ENVIRON

July 16, 2013

Via E Mail and FedEx

Mr. Mostafa Mehran
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, AR 72118-5317

Re: Whirlpool Corporation, Fort Smith, Arkansas
Final Remedy Work Plan

Dear Mr. Mehran:

ENVIRON International Corporation (ENVIRON) on behalf of Whirlpool Corporation has prepared the attached Final Remedy Work Plan in accordance with the Letter of Agreement dated July 19, 2002 for ADEQ consideration. The Work Plan provides details on the activities and schedule for implementation of the final remedy for the Whirlpool Site as defined by the Revised Risk Management Plan dated May 21, 2013 and Addendum dated June 6, 2013.

If you have any questions or comments please contact me at your earliest convenience.

Sincerely,

Tamara R. House-Knight

Tamara R. House-Knight, PhD
Senior Associate / Toxicologist

cc: Tammie Hynum - ADEQ
Robert Karwowski – Whirlpool Corporation



Final Remedy Work Plan
FT. Smith, Arkansas

Prepared for:
Whirlpool Corporation
Benton Harbor, MI

Prepared by:
ENVIRON International Corporation
Little Rock, Arkansas

Date:
July 16, 2013

Project Number:
2131344B

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Contents

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Acronyms and Abbreviations

ADEQ:	Arkansas Department of Environmental Quality
AR:	Administrative Record
bgs:	below ground surface
cis-1,2-DCE:	cis-1,2-dichloroethylene
CSM:	Conceptual Site Model
COC:	Constituent of Concern
CVOC:	Chlorinated Volatile Organic Compounds
1,1-DCE:	1,1-dichloroethylene
HHRA:	Human Health Risk Assessment
IC:	Institutional Control
ISCO:	In-situ Chemical Oxidation
LOA:	Letter of Agreement
MCL:	Maximum Contaminant Level
MNA:	Monitored Natural Attenuation
PCE:	Tetrachloroethylene
RER:	Risk Evaluation Report
RMP:	Risk Management Plan
RRMP:	Revised Risk Management Plan
SOD:	Soil Oxidant Demand
TCE:	Trichloroethylene
TCA:	Trichloroacetic acid
trans-1,2-DCE:	trans- 1,2-dichloroethylene
UST:	Underground Storage Tank
USEPA:	United States Environmental Protection Agency
VOC:	Volatile Organic Compound
Work Plan	Final Remedy Work Plan

1. Introduction

As required by the Letter of Agreement (LOA) dated July 19, 2002 and committed to in both the Revised Risk Management Plan dated May 21 , 2013 and Addendum dated June 6, 2013 (collectively the RRMP), ENVIRON on behalf of Whirlpool Corporation is submitting this Final Remedy Work Plan (Work Plan). The purpose of the Work Plan is to outline relevant elements to implement the final remedy defined by the RRMP. This Work Plan provides details on the activities and schedule for implementation of the final remedy for the Whirlpool Site.

In accordance with LOA, the RRMP provides the basis for the final remedy selection, including a summary of activities already completed at the site. This Work Plan reflects the plan to implement the recommendations of the RRMP, and is not intended to restate or summarize the RRMP. The Work Plan is complimentary to the RRMP therefore will reference relevant sections of the RRMP where appropriate.

1.1 Background

The following is a summary of Section 1.1 of the RRMP. For more detail please see Section 1.1 of the RRMP.

1.1.1 General Site Description

The Whirlpool Fort Smith facility is located at 6400 Jenny Lind Road on the south side of Fort Smith, Arkansas (Figure 1) and is currently inactive. The entire facility is approximately 153 acres and includes the main manufacturing building (approximately 1.3 million square feet), separate warehouse and administrative offices, and approximately 21 acres of undeveloped land (Figure 2). Additional buildings located on the north side of the property include a water treatment plant and boiler house. The majority of the property surrounding the buildings is covered with concrete or asphalt service roads and parking. Some gravel parking areas are also present.

1.1.2 Facility Operations

Historical manufacturing processes at the Whirlpool Fort Smith facility involved metal fabrication, plastic thermoforming and assembly operations. Constituents in the soil and groundwater identified during facility investigations are the result of historical practices.

Dating back to approximately 1967, equipment degreasing operations utilizing trichloroethylene (TCE) were performed in the former degreaser building located near the northwestern corner of the main manufacturing building, west of the boiler house (Figure 2). The degreasing equipment consisted of a tank and parts rack. The degreasing operations involved placing parts into the parts rack positioned over the tank. The TCE tank was then heated, creating a TCE vapor in the area where the parts were placed. Following degreasing activities, the vapor was condensed and returned to the tank below the parts rack.

The use of TCE in the degreasing operations ceased after TCE was determined to be a hazardous waste and the TCE degreasing process was addressed in hazardous waste regulations promulgated in 1980. Trichloroacetic acid (TCA) replaced the use of TCE until the degreaser operation ceased altogether in 1989. No historical records that document any TCE spills or release incidents from the degreaser building have been located. It is possible that historical leaks from the tank or surface spills in the vicinity of the degreaser building may have occurred, resulting in releases to the soil and groundwater.

1.1.3 Previous Site Investigations

A series of soil and groundwater studies were initiated at the site as part of a project to remove one underground storage tank (UST) previously containing fuel. The UST closure certification analytical data indicated the presence of TCE and other solvents in the shallow groundwater. Subsequent investigations have been completed to delineate soil and groundwater impacts. Based on previous investigations it was determined the primary constituent of concern (COC) is TCE. Tetrachloroethylene (PCE), and TCE daughter products (including cis-1,2-dichloroethylene (cis-1,2-DCE) and trans- 1,2-dichloroethylene (trans-1,2-DCE), 1,1-dichloroethylene (1,1-DCE), and vinyl chloride) resulting from the natural degradation of PCE and TCE have also been periodically detected in monitoring wells.

1.1.4 Historical Bench Scale and Pilot Studies

In 2000, a bench scale treatability study was completed to investigate the effectiveness of permanganate for treating chlorinated compounds in site specific soils. Soil samples were collected from MW-25, and used for the study. In this study TCE was found at a concentration of 100,000 ug/l, which was representative of site conditions. Testing was then completed to verify that oxidant could destroy the TCE in the site specific sample and total permanganate demand was also determined. The bench scale study results indicated that permanganate was able to reduce TCE concentrations in the representative sol sample by almost 100%. A total potassium permanganate demand of 1 to 2.5 g/kg wet weight soils was identified although a comment was included that the concentration of permanganate would most likely need to be increased in the field.

An on-site pilot scale test was conducted in 2002 to evaluate the use of permanganate for full scale treatment at the site based on the results of the Bench Scale evaluations. This test was conducted in the transmissive gravel zone. The soil oxidant demand used for oxidant calculations during this test was less than the oxidant demand identified during the bench scale study, therefore, less than the suggested amount of oxidant was applied during the field scale test. The results indicated that in-situ chemical oxidation (ISCO) was effective in treating the COCs within the treatment zone and over 20 feet outside the treatment zone in the transmissive gravel portion. After the test was completed, COC concentrations rebounded to pre-test levels since the placement of the test area was too far from the plume. Back diffusion from areas of higher TCE concentration occurred due to the flow direction from areas of higher TCE concentrations through the test location.

Permanganate was also evaluated in off-site interim measure activities in April and June of 2009. The objective of this interim measure was to evaluate the effectiveness of using ISCO to treat the core of the offsite plume. Permanganate was applied to eight injection wells and has been, and is currently being, monitored. As evidence of either very slow movement of groundwater or variation in the transmissive layer underneath the residential properties in the area, permanganate was still present in several off-site monitoring wells during the October

2012 groundwater sampling event. This shows that previously injected permanganate is not being uniformly distributed throughout the subsurface to treat impacted groundwater throughout the plume. However based upon the 2010 Interim Measure Status Report, “The analytical data suggest permanganate treatment is very effective within the radius of influence of the injection well”. As part of the interim measure, in late 2010 and early 2011, a groundwater extraction well was used to attempt movement of the permanganate through the subsurface; however this effort was only marginally successful due to the tight clays making it impractical for consideration on a larger scale off-site. Therefore, although ISCO may not be effective for treating the entire off-site plume, it can be an effective tool for reducing higher TCE concentration in targeted locations within the transmissive zone.

Based upon these completed bench scale and pilot scale studies, it is apparent that ISCO can treat TCE at portions of the site within the transmissive zone, however additional design information is required to determine if a modified approach and/or other oxidant could be more effective than what has been attempted.

1.1.5 Conceptual Site Model

The Conceptual Site Model (CSM) characterizes the site conditions and summarizes the basis for the hypothetical exposure pathways evaluated in the Human Health Risk Assessment (presented as Appendix A to the Revised Risk Management Plan (RRMP)). Key components of the CSM include actual and potential land use and exposure based on physical, release and risk management profiles on-site and off-site. A summary of the current site conditions is provided below:

1.1.5.1 On-Site Current Conditions

Whirlpool manufactured refrigerators and trash compactors at the site until June 2012. There are currently no on-site manufacturing operations.

Future site activities will be restricted to nonresidential (commercial and/or industrial) uses through restrictive covenants to be recorded with the property deed(s). It is presumed all future uses at the site will be nonresidential.

Based on the data collected to date, the known area of impacted soil is within the property boundaries and security fencing (see Figure 3 of the RRMP) and thus entirely on-site. Impacted soils, while not heavily impacted, are localized to the area immediately to the west of the former degreaser building where elevated concentrations of TCE were detected in groundwater. The area of impacted soil is an approximately 50 by 250-foot area west of the former degreaser building.

TCE is thought to have migrated through fractures in the silt/clay soil on site eventually encountering the permeable sand/gravel soil above the shale bedrock which served as a preferential migration pathway for TCE.

The highest impact of TCE in groundwater on-site has been identified at MW-25 near the northwestern corner of the building. Additional higher levels of impact (greater than 10 mg/L of TCE) have been identified at ITMW-19. Together these two points currently constitute the heart of the source area on-site.

The groundwater plume extends approximately 1,000 feet to the south southwest from the source and to the north across Ingersoll Avenue (Figure 3). The southern boundary of affected groundwater remains on-site in this direction. There are no known offsite groundwater impacts to the east, south or west of the Whirlpool property boundaries.

1.1.5.2 Off-Site Current Conditions

Land use down-gradient (north) of the site is residential. Residential properties to the north include both single-family and multifamily homes. A recreational facility is located over 500 feet northeast of the Whirlpool property boundary, adjacent to the residential area. No agricultural properties are located in the vicinity of the site. Discussion concerning properties to the east, south and west are not incorporated into this discussion since they have no impact from the site.

Groundwater with detected concentrations of TCE above USEPA drinking water criteria maximum contaminant levels (MCLs) extends into the residential neighborhood north of the site. There are no known soil or groundwater impacts off-site to the east, west or south. The recreational facility to the northeast is located over 1,000 feet east of the impacted groundwater area. The extent of the off-site groundwater plume is shown on Figure 3. While the transmissive zone is mostly comprised of clayey material, the gravel-containing zone contains some gravel and sandy gravel that varies in thickness from about 6 to 7 feet near the source area on-site and thins to be nonexistent immediately north of Jacobs Avenue as identified on existing boring logs. The higher TCE concentrations in groundwater are generally limited to a gravel-containing portion of the transmissive zone. Additional details on the site geology and hydrogeology are documented in multiple previous reports and work plans (see RRMP).

The current understanding of site lithology, contaminant concentration, and groundwater flow pathway together identify that groundwater from the source area is likely not flowing directly north/northeast into the residential area. However given the flat groundwater elevation of the area around Ingersoll Ave, groundwater may potentially be flowing from the dissolved phase plume (i.e. areas located within the groundwater plume not associated with the source area) northwest of MW-25, past Ingersoll Avenue, and into the residential neighborhood. High precipitation events have the potential to alter this flow path as well as the presence of the groundwater divide just south of Ingersoll Avenue.

All potable water used by the Whirlpool facility and the surrounding area's residents is provided by the municipal water system. There are currently no uses of groundwater within or near the impacted groundwater. However, there is no ordinance or restriction prohibiting groundwater use in the impacted area at this time.

1.2 Human Health Risk Assessment Conclusions

As discussed in the HHRA (Appendix A of the RRMP), potential exposures to VOCs detected in on-site soil and off-site groundwater under current land and groundwater uses do not present potentially significant risks to the evaluated receptors.

Under current on-site land and groundwater uses, potential risks could exist for certain on-site exposures to groundwater as presented in the HHRA (Appendix A of the RRMP).

In the hypothetical scenario in which water use wells are installed in the area of impacted offsite groundwater, potentially significant exposures could result from use of the groundwater.

1.3 Remedy Objectives

Based on the conclusions of the HHRA, as discussed in Sections 2.4 and 2.5 of the RRMP, the objectives of the remedy are to meet risk limits on-site and eliminate potential hypothetical exposures off-site. Specifically, the remedial action criteria stated in Section 2.5 of the RRMP are:

- On-site groundwater - reduce concentrations in groundwater at the source to meet risk limits and reduce or eliminate the source to the off-site groundwater plume which will ultimately reduce the concentrations in off-site groundwater.

- Off-site groundwater - prevent the use of groundwater that has VOC concentrations that exceed the MCLs until those concentrations decrease to levels that are at or below MCLs.

1.4 Remedy Technical Approach

To achieve these objectives, the final remedy defined by the RRMP for the site includes on- and off-site institutional controls (IC's) to prevent exposure, on- and off-site in-situ chemical oxidation (ISCO) to reduce or eliminate VOC concentrations, and on- and off-site monitored natural attenuation (MNA) to confirm reduction of VOC concentrations and to confirm that potential exposures do not present potentially significant risks.

Subsequent sections of this Final Remedy Work Plan (Work Plan) provide discussion of the tasks required to complete the final remedy to prevent exposures, reduce VOC concentrations, and monitor the progress of the remedy. A schedule for implementation of these tasks is also included as Figure 8.

2 Institutional Controls

As summarized in Section 1.4, no current exposures to VOCs detected in on-site soil and off-site groundwater present potentially significant risks to the evaluated receptors. Exposure to on-site groundwater could present potentially significant risks under current on-site land and groundwater uses. In a hypothetical future scenario in which water use wells are installed in the area of impacted off-site groundwater, potentially significant exposures could result from use of the groundwater.

To maintain current off-site uses, which do not present potentially significant risks, and to control on-site exposures and eliminate hypothetical future potable use of groundwater, IC's are proposed to be utilized. These institutional controls will be used as an enforceable mechanism to control potential current exposure to on-site soil and groundwater and potential hypothetical future exposure to off-site groundwater. These institutional controls will be maintained until concentrations of COC meet the remedy objectives for a period of at least four consecutive quarters.

Whirlpool will record restrictive covenants on the site that will require future owners of the property to adhere to the recorded restrictions. In order to meet obligations associated with the off-site restrictions, Whirlpool will pursue off-site institutional controls after the acceptance of the final remedy by ADEQ in cooperation with residents and the City of Ft Smith.

3 Remedy Implementation

This section of the Work Plan outlines how the final remedy, as defined by the RRMP, will be implemented to reduce or eliminate concentrations of VOCs in soil and groundwater and monitor progress. Use of active technology in conjunction with the proposed institutional controls, to eliminate exposure, is designed to shorten the necessary duration over which these restrictions are necessary. The monitoring is designed to provide a quantitative mechanism for tracking reduction of VOCs and confirm that potentially significant exposures do not exist.

The overarching implementation strategy will incorporate an adaptive remedy approach outlined in USEPA guidance. As the project progresses additional data collected will be incorporated into the site understanding and will be used to guide future activities to expedite achievement of the project corrective action goals. The adaptive remedy approach will therefore incorporate the use of supplemental work plans that define future actions that are based on the findings of previous activities. Whirlpool will involve both ADEQ and provide for public comment in accord with this guidance in the adaptive remedy approach.

An important element of the final remedy includes creating a plan to inform the public of the corrective action activities, filing institutional controls, ISCO applications in a phased approach, installing additional vapor monitoring points, monitoring and reporting soil vapor and groundwater information, and completing performance monitoring on a quarterly, annual, and 5 year basis. These tasks and the associated implementation are discussed in more detail in the sections that follow.

3.1 Public Involvement Plan

As specified in the LOA and RRMP, Whirlpool will seek public comment on the Administrative Record (AR) and the proposed corrective measures to be implemented for the Fort Smith site with Arkansas Department of Environmental Quality (ADEQ) participation in accord with the guidance set out in the LOA. The public involvement plan will consist of:

- Establishing a local repository for project documents (completed);
- Compiling a copy of the Administrative Record (AR) for public access at the repository (completed);
- Providing public notice of the availability of the AR and a request for comments on the AR and the proposed corrective measures within 30 days; and
- Conducting a public meeting for all residents and city leaders to review and comment on the final corrective measure.

Whirlpool has already established a local document repository where the public has access to the AR (i.e., the collection of documents forming the basis for the final remedy). The location of the document repository is the City of Fort Smith Public Library which is located at 3201 Rogers Avenue in Fort Smith.

Whirlpool has provided a copy of relevant site documents to the repository that will provide the public the basis to understand the selection of the final corrective measure. This repository will be updated as documents are published. Whirlpool will work with ADEQ and the City of Fort Smith to place a public notice in a local newspaper advertising the availability of the AR and asking for public comments on the selection of the final corrective measure. The public will be directed to provide comments to ADEQ. The public comment period will be for a maximum of 30 calendar daysWhirlpool will conduct a public meeting to present the corrective measure and solicit feedback from residents and city leaders. Following receipt of comments and direction from ADEQ, Whirlpool will update the AR as necessary. Once the AR public comment is complete and written approval to commence with implementation of the work plan is received from ADEQ, will the remedy implementation as defined by this Work Plan will begin.

3.2 In-Situ Chemical Oxidation

As stated in the RRMP, the ISCO remedy component incorporates a phased approach including a pre-design phase followed by at least two phases (Implementation Phases 1 and 2) of chemical oxidant injections. The purpose of the pre-design phase is to gather additional information required to ensure that the proper oxidant is being used, that it is being delivered in the correct quantity and in the correct manner(s) to maximize contact with surrounding impacted medium. Phase 1 includes the first round of injections at the three predefined areas of treatment (Figure 3), although these areas may be modified if pre-design results indicate that treatment in other or additional areas would be more beneficial.

The purpose of Phase 1 is to reduce on-site source area mass of contaminant and off-site concentrations at Ingersoll Avenue and near IW-77.   Securing access agreements for off-site injections is a critical element of Phase 1. Phase 1 will include injection of an oxidant into the currently identified areas of highest TCE concentrations on-site. Phase 1 will be completed after 3 and 6 month monitoring events have been completed following the first round of injections. Based upon the data gathered during Phase 1, Phase 2 will include additional targeted injections to continue to facilitate source reduction as well as off-site reduction of high concentrations as access agreements are put into place. Phase 2 may also include the installation of additional injection wells. Again, 3 and 6 month monitoring events will occur and additional Phases, if necessary, will be evaluated and implemented.

3.2.1 Pre-Design

Pre-design activities are a critical component to the overall success of the ISCO plan at the Site. The pre design activities incorporate the current site data with targeted activities required to provide a basis for a successful design.

The effectiveness of previous ISCO applications have been reduced due to back diffusion and a site characterization that was not as thoroughly developed as today. Therefore it is critically important to further understand the formation and location of the transmissive zones, the characterization of the COC mass, the hydraulic conductivity of all of the layers (or lenses) within the transmissive zone, the radius of influence of an injection point, the availability of an oxidant to oxidize COCs within site specific soils, and amount of oxidant required to effectively oxidize COCs to below target levels. Developing this information will allow for an ISCO remedy to be properly designed.

Prior to the start of any field work associated with the pre design activities, a health and safety plan will be prepared and implemented and a utility survey will be completed to identify the safe working areas.

The objectives of the pre-design activities are to fully develop COC characterization needed for the final remedy design within the three proposed injection locations, to further evaluate the transmissive zones and associated hydraulic conductivity within each zone at each proposed injection area, and to further test the expected radius of influence for injection points located within each proposed injection area. These results will aid in understanding the potential for getting the oxidant to the COCs. Successful pre-design results will verify that COCs are located within zones that are accessible to oxidants. Results will also assist in determining correct oxidant delivery methods. If the zone of contamination is thicker (in depth) than previously identified, and if radius of influence tests produce smaller effective areas than the 10-foot radius of influence identified in previous pilot studies, then other oxidant delivery methods such as the Lang Tool in-situ mixing method may be evaluated in lieu of injection wells.

A review of each area and associated pre-design testing information to be completed within that area is detailed below. Areas 1, 2, and 3 are defined on Figures 3, 4, and 5.

3.2.1.1 AREA 1 Pre-Design Activities

Area 1 (see Figures 3 and 4) is located within the on-site source area near the northern edge of the former manufacturing building. Fall 2012 and spring 2013 site groundwater sampling results for wells located within and near Area 1 indicate that groundwater concentrations are highest at monitoring wells MW-25 and ITMW- 19. The well logs for these two wells indicate differences in subsurface stratigraphy profile, depth and degree of saturation and VOC impacts within a relatively small area. The saturated sand and gravel layers within the moist clay and fine sand and silts in ITMW-19 result in very large conductivity ranges within a small vertical interval and maximizes the potential for absorbing VOCs into clayey material.

The rebound of VOCs following previous ISCO treatment in the source area occurred within six months following injection[1]. The field pilot report indicates the rebound may be attributed to recharge of the area with impacted groundwater. The discussion relating to the possibility of desorption of VOCs from fine-grained soils is limited to an implication based on changing groundwater levels. The pilot test was centered in the area around ITMW-11. The boring log for ITMW-11 indicates elevated field screening results in the fine soils from near grade to saturated soil at depth. The ISCO application was directed into the basal aquifer unit only in temporary wells screened from 20 to 24 feet below ground surface (bgs). Saturated conditions in ITMW-11 are indicated from 16 to 29 feet bgs in material ranging from fine silty sand to sand and gravel. The mass of VOCs in the fine grained soil is an important piece of information for design of the ISCO application.

To more fully understand the soil (vadose and saturated) and groundwater COC concentrations within the proposed remedy area, as well as the potential oxidant demand, the conductivity

[1] Final Report on Field Pilot Test of In-Situ Ground Water Treatment Using Chemical Oxidation, ERM August 2002

profiles, the potential radius of influence for injection of an oxidant, etc. the following data will be collected in Area 1:

- Geoprobe soil borings and groundwater sampling to refine the extent of the source area to the south, east and west;
- Geoprobe soil borings to collect groundwater and saturated soil samples for bench testing for oxidant selection and oxidant demand;
- Geoprobe borings for HPT and conductivity profiling to determine slug test intervals; and,
- Geoprobe borings to complete discrete interval slug testing.

Figure 4 depicts the approximate locations for sampling to confirm the area to be treated. Continuous soil sampling will be conducted, soil will be field screened with a PID and the site lithological profile recorded as observed by the Geologist. Soil samples will be collected for laboratory analysis from the top of the saturated zone and from the saturated zone. Groundwater sampling will then be completed for the two intervals from which soil was collected. The soil and groundwater samples will be analyzed by SW486 Method 8260 and soil samples will be collected using USEPA method 5035. The step out samples denoted on Figure 4 will be collected but will be placed on hold at the laboratory pending analysis of the other initial step out samples. If the initial samples analyzed in the first round do not show impact (below MCLs for groundwater or non-detects for soil) then the samples originally placed on hold will be analyzed. ENVIRON`s Procedure for Soil Boring Installation and Sampling is attached as Appendix A.

The range in lithology noted on the well logs indicates the site horizontal conductivity varies greatly with depth. Former pilot work near Area 1 resulted in a rebound in VOC concentrations within 90 days of oxidant application. The oxidant was applied through a four foot screened interval placed near the upper portion of approximately 13 feet of saturation. The conclusions of the pilot test (ERM 2002) pose the following questions:

- The generally accepted groundwater flow velocity is approximately 2-feet per month. If rebound is due to the influx of additional impacted water post treatment then the groundwater flow velocity may be greater than 2-feet per month and/or groundwater flow direction is more variable than assumed.
- Groundwater color change with well purging (purple) indicated the presence of residual permanganate six months post injection. Therefore the permanganate may not have been distributed across the impacted zone.

During injection activities the injectant will follow the path of least resistance. This path may not be where the dissolved and /or adsorbed VOCs reside in the soil matrix. The purpose of this task is to refine the understanding of the site hydraulic characteristics within the saturated impacted zone. This information is needed to design the injection methodology.

The Geoprobe System® down-hole Hydraulic Profiling Tool (HPT), measures electrical conductivity (EC) and fluid injection pressure response. This information relates in-situ grain size distribution to the fluid transmittal properties of the unconsolidated profile. As the probe is advanced, clean water is pumped through a screen on the side of the HPT probe at rates in the range of 100 to 400 mL/minute while the injection pressure and EC response is measured with depth. Injection pressure is an indication of the hydraulic properties of the soil (i.e., relatively low pressure response is indicative of a relatively large grain size and the ability to easily transmit water and vice versa). EC measurements with depth generally correlate to grain size and water injection flow rate (i.e., the high electrical conductivity indicates reduced grain size such as clay which requires higher fluid injection pressure and lowers the water flow rate and vice versa). The resulting output is a standard electrical conductivity graph with a graph of pressure and flow rate of the fluid injection. This work will be completed at four locations across Area 1 (Figure 4). Based on these results, hydraulic slug tests will be selected for the discreet zones indicated by the changes in conductivity and hydraulic fluid pressure.

The Geoprobe System® Pneumatic testing kit will be used to conduct slug tests through the probe apparatus. The Geoprobe drill stem rods are driven to the bottom of the interval to be tested then pulled (retracted) back up the bore approximately four feet to extract and expose the 3.5 foot screened section to the test interval. Prior to testing, the drive point is developed through mechanical surging. After the water level stabilizes in the test point, air pressure is used to push water out of the screen. The pressure is allowed to stabilize and then released to allow water to re-enter the screen bore to simulate a “slug-in” or “rising head” test. A slug-out or falling head test is simulated by pulling a vacuum on the well then releasing and monitoring time for the water level to reach static. A small transducer in the test point monitors the pressure change which is recorded and graphed on a lap-top computer. The slug test data can be analyzed using solutions based on Bouwer and Rice, Hvorslev and the KGS Model.

Examination of the well logs indicates a high degree of variability vertically in lithology over the 10 to 15 feet saturated soil zone. The results of the slug testing will assist in designing the injection methodology by providing an estimate of conductivity for each of the impacted lithologic zones.

3.2.1.2 AREA 2 Pre-Design Activities

Fall 2012 and spring 2013 site groundwater sampling results for wells located within Area 2 indicates groundwater concentrations are highest at well IW-79[2].

As discuss above for Area 1, additional data collection is necessary to fully understand the lithology, hydraulic conductivity, oxidant demand, etc. in Area 2, therefore the following data will be collected:

- Geoprobe soil borings and groundwater sampling at the east and west edge of the treatment area to confirm there are no large changes in lithological profile that will affect the injection design and collect saturated soil and groundwater samples to confirm the treatment area;

[2] Figures 3 and 4, 2012-2013 Annual Groundwater Monitoring Report

- Geoprobe soil borings to collect groundwater and saturated soil samples for bench testing for oxidant selection and oxidant demand;
- Geoprobe borings for HPT and conductivity profiling to determine slug test intervals; and,
- Geoprobe borings to complete discrete interval slug testing.

Figure 5 indicates the approximate locations for sampling to confirm the area to be treated. Continuous soil sampling will be conducted, soil will be field screened with a PID and the site lithological profile recorded as observed by the Geologist. Soil samples will be collected for laboratory analysis from the top of the saturated zone and from the saturated sands. Groundwater sampling will then be completed for the two intervals from which soil was collected. The soil and groundwater samples will be analyzed by USEPA method 8260. The soil sample collection will be conducted using USEPA method 5035.

An additional boring will be completed near MW-33 to investigate this area where the groundwater concentration is more elevated than in surrounding wells.

The purpose of conducting HPT and conductivity profiling in Area 2 is to refine the understanding of the site hydraulic characteristics within the Area 2 saturated impacted zone to design the injection methodology.

The HPT/EC work will be completed at one location near the bench testing data collection boring (Figure 5). Based on these results, hydraulic slug tests will be selected for the discreet zones indicated by the changes in conductivity and hydraulic fluid pressure.

3.2.1.3 AREA 3 Pre-Design Activities

Groundwater concentrations at IW-77 are higher than at the upgradient wells in Area 2. The field screening data indicates there are low level detects of VOCs above the saturated soils.

As discuss above for Areas 1 and 2, additional data collection is necessary to fully understand the lithology, hydraulic conductivity, oxidant demand, etc. in Area 3, therefore the following data will be collected:

- Geoprobe soil borings and groundwater sampling at the east and west edge of the treatment area to confirm there are no large changes in lithological profile that will affect the injection design and collect saturated soil and groundwater samples to confirm the treatment area;
- Geoprobe soil borings to collect groundwater and saturated soil samples for bench testing for oxidant selection and oxidant demand;
- Geoprobe borings for HPT and conductivity profiling to determine slug test intervals; and,
- Geoprobe borings to complete discrete interval slug testing.

Figure 5 depicts the approximate locations for Geoprobe® sample locations to confirm the area to be treated. Continuous soil sampling will be conducted, soil will be field screened with a PID and the site lithological profile recorded as observed by the Geologist. Soil samples will be collected for laboratory analysis from the top of the saturated zone and from the saturated sands. Groundwater sampling will then be completed for the two intervals from which soil is collected. The soil and groundwater samples will be analyzed by USEPA method 8260B. The soil sample collection will be conducted using USEPA method 5035.

The purpose of this task is to test for site hydraulic characteristics within the Area 3 saturated impacted zone to design the injection methodology.

The HPT/EC work will be completed at one location near the bench testing data collection boring (Figure 5). Based on these results, hydraulic slug tests will be selected for the discreet zones indicated by the changes in conductivity and hydraulic fluid pressure.

3.2.2 Bench Scale Testing

Bench scale testing is required to identify the appropriate oxidant to use in the pilot and potentially full scale injection application(s). During the bench scale testing, various oxidants (at least two) will be reviewed for ability to oxidize COCs at the site. In addition to a review of oxidants, the bench scale testing will be used to determine the current soil oxidant demand at the areas of injection to calculate the amount of injectant required to treat each specific area. .

3.2.2.1 Area 1 Bench Scale Testing

In order to provide the soil necessary to complete the bench scale testing, samples will be collected from the two locations with the historically highest VOC concentrations in groundwater (MW-25 and ITMW-19). These samples will be submitted to an appropriate laboratory for bench testing.

In accordance with Section 3.2.1.1 above, soil and groundwater samples will also be collected from these areas. A full soil profile will be completed with field screening and saturated soil and groundwater from the same interval with the highest TCE concentration will be submitted for testing. The testing will include soil oxidant demand (SOD), effective porosity, bulk density, fraction of organic carbon and oxidation validation utilizing soil and groundwater sample(s) from the site.

3.2.2.2 Area 2 Bench Scale Testing

Soil and groundwater samples will be collected from one location near the well with historically highest VOC concentrations in groundwater (IW-79) and submitted for bench testing. A full soil profile will be completed with field screening and the most elevated saturated soil and groundwater from the same interval with the highest TCE concentration will be submitted for testing (a second boring may be required to collect the required volume of sample). The testing will include soil oxidant demand (SOD), effective porosity, bulk density, fraction of organic carbon and oxidation validation utilizing soil and groundwater sample(s) from the site.

3.2.2.3 Area 3 Bench Scale Testing

Soil and groundwater samples will be collected from one location near the well with the historically highest VOC concentrations in groundwater (IW-77) and submitted for bench testing. The testing will include soil oxidant demand (SOD), effective porosity, bulk density, fraction of organic carbon and oxidation validation utilizing soil and groundwater sample(s) from the site.

3.2.3 Pilot Scale Testing

After completion of bench scale testing and review of other pre-design field activities and analytical results, a pilot scale test will be completed at Area 1. Other small scale pilot testing activities may be completed at Areas 2 and 3 if results appear to require additional information prior to application of ISCO at these areas.

Conceptual Pilot Test Scenario:

- Install approximately 20 direct push (Geoprobe) boreholes deployed across a 10-foot vertical interval (exact placement to be determined based upon pre-design results).
- Borehole locations will be generally placed on a grid pattern with offsets on each row to encourage overlap of radius of influence from the injection points.
- Geoprobe® tooling will be driven to depth at each location and injectant(s) added at quantities determined based on results of the bench scale testing; injection pressures will also be determined based upon pre-design results.
- A minimum of four 1inch piezometers will be installed within and adjacent to the pilot test area, to monitor performance. These piezometers will be located at varying distances from the pilot test area to assist in evaluation of oxidant reaction/COC reduction with distance from the pilot area. If possible, based upon pilot location, in place monitoring wells will also be used to monitor performance.

3.2.4 Design

The design of the ISCO system will commence after completion of the predesign activities including bench scale and pilot testing. The data and results from the activities will be incorporated into the design of the amount, process(s) and method(s) of delivery of the oxidant to the target areas. An ISCO Final Design Work Plan will be prepared that may include the following components and will be submitted to ADEQ for review.

- Site Plan
- Design Basis

- Bench / Pilot Scale Review
- Plans / Specifications
  - Process Diagrams
  - Equipment Lists
  - Operating procedures
  - Specifications for Equipment and Material
  - Identification of injection location type (permanent / temporary)
- Health and Safety Plan
- Waste Management Plan
- Required Permits
- Long Lead Procurement Considerations
- Detailed Project Schedule
- Final Design Report

3.2.5 Implementation

After completion of Design the first phase of ISCO will begin. The result of the Design may alter the specifics of the phased implementation. The details of the phased implementation will be described in the Design Report completed as a deliverable from Section 2.2.2. The following outline of the phased implementation of ISCO is presented as an overview based on current site understanding.

3.2.5.1 Phase I Implementation

Phase I includes the first round of oxidant injection into the approximate locations identified on Figure 3. Information gathered in the pre-design and design stages will be used to further refine the areas slated for injection, the oxidant type, and the manner of injection or oxidant delivery. The Phase I implementation may incorporate the use of additional pilot / test areas to validate the design developed during design (Section 2.2.2 of this work plan). For ease of consideration in the use of pilot testing it is best viewed as the initial activity of the 1st phase, defined by the detailed design outlined in Section 2.2.2 of this Work Plan.

Based upon the current site understanding, Phase I will include the injection of an oxidant (currently anticipated to be activated persulfate) into the three areas outlined on Figure 3. Injection points will be installed on 10-foot centers (unless pre-design results show the need for a different spacing). Information gathered during the pre-design stage will help determine the appropriate delivery method(s), however if injection points are used, most of the points are currently planned be completed as temporary points via Geoprobe® to allow the greatest flexibility for continued oxidant delivery as required in later stages. Some permanent points may be installed in the source area (Area 1) if data gathered during the pre-design investigation show that injection at specific depths will continue to provide the contact required to adequately oxidize the COCs. Assuming injection points will be used as the delivery method, these injection points will be screened in the transmissive zone only. Area 1 (the on-site source area) is currently estimated to be 320 feet by 80 feet, and as such would require approximately 256 injection points. Area 2 (north of Ingersoll Avenue) is estimated to be 210 feet by 20 feet and as such would require approximately 42 injection points. Area 3 (near IW-77) is estimated to be 90 feet by 30 feet, and as such would require approximately 27 injection points. Injection points may be added or removed depending upon the hydraulic conductivity and lithology identified during the pre-design phase of work and resulting design.

Current data suggests that persulfate may be more effective in treating COCs than permanganate which was previously used; however additional evaluation will be performed prior to injection event(s) to verify the appropriate oxidant (including bench scale and pilot scale studies). If persulfate is used (assuming a soil oxidant demand of 5 grams of persulfate per kg of treated soil) up to 45,000 pounds of persulfate could be injected into Area 1, up to 7,000 pounds of persulfate could be injected into Area 2, and up to 4,500 pounds of persulfate could be injected into Area 3. All injections would be completed under pressure. To determine the correct pressure breakthrough would be determined then the pressure would be decreased to approximately 3 to 5 psi. If necessary, peroxide may be added to continue to reduce mass following the persulfate injections if manganese is not identified within the injection area due to prior permanganate injections. The type and dosage of oxidant used are both critically important to the treatment of the proposed areas. Therefore, bench scale and pilot studies performed during the pre-design phase will evaluate oxidant type and oxidant potential on site-specific soils.

As part of Phase I implementation, additional monitoring points will be installed at various locations within Areas 1, 2, and 3 to determine the level of effectiveness at the 3 month and 6 month stages post ISCO application. Additional monitoring events maybe completed if pilot test results indicate the need for a longer monitoring period. The location of these monitoring points will be affected by the data gathered during the pre-design investigation. Hydraulic conductivity and estimated radius of influence data will assist in determining the correct placement of the monitoring wells so that short term effectiveness can be appropriately measured. Monitoring points will be analyzed for VOCs via 8260B as currently completed during semi-annual monitoring events. After monitoring is completed (at least 6 months post ISCO injection), Phase II implementation will begin.

3.2.5.2 Phase II Implementation

While the purpose of Phase I is mass COC reduction and control of COCs migrating off-site, Phase II will focus on further reduction of remaining COCs concentrations by ISCO to levels appropriate for the continued reduction of COC via monitored natural attenuation (MNA). Phase II will address any identified back diffusion after implementation of Phase I if any.

Based upon the data gathered during the previous stages, Phase II will include additional targeted ISCO delivery. It is likely that additional Geoprobe® injection borings will be completed in all three areas to achieve oxidant delivery/impacted soil contact at the appropriate locations as identified by the Phase I monitoring data. It is assumed that the same oxidant used during Phase I would be used during Phase II. Because oxidant quantity and location are dependent upon the monitoring data gathered during Phase I, they cannot be reasonably estimated at this time.

As described within Phase I implementation, Phase II will also include 3 and 6 month monitoring events to evaluate the effectiveness of the ISCO application. Groundwater samples collected from these monitoring points will be analyzed for VOCs via method 8260B as currently completed during semi-annual sampling events.

At the end of the 6 month monitoring program, results will be evaluated to determine if additional ISCO phases are required to reach appropriate COC levels.

3.3 Monitored Natural Attenuation

Monitored Natural Attenuation (MNA) is continuing reliance on naturally occurring subsurface processes to control or prevent migration and/or over time achieve site-specific remediation objectives (USEPA 1989). Natural attenuation processes (the NA of MNA) include a variety of naturally occurring physical, chemical, and biological processes that, under favorable conditions, substantially reduce the mass, toxicity, mobility, volume, or COC concentrations in soil and/or groundwater. Natural attenuation can be very effective in reducing the mass of COCs including the off-site plume. The COC's can be biologically degraded both anaerobically (via reductive dechlorination) or aerobically. MNA will be relied on to reduce residual COC's after the effectiveness of the ISCO marginalizes.

Since MNA relies on source reduction, natural recovery processes can potentially be inhibited or stalled if ongoing sources of contamination are not controlled. Efforts to reduce or eliminate sources benefit the ongoing natural recovery of the Site.

NA will continue to be monitored throughout the final remedy process.

3.4 Soil Vapor Monitoring

Whirlpool installed soil gas monitoring points in May 2012 to collect soil gas data to provide an additional line of evidence to compliment the vapor intrusion modeling analysis completed to date. These soil gas data and the vapor intrusion modeling results have been presented in the RRMP. The soil gas data collected over the off-site plume to date[3] show that TCE volatilizes from the groundwater and the TCE vapor reaches levels that are not indicative of a public health concern by the time it is within seven feet of the ground surface, if not sooner, at the locations monitored to date. These data show the vapor intrusion pathway from groundwater through the overlying soil terminates at a soil depth well below the ground surface and therefore well below

[3] Included in Table 4 of Appendix A in the May 21, 2013 Revised Risk Management Plan (ENVIRON 2013).

any residential structure. These findings corroborate the modeling results which indicate vapor intrusion is not occurring at levels that would present a public health concern.

Although the existing soil gas monitoring results already provide data that corroborates the conclusion that there is no unacceptable vapor intrusion risk from the Site, Whirlpool concluded that additional soil gas monitoring points should be installed in order to enhance coverage of the off-site plume. As discussed in the RRMP submitted to ADEQ, the performance monitoring activities for the site will include a soil gas monitoring plan. The objective of this soil gas monitoring component is to provide the community with additional assurance that the off-site groundwater plume north of the Site does not present a concern for vapor intrusion into the indoor air of buildings overlying the plume. Whirlpool will evaluate the additional soil gas data following the approach used in the RRMP and as part of the overall evaluation of remedy performance.

Whirlpool will work with the ADEQ to select appropriate locations for additional soil gas monitoring points to augment the existing soil gas monitoring points. The new soil gas monitoring points will provide additional lateral coverage over the off-site groundwater plume area. The locations of the additional soil gas monitoring points will be selected based on proximity to: (1) existing off-site groundwater monitoring wells with higher concentrations of TCE, and (2) an occupied residential building. The idea is to install additional soil gas monitoring points at locations that have higher potential for vapor intrusion to occur compared with other locations in the area. Proposed additional soil gas monitoring locations are shown on Figure 6.

At each of these locations, monitoring points will be installed at two depths between the ground surface and the groundwater (as shown on Figure 7). The first will be installed just above the groundwater surface to characterize the soil gas due to volatilization of TCE from the groundwater. The second monitoring point will be installed at a depth approximately midway between the groundwater surface and the ground surface, or at least five feet below ground surface, to characterize the degree to which TCE in vapor from the groundwater is or is not migrating to the shallower depth. Soil gas samples will be collected using USEPA and industry standard methods and analyzed for TCE and breakdown components by an accredited analytical laboratory. Soil cuttings generated during the installation of these monitoring points will be containerized, characterized, and disposed of at a licensed disposal facility.

In the event these additional soil gas monitoring data are inconsistent with the current findings; Whirlpool will propose additional investigation that is appropriate for addressing the findings. Such additional investigation may include the collection of sub-slab soil gas samples from under existing residences with concrete slabs. The sub-slab soil gas data would be used to determine if the vapor intrusion pathway from groundwater actually extends to a particular building foundation and presents a potential for significant soil gas entry through the slab. If the targeted sub slab sampling indicates potential for vapor intrusion into the residence, indoor air data will then be collected. These data would be used to determine whether vapor intrusion into indoor air is actually occurring, and if so, the degree of significance.

Whirlpool's plan to assess sub-slab soil before indoor air has the advantage of reducing the impact of potential indoor and/or outdoor sources of TCE[4,5]. The need to avoid having

[4] Interstate Technology Regulatory Council (ITRC). 2007. Technical and Regulatory Guidance. Vapor Intrusion Pathway: A Practical Guideline. January.

assessment results affected by background levels of TCE from indoor and outdoor sources, or “false positives”, is particularly important because TCE is or has been an ingredient in many common household products, including lubricants, adhesives, adhesive removers, automotive and household cleaners, aerosol and liquid spot removers, oven cleaners, silicone lubricants, and aerosol gun cleaners. Because of such indoor sources, it is not unusual to find measureable levels of TCE in residential indoor air even when no vapor intrusion is occurring. In fact, a recent USEPA report showed that it is not unusual for background indoor air levels of TCE in residences to exceed USEPA indoor air screening levels[6] in locations in which no TCE is known to be present from any source other than products found in the home. For these reasons, Whirlpool is following the industry recommended practice of gathering sub-slab soil gas data in order to distinguish vapor intrusion from impacts on indoor air due to other sources of TCE.

3.5 Groundwater Monitoring and Reporting

In addition to the enactment of institutional controls, ISCO applications, MNA and vapor monitoring, groundwater will also be monitored. Groundwater monitoring will continue to be implemented to confirm that the chosen remedy elements continue to be protective of human health. In the case of groundwater, monitoring will verify plume stability and decreasing groundwater impact over time.

The groundwater monitoring program will be instituted as part of the MNA monitoring discussed in Section 3.3 below.

[5] United States Environmental Protection Agency (USEPA). 2011. Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences (1990 – 2005): A Compilation of Statistics for Assessing Vapor Intrusion. USEPA 530-R-10-001. Office of Solid Waste and Emergency Response, Washington DC. June.

4 Performance Monitoring

The primary elements of the final remedy include institutional controls that maintain existing on-site soil and groundwater restrictions, off-site groundwater restrictions, active source reduction on-site via ISCO, targeted active source reduction off-site via ISCO, and on- and off-site monitoring of VOC concentrations for natural attenuation. Performance monitoring will be implemented to provide a quantitative mechanism for tracking reduction of VOCs and confirm the primary elements continue to be protective of human health. Performance monitoring details are presented in the following sections.

In accordance with the LOA and RRMP Whirlpool will complete the following required Performance Monitoring and Reviews.

4.1 Chemical Oxidation Monitoring

Whirlpool will implement a tiered monitoring program to address chemical reductions completed as part of the on-site and off-site ISCO effort. The effectiveness monitoring will include the existing monitoring well network and additional monitoring points both up and down gradient of the injection areas. At a minimum, it is expected that chemical oxidation performance monitoring will be completed at the following intervals post injection(s): three months and six months in the phased approach.

Pre-design testing will include the collection of soil and groundwater samples throughout Areas 1, 2, and 3. This will be the first step to monitoring for the ISCO remedy.

Once the pre-design information has been gathered and the oxidant type and final delivery methodology has been established, the injection delivery methodology (currently assumed to be a combination of temporary and permanent injection wells) and monitoring wells will be installed. After the wells are installed the baseline monitoring event will be completed. During this event, monitoring points throughout Areas 1, 2, and 3 will be sampled for VOCs by method 8260B. This sampling event will provide the data against which the effectiveness of the ISCO applications will be measured. At least 12 monitoring points will be measured.

After the first ISCO application is complete, the monitoring points will again be sampled both 3 months after application and 6 months after application. Samples will include the collection of groundwater for analysis via method 8260B. A technical memorandum will be completed after the 6 month monitoring event to evaluate the effectiveness of the use of ISCO at the site.

Based upon the results of the 3 and 6 month monitoring events, the second ISCO application will be designed and completed. After the second ISCO application is complete, the monitoring points will again be sampled at both the 3 and 6 month points. A technical memorandum will again be completed after the 6 month monitoring event to evaluate the effectiveness of the ISCO application.

Effectiveness of chemical oxidation will be monitored through quarterly groundwater sampling events. The effectiveness will be determined by comparison of data points to the baseline established after the first sampling event, post any chemical oxidant injection round / phase. Subsequent sampling data will be compared to the initial baseline point after the completion of a round of injections. If monitored parameters do not indicate a reduction in TCE concentrations and other COC's within one (1) year of the phased implementation defined by Section 4.1 Final Remedy Selection of the RRMP, additional measures will be implemented. Whirlpool will not wait for the formal 5 year technical review required by the LOA before evaluating effectiveness or implementing additional measures. Additional measures may include additional round(s) of chemical oxidant injection, expansion of the injection network and/or use of alternative remedial technologies as presented in Section 4.1 Final Remedy Selection of the RRMP.

Additional monitoring for MNA and general groundwater trends will also be evaluated as discussed below.

4.2 MNA & Groundwater Monitoring

Monitoring (the M of MNA) is an integral component of the MNA remedy. Long-term monitoring of environmental restoration recognizes that uncertainty is inherent to any cleanup activity and must be managed through data collection and monitoring (US Department of Energy (USDOE) 1997).

MNA monitoring will be conducted in conjunction with groundwater monitoring activities. Whirlpool will implement a program of quarterly groundwater monitoring for a five-year period to verify effectiveness of natural attenuation. The monitoring program will include the analysis of VOCs by SW486 Method 8260 where the key COC compounds, TCE, PCE, 1,1-DCE, 1,1-DCA, cis-1,2-DCE and vinyl chloride, will be reviewed. The monitoring program will also include the collection of natural attenuation indicator parameters including sulfates, chloride, nitrogen/nitrate, and iron.

The wells to be sampled include:

- Plume Boundary Wells; MW-50, MW-60, MW-61, MW-67, MW-66, MW-63, MW-62, MW-36, MW-27, MW-28, ITMW-16, ITMW-2, MW-22, ITMW-4, ITMW-6, MW-29, ITMW-20, MW-26, MW-31, MW-39, MW-40, IW-72, and MW-68.
- On-Site Wells; MW-25, ITMW-19, ITMW-17, ITMW-11, ITMW-12, ITMW-18, ITMW-15, MW-38, MW-33, MW-65, MW-35R, IW-80, MW-34, MW-32, ITMW-21, ITMW-7, ITMW-10, ITMW-9, ITMW-1, ITMW-13, and ITMW-14.
- Off-Site Wells: IW-73, IW-74, MW-41, IW-76, IW-77, MW-71, RW-69, MW-46R, MW-55, MW-56, MW-57, and MW-58.

Plume boundary wells will not be analyzed for MNA indicator parameters as the wells would not be expected to contain COCs.

Purge water collected during low flow sampling activities will be containerized, characterized, and disposed of at a licensed disposal facility.

If after the first two years, significant trends are shown to support natural attenuation, a reduction in the monitoring frequency will be discussed with ADEQ.

If data trends do not indicate natural attenuation effectiveness within two years after the first chemical oxidation injection, then additional measures will be considered as defined in Section 4.1 Final Remedy Selection of the RRMP.

Data from monitoring activities will be complied in annual monitoring reports. Precipitation measurements at the Arkansas River gauging station will also be included in the annual monitoring reports.

4.3 Soil Vapor Monitoring

Whirlpool will implement a program of soil gas monitoring for a five year period on an semiannual basis to monitor the soil gas concentrations to confirm that groundwater-derived vapors are not migrating and that vapor intrusion continues to be an incomplete pathway. The program will use the existing soil gas sampling points augmented with the additional soil gas sampling points (discussed in Section 2.5) to be incorporated into the performance monitoring program. The soil gas monitoring will include analysis of CVOCs that have inhalation toxicity values and where the detected concentration in groundwater exceeds the MCL at or near the soil gas sampling point.

4.4 Performance Monitoring / Reviews

As defined by the LOA and included in the RRMP, Whirlpool will complete the following performance monitoring and reviews. All performance monitoring documents addressed by this section of the Work Plan will be submitted to both ADEQ and the City of Fort Smith as committed to in the RRMP.

4.4.1 Quarterly Performance Monitoring

Whirlpool will prepare quarterly Corrective Action and Operation and Maintenance Status Reports as required in the LOA. In addition to the LOA requirements, and committed to the RRMP, Whirlpool will provide quarterly performance evaluations on the effectiveness of both the chemical oxidation and natural attenuation programs. If during the course of the final remedy implementation, progress in meeting remedial action criteria is not satisfactory to both ADEQ and Whirlpool, additional measures will be undertaken as presented in the previous sections of this addendum and the RRMP to expedite meeting the remedial action criteria in concurrence with ADEQ participation and approval.

The quarterly status reports will contain the following:

- Description of work completed,
- Summaries of all findings in the reporting period,
- Summaries of problems encountered during the reporting period and actions taken to address problems,
- Deviations from any approved work plans or schedules including justification for any delays with revised projected completion date(s), and
- Projected work for the next reporting period.

4.4.2 Annual Monitoring Report

Whirlpool will prepare annual performance monitoring reports that summarize the results of the annual groundwater, ISCO, MNA, and vapor point monitoring activities. The annual monitoring report will contain the following:

- Summaries of the annual groundwater, ISCO, MNA, and vapor point monitoring results with comparisons to corrective action criteria;
- Summaries of groundwater level elevation data;
- A review of the MNA indicator data with trend analysis for TCE; and
- Copies of the laboratory analytical reports.

In the event that the five-year monitoring program, as discussed in the sections above, indicate that the performance criteria have been met, Whirlpool will propose that all performance monitoring cease.

4.4.3 Five Year Review

Consistent with the 2005 Arkansas Groundwater Remediation Level Interim Policy and as required by the LOA, five years after initiating the Final Remedy Whirlpool will submit a comprehensive five-year technical review of the status of the Whirlpool site final remedy and assess the need for further actions if necessary.

4.5 Contingency Plan

If during the course of the final remedy implementation, progress in meeting remedial action criteria is not satisfactory to both ADEQ and Whirlpool, additional measures will be undertaken as presented in the RRMP to expedite meeting the remedial action criteria in concurrence with ADEQ participation and approval.

5 Schedule

The Work Plan implementation schedule is presented on Figure 8 and represents Whirlpool's estimate of the timing for completion of each of the outlined tasks above. The schedule reinforces Whirlpool's commitment to an efficient, expeditious implementation of the final remedy following notification to proceed from the ADEQ.

This schedule is based upon ADEQ issuance of the final RADD by November 1, 2013. An extension of the timeline required to approve the RADD will also require schedule extension to the items which follow RADD approval on Figure 8.

Various assumptions were made in drafting this schedule, specific assumptions are listed below:

- Field work will not occur during the months of January or February due to the unpredictability of weather conditions
- Vendor and subcontractor schedules/lead times can accommodate the project schedule as submitted
- Pilot Scale Implementation includes adequate time to fully measure the performance of the oxidant as well as evaluate potential back diffusion due to COCs contained within tight soil lenses
- Design of Phase I Implementation commences prior to completion of Pilot Scale monitoring, therefore, it is assumed that information obtained from the last Pilot Scale monitoring event will be fairly consistent with earlier monitoring events (ie. no last minute monitoring surprises that will affect the design)
- Property access issues can be resolved in a timely manner so as not to impact scheduled field work activities
- Laboratory analytical data will be received within a two week turnaround time

The schedule will be reviewed on quarterly basis as part of the performance monitoring. Any schedule revisions will be addressed in the quarterly, annual and five year review reports.

6 References

Arkansas Department of Environmental Quality. (ADEQ). 2002. “Letter of Agreement to Implement a Risk Management Strategy Between The Arkansas Department of Environmental Quality and Whirlpool Corporation,” July 19.

Environmental Resources Management (ERM). 2007. “Risk Evaluation Report”, June 14.

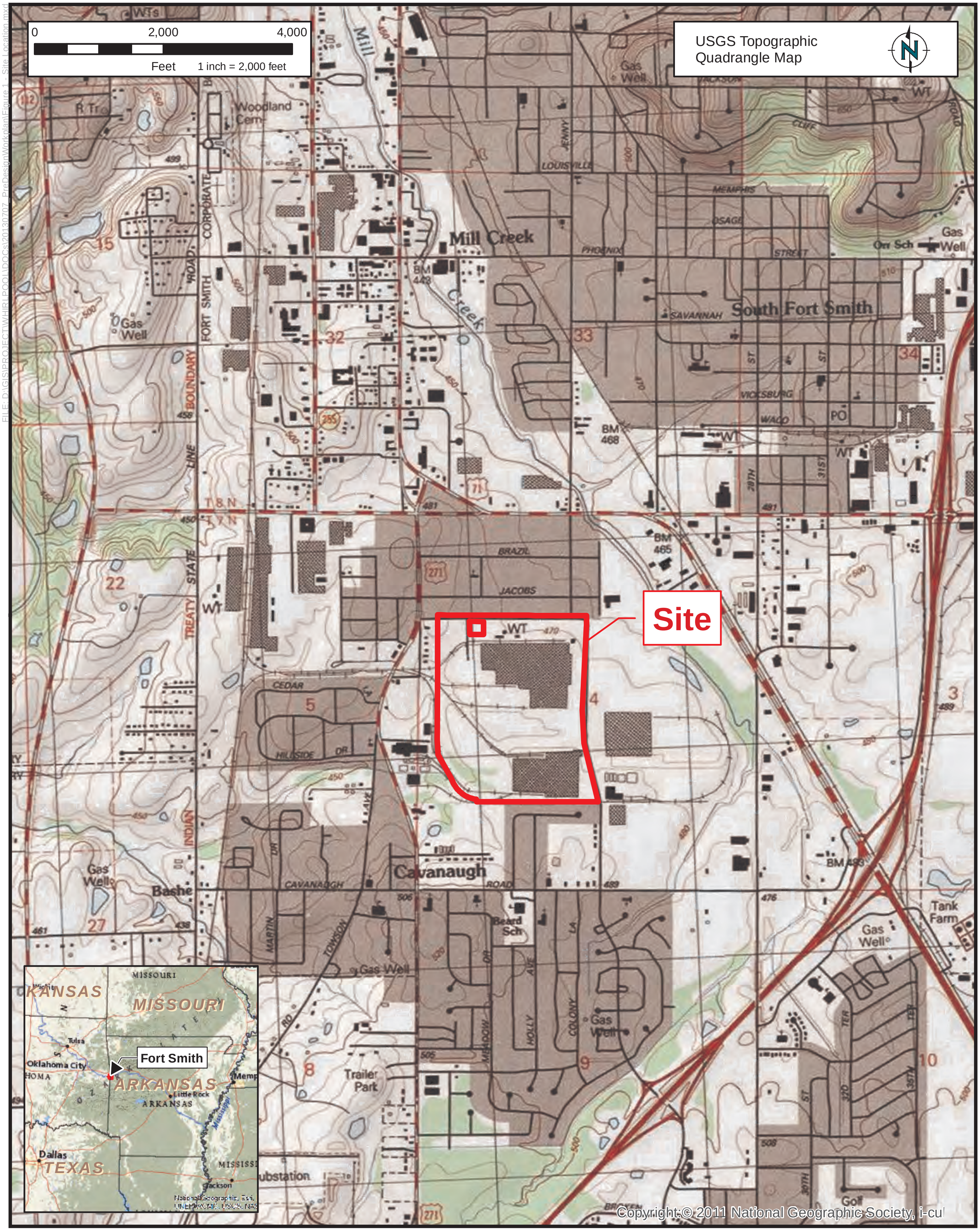
ERM. 2008. “Risk Management Plan,” March 27.

ENVIRON. 2013. “Human Health Risk Assessment (HHRA)”, April 8.

ENVIRON. 2013. “Revised Risk Management Plan (RRMP)”, May 21.

ENVIRON. 2013. “Revised Risk Management Plan (RRMP) Addendum”, June 14.

Figures



ENVIRON

SITE LOCATION

Whirlpool Facility - Fort Sm ith, Ark an sas

Figure 1

DRAFTED BY: KTS | DATE: 07/16/2013 | PROJECT: 2131344B

FILE: D:\GIS\PROJECT\WHIRLPOOL\DOCs\20130707_PreDesignWorkplan\Figure 2 - Site Layout.mxd

ENVIRON

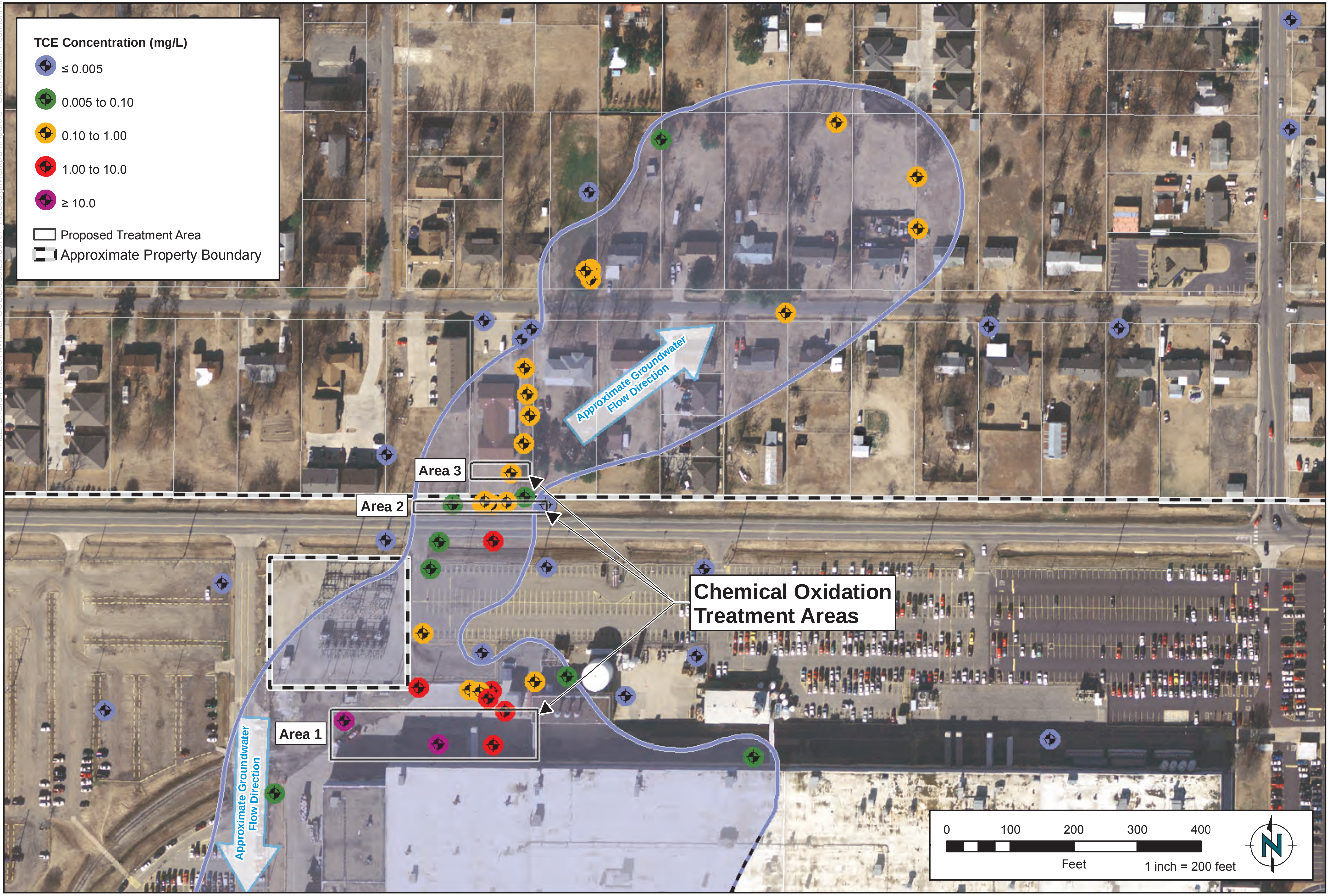
DRAFTED BY: KTS | DATE: 07/16/2013

SITE LAYOUT

Whirlpool Facility - Fort Sm ith, Ark an sas

Figure 2

PROJECT: 2131344B



ENVIRON

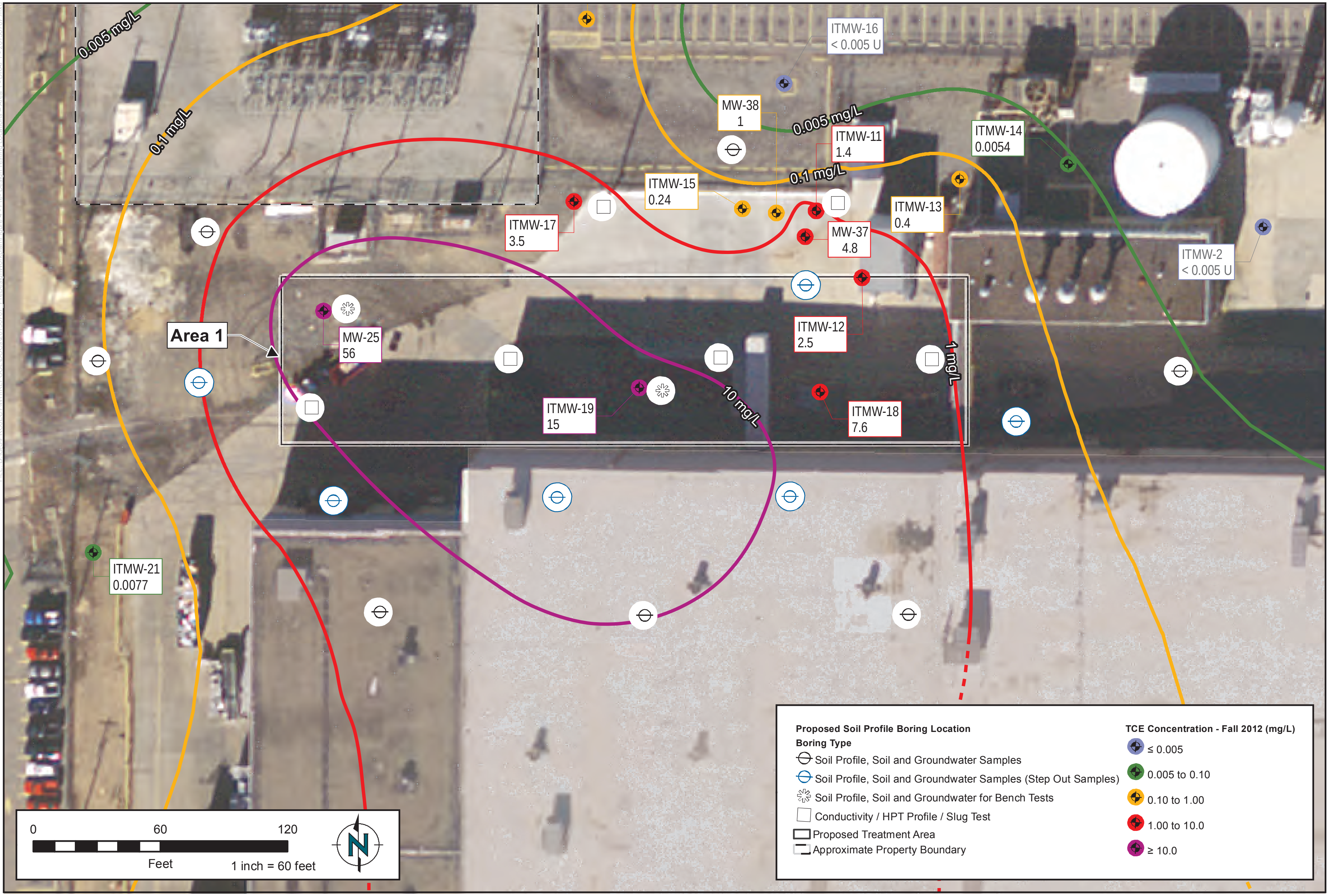
DRAFTED BY: KTS | DATE: 07/06/2013

GROUNDWATER TREATMENT AREAS AND FALL 2012 GROUNDWATER RESULTS

Whirlpool Facility - Fort Smith, Arkansas

Figure 3

PROJECT: 2131344B



ENVIRON

PRE-DESIGN TESTING LOCATIONS – AREA 1

Whirlpool Facility - Fort Smith, Arkansas

Figure 4

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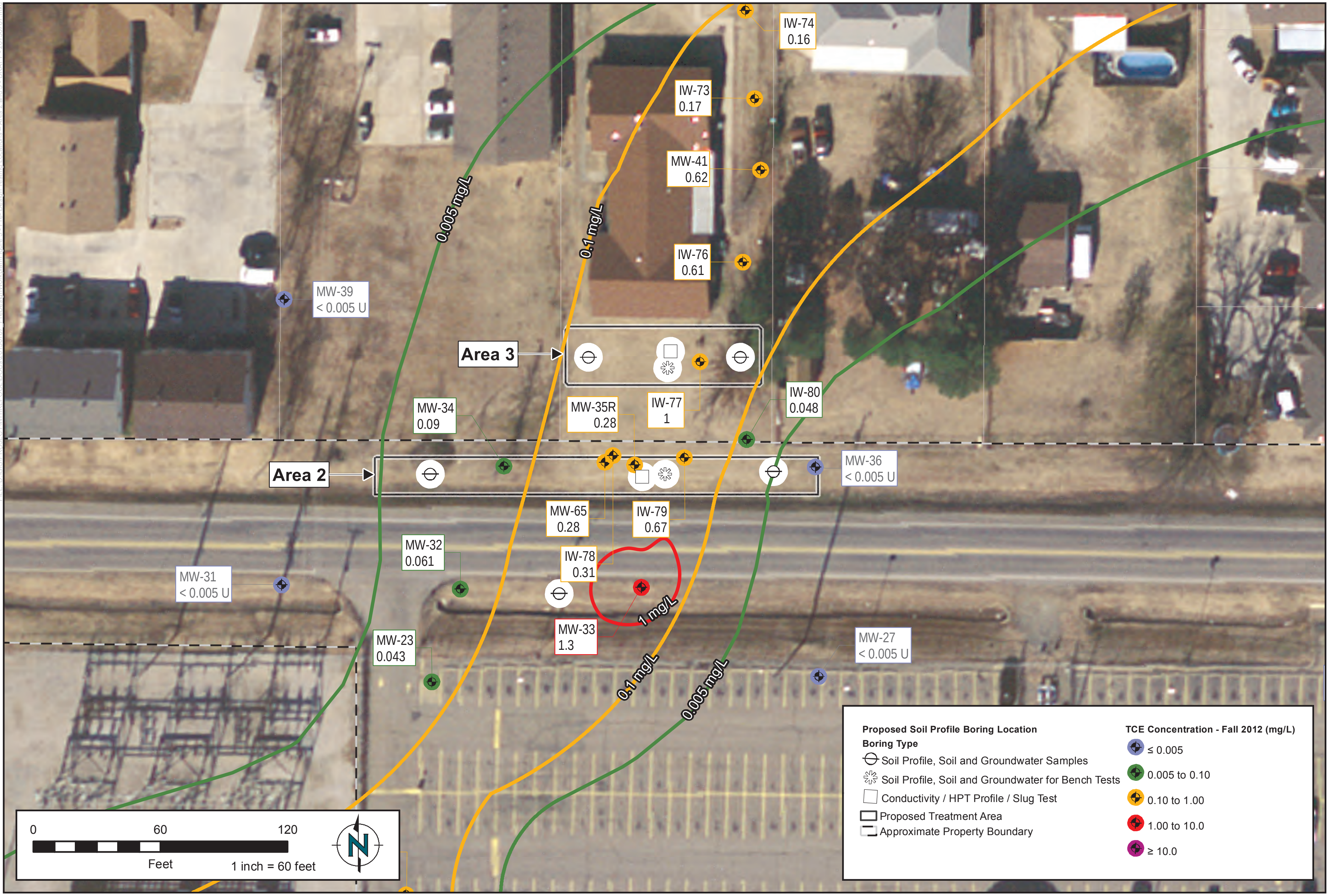

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DATE: 07/16/2013

PRE-DESIGN TESTING LOCATIONS – AREAS 2 AND 3

Whirlpool Facility - Fort Smith, Arkansas

Figure 5

PROJECT: 2131344B

FILE: D:\GIS\PROJECT\WHIRLPOOL\DOCs\20130707_PreDesignWorkplan\Figure 6 - Proposed Additional Soil Gas Locations.mxd

ENVIRON

DRAFTED BY: KTS

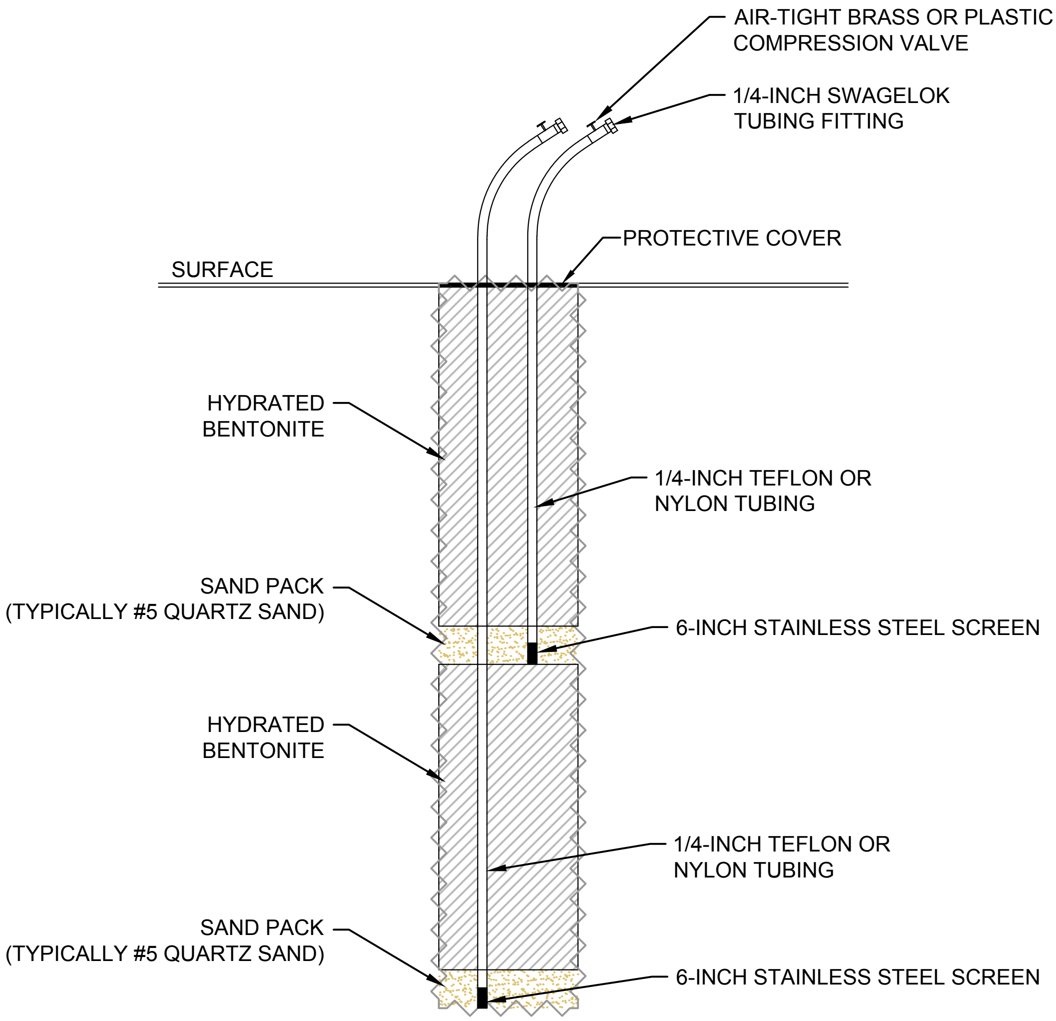
DATE: 07/16/2013

PROPOSED ADDITIONAL SOIL GAS LOCATIONS

Whirlpool Facility - Fort Sm ith, Ark an sas

Figure 6

PROJECT: 2131344B



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ENVIRON

TYPICAL NESTED SOIL GAS MONITORING POINT CONSTRUCTION DETAILS

WHIRLPOOL CORPORATION
6400 JENNY LIND ROAD
FORT SMITH, ARKANSAS

FIGURE 7

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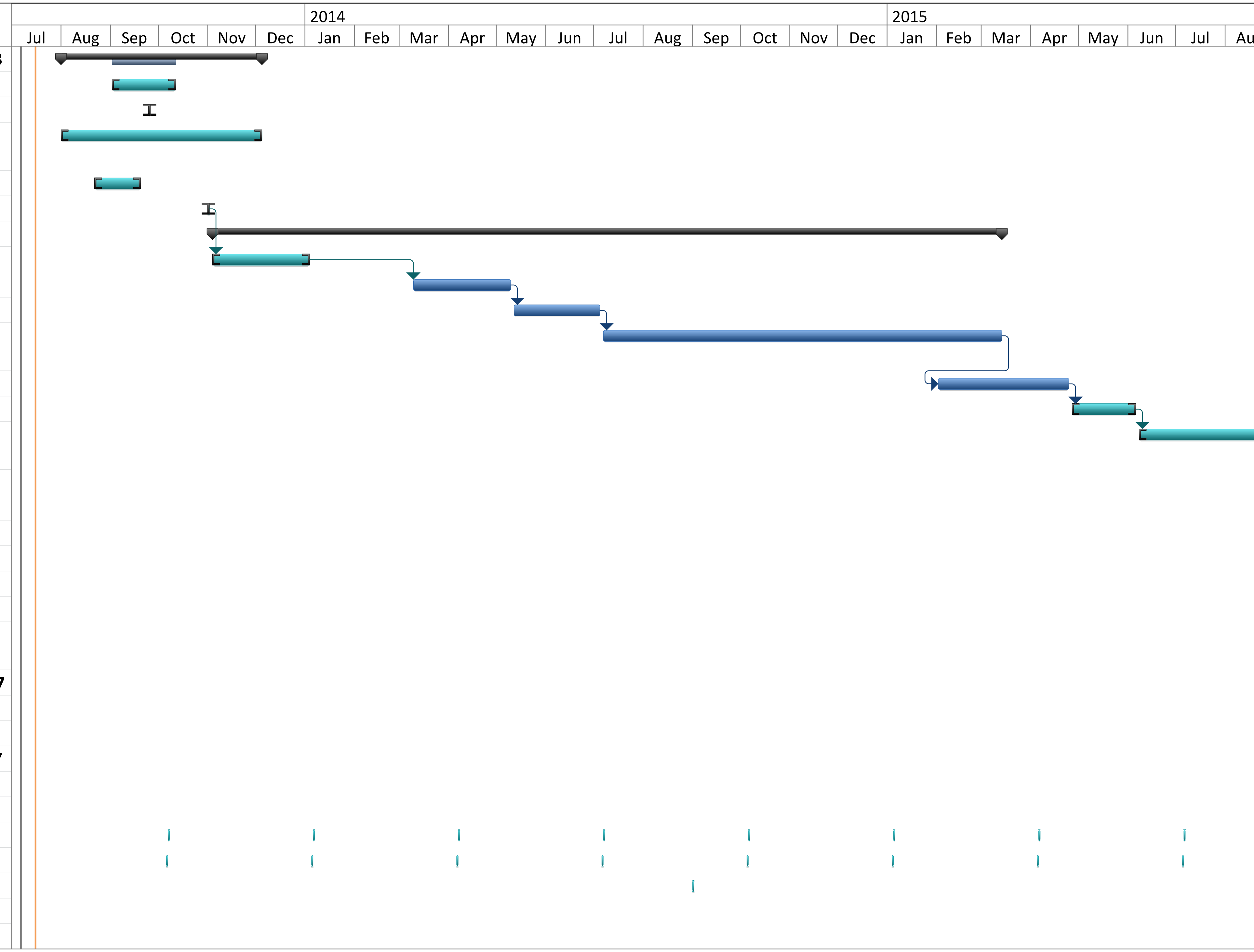
TSP 7/8/13 [2131344_DETAIL]
F:\2131344

Figure 8: Final Remedy Work Plan Schedule

ID	Indicators	Task Name	Duration	Start	Finish
1		**Public Involvement Plan**	**90 days**	**Thu 8/1/13**	**Wed 12/4/13**
2		30 Day Public Comment Period	30 days	Mon 9/2/13	Fri 10/11/13
3		Public Meeting	1 day	Wed 9/25/13	Wed 9/25/13
4		On-Site Deed Restrictions/Institutional Controls	90 days	Thu 8/1/13	Wed 12/4/13
5		Vapor Point Installation	21 days	Thu 8/22/13	Thu 9/19/13
6		ADEQ Issues Final RADD	1 day	Fri 11/1/13	Fri 11/1/13
7		**ISCO: Pre-Design**	**355 days**	**Mon 11/4/13**	**Fri 3/13/15**
8		Vendor/Subcontractor Process	45 days	Mon 11/4/13	Fri 1/3/14
9		Sampling & Field Testing	45 days	Mon 3/10/14	Fri 5/9/14
10		Bench Scale Testing	40 days	Mon 5/12/14	Fri 7/4/14
11		Pilot Scale Testing & Monitoring of Test	180 days	Mon 7/7/14	Fri 3/13/15
12		Design	60 days	Mon 2/2/15	Fri 4/24/15
13		ADEQ Review/Approval of Design	30 days	Mon 4/27/15	Fri 6/5/15
14		Underground Injection Control Permit Submission and Approval	180 days	Mon 6/8/15	Fri 2/12/16
15		**ISCO: Phase I**	**324 days**	**Mon 2/15/16**	**Thu 5/11/17**
16		Vendor/Subcontractor Process	45 days	Mon 2/15/16	Fri 4/15/16
17		ISCO Phase I Application	45 days	Mon 4/18/16	Fri 6/17/16
18		3 Month Monitoring Event	2 wks	Mon 9/5/16	Fri 9/16/16
19		6 Month Monitoring Event	2 wks	Mon 12/5/16	Fri 12/16/16
20		Phase I Report & Phase II Design	60 days	Fri 1/6/17	Thu 3/30/17
21		ADEQ Review/Approval of Design	30 days	Fri 3/31/17	Thu 5/11/17
22		**ISCO: Phase II**	**184 days**	**Sat 4/1/17**	**Thu 12/14/17**
23		Vendor/Subcontractor Process	30 days	Fri 5/12/17	Thu 6/22/17
24		ISCO Phase II Application	45 days	Fri 6/23/17	Thu 8/24/17
25		3 Month Monitoring Event	2 wks	Fri 12/1/17	Thu 12/14/17
26		6 Month Monitoring Event	2 wks	Sat 4/1/17	Thu 4/13/17
27		Phase II Report	45 days	Thu 5/4/17	Wed 7/5/17
28		**MNA & Groundwater Monitoring**	**1236 days**	**Mon 10/7/13**	**Mon 7/2/18**
49		**Quarterly Performance Monitoring**	**1235 days**	**Sun 10/6/13**	**Sun 7/1/18**
70		**Annual Monitoring Report**	**1046 days**	**Mon 9/1/14**	**Mon 9/3/18**
76		Five Year Review	1 mon	Fri 11/9/18	Thu 12/6/18
77					



Project: 3013-07-11 Figure 8_Dra
Date: Tue 7/16/13

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	
Summary	Inactive Task	Duration-only	Finish-only	

Figure 8: Final Remedy Work Plan Schedule