods that reliably conserve VOCs during the grinding of large objects, nor are there good methods for extracting non-polar organic contaminants from plastic matrices without dissolving the plastic.

Use a judgmental sampling approach to sample debris, selecting sampling locations by matrix and physical properties. Use a chip sampling technique for porous materials and wipe sampling for non-porous materials. It is difficult to collect a representative sample of debris because of its heterogeneous composition. Compositing large objects will not result in meaningful data, and obtaining a sample of different components of debris is not always practical. Only if feasible, separate debris into components (e.g., metal, plastic, wood) and collect a representative surface sample of each.

4.3.8 Compressed Liquid/Gas Cylinders

Although dealing with compressed liquid/gas cylinders is outside the scope of this document, they are often found at waste sites. Compressed liquids and gases are stored in a variety of low- and high-pressure vessels or cylinders. Though the liquids or gases in the cylinders are rarely considered to be waste, the original cylinder may have been weakened by exposure to heat, pressure, or outside contamination. Cylinders represent a chemical, explosion/fire, and projectile hazard. Compressed liquids and gases, especially those in cylinders, should be sampled only by specialists.

4.4 SAMPLE PREPARATION

Sample preparation depends on the sampling objectives and analyses to be performed. Proper sample preparation and handling maintain sample integrity. Improper handling can render samples unsuitable for analysis. For example, homogenizing and compositing samples result in a loss of volatile constituents and are thus inappropriate when volatile contaminants are of concern. Sample preparation for waste may include, but is not limited to:

- Removing extraneous material
- Homogenizing
- Splitting
- Final preparation

Another field preparation technique is compositing of samples, which requires that each discrete aliquot be equal, and that the aliquots be thoroughly homogenized. Compositing waste samples is discussed in detail in Section 2.3.2.

4.4.1 Removing Extraneous Material

During sample collection, identify and discard materials from the sample which are not relevant or vital for characterizing the site, since their presence may introduce an error into the sampling or analytical procedures. Examples of extraneous material include pieces of glass, twigs, or leaves. However, not all external materials are extraneous. For example, when sampling at a junkyard, lead-contaminated battery casing pieces should not be removed from a sample if the casing comprises more than 10 percent of the sample volume. (For such a sample to be representative, it must incorporate the lead from the casing.) Collect samples of any material thought to be a potential source of contamination. Discuss any special analytical requirements for extraneous materials with the project team (project management, geologists, and chemists), and notify the laboratory of any special sample handling requirements or method changes.

4.4.2 Homogenizing

Homogenizing is the mixing or blending of a grab or composite sample to distribute contaminants uniformly within the sample. Ideally, proper homogenizing ensures that all portions of the sample are equal or identical in composition and are representative of the total sample collected. Incomplete homogenizing can introduce sampling error. Homogenizing requires additional handling of the waste and is not appropriate for all wastes. Unless layered, liquid wastes can be assumed to be homogeneous and do not require additional mixing. If they occur in phases, treat each phase as a unique homogeneous medium and sample each separately, as discussed in Section 2.3.1. Solid samples that will be composited should be homogenized after all aliquots have been combined. Manually homogenize solid and sludge samples using a stainless steel spoon or scoop and a stainless steel bucket or pyrex bowl, or use a disposable plastic scoop and pan, depending on the analyses. Do not homogenize samples for VOC analysis.

4.4.3 Splitting

After collection and field preparation, samples are split into two or more equivalent parts when two or more portions of the same sample need to be analyzed separately. Split samples are most often collected in enforcement actions to compare sample results obtained by EPA with those obtained by the potentially responsible party. Split samples also provide measures of sample variability and analytical error. Before splitting, follow the homogenization techniques outlined above. Fill two sample collection jars at the same time, alternating spoonfuls (or scoopfuls) of homogenized sample between them. Samples for VOC analysis should not be homogenized; instead, collect two uniform samples concurrently from the same location (collocated).

4.4.4 Final Preparation

Select sample containers on the basis of compatibility with the material being sampled, resistance to breakage, and capacity. Appropriate sample volumes and containers will vary according to the parameters being analyzed. Actual sample volumes, appropriate containers, and holding times are specified in the U.S. EPA *Quality Assurance/Quality Control (QA/QC) Guidance for Removal Activities*, EPA/540/G-90/004, April 1990, in 40 CFR 136, and in the *Compendium of ERT Waste Sampling Procedures*, OSWER Directive 9360.4-07. Package all samples in compliance with current International Air Transport Association (IATA) or Department of Transportation (DOT) requirements, as applicable. Packaging should be performed by someone trained in current DOT shipping procedures.

Specific handling techniques may be required for physical parameters such as permeability or particle size distribution. Preservation of the original sample conditions will determine in part the representativeness of the analytical results. Permeability is affected by evaporation and by thermal variations; particle size is affected by handling. In general, cooling samples can help maintain original conditions; however, wastes are

often of such high concentration that cooling a sample is not necessary.

4.5 EXAMPLE SITE

Table 1 is a sample log for the ABC Plating site, illustrating the parameters used by the analytical laboratory to evaluate each waste source. The analytical results provided preliminary information on waste composition plus data necessary to begin clean-up strategy and treatment/disposal planning. The sampling objective of the initial assessment was to establish threat.

4.5.1 Source Sampling

The following is a detailed description of the sampling activities listed in Table 1.

Drum Sampling

Samples were collected from three drums tentatively identified from screening results as containing cyanide bases. They were sent for laboratory analysis of free and total cyanide, TCL organic compounds, and metals. Each sample was collected using a COLIWASA sampler which preserved phase layers that were present.

Vat Sampling

Samples were collected from two vats which were tentatively identified as containing cyanide bases. They were sent for laboratory analysis of free and total cyanide and metals. Vat samples were assumed to be relatively homogeneous and were collected using a COLIWASA-style glass thief.

Waste Pile Sampling

Two composite samples were collected (one from each waste pile) for laboratory analysis of free and total cyanide and metals. For each pile, four aliquots were collected from 12-inch depths at equally-spaced points located along the previously established transect. Sample aliquots were collected with a corkscrew auger and a hard plastic scoop. Aliquots from each pile were composited in separate disposable plastic trays.

Impoundment Sampling

Two waste liquid samples and five waste bottom sludge samples were collected from each impoundment. Waste liquids were analyzed in the laboratory for full TAL substances and the waste sludges were laboratory analyzed for full TCL substances. Sample locations and techniques were identical to those chosen for initial screening (Section 3.3.4). Waste liquid samples were collected using a bacon bomb sampler and waste sludge samples were collected with a Ponar dredge.

Surface Sampling

Non-porous walls and the concrete slab floor in the plating building were wipe and chip sampled, respectively. A one-square foot template was used to mark each area for wipe sampling. Sterile gauze pads soaked in hexane were used to collect four samples from non-porous walls. Four chip samples were collected from the floor using block hammers and chisels. Wipe and chip samples were analyzed for metals and cyanide to determine if the facility block walls and concrete floor needed to be sent to a secure or sanitary chemical landfill.

4.5.2 Sample Preparation

Removing Extraneous Material

Drum, vat, and impoundment liquid samples did not contain extraneous material. Stones and small pieces of stainless steel wire were removed from solid samples collected from the waste pile, but clumps of blue-green solid material were not removed. Based on screening data and knowledge of plating processes, the clumps were suspected to be plating solids containing high concentrations of metals and possibly cyanide. Sticks and other extraneous materials (e.g., plastic and metal objects) were discarded from dredged impoundment sludge samples. The presence of extraneous materials was documented for later consideration during treatment/disposal technology evaluation.

Homogenizing Samples

Homogeneity was assumed for most liquid samples, since plating processes require homogenous solutions to promote for even ion movement and uniformity of the coating. The liquid samples which appeared to be

uniform were not homogenized. Several drums containing liquid materials had distinct phases present which were visible in the glass thieves during sampling. Each phase was sampled separately using a COLIWASA. The solid waste piles and impoundment sludge samples were homogenized after screening results indicated a lack of volatile organic compounds. Since metals were a primary concern at the site, pyrex mixing bowls (instead of disposable aluminum pans) were used to homogenize samples.

Splitting Samples

At the request of the State, all initial containerized and impoundment waste samples were split during the removal assessment. The split samples were preserved and labelled, then chain of custody papersand samples were signed over to an on-site state representative.

Table 1: ABC Plating Sample Log

Sampling Locations	Number of Samples	Analytical Parameters
Plating Vats	2	metals, cyanide
Drums	3	metals, cyanide, full TCL substances
Waste Piles	2	metals, cyanide
Impoundment Liquids	4	full TAL substances
Impoundment Sludges	10	full TCL substances
Surfaces	8	metals, cyanide

5.0 QUALITY ASSURANCE/QUALITY CONTROL

5.1 INTRODUCTION

The goal of representative sampling is to obtain analytical results that accurately depict site conditions during a given time. The goal of quality assurance/quality control (QA/QC) is to implement correct methodologies which limit the introduction of error into the sampling and analytical procedures, and ultimately into the analytical data.

QA/QC samples evaluate three types of information: 1) the degree of site variation; 2) whether samples were cross-contaminated during sampling and sample handling procedures; and 3) whether a discrepancy in sample results is a result of laboratory handling and analysis procedures.

5.2 DATA CATEGORIES

EPA has established data quality objectives (DQOs) which ensure that the precision, accuracy, representativeness, and quality of environmental data are appropriate for their intended application. Superfund DQO guidance defines two broad categories of analytical data: *screening* and *definitive*.

Screening data are generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, rather than elaborate extraction/digestion and cleanup. At least 10 percent of the screening data are confirmed using the analytical methods and QA/QC procedures and criteria associated with definitive data. Screening data without associated confirmation data are not considered to be data of known quality To be acceptable, screening data must include the following: chain of custody, initial and continuing calibration, analyte identification, and analyte quantification. Streamlined QC requirements are the defining characteristic of screening data.

Definitive data are generated using rigorous analytical methods (e.g., approved EPA reference methods). These data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined. QC measures for definitive data contain all of the elements associated with screening data, but also may include trip, method, and rinsate blanks; matrix spikes; performance evaluation samples; and replicate analyses for error determination.

For further information on these QA/QC objectives, please refer to EPA's *Quality Assurance/Quality Control Guidance for Removal Activities* or EPA's *Data Quality Objectives Process for Superfund.*

5.3 SOURCES OF ERROR

The four most common potential sources of data error in waste sampling are:

- Sampling design
- Sampling methodology
- Sample heterogeneity
- Analytical procedures

5.3.1 Sampling Design

Waste samples are often heterogeneous. Waste components separate into phases or layers by specific gravity and solubility. For example, an impoundment may have an oily layer on top and relatively contaminant-free water below. Failure to account for differences in composition of multiple phases can introduce sampling error. The sampling design must account for all phases and strata which may contain hazardous substances.

The sampling design should utilize approved SOPs and previously approved sampling designs to ensure uniformity and comparability between samples. The actual sample collection process should be determined prior to sampling. All samples should be collected using a uniform surface area and/or depth to ensure data comparability. Sampling equipment must be standardized for like sampling situations.

The sampling design should fulfill sampling and data quality objectives. The QA objectives selected should be built into the sampling design, including all necessary QA/QC samples.

5.3.2 Sampling Methodology

Sampling methodology and sample handling procedures have possible sources of error, including: cross-contamination from inappropriate use of sample collection equipment; unclean sample containers; improper sampling equipment decontamination; and improper shipment procedures. Procedures for collecting, handling, and shipping samples should be standardized to allow easier identification of any source(s) of error, and to minimize the potential for error. Use SOPs to ensure that all given sampling techniques are performed in the same manner, regardless of the individual sampling team, date, or location of sampling activity. Use field blanks, replicate samples, trip blanks, and rinsate blanks to identify errors due to improper sampling methodology and sample handling procedures.

Site screening and haz-catting often employ kits or "cookbook" procedures requiring interpretations based on chemical reactions which produce a color change. The degree of subjectivity inherent in interpretation, and the complexity of some of the procedures, introduce a significant source of potential error.

5.3.3 Sample Heterogeneity

Wastes may become heterogeneous through vaporization, settling, solubility, migration, or addition of new wastes over time. Identify heterogeneity by obtaining several samples or composite aliquots from various depths.

Waste sources vary both in type and in concentration level. Incorporate representative sampling techniques into the sampling design to identify and define this variation accurately. Collect a grab sample of each phase or stratum suspected of containing contaminants of concern; the samples will be relatively homogeneous and representative of their respective phases. For example, if an impoundment has three liquid phases and sludge on the bottom, collect one sample of each liquid phase and a sample of the bottom sludge.

5.3.4 Analytical Procedures

Analytical procedures may introduce errors from: laboratory cross-contamination; inefficient extraction; and inappropriate methodology. High concentration waste samples tend to foul analytical equipment, which can lead to poor data reproducibility. Matrix spike, laboratory duplicate, performance evaluation, and laboratory control samples help to distinguish analytical error from sampling error.

5.4 QA/QC SAMPLES

QA/QC samples are collected at the site or prepared for or by the laboratory. Analysis of the QA/QC samples provides information on the variability and usability of waste sampling data, indicates possible field sampling or laboratory error, and provides a basis for future validation and usability of the analytical data. The most common field QA/QC samples are field replicate, background, and rinsate blank samples. The most common laboratory QA/QC samples are performance evaluation, matrix spike (MS), and matrix spike duplicate (MSD) samples. QA/QC results may suggest the need for modifying sample collection, preparation, handling, or analytical procedures if the resultant data do not meet site-specific quality assurance objectives.

Waste is typically characterized by high concentrations of contaminants, making precision and accuracy less important than for samples with lower concentrations (e.g., water, air). This eliminates the need for frequent field blanks. In addition, contaminant concentrations in waste samples are often several orders of magnitude higher than the concentrations of standard laboratory QA/QC mixes, which may render them useless in measuring laboratory error. The laboratory spikes are not detected because of masking caused by the high sample concentrations. Fouling of analytical equipment associated with high concentration samples may occur. Analytical error in waste sampling can be measured by performance evaluation samples and laboratory control samples, which are not subject to matrix interferences.

Refer to data validation procedures in U.S. EPA *Quality Assurance/Quality Control (QA/QC) Guidance for Removal Activities*, EPA/540/G-90/004, April 1990, for guidelines on utilizing QA/QC

analytical results. The following sections briefly describe the types of QA/QC samples appropriate for waste sampling.

5.4.1 Field Replicate Samples

Field replicates, also referred to as field duplicates and split samples, are field samples obtained from one sampling point, homogenized (where appropriate), divided into separate containers, and treated as separate samples throughout the remaining sample handling and analytical processes. Use replicate samples to assess error associated with sample heterogeneity, sample methodology, and analytical procedures. Field replicates can also be used when determining total error for critical samples with contamination concentrations near the action level. In such a case, a minimum of eight replicate samples is recommended for valid statistical analysis. Field replicates may be sent to two or more laboratories or to the same laboratory as unique samples. For total error determination, samples should be analyzed by the same laboratory.

5.4.2 Collocated Samples

A collocated sample is collected from an area adjoining a field sample to determine local variability of the waste. Collocated samples of solids, such as waste pile samples, are situated side by side. Collocated samples of liquids, such as vat samples, are collected from the same location and depth. Collocated samples are collected and analyzed as discrete samples; they are not composited. Because of the non-homogeneous nature of many waste sources, collocated samples should not be used to assess variability within a large source and are not recommended for assessing error. Determine the applicability of collocated samples on a site-by-site and source-by-source basis.

5.4.3 Background Samples

Waste sampling typically involves containerized or relatively immobile waste streams. Background sampling, which is appropriate when sampling soil, surface water, groundwater, and air, has less application to waste sampling. In some cases (e.g., uncontainerized waste) soil samples from uncontaminated areas can serve as background samples for waste sampling. Background samples are appropriate for some surface sampling applications, as discussed in Section 4.3.6.

5.4.4 Performance Evaluation/ Laboratory Control Samples

A performance evaluation (PE) sample evaluates the overall error contributed by the analytical laboratory and detects any bias in the analytical method being used. PE samples contain known quantities of target analytes manufactured under strict quality control. They are usually prepared by a third party under an EPA certification program. The samples are usually submitted "blind" to analytical laboratories (the sampling team knows the contents of the samples, but the laboratory does not). Laboratory analytical error may be evaluated by the percent recoveries and correct identification of the components in the PE sample.

A blind PE sample may be included in a set of split samples provided to the PRP. The PE sample will measure PRP laboratory accuracy, which may be critical during enforcement litigation.

A laboratory control sample (LCS) also contains known quantities of target analytes in certified clean water. In this case, the laboratory knows the contents of the sample; the LCS is usually prepared by the laboratory. PE and LCS samples are not affected by waste matrix interference, and thus can provide a clear measure of laboratory error.

5.4.5 Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike and matrix spike duplicate samples (MS/MSDs) are field samples that are spiked in the laboratory with a known concentration of a target analyte(s) in order to determine percent recoveries in sample extraction. The percent recovery from MS/MSDs indicates the degree to which matrix interferences will affect the identification of a substance. MS/MSDs can also be used to monitor laboratory performance. When four or more pairs of MS/MSDs are analyzed, the data obtained may also be used to evaluate error due to laboratory bias and precision. Analyze one MS/MSD pair to assess bias for every 20 samples, and use the average percent recovery for the pair. To assess precision, analyze at least 8 matrix spike replicates from the same sample, and determine the standard deviation and the

coefficient of variation. See pages 9-10 of the *U.S. EPA Quality Assurance/Quality Control (QA/QC) Guidance for Removal Activities*, April 1990, for directions on calculating analytical error. MS/MSDs are recommended for screening data and are required as one of several methods for determining analytical error for definitive data. Since the MS/MSDs are spiked field samples, provide sufficient volume for three separate analyses. Because the spiking solutions used in MS/MSDs are often obscured by high concentrations of contaminants or by matrix effects, the usefulness of MS/MSDs for high concentration samples may be limited.

5.4.6 Rinsate Blank Samples

A rinsate blank is used to assess cross-contamination from improper equipment decontamination procedures. Rinsate blanks are samples obtained by running analyte-free water over decontaminated sampling equipment. Any residual contamination should appear in the rinsate sample data. Analyze the rinsate blank for the same analytical parameters as the field samples collected that day. Handle and ship the rinsate like a low-concentration field sample. Where dedicated sampling equipment is not utilized, collect one rinsate blank per sampling batch per day.

5.4.7 Field Blank Samples

Field blanks are samples prepared in the field using certified clean water or sand which are then submitted to the laboratory for analysis. A field blank is used to evaluate contamination or error associated with sampling methodology, preservation, handling/shipping, and laboratory procedures. For high-concentration samples, the usefulness of field blanks is limited. Parts per billion (ppb) or low parts per million (ppm) error has little significance when identifying high concentration wastes or addressing action levels in the hundreds of ppm. If available and appropriate, submit one field blank per day.

5.4.8 Trip Blank Samples

Trip blanks are samples prepared prior to going into the field. They consist of certified clean water or sand, and are not opened until they reach the laboratory. If available, utilize trip blanks to meet QA objectives for volatile organic analyses only. Handle, transport, and analyze trip blanks in the same manner as the other volatile organic samples collected that day. Trip blanks are used to evaluate error associated with sampling methodology, shipping and handling, and analytical procedures, since any volatile contamination of a trip blank would have to be introduced during one of those procedures. Since waste samples are often high concentration, trip blanks are not typically used during waste sampling.

5.4.9 Laboratory Duplicate Samples

A laboratory duplicate is a sample that undergoes preparation and analysis twice. The laboratory takes two aliquots of one sample and analyses them as separate samples. Comparison of data from the two analyses provides a measure of analytical reproducibility within a sample set. Discrepancies in duplicate analyses may indicate poor homogenization in the field or other sample preparation error, either in the field or in the laboratory. The benefit of laboratory duplicates in waste sampling may be limited. High concentration waste samples may foul analytical equipment and result in unavoidably poor reproducibility. Laboratory duplicates of high concentration waste samples should not be used to measure laboratory performance.

5.5 EVALUATION OF ANALYTICAL ERROR

Analytical error becomes significant in decision-making as sample results approach the action level. The acceptable level of error is determined by the intended use of the data and litigation concerns. Definitive data require quantitative measurement of analytical error with PE samples and replicates. The other QA samples identified in this section can indicate a variety of qualitative and quantitative sampling errors. As discussed earlier, error in the ppb or low ppm range may not be of concern when analyzing high concentration wastes.

5.6 CORRELATION BETWEEN FIELD SCREENING RESULTS AND LABORATORY RESULTS

A cost-effective approach for evaluating wastes and waste sources is to compare inexpensive field screening data and other field measurements (e.g., XRF) with laboratory results. This relies in part on

statistical correlation, which involves computing an index called the correlation coefficient (r) that indicates the degree and nature of the relationship between two or more sets of values. The correlation coefficient ranges from -1.0 (a perfect inverse or negative relationship), through 0 (no relationship), to +1.0 (a perfect direct or positive relationship). The square of the correlation coefficient, called the coefficient of determination, R^2, is an estimate of the proportion of variance in one variable (the dependent variable) that can be accounted for by the independent variables. An acceptable R^2 value depends on the sampling objectives and intended data uses. As a rule, statistical relationships should have an R^2 value of at least 0.6 to determine a reliable model. For health or risk assessment purposes, the acceptable R^2 value may be more stringent (e.g., 0.6). Analytical calibration regressions have an R^2 value of 0.98 or greater. Once a reliable regression equation has been derived, the field screening data can be used to predict laboratory results. These predicted values can then be located on a base map and contoured (mapping methods are described in Section 6.4). The contour maps can illustrate the estimated extent of contamination (for certain waste sources) and the adequacy of the sampling program.

5.7 EXAMPLE SITE

5.7.1 QA Objectives

Screening data, which generate non-definitive, unconfirmed results (e.g., total hydrocarbons, total halogens, cyanide, PCBs) were used to select analytical parameters. Samples were sent to the analytical laboratory under protocols which provided definitive data. The rigorous laboratory analyses provided definitive identification and quantitation of contaminants (e.g., 50 ppm benzene, 110 ppm total chromium, 75 ppm total cyanide).

5.7.2 Sources of Error

All direct reading instruments were maintained and calibrated in accordance with their instruction manuals. Many of these instruments are class-specific (e.g. volatile organic vapors) with relative response rates that are dependent on the calibration gas selected. Instrument response to ambient vapor concentrations may differ by an order of magnitude from response to calibration standards. If compounds of interest are known, site-specific standards may be prepared; they are most applicable for field gas chromatographs (GCs). These standards can be prepared on site in a gas bag or flask, but have limited holding times. Preparation of standards on site introduces its own potential error. For sites of long duration, specialty mixtures may be ordered from a specialty gas company or an analytical laboratory.

The number and location of initial field samples were based on observation and professional judgment (as outlined in Section 2.8). Liquid wastes in the vats, impoundments, and transformers were assumed to be homogeneous because there were no visible phases. (An erroneous observation could introduce significant error into the sampling design.)

Field standard operating procedures, documented in the site sampling plan, established consistent screening and sampling procedures among all samplers. This reduced the chances for variability and error during sampling. Site briefings were conducted prior to all sampling and screening events to review the use of proper screening and sampling techniques.

Other steps taken to limit error included proper sample preparation, adherence to sample holding times, and the use of proper shipment procedures. All off-site laboratory sample analyses were performed using EPA standard methods and protocols.

5.7.3 Field QA/QC Samples

Few field QA/QC samples were collected during waste sampling at the ABC Plating site. For the low-concentration impoundment liquids, a PE sample for metals was sent to the laboratory. (The PE sample is not affected by matrix interferences.) Field and trip blanks were not applicable since they are used to determine cross-contamination of low concentration samples. Cross-contamination that may occur during storage and shipping is minimal compared to the high ppm or percent level concentrations which are typically found in plating wastes. Nevertheless, suspected high concentration samples were shipped separately from the low level samples. One rinsate blank sample was collected from the impoundment sampling equipment (dredge and bacon bomb samplers) to check for cross-contamination during equipment decontamination.

5.7.4 Laboratory QA/QC Samples

Instructions on matrices, target compounds, and QA/QC criteria of particular interest were provided to the laboratory to help ensure that analytical results met the required objectives. The laboratory was instructed to run a duplicate of LCS samples for each batch of high concentration liquid vat samples to check reproducibility of the laboratory results. A matrix spike was not requested because the level of error measured by the standard low/medium spiking mixtures did not apply to the expected high concentrations in the samples. The laboratory analyzed the metals using the methods of inductively coupled plasma (ICP) spectrometry and atomic absorption (AA). The presence of cyanide was confirmed in the laboratory using total and amenable cyanide analyses (colorimetric manual method, SW-846 Method 9010).

PE sample results indicated low recoveries for some metals. The difference between LCS duplicate results was within the acceptable range, so these results were used as estimates with a low bias. The confirmation by a second method on 10 percent, or one per batch, of the high concentration samples indicated acceptable accuracy.

The waste pile was thought to be vat bottom materials of high contaminant concentrations, therefore a matrix spike was not requested. An LCS duplicate was used to evaluate the reproducibility of the results and to establish if the solid samples were homogeneous. Agreement between the LCS duplicates indicates good laboratory precision. When results of the LCS and LCS duplicate correlate, but the field replicates do not, two possible errors are indicated: either the matrix interfered with recovery, or there was poor sample homogenization in the field. The laboratory does not homogenize samples unless specified in the analytical method.

For the impoundment samples, matrix spike and LCS duplicate samples were used. Matrix spikes are applicable since the impoundment samples have a lower concentration than the vat samples. Matrix spike recoveries for certain metals were low. However, LCS results were within control limits, indicating good laboratory performance.

6.0 DATA PRESENTATION AND ANALYSIS

6.1 INTRODUCTION

Data presentation and analysis techniques are performed with analytical, field screening, or geophysical results. The techniques discussed below can be used to compare analytical values, to evaluate numerical distribution of data, and to reveal the location of "hot spots" and the extent of contamination at a site. The appropriate methods to present and analyze sample data depend on the sampling objectives, the number of samples collected, the sampling approaches used, and other considerations.

6.2 DATA POSTING

Data posting involves placement of sample values on a site base map or cross-section. Data posting is useful for displaying the distribution of sample values, visually depicting the location of wastes with associated assessment data. Data posting requires each sample to have a specific location (e.g., *x*, *y*, and sometimes *z* coordinates). Ideally, the sample coordinates are surveyed values or inventoried and numbered containers, facilitating placement on a scaled map. Data posting is useful for depicting concentration values of non-containerized wastes and surfaces, but has limited application to containerized wastes.

6.3 CROSS-SECTION/FENCE DIAGRAMS

Cross-section diagrams (two-dimensional) and fence diagrams (three-dimensional) depict layers or phases of wastes in sources such as tanks and impoundments. Two-dimensional cross-sections may be used to illustrate vertical profiles of waste concentrations in containerized wastes or impoundments. For solid wastes in waste piles, three-dimensional fence diagrams are often used to interpolate data between sampling locations. Solid wastes in waste piles do not usually form horizontal layers, so fence diagrams based on a few sampling points may not be representative. Both cross-sections and fence diagrams can provide useful visual interpretations of contaminant concentrations.

6.4 CONTOUR MAPPING

Contour maps are useful for depicting contaminant concentration values in waste piles or impoundments. Contour mapping requires an accurate, to-scale basemap of the site. After data posting sample values on the basemap, insert contour lines (or isopleths) at a specified contour interval, interpolating values between sample points. Contour lines can be drawn manually or can be generated by computer using contouring software. Although the software makes the contouring process easier, computer programs have a limitation: as they interpolate between data points, they attempt to "smooth" the values by fitting contour intervals to the full range of data values. This can result in a contour map that does not accurately represent general site contaminant trends. Typical waste sites have low concentration/non-detect areas and "hot spots." If there is a big difference in concentration between the waste "hot spot" and the surrounding area, the computer contouring program, using a contour interval that attempts to smooth the "hot spots," may eliminate most of the subtle site features and general trends. For waste sampling, contouring may apply only to large waste piles and impoundments.

6.5 STATISTICAL GRAPHICS

If using statistical interpretation, the distribution or spread of the data set is important in determining which statistical techniques to use. Common statistical analyses, such as the t-test, rely on normally distributed data. The histogram is a statistical bar graph which displays the distribution of a data set. A normally distributed data set takes the shape of a bell curve, with the mean and median close together about halfway between the maximum and minimum values. A probability plot depicts cumulative percent against the concentration of the contaminant of concern. A normally distributed data set, when plotted as a probability plot, would appear as a straight line. A histogram or probability plot can be used to see trends and anomalies in the data from a waste source (e.g., impoundment) prior to conducting more rigorous forms of statistical analysis. As with contour mapping, statistical data interpretation applications for waste are limited.

6.6 RECOMMENDED DATA INTERPRETATION METHODS

The data interpretation methods chosen depend on project-specific considerations, such as the number of sampling locations and their associated range in values. Data which are dissimilar in composition (e.g., drums with different chemicals or different waste media) should not be compared using statistical interpretation methods. Data posting, screening, and sampling data sheets, and cross-section/fence diagrams may be appropriate. A site feature depicting extremely low data values (e.g., non-detects), together with significantly higher values (e.g., 5000 ppm) from neighboring "hot spots" with little or no concentration gradient in between, does not lend itself to contouring.

6.7 EXAMPLE SITE

Figure 9 illustrates a transect of impoundment No.1 in a two-dimensional cross-section. The sampling intervals are indicated by the twenty foot markings along the transect of the cross-section. Analytical results were data posted on the cross-section to illustrate contaminant trends. Contaminant volume can be visualized by depicting both the sludge layer and impoundment bottom. The bottom sludges contained 300 to 427 ppm total chromium; other parameters exhibited a similar concentration gradient range.

Table 2 presents the haz-catting results of all containerized waste and waste piles on site. This table was generated as the initial step in analyzing the data prior to posting on the base map and lists results from several different tests. These data were then posted on the base map.

Figure 9: Posted Total Chromium Data for Impoundment No. 1

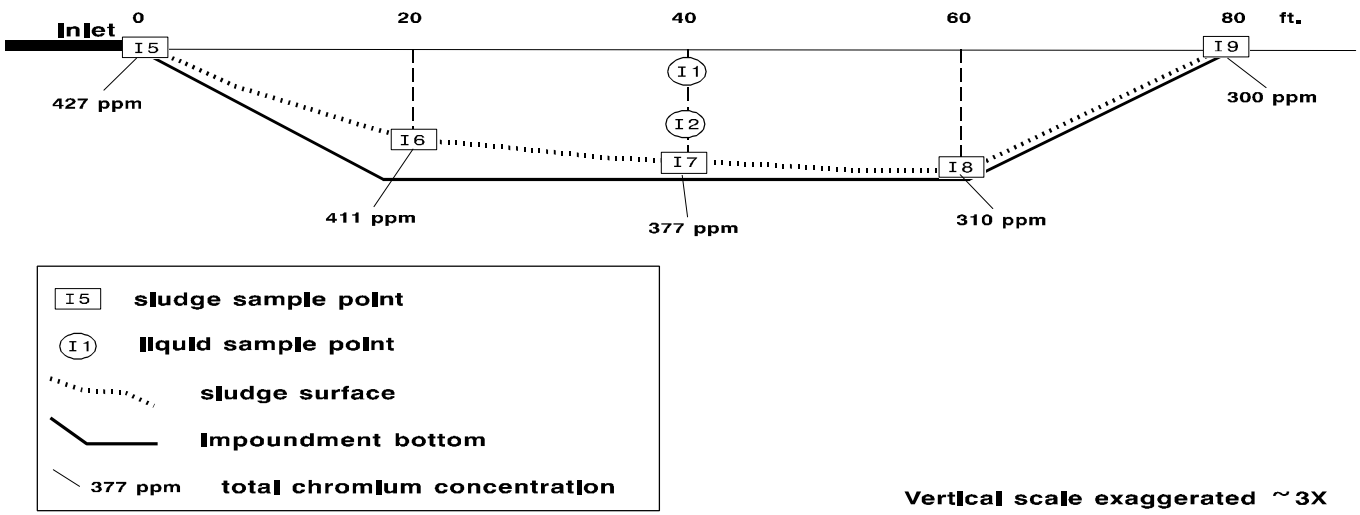


Table 2: Haz-Cat Results
ABC Plating Site
(page 1 of 2)

Container	Rad	pH	CN	PID	FID	Solubility in water	Chlorine Test	Peroxide Test	Phase	Cu^+	Comments
D1	ND	12	Y	N/A	N/A	Y	N	N	L	N	cyanide base
D2	ND	>12	Y	N/A	N/A	Y	N	N	L	N	cyanide base
D3	ND	>12	Y	N/A	N/A	Y	N	N	L	N	cyanide base
D4	ND	>12	N	N/A	N/A	Y	N	N	L	N	base
D5	ND	6	N/A	4	2	Y	N	N	L	N	inconclusive
D6	ND	7	N/A	18	35	N Floats	N	N	L	N	oil
D7	ND	7	N/A	26	70	N Floats	N	N	L	N	oil
D8	ND	7	N/A	14	39	N Floats	N	N	L	N	oil
D9	ND	7	N/A	45	128	N Sinks	N	N	L	N	halogenated solvent
D10	ND	N/A	N	18	26	Y	N	N	L	N	kersosene
D11	ND	5	N/A	6	11	Y	N	N	L	N	open; rain water?
D12	ND	5	N/A	8	6	Y	N	N	L	N	open; rain water?
D13	ND	5	N/A	ND	ND	Y	N	N	L	N	inconclusive
D14	ND	5	N/A	ND	ND	Y	N	N	L	N	inconclusive
D15	ND	<2	N/A	N/A	N/A	Reacts	N	N	L	N	strong acid
D16	ND	<2	N/A	N/A	N/A	Reacts	N	N	L	N	strong acid
D17	ND	<2	N/A	N/A	N/A	Reacts	N	N	L	N	strong acid
D18	ND	<2	N/A	N/A	N/A	Reacts	N	N	L	N	strong acid
D19	ND	>11	N	N/A	N/A	Y	N	N	S	N	caustic soda

Table 2: Haz-Cat Results (Cont'd)
ABC Plating Site
(page 2 of 2)

Container	Rad	pH	CN	PID	FID	Solubility in water	Chlorine Test	Peroxide Test	Phase	Cu^+	Comments
V1	ND	>12	Y	N/A	N/A	Y	N	N	L	N	cyanide base
V2	ND	>12	Y	N/A	N/A	Y	N	N	L	N	cyanide base
V3	ND	9	N	ND	ND	Y	N	N	L	N	inconclusive
V4	ND	2	N	N/A	N/A	Y	N	N	L	N	acid
V5	ND	2	N	N/A	N/A	Y	N	N	L	N	acid
V6	ND	8	N	ND	ND	Y	N	N	L	N	inconclusive
V7	ND	2	N	N/A	N/A	Y	N	N	L	N	acid
V8	ND	2	N	N/A	N/A	Y	N	N	L	N	acid
V9	ND	8	N	ND	ND	Y	N	N	L	N	inconclusive
V10	ND	<2	N	N/A	N/A	Reacts	N	N	L	Y	strong acid
V11	ND	<2	N	N/A	N/A	Reacts	N	N	L	Y	strong acid
V12	ND	8	N	ND	ND	Y	N	N	L	N	inconclusive
V13	ND	<2	N	N/A	N/A	Reacts	N	N	L	N	strong acid
V14	ND	<2	N	N/A	N/A	Reacts	N	N	L	N	strong acid
V15	ND	>12	N	N/A	N/A	Y	N	N	L	N	strong base
P1	ND	N/A	Y	ND	ND	N	N	N/A	S	N/A	inconclusive
P2	ND	N/A	Y	ND	ND	N	N	N/A	S	N/A	inconclusive

ND -- none detected
NA -- not applicable

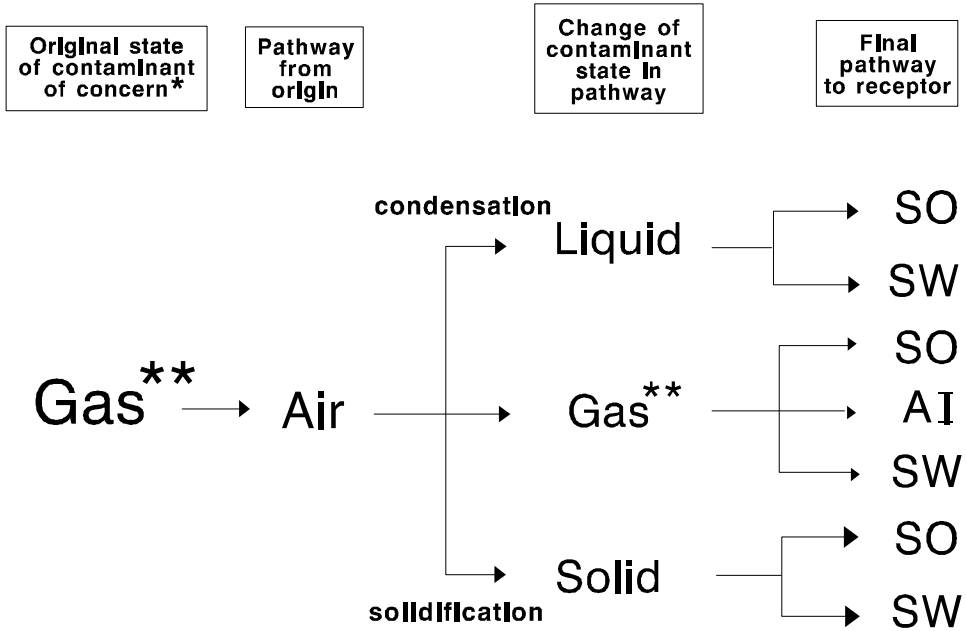
L -- liquid
S -- solid

Y -- yes
N -- no

APPENDIX A -- Example of Flow Diagram For Conceptual Site Model

Figure A-1

Migration Routes of a Gas Contaminant from Origin to Receptor



Receptor		
Human	Ecological Threat	
	Terrestrial	Aquatic
G,D	G,D	N/A
G,D	G,D	G,D
I,D	I,D	N/A
I,D	I,D	N/A
G,D	I,D	G,D
G,D	G,D	N/A
G,D	G,D	G,D

* May be a transformation product
** Includes vapors

Receptor Key

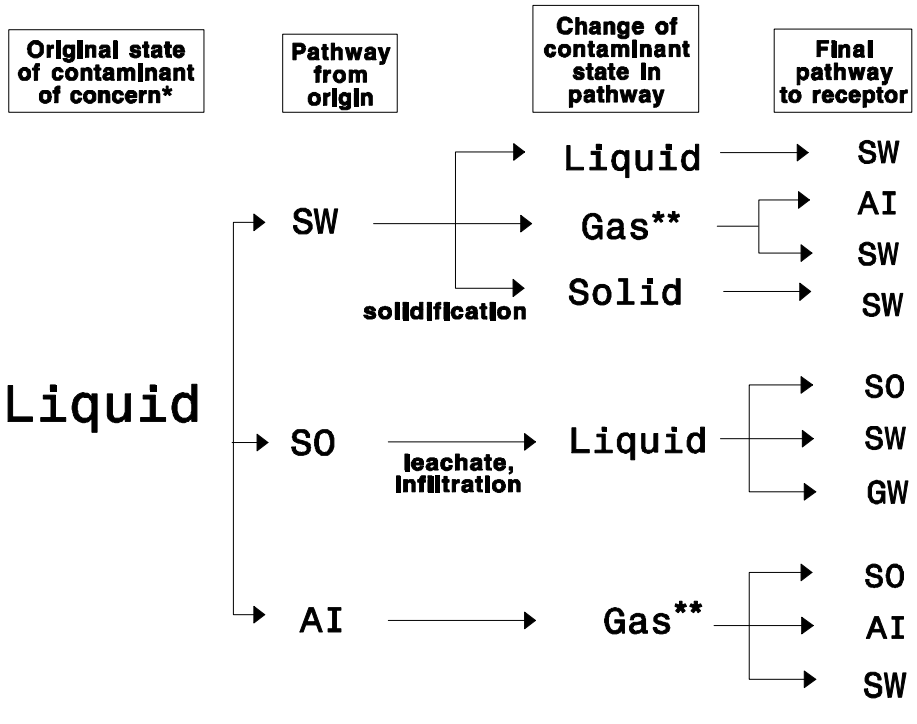
D = Dermal Contact
I = Inhalation
G = Ingestion
N/A = Not Applicable

Pathway Key

AI = Air
SO = Soil
SW = Surface Water (Including sediments)
GW = Ground Water

Figure A-2

Migration Routes of a Liquid Contaminant from Origin to Receptor



Receptor		
Human	Ecological Threat	
	Terrestrial	Aquatic
G,D	G,D	G,D
I,D	I,D	N/A
G,D	G,D	G,A
G,D	G,D	G,D
G,D	G,D	N/A
G,D	G,D	G,D
G,D	N/A	N/A
G,D	G,D	N/A
I,D	I,D	N/A
G,D	G,D	G,D

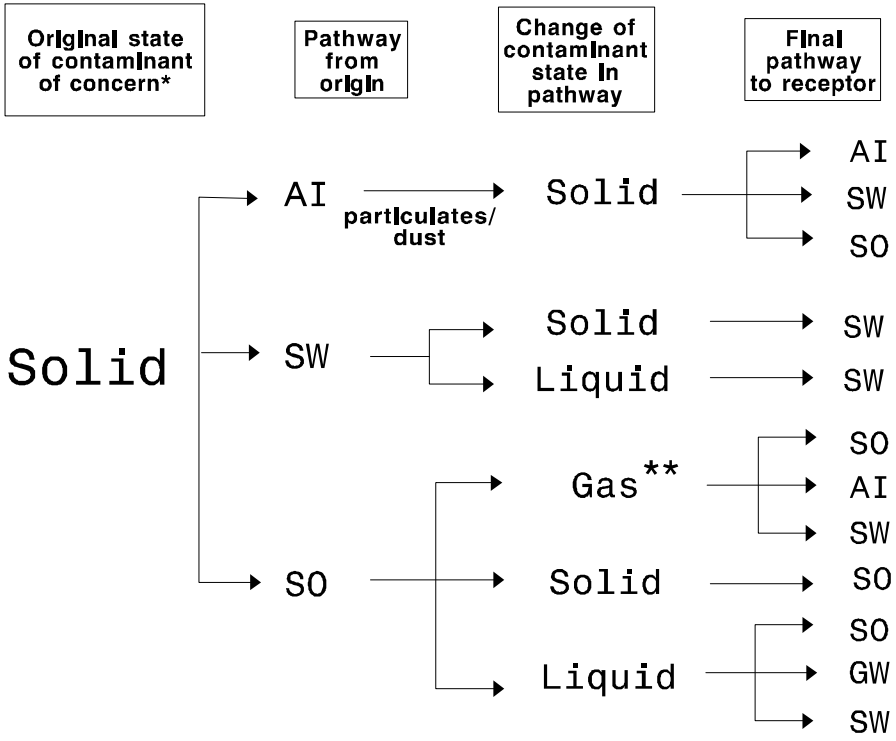
* May be a transformation product
** Includes vapors

Receptor Key
D = Dermal Contact
I = Inhalation
G = Ingestion
N/A = Not Applicable

Pathway Key
AI = Air
SO = Soil
SW = Surface Water (including sediments)
GW = Ground Water

Figure A-3

Migration Routes of a Solid Contaminant from Origin to Receptor



Receptor		
Human	Ecological Threat	
	Terrestrial	Aquatic
I,D	I,D	N/A
G,D	G,D	G,D
G,D	G,D	N/A
G,D	G,D	G,D
G,D	G,D	G,D
G,D	G,D	N/A
I,D	I,D	N/A
G,D	G,D	G,D
G,D	G,D	N/A
G,D	G,D	N/A
G,D	N/A	N/A
G,D	G,D	G,D

* May be a transformation product
** Includes vapors

Receptor Key
D = Dermal Contact
I = Inhalation
G = Ingestion
N/A = Not Applicable

Pathway Key
AI = Air
SO = Soil
SW = Surface Water (Including sediments)
GW = Ground Water

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CHIP, WIPE, AND SWEEP SAMPLING

SOP#: 2011
DATE: 11/16/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) outlines the recommended protocol and equipment for collection of representative chip, wipe, and sweep samples to monitor potential surficial contamination.

This method of sampling is appropriate for surfaces contaminated with non-volatile species of analytes (i.e., PCB, PCDD, PCDF, metals, cyanide, etc.) Detection limits are analyte specific. Sample size should be determined based upon the detection limit desired and the amount of sample requested by the analytical laboratory. Typical sample area is one square foot. However, based upon sampling location, the sample size may need modification due to area configuration.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent on site conditions, equipment limitations or limitations imposed by the procedure or other procedure limitations. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. EPA endorsement or recommendation for use.

2.0 METHOD SUMMARY

Since surface situations vary widely, no universal sampling method can be recommended. Rather, the method and implements used must be tailored to suit a specific sampling site. The sampling location should be selected based upon the potential for contamination as a result of manufacturing processes or personnel practices.

Chip sampling is appropriate for porous surfaces and is generally accomplished with either a hammer and chisel, or an electric hammer. The sampling device should be laboratory cleaned and wrapped in clean, autoclaved aluminum foil until ready for use. To collect the sample, a measured and marked off area is chipped both horizontally and vertically to an even depth of 1/8 inch. The sample is then transferred to the proper sample container.

Wipe samples are collected from smooth surfaces to indicate surficial contamination; a sample location is measured and marked off. While wearing a new pair of surgical gloves, a sterile gauze pad is opened, and soaked with solvent. The solvent used is dependent on the surface being sampled. This pad is then stroked firmly over the sample surface, first vertically, then horizontally, to ensure complete coverage. The pad is then transferred to the sample container.

Sweep sampling is an effective method for the collection of dust or residue on porous or non-porous surfaces. To collect such a sample, an appropriate area is measured off. Then, while wearing a new pair of disposable surgical gloves, a dedicated brush is used to sweep material into a dedicated dust pan. The sample is then transferred to the proper sample container.

Samples collected by all three methods are then sent to the laboratory for analysis.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Samples should be stored out of direct sunlight to reduce photodegredation, cooled to 4°C and shipped to the laboratory performing the analysis. Appropriately sized laboratory cleaned, glass sample jars should be used for sample collection. The amount of sample required will be determined in concert with the analytical laboratory.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

This method has few significant interferences or problems. Typical problems result from rough porous

surfaces which may be difficult to wipe, chip, or sweep.

5.0 EQUIPMENT

Equipment required for performing chip, wipe, or sweep sampling is as follows:

- Lab clean sample containers of proper size and composition
- Site logbook
- Sample analysis request forms
- Chain of Custody records
- Custody seals
- Field data sheets
- Sample labels
- Disposable surgical gloves
- Sterile wrapped gauze pad (3 in. x 3 in.)
- Appropriate pesticide (HPLC) grade solvent
- Medium sized laboratory cleaned paint brush
- Medium sized laboratory cleaned chisel
- Autoclaved aluminum foil
- Camera
- Hexane (pesticide/HPLC grade)
- Iso-octane
- Distilled/deionized water

6.0 REAGENTS

Reagents are not required for preservation of chip, wipe or sweep samples. However, reagents will be utilized for decontamination of sampling equipment.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.

2. Obtain necessary sampling and monitoring equipment.

3. Decontaminate or preclean equipment, and ensure that it is in working order.

4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.

6. Mark all sampling locations. If required the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

7.2 Chip Sample Collection

Sampling of porous surfaces is generally accomplished by using a chisel and hammer or electric hammer. The sampling device should be laboratory cleaned or field decontaminated as per the Sampling Equipment Decontamination SOP. It is then wrapped in cleaned, autoclaved aluminum foil. The sampler should remain in this wrapping until it is needed. Each sampling device should be used for only one sample.

1. Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.

2. Record surface area to be chipped.

3. Don a new pair of disposable surgical gloves.

4. Open a laboratory-cleaned chisel or equivalent sampling device.

5. Chip the sample area horizontally, then vertically to an even depth of approximately 1/8 inch.

6. Place the sample in an appropriately prepared sample container with a Teflon lined cap.

7. Cap the sample container, attach the label and custody seal, and place in a plastic bag. Record all pertinent data in the site logbook and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.

8. Store samples out of direct sunlight and cool to 4EC.

9. Follow proper decontamination procedures then deliver sample(s) to the laboratory for analysis.

7.3 Wipe Sample Collection

Wipe sampling is accomplished by using a sterile

gauze pad, adding a solvent in which the contaminant is most soluble, then wiping a pre-determined, pre-measured area. The sample is packaged in an amber jar to prevent photodegradation and packed in coolers for shipment to the lab. Each gauze pad is used for only one wipe sample.

1. Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.

2. Record surface area to be wiped.

3. Don a new pair of disposable surgical gloves.

4. Open new sterile package of gauze pad.

5. Soak the pad with solvent of choice.

6. Wipe the marked surface area using firm strokes. Wipe vertically, then horizontally to insure complete surface coverage.

7. Place the gauze pad in an appropriately prepared sample container with a Teflon-lined cap.

8. Cap the sample container, attach the label and custody seal, and place in a plastic bag. Record all pertinent data in the site logbook and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.

9. Store samples out of direct sunlight and cool to 4ºC.

10. Follow proper decontamination procedures, then deliver sample(s) to the laboratory for analysis.

7.4 Sweep Sample Collection

Sweep sampling is appropriate for bulk contamination. This procedure utilizes a dedicated, hand held sweeper brush to acquire a sample from a pre-measured area.

1. Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.

2. Record the surface area to be swept.

3. Don new pair of disposable surgical gloves.

4. Sweep the measured area using a dedicated brush; collect the sample in a dedicated dust pan.

5. Transfer sample from dust pan to sample container.

6. Cap the sample container, attach the label and custody seal, and place in a plastic bag. Record all pertinent data in the site log book and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.

7. Store samples out of direct sunlight and cool to 4EC.

8. Leave contaminated sampling device in the sample material, unless decontamination is practical.

9. Follow proper decontamination procedures, then deliver sample(s) to the laboratory for analysis.

8.0 CALCULATIONS

Results are usually provided in mg/g, µg/g, mass per unit area, or other appropriate measurement. Calculations are typically done by the laboratory.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

The following general quality assurance procedures apply:

1. All data must be documented on standard chain of custody forms, field data sheets or within the site logbook.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

The following specific quality assurance activities apply to wipe samples:

For wipe samples, a blank should be collected for each sampling event. This consists of a sterile gauze pad, wet with the appropriate solvent, and placed in a prepared sample container. The blank will help identify potential introduction of contaminants via the sampling methods, the pad, solvent or sample container. Spiked wipe samples can also be collected to better assess the data being generated. These are prepared by spiking a piece of foil of known area with a standard of the analyte of choice. The solvent containing the standard is allowed to evaporate, and the foil is wiped in a manner identical to the other wipe samples.

Specific quality assurance activities for chip and sweep samples should be determined on a site specific basis.

10.0 DATA VALIDATION

A review of the quality control samples will be conducted and the data utilized to qualify the environmental results.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow EPA, OSHA and corporate health and safety procedures.

12.0 REFERENCES

U.S. EPA, A Compendium of Superfund Field Operation Methods. EPA/540/5-87/001.

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APPENDIX C
EPA ERT SOP No. 2011: Chip, Wipe and Sweep Sampling

CHIP, WIPE, AND SWEEP SAMPLING

SOP#: 2011
DATE: 11/16/94
REV. #: 0.0

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2.0 METHOD SUMMARY

Since surface situations vary widely, no universal sampling method can be recommended. Rather, the method and implements used must be tailored to suit a specific sampling site. The sampling location should be selected based upon the potential for contamination as a result of manufacturing processes or personnel practices.

Chip sampling is appropriate for porous surfaces and is generally accomplished with either a hammer and chisel, or an electric hammer. The sampling device should be laboratory cleaned and wrapped in clean, autoclaved aluminum foil until ready for use. To collect the sample, a measured and marked off area is chipped both horizontally and vertically to an even depth of 1/8 inch. The sample is then transferred to the proper sample container.

Wipe samples are collected from smooth surfaces to indicate surficial contamination; a sample location is measured and marked off. While wearing a new pair of surgical gloves, a sterile gauze pad is opened, and soaked with solvent. The solvent used is dependent on the surface being sampled. This pad is then stroked firmly over the sample surface, first vertically, then horizontally, to ensure complete coverage. The pad is then transferred to the sample container.

Sweep sampling is an effective method for the collection of dust or residue on porous or non-porous surfaces. To collect such a sample, an appropriate area is measured off. Then, while wearing a new pair of disposable surgical gloves, a dedicated brush is used to sweep material into a dedicated dust pan. The sample is then transferred to the proper sample container.

Samples collected by all three methods are then sent to the laboratory for analysis.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Samples should be stored out of direct sunlight to reduce photodegredation, cooled to 4°C and shipped to the laboratory performing the analysis. Appropriately sized laboratory cleaned, glass sample jars should be used for sample collection. The amount of sample required will be determined in concert with the analytical laboratory.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

This method has few significant interferences or problems. Typical problems result from rough porous

surfaces which may be difficult to wipe, chip, or sweep.

5.0 EQUIPMENT

Equipment required for performing chip, wipe, or sweep sampling is as follows:

- Lab clean sample containers of proper size and composition
- Site logbook
- Sample analysis request forms
- Chain of Custody records
- Custody seals
- Field data sheets
- Sample labels
- Disposable surgical gloves
- Sterile wrapped gauze pad (3 in. x 3 in.)
- Appropriate pesticide (HPLC) grade solvent
- Medium sized laboratory cleaned paint brush
- Medium sized laboratory cleaned chisel
- Autoclaved aluminum foil
- Camera
- Hexane (pesticide/HPLC grade)
- Iso-octane
- Distilled/deionized water

6.0 REAGENTS

Reagents are not required for preservation of chip, wipe or sweep samples. However, reagents will be utilized for decontamination of sampling equipment.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.

2. Obtain necessary sampling and monitoring equipment.

3. Decontaminate or preclean equipment, and ensure that it is in working order.

4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.

6. Mark all sampling locations. If required the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

7.2 Chip Sample Collection

Sampling of porous surfaces is generally accomplished by using a chisel and hammer or electric hammer. The sampling device should be laboratory cleaned or field decontaminated as per the Sampling Equipment Decontamination SOP. It is then wrapped in cleaned, autoclaved aluminum foil. The sampler should remain in this wrapping until it is needed. Each sampling device should be used for only one sample.

1. Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.

2. Record surface area to be chipped.

3. Don a new pair of disposable surgical gloves.

4. Open a laboratory-cleaned chisel or equivalent sampling device.

5. Chip the sample area horizontally, then vertically to an even depth of approximately 1/8 inch.

6. Place the sample in an appropriately prepared sample container with a Teflon lined cap.

7. Cap the sample container, attach the label and custody seal, and place in a plastic bag. Record all pertinent data in the site logbook and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.

8. Store samples out of direct sunlight and cool to 4EC.

9. Follow proper decontamination procedures then deliver sample(s) to the laboratory for analysis.

7.3 Wipe Sample Collection

Wipe sampling is accomplished by using a sterile

gauze pad, adding a solvent in which the contaminant is most soluble, then wiping a pre-determined, pre-measured area. The sample is packaged in an amber jar to prevent photodegradation and packed in coolers for shipment to the lab. Each gauze pad is used for only one wipe sample.

1. Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.

2. Record surface area to be wiped.

3. Don a new pair of disposable surgical gloves.

4. Open new sterile package of gauze pad.

5. Soak the pad with solvent of choice.

6. Wipe the marked surface area using firm strokes. Wipe vertically, then horizontally to insure complete surface coverage.

7. Place the gauze pad in an appropriately prepared sample container with a Teflon-lined cap.

8. Cap the sample container, attach the label and custody seal, and place in a plastic bag. Record all pertinent data in the site logbook and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.

9. Store samples out of direct sunlight and cool to 4ºC.

10. Follow proper decontamination procedures, then deliver sample(s) to the laboratory for analysis.

7.4 Sweep Sample Collection

Sweep sampling is appropriate for bulk contamination. This procedure utilizes a dedicated, hand held sweeper brush to acquire a sample from a pre-measured area.

1. Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.

2. Record the surface area to be swept.

3. Don new pair of disposable surgical gloves.

4. Sweep the measured area using a dedicated brush; collect the sample in a dedicated dust pan.

5. Transfer sample from dust pan to sample container.

6. Cap the sample container, attach the label and custody seal, and place in a plastic bag. Record all pertinent data in the site log book and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.

7. Store samples out of direct sunlight and cool to 4EC.

8. Leave contaminated sampling device in the sample material, unless decontamination is practical.

9. Follow proper decontamination procedures, then deliver sample(s) to the laboratory for analysis.

8.0 CALCULATIONS

Results are usually provided in mg/g, µg/g, mass per unit area, or other appropriate measurement. Calculations are typically done by the laboratory.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

The following general quality assurance procedures apply:

1. All data must be documented on standard chain of custody forms, field data sheets or within the site logbook.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

The following specific quality assurance activities apply to wipe samples:

For wipe samples, a blank should be collected for each sampling event. This consists of a sterile gauze pad, wet with the appropriate solvent, and placed in a prepared sample container. The blank will help identify potential introduction of contaminants via the sampling methods, the pad, solvent or sample container. Spiked wipe samples can also be collected to better assess the data being generated. These are prepared by spiking a piece of foil of known area with a standard of the analyte of choice. The solvent containing the standard is allowed to evaporate, and the foil is wiped in a manner identical to the other wipe samples.

Specific quality assurance activities for chip and sweep samples should be determined on a site specific basis.

10.0 DATA VALIDATION

A review of the quality control samples will be conducted and the data utilized to qualify the environmental results.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow EPA, OSHA and corporate health and safety procedures.

12.0 REFERENCES

U.S. EPA, A Compendium of Superfund Field Operation Methods. EPA/540/5-87/001.

NJDEP Field Sampling Procedures Manual, February, 1988.

APPENDIX D EPA ERT SOP No. 2007 Collection of Groundwater Samples

GROUNDWATER WELL SAMPLING

SOP#: 2007
DATE: 01/26/95
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The objective of this standard operating procedure (SOP) is to provide general reference information on sampling of ground water wells. This guideline is primarily concerned with the collection of water samples from the saturated zone of the subsurface. Every effort must be made to ensure that the sample is representative of the particular zone of water being sampled. These procedures are designed to be used in conjunction with analyses for the most common types of ground water contaminants (e.g., volatile and semi-volatile organic compounds, pesticides, metals, biological parameters).

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

In order to obtain a representative groundwater sample for chemical analysis it is important to remove stagnant water in the well casing and the water immediately adjacent to the well before collection of the sample. This may be achieved with one of a number of instruments. The most common of these are the bailer, submersible pump, non-contact gas bladder pump, inertia pump and suction pump. At a minimum, three well volumes should be purged, if possible. Equipment must be decontaminated prior to use and between wells. Once purging is completed and the correct laboratory-cleaned sample containers have been prepared, sampling may proceed. Sampling may be conducted with any of the above instruments, and need not be the same as the device used for purging. Care should be taken when choosing the sampling device as some will affect the integrity of the sample. Sampling should occur in a progression from the least to most contaminated well, if this information is known.

The growing concern over the past several years over low levels of volatile organic compounds in water supplies has led to the development of highly sophisticated analytical methods that can provide detection limits at part per trillion levels. While the laboratory methods are extremely sensitive, well controlled and quality assured, they cannot compensate for a poorly collected sample. The collection of a sample should be as sensitive, highly developed and quality assured as the analytical procedures.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The type of analysis for which a sample is being collected determines the type of bottle, preservative, holding time, and filtering requirements. Samples should be collected directly from the sampling device into appropriate laboratory cleaned containers. Check that a Teflon liner is present in the cap, if required. Attach a sample identification label. Complete a field data sheet, a chain of custody form, and record all pertinent data in the site logbook.

Samples shall be appropriately preserved, labelled, logged, and placed in a cooler to be maintained at 4EC. Samples must be shipped well before the holding time is up and ideally should be shipped within 24 hours of sample collection. It is imperative that samples be shipped or delivered daily to the analytical laboratory in order to maximize the time available for the laboratory to perform the analyses. The bottles should be shipped with adequate packing and cooling to ensure that they arrive intact.

Sample retrieval systems suitable for the valid collection of volatile organic samples are: positive displacement bladder pumps, gear driven submersible pumps, syringe samplers and bailers (Barcelona, 1984; Nielsen, 1985). Field conditions and other constraints will limit the choice of appropriate systems. The focus of concern must remain to provide a valid sample for analysis, one which has been subjected to the least amount of turbulence possible.

Treatment of the sample with sodium thiosulfate preservative is required only if there is residual chlorine in the water that could cause free radical chlorination and change the identity of the original contaminants. It should not be used if there is no chlorine in the water.

Holding time for volatiles analysis is seven days. It is imperative that the sample be shipped or delivered daily to the analytical laboratory. The bottles must be shipped on their sides to aid in maintaining the airtight seal during shipment, with adequate packing and cooling to ensure that they arrive intact.

For collection of volatile organic samples, refer to the work plan to ensure that 40 mL glass sample vials with Teflon lined septa are ordered and in sufficient numbers. Check sampling supplies; field kit for chlorine, preservatives, Parafilm, foam sleeves and coolers. Due to the extreme trace levels at which volatile organics are detectable, cross contamination and introduction of contaminants must be avoided. Trip blanks are incorporated into the shipment package to provide a check against cross contamination.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

4.1 General

The primary goal in performing ground water sampling is to obtain a representative sample of the ground water body. Analysis can be compromised by field personnel in two primary ways: (1) taking an unrepresentative sample, or (2) by incorrect handling of the sample. There are numerous ways of introducing foreign contaminants into a sample, and these must be avoided by following strict sampling procedures and utilizing trained field personnel.

4.2 Purging

In a nonpumping well, there will be little or no vertical mixing of the water, and stratification will occur. The well water in the screened section will mix with the ground water due to normal flow patterns, but the well water above the screened section will remain isolated, become stagnant, and may lack the contaminants representative of the ground water. Persons sampling should realize that stagnant water may contain foreign material inadvertently or deliberately introduced from the surface, resulting in an unrepresentative sample. To safeguard against collecting nonrepresentative stagnant water, the following guidelines and techniques should be adhered to during sampling:

1. As a general rule, all monitor wells should be pumped or bailed prior to sampling. Purge water should be containerized on site or handled as specified in the site specific project plan. Evacuation of a minimum of one volume of water in the well casing, and preferably three to five volumes, is recommended for a representative sample. In a high-yielding ground water formation and where there is no stagnant water in the well above the screened section, evacuation prior to sample withdrawal is not as critical. However, in all cases where the monitoring data is to be used for enforcement actions, evacuation is recommended.

2. When purging with a pump (not a bailer), the pump should be set at the screened interval, or if the well is an open-rock well, it should be set at the same depth the sample will be collected. When sampling a screened well, the sample should also be collected from the same depth the pump was set at.

3. The well should be sampled as soon as possible after purging.

4. Analytical parameters typically dictate whether the sample should be collected through the purging device, or through a separate sampling instrument.

5. For wells that can be pumped or bailed to dryness with the equipment being used, the well should be evacuated and allowed to

recover prior to collecting a sample. If the recovery rate is fairly rapid and time allows, evacuation of more than one volume of water is preferred. If recovery is slow, sample the well upon recovery after one evacuation.

6. A non-representative sample can also result from excessive pre-pumping of the monitoring well. Stratification of the leachate concentration in the ground water formation may occur, or heavier-than-water compounds may sink to the lower portions of the aquifer. Excessive pumping can dilute or increase the contaminant concentrations from what is representative of the sampling point of interest.

4.3 Materials

Materials of construction for samplers and evacuation equipment (bladders, pump, bailers, tubing, etc.) should be limited to stainless steel, Teflon[R], and glass in areas where concentrations are expected to be at or near the detection limit. The tendency of organics to leach into and out of many materials make the selection of materials critical for trace analyses. The use of plastics, such as PVC or polyethylene, should be avoided when analyzing for organics. However, PVC may be used for evacuation equipment as it will not come in contact with the sample, and in highly contaminated wells, disposable equipment (i.e., polypropylene bailers) may be appropriate to avoid cross-contamination.

Materials of construction (bladders/ pumps, bailers, tubing, etc.) suitable for collecting and handling Volatile Organic Samples should be limited to stainless steel, Teflon and glass in areas which detection limit range concentrations are expected. The tendency of organics to leach into and out of many materials, make the selection of materials critical for these trace analyses. The use of plastics, e.g., PVC etc., should be avoided. There are numerous ways of introducing foreign contaminants into a sample, and these must be avoided by following strict sampling procedures and utlization of trained personnel.

4.4 Advantages/Disadvantages of Certain Equipment

4.4.1 Bailers

Advantages

- Only practical limitations on size and materials
- No power source needed
- Portable
- Inexpensive, so it can be dedicated and hung in a well, thereby reducing the chances of cross contamination
- Minimal outgassing of volatile organics while sample is in bailer
- Readily available
- Removes stagnant water first
- Rapid, simple method for removing small volumes of purge water

Disadvantages

- Time-consuming to flush a large well of stagnant water
- Transfer of sample may cause aeration
- Stoppers at the bottom of the bailer usually leak thus the bailer must be brought to the surface rapidly
- If the bailer is allowed to hit the bottom of the well boring, gravel can displace the ball valve not allowing the bailer to hold water

4.4.2 Submersible Pumps

Advantages

- Portable and can be transported to several wells
- Depending upon the size of the pump and the pumping depths, relatively high pumping rates are possible
- Generally very reliable and does not require priming

Disadvantages

- Potential for effects on analysis of trace organics
- Heavy and cumbersome to deal with, particularly in deeper wells
- Expensive
- Power source needed
- Sediment in water may cause problems with the pumps
- Impractical in low yielding or shallow wells

4.4.3 Non-Contact Gas Bladder Pumps

Advantages

- Maintains integrity of sample
- Easy to use
- Can sample from discrete locations within the monitor well

Disadvantages

- Difficulty in cleaning, though dedicated tubing and bladder may be used
- Only useful to about 100 feet
- Supply of gas for operation, gas bottles and/or compressors are often difficult to obtain and are cumbersome
- Relatively low pumping rates
- Requires air compressor or pressurized gas source and control box

4.4.4 Suction Pumps

Advantages

- Portable, inexpensive, and readily available

Disadvantages

- Restricted to areas with water levels within 20 to 25 feet of the ground surface
- Vacuum can cause loss of dissolved gasses and volatile organics
- Pump must be primed and vacuum is often difficult to maintain during initial stages of pumping

4.4.5 Inertia Pumps

Advantages

- Portable, inexpensive, and readily available
- Offers a rapid method for purging relatively shallow wells

Disadvantages

- Restricted to areas with water levels within 70 feet of the ground surface
- May be time consuming to purge wells with these manual pumps
- Labor intensive
- WaTerra pumps are only effective in 2-inch diameter wells

5.0 EQUIPMENT APPARATUS

5.1 Equipment Checklist

5.1.1 General

- Water level indicator
  - electric sounder
  - steel tape
  - transducer
  - reflection sounder
  - airline
- Depth sounder
- Appropriate keys for well cap locks
- Steel brush
- HNU or OVA (whichever is most appropriate)
- Logbook
- Calculator
- Field data sheets and samples labels

- Chain of custody records and seals
- Sample containers
- Engineer's rule
- Sharp knife (locking blade)
- Tool box (to include at least: screwdrivers, pliers, hacksaw, hammer, flashlight, adjustable wrench)
- Leather work gloves
- Appropriate Health & Safety gear
- 5-gallon pail
- Plastic sheeting
- Shipping containers
- Packing materials
- Bolt cutters
- Ziploc plastic bags
- Containers for evacuation liquids
- Decontamination solutions
- Tap water
- Non phosphate soap
- Several brushes
- Pails or tubs
- Aluminum foil
- Garden sprayer
- Preservatives
- Distilled or deionized water
- Fire extinguisher (if using a generator for your power source)

5.1.2 Bailers

- Clean, decontaminated bailers of appropriate size and construction material
- Nylon line, enough to dedicate to each well
- Teflon coated bailer wire
- Sharp knife
- Aluminum foil (to wrap clean bailers)
- Five gallon bucket

5.1.3 Submersible Pump

- Pump(s)
- Generator (110, 120, or 240 volt) or 12 volt battery if inaccessible to field vehicle - amp meter is useful
- 1" black PVC coil tubing - enough to dedicate to each well
- Hose clamps
- Safety cable
- Tool box supplement
  - pipe wrenches
  - wire strippers
  - electrical tape
  - heat shrink
  - hose connectors
  - Teflon tape
- Winch, pulley or hoist
- Gasoline for generator/gas can
- Flow meter with gate valve
- 1" nipples and various plumbing (i.e., pipe connectors)
- Control box (if necessary)

5.1.4 Non-Gas Contact Bladder Pump

- Non-gas contact bladder pump
- Compressor or nitrogen gas tank
- Batteries and charger
- Teflon tubing - enough to dedicate to each well
- Swagelock fitting
- Toolbox supplements - same as submersible pump
- Control box (if necessary)

5.1.5 Suction Pump

- Pump
- 1" black PVC coil tubing - enough to dedicate to each well
- Gasoline - if required
- Toolbox
- Plumbing fittings
- Flow meter with gate valve

5.1.6 Inertia Pump

- Pump assembly (WaTerra pump, piston pump)
- Five gallon bucket

6.0 REAGENTS

Reagents may be utilized for preservation of samples and for decontamination of sampling equipment. The preservatives required are specified by the analysis to be performed. Decontamination solutions are specified in ERT SOP #2006, Sampling Equipment Decontamination.

7.0 PROCEDURE

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed (i.e, diameter and depth of wells to be sampled).

2. Obtain necessary sampling and monitoring equipment, appropriate to type of contaminant being investigated. For collection of volatile organic samples, refer to the work plan to ensure that 40 mL glass sample vials with Teflon lined septa are ordered and in sufficient numbers. Check sampling supplies; field kit for chlorine, preservatives, Parafilm, foam sleeves and coolers. Due to extreme trace levels at which volatile organics are detectable, cross contamination and introduction of contaminants must be avoided. Trip blanks are incorporated into the shipment package to provide a check against cross contamination.

3. Decontaminate or preclean equipment, and ensure that it is in working order.

4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.

6. Identify and mark all sampling locations.

7.2 Field Preparation

1. Start at the least contaminated well, if known.

2. Lay plastic sheeting around the well to minimize likelihood of contamination of equipment from soil adjacent to the well.

3. Remove locking well cap, note location, time of day, and date in field notebook or appropriate log form.

4. Remove well casing cap.

5. Screen headspace of well with an appropriate monitoring instrument to determine the presence of volatile organic compounds and record in site logbook.

6. Lower water level measuring device or equivalent (i.e., permanently installed transducers or airline) into well until water surface is encountered.

7. Measure distance from water surface to reference measuring point on well casing or protective barrier post and record in site logbook. Alternatively, if no reference point, note that water level measurement is from top of steel casing, top of PVC riser pipe, from ground surface, or some other position on the well head.

   If floating organics are of concern, this can be determined by measuring the water level with an oil/water interface probe which measures floating organics.

8. Measure total depth of well (at least twice to confirm measurement) and record in site logbook or on field data sheet.

9. Calculate the volume of water in the well and the volume to be purged using the calculations in Section 8.0.

10. Select the appropriate purging and sampling equipment.

11. If residual chlorine is suspected, use the Hach Field Test Kit for chlorine to determine if there is residual chlorine in the water to be sampled. If there is, treat the sample vial with a crystal of sodium thiosulfate prior to sample collection.

7.3 Purging

The amount of flushing a well receives prior to sample collection depends on the intent of the monitoring program as well as the hydrogeologic conditions. Programs where overall quality determination of water resources are involved may require long pumping periods to obtain a sample that is representative of a large volume of that aquifer. The pumped volume can be determined prior to sampling so that the sample is

a collected after a known volume of the water is evacuated from the aquifer, or the well can be pumped until the stabilization of parameters such as temperature, electrical conductance, pH, or turbidity has occurred.

However, monitoring for defining a contaminant plume requires a representative sample of a small volume of the aquifer. These circumstances require that the well be pumped enough to remove the stagnant water but not enough to induce flow from other areas. Generally, three well volumes are considered effective, or calculations can be made to determine, on the basis of the aquifer parameters and well dimensions, the appropriate volume to remove prior to sampling.

During purging, water level measurements may be taken regularly at 15-30 second intervals. This data may be used to compute aquifer transmissivity and other hydraulic characteristics. The following well evacuation devices are most commonly used. Other evacuation devices are available, but have been omitted in this discussion due to their limited use.

7.3.1 Bailers

Bailers are the simplest purging device used and have many advantages. They generally consist of a rigid length of tube, usually with a ball check-valve at the bottom. A line is used to lower the bailer into the well and retrieve a volume of water. The three most common types of bailer are PVC, Teflon, and stainless steel.

This manual method of purging is best suited to shallow or narrow diameter wells. For deep, larger diameter wells which require evacuation of large volumes of water, other mechanical devices may be more appropriate.

7.3.1.1 Operation

Equipment needed will include a clean decontaminated bailer, Teflon or nylon line, a sharp knife, and plastic sheeting.

1. Determine the volume of water to be purged as described in 8.0, calculations.

2. Lay plastic sheeting around the well to prevent contamination of the bailer line with foreign materials.

3. Attach the line to the bailer and slowly lower until the bailer is completely submerged, being careful not to drop the bailer to the water, causing turbulence and the possible loss of volatile organic contaminants.

4. Pull bailer out ensuring that the line either falls onto a clean area of plastic sheeting or never touches the ground.

5. Empty the bailer into a pail until full to determine the number of bails necessary to achieve the required purge volume.

6. Thereafter, pour the water into a container and dispose of purge waters as specified in the site specific sampling plan.

7.3.2 Submersible Pumps

The use of submersible pumps for sample collection is permissible provided they are constructed of suitably noncontaminating materials. The chief drawback, however, is the difficulty avoiding cross-contamination between wells. Although some units can be disassembled easily to allow surfaces contacted by contaminants to be cleaned, field decontamination may be difficult and require solvents that can affect sample analysis. The use of submersible pumps in multiple well-sampling programs, therefore, should be carefully considered against other sampling mechanisms (bailers, bladder pumps). In most cases, a sample can be collected by bailer after purging with a submersible pump, however, submersible pumps may be the only practical sampling device for extremely deep wells (greater than 300 feet of water). Under those conditions, dedicated pump systems should be installed to eliminate the potential for cross-contamination of well samples.

Submersible pumps generally use one of two types of power supplies, either electric or compressed gas or air. Electric powered pumps can run off a 12 volt DC rechargeable battery, or a 110 or 220 volt AC power supply. Those units powered by compressed air normally use a small electric or gas-powered air compressor. They may also utilize compressed gas (i.e., nitrogen) from bottles. Different size pumps are available for different depth or diameter monitoring wells.

7.3.2.1 Operation

1. Determine the volume of water to be purged as described in 8.0 Calculations.

2. Lay plastic sheeting around the well to prevent contamination of pumps, hoses or lines with foreign materials.

3. Assemble pump, hoses and safety cable, and lower the pump into the well. Make sure the pump is deep enough so all the water is not evacuated. (Running the pump without water may cause damage.)

4. Attach flow meter to the outlet hose to measure the volume of water purged.

5. Use a ground fault circuit interrupter (GFCI) or ground the generator to avoid possible electric shock.

6. Attach power supply, and purge the well until the specified volume of water has been evacuated (or until field parameters, such as temperature, pH, conductivity, etc, have stabilized). Do not allow the pump to run dry. If the pumping rate exceeds the well recharge rate, lower the pump further into the well, and continue pumping.

7. Collect and dispose of purge waters as specified in the site specific sampling plan.

7.3.3 Non-Contact Gas Bladder Pumps

For this procedure, an all stainless-steel and Teflon Middleburg-squeeze bladder pump (e.g., IEA, TIMCO, Well Wizard, Geoguard, and others) is used to provide the least amount of material interference to the sample (Barcelona, 1985). Water comes into contact with the inside of the bladder (Teflon) and the sample tubing, also Teflon, that may be dedicated to each well. Some wells may have permanently installed bladder pumps, (i.e., Well Wizard, Geoguard), that will be used to sample for all parameters.

7.3.3.1 Operation

1. Assemble Teflon tubing, pump and charged control box.

2. Procedure for purging with a bladder pump is the same as for a submersible pump (Section 7.3.2.1).

3. Be sure to adjust flow rate to prevent violent jolting of the hose as sample is drawn in.

7.3.4 Suction Pumps

There are many different types of suction pumps. They include: centrifugal, peristaltic and diaphragm. Diaphragm pumps can be used for well evacuation at a fast pumping rate and sampling at a low pumping rate. The peristaltic pump is a low volume pump that uses rollers to squeeze the flexible tubing thereby creating suction. This tubing can be dedicated to a well to prevent cross contamination. Peristaltic pumps, however, require a power source.

7.3.4.1 Operation

1. Assembly of the pump, tubing, and power source if necessary.

2. Procedure for purging with a suction pump is exactly the same as for a submersible pump (Section 7.3.2.1).

7.3.5 Inertia Pumps

Inertia pumps such as the WaTerra pump and piston pump, are manually operated. They are most appropriate to use when wells are too deep to bail by hand, or too shallow or narrow (or inaccessible) to warrant an automatic (submersible, etc.) pump. These pumps are made of plastic and may be either decontaminated or discarded.

7.3.5.1 Operation

1. Determine the volume of water to be purged as described in 8.0, Calculations.

2. Lay plastic sheeting around the well to prevent contamination of pumps or hoses with foreign materials.

3. Assemble pump and lower to the appropriate depth in the well.

4. Begin pumping manually, discharging water into a 5 gallon bucket (or other graduated vessel). Purge until specified volume of water has been evacuated (or until field parameters such as temperature, pH,

conductivity, etc. have stabilized).

5. Collect and dispose of purge waters as specified in the site specific project plan.

7.4 Sampling

Sample withdrawal methods require the use of pumps, compressed air, bailers, and samplers. Ideally, purging and sample withdrawal equipment should be completely inert, economical to manufacture, easily cleaned, sterilized, reusable, able to operate at remote sites in the absence of power resources, and capable of delivering variable rates for sample collection.

There are several factors to take into consideration when choosing a sampling device. Care should be taken when reviewing the advantages or disadvantages of any one device. It may be appropriate to use a different device to sample than that which was used to purge. The most common example of this is the use of a submersible pump to purge and a bailer to sample.

7.4.1 Bailers

The positive-displacement volatile sampling bailer is perhaps the most appropriate for collection of water samples for volatile analysis. Other bailer types (messenger, bottom fill, etc.) are less desirable, but may be mandated by cost and site conditions.

7.4.1.1 Operation

1. Surround the monitor well with clean plastic sheeting. If using the GPI bailer, insert a vial into the claim and assemble the unit.

2. Attach a line to a clean decontaminated bailer.
3. Lower the bailer slowly and gently into the well, taking care not to shake the casing sides or to splash the bailer into the water. Stop lowering at a point adjacent to the screen.

4. Allow bailer to fill and then slowly and gently retrieve the bailer from the well avoiding contact with the casing, so as not to knock flakes of rust or other foreign materials into the bailer. If using the GPI bailer for collecting volatile organic samples, once at the surface, remove the bailer from the cable. Carefully open the GPI bailer unit and remove the vial. Begin slowly pouring from the bailer, and collect the duplicate samples from the midstream sample.

5. Remove the cap from the sample container and place it on the plastic sheet or in a location where it won't become contaminated. See Section 7.7 for special considerations on VOA samples.

6. Begin slowly pouring from the bailer.

7. Filter and preserve samples as required by sampling plan.

8. Cap the sample container tightly and place prelabeled sample container in a carrier.

9. Replace the well cap.

10. Log all samples in the site logbook and on field data sheets and label all samples.

11. Package samples and complete necessary paperwork.

12. Transport sample to decontamination zone for preparation for transport to analytical laboratory.

7.4.2 Submersible Pumps

Although it is recommended that samples not be collected with a submersible pump due to the reasons stated in Section 4.4.2, there are some situations where they may be used.

7.4.2.1 Operation

1. Allow the monitor well to recharge after purging, keeping the pump just above screened section.

2. Attach gate valve to hose (if not already fitted), and reduce flow of water to a manageable sampling rate.

3. Assemble the appropriate bottles.

4. If no gate valve is available, run the water

down the side of a clean jar and fill the sample bottles from the jar.

5. Cap the sample container tightly and place prelabeled sample container in a carrier.

6. Replace the well cap.

7. Log all samples in the site logbook and on the field data sheets and label all samples.

8. Package samples and complete necessary paperwork.

9. Transport sample to decontamination zone for preparation for transport to the analytical laboratory.

10. Upon completion, remove pump and assembly and fully decontaminate prior to setting into the next sample well. Dedicate the tubing to the hole.

7.4.3 Non-Contact Gas Bladder Pumps

The use of a non-contact gas positive displacement bladder pump is often mandated by the use of dedicated pumps installed in wells. These pumps are also suitable for shallow (less than 100 feet) wells. They are somewhat difficult to clean, but may be used with dedicated sample tubing to avoid cleaning. These pumps require a power supply and a compressed gas supply (or compressor). They may be operated at variable flow and pressure rates making them ideal for both purging and sampling.

Barcelona (1984) and Nielsen (1985) report that the non-contact gas positive displacement pumps cause the least amount of alteration in sample integrity as compared to other sample retrieval methods.

7.4.3.1 Operation

1. Allow well to recharge after purging.

2. Assemble the appropriate bottles.

3. Turn pump on, increase the cycle time and reduce the pressure to the minimum that will allow the sample to come to the surface.

4. Cap the sample container tightly and place prelabeled sample container in a carrier.

5. Replace the well cap.

6. Log all samples in the site logbook and on field data sheets and label all samples.

7. Package samples and complete necessary paperwork.

8. Transport sample to decontamination zone for preparation for transport to analytical laboratory.

9. On completion, remove the tubing from the well and either replace the Teflon tubing and bladder with new dedicated tubing and bladder or rigorously decontaminate the existing materials.

10. Nonfiltered samples shall be collected directly from the outlet tubing into the sample bottle.

11. For filtered samples, connect the pump outlet tubing directly to the filter unit. The pump pressure should remain decreased so that the pressure build up on the filter does not blow out the pump bladder or displace the filter. For the Geotech barrel filter, no actual connections are necessary so this is not a concern.

7.4.4 Suction Pumps

In view of the limitations of these type pumps, they are not recommended for sampling purposes.

7.4.5 Inertia Pumps

Inertia pumps may be used to collect samples. It is more common, however, to purge with these pumps and sample with a bailer (Section 7.4.1).

7.4.5.1 Operation

1. Following well evacuation, allow the well to recharge.

2. Assemble the appropriate bottles.

3. Since these pumps are manually operated,

the flow rate may be regulated by the sampler. The sample may be discharged from the pump outlet directly into the appropriate sample container.

4. Cap the sample container tightly and place prelabeled sample container in a carrier.

5. Replace the well cap.

6. Log all samples in the site logbook and on field data sheets and label all samples.

7. Package samples and complete necessary paperwork.

8. Transport sample to decontamination zone for preparation for transport to the analytical laboratory.

9. Upon completion, remove pump and decontaminate or discard, as appropriate.

7.4.6. Sample Retrieval - Syringe

A limited number of commercial syringe type samplers are available, (IEA, TIMCO, etc.) some are homemade devices. These devices are claimed to provide good quality samples for volatile analysis, but are severly limited in sample volume and are specific to sampling for volatiles. Essentially, they operated with an evacuated chamber that is lowered down the well, and allowed to fill with the pressure of the water. The entire mechanism is then brought to the surface with the sample. The sample may then be transferred to a sample vial, or the entire unit may be sent as the sample container.

1. Evacuate the syringe if necessary, and lower the sampling device to just below the well screen.

2. Remove the constriction from the device and allow the sample to fill the syringe, apply slight suction as necessary.

3. Bring unit to the surface. If necessary, transfer the sample to vials, as outlined in steps 2 through 7 above.

7.5 Filtering

For samples requiring filtering, such as total metals analysis, the filter must be decontaminated prior to and between uses. Filters work by two methods. A barrel filter such as the "Geotech" filter works with a bicycle pump, used to build up positive pressure in the chamber containing the sample which is then forced through the filter paper (minimum size 0.45 µm) into a jar placed underneath. The barrel itself is filled manually from the bailer or directly via the hose of the sampling pump. The pressure must be maintained up to 30 lbs/in^2 by periodic pumping.

A vacuum type filter involves two chambers; the upper chamber contains the sample and a filter (minimum size 0.45 µm) divides the chambers. Using a hand pump or a Gilian type pump, air is withdrawn from the lower chamber, creating a vacuum and thus causing the sample to move through the filter into the lower chamber where it is drained into a sample jar. Repeated pumping may be required to drain all the sample into the lower chamber. If preservation of the sample is necessary, this should be done after filtering.

7.6 Post Operation

After all samples are collected and preserved, the sampling equipment should be decontaminated prior to sampling another well to prevent cross-contamination of equipment and monitor wells between locations.

1. Decontaminate all equipment.

2. Replace sampling equipment in storage containers.

3. Prepare and transport ground water samples to the laboratory. Check sample documentation and make sure samples are properly packed for shipment.

7.7 Special Considerations for VOA Sampling

The proper collection of a sample for volatile organics requires minimal disturbance of the sample to limit volatilization and therefore a loss of volatiles from the sample.

Sample retrieval systems suitable for the valid collection of volatile organic samples are: positive displacement bladder pumps, gear driven submersible pumps, syringe samplers and bailers (Barcelona, 1984; Nielsen, 1985). Field conditions and other constraints will limit the choice of appropriate systems. The focus of concern must be to provide a valid sample for analysis, one which has been subjected to the least amount of turbulence possible.

The following procedures should be followed:

1. Open the vial, set cap in a clean place, and collect the sample during the middle of the cycle. When collecting duplicates, collect both samples at the same time.

2. Fill the vial to just overflowing. Do not rinse the vial, nor excessively overflow it. There should be a convex meniscus on the top of the vial.

3. Check that the cap has not been contaminated (splashed) and carefully cap the vial. Place the cap directly over the top and screw down firmly. Do not overtighten and break the cap.

4. Invert the vial and tap gently. Observe vial for at least ten (10) seconds. If an air bubble appears, discard the sample and begin again. It is imperative that no entrapped air is in the sample vial.

5. Immediately place the vial in the protective foam sleeve and place into the cooler, oriented so that it is lying on its side, not straight up.

6. The holding time for VOAs is seven days. Samples should be shipped or delivered to the laboratory daily so as not to exceed the holding time. Ensure that the samples remain at 4EC, but do not allow them to freeze.

8.0 CALCULATIONS

If it is necessary to calculate the volume of the well, utilize the following equation:

$$\textit{Well volume} \;\; ' \;\; nr^2h\,(cf) \qquad [\textit{Equation } 1]$$

where:

n	=	pi
r	=	radius of monitoring well (feet)
h	=	height of the water column (feet) [This may be determined by subtracting the depth to water from the total depth of the well as measured from the same reference point.]
cf	=	conversion factor (gal/ft^3) = 7.48 gal/ft^3 [In this equation, 7.48 gal/ft^3 is the necessary conversion factor.]

Monitor well diameters are typically 2", 3", 4", or 6". Knowing the diameter of the monitor well, there are a number of standard conversion factors which can be used to simplify the equation above.

The volume, in gallons per linear foot, for various standard monitor well diameters can be calculated as follows:

$$v(gal/ft) \;\; ' \;\; nr^2\,(cf) \qquad [\textit{Equation } 2]$$

where:

n	=	pi
r	=	radius of monitoring well (feet)
cf	=	conversion factor (7.48 gal/ft^3)

For a 2" diameter well, the volume per linear foot can be calculated as follows:

$$\begin{aligned} vol/linear\ ft \;\; &' \;\; nr^2\,(cf) \qquad [\textit{Equation } 2] \\ &' \;\; 3.14\,(1/12\ ft)^2 \;\; 7.48\ gal/ft^3 \\ &' \;\; 0.1632\ gal/ft \end{aligned}$$

Remember that if you have a 2" diameter well, you must convert this to the radius in feet to be able to use the equation.

The conversion factors for the common size monitor wells are as follows:

Well diameter	2"	3"	4"	6"
Volume (gal/ft.)	0.1632	0.3672	0.6528	1.4688

If you utilize the conversion factors above, Equation

1 should be modified as follows:

$$\textit{Well volume} = (h)(cf) \qquad [\textit{Equation } 3]$$

where:

h	=	height of water column (feet)
cf	=	the conversion factor calculated from Equation 2

The well volume is typically tripled to determine the volume to be purged.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following general QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation and they must be documented.

3. The collection of rinsate blanks is recommended to evaluate potential for cross contamination from the purging and/or sampling equipment.

4. Trip blanks are required if analytical parameters include VOAs.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA or REAC health and safety guidelines. More specifically, depending upon the site specific contaminants, various protective programs must be implemented prior to sampling the first well. The site health and safety plan should be reviewed with specific emphasis placed on the protection program planned for the well sampling tasks. Standard safe operating practices should be followed such as minimizing contact with potential contaminants in both the vapor phase and liquid matrix through the use of respirators and disposable clothing.

When working around volatile organic contaminants:

1. Avoid breathing constituents venting from the well.

2. Pre-survey the well head-space with an FID/PID prior to sampling.

3. If monitoring results indicate organic constituents, sampling activities may be conducted in Level C protection. At a minimum, skin protection will be afforded by disposable protective clothing.

Physical hazards associated with well sampling:

1. Lifting injuries associated with pump and bailers retrieval; moving equipment.

2. Use of pocket knives for cutting discharge hose.

3. Heat/cold stress as a result of exposure to extreme temperatures and protective clothing.

4. Slip, trip, fall conditions as a result of pump discharge.

5. Restricted mobility due to the wearing of protective clothing.

6. Electrical shock associated with use of submersible pumps is possible. Use a GFCI or a copper grounding stake to avoid this problem.

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APPENDIX E
EPA ERT SOP No. 2006: Sampling Equipment Decontamination

SAMPLING EQUIPMENT DECONTAMINATION

SOP#: 2006
DATE: 08/11/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide a description of the methods used for preventing, minimizing, or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination and to provide general guidelines for developing decontamination procedures for sampling equipment to be used during hazardous waste operations as per 29 Code of Federal Regulations (CFR) 1910.120. This SOP does not address personnel decontamination.

These are standard (i.e. typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitation, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Removing or neutralizing contaminants from equipment minimizes the likelihood of sample cross contamination, reduces or eliminates transfer of contaminants to clean areas, and prevents the mixing of incompatible substances.

Gross contamination can be removed by physical decontamination procedures. These abrasive and non-abrasive methods include the use of brushes, air and wet blasting, and high and low pressure water cleaning.

The first step, a soap and water wash, removes all visible particulate matter and residual oils and grease. This may be preceded by a steam or high pressure water wash to facilitate residuals removal. The second step involves a tap water rinse and a distilled/deionized water rinse to remove the detergent. An acid rinse provides a low pH media for trace metals removal and is included in the decontamination process if metal samples are to be collected. It is followed by another distilled/deionized water rinse. If sample analysis does not include metals, the acid rinse step can be omitted. Next, a high purity solvent rinse is performed for trace organics removal if organics are a concern at the site. Typical solvents used for removal of organic contaminants include acetone, hexane, or water. Acetone is typically chosen because it is an excellent solvent, miscible in water, and not a target analyte on the Priority Pollutant List. If acetone is known to be a contaminant of concern at a given site or if Target Compound List analysis (which includes acetone) is to be performed, another solvent may be substituted. The solvent must be allowed to evaporate completely and then a final distilled/deionized water rinse is performed. This rinse removes any residual traces of the solvent.

The decontamination procedure described above may be summarized as follows:

1. Physical removal
2. Non-phosphate detergent wash
3. Tap water rinse
4. Distilled/deionized water rinse
5. 10% nitric acid rinse
6. Distilled/deionized water rinse
7. Solvent rinse (pesticide grade)
8. Air dry
9. Distilled/deionized water rinse

If a particular contaminant fraction is not present at the site, the nine (9) step decontamination procedure specified above may be modified for site specificity. For example, the nitric acid rinse may be eliminated if metals are not of concern at a site. Similarly, the solvent rinse may be eliminated if organics are not of

concern at a site. Modifications to the standard procedure should be documented in the site specific work plan or subsequent report.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample to be collected and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest.
More specifically, sample collection and analysis of decontamination waste may be required before beginning proper disposal of decontamination liquids and solids generated at a site. This should be determined prior to initiation of site activities.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

- The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be analyte free (specifically for the contaminants of concern).

- The use of an untreated potable water supply is not an acceptable substitute for tap water. Tap water may be used from any municipal or industrial water treatment system.

- If acids or solvents are utilized in decontamination they raise health and safety, and waste disposal concerns.

- Damage can be incurred by acid and solvent washing of complex and sophisticated sampling equipment.

5.0 EQUIPMENT/APPARATUS

Decontamination equipment, materials, and supplies are generally selected based on availability. Other considerations include the ease of decontaminating or disposing of the equipment. Most equipment and supplies can be easily procured. For example, soft-bristle scrub brushes or long-handled bottle brushes can be used to remove contaminants. Large galvanized wash tubs, stock tanks, or buckets can hold wash and rinse solutions. Children's wading pools can also be used. Large plastic garbage cans or other similar containers lined with plastic bags can help segregate contaminated equipment. Contaminated liquid can be stored temporarily in metal or plastic cans or drums.

The following standard materials and equipment are recommended for decontamination activities:

5.1 Decontamination Solutions

- Non-phosphate detergent
- Selected solvents (acetone, hexane, nitric acid, etc.)
- Tap water
- Distilled or deionized water

5.2 Decontamination Tools/Supplies

- Long and short handled brushes
- Bottle brushes
- Drop cloth/plastic sheeting
- Paper towels
- Plastic or galvanized tubs or buckets
- Pressurized sprayers (H_2O)
- Solvent sprayers
- Aluminum foil

5.3 Health and Safety Equipment

Appropriate personal protective equipment (i.e., safety glasses or splash shield, appropriate gloves, aprons or coveralls, respirator, emergency eye wash)

5.4 Waste Disposal

- Trash bags
- Trash containers
- 55-gallon drums
- Metal/plastic buckets/containers for storage and disposal of decontamination solutions

6.0 REAGENTS

There are no reagents used in this procedure aside from the actual decontamination solutions. Table 1 (Appendix A) lists solvent rinses which may be required for elimination of particular chemicals. In

general, the following solvents are typically utilized for decontamination purposes:

- 10% nitric acid is typically used for inorganic compounds such as metals. An acid rinse may not be required if inorganics are not a contaminant of concern.
- Acetone (pesticide grade)[1]
- Hexane (pesticide grade)[1]
- Methanol[1]

[1] - Only if sample is to be analyzed for organics.

7.0 PROCEDURES

As part of the health and safety plan, a decontamination plan should be developed and reviewed. The decontamination line should be set up before any personnel or equipment enter the areas of potential exposure. The equipment decontamination plan should include:

- The number, location, and layout of decontamination stations.
- Decontamination equipment needed.
- Appropriate decontamination methods.
- Methods for disposal of contaminated clothing, equipment, and solutions.
- Procedures can be established to minimize the potential for contamination. This may include: (1) work practices that minimize contact with potential contaminants; (2) using remote sampling techniques; (3) covering monitoring and sampling equipment with plastic, aluminum foil, or other protective material; (4) watering down dusty areas; (5) avoiding laying down equipment in areas of obvious contamination; and (6) use of disposable sampling equipment.

7.1 Decontamination Methods

All samples and equipment leaving the contaminated area of a site must be decontaminated to remove any contamination that may have adhered to equipment. Various decontamination methods will remove contaminants by: (1) flushing or other physical action, or (2) chemical complexing to inactivate contaminants by neutralization, chemical reaction, disinfection, or sterilization.

Physical decontamination techniques can be grouped into two categories: abrasive methods and non-abrasive methods, as follows:

7.1.1 Abrasive Cleaning Methods

Abrasive cleaning methods work by rubbing and wearing away the top layer of the surface containing the contaminant. The mechanical abrasive cleaning methods are most commonly used at hazardous waste sites. The following abrasive methods are available:

<u>Mechanical</u>

Mechanical methods of decontamination include using metal or nylon brushes. The amount and type of contaminants removed will vary with the hardness of bristles, length of time brushed, degree of brush contact, degree of contamination, nature of the surface being cleaned, and degree of contaminant adherence to the surface.

<u>Air Blasting</u>

Air blasting equipment uses compressed air to force abrasive material through a nozzle at high velocities. The distance between nozzle and surface cleaned, air pressure, time of application, and angle at which the abrasive strikes the surface will dictate cleaning efficiency. Disadvantages of this method are the inability to control the amount of material removed and the large amount of waste generated.

<u>Wet Blasting</u>

Wet blast cleaning involves use of a suspended fine abrasive. The abrasive/water mixture is delivered by compressed air to the contaminated area. By using a very fine abrasive, the amount of materials removed can be carefully controlled.

7.1.2 Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods work by forcing the contaminant off a surface with pressure. In general, the equipment surface is not removed using non-abrasive methods.

Low-Pressure Water

This method consists of a container which is filled with water. The user pumps air out of the container to create a vacuum. A slender nozzle and hose allow the user to spray in hard-to-reach places.

High-Pressure Water

This method consists of a high-pressure pump, an operator controlled directional nozzle, and a high-pressure hose. Operating pressure usually ranges from 340 to 680 atmospheres (atm) and flow rates usually range from 20 to 140 liters per minute.

Ultra-High-Pressure Water

This system produces a water jet that is pressured from 1,000 to 4,000 atmospheres. This ultra-high-pressure spray can remove tightly-adhered surface films. The water velocity ranges from 500 meters/second (m/s) (1,000 atm) to 900 m/s (4,000 atm). Additives can be used to enhance the cleaning action.

Rinsing

Contaminants are removed by rinsing through dilution, physical attraction, and solubilization.

Damp Cloth Removal

In some instances, due to sensitive, non-waterproof equipment or due to the unlikelihood of equipment being contaminated, it is not necessary to conduct an extensive decontamination procedure. For example, air sampling pumps hooked on a fence, placed on a drum, or wrapped in plastic bags are not likely to become heavily contaminated. A damp cloth should be used to wipe off contaminants which may have adhered to equipment through airborne contaminants or from surfaces upon which the equipment was set.

Disinfection/Sterilization

Disinfectants are a practical means of inactivating infectious agents. Unfortunately, standard sterilization methods are impractical for large equipment. This method of decontamination is typically performed off-site.

7.2 Field Sampling Equipment Decontamination Procedures

The decontamination line is setup so that the first station is used to clean the most contaminated item. It progresses to the last station where the least contaminated item is cleaned. The spread of contaminants is further reduced by separating each decontamination station by a minimum of three (3) feet. Ideally, the contamination should decrease as the equipment progresses from one station to another farther along in the line.

A site is typically divided up into the following boundaries: Hot Zone or Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ), and the Support or Safe Zone (SZ). The decontamination line should be setup in the Contamination Reduction Corridor (CRC) which is in the CRZ. Figure 1 (Appendix B) shows a typical contaminant reduction zone layout. The CRC controls access into and out of the exclusion zone and confines decontamination activities to a limited area. The CRC boundaries should be conspicuously marked. The far end is the hotline, the boundary between the exclusion zone and the contamination reduction zone. The size of the decontamination corridor depends on the number of stations in the decontamination process, overall dimensions of the work zones, and amount of space available at the site. Whenever possible, it should be a straight line.

Anyone in the CRC should be wearing the level of protection designated for the decontamination crew. Another corridor may be required for the entry and exit of heavy equipment. Sampling and monitoring equipment and sampling supplies are all maintained outside of the CRC. Personnel don their equipment away from the CRC and enter the exclusion zone through a separate access control point at the hotline. One person (or more) dedicated to decontaminating equipment is recommended.

7.2.1 Decontamination Setup

Starting with the most contaminated station, the decontamination setup should be as follows:

Station 1: Segregate Equipment Drop

Place plastic sheeting on the ground (Figure 2, Appendix B). Size will depend on amount of

equipment to be decontaminated. Provide containers lined with plastic if equipment is to be segregated. Segregation may be required if sensitive equipment or mildly contaminated equipment is used at the same time as equipment which is likely to be heavily contaminated.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

As indicated in 7.1.2, a high-pressure wash may be required for compounds which are difficult to remove by washing with brushes. The elevated temperature of the water from the high-pressure washers is excellent at removing greasy/oily compounds. High pressure washers require water and electricity.

A decontamination pad may be required for the high-pressure wash area. An example of a wash pad may consist of an approximately 1 1/2 foot-deep basin lined with plastic sheeting and sloped to a sump at one corner. A layer of sand can be placed over the plastic and the basin is filled with gravel or shell. The sump is also lined with visqueen and a barrel is placed in the hole to prevent collapse. A sump pump is used to remove the water from the sump for transfer into a drum.

Typically heavy machinery is decontaminated at the end of the day unless site sampling requires that the machinery be decontaminated frequently. A separate decontamination pad may be required for heavy equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Prior to setting up Station 3, place plastic sheeting on the ground to cover areas under Station 3 through Station 10.
Fill a wash basin, a large bucket, or child's swimming pool with non-phosphate detergent and tap water. Several bottle and bristle brushes to physically remove contamination should be dedicated to this station . Approximately 10 - 50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 4: Water Basin

Fill a wash basin, a large bucket, or child's swimming pool with tap water. Several bottle and bristle brushes should be dedicated to this station. Approximately 10-50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 5: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to contain the water during the rinsing process. Approximately 10-20 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 6: Nitric Acid Sprayers

Fill a spray bottle with 10% nitric acid. An acid rinse may not be required if inorganics are not a contaminant of concern. The amount of acid will depend on the amount of equipment to be decontaminated. Provide a 5-gallon bucket or basin to collect acid during the rinsing process.

Station 7: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 8: Organic Solvent Sprayers

Fill a spray bottle with an organic solvent. After each solvent rinse, the equipment should be rinsed with distilled/deionized water and air dried. Amount of solvent will depend on the amount of equipment to decontaminate. Provide a 5-gallon bucket or basin to collect the solvent during the rinsing process.

Solvent rinses may not be required unless organics are a contaminant of concern, and may be eliminated from the station sequence.

Station 9: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 10: Clean Equipment Drop

Lay a clean piece of plastic sheeting over the bottom

plastic layer. This will allow easy removal of the plastic in the event that it becomes dirty. Provide aluminum foil, plastic, or other protective material to wrap clean equipment.

7.2.2 Decontamination Procedures

Station 1: Segregate Equipment Drop

Deposit equipment used on-site (i.e., tools, sampling devices and containers, monitoring instruments radios, clipboards, etc.) on the plastic drop cloth/sheet or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross contamination. Loose leaf sampling data sheets or maps can be placed in plastic zip lock bags if contamination is evident.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

Use high pressure wash on grossly contaminated equipment. Do not use high- pressure wash on sensitive or non-waterproof equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Scrub equipment with soap and water using bottle and bristle brushes. Only sensitive equipment (i.e., radios, air monitoring and sampling equipment) which is waterproof should be washed. Equipment which is not waterproof should have plastic bags removed and wiped down with a damp cloth. Acids and organic rinses may also ruin sensitive equipment. Consult the manufacturers for recommended decontamination solutions.

Station 4: Equipment Rinse

Wash soap off of equipment with water by immersing the equipment in the water while brushing. Repeat as many times as necessary.

Station 5: Low-Pressure Rinse

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 6: Nitric Acid Sprayers (required only if metals are a contaminant of concern)

Using a spray bottle rinse sampling equipment with nitric acid. Begin spraying (inside and outside) at one end of the equipment allowing the acid to drip to the other end into a 5-gallon bucket. A rinsate blank may be required at this station. Refer to Section 9.

Station 7: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 8: Organic Solvent Sprayers

Rinse sampling equipment with a solvent. Begin spraying (inside and outside) at one end of the equipment allowing the solvent to drip to the other end into a 5-gallon bucket. Allow the solvent to evaporate from the equipment before going to the next station. A QC rinsate sample may be required at this station.

Station 9: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure washer.

Station 10 : Clean Equipment Drop

Lay clean equipment on plastic sheeting. Once air dried, wrap sampling equipment with aluminum foil, plastic, or other protective material.

7.2.3 Post Decontamination Procedures

1. Collect high-pressure pad and heavy equipment decontamination area liquid and waste and store in appropriate drum or container. A sump pump can aid in the collection process. Refer to the Department of Transportation (DOT) requirements for appropriate containers based on the contaminant of concern.

2. Collect high-pressure pad and heavy equipment decontamination area solid waste and store in appropriate drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

3. Empty soap and water liquid wastes from basins and buckets and store in appropriate

drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

4. Empty acid rinse waste and place in appropriate container or neutralize with a base and place in appropriate drum. pH paper or an equivalent pH test is required for neutralization. Consult DOT requirements for appropriate drum for acid rinse waste.

5. Empty solvent rinse sprayer and solvent waste into an appropriate container. Consult DOT requirements for appropriate drum for solvent rinse waste.

6. Using low-pressure sprayers, rinse basins, and brushes. Place liquid generated from this process into the wash water rinse container.

7. Empty low-pressure sprayer water onto the ground.

8. Place all solid waste materials generated from the decontamination area (i.e., gloves and plastic sheeting, etc.) in an approved DOT drum. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

9. Write appropriate labels for waste and make arrangements for disposal. Consult DOT regulations for the appropriate label for each drum generated from the decontamination process.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITYASSURANCE/ QUALITY CONTROL

A rinsate blank is one specific type of quality control sample associated with the field decontamination process. This sample will provide information on the effectiveness of the decontamination process employed in the field.

Rinsate blanks are samples obtained by running analyte free water over decontaminated sampling equipment to test for residual contamination. The blank water is collected in sample containers for handling, shipment, and analysis. These samples are treated identical to samples collected that day. A rinsate blank is used to assess cross contamination brought about by improper decontamination procedures. Where dedicated sampling equipment is not utilized, collect one rinsate blank per day per type of sampling device samples to meet QA2 and QA3 objectives.

If sampling equipment requires the use of plastic tubing it should be disposed of as contaminated and replaced with clean tubing before additional sampling occurs.

10.0 DATA VALIDATION

Results of quality control samples will be evaluated for contamination. This information will be utilized to qualify the environmental sample results in accordance with the project's data quality objectives.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow OSHA, U.S. EPA, corporate, and other applicable health and safety procedures.

Decontamination can pose hazards under certain circumstances. Hazardous substances may be incompatible with decontamination materials. For example, the decontamination solution may react with contaminants to produce heat, explosion, or toxic products. Also, vapors from decontamination solutions may pose a direct health hazard to workers by inhalation, contact, fire, or explosion.

The decontamination solutions must be determined to be acceptable before use. Decontamination materials may degrade protective clothing or equipment; some solvents can permeate protective clothing. If decontamination materials do pose a health hazard, measures should be taken to protect personnel or substitutions should be made to eliminate the hazard. The choice of respiratory protection based on contaminants of concern from the site may not be appropriate for solvents used in the decontamination process.

Safety considerations should be addressed when using abrasive and non-abrasive decontamination

equipment. Maximum air pressure produced by abrasive equipment could cause physical injury. Displaced material requires control mechanisms.

Material generated from decontamination activities requires proper handling, storage, and disposal. Personal Protective Equipment may be required for these activities.

Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard (i.e., acetone, alcohol, and trisodiumphosphate).

In some jurisdictions, phosphate containing detergents (i.e., TSP) are banned.

12.0 REFERENCES

Field Sampling Procedures Manual, New Jersey Department of Environmental Protection, February, 1988.

A Compendium of Superfund Field Operations Methods, EPA 540/p-87/001.

Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, USEPA Region IV, April 1, 1986.

Guidelines for the Selection of Chemical Protective Clothing, Volume 1, Third Edition, American Conference of Governmental Industrial Hygienists, Inc., February, 1987.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, October, 1985.

APPENDIX A

Table

Table 1. Soluble Contaminants and Recommended Solvent Rinse

TABLE 1 Soluble Contaminants and Recommended Solvent Rinse		
SOLVENT[1]	EXAMPLES OF SOLVENTS	SOLUBLE CONTAMINANTS
Water	Deionized water Tap water	Low-chain hydrocarbons Inorganic compounds Salts Some organic acids and other polar compounds
Dilute Acids	Nitric acid Acetic acid Boric acid	Basic (caustic) compounds (e.g., amines and hydrazines)
Dilute Bases	Sodium bicarbonate (e.g., soap detergent)	Acidic compounds Phenol Thiols Some nitro and sulfonic compounds
Organic Solvents [2]	Alcohols Ethers Ketones Aromatics Straight chain alkalines (e.g., hexane) Common petroleum products (e.g., fuel, oil, kerosene)	Nonpolar compounds (e.g., some organic compounds)
Organic Solvent[2]	Hexane	PCBs

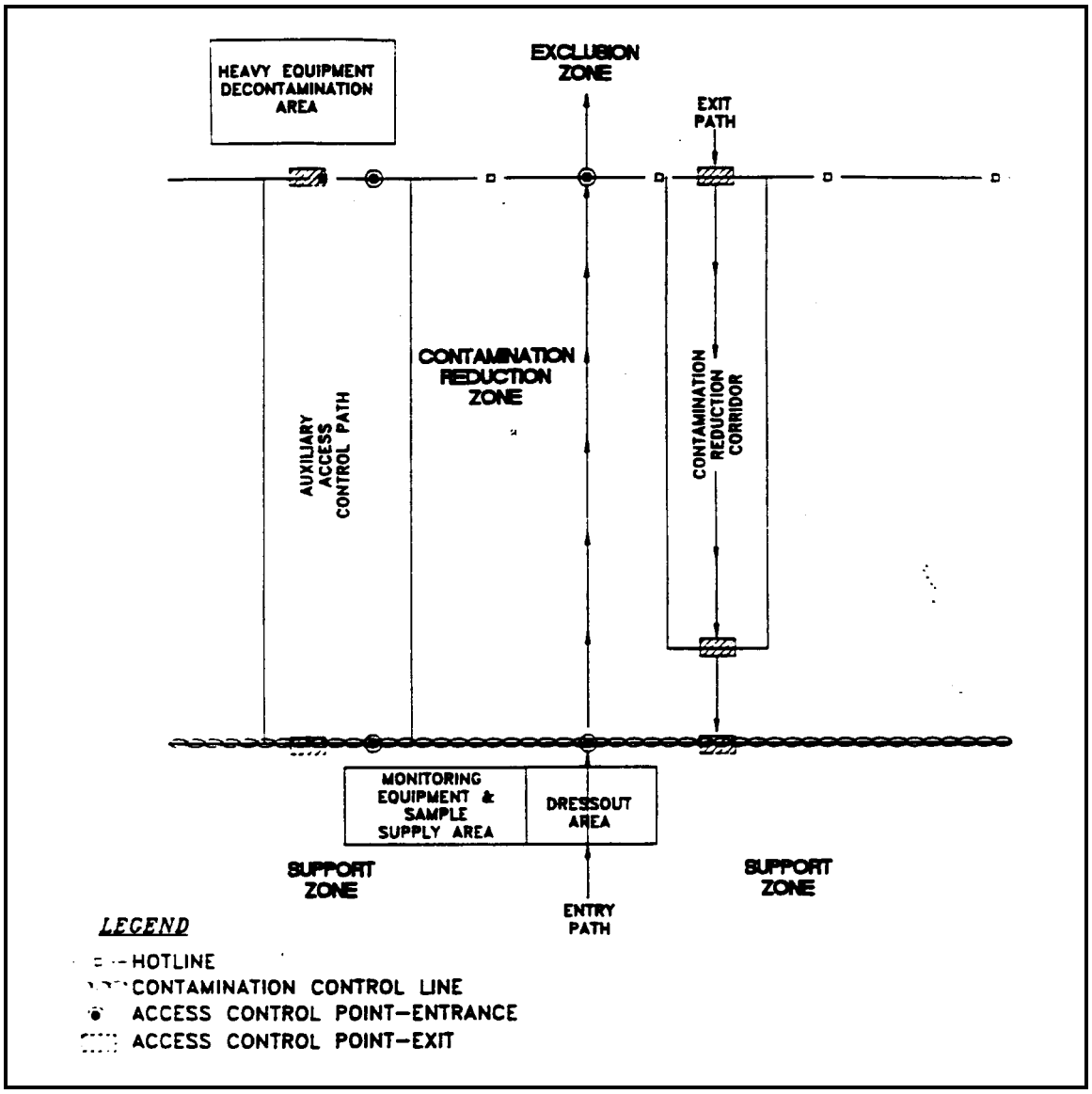
[1] - Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard

[2] - WARNING: Some organic solvents can permeate and/or degrade the protective clothing

APPENDIX B

Figures

Figure 1. Contamination Reduction Zone Layout



1.0 Introduction

As part of the scope of work for Technical Directive Document (TDD) No. TO-0009-08-01-01, the EPA Site Assessment Manager (SAM), requested the START contractor to review and provide technical comments pertaining to the Naismith Engineering, Inc. (NEI), May 2008 report entitled "*Supplemental Information for the EPA 2008 CERCLA Preliminary Assessment and Site Inspection*". The NEI report can be found as Reference No. 66 in the U.S. EPA 2009 Site Inspection Report. The NEI report was prepared on behalf of the Sherwin Alumina Company (SAC).

The comments focus on the air migration pathway portion of the NEI May 2008 report. The NEI report relates to the SAC 204 Facility that includes four red mud beds or lagoons, three of which are used to dispose of red mud generated from the production of alumina by the SAC Gregory facility. This review evaluates some of the NEI report references as needed for clarification of report contents, including calculations methods. Most of the NEI report focuses on Red Mud Beds (RMB) 1 and 2, which are the red mud beds nearest to the Leo Miller Road Site.

2.0 Technical Evaluation

The NEI report includes considerable emphasis on U.S. EPA's *"Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites"*, February 1985 manual. The manual provides methodology for rapid assessment (such as during an emergency response) of inhalation exposure of people living in the vicinity of a surface contamination site to respirable particulate emissions. Respirable particulate matter is defined to include airborne particles equal to or less than 10 µm aerodynamic diameter. Methods include site survey procedure, particulate emissions equations, procedures for mapping atmospheric contaminant concentration distributions using computer

modeling, and calculation of inhalation exposure. The quantitative procedures include simplifying assumptions about the contaminated surface and atmospheric environment so the approach can be used during an emergency response to obtain an assessment of potential atmospheric contamination in less than 24 hours. One basic assumption in the EPA manual is that uniform contamination of a symmetrical land area is present and that the concentration in respirable particulate emissions matches the bulk contaminant concentration in the surface material. The second basic assumption is that emission rates associated with wind and mechanical entrainment processes are continuous and steady. Other assumptions in the NEI report include: emission sources are modeled as either a 10 m x 10 m square or 100 m x 100 m square source size; meteorology at a site may be represented using average climatology date from U.S. climatic regions; and, that emissions are uniformly distributed over the area source. Of special interest for the SAC large RMB's, the manual states that emissions concentration estimates for the two assumed sizes were found to be reasonable approximations for other source sizes. Much of the NEI report calculations, terminology and rationale are based on the EPA manual (Ref. 69). Reference 70 contains the SAC emissions calculations that are based on the Reference 69 methods, assumptions, and equations.

It appears that some SAC red mud bed conditions do not match the EPA manual assumptions. Apparently there have been different facility owners; as a result, alumina production processes may have changed over time. Likewise, the geographical locations of bauxite ore sources have varied, possibly resulting in variations in chemical content. Also there may be or have been variations in the lagoon drying process and equipment. Additionally, the red mud lagoons are very large: the combined size of all 4 red mud beds is 3,416 acres, and the combined size of RMB's 1 and 2 is 2,316 acres. For those reasons, the red mud chemical concentrations may not be uniform throughout and could vary according to the location in a RMB. Also, it is not clear if there is a crust on the RMB's and, specifically, if RMB's 1 and 2 have similar surface characteristics. The NEI calculations group RMB's 1 and 2 together to form one emissions

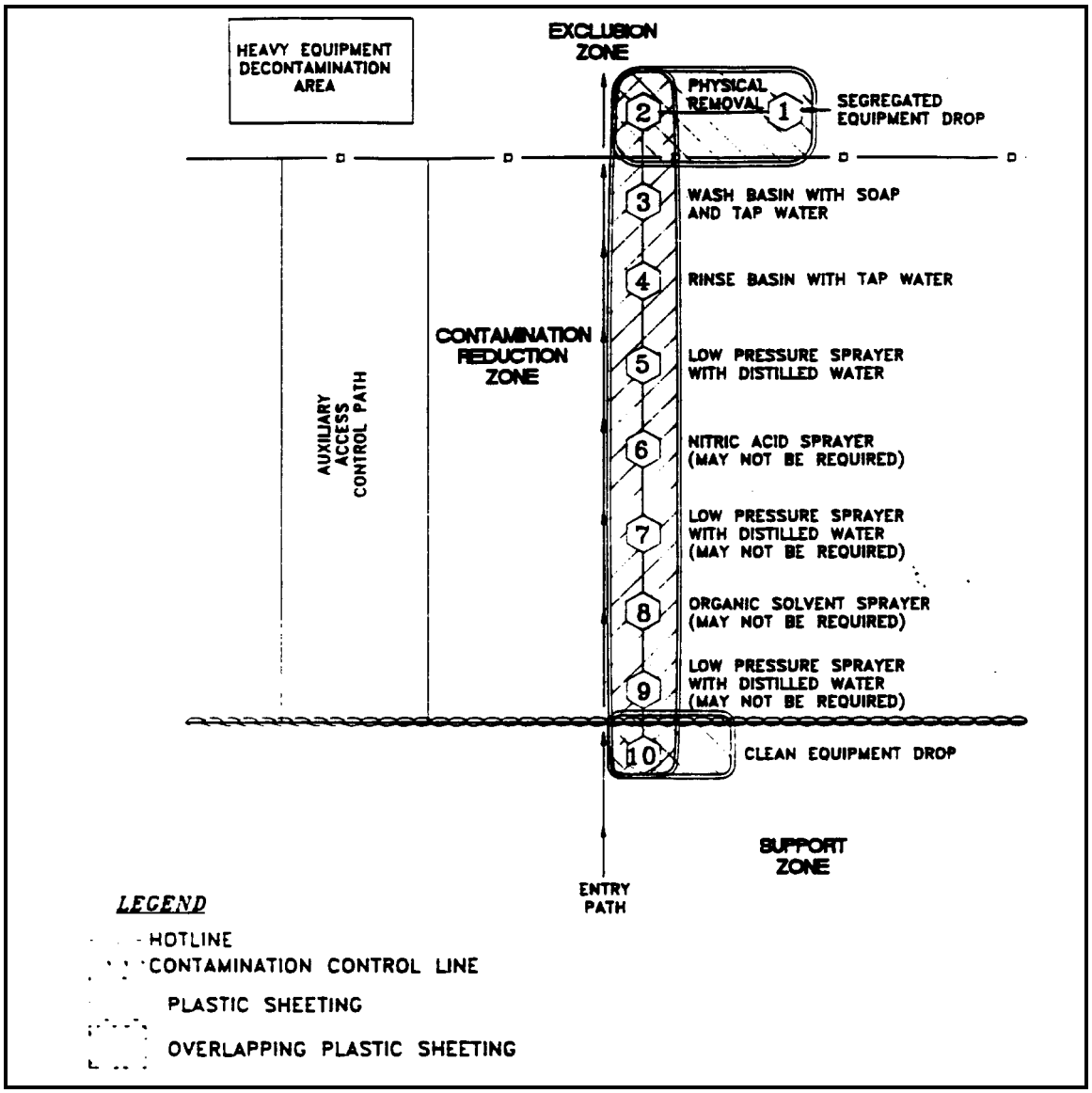
source, this would indicate NEI is assuming the surfaces of the two lagoons are similar. The NEI calculations assume that the surface is bare (no vegetation, rocks, etc.) and highly erodible, and that it is an "unlimited reservoir" of particulates.

Apparently the red mud is transported as a slurry, which might possibly vary in moisture content. There seems to be inconsistent information describing how the red mud is brought to the lagoons from the SAC facility in Gregory, TX: by underground pipeline and sent out through a vertical standpipe to form piles and/or by trucks from the SAC facility. The documentation provided by NEI did not reveal a description of the actual RMB drying process. The NEI calculations assume that emissions are generated by wind processes only and do not include emissions from mechanical re-suspension of particulates, including vehicle traffic on unpaved roads. However, if there is mechanical disturbance (such as scraping, grading, smoothing, etc.) of the lagoon surface that moves or turns over the surface material, that operation could result in exposure of fresh surface material and release significant amounts of particulates into the air. Also, if there is vehicle traffic on the lagoon areas, the traffic could also contribute particulate emissions if dust suppression methods are not used. If these types of RMB drying or loading operations are present, the emissions calculations should include the mechanical disturbance portion of the calculation equation to avoid under-estimating the particulate emissions.

APPENDIX B (Cont'd.)

Figures

Figure 2. Decontamination Layout



APPENDIX K

Evaluation of NEI's "*Supplemental Information for the EPA 2008 CERCLA Preliminary Assessment and Site Inspection*"

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