Appendix A
Site Characterization Summary and Remediation Plan

Site Characterization Summary & Remediation Plan Milepost 174.5 Release Site

Chevron Pipe Line Company
Salt Lake Pump Station
Salt Lake City, Utah
Bellaire, Texas

July 2010

EarthFax EarthFax Engineering, Inc.

Engineers / Scientists
www.earthfax.com

TABLE OF CONTENTS

FIGURES

APPENDICES

SITE CHARACTERIZATION SUMMARY & REMEDIATION PLAN MILEPOST 174.5 RELEASE SITE

CHAPTER 1

INTRODUCTION

The recent pipeline release at MP 174.5 has resulted in contamination of the soils surrounding the pipeline's leak point along with the soils beneath a temporary crude pool created to contain the leak during the event. As of July 12, 2010 approximately 500 cubic yards of material have been excavated from the site to remove a portion of the visibly contaminated soils and expose Rocky Mountain Power's ("RMP") buried transmission lines running north-south through the site with approximately 1,700 cubic yards of contaminated soil remaining. The purpose of this report is to summarize the investigation performed to delineate the extent of the remaining contamination and to outline a plan for remediation of the site.

This document is divided into three chapters, including this introduction. A summary of the methods and findings of the site investigation are discussed in Chapter 2. An outline of the remediation plan follows in Chapter 3. Figures and appendices follow the text.

CHAPTER 2
SITE CHARACTERIZATION

2.1 INVESTIGATIONAL METHODS

The characterization of the spill site was performed by drilling exploratory boreholes at the locations shown in the attached Figure 2-1. These boreholes were drilled with a tractor-mounted geoprobe rig (BH1-BH10), with a backhoe (BH11), or by hand with a bucket auger (BH12-BH15) during the week of June 21, 2010. The soils recovered were analyzed in the field for organic vapors using an organic vapor analyzer ("OVA") and samples were collected and submitted for laboratory analyses. Laboratory samples were collected as soon as clean soils were encountered in each boring as indicated by observations of soil staining or organic vapor content.

A total station survey was also conducted to create an accurate base map for site activities and to establish the relative elevation of the boreholes, ground surface at the leak point, crude pool, and Red Butte Creek. An arbitrary datum of 100 feet was established on a curb near the William's Building emergency generator bays for this survey. This datum can also be used to re-establish the expected depth of contaminated soils during cleanup. If desired, this datum and other control points from the survey can be tied into USGS coordinate system at a later date.

2.2 BOREHOLE SUMMARY

Following is a summary of the findings for each borehole. Figure 2-2 shows each boring at its respective elevation with the extent of visible staining, sample locations, and analytical laboratory results for these samples. This figure also includes the elevation of the ground surface at the leak point, crude pool, and Red Butte Creek. The logs for each boring with OVA readings and laboratory analytical results can be found in Appendices A and B, respectively.

Note: All references to depth refer to the depth below the ground surface at the time of drilling.

- BH-1: Located between two power terminal foundations, drilled to 20 ft (level of deep foundations supporting terminal). Visible crude staining to 5.5 ft.
- BH-2: Located between two power terminal foundations, drilled to refusal at 18 ft. Visible crude staining to 12 ft with a strong hydrocarbon odor present to 14 ft.
- BH-3: Located uphill of the spill as shown on Figure 1, drilled to refusal at 23 ft. No hydrocarbon odor or staining present.
- BH-4: Located near the bridge over Red Butte Creek, below the crude "channel" present during the release, drilled to refusal at 12.5 ft. Visible crude staining from 5-7 ft (0-5 ft already excavated and replaced).
- BH-5: Located along the crest of the slope to Red Butte Creek, drilled to 16 ft. Visible crude staining to 5.5 ft.
- BH-6: Located near the crest of the slope to Red Butte Creek in the bottom of an excavation performed to expose concrete covering the RMP transmission lines, drilled to 12 ft. Visible crude staining to 4 ft.
- BH-7: Located near the crest of the slope to Red Butte Creek in the bottom of an excavation performed to expose concrete covering the RMP transmission lines, drilled to 12 ft. Visible crude staining from 4-4.5 ft.
- BH-8: Located south of the area excavated to create the crude pool, drilled to refusal at 17 ft. No hydrocarbon odor or staining present.
- BH-9: Located near the southwest corner of the emergency generator bay, uphill from the crude pool area. Drilled to refusal at 17 ft. No hydrocarbon odor or staining present.

- BH-10: Located between the two crude lines downstream from the leak point, drilled to verify if crude traveled along the pipe bedding. This area was previously excavated to expose and inspect a weld. As a result, the top 3 ft. are comprised of recently placed fill and appear slightly contaminated due to mixing with contaminated soils. Below this level the soil appears clean at 4 ft.

- BH-11: Located between the two crude lines, downstream from BH-10, test pit dug to 12 ft (2 ft below the lower of the two pipelines). No hydrocarbon odor or staining present.

- BH-12 through BH-15: Hand borings installed in the center of the 4 RMP transmission lines from 0-4 ft below the transmission line's sand bedding layer after the protective concrete layer was removed. No hydrocarbon odor or staining present.

2.3 EXPECTED EXTENT OF CONTAMINATION

Based on observations made during the drilling, it appears as if the crude oil is present in the soil roughly 12-14 feet below the ground surface (at the time of drilling) near the leak point at the electrical towers and 5-6 feet below the ground surface at the southern end of the pool location (see Figure 2-1). Three borings were installed uphill and south of the known contaminated area to assess whether the contamination had migrated off-site. Based on the observations made of these boreholes as well as observations made of the pipeline repair excavation, it appears as if the crude did not significantly migrate off site to the north, east, or south. However, based on soil staining and observations of excavations made at the level of the river, it is apparent that the crude oil migrated westerly through the soil down to Red Butte Creek.

Since geoprobe boreholes could not be drilled in the area surrounding the RMP power lines, the overlying concrete slab was removed in its entirety throughout the existing excavation area to evaluate whether the crude had migrated into the underlying sand bedding layer. Hand augered soil borings were then drilled to depths of 4 feet below the base of the sand bedding layer to assess the extent of crude contamination in this area. With the exception of the area immediately surrounding the power terminals, it was observed that the crude only contaminated

the westernmost edge of the sand and did not infiltrate the sand layer or beneath. The sand is significantly contaminated on the two westernmost power wires near the terminal towers but the contamination does not appear to extend beyond 20 feet south of the terminal towers. These transmission wires have since been removed as of July 2, 2010.

Though a soil boring could not be safely drilled between the existing excavation at the crude pool location and the emergency generator bays, patchy crude staining was observed on the face of the excavation and is only expected to extend several feet toward the generator bays in the location shown on Figure 2-1.

CHAPTER 3
EXCAVATION & REPLACEMENT PLAN

As requested by Chevron Pipe Line ("CPL") and Chevron Environmental Management Company ("EMC"), the following is an outline of the plan to excavate and replace the contaminated soils at the spill site. The Surface Water Drainage Control Plan necessary to begin work on the site has been implemented and control structures have been constructed on the site.

It is anticipated that the excavation and replacement can take place in a single phase with the exception of the patchy stained area in the excavation wall downhill of the generator bay building. It is recommended that the stained soils in this excavation wall be excavated and replaced in the same day near the end of the project after the soils below have been replaced. This will minimize the amount of time this excavation remains open directly beneath the generator bays.

It is our understanding that the terminal towers present on the northern side of the contaminated area were disassembled by RMP during the week of July 5, 2010 and relocated to the south. With visual contamination observed at depths up to 12 feet in the vicinity of the towers, part or all of the tower foundations left behind from this disassembly (18 ft deep on cable towers, 3 feet deep on power line towers) will need to be demolished to allow for excavation of contaminated soils.

Under the direction of EarthFax, the following sequence of events is recommended for the excavation and replacement of the contaminated soils at the spill site:

1. Remove the three large trees near the river at the northern end of the contaminated area (completed week of July 5, 2010).
2. Starting at the downhill portion of the known contamination area, continue excavating all visually contaminated soils.

- Excavation slopes will need to be benched at approximately 1H:1V in the area beneath the generator bay in order to obtain the depth required down to the river without undermining the generator bay building. It is recommended that this excavation and backfill begin at the southern end and progress toward the north approximately 20 feet at a time beneath the generator building. This will prevent the excavator from entering down into the excavation beneath these steep slopes. Note: Contamination is not expected to be present more than several feet beneath the river in this location.

- Excavation slopes will need to be benched/sloped at 1.5H:1V as required by OSHA for Type C soils in the northern (power terminal tower area) section where excavation depths are deeper and contamination is known to extend below the level of the river. The extent of the excavation at this slope can be seen on Figure 2-1 along with the extent of an access ramp excavated at 1.75H:1V. As seen on the figure, maintaining this slope will require exposing the Chevron crude pipelines in the area surrounding the excavation. Place supports under the pipe as directed by CPL to provide structural support for the pipelines as the excavation progresses.

- Segregate clean (uphill) soils from contaminated soils as much as possible and store them in the staging area.

- Demolish the RMP power terminal foundations in sections as the excavation progresses downward.

- Once the level of the river is reached on the northern end, create a temporary dam upstream to pump the river around the excavation area to allow for contaminated soils to be excavated below the river elevation. It is expected that this dam can be installed upstream of the nearby road culverts using supersacks of sand.

3. Using an OVA, measure the concentration of organic vapors emanating from the soils to assess the cleanliness of the soil. Once OVA measurements indicate that the soil is clean, take a grab sample for laboratory analysis from all areas surrounding excavated, stained soils. Both OVA measurements and confirmation samples shall be taken as outlined in the Confirmation Sampling Plan.

4. If laboratory analyses (1 day turnaround) indicate that cleanup criteria have been met, begin replacing excavated soils with compacted common fill. Common fill is excavated granular fill or imported soil that consists of gravels, sands, silts, or mixtures that are free of debris, vegetation, sod, frozen soil, contaminants, deleterious materials, and rocks over 4 inches. Common fill should be granular and well-graded and should have the following gradation limits:

Sieve Size	% Passing
4"	100
No. 4 (4.75mm)	40-70
No. 200 (0.075mm)	10-35

This material should be placed in lifts not exceeding 8 inches before compaction and should be uniformly compacted to at least 95% of its Standard Proctor maximum dry density (ASTM D698, AASHTO T-99) at +/-2% of the optimum moisture content. A sufficiently large trackhoe mounted vibratory plate should be used to compact the common fill.

5. It is our understanding that RMP may intend to install a new power terminal slightly south of the existing power terminal after the completion of contamination removal. Though the final location of the new RMP terminal has not been established, it is recommended that its proposed location be verified with RMP prior to backfilling the excavation. RMP may specify a specific material and compaction requirement in the vicinity of a new terminal if one is to be installed within the excavation area.

6. Place compacted common fill as described in Step 4 to within 8 inches of the existing grade. Note: Compact the last lift of common fill by lightly tamping with the bucket, this will allow for the topsoil to adhere better and allow for improved infiltration of rain water to prevent erosion.

7. Replace the previously demolished sprinkler system under the direction of the university once all backfill has been placed.

8. Loosely place 8 inches of topsoil over the newly placed fill.

9. Place sod on the finished ground surface. Note: If the slope is to remain un-vegetated for longer than a week it is recommended that erosion control blankets be placed on the slope until the sprinkler system can be installed and sod laid.

Contaminated soils will be loaded into end dumps at the site and hauled directly to the Clean Harbors Non-Hazardous Waste Facility at Grassy Mountain, Utah. It is estimated there will be approximately 1,700 cubic yards of contaminated soils excavated from the site with approximately 2,200 compacted cubic yards required to bring the site back to its original grade.

FIGURES

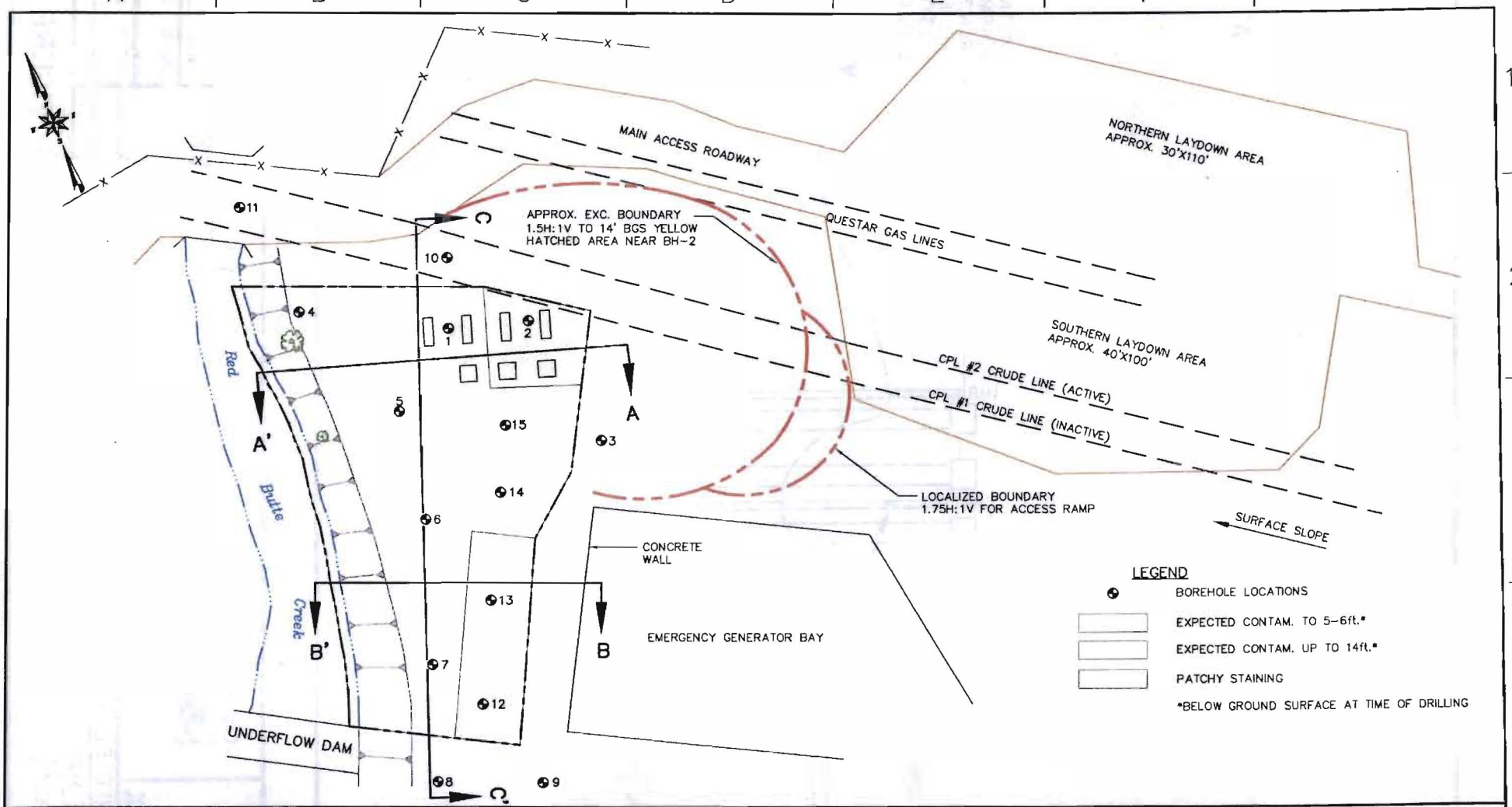
APPENDIX A

Soil Boring Logs

APPENDIX B

Laboratory Analytical Results

FIGURES



REVISIONS

DR SWF/SAM CH. GWW
DR APP. GWW
ENGR. SM
OPR'G DEPT. APPROVED
ENG'R. DEPT.

EarthFax

Chevron Pipe Line

Red Butte Release

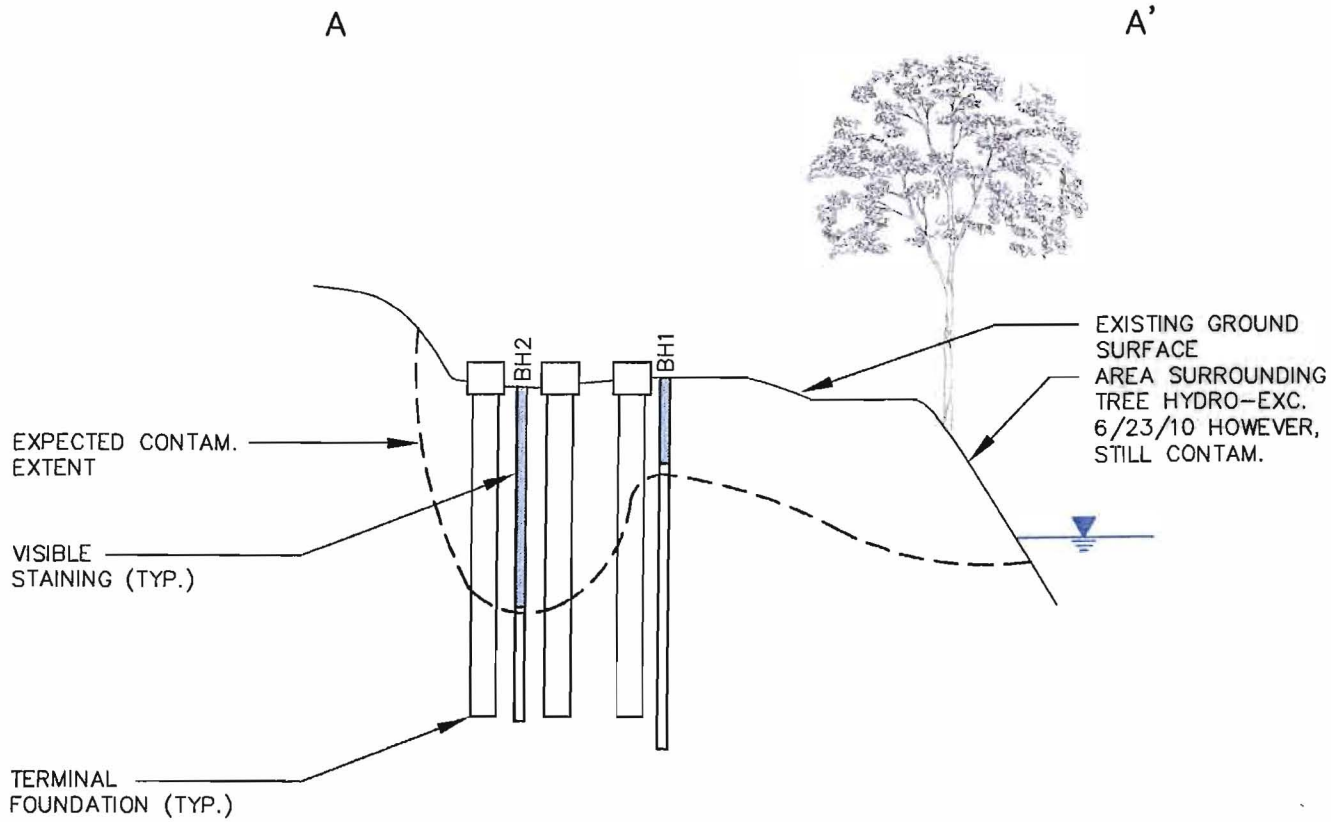
SCALE 1" = 20' DATE 07-12-10

MP 174.5 RED BUTTE RELEASE
SPILL SITE MAP
W/ BOREHOLE LOCATIONS & EXPECTED EXTENT OF CONTAMINATION

C.C.
S.O.

Figure 2-1

G:\VCT300\SPILL SITE INVEST & EXC\NEWEST REPORT\DWG\FIG 2-1.DWG



REV

EarthFax

Chevron Pipe Line

Red Butte Release

DR SWF CH. GWW
DR APP. GWW
ENGR. SM
DPR'G. DEPT. APPROVED
ENG'R. DEPT.

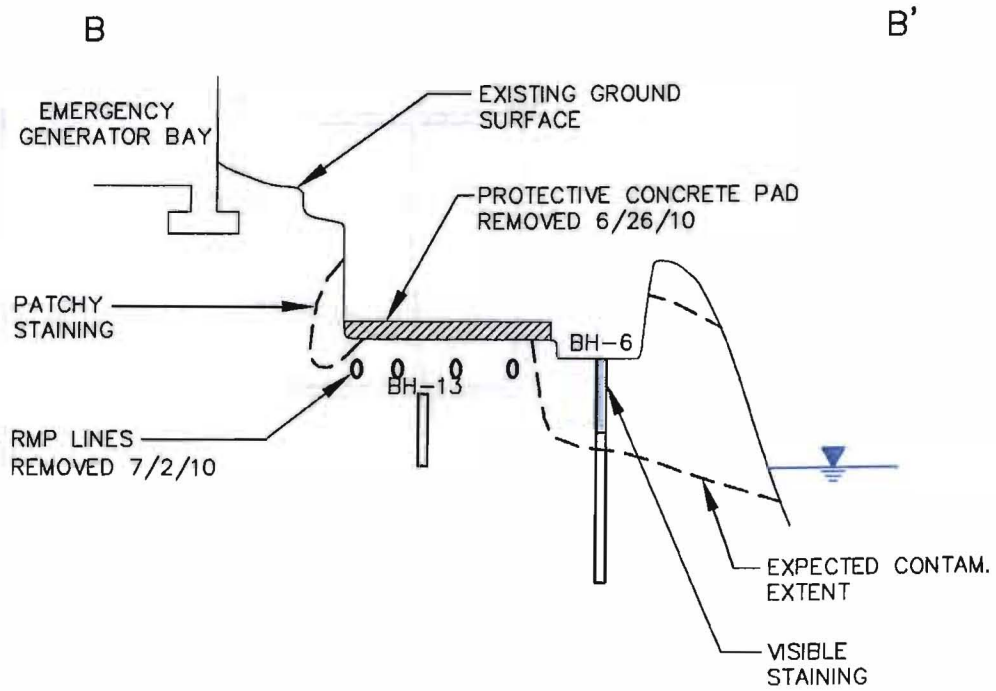
MP174.5 RED BUTTE RELEASE
SPILL SITE MAP
SECTION A-A'

SCALE: HORZ. 1"=20' VERT. 1"=10' DATE 07/2010

C. C. _____
S. D. _____

FIGURE 2-1A

G:\UC1300\SPILL SITE INVEST & EXC\NEWEST REPORT\DWG\FIG 2-1A.DWG



REV

EarthFax

Chevron Pipe Line

Chevron Red Butte Release

DR SWF CH. GWW
DR APP. GWW
ENGR. SM
DPR'G. DEPT.
APPROVED
ENG'R. DEPT.

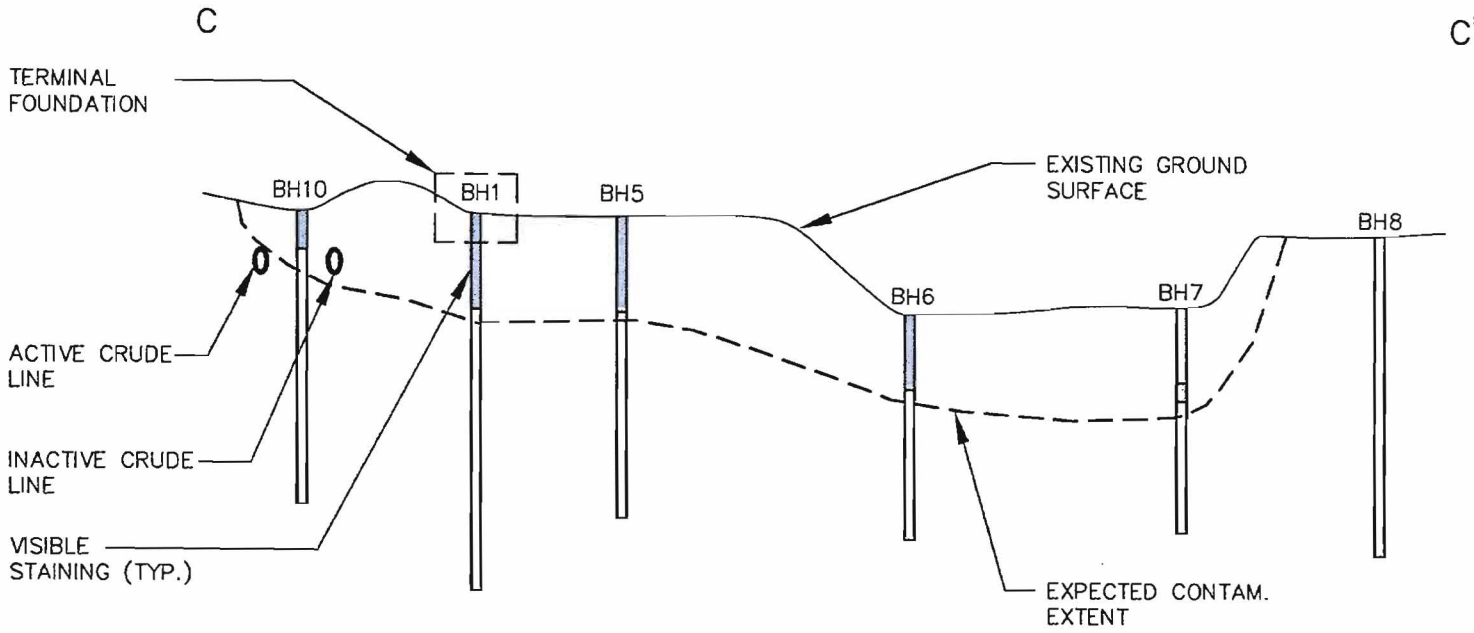
MP174.5 RED BUTTE RELEASE
SPILL SITE MAP
SECTION B-B'

SCALE: HORZ. 1"=20' DATE 07/2010
VERT. 1"=10'

C. C.
S. D.

FIGURE 2-1B

G:\UC1300\SPILL SITE INVEST & EXC\NEWEST REPORT\DWG\FIG 2-1B.DWG



EarthFax

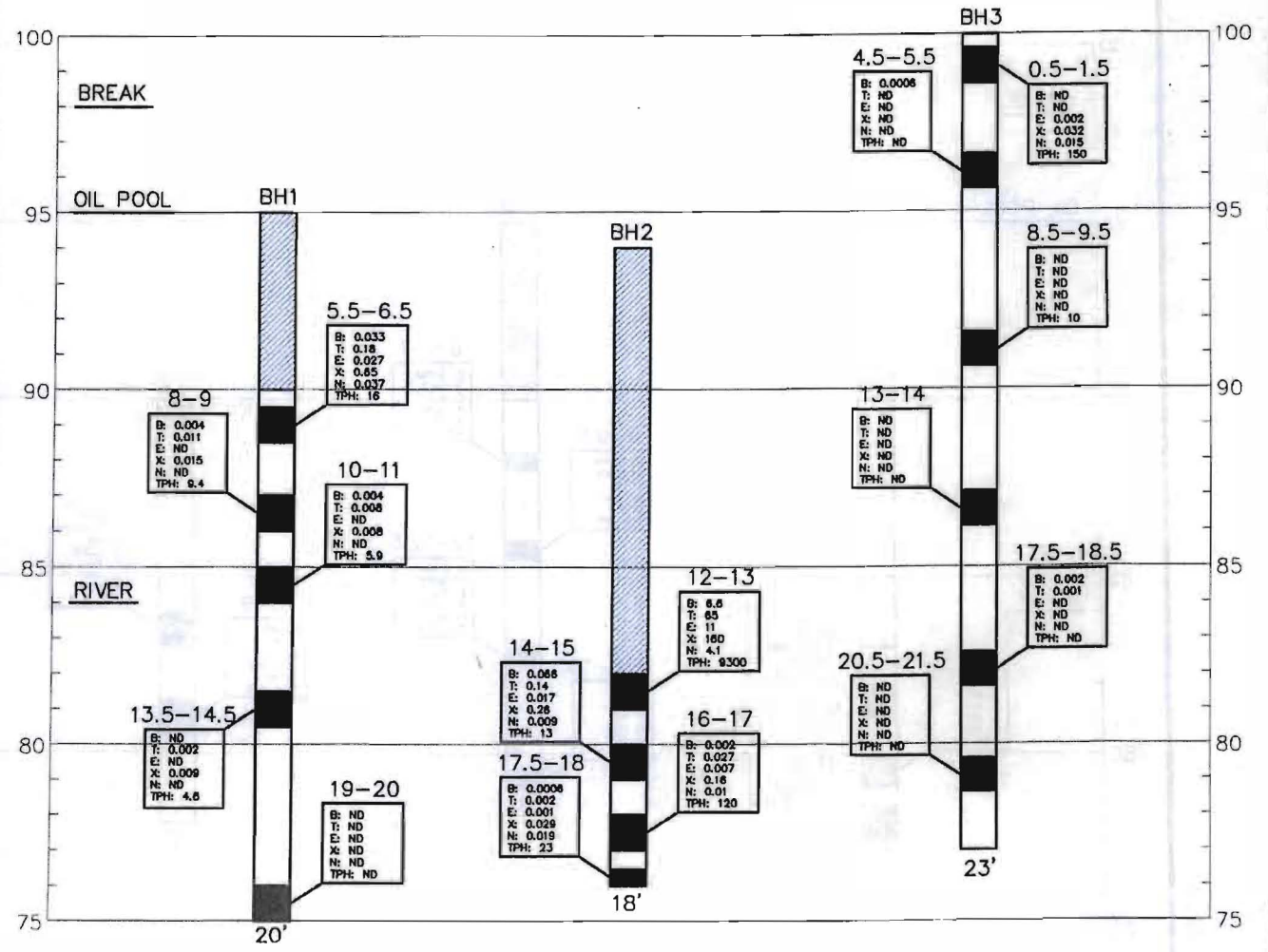
Chevron Pipe Line

Chevron Red Butte Release

MP174.5 RED BUTTE RELEASE
SPILL SITE MAP
SECTION C–C'

DR SWF CH. GWW DR APP. GWW ENGR. SM	OPR'G. DEPT ENG'R DEPT.	APPROVED	SCALE HORZ. 1"=20' VERT. 1"=10' DATE 07/2010 C.C S.O.	REV	FIGURE 2–1C

G:\UC1300\SPILL SITE INVEST & EXC\NEWEST REPORT\DWG\FIG 2-1C.DWG



NOTE: ALL CONCENTRATIONS IN MG/KG

LEGEND

VISIBLE STAINING

SAMPLE

REV

EarthFax

Chevron Pipe Line

Red Butte Release

DR SWF CH. GWW
DR APP. GWW
ENGR. SM
OPR'G. DEPT. APPROVED
ENG'R. DEPT.

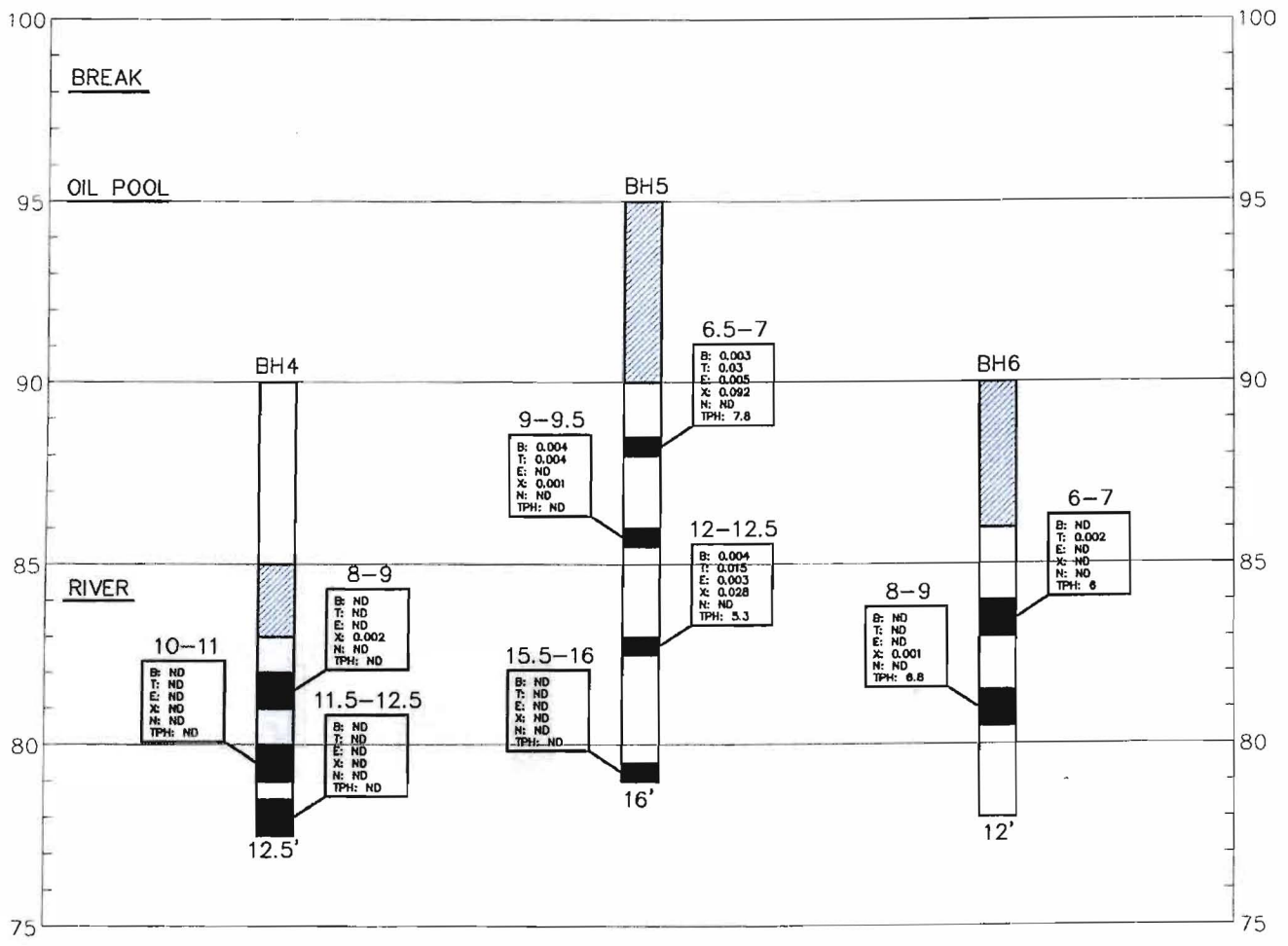
MP174.5 RED BUTTE RELEASE
SOIL BORING SUMMARY & LAB RESULTS
BORINGS 1–3

SCALE 1" = 5' DATE 07/2010

C. C.
S. D.

FIGURE 2–2A

G:\UC1300\SPILL SITE INVEST & EXC\NEWEST REPORT\DWG\FIG 2-2A.DWG



NOTE: ALL CONCENTRATIONS IN MG/KG

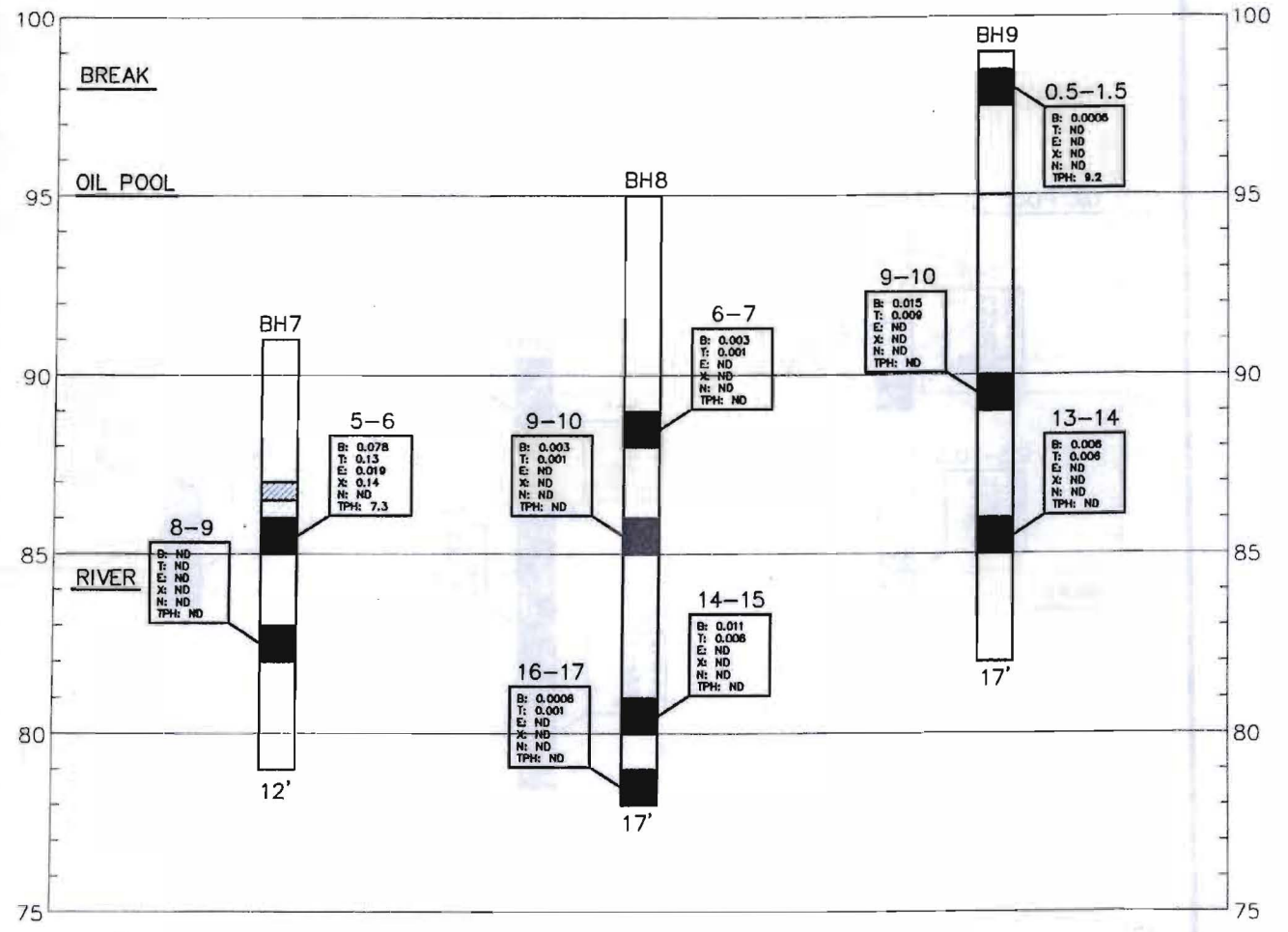
LEGEND

VISIBLE STAINING

SAMPLE

G:\UC1300\SPILL SITE INVEST & EXC\NEWEST REPORT\DWG\FIG 2-2B.DWG

REV			
EarthFax	Chevron Pipe Line	Red Butte Release	DR SWF CH. GWW DR APP. GWW ENGR. SM OPR'G. DEPT. APPROVED ENG'R. DEPT.
MP174.5 RED BUTTE RELEASE SOIL BORING SUMMARY & LAB RESULTS BORINGS 4–6	SCALE 1" = 5' DATE 07/2010 C. C. _____ S. D. _____	FIGURE 2–2B	



NOTE: ALL CONCENTRATIONS IN MG/KG

LEGEND

VISIBLE STAINING

SAMPLE

REV

EarthFax

Chevron Pipe Line

Red Butte Release

DR SWF CH. GWW
DR APP. GWW
ENGR. SM
DPR' G. DEPT. APPROVED
ENG' R. DEPT.

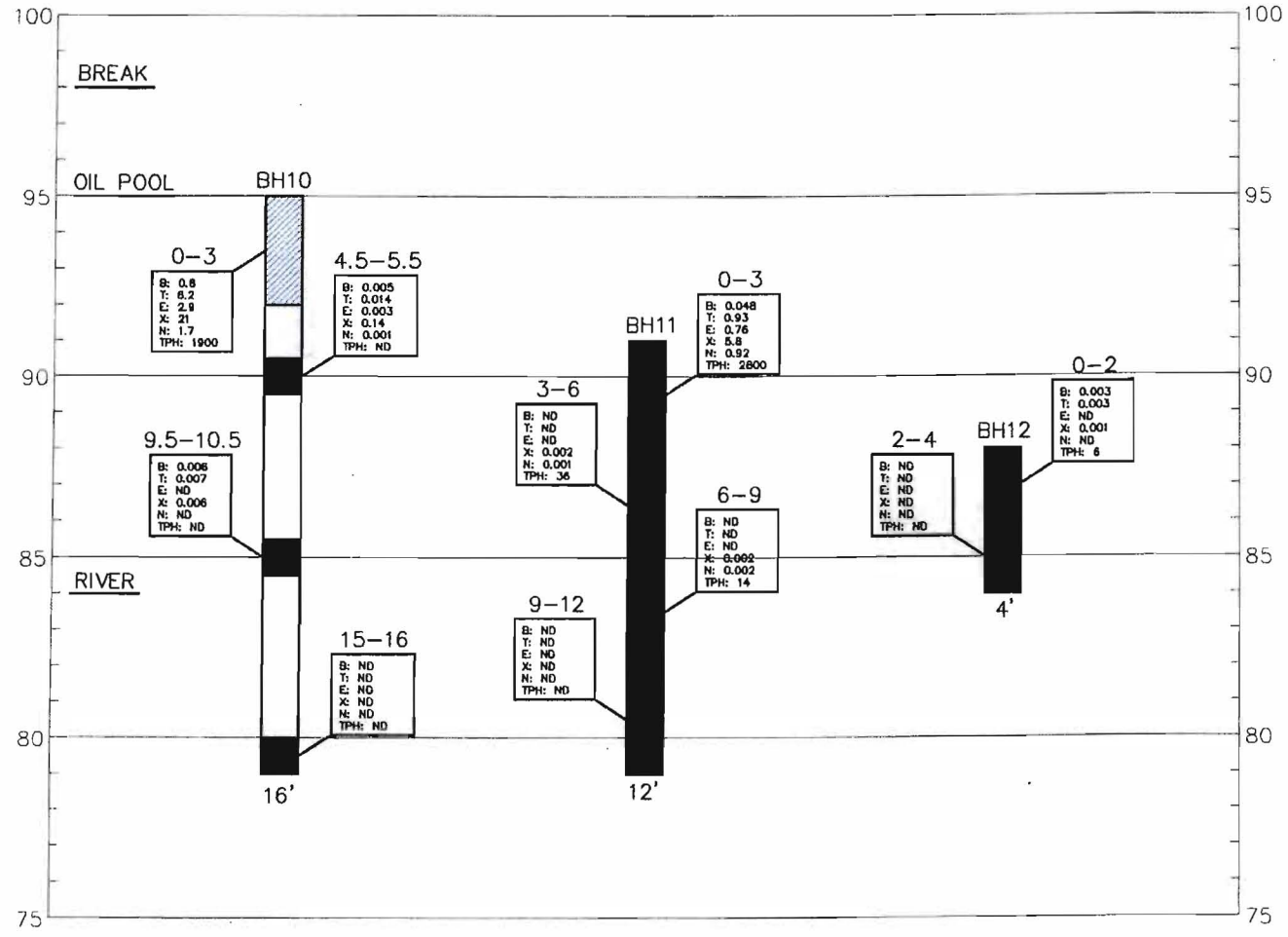
MP174.5 RED BUTTE RELEASE
SOIL BORING SUMMARY & LAB RESULTS
BORINGS 7-9

SCALE 1" = 5' DATE 07/2010

C. C.
S. D.

FIGURE 2-2C

G:\UC1300\SPILL SITE INVEST & EXC\NEWEST REPORT\DWG\FIG 2-2C.DWG



NOTE: ALL CONCENTRATIONS IN MG/KG

LEGEND

VISIBLE STAINING

SAMPLE

REV

EarthFax

Chevron Pipe Line

Red Butte Release

DR SWF CH. GWW
DR APP. GWW
ENGR. SM
OPR'G. DEPT.
APPROVED
ENG'R. DEPT.

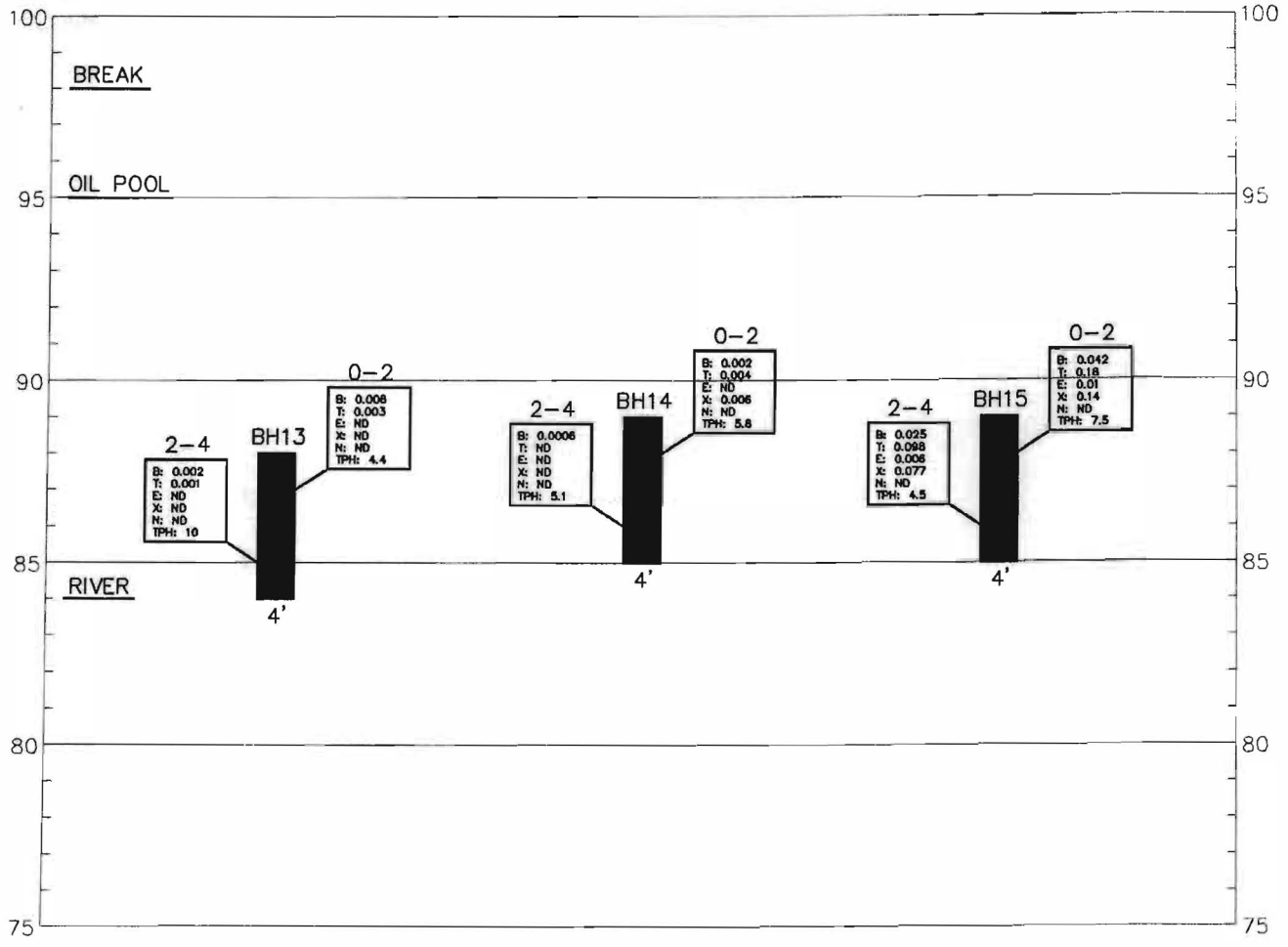
MP174.5 RED BUTTE RELEASE
SOIL BORING SUMMARY & LAB RESULTS
BORINGS 10–12

SCALE 1" = 5' DATE 07/2010

C. C.
S. D.

FIGURE 2–2D

G:\UC1300\SPILL SITE INVEST & EXC\NEWEST REPORT\DWG\FIG 2-2D.DWG



NOTE: ALL CONCENTRATIONS IN MG/KG

LEGEND

VISIBLE STAINING

SAMPLE

G:\UC1300\SPILL SITE INVEST & EXC\NEWEST REPORT\DWG\FIG 2-2E.DWG

REV

EarthFax

Chevron Pipe Line

Red Butte Release

DR SWF CH. GWW
DR APP. GWW
ENGR. SM
DPR' G. DEPT. APPROVED
ENG' R. DEPT.

MP174.5 RED BUTTE RELEASE
SOIL BORING SUMMARY & LAB RESULTS
BORINGS 13–15

SCALE 1" = 5' DATE 07/2010

C. C.
S. D.

FIGURE 2–2E

APPENDIX A

Soil Boring Logs