October 7, 2014

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

Re: Response to ADEQ Correspondence Dated September 23, 2014
Area 1 Work Plan – September 2014
Whirlpool Corporation
Fort Smith, Arkansas
EPA No. ARD042755389
AFIN No. 66-00048
CAO LIS 13-202

Dear Mr. Mehran:

ENVIRON International Corporation (ENVIRON), on behalf of Whirlpool Corporation, is submitting this response to your September 23, 2014, letter providing comments on the Area 1 Work Plan – September 2014 (received on September 26). Arkansas Department of Environmental Quality (ADEQ) comments are provided in the text below and the respective response follows.

The responses below address ADEQ comments regarding soil removal, use of roll-off boxes to contain soil from the large diameter borings, oxidant distribution, supplemental discussion of the oxidants to be used and additional analysis requested by ADEQ for soil samples collected during installation of new monitoring wells to assess the effectiveness of the remedy at Area 1.

ADEQ Comment:

3.1 Supplemental Interim Measure - Soil Removal In The Linear Drainage Feature (1st paragraph, 3rd sentence): *The amount of contaminated soil identified to be removed seems inadequate to meet the remedial action level (RAL) for the subsurface soil outlined in the Remedial Action Decision Document (RADD) (0.129 mg/kg). Four foot diameter boreholes set on fifteen (15) foot centers will not remove even half of the contaminated soil. Please discuss in detail how the removal of limited amount of soil proposed in the work plan will remediate the soil below the RAL***.**

ENVIRON Response:

Overview

The proposed soil removal action in the linear drainage feature as described within the Area 1 Work Plan – September 2014 (Work Plan) is designed to:

- Aggressively address the soil contamination found in Area 1 through a remediation plan that can be quickly and effectively implemented and completed;
- Remove “hot spots” with the most contaminated soil;

- Achieve the objectives of the RADD in combination with the other remedial activities including chemical oxidation injections and containment;
- Enhance groundwater remediation through in-situ chemical oxidation (ISCO) and monitored natural attenuation (MNA); and
- Advance the redevelopment of the site to bring jobs and commercial activity to the area.

Additional soil removal in Area 1 beyond that proposed in the work plan would offer few, if any, additional environmental benefits, while creating significant additional complications that would negatively affect the progress of onsite and offsite remediation, as well as the redevelopment of the overall site. The selected management method of onsite impacted soils under the RADD is capping and containment, not removal of soil to below the RAL. This method was chosen precisely because soil removal would neither reduce the risk of exposure to onsite workers or area residents nor would it materially impact the offsite groundwater contamination. The removal of substantial additional soil in this area in an attempt to achieve the RAL is not a better solution for soil and groundwater remediation than the ISCO, capping and engineering controls that are required by the RADD. In fact, the remediation work performed in the "neck area" and Areas 2 and 3 has already effectively begun to aggressively address offsite groundwater impacts (results of the second ISCO injection event will be presented in the 2014 Third Quarterly Progress Report).

In addition, substantial additional soil removal in Area 1 to meet the RAL presents several engineering and operational drawbacks. Substantial additional soil removal would threaten the structural integrity of the former manufacturing building and stability of the electrical substation. It would also require de-watering operations. These issues would likely complicate and delay completion of the remediation activities required under the RADD and the ongoing redevelopment of the property. Both the hot-spot removal set forth in Whirlpool's Area 1 Work Plan and the concept of substantially expanded excavation are discussed further below.

Benefits of Proposed Hot-Spot Removal Plan

There are several benefits to the soil removal effort proposed under the Work Plan that are consistent with the goals of the RADD. First, the hot-spot soil removal effort removes the soil in Area 1 and the linear drainage feature exhibiting the highest trichloroethylene (TCE) concentrations detected in soil at the site. As described in the RADD, this hot spot removal effort is technically feasible for the kind of moderate volumes Whirlpool has proposed to remove, and the hot spot removal effort is effective in reducing the mass of TCE at the site.

Second, the proposed removals are intended to facilitate passive adjustment of the naturally low groundwater pH to a more neutral condition by filling the open void after completing the large diameter borings with crushed dolomite limestone gravel. Low groundwater pH may inhibit further natural breakdown of TCE and its degradation products in groundwater. The crushed dolomite limestone gravel is an inert material that may marginally increase the pH of the natural groundwater.

Third, the large diameter borings backfilled with limestone gravel would provide access to the subsurface to facilitate or enhance other remedies, as necessary. For example, the limestone gravel backfill is anticipated to exhibit greater pore space than native conditions in the Basal Transmissive Zone; therefore, the limestone gravel backfill could accommodate injection of greater volumes of oxidants or supplemental materials to facilitate or enhance remediation.

Fourth, the proposed plan can be accomplished aggressively. The hot spot removal, limestone fill and ISCO injection can be completed over the course of the next several weeks, enabling a rapid realization of the benefits of these activities, and allowing all parties to continue to focus on the goals of the RADD, including the remediation of the offsite groundwater during the coming months.

Evaluation of Expanded Additional Soil Removal

First, soil impacts in Area 1 are not contributing to groundwater contamination extending north beyond the Whirlpool property. The 2014 first and second quarterly groundwater monitoring reports both indicate that a hydraulic divide exists south of Ingersoll Avenue (i.e. groundwater on the south side of Ingersoll Avenue flows south). Therefore, any soil and related groundwater impacts in Area 1 do not impact the residential areas to the north.

Second, onsite surface soils do not contain contaminants above the acceptable direct contact risk-based screening levels. Moreover, the containment measures outlined in the RADD to subsequently be completed (containment to be implemented late in 2015 after active remediation in Area 1 is completed) provide the same level of protection as an expanded soil removal effort. The RADD envisioned containment based corrective measures for onsite subsurface soils above RALs to provide protection of human health and the environment since containment measures effectively reduce or eliminate the exposure to impacted soils, while preventing downward migration of water through the contaminated soils, reducing TCE transferred from soils to groundwater. The containment (impervious cover) actions outlined in by the RADD will be completed, thus providing the same or greater protection from exposure to onsite workers as would be achieved through expanded soil removal efforts.

Complications of Expanded Soil Removal

Any type of substantial soil removal effort to attempt to achieve soil RALs would encounter several complications including:

- Geotechnical settlement or foundation failure with the former manufacturing building and electrical substation;
- Underground utilities present in Area 1;
- Dewatering efforts to facilitate substantial excavations; and
- Removal of impacted saturated soil underlying less impacted Vadose Zone soil.

First, extending soil removal efforts down to the Basal Transmissive Zone and surface of bedrock is necessary to reach much of the TCE-contaminated soil that has been detected in the Basal Transmissive Zone. Soil removal efforts to these depths near the former manufacturing building and electrical substation would create significant geotechnical or foundation failure complications for the building and substation. Conservative evaluation of unsupported excavations near the building indicates that excavation within 25 to 30 feet of the building (i.e. excavation with a 1:1 horizontal to vertical slope from the building foundations to surface of bedrock) could compromise building foundations; and therefore, require significant shoring efforts to preclude structural issues with the building (i.e. settlement, structural cracks and/or partial collapse). Soil impacts existing beneath the building would still remain after performing even the most extensive exterior soil removal efforts. Excavations near the electrical substation have the same concerns regarding shoring to preclude settlement or slope failure issues within the substation.

Second, underground utilities in Area 1 also complicate substantial additional soil removal efforts in Area 1 beyond those in the Work Plan since the main electrical service for the facility is present underground in Area 1. Therefore, the electric service may need to be removed and replaced to facilitate a significant soil removal effort in Area 1.

Third, substantial soil removal efforts will also require dewatering to manage groundwater in the confined aquifer. This would further complicate and delay soil removal efforts. The design for dewatering efforts would require further investigation and pump tests to assess effectiveness of dewatering, followed by water treatment design and treatability tests to facilitate treatment and possible discharge of the treated effluent generated while dewatering to the City of Fort Smith publicly owned treatment works (POTWs). Efforts to implement an effective dewatering plan would delay implementation of the Area 1 remedy until the 2015 calendar year. Again, a substantial exterior soil removal effort, even if dewatering is performed, would leave impacted soil beneath the building.

Fourth, as depicted in the membrane interface probe (MIP) screening results in the Area 1 Soil Investigation Summary Report (August 15, 2014), greater soil impacts are more prevalent in the deeper Basal Transmissive Zone as compared to the shallower Vadose Zone. Soil removal efforts are therefore complicated by requiring removal and management of the shallower Vadose Zone soil in order to access the deeper more contaminated soil in many areas of Area 1 in the Basal Transmissive Zone. As stated above, substantial soil removal efforts to attempt to remove the most contaminated soil at the site would leave impacted soil beneath the building.

Collectively, these complications would create significant delays in the completion of an expanded soil effort and disruption to the surrounding neighborhood. Such delays, structural hazards, and general uncertainty will not only delay progress in achieving the goals of the RADD, but also endanger ongoing efforts to redevelop the site.

ADEQ Comment:

3.1 Supplemental Interim Measure – Soil Removal In The Linear Drainage Feature (4th paragraph, 1st sentence): *Given the possibility that one or both of the stockpiles will be classified as hazardous waste, roll-off containers should be used to hold stockpiles prior to characterization and disposal.*

ENVIRON Response:

Roll-off containers are being used to contain soil removed while performing the large diameter borings as requested.

ADEQ Comment:

4.2 Reagent Injection (1st paragraph, 1st sentence): *Based on the results of the previous tracer and In-Situ Chemical Oxidation injections, it is apparent the groundwater flow in the Basal Transmissive Zone is controlled to some extent by the presence of preferential flow paths created by variations in depositional processes. Please describe what precautions will be taken during oxidant injection to minimize the channeling of oxidant to preferential pathways to avoid reducing the overall coverage of the Basal Transmissive Zone.*

ENVIRON Response:

To the extent that groundwater flow is controlled by the presence of preferential flow paths, TCE impact in groundwater will also move along with the groundwater through the same preferential pathways in the Basal Transmissive Zone. Similarly, oxidant solution injected within the Basal Transmissive Zone will also move along the same preferential pathways and react with the dissolved TCE. During injection the flow rate and pressure at each injection point is monitored along with water levels at nearby injection/ monitoring wells. During injection of bromide tracer and Base Activated Sodium Persulfate (BASP) adequate flow rates have been achieved at pressures generally less than 20 pounds per square inch (psi) resulting in limited (< 1 foot) changes in water levels in nearby monitoring points. ENVIRON will continue to monitor pressure and water level during injection and as a precaution reduce or stop injection if monitoring data indicate over-pressurization through preferential pathways is occurring. Further, monitoring data from approximately 30 days and 90 days after the second injection event indicate persulfate remains at concentrations greater than 1% of the injected concentration in wells located immediately within the injection/ treatment zones and at wells located outside of the injection/ treatment zones indicating substantial saturation and coverage of the Basal Transmissive Zone in these areas following injection.

In addition, Section 4.1 of the Work Plan mentions that modifications to the chosen reagent may occur based upon the results of the second ISCO injection event. As indicated above, additional analytical results from monitoring of the second ISCO injection event have been received since the submission of the Work Plan on September 8, 2014. The results of the Modified Fenton's reagent (MFR) ISCO injections in June 2014 suggest the MFR oxidant

successfully desorbed TCE from soils as indicated by the increase in TCE concentrations in groundwater samples from MW-25 and MW-85 (see attached tables) (the results of the second ISCO injection event will be compiled in the 2014 Third Quarter Progress Report). Based on these results, a supplemental MFR injection is proposed to facilitate further TCE desorption, followed by injection of BASP oxidant to treat TCE in groundwater. Therefore, the following injection activities will be performed in addition to those presented in the Area 1 Work Plan:

- Temporary Injection Points: Inject 50 to 200 gallons each of MFR into 16 additional temporary injection points, for a total of approximately 800 to 3,200 gallons of additional MFR solution.

The additional temporary injection points will be located in the western portion of Area 1 where higher TCE concentrations have been found in the Basal Transmissive Zone (see attached figure for location of additional temporary injection points). Actual locations may be modified based on field screening and analytical results from the new injection and monitoring wells installed according to the Area 1 Work Plan. Following MFR injection, BASP would be injected into the 40 injection wells and 21 temporary injection points as described in the Area 1 Work Plan. The injection of MFR is expected to promote the desorption or transfer of TCE and other contaminant of concern (COCs) from soil at areas outside of existing preferential groundwater flow paths. Treatment of the desorbed TCE would then occur via the subsequent BASP injection.

ADEQ Comment:

5.2 Additional Monitoring Wells (3rd paragraph, 2nd sentence): *ADEQ requests that a representative selection of soil samples be obtained from these new monitoring wells for soil property analysis (e.g. dry bulk densities, grain size analysis, porosity, moisture content, total organic carbon content). This information will be essential in understanding the distribution and natural attenuation of chlorinated ethenes in the subsurface. This is a requirement of the RADD.*

ENVIRON Response:

We agree that aquifer materials should, and will, be tested for hydrologic and geochemical properties in accordance with the RADD (Section 6. Proposed/Recommended Remedies, B. Groundwater, page 14). Six representative soil samples will be collected from three boring locations. One sample will be collected from the Vadose Zone and one sample from the Basal Transmissive Zone for analysis of Atterberg Limits, dry bulk density, grain size analysis, porosity, moisture content and total organic carbon content.

This data will add to the extensive subsurface investigation that has already been performed at the site, including but not limited to:

- More than 20 MIPs to screen subsurface conditions in Area 1;
- Soil probes, soil borings and monitoring wells performed to facilitate collection of more than 100 soil samples from Area 1; and

- More than 200 groundwater samples from Area 1 for analysis of total volatile organic compounds (VOCs), water quality and MNA parameters.

We will integrate the results of the requested hydrologic and geochemical analysis into this already extensive subsoil investigation, which, we believe, already provides a strong understanding of the distribution and natural attenuation of chlorinated ethenes in the subsurface. The results of this additional data may also be used in subsequent modeling efforts.

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

Sincerely,

ENVIRON International Corporation

Michael F. Ellis, PE
Principal

LIST OF ATTACHMENTS

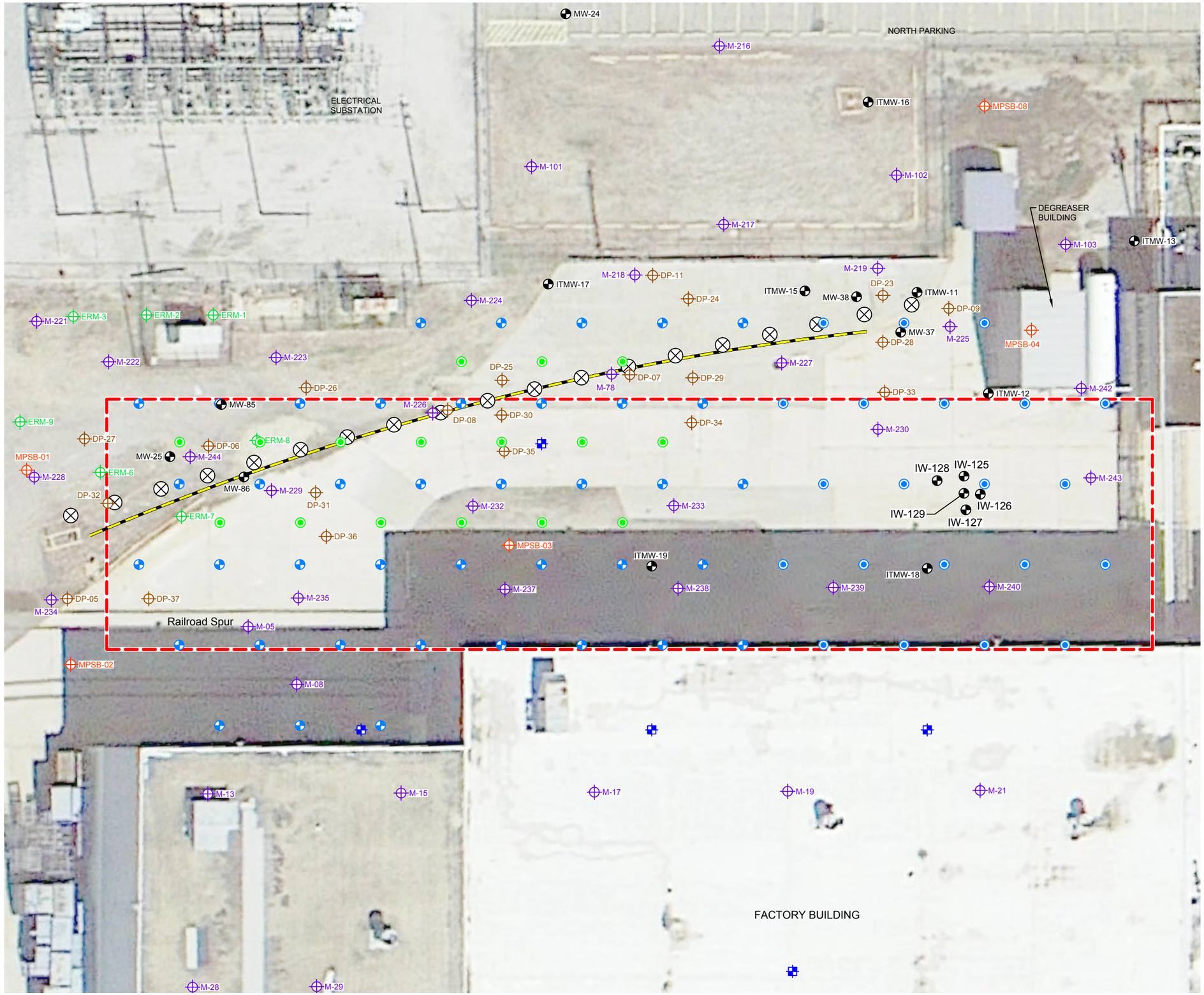
Table 1: Summary of TCE Concentrations – Area 1/MW-25
Figure 1: Area 1 Detail

TABLE

TABLE 1
Summary of TCE Concentrations
Area 1/ MW-25
May-September 2014
Whirlpool Corporation, Fort Smith, Arkansas

		TCE Concentrations (ug/L)		
Event	Date(s)	MW-25	MW-85	MW-86
Baseline	5/29/2014	18500	1970	533000
34 days after second injection	7/8/2014	49900	3780	nm
56 days after second injection	7/31/2014	71700	nm	nm
98 days after second injection	9/11/2014	nm	5820	129000
	Percent Reduction	-287.6%	-195.4%	75.8%

FIGURE



AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH PRO. PHOTO TAKEN MAY 6, 2014.

LEGEND

- EXTENT OF AREA 1
- FORMER LINEAR DRAINAGE FEATURE
- MIP BORINGS
- ERM BORINGS
- DP BORINGS
- MPSB BORINGS
- MONITORING/INJECTION WELLS
- INJECTION POINTS (INSTALLED AS WELLS) (BASP)
- PROPOSED MONITORING WELL
- TEMPORARY INJECTION POINTS (BASP)
- LARGE DIAMETER BORINGS @15'O.C.
- TEMPORARY INJECTION POINTS (MFR)

APPROX. SCALE (ft.)

0 30

AREA 1 DETAIL

WHIRLPOOL FACILITY
FORT SMITH, ARKANSAS

ENVIRON

FIGURE 1

DRAFTED BY: CKL | DATE: 10/1/14 | 3433233A

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