Table 1. Summary of Review of Boring Log Records

Soil Boring ID	Date	LNAPL Review	Depth Interval Noted			State Plane Coordinates	
			Top (ft)	Bottom (ft)	Comment	X	Y
MW-131	10/16/1994	No				860997.60000	431459.60000
B-1	12/9/1994	Yes	0.0	22.0		862063.50000	431544.40000
B-2	12/13/1994	Yes	0.0	5.0		861914.40000	431243.60000
B-3	12/13/1994	No				861886.30000	430986.90000
B-4	12/14/1994	No				861873.10000	430801.00000
B-5	12/14/1994	No				862122.40000	431261.80000
B-6	12/14/1994	Yes	1.0	1.7		861738.50000	430916.70000
B-7	12/15/1994	Yes	0.0	45.0		861945.80000	432011.60000
B-8	12/15/1994	Yes	0.0	45.0		862244.60000	432185.10000
MW-132	10/16/1995	No				860785.60000	431521.20000
MW-133	10/17/1995	No				860594.80000	431572.80000
MW-135	11/14/1995	No				861071.60000	431438.60000
MGB-2	1/15/1997	No				860738.10000	431950.00000
MGB-3	1/15/1997	No				860725.10000	432056.00000
MGB-4	1/16/1997	No				860977.10000	431854.00000
MGB-5	1/16/1997	No				861008.10000	431620.00000
MGB-6	1/20/1997	No				861113.10000	432136.90000
MGB-7	1/20/1997	No				860939.10000	432156.00000
MGB-8	1/20/1997	No				861105.10000	432286.90000
MGB-9	1/20/1997	Yes	5.0	6.5		860905.10000	432299.00000
MGB-10	1/21/1997	No				860527.10000	432000.00000
MGB-11	1/21/1997	No				860791.10000	431602.00000
MGB-12	1/21/1997	No				860874.10000	431494.00000
MGB-13	1/22/1997	No				860731.10000	431782.00000
MGB-14	1/22/1997	No				860730.10000	432210.00000
MW-101	9/15/1995	No				859696.80000	432574.80000
MW-101D	2/27/1996	No				859693.30000	432566.30000
MW-102	10/24/1995	No				860256.10000	432508.40000
MW-103	10/25/1995	No				860824.20000	432431.10000
MW-104	10/26/1995	No				861166.90000	432372.30000
MW-105	10/12/1995	Yes	2.0	8.0		861692.00000	432340.60000
MW-106	10/10/1995	Yes	2.5	15.0	Fee product	862395.50000	432255.20000
MW-107	9/21/1995	No				863051.40000	432243.40000
MW-108	9/19/1995	Maybe	5.0	12.0	Oil or humate	862954.60000	432961.80000
MW-108D	2/9/1996	Maybe	5.0	10.0	Oil or humate	862990.60000	432973.90000
MW-109	9/12/1995	No				862380.90000	432894.10000
MW-110	10/26/1995	Yes	0.0	8.0		861748.50000	432777.20000
MW-111	9/29/1995	Yes	28.0	34.0		861916.10000	433491.50000
MW-112	10/17/1995	Yes	0.0	37.0		861244.60000	431555.70000
MW-113	10/19/1995	Yes	0.0	9.5		861109.20000	431181.00000
MW-114	10/4/1995	Yes	6.0	15.5		861008.10000	430604.50000
MW-115	10/30/1995	Yes	11.0	13.0		861739.10000	431495.30000
MW-115D	6/4/1996	Yes	11.0	13.0		861728.60000	431511.00000
MW-116	10/6/1995	No				861646.70000	430655.30000
MW-117	11/1/1995	Yes	7.5	15.5		862451.20000	431162.70000
MW-117D	2/19/1996	Yes	7.5	15.5		862441.50000	431183.30000
MW-301	3/19/1996	No				861750.10000	433321.40000

Table 1. Summary of Review of Boring Log Records

Soil Boring ID	Date	LNAPL Review	Depth Interval Noted		Comment	State Plane Coordinates	
			Top (ft)	Bottom (ft)		X	Y
MW-302	3/14/1996	Yes	8.0	14.5	Petroleum odor	861622.10000	433017.30000
MW-303	3/19/1996	No				861589.60000	432792.40000
MW-304	3/21/1996	No				861066.50000	431439.60000
MW-305	3/27/1996	No				860589.10000	431574.00000
MW-306	3/26/1996	No				860779.10000	431058.00000
MW-307	3/26/1996	No				860831.10000	430685.00000
MW-308	3/27/1996	No				861508.10000	433101.90000
MW-309	3/27/1996	No				861503.10000	432798.90000
MW-310	5/2/1996	No				861285.70000	433224.40000
MW-311	5/2/1996	No				861231.90000	432925.30000
MW-312	5/30/1996	No				860637.10000	431987.40000
MW-313	5/28/1996	No				860455.00000	431244.50000
MW-314	6/4/1996	No				862689.10000	433802.60000
MW-351	4/22/1996	No				862263.50000	432104.00000
MW-352	4/17/1996	Maybe	13.0	14.5		861903.50000	432194.80000
MW-352D	5/15/1996	Maybe	13.0	14.5		861907.30000	432209.90000
MW-353	4/4/1996	Yes	23.0	23.0		861507.20000	432096.80000
MW-354	4/3/1996	No				861135.60000	432058.20000
MW-355	4/24/1996	Yes	3.0	4.0		862234.30000	431698.80000
MW-356	4/15/1996	Yes	8.0	8.5		861833.50000	431741.00000
MW-357	4/8/1996	Yes	5.0	11.0		861510.20000	431838.90000
MW-358	4/3/1996	No				861086.20000	431853.00000
MW-358D	5/7/1996	No				861089.60000	431840.00000
MW-359	5/1/1996	No				862007.60000	431107.00000
MW-360D	12/13/1996	No				861804.40000	431777.90000
SB-476	12/11/1996	Yes	9.0	14.0	hydrocarbon stained	861984.09500	431687.57300
SB-477	1/15/1997	No				862017.60000	432075.80000
SB-478	1/16/1997	Yes	2.0	9.0		862001.90000	432055.50000
SB-479	1/21/1997	Yes	3.0	10.0		862056.60000	432048.80000
SB-480	1/15/1997	No				862043.30000	432109.50000
SB-481	1/16/1997	No				862003.10000	432077.90000
SB-482	1/22/1997	Yes	5.0	12.0		862042.30000	432032.90000
SB-483	1/22/1997	No				862087.00000	432039.40000
MC-158		Yes	10.5	11.0	oil globules on bucket	860644.58321	430812.71893

Prepared for:

LCP SITE STEERING COMMITTEE

WORK PLAN FOR SITE-WIDE ASSESSMENT FOR PETROLEUM PRODUCT (OPERABLE UNIT 2)

LCP CHEMICALS SITE BRUNSWICK, GEORGIA

Prepared by:

EPS

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April 2012
Revised May 9, 2012

WORKPLAN FOR SITE-WIDE ASSESSMENT OF PETROLEUM PRODUCT (OPERABLE UNIT 2)

LCP CHEMICALS SITE OPERABLE UNIT TWO
BRUNSWICK, GEORGIA

Prepared for:
LCP SITE STEERING COMMITTEE

Prepared by:
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Kirk Kessler, Principal

April 2012

EPS

WORKPLAN FOR SITE-WIDE ASSESSMENT OF PETROLEUM PRODUCT (OPERABLE UNIT 2) LCP CHEMICALS SITE BRUNSWICK, GEORGIA

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Terms of Reference

Honeywell International (formerly AlliedSignal, Inc.), the Atlantic Richfield Company (Arco), and the Georgia Power Company are Responsible Parties (RPs) under an Administrative Order on Consent (AOC), to conduct Remedial Investigation and Feasibility Studies (RI/FS) for the LCP Chemicals Site (LCP Site) in Brunswick, Georgia. The LCP Site is being managed as three Operable Units (OUs). OU2 addresses groundwater beneath the LCP Site.

This document presents a plan to conduct a site-wide assessment for the presence of light non-aqueous phase liquid (LNAPL) petroleum product potentially present on the LCP Site. The assessment will be initially targeted in areas that based on past soil borings are believed to have the greatest potential for LNAPL, and if found to be present, further delineation will be performed during the same mobilization event. The assessment will utilize direct-push (DP) methods allowing collection of a continuous soil core, and placement of temporary well points as needed where LNAPL is judged to potentially be present. Results of this assessment will be integrated with a separate phase of work being performed along the uplands/marsh shoreline.

1.2 Background

Numerous soil borings have been drilled during past assessments on the LCP Site, and detailed boring logs are available for review to identify the LNAPL potential across the site. The borings vary in depth but generally extended to the depth of the groundwater table, thus they are useful in identifying the LNAPL potential. An operational diagram of the former Arco refinery is also available to aid in this review. Furthermore, the past episodes of soil sampling and groundwater monitoring across the site offer another line of evidence used in this review of LNAPL potential.

1.3 Study Objectives

The objective of this assessment is to delineate the extent, if any, of LNAPL on the LCP Site.

2 BASIS FOR PROPOSED LNAPL ASSESSMENT SCOPE

2.1 Process of Evaluation Applied to Boring Logs Review

A library of soil boring and monitoring well installation logs from past removal and remedial action assessment events was reviewed for descriptors of LNAPL presence – comments such as "staining", "odor", "oil" were logged into a spreadsheet file for use in mapping (in GIS). Three qualitative categories were established for this review:

- "no" where there was no indication of LNAPL;
- "maybe" where notations on the boring logs describe discoloration or possible petroleum hydrocarbon presence; and
- "yes" where notation on the boring logs describe definitive evidence of petroleum hydrocarbon staining such as staining or presence of free oil.

Table 1 provides this review compilation. Figure 1 provides the spatial distribution of the boring logs that were reviewed along with the LNAPL review designation.

2.2 Review of Past Groundwater Monitoring Data

Multiple episodes of past groundwater monitoring are available in the database for wells across the Site that have been tested for chemicals associated with petroleum hydrocarbons. Typical and appropriate indicators of petroleum hydrocarbons include:

- BTEX (benzene, toluene, ethylbenzene, xylenes); and
- Naphthalene.

These constituents have been mapped in GIS in a manner that identifies the highest concentration detected for a given constituent across the time series of past monitoring. Figures 2a through 2e provide the results of this mapping protocol.

The distribution of BTEX (Figures 2a through 2d) show two areas of note: (1) the more significant concentrations are present in a region near the uplands/marsh shoreline in the western portion of "Quadrant 3", and (2) an area of generally lesser concentrations is present from B Street south to MW-113 and from the cell building area west to the shoreline. The naphthalene distribution in groundwater is similar to BTEX with generally higher concentrations exhibited and a somewhat broader areal distribution across "Quadrant 3".

2.3 Review of Subsurface Soils (smear zone) Data

Soil samples previously characterized for BTEX and naphthalene that span the zone of water-table fluctuation (i.e., the LNAPL "smear zone") were used as another line of evidence in the work scope development for the LNAPL assessment. Data were selected from the database from

a depth interval of 5-10 feet (queried by "D1>=5 and D1<=10"), regardless of whether the area had been remediated or not (i.e., "Removed" flag of both 0 and 1 were used) in order the best understand the original conditions of the smear zone soils. Figures 3a through 3e present the distribution of BTEX and naphthalene in the soils of the smear zone depth interval.

Three distinct areas of interest develop from this exercise. One area of interest is in "Quadrant 3" centered in the northwest portion of that quadrant. Two areas of interest occur in "Quadrant 4", one in what perhaps was formerly a railcar loading area in the southwestern portion of that quadrant and the other to the east, in the area referred to as the "Old South Tank Farm". The patterns are quite similar for each of the BTEX constituents and naphthalene.

2.4 Proposed Locations for LNAPL Assessment in 2012

Figure 4 shows the locations proposed for the LNAPL assessment. Six locations are already planned (and approved by EPA/EPD) along the uplands/marsh transect used in the groundwater flux modeling (DP-1 through DP-6 on Figure 4). Several of these locations are ideally situated in areas of interest developed during the reviews described above. Five additional locations are proposed as shown in Figure 4 in more upland-based locations where the LNAPL potential is suspected to be greatest, based primarily on the boring logs review.

Additional LNAPL assessment borings will be performed as needed to delineate LNAPL if found, whether identified from the shoreline flux program or this site-wide assessment program.

3 FIELD METHODS

3.1 Direct Push Procedure

DP technology will be used for the LNAPL assessment. The DP procedure will utilize dual-tube (DT) technology. DT technology uses both an outer and inner rod. The outer rod is equipped with a cutting shoe that cuts a soil core which is collected inside of the outer casing sliding into the acetate liner held in place by the inside rod string. When at depth, the inside rod string and the soils retained in the acetate liner is removed from inside of the outer rods. The outer rods remain in the ground thereby providing a cased hole. A clean liner is then attached to the inner rods, sent back down within the outer rods and another outer rod is added to the drill string. DP borings will be advanced to a depth of 15 feet below ground surface at each location. This depth of penetration will ensure that the borings area advanced the full thickness of the smear zone and slightly beyond. Soil cores will be examined for the indicators of LNAPL – this will include: (1) visual observation for discoloration, staining or free oil, (2) identification of odor (if noticed in breathing zone – no intentional odor screening will be performed), and (3) ~~"shake tests" of subsamples from stained sections of the core to see if NAPL is mobilized (shake testing simply involves placement of a small volume of soil into a water-containing glass jar and vigorously shaking to displace free oil, then visually examining the jar for the presence of NAPL)~~use of ultraviolet light scanning the soil core (core will be split) for presence of petroleum. Each soil core will be transported to an onsite darkroom in the acetate liner to be visually screened with a handheld UV light (356/254 nm). Any observed fluorescence will be recorded by describing relative intensity of fluorescence within the core and soil depth at which the fluorescence occurred.

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Temporary monitoring wells will be installed in the DP borings, where LNAPL is suspected based upon the screening process identified above. The temporary monitoring wells will be installed in general accordance with the procedures outlined in the USEPA Region IV Science and Ecosystem Support Division standard operating procedure for Design and Installation of Monitoring Wells (SESDGUID-101-R0 dated February 2008).

3.2 LNAPL Thickness Measurements

Temporary wells that are installed as part of the flux study and the site-wide assessment, will be ~~tested~~ measured for the presence of LNAPL during the field mobilization event and on an "opportunistic" basis (i.e., when field personnel are on Site for other purposes) for a period of time beyond. LNAPL thickness measurements will be accomplished with either the use of an interface probe, or with the use of Kolor Kut paste or similar products. Groundwater sampling is not planned for these temporary wells.