

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

**Re: Response to ADEQ Correspondence Dated June 12, 2015  
First Quarter 2015 Progress Report – May 2015  
Whirlpool Corporation  
Fort Smith, Arkansas  
EPA No. ARD042755389  
AFIN No. 66-00048  
CAO LIS 13-202**

Dear Mr. Mehran:

Date July 15, 2015

Ramboll Environ US Corporation (Ramboll Environ), on behalf of Whirlpool Corporation, is submitting this response to Arkansas Department of Environmental Quality's (ADEQ) June 12, 2015, comment letter on Ramboll Environ's First Quarter 2015 Progress Report dated May 2015. ADEQ comments are provided in italics below and the respective response follows.

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**Volume 1, Section 2, Groundwater Sample Collection and Onsite Activities:** *Current sampling schedule and analyte list should be maintained until the end of the two year evaluation period specified in the Remedial Action Decision Document (RADD). Four data points are considered the minimum for Mann-Kendall trend analysis. Therefore, all newly constructed monitoring wells should be sampled quarterly for all analytes specified in the RADD for a minimum of one year. Modification to the sampling plan will be evaluated subsequent to the Technical Review at the end of two years.*

**Ramboll Environ Response:** Whirlpool concurs with ADEQ that four data points are considered the minimum to perform the Mann-Kendall trend analysis and Whirlpool has presented trend analysis for trichloroethene (TCE) and its degradation products cis-1,2-dichloroethene and vinyl chloride (VC) for wells with at least four data points (Table 8 in the First Quarter Groundwater Monitoring Report). All monitoring wells identified in the December 2013 Remedial Action Decision Document (RADD) were sampled for monitored natural attenuation (MNA) parameters and volatile organic compounds (VOCs) as required. New monitoring wells consist of the following wells with the respective number of

groundwater monitoring events and monitoring parameters (monitoring through April 2015):

- MW-81 and MW-82 installed in May 2014 in Area 3 have been sampled for VOCs during five monitoring events and MNA parameters during the first quarter of 2015;
- MW-83 and MW-84 installed in May 2014 in the neck area have been sampled for VOCs during five monitoring events and MNA parameters during the first quarter of 2015;
- MW-85 and MW-86 installed in May 2014 in Area 1 have been sampled for VOCs during five monitoring events and MNA parameters during the first quarter of 2015;
- MW-87 through MW-91 installed in June 2014 at the northeast corner of the former manufacturing building have been sampled for VOCs during four monitoring events and MNA parameters during the first quarter of 2015;
- MW-92 through MW-95 installed in October 2014 immediately south of Area 1 have been sampled for VOCs during three monitoring events; and
- MW-96 through MW-99 installed in October 2014 on the Boys & Girls Club property have been sampled for VOCs during three monitoring events.

Whirlpool respectfully disagrees that all wells must be monitored for VOCs and MNA parameters. MW-81 through MW-86 were installed within or immediately adjacent to treatment areas where in-situ chemical oxidation (ISCO) was performed. Performance of MNA monitoring at these locations is not recommended since the ISCO process interferes with useful MNA parameters. In addition, several existing wells are adjacent to the new monitoring wells and MNA parameters are monitored in these wells (i.e. IW-77 in Area 3 is adjacent to MW-81 and MW-82; MW-33, MW-34, MW35R and MW-65 in Area 2 are located near MW-83 and MW-84; and MW-25 in Area 1 is adjacent to MW-85 and MW-86). Whirlpool is in the process of developing a scientifically based groundwater monitoring program that will support the long term monitoring needs focusing on monitoring “key” wells in the most efficient manner. The sampling program planned for the third quarter monitoring event will mimic the sampling completed during the second quarter event in 2015 (April 2015). The third quarter 2015 monitoring event will consist of VOCs and MNA parameters for the 56 plume boundary, onsite and offsite wells specified in the 2013 RADD, as well as supplemental VOC monitoring at 31 wells to gather information necessary to evaluate ISCO, plume separation, shallow groundwater and potential impact at the Boys and Girls Club (NE corner wells). The third quarter monitoring event is scheduled to commence during the week of July 20, 2015.

**Volume 1, Section 3, Results, 3.3.1 VOC Results, Plume Boundary Wells:** *Due to both TCE concentrations in excess of the maximum contaminant level (MCL) in MW-61 and an increasing trend in TCE concentration, additional delineation of the plume is required.*

*Please submit a proposal to add a monitoring well down-gradient of MW-61. Additionally, increasing TCE concentration trends are now present in MW-66 and MW-67 in the northern plume with concentrations approaching the MCL. The footprint of the northeast plume continues to expand to the northeast.*

**Ramboll Environ Response:** TCE concentrations continue to remain above the RAL at MW-61 and a down-gradient well was proposed in the Response to ADEQ's Comments on the Second Quarter Progress Report dated October 22, 2014. DP-58 was performed north of the northeast corner of Jenny Lind Road and Brazil Avenue and TCE concentrations in soil and groundwater were below detection limits at this location. Access to install a monitoring well at this location has not been denied by the city of Fort Smith, but the pending Jenny Lind road construction project will likely subject a well in the city right-of-way at this location to potential damage. Whirlpool will request authorization from the City of Fort Smith to install a monitoring well at the former location of DP-58, and will install the well if access is granted.

The level reported for MW-66 [2.4 micrograms per liter ( $\mu\text{g/L}$ )] is within historical ranges for this well, and is below reported detections from the first and second quarter sampling in 2014 (3.5  $\mu\text{g/L}$  and 3.1  $\mu\text{g/L}$  respectively). Although trend analysis for the entire data set might suggest an increasing trend, closer examination indicates that the TCE concentrations over the last five years have ranged from 1.6  $\mu\text{g/L}$  to 3.5  $\mu\text{g/L}$  which is not indicative of an increasing trend.

Whirlpool agrees that this was the first monitoring event that TCE was detected at an unqualified concentration at MW-67. As shown on Table 7 of Attachment A of the First Quarter 2014 Progress Report, TCE was previously detected at an estimated (qualified) concentration of 1  $\mu\text{g/L}$  at MW-67 in October 2006 and during 2007 through 2014 TCE concentrations at MW-67 have been reported as less than 0.17  $\mu\text{g/L}$  to less than 5  $\mu\text{g/L}$ . The first quarter 2015 TCE concentration of 1.3  $\mu\text{g/L}$  at MW-67 is within the range of prior detection limits (0.17  $\mu\text{g/L}$  to 5  $\mu\text{g/L}$ ) and therefore can be considered consistent with the historical data. A single detection of TCE is not indicative of plume expansion and fluctuations of TCE concentrations near the plume boundaries are not unexpected.

Whirlpool will continue to closely monitor the plume concentrations.

**Volume 1, Section 4, Plume Stability, 4.1 Lines of Evidence, 4.1.1 Statistical Analysis of Temporal Trends:** *The most down-gradient monitoring wells (MW-61, MW-66, MW-67, MW-56 and MW-57) in the north and ITMW-6 and ITMW-10 in the south continue to show increasing trends in TCE concentration. These seven wells are located at distal portions of plumes. With the exception of MW-58, ITMW-07 and MW-28, all 22 wells with decreasing trends are located near the source area where in-situ chemical oxidation (ISCO) treatments have been conducted. Although it is evident the total mass of contamination in groundwater at the site has been reduced, it is also equally evident the northern and southern plumes continue expanding down-gradient. Whirlpool should evaluate this expansion at the down-gradient limits of the plume.*

**Ramboll Environ Response:** Whirlpool concurs with ADEQ that the total mass of contamination in the groundwater at the site has been reduced and Whirlpool continues to evaluate the plume concentrations. Whirlpool concurs with ADEQ that source area depletion efforts will not have immediate impacts on the TCE concentrations in groundwater at the plume boundaries. Although, plume expansion has occurred at MW-61, evidence of plume expansion at other locations in the north plume does not exist.

The source depletion efforts are reducing contaminant mass to allow MNA to be more effective in accordance with the RADD. TCE concentration data from the north plume boundary wells is plotted on Figure 1 and indicates groundwater concentrations have been relatively consistent over the last decade ranging from approximately 1 µg/L to 12 µg/L (non-detect data was not plotted) excluding the more recent upward trend in concentrations at MW-61.

TCE concentration data from wells within the north plume (MW-56, MW-57 and MW-58) are plotted on Figure 2. This data indicates groundwater concentrations have been relatively consistent over the last decade with concentrations generally ranging from 100 µg/L to 600 µg/L in wells MW-56, MW-57 and MW-58 (data outliers to this general range of data exist).

We acknowledge an increasing trend for TCE concentrations at ITMW-10 based upon 25 years of monitoring; however, we also acknowledge that MNA is active at this location based upon the concentrations of cis-1,2-DCE that have ranged from 32 µg/L to 39 µg/L during the last six quarters of monitoring. Further ITMW-4, ITMW-6 and ITMW-9 provide a boundary for the evaluation of the extent of the south plume (i.e. ITMW-10 is not representative of the south plume boundary), and these wells are more than 400 feet and 1,100 feet from the south and east property boundaries, respectively.

ITMW-4 exhibits a decreasing trend.

We acknowledge an increasing trend is noted for ITMW-6 if the Mann-Kendall trend analysis is performed for data from 2009 through the first quarter 2015 for this well (i.e. Table 8). However, after closer examination it is clear that TCE concentrations have remained relatively stable over the last 26 years at ITMW-6. The highest TCE concentration measured was 25 µg/L in February 1999 and concentrations have ranged from 2.7 µg/L to 4.4 µg/L during the last six quarterly monitoring events (for reference the TCE concentration during the first quarter of 2015 was 3.7 µg/L). In addition, the cis-1,2-DCE concentrations at ITMW-6 during the last six quarterly monitoring events have ranged from 4.9 µg/L to 6.7 µg/L indicating that MNA is active in this section of the plume (based upon the cis-1,2-DCE concentrations exceeding the TCE concentrations).

The TCE concentrations at ITMW-9 are stable and have ranged from 75.3 µg/L to 141 µg/L during the last six quarterly monitoring events (for reference the TCE concentration during the first quarter of 2015 was 89.6 µg/L).

**Volume 1, Section 4.1.1 Statistical Analysis of Temporal Trends:** *The increase from a value, previously flagged as undetected, to an unqualified detection of 1.3 µg/L in MW-67 cannot be considered to be consistent with the historical data from that well. Please explain.*

**Ramboll Environ Response:** This comment was addressed above. As shown on Table 7 of the First Quarter 2015 Groundwater Monitoring Report, TCE was previously detected at an estimated (qualified) concentration of 1 µg/L at MW-67 in October 2006 and during 2007 through 2014 TCE concentrations at MW-67 have been reported as less than 0.17 µg/L to less than 5 µg/L. The first quarter 2015 TCE concentration of 1.3 µg/L at MW-67 is within the range of prior detection limits (0.17 µg/L to 5 µg/L) and therefore can be considered consistent with the historical data.

**Volume 1, Section 4.1.2 Isoconcentration Maps:** *With the new detection of TCE in MW-67, the 5 µg/L isoconcentration line should be moved much closer to the MW-67 and MW-66 than currently drawn. Please correct.*

**Ramboll Environ Response:** As discussed above in responses to prior comments on TCE concentrations near the down-gradient edge of the northern plume, the first quarter 2015 detected concentration of TCE at MW-67 does not necessarily indicate an expansion of the plume beyond the prior boundary. The first detection of TCE does not necessarily indicate plume expansion. In fact, TCE was detected at a very similar low concentration in October 2006 at 1 µg/L (J), and then the concentration was below detection limits for several years. The methodology used to prepare isoconcentration maps has been consistent and follows standard conventions including the use of professional judgement.

The depiction of the 5 µg/L contour in the 2015 First Quarter Groundwater Monitoring Report is based upon the laboratory results for the full set of boundary monitoring wells in addition to the results from MW-67. Variations in TCE concentrations in groundwater in respective monitoring wells and the corresponding fluctuations in plume boundaries are expected; however, the general trend of average TCE concentrations in groundwater samples collected throughout the affected area continues to trend downward indicating overall TCE mass reduction (see Table 10 First Quarter 2015 Groundwater Monitoring Report). Whirlpool agrees that this was the first monitoring event that TCE was detected at an unqualified concentration at MW-67 (as previously discussed).

The isoconcentration contours are illustrative depictions used to provide guidance in visualizing the occurrence and concentration of constituents in groundwater between and beyond data points but do not imply certainty where data are extrapolated.

**Volume 1, Section 4.2, Summary of Plume Stability:** *No rationale is provided for the contraction of the 5 µg/L contour line in the vicinity of MW-63 in the northern plume and ITMW-04 in the southern plume. Therefore, the reductions in the plume areas by 5% and 3% respectively cannot be confirmed. Unless there is geologic or hydrologic evidence to the contrary, drawing of the isoconcentration contour lines should follow standard conventions. Please explain.*

**Ramboll Environ Response:** The 5 µg/L isoconcentration line at MW-63 was moved approximately 50 feet north based upon comparison of the 2014 Fourth Quarter North Plume Isoconcentration Map and the 2015 First Quarter North Plume Isoconcentration Map which is presumed to be the basis for the comment. The TCE concentration at MW-63 decreased from 9.4 µg/L during the fourth quarter of 2014 to 8.2 µg/L during the first quarter of 2015. During ten years of monitoring at this location, the TCE concentrations have consistently remained between approximately 4 µg/L and 12 µg/L. The depiction of the 5 µg/L isoconcentration line closer to MW-63 is likely a more accurate depiction of the isoconcentration line based upon the consistent northeasterly groundwater flow direction in the residential area north of the former manufacturing building.

The methodology used to prepare isoconcentration maps has been consistent and follows standard conventions including the use of professional judgement. We would like to emphasize that the isoconcentration contours are illustrative depictions used to provide guidance in visualizing the occurrence and concentration of constituents in groundwater between and beyond data points but do not imply certainty where data are extrapolated.

The discussion of plume reduction by 5% is not based upon the 5 µg/L isoconcentration line, but rather based upon the change in area of the 100 µg/L isoconcentration line, which is a far better metric for assessing the impacts of groundwater remediation. As discussed above, the source depletion efforts will not have significant impacts on the TCE concentrations at the plume boundaries corresponding to the 5 µg/L isoconcentration line.

**Volume 1, Section 4.2 Summary of Plume Stability:** *This section states that increases in TCE concentrations observed in MW-66 and MW-67 are within historical ranges and continue to be reported at levels below the remedial action level (RAL). Arkansas Department of Environmental Quality (ADEQ) disagrees with this statement. Although the concentration is below the RAL, this is the first sampling event that MW-67 has had a detection of TCE and therefore is not within historical ranges. ADEQ will continue to closely monitor this area.*

**Ramboll Environ Response:** The level reported for MW-66 (2.4 µg/L) is within historical ranges for this well, and is below reported detections from the first and second quarter sampling in 2014 (3.5 µg/L and 3.1 µg/L respectively). MW-67 was discussed above. Whirlpool will continue to closely monitor the plume concentrations.

**Volume 1, Section 6, Summary and Conclusion, 4<sup>th</sup> Bullet:** *While there is evidence that limited biodegradation is ongoing in some portions of the facility, the extremely slow rate of natural attenuation, especially in the northern plume, is a concern. At this point, it appears extremely doubtful that natural attenuation alone can be relied upon to remediate contamination within a reasonable period of time. At a minimum, it should be expected that the natural attenuation rate should be sufficient to halt the down-gradient expansion of the*

*contaminated plume. At the conclusion of the two year evaluation period, Whirlpool would be prepared to provide evidence that natural attenuation will be sufficient to remediate the northern plume within a reasonable amount of time or provide an active remedy to halt expansion of the plume into further offsite areas.*

**Ramboll Environ Response:** Whirlpool concurs with ADEQ that natural attenuation via biodegradation processes is occurring in some locations of the northern and southern plumes. The natural attenuation evaluation, as part of the two year technical evaluation, will be based on multiple lines of evidence, including evaluation of biogeochemical data, statistical trend analysis, and fate and transport modeling. The biogeochemical data will be used to establish the types of environmental conditions that are sustaining natural attenuation rates in the two plumes. Observed natural attenuation rates in the northern and southern plumes will be estimated using a statistical analysis of historical chemical data. Based on these natural attenuation rates, a groundwater flow and transport model will be used to estimate the clean-up times for each plume. If the modeling results indicate that natural attenuation is not able to remediate the northern plume within a reasonable amount of time, Whirlpool will develop an active remediation strategy to mitigate expansion of the northern plume.

**Volume 2, Page 1, Section 2, Summary of Findings:** *The last bullet states that indoor air sampling was conducted in April 2013 at 1410 Jacobs Avenue and indoor air sampling results did not detect TCE or breakdown constituents in indoor air. Although all samples are non-detect, the laboratory reporting limits for TCE and VC were above their respective USEPA residential air screening levels even at one-half the reporting limit. Please discuss these results and how they are protective of residential receptors*

**Ramboll Environ Response:** The USEPA Regional Screening Levels (RSLs) were developed as screening values to eliminate chemicals that may be present but below a level of concern and aid in determining if additional evaluation is warranted. RSLs for carcinogenic compounds are two orders of magnitude below the upper-bound lifetime cancer risk considered acceptable by ADEQ and USEPA of 1E-04. In accordance with the 2013 RADD Section 4, modeled indoor air concentrations will be evaluated based on carcinogenic risks between 1E-04 and 1E-06 and a hazard quotient of 1.0 for non-carcinogens. The laboratory reporting limits for TCE and VC are within the acceptable carcinogenic target risk range of 1E-04 and 1E-06 and below the hazard quotient of 1.0 for non-carcinogens.

**Volume 2, Shallow Offsite Groundwater Investigation Report, Conclusions, Third Paragraph:** *Until static water levels can be obtained in the shallow wells and compared to water levels in deep wells completed entirely within the Basal Aquifer, the conclusion that groundwater flowed upward via short-cutting through the poorly-completed ¾ inch monitoring wells to the shallow silty sand layer cannot be substantiated. Whirlpool should submit a schedule for the replacement of these wells as well as submitting groundwater elevation data for the wells included in the report. The work plan for the plug and abandonment and replacement of these wells has been previously approved.*

**Ramboll Environ Response:** The well replacement effort commenced on Monday June 22, 2015, and was completed by July 2, 2015. ADEQ visited the site on June 26 to observe the progress of well replacement. All of the replacement wells were developed by July 2, 2015, and these wells will be sampled during the third quarter groundwater sampling event to commence on July 20, 2015.

-ooOoo-

Yours sincerely



**Michael F. Ellis, PE**  
Principal

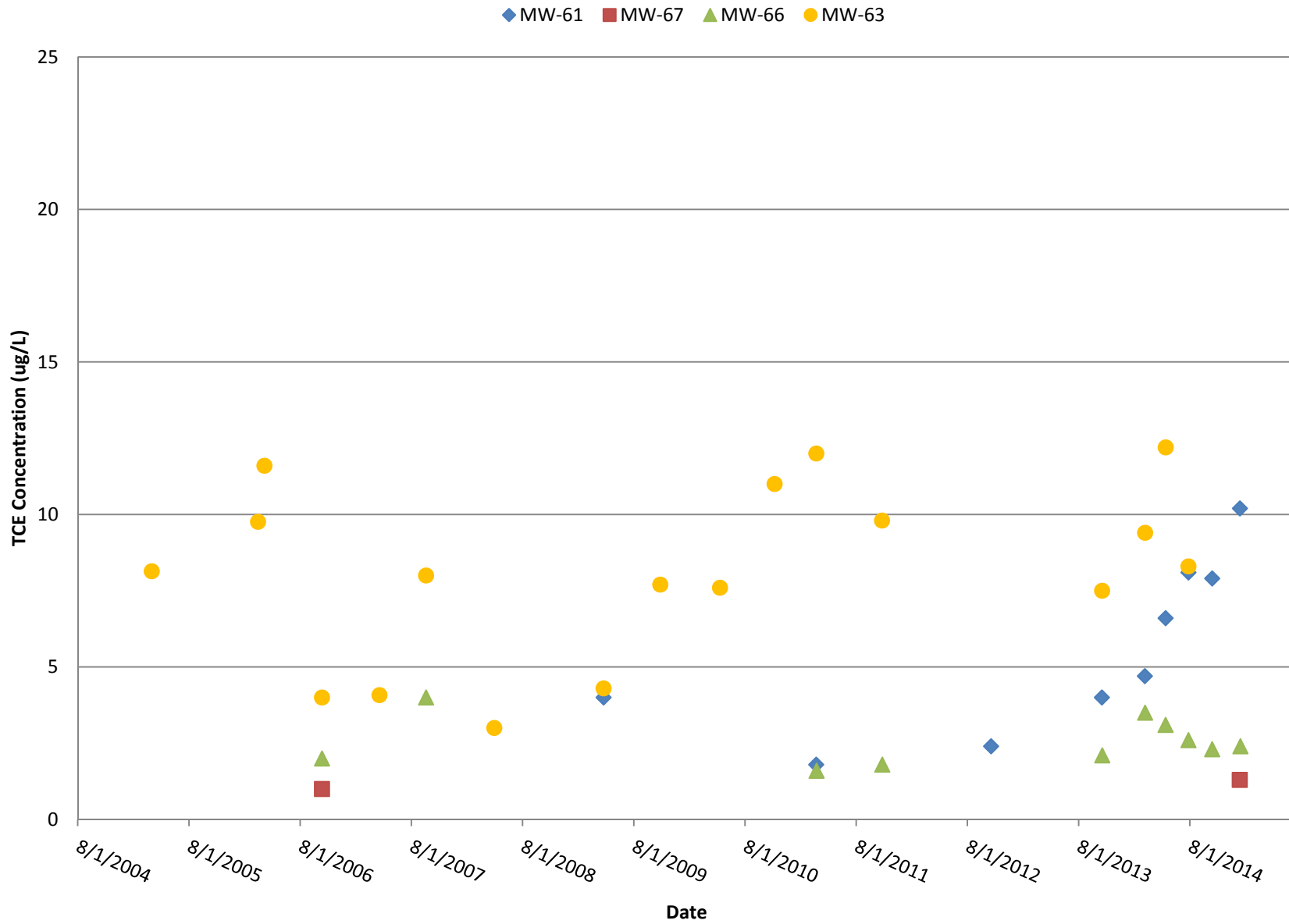
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## LIST OF FIGURES

- Figure 1: TCE Concentrations vs Time – North Plume Boundary Wells
- Figure 2: TCE Concentrations vs Time –Wells Within the North Plume

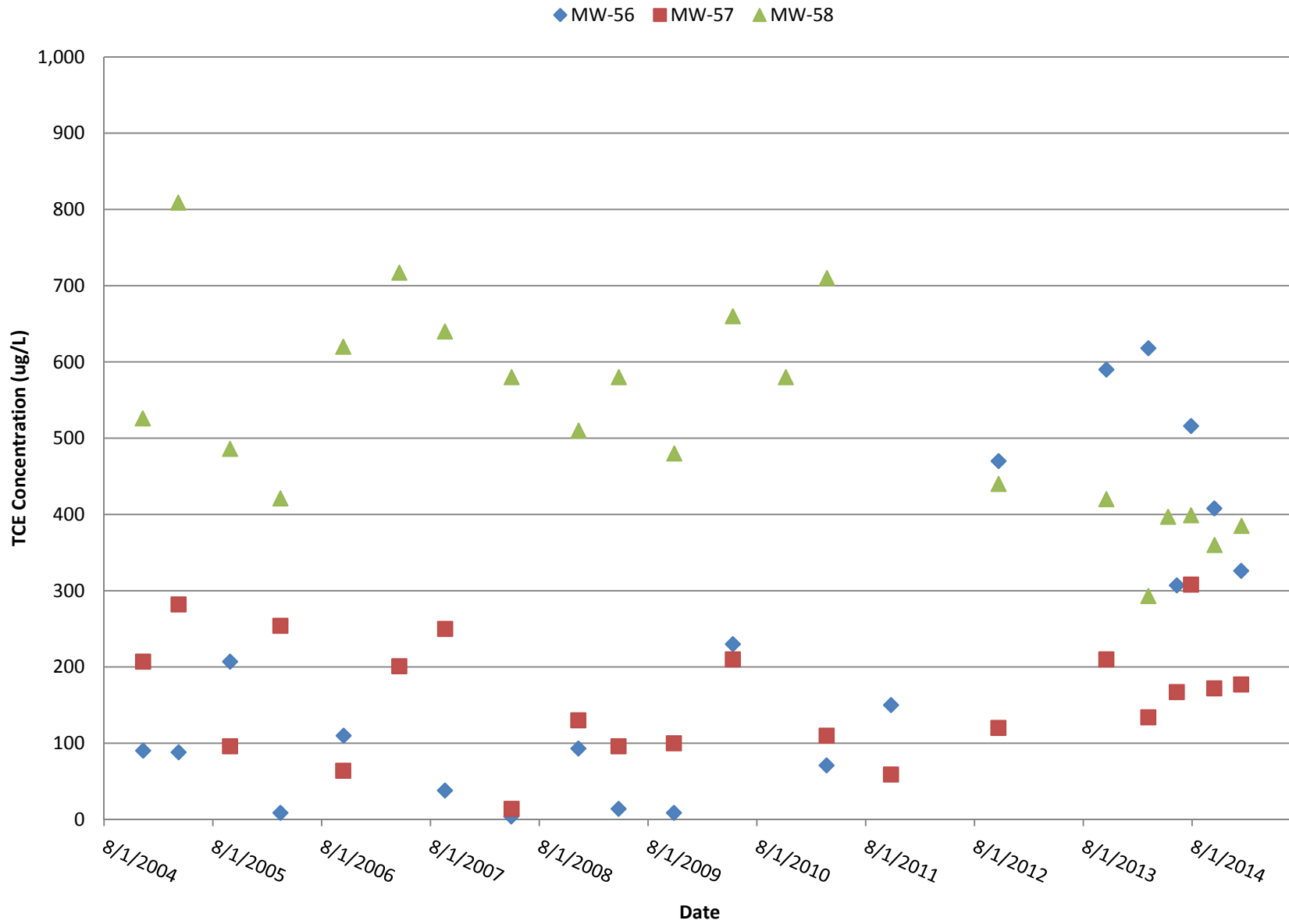


# TCE Concentrations vs Time – North Plume Boundary Wells



**Figure 1**  
Whirlpool Facility  
Fort Smith, Arkansas

# TCE Concentrations vs Time – Wells Within the North Plume



**Figure 2**  
Whirlpool Facility  
Fort Smith, Arkansas