EXIDE TECHNOLOGIES World Leader in Electrical Energy Solutions

Exide Technologies
Frisco Smelter
P.O. Box 250
Frisco, TX 75034
Tel (972) 335-2121

July 8, 2013

Mr. Zak Covar
Executive Director
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78753

Sunita Singhvi, Chief
Compliance Enforcement Section (6EN-HE)
Compliance Assurance and Enforcement Division
U.S, EPA, Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733
Attention: Paul James

Order Compliance Team
Enforcement Division, MC 149A
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Attn: Mr. Gary Beyer, TCEQ
Mr. Bill Shafford, TCEQ

Subject: Exide Technologies Frisco Recycling Center, Frisco, Texas
TCEQ Agreed Order Docket No. 2011-1712-IHW-E; IHW Permit No. 50206; TCEQ SWR No. 30516
EPA Administrative Order on Consent RCRA 06-2012-0966
Certification of Compliance with Ordering Provision Deadlines to Date
Submission of Affected Property Assessment Report

Dear Mr. Covar and Ms. Singhvi,

Exide Technologies ("Exide") has taken actions at the Frisco Recycling Center in Frisco, Texas to comply with the ordering provisions of TCEQ Agreed Order Docket No. 2011-1712-IHW-E ("AO"), and EPA Administrative Order on Consent RCRA 06-2012-0966 ("EPA AOC"). Accordingly, Exide provides the following information regarding those actions and provides this written certification.

First, enclosed please find an Affected Property Assessment Report ("APAR"). In compliance with Section III.3.c.i-ii of the AO this submission is made within 150 days after the February 10, 2013 effective date of the AO and the APAR addresses investigation of the discharges located on the southwest corner, south side, and below the opening on the north face of the Slag Treatment Building, the east side of the South Disposal Area, at the drainage swale west of the Crystallizer, and the on-site portion of the Stewart Creek embankment, sediments, and surface water, as well as RCRA Facility Investigation units listed in IHW Permit No. 50206, PS IX.C, solid waste management units and areas identified by previous TCEQ and EPA investigations and any new releases discovered subsequent to issuance of the permit in October 1986.

The APAR is also submitted to EPA pursuant to the ordering provisions of the EPA AOC. The enclosed APAR incorporates the revised Site Investigation Report and addresses EPA comments on the July 12, 2012 Site Investigation Report.

Second, section III.3.c.iii of the AO requires that Exide dispose of the berm material located near the west side of the South Disposal Area at an authorized facility no later than 150 days after the effective date of the AO. Although not explicitly required by the AO, the TCEQ also required removal of berm material near the south side of the South Disposal Area. Removal activities in these areas commenced on April 11, 2013 and were completed on June 3, 2013. Attachment 1 includes documentation for this activity.

Finally, in accordance with Section III.3.c.iv of the AO Exide has implemented measures to ensure the integrity of the cover of the South Disposal Area. Those measures are described in Attachment 2. There is no untreated slag and refractory brick remaining at the Slag Treatment Building.

Sincerely,

Exide Technologies

Vanessa R Coleman

Vanessa Coleman
Site Manager

Attachments

CC: Mr. Gary Beyer – TCEQ – 2 copies
Mr. Bill Shafford – TCEQ
Ms. Margaret Ligarde – TCEQ
Mr. John Shelton – TCEQ
Mr. Chris Shaw – TCEQ
Mr. Paul James – EPA
Mr. Guy Tidmore – EPA
Mr. Jay Przyborski – EPA
Mr. Mack Borchardt – City of Frisco
Mr. Matthew Love – Exide Technologies
Ms. Aileen Hooks – Baker Botts
Waste Section Manager, Dallas/Fort Worth Regional Office, Texas Commission on Environmental Quality, 2309 Gravel Drive, Fort Worth, Texas 77118-6951

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

I certify that this document and all attachments were prepared under my direction or supervision. I certify that the information contained in or accompanying this submittal is true, accurate, and complete. I certify that this submittal and all attachments were prepared in compliance with the RCRA § 3013 Administrative Order on Consent entered into between EPA and Exide Technologies; docket number RCRA 06-2012-0966. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Vanessa R Coleman

Vanessa Coleman, Exide Technologies

State of Texas §
County of Dallas §

The foregoing instrument was subscribed and sworn before me this 5th day of July, 2013 by Vanessa Coleman.

Notary Public, State of Texas
My commission expires: July 28, 2015

BRIAN MICHAEL WHITE
MY COMMISSION EXPIRES
July 28, 2015

Attachment 1

PBW

Consulting Engineers
and Scientists

PASTOR, BEHLING & WHEELER, LLC
2201 Double Creek Drive, Suite 4004
Round Rock, TX 78664

Tel (512) 671-3434
Fax (512) 671-3446

July 9, 2013
PBW Project No. 1755

Ms. Vanessa Coleman
Site Manager
Exide Technologies
7471 S. 5th Street
Frisco, TX,

Subject: FRC Former Shooting Range Berm Removal Action

Dear Ms. Coleman:

The purpose of this letter is to document the removal and disposal of the Former Shooting Range Berm (SRB) as required by Ordering Provision 3.c.iii of the TCEQ Agreed Order effective February 10, 2013 (Docket No. 2011-1712-IHW-IHW-E). Although not explicitly required by the Agreed Order, the TCEQ also required the removal of berm material near the south side of the South Disposal Area (the South Berm). Removal actions for the SRB and South Berm were performed separately and are described separately below.

FORMER SHOOTING RANGE BERM REMOVAL ACTION

The removal of the SRB was performed in multiple phases as prescribed by the Shooting Range Berm Waste Characterization Sampling and Analysis Plan (SAP) dated March 29, 2013. The SAP called for the removal, segregation, characterization and disposal of the east face of the berm, composite characterization sampling of the remainder of the berm, then removal and disposal of the remainder of the berm. Following removal of the SRB, a TCEQ representative inspected the SRB and did not indicate that additional excavation was required to fulfill the requirements of the Agreed Order. The following summarizes activities associated with the removal of the SRB.

East Face of SRB

The SRB removal action began on April 11, 2013 with the excavation of the east face of the berm. The top of the berm was also excavated at this time. Prior to beginning the removal action, all trees and underbrush were removed at ground level and stockpiled on-site. Loose slag observed on the ground surface of the SRB was removed by hand and staged on-site prior to characterization sampling and disposal.

The east face of the berm was excavated to a nominal depth of approximately 1 foot below existing ground surface. The excavated material, including soil and root balls, was loaded into a haul truck using a track hoe and transferred to 20-cubic yard capacity hazardous waste roll-off boxes staged on the concrete Crystallizer access road within the Former Operating Plant boundary. Excavation of the east face of the berm was completed on April 13, 2013. Eighteen roll-off boxes were used to store the removed material. One 5-point composite sample was collected from each roll-off box for disposal characterization purposes. Composite sample results for four of the eighteen roll-off boxes tested hazardous. Exide elected to transport all of the roll-off boxes containing east face SRB material to EQ in Tulsa, Oklahoma under hazardous waste manifests for treatment to meet land disposal restrictions and for disposal.

Remainder of SRB
The portion of the SRB remaining after the east face and top had been removed was sampled for disposal characterization at the rate of one 7-point composite sample for every approximate 200 cubic yards of in-place soil, as described in the SAP. These composite samples were collected on April 16, 2013. All of the composite sample results were below Class 2 criteria and were classified for disposal as Class 2 non-hazardous.

Excavation of the remainder of the SRB was performed May 7, 2013 through May 10, 2013 by direct loading with a track hoe into 12-cubic yard capacity dump trucks. The excavated soil from the remainder of the berm was transported directly to the Waste Management DFW Landfill and disposed as Class 2 non-hazardous material.

Post Removal Soil Sampling
Post removal soil samples were collected on May 15, 2013, May 21, 2013, and June 3, 2013 from the footprint of the former SRB to assess soils remaining in this area. The SRB post removal soil sample data are presented in the APAR for the Former Operating Plant.

SOUTH BERM REMOVAL ACTION

The South Berm was excavated on June 3, 2013 using similar methods as those utilized in excavating the east face of the SRB. Prior to beginning the removal action, all trees and underbrush were removed at ground level and stockpiled on-site. Loose slag observed on the ground surface of the South Berm was removed by hand and staged on-site pending characterization sampling and disposal.

The area referred to as the South Berm is a rock cut bank where soil and rock were pushed up against an outcrop of the Austin Chalk. The South Berm was excavated to a nominal depth of approximately 1 foot below existing ground surface to bedrock exposure of the Austin Chalk. The excavated material, including soil and root balls, was loaded directly into 20-cubic yard capacity hazardous waste roll-off boxes using a track hoe, then transferred and staged on the concrete Crystallizer access road within the Former Operating Plant boundary. One 5-point composite sample was collected from each roll-off box for disposal characterization purposes. A total of 2 roll-off boxes were used to store the South Berm material pending results of disposal characterization. One of the two composite samples tested hazardous. Exide elected to transfer both roll-off boxes containing South Berm material to EQ in Tulsa, Oklahoma under hazardous waste manifests for treatment to meet land disposal restrictions and for disposal.

Post Removal Soil Sampling
Post removal soil samples were collected on June 3, 2013 from the footprint of the former South Berm to assess soils remaining in this area. The SRB post removal soil sample data are presented in the APAR for the Former Operating Plant.

Sincerely,

Pastor, Behling & Wheeler, LLC

For Tim Jennings, P.G.

Attachment 2

W&M ENVIRONMENTAL GROUP, INC.

July 5, 2013

Matt Love, Director, Global Environmental Remediation
Exide Technologies, Inc.
P.O. Box 14205
Reading, PA 19612-4205

RE: South Disposal Area Cap Repair Report
Exide Frisco Recycling Center
7471 South 5th Street - Frisco, Texas
TCEQ SWR No. 30516, TCEQ Hazardous Waste Permit No. HW-50206; TCEQ Agreed Order Docket No. 2011-1712-IHW-E; EPA ID No. TXD006451090;
W&M Project No. 112.072

Dear Mr. Love:

This letter summarizes the identification and repair of discrete areas of the South Disposal Area cap at Exide's Frisco Recycling Center located at 7471 South 5th Street in Frisco, Texas (refer to Location Plan, **Figure 1**).

BACKGROUND AND PROJECT SCOPE

W&M completed visual inspections of the Exide facility to identify the presence of furnace slag or battery case fragments exposed at the ground surface. The results of these inspections are documented in a W&M report titled *Inspection of Facility Operating Areas* dated March 28, 2013. A grassed and lightly wooded area located south of the main operating plant and referred to as the South Disposal Area (SDA) was included in that inspection. The location of the SDA in relation to the overall facility is depicted on the Site Map attached as **Figure 2.**

Under Item 3(c)(iv) of the Ordering Provisions in a January 30, 2013 Agreed Order (Docket Number 2011-1712-IHW-E), TCEQ required the following:

> *"Implement proper operational changes and engineering controls to prevent the release of untreated slag and refractory brick from the Slag Treatment Building and ensure the integrity of and maintain the cover of the South Disposal Area to prevent the release of battery chips near the South Disposal Area."*

This letter summarizes the inspection and repair activities to satisfy the requirements of this Ordering Provision that relate to the SDA.

SDA CAP INSPECTION

In late 2011 and again in March and June 2013, W&M staff systematically walked the SDA to document evidence of disturbance to the cap such as exposed slag, battery case fragments, and penetrations of the cap or areas of erosion. The assessment consisted of visual, on the ground observations only and did not include physical digging or intrusive investigations. Features and materials observed were marked with flags and locations documented using a Trimble GeoXT GPS receiver. Each feature was assigned a unique designation and number along with its geographic coordinates. Cap disturbance location coordinates are listed in **Table 1** and depicted on **Figure 3**.

SDA REPAIRS

The most common type of disturbance in the cap consisted of animal burrows which occasionally resulted in small pieces of plastic or battery case fragments being brought to ground surface. Only a few areas of the SDA had experienced erosion, depressions, or areas of exposed slag. All 21 disturbances identified were targeted for repairs based upon the cap inspection.

On June 3, 2013, representatives of W&M, Pastor, Behling & Wheeler, LLC (PB&W) and Remediation Services, Inc. (RSI) met with Dorothy Lewis, an Environmental Investigator with TCEQ's Region 4 Office in Fort Worth, Texas. The SDA was walked and typical areas requiring repair were pointed out along with the proposed repair procedures. Ms. Lewis contacted Mr. Gary Beyer, the TCEQ Project Manager in Austin and Mr. Beyer indicated it was acceptable to proceed with the work in order to satisfy the requirements of the Agreed Order.

On June 5, 2013 W&M and RSI Remediation Services, Inc. (RSI) initiated SDA cap repair activities by filling each open hole or apparent cap penetration with fine gravel sized bentonite clay. Pin flags marking each disturbance were left in place for later capping with clay soil.

On June 27, 2013, RSI guided by W&M capped all 21 locations of cap disturbance with clean imported low plasticity sandy clay soil. Soil was deposited to a width of approximately 10-12 inches over each disturbance and feathered out a few feet so it would not impede future mowing activities. Additionally, straw wattles were staked into place perpendicular to the SDA dip to prevent erosion of the clay spot caps. Subsequently, RSI placed seed and straw mats across each area to promote vegetative growth and prevent erosion. Photographs of the capping activities are provided in **Attachment A.**

CONCLUSIONS

Areas of disturbance in the soil cap in the SDA were identified and systematically repaired to reinstate cap integrity. All identified areas were repaired by filling open holes with fine bentonite pellets and/or capped using clean imported soil, and stabilized using seed, straw mats and erosion control wattles.

This report was prepared for the sole use of Exide Technologies by employing generally accepted methods and customary practices of the engineering profession. W&M appreciates the opportunity to be of service to you on this project. If you have any questions or need additional information, please contact Frank Clark, P.E. at 972-509-9611.

Very truly yours,
W&M ENVIRONMENTAL GROUP, INC.

Frank W. Clark

Frank W. Clark, P.E., P.G.
Senior Consultant

Brent Vollmar

Brent Vollmar
Environmental Scientist

Figures, Tables, Attachment A

FIGURES

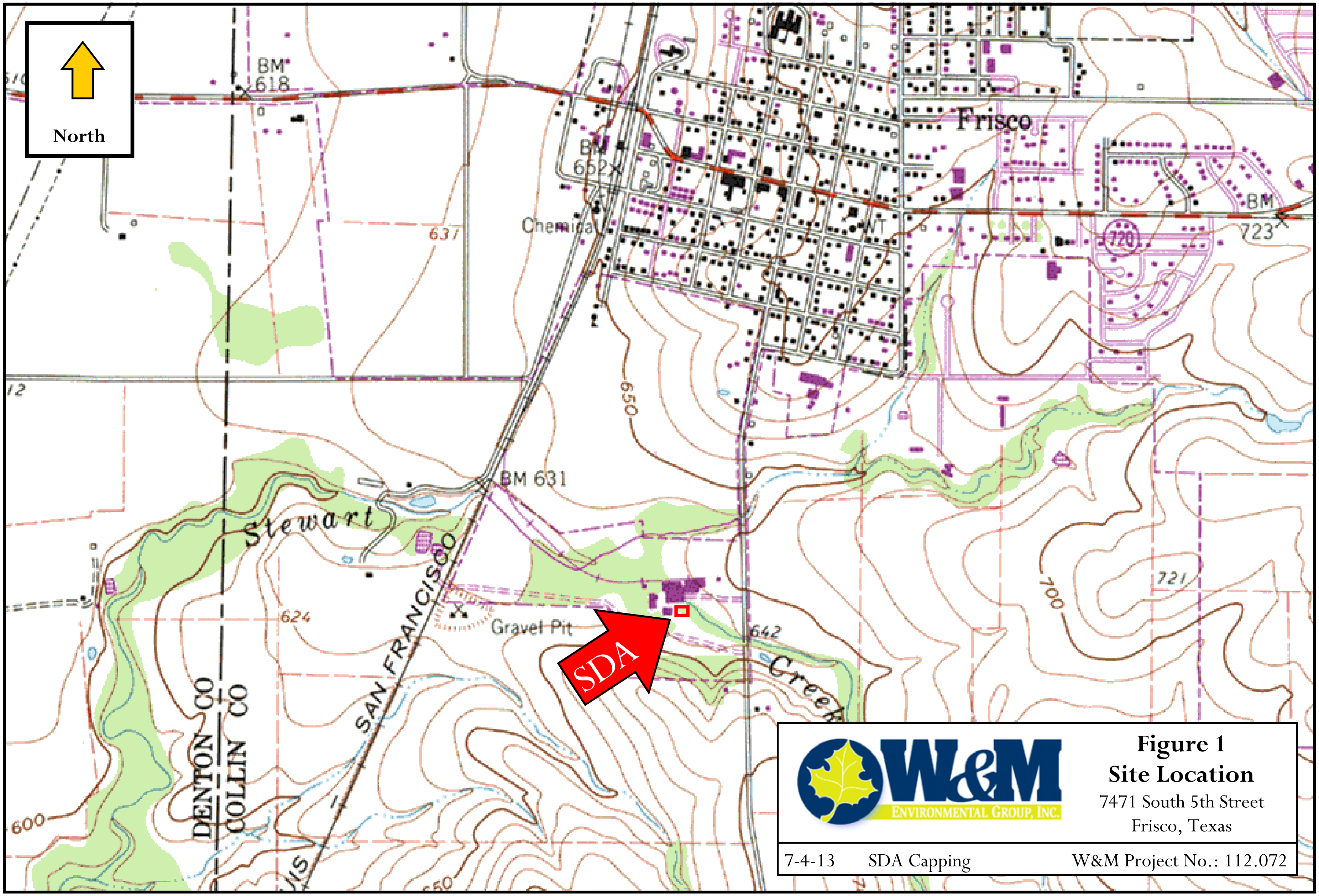


Figure 1
Site Location
7471 South 5th Street
Frisco, Texas

7-4-13 SDA Capping W&M Project No.: 112.072

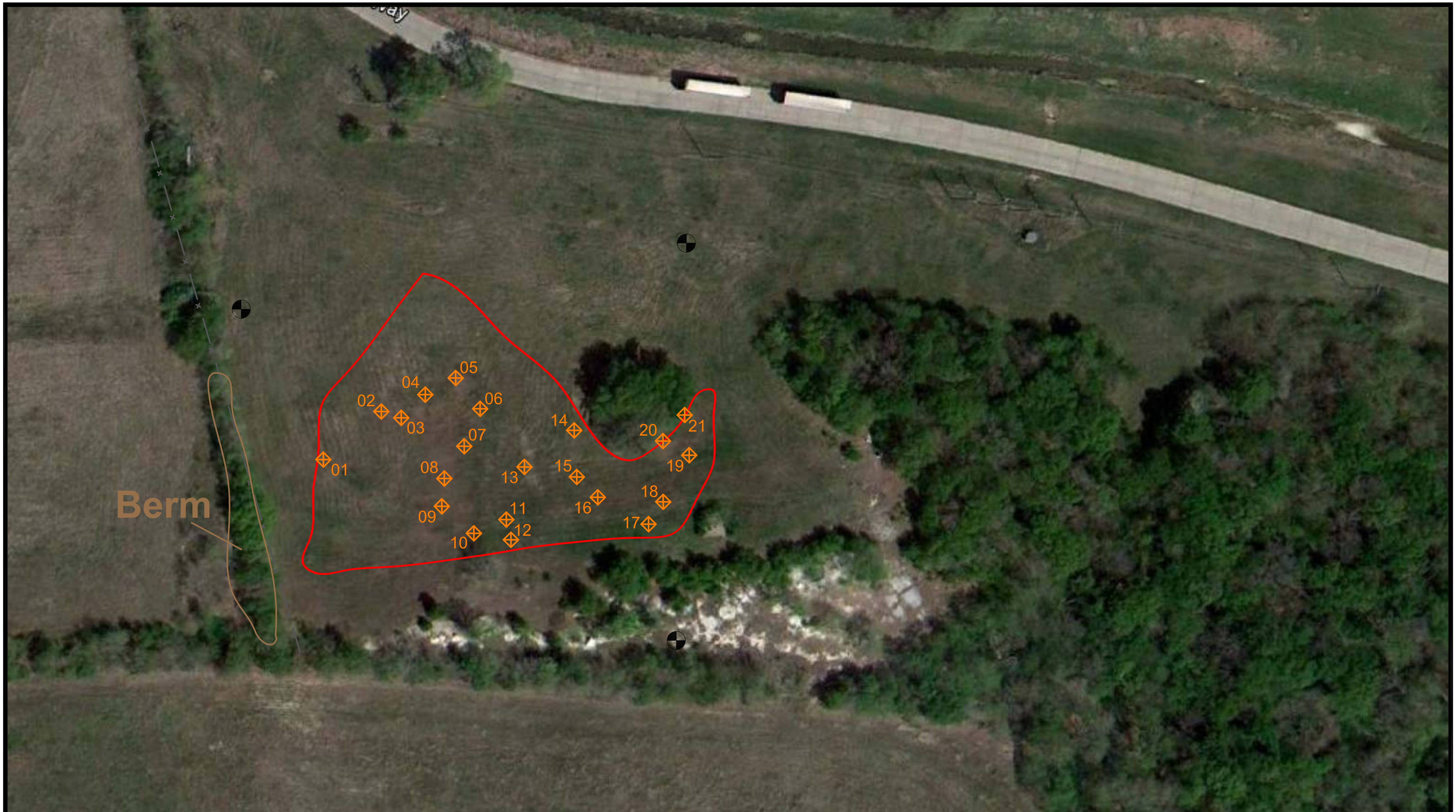
Legend

Interim Action Boundary (Approximate)

Figure 2
Site Map
7471 South 5th Street
Frisco, Texas

W&M Environmental Group, Inc.
www.wh-m.com

3/22/13	W&M Project No. 112.072		Disposal Area Investigation	Drawn by: BV



Legend

Clay Soil Capped Areas

Mapped Disposal Area Boundary per 1993 RFI

0' 100' 200'
APPROXIMATE SCALE

N

Figure 3
South Disposal Area
7471 South 5th Street
Frisco, Texas

W&M Environmental Group, Inc.
www.wh-m.com

9/28/11	W&M Project No. 112.072		Drawn by: SF	Revised by: BV, 7/4/13

TABLES

TABLE 1
Cap Repairs in the South Disposal Area
Exide South Disposal Areas

Exide Technologies
7471 South 5th Street
Frisco, Texas

	Capped Area	Latitude	Longitude	Description	How to Address	Addressed (Y/N)
	Observed Areas of South Disposal Area Cap Degradation					
South Disposal Area	cap-01 x3	33.13882292	-96.82879681	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-02	33.13891856	-96.82865777	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-03	33.13890603	-96.82860985	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-04	33.13895249	-96.82855351	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-05 x3	33.13898645	-96.82847798	Exposed Lead Buttons	Clay Cap	Y
	cap-06	33.13892506	-96.82841999	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-07	33.13884897	-96.82845894	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-08	33.1387913	-96.82850186	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-09	33.13872853	-96.82851144	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-10	33.13867361	-96.82843502	Large Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-11	33.13870179	-96.82835852	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-12	33.13866086	-96.82834671	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-13	33.13880864	-96.82831202	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-14	33.13888223	-96.82819373	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-15	33.13878791	-96.8281885	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-16	33.13874678	-96.82813857	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-17	33.13869415	-96.82801559	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-18	33.13874162	-96.82797489	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-19	33.13883102	-96.82791973	Depression	Clay Cap	Y
	cap-20	33.13886272	-96.82798407	Animal Burrow	Bentonite Fill, Clay Cap	Y
	cap-21	33.13891182	-96.82792958	Eroded Soil	Clay Cap	Y

1 - Coordinates represent the approximate center of clay cap
2- Coordinates are in the Global Lat/Long. System, WGS 1984 Datum

PHOTOGRAPHIC LOG

ATTACHMENT A

Photo 1: View of the South Disposal Area (SDA) from the western boundary facing east.

Photo 2: SDA as viewed to the north with Exide plant in the background.

Photo 3: Animal burrow with plastic chips exposed near entrance.

Photo 4: Slag material exposed by animal activity within the SDA.

Photo 5: Filling of animal burrow within the SDA with fine grained bentonite chips.

Photo 6: Bentonite filled animal burrow.

Photo 7: Capping animal burrow (cap-01) along western SDA boundary as viewed to the east.

Photo 8: Feathering out clay cap.

Photo 9: View of completed spot cap.

Photo 10: Completed spot cap in eastern portion of SDA as viewed to the South.

Photo 11: View of repaired area after placement of seed and erosion mats.

Photo 12: Completed area with erosion mat and wattle.

Photo 13: Multiple areas with erosion mat and straw wattles.

Photo 14: Completed area with erosion mat in place.

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Notes:
1. X – included in APAR.
2. NA – not applicable.

COVER PAGE

Program ID No. (primary): **RN100218643** Report date: **July 9, 2013**
TCEQ Region No.: **4** MSD Certificate No.: ____
Additional Program ID Numbers: SWR/Facility ID No.: **30516** PST Facility ID No.: ____
DCRP ID No.: ____ VCP ID No.: ____ LPST ID No.: ____
MSW Tracking No.: ____ HW Permit/CP No.: **HW-50206** Enforcement ID No.: ____
Other ID Nos.: **Agreed Order Docket No. 2011-1712-IHW-E; CN600129787**

Reason for submittal (check all that apply):

- ☒ Initial submittal
- ☐ Revision
- ☐ Notice of Deficiency Letter
- ☒ Permit/Compliance Plan
- ☐ Voluntary response
- ☒ Enforcement/Agreed order
- ☐ Directive/NOV letter
- ☐ Other: ____

On-Site Property Information

On-Site Property Information: **Frisco Recycling Center, Former Operating Plant**
On-Site Property (Facility) Name: **Frisco Recycling Center, Former Operating Plant**
Street no. **7471** Pre dir: **South** Street name: **5th** Street type: **Street** Post dir: ____
City: **Frisco** County: **Collin** County Code **43** Zip **75034**
Nearest street intersection and location description: **On-site property located at intersection of Eagan Dr. and Parkwood Dr.**

Latitude: **Degrees, Minutes, Seconds** OR ~~Decimal Degrees~~ (indicate one) **33° 08'30.21"**
Longitude: **Degrees, Minutes, Seconds** OR ~~Decimal Degrees~~ (indicate one) **96°50'04.68"**

Contact Person for On-Site Property Information and Acknowledgment

Company Name or Person: **Exide Technologies**
Contact Name: **Matthew A. Love** Title: **Director, Global Environmental Remediation**
Mailing Address: **3000 Montrose Avenue**
City: **Reading** State: **PA** Zip: **19605** Phone: **(610) 921-4054**
e-mail: **Matt.Love@exide.com** Fax: **(610) 921-4063**
Person is: __ property owner __ property manager __ potential purchaser __ tenant __ operator
Other **property owner's representative**

By my signature below, I acknowledge the requirement of §350.2(a) that no person shall submit information to the executive director or to parties who are required to be provided information under this chapter which they know or reasonably should have known to be false or intentionally misleading, or fail to submit available information which is critical to the understanding of the matter at hand or to the basis of critical decisions which reasonably would have been influenced by that information. Violation of this rule may subject a person to the imposition of administrative, civil, or criminal penalties.

Signature of Person [signature] Name (print): MATTHEW A. LOVE Date: 7/9/13

Consultant Contact Person

Consultant Company Name: **Pastor, Behling & Wheeler, LLC**
Contact Person: **Eric Pastor** Title: **Principal Engineer**
Mailing Address: **2201 Double Creek Dr., Suite 4004**
City: **Round Rock** State: **Texas** Zip: **78664**
Phone: **512-671-3434** Fax: **512-671-3446** E-mail address **eric.pastor@pbwllc.com**

PROFESSIONAL SIGNATURES AND SEALS

Professional Geoscientist

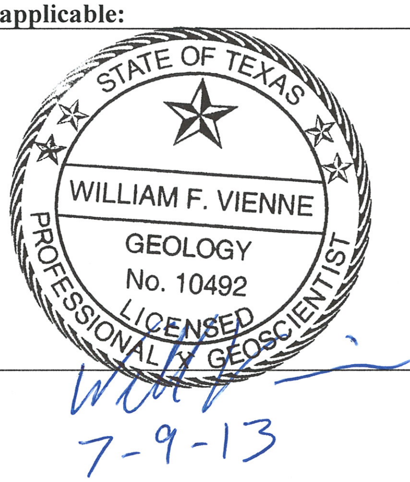
Will Vienne	**10492**	**11/30/2013**
Professional Geoscientist	Geoscientist License Number	Expiration date
	7-9-13	
Signature	Date	
512-671-3434	**512-671-3446**	**will.vienne@pbwllc.com**
Telephone number	FAX number	E-mail

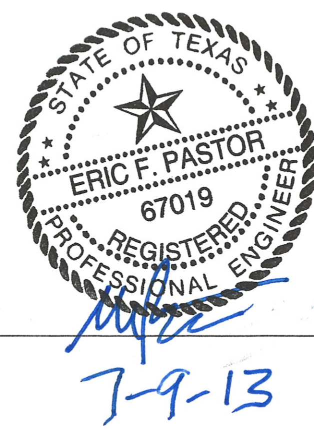
Professional Engineer

Eric Pastor	**67019**	**9/30/2013**
Professional Engineer	P.E. License number	Expiration date
	7-9-13	
Signature	Date	
512-671-3434	**512-671-3446**	**eric.pastor@pbwllc.com**
Telephone number	FAX number	E-mail

Pastor, Behling & Wheeler, LLC	**4760**	**5/31/2014**
Firm Engineering Registration Number	Engineering Registration No.	Expiration date
Pastor, Behling & Wheeler, LLC	**50248**	**4/30/2014**
Firm Geoscience Registration Number	Geoscience Registration No.	Expiration date

Seals, as applicable:





EXECUTIVE SUMMARY

Environmental Media	Actual or Probable Exposures On-Site?		Actual or Probable Exposures Off-Site?		Have notifications for actual or probable exposures been completed? (§350.55(e))		
	Yes	No	Yes	No	Yes	No	N/A
Soil		x		x			x
Groundwater		x		x			x
Sediment		x		x			x
Surface Water		x		x			x

Is there, or has there been, an affected or potentially affected water well? ___ Yes _x_ No
If yes, what is the well used for? ____________

Actual land use: On-site: ___ Res _x_ C/I Off-site affected property: ___ Res ___ C/I _x_ N/A
Land use for critical PCL determination: On-site: ___ Res _x_ C/I Off-site affected property: ___ Res ___ C/I _x_ N/A
Did the affected property pass the Tier 1 ecological exclusion criteria checklist? ___ Yes _x_ No

Affected groundwater-bearing unit(s) (in order from depth below ground surface), or uppermost groundwater-bearing unit if none affected

Unit No.	Name	Depth below ground surface (ft)	Resource Classification (1, 2, or 3)
1	Upper GW Bearing Unit	Approx. 0.5-20	3 (see Section 2.5)

Assessment

Environmental Media		Assessment Levels Exceeded? On-Site?			Off-Site?			Affected property defined to RAL?			Is COC extent stable or expanding?	General classes of COCs (VOCs SVOCs, metals, etc.)
		Yes	No	Not sampled	Yes	No	Not sampled	Yes	No	N/A		
Soil	*Surface*	x					x	x			Stable	Metals (primarily Pb and Cd), TPH, VOCs, SVOCs
Soil	*Subsurface*	x					x	x			Stable	Metals (primarily Pb and Cd), TPH, VOCs, SVOCs
Groundwater			x				x			x	NA	NA
Sediment[1]			x		x						NA	Metals (primarily Pb and Cd)
Surface Water			x				x			x	NA	NA

Notes:

1. Sediment data are discussed in Sections 7 and 9. No RAL exceedances were present in on-site samples. Additional evaluation, outside of this APAR, is recommended to address potential localized effects in downstream hot spot areas identified in off-site data collected as part of other previous and ongoing studies.

EXECUTIVE SUMMARY

NAPL Occurrence Matrix

		NAPL Occurrence	Description
NAPL in vadose zone	x	No NAPL in vadose zone	There is no direct or indirect evidence of NAPL in the vadose zone
		NAPL in/on soil	NAPL detected in or on unsaturated, unconsolidated clay-, silt-, sand-, and/or gravel-dominated soils
		NAPL in fractured clay	NAPL detected in fractures of unsaturated fine-grained soils
		NAPL in fractured or porous rock	NAPL detected in unsaturated lithologic material
		NAPL in karst	NAPL detected in karst environment
NAPL at capillary fringe	x	No NAPL at capillary fringe	There is no direct or indirect evidence of NAPL at the capillary fringe
		NAPL at capillary fringe	NAPL detected at vadose-saturated zone transition, capillary fringe (in contact with water table)
NAPL in saturated zone	x	No NAPL in saturated zone	There is no direct or indirect evidence of NAPL in the saturated zone
		NAPL in soil	NAPL detected in saturated unconsolidated clay-, silt-, sand-, and/or gravel-dominated soils
		NAPL in fractured clay	NAPL detected in fractures of saturated fine-grained soil or other double-porosity sediments
		NAPL in saturated fractured or porous rock	NAPL detected in saturated lithologic material
		NAPL in saturated karst	NAPL detected in karst environment within the saturated zone
NAPL in surface water or sediment	x	No NAPL in surface water or sediment	There is no direct or indirect evidence of NAPL in surface water or sediments
		NAPL in surface water	NAPL detected in surface water at exceedance concentration levels or visual observation
		NAPL in sediments	NAPL detected in sediments at exceedance concentration levels or visual observation via migration pathway or a direct release

Remedy Decision

Environmental Media		Critical PCL exceeded on-site?			Critical PCL exceeded off-site?			PCLE zones defined?			General class (VOCs, SVOCs, metals, etc.) of COCs requiring remedy
		Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	
Soil	*Surface*	x					x	x			**Metals (Pb and Cd)**
	Subsurface	x					x	x			**Metals (Pb only)**
Groundwater			x				x			x	
Sediment[1]			x								
Surface Water			x				x			x	

Notes:

1. Sediment data are discussed in Sections 7 and 9. No RAL exceedances were present in on-site samples. Additional evaluation, outside of this APAR, is recommended to address potential localized effects in downstream hot spot areas identified in off-site data collected as part of other previous and ongoing studies.

EXECUTIVE SUMMARY

NAPL Triggers

	NAPL Response Action Triggers	Description of Triggers
x	No NAPL response action triggers	No NAPL triggers have been observed in any assessment zones (vadose, capillary fringe and saturated), nor in surface water or sediments
	NAPL vapor accumulation is explosive	NAPL vapors accumulate in buildings, utility and other conduits, other existing structures, or within anticipated construction areas at levels that are potentially explosive (≥ 25% LEL)
	NAPL zone expanding	NAPL zone is observed to be expanding using time-series data
	Mobile NAPL in vadose zone	NAPL zone is observably mobile, or is theoretically mobile based on COC concentrations and residual saturation
	NAPL creating an aesthetic impact or causing nuisance condition	NAPL is responsible for objectionable characteristics (e.g., taste, odor, color, etc.) resulting in making a natural resource or soil unfit for intended use
	NAPL in contact with Class 1 groundwater	NAPL has come in actual contact with saturated zone or capillary fringe of a Class 1 GWBU
	NAPL in contact with Class 2 or 3 groundwater	NAPL has come in actual contact with saturated zone or capillary fringe of a Class 2 or Class 3 GWBU
	NAPL in contact with surface water	Liquid containing COC concentrations that exceed the aqueous solubility in contact with surface water via various migration pathways or direct release to surface water
	NAPL in or on sediments	Liquid containing COC concentrations that exceed the aqueous solubility impact surface water sediments via migration pathway or a direct release

CONCLUSIONS AND RECOMMENDATIONS

Project Background and Scope of Investigation

This Affected Property Assessment Report (APAR) describes the methods, findings, and results of investigation activities performed at the Exide Technologies (Exide) Frisco Recycling Center (FRC) Former Operating Plant (FOP or the Site). Investigation activities were performed in accordance with an Administrative Order on Consent (AOC) entered into by Exide and the United States Environmental Protection Agency (EPA) effective May 2, 2012 (original Docket No. RCRA 06-2011-0966; re-designated by EPA as Docket No. RCRA 06-2012-0966) and with a Texas Commission on Environmental Quality (TCEQ) Agreed Order effective February 10, 2013 (Docket No. 2011-1712-IHW-E). The Agreed Order incorporates outstanding requirements of Exide under the AOC, namely the requirements regarding (i) finalization of the implementation of the requirements of the revised Sampling and Analysis Work Plan (Work Plan) prepared by Conestoga Rovers & Associates (CRA) and approved by the EPA on December 2, 2011 and (ii) revision and finalization of the Site Investigation Report (SIR) covering a portion of the Site, which was prepared by Pastor, Behling & Wheeler, LLC (PBW) and submitted to the EPA on July 12, 2012. The SIR addressed requirements and goals outlined in the Work Plan and included a summary of actions taken to comply with the AOC and an evaluation/comparison of sample data to appropriate Texas Risk Reduction Program (TRRP) protective concentration levels (PCLs) or risk-based exposure limits (RBELs), as applicable. Data and findings presented in the SIR have been incorporated into this APAR.

Burrs Metals constructed the FRC facility and began operations in approximately 1964 to produce lead oxide (CRA, 2011). In approximately 1969, battery recycling operations began at the facility. Spent lead-acid batteries and other lead-bearing scrap materials were recycled to produce lead, lead alloys, and lead oxide. Exide purchased the FRC in 2000 from Gould National Batteries, Inc. (GNB) and operated the plant until its closure in November 2012.

The FOP property consists of the FRC's former production/operation area, two closed pre-RCRA landfills (North Disposal Area and South Disposal Area), one closed Class 2 landfill (the Slag Landfill), one active Class 2 landfill (Class 2 Landfill), and ancillary facilities (Figure 1A.1). Two intermittent creeks cross the property from east to west, including Stewart Creek, which runs along the south side of the former production area, and a tributary to Stewart Creek (the "North Tributary"), which runs north of the North Disposal Area and the Slag Landfill. The North Tributary converges with Stewart Creek northwest of the former production area.

The affected property assessment strategy was guided by knowledge of historical Site operations, data from previous RCRA Facility Investigations (RFIs) and other assessment activities, and the physical setting of the Site. The initial assessment strategy for the EPA Site Investigation activities, discussed in Section 3 of this APAR, was described in the EPA-approved Work Plan (CRA, 2011). Subsequent steps involved a review of previous Site investigations and identification of data gaps or uncompleted agency recommendations on those previous investigations (including EPA comments on the SIR). Data gaps, including data gaps identified by the TCEQ, were discussed in a series of three meetings with EPA and TCEQ representatives in February 2013 to refine the assessment approach used for this APAR investigation.

The nature and extent of Chemicals of Concern (COCs) in environmental media were evaluated primarily using data collected during the SIR and APAR investigations. As part of these investigations, approximately 400 soil samples, 25 surface water and 25 sediment samples (from Stewart Creek and the North Tributary), and 50 groundwater samples from 38 monitoring wells

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were collected from the Site or adjacent vicinity and were analyzed for the primary COCs of lead and cadmium. Additional COCs such as other metals (including arsenic and selenium), total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) were analyzed in samples from process areas or other locations associated with specific COCs (e.g., TPH in the Former Diesel Fuel Tank release area). The extent of COCs in environmental media at the Site was evaluated through comparisons to TRRP PCLs or RBELs, as applicable. In addition to these activities, an inspection of the FOP was performed by W&M Environmental (W&M) to locate and identify exposed slag, battery case chips, and/or other debris (Appendix 18).

Since 1983, numerous investigations have been conducted to evaluate COCs (primarily lead and cadmium) in soil, groundwater, surface water, and sediment at or in the near vicinity of the Site (see Section 1.2.3). Available historical data from reports and documents completed prior to the SIR are included in Appendix 17. These data were used to develop assessment strategies for the SIR and APAR investigations, but were not used to delineate residential assessment level (RAL) or PCL exceedance zones at the Site.

Affected Property Assessment Results

<u>Applicable Exposure Pathways and TRRP Assessment Levels</u>

Potentially complete human health exposure pathways identified as applicable for this affected property assessment are listed in the following table:

Potentially Complete Exposure Pathway	Environmental Media Assessed
$^{Tot}Soil_{Comb}$	Surface Soil
$^{GW}Soil_{Class3}$	Surface Soil; Subsurface Soil
$^{Air}Soil_{Inh\text{-}V}$	Surface Soil (included in $^{Tot}Soil_{Comb}$ assessment); Subsurface Soil
$^{GW}GW_{Class3}$	Groundwater
$^{Air}GW_{Inh\text{-}V}$	Groundwater
^{SW}GW	Groundwater
^{Sed}Sed	Sediment
^{SW}SW	Surface Water

As specified in TRRP [30 TAC §350.51(c)], evaluation of COCs for the potentially complete exposure pathways and environmental media listed in the table above was initially performed using assessment levels for residential land use (RALs) or RBELs, as applicable. Based on the current and anticipated future land use of the Site, and planned restrictive covenants specifying commercial-industrial land use, critical PCLs were developed using assessment levels established for commercial-industrial land use or RBELs, as applicable, to evaluate the extent of critical PCL exceedance (PCLE) zones at the Site.

CONCLUSIONS AND RECOMMENDATIONS

PCL Exceedances and Affected Property Areas

Sample data collected during the SIR and APAR indicate that soil is the primary affected medium at the Site, and that lead and cadmium are the primary COCs. Three soil affected property areas were identified at the Site. Each affected property area was delineated using RALs established for Site COCs (Figure 1B). As discussed in Sections 10 and 11, all COCs other than lead, cadmium, and arsenic in surface and subsurface soil were screened from critical PCL development. Lead and cadmium were the only COCs that exceeded critical PCLs in soil samples from the Site. Arsenic was analyzed in sixty soil samples from the Site in specific process areas within the former production area and at surface soil sample locations potentially affected by atmospheric deposition of particulates from FOP-generated emissions and fugitive dust. No exceedances of the arsenic critical PCL were detected in these soil samples. Additional detailed information regarding the nature and extent of the soil critical PCLE zones identified at the Site is provided in Sections 4 and 11.

All groundwater, surface water, and sediment sample data collected as part of the SIR and APAR investigation activities were below applicable RALs and RBELs; therefore, no affected property areas were identified for these media. Groundwater samples from one monitoring well (LMW-9), located east and cross-gradient from the Class 2 Landfill, exceeded the established groundwater to surface water (^{SW}GW) PCL for selenium. TRRP Rules 30 TAC §350.37(i) and §350.37(f) indicate that ^{SW}GW PCLs are applicable groundwater PCLs at the point of exposure (POE) where groundwater discharges to surface water. Monitoring well LMW-9 is located approximately 660 feet upgradient of the point of groundwater discharge into the North Tributary. An attenuation model documented in Appendix 11 demonstrates that the selenium concentration at LMW-9 would not migrate to this POE. Based on this evaluation the selenium concentrations observed at LMW-9 do not exceed the RAL. Therefore, no groundwater affected property areas were identified at the Site.

NAPL Discussion

Non-aqueous phase liquids (NAPL) were not encountered during SIR or APAR investigation activities.

Response Actions and Recommendations

Soil

In conjunction with this APAR and in accordance with the aforementioned TCEQ Agreed Order, soil and debris associated with a former shooting range berm located adjacent to the South Disposal Area have been removed and disposed off-site. COC concentrations in residual soil samples collected after berm removal activities were below applicable critical PCLs (see Section 4).

The Site will be deed restricted to commercial-industrial land use. Based on this future land use, soil critical PCLs were developed based on commercial-industrial PCLs. Additional actions are required to address areas where COC concentrations (primarily lead) exceed critical PCLs and where fill containing some slag material was observed in soils under the Battery Receiving/Storage Building. In compliance with the TCEQ Agreed Order, and upon approval of this APAR, a Response Action Plan (RAP) will be prepared to describe proposed response actions for those areas. Although specific response actions will be detailed in the RAP, it is

CONCLUSIONS AND RECOMMENDATIONS

anticipated that soils in the critical PCL exceedance (PCLE) zone areas will likely be addressed by a combination of surface soil excavation where vertical impacts are shallow and/or localized, capping of other impacted areas, particularly within and near the previously closed landfills, and repair of the closed landfill caps, as necessary. Proposed response actions will likely also include excavation/removal and verification sampling of areas of exposed slag and battery chips identified during the W&M inspections, including areas on the banks of the western reach of Stewart Creek on-site.

Groundwater

Although no affected groundwater areas were identified at the Site as noted above, future groundwater monitoring is recommended to evaluate possible future effects on groundwater from Site waste management units. This recommendation includes monitoring of groundwater in the vicinity of the Class 2 Landfill in accordance with the previously submitted Class 2 Landfill Groundwater Monitoring Plan (PBW, 2013a) upon TCEQ approval.

Stewart Creek Sediments

As noted above, Stewart Creek and the North Tributary sediment sample data collected from the Site as part of the SIR and APAR investigations were below applicable PCLs. These findings are consistent with previous creek sediment remediation activities conducted at the Site (see Chronology table and discussion in Section 1.2.3). However, previous investigations described therein and in other studies of Stewart Creek (see Section 7) have identified localized lead and cadmium hot spots within Stewart Creek sediment downstream of the Site, including adjacent to the Former Stewart Creek Wastewater Treatment Plant (FSCWWTP) immediately downstream of the Site, approximately near the Dallas North Tollway, and further downstream. A focused evaluation, outside of this APAR, is recommended to address potential localized effects at these downstream sediment hot spot areas. Additional investigations of downstream Stewart Creek sediments by others (Southwest Geosciences for the City of Frisco) are planned or underway. Following the completion of these additional investigations, it is recommended that potential stakeholders (City of Frisco, Exide, and others) collaborate to discuss the investigation results and approaches for evaluation/response.

Chronology

Date of Report or Event(s)	*Title of Report* / Assessment Activities	Author/Assessor	Summary of Environmental Assessment and/or Correspondence
1964-2012	Plant in operation	GNB/Exide Technologies	Lead oxide production (1964-2012) and secondary lead smelting activities (1969-2012).
August 29, 1983	Groundwater Investigation; Frisco, Texas Plant	Dames & Moore	Seven borings were advanced in the vicinity of the North Disposal Area and South Disposal Area. Cores collected from the borings were evaluated for geotechnical properties. Seven monitoring wells were installed within the borings, groundwater was sampled and aquifer testing performed at each well. The study concluded that groundwater was flowing towards and discharging into Stewart Creek at a low flow rate (e.g. $3.1x10^{-5}$ to $1.0x10^{-8}$ cm/s). Slight exceedances of the standards for cadmium (0.01 mg/L) and/or lead (0.13) were noted in three wells. Additional groundwater monitoring was recommended in the report.
1986	Stewart Creek sediment remediation	Southwest Laboratories	A Stewart Creek surface water and sediment investigation in 1984 and 1986 indicated elevated concentrations of lead and cadmium in sediment samples. Subsequently, sediments in Stewart Creek were removed by dredging along the portion that lies between the former 5th Street and the BNSF railroad. Three dredging events were performed and the sediments were sampled following each event and evaluated for EP Toxicity for lead and cadmium. The final sampling event data indicated that sediments in the cleanup area were below the cleanup standards of 5.0 mg/L for lead EP Toxicity and 1.0 mg/L for cadmium EP Toxicity.
November 16, 1987	RCRA Facility Assessment	Texas Water Commission	A RCRA Facility Assessment was issued by the Texas Water Commission (TWC) November 16, 1987. In the assessment, nine SWMUs were identified: (1) Battery Storage Area; (2) Raw Material Storage Area; (3) Slag Landfill; (4) North Disposal Area; (5) South Disposal Area; (6) Stewart Creek; (7) Old Drum Storage Area; (8) Stewart Creek Sediment Dredging Waste Pile; and (9) Product Waste Pile.
May 8, 1991	Phase I RCRA Facility Investigation	Lake Engineering, Inc.	The Phase I RCRA Facility Investigation (RFI) was initiated in 1990 and consisted of investigation of several Waste Management Areas (WMAs). Waste Management Areas were designated for the purpose of designing a groundwater monitoring system. Investigative activities included soil and groundwater investigations of WMA 1 (North Disposal Area and Slag Landfill), WMA 2 (Battery Storage Area, Raw Material Storage Area, Old Drum Storage Area, Product Waste Pile and Oil Leak) and WMA 3 (South Disposal Area); an investigation of WMA 4 (Stewart Creek); and delineation of the North Disposal Area and South Disposal Area. The limits of the North Disposal Area and South Disposal Areas were delineated during the Phase I RFI by borings around the perimeter and within the units. The Phase I RFI report, dated May 8, 1991 (Lake, 1991), and the Addendum to the Phase I RFI Report dated December 10, 1993 (Lake, 1993) identified lead as the primary COC at the Site, and soil as the primary environmental media of concern. The Phase I RFI also concluded that cadmium is present in soils, but at very low concentrations.
1991-1992	Stream Investigations of Stewart Creek	Resource Consultants, Inc.	A study conducted by Resource Consultants in 1991 (RCI, 1991) investigated sediments at one location upstream of the Site and two locations downstream relative to the Site. Cadmium hotspots were indicated in the two samples collected downstream. Resource Consultants conducted an additional study in 1992 (RCI, 1992) that investigated the biotic community in order to classify the stream. Three sample locations were chosen, with one upstream of the Site and two locations downstream of the Site. Based on the biotic community observed during the study, the stream was classified as an intermittent stream.
August 26, 1993	RCRA Facility Investigation Report Notice of Deficiency	Texas Water Commission	Following review of the RCRA Facility Investigation Report (Lake, 1991), the Texas Water Commission (TWC) issued a Notice of Deficiency letter dated August 26, 1993. In the Notice of Deficiency, TWC requested additional information and changes to the sampling and statistical methods for groundwater and soil background value calculations and comparisons to RFI sample values. The TWC also requested that Stewart Creek be addressed as a separate RFI project from the rest of the facility. In addition, TWC requested pH analysis for all future groundwater samples and additional information regarding the soil properties encountered during the delineations of the South Disposal Area and North Disposal Area. Various other miscellaneous details regarding the investigation were also requested.
December 10, 1993	Addendum to the RCRA Facility Investigation for GNB Incorporated; Frisco, Texas	Lake Engineering, Inc.	The RFI addendum was submitted in response to the TWC Notice of Deficiency letter dated August 26, 1993 (TWC, 1993). The addendum provided additional information as requested by TWC, including a rationale of using MCLs and the Superfund cleanup guidelines in lieu of background values; additional information regarding the soil properties encountered during the North Disposal Area and South Disposal Area delineations, and other investigation details as requested by the TWC.
June 3, 1994	Phase I RFI Report and Addendum Approval	Texas Natural Resource Conservation Commission	The Texas Natural Resource Conservation Commission (TNRCC) approved the Phase I RFI report and Addendum in correspondence dated June 3, 1994, and requested a Phase II RFI to conduct additional investigation at the former railroad culvert down-gradient of the Slag Landfill; along the railroad spur south of the North Disposal Area; at the closed battery storage area; in the vicinity of the acid sump located in the Battery Breaker Building; in the vicinity of the South Disposal Area; and in the Truck Staging Area. In addition, TNRCC requested that the soil cap over the North Disposal Area be evaluated for integrity.
August 30, 1995	Notification of On-Site Class II Industrial Waste Landfill	RMT/Jones & Neuse, Inc.	Prior to construction of the on-Site Class II landfill, a notification was prepared and submitted during 1995 by RMT/JN that included specifications of the landfill design, waste composition, site geology, a groundwater monitoring plan, and a closure and post closure care plan. To characterize the site geology, eighteen soil borings were collected and lithologically described by a geologist. Monitoring wells were installed within nine of the soil borings. Slug tests were performed in four wells and a pump test was performed in LMW-17. One groundwater elevation gauging event was conducted. The geologic assessment indicated the presence of limited sand and gravel lenses in the south to southwest portion of the landfill area. The groundwater elevation gauging event indicated a hydrogeologic gradient to the southwest towards the North Tributary.

Chronology

Date of Report or Event(s)	*Title of Report* / Assessment Activities	Author/Assessor	Summary of Environmental Assessment and/or Correspondence
May 1996	Stewart Creek Final Phase II RFI Report; GNB Technologies; Frisco, Texas	RMT/Jones & Neuse, Inc.	The Stewart Creek Phase II investigation was performed in accordance with a work plan approved by TNRCC on January 29, 1996. Eighty sediment samples were collected and analyzed for lead and cadmium during 1995. In addition, 20 background sediment samples were collected upstream of the former 5th Street on Stewart Creek and Cottonwood Creek, which is a creek that feeds into Stewart Creek. Twenty-six sediment samples were collected in areas of accumulated sediment along Stewart Creek during February 1996. Sixteen sediment sample results reported in the Phase I RFI report (Lake, 1991) were also included in the Stewart Creek Final Phase II Report. Sediment sample locations ranged from the main plant area to the Stewart Creek West WWTP, which is located downstream of the Site. Based on sampling results, the report recommended further study of the Stewart Creek segment between the former 5th Street and the 7700-foot marker.
August 1998	Phase II RFI	JD Consulting, Inc.	A Phase II RFI was conducted by JD Consulting, Inc. (JDC) in June 1998, pursuant to a work plan prepared by RMT/Jones and Neuse (RMT/JN. 1994), modified by letter dated September 24, 1995 (GNB, 1995), and approved, with modifications, by the TNRCC on February 27, 1998. The Phase II RFI addressed the areas referenced in the TNRCC's June 3, 1994 correspondence, which approved and noted deficiencies in the Phase I and Phase I RFI Addendum that were to be addressed in the Phase II RFI. Investigative activities included soil sampling at the truck staging area, the railroad spur, and the area adjacent to monitoring well B7R (Figure 1B). Further delineation of the lateral extent of soil COC concentrations above applicable regulatory standards at the South Disposal Area and development of a Corrective Measures Study were also addressed in the Phase II RFI for the South Disposal Area. Several exceedances of the lead investigation limit of 500 mg/kg were encountered in surface soil samples, including in the area adjacent to B7R, at the railroad spur area, and the South Disposal Area. Subsurface soil exceedances for lead were noted in the railroad spur area and the South Disposal Area.
August 1998	Human Health and Ecological Risk Assessment	JD Consulting, Inc.	Stewart Creek was addressed as a separate project from the Phase II RFI pursuant to a TNRCC request dated September 6, 1993. The Human Health and Ecological Risk Assessment (HHERA) and Corrective Measures Study for Stewart Creek (JDC, 1998b) were submitted to the TNRCC on August 5, 1998. This study included an evaluation of Stewart Creek sediment and surface water data from several investigations, including the Phase I RFI (Lake, 1991), the Phase II RFI (JDC, 1998a), additional sediment sampling performed by RMT/JN in 1995 and 1996 and the Stewart Creek Final Phase II (RMT/JN, 1996). The study area for the HHERA included portions of Stewart Creek at the facility area and areas downstream of the facility. The study concluded that the levels of cadmium and lead in surface water do not pose a risk to ecological or human receptors. The sediments within the facility boundaries, however, pose a potential risk to human and ecological receptors. In addition, the study noted that cadmium and lead levels at four locations downstream of the facility boundary (6,500 ft, 7,000 ft, 7,200 ft, and 7,600 feet downstream of the former 5th Street) may also pose an ecological risk and warranted further investigation. A Corrective Measures Study was recommended for the on-Site sediments.
January 13, 2000	Acceptance Closure for Four Solid Waste Management Units	Texas Natural Resource Conservation Commission	The TNRCC issued a letter dated January 13, 2000, that approved closure for the following SWMUs: the former Battery Storage Area, Old Drum Storage Area, Stewart Creek Dredging Waste Pile and the Product Waste Pile. The letter stated that each SWMU was closed according to the closure plans approved by the TNRCC.
July 2000	Stewart Creek Corrective Measures Implementation Report	JD Consulting, Inc.	As a result of the HHERA described above, an approximate 2,800-foot stretch of the creek sediments was remediated to standards for lead and cadmium approved by the TNRCC (91 milligrams per kilogram [mg/kg] for lead and 4.23 mg/kg for cadmium). The remediation was carried out by first removing visible slag "buttons" from the creek bed and banks, then excavating the soils at an average depth of 1ft. Soils were excavated to deeper depths as needed based on the extent of slag presence in the soil. Excavated soil was screened for recoverable slag fragments, which were recycled in the blast furnace at the facility. Remaining soil was stockpiled and sampled for TCLP analysis for lead and cadmium. Most samples passed the criteria for Class II waste; the samples that did not pass the criteria were treated until they passed. Some stockpiled material was tested for SPLP lead and cadmium for potential re-use as intermediate fill in the active Class 2 landfill at the facility. The TNRCC approved the reuse proposal on November 8, 1999. The material that met the re-use criteria were stored in the Class 2 landfill, while the material that did not meet the re-use criteria but met or was treated to meet the Class 2 waste criteria was disposed of off-site in an appropriate landfill.
July 15, 2003	Leaking Petroleum Storage Tank (LPST) Case Closure of Subsurface Release of Hydrocarbons at G.N.B. Technologies Facility	Texas Commission on Environmental Quality	A diesel oil release residue was discovered in April 1988 during the construction of the retaining wall adjacent to Stewart Creek. Details of the discovery and subsequent remedial actions are provided in a letter by Lake Engineering to the Texas Water Commission (Lake, 1988). Following discovery of the residue, a pump and mobile storage tank were immediately installed. Three test holes were advanced to determine the extent of residue; residue was not detected in any of the holes. To enhance collection of residue, an oil recovery sump and intercept trenches were constructed. TCEQ issued a letter dated July 15, 2003, certifying that the former diesel fuel release (LPST ID No. 106075) had met site closure requirements and that no further action was necessary.
2009-2011	TCEQ and EPA Inspections	Texas Commission on Environmental Quality and United States Environmental Protection Agency	TCEQ and EPA performed multiple inspections of the Site. Key investigations are listed in Table 1C.
March 29, 2011	Suspect Slag Sampling Report; Stewart Creek - West Segment	W&M Environmental	W&M Environmental conducted a visual survey of the western reach of Stewart Creek from the Battery Receiving/Storage Building to the BNSF railroad. Suspected slag samples collected from the banks of the creek were photographed and evaluated for Pb, Ca, and Fe to develop a visual criteria for identifying suspected slag in the field. Ca and Fe were evaluated to differentiate between Pb slag and limestone fragments. Based on analytical results and the resultant visual criteria, slag occurrences were observed along the majority of the study area on both sides of the creek but were noted to occur more frequently along the central portion and eastern portions of the study area.

Chronology

Date of Report or Event(s)	*Title of Report* / Assessment Activities	Author/Assessor	Summary of Environmental Assessment and/or Correspondence
August 1, 2011	RCRA Section 3013(a) Administrative Order	United States Environmental Protection Agency	The Administrative Order was issued on August 1, 2011 (Docket No. RCRA 06-2011-0966; re-designated by EPA as Docket No. RCRA 06-2012-0966), following an EPA inspection on December 14-18 2009 and March 29, 2010 and review of historical documents. EPA concluded that there was potential soil, groundwater, sediment and surface water contamination resulting from the activities at the facility and issued the Administrative Order. The Administrative Order ordered Exide to submit to EPA a workplan that proposed sampling and analysis. A sampling and analysis workplan was prepared by Conestoga-Rovers and submitted November 2011. The Site Investigation (PBW, 2012), detailed below, addressed areas noted as potential areas of concern in the Administrative Order. Additional details of the Administrative Order are provided in Table 1C.
October 7, 2011	Geotechnical Engineering Report	Rone Engineering	A geotechnical study was performed in 2011 in the general area of WMA 1 (North Disposal Area and Slag Landfill) to support the engineering design for a series of buildings and upgrades to existing facility structures proposed at the time of the report. The lithologic information obtained from the borings drilled for this investigation was used in support of Site hydrogeologic evaluation and for the development of geologic cross-sections in this APAR.
December 28, 2011	North and South Disposal Areas Evaluation	W&M Environmental	W&M conducted a visual inspection of the North Disposal Area and the South Disposal Area to assess the condition of the soil caps and to inspect for suspected slag on the ground surface within each area. The study identified limited areas of exposed slag and/or battery chips in the South Disposal Area as well as isolated occurrences of slag on the ground surface to the north and east of the area. The study also noted cracks in the soil above the South Disposal Area, but no slag or battery chips were identified in the areas of cracking. In the North Disposal Area, exposed slag was noted within materials storage areas and areas of heavy vehicular traffic in the southern portion of the area. In addition, isolated occurrences of slag were noted along the North Tributary, the railroad spur, and in the north wooded area.
July 12, 2012	Site Investigation Report	Pastor, Behling & Wheeler, LLC	The SIR investigation was performed in accordance with a Sampling and Analysis Work Plan prepared by Conestoga-Rover Associates, submitted November 2011, and approved by the EPA by email on December 2, 2011, and pursuant to Paragraph 33 of the AOC for the Site, dated May 2, 2012. An investigation of soil, groundwater, surface water, and sediment was conducted to evaluate the nature, location, extent, direction, and rate of movement of any hazardous wastes and/or hazardous constituents which are present at or have been released at the facility. Soil samples were collected from the North Disposal Area, Slag Landfill, the Raw Material Storage Area, South Disposal Area, Boneyard, Bale Stabilization Area, Crystallization Unit Frac Tank area, Stewart Creek Corridor, and the Shooting Range Berm. Sediments were sampled in Stewart Creek and the North Tributary, and surface water was sampled in Stewart Creek. Two surface water gauging stations were installed along Stewart Creek and three monthly gauging events of the surface water and groundwater wells were performed. A groundwater investigation was also conducted during the SIR investigation, which included the installation of two background wells to the east of the Site and sampling of eleven existing wells in order to evaluate groundwater conditions downgradient of WMA 1 (the closed North Disposal Area and Slag Landfill), WMA 2 (the closed Battery Storage Area, Raw Material Storage Area, the closed Old Drum Storage Area, the closed Product Waste Pile and the Former Diesel Fuel Tank leak area) and WMA 3 (South Disposal Area). The report recommended additional investigation at the Raw Material Storage Area and the Stewart Creek Flood Wall at a creek-side sample location adjacent to the Battery Storage/Receiving Building.
Effective February 10, 2013	Agreed Order; Docket No. 2011-1712-IHW-E	Texas Commission on Environmental Quality	The TCEQ Agreed Order was entered effective February 10, 2013, between TCEQ and Exide. The Agreed Order ordered Exide to prevent disposal of waste in the active Class 2 landfill that exceeds LDR Treatment Standards; to submit a groundwater monitoring plan for the active landfill; to submit an APAR to address areas of concern identified in the May 6, 2011 TCEQ inspection; to submit an APAR for the RCRA Facility Investigation units listed in RCRA HW Permit No. 50206, PS IX.C. and any new areas identified by previous EPA and TCEQ investigations; to dispose of the berm material near the west side of the South Disposal Area; to prevent release of untreated slag and refractory brick from the Slag Treatment Building; and to ensure integrity of and maintain the cover of the South Disposal Area.
May 2013	Wall Seepage Project; Retaining Wall at Stewart Creek	W&M Environmental	W&M prepared a report detailing the procedures of the French drain installation along the flood wall. The French drain was installed to prevent seepage along the creek side of the flood wall, which had been previously observed. In the fall of 2012, W&M installed a French drain from the eastern edge of the Slag Treatment Building to the southeast corner of the Battery Storage/Receiving Building. The installation was completed in roughly 100-foot sections. First, the concrete was broken and the soil excavated. The soil was stockpiled on polyethylene sheeting and covered nightly with additional sheeting. Next, the wall footing was sealed with asphaltic sealer and a 40 ml HDPE liner. Then, a 4-inch PVC underdrain was installed and surrounded by crushed stone and the concrete replaced. In addition, collection sumps were installed at the west end of the wall: one to collect liquids from the new underdrain system and another to collect surface runoff. The excavated soil was sampled and characterized for disposal off-site, by manifest, in an appropriate landfill.
January - May 2013	Affected Property Assessment	Pastor, Behling & Wheeler, LLC	Pursuant to the Agreed Order effective February 10, 2013, PBW conducted an affected property assessment of potentially affected media at the Site during January - May 2013. Media that were investigated included soil, groundwater, and Stewart Creek and the North Tributary surface water and sediments. Further details are provided in this report.

SPECIALIZED SUBMITTALS CHECKLIST

_____ Check here if no specialized submittals in this report

	If included, specify section or appendix
Ecological Risk Assessment	
Reasoned justification, expedited stream evaluation, Tier 2 or 3 ecological risk assessment, and/or proposal for ecological services analysis	Tier 2 SLERA; Section 9
Statistics	
Calculated site-specific background concentrations	Appendix 8
Used alternate statistical methods to determine proxy values for non-detected results (§350.51(n))	
Calculated representative concentrations (§350.79(2)) for remedy decision	
Analytical Issues	
Used SQL for assessment or critical PCL instead of the MQL (§350.51(d)(1)) or PCL (§350.79)	
The MQL of the analytical method exceeds assessment levels/critical PCLs (§350.54(e)(3))	Section 10
Human Health/Toxicology	
Variance to exposure factors approved by TCEQ Executive Director (§350.74(j)(2))	
Developed PCLs based on alternate exposure areas	
Evaluated non-standard exposure pathway (e.g., agricultural, contact recreation, etc)	contact recreation; Appendix 9
Combined exposure pathways across media for simultaneously exposed populations (§350.71(j))	
Adjusted PCLs due to residual saturation, cumulative risk, hazard index, aesthetic concerns, or theoretical soil vapor	
Utilized non-default human health RBELs to calculate PCLs (includes use of non-default parameters, toxicity factors not published in rule, etc.) (§350.51(l), §350.73, §350.74)	
Calculated Tier 2 or 3 RBELs/PCLs or TSCA levels for polychlorinated biphenyls, or calculated Tier 2 or 3 RBELS/PCLs for cadmium, lead, dibenzo-p-dioxins, dibenzofurans, and/or polycyclic aromatic hydrocarbons	
Calculated Tier 1, 2, or 3 total petroleum hydrocarbon (TPH) PCLs	Appendix 9
Developed sediment/surface water human health RBELs and PCLs	Appendix 9
Fate and Transport	
Used or developed groundwater to surface water dilution factors	
Calculated Tier 2 PCL	Appendix 9
Calculated Tier 3 PCL	
Groundwater Issues	
Conducted aquifer test, classified Class 3 groundwater, or determined non-groundwater bearing unit (saturated soil)	Appendix 7

1.0 PROPERTY INFORMATION

1.1 Physical Location

1.1.1 Property Location and Land Use

The Exide Technologies (Exide) Frisco Recycling Center (FRC) is a former battery recycling and secondary lead smelting facility located at 7471 South 5th Street in Frisco, Collin County, Texas. This Affected Property Assessment Report (APAR) addresses assessment activities conducted at the FRC Former Operating Plant (FOP, or the Site), an approximate 87-acre tract consisting of the FRC's former operational areas, two closed pre-RCRA landfills (North Disposal Area and South Disposal Area), one closed Class 2 landfill (the Slag Landfill), one active Class 2 landfill, and other ancillary facilities (Figure 1A.1). The current and anticipated future land use of the on-site property is commercial-industrial. The FOP encompasses all areas assessed in the Site Investigation Report (SIR) prepared by Pastor, Behling & Wheeler, LLC (PBW) and submitted to the United States Environmental Protection Agency (EPA) on July 12, 2012.

Land immediately adjacent to the FOP primarily consists of undeveloped portions of the FRC property designated as the "Undeveloped Buffer Property" (Figure 1A.1). An affected property assessment of the Undeveloped Buffer Property is being conducted concurrently with the FOP investigation, and an APAR for the Undeveloped Buffer Property will be submitted separately from this APAR. Land immediately adjacent to the FOP includes the following properties:

- West: Undeveloped Buffer Property and the St. Louis-San Francisco Railroad (owned by BNSF);
- North: Undeveloped Buffer Property, an aggregates facility, an automotive repair facility, an equipment/automotive yard, a batting cage facility, a heating and air conditioning facility, other commercial properties, and residential properties;
- Northeast: An automotive repair facility and a plumbing supply facility;
- East: Undeveloped Buffer Property; and
- South: Undeveloped Buffer Property.

Land surrounding the properties immediately adjacent to the FOP includes both residential and commercial-industrial properties (Figure 1A.1).

1.1.2 Topography

The Site is located within a shallow valley created by the drainages of two intermittent streams that flow in a general east to west direction through the Site. The on-site streams include Stewart Creek, which runs along the south side of the former production area, and an unnamed tributary of Stewart Creek (the "North Tributary"), which runs north of the North Disposal Area and the Slag Landfill (Figure 1A.1). The confluence of these streams occurs northwest of the FOP's former production area.

In general, the ground surface at the Site slopes toward Stewart Creek or the North Tributary. Based on survey data from the Site, ground surface elevations range from approximately 685 feet above mean sea level (msl) in the southeastern portion of the Site at an outcrop of the Austin Group (the "Austin Chalk") to approximately 610 feet msl at Stewart Creek near the western boundary of the Site.

According to the 2009 Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map for Collin County, Texas, areas of the Site along Stewart Creek and the North Tributary are located within the 100-year flood plain (FEMA, 2009) (Figure 1A.2). A flood wall was constructed between the former production area and Stewart Creek in 1988 to reduce the potential for flooding in this area.

1.1.3 Weather

The average annual rainfall in the Dallas area is highly variable, ranging from less than 20 inches per year to more than 50 inches per year, with the largest amount of monthly precipitation occurring in May and October. Periods of rainy weather typically last for one to two days. Thunderstorms occur throughout the year, but are most common during the spring. During the summer, daily high temperatures frequently exceed 100 degrees Fahrenheit (^{o}F) and daily lows are generally less than 80^{o}F. Summer hot spells are typically 3 to 5 days in duration, broken up by periods of thunderstorm activity. Winters are mild, with short periods of extreme cold. (NOAA, 2013)

The Texas Commission on Environmental Quality (TCEQ) has published wind rose diagrams for the Dallas-Fort Worth area using wind data obtained from the EPA for the years 1984-1992 (TCEQ, 2013a). The TCEQ wind rose diagrams indicate that the prevailing wind direction in the area is toward the north during each month of the year. Southerly (south to north) winds are particularly dominant during spring, summer, and fall months. Northerly winds are common in winter, but still occur less frequently than southerly winds during that period.

1.2 Affected Property and Sources of Release

1.2.1 History and Operations

Burrs Metals constructed the FRC facility and began operations in approximately 1964 to produce lead oxide. In approximately 1969, battery recycling operations began at the facility. Since 1969, the FRC has recycled spent automobile and industrial batteries and other lead-bearing scrap materials to produce lead, lead alloys, and lead oxide. Exide purchased the facility in 2000 from Gould National Batteries, Inc. (GNB) and operated the plant until its closure in November 2012. Demolition of on-site buildings is being conducted in accordance with the Decontamination and Demolition Work Plan (PBW/RSI, 2013a), the last revision of which was submitted to the TCEQ on January 25, 2013. Currently, demolition of most on-site buildings has been completed.

A RCRA Hazardous Waste Permit for the FRC (RCRA HW Permit No. 50206) was originally issued to GNB on May 24, 1988 (Exide, 2001). The RCRA HW Permit was reissued to Exide on March 30, 2001. The permit authorized the FRC to store and process lead-acid batteries and other lead-bearing materials in two permitted units: The Battery Receiving/Storage Building (RCRA HW Permit Unit No. 001) and the Raw Material Storage Building (RCRA HW Permit Unit No. 002). Both permitted units are located within the former production area at the Site (Figure 1A.1). Closure activities for the two permitted units are ongoing in conformance with closure requirements in the RCRA Permit, discussions with TCEQ personnel, and procedures detailed in the Decontamination and Demolition Work Plan (PBW/RSI, 2013a).

Additional structures located within the former production area include the Battery Breaker Building, Slag Treatment Building, Maintenance Building, Blast Furnace Building (formerly housed the blast furnace and reverberatory furnace), an oxide production facility (Oxide Building), refining operations (Refines and Shipping), a wastewater treatment facility, an administrative building, and other ancillary facilities (Figure 1A.1). Site facilities located outside of the former production area include a storm water retention pond, Crystallization Unit (used in wastewater treatment process), two closed pre-RCRA landfills (North Disposal Area and South Disposal Area), one closed Class 2 landfill (the Slag Landfill), an active Class 2 landfill (the Class 2 Landfill), a former City of Frisco fire training facility, and a former shooting range berm.

The processes used at the FRC were typical of the secondary lead recycling industry (Lake, 1991; RMT/JN, 1995; Exide, 2001; TCEQ, 2011b). Batteries and other lead-bearing scrap received by the FRC were initially stored in the Battery Receiving/Storage Building. The batteries were transferred to the Battery Breaker Building, where they were shredded or crushed. Lead-bearing materials were separated from the polypropylene and hard rubber components of the batteries using a vibrating table and water baths located in the Battery Breaker Building. The lead-bearing components of the batteries were rinsed and temporarily stored with other lead-bearing scrap in the Raw Material Storage Building. This material was taken from the Raw Material Storage Building and was typically fed to the reverberatory furnace via a front end loader. Slag from the reverbatory furnace and drosses from refining operations were used as feed for the blast furnace. From the furnaces, refining kettles received the lead for preparing lead bullion. Slag from the blast furnace was periodically taken by front end loader to the Slag Treatment Building, where it was crushed, screened, and mixed with water and a stabilization agent to chemically fix the remaining lead content. Treated slag was disposed on-site in the Class 2 Landfill or was sent off-site for disposal.

Process wastewater previously generated at the Site was treated in the on-site wastewater treatment facility and then discharged to the North Texas Municipal Water District sanitary sewer.

Storm water control features within the former production area include a concrete slab cover, a retention wall/flood wall, and a French drain system that route storm water to the storm water retention pond located south of Stewart Creek via a conduit passing over the creek. The ground surface within the former production area slopes toward the retention wall/flood wall and storm water retention pond conduit. Water within the retention pond is treated and then discharged to the North Texas Municipal Water District sanitary sewer. The Site is permitted by the TCEQ to discharge water from the retention pond to Stewart Creek, but this has not occurred since approximately 2009. Runoff from areas outside of the former production area flows into Stewart Creek or the North Tributary.

1.2.2 Project Overview

This APAR describes the methods, findings, and results of investigation activities performed at Exide's FRC FOP in accordance with the TCEQ Agreed Order effective February 10, 2013 (Docket No. 2011-1712-IHW-E). This APAR constitutes a revision of the SIR (PBW, 2012a) prepared by PBW and submitted to the EPA on July 12, 2012, and incorporates the outstanding requirements of Exide under the Administrative Order on Consent (AOC) entered into by Exide and the EPA effective May 2, 2012 (original Docket No. RCRA 06-2011-0966; re-designated by EPA as Docket No. RCRA 06-2012-0966) that were incorporated into the Agreed Order, namely the requirements regarding (i) finalization of the implementation of the requirements of the revised Sampling and Analysis Work Plan (Work Plan) prepared by Conestoga Rovers & Associates (CRA) and approved by the EPA on December 2, 2011 and (ii) revision and finalization of the SIR. The SIR addressed requirements and goals outlined in the Work Plan and included a summary of actions taken to comply with the AOC and an evaluation/comparison of sample data to appropriate Texas Risk Reduction Program (TRRP) protective concentration levels (PCLs) or risk-based exposure limits (RBELs), as applicable. Per the TCEQ Agreed Order, data and findings presented in the SIR have been incorporated into this APAR.

1.2.3 Previous Investigations

Since 1983, multiple investigations have been conducted to characterize the Site soil, groundwater, surface water, and sediments, and evaluate the presence of Chemicals of Concern (COCs) in these media. Available historical data from these investigations are included in Appendix 17. Where historical data indicated PCL exceedances, additional investigation was conducted in those areas. However, historical data were not used to delineate PCL exceedances. PCL exceedances were delineated through sampling activities conducted in connection with the SIR or the APAR investigation of the Site. A summary of key historical documents is described below, with additional documents and information provided in Table 1C.

Groundwater Investigation, Frisco, Texas Plant, Dames and Moore, 1983 (D&M, 1983).
D&M conducted a groundwater investigation in the vicinity of the North Disposal Area and the South Disposal Area in 1983. For the investigation, seven cores were collected for geotechnical testing and monitoring wells were installed within the geotechnical borings. In-situ permeability tests were performed within and groundwater samples were collected from the monitoring wells. The study concluded that groundwater was flowing toward and discharging into Stewart Creek and its tributaries at a low flow rate (e.g., 3.1×10^{-5} to 1.0×10^{-8} cm/sec).

Water and Sediment Tests, GNB Lead Plant, Southwestern Laboratories, 1986a (SWL, 1986a).
Stream Sediment Tests; GNB, Inc. Plant, Southwestern Laboratories, 1986b (SWL, 1986b).
Stream Sediment Test; GNB, Inc. Plant, Southwestern Laboratories, 1986c (SWL, 1986c).
Stream Sediment Tests, GNB, Nc. Plant, Southwestern Laboratories, 1986d (SWL, 1986d).
Water and stream sediment tests were performed in early 1986 by Southwest Laboratories at twenty-eight locations along the North Tributary and Stewart Creek from the former 5th Street (now Eagan Drive) to the BNSF railroad (SWL, 1986a). These tests were designed as a follow-up sampling event to soil and surface water tests performed by Southwest Laboratories during 1984 that indicated elevated concentrations in four soil sediment samples of lead and cadmium. The surface water and sediment sampling results of the 1986 sampling event indicated four stream sediment samples exceeded the criteria of 5 mg/L of for leachable lead (toxicity using EP Toxicity procedure) and/or 1 mg/L for leachable cadmium (SWL, 1986a). Dredging activities of Stewart Creek sediments were performed during 1986 along the segment from the plant area to the BNSF railroad. Three dredging events were performed and sediments were sampled following each event and evaluated for EP Toxicity for lead and cadmium (SWL, 1986b, 1986c and 1986d). The final sediment sampling event data (SWL, 1986d) indicated that sediments in the cleanup area were below the cleanup standards of 5.0 mg/L for lead EP Toxicity and 1.0 mg/L for cadmium EP Toxicity.

RCRA Facility Assessment, Texas Water Commission, 1987 (TWC, 1987).
A RCRA Facility Assessment was issued by the Texas Water Commission (TWC) on November 16, 1987. In the assessment, nine Waste Management Units (WMUs) were identified: (1) Battery Storage Area; (2) Raw Material Storage Area; (3) Slag Landfill; (4) North Disposal Area; (5) South Disposal Area; (6) Stewart Creek; (7) Old Drum Storage Area; (8) Stewart Creek Sediment Dredging Waste Pile; and (9) Product Waste Pile.

Phase I RCRA Facility Investigation, Lake Engineering, 1991 (Lake, 1991).

The Phase I RCRA Facility Investigation (RFI) was initiated in 1990 and consisted of the investigation of several Waste Management Areas (WMAs). WMAs were designated for the purpose of designing a groundwater monitoring system. Investigative activities included soil and groundwater investigations of WMA 1 (North Disposal Area and Slag Landfill), WMA 2 (Battery Storage Area, Raw Material Storage Area, Old Drum Storage Area, Product Waste Pile, and Oil Leak) and WMA 3 (South Disposal Area); an investigation of WMA 4 (Stewart Creek); and delineation of the North Disposal Area and South Disposal Area. The limits of the North Disposal Area and South Disposal Area were estimated during the Phase I RFI by borings around the perimeter of and within the landfills. The Phase I RFI report, dated May 8, 1991 (Lake, 1991), and the Addendum to the Phase I RFI Report dated December 10, 1993 (Lake, 1993) identified lead as the primary COC at the Site, and soil as the primary environmental medium of concern. The Phase I RFI also concluded that cadmium is present in soils, but at very low concentrations.

The Texas Natural Resource Conservation Commission (TNRCC) approved the Phase I RFI report and Addendum in correspondence dated June 3, 1994, and requested a Phase II RFI to conduct additional investigation at the former railroad culvert down-gradient of the Slag Landfill; along the railroad spur south of the North Disposal Area; at the closed battery storage area; in the vicinity of the acid sump located in the Battery Breaker Building; in the vicinity of the South Disposal Area; and in the Truck Staging Area. The TNRCC also requested that the Phase II workplan propose remediation of the areas of thinned cover at the North Disposal Area.

Stream Investigation; Stewart Creek; Collin County, Texas, Resource Consultants, 1991 (RC, 1991).
Stream Investigation; Stewart Creek; Collin County, Texas, Resource Consultants, 1992 (RC, 1992).

A study conducted by Resource Consultants in 1991 (RCI, 1991) investigated sediments and surface water at one location upstream of the Site and two locations downstream of the Site. Cadmium hotspots were indicated in the two sediment samples collected downstream. Resource Consultants conducted an additional study in 1992 (RCI, 1992) that investigated the biotic community in order to classify the stream. Three sample locations were chosen, with one upstream of the Site and two locations downstream of the Site. Based on the biotic community observed during the study, the stream was classified as an intermittent stream.

RCRA Facility Investigation (RFI) Report Notice of Deficiency, Texas Water Commission, 1993 (TWC, 1993).

Following review of the RCRA Facility Investigation Report (Lake, 1991), the TWC issued a Notice of Deficiency letter dated August 26, 1993. In the Notice of Deficiency, TWC requested additional information and changes to the sampling and statistical methods for groundwater and soil background value calculations and comparisons to RFI sample values. The TWC also requested that Stewart Creek be addressed as a separate RFI project from the rest of the facility. The TWC also requested pH and sulfate analysis for future groundwater samples and additional information regarding the soil properties encountered during the delineations of the South Disposal Area and North Disposal Area. Various other details regarding the investigation were also requested.

Addendum to the RCRA Facility Investigation for GNB Incorporated; Frisco, Texas, Lake Engineering, Inc. (Lake, 1993).

The RFI addendum was submitted in response to the TWC Notice of Deficiency letter dated August 26, 1993 (TWC, 1993). The addendum provided additional information as requested by TWC, including a rationale of using MCLs and the Superfund cleanup guidelines in lieu of background values, additional information regarding the soil properties encountered during the North Disposal Area and South Disposal Area delineations, and other investigation details as requested by the TWC.

Notification of On-site Class 2 Industrial Waste Landfill, RMT/Jones & Neuse, Inc., 1995 (RMT/JN, 1995).
Prior to construction of the on-site Class 2 Landfill located near the northern boundary of the FOP, a notification was prepared and submitted during 1995 by RMT/JN that included specifications of the landfill design, waste composition, landfill-area geology, a groundwater monitoring plan, and a closure and post-closure care plan. To characterize the landfill-area geology, eighteen soil borings were completed and lithologically described by a geologist. Monitoring wells were installed within nine of the soil borings. Slug tests were performed in four wells and a pumping test was performed in LMW-17. One groundwater elevation gauging event also was conducted. The geologic assessment indicated the presence of limited sand and gravel lenses in the south to southwest portion of the landfill area. The groundwater elevation gauging event indicated a hydrogeologic gradient to the southwest toward the North Tributary.

Stewart Creek Final Phase II RFI Report; GNB Technologies; Frisco, Texas, RMT/Jones & Neuse, Inc., 1996 (RMT/JN, 1996).
The Stewart Creek Phase II investigation was performed in accordance with a work plan approved by TNRCC on January 29, 1996. Ninety-eight sediment samples had been previously collected and analyzed for lead and cadmium during 1995. Twenty background sediment samples were also collected upstream of the former 5th Street on Stewart Creek and Cottonwood Creek, which is a creek that feeds into Stewart Creek. Twenty-six sediment samples were collected in areas of accumulated sediment along Stewart Creek during February 1996. Sixteen sediment sample results reported in the Phase I RFI report (Lake, 1991) were also included in the Stewart Creek Final Phase II Report. Sediment sample locations ranged from the main plant area to the Stewart Creek West Wastewater Treatment Plant, which is located downstream of the Site. Based on sampling results, the report recommended further study of the Stewart Creek segment between the former 5th Street and the 7700-foot marker.

Human Health and Ecological Risk Assessment, JD Consulting, Inc., 1998 (JDC, 1998b).
Stewart Creek was addressed as a separate project from the Phase II RFI pursuant to a TNRCC request dated September 16, 1993. The Human Health and Ecological Risk Assessment (HHERA) and Corrective Measures Study for Stewart Creek (JDC, 1998b) were submitted to the TNRCC on August 5, 1998. This study included an evaluation of Stewart Creek sediment and surface water data from several investigations, including the Phase I RFI (Lake, 1991), the Phase II RFI (JDC, 1998a), additional sediment sampling performed by RMT/JN in 1995 and 1996 and the Stewart Creek Final Phase II (RMT/JN, 1996). The study area for the HHERA included portions of Stewart Creek at the facility area and areas downstream of the facility. The study concluded that the levels of cadmium and lead in surface water did not pose a risk to ecological or human receptors, but that the sediments within the facility boundaries posed a potential risk to human and ecological receptors. In addition, the study noted that cadmium and lead levels at four locations downstream of the facility boundary (6,500 ft, 7,000 ft, 7,200 ft, and 7,600 feet downstream of the former 5th Street) may also pose an ecological risk and warranted further investigation. A Corrective Measures Study for on-site sediments was included in the report as a separate section. Implementation was carried out in accordance with the Corrective Measures Study and a report dated July 13, 2000 was submitted to the TNRCC (See JDC, 2000 below for further details).

Phase II RFI, JD Consulting, Inc., 1998 (JDC, 1998a).
A Phase II RFI was conducted by JDC in June 1998 and submitted to the TNRCC in August 1998, pursuant to a work plan prepared by RMT/Jones and Neuse (RMT/JN. 1994), modified by letter dated September 24, 1995 (GNB, 1995), and approved, with modifications, by the TNRCC on February 27, 1998. The Phase II RFI addressed the areas referenced in the TNRCC's June 3, 1994 correspondence, which approved and noted deficiencies in the Phase I and Phase I RFI Addendum that were to be addressed in the Phase II RFI. Investigative activities included soil sampling at the railroad spur and in the vicinity of the Truck Staging Area (Figure 1B). Further delineation of the lateral extent of soil COC

concentrations above applicable regulatory standards at the South Disposal Area and development of a Corrective Measures Study were also addressed in the Phase II RFI for the South Disposal Area. Several exceedances of the lead investigation limit of 500 mg/kg were encountered in soil samples from the railroad spur area, north of the Truck Staging Area at sample location NTS-1, and the South Disposal Area.

Acceptance of Closure Certification for Four Solid Waste Management Units, Texas Natural Resource Conservation Commission, 2000 (TNRCC, 2000).
The TNRCC issued a letter dated January 13, 2000, that approved closure for the following WMUs: The former Battery Storage Area, Old Drum Storage Area, Stewart Creek Sediment Dredging Waste Pile, and the Product Waste Pile. The letter stated that each WMU was closed according to the closure plans approved by the TNRCC.

Corrective Measures Implementation Report, JD Consulting, Inc., 2000 (JDC, 2000).
As a result of the HHERA described above, an approximate 2,800-foot stretch of Stewart Creek sediment was remediated to standards for lead and cadmium approved by the TNRCC (91 mg/kg for lead and 4.23 mg/kg for cadmium). The remediation was carried out by first removing visible slag "buttons" from the creek bed and banks, then excavating the soil/sediment to an average depth of 1 foot. Soil/sediment was excavated to deeper depths as needed based on the extent of slag present. Excavated soil/sediment was screened for recoverable slag fragments, which were recycled in the blast furnace at the facility. Remaining soil/sediment was stockpiled and sampled for TCLP analysis for lead and cadmium. Most samples passed the criteria for Class 2 waste; the samples that did not pass the criteria were treated until they passed. Some stockpiled material was tested for SPLP lead and cadmium for potential re-use as intermediate fill in the active Class 2 Landfill at the facility. The TNRCC approved the re-use proposal on November 8, 1999.

Leaking Petroleum Storage Tank (LPST) Case Closure of Subsurface Release of Hydrocarbons at G.N.B Technologies Facility, Texas Commission on Environmental Quality, 2003 (TCEQ, 2003).
Residue associated with a diesel fuel release was discovered in April 1988 during the construction of the retaining wall/flood wall adjacent to Stewart Creek. Details of the discovery and subsequent remedial actions are provided in a letter by Lake Engineering to the TWC (Lake, 1988). Following discovery of the residue, a pump and mobile storage tank were immediately installed. Three test holes were advanced to determine the extent of residue; residue was not detected in any of the holes. To enhance collection of residue, an oil recovery sump and intercept trenches were constructed. TCEQ issued a letter dated July 15, 2003 certifying that the former diesel fuel release (LPST ID No. 106075) had met site closure requirements and that no further action was necessary.

TCEQ and EPA Inspections, 2009-2011.
TCEQ and EPA performed multiple inspections of the Site. Key inspections and findings are noted in Table 1C.

Suspect Slag Sampling Report; Stewart Creek – West Segment, W&M Environmental, 2011 (W&M, 2011a).
W&M Environmental (W&M) conducted a visual survey of the western reach of Stewart Creek from the Battery Receiving/Storage Building to the BNSF railroad. Suspected slag samples collected from the banks of the creek were photographed and evaluated for lead, cadmium, and iron to develop a visual criteria for identifying suspected slag in the field. Based on analytical results and the resultant visual criteria, occasional slag occurrences were observed along the majority of the study area on both sides of the creek but were noted to occur more frequently along the central portion and eastern portions of the study area.

North and South Disposal Areas Evaluation, W&M Environmental, 2011 (W&M 2011b).
W&M conducted a visual inspection of the North Disposal Area and the South Disposal Area to assess the condition of the soil caps and to inspect for suspected slag on the ground surface within each area. The study identified limited areas of exposed slag and/or battery case chips in the South Disposal Area as well as isolated occurrences of slag on the ground surface to the north and east of the area. The study also noted cracks in the soil above the South Disposal Area, but no slag or battery case chips were identified in the areas of cracking. In the North Disposal Area, exposed slag was noted within materials storage areas and areas of heavy vehicular traffic in the southern portion of the area. In addition, isolated occurrences of slag were noted along the North Tributary, the railroad spur, and in the wooded area on the north side of the North Disposal Area.

Geotechnical Engineering Report, Rone Engineering, 2011 (Rone, 2011).
A geotechnical study was performed in 2011 in the general area of WMA 1 (North Disposal Area and Slag Landfill) to support the engineering design for a series of buildings and upgrades to existing facility structures proposed at the time of the report. The lithologic information obtained from the borings drilled for this investigation was used in support of Site hydrogeologic evaluation and for the development of geologic cross sections in this APAR.

RCRA Section 3013(a) Administrative Order, United States Environmental Protection Agency, 2011 (EPA, 2011).
The Administrative Order was issued on August 1, 2011 (Docket No. RCRA 06-2011-0966; re-designated by EPA as Docket No. RCRA 06-2012-0966), following an EPA inspection on December 14-18, 2009 and March 29, 2010 and review of historical documents. EPA concluded that there was potential soil, groundwater, sediment, and surface water contamination resulting from the activities at the facility and issued the Administrative Order. The Administrative Order ordered Exide to submit to EPA a workplan that proposed sampling and analysis. A sampling and analysis workplan was prepared by Conestoga-Rovers and submitted to the EPA in November 2011 (CRA, 2011). The SIR (PBW, 2012a) addressed areas noted as potential areas of concern in the Administrative Order. Additional details of the Administrative Order are provided in Table 1C.

Site Investigation Report, Pastor, Behling & Wheeler, LLC, 2012 (PBW, 2012a).
The SIR investigation was performed in accordance with a Sampling and Analysis Work Plan prepared by Conestoga-Rover Associates, submitted November 2011, and approved by the EPA by email on December 2, 2011, and pursuant to Paragraph 33 of the AOC for the Site, dated May 2, 2012. An investigation of soil, groundwater, surface water, and sediment was conducted to evaluate the nature, location, extent, direction, and rate of movement of any hazardous wastes and/or hazardous constituents which are present at or have been released at the facility. Soil samples were collected from the vicinity of the North Disposal Area, the Slag Landfill, the Raw Material Storage Area, South Disposal Area, Boneyard, Bale Stabilization Area, Crystallization Unit Frac Tank Area, Stewart Creek Corridor, and the Shooting Range Berm area. Sediments were sampled in Stewart Creek and the North Tributary, and surface water was sampled in Stewart Creek. Two surface water gauging stations were installed along Stewart Creek and three gauging events of the surface water and groundwater wells were performed. A groundwater investigation was also conducted during the SIR investigation, which included the installation of two background wells to the east of the Site and sampling of eleven existing wells in order to evaluate groundwater conditions downgradient of WMA 1 (the closed North Disposal Area and Slag Landfill), WMA 2 (the closed Battery Storage Area, Raw Material Storage Area, the closed Old Drum Storage Area, the closed Product Waste Pile and the Former Diesel Fuel Tank release area), and WMA 3 (South Disposal Area). The report recommended additional soil investigations at the Raw Material Storage Area and the Stewart Creek Flood Wall at a creek side sample location adjacent to the Battery Receiving/Storage Building.

<u>Agreed Order; Docket No. 2011-1712-IHW-E, Texas Commission on Environmental Quality, 2013 (TCEQ, 2013b).</u>
The TCEQ Agreed Order was entered into between TCEQ and Exide, effective February 10, 2013. The Agreed Order ordered Exide to prevent disposal of waste in the active landfill that exceeds LDR Treatment Standards; to submit a groundwater monitoring plan for the active landfill; to submit an APAR to address areas of concern identified in the May 6, 2011 TCEQ inspection; to submit an APAR for the RCRA Facility Investigation units listed in RCRA HW Permit No. 50206, PS IX.C. and any new areas identified by previous EPA and TCEQ investigations; to dispose of the berm material near the west side of the South Disposal Area; to prevent release of untreated slag and refractory brick from the Slag Treatment Building; and to ensure integrity of and maintain the cover of the South Disposal Area.

<u>Wall Seepage Project; Retaining Wall at Stewart Creek, W&M Environmental, 2013 (W&M, 2013).</u>
W&M prepared a report detailing the procedures of the French drain installation along the facility side of the flood wall. The French drain was installed to prevent seepage along the creek side of the flood wall, which had been previously observed. In the fall of 2012, W&M installed a French drain from the eastern edge of the Slag Treatment Building to the southeast corner of the Battery Receiving/Storage Building. The installation was completed in roughly 100-foot sections. First, the concrete was broken and the soil excavated. The soil was stockpiled on polyethylene sheeting and covered nightly with additional sheeting. Next, the wall footing was sealed with asphaltic sealer and a 40 ml HDPE liner. Then, a 4-inch PVC underdrain was installed and surrounded by crushed stone and the concrete replaced. Collection sumps were installed at the west end of the wall: one to collect liquids from the new underdrain system and another to collect surface runoff. The excavated soil was sampled and characterized for disposal off-site, by manifest, in an appropriate landfill. The Wall Seepage Project Report is reproduced in Appendix 19 of this APAR.

1.2.4 Potential Sources of Release

Potential source areas were identified based on historical knowledge of operations at the Site, including waste storage, processing, handling, and disposal activities. As described in the following sections, potential source areas evaluated during the SIR and APAR investigations include WMUs identified in the Phase I RFI (Lake, 1991; Lake, 1993; and JDC, 1998a), areas identified in the EPA-approved Work Plan (CRA, 2011), WMUs identified on the TCEQ Solid Waste Notice of Registration for the FRC (NOR No. 30516), and other potential source areas.

1.2.4.1 Potential Sources of Release Identified in the Phase I RFI

The Phase I RFI (Lake, 1991) evaluated nine WMUs that were identified in the RCRA HW Permit as units requiring investigation:

1. <u>Battery Storage Area</u>
   The former Battery Storage Area was located on a concrete slab within the former production area and was used to store palletized whole spent lead-acid batteries (Lake, 1991). The unit was closed in 1989. Closure information and the closure certification for this unit were included in the Phase I RFI Report. According to Exide personnel, the Battery Receiving/Storage Building (RCRA HW Permit Unit No. 001) was constructed in approximately 1988-1989 to replace the Battery Storage Area.

2. Raw Material Storage Area
The Raw Material Storage Area is a steel and concrete building with a concrete slab floor located within the former production area. It was used to temporarily store lead-bearing raw materials and other process materials (Lake, 1991; RMT/JN 1995). The unit is registered on the 2001 RCRA Permit as the "Raw Material Storage Building" (RCRA HW Permit Unit No. 002). According to Exide personnel, the unit was constructed in approximately 1979-1980.

3. Slag Landfill
The Slag Landfill is a closed landfill, listed as inactive on the NOR, that was used for the disposal of non-hazardous, Class 2, slag-containing material. It is located northwest of the former production area and is bound by the North Tributary to the north, the North Disposal Area to the southeast, and the railroad spur to the southwest.

4. North Disposal Area
The North Disposal Area is a pre-RCRA closed landfill located immediately north of the former production area. It is bound by the Slag Landfill to the west and the Bale Stabilization Area to the east. The landfill was capped and closed in 1978. Closure documentation was included in the Phase I RFI Report (Lake, 1991). The lateral and vertical extents of the North Disposal Area were estimated as part of the Phase I RFI, documented in the 1993 Addendum to the Phase I RFI (Lake, 1993). The locations of the delineation borings are shown on Figure 1B. Boring locations with the "NL" designation were bored through clay soils to a minimum depth of ten feet below ground surface (bgs). During the Phase I RFI "several pockets of slag, construction debris, and normal household and industrial trash" were encountered within the North Disposal Area (Lake, 1993).

5. South Disposal Area
The South Disposal Area is a closed pre-RCRA landfill located on the south side of the FOP property used for the disposal of battery case chips and slag (Lake, 1991). According to a memorandum provided by Larry Eagan (Eagan, 2013a), former plant manager at the FRC, soil was quarried from a borrow pit at the location of the South Disposal Area during the period from 1960 to 1964 (prior to construction of the landfill) to serve as fill for the foundation of the Oxide Building. The South Disposal Area landfill was capped and closed in 1974. Closure documentation was included in the Phase I RFI Report (Lake, 1991). The lateral and vertical extents of the South Disposal Area were estimated as part of the Phase I RFI, documented in the 1993 Addendum to the Phase I RFI (Lake, 1993). The locations of the Phase I RFI borings in this area are shown on Figure 1B. Boring locations with the "SL" designation were bored through clay soils to a minimum depth of eight feet bgs. During the Phase I RFI "blast furnace slag and rubber chips" were encountered within the South Disposal Area (Lake, 1993).

6. Stewart Creek
Stewart Creek is an on-site stream that runs along the south side of the former production area. The TCEQ has classified Stewart Creek as an intermittent stream (TCEQ, 2011a). Several remediation actions have been implemented within Stewart Creek, including dredging activities that removed impacted sediment and slag from the channel and banks in 1986 and 1999. JDC submitted a report (JDC, 2000) to the TNRCC documenting remediation activities conducted in the creek in 1999. Completion of the closure/remediation actions was approved by the TNRCC in a letter dated July 25, 2000.

   In 1988, GNB constructed a flood wall between the former production area and Stewart Creek to protect against potential flood waters in this area. The flood wall is also part of a runoff control system that routes rainfall that falls on the former production area to the storm water retention pond for subsequent treatment.

7. Old Drum Storage Area
   The Old Drum Storage Area was formerly located on the south side of the Raw Material Storage Building. GNB removed impacted soil during the closure of the Old Drum Storage Area in 1987 and deed recorded the area in accordance with the closure plan. The closure certification and related information on the closure were included in the Phase I RFI Report (Lake, 1991).

8. Stewart Creek Sediment Dredging Waste Pile
   A pile of sediment dredged from Stewart Creek in 1986 was disposed on-site overlying the western portion of the North Disposal Area. The dredged sediment pile was capped and closed in 1989. The closure report and related information were provided in the Phase I RFI Report (Lake, 1991).

9. Product Waste Pile
   The Product Waste Pile area was formerly located adjacent to the Battery Breaker Building. It included two waste piles that served as collection points for rubber battery case chips stored on top of the concrete slab in the former production area. The closure certification completed in 1988 and related closure information were provided in the Phase I RFI Report (Lake, 1991).

As previously noted in Section 1.2.3, the nine WMUs listed above were initially identified by the TWC in an RFA dated November 16, 1987 (TWC, 1987). Closure of the former Battery Storage Area, Old Drum Storage Area, Stewart Creek Sediment Dredging Waste Pile, and Product Waste Pile was approved by the TNRCC in a letter dated January 13, 2000 (TNRCC, 2000). As noted previously, completion of the closure/remediation actions associated with Stewart Creek in 1999 was approved by the TNRCC in a letter dated July 25, 2000.

A tenth WMU, residue from a diesel release at the Former Diesel Tank area (Figure 1B), was identified during construction of the flood wall in 1988, and after the initial TWC RFA for the Site was completed. The release was subsequently remediated and closed within the TCEQ LPST Program (LPST ID No. 106075). As noted previously, the TCEQ approved completion of the corrective action requirements for the release incident in a letter dated July 15, 2003 (TCEQ, 2003).

Additional investigative activities were conducted in these and other areas of the Site during the Phase II RFI (JDC, 1998b). As noted in Section 1.2.3, several exceedances of the RAL for lead were detected during this study in soil samples at the railroad spur near the Battery Breaker Building, in the vicinity of the Truck Staging Area, and in the vicinity of the South Disposal Area.
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1.2.4.2 Potential Sources Identified in the 2011 Sampling and Analysis Work Plan

The EPA-approved Work Plan (CRA, 2011) identified eight potential source areas requiring investigation, including several areas identified in the Phase I RFI (the North Disposal Area, Slag Landfill, Raw Material Storage Area, and South Disposal Area), and the following additional areas:

1. Boneyard
   The Boneyard was located on the southwest side of the Slag Landfill within the boundary of the Slag Landfill. Unused equipment was formerly stored in this area (CRA, 2011). During an inspection in December 2009, the EPA noted that several pieces of equipment in this area contained process materials/wastes and that one piece of hydraulic equipment was leaking.

2. Bale Stabilization Area
   The Bale Stabilization Area is located along the eastern edge of the North Disposal Area and adjacent to the Truck Staging Area. Bales of shrink wrap and cardboard materials used as packaging for batteries delivered to the Site were placed in roll-off boxes located in this area and treated with a stabilization agent prior to off-site disposal (CRA, 2011; TCEQ, 2011b).

3. Crystallization Unit Frac Tank
   The Crystallization Unit, located on the south side of the property, is used to remove sodium sulfate from water after treatment in the Wastewater Treatment Facility (CRA, 2011). Approximately once per month, a "boil out" of the Crystallization Unit is performed to clean the unit. The liquid from the boil out is collected in the Crystallization Unit Frac Tank, sampled, and then sent off-site for solidification and disposal. The Crystallization Unit Frac Tank sits on top of the Crystallization Unit's concrete slab foundation. The AOC states that EPA inspectors observed liquid leaking from the frac tank, as well as visible drainage pathways leading from the frac tank to the edge of the concrete slab. Following the EPA's inspection of this area, the frac tank seals were repaired and inspected, and curbing was enhanced such that runoff or spillage in the area is collected in a sump, treated as necessary, and returned to the storm water process stream (CRA, 2011).

4. Stewart Creek Flood Wall
   During a TCEQ inspection of the Site in May-June 2011, the TCEQ noted seepage along the Stewart Creek flood wall near the Slag Treatment Building and where the storm water conduit exits the flood wall near the Battery Receiving/Storage Building (TCEQ, 2011b). Following the TCEQ inspection, a French drain system was installed along the facility side of the flood wall to route water away from the flood wall (see Appendix 19).

5. Former Shooting Range Berm
   A shooting range formerly operated in the vicinity of the South Disposal Area. A soil pile behind the former target area was located west of the South Disposal Area (Figure 1A.1). Battery casings and slag were noted during the TCEQ inspection on the easternmost surface of the pile (TCEQ, 2011b). During the SIR investigation, the former shooting range berm was evaluated by means of three test trenches excavated perpendicular (east-west) to the long axis (north-south) of the berm. These test trenches were visually inspected for bullets, clay pigeon fragments, battery casing fragments, and slag or other foreign materials. No soil samples were collected at that time. The test trench observations indicated that foreign materials were generally absent in the westernmost portions of the berm and were generally limited to near or just below the berm surface (i.e., not in the berm interior) in the easternmost portions of the berm. Pursuant to Ordering Provision 3.c.iii of the TCEQ Agreed Order, the former Shooting Range Berm was removed in April 2013. Residual soil samples were collected after removal of the berm (see Section 4).

   Bermed material identified by the TCEQ east-adjacent to the former Shooting Range Berm (the South Berm) was also removed as required by the TCEQ in June 2013. Residual soil samples were collected from the footprint of the South Berm after it was removed (see Section 4).

1.2.4.3 Notice of Registration Waste Management Units

Seventeen WMUs are listed on the TCEQ NOR for the FRC (NOR No. 30516) (Appendix 4). A copy of the NOR for the FRC is provided in Appendix 4. The following table summarizes each of the WMUs listed on the NOR.

WMU ID No.	NOR Description	Status on NOR	Additional Information
1	*No description provided in NOR*	Inactive	According to plant personnel, this unit corresponds to the Former Product Waste Pile that was removed in 1988 (see item 9 in Section 1.2.4.1); closure of this unit was approved by the TCEQ in 2000, but the status on the NOR has not been updated.
3	North Disposal Area, pre- RCRA	Closed	Closed in 1978.
4	South Disposal Area, pre- RCRA	Closed	Closed in 1974.
5	Raw material storage building (capacity 4150 tons)	Active	RCRA Permit Unit 002. Closure procedures provided in RCRA Permit.
6	3-yard dump hoppers for storage of rubber chips. Unit is inactive.	Inactive	According to plant personnel these were staged on west side of Battery Breaker Building on the concrete slab in the former production area.
7	North Landfill, treated blast slag, inactive 1996, Non-Haz, class II, monofill.	Inactive	The Slag Landfill (located west of North Disposal Area).
8	Treatment tank for blast furnace slag located south of breaker building.	Active	Slag Treatment Building (<90-day unit). Closure procedures provided in Decontamination and Demolition Plan (PBW/RSI, 2013a).
9	Wastewater / Grey Treatment facility.	Active	Wastewater Treatment Facility; will remain in operation at least until decon/demo is complete.
10	Accumulation area for Storage prior to shipment.	Inactive	According to a letter from GNB to the TNRCC dated January 24, 1996, Unit 010 never existed at the FRC and was inadvertently added to the NOR.
11	Battery Receiving / Storage building. Storage of batteries prior to processing.	Active	RCRA Permit Unit 001. Closure procedures provided in RCRA Permit.
12	Landfill, North Property, 1996	Active	Closed and open cells of Class 2 Landfill that contain treated slag.
13	Stewart Creek dredged sediments pile. 4/89 Closed 8/89. Waste code 149620.	Closed	Dredged sediment pile overlying the western side of North Disposal Area; closed in 1989.
14	Roll-off container/box	Active	These are rental units that are picked up for disposal when full and replaced with empty containers. According to FRC personnel, the roll-off boxes are or were previously located on south side of Oxide Building, on west side of Raw Material Storage Building, at the Battery Receiving/ Storage Building loading dock, between the Slag Treatment Building and Wastewater Treatment Facility, and in the Bale Stabilization Area.
15	Frac tank used to store purge water	Active	Crystallization Unit Frac Tank.
16	Drums	Active	Temporary drum staging area located on south side of Refines and Shipping building. Used to store drums containing dust and oxide collected during decontamination. No drums are currently located in this area.
17	Debris Piles	Active	Previously located in the Boneyard within Slag Landfill. These were stockpiles of assorted debris (wood, fiberglass, etc.) collected and stockpiled during plant cleanup and demolition. The piles were removed in April 2013.

1.2.4.4 Other Potential Source Areas

Other potential source areas include areas where stack-generated and/or fugitive dust particulates have been aerially deposited. Since operations at the FRC stopped in November 2012, air emissions and aerial deposition of COCs within the confines of the Site, proximate to known COC-generating activities, have ceased other than what may be entrained from surface soils as fugitive dust during windy periods. During the ongoing decontamination and demolition activities at the Site, dust suppression measures are being implemented to reduce the potential for particulate emissions associated with these activities. Air monitoring is also being conducted. Details of the dust suppression and air monitoring procedures being performed during decontamination and demolition activities are provided in the Dust Control Plan (PBW/RSI, 2013b) and Perimeter Air Monitoring Plan (PBW/RSI 2013c), respectively, the last revisions of which were submitted to the TCEQ on February 20, 2013.

1.2.5 Affected Property Description

An affected property is defined as the entire area which contains releases of COCs at concentrations equal to or greater than the assessment level applicable for groundwater classification and residential land use (30 TAC §350.4(a)(1)). Assessment levels for the potentially complete pathways, which are discussed in Section 2 of this APAR, were used for comparison with Site sample data results to determine the extent of the affected property for each potentially affected environmental media, as applicable.

The primary COCs evaluated for this affected property assessment are lead and cadmium, based on historical operations, process knowledge, previous investigations, and guidance, direction, and/or approval given by EPA and TCEQ as part of permits, orders, and program requirements (see Section 3 for detailed information on Site COCs). Additional analytes, including arsenic and selenium, VOCs, SVOCs, and TPH were also evaluated, typically in association with specific process areas, as identified and discussed in Section 3 of this APAR. Affected property boundaries were laterally and vertically delineated based on the extent of applicable assessment level exceedances for the primary COCs of lead and cadmium as detected in samples collected from or near the Site within each potentially affected media, considering the historical identification of these COCs, their higher concentrations (particularly for lead), and broader areas of potential impact.

During the SIR and APAR Site investigations, approximately 400 soil samples, 25 surface water and 25 sediment samples (from Stewart Creek and the North Tributary), and groundwater samples from 38 monitoring wells were collected and analyzed for one or more COCs. Based on these data, three affected property areas (all soil affected property areas) were identified at the Site, each of which has been delineated. Historical sample data from previous investigations conducted at the Site, including from the Phase I and Phase II RFIs, were reviewed and were used to develop sampling strategies; however, these data were not used to delineate affected property boundaries at the Site.

SIR and APAR sample data, as well as historical data from the Site, indicate that soil is the primary affected medium at the Site. All groundwater, surface water, and sediment sample data collected during the SIR and APAR investigations were below applicable residential assessment levels (RALs) and RBELs; therefore, no affected property areas were identified for these media.

Groundwater samples from one monitoring well (LMW-9), located east and cross-gradient from the Class 2 Landfill, exceeded the established groundwater-to-surface water (^{SW}GW) PCL for selenium. TRRP Rules 30 TAC §350.37(i) and §350.37(f) indicate that ^{SW}GW PCLs are applicable groundwater PCLs at the point of exposure where groundwater discharges to surface water. Monitoring well LMW-9 is located approximately 660 feet upgradient of the point of groundwater discharge into the North Tributary. An attenuation model, documented in Appendix 11, demonstrates that the selenium concentration at LMW-9 would not migrate to this point of exposure. Based on this evaluation the selenium concentrations observed at LMW-9 do not exceed the RAL. Therefore, no areas with affected groundwater were identified at the Site.

Detailed discussions of soil, groundwater, surface water, and sediment sample data from the SIR and APAR investigations are provided in Sections 4, 5, 6, and 7, respectively. A brief description of each of the affected property areas identified at the Site, based on soil RAL exceedances, is provided below. A more detailed discussion of these areas, including delineation data, is provided in Section 4.

1.2.5.1 Affected Property No. 1 (North Area)

Affected Property No. 1 (North Area) is located north of the North Tributary and south of the Class 2 Landfill (Figure 1B). Exceedances of the soil RAL for lead were detected in several soil samples from this area. The maximum soil sample concentration of lead detected in this area was 2,920 mg/kg in sample E-11 (0-0.5'). The affected property was laterally delineated within the FOP site boundary by soil samples collected to the east, north, and west of the affected property, and by sediment samples collected from the North Tributary to the south that were below the applicable assessment levels for sediment and soil (see Section 7). Affected Property No. 1 was vertically delineated to below the background lead concentration (31.5 mg/kg, as developed in Appendix 8) at a depth of 4 feet bgs at location E-11, where the maximum lead soil concentration in this area was detected (see Table 4D.1). Consistent with 30 TAC §350.51(d)(1), vertical delineation was performed to background (rather than to the RAL) at this location because a monitoring well was not installed within or downgradient of the affected property area. Atmospheric deposition of lead from FOP emissions is believed to be the source of lead concentrations above the RAL in soils in this area.

1.2.5.2 Affected Property No. 2 (Production Area)

Affected Property No. 2 (Production Area) encompasses the majority of the former production area, the Slag Landfill, and the North Disposal Area (Figure 1B). Based on their historical use, the entire Slag Landfill and North Disposal Area were included within the affected property zone. Exceedances of the soil RALs for lead and cadmium were detected in samples within the affected property zone, with a maximum lead concentration of 95,000 mg/kg in soil sample 2013-WMU14-1 (0.9-2'), collected from the Battery Receiving/Storage Building loading dock, and a maximum cadmium concentration of 984 mg/kg in soil sample 2012-FWFS-9 (Floor), collected from the excavation for the French drain along the north side of the flood wall near the Slag Treatment Building. The soil RAL exceedance zone was laterally delineated within the FOP site boundary. It was also delineated between the former production area and Stewart Creek by approximately twenty soil samples collected along the north side of the creek. Consistent with 30 TAC §350.51(d)(2), RALs were used for vertical delineation purposes within Affected Property No. 2 since a groundwater assessment was performed in this area by sampling multiple groundwater monitoring wells within and downgradient of the affected property. Vertical delineation to the RAL was typically completed at depths of less than 5 feet bgs (outside of landfill areas); however, at several locations within the former production area, including within the Battery Receiving/Storage Building and Raw Material Storage Building, the affected property was vertically delineated at depths deeper than 5 feet bgs or was not vertically delineated before reaching the saturated zone. Soil samples at two locations within the Battery Receiving/Storage Building (2013-BSB-2 and 2013-BSB-9) and one location within the Raw Material Storage Building (2013-RMSB-4) from the approximate depth of observed saturation at these locations exceeded the applicable RAL for lead. Consistent with 30 TAC §350.51(d)(3), groundwater samples were collected from monitoring wells MW-31, located within the Battery Receiving/Storage Building, and MW-27 and MW-29, located downgradient of the Raw Material Storage Building, to assess groundwater in this area. As shown on Table 5B.1, lead and cadmium were not detected above applicable RALs in the groundwater samples from these wells.

The depth of fill material within the North Disposal Area was assessed as part of the 1993 Addendum to the Phase I RFI (Lake, 1993). The reported maximum depth of fill material was 20 feet bgs, observed in test pits and soil borings completed in the North Disposal Area during the study.

1.2.5.3 Affected Property No. 3 (South Area)

Affected Property No. 3 (South Area) is located on the south side of the FOP property, south of Stewart Creek (Figure 1B). Exceedances of the soil RAL for lead were detected in several soil samples from the vicinity of the South Disposal Area, the wooded area east of the South Disposal Area, and in one soil sample (2013-CUFT-7 (0-0.5')) located in the drainage ditch west of the Crystallization Unit. Based on its historical use, the entire South Disposal Area was included within the affected property boundary. The maximum soil sample concentration of lead in this area was 2,340 mg/kg in sample ECO-7 (0-0.5'), located in the wooded area east of the South Disposal Area (Figure 1B). The soil RAL exceedance zone was laterally delineated within the FOP site boundary in this area. Consistent with 30 TAC §350.51(d)(2), the affected property was vertically delineated to the RAL at a maximum sample depth of 2 feet bgs in the vicinity (but outside the boundary) of the South Disposal Area and 0.5 feet bgs in both the wooded area east of the South Disposal Area and in the drainage ditch west of the Crystallization Unit. As detailed in Section 4, additional evaluation is recommended at the isolated RAL exceedance location in the drainage ditch west of the Crystallization Unit (2013-CUFT-7) to provide vertical delineation to background at this location.

The reported maximum depth of fill material observed within the South Disposal Area was 8 feet bgs during the investigation completed in this area as part of the 1993 Addendum to the RFI (Lake, 1993).

1.3 Geology, Hydrogeology, and Surface Water Hydrology

1.3.1 Geology

The Site is situated in southwestern Collin County along the north-south trending contacts between the Cretaceous-aged Austin Chalk, the Cretaceous-aged Eagle Ford Formation ("Eagle Ford Shale"), and Quaternary-aged undivided surficial deposits (Figure 1C). Regional dip is to the east and southeast such that outcropping rock formations become relatively younger from west to east, with the exception of Quaternary deposits, which are generally controlled by variations in topography. Geologic units encountered at the Site are as follows (from youngest to oldest):

- <u>Quaternary Undivided Surficial Deposits</u>: Sand, clay, silt, and gravel; mostly colluvium and minor alluvium (McGowen et al., 1991).

- <u>Austin Chalk</u>: Upper and lower parts consist of light gray massive chalk (limestone primarily composed of the calcareous skeletons of micro-organisms) with some calcareous clay interbeds and partings; middle part mainly light gray bedded marl with massive chalk interbeds (McGowen et al., 1991).

- <u>Eagle Ford Shale</u>: Medium to dark gray shale (fine-grained, fissile, sedimentary rock composed of clay-sized and silt-sized particles); commonly selenitic (contains gypsum) and bituminous with thin platy beds of sandstone and sandy limestone in middle and upper parts (McGowen et al., 1991).

A regional geologic map is provided as Figure 1C and a generalized regional geologic cross section is provided as Figure 1D. A geologic cross section location map for cross sections constructed using soil boring data from the Site is provided as Figure 4C.1 and the cross sections are provided on Figure 4C.2.

The Austin Chalk forms steep hillsides to the north, east, and south of the Site. Within the FRC property boundary, the drainages of Stewart Creek and the North Tributary have eroded the Austin Chalk such that the Quaternary surficial deposits typically lie directly on top of the Eagle Ford Shale. The surface of the Eagle Ford Shale has also been eroded in the vicinity of the Site such that it and the overlying Quaternary surficial deposits generally slope toward Stewart Creek and the North Tributary, and to the west in the downstream direction of these drainages (see Figure 4C.2).

The geology encountered at the Site generally consisted of approximately 10 to 30 feet of moist to wet clay-rich colluvial soils overlying Eagle Ford Shale. Colluvium is a general term used to define soil material and rock debris that accumulates at the base of hillsides due to erosional forces such as slides, slumps, sheetfloods, or debris flows (USGS, 2013). It is typically characterized by heterogeneous and poorly sorted material. As depicted in Geologic Cross Sections A-A' through E-E' (Figure 4C.2), the colluvial soils at the Site typically consist of clay and silty clay with minor occurrences of gravelly clay (gravel suspended in a clay matrix) and discontinuous clayey sand and clayey gravel lenses.

1.3.2 Hydrogeology

The uppermost groundwater-bearing unit (GWBU) at the Site is comprised of the clay-rich colluvial soils situated on top of the Eagle Ford Shale, which acts as an aquiclude unit at the base of the uppermost GWBU. During the SIR and APAR investigations, a total of six groundwater gauging events (three gauging events during the SIR investigation in 2012 and three gauging events during the APAR investigation in 2013) were conducted using monitoring wells completed in the upper GWBU at the Site (Table 5D). During these gauging events, depth to water measurements ranged from less than 0.5 feet bgs in well MW-18, located on the bank of the North Tributary north of the Slag Landfill, to approximately 21 feet bgs in well MW-20, located on the Undeveloped Buffer Property east of the former production area. Groundwater potentiometric surface maps for the three APAR investigation water level gauging events (conducted on March 11, 2013; April 5, 2013; and April 29, 2013) are provided as Figures 5A.1 through 5A.3. The potentiometric surfaces depicted on each of these figures slope toward Stewart Creek and/or the North Tributary, suggesting that groundwater flow within the upper GWBU at the Site is strongly controlled by topography and that groundwater discharges to the on-site creeks. A detailed discussion of the characteristics of the uppermost GWBU at the Site is provided in the Groundwater Resource Classification Evaluation Report included in Appendix 7 of this APAR.

The Texas Water Development Board (TWBD) does not consider the Austin Chalk, the Eagle Ford Shale, or the Quaternary undivided surficial deposits in the vicinity of the Site to be major or minor water producing formations of Texas (George et al., 2011). A water well records search performed within an approximate 0.5-mile radius of the Site identified five potential wells completed in the Woodbine, Paluxy, or Twin Mountain Formations (see Section 2). These formations all lie stratigraphically below the Eagle Ford Shale (Figure 1D).

The Woodbine Formation lies directly below the Eagle Ford Shale and is considered a minor aquifer of Texas (George et al., 2011). The Paluxy and Twin Mountains Formations lie at deeper depths, and comprise the upper and lower portions, respectively, of the Trinity Aquifer, which is considered a major aquifer of Texas (George et al., 2011). The Paluxy Formation is separated from the Woodbine Formation by the Washita and Fredericksburg Groups. According to Nordstrom (1982), both the Washita and Fredericksburg Groups consist predominantly of limestone, shale, clay, and marl and yield only small amounts of water to localized areas. The Paluxy and Twin Mountains Formations are separated by the relatively impermeable Glen Rose Formation, which is composed primarily of argillaceous limestone. Based on a regional cross section constructed by Nordstrom (1982) (Figure 1D), the approximate depths of these formations near the Site are as follows:

- Eagle Ford Shale: Near surface to 550 feet bgs;
- Woodbine Formation: 550 to 850 feet bgs;
- Washita Group: 850 to 1,325 feet bgs;
- Fredericksburg Group: 1,325 to 1,400 feet bgs;
- Paluxy Formation: 1,400 to 1,650 feet bgs;
- Glen Rose Formation: 1,650 to 2,100 feet bgs; and
- Twin Mountains Formation: 2,100 to 2,650 feet bgs;

1.3.3 Surface Water Hydrology

As stated previously, Stewart Creek and a tributary of Stewart Creek, the North Tributary, flow in an approximate east to west direction through the central portion of the Site. Stewart Creek is a small first order stream within the Trinity River Basin that drains a watershed of approximately 3 square miles upstream of the FRC. It flows into Lewisville Lake (Classified Segment 0823), located approximately 5 miles downstream of the FRC. The on-site portions of Stewart Creek and the North Tributary receive surface water flow from five distinct creeks that collect water from east of the Site. These creeks have been incorporated into parks as water features, run along roadways and/or run through neighborhoods and other developments, and are part of the surface water features within the Frisco City limits that are contained within the City's MS4 storm water management permit. Urban runoff is the primary source of water in Stewart Creek and eventually feeds into the on-site portion of Stewart Creek. The TCEQ has classified Stewart Creek as an intermittent stream (TCEQ, 2011a).

Two staff gauges were installed in Stewart Creek during the 2012 SIR investigation to measure water level elevations in the creek. As shown on Figures 5A.1 through 5A.3, Staff Gauge #1 is located in the eastern portion of the Site (near the upstream end of the on-site reach of Stewart Creek) and Staff Gauge #2 is located in the western portion of the Site (near the downstream end of the on-site reach of Stewart Creek). Creek water levels at the staff gauges were measured concurrent with groundwater gauging events twice during the SIR investigation (January 17, 2012 and February 13, 2012) and twice during the APAR investigation (April 5, 2013 and April 29, 2013). As shown on the groundwater potentiometric surface maps on Figures 5A.2 and 5A.3 (representing the April 5, 2013 and April 29, 2013 gauging events, respectively), the creek water level elevations at the staff gauge locations on those dates were generally lower than the projected potentiometric surface contours in their immediate vicinity, suggesting that the creek is a gaining stream (i.e., groundwater discharges to the creek). Although staff gauges were not installed in the North Tributary, the groundwater potentiometric contours in the vicinity of the North Tributary on Figures 5A.1 through 5A.3 suggest that it is also a gaining stream.

The current stream channels of Stewart Creek and the North Tributary have been altered from their historical flow paths, as evident in historical photographs of the Site (Appendix 20). Prior to approximately 1968, Stewart Creek flowed in a northwestward direction through the former production area (which consisted only of the Oxide Building at that time) and the North Disposal Area and Slag Landfill (prior to their construction). During this period, the confluence of Stewart Creek and the North Tributary was located near the current boundary of the North Disposal Area and Slag Landfill. Prior to 1956, Stewart Creek ran in a southward direction from this point to a small lake upstream of the BNSF rail line west of the FRC (the lake was created by a small dam in the vicinity of the railroad bridge). By 1956, the lake was drained and the western reach of Stewart Creek was in its approximate current position. During the period from approximately 1968 to 1971, the section of the former Stewart Creek channel that ran through the former production area was filled with on-site soil to expand the general plant area, and the stream was rerouted to its current configuration (Eagan, 2013a). According to plant personnel, the North Tributary was rerouted to its current position in approximately 1993 (Eagan, 2013b). The projected paths of the former Stewart Creek and North Tributary creek channels are shown on Figure 1B.

During the APAR investigation, several monitoring wells (MW-21, MW-22, MW-24, and MW-30) were completed within or immediately adjacent to the projected former Stewart Creek and North Tributary creek channels to evaluate these features as potential preferential pathways for migration of Site COCs. Fill material associated with the projected former infilled creek paths was observed at MW-24, located south of the Slag Landfill, and MW-30, located near the northwest corner of the Battery Breaker Building. Fill material was not observed at MW-21 or MW-22, located within the projected former paths of the North Tributary east of the Slag Landfill. Boring logs for these monitoring wells are provided in Appendix 2. Soil and groundwater data for the former creek channel monitoring wells are presented in Sections 4 and 5, respectively.

Table 1A Sources of Release

Affected Property Name/Number	Name of Potential Source	Type of Potential Source	NOR unit or SWMU Number, if Applicable	Substances of Potential Concern	Size of Source (capacity, area, or volume)[1]	Status of Source		Was a Release from This Source Confirmed?			
						Status	If closed or other, list date closed or explain	No	Yes[2]	Discovery method	Date
No. 1	Former Operating Plant Emissions	Aerial deposition	NA	Lead and cadmium	30 acres (assumed; TCEQ default)	Operations stopped	November 2012		X	Site assessment	2012-2013
No. 2	Battery Storage Building	HW container storage area	RCRA SWMU No. 1/NOR WMU No. 11	Lead and cadmium	< 0.5 acres	Inactive			X	Site assessment	2012-2013
No. 2	Raw Material Storage Building	HW Containment Building	RCRA SWMU No. 2/NOR WMU No. 5	Lead and cadmium, RCRA 8 metals, SVOCs, VOCs*	< 0.5 acres	Inactive			X	Site assessment	2012-2013
No. 2	Slag Treatment Building	Waste treatment unit	NOR WMU No. 8	Lead and cadmium, petroleum hydrocarbons*	< 0.5 acres	Inactive			X	Site assessment	2012-2013
No. 2	Slag Landfill	Landfill	RCRA SWMU No. 3/NOR WMU No. 7	Lead and cadmium	~ 3.5 acres	Closed	1996		X	Site assessment	2012-2013
No. 2	North Disposal Area	Landfill	RCRA SWMU No. 4/NOR WMU No. 3	Lead and cadmium	~ 5.5 acres	Closed	1978		X	Site assessment	2012-2013
No. 2	Stewart Creek Sediment Dredging Waste Pile (overlying west side of North Disposal Area)	Capped waste pile	RCRA SWMU No. 8/NOR WMU No. 13	Lead and cadmium	~ 1 acre	Closed	1989		X	Site assessment	2012-2013
No. 2	Product Waste Pile (adjacent to Battery Breaker Building	Former waste pile	RCRA SWMU No. 9/NOR WMU No. 1	Lead and cadmium	< 0.5 acres	Removed and Closed	2000		X	Site assessment	2012-2013
No. 2	3-yard dump hoppers (west side of Battery Breaker Building)	Container	NOR WMU No. 6	Lead and cadmium	< 0.5 acres	Inactive			X	Site assessment	2012-2013
No. 2	Boneyard	Equipment storage area	NA	Lead and cadmium	~ 0.5 acres	Inactive			X	Site assessment	2012-2013
No. 2	Roll-off boxes (several locations in former production area and in Bale Stabilization Area)	Roll-off boxes used to store treated HW	NOR WMU No. 14	Lead and cadmium	< 0.5 acres	Inactive			X	Site assessment	2012-2013

Table 1A Sources of Release

Affected Property Name/Number	Name of Potential Source	Type of Potential Source	NOR unit or SWMU Number, if Applicable	Substances of Potential Concern	Size of Source (capacity, area, or volume)[1]	Status of Source		Was a Release from This Source Confirmed?			
						Status	If closed or other, list date closed or explain	No	Yes[2]	Discovery method	Date
No. 2	Stewart Creek Flood Wall	Spills	NA	Lead and cadmium, petroleum hydrocarbons*	< 0.5 acres	Active			X	TCEQ Inspection	May-June 2011
No. 2	Wastewater Treatment Facility	Wastewater treatment unit	NOR WMU No. 9	Lead and cadmium, petroleum hydrocarbons*	< 0.5 acres	Active			X	Site assessment	2012-2013
No. 2	Boneyard debris piles	Debris piles	NOR WMU No. 17	Lead and cadmium	< 0.5 acres	Removed	2013		X	Site assessment	2012-2013
No. 3	South Disposal Area	Landfill	RCRA SWMU No. 5/NOR WMU No. 4	Lead and cadmium	~ 1 acre	Closed	1974		X	Site assessment	2012-2013
No. 3	Former Shooting Range Berm	Soil pile adjacent to South Disposal Area	NA	Lead and cadmium	< 0.5 acres	Removed	2013		X	Site assessment	2012-2013
No. 3	Former Operating Plant Emissions	Aerial deposition	NA	Lead and cadmium	30 acres (assumed; TCEQ default)	Operations stopped	November 2012		X	Site assessment	2012-2013
No. 3	Crystallization Unit drainage ditch (at sample location 2013-CUFT-7A)	Unknown	NA	Lead and cadmium	< 0.5 acres	Not removed			X	Site assessment	2012-2013
Various	Exposed Battery Chips/Slag	Battery Chips/Slag	NA	Lead and cadmium	< 0.5 acres (each)	Not removed			X	Site assessment	2012-2013
NA	Class 2 Landfill	Landfill	NOR WMU No. 12	Lead and cadmium	~ 7 acres	Active		X			

1. A 30-acre source area was assumed for establishing PCLs for all areas of the Site.
2. Indicates that COCs were detected in vicinity of potential source above Residential Assessment Levels (RALs). Actual source of release may not be clearly identified.
3. RAL exceedances at Site were detected in soil only.
4. * - Lead and cadmium are the primary COCs; however, process area-specific COCs were additionally analyzed in these areas.
5. NA - Not applicable.
6. HW - Hazardous waste.

Table 1C
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Author	Date	Title	Contents	Outstanding issues / recommendations	Comments
Dames and Moore	8/29/1983	Groundwater Investigation; Frisco, Texas Plant	Dames and Moore conducted a groundwater investigation in the vicinity of the North Disposal Area and the South Disposal Area in 1983. For the investigation, seven cores were collected for geotechnical testing. Monitoring wells were installed within the geotechnical borings. In-situ permeability tests were performed within and groundwater samples were collected from the monitoring wells. The study concluded that groundwater was flowing towards and discharging into Stewart Creek and its tributaries at a low flow rate (e.g. $3.1x10^{-5}$ to $1.0x10^{-8}$ cm/sec).	"...the groundwater levels in several wells have not recovered to static levels. Therefore, water level readings should be made in all the site monitoring wells for a period of 6 months to a year." ..."the potentiometric surface should be revised to determine if there are significant changes in flow direction as a result of the new data." Once static water levels are reached"...the positioning and depths of the present wells should be examined critically at that time and modifications made to the system to assure representative monitoring of the disposal facilities. In particular, once static water level conditions are reached in wells B-1, B-3 and B-4, shallower wells intercepting the groundwater table should be installed adjacent to each of these wells to provide water quality data representative of the upper ground water flow system" "...additional groundwater samples should be collected from all wells except B-1, B-3 and B-4 to evaluate chemical variations with time. Monitoring wells B-1, B-3 and B-4 should not be sampled so that these wells can recover to static water levels."	The following wells were plugged and abandoned during the Phase I RCRA Facility Investigation (Lake, 1991): B-1, B-1S, B-2, B-2N. B-3, B-4, B-4N, B-5, B-6, B-7, B-8, and B-9 (B-8 and B-9 installed in 1987 by Southwest Laboratories). The wells were plugged and abandoned at the request of the TWC due to potential surface completion issues.
Southwest Laboratories	2/21/1986	Water and Sediment Tests	28 creek water samples, 28 stream sediment samples and 4 creek bank samples were collected and analyzed for lead and cadmium. The soil and sediment samples were analyzed using EP toxicity procedure.	"...we recommend sediments be excavated from the stream bed from current sample location 7, westward to sample location 19; this is a distance of approximately 1700 feet on Stewart Creek. The north branch appears to be relatively "clean" as indicated by our current analytical test results." "At this time is appears that only stream sediment samples need to be analyzed in the future as water sample test results by SWL to date have not shown unacceptable concentrations of lead and/or cadmium. Sampling and testing of sediments if recommended by the soil engineer before, during and after the excavation work."	Stewart Creek was remediated during 1986 and again during 2000. Remedial activities conducted during 2000 approved by letter dated 7/25/2000. Sediments tested as recommended following remediation activities in 1986.
Southwest Laboratories	5/21/1986	Stream Sediment Samples	Following an initial dredge of Stewart Creek sediments, 12 stream sediment samples were collected and evaluated for lead and cadmium using the EP toxicity procedure.	"We suggest redredging the Stewart Creek from about 50 feet east of sample location 1 to approximately 50 feet west of sample location 2. This is a distance of about 250 feet."	Stewart Creek was remediated during 1986 and again during 2000. Remedial activities conducted during 2000 approved by letter dated 7/25/2000.
Southwest Laboratories	6/13/1986	Stream Sediment Test	Following a second dredge of Stewart Creek sediment, 23 stream sediment samples were collected from a stockpile of stream sediments (19 samples) and Stewart Creek (4 samples) and evaluated for lead and cadmium using the EP toxicity procedure.	None noted. Two of the four stream sediment samples were above the 5 mg/L EPA limit of leachable lead.	Stewart Creek was remediated during 1986 and again during 2000. Remedial activities conducted during 2000 approved by letter dated 7/25/2000.
Southwest Laboratories	7/29/1986	Stream Sediment Tests	Following a third dredge of Stewart Creek sediments (approximately 300 feet), four Stewart Creek sediment samples were collected and evaluated for lead and cadmium using the EP toxicity procedure.	"The four sediment sample tests indicated that the current EPA specifications for lead (5 mg/L) and cadmium (1 mg/L) were not exceeded."	Stewart Creek was remediated during 1986 and again during 2000. Remedial activities conducted during 2000 approved by letter dated 7/25/2000.
Southwest Laboratories	9/10/1987	Three Monitor Wells	Two new monitoring wells were installed (B-8 and B-9) and B-3 drilled out and replaced due to damaged casing.	Report detailing the installation of two new monitoring wells (B-8 and B-9) and the replacement of well B-3 by drilling out and replacing the well. B-3 was replaced due to damaged casing.	None noted.
Texas Water Commission	11/16/1987	RCRA Facility Assessment	A RCRA Facility Assessment was issued by the Texas Water Commission (TWC) November 16, 1987. In the assessment, nine SWMUs were identified: (1) Battery Storage Area; (2) Raw Material Storage Area; (3) Slag Landfill; (4) North Disposal Area; (5) South Disposal Area; (6) Stewart Creek; (7) Old Drum Storage Area; (8) Stewart Creek Sediment Dredging Waste Pile; and (9) Product Waste Pile.		
Lake Engineering, Inc.	9/8/1989	RCRA Facility Investigation Workplan for GNB Incorporated, Frisco, TX	Proposed investigation of several Waste Management Areas (WMAs). Third revision approved by TWC letter dated February 6, 1990	The "location of the boundaries of the landfills (will be delineated)...and information regarding the construction and condition of the cover of each landfill" will be gathered. The landfills will be delineated horizontally by examining historical aerial photography and conducting interviews with employees...to determine the approximate outline of the landfills..."The exact location of the boundaries will be determined using a hammer drill as a pneumatic soil problem...the probing will begin on 100' centers and become more closely spaced as required...The depth of the disposal areas will be determined by trenching in the center of the North (2 trenches) and South (1 trench) areas. The depth of the active slag fill can be determined from pre-existing ground level contours v versus current elevations....During the determination of the boundaries of the landfills, an inspection will be made to ascertain the construction of the covers on the landfills and their conditions. This determination will include visual inspections of the holes and the trenches."	Addressed during Phase I RFI (Lake, 1991)

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Author	Date	Title	Contents	Outstanding issues / recommendations	Comments
Lake Engineering, Inc.	9/8/1989	RCRA Facility Investigation Workplan for GNB Incorporated, Frisco, TX (Continued)		"The possibility of contamination under the controlled surface slab, such as under the raw material pile and the old rubber chip pile, has been raised by the stipulations of the permit. In order to investigate this possibility, the slab would have to be breached, thus increasing the possibility of future migration pathways. To place holes through the controlled surface would weaken the integrity of the system. Any hole, even though grouted to the surface will expand and contract at a different rate than the slab itself...If contamination does exist under the slab it is immobile, unless it is in contact with liquid. If it is in contact with liquid and is being moved downgradient, it will be detected by the proposed facility monitor wells which border the production area."	An official closure approval letter was requested of the TWC by letter dated December 22, 1999. Closure was approved by TNRCC by letter dated January 13, 2000.
				"To address the (the extent of the) diesel oil plume, a series of four hand or power auger samples will be taken outside of the containment wall...and will be sampled to a depth of eight feet, the depth equivalent to the level of the diesel skim found in the recovery sump... (and) analyzed for Total Petroleum Hydrocarbons (TPH)."	Addressed during Phase I RFI (Lake, 1991)
				"...the well installation borings will be (visually and geotechnically) logged to provide additional knowledge of the subsurface...Continuous recovery soil borings will be made at all well installations. Samples of this material will be used to determine permeability, lead and cadmium concentrations (and total petroleum hydrocarbons, where applicable), grain size and composition. In general, these samples for analysis will be taken at the start of each hole (0 to 6"), at the 6 to 12" interval, at 12 to 18", at the 5' level and at five foot intervals thereafter, until the water table is encountered...The samples taken from proposed monitor wells MW-10, B-1N, B-7N, and the eastern piezometer locations (P1 and P2)...will be used to establish soil background parameters...A total of 217 soil samples are currently proposed for analyses. These will be collected from the borings at the monitor well and piezometer locations, along the containment wall (diesel oil plume investigation), and adjacent to existing well B-3."	Addressed during Phase I RFI (Lake, 1991)
				"To determine whether or not surface contamination could have been a contributing factor to the elevated lead level existing at B-3, a series of surface soil samples will be collected immediately uphill of this well. The samples will be analyzed (for total lead and total cadmium)."	Addressed during Phase I RFI (Lake, 1991)
				"The hydrogeologic investigation will involve the removal of the ten existing monitor wells and the installation of eighteen new monitor wells and three piezometers. The combined data collected from the replacement and new monitor wells will be used to assess the present hydrogeologic conditions at the facility. In addition, the visual and geotechnical logging of the wells will allow geologic cross sections of the site to be developed...The hydrogeologic activities are designed to address the following...to confirm the direction of groundwater flow; to further define the local groundwater flow pattern; to determine the uppermost aquifer beneath the solid waste management areas; to develop geologic sections of the facility areal to determine the vertical and horizontal extent of any contamination at any of the WMA's; to determine the hydraulic conductivity of the aquifer system; to determine the background groundwater contaminant concentrations; and to determine whether any releases to the soil and groundwater have occurred from any of the units listed in the permit."	Addressed during Phase I RFI (Lake, 1991)
				"...the degree of contamination which may be encountered along Stewart Creek...will be accomplished by taking (9) sediment samples along Stewart Creek and the unnamed tributary...In addition to sediment samples, (9) water samples will be taken at the same locations, if water is present. Also, water level elevations will be surveyed, if possible, to determine the relationship of the stream levels to the water table."	Addressed during Phase I RFI (Lake, 1991)
				Potential contamination by fine lead contaminated particulate material from the Raw Material Storage Area (RMSA) is proposed to be addressed by way of the proposed investigation of the North Disposal Area, since this is likely the receiving area of any releases and it would be impossible to differentiate particulate contamination from other sources of contamination.	Addressed during Phase I RFI (Lake, 1991)
Resource Consultants, Inc.	2/1/1991	Stream Investigation; Stewart Creek; Collin County, Texas	A study conducted by Resource Consultants in 1991 investigated sediments at one location upstream of the Site and two locations downstream relative to the Site. Cadmium hotspots were indicated in the two samples collected downstream.		
Lake Engineering, Inc.	5/8/1991	RCRA Facility Investigation for GNB Incorporated; Frisco, TX	RCRA Facility Investigation that included investigation of four Waste Management Areas (WMA)	WMA1 (Slag Landfill, North Disposal Area, Sediment Waste Pile): "Evaluation of the groundwater data collected indicates that WMA 1 is not contributing lead or cadmium contamination to the substrate. However, the monitor wells for the area should continue to be monitored as specified in the operating permit in order to ensure the proper ongoing management of these units."	Groundwater sampling results and discussion for the APAR investigation are included in Section 5 of the APAR.

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Author	Date	Title	Contents	Outstanding issues / recommendations	Comments
				Slag landfill (SL): "A permit application has been made for fixating and stabilizing the slag prior to disposal. No further action is recommended in relation to this unit."	
				North Disposal Area (NDA): "In general the cover is in good condition, but has thinned in some areas. The cover of the landfill should be repaired in areas of thinning by emplacing compacted native soil to achieve a total cover depth of two feet." Native soil discussed as having good properties (e.g. low permeability and tests run for other landfill) for landfill cover application.	NDA cover in need of additional soil placement, see W&M, Mar 2011 and PBW, 2012.
				Stewart Creek Sediment Dredging Waste Pile: closed in 1989 in accordance with TWC approved plan. "The cover of the unit is in good repair and well vegetated. No further action beyond continued periodic inspection of the cover and limiting access to the unit is recommended."	An official closure approval letter was requested of the TWC for this area by letter dated December 22, 1999. Closure was approved by TNRCC by letter dated January 13, 2000.
				WMA 2 (Bale Stabilization Area, Raw Material Storage Area, Old Drum Storage Area, Battery Storage Area, Product Waste Pile, Diesel Oil Spill): "Interpretation of the data gathered in relation to WMA 2 indicates that the area is not contributing Pb or Cd contamination to the substrate. The information gathered in relation to the diesel spill indicates that the spill is not migrating beyond the original area of discovery. It is recommended that monitoring be continued on wells surrounding this area."	NFA for diesel spill area issued by TCEQ on July 15, 2003. See below for details regarding other areas.
				Battery Storage Area (BSA): "The battery storage area referred to in the permit was closed under TWC approval. The unit was cleaned, contaminated soil removed, and the area was paved and deed recorded. No further action is recommended in relation to this unit."	Following closure of this area, the blast furnace slag stabilization unit was built over the area. TWC comments indicate additional investigation was needed below the concrete slab of this area to confirm additional contamination had not occurred due to eroded concrete covering the area. The former Battery Storage Area was closed in accordance with a TWC-approved closure plan dated March 1988 and a certification letter was subsequently submitted to TWC on January 24, 1989. An official approval letter was requested of the TWC by letter dated December 22, 1999. Closure was approved by TNRCC by letter dated January 13, 2000.
				Raw Material Storage Area (RMSA): "(The RMSA) is a covered building and materials are protected from precipitation. Further, the building is located within a runoff controlled area. No further action is recommended for this unit."	No further action requested by TWC in Notice of Deficiency letter (TWC, 1993).
				Old Drum Storage Area: "The old drum storage area referred to in the permit was closed under TWC approval. The unit was cleaned, contaminated soil was removed, and the area was paved and deed recorded. No further action is recommended in regard to this unit."	Closed according to an agreed order issued on March 17, 1987. Official approval letter requested from TWC by letter dated December 22, 1999. Closure was approved by TNRCC by letter dated January 13, 2000.
				Product (rubber chip) Waste Pile: "The product waste pile was closed according to a closure plan approved by the TWC. No further action is recommended in regard to this unit."	Closed in accordance with a closure plan approved by TWC on January 22, 1988 and as required by an Agreed Order issued March 17, 1987. The waste piles were certified as closed in March 1988. An official approval letter was requested from the TWC (TNRCC) by letter dated December 22, 1999. Closure was approved by TNRCC by letter dated January 13, 2000.
				Diesel Oil Leak: "The retrieval sump should continue to be monitored and the oil should be removed as required. For the following reasons, no additional action is recommended for this unit: 1) only moderately low levels of TPH have been detected in groundwater and soils in the immediate area of the original leak; 2) the surface overlying the spill is now entirely paved; 3) only small quantities of free product accumulate between pumping intervals indicating the majority of the oil has been retrieved."	NFA for diesel spill area issued by TCEQ on July 15, 2003.
				WMA 3 (South Disposal Area, "SDA"): The horizontal and vertical extent of the landfill have been identified… In general the cover is in good condition, but has thinned in some areas…and should be rehabilitated...traffic in the area should be restricted... ...lead concentrations in B-1N ranged from 0.03 to 0.15 mg/L…the three wells immediately downgradient (B2R, B3R and B4R) have shown no Pb or Cd concentrations exceedances of the Primary Drinking Water standards. ...MW-12 and MW-13 indicated elevated Pb readings, near or above the MCL, on two and one sampling events, respectively. ...these readings are not statistically significant. ...it is recommended that groundwater monitoring of all wells around this management area be continued."	SDA soil cover in need of additional soil placement. See W&M, Mar 2011 and TCEQ, 2011. Groundwater monitoring data provided in Phase II (JDC, 1998). Additional groundwater monitoring described in Section 5 of the APAR.
				WMA 4 (Stewart Creek): …in the areas of Stewart Creek, where observed levels exceed the action level for lead (1000 mg/kg)… be resampled on a tighter sampling pattern…"	Stewart Creek was remediated on-Site during 2000 and remedial activities approved by letter dated 7/25/2000.
Lake Engineering, Inc.	5/8/1991	RCRA Facility Investigation for GNB Incorporated; Frisco, TX (Continued)		"…the soil sampling in the general grounds area indicated several locations where lead in soil exceeds the cleanup level of 1000 mg/kg… These locations are 1) east of the entrance to the truck staging area and 2) west of the battery storage building…	Soils in the area west of the battery storage building was investigated as part of APAR (see Section 4). Soils in the area east of TSA investigated in Phase II (JDS, 1998) and in APAR (Section 4).
				Monitoring of all wells in this area should be continued.	Groundwater monitoring data reported in Phase II RFI (JDC, 1998)

Table 1C
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Author	Date	Title	Contents	Outstanding issues / recommendations	Comments
				"The elevated concentration of lead (greater than MCL of 0.05 mg/L) at the culvert on 5th Street could be indicative of road runoff...Since surface water samples at the 5th Street culvert suggest a possible impact from runoff, additional investigation of the drainage channels along the road is recommended."	Stewart Creek was remediated during 2000 and remedial activities approved by letter dated 7/25/2000.
Resource Consultants, Inc.	12/1/1992	Stream Investigation; Stewart Creek; Collin County, Texas	Resource Consultants conducted an additional study in 1992 that investigated the biotic community in order to classify the stream. Three sample locations were chosen, with one upstream of the Site and two locations downstream of the Site. Based on the biotic community observed during the study, the stream was classified as an intermittent stream.		
TWC	8/26/1993	Notice of Deficiency	TWC Comments on 1991 RCRA Facility Investigation	Requested clarification of various technical aspects of the Phase I RFI, including why groundwater background levels were not established and why groundwater values were not compared to same. Soil background levels also need to be determined.	Background soil samples were collected for the SIR (PBW, 2012) and the APAR investigation (Appendix 8). Background monitoring wells installed for the SIR.
				"TWC is in agreement that groundwater monitoring for Pb and Cd should continue on a quarterly basis. Analysis for pH and sulfates must also be included."	Pb, Cd, pH and sulfates analyzed in groundwater samples for SIR (PBW, 2012) and the APAR investigation (Section 5).
				Requested statistical methods for comparison to background soil concentrations to be specified.	Background soil samples were collected for the SIR (PBW, 2012). A statistical analysis of the samples is included in the APAR (Appendix 8).
				"The results of the surface water and sediment sampling for the RFI indicate that an adverse impact on Stewart Creek from this facility appears to be continuing… In addition, TWC stream monitoring data collected in 1989-1991 from stations downstream of the GNB facility show dissolved lead levels which exceed the State Water Quality standard for lead. Statistically significant contamination by lead and cadmium is shown in the stream sediments, indicating an ongoing problem with releases from this facility...the investigation and remediation of Stewart Creek will be addressed in a separate letter, and will be handled as a separate RFI project."	Stewart Creek was remediated during 2000 and remedial activities approved by TNRCC letter dated 7/25/2000.
				"The TWC has some concern about pH values in the range of 3.0 to 6.0 from calcareous formations…. Any additional groundwater analyses should include an analysis for pH. Background groundwater pH values for comparison purposes must also be established."	The wells that indicated pH ranges between 3.0-6.0 during the 1991 RFI investigation were B-3R, B-8N, MW-10, MW-12, and MW-13. During the 2012 Site Investigation, B-8N was discovered to have been damaged beyond repair and B-3R was dry during the Site Investigation and APAR investigation: these two wells were not sampled. MW-10 was not sampled during the 2012 Site Investigation in accordance with the November 2011 EPA-approved workplan for Site Investigation activities but was sampled during the APAR investigation and had a pH value of 7.38. MW-12 and MW-13 had pH values above 6.0 and ranged from 6.78-7.40 for groundwater sampling events for the SIR (PBW, 2012) and APAR investigation. Because B-8N was damaged beyond repair, MW-18, located nearby B-8N, was sampled as a replacement with prior EPA approval. MW-18 had pH values above 6.0 and ranged from 7.14-7.38 for the SIR and APAR investigation groundwater sampling events. All wells had a pH value above 6.0 during the SIR and APAR investigation groundwater sampling events except for the following wells sampled during the APAR investigation: MW-27 (5.82), MW-29 (5.82) and B9N (5.62).
				"Please provide correspondence documenting TWC approval of the certified closure of the battery storage area"	In their Phase I RFI Report approval letter dated June 3, 1994,TNRCC acknowledged that a Texas registered P.E. certified the closure of the battery storage area according to the Closure Plan. GNB requested official approval of closure from TNRCC by letter dated December 22, 1999. Closure was approved by TNRCC by letter dated January 13, 2000.
				"The report does not indicate the type and thickness of soil or rock underlying the waste in the North Landfill...(and)...South Landfill. Please provide a description of the underlying soil/rock."	Descriptions provided in Phase I Addendum (Lake, 1993).
TNRCC	9/16/1993	TNRCC Letter: RCRA Facility Investigation Report/Stewart Creek Phase II RFI	Letter designed to specifically address investigation and remediation of Stewart Creek separately from other WMAs.	Required GNB to conduct a separate investigation on Stewart Creek apart from the RFI/CMI program from the rest of the facility.	Addressed separately as requested by 1994 Workplan.
				A surface water value exceeded State Water Quality Standards for dissolved Pb. Additional samples collected by TNRCC at stations downstream of the site during 1989-1991 showed elevated lead levels in surface water.	Stewart Creek was remediated on-Site during 2000 and remedial activities approved by letter dated 7/25/2000. Surface water samples collected and reported in the SIR (PBW, 2012) and APAR (Section 6) were below the surface water PCL.
				"GNB is to sample sediments downstream from the facility until the lead levels are shown statistically to be at background, using acceptable sampling and analytical methods, sampling points and an acceptable statistical method to determine the point that the stream is no longer impacted by the facility. Sediment samples must be analyzed for total Pb and total Cd."	Stewart Creek was remediated on-Site during 2000 and remedial activities approved by letter dated 7/25/2000. Downstream sediment sampling results reported in Final Phase II Stewart Creek RFI (RMT/JN, 1996). Additional evaluation, outside of this APAR, is recommended to address downstream sediment hotspots (see Section 7 of APAR).

Table 1C
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Author	Date	Title	Contents	Outstanding issues / recommendations	Comments
TNRCC	9/16/1993	TNRCC Letter: RCRA Facility Investigation Report/Stewart Creek Phase II RFI (Continued)		"High levels of Pb (in sediments) were found near the large conduits installed through the closed NDA, which routes the unnamed tributary to Stewart Creek… In the Phase II RFI Workplan, please detail how potential contamination via this conduit can be investigated."	Stewart Creek was remediated on-Site during 2000 and remedial activities approved by letter dated 7/25/2000. The north tributary was re-routed after the Phase I sampling and the conduits plugged in 2000 (See Remediation Services, Inc., 2000 report detailed in this table). Five soil samples were collected and analyzed for lead and/or cadmium in this area and one monitoring well installed and sampled (MW-24) as part of this APAR.
GNB	12/9/1993	GNB letter: RCRA Facility Investigation Notice of Deficiency response		Groundwater background levels were not determined, therefore sample values were not compared to background concentrations. MCLs were used for comparison instead. A new background monitor well is proposed to the east of the facility to determine background water concentrations (e.g. total and dissolved Cd and Pb, pH).	A background monitoring well east of the facility was not installed during the Phase II investigation. Two background wells (MW-19 and MW-20) were installed during the Site Investigation (PBW, 2012).
				Four new background soil sample locations are proposed east of the facility in order to compare to soil sample values. The background samples will be collected in 6-inch intervals at 0-6, 6-12 and 12-18 inches and analyzed for "indicator parameters as specified in the permit." Soil samples will be compared to background concentrations as determined from the 4 samples east of the facility.	Background soil samples were collected for the SIR (PBW, 2012) and the APAR investigation. A statistical analysis of the samples is included in the APAR (Appendix 8).
				"A certification of closure (for the battery storage area) has been located and will be submitted to the Agency."	The TNRCC acknowledged possession of the certification of closure in their letter dated 6/3/1994. GNB requested official approval of closure from TNRCC by letter dated December 22, 1999. Closure was approved by TNRCC by letter dated January 13, 2000.
Lake Engineering, Inc.	12/10/1993	Addendum to the RCRA Facility Investigation for GNB Incorporated; Frisco, TX	Addendum submitted to address concerns of 8/26/1993 TWC letter	Same recommendations as 1991 report. TNRCC comments addressed in Dec 9, 1993 letter and by edits throughout the report.	
				"The installation of a background monitor well east of the facility to determine background groundwater concentrations for the indicator constituents listed in the facility's operating permit is recommended. Four groundwater sampling events spaced at two month intervals should be conducted from the well and analyzed for total Cd and Pb; dissolved Cd and Pb; and pH. Statistical analyses should be performed on the RFI groundwater data and the new background concentrations to determine what impact, if any, the operations at the facility have had on the groundwater beneath the Site."	A background monitoring well east of the facility was not installed during the Phase II investigation. Two background wells (MW-19 and MW-20) were installed during the Site Investigation (PBW, 2012). Groundwater data collected for APAR (Section 5) compared to RALs.
	1/21/1994	Stewart Creek Phase II Workplan	Approved by letter June 1, 1994 and modified August 3, 1994, modification approved August 8, 1994		
TNRCC	6/1/1994	Stewart Creek Phase II Workplan Approval	Conditional approval	Tighter sampling intervals of Stewart Creek sediments than workplan proposes: 100-ft intervals for first quarter mile from property boundary, continue at quarter mile increments until delineated	Sediment sampling results reported in Final Phase II Stewart Creek RFI (RMT/JN, 1996). Stewart Creek was remediated during 2000 and remedial activities approved by letter dated 7/25/2000.
				Background samples and statistical method: collect 8 background sediment samples upstream from 5th Street and collect 8 background soil samples from the east side buffer zone of plant at 12-18 inches bgs. On the background data sets, perform outlier test, test of normal distribution (or use non-parametric methods), then perform UTL statistical method.	Stewart Creek was remediated during 2000 and remedial activities approved by letter dated 7/25/2000. Surface water sampling was performed during the Site Investigation (PBW, 2012) and APAR investigation. Background soil samples were collected for the SIR (PBW, 2012) and the APAR investigation. A statistical analysis of the samples is included in the APAR (Appendix 8).
				Downstream sediment samples: Collect as large a core of sediment as possible, do not composite, and analyze each sample separately. Background sediment samples should be collected in the same manner.	Downstream sediment sampling results reported in Final Phase II Stewart Creek RFI (RMT/JN, 1996). Stewart Creek was remediated during 2000 and remedial activities approved by letter dated 7/25/2000.
				"The workplan states that collection of surface water samples will be dependent upon stream flow. Surface water samples should be collected regardless of flow. If the stream is at low flow conditions, then samples must be collected up to the farthest upstream location as practical, provided the locations are adjacent to or downstream from the facility."	Stewart Creek was remediated during 2000 and remedial activities approved by letter dated 7/25/2000. Surface water sampling was performed during the Site Investigation (PBW, 2012) and the APAR investigation (Section 6).
				Analyze three samples of blast furnace slag located in the creek and three samples of blast furnace slag from the plant directly for total and TCLP lead and cadmium.	W&M (W&M, 2011a) sampled suspected slag from Stewart Creek and analyzed the samples for total Pb and Cd. The samples were also analyzed for Fe and Ca to differentiate slag from limestone fragments.
Delta	1994	Stewart Creek Phase II RFI	20 sediment samples collected and analyzed for Cd and Pb	Remedial activities should focus on stream segment between GNB and 7700 feet downstream of Stewart Creek at 5th Street	Stewart Creek was remediated on-Site during 2000 and remedial activities approved by letter dated 7/25/2000. Additional evaluation, outside of this APAR, is recommended to address downstream sediment hotspots (see Section 7 of APAR).
				Develop corrective measures study	See JDC, 1998.
				Develop Tier 1 eco risk assessment	See JDC, 1998.
TNRCC	6/3/1994	TNRCC Approval of Phase I and Phase I Addendum	Required several areas of concern to be addressed in Phase II	Background wells: TNRCC requires GNB to install one monitor well for SWMUs 3 (SL), 4 (NDA), 5 (SDA) and 8 (Stewart Creek Sediment Dredging Waste Pile). Also recommended are additional background wells to provide an adequate sample population for statistical calculations to determine if background values have been exceeded. It is unclear if well B1-R has been impacted by the South Disposal Area, so an additional well may need to be installed up-gradient of the SDA to be used as background.	A background monitoring well east of the facility was not installed during the Phase II investigation. Two background wells (MW-19 and MW-20) were installed during the Site Investigation (PBW, 2012).

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TNRCC	6/3/1994	TNRCC Approval of Phase I and Phase I Addendum (Continued)		Groundwater monitoring: "...TNRCC is requesting that groundwater samples be analyzed for sulfates.." in addition to the parameters proposed in the Phase I Addendum (i.e. total and dissolved Pb and Cd, pH)	Quarterly groundwater monitoring results were presented for total lead in the Phase II Investigation report (JDC, 1998). Total and dissolved Pb and Cd, pH and sulfates were analyzed in groundwater samples collected for the SIR (PBW, 2012) and the APAR investigation (Section 5).
				Background soil: "...background soil samples must correspond to the same soil type, or soil horizon as the down-gradient samples."	A background soil study was conducted in 1993, however, TNRCC did not agree with the values. Background samples were not collected during the Phase II investigation. During the Site Investigation (PBW, 2012) and the APAR investigation, background soil samples were collected (Appendix 8).
				WMA 1: "Additional soil samples should be collected around the outfall of the old railroad culvert down-gradient of the active slag landfill to determine whether this area could be a "hot spot" due to historical runoff from the slag landfill or north disposal area. Soil samples should also be collected south of the north disposal area along the railroad tracks." Samples to be collected from 0-6, 6-12, 12-18, 18-24 inches and at 3 feet. Samples are not to be composited. If sample results indicate hazardous constituents are present at deeper than 4 feet, the collection of deeper samples may be necessary.	The former railroad culvert outfall was addressed during the APAR investigation. Four soil samples were collected and analyzed to evaluate lead and cadmium in the area (Section 4).
				North Landfill: to address the thinned cover in some areas, the Phase II workplan should propose the necessary remediation, including whether placement of additional cap material is necessary during the Phase II RFI.	NDA cover in need of additional soil placement, see W&M, Mar 2011 and PBW, 2012.
				WMA 2: Closed battery storage area: "...photographs of the Battery Storage Area taken after closure was completed show pitted, eroded and cracked concrete, indicating a potential release pathway to the soil beneath this unit. Since the closure, a building has been constructed over the site. The TNRCC cannot conclude at this time that the subsurface soil in this area was not impacted by the previous battery storage practices. Please propose a method to investigate the subsurface soils in this area to document that a release did not occur.	Following closure of this area, the blast furnace slag stabilization unit was built over the area. TWC comments indicate additional investigation was needed below the concrete slab of this area to confirm additional contamination has not occurred due to eroded concrete covering the area. The former Battery Storage Area was closed in accordance with a TWC-approved closure plan dated March 1988 and a certification letter was subsequently submitted to TWC on January 24, 1989. GNB request official approval of closure from TNRCC by letter dated December 22, 1999. Closure was approved by TNRCC by letter dated January 13, 2000.
				WMA 2: Battery Acid Management System: "The acid sump, located at the battery breaker, is a SWMU, with a conduit leading to the on-site wastewater treatment plant. The WWTP includes subsurface treatment tanks. Groundwater samples from MW-12 and 13 showed a pH of 3.9, 5.0 and 4.9, which is lower than the expected range for ground water in this area. It is our understanding that the acid sump has been recently checked for integrity and that the conduit leading from the sump to the WWTP has been replaced. Please provide documentation of the physical integrity of the sump and the conduit, and removal of the previous conduit. Also, please provide information on repairs and/or changes to the sump or the conduit. In the Phase II workplan, please propose a method to sample soils in the proximity of the sump and conduit. Provide information, if available, pertaining to integrity testing conducted on the subsurface WWTP tanks. If these tanks have not been integrity tested by an independent Texas registered PE, then integrity testing, and possibly subsurface soil sampling, will be necessary as part of the Phase II RFI.	pH values were above 6.0 for groundwater samples collected at MW-12 (6.78-7.17) and MW-13 (7.13-7.40) during the groundwater sampling events for the SIR (PBW, 2012) and APAR investigation (Section 5). GNB proposed to provide documentation of the integrity of the battery acid management system (i.e. sump, current conduit, and removal or previous piping); available information compiled on repairs and/or changes to the sump and conduit; and information complied on integrity of subsurface tanks at the on-site WWTP. Further investigation was not requested by TNRCC.
				WMA 2: Stored Raw Materials: "In the area immediately adjacent to the battery breaker, liquid materials collect on the floor prior to draining into the acid sump. This appears to be management of a solid waste...and meets the definition of a SWMU. The integrity of the concrete receiving this material is questionable, due to the appearance of eroded and cracked concrete and the nature of the liquid. This area must be cleared of the liquid, and the integrity of the concrete and possibly the underlying soils must be investigated as part of the Phase II."	This area addressed in the APAR investigation. A sample was collected and analyzed at this location to evaluate lead, cadmium and pH.
				WMA 2: "Soil borings must be completed at approximately every 100 feet around WMA 2."	Soil borings were proposed in the Phase II workplan south of WMA 2 along Stewart Creek. Samples were not proposed along the northern border of WMA 2 due to this area being up-gradient of potential source areas. Many borings have been completed and sampled subslab within WMA2, including in the Battery Receiving/Storage Building, the Slag Treatment Building and outside vicinity, the Raw Material Storage Building and outside vicinity, as well as various other areas. Further discussion is provided in Section 4 of the APAR.
				WMA 3: South Disposal Area: "During the Phase I RFI, it appears that some sample points showing high lead results were not sampled at greater depths. Additional borings are needed in the area to further delineate lateral and vertical extent of contamination. An additional well should be installed near B1-R and screened in a deeper zone, since B-1R appears to be screened in the vadose zone and seldom supplies a water sample. Monitoring well B-4R appears to need replacing for the same reason."	The Phase II investigation further delineated SDA lead exceedances. Additional delineation of SDA soil sample exceedances was also conducted for the SIR (PBW, 2012) and the APAR investigation (Section 4). B-1R and B-4R are both completed to the top of the shale bedrock and are fully penetrating of the uppermost groundwater bearing unit.

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TNRCC	6/3/1994	TNRCC Approval of Phase I and Phase I Addendum (Continued)		WMA 3: "Further interpretation of the WMA 3 subsurface is necessary. A revised groundwater contour map and more detailed cross sections of the SDA should be included in the final Phase II report, incorporating the additional information collected during the RFI."	Completed in Phase II (JDC, 1998) and SIR (PBW, 2012).
				Truck Staging Area (TSA): Exceedances indicated at MW-10 at upper 6 inches. "...These lead levels may have been caused by historical runoff from the TSA. Aerial photos from 1979 and 1981 show that this area was not paved and curbed at that time. ...bundles of spent batteries...may have leaked onto the ground while the trucks were/are parked in the TSA... the TNRCC is requiring additional soil borings along the periphery of the staging area and along the 5th Street drainage ditch. Each soil boring should be sampled for lead and cadmium every 6 inches to a min depth of 3 feet."	TSA sampled during Phase II (JDC, 1998) and lead exceedances delineated during the Phase II and the Site Investigation (PBW, 2012). Further delineation of MW-10 addressed in APAR investigation. Seven soil samples collected and analyzed to evaluate lead in this area (Section 4).
				Hydrogeology: "The cross sections and lithologic logs show some gravel layers...Please use the additional information gathered during the Phase II RFI to further interpret the stratigraphy immediately below the facility...and provide more detailed cross sections in the Phase II report."	Completed in Phase II and SIR. Detailed evaluation provided in Appendix 7 of APAR.
RMT/Jones and Neuse, Inc.	10/1/1994	Workplan for Phase II RCRA Facility Investigation; GNB Facility, Frisco, Texas	Conditionally approved by TNRCC letter dated February 27, 1998	Background monitor wells: "The following four background wells are recommended to adequately define groundwater concentrations at the site: 1) two new wells east of 5th street; 2) one new well south/southeast of WMA3 (SDA); and 3) one new well northeast of WMA1 (Slag Landfill, North Disposal Area, Sediment Waste Pile)...(also), the surficial water-bearing zone penetrated in soil borings proximal to Stewart Creek is not present at well B-1R (SDA). The location of the well on the bluff, which is capped by the relatively impermeable Austin Chalk Formation, may account for the absence of the surficial water in this area. A well located near the topographic saddle south/southwest of the south disposal area may provide hydraulically up-gradient (background) groundwater samples for WMA3."	Background monitor wells not installed during Phase II investigation due to on-site construction activities and dry weather. Two background wells (MW-19 and MW-20) were installed east of the facility and reported in the SIR (PBW, 2012).
				"...three soil borings will be drilled in the area of WMA 3 to determine the surface geology adjacent to the SDA. The primary emphasis of these soil borings is to determine the extent of the sand and gravel layers noted in previous investigations. "	Addressed in Phase II RFI (JDC, 1998).
				"Well B4R will be plugged and decommissioned, and a replacement well installed slightly northwest of the location of this well. The new monitor well will be completed to a depth of approximately 40 feet."	Well not replaced due to dry conditions at the site during the time of the Phase II investigation. Well B4R is completed to the top of the shale bedrock and produced groundwater samples for SIR and APAR investigations (Section 5).
				Background soil: "Surface soils not impacted from lead emissions of vehicular traffic as well as subsurface soil will be evaluated from a minimum of six locations along the perimeter of the property. Only locations upwind (south or west) of the plant are recommended. Samples will be collected from the 0 to 6" and 6 to 12" depths and analyzed for both lead and cadmium as well as pH. In addition to this data, soil lead concentrations are also being evaluated by Delta from analytical data generated during the Stewart Creek Phase II RFI activities."	During the Site Investigation (PBW, 2012) and APAR investigation, background soil samples were collected (Appendix 8).
				WMA1: (NDA, Stewart Creek Dredged Sediment Pile, SL) former railroad culvert "...three soil sampling locations are proposed south of the north disposal area along the railroad tracks..."	Sampling completed during Phase II between WMA1 and WMA2 along railroad tracks.
				NDA recommendations: "...1) a visual inspection be conducted to determine all areas of the north disposal area in which the cap has deteriorated; 2) a permeable geotextile fabric be installed in these areas prior to the addition of native fill; 3) the cover material be tested for lead cadmium, pH and texture; 4) re-seed cover material with suitable grass mixture and 5) limit future access in this area."	NDA cover in need of additional soil placement, see W&M, Mar 2011 and PBW, 2012.
				WMA 2: Former battery storage area: "...the integrity of the concrete floor will be determined by an independent Texas registered professional engineer during the Phase II RFI. Soil sampling from beneath the existing paved surface is not recommended at this time. Such sampling (i.e. drilling through concrete) may provide a conduit for future contamination and should be evaluated following the inspection process."	An official closure approval letter was requested of the TWC for this area by letter dated December 22, 1999. Closure was approved by TNRCC by letter dated January 13, 2000.
				Battery acid management system: "During the Phase II RFI, the following activities will be conducted related to the battery acid management system: 1) documentation provided of physical integrity of sump, current conduit, and removal of previous piping; 2) available information compiled on repairs and/or changes to sump and conduit; and 3) information compiled in integrity of subsurface tanks at on-site WWTP."	

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RMT/Jones and Neuse, Inc.	10/1/1994	Workplan for Phase II RCRA Facility Investigation; GNB Facility, Frisco, Texas (Continued)		Soil borings around WMA 2: "Ten soil borings will be completed along Stewart Creek on the south side of WMA 2 to evaluate potential contamination. Of particular concern is the release of acidic materials which would impact soil and groundwater pH. Soil borings are proposed along the south and west sides of the process area just outside of the paved area. These locations are hydraulically downgradient of the battery breaker sump and conduit. No soil borings are proposed along the north perimeter of the WMA2 since these locations are hydraulically upgradient of the potential source areas."	Addressed in the Human Health and Ecological Risk Assessment and Corrective Measures Study (JDC, 1998).
				WMA 3 (SDA): "A grid layout for soil sampling is proposed for the SDA to determine the lateral and vertical extent of soil contamination. The spacing of the grid lines will be 50 by 50 feet with soil samples collected to a depth of six feet at every grid node. Samples will initially be only analyzed from the 100 by 100 foot interval at grid points outside of the boundaries of the SDA. All other soil samples will be held at the laboratory for later analysis, if necessary. The data from the sampling results will be evaluated with a geostatistical program to generate isopleths of soil lead and cadmium concentrations. The program can also be utilized to determine where additional data is required to refine the isopleths. This evaluation will help to determine if soil samples should then be analyzed. Following the review of the analytical data, one or more samples may then be analyzed for leachable concentrations of lead and/or cadmium utilizing the SPLP."	Addressed during Phase II RFI (JDC, 1998)
				Additional monitor well (re-stated from background monitor wells section above regarding B-1R.)	Background monitor wells not installed during Phase II investigation due to on-site construction activities and dry weather. Two background wells (MW-19 and MW-20) were installed east of the facility and reported in the SIR (PBW, 2012).
				Truck staging area (TSA): "A total of eight soil borings are proposed for installation along the periphery of the truck staging area and along 5th street. Soil borings will be located approximately 100 feet apart around the staging area and along the west side of 5th street from the staging area to Stewart Creek. The soil borings will be drilled to a minimum depth of six feet. Soil samples will be collected from each six inch interval to a depth of three feet. Below three feet, samples will be collected every 12 inches. All samples from the 0 to 3 foot depth interval will be analyzed for total lead and cadmium as well as pH. Samples collected from below the three foot depth will be initially held at the laboratory...Soil borings are not recommended within the truck staging area, rather around the perimeter and north of Stewart Creek."	TSA sampling conducted during Phase II investigation (JDC, 1998).
				Site geology: "Three geotechnical borings will be installed during the Phase II RFI to further evaluate site geology. Of primary concern is the presence of discontinuous gravel layers."	Not addressed in Phase II investigation. Addressed in SIR (PBW, 2012) and APAR investigation. Detailed evaluation provided in Appendix 7.
				"Water levels from available wells will be measured during a one-day time period to determine groundwater flow and for development of a groundwater contour map."	Not addressed in Phase II investigation. Water level measurements presented in SIR (PBW, 2012) and APAR (Section 5).
GNB	10/12/1994	Miscellaneous Stained Soil Samples	Letter from GNB to TNRCC presenting results of Delta sampling of stained soils near the retaining wall and Stewart Creek walking bridge. Suggested staining may have originated from water coming from under the footing of the flood wall. The conduit seal appeared sound, so it appeared that the seeps may have been caused by hydraulic pressure from the interior and underside of the flood wall.	Actions taken include: "A small area of black top North of the conduit sump was removed and the new concrete poured and sealed against the battery building and flood wall, etc."	
				"The stained soil has been scraped up and drummed and will be handled appropriately."	
				"Confirmation samples were collected on October 12, 1994 by Delta."	See stabilization approval letter (TNRCC, 1997).
Delta	10/16/1994	Miscellaneous Stained Soil Samples	Four surface soil samples were collected near the GNB Stewart Creek walking bridge adjacent to the retaining wall. Three of the samples were collected from stained soils, while one was collected nearby and adjacent to the retaining wall from an area that was not stained.		
Delta	10/20/1994	Miscellaneous Stained Soil Samples	Three soil samples were collected on the creek side of the retaining wall at locations where water seepage through the retaining wall had been observed. One surface soil sample was collected from a similar unaffected area of soil.		See stabilization approval letter (TNRCC, 1997).
GNB	3/20/1995	Stewart Creek Phase II Implementation Notice		Modifies sampling frequency of Stewart Creek to less frequent intervals due to low concentrations of Pb and Cd found in certain areas of the creek and to refine additional samples based on results	

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RMT/Jones and Neuse, Inc.	8/30/1995	Notification of On-Site Class II Industrial Waste Landfill	Prior to construction of the on-Site Class II landfill, a notification was prepared and submitted during 1995 by RMT/JN that included specifications of the landfill design, waste composition, site geology, a groundwater monitoring plan, and a closure and post closure care plan. To characterize the site geology, eighteen soil borings were collected and lithologically described by a geologist. Monitoring wells were installed within nine of the soil borings. Slug tests were performed in four wells and a pump test was performed in LMW-17. One groundwater elevation gauging event was conducted. The geologic assessment indicated the presence of limited sand and gravel lenses in the south to southwest portion of the landfill area. The groundwater elevation gauging event indicated a hydrogeologic gradient to the southwest towards the North Tributary.		
GNB	9/24/1995	Revisions to Stewart Creek Phase II RFI Work Plan		Sediment sample locations to be selected based on sediment accumulations identified (6 total) in aerial photos. Within each sediment accumulation area, 3 to 5 sediment grab samples will be collected.	Sediment samples were collected in this manner and reported in the Stewart Creek Final Phase II Report (RMT/JN, 1996) Stewart Creek was remediated during 2000 and remedial activities approved by letter dated 7/25/2000.
RMT/Jones and Neuse, Inc.	5/1/1996	Stewart Creek Final Phase II RFI Report	The Stewart Creek Phase II investigation was performed in accordance with a work plan approved by TNRCC on January 29, 1996. Eighty sediment samples were collected and analyzed for lead and cadmium during 1994. In addition, 20 background sediment samples were collected upstream of the former 5th Street on Stewart Creek and Cottonwood Creek, which is a creek that feeds into Stewart Creek. Twenty-six sediment samples were collected in areas of accumulated sediment along Stewart Creek during February 1996. Sixteen sediment sample results reported in the Phase I RFI report (Lake, 1991) were also included in the Stewart Creek Final Phase II Report. Sediment sample locations ranged from the main plant area to the Stewart Creek West WWTP, which is located downstream of the Site. Based on sampling results, the report recommended further study of the Stewart Creek segment between the former 5th Street and the 7700-foot marker.	"It can be concluded from this investigation and previous investigations that remedial activities and stabilization should focus on the stream segment between GNB and approximately 7700 feet downstream of Stewart Creek at 5th Street."	Stewart Creek was remediated on-Site during 2000 and remedial activities approved by letter dated 7/25/2000. Additional evaluation, outside of this APAR, is recommended to address downstream sediment hotspots (see Section 7 of APAR).
				"A Corrective Measures Study for the stream sediment between 5th Street and the 7700 foot marker and a Tier I qualitative ecological risk assessment will be submitted."	A corrective measures study for this stream segment was submitted 8/1/1998 (JDC, 1998). Stewart Creek was remediated on-Site during 2000 and remedial activities approved by letter dated 7/25/2000.
TNRCC	3/26/1997	Miscellaneous Stained Soil Samples - Stabilization Approval		"This letter approves the sampling and excavation of contaminated soil as a stabilization measure."	
				"It is understood that further investigation of this area will be included in the Phase II RFI for the facility upon TNRCC review and approval of the Phase II RFI workplan submitted January 1, 1994 and revised October 5, 1994."	This area was investigated during the SIR (PBW, 2012) and the APAR investigation (Section 4).
TNRCC	2/27/1998	Conditional approval of Phase II RCRA Facility Investigation Workplan		Background soil concentration: GNB conducted a background soil study in 1993 (results presented in Phase II Workplan) to determine background concentration of Pb and Cd. TNRCC does not agree with values as representative of background and also required that background samples be taken at similar intervals as proposed soil samples to be collected.	Background soil sampling performed for SIR (PBW, 2012) and APAR investigation. Statistical analysis of the samples is provided in the APAR (Appendix 8).
				WMA 1: "...the TNRCC is requiring soil samples to be collected at the railroad spur unloading area located on the southern side of the NDA."	Railroad spur samples were collected during the Phase II investigation (RRS-1, RRS-2, RRS-3 and RRS-4).
				Modification of sampling procedures at the railroad culvert outfall requested: instead of sampling the first two inches, sample at intervals similar to that stated in the June 3, 1994 TNRCC letter. Samples are not to be composited.	Soil investigation in the vicinity of the former railroad culvert addressed in APAR investigation. Three soil borings completed and sampled to evaluate lead and cadmium in this area (Section 4).
				"...the soil and groundwater samples collected from boring B-7N...showed levels of lead which appear to be elevated. The lateral and vertical extent of contamination must be determined for all areas around WMA1."	The Phase II investigation (JDC, 1998) and SIR (PBW, 2012) established lateral delineation around boring B-7N. Vertical delineation of soil at this boring was achieved during the Phase I RFI.
				WMA 2: Even if/when GNB submits integrity check documentation, TNRCC stated that GNB will have to sample underneath WMA 2. "...the TNRCC strongly suspects that the soils underlying WMA 2 have been impacted...as evidenced by seepage from underneath the battery storage area along Stewart Creek...documented by Misc. Stained Soil samples report dated October 6, 1994... TNRCC will assume a release beneath WMA 2 (if borings not advanced through concrete at WMA2).	Multiple soil borings were advanced through concrete throughout WMA2 during the Site Investigation (PBW, 2012) and APAR investigation. In addition, samples were collected along the Stewart Creek floodwall following concrete removal from the area during French drain construction activities. An official closure approval letter was requested for this area of the TWC by letter dated December 22, 1999. Closure was approved by TNRCC by letter dated January 13, 2000.
				WMA 3: SDA: Groundwater delineation is not addressed adequately. The TNRCC suspects that the acidic conditions, lead and cadmium detected in MW-12 may be associated with the SDA.	During the groundwater sampling events for the SIR (PBW, 2012) and APAR investigation, MW-12 had pH ranging from 6.48-7.17. Pb and Cd levels were below Residential Assessment Levels for both sampling events (Section 5).
				Truck Staging Area: "Soil samples should be collected around and in (the truck staging area) and sampled at the same depths as the proposed samples during the Phase II RFI."	TSA samples collected from non-paved areas during Phase II investigation.

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GNB	3/31/1998	Letter response to Phase II Workplan conditional approval	Confirms TNRCC comments will be integrated into new workplan	In lieu of the Phase II soil borings between WMA 1 and WMA 2, a BLRA and CMS will be submitted for Stewart Creek and submitted by Aug 1, 1998	Borings proposed for this area are specified in the Phase II workplan as being located along Stewart Creek only: boundaries north of WMA 2 are upgradient of potential areas of contamination. See also Human Health and Ecological Risk Assessment and Corrective Measures Study (JDC, 1998).
				"GNB will perform the appropriate aspects of the Phase II investigation at the WMA 3 to determine the lateral extent of lead contamination in the shallow soil and to evaluate risk and develop the CMS for this area. In addition, GNB will determine the extent of lead in groundwater in the area of MWs B1N, BR3, MW12 and MW13."	Quarterly groundwater monitoring results (including those for B-1R, B-3R, MW-12 and MW-13) were presented for total lead in the Phase II Investigation report (JDC, 1998). In addition, groundwater sampling was performed during the Site Investigation (PBW, 2012) and the APAR investigation (Section 5). Soil sampling of WMA 3 addressed in the Phase II investigation as described in the workplan (RMT/JN, 1994)
				Additional samples will be collected from non-paved areas of the truck staging area, the area around B7N and samples will be collected from the RR spur unloading area between WMA1 and WMA2. The purpose of the soil sampling is to determine the lateral extent of lead contamination in shallow soil and to gather the appropriate information to evaluate risk and to develop the CMS for these areas.	All three areas were addressed during the Phase II investigation (JDC, 1998).
JDC	8/1/1998	Human Health and Ecological Risk Assessment and Corrective Measures Study Report for Stewart Creek	Stewart Creek was addressed as a separate project from the Phase II RFI pursuant to a TNRCC request dated September 16, 1993. The Human Health and Ecological Risk Assessment (HHERA) and Corrective Measures Study for Stewart Creek (JDC, 1998b) were submitted to the TNRCC on August 5, 1998. This study included an evaluation of Stewart Creek sediment and surface water data from several investigations, including the Phase I RFI (Lake, 1991), the Phase II RFI (JDC, 1998a), additional sediment sampling performed by RMT/JN in 1995 and 1996 and the Stewart Creek Final Phase II (RMT/JN, 1996). The study area for the HHERA included portions of Stewart Creek at the facility area and areas downstream of the facility.	HHERA: Surface water concentrations of Cd and Pb do not pose a risk to human or ecological receptors. Cd and Pb in creek sediments within GNB's facility boundaries may pose a risk to on site workers. Corrective measures are recommended for the 2050 foot section of Stewart Creek within the GNB facility from a location 750 feet downstream from the former South 5th Street to the northwest facility boundary (approximately 2800 feet downstream from the former south 5th street) because the sediments in this portion of the creek consistently exceed the ecological screening levels for lead (218 mg/kg) and for cadmium (10 mg/kg). The 4 locations downstream of the northwest facility boundary (6500 feet, 7000 feet, 7200 feet and 7600 feet downstream of the former South 5th Street) that exceeded for sediment screening levels should also be evaluated.	Stewart Creek was remediated during 2000 and remedial activities approved by letter dated 7/25/2000. Additional evaluation, outside of this APAR, is recommended to address downstream sediment hotspots (see Section 7 of APAR).
				CMS: Additional sampling and statistical evaluation of downstream sediment samples that exceeded screening values for Pb and Cd. At least five samples at each area should be collected and analyzed for total lead and cadmium to characterize the lateral and vertical extent of sediments that exceed the screening levels. The sampling results will be used to estimate the volumes of contaminated sediments to be addressed by evaluation of corrective measures, if necessary.	A CMS of on-Site sediments was included in the HHERA; following implementation of the CMS, a Corrective Measures Implementation Report (CMI) dated July 13, 2000, was submitted to TNRCC. Additional evaluation, outside of this APAR, is recommended to address downstream sediment hotspots (see Section 7 of APAR).
JDC Consulting	8/1/1998	Phase II RFI Report	A Phase II RFI was conducted by JD Consulting, Inc. (JDC) in June 1998, pursuant to a work plan prepared by RMT/Jones and Neuse (RMT/JN. 1994), modified by letter dated September 24, 1995 (GNB, 1995), and approved, with modifications, by the TNRCC on February 27, 1998. The Phase II RFI addressed the areas referenced in the TNRCC's June 3, 1994 correspondence, which approved and noted deficiencies in the Phase I and Phase I RFI Addendum that were to be addressed in the Phase II RFI. Investigative activities included soil sampling at the truck staging area, the railroad spur, and the area in the vicinity of the Truck Staging Area (Figure 1B). Further delineation of the lateral extent of soil COC concentrations above applicable regulatory standards at the South Disposal Area and development of a Corrective Measures Study were also addressed in the Phase II RFI for the South Disposal Area.	Truck Staging Area: "The Phase II RFI shallow surface soil sample result of 11800 mg/kg lead from NTS2 exceeds the proposed investigation limit….the subsurface soil samples collected from NTSB1 (same location as NTS2) had lead concentrations that were all below the proposed investigation limit (500 mg/kg)...vertical extent determined... It is recommended that stabilization measures be evaluated, and additional investigation conducted, to determine the extent of lead at concentrations above the proposed investigation limit...at this area."	NTS2/NTSB1 has been delineated by soil sample 2012-NDA-3, collected during the Site Investigation (PBW, 2012) (Section 4).

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JDC Consulting	8/1/1998	Phase II RFI Report (Continued)		Railroad Spur: "Surface soil samples…had lead concentrations that exceeded the proposed investigation limit…. Only one soil sample (collected deeper than 24") (RRS4e 24-42") had a lead concentration that exceeded the proposed investigation limit…(42-48" in same sample was below investigative limit). Therefore, the vertical extent of lead in soil, relative to the proposed investigation limit, has been determined at the railroad spur. Access to this area is limited because of the boundaries of WMA1 and WMA2, therefore an investigation to determine the lateral extend of lead concentrations in surface and subsurface soils is not recommended or feasible. The lead concentrations reported for the surface soil samples collected from boring RRS 1 appear anomalous because they increase with depth, therefore, it is recommended that this area be resampled."	Addressed in APAR investigation. Soil samples collected and analyzed to evaluate lead and cadmium in this area (Section 4).
				South Disposal Area: The following surface soil samples exceeded the proposed investigation limit: SDA2, SDA3, SDA4, SDA5, SDA9-1, SDA9-2. "Most of the impact was limited to the upper 12 inches of soil. Only two soil samples exceeded the proposed soil investigation limit in the 12-18 and 18-24" intervals (SDA9-2c and SDA9-2d) and only one sample collected from the 12-18" depth interval exceeded the proposed surface soil cleanup level (1000 mg/kg). ...Two subsurface soil samples collected from the 24-30" and 30-36" depth intervals in boring SDA8 exceeded the proposed investigation limit. Deeper intervals at this sample did not exceed the proposed investigation limit. Thus, the vertical extent of lead concentrations in soil, relative to the proposed investigation limit of 500 mg/kg, has been determined at the SDA. It is recommended that an investigation to determine the lateral extent of lead concentrations in surface soil be implemented at the areas north of the SDA where lead concentrations in the Phase II surface soil samples exceeded the proposed investigation limit of 500 mg/kg."	Surface soils near the SDA were further delineated in the SIR (PBW, 2012) and APAR (Section 4).
				Groundwater: the pH anomaly (at MW-12 and MW-13) was not investigated due to dry weather conditions and construction, but a corrective measure will be proposed once the investigation is conducted.	MW-12 and MW-13 showed pH values greater than 6.0 during the January 2012 SIR Investigation (PBW, 2012) and the APAR groundwater sampling events.
TNRCC	7/29/1999	Corrective Measures Implementation Workplan Conditional Approval	Approval with modifications	"The report states that the ecological screening level for lead is 218 ppm, equivalent to the Effects Range Median (ERM) for marine sediments. Since the creek is located in an area unaffected by tidal influences, please used the Threshold Effects Level (TEL) for sediment, which is 35 ppm for lead. "	Stewart Creek was remediated on-Site during 2000 and remedial activities approved by letter dated 7/25/2000.
				"The report states that the ecological screening level for cadmium is 10 ppm, equivalent to the ERM for marine sediments. Since the creek is located in an area unaffected by tidal influences, please use the TEL for cadmium, which is 6 ppm. Please remember that site-specific background concentrations may be substituted for the previously mentioned screening levels."	Stewart Creek was remediated on-Site during 2000 and remedial activities approved by letter dated 7/25/2000.
TNRCC	1/13/2000	Acceptance of Closure Certification for 4 Solid Waste Management Units	Approval of four SWMUs	Closure approval for the former Battery Storage Area, Old Drum Storage Area, Stewart Creek Sediment Dredging Waste Pile and the Product Waste Pile.	
Remediation Services, Inc.	2/15/2000	Culvert Plugging	Details the plugging of the former railroad culvert. Plugging completed during February 2000.		
JDC Consulting	7/13/2000	Stewart Creek Corrective Measures Implementation Report	As a result of the HHERA conducted by JDC in 1998, an approximate 2,800-foot stretch of the creek sediments was remediated to standards for lead and cadmium approved by the TNRCC (91 milligrams per kilogram [mg/kg] for lead and 4.23 mg/kg for cadmium). The remediation was carried out by first removing visible slag "buttons" from the creek bed and banks, then excavating the soils at an average depth of 1ft. Soils were excavated to deeper depths as needed based on the extent of slag presence in the soil. Excavated soil was screened for recoverable slag fragments, which were recycled in the blast furnace at the facility. Remaining soil was stockpiled and sampled for TCLP analysis for lead and cadmium. Most samples passed the criteria for Class II waste; the samples that did not pass the criteria were treated until they passed. Some stockpiled material was tested for SPLP lead and cadmium for potential re-use as intermediate fill in the active Class 2 landfill at the facility. The TNRCC approved the reuse proposal on November 8, 1999.	Sediments were mechanically removed to one foot from the channel and banks of Stewart Creek. Deeper depths were removed if slag material was present at deeper depths.	
TNRCC	7/25/2000	Stewart Creek Corrective Measures Implementation Report Response	Acknowledges attainment of cleanup standards	"Based on the information contained in the Final Report and other information available to staff, it appears that cleanup at Stewart Creek has attained RRS No. 1. GNB Technologies, Inc. is released from deed recordation and post-closure care requirements.	

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TCEQ	7/15/2003	Leaking Petroleum Storage Tank (LPST) Case Closure of Subsurface Release of Hydrocarbons at G.N.B Technologies Facility	A diesel oil release residue was discovered in April 1988 during the construction of the retaining wall adjacent to Stewart Creek. Details of the discovery and subsequent remedial actions are provided in a letter by Lake Engineering to the Texas Water Commission (Lake, 1988). Following discovery of the residue, a pump and mobile storage tank were immediately installed. Three test holes were advanced to determine the extent of residue; residue was not detected in any of the holes. To enhance collection of residue, an oil recovery sump and intercept trenches were constructed. TCEQ issued a letter dated July 15, 2003, certifying that the former diesel fuel release (LPST ID No. 106075) had met site closure requirements and that no further action was necessary.	The letter stated that no further action was necessary.	
EPA	4/1/2010	Report of RCRA Sampling Inspection at Exide Technologies	EPA visited the Site on April 1 and April 15, 2010, to collect samples of the landfill, leachate tank, untreated slag and treated slag.	A sample of the leachate from a tank that collects leachate from the Class 2 landfill indicated elevated levels of arsenic and selenium.	Groundwater samples collected around the Class 2 landfill during APAR analyzed for arsenic and selenium (Section 5).
W&M Environmental	3/28/2011	Suspect Slag Sampling Report	W&M Environmental conducted a visual survey of the western reach of Stewart Creek from the Battery Receiving/Storage Building to the BNSF railroad. Suspected slag samples collected from the banks of the creek were photographed and evaluated for Pb, Ca, and Fe to develop a visual criteria for identifying suspected slag in the field.	"Probable slag materials have been identified in the western reach of Stewart Creek at the Site...The location of materials identified as probable slag based on laboratory results suggests that slag materials are concentrated near the middle of the Site, but are also present to the eastern boundary of the study Site. When the analytical data are considered in combination with the distribution of probable slag, the slag may not extend to the western boundary of the Site."	W&M conducted additional evaluation of suspected slag material site-wide. The report is included as an appendix to the APAR (Appendix 18).
TCEQ	5/6/2011	Inspection Report	Results from TCEQ inspection conducted May 6, 2011	"...TCEQ staff observed that the floor (in the slag treatment building) of the <90 day tank was covered by free liquids. The free liquids were identified by Exide personnel as equipment wash down water and dust suppression water. TCEQ staff observed these waters contacting the untreated piles of slag and refractory brick in the tank. TCEQ staff also noted that this water contacts loose fragments of wastes on the crusher when the crusher is washed down. A sump is used to collect these waters until it can be used in the slag treatment process...TCEQ staff observed...overflow."	Soil sampling has been performed sub-slab in this building for the APAR investigation (Section 4). All liquids and water have been removed and the building has been decontaminated and demolished.
				"...Ms. Lewis collected a sample of a material resembling blast furnace slag from the north side of the (slag treatment) building. The sample was collected beneath the opening used to transfer untreated refractory brick and untreated blast furnace slag into the building...Sample results...indicated that the sample contained elevated concentrations of lead (total: 47,100 mg/kg, TCLP 59.3 mg/L) and cadmium (total: 574 mg/kg, TCLP: 1.74 mg/L)."	Addressed during APAR investigation. Nine soil samples collected and analyzed to evaluate lead and cadmium in the area (Section 4). All liquids and water have been removed and the building has been decontaminated and demolished.
				"...TCEQ staff viewed the on-site active industrial non-hazardous Class 2 landfill. Two of the landfill cells were capped but a third cell was active. TCEQ staff collected two samples of the treated slag and one sample of a material resembling mud that consisted of contact water and sediments. The analytical sample results indicate that slag containing hazardous concentrations of lead (total 36,200 mg/kg, TCLP 44.8 mg/L) and cadmium (total 433 mg/kg, TCLP 1.43 mg/L)were present in the nonhazardous class 2 landfill."	Being addressed per Response Action Workplan (RAWP).
				"TCEQ staff observed large amounts of untreated slag and battery chips in the (shooting range) berm which appeared to have originated from the South Disposal Area."	Removal of Shooting Range Berm completed. Verification soil samples are included in the APAR (Section 4).
				"...TCEQ staff observed a white solid and several battery chips in a drainage swale west of the Crystallizer. TCEQ also observed dead vegetation and a white solid along a drainage pathway that began at the Crystallizer and ended at the culvert. ...staff collected a sample of the soil at the opening of the culvert which contained the white solid. The sample's analytical results indicated that the soil contained elevated concentrations of lead (total 694 mg/kg, TCLP 3.92 mg/L) and sulfates (total 6040 mg/kg)."	Addressed during APAR investigation. Thirteen soil samples collected and analyzed to evaluate lead, cadmium and sulfate in the area (Section 4).
				"...TCEQ staff inspected the barrier wall and the Stewart Creek embankment. TCEQ staff observed dead vegetation near a crack in the barrier wall where a liquid was discharging (slag treatment building on other side of wall). TCEQ collected a soil sample from the embankment where the dead vegetation was observed and sample analysis results indicated an elevated concentration of lead (total 3560 mg/kg, TCLP 12.2 mg/L)."	Addressed during APAR investigation. Soil samples collected and analyzed to evaluate lead and cadmium in the area (Section 4).

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TCEQ	5/6/2011	Inspection Report (Continued)		"...TCEQ staff observed a dark rust-colored stain along the wall where the stormwater pipe exited the wall. The pipe appeared to be leaking due to worn out gaskets. TCEQ staff collected a sample of the soil and rock along the embankment beneath the pipe. Sample analysis results indicated elevated concentrations of lead (total 39800 mg/kg, TCLP 127 mg/L) and cadmium (total 894 mg/kg, TCLP 12.2 mg/L)."	Addressed during APAR investigation. Soil samples collected and analyzed to evaluate lead and cadmium in the area (Section 4).
				"Review of sample results indicated elevated concentrations of lead and cadmium along the barrier wall that could potentially impact the waters of Stewart Creek. However, according to the analytical sample results of the water samples collected from Stewart Creek, it does not appear that the lead and cadmium discharges from the facility have contaminated the Stewart Creek water. Analytical sample results indicate there are no detectable concentrations of lead or cadmium in water. Elevated concentrations of lead and cadmium were also detected in the treated slag disposed in the landfill. Elevated concentrations of lead were also detected in soils near a culvert that discharges to the City of Frisco. Elevated concentrations of lead and cadmium were also detected around the outside of the Slag Treatment Building."	Addressed during APAR investigation. Soil samples collected and analyzed to evaluate for lead and cadmium in the area (Section 4).
EPA	8/1/2011	RCRA Section 3013(a) Administrative Order Docket No. RCRA 06-2011-0966; Re-designated by EPA as Docket No. 06-2012-0966	The Administrative Order (AO) was issued following an EPA inspection on December 14-18 2009 and March 29, 2010 and review of historical documents. EPA concluded that there was potential soil, groundwater, sediment and surface water contamination resulting from activities at the facility and issued the AO. The AO ordered Exide to submit to EPA a workplan that proposed sampling and analysis. The requirements are detailed in the following column.	"A preliminary facility-specific Site Conceptual Model (CSM)..."	CSM provided in workplan submitted November 2011 (CRA, 2011) and refined in SIR (PBW, 2012). CSM elements (exposure pathways) provided in Section 2 of APAR.
				"A plan and timetable for sampling and analysis of soil to characterize the nature and extent of horizontal and vertical contamination, and to identify source areas and potential source areas, including but not limited to, areas in the vicinity of the NDA, SDA, RMSA, inactive SL, Boneyard (BY), Bale Stabilization Area (BSA), Crystallization Unit Frac Tank (CUFT), and seepage along the flood wall. The soil sampling program shall include the collection of background soil samples (not impacted by facility operations) to account for any natural background metal concentrations. The plan shall include the locations and depths of the soil samples, collection and analytical methods, and the parameters for analysis."	A workplan submitted in November 2011 (CRA, 2011) to address each of these requirements.
				"A plan and timetable for the collection and analysis of surface water and sediment samples associated with Stewart Creek (March 29, 2010 EPA samples of soil between flood wall and Stewart Creek showed elevated levels of lead). Surface water and sediment sampling shall focus on the upstream side of the facility, within the facility at or immediately downstream of source/potential source areas, on the downstream side of the facility at the property boundary, and any off site sampling that may be needed to determine the nature and extent of contamination. In the event that the creek is dry, soil samples shall be collected for analysis in lieu of surface water and sediment samples, in similar locations. The plan shall include the locations of the surface water and sediment (or soil) samples, collection and analytical methods, and the parameters for analysis.	A workplan submitted in November 2011 (CRA, 2011) to address each of these requirements.
				"A plan and timetable for characterizing the groundwater flow direction and groundwater quality. The plan shall focus on the collection of groundwater samples upgradient of, within and downgradient of source areas/potential source areas (including but not limited to....i.e. NDA, SDA, SL, BY, BSA, CUFT, flood wall. The plan shall include the location and depths of monitoring wells, well construction methods, well sampling methods, analytical methods, and the parameters for analysis."	A workplan submitted in November 2011 (CRA, 2011) to address each of these requirements.
Rone Engineering	10/7/2011	Geotechnical Engineering Report	A geotechnical study was performed in 2011 in the general area of WMA 1 (North Disposal Area and Slag Landfill) to support the engineering design for a series of buildings and upgrades to existing facility structures proposed at the time of the report. The lithologic information obtained from the borings drilled for this investigation was used in support of Site hydrogeologic evaluation and for the development of geologic cross-sections in the APAR.	None	

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W&M Environmental	12/28/2011	North and South Disposal Areas Evaluation	W&M conducted a visual inspection of the North Disposal Area and the South Disposal Area to assess the condition of the soil caps and to inspect for suspected slag on the ground surface within each area. The study identified limited areas of exposed slag and/or battery chips in the South Disposal Area as well as isolated occurrences of slag on the ground surface to the north and east of the area. The study also noted cracks in the soil above the South Disposal Area, but no slag or battery chips were identified in the areas of cracking. In the North Disposal Area, exposed slag was noted within materials storage areas and areas of heavy vehicular traffic in the southern portion of the area. In addition, isolated occurrences of slag were noted along the North Tributary, the railroad spur, and in the north wooded area.	"Areas to the south and east of the designated SDA contain exposed materials, as does the gun range berm located immediately to the west. Intermittent and isolated observations of chips and small slag fragments were noted in areas to the north of the SDA, and within wooded and overgrown areas east of the SDA...It is possible that many observations of surficial material represented isolated conditions that can be managed with minimal effort; other areas will warrant some additional intrusive investigations to define the depth and lateral extent of material to be managed."	W&M conducted additional evaluation of suspected slag material site-wide. The report is included as an appendix to the APAR (Appendix 18).
PBW	7/12/2012	Site Investigation Report		North Disposal Area: "Lead concentrations in the 2 to 4 foot interval below ground surface (bgs) depth interval sample from location 2012-NDA-1 and in the 0 to 2 foot depth interval sample from location 2012-NDA-3, both north of the previously identified NDA boundary, exceeded the lead critical PCL. Soil sample data from the current and previous investigations were combined to evaluate the lateral extent of soil PCL exceedances in the NDA vicinity. Based on this information, the northern extent of PCL exceedances is delineated by sample locations 2012-NDA-4, 2012-NDA-2 and 2012-NDA-6. The eastern extent of the PCL exceedances is bound by previous sample locations NTS-1, TS-2, and TS-1. Soil PCL exceedances were not bound to the south and west due to the presence of the Slag Landfill to the west and process buildings to the south. In light of the noted surface soil exceedances and apparent boundary extension further north from the previously identified NDA boundary, and in conjunction with the findings noted below for the Bale Stabilization Area, which is located over part of the NDA surface, it is recommended that the PCL exceedances in this area be addressed by a combination of surface soil excavation where vertical impacts are shallow, extension of the existing NDA cap in areas outside of the previously defined cap boundaries where impacts are not limited to shallow depths, and repair of the existing cap as necessary.	Soils in NDA vicinity evaluated in Section 4 of APAR. Additional sampling was conducted at TS-1 and TS-2. Soil samples were also collected east of NTS-1 in the vicinity of these locations.
				Slag Landfill: The lead concentration in the 2 to 4 foot bgs depth interval sample from location 2012-SL-1, west of the previously identified Slag Landfill boundary, exceeded the lead critical PCL. Slag fragments were noted in this boring suggesting that the landfill may extend to this location. Subsequent interviews with long-time Facility personnel indicate this is likely the case. The lateral extent of the lead exceedance is bound to the north by sample locations 2012-SL-2 and 2012-SL-3, and to the west and south by previous sample locations B8N, MW-16 and MW-16S, and the railroad spur in that area, which is believed to precede the construction of the landfill. Soil PCL exceedances were not bound to the southeast due to the presence of the NDA in this direction. In light of the apparent extension of the landfill boundary further to the west from the previously identified boundary and in conjunction with the findings noted below for the Boneyard area, which is located over part of the Slag Landfill surface, it is recommended that PCL exceedances in this area be addressed by a combination of surface soil excavation where vertical impacts are shallow, extension of the existing Slag Landfill cap in areas outside of the previously defined cap boundaries where impacts are not limited to shallow depths, and repair of the existing cap as necessary.	Soils in vicinity of Slag Landfill evaluated in Section 4 of APAR.
				Raw Material Storage Area: The lead concentration in the 0.5 to 2.5 foot bgs depth interval sample from location 2012-RMSA-2, in the southeastern part of the RMSA, exceeded the lead critical PCL. Cadmium and lead concentrations in all three other soil borings from this area were below their critical PCLs and total petroleum hydrocarbons (TPH) was not detected in any of the four soil samples from the RMSA. It is recommended that the extent of this PCL exceedance and the appropriate remedial action to address this area be evaluated following the planned decontamination and dismantling of the RMSA in conjunction with Facility closure activities.	Addressed during APAR investigation. Fifty-two soil samples collected and analyzed to evaluate cadmium and/or lead in this area (Section 4).

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PBW	7/12/2012	Site Investigation Report (Continued)		South Disposal Area: No PCL exceedances were noted in any of the ten SDA soil samples collected and, therefore, these samples serve to generally bound the extent of PCL exceedances noted in previous soil samples from this area. Elevated lead concentrations limited to surface samples from previous soil samples in the northeastern part of this area are consistent with reported sporadic surface accumulations of battery cases and slag in the area. As noted in the Work Plan (CRA, 2011) and previously discussed with EPA, Exide has been performing a comprehensive inspection of the SDA with the objective of identifying and addressing battery case and slag accumulations in this vicinity. To the extent that areas where soils with COC concentrations exceeding PCLs do not coincide with locations where incidental battery cases and/or slag will be addressed, these soils could be addressed via focused excavation or additional capping.	Soils in vicinity of SDA evaluated in Section 4 of APAR. W&M conducted additional evaluation of suspected slag Site-wide, including in SDA vicinity. The report is included as an appendix to the APAR (Appendix 18).
				Boneyard: The lead concentration in the 0 to 2 foot bgs depth interval sample from location 2012-BY-4 in the southwestern part of the Boneyard exceeded the critical PCL for lead. Cadmium and lead concentrations in the four other soil borings from this area were below their critical PCLs. Slag was encountered at the base of boring 2012-BY-4 at a depth of 2 feet bgs, likely indicating that the Slag Landfill extends to this area. The extension of the Slag Landfill to this location is consistent with the observation of slag in boring 2012-SL-1 to the northwest as the two borings suggest the Slag Landfill extends further west than had been previously indicated. Subsequent interviews with long-time Facility personnel indicate this is likely the case. The western and southern extent of the landfill is bound by data from previous sample locations B8N, MW-16 and MW-16S, if not by the railroad spur in that area, which is believed to precede the construction of the landfill. In light of the apparent extension of the Slag Landfill boundary further to the west from the previously identified boundary and in conjunction with the findings noted above for the landfill, it is recommended that PCL exceedances in this area be addressed by a combination of surface soil excavation where vertical impacts are shallow, extension of the existing Slag Landfill cap in areas outside of the previously defined cap boundaries where impacts are not limited to shallow depths, and repair of the existing cap as necessary.	Soils in vicinity of Boneyard evaluated in Section 4 of APAR.
				Bale Stabilization Area: The lead concentrations in the 0 to 2 foot bgs depth interval sample from location 2012-BSA-2, and the 0 to 1 foot bgs depth interval samples from 2012-BSA-4c and 2012-BSA-4d exceeded the lead critical PCL. The cadmium concentration in the 0 to 2 foot bgs depth interval sample from 2012-BSA-3A exceeded the cadmium critical PCL. Cadmium and lead concentrations in all other soil samples from this area were below their critical PCLs. The northern extent of PCL exceedances in the bale Stabilization Area surface soils is delineated by NDA sample locations 2012-NDA-3 (for cadmium) and 2012-NDA-6 (for lead). In light of these results and in conjunction with the findings noted above for the NDA, it is recommended that PCL exceedances in this area be addressed by a combination of surface soil excavation where vertical impacts are shallow, extension of the existing NDA cap in areas outside of the previously defined cap boundaries where impacts are not limited to shallow depths, and repair of the existing cap as necessary.	Soils in vicinity of Bale Stabilization Area evaluated in Section 4 of APAR.
				Crystallization Unit Frac Tank: Two soil samples were collected from two locations in the vicinity of the former Crystallization Unit Frac Tank and analyzed for antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, zinc, and sulfate. All sample concentrations were below their respective critical PCLs. No further action is recommended in this area.	Soils in vicinity of Crystallizer Unit evaluated in Section 4 of APAR.
				Stewart Creek Flood Wall Creek Side: Nine soil samples were collected from the 0 to 2 foot bgs depth interval from nine borings advanced along the creek side of the Stewart Creek flood wall. These samples were analyzed for cadmium, lead and TPH. The sole PCL exceedance noted in these samples was a lead concentration of 2,240 mg/kg in sample 2012-FWCS-1 (0-2) near the western end of the flood wall. Additional sampling is proposed in this vicinity to define the lateral and vertical extent of this exceedance. The additional sampling will be performed concurrent with the collection/analyses of soil samples during construction of a French drain system (including an impermeable barrier liner) between the flood wall and the Facility process area.	Soil samples were collected during construction of the French drain during September-October 2012 and additional samples collected during the APAR investigation. Area in the vicinity of 2012-FWCS-1 addressed during APAR investigation. Additional soil samples collected and analyzed during APAR investigation to further evaluate lead in this area. Additional soils on creek side of Flood Wall evaluated in Section 4 of APAR.

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PBW	7/12/2012	Site Investigation Report (Continued)		Shooting Range Berm: The eastern face of the former shooting range berm was investigated by means of three test trenches excavated perpendicular (east–west) to the long axis (north-south) of the berm. These test trenches were visually inspected for bullets, clay pigeon fragments, battery casing fragments, slag or other foreign materials, but no soil samples were collected. The test trench observations indicate that foreign material was generally absent in the upper, westernmost portions of the berm and that, within the lower, eastern portions of the berm, this material was generally limited to near or just below the berm surface (e.g., not in the berm interior). Thus, although no data were collected from this area for comparison to TRRP PCLs, the test trench observations suggest that slag and battery cases are limited to the eastern face of the berm and are not distributed throughout the berm. It is recommended that the berm soils containing slag and/or battery cases be removed to a maximum depth of bedrock and post-excavation samples be collected for comparison to lead and cadmium PCLs.	Shooting Range Berm removed. Data for post-removal verification soil samples evaluated in Section 4 of APAR.
				Stewart Creek Sediment: Sediment ecological PCLs derived for cadmium and lead were lower than the human health PCLs for those metals and were therefore, the critical PCLs for sediment. The ecological PCL was derived to be protective of benthic and aquatic organisms, and is the mid-point of the ecological benchmark and the second effects level. None of the 25 sediment samples collected from Stewart Creek or the North Tributary contained cadmium or lead at concentrations in excess of the critical PCL.	Site Stewart Creek and North Tributary sediment samples evaluated in Section 7 of APAR.
				Surface Water: Surface water ecological PCLs derived for cadmium and lead were lower than the human health PCLs for those metals and were therefore, the critical PCLs for surface water. The ecological PCLs were derived to be protective of chronic aquatic life. Dissolved cadmium and lead concentrations in 15 Stewart Creek surface water samples were compared to these critical surface water PCLs. The only concentrations exceeding their respective critical PCLs were dissolved cadmium and lead concentrations in surface water samples 2012-SW-1 and 2012-SW-2, near the downstream boundary of the Site, and the dissolved cadmium concentration in sample 2012-SW-11, upstream of the plant operational area. These were the only samples with detectable dissolved concentrations and all of these results were estimated (J-flag) values very near the limits of detection. None of the measured concentrations exceeded acute aquatic life screening values and all were far below human health based PCLs and even below drinking water standards (if surface water were a drinking water resource). In light of these considerations, the isolated and inconsistent nature of the few surface water PCL exceedances, and most significantly, the absence of any detectable dissolved cadmium or lead concentrations in surface water samples collected in the near vicinity of potential source areas near Stewart Creek, such as the RMSA, the SDA, or near the flood wall, no further investigation of surface water is recommended.	Evaluated in SLERA and APAR based on TCEQ classification of Stewart Creek as an intermittent stream (see Sections 6 and 9).
				Groundwater: The uppermost GWBU at the Site consists of the clay-rich alluvial soils situated above the Eagle Ford Formation. Groundwater within this unit generally occurs under unconfined conditions. The potentiometric surface for this GWBU (based on water level elevations measured in Site monitoring wells on February 13, 2012) generally slopes toward the southwest at a gradient of approximately 0.018 ft./ft. except near the bluff at the southern boundary of the Site where it slopes steeply toward the north and Stewart Creek. Although localized transmissive zones are present within the uppermost GWBU, the lateral extents of these more transmissive zones within the overall clay-rich soils of the GWBU are limited and, thus, significant groundwater transmissivity within the GWBU as a whole is not expected. Since there is no current or future drinking water pathway, the critical PCL for groundwater was not based on drinking water exposure, but rather was based on a groundwater to surface water PCL. The critical PCL for cadmium and lead in groundwater was compared to dissolved concentrations of these metals. None of the dissolved cadmium and lead concentrations exceed the critical PCL. Based on these results, no further groundwater investigation or remediation is recommended.	Re-evaluated based on groundwater classification (Class 3). Groundwater classification information provided in Appendix 7 of the APAR.
EPA	9/12/2012	Comments on SIR		Please note under 350.51(d)(1), one shall delineate to vertical limit of COCs in soil exceeding background concentrations, including the soil-to-GW pathway	Delineated to RALs in conjunction with groundwater investigation. 351.51(d)(1) states that delineation to background is not needed if an adequate groundwater assessment has been conducted (e.g. COC concentrations in the groundwater have been measured from appropriate locations)
				Since the MSD agreement has not been established at this time, all soil results must be re-evaluated under correct assessment PCLs	MSD- based conclusions have been removed in the APAR.

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EPA	9/12/2012	Comments on SIR (Continued)		All nine soil results from the Stewart Creek Flood Wall Creek Side exceed background concentrations and $^{GW}Soil_{Ing}$	Background issue addressed by comment above regarding vertical delineation of soils when a groundwater assessment has been conducted. Information on groundwater classification is provided in Appendix 7 of the APAR. Soil data evaluation relative to $^{GW}Soil_{Ing}$ provided in Section 4 of APAR.
				Was there a door-to-door water well inventory to identify unregistered water wells in area, which EPA believes are present; What is the status of well 18-50-8C drilled by Frisco Concrete	A water well field survey was conducted by Larry Eagan during October and November 2012. During this survey it was concluded that the Frisco Concrete well is believed destroyed.
				Include findings from W&M inspection reports and discuss implications	Reports included as appendix in the APAR (Appendix 18). Implications discussed therein.
				Due to abundance of small to large animal burrows around the facility, may need data for deeper subsurface since soil burrow terrestrial receptors may exist at the site.	SLERA (Section 9) prepared to evaluate potential ecological receptors/exposures.
				Eco assessment is in order due to COC, the creek, and the surrounding environment ecosystems	SLERA (Section 9) conducted in accordance with approved SLERA workplan.
				Where do we stand at this facility regarding GW classification	Groundwater classification information is provided in Appendix 7 of the APAR.
				Please explain why so many J flagged soil data for Pb and Cd and how does it affect outcome of report	Clarified in APAR (see Section 3.5).
				Pb and Cd concentrations are flagged as estimates and may not represent actual concentrations. Cd is also flagged as out of normal QA ranges	Clarified in APAR (see Section 3.5).
				What are Exide's plans to remediate area of contamination in Slag Landfill	Will be addressed in Response Action Plan to be prepared after final APAR approval by TCEQ.
				Pb and Cd exceedances in reconnaissance GW samples	Data for reconnaissance water samples collected from soil borings discussed by area in Section 4 of APAR.
				Do not agree with statement at this time "no further investigation of surface water is recommended"	Re-evaluated in SLERA and APAR based on TCEQ classification of Stewart Creek as an intermittent stream.
				For soils, different PCLs should be considered based on area of current and future land use…e.g., soil samples at the flood wall should be compared to eco PCL or background	Additional soil samples were collected along the flood wall in support of the SLERA. Data evaluated in SLERA (Section 9).
				Since hazardous wastes have been disposed of in Crystallization Unit Frac Tank, must delineate to background levels	Per TRRP requirements, soils were evaluated relative to Residential Assessment Levels (See Section 4).
				Due to the change in depositional energy environments from on-site (channelized creek with coarser grain sediments) to off-site (meandering creek with finer grain sediment) confirmation sampling downstream is necessary	Downstream sediment samples were collected from the segment of Stewart Creek that runs alongside the Former Stewart Creek Wastewater Treatment Plant and in other downstream areas as part of other investigations. Further evaluation of sediment hot spots in these down stream areas is recommended (see Section 7).
				Due to exceedances in surface water, off-site surface water confirmation sampling (down stream) is essential	Re-evaluated in APAR and SLERA based on TCEQ classification of Stewart Creek as an intermittent stream.
EPA	12/18/2012	Consent Agreement and Final Order		Compliance: "...the respondent shall continue with the implementation of the sampling plan approved by EPA pursuant to such agreed order, including use of the procedures set forth in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846 and the corresponding method detection limits, for the delineation of any lead contamination to applicable TRRP standards in the affected media in area bounded by the south side of the flood wall near the Battery Storage Area and Stewart Creek ("Flood Wall Area").	Evaluation of soils data in Battery Storage area and Flood Wall area relative to TRRP RALs provided in Section 4.
				"Within thirty days of the effective date of this CAFO, Exide will submit a work completion implementation of the sampling plan approved by EPA and delineation of any lead contamination of the Flood Wall Area to applicable TRRP standards in the affected media; and (ii) to develop and implement a Response Action Plan to be approved by the TCEQ for the defined area of contamination requiring remediation, in accordance with 30 TAC 335.174 (40 CFR 264 Subpart G and 264.310) and 30 TAC 350 (TRRP)."	Work completion plan submitted to EPA on January 17, 2013.
TCEQ	2/10/2013	Agreed Order		"Within 150 days after the effective date of this Agreed Order: Submit an APAR for the unauthorized discharges located on the southwest corner, south side, and below the opening on the north face of the Slag Treatment Building, the east side of the South Disposal Area, at the drainage swale west of the Crystallizer, and the on-site portion of the Stewart Creek embankment, sediments, and surface water...The Site Investigation Report will be incorporated into the APAR...	Soils evaluation provided in Section 4. Sediment evaluation provided in Section 7. Surface water evaluation provided in Section 6.
				"...Submit an APAR for the RCRA Facility Investigation units listed in IHW Permit No. 50206, PS IX.C. and also for any and all solid waste management units and areas identified by previous TCEQ and EPA investigations and any new releases discovered subsequent to issuance of the permit in October 1986, as required by IHW Permit No. 50206, PS IS.A...The APAR required by (order above) may be satisfied by submittal of a single APAR covering both requirements."	APAR submitted to address this requirement.

Table 1C
Exide Frisco Recycling Center
Historical Document Summary

Author	Date	Title	Contents	Outstanding issues / recommendations	Comments
TCEQ	2/7/2013	Handout at 2/8/2013 Meeting		Affected Property Assessment Report (APAR) - General Discussion: The APAR should be an all-inclusive, stand-alone document. Please include the information presented in the July 12, 2012 Site Investigation Report (SIR) in the APAR. The APAR should satisfy all requirements of the pending TCEQ order...the Permit, the EPA requirements and comments to the July 12 SIR.	APAR submitted to address requested elements.
				The results of past studies and past data can be used for historical reference, but may need to be revisited in order to accurately describe current conditions. New data will be required to verify current conditions since site conditions may have changed due to the fact that it has been an active facility, and relatively newer contamination may have been deposited in areas that were considered "clean" in the past. Confirmation sampling should be conducted on previously closed sites to verify whether or not releases have occurred, and that the configuration of the site boundaries has not changed.	Past data evaluated in context of individual data points/closed areas. New data provided in APAR Sections 4,5,6,7 and 9 were used for affected property assessment and evaluation of previously closed areas. Historical data provided in Appendix 17 for reference purposes.
				A visual and/or instrumental (XRF?) recon of the entire site for slag and battery chips should be conducted.	W&M conducted a visual inspection of the western reach of Stewart Creek (west of the Battery Storage Building). W&M tested several samples of suspected slag to develop a visual criteria for identifying suspected slag (W&M, March 2011). In a separate event, W&M conducted a visual inspection of the NDA (including the Slag Landfill and the areas immediately north of the Slag landfill and the wooded area north of the NDA and south of the north tributary of Stewart Creek (W&M, December 2011). The SDA was evaluated from the northeastern most reach of the SDA to the property line to the west and south. Because these areas are the sites of past slag disposal/placement, these are the areas most likely to contain exposed slag. An updated inspection report by W&M is included in the APAR in an appendix (Appendix 18).
				TCEQ Ordering Provisions 3.b.i.i. - Within 60 days (due and submitted by April 11, 2013) of the date of the Agreed Order Issuance, submit to the Executive Director for approval a groundwater monitoring program at the active landfill to be implemented following receipt of written approval from the executive director.	A groundwater monitoring plan for the Class 2 landfill was submitted on April 11, 2013.
				TCEQ Ordering Provisions 3.c.i - Within 150 days (due July 10, 2013) of the date of the Agreed order, submit an APAR for the unauthorized discharges located on the southwest corner, south side and below the opening on the north face of the Slag Treatment Building, the east side of the South Disposal Area, at the drainage swale west of the Crystallizer, and the on-site portion of the Stewart Creek embankment, obligations specified in IHW Permit No. 50206, PS IX, to the Executive Director for approval. The Site Investigation Report will be incorporated into the APAR under this provision and ordering provision number 3.c.ii, below. If response actions are necessary comply with all provisions of the TRRP, Institutional Controls and corrective actions obligation specified in IHW Permit No. 50206, PS IX.	APAR submitted to address requested elements. RAP to be submitted after final APAR approval by TCEQ.
				TCEQ Ordering Provisions 3.c.ii - Within 150 days (due date July 10, 2013) of the date of the Agreed Order submit an APAR for the RCRA Facility Investigation units listed in IHW Permit No. 50206, PS IX.C and also for any and all solid waste management units and areas identified by previous TCEQ and EPA investigations and any new releases discovered subsequent to issuance of the permit in October 1986, as required by IHW Permit No. 50206, PS IXA. If response actions are necessary, comply with all applicable provisions of TRRP. If the Response Action Plan does not propose a permanent remedy, then it shall be submitted as part of a new Compliance Plan application as specified in PS IX.B.6. The RAP shall contain detailed final engineering design and monitoring plans and schedules necessary to implement the selected remedy. Implementation of the corrective measures shall be addressed through a new CP as specified in PS IX.B.6; The APAR required by ordering provision no. 3.c.i. above may be satisfied by submittal of a single APAR covering both requirements.	APAR submitted to address requested elements. RAP to be submitted after final APAR approval by TCEQ.
				TCEQ Ordering Provisions 3.c.ii - Dispose of the berm material (within 150 days of issue of Agreed Order) located near the west side of the South Disposal Area at an authorized facility.	Removal of Shooting Range Berm completed. Verification soil samples are evaluated in Section 4.

Table 1C
Exide Frisco Recycling Center
Historical Document Summary

Author	Date	Title	Contents	Outstanding issues / recommendations	Comments
TCEQ	2/7/2013	Handout at 2/8/2013 Meeting (Continued)		TCEQ Permit Provisions requiring Closure according to Permit Provision VII.C and D. Specifically VII.D.2.a. – Within 120 days of the determination that closure to Remedy Standard A cannot be attained, the permittee shall submit to the TNRCC a response action plan (RAP) and an affected property assessment report (APAR) in accordance with procedures described in the approved closure plans for Container Storage Area (Battery Receiving/Storage Area) and Containment Building (Raw Materials Storage Building) referenced by Provision VII.A.1. and the requirements of 30 TAC Sections 350.94 and 350.91 for review and approval by the Executive Director. These provisions will require coordination with TCEQ IHW Permits staff.	A RAP will be submitted after final APAR approved by TCEQ. Exide has been coordinating with TCEQ IHW permits staff.
				A further discussion of the overlapping portions of the Order and Permit are presented in the discussion of the Raw Materials Storage Area below.	
				TCEQ Permit Section IX – Corrective Action for Solid Waste Management Units (SWMUs) The Order refers to this portion of the Permit and is meant to be all inclusive not only for the RFI units, but also any new SWMUs.	No specific new SWMUs identified during APAR investigation. Two monitoring wells installed in former North Tributary infill and soil samples collected. No waste was encountered during soil sampling and well installation in this area.
				APAR data gaps: PG Seal Geologic cross sections were not PG sealed. Please submit a new APAR in which all appropriate documents are PG sealed.	All geologic cross sections in the APAR are sealed by a PG.
				Interim Actions at Stewart Creek Flood Wall – As a result of investigations performed as part of the EPA Order, discharges of contaminated surface runoff water were identified in the vicinity of the Stewart Creek Flood Wall adjacent to the Slag and Wastewater Treatment Buildings. An interim action was taken by the facility to intercept this contaminated water to prevent discharge to Stewart Creek. In the APAR, include a full discussion of activities, chronology of events, sample results, engineered drawings, a discussion of contaminated water origin, transport, sampling, classification, handling, and disposal. If this is to be a permanent remedy, it should be included in a RAP. If the discharges are from the RCRA permitted units (and) have resulted in soil contamination that cannot be remediated to non-hazardous concentrations, the soils will have to be closed as a RCRA landfill subject to 30 years of detection monitoring, or if groundwater contamination is present, a modification to the permit for a compliance plan for corrective action/compliance monitoring will be required.	Detailed information of the French Drain is included as an appendix to the APAR (Appendix 19). Permanent remedy to be determined and will be presented in RAP.
				COC screening Lead and Cadmium are the presumptive COCs. However, a complete historical review should be conducted of all products, waste management activities, and past COC occurrences and investigations, such as arsenic and selenium as measured in a landfill leachate sample by a 2009 EPA investigation, PST removals and final closure documentation, spills around the above ground diesel tank, corrosive liquids from battery acid at Battery Breaking area, herbicides, pesticide storage etc. and justification as to why/why not these constituents are being screened according to TRRP-10 and TRRP-14. Include documentation such as maps, interviews with former employees and any other documentation.	COCs were discussed during the February 15, 2013, meeting between TCEQ and Exide. A COC screening/selection discussion based on TRRP guidance is provided in the APAR (Sections 3.1.2 and 10).
				Sampling Procedures As part of the sampling process at the lab, during the soil screening process, are chunks of slag ground up and included in the sample results, or are they excluded by screening?	The lab homogenizes samples for analysis and includes the entire sample as collected, in accordance with SW-846, 6010b.
				In addition to sampling for total metals, TCLP sampling should be conducted on any areas where waste was deposited after July 26, 1982 and compared to 40 CFR 264.24, Toxicity Characteristics to determine if the waste is characteristically hazardous.	No specific areas for TCLP sampling were identified during APAR investigation.
				Complete GW Investigation The groundwater investigation only examined the groundwater/surface water interface, from wells located along the banks of Stewart Creek. Groundwater PCLs were not delineated due to a possible MSD promised by the City of Frisco. MSDs are not allowed on RCRA Permitted facilities. A more definitive delineation of subsurface transmissive zones and the extent of groundwater contamination is required to the appropriate PCL.	MSD- based conclusions have been removed in the APAR. Groundwater investigation and PCL development documented in APAR (Section 5). An updated groundwater classification evaluation provided in APAR (Appendix 7).
				A complete understanding of the possible exposure pathways of soil to groundwater, soil to surface water/sediment, groundwater to surface water/sediment, and the potential for groundwater migration off-site is required.	PCLs, including potential exposure pathways, were discussed in the February 15, 2013 meeting between TCEQ and Exide. A complete PCL discussion is provided in the APAR (Sections 4,5,6 and 7).

Table 1C
Exide Frisco Recycling Center
Historical Document Summary

Author	Date	Title	Contents	Outstanding issues / recommendations	Comments
TCEQ	2/7/2013	Handout at 2/8/2013 Meeting (Continued)		Regarding groundwater classification, our joint determination that the eastern portion of the site can be classified as saturate soils and the western portion of the site can be classified as Class 3 based upon the limited aerial extent and storativity of the alluvial lobe. The groundwater classification evaluation according to TRRP-8 should be presented in the APAR. A discussion of high sulfate levels should also be included. The limited groundwater data presented as part of the July 12, Site Investigation Report suggests that all groundwater migrates toward and discharges into Stewart Creek. Please provide a complete evaluation of groundwater at the site, including a delineation of the groundwater/saturated soils boundary, groundwater conditions at the Class 2 landfill and between the landfill and the surface water discharge points, and groundwater conditions beneath each SWMU. An examination of groundwater in the infill of the former Relocated Tributary should be conducted. The existence of a preferred permeability pathway in the infill should be assessed, and determine the point of discharge, into Stewart Creek or back into the Relocated Tributary.	Applicable PCLs based on a Class 3 groundwater classification (Appendix 7). Monitoring wells installed in the infill of the former North Tributary and groundwater sampling conducted. A discussion of sulfate levels is provided in the APAR (Section 5). Groundwater conditions are addressed in Section 1 of the APAR and groundwater chemistry addressed in Section 5 of the APAR.
				If any new evidence to the contrary of the "limited extent" of the alluvial aquifer is revealed as a result of a more extensive assessment of groundwater conditions (i.e.. groundwater migration off-site in the western portion of the facility) as part of the APAR, a re-evaluation of the Class 3 designation will be required. Please include the water well survey as presented in the SIR in the APAR	See Appendix 7 for groundwater classification discussion. An updated water well survey is provided in Appendix 5 of the APAR.
				Complete Surface Water Investigation- Exceedances of surface water for Stewart Creek exist at SW-1 and SW-2 locations for Lead and Cadmium at downstream edge of facility with J flagged results. An exceedance of surface water SW-11 for Cadmium located upstream, also J flagged. These locations should be resampled to confirm their existence. Use the TRRP Guidance 24 –Determining PCLs for Surface Water and Sediment and provide a complete assessment of this exposure pathway. Since it is anticipated that Grand Park will be constructed downstream of the facility, conduct a comparison of Stewart Creek surface water to contact recreation PCLs as well as other considerations as examined using TRRP Guidance No. 24. Potential for impacts to Stewart Creek along the industrial portion of the facility should be fully examined. If it is determined that the industrial area is to be closed as a RCRA unit, provisions should be made for a regular surface water sampling program to monitor contaminant levels through time to determine potential current and future impacts.	Exceedances reported in the SIR assumed a classification of Stewart Creek as a perennial stream. Based on the classification of Stewart Creek by TCEQ as an intermittent creek, surface water exceedances of lead and cadmium were not indicated during the 2012 surface water sampling event. Thus, consistent with discussion with TCEQ during February 2013, re-sampling of surface water was not performed. The contact recreation PCL for Cd was used and PBW developed a contact recreation PCL for lead in surface water (See Appendix 9). Surface water data evaluated in Section 6.
				Surface water and sediment in the relocated North Tributary should be sampled.	Sediment was sampled in the North Tributary during the 2012 Site Investigation and evaluated in Section 7 of APAR. Surface water sampled in the North Tributary and the results evaluated in Section 6 of APAR.
				Tier II SLERA – The facility must conduct a Tier II SLERA, which is currently underway.	SLERA was conducted in accordance with TCEQ/EPA-approved Work Plan (See Section 9).
				EPA Comments – The APARs should address all the comments provided by EPA to the July 12, Site Investigation Report.	EPA comments addressed in APAR (see comment-by-comment description provided previously in this table).
				Soil Investigation – The soil investigation report should re-evaluate the extent of contamination using the proper PCL. Soil to Surface Water and Soil to dust inhalation should be considered in addition to Soil to GW ingestion. If the Class 3 groundwater is affected, a soil PCL is 150 ppm lead for greater than 30 acre exposure area. Soil sample depth and sampling interval should be determined by the depositional environment. 0-6 inches for aerial deposition, 0-2 ft. intervals can be used for other areas as long as the absence or presence of slag/battery chips is noted in the boring log and as a column a table which summarizes the sampling results.	The selection of the soil Critical PCL discussed in APAR Section 3. Soil samples were collected from 0-6" to evaluate for aerial deposition. All soil samples were lithologically logged and slag was noted when present. The lead critical PCL was identified as 1600 mg/kg based on a Tier 2 evaluation of the soil to groundwater PCL (see Sections 3, 4 and 11). The presence of slag is noted in the boring logs (Appendix 2) and discussed in Section 4 of the APAR.
				Soil Background Sampling, page 32 - The use of background sample results is permitted if the Soil to GW Ing number is lower than background. Some of the sample results in Table 5 appear to be outliers. Also, you can default to Texas Specific Soil Background numbers as per TRRP. Please complete the site specific background determinations and compare them to the Texas Specific Soil Background numbers.	The background soil samples collected during the Site Investigation have been statistically evaluated. The statistical evaluation is presented in the APAR (Appendix 8).
				As mentioned in the initial general discussion, determine the extent of slag/battery chips throughout the facility. This will require a robust sampling plan to determine if the slag is concentrated in certain areas, or does it exist throughout the facility	W&M inspection reports for exposed slag/battery chips provided in Appendix 18.

Table 1C
Exide Frisco Recycling Center
Historical Document Summary

Author	Date	Title	Contents	Outstanding issues / recommendations	Comments
TCEQ	2/7/2013	Handout at 2/8/2013 Meeting (Continued)		In areas where battery acid may have been present, measure the pH of the soils and determine corrosivity (Battery Receiving/Storage Building and Bale Stabilization Areas).	Soil pH included in the analysis of soils collected in the vicinity of these areas. Fifty-three soil samples were collected and analyzed to evaluate pH in these areas (Section 4).
				Interim measures (vegetative cover, artificial cover, hydro-mulch) may be necessary to prevent fugitive dust emissions from occurring from disturbed or exposed soils where such emissions are occurring (wind-blown dust) until such time a final remedy has been put in place.	A dust control plan was implemented for dust control during decontamination and demolition. A perimeter air monitoring program has been implemented outside of this APAR and monthly data are provided to TCEQ.
				North Disposal Area (NDA) – Black, gravel sized slag fragments were noted in sample NDA-1 boring log, from 2-2.5 ft. This indicates the necessity to determine the northern most extent of slag in the subsurface. Also, the boring was noted as infilling with water. This boring appears to be in the infilled portion of the Relocated North Tributary and a ground water sample should be analyzed to determine the presence of COCs. NDA-2 has fill from 0-4ft, with the northern boundary not determined. Additional sampling to the north required to determine the extent of fill. NDA-3 has fill from 0-4.5 ft. NDA-5 slag blocked the sampling barrel at 6 inch depth and precluded deeper sampling. More sampling to determine the extent of the slag and landfill should be undertaken. If the NDA is to be capped, any contamination outside the landfill boundaries should be consolidated into the landfill, or properly disposed at an off-site facility.	Groundwater monitoring wells installed in the former North Tributary. The well borings were continuously sampled for lithologic purposes and selected soil samples collected for laboratory analyses (Section 4). Groundwater samples were also collected from the monitoring wells (Section 5). Extent of NDA has been delineated by borings 2012-NDA-4, 2012-NDA-6, B7N, MW-21 and MW-22.
				Slag Landfill – Depending upon the critical PCL (groundwater to surface water PCL,etc.) the extent of contamination in the Slag Landfill may or may not have been determined. The erosion of contaminated soil directly to and potential for leaching to the infilled areas of the Relocated North Tributary should be examined.	The selection of the groundwater RAL to be used for delineation purposes is described in Section 5. Monitoring well installed in the former North Tributary infill in the vicinity of the Slag Landfill. Two monitoring wells and soil samples collected and analyzed to evaluate lead and cadmium in this area (Sections 4 and 5).
				Raw Materials Storage Area – Regulatory overlap exists between closure requirements for the Raw Materials Storage Building, which shall be closed according to IHW Permit Provision VII.D., Permit RFI requirements Provisions IX. C-G., and Ordering Provisions 3.c.i and ii. These areas overlap and require compliance with different regulations with different timeframes for the same area. Permit Provision VII.D. 2.a. stipulates "within 120 days of the determination that closure to Remedy Standard A cannot be obtained, the permittee shall submit to the TNRCC a RAP and APAR for Raw Materials Storage Bldg and Battery Receiving/Storage Area. Order stipulates submission of an APAR within 150 days of the date of issuance of the Agreed Order (7/10/2013). Permit Provision IX. E. requires the submission of a schedule. What is the anticipated timing for the closure of the two permitted units? In the Response Action Work Plan, Appendix A. Waste Stabilization Plan, page 5, it states "At the completion of the work, the sediments (from the decontamination area) will be removed and transferred to the existing Slag Treatment Building (not a permitted unit) at the facility for treatment or transferred to a less than 90 day container for characterization, storage and disposal in accordance with local, state, and federal requirements." The requirements for the APARs as stipulated in the order are meant to be all inclusive and should include the APAR for the Raw Materials Storage Area. However, if waste management activities are conducted during the remediation phase after the APAR has been completed, another APAR or some form of closure documentation for the area will be necessary to determine if any contamination has occurred due to the remediation activities.	As described in Section 4, soil samples collected below the Battery Receiving/Storage Building and Raw Material Storage Building exceed critical soil PCLs for lead and cadmium. A Response Action Plan to address these areas will be submitted after TCEQ approval of the final APAR. Closure of permitted units is being performed as required by the permit.
				The Decontamination and Demolition Plan, Revision 1, dated January 25, 2013, Section 6.1.6 Soils Verification Sampling discusses soils sampling for the soils immediately beneath Raw Materials Storage Bldg. but not the Battery Receiving/Storage Area.	Subslab soil samples were collected in the Battery Storage/Receiving Area in areas identified with cracking or pitting based on an examination of the concrete floor. Fifty-one subslab soil samples were collected in areas of cracking and/or pitting of the slab and analyzed to evaluate lead, cadmium and pH (Section 4).
				According to TCEQ Ordering Provisions 3.c.i - Within 150 days (due July 10) of the (effective) date of the Agreed Order, submit an APAR for the unauthorized discharges located on the southwest corner, south side, and below the opening on the north face of the Slag Treatment Building.	This area addressed in APAR. Soil samples collected and analyzed to evaluate lead and cadmium in the area (Section 4).

Table 1C
Exide Frisco Recycling Center
Historical Document Summary

Author	Date	Title	Contents	Outstanding issues / recommendations	Comments
TCEQ	2/7/2013	Handout at 2/8/2013 Meeting (Continued)		South Disposal Area – Discharges noted in the TCEQ inspection for the east side of the South Disposal Area must be delineated according to Ordering Provision 3.C.i. Groundwater monitoring wells need to be installed between the South Disposal Area and Stewart Creek to determine possible impact. Surface water quality standards need to be met in monitoring wells adjacent to Stewart Creek according to TRRP-24. Additional soil sampling to the east and west to define the eastern and western boundaries is required. 0-6 inch aerial deposition samples are necessary. The existence of high levels of contamination at the surface in the landfill interior will require remediation/capping.	Additional soil sampling to the east of the SDA performed to further delineate lead exceedances. Surface soil samples (0-6") have been collected in this area for the SLERA evaluated for lead and cadmium. Additional samples were collected north of SDA-4 and SDA-3 and were evaluated for COCs from 0-6". Samples collected for the SLERA in the wooded area to the east of the SDA were collected from the 0-6" interval. Additional soil samples collected and analyzed to evaluate lead and cadmium in this area during the APAR investigation. The groundwater to surface water PCL was considered a pathway for wells located adjacent to Stewart Creek, the groundwater to surface water point of exposure. Water levels were evaluated in monitoring wells between the South Disposal Area and Stewart Creek. B-4R was sampled as part of the investigation. An attempt was made to sample B-3R but the well provided an insufficient volume for sampling.
				Site Specific Recommendations – Non-RFI SWMUs Boneyard – Additional groundwater monitoring wells may need to be installed between the Boneyard and Stewart Creek to determine possible impact to the west and east of MW-16. Determine if any additional slag fragments are in this area to determine if either capping or spot excavation is necessary.	Additional soil samples were collected in the vicinity of MW-16 to determine the extent of lead and/or cadmium contamination in the vicinity (Section 4). An additional monitoring well (MW-24) was installed to the east of MW-16 (Section 5). W&M performed a Site-wide survey for slag; the report is included in an appendix to the APAR (Appendix 8).
				Bale Stabilization Area – How were the bales treated and stabilized in this area? Additional soil and groundwater samples should be gathered from this area. Identification of exposed battery chips and slag during a 2010 inspection performed by the EPA should necessitate a higher frequency of confirmation sampling to ensure additional exceedances outside the landfill boundaries are not present.	The requested information is included in the APAR (Section 1). Per a separate comment, a monitoring well (with soil sampling) was installed and sampled to evaluate for total and dissolved lead and cadmium, pH and sulfate. A substantial number of soil samples were previously collected in this area for the SIR (PBW, 2012). These are described in Section 4.
				Crystallization Unit Frac Tank – The discharge at the drainage swale west of the Crystallization Unit should be sampled and the extent of contamination determined.	Soil samples were collected in the vicinity of the drainage swale west of the Crystallization Unit Frac Tank. Ten soil samples collected and analyzed to evaluate lead, cadmium and sulfate in the area (Section 4).
				Stewart Creek Floodwall – Additional sampling in the vicinity of FWCS-1 should be conducted and the extent of contamination defined. Discharges of groundwater/perched water/wash water should be sampled and discussed. Groundwater monitoring should be conducted to determine if groundwater is affected. Provide engineered drawings of the French drain system and a discussion of its function in relation to present and future uses to intercept discharges that could impact Stewart Creek.	Additional soil samples were collected to address lead and/or cadmium exceedances in soil samples collected along the Stewart Creek Floodwall (Section 4). A groundwater investigation was conducted to determine if groundwater is affected. Four soil samples collected and analyzed to evaluate lead and cadmium in this area. Wells MW-17 and B5N were also sampled in this area. A report for the French Drain (W&M, 2013) is provided in Appendix 19.
				Berm Material – Ordering Provision 3.c.iii require proper disposal of the Berm Material. Conduct confirmation sampling to determine that all contaminated berm material has been excavated.	Removal of Shooting Range Berm has been completed. Verification soil samples are included in the APAR (Section 4).
W&M Environmental	5/10/2013	Wall Seepage Project; Retaining Wall at Stewart Creek; Exide Frisco Recycling Facility	W&M prepared a report detailing the procedures of the French drain installation along the flood wall. The French drain was installed to prevent seepage along the creek side of the flood wall, which had been previously observed. In the fall of 2012, W&M installed a French drain from the eastern edge of the Slag Treatment Building to the southeast corner of the Battery Storage/Receiving Building. The installation was completed in roughly 100-foot sections. First, the concrete was broken and the soil excavated. The soil was stockpiled on polyethylene sheeting and covered nightly with additional sheeting. Next, the wall footing was sealed with asphaltic sealer and a 40 ml HDPE liner. Then, a 4-inch PVC underdrain was installed and surrounded by crushed stone and the concrete replaced. In addition, collection sumps were installed at the west end of the wall: one to collect liquids from the new underdrain system and another to collect surface runoff. The excavated soil was sampled and characterized for disposal off-site, by manifest, in an appropriate landfill.		Included in Appendix 19 of APAR.

EXPLANATION

On-Site Property Boundary

FRC Property Boundary

N

Scale in Feet

0 75 150

Source of photo:
Imagery from NCTCOG, 2009 photography.

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 1A.1

ON-SITE PROPERTY MAP

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- On-Site Property Boundary
- FRC Property Boundary
- Special Flood Hazard Areas Subject to Inundation by the 1% Annual Chance Flood (100-year Flood) (FEMA, 2009)
- Areas of 0.2% Annual Chance Flood, Areas of 1% Chance Flood with Average Depths of Less that 1 foot or with Drainage Areas Less than 1 Square Mile, or Areas Protected by Levees from 1% Annual Chance Flood (FEMA, 2009)

N

Scale in Feet

0 75 150

Source of photo:
Imagery from NCTCOG, 2009 photography.

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 1A.2

ON-SITE PROPERTY MAP WITH FLOOD ZONES

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- On-Site Property Boundary
- FRC Property Boundary
- Former Path of North Tributary (1951 Aerial Photo)
- Former Path of North Tributary (1972 Aerial Photo)
- Former Path of Stewart Creek (1951 Aerial Photo)
- Monitoring Well Location
- Well Plugged and Abandoned, Destroyed or Not Found
- Soil Sample Location (2012-2013)
- Sediment and Surface Water Sample Location (2012-2013)
- Phase II RFI Soil Sample Location (1998)
- Phase I RFI Soil Sample Location (1991)
- Disposal Area Delineation Boring Location (1993)
- Dredged Sediment Stockpile Sample Location (1986)
- Dredged Sediment Stockpile Sample Location (1987)
- Old Drum Storage Area Sample Location (1987)
- Geotech Boring Location (2011)
- Class 2 Landfill Notification Boring (1995)
- Soil Ral Exceedance Zone
- Surface Drainage Direction
- Water Line
- Fire Hydrant
- Sanitary Sewer Line
- Sanitary Sewer Manhole
- Stormwater Line
- Stormwater Manhole
- Stormwater Inlet/Basin
- Gas Line
- Fiber Optic Line

Note:
1. Locations of utilities shown are approximate. Additional underground utilities are prevalent throughout the former production area, commonly within concrete trenches.

Source of photo:
Imagery from NCTCOG, 2009 photography.
Source of utilities:
City of Frisco, GIS Department

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 1B

AFFECTED PROPERTY MAP

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
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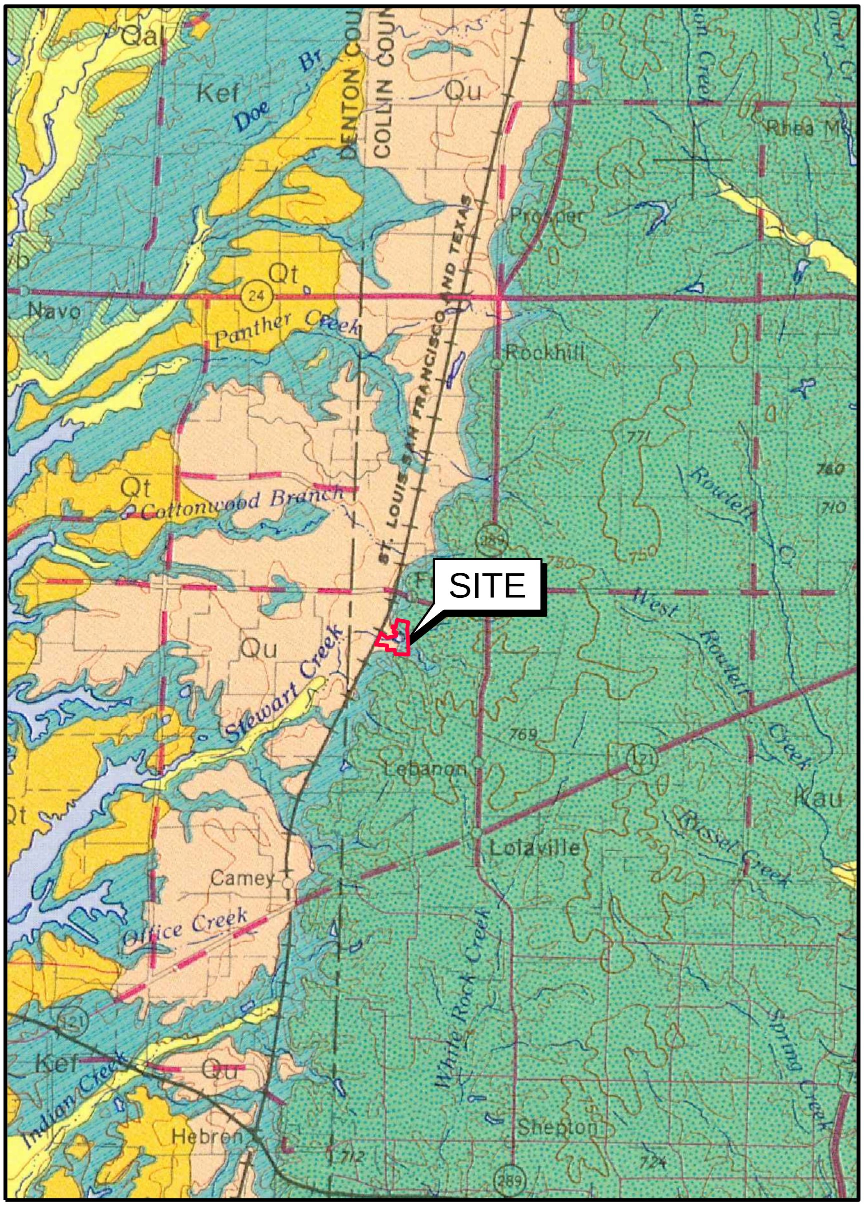
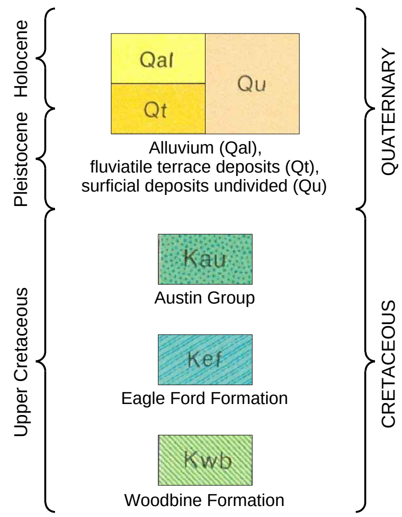


EXPLANATION



Alluvium (Qal), fluviatile terrace deposits (Qt), surficial deposits undivided (Qu)

Austin Group

Eagle Ford Formation

Woodbine Formation

Scale 1:250,000

0 3

Statute Miles

Source: Geologic Atlas of Texas, Sherman Sheet (McGowen et al., 1991).

FRISCO RECYCLING CENTER

FRISCO, TEXAS

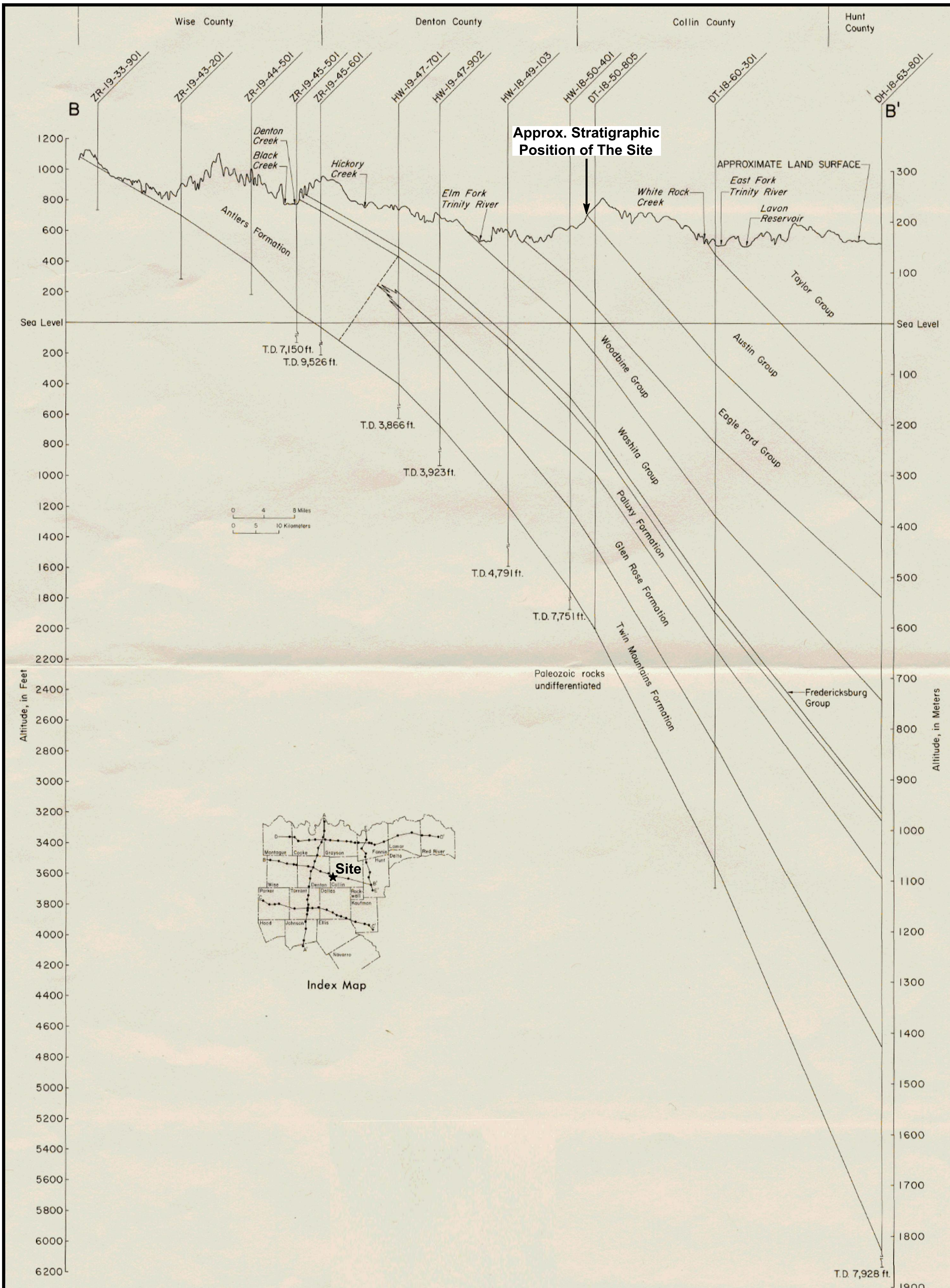
Figure 1C

REGIONAL GEOLOGIC MAP

PROJECT: 1755	BY: AJD	REVISIONS
DATE: APR., 2013	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 1D

REGIONAL GEOLOGIC CROSS SECTION

PROJECT: 1755	BY: AJD	REVISIONS
DATE: APR., 2013	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Source:
After Nordstrom (1982).

2.0 EXPOSURE PATHWAYS AND GROUNDWATER RESOURCE CLASSIFICATION

This section addresses TRRP requirements, but also includes additional information regarding potential receptors previously provided in (and updated from) the SIR (PBW, 2012a).

2.1 Source(s) of Potable Water for On-site Property and Affected Off-Site Properties

Potable water for the Site and properties within the vicinity of the Site is provided by the City of Frisco, which purchases treated surface water from the North Texas Municipal Water District (NTMWD). The primary source for the NTMWD water supply is Lavon Lake, which is located approximately 16 miles east of the Site (City of Frisco, 2012).

2.2 Field Receptor Survey

As required by TRRP, a survey of potential receptors within at least 500 feet of the affected property areas has been completed. The 500-foot radius boundary is depicted on Figure 2A. Land within 500 feet of the affected property areas is contained almost entirely within the boundaries of the FOP or the Exide-owned Undeveloped Buffer Property, which is being investigated separately as a TCEQ Voluntary Cleanup Program (VCP) site. Field receptor surveys of the area within the TRRP-required 500-foot affected property radius and the Site vicinity beyond the 500-foot radius was conducted February 22, 2012 and October 22, 2012 by Kirby Tyndall of PBW. Trip reports for the field receptor surveys are included with the receptor survey photographs in Figure 2B. In addition to the field receptor survey conducted by PBW, a supplemental field water well survey was conducted by Larry Eagan on behalf of Exide in October-November 2012 within approximately 0.5 miles of the FRC property. The findings of the field receptor surveys and supplemental water well survey are discussed in Section 2.4.

2.3 Records Survey

A water well records search was performed by Banks Environmental Data (Banks) on June 5, 2013 as part of the SIR investigation to identify water wells located within approximately 0.5 miles of the FRC. As noted in the Banks report (Appendix 5), the following databases were accessed during the water well search:

- TWDB databases: Groundwater Data, Submitted Drillers Reports;
- TCEQ databases: Water Utility Database, Public Water Systems Database, Central Records;
- Local Groundwater Conservation District and Subsidence District Records; and
- USGS databases: National Water Information System.

2.4 Receptor Survey Results

The first receptor survey, conducted in February of 2013, focused primarily on developed properties in the vicinity of the FRC. Developed land near the facility includes residential, industrial, and commercial properties. Several schools and parks with playgrounds are located within nearby residential neighborhoods: Grand Park is located approximately 5,000 feet southwest of the FRC, First Street Park, which contains a community garden, is located approximately 4,000 feet due north of the FRC, and Oakbrook and Hickory Parks are located in neighborhoods across 5th Street, east of the FRC.

The second receptor survey, conducted in October of 2012, focused primarily on Stewart Creek, the North Tributary, and potential ecological habitat. Receptors of potential concern previously identified during the February 2012 survey were confirmed and/or further evaluated during the second receptor survey. On-site and downstream portions of Stewart Creek and the North Tributary are considered potential surface water receptors. During the February 2012 receptor survey, no additional potential surface water receptors were identified. During the survey, the upstream segments of both Stewart Creek and the North Tributary, which run through developed neighborhoods east of the FRC, were observed. Much of the base flow of Stewart Creek and the North Tributary is attributed to surface runoff from upstream irrigation systems. Surface water in the vicinity of the FRC is not used for domestic or agricultural purposes. The ground surface within the survey area generally slopes toward the drainages of Stewart Creek and the North Tributary, and in the downstream direction of these creeks to the west. As noted previously, Stewart Creek is considered by the TCEQ to be an intermittent stream (TCEQ, 2011a).

The records survey and supplemental field water well survey identified five potential water wells within approximately 0.5 miles of the Site (Table 2A). The reported locations of the wells are shown on Figure 2C. Mr. Eagan presented the findings of the supplemental water well field survey in a memorandum dated December 18, 2012 (included in Appendix 5). As described therein, the memorandum also included the evaluation of a possible well location that was observed during the field survey. A summary of the findings for the records survey and the water well field survey is provided below:

- Based on State well records, Figure 2C well location No. 1 (TWDB State Well No. 18-50-8C) consists of one domestic well screened from 600 to 620 feet bgs. The reported location of the well is approximately 0.25 miles northwest of the Site, in the vicinity of the intersection of Page Street and John W. Elliot Drive. Well records indicate that the well is owned by Frisco Concrete, which is no longer in operation at this location. Donnie Mayfield, a City of Frisco employee who oversaw the demolition of three home sites located in the vicinity of the reported well location, was interviewed by Mr. Eagan on October 19, 2012. Mr. Mayfield indicated that the Frisco Concrete cement plant was formerly located in the vicinity of the demolished home sites. Lynn Floyd, of Floyd Architectural Millwork at 8734 John W. Elliot Drive, the only current business owner and operator in the vicinity of the reported well, was interviewed by Mr. Eagan on October 22, 2012. Mr. Floyd, who has operated a business at this address for 15 years, indicated that he was not aware of any active wells in the area. Evidence of an active well in the area was not observed during a walking survey performed by Mr. Eagan on October 22, 2012. Based on this evaluation, the well is believed to be destroyed.

- Based on State well records, Figure 2C well location No. 2 is a cluster of four public supply wells (TWDB State Well Nos. 18-50-802, 18-50-803,18-50-804, and Public Water System ID G04300005A) owned by the City of Frisco. Well records indicate that the four wells are completed in the Paluxy and/or Twin Mountains Formations with total depths ranging from approximately 1600 to 2800 feet bgs. The reported wells are located approximately 0.25 miles northeast of the Site, in the vicinity of Elm Street and 7thStreet. Mr. Eagan interviewed Mr. Mayfield of the City of Frisco on October 19, 2012 in regards to the wells. Mr. Mayfield indicated that two of the wells are capped and not currently in use by the City of Frisco, but could be utilized in an emergency. According to Mr. Mayfield, the other two wells have been plugged and abandoned.

- A possible well location was preliminarily identified during the February 2012 receptor survey by PBW and again by Mr. Eagan during the supplemental field water well survey. Specifically, a small concrete structure, possibly associated with a well, was observed at 8661 7th Street, located approximately 0.20 miles northeast of the Site (see Appendix 5). The owner of the property, Janet Lovelady, was interviewed over the phone by Mr. Eagan on November 7, 2012. Ms. Lovelady indicated that there is no active well currently located on the property, but that there had been a well on the property in the distant past that was believed to have caved in. As noted previously, the records search did not indicate a well at this location. Based on this evaluation, the observed concrete structure was determined to not be an active well.

There were no active water wells identified in the upper GWBU within 0.5 miles of the Site.

Potential ecological receptors are discussed in the Screening Level Ecological Risk Assessment (SLERA) presented in Section 9.

2.5 Groundwater Resource Classification

An assessment of the groundwater classification for the uppermost GWBU at the Site was completed in accordance with the procedures described in TCEQ regulatory guidance document RG-366/TRRP-8 (TCEQ, 2010a). PBW initially summarized groundwater classification assessment activities in a memorandum dated November 29, 2012, in which the uppermost GWBU was classified as a Class 3 groundwater resource. This memorandum was submitted to and discussed with TCEQ and EPA representatives in a meeting on December 7, 2012, and TCEQ concurrence with the Class 3 classification was documented by a TCEQ Interoffice Memorandum that summarized the meeting discussion (TCEQ, 2013c). Based on information obtained subsequent to the November 29, 2012 memorandum, PBW prepared a report entitled *Updated Groundwater Resource Classification Evaluation*, which is provided in Appendix 7 of this APAR. Like the initial groundwater classification memorandum, the updated evaluation concluded that the uppermost GWBU at the Site is a Class 3 groundwater resource.

2.6 Exposure Pathways

Based on the Site history and current and anticipated future land use of the affected properties, the following human health exposure pathways were identified for evaluation in the APAR in accordance with 30 TAC §350.71(c): 1) COCs in Class 3 groundwater; 2) combination of inhalation of volatile emissions and particulates from COCs in surface soil, dermal contact with COCs in surface soil, and ingestion of COCs in surface soil for commercial-industrial workers; 3) leaching of COCs in surface or subsurface soils to groundwater; and 4) contact with surface water or sediment containing COCs originating from a source area (Table 2C). Tier 1 PCLs were used to evaluate the potential impacts of the first two exposure pathways, as they are considered complete for the affected property areas, while Tier 1 or Tier 2 PCLs were used to evaluate the third pathway. The fourth pathway is evaluated in Sections 2.6.2 and 2.6.3 to assess whether PCLs are applicable for possible impacts to surface water and sediment in Stewart Creek and the North Tributary from groundwater discharge and/or overland surface runoff. Direct contact with surface water and sediment, also relating to pathway four listed above, was evaluated by comparing Site data to human health and ecological PCLs.

Likewise, for the areas with potential ecological habitat (not the former production area or landfill areas, as detailed in the SLERA), the primary release mechanism was historical operations and associated air emissions with subsequent deposition of lead and cadmium on surface soil. The SLERA for the Site addresses the exposure pathways related to the introduction of cadmium and lead to surface soils in those areas that will remain ecological habitat for the foreseeable future, and surface water and sediment of Stewart Creek. The SLERA concluded that there are no potential risks associated with soils left remaining after required remedial actions are completed based on the applicable commercial-industrial $^{Tot}Soil_{Comb}$ for lead.

The primary release mechanism at the affected properties was historic releases from former operations and waste units, as well as fugitive dust sources and permitted historical air emissions. The air emissions from the facility could have subsequently settled and deposited on surfaces nearby. The complete exposure pathways associated with potential contact with Site-related COCs include direct exposure to soil, leaching to groundwater, and potential surface runoff of cadmium and lead into Stewart Creek and the North Tributary.

Since the plant stopped operating at the end of November 2012, continued air emissions and deposition of COCs onto surface soil has ceased other than what may be entrained from surface soils through fugitive dust emissions during windy periods. As noted in Section 1.2.4.4, during the ongoing decontamination and demolition activities at the Site, dust suppression measures are being implemented to reduce the potential for particulate emissions associated with these activities.

2.6.1 Chemical/Physical Properties Governing Transport of Cadmium and Lead

Lead and cadmium, like all compounds, have the potential to move within environmental media (e.g., soil) to some degree. The ability for a compound to be transported within a medium or between media is based on the chemical and physical characteristics of the compound(s) and the source medium as well as the receiving medium. Physical characteristics include parameters such as grain size and moisture content for surface soil particles. Chemical characteristics include parameters such as soil/water distribution coefficients, adsorption potential, and degradation characteristics for potential contaminants. These chemical characteristics are specific to each chemical present, and may be affected by the physical characteristics of the media in which the chemical is present. In surface water, physical and chemical characteristics are both important because transport may occur in solution or in association with suspended sediment. Dissolved-phase transport is the dominant contaminant migration mechanism in groundwater; therefore, chemical characteristics are often important with respect to that medium as well. Lead and cadmium generally tend to remain bound to organic matter, minerals, clays, and silts in soil and, as such, they are relatively immobile. Neither lead nor cadmium is considered water soluble although their solubility will increase in acidic conditions. If present in the dissolved phase, both can migrate in groundwater, although that migration can be significantly attenuated through sorption to the groundwater matrix, particularly in clay-rich soils such as those that comprise the uppermost GWBU at the Site.

2.6.2 Transport of COCs in Surface Soil Via Surface Runoff

The potential for soil releases to surface water and sediment via runoff was evaluated per TRRP regulatory guidance document RG-366/TRRP-24 (TCEQ, 2007). Section 7.4 of TRRP-24 describes the general approach for characterizing dissolved and particulate COC releases to surface water and sediment from erodible soils and the development of PCLs for this pathway. If PCLs are necessary, they only apply to the area and thickness of soils likely to be eroded based on a property-specific evaluation. To determine if this pathway is complete, TRRP-24 indicates that the following factors can be used to determine whether the transport of affected soil and COCs is relevant:

- Proximity of surface waters;
- Extent of exposed or erodible soils;
- Extent of erodible impacts;
- Transport or erosion potential based on soil types, compaction, vegetation density, and slope; and
- Presence of metals and/or persistent bioaccumulative organic COCs in soil.

Overland surface runoff from surface soil to Stewart Creek and the North Tributary has the potential to result in the transport of lead and cadmium bound to soil particles to these surface water bodies during/after rainfall events. Overland flow during runoff events would be expected to occur in the direction of topographic slope and would more likely occur with significant rainfall events when soils are fully saturated and/or precipitation rates are greater than infiltration rates.

There is limited physical evidence of erodible impacts other than a small area of wash-out on the south side of the railroad spur on the western-most portion of the former production area. Additionally, there are areas of preferential surface water flow in the South Wooded Area that are stabilized by natural vegetation. The majority of the Site where runoff is not controlled by the storm water collection system is vegetated, with little exposed soil. Furthermore, the soils at the Site are predominantly clay, and clay soils have a relatively low erosive potential.

Dissolved lead and cadmium associated with surface runoff from the Site is expected to be generally low due to the relatively low solubilities of cadmium and lead. Lead and cadmium will preferentially partition to organic matter in soil and sediment. Once bound to organic matter, lead and cadmium migrate as part of the sediment matrix, if sediment is suspended during storm events. The relatively low measured lead and cadmium concentrations in the Site sediment samples collected from Stewart Creek and North Tributary during the SIR and APAR investigations also support that there is little evidence that overland erosion and transport of soil COCs is a significant migration pathway. Based on the evaluation of TRRP-24 factors described herein, PCLs were not developed for Site surface soil to evaluate this pathway. It should be noted, however, that potential impacts to human and ecological receptors potentially contacting COCs in surface water and sediment are evaluated in this APAR (see Sections 6, 7, and 9).

2.6.3 Transport of COCs in Groundwater to Surface Water and Sediments

Leaching and infiltration of COCs from surface and subsurface soils into groundwater may occur; however, neither cadmium nor lead is very mobile in the environment. Groundwater data from the Site suggest that neither COC has leached from soils to groundwater to an appreciable extent. Based on the groundwater potentiometric surface maps presented as Figures 5A.1 through 5A.3, Stewart Creek and the North Tributary appear to be gaining streams, but none of the Site data suggest that impacted groundwater is or has discharged to surface water.

Groundwater data from Site wells nearest Stewart Creek and the North Tributary were evaluated by assuming they represent groundwater discharge to surface water in these creeks per 30 TAC §350.37(i) and 30 TAC §350.51(f). None of the groundwater samples collected during the SIR and APAR investigations at wells that would be considered potential groundwater to surface water Point of Exposure (POE) wells (MW-B5N, MW-B7N, MW-9N, MW-11, MW-12, MW-13, MW-14, MW-16, MW-16S, MW-17, MW-21, MW-22, MW-24, MW-26, MW-27, MW-29, P-1, LMW-5, LMW-8, LMW-17, and LMW-22) contained COC concentrations that exceeded the applicable groundwater to surface water PCL (^{SW}GW) ambient water quality criteria for these constituents (Table 5B.1). Likewise, cadmium and lead measured in surface water and sediment samples (Tables 6B and 7B, respectively) were below surface water ambient water quality criteria and sediment PCLs. Consistent with TRRP-24 guidance, a ^{GW}Sed PCL was not developed for this pathway since it is not likely to be complete because the sediment PCL for direct contact was not exceeded for either ecological or human receptors in Site samples collected during the SIR and APAR investigations.

This evaluation suggests that the groundwater to surface water and groundwater to sediment pathways are incomplete or insignificant exposure pathways. The potential impact of groundwater to surface water is also discussed in the Groundwater Assessment section of this APAR (Section 5).

Table 2A Water Well Summary

Well ID on Figure 2C	Source Well ID	Owner of Record	Approximate Distance from Site (miles)	Screened Interval (feet bgs)	Casing Interval (feet bgs)	Cemented Interval (feet bgs)	Surface Completion Type	Total Depth (feet bgs)	Completion Date	Producing Formation	Current Water Use	Current Status	Data Source
1	18-50-8C	Frisco Concrete	0.25	600-620	0-600	--	--	620	2/14/1980	Woodbine	NA	Destroyed	TWDB, field survey, and interviews
2	18-50-802	City of Frisco	0.25	1440-1632	0-1440	--	--	1632	1/1/1940	Paluxy	Unused	inactive (possibly plugged and abandoned)[1]	TWDB, interview with City employee
2	18-50-803	City of Frisco	0.25	1440-2796	0-1440	0-1440	--	2796	3/22/1950	Paluxy and Twin Mountains	Unused	inactive (possibly plugged and abandoned)[1]	TWDB, interview with City employee
2	18-50-804	City of Frisco	0.25	--	--	--	--	1680	1/1/1924	Paluxy	Unused	Plugged and abandoned	TWDB, interview with City employee
2	G0430005A	City of Frisco	0.25	--	--	--	--	2796	3/22/1950	Paluxy and/or Twin Mountains	Unused	inactive (possibly plugged and abandoned)[1]	TCEQ, interview with City employee

Notes:

1. [1] - Donny Mayfield, City of Frisco employee, indicated that two of the four City of Frisco-owned wells have been plugged and abandoned and that the remaining two wells are capped and unused (see Section 2.4 for additional details).
2. "--" - information not available.
3. NA - not applicable.
4. bgs - below ground surface.
5. TWDB - Texas Water Development Board.

Table 2C Complete or Reasonably Anticipated to be Complete Exposure Pathways

<table>
<tr><th>Exposure Pathway</th><th>Surface Soil[1]</th><th>Subsurface Soil[2]</th><th>Groundwater</th><th>Surface Water/ Sediment</th></tr>
<tr><td>${}^{Tot}Soil_{Comb}{}^{3}$</td><td>X</td><td>NA</td><td rowspan="3">NA</td><td rowspan="7">NA</td></tr>
<tr><td>${}^{Air}Soil_{Inh\text{-}V}$</td><td>NA</td><td>X</td></tr>
<tr><td>${}^{GW}Soil_{Ing}$ or ${}^{GW}Soil_{Class3}$</td><td>X</td><td>X</td></tr>
<tr><td>${}^{GW}GW_{Ing}$ or ${}^{GW}GW_{Class3}$</td><td rowspan="5">NA</td><td rowspan="5">NA</td><td>X</td></tr>
<tr><td>${}^{Air}GW_{Inh\text{-}V}$</td><td>X</td></tr>
<tr><td>${}^{SW}GW$</td><td>X*</td></tr>
<tr><td>${}^{Sed}GW$</td><td></td></tr>
<tr><td>${}^{SW}SW$ or ${}^{Sed}Sed$</td><td>NA</td><td>X</td></tr>
<tr><td>Other (specify)</td><td></td><td></td><td></td><td></td></tr>
</table>

Notes:

1. Residential: soils from 0-15 feet deep, or to bedrock or groundwater-bearing unit if shallower.
   Commercial/industrial: soils from 0-5 feet deep, or to bedrock or groundwater-bearing unit if shallower.
2. The vadose zone beneath the surface soil extending to the groundwater-bearing unit, and including unsaturated zones between stratified groundwater-bearing units.
3. Residential: ${}^{Air}Soil_{Inh\text{-}VP} + {}^{Soil}Soil_{Ing} + {}^{Soil}Soil_{Derm} + {}^{Veg}Soil_{Ing}$
   Commercial/industrial: ${}^{Air}Soil_{Inh\text{-}VP} + {}^{Soil}Soil_{Ing} + {}^{Soil}Soil_{Derm}$
4. **X** - complete or reasonably complete exposure pathway.
5. * - The ${}^{SW}GW$ exposure pathway only applies in areas where there is a potential point of discharge of groundwater to surface water (i.e., in the near vicinity of Stewart Creek or the North Tributary).

EXPLANATION

- On-Site Property Boundary
- FRC Property Boundary
- Former Path of North Tributary (1951 Aerial Photo)
- Former Path of North Tributary (1972 Aerial Photo)
- Former Path of Stewart Creek (1951 Aerial Photo)
- Monitoring Well Location
- Well Plugged and Abandoned, Destroyed or Not Found
- Soil Sample Location (2012-2013)
- Sediment and Surface Water Sample Location (2012-2013)
- Phase II RFI Soil Sample Location (1998)
- Phase I RFI Soil Sample Location (1991)
- Disposal Area Delineation Boring Location (1993)
- Dredged Sediment Stockpile Sample Location (1986)
- Dredged Sediment Stockpile Sample Location (1987)
- Old Drum Storage Area Sample Location (1987)
- Geotech Boring Location (2011)
- Class 2 Landfill Notification Boring (1995)
- Soil Ral Exceedance Zone
- Surface Drainage Direction
- Approximate 500-Foot Radius of Affected Property

N

Scale in Feet
0 75 150

Source of photo:
Imagery from NCTCOG, 2009 photography.

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 2A

POTENTIAL RECEPTORS MAP

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Figure 2B
Field Survey Photographs

Photo 1 At apartment complex on E. Hickory, west of Preston Rd. looking toward North Tributary. This landscaping feature drains into Stewart Creek.

Figure 2B
Field Survey Photographs

Photo 2 Looking upstream at North Tributary from bridge at apartment complex on E. Hickory St. Irrigation system is visible (associated with apartment complex landscaping).

Figure 2B
Field Survey Photographs

Photo 3 Looking downstream at North Tributary from bridge at apartment complex on E. Hickory St. Stream bed is paved until it reaches Oak Creek Park.

Figure 2B
Field Survey Photographs

Photo 4 North Tributary of Stewart Creek at Oak Creek Park at E. Hickory St. and Woodstream Drive.

Figure 2B
Field Survey Photographs

Photo 5 Standing on bridge on Woodstream Dr. looking downstream at the North Tributary.

Figure 2B
Field Survey Photographs

Photo 6 Looking downstream at the North Tributary in Oak Creek Park.

Figure 2B
Field Survey Photographs

Photo 7 Looking downstream at the North Tributary in Oak Creek Park.

Figure 2B
Field Survey Photographs

Photo 8 On-site on bridge on Eagan Dr. looking upstream at Stewart Creek.

Figure 2B
Field Survey Photographs

Photo 9 On-site on bridge on Eagan Dr. looking downstream at Stewart Creek as it enters the Site.

Figure 2B
Field Survey Photographs

Photo 10. Standing on Eagan Dr. just south of Crystallizer Rd. Way looking at dense shrubs and trees.

Figure 2B
Field Survey Photographs

Photo 11 Standing on Crystallizer Rd. Way southeast of South Disposal Area, view looking south.

Figure 2B
Field Survey Photographs

Photo 12 Standing on Crystallizer Rd. Way looking south toward the South Disposal Area.

Figure 2B
Field Survey Photographs

Photo 13 Standing on Crystallizer Rd. Way looking southwest. The former Shooting Range Berm is visible in the background.

Figure 2B
Field Survey Photographs

Photo 14 Stewart Creek adjacent to former production area at Site.

Figure 2B
Field Survey Photographs

Photo 15 Standing near the western side of the hayfield on the Lake Parcel, looking toward the storm water retention pond.

Figure 2B
Field Survey Photographs

Photo 16 Looking upstream of the North Tributary of Stewart Creek on-site on the road leading from the FRC plant to the Class 2 Landfill.

Figure 2B
Field Survey Photographs

Photo 17 Looking downstream at the relocated North Tributary on-site on the road leading from the FRC plant to the Class 2 Landfill.

Figure 2B
Field Survey Photographs

Site Visit Forms:

GENERAL RECEPTOR SURVEY SITE VISIT

Date: February 22, 2012

Project No: 1732 Project Name: Exide Frisco Facility located at 7471 S. Fifth St. Frisco, TX Collin County Page 1 of: 2

Site Visit by Kirby Tyndall and Eric Pastor Arrival Time: about 9:30 am

Weather (@ arrival): 70 degrees, partial cloud cover, 7 mph SSE Weather (past 48 hrs.) mild, no precipitation

General Survey Location (i.d., description) Secondary Lead Smelter, Lead Metal Recycling

Air Temperature @ arrival: Departure Time: 2:30 pm

Is Access to the Site restricted? Yes If so, how (eg., fencing, security, etc.): fencing, security, active operations

GENERAL SITE INFORMATION

Current Site Conditions and Operations and general notes: Approximate Site Area: approx. 87 acres

Operating facility with health and safety program in place. Runoff from operating area contained and treated per SWPPP. Little evidence of overland flow from areas outside of SWPPP control.

Land Use On Site:	Land Use within 1 mile of Site:
% Urban:	% Urban: 30%
% Rural:	% Rural:
% Residential:	% Residential: 40%
% Industrial: 75% Heavy Industrial	% Industrial: 20%
% Ag (describe crops): 10% hayfield (crop not sold)	% Ag (describe crops):
% Recreational (describe):	% Recreational (describe): ~5%
% Undisturbed: 15% overgrowth of trees	% Undisturbed: ~5%
% Other:	% Other:
Latitude: 40.5389	**Longitude:** -90.2637

LAND USE WITHIN 500 FEET OF THE FACILITY

Primarily commercial/industrial land use.

LAND USE WITHIN 1,000 FEET OF THE FACILITY

Primarily industrial and commercial land use although there are some residential areas within 1000 feet to the north of the facility.

EVIDENCE OF WATER WELLS IN AREA

Possible well in backyard of house near Ash and 7th.

SENSITIVE RECEPTORS IN AREA

Community Garden at First Street Park due north of the facility.

Grand Park is roughly 2400 ft southwest of the facility.

Frisco Child Development Center with a playground is within 1000 feet of the facility, to the northeast.

There are several neighborhood parks to the north and east of the facility at distances greater than 1000 feet from the facility.

A pre-school is approximately 1500 feet to the southeast of the facility.

SURFACE WATER IN THE AREA

Upstream of the facility in Stewart Creek and the North Tributary, the streams run through neighborhoods and appear to be fed by runoff and residential irrigation.

On-site, Stewart Creek and the North Tributary converge, and then exit the property. Stewart Creek runs mostly through undeveloped land until it discharges into Lake Lewisville.

ADDITIONAL INFORMATION

See attached notes on area figure collected during the Site visit.

PASTOR, BEHLING & WHEELER, LLC
2201 DOUBLE CREEK DR., SUITE 4004
ROUND ROCK, TEXAS78664
(512) 671-3434
FAX: (512) 671-3446

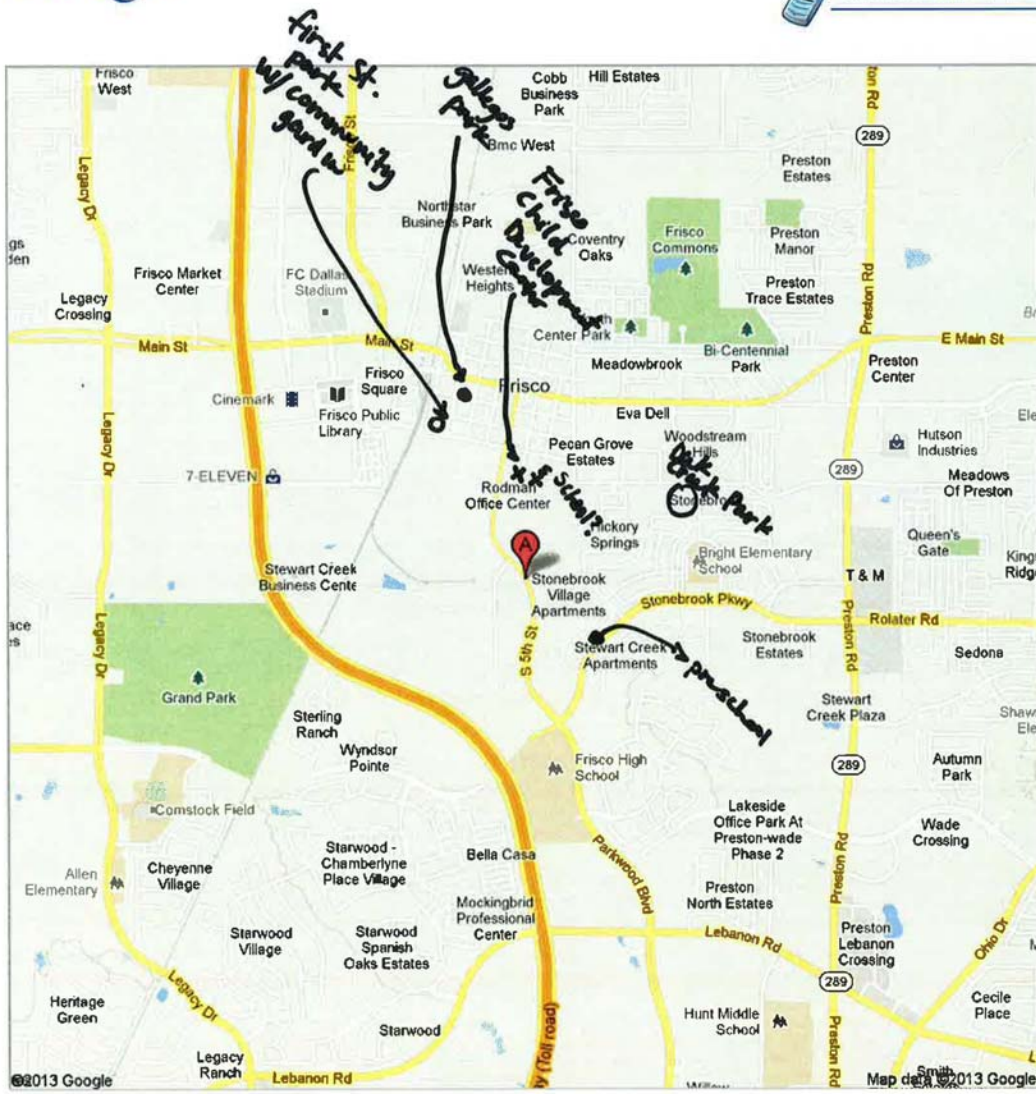
Figure 2B
Field Survey Photographs

7471 S 5th St, Frisco, TX - Google Maps

Google

Address **7471 S 5th St**
Frisco, TX 75034

Get Google Maps on your phone
Text the word **"GMAPS"** to **466453**



maps.google.com/maps?f=q&source=s_q&hl=en&geocode=&q=7471+S+5th+St,+Frisco,+TX&aq=0&oq=7471+S.+5th+St.+Frisco,+TX&sll=31.168934,-100.... 1/1

Figure 2B
Field Survey Photographs

ECOLOGICAL SURVEY SITE VISIT

Date: October 22, 2012

Project No: 1755 Project Name: Exide Frisco Facility located at 7471 S. Fifth St. Frisco, TX Collin County Page 1 of 1

Site Visit by: Kirby Tyndall and Margaret Roy Arrival Time: about 9:00 am

Weather (@ arrival): 75 degrees, partial cloud cover Weather (past 48 hrs.): mild, no precipitation

General Survey Location (i.d., description) Secondary Lead Smelter, Lead Metal Recycling

Air Temperature @ arrival: Departure Time: 2:00 pm

Is Access to the Site restricted? Yes If so, how (eg., fencing, security, etc.): fencing, security, active operations

GENERAL SITE INFORMATION

Current Site Conditions and Operations (describe): Approximate Site Area: approx. 87 acres

Operating facility with health and safety program in place. Runoff from operating area contained and treated per SWPPP. Little evidence of overland flow from areas outside of SWPPP control.

Land Use On Site:	Land Use within 1 mile of Site:
% Urban:	% Urban: 30%
% Rural:	% Rural:
% Residential:	% Residential: 40%
% Industrial: 75% Heavy Industrial	% Industrial: 20%
% Ag (describe crops): 10% hayfield (crop not sold)	% Ag (describe crops):
% Recreational (describe):	% Recreational (describe): ~5%
% Undisturbed: 15% overgrowth of trees	% Undisturbed: ~5%
% Other:	% Other:

Latitude: 40.5389 **Longitude:** -90.2637

UPLAND/TERRESTRIAL HABITAT

Estimate the percentage of the site's surface that is Eco Habitat – approximately 25%
Of the estimated percentage that is Eco Habitat, what percentage is wooded? 15% Shrub/Scrub? Open Field? 10% (hayfield) Misc.?

Estimate the percentage of the site's surface that is: Exposed soil – less than 1%
Covered by pavement – ~5%
Covered by buildings/slab (capped landfills included) – ~ 60%
Covered by water (surface water impoundments included) – ~ 5%
Covered by vegetation – ~30

Described the predominant type and size of vegetation in the area of potential Eco Habitat, and how dense the vegetation is: there are two areas of dense overgrown trees and one open/cultivated hay field.

SURFACE WATER HABITAT

Is there open-water flowing or non-flowing aquatic system present at the Site? yes Please describe: intermittent stream

If known, what is the name of the waterbody(ies) on or adjacent to the site? Stewart Creek and North Tributary What are its known uses? Part of the City's Municipal Stormwater permit

What is the approximate size of the waterbody(ies) in acres? What is average depth of the water? Varies

Is any aquatic vegetation present? No If yes, please describe as emergent, submergent or floating:

What is the source of the water in the waterbody? Upstream residential irrigation and storm runoff

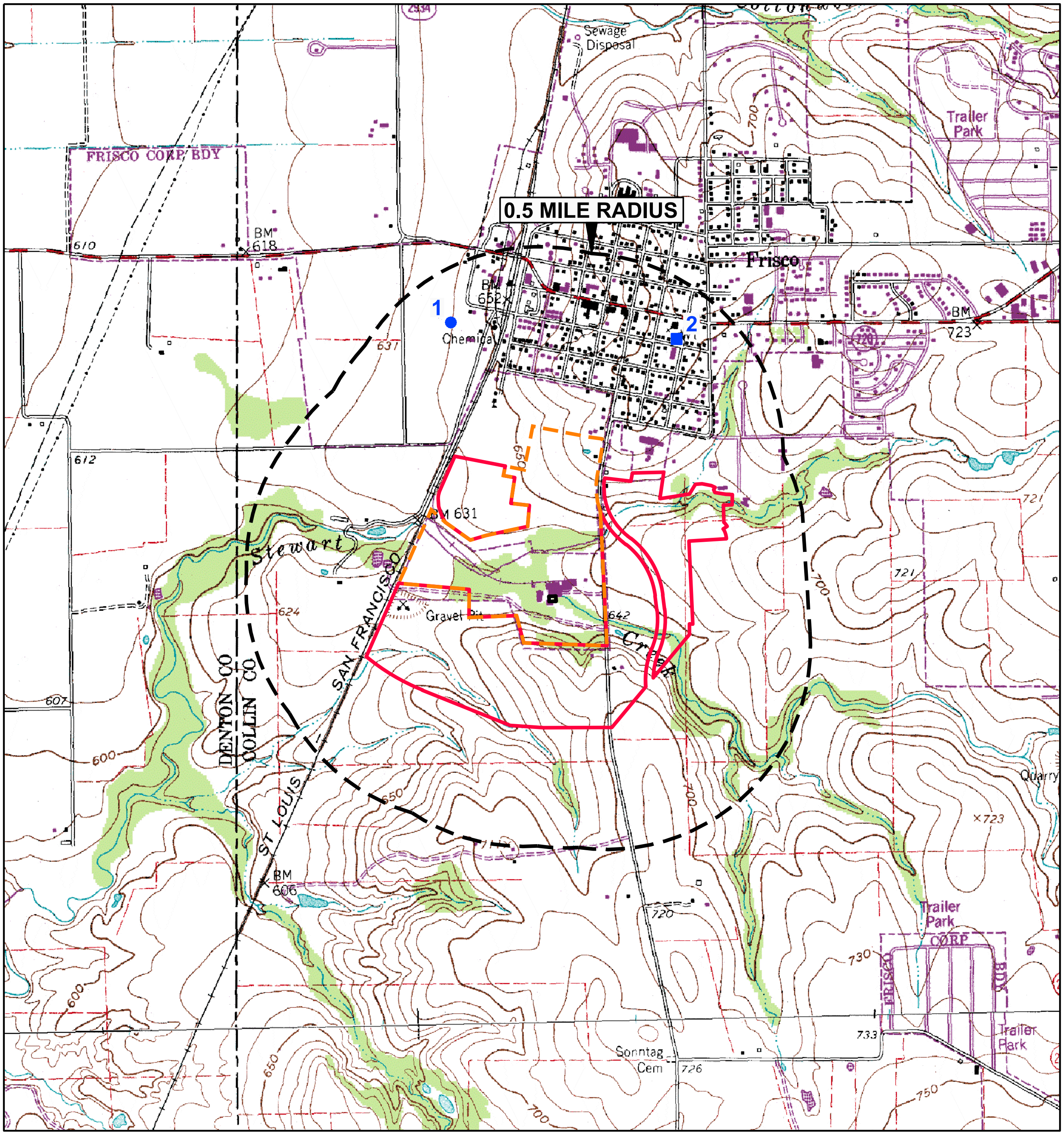
Where does the waterbody discharge and indicate where the discharge occurs (onsite vs off; and distance)? Lake Lewisville, approx. 6 miles away

What is the general composition of the substrate? Bedrock with some boulders, cobble, and gravel present.

What is the condition of the bank? On-site the creek is channelized with a slight slope and maintained

ADDITIONAL INFORMATION

PASTOR, BEHLING & WHEELER, LLC
2201 DOUBLE CREEK DR., SUITE 4004
ROUND ROCK, TEXAS78664
(512) 671-3434
FAX: (512) 671-3446



EXPLANATION

- ● Water Well (Destroyed or Plugged and Abandoned)
- ■ Water Well Cluster (Unused or Plugged and Abandoned)
- On-Site Property Boundary
- FRC Property Boundary

N

Scale in Feet

0 1000 2000

SOURCE:
Base map from www.tnris.org, Frisco, TX 7.5 min. USGS quadrangle dated 1995.

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 2C

WATER WELL MAP

PROJECT: 1755	BY: AJD	REVISIONS
DATE: JUNE, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

3.0 ASSESSMENT STRATEGY

As detailed below, the initial assessment strategy was described in the EPA-approved Work Plan (CRA, 2011). Subsequent steps involved a review of all previous Site investigations and identification of data gaps or uncompleted agency recommendations on these investigations (including EPA comments on the SIR). Data gaps, including data gaps identified by the TCEQ were discussed in a series of three meetings with EPA and the TCEQ representatives in February 2013 to refine the assessment approach used for this APAR.

3.1 General Assessment Issues

3.1.1 Environmental Media Assessed

The environmental media assessed during the SIR and APAR investigations included all media associated with the potentially complete exposure pathways identified for the Site, which are discussed in detail in Section 2.6 and are presented in the table below:

Potentially Complete Exposure Pathway	Environmental Media Assessed
$^{Tot}Soil_{Comb}$	Surface Soil
$^{GW}Soil_{Class3}$	Surface Soil; Subsurface Soil
$^{Air}Soil_{Inh}$	Surface Soil (included in $^{Tot}Soil_{Comb}$ assessment); Subsurface Soil
$^{GW}GW_{Class3}$	Groundwater
$^{Air}GW_{Inh\text{-}V}$	Groundwater
^{SW}GW	Groundwater
^{Sed}Sed	Sediment
^{SW}SW	Surface Water

3.1.2 Target COCs

COCs are defined by TRRP Rule §350.4(a)(11) as "any chemical that has the potential to adversely affect ecological or human receptors due to its concentration, distribution, and mode of toxicity." Target COCs are defined by TCEQ in RG-366/TRRP-10 (TCEQ, 2008) as those COCs that are known or are reasonably anticipated to be associated with historical or current activities for a specific project and are the focus of the investigation. TRRP allows the use of several approaches to identify target COCs for an investigation. These include using a permit, order, or program requirements to assist in focusing the list of target COCs, while evaluating project objectives, using professional judgment, and using previously collected analytical data. TRRP-10 provides an eight step process to follow when identifying target COCs during project planning of an environmental investigation, which are described below in relation to the Site.

Step 1 – Evaluate Permit, Order, or Program Requirements

The first step identified in TRRP-10 for selecting target COCs begins with 1) Evaluate permit, order, or program requirements. This section describes the evaluation of previous administrative records and program requirements for the Site.

The initial RCRA Permit issued by the TWC for the FRC (RCRA Permit 50206) required investigation for nine WMUs at the Site. The permit specifies in Sections VII and VIII that lead and cadmium are to be analyzed in waste materials, soil, and groundwater at these WMUs.

The Phase I RFI Report (Lake, 1991), and the Addendum to the Phase I RFI Report (Lake, 1993) identified lead as the primary COC at the Site, and soil as the primary environmental media of concern. The reports also identified cadmium as being present in Site soils. The TNRCC-approved the Phase I RFI Report and Addendum in correspondence dated June 3, 1994, and requested a Phase II RFI of selected areas of the Site, and specifically limited the COCs to lead and cadmium.

Since institution of the RFI process, numerous correspondences and approvals for various investigations conducted under different TNRCC/TCEQ programs have been conducted for the Site, most of which specified lead and cadmium as the primary COCs. In specific instances when information was available to suggest that a potential release may have occurred or a specific operation/activity had taken place, such as following the discovery of a release from the Former Diesel Tank, additional COCs were analyzed for that area.

In 2011, the Work Plan was submitted to the EPA in response to Section VI of the Administrative Order issued to Exide by the EPA. The Work Plan, which was approved by the EPA on December 2, 2011, identified lead and cadmium as the primary COCs to be evaluated in soil, groundwater, surface water, and sediment samples.

Step 2 – Evaluate Project Objectives

The project objectives, over the approximate 30 years of numerous investigations and remediation projects conducted at the Site, have been primarily to identify the nature and extent of Site-related impacts to environmental media and remediate to appropriate standards that are protective of human health and the environment. Most recently, the project objective identified in the 2011 Work Plan was to define the nature and extent of contamination at the identified WMUs and several non-RFI areas. Additional samples were also collected to meet delineation requirements of TRRP and to provide data to support the SLERA for the areas on-site that might provide ecological habitat.

Step 3 – Collect Information That Will Help Determine the Target COC List

The target COC list can be developed based on current and historical operations, chemical release information, knowledge of chemical processes and activities, applicable industry specific lists, information from similar sites, or nearby potential sources, chemical information, and analytical data. Historical operations were reviewed for potential chemicals that may have been used and/or released at the Site. Secondary lead smelting at a battery recycling plant is a fairly simple metallurgical process with few feed stocks, very little chemical use, and a fairly well-defined waste stream. As shown in a feed summary table for 2011, the last full year of operation (Appendix 21), over 88% of the feed materials used at the FRC smelter in 2011 were scrap junk batteries, with industrial battery plates the second most predominant feed material. Mr. Larry Eagan, a former FRC plant manager, confirmed that this feed composition was generally similar during the operational period of the plant for which he was familiar. As noted on the Material Safety Data Sheet (MSDS) for lead acid batteries, the primary component of the battery is inorganic lead (Appendix 21).

TRRP-10 mentions applicable industry specific lists including two documents that were evaluated to support the COC list determination for this APAR. The federal EPA document, Compliance Sector Notebook for Nonferrous Metals Industry (EPA, 1995) for secondary lead processing only lists pollution outputs for this industry sector as air emissions containing sulfur dioxide and particulate matter containing lead and cadmium, and other wastes that include slag and emission control dust (K069 waste). The Battery Reclamation Industry Profile in EPA (1995) (used to assist in the planning and evaluation of sites being considered for remediation, redevelopment, and re-use) states that "common waste products encountered at Superfund assessment and remediation projects include lead-contaminated soil and ground water, highly acidified soils and leachate, and large volumes of contaminated battery casings." General data in the open literature shows that slag and K069 are predominantly lead, with lesser constituents, including cadmium, arsenic, and selenium, reported anywhere from one-tenth to one-hundredth of the concentration of lead (EPA, 1997; Lewis and Hugo, 2000; Paintal, 1990). AP-42 (EPA, 1997) provides some estimates on percentages of lead in the particulates from different furnace operations; generally, lead accounts for the majority of the particulate material (ranging from 42 percent to 85 percent), with other elements generally accounting for less than 1% of the particulate material.

Step 4 – Review the Information Using Professional Judgment

TRRP-10 states that "In cases where sufficient requirements or evidence exists, collecting additional analytical data may be unnecessary to designate a target COC list for a project. Professional judgment, combined with institutional knowledge may dictate that a COC or a class of COCs is realistically a target COC for a project. Common examples include… lead for a battery manufacturing facility (TCEQ, 2008)." Professional judgment may also be used to tailor the list of COCs associated with a specific release.

Professional judgment, based on process knowledge about operations and data from the numerous previous investigations at the Site, indicates that lead and cadmium are the appropriate target COCs for the FRC. Furthermore, for samples where additional compounds were included in the analyte list, such as at the Crystallization Unit, the detected compounds were generally below screening criteria and/or would not compel a different risk or remedial action for the area than the risks/actions identified based on lead and cadmium concentrations.

Arsenic and selenium were identified at elevated concentrations in a sample collected by EPA from the Class 2 Landfill leachate storage tank during an April 2010 RCRA sampling inspection (EPA, 2010a). Based on this information, these metals were included in focused areas potentially associated with this particular waste stream (i.e., Class 2 Landfill, Slag Treatment Building, and Raw Material Storage Building). Arsenic was also included in the analyte list for selected surface soil samples, particularly in the prevailing downwind areas to evaluate atmospheric deposition of this metal from stack emissions.

Step 5 – Select Options When Information Is Insufficient

Based on the information presented above, it is believed that there is sufficient information to reliably identify the primary COCs for the Site and adequately characterize the Site conditions so that the Site conditions may be protective of human health and the environment.

Step 6 – Designate the Target COCs

The last step prior to initiating an investigation is identified in TRRP-10 as designating the Target COCs and indicates "If a permit, order or program requirement dictates a target COC and/or analyte list that is applicable and appropriate for the TRRP project, further efforts in identifying target COCs for the project are not necessary. Document the target COCs from this list and proceed. If Step 1 does not meet the project-specific needs, proceed to Steps 2 through 5."

After following the steps of TRRP-10, the primary COCs for the Site are lead and cadmium, based on historical operations, process knowledge, previous investigations, and guidance, direction, and/or approval given by the EPA and TCEQ as part of permits, orders, and program requirements. All of the above steps strongly support the conclusion that the primary COCs for the Site are lead and cadmium. Process area-specific COCs, such as total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), and semivolatile compounds (SVOCs) were also evaluated in potential source areas for these compounds (e.g., VOCs were analyzed in soil samples from the Maintenance Building to evaluate the potential presence of solvents in this area). As previously noted, arsenic and selenium were also analyzed in samples from specified areas of the Site.

The remaining Steps of TRRP-10 include conducting the project and documenting and reporting the results. This APAR serves to document the project investigation and report the findings.

3.1.3 Background

Consistent with 30 TAC §350.51(l), site-specific background concentrations were calculated for arsenic and lead in soil using background soil samples collected on March 29, 2012 and May 9, 2013 from within an area of the City of Frisco's Grand Park, located approximately 0.75 miles southwest of the Site near the intersection of Legacy Drive and Stonebrook Parkway. The background sample area was approved by the EPA in a meeting on January 4, 2012. Background samples from the March 29, 2012 sampling event were also analyzed for cadmium, but a site-specific background concentration for cadmium was not calculated due to the high number of non-detect results for cadmium in these samples. A letter summarizing the background study was submitted to the TCEQ on May 31, 2013 (Appendix 8). As detailed in the letter, the representative site-specific background concentration calculated for arsenic was 15.9 mg/kg and the representative site-specific background concentration calculated for lead was 31.5 mg/kg.

3.2 Assessment Strategy

The Site assessment strategy was guided by knowledge of historical Site operations, data from previous investigations, and the physical setting of the Site. The SIR assessment was performed in accordance with the Work Plan (CRA, 2011) and guidance provided by the EPA during the SIR investigation. The sampling assessment for the APAR investigation was developed based on subsequent comments by the TCEQ and EPA on the SIR and from guidance provided by the TCEQ and EPA during a series of meetings conducted in February 2013 (February 8, 2013; February 15, 2013; and February 21, 2013), as described previously. During the February 21, 2013 meeting, summary tables and figures describing the proposed APAR sampling program were reviewed with the TCEQ and the EPA, prior to implementation.

3.2.1 Soil Assessment Strategy

The primary soil assessment strategy during the SIR and APAR investigations consisted of an evaluation of lead and cadmium concentrations in soil samples from within and/or in the vicinity of the potential source areas identified in Section 1.2.4. As specified in a memorandum dated February 7, 2013 provided by Gary Beyer of the TCEQ in the February 8, 2013 meeting (TCEQ, 2013d), historic soil samples (i.e., samples collected prior to the SIR investigation) were not used to delineate the affected property boundaries. To account for potential environmental impacts that might have occurred since the collection of historic samples, several historic sample locations with reported soil sample COC concentrations below applicable RALs were re-sampled to confirm delineation of the affected property boundaries at these locations.

The soil sampling and analysis strategy varied slightly in specific areas of the Site. Soil samples from the RCRA-permitted units were collected and analyzed based on requirements in the approved RCRA Permit (Exide, 2001), the Decontamination and Demolition Work Plan (PBW/RSI, 2013a), and discussions with TCEQ personnel. Soil samples collected from the vicinity of the Former Diesel Tank release (Lake, 1991) and from the Maintenance Building (where solvents were reported to have been previously used) were analyzed for petroleum hydrocarbon constituents, including TPH, VOCs, and/or SVOCs, in addition to lead and cadmium. The Lake Parcel, an area along the western boundary of the Site that was not identified as a potential source area, was sampled to evaluate lead and cadmium in this area.

As noted previously, specific soil samples collected from within or in the vicinity of the former production area and from areas representative of potential atmospheric deposition of COCs were identified for arsenic analysis. Sixty soil samples were analyzed for arsenic during the APAR investigation (Table 4D.2). During the February 21, 2013 meeting, the TCEQ requested that several soil samples within the former production area be analyzed for selenium. Based on this request, forty soil samples from this area were analyzed for selenium. As discussed in Section 4, all arsenic and selenium soil sample results were below their respective critical PCLs (Table 4D.2).

In August-November 2012, W&M installed a French drain system along the facility side of the flood wall to convey shallow perched water away from the flood wall to sumps, where it could be discharged to the on-site storm water treatment system. During construction of the French drain, PBW collected soil samples from the walls and floor of the French drain excavation at nine locations (FWFS-1 through FWFS-9). In accordance with the Work Plan, these samples were analyzed for lead, cadmium, and TPH. Data for these soil samples are provided in Section 4. A report summarizing the French drain construction activities is provided in Appendix 19.

Select soil samples within the Bale Stabilization Area were analyzed using the Synthetic Precipitation Leaching Procedure (SPLP) method during the SIR investigation. The results of the SPLP evaluation are presented in Appendix 22.

During the SIR, several soil borings (2012-RMSA-2, 2012-RMSA-4, 2012-NDA-1, 2012-SL-2, and 2012-SL-3) filled with water after being drilled and sampled. In accordance with field procedures for these areas in the Work Plan (CRA, 2011), a soil boring water sample was collected from each of these borings. Monitoring wells were not constructed at these locations and the borings were not developed prior to collection of the boring water samples. Given the location of samples 2012-RMSA-2 and 2012-RMSA-4 within the center of the former production area and the very shallow depth where the water was observed in these borings (less than 3 feet bgs), these samples likely represent washdown water perched directly below the concrete slab floor. The remaining soil boring water samples were collected from borings with saturated depths more consistent with typical groundwater levels observed at the Site, and may represent groundwater within the upper GWBU; however, because these locations were not completed as permanent monitoring wells and the borings were not developed prior to sampling, the boring water sample results are not compared to groundwater PCLs. The soil boring water sample data are provided in Table 4D.6.

3.2.2 Groundwater Assessment Strategy

In accordance with the EPA-approved Work Plan, groundwater samples collected during the SIR investigation included samples from three monitoring wells (MW-19, MW-20, and LMW-19) designated as background wells and twelve monitoring wells (MW-12, MW-13, MW-14, MW-16, MW-16S, MW-17, MW-18, B8N, B5N, B2R, B3R, and B4R) located downgradient of RFI-designated WMAs. Monitoring wells B8N, B2R, and B3R were not sampled during the SIR investigation (B8N and B2R were damaged beyond repair and B3R was dry). In accordance with the TCEQ Agreed Order, SIR groundwater data have been included in this APAR (see Tables 5B.1, 5C, and 5D).

Monitoring wells installed in 2013 as part of the APAR investigation included three wells located between the former production area and Stewart Creek (MW-26, MW-27, and MW-29), one well located within the Battery Receiving/Storage Building (MW-31), four wells located within the projected former creek paths of Stewart Creek and/or the North Tributary (MW-21, MW-22, MW-24, and MW-30), one well in the vicinity of the Bale Stabilization Area and Truck Staging Area (MW-23), one well located downgradient of the Crystallization Unit and Crystallization Unit frac tank (MW-25), and four wells located in the vicinity of the Class 2 Landfill (LMW-21, LMW-22, PMW-19R, and PMW-20R). Monitoring wells PMW-19R and PMW-20R are replacement wells for PMW-19 and PMW-20, respectively, which were plugged and abandoned during the APAR investigation due to the absence of completion information for these previously existing wells.

During the APAR and SIR investigations, groundwater samples were collected from thirty-five on-site monitoring wells, including the newly installed wells listed above and wells previously installed during the SIR and RFI assessments, and three monitoring wells (MW-19, MW-20, and MW-28) located adjacent to the FOP on the Undeveloped Buffer Property (additional monitoring wells were installed on the Undeveloped Buffer Property; the data for samples from these wells are discussed in the APAR being prepared for that site). The SIR and APAR groundwater data are presented in Section 5 of this APAR.

All monitoring wells sampled during the APAR and SIR investigations were analyzed for total and dissolved lead and cadmium (subject to the production of sufficient sample volume by the well being sampled). Groundwater samples collected during the SIR investigation were additionally analyzed for total dissolved solids (TDS) and sulfate. As specified in the February 7, 2013 memorandum from the TCEQ (TCEQ, 2013d), sulfate was also analyzed in all groundwater samples collected during the APAR investigation. Additional process-specific COCs were analyzed in certain areas, including TPH and PAHs in well MW-27, located downgradient of the Former Diesel Tank release area, and arsenic and selenium in wells located in the Class 2 Landfill area.

To evaluate groundwater flow directions at the Site, static water levels were gauged in Site wells and at two surface water gauges located in Stewart Creek several times over the course of the SIR and APAR assessments. Water elevation data are provided in Table 5D and groundwater potentiometric surface maps are provided as Figures 5A.1 through 5A.3.

3.2.3 Surface Water and Sediment Assessment Strategy

An assessment of potential impacts to surface water and sediment has been conducted at the Site. During the SIR and APAR investigations, surface water and sediment samples were collected from fifteen locations within Stewart Creek and ten locations within the North Tributary (Figure 1B). The surface water and sediment samples were collected from the same approximate locations at semi-regular intervals along the entire reach of the on-site portions of the creeks. Two surface water and sediment samples were additionally collected from a section of Stewart Creek upstream from the Site (at sample points 14 and 15). Surface water samples were analyzed for total and dissolved lead and cadmium. Sediment samples were analyzed for lead, cadmium, and grain size distribution. Per the Work Plan (CRA, 2011), sediment samples were also analyzed for organic carbon to provide additional information related to the potential bioavailability of compounds in the sediment to hypothetical ecological receptors.

3.2.4 Reconnaissance Slag and Battery Case Chip Assessment

In 2011, W&M conducted visual inspections to identify exposed slag, battery case chips, and other debris along the banks of Stewart Creek west of the former production area (W&M, 2011a) and in the vicinity of the North Disposal Area and South Disposal Area (W&M, 2011b). The reports documenting the inspections in these areas were submitted to EPA and TCEQ representatives in a meeting on January 4, 2011. In 2013, W&M completed additional inspections on the remaining FRC operating areas, including the RCRA-Permitted area, the Class 2 Landfill area, and the wooded area near the North Tributary. The 2013 W&M inspection report is reproduced in Appendix 18 of this APAR.

3.2.5 Utilities/Preferential Pathways

Multiple underground utilities are present at and in the general vicinity of the Site, including buried natural gas, water, storm water, wastewater, and fiber optic lines (Figure 1B). Within the former production area, utilities generally are routed through shallow pipe vaults completed in concrete. These vaults run throughout the former production area. Due to their occurrence throughout the former production area, these vaults are not shown on Figure 1B. Sample data from the Site do not suggest that these buried utilities are acting as preferential pathways for Site COCs, evident in the observed concentrations of lead and cadmium in groundwater samples from the Site, which were all below applicable PCLs (Table 5B.1). Furthermore, the distribution of soil samples that exceeded the applicable PCLs for cadmium or lead (i.e., the distribution of the affected property boundaries), does not appear to be affected by the locations of buried utilities. These data support the assumptions presented in Section 2.6.1 regarding the mobility of lead and cadmium in soil; specifically, that lead and cadmium tend to remain bound to organic matter, minerals, clays, and silts in soil and, as such, are relatively immobile.

As discussed previously, preferential pathways associated with infilled portions of the former paths of Stewart Creek and the North Tributary were evaluated during this APAR. Based on groundwater sample data from monitoring wells completed within or in the immediate vicinity of the projected former creek paths (i.e., MW-21, MW-22, MW-24, and MW-30) that showed no PCL exceedances, the former creek paths do not appear to be acting as preferential pathways for potential migration of Site COCs (Table 5B.1).

Some soil staining, elevated photo ionization detector (PID) readings, and petroleum hydrocarbon odors were noted in borings completed in the Raw Material Storage Building, Slag Treatment Building and vicinity, and the French drain excavation. However, NAPL was not observed in these areas or elsewhere at the Site; and no effects due to preferential NAPL pathways were indicated.

3.3 Assessment Methods

Field and laboratory investigation activities described herein were performed during the periods from January 2012 to May 2012 (SIR investigation) and February 2013 to June 2013 (APAR investigation). The field and laboratory activities were implemented in general conformance with TRRP requirements and with the methods and procedures described in the EPA-approved Work Plan (CRA, 2011), subject to minor modifications as discussed in meetings with the TCEQ and EPA.

3.3.1 Soil Assessment Methods

Soil samples were collected using several methods, including a Geoprobe drilling rig with direct push technology (DPT) outfitted with 4-foot or 5-foot core barrel lined with a cellulose acetate butyrate (CAB) disposable liner, a hollow-stem auger drilling rig utilizing a 5-foot split spoon core barrel, and hand tools (i.e., a hammer drive sampler with a CAB disposable liner, hand augers, and disposable trowels). Samples were lithologically logged and classified based on the Unified Soil Classification System (USCS). PID and field soil pH readings (conducted during the SIR investigation) were collected within certain process areas, where applicable. PID and soil pH meters were calibrated daily in accordance with the manufacturer's specifications. Following completion of sampling activities, boreholes were plugged with hydrated bentonite pellets. Non-disposable equipment contacting sampled material was decontaminated prior to use and between each sample location, and equipment blanks were collected to ensure that decontamination procedures were adequate. Sample locations were typically logged in the field with a Trimble global positioning system (GPS) with real-time differential correction capabilities, or were pre-loaded onto the GPS unit and marked in the field prior to sampling. Coordinates for SIR and APAR sample locations are provided in Appendix 23.

Multiple soil samples were typically collected at various depth intervals from borings completed at the Site and were analyzed, as necessary, to evaluate/delineate affected property areas at the Site. Samples were placed in containers supplied by Test America, sealed, labeled, and placed on ice in an insulated ice chest for delivery to Test America's Houston, Texas laboratory. Appropriate chain of custody documentation, blanks, and seals accompanied the samples in accordance with TRRP requirements.

For most soil samples, the analytical program consisted of analysis for lead and cadmium by EPA Method 6000 series. For soil samples from select process areas, the analytical suite included VOCs by EPA Method 8260, SVOCs or PAHs by EPA Method 8270, TPH by TCEQ Method TX1005, and/or additional metals by EPA Method 6000/7000 series. Analyses were conducted in accordance with the appropriate EPA SW-846 methodologies by Test America.

3.3.2 Groundwater Assessment Methods

Monitoring wells installed during the SIR and APAR investigations were constructed of 2-inch flush-threaded PVC with 0.010-inch slotted screen generally installed from near the top of the Eagle Ford Shale unit to at least the top of the observed saturated zone. A filter pack of silica sand was installed within the annulus of each well around the screened interval and a bentonite clay seal was placed on top of the filter pack. The wells were completed to ground surface with cement. Surface completions consisted of above-grade protective steel casing stick-ups or flush-grade steel well vaults. Each permanent monitoring well sampled during the SIR and APAR investigations was surveyed by a licensed, professional surveyor using the Texas State Plane coordinate system, North American Datum of 1983 (NAD 83), and North American Vertical Datum of 1988 (NAVD88) (Appendix 23). Monitoring well boring logs with completion details are provided in Appendix 2 and the State monitoring well records for the monitoring wells installed during the SIR and APAR investigations are provided in Appendix 6.

After installation, monitoring wells were developed by surging and pumping or bailing the well until physical parameters (e.g., temperature, conductivity, and pH) had stabilized or the well went dry (wells that went dry were typically allowed to go dry and recharge several times during development). Groundwater samples were collected using low-flow sampling procedures and dedicated or disposable sample tubing. Monitoring wells were purged using low-flow techniques. Prior to sampling and during purging, depth-to-water measurements were collected to the nearest one-hundredth of a foot using a Keck electronic water level meter with a graduated tape. Groundwater samples were collected following stabilization of physical parameters (e.g., temperature, conductivity, and pH). Monitoring wells in which water levels did not stabilize were pumped dry and were sampled the following day with no additional purging. Groundwater samples for dissolved metals analysis were filtered in the field using a 10 micron filter during the SIR investigation in accordance with the EPA-approved Work Plan (CRA, 2011). In accordance with generally accepted procedures for the collection of water samples for dissolved metals analysis (TCEQ, 2012a; Boghichi, 2003), groundwater samples collected for dissolved metals analysis during the APAR investigation were filtered in the field using a 0.45 micron filter. Groundwater samples analyzed for total metals were typically not filtered in the field. However, groundwater samples collected for total metals analysis during the APAR investigation were filtered with a 10 micron filter if turbidity measurements were above 10 NTUs during sampling. Groundwater samples were collected in method-specified containers with appropriate preservatives and were placed on ice pending transport to the laboratory under chain-of-custody control.

During the SIR investigation, groundwater samples were analyzed for total and dissolved cadmium and lead (EPA Method 6000 series), sulfate (EPA Method 300.0), and TDS (Method 2540C). During the APAR investigation, groundwater samples were analyzed for total and dissolved cadmium and lead and sulfate using the same analytical methods used during the SIR investigation. Groundwater samples collected downgradient of the Former Diesel Tank release area (from MW-27) were additionally analyzed for TPH (TCEQ Method TX1005) and PAHs (EPA Method 8270). Samples collected in the vicinity of the Class 2 Landfill were additionally analyzed for arsenic and selenium (EPA Method 6000 series). Analyses were conducted in accordance with EPA SW-846, or other appropriate methodologies, by Test America.

3.3.3 Surface Water Assessment Methods

Surface water samples were collected using a peristaltic pump with disposable tubing lowered to approximately the mid-depth within the water column at each sample location. Samples were collected from the most downstream sample location first, and were then collected progressively upstream. Samples were collected for both total and dissolved lead and cadmium. The samples collected from Stewart Creek for dissolved analysis were filtered in the field using a 10 micron filter during the SIR investigation in accordance with the EPA-approved Work Plan. In accordance with TCEQ guidelines (TCEQ, 2012a), surface water samples collected for dissolved metals analysis from the North Tributary during the APAR investigation were filtered in the field using a 0.45 micron filter. Sample locations were typically logged in the field with a Trimble GPS with real-time differential correction capabilities, or were pre-loaded onto the GPS unit and marked in the field prior to sampling. Coordinates for SIR and APAR surface water sample locations are provided in Appendix 23.

Samples were placed in containers supplied by Test America, sealed, labeled, and placed on ice in an insulated ice chest for delivery to Test America's Houston, Texas laboratory. Appropriate chain of custody documentation, blanks, and seals accompanied the samples to the laboratory. Total and dissolved lead and cadmium analyses were performed by EPA Method 6000 series. Analyses were conducted in accordance with the appropriate EPA SW-846 methodologies by Test America.

3.3.4 Sediment Assessment Methods

Sediment samples were collected starting at the downstream-most Site location within Stewart Creek (2012-SED-1), with subsequent samples collected sequentially upstream. Likewise, sediment samples were collected starting at the downstream-most location of the North Tributary (2012-SED-16), with subsequent samples collected sequentially upstream. Sample locations were typically logged in the field with a Trimble GPS with real-time differential correction capabilities, or were pre-loaded onto the GPS unit and marked in the field prior to sampling. Coordinates for SIR and APAR sediment sample locations are provided in Appendix 23.

Sediment samples were collected to a depth of approximately 6 inches below the sediment surface using a Petite Ponar grab sampler. The open sampler was dropped through the water column into the sediments, locked closed, removed from the water and placed in a stainless steel pan for delivery to the sample processing area. At some locations if sufficient sample volume was not collected during the first drop attempt, a second drop was performed to collect additional sample volume.

Samples were placed in containers supplied by Test America, sealed, labeled, and placed on ice in an insulated ice chest for delivery to Test America's Houston, Texas laboratory. Appropriate chain of custody documentation, blanks, and seals accompanied the samples to the laboratory.

Per the EPA-approved Work Plan, the analytical program for Site sediment samples consisted of analysis for lead and cadmium by EPA Method 6000 series. Analyses were conducted in accordance with the appropriate EPA SW-846 methodologies by Test America.

3.4 Investigation-Derived Waste

Soil and monitoring well purge/development water investigation-derived waste (IDW) was initially stored in 55-gallon steel drums at the Site pending disposition. Purge/development water IDW was disposed in the on-site Wastewater Treatment Facility. Soil IDW was characterized and removed from the Site in accordance with state and federal regulations. All IDW for the SIR and APAR investigations has been removed from the Site or processed on-site (in the case of purge/development water). The waste characterization and disposition documentation for the soil IDW from the SIR and APAR investigations is provided in Appendix 12 of this APAR.

3.5 Data Quality

The laboratory analytical methods utilized for the analysis of the COCs outlined in Section 3.1 were appropriate and commonly utilized EPA SW-846 methodologies, or other appropriate methodology, for the type of COCs in each analysis group. Sample quantitation limits (SQLs) for all analytes were below applicable PCLs for all media evaluated, with the exception of the SVOCs benzidine and n-nitrosodimethylamine (see Section 10). Field duplicate sample data for soil, groundwater, and surface water are included in the data summary tables provided in Sections 4, 5, and 6. Per the Work Plan, field duplicates were not collected for soil or sediment samples collected during the SIR. Laboratory quality assurance/quality control (QA/QC) data and blank data (trip blanks and equipment blanks) are discussed in the data usability summaries (DUS) and validation reports in Appendix 10. A summary of the data validation procedures for the 2012 SIR and 2013 APAR investigations are provided in the following sections.

3.5.1 SIR Investigation Data Validation Summary

Consistent with Quality Assurance Project Plan (QAPP) procedures provided in the Work Plan, data validation was performed on 100% of the environmental samples. The data validation for the SIR investigation consisted of a systematic review of the analytical results, associated quality control (QC) methods and results, and all of the supporting data as presented in Level IV data packages supplied by the laboratory. The validation also included a data verification process and usability determination and was performed using the guidelines presented in the EPA Contract Laboratory Program *National Functional Guidelines (NFG) for Inorganic Superfund Data Review* (EPA, 2010c) and *National Functional Guidelines (NFG) for Superfund Organic Methods Data Review* (EPA, 2008). Results of the validation are presented in data validation and usability summary reports by sampling event (Appendix 10).

The validator performed the validation using the following QC criteria:

- Laboratory Accuracy – the method-specified recovery control limits of 75-125% for metals and TPH and the laboratory-derived control limits for PAH and the wet chemistry parameters (as specified in the QAPP) with a data rejection limit of 30% for inorganics and 10% for organics.
- Laboratory Precision – the method-specified RPD control limit of 20% (as specified in the QAPP) or an absolute difference control limit of 1x the reporting limit (if either result is less than or equal to 5x the reporting limit) per the NFG.
- Field Precision (for the groundwater and surface water field duplicates) – an RPD control limit of 20% or an absolute difference control limit of 2x the reporting limit (if either result is less than or equal to 5x the reporting limit), which is considered typical for data quality assessment of an aqueous matrix.

Analytical results associated with a QC deficiency were flagged using the QAPP-specified data validation qualifiers, which are defined as follows:

U Blank contamination; the analyte was not detected substantially above the level reported in an associated laboratory and/or field blank. Using a U-flag for blank contamination is consistent with the guidance document *National Functional Guidelines (NFG) for Inorganic Superfund Data Review* (EPA, 2010c).

UJ Estimated; the analyte was not detected above the reporting limit; however, the reporting limit is approximate due to exceedance of one or more QC requirements.

J Estimated; the reported sample concentration is approximate due to exceedance of one or more QC requirements. Directional bias cannot be determined.

J- Estimated low; the reported sample concentration is approximate due to exceedance of one or more QC requirements. The actual value is expected to be lower.

J+ Estimated high; the reported sample concentration is approximate due to exceedance of one or more QC requirements. The actual value is expected to be higher.

R Rejected; the sample result is rejected due to serious QC deficiencies that make it impossible to verify the presence or absence of the analyte.

When an option exists to assign two different flags, the flag higher in the data quality hierarchy was assigned (R > UJ > U > NJ > J > J+ or J-).

In order to determine if data quality objectives were met, the completeness of the analytical results data set was evaluated. The field completeness, which is the percentage of tests performed compared to the total number of tests planned for environmental samples, was calculated as 98.7%. The laboratory completeness, which is the percentage of valid analytical results (i.e., those without an R flag) compared to the total number of results reported for environmental samples, was calculated as 99.6%. Both of these are above the standard goal of 90%. The quality of the investigation data is acceptable for the goals of this report.

All analytical results presented in the tables and figures of this report include the data validation qualifier, if any was applied. Appendix 10 lists all of the qualified results along with the specific reasons for qualification.

Results with no qualification and those qualified as estimated are of acceptable quality for the intended use. Some results are qualified as estimated (J, J+, J- or UJ) due to minor QC issues, primarily poor laboratory duplicate precision for metals in the soil or sediment samples. This is not considered unusual due to the inherent variability of soil and sediment samples. Note that a data validation qualifier of J may be assigned solely because the analytical result was qualified by the laboratory as an estimated concentration between the sample detection limit and the sample quantitation limit. The concentration reported for detects or the reporting limit for non-detects is considered estimated with a high bias (J+ flag), low bias (J- flag), or unknown bias (J or UJ flag).

Results that are qualified as associated with a contaminated blank (U) are also useable. Nine results for cadmium are U-qualified because the analyte was not detected substantially above the level in an associated laboratory blank or field QC blank. In each case, cadmium should be considered not detected at the sample location.

Results that are rejected (R) are typically not useable. Two antimony results are qualified as rejected (R) per EPA recommendations in the National Functional Guidelines (EPA, 2008 and EPA, 2010). However, these non-detected results (in soil samples 2012-CUFT-1(0-2') and 2012-CUFT-2 (0-2')) are rejected due to a matrix spike duplicate recovery of 29%, which is just below the data rejection limit for inorganics of 30%, while the corresponding matrix spike recovery is 30%. This indicates the results may be up to 4x below the actual value. The sample detection limits (SDLs) for these two non-detects (0.293 mg/Kg and 0.283 mg/Kg) are more than 50x below the delineation standard for antimony in soils (15 mg/Kg). Thus, the results are considered useable for demonstrating conformance with the assessment goals and criteria.

3.5.2 APAR Investigation Data Validation Summary

Data collected for the 2013 affected property assessment were validated in accordance with TRRP requirements. A review was completed on 100% of the environmental samples to determine conformance with the requirements of the TRRP guidance document, *Review and Reporting of COC Concentration Data* (RGG-366/TRRP-13) (TCEQ, 2010b) and for adherence to project objectives. Results of the review are presented in data usability summaries (DUS) by sample media and month (Appendix 10).

Criteria used for the data usability review are as follows:

- Inorganics: 70-130% spike recovery (and not less than 30% or data are rejected) and ±MQL difference or 30% RPD (for laboratory duplicates) as recommended in TRRP-13.
- Organics: 60-140% spike recovery (and not less than 10% or data are rejected) and ±MQL difference or 40% RPD (for laboratory duplicates) as recommended in TRRP-13.
- Soil Samples: ± 3x MQL difference (if either result is less than 5x MQL) or 50% RPD (for field duplicates) as recommended in TRRP-13.
- Groundwater Samples: ± 2x MQL difference (if either result is less than 5x MQL) or 30% RPD (for field duplicates) as recommended in TRRP-13.

If an item was found outside of the review criteria, the reviewer applied a data qualifier and bias code to the results for the affected samples in accordance with TRRP-13. Per TRRP-13, the qualifiers and codes are defined as follows:

U Not detected; the analyte was not detected >5x (10x for common contaminants) the level in an associated blank and thus should be considered not detected above the level of the associated numerical value (i.e., the reported sample concentration).

UJ Estimated data; the analyte was not detected above the reported sample detection limit (SDL). The numerical value of the SDL is estimated and may be inaccurate.

J Estimated data; the analyte was detected and identified. The associated numerical value (i.e., the reported sample concentration) is the approximate concentration of the analyte in the sample.

NJ Tentatively identified, estimated data; the analysis indicates the presence of the analyte for which there is presumptive evidence to make a tentative identification and the associated numerical value represents its approximate concentration.

NS Not selected; another result (from a secondary dilution, different analytical method, re-sampling, etc.) is selected for use based on QC outcomes and/or reported concentrations.

R Rejected data; the result is unusable. Serious QC deficiencies make it impossible to verify the absence or presence of this analyte.

X7 The laboratory is not NELAC accredited under the Texas Laboratory Accreditation Program for this analyte in this matrix analyzed by this method. The TCEQ does not offer accreditation for this analyte, in this matrix, analyzed by this method.

X8 The laboratory is not NELAC accredited under the Texas Laboratory Accreditation Program for this analyte in this matrix analyzed by this method. The TCEQ offers accreditation for this analyte in this matrix by this method, but the laboratory is not accredited for this analyte in this matrix by this method. The analyte result is validated and reported as part of a suite of analytes for the method.

H Bias in sample result is likely to be high.

L Bias in sample result is likely to be low.

When an option exists to assign two different flags, the flag higher in the data quality hierarchy was assigned (R > U > NJ > J > JL/JH for detects and R > UJ > UJL for non-detects).

All analytical results presented in the tables and figures of this report include the data qualifier, if any was applied. Appendix 10 lists all of the qualified results along with the specific reasons for qualification.

Results with no qualification and those qualified as estimated are of acceptable quality for the intended use. Some results are qualified as estimated (J, JH, JL, UJ or UJL) due to minor QC issues, primarily poor laboratory duplicate precision for metals in the soil samples. This is not considered unusual due to the inherent variability of soil samples. Note that a data qualifier of J may be assigned solely because the analytical result was qualified by the laboratory as an estimated concentration between the sample detection limit and the quantitation limit. The concentration reported for detects or the reporting limit for non-detects is considered estimated with a high bias (JH flag), low bias (JL or UJL flag), or unknown bias (J or UJ flag).

Results that are qualified as not detected because the result is associated with a contaminated blank (U) are also useable. One result for methylene chloride and ten (10) results for chloroform are U-qualified because the analyte was not detected substantially above the level in an associated laboratory blank. In each case, the analyte should be considered not detected at or above the reported concentration for the sample location.

Results that are rejected (R) are not useable. Two non-detects (for benzidine and 3,3'-dichlorobenzidine in soil sample MW-27 (0-1’)) are qualified as rejected (R) per TRRP-13 guidelines due to extremely low laboratory control spike (LCS) recovery (0%). In each case, it is not possible to determine the absence or presence of the analyte due to serious QC deficiencies.

3.5.3 Data Quality Issues Regarding Sample MW-31 (0.9-2’)

Significant discrepancies in duplicate soil sample results for the 0.9 to 2-foot depth bgs sample interval at sample location MW-31 (parent sample lead concentration = 12,900 mg/kg; duplicate sample lead concentration = 68 mg/kg) indicated possible incorrect labeling of the 0.9 to 2-foot sample interval for this location. An examination of the 0.9 to 2-foot samples by laboratory personnel indicate that the physical appearance of the duplicate sample was consistent with the physical appearance of the 0.9 to 2-foot depth interval as described on the boring log for MW-31. The physical appearance of the parent sample from this interval was consistent with the boring log description of deeper intervals, suggesting that the 0.9 to 2-foot parent sample was collected from a deeper depth. To confirm the suspected incorrect depth label for the 0.9 to 2-foot parent sample, a second soil boring (MW-31R) was drilled and sampled adjacent to MW-31. The results for soil samples collected from this boring (also sampled in duplicate) were similar to the MW-31 (0.9-2) duplicate sample, thus confirming the suspected incorrect depth label on the original parent sample. As a conservative measure, all soil samples from boring MW-31 were flagged as "NS", indicating that other results (i.e., results from boring MW-31R) were selected for use based on the QC outcomes.

Table 3A Underground Utilities

Utility Type	Construction Material	Backfill Material	Approximate Depth (ft)	Utility company Name	Potential Migration Pathway?		Affected?	
					Yes	No	Yes	No
Fiber Optic Cable	NA	Unknown	4-5	Various		x		x
Natural Gas	Unknown	Unknown	Unknown	Atmos Energy		x		x
Sanitary Sewer	Unknown	Unknown	Unknown	City of Frisco		x	x[1]	
City Water	Unknown	Unknown	Unknown	City of Frisco		x	x[1]	
Storm Water	Unknown	Unknown	Unknown	Exide		x	x[1]	
Wastewater	Unknown	Unknown	Unknown	Exide		x	x[1]	

Notes:

1. [1] - Sections of these utilities are within areas of the affected property where soil concentrations exceed applicable PCLs, and may be affected. As noted in Section 3.2.5, Site data do not suggest that these utilities are acting as preferential pathways for migration of Site COCs.

4.0 SOIL ASSESSMENT

4.1 Derivation of Assessment Levels

As discussed in Section 2.6, applicable soil assessment levels are based on the following exposure pathways:

- *Surface Soil*: The $^{Tot}Soil_{Comb}$ and $^{GW}Soil_{Class3}$ pathways are considered potentially complete for surface soil, defined as soil from ground surface to 15 feet bgs for residential land use and from ground surface to 5 feet bgs for commercial-industrial land use.

- *Subsurface Soil:* The $^{Air}Soil_{Inh\text{-}V}$ and $^{GW}Soil_{Class3}$ pathways are considered potentially complete for subsurface soils, defined as soil below 15 feet bgs for residential land use and below 5 feet bgs for commercial-industrial land use.

As listed above, soil assessment levels are based on potential human health exposure pathways. An evaluation of potential ecological pathways is provided in the SLERA in Section 9 of this APAR. TRRP [30 TAC §350.51(c)] requires delineation of COCs in soil samples for assessment purposes be performed using assessment levels established for residential land use (RALs) (even for properties with commercial-industrial land use) to determine whether off-site properties may be affected. For this APAR, RALs are defined as the lowest of the applicable TRRP Tier 1 or Tier 2 **residential** PCLs for each COC, based on the applicable exposure pathways described above and an assumed 30-acre source area size. In accordance with 30 TAC §350.51(d)(2), the vertical assessment of COCs in soil was also performed to the appropriate RAL because a groundwater assessment was performed as part of this investigation (see Section 5 of this APAR), except within Affected Property No. 1, where the affected property was delineated to background levels, as discussed in Section 4.2.15. Background soil concentrations listed in Table 4A and 4C are Texas-specific median background values from Figure 30 TAC 35.51(m) except for arsenic and lead, for which site-specific background concentrations were determined, as presented in Appendix 8. The derivation of RALs for surface soil and subsurface soil is summarized in Tables 4A and 4C, respectively. Documentation on the development of Tier 2 PCLs is provided in Appendix 9.

For this APAR, critical PCLs are defined as the lowest applicable TRRP **commercial-industrial** PCL for each COC, based on the applicable exposure pathways described above and an assumed 30-acre source area size. Critical PCL exceedances in soil samples from the Site are discussed in this section of the APAR, but are also addressed in Section 11.

4.2 Nature and Extent of COCs and NAPL in Soil

Soil affected property boundaries have been delineated based on the lateral and vertical extent of RAL exceedances of the primary COCs (i.e., lead and cadmium) and, as applicable, process area-specific COCs (e.g., TPH in the Former Diesel Tank release area) observed in soil samples collected as part of the SIR and APAR investigations. A discussion of the extent of soil affected properties is provided in Section 1.2.5. The following sections address the nature and extent of RAL and critical PCL exceedances of lead, cadmium, and process area-specific COCs in soil samples collected within or in the vicinity of the WMUs listed on the FRC's NOR and within or in the vicinity of the potential source areas identified in the Work Plan (CRA, 2011), or identified in EPA comments on the SIR or in subsequent discussions with the TCEQ and EPA (see Section 3). Additional data from soil samples collected to evaluate potential atmospheric deposition of COCs, areas of potential ecological habitat, and other areas sampled at the Site during the SIR and APAR investigations are also discussed in the following sections, along with data from the soil boring water samples collected in accordance with the Work Plan requirements, as described in Section 3.2.1.

SIR and APAR investigation soil sample data discussed in Sections 4.2.1 through 4.2.16 are summarized in Tables 4D.1 through 4D.5. Soil boring water sample data are summarized in Table 4D.6. Laboratory reports for the SIR and APAR investigation data are provided in Appendix 10 and a summary of available historical soil data are presented in Appendix 17. A soil sample location map, which includes a summary of lead and cadmium soil data, is provided on Figure 4A and soil boring logs are provided in Appendix 2. A cross section location map is presented on Figure 4C.1 and cross sections based on soil borings completed at the Site are presented on Figure 4C.2.

4.2.1 Battery Receiving/Storage Building (RCRA HW Permit Unit No. 001; NOR WMU No. 11)

Sixty-one soil samples (including duplicate samples) were collected from the Battery Receiving/Storage Building from twelve boring locations inside the building. In accordance with the closure requirements provided in the RCRA Permit (Exide, 2001), soil samples were collected from soil underlying the concrete slab in the Battery Receiving/Storage Building at locations where potential exposure pathways existed to the underlying soil (cracks or other defects in the foundation noted during the unit inspection). As specified in the closure plan, soil samples were collected from each boring at various depth intervals until the saturated zone was encountered. Consistent with permit requirements and as detailed in the Decontamination and Demolition Work Plan (PBW/RSI, 2013a), soil samples were analyzed for lead and cadmium.

Two distinct zones of non-native material, or fill zones, were typically encountered below the concrete slab in borings completed below the Battery Receiving/Storage Building. The upper fill zone, directly below the building, generally consisted of select fill material (reddish-yellow clayey sand) within the upper 4 to 8 feet bgs. No slag material was observed in the upper fill zone. The lower fill zone generally consisted of silty clay or sandy clay to a depth of 10.5 feet bgs or less. Slag material was observed within the lower fill zone. Based on information from Exide personnel, the slag material in the lower fill zone was not placed in connection with, and pre-dated, construction of the Battery Receiving/Storage Building (Hooks, 2013). The exact date of placement of material in the lower fill zone is not known, but long time company personnel have reported that the placement is believed to have occurred in the late 1970s (Hooks, 2013). Therefore, the placement of the material observed in the lower fill zone is considered pre-RCRA. Native silty clay soil was typically encountered below the lower fill zone, at a depth of 10.5 feet bgs or below.

Lead concentrations in at least one soil sample from each soil boring completed in the Battery Receiving/Storage Building, except for boring 2013-BSB-3, exceeded the applicable RAL for lead (500 mg/kg for surface soil; 27,451 mg/kg for subsurface soil). Cadmium results for all soil samples from the building were below applicable RALs (52 mg/kg for surface soil; 2,950 mg/kg for subsurface soil). The lead RAL exceedances typically occurred in samples collected from the lower zone of fill where slag was observed.

The entire Battery Receiving/Storage Building lies within Affected Property No. 2. It is bordered to the east and north by other areas of the affected property. The affected property is delineated to the south by soil samples from locations 2012-FWCS-2, 2012-FWCS-3, 2012-FWCS-4, and 2013-FWFS-1A, 2012-FWFS-2, and to the west by 2012-FWCS-11, and 2013-FWCS-1B. Vertical delineation of lead to the applicable RAL in the Battery Receiving/Storage Building was typically completed to approximately 11 feet bgs or less;

however, in borings 2013-BSB-2 and 2013-BSB-9, soil samples collected from the depth of observed saturation (approximately 11 feet bgs) exceeded the applicable RAL for lead (but were below the applicable critical PCL). Groundwater samples analyzed for total and dissolved lead and cadmium were collected from monitoring well MW-31, completed within the Battery Receiving/Storage Building (see Figure 5B). As shown in Table 5B.1, lead and cadmium were not detected in the groundwater samples from MW-31.

The applicable critical PCL for lead (1,600 mg/kg for surface soil; 27,451 mg/kg for subsurface soil) was exceeded in three soil samples from the Battery Receiving/Storage Building: Samples 2013-BSB-1 (8-10'), 2013-BSB-8 (8-10'), and MW-31 (0.9-2'). As detailed in Section 3.5.3 and in Table 4D.1 (footnote 3), it is suspected that the sample depth for MW-31 (0.9-2') was incorrectly labeled in the field. This sample likely represents a deeper sample interval based on the sample appearance and inconsistent lead concentrations between that sample relative to a field duplicate sample and two resamples (parent and field duplicate) of this depth interval from immediately adjacent boring MW-31R. As noted in Section 3.5.2, soil sample results from boring MW-31 were NS-flagged (not selected for use), indicating that other results (i.e., soil sample results from boring MW-31R) were selected for use as representative results for this location based on the QC outcomes.

Fifty-three soil samples from the Battery Receiving/Storage Building were also analyzed for pH. The average pH for these samples was 7.54, and all but two of the samples had a pH value greater than 6.00. These two samples, 2013-BSB-4 (0.9-2') and 2013-BSB-8 (2-4'), had relatively low pH results of 4.44 and 4.45, respectively. PCLs have not been established for this geochemical parameter.

4.2.2 Raw Material Storage Building (RCRA HW Permit Unit No. 002; NOR WMU No. 5)

Fifty-two soil samples (including duplicate samples) were collected from beneath the concrete slab in the Raw Material Storage Building ("RMSB" samples) or adjacent vicinity ("RMSA" samples), including forty soil samples (including duplicate samples) from ten borings completed inside the Raw Material Storage Building. The RCRA Permit requirements for the Raw Material Storage Building provided that sub-slab closure soil samples be collected from various depth intervals to the depth of the saturated zone at locations arranged on a grid system within the building. As discussed with TCEQ personnel and detailed in the Decontamination and Demolition Work Plan (PBW/RSI, 2013a), a nine sample grid system was proposed for this unit. Due to inaccessibility or prohibitive slab thicknesses at several of the proposed sample locations, some sample locations within the building had to be adjusted slightly from an exact grid configuration (Figure 4A). One sample location was also added within the building, for a total of ten sample locations inside the building. Consistent with the RCRA Permit requirements, these adjusted/added locations corresponded to areas where potential exposure pathways to the underlying soil (cracks or other defects in the foundation noted during the unit inspection) were observed.

Based on closure requirements in the RCRA Permit, discussions with TCEQ personnel, and procedures detailed in the Decontamination and Demolition Work Plan, all soil samples collected from the Raw Material Storage Building were analyzed for lead and cadmium, and samples collected from three sample locations were analyzed for a broader suite of compounds, including RCRA 8 metals, VOCs, and SVOCs. The three sample locations identified for the expanded analyte suite (2013-RMSB-4, 2013-RMSB-2, and 2013-RMSB-10) were selected to correspond to locations where, based on observations during the unit inspection, the potential exposure pathways to the underlying soil were believed to be more likely to be complete. All RMSB soil samples were also analyzed for arsenic and selenium. Several soil samples from borings 2012-RMSA-1, 2012-RMSA-2, 2012-RMSA-3, 2012-RMSA-4, and 2012-RMSA-6, located adjacent to the Raw Material Storage Building, were additionally analyzed for TPH (TX1005), per the Work Plan (CRA, 2011) requirements.

The soil borings completed in the Raw Material Storage Building and immediate vicinity generally contained a zone of fill material immediately below the concrete slab measuring from less than 0.5 feet to approximately 5 feet in thickness. Trace amounts of battery chips were noted in boring 2013-RMSB-4 within the zone of fill from 2 to 3.8 feet bgs. Battery chips and/or slag were not observed in any of the other borings completed inside or in the immediate vicinity of the Raw Material Storage Building. Trace black staining and hydrocarbon odors were noted in several borings from the Raw Material Storage Building. All borings completed in the Raw Material Storage Building were field-screened for organic vapors using a PID. The PID readings were generally low (<5 ppm-v); however, a PID reading of 1,957 ppm-v was noted in boring 2013-RMSB-5 within the 2 to 5-foot bgs depth interval. Based on that observation, this sample was analyzed for VOCs in addition to cadmium, lead, arsenic, and selenium. All VOC results for this sample were below applicable RALs (Table 4D.5). NAPL was not observed in soil samples from any of the borings completed in the Raw Material Storage Building or immediate vicinity. As a further check on the possible presence of NAPL, an oil-water interface probe was used to evaluate NAPL within the observed saturated zone in several borings within the Raw Material Storage Building (see boring logs in Appendix 2). NAPL was not detected in any of the borings evaluated with the oil-water interface probe.

Lead concentrations in eighteen soil samples and cadmium concentrations in three soil samples from the Raw Material Storage Building or immediate vicinity exceeded their respective RALs (Table 4D.1). Arsenic concentrations in three soil samples from this area exceeded the RAL (Table 4D.2). The cadmium and arsenic RAL exceedances were co-located with corresponding lead RAL exceedances. Other analyzed constituents, including TPH, VOCs, SVOCs, and additional RCRA 8 metals were below RALs for all samples collected in this area. As a conservative measure, the entire Raw Material Storage Building was included within Affected Property No. 2, even though some borings did not contain samples that exceeded applicable RALs for any analyte. The Raw Material Storage Building is bordered to the east, west, and north by other areas within the affected property (Figure 4A). The affected property is delineated south of the Raw Material Storage Building by soil samples from borings 2012-RMSA-3, 2012-FWCS-9, and MW-27. The maximum depth at which the affected property zone was vertically delineated in the vicinity of the Raw Material Storage Building was 9 feet bgs, at boring location 2013-RMSB-5. However, in boring 2013-RMSB-4, a soil sample collected from the depth of observed saturation (2013-RMSB-4 (5-6')) exceeded the RAL for lead (but was below the critical PCL). Consistent with 30 TAC §350.51(d)(3), groundwater samples were collected from monitoring wells MW-27 and MW-29, located near and downgradient of the Raw Material Storage Building. Lead and cadmium concentrations in the groundwater samples from both wells were below applicable RALs (Table 5B.1).

The lead critical PCL was exceeded in soil samples from borings 2013-RMSB-1 and 2013-RMSB-5, located within the Raw Material Storage Building, and 2012-RMSA-2, 2013-RMSA-6, and 2013-RMSA-7, located on the east side of the Raw Material Storage Building (Table 4D.1).

Select soil samples collected from this area were also analyzed for pH and sulfate during the 2012 SIR investigation. Results for pH ranged from 6.83 to 10.76 and results for sulfate ranged from 1,030 mg/kg to 6,700 mg/kg. PCLs are not established for these geochemical parameters.

As noted in Section 3.2.1, water samples were collected from borings 2012-RMSA-2 and 2012-RMSA-4 during the SIR investigation in accordance with the Work Plan (CRA, 2011) requirements and based on the observation of perched water in the subslab soils at these locations. The total depths of these borings were 2.5 feet bgs and 3.5 feet bgs, respectively. Given the locations of these borings, the very shallow depth where the water was observed (less than 3 feet bgs), these samples represent washdown water perched directly below the concrete slab floor in this area. The soil boring water samples were analyzed for lead and cadmium. As shown on Table 4D.6, the reported concentrations in these samples ranged from 0.04 mg/L to 0.089 mg/L for cadmium and from 0.421 mg/L to 1.68 mg/L for lead. The shallow washdown water observed below the concrete slab is not considered groundwater and consistent with the provisions of the Work Plan specifying collection of these samples, the lead and cadmium concentrations in these reconnaissance soil boring water samples are not considered representative of concentrations of these metals in groundwater. As such, these data were used for screening purposes only and were not compared to groundwater RALs.

4.2.3 Slag Treatment Building (NOR WMU No. 8)

Ten subslab soil samples (including duplicates) were collected at depths up to 5.5 feet bgs at eight locations (2013-STB-5 through 2013-STB-12) inside the Slag Treatment Building, and were analyzed for lead and cadmium. These locations correspond to areas where evidence of cracks or other defects in the foundation were noted during inspection of the building. Ten additional soil samples (including duplicates) were collected in the immediate vicinity on the northern side of the building at four locations (2013-STB-1 through 2013-STB-4), including samples from one boring (2013-STB-2) completed at the approximate location of the sample collected on top of the concrete slab by the TCEQ during the TCEQ Site inspection in May-June 2011. The reported lead concentration of the TCEQ sample from this location was 47,100 mg/kg (TCEQ, 2011b). Samples from 2013-STB-2 were collected from below the slab to evaluate the potential for a COC release to the subsurface in this area.

Lead concentrations exceeded RALs in eleven of the nineteen soil samples collected from this area, including samples collected inside and north of the Slag Treatment Building. Cadmium concentrations exceeded the RAL in six soil samples, each co-located with a lead RAL exceedance. Lead concentrations for samples 2013-STB-2 (2.5-4') and 2013-STB-2 (4-5'), collected from below the concrete slab at the approximate location of the previous TCEQ Site inspection sample, were 773 J mg/kg (the maximum concentration of two field duplicates) and 18.8 mg/kg, respectively. Critical PCL exceedances for lead were detected in soil samples from borings 2013-STB-1, 2013-STB-4, and 2013-STB-9. No exceedances of the critical PCL for cadmium were detected. As a conservative measure, the entire Slag Treatment Building was included within Affected Property No. 2. The Slag Treatment Building is bordered to the northwest and north by other areas of the affected property. Affected Property No. 2 in the vicinity of the Slag Treatment Building is delineated south toward Stewart Creek and east by soil samples from borings 2012-FWCS-6, 2012-FWCS-7, MW-29, 2012-FWCS-9, MW-27, and 2012-RMSA-3 (Figure 4A). The highest detected concentration of lead at the Slag Treatment Building occurred in boring 2013-STB-4 (16,100 mg/kg in the 2 to 4-foot bgs sample depth interval). Vertical delineation of the affected property was completed at this location at a depth of 4 feet bgs, where a lead concentration of 77.9 mg/kg was observed.

A zone of fill material was noted below the concrete slab in this area to a typical depth of approximately 2 to 3 feet bgs. No slag or battery chips were observed within the fill material. Black staining and hydrocarbon odors were noted in several borings from this area. Select samples from these borings were analyzed for TPH, VOCs, and/or PAHs. All TPH, VOC, and PAH results for all samples analyzed for these constituents were below applicable RALs (see Tables 4D.3 through 4D.5).

Arsenic and selenium analyses were performed on samples 2013-STB-1 (0-2') and 2013-STB-4 (0-2'). Concentrations of arsenic in both samples exceeded the applicable RAL (24 mg/kg for surface soil), but were below the critical PCL (196 mg/kg for surface soil). Both arsenic RAL exceedances were co-located with lead RAL and critical PCL exceedances. Concentrations of selenium in both of these samples were below the applicable RAL (160 mg/kg for surface soil).

4.2.4 Stewart Creek Flood Wall

Flood Wall Facility Side

Twenty-three soil samples were collected along the facility side of the flood wall. The majority of these samples were collected from the walls or floor of the French drain excavation in September-October 2012. Additional soil samples were collected during the APAR investigation to vertically delineate COC exceedances at the French drain excavation sample locations. The 2012 French drain samples were analyzed for lead, cadmium, and TPH (TX1005). The 2013 facility side flood wall soil samples collected during the APAR investigation were analyzed for lead and cadmium (as necessary to delineate the affected property). One APAR sample, 2012-FWFS-9 (4-5'), was additionally analyzed for TPH (TX1005 and TX1006) and VOCs based on a hydrocarbon odor and an elevated PID reading of 1,800 ppm-v noted for this sample interval.

RAL exceedances for lead were detected in eleven of the twenty-three samples collected in this area. Five cadmium RAL exceedances were also detected, which were all co-located with lead RAL exceedances. Exceedances of the critical PCL for lead were also detected in eight samples from this area, with one of the eight having an exceedance of the critical PCL for cadmium. Sample 2012-FWFS-9 (4-5') was the only soil sample collected during the SIR or APAR investigations that exceeded default Tier 1 PCLs for TPH. This sample was analyzed for TPH by Method TX1006 to develop a TPH Mixture RAL in accordance with TCEQ RG-366/TRRP-27 (TCEQ, 2010c). Documentation on the development of the TPH Mixture RAL is provided in Appendix 9. The concentration of total TPH (i.e., the C6-C35 range) in sample 2012-FWFS-9 (4-5') was below the calculated TPH Mixture RAL; therefore, no exceedances of applicable TPH RALs were detected in any soil sample analyzed for TPH during the SIR or APAR investigation.

The facility side flood wall soil samples are located along the southern edge of Affected Property No. 2. The affected property is delineated to the south toward Stewart Creek by soil samples from multiple locations on the facility side (2012-FWFS-2 and 2012-FWFS-3) and by soil samples from multiple locations on the creek side of the flood wall (2013-FWFS-1A, 2012-FWCS-2, 2012-FWCS-3, 2012-FWCS-4, 2012-FWCS-5, 2012-FWCS-6, 2012-FWCS-7, 2012-FWFS-7A, MW-29, and 2012-FWCS-9). The highest detected concentration of lead along the facility side of the flood wall occurred at 2012-FWFS-5 (52,000 mg/kg at 1.7 feet bgs), located between the Slag Treatment Building and the Wastewater Treatment Facility. Vertical delineation of the affected property at 2012-FWFS-5 was completed at a depth of 3.3 feet bgs, where a lead concentration of 358 mg/kg was observed. The maximum observed vertical delineation depth of the affected property along the facility side of the flood wall was 4 feet bgs at 2012-FWFS-1, where a lead concentration of 30.9 J mg/kg was observed.

Flood Wall Creek Side

Nine soil samples were collected from the 0 to 2-foot bgs depth interval from nine borings (2012-FWCS-1 through 2012-FWCS-9) along the creek side of the Stewart Creek flood wall during the SIR investigation in 2012. The sample locations were selected with EPA's corroboration to generally correspond to areas where indications of seepage along the Stewart Creek flood wall were observed. These samples were analyzed for lead, cadmium, and TPH. During the APAR investigation, soil samples were collected from the approximate locations of several of the SIR borings and from additional locations in this area to delineate lead RAL exceedances detected in the SIR facility side flood wall or creek side flood wall soil samples. During the APAR investigation, soil samples were also collected on the creek side of the flood wall to evaluate the former Diesel Fuel Tank release area and Old Drum Storage Area (soil boring MW-27) and to evaluate areas of potential ecological habitat along Stewart Creek ("SCC" samples). The soil sample collected at MW-27 (MW-27(0-1')) was analyzed for lead, TPH, and SVOCs, while samples from the four SCC locations in the vicinity of the flood wall (SCC-3, SCC-3A, SCC-6, and SCC-8) were analyzed for lead and cadmium (as necessary to evaluate soil in this area and to delineate the affected property).

Six of the twenty-one creek side flood wall sample locations sampled during the SIR and APAR investigations contained samples that exceeded the applicable RAL for lead. All samples analyzed for cadmium in this area were below the applicable RAL for cadmium. TPH and SVOC results were below applicable RALs for all soil samples analyzed for those constituents in the flood wall area, including at MW-27. RAL exceedances of lead were detected in boring 2012-FWCS-8 located south of the Slag Treatment Building, SCC-3 located south of the truck washing station, and several borings (2012-FWCS-1, 2012-FWCS-1A, 2012-FWCS-12, and SCC-8) located on the west side of the flood wall near the Battery Receiving/Storage Building. The lead RAL exceedance in 2012-FWCS-8 is delineated toward Stewart Creek by boring MW-29. The lead RAL exceedance at SCC-3 is delineated to the south by SCC-3A and to the west by 2013-MB-1, 2013-MB-2, and MW-27. The lead RAL exceedances on the west side of the Battery Receiving/Storage Building are delineated to the west by 2012-FWCS-11 and to the south toward Stewart Creek by 2013-FWCS-1B.

The affected property was delineated vertically at the boring location with the highest detected sample concentration for lead (31,000 mg/kg in sample 2012-FWCS-12 (2-2.7')) along the creek side of the flood wall at a depth of 4 feet bgs, where a lead concentration of 19.1 mg/kg was observed. The affected property was additionally vertically delineated at a depth of 4 feet bgs at locations 2012-FWCS-1 and SCC-3. Exceedances of the critical PCL for lead were detected in samples from 2012-FWCS-1, 2012-FWCS-1A, 2012-FWCS-12, SCC-3, and SCC-8.

Two APAR investigation soil samples (2012-FWCS-1A (1-2') and SCC-3 (2-4')) collected in this area were also analyzed for arsenic. As shown on Table 4D.2, the concentration of arsenic in sample 2012-FWCS-1A was above the RAL; however, concentrations of arsenic in both samples were below the critical PCL.

4.2.5 Additional NOR WMUs within the Former Production Area (NOR WMU Nos. 6, 9, 14, and 16)

Soil samples have been collected from within or in the immediate vicinity of each of the remaining NOR WMUs located within the former production area (i.e., NOR WMUs other than the Raw Material Storage Building, Battery Receiving/Storage Building, and Slag Treatment Building). WMU No. 1 is not included in this discussion. Based on information from Exide personnel, WMU No. 1 corresponds to the Former Product Waste Pile (see Section 1.2.4.1 for unit description) that was removed in 1988, and was issued a closure letter by the TNRCC dated January 13, 2000. A list of the remaining WMUs located within the former production area, along with the names of the soil sample borings collected from within or in the immediate vicinity of these units, is provided in the table below.

WMU ID No.	Description	General Location	Representative Soil Boring(s)
6	Former location of battery chip hoppers	West side of Battery Breaker Building	2013-WMU6-1
9	Wastewater Treatment Facility	Between Battery Receiving/Storage Building and Slag Treatment Building	2012-FWFS-2, 2012-FWFS-3, 2012-FWFS-4, and 2012-FWFS-5
14	Former locations of roll-off boxes containing hazardous waste; located in four separate areas	Battery Receiving/Storage Building loading dock (WMU No. 14-1), west side of Raw Material Storage Building (WMU No. 14-2), south side of Oxide Building (WMU No. 14-3), and within the Bale Stabilization Area (WMU No. 14-4)	2013-WMU14-1, 2013-WMU14-2, 2013-WMU14-3, 2012-FWFS-5, and Bale Stabilization Area borings
16	Temporary drum staging area	South side of Refines and Shipping	2013-WMU16-1

All of these WMUs are located within the pavement that is prevalent throughout the former production area, except for WMU No. 14-4, which is located in the Bale Stabilization Area. The Bale Stabilization Area is discussed in Section 4.2.10. The remainder of this section applies only to the WMUs located within the paved area of the former production area (WMU Nos. 6, 9, 14-1, 14-2, 14-3, and 16). Soil samples analyzed for lead and/or cadmium were collected within the upper 5 feet bgs from or in the immediate vicinity of these units. Samples from the immediate vicinity of the Wastewater Treatment Facility (WMU No. 9), which included four French drain soil samples (2012-FWFS-2 through 2012-FWFS-5), were additionally analyzed for TPH (TX1005). RAL exceedances and critical PCL exceedances for lead were detected in samples from WMU Nos. 6, 9, and 14-1. Cadmium and TPH concentrations in all samples evaluated for these constituents were below applicable RALs, except for cadmium in sample 2012-FWFS-5 (Wall), which exceeded the RAL for cadmium.

Each of the units, with the exception of WMU No. 16, is located within the boundaries of Affected Property No. 2. Although COC exceedances were not detected in samples from WMU No. 14-2 or WMU No. 14-3, these units are surrounded by other areas of the affected property, and are included within the affected property boundary. WMU No. 6 is bordered on all sides by other areas of the affected property. WMU Nos. 9 and 14-1 are bordered to the northwest, north, and east by other areas of the affected property. RAL exceedances for lead in samples from WMU Nos. 9 and 14-1 are delineated to the south by soil data from borings 2013-FWFS-1A, 2012-FWFS-2, 2012-FWFS-3, 2012-FWCS-2, 2012-FWCS-3, 2012-FWCS-4, 2012-FWCS-5, and 2012-FWCS-6. Vertical delineation to the applicable RAL for lead was completed at WMU No. 6 at a depth of 4 feet bgs (in boring 2013-WMU6-1, where a lead concentration of 46.5 mg/kg was observed) and at WMU No. 9 at a depth of 3.3 feet bgs (at location 2012-FWFS-5, where a lead concentration of 358 mg/kg was observed). Soil samples were collected to a total depth of 5 feet bgs at WMU No. 14-1; however, lead RAL exceedances were not vertically delineated by the samples from this location. As a conservative measure and consistent with TRRP provisions, it was thus assumed that the lead RAL exceedance zone at this location extends to the saturated zone, as observed in adjacent samples collected from the Battery Receiving/Storage Building. As noted previously, a groundwater sample was collected from monitoring well MW-31, located immediately west of WMU No. 14-1. Neither lead nor cadmium were detected in the groundwater sample from MW-31.

4.2.6 North Disposal Area (NOR WMU No. 3)

Nine soil samples analyzed for lead and cadmium were collected from five locations along the north side of the North Disposal Area as part of the SIR investigation in 2012. Initially, borings were completed at 2012-NDA-1, 2012-NDA-2, and 2012-NDA-3. Foreign materials, including slag and/or rubbish (as defined in 30 TAC §330.3(A)(130), were observed in all three of these borings. Lead concentrations in the 2 to 4-foot bgs depth interval from borings 2012-NDA-1 and 2012-NDA-2 and in the 0 to 2-foot bgs depth interval from boring 2012-NDA-3 exceeded the RAL for lead. Additional borings were completed to the north at 2012-NDA-4, 2012-NDA-5, and 2012-NDA-6 to evaluate the northern extent of the North Disposal Area, which was delineated by 2012-NDA-4 and 2012-NDA-6.

In accordance with the Work Plan (CRA, 2011), soil boring water within boring 2012-NDA-1 (observed at a depth of 4.5 feet bgs) was collected and analyzed for lead and cadmium during the SIR investigation. The cadmium concentration was 0.00079J mg/L and the lead concentration was 0.0192 mg/L (Table 4D.6). Since this boring water sample was not collected from a developed permanent monitoring well, and in accordance with Work Plan provisions, the sample results are not considered representative of metals concentrations in groundwater. As such, these data were not compared to groundwater PCLs.

Additional soil samples were collected in this area from the upper 5 feet bgs, and generally in the upper 0.5 feet bgs, as part of the APAR investigation at ECO-11, ECO-12, and at monitoring wells MW-21 and MW-22. As shown on Figure 4A, monitoring wells MW-21 and MW-22 were completed within the projected former creek paths of the North Tributary, based on the projected location of these creek paths in 1951 and 1972 aerial photographs (Appendix 20), to evaluate possible fill material in the former creek channels. As noted on the boring logs for MW-21 and MW-22 (Appendix 2), fill material was not observed at either of these locations. Lead and cadmium concentrations in all samples collected between the North Disposal Area and the North Tributary during the APAR investigation were below applicable RALs.

Four APAR investigation surface soil samples (ECO-11, ECO-12, MW-21, and MW-22) collected from the 0.0 to 0.5 feet bgs depth interval in this area were additionally analyzed for arsenic to evaluate potential atmospheric deposition of arsenic in the prevailing downwind direction from the former production area. As shown in Table 4D.2, all arsenic results in these samples were below the RAL.

During the APAR investigation, soil samples were collected on the south side of the North Disposal Area within the former production area from three borings completed in the Battery Breaker Building (2013-RRS-3A, 2013-RRS-4A, and 2013-BB-1) and from one boring completed within the projected location of the infilled former creek channel of Stewart Creek in this area (MW-30). The former Stewart Creek channel was projected as shown on Figure 4A based on a 1951 aerial photograph (Appendix 20). These samples were analyzed for lead and cadmium. RAL and critical PCL exceedances for lead were detected at each sample location within the Battery Breaker Building and at MW-30. A RAL exceedance for cadmium was also detected at MW-30. The RAL exceedance zone was delineated to 2 feet bgs in the Battery Breaker Building (based on a lead concentration of 84.2 mg/kg at location 2013-RRS-3A) and 0.5 feet bgs at MW-30 (based on a lead concentration of 128 mg/kg at this location).

Sample 2013-BB-1, located near the sump in the Battery Breaker Building, was additionally analyzed for pH. The pH result for this sample was 7.15 (Table 4E). PCLs are not established for this geochemical parameter.

Fill material (primarily composed of silty or gravelly clay) was encountered in MW-30 to a depth of 28.5 feet bgs, which corresponds to the top of the Eagle Ford Shale. Pieces of slag were observed at approximately 28 feet bgs in MW-30 (but were not observed elsewhere in this boring). Based on historical aerial photographs, it appears that the slag containing material was placed within the infilled area prior to 1972. A monitoring well was completed at this location and a groundwater sample was collected and analyzed for total and dissolved lead and cadmium, and sulfate. As shown on Table 5B.1, all lead and cadmium concentrations in groundwater samples from this location were below applicable PCLs.

The entire North Disposal Area lies within the boundaries of Affected Property No. 2. As noted previously, the lateral and vertical extents of the North Disposal Area were evaluated during an extensive investigation as part of the Phase I RFI and are documented in the 1993 Addendum to the Phase I RFI Report (Lake, 1993). The northern boundary of the North Disposal Area, as estimated in the 1993 Addendum to the Phase I RFI Report, has been adjusted northward to incorporate borings 2012-NDA-1, 2012-NDA-2, 2012-NDA-3, and 2012-NDA-5, based on observations of slag and/or other debris in these borings. No evidence of fill or non-native material was observed in borings completed north of these locations, which includes borings MW-21, MW-22, 2012-NDA-4, 2012-NDA-6, ECO-11, and ECO-12.

NOR WMU No. 13, the Stewart Creek dredged sediment waste pile, overlies the western section of the North Disposal Area adjacent to the Slag Landfill. This unit was capped and closed in 1989, and approval of the closure was issued by the TNRCC in a letter dated January 13, 2000. The evaluations of North Disposal Area and the Slag Landfill are also applicable to this unit.

4.2.7 Slag Landfill (NOR WMU No. 7) and Former Stewart Creek and North Tributary Railroad Outfall

Six soil samples were collected from three borings (2012-SL-1 through 2012-SL-3) within or in the immediate vicinity of the Slag Landfill during the SIR investigation (does not include samples collected within the Boneyard, which is discussed in Section 4.2.8). Each of the Slag Landfill area samples were analyzed for lead and cadmium. The lead concentration in the 2 to 4-foot and 4 to 5-foot bgs depth interval sample from location 2012-SL-1 exceeded the applicable lead RAL and lead critical PCL. Slag fragments were also noted in this boring. Subsequent interviews with long-time facility personnel indicated that the Slag Landfill extends south to the railroad spur, which is believed to precede the construction of the landfill. The projected extent of the Slag Landfill is bound to the north and west by borings in which fill was not observed, including 2012-SL-2, 2012-SL-3, B8N, and MW-18 (see Appendix 2 for logs of these borings). The Slag Landfill is bound to the east by the North Disposal Area.

Additional borings were completed on the south side of the Slag Landfill during the 2013 APAR investigation to assess the southern extent of the landfill, to assess the infilled former outfall of Stewart Creek and the North Tributary in this area, and to delineate Affected Property No. 2 in the direction of Stewart Creek.

South of the railroad spur, the ground surface slopes steeply toward Stewart Creek. Borings 2013-SL-4 and MW-24 were completed on the immediate south side of the railroad spur, at the top of this slope. As shown on the boring logs in Appendix 2, slag was not observed in either of these borings, which supports the information provided by facility personnel that the Slag Landfill does not extend south of the railroad spur.

Monitoring well MW-24 was completed within the infilled portion of the former path of Stewart Creek and the North Tributary south of the Slag Landfill. A series of concrete culverts (plugged with concrete according to former facility personnel) that run under the railroad spur are visible along the north bank of

Stewart Creek in this area (photo provided in Appendix 13), confirming the projected former creek path in this area. Three additional borings (RO-1 through RO-3) were completed at the outfall of these culverts next to Stewart Creek. As noted in the slag survey report by W&M (Appendix 18), pieces of slag were observed on the ground surface along the north bank of Stewart Creek in the vicinity of the railroad outfall.

The entire Slag Landfill is included within the boundaries of Affected Property No. 2. The affected property is delineated to the north by 2012-SL-2 and 2012-SL-3, and to the east by MW-22. Lead RAL exceedances west and south of the Slag Landfill were detected at SCC-11, 2013-RO-1, 2013-RO-2, MW-17 (historical data provided in Appendix 17), B5N (historical data provided in Appendix 17), and in a cluster of borings (2012-FWCS-1, 2012-FWCS-1A, and 2012-FWCS-12) located on the west side of the flood wall near the Battery Receiving/Storage Building. The applicable critical PCL for lead was exceeded in borings 2012-FWCS-1, 2012-FWCS-1A, 2012-FWCS-12, and MW-17 (historical data provided in Appendix 17). The RAL for cadmium was only exceeded in SCC-11. Lateral delineation of the affected property between the Slag Landfill and Stewart Creek was completed by soil samples from borings SCC-11A, SCC-12, 2013-SL-4, SCC-10A, 2013-RO-3, 2013-MW-17A, 2012-FWCS-11, and 2013-FWCS-1B. The vertical extent of the affected property in this area was evaluated at location 2012-FWCS-12, the boring with the highest detected lead concentration in this area (31,000 mg/kg in the 2 to 2.7-foot bgs sample depth interval). The affected property was delineated at a depth of 4 feet bgs at this location, where a lead concentration of 19.1 mg/kg was observed.

Concentrations of lead and cadmium in the soil sample collected from MW-24, completed within the projected former creek path of Stewart Creek and the North Tributary, were below RALs; however, MW-24 was included within the affected property boundary because it is bordered to the north by the Slag Landfill and to the east, south, and west by other areas of the affected property.

Soil sample SCC-12, collected from the 0.0 to 0.5-foot bgs depth interval, was also analyzed for arsenic to evaluate potential atmospheric deposition of arsenic in this area. As shown on Table 4D.2, the arsenic result for this sample was below the RAL.

In accordance with the Work Plan (CRA, 2011), soil boring water within borings 2012-SL-2 and 2012-SL-3 (observed at depths of 7.5 feet bgs and 10.3 feet bgs, respectively) was collected and analyzed for lead and cadmium during the SIR investigation. Cadmium concentrations in both samples were 0.005 mg/L (U-flagged for blank contamination). The lead concentration was 0.0141 mg/L in the 2012-SL-2 sample and <0.0029 mg/L in the 2012-SL-3 sample (Table 4D.6). Since these samples were not collected from developed permanent monitoring wells, and in accordance with Work Plan provisions, the sample results are not considered representative of metals concentrations in groundwater. As such, these data were not compared to groundwater PCLs.

4.2.8 Boneyard and NOR WMU No. 17

During the SIR investigation, five soil samples were collected from the 0 to 2-foot bgs interval at five borings (2012-BY-1 through 2012-BY-5) within the Boneyard, located on the western portion of the Slag Landfill. The samples were analyzed for lead and cadmium. Consistent with the Work Plan (CRA, 2011) provisions, TPH analyses were not performed on these samples because no soil staining, odor, or elevated PID readings were observed during completion of the borings. The lead concentration in borings 2012-BY-2 and 2012-BY-4 exceeded the applicable RAL for lead. Lead concentrations in the other three samples from this area were below applicable RALs. Critical PCLs were only exceeded for lead, in boring 2012-BY-4. Slag was encountered at the base of boring 2012-BY-4 at a depth of 2 feet bgs, consistent with the location of slag in the borings within the Slag Landfill.

During the APAR investigation, two soil samples analyzed for lead and cadmium were collected from the 0 to 0.5-foot bgs depth interval at the former locations of two debris piles within the Boneyard area (2013-WMU17-1 and 2013-WMU17-2). The debris piles had been removed prior to the collection of soil samples. Lead concentrations in both samples exceeded the applicable RAL, but were below the critical PCL. Cadmium results were below the applicable RAL in both samples.

The Boneyard is completely contained within the Slag Landfill, which is located entirely within Affected Property No. 2. Because the Boneyard overlies the Slag Landfill, vertical delineation to RALs was not performed in this area.

4.2.9 Class 2 Landfill (NOR WMU No. 12)

During the APAR investigation, four monitoring wells (PMW-19R, PMW-20R, LMW-21, and LMW-22) were installed around the Class 2 Landfill, located near the northern boundary of the Site. Soil samples were collected continuously from the monitoring well borings for lithologic purposes. Samples from the 0.0 to 0.5-foot bgs depth interval from these borings were analyzed for lead and cadmium to evaluate the potential for atmospheric deposition of these metals in this area in the prevailing downwind direction from the former production area. Soil samples from PMW-19R and LMW-22 were additionally analyzed for arsenic to evaluate potential aerial deposition of arsenic in this area. Concentrations of lead, cadmium, and arsenic were below applicable RALs in all of these soil samples analyzed in the Class 2 Landfill area.

4.2.10 Bale Stabilization Area

Initially, five soil samples were collected from five locations (2012-BSA-1 through 2012-BSA-5) in the Bale Stabilization Area during the SIR investigation. These samples were analyzed for cadmium and lead.

As part of the SIR investigation, SPLP analysis was performed for a preliminary evaluation of the potential for soil leaching to groundwater. Samples 2012-BSA-1A (0-2’) and 2012-BSA-3A (0-2’) were collected as resamples of samples 2012-BSA-1 and 2012-BSA-3, respectively to allow for SPLP analysis at those locations (after initial total lead and/or cadmium analysis). SPLP-cadmium analysis was performed on sample 2012-BSA-3A (0-2’). Similarly, additional samples 2012-BSA-4a (0-1'), 2012-BSA–4b (0-1'), 2012-BSA–4c (0-1'), 2012-BSA–4d (0-1’), and 2012-BSA–4e (0-1’) were collected in a one-foot radius around previous sample location 2012-BSA-4. Cadmium and lead analyses were performed on all five of these samples. Based on those results, SPLP analyses were performed on samples 2012-BSA-4a (0-1'), 2012-BSA–4c (0-1’) and 2012-BSA–4d (0-1'). The SPLP analysis results are provided in Appendix 22.

Lead concentrations in eight of the twelve soil samples collected from the Bale Stabilization Area during the SIR investigation in 2012 exceeded the applicable RAL for lead, and three samples exceeded the applicable critical PCL for lead. Cadmium concentrations exceeded the applicable RAL in three of the SIR samples and exceeded the critical PCL in one sample (2012-BSA-3A (0-2’)).

Additional soil samples were collected as part of the APAR investigation in 2013 to vertically delineate the affected property at the location where the highest concentration of lead was observed in this area during the 2012 SIR investigation (2012-BSA-2) and to gather pH data for this area (2013-BSA-6 and 2013-BSA-7). Soil samples were also collected during the installation of monitoring well MW-23, located on the southeast side of the Bail Stabilization Area.

The western portion of the Bale Stabilization Area lies on top of the North Disposal Area. Some debris was observed in borings completed in this area, including a black plastic fragment in the upper two feet in 2012-BSA-4 and a plastic bag fragment and mulch at 4.9 feet bgs in 2013-BSA-6. Additional fill material (sand and silt not associated with the North Disposal Area) was observed within the upper 2.5 feet bgs at MW-23. Slag, battery chips, rubbish, or other types of debris were not observed at this location. The fill material at MW-23 is likely associated with construction of the Truck Staging Area parking lot or landscaping activities in this area. The near surface sample from MW-23, collected from the 0.0 to 0.5 feet bgs depth interval, exceeded the RAL for lead, but did not exceed the critical PCL. The 0.5 to 2-foot bgs sample from MW-23 did not exceed the RAL for lead. The upper sample from MW-23 was additionally analyzed for cadmium, and the result was less than the RAL.

The Bale Stabilization Area lies entirely within the boundaries of Affected Property No. 2. It is bordered to the south by other areas within the affected property and to the west by the North Disposal Area, which also lies within Affected Property No. 2. RAL exceedances within the Bale Stabilization Area are bounded to the North by 2012-NDA-6, to the northeast by ECO-12, and to the east by 2013-TS-1 and 2013-TS-2. As noted previously, a large portion of the Bale Stabilization Area is located within the North Disposal Area. Outside of the landfill, the affected property was vertically delineated at the location with the highest detected lead concentration (25,900 mg/kg in sample 2012-BSA-2 (0-2')), at a depth of 2 feet bgs, where a lead concentration of 123 mg/kg was observed. Outside the landfill, cadmium concentrations were also vertically delineated to below the RAL at 2012-BSA-2 at 2 feet bgs, where a cadmium concentration of 0.652 mg/kg was observed. Cadmium was not vertically delineated to below the RAL at 2012-BSA-3A, the location where the highest cadmium concentration (935 mg/kg in the 0 to 2-foot bgs sample depth interval) was detected in this area, because 2012-BSA-3A is located within the North Disposal Area.

During the APAR investigation, pH data were evaluated at three locations in the Bail Stabilization Area (2013-BSA-6, 2013-BSA-7, and MW-23). The pH data ranged from 8.03 to 8.51 (Table 4E). PCLs are not established for this geochemical parameter.

4.2.11 Truck Staging Area, Administrative Building Area, and Maintenance Building

Although not identified as a potential source area in the Work Plan, soil samples were collected adjacent to the Truck Staging Area and Administrative Building (east of the former production area) within the upper 5 feet bgs to delineate RAL and critical PCL exceedances for lead detected in historical samples from boring MW-10 (Appendix 17) and to evaluate shallow soils on the north side of the Administrative Building. Soil samples were also collected at sample locations 2013-TS-1 and 2013-TS-2 to verify that concentrations of lead were below RALs, as indicated by historical data from Phase II RFI borings TS-1 and TS-2 (Appendix 17). Lead was analyzed in all samples from this area and cadmium was analyzed in at least one sample at each location. Sample 2013-AD-2 (0-0.5') was additionally analyzed for arsenic to evaluate potential atmospheric deposition of arsenic at this location.

Lead RAL exceedances were detected in soil samples collected near the Administrative Building in borings 2013-FOP-1 and 2013-AD-1, and in soil samples collected west and south of MW-10 in borings

2013-MW10-3, 2013-MW10-2, and 2013-AD-2 (collected within grass median at entrance to Site). The lead RAL exceedance zone was laterally delineated on-site in this area by soil samples from borings 2013-TS-1, 2013-TS-2, 2013-MW10-1, 2013-AD-2A, and SCC-1. The affected property was vertically delineated at the location in this area that had the highest detected lead concentration (6,460 mg/kg in soil sample 2013-FOP-1 (0-0.5')) at a depth of 2 feet bgs, where a lead concentration of 90.4 J mg/kg was observed. All cadmium results for the samples collected in this area and the arsenic result for the sample analyzed for arsenic in this area (2013-AD-2) were below applicable RALs.

Two soil samples were collected below the concrete slab in the Maintenance Building and were analyzed for lead and cadmium. These samples were also analyzed for VOCs, based on the reported use of solvents in this building. The concentrations of all analytes in both samples from the Maintenance Building were below applicable RALs.

4.2.12 South Disposal Area (NOR WMU No. 4)

As noted previously in Section 1.2, multiple delineation borings were drilled in the South Disposal Area as part of the Phase I RFI activities (Lake, 1993). During the SIR investigation, ten soil samples were collected from five borings in the vicinity of the South Disposal Area. These samples were analyzed for lead and cadmium. RAL exceedances for lead were detected in boring 2012-SDA-2. No RAL exceedances were detected for cadmium.

As part of the APAR investigation, additional soil borings were completed in the vicinity of the South Disposal Area to laterally and/or vertically delineate lead RAL exceedances at 2012-SDA-2 and at historical boring locations BS-2, BS-3, BS-5, SDA-3, and SDA-4. Samples collected from locations that had not previously been sampled were analyzed for cadmium in addition to lead. Samples from two locations (SDA-4A and ECO-7) were also analyzed for arsenic to evaluate potential aerial deposition of arsenic in this area. All cadmium and arsenic results were below RALs for samples analyzed for these constituents in this area.

The South Disposal Area lies entirely within the boundaries of Affected Property No. 3. As noted previously, the lateral and vertical extents of the South Disposal Area were evaluated during an extensive investigation as part of the Phase I RFI and are documented in the 1993 Addendum to the Phase I RFI Report (Lake, 1993). During the APAR investigation, Affected Property No. 3 was laterally delineated to the north by sample locations 2012-SDA-1, SCC-4, 2012-SDA-3, 2013-SDA-3A, SCC-2, and ECO-5; to the east by ECO-1, ECO-2, and ECO-4; to the south by ECO-7B, ECO-10, 2012-SDA-4, 2012-SDA-5, SB-VS-1, and SB-VS-2; and to the west by 2013-B4R and numerous verification samples collected within the footprint of the former Shooting Range Berm (see Section 4.2.14 below), after the berm had been removed. "SCC" and "ECO" samples are samples collected during the APAR investigation from the 0 to 0.5-foot bgs interval in various areas of the Site to evaluate areas of potential ecological habitat in accordance with the approved SLERA Work Plan (PBW, 2012b). The ecological samples in the vicinity of the South Disposal Area were collected to evaluate the south wooded area located east of the South Disposal Area and areas along Stewart Creek (the Stewart Creek corridor).

Vertical delineation of the affected property was completed in the vicinity of the South Disposal Area (outside of the landfill) and south wooded at the sample location with the highest detected lead concentration in this area (2,340 mg/kg in sample ECO-7 (0-0.5')) at a depth of 0.5 feet bgs, where a lead concentration of 76.5 J mg/kg was observed. The maximum delineation depth of the affected property in this area (outside the landfill) was observed at 2 feet bgs at locations BS-3 and 2012-SDA-2, where lead concentrations of 40.2 mg/kg and 11.3 mg/kg, respectively, were observed. The RAL exceedance zone in historical boring SDA-8 was delineated at that location at a depth of 4 feet bgs during the Phase II RFI (JDC, 1998a). Based on the description of fill material within this boring, as noted on the boring log provided in the Phase II RFI, SDA-8 appears to be located within the boundaries of the South Disposal Area; therefore, additional verification of the historical vertical delineation depth at this location was not performed.

Critical PCL exceedances for lead were detected within Affected Property No. 3 in several historic soil borings completed near the South Disposal Area (BS-2, BS-3, SDA-2, SDA-3, SDA-4, SDA-9-1, and SDA-9-2; data provided in Appendix 17) and in three ecological samples from the south wooded area (ECO-3, ECO-7, and ECO-9; Table 4D.1).

4.2.13 Crystallization Unit Frac Tank (NOR WMU No. 15)

As part of the 2012 SIR, two soil samples were collected from two locations in the vicinity of the Crystallization Unit Frac Tank. Sampling was performed in this area to assess potential impacts due to observations during regulatory agency inspections of liquid leaking from the frac tank, as well as visible drainage pathways leading from the frac tank to the edge of the concrete pad. These soil samples were analyzed for antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, and zinc. All sample concentrations were below their respective RALs.

During the APAR investigation, additional soil samples were collected within the upper 5-foot bgs interval along the surface water drainage pathway on the west side of the Crystallization Unit. Soil samples were initially collected from seven locations along the drainage pathway next to the Crystallization Unit and the drainage ditch that runs west along the south side of Crystallizer Road Way, and were analyzed for lead and cadmium. The 0 to 0.5-foot sample from boring 2013-CUFT-7 was additionally analyzed for arsenic to evaluate potential atmospheric deposition of arsenic in this area. All sample results in all samples collected in this area were below applicable RALs, except for the 0 to 0.5-foot bgs sample in boring 2013-CUFT-7, which exceeded the applicable RAL for lead. Additional samples were collected west and south of 2013-CUFT-7 from borings 2013-CUFT-7A and 2013-CUFT-10 (within the ditch area down slope from 2013-CUFT-7) to laterally delineate the RAL exceedance zone in this area. The samples from the two additional borings were analyzed for lead and cadmium. The sample results were below applicable RALs for both constituents in both borings, effectively laterally delineating the affected property on-site in this area. The lead concentration in the 0.5 to 2-foot bgs depth interval from boring 2013-CUFT-7 was 267 mg/kg, which is below the RAL; however, per 30 TAC §350.51(d)(1) vertical delineation should be completed to below the site-specific background concentration since a groundwater sample was not collected in this area. Therefore, additional assessment is recommended to vertically delineate lead concentrations in soil at 2013-CUFT-7 to below the site-specific background concentration of 31.5 mg/kg. Critical PCLs were not exceeded in samples from this area.

Specific samples collected from this area were also analyzed for pH during the SIR investigation and sulfate during both the SIR and APAR investigations (Table 4E). Results for pH in these samples ranged from 6.32 to 6.82. The sulfate results were highly variable, ranging from 56.7 to 8,710 mg/kg. PCLs are not established for these geochemical parameters.

4.2.14 Former Shooting Range Berm and the South Berm

In accordance with the TCEQ Agreed Order, soil that composed the former Shooting Range Berm, located immediately west of the South Disposal Area, was removed in 2013. Near surface verification soil samples were collected at fourteen locations within the footprint of the former berm, and the soil samples were analyzed for lead and cadmium. Concentrations of lead in two of the samples (SRB-VS-9 and SRB-VS-9A) exceeded the applicable RAL for lead. The RAL exceedance zone at the former Shooting Range Berm is contained within Affected Property No. 3. The affected property is delineated on-site in the vicinity of the former Shooting Range Berm by samples SRB-VS-1 through SRB-VS-8, SRB-VS-9B, SRB-VS-9C, SRB-VS-10, SRB-VS-11, 2012-SDA-4, and 2012-SDA-5. Vertical delineation of the affected property in this area was completed at SRB-VS-9, where the highest lead concentration was detected (1,330 mg/kg in the 0 to 0.5-foot bgs sample depth interval), at a depth of 0.5 feet bgs, where a lead concentration of 14.8 J mg/kg was observed. Critical PCLs were not exceeded in the verification samples from the former Shooting Range Berm.

Bermed material (the South Berm) identified by the TCEQ southeast-adjacent to the former Shooting Range Berm was also removed in 2013. Two verification soil samples (SB-VS-1 and SB-VS-2) were collected from the footprint of the South Berm after it was removed, and were analyzed for lead and cadmium. Lead and cadmium concentrations in both of these samples were below their respective RALs.

4.2.15 Potential Ecological Habitat Areas

As discussed in the SLERA in Section 9 and per the SLERA Work Plan (PBW, 2012b), soil samples were collected from the 0 to 0.5-foot bgs depth interval from various parts of the Site designated as areas of potential ecological habitat. These include the north wooded area adjacent to the North Tributary, the south wooded area adjacent to the South Disposal Area, and along the Stewart Creek corridor. Evaluations of the ecological soil samples collected within the south wooded area and the Stewart Creek corridor were discussed in previous sections covering the Stewart Creek Flood Wall, Slag Landfill, and South Disposal Area.

Over thirty soil samples were collected within the north wooded area located adjacent to the North Tributary. These samples were analyzed for lead and/or cadmium. Five of the north wooded area samples (from borings E-11A, ECO-11, ECO-12, MW-21, and MW-22) were additionally analyzed for arsenic to evaluate potential aerial deposition of arsenic in this area. All cadmium and arsenic results were below applicable RALs for all samples analyzed for these constituents in this area, except for soil sample E-11A, which had an arsenic concentration (27.4 mg/kg) that exceeded the RAL of 24 mg/kg, but was below the critical PCL of 196 mg/kg. This sample also exceeded the RAL for lead.

Lead RAL exceedances were detected at eight sample locations within the wooded area on the north side of the North Tributary (Affected Property No. 1). Affected Property No. 1 was delineated to the north by soil samples D-13, D-14, D-15, and soil samples from several of the Class 2 Landfill monitoring wells, including LMW-22 and LMW-21; to the west by E-11B; to the south by sediment samples collected within the North Tributary (see Section 7 of this APAR); and to the east by E-15A. Consistent with 30 TAC §350.51(d)(1), vertical delineation of the affected property was completed to the background concentration for lead at the sample location with the highest detected concentration of lead in this area (2,920 mg/kg in E-11 in the 0 to 0.5-foot bgs sample depth interval), at a depth of 4 feet, where a lead concentration of 5.26 mg/kg was observed. Critical PCL exceedances for lead were detected in three soil samples (E-11, E-12, and E-13) collected from the 0 to 0.5-foot bgs depth interval within the affected property boundary.

4.2.16 Lake Parcel

Fifteen soil samples were collected from eleven locations on the Lake Parcel, located near the western boundary of the Site (Figure 4A). Soil samples were collected from the 0 to 3-inch bgs interval at each of the sampling locations in this area. Additional samples were collected at 1 foot bgs at four of the sampling locations (G-4, G-5, H-4, and H-5). All of the soil samples collected from the Lake Parcel were analyzed for lead and cadmium, and all results were below applicable RALs. The lead results for all of the soil samples collected at 1 foot bgs were also below the site-specific background concentration for lead.

Table 4A Surface Soil Residential Assessment Levels with No Ecological Component

COC	Source Area Size (acres)	$^{Tot}Soil_{Comb}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL (mg/kg)	Tier	RAL[1] (mg/kg)	MQL (mg/kg)	Background[2] (mg/kg)	Maximum Concentration Detected: Sample ID	Sample Depth (feet bgs)	Sample Date	Conc (mg/kg)
Metals											
Antimony	30	**1.5E+01**	2.7E+02	1	1.5E+01	3.2E+00	1.0E+00	--	--	--	--
Arsenic	30	**2.4E+01**	3.0E+02	2	2.4E+01	1.0E+00	1.6E+01	2012-FWCS-1A (1-2')	1-2*	03/05/13	**115**
Barium	30	**8.1E+03**	2.2E+04	1	8.1E+03	1.0E+00	3.0E+02	2013-RMSB-4 (5-6)	5-6	05/07/13	131
Beryllium	30	**3.8E+01**	9.2E+01	1	3.8E+01	3.2E-01	1.5E+00	2012 CUFT-2 (0-2')	0-2	01/06/12	0.806
Cadmium	30	**5.2E+01**	3.0E+03	2	5.2E+01	2.5E-01	NP	2012-FWFS-9 (Floor)	2.4	09/04/12	**984**
Chromium	30	**2.7E+04**	1.2E+05	1	2.7E+04	5.0E-01	3.0E+01	2013-RMSB-2 (2.5-5)	2.5-5*	05/08/13	22.4
Lead	30	**5.0E+02**	2.7E+04	2	5.0E+02	5.0E-01	3.2E+01	2013-WMU14-1 (0.9-2)	0.9-2*	05/07/13	**95000**
Mercury	30	2.1E+00	**3.9E-01**	1	3.9E-01	5.0E-02	4.0E-02	2013-RMSB-4 (5-6)	5-6	05/07/13	0.013 J
Nickel	30	**8.4E+02**	7.9E+03	1	8.4E+02	1.3E+00	1.0E+01	2012 CUFT-1 (0-2')	0-2	01/06/12	12.4
Selenium	30	3.1E+02	**1.6E+02**	2	1.6E+02	2.0E+00	3.0E-01	2012-FWCS-1A (1-2')	1-2*	03/05/13	12.6
Silver	30	9.7E+01	**2.4E+01**	1	2.4E+01	5.0E-01	NP	--	--	--	--
Zinc	30	**9.9E+03**	1.2E+05	1	9.9E+03	1.9E+00	3.0E+01	2012 CUFT-1 (0-2')	0-2	01/06/12	55
Total Petroleum Hydrocarbons (TPH) by TX1005[3]											
T/R Hydrocarbons: C6-C12	30	--	--	--	--	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	532 JH
T/R Hydrocarbons: >C12-C28	30	--	--	--	--	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	4730 JH
T/R Hydrocarbons: >C28-C35	30	--	--	--	--	1.0E+01	--	2013-STB-11 (0.5-1.3')	0.5-1.3	03/14/13	1380
T/R Hydrocarbons: C6-C35	30	--	--	1	1.3E+04	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	5490 JH
Total Petroleum Hydrocarbons (TPH) by TX1006[3]											
nC6 Aliphatics	30	--	--	1	--	1.0E+01	--	--	--	--	--
<C6-C8 Aliphatics	30	--	--	1	--	1.0E+01	--	--	--	--	--
>C8-C10 Aliphatics	30	--	--	1	--	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	67 X7,J
>C10-C12 Aliphatics	30	--	--	1	--	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	856 JH
>C12-C16 Aliphatics	30	--	--	1	--	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	999 X7, JH
>C16-C21 Aliphatics	30	--	--	1	--	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	1110 X7, JH
>C21-C35 Aliphatics	30	--	--	1	--	1.0E+01	--	2013-STB-11(0.5-1.3)	0.5-1.3	03/14/13	168 X7
>C7-C8 Aromatics	30	--	--	1	--	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	12.8 X7,J
>C8-C10 Aromatics	30	--	--	1	--	1.0E+01	--	2013-STB-11(0.5-1.3)	0.5-1.3	03/14/13	6.17 X7, J
>C10-C12 Aromatics	30	--	--	1	--	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	62.9 X7,J
>C12-C16 Aromatics	30	--	--	1	--	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	684 X7, JH
>C16-C21 Aromatics	30	--	--	1	--	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	737 X7, JH
>C21-C35 Aromatics	30	--	--	1	--	1.0E+01	--	2013-STB-11(0.5-1.3)	0.5-1.3	03/14/13	383 X7
>C6-C35	30	--	--	--	1.3E+04	1.0E+01	--	2012-FWFS-9 (4-5)	4-5	04/29/13	4810 X7, JH

Table 4A Surface Soil Residential Assessment Levels with No Ecological Component

COC	Source Area Size (acres)	$^{Tot}Soil_{Comb}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL (mg/kg)	Tier	RAL[1] (mg/kg)	MQL (mg/kg)	Background[2] (mg/kg)	Maximum Concentration Detected: Sample ID	Sample Depth (feet bgs)	Sample Date	Conc (mg/kg)
Volatile Organic Compounds (VOCs)											
1,1,1-Trichloroethane	30	3.2E+04	**8.1E+01**	1	8.1E+01	5.0E-03	--	--	--	--	--
1,1,2,2-Tetrachloroethane	30	3.0E+01	**1.2E+00**	1	1.2E+00	5.0E-03	--	--	--	--	--
1,1,2-Trichloroethane	30	1.0E+01	**1.0E+00**	1	1.0E+00	5.0E-03	--	--	--	--	--
1,1-Dichloroethane	30	8.8E+03	**9.2E+02**	1	9.2E+02	5.0E-03	--	--	--	--	--
1,1-Dichloroethene	30	1.6E+03	**2.5E+00**	1	2.5E+00	5.0E-03	--	--	--	--	--
1,2-Dichloroethane	30	6.4E+00	**6.9E-01**	1	6.9E-01	5.0E-03	--	--	--	--	--
1,2-Dichloroethene, Total	30	NP	NP	--	--	1.0E-02	--	--	--	--	--
1,2-Dichloropropane	30	3.1E+01	**1.1E+00**	1	1.1E+00	5.0E-03	--	--	--	--	--
2-Butanone (MEK)	30	3.3E+04	**1.5E+03**	1	1.5E+03	1.0E-02	--	--	--	--	--
2-Hexanone	30	2.1E+02	**1.6E+01**	1	1.6E+01	1.0E-02	--	--	--	--	--
4-Methyl-2-pentanone (MIBK)	30	5.4E+03	**2.5E+02**	1	2.5E+02	1.0E-02	--	--	--	--	--
Acetone	30	5.9E+04	**2.1E+03**	1	2.1E+03	1.0E-02	--	2013-MB-1 (4-5')	4-5	03/14/13	0.358
Benzene	30	6.9E+01	**1.3E+00**	1	1.3E+00	5.0E-03	--	2013-STB-6 (0.5-1.1')	0.5-1.1	03/14/13	0.0406
Bromodichloromethane	30	9.8E+01	**3.3E+00**	1	3.3E+00	5.0E-03	--	--	--	--	--
Bromoform	30	2.8E+02	**3.2E+01**	1	3.2E+01	5.0E-03	--	--	--	--	--
Bromomethane	30	2.9E+01	**6.5E+00**	1	6.5E+00	1.0E-02	--	--	--	--	--
Carbon disulfide	30	3.3E+03	**6.8E+02**	1	6.8E+02	1.0E-02	--	2013-RMSB-10 (7')	7	5/8/2013	0.00399 J
Carbon tetrachloride	30	2.3E+01	**3.1E+00**	1	3.1E+00	5.0E-03	--	--	--	--	--
Chlorobenzene	30	3.2E+02	**5.5E+01**	1	5.5E+01	5.0E-03	--	--	--	--	--
Chlorobromomethane	30	3.3E+03	**1.5E+02**	1	1.5E+02	5.0E-03	--	--	--	--	--
Chloroethane	30	2.3E+04	**1.5E+03**	1	1.5E+03	1.0E-02	--	--	--	--	--
Chloroform	30	**8.0E+00**	5.1E+01	1	8.0E+00	5.0E-03	--	2012-FWFS-9 (4-5')	4-5	4/29/2013	0.01220 U
Chloromethane	30	8.4E+01	**2.0E+01**	1	2.0E+01	1.0E-02	--	--	--	--	--
cis-1,2-Dichloroethene	30	1.2E+02	**1.2E+01**	1	1.2E+01	5.0E-03	--	--	--	--	--
cis-1,3-Dichloropropene	30	7.8E+00	**3.3E-01**	1	3.3E-01	5.0E-03	--	--	--	--	--
Dibromochloromethane	30	7.2E+01	**2.5E+00**	1	2.5E+00	5.0E-03	--	--	--	--	--
Ethylbenzene	30	5.3E+03	**3.8E+02**	1	3.8E+02	5.0E-03	--	2013-STB-6 (0.5-1.1')	0.5-1.1	03/14/13	0.0765
Methyl tert-butyl ether	30	5.9E+02	**3.1E+01**	1	3.1E+01	5.0E-03	--	2013-RMSB-5 (2-5')	2-5	5/7/2013	0.00233
Methylene Chloride	30	4.7E+02	**6.5E-01**	1	6.5E-01	1.0E-02	--	2012-FWFS-9 (4-5')	4-5	4/29/2013	0.14 U
m-Xylene and p-Xylene	30	**4.7E+03**	5.3E+03	1	4.7E+03	1.0E-02	--	--	--	--	--
o-Xylene	30	2.9E+04	**3.5E+03**	1	3.5E+03	5.0E-03	--	2013-STB-6 (0.5-1.1')	0.5-1.1	03/14/13	0.0148

Table 4A Surface Soil Residential Assessment Levels with No Ecological Component

COC	Source Area Size (acres)	$^{Tot}Soil_{Comb}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL Tier	RAL[1] (mg/kg)	MQL (mg/kg)	Background[2] (mg/kg)	Maximum Concentration Detected: Sample ID	Sample Depth (feet bgs)	Sample Date	Conc (mg/kg)
Volatile Organic Compounds (VOCs) Continued											
Styrene	30	4.3E+03	**1.6E+02**	1	1.6E+02	5.0E-03	--	--	--	--	--
Tetrachloroethene	30	4.2E+02	**2.5E+00**	1	2.5E+00	5.0E-03	--	2013-STB-6 (0.5-1.1')	0.5-1.1	03/14/13	0.0116
Toluene	30	5.4E+03	**4.1E+02**	1	4.1E+02	5.0E-03	--	--	--	--	--
trans-1,2-Dichloroethene	30	3.7E+02	**2.5E+01**	1	2.5E+01	5.0E-03	--	--	--	--	--
trans-1,3-Dichloropropene	30	2.6E+01	**1.8E+00**	1	1.8E+00	5.0E-03	--	--	--	--	--
Trichloroethene	30	1.1E+01	**1.7E+00**	1	1.7E+00	5.0E-03	--	--	--	--	--
Vinyl acetate	30	**1.5E+03**	2.7E+03	1	1.5E+03	5.0E-03	--	--	--	--	--
Vinyl chloride	30	3.4E+00	**1.1E+00**	1	1.1E+00	1.0E-02	--	--	--	--	--
Xylenes, Total	30	**3.7E+03**	6.1E+03	1	3.7E+03	5.0E-03	--	2013-STB-6 (0.5-1.1')	0.5-1.1	03/14/13	0.0319
Semivolatile Organic Compounds (SVOCs)											
1,2,4-Trichlorobenzene	30	**7.0E+01**	2.4E+02	1	7.0E+01	1.7E-02	--	--	--	--	--
1,2-Dichlorobenzene	30	**3.9E+02**	8.9E+02	1	3.9E+02	1.7E-02	--	--	--	--	--
1,3-Dichlorobenzene	30	**6.2E+01**	3.4E+02	1	6.2E+01	1.7E-02	--	--	--	--	--
1,4-Dichlorobenzene	30	2.5E+02	**1.1E+02**	1	1.1E+02	1.7E-02	--	--	--	--	--
1-Methylnaphthalene	30	**1.5E+02**	**1.5E+02**	1	1.5E+02	1.7E+01	--	2013-STB-6 (0.5-1.1')	0.5-1.1	03/14/13	0.358 J
2,4,5-Trichlorophenol	30	6.7E+03	**1.7E+03**	1	1.7E+03	1.7E-02	--	--	--	--	--
2,4,6-Trichlorophenol	30	6.7E+01	**8.7E+00**	1	8.7E+00	1.7E-02	--	--	--	--	--
2,4-Dichlorophenol	30	2.0E+02	**1.8E+01**	1	1.8E+01	1.7E-02	--	--	--	--	--
2,4-Dimethylphenol	30	1.3E+03	**1.6E+02**	1	1.6E+02	1.7E-02	--	--	--	--	--
2,4-Dinitrophenol	30	1.3E+02	**4.7E+00**	1	4.7E+00	1.0E-01	--	--	--	--	--
2,4-Dinitrotoluene	30	6.9E+00	**2.7E-01**	1	2.7E-01	1.7E-02	--	--	--	--	--
2,6-Dinitrotoluene	30	6.9E+00	**2.4E-01**	1	2.4E-01	1.7E-02	--	--	--	--	--
2-Chloronaphthalene	30	**5.0E+03**	3.3E+04	1	5.0E+03	1.7E-02	--	--	--	--	--
2-Chlorophenol	30	4.1E+02	**8.2E+01**	1	8.2E+01	1.7E-02	--	--	--	--	--
2-Methylnaphthalene	30	**2.5E+02**	8.5E+02	1	2.5E+02	1.7E-02	--	2013-RMSB-2 (5-6)	5-6	5/8/2013	3.68
2-Methylphenol	30	3.3E+03	**3.6E+02**	1	3.6E+02	1.7E-02	--	--	--	--	--
2-Nitroaniline	30	1.1E+01	**1.1E+00**	1	1.1E+00	1.7E-02	--	--	--	--	--
2-Nitrophenol	30	1.3E+02	**6.7E+00**	1	6.7E+00	1.7E-02	--	--	--	--	--
3 & 4 Methylphenol	30	3.2E+02	**3.2E+01**	1	3.2E+01	3.3E-02	--	--	--	--	--
3,3'-Dichlorobenzidine	30	1.0E+01	**3.1E+00**	1	3.1E+00	1.7E-02	--	--	--	--	--
3-Nitroaniline	30	1.2E+01	**1.3E+00**	1	1.3E+00	1.7E-02	--	--	--	--	--
4,6-Dinitro-2-methylphenol	30	6.7E+00	**2.3E-01**	1	2.3E-01	1.7E-02	--	--	--	--	--

Table 4A Surface Soil Residential Assessment Levels with No Ecological Component

COC	Source Area Size (acres)	$^{Tot}Soil_{Comb}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL Tier	RAL[1] (mg/kg)	MQL (mg/kg)	Background[2] (mg/kg)	Maximum Concentration Detected: Sample ID	Sample Depth (feet bgs)	Sample Date	Conc (mg/kg)
Semivolatile Organic Compounds (SVOCs) Continued											
4-Bromophenyl phenyl ether	30	**2.7E-01**	1.8E+01	1	2.7E-01	1.7E-02	--	--	--	--	--
4-Chloro-3-methylphenol	30	3.3E+02	**2.3E+02**	1	2.3E+02	1.7E-02	--	--	--	--	--
4-Chloroaniline	30	2.3E+01	**1.0E+00**	1	1.0E+00	1.7E-02	--	--	--	--	--
4-Chlorophenyl phenyl ether	30	**1.5E-01**	1.6E+00	1	1.5E-01	1.7E-02	--	--	--	--	--
4-Nitroaniline	30	1.9E+02	**5.4E+00**	1	5.4E+00	1.7E-02	--	--	--	--	--
4-Nitrophenol	30	1.3E+02	**5.0E+00**	1	5.0E+00	1.7E-02	--	--	--	--	--
Acenaphthene	30	**3.0E+03**	1.2E+04	1	3.0E+03	1.7E-02	--	--	--	--	--
Acenaphthylene	30	**3.8E+03**	2.0E+04	1	3.8E+03	1.7E-02	--	--	--	--	--
Anthracene	30	**1.8E+04**	3.4E+05	1	1.8E+04	1.7E-02	--	SCC-8 (0-0.5')	0-0.5	1/15/2013	0.005 J
Benzidine	30	1.3E-02	**5.5E-04**	1	5.5E-04	8.3E-02	--	--	--	--	--
Benzo[a]anthracene	30	**5.6E+00**	8.9E+02	1	5.6E+00	1.7E-02	--	SCC-8 (0-0.5')	0-0.5	1/15/2013	0.0169 J
Benzo[a]pyrene	30	**5.6E-01**	3.8E+02	1	5.6E-01	1.7E-02	--	SCC-8 (0-0.5')	0-0.5	1/15/2013	0.0323
Benzo[b]fluoranthene	30	**5.7E+00**	3.0E+03	1	5.7E+00	1.7E-02	--	SCC-8 (0-0.5')	0-0.5	1/15/2013	0.0542
Benzo[g,h,i]perylene	30	**1.8E+03**	1.0E+06	1	1.8E+03	1.7E-02	--	SCC-8 (0-0.5')	0-0.5	1/15/2013	0.0336
Benzo[k]fluoranthene	30	**5.7E+01**	3.1E+04	1	5.7E+01	1.7E-02	--	SCC-8 (0-0.5')	0-0.5	1/15/2013	0.0161 J
Benzyl alcohol	30	6.7E+03	**2.9E+02**	1	2.9E+02	1.7E-02	--	--	--	--	--
bis (2-Chloroisopropyl) ether	30	4.1E+01	**9.5E+00**	1	9.5E+00	1.7E-02	--	--	--	--	--
Bis(2-chloroethoxy)methane	30	2.5E+00	**5.9E-01**	1	5.9E-01	1.7E-02	--	--	--	--	--
Bis(2-chloroethyl)ether	30	1.4E+00	**1.1E-01**	1	1.1E-01	1.7E-02	--	--	--	--	--
Bis(2-ethylhexyl) phthalate	30	**4.3E+01**	8.2E+03	1	4.3E+01	6.7E-02	--	2013-RMSB-4 (5-6)	5-6	5/7/2013	0.365
Butyl benzyl phthalate	30	**1.6E+03**	1.3E+04	1	1.6E+03	6.7E-02	--	2013-RMSB-10 (5-6')	5-6	5/8/2013	0.0106 J
Carbazole	30	2.3E+02	**2.3E+02**	1	2.3E+02	1.7E-02	--	--	--	--	--
Chrysene	30	**5.6E+02**	7.7E+04	1	5.6E+02	1.7E-02	--	SCC-8 (0-0.5')	0-0.5	1/15/2013	0.0394
Dibenz(a,h)anthracene	30	**5.5E-01**	7.6E+02	1	5.5E-01	1.7E-02	--	SCC-8 (0-0.5')	0-0.5	1/15/2013	0.0386
Dibenzofuran	30	**2.7E+02**	1.7E+03	1	2.7E+02	1.7E-02	--	2013-RMSB-2 (5-6)	5-6	5/8/2013	0.248
Diethyl phthalate	30	5.3E+04	**7.8E+03**	1	7.8E+03	6.7E-02	--	2013-RMSB-10 (5-6')	5-6	5/8/2013	0.0459 J
Dimethyl phthalate	30	5.3E+04	**3.1E+03**	1	3.1E+03	6.7E-02	--	--	--	--	--
Di-n-butyl phthalate	30	**6.2E+03**	1.7E+05	1	6.2E+03	6.7E-02	--	--	--	--	--
Di-n-octyl phthalate	30	**2.6E+03**	1.0E+06	1	2.6E+03	6.7E-02	--	--	--	--	--
Fluoranthene	30	**2.3E+03**	9.6E+04	1	2.3E+03	1.7E-02	--	SCC-8 (0-0.5')	0-0.5	1/15/2013	0.0239

Table 4A Surface Soil Residential Assessment Levels with No Ecological Component

COC	Source Area Size (acres)	$^{Tot}Soil_{Comb}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL Tier	RAL[1] (mg/kg)	MQL (mg/kg)	Background[2] (mg/kg)	Maximum Concentration Detected: Sample ID	Sample Depth (feet bgs)	Sample Date	Conc (mg/kg)
Fluorene	30	**2.3E+03**	1.5E+04	1	2.3E+03	1.7E-02	--	2013-RMSB-2 (5-6)	5-6	5/8/2013	0.317
Hexachlorobenzene	30	**1.0E+00**	5.6E+01	1	1.0E+00	1.7E-02	--	--	--	--	--
Semivolatile Organic Compounds (SVOCs) Continued											
Hexachlorobutadiene	30	**1.2E+01**	1.6E+02	1	1.2E+01	1.7E-02	--	--	--	--	--
Hexachlorocyclopentadiene	30	**7.2E+00**	9.6E+02	1	7.2E+00	1.7E-02	--	--	--	--	--
Hexachloroethane	30	**4.6E+01**	6.4E+01	1	4.6E+01	1.7E-02	--	--	--	--	--
Indeno[1,2,3-cd]pyrene	30	**5.7E+00**	8.7E+03	1	5.7E+00	1.7E-02	--	SCC-8 (0-0.5')	0-0.5	1/15/2013	0.0495
Isophorone	30	4.9E+03	**1.5E+02**	1	1.5E+02	1.7E-02	--	--	--	--	--
Naphthalene	30	**1.2E+02**	1.6E+03	1	1.2E+02	1.7E-02	--	2013-RMSB-2 (5-6)	5-6	5/8/2013	0.963
Nitrobenzene	30	3.4E+01	**1.8E+01**	1	1.8E+01	1.7E-02	--	--	--	--	--
N-Nitrosodimethylamine	30	5.5E-02	**1.8E-03**	1	1.8E-03	1.7E-02	--	--	--	--	--
N-Nitrosodi-n-propylamine	30	4.0E-01	**1.8E-02**	1	1.8E-02	1.7E-02	--	--	--	--	--
N-Nitrosodiphenylamine	30	5.7E+02	**1.4E+02**	1	1.4E+02	1.7E-02	--	--	--	--	--
Pentachlorophenol	30	**7.3E-01**	9.2E-01	1	7.3E-01	1.7E-01	--	--	--	--	--
Phenanthrene	30	**1.7E+03**	2.1E+04	1	1.7E+03	1.7E-02	--	2013-RMSB-2 (5-6)	5-6	5/8/2013	0.496
Phenol	30	2.0E+04	**9.6E+02**	1	9.6E+02	1.7E-02	--	--	--	--	--
Pyrene	30	**1.7E+03**	5.6E+04	1	1.7E+03	1.7E-02	--	SCC-8 (0-0.5')	0-0.5	1/15/2013	0.0223

Notes:

1. The Residential Assessment Level (RAL) is the lower of the TRRP Tier 1 $^{GW}Soil_{Class3}$ and $^{Tot}Soil_{Comb}$ PCLs for a 30-acre source area (TCEQ, 2012c), except where Tier 2 PCLs are applicable. The lower of the applicable PCLs is bolded.
2. Background values for metals are Texas-specific background values based on Figure 30 TAC 350.51(m), except for arsenic and lead. Arsenic and lead values are site-specific background values (see Appendix 8).
3. As detailed in Appendix 9, a TPH Mixture RAL was developed for sample 2012-FWFS-9 (4-5'), the only sample with TPH concentrations that exceeded default TPH PCLs. Default RALs used for comparison with the remaining soil samples analyzed for TPH are provided on Table 4D.3 and 4D.4.
4. NP - PCL not published.
5. Data Qualifiers (see Section 3.5): J - estimated result; JH - estimated result, biased high; U - not detected, detected in associated blank; X7 - TCEQ does not offer accreditation for this analyte.
6. MQL values that exceed RALs are highlighted.
7. Maximum sample concentrations that exceed RALs are bolded.
8. "--" - not applicable.
9. * - Sub-slab or sub-gabion basket sample; top depth represents the approximate top of soil.
10. The RAL for TPH is a TPH Mixture RAL developed in accordance with RG-366/TRRP-27 (see Appendix 9).
11. Ecological component evaluated in SLERA (Section 9).

Table 4C Subsurface Soil Residential Assessment Levels with No Ecological Component

COC	Source Area Size (acres)	$^{Air}Soil_{Inh-V}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL (mg/kg)	Tier	RAL[1] (mg/kg)	MQL (mg/kg)	Background[2] (mg/kg)	Maximum Concentration Detected: Sample ID	Sample Depth (feet bgs)	Sample Date	Conc (mg/kg)
Metals											
Cadmium	30	NP	**3.0E+03**	2	3.0E+03	2.5E-01	NP	2012-NDA-2 (16-18')	16-18	01/10/12	0.0364
Lead	30	NP	**2.7E+04**	2	2.7E+04	5.0E-01	3.2E+01	2012-NDA-2 (16-18')	16-18	01/10/12	14

Notes:

1. The Residential Assessment Level (RAL) is the lower of the TRRP Tier 1 $^{GW}Soil_{Class3}$ and $^{Air}Soil_{Inh-v}$ (if applicable) PCLs for a 30-acre source aera (TCEQ, 2012c), except where Tier 2 PCLs are applicable. The lower of the applicable PCLs is bolded.
2. The background value for lead is as site-specific background value (see Appendix 8).
3. NP = PCL not published.
5. MQL values that exceed RALs are highlighted (no exceedances detected).
6. Maximum sample concentrations that exceed RALs are bolded (no exceedances detected).
7. "--" - not applicable.
8. * - Sub-slab or sub-gabion basket sample; top depth represents the approximate top of soil.
9. The RAL for TPH is a TPH Mixture RAL developed in accordance with RG-366/TRRP-27 (see Appendix 9).
10. Ecological component evaluated in SLERA (Section 9).

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
FORMER PRODUCTION AREA				
Battery Receiving/Storage Building				
2013-BSB-1 (0.9-2)	04/11/13	0.9-2*	<0.0266	9.56
2013-BSB-1 (2-4)	04/11/13	2-4	0.0409 J	56.2
2013-BSB-1 (4-5)	04/11/13	4-5	0.0977 J	31.6
2013-BSB-1 (6.3-7.7)	04/11/13	6.3-7.7	3.64	**14100**
2013-BSB-1 (8-10)	04/11/13	8-10	7.99	**42700**
2013-BSB-1 (11.6)	04/11/13	11.6	0.487	124
2013-BSB-2 (0.9-2)	04/11/13	0.9-2*	<0.0276	70.4
2013-BSB-2 (2-4)	04/11/13	2-4	0.0399 J	9.36
2013-BSB-2 (4-5)	04/11/13	4-5	0.334	**1080**
2013-BSB-2 (8-10)	04/11/13	8-10	0.484	41.6
2013-BSB-2 (11.2)	04/11/13	11.2	0.638	**684**
2013-BSB-3 (0.9-2)	04/10/13	0.9-2*	<0.0279	14.8
2013-BSB-3 (2-4)	04/10/13	2-4	0.626	206
2013-BSB-3 (4-5)	04/10/13	4-5	0.909	499
2013-BSB-3 (8-10)	04/10/13	8-10	0.509	368
2013-BSB-3 (11)	04/10/13	11	0.434	26.1
2013-BSB-4 (0.9-2)	04/10/13	0.9-2*	1.65	37.9
2013-BSB-4 (2-4)	04/10/13	2-4	2.86	**1110**
2013-BSB-4 (4-5)	04/10/13	4-5	0.158 J	111
2013-BSB-4 (8-10)	04/10/13	8-10	0.411	214
2013-BSB-4 (11)	04/10/13	11	0.365	19.4
2013-BSB-5 (0.9-2)	04/11/13	0.9-2*	0.137 J	5.28
2013-BSB-5 (0.9-2) Dup	04/11/13	0.9-2*	0.341	6.48
2013-BSB-5 (2-4)	04/11/13	2-4	0.0557 J	21.6
2013-BSB-5 (4-5)	04/11/13	4-5	0.299	122
2013-BSB-5 (8-10)	04/11/13	8-10	0.479	**1580**
2013-BSB-5 (11.2)	04/11/13	11.2	0.458	53.9
2013-BSB-6 (0.9-2)	04/11/13	0.9-2*	<0.0304	24.4
2013-BSB-6 (2-4)	04/11/13	2-4	0.0393 J	23.7
2013-BSB-6 (4-5)	04/11/13	4-5	0.695	**586 J**
2013-BSB-6 (8-10)	04/11/13	8-10	0.91	**3150**
2013-BSB-6 (11.1)	04/11/13	11.1	0.439	20.3

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
***Battery Receiving/Storage Building* (Continued)**				
2013-BSB-7 (0.9-2)	04/11/13	0.9-2*	0.37	26.8 J
2013-BSB-7 (2-4)	04/11/13	2-4	0.13 J	221
2013-BSB-7 (4-5)	04/11/13	4-5	0.13 J	56.6
2013-BSB-7 (8-10)	04/11/13	8-10	1.98	**3050**
2013-BSB-7 (11)	04/11/13	11	0.449	17.6
2013-BSB-8 (0.9-2)	04/10/11	0.9-2*	0.782	22.6
2013-BSB-8 (2-4)	04/10/13	2-4	1.93	6.75
2013-BSB-8 (4-5)	04/10/13	4-5	0.117 J	70.7
2013-BSB-8 (8-10)	04/10/13	8-10	10.1	**54600**
2013-BSB-8 (11)	04/10/13	11	0.592	43.3
2013-BSB-9 (0.9-2)	04/10/11	0.9-2*	0.783 J	23.6 J
2013-BSB-9 (0.9-2) Dup	04/10/11	0.9-2*	2.08 J	93.4 J
2013-BSB-9 (2-4)	04/10/13	2-4	<0.0287	15.7 J
2013-BSB-9 (4-5)	04/10/13	4-5	0.107 J	13
2013-BSB-9 (8-10)	04/10/13	8-10	1.31	**1830**
2013-BSB-9 (11)	04/10/13	11	1.17	**672**
2013-BSB-10 (0.9-2)	04/11/13	0.9-2*	<0.0286	15.2
2013-BSB-10 (2-4)	04/11/13	2-4	<0.0308	8.88 J
2013-BSB-10 (4-5)	04/11/13	4-5	0.0713 J	25.2
2013-BSB-10 (8-10)	04/11/13	8-10	7.68	**2590**
2013-BSB-10 (11.4)	04/11/13	11.4	0.488	30.9
MW-31 (0.9-2)[3]	05/09/13	0.9-2	1.67 NS	**12900 NS**
MW-31 (0.9-2) Dup[3]	05/09/13	0.9-2	<0.0304 NS	68 NS
MW-31 (5.8-8)	05/09/13	5.8-8	1.35 NS	**1210 NS**
MW-31 (9.5)	05/09/13	9.5	0.245 J, NS	41 NS
MW-31R (0.9-2)	05/21/13	0.9-2	0.0737 J	18.3 J
MW-31R (0.9-2) Dup	05/21/13	0.9-2	0.0397 J	10.7 J
MW-31R (5.8-7.3)	05/21/13	5.8-7.3	5.8	**3150**
MW-31R (9.5)	05/21/13	9.5	0.288 J	35.4 J
Raw Material Storage Building and Immediate Vicinity				
2012-RMSA-1(1.5-2.5')	01/06/12	1.5-2.5	1.3	116
2012-RMSA-2 (0.5-2.5')	01/05/12	0.5-2.5	2.9	**2950**
2013-RMSA-2 (2.5-4')	03/06/13	2.5-4	--	**1520**
2013-RMSA-2 (4-5')	03/06/13	4-5	--	18.9

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
***Raw Material Storage Building and Immediate Vicinity* (Continued)**				
2012-RMSA-3 (1-3')	01/05/12	1-3	3.9	412
2012-RMSA-4 (1.5-3.5')	01/06/12	1.5-3.5	2.5	**856**
2013-RMSA-5 (0-2')	03/06/13	0-2	0.96	63.4
2013-RMSA-6 (0-2')	03/06/13	0-2	4.00	**6690**
2013-RMSA-6 (2-4')	03/06/13	2-4	--	**4230**
2013-RMSA-6 (4-5')	03/06/13	4-5	--	24.2
2013-RMSA-7 (0-2')	03/06/13	0-2	4.16	**2130**
2013-RMSA-7 (2-4)	03/06/13	2-4	--	35.5
2013-RMSB-1 (1.5-2)	05/08/13	1.5-2*	14.3 J	**1920 J**
2013-RMSB-1 (2-5)	05/08/13	2-5	0.265 J	18.4
2013-RMSB-1 (2-5) Dup	05/08/13	2-5	0.463 J	49.3 J
2013-RMSB-1 (5-5.5)	05/08/13	5-5.5	1.37	240
2013-RMSB-1 (6)	05/08/13	6	0.46	27.8
2013-RMSB-2 (2.5-5)	05/08/13	2.5-5*	2.31	114
2013-RMSB-2 (5-6)	05/08/13	5-6	3.86	226
2013-RMSB-3 (1.5-2')	05/08/13	1.5-2*	0.303	56.4
2013-RMSB-3 (1.5-2') Dup	05/08/13	1.5-2*	0.233 J	66.7
2013-RMSB-3 (2-3)	05/08/13	2-3	<0.0283	8.78 J
2013-RMSB-3 (5-5.5)	05/08/13	5-5.5	0.719	142
2013-RMSB-3 (6)	05/08/13	6	0.183 J	37.6
2013-RMSB-4 (0-2)	05/07/13	0-2	0.471 J	39.7
2013-RMSB-4 (2-5)	05/07/13	2-5	<0.0278	8.26
2013-RMSB-4 (5-6)	05/07/13	5-6	7.40	**2820**
2013-RMSB-5 (1.3-2)	05/07/13	1.3-2*	**72.1**	**1790 J**
2013-RMSB-5 (1.3-2) Dup	05/07/13	1.3-2*	**65.2**	**1580 J**
2013-RMSB-5 (2-5)	05/07/13	2-5	23.9	**4330**
2013-RMSB-5 (5-7)	05/07/13	5-7	**60.7**	**10200**
2013-RMSB-5 (9)	05/07/13	9	1.07	36.8
2013-RMSB-6 (1.3-2)	05/07/13	1.3-2*	0.949	**615**
2013-RMSB-6 (1.3-2) Dup	05/07/13	1.3-2*	0.878	**716**
2013-RMSB-6 (2-2.5)	05/07/13	2-2.5	0.0522 J	16.6
2013-RMSB-6 (5-7)	05/07/13	5-7	0.49	25.3
2013-RMSB-6 (7.5)	05/07/13	7.5	0.499	20.9
2013-RMSB-7 (1.5-2)	05/08/13	1.5-2*	0.372	115
2013-RMSB-7 (2-4)	05/08/13	2-4	0.405	25.9
2013-RMSB-7 (5-6)	05/08/13	5-6	0.379	175
2013-RMSB-7 (6.5)	05/08/13	6.5	0.475	63.5
2013-RMSB-8 (2.1-3.1)	05/08/13	2.1-3.1*	1.93	314
2013-RMSB-8 (5-7)	05/08/13	5-7	18.7	**4240**
2013-RMSB-8 (7.5)	05/08/13	7.5	0.379	23

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
***Raw Material Storage Building and Immediate Vicinity* (Continued)**				
2013-RMSB-9 (1.3-2)	05/07/13	1.3-2*	4.05	**1210**
2013-RMSB-9 (2-2.5)	05/07/13	2-2.5	0.402	68.5
2013-RMSB-9 (5-7)	05/07/13	5-7	0.449	50.1
2013-RMSB-9 (8)	05/07/13	8	0.435	16.7
2013-RMSB-10 (1.3-2)	05/08/13	1.3-2*	23.5	12.9
2013-RMSB-10 (2-3)	05/08/13	2-3	17.2	**1030**
2013-RMSB-10 (5-6)	05/08/13	5-6	35.8	**911**
2013-RMSB-10 (7)	05/08/13	7	0.506	19.2
Slag Treatment Building				
2013-STB-1 (0-2')	03/06/13	0-2	**181**	**7050**
2013-STB-1 (2-4')	03/06/13	2-4	**483**	**634**
2013-STB-1 (4-5')	03/06/13	4-5	7.06	149
2013-STB-2 (2.5-4')	03/06/13	2.5-4	1.13 J	150 J
2013-STB-2 (2.5-4') Dup	03/06/13	2.5-4	3.43 J	**773 J**
2013-STB-2 (4-5')	03/06/13	4-5	--	18.8
2013-STB-3 (0-2')	03/06/13	0-2	8.21 J	82.1 J
2013-STB-4 (0-2')	03/06/13	0-2	**69.5**	**3720**
2013-STB-4 (2-4')	03/06/13	2-4	**124**	**16100**
2013-STB-4 (4-5')	03/06/13	4-5	9.21	77.9
2013-STB-5 (0.5-1.5')	03/14/13	0.5-1.5*	2.35	178
2013-STB-5 (0.5-1.5') Dup	03/14/13	0.5-1.5*	2.26	159
2013-STB-6 (0.5-1.1')	03/14/13	0.5-1.1*	**146**	**620**
2013-STB-7 (0.5-1.2')	03/14/13	0.5-1.2*	6.65	**1430**
2013-STB-8 (0.8-1.3')	03/14/13	0.8-1.3*	7.80	**1190**
2013-STB-9 (0.5-1.0')	03/14/13	0.5-1*	24.9	**2640**
2013-STB-9 (5-5.5)	05/07/13	5-5.5	0.467	38.8
2013-STB-10 (0.5-1.1')	03/14/13	0.5-1.1*	7.5 J	137
2013-STB-11 (0.5-1.3')	03/14/13	0.5-1.3*	16.6	**1100**
2013-STB-12 (0.5-1.2')	03/14/13	0.5-1.2*	**103**	**1070**
Flood Wall - Facility Side				
2012-FWFS-1 (Wall)	10/22/12	2.0	4.7	**22900**
2012-FWFS-1 (Floor)	10/22/12	4.0	**143**	**4410**
2012-FWFS-1 (4-5')	03/06/13	4-5	0.528	30.9 J
2012-FWFS-2 (Wall)	10/22/12	2.4	0.27	13
2012-FWFS-2 (Floor)	10/22/12	4.0	0.11	18
2012-FWFS-3 (Wall)	10/22/12	1.9	0.26	32
2012-FWFS-3 (Floor)	10/22/12	3.0	0.27	33
2012-FWFS-4 (Wall)	09/24/12	1.6	0.47	47
2012-FWFS-4 (Floor)	09/24/12	3.1	4.0	**504**
2012-FWFS-4 (3-4')	04/29/13	3-4	**--**	17.2

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
Flood Wall - Facility Side **(Continued)**				
2012-FWFS-5 (Wall)	09/24/12	1.7	**273**	**52000**
2012-FWFS-5 (Floor)	09/24/12	3.3	1.4	358
2012-FWFS-6 (Wall)	09/04/12	1.1	**69**	**6970**
2012-FWFS-6 (Floor)	09/04/12	2.1	**387**	**4860**
2012-FWFS-6 (2-4')	04/29/13	2-4	13.3	324
2012-FWFS-7 (Wall)	09/04/12	1.2	35	**8540**
2012-FWFS-7 (Floor)	09/04/12	2.3	0.56	29
2012-FWFS-8 (Wall)	09/04/12	1.1	3.3	**1550**
2012-FWFS-8 (Floor)	09/04/12	2.2	10	**537**
2012-FWFS-8 (2-4')	04/29/13	2-4	--	13.5
2012-FWFS-9 (Wall)	09/04/12	1.8	15	**7480**
2012-FWFS-9 (Floor)	09/04/12	2.4	**984**	**2800**
2012-FWFS-9 (2.5-4')	04/29/13	2.5-4	0.624	21
NOR WMU Nos. 6, 14, and 16				
2013-WMU6-1 (0.9-2)	05/07/13	0.9-2*	2.41 J	**10800 J**
2013-WMU6-1 (2-4)	05/07/13	2-4	--	**33200**
2013-WMU6-1 (4-5)	05/07/13	4-5	--	46.5
2013-WMU14-1 (0.9-2)	05/07/13	0.9-2*	16.6	**95000**
2013-WMU14-1 (0.9-2) Dup	05/07/13	0.9-2*	13.6	**69000**
2013-WMU14-1 (2-4)	05/07/13	2-4	--	**31400**
2013-WMU14-1 (4-5)	05/07/13	4-5	--	**3470**
2013-WMU14-2 (0.9-2)	05/07/13	0.9-2*	2.52	100
2013-WMU14-3 (0.9-2)	05/07/13	0.9-2*	0.357	11.6
2013-WMU16-1 (0.9-2)	05/07/13	0.9-2*	0.415	18.2
Bale Stabilization Area				
2012-BSA-1 (0-2')	01/04/12	0-2	5.1	**1250**
2012-BSA-1A (0-2')	03/23/12	0-2	--	97
2012-BSA-2 (0-2')	01/04/12	0-2	**102**	**25900**
2012-BSA-2 (2-4')	04/29/13	2-4	0.652	123
2012-BSA-3 (0-2')	01/04/12	0-2	**95**	106
2012-BSA-3A (0-2')	03/23/12	0-2	**935**	--
2012-BSA-4 (0-2')	01/04/12	0-2	1.0	**1090**
2012-BSA-4a (0-1')	03/29/12	0-1	9.8	**1510**
2012-BSA-4b (0-1')	03/29/12	0-1	3.3	344
2012-BSA-4c (0-1')	03/29/12	0-1	17	**2730**
2012-BSA-4d (0-1')	03/29/12	0-1	17	**3000**
2012-BSA-4e (0-1')	03/29/12	0-1	6.2	**634**
2012-BSA-5 (0-2')	01/04/12	0-2	13	**858**
MW-23 (0-0.5)	03/05/13	0-0.5	3.5	**1280**
MW-23 (0.5-2)	03/05/13	0.5-2	--	481

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
Maintenance Building				
2013-MB-1 (0-2')	03/14/13	0-2	0.04 J	46.7
2013-MB-2 (0-2')	03/14/13	0-2	2.32	245
Battery Breaker Area				
MW-30 (0-0.5')	03/27/13	0-0.5	**62.7 J**	**20300**
MW-30 (0-0.5') Dup	03/27/13	0-0.5	32 J	**19200**
MW-30 (0.5-2')	03/27/13	0.5-2	--	128
2013-RRS-3A (0.8-2')	03/27/13	0.8-2*	13.0	**2610**
2013-RRS-3A (2-4')	03/27/13	2-4	--	84.2
2013-RRS-4A (0.9-2')	05/21/13	0.9-2	18.2	**5540**
2013-BB-1 (0.9-2)	05/21/13	0.9-2	16.1	**3960**
Truck Staging Area and Administrative Building Area				
2013-AD-1 (0-0.5')	3/14/2013	0-0.5	7.52	**2570**
2013-AD-1 (0.5-2')	3/14/2013	0.5-2	--	174 J
2013-AD-2 (0-0.5')	3/15/2013	0-0.5	9.62	**3770**
2013-AD-2 (0.5-2')	4/29/2013	0.5-2	--	**569 J**
2013-AD-2 (0.5-2') Dup	4/29/2013	0.5-2	--	306 J
2013-AD-2 (2-4')	4/29/2013	2-4	--	114 J
2013-AD-2A (0-0.5')	3/27/2013	0-0.5	0.296 J	175
2013-FOP-1 (0-0.5')	3/14/2013	0-0.5	20.1	**6460**
2013-FOP-1 (0.5-2')	3/14/2013	0.5-2	--	**505**
2013-FOP-1 (2-4)	3/14/2013	2-4	--	90.4 J
2013-MW10-1 (0-0.5')	03/05/13	0-0.5	0.578	202 J
2013-MW10-2 (0-0.5)	03/05/13	0-0.5	3.25	**1200**
2013-MW10-2 (0.5-2)	03/05/13	0.5-2	--	44.1
2013-MW10-3 (0-0.5')	03/05/13	0-0.5	18.8	**3920 J**
2013-MW10-3 (0-0.5') Dup	03/05/13	0-0.5	13.6	**1520 J**
2013-MW10-3 (0.5-2')	03/05/13	0.5-2	--	208
2013-TS-1 (0-0.5')	03/14/13	0-0.5	0.183J	10.2 J
2013-TS-2 (0-0.5')	03/14/13	0-0.5	0.591	98.6
STEWART CREEK CORRIDOR				
2012-FWCS-1 (0-2')	01/18/12	0-2	10	**2240**
2012-FWCS-1 (2-2.5')	09/04/12	2-2.5	--	**6270**
2012-FWCS-1 (2.5-4')	03/05/13	2.5-4	--	**780**
2012-FWCS-1 (4-5')	03/05/13	4-5	--	22
2012-FWCS-1A (1-2')	03/05/13	1-2*	--	**19400**
2012-FWCS-1A (1-2') Dup	03/05/13	1-2	--	**12100**
2012-FWCS-1A (2-4')	03/05/13	2-4	--	12.4
2013-FWCS-1B (1.1-1.6')	03/15/13	1.1-1.6*	0.783	80.1 JH
2012-FWCS-2 (0-2')	01/19/12	0-2	0.076	24
2012-FWCS-3 (0-2')	01/19/12	0-2	0.15	35

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
STEWART CREEK CORRIDOR (Continued)				
2012-FWCS-4 (0-2')	01/19/12	0-2	0.12	158
2012-FWCS-5 (0-2')	01/19/12	0-2	1.3	224
2012-FWCS-6 (0-2')	01/19/12	0-2	0.90	253
2012-FWCS-7 (0-2')	01/19/12	0-2	0.58	64
2012-FWCS-8 (0-2')	01/18/12	0-2	234	**853**
2012-FWCS-9 (0-2')	01/18/12	0-2	3.1	81
2012-FWCS-11 (0-2')	09/04/12	0-2	--	217
2012-FWCS-12 (0-2')	09/04/12	0-2	--	**20500**
2012-FWCS-12 (2-2.7')	03/15/13	2-2.7	4.09	**31000**
2012-FWCS-12 (4-5')	03/15/13	4-5	--	19.1
2013-FWFS-1A (2-4')	03/05/13	2-4	--	15
2013-FWFS-1A (4-5')	03/05/13	4-5	--	14.9
2012-FWFS-7A (0-0.5)	05/21/13	0-0.5	0.32	44.7 J
2013-MW-17A (0-0.5')	03/15/13	0-0.5	0.921	279
2013-RO-1 (0-0.5')	03/05/13	0-0.5	2.91	**1170**
2013-RO-1 (0.5-1')	03/05/13	0.5-1	--	19.8
2013-RO-2 (0-0.5')	03/05/13	0-0.5	5.26	**811**
2013-RO-3 (0-0.5')	03/15/13	0-0.5	0.347	26.1 J
MW-24 (0-0.5')	03/05/13	0-0.5	0.0829 J	8.82 J
MW-27 (0-1')	03/05/13	0-1	--	400
MW-29 (0-0.5')	03/06/13	0-0.5	3.38	455
MW-29 (2.5-4')	03/05/13	2.5-4	1.56	87.3
MW-29 (4-5')	03/05/13	4-5	< 0.0306	8.6
SCC-1 (0-0.5')	01/15/13	0-0.5	1.21	188
SCC-2 (0-0.5')	01/15/13	0-0.5	0.897	99.4
SCC-3 (0-0.5')	01/15/13	0-0.5	33.3	**3510**
SCC-3 (0.5-2')	03/05/13	0.5-2	--	**535**
SCC-3 (2-4')	03/05/13	2-4	--	**1300 J**
SCC-3 (4-5')	03/05/13	4-5	--	15.2
SCC-3A (0-0.5')	03/05/13	0-0.5	--	140
SCC-4 (0-0.5')	01/15/13	0-0.5	0.851	199
SCC-5 (0-0.5')	01/15/13	0-0.5	1.51	443
SCC-6 (0-0.5')	01/15/13	0-0.5	1.04	200
SCC-7 (0-0.5')	01/15/13	0-0.5	0.681	186
SCC-8 (0-0.5')	01/15/13	0-0.5	6.93	**4870**
SCC-9 (0-0.5')	01/15/13	0-0.5	2.36	149
SCC-10 (0-0.5')	01/15/13	0-0.5	6.55	**1510**
SCC-10 (0.5-2')	03/05/13	0.5-2	--	23.5
SCC-10A (0-0.5')	03/05/13	0-0.5	1.40	296
SCC-11 (0-0.5')	01/15/13	0-0.5	**106**	**788**

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
STEWART CREEK CORRIDOR (Continued)				
SCC-11 (2-4')	03/06/13	2-4	0.538	17.6 J
SCC-11 (2-4') Dup	03/06/13	2-4	0.697	60.9 J
SCC-11A (0-0.5')	03/06/13	0-0.5	2.45	268
SCC-12 (0-0.5')	01/15/13	0-0.5	1.44	210
SCC-13 (0-0.5')	01/15/13	0-0.5	0.253 J	34.6
SCC-14 (0-0.5')	01/15/13	0-0.5	0.158 J	42.7
SCC-15 (0-0.5')	01/15/13	0-0.5	1.62 J	177
NORTH AREA				
Slag Landfill and Boneyard				
2012-BY-1 (0-2')	01/04/12	0-2	1.0	28
2012-BY-2 (0-2')	01/04/12	0-2	13	**1420**
2012-BY-3 (0-2')	01/04/12	0-2	0.90	75
2012-BY-4 (0-2')	01/04/12	0-2	**66**	**47000**
2012-BY-5 (0-2')	01/04/12	0-2	5.4	431
2012-SL-1 (0-2')	01/10/12	0-2	2.3	379
2012-SL-1 (2-4')	01/10/12	2-4	50	**7970**
2012-SL-1 (4-5')	03/06/13	4-5	--	**48500**
2012-SL-2 (0-2')	01/10/12	0-2	0.80	84
2012-SL-2 (5-7')	01/10/12	5-7	0.58	7.3
2012-SL-3 (0-2')	01/10/12	0-2	0.75	47
2012-SL-3 (8-10')	01/10/12	8-10	1.0	7.2
2013-SL-4 (0-0.5')	03/07/13	0-0.5	21.5	82.3
2013-WMU17-1 (0-0.5')	3/15/2013	0-0.5	6.14	**1350**
2013-WMU17-2 (0-0.5')	3/15/2013	0-0.5	6.09	**1460**
North Disposal Area				
2012-NDA-1 (0-2')	01/10/12	0-2	4.0	318
2012-NDA-1 (2-4')	01/10/12	2-4	27	**7060**
2012-NDA-1 (4-5')	03/05/13	4-5	--	19
2012-NDA-2 (0-2')	01/10/12	0-2	1.8	284
2012-NDA-2 (2-4')	01/10/12	2-4	0.68	**1030**
2012-NDA-2 (16-18')	01/10/12	16-18	0.036	14
2012-NDA-3 (0-2')	01/10/12	0-2	11	**2410**
2012-NDA-3 (17-19')	01/10/12	17-19	0.034	8.9
2012-NDA-4 (2-4')	02/22/12	2-4	--	228
2012-NDA-6 (0-2')	02/22/12	0-2	--	113
North Tributary Corridor and North Wooded Area				
D-11	03/28/12	0-0.5	3.62	**524**
D-11 (0.5-1.0')	04/22/13	0.5-1	--	312
D-12	03/28/12	0-0.5	3.71	**522**

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
North Tributary Corridor and North Wooded Area **(Continued)**				
D-12 (0.5-1')	04/22/13	0.5-1	--	29.7
D-13	03/28/12	0-0.5	2.98	434
D-14	03/28/12	0-0.5	1.445 J	204
D-15	03/28/12	0-0.5	1.61 J	245
E-11	03/28/12	0-0.5	17.8	**2920**
E-11 (0.5-2')	03/06/13	0.5-2	--	109
E-11 (2-4')	03/06/13	2-4	0.865	46
E-11 (4-5')	03/06/13	4-5	0.511	5.26
E-11 (5-7')	04/29/13	5-7	0.385	--
E-11 (7-9')	04/29/13	7-9	0.485	--
E-11 (9-10.7')	04/29/13	9-10.9	0.367	--
E-11A (0-0.5')	03/06/13	0-0.5	3.89	**816**
E-11A (0.5-1')	04/22/13	0.5-1	--	285
E-11B (0-0.5')	03/15/13	0-0.5	0.922	216
E-12	03/28/12	0-0.5	18.3	**2610**
E-12 (0.5-1')	04/22/13	0.5-1	--	70
E-13	03/28/12	0-0.5	10.1	**1850**
E-13 (0.5-1)	04/22/13	0.5-1	--	33.6
E-14	03/28/12	0-0.5	5.64	**1090**
E-14 (0.5-1')	04/22/13	0.5-1	--	54.9
E-15	03/28/12	0-0.5	4.34	**893**
E-15 (0.5-1')	04/22/13	0.5-1	--	43.6
E-15A (0-0.5')	03/06/13	0-0.5	1.51	234
ECO-11 (0-0.5')	03/05/13	0-0.5	0.809	45.3
ECO-12 (0-0.5')	03/05/13	0-0.5	0.953	240
MW-21 (0-0.5')	03/05/13	0-0.5	0.340	8.6
MW-22 (0-0.5')	03/05/13	0-0.5	0.853	84.2
Class 2 Landfill Area				
2013-PMW-19R (0-0.5)	02/26/13	0-0.5	< 0.0302	20.4
2013-PMW-20R (0-0.5)	02/26/13	0-0.5	0.362	149
2013-LMW-21 (0-0.5)	02/27/13	0-0.5	0.796	209
2013-LMW-22 (0-0.5)	02/27/13	0-0.5	1.32	282
SOUTH AREA				
South Disposal Area				
2013-BS2-1 (0.5-2')	4/29/2013	0.5-2	--	73.9
BS-3 (1-2')	03/04/13	1-2	--	**610**
BS-3 (2-4')	03/04/13	2-4	--	40.2
2013-B4R-A (0-0.5')	04/29/13	0-0.5	0.181J	187 J
2013-B4R-A (0-0.5') Dup	04/29/13	0-0.5	0.712	382 J

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
South Disposal Area **(Continued)**				
2013-BS5-1 (0.5-2')	04/29/13	0.5-2	--	3.85
2012-SDA-1 (0-2')	01/04/12	0-2	1.2	164
2012-SDA-1 (2-4')	01/04/12	2-4	0.32	33
2012-SDA-2 (0-2')	01/04/12	0-2	7.0	**1090**
2012-SDA-2 (2-4')	01/04/12	2-4	0.30	11.3
2012-SDA-3 (0-2')	01/04/12	0-2	1.0	74
2012-SDA-3 (2-4')	01/04/12	2-4	0.57	13
2013-SDA-3A (0-0.5')	03/04/13	0-0.5	1.14	452
2012-SDA-4 (0-2')	01/04/12	0-2	0.83	20
2012-SDA-4 (2-4')	01/04/12	2-4	0.53	4.2
2013-SDA-4A (0-0.5')	03/04/13	0-0.5	5.02	**1570**
2013-SDA-4A (0.5-2')	03/04/13	0.5-2	--	69.6
2012-SDA-5 (0-2')	01/04/12	0-2	1.1	91
2012-SDA-5 (2-2.9')	01/04/12	2-2.9	0.36	3.7
South Wooded Area				
ECO-1 (0-0.5')	01/15/13	0-0.5	1.85	431
ECO-2 (0-0.5')	01/15/13	0-0.5	3.19	396
ECO-3 (0-0.5')	01/15/13	0-0.5	10.1	**1740**
ECO-3 (0.5-2')	03/06/13	0.5-2	--	43.9
ECO-4 (0-0.5')	01/15/13	0-0.5	2.97	373
ECO-5 (0-0.5')	01/15/13	0-0.5	1.62	221
ECO-6 (0-0.5')	01/15/13	0-0.5	7.92	**1030**
ECO-6 (0.5-2')	03/04/13	0.5-2	--	22.7
ECO-7 (0-0.5')	01/15/13	0-0.5	14.6	**2340**
ECO-7 (0.5-2')	03/06/13	0.5-2	--	76.5 J
ECO-7 (0.5-2') Dup	03/06/13	0.5-2	2.64	400 J
ECO-7A (0-0.5')	03/06/13	0-0.5	3.61	**606**
ECO-7B (0-0.5')	03/15/13	0-0.5	2.48	327
ECO-8 (0-0.5')	01/15/13	0-0.5	3.61	**600**
ECO-8 (0.5-2')	03/04/13	0.5-2	--	112
ECO-9 (0-0.5')	01/15/13	0-0.5	12.6	**2050**
ECO-9 (0.5-2')	03/04/13	0.5-2	--	412
ECO-10 (0-0.5')	01/15/13	0-0.5	3.30	345
Crystallization Unit Area				
2012 CUFT-1(0-2')	01/06/12	0-2	0.34	13
2012 CUFT-2 (0-2')	01/06/12	0-2	0.47	33
2013-CUFT-3 (0-0.5')	03/04/13	0-0.5	1.58 J	25.4 J
2013-CUFT-4 (0-0.5')	03/04/13	0-0.5	4.38	107
2013-CUFT-5 (0-0.5')	03/04/13	0-0.5	3.10	442
2013-CUFT-6 (0-0.5')	03/04/13	0-0.5	7.65	71.3 J
2013-CUFT-6 (0-0.5') Dup	03/04/13	0-0.5	7.80	365 J

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
Crystallization Unit Area **(Continued)**				
2013-CUFT-7 (0-0.5')	03/04/13	0-0.5	5.68	**746**
2013-CUFT-7 (0.5-2')	03/04/13	0.5-2	--	267
2013-CUFT-7A (0-0.5')	03/07/13	0-0.5	5.83	80.2
2013-CUFT-8 (0-0.5')	03/04/13	0-0.5	0.192 J	28.8
2013-CUFT-9 (0-0.5')	03/04/13	0-0.5	0.307	32.8
2013-CUFT-10 (0-0.5')	03/07/13	0-0.5	1.53	319
Shooting Range Berm and South Berm Verification Samples				
SRB-VS-1	05/15/13	0-0.5	0.186 J	27.8
SRB-VS-2	05/15/13	0-0.5	0.132 J	58.1
SRB-VS-3	05/15/13	0-0.5	0.891	20.7
SRB-VS-4	05/15/13	0-0.5	0.551	21.8
SRB-VS-5	05/15/13	0-0.5	2.43	477
SRB-VS-6	05/15/13	0-0.5	0.159 J	11.3
SRB-VS-7	05/15/13	0-0.5	0.729	24.8
SRB-VS-8	05/15/13	0-0.5	0.682	40.4
SRB-VS-9	05/15/13	0-0.5	7.79	**1330**
SRB-VS-9 (0.5-2)	05/21/13	0.5-2	0.0522 J	14.8 J
SRB-VS-9A (0-0.5)	05/21/13	0-0.5	6.58	**1040**
SRB-VS-9B (0-0.5)	05/21/13	0-0.5	1.39	305
SRB-VS-9C	06/03/13	0-0.5	1.81	333
SRB-VS-10	05/15/13	0-0.5	1.35	203
SRB-VS-11	05/15/13	0-0.5	2.47	384
SB-VS-1	06/03/13	0-0.5	1.20	6.1
SB-VS-2	06/03/13	0-0.5	1.13	12.9
LAKE PARCEL				
F-4	3/28/2012	0-3"	2.51 J	255
F-5	3/28/2012	0-3"	3.51	367
G-4	3/28/2012	0-3"	2.17	222
G-4 (1ft)	3/27/2013	1	< 0.0325	18.2
G-5	3/28/2012	0-3"	2.61 J	273
G-5 (1ft)	3/27/2013	1	< 0.0346	13.9
G-6	3/28/2012	0-3"	1.96 J	268
H-3	3/28/2012	0-3"	1.06 J	154
H-4	3/28/2012	0-3"	< 1.05	120
H-4 (1ft)	3/27/2013	1	0.0782 J	17.9
H-5	3/28/2012	0-3"	1.54 J	147
H-5 (1ft)	3/27/2013	1	< 0.0325	15.9

Table 4D.1 Soil Data Summary - Cadmium and Lead

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
LAKE PARCEL (Continued)				
H5-2	2/7/2013	0-3"	1.40	154
H4-2	2/7/2013	0-3"	1.30	145
G4-2	2/7/2013	0-3"	1.50	166

Notes:

1. [1] - The Residential Assessment Level (RAL) is the lower of the TRRP residential Tier 1 $^{Tot}Soil_{Comb}$ (applicable to surface soil only) and Tier 2 $^{GW}Soil_{Class3}$ PCLs for a 30-acre source area (TCEQ, 2012c). The $^{Air}Soil_{Inh-V}$ pathway is not applicable to lead or cadmium and was therefore not used to develop RALs.
2. [2] - The critical PCL is the lower of the TRRP commercial-industrial Tier 1 $^{Tot}Soil_{Comb}$ (applicable to surface soil only) and Tier 2 $^{GW}Soil_{Class3}$ PCLs for a 30-acre source area (TCEQ, 2012c). The $^{Air}Soil_{Inh-V}$ pathway is not applicable to lead or cadmium and was therefore not used to develop critcial PCLs.
3. [3] - Discrepancies in the duplicate soil sample results for the 0.9- to 2-foot interval at sample location MW-31 (12,900 mg/kg and 68 mg/kg) indicate possible incorrect labeling of the 0.9- to 2-foot sample depth interval for this sample. Furthermore, an examinaton of the 0.9- to 2-foot samples by laboratory personnel indicate that the physical appearance of the duplicate sample is consistent with the physical appearance of the 0.9- to 2-foot interval as described on the boring log. The physical appearance of the parent sample from the 0.9- to 2-foot interval was consistent with the boring log descriptions of samples collected deeper in the core, suggesting that the 0.9- to 2-foot parent sample was collected from a deeper depth. To confirm the incorrect depth label, the approximate location of MW-31 was re-sampled on May 21, 2013 at the approximate depth intervals sampled on May 9, 2013. As shown above, the resample MW-31R results (also sampled in duplicate) confirm the suspect incorrect depth label on the original parent sample. As a conservative measure, all samples from boring MW-31 were flagged "NS" (not selected for use) and data from adjacent boring MW-31R were used for assessing soil concentrations at this location.
4. Surface Soil = 0-15 feet bgs for residential land use and 0-5 feet bgs for commercial-industrial land use; subsurface soil = greater than 15 feet bgs for residential land use and greater than 5 feet bgs for commercial-industrial land use.
5. RAL exceedances are bolded. Critical PCL exceedances are highlighted and bolded.
6. Data qualifiers: J - estimated result; JH - estimated result, biased high, NS - not selected for use.
7. bgs - Below ground surface.
8. * - Sub-slab or sub-gabion basket sample; top depth represents the approximate top of soil.
9. "--" - Not analyzed.

Table 4D.2 Soil Data Summary - Lead, Cadmium, and Additional Metals

Sample ID	Sample Date	Sample Depth	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Nickel	Selenium	Silver	Zinc
		(feet)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Residential Assessment Level[1]:			15	24	8096	38	52	26570	500	0.39	830	160	24	9900
Critical PCL[2]:			271	196	22192	92	852	74569	1600	0.39	7900	160	71	250000
Subsurface Soil Residential Assessment Level[1]:			271	301	22192	92	2950	120010	27451	0.39	7868	160	24	118024
Subsurface Soil Critical PCL[2]:			271	301	22192	92	2950	120010	27451	0.39	23500	160	71	352498
FORMER PRODUCTION AREA														
Raw Material Storage Area														
2013-RMSA-7 (0-2')	03/06/13	0-2	--	**25**	--	--	4.16	--	**2130**	--	--	0.669J	--	--
Raw Material Storage Building														
2013-RMSB-1 (1.5-2)	05/08/13		--	19.4	--	--	14.3	--	**1920**	--	--	< 0.351	--	--
2013-RMSB-1 (2-5)	05/08/13	1.5-2*	--	10.7	--	--	0.265 J	--	18.4	--	--	< 0.335	--	--
2013-RMSB-1 (2-5) Dup	05/08/13	2-5	--	12.0	--	--	0.463	--	49.3	--	--	0.715 J	--	--
2013-RMSB-1 (5-5.5)	05/08/13	5-5.5	--	13.2	--	--	1.37	--	240	--	--	0.741 J	--	--
2013-RMSB-1 (6)	05/08/13	6	--	11.7	--	--	0.46	--	27.8	--	--	0.661 J	--	--
2013-RMSB-2 (2.5-5)	05/08/13	2.5-5*	--	12.5	127	--	2.31	22.4	114	0.0104 J	--	0.722 J	<0.159	--
2013-RMSB-2 (5-6)	05/08/13	5-6	--	11.3	108	--	3.86	18.6	226	<0.00501	--	0.681 J	<0.153	--
2013-RMSB-3 (1.5-2')	05/08/13	1.5-2*	--	6.19	--	--	0.303	--	56.4	--	--	<0.308	--	--
2013-RMSB-3 (1.5-2') Dup	05/08/13	1.5-2*	--	4.50	--	--	0.233 J	--	66.7	--	--	<0.302	--	--
2013-RMSB-3 (2-3')	05/08/13	2-3	--	4.08 J	--	--	<0.0283	--	8.78 J	--	--	<0.285	--	--
2013-RMSB-3 (5-5.5')	05/08/13	5-5.5	--	5.92	--	--	0.72	--	142	--	--	<0.298	--	--
2013-RMSB-3 (6')	05/08/13	6	--	3.95	--	--	0.183 J	--	37.6	--	--	<0.327	--	--
2013-RMSB-4 (0-2)	05/07/13	0-2	--	4.78	121	--	0.0471 J	8.97	39.7	0.00537 J	--	<0.305	<0.14	--
2013-RMSB-4 (2-5)	05/07/13	2-5	--	6.41	48.6	--	<0.0278	8.94	8.26	<0.00385	--	<0.281	<0.129	--
2013-RMSB-4 (5-6)	05/07/13	5-6	--	16.8	131	--	7.40	21.6	**2820**	0.013 J	--	2.37 J	<0.14	--
2013-RMSB-5 (1.3-2)	05/07/13	1.3-2*	--	17.5	--	--	**72.1**	--	**1790**	--	--	4.77	--	--
2013-RMSB-5 (1.3-2) Dup	05/07/13	1.3-2*	--	14.7	--	--	**65.2**	--	**1580**	--	--	4.21	--	--
2013-RMSB-5 (2-5)	05/07/13	2-5	--	**43.3**	--	--	23.9	--	**4330**	--	--	0.544 J	--	--
2013-RMSB-5 (5-7)	05/07/13	5-7	--	**44.5**	--	--	**60.7**	--	**10200**	--	--	2.99	--	--
2013-RMSB-5 (9)	05/07/13	9	--	11.5	--	--	1.07	--	36.8	--	--	0.833 J	--	--
2013-RMSB-6 (1.3-2)	05/07/13	1.3-2*	--	8.6	--	--	0.949	--	**615**	--	--	0.318 J	--	--
2013-RMSB-6 (1.3-2) Dup	05/07/13	1.3-2*	--	6.32	--	--	0.878	--	**716**	--	--	<0.305	--	--
2013-RMSB-6 (2-2.5)	05/07/13	2-2.5	--	5.15	--	--	0.0522 J	--	16.6	--	--	<0.300	--	--
2013-RMSB-6 (5-7)	05/07/13	5-7	--	12.1	--	--	0.490	--	25.3	--	--	0.757 J	--	--
2013-RMSB-6 (7.5)	05/07/13	7.5	--	11.5	--	--	0.499	--	20.9	--	--	0.418 J	--	--
2013-RMSB-7 (1.5-2)	05/08/13	1.5-2*	--	3.96	--	--	0.372	--	115	--	--	<0.306	--	--
2013-RMSB-7 (2-4)	05/08/13	2-4	--	11.1	--	--	0.405	--	25.9	--	--	0.478 J	--	--
2013-RMSB-7 (5-6)	05/08/13	5-6	--	4.23	--	--	0.379	--	175	--	--	<0.293	--	--
2013-RMSB-7 (6.5)	05/08/13	6.5	--	10.7	--	--	0.475	--	63.5	--	--	0.411 J	--	--

Table 4D.2 Soil Data Summary - Lead, Cadmium, and Additional Metals

Sample ID	Sample Date	Sample Depth	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Nickel	Selenium	Silver	Zinc
		(feet)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Residential Assessment Level[1]:			15	24	8096	38	52	26570	500	0.39	830	160	24	9900
Critical PCL[2]:			271	196	22192	92	852	74569	1600	0.39	7900	160	71	250000
Subsurface Soil Residential Assessment Level[1]:			271	301	22192	92	2950	120010	27451	0.39	7868	160	24	118024
Subsurface Soil Critical PCL[2]:			271	301	22192	92	2950	120010	27451	0.39	23500	160	71	352498
Raw Material Storage Building (Continued)														
2013-RMSB-8 (2.1-3.1)	05/08/13	2.1-3.1*	--	16.3	--	--	1.93	--	314	--	--	1.59 J	--	--
2013-RMSB-8 (5-7)	05/08/13	5-7	--	**36.9**	--	--	18.7	--	**4240**	--	--	3.62J	--	--
2013-RMSB-8 (7.5)	05/08/13	7.5	--	10.7	--	--	0.379	--	23	--	--	0.526 J	--	--
2013-RMSB-9 (1.3-2)	05/07/13	1.3-2*	--	6.62	--	--	4.05	--	**1210**	--	--	0.467 J	--	--
2013-RMSB-9 (2-2.5)	05/07/13	2-2.5	--	4.79	--	--	0.402	--	68.5	--	--	<0.302	--	--
2013-RMSB-9 (5-7)	05/07/13	5-7	--	12.7	--	--	0.449	--	50.1	--	--	0.754 J	--	--
2013-RMSB-9 (8)	05/07/13	8	--	12.3	--	--	0.435	--	16.7	--	--	0.751 J	--	--
2013-RMSB-10 (1.3-2)	05/08/13	1.3-2*	--	5.07	55.3	--	23.5	9.51	12.9	<0.00439	--	0.346 J	<0.144	--
2013-RMSB-10 (2-3)	05/08/13	2-3	--	7.1	87.2	--	17.2	12.9	**1030**	0.0125 J	--	<0.311	<0.143	--
2013-RMSB-10 (5-6)	05/08/13	5-6	--	9.2	87.8	--	35.8	15.8	**911**	0.00409 J	--	0.43J	<0.138	--
2013-RMSB-10 (7)	05/08/13	7	--	12.1	122	--	0.506	21.6	19	<0.00445	--	0.57J	<0.152	--
Slag Treatment Building														
2013-STB-1 (0-2')	03/06/13	0-2	--	**97**	--	--	**181**	--	**7050**	--	--	1.62J	--	--
2013-STB-4 (0-2')	03/06/13	0-2	--	**38**	--	--	**69.5**	--	**3720**	--	--	0.866J	--	--
Bale Stabilization Area														
MW-23 (0-0.5')	03/05/13	0-0.5	--	11.2	--	--	3.5	--	**1280**	--	--	<0.298	--	--
Administrative Building Area														
2013-AD-2 (0-0.5)	03/15/13	0-0.5	--	16.8	--	--	9.62	--	**3770**	--	--	--	--	--
STEWART CREEK CORRIDOR														
2012-FWCS-1A (1-2')	03/05/13	1-2*	--	**115**	--	--	--	--	**19400**	--	--	12.6	--	--
SCC-3 (2-4')	03/05/13	2-4	--	9.0	--	--	--	--	**1300**	--	--	<0.302	--	--
SCC-12	01/15/13	0-0.5	--	14.2	--	--	1.44	--	210	--	--	--	--	--
NORTH AREA														
North Tributary Corridor and North Wooded Area														
E-11A (0-0.5)	03/06/13	0-0.5	--	**27.4**	--	--	3.89	--	**816**	--	--	--	--	--
ECO-11 (0-0.5)	03/05/13	0-0.5	--	11.1	--	--	0.809	--	45.3	--	--	--	--	--
ECO-12 (0-0.5)	03/05/13	0-0.5	--	11.9	--	--	0.953	--	240	--	--	--	--	--
MW-21 (0-0.5)	03/05/13	0-0.5	--	7.09	--	--	0.34	--	8.59	--	--	--	--	--
MW-22 (0-0.5)	03/05/13	0-0.5	--	13.0	--	--	0.853	--	84.2	--	--	--	--	--
Class 2 Landfill Area														
PMW-19R (0-0.5)	02/26/13	0-0.5	--	11.2	--	--	<0.0302	--	20.4	--	--	--	--	--
LMW-22	02/27/13	0-0.5	--	22.7	--	--	1.32	--	282	--	--	--	--	--

Table 4D.2 Soil Data Summary - Lead, Cadmium, and Additional Metals

Sample ID	Sample Date	Sample Depth	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Nickel	Selenium	Silver	Zinc
		(feet)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Residential Assessment Level[1]:			15	24	8096	38	52	26570	500	0.39	830	160	24	9900
Critical PCL[2]:			271	196	22192	92	852	74569	1600	0.39	7900	160	71	250000
Subsurface Soil Residential Assessment Level[1]:			271	301	22192	92	2950	120010	27451	0.39	7868	160	24	118024
Subsurface Soil Critical PCL[2]:			271	301	22192	92	2950	120010	27451	0.39	23500	160	71	352498
SOUTH AREA														
South Disposal Area														
SDA-4A (0.0-0.5)	03/04/13	0-0.5	--	12.4	--	--	5.02	--	**1570**	--	--	--	--	--
South Wooded Area														
ECO-7	01/15/13	0-0.5	--	18.1	--	--	14.6	--	**2340**	--	--	--	--	--
Crystalization Unit Area														
2012 CUFT-1 (0-2')	01/06/12	0-2	<0.29 R	7.2 J	51 J	0.764	0.34	8.22	13	--	12.4	<0.33	<0.15	55 J
2012 CUFT-2 (0-2')	01/06/12	0-2	<0.28 R	6.8 J	50 J	0.806	0.47	9.52	33	--	9.1	<0.32	<0.15	45 J
2013-CUFT-7(0-0.5)	03/04/13	0-0.5	--	13.2 J	--	--	5.68	--	**746**	--	--	--	--	--

Notes:

1. [1] - The Residential Assessment Level (RAL) is the lower of the TRRP residential Tier 1 $^{Tot}Soil_{Comb}$ (applicable to surface soil only), $^{Air}Soil_{Inh\text{-}V}$ (applicable to mercury only) and Tier 1 or Tier 2 $^{GW}Soil_{Class3}$ PCLs for a 30-acre source area (TCEQ, 2012c).
2. [2] - The critical PCL is the lower of the TRRP commercial-industrial Tier 1 $^{Tot}Soil_{Comb}$ (applicable to surface soil only), $^{Air}Soil_{Inh\text{-}V}$ (applicable to mercury only) and Tier 1 or Tier 2 $^{GW}Soil_{Class3}$ PCLs for a 30-acre source area (TCEQ, 2012c).
3. Surface Soil = 0-15 feet bgs for residential land use and 0-5 feet bgs for commercial-industrial land use; subsurface soil = greater than 15 feet bgs for residential land use and greater than 5 feet bgs for commercial-industrial land use.
4. RAL exceedances are bolded. Critical PCL exceedances are highlighted and bolded.
5. Data Qualifiers (see Section 3.5): J - estimated result; R - rejected data.
6. bgs - Below ground surface.
7. * - Sub-slab or sub-gabion basket sample; top depth represents the approximate top of soil.
8. "--" - Not analyzed.

Table 4D.3 Soil Data Summary - Total Petroleum Hydrocarbons (TX1005)

Sample ID	Sample Date	Sample Depth (feet bgs)	TPH: C6-C12 (mg/kg)	TPH: >C12-C28 (mg/kg)	TPH: >C28-C35 (mg/kg)	TPH: C6-C35 (mg/kg)
Default Residential Assessment Level[1]:			1065	1984	1984	NA
TPH Mixture Residential Assessment Level[2]:			NA	NA	NA	12500
FORMER PROCESS AREA						
Raw Material Storage Area						
2012-RMSA-1(1.5-2.5')	01/06/12	1.5-2.5	<4.94	<6.41	<10.1	<10.1
2012-RMSA-2 (0.5-2.5')	01/05/12	0.5-2.5	<6.59	<8.55	<13.5	<13.5
2012-RMSA-3(1-3')	01/05/12	1-3	<5.9	<7.66	<12.1	<12.1
2012-RMSA-4(1.5-3.5')	01/06/12	1.5-3.5	<6.29	<8.16	<12.9	<12.9
2013-RMSA-6 (2.6-3.3')	03/07/13	2.6-3.3	<5.39	<5.75	<5.75	<10.6
Flood Wall Facility Side						
2012-FWFS-1 (Floor)	10/22/12	4.0	<4.02 UJ	<4.30 UJ	<4.30 UJ	<7.92 UJ
2012-FWFS-1 (Wall)	10/22/12	2.0	<4.97 UJ	<5.31 UJ	<5.31 UJ	<9.79 UJ
2012-FWFS-2 (Floor)	10/22/12	4.0	<5.06 UJ	<5.40 UJ	<5.40 UJ	<9.95 UJ
2012-FWFS-2 (Wall)	10/22/12	2.4	<4.75 UJ	<5.07 UJ	<5.07 UJ	<9.35 UJ
2012-FWFS-3 (Floor)	10/22/12	3.0	<5.06 UJ	<5.40 UJ	<5.40 UJ	<9.95 UJ
2012-FWFS-3 (Wall)	10/22/12	1.9	<4.84 UJ	<5.17 UJ	<5.17 UJ	<9.53 UJ
2012-FWFS-4 (Floor)	09/24/12	3.1	<4.99	<5.33	<5.33	<9.82
2012-FWFS-4 (Wall)	09/24/12	1.6	<4.67	<4.99	<4.99	<9.2
2012-FWFS-5 (Floor)	09/24/12	3.3	<5.09	<5.44	<5.44	<10.0
2012-FWFS-5 (Wall)	09/24/12	1.7	<4.85	<5.18	<5.18	<9.54
2012-FWFS-6 (Floor)	09/04/12	2.1	<4.95	<5.29	<5.29	<9.74
2012-FWFS-6 (Wall)	09/04/12	1.1	<4.84	<5.17	<5.17	<9.53
2012-FWFS-7 (Floor)	09/04/12	2.3	<4.93	<5.27	<5.27	<9.71
2012-FWFS-7 (Wall)	09/04/12	1.2	<4.66	<4.98	<4.98	<9.18
2012-FWFS-8 (Floor)	09/04/12	2.2	<4.99	<5.33	<5.33	<9.82
2012-FWFS-8 (Wall)	09/04/12	1.1	<4.79	<5.12	<5.12	<9.43
2012-FWFS-9 (Floor)	09/04/12	2.4	<3.93	<4.20	<4.20	<7.74
2012-FWFS-9 (Wall)	09/04/12	1.8	<5.20	<5.56	<5.56	<10.2
2012-FWFS-9 (4-5')[2]	04/29/13	4-5	532 JH	4730 JH	228 JH	5490 JH
Slag Treatment Building						
2013-STB-2 (4-5')	03/07/13	4-5	<5.18	<5.53	<5.53	<10.2
2013-STB-6 (0.5-1.1')	03/14/13	0.5-1.1	71.4	550	1130	1750
2013-STB-11 (0.5-1.3')	03/14/13	0.5-1.3	55.5	416	1380	1850
STEWART CREEK CORRIDOR						
2012-FWCS-1 (0-2')	01/18/12	0-2	<5.99	<7.78	<12.3	<12.3
2012-FWCS-2 (0-2')	01/19/12	0-2	<5.85	30.5J	<12	30.5J
2012-FWCS-3 (0-2')	01/19/12	0-2	<6.05	<7.85	<12.4	<12.4
2012-FWCS-4 (0-2')	01/19/12	0-2	<6.58	<8.54	<13.5	<13.5
2012-FWCS-5 (0-2')	01/19/12	0-2	<6.12	<7.95	<12.6	<12.6
2012-FWCS-6 (0-2')	01/19/12	0-2	<6.33	<8.21	<13	<13
2012-FWCS-7 (0-2')	01/19/12	0-2	<6.66	<8.64	<13.7	<13.7
2012-FWCS-8 (0-2')	01/18/12	0-2	<6.22	<8.08	<12.8	<12.8
2012-FWCS-9 (0-2')	01/18/12	0-2	<6.73	<8.74	<13.8	<13.8
MW-27 (0-1')	03/05/13	0-1	<4.84	<5.17	<5.17	<9.53

Notes:

1. [1] - Default Residential Assessment Levels (RALs) are the lower of the TRRP residential Tier 1 $^{Tot}Soil_{Comb}$ and $^{GW}Soil_{Class3}$ PCLs for a 30-acre source (TCEQ, 2012c).
2. [2] - Default RALs were used as the applicable assessment levels for all soil samples analyzed for TPH except for sample 2012-FWFS-9 (4-5'), which was the only sample that exceeded a default RAL (for the >C12-C28 TPH range). A TPH Mixture RAL was developed with TPH TX1006 data from sample 2012-FWFS-9 (4-5') (see Appendix 9).
3. Results exceeding applicable RALs are bolded (no exceedances were observed).
4. Data Qualifiers (see Section 3.5): UJ - estimated result, not detected; JH - estimated result, biased high.
5. NA - Not applicable.

Table 4D.4 Soil Data Summary - Total Petroleum Hydrocarbons (TX1006)

Sample ID:			2012-FWFS-9 (4-5)	2013-STB-11(0.5-1.3)
Sample Date:			04/29/13	03/14/13
Sample Depth (feet):			4-5	0.5-1.3
TPH TX1006 Fraction	Default RAL[1]	TPH Mixture RAL[2]	(mg/kg)	(mg/kg)
nC6 Aliphatics	2500	--	<5.58 X7	<1.77 X7
<C6-C8 Aliphatics	2500	--	<5.30 X7	<1.68 X7
>C8-C10 Aliphatics	2700	--	67 X7, J	15.1 X7, J
>C10-C12 Aliphatics	2500	--	856 X7, JH	19.3 X7, J
>C12-C16 Aliphatics	3200	--	999 X7, JH	8.83 X7, J
>C16-C21 Aliphatics	133131	--	1110 X7, JH	22.9 X7
>C21-C35 Aliphatics	106505	--	126 X7, JH	168 X7
>C7-C8 Aromatics	1003	--	12.8 X7, J	11.7 X7, J
>C8-C10 Aromatics	1100	--	<14.4 X7	6.17 X7, J
>C10-C12 Aromatics	1500	--	62.9 X7, J	4.81 X7, J
>C12-C16 Aromatics	2000	--	684 X7, JH	13.3 X7, J
>C16-C21 Aromatics	1900	--	737 X7, JH	31.4 X7
>C21-C35 Aromatics	1900	--	157 X7, JH	383 X7
>C6-C35	--	12500	4810 X7, JH	684 X7

Notes:

1. [1] - Default Residential Assessment Levels (RALs) are the lower of the TRRP Tier 1 residential ${}^{Tot}Soil_{Comb}$ and ${}^{GW}Soil_{Class3}$ PCLs for a 30-acre source area (TCEQ, 2012c).
2. [2] - Default RALs were used as the applicable assessment levels for soil samples analyzed for TPH except for sample 2012-FWFS-9 (4-5'), which was the only sample that exceeded a default TPH RAL (for the >C12-C28 TPH range in the TX1005 analysis of this sample; see Table 4D.3). As shown in the table above, no exceedances of the default TPH TX1006 RALs were detected in either soil sample analyzed by this method.
3. Results that exceed applicable RALs are bolded (no exceedances detected).
4. Data Qualifiers (see Section 3.5): J - estimated result; JH - estimated result, biased high; X7 - TCEQ does not offer lab accreditation for this analyte.

Table 4D.5 Soil Data Summary - Volatile Organic Compounds and Semivolatile Organic Compounds

Sample ID:			2012-FWFS-9 (4-5')	2013-MB-1 (0-2')	2013-MB-1 (4-5')	2013-MB-2 (0-2')	MW-27 (0-1')	2013-STB-2 (4-5')	2013-STB-6 (0.5-1.1')	2013-STB-11 (0.5-1.3')	SCC-3 (0-0.5')	SCC-6 (0-0.5')	SCC-8 (0-0.5')	2013-RMSA-6 (2.6-3.3')	2013-RMSB-2 (2.5-5')	2013-RMSB-2 (5-6')	2013-RMSB-4 (0-2')	2013-RMSB-4 (2-5')	2013-RMSB-4 (5-6')	2013-RMSB-5 (2-5')	2013-RMSB-10 (1.3-2')	2013-RMSB-10 (2-3')	2013-RMSB-10 (5-6')	2013-RMSB-10 (7')
Sample Date:			4/29/2013	03/14/13	03/14/13	03/14/13	03/05/13	03/07/13	03/14/13	03/14/13	1/15/2013	1/15/2013	1/15/2013	03/07/13	5/8/2013	5/8/2013	5/7/2013	5/7/2013	5/7/2013	5/7/2013	5/8/2013	5/8/2013	5/8/2013	5/8/2013
Sample Depth (feet bgs):		Critical	4-5	0-2	4-5	0-2	0-1	4-5	0.5-1.1*	0.5-1.3*	0-0.5	0-0.5	0-0.5	2.6-3.3	2.5-5*	5-6	0-2	2-5	5-6	2-5	1.3-2*	2-3	5-6	7
	RAL[1]	PCL[2]	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Volatile Organic Compounds																								
1,1,1-Trichloroethane	81	81	<0.01010	<0.000844	<0.000967	<0.000944	--	<0.00101	<0.000813	<0.000819	--	--	--	<0.00105	<0.000989	<0.00518	<0.00092	<0.00088	<0.00097	<0.00094	<0.000906	<0.000915	<0.000904	<0.000995
1,1,2,2-Tetrachloroethane	1.15	2.59	<0.01180	<0.000992	<0.00114	<0.00111	--	<0.00119	<0.000956	<0.000963	--	--	--	<0.00123	<0.00116	<0.00609	<0.00108 UJL	<0.00103 UJL	<0.00114 UJL	<0.00111	<0.00107	<0.00108	<0.00106	<0.00117
1,1,2-Trichloroethane	1.00	1.00	<0.00993	<0.000833	<0.000954	<0.000931	--	<0.000998	<0.000802	<0.000808	--	--	--	<0.00104	<0.000976	<0.00511	<0.00090	<0.00086	<0.00095	<0.000928	<0.000894	<0.000903	<0.000892	<0.000982
1,1-Dichloroethane	925	2762	<0.01180	<0.000992	<0.00114	<0.00111	--	<0.00119	<0.000956	<0.000963	--	--	--	<0.00123	<0.00116	<0.00609	<0.00108	<0.00103	<0.00114	<0.00111	<0.00107	<0.00108	<0.00106	<0.00117
1,1-Dichloroethene	2.50	2.50	<0.01660	<0.00139	<0.00159	<0.00156	--	<0.00167	<0.00134	<0.00135	--	--	--	<0.00173	<0.00163	<0.00854	<0.00151	<0.00144	<0.00159	<0.00155	<0.00149	<0.00151	<0.00149	<0.00164
1,2-Dichloroethane	0.686	0.686	<0.01220	<0.00103	<0.00118	<0.00115	--	<0.00123	<0.000989	<0.000997	--	--	--	<0.00128	<0.00120	<0.00630	<0.00111	<0.00107	<0.00118	<0.00114	<0.0011	<0.00111	<0.0011	<0.00121
1,2-Dichloroethene, Total	NP	NP	<0.02580	<0.00217	<0.00248	<0.00242	--	<0.0026	<0.00209	<0.0021	--	--	--	<0.0027	<0.00254	<0.01330	<0.00235	<0.00225	<0.00248	<0.00241	<0.00233	<0.00235	<0.00232	<0.00256
1,2-Dichloropropane	1.14	1.14	<0.00965	<0.00081	<0.000927	<0.000905	--	<0.000971	<0.00078	<0.000786	--	--	--	<0.00101	<0.000949	<0.00497	<0.00088	<0.00084	<0.00093	<0.000902	<0.00087	<0.000878	<0.000867	<0.000955
2-Butanone (MEK)	1464	4374	<0.0258 UJ	<0.00217 UJ	<0.0367 UJ	<0.00242 UJ	--	<0.0266 UJ	<0.00209 UJ	<0.0021 UJ	--	--	--	<0.0027 UJ	<0.0157 UJ	<0.0133 UJ	<0.00235 UJL	<0.00225 UJL	<0.0175 J	<0.028	<0.00233	<0.00235	<0.023 UJ	<0.0535 UJ
2-Hexanone	16.1	48.2	<0.01370	<0.00115	<0.00132	<0.00129	--	<0.00138	<0.00111	<0.00112	--	--	--	<0.00143	<0.00135	<0.00707	<0.00125 UJL	<0.00120 UJL	<0.00132 UJL	<0.00128	<0.00124	<0.00125	<0.00123	<0.00136
4-Methyl-2-pentanone (MIBK)	247	739	<0.02000	<0.00168	<0.00192	<0.00187	--	<0.00201	<0.00161	<0.00163	--	--	--	<0.00209	<0.00196	<0.01030	<0.00182 UJL	<0.00174 UJL	<0.00192 UJL	0.00202 J	<0.0018	<0.00182	<0.0018	<0.00198
Acetone	2137	6383	0.04830J	0.172	0.347	0.241	--	0.1260	0.137	0.0361	--	--	--	<0.00236	0.133	<0.01160	<0.00205 UJL	<0.00196 UJL	0.114 J	0.23	0.0346	<0.00205	0.181	0.358
Benzene	1.28	1.28	<0.00857	<0.000719	<0.000823	0.00711	--	<0.000862	0.0406	0.0044J	--	--	--	0.00151J	<0.000842	<0.00441	<0.00078	<0.00075	<0.00082	<0.000801	<0.000772	<0.000779	<0.00077	<0.000847
Bromodichloromethane	3.27	7.33	<0.00897	<0.000753	<0.000862	<0.000842	--	<0.000903	<0.000725	<0.000731	--	--	--	<0.000936	<0.000882	<0.00462	<0.00082	<0.00078	<0.00086	<0.000839	<0.000808	<0.000816	<0.000806	<0.000888
Bromoform	31.6	70.7	<0.01860	<0.00156	<0.00179	<0.00175	--	<0.00187	<0.0015	<0.00152	--	--	--	<0.00194	<0.00183	<0.00960	<0.00169	<0.00162	<0.00179	<0.00174	<0.00168	<0.00169	<0.00167	<0.00184
Bromomethane	6.54	19.52	<0.0113 X8	<0.000947 X8	<0.00108 X8	<0.00106 X8	--	<0.00114 X8	<0.000912 X8	<0.000919 X8	--	--	--	<0.00118 X8	<0.00111 X8	<0.00581 X8	<0.00103 X8	<0.000982 X8	<0.00108 X8	<0.00105 X8	<0.00102 X8	<0.00103 X8	<0.00101 X8	<0.00112 X8
Carbon disulfide	679	2028	<0.00748	<0.000627	<0.000718	<0.000701	--	<0.000752	<0.000604	<0.000609	--	--	--	<0.00078	<0.000735	<0.00385	<0.00068 UJL	<0.000651 UJL	<0.000718 UJL	0.00418	<0.000674	<0.00068	<0.000672	0.00399 J
Carbon tetrachloride	3.09	3.09	<0.01540	<0.00129	<0.00148	<0.00144	--	<0.00155	<0.00124	<0.00125	--	--	--	<0.0016	<0.00151	<0.00791	<0.00140	<0.00134	<0.00148	<0.00144	<0.00138	<0.0014	<0.00138	<0.00152
Chlorobenzene	54.6	54.6	<0.01310	<0.0011	<0.00125	<0.00122	--	<0.00131	<0.00105	<0.00106	--	--	--	<0.00136	<0.00128	<0.00672	<0.00119	<0.00114	<0.00125	<0.00122	<0.00118	<0.00119	<0.00117	<0.00129
Chlorobromomethane	152	454	<0.02420	<0.00203	<0.00233	<0.00227	--	<0.00243	<0.00196	<0.00197	--	--	--	<0.00253	<0.00238	<0.01250	<0.00220	<0.00211	<0.00233	<0.00226	<0.00218	<0.0022	<0.00217	<0.00239
Chloroethane	1545	4615	<0.01900	<0.0016	<0.00183	<0.00179	--	<0.00191	<0.00154	<0.00155	--	--	--	<0.00199	<0.00187	<0.00981	<0.00173	<0.00166	<0.00183	<0.00178	<0.00171	<0.00173	<0.00171	<0.00188
Chloroform	8.01	13.46	0.0122 U	0.00134J	0.0013J	0.00139J	--	<0.000903	0.00128J	0.00109J	--	--	--	<0.000936	0.00114 U	0.00617 U	0.00138 U	0.00131 U	0.00154 U	0.00109 U	0.00127 U	0.000861 U	0.00115 U	<0.000888
Chloromethane	20.3	45.4	<0.02260	<0.00189	<0.00217	<0.00212	--	<0.00227	<0.00182	<0.00184	--	--	--	<0.00236	<0.00222	<0.01160	<0.00205	<0.00196	<0.00217	<0.00211	<0.00203	<0.00205	<0.00203	<0.00223
cis-1,2-Dichloroethene	12.4	12.4	<0.01130	<0.000947	<0.00108	<0.00106	--	<0.00114	<0.000912	<0.000919	--	--	--	<0.00118	<0.00111	<0.00581	<0.00103	<0.00098	<0.00108	<0.00105	<0.00102	<0.00103	<0.00101	<0.00112
cis-1,3-Dichloropropene	0.332	0.744	<0.00734	<0.000616	<0.000705	<0.000689	--	<0.000738	<0.000593	<0.000598	--	--	--	<0.000766	<0.000722	<0.00378	<0.00067	<0.00064	<0.00071	<0.000686	<0.000661	<0.000668	<0.00066	<0.000726
Dibromochloromethane	2.46	5.50	<0.01280	<0.00107	<0.00123	<0.0012	--	<0.00129	<0.00103	<0.00104	--	--	--	<0.00133	<0.00126	<0.00658	<0.00116	<0.00111	<0.00123	<0.00119	<0.00115	<0.00116	<0.00115	<0.00126
Ethylbenzene	382	382	<0.01390	<0.00116	0.00145J	<0.0013	--	<0.00139	0.0765	0.0322	--	--	--	<0.00145	<0.00136	<0.00714	<0.00126	<0.00121	<0.00133	<0.0013	<0.00125	<0.00126	<0.00125	<0.00137
Methyl tert-butyl ether	31	93	<0.02490	--	--	--	--	--	--	--	--	--	--	--	<0.00245	<0.01280	< 0.0023 UJL	< 0.0022 UJL	< 0.0024 UJL	0.00233	<0.00224	<0.00226	0.00316 J	<0.00246
Methylene Chloride	0.654	0.654	0.14 U	<0.0025	<0.00286	<0.00279	--	<0.00299	<0.00241	<0.00242	--	--	--	<0.00311	0.00539 J	0.0186 J	<0.00271	0.00434J	0.00504J	<0.00278	<0.00268	<0.00271	<0.00268	<0.00295
m-xylene & p-xylene	4700	5300	<0.02070	<0.00173	0.0068J	<0.00194	--	<0.00208	0.0171	<0.00168	--	--	--	<0.00216	<0.00203	<0.01060	<0.00188	<0.00180	<0.00199	<0.00193	<0.00186	<0.00188	<0.00186	<0.00204
o-Xylene	3536	3536	<0.01540	<0.00129	0.00422J	<0.00144	--	<0.0015	0.0148	0.00454J	--	--	--	<0.0016	<0.00151	<0.00791	<0.00140	<0.00134	<0.00148	<0.00144	<0.00138	<0.0014	<0.00138	<0.00152
Styrene	163	163	<0.00965	<0.00081	<0.000927	<0.000905	--	<0.000971	<0.00078	<0.000786	--	--	--	<0.00101	<0.000949	<0.00497	<0.00088	<0.00084	<0.00093	<0.000902	<0.00087	<0.000878	<0.000867	<0.000955
Tetrachloroethene	2.51	2.51	<0.00965	<0.00081	<0.000927	<0.000905	--	<0.000971	<0.00078	<0.000786	--	--	--	<0.00101	<0.000949	<0.00497	<0.00088	<0.00084	<0.00093	<0.000902	<0.00087	<0.000878	<0.000867	<0.000955
Toluene	411	411	<0.01880	0.00436J	0.00752	0.00857	--	<0.00189	0.0116	0.00555	--	--	--	<0.00196	<0.00184	<0.00967	<0.00171	<0.00163	<0.00180	<0.00175	<0.00169	<0.00171	<0.00169	<0.00186
trans-1,2-Dichloroethene	24.5	24.5	<0.01550	<0.0013	<0.00149	<0.00145	--	<0.00156	<0.00125	<0.00126	--	--	--	<0.00162	<0.00152	<0.00798	<0.00141	<0.00135	<0.00149	<0.00145	<0.0014	<0.00141	<0.00139	<0.00153
trans-1,3-Dichloropropene	1.79	4.02	<0.00789	<0.000662	<0.000758	<0.00074	--	<0.000793	<0.000637	<0.000642	--	--	--	<0.000823	<0.000775	<0.00406	<0.00072	<0.00069	<0.00076	<0.000737	<0.00071	<0.000717	<0.000708	<0.00078
Trichloroethene	1.68	1.68	<0.01900	<0.0016	<0.00183	<0.00179	--	<0.00191	<0.00154	<0.00155	--	--	--	<0.00199	<0.00187	<0.00981	<0.00173	<0.00166	<0.00183	<0.00178	<0.00171	<0.00173	<0.00171	<0.00188
Vinyl acetate	1549	2206	<0.01260	<0.00106	<0.00121	<0.00119	--	<0.00127	<0.00102	<0.00103	--	--	--	<0.00132	<0.00124	<0.00651	<0.00115 UJL	<0.0011 UJL	<0.00121 UJL	<0.00118	<0.00114	<0.00115	<0.00114	<0.00125
Vinyl chloride	1.11	1.11	<0.01220	<0.00103	<0.00118	<0.00115	--	<0.00123	<0.000989	<0.000997	--	--	--	<0.00128	<0.00120	<0.00630	<0.00111	<0.00107	<0.00118	<0.00114	<0.0011	<0.00111	<0.0011	<0.00121
Xylenes, Total	3722	6126	<0.01540	<0.00129	0.011	<0.00144	--	<0.00155	0.0319	0.00454J	--	--	--	<0.0016	<0.00151	<0.00791	<0.00140	<0.00134	<0.00148	<0.00144	<0.00138	<0.0014	<0.00138	<0.00152
Semivolatile Organic Compounds																								
1,2,4-Trichlorobenzene	69.5	107.0	--	--	--	--	<0.00268	--	--	--	--	--	--	--	<0.00279	<0.00293	<0.00259	<0.00247	<0.00273	--	<0.00257	<0.0026	<0.00256	<0.00282
1,2-Dichlorobenzene	389	571	--	--	--	--	<0.00385	--	--	--	--	--	--	--	<0.00402	<0.00422	<0.00373	<0.00355	<0.00393	--	<0.00369	<0.00373	<0.00368	<0.00405
1,3-Dichlorobenzene	61.6	88.2	--	--	--	--	<0.00196	--	--	--	--	--	--	--	<0.00205	<0.00215	<0.00190	<0.00181	<0.00200	--	<0.00188	<0.0019	<0.00188	<0.00207
1,4-Dichlorobenzene	105	105	--	--	--	--	<0.00287	--	--	--	--	--	--	--	<0.00299	<0.00314	<0.00278	<0.00264	<0.00293	--	<0.00275	<0.00278	<0.00274	<0.00302
1-Methylnaphthalene	147	330	--	--	--	--	--	--	0.358J	0.336J	<0.002	<0.0021	<0.0021	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	1691	5050	--	--	--	--	<0.0128	--	--	--	--	--	--	--	<0.0133	<0.014	<0.01240	<0.01180	<0.01300	--	<0.0122	<0.0124	<0.0122	<0.0134
2,4,6-Trichlorophenol	8.75	26.12	--	--	--	--	<0.00342	--	--	--	--	--	--	--	<0.00357	<0.00374	<0.00331	<0.00315	<0.00349	--	<0.00328	<0.00331	<0.00327	<0.0036
2,4-Dichlorophenol	17.6	52.5	--	--	--	--	<0.00493	--	--	--	--	--	--	--	<0.00515	<0.0054	<0.00478	<0.00455	<0.00504	--	<0.00473	<0.00478	<0.00472	<0.0052
2,4-Dimethylphenol	162	483	--	--	--	--	<0.0109	--	--	--	--	--	--	--	<0.0114	<0.012	<0.01060	<0.01010	<0.01120	--	<0.0105	<0.0106	<0.0105	<0.0115
2,4-Dinitrophenol	4.68	13.99	--	--	--	--	<0.00602	--	--	--	--	--	--	--	<0.00628	<0.00659	<0.00583	<0.00555	<0.00614	--	<0.00577	<0.00584	<0.00576	<0.00634
2,4-Dinitrotoluene	0.266	0.596	--	--	--	--	<0.0046	--	--	--	--	--	--	--	<0.0048	<0.00504	<0.00446	<0.00424	<0.00470	--	<0.00441	<0.00446	<0.0044	<0.00485
2,6-Dinitrotoluene	0.240	0.539	--	--	--	--	<0.00376	--	--	--	--	--	--	--	<0.00393	<0.00412	<0.00364	<0.00347	<0.00384	--	<0.00361	<0.00365	<0.0036	<0.00396
2-Chloronaphthalene	5042	49552	--	--	--	--	<0.00154	--	--	--	--	--	--	--	<0.00161	<0.00169	<0.00149	<0.00142	<0.00158	--	<0.00148	<0.0015	<0.00148	<0.00162
2-Chlorophenol	81.6	243.8	--	--	--	--	<0.00251	--	--	--	--	--	--	--	<0.00262	<0.00275	<0.00243	<0.00231	<0.00256	--	<0.00241	<0.00244	<0.0024	<0.00264
2-Methylnaphthalene	252	2478	--	--	--	--	<0.00349	--	0.391J	<0.147	<0.0035	<0.0036	<0.0037	--	0.00709 J	3.68	<0.00339	<0.00322	0.01140J	--	<0.00335	<0.00339	0.01 J	0.165
2-Methylphenol	356	1063	--	--	--	--	<0.00412	--	--	--	--	--	--	--	<0.0043	<0.00451	<0.00399	<0.00379	<0.00421	--	<0.00395	<0.00399	<0.00394	<0.00434
2-Nitroaniline	1.10	3.28	--	--	--	--	<0.00623	--	--	--	--	--	--	--	<0.00651	<0.00682	<0.00604	<0.00574	<0.00637	--	<0.00598	<0.00605	<0.00597	<0.00656
2-Nitrophenol	6.73	20.09	--	--	--	--	<0.00496	--	--	--	--	--	--	--	<0.00518	<0.00543	<0.00481	<0.00457	<0.00506	--	<0.00476	<0.00481	<0.00475	<0.00522
3 & 4 Methylphenol	330	94	--	--	--	--	<0.00356	--	--	--	--	--	--	--	<0.00371	<0.00389	<0.00345	<0.00328	<0.00363	--	<0.00341	<0.00345	<0.0034	<0.00375
3,3'-Dichlorobenzidine	3.13	7.02	--	--	--	--	<0.013 R	--	--	--	--	--	--	--	<0.0135	<0.0142	<0.01260	<0.01190	<0.01320	--	<0.0124	<0.0126	<0.0124	<0.0136
3-Nitroaniline	1.28	3.82	--	--	--	--	<0.00911	--	--	--	--	--	--	--	<0.00951	<0.00998	<0.00883 UJL	<0.0084 UJL	<0.00931 UJL	--	<0.00874	<0.00884	<0.00872	<0.0096

Table 4D.5 Soil Data Summary - Volatile Organic Compounds and Semivolatile Organic Compounds

Sample ID:			2012-FWFS-9 (4-5')	2013-MB-1 (0-2')	2013-MB-1 (4-5')	2013-MB-2 (0-2')	MW-27 (0-1')	2013-STB-2 (4-5')	2013-STB-6 (0.5-1.1')	2013-STB-11 (0.5-1.3')	SCC-3 (0-0.5')	SCC-6 (0-0.5')	SCC-8 (0-0.5')	2013-RMSA-6 (2.6-3.3')	2013-RMSB-2 (2.5-5')	2013-RMSB-2 (5-6')	2013-RMSB-4 (0-2')	2013-RMSB-4 (2-5')	2013-RMSB-4 (5-6')	2013-RMSB-5 (2-5')	2013-RMSB-10 (1.3-2')	2013-RMSB-10 (2-3')	2013-RMSB-10 (5-6')	2013-RMSB-10 (7')
Sample Date:			4/29/2013	03/14/13	03/14/13	03/14/13	03/05/13	03/07/13	03/14/13	03/14/13	1/15/2013	1/15/2013	1/15/2013	03/07/13	5/8/2013	5/8/2013	5/7/2013	5/7/2013	5/7/2013	5/7/2013	5/8/2013	5/8/2013	5/8/2013	5/8/2013
Sample Depth (feet bgs):		**Critical**	4-5	0-2	4-5	0-2	0-1	4-5	0.5-1.1*	0.5-1.3*	0-0.5	0-0.5	0-0.5	2.6-3.3	2.5-5*	5-6	0-2	2-5	5-6	2-5	1.3-2*	2-3	5-6	7
	RAL[1]	**PCL[2]**	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Semivolatile Organic Compounds (Continued)																								
4,6-Dinitro-2-methylphenol	0.234	0.700	--	--	--	--	<0.00635	--	--	--	--	--	--	--	< 0.00663 UJL	< 0.00695 UJL	< 0.00615 UJL	< 0.00585 UJL	< 0.00648 UJL	--	< 0.00609 UJL	< 0.00616 UJL	< 0.00608 UJL	< 0.00669 UJL
4-Bromophenyl phenyl ether	0.268	1.105	--	--	--	--	<0.00362	--	--	--	--	--	--	--	<0.00378	<0.00396	<0.00351	<0.00334	<0.00370	--	<0.00347	<0.00351	<0.00346	<0.00381
4-Chloro-3-methylphenol	226	676	--	--	--	--	<0.0199	--	--	--	--	--	--	--	<0.0207	<0.0217	<0.01920	<0.01830	<0.02030	--	<0.019	<0.0193	<0.019	<0.0209
4-Chloroaniline	1.04	2.33	--	--	--	--	<0.00742	--	--	--	--	--	--	--	<0.00774	<0.00812	<0.00719	<0.00684	<0.00758	--	<0.00712	<0.0072	<0.0071	<0.00781
4-Chlorophenyl phenyl ether	0.154	0.799	--	--	--	--	<0.00229	--	--	--	--	--	--	--	<0.0024	<0.00251	<0.00222	<0.00211	<0.00234	--	<0.0022	<0.00223	<0.0022	<0.00242
4-Nitroaniline	5.40	12.09	--	--	--	--	<0.0142	--	--	--	--	--	--	--	<0.0148	<0.0156	<0.01380	<0.01310	<0.01450	--	<0.0136	<0.0138	<0.0136	<0.015
4-Nitrophenol	4.99	14.91	--	--	--	--	<0.00648	--	--	--	--	--	--	--	<0.00676	<0.00709	<0.00628	<0.00597	<0.00661	--	<0.00621	<0.00628	<0.0062	<0.00682
Acenaphthene	2965	35297	--	--	--	--	<0.00184	--	<0.079	<0.0774	<0.0019	<0.0019	<0.0019	--	<0.00192	<0.00201	<0.00178	<0.00169	<0.00187	--	<0.00176	<0.00178	<0.00176	<0.00193
Acenaphthylene	3782	37164	--	--	--	--	<0.00127	--	<0.0548	<0.0537	<0.0013	<0.0013	<0.0013	--	<0.00133	<0.0014	<0.00124	<0.00117	<0.00130	--	<0.00122	<0.00124	<0.00122	<0.00134
Anthracene	17744	185818	--	--	--	--	<0.00163	--	<0.0702	<0.0688	0.002J	<0.0017	0.005J	--	<0.0017	<0.00179	<0.00158	<0.00150	<0.00167	--	<0.00156	<0.00158	<0.00156	<0.00172
Benzidine	0.0005	0.0012	--	--	--	--	<0.0115 R	--	--	--	--	--	--	--	< 0.012 UJ	< 0.0126 UJ	< 0.0111 UJL	< 0.0106 UJL	< 0.0117 UJL	--	< 0.011 UJL	< 0.0112 UJL	< 0.011 UJL	< 0.0121 UJL
Benzo[a]anthracene	5.65	23.58	--	--	--	--	<0.00176	--	<0.0757	<0.0742	0.009J	0.0033J	0.0169J	--	<0.00184	<0.00193	<0.00171	<0.00162	<0.00180	--	<0.00169	<0.00171	<0.00168	<0.00185
Benzo[a]pyrene	0.564	2.368	--	--	--	--	<0.00205	--	<0.0883	<0.0865	0.0245	0.0194J	0.0323	--	<0.00214	<0.00225	<0.00199	<0.00189	<0.00210	--	<0.00197	<0.00199	<0.00196	<0.00216
Benzo[b]fluoranthene	5.71	23.65	--	--	--	--	<0.00219	--	<0.0943	<0.0924	0.0333J	0.0194J	0.0542	--	<0.00229	<0.0024	<0.00213	<0.00202	<0.00224	--	<0.0021	<0.00213	<0.0021	<0.00231
Benzo[g,h,i]perylene	1780	18582	--	--	--	--	<0.00646	--	<0.278	<0.272	0.0263	0.0202J	0.0336	--	<0.00675	<0.00708	<0.00626	<0.00596	<0.00660	--	<0.0062	<0.00627	<0.00618	<0.00681
Benzo[k]fluoranthene	57.2	237.1	--	--	--	--	<0.0019	--	<0.0817	<0.0801	0.0072J	0.0022J	0.0161J	--	<0.00198	<0.00208	<0.00184	<0.00175	<0.00194	--	<0.00182	<0.00184	<0.00182	<0.002
Benzyl alcohol	293	875	--	--	--	--	<0.00743	--	--	--	--	--	--	--	<0.00776	<0.00814	<0.00720	<0.00685	<0.00759	--	<0.00713	<0.00721	<0.00711	<0.00783
bis (2-Chloroisopropyl) ether	9.50	21.28	--	--	--	--	<0.0113	--	--	--	--	--	--	--	<0.0118	<0.0123	<0.01090	<0.01040	<0.01150	--	<0.0108	<0.0109	<0.0108	<0.0119
Bis(2-chloroethoxy)methane	0.588	1.318	--	--	--	--	<0.00181	--	--	--	--	--	--	--	<0.00189	<0.00198	<0.00175	<0.00167	<0.00185	--	<0.00174	<0.00176	<0.00173	<0.00191
Bis(2-chloroethyl)ether	0.105	0.236	--	--	--	--	<0.0021	--	--	--	--	--	--	--	<0.0022	<0.0023	<0.00204	<0.00194	<0.00215	--	<0.00202	<0.00204	<0.00201	<0.00221
Bis(2-ethylhexyl) phthalate	43.2	562.8	--	--	--	--	<0.00684	--	--	--	--	--	--	--	0.00737 J	0.0652 J	0.01190J	0.00939J	0.365	--	<0.00656	0.0222 J	0.216	<0.00721
Butyl benzyl phthalate	1609	10041	--	--	--	--	<0.00789	--	--	--	--	--	--	--	<0.00824	<0.00864	<0.00765	<0.00727	<0.00806	--	<0.00757	0.01 J	0.0106 J	<0.00831
Carbazole	228	512	--	--	--	--	<0.00398	--	--	--	--	--	--	--	<0.00415	<0.00435	<0.00385	<0.00367	<0.00406	--	<0.00381	<0.00386	<0.00381	<0.00419
Chrysene	560	2365	--	--	--	--	<0.0013	--	<0.0559	<0.0548	0.0137	0.0085J	0.0394	--	<0.00136	<0.00142	<0.00126	<0.00120	<0.00133	--	<0.00125	<0.00126	<0.00124	<0.00137
Dibenz(a,h)anthracene	0.549	2.372	--	--	--	--	<0.00463	--	<0.199	<0.195	0.0047	0.0048	0.0386	--	<0.00483	<0.00507	<0.00448	<0.00426	<0.00473	--	<0.00444	<0.00449	<0.00443	<0.00487
Dibenzofuran	266	2725	--	--	--	--	<0.00227	--	--	--	--	--	--	--	<0.00237	0.248	<0.00220	<0.00209	<0.00232	--	<0.00218	<0.0022	<0.00217	<0.00239
Diethyl phthalate	7793	23274	--	--	--	--	<0.0107	--	--	--	--	--	--	--	<0.0112	<0.0118	0.01960J	0.02590J	0.01580J	--	<0.0103	0.0381 J	0.0459 J	<0.0113
Dimethyl phthalate	3110	9289	--	--	--	--	<0.00623	--	--	--	--	--	--	--	<0.00651	<0.00682	<0.00604	<0.00574	<0.00637	--	<0.00598	<0.00605	<0.00597	<0.00656
Di-n-butyl phthalate	6185	68133	--	--	--	--	<0.0033	--	--	--	--	--	--	--	<0.00345	<0.00361	<0.00320	<0.00304	<0.00337	--	<0.00317	<0.0032	<0.00316	<0.00348
Di-n-octyl phthalate	2578	27253	--	--	--	--	<0.00242	--	--	--	--	--	--	--	<0.00253	<0.00265	<0.00235	<0.00223	<0.00247	--	<0.00232	<0.00235	<0.00232	<0.00255
Fluoranthene	2316	24776	--	--	--	--	<0.00396	--	<0.171	<0.167	0.0198	0.0089	0.0239	--	<0.00414	<0.00434	<0.00384	<0.00365	<0.00405	--	<0.0038	<0.00384	<0.00379	<0.00417
Fluorene	2263	24776	--	--	--	--	<0.00301	--	<0.129	<0.127	0.0031	0.0031	<0.0032	--	<0.00314	0.317	<0.00292	<0.00277	<0.00307	--	<0.00289	<0.00292	<0.00288	<0.00317
Hexachlorobenzene	1.02	6.91	--	--	--	--	<0.00194	--	--	--	--	--	--	--	<0.00202	<0.00212	<0.00188	<0.00179	<0.00198	--	<0.00186	<0.00188	<0.00185	<0.00204
Hexachlorobutadiene	12.0	22.8	--	--	--	--	<0.00245	--	--	--	--	--	--	--	<0.00256	<0.00268	<0.00237	<0.00226	<0.00250	--	<0.00235	<0.00237	<0.00234	<0.00258
Hexachlorocyclopentadiene	7.16	10.18	--	--	--	--	<0.00588	--	--	--	--	--	--	--	<0.00613	<0.00643	<0.00570	<0.00542	<0.00600	--	<0.00564	<0.0057	<0.00562	<0.00619
Hexachloroethane	45.8	191.9	--	--	--	--	<0.00294	--	--	--	--	--	--	--	<0.00307	<0.00322	<0.00285	<0.00271	<0.00301	--	<0.00282	<0.00286	<0.00282	<0.0031
Indeno[1,2,3-cd]pyrene	5.72	23.73	--	--	--	--	<0.00446	--	<0.192	<0.188	0.0427	0.0047	0.0495	--	<0.00466	<0.00488	<0.00432	<0.00411	<0.00456	--	<0.00428	<0.00433	<0.00427	<0.0047
Isophorone	150	336	--	--	--	--	<0.00127	--	--	--	--	--	--	--	<0.00133	<0.0014	<0.00124	<0.00117	<0.00130	--	<0.00122	<0.00124	<0.00122	<0.00134
Naphthalene	124	190	--	--	--	--	<0.00172	--	<0.074	<0.0726	0.0017	0.0018	<0.0018	--	<0.0018	0.963	<0.00167	<0.00159	0.00859J	--	<0.00165	<0.00167	0.0659	0.167
Nitrobenzene	17.6	52.5	--	--	--	--	<0.00377	--	--	--	--	--	--	--	<0.00394	<0.00413	<0.00366	<0.00348	<0.00385	--	<0.00362	<0.00366	<0.00361	<0.00397
N-Nitrosodimethylamine	0.002	0.004	--	--	--	--	<0.00534	--	--	--	--	--	--	--	<0.00558	<0.00585	<0.00518	<0.00492	<0.00545	--	<0.00512	<0.00518	<0.00511	<0.00562
N-Nitrosodi-n-propylamine	0.018	0.039	--	--	--	--	<0.00283	--	--	--	--	--	--	--	<0.00295	<0.0031	<0.00274	<0.00261	<0.00289	--	<0.00271	<0.00274	<0.00271	<0.00298
N-Nitrosodiphenylamine	141	316	--	--	--	--	<0.00241	--	--	--	--	--	--	--	<0.00252	<0.00264	<0.00234	<0.00222	<0.00246	--	<0.00231	<0.00234	<0.00231	<0.00254
Pentachlorophenol	0.725	0.916	--	--	--	--	<0.0051	--	--	--	--	--	--	--	<0.00532	<0.00558	<0.00494	<0.00470	<0.00521	--	<0.00489	<0.00495	<0.00488	<0.00537
Phenanthrene	1705	18582	--	--	--	--	<0.00631	--	<0.271	<0.266	0.0083	0.0066	0.0113J	--	<0.00659	0.496	<0.00612	<0.00582	<0.00644	--	<0.00605	<0.00612	<0.00604	<0.00664
Phenol	957	2859	--	--	--	--	<0.0054	--	--	--	--	--	--	--	<0.00564	<0.00592	<0.00524	<0.00498	<0.00552	--	<0.00518	<0.00524	<0.00517	<0.00569
Pyrene	1698	18582	--	--	--	--	<0.00233	--	<0.1	<0.0984	0.0158	0.0079	0.0223	--	<0.00244	<0.00255	<0.00226	<0.00215	<0.00238	--	<0.00224	<0.00226	<0.00223	<0.00246

Notes:

1. [1] - Residential Assessment Levels (RALs) are the lower of the TRRP Tier 1 residential ${}^{Tot}Soil_{Comb}$ and ${}^{GW}Soil_{Class3}$ PCLs for a 30-acre source area (TCEQ, 2012c).
2. [2] - Critical PCLs are the lower of the TRRP commercial-industrial Tier 1 ${}^{Tot}Soil_{Comb}$ and Tier 1 ${}^{GW}Soil_{Class3}$ PCLs for a 30-acre source area (TCEQ, 2012c).
3. RAL exceedances are bolded and critical PCL exceedances are highlighted (no exceedances were observed).
4. Data Qualifiers (see Section 3.5): J - estimated result; UJ - estimated result, not detected; UJL - estimated result, not detected, biased low; U - not detected, detected in associated blank; X8 - laboratory not accredited for this analyte.
5. * - Sub-slab or sub-gabion basket sample; top depth represents the approximate top of soil.

Table 4D.6 Soil Boring Water Samples

Sample ID	Sample Date	Cadmium (mg/L)	Lead (mg/L)	Comments
2012-RMSA-2[1]	1/5/2012	0.089	0.421	Boring total depth - 2.5 ft bgs
2012-RMSA-4[1]	1/6/2012	0.04	1.68	Boring total depth - 3.5 ft bgs
2012-NDA-1	1/10/2012	0.00079J	0.0192	Boring total depth - 8.0 ft bgs
2012-SL-2	1/10/2012	0.005 U	0.0141	Boring total depth - 8.0 ft bgs
2012-SL-3	1/10/2012	0.005 U	<0.0029	Boring total depth - 12.0 ft bgs

Notes:

1. [1] - The RMSA samples represent washwater perched below the concrete slab near the Raw Material Storage Building.
2. The soil boring water samples were collected in accordance with the Sampling and Analysis Work Plan (CRA, 2011). Wells were not completed at these locations and the borings were not developed prior to sampling; therefore, comparison to groundwater PCLs is not applicable.
2. mg/L - milligrams/Liter.
3. Data Qualifiers (see Section 3.5): J = estimated result; U = blank contamination.
4. ft bgs - feet below ground surface.

Table 4E Soil Geochemical Data

Sample ID	Sample Date	Sample Depth (feet)	pH std units	Sulfate (mg/kg)
Battery Receiving/Storage Building				
2013-BSB-1 (0.9-2)	04/11/13	--	7.02	--
2013-BSB-1 (2-4)	04/11/13	--	7.76	--
2013-BSB-1 (4-5)	04/11/13	--	7.77	--
2013-BSB-1 (6.3-7.7)	04/11/13	--	7.20	--
2013-BSB-1 (8-10)	04/11/13	--	7.14	--
2013-BSB-1 (11.6)	04/11/13	--	7.59	--
2013-BSB-2 (0.9-2)	04/11/13	--	7.89	--
2013-BSB-2 (2-4)	04/11/13	--	8.01	--
2013-BSB-2 (4-5)	04/11/13	--	7.88	--
2013-BSB-2 (8-10)	04/11/13	--	7.54	--
2013-BSB-2 (11.2)	04/11/13	--	7.46	--
2013-BSB-3 (0.9-2)	4/10/2013	--	7.61	--
2013-BSB-3 (2-4)	4/10/2013	--	8.47	--
2013-BSB-3 (4-5)	4/10/2013	--	8.13	--
2013-BSB-3 (8-10)	4/10/2013	--	7.72	--
2013-BSB-3 (11)	4/10/2013	--	7.87	--
2013-BSB-4 (0.9-2)	4/10/2013	--	4.44	--
2013-BSB-4 (2-4)	4/10/2013	--	6.74	--
2013-BSB-4 (4-5)	4/10/2013	--	7.90	--
2013-BSB-4 (8-10)	4/10/2013	--	7.64	--
2013-BSB-4 (11)	4/10/2013	--	8.17	--
2013-BSB-5 (0.9-2)	04/11/13	--	6.72	--
2013-BSB-5 (0.9-2) Dup	04/11/13	--	7.18	--
2013-BSB-5 (2-4)	04/11/13	--	7.66	--
2013-BSB-5 (4-5)	04/11/13	--	7.86	--
2013-BSB-5 (8-10)	04/11/13	--	7.22	--
2013-BSB-5 (11.2)	04/11/13	--	7.61	--
2013-BSB-6 (0.9-2)	04/11/13	--	8.14	--
2013-BSB-6 (2-4)	04/11/13	--	7.56	--
2013-BSB-6 (4-5)	04/11/13	--	9.39	--
2013-BSB-6 (8-10)	04/11/13	--	7.54	--
2013-BSB-6 (11.1)	04/11/13	--	7.82	--
2013-BSB-7 (0.9-2)	04/11/13	--	7.84	--
2013-BSB-7 (2-4)	04/11/13	--	7.74	--
2013-BSB-7 (4-5)	04/11/13	--	7.88	--
2013-BSB-7 (8-10)	04/11/13	--	7.26	--
2013-BSB-7 (11)	04/11/13	--	7.62	--
2013-BSB-8 (0.9-2)	4/10/2013	--	6.20	--
2013-BSB-8 (11)	4/10/2013	--	7.89	--
2013-BSB-8 (2-4)	4/10/2013	--	4.45	--
2013-BSB-8 (4-5)	4/10/2013	--	8.13	--
2013-BSB-8 (8-10)	4/10/2013	--	7.45	--
2013-BSB-9 (0.9-2)	4/10/2013	--	7.75	--
2013-BSB-9 (0.9-2) Dup	4/10/2013	--	7.75	--
2013-BSB-9 (2-4)	4/10/2013	--	7.66	--
2013-BSB-9 (4-5)	4/10/2013	--	8.00	--

Table 4E Soil Geochemical Data

Sample ID	Sample Date	Sample Depth (feet)	pH std units	Sulfate (mg/kg)
Battery Receiving/Storage Building				
2013-BSB-9 (8-10)	4/10/2013	--	7.68	--
2013-BSB-9 (11)	4/10/2013	--	7.41	--
2013-BSB-10 (0.9-2)	04/11/13	--	7.54	--
2013-BSB-10 (2-4)	04/11/13	--	7.92	--
2013-BSB-10 (4-5)	04/11/13	--	8.05	--
2013-BSB-10 (8-10)	04/11/13	--	7.26	--
2013-BSB-10 (11.4)	04/11/13	--	7.42	--
Raw Material Storage Area				
2012-RMSA-1(1.5-2.5')	01/06/12	1.5-2.5	7.10	1030
2012-RMSA-2 (0.5-2.5')	01/05/12	0.5-2.5	10.76	6700
2012-RMSA-3(1-3')	01/05/12	1-3	6.83	1820
2012-RMSA-4(1.5-3.5')	01/06/12	1.5-3.5	6.95	1060
Bale Stabilization Area				
2013-BSA-6 (0-2')	03/05/13	0-2	8.35	--
2013-BSA-7 (0-2')	03/05/13	0-2	8.03	--
MW-23 (0-0.5')	03/05/13	0-0.5	8.51	--
Crystalization Unit Area				
2012 CUFT-1(0-2')	01/06/12	0-2	6.50	7370
2012 CUFT-1(2-4')	01/06/12	2-4	6.82	--
2012 CUFT-2 (0-2')	01/06/12	0-2	6.38	8190
2012 CUFT-2 (2-4')	01/06/12	2-4	6.32	--
2013-CUFT-3 (0-0.5')	03/04/13	0-0.5	--	8710
2013-CUFT-4 (0-0.5')	03/04/13	0-0.5	--	7200
2013-CUFT-5 (0-0.5')	03/04/13	0-0.5	--	56.7
2013-CUFT-6 (0-0.5')	03/04/13	0-0.5	--	314
2013-CUFT-6 (0-0.5') Dup	03/04/13	0-0.5	--	294
2013-CUFT-7 (0-0.5')	03/04/13	0-0.5	--	69.6
2013-CUFT-7A (0-0.5')	03/07/13	0-0.5	--	371
2013-CUFT-8 (0-0.5')	03/04/13	0-0.5	--	5400
2013-CUFT-9 (0-0.5')	03/04/13	0-0.5	--	2960
2013-CUFT-10 (0-0.5')	03/07/13	0-0.5	--	68.2
Battery Breaker Building				
2013-BB-1 (0.9-2)	05/21/13	--	7.15	--

Notes:

1. Protective concentration levels (PCLs) are not established for pH or sulfate.

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
FORMER PRODUCTION AREA				
Battery Receiving/Storage Building				
2013-BSB-1 (0.9-2)	04/11/13	0.9-2*	<0.0266	9.56
2013-BSB-1 (2-4)	04/11/13	2-4	0.0409 J	56.2
2013-BSB-1 (4-5)	04/11/13	4-5	0.0977 J	31.6
2013-BSB-1 (6.3-7.7)	04/11/13	6.3-7.7	3.64	**14100**
2013-BSB-1 (8-10)	04/11/13	8-10	7.99	**42700**
2013-BSB-1 (11.6)	04/11/13	11.6	0.487	124
2013-BSB-2 (0.9-2)	04/11/13	0.9-2*	<0.0276	70.4
2013-BSB-2 (2-4)	04/11/13	2-4	0.0399 J	9.36
2013-BSB-2 (4-5)	04/11/13	4-5	0.334	**1080**
2013-BSB-2 (8-10)	04/11/13	8-10	0.484	41.6
2013-BSB-2 (11.2)	04/11/13	11.2	0.638	**684**
2013-BSB-3 (0.9-2)	04/10/13	0.9-2*	<0.0279	14.8
2013-BSB-3 (2-4)	04/10/13	2-4	0.626	206
2013-BSB-3 (4-5)	04/10/13	4-5	0.909	499
2013-BSB-3 (8-10)	04/10/13	8-10	0.509	368
2013-BSB-3 (11)	04/10/13	11	0.434	26.1
2013-BSB-4 (0.9-2)	04/10/13	0.9-2*	1.65	37.9
2013-BSB-4 (2-4)	04/10/13	2-4	2.86	**1110**
2013-BSB-4 (4-5)	04/10/13	4-5	0.158 J	111
2013-BSB-4 (8-10)	04/10/13	8-10	0.411	214
2013-BSB-4 (11)	04/10/13	11	0.365	19.4
2013-BSB-5 (0.9-2)	04/11/13	0.9-2*	0.137 J	5.28
2013-BSB-5 (0.9-2) Dup	04/11/13	0.9-2*	0.341	6.48
2013-BSB-5 (2-4)	04/11/13	2-4	0.0557 J	21.6
2013-BSB-5 (4-5)	04/11/13	4-5	0.299	122
2013-BSB-5 (8-10)	04/11/13	8-10	0.479	**1580**
2013-BSB-5 (11.2)	04/11/13	11.2	0.458	53.9
2013-BSB-6 (0.9-2)	04/11/13	0.9-2*	<0.0304	24.4
2013-BSB-6 (2-4)	04/11/13	2-4	0.0393 J	23.7
2013-BSB-6 (4-5)	04/11/13	4-5	0.695	**586 J**
2013-BSB-6 (8-10)	04/11/13	8-10	0.91	**3150**
2013-BSB-6 (11.1)	04/11/13	11.1	0.439	20.3
2013-BSB-7 (0.9-2)	04/11/13	0.9-2*	0.37	26.8 J
2013-BSB-7 (2-4)	04/11/13	2-4	0.13 J	221
2013-BSB-7 (4-5)	04/11/13	4-5	0.13 J	56.6
2013-BSB-7 (8-10)	04/11/13	8-10	1.98	**3050**
2013-BSB-7 (11)	04/11/13	11	0.449	17.6
2013-BSB-8 (0.9-2)	04/10/11	0.9-2*	0.782	22.6
2013-BSB-8 (2-4)	04/10/13	2-4	1.93	6.75
2013-BSB-8 (4-5)	04/10/13	4-5	0.117 J	70.7
2013-BSB-8 (8-10)	04/10/13	8-10	10.1	**54600**
2013-BSB-8 (11)	04/10/13	11	0.592	43.3
2013-BSB-9 (0.9-2)	04/10/11	0.9-2*	0.783 J	23.6 J
2013-BSB-9 (0.9-2) Dup	04/10/11	0.9-2*	2.08 J	93.4 J
2013-BSB-9 (2-4)	04/10/13	2-4	<0.0287	15.7 J
2013-BSB-9 (4-5)	04/10/13	4-5	0.107 J	13
2013-BSB-9 (8-10)	04/10/13	8-10	1.31	**1830**
2013-BSB-9 (11)	04/10/13	11	1.17	**672**
2013-BSB-10 (0.9-2)	04/11/13	0.9-2*	<0.0286	15.2
2013-BSB-10 (2-4)	04/11/13	2-4	<0.0308	8.88 J
2013-BSB-10 (4-5)	04/11/13	4-5	0.0713 J	25.2
2013-BSB-10 (8-10)	04/11/13	8-10	7.68	**2590**
2013-BSB-10 (11.4)	04/11/13	11.4	0.488	30.9
MW-31 (0.9-2)[3]	05/09/13	0.9-2	1.67 NS	**12900 NS**
MW-31 (0.9-2) Dup[3]	05/09/13	0.9-2	<0.0304 NS	68 NS
MW-31 (5.8-8)	05/09/13	5.8-8	1.35 NS	**1210 NS**
MW-31 (9.5)	05/09/13	9.5	0.245 J, NS	41 NS
MW-31R (0.9-2)	05/21/13	0.9-2	0.0737 J	18.3 J
MW-31R (0.9-2) Dup	05/21/13	0.9-2	0.0397 J	10.7 J
MW-31R (5.8-7.3)	05/21/13	5.8-7.3	5.8	**3150**
MW-31R (9.5)	05/21/13	9.5	0.288 J	35.4 J
Raw Material Storage Building and Immediate Vicinity				
2012-RMSA-1(1.5-2.5')	01/06/12	1.5-2.5	1.3	116
2012-RMSA-2 (0.5-2.5')	01/05/12	0.5-2.5	2.9	**2950**
2013-RMSA-2 (2.5-4')	03/06/13	2.5-4	–	**1520**
2013-RMSA-2 (4-5')	03/06/13	4-5	–	18.9
2012-RMSA-3 (1-3')	01/05/12	1-3	3.9	412
2012-RMSA-4 (1.5-3.5')	01/06/12	1.5-3.5	2.5	**856**
2013-RMSA-5 (0-2')	03/06/13	0-2	0.96	63.4
2013-RMSA-6 (0-2')	03/06/13	0-2	4.00	**6690**
2013-RMSA-6 (2-4')	03/06/13	2-4	–	**4230**
2013-RMSA-6 (4-5')	03/06/13	4-5	–	24.2
2013-RMSA-7 (0-2')	03/06/13	0-2	4.16	**2130**
2013-RMSA-7 (2-4')	03/06/13	2-4	–	35.5
2013-RMSB-1 (1.5-2)	05/08/13	1.5-2*	14.3 J	**1920 J**
2013-RMSB-1 (2-5)	05/08/13	2-5	0.265 J	18.4
2013-RMSB-1 (2-5) Dup	05/08/13	2-5	0.463 J	49.3 J
2013-RMSB-1 (5-5.5)	05/08/13	5-5.5	1.37	240
2013-RMSB-1 (6)	05/08/13	6	0.46	27.8
2013-RMSB-2 (2.5-5)	05/08/13	2.5-5*	2.31	114
2013-RMSB-2 (5-6)	05/08/13	5-6	3.86	226
2013-RMSB-3 (1.5-2')	05/08/13	1.5-2*	0.303	56.4
2013-RMSB-3 (1.5-2') Dup	05/08/13	1.5-2*	0.233 J	66.7
2013-RMSB-3 (2-3)	05/08/13	2-3	<0.0283	8.78 J
2013-RMSB-3 (5-5.5)	05/08/13	5-5.5	0.719	142
2013-RMSB-3 (6)	05/08/13	6	0.183 J	37.6
2013-RMSB-4 (0-2)	05/07/13	0-2	0.471 J	39.7
2013-RMSB-4 (2-5)	05/07/13	2-5	<0.0278	8.26
2013-RMSB-4 (5-6)	05/07/13	5-6	7.40	**2820**
2013-RMSB-5 (1.3-2)	05/07/13	1.3-2*	**72.1**	**1790 J**
2013-RMSB-5 (1.3-2) Dup	05/07/13	1.3-2*	**65.2**	**1580 J**
2013-RMSB-5 (2-5)	05/07/13	2-5	23.9	**4330**
2013-RMSB-5 (5-7)	05/07/13	5-7	**60.7**	**10200**
2013-RMSB-5 (9)	05/07/13	9	1.07	36.8
2013-RMSB-6 (1.3-2)	05/07/13	1.3-2*	0.949	**615**
2013-RMSB-6 (1.3-2) Dup	05/07/13	1.3-2*	0.878	**716**
2013-RMSB-6 (2-2.5)	05/07/13	2-2.5	0.0522 J	16.6
2013-RMSB-6 (5-7)	05/07/13	5-7	0.49	25.3
2013-RMSB-6 (7.5)	05/07/13	7.5	0.499	20.9
2013-RMSB-7 (1.5-2)	05/08/13	1.5-2*	0.372	115
2013-RMSB-7 (2-4)	05/08/13	2-4	0.405	25.9
2013-RMSB-7 (5-6)	05/08/13	5-6	0.379	175
2013-RMSB-7 (6.5)	05/08/13	6.5	0.475	63.5
2013-RMSB-8 (2.1-3.1)	05/08/13	2.1-3.1*	1.93	314
2013-RMSB-8 (5-7)	05/08/13	5-7	18.7	**4240**
2013-RMSB-8 (7.5)	05/08/13	7.5	0.379	23
2013-RMSB-9 (1.3-2)	05/07/13	1.3-2*	4.05	**1210**
2013-RMSB-9 (2-2.5)	05/07/13	2-2.5	0.402	68.5
2013-RMSB-9 (5-7)	05/07/13	5-7	0.449	50.1
2013-RMSB-9 (8)	05/07/13	8	0.435	16.7
2013-RMSB-10 (1.3-2)	05/08/13	1.3-2*	23.5	12.9
2013-RMSB-10 (2-3)	05/08/13	2-3	17.2	**1030**
2013-RMSB-10 (5-6)	05/08/13	5-6	35.8	**911**
2013-RMSB-10 (7)	05/08/13	7	0.506	19.2
Slag Treatment Building				
2013-STB-1 (0-2')	03/06/13	0-2	**181**	**7050**
2013-STB-1 (2-4')	03/06/13	2-4	**483**	**634**
2013-STB-1 (4-5')	03/06/13	4-5	7.06	149
2013-STB-2 (2.5-4')	03/06/13	2.5-4	1.13 J	150 J
2013-STB-2 (2.5-4') Dup	03/06/13	2.5-4	3.43 J	**773 J**
2013-STB-2 (4-5')	03/06/13	4-5	–	18.8
2013-STB-3 (0-2')	03/06/13	0-2	8.21 J	82.1 J
2013-STB-4 (0-2')	03/06/13	0-2	**69.5**	**3720**
2013-STB-4 (2-4')	03/06/13	2-4	**124**	**16100**
2013-STB-4 (4-5')	03/06/13	4-5	9.21	77.9
2013-STB-5 (0.5-1.5')	03/14/13	0.5-1.5*	2.35	178
2013-STB-5 (0.5-1.5') Dup	03/14/13	0.5-1.5*	2.26	159
2013-STB-6 (0.5-1.1')	03/14/13	0.5-1.1*	**146**	**620**
2013-STB-7 (0.5-1.2')	03/14/13	0.5-1.2*	6.65	**1430**
2013-STB-8 (0.8-1.3')	03/14/13	0.8-1.3*	7.80	**1190**
2013-STB-9 (0.5-1.0')	03/14/13	0.5-1*	24.9	**2640**
2013-STB-9 (5-5.5)	05/07/13	5-5.5	0.467	38.8
2013-STB-10 (0.5-1.1')	03/14/13	0.5-1.1*	7.5 J	137
2013-STB-11 (0.5-1.3')	03/14/13	0.5-1.3*	16.6	**1100**
2013-STB-12 (0.5-1.2')	03/14/13	0.5-1.2*	**103**	**1070**
Flood Wall - Facility Side				
2012-FWFS-1 (Floor)	10/22/12	4.0	**143**	**4410**
2012-FWFS-1 (Wall)	10/22/12	2.0	4.7	**22900**
2012-FWFS-1 (4-5')	03/06/13	4-5	0.528	30.9 J
2012-FWFS-2 (Floor)	10/22/12	4.0	0.11	18
2012-FWFS-2 (Wall)	10/22/12	2.4	0.27	13
2012-FWFS-3 (Floor)	10/22/12	3.0	0.27	33
2012-FWFS-3 (Wall)	10/22/12	1.9	0.26	32
2012-FWFS-4 (Floor)	09/24/12	3.1	4.0	**504**
2012-FWFS-4 (Wall)	09/24/12	1.6	0.47	47
2012-FWFS-4 (3-4')	04/29/13	3-4	–	17.2
2012-FWFS-5 (Floor)	09/24/12	3.3	1.4	358
2012-FWFS-5 (Wall)	09/24/12	1.7	**273**	**52000**
2012-FWFS-6 (Floor)	09/04/12	2.1	**387**	**4860**
2012-FWFS-6 (Wall)	09/04/12	1.1	**69**	**6970**
2012-FWFS-6 (2-4')	04/29/13	2-4	13.3	324
2012-FWFS-7 (Floor)	09/04/12	2.3	0.56	29
2012-FWFS-7 (Wall)	09/04/12	1.2	35	**8540**
2012-FWFS-8 (Floor)	09/04/12	2.2	10	**537**
2012-FWFS-8 (Wall)	09/04/12	1.1	3.3	**1550**
2012-FWFS-8 (2-4')	04/29/13	2-4	–	13.5
2012-FWFS-9 (Floor)	09/04/12	2.4	**984**	**2800**
2012-FWFS-9 (Wall)	09/04/12	1.8	15	**7480**
2012-FWFS-9 (2.5-4')	04/29/13	2.5-4	0.624	21
NOR WMU Nos. 6, 14, and 16				
2013-WMU6-1 (0.9-2)	05/07/13	0.9-2*	2.41 J	**10800 J**
2013-WMU6-1 (2-4)	05/07/13	2-4	–	**33200**
2013-WMU6-1 (4-5)	05/07/13	4-5	–	46.5
2013-WMU14-1 (0.9-2)	05/07/13	0.9-2*	16.6	**95000**
2013-WMU14-1 (0.9-2) Dup	05/07/13	0.9-2*	13.6	**69000**
2013-WMU14-1 (2-4)	05/07/13	2-4	–	**31400**
2013-WMU14-1 (4-5)	05/07/13	4-5	–	**3470**
2013-WMU14-2 (0.9-2)	05/07/13	0.9-2*	2.52	100
2013-WMU14-3 (0.9-2)	05/07/13	0.9-2*	0.357	11.6
2013-WMU16-1 (0.9-2)	05/07/13	0.9-2*	0.415	18.2
Bale Stabilization Area				
2012-BSA-1 (0-2')	01/04/12	0-2	5.1	**1250**
2012-BSA-1A (0-2')	03/23/12	0-2	–	97
2012-BSA-2 (0-2')	01/04/12	0-2	**102**	**25900**
2012-BSA-2 (2-4')	04/29/13	2-4	0.652	123
2012-BSA-3 (0-2')	01/04/12	0-2	**95**	106
2012-BSA-3A (0-2')	03/23/12	0-2	**935**	–
2012-BSA-4 (0-2')	01/04/12	0-2	1.0	**1090**
2012-BSA-4a (0-1')	03/29/12	0-1	9.8	**1510**
2012-BSA-4b (0-1')	03/29/12	0-1	3.3	344
2012-BSA-4c (0-1')	03/29/12	0-1	17	**2730**
2012-BSA-4d (0-1')	03/29/12	0-1	17	**3000**
2012-BSA-4e (0-1')	03/29/12	0-1	6.2	**634**
2012-BSA-5 (0-2')	01/04/12	0-2	13	**858**
MW-23 (0-0.5)	03/05/13	0-0.5	3.5	**1280**
MW-23 (0.5-2)	03/05/13	0.5-2	–	481
Maintenance Building				
2013-MB-1 (0-2')	03/14/13	0-2	0.04 J	46.7
2013-MB-2 (0-2')	03/14/13	0-2	2.32	245
Battery Breaker Area				
MW-30 (0-0.5')	03/27/13	0-0.5	**62.7 J**	**20300**
MW-30 (0-0.5') Dup	03/27/13	0-0.5	32 J	**19200**
MW-30 (0.5-2')	03/27/13	0.5-2	–	128
2013-RRS-3A (0.8-2')	03/27/13	0.8-2*	13.0	**2610**
2013-RRS-3A (2-4')	03/27/13	2-4	–	84.2
2013-RRS-4A (0.9-2')	05/21/13	0.9-2	18.2	**5540**
2013-BB-1 (0.9-2)	05/21/13	0.9-2	16.1	**3960**
Truck Staging Area and Administrative Building Area				
2013-AD-1 (0-0.5')	3/14/2013	0-0.5	7.52	**2570**
2013-AD-1 (0.5-2')	3/14/2013	0.5-2	–	174 J
2013-AD-2 (0-0.5')	3/15/2013	0-0.5	9.62	**3770**
2013-AD-2 (0.5-2')	4/29/2013	0.5-2	–	**569 J**
2013-AD-2 (0.5-2') Dup	4/29/2013	0.5-2	–	306 J
2013-AD-2 (2-4')	4/29/2013	2-4	–	114 J
2013-AD-2A (0-0.5')	3/27/2013	0-0.5	0.296 J	175
2013-FOP-1 (0-0.5')	3/14/2013	0-0.5	20.1	**6460**
2013-FOP-1 (0.5-2')	3/14/2013	0.5-2	–	**505**
2013-FOP-1 (2-4)	3/14/2013	2-4	–	90.4 J
2013-MW10-1 (0-0.5')	03/05/13	0-0.5	0.578	202 J
2013-MW10-2 (0-0.5)	03/05/13	0-0.5	3.25	**1200**
2013-MW10-2 (0.5-2)	03/05/13	0.5-2	–	44.1
2013-MW10-3 (0-0.5')	03/05/13	0-0.5	18.8	**3920 J**
2013-MW10-3 (0-0.5') Dup	03/05/13	0-0.5	13.6	**1520 J**
2013-MW10-3 (0.5-2')	03/05/13	0.5-2	–	208
2013-TS-1 (0-0.5')	03/14/13	0-0.5	0.183J	10.2 J
2013-TS-2 (0-0.5')	03/14/13	0-0.5	0.591	98.6

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
STEWART CREEK CORRIDOR				
2012-FWCS-1 (0-2')	01/18/12	0-2	10	**2240**
2012-FWCS-1 (2-2.5')	09/04/12	2-2.5	–	**6270**
2012-FWCS-1 (2.5-4')	03/05/13	2.5-4	–	**780**
2012-FWCS-1 (4-5')	03/05/13	4-5	–	22
2012-FWCS-1A (1-2')	03/05/13	1-2*	–	**19400**
2012-FWCS-1A (1-2') Dup	03/05/13	1-2	–	**12100**
2012-FWCS-1A (2-4')	03/05/13	2-4	–	12.4
2013-FWCS-1B (1.1-1.6')	03/15/13	1.1-1.6*	0.783	80.1 JH
2012-FWCS-2 (0-2')	01/19/12	0-2	0.076	24
2012-FWCS-3 (0-2')	01/19/12	0-2	0.15	35
2012-FWCS-4 (0-2')	01/19/12	0-2	0.12	158
2012-FWCS-5 (0-2')	01/19/12	0-2	1.3	224
2012-FWCS-6 (0-2')	01/19/12	0-2	0.90	253
2012-FWCS-7 (0-2')	01/19/12	0-2	0.58	64
2012-FWCS-8 (0-2')	01/18/12	0-2	234	**853**
2012-FWCS-9 (0-2')	01/18/12	0-2	3.1	81
2012-FWCS-11 (0-2')	09/04/12	0-2	–	217
2012-FWCS-12 (0-2')	09/04/12	0-2	–	**20500**
2012-FWCS-12 (2-2.7)	03/15/13	2-2.7	4.09	**31000**
2012-FWCS-12 (4-5')	03/15/13	4-5	–	19.1
2013-FWFS-1A (2-4')	03/05/13	2-4	–	15
2013-FWFS-1A (4-5')	03/05/13	4-5	–	14.9
2012-FWFS-7A (0-0.5)	05/21/13	0-0.5	0.32	44.7 J
2013-MW-17A (0-0.5')	03/15/13	0-0.5	0.921	279
2013-RO-1 (0-0.5')	03/05/13	0-0.5	2.91	**1170**
2013-RO-1 (0.5-1')	03/05/13	0.5-1	–	19.8
2013-RO-2 (0-0.5')	03/05/13	0-0.5	5.26	**811**
2013-RO-3 (0-0.5')	03/15/13	0-0.5	0.347	26.1 J
MW-24 (0-0.5')	03/05/13	0-0.5	0.0829 J	8.82 J
MW-27 (0-1')	03/05/13	0-1	–	400
MW-29 (0-0.5')	03/06/13	0-0.5	3.38	455
MW-29 (2.5-4')	03/05/13	2.5-4	1.56	87.3
MW-29 (4-5')	03/05/13	4-5	< 0.0306	8.6
SCC-1 (0-0.5')	01/15/13	0-0.5	1.21	188
SCC-2 (0-0.5')	01/15/13	0-0.5	0.897	99.4
SCC-3 (0-0.5')	01/15/13	0-0.5	33.3	**3510**
SCC-3 (0.5-2')	03/05/13	0.5-2	–	**535**
SCC-3 (2-4')	03/05/13	2-4	–	**1300 J**
SCC-3 (4-5')	03/05/13	4-5	–	15.2
SCC-3A (0-0.5')	03/05/13	0-0.5	–	140
SCC-4 (0-0.5')	01/15/13	0-0.5	0.851	199
SCC-5 (0-0.5')	01/15/13	0-0.5	1.51	443
SCC-6 (0-0.5')	01/15/13	0-0.5	1.04	200
SCC-7 (0-0.5')	01/15/13	0-0.5	0.681	186
SCC-8 (0-0.5')	01/15/13	0-0.5	6.93	**4870**
SCC-9 (0-0.5')	01/15/13	0-0.5	2.36	149
SCC-10 (0-0.5')	01/15/13	0-0.5	6.55	**1510**
SCC-10 (0.5-2')	03/05/13	0.5-2	–	23.5
SCC-10A (0-0.5')	03/05/13	0-0.5	1.40	296
SCC-11 (0-0.5')	01/15/13	0-0.5	**106**	**788**
SCC-11 (2-4')	03/06/13	2-4	0.538	17.6 J
SCC-11 (2-4') Dup	03/06/13	2-4	0.697	60.9 J
SCC-11A (0-0.5')	03/06/13	0-0.5	2.45	268
SCC-12 (0-0.5')	01/15/13	0-0.5	1.44	210
SCC-13 (0-0.5')	01/15/13	0-0.5	0.253 J	34.6
SCC-14 (0-0.5')	01/15/13	0-0.5	0.158 J	42.7
SCC-15 (0-0.5')	01/15/13	0-0.5	1.62 J	177
NORTH AREA				
Slag Landfill and Boneyard				
2012-BY-1 (0-2')	01/04/12	0-2	1.0	28
2012-BY-2 (0-2')	01/04/12	0-2	13	**1420**
2012-BY-3 (0-2')	01/04/12	0-2	0.90	75
2012-BY-4 (0-2')	01/04/12	0-2	**66**	**47000**
2012-BY-5 (0-2')	01/04/12	0-2	5.4	431
2012-SL-1 (0-2')	01/10/12	0-2	2.3	379
2012-SL-1 (2-4')	01/10/12	2-4	50	**7970**
2012-SL-1 (4-5')	03/06/13	4-5	–	**48500**
2012-SL-2 (0-2')	01/10/12	0-2	0.80	84
2012-SL-2 (5-7')	01/10/12	5-7	0.58	7.3
2012-SL-3 (0-2')	01/10/12	0-2	0.75	47
2012-SL-3 (8-10')	01/10/12	8-10	1.0	7.2
2013-SL-4 (0-0.5')	03/07/13	0-0.5	21.5	82.3
2013-WMU17-1 (0-0.5')	3/15/2013	0-0.5	6.14	**1350**
2013-WMU17-2 (0-0.5')	3/15/2013	0-0.5	6.09	**1460**
North Disposal Area				
2012-NDA-1 (0-2')	01/10/12	0-2	4.0	318
2012-NDA-1 (2-4')	01/10/12	2-4	27	**7060**
2012-NDA-1 (4-5')	03/05/13	4-5	–	19
2012-NDA-2 (0-2')	01/10/12	0-2	1.8	284
2012-NDA-2 (2-4')	01/10/12	2-4	0.68	**1030**
2012-NDA-2 (16-18')	01/10/12	16-18	0.036	14
2012-NDA-3 (0-2')	01/10/12	0-2	11	**2410**
2012-NDA-3 (17-19')	01/10/12	17-19	0.034	8.9
2012-NDA-4 (2-4')	02/22/12	2-4	–	228
2012-NDA-6 (0-2')	02/22/12	0-2	–	113
North Tributary Corridor and North Wooded Area				
D-11	03/28/12	0-0.5	3.62	**524**
D-11 (0.5-1.0')	04/22/13	0.5-1	–	312
D-12	03/28/12	0-0.5	3.71	**522**
D-12 (0.5-1')	04/22/13	0.5-1	–	29.7
D-13	03/28/12	0-0.5	2.98	434
D-14	03/28/12	0-0.5	1.445 J	204
D-15	03/28/12	0-0.5	1.61 J	245
E-11	03/28/12	0-0.5	17.8	**2920**
E-11 (0.5-2')	03/06/13	0.5-2	–	109
E-11 (2-4')	03/06/13	2-4	0.865	46
E-11 (4-5')	03/06/13	4-5	0.511	5.26
E-11 (5-7')	04/29/13	5-7	0.385	--
E-11 (7-9')	04/29/13	7-9	0.485	--
E-11 (9-10.7')	04/29/13	9-10.9	0.367	--
E-11A (0-0.5')	03/06/13	0-0.5	3.89	**816**
E-11A (0.5-1')	04/22/13	0.5-1	–	285
E-11B (0-0.5')	03/15/13	0-0.5	0.922	216
E-12	03/28/12	0-0.5	18.3	**2610**
E-12 (0.5-1')	04/22/13	0.5-1	–	70
E-13	03/28/12	0-0.5	10.1	**1850**
E-13 (0.5-1)	04/22/13	0.5-1	–	33.6
E-14	03/28/12	0-0.5	5.64	**1090**
E-14 (0.5-1')	04/22/13	0.5-1	–	54.9
E-15	03/28/12	0-0.5	4.34	**893**
E-15 (0.5-1')	04/22/13	0.5-1	–	43.6
E-15A (0-0.5')	03/06/13	0-0.5	1.51	234
ECO-11 (0-0.5')	03/05/13	0-0.5	0.809	45.3
ECO-12 (0-0.5')	03/05/13	0-0.5	0.953	240
MW-21 (0-0.5')	03/05/13	0-0.5	0.340	8.6
MW-22 (0-0.5')	03/05/13	0-0.5	0.853	84.2
Class 2 Landfill Area				
2013-PMW-19R (0-0.5)	02/26/13	0-0.5	< 0.0302	20.4
2013-PMW-20R (0-0.5)	02/26/13	0-0.5	0.362	149
2013-LMW-21 (0-0.5)	02/27/13	0-0.5	0.796	209
2013-LMW-22 (0-0.5)	02/27/13	0-0.5	1.32	282
SOUTH AREA				
South Disposal Area				
2013-BS2-1 (0.5-2')	4/29/2013	0.5-2	–	73.9
BS-3 (1-2')	03/04/13	1-2	–	**610**
BS-3 (2-4')	03/04/13	2-4	–	40.2
2013-B4R-A (0-0.5')	04/29/13	0-0.5	0.181J	187 J
2013-B4R-A (0-0.5') Dup	04/29/13	0-0.5	0.712	382 J
2013-BS5-1 (0.5-2')	04/29/13	0.5-2	–	3.85
2012-SDA-1 (0-2')	01/04/12	0-2	1.2	164
2012-SDA-1 (2-4')	01/04/12	2-4	0.32	33
2012-SDA-2 (0-2')	01/04/12	0-2	7.0	**1090**
2012-SDA-2 (2-4')	01/04/12	2-4	0.30	11
2012-SDA-3 (0-2')	01/04/12	0-2	1.0	74
2012-SDA-3 (2-4')	01/04/12	2-4	0.57	13
2013-SDA-3A (0-0.5')	03/04/13	0-0.5	1.14	452
2012-SDA-4 (0-2')	01/04/12	0-2	0.83	20
2012-SDA-4 (2-4')	01/04/12	2-4	0.53	4.2
2013-SDA-4A (0-0.5')	03/04/13	0-0.5	5.02	**1570**
2013-SDA-4A (0.5-2')	03/04/13	0.5-2	–	69.6
2012-SDA-5 (0-2')	01/04/12	0-2	1.1	91
2012-SDA-5 (2-2.9')	01/04/12	2-2.9	0.36	3.7
South Wooded Area				
ECO-1 (0-0.5')	01/15/13	0-0.5	1.85	431
ECO-2 (0-0.5')	01/15/13	0-0.5	3.19	396
ECO-3 (0-0.5')	01/15/13	0-0.5	10.1	**1740**
ECO-3 (0.5-2')	03/06/13	0.5-2	–	43.9
ECO-4 (0-0.5')	01/15/13	0-0.5	2.97	373
ECO-5 (0-0.5')	01/15/13	0-0.5	1.62	221
ECO-6 (0-0.5')	01/15/13	0-0.5	7.92	**1030**
ECO-6 (0.5-2')	03/04/13	0.5-2	–	22.7
ECO-7 (0-0.5')	01/15/13	0-0.5	14.6	**2340**
ECO-7 (0.5-2')	03/06/13	0.5-2	–	76.5 J
ECO-7 (0.5-2') Dup	03/06/13	0.5-2	2.64	400 J
ECO-7A (0-0.5')	03/06/13	0-0.5	3.61	**606**
ECO-7B (0-0.5')	03/15/13	0-0.5	2.48	327
ECO-8 (0-0.5')	01/15/13	0-0.5	3.61	**600**
ECO-8 (0.5-2')	03/04/13	0.5-2	–	112
ECO-9 (0-0.5')	01/15/13	0-0.5	12.6	**2050**
ECO-9 (0.5-2')	03/04/13	0.5-2	–	412
ECO-10 (0-0.5')	01/15/13	0-0.5	3.30	345
Crystallization Unit Area				
2012 CUFT-1(0-2')	01/06/12	0-2	0.34	13
2012 CUFT-2 (0-2')	01/06/12	0-2	0.47	33
2013-CUFT-3 (0-0.5')	03/04/13	0-0.5	1.58 J	25.4 J
2013-CUFT-4 (0-0.5')	03/04/13	0-0.5	4.38	107
2013-CUFT-5 (0-0.5')	03/04/13	0-0.5	3.10	442
2013-CUFT-6 (0-0.5')	03/04/13	0-0.5	7.65	71.3 J
2013-CUFT-6 (0-0.5') Dup	03/04/13	0-0.5	7.80	365 J
2013-CUFT-7 (0-0.5')	03/04/13	0-0.5	5.68	**746**
2013-CUFT-7 (0.5-2')	03/04/13	0.5-2	–	267
2013-CUFT-7A (0-0.5')	03/07/13	0-0.5	5.83	80.2
2013-CUFT-8 (0-0.5')	03/04/13	0-0.5	0.192 J	28.8
2013-CUFT-9 (0-0.5')	03/04/13	0-0.5	0.307	32.8
2013-CUFT-10 (0-0.5')	03/07/13	0-0.5	1.53	319
Shooting Range Berm and South Berm Verification Samples				
SRB-VS-1	05/15/13	0-0.5	0.186 J	27.8
SRB-VS-2	05/15/13	0-0.5	0.132 J	58.1
SRB-VS-3	05/15/13	0-0.5	0.891	20.7
SRB-VS-4	05/15/13	0-0.5	0.551	21.8
SRB-VS-5	05/15/13	0-0.5	2.43	477
SRB-VS-6	05/15/13	0-0.5	0.159 J	11.3
SRB-VS-7	05/15/13	0-0.5	0.729	24.8
SRB-VS-8	05/15/13	0-0.5	0.682	40.4
SRB-VS-9	05/15/13	0-0.5	7.79	**1330**
SRB-VS-9 (0.5-2)	05/21/13	0.5-2	0.0522 J	14.8 J
SRB-VS-9A (0-0.5)	05/21/13	0-0.5	6.58	**1040**
SRB-VS-9B (0-0.5)	05/21/13	0-0.5	1.39	305
SRB-VS-9C	06/03/13	0-0.5	1.81	333
SRB-VS-10	05/15/13	0-0.5	1.35	203
SRB-VS-11	05/15/13	0-0.5	2.47	384
SB-VS-1	06/03/13	0-0.5	1.20	6.1
SB-VS-2	06/03/13	0-0.5	1.13	12.9
LAKE PARCEL				
F-4	3/28/2012	0-3"	2.51 J	255
F-5	3/28/2012	0-3"	3.51	367
G-4	3/28/2012	0-3"	2.17	222
G-4 (1ft)	3/27/2013	1	< 0.0325	18.2
G-5	3/28/2012	0-3"	2.61 J	273
G-5 (1ft)	3/27/2013	1	< 0.0346	13.9
G-6	3/28/2012	0-3"	1.96 J	268
H-3	3/28/2012	0-3"	1.06 J	154
H-4	3/28/2012	0-3"	< 1.05	120
H-4 (1ft)	3/27/2013	1	0.0782 J	17.9
H-5	3/28/2012	0-3"	1.54 J	147
H-5 (1ft)	3/27/2013	1	< 0.0325	15.9
H5-2	2/7/2013	0-3"	1.40	154
H4-2	2/7/2013	0-3"	1.30	145
G4-2	2/7/2013	0-3"	1.50	166

EXPLANATION

- On-Site Property Boundary
- FRC Property Boundary
- Former Path of North Tributary (1951 Aerial Photo)
- Former Path of North Tributary (1972 Aerial Photo)
- Former Path of Stewart Creek (1951 Aerial Photo)
- Monitoring Well Location
- Soil Sample Location (2012-2013)
- Soil RAL Exceedance Zone
- Surface Drainage Direction

Notes:

1. The Residential Assessment Level (RAL) is the minimum of the TRRP residential Tier 1 ${}^{Tot}Soil_{Comb}$ (applicable to surface soil only) and Tier 2 ${}^{GW}Soil_{Class3}$ PCLs for a 30-acre source area (TCEQ, 2012). The ${}^{Air}Soil_{Inh-V}$ pathway is not applicable to lead or cadmium and was therefore not used to develop RALs.
2. The critical PCL is the minimum of the TRRP commercial-industrial Tier 1 ${}^{Tot}Soil_{Comb}$ (applicable to surface soil only) and Tier 2 ${}^{GW}Soil_{Class3}$ PCLs for a 30-acre source area (TCEQ, 2012). The ${}^{Air}Soil_{Inh-V}$ pathway is not applicable to lead or cadmium and was therefore not used to develop critcial PCLs.
3. Surface Soil = 0-15 feet bgs for residential land use and 0-5 feet bgs for commercial -industrial land use; subsurface soil = greater than 15 feet bgs for residential land use and greater than 5 feet bgs for commercial-industrial land use.
4. RAL exceedances are bolded. Critical PCL exceedances are highlighted and bolded.
5. Soil samples analyzed for the SIR and APAR investigations (2012-2013) were used to delineate affected property boundaries; therefore, only SIR and APAR soil sample results are presented. Historical soil sample data are presented in Appendix 17 of this APAR.
6. Data qualifiers: See Section 3.5.
7. bgs - Below ground surface.
8. * - Sub-slab or sub-gabion basket sample; top depth represents the approximate top of soil.
9. "--" - Not analyzed.
10. Soil samples from borings 2013-BSA-6 and 2013-BSA-7 were analyzed for pH only; samples from boring 2012-FWFS-7B were not analyzed because affected property was delineated at 2012-FWFS-7A to the north; 2012-NDA-5 was installed for delineation of the North Disposal Area boundary, and because slag was encountered in this boring a subsequent boring was completed at 2012-NDA-6 (only samples from 2012-NDA-6 were analyzed).

Scale in Feet
0 75 150

Source of photo:
Imagery from NCTCOG, 2009 photography.

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 4A
SOIL COC CONCENTRATION MAP
LEAD AND CADMIUM

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- On-Site Property Boundary
- FRC Property Boundary
- Former Path of North Tributary (1951 Aerial Photo)
- Former Path of North Tributary (1972 Aerial Photo)
- Former Path of Stewart Creek (1951 Aerial Photo)
- Monitoring Well Location
- Well Plugged and Abandoned, Destroyed or Not Found
- Staff Gauge
- Soil Sample Location (2012-2013)
- Sediment and Surface Water Sample Location (2012-2013)
- Phase II RFI Soil Sample Location (1998)
- Phase I RFI Soil Sample Location (1991)
- Disposal Area Delineation Boring Location (1993)
- Dredged Sediment Stockpile Sample Location (1986)
- Dredged Sediment Stockpile Sample Location (1987)
- Old Drum Storage Area Sample Location (1987)
- Geotech Boring Location (2011)
- Class 2 Landfill Notification Boring (1995)
- A—A' Geologic Cross Section Location Lines

DRAFT
FOR REVIEW ONLY

N

Scale in Feet
0 75 150

Source of photo:
Imagery from NCTCOG, 2009 photography.

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 4C.1

CROSS SECTION LOCATION MAP

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: WFV	

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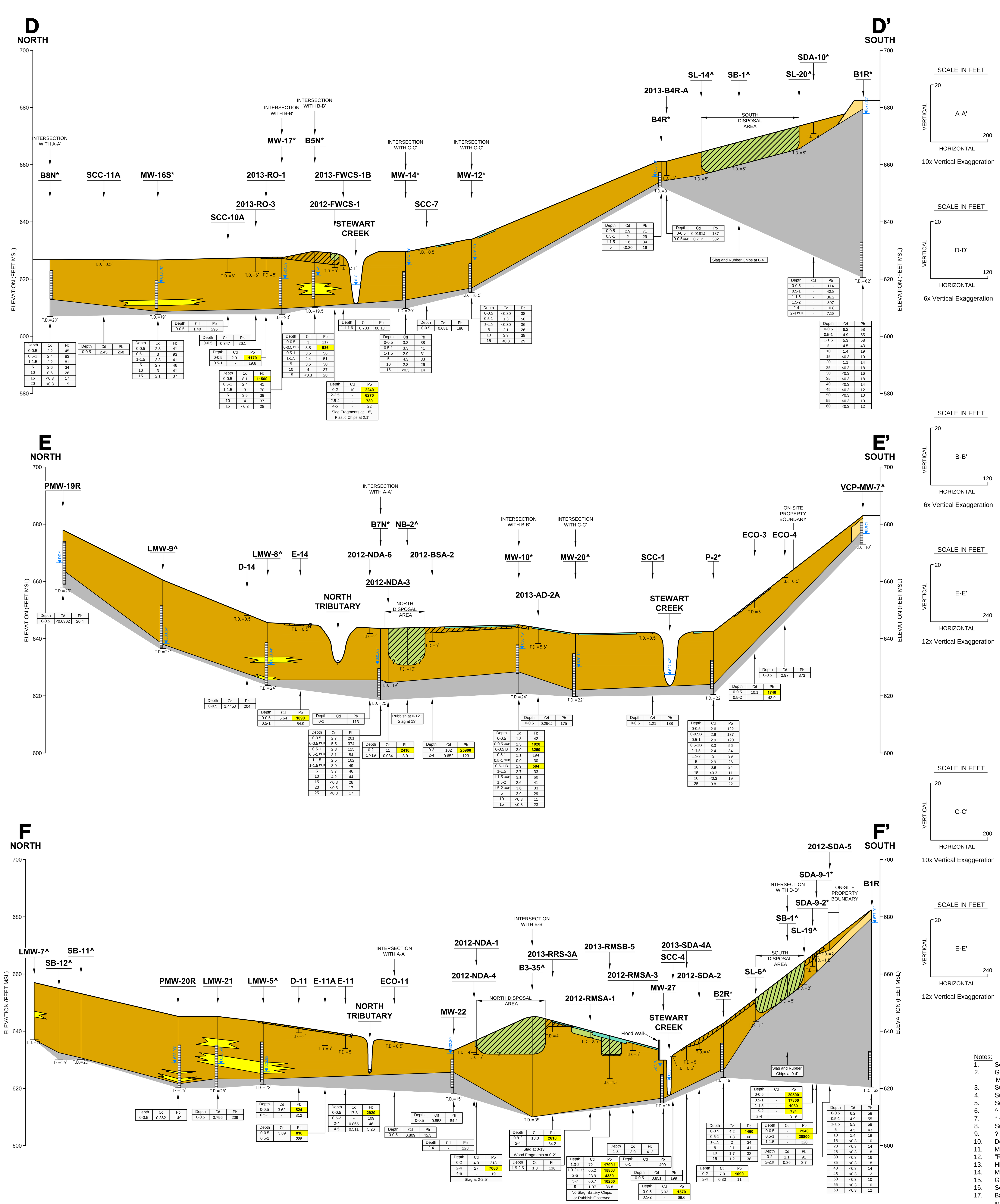
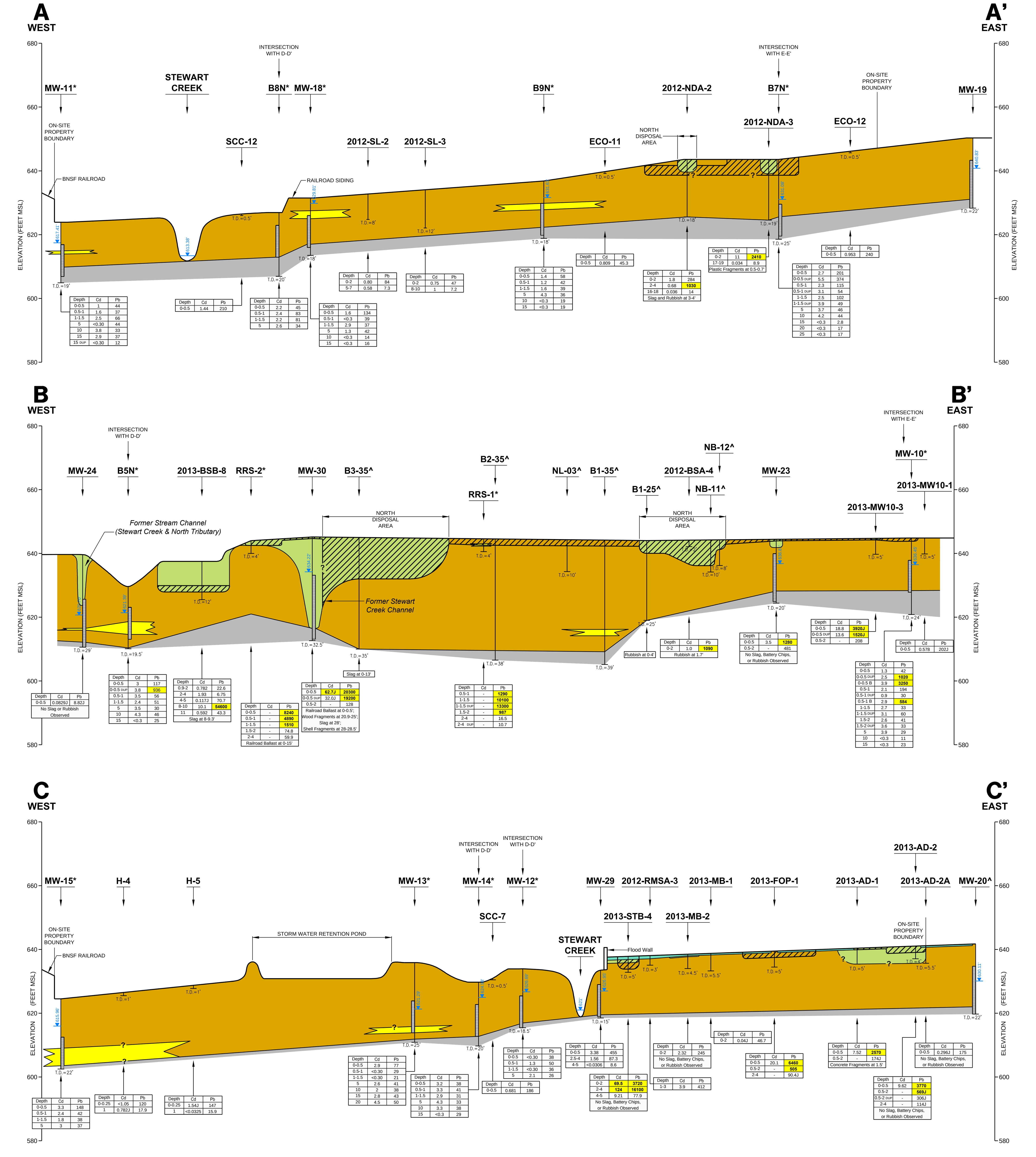
CONSULTING ENGINEERS AND SCIENTISTS





Notes:

1. See Figure 4C.1 for cross section locations.
2. Ground surface elevations and creek bed topography are estimated. Monitoring well elevations were surveyed by a professional surveyor.
3. Surface soil RALs (0-15 feet bgs): Pb = 500 mg/kg; Cd = 52 mg/kg.
4. Subsurface soil RALs (greater than 15 feet bgs): Pb = 27,451 mg/kg; Cd = 2,950 mg/kg.
5. Soil sample results that exceed the applicable RAL are highlighted and bolded.
6. ^ - Soil sample data not available.
7. * - Soil sample results based on historical data (see Appendix 17).
8. Surface water elevations in Stewart Creek inferred from staff gauge elevations measured 4/29/2013.
9. ? - Boundary uncertain.
10. Depths given in feet bgs.
11. MSL - Above mean sea level.
12. "Rubbish" used as defined in 30 TAC 330.3(A)(130).
13. Historical data not used to delineate RAL exceedance zone.
14. Monitoring wells B8N, LMW-7, and B2R either plugged and abandoned or destroyed.
15. Gabion basket present at 0.0 to 1.1 feet bgs at 2013-FWCS-1B.
16. Soil data provided for B1R is from B1N, which was replaced by B1R.
17. Based on historical use, the North Disposal Area, South Disposal Area, and Slag Landfill are included entirely within the affected property and critical PCLE zone boundaries.
18. Data qualifiers (See Section 3.5)

EXPLANATION

GENERALIZED LITHOLOGIC ABBREVIATIONS

- Concrete
- Fill
- Clay or Silty Clay with Minor Occurrences of Silt and Gravelly Clay (Gravel Suspended in Clay Matrix)
- Gravel or Sand (Typically Clayey)
- Austin Chalk Limestone
- Eagle Ford Shale
- Soil RAL Exceedance Zone

MONITORING WELL CONSTRUCTION

Screened Interval
T.D.=24'
Bottom Cap
Total Depth

Water Level (Ft MSL) Measured 4/29/13

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
7-9-13

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 4C.2

GEOLOGIC CROSS SECTIONS

PROJECT: 1755	BY: AJD	REVISIONS
DATE: JUNE, 2013	CHECKED: WFV	

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5.0 GROUNDWATER ASSESSMENT

As detailed in Section 1.3, the uppermost groundwater-bearing unit (GWBU) at the Site is comprised of clay-rich colluvial soils lying on top of the Eagle Ford Shale. As described in Section 2.5 and Appendix 7, the uppermost GWBU is classified as a Class 3 groundwater resource. Potential COC impacts to this groundwater zone were evaluated through the collection of groundwater samples from thirty-eight groundwater monitoring wells, including fourteen monitoring wells installed as part of this 2013 assessment (MW-21 through MW-31, LMW-21, LMW-22, and PMW-20R), two monitoring wells (MW-19 and MW-20) installed on the adjacent Exide-owned Undeveloped Buffer Property east of the FOP as part of the 2012 SIR per the EPA-approved Work Plan (CRA, 2011), and twenty-two monitoring wells installed as part of previous Site investigations. Three of the newly installed monitoring wells (MW-26, MW-27, and MW-29) are located between the former production area and Stewart Creek. Two monitoring wells at the Site (B3R and PMW-19R) were not sampled because either the well produced an insufficient volume of water for sampling (B3R) or the well was dry (PMW-19R) during sampling events.

5.1 Derivation of Assessment Levels

Groundwater assessment levels are based on the $^{GW}\mathbf{GW}_{\mathbf{Class3}}$ and $^{Air}\mathbf{GW}_{\mathbf{Inh\text{-}V}}$ exposure pathways for all areas of the Site. The $^{SW}\mathbf{GW}$ exposure pathway is also considered to be complete in areas where there is a potential point of discharge of groundwater to surface water (i.e., in the near vicinity of Stewart Creek or the North Tributary). The ^{SW}GW PCLs were set to ^{SW}SW RBELs (i.e., no dilution factor was used) because Stewart Creek (and thus the North Tributary) is classified by the TCEQ as an intermittent stream (TCEQ, 2011a). In accordance with that classification and per TCEQ RG-194 (TCEQ, 2012b), the ^{SW}SW RBELs are based on acute ecological criteria. The ^{SW}SW RBELs were calculated based on a hardness value of 106 mg/L for Lake Lewisville (Segment 0823), located approximately 5 miles downstream from the Site (Appendix 9). The groundwater to sediment PCL (^{Sed}GW) pathway is not applicable, as described in Section 2.6.3.

Delineation of COCs in groundwater was completed using assessment levels established for residential land use (RALs) or ^{SW}GW PCLs (if applicable). As presented on Table 5A, groundwater RALs were established based on the lowest applicable TRRP Tier 1 residential PCL.

5.2 Nature and Extent of COCs in Groundwater

Samples from all groundwater monitoring wells were analyzed for total and dissolved concentrations of the primary COCs of lead and cadmium. The concentrations of these COCs were compared to applicable PCLs, as described in Table 5B.1. Based on the observation of elevated arsenic and selenium concentrations in a sample collected from the Class 2 Landfill leachate collection tank (see Section 3.1.2 for additional information), groundwater samples from the Class 2 Landfill area were also analyzed for total and dissolved concentrations of arsenic and selenium. Monitoring well MW-27 was installed in the near vicinity of the Former Diesel Fuel Tank release area, between the former tank location and Stewart Creek (see Figure 5B). The groundwater sample from MW-27 was analyzed for TPH and PAHs in addition to total and dissolved cadmium and lead.

Groundwater sample data from all Site monitoring wells were below applicable PCLs for all COCs (Tables 5B.1 through 5B.3). At monitoring well LMW-9, concentrations of selenium were below the RAL but above the ^{SW}GW PCL. TRRP Rules §350.37(i) and §350.51(f) indicate that ^{SW}GW PCLs only apply to monitoring wells located where there is a potential point of discharge to surface water (the groundwater to surface water point of exposure (POE)). Because LMW-9 is not located at a potential point of discharge to surface water, a direct comparison of the LMW-9 groundwater sample data to ^{SW}GW PCLs is not appropriate. LMW-9 is located on the east side of the Class 2 Landfill. As shown on the groundwater potentiometric surface maps presented in this APAR (Figures 5A.1 through 5A.3), it is positioned cross-gradient from the Class 2 Landfill and upgradient from the North Tributary. LMW-9 is located approximately 400 feet from the North Tributary at its closest point and approximately 660 feet from the North Tributary in terms of the inferred northeast to southwest groundwater flow path.

An attenuation model was completed to evaluate the potential migration of selenium from LMW-9 to the North Tributary. The attenuation model (documented in Appendix 11) demonstrates that the potential migration of selenium from LMW-9 will not result in an exceedance of the ^{SW}GW PCL at the North Tributary POE. The result of the attenuation calculation is supported by the fact that ^{SW}GW PCL exceedances were not detected in groundwater samples from three monitoring wells (LMW-8, LMW-17, and LMW-22) located between LMW-9 and the North Tributary. Based on this evaluation, the selenium concentration at LMW-9 is not indicative of a PCL exceedance. Based on the absence of groundwater PCL exceedances, a groundwater affected property is not indicated at the Site. However, as discussed in the Conclusions and Recommendations section of this APAR, future groundwater monitoring at the Site is recommended.

Sulfate and TDS were also evaluated in monitoring wells sampled at the Site. Both parameters were analyzed during the SIR investigation per the EPA-approved Work Plan (CRA, 2011). Per the February 7, 2013 memorandum issued by the TCEQ (TCEQ, 2013d), sulfate was also analyzed during the APAR investigation. As shown in Table 5C, sulfate and TDS sample concentrations were variable at the Site. Variability in these parameters does not appear to be related the proximity to potential source areas. For example, the second highest sulfate concentration (4,040 mg/L) observed was at background well MW-20 located on the Undeveloped Buffer Property east of the former production area. Moreover, the sulfate concentration in monitoring well MW-31, located in the Battery Receiving/Storage Building and screened within an interval where slag was observed, was reported at a much lower concentration of 927 mg/L.

5.3 Nature and Extent of NAPL in Groundwater

NAPL was not observed in groundwater at the Site.

Table 5A Groundwater Residential Assessment Levels

COC	$^{GW}GW_{Class\ 3}$ PCL (mg/L)	$^{Air}GW_{Inh-V}$ PCL (mg/L)	RAL[1] (mg/L)	MQL (mg/L)	Maximum Concentration Detected: Sample ID	Screen Depth (feet bgs)	Sample Date	Conc (mg/L)
Metals								
Arsenic	**1.0E+00**	--	1.0E+00	1.0E-02	--	--	--	--
Cadmium	**5.0E-01**	--	5.0E-01	5.0E-03	MW-25	7-22	3/19/2013	0.0031J
Lead	**1.5E+00**	--	1.5E+00	1.0E-02	B4R	4-9	1/18/2012	0.076 J-
Selenium	**5.0E+00**	--	5.0E+00	4.0E-02	LMW-9	9-23	4/12/2013	0.944
TPH								
T/R Hydrocarbons: C6-C12	**9.8E+01**	2.3E+02	9.8E+01	5.0E+00	--	--	--	--
T/R Hydrocarbons: >C12-C28	**9.8E+01**	9.7E+02	9.8E+01	5.0E+00	--	--	--	--
T/R Hydrocarbons: >C28-C35	**9.8E+01**	9.7E+02	9.8E+01	5.0E+00	--	--	--	--
T/R Hydrocarbons: C6-C35	--	--	--	5.0E+00	--	--	--	--
PAHs								
1-Methylnaphthalene	**3.1E+00**	--	3.1E+00	2.0E-03	MW-27	5-15	04/09/13	0.00138 J
2-Methylnaphthalene	**9.8E+00**	--	9.8E+00	1.5E-03	MW-27	5-15	04/09/13	0.000222 J
Acenaphthene	**1.5E+02**	--	1.5E+02	1.0E-03	MW-27	5-15	04/09/13	0.00016
Acenaphthylene	**1.5E+02**	--	1.5E+02	1.0E-03	--	--	--	--
Anthracene	**7.3E+02**	--	7.3E+02	1.0E-03	--	--	--	--
Benzo[a]anthracene	**1.3E-01**	2.6E+02	1.3E-01	2.0E-03	--	--	--	--
Benzo[a]pyrene	**2.0E-02**	5.0E+01	2.0E-02	1.5E-03	--	--	--	--
Benzo[b]fluoranthene	**1.3E-01**	2.1E+02	1.3E-01	2.0E-03	--	--	--	--
Benzo[g,h,i]perylene	**7.3E+01**	--	7.3E+01	2.5E-03	--	--	--	--
Benzo[k]fluoranthene	**1.3E+00**	1.3E+04	1.3E+00	2.0E-03	--	--	--	--
Chrysene	**1.3E+01**	7.5E+04	1.3E+01	1.5E-03	--	--	--	--
Dibenz(a,h)anthracene	**2.0E-02**	1.3E+02	2.0E-02	2.5E-03	--	--	--	--
Fluoranthene	**9.8E+01**	--	9.8E+01	2.5E-03	--	--	--	--
Fluorene	**9.8E+01**	--	9.8E+01	1.5E-03	MW-27	5-15	04/09/13	0.00019 J
Indeno[1,2,3-cd]pyrene	**1.3E-01**	1.2E+03	1.3E-01	2.0E-03	--	--	--	--
Naphthalene	4.9E+01	**4.1E+01**	4.1E+01	5.0E-03	MW-27	5-15	04/09/13	0.00152 J
Phenanthrene	**7.3E+01**	--	7.3E+01	1.5E-03	--	--	--	--
Pyrene	**7.3E+01**	--	7.3E+01	2.0E-03	--	--	--	--

1. [1] - The Residential Assessment Level (RAL) is the lower of the TRRP Tier 1 residential $^{GW}GW_{Class3}$ and $^{Air}GW_{Inh-V}$ PCLs (TCEQ, 2012c). Per TRRP-24, the ^{SW}GW PCL also applies (to dissolved-phase COCs) for monitoring wells in locations where there is a potential point of discharge of groundwater to surface water (i.e., in the near vicinity of Stewart Creek or the North Tributary). ^{SW}GW PCLs and RALs are presented in Tables 5B.1 through 5B.3 for comparison with Site groundwater data.
2. Data qualifiers (see Section 3.5): J - estimated result; J- - estimated result, biased low.
3. MQL values that exceed the RAL are highlighted (exceedances not observed).
4. Maximum sample concentrations that exceed RALs are hightlighted and bolded (no exceedances observed).
5. "--" - Not applicable.

Table 5B.1 Groundwater Data Summary - Cadmium and Lead

Well ID	Screen Interval (ft bgs)	Sample Date	Total		Dissolved	
			Cadmium (mg/L)	Lead (mg/L)	Cadmium (mg/L)	Lead (mg/L)
RAL[1]			0.5	1.5	0.5	1.5
SWGW PCL[2]			NA	NA	0.00908	0.0688
B1R	49.5-59.5	3/22/2013	0.0004J	0.0036J	0.0004J	<0.0029
B3R	4-14	1/16/2012	Dry			
		3/18/2013	--[4]	--[4]	--[4]	--[4]
B4R	4-9	1/18/2012	0.00062J	0.076 -J	--[4]	--[4]
		3/19/2013	0.0015J	0.0081J	0.0017J	0.0058J
B5N	6.5-16.5	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
		3/22/2013	<0.00035	<0.0029	<0.00035	<0.0029
B7N	14-24	3/18/2013	<0.00035	<0.0029	<0.00035	<0.0029
B9N	7-17	4/10/2013	<0.00035	<0.0029	<0.00035	<0.0029
field duplicate		4/10/2013	<0.00035	<0.0029	<0.00035	<0.0029
MW-10	7-17	3/18/2013	0.0012J	0.0076J	0.0013J	0.003J
MW-11	7-17	4/9/2013	<0.00035	<0.0029	<0.00035	<0.0029
MW-12	8-18.5	1/16/2012	<0.00035	<0.0029	<0.00035	<0.0029
		3/13/2013	0.00103J	0.0029J	<0.00035	<0.0029
MW-13	12-22	1/16/2012	<0.00035	<0.0029	<0.00035	<0.0029
		3/13/2013	<0.00035	<0.0029	<0.00035	<0.0029
MW-14	7-17	1/16/2012	<0.00035	0.00311J	<0.00035	<0.0029
		3/13/2013	<0.00035	<0.0029	0.0007J	<0.0029
MW-15	12-22	4/10/2013	<0.00035	<0.0029	<0.00035	<0.0029
MW-16	67.5-77.5	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
		4/9/2013	<0.00035	0.0044J	<0.00035	0.0039J
MW-16S	7-17	1/17/2012	<0.00035	<0.0029	<0.00035	0.00299J
		4/9/2013	0.0012J	0.005J	0.0007J	0.0041J
MW-17	7-17	1/18/2012	<0.00035	0.00411J	<0.00035	0.0029 UJ
		3/22/2013	0.0004J	<0.0029	<0.00035	<0.0029
MW-18	5.5-15.5	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
Dup		1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
		3/18/2013	<0.00035	<0.0029	<0.00035	<0.0029
MW-19*	7-22	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
MW-20*	7-22	1/18/2012	<0.00035	<0.0029	--[4]	--[4]
MW-21	3-13	4/9/2013	0.0005J	<0.0029	0.0005J	<0.0029
MW-22	3-13	4/9/2013	0.0029J	0.0063J	0.0029J	0.004J
MW-23	4.5-19.5	3/19/2013	<0.00035	<0.0029	<0.00035	<0.0029
MW-24	14-29	3/18/2013	<0.00035	0.0038J	<0.00035	0.0054J
MW-25	7-22	3/19/2013	0.0031J	0.0064J	0.003J	0.0074J
MW-26	5-15	4/9/2013	0.0006J	<0.0029	0.0004J	<0.0029
MW-27	5-15	4/9/2013	0.001J	0.0029J	0.0009J	0.0035J
MW-28*	5-20	3/21/2013	<0.00035	<0.0029	<0.00035	<0.0029
MW-29	4.5-14.5	4/9/2013	0.0015J	<0.0029	0.0014J	<0.0029
MW-30	12-32	4/10/2013	<0.00035	0.0031J	<0.00035	<0.0029
MW-31	8-23	5/13/2013	<0.00035	<0.0029	<0.00035	<0.0029
P-1	10-20	4/9/2013	<0.00035	<0.0029	<0.00035	<0.0029
P-2	10-20	3/19/2013	0.0012J	0.005J	0.0014J	0.005J
LMW-5	7-21	3/13/2013	< 0.00035	< 0.0029	< 0.00035 UJ	< 0.0029
LMW-8	7-21	3/13/2013	< 0.00035	< 0.0029	< 0.00035 UJ	< 0.0029
LMW-9	9-23	3/13/2013	< 0.00035	< 0.0029	< 0.00035 UJ	< 0.0029
LMW-17	10-20	3/12/2013	< 0.00035	< 0.0029	< 0.00035	< 0.0029

Table 5B.1 Groundwater Data Summary - Cadmium and Lead

Well ID	Screen Interval (ft bgs)	Sample Date	Total		Dissolved	
			Cadmium (mg/L)	Lead (mg/L)	Cadmium (mg/L)	Lead (mg/L)
RAL[1]			**0.5**	**1.5**	**0.5**	**1.5**
^{SW}GW PCL[2]			**NA**	**NA**	**0.00908**	**0.0688**
LMW-21	10-25	3/12/2013	< 0.00035	< 0.0029	< 0.00035	< 0.0029
field duplicate		3/12/2013	< 0.00035	< 0.0029	< 0.00035	< 0.0029
LMW-22	5-20	3/13/2013	< 0.00035	< 0.0029	< 0.00035 UJ	< 0.0029
LMW-19[3]	ND	1/18/2012	<0.00035	<0.0029	<0.00035	<0.0029
PMW-19R[3]	4-19	3/12/2013	Dry			
		4/12/2013	Dry			
PMW-20R[3]	10-25	3/12/2013	< 0.00035	< 0.0029	< 0.00035 UJ	< 0.0029

Notes:

1. [1] - The Residential Assessment Level (RAL) is the the TRRP Tier 1 residential $^{GW}GW_{Class3}$ PCL ($^{Air}GW_{Inh-V}$ PCL not applicable).
2. [2] - ^{SW}GW PCL conservatively set at the ^{SW}SW RBEL (i.e., no dilution factor). ^{SW}SW RBEL based on acute ecological criteria for Stewart Creek and the North Tributary (intermittent streams). Cadmium and lead RBELs calculated based on a hardness value of 106 mg/L for Lake Lewisville, Segment 0823. Per TRRP-24, specific aquatic life criteria for cadmium and lead apply to dissolved rather than total concentrations since the dissolved phase represents the bioavailable form. Also per TRRP-24, the ^{SW}GW PCL also applies to monitoring wells where there is a potential point of discharge of groundwater to surface water (i.e., in the near vicinity of Stwart Creek or the North Tributary).
3. [3] - Wells PMW-19R and PMW-20R are replacement wells for LMW-19 and PMW-20, respectively. LMW-19 and PMW-20 were plugged and replaced in February 2013 due to absence of boring logs and well construction data.
4. [4] - Well did not yield sufficient volume of water for sample analysis.
5. * - Well located on Undeveloped Buffer Property. MW-19 and MW-20 were installed and sampled as part of the 2012 SIR per the Sampling and Analysis Work Plan (CRA, 2011) as background monitoring wells.
6. Samples for dissolved analysis field filtered with either a 10 micron filter (2012 samples) or 0.45 micron filter (2013 samples) (see Section 3.3.2).
7. Data qualifiers (see Section 3.5): J - estimated result; J- - estimated result, biased low; UJ - estimated result, not detected.
8. PCL exceedances are highlighted and bolded (no exceedances were detected).
9. ND - Data not available.

Table 5B.2 Groundwater Data Summary - Arsenic and Selenium

Well ID	Screen Interval (ft bgs)	Sample Date	Total Metals		Dissolved Metals	
			Arsenic (mg/L)	Selenium (mg/L)	Arsenic (mg/L)	Selenium (mg/L)
RAL[1]			**1.0**	**5.0**	**1.0**	**5.0**
^{SW}GW PCL[2]			**NA**	**NA**	**0.34**	**0.02**
LMW-5	7-21	3/13/2013	< 0.00328	< 0.00417	< 0.00328	<0.00417 UJ
LMW-8	7-21	3/13/2013	< 0.00328	0.0104 J	< 0.00328	0.0057 J
		4/12/2013	--	0.0055 J	--	0.0056 J
LMW-9	9-23	3/13/2013	< 0.00328	0.491[4]	< 0.00328	0.489[4]
		4/12/2013	--	0.944[4]	--	0.844[4]
LMW-17	10-20	3/12/2013	< 0.00328	< 0.00417	< 0.00328	< 0.00417
LMW-21	10-25	3/12/2013	< 0.00328	< 0.00417	< 0.00328	< 0.00417
field duplicate		3/12/2013	< 0.00328	< 0.00417	< 0.00328	< 0.00417
		4/11/2013	--	< 0.00417	--	< 0.00417
LMW-22	5-20	3/13/2013	< 0.00328	< 0.00417	< 0.00328	< 0.00417
LMW-19[3]	ND	1/18/2012	--	--	--	--
MW-28	5-20	3/21/2013	< 0.00328	< 0.00417	< 0.00328	<0.00417 UJ
PMW-19R[3]	4-19	3/12/2013	DRY			
		4/12/2013	DRY			
PMW-20R[3]	10-25	3/12/2013	< 0.00328	0.00931 J	< 0.00328	0.00509 J
		4/11/2013	--	0.009 J	--	0.0073 J

Notes:

1. [1] - The Residential Assessment Level (RAL) is the the TRRP Tier 1 residential $^{GW}GW_{Class3}$ ($^{Air}GW_{Inh-V}$ PCL not applicable).
2. [2] - ^{SW}GW PCL conservatively set at the ^{SW}SW RBEL (i.e., no dilution factor). ^{SW}SW RBEL based on acute ecological criteria for Stewart Creek and the North Tributary (intermittent streams). Cadmium and lead RBELs calculated based on a hardness value of 106 mg/L for Lake Lewisville, Segment 0823. Per TRRP-24, specific aquatic life criteria for cadmium and lead apply to dissolved rather than total concentrations since the dissolved phase represents the bioavailable form. Also per TRRP-24, the ^{SW}GW PCL also applies to monitoring wells where there is a potential point of discharge of groundwater to surface water (i.e., in the near vicinity of Stwart Creek or the North Tributary).
3. [3] - Wells PMW-19R and PMW-20R are replacement wells for LMW-19 and PMW-20, respectively. LMW-19 and PMW-20 were plugged and replaced in February 2013 due to absence of boring logs and well construction data.
4. [4] - LMW-9 is not located at a potential point of discharge to surface water; therefore, a direct comparison of the LMW-9 data to ^{SW}GW PCLs is not applicable. An attenuation evaluation (see Appendix 11) for the potential migration of selenium from this well to the North Tributary demonstrates that the potential migration of selenium from LMW-9 will not result in an exceedance of the ^{SW}GW PCL at the North Tributary POE.
5. Samples for dissolved analysis field filtered with either a 10 micron filter (2012 samples) or 0.45 micron filter (2013 samples) (see Section 3.3.2).
6. PCL exceedances are highlighted and bolded (no exceedances were observed).
7. "--" - not analyzed.
8. ND - data not available
9. Data qualifiers (see Section 3.5): J - estimated result; UJ - estimated result, not detected.

Table 5B.3 Groundwater Data Summary - Total Petroleum Hydrocarbons and Polycyclic Aromatic Hydrocarbons

Sample ID: Sample Date: Screen Depth (feet bgs):	Minimum of TRRP Tier 1 Residential $^{GW}GW_{Class\ 3}$ and $^{Air}GW_{Inh-V}$ PCLs	Minimum of TRRP Tier 1 C/I $^{GW}GW_{Class\ 3}$ and $^{Air}GW_{Inh-V}$ PCLs	Acute[3] Aquatic Receptor ^{SW}GW PCL	Contact[3] Recreation Receptor ^{SW}GW PCL	RAL[1]	Critical PCL[2]	MW-27 04/09/13 5-15 (mg/L)
Total Petroleum Hydrocarbons TX1005							
C6-C12	98	292	--	--	98	292	<0.808
>C12-C28	98	292	--	--	98	292	<0.935
>C28-C35	98	292	--	--	98	292	<0.935
C6-C35	--	--	--	--	--	--	<1.52
Polycyclic Aromatic Hydrocarbons							
1-Methylnaphthalene	3.1	7.0	--	4.8	3.1	4.8	0.00138 J, X7
2-Methylnaphthalene	9.8	29.2	0.38	0.28	0.28	0.28	0.000222 J
Acenaphthene	147	438	--	2.4	2.4	2.4	0.000156 J
Acenaphthylene	147	438	--	3.3	3.3	3.3	<0.00006
Anthracene	733	2190	0.0018	10.7	0.0018	0.0018	<0.00005
Benzo[a]anthracene	0.13	0.28	0.21	--	0.13	0.21	<0.00008
Benzo[a]pyrene	0.02	0.02	--	--	0.02	0.02	<0.00008
Benzo[b]fluoranthene	0.13	0.28	--	--	0.13	0.28	<0.00007
Benzo[g,h,i]perylene	73	219	--	--	73	219	<0.00008
Benzo[k]fluoranthene	1.3	2.8	--	--	1.3	2.8	<0.00009
Chrysene	13	28	0.207	--	0.207	0.207	<0.00008
Dibenz(a,h)anthracene	0.020	0.028	0.149	--	0.020	0.028	<0.00008
Fluoranthene	98	292	--	--	98	292	<0.00007
Fluorene	98	292	0.064	2.1	0.064	0.064	0.00019 J
Indeno[1,2,3-cd]pyrene	0.13	0.28	--	--	0.13	0.28	<0.00007
Naphthalene	41	57	1.5	2.55	1.5	1.5	0.00152 J
Phenanthrene	73	219	0.030	1.07	0.030	0.030	<0.00006
Pyrene	73	219	0.206	--	0.206	0.206	<0.00011

1. [1] - Residential Assessment Levels (RALs) are the minimum of the TRRP residential Tier 1 $^{GW}GW_{Class3}$ and $^{Air}GW_{Inh-V}$ PCLs, or applicable ^{SW}GW PCLs.
2. [2] - Critical PCLs are the minimum of the TRRP commercial-industrial Tier 1 $^{GW}GW_{Class3}$ and $^{Air}GW_{Inh-V}$ PCLs, or applicable ^{SW}GW PCLs.
3. [3] - See Appendix 9 for development of ^{SW}GW PCLs.
4. RAL exceedances are bolded and critical PCL exceedances are highlighted (no exceedances were observed).
5. Data qualifiers (see Section 3.5): J - estimated result; X7 - TCEQ does not offer lab accreditation for this analyte analyzed by EPA Method 8270.
6. "--" - Not applicable.
7. All values in mg/L.

Table 5C Groundwater Geochemical Data Summary

Well ID	Sample Date	Screen Interval (ft bgs)	Sulfate (mg/L)	TDS (mg/L)
B4R	1/18/2012	4-9	178	1170
	3/19/2013		953	--
B1R	3/22/2013	49.5-59.5	18	--
B5N	1/17/2012	6.5-16.5	889	1550
	3/22/2013		946	--
B7N	3/18/2013	14-24	1820	--
B9N	4/10/2013	7-17	720	--
field duplicate	4/10/2013		726	--
MW-10	3/18/2013	7-17	753	--
MW-11	4/9/2013	7-17	281	--
MW-12	1/16/2012	8-18.5	2520	1960
MW-12	4/9/2013		2490	--
MW-13	1/16/2012	12-22	1200	2230
	4/9/2013		1020	--
MW-14	1/16/2012	7-17	2630	4180
	4/9/2013		2560	--
MW-15	4/10/2013	12-22	736	--
MW-16	1/17/2012	67.5-77.5	298	1380
	4/9/2013		276	--
MW-16S	1/17/2012	7-17	1080	7980
	4/9/2013		1270	--
MW-17	1/18/2012	7-17	1590	3140
	3/22/2013		1510	--
MW-18	1/17/2012	5-15.5	453	1040
Dup	1/17/2012		455	1220
	3/18/2013		298	--
MW-19	1/17/2012	7-22	854	1760
MW-20	1/18/2012	7-22	4040	6020
MW-21	4/9/2013	3-13	2010	--
MW-22	4/9/2013	3-13	2180	--
MW-23	3/19/2013	4.5-19.5	2090	--
MW-24	3/18/2013	14-29	1640	--
MW-25	3/19/2013	7-22	3700	--
MW-26	4/9/2013	5-15	2480	--
MW-27	4/9/2013	5-15	1530	--
MW-28	4/12/2013	5-20	174	--
MW-29	4/9/2013	4.5-14.5	4260	--
MW-30	4/10/2013	12-32	711	--
MW-31	5/13/2013	8-23	927	--
P-1	4/9/2013	10-20	169	--
P-2	3/19/2013	10-20	2560	--
LMW-5	4/12/2013	7-21	157	--
LMW-8	3/13/2013	7-21	130	--
LMW-9	4/12/2013	9-23	1770	--
LMW-17	4/11/2013	10-20	142	--
LMW-21	4/11/2013	6-25	406	--
LMW-22	4/12/2013	5-20	99	--
LMW-19	1/18/2012	ND	813	3160
PMW-20R	4/11/2013	10-25	268	--

Notes:

1. ND - Data not available.
2. "--" - Not analyzed.

Table 5D Groundwater Measurements

Well ID	TOC Elevation (ft msl)	Screen Interval (ft bgs)	Measurement Date	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft msl)
Former Operating Plant Wells					
B1R	682.72	49.5-59.5	12/13/11	3.62	679.10
			01/16/12	3.74	678.98
			02/13/12	1.87	680.85
			03/11/13	4.64	678.08
			04/05/13	4.52	678.20
			04/29/13	4.81	677.91
B3R	650.23	4-14	12/13/11	DRY	DRY
			01/16/12	DRY	DRY
			02/13/12	9.41	640.82
			03/11/13	14.92	635.31
			04/05/13	14.96	635.27
			04/29/13	12.96	637.27
B4R	664.58	4-9	12/13/11	8.67	655.91
			01/16/12	8.01	656.57
			02/13/12	11.89	652.69
			03/11/13	7.66	656.92
			04/05/13	7.57	657.01
			04/29/13	8.79	655.79
B5N	631.43	6.5-16.5	12/13/11	9.95	621.48
			01/16/12	9.91	621.52
			02/13/12	9.76	621.67
			03/11/13	9.72	621.71
			04/05/13	9.68	621.75
			04/29/13	10.04	621.39
B7N	645.60	14-24	12/13/11	NM	NM
			01/16/12	13.84	631.76
			02/13/12	13.09	632.51
			03/11/13	14.33	631.27
			04/05/13	14.31	631.29
			04/29/13	14.52	631.08
B9N	640.69	7-17	12/13/11	7.31	633.38
			01/16/12	8.78	631.91
			02/13/12	8.84	631.85
			03/11/13	8.39	632.30
			04/05/13	8.76	631.93
			04/29/13	9.06	631.63
LMW-1	638.74	5-20	04/29/13	9.14	629.60
LMW-2	641.01	6-21	04/29/13	11.12	629.89
LMW-3	639.78	6-16	04/29/13	12.08	627.70
LMW-4	639.15	12-22	04/29/13	11.69	627.46
LMW-5	643.27	7-21	03/11/13	17.69	625.58
			04/05/13	17.02	626.25
			04/29/13	17.29	625.98

Table 5D Groundwater Measurements

Well ID	TOC Elevation (ft msl)	Screen Interval (ft bgs)	Measurement Date	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft msl)
Former Operating Plant Wells (Continued)					
LMW-8	645.57	7-21	03/11/13	14.93	630.64
			04/05/13	14.52	631.05
			04/29/13	14.63	630.94
LMW-9	660.48	9-23	03/11/13	16.24	644.24
			04/05/13	20.21	640.27
			04/29/13	22.14	638.34
LMW-17	646.34	10-20	03/11/13	18.52	627.82
			04/05/13	18.34	628.00
			04/29/13	16.81	629.53
LMW-21	648.28	10-25	03/11/13	20.11	628.17
			04/05/13	19.29	628.99
			04/29/13	19.62	628.66
LMW-22	646.99	5-20	03/11/13	17.18	629.81
			04/05/13	16.93	630.06
			04/29/13	17.16	629.83
MW-10	644.82	7-17	12/13/11	8.76	636.06
			01/16/12	8.71	636.11
			02/13/12	6.64	638.18
			03/11/13	8.71	636.11
			04/05/13	8.63	636.19
			04/29/13	8.37	636.45
MW-11	626.54	7-17	12/13/11	8.62	617.92
			01/16/12	19.61	606.93
			02/13/12	7.73	618.81
			03/11/13	5.94	620.60
			04/05/13	7.64	618.90
			04/29/13	9.13	617.41
MW-12	635.16	8-18.5	12/13/11	8.54	626.62
			01/16/12	8.62	626.54
			02/13/12	8.14	627.02
			03/11/13	8.22	626.94
			04/05/13	8.17	626.99
			04/29/13	8.47	626.69
MW-13	637.08	12-22	12/13/11	15.75	621.33
			01/16/12	15.83	621.25
			02/13/12	15.57	621.51
			03/11/13	15.42	621.66
			04/05/13	15.33	621.75
			04/29/13	15.79	621.29
MW-14	631.01	7-17	12/13/11	5.88	625.13
			01/16/12	5.94	625.07
			02/13/12	5.79	625.22
			03/11/13	5.81	625.20
			04/05/13	5.74	625.27
			04/29/13	6.03	624.98

Table 5D Groundwater Measurements

Well ID	TOC Elevation (ft msl)	Screen Interval (ft bgs)	Measurement Date	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft msl)
Former Operating Plant Wells (Continued)					
MW-15	626.58	12-22	12/13/11	12.08	614.50
			01/16/12	12.13	614.45
			02/13/12	6.83	619.75
			03/11/13	11.53	615.05
			04/05/13	10.97	615.61
			04/29/13	10.62	615.96
MW-16	628.88	67.5-77.5	12/13/11	10.26	618.62
			01/16/12	10.33	618.55
			02/13/12	10.92	617.96
			03/11/13	9.67	619.21
			04/05/13	9.61	619.27
			04/29/13	10.01	618.87
MW-16S	628.00	7-17	12/13/11	9.05	618.95
			01/16/12	9.12	618.88
			02/13/12	8.67	619.33
			03/11/13	8.92	619.08
			04/05/13	8.84	619.16
			04/29/13	9.22	618.78
MW-17	629.00	7-17	12/13/11	8.55	620.45
			01/16/12	8.62	620.38
			02/13/12	8.28	620.72
			03/11/13	8.29	620.71
			04/05/13	8.27	620.73
			04/29/13	8.71	620.29
MW-18	633.00	5.5-15.5	12/13/11	1.86	631.14
			01/16/12	1.96	631.04
			02/13/12	1.86	631.14
			03/11/13	2.53	630.47
			04/05/13	2.51	630.49
			04/29/13	3.19	629.81
MW-21	635.99	3-13	03/11/13	3.24	632.75
			04/05/13	3.17	632.82
			04/29/13	4.39	631.60
MW-22	636.89	3-13	03/11/13	3.71	633.18
			04/05/13	3.62	633.27
			04/29/13	4.59	632.30
MW-23	644.15	4.5-19.5	03/11/13	7.13	637.02
			04/05/13	7.04	637.11
			04/29/13	7.34	636.81
MW-24	642.96	14-29	03/11/13	21.77	621.19
			04/05/13	21.72	621.24
			04/29/13	22.26	620.70
MW-25	635.85	7-22	03/11/13	12.29	623.56
			04/05/13	11.71	624.14
			04/29/13	11.39	624.46

Table 5D Groundwater Measurements

Well ID	TOC Elevation (ft msl)	Screen Interval (ft bgs)	Measurement Date	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft msl)
Former Operating Plant Wells (Continued)					
MW-26	631.93	5-15	03/11/13	9.98	621.95
			04/05/13	9.52	622.41
			04/29/13	9.21	622.72
MW-27	633.42	5-15	03/11/13	6.03	627.39
			04/05/13	5.92	627.50
			04/29/13	5.64	627.78
MW-29	633.51	4.5-14.5	03/11/13	13.08	620.43
			04/05/13	6.96	626.55
			04/29/13	6.56	626.95
MW-30	645.48	12-32	04/05/13	11.47	634.01
			04/29/13	11.26	634.22
MW-31	636.71	8-23	05/13/13	10.58	626.13
P-1	647.24	10-20	12/13/11	11.54	635.70
			01/16/12	11.47	635.77
			02/13/12	9.89	637.35
			03/11/13	13.91	633.33
			04/05/13	13.91	633.33
			04/29/13	13.72	633.52
P-2	643.55	10-20	12/13/11	15.91	627.64
			01/16/12	15.94	627.61
			02/13/12	14.31	629.24
			03/11/13	16.34	627.21
			04/05/13	16.31	627.24
			04/29/13	15.44	628.11
PMW-19	678.74		12/13/11	NM	NM
			01/16/12	16.67	662.07
			02/13/12	18.27	660.47
PMW-19R	681.79	4-19	03/11/13	DRY	DRY
			04/05/13	DRY	DRY
			04/29/13	DRY	DRY
PMW-20R	648.09	10-25	03/11/13	18.91	629.18
			04/05/13	19.06	629.03
			04/29/13	19.16	628.93
Undeveloped Buffer Property Wells					
MW-19	653.34	7-22	01/16/12	18.59	634.75
			02/13/12	11.73	641.61
			03/11/13	12.81	640.53
			04/05/13	12.87	640.47
			04/29/13	12.51	640.83
MW-20	644.70	7-22	01/16/12	24.02	620.68
			02/13/12	12.79	631.91
			03/11/13	16.34	628.36
			04/05/13	16.31	628.39
			04/29/13	14.59	630.11

Table 5D Groundwater Measurements

Well ID	TOC Elevation (ft msl)	Screen Interval (ft bgs)	Measurement Date	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft msl)
Undeveloped Buffer Property Wells (Continued)					
MW-28	642.91	5-20	03/11/13	14.81	628.10
			04/05/13	14.68	628.23
			04/29/13	13.67	629.24
MW-31	636.71	8-23	05/10/13	10.46	626.25
VCP-MW-1	655.88	2.5-10	03/11/13	12.81	643.07
			04/05/13	12.80	643.08
			04/29/13	12.81	643.07
VCP-MW-2	631.16	5-15	03/11/13	12.17	618.99
			04/05/13	11.79	619.37
			04/29/13	11.26	619.90
VCP-MW-3	634.06	5-15	03/11/13	13.99	620.07
			04/05/13	13.72	620.34
			04/29/13	13.74	620.32
VCP-MW-4	635.43	5-15	03/11/13	7.18	628.25
			04/05/13	6.74	628.69
			04/29/13	6.91	628.52
VCP-MW-5	643.97	5-20	03/11/13	15.31	628.66
			04/05/13	15.27	628.70
			04/29/13	14.44	629.53
VCP-MW-6	644.71	5-20	03/11/13	16.32	628.39
			04/05/13	16.49	628.22
			04/29/13	16.04	628.67
VCP-MW-7	685.18	2.5-10	04/29/13	DRY	DRY
VCP-MW-8	651.02	6-16	04/29/13	12.40	638.62
VCP-MW-9	666.96	2.5-20	04/29/13	13.82	653.14
VCP-MW-10	669.74	2.5-15	04/29/13	13.21	656.53
VCP-MW-11	672.73	2.5-15	04/29/13	DRY	DRY
Stewart Creek Staff Gauges					
Staff Gauge ID	**Zero Elevation (feet amsl)**	**Measurement Date**		**Surface Water Measurement (feet above zero)**	**Surface Water Elevation (feet amsl)**
Staff Gauge No. 1	627.75	01/17/12		0.25	628.00
		02/13/12		0.32	628.07
(re-surveyed 5/16/13)	627.62	04/05/13		0.28	627.90
		04/29/13		-0.20	627.42
Staff Gauge No. 2	613.75	01/17/12		0.09	613.84
		02/13/12		0.46	614.21
(re-surveyed 5/16/13)	613.53	04/05/13		0.24	613.77
		04/29/13		-0.15	613.38

Notes:
1. bgs - below ground surface.
2. msl - above mean sea level.
3. btoc - below top of casing.
4. NM - not measured.
5. Stewart Creek staff gauges were re-surveyed on May 16, 2013 as a result of displacement that occurred since the previous survey event in 2012 due to a storm event.

EXPLANATION

On-Site Property Boundary
FRC Property Boundary
Existing Monitoring Well Location
Well Plugged and Abandoned, Destroyed, or Not Found
Staff Gauge
(620.60) Groundwater Elevation Measured 3/11/13 (Ft MSL)
645 Potentiometric Contour (Ft MSL) C.I.=5 Ft
Inferred Potentiometric Contour

Notes:
1. Wells MW-16 and B1R are screened entirely in Eagle Ford Shale, and were not used to construct potentiometric contours.
2. Surface water Staff Gauges were not monitored during the water level measurement event.
3. NM - not measured.
4. At the time of this water measurement event, monitoring wells MW-30, MW-31, and VCP-MW-7 through VCP-MW-11 had not yet been installed.

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
7-9-13

N

Scale in Feet
0 75 150

Source of photo:
Imagery from NCTCOG, 2009 photography.

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 5A.1

GROUNDWATER POTENTIOMETRIC SURFACE MAP MARCH 11, 2013

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- On-Site Property Boundary
- FRC Property Boundary
- Existing Monitoring Well Location
- Well Plugged and Abandoned, Destroyed, or Not Found
- Staff Gauge
- (620.60) Groundwater/Surface Water Elevation Measured 4/5/13 (Ft MSL)
- 645 Potentiometric Contour (Ft MSL) C.I.=5 Ft
- Inferred Potentiometric Contour

Notes:
1. Wells MW-16 and B1R are screened entirely in Eagle Ford Shale, and were not used to construct potentiometric contours.
2. NM - not measured.
3. At the time of this water measurement event, monitoring wells MW-31 and VCP-MW-7 through VCP-MW-11 had not yet been installed.

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
7-9-13

N

Scale in Feet

0 75 150

Source of photo:
Imagery from NCTCOG, 2009 photography.

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 5A.2

GROUNDWATER POTENTIOMETRIC SURFACE MAP APRIL 5, 2013

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

On-Site Property Boundary

FRC Property Boundary

Existing Monitoring Well Location

Well Plugged and Abandoned, Destroyed, or Not Found

Staff Gauge

(620.60) Groundwater/Surface Water Elevation Measured 4/29/13 (Ft MSL)

645 Potentiometric Contour (Ft MSL) C.I.=5 Ft

Inferred Potentiometric Contour

Notes:
1. Wells MW-16 and B1R are screened entirely in Eagle Ford Shale, and were not used to construct potentiometric contours.
2. At the time of this water measurement event, monitoring well MW-31 had not yet been installed.

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
7-9-13

N

Scale in Feet

0 75 150

Source of photo:
Imagery from NCTCOG, 2009 photography.

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 5A.3

GROUNDWATER POTENTIOMETRIC SURFACE MAP APRIL 29, 2013

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

6.0 SURFACE WATER ASSESSMENT AND CRITICAL PCL DEVELOPMENT

6.1 Type of Surface Water and Applicable Water Quality Criteria

Stewart Creek in the area of the FOP is classified by TCEQ as an intermittent stream (TCEQ, 2011a). It is believed that much of the base flow in the creek is from surface runoff from residential and commercial irrigation systems in the neighborhoods of Frisco in the upstream portion of the watershed. Further discussion of Stewart Creek and the North Tributary, and photographs of these streams, are provided in Figure 2B and in the SLERA (Section 9). The critical surface water PCL used for decision-making purposes for both cadmium and lead is the lower value between the human health contact recreation PCL and the acute ambient water quality criteria. Both criteria are important when evaluating potential impacts in intermittent streams. The human health PCLs are based on a recreational exposure scenario whereby surface water is routinely contacted via incidental ingestion and dermal contact as described in TCEQ's TRRP-24 Guidance Document (TCEQ, 2007).

6.2 Surface Water Risk-Based Exposure Levels (RBELs) for Human Health and Aquatic Life Protection

Table 6A provides a summary of the numerous RBELs and PCLs potentially applicable for surface water exposure pathways. TRRP-24 (TCEQ, 2007) details the process for determining the surface water risk-based exposure limit (^{SW}RBEL). For aquatic life and human health protection, the ^{SW}RBEL is equivalent to the surface water exposure pathway PCL (^{SW}SW). Per the guidance, the source medium and the exposure medium is the surface water, and the receptors are aquatic biota and humans that are directly or indirectly exposed to COCs in surface water. Many of the potential RBEL and PCL values are provided in the Texas Surface Water Quality Standards (TCEQ, 2012b), while others for non-typical uses such as contact recreation have been developed by the TCEQ based on default assumptions. In accordance with TRRP-24 (TCEQ, 2007), because Stewart Creek is an intermittent stream (and thus not a sustainable fishery) and is not used as a primary drinking water source, neither the water/fish ingestion nor the fish ingestion pathways are complete. As such, and consistent with discussions with TCEQ personnel in the February 2013 meetings described previously, the RBEL used in this evaluation is based on exposure assumptions for a contact recreation scenario since this pathway is potentially complete. Appendix 9 provides additional discussion on the derivation of a contact recreation PCL for lead since there is not a value provided by TCEQ for this compound. Due to the intermittent classification of Stewart Creek, acute aquatic water criteria were used in the comparison to Site data to protect aquatic biota in accordance with TRRP-24 (TCEQ, 2007) guidance for intermittent streams.

6.3 Nature and Extent of COCs in Surface Water

Table 6B summarizes the analytical results for the fifteen Stewart Creek and ten North Tributary surface water samples while Figure 6A shows the concentrations by sample location. Because human and ecological receptors have the potential to contact surface water, the surface water data were compared to conservative screening levels (i.e., PCLs) that were developed to be protective of these potential exposure scenarios and pathways.

6.4 Critical PCL for Surface Water

The ecological PCLs derived for cadmium and lead were lower than the human health PCLs for those metals (see Table 6B), and are therefore, the critical PCLs. The ecological PCLs were derived to be protective of acute aquatic life, and were calculated per TCEQ guidance (TCEQ, 2006) using a hardness value for the nearest classified downstream segment. A hardness value of 106 mg/L for Segment 0823 was used per TCEQ guidance (2012b).

While total and dissolved metals concentrations were measured in surface water samples, the TRRP screening criteria are only applicable to dissolved concentrations (TCEQ, 2012b), and thus only dissolved concentration data were used for comparison to the critical surface water PCLs. None of the measured concentrations exceeded the acute aquatic life value as listed in Table 6B and all were far below the human health-based PCLs.

Table 6A Surface Water Critical PCLs

COC	Background (mg/L)	MQL (mg/L)	Human Health[1] ($^{SW}SW_{HH}$) Water and fish (mg/L)	Fish only (mg/L)	Contact Recreation (mg/L)	Aquatic Life and Ecological[2] ($^{SW}SW_{eco}$) Acute[3] (mg/L)	Chronic (mg/L)	Wildlife receptors (mg/L)	Conc Max (mg/L)	Rep[4] (mg/L)
Cadmium	NA	0.005	NC	NC	0.149	0.00908	NC	NC	0.002J	0.002J
Lead	NA	0.01	NC	NC	1.5[5]	0.0688	NC	NC	0.0046J	0.0046J

Notes:

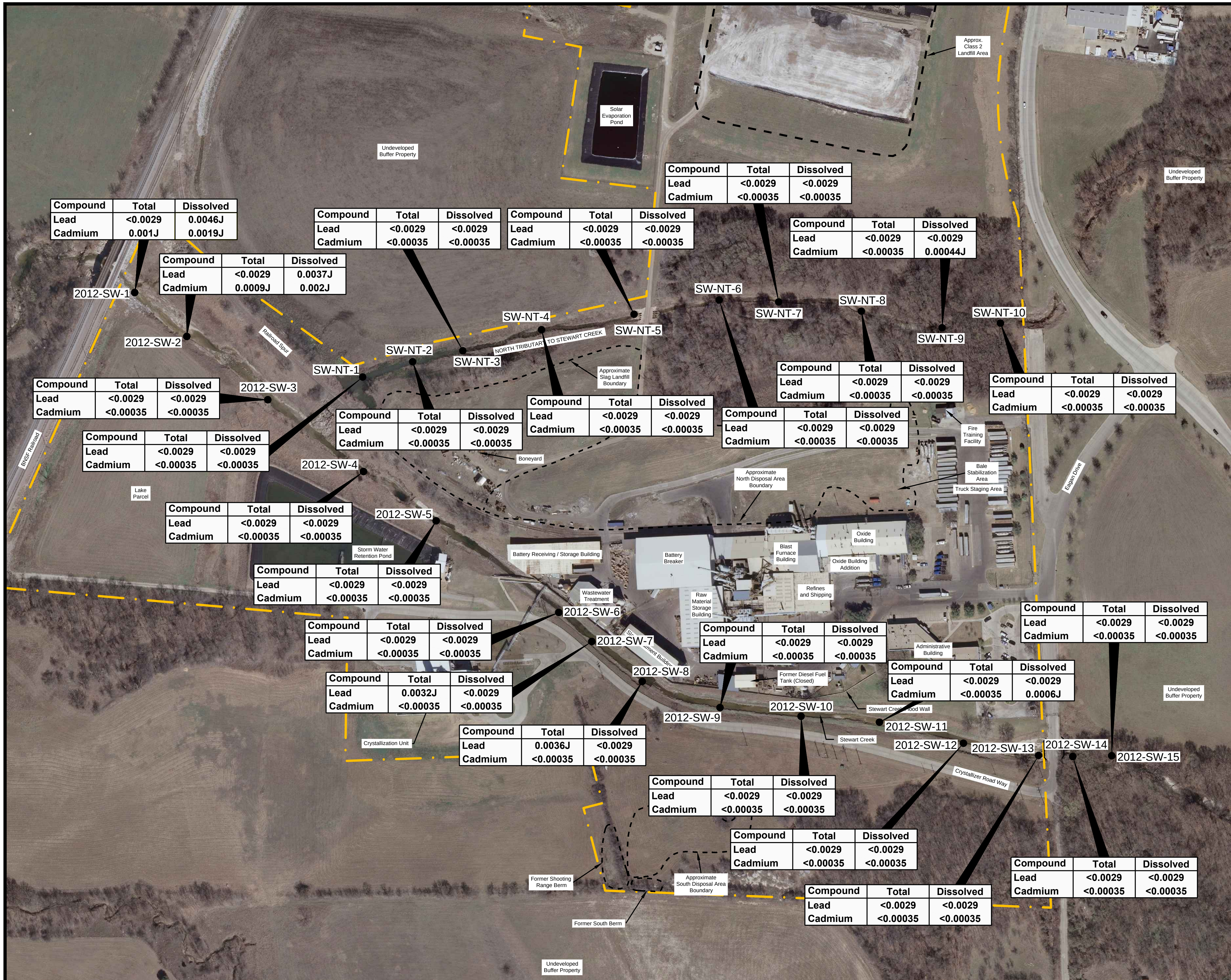
1. [1] - $^{SW}SW_{HH}$ – Surface water PCL protective of human health.
2. [2] - $^{SW}SW_{eco}$ – Surface water PCL protective of aquatic life and wildlife ecological receptors.
3. [3] - RBELs calculated based on a hardness value of 106 mg/L for Lake Lewisville Segment 0823 per Implementation Guidance (TCEQ, 2012b).
4. [4] - Maximum concentrations were used as the Representative Concentration in the SLERA.
5. See Appendix 9 for discussion related to derivation of contact recreation value for lead.
6. Data qualifiers (see Section 3.5): J - estimated result.
7. NA - Not available.
8. NC - Not a complete pathway.

Table 6B Surface Water Data Summary

Sample ID	Sample Date	Total Metals		Dissolved Metals	
		Cadmium (mg/L)	Lead (mg/L)	Cadmium (mg/L)	Lead (mg/L)
Human Health Contact Recreation PCL[1]		**NA**	**NA**	**0.149**	**1.5**
Acute Aquatic Life RBEL[2]		**NA**	**NA**	**0.00908**	**0.0688**
Critical Surface Water PCL		**NA**	**NA**	**0.00908**	**0.0688**
2012-SW-1	1/17/2012	0.001J	<0.0029	0.0019J	0.0046J
2012-SW-2	1/17/2012	0.0009J	<0.0029	0.002J	0.0037J
2012-SW-3	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-4	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-5	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-6	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-7	1/17/2012	<0.00035	0.0032J	<0.00035	<0.0029
2012-SW-7 (Dup)	1/17/2013	<0.00035	0.003J	<0.00035	<0.0029
2012-SW-8	1/17/2012	<0.00035	0.0036J	<0.00035	<0.0029
2012-SW-9	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-10	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-11	1/17/2012	<0.00035	<0.0029	0.0006J	<0.0029
2012-SW-12	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-13	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-14	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-15	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-1	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-2	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-3	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-4	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-5	3/21/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-6	3/21/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-7	3/21/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-8	3/21/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-9	3/21/2013	<0.00035	<0.0029	0.00044J	<0.0029
SW-NT-10	3/21/2013	<0.00035	<0.0029	<0.00035	<0.0029

Notes:

1. [1] - Contact Recreation Water PCLs, Updated March 2006.
2. [2] - RBELs calculated based on a hardness value of 106 mg/L from Segment 0823.
3. Data qualifiers (see Section 3.5): J - estimated result.
4. Highlighted cells have detected values which exceed the critical surface water PCL (no exceedances detected).
5. NA - Not applicable.



Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	0.0046J
Cadmium	0.001J	0.0019J

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	0.00044J

Compound	Total	Dissolved
Lead	<0.0029	0.0037J
Cadmium	0.0009J	0.002J

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	0.0006J

Compound	Total	Dissolved
Lead	0.0032J	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	0.0036J	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

Compound	Total	Dissolved
Lead	<0.0029	<0.0029
Cadmium	<0.00035	<0.00035

EXPLANATION

Investigation Area Boundary

Surface Water Sample Location

Notes:
1. All Concentrations in mg/L.
2. Critical Surface Water PCL is 0.00908 mg/L for cadmium and 0.0688 mg/L for lead.
3. Data Qualifier:
   J = Estimated Concentration

N

Scale in Feet
0 125 250

Source of photo:
Imagery from NCTCOG, 2009 photography.

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 6A

SURFACE WATER SAMPLE LOCATIONS AND CADMIUM AND LEAD CONCENTRATIONS

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

7.0 SEDIMENT ASSESSMENT AND CRITICAL PCL DEVELOPMENT

7.1 Type of Sediment and Applicable Criteria

As indicated in the previous section, Stewart Creek in the area of the FOP is classified by TCEQ as an intermittent stream (TCEQ, 2011a). It is believed that much of the base flow in the Creek is from surface runoff from residential and commercial irrigation systems in the neighborhoods of Frisco in the upstream portion of the watershed and following large rain events. Further discussions of Stewart Creek and the North Tributary, and photographs of these streams, are provided in Figure 2B and in the SLERA included in Section 9 of this APAR.

Table 7B summarizes the analytical results for the fifteen and ten sediment samples collected from Stewart Creek and the North Tributary, respectively. Figure 7A shows these data by sampling location. Because human and ecological receptors may potentially contact these sediments, the cadmium and lead sediment data were compared to conservative screening levels (i.e., PCLs) that were developed to be protective of those potential human and ecological exposure pathways.

7.2 Sediment Risk-Based Exposure Levels (RBELs)

Table 7A provides a summary of the RBELs and PCLs potentially applicable for sediment exposure pathways. TRRP-24 Guidance (TCEQ, 2007) details the process for determining the sediment risk-based exposure PCLs for human health exposure and provides default values for stakeholder use (${}^{Tot}Sed_{Comb}$). Sediment PCLs protective of benthic organisms are provided in the TCEQ Ecological Risk Assessment Guidance (TCEQ, 2006), and are the midpoint of the benchmark value and the second effects level value for each compound. Stewart Creek and the North Tributary are freshwater bodies and, as such, PCLs for freshwater sediment were used in this evaluation.

7.3 Nature and Extent of COCs in Sediment

The critical PCL used for decision-making purposes for both cadmium and lead is the lower value between the human health and ecological receptor values. The ecological PCL was the lower of the two and is, therefore, the critical PCL. The ecological PCL was derived to be protective of benthic and aquatic organisms, and is the mid-point of the ecological benchmark and the second effects level per TCEQ guidance (TCEQ, 2006). The human health PCL is based on a recreational exposure scenario whereby sediment is routinely contacted via incidental ingestion and dermal contact as described in TRRP-24 (TCEQ, 2007). None of the Site sediment samples collected as part of the SIR and APAR investigations contained cadmium or lead at concentrations in excess of the critical PCL.

As per the Work Plan (CRA, 2011), organic carbon analysis was performed on the sediment samples to provide additional information related to the potential bioavailability of compounds in the sediment to hypothetical ecological receptors. As shown in Table 7B, sediment organic carbon concentrations ranged from 3.78 J to 92.3 g/kg (approximately 0.4 to 9.2 %). Grain size analysis was also performed on the sediment samples. These data, included in Table 7B, show that for all sediment samples, except 2012-SED-1 (collected at the downstream Site boundary), more than 50% of the sediment was coarse-grained (i.e., sand and gravel-sized) material. In nineteen of the twenty-five sediment samples, more than 80% of the sediment was coarse-grained material.

Several studies since the 1990s have been performed to investigate the surface water and sediments of Stewart Creek at the Site and in downstream areas (see Section 1.2.3). JD Consulting, LLC conducted a Human Health and Ecological Risk Assessment (HHERA) in 1998 (JDC, 1998b) that investigated

Stewart Creek surface water and sediments. The study concluded that surface water did not pose a risk to human or ecological receptors while lead concentrations in sediment in the on-site portion of Stewart Creek may pose a risk to human and ecological receptors. The on-site sediments were subsequently remediated in 2000 (JDC, 2000). It was also noted in the HHERA (JDC, 1998b) that cadmium and/or lead levels in several hot spot sediment areas downstream of the facility boundary may pose an ecological risk. Historical surface water and sediment data available for Stewart Creek, including data from the JDC (1998b) study, are provided in Appendix 17.

Southwest Geoscience (SWG) conducted a study in 2013 that investigated potential impacts from lead and/or cadmium in sediments in areas downstream of the Site (SWG, 2013a). Several hot spot sediment sample locations within Stewart Creek near the Dallas North Tollway were noted as having elevated concentrations of lead or cadmium. PBW conducted a SLERA for the Former Stewart Creek Wastewater Treatment Plant (FSCWWTP) located immediately downstream of the Site during 2012 and 2013 (PBW, 2013b), and this study noted hot spots with elevated concentrations of lead or cadmium in the stream segment adjacent to the FSCWWTP immediately downstream of the Site.

SWG conducted a second study (SWG, 2013b) that evaluated the presence of visible battery chips and slag in Stewart Creek downstream from the Site, from the BNSF railroad bridge immediately west of the Site to approximately 5 miles downstream from the Site. SWG's walking survey identified occurrences of battery chips and potential slag material in the Stewart Creek channel from Stonebrook Parkway to the Dallas North Tollway bridge and in the vicinity of the BNSF railroad bridge. As described in the report for that study (SWG, 2013b), SWG, on behalf of the City of Frisco, will be performing additional investigation of sediments within these downstream areas of Stewart Creek.

Additional evaluation, outside of this APAR, is recommended to address potential localized effects in the hot spot areas identified in those other studies. Following completion of the additional SWG Stewart Creek sediment investigation activities described above, it is recommended that potential stakeholders (City of Frisco, Exide and others) collaborate to discuss the investigation results and approaches for evaluation/response.

Table 7A. Sediment Critical PCLs

COC	MQL (mg/kg)	Background (mg/kg)	Human Health ($^{Sed}Sed_{HH}$)[1] Contact recreation (mg/kg)	Human Health ($^{Sed}Sed_{HH}$)[1] Ingestion of impacted fish/shellfish (mg/kg)	Ecological ($^{Sed}Sed_{Eco}$)[2] Benthics (mg/kg)	Ecological ($^{Sed}Sed_{Eco}$)[2] Wildlife receptors/fish (mg/kg)	Conc Max (mg/kg)	Conc Rep[3] (mg/kg)
Cadmium	0.349	NA	1100	NC	2.985	SLERA	2.08J-	1.09
Lead	0.698	NA	500	NC	81.9	SLERA	28.2J	16.05

Notes:

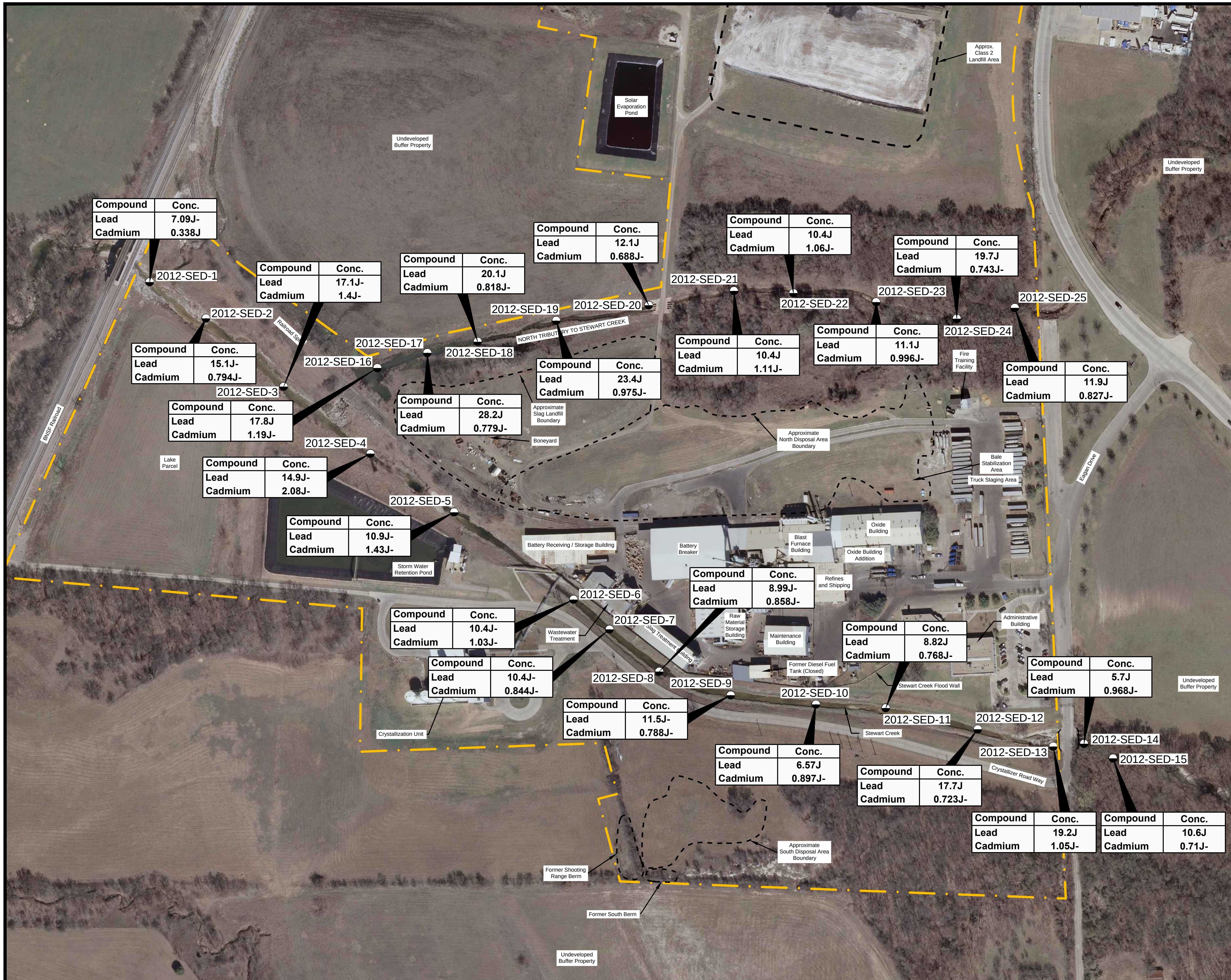
1. [1] - $^{Sed}SED_{HH}$ – Sediment PCL protective of human health.
2. [2] - $^{Sed}SED_{Eco}$ – Sediment PCL protective of ecological receptors.
3. [3] - 95% Upper Confidence Limit was estimated and used as the Representative Concentration in the SLERA.
4. Data qualifiers (see Section 3.5): J - estimated concentration; J- - estimated, biased low.
5. NA - Not available.
6. NC - Not a complete pathway. Ingestion of impacted fish/shellfish is not a complete pathway for an intermittent creek (not a sustainable fishery) per TRRP-24 (TCEQ, 2007).

Table 7B Sediment Data Summary

Sample ID	Sample Date	Metals (mg/Kg)		Total Organic Carbon (g/kg)	Grain Size (%)			
		Cadmium	Lead		Gravel	Sand	Silt	Clay
TRRP Ecological Benchmarks (RG-263)		**0.99**	**35.8**	**NA**	**NA**	**NA**	**NA**	**NA**
TRRP Ecological Secondary Effects Level		**4.98**	**128**	**NA**	**NA**	**NA**	**NA**	**NA**
TRRP Ecological Protective Concentration		**2.985**	**81.9**	**NA**	**NA**	**NA**	**NA**	**NA**
TRRP Tier 1 Human Health $^{Tot}Sed_{Comb}$ PCL		**1100**	**500**	**NA**	**NA**	**NA**	**NA**	**NA**
Critical Sediment PCL		**3.0**	**81.9**	**NA**	**NA**	**NA**	**NA**	**NA**
Stewart Creek								
2012-SED-1	1/11/2012	0.338 J	7.09 J-	4.77	13.1	21.4	34.7	30.8
2012-SED-2	1/11/2012	0.794 J-	15.1 J-	5.31	42.6	41.4	8.0	8.1
2012-SED-3	1/11/2012	1.4 J-	17.1 J-	7.36	61.0	19.1	12.4	7.5
2012-SED-4	1/11/2012	2.08 J-	14.9 J-	13.2	35.2	35.2	19.9	9.7
2012-SED-5	1/11/2012	1.43 J-	10.9 J-	92.3	50.2	34.7	12.5	2.6
2012-SED-6	1/11/2012	1.03 J-	10.4 J-	71.4	49.1	36.3	10.2	4.4
2012-SED-7	1/11/2012	0.844 J-	10.4 J-	69.3	37.3	42.1	13.7	7.0
2012-SED-8	1/11/2012	0.858 J-	8.99 J-	71.5	52.4	28.4	14.8	4.4
2012-SED-9	1/11/2012	0.788 J-	11.5 J-	89.8	39.0	40.4	12.0	8.6
2012-SED-10	1/12/2012	0.897 J-	6.57 J	6.99	42.2	42.7	10.7	4.4
2012-SED-11	1/12/2012	0.768 J-	8.82 J	10.0	53.2	40.6	0.9	5.3
2012-SED-12	1/12/2012	0.723 J-	17.7 J	10.7	35.2	19.8	21.5	23.5
2012-SED-13	1/12/2012	1.05 J-	19.2 J	3.78 J	41.4	45.9	7.9	4.8
2012-SED-14	1/12/2012	0.968 J-	5.7 J	10.1	47.2	36.6	7.7	8.5
2012-SED-15	1/12/2012	0.71 J-	10.6 J	10.7	11.6	53.6	20.0	14.8
North Tributary								
2012-SED-16	1/12/2012	1.19 J-	17.8 J	9.6	30.9	50.5	9.6	9.0
2012-SED-17	1/12/2012	0.779 J-	28.2 J	13.9	38.4	44.0	6.9	10.7
2012-SED-18	1/12/2012	0.818 J-	20.1 J	--	34.8	49.5	9.5	6.2
2012-SED-19	1/12/2012	0.975 J-	23.4 J	15.1	30.8	57.4	4.8	7.0
2012-SED-20	1/12/2012	0.688 J-	12.1 J	22.1	39.4	44.1	11.3	5.2
2012-SED-21	1/12/2012	1.11 J-	10.4 J	32.6	67.6	24.5	5.4	2.5
2012-SED-22	1/12/2012	1.06 J-	10.4 J	26.5	42.5	38.7	15.2	3.6
2012-SED-23	1/12/2012	0.996 J-	11.1 J	42.4	52.4	36.1	7.9	3.6
2012-SED-24	1/12/2012	0.743 J-	19.7 J	8.68	28.5	53.2	9.7	8.6
2012-SED-25	1/12/2012	0.827 J-	11.9 J	35.5	34.1	46.2	15.5	4.2

Notes:

1. No cadmium or lead concentrations exceeded their respective critical PCLs.
2. mg/Kg - milligrams/Kilogram
3. g/Kg - grams/Kilogram
4. NA - Not Applicable
5. "--" - Not Analyzed
6. Data qualifiers (see Section 3.5): J - estimated result; J- - estimated result, biased low.



EXPLANATION

Investigation Area Boundary

Sediment Sample Location

Notes:
1. All Concentrations in mg/Kg.
2. Critical Sediment PCL is 3.0 mg/kg for cadmium and 81.9 mg/kg for lead.
3. Data Qualifiers:
   J = Estimated Concentration
   J- = Estimated, Biased Low

N

Scale in Feet
0 125 250

Source of photo:
Imagery from NCTCOG, 2009 photography.

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 7A

SEDIMENT SAMPLE LOCATIONS AND CADMIUM AND LEAD CONCENTRATIONS

PROJECT: 1755	BY: AJD	REVISIONS
DATE: JUNE, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

9.0 ECOLOGICAL RISK ASSESSMENT

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

EXIDE TECHNOLOGIES
FORMER OPERATING PLANT
FRISCO, TEXAS

US EPA Docket No. RCRA-06-2011-0966

May 10, 2013

Prepared for:

EXIDE TECHNOLOGIES

Prepared by:

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1.0 INTRODUCTION

This report describes the Tier 2 screening-level ecological risk assessment (SLERA) conducted for the Exide Technologies (Exide) former operating plant in Frisco, Texas. The location of the former plant is shown on the Site Location Map presented on Figure 1. The "Site", as shown on Figure 1, is synonymous with the term "Former Operating Plant" or "Investigation Area Boundary" used in this SLERA and was defined as the "Exide Frisco Recycling Center" in the approved Work Plan (PBW, 2012).

The facility was a lead oxide manufacturing plant and later a lead metal recycling facility (secondary lead smelter) that was in operation in Frisco, Texas since approximately 1964, with recycling operations commencing in 1969 until operations ceased in November 2012. The facility recycled spent lead-acid batteries and other lead-bearing scrap materials. The scrap lead was smelted and refined to produce lead, lead alloys and lead oxide.

All data collection and analysis for the SLERA has been conducted using the Texas Commission on Environmental Quality's (TCEQ's) *Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas RG-263 (Revised Update 2006)* as the primary guidance document. The SLERA is a conservative assessment that is used to evaluate the likelihood that a particular ecological risk may exist. In general, the SLERA is also used to evaluate the need for additional ecological evaluation.

The *Screening Level Ecological Risk Assessment Work Plan for the Exide Frisco Recycling Center, Frisco, Texas* (PBW, 2012) was submitted to the TCEQ on December 21, 2012 following discussions with the TCEQ regarding data needs, additional sampling, and the general approach for the SLERA. The TCEQ indicated in a letter dated January 16, 2013 that the Work Plan was acceptable provided that the SLERA text contain additional clarification for two points:1) additional information related to the groundwater to surface water pathway and 2) past wastewater/storm water management at the Site during operations as well as future management during demolition and remediation. The ecological risk analysis using the general screening level risk assessment approach and assumptions outlined in the Work Plan (PBW, 2012) as well as the requested additional information are included in this report.

Agreements put in place between Exide and the City of Frisco pursuant to which the facility ceased operations at the end of November 2012 specified that a significant portion of the Exide-owned undeveloped buffer property surrounding the former operating plant would become commercial development. Exide will retain ownership of the former operating plant (the Site), shown on Figure 1, except that the City has an option to acquire the Lake Parcel and the Pond Parcel, shown on Figure 2, at some later time. Exide will remove its current structures, except for the administration building and the fire training facility (Figure 2). Pending evaluation in the Response Action Plan (RAP) for the Site, Exide will manage and maintain the caps on the disposal areas/landfills within the former operating plant. This SLERA evaluates potential ecological risks within the former operating plant (labeled "Investigation Area Boundary" on the report Figures 1 through 8). As previously mentioned, the term "Investigation Area Boundary" shown on Figures 2 through 8, is synonymous with the "Site" shown on Figure 1. The SLERA incorporates the anticipated future land use for this area when defining the ecological exposure areas. Some areas within the Investigation Area Boundary (e.g., former process areas and landfills) are excluded from the SLERA because of a lack of ecological habitat related to the presence of building slabs, asphalt, and other coverings/caps that are currently managed and maintained and will continue to be managed and maintained in the future. The Tier 1 Exclusion Criteria Checklist is used to document those areas excluded from ecological evaluation in the Affected Property Assessment Report (APAR) and SLERA. Appendix A contains the Tier 1 Exclusion Criteria Checklist. Figure 2 provides a diagram of the areas evaluated in the SLERA as shaded in blue-grey.

2.0 SITE DESCRIPTION AND ENVIRONMENTAL SETTING

This section provides a summary of the history of the Site, current environmental setting and the anticipated future land use of the Site. The current and future environmental setting information was considered to determine current potentially complete exposure pathways.

2.1 Site History

The Site was a lead oxide manufacturing plant and later a secondary lead smelter (a lead metal recycling facility) that was in operation since approximately 1964 (lead smelting operations began in approximately 1969). The operations ceased at the end of November 2012 and demolition of most of the Site buildings is currently underway. Figure 1 shows the Site Location Map. Spent lead-acid batteries and other lead-bearing scrap materials were recycled at the Site. The scrap lead was smelted and refined to produce lead, lead alloys and lead oxide. The operational portion of the Site consisted of a battery receiving/storage building, battery breaker operations, raw materials storage, a laboratory, a blast furnace, a reverbatory furnace, an oxide production facility, refining operations, one active Class 2 waste landfill, several closed landfills, slag treatment building, a wastewater treatment plant and a storm water retention pond.

Wastewater is currently not generated at the Site because there is no active recycling or smelting processes currently in place. Wastewater previously generated at the Site was treated in the wastewater treatment facility located on-site and then discharged to the North Texas Municipal Water District (NTMWD) sanitary sewer.

Storm water control features within the production area include a concrete slab cover and a retention wall/flood wall that route storm water to the retention pond located south of Stewart Creek via a conduit passing over Stewart Creek. The ground surface within the production area has a general slope toward the retention wall/flood wall and storm water retention pond conduit. Water within the retention pond is treated and then discharged to the NTMWD sanitary sewer. The Site is permitted by the TCEQ to discharge water from the retention pond to Stewart Creek, but this has not occurred since approximately 2009. The adjacent areas, which include the disposal areas, have moderate relief stabilized with vegetation. Runoff from these areas flows into Stewart Creek, the North Tributary, or drainage ditches. The ultimate storm water management plan will be designed in conjunction with the final remediation and maintenance design to be developed in the RAP for the Site. All surface water features within the City of Frisco, including Stewart Creek, are included within the City's MS4 permit.

Several studies since the 1990s have been performed to investigate the surface water and sediments of Stewart Creek at the Site and in downstream areas. JD Consulting, LLC conducted a Human Health and

Ecological Risk Assessment (HHERA) in 1998 (JDC, 1998) that investigated Stewart Creek surface water and sediments. The study concluded that surface water did not pose a risk to human or ecological receptors while lead concentrations in sediment in the on-Site portion of Stewart Creek may pose a risk to human and ecological receptors. The on-Site sediments were subsequently remediated in 2000 (JDC, 2000). It was also noted in the HHERA (JDC, 1998) that cadmium and/or lead levels in several hot spot sediment areas downstream of the facility boundary may pose an ecological risk. Southwest Geoscience (SWG) conducted a study in 2013 to investigate potential impacts from lead and/or cadmium in sediments downstream of the Site (SWG, 2013). Several hot spot sediment sample locations within Stewart Creek near the Dallas North Tollway were noted as having elevated concentrations of lead or cadmium. PBW conducted a SLERA for the Former Stewart Creek Wastewater Treatment Plant (FSCWWTP), located immediately downstream of the Site during 2012 and 2013 (PBW, 2013) and this study noted hot spots with elevated concentrations of lead or cadmium in the stream segment adjacent to the FSCWWTP. The location of the FSCWWTP is shown on Figure 1. Further evaluation to address these sediment hot spots in Stewart Creek downstream of the Site is recommended.

Whitehead and Mueller conducted studies during 2011 (W&M, 2011a and W&M, 2011b) to evaluate the presence of potential slag along the banks of the on-Site western reach of Stewart Creek and the areas within and adjacent to the North and South Disposal Areas. Several areas on the banks of the western reach of Stewart Creek, within the woods north of the North Disposal Area and within the northernmost portion of the woods to the east of the South Disposal Area were identified that contained isolated occurrences of slag and battery chips. These identified areas containing visible slag or battery chips will be addressed as part of a response action for the Site and thus were not specifically sampled for this SLERA.

2.2 Current Environmental Setting

The Site is located within the shallow valley created by the drainages of Stewart Creek and a tributary to Stewart Creek located to the North ("North Tributary") as shown on Figures 1 and 2. The on-Site portions of Stewart Creek and the North Tributary receive surface water flow from five distinct creeks that collect water from east of the Site. Figure 1 shows a 2011 aerial photograph with the creeks visible and Appendix B presents photographs taken from upstream locations during a Site visit on October 22, 2012. These creeks have been incorporated into parks as water features, run along roadways and/or run through neighborhoods and other developments, and are part of the surface water features within the Frisco City limits that are contained within the City's MS4 storm water management permit. Urban runoff eventually feeds into the portion of Stewart Creek that is within the boundaries of the Site and is the primary source of water in Stewart Creek. The TCEQ has classified Stewart Creek as an intermittent stream (TCEQ, 2011a).

The ground surface in the northern portion of the Site is relatively level and slopes gently toward either Stewart Creek or the North Tributary. In the southeastern portion of the Site, the ground surface slopes steeply downward toward the north (toward Stewart Creek) due to the natural topography. In the southwestern part of the Site, ground surface slope is also north toward Stewart Creek but at a more gentle magnitude.

2.3 Future Environmental Setting

Figure 2 shows the Site Land Use Map and identifies areas that will potentially remain as ecological habitat. The former operations area and all associated buildings, except for the administration building and the fire training facility, will be demolished to the slab level. The Wastewater Treatment Building and Crystallizer Building (also part of wastewater treatment) will be the last buildings demolished. Pending evaluation in the RAP for the Site, waste disposal area caps will be managed and maintained or otherwise addressed in compliance with applicable TCEQ requirements. The Site will remain under the ownership of Exide with the possible exception of the Lake Parcel and the Pond Parcel, for which ownership might be transferred to the City of Frisco at the City's discretion in the future. All areas of the Site that continue to be owned by Exide will continue to be mowed and maintained by Exide with the exception of the South Wooded Area, North Wooded Area and the Stewart Creek Corridor. Currently, it is anticipated that these areas will continue to be unmaintained.

For the purposes of the SLERA, it was assumed that Stewart Creek and the North Tributary will remain as part of a freshwater urban creek that collects surface water runoff from the nearby residential areas. As such, they were evaluated in the SLERA as aquatic habitat. Terrestrial areas to be evaluated in the SLERA include the Lake Parcel, the South Wooded Area, the North Wooded Area, and the terrestrial corridor along Stewart Creek. The Lake Parcel was cultivated and harvested for hay as recently as 2008. Currently, the eastern part of the corridor along Stewart Creek in the Investigation Area Boundary and the Lake Parcel are routinely mowed and periodically bush hogged, but both could provide terrestrial habitat for mammals and birds. The South Wooded Area and North Wooded Area are overgrown and not maintained; both areas could provide terrestrial habitat for mammals and birds.

3.0 PROBLEM FORMULATION

Per TCEQ guidance (TCEQ, 2006), Problem Formulation is the first phase of the SLERA and establishes the goals, breadth, and focus of the assessment. Therefore, this section identifies the major factors that were considered in the assessment, such as the affected property size and ecology, distribution of chemicals of concern (COCs), and potential ecological receptors.

3.1 Site COCs

The Site COCs are lead and cadmium based on historical operations, process site knowledge and previous investigations that showed that these were the primary COCs at the Site. The Phase I Report dated May 8, 1991 (Lake, 1991), and the Addendum to the Phase I RCRA Facility Investigation (RFI) Report dated December 10, 1993 (Lake, 1993) identified lead as the primary COC at the Site, and soil as the primary environmental media of concern. Cadmium is also present in soils. The Texas Natural Resource Conservation Commission (TNRCC) approved the Phase I RFI Report and Addendum in correspondence dated June 3, 1994, and requested a Phase II RFI of selected areas of the Site and specifically limited the COCs to cadmium and lead.

In addition to lead and cadmium, polycyclic aromatic hydrocarbons (PAHs) were analyzed from three soil samples along the retention wall by Stewart Creek. During construction of the retention wall along Stewart Creek during the spring of 1988, residue resulting from an earlier release from a diesel tank was discovered (Lake, 1989). This spill was remediated and no further action was recommended in the Phase I RFI (Lake, 1993); however PAHs are included as area-specific COCs for completeness. Additional discussion for COC selection, sampling strategy, and analytical suites for the various process areas and portions of the Site is included in the APAR.

Lead and cadmium are considered bioaccumulative in soil while only cadmium is considered bioaccumulative in sediment (Table 3-1 in TCEQ, 2006). The maximum detected concentration from each exposure area was used for media/benchmark screening and the 95 percent upper confidence limit on the mean (95% UCL) was used as the exposure point concentration in the food web analysis. U.S. Environmental Protection Agency's (EPA's) most recent ProUCL software program was used to calculate the 95% UCL concentrations for the constituents in exposure areas (EPA 2010a and 2010b). Appendix C provides the ProUCL output for soil and sediment for the different exposure areas. It should be noted that in the statistical calculations and corresponding data summary, sample points with lead concentrations exceeding 1,600 mg/kg (the industrial $^{Tot}Soil_{Comb}$ protective concentration limit for lead and the anticipated critical lead PCL for the Site pending confirmation in the PCL development section in the

APAR) were removed from the data set for the SLERA because these areas will be addressed to remove potential ecological exposure as part of response action at the Site. Additionally, one area with elevated cadmium in the vicinity of sample location SCC-11 where a concentration of 106 mg/kg was reported will also be addressed to remove the potential ecological exposure as part of a response action at the Site. The data point associated with this location was also removed from the statistical evaluation.

3.1.1 Data Summary

Multiple investigations have been conducted at the Site, as discussed and presented in greater detail in the Site APAR. For the SLERA, however, some of these data are not useable because they may no longer represent current and future exposure conditions, were collected in areas not associated with ecological habitat, or were collected at a depth that does not represent potential ecological exposure. The TCEQ defines the soil depth of ecological exposure as 0-6 inches (TCEQ, 2006).

The data set used for the SLERA consisted of data collected for several different purposes. The quality and representativeness of these data were reviewed to ensure that they met the data quality needs of the SLERA. Surface soil, sediment, surface water and groundwater data used in this SLERA were collected from the following investigations:

Soil:

- Surface soil data for the Lake Parcel and North Wooded Area collected in 2012;
- Surface soil collected to address data needs identified for the SLERA at the South Wooded Area and Stewart Creek Corridor in 2013;
- Site APAR investigation sampling for the Stewart Creek Corridor in 2013,
- Three additional surface soil samples collected at the Lake Parcel in 2013.

Sediment:

- Data collected in Stewart Creek and North Tributary during the 2012 EPA Site Investigation Report activities.

Surface Water:

- Data collected in Stewart Creek during the 2012 EPA Site Investigation Report activities;
- Data collected in North Tributary in 2013 to support the Site APAR.

Groundwater:

- Data collected in April 2013 from wells located near Stewart Creek and the North Tributary to represent the groundwater that may discharge to surface water.

Tables 1 through 4 list data used for evaluating potential ecological exposures for soil, sediment, surface water, and groundwater, respectively. The sample locations are shown on Figures 3, 4 and 5 for soil, sediment and surface water, respectively and the point of exposure wells sampled to represent the groundwater to surface water pathway are shown on Figure 6.

Soils in the terrestrial habitat South Wooded Areaand the Stewart Creek Corridor were sampled to support the SLERA as described in the SLERA Work Plan (PBW, 2012). There were eight surface soil samples collected from a depth of 0-3 inches below ground surface (bgs) from the Lake Parcel. The 0-3 inches bgs soil depth is considered relevant because it is within the 0-6 inch bgs ecologically relevant surface soil as defined by TCEQ (2006). Three additional samples were later collected and these data were added to the data set for inclusion in the SLERA. Surface soil samples that had been collected from the North Wooded Area in 2012 were also used to characterize potential risks in the SLERA. Supplemental data were collected as part of the recent Site APAR investigation to better characterize the nature and extent of contamination at the Site and, as such, surface samples collected as part of those activities along the Stewart Creek Corridor, the North Wooded Area, and the South Wooded Area were included in the SLERA. As shown on Figure 3, spatial coverage of the samples in the four terrestrial areas of ecological interest is complete and sufficiently representative of the ecological exposure unit for each area. Figures 7 and 8 show the surface soil sample locations and concentrations for lead and cadmium, respectively.

Three soil locations along the Stewart Creek Corridor were sampled for PAHs (SCC-3, SCC-6 and SCC-8) to evaluate potential impacts to ecological receptors related to an historical leak from a diesel tank that was reported in the vicinity north of the flood wall. PAHs were assessed in this SLERA based on their molecular weight, as defined by EPA (2007). Low molecular weight PAHs (LPAHs) are defined as having less than four rings and high molecular weight PAHs (HPAHs) have four rings or more. The detected LPAHs and HPAHs were summed respectively. For the LPAHs, only anthracene and phenanthrene were detected in two of the samples but most of the individual HPAHs were detected in all three samples. PAHs that were not detected, or U-flagged, were not included in the summations; however, estimated, or J-flagged, concentrations were included. Location SCC-8 has the highest detected LPAH and HPAH concentrations at 0.02 mg/kg and 0.33 mg/kg, respectively.

The spatial coverage of the sediment and surface water data in Stewart Creek and North Tributary provides sufficient sample data for the SLERA. Tables 2 and 3 provide the analytical data for sediment and surface water while Figures 4 and 5 provide the sample locations and concentration data.

3.1.2 TCEQ Benchmarks/Initial Screening Comparison

Table 5 lists the TCEQ soil, freshwater sediment, and acute surface water (freshwater) benchmarks (TCEQ, 2006; 2011b) that were used in this SLERA as an initial screening step. Soil screening values protective of earthworms for PAHs are also listed (EPA, 2007). Acute surface water quality standards were used for comparison for surface water and potential groundwater discharge to surface water since the TCEQ classifies Stewart Creek as an intermittent stream and, as such, the acute surface water benchmarks are the applicable standards (TCEQ, 2006, 2011a, 2011b).

Required Element #1 is the comparison of the maximum detected concentration from an exposure area to the benchmark. For surface soil (see Table 1) there are only two locations in the Stewart Creek Corridor (SCC-3 and SCC-11) with detections of cadmium (33.3 mg/kg and 106 mg/kg) that exceed the plant benchmark of 32 mg/kg; however, the majority of the detections of lead in the four terrestrial exposure areas exceed the plant benchmark of 120 mg/kg. Detections of PAHs are well below the EPA SSLs protective of earthworms. The location of the 106 mg/kg cadmium concentration was removed from the data set as this location is considered a hotspot and will be addressed to remove the ecological exposure pathway in the response action to be proposed in the RAP.

Table 2 shows the sediment data from Stewart Creek and the North Tributary. All of the detections of cadmium in sediment are estimated (J flagged) or estimated, biased low (J- flagged) concentrations, but are similar to the freshwater sediment benchmark of 0.99 mg/kg. No lead detections exceed the freshwater benchmark of 35.8 mg/kg. Table 3 shows the surface water data compared to the acute freshwater surface water criteria. There are no exceedances of the applicable lead or cadmium criteria.

Table 4 shows the groundwater data for wells in the vicinity of Stewart Creek at the North Tributary near ecological points of exposure compared to the acute surface water benchmarks. None of the measured concentrations or detection limits in these wells exceed the acute surface water benchmarks. This suggests that the potential impacts of groundwater to surface water in the North Tributary and Stewart Creek is not significant. This conclusion is also supported by the very low and infrequent measured concentrations of cadmium and lead in surface water samples from these areas (Table 3).

Based on the initial screening benchmark comparison, lead and cadmium are carried forward as COCs for soil in all four terrestrial areas because lead and cadmium are considered bioaccumulative in soil (Table 3-1 in TCEQ 2006) and there are detections of both COCs above the benchmarks. Cadmium is considered bioaccumulative in sediment (Table 3-1 in TCEQ, 2006). Lead is not considered bioaccumulative in sediment. Since lead was not detected above the benchmark in sediment, lead could be removed as a COC for sediment exposures. However, lead and cadmium are retained in sediment as COCs because of the intermittent nature of Stewart Creek and the North Tributary; the sediment could be considered soil at certain times of the year. Lead and cadmium are considered bioaccumulative in soil (TCEQ, 2006). Concentrations of cadmium and lead in the sediment were well below initial screening benchmarks for soil. Lead and cadmium were both removed as COCs from surface water and groundwater to surface water exposure because there are no exceedances of the surface water criteria and neither lead nor cadmium is considered bioaccumulative in surface water.

3.1.3 COC Fate and Transport and Ecotoxicological Profiles

Potential fate and transport mechanisms are discussed below for the COCs as discussed in Section 3.1: cadmium, lead and PAHs (TCEQ's Ecological Risk Assessment Required Element #4).

3.1.3.1 Cadmium

Cadmium is a naturally occurring element and is typically associated with other metals such as zinc and lead. Cadmium use was infrequent prior to the 20th century; however, recognition of its resistance to corrosion increased its demand, and it is now used in the manufacture of metal alloys, in nickel cadmium batteries, in pigments, metal coatings, and plastics. Cadmium emissions to the atmosphere result from combustion of fossil fuels, industrial emissions, or erosion of soils (Elinder, 1985). In nature, two oxidation states are possible (0 and +2), however, the zero or metallic state is rare. Mobility and bioavailability of cadmium in aquatic systems is enhanced under conditions of low pH, low hardness, low suspended solids, high conductivity, and low salinity (Irwin et al., 1997). Cadmium in surface water accumulates more rapidly in the sediments than in living organisms. The toxicity of cadmium in sediments is affected by sediment content of acid volatile sulfides and total organic carbon. If released or deposited on soil, cadmium is largely retained in the surface layers of soil and is expected to convert to insoluble forms such as cadmium carbonate (EPA, 2005a).

Aquatic and terrestrial organisms bioaccumulate cadmium (Callahan et al., 1979) and TCEQ considers cadmium bioaccumulative in sediment (Table 3-1 in TCEQ, 2006). Bioaccumulation in fish is dependent on the pH and organic content of the water, which are the major determinants of water/sediment partitioning. Because cadmium accumulates in kidney and liver tissue rather than in muscle, and because intestinal absorption of cadmium is low, one would expect a low amount of biomagnification of cadmium in the food chain (ATSDR, 1991).

3.1.3.2 Lead

Lead, a naturally occurring element, is one of the most ubiquitous contaminants in the developed world because of its long history of a variety of domestic, medicinal and industrial uses. Lead is strongly sorbed in sediments and the rate is correlated with grain size and organic content. In the absence of soluble complexing species, lead is almost totally adsorbed to clay particles at pHs greater than 6 (Moore and Ramamoorthy, 1984). In surface water, lead is most soluble and bioavailable under conditions of low pH, low organic content, low levels of suspended solids, and low levels of salts of calcium, iron, manganese, zinc, and cadmium. In surface water, lead exists in three forms, dissolved labile, dissolved bound (e.g., colloids or strong complexes), or as a particulate (Benes et al,. 1985). Most lead in natural waters is precipitated to the sediment as carbonates or hydroxides (Demayo et al,. 1982). Lead in soil is relatively immobile and persistent. Lead forms complexes with organic matter and clay minerals, which limits its mobility (EPA, 2005b).

3.1.3.3 PAHs

PAHs are ubiquitous in nature, detected in sediment, soil, air, surface water, and plant and animal tissues. They are formed as a result of incomplete combustion of organic materials such as wood, coal, and oil and exist in the environment from natural sources. It is estimated that approximately 270,000 metric tons of PAHs reach the environment yearly (Eisler, 1987). The composition of PAHs can vary according to the source and in this case the source is assumed to be petroleum products. Much of the PAHs released into the atmosphere reaches the soil by direct deposition or deposition on vegetation. Plants can adsorb or assimilate PAHs and metabolize and degrade the PAHs. However, if the rate of assimilation exceeds metabolism, PAHs can accumulate in plants (Edwards 1983). PAHs can be taken into the mammalian body by inhalation, skin contact, or ingestion, although they are poorly absorbed from the gastrointestinal tract. Elimination of PAHs and their metabolites is primarily through the hepatobiliary system and the gastrointestinal tract (Sims and Overcash, 1983). In vertebrates, including fish, there is an enzyme (known by various names like mixed-function oxidases or P450-dependent monooxygenases) system that metabolizes PAHs, limiting bioaccumulation up the food chain (West et al., 1984). An uptake factor of zero is recommended by EPA (1997) in the derivation of the soil screening levels for the mammalian carnivore. Bioavailability of PAHs to plants is decreased with increasing organic soil content (Greenberg, 2003). Sverdrup, et al. (2003) conducted tests with eight PAHs on seed emergence and early life-stage growth of three terrestrial plants, red clover (*Trifolium pretense*), ryegrass (*Loliumperenne*), and mustard (*Sinapsisalba*). Concentrations estimated to give a 20% reduction (EC_{20}) in seedlings ranged from 140 mg/kg to 650 mg/kg for fluoranthene, 55 mg/kg to 380 mg/kg for fluorene, 37 mg/kg to 300 mg/kg for phenanthrene, and 49 mg/kg to 1,300 mg/kg for pyrene. EC_{20} values demonstrated a large difference in sensitivity between plant species (Sverdrup et al., 2003).

3.2 Conceptual Site Model

Based on the Site history and current and anticipated future land use for the areas with potential ecolcgical habitat, the SLERA is focused on deposition of lead and cadmium on surface soil as the primary release mechanisms and exposure routes of site-related COCs. This SLERA addresses the exposure pathways related to the introduction of the cadmium and lead to surface soils, surface water, and sediment of Stewart Creek in those areas that will remain ecological habitat for the foreseeable future. Benthic invertebrates in sediment, water column receptors, soil invertebrates, birds, and mammals could be exposed directly and indirectly to cadmium, lead and PAHs in the habitat areas.

A conceptual site model (CSM) for the Site is presented as Figure 9 and illustrates the exposure analysis described above. Development of a CSM is TCEQ's Ecological Risk Assessment Required Element #3. The CSM is a diagram that illustrates the potential contaminant sources, release mechanisms, transport pathways, exposure media, and receptors considered for the SLERA.

The primary release mechanism and associated route of ecological exposure in the habitat areas is through air deposition of cadmium and lead onto the surfaces, direct exposure to soil, and potential surface runoff of cadmium and lead into Stewart Creek and the North Tributary. The on-Site portion of Stewart Creek and the North Tributary are vegetated with defined cut-in banks limiting the accessibility of wading birds. The terrestrial areas have significant amount of ground vegetative litter which is commonly used as surface burrows by native wildlife. Burrows were noted throughout the habitat areas, but were typically only a few inches deep into the leaf litter and soil.

3.2.1 Chemical/Physical Properties Governing Transport of Cadmium and Lead

Lead and cadmium, like all compounds, have the potential to move within environmental media (e.g., soil) to some degree. The ability for a compound to be transported within a medium or between media is based on the chemical and physical characteristics of the compound(s) and the source medium as well as the receiving medium. Physical characteristics include parameters such as grain size and moisture content for surface soil particles. Chemical characteristics include parameters such as soil/water distribution coefficients, adsorption potential and degradation characteristics for potential contaminants.

These chemical characteristics are specific to each chemical present, and may also be affected by the physical characteristics of the media in which the chemical is present. In surface water, physical and chemical characteristics are both important because transport may occur in solution or in association with suspended sediment. Dissolved-phase transport is the dominant contaminant migration mechanism in groundwater; therefore, chemical characteristics are often important with respect to that medium as well. Lead and cadmium generally tend to remain bound to organic matter, minerals, clays, and silts in soil and, as such, they are relatively immobile. Neither lead nor cadmium is considered water soluble although their solubility will increase in acidic conditions. If present in the dissolved phase, both can migrate in groundwater, although that migration can be significantly attenuated through sorption to the groundwater matrix, particularly in clay-rich soils such as these that comprise the uppermost groundwater-bearing unit at the Site.

3.2.2 Transport of COCs in Surface Soil Via Surface Runoff

Overland surface runoff from surface soil to Stewart Creek and the North Tributary has the potential to result in lead and cadmium bound to soil particles being transported during/after rainfall events into these surface water bodies. Overland flow during runoff events would be expected to occur in the direction of topographic slope and would more likely occur with significant rainfall events when soils are fully saturated and/or precipitation rates are greater than infiltration rates. The Site is relatively flat, with limited elevation changes over the Site, generally less than five to ten feet over the entire Site, with a gradual slope increase in the vicinity of Stewart Creek and lesser so at the North Tributary. Because of the limited topographic slope and vegetative cover, the Site is generally not conducive to high runoff velocities or high sediment loads. In addition, the soils at the Site are predominantly clay, and clay soils have a relatively low erosive potential.

There is limited physical evidence of erodible impacts other than a small area of wash-out on the south side of the railroad spur on the western-most portion of the former operations area. Additionally, there are areas of preferential surface water flow in the South Wooded Area that are stabilized by natural vegetation.

Dissolved lead and cadmium associated with surface runoff from the Site would likewise be expected to be generally low due to the relatively low solubilities of cadmium and lead. Lead and cadmium will preferentially partition to organic matter in soil and sediment. Once bound to organic matter, lead and cadmium and migrate as part of the sediment matrix if sediment is re-suspended during storm events and moved downstream. Stewart Creek and the North Tributary generally have a bedrock or gravel bed in the vicinity of the Site, suggesting that there is limited erosion of surface soils in this area. Table 2 shows the grain size of the sediment samples taken from Stewart Creek and the North Tributary. The grain size data indicate that the larger-sized particles (gravel and sand) are more prevalent than the smaller silt or clay particles. The relatively low measured lead and cadmium concentrations in the sediment in Stewart Creek and North Tributary also suggest that there is little evidence that overland erosion and transport of soil COCs is a significant migration pathway. It should be noted, however, that impacts to ecological receptors potentially contacting COCs in surface water and sediment are evaluated in the SLERA.

3.2.3 Transport of COCs in Groundwater to Surface Water and Sediments

Leaching and infiltration of COCs from the surface and surface soil through subsurface soil into groundwater have the potential to occur, although neither cadmium nor lead are very mobile in the environment or leach to an appreciable extent. Table 4 presents a summary of groundwater data for monitoring wells located in the vicinity of Stewart Creek or the North Tributary. The groundwater data from these wells represent groundwater discharge to the surface water in these creeks.

3.3 Assessment Endpoints

As required by the TCEQ's Ecological Risk Assessment Required Element #2, ecological communities and major feeding guilds applicable to the Site were identified. Assessment endpoints are explicit expressions of the actual environmental value to be protected (EPA, 1997). If these endpoints are found to be significantly affected, they can trigger further action. The assessment endpoints for the Site are:

- Protection of aquatic life in Stewart Creek with no unacceptable effects on species diversity and abundance (and viable reproduction) due to Site-related cadmium or lead in the surface water and sediment.
- Protection of birds and mammals with no unacceptable effects on species diversity and abundance (and viable reproduction) due to Site-related cadmium or lead in the surface water and sediment.
- Protection of soil invertebrate communities with no unacceptable effects on species diversity and abundance due to Site-related cadmium, lead or PAHs in the surface soils.
- Protection of birds and mammals with no unacceptable effects on species diversity and abundance (and viable reproduction) due to Site-related cadmium, lead or PAHs in the surface soils.

Note that PAHs are only applicable to the corridor area near the former plant and do not apply across all of the exposure areas.

Appendix D includes the special status species county listings for Collin and Denton counties. With the exception of the timber/canebrake rattlesnake that might be present in the Lake Parcel, South Wooded Area, North Wooded Area, or along the Stewart Creek Corridor, it is unlikely that any of these special status species would be present at the Site due to the urban nature of the area. The conclusion that the timber/canebrake rattlesnake could be present at the Site is solely based on the broad and general habitat requirements of the snake and not on any physical observations. An evaluation of the likelihood of the presence of any of the state or federally listed species is presented on Table 7. Additionally, it is noted that the TCEQ Water Quality Division stated in the Exide Technologies Texas Pollutant Discharge Elimination System (TPDES) permit renewal memorandum in July 2011 "The discharge from this permit action is not expected to have an effect on any federal endangered or threatened aquatic or aquatic dependent species or proposed species or their critical habitat" (TCEQ, 2011c).

3.4 Exposure Assessment

The exposure assessment phase expands the problem formulation and defines quantitative inputs for the exposures. A listing of input data available from the literature and exposure assumptions that leads to the calculation of the exposure dose for each receptor is TCEQ's Ecological Risk Assessment Required Element #5. Table 8 lists the assessment species and the input parameters that were used in this SLERA. The raccoon and snowy egret represent wildlife exposures at Stewart Creek and the North Tributary. The least shrew, American robin, red-tailed hawk and red fox represent exposures in the terrestrial system. Because Stewart Creek and the North Tributary are considered intermittent, the sediment data were conservatively evaluated both as soil and as sediment. The raccoon and snowy egret were assessed in an exposure model using sediment. The raccoon was also assessed using the riparian (Stewart Creek Corridor) soil sample data to evaluate exposures in the dry portion of the season.

3.4.1 Food Web IngestionModeling

Food web ingestion-based modeling calculations were performed to characterize potential exposures to Site COCs via the food web and to identify potential risks for upper trophic level mammals and birds. Ingestion modeling is based on species-specific exposure parameters and ingestion intake requirements using allometric equations (EPA, 1993). Wildlife exposure parameters are listed on Table 8. Species-specific ingestion models are presented in Appendix C, but the following general equation (TCEQ, 2006) was used to estimate oral exposure for wildlife receptors:

$$\text{Dose (mg/kg - day)} = \left(\frac{(((\text{IRfood} \times \text{Cfood}) + (IRwater \times Cwater) + (IRsoil / sed \times Csoil / sed))EMF)}{\text{BW}} \right)$$

Where:

Dose	=	Estimated dose from ingestion (mg COPC/kg body weight/day)
IRfood	=	Ingestion rate of food (prey) (kg/day)
Cfood	=	COPC concentration in food (mg/kg)
IRwater	=	Ingestion rate of water (L/day)
Cwater	=	COPC concentration in water (mg/L)
IRsoil/sed	=	Ingestion rate of soil or sediment (kg/day)
Csoil/sed	=	COPC concentration in soil or sediment (mg/kg)
EMF	=	Exposure modifying factor (unitless)
BW	=	Body weight of the organism (kg)

The purpose of food web modeling is to characterize potential exposures to COCs via the food web and to identify potential risks for upper trophic-level organisms. Through food web modeling, COCs are either retained for or eliminated from further steps of the SLERA. The food web modeling occurs in two phases per Required Elements #6 and #7 (TCEQ, 2006): a conservative no observed adverse effect level (NOAEL)-based analysis followed by a less-conservative NOAEL - and lowest observed adverse effect level (LOAEL) - based analysis. As described by TCEQ (2006): "In the risk estimate generated in Required Element #6, an HQ is based on reasonably conservative exposure assumptions and representative NOAEL-based TRV." These initial or "conservative" assumptions include 100% bioavailability of the COCs and a site foraging factor of 100 % for each of the receptors. Required Element #7 of the Tier 2 SLERA provides for calculation of HQs using less conservative exposure assumptions and TRVs based on both the NOAEL and LOAEL data (TCEQ, 2006 Section 3.11). These refined or "less-conservative" assumptions can include changes to exposure modifying factors such as a site foraging factor of less than 100%.

3.4.2 COC Uptake into Food Items

Chemicals in tissues of organisms of the food web are likely to be ingested by the species that feed on them (i.e., those occupying higher trophic levels); the result of which may be the expression of toxicological effects by the higher trophic level species. Chemical-specific uptake factors were taken from the EPA's *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA, 1999). Table 9 lists the uptake factors used in the food web modeling.

3.4.3 Exposure Point Concentrations

The basic unit of exposure is the exposure point concentration (EPC), defined as the concentration of a chemical in a specific environmental medium at the point of contact for a receptor. Both the maximum detected concentration and the 95% UCLs were evaluated in the SLERA. The maximum detected concentration was used for comparison to the benchmarks. 95% UCLs were used as the EPC in the food web analysis. EPA's most recent ProUCL software program was used to calculate the 95% UCL concentrations for the constituents in soil, surface water and sediment (EPA 2010a and 2010b).

Appendix C provides the statistical calculations for these data. The EPA's ProUCL Version 4.1 software program (EPA, 2010a) was used to test the distributions of the data for each compound and dataset and calculate parametric and distribution-free (i.e., nonparametric) 95% UCL concentrations and summary statistics from data sets including non-detect concentration values. The maximum detected summation value for HPAHs and LPAHs was used in the SLERA because the data set was limited to three samples from the area of historical diesel tank release.

4.0 TOXICITY ASSESSMENT

Mammal and bird toxicity reference values (TRVs) were taken from the EPA's Soil Screening Level (SSL) documents for cadmium (EPA, 2005a), lead (EPA, 2005b), PAHs (EPA, 2007) and the open literature. TRVs are the concentration of chemical exposure from an environmental media below which no significant ecological effects are anticipated. The TRVs used in this evaluation are considered screening level TRVs in that they are generally the lowest value available for that compound and endpoint based on a set of criteria and assumptions developed by EPA when estimating soil screening levels (EPA, 2005c). Because a NOAEL represents a concentration at which no adverse effects are noted, it is the preferred TRV in developing conservative soil screening values. For this SLERA, both NOAELs and LOAELs are required per TCEQ (2006). The LOAELs, or concentration at which the lowest effect was noted, were developed from the EPA SSL documents for each COC. To determine the LOAEL for each COC and receptor, the methodology employed by EPA to determine the NOAEL was replicated. For instance, if a NOAEL was based on the geometric mean of the NOAEL values for the growth endpoint, then the LOAEL was determined by calculating the geometric mean of the LOAEL values presented for the growth endpoint. When the NOAEL TRV recommended by EPA was based on a single study (as is the case for lead) the LOAEL TRV reported by this same study which determined the NOAEL was used. It is preferred to use the same study for both the NOAEL and LOAEL because the variability between study animals, study conditions and study endpoints is minimized. The mammalian and avian TRVs for each of the COCs are discussed below:

4.1 Cadmium

The avian NOAEL of 1.47 mg/kg-day is a geometric mean based on growth and reproduction endpoints (EPA, 2005a). LOAELs reported in EPA 2005a ranged from 1.05 mg/kg-day to 37.6 mg/kg-day for growth and 2.37 mg/kg-day to 21.1 mg/kg-day for reproduction. A geometric mean of all of the avian LOAEL values listed in EPA 2005a based on growth and reproduction equals 6.35 mg/kg-day. The value of 6.35 mg/kg-day was used as the avian LOAEL TRV.

The mammalian NOAEL of 0.770 mg/kg-day presented in EPA 2005a is based on a study by Yuhas et al. (1979) with a growth endpoint. Yuhas et al (1979) also defines a mammalian LOAEL of 7.70 mg/kg-day. The value of 7.70 mg/kg-day was used as the mammalian LOAEL TRV.

4.2 Lead

The avian NOAEL of 1.63 mg/kg-day was determined by EPA (2005b) and is based on a single study (Edens and Garlich, 1983) with reproduction as the endpoint. A LOAEL of 3.26 mg/kg-day was reported by Edens and Garlich (1983). The value of 3.26 mg/kg-day was used as the avian LOAEL TRV.

The mammalian NOAEL of 4.70 mg/kg-day was determined by EPA (2005b) and is based on a single study (Kimmel et al., 1980) using growth as the study endpoint. A LOAEL of 8.90 mg/kg-day was reported from Kimmel et al. (1980). The value of 8.90 mg/kg-day was used as the mammalian LOAEL TRV.

4.3 PAHs

EPA (2007) does not provide an avian TRV for PAHs; therefore, avian toxicity data were taken from the open literature. A study by Patton and Dieter (1980) was selected to represent oral toxicity for the LPAHs as a group for oral toxicity to birds because it has chronic exposure duration and both a LOAEL (228 mg/kg-day) and NOAEL (210 mg/kg-day) are defined by the researchers. The HPAH LOAEL (20 mg/kg-day) for oral exposure with a preferred critical effect (growth) is from the Trust et al. (1994) which assessed avian exposure of 7,12-dimethylben(a)anthracene. The avian NOAEL for HPAHs of 2 mg/kg-day was estimated using an uncertainty factor of 10.

For LPAHs, the mammalian NOAEL of 65.5 mg/kg-day is a based on a single study with the rat as the test species and a growth endpoint (Verschuuren et al., 1976). The corresponding LOAEL from Verschuuren et al. (1976) was 328 mg/kg-day. Similarly for HPAHs, the NOAEL of 0.615 mg/kg-day is from a single study listed in EPA 2007 with the mouse as the test species and survival as the endpoint (Culp et al., 1998). The LOAEL of 3.07 mg/kg-day is also taken from Culp et al. (1998).

5.0 RISK CHARACTERIZATION

Predictions of the likelihood for adverse effects, if any, for the food web modeling are based on hazard quotients (HQs) (EPA, 1997). The HQs were calculated by dividing the estimated dose by the TRVs for each of the COCs for each of the upper trophic-level receptors.

NOAEL – HQ = Exposure Dose/ NOAEL-TRV

LOAEL – HQ = Exposure Dose/LOAEL-TRV

The HQ value of 1 is considered the threshold for indicating that adverse effects may occur. An HQ less than or equal to a value of 1 (to one significant figure) indicates that adverse impacts to wildlife are considered unlikely (EPA, 1997). An HQ greater than 1 is an indication that further evaluation may be necessary to evaluate the potential for adverse impacts to wildlife.

5.1 Hazard Quotient Analyses

For the initial conservative analysis as described in TCEQ (2006), HQs were calculated using no adverse effect or NOAEL-based TRVs, assumptions of 100 % bioavailability and no exposure modifying factors (Required Element #6) (TCEQ, 2006). Appendix E shows the risk calculations for the SLERA, with the HQs summarized on Table 10, for the initial conservative assessment. As outlined in the TCEQ guidance, if the HQ is greater than one in the initial conservative analysis, then the refined (less conservative) analysis is completed.

TCEQ's Ecological Risk Assessment Required Element #7 requires that the exposure parameters remain as in the initial conservative analysis (e.g., body weight, ingestion rates, and the exposure point concentration), but other factors can be modified such as the exposure modifying factor, depending on the species and site conditions. The HQ is calculated with the same NOAEL used in the initial conservative analysis, but a LOAEL-based TRV is added and the exposure is modified using the receptor's home range in relation to the exposure area size. Table 11 shows the HQs for the refined(less conservative) assessment. Each exposure area is discussed below.

5.1.1 Potential Risks to Plants and Soil Invertebrates – Terrestrial Areas

As discussed previously, sample points with lead concentrations exceeding 1,600 mg/kg (the industrial $^{Tot}Soil_{Comb}$ protective concentration limit for lead and the anticipated critical human health lead PCL for the Site pending confirmation in the PCL development section in the APAR) were removed from the data set for the SLERA because these areas will be addressed as part of response action for the Site.

South Wooded Area - Detections of lead in all samples are greater than the lead soil screening benchmark protective of the plant community (120 mg/kg), but are well below the benchmarks for protection of earthworms (1,700 mg/kg) following the response action. There are three of the 12 samples are greater than the anticipated critical human health lead PCL of 1,600 mg/kg. There are no exceedances of the cadmium benchmarks.

North Wooded Area - Detections of lead in most samples are greater than the lead soil screening benchmark protective of the plant community (120 mg/kg), but are well below the benchmarks for protection of earthworms (1,700 mg/kg) following the response action. There are three of the 16 samples are greater than the anticipated critical human health lead PCL of 1,600 mg/kg. . There are no exceedances of the cadmium benchmarks.

Lake Parcel - Detections of lead in all samples are equal to or greater than the lead soil screening benchmark protective of the plant community (120 mg/kg), but are well below the benchmarks for protection of earthworms (1,700 mg/kg). There are no exceedances of the cadmium benchmarks.

Stewart Creek Corridor - Detections of lead in most samples are greater than the lead soil screening benchmark protective of the plant community (120 mg/kg), but are well below the benchmarks for protection of earthworms (1,700 mg/kg) following the response action. There are two of the 26 samples are greater than the anticipated critical human health lead PCL of 1,600 mg/kg. There are no exceedances of the cadmium or PAH benchmarks.

5.1.2 Potential Risks to Benthic Invertebrates in Sediment

For Stewart Creek and the North Tributary all detected concentrations of lead in sediment were below the benthic invertebrate initial conservative screening benchmark of 35.8 mg/kg. The maximum detected concentrations of cadmium in sediment were below the midpoint of the sediment benchmark and the second effects level which is 3 mg/kg. The use of this midpoint is considered the default sediment PCL protective of benthic organisms (TCEQ, 2006).

5.1.3 Potential Risks to Aquatic Life Organisms in Surface Water

For Stewart Creek and the North Tributary, surface water detections of lead and cadmium were all below acute surface water criteria. When groundwater data from wells located near Stewart Creek and the North Tributary are compared to the acute surface water benchmarks, none of the measured concentrations or detection limits in the samples from wells exceed the acute surface water benchmarks. Based on this SLERA, further evaluation of the North Tributary or Stewart Creek within the Site as an aquatic habitat is not warranted. Other previous studies described in Section 2.1, identified lead and/or cadmium hot spots within Stewart Creek sediment in areas downstream of the Site adjacent to the FSCWWTP, approximately near the Dallas North Tollway or further downstream. It is uncertain if the source of the lead and/or cadmium associated with the hot spots originated from the FSCWWTP or the former operating plant. Additional evaluation, outside of this SLERA or APAR, is recommended to address potential localized effects in any downstream hot spot areas.

5.1.4 Potential Risks To Upper Trophic Level Receptors

Three terrestrial areas were evaluated in the SLERA for potential ecological exposure to cadmium and lead in soils; South Wooded Area, North Wooded Area and Lake Parcel. Additionally, the Stewart Creek terrestrial/riparian corridor was evaluated as terrestrial habitat and Stewart Creek and the North Tributary were evaluated as aquatic habitat. As discussed previously, sample points with lead concentrations exceeding 1,600 mg/kg (the industrial $^{Tot}Soil_{Comb}$ protective concentration limit for lead and the anticipated critical human health lead PCL for the Site pending confirmation in the PCL development section in the APAR) were removed from the data set for the SLERA because these areas will be addressed as part of response action for the Site. Results of the evaluation for each of these areas are provided below:

South Wooded Area - Using the initial conservative exposure parameters and the unlikely assumption that the birds and mammals forage in the area 100 % of the time, the resulting HQs are greater than one for the upper trophic level as represented by the red fox (Table 10). In the refined (less conservative) analysis, the exposure is modified based on the home range of the receptor in relation to the size of the exposure area. This exposure modifying factor represents the portion of exposure likely based on the available size of the exposure area in perspective to the size of the area that the species will travel to forage. The South Wooded area is 4.9 acres and the home range for the red fox is 237 acres [the smallest of the listed territory sizes in EPA (1993) were used in the assessment]. Table 11 shows the HQs following the refined (less conservative) assessment. The NOAEL-based HQ for cadmium for the fox is equal to one, but the corresponding LOAEL-based HQ for cadmium for the fox is below one. Both the NOAEL-based HQ and the LOAEL-based HQ for lead for the fox are less than one. According to TCEQ (2006), if LOAEL-based HQ is less than one in the refined (less conservative) assessment, then no further evaluation is necessary. Based on the SLERA for the South Wooded Area, no further evaluation is necessary.

North Wooded Area -Similar to the South Wooded Area, the red fox has HQs greater than 1 in the initial conservative assessment. In the refined (less conservative) analysis, the exposure modifying factor is based on the size of the North Wooded Area of 10 acres and a home range of the fox is 237 acres. As shown in Table 11, the resulting LOAEL-based HQs are less than 1 for the red fox. As described above, because the LOAEL-based HQs are less than one, further ecological evaluation is not required.

Lake Parcel - Similar to the South Wooded Area, the red fox has HQs greater than 1 in the initial conservative assessment. In the refined less conservative analysis, the exposure modifying factor is based on the size of the Lake Parcel of 7.4 acres and a home range of the fox of 237 acres. As shown in Table 11, the resulting NOAEL-based and LOAEL-based HQs are less than 1 for the red fox.

Stewart Creek and North Tributary Corridor - Stewart Creek and the North Tributary were evaluated as one exposure unit using the snowy egret and raccoon as receptors. There is no predicted risk to the egret or raccoon from exposures to cadmium or lead in sediment following the initial conservative assessment (Table 10). The less-conservative evaluation was not necessary for the evaluation of cadmium and lead in sediment. The transitional corridor area was evaluated using the same urban tolerant terrestrial receptors as for the other exposure areas. Additionally, the raccoon was evaluated for exposures to soils in the corridor. The sediment exposure model was modified to remove the fish ingestion pathway and the ingestion of invertebrates was assumed to be 60% of its diet and the remaining 40% was assumed to be plants. Using the initial conservative exposure parameters and assuming that the birds and mammals forage in the corridor 100 percent of the time, the red fox and raccoon have HQs greater than 1. In the refined less conservative analysis, the exposure is modified based on the size of the corridor (8.34 acres). As shown in Table 11, the resulting HQs are less than 1 for both the red fox and the raccoon.

5.2 Overall Potential Site Risks

This SLERA concludes that there is minimal risk from lead, cadmium or PAHs in soils, sediment or surface water to potential ecological receptors at the former operating plant. Soils concentrations of lead do exceed the soil screening benchmark protective of terrestrial plant communities but are significantly below the benchmark protective of soil invertebrates, considering the reasoned justification that remediation of soil with lead concentrations greater than the anticipated human health critical PCL will be reported in the RAP for the Site. There is no evidence of stressed vegetation at the facility and no other indications of risk from any of the pathways evaluated. Also, as discussed previously in Section 2.1, further evaluation to address Stewart Creek sediment hot spots in downstream areas of the Site, identified in other studies, is recommended.

6.0 UNCERTAINTY ANALYSIS

The characterization of uncertainty is a component of the ERA process (EPA, 1997) and is Required Element #8 in the TCEQ process (TCEQ, 2006). Due to the multiplicity of potential receptor species and general lack of detailed knowledge and/or variability surrounding their life cycles, feeding habits, and relative toxicological sensitivity, the uncertainty surrounding estimates of ecological hazard can be substantial. The criteria used in this assessment are intended to provide a conservative assessment of potential ecological hazards. This SLERA did not account for site-specific factors such as chemical bioavailability, adaptive tolerance, reproductive potential, or use of similar nearby ecosystems. Such factors would most likely tend to mitigate the estimated degree and ecological significance of loss or impairment of a portion of some ecological population(s) due to both chemical and physical stressors in the area. The approach used in this assessment does develop protective (conservative) estimates of exposure, which likely indicate a potential for hazard that is greater than actually encountered by organisms that might utilize the Site.

The criteria used in this assessment are all chemical-specific and as such, cannot address the additive, antagonistic, or synergistic effects of the mixtures of chemicals typically present in the environment. Furthermore, SLERAs do not typically take into account the nature and constitution of the specific ecosystem present at a Site, the potential toxicity of other constituents (naturally occurring) that were not quantified, or the pervasive influence of physical stressors associated with the disruptions caused by human activities. Uncertainties applicable to this SLERA are described below:

Exposure Concentrations – Risk may be overestimated in the exposure assessment because the selected EPCs are either the maximum detected (in the benchmark screening) or the 95 %UCL (in the food web modeling) concentrations. However, use of the 95 % UCL is intentionally conservative and follows regulatory guidelines.

Selection of Wildlife Species Subject to Evaluation – The snowy egret and raccoon were selected to represent all bird and mammal species that may contact COCs in Stewart Creek and the North Tributary sediment directly during foraging as well as indirectly via the food chain. The shrew, red fox, American robin and red-tailed hawk were evaluated as terrestrial receptors exposed to surface soil in the various exposure areas. The selection of these species to represent mammals and birds was based on site observations, their potential to contact sediment or soil directly or indirectly, and professional judgment. Neither the raccoon or snowy egret have been observed in Stewart Creek but both are likely found in the area and both have feeding habits that increase the likelihood that they might contact sediment in Stewart Creek. Similarly, the shrew, robin, hawk and fox may or may not have been present at the Site. The myriad of factors that influence animal and bird behavior, the small size of the creek and terrestrial areas with protective cover, water flow in the creek, and the industrial/residential/commercial nature of the area and nearby vicinity limits the ecological productivity of the area and, therefore, the exposure to birds and mammals is likely overestimated in this SLERA.

Simultaneous Exposure to Multiple Constituents – Another source of uncertainty originated from the use of toxicity values reported in the open literature that were derived from single-species, single-constituent laboratory studies. Prediction of ecosystem effects from laboratory studies is difficult. Laboratory studies cannot take into account the effects of environmental factors that may add to the effects of chemical stress. TRVs were selected from studies using single-constituent exposure scenarios. The endpoint species selected to represent the wildlife expected to occur within the exposure area were exposed to a variety of constituents, and it is not known whether the individual constituents in this mixture are synergistic, additive, or antagonistic. Therefore, the magnitude of this uncertainty is not measurable and risk could be overestimated or underestimated. Interactive effects were also not addressed and this could increase or decrease risk.

TRVs – TRVs are designed to be conservative estimates of potential toxicity based on a variety of measurement endpoints for various ecological receptors, typically in a laboratory setting using standard species that are commercially available. In the initial phase of the SLERA, NOAEL-based TRVs are used while in the refined less conservative HQ calculation of Required Element #7, LOAEL-based TRVs are used. It is important to evaluate the adequacy and validity of the TRV during the SLERA process since sometimes the conservatism built into the TRV-derivation process limits the usefulness of the value. For example, the avian TRV for lead results in an Eco-SSL that is near background levels of lead This is discussed by EPA (2005b): "The eco SSL for avian wildlife is however lower than the 50th percentile for reported background concentrations in eastern and western U.S. soils." If the data used in the evaluation (EPA, 2005b) are inspected closer, the tremendous variability in the numerous studies and the conservative assumptions used to select the TRV result in a value that is not representative of the majority of the NOAELs for the compound. Again, using lead as an example, the range of TRVs looking at all NOAEL endpoints and species is from 0.0584 mg/kg-day to 304 mg/kg-day, which is a 10,000-fold difference. Often the geometric mean of the dataset is used to estimate the TRV but, in the case of lead, the lowest LOAEL value was lower than the geometric mean for the NOAEL (10.9 mg/kg-day) so the NOAEL-based TRV was set at a lower value which was more than 1/10th of the geometric mean. It should be noted that the range of LOAELs were highly variable as well, from 0.111 to 625 mg/kg-day, and the LOAEL-based TRV used in this risk assessment of 3.6 mg/kg-day is lower than the geometric mean of the NOAELs. Because the TRV is very influential in the calculation of HQs, it is extremely important to evaluate sources of uncertainty and variability in these values. It is likely that the conservative nature of the TRV selected for use in the SLERA will overestimate potential risk to birds and mammals.

Lead Terrestrial Plant Benchmark – The lead benchmark protective of the terrestrial plant community is from the EPA's Soil Screening Levels for Lead (EPA, 2005b) and is a geometric mean of the maximum acceptable toxicant concentrations values for four test species (loblolly pine, red maple, clover and ryegrass) under three test conditions (pH and percent organic matter) and is equal to 120 mg/kg dry weight. The individual toxicity values ranged from 22 mg/kg for ryegrass to 316 mg/kg for clover. The EPA chose data from tests performed using soil conditions favoring high bioavailability or upland aerobic soils (low pH and organic matter). The preferred endpoint for plant was biomass production, as it is normally the most sensitive measurement. Other studies listed in EPA (2005b) but not used in the development of the SSL list no effect levels as high as 1,000 mg/kg and low effect levels as low as 50 mg/kg. The variability of the data suggests toxicity to a plant community is difficult to assess based on studies using one plant species under controlled test conditions. The applicability of this benchmark concentrations protective of all terrestrial plants at the former operational plant is highly uncertain and is most likely overly conservative. TCEQ does not recommend the application of ecologically-based PCLs based on the plant community. As described in Section 3.13 of TCEQ 2006, "The ecological PCL is not directly intended to be protective of on-site receptors with limited mobility or range (e.g., plants, soil invertebrates and small rodents)." Based on the uncertainty in the plant benchmark and TCEQ's recognition of the limitations of the soil benchmarks, an ecologically-based PCL protective of the terrestrial plant community is not recommended.

Bioavailability and Absorption – The bioavailability and absorption of all of the COCs was conservatively assumed to be 100 % in the SLERA. There were no adjustment factors to account for COCs binding irreversibly onto sediment particles, for being present in a form that is not biologically available or active, or to account for the differences in the absorption between the test material that serves as the basis for the TRV for soil and site sediment. Sediment geochemical parameters such as the quantity and type/quality of organic carbon, the presence of acid volatile sulfides, the redox state of the sediment, salinity or pH can influence whether a COC is tightly bound within the sediment and unavailable for uptake or whether it is freely dissolved and can be absorbed into organisms (ITRC, 2011). The total organic carbon of the North Tributary and Stewart Creek is approximately 20 g/kg and the grain size of the sediment tends toward larger sizes such as gravel and sand and not the silt or clay (Table 2). The influence of the organic carbon, grain size and other site specific conditions in the North Tributary and Stewart Creek on COC availability is not known, but given that organic carbon is present in the sediments indicates that the site conditions could result in less than 100% bioavailability of lead and cadmium to ecological receptors. Assumption of 100 % bioavailability of COCs will result in the overestimation of risk in this SLERA. The influence of organic carbon or sulfide is unknown and the presence of these factors could reduce the bioavailability of the COCs in Stewart Creek.

Uptake Factors – The open literature was reviewed for sediment to receptor (e.g., aquatic plant, benthic invertebrate) uptake factors. Uptake factors were adjusted to dry weight. It is also assumed that the PAHs will be metabolized in vertebrate systems (EPA, 2007) and therefore a food chain multiplier of 1 was used in the trophic calculations. The magnitude of the uncertainty associated with the uptake factors is unknown.

Surface Water Exposure – This SLERA assumes that sediment exposure is the primary exposure pathway and does not include a surface water exposure component. All of the detected concentrations of the COCs in surface water were below the acute aquatic criteria. The raccoon diet was adjusted to 60% benthic invertebrates, 30% fish and 10% plants to focus on sediment exposure and does not include an aquatic insect or amphibian exposure component (i.e., modeled tissue concentrations from surface water). Because the detections of lead and cadmium in the surface water are consistently below the acute criteria, ecological risks from exposure to surface water is within acceptable ranges.

Amphibians and Reptiles – The assessment of reptiles and amphibians in an ecological risk assessment is significantly limited by the lack of technical information available on environmental exposures to these species and resulting toxicity. Studies that are available involvepesticide and other organic compounds mainly involving crocodilians and turtles. Many of the experimental studies involve contamination of eggs to determine effects on embryo development. Much of the toxicity testing has been performed for pest control purposes for fumigants, sprays and foggers that have little relevance to environmental exposures (Fryday and Thompson, 2009). There is the possibility that the timber/canebrake rattlesnake could be present in or around the Site, however, its presence is speculative and based on the assessment of the birds and mammals evaluated in the SLERA, risks would be expected to be minimal.

7.0 PCL CALCULATIONS AND SLERA RECOMMENDATIONS

TCEQ's Ecological Risk AssessmentRequired Element #9 is the calculation of medium-specific PCLs bounded by the NOAEL and LOAEL (i.e., comparative PCLs) for those COCs thatare not eliminated as a result of the HQ analysis or uncertainty analysis.

This SLERA concludes that additional assessment of ecological exposures of lead, cadmium or PAHs in soils, sediment or surface water at the former operating plantis not necessary. This conclusion is based on the overall low HQs estimated for the various receptors and media at the Site. Soils concentrations of lead do exceed the soil benchmark protective of terrestrial plant communities but are significantly below the benchmark protective of soil invertebrates considering the reasoned justification that remediation of soil with lead concentrations greater than the anticipated human health critical PCL will be reported in the RAP for the Site . There is no evidence of stressed vegetation at the facility and no other indications of risk from any of the pathways evaluated. As described in Section 3.13 of TCEQ 2006, "The ecological PCL is not directly intended to be protective of on-site receptors with limited mobility or range (e.g., plants, soil invertebrates and small rodents)." Based on the uncertainty in the plant benchmark and TCEQ's recognition of the limitations of the soil benchmarks, an ecologically-based PCL protective of the terrestrial plant community is not recommended. Ecologically-based PCLs are not estimated for this Site based on the findings of the SLERA due to the low likelihood of ecological risk at the Site.

TCEQ's Ecological Risk Assessment Required Element #10 is the recommendation for managing ecological risk if it is determined that there is unacceptable risk and ecological PCLs are developed in the SLERA. Because ecologically based PCLs are not applicable or necessary, there is no need for further Site evaluation and potential ecological exposure does not result in risk management decisions for the former operating plant. Other previous studies described in Section 2.1, identified lead and/or cadmium hot spots within Stewart Creek sediment in areas downstream of the Site adjacent to the FSCWWTP, approximately near the Dallas North Tollway or further downstream. Additional evaluation, outside of this SLERA or APAR, is recommended to address potential localized effects in the hot spot areas identified in those other studies.

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TABLES

Table 1. Summary of Surface Soil Data for Areas of Ecological Interest
Screening Level Ecological Risk Assessment

Sample I.D.	Sample Date	Depth (ft bgs)	Cadmium (mg/kg)	Lead (mg/kg)	Polycyclic Aromatic Hydrocarbons (mg/kg)													HPAH	LPAH
					Anthracene*	Benzo(a)anthracene**	Benzo(a)pyrene**	Benzo(b)fluoranthene**	Benzo(g,h,i)perylene**	Benzo(k)fluoranthene**	Chrysene**	Dibenz(a,h)anthracene**	Fluoranthene**	Indeno(1,2,3-cd)pyrene**	Phenanthrene*	Pyrene**		
Soil Benchmark (plants)			**32**	**120**	not available													**NA**	**NA**
Soil Benchmark (earthworms)			**140**	**1700**	not available													**18**	**29**
Critical Benchmark			**32**	**120**	not available													**18**	**29**
Surface Soil Sampling at Lake Parcel																			
F-4	3/28/2012	0-0.4	2.51J	255	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F-5	3/28/2012	0-0.4	3.51	367	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-4	3/28/2012	0-0.4	2.17	222	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-5	3/28/2012	0-0.4	2.61J	273	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-6	3/28/2012	0-0.4	1.96J	268	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H-3	3/28/2012	0-0.4	1.06J	154	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H-4	3/28/2012	0-0.4	<1.05	120	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H-5	3/28/2012	0-0.4	1.54J	147	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H5-2	2/7/2013	0-0.4	1.4	154	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H4-2	2/7/2013	0-0.4	1.3	145	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G4-2	2/7/2013	0-0.4	1.5	166	--	--	--	--	--	--	--	--	--	--	--	--	--	--
South Wooded Area																			
ECO-1 (0-0.5')	01/15/13	0-0.5	1.85	431	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-2 (0-0.5')	01/15/13	0-0.5	3.19	396	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-3 (0-0.5')	01/15/13	0-0.5	10.1	1,740	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-4 (0-0.5')	01/15/13	0-0.5	2.97	373	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-5 (0-0.5')	01/15/13	0-0.5	1.62	221	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-6 (0-0.5')	01/15/13	0-0.5	7.92	1,030	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-7 (0-0.5')	01/15/13	0-0.5	14.6	2,340	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-7A (0-0.5')	03/06/13	0-0.5	3.61	606	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-7B (0-0.5')	03/15/13	0-0.5	2.48	327	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-8 (0-0.5')	01/15/13	0-0.5	3.61J	600	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-9 (0-0.5')	01/15/13	0-0.5	12.6	2,050	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-10 (0-0.5')	01/15/13	0-0.5	3.3	345	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Stewart Creek Corridor																		--	--
MW-27	03/05/13	0-1	--	400	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-29	03/06/13	0-0.5	3.38	455	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2013-RO-1 (0-0.5')	03/05/13	0-0.5	2.91	1170	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2013-RO-2 (0-0.5')	03/05/13	0-0.5	5.26	811	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2013-RO-3 (0-0.5')	03/05/13	0-0.5	0.347	26.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2013-MW-17A (0-0.5')	03/05/13	0-0.5	0.921	279	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-10A (0-0.5')	03/05/13	0-0.5	1.4	296	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-24 (0-0.5')	03/05/13	0-0.5	0.0829J	8.82	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-1 (0-0.5')	01/15/13	0-0.5	1.21	188.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-2 (0-0.5')	01/15/13	0-0.5	0.897	99.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-3 (0-0.5')	01/15/13	0-0.5	33.3	3510	0.00203J	0.00903J	0.0245	0.0333J	0.0263	0.00719J	0.0137J	<0.00469	0.0198J	0.0427J	0.00828J	0.0158J	0.01031	0.1923
SCC-3A (0-0.5')	03/05/13	0-0.5	--	140	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-4 (0-0.5')	01/15/13	0-0.5	0.851	199	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-5 (0-0.5')	01/15/13	0-0.5	1.51	443	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-6 (0-0.5')	01/15/13	0-0.5	1.04	200	<0.0017	0.00331J	0.0194J	0.0194J	0.0202J	0.00218J	0.00851J	<0.00482	0.0089J	<0.00465	<0.00657	0.0079J	NA	0.0898
SCC-7 (0-0.5')	01/15/13	0-0.5	0.681	186	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-8 (0-0.5')	01/15/13	0-0.5	6.93	4870	0.00502J	0.0169J	0.0323	0.0542	0.0336	0.0161J	0.0394	0.0386	0.0239	0.0495	0.0113J	0.0223	0.0163	0.3268
SCC-9 (0-0.5')	01/15/13	0-0.5	2.36	149	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-10 (0-0.5')	01/15/13	0-0.5	6.55	1510	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-10A (0-0.5')	03/05/13	0-0.5	1.40	296														
SCC-11 (0-0.5')	01/15/13	0-0.5	106.00	788	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-11A (0-0.5')	03/06/13	0-0.5	2.45	268	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-12 (0-0.5')	01/15/13	0-0.5	1.44	210	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-13 (0-0.5')	01/15/13	0-0.5	0.253J	34.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-14 (0-0.5')	01/15/13	0-0.5	0.158J	42.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCC-15 (0-0.5')	01/15/13	0-0.5	1.62	177	--	--	--	--	--	--	--	--	--	--	--	--	--	--
North Wooded Area																		--	--
MW-21 (0-0.5')	03/05/13	0-0.5	0.34	8.59	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-22 (0-0.5')	03/05/13	0-0.5	0.853	84.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-11 (0-0.5')	03/05/13	0-0.5	0.809	45.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECO-12 (0-0.5')	03/05/13	0-0.5	0.953	240	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D-11	3/28/2012	0-0.5	3.62	524	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D-12	3/28/2012	0-0.5	3.71	522	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D-13	3/28/2012	0-0.5	2.98	434	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D-14	3/28/2012	0-0.5	1.44J	204	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D-15	3/28/2012	0-0.5	1.61J	245	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-11	3/28/2012	0-0.5	17.8	2920	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-11A (0-0.5')	03/06/13	0-0.5	3.89	816	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-12	3/28/2012	0-0.5	18.3	2610	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-13	3/28/2012	0-0.5	10.1	1850	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-14	3/28/2012	0-0.5	5.64	1090	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-15	3/28/2012	0-0.5	4.34	893	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-15A (0-0.5')	03/06/13	0-0.5	1.51	234	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Soil benchmarks for cadmium and lead from TCEQ, 2006 (Ta ble 3-4). Soil benchmarks from LPAHs and HPAHs from EPA 2007

mg/Kg - milligrams/Kilogram

HPAH - High Molecular Weight PAHs (Sum of individual HPAH compounds denoted with **)

LPAH - Low Molecular Weight PAHs (Sum of individual LPAH compounds denoted with *)

NA - Not Applicable

"--" - Not Analyzed

ft - feet

bgs - below ground surface

Table 2. Summary of Sediment Data for Stewart Creek and North Tributary
Screening Level Ecological Risk Assessment

Sample I.D.	Sample Date	Metals (mg/Kg)		Total Organic Carbon (g/Kg)	Grain Size (%)			
		Cadmium	Lead		Gravel	Sand	Silt	Clay
Freshwater Sediment Benchmark		**0.99**	**35.8**	**NA**	**NA**	**NA**	**NA**	**NA**
Stewart Creek								
2012-SED-1	1/11/2012	0.34 J	7.09 J-	4.77	13.10	21.40	34.70	30.80
2012-SED-2	1/11/2012	0.79 J-	15.10 J-	5.31	42.60	41.40	8.00	8.10
2012-SED-3	1/11/2012	1.40 J-	17.10 J-	7.36	61.00	19.10	12.40	7.50
2012-SED-4	1/11/2012	2.08 J-	14.90 J-	13.20	35.20	35.20	19.90	9.70
2012-SED-5	1/11/2012	1.43 J-	10.90 J-	92.30	50.20	34.70	12.50	2.60
2012-SED-6	1/11/2012	1.03 J-	10.40 J-	71.40	49.10	36.30	10.20	4.40
2012-SED-7	1/11/2012	0.84 J-	10.40 J-	69.30	37.30	42.10	13.70	7.00
2012-SED-8	1/11/2012	0.86 J-	8.99 J-	71.50	52.40	28.40	14.80	4.40
2012-SED-9	1/11/2012	0.79 J-	11.50 J-	89.80	39.00	40.40	12.00	8.60
2012-SED-10	1/12/2012	0.90 J-	6.57 J	6.99	42.20	42.70	10.70	4.40
2012-SED-11	1/12/2012	0.77 J-	8.82 J	10.00	53.20	40.60	0.90	5.30
2012-SED-12	1/12/2012	0.72 J-	17.70 J	10.70	35.20	19.80	21.50	23.50
2012-SED-13	1/12/2012	1.05 J-	19.20 J	3.78 J	41.40	45.90	7.90	4.80
North Tributary								
2012-SED-16	1/12/2012	1.19 J-	17.80 J	9.60	30.90	50.50	9.60	9.00
2012-SED-17	1/12/2012	0.78 J-	28.20 J	13.90	38.40	44.00	6.90	10.70
2012-SED-18	1/12/2012	0.82 J-	20.10 J	--	34.80	49.50	9.50	6.20
2012-SED-19	1/12/2012	0.98 J-	23.40 J	15.10	30.80	57.40	4.80	7.00
2012-SED-20	1/12/2012	0.69 J-	12.10 J	22.10	39.40	44.10	11.30	5.20
2012-SED-21	1/12/2012	1.10 J-	10.40 J	32.60	67.60	24.50	5.40	2.50
2012-SED-22	1/12/2012	1.06 J-	10.40 J	26.50	42.50	38.70	15.20	3.60
2012-SED-23	1/12/2012	0.99 J-	11.10 J	42.40	52.40	36.10	7.90	3.60
2012-SED-24	1/12/2012	0.74 J-	19.70 J	8.68	28.50	53.20	9.70	8.60
2012-SED-25	1/12/2012	0.83 J-	11.90 J	35.50	34.10	46.20	15.50	4.20

Notes:

Freshwater Sediment Benchmarks from TCEQ 2006 (Table 3-3)

mg/Kg - milligrams/Kilogram

g/Kg - grams/Kilogram

Data Qualifiers: J = estimated concentration; J- = estimated, biased low.

NA - Not Applicable

"--" - Not Analyzed

Table 3. Summary of Surface Water Data for Stewart Creek and North Tributary
Screening Level Ecological Risk Assessment

Sample I.D.	Sample Date	Total Metals		Dissolved Metals	
		Cadmium (mg/L)	Lead (mg/L)	Cadmium (mg/L)	Lead (mg/L)
Acute Aquatic Life RBEL[1]		**NA**	**NA**	**0.00908**	**0.0688**
Stewart Creek					
2012-SW-1	1/17/2012	0.001J	<0.0029	0.0019J	0.0046J
2012-SW-2	1/17/2012	0.0009J	<0.0029	0.002J	0.0037J
2012-SW-3	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-4	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-5	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-6	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-7	1/17/2012	<0.00035	0.0032J	<0.00035	<0.0029
2012-SW-8	1/17/2012	<0.00035	0.0036J	<0.00035	<0.0029
2012-SW-9	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-10	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-11	1/17/2012	<0.00035	<0.0029	0.0006J	<0.0029
2012-SW-12	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
2012-SW-13	1/17/2012	<0.00035	<0.0029	<0.00035	<0.0029
North Tributary					
SW-NT-1	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-2	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-3	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-4	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-5	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-6	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-7	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-8	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029
SW-NT-9	3/20/2013	<0.00035	<0.0029	0.00044J	<0.0029
SW-NT-10	3/20/2013	<0.00035	<0.0029	<0.00035	<0.0029

Notes:

1. RBELs calculated based on a hardness value of 106 mg/L for Lake Lewisville Segment 0823 per Implementation Guidance (TCEQ, 2012).

RBEL - Risk Based Exposure Limit

mg/L - milligrams/Liter

PCL - Protective Concentration Level

Data Qualifiers: J = estimated concentration

NA - Not Applicable

Table 4. Summary of Groundwater Data for Monitoring Wells in Vicinity of Stewart Creek and North Tributary
Screening Level Ecological Risk Assessment

Sample I.D.	Sample Date	Total Metals				Dissolved Metals[3]				Sulfate (mg/L)	TDS (mg/L)
		Arsenic (mg/L)	Cadmium (mg/L)	Lead (mg/L)	Selenium (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Lead (mg/L)	Selenium (mg/L)		
^{SW}GW PCL[1]		NA[2]	NA[2]	NA[2]	**0.02**	**0.34**	**0.00908**	**0.0688**	**0.02**	NA	NA
2012-B5N	1/17/2012	--	<0.00035	<0.0029	--	--	<0.00035	<0.0029	--	889	1550
B5N	3/22/2013	--	<0.00035	<0.0029	--	--	<0.00035	<0.0029	--	946	--
B7N	3/18/2013	--	<0.00035	<0.0029	--	--	<0.00035	<0.0029	--	1820	--
B9N	4/10/2013	--	<0.00035	<0.0029	--	--	<0.00035	<0.0029	--	720	--
B9N (*field duplicate*)	4/10/2013	--	<0.00035	<0.0029	--	--	<0.00035	<0.0029	--	726	--
MW-11	4/9/2013	--	<0.00035	<0.0029	--	--	<0.00035	<0.0029	--	281	--
MW-12	3/13/2013	--	0.00103J	0.0029J	--	--	<0.00035	<0.0029	--	2490*	--
2012-MW-13	1/16/2012	--	<0.00035	<0.0029	--	--	<0.00035	<0.0029	--	1200	2230
MW-13	3/13/2013	--	<0.00035	<0.0029	--	--	<0.00035	<0.0029	--	1020*	--
2012-MW-14	1/16/2012	--	<0.00035	0.00311J	--	--	<0.00035	<0.0029	--	2630	4180
MW-14	3/13/2013	--	<0.00035	<0.0029	--	--	0.0007J	<0.0029	--	2560*	--
2012-MW-16	1/17/2012	--	<0.00035	<0.0029	--	--	<0.00035	<0.0029	--	298	1380
MW-16	4/9/2013	--	<0.00035	0.0044J	--	--	<0.00035	0.0039J	--	276	--
2012-MW-16S	1/17/2012	--	<0.00035	<0.0029	--	--	<0.00035	0.00299J	--	1080	7980
MW-16S	4/9/2013	--	0.0012J	0.005J	--	--	0.0007J	0.0041J	--	1270	--
2012-MW-17	1/18/2012	--	<0.00035	0.00411J	--	--	<0.00035	0.0029 UJ	--	1590	3140
MW-17	3/22/2013	--	0.0004J	<0.0029	--	--	<0.00035	<0.0029	--	1510	--
MW-18	3/18/2013	--	<0.00035	<0.0029	--	--	<0.00035	<0.0029	--	298	--
MW-21	4/9/2013	--	0.0005J	<0.0029	--	--	0.0005J	<0.0029	--	2010	--
MW-22	4/9/2013	--	0.0029J	0.0063J	--	--	0.0029J	0.004J	--	2180	--
MW-24	3/18/2013	--	<0.00035	0.0038J	--	--	<0.00035	0.0054J	--	1640	--
MW-26	4/9/2013	--	0.0006J	<0.0029	--	--	0.0004J	<0.0029	--	2480	--
MW-27	4/9/2013	--	0.001J	0.0029J	--	--	0.0009J	0.0035J	--	1530	--
MW-29	4/9/2013	--	0.0015J	<0.0029	--	--	0.0014J	<0.0029	--	4260	--
P-1	4/9/2013	--	<0.00035	<0.0029	--	--	<0.00035	<0.0029	--	169	--
LMW-5	3/13/2013	< 0.00328	< 0.00035	< 0.0029	< 0.00417	< 0.00328	< 0.00035	< 0.0029	< 0.00417	157*	--
LMW-8	3/13/2013	< 0.00328	< 0.00035	< 0.0029	0.0104 J	< 0.00328	< 0.00035	< 0.0029	0.00570 J	130	--
LMW-17	3/12/2013	< 0.00328	< 0.00035	< 0.0029	< 0.00417	< 0.00328	< 0.00035	< 0.0029	< 0.00417	142*	--
LMW-22	3/13/2013	< 0.00328	< 0.00035	< 0.0029	< 0.00417	< 0.00328	< 0.00035	< 0.0029	< 0.00417	99*	--

Notes:

1. ^{SW}GW PCL conservatively set at the ^{SW}SW RBEL (i.e., no dilution factor). ^{SW}SW RBEL based on acute ecological criteria for Stewart Creek and the North Tributary (intermittent streams).
   Cadmium and lead RBELs calculated based on a hardness value of 106 mg/L for Lake Lewisville, Segment 0823.
2. Per TRRP-24, specific aquatic life criteria for arsenic, cadmium and lead apply to dissolved rather than total concentrations since the dissolved phase represents the bioavailable form.
3. Samples for dissolved analysis field filtered with 0.45 micron filter.

Data for arsenic and selenium are associated with the Class 2 Landfill. Data for arsenic, selenium, sulfate and TDS are presented for completeness and consistency with the APAR.

* Sulfate samples taken April 9 -12, 2013.

TDS - Total Dissolved Solids

mg/L - milligrams/Liter.

Data Qualifiers: J = estimated concentration; UJ = estimated, not detected.

NA - Not Applicable.

"--" - Not Analyzed.

Table 5. TCEQ Benchmarks for Cadmium, Lead and PAHs
Screening Level Ecological Risk Assessment

COC	Soil Benchmark - Plants (mg/kg dry weight)	Soil Benchmark - Earthworms (mg/kg dry weight)	Acute Freshwater Benchmark (mg/L)*	Freshwater Sediment Benchmark (mg/kg dry weight)
Cadmium	32	140	0.00908	0.99
Lead	120	1700	0.0688	35.80
HPAH	Not Listed	18	NA	NA
LPAH	Not Listed	29	NA	NA

Notes:

Source: TCEQ, 2011 for acute freshwater benchmarks and TCEQ, 2006 for freshwater sediment and soil benchmarks.

Earthworm benchmarks from EPA Ecological Soil Screening Levels for PAHs (June 2007).

*Adjusted using hardness of 106 mg/L from Lake Lewisville Section 0823 per Implementation Guidance (TCEQ, 2012).

mg/Kg - milligrams/Kilogram

mg/L - milligrams/Liter

NA - Not Applicable

LPAH - low molecular weight polycyclic aromatic hydrocarbon

HPAH - high molecular weight polycyclic aromatic hydrocarbon

Table 6. Soil and Sediment Data Summary Statistics
Screening Level Ecological Risk Assessment

Chemicals of Concern	Average (mg/kg)	Maximum Detection (mg/kg)	Minimum Detection (mg/kg)	95% UCL (mg/kg)	Statistic Used
South Wooded Area Soil*					
Cadmium	3.39	7.92	1.62	4.68	95% Approximate Gamma UCL
Lead	481.00	1030.00	221.00	630.00	95% Student's t
Lake Parcel Soil					
Cadmium	1.96	3.51	1.06	2.30	95% KM(t) UCL
Lead	206.50	367.00	120.00	248.30	95% Student's t
Stewart Creek Corridor Soil*					
Cadmium	1.77	6.55	0.08	2.64	95% Approximate Gamma UCL
Lead	186.80	1510.00	8.82	501.50	95% Approximate Gamma UCL
HPAHs**	--	0.33	--	--	--
LPAHs**	--	0.02	--	--	--
North Wooded Area Soil*					
Cadmium	2.33	5.64	0.34	3.12	95% Student's t
Lead	396.90	1090.00	8.59	555.00	95% Student's t
Stewart Creek + North Tributary Sediment					
Cadmium	0.97	2.08	0.34	1.09	95% Approximate Gamma
Lead	14.08	28.20	6.57	16.05	95% Student's t

Notes:
UCL - upper confidence limit

* Samples with measured lead concentrations greater than 1,600 mg/kg were removed from the UCL calculation since this value is the human health critical PCL and these areas will be addressed through a response action to be described in the Response Action Plan (RAP).

** The maximum summation of LPAHs and HPAHs were from location SCC-8.

Table 7. Threatened and Endangered Species - Collin and Denton Counties
Screening Level Ecological Risk Assessment

Common Name[1]	Scientific Name	Status[2] Federal	Status[2] Texas	Description	Signficant Presence Terrestrial	Signficant Presence Aquatic	Comment
Birds							
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T	Year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.	N	N	Unlikely to feed on local prey in urban area; possible rare fly-overs.
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL		migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.	N	N	May occur as infrequent transient.
Bald Eagle	*Haliaeetus leucocephalus*	DL	T	Found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds.	N	N	May occur as infrequent transient.
Interior Least Tern	*Sterna antillarum athalassos*	LE	E	Subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony.	N	N	May occur as infrequent transient.
Peregrine Falcon	*Falco peregrinus tundrius*	DL	T	Migrates across the state from more northern breeding areas in US and Canada to winter along coast and farther south; no longer listed in Texas, but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level.	N	N	Unlikely to feed on local prey; possible rare fly-overs.
Piping Plover	*Charadrius melodus*	LT	T	Wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats.	N	N	May occur as infrequent transient.
Sprague's Pipit	*Anthus spragueii*	C		Only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.	N	N	Unlikely to feed on local prey in urban area; possible rare fly-overs.
White-faced Ibis	*Plegadis chihi*		T	Prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats. The white-faced ibis seems to prefer freshwater marshes, where it can find insects, newts, leeches, earthworms, snails and especially crayfish, frogs and fish. They roost on low platforms of dead reed stems or on mud banks. In Texas, they breed and winter along the Gulf Coast and may occur as migrants in the Panhandle and West Texas (TPWD, 2013).	N	N	Unlikely to forage in small urban intermittent creeks. Refer to determination during TPDES permit renewal: "The discharge from this permit action is not expected to have an effect on any federal endangered or threatened aquatic or aquatic dependent species or proposed species or their critical habitat" (TCEQ, 2011b).
Whooping Crane	*Grus americana*	LE	E	Potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties.	N	N	
Wood Stork	*Mycteria americana*		T	Forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960.	N	N	
Mammals							
Red wolf	*Canis rufus*	LE	E	Extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies.	N	N	Considered extirpated from region.
Mollusks							
Louisiana Pigtoe	*Pleurobe mariddellii*		T	Found in streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins. Ranged from eastern Texas drainages into Louisiana, but has been exceptionally rare in recent decades. Since the mid-1990s, small numbers of living specimens have been found in the Neches River and some of its tributaries and the Angelina River (TPWD, 2009).	N	N	Unlikely to forage in small urban intermittent creeks. Refer to determination during TPDES permit renewal: "The discharge from this permit action is not expected to have an effect on any federal endangered or threatened aquatic or aquatic dependent species or proposed species or their critical habitat" (TCEQ, 2011b).
Texas heelsplitter	*Potamilus amphichaenus*		T	Found in quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins	N	N	
Reptiles							
Alligator snapping turtle	*Macrochelys temminckii*		T	Perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers.	N	N	Unlikely to forage in small urban intermittent creeks. Refer to determination during TPDES permit renewal: "The discharge from this permit action is not expected to have an effect on any federal endangered or threatened aquatic or aquatic dependent species or proposed species or their critical habitat" (TCEQ, 2011b).
Timber/Canebrake rattlesnake	*Crotalus horridus*		T	Swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto.	**Y**	N	Habitat would not deter presence. Diet is mainly rodents and rabbits which could be present in the area.
Texas horned lizard	*Phrynosoma cornutum*		T	Open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive.	N	N	Diet is primarily harvester ants. No harvester ant nests were noted on site. Unlikely to be present.

Notes:

1 - Taxa provided in the Texas Parks and Wildlife Departments Rare, Threatened, and Endangered Species of Texas List for Denton and Collin Counties.

http://www.tpwd.state.tx.us/gis/ris/es/ Only taxa listed as threatened or endangered on either the federal or state list are included.

2 - T = Threatened; E = Endangered; C = Candidate for Listing; LT = Listed Threatened; LE = Listed Endangered; DL = De-Listed.

TPWD 2009, 15 Texas Freshwater Mussels Placed on State Threatened List. November 5, 2009. http://www.texashuntfish.com/app/view/Post/27233/15-Texas-Freshwater-Mussels-Placed-on-State-Threatened-List

TPWD 2013, On Line Species Information on White Faced Ibis: http://www.tpwd.state.tx.us/huntwild/wild/species/ibis/

TPDES - Texas Pollutant Discharge Elimination System

TCEQ 2011c, July 29, 2011 Memorandum from Sue Reilly, Standards Implementation Team, Water Quality Assessment Division to the Industrial Permits Team regarding Exide Technologies; Permit no WQ0002964000. Renewal; Application received June 23, 2011.

Table 8. Exposure Assumptions for Food Web Ingestion Modeling
Screening Level Ecological Risk Assessment

		AQUATIC RECEPTORS				TERRESTRIAL RECEPTORS							
		Snowy Egret		Raccoon		Fox		Least Shrew		Red-Tailed Hawk		American Robin	
Parameter	Definition	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference
IR	Soil or Sediment Ingestion Rate (kg/day)*	5.30E-03	EPA, 1993	2.63E-02	EPA, 1993	3.00E-03	Beyer, 1994	2.71E-07	EPA, 1993	8.97E-06	EPA, 1993	2.52E-06	EPA, 1993
BW	Body weight (kg)	3.71E-01	EPA, 1993	5.63E+00	EPA, 1993	4.13E+00	EPA, 1993	4.00E-03	Davis and Schmidley, 2009	9.57E-01	EPA, 1993	6.30E-02	EPA, 1993
IR	Food Ingestion Rate (kg/day)*	3.10E-02	EPA, 1993	2.80E-01	EPA, 1993	1.08E-01	EPA, 1993	3.38E-06	EPA, 1993	4.48E-04	EPA, 1993	4.85E-05	EPA, 1993
Dfm	Dietary fraction of small mammals (unitless)	NA	EPA, 1993	NA	EPA, 1993	1.00E+00	EPA, 1993	NA	--	7.85E-01	EPA, 1993	NA	--
Dfb	Dietary fraction of birds (unitless)	NA	EPA, 1993	NA	EPA, 1993	NA	--	NA	--	2.15E-01	EPA, 1993	NA	--
Dfa	Dietary fraction of arthropods (unitless)	NA	--	NA	--	NA	--	9.00E-01	EPA, 1993	NA	--	4.60E-01	EPA, 1993
Dfs	Dietary fraction of plants, seeds and other vegetation (unitless)	NA	--	1.0E-01	EPA, 1993	NA	--	1.00E-01	EPA, 1993	NA	--	8.00E-02	EPA, 1993
Dfe	Dietary fraction of earthworms (unitless)	NA	--	NA	--	NA	--	NA	--	NA	--	4.60E-01	EPA, 1993
Dbi	Dietary fraction of benthic invertebrates (unitless)	3.0E-01	Terres, 1980	6.0E-01	EPA, 1993	NA	--	NA	--	NA	--	NA	--
Df	Dietary fraction of fish (unitless)	7.0E-01	Terres, 1980	3.0E-01	EPA, 1993	NA	--	NA	--	NA	--	NA	--

Notes:

*Expressed in dry weight

NA - not applicable.

EPA, 1993. Wildlife Exposure Factors Handbook. Office of Research and Development. EPA/600/R-93/187. December

Terres, J.K. 1980. The Audubon Society Encyclopedia of North American Birds. Wing Books. NY

Davis and Schmidley, 2009. The Mammals of Texas, online edition. http://www.nsrl.ttu.edu/tmot1/

Beyer, W.N. E.Conner, and S. Gerould 1994. Estimates of Soil Ingestion by Wildlife. J. Wildl. Manage. 58:375-382

Table 9. Uptake Factors Used in Food Web Ingestion Modeling
Screening Level Ecological Risk Assessment

Analyte	Soil to Plant UF	Sediment to Benthic Invertebrate UF	Soil to Earthworm or Arthropod UF	Plant to Wildlife UF [1]	Soil to Wildlife UF [1]	Plant to Bird UF [1]	Soil to Bird UF [1]
Cadmium	3.6E-01	3.4E+00	9.6E-01	7.4E-05	1.6E-06	4.7E-02	1.5E-03
Lead	4.5E-02	6.3E-01	3.0E-02	1.9E-04	4.1E-06	NS	NS
HPAHs	2.0E-02	NA	7.0E-02	1.3E-01	2.8E-03	7.2E-02	2.3E-03
LPAHs	2.0E-02	NA	7.0E-02	1.3E-01	2.8E-03	7.2E-02	2.3E-03

Notes:

All uptake factors taken from EPA, 1999.

UF - Uptake Factor

NS - EPA, 1999 indicates insufficient data to determine value.

NA - not a chemical of concern in this media.

LPAH - low molecular weight polycyclic aromatic hydrocarbon.

HPAH - high molecular weight polycyclic aromatic hydrocarbon.

1. UFs for PAHs are based on Indeno(1,2,3-cd)pyrene which has the most conservative UF of the PAHs listed in EPA 1999.

Indeno(1,2,3-cd)pyrene was detected at the Site (see Table 2).

Values for LPAHs are not provided in EPA 1999; therefore, the values representing the HPAHs were used as surrogate values.

EPA, 1999. *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities*. *Peer Review Draft*. Office of Solid Waste, Washington, D.C.August 1999.

Table 10. NOAEL Based HQ Summary: Initial Conservative Assessment
Screening Level Ecological Risk Assessment

COC	Snowy Egret	Raccoon	American Robin	Red-Tailed Hawk	Least Shrew	Fox
	NOAEL-HQ					
South Wooded Area						
Cadmium	--	--	2.00E-03	3.00E-01	5.00E-03	3.40E+01
Lead	--	--	3.00E-02	9.00E-01	1.00E-02	2.40E+01
Lake Parcel Soil						
Cadmium	--	--	1.00E-03	1.00E-01	3.00E-03	1.70E+01
Lead	--	--	1.00E-02	4.00E-01	5.00E-03	9.40E+00
Stewart Creek Corridor Soil						
Cadmium	--	4.00E-01	1.00E-03	1.00E-01	3.00E-03	1.90E+01
Lead	--	2.60E+00	2.00E-02	8.00E-01	1.00E-02	1.90E+01
HPAHs	--	NA	2.00E-05	1.00E-03	7.00E-05	2.00E-01
LPAHs	--	NA	7.00E-09	6.00E-07	3.00E-08	1.00E-04
North Wooded Area						
Cadmium	--	--	2.00E-03	2.00E-01	3.00E-03	2.40E+01
Lead	--	--	2.00E-02	9.00E-01	1.00E-02	2.20E+01
Stewart Creek + North Tributary Sediment						
Cadmium	1.00E-01	2.00E-01	--	--	--	--
Lead	9.00E-01	1.00E-01	--	--	--	--

Notes:

COC - Chemical of Concern

NOAEL - No Observed Adverse Effect Level

HQ - Hazard Quotient

According to Section 3.10 of TCEQ 2006; if the HQ is ≤ 1 for a given COC, then the COC is dropped from further consideration, therefore only those COCs and receptors with HQ > 1 are carried forward to the refined or less-conservative assessment (see Table 11).

Table 11. NOAEL and LOAEL Based HQ Summary: Refined Less-Conservative Assessment
Screening Level Ecological Risk Assessment

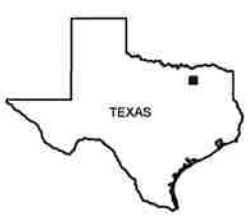
COC	Snowy Egret		Raccoon		American Robin		Red-Tailed Hawk		Least Shrew		Fox	
	NOAEL-HQ	LOAEL-HQ	NOAEL-HQ	LOAEL-HQ	NOAEL-HQ	LOAEL-HQ	NOAEL-HQ	LOAEL-HQ	NOAEL-HQ	LOAEL-HQ	NOAEL-HQ	LOAEL-HQ
South Wooded Area												
Cadmium	--	--	--	--	NA	NA	NA	NA	NA	NA	1.10E+00	1.00E-01
Lead	--	--	--	--	NA	NA	NA	NA	NA	NA	8.00E-01	4.00E-01
Lake Parcel Soil												
Cadmium	--	--	--	--	NA	NA	NA	NA	NA	NA	5.00E-01	5.00E-02
Lead	--	--	--	--	NA	NA	NA	NA	NA	NA	3.00E-01	2.00E-01
Stewart Creek Corridor Soil												
Cadmium	--	--	NA	NA	NA	NA	NA	NA	NA	NA	1.10E+00	1.00E-01
Lead	--	--	2.00E-01	1.00E-01	NA	NA	NA	NA	NA	NA	1.10E+00	6.00E-01
LPAHs	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HPAHs	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
North Wooded Area												
Cadmium	--	--	--	--	NA	NA	NA	NA	NA	NA	1.60E+00	2.00E-01
Lead	--	--	--	--	NA	NA	NA	NA	NA	NA	1.50E+00	8.00E-01
Stewart Creek + North Tributary Sediment												
Cadmium	NA	NA	NA	NA	--	--	--	--	--	--	--	--
Lead	NA	NA	NA	NA	--	--	--	--	--	--	--	--

Notes:
COC - Chemical of Concern
NOAEL - No Observed Adverse Effect Level
LOAEL - Lowest Observed Adverse Effect Level
HQ - Hazard Quotient
An HQ value less than 1 indicates that risk is minimal.
NA- Not Appplicable, indicating that the HQ < 1 in the initial conservative assessment and further evaluation not necessary in the refined less-conservative assessment.
"--" indcates that the pathway in not applicable.

FIGURES

Investigation Area Boundary

Boundary of Property Owned by Exide



QUADRANGLE LOCATIONS

N

Approx. Scale in Feet

0 1000 2000

SOURCE:
Base map from Google Earth, photography dated 3-31-2011.

FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 1

SITE LOCATION MAP

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

Investigation Area Boundary

Operational/ Waste Management Areas

Ecological Habitat Areas Evaluated in SLERA

N

Scale in Feet

0 150 300

Source of photo:
Imagery from NCTCOG, 2009 photography.

FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 2

SITE LAND USE MAP

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- Investigation Area Boundary
- Surface Soil Sample Location
- Operational/ Waste Management Areas
- Ecological Habitat Areas Evaluated in SLERA

N

Scale in Feet

0 150 300

Source of photo:
Imagery from NCTCOG, 2009 photography.

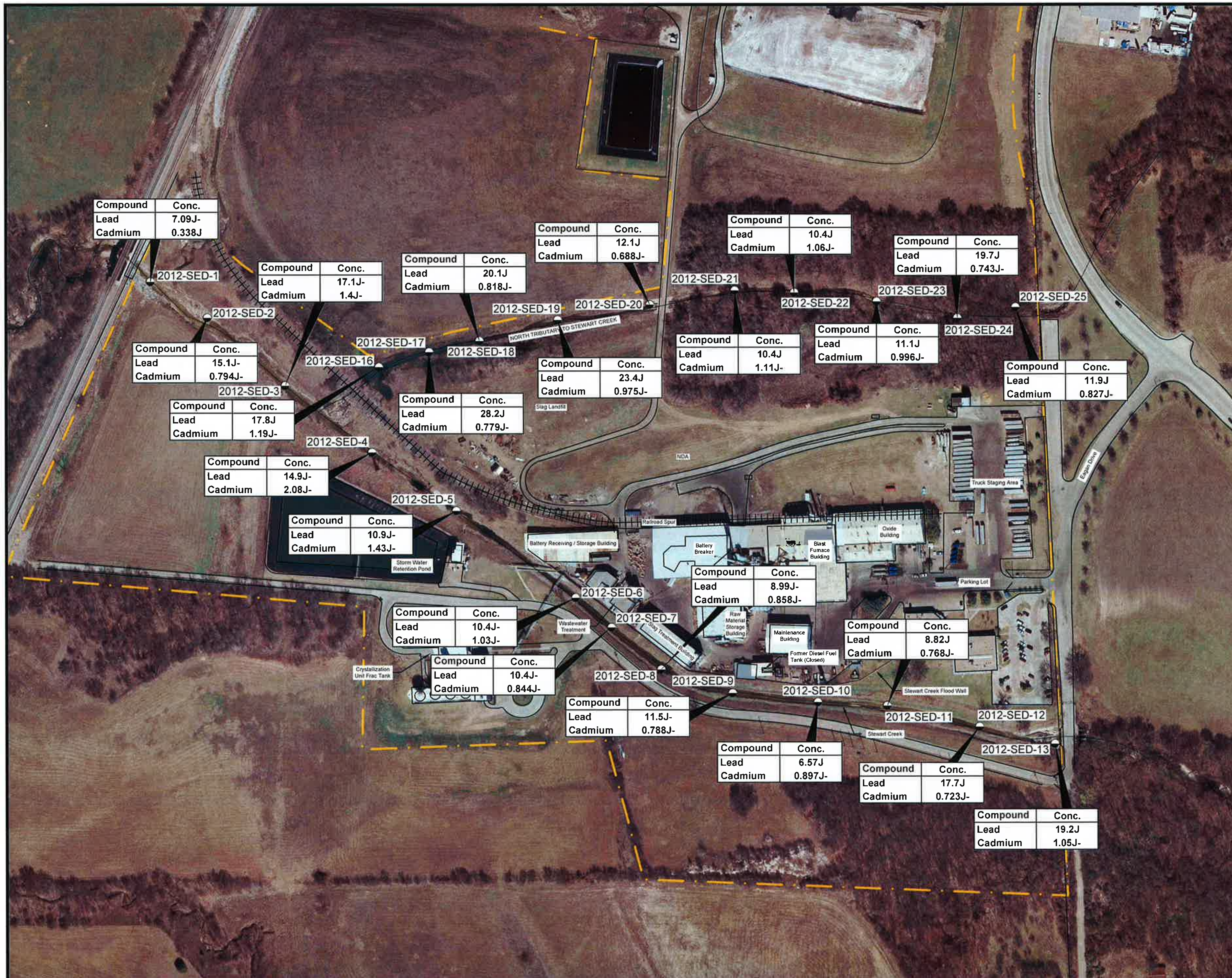
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 3

SURFACE SOIL SAMPLE LOCATIONS IN AREAS OF ECOLOGICAL INTEREST

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

Investigation Area Boundary

Sediment Sample Location

Notes:
1. All Concentrations in mg/Kg.
2. Data Qualifiers:
J = Estimated Concentration
J- = Estimated, biased low

N

Scale in Feet
0 125 250

Source of photo:
Imagery from NCTCOG, 2009 photography.

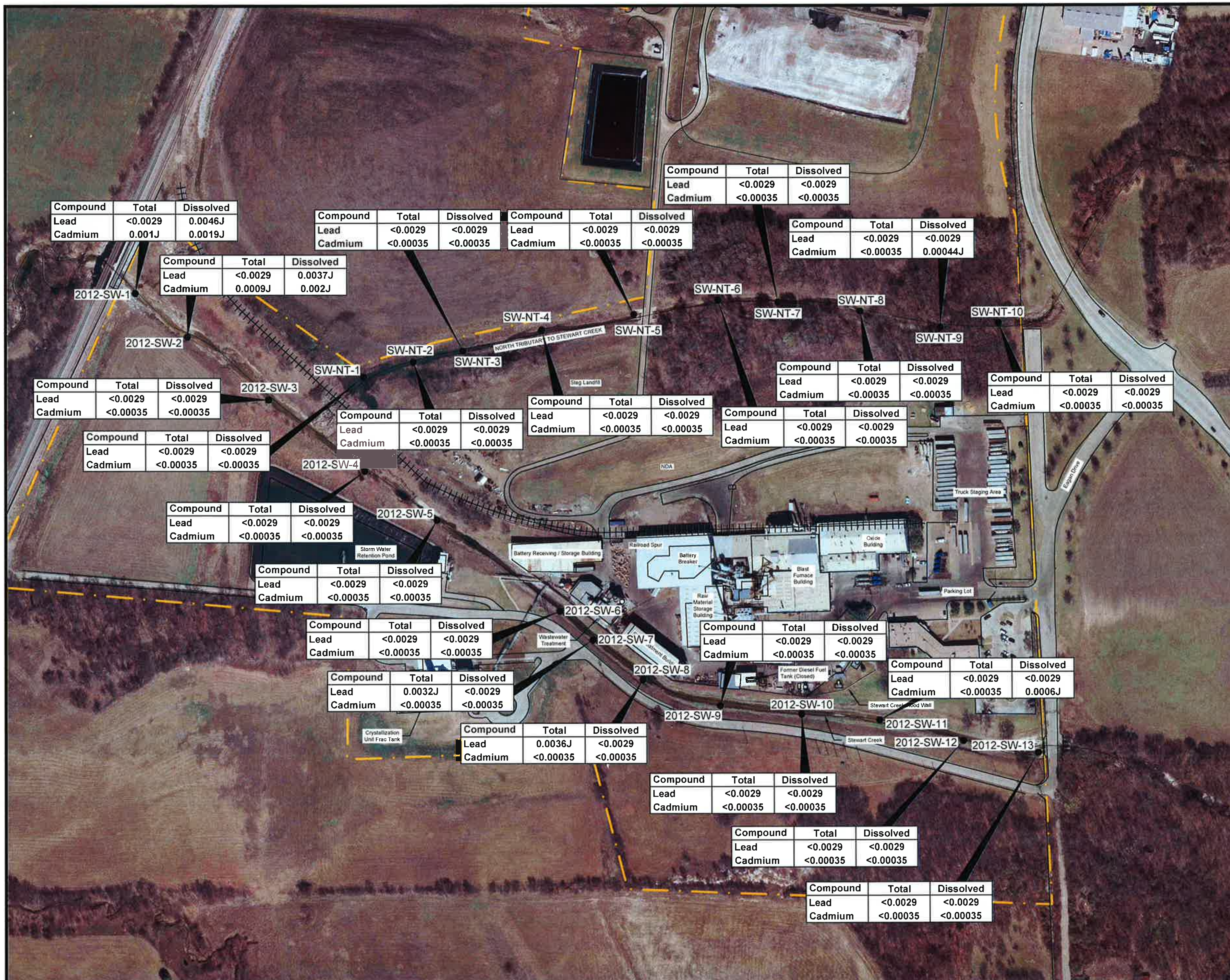
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 4

SEDIMENT SAMPLE LOCATIONS AND CADMIUM AND LEAD CONCENTRATIONS

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

— — Investigation Area Boundary

● Surface Water Sample Location

Notes:
1. All Concentrations in mg/L.
2. No concentrations exceed the Acute Aquatic Life RBELs:
   Cadmium - 0.0098 mg/L
   Lead - 0.0688 mg/L
3. Data Qualifier:
   J = Estimated Concentration
4. RBEL = Risk Based Exposure Levels

N

Scale in Feet
0 125 250

Source of photo:
Imagery from NCTCOG, 2009 photography.

FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 5

SURFACE WATER SAMPLE LOCATIONS AND CADMIUM AND LEAD CONCENTRATIONS

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- Investigation Area Boundary
- Monitoring Well Location
- (620.60) Water-Level Elevation Measured 3/11/13 (Ft MSL)

N

Scale in Feet

0 150 300

Source of photo:
Imagery from NCTCOG, 2009 photography.

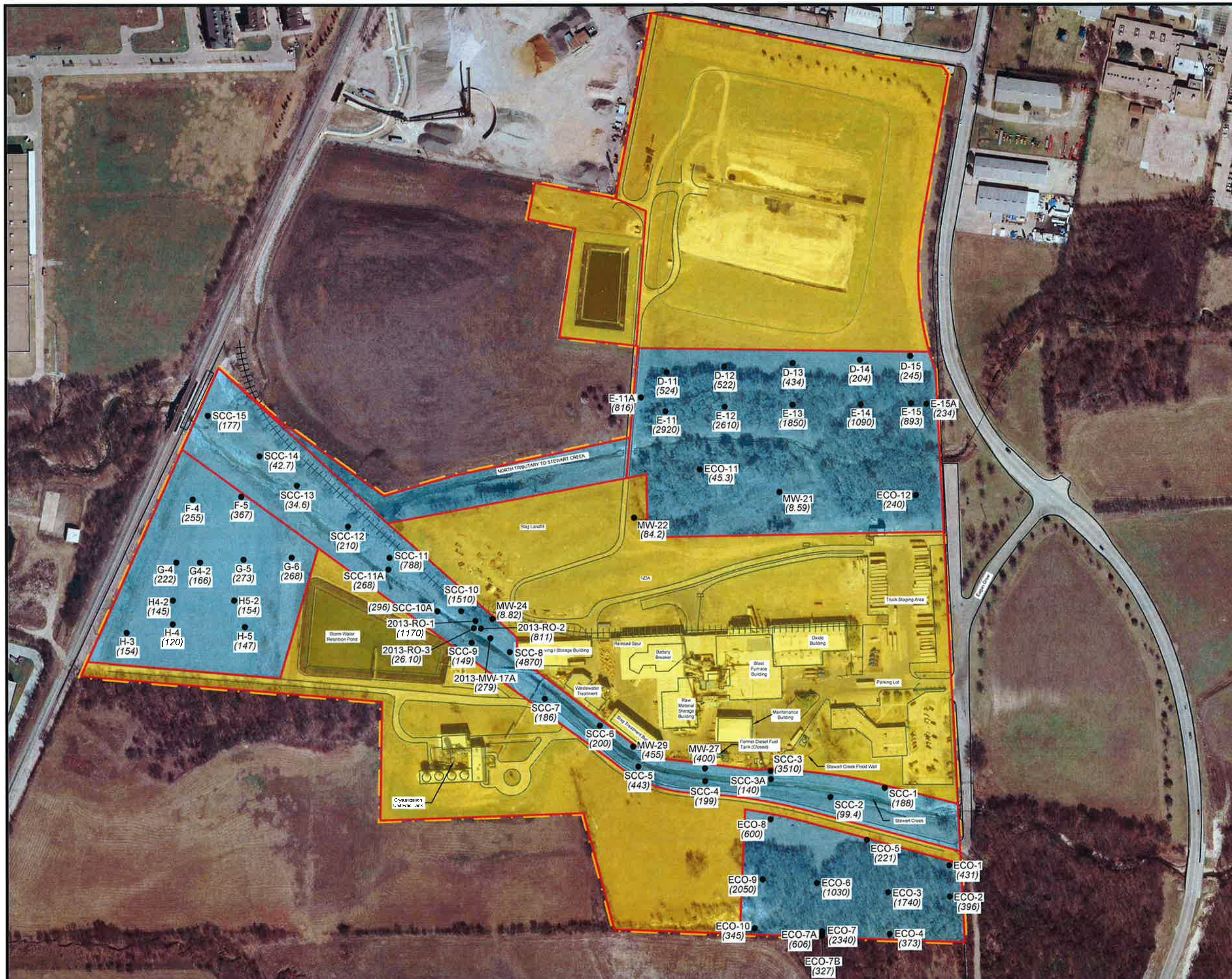
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 6

GROUNDWATER SAMPLE LOCATIONS NEAR ECOLOGICAL POTENTIAL POINTS OF EXPOSURE

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Investigation Area Boundary
- ● Surface Soil Sample Location
- (1.35) Lead Concentration (mg/Kg)
- Operational/ Waste Management Areas
- Ecological Habitat Areas Evaluated in SLERA

Notes:
1. All Concentrations in mg/Kg.

Source of photo:
Imagery from NCTCOG, 2009 photography.

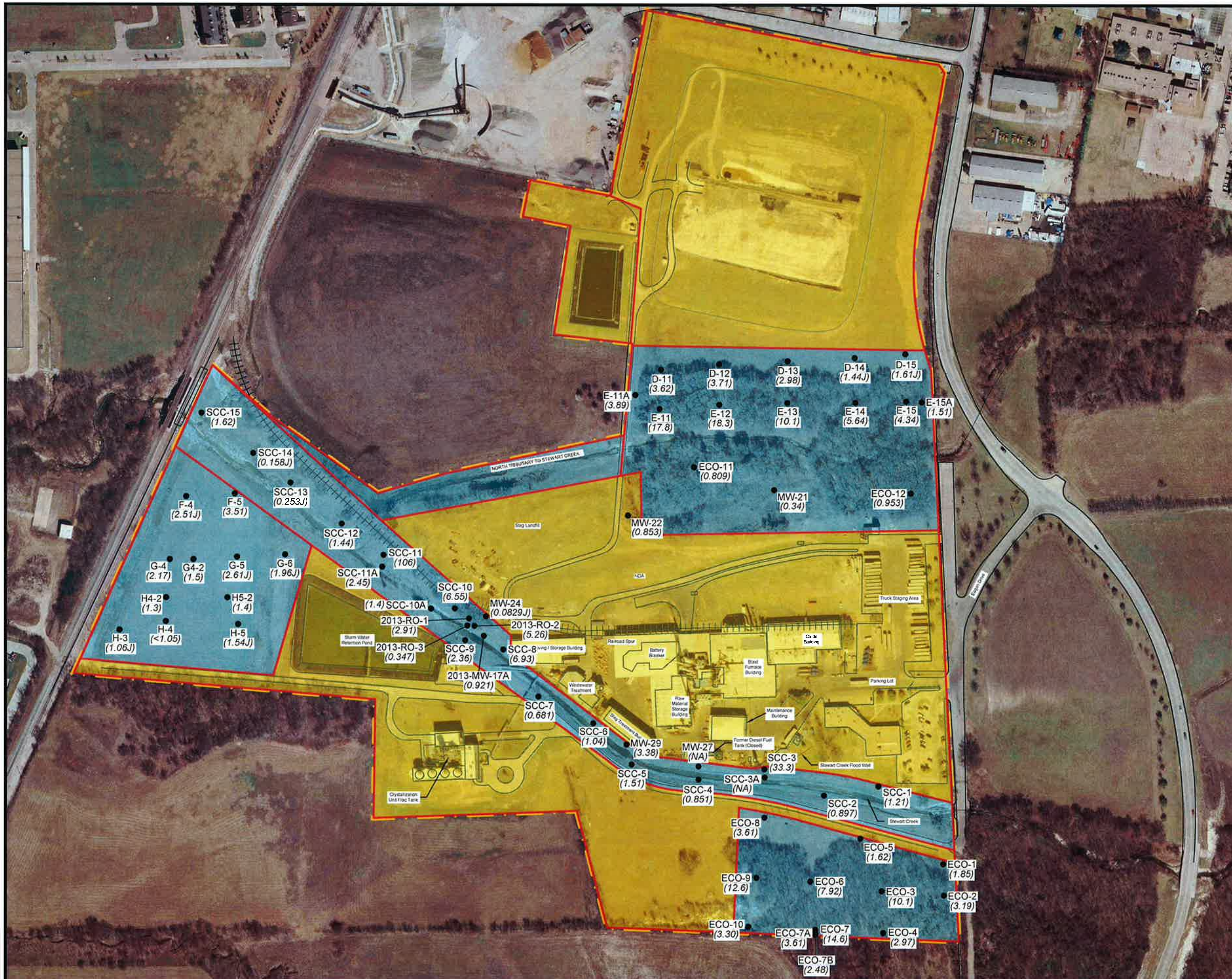
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 7

LEAD CONCENTRATIONS IN SURFACE SOIL

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Investigation Area Boundary
- Surface Soil Sample Location
- (1.35) Cadmium Concentration (mg/Kg)
- Operational/ Waste Management Areas
- Ecological Habitat Areas Evaluated in SLERA

Notes:
1. All Concentrations in mg/Kg.
2. NA - Not analyzed

N

Scale in Feet
0 150 300

Source of photo:
Imagery from NCTCOG, 2009 photography.

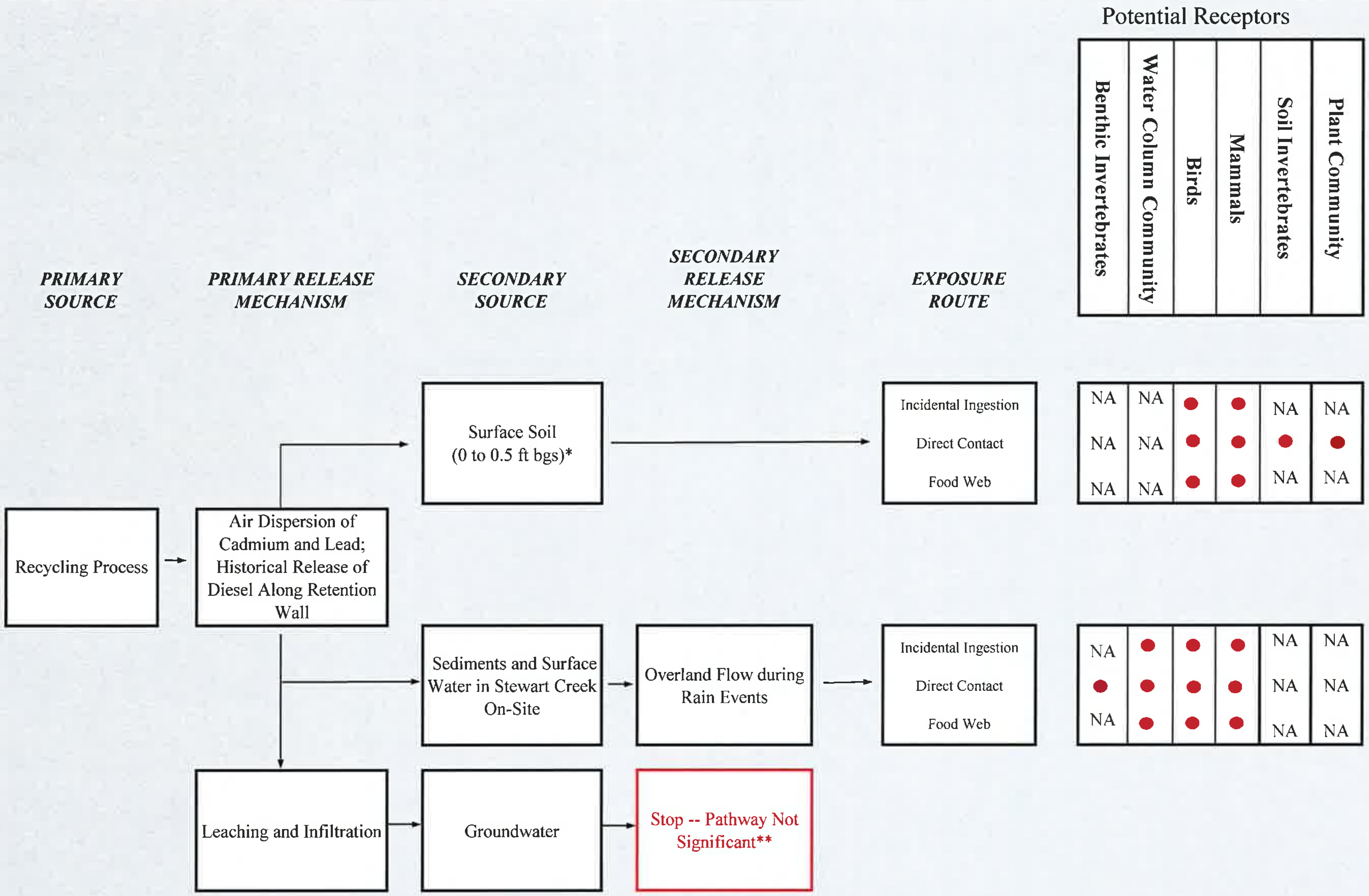
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 8

CADMIUM CONCENTRATIONS IN SURFACE SOIL

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



Legend:
● Potentially complete pathway
NA Not an applicable pathway for the particular receptor.
* The 0-0.5 ft bgs is the relevant soil depth for terrestrial ecological exposures. Terrestrial exposure areas include the Lake Parcel, Stewart Creek Corridor, and North and South Wooded Areas.
** Groundwater from the Site discharges to Stewart Creek, but dissolved Cd and Pb concentrations were not detected above ecological surface water quality criteria in groundwater samples nearest Stewart Creek and North Tributary.

Figure 9. Ecological Conceptual Site Model
Frisco Recycling Center

APPENDIX A
TIER 1 EXCLUSION CRITERIA CHECKLIST

Figure: 30 TAC §350.77(b)

TIER 1: Exclusion Criteria Checklist

This exclusion criteria checklist is intended to aid the person and the TNRCC in determining whether or not further ecological evaluation is necessary at an affected property where a response action is being pursued under the Texas Risk Reduction Program (TRRP). Exclusion criteria refer to those conditions at an affected property which preclude the need *for* a formal ecological risk assessment (ERA) because there are incomplete or insignificant ecological exposure pathways due to the nature of the affected property setting and/or the condition of the affected property media. This checklist (and/or a Tier 2 or 3 ERA or the equivalent) must be completed by the person *for* all affected property subject to the TRRP. The person should be familiar with the affected property but need not be a professional scientist in order to respond, although some questions will likely require contacting a wildlife management agency (Le., Texas Parks and Wildlife Department or *U.S.* Fish and Wildlife Service). The checklist is designed *for* general applicability to all affected property; however, there may be unusual circumstances which require professional judgment in order to determine the need *for* further ecological evaluation (e.g., cave-dwelling receptors). In these cases, the person is strongly encouraged to contact TNRCC before proceeding.

Besides some preliminary information, the checklist consists of three major parts, each of which must be completed unless otherwise instructed. PART I requests affected property identification and background information. PART II contains the actual exclusion criteria and supportive information. PART III is a qualitative summary statement and a certification of the information provided by the person. Answers should reflect existing conditions and should not consider future remedial actions at the affected property. Completion of the checklist should lead to a logical conclusion as to whether further evaluation is warranted. Definitions of terms used in the checklist have been provided and users are strongly encouraged to familiarize themselves with these definitions before beginning the checklist.

Name of Facility:

Exide Frisco Former Operating Plant

Affected Property Location:

7471 South Fifth Street. Frisco, TX. Collin County

PART I. Affected Property Identification and Background Information

1) Provide a description of the specific area of the response action and the nature of the release. Include estimated acreage of the affected property and the facility property, and a description of the type of facility and/or operation associated with the affected property. Also describe the location of the affected property with respect to the facility property boundaries and public roadways.

The location of the Former Operating Plant was a lead oxide manufacturing plant and a lead metal recycling facility (secondary lead smelter) that had been in operation in Frisco, Texas, since approximately 1964, with recycling commencing in 1969 until operations ended in November 2012. The facility recycled spent lead-acid batteries and other lead-bearing scrap materials. The scrap lead was smelted and refined to produce lead, lead alloys and lead oxide.

Figure: 30 TAC §350.77(b) continued

Attach available USGS topographic maps and/or aerial or other affected property photographs to this form to depict the affected property and surrounding area. Indicate attachments:

☐ Topo map ☐ Aerial photo X Other (See Appendix B)

2) Identify environmental media known or suspected to contain chemicals of concern (COCs) at the present time.

Check all that apply:

Known/Suspected COC location based on sampling data?

X Soil < 5 ft below ground	**X Yes**	☐ No
☐Soil > 5 ft below ground surface	☐ Yes	**X** No
☐ Groundwater	☐ Yes	**X** No
X Surface Water/Sediments	**X Yes**	☐ No

Explain (previously submitted information may be referenced):

Based on facility history and current and future land use, surface deposition of lead and cadmium was the primary route of COC distribution into the environment in the areas of ecological concern. Surface soil contamination and potentially runoff of lead and cadmium into Stewart Creek and the North Tributary may have occurred in the past. Slag material was historically used in Stewart Creek for erosion protection. A TCEQ-approved removal action was performed in 2000 to address these materials.

3) Provide the information below for the nearest surface water body which has become or has the potential to become impacted from migrating COCs via surface water runoff, air deposition, groundwater seepage, etc. Exclude wastewater treatment facilities and stormwater conveyances/impoundments authorized by permit. Also exclude conveyances, decorative ponds, and those portions of process facilities which are:

a. Not in contact with surface waters in the State or other surface waters which are ultimately in contact with surface waters in the State; and

b. Not consistently or routinely utilized as valuable habitat for natural communities including birds, mammals, reptiles, etc.

The water body is **Stewart Creek** and is best described as a:

X freshwater stream ________perennial (has water all year)

___X____intermittent (dries up completely for at least 1 week a year)

________intermittent with perennial pools

☐ freshwater swamp/marsh/wetland

☐ saltwater or brackish marsh/swamp/wetland

☐ reservoir, lake, or pond; approximate surface acres:

☐ drainage ditch

☐ tidal stream ☐ bay ☐ estuary

☐ other; specify

Figure: 30 TAC §350.77(b) continued

Is the water body listed as a State classified segment in Appendix C of the current Texas Surface Water Quality Standards; §§307.1 - 307.1O?

☐ Yes Segment # Use Classification:

X No

If the water body is not a State classified segment, identify the first downstream classified segment.

Name: **Lake Lewisville**

Segment #: **0823**

Use Classification: **Aquatic Life, Contact Recreation, Fish Consumption**

As necessary, provide further description of surface waters in the vicinity of the affected property:

Stewart Creek crosses Collin and Denton Counties. It is an intermittent stream in the Trinity River Basin.

PART II. Exclusion Criteria and Supportive Information

Subpart A. Surface Water/Sediment Exposure

1) Regarding the affected property where a response action is being pursued under the TRRP, have COCs migrated and resulted in a release or imminent threat of release to either surface waters or to their associated sediments via surface water runoff, air deposition, groundwater seepage, etc.? Exclude wastewater treatment facilities and stormwater conveyances/impoundments authorized by permit. Also exclude conveyances, decorative ponds, and those portions of process facilities which are:

    a. Not in contact with surface waters in the State or other surface waters which are ultimately in contact with surface waters in the State; and

    b. Not consistently or routinely utilized as valuable habitat for natural communities including birds, mammals, reptiles, etc.

X Yes ☐ No

Explain: **COCs may have migrated and resulted in a release to Stewart Creek from overland flow and surface water runoff. Slag material was historically used in Stewart Creek for erosion protection. A TCEQ-approved removal action was performed in 2000 to address these materials.**

If the answer is Yes to Subpart A above, the affected property does not meet the exclusion criteria. However, complete the remainder of Part II to determine if there is a complete and/or significant soil exposure pathway, then complete PART III - Qualitative Summary and Certification. If the answer is No, go to Subpart B.

Subpart B. Affected Property Setting

In answering "Yes" to the following question, it is understood that the affected property is not attractive to wildlife or livestock, including threatened or endangered species (i.e., the affected property does not serve as valuable habitat, foraging area, or refuge for ecological communities). (May require consultation with wildlife management agencies.)

1) Is the affected property wholly contained within contiguous land characterized by: pavement, buildings,

Figure: 30 TAC §350.77(b) continued

landscaped area, functioning cap, roadways, equipment storage area, manufacturing or process area, other surface cover or structure, or otherwise disturbed ground?

☐ Yes **X** No

Explain: **Agreements put in place between Exide and the City of Frisco pursuant to which the facility ceased operations at the end of November 2012 specified that a significant portion of the Exide-owned undeveloped buffer property surrounding the former operating plant would become commercial development. Exide will retain ownership of the former operating plant (the Site), except that the City has an option to acquire the Lake Parcel and Pond Parcel at some later time. Exide will remove its current structures, except for the administration building and the fire training facility. Pending evaluation in the Response Action Plan (RAP) for the Site, Exide will manage and maintain the caps on the disposal areas/landfills within the Site. The SLERA incorporates the future land use for this area when defining the ecological exposure areas. Some areas within the Site (e.g., former process areas and landfills) are excluded from the SLERA because of a lack of ecological habitat related to the presence of building slabs, asphalt, and other coverings/caps that are currently managed and maintained and will continue to be managed and maintained in the future.**

If the answer to Subpart B above is Yes, the affected property meets the exclusion criteria, assuming the answer to Subpart A was No. Skip Subparts C and D and complete PART III - Qualitative Summary and Certification. If the answer to Subpart B above is No, go to Subpart C.

Subpart C. Soil Exposure

1) Are COCs which are in the soil of the affected property solely below the first 5 feet beneath ground surface or does the affected property have a physical barrier present to prevent exposure of receptors to COCs in surface soil?

☐ Yes X No

Explain:

Soils that have lead concentrations greater than 1,600 mg/kg will be addressed in a RAP. Areas of terrestrial uplands which may remain undeveloped will be evaluated in the SLERA.

If the answer to Subpart C above is Yes, the affected property meets the exclusion criteria, assuming the answer to Subpart A was No. Skip Subpart D and complete PART III - Qualitative Summary and Certification.If the answer to Subpart C above is No, proceed to Subpart D.

Subpart D. *De Minimus*Land Area

In answering "Yes" to the question below, it is understood that all of the following conditions apply:

- The affected property is not known to serve as habitat, foraging area, or refuge to threatened/endangered or otherwise protected species. (Will likely require consultation with wildlife management agencies.)
- Similar but unimpacted habitat exists within a half-mile radius.
- The affected property is not known to be located within one-quarter mile of sensitive environmental areas (e.g., rookeries, wildlife management areas, preserves). (Will likely require consultation with wildlife management agencies.)
- There is no reason to suspect that the COCs associated with the affected property will migrate such that the affected property will become larger than one acre.

1) Using human health protective concentration levels as a basis to determine the extent of the COCs, does the affected property consist of one acre or less and does it meet all of the conditions above?

☐ Yes ☐ No

Explain how conditions are met/not met:

Figure: 30 TAC §350.77(b) continued

If the answer to Subpart D above is Yes, then no further ecological evaluation is needed at this affected property, assuming the answer to Subpart A was No. Complete PART III - Qualitative Summary and Certification. If the answer to Subpart D above is No, proceed to Tier 2 or 3 or comparable ERA.

PART Ill. Qualitative Summary and Certification (Complete in all cases.)

Attach a brief statement (not to exceed I page) summarizing the information you have provided in this form. This summary should include sufficient information to verify that the affected property meets or does not meet the exclusion criteria. The person should make the initial decision regarding the need for further ecological evaluation (ie., Tier 2 or 3) based upon the results of this checklist. After review, TNRCC will make a final determination on the need for further assessment. Note that the person has the continuing obligation to reenter the ERA process if changing circumstances result in the affected property not meeting the Tier 1 exclusion criteria.

Completed by:

Margaret Roy

Margaret Roy
Senior Environmental Scientist
May 10, 2013

I believe that the information submitted is true, accurate, and complete, to the best of my knowledge.

Mitch A. L

Matthew A. Love
Director - Global Environmental Remediation
Exide Technologies
May 10, 2013

Supporting Documentation for Exclusion Criteria Checklist

The Exide Technologies (Exide) Former Operating Plant was a lead oxide manufacturing plant and a lead metal recycling facility (secondary lead smelter) that had been in operation in Frisco, Texas, since approximately 1964 with recycling operations commencing in 1969 until operations ended in November 2012. The facility recycled spent lead-acid batteries and other lead-bearing scrap materials. The scrap lead was smelted and refined to produce lead, lead alloys and lead oxide.

Agreements put in place between Exide and the City of Frisco pursuant to which the facility cease operations by the end of November 2012 and a significant portion of the Exide owned property surrounding the operating facility would become commercial development. Exide retains ownership of the former operating plant (the Site), and will remove its current structures except for the administration building and fire training facility pending evaluation in the RAP for the Site, Exide will manage and maintain the caps on the disposal areas/landfills.

Areas that may provide some ecological resources in the future include the Lake Parcel, North Wooded Area, South Wooded Area, the riparian transitional area of Stewart Creek, Stewart Creek and the North Tributary. The Conceptual Site Model indicated that overland flow/surface water runoff could have been an open exposure pathway from the Site soils to Stewart Creek and the North Tributary. Site COCs are cadmium and lead. PAHs are also considered COCs in a select area where a hydrocarbon spill occurred.

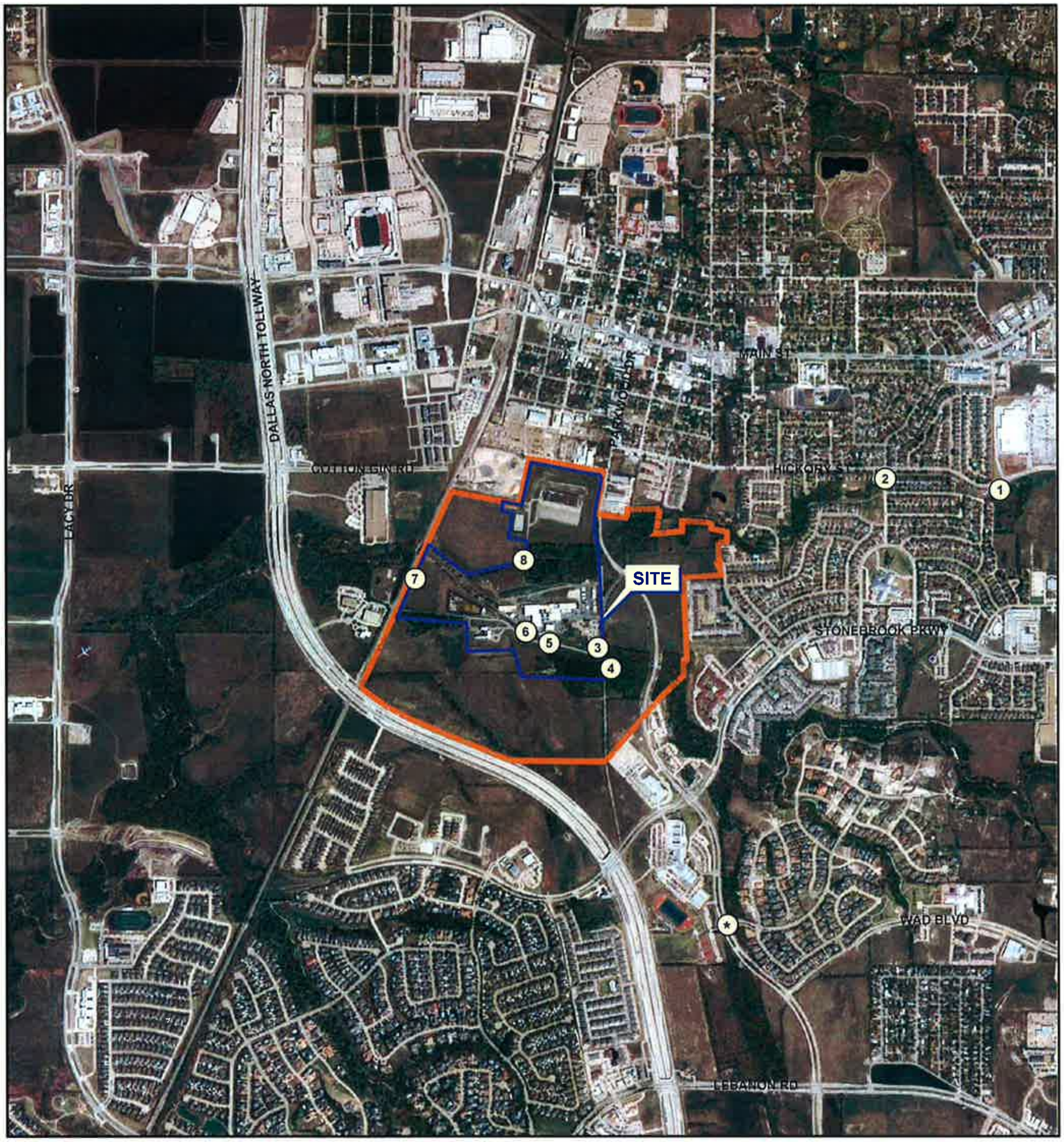
Stewart Creek is a small intermittent creek in the Trinity River Basin. The total length of Stewart Creek is 6 miles. Stewart Creek is expected to support a benthic invertebrate and limited freshwater fish population when water is present. The flow of Stewart Creek is influenced by rainfall events and is a series of small pools with little flow followed by high velocity flows following rain events.

The groundwater to surface water pathway is potentially complete but the analytical data indicate that the COCs in groundwater are below acute aquatic criteria and therefore this pathway is not considered further.

The Tier 1 Exclusion Criteria Checklist in the APAR documents that exposure pathways to soils and the terrestrial system are complete in selected areas. A Screening Level Ecological Risk Assessment (SLERA) is required for the selected terrestrial areas and Stewart Creek (including the North Tributary). A SLERA will evaluate potential ecological risks within the Site, and incorporates the future land use in defining the ecological exposure areas for the Site. Some areas within the former operating plant (e.g., former process areas and landfills) are excluded from the SLERA due to a lack of habitat.

APPENDIX B

PHOTOGRAPHIC LOG

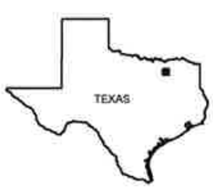


Investigation Area Boundary

Boundary of Property Owned by Exide

(1) Photograph Location

(*) Entrance to Chapel Creek Estates with Several Fountains in Stewart Creek



N

Approx. Scale in Feet

0 1000 2000

SOURCE:
Base map from Google Earth, photography dated 3-31-2011.

FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure B-1

SITE LOCATION MAP WITH NUMBERED REFERENCES TO PICTURES

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Picture 1a. At apartment complex on E. Hickory, west of Preston Rd. looking toward north tributary of Stewart Creek. This landscaping feature with irrigation pipes visible drains into Stewart Creek.

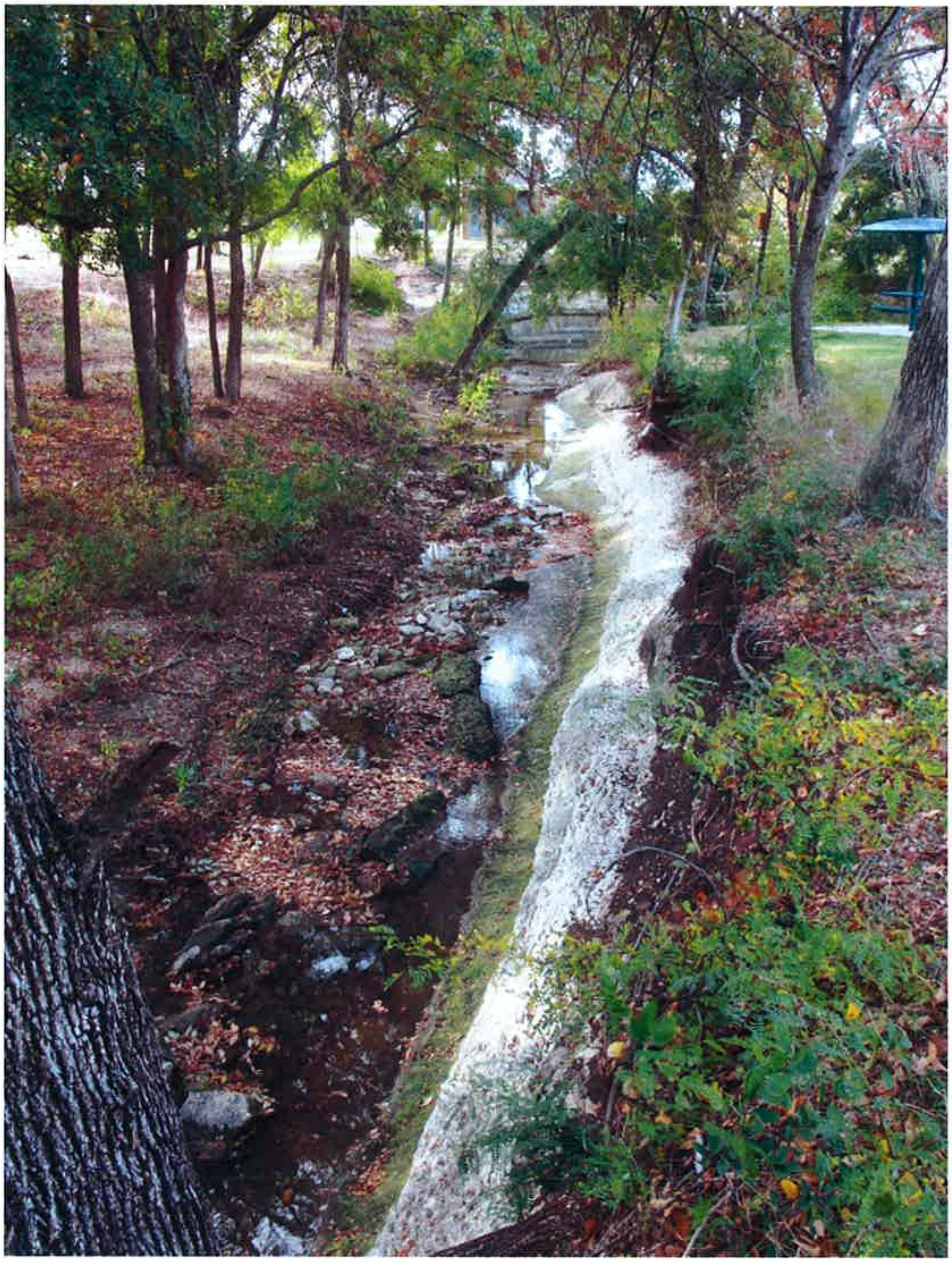
Picture 1b. Looking upstream at north tributary of Stewart Creek from bridge at apartment complex on E. Hickory St. Irrigation system is visible (associated with apartment complex landscaping).

Picture 1c. Looking downstream at north tributary of Stewart Creek from bridge at apartment complex on E. Hickory St. Streambed is paved until it reaches Oak Creek Park.

Picture 2a. North tributary of Stewart Creek at Oak Creek Park at E. Hickory St. and Woodstream Drive.

Picture 2b. Standing on bridge on Woodstream Dr. looking downstream at the North Tributary of Stewart Creek.

Picture 2c. Looking downstream at the North Tributary of Stewart Creek in Oak Creek Park.



Picture 2d. Looking downstream at the North Tributary of Stewart Creek in Oak Creek Park.

Picture 3a. On-site on bridge on Eagan Dr. looking upstream at Stewart Creek.

Picture 3b. On-site on bridge on Eagan Dr. looking downstream at Stewart Creek as it enters the Site.

Picture 4. Standing on Eagan Dr. just south of Crystallizer Rd. looking at dense shrubs and trees south east of the South Disposal Area.

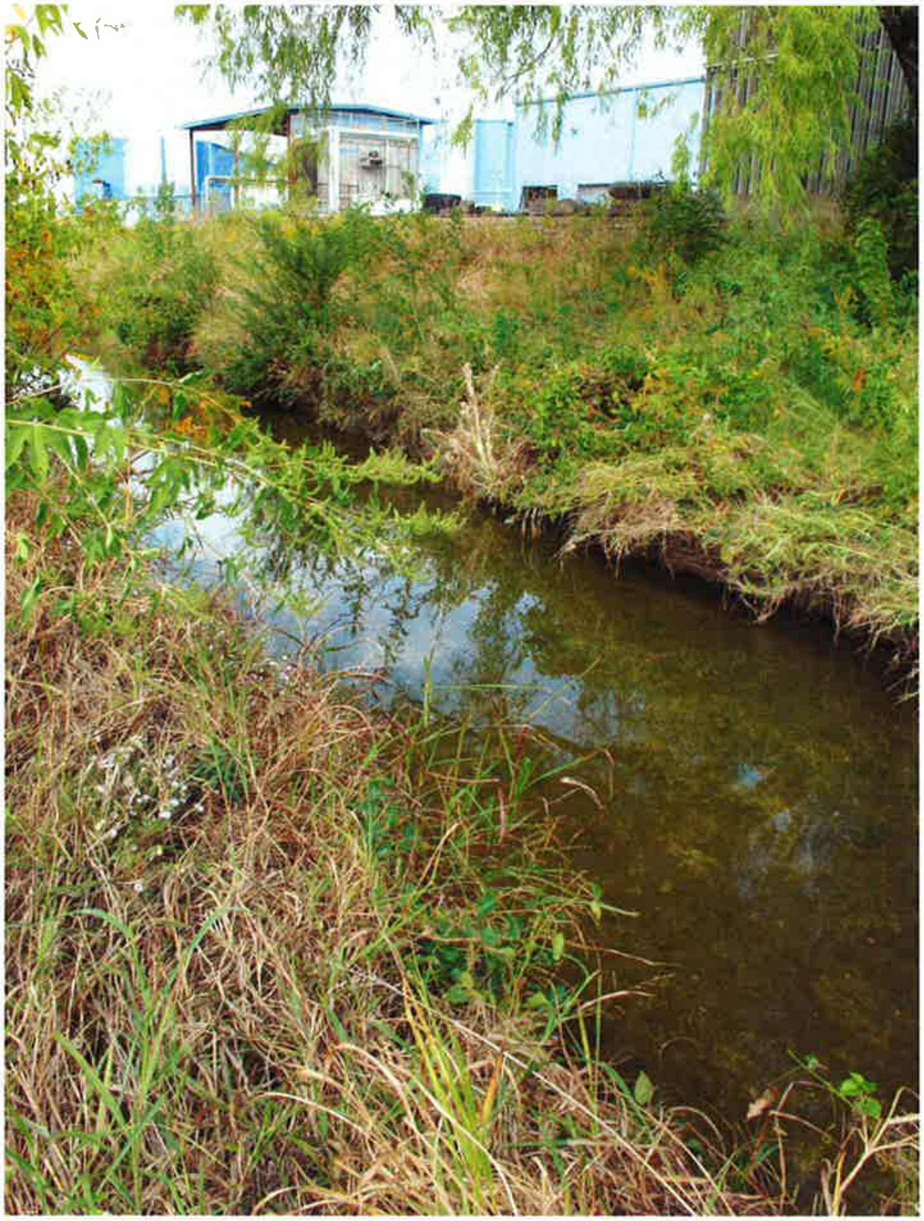
Picture 5a. Standing on Crystallizer Rd. looking south just to the left of the South Disposal Area.

Picture 5b. Standing on Crystallizer Rd. looking south toward the South Disposal Area.

Picture 5c. Standing on Crystallizer Rd. looking south just to the right of the South Disposal Area.

Picture 5d. Standing in the South Disposal Area and showing evidence of burrows or feeding by mammals in the area. These holes were approximately 3 inches in diameter, mostly appears surficial and in the grass bed, and if they extended to the soil, they generally did not extend very far into the soil.

Picture 6. Stewart Creek directly behind the main plant at the Site.



Picture 7a. Standing near the western side of the hayfield in the "Lake Parcel" looking toward the storm water retention pond.

Picture 7b. Evidence of larger burrowing mammal in the hayfield in the "Lake Parcel". This hole was approximately 6 to 8 inches across but did not extend very far into the soil.

Picture 8a. Looking upstream of the relocated North Tributary of Stewart Creek on-site on the road leading from the FRC plant to the landfill to the north of the facility.

Picture 8b. Looking downstream of the relocated North Tributary of Stewart Creek on-site on the road leading from the Site to the landfill to the north of the facility.

APPENDIX C

STATISTICAL OUTPUT

General UCL Statistics for Data Sets with Non-Detects

SOUTH WOODED AREA SURFACE SOIL

User Selected Options	
From File	Sheet1.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cd

General Statistics			
Number of Valid Observations	9	Number of Distinct Observations	8
Raw Statistics		**Log-transformed Statistics**	
Minimum	1.62	Minimum of Log Data	0.482
Maximum	7.92	Maximum of Log Data	2.069
Mean	3.394	Mean of log Data	1.121
Geometric Mean	3.067	SD of log Data	0.457
Median	3.19		
SD	1.843		
Std. Error of Mean	0.614		
Coefficient of Variation	0.543		
Skewness	2.12		

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.757	Shapiro Wilk Test Statistic	0.914
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4.537	95% H-UCL	4.848
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5.62
95% Adjusted-CLT UCL (Chen-1995)	4.869	97.5% Chebyshev (MVUE) UCL	6.597
95% Modified-t UCL (Johnson-1978)	4.609	99% Chebyshev (MVUE) UCL	8.517
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3.463	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.98		
MLE of Mean	3.394		
MLE of Standard Deviation	1.824		
nu star	62.34		
Approximate Chi Square Value (.05)	45.18	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0231	95% CLT UCL	4.405
Adjusted Chi Square Value	42.11	95% Jackknife UCL	4.537
		95% Standard Bootstrap UCL	4.35
Anderson-Darling Test Statistic	0.539	95% Bootstrap-t UCL	5.377
Anderson-Darling 5% Critical Value	0.723	95% Hall's Bootstrap UCL	9.013
Kolmogorov-Smirnov Test Statistic	0.276	95% Percentile Bootstrap UCL	4.441
Kolmogorov-Smirnov 5% Critical Value	0.28	95% BCA Bootstrap UCL	4.789
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	6.072
		97.5% Chebyshev(Mean, Sd) UCL	7.231
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	9.507
95% Approximate Gamma UCL (Use when n >= 40)	4.684		
95% Adjusted Gamma UCL (Use when n < 40)	5.025		
Potential UCL to Use		Use 95% Approximate Gamma UCL	4.684

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Pb

General Statistics			
Number of Valid Observations	9	Number of Distinct Observations	9
Raw Statistics		Log-transformed Statistics	
Minimum	221	Minimum of Log Data	5.398
Maximum	1030	Maximum of Log Data	6.937
Mean	481	Mean of log Data	6.082
Geometric Mean	438.1	SD of log Data	0.445
Median	396		
SD	240.4		
Std. Error of Mean	80.14		
Coefficient of Variation	0.5		
Skewness	1.658		

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.839	Shapiro Wilk Test Statistic	0.955
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	630	95% H-UCL	681.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	790.4
95% Adjusted-CLT UCL (Chen-1995)	660.1	97.5% Chebyshev (MVUE) UCL	925.6
95% Modified-t UCL (Johnson-1978)	637.4	99% Chebyshev (MVUE) UCL	1191
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.749	Data appear Normal at 5% Significance Level	
Theta Star	128.3		
MLE of Mean	481		
MLE of Standard Deviation	248.4		
nu star	67.48		
Approximate Chi Square Value (.05)	49.58	Nonparametric Statistics	
Adjusted Level of Significance	0.0231	95% CLT UCL	612.8
Adjusted Chi Square Value	46.36	95% Jackknife UCL	630
		95% Standard Bootstrap UCL	607.2
Anderson-Darling Test Statistic	0.39	95% Bootstrap-t UCL	731.3
Anderson-Darling 5% Critical Value	0.723	95% Hall's Bootstrap UCL	1190
Kolmogorov-Smirnov Test Statistic	0.21	95% Percentile Bootstrap UCL	616.4
Kolmogorov-Smirnov 5% Critical Value	0.28	95% BCA Bootstrap UCL	650.9
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	830.3
		97.5% Chebyshev(Mean, Sd) UCL	981.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1278
95% Approximate Gamma UCL (Use when n >= 40)	654.7		
95% Adjusted Gamma UCL (Use when n < 40)	700.2		
Potential UCL to Use		Use 95% Student's-t UCL	630

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	LAKE PARCEL SURFACE SOIL
From File	J:\1755 - Lake Parcel Soil data.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cd

General Statistics			
Number of Valid Data	11	Number of Detected Data	10
Number of Distinct Detected Data	10	Number of Non-Detect Data	1
		Percent Non-Detects	9.09%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.06	Minimum Detected	0.0583
Maximum Detected	3.51	Maximum Detected	1.256
Mean of Detected	1.956	Mean of Detected	0.608
SD of Detected	0.754	SD of Detected	0.371
Minimum Non-Detect	1.05	Minimum Non-Detect	0.0488
Maximum Non-Detect	1.05	Maximum Non-Detect	0.0488
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.923	Shapiro Wilk Test Statistic	0.969
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.826	Mean	0.494
SD	0.835	SD	0.516
95% DL/2 (t) UCL	2.282	95% H-Stat (DL/2) UCL	2.68
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.836	Mean in Log Scale	0.524
SD	0.788	SD in Log Scale	0.448
95% MLE (t) UCL	2.266	Mean in Original Scale	1.845
95% MLE (Tiku) UCL	2.259	SD in Original Scale	0.805
		95% t UCL	2.285
		95% Percentile Bootstrap UCL	2.255
		95% BCA Bootstrap UCL	2.286
		95% H UCL	2.518
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	5.721	Data appear Normal at 5% Significance Level	
Theta Star	0.342		
nu star	114.4		
A-D Test Statistic	0.264	Nonparametric Statistics	
5% A-D Critical Value	0.727	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.727	Mean	1.875
5% K-S Critical Value	0.267	SD	0.729
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.232
		95% KM (t) UCL	2.295
Assuming Gamma Distribution		95% KM (z) UCL	2.256
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.286
Minimum	1.00E-06	95% KM (bootstrap t) UCL	2.449
Maximum	3.51	95% KM (BCA) UCL	2.289
Mean	1.778	95% KM (Percentile Bootstrap) UCL	2.279
Median	1.54	95% KM (Chebyshev) UCL	2.885
SD	0.927	97.5% KM (Chebyshev) UCL	3.322
k star	0.422	99% KM (Chebyshev) UCL	4.18

Theta star	4.213		
Nu star	9.286	Potential UCLs to Use	
AppChi2	3.501	95% KM (t) UCL	2.295
95% Gamma Approximate UCL (Use when n >= 40)	4.717	95% KM (Percentile Bootstrap) UCL	2.279
95% Adjusted Gamma UCL (Use when n < 40)	5.605		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Pb

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	10
Raw Statistics		Log-transformed Statistics	
Minimum	120	Minimum of Log Data	4.787
Maximum	367	Maximum of Log Data	5.905
Mean	206.5	Mean of log Data	5.272
Geometric Mean	194.8	SD of log Data	0.353
Median	166		
SD	76.49		
Std. Error of Mean	23.06		
Coefficient of Variation	0.371		
Skewness	0.912		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.883	Shapiro Wilk Test Statistic	0.919
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	248.3	95% H-UCL	259.1
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	302.6
95% Adjusted-CLT UCL (Chen-1995)	251.2	97.5% Chebyshev (MVUE) UCL	344.4
95% Modified-t UCL (Johnson-1978)	249.3	99% Chebyshev (MVUE) UCL	426.5
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	6.424	Data appear Normal at 5% Significance Level	
Theta Star	32.14		
MLE of Mean	206.5		
MLE of Standard Deviation	81.46		
nu star	141.3		
Approximate Chi Square Value (.05)	114.9	Nonparametric Statistics	
Adjusted Level of Significance	0.0278	95% CLT UCL	244.4
Adjusted Chi Square Value	111	95% Jackknife UCL	248.3
		95% Standard Bootstrap UCL	242.3
Anderson-Darling Test Statistic	0.551	95% Bootstrap-t UCL	257.7
Anderson-Darling 5% Critical Value	0.73	95% Hall's Bootstrap UCL	249.4
Kolmogorov-Smirnov Test Statistic	0.24	95% Percentile Bootstrap UCL	245.2
Kolmogorov-Smirnov 5% Critical Value	0.256	95% BCA Bootstrap UCL	245.9
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	307
		97.5% Chebyshev(Mean, Sd) UCL	350.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	435.9
95% Approximate Gamma UCL (Use when n >= 40)	254		
95% Adjusted Gamma UCL (Use when n < 40)	262.9		
Potential UCL to Use		Use 95% Student's-t UCL	248.3

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

General UCL Statistics for Data Sets with Non-Detects

STEWART CREEK CORRIDOR SOIL

User Selected Options	
From File	Sheet1.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cd

General Statistics			
Number of Valid Observations	20	Number of Distinct Observations	20
Raw Statistics		Log-transformed Statistics	
Minimum	0.0829	Minimum of Log Data	-2.49
Maximum	6.55	Maximum of Log Data	1.879
Mean	1.766	Mean of log Data	0.0951
Geometric Mean	1.1	SD of log Data	1.118
Median	1.305		
SD	1.689		
Std. Error of Mean	0.378		
Coefficient of Variation	0.956		
Skewness	1.689		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.821	Shapiro Wilk Test Statistic	0.955
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	2.419	95% H-UCL	4.227
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.396
95% Adjusted-CLT UCL (Chen-1995)	2.54	97.5% Chebyshev (MVUE) UCL	5.45
95% Modified-t UCL (Johnson-1978)	2.443	99% Chebyshev (MVUE) UCL	7.52
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.049	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1.684		
MLE of Mean	1.766		
MLE of Standard Deviation	1.724		
nu star	41.95		
Approximate Chi Square Value (.05)	28.11	Nonparametric Statistics	
Adjusted Level of Significance	0.038	95% CLT UCL	2.387
Adjusted Chi Square Value	27.21	95% Jackknife UCL	2.419
		95% Standard Bootstrap UCL	2.367
Anderson-Darling Test Statistic	0.202	95% Bootstrap-t UCL	2.785
Anderson-Darling 5% Critical Value	0.764	95% Hall's Bootstrap UCL	3.146
Kolmogorov-Smirnov Test Statistic	0.114	95% Percentile Bootstrap UCL	2.4
Kolmogorov-Smirnov 5% Critical Value	0.199	95% BCA Bootstrap UCL	2.533
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3.412
		97.5% Chebyshev(Mean, Sd) UCL	4.125
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	5.524
95% Approximate Gamma UCL (Use when n >= 40)	2.636		
95% Adjusted Gamma UCL (Use when n < 40)	2.723		
Potential UCL to Use		Use 95% Approximate Gamma UCL	**2.636**

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Pb

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	22
Raw Statistics		Log-transformed Statistics	
Minimum	8.82	Minimum of Log Data	2.177
Maximum	1510	Maximum of Log Data	7.32
Mean	331.5	Mean of log Data	5.23
Geometric Mean	186.8	SD of log Data	1.221
Median	199.5		
SD	376.1		
Std. Error of Mean	80.18		
Coefficient of Variation	1.135		
Skewness	2.152		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.725	Shapiro Wilk Test Statistic	0.945
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	469.5	95% H-UCL	852.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	866
95% Adjusted-CLT UCL (Chen-1995)	502.7	97.5% Chebyshev (MVUE) UCL	1079
95% Modified-t UCL (Johnson-1978)	475.6	99% Chebyshev (MVUE) UCL	1499
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.899	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	368.8		
MLE of Mean	331.5		
MLE of Standard Deviation	349.6		
nu star	39.55		
Approximate Chi Square Value (.05)	26.14	Nonparametric Statistics	
Adjusted Level of Significance	0.0386	95% CLT UCL	463.4
Adjusted Chi Square Value	25.33	95% Jackknife UCL	469.5
		95% Standard Bootstrap UCL	458
Anderson-Darling Test Statistic	0.472	95% Bootstrap-t UCL	581.3
Anderson-Darling 5% Critical Value	0.771	95% Hall's Bootstrap UCL	645
Kolmogorov-Smirnov Test Statistic	0.137	95% Percentile Bootstrap UCL	466.1
Kolmogorov-Smirnov 5% Critical Value	0.191	95% BCA Bootstrap UCL	496.1
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	681
		97.5% Chebyshev(Mean, Sd) UCL	832.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1129
95% Approximate Gamma UCL (Use when n >= 40)	501.5		
95% Adjusted Gamma UCL (Use when n < 40)	517.6		
Potential UCL to Use		Use 95% Approximate Gamma UCL	**501.5**

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

General UCL Statistics for Data Sets with Non-Detects

NORTH WOODED AREAS SURFACE SOIL

User Selected Options	
From File	Sheet1.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cd

General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	13
Raw Statistics		Log-transformed Statistics	
Minimum	0.34	Minimum of Log Data	-1.079
Maximum	5.64	Maximum of Log Data	1.73
Mean	2.439	Mean of log Data	0.616
Geometric Mean	1.851	SD of log Data	0.837
Median	1.61		
SD	1.674		
Std. Error of Mean	0.464		
Coefficient of Variation	0.686		
Skewness	0.492		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.912	Shapiro Wilk Test Statistic	0.933
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	3.266	95% H-UCL	4.896
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5.265
95% Adjusted-CLT UCL (Chen-1995)	3.27	97.5% Chebyshev (MVUE) UCL	6.445
95% Modified-t UCL (Johnson-1978)	3.277	99% Chebyshev (MVUE) UCL	8.762
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.561	Data appear Normal at 5% Significance Level	
Theta Star	1.562		
MLE of Mean	2.439		
MLE of Standard Deviation	1.952		
nu star	40.59		
Approximate Chi Square Value (.05)	26.99	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	3.203
Adjusted Chi Square Value	25.42	95% Jackknife UCL	3.266
		95% Standard Bootstrap UCL	3.184
Anderson-Darling Test Statistic	0.418	95% Bootstrap-t UCL	3.355
Anderson-Darling 5% Critical Value	0.744	95% Hall's Bootstrap UCL	3.231
Kolmogorov-Smirnov Test Statistic	0.181	95% Percentile Bootstrap UCL	3.172
Kolmogorov-Smirnov 5% Critical Value	0.24	95% BCA Bootstrap UCL	3.243
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	4.463
		97.5% Chebyshev(Mean, Sd) UCL	5.338
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	7.058
95% Approximate Gamma UCL (Use when n >= 40)	3.668		
95% Adjusted Gamma UCL (Use when n < 40)	3.895		
Potential UCL to Use		**Use 95% Student's-t UCL**	**3.266**

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Pb

General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	13
Raw Statistics		Log-transformed Statistics	
Minimum	8.59	Minimum of Log Data	2.151
Maximum	1090	Maximum of Log Data	6.994
Mean	410.8	Mean of log Data	5.48
Geometric Mean	239.8	SD of log Data	1.356
Median	245		
SD	343.6		
Std. Error of Mean	95.29		
Coefficient of Variation	0.836		
Skewness	0.783		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.909	Shapiro Wilk Test Statistic	0.883
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	580.6	95% H-UCL	2370
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1507
95% Adjusted-CLT UCL (Chen-1995)	589.6	97.5% Chebyshev (MVUE) UCL	1927
95% Modified-t UCL (Johnson-1978)	584.1	99% Chebyshev (MVUE) UCL	2753
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.87	Data appear Normal at 5% Significance Level	
Theta Star	472		
MLE of Mean	410.8		
MLE of Standard Deviation	440.3		
nu star	22.63		
Approximate Chi Square Value (.05)	12.81	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	567.5
Adjusted Chi Square Value	11.77	95% Jackknife UCL	580.6
		95% Standard Bootstrap UCL	565.2
Anderson-Darling Test Statistic	0.271	95% Bootstrap-t UCL	615.3
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL	588.6
Kolmogorov-Smirnov Test Statistic	0.149	95% Percentile Bootstrap UCL	554.9
Kolmogorov-Smirnov 5% Critical Value	0.243	95% BCA Bootstrap UCL	568.5
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	826.1
		97.5% Chebyshev(Mean, Sd) UCL	1006
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1359
95% Approximate Gamma UCL (Use when n >= 40)	725.6		
95% Adjusted Gamma UCL (Use when n < 40)	789.8		
Potential UCL to Use		**Use 95% Student's-t UCL**	**580.6**

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

General UCL Statistics for Data Sets with Non-Detects
STEWART CREEK AND NORTH TRIBUTARY SEDIMENT

User Selected Options	
From File	Sheet1.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cd

General Statistics			
Number of Valid Observations	23	Number of Distinct Observations	23
Raw Statistics		Log-transformed Statistics	
Minimum	0.338	Minimum of Log Data	-1.085
Maximum	2.08	Maximum of Log Data	0.732
Mean	0.965	Mean of log Data	-0.0901
Geometric Mean	0.914	SD of log Data	0.339
Median	0.858		
SD	0.339		
Std. Error of Mean	0.0706		
Coefficient of Variation	0.351		
Skewness	1.615		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.855	Shapiro Wilk Test Statistic	0.909
Shapiro Wilk Critical Value	0.914	Shapiro Wilk Critical Value	0.914
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.086	95% H-UCL	1.106
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.269
95% Adjusted-CLT UCL (Chen-1995)	1.106	97.5% Chebyshev (MVUE) UCL	1.4
95% Modified-t UCL (Johnson-1978)	1.09	99% Chebyshev (MVUE) UCL	1.658
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	8.209	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	0.118		
MLE of Mean	0.965		
MLE of Standard Deviation	0.337		
nu star	377.6		
Approximate Chi Square Value (.05)	333.6	Nonparametric Statistics	
Adjusted Level of Significance	0.0389	95% CLT UCL	1.081
Adjusted Chi Square Value	330.6	95% Jackknife UCL	1.086
		95% Standard Bootstrap UCL	1.08
Anderson-Darling Test Statistic	0.778	95% Bootstrap-t UCL	1.129
Anderson-Darling 5% Critical Value	0.744	95% Hall's Bootstrap UCL	1.195
Kolmogorov-Smirnov Test Statistic	0.149	95% Percentile Bootstrap UCL	1.087
Kolmogorov-Smirnov 5% Critical Value	0.182	95% BCA Bootstrap UCL	1.11
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.273
		97.5% Chebyshev(Mean, Sd) UCL	1.406
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.667
95% Approximate Gamma UCL (Use when n >= 40)	1.092		
95% Adjusted Gamma UCL (Use when n < 40)	1.102		
Potential UCL to Use		Use 95% Approximate Gamma UCL	**1.092**

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Pb

General Statistics			
Number of Valid Observations	23	Number of Distinct Observations	20
Raw Statistics		Log-transformed Statistics	
Minimum	6.57	Minimum of Log Data	1.883
Maximum	28.2	Maximum of Log Data	3.339
Mean	14.08	Mean of log Data	2.575
Geometric Mean	13.13	SD of log Data	0.38
Median	11.9		
SD	5.5		
Std. Error of Mean	1.147		
Coefficient of Variation	0.391		
Skewness	0.884		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.921	Shapiro Wilk Test Statistic	0.967
Shapiro Wilk Critical Value	0.914	Shapiro Wilk Critical Value	0.914
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	16.05	95% H-UCL	16.43
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	19.03
95% Adjusted-CLT UCL (Chen-1995)	16.19	97.5% Chebyshev (MVUE) UCL	21.18
95% Modified-t UCL (Johnson-1978)	16.08	99% Chebyshev (MVUE) UCL	25.4
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	6.425	Data appear Normal at 5% Significance Level	
Theta Star	2.191		
MLE of Mean	14.08		
MLE of Standard Deviation	5.554		
nu star	295.5		
Approximate Chi Square Value (.05)	256.7	Nonparametric Statistics	
Adjusted Level of Significance	0.0389	95% CLT UCL	15.96
Adjusted Chi Square Value	254.1	95% Jackknife UCL	16.05
		95% Standard Bootstrap UCL	15.94
Anderson-Darling Test Statistic	0.48	95% Bootstrap-t UCL	16.43
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	16.24
Kolmogorov-Smirnov Test Statistic	0.174	95% Percentile Bootstrap UCL	15.97
Kolmogorov-Smirnov 5% Critical Value	0.182	95% BCA Bootstrap UCL	16.19
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	19.08
		97.5% Chebyshev(Mean, Sd) UCL	21.24
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	25.49
95% Approximate Gamma UCL (Use when n >= 40)	16.21		
95% Adjusted Gamma UCL (Use when n < 40)	16.37		
Potential UCL to Use		Use 95% Student's-t UCL	**16.05**

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

APPENDIX D

TEXAS PARKS & WILDLIFE DEPARTMENT ANNOTATED COUNTY LISTS OF RARE SPECIES FOR COLLIN AND DENTON COUNTIES

Revised
2/28/2011

COLLIN COUNTY

BIRDS		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinusanatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon *Falco peregrinustundrius* DL

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bald Eagle *Haliaeetusleucocephalus* DL T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Henslow's Sparrow *Ammodramushenslowii*

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Interior Least Tern *Sterna antillarumathalassos* LE E

subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony

Peregrine Falcon *Falco peregrinus* DL T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Piping Plover	*Charadriusmelodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Sprague's Pipit	*Anthusspragueii*	C	

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

Western Burrowing Owl	*Athenecuniculariahypugaea*		

open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows

White-faced Ibis	*Plegadischihi*		T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

Whooping Crane	*Grus Americana*	LE	E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork	*Mycteriaamericana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

	CRUSTACEANS	Federal Status	State Status
A crayfish	*Procambarussteigmani*		

burrower in long-grass prairie; all animals were collected with traps, thus there is no knowledge of depths of burrows; herbivore; crepuscular, nocturnal

	MAMMALS	Federal Status	State Status
Plains spotted skunk	*Spilogaleputoriusinterrupta*		

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Red wolf	*Canisrufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

	MOLLUSKS	Federal Status	State Status
Fawnsfoot	*Truncilladonaciformis*		

small and large rivers especially on sand, mud, rocky mud, and sand and gravel, also silt and cobble bottoms in still to swiftly flowing waters; Red (historic), Cypress (historic), Sabine (historic), Neches, Trinity, and San Jacinto River basins.

Little spectaclecase	*Villosalienosa*		

creeks, rivers, and reservoirs, sandy substrates in slight to moderate current, usually along the banks in slower currents; east Texas, Cypress through San Jacinto River basins

Louisiana pigtoe	*Pleurobemariddellii*		T

streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins

Texas heelsplitter	*Potamilusamphichaenus*		T

quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins

Wabash pigtoe	*Fusconaiaflava*		

creeks to large rivers on mud, sand, and gravel from all habitats except deep shifting sands; found in moderate to swift current velocities; east Texas River basins, Red through San Jacinto River basins; elsewhere occurs in reservoirs and lakes with no flow

REPTILES		Federal Status	State Status
Alligator snapping turtle	*Macrochelystemminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Texas garter snake	*Thamnophissirtalisannectens*		

wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August

Texas horned lizard	*Phrynosomacornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

Timber/Canebrake rattlesnake	*Crotalushorridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

Last Updated 2/28/2011

DENTON COUNTY

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinusanatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinustundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bald Eagle	*Haliaeetusleucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Henslow's Sparrow	*Ammodramushenslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Sprague's Pipit	*Anthusspragueii*	C	

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

Western Burrowing Owl	*Athenecuniculariahypugaea*		

open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows

White-faced Ibis	*Plegadischihi*		T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

Whooping Crane *Grusamericana* LE E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork *Mycteriaamericana* T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

MAMMALS

Federal Status | State Status

Plains spotted skunk *Spilogaleputoriusinterrupta*

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Red wolf *Canisrufus* LE E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

MOLLUSKS

Federal Status | State Status

Fawnsfoot *Truncilladonaciformis*

small and large rivers especially on sand, mud, rocky mud, and sand and gravel, also silt and cobble bottoms in still to swiftly flowing waters; Red (historic), Cypress (historic), Sabine (historic), Neches, Trinity, and San Jacinto River basins.

Little spectaclecase *Villosalienosa*

creeks, rivers, and reservoirs, sandy substrates in slight to moderate current, usually along the banks in slower currents; east Texas, Cypress through San Jacinto River basins

Louisiana pigtoe *Pleurobemariddellii* T

streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins

Texas heelsplitter *Potamilusamphichaenus* T

quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins

Wabash pigtoe *Fusconaiaflava*

creeks to large rivers on mud, sand, and gravel from all habitats except deep shifting sands; found in moderate to swift current velocities; east Texas River basins, Red through San Jacinto River basins; elsewhere occurs in reservoirs and lakes with no flow

REPTILES		Federal Status	State Status
Texas garter snake	*Thamnophissirtalisannectens*		
wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August			
Texas horned lizard	*Phrynosomacornutum*		T
open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September			
Timber/Canebrake rattlesnake	*Crotalushorridus*		T
swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto			

PLANTS		Federal Status	State Status
Glen Rose yucca	*Yucca necopina*		
Texas endemic; grasslands on sandy soils and limestone outcrops; flowering April-June			

APPENDIX E

ECOLOGICAL RISK ASSESSMENT CALCULATIONS

Screening Level Ecological Risk Assessment
Former Operating Plant
All Terrestrial Exposure Areas
Frisco, Texas
April, 2013

Table E-1
Exposure Point Concentrations

Data: 95% UCL COCs	South Wooded Area Soil (mg/kg)	North Wooded Area Soil (mg/kg)	Lake Parcel Soil (mg/kg)	Stewart Creek Corridor Soil (mg/kg)
Cadmium	4.68	3.27	2.30	2.64
Lead	630.0	580.6	248.3	501.5
HPAHs	NA	NA	NA	0.33
LPAHs	NA	NA	NA	0.02

Notes:
NA - Not Applicable

Three samples along the flood wall were analyzed for PAHs to evaluate potential impact associated with a release from a diesel tank. Values represent maximum detections and not 95% UCLs.

Screening Level Ecological Risk Assessment
Former Operating Plant
Frisco, Texas
April, 2013

Table E-2
Fraction of Components in Receptor Diet

Common Name	Small Mammals	Small Birds	Arthropods	Plants, Seeds, Vegetation	Earthworms
Birds					
American Robin			580.6	0.1	0.5
Red-Tailed Hawk	0.785	0.215			
Mammals					
Red Fox	1				
Least Shrew			0.9	0.1	

Notes:
1. Dietary Fractions from EPA, 1993.
2. EPA, 1993. Wildlife Exposure Factors Handbook. Office of Research and Development. EPA/600/R-93/187. December.

Screening Level Ecological Risk Assessment
Former Operating Plant
Frisco, Texas
April, 2013

Table E-3
NOAEL and LOAEL Toxicity Data

COC	Avian NOAEL TRV (mg/kg-day)	Avian LOAEL TRV (mg/kg-day)	Mammalian NOAEL TRV 3.266	Mammalian LOAEL TRV (mg/kg-day)
Cadmium	1.47	6.4	580.6	7.7
Lead	1.63	3.26	4.70	8.90
High MW PAHs	2	20	0.62	3.07
Low MW PAHs	210	228	66	328

Notes:

1. Cadmium NOAELs and LOAELs from EPA 2005a. Ecological Soil Screening Levels for Cadmium.
2. Lead NOAELs and LOAELs from EPA 2005b. Ecological Soil Screening Levels for Lead.
3. PAHs NOAELs and LOAELs from EPA 2007. Ecological Soil Screening Levels for PAHs.

Screening Level Ecological Risk Assessment
Former Operating Plant
Frisco, Texas
April, 2013

Table E-4
Uptake Factors for Terrestrial Assessment

Analyte	Soil to Plant UF	Sediment to Benthic Invertebrate UF	Sediment to Fish UF	Water to Fish UF	Soil to Earthworm or Arthropod UF	Plant to Wildlife UF (1)	Soil to Wildlife UF (1)	Plant to Bird UF (1)	Soil to Bird UF (1)
Cadmium	0.364	3.40	1	907	0.96	7.44E-05	1.64E-06	4.71E-02	1.51E-03
Lead	0.045	0.63	1	0.09	0.03	1.86E-04	4.09E-06	NS	NS
High MW PAHs	0.020	NA	3	NA	0.07	1.28E-01	2.82E-03	7.24E-02	2.32E-03
Low MW PAHs	0.020	NA	580.6	NA	0.07	1.28E-01	2.82E-03	7.24E-02	2.32E-03

Notes:
1. EPA. August 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Office of Solid Waste and Emergency Response. EPA530-D-99-001.
2. NS - EPA, 1999 indicates insufficient data to determine value.
3. NA - Not applicable. PAHs only in terrestrial assessment.
4. UFs for PAHs are based on Indeno(1,2,3-cd)pyrene which has the most conservative UF of the PAHs listed in EPA 1999.
5. Indeno(1,2,3-cd)pyrene was detected in all three samples (SCC-3, SCC-6 and SCC-8).
6. Values for LPAHs do not exist in EPA 1999, the values representing the HPAHs were used as the surrogate values.

South Wooded Area
Terrestrial HQ Calculations

Screening Level Ecological Risk Assessment
Former Operating Plant
South Wooded Area
Frisco, Texas
April, 2013

Table E-5
Ingestion-Pathway Exposure Assumptions for Terrestrial Wildlife Measurement Receptors

Common Name	Body Weight (kg)	Food Ingestion Rate (kg/day)	Soil Ingestion (% of diet)	Soil Ingestion Rate (kg/day)	Exposure Modifying Factor (EMF)	Site Area (Acres)	Home Range (Acres)
Birds							
Red Tailed Hawk	9.57E-01	3.27E+00	2	8.97E-06	0.03	4.92	148
American Robin	6.30E-02	5.8E+02	5.2	3.02E+01	1	4.92	2
Mammals							
Red Fox	4.13E+00	1.08E-01	2.7	3.00E-03	0.02	4.92	237
Least Shrew	4.00E-03	3.38E-06	8	2.71E-07	1	4.92	1

Notes:

1. Factors from EPA, 1993 unless noted otherwise.
2. EPA, 1993. Wildlife Exposure Factors Handbook. Office of Research and Development. EPA/600/R-93/187. December
3. Least Shrew Body Weight from: Davis and Schmidley, 2009. The Mammals of Texas, online edition. www.nrsl.ttu.edu/tmot1/ .
4. Fox Soil ingestion rate from: Beyer, W.N. E.Cnner, and S. Gerould 1994. Estimates of Soil Ingestion by Wildlife. J. Wildl. Manage. 58:375-382.
5. EMF of 1 used for all initial conservative calculations. If a value less than 1 was used, it is noted in the text.
6. EMF for red-tailed hawk and red fox for less-conservative assessment based on ratio of site area to home range.
7. Home range for red-tailed hawk and red fox from EPA 1993, the lowest of the values presented.

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Table E-6
Hazard Quotient Calculations for the American Robin - Initial Conservative Exposure Parameters

American Robin COC	95% UCL Soil Conc (mg/kg)	Soil to Earthworm or Arthropod UF	Earthworm/ Arthropod Conc (mg/kg)	Soil to Plant UF	Plant Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	4.7E+00	9.6E-01	4.5E+00	3.6E-01	1.7E+00	4.2E+04	1.5E+00	2.8E+04
Lead	6.3E+02	3.0E-02	1.9E+01	4.5E-02	2.8E+01	4.8E+05	1.6E+00	3.0E+05

$$Dose = [(Conc_{Earthworm/Arthropod}s \times IR_{food})0.92 + (IR_{food} \times Conc_{Plants})0.08 + (IR_{soil} \times Conc_{Soil})] / Body\ Weight_{robin}$$

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South Wooded Area
Frisco, Texas
April, 2013

Table E-7
Hazard Quotient Calculations for the Red-Tailed Hawk - Initial Conservative Exposure Parameters

Red-Tailed Hawk COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Soil to Wildlife Bird UF - American Robin	Plant to Wildlife Bird UF - American Robin	FCM - American Robin	Small Bird Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	4.7E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	1.0E+03	1.5E-03	4.7E-02	1.0E+00	4.1E+04	3.3E+04	1.5E+00	2.3E+04
Lead	6.3E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	4.3E+03	NS	NS	1.0E+00	1.7E+05	1.4E+05	1.6E+00	8.5E+04

$Dose = (Conc_{Small\ Mammals} \times IR_{food})0.785 + (IR_{food} \times Conc_{Birds})0.215 + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{hawk}$

$Conc_{small\ mammal} = Conc_{least\ shrew}\ (mg/kg\ BW) = [(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ mammal}$

$Conc_{small\ bird} = Conc_{robin}\ (mg/kg\ BW) = [(Conc_{soil} \times UF_{soil\text{-}small\ bird}) + (Conc_{plant} \times UF_{plant\text{-}small\ bird} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ bird}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ bird}$

where DF = dietary fraction of food item, FCM=Food Chain Multiplier. Equation adapted from Equation 5-12 in EPA, 1999

Assume FCM = 1 for PAHs.

NS - EPA, 1999 indicates insufficient data to determine value.

Screening Level Ecological Risk Assessment
Former Operating Plant
South Wooded Area
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Table E-8
Hazard Quotient Calculations for the Red Fox - Initial Conservative Exposure Parameters

Red Fox COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	4.7E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	1.0E+03	2.6E+01	5.8E+02	4.6E-02
Lead	6.3E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	4.3E+03	1.1E+02	4.7E+00	2.4E+01

Dose = $(Conc_{Small\ Mammals} \times IR_{food})1 + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{fox}$

$Conc_{small\ mammal} = Conc_{least\ shrew}$ (mg/kg BW) = $[(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ mammal}$

where DF = dietary fraction of food item, FCM = Food Chain Multiplier. Equation adapted from Equation 5-12 in EPA, 1999

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Table E-9
Hazard Quotient Calculations for the Least Shrew - Initial Conservative Exposure Parameters

Red-Tailed Hawk COC	95% UCL Soil Conc (mg/kg)	Soil to Earthworm or Arthropod UF	Earthworm/ Arthropod Conc (mg/kg)	Soil to Plant UF	Plant Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	4.7E+00	9.6E-01	4.5E+00	3.6E-01	1.7E+00	3.9E-03	5.8E+02	6.7E-06
Lead	6.3E+02	3.0E-02	1.9E+01	4.5E-02	2.8E+01	5.9E-02	4.7E+00	1.3E-02

$$\text{Dose} = (\text{Conc}_{\text{Earthworm/Arthropod}} \times \text{IR}_{\text{food}})0.9 + (\text{IR}_{\text{food}} \times \text{Conc}_{\text{Plants}})0.1 + (\text{IR}_{\text{soil}} \times \text{Conc}_{\text{Soil}})/\text{Body Weight}_{\text{shrew}}$$

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Table E-10
Hazard Quotient Calculations for the Red Fox - Refined Less-Conservative Exposure Parameters

Red Fox										Based on Less-Conservative Exposure Parameters	
COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	LOAEL Toxicity Reference Value (mg/kg BW-day)	NOAEL Hazard Quotient (unitless)	LOAEL Hazard Quotient (unitless)
Cadmium	4.7E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	1.0E+03	8.8E-01	5.8E+02	7.7E+00	1.5E-03	1.1E-01
Lead	6.3E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	4.3E+03	3.7E+00	4.7E+00	8.9E+00	7.9E-01	4.2E-01

$Dose = EMF*(Conc_{Small\ Mammals} \times IR_{food})] + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{fox}$

$Conc_{small\ mammal} = Conc_{least\ shrew}\ (mg/kg\ BW) = [(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ mammal}$

where DF = dietary fraction of food item, FCM = Food Chain Multiplier. Equation adapted from Equation 5-12 in EPA, 1999

North Wooded Area
Terrestrial HQ Calculations

4/18/2013

Screening Level Ecological Risk Assessment
Former Operating Plant
North Wooded Area
Frisco, Texas
April, 2013
Table E-11
Ingestion-Pathway Exposure Assumptions for Terrestrial Wildlife Measurement Receptors

Common Name	Body Weight (kg)	Food Ingestion Rate (kg/day)	Soil Ingestion (% of diet)	Soil Ingestion Rate (kg/day)	Exposure Modifying Factor (EMF)	Site Area (Acres)	Home Range (Acres)
Birds							
Red Tailed Hawk	9.57E-01	4.48E-04	2	8.97E-06	0.07	10.04	148
American Robin	6.30E-02	4.85E-05	5.2	2.52E-06	1	10.04	2
Mammals							
Red Fox	4.13E+00	1.08E-01	2.7	3.00E-03	0.04	10.04	237
Least Shrew	4.00E-03	3.38E-06	8	2.71E-07	1	10.04	1

Notes:
1. Factors from EPA, 1993 unless noted otherwise.
2. EPA, 1993. Wildlife Exposure Factors Handbook. Office of Research and Development. EPA/600/R-93/187. December
3. Least Shrew Body Weight from: Davis and Schmidley, 2009. The Mammals of Texas, online edition. www.nrsl.ttu.edu/tmot1/ .
4. Fox Soil ingestion rate from: Beyer, W.N. E.Cnner, and S. Gerould 1994. Estimates of Soil Ingestion by Wildlife. J. Wildl. Manage. 58:375-382.
5. EMF of 1 used for all conservative calculations. If a value less than 1 was used, it is noted in the text.
6. EMF for red-tailed hawk and red fox for less-conservative assessment based on ratio of site area to home range.
7. Home range for red-tailed hawk and red fox from EPA 1993, the lowest of the values presented.

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Table E-12
Hazard Quotient Calculations for the American Robin - Initial Conservative Exposure Parameters

American Robin COC	95% UCL Soil Conc (mg/kg)	Soil to Earthworm or Arthropod UF	Earthworm/ Arthropod Conc (mg/kg)	Soil to Plant UF	Plant Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	3.2E+00	9.6E-01	3.1E+00	3.6E-01	1.2E+00	2.4E-03	1.5E+00	1.6E-03
Lead	5.8E+02	3.0E-02	1.7E+01	4.5E-02	2.6E+01	3.7E-02	1.6E+00	2.3E-02

$$Dose = [(Conc_{Earthworm/Arthropod}s \times IR_{food})0.92 + (IR_{food} \times Conc_{Plants})0.08 + (IR_{soil} \times Conc_{Soil})] / Body\ Weight_{robin}$$

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North Wooded Area
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April, 2013

Table E-13
Hazard Quotient Calculations for the Red-Tailed Hawk - Initial Conservative Exposure Parameters

Red-Tailed Hawk COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Soil to Wildlife Bird UF - American Robin	Plant to Wildlife Bird UF - American Robin	FCM - American Robin	Small Bird Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	3.2E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	6.9E+02	1.5E-03	4.7E-02	1.0E+00	4.5E+01	2.6E-01	1.5E+00	1.8E-01
Lead	5.8E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	3.9E+03	NS	NS	1.0E+00	2.5E+02	1.5E+00	1.6E+00	9.0E-01

Dose = $(Conc_{Small\ Mammals} \times IR_{food})0.785 + (IR_{food} \times Conc_{Birds})0.215 + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{hawk}$

$Conc_{small\ mammal} = Conc_{least\ shrew}$ (mg/kg BW) = $[(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ mammal}$

$Conc_{small\ bird} = Conc_{robin}$ (mg/kg BW) = $[(Conc_{soil} \times UF_{soil\text{-}small\ bird}) + (Conc_{plant} \times UF_{plant\text{-}small\ bird} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ bird}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ bird}$

where DF = dietary fraction of food item, FCM=Food Chain Multiplier. Equation adapted from Equation 5-12 in EPA, 1999

Assume FCM = 1 for PAHs.

NS - EPA, 1999 indicates insufficient data to determine value.

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Table E-14
Hazard Quotient Calculations for the Red Fox - Initial Conservative Exposure Parameters

Red Fox COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	3.2E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	6.9E+02	1.8E+01	7.7E-01	2.4E+01
Lead	5.8E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	3.9E+03	1.0E+02	4.7E+00	2.2E+01

$Dose = (Conc_{Small\ Mammals} \times IR_{food})1 + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{fox}$

$Conc_{small\ mammal} = Conc_{least\ shrew}\ (mg/kg\ BW) = [(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ mammal}$

where DF = dietary fraction of food item, FCM = Food Chain Multiplier. Equation adapted from Equation 5-12 in EPA, 1999

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Table E-15
Hazard Quotient Calculations for the Least Shrew - Initial Conservative Exposure Parameters

Red-Tailed Hawk COC	95% UCL Soil Conc (mg/kg)	Soil to Earthworm or Arthropod UF	Earthworm/ Arthropod Conc (mg/kg)	Soil to Plant UF	Plant Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	3.2E+00	9.6E-01	3.1E+00	3.6E-01	1.2E+00	2.7E-03	7.7E-01	3.4E-03
Lead	5.8E+02	3.0E-02	1.7E+01	4.5E-02	2.6E+01	5.5E-02	4.7E+00	1.2E-02

$$Dose = (Conc_{Earthworm/Arthropod} \times IR_{food})0.9 + (IR_{food} \times Conc_{Plants})0.1 + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{shrew}$$

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Table E-16
Hazard Quotient Calculations for the Red Fox - Refined Less-Conservative Exposure Parameters

Red Fox										Based on Less-Conservative Exposure Parameters	
COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	LOAEL Toxicity Reference Value (mg/kg BW-day)	NOAEL Hazard Quotient (unitless)	LOAEL Hazard Quotient (unitless)
Cadmium	3.2E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	6.9E+02	1.2E+00	7.7E-01	7.7E+00	1.6E+00	1.6E-01
Lead	5.8E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	3.9E+03	7.0E+00	4.7E+00	8.9E+00	1.5E+00	7.8E-01

Dose = $(Conc_{Small\ Mammals} \times IR_{food})1 + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{fox}$

$Conc_{small\ mammal} = Conc_{least\ shrew}$ (mg/kg BW) = $[(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ mammal}$

where DF = dietary fraction of food item, FCM = Food Chain Multiplier. Equation adapted from Equation 5-12 in EPA, 1999

Lake Parcel
Terrestrial HQ Calculations

Screening Level Ecological Risk Assessment
Former Operating Plant
Lake Parcel
Frisco, Texas
April, 2013

Table E-17
Ingestion-Pathway Exposure Assumptions for Terrestrial Wildlife Measurement Receptors

Common Name	Body Weight (kg)	Food Ingestion Rate (kg/day)	Soil Ingestion (% of diet)	Soil Ingestion Rate (kg/day)	Exposure Modifying Factor (EMF)	Site Area (Acres)	Home Range (Acres)
Birds							
Red Tailed Hawk	9.57E-01	4.48E-04	2	8.97E-06	0.05	7.39	148
American Robin	6.30E-02	4.85E-05	5.2	2.52E-06	1	7.39	2
Mammals							
Red Fox	4.13E+00	1.08E-01	2.7	3.00E-03	0.03	7.39	237
Least Shrew	4.00E-03	3.38E-06	8	2.71E-07	1	7.39	1

Notes:
1. Factors from EPA, 1993 unless noted otherwise.
2. EPA, 1993. Wildlife Exposure Factors Handbook. Office of Research and Development. EPA/600/R-93/187. December
3. Least Shrew Body Weight from: Davis and Schmidley, 2009. The Mammals of Texas, online edition. www.nrsl.ttu.edu/tmot1/ .
4. Fox Soil ingestion rate from: Beyer, W.N. E.Cnner, and S. Gerould 1994. Estimates of Soil Ingestion by Wildlife. J. Wildl. Manage. 58:375-382.
5. EMF of 1 used for all conservative calculations. If a value less than 1 was used it is noted in the text.
6. EMF for red-tailed hawk and red fox for less-conservative assessment based on ratio of site area to home range.
7. Home range for red-tailed hawk and red fox from EPA 1993, the lowest of the values presented.

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Table E-18
Hazard Quotient Calculations for the American Robin - Initial Conservative Exposure Parameters

American Robin COC	95% UCL Soil Conc (mg/kg)	Soil to Earthworm or Arthropod UF	Earthworm/ Arthropod Conc (mg/kg)	Soil to Plant UF	Plant Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	2.3E+00	9.6E-01	2.2E+00	3.6E-01	8.4E-01	1.7E-03	1.5E+00	1.2E-03
Lead	2.5E+02	3.0E-02	7.4E+00	4.5E-02	1.1E+01	1.6E-02	1.6E+00	9.8E-03

$$Dose = [(Conc_{Earthworm/Arthropod}s \times IR_{food})0.92 + (IR_{food} \times Conc_{Plants})0.08 + (IR_{soil} \times Conc_{Soil})] / Body\ Weight_{robin}$$

Screening Level Ecological Risk Assessment
Former Operating Plant
Lake Parcel
Frisco, Texas
April, 2013
Table E-19
Hazard Quotient Calculations for the Red-Tailed Hawk - Initial Conservative Exposure Parameters

Red-Tailed Hawk COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Soil to Wildlife Bird UF - American Robin	Plant to Wildlife Bird UF - American	FCM - American Robin	Small Bird Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	2.3E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	5.0E+02	1.5E-03	4.7E-02	1.0E+00	3.2E+01	1.9E-01	1.5E+00	1.3E-01
Lead	2.5E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	1.7E+03	NS	NS	1.0E+00	1.1E+02	6.3E-01	1.6E+00	3.9E-01

Dose = $(Conc_{Small\ Mammals} \times IR_{food})0.785 + (IR_{food} \times Conc_{Birds})0.215 + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{hawk}$

$Conc_{small\ mammal} = Conc_{least\ shrew}$ (mg/kg BW) = $[(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ mammal}$.

$Conc_{small\ bird} = Conc_{robin}$ (mg/kg BW) = $[(Conc_{soil} \times UF_{soil\text{-}small\ bird}) + (Conc_{plant} \times UF_{plant\text{-}small\ bird} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ bird}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ bird}$

where DF = dietary fraction of food item, FCM=Food Chain Multiplier. Equation adapted from Equation 5-12 in EPA, 1999

NS - EPA, 1999 indicates insufficient data to determine value.

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Table E-20
Hazard Quotient Calculations for the Red Fox - Initial Conservative Exposure Parameters

Red Fox COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	2.3E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	5.0E+02	1.3E+01	7.7E-01	1.7E+01
Lead	2.5E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	1.7E+03	4.4E+01	4.7E+00	9.4E+00

Dose = $(Conc_{Small\ Mammals} \times IR_{food})1 + (IR_{soil} \times Conc_{Soil})$/Body $Weight_{fox}$

$Conc_{small\ mammal} = Conc_{least\ shrew}$ (mg/kg BW) = $[(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ mammal}$

where DF = dietary fraction of food item, FCM = Food Chain Multiplier. Equation adapted from Equation 5-12 in EPA, 1999

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Table E-21
Hazard Quotient Calculations for the Least Shrew - Initial Conservative Exposure Parameters

Least Shrew COC	95% UCL Soil Conc (mg/kg)	Soil to Earthworm or Arthropod UF	Earthworm/ Arthropod Conc (mg/kg)	Soil to Plant UF	Plant Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	2.3E+00	9.6E-01	2.2E+00	3.6E-01	8.4E-01	1.9E-03	7.7E-01	2.5E-03
Lead	2.5E+02	3.0E-02	7.4E+00	4.5E-02	1.1E+01	2.3E-02	4.7E+00	5.0E-03

$$Dose = (Conc_{Earthworm/Arthropod} \times IR_{food})0.9 + (IR_{food} \times Conc_{Plants})0.1 + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{shrew}$$

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Table E-22
Hazard Quotient Calculations for the Red Fox - Refined Less-Conservative Exposure Parameters

Red Fox										Based on Less-Conservative Exposure Parameters	
COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	LOAEL Toxicity Reference Value (mg/kg BW-day)	NOAEL Hazard Quotient (unitless)	LOAEL Hazard Quotient (unitless)
Cadmium	2.3E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	5.0E+02	4.1E-01	7.7E-01	7.7E+00	5.3E-01	5.3E-02
Lead	2.5E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	1.7E+03	1.4E+00	4.7E+00	8.9E+00	2.9E-01	1.5E-01

Dose = $[(Conc_{Small\ Mammals} \times IR_{food})1 + (IR_{soil} \times Conc_{Soil})]/Body\ Weight_{fox}$

$Conc_{small\ mammal} = Conc_{least\ shrew}$ (mg/kg BW) = $[(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ m.}$

where DF = dietary fraction of food item, FCM = Food Chain Multiplier. Equation adapted from Equation 5-12 in EPA, 1999

Stewart Creek and North Tributary- Sediment Expsoures

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Table E-23
Exposure Point Concentrations

Data: 95% UCL COCs	Sediment mg/kg
Cadmium	1.09
Lead	16.05

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Table E-24
Ingestion-Pathway Exposure Assumptions for Aquatic Wildlife Measurement Receptors

Common Name	Scientific Name	Body Weight (kg)		Food Ingestion Rate (kg/day)		Sediment Ingestion (% of diet)		Sediment Ingestion Rate (kg/day)	Exposure Modifying Factor (EMF)
Bird									
Snowy Egret	*Egretta thula*	0.371	a	0.031	b	17	c	0.0053	1
Mammal									
Raccoon	*Procyon lotor*	5.63	a	0.280	b	9.4	c	0.0263	1

Notes:

a. *Wildlife Exposure Factors Handbook* (EPA, 1993) Geometric mean of raccoon body weights for both sexes.
To be conservative, the lower of the average male or female body weight was used if available (Dunning, 1993)

b. Food ingestion rates for mammals determined using FI (kg/day) = 0.0687 $Wt^{0.822}$ (kg) from EPA 1993 (equation 3-7). Food ingestion rate for all mammals.
Food ingestion rates for birds determined using FI (kg/day) = 0.0582 $Wt^{0.651}$ (g) from EPA 1993 (equation 3-5). Food ingestion rate for all birds.

c. *Estimates of Soil Ingestion by Wildlife* (Beyer, 1994). Sediment ingestion taken from Beyer (1994).

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Table E-25
Fraction of Components in Receptor Diet

Common Name	Aquatic Vascular Plants	Benthic Invertebrates	Fish	Reference
Bird				
Snowy Egret		0.3	0.7	Terres, 1980
Mammal				
Raccoon	0.1	0.6	0.3	EPA 1993

Notes:
1. Terres, J.K. 1980. The Audubon Society Encyclopedia of North American Birds. Wing Books. NY.
2. EPA 1993 Wildlife Exposure Factors Handbook. Office of Research and Development. EPA/600/R-93/187. December.

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Table E-26
Hazard Quotient Calculations for the Snowy Egret - Initial Conservative Exposure Parameters

Snowy Egret COC	95% UCL Sediment Conc (mg/kg)	Benthic Invertebrate UF (unitless)	Benthic Invertebrate Conc (mg/kg)	Fish UF (unitless)	Fish Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	1.1E+00	3.4E+00	3.7E+00	1.0E+00	1.1E+00	1.7E-01	1.5E+00	1.2E-01
Lead	1.6E+01	6.3E-01	1.0E+01	1.0E+00	1.6E+01	1.4E+00	1.6E+00	8.7E-01

$$\text{Dose} = [(\text{Conc}_{benthics} \times \text{IR}_{food})0.3 + (\text{IR}_{food} \times \text{Conc}_{fish})0.7 + (\text{IR}_{sed} \times \text{Conc}_{Sediment})]/\text{Body Weight}_{Egret}$$

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Table E-27
Hazard Quotient Calculations for the Raccoon - Initial Conservative Exposure Parameters

Raccoon COC	95% UCL Sediment Conc (mg/kg)	Aquatic Plant UF (unitless)	Aquatic Plant Conc (mg/kg)	Benthic Invertebrate UF (unitless)	Benthic Invertebrate Conc (mg/kg)	Fish UF (unitless)	Fish Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure NOAEL Hazard Quotient (unitless)
Cadmium	1.1E+00	3.6E-01	4.0E-01	3.4E+00	3.7E+00	1.0E+00	1.1E+00	1.3E-01	7.7E-01	1.7E-01
Lead	1.6E+01	4.5E-02	7.2E-01	6.3E-01	1.0E+01	1.0E+00	1.6E+01	6.2E-01	4.7E+00	1.3E-01

$$Dose = [(Conc_{benthics} \times IR_{food})0.6 + (IR_{food} \times Conc_{fish})0.3 + (IR_{food} \times Conc_{plant})0.1 + (IR_{sed} \times Conc_{Sediment})]/Body\ Weight_{raccoon}$$

Stewart Creek Corridor Area
Terrestrial HQ Calculations

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Former Operating Plant
Frisco, Texas
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Table E-28
Ingestion-Pathway Exposure Assumptions for Terrestrial Wildlife Measurement Receptors

Common Name	Body Weight (kg)	Food Ingestion Rate (kg/day)	Soil Ingestion (% of diet)	Soil Ingestion Rate (kg/day)	Exposure Modifying Factor (EMF)	Site Area (Acres)	Home Range (Acres)
Birds							
Red Tailed Hawk	9.57E-01	4.48E-04	2	8.97E-06	0.06	8.34	148
American Robin	6.30E-02	4.85E-05	5.2	2.52E-06	1	8.34	2
Mammals							
Red Fox	4.13E+00	1.08E-01	2.7	3.00E-03	0.04	8.34	237
Least Shrew	4.00E-03	3.38E-06	8	2.71E-07	1	8.34	1

Notes:
1. Factors from EPA, 1993 unless noted otherwise.
2. EPA, 1993. Wildlife Exposure Factors Handbook. Office of Research and Development. EPA/600/R-93/187. December
3. Least Shrew Body Weight from: Davis and Schmidley, 2009. The Mammals of Texas, online edition. www.nrsl.ttu.edu/tmot1/ .
4. Fox Soil ingestion rate from: Beyer, W.N. E.Cnner, and S. Gerould 1994. Estimates of Soil Ingestion by Wildlife. J. Wildl. Manage. 58:375-382.
5. EMF of 1 used for all conservative calculations. If a value less than 1 was used, it is noted in the text.
6. EMF for red-tailed hawk and red fox for less-conservative assessment based on ratio of site area to home range.
7. Home range for red-tailed hawk and red fox from EPA 1993, the lowest of the values presented.

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Table E-29
Hazard Quotient Calculations for the American Robin - Initial Conservative Exposure Parameters

American Robin COC	95% UCL Soil Conc (mg/kg)	Soil to Earthworm or Arthropod UF	Earthworm/ Arthropod Conc (mg/kg)	Soil to Plant UF	Plant Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	2.6E+00	9.6E-01	2.5E+00	3.6E-01	9.6E-01	2.0E-03	1.5E+00	1.3E-03
Lead	5.0E+02	3.0E-02	1.5E+01	4.5E-02	2.3E+01	3.2E-02	1.6E+00	2.0E-02
HPAHs	3.3E-01	7.0E-02	2.3E-02	2.0E-02	6.6E-03	3.0E-05	2.0E+00	1.5E-05
LPAHs	1.6E-02	7.0E-02	1.1E-03	2.0E-02	3.3E-04	1.5E-06	2.1E+02	7.1E-09

$$Dose = [(Conc_{Earthworm/Arthropod}s \times IR_{food})0.92 + (IR_{food} \times Conc_{Plants})0.08 + (IR_{soil} \times Conc_{Soil})] / Body\ Weight_{robin}$$

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Table E-30
Hazard Quotient Calculations for the Red-Tailed Hawk - Initial Conservative Exposure Parameters

Red-Tailed Hawk COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Soil to Wildlife Bird UF - American Robin	Plant to Wildlife Bird UF - American Robin	FCM - American Robin	Small Bird Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	2.6E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	5.7E+02	1.5E-03	4.7E-02	1.0E+00	3.7E+01	2.1E-01	1.5E+00	1.4E-01
Lead	5.0E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	3.4E+03	NS	NS	1.0E+00	2.2E+02	1.3E+00	1.6E+00	7.8E-01
HPAHs	3.3E-01	2.8E-03	1.3E-01	1.0E+00	1.0E+00	5.4E+00	2.3E-03	7.2E-02	1.0E+00	5.3E+00	2.5E-03	2.0E+00	1.3E-03
LPAHs	1.6E-02	2.8E-03	1.3E-01	1.0E+00	1.0E+00	2.7E-01	2.3E-03	7.2E-02	1.0E+00	2.6E-01	1.3E-04	2.1E+02	6.0E-07

Dose = $(Conc_{Small\ Mammals} \times IR_{food})0.785 + (IR_{food} \times Conc_{Birds})0.215 + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{hawk}$

$Conc_{small\ mammal} = Conc_{least\ shrew}$ (mg/kg BW) = $[(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ mammal}$,

$Conc_{small\ bird} = Conc_{robin}$ (mg/kg BW) = $[(Conc_{soil} \times UF_{soil\text{-}small\ bird}) + (Conc_{plant} \times UF_{plant\text{-}small\ bird} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ bird}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ bird}$

where DF = dietary fraction of food item, FCM=Food Chain Multiplier Equation adapted from Equation 5-12 in EPA, 1999

Assume FCM = 1 for PAHs.

NS - EPA, 1999 indicates insufficient data to determine value.

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Table E-31
Hazard Quotient Calculations for the Red Fox - Initial Conservative Exposure Parameters

Red Fox COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	2.6E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	5.7E+02	1.5E+01	7.7E-01	1.9E+01
Lead	5.0E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	3.4E+03	8.9E+01	4.7E+00	1.9E+01
HPAHs	3.3E-01	2.8E-03	1.3E-01	1.0E+00	1.0E+00	5.4E+00	1.4E-01	6.2E-01	2.30E-01
LPAHs	1.6E-02	2.8E-03	1.3E-01	1.0E+00	1.0E+00	2.7E-01	7.1E-03	6.6E+01	1.08E-04

Dose = $(Conc_{Small\ Mammals} \times IR_{food})1 + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{fox}$

$Conc_{small\ mammal} = Conc_{least\ shrew}$ (mg/kg BW) = $[(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ mammal}$

where DF = dietary fraction of food item, FCM = Food Chain Multiplier. Equation adapted from Equation 5-12 in EPA, 1999

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Table E-32
Hazard Quotient Calculations for the Least Shrew -Initial Conservative Exposure Parameters

Red-Tailed Hawk COC	95% UCL Soil Conc (mg/kg)	Soil to Earthworm or Arthropod UF	Earthworm/ Arthropod Conc (mg/kg)	Soil to Plant UF	Plant Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	2.6E+00	9.6E-01	2.5E+00	3.6E-01	9.6E-01	2.2E-03	7.7E-01	2.8E-03
Lead	5.0E+02	3.0E-02	1.5E+01	4.5E-02	2.3E+01	4.7E-02	4.7E+00	1.0E-02
HPAHs	3.3E-01	7.0E-02	2.3E-02	2.0E-02	6.6E-03	4.0E-05	6.2E-01	6.5E-05
LPAHs	1.6E-02	7.0E-02	1.1E-03	2.0E-02	3.3E-04	2.0E-06	6.6E+01	3.1E-08

$$\text{Dose} = (\text{Conc}_{\text{Earthworm/Arthropod}} \times \text{IR}_{\text{food}})0.9 + (\text{IR}_{\text{food}} \times \text{Conc}_{\text{Plants}})0.1 + (\text{IR}_{\text{soil}} \times \text{Conc}_{\text{Soil}})/\text{Body Weight}_{\text{shrew}}$$

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Table E-33
Hazard Quotient Calculations for the Red Fox - Refined Less-Conservative Exposure Parameters

Red Fox COC	95% UCL Soil Conc (mg/kg)	Soil to Wildlife Mammal UF - Least Shrew	Plant to Wildlife Mammal UF - Least Shrew	FCM - Arthropod	FCM - Least Shrew	Small Mammal Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	LOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Less-Conservative Exposure Parameters: NOAEL Hazard Quotient (unitless)	Based on Less-Conservative Exposure Parameters: LOAEL Hazard Quotient (unitless)
Cadmium	2.6E+00	1.6E-06	7.4E-05	1.0E+00	1.0E+00	5.7E+02	8.4E-01	7.7E-01	7.7E+00	1.1E+00	1.1E-01
Lead	5.0E+02	4.1E-06	1.9E-04	1.0E+00	1.0E+00	3.4E+03	5.0E+00	4.7E+00	8.9E+00	1.1E+00	5.6E-01
HPAHs	3.3E-01	2.8E-03	1.3E-01	1.0E+00	1.0E+00	5.4E+00	1.4E-01	6.2E-01	3.1E+00	2.3E-01	4.6E-02
LPAHs	1.6E-02	2.8E-03	1.3E-01	1.0E+00	1.0E+00	2.7E-01	7.1E-03	6.6E+01	3.3E+02	1.1E-04	2.2E-05

$Dose = EMF^*(Conc_{Small\ Mammals} \times IR_{food})] + (IR_{soil} \times Conc_{Soil})/Body\ Weight_{fox}$

$Conc_{small\ mammal} = Conc_{least\ shrew}\ (mg/kg\ BW) = [(Conc_{soil} \times UF_{soil\text{-}small\ mammal}) + (Conc_{plant} \times UF_{plant\text{-}small\ mammal} \times DF_{plant}) + (Conc_{arthropod} \times [FCM_{small\ mammal}/FCM_{arthropod}] \times DF_{arthropod})]/BW_{small\ mammal}$

where DF = dietary fraction of food item, FCM = Food Chain Multiplier. Equation adapted from Equation 5-12 in EPA, 1999

4/16/2013

Stewart Creek Corridor - Soil Exposures for the Raccoon

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Stewart Creek Corridor Terrestrial Assessment of Raccoon
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Table E-34
Exposure Point Concentrations

Data: 95% UCL COCs	Soil mg/kg
Cadmium	2.64E+00
Lead	5.02E+02

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Former Operating Plant
Stewart Creek Corridor Terrestrial Assessment of Raccoon
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Table E-35
Ingestion-Pathway Exposure Assumptions for Aquatic Wildlife Measurement Receptors

Common Name	Scientific Name	Body Weight (kg)		Food Ingestion Rate (kg/day)		Sediment Ingestion (% of diet)		Sediment Ingestion Rate (kg/day)	Exposure Modifying Factor (EMF)	Site Area (Acres)	Home Range (Acres)
Mammal											
Raccoon	*Procyon lotor*	5.63	a	0.280	b	9.4	c	0.0263	0.09	8.34	96.3

Notes:
1. *Wildlife Exposure Factors Handbook* (EPA, 1993) Geometric mean of raccoon body weights for both sexes.
2. Food ingestion rates for mammals determined using FI (kg/day) = 0.0687 $Wt^{0.822}$ (kg) from EPA 1993 (equation 3-7). Food ingestion rate for all mammals.
3. *Estimates of Soil Ingestion by Wildlife* (Beyer, 1994). Sediment ingestion taken from Beyer (1994).
4. *Wildlife Exposure Factors Handbook* (EPA, 1993) for raccoon dietary composition.
5. EMF of 1 used for conservative calculations.
6. EMF for less-conservative assessment based on ratio of site area to home range.
7. Home range from EPA 1993, the lowest of the values presented.

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Frisco, Texas
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Table E-36
Fraction of Components in Receptor Diet

Common Name	Aquatic Vascular Plants	Benthic Invertebrates	Reference
Mammal			
Raccoon	0.4	0.6	EPA 1993

1. *Wildlife Exposure Factors Handbook* (EPA, 1993).

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Table E-37
Hazard Quotient Calculations for the Raccoon - Initial Conservative Exposure Parameters

Raccoon COC	95% UCL Sediment Conc (mg/kg)	Aquatic Plant UF (unitless)	Aquatic Plant Conc (mg/kg)	Benthic Invertebrate UF (unitless)	Benthic Invertebrate Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	Based on Conservative Exposure Parameters NOAEL Hazard Quotient (unitless)
Cadmium	2.6E+00	3.6E-01	9.6E-01	3.4E+00	9.0E+00	3.0E-01	7.7E-01	3.9E-01
Lead	5.0E+02	4.5E-02	2.3E+01	6.3E-01	3.2E+02	1.2E+01	4.7E+00	2.6E+00

$$\text{Dose} = [(\text{Conc}_{benthics} \times \text{IR}_{food})0.6 + (\text{IR}_{food} \times \text{Conc}_{plant})0.4 + (\text{IR}_{sed} \times \text{Conc}_{Sediment})]/\text{Body Weight}_{raccoon}$$

Screening Level Ecological Risk Assessment
Former Operating Plant
Stewart Creek Corridor Terrestrial Assessment of Raccoon
Frisco, Texas
April, 2013

Table E-38
Hazard Quotient Calculations for the Raccoon - Refined Less Conservative Exposure Parameters

Raccoon									Based on Less-Conservative Exposure Parameters	
COC	95% UCL Soil Conc (mg/kg)	Aquatic Plant UF (unitless)	Aquatic Plant Conc (mg/kg)	Benthic Invertebrate UF (unitless)	Benthic Invertebrate Conc (mg/kg)	Total Daily Dose Rate (mg/kg BW-day)	NOAEL Toxicity Reference Value (mg/kg BW-day)	LOAEL Toxicity Reference Value (mg/kg BW-day)	NOAEL Hazard Quotient (unitless)	LOAEL Hazard Quotient (unitless)
Cadmium	2.6E+00	3.6E-01	9.6E-01	3.4E+00	9.0E+00	2.6E-02	7.7E-01	7.7E+00	3.4E-02	3.4E-03
Lead	5.0E+02	4.5E-02	2.3E+01	6.3E-01	3.2E+02	1.1E+00	4.7E+00	8.9E+00	2.3E-01	1.2E-01

$$\text{Dose} = \text{EMF}^*[(\text{Conc}_{benthics} \times \text{IR}_{food})0.6 + (\text{IR}_{food} \times \text{Conc}_{plant})0.4 + (\text{IR}_{sed} \times \text{Conc}_{Sediment})]/\text{Body Weight}_{raccoon}$$

10.0 COC SCREENING

TRRP Rules 30 TAC §350.71(k)(1) and §350.71(k)(3) specify that a COC may be screened from critical PCL development if all detected COC concentrations and sample quantitation limits (SQLs) are less than applicable RALs or if all SQLs for analytes not detected are less than applicable RALs. All COCs sampled in all media were screened from critical PCL development based on these criteria, with the exception of lead, cadmium, and arsenic in soil and the two SVOCs discussed in Section 10.4 below.

10.1 Frequency of Detection

A COC can be screened from critical PCL development if more than 20 samples of the media were collected and the COC was detected in less than 5 percent of the samples (30 TAC §350.71(k)(2)(A)). No COCs at the Site were screened out based on frequency of detection.

10.2 Lab Contaminant or Blank Contaminant

A COC can be screened from critical PCL development if it is a common laboratory contaminant, as long as the concentration of the COC detected in each sample for that environmental medium does not exceed 10 times the maximum amount detected in any associated blank and the COC is not anticipated to be present based on knowledge of on-site historical operations including consideration of companion and daughter products (30 TAC §350.71(k)(2)(B)). No COCs at the Site were screened out based on lab contaminants or blank contaminants.

10.3 COC Not Sourced On-site

A COC can be screened from critical PCL development if it can be demonstrated that the COC did not result from activity at the on-site property based on appropriate evidence, including, but not limited to, the concentration and distribution of the COC in environmental media, source area information, consideration of companion and daughter products, and knowledge of on-site historical operations (30 TAC §350.71(k)(2)(E)). This exclusion is applicable to COCs with sample quantitation limits exceeding the assessment levels (See Section 10.4). No COCs at the Site were screened out based on off-site sources.

10.4 Appropriate Sample Quantitation Limits

Two SVOCs (benzidine and n-nitrosodimethylamine) that were screened from critical PCL development had soil sample SQLs greater than the applicable RALs (Tables 4A and 4C). These compounds were analyzed by appropriate EPA methods (see Section 3.3.1 and Appendix 10) that represent the best available technology. There is no indication that the presence of these compounds should be expected at the Site based on knowledge of the Site history and operations. These compounds are not considered daughter or companion products of any parent COCs that cannot be screened from critical PCL development.

10.5 Screened COCs Expected to be Present Dropped from Future Sampling

No screened COCs are expected to be present at the Site.

Table 10A - COC Screening Summary Table

								SQL Justifications	
1	2	3	4	5	6	7	8	9	10
Chemical of Concern	All detected concentrations and SQLs < residential assessment level in all sampled media §350.71(k)(1)	COC not detected in any sample in the medium §350.71(k)(3)	Frequency of detects <5% of the >20 samples in this medium §350.71(k)(2)(A)(i) through (iii)	Common lab contaminant §350.71(k)(2)(B)	Blank contaminant §350.71(k)(2)(C)	Max conc < background §350.71(k)(2)(D)	COC not sourced on-site §350.71(k)(2)(E)	All SQLs < RAL §350.71(k)(3)(A)	SQL > RAL but justified §350.71(k)(3)(B)
Metals									
Arsenic	gw								
Barium	soil 0-15 ft								
Beryllium	soil 0-15 ft								
Cadmium	soil >15 ft, gw, sed, sw								
Chromium	soil 0-15 ft								
Lead	soil >15 ft, gw, sed, sw								
Mercury	soil 0-15 ft								
Nickel	soil 0-15 ft								
Selenium	soil 0-15 ft, gw								
Silver		soil 0-15 ft						soil 0-15 ft	
Zinc	soil 0-15 ft								
Total Petroleum Hydrocarbons (TPH) by TX1005									
T/R Hydrocarbons: C6-C12	soil 0-15 ft	gw						gw	
T/R Hydrocarbons: >C12-C28	soil 0-15 ft	gw						gw	
T/R Hydrocarbons: >C28-C35	soil 0-15 ft	gw						gw	
T/R Hydrocarbons: C6-C35	soil 0-15 ft	gw						gw	
Total Petroleum Hydrocarbons (TPH) by TX1006									
nC6 Aliphatics		soil 0-15 ft						soil 0-15 ft	
<C6-C8 Aliphatics		soil 0-15 ft						soil 0-15 ft	
>C8-C10 Aliphatics	soil 0-15 ft								
>C10-C12 Aliphatics	soil 0-15 ft								
>C12-C16 Aliphatics	soil 0-15 ft								
>C16-C21 Aliphatics	soil 0-15 ft								
>C21-C35 Aliphatics	soil 0-15 ft								
>C7-C8 Aromatics	soil 0-15 ft								
>C8-C10 Aromatics	soil 0-15 ft								
>C10-C12 Aromatics	soil 0-15 ft								
>C12-C16 Aromatics	soil 0-15 ft								
>C16-C21 Aromatics	soil 0-15 ft								
>C21-C35 Aromatics	soil 0-15 ft								
>C6-C35	soil 0-15 ft								
Volatile Organic Compounds (VOCs)									
1,1,1-Trichloroethane		soil 0-15 ft						soil 0-15 ft	
1,1,2,2-Tetrachloroethane		soil 0-15 ft						soil 0-15 ft	
1,1,2-Trichloroethane		soil 0-15 ft						soil 0-15 ft	
1,1-Dichloroethane		soil 0-15 ft						soil 0-15 ft	
1,1-Dichloroethene		soil 0-15 ft						soil 0-15 ft	
1,2-Dichloroethane		soil 0-15 ft						soil 0-15 ft	
1,2-Dichloroethene, Total		soil 0-15 ft						soil 0-15 ft	
1,2-Dichloropropane		soil 0-15 ft						soil 0-15 ft	
2-Butanone (MEK)		soil 0-15 ft						soil 0-15 ft	
2-Hexanone		soil 0-15 ft						soil 0-15 ft	
4-Methyl-2-pentanone (MIBK)		soil 0-15 ft						soil 0-15 ft	
Acetone	soil 0-15 ft								
Benzene	soil 0-15 ft								
Bromodichloromethane		soil 0-15 ft						soil 0-15 ft	
Bromoform		soil 0-15 ft						soil 0-15 ft	
Bromomethane		soil 0-15 ft						soil 0-15 ft	
Carbon disulfide	soil 0-15 ft								
Carbon tetrachloride		soil 0-15 ft						soil 0-15 ft	
Chlorobenzene		soil 0-15 ft						soil 0-15 ft	
Chlorobromomethane		soil 0-15 ft						soil 0-15 ft	

Table 10A - COC Screening Summary Table

								SQL Justifications	
1	2	3	4	5	6	7	8	9	10
Chemical of Concern	All detected concentrations and SQLs < residential assessment level in all sampled media §350.71(k)(1)	COC not detected in any sample in the medium §350.71(k)(3)	Frequency of detects <5% of the >20 samples in this medium §350.71(k)(2) (A)(i) through (iii)	Common lab contaminant §350.71(k)(2)(B)	Blank contaminant §350.71(k)(2)(C)	Max conc < background §350.71(k)(2)(D)	COC not sourced on-site §350.71(k)(2)(E)	All SQLs < RAL §350.71(k)(3)(A)	SQL > RAL but justified §350.71(k)(3)(B)
Volatile Organic Compounds (VOCs) (Continued)									
Chloroethane		soil 0-15 ft						soil 0-15 ft	
Chloroform	soil 0-15 ft								
Chloromethane		soil 0-15 ft						soil 0-15 ft	
cis-1,2-Dichloroethene		soil 0-15 ft						soil 0-15 ft	
cis-1,3-Dichloropropene		soil 0-15 ft						soil 0-15 ft	
Dibromochloromethane		soil 0-15 ft						soil 0-15 ft	
Ethylbenzene	soil 0-15 ft								
Methyl tert-butyl ether	soil 0-15 ft								
Methylene Chloride	soil 0-15 ft								
m-Xylene and p-Xylene		soil 0-15 ft						soil 0-15 ft	
o-Xylene	soil 0-15 ft								
Styrene		soil 0-15 ft						soil 0-15 ft	
Tetrachloroethene	soil 0-15 ft								
Toluene		soil 0-15 ft						soil 0-15 ft	
trans-1,2-Dichloroethene		soil 0-15 ft						soil 0-15 ft	
trans-1,3-Dichloropropene		soil 0-15 ft						soil 0-15 ft	
Trichloroethene		soil 0-15 ft						soil 0-15 ft	
Vinyl acetate		soil 0-15 ft						soil 0-15 ft	
Vinyl chloride		soil 0-15 ft						soil 0-15 ft	
Xylenes, Total	soil 0-15 ft								
Semivolatile Organic Compounds (SVOCs)									
1,2,4-Trichlorobenzene		soil 0-15 ft						soil 0-15 ft	
1,2-Dichlorobenzene		soil 0-15 ft						soil 0-15 ft	
1,3-Dichlorobenzene		soil 0-15 ft						soil 0-15 ft	
1,4-Dichlorobenzene		soil 0-15 ft						soil 0-15 ft	
1-Methylnaphthalene	soil 0-15 ft, gw								
2,4,5-Trichlorophenol		soil 0-15 ft						soil 0-15 ft	
2,4,6-Trichlorophenol		soil 0-15 ft						soil 0-15 ft	
2,4-Dichlorophenol		soil 0-15 ft						soil 0-15 ft	
2,4-Dimethylphenol		soil 0-15 ft						soil 0-15 ft	
2,4-Dinitrophenol		soil 0-15 ft						soil 0-15 ft	
2,4-Dinitrotoluene		soil 0-15 ft						soil 0-15 ft	
2,6-Dinitrotoluene		soil 0-15 ft						soil 0-15 ft	
2-Chloronaphthalene		soil 0-15 ft						soil 0-15 ft	
2-Chlorophenol		soil 0-15 ft						soil 0-15 ft	
2-Methylnaphthalene	soil 0-15 ft, gw								
2-Methylphenol		soil 0-15 ft						soil 0-15 ft	
2-Nitroaniline		soil 0-15 ft						soil 0-15 ft	
2-Nitrophenol		soil 0-15 ft						soil 0-15 ft	
3 & 4 Methylphenol		soil 0-15 ft						soil 0-15 ft	
3,3'-Dichlorobenzidine		soil 0-15 ft						soil 0-15 ft	
3-Nitroaniline		soil 0-15 ft						soil 0-15 ft	
4,6-Dinitro-2-methylphenol		soil 0-15 ft						soil 0-15 ft	
4-Bromophenyl phenyl ether		soil 0-15 ft						soil 0-15 ft	
4-Chloro-3-methylphenol		soil 0-15 ft						soil 0-15 ft	
4-Chloroaniline		soil 0-15 ft						soil 0-15 ft	
4-Chlorophenyl phenyl ether		soil 0-15 ft						soil 0-15 ft	
4-Nitroaniline		soil 0-15 ft						soil 0-15 ft	
4-Nitrophenol		soil 0-15 ft						soil 0-15 ft	
Acenaphthene	gw	soil 0-15 ft						soil 0-15 ft	
Acenaphthylene		soil 0-15 ft, gw						soil 0-15 ft, gw	
Anthracene	soil 0-15 ft	gw						gw	

Table 10A - COC Screening Summary Table

								SQL Justifications	
1	2	3	4	5	6	7	8	9	10
Chemical of Concern	All detected concentrations and SQLs < residential assessment level in all sampled media §350.71(k)(1)	COC not detected in any sample in the medium §350.71(k)(3)	Frequency of detects <5% of the >20 samples in this medium §350.71(k)(2) (A)(i) through (iii)	Common lab contaminant §350.71(k)(2)(B)	Blank contaminant §350.71(k)(2)(C)	Max conc < background §350.71(k)(2)(D)	COC not sourced on-site §350.71(k)(2)(E)	All SQLs < RAL §350.71(k)(3)(A)	SQL > RAL but justified §350.71(k)(3)(B)
Semivolatile Organic Compounds (SVOCs) (Continued)									
Benzidine		soil 0-15 ft							soil 0-15 ft
Benzo[a]anthracene	soil 0-15 ft	gw						gw	
Benzo[a]pyrene	soil 0-15 ft	gw						gw	
Benzo[b]fluoranthene	soil 0-15 ft	gw						gw	
Benzo[g,h,i]perylene	soil 0-15 ft	gw						gw	
Benzo[k]fluoranthene	soil 0-15 ft	gw						gw	
Benzyl alcohol		soil 0-15 ft						soil 0-15 ft	
bis (2-Chloroisopropyl) ether		soil 0-15 ft						soil 0-15 ft	
Bis(2-chloroethoxy)methane		soil 0-15 ft						soil 0-15 ft	
Bis(2-chloroethyl)ether		soil 0-15 ft						soil 0-15 ft	
Bis(2-ethylhexyl) phthalate	soil 0-15 ft								
Butyl benzyl phthalate	soil 0-15 ft								
Carbazole		soil 0-15 ft						soil 0-15 ft	
Chrysene	soil 0-15 ft	gw						gw	
Dibenz(a,h)anthracene	soil 0-15 ft	gw						gw	
Dibenzofuran	soil 0-15 ft								
Diethyl phthalate	soil 0-15 ft								
Dimethyl phthalate		soil 0-15 ft						soil 0-15 ft	
Di-n-butyl phthalate		soil 0-15 ft						soil 0-15 ft	
Di-n-octyl phthalate		soil 0-15 ft						soil 0-15 ft	
Fluoranthene	soil 0-15 ft	gw						gw	
Fluorene	soil 0-15 ft, gw								
Hexachlorobenzene		soil 0-15 ft						soil 0-15 ft	
Hexachlorobutadiene		soil 0-15 ft						soil 0-15 ft	
Hexachlorocyclopentadiene		soil 0-15 ft						soil 0-15 ft	
Hexachloroethane		soil 0-15 ft						soil 0-15 ft	
Indeno[1,2,3-cd]pyrene	soil 0-15 ft	gw						gw	
Isophorone		soil 0-15 ft						soil 0-15 ft	
Naphthalene	soil 0-15 ft, gw								
Nitrobenzene		soil 0-15 ft						soil 0-15 ft	
N-Nitrosodimethylamine		soil 0-15 ft							soil 0-15 ft
N-Nitrosodi-n-propylamine		soil 0-15 ft						soil 0-15 ft	
N-Nitrosodiphenylamine		soil 0-15 ft						soil 0-15 ft	
Pentachlorophenol		soil 0-15 ft						soil 0-15 ft	
Phenanthrene	soil 0-15 ft	gw						gw	
Phenol		soil 0-15 ft						soil 0-15 ft	
Pyrene	soil 0-15 ft	gw						gw	

11.0 SOIL CRITICAL PCL DEVELOPMENT

11.1 Tier 2 or 3 PCL Development and Non-Default Parameters

As described in Section 10, lead, cadmium, and arsenic were the only constituents analyzed in soil samples from the Site that were not screened from critical PCL development. In accordance with 30 TAC §350.75(c)(1), Tier 2 $^{GW}Soil_{Class3}$ PCLs were developed for lead, cadmium, arsenic, and selenium using site-specific data and equations provided in TRRP Figure 30 TAC §350.75(b)(1). Documentation for the development of the Tier 2 critical PCLs is provided in Appendix 9.

Non-Default Affected Property Parameters

Site-specific pH soil sample results were used to determine soil-water partition coefficient (Kd) values for calculating Tier 2 PCLs in accordance with 30 TAC §350.73(f)(1). Sixty-five soil samples were evaluated for pH; the results are presented in Table 4E. The average pH value for soils was 7.5, with corresponding Kd values being 1,830 L/kg for lead, 590 L/kg for cadmium, and 30 L/kg for arsenic.

11.2 Soil PCL Adjustments

No residual saturation, cumulative risk, hazard index or other adjustments were made to PCLs for COCs detected at the Site.

11.3 Soil Critical PCLs

The Site will be deed recorded to commercial-industrial land use. Based on this proposed future land use, soil critical PCLs were established using commercial-industrial Tier 1 $^{Tot}Soil_{Comb}$ (for surface soil only) and Tier 2 $^{GW}Soil_{Class3}$ PCLs. The $^{Air}Soil_{Inh\text{-}V}$ exposure pathway is not applicable for lead, cadmium, or arsenic, and was not used to develop soil critical PCLs. Development of the critical PCLs for these constituents in surface soil and subsurface soil is summarized in Tables 11A and 11B, respectively. As described in Section 4, lead and cadmium concentrations in soil samples exceeded critical PCLs within each of the three soil affected property zones identified at the Site. None of the sixty Site soil samples analyzed for arsenic exceeded the applicable critical PCL for arsenic. A map showing the critical PCL exceedance (PCLE) zone is presented as Figure 11A and cross sections showing the PCLE zone are provided on Figure 11C.

Table 11A - Surface Soil Critical PCLs

COC	Source Area Size (acres)	$^{Tot}Soil_{Comb}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL (mg/kg)	Tier	cPCL[1] (mg/kg)	MQL (mg/kg)	Site-specific Background[2] (mg/kg)	Maximum Concentration: Sample ID	Sample Depth (feet bgs)	Sample Date	Conc (mg/kg)	Remedy or NFA (mg/kg)
Arsenic	30	**196**	301	2	196	1.00	15.9	2012-FWCS-1A (1-2')	1-2*	03/05/13	115	NFA
Cadmium	30	**852**	2950	2	852	0.25	NA	2012-FWFS-9 (Floor)	2.4	09/04/12	**984**	Remedy
Lead	30	**1600**	27451	2	1600	0.50	31.5	2013-WMU14-1 (0.9-2)	0.9-2*	05/07/13	**95000**	Remedy

Notes:

1. The critical PCL (cPCL) is the lower of the TRRP commercial-industrial Tier 1 $^{Tot}Soil_{Comb}$ and Tier 2 $^{GW}Soil_{class3}$ PCLs for a 30-acre source area. Documentation on the development of Tier 2 PCLs is provided in Appendix 9. The minimum applicable PCL is bolded.
2. Background values for arsenic and lead are site-specific background values (see Appendix 8).
3. Sample results that exceed the critical PCL are highlighted and bolded.
4. NA - Not applicable.
5. * - Sub-slab or sub-gabion basket sample; top depth represents the approximate top of soil.

Table 11B Subsurface Soil Critical PCLs

COC	Source Area Size (acres)	$^{Air}Soil_{Inh-V}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL (mg/kg)	$^{GW}Soil_{Class3}$ PCL Tier	cPCL[1] (mg/kg)	MQL (mg/kg)	Site-specific Background[2] (mg/kg)	Maximum Concentration: Sample ID	Maximum Concentration: Sample Depth (feet bgs)	Maximum Concentration: Sample Date	Maximum Concentration: Conc (mg/kg)	Remedy or NFA (mg/kg)
Arsenic	30	NA	301	2	301	1.0	15.9	2013-RMSB-5 (5-7)	5-7	05/07/13	44.5	NFA
Cadmium	30	NA	2950	2	2950	0.25	NA	2013-RMSB-5 (5-7)	5-7	05/07/13	60.7	NFA
Lead	30	NA	27451	2	27451	0.50	31.5	2013-BSB-8 (8-10)	8-10	04/10/13	**54600**	Remedy

Notes:

1. [1] - The $^{Air}Soil_{Inh-V}$ pathway is not applicable for arsenic, cadmium, or lead; therefore, the critical PCL (cPCL) for each of these constituents is equal to the TRRP commercial-industrial Tier 2 $^{GW}Soil_{Class3}$ PCL. Documentation on the development of Tier 2 PCLs is provided in Appendix 9.
2. Background values for arsenic and lead are site-specific background values (see Appendix 8).
3. Sample results that exceed the critical PCL are highlighted and bolded.
4. NA - Not applicable.

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
FORMER PRODUCTION AREA				
Battery Receiving/Storage Building				
2013-BSB-1 (0.9-2)	04/11/13	0.9-2*	<0.0266	9.56
2013-BSB-1 (2-4)	04/11/13	2-4	0.0409 J	56.2
2013-BSB-1 (4-5)	04/11/13	4-5	0.0977 J	31.6
2013-BSB-1 (6.3-7.7)	04/11/13	6.3-7.7	3.64	**14100**
2013-BSB-1 (8-10)	04/11/13	8-10	7.99	**42700**
2013-BSB-1 (11.6)	04/11/13	11.6	0.487	124
2013-BSB-2 (0.9-2)	04/11/13	0.9-2*	<0.0276	70.4
2013-BSB-2 (2-4)	04/11/13	2-4	0.0399 J	9.36
2013-BSB-2 (4-5)	04/11/13	4-5	0.334	**1080**
2013-BSB-2 (8-10)	04/11/13	8-10	0.484	41.6
2013-BSB-2 (11.2)	04/11/13	11.2	0.638	**684**
2013-BSB-3 (0.9-2)	04/10/13	0.9-2*	<0.0279	14.8
2013-BSB-3 (2-4)	04/10/13	2-4	0.626	206
2013-BSB-3 (4-5)	04/10/13	4-5	0.909	499
2013-BSB-3 (8-10)	04/10/13	8-10	0.509	368
2013-BSB-3 (11)	04/10/13	11	0.434	26.1
2013-BSB-4 (0.9-2)	04/10/13	0.9-2*	1.65	37.9
2013-BSB-4 (2-4)	04/10/13	2-4	2.86	**1110**
2013-BSB-4 (4-5)	04/10/13	4-5	0.158 J	111
2013-BSB-4 (8-10)	04/10/13	8-10	0.411	214
2013-BSB-4 (11)	04/10/13	11	0.365	19.4
2013-BSB-5 (0.9-2)	04/11/13	0.9-2*	0.137 J	5.28
2013-BSB-5 (0.9-2) Dup	04/11/13	0.9-2*	0.341	6.48
2013-BSB-5 (2-4)	04/11/13	2-4	0.0557 J	21.6
2013-BSB-5 (4-5)	04/11/13	4-5	0.299	122
2013-BSB-5 (8-10)	04/11/13	8-10	0.479	**1580**
2013-BSB-5 (11.2)	04/11/13	11.2	0.458	53.9
2013-BSB-6 (0.9-2)	04/11/13	0.9-2*	<0.0304	24.4
2013-BSB-6 (2-4)	04/11/13	2-4	0.0393 J	23.7
2013-BSB-6 (4-5)	04/11/13	4-5	0.695	**586 J**
2013-BSB-6 (8-10)	04/11/13	8-10	0.91	**3150**
2013-BSB-6 (11.1)	04/11/13	11.1	0.439	20.3
2013-BSB-7 (0.9-2)	04/11/13	0.9-2*	0.37	26.8 J
2013-BSB-7 (2-4)	04/11/13	2-4	0.13 J	221
2013-BSB-7 (4-5)	04/11/13	4-5	0.13 J	56.6
2013-BSB-7 (8-10)	04/11/13	8-10	1.98	**3050**
2013-BSB-7 (11)	04/11/13	11	0.449	17.6
2013-BSB-8 (0.9-2)	04/10/11	0.9-2*	0.782	22.6
2013-BSB-8 (2-4)	04/10/13	2-4	1.93	6.75
2013-BSB-8 (4-5)	04/10/13	4-5	0.117 J	70.7
2013-BSB-8 (8-10)	04/10/13	8-10	10.1	**54600**
2013-BSB-8 (11)	04/10/13	11	0.592	43.3
2013-BSB-9 (0.9-2)	04/10/11	0.9-2*	0.783 J	23.6 J
2013-BSB-9 (0.9-2) Dup	04/10/11	0.9-2*	2.08 J	93.4 J
2013-BSB-9 (2-4)	04/10/13	2-4	<0.0287	15.7 J
2013-BSB-9 (4-5)	04/10/13	4-5	0.107 J	13
2013-BSB-9 (8-10)	04/10/13	8-10	1.31	**1830**
2013-BSB-9 (11)	04/10/13	11	1.17	**672**
2013-BSB-10 (0.9-2)	04/11/13	0.9-2*	<0.0286	15.2
2013-BSB-10 (2-4)	04/11/13	2-4	<0.0308	8.88 J
2013-BSB-10 (4-5)	04/11/13	4-5	0.0713 J	25.2
2013-BSB-10 (8-10)	04/11/13	8-10	7.68	**2590**
2013-BSB-10 (11.4)	04/11/13	11.4	0.488	30.9
MW-31 (0.9-2)[3]	05/09/13	0.9-2	1.67 NS	**12900 NS**
MW-31 (0.9-2) Dup[3]	05/09/13	0.9-2	<0.0304 NS	68 NS
MW-31 (5.8-8)	05/09/13	5.8-8	1.35 NS	**1210 NS**
MW-31 (9.5)	05/09/13	9.5	0.245 J, NS	41 NS
MW-31R (0.9-2)	05/21/13	0.9-2	0.0737 J	18.3 J
MW-31R (0.9-2) Dup	05/21/13	0.9-2	0.0397 J	10.7 J
MW-31R (5.8-7.3)	05/21/13	5.8-7.3	5.8	**3150**
MW-31R (9.5)	05/21/13	9.5	0.288 J	35.4 J
Raw Material Storage Building and Immediate Vicinity				
2012-RMSA-1(1.5-2.5')	01/06/12	1.5-2.5	1.3	116
2012-RMSA-2 (0.5-2.5')	01/05/12	0.5-2.5	2.9	**2950**
2013-RMSA-2 (2.5-4')	03/06/13	2.5-4	–	**1520**
2013-RMSA-2 (4-5')	03/06/13	4-5	–	18.9
2012-RMSA-3 (1-3')	01/05/12	1-3	3.9	412
2012-RMSA-4 (1.5-3.5')	01/06/12	1.5-3.5	2.5	**856**
2013-RMSA-5 (0-2')	03/06/13	0-2	0.96	63.4
2013-RMSA-6 (0-2')	03/06/13	0-2	4.00	**6690**
2013-RMSA-6 (2-4')	03/06/13	2-4	–	**4230**
2013-RMSA-6 (4-5')	03/06/13	4-5	–	24.2
2013-RMSA-7 (0-2')	03/06/13	0-2	4.16	**2130**
2013-RMSA-7 (2-4')	03/06/13	2-4	–	35.5
2013-RMSB-1 (1.5-2)	05/08/13	1.5-2*	14.3 J	**1920 J**
2013-RMSB-1 (2-5)	05/08/13	2-5	0.265 J	18.4
2013-RMSB-1 (2-5) Dup	05/08/13	2-5	0.463 J	49.3 J
2013-RMSB-1 (5-5.5)	05/08/13	5-5.5	1.37	240
2013-RMSB-1 (6)	05/08/13	6	0.46	27.8
2013-RMSB-2 (2.5-5)	05/08/13	2.5-5*	2.31	114
2013-RMSB-2 (5-6)	05/08/13	5-6	3.86	226
2013-RMSB-3 (1.5-2')	05/08/13	1.5-2*	0.303	56.4
2013-RMSB-3 (1.5-2') Dup	05/08/13	1.5-2*	0.233 J	66.7
2013-RMSB-3 (2-3)	05/08/13	2-3	<0.0283	8.78 J
2013-RMSB-3 (5-5.5)	05/08/13	5-5.5	0.719	142
2013-RMSB-3 (6)	05/08/13	6	0.183 J	37.6
2013-RMSB-4 (0-2)	05/07/13	0-2	0.471 J	39.7
2013-RMSB-4 (2-5)	05/07/13	2-5	<0.0278	8.26
2013-RMSB-4 (5-6)	05/07/13	5-6	7.40	**2820**
2013-RMSB-5 (1.3-2)	05/07/13	1.3-2*	**72.1**	**1790 J**
2013-RMSB-5 (1.3-2) Dup	05/07/13	1.3-2*	**65.2**	**1580 J**
2013-RMSB-5 (2-5)	05/07/13	2-5	23.9	**4330**
2013-RMSB-5 (5-7)	05/07/13	5-7	**60.7**	**10200**
2013-RMSB-5 (9)	05/07/13	9	1.07	36.8
2013-RMSB-6 (1.3-2)	05/07/13	1.3-2*	0.949	**615**
2013-RMSB-6 (1.3-2) Dup	05/07/13	1.3-2*	0.878	**716**
2013-RMSB-6 (2-2.5)	05/07/13	2-2.5	0.0522 J	16.6
2013-RMSB-6 (5-7)	05/07/13	5-7	0.49	25.3
2013-RMSB-6 (7.5)	05/07/13	7.5	0.499	20.9
2013-RMSB-7 (1.5-2)	05/08/13	1.5-2*	0.372	115
2013-RMSB-7 (2-4)	05/08/13	2-4	0.405	25.9
2013-RMSB-7 (5-6)	05/08/13	5-6	0.379	175
2013-RMSB-7 (6.5)	05/08/13	6.5	0.475	63.5
2013-RMSB-8 (2.1-3.1)	05/08/13	2.1-3.1*	1.93	314
2013-RMSB-8 (5-7)	05/08/13	5-7	18.7	**4240**
2013-RMSB-8 (7.5)	05/08/13	7.5	0.379	23
2013-RMSB-9 (1.3-2)	05/07/13	1.3-2*	4.05	**1210**
2013-RMSB-9 (2-2.5)	05/07/13	2-2.5	0.402	68.5
2013-RMSB-9 (5-7)	05/07/13	5-7	0.449	50.1
2013-RMSB-9 (8)	05/07/13	8	0.435	16.7
2013-RMSB-10 (1.3-2)	05/08/13	1.3-2*	23.5	12.9
2013-RMSB-10 (2-3)	05/08/13	2-3	17.2	**1030**
2013-RMSB-10 (5-6)	05/08/13	5-6	35.8	**911**
2013-RMSB-10 (7)	05/08/13	7	0.506	19.2
Slag Treatment Building				
2013-STB-1 (0-2')	03/06/13	0-2	**181**	**7050**
2013-STB-1 (2-4')	03/06/13	2-4	**483**	**634**
2013-STB-1 (4-5')	03/06/13	4-5	7.06	149
2013-STB-2 (2.5-4')	03/06/13	2.5-4	1.13 J	150 J
2013-STB-2 (2.5-4') Dup	03/06/13	2.5-4	3.43 J	**773 J**
2013-STB-2 (4-5')	03/06/13	4-5	–	18.8
2013-STB-3 (0-2')	03/06/13	0-2	8.21 J	82.1 J
2013-STB-4 (0-2')	03/06/13	0-2	**69.5**	**3720**
2013-STB-4 (2-4')	03/06/13	2-4	**124**	**16100**
2013-STB-4 (4-5')	03/06/13	4-5	9.21	77.9
2013-STB-5 (0.5-1.5')	03/14/13	0.5-1.5*	2.35	178
2013-STB-5 (0.5-1.5') Dup	03/14/13	0.5-1.5*	2.26	159
2013-STB-6 (0.5-1.1')	03/14/13	0.5-1.1*	**146**	**620**
2013-STB-7 (0.5-1.2')	03/14/13	0.5-1.2*	6.65	**1430**
2013-STB-8 (0.8-1.3')	03/14/13	0.8-1.3*	7.80	**1190**
2013-STB-9 (0.5-1.0')	03/14/13	0.5-1*	24.9	**2640**
2013-STB-9 (5-5.5)	05/07/13	5-5.5	0.467	38.8
2013-STB-10 (0.5-1.1')	03/14/13	0.5-1.1*	7.5 J	137
2013-STB-11 (0.5-1.3')	03/14/13	0.5-1.3*	16.6	**1100**
2013-STB-12 (0.5-1.2')	03/14/13	0.5-1.2*	**103**	**1070**
Flood Wall - Facility Side				
2012-FWFS-1 (Floor)	10/22/12	4.0	**143**	**4410**
2012-FWFS-1 (Wall)	10/22/12	2.0	4.7	**22900**
2012-FWFS-1 (4-5')	03/06/13	4-5	0.528	30.9 J
2012-FWFS-2 (Floor)	10/22/12	4.0	0.11	18
2012-FWFS-2 (Wall)	10/22/12	2.4	0.27	13
2012-FWFS-3 (Floor)	10/22/12	3.0	0.27	33
2012-FWFS-3 (Wall)	10/22/12	1.9	0.26	32
2012-FWFS-4 (Floor)	09/24/12	3.1	4.0	**504**
2012-FWFS-4 (Wall)	09/24/12	1.6	0.47	47
2012-FWFS-4 (3-4')	04/29/13	3-4	–	17.2
2012-FWFS-5 (Floor)	09/24/12	3.3	1.4	358
2012-FWFS-5 (Wall)	09/24/12	1.7	**273**	**52000**
2012-FWFS-6 (Floor)	09/04/12	2.1	**387**	**4860**
2012-FWFS-6 (Wall)	09/04/12	1.1	**69**	**6970**
2012-FWFS-6 (2-4')	04/29/13	2-4	13.3	324
2012-FWFS-7 (Floor)	09/04/12	2.3	0.56	29
2012-FWFS-7 (Wall)	09/04/12	1.2	35	**8540**
2012-FWFS-8 (Floor)	09/04/12	2.2	10	**537**
2012-FWFS-8 (Wall)	09/04/12	1.1	3.3	**1550**
2012-FWFS-8 (2-4')	04/29/13	2-4	–	13.5
2012-FWFS-9 (Floor)	09/04/12	2.4	**984**	**2800**
2012-FWFS-9 (Wall)	09/04/12	1.8	15	**7480**
2012-FWFS-9 (2.5-4')	04/29/13	2.5-4	0.624	21
NOR WMU Nos. 6, 14, and 16				
2013-WMU6-1 (0.9-2)	05/07/13	0.9-2*	2.41 J	**10800 J**
2013-WMU6-1 (2-4)	05/07/13	2-4	–	**33200**
2013-WMU6-1 (4-5)	05/07/13	4-5	–	46.5
2013-WMU14-1 (0.9-2)	05/07/13	0.9-2*	16.6	**95000**
2013-WMU14-1 (0.9-2) Dup	05/07/13	0.9-2*	13.6	**69000**
2013-WMU14-1 (2-4)	05/07/13	2-4	–	**31400**
2013-WMU14-1 (4-5)	05/07/13	4-5	–	**3470**
2013-WMU14-2 (0.9-2)	05/07/13	0.9-2*	2.52	100
2013-WMU14-3 (0.9-2)	05/07/13	0.9-2*	0.357	11.6
2013-WMU16-1 (0.9-2)	05/07/13	0.9-2*	0.415	18.2
Bale Stabilization Area				
2012-BSA-1 (0-2')	01/04/12	0-2	5.1	**1250**
2012-BSA-1A (0-2')	03/23/12	0-2	–	97
2012-BSA-2 (0-2')	01/04/12	0-2	**102**	**25900**
2012-BSA-2 (2-4')	04/29/13	2-4	0.652	123
2012-BSA-3 (0-2')	01/04/12	0-2	**95**	106
2012-BSA-3A (0-2')	03/23/12	0-2	**935**	–
2012-BSA-4 (0-2')	01/04/12	0-2	1.0	**1090**
2012-BSA-4a (0-1')	03/29/12	0-1	9.8	**1510**
2012-BSA-4b (0-1')	03/29/12	0-1	3.3	344
2012-BSA-4c (0-1')	03/29/12	0-1	17	**2730**
2012-BSA-4d (0-1')	03/29/12	0-1	17	**3000**
2012-BSA-4e (0-1')	03/29/12	0-1	6.2	**634**
2012-BSA-5 (0-2')	01/04/12	0-2	13	**858**
MW-23 (0-0.5)	03/05/13	0-0.5	3.5	**1280**
MW-23 (0.5-2)	03/05/13	0.5-2	–	481
Maintenance Building				
2013-MB-1 (0-2')	03/14/13	0-2	0.04 J	46.7
2013-MB-2 (0-2')	03/14/13	0-2	2.32	245
Battery Breaker Area				
MW-30 (0-0.5')	03/27/13	0-0.5	**62.7 J**	**20300**
MW-30 (0-0.5') Dup	03/27/13	0-0.5	32 J	**19200**
MW-30 (0.5-2')	03/27/13	0.5-2	–	128
2013-RRS-3A (0.8-2')	03/27/13	0.8-2*	13.0	**2610**
2013-RRS-3A (2-4')	03/27/13	2-4	–	84.2
2013-RRS-4A (0.9-2')	05/21/13	0.9-2	18.2	**5540**
2013-BB-1 (0.9-2)	05/21/13	0.9-2	16.1	**3960**
Truck Staging Area and Administrative Building Area				
2013-AD-1 (0-0.5')	3/14/2013	0-0.5	7.52	**2570**
2013-AD-1 (0.5-2')	3/14/2013	0.5-2	–	174 J
2013-AD-2 (0-0.5')	3/15/2013	0-0.5	9.62	**3770**
2013-AD-2 (0.5-2')	4/29/2013	0.5-2	–	**569 J**
2013-AD-2 (0.5-2') Dup	4/29/2013	0.5-2	–	306 J
2013-AD-2 (2-4')	4/29/2013	2-4	–	114 J
2013-AD-2A (0-0.5')	3/27/2013	0-0.5	0.296 J	175
2013-FOP-1 (0-0.5')	3/14/2013	0-0.5	20.1	**6460**
2013-FOP-1 (0.5-2')	3/14/2013	0.5-2	–	**505**
2013-FOP-1 (2-4)	3/14/2013	2-4	–	90.4 J
2013-MW 10-1 (0-0.5')	03/05/13	0-0.5	0.578	202 J
2013-MW 10-2 (0-0.5)	03/05/13	0-0.5	3.25	**1200**
2013-MW 10-2 (0.5-2)	03/05/13	0.5-2	–	44.1
2013-MW 10-3 (0-0.5')	03/05/13	0-0.5	18.8	**3920 J**
2013-MW 10-3 (0-0.5') Dup	03/05/13	0-0.5	13.6	**1520 J**
2013-MW 10-3 (0.5-2')	03/05/13	0.5-2	–	208
2013-TS-1 (0-0.5)	03/14/13	0-0.5	0.183J	10.2 J
2013-TS-2 (0-0.5)	03/14/13	0-0.5	0.591	98.6

Sample ID	Sample Date	Sample Depth (feet bgs)	Cadmium (mg/kg)	Lead (mg/kg)
Surface Soil Residential Assessment Level (0-15 feet bgs)[1]:			52	500
Surface Soil Critical PCL (0-5 feet bgs)[2]:			852	1600
Subsurface Soil Residential Assessment Level (>15 feet bgs)[1]:			2950	27451
Subsurface Soil Critical PCL (>5 feet bgs)[2]:			2950	27451
STEWART CREEK CORRIDOR				
2012-FWCS-1 (0-2')	01/18/12	0-2	10	**2240**
2012-FWCS-1 (2-2.5')	09/04/12	2-2.5	–	**6270**
2012-FWCS-1 (2.5-4')	03/05/13	2.5-4	–	**780**
2012-FWCS-1 (4-5')	03/05/13	4-5	–	22
2012-FWCS-1A (1-2')	03/05/13	1-2*	–	**19400**
2012-FWCS-1A (1-2') Dup	03/05/13	1-2	–	**12100**
2012-FWCS-1A (2-4')	03/05/13	2-4	–	12.4
2013-FWCS-1B (1.1-1.6')	03/15/13	1.1-1.6*	0.783	80.1 JH
2012-FWCS-2 (0-2')	01/19/12	0-2	0.076	24
2012-FWCS-3 (0-2')	01/19/12	0-2	0.15	35
2012-FWCS-4 (0-2')	01/19/12	0-2	0.12	158
2012-FWCS-5 (0-2')	01/19/12	0-2	1.3	224
2012-FWCS-6 (0-2')	01/19/12	0-2	0.90	253
2012-FWCS-7 (0-2')	01/19/12	0-2	0.58	64
2012-FWCS-8 (0-2')	01/18/12	0-2	234	**853**
2012-FWCS-9 (0-2')	01/18/12	0-2	3.1	81
2012-FWCS-11 (0-2')	09/04/12	0-2	–	217
2012-FWCS-12 (0-2')	09/04/12	0-2	–	**20500**
2012-FWCS-12 (2-2.7')	03/15/13	2-2.7	4.09	**31000**
2012-FWCS-12 (4-5')	03/15/13	4-5	–	19.1
2013-FWFS-1A (2-4')	03/05/13	2-4	–	15
2013-FWFS-1A (4-5')	03/05/13	4-5	–	14.9
2012-FWFS-7A (0-0.5)	05/21/13	0-0.5	0.32	44.7 J
2013-MW-17A (0-0.5')	03/15/13	0-0.5	0.921	279
2013-RO-1 (0-0.5')	03/05/13	0-0.5	2.91	**1170**
2013-RO-1 (0.5-1')	03/05/13	0.5-1	–	19.8
2013-RO-2 (0-0.5')	03/05/13	0-0.5	5.26	**811**
2013-RO-3 (0-0.5')	03/15/13	0-0.5	0.347	26.1 J
MW-24 (0-0.5')	03/05/13	0-0.5	0.0829 J	8.82 J
MW-27 (0-1')	03/05/13	0-1	–	400
MW-29 (0-0.5')	03/06/13	0-0.5	3.38	455
MW-29 (2.5-4')	03/05/13	2.5-4	1.56	87.3
MW-29 (4-5')	03/05/13	4-5	< 0.0306	8.6
SCC-1 (0-0.5')	01/15/13	0-0.5	1.21	188
SCC-2 (0-0.5')	01/15/13	0-0.5	0.897	99.4
SCC-3 (0-0.5')	01/15/13	0-0.5	33.3	**3510**
SCC-3 (0.5-2')	03/05/13	0.5-2	–	**535**
SCC-3 (2-4')	03/05/13	2-4	–	**1300 J**
SCC-3 (4-5')	03/05/13	4-5	–	15.2
SCC-3A (0-0.5')	03/05/13	0-0.5	–	140
SCC-4 (0-0.5')	01/15/13	0-0.5	0.851	199
SCC-5 (0-0.5')	01/15/13	0-0.5	1.51	443
SCC-6 (0-0.5')	01/15/13	0-0.5	1.04	200
SCC-7 (0-0.5')	01/15/13	0-0.5	0.681	186
SCC-8 (0-0.5')	01/15/13	0-0.5	6.93	**4870**
SCC-9 (0-0.5')	01/15/13	0-0.5	2.36	149
SCC-10 (0-0.5')	01/15/13	0-0.5	6.55	**1510**
SCC-10 (0.5-2')	03/05/13	0.5-2	–	23.5
SCC-10A (0-0.5')	03/05/13	0-0.5	1.40	296
SCC-11 (0-0.5')	01/15/13	0-0.5	**106**	**788**
SCC-11 (2-4')	03/06/13	2-4	0.538	17.6 J
SCC-11 (2-4') Dup	03/06/13	2-4	0.697	60.9 J
SCC-11A (0-0.5')	03/06/13	0-0.5	2.45	268
SCC-12 (0-0.5')	01/15/13	0-0.5	1.44	210
SCC-13 (0-0.5')	01/15/13	0-0.5	0.253 J	34.6
SCC-14 (0-0.5')	01/15/13	0-0.5	0.158 J	42.7
SCC-15 (0-0.5')	01/15/13	0-0.5	1.62 J	177
NORTH AREA				
Slag Landfill and Boneyard				
2012-BY-1 (0-2')	01/04/12	0-2	1.0	28
2012-BY-2 (0-2')	01/04/12	0-2	13	**1420**
2012-BY-3 (0-2')	01/04/12	0-2	0.90	75
2012-BY-4 (0-2')	01/04/12	0-2	**66**	**47000**
2012-BY-5 (0-2')	01/04/12	0-2	5.4	431
2012-SL-1 (0-2')	01/10/12	0-2	2.3	379
2012-SL-1 (2-4')	01/10/12	2-4	50	**7970**
2012-SL-1 (4-5')	03/06/13	4-5	–	**48500**
2012-SL-2 (0-2')	01/10/12	0-2	0.80	84
2012-SL-2 (5-7')	01/10/12	5-7	0.58	73
2012-SL-3 (0-2')	01/10/12	0-2	0.75	47
2012-SL-3 (8-10')	01/10/12	8-10	1.0	7.2
2013-SL-4 (0-0.5')	03/07/13	0-0.5	21.5	82.3
2013-WMU17-1 (0-0.5')	3/15/2013	0-0.5	6.14	**1350**
2013-WMU17-2 (0-0.5')	3/15/2013	0-0.5	6.09	**1460**
North Disposal Area				
2012-NDA-1 (0-2')	01/10/12	0-2	4.0	318
2012-NDA-1 (2-4')	01/10/12	2-4	27	**7060**
2012-NDA-1 (4-5')	03/05/13	4-5	–	19
2012-NDA-2 (0-2')	01/10/12	0-2	1.8	284
2012-NDA-2 (2-4')	01/10/12	2-4	0.68	**1030**
2012-NDA-2 (16-18')	01/10/12	16-18	0.036	14
2012-NDA-3 (0-2')	01/10/12	0-2	11	**2410**
2012-NDA-3 (17-19')	01/10/12	17-19	0.034	8.9
2012-NDA-4 (2-4')	02/22/12	2-4	–	228
2012-NDA-6 (0-2')	02/22/12	0-2	–	113
North Tributary Corridor and North Wooded Area				
D-11	03/28/12	0-0.5	3.62	**524**
D-11 (0.5-1.0')	04/22/13	0.5-1	–	312
D-12	03/28/12	0-0.5	3.71	**522**
D-12 (0.5-1')	04/22/13	0.5-1	–	29.7
D-13	03/28/12	0-0.5	2.98	434
D-14	03/28/12	0-0.5	1.445 J	204
D-15	03/28/12	0-0.5	1.61 J	245
E-11	03/28/12	0-0.5	17.8	**2920**
E-11 (0.5-2')	03/06/13	0.5-2	–	109
E-11 (2-4')	03/06/13	2-4	0.865	46
E-11 (4-5')	03/06/13	4-5	0.511	5.26
E-11 (5-7')	04/29/13	5-7	0.385	--
E-11 (7-9')	04/29/13	7-9	0.485	--
E-11 (9-10.7')	04/29/13	9-10.9	0.367	--
E-11A (0-0.5')	03/06/13	0-0.5	3.89	**816**
E-11A (0.5-1')	04/22/13	0.5-1	–	285
E-11B (0-0.5')	03/15/13	0-0.5	0.922	216
E-12	03/28/12	0-0.5	18.3	**2610**
E-12 (0.5-1')	04/22/13	0.5-1	–	70
E-13	03/28/12	0-0.5	10.1	**1850**
E-13 (0.5-1)	04/22/13	0.5-1	–	33.6
E-14	03/28/12	0-0.5	5.64	**1090**
E-14 (0.5-1')	04/22/13	0.5-1	–	54.9
E-15	03/28/12	0-0.5	4.34	**893**
E-15 (0.5-1')	04/22/13	0.5-1	–	43.6
E-15A (0-0.5')	03/06/13	0-0.5	1.51	234
ECO-11 (0-0.5')	03/05/13	0-0.5	0.809	45.3
ECO-12 (0-0.5')	03/05/13	0-0.5	0.953	240
MW-21 (0-0.5')	03/05/13	0-0.5	0.340	8.6
MW-22 (0-0.5')	03/05/13	0-0.5	0.853	84.2
Class 2 Landfill Area				
2013-PMW-19R (0-0.5)	02/26/13	0-0.5	< 0.0302	20.4
2013-PMW-20R (0-0.5)	02/26/13	0-0.5	0.362	149
2013-LMW-21 (0-0.5)	02/27/13	0-0.5	0.796	209
2013-LMW-22 (0-0.5)	02/27/13	0-0.5	1.32	282
SOUTH AREA				
South Disposal Area				
2013-BS2-1 (0.5-2')	4/29/2013	0.5-2	–	73.9
BS-3 (1-2')	03/04/13	1-2	–	**610**
BS-3 (2-4')	03/04/13	2-4	–	40.2
2013-B4R-A (0-0.5')	04/29/13	0-0.5	0.181J	187 J
2013-B4R-A (0-0.5') Dup	04/29/13	0-0.5	0.712	382 J
2013-BS5-1 (0.5-2')	04/29/13	0.5-2	–	3.85
2012-SDA-1 (0-2')	01/04/12	0-2	1.2	164
2012-SDA-1 (2-4')	01/04/12	2-4	0.32	33
2012-SDA-2 (0-2')	01/04/12	0-2	7.0	**1090**
2012-SDA-2 (2-4')	01/04/12	2-4	0.30	11
2012-SDA-3 (0-2')	01/04/12	0-2	1.0	74
2012-SDA-3 (2-4')	01/04/12	2-4	0.57	13
2013-SDA-3A (0-0.5')	03/04/13	0-0.5	1.14	452
2012-SDA-4 (0-2')	01/04/12	0-2	0.83	20
2012-SDA-4 (2-4')	01/04/12	2-4	0.53	4.2
2013-SDA-4A (0-0.5')	03/04/13	0-0.5	5.02	**1570**
2013-SDA-4A (0.5-2')	03/04/13	0.5-2	–	69.6
2012-SDA-5 (0-2')	01/04/12	0-2	1.1	91
2012-SDA-5 (2-2.9')	01/04/12	2-2.9	0.36	3.7
South Wooded Area				
ECO-1 (0-0.5')	01/15/13	0-0.5	1.85	431
ECO-2 (0-0.5')	01/15/13	0-0.5	3.19	396
ECO-3 (0-0.5')	01/15/13	0-0.5	10.1	**1740**
ECO-3 (0.5-2')	03/06/13	0.5-2	–	43.9
ECO-4 (0-0.5')	01/15/13	0-0.5	2.97	373
ECO-5 (0-0.5')	01/15/13	0-0.5	1.62	221
ECO-6 (0-0.5')	01/15/13	0-0.5	7.92	**1030**
ECO-6 (0.5-2')	03/04/13	0.5-2	–	22.7
ECO-7 (0-0.5')	01/15/13	0-0.5	14.6	**2340**
ECO-7 (0.5-2')	03/06/13	0.5-2	–	76.5 J
ECO-7 (0.5-2') Dup	03/06/13	0.5-2	2.64	400 J
ECO-7A (0-0.5')	03/06/13	0-0.5	3.61	**606**
ECO-7B (0-0.5')	03/15/13	0-0.5	2.48	327
ECO-8 (0-0.5')	01/15/13	0-0.5	3.61	**600**
ECO-8 (0.5-2')	03/04/13	0.5-2	–	112
ECO-9 (0-0.5')	01/15/13	0-0.5	12.6	**2050**
ECO-9 (0.5-2')	03/04/13	0.5-2	–	412
ECO-10 (0-0.5')	01/15/13	0-0.5	3.30	345
Crystallization Unit Area				
2012 CUFT-1(0-2')	01/06/12	0-2	0.34	13
2012 CUFT-2 (0-2')	01/06/12	0-2	0.47	33
2013-CUFT-3 (0-0.5')	03/04/13	0-0.5	1.58 J	25.4 J
2013-CUFT-4 (0-0.5')	03/04/13	0-0.5	4.38	107
2013-CUFT-5 (0-0.5')	03/04/13	0-0.5	3.10	442
2013-CUFT-6 (0-0.5')	03/04/13	0-0.5	7.65	71.3 J
2013-CUFT-6 (0-0.5') Dup	03/04/13	0-0.5	7.80	365 J
2013-CUFT-7 (0-0.5')	03/04/13	0-0.5	5.68	**746**
2013-CUFT-7 (0.5-2')	03/04/13	0.5-2	–	267
2013-CUFT-7A (0-0.5')	03/07/13	0-0.5	5.83	80.2
2013-CUFT-8 (0-0.5')	03/04/13	0-0.5	0.192 J	28.8
2013-CUFT-9 (0-0.5')	03/04/13	0-0.5	0.307	32.8
2013-CUFT-10 (0-0.5')	03/07/13	0-0.5	1.53	319
Shooting Range Berm and South Berm Verification Samples				
SRB-VS-1	05/15/13	0-0.5	0.186 J	27.8
SRB-VS-2	05/15/13	0-0.5	0.132 J	58.1
SRB-VS-3	05/15/13	0-0.5	0.891	20.7
SRB-VS-4	05/15/13	0-0.5	0.551	21.8
SRB-VS-5	05/15/13	0-0.5	2.43	477
SRB-VS-6	05/15/13	0-0.5	0.159 J	11.3
SRB-VS-7	05/15/13	0-0.5	0.729	24.8
SRB-VS-8	05/15/13	0-0.5	0.682	40.4
SRB-VS-9	05/15/13	0-0.5	7.79	**1330**
SRB-VS-9 (0.5-2)	05/21/13	0.5-2	0.0522 J	14.8 J
SRB-VS-9A (0-0.5)	05/21/13	0-0.5	6.58	**1040**
SRB-VS-9B (0-0.5)	05/21/13	0-0.5	1.39	305
SRB-VS-9C	06/03/13	0-0.5	1.81	333
SRB-VS-10	05/15/13	0-0.5	1.35	203
SRB-VS-11	05/15/13	0-0.5	2.47	384
SB-VS-1	06/03/13	0-0.5	1.20	6.1
SB-VS-2	06/03/13	0-0.5	1.13	12.9
LAKE PARCEL				
F-4	3/28/2012	0-3"	2.51 J	255
F-5	3/28/2012	0-3"	3.51	367
G-4	3/28/2012	0-3"	2.17	222
G-4 (1ft)	3/27/2013	1	< 0.0325	18.2
G-5	3/28/2012	0-3"	2.61 J	273
G-5 (1ft)	3/27/2013	1	< 0.0346	13.9
G-6	3/28/2012	0-3"	1.96 J	268
H-3	3/28/2012	0-3"	1.06 J	154
H-4	3/28/2012	0-3"	< 1.05	120
H-4 (1ft)	3/27/2013	1	0.0782 J	17.9
H-5	3/28/2012	0-3"	1.54 J	147
H-5 (1ft)	3/27/2013	1	< 0.0325	15.9
H5-2	2/7/2013	0-3"	1.40	154
H4-2	2/7/2013	0-3"	1.30	145
G4-2	2/7/2013	0-3"	1.50	166

EXPLANATION

- On-Site Property Boundary
- FRC Property Boundary
- Former Path of North Tributary (1951 Aerial Photo)
- Former Path of North Tributary (1972 Aerial Photo)
- Former Path of Stewart Creek (1951 Aerial Photo)
- Monitoring Well Location
- Well Plugged and Abandoned, Destroyed or Not Found
- Soil Sample Location (2012-2013)
- Sediment and Surface Water Sample Location (2012-2013)
- Approx. PCLE Zone

Notes:

1. The Residential Assessment Level (RAL) is the minimum of the TRRP residential Tier 1 $^{Tot}Soil_{Comb}$ (applicable to surface soil only) and Tier 2 $^{GW}Soil_{Class3}$ PCLs for a 30-acre source area (TCEQ, 2012). The $^{Air}Soil_{Inh\text{-}V}$ pathway is not applicable to lead or cadmium and was therefore not used to develop RALs.
2. The critical PCL is the minimum of the TRRP commercial-industrial Tier 1 $^{Tot}Soil_{Comb}$ (applicable to surface soil only) and Tier 2 $^{GW}Soil_{Class3}$ PCLs for a 30-acre source area (TCEQ, 2012). The $^{Air}Soil_{Inh\text{-}V}$ pathway is not applicable to lead, cadmium or arsenic and was therefore not used to develop critcial PCLs.
3. Surface Soil = 0-15 feet bgs for residential land use and 0-5 feet bgs for commercial -industrial land use; subsurface soil = greater than 15 feet bgs for residential land use and greater than 5 feet bgs for commercial-industrial land use.
4. RAL exceedances are bolded. Critical PCL exceedances are highlighted and bolded.
5. Only SIR and APAR investigation samples are shown.
6. Data qualifiers: See Section 3.5.
7. bgs - Below ground surface.
8. *- Sub-slab or sub-gabion basket sample; top depth represents the approximate top of soil.
9. "--" - Not analyzed.
10. Soil samples from borings 2013-BSA-6 and 2013-BSA-7 were analyzed for pH only; samples from boring 2012-FWFS-7B were not analyzed because affected property was delineated at 2012-FWFS-7A to the north; 2012-NDA-5 was installed for delineation of the North Disposal Area boundary, and because slag was encountered in this boring a subsequent boring was completed at 2012-NDA-6 (only samples from 2012-NDA-6 were analyzed).

N

Scale in Feet

0 75 150

Source of photo:
Imagery from NCTCOG, 2009 photography.

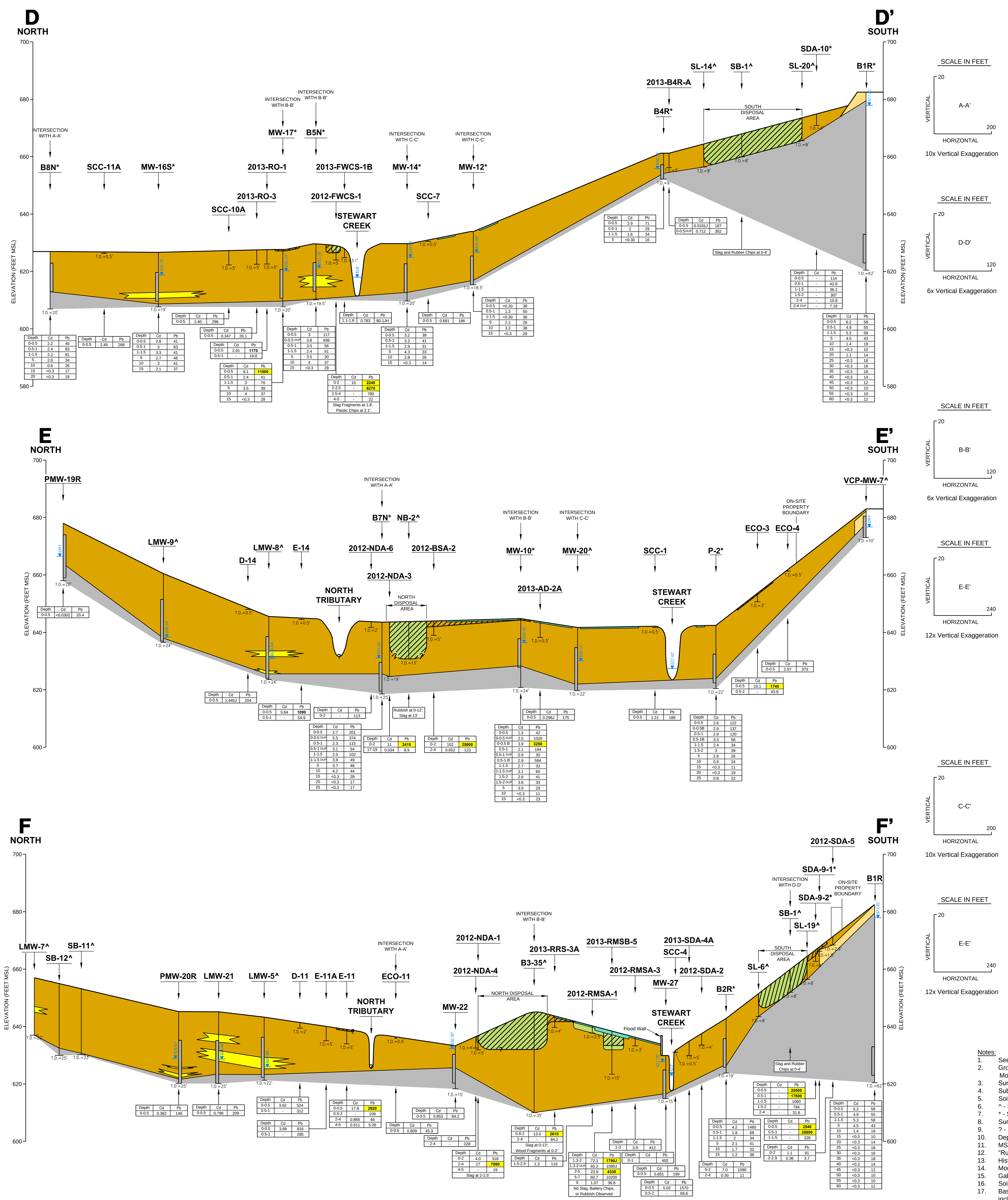
FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

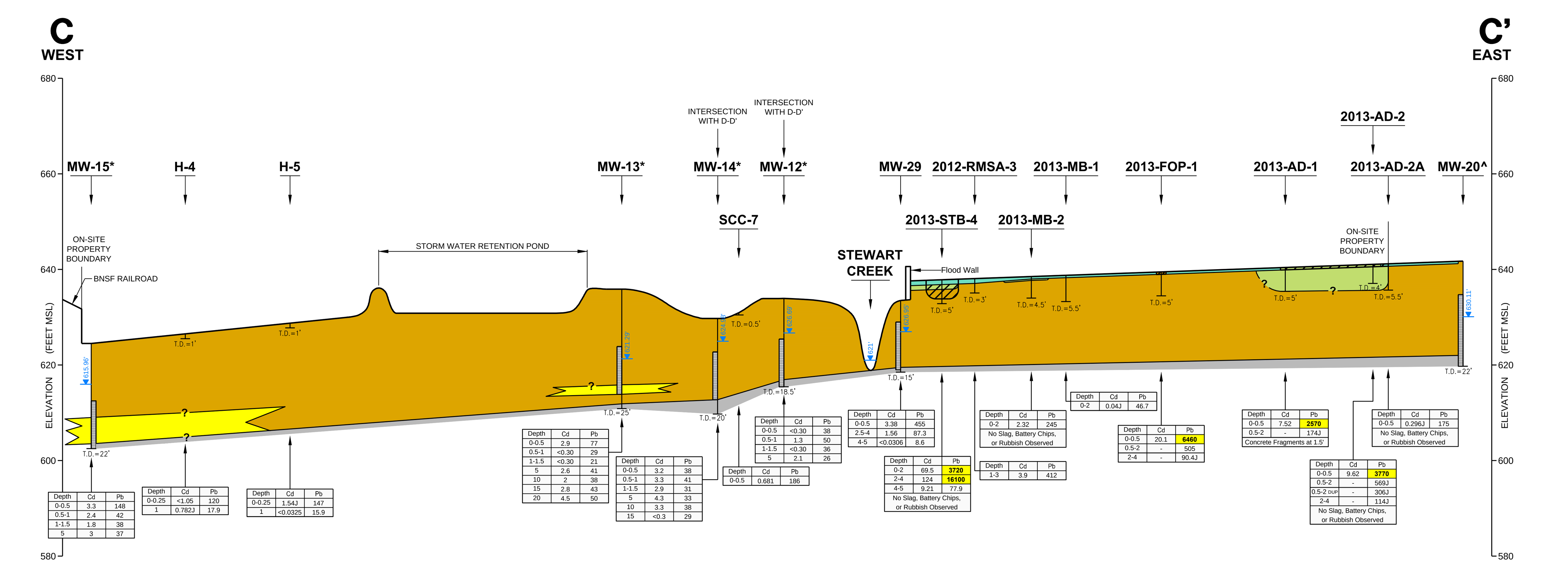
Figure 11A

SOIL PCLE ZONE MAP

PROJECT: 1755	BY: AJD	REVISIONS
DATE: MAY, 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS





Notes:

1. See Figure 4C.1 for cross section locations.
2. Ground surface elevations and creek bed topography are estimated. Monitoring well elevations were surveyed by a professional surveyor.
3. Surface soil critical PCLs (0-5 feet bgs): Pb = 1,600 mg/kg; Cd = 852 mg/kg.
4. Subsurface soil critical PCLs (greater than 5 feet bgs): Pb = 27,451 mg/kg; Cd = 2,950 mg/kg.
5. Soil sample results that exceed the applicable critical PCL are highlighted and bolded.
6. ^ - Soil sample data not available.
7. * - Soil sample results based on historical data (see Appendix 17).
8. Surface water elevations in Stewart Creek inferred from staff gauge elevations measured 4/29/2013.
9. ? - Boundary uncertain.
10. Depths given in feet bgs.
11. MSL - Above mean sea level.
12. "Rubbish" used as defined in 30 TAC 330.3(A)(130).
13. Historical data not used to delineate RAL exceedance zone.
14. Monitoring wells B8N, LMW-7, and B2R either plugged and abandoned or destroyed.
15. Gabion basket present at 0.0 to 1.1 feet bgs at 2013-FWCS-1B.
16. Soil data provided for B1R is from B1N, which was replaced by B1R.
17. Based on historical use, the North Disposal Area, South Disposal Area, and Slag Landfill are included entirely within the affected property and critical PCLE zone boundaries.
18. Data qualifiers (See Section 3.5)

EXPLANATION

GENERALIZED LITHOLOGIC ABBREVIATIONS

- Concrete
- Fill
- Clay or Silty Clay with Minor Occurrences of Silt and Gravelly Clay (Gravel Suspended in Clay Matrix)
- Gravel or Sand (Typically Clayey)
- Austin Chalk Limestone
- Eagle Ford Shale
- Soil PCLE Zone

MONITORING WELL CONSTRUCTION

Screened Interval
Bottom Cap
T.D.=24'
Total Depth

Water Level (Ft MSL) Measured 4/29/13

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
7-9-13

FORMER OPERATING PLANT
FRISCO RECYCLING CENTER
FRISCO, TEXAS

Figure 11C

CROSS SECTIONS OF THE PCLE ZONE

PROJECT: 1755	BY: AJD	REVISIONS
DATE: JUNE, 2013	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

12.0 GROUNDWATER CRITICAL PCL DEVELOPMENT

12.1 Tier 2 or 3 PCL Development and Non-Default Parameters

Tier 2 or Tier 3 PCLs were not developed for groundwater COCs; therefore, this section is not applicable.

12.2 Groundwater PCL Adjustments

Groundwater PCL adjustments were not made for groundwater COCs; therefore, this section is not applicable.

12.3 Groundwater Critical PCLs

As discussed in Section 10, TRRP Rules 30 TAC §350.71(k)(1) and §350.71(k)(3) specify that a COC may be screened from critical PCL development if all detected COC concentrations and SQLs are less than applicable RALs or if all SQLs for analytes not detected are less than applicable RALs. As discussed in Section 5, concentrations of all COCs in all groundwater samples collected as part of this affected property assessment were less than applicable RALs; therefore, all groundwater COCs were screened from critical PCL development.

AFFECTED PROPERTY ASSESSMENT REPORT

Former Operating Plant
Frisco Recycling Center
Frisco, Texas

Appendices

Appendix 1 Notifications [*not applicable*]

Appendix 2 Boring Logs and Monitoring Well Completion Details

Appendix 3 Monitoring Well Development and Purging Data

Appendix 4 Registration and Institutional Controls

Appendix 5 Water Well Records

Appendix 6 Monitoring Well Records

Appendix 7 Groundwater Resource Classification Evaluation

Appendix 8 Statistics Data Tables and Calculations

Appendix 9 Development of Non-Default RBELs and PCLs

Appendix 10 Laboratory Data Packages and Data Usability Summary

Appendix 11 Selenium Groundwater Attenuation Demonstration

Appendix 12 Waste Characterization and Disposition Documentation

Appendix 13 Photographic Documentation

Appendix 14 Standard Operating Procedures [*not applicable*]

Appendix 15 OSHA Health and Safety Plan (§350.74(b)(1)) [*not applicable*]

Appendix 16 Reference List

Appendix 17 Historical Data

Appendix 18 W&M Slag and Battery Case Chip Survey Report

Appendix 19 French Drain Construction Report

Appendix 20 Historical Aerial Photographs

Appendix 21 FRC Feed Documentation

Appendix 22 SPLP Data Summary

Appendix 23 SIR and APAR Sample Coordinates

Appendix 2

Boring Logs and Monitoring Well Completion Details

2013 APAR Investigation Boring Logs

Exide Technologies	Log of Boring: MW-21

Frisco Recycling Center Frisco, TX	Completion Date:	3/5/2013	Drilling Method:	HSA/DPT
	Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
	Driller:	Dan Spaust	Total Depth (ft):	15
PBW Project No. 1755	Driller's License:	3038M	Northing:	7102518.8983
	Logged By:	Tim Jennings, P.G.	Easting:	2480490.8249
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	633.66
	Sampling Method:	5' Split Spoon/5' Samp Tube	TOC Elev. (ft AMSL):	635.99

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0		3.8/5.0	CL	0-0.5	(0 - 1.0) Silty CLAY, light grayish brown, abundant orange staining (iron oxide), moist, soft, low to medium plasticity.
				0.5-2	(1.0 - 4.0) Gravelly CLAY, light brownish orange, very moist, soft to firm, low plasticity, ~20% medium gravel in clay matrix.
				2-4	
			CH	4-5	(4.0 - 5.0) CLAY, light grayish brown, abundant orange staining (iron oxide), moist, hard, medium to high plasticity.
5		2.5/2.5	CL		(5.0 - 5.5) Gravelly CLAY, light brown and orange, moist, firm, medium plasticity, 10-30% fine to medium gravel in clay matrix.
					(5.5 - 10.5) Silty CLAY, light brown, orange and gray laminations, moist, hard, medium plasticity, heavily weathered shale.
		2.5/2.5			
10		2.5/2.5	SH		(10.5 - 15.0) SHALE, gray, moist, hard, weathered shale.
		2.5/2.5			
15					

Notes:
This log should not to be used separately from the report to which it is attached.

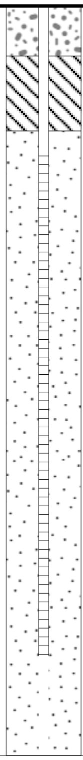
Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 2.5) Bentonite Hole Plug
(2.5 - 15.0) 20/40 Silica Sand

Well Materials
(+2.33 - 3.0) Casing, 2" Sch 40 FJT PVC
(3.0 - 13.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Exide Technologies	Log of Boring: MW-22

Frisco Recycling Center Frisco, TX	Completion Date:	3/5/2013	Drilling Method:	HSA/DPT
	Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
	Driller:	Dan Spaust	Total Depth (ft):	15
PBW Project No. 1755	Driller's License:	3038M	Northing:	7102440.5654
	Logged By:	Tim Jennings, P.G.	Easting:	2480046.6732
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	633.29
	Sampling Method:	5' Split Spoon/5' Samp Tube	TOC Elev. (ft AMSL):	636.89



Depth (ft)	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0	3.5/5.0	CL	0-0.5	(0 - 1.5) Gravelly CLAY, light grayish brown, abundant orange staining (iron oxide), moist, soft, low plasticity.
			0.5-2	(1.5 - 3.0) Silty CLAY, light grayish brown, abundant orange staining (iron oxide), moist, soft, low plasticity.
			2-4	(3.0 - 5.0) Gravelly CLAY, light grayish brown, abundant orange staining (iron oxide), moist, soft, low plasticity.
			4-5	
5	1.0/2.5			(5.0 - 7.7) Silty CLAY, light brown, orange and gray, moist, firm, medium plasticity.
	2.5/2.5	SH		(7.7 - 12.3) SHALE, gray, brown and orange; moist, firm, weathered.
10	2.5/2.5			
	2.5/2.5			(12.3 - 15.0) SHALE, gray, dry, hard.
15				

PBW

Pastor, Behling & Wheeler, LLC
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Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This log should not to be used separately from the report to which it is attached.

Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 2.5) Bentonite Hole Plug
(2.5 - 15.0) 20/40 Silica Sand

Well Materials
(+3.6 - 3.0) Casing, 2" Sch 40 FJT PVC
(3.0 - 13.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies

Log of Boring: MW-23

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	3/5/2013	Drilling Method:	HSA/DPT
Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
Driller:	Dan Spaust	Total Depth (ft):	20
Driller's License:	3038M	Northing:	7102124.8425
Logged By:	Tim Jennings, P.G.	Easting:	2480769.4386
Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	644.32
Sampling Method:	5' Split Spoon/5' Samp Tube	TOC Elev. (ft AMSL):	644.15

Depth (ft)	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0 - 0.3	5.0/5.0	FILL	0-0.5	(0 - 0.3) FILL, surficial fill not associated with NDA, no foreign objects (e.g. slag, battery chips or trash) observed, sand with clay, reddish brown, moist, soft.
0.3 - 2.6		FILL	0.5-2	(0.3 - 2.6) FILL, surficial fill not associated with NDA, no foreign objects (e.g. slag, battery chips or trash) observed, silty clay/clayey silt, trace gravel, dark reddish brown, moist, firm, low plasticity.
2.6 - 5.5		ML	2-4, 4-5	(2.6 - 5.5) Clayey SILT, dark reddish brown, dry, hard, low plasticity, ~15% calcareous nodules.
5.5 - 10	0.5/5.0	CH		(5.5 - 10) Silty CLAY, light brown, moist, soft to firm, high plasticity, ~10-15% carbonate nodules in clay matrix (based on cuttings).
10 - 12.2	2.5/2.5	CH		(10 - 12.2) Gravelly, sandy CLAY; light brown, moist to wet, ~20-30% fine to medium gravel and ~10-20% fine to medium sand in clay matrix.
12.2 - 16.2	2.5/2.5	CL/CH		(12.2 - 16.2) Silty CLAY, light brown, orange and gray, moist, firm to hard, laminated, possibly heavily weathered shale.
16.2 - 17.7	4.5/5.0	SH		(16.2 - 17.7) SHALE, light brown, orange and gray, moist, firm, friable and weathered.
17.7 - 20.0		SH		(17.7 - 20.0) SHALE, gray, moist, hard.

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Notes:
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Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 3.5) Bentonite Hole Plug
(3.5 - 19.5) 20/40 Silica Sand
(19.5 - 20.0) Sloughed Material

Well Materials
(-.17 - 4.5) Casing, 2" Sch 40 FJT PVC
(4.5 - 19.5) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies

Log of Boring: MW-24

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	3/5/2013	Drilling Method:	HSA/DPT
Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
Driller:	Dan Spaust	Total Depth (ft):	29
Driller's License:	3038M	Northing:	7102133.0317
Logged By:	Tim Jennings, P.G.	Easting:	2479613.4306
Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	639.62
Sampling Method:	5' Split Spoon/5' Samp Tube	TOC Elev. (ft AMSL):	642.96

Depth (ft)	Recovery (ft/ft)	Sample
0	5.0/5.0	0-0.5
		0.5-2
		2-4
		4-5
5	1.5/2.5	
	2.5/2.5	
10	1.5/2.5	
	2.5/2.5	
15	1.5/2.5	
	2.5/2.5	
20	3.0/3.0	
	1.0/2.0	
25	1.0/2.5	
	1.5/1.5	

USCS	Lithologic Description
FILL	(0 - 5.0) Silty clay/clayey silt FILL, moist, firm, low plasticity, dry and very hard 3-5'.
FILL	(5.0 - 12.8) Gravelly clay FILL, dark brown and dark grayish brown, light brown 7.5-9.5, moist, firm to hard, medium to high plasticity, ~5-10% fine to coarse gravel fill, large carbonate cobbles at 11'.
FILL	(12.8 - 15.9) Sandy clay FILL; dark reddish brown, moist, hard, low plasticity clay, iron oxide staining, very stiff.
CL	(15.9 - 18.5) Silty, sandy CLAY; dark reddish brown, trace iron oxide staining, moist, firm, medium plasticity, increasing moisture downward.
MH	(18.5 - 20.2) Clayey SILT, dark brown, wet, soft, high plasticity.
CH	(20.2 - 23.1) Silty CLAY, grayish brown, moist to wet, firm, <5% fine calcareous nodules, wet sand interbedded at 22.5-22.6'.
SW	(23.1 - 23.7) Clayey SAND, brown, wet, soft, sub-rounded sand, ~10-20% clay in fine to coarse sand.
CL	(23.7 - 27.5) Gravelly CLAY, light brown to brown, wet, firm, sub-rounded gravel, medium plasticity clay, ~30-40% fine gravel in clay matrix, sandy gravel 27.3-27.5'.
SH	(27.5 - 28.4) SHALE, light brown, orange and gray, abundant iron oxide staining, weathered.
SH	(28.4 - 29.0) SHALE, gray, dry, very hard.

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Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 12.0) Bentonite Hole Plug
(12.0 - 29.0) 20/40 Silica Sand

Well Materials
(+3.34 - 14.0) Casing, 2" Sch 40 FJT PVC
(14.0 - 29.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies	Log of Boring: MW-25

Frisco Recycling Center Frisco, TX	Completion Date:	2/27/2013	Drilling Method:	HSA
	Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
	Driller:	Chris Combs	Total Depth (ft):	22
PBW Project No. 1755	Driller's License:	56033	Northing:	7101782.1994
	Logged By:	Roberta Russell	Easting:	2479376.8891
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	633.36
	Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	635.85

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0–5		5.0/5.0	CL/ML		(0 - 20.0) Silty CLAY/Clayey SILT, dark reddish brown, moist, soft to firm, low plasticity, very moist at 13.5 to 15.0', gravelly clay lenses in very moist calcareous clay at 15.5-15.6', 16.5-16.7', 17.5-17.9'.
5–10		5.0/5.0			
10–15		5.0/5.0			
15–20		5.0/5.0			
20–20.5		1.0/1.0	GC		(20.0 - 20.5) GRAVEL with clay; wet, soft, low plasticity clay (~20% clay).
20.5–21			SH		(20.5 - 21.0) SHALE, dry, hard.
21–22		0.0/1.0	NR		(21.0 - 22.0) No recovery

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Annular Materials
(0.0 - 0.5) Concrete
(0.5 - 2.0) Bentonite Grout
(2.0 - 4.0) Bentonite Hole Plug
(4.0 - 22.0) 20/40 Silica Sand

Well Materials
(+2.49 - 7.0) Casing, 2" Sch 40 FJT PVC
(7.0 - 22.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies	Log of Boring: MW-26

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	HSA
	Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
	Driller:	Dan Spaust	Total Depth (ft):	15
PBW Project No. 1755	Driller's License:	3038M	Northing:	7101865.0034
	Logged By:	Tim Jennings, P.G.	Easting:	2479876.33
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	628.34
	Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	631.93

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0		4.0/5.0	CL		(0 - 1.0) Sandy CLAY, light reddish brown, moist, firm, low plasticity.
					(1.0 - 5.0) Silty CLAY, dark reddish brown, trace iron oxide orange staining, moist, wet at 3', soft to firm, low plasticity.
5		1.5/2.5	CH		(5.0 - 9.4) Silty CLAY, brown, moist to wet, firm, high plasticity.
		2.5/2.5			
10		1.5/2.5	CL		(9.4 - 10.8) Gravelly CLAY, brown, moist to wet, firm, medium plasticity clay, ~20-40% fine to medium gravel.
					(10.8 - 13.0) Silty CLAY, light brown and orange, laminated with trace iron oxide staining, moist to wet, firm, medium plasticity.
		1.5/2.5	SH		(13.0 - 15.0) SHALE, gray, orange and light brown, trace iron oxide above 14', dry, hard, very hard at 14.5 to 15', low plasticity, weathered.
15					

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Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 4.0) Bentonite Hole Plug
(4.0 - 15.0) 20/40 Silica Sand

Well Materials
(+3.59 - 5.0) Casing, 2" Sch 40 FJT PVC
(5.0 - 15.0) Screen, 2" Sch 40 FJT PVC,
0.010 slot

Exide Technologies	Log of Boring: MW-27

Frisco Recycling Center Frisco, TX				
	Completion Date:	3/6/2013	Drilling Method:	HSA/DPT
	Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
	Driller:	Dan Spaust	Total Depth (ft):	15
	Driller's License:	3038M	Northing:	7101675.2344
PBW Project No. 1755	Logged By:	Tim Jennings, P.G.	Easting:	2480260.288
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	629.89
	Sampling Method:	5' Split Spoon/5' Samp Tube	TOC Elev. (ft AMSL):	633.42

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Sample	PID (ppm)	Lithologic Description
0		4.5/5.0	CL	0-0.5		(0 - 2.5) Silty CLAY, dark reddish brown, moist, soft, low to medium plasticity, moderate hydrocarbon odor below 1'.
				0.5-2	0.1	
				2-4	-	(2.5 - 5.0) Silty CLAY, yellowish brown, wet, very soft, low to medium plasticity, trace sand, some black staining, moderate hydrocarbon odor.
				4-5	0.3	
5		2.5/2.5	MH		125.4	(5.0 - 7.0) Sandy, clayey SILT; gray, moist to wet, soft, high plasticity clay, <5% fine gravel, moderate hydrocarbon odor.
		2.5/2.5	CH		65	(7.0 - 8.0) Silty CLAY, gray, moist to wet, soft, high plasticity, trace calcareous nodules, moderate hydrocarbon odor.
					13	(8.0 - 11.5) Sandy, gravelly CLAY; gray, moist to wet, locally wet, firm, high plasticity clay, ~10-20% fine to medium sand, ~5-10% fine gravel.
10		2.5/2.5			0.5	
			CL		0.5	(11.5 - 13.4) Gravelly CLAY, gray, moist, firm, medium plasticity clay, ~20-40% fine to medium gravel in clay matrix.
		2.5/2.5	SH		1.8	(13.4 - 14.6) SHALE, gray and orange, moist, hard, low plasticity, weathered.
15						(14.6 - 15.0) SHALE, gray, dry, hard.

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Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 4.0) Bentonite Hole Plug
(4.0 - 15.0) 20/40 Silica Sand

Well Materials
(+3.53 - 5.0) Casing, 2" Sch 40 FJT PVC
(5.0 - 15.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies	Log of Boring: MW-28

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	2/27/2013	Drilling Method:	HSA
Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
Driller:	Chris Combs	Total Depth (ft):	20
Driller's License:	56033	Northing:	7102977.6985
Logged By:	Roberta Russell	Easting:	2479831.956
Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	639.47
Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	642.91

Depth (ft)	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0	5.0/5.0	CL/ML		(0 - 10.8) Silty CLAY/Clayey SILT, dark reddish brown, soft to firm, low to medium plasticity, calcareous nodules starting at 7.5'.
5	5.0/5.0			
10	4.2/5.0	CL		(10.8 - 13.5) Gravelly CLAY, yellowish brown, moist, wet at 12.8', soft to firm, low to medium plasticity clay, calcareous nodules, ~10% gravel in clay matrix.
				(13.5 - 16.5) Sandy CLAY, yellowish brown, wet, soft to firm, low plasticity clay, calcareous nodules.
15	5.0/5.0	CL/ML		(16.5 - 19.5) Silty CLAY/Clayey SILT, yellowish brown, moist, soft to firm, low to medium plasticity.
		SH		(19.5 - 20.0) SHALE, dry, hard.
20				

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Annular Materials
(0.0 - 0.5) Concrete
(0.5 - 1.0) Bentonite Grout
(1.0 - 2.5) Bentonite Hole Plug
(2.5 - 20.0) 20/40 Silica Sand

Well Materials
(+3.44 - 5.0) Casing, 2" Sch 40 FJT PVC
(5.0 - 20.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies	Log of Boring: MW-29

Frisco Recycling Center Frisco, TX PBW Project No. 1755				
	Completion Date:	3/6/2013	Drilling Method:	HSA/DPT
	Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
	Driller:	Dan Spaust	Total Depth (ft):	15
	Driller's License:	3038M	Northing:	7101741.6829
	Logged By:	Tim Jennings, P.G.	Easting:	2480041.8696
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	629.39
	Sampling Method:	5' Split Spoon/5' Samp Tube	TOC Elev. (ft AMSL):	633.51

Depth (ft)	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0 - 5	5.0/5.0	CL/ML	0-0.5 0.5-2 2-4 4-5	(0 - 5.0) Silty CLAY/Clayey SILT, dark reddish brown, orange iron oxide staining from 0-0.5', moist, wet at 4', firm to hard, low plasticity, clayey gravel lens from 2.6-2.7'.
5 - 7.5	2.5/2.5	CH		(5.0 - 8.0) Silty CLAY, dark grayish brown, moist to wet, firm, high plasticity, fine to medium gravel in silty clay matrix at 5-5.8'.
7.5 - 10	1.5/2.5	CH		(8.0 - 11.4) Silty CLAY, light brown, moist, firm, high plasticity, <5% fine gravel.
10 - 12.5	1.5/2.5	CH / SH		(11.4 - 14.0) SHALE, gray and orange, trace iron oxide, moist, firm to hard, medium plasticity, weathered.
12.5 - 15	2.5/2.5	SH		(14.0 - 15.0) SHALE, gray, dry, hard.

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Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 4.0) Bentonite Hole Plug
(4.0 - 14.5) 20/40 Silica Sand
(14.5 - 15.0) Sloughed Material

Well Materials
(+4.12 - 4.5) Casing, 2" Sch 40 FJT PVC
(4.5 - 14.5) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies	Log of Boring: MW-30

Frisco Recycling Center, Frisco, TX				
PBW Project No. 1755	Completion Date:	3/28/2013	Drilling Method:	HSA
	Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
	Driller:	Dan Spaust	Total Depth (ft):	32.5
	Driller's License:	3038M	Northing:	7102086.1889
	Logged By:	Tim Jennings, P.G.	Easting:	2480011.0566
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	645.483805
	Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	645.148475

Depth (ft)	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0	0.5/5	CL	0-0.5	(0 - 0.5) Sandy Gravelly CLAY, dark grayish brown, moist, firm, medium plasticity, ~10-20% fine to coarse sand, ~20-30% fine to coarse gravel and cobbles (railroad balast).
		NR	0.5-2, 2-4, 4-5	(0.5 - 5.0) No Recovery
5	1.3/5	FILL		(5.0 - 20.9) FILL, silty clay, dark grayish brown, moist to wet, soft, medium to high plasticity, trace of fine gravel,
10	1/2.5			
	2.5/2.5			
15	2/5			
20	2.5/2.5	FILL		(20.9 - 26.5) FILL, gravelly clay, light brown, wet, soft, high plasticity, ~30-40% fine gravel in clay matrix, wood fragments locally to 25'.
	2.5/2.5			
25	2.5/2.5	FILL		(26.5 - 28.5) FILL, gravelly clay, wet, firm to hard, medium plasticity, ~40-50% fine to medium gravel in clay matrix, pieces of slag/lead at 28', shell fragments at 28-28.5'.
	2.5/2.5	SH		(28.5 - 30.5) SHALE, gray and orange, abundant fe ox staining, wet, hard, medium plasticity.
30	2.5/2.5	SH		(30.5 - 32.5) SHALE, gray, moist, no cementation, very hard.

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Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 10.0) Bentonite Hole Plug
(10.0 - 32.5) 20/40 Silica Sand

Well Materials
(0 - 12.0) Casing, 2" Sch 40 FJT PVC
(12.0 - 32.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies

Log of Boring: MW-31

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	5/9/2013	Drilling Method:	HSA
Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
Driller:	Margarito Estrada	Total Depth (ft):	24
Driller's License:	58164	Northing:	7102001.9818
Logged By:	Tim Jennings, P.G.	Easting:	2479800.4009
Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	637.17
Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	636.71

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0		4/5	CON		(0 - 0.9) CONCRETE SLAB
			FILL	0.9-2	(0.9 - 5.8) FILL, clayey sand and sandy clay, orange, trace iron oxide nodules.
5		5/5	FILL	5.8-8	(5.8 - 8) FILL, silty clay, trace fine gravel, moist to wet, dark brown, trace battery chips at 5.8-8', wet at 9.5', slag observed.
10		5/5	CL	9.5	(8 - 16) Silty clay, dark brown.
15		cuttings	CL		(16 - 21) Silty CLAY and clayey SILT, trace gravel and sand, greater sand content with depth, yellowish brown.
20			CL		(21 - 22) Gravelly CLAY, ~20% fine to medium gravel in clay matrix.
			SH		(22 - 24) SHALE potentially, drilling more difficult.

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Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 6.0) Bentonite Hole Plug
(6.0 - 23.0) 20/40 Silica Sand

Well Materials
(0 - 8.0) Casing, 2" Sch 40 FJT PVC
(8.0 - 23.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies	Log of Boring: PMW-19R

Frisco Recycling Center Frisco, TX	Completion Date:	2/26/2013	Drilling Method:	HSA
	Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
	Driller:	Dan Spaust	Total Depth (ft):	20
PBW Project No. 1755	Driller's License:	3038M	Northing:	7103664.081
	Logged By:	Roberta Russell	Easting:	2480920.3742
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	678.45
	Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	681.79

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0		3.6/5.0	CL	0-0.5 0.5-2 2-4	(0 - 3.0) CLAY with trace gravel, dark reddish brown, moist, soft to firm, low to medium plasticity, abundant calcareous nodules.
			CL/ML	4-5	(3.0 - 13.0) Clayey SILT/Silty CLAY, dark reddish brown, yellowish brown from 7-10', slightly moist, very hard, low plasticity, friable from 5-6.5'.
5		3.1/5.0			
10		3.4/5.0			
			SC/CL		(13.0 - 14.0) Clayey SAND/Sandy CLAY, light yellowish brown with orange staining (iron oxide), moist, soft, low plasticity.
15		4.5/5.0	SH		(14.0 - 19.0) SHALE, dark gray with orange staining (iron oxide along fractures and bedding planes), dry to slightly moist, soft to firm, high plasticity, weathered.
					(19.0 - 20.0) SHALE, dark gray, dry, very hard.
20					

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Annular Materials
(0.0 - 0.5) Concrete
(0.5 - 1.0) Bentonite Grout
(1.0 - 2.5) Bentonite Hole Plug
(2.5 -19.0) 20/40 Silica Sand
(19.0 - 20.0) Sloughed Material

Well Materials
(+3.34 - 4.0) Casing, 2" Sch 40 FJT PVC
(4.0 - 19.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies

Log of Boring: PMW-20R

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	2/26/2013	Drilling Method:	HSA
Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
Driller:	Chris Combs	Total Depth (ft):	25
Driller's License:	56033	Northing:	7103357.9244
Logged By:	Roberta Russell	Easting:	2480030.2079
Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	645.2
Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	648.09

Depth (ft)	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0	5.0/5.0	CH	0-0.5; 0.5-2	(0 - 2.6) CLAY, dark reddish brown, moist, soft, high plasticity.
		ML	2-4; 4-5	(2.6 - 7.5) Clayey SILT, dark reddish brown, dry to moist, very hard, low plasticity, trace to moderate calcareous nodules.
5	2.7/5.0	SC/CL		(7.5 - 11.0) Sandy CLAY/Clayey SAND, moist, soft to firm, low plasticity, more clay with depth, abundant calcareous nodules.
10	5.0/5.0	CL		(11.0 - 19.5) CLAY, reddish yellow, with trace to moderate gravel, moist, firm, low to medium plasticity, very fine to medium gravel (5-20%) in clay matrix.
15	5.0/5.0	GC		(19.5 - 20.0) GRAVEL with clay; reddish yellow, wet, very soft, ~20-30% clay matrix.
20	5.0/5.0	CL		(20.0 - 21.8) CLAY with gravel; reddish yellow, wet, soft to firm, low to medium plasticity clay, <5% carbonate gravel in clay.
		GC		(21.8 - 23.0) GRAVEL with clay; reddish yellow, wet, soft, 30-40% low to medium plasticity clay matrix in fine to medium gravel.
		CL		(23.0 - 23.5) CLAY with gravel; reddish yellow, very moist, hard, low to medium plasticity clay, 30-40% fine to medium gravel.
25		SH		(23.5 - 25.0) SHALE, dark gray, dry, very hard, low to medium plasticity, fissile, slightly weathered.

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Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 7.0) Bentonite Grout
(7.0 - 9.0) Bentonite Hole Plug
(9.0 - 25.0) 20/40 Silica Sand

Well Materials
(+2.89 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies	Log of Boring: LMW-21

Frisco Recycling Center Frisco, TX				
	Completion Date:	2/27/2013	Drilling Method:	HSA
	Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
	Driller:	Chris Combs	Total Depth (ft):	25
PBW Project No. 1755	Driller's License:	56033	Northing:	7103205.9759
	Logged By:	Tim Jennings, P.G.	Easting:	2480099.7956
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	645.12
	Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	648.28

Depth (ft)	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0	5.0/5.0	CH	0-0.5	(0 - 1.1) Sandy, gravelly CLAY; wet, very soft, slow dilatancy, high plasticity clay, ~20-30% fine sand and fine gravel.
		CH	0.5-2, 2-4, 4-5	(1.1 - 7.9) Silty CLAY, dark gray, moist, firm to hard, no dilatancy, medium to high plasticity, trace carbonate gravel below 5'.
5	5.0/5.0	SW		(7.9 - 10.6) Clayey, gravelly SAND; light brown, fine to coarse sand, moist, soft to firm, medium plasticity clay, ~10-20% clay and ~10-20% fine to medium gravel.
10	5.0/5.0	CL		(10.6 - 13.5) Clayey SILT, light brown, moist, soft to firm, slow dilatancy, medium plasticity.
		SW		(13.5 - 16.0) Gravelly, clayey SAND; light brown, fine to coarse sand, moist to wet, wet at 15.8-16', firm to soft, ~40-50% fine to medium gravel, ~5-10% clay above 15'.
15	2.5/5.0	ML		(16.0 - 17.2) Sandy SILT, light brown, wet, soft, medium plasticity.
		CL		(17.2 - 21.8) Sandy, gravelly CLAY; wet to dry, firm to hard, medium plasticity clay, fine to medium gravel (~5-10%) and fine to coarse sand (~10-20%) in clay matrix.
20	2.2/5.0	SH		(21.8 - 25.0) SHALE, brownish gray, dry, very hard.
25				

Notes:
This log should not to be used separately from the report to which it is attached.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 8.0) Bentonite Hole Plug
(8.0 - 25.0) 20/40 Silica Sand

Well Materials
(+3.16 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies

Log of Boring: LMW-22

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	2/27/2013	Drilling Method:	HSA
Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
Driller:	Dan Spaust	Total Depth (ft):	20
Driller's License:	3038M	Northing:	7102891.2829
Logged By:	Roberta Russell	Easting:	2480355.4657
Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	643.32
Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	646.71

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Sample	Lithologic Description
0		4.5/5.0	CL	0-0.5	(0 - 12.5) CLAY/Silty CLAY, dark reddish brown, yellowish brown from 9-12.5', moist, soft to firm, low to medium plasticity, ~10% calcareous nodules from 9-12.5'.
				0.5-2	
				2-4	
				4-5	
5		4.4/5.0			
10		4.0/5.0			
					(12.5 - 13.0) CLAY with gravel; yellowish brown, moist, soft, low plasticity, ~30-40% gravel in clay matrix.
					(13.0 - 16.0) Sandy CLAY, yellowish brown, moist, soft, low plasticity.
15		4.3/5.0			
					(16.0 - 17.0) Gravelly CLAY, yellowish brown, ~30-40% gravel in clay matrix.
					(17.0 - 19.5) Silty CLAY, grayish brown with orange staining, very moist, soft to firm, low plasticity.
			SH		(19.5 - 20.0) SHALE, gray, dry, hard, low to medium plasticity.
20					

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Notes:
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Annular Materials
(0.0 - 0.5) Concrete
(0.5 - 1.0) Bentonite Grout
(1.0 - 2.5) Bentonite Hole Plug
(2.5 - 20.0) 20/40 Silica Sand

Well Materials
(+3.67 - 5.0) Casing, 2" Sch 40 FJT PVC
(5.0 - 20.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies

Log of Boring: VCP-MW-1

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	2/28/2013	Drilling Method:	HSA
Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
Driller:	Chris Combs	Total Depth (ft):	10
Driller's License:	56033	Northing:	7101501.9575
Logged By:	Tim Jennings, P.G.	Easting:	2479866.9837
Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	652.99
Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	655.88

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	PID (ppm)	Lithologic Description
0		5.0/5.0	MH	0.9	(0 - 3.6) Clayey SILT, grayish brown, moist to wet, soft to firm, high plasticity.
				1.2	
				1.2	
				0.7	(3.6 - 7.5) SHALE, light brown, orange and gray, moist, firm to hard, medium plasticity, weathered.
			SH	0.5	
5		5.0/5.0		1.3	
				1.1	
				1.3	(7.5 - 10.0) SHALE, dark gray, dry, hard.
				0.9	
				0.8	
10					

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Notes:

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Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 2.0) Bentonite Hole Plug
(2.0 - 10.0) 20/40 Silica Sand

Well Materials
(+2.89 - 2.5) Casing, 2" Sch 40 FJT PVC
(2.5 - 10.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies	Log of Boring: VCP-MW-2

Frisco Recycling Center, Frisco, TX / PBW Project No. 1755			
Completion Date:	3/1/2013	Drilling Method:	HSA
Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
Driller:	Chris Combs	Total Depth (ft):	20
Driller's License:	56033	Northing:	7101872.3093
Logged By:	Tim Jennings, P.G.	Easting:	2479265.8773
Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	627.74
Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	631.16

Depth (ft)	Recovery (ft/ft)	USCS	PID (ppm)	Lithologic Description
0	5.0/5.0	MH	6.2, 7.0, 9.3, 8.7	(0 - 4.0) Clayey SILT, dark grayish brown, moist, soft to firm, high plasticity, abundant roots to 4'.
5	5.0/5.0	CL	7.2, 8.8, 7.2, 8.1, 8.1	(4.0 - 9.0) Silty CLAY, dark grayish brown, moist soft, medium plasticity, rust colored mottling locally, friable, abundant roots, iron oxide mottling below 6'.
10	5.0/5.0	CL/CH	9.3, 8.5	(9.0 - 11.1) Silty CLAY, dark grayish brown, moist firm, medium to high plasticity, light gray laminae.
		CH	7.0, 6.6, 3.2	(11.1 - 13.6) Gravelly CLAY, light brown and orange, moist to wet, firm, high plasticity clay, ~20-30% fine to medium gravel in clay matrix, increasing moisture with depth.
15	3.5/5.0	CH	7.2, 8.1	(13.6 - 15.6) Silty CLAY, light brown to orange, wet, soft, high plasticity, <5% fine to coarse sand.
		SH	5.4, 5.2	(15.6 - 18.2) SHALE, gray to light brown, moist, hard, abundant iron oxide along bedding planes, weathered.
20		SH	12.0, 25.1	(18.2 - 20.0) SHALE, dark gray, dry, hard.

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Notes:

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Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 4.0) Bentonite Hole Plug
(4.0 - 20.0) 20/40 Silica Sand

Well Materials
(+3.42 - 5.0) Casing, 2" Sch 40 FJT PVC
(5.0 - 20.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies	Log of Boring: VCP-MW-3

Frisco Recycling Center Frisco, TX				
	Completion Date:	2/28/2013	Drilling Method:	HSA
	Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
	Driller:	Chris Combs	Total Depth (ft):	15
PBW Project No. 1755	Driller's License:	56033	Northing:	7102743.5737
	Logged By:	Tim Jennings, P.G.	Easting:	2478984.5144
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	631.34
	Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	634.06

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	PID (ppm)	Lithologic Description
0		4.3/5.0	CH/MH	0..8	(0 - 3.4) Silty CLAY/Clayey SILT, dark grayish brown, moist, soft to firm, high plasticity, abundant roots at 0-0.5'.
				0.1	
				0.5	
			CL	0.3	(3.4 - 7.3) Silty gravelly CLAY; light brown, moist, firm to hard, medium plasticity clay, ~10-30% fine calcareous gravel.
				1.1	
5		2.4/5.0		0.6	
				0.6	
				0.1	(7.3 - 7.6) Silty CLAY, light brown, moist firm to hard, medium plasticity, orange and green laminated.
			NR	-	(7.6 - 10.0) No Recovery
				-	
10		5.0/5.0	CH	0.4	(10.0 - 13.0) Silty CLAY, light brown, wet, soft, high plasticity.
				0.5	
				0.4	
			SH	1.1	(13.0 - 15.0) SHALE, gray, moist, firm to hard, medium plasticity, abundant iron oxide partings, weathered.
				0.4	
15					

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<u>Annular Materials</u>
(0.0 - 2.0) Concrete
(2.0 - 4.0) Bentonite Hole Plug
(4.0 - 15.0) 20/40 Silica Sand

<u>Well Materials</u>
(+2.72 - 5.0) Casing, 2" Sch 40 FJT PVC
(5.0 - 15.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies — Log of Boring: VCP-MW-4

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	2/28/2013	Drilling Method:	HSA
Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
Driller:	Chris Combs	Total Depth (ft):	15
Driller's License:	56033	Northing:	7102521.1042
Logged By:	Tim Jennings, P.G.	Easting:	2479285.0237
Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	632.18
Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	635.43

Depth (ft)	Recovery (ft/ft)	USCS	PID (ppm)	Lithologic Description
0	2.5/5.0	MH	0, 0	(0 - 1.8) Clayey SILT, dark grayish brown, moist soft, high plasticity, trace calcareous nodules.
		CL/CH	0.4, -, -	(1.8 - 5.3) Silty CLAY, brown to light brown, moist, soft to firm, medium to high plasticity, trace to 5% calcareous nodules.
5	3.0/5.0	CL/GC	0.1, 0	(5.3 - 6.6) Gravelly CLAY/Clayey GRAVEL, sub-rounded gravel, moist, soft to firm, medium plasticity clay, ~40-60% fine to medium gravel in clay matrix.
		CL/CH	0.1, -, -, 1	(6.6 - 10.7) Silty CLAY, orange, brown and gray mottled, moist, firm, medium to high plasticity.
10	5.0/5.0	SH	0, 0.1, 0.3, 0.1	(10.7 - 15.0) SHALE, orangish brown to gray, moist to dry, firm to hard, medium plasticity, abundant iron oxide along bedding planes.
15				

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Notes:

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Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 3.0) Bentonite Hole Plug
(3.0 - 15.0) 20/40 Silica Sand

Well Materials
(+3.25 - 5.0) Casing, 2" Sch 40 FJT PVC
(5.0 - 15.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies	Log of Boring: VCP-MW-5

Frisco Recycling Center Frisco, TX	Completion Date:	2/27/2013	Drilling Method:	HSA
	Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
	Driller:	Chris Combs	Total Depth (ft):	20
PBW Project No. 1755	Driller's License:	56033	Northing:	7102925.8587
	Logged By:	Tim Jennings, P.G.	Easting:	2480000.584
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	640.8
	Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	643.97

Depth (ft)	Recovery (ft/ft)	USCS	Lithologic Description
0	5.0/5.0	CH	(0 - 6.6) Silty CLAY, dark grayish brown, moist to dry, firm to hard, high plasticity, few (<5%) small calcareous nodules below 3.3', dry below 3.5'.
5	2.5/5.0	CL/CH	(6.6 - 11.5) Sandy, silty CLAY; light brown, light gray and orange laminated, moist, very hard, medium to high plasticity, ~10-20% fine to coarse sand in clay matrix.
10	3.2/5.0	CH	(11.5 - 12.0) Sandy, gravelly CLAY; brown orange, moist, firm, high plasticity clay.
		SW	(12.0 - 12.8) Clayey, gravelly SAND; wet, soft, ~20-30% clay, ~10-20% fine to medium gravel.
		CH	(12.8 - 15.9) Sandy, gravelly CLAY; brown orange, moist, firm, high plasticity clay, ~10-20% fine sand and fine gravel, possibly calcareous nodules.
15	2.5/5.0	CL	(15.9 - 17.5) CLAY, orange and gray mottled, moist, firm, medium plasticity, <5% fine to medium gravel and calcareous nodules, possible reworked shale.
		SH	(17.5 - 17.7) SHALE, gray, moist, firm, high plasticity.
		SH	(17.7 - 20.0) SHALE, gray, very hard, poor recovery.
20			

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Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 3.0) Bentonite Hole Plug
(3.0 - 20.0) 20/40 Silica Sand

Well Materials
(+3.17 - 5.0) Casing, 2" Sch 40 FJT PVC
(5.0 - 20.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies

Log of Boring: VCP-MW-6

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	2/27/2013	Drilling Method:	HSA
Drilling Company:	Strata Core Services, LLC	Borehole Diameter (in.):	7.75
Driller:	Chris Combs	Total Depth (ft):	20
Driller's License:	56033	Northing:	7103251.5523
Logged By:	Tim Jennings, P.G.	Easting:	2479837.0804
Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	641.1
Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	644.71

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Lithologic Description
0		5.0/5.0	CH	(0 - 6.6) Silty CLAY, dark grayish brown, moist to dry, soft to hard, high plasticity, <5% calcareous nodules, hard and dry below 3.7', brown, ~5-10% calcareous nodules at 5-6.6', very stiff 6-6.6'.
5		3.7/5.0	CL/CH	(6.6 - 10.0) Silty, gravelly CLAY; brown orange, moist, hard to very hard, medium to high plasticity clay, well laminated, ~10-20% fine to medium gravel and calcareous nodules.
10		3.7/5.0	MH	(10.0 - 15.0) Clayey SILT, moist to wet, soft, high plasticity, ~20-30% fine to medium gravel and fine to coarse sand from 12.3-12.8', wet below 12.3'.
15		5.0/5.0	SM/SW	(15.0 - 16.5) Silty, gravelly SAND; brown, wet, soft, ~10% fines, ~20-30% fine to medium sub-rounded gravel in fine to coarse sand.
			CH	(16.5 - 17.1) Silty CLAY, brown, wet, soft, high plasticity, trace fine gravel in clay matrix.
			SH	(17.1 - 20.0) SHALE, gray and brown, moist, firm to hard, iron oxide staining along bedding planes, weathered.
20				

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Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 3.0) Bentonite Hole Plug
(3.0 - 20.0) 20/40 Silica Sand

Well Materials
(+3.61 - 5.0) Casing, 2" Sch 40 FJT PVC
(5.0 - 20.0) Screen, 2" Sch 40 FJT PVC, 0.010 slot

Exide Technologies	Log of Boring: VCP-MW-7

Frisco Recycling Center Frisco, TX	Completion Date:	4/18/2013	Drilling Method:	HSA
	Drilling Company:	Sunbelt Environmental	Borehole Diameter (in.):	8.25
	Driller:	Joe Garcia	Total Depth (ft):	10
PBW Project No. 1755	Driller's License:	58780	Northing:	7100967.0459
	Logged By:	Carolyn Sexton	Easting:	2481078.6125
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	683.116976
	Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	685.176513

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	PID (ppm)	Lithologic Description
0		4.0/4.0	CL	0	(0 - 0.8) Silty CLAY, dark gray brown, moist, soft, low plasticity, trace med. size gravel in top 0.5', gradational contact.
				0	(0.8 - 1.1) Chalky, silty LIMESTONE, weathered, orange iron oxide staining.
			LS	0	(1.1 - 6.2) Chalky, silty LIMESTONE, light tan, brittle, dry, hard, <5% dark brown and orange ironstone nodules from 4.0-4.2'.
				0	
5		5.0/5.0		0	
				0	
			SH	0	(6.2 - 10) Chalky, silty SHALE, dark gray, fissile, blocky at base, dry, hard.
				0	
				0	
		1.0/1.0		0	
10					

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Notes:

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Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 2.0) Bentonite Hole Plug
(2.0 - 10.0) Industrial Quartz Sand

Well Materials
(+2.06 - 2.5) Casing, 2" Sch 40 PVC
(2.5 - 10.0) Screen, 2" Sch 40 PVC, 0.010 slot

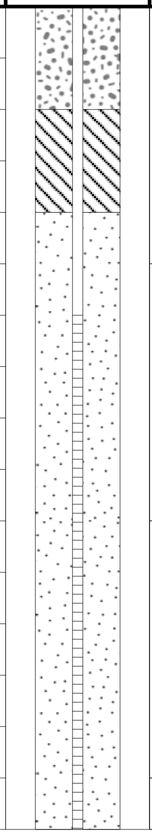
Exide Technologies

Log of Boring: VCP-MW-8

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	4/17/2013	Drilling Method:	HSA
Drilling Company:	Sunbelt Environmental	Borehole Diameter (in.):	8.25
Driller:	Joe Garcia	Total Depth (ft):	16
Driller's License:	58781	Northing:	7102884.3737
Logged By:	Carolyn Sexton	Easting:	2481077.5726
Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	648.101225
Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	651.023133



Depth (ft)	Recovery (ft/ft)	USCS	PID (ppm)	Lithologic Description
0	3.0/5.0	FILL	0	(0 - 3.6) FILL, gray brown, dry, with silty clay, coarse sand to large gravel, asphalt-like nodules, calcareous nodules.
			0	
			0	
			0	(3.6 - 7.4) Silty CLAY, dark brown, moist, low plasticity, ~10% graded angular fine to med. sand and calcareous nodules.
		CL	0	
5	2.5/5.0		0	
			0	
			0	(7.4 - 11.1) Silty CLAY, medium-brown to gray, moist to wet, low to med. plasticity, ~10-20% coarse sand to medium gravel.
			0	
			0	
10	3.2/5.0		0	
			0	(11.1 - 15.9) Slightly silty CLAY, gray brown, moist to wet, low to med. plasticity, ~30-40% gravel from 11.1-11.3'.
			0	
			0	
			0	
15	1.0/1.0		0	
		LS		(15.9 - 16) LIMESTONE, grayish tan, competent, microcrystaline to very fine grained, contains veins of secondary crystals.

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Notes:

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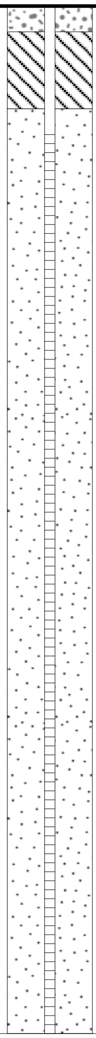
Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 4.0) Bentonite Hole Plug
(4.0 - 16.0) Industrial Quartz Sand

Well Materials
(+2.92 - 6.0) Casing, 2" Sch 40 PVC
(6.0 - 16.0) Screen, 2" Sch 40 PVC, 0.010 slot

Exide Technologies	Log of Boring: VCP-MW-9

Frisco Recycling Center Frisco, TX	Completion Date:	4/17/2013	Drilling Method:	HSA
	Drilling Company:	Sunbelt Environmental	Borehole Diameter (in.):	8.25
	Driller:	Joe Garcia	Total Depth (ft):	20
PBW Project No. 1755	Driller's License:	58782	Northing:	7103297.5194
	Logged By:	Carolyn Sexton	Easting:	2481042.4147
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	664.314339
	Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	666.957891



Depth (ft)	Recovery (ft/ft)	USCS	PID (ppm)	Lithologic Description
0	4.0/5.0	CL	0	(0 - 0.7) Silty CLAY, dark brown, slighly moist, firm, low plasticity, with root fragments and angular coarse sand to med. gravel.
		CL	0	(0.7 - 2.7) Silty CLAY, dark brown to black, slightly moist, firm to hard, low plasticity, with calcareous nodules and 10-20% angular coarse sand to fine gravel.
			0	
		GC	0	(2.7 - 5) Clayey GRAVEL, yellow-brown, moist to wet, firm, low plasticity, ~40-50% fine to med. carbonate gravel in clay matrix.
			0	
5	5.0/5.0	CL	0	(5 - 6.1) Silty CLAY, gray with orange iron oxide staining, moist, soft to firm, low to medium plasticity, calcareous nodule lense from 5.5-5.6', laminated fine sand from 5.9-6.05'.
			0	(6.1 - 18.8) Silty CLAY, gray with orange iron oxide staining, moist, firm, low plasticity, moderately weathered throughout, contains horizontal carbonate and inron oxide staining and vertical iron oxide filled fractures.
			0	
			0	
			0	
10	5.0/5.0	CL	0	
			0	
			0	
			0	
			0	
15	5.0/5.0		0	
			0	
			0	
			0	
		SH	0	(18.8 - 20) SHALE, dark gray, moist, firm, low plasticity, unweathered.
20				

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Notes:

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Annular Materials
(0.0 - 0.5) Concrete
(0.5 - 2.0) Bentonite Hole Plug
(2.0 - 20.0) Industrial Quartz Sand

Well Materials
(+2.64 - 2.5) Casing, 2" Sch 40 PVC
(2.5 - 20.0) Screen, 2" Sch 40 PVC, 0.010 slot

Exide Technologies	Log of Boring: VCP-MW-10

Frisco Recycling Center Frisco, TX	Completion Date:	4/17/2013	Drilling Method:	HSA
	Drilling Company:	Sunbelt Environmental	Borehole Diameter (in.):	8.25
	Driller:	Joe Garcia	Total Depth (ft):	15
PBW Project No. 1755	Driller's License:	58783	Northing:	7103274.8564
	Logged By:	Carolyn Sexton	Easting:	2481265.9907
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	667.108585
	Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	669.744622

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	PID (ppm)	Lithologic Description
0		5.0/5.0	CL	0	(0 - 0.4) Silty CLAY, dark brown, with roots and 5-10% fine gravel and calcareous nodules.
				0	(0.4 - 1.2) Sandy CLAY, light gray, interlayered soft clay and iron oxide stained sand, slightly moist, low to medium plasticity.
				0	(1.2 - 5.6) Silty CLAY, dark brown-gray, moist, low to medium plasticity, carbonate coarse sand to fine gravel within clay matrix throughout, coarse gravel from 1.6-2.8'.
				0	
				0	
5		5.0/5.0		0	(5.6 - 12.4) Silty CLAY, light to medium gray, moist, soft, friable and fissile, massive below 7.7', limonite and orange iron oxide staining throughout.
				0	
				0	
				0	
				0	
10		5.0/5.0		0	
				0	
			SH	0	(12.4 - 15) SHALE, dark gray, slightly moist, low plasticity, slightly weathered.
				0	
				0	
15					

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Notes:

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Annular Materials
(0.0 - 0.5) Concrete
(0.5 - 2.0) Bentonite Hole Plug
(2.0 - 15.0) Industrial Quartz Sand

Well Materials
(+2.64 - 2.5) Casing, 2" Sch 40 PVC
(2.5 - 15.0) Screen, 2" Sch 40 PVC, 0.010 slot

Exide Technologies	Log of Boring: VCP-MW-11

Frisco Recycling Center Frisco, TX				
	Completion Date:	4/17/2013	Drilling Method:	HSA
	Drilling Company:	Sunbelt Environmental	Borehole Diameter (in.):	8.25
	Driller:	Joe Garcia	Total Depth (ft):	15
PBW Project No. 1755	Driller's License:	58784	Northing:	7103365.2704
	Logged By:	Carolyn Sexton	Easting:	2481418.2146
	Field Supervisor:	Tim Jennings, P.G.	Ground Elev. (ft AMSL):	670.152153
	Sampling Method:	5' Split Spoon	TOC Elev. (ft AMSL):	672.734085

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	PID (ppm)	Lithologic Description
0				0	(0 - 0.8) Silty CLAY, deep brown, slightly moist, low plasticity, soft to firm, contains roots.
				0	(0.8 - 5) Slightly silty CLAY, yellow-gray, slightly dry, firm to hard, low plasticity, 10-30% coarse sand to fine gravel dispersed within clay matrix, roots to 3.2', calcareous laminae and iron oxide staining throughout.
		3.6/5.0		0	
				0	
				0	
5			CL	0	(5 - 10) Weathered SHALE, gray, slightly dry, firm to hard, low plasticity, iron oxide staining and carbonate filled laminae throughout.
				0	
		3.4/5.0		0	
				0	
				0	
10				0	(10 - 12.8) SHALE, dark gray, friable, iron oxide staining, weathered.
				0	
		5.0/5.0	SH	0	
				0	(12.8 - 15) SHALE, dark gray, dry, very hard, fissile, unweathered.
				0	
15					

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Notes:

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Annular Materials
(0.0 - 0.5) Concrete
(0.5 - 2.0) Bentonite Hole Plug
(2.0 - 15.0) Industrial Quartz Sand

Well Materials
(+2.58 - 2.5) Casing, 2" Sch 40 PVC
(2.5 - 15.0) Screen, 2" Sch 40 PVC, 0.010 slot

Exide Technologies	Log of Boring: 2012-BSA-2

Frisco Recycling Center Frisco, TX	Completion Date:	4/29/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7102274.2792
	Logged By:	Will Vienne, P.G.	Easting:	2480735.1448
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 4	4/4	2 - 4	CL	(0 - 5.0) CLAY and Silty CLAY, very dark gray, trace orange Fe mottling, trace limestone pebbles, moderately abundant limestone granules, dry to slightly moist, firm, low to medium plasticity.
4 - 5	1/1	4 - 5		

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Notes:

Borehole plugged with bentonite chips upon completion.

This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-BSA-6

Completion Date:	3/5/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	5
Field Supervisor:	Tim Jennings, P.G.	Northing:	7102200.9899
Logged By:	Roberta Russell	Easting:	2480652.3935
Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 2	FILL	(0 - 0.3) FILL, sand w/gravel, light reddish brown, unconsolidated, dry, hard.
0.3 - 5		2 - 5	FILL	(0.3 - 5.0) FILL, silty clay, trace gravel, reddish brown, plastic bag fragment and mulch @ 4.9', moist, firm, low plasticity.

Depth scale: 0, 1, 2, 3, 4, 5

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Notes:

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This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-BSA-7

Frisco Recycling Center Frisco, TX	Completion Date:	3/5/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102250.9587
	Logged By:	Roberta Russell	Easting:	2480715.8882
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 1.3	5/5	0 - 2	FILL	(0 - 1.3) FILL, surficial fill not associated with NDA, clay with sand and gravel, ~30-40% medium gravel and sand, no foreign objects (e.g. slag, battery chips or trash) observed, light reddish brown, dry, firm, low plasticity.
1.3 – 5			CL	(1.3 - 5.0) Silty CLAY, dark reddish brown, trace calcareous nodules from 4.5-5', moist, firm, low plasticity.

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Notes:

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Exide Technologies	Log of Boring: 2013-AD-1

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101895.7037
	Logged By:	Will Vienne, P.G.	Easting:	2480807.5725
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4/4	0 - 0.5	FILL	(0 - 5.0) FILL, dark grayish brown, moist, soft to slightly firm, low plasticity, concrete fragment at 1.5', moderately organic clay at 0-0.6' with abundant root fragments, very fine clayey sand with Fe staining 0.6-2.9', silty clay with trace limestone granules from 2.9-4', wet clayey sand with Fe staining at 4-5'.
1		0.5 - 2		
2		2 - 4		
3				
4	1/1			
5				

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Notes:

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Exide Technologies	Log of Boring: 2013-AD-2

Frisco Recycling Center Frisco, TX	Completion Date:	4/29/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101914.0818
	Logged By:	Will Vienne, P.G.	Easting:	2480989.7962
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 4	3.5/4	0.5 - 2 2 - 4	FILL	(0 - 4.0) FILL, sandy to silty clay, sandy clay from 0-3', silty clay from 3-4', brown, very dark gray from 3-4', common limestone granules, trace limestone pebbles, trace root/plant material.
4 – 5	1/1	4 - 5	FILL	(4.0 - 5.0) FILL, clayey sand, gray, wet, no cementation, soft, abundant pebble and granule sized gravel.

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Notes:

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Exide Technologies	Log of Boring: 2013-AD-2A

Frisco Recycling Center Frisco, TX	Completion Date:	3/27/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	6
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101930.698
	Logged By:	Tim Jennings, P.G.	Easting:	2481017.163
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5		CON	(0 - 0.5) CONCRETE SLAB
1		0.5 - 2	CH	(0.5 - 1.7) Silty CLAY, grayish brown, trace fine gravel, moist, no cementation, soft, high plasticity.
2		2 - 4	CL	(1.7 - 5.5) Silty CLAY, light brownish-orange, few carbonate nodules (fine-very fine), moist, wet below 5.3', firm to soft, medium plasticity.
3				
4		4 - 5		
5	0.5/1			
6				

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Notes:

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Exide Technologies	Log of Boring: 2013-FOP-1

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101872.2058
	Logged By:	Will Vienne, P.G.	Easting:	2480549.0768
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 4	3.6/4	0 - 0.5	CL	(0 - 5.0) Silty CLAY, very dark brownish gray, dry, slightly firm to firm, low plasticity clay, moderately organic with abundant decayed plant fragments to 2.7', firmer with abundant limestone granules below 2.7', limestone pebbles at 2.7-2.8'.
		0.5 - 2		
		2 - 4		
4 - 5	1/1	4 - 5		

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Notes:

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Exide Technologies	Log of Boring: 2013-BB-1

Frisco Recycling Center, Frisco, TX	Completion Date:	5/21/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	8
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102006.534
	Logged By:	Tim Jennings, P.G.	Easting:	2480117.377
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	3.1/4		CON	(0 - 0.9) CONCRETE SLAB
1		0.9 - 2	FILL	(0.9 - 1.3) FILL, sand and gravel road base.
2		2 - 3	CH/MH	(1.3 - 3.1) Clayey SILT, silty CLAY, dark grayish brown, ~20% medium sand from 1.3-1.6', wet, very soft, high plasticity.
3			NR	(3.1 - 4.0) No recovery.
4	1.4/4	4 - 5	CH	(4.0 - 5.4) Silty CLAY, light gray to black, wet, soft to firm, high plasticity.
5				
6			NR	(5.4 - 8.0) No recovery.
7				
8				

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Notes:

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Exide Technologies	Log of Boring: 2013-BSB-1

Frisco Recycling Center Frisco, TX			
Completion Date:	4/11/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	12
Field Supervisor:	Tim Jennings, P.G.	Northing:	7102047.0799
Logged By:	Roberta Russell	Easting:	2479711.821
Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

PBW Project No. 1755

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 0.9	3.4/4		CON	(0 - 0.9) CONCRETE SLAB
0.9 - 6.3	3.4/4 (0-4); 4/4 (4-8)	0.9 - 2; 2 - 4; 4 - 5	FILL	(0.9 - 6.3) FILL, clayey sand, reddish yellow, increasing clay content with depth, with trace black, very fine gravel, moist, soft, low plasticity.
6.3 - 9.3	4/4 (4-8); 4/4 (8-12)	6.3 - 7.7; 8 - 10	FILL	(6.3 - 9.3) FILL, silty clay, dark reddish brown, trace slag (<0.1") from 6.3-7.7', gravel lens at 9.2-9.3', moist, firm, low plasticity.
9.3 - 12.0	4/4	11.6	CL	(9.3 - 12.0) Silty CLAY, dark reddish brown, trace red mottling, trace calcareous nodules, moist, wet at 11.6', firm, low plasticity.

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Notes:

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Exide Technologies	Log of Boring: 2013-BSB-2

Frisco Recycling Center Frisco, TX	Completion Date:	4/11/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	12
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102035.3349
	Logged By:	Roberta Russell	Easting:	2479770.635
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	3.4/4		CON	(0 - 0.9) CONCRETE SLAB
1		0.9 - 2	FILL	(0.9 - 5.4) FILL, clayey sand, reddish yellow, trace black staining from 4.0-5.4', greater clay content with depth, with trace black, well-rounded, very fine gravel from 0.9-1.1', moist, soft.
2		2 - 4		
3				
4	4/4	4 - 5		
5				(5.4 - 8.9) FILL, silty clay, dark reddish brown, trace slag fragments (<0.1") from 5.7-6.6', large battery chip (~1.5") at 6.4', gravel lens at 7.2-7.4' (~40% fine-medium gravel in silty clay matrix), moist, soft, low plasticity.
6				
7				
8	4/4	8 - 10		
9			CL	(8.9 - 12.0) Silty CLAY, dark reddish brown, moist, wet at 11.2', soft to firm, low plasticity.
10		11.2		
11				
12				

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Notes:

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Exide Technologies

Log of Boring: 2013-BSB-3

Frisco Recycling Center Frisco, TX	Completion Date:	4/10/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	12
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102029.7369
	Logged By:	Roberta Russell	Easting:	2479797.551
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 0.9	4/4 (0 - 4)		CON	(0 - 0.9) CONCRETE SLAB
0.9 - 4.0		0.9 - 2; 2 - 4	FILL	(0.9 - 4.0) FILL, silty, clayey sand, reddish yellow, with a black, well-rounded and hard coarse pebble at 2.6' (likely Fe nodule), moist, soft to firm.
4.0 - 5.0	4/4 (4 - 8)	4 - 5	FILL	(4.0 - 5.0) FILL, sandy clay, reddish yellow, moist, soft, low plasticity.
5.0 - 7.1			FILL	(5.0 - 7.1) FILL, silty clay, dark reddish brown, silty gravel lens from 7-7.1' (~50% medium to coarse gravel), moist, soft to firm, low plasticity.
7.1 - 12.0	4/4 (8 - 12)	8 - 10; 11	CL	(7.1 - 12.0) Silty CLAY, dark reddish brown, moist, wet at 11.0', firm, low plasticity.

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.

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Exide Technologies	Log of Boring: 2013-BSB-4

Frisco Recycling Center Frisco, TX	Completion Date:	4/10/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	12
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102020.0503
	Logged By:	Roberta Russell	Easting:	2479814.7476
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 0.9	3.1/4		CON	(0 - 0.9) CONCRETE SLAB
0.9 – 4.8	3.1/4 (0–4); 4/4 (4–8)	0.9 - 2; 2 - 4; 4 - 5	FILL	(0.9 - 4.8) FILL, silty, clayey sand, reddish yellow, moist, soft.
4.8 – 7.2	4/4		FILL	(4.8 - 7.2) FILL, silty clay, dark reddish brown, gravel lens (~70% fine to medium gravel) from 7.0-7.2', moist, soft to firm, low plasticity.
7.2 – 12.0	4/4 (8–12)	8 - 10; 11	CL	(7.2 - 12.0) Silty CLAY, dark reddish brown, moist, wet at 11.0', firm, low plasticity.

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.

This boring log should not be used seperately from the report to which it is attached.

Exide Technologies

Log of Boring: 2013-BSB-5

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	4/11/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	12
Field Supervisor:	Tim Jennings, P.G.	Northing:	7102021.0899
Logged By:	Roberta Russell	Easting:	2479781.149
Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 0.9	3.1/4		CON	(0 - 0.9) CONCRETE SLAB
0.9 – 5.6	3.1/4; 4/4	0.9 - 2; 2 - 4; 4 - 5	FILL	(0.9 - 5.6) FILL, clayey sand, reddish yellow, trace black staining, moist, soft, increasing clay content with depth.
5.6 – 8.6	4/4; 4/4		FILL	(5.6 - 8.6) FILL, silty clay, dark reddish brown, trace slag fragments from 5.6-8', trace coarse gravel lens from 7.6-7.7'.
8.6 – 12.0	4/4	8 - 10; 11.2	CL	(8.6 - 12.0) Silty CLAY, dark reddish brown, moist, wet at 11.2', firm, low plasticity.

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Notes:

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This boring log should not be used seperately from the report to which it is attached.

Exide Technologies

Log of Boring: 2013-BSB-6

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	4/11/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	12
Field Supervisor:	Tim Jennings, P.G.	Northing:	7102030.9419
Logged By:	Roberta Russell	Easting:	2479850.401
Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 0.9	2.5/4 (0-4)		CON	(0 - 0.9) CONCRETE SLAB
0.9 - 5.7	2.5/4 (0-4); 4/4 (4-8)	0.9 - 2; 2 - 4; 4 - 5	FILL	(0.9 - 5.7) FILL, clayey sand, reddish yellow, moist, soft to firm, low plasticity.
5.7 - 9.3	4/4 (4-8); 4/4 (8-12)	8 - 10	FILL	(5.7 - 9.3) FILL, silty clay, dark reddish brown, gravel lens (~40% medium to coarse gravel in silty clay matrix) with abundant slag (~30% fine gravel-sized) at 7.2-7.3', slag fragment (<0.2") at 8.7', moist, firm, low plasticity.
9.3 - 12.0	4/4 (8-12)	11.1	CL	(9.3 - 12.0) Silty CLAY, dark reddish brown, trace calcareous precipitates, moist, wet at 11.1', soft to firm, low plasticity.

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Notes:

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Exide Technologies	Log of Boring: 2013-BSB-7

Frisco Recycling Center, Frisco, TX	Completion Date:	4/10/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	12
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102020.6659
	Logged By:	Roberta Russell	Easting:	2479830.487
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	3.4/4		CON	(0 - 0.9) CONCRETE SLAB
1		0.9 - 2	FILL	(0.9 - 5.3) FILL, clayey sand/sandy clay, reddish yellow, ~10% black and red well-rounded very fine gravel, moderate black staining, moist, soft to firm, low plasticity.
2		2 - 4		
3				
4	4/4	4 - 5		
5				(5.3 - 9.1) FILL, silty clay, dark reddish brown with moderate yellowish brown staining, gravel lens from 7.0-7.1', slag fragments with some black metallic and trace red oxidized material at 7.1', moist, firm, low plasticity.
6				
7				
8	4/4	8 - 10		
9			CL	(9.1 - 12.0) Silty CLAY, dark reddish brown, trace calcareous precipitates, moist, wet at 11.0', soft to firm, low plasticity.
10		11		
11				
12				

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Notes:

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Exide Technologies	Log of Boring: 2013-BSB-8

Frisco Recycling Center Frisco, TX	Completion Date:	4/10/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	12
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102044.5099
	Logged By:	Roberta Russell	Easting:	2479811.731
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 0.9	3.5/4 (0–4)		CON	(0 - 0.9) CONCRETE SLAB
0.9 – 3.5		0.9 - 2; 2 - 4	FILL	(0.9 - 3.5) FILL, silty sand, reddish yellow, moist, unconsolidated.
3.5 – 5.9	2.5/4 (4–8)	4 - 5	FILL	(3.5 - 5.9) FILL, silty, sandy clay, reddish brown, moist, soft, low plasticity.
5.9 – 9.5	3.5/4 (8–12)	8 - 10	FILL	(5.9 - 9.5) FILL, silty clay, dark reddish brown, slag fragments at 8.0 and 9.3', moist, soft, low plasticity.
9.5 – 12.0		11	CL	(9.5 - 12.0) Silty CLAY, dark reddish brown, moist, wet at 11.0', firm, low plasticity.

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Notes:

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Exide Technologies	Log of Boring: 2013-BSB-9

Frisco Recycling Center Frisco, TX	Completion Date:	4/10/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	20
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102065.3359
	Logged By:	Roberta Russell	Easting:	2479812.374
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4/4		CON	(0 - 0.9) CONCRETE SLAB
1		0.9 - 2	FILL	(0.9 - 3.3) FILL, silty sand, reddish yellow, very moist (possibly from concrete corer), soft.
2		2 - 4		
3				(3.3 - 6.0) FILL, sandy clay, reddish yellow, gravelly clay lens at 6.0', moist, soft, low plasticity.
4	3/4	4 - 5		
6				(6.0 - 8.1) FILL, silty clay, dark reddish brown, moderate orange staining, moist, soft, low plasticity.
8	4/4	8 - 10		(8.1 - 9.2) FILL, sandy clay, reddish brown, moist, soft, low plasticity.
9			CL	(9.2 - 16.6) Silty CLAY, dark reddish brown, moist, wet at 11.0', firm, low plasticity.
11		11		
12	4/4			
16	4/4		GC	(16.6 - 17.8) Clayey GRAVEL, ~60% medium gravel, light reddish brown, wet, soft.
17.8			CL	(17.8 - 18.4) Silty CLAY, light reddish brown, wet, firm, low plasticity.
18.4				(18.4 - 18.9) Calcareous CLAY, light reddish brown with orange staining, wet, firm, low plasticity.
18.9			GC	(18.9 - 19.8) Clayey GRAVEL, ~ 70% medium to coarse gravel, light reddish brown, wet, soft.
19.8			CL	(19.8 - 20.0) Calcareous CLAY, light reddish brown with orange staining, wet, firm, low plasticity.
20				

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Notes:

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Exide Technologies	Log of Boring: 2013-BSB-10

Frisco Recycling Center Frisco, TX	Completion Date:	4/11/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	12
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102049.9659
	Logged By:	Roberta Russell	Easting:	2479884.153
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 0.9	3.5/4		CON	(0 - 0.9) CONCRETE SLAB
0.9 – 4.9	3.5/4 (0–4); 3.6/4 (4–8)	0.9 - 2; 2 - 4; 4 - 5	FILL	(0.9 - 4.9) FILL, clayey sand, reddish yellow, moist, soft to firm, low plasticity, greater clay content with depth; with black, well-rounded, coarse pebble at 4.0'.
4.9 – 10.4	3.6/4 (4–8); 4/4 (8–12)	8 - 10	FILL	(4.9 - 10.4) FILL, silty clay, dark reddish brown, moist, soft to firm, low plasticity, ~10% slag (fine to medium gravel-sized) from 5.5-7.9', gravelly clay lens (~20% medium to coarse gravel in silty clay matrix) from 6.6-6.7'.
10.4 – 12.0	4/4	11.4	CL	(10.4 - 12.0) Silty CLAY, dark reddish brown, moist to wet, soft to firm, low plasticity, saturated at 11.4'.

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Notes:

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Exide Technologies

Log of Boring: MW-31(R)

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	5/21/2013	Drilling Method:	DPT
Driller:	Dan Spaust	Borehole Diameter (in.):	2
Driller's License:	3038	Total Depth (ft):	12
Field Supervisor:	Tim Jennings, P.G.	Northing:	7103086.71
Logged By:	Tim Jennings, P.G.	Easting:	2480178.9987
Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 0.9	3.7/4 (0–4)		CON	(0 - 0.9) CONCRETE SLAB
0.9 – 5.4	3.7/4 (0–4); 3.3/4 (4–8)	0.9 - 2	FILL	(0.9 - 5.4) FILL, sandy clay, red and reddish gray, moist, firm, medium plasticity.
5.4 – 7.0	3.3/4	5.8 - 7.3	FILL	(5.4 - 7.0) FILL, silty clay, dark grayish black, moist, firm, high plasticity, fragments of limestone and slag below 6.7'.
7.0 – 7.3	3.3/4	5.8 - 7.3	FILL	(7.0 - 7.3) FILL, sand, gravel and slag, dry.
7.3 – 8.0	3.3/4		NR	(7.3 - 8.0) No recovery.
8.0 – 12.0	3.8/4	9.5	CH/MH	(8.0 - 12.0) Silty CLAY/Clayey SILT, dark gray, moist, wet below 9.5', firm to soft, high plasticity.

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Notes:

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Exide Technologies	Log of Boring: 2013-MB-1

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	5.5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101768.9942
	Logged By:	Will Vienne, P.G.	Easting:	2480378.5615
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 0.5	4/4		0 - 2	CON	(0 - 0.5) CONCRETE SLAB
0.5 - 5.5		3.3		CL	(0.5 - 5.5) Silty CLAY, very dark brownish gray, slightly sandy at 0.5-2.5, moist, some perched water below concrete (may be from concrete corer).
		1.6	2 - 4		
	1.5/1.5	14	4 - 5		

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Notes:

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Exide Technologies

Log of Boring: 2013-MB-2

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	3/14/2013	Drilling Method:	DPT
Driller:	Dan Spaust	Borehole Diameter (in.):	2
Driller's License:	3038	Total Depth (ft):	4.5
Field Supervisor:	Will Vienne, P.G.	Northing:	7101789.6858
Logged By:	Will Vienne, P.G.	Easting:	2480309.4631
Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0				CON	(0 - 0.5) CONCRETE SLAB
	3.6/4			FILL	(0.5 - 0.8) Road base material.
1		27.5	0 - 2	CL	(0.8 - 4.5) Silty CLAY, abundant silt, very dark gray, trace black staining, dry to moist, soft, low to no plasticity, refusal at 4.5'.
2					
3		21.5	2 - 4		
4					

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Notes:

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Exide Technologies	Log of Boring: 2012-FWFS-1

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	6
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101959.7756
	Logged By:	Roberta Russell	Easting:	2479787.6109
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 0.5	5/5		CON	(0 - 0.5) CONCRETE SLAB
0.5 - 4			CL	(0.5 - 6.0) Silty CLAY, trace gravel from 0.5-1.7', dark reddish brown, trace calcareous nodules, moist, soft to hard, low plasticity.
4 - 5		4 - 5		
5 - 6	1/1	5 - 6		

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Notes:

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Exide Technologies	Log of Boring: 2013-FWFS-1A

Frisco Recycling Center Frisco, TX			
Completion Date:	3/5/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	5
Field Supervisor:	Tim Jennings, P.G.	Northing:	7101951.4239
Logged By:	Roberta Russell	Easting:	2479776.2769
Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

PBW Project No. 1755

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 3.5	3/5	2 - 4	FILL	(0 - 3.5) FILL, gravel, gabion fill.
3.5 – 5		4 - 5	CL	(3.5 - 5.0) Silty CLAY, dark reddish brown,~30% calcareous nodules and fine gravel from 4-5', wet, soft.

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Notes:

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Exide Technologies	Log of Boring: 2012-FWFS-4

Frisco Recycling Center Frisco, TX	Completion Date:	4/29/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101873.4335
	Logged By:	Will Vienne, P.G.	Easting:	2479897.671
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	3/4			CON	(0 - 0.75) CONCRETE SLAB
1				FILL	(0.75 - 2.4) FILL, gravelly, sandy clay, dark gray and brownish gray, wet (possibly from concrete corer), limestone and granite gravel, unconsolidated.
2					
3		123	3 - 4	CL	(2.4 - 5.0) CLAY, very dark gray, trace limestone granules, moist, soft, low to medium plasticity.
4	1/1	258	4 - 5		
5					

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Notes:

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Exide Technologies	Log of Boring: 2012-FWFS-6

Frisco Recycling Center Frisco, TX	Completion Date:	4/29/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101811.8251
	Logged By:	Will Vienne, P.G.	Easting:	2479976.3353
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	2.3/4			CON	(0 - 0.75) CONCRETE SLAB
1				FILL	(0.75 - 2.5) FILL, clayey sand with moderately abundant pebble-sized limestone and granite gravel, mottled dark gray and brownish gray, wet (possibly from concrete corer).
2					
3		115	2 - 4	CH	(2.5 - 5.0) CLAY, very dark gray, very moist, soft, medium to high plasticity.
4	1/1	108	4 - 5		
5					

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Notes:

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Exide Technologies	Log of Boring: 2012-FWFS-7A

Frisco Recycling Center Frisco, TX	Completion Date:	5/21/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101766.6481
	Logged By:	Tim Jennings, P.G.	Easting:	2480011.6948
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	3/4	0 - 0.5	CL	(0 - 1.5) Silty CLAY, dark brown to light brown, moist, firm, medium plasticity, ~5% fine carbonate nodules.
1		0.5 - 2		
2		2 - 3	MH	(1.5 - 2.6) Clayey SILT, brown, wet, soft to firm, high plasticity.
			CL	(2.6 - 3.0) Gravelly CLAY, dark brown, wet, soft, medium plasticity, ~30-40% fine to medium gravel in clay matrix.
3			NR	(3.0 - 4.0) No recovery.
4	1/1	4 - 5	MH	(4.0 - 5.0) Clayey SILT, dark brown, wet, soft, high plasticity.
5				

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Notes:

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Exide Technologies	Log of Boring: 2012-FWFS-7B

Frisco Recycling Center Frisco, TX	Completion Date:	5/21/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101756.6481
	Logged By:	Tim Jennings, P.G.	Easting:	2480011.6948
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	3/4	0 - 0.5	CL	(0 - 0.3) Silty CLAY, dark brown, dry, hard, medium plasticity.
1		0.5 - 2	CH/MH	(0.3 - 5.0) Silty CLAY/Clayey SILT, dark reddish brown, moist, wet below 2.5', firm to soft, high plasticity.
2		2 - 3		
3				
4	1/1	4 - 5		
5				

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Notes:

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Exide Technologies

Log of Boring: 2012-FWFS-8

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	4/29/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	5
Field Supervisor:	Will Vienne, P.G.	Northing:	7101748.9161
Logged By:	Will Vienne, P.G.	Easting:	2480053.981
Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 0.75	3.2/4			CON	(0 - 0.75) CONCRETE SLAB
0.75 - 1.0				FILL	(0.75 - 1.0) FILL, gravelly, clayey sand, reddish brown, very moist, unconsolidated, pebble-sized limestone and granite gravel.
1.0 - 2.0				FILL	(1.0 - 2.0) FILL, clay, very dark gray, moist, soft to firm, low to medium plasticity, abundant slag at 1.8-2.0' (up to 1" diameter).
2.0 - 4.0		203	2 - 4	CH	(2.0 - 5.0) CLAY, very dark gray, moist, soft, low to high plasticity, high plasticity below 4.0', silty from 2.0-4.0'.
4.0 - 5.0	1/1	492	4 - 5	CH	

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Notes:

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Exide Technologies	Log of Boring: 2012-FWFS-9

Frisco Recycling Center Frisco, TX	Completion Date:	4/29/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101720.026
	Logged By:	Will Vienne, P.G.	Easting:	2480094.8122
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	3.4/4			CON	(0 - 0.75) CONCRETE SLAB
1				FILL	(0.75 - 1.3) FILL, gravelly (pebble-sized), clayey sand, light brown, wet (possibly from concrete corer).
2				CH	(1.3 - 5.0) CLAY, very dark gray, very moist, soft, medium to high plasticity, strong hydrocarbon odor at 4-5'.
3		1361	2.5 - 4		
4	1/1	1800	4 - 5		
5					

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.

This boring log should not be used seperately from the report to which it is attached.

Exide Technologies

Log of Boring: 2013-RMSA-2

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101817.2841
	Logged By:	Roberta Russell	Easting:	2480247.4183
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4.1/5		CON	(0 - 0.6) CONCRETE SLAB
1			CL/ML	(0.6 - 5.0) Silty CLAY/clayey SILT, dark brown, very moist, soft to firm, low plasticity.
2				
3		2.5 - 4		
4		4 - 5		
5				

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Notes:

Borehole plugged with bentonite chips upon completion.

This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-RMSA-5

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101856.8311
	Logged By:	Roberta Russell	Easting:	2480261.4445
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	3/5	0 - 2	CON	(0 - 0.5) CONCRETE SLAB
1			CL	(0.5 - 5.0) Silty CLAY, wet from 0.5-2.5 (possibly from concrete corer), moist, soft to firm, low plasticity.
2		2 - 4		
3				
4		4 - 5		
5				

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Notes:

Borehole plugged with bentonite chips upon completion.

This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-RMSA-6

Frisco Recycling Center Frisco, TX				
	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101795.7748
	Logged By:	Roberta Russell	Easting:	2480248.438
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	4.5/5		0 - 2.5	CON	(0 - 0.5) CONCRETE SLAB
0.5				ML	(0.5 - 2.0) Clayey SILT, dark brown, moist, soft to firm, low plasticity.
2				CL	(2.0 - 3.3) Gravelly CLAY, dark brown-black, wet, very soft, low plasticity.
2.5		35	2.5 - 4		
3.3				CL	(3.3 - 5.0) Silty CLAY, dark brown-black, moist, firm, low plasticity.
4			4 - 5		
5					

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Notes:

Borehole plugged with bentonite chips upon completion.

This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-RMSA-7

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101813.4245
	Logged By:	Roberta Russell	Easting:	2480271.7807
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 0.7	4.3/5	0 - 2	CON	(0 - 0.7) CONCRETE SLAB
0.7 - 2.5		0 - 2	FILL	(0.7 - 2.5) FILL, clayey gravel/gravelly clay, ~20% gravel, dark brown to light brown, wet (possibly from concrete corer).
2.5 - 5.0		2 - 4; 4 - 5	CL/ML	(2.5 - 5.0) Silty CLAY/clayey SILT, dark brown with black staining, moist, firm, low plasticity.

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Notes:

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This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-RMSB-1

Frisco Recycling Center Frisco, TX	Completion Date:	5/8/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	15
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101909.9542
	Logged By:	Roberta Russell	Easting:	2480142.5204
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 1.5	4/5			CON	(0 - 1.5) CONCRETE SLAB
1.5 - 2		1.2	1.5 - 2	CL	(1.5 - 9.8) Silty CLAY/CLAY, dark brown, moist, wet at 6.5', soft to firm, low to medium plasticity.
2 - 5		10.1	2 - 5	CL	
5 - 5.5	3/5	1.2	5 - 5.5	CL	
6			6	CL	
9.8 - 11.5				CL	(9.8 - 11.5) Sandy CLAY, grayish brown, wet, soft, low plasticity.
10 - 15	3.5/5			CL	
11.5 - 15.0				CL	(11.5 - 15.0) Silty CLAY, dark grayish brown, wet, soft, low to medium plasticity.

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.
Open borehole evaluated with oil/water interface probe. No product indicated in borehole.
This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-RMSB-2

Frisco Recycling Center Frisco, TX	Completion Date:	5/8/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	15
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101911.479
	Logged By:	Roberta Russell	Easting:	2480173.4829
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 2.5	4/5			CON	(0 - 2.5) CONCRETE SLAB
2.5 - 2.9		3.6	2.5 - 5	FILL	(2.5 - 2.9) FILL, gravel (fine-medium) with sand, tan, moist, unconsolidated.
2.9 - 6.0				CL	(2.9 - 6.0) Silty CLAY with trace sand, dark brown, moist, wet at 6'.
5 - 6	3/5	29.7	5 - 6	CL	
6.0 - 12.0				CL	(6.0 - 12.0) Sandy CLAY, grayish brown, wet, very soft, low plasticity.
10 - 15	4.5/5			CL	
12.0 - 15.0				CL	(12.0 - 15.0) Silty CLAY, trace fine gravel, dark brown, wet, very hard, low to medium plasticity.

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Notes:

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Open borehole evaluated with oil/water interface probe. No product indicated in borehole.
This boring log should not be used seperately from the report to which it is attached.

Exide Technologies

Log of Boring: 2013-RMSB-3

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	5/8/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	15
Field Supervisor:	Tim Jennings, P.G.	Northing:	7101920.9601
Logged By:	Roberta Russell	Easting:	2480184.5299
Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 1.5	2.7/5			CON	(0 - 1.5) CONCRETE SLAB
1.5 - 6.2	2.7/5 (0-5); 2.7/5 (5-10)	0.8 1.9 0.8	1.5 - 2 2 - 2.5 5 - 5.5 6	FILL	(1.5 - 6.2) FILL, clayey sand/sandy clay, grayish brown with orange Fe staining, moist, wet at 6.2', soft, low plasticity.
6.2 - 10.0	2.7/5			CL	(6.2 - 10.0) Silty CLAY, dark brown, moderate hydrocarbon odor.
10.0 - 12.0	3.2/5			CL	(10.0 - 12.0) Sandy CLAY, dark grayish brown, wet, soft, low to medium plasticity.
12.0 - 15.0	3.2/5			CL	(12.0 - 15.0) Silty CLAY, dark brown, wet, very hard, low to medium plasticity.

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.
Open borehole evaluated with oil/water interface probe. No product indicated in borehole.
This boring log should not be used seperately from the report to which it is attached.

Exide Technologies

Log of Boring: 2013-RMSB-4

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	5/7/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	15
Field Supervisor:	Tim Jennings, P.G.	Northing:	7101919.0213
Logged By:	Roberta Russell	Easting:	2480206.1515
Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 5	5/5	28	0 - 2	FILL	(0 - 0.3) FILL, gravel (medium), gray, dry, unconsolidated.
		22	2 - 5	FILL	(0.3 - 3.8) FILL, clayey sand, orange to grayish brown with orange Fe staining, plastic chip noted in this interval while sampling.
5 - 10	2.5/5	1.4	5 - 6	CL	(3.8 - 15.0) CLAY/silty CLAY, dark reddish brown, gravelly clay (~10% medium gravel in clay matrix) from 11.5-11.7', moist, wet at 6.0', firm to hard, low to medium plasticity.
		1.4		CL	
10 - 15	5/5			CL	

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Notes:

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Open borehole evaluated with oil/water interface probe. No product indicated in borehole.
This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-RMSB-5

Frisco Recycling Center Frisco, TX	Completion Date:	5/7/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	15
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101877.9929
	Logged By:	Roberta Russell	Easting:	2480144.0945
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 1.3	3/5			CON	(0 - 1.3) CONCRETE SLAB
1.3 - 2		95.7	1.3 - 2	FILL	(1.3 - 3.5) FILL, road base, tan, dry.
2 - 5		1957	2 - 5	FILL	(3.5 - 6.5) FILL, silty clay/clayey silt, ~30% medium gravel with clayey silt/silty clay matrix, tan, very moist, soft, tan, very moist, soft.
5 - 7	5/5	600	5 - 7	FILL / CL	(6.5 - 15.0) Silty CLAY, dark reddish brown, grayish brown with depth, moist, wet at 9.0', soft to firm, low plasticity, gravelly clay (~20-30% fine to medium gravel in clay matrix) at 11.0-11.1 and 11.3-11.4', hydrocarbon odor from 9.0-10.0'.
9 - 10		1240	9	CL	
10 - 15	5/5			CL	

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.
Open borehole evaluated with oil/water interface probe. No product indicated in borehole.
This boring log should not be used seperately from the report to which it is attached.

Exide Technologies

Log of Boring: 2013-RMSB-6

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	5/7/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	15
Field Supervisor:	Tim Jennings, P.G.	Northing:	7101879.5177
Logged By:	Roberta Russell	Easting:	2480175.057
Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 1.3	2.5/5 (0-5)			CON	(0 - 1.3) CONCRETE SLAB
1.3 - 6.6		1	1.3 - 2	FILL	(1.3 - 6.6) FILL, silty clay/clayey silt, trace black staining, moist, soft to firm, low plasticity.
		1.5	2 - 2.5		
	5/5 (5-10)	3.7	5 - 7		
6.6 - 15.0			7.5	CL	(6.6 - 15.0) Silty CLAY, dark reddish brown, moist, wet at 7.5', soft, low to medium plasticity, moderate hydrocarbon odor.
	5/5 (10-15)				

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Notes:

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Exide Technologies	Log of Boring: 2013-RMSB-7

Frisco Recycling Center Frisco, TX	Completion Date:	5/8/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	15
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101881.0426
	Logged By:	Roberta Russell	Easting:	2480206.0194
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 1.5	3/5			CON	(0 - 1.5) CONCRETE SLAB
1.5 - 1.7		1.5	1.5 - 2	FILL	(1.5 - 1.7) FILL, clayey sand/sandy clay, orange, moist, soft, low plasticity.
1.7 - 7.0		2.1	2 - 4	CL	(1.7 - 7.0) Silty CLAY, dark brown, moist, wet at 6.5', soft, low plasticity.
	5/5	1.5	5 - 6		
			6.5		
7.0 - 12.0					(7.0 - 12.0) Sandy CLAY, grayish brown, wet, soft, low plasticity.
12.0 - 15.0	4.5/5				(12.0 - 15.0) Silty CLAY, dark brown, trace calcareous precipitates, wet, very hard, low to medium plasticity.

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.
Open borehole evaluated with oil/water interface probe. No product indicated in borehole.
This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-RMSB-8

Frisco Recycling Center Frisco, TX	Completion Date:	5/8/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	15
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101841.0881
	Logged By:	Roberta Russell	Easting:	2480146.938
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 2.1	2/5			CON	(0 - 2.1) CONCRETE SLAB
2.1 - 3.1		0.4	2.1 - 3.1	FILL	(2.1 - 3.1) FILL, sandy, gravelly clay, ~10% sand and gravel in clay matrix, tan, moderate hydrocarbon odor.
3.1 - 5.0				NR	(3.1 - 5.0) No recovery.
5.0 - 10.0	3/5	1.2	5 - 7	CL/ML	(5.0 - 10.0) Silty CLAY/clayey SILT, dark reddish brown, wet at 7.5', soft, low to medium plasticity.
			7.5		
10.0 - 10.4	5/5			CL	(10.0 - 10.4) Sandy, gravelly CLAY, ~20% sand and gravel in clay matrix, grayish brown, wet, soft, low to medium plasticity, moderate hydrocarbon odor.
10.4 - 14.2				CL	(10.4 - 14.2) Sandy CLAY, grayish brown, wet, soft, low to medium plasticity, moderate hydrocarbon odor.
14.2 - 14.7				GC	(14.2 - 14.7) Clayey GRAVEL, ~60% fine to medium gravel, grayish brown, wet, soft, moderate hydrocarbon odor.
14.7 - 15.0				CL	(14.7 - 15.0) Sandy CLAY, grayish brown, wet, soft, low to medium plasticity, moderate hydrocarbon odor.

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.
Open borehole evaluated with oil/water interface probe. No product indicated in borehole.
This boring log should not be used seperately from the report to which it is attached.

Exide Technologies

Log of Boring: 2013-RMSB-9

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	5/7/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	15
Field Supervisor:	Tim Jennings, P.G.	Northing:	7101850.5528
Logged By:	Roberta Russell	Easting:	2480176.4834
Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 1.3	3/5			CON	(0 - 1.3) CONCRETE SLAB
1.3 - 6.5	3/5 (0-5); 5/5 (5-10)	2.2; 4,7; 4.7	1.3 - 2; 2 - 2.5; 5 - 7	FILL	(1.3 - 6.5) FILL, silty clay, orange and brown, moist, soft to firm, low to medium plasticity.
6.5 - 15.0	5/5 (5-10); 5/5 (10-15)	148	8	CL	(6.5 - 15.0) Silty CLAY, dark reddish brown, moist, wet at 9.0', soft to firm, low plasticity, greater plasticity with depth, trace gravel from 13.0-15.0', moderate hydrocarbon odor.

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Notes:

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This boring log should not be used seperately from the report to which it is attached.

Exide Technologies

Log of Boring: 2013-RMSB-10

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	5/8/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	15
Field Supervisor:	Tim Jennings, P.G.	Northing:	7101844.1378
Logged By:	Roberta Russell	Easting:	2480208.8629
Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 1.3	2.2/5			CON	(0 - 1.3) CONCRETE SLAB
1.3 - 3.4		1.1	1.3 - 2	FILL	(1.3 - 3.4) FILL, sandy clay/clayey sand, orange, moist, firm, low plasticity.
		2.5	2 - 3		
3.4 - 8.2	5/5	3.7	5 - 6	CL	(3.4 - 8.2) Silty CLAY, dark brown, moist, wet at 7.0'.
			7		
8.2 - 10.0				CL	(8.2 - 10.0) Sandy CLAY, dark grayish brown, wet, moderate hydrocarbon odor.
10.0 - 15.0	3.5/5			CL	(10.0 - 15.0) Silty CLAY/CLAY, dark brown, wet, firm, medium plasticity, moderate hydrocarbon odor.

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.
Open borehole evaluated with oil/water interface probe. No product indicated in borehole.
This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-RRS-3A

Frisco Recycling Center Frisco, TX	Completion Date:	3/27/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102073.967
	Logged By:	Roberta Russell	Easting:	2480071.193
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5		CON	(0 - 0.8) CONCRETE SLAB
1		0.8 - 2	FILL	(0.8 - 1.9) FILL, sandy, gravelly clay, ~20-30% fine-coarse sand and fine gravel in high-plasticity clay matrix, wet to moist, soft.
2		2 - 4	CH	(1.9 - 5.8) FILL, silty clay, trace fine gravel, dark grayish brown, moist, soft, high plasticity.
3				
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: 2013-RRS-4A

Frisco Recycling Center Frisco, TX	Completion Date:	5/21/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	3
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102060.752
	Logged By:	Tim Jennings, P.G.	Easting:	2480183.5008
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	3/3		CON	(0 - 0.9) CONCRETE SLAB
1		0.9 - 2	FILL	(0.9 - 3.0) FILL, gravel, clay and sand fill, dry, possible slag fragment at 2.0', refusal at 3.0' at apparent concrete.
2		2 - 3		
3				

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.

This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-STB-1

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101857.2181
	Logged By:	Roberta Russell	Easting:	2480006.9654
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	3.6/5	0 - 2	CON	(0 - 0.7) CONCRETE SLAB
1			FILL	(0.7 - 3.0) FILL, gravel with sand and clay, light brown, wet (possibly from concrete corer), unconsolidated or soft clay.
2		2 - 4		
3			CL	(3.0 - 5.0) SILTY CLAY/CLAY, dark brown to black, very moist, soft, low to medium plasticity.
4		4 - 5		
5				

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Notes:

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Exide Technologies

Log of Boring: 2013-STB-2

Frisco Recycling Center Frisco, TX	Completion Date:	3/7/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101809.889
	Logged By:	Roberta Russell	Easting:	2480060.3992
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 – 1.0	2.5/5			CON	(0 - 1.0) CONCRETE SLAB
1.0 – 3.0				FILL	(1.0 - 3.0) FILL, light to dark brown, gravel.
2.5 – 4		0.7	2.5 - 4		
3.0 – 3.4				FILL	(3.0 - 3.4) FILL, light yellowish brown, clayey gravel, moist, firm.
3.4 – 5.0				CL	(3.4 - 5.0) SILTY CLAY, dark brown, ~10% calcareous nodules, moist, firm to hard, low plasticity.
4 – 5		1.7	4 - 5		

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Notes:

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Exide Technologies	Log of Boring: 2013-STB-3

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101843.085
	Logged By:	Roberta Russell	Easting:	2480095.1282
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	3.7/5	0 - 2	CON	(0 - 0.7) CONCRETE SLAB
1			FILL	(0.7 - 2.0) FILL, gravelly clay, ~10-20% medium gravel, yellowish brown, wet (possibly from concrete corer), firm, low plasticity.
2		2 - 4	CH	(2.0 - 5.0) CLAY, dark gray, moist, firm to hard, medium to high plasticity.
3				
4		4 - 5		
5				

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.

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Exide Technologies	Log of Boring: 2013-STB-4

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101763.9043
	Logged By:	Roberta Russell	Easting:	2480125.1415
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	2.7/5		0 - 2	CON	(0 - 1.0) CONCRETE SLAB
1				FILL	(1.0 - 2.0) FILL, gravel, wet (possibly from concrete corer).
2		22	2 - 4	CL	(2.0 - 5.0) Silty CLAY, black to dark gray, moderate hydrocarbon odor, wet, soft, low plasticity.
3					
4			4 - 5		
5					

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Notes:

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This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-STB-5

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	1.5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101810.1084
	Logged By:	Will Vienne, P.G.	Easting:	2480039.3263
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	1.5/2	35.3	0 - 1.5	CON	(0 - 0.5) CONCRETE SLAB
1				FILL	(0.5 - 1.2) FILL, crushed black asphalt-like material and reddish granite, abundant feldspar and quartz, wet (may be from concrete corer), unconsolidated, granule to pebble sized.
					(1.2 - 1.5) FILL, sand, brown, abundant Fe staining, moist, unconsolidated, moderate sorting, very fine to fine grained, refusal at 1.5'.

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Notes:

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This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-STB-6

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	1.1
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101799.4733
	Logged By:	Will Vienne, P.G.	Easting:	2480030.8108
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	0.6/1.1	50.1		CON	(0 - 0.5) CONCRETE SLAB
			0.5 - 1.1	FILL	(0.5 - 0.8) FILL, crushed black asphalt-like material, reddish granite, granule to pebble sized, moist, unconsolidated.
1					(0.8 - 1.1) FILL, sand, heavy black stain at 0.8-1', moist, unconsolidated, very fine to fine grained, moderate sorting, refusal at 1.1'.

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Notes:

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This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-STB-7

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	1.2
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101819.0361
	Logged By:	Will Vienne, P.G.	Easting:	2480034.4435
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	0.7/1.2	32.6		CON	(0 - 0.5) CONCRETE SLAB
1			0.5 - 1.2	FILL	(0.5 - 1.2) FILL, crushed black asphalt-like material and reddish granite, granule to pebble sized, wet (may be from concrete corer), refusal at 1.2'.

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Notes:

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Exide Technologies	Log of Boring: 2013-STB-8

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	1.3
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101852.704
	Logged By:	Will Vienne, P.G.	Easting:	2479989.8386
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	0.5/1.3	60.7		CON	(0 - 0.8) CONCRETE SLAB
1			0.5 - 1.3	FILL	(0.8 - 1.2) FILL, black asphalt-like material and reddish granite, granule to pebble sized, wet (may be from concrete corer), unconsolidated.
					(1.2 - 1.3) FILL, sand, brown with Fe staining, very fine to fine grained, medium sorting, wet (may be from concrete corer), refusal at 1.3'.

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Notes:

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Exide Technologies

Log of Boring: 2013-STB-9

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	5/7/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	8
Field Supervisor:	Tim Jennings, P.G.	Northing:	7101812.453
Logged By:	Roberta Russell	Easting:	2479995.8612
Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0 - 0.5	2/5			CON	(0 - 0.5) CONCRETE SLAB
0.5 - 1.6		0.2	0.5 - 1	FILL	(0.5 - 1.6) FILL, clayey sand, orange, trace black staining, moist, soft.
1.6 - 5.5			5 - 5.5	CL	(1.6 - 5.5) Silty CLAY, dark brown, moist, hard, medium plasticity.
5.5 - 5.7	3/3			CL	(5.5 - 5.7) Gravelly, sandy CLAY, ~30% fine gravel and sand in clay matrix, wet, dark brown with orange Fe staining, wet, soft.
5.7 - 8.0				CL	(5.7 - 8.0) Silty CLAY, dark brown, wet, firm to hard, medium plasticity.

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Notes:

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This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-STB-10

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	1.1
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101831.6381
	Logged By:	Will Vienne, P.G.	Easting:	2479971.7708
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	0.4/1.1	0.4		CON	(0 - 0.5) CONCRETE SLAB
			0.5 - 1.1	FILL	(0.5 - 0.6) FILL, crushed black asphalt-like material and red granite, granule to pebble sized, wet (may be from concrete corer), unconsolidated.
1					(0.6 - 1.1) FILL, sand, brown, heavy Fe staining, very fine to fine grained, moderate sorting, wet (may be from concrete corer), unconsolidated.

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Notes:

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Exide Technologies	Log of Boring: 2013-STB-11

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	1.4
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101768.0406
	Logged By:	Will Vienne, P.G.	Easting:	2480094.6771
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0				CON	(0 - 0.5) CONCRETE SLAB
	0.9/1.4	67.8	0.5 - 1.4	FILL	(0.5 - 1.1) FILL, black asphalt-like material and reddish granite, granule to pebble sized, wet (may be from concrete corer).
1					(1.1 - 1.4) FILL, sand, brown with Fe staining, very fine to fine grained, moderate sorting, wet (may be from concrete corer), refusal at 1.4'.

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Notes:

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Exide Technologies	Log of Boring: 2013-STB-12

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	1.2
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101780.8028
	Logged By:	Will Vienne, P.G.	Easting:	2480016.3817
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	0.7/1.2	46.6		CON	(0 - 0.5) CONCRETE SLAB
			0.5 - 1.2	FILL	(0.5 - 0.9) FILL, crushed black asphalt-like material and red granite, moist (may be from concrete corer), unconsolidated.
1					(0.9 - 1.2) FILL, sand, brown with heavy Fe staining, very fine to fine grained, moderate sorting, wet (may be from concrete corer), unconsolidated.

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Notes:

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Exide Technologies	Log of Boring: 2013-WMU6-1

Frisco Recycling Center Frisco, TX	Completion Date:	5/7/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101955.0582
	Logged By:	Roberta Russell	Easting:	2479994.3068
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5		CON	(0 - 0.9) CONCRETE SLAB
1		0.9 - 2	FILL	(0.9 - 2.7) FILL, clayey silt/silty clay, dark brown with orange and black staining, moist, soft to firm, low plasticity.
2		2 - 4		
3			CL	(2.7 - 5.0) Silty CLAY, dark brown, trace calcareous precipitates, moist, firm, low to medium plasticity.
4		4 - 5		
5				

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Notes:

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Exide Technologies

Log of Boring: 2013-WMU14-1

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	5/7/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	5
Field Supervisor:	Tim Jennings, P.G.	Northing:	7101992.1222
Logged By:	Roberta Russell	Easting:	2479881.2748
Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 0.9	4.1/5		CON	(0 - 0.9) CONCRETE SLAB
0.9 - 5		0.9 - 2 2 - 4 4 - 5	FILL	(0.9 - 5.0) FILL, silty clay/clayey silt, dark reddish brown with trace orange and black staining, trace battery chips and slag fragments (<0.5" diameter) from 0.9-3.0', moist, soft to firm, low plasticity.

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Notes:

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Exide Technologies	Log of Boring: 2013-WMU14-2

Frisco Recycling Center Frisco, TX	Completion Date:	5/7/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101826.2342
	Logged By:	Roberta Russell	Easting:	2480109.0334
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm)	Sample Interval	USCS	Lithologic Description
0	4.1/5			CON	(0 - 0.9) CONCRETE SLAB
1		1.1	0.9 - 2	FILL	(0.9 - 1.5) FILL, sandy clay, moist, firm, low plasticity.
2					(1.5 - 5.0) FILL, silty clay/clayey silt, dark brown, moist, soft to firm, low plasticity, trace hydrocarbon odor.
3		0.8	2 - 4		
4		11.8	4 - 5		
5					

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.

This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-WMU14-3

Frisco Recycling Center Frisco, TX	Completion Date:	5/7/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102020.6551
	Logged By:	Roberta Russell	Easting:	2480630.7817
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4.1/5		CON	(0 - 0.9) CONCRETE SLAB
1		0.9 - 2	FILL	(0.9 - 4.6) FILL, silty clay/clayey silt, grayish brown with orange Fe staining, moist, firm, low plasticity.
2		2 - 4		
3				
4		4 - 5	GC	(4.6 - 5.0) Clayey GRAVEL, ~50-60% corase sand and fine -medium gravel in silty clay matrix, grayish brown with orange Fe staining, moist.
5				

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.

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Exide Technologies	Log of Boring: 2013-WMU16-1

Frisco Recycling Center Frisco, TX	Completion Date:	5/7/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101886.1348
	Logged By:	Roberta Russell	Easting:	2480414.841
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4.1/5		CON	(0 - 0.9) CONCRETE SLAB
1		0.9 - 2	FILL	(0.9 - 1.5) FILL, gravel (coarse pebbles), dry, unconsolidated.
2		2 - 4	CL	(1.5 - 5.0) Silty CLAY, dark brown, moist, firm, low plasticity.
3				
4		4 - 5		
5				

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Notes:

Borehole plugged with bentonite chips and concrete repaired upon completion.

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Exide Technologies	Log of Boring: 2012-BY-4

Frisco Recycling Center Frisco, TX	Completion Date:	3/5/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	2
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102230.7699
	Logged By:	Roberta Russell	Easting:	2479578.9168
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0			FILL	(0 - 1.5) FILL, clayey silt, light yellowish brown, moist, hard, low plasticity.
1	2/2			
				(1.5 - 2.0) FILL, abundant slag, gravel with silt and clay, dry, firm.
2				

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Notes:

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Exide Technologies	Log of Boring: E-11

Frisco Recycling Center, Frisco, TX	Completion Date:	4/29/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	16
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7102765.709
	Logged By:	Roberta Russell	Easting:	2480143.5364
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 4	4/4	0 - 0.5; 0.5 - 2; 2 - 4	CL	(0 - 5.9) Silty CLAY, trace fine-medium gravel, trace carbonate precipitates below 4.5', dark reddish brown, trace Fe staining below 5.0', moist, firm, low plasticity.
4 – 8	4/4	4 - 5; 5 - 7; 7 - 9	CL/ML	(5.9 - 12.0) Silty CLAY/clayey SILT, light grayish brown, abundant orange Fe staining, abundant calcareous precipitates, gravelly clay lenses (~30% medium gravel in clay matrix) at 5.9-6.0 and 6.6-6.7', gravelly clay lens (~10% gravel in clay matrix) from 11.3-12.0', moist, wet at 10.9', firm to hard, softer with depth, low plasticity.
8 – 12	4/4	9 - 10.9		
12 – 16	4/4		CL	(12.0 - 16.0) Gravelly CLAY, ~15-20% fine-medium gravel in clay matrix, light grayish brown with abundant orange Fe staining, wet, soft, low plasticity.

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Exide Technologies	Log of Boring: E-11A

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102808.2937
	Logged By:	Roberta Russell	Easting:	2480069.2399
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 0.5	CL	(0 - 5.0) Silty CLAY/CLAY, dark reddish brown, trace orange Fe-ox staining from 3-5', trace calcareous nodules from 3.3-5', moist, firm to hard, low to medium plasticity.
1		0.5 - 2		
2		2 - 4		
3				
4		4 - 5		
5				

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Exide Technologies	Log of Boring: E-11B

Frisco Recycling Center Frisco, TX	Completion Date:	3/15/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7102809.7866
	Logged By:	Will Vienne, P.G.	Easting:	2480025.1527
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	3.5/4	0 - 0.5	CL	(0 - 5.0) Slightly silty CLAY, very dark gray to dark brownish gray, soft and moist at 0-0.8', hard and dry at 0.8-5' with abundant limestone granules, low to medium plasticity clay.
1		0.5 - 2		
2		2 - 3.5		
3				
4	1/1	4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: E-15A

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102787.1342
	Logged By:	Roberta Russell	Easting:	2480940.0881
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 0.5	CL	(0 - 0.5) SILTY CLAY, dark reddish brown, moist, soft, low plasticity.
1		0.5 - 2		(0.5 - 3.0) Gravelly CLAY, ~10% medium gravel, thin interbedded clayey medium to coarse gravel(~40% gravel), light brown, moist, soft.
2		2 - 4		
3			ML	(3.0 - 4.4) Sandy SILT w/clay and gravel,~20% medium to coarse gravel, light yellowish brown, moist, soft.
4		4 - 5	CL/ML	(4.4 - 5.0) Silty CLAY/clayey SILT, light grayish brown, abundant orange Fe-ox staining, moist, firm, low plasticity.
5				

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Notes:

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Exide Technologies	Log of Boring: ECO-11

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102588.4364
	Logged By:	Roberta Russell	Easting:	2480247.5265
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4.5/5	0 - 0.5	CL	(0 - 4.1) Silty CLAY, dark brown, moist, soft to firm, low plasticity.
1		0.5 - 2		
2				
3		2 - 4		
4		4 - 5		(4.1 - 5.0) Gravelly CLAY, ~20% fine gravel, dark brown, wet, soft, low plasticity clay.
5				

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Notes:

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Exide Technologies	Log of Boring: ECO-12

Frisco Recycling Center Frisco, TX	Completion Date:	3/5/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102508.9348
	Logged By:	Roberta Russell	Easting:	2480906.7256
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 0.5	CL	(0 - 1.3) Silty CLAY, dark brown, trace gravel, moist, hard, low plasticity.
1		0.5 - 2	GC	(1.3 - 1.5) GRAVEL, w/CLAY, medium gravel, dark, soft.
2			CL	(1.5 - 4.7) Silty CLAY, light reddish brown, moist, firm, low to medium plasticity.
3		2 - 4		
4		4 - 5		(4.7 - 5.0) Gravelly CLAY, ~10% medium gravel, moist, firm, low plasticity clay.
5				

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Notes:

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Exide Technologies

Log of Boring: 2012-NDA-1

Frisco Recycling Center Frisco, TX	Completion Date:	3/5/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	6
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7102386.1757
	Logged By:	Roberta Russell	Easting:	2480118.7926
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 1.7	4.6/5		FILL	(0 - 1.7) FILL, silty clay, dark brown, abundant orange Fe-ox staining, 1" slag fragment at 1.6', moist, soft to firm, low plasticity.
1.7 – 6.0		4 - 5	CL	(1.7 - 6.0) Silty CLAY, dark reddish brown, moist, wet at 4.1', soft to firm, low plasticity.
5 – 6	1/1	5 - 6	CL	

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Notes:

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Exide Technologies	Log of Boring: 2012-SL-1

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	6
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7102343.7519
	Logged By:	Roberta Russell	Easting:	2479384.4867
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 0.6	3.6/5		FILL	(0 - 0.6) FILL, clayey silt, dark reddish brown, moist, soft, low plasticity.
0.6 – 1.6			FILL	(0.6 - 1.6) FILL, silty clay, light grayish brown, orange Fe staining, moist, firm, low plasticity.
1.6 – 2.5			CL	(1.6 - 2.5) CLAY, dark gray, dry.
2.5 – 3.0			FILL	(2.5 - 3.0) FILL, silty clay, trace gravel, gray, abundant orange staining, moist, firm, low plasticity.
3.0 – 6.0		4 - 5	FILL	(3.0 - 6.0) FILL, abundant slag, dark gray, dry.
5 – 6	0.5/1	5 - 6	FILL	

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Exide Technologies	Log of Boring: 2013-SL-4

Frisco Recycling Center Frisco, TX	Completion Date:	3/7/2013	Drilling Method:	Hand Auger
	Driller:	Margarito Estrada	Borehole Diameter (in.):	3
	Driller's License:	58164	Total Depth (ft):	4
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102263.8969
	Logged By:	Roberta Russell	Easting:	2479414.9719
	Sampling Method:	3"X6" Hand Auger	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	0.5/0.5	0 - 0.5	CL/ML	(0 - 4.0) Silty CLAY/clayey SILT, dark brown, orange and red Fe staining, ~10% calcareous nodules, moist, soft to firm, low plasticity.
	0.5/0.5	0.5 - 2		
1	0.5/0.5			
	0.5/0.5			
2	0.5/0.5	2 - 4		
	0.5/0.5			
3	0.5/0.5			
	0.4/0.5			
4				

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Exide Technologies	Log of Boring: 2013-MW10-1

Frisco Recycling Center Frisco, TX	Completion Date:	3/5/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101995.4879
	Logged By:	Roberta Russell	Easting:	2480989.1399
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 0.5	CH	(0 - 3.0) CLAY, dark reddish brown, moist, soft, medium to high plasticity.
1		0.5 - 2		
2		2 - 4		
3			ML	(3.0 - 5.0) Clayey SILT, dark reddish brown, calcareous nodules (10%), slightly moist, hard, low plasticity.
4		4 - 5		
5				

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Exide Technologies	Log of Boring: 2013-MW10-2

Frisco Recycling Center Frisco, TX	Completion Date:	3/5/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101953.2098
	Logged By:	Roberta Russell	Easting:	2480965.5869
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 0.5	FILL	(0 - 0.2) FILL, sand, dark reddish brown, moist, soft.
1		0.5 - 2	CL	(0.2 - 4.5) Silty CLAY, dark reddish brown, calcareous nodules from 2.5-4.5', moist, soft to firm, low plasticity.
2				
3		2 - 4		
4				
5		4 - 5	ML	(4.5 - 5.0) Sandy SILT, trace medium gravel, light yellowish brown, calcareous, slightly moist, soft.

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Notes:

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Exide Technologies	Log of Boring: 2013-MW10-3

Frisco Recycling Center Frisco, TX	Completion Date:	3/5/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101988.5518
	Logged By:	Roberta Russell	Easting:	2480897.199
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 0.5	FILL	(0 - 0.4) FILL, silty clay with sand and gravel, red Fe-ox staining, plastic chip present, moist, soft, low plasticity.
1		0.5 - 2	ML/CL	(0.4 - 5.0) Clayey SILT/SILTY clay, dark reddish brown, calcareous nodules from 2.6 - 5', moist, soft to firm, low plasticity.
2		2 - 4		
3				
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: 2013-TS-1

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	4
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7102097.0348
	Logged By:	Will Vienne, P.G.	Easting:	2480985.384
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 4	4/4	0 - 0.5 0.5 - 2 2 - 4	CL	(0 - 4.0) Silty CLAY, very dark brown gray, weathered, dry, slightly firm to firm, low plasticity clay, root fragments at 0-0.3', trace limestone granules in moderately organic clay at 0-2.2', abundant limestone granules below 2.2'.

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Exide Technologies	Log of Boring: 2013-TS-2

Frisco Recycling Center Frisco, TX	Completion Date:	3/14/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	4
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7102252.6153
	Logged By:	Will Vienne, P.G.	Easting:	2480976.5784
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4/4	0 - 0.5	CL	(0 - 4.0) Silty CLAY, dark brownish gray, dry, slightly firm to firm, low plasticity clay, trace root fragments from 0-0.4', trace limestone granules in moderately organic clay at 0-2.3', gray brown below 2.3' with abundant limestone granules.
1		0.5 - 2		
2		2 - 4		
3				
4				

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Exide Technologies	Log of Boring: 2013-BS2-1

Frisco Recycling Center Frisco, TX				
	Completion Date:	4/29/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101512.9229
	Logged By:	Will Vienne, P.G.	Easting:	2480177.639
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0–4	3.7/4	0.5 - 2; 2 - 4	CL	(0 - 5.0) Silty CLAY, common limestone granules and calcareous precipitates, brownish gray, trace mottled Fe staining, dry, soft to firm, low to medium plasticity.
4–5	1/1	4 - 5	CL	

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Exide Technologies

Log of Boring: BS-3

Frisco Recycling Center
Frisco, TX

PBW Project No. 1755

Completion Date:	3/4/2013	Drilling Method:	DPT
Driller:	Margarito Estrada	Borehole Diameter (in.):	2
Driller's License:	58164	Total Depth (ft):	5
Field Supervisor:	Will Vienne, P.G.	Northing:	7101491.1574
Logged By:	Will Vienne, P.G.	Easting:	2480214.5135
Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0–5	5/5	1 - 2 2 - 4 4 - 5	CL	(0 - 5.0) CLAY/silty CLAY, dark brownish gray, roots and clay with abundant limestone and shale pebbles at 0-0.6', soft clay with abundant limestone clay granules at 0.6-3.3', firm silty clay at 3.3-5', slightly moist, soft to firm, low to medium plasticity.

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Notes:

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Exide Technologies	Log of Boring: 2013-B4R-A

Frisco Recycling Center Frisco, TX	Completion Date:	4/29/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101414.5525
	Logged By:	Will Vienne, P.G.	Easting:	2479942.58
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	3.6/4	0 - 0.5	CL	(0 - 5.0) Silty CLAY, brownish gray, slightly sandy at 4.0-5.0', some fissile fragments near base, dry, common Fe staining, no to moderate cementation, some cementation at 4.4-4.5', low plasticity.
1		0.5 - 2		
2				
3		2 - 4		
4	1/1	4 - 5		
5				

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Exide Technologies	Log of Boring: 2013-BS5-1

Frisco Recycling Center Frisco, TX	Completion Date:	4/29/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101471.5118
	Logged By:	Will Vienne, P.G.	Easting:	2480114.1188
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 4	4/4	0.5 - 2 2 - 4	CL	(0 - 5.0) Sandy, silty CLAY, brownish gray,trace yellow precipitate below 2.9', moderate to abundant Fe staining, moist, soft, low plasticity.
4 – 5	1/1	4 - 5		

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Exide Technologies	Log of Boring: 2013-CUFT-3

Frisco Recycling Center Frisco, TX	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101737.6536
	Logged By:	Will Vienne, P.G.	Easting:	2479344.9752
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4.5/5	0 - 0.5	CL	(0 - 5.0) CLAY, dark brownish gray, abundant limestone pebbles in clay matrix at 0-0.6', trace limestone granules below 0.6', white precipitate like substance at surface, moist 0-0.6', soft to slightly firm, low to medium plasticity.
1		0.5 - 2		
2				
3		2 - 4		
4		4 - 5		
5				

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Notes:

Borehole plugged with bentonite chips upon completion.

This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-CUFT-4

Frisco Recycling Center Frisco, TX	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101888.98
	Logged By:	Will Vienne, P.G.	Easting:	2479303.0138
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4.6/5	0 - 0.5	CL	(0 - 5.0) CLAY, dark gray, trace limestone granules, moderately abundant decayed plant fragments, wet at 0-0.5', moist below 0.5', soft, low plasticity.
1		0.5 - 2		
2		2 - 4		
3				
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: 2013-CUFT-5

Frisco Recycling Center Frisco, TX				
	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101906.1421
	Logged By:	Will Vienne, P.G.	Easting:	2479178.0231
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4.7/5	0 - 0.5	CL	(0 - 5.0) Silty CLAY, v. dark gray, abundant limestone granules, moderately abundant decayed plant material, moist, soft to slightly firm, low plasticity.
1		0.5 - 2		
2		2 - 4		
3				
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: 2013-CUFT-6

Frisco Recycling Center Frisco, TX	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101910.6793
	Logged By:	Will Vienne, P.G.	Easting:	2479083.0433
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4.3/5	0 - 0.5	CL	(0 - 5.0) Silty CLAY, dark gray, trace limestone granules, moderately abundant decayed plant material, moist, soft, low to medium plasticity.
1		0.5 - 2		
2				
3		2 - 4		
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: 2013-CUFT-7

Frisco Recycling Center Frisco, TX	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101923.4133
	Logged By:	Will Vienne, P.G.	Easting:	2478975.0661
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 0.5	CL	(0 - 5.0) Silty CLAY, slightly sandy at 0-0.4', dark gray, slightly moist, soft at 0-1.8', firm below 1.8', low plasticity.
1		0.5 - 2		
2		2 - 4		
3				
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: 2013-CUFT-7A

Frisco Recycling Center Frisco, TX	Completion Date:	3/7/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101907.9099
	Logged By:	Roberta Russell	Easting:	2478965.4179
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4.8/5	0 - 0.5	CL	(0 - 5.0) Silty CLAY/CLAY, dark reddish brown, moist, firm, low to medium plasticity.
1		0.5 - 2		
2		2 - 4		
3				
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: 2013-CUFT-8

Frisco Recycling Center Frisco, TX	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101684.4603
	Logged By:	Will Vienne, P.G.	Easting:	2479346.4925
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 0.5	CL	(0 - 5.0) Silty CLAY, grayish brown, moderate to abundant limestone granules throughout, firm, shale fragments at 2.8-3.2', soft and moist at 0-0.9', dry and firm below 0.9', low plasticity.
1		0.5 - 2		
2		2 - 4		
3				
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: 2012-FWFS-1

Frisco Recycling Center Frisco, TX	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101762.3225
	Logged By:	Will Vienne, P.G.	Easting:	2479323.7294
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 0.5	CL	(0 - 5.0) CLAY, dark brownish gray, abundant limestone pebbles in clay matrix 0-0.5', trace limestone granules below 0.5', white precipitate-like material in fracture fills from 0-2', very dark gray organic clay at 3-5' with abundant decayed plant fragments, slightly moist to dry, low plasticity.
1		0.5 - 2		
2		2 - 4		
3				
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: 2013-CUFT-10

Frisco Recycling Center Frisco, TX	Completion Date:	3/7/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101931.4899
	Logged By:	Roberta Russell	Easting:	2478954.0769
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4.4/5	0 - 0.5	FILL	(0 - 0.5) FILL, clayey silt w/gravel, dark brown, ~10% medium gravel, battery chip at 0.5', moist, soft, low plasticity silt.
1		0.5 - 2	CL	(0.5 - 5.0) SILTY CLAY, moist, firm, low to medium plasticity.
2		2 - 4		
3				
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: ECO-3

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	Hand Auger
	Driller:	Margarito Estrada	Borehole Diameter (in.):	3
	Driller's License:	58164	Total Depth (ft):	3
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101296.3389
	Logged By:	Roberta Russell	Easting:	2480817.4415
	Sampling Method:	3"X6" Hand Auger	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	0.5/0.5	0 - 0.5	CL	(0 - 3.0) Silty CLAY, dark reddish brown, abundant root material at 0-2', moist, soft to firm, low plasticity.
	0.5/0.5	0.5 - 2		
1	0.5/0.5			
	0.5/0.5			
2	0.5/0.5	2 - 3		
	0.5/0.5			
3				

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Notes:

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Exide Technologies	Log of Boring: ECO-6

Frisco Recycling Center Frisco, TX	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101325.3004
	Logged By:	Will Vienne, P.G.	Easting:	2480600.8295
	Sampling Method:	3"x 5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 5	4.6/5	0.5 - 2 2 - 4 4 - 5	CL	(0 - 5.0) Silty CLAY, dark brownish gray, trace limestone granules, slightly moist to dry, soft to firm, soft at 0-2', firm at 2-5', low plasticity.

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Notes:

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Exide Technologies	Log of Boring: ECO-7

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	Hand Auger
	Driller:	Margarito Estrada	Borehole Diameter (in.):	3
	Driller's License:	58164	Total Depth (ft):	3
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101179.0319
	Logged By:	Roberta Russell	Easting:	2480616.4118
	Sampling Method:	3"X6" Hand Auger	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	0.5/0.5		CL/ML	(0 - 3.0) Silty CLAY/clayey SILT, dark reddish brown, abundant root material from 0-0.5', moist, soft to firm, low plasticity.
	0.5/0.5	0.5 - 2		
1	0.5/0.5			
	0.5/0.5			
2	0.5/0.5	2 - 3		
	0.5/0.5			
3				

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Notes:

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Exide Technologies	Log of Boring: ECO-7A

Frisco Recycling Center Frisco, TX	Completion Date:	3/6/2013	Drilling Method:	Hand Auger
	Driller:	Margarito Estrada	Borehole Diameter (in.):	3
	Driller's License:	58164	Total Depth (ft):	3
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101171.2643
	Logged By:	Roberta Russell	Easting:	2480616.2589
	Sampling Method:	3"X6" Hand Auger	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	0.5/0.5	0 - 0.5	CL/ML	(0 - 2.5) Silty CLAY/clayey SILT, dark reddish brown, ~10% calcareous nodules, moist, soft to firm, low plasticity.
	0.5/0.5	0.5 - 2		
1	0.5/0.5			
	0.5/0.5			
2	0.5/0.5	2 - 3		
	0.5/0.5		CL	(2.5 - 3.0) Silty CLAY, yellowish brown, dry, very hard, low plasticity.
3				

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Notes:

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Exide Technologies	Log of Boring: ECO-7B

Frisco Recycling Center Frisco, TX				
	Completion Date:	3/15/2013	Drilling Method:	Drive Sampler
	Driller:	--	Borehole Diameter (in.):	2
	Driller's License:	--	Total Depth (ft):	2
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101168.7735
	Logged By:	Will Vienne, P.G.	Easting:	2480616.5561
	Sampling Method:	6" Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	0.5/0.5	0 - 0.5	CL	(0 - 2.0) Slightly Sandy SILTY CLAY, dark brownish gray, becoming more brown with Fe staining with depth, increased clay content below 1', dry, soft to slightly firm, low plasticity.
	0.5/0.5	0.5 - 1		
1	0.5/0.5	1 - 1.5		
	0.5/0.5	1.5 - 2		
2				

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Notes:

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Exide Technologies	Log of Boring: ECO-8

Frisco Recycling Center Frisco, TX	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101519.2687
	Logged By:	Will Vienne, P.G.	Easting:	2480460.2113
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	4.6/5		CL	(0 - 5.0) Silty CLAY, dark brownish gray, trace limestone pebbles, increasing firmness with depth, slightly moist, soft to slightly firm, low plasticity.
1		0.5 - 2		
2		2 - 4		
3				
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: ECO-9

Frisco Recycling Center Frisco, TX	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101336.2375
	Logged By:	Will Vienne, P.G.	Easting:	2480435.6624
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 1.4	3.9/5	0.5 - 2	CL	(0 - 1.4) Silty CLAY, potential fill, weathered, very dark brownish gray, abundant limestone pebbles, fragmented and unconsolidated shale from 1-1.4', slightly moist, soft, low plasticity.
1.4 - 5.0		2 - 3.9	SW	(1.4 - 5.0) Silty SAND, potential fill, light brown, very fine grained, dry, becoming clayey at 3.6-3.9', dry, unconsolidated.

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Notes:

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Exide Technologies	Log of Boring: SRB-VS-9

Frisco Recycling Center Frisco, TX	Completion Date:	5/21/2013	Drilling Method:	DPT
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7101361.944
	Logged By:	Tim Jennings, P.G.	Easting:	2479938.26
	Sampling Method:	4' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 4	4/4	0.9 - 2 2 - 4	CL	(0 - 3.1) Silty CLAY, brown, dry to moist, firm, medium plasticity.
4 – 5	1/1	4 - 5	SH	(3.1 - 5.0) Weathered shale, brown, moist to dry, hard.

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Notes:

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Exide Technologies	Log of Boring: 2013-SDA-3A

Frisco Recycling Center Frisco, TX	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101576.8349
	Logged By:	Will Vienne, P.G.	Easting:	2480331.1409
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 0.5	CL	(0 - 5.0) Silty CLAY, dark brownish gray, trace limestone pebbles and granules, slightly moist, slightly soft to slightly firm, low to medium plasticity.
1		0.5 - 2		
2		2 - 4		
3				
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: 2013-SDA-4A

Frisco Recycling Center Frisco, TX	Completion Date:	3/4/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7101587.5249
	Logged By:	Will Vienne, P.G.	Easting:	2480227.9279
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0	5/5	0 - 0.5	CL	(0 - 5.0) CLAY and silty CLAY, dark brownish gray, abundant limestone pebbles and fragmented shale in clay matrix at 0-0.7' with abundant roots, trace carbonate granules and pebbles below 0.7', slightly moist, soft to slightly firm, low to medium plasticity.
1		0.5 - 2		
2				
3		2 - 4		
4		4 - 5		
5				

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Notes:

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Exide Technologies	Log of Boring: 2012-FWCS-1

Frisco Recycling Center Frisco, TX	Completion Date:	3/5/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102032.2705
	Logged By:	Roberta Russell	Easting:	2479675.8982
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 – 2.4	4.5/5		FILL	(0 - 2.4) FILL, clayey silt/silty clay, reddish brown, slag fragment at 1.8', plastic chip at 2.1', trace orange staining, moist, soft to firm.
2.4 – 5.0		2 - 4 4 - 5	ML	(2.4 - 5.0) Clayey SILT, dark reddish brown, moist, soft to firm, low plasticity.

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Notes:

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Exide Technologies

Log of Boring: 2012-FWCS-1A

Frisco Recycling Center Frisco, TX	Completion Date:	3/5/2013	Drilling Method:	DPT
	Driller:	Margarito Estrada	Borehole Diameter (in.):	2
	Driller's License:	58164	Total Depth (ft):	5
PBW Project No. 1755	Field Supervisor:	Tim Jennings, P.G.	Northing:	7102026.4054
	Logged By:	Roberta Russell	Easting:	2479670.9974
	Sampling Method:	5' Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0 - 1	4/5			(0 - 1.0) GABION BASKET
1 - 2		1 - 2	FILL	(1.0 - 2.0) FILL, clayey silt, light reddish brown, slag/battery chip fragments at ~2', dry, hard.
2 - 5		2 - 4 4 - 5	ML/CL	(2.0 - 5.0) Clayey SILT/silty CLAY, dark reddish brown, trace red Fe-ox staining, moist.

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:

Borehole plugged with bentonite chips upon completion.

This boring log should not be used seperately from the report to which it is attached.

Exide Technologies	Log of Boring: 2013-FWCS-1B

Frisco Recycling Center Frisco, TX	Completion Date:	3/15/2013	Drilling Method:	Drive Sampler
	Driller:	Dan Spaust	Borehole Diameter (in.):	2
	Driller's License:	3038	Total Depth (ft):	3.1
PBW Project No. 1755	Field Supervisor:	Will Vienne, P.G.	Northing:	7102016.0586
	Logged By:	Will Vienne, P.G.	Easting:	2479668.7979
	Sampling Method:	6" Lined Tube	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	Sample Interval	USCS	Lithologic Description
0–1	NR		NR	(0 - 1.1) GABION BASKET, no recovery.
1	0.5/0.5	1.1 - 1.6	CL	(1.1 - 3.1) Silty CLAY, dark brown to gray, common decayed plant material, abundant limestone granules, moist at 1.1-2.6', wet at 2.6-3.1', soft, low to medium plasticity.
2	0.5/0.5	1.6 - 2.1		
	0.5/0.5	2.1 - 2.6		
3	0.5/0.5	2.6 - 3.1		

PBW

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