

April 3, 2014

**By Electronic Mail and FedEx**

Mr. Mostafa Mehran  
Technical Branch, Hazardous Waste Division  
Arkansas Department of Environmental Quality  
5301 Northshore Drive  
North Little Rock, AR 72118

**Re: Whirlpool Corporation, Fort Smith, Arkansas  
Final Remedy Work Plan – Response to Comments  
CAO LIS 13-202  
EPA No. ARD042755389  
AFIN No. 66-00048**

Dear Mr. Mehran:

On behalf of Whirlpool Corporation, ENVIRON International Corporation (ENVIRON) has prepared this written response to your letter dated March 17, 2014. ENVIRON's response follows for each item.

**Section 1.1.4, Historical Bench Scale and Pilot Studies, 2nd Paragraph, 5th Sentence:**

Please provide clarification of this sentence.

ENVIRON Response:

The referenced sentence is *“After the test was completed, COC concentrations rebounded to pre-test levels as a result of the placement of the test area being too far from the plume”*. This sentence should be modified to *“After the test was completed, COC concentrations rebounded to pre-test levels. This rebound effect could be attributed to leaching of COCs adsorbed to soil particles coupled with normal transport mechanisms associated with advection and dispersion contributed to rebound of TCE concentrations in groundwater.”*

**Section 1.1.4, Historical Bench Scale and Pilot Studies, 2nd Paragraph, 6th Sentence:**

In spite of slow groundwater flow rates, rapid rebound has occurred. The rebound could be caused by the presence of free product in the soil pore spaces rather than back diffusion. Please address in the revised Final Remedy Work Plan.

ENVIRON Response:

No free product has been observed at the site. This rebound effect could be attributed to leaching of COCs adsorbed to soil particles coupled with normal transport mechanisms

associated with advection and dispersion contributed to rebound of TCE concentrations in groundwater.

#### **Section 1.4, Remedy Technical Approach:**

The acronym ICs is not listed in the Acronyms and Abbreviations section at the beginning of the report. Please correct.

ENVIRON Response:

IC stands for Institutional Control. A revised Acronyms and Abbreviations section is attached.

#### **Section 2.2, Impermeable Soil Cover:**

Please provide additional data regarding the impermeable coating that will be used on the asphalt.

ENVIRON Response:

The design of the impermeable soil cover will be completed after ISCO implementation in the proposed impermeable soil cover area has been completed. The information regarding the coating to be used will be provided to ADEQ at that time.

#### **Section 2.3.3, Adaptive Remedy Implementation:**

Please provide details pertaining to injection points, borings, monitoring wells, and temporary monitoring points. At a minimum, please include the following data:

- Location
- Proposed depth of injection, screen and sample collection
- Planned volume and rate of injection

ENVIRON Response:

The remedy is being implemented in an adaptive approach, where data gathered to date will guide the remedy implementation. Therefore only information from the current phase of implementation is available at this time. Enhanced remedy implementation efforts will be documented in supplement scopes of work to complete the adaptive remedy, which will be submitted to ADEQ prior to scope implementation.

The current remedy implementation phase, which commenced on February 24<sup>th</sup>, 2014, includes three nested injection arrays as shown on the attached figure 1 consisting of a total of 30 injection wells. The basis for selection of the location of the subject injection arrays and current injection implementation phase was presented to ADEQ during a conference call on March 11, 2014. The location of the well arrays was provided to the ADEQ's David Gillespie and Charles Johnson on March 11, 2014. Injection Array 1 is located at the neck area of the groundwater plume and includes twelve injection wells; the injection efforts in the neck area are supplemental to the remediation work considered in the Remedial Action Decision Document (RADD). Injection Array 2 is targeted at Areas 2 and 3 and includes thirteen injection wells, which accounts for nearly 20% of the 69 injection points considered in the

RADD for Areas 2 and 3. Injection Array 3 is located in Area 1 and includes five injection wells.

ISCO injection began on March 24, 2014. About 800 gallons of an approximately 12% base activated sodium persulfate solution was injected into injection well 1 at Injection Array 1 (i.e., in the neck area), 600 gallons was injected into injection well 2 at Injection Array 2 (i.e., at Areas 2 and 3), and 200 gallons was injected into injection well 3 at Injection Array 3 (i.e., in Area 1). Most injection was implemented via gravity flow; however some injection was completed at rates of up to 2 gallons per minute with up to 20 psi at the wellhead. Additional information, as well as other details regarding the first round of ISCO injection activities, is currently being collected and compiled and will be presented to ADEQ with the next quarterly report on May 15, 2014.

In addition, the May 15, 2014 submittal will describe the scope for the next (May/June) injection event, which will consist of injections to be performed at existing injection wells at the respective injection arrays as well as at temporary injection points (i.e., direct-push injections). At a minimum, the temporary injection points will include:

- 40 to 50 temporary injection points in Areas 2 and 3 (the proposed temporary injection points and the existing injection wells account for 75% to 90% of the injection points specified in the RADD);
- 15 to 30 temporary injection points at the neck area (remediation supplemental to the requirements in the RADD);
- 5 to 15 temporary injection points in Area 1 (focused on COC mass removal up-gradient of the neck area).

The planned injection event is anticipated to reduce COC mass in the neck area and Areas 2 and 3; the combined efforts in these areas is anticipated to significantly reduce further contribution of COCs in groundwater to the northern portion of the plume. Consistent with the adaptive remedial approach specified in the Work Plan, subsequent injection events will be presented to ADEQ and implemented following evaluation of the above injection event.

If at any time you have specific questions that have not been addressed please let us know.

## **Section 2.4, Monitored Natural Attenuation:**

Soil samples should also be secured and analyzed to determine the effectiveness of remedy in the ongoing occurrence of natural attenuation (e.g. presence of suitable bacterial, presence of adequate electron acceptors, etc.). Please make the necessary revisions.

### **ENVIRON Response:**

The RADD did not require soil samples for the establishment of baseline MNA and ongoing Quarterly evaluation of NA parameters, therefore soil samples are not being collected as part of the groundwater monitoring program. The groundwater NA data will be submitted to ADEQ as part of the 1<sup>st</sup> Quarter 2014 Progress Report that is due May 15, 2014.

## **Section 2.6, Groundwater Monitoring:**

In addition to the Constituents of Concern (COCs), monitoring of groundwater should include parameters listed in the RADD necessary to evaluate the natural attenuation at the site. Please make the necessary revisions.

### **ENVIRON Response:**

Agree. The 1<sup>st</sup> Quarter 2014 groundwater sampling includes these parameters. This data will be presented in the 1<sup>st</sup> Quarter 2014 Groundwater Monitoring Report as required by the RADD.

We welcome the opportunity to discuss this letter and associated concerns with you at your earliest convenience.

Sincerely,



Tamara R. House-Knight, PhD  
Manager/Toxicologist

### **Attachments**

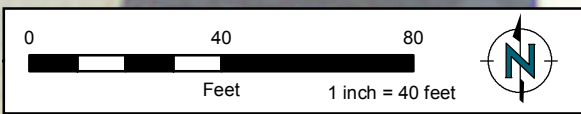
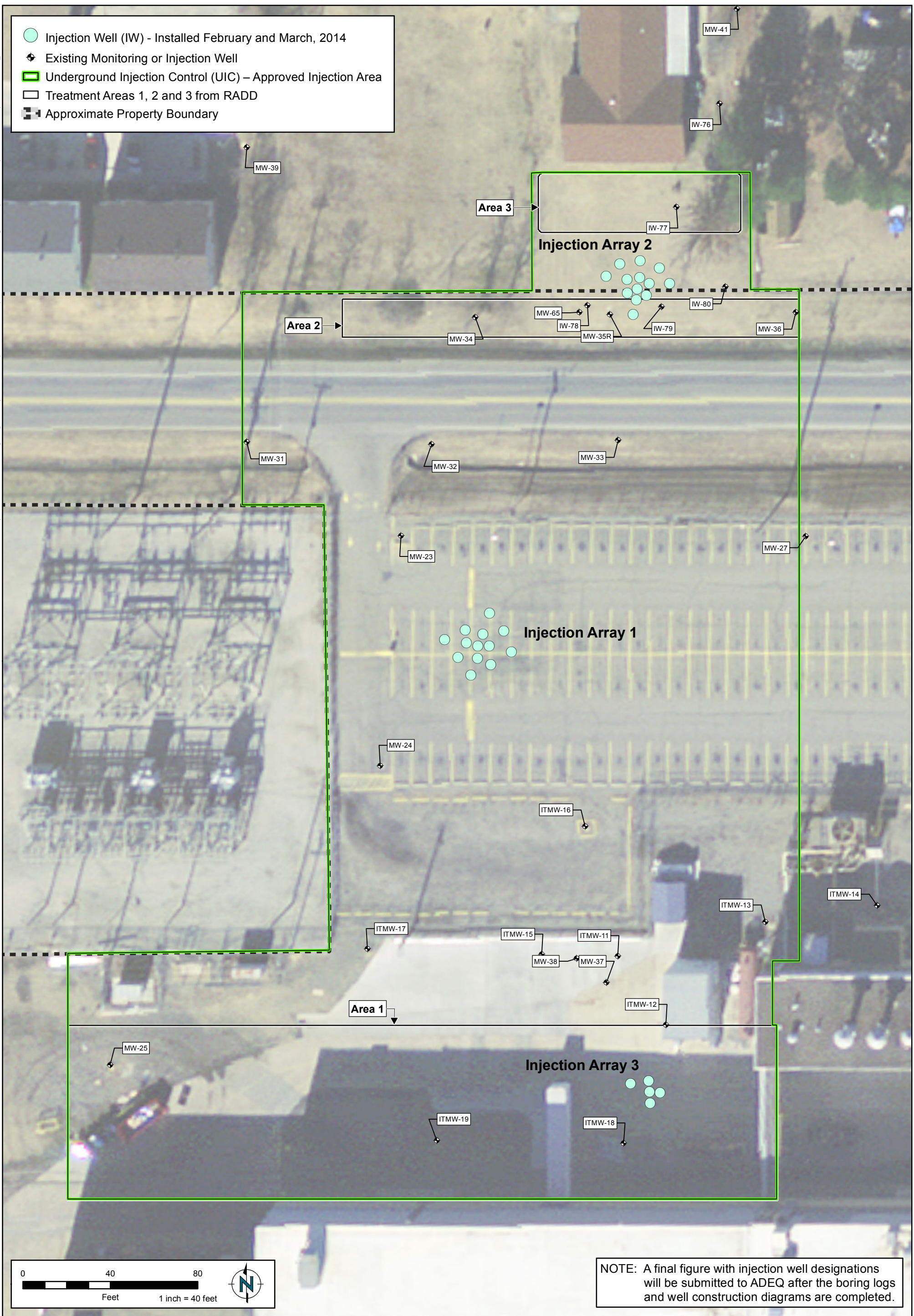
Revised List of Acronyms

Figure 1 – Injection Well Array Locations Installed February, March 2014



FILE: C:\Users\smallley\Documents\ArcGIS\Projects\Injection Well Arrays Installed February and March 2014\1011\Figure 1 - Injection Well Arrays Installed February and March 2014\_1011\Figure 1 - Injection Well Arrays Installed February and March 2014\_1011.mxd

- Injection Well (IW) - Installed February and March, 2014
- ⊕ Existing Monitoring or Injection Well
- ▭ Underground Injection Control (UIC) – Approved Injection Area
- ▭ Treatment Areas 1, 2 and 3 from RADD
- ⊞ Approximate Property Boundary



NOTE: A final figure with injection well designations will be submitted to ADEQ after the boring logs and well construction diagrams are completed.



## Acronyms and Abbreviations

ADEQ:	Arkansas Department of Environmental Quality
cis-1,2-DCE:	cis-1,2-dichloroethylene
COC:	constituent of concern
CSM:	conceptual site model
1,1-DCE:	1,1-dichloroethylene
EC:	Electrical Conductivity
HHRA:	human health risk assessment
HPT:	hydraulic profiling tool
IC:	institutional control
ISCO:	<i>in-situ</i> chemical oxidation
ITMW:	International Technology monitoring well
MCL:	Maximum Contaminant Level
MIP:	membrane interface probe
MNA:	monitored natural attenuation
MW:	monitoring well
PCE:	tetrachloroethylene
RADD:	Remedial Action Decision Document
RAL:	remedial action level
RRMP:	Revised Risk Management Plan
1,1,1 - TCA:	1,1,1,-Trichloroethane
TCE:	trichloroethylene
trans-1,2-DCE:	trans- 1,2-dichloroethylene
UST:	underground storage tank
USEPA:	United States Environmental Protection Agency
Work Plan	Final Remedy Work Plan