May 13, 2015

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

Re: Response to ADEQ Correspondence Dated April 8, 2015
Offsite Soil Vapor Monitoring Results – March 19, 2015
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 April 8, 2015, comment letter (received on April 13) providing comments on the Offsite Soil Vapor Monitoring Results from March 19, 2015. Arkansas Department of Environmental Quality (ADEQ) comments are provided in italics below and the respective response follows.

Comment 1 – First Page, 1st Paragraph, Second Sentence:

The report states that groundwater and soil vapor samples were collected from five (5) properties; however, the report includes data from only three (3) properties. Please include the data obtained for the other two (2) properties.

ENVIRON Response: The March 19, 2015 correspondence was intended to transmit the results of the investigation provided to the residents on March 17, 2015. The two other properties noted in the correspondence are Whirlpool owned. All data from the Offsite Soil Vapor Monitoring effort are included in the 2015 First Quarter Progress Report submitted on May 11, 2015.

Comment 2 – First Page, Third Paragraph:

Whirlpool states that formal reports summarizing the soil vapor and shallow groundwater investigation will be included in the First Quarter 2015 Progress Report. It is unclear which model was used to calculate the "Modeled Indoor Air Concentration". Whirlpool should reference the model used in the calculations and include all the data used to calculate the modelled indoor air concentration.

In addition, it appears Whirlpool modeled indoor air concentrations for trichloroethylene (TCE). However, according to the analytical data, TCE daughter products were detected in these samples. Therefore, all chlorinated volatile organic compounds (VOCs) detected and listed in the facility's Remedial Action Decision Document (RADD) should be included in the indoor air modelling.

ENVIRON Response:
The calculation of potential vapor intrusion risk estimates from groundwater is performed as discussed in Section 3.3.1 of the Human Health Risk Assessment that was included as Appendix A to the Revised Risk Management Plan (2013). Specifically, indoor air concentrations resulting from groundwater vapor intrusion into a building are estimated using the attenuation factor (α) described by Johnson and Ettinger (1991). The α is derived in Johnson and Ettinger's 1991 journal article and the total effective diffusion (D_{eff}^T) input is calculated using a soil-water profile in the Vadose Zone estimated using the van Genuchten soil-water retention equation with default water retention parameters appropriate for silty clay (USEPA 2004a).

The inputs to the risk calculations are included in the following tables (attached to this response letter):

- Toxicity values – Attachment A.1;
- Physical and Chemical Properties – Attachment A.2;
- Calculated Soil Moisture Profile for silty clay Vadose Zone soil for a depth to water of 12 feet – Attachment A.3;
- Building characteristics (e.g. size, air exchange rate) – bottom of Attachment A.4;
- Calculation of total effective diffusion and α – top of Attachment A.4 for each chemical evaluated; and
- Risk calculations for offsite groundwater – Attachment A.5 and Attachment A.6.

We are aware that the methodology described in the Human Health Risk Assessment and summarized above differs from USEPA's generic implementation of the Johnson and Ettinger Model (JEM). USEPA does not use a continuous soil moisture profile, but rather uses a step-function with a capillary fringe in the JEM. EPA's simplified implementation generally results in a drier Vadose Zone than is calculated using either the van Genuchten soil-water retention equation or HYDRUS. Using the site specific data in the JEM enhances the model. USEPA's generic spreadsheets will accept the D_{eff}^T from either the van Genuchten equation or HYDRUS by substituting the D_{eff}^T in USEPA's "INTERCALCS" sheet with the D_{eff}^T from either of these calculations.

In the March 19, 2015 letter, modeled indoor air concentrations were presented only for TCE detected in soil vapor samples since TCE is the main constituent of concern for the Site. However, modeled indoor air concentrations and cumulative cancer risks and non-cancer hazards were determined for all detected VOCs in soil gas and groundwater. These results are provided in the 2015 First Quarter Progress Report submitted on May 11, 2015 and are presented in Attachment B, and they do not change the conclusion that indoor air concentrations are not a human health concern.

Comment 3 – Page 3, First Paragraph:

Whirlpool compared the modeled indoor air concentrations to USEPA interim residential air action level of 2 µg/m^3 from the USEPA Region 9 Response Action Levels and

Recommendations to Address Near-Term Inhalation Exposures to TCE in Air from Subsurface Vapor Intrusion Memo dated July 9, 2014. Indoor air contaminant concentrations should be compared to their respective USEPA Regional Screening Levels for Residential Air (January 2015; HQ=0.1) or screening levels calculated by the USEPA Vapor Intrusion Screening Level (VISL) Calculator. Should Whirlpool utilize the USEPA VISL Calculator, all output data should be submitted to ADEEQ.

ENVIRON Response: The USEPA Regional Screening Levels (RSLs) were developed as screening values to eliminate chemicals that maybe present but below a level of concern and aid in determining if additional evaluation is warranted. RSLs for carcinogenic compounds are two (2) 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.

Comment 4 – Page 3, Second Paragraph:

This sections states cancer and non-cancer risks were calculated based on groundwater and soil vapor results for TCE. However, according to the analytical data, TCE daughter products were detected in these samples. It is unclear whether these contaminants were included in the risk calculations. All chlorinated VOCs detected in groundwater and soil vapor and listed in the facility's RADD should be included in the risk calculations. In addition, please provide ADEQ with all risk calculations.

ENVIRON Response: Carcinogenic risks and non-cancer hazards were determined for all detected VOCs in shallow groundwater and soil vapor samples. These results, which show that carcinogenic risks and non-cancer hazards are below levels deemed acceptable by ADEQ as defined in the RADD, are provided in the 2015 First Quarter Progress Report submitted on May 11, 2015 and as well as in Attachment B of this correspondence.

Comment 5 – Page 4, Last Paragraph:

Whirlpool has indicated that signed forms by the respective property owners concerning crawl space and indoor air sampling are attached in the report. These forms were not received by ADEQ and should be submitted.

ENVIRON Response: To date, crawl space and indoor air sampling has been performed on Parcel #3 per the request of the property owner. The form refusing sampling by the property owner of Parcel #1 is attached. The documentation from Parcel #2 will be requested.

-oo0oo-

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

Sincerely,

ENVIRON International Corporation

Michael F. Ellis, PE
Principal

Attachment A – Risk Calculations and Input Parameters
Attachment B - Modeled Indoor Air Concentrations and Calculated Cancer Risks and Non-cancer Hazards for Residential Soil Vapor Results

Attachment C – Resident Approval / Disapproval Documentation

Attachment A

Risk Calculations and Input Parameters

Contents:

Attachment A.1: Toxicity Values
Whirlpool, Fort Smith, Arkansas

Chem Group	Chemical	CASRN	Cancer Classification			ADAF			URF ($mg/m^3)^{-1}$			RfC (mg/m^3)			
			Group	Ref	Note	Y/N	f_{oral}	f_{inh}	Value	Ref	Notes	Value	UF	Ref	Notes
VOC	Acetone	67-64-1	ID	1		N						3.1E+01	100	129	111
VOC	Benzene	71-43-2	A	1		N			7.8E-03	1	60	3.0E-02	300	1	
VOC	Bromoform	75-25-2	B2	1		N			1.1E-03	1				126	90
VOC	Carbon Disulfide	75-15-0				N						7.0E-01	30	1	
VOC	Chlorobenzene	108-90-7	D	1		N						5.0E-02	1,000	126	
VOC	Chloroform	67-66-3	B2	1		N			2.3E-02	1		5.0E-02	100	117	
VOC	Dibromochloromethane	124-48-1	C	1		N								126	90
VOC	1,2-Dichloroethane	107-06-2	B2	1		N			2.6E-02	1		7.0E-03	3,000	126	
VOC	1,1-Dichloroethene	75-35-4	C	1		N						2.0E-01	30	1	
VOC	cis-1,2-Dichloroethene	156-59-2	ID	1		N								1	90
VOC	trans-1,2-Dichloroethene	156-60-5	ID	1		N								1	90
VOC	Methylene Chloride	75-09-2	LC	1		Y	1	1	1.0E-05	1	159	6.0E-01	30	1	
VOC	Tetrachloroethene	127-18-4	LC	1		N			2.6E-04	1		4.0E-02	1,000	1	
VOC	Toluene	108-88-3	ID	1		N						5.0E+00	10	1	
VOC	1,1,1-Trichloroethane	71-55-6	ID	1		N						5.0E+00	100	1	
VOC	Trichloroethene	79-01-6	HC	1		Y	0.202	0.244	4.1E-03	1	159	2.0E-03	100	1	
VOC	Vinyl Chloride	75-01-4	A	1		N			4.4E-03	1	79	1.0E-01	30	1	

References

	Toxicity values were selected following the hierarchy of sources defined by USEPA (Human Health Toxicity Values in Superfund Risk Assessment, 2003), as discussed in Appendix A, Section 4 of the ADEQ-approved Revised Risk Management Plan, which was used as the basis for the ADEQ Remedial Action Decision. Values are current as of March 5, 2014.
1	USEPA. Integrated Risk Information System (IRIS). On-line database.
117	USEPA. NCEA. 2003. Risk Assessment Issue Paper for: Derivation of Provisional Subchronic and Chronic RfCs for Chloroform [CASRN 67-66-3]. January 23.
126	Provisional Peer Reviewed Toxicity Values for Superfund (PPRTV) Database.
129	ATSDR. 2013. Minimal Risk Levels. March.

Notes:

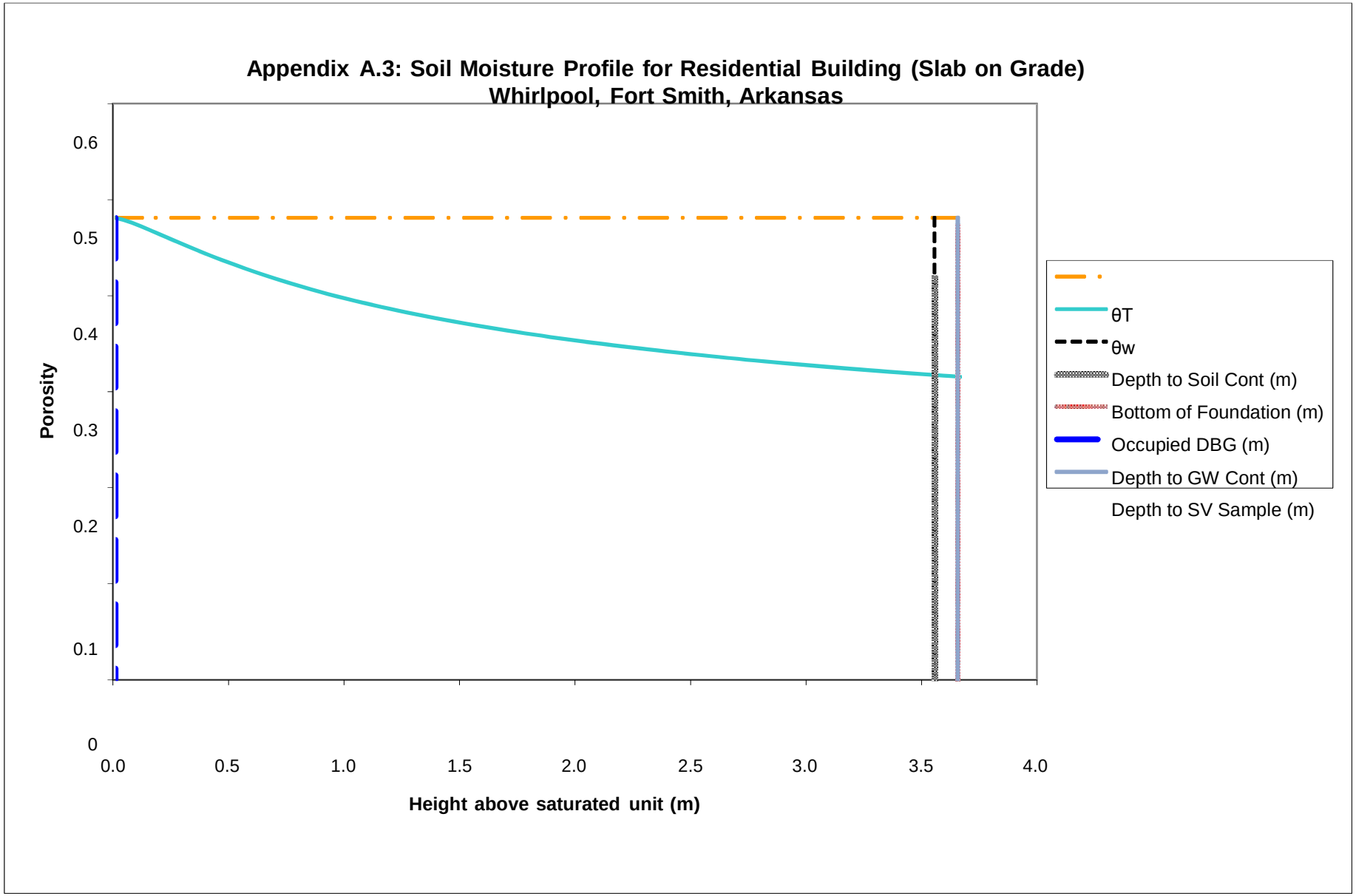
60	IRIS provides a range of 2.2E-6 to 7.8E-6 (ug/m3)-1 as the inhalation URF for Benzene.
79	For evaluating partial lifetime exposures that include early-life exposure, the unit risk factor is also used in risk calculations that do not prorate the early-life exposure, per USEPA's May 2000 Toxicological Review.
90	Inadequate data exist to derive a toxicity value, according to the indicated reference.
111	Value as published is an MRL in the indicated reference.
159	Because the chemical has a mutagenic mode of action according to USEPA, the SF and URF are adjusted by the following age-dependent adjustment factors (ADAFs) before use: 10 for ages 0 to 2; 3 for ages 2 to 16; and 1 for ages 16 and older (USEPA 2005).

Attachment A.2: Physical and Chemical Properties
Whirlpool, Fort Smith, Arkansas

Chem Group	Chemical	CASRN	H (unitless)			D_{air} (m^2/d)		D_{water} (m^2/d)		HENRY Ref Temp (°C)
			Value	Adjusted	Ref	Value	Ref	Value	Ref	Value
VOC	Acetone	67-64-1	1.6E-03	1.1E-03	44	1.1E+00	44	9.8E-05	44	2.5E+01
VOC	Benzene	71-43-2	2.3E-01	1.6E-01	44	7.6E-01	44	8.5E-05	44	2.5E+01
VOC	Bromoform	75-25-2	2.2E-02	1.3E-02	44	1.3E-01	44	8.9E-05	44	2.5E+01
VOC	Carbon Disulfide	75-15-0	1.2E+00	9.3E-01	44	9.0E-01	44	8.6E-05	44	2.5E+01
VOC	Chlorobenzene	108-90-7	1.5E-01	9.8E-02	44	6.3E-01	44	7.5E-05	44	2.5E+01
VOC	Chloroform	67-66-3	1.5E-01	1.1E-01	44	9.0E-01	44	8.6E-05	44	2.5E+01
VOC	Dibromochloromethane	124-48-1	3.2E-02	2.4E-02	44	1.7E-01	44	9.1E-05	44	2.5E+01
VOC	1,2-Dichloroethane	107-06-2	4.0E-02	2.7E-02	44	9.0E-01	44	8.6E-05	44	2.5E+01
VOC	1,1-Dichloroethene	75-35-4	1.1E+00	8.1E-01	44	7.8E-01	44	9.0E-05	44	2.5E+01
VOC	cis-1,2-Dichloroethene	156-59-2	1.7E-01	1.2E-01	44	6.4E-01	44	9.8E-05	44	2.5E+01
VOC	trans-1,2-Dichloroethene	156-60-5	3.9E-01	2.8E-01	44	6.1E-01	44	1.0E-04	44	2.5E+01
VOC	Methylene Chloride	75-09-2	9.0E-02	6.6E-02	44	8.7E-01	44	1.0E-04	44	2.5E+01
VOC	Tetrachloroethene	127-18-4	7.5E-01	4.9E-01	44	6.2E-01	44	7.1E-05	44	2.5E+01
VOC	Toluene	108-88-3	2.7E-01	1.8E-01	44	7.5E-01	44	7.4E-05	44	2.5E+01
VOC	1,1,1-Trichloroethane	71-55-6	7.1E-01	5.0E-01	44	6.7E-01	44	7.6E-05	44	2.5E+01
VOC	Trichloroethene	79-01-6	4.2E-01	2.9E-01	44	6.8E-01	44	7.9E-05	44	2.5E+01
VOC	Vinyl Chloride	75-01-4	1.1E+00	9.0E-01	44	9.2E-01	44	1.1E-04	71	2.5E+01

References:

	Physical and chemical parameters were selected following the hierarchy of sources used by USEPA (Soil Screening Guidance: Technical Background Document, 1996), as discussed in Appendix A, Section 54 of the ADEQ-approved Revised Risk Management Plan, which was used as the basis for the ADEQ Remedial Action Decision.
44	USEPA. 1996. Soil Screening Guidance: Technical Background Document and User Guide. Office of Emergency and Remedial Response. EPA/540/R-95/128. May.
71	USEPA. 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. OSWER 9355.4-24. December.



Notes:

The soil-water profile in the vadose zone is estimated using the van Genuchten soil-water retention equation with default water retention parameters appropriate for silt clay, as discussed in Appendix A, Section 3.3.1 of the ADEQ-approved Revised Risk Management Plan, which was used as the basis for the ADEQ Remedial Action Decisio

Attachment A.4: Normalized Indoor Air Concentration in a Residential Building (Slab on Grade) due to Vapor Intrusion from Groundwater
Whirlpool, Fort Smith, Arkansas

Chem Group	Chemical	CASRN	D_{air} (m^2/day)	D_{water} (m^2/day)	H (unitless)	D_{crack} (m^2/day)	D_{eff}^T (m^2/day)	α_{soil}	α_{sla}	α	C_{bldg} (L-water/m^3)
VOC	Acetone	67-64-1	1.07E+00	9.85E-05	1.14E-03	1.72E-01	1.87E-02	6.80E-02	2.73E-03	1.86E-04	2.12E-04
VOC	Benzene	71-43-2	7.60E-01	8.47E-05	1.59E-01	1.22E-01	8.15E-04	3.17E-03	2.73E-03	8.67E-06	1.38E-03
VOC	Bromoform	75-25-2	1.29E-01	8.90E-05	1.34E-02	2.07E-02	1.64E-03	6.37E-03	2.73E-03	1.74E-05	2.33E-04
VOC	Carbon Disulfide	75-15-0	8.99E-01	8.64E-05	9.26E-01	1.44E-01	2.93E-04	1.14E-03	2.73E-03	3.12E-06	2.89E-03
VOC	Chlorobenzene	108-90-7	6.31E-01	7.52E-05	9.77E-02	1.01E-01	9.32E-04	3.63E-03	2.73E-03	9.91E-06	9.68E-04
VOC	Chloroform	67-66-3	8.99E-01	8.64E-05	1.07E-01	1.44E-01	1.11E-03	4.32E-03	2.73E-03	1.18E-05	1.27E-03
VOC	Dibromochloromethane	124-48-1	1.69E-01	9.07E-05	2.38E-02	2.72E-02	1.27E-03	4.94E-03	2.73E-03	1.35E-05	3.21E-04
VOC	1,2-Dichloroethane	107-06-2	8.99E-01	8.55E-05	2.74E-02	1.44E-01	2.37E-03	9.19E-03	2.73E-03	2.51E-05	6.88E-04
VOC	1,1-Dichloroethene	75-35-4	7.78E-01	8.99E-05	8.10E-01	1.25E-01	3.12E-04	1.22E-03	2.73E-03	3.32E-06	2.69E-03
VOC	cis-1,2-Dichloroethene	156-59-2	6.36E-01	9.76E-05	1.19E-01	1.02E-01	9.72E-04	3.78E-03	2.73E-03	1.03E-05	1.22E-03
VOC	trans-1,2-Dichloroethene	156-60-5	6.11E-01	1.03E-04	2.81E-01	9.81E-02	5.96E-04	2.32E-03	2.73E-03	6.35E-06	1.79E-03
VOC	Methylene Chloride	75-09-2	8.73E-01	1.01E-04	6.60E-02	1.40E-01	1.58E-03	6.14E-03	2.73E-03	1.68E-05	1.11E-03
VOC	Tetrachloroethene	127-18-4	6.22E-01	7.08E-05	4.90E-01	9.99E-02	3.40E-04	1.33E-03	2.73E-03	3.63E-06	1.78E-03
VOC	Toluene	108-88-3	7.52E-01	7.43E-05	1.80E-01	1.21E-01	6.97E-04	2.71E-03	2.73E-03	7.41E-06	1.34E-03
VOC	1,1,1-Trichloroethane	71-55-6	6.74E-01	7.60E-05	4.97E-01	1.08E-01	3.64E-04	1.42E-03	2.73E-03	3.87E-06	1.92E-03
VOC	Trichloroethene	79-01-6	6.83E-01	7.86E-05	2.88E-01	1.10E-01	5.23E-04	2.04E-03	2.73E-03	5.57E-06	1.60E-03
VOC	Vinyl Chloride	75-01-4	9.16E-01	1.06E-04	9.00E-01	1.47E-01	3.44E-04	1.34E-03	2.73E-03	3.66E-06	3.30E-03
Notes:	**Crack Soil and Building Characteristics**			**Crack Soil**							
	SCS Soil texture class			Sand							
	Bulk density	kg/L	ρ_b	1.66							
	Total porosity	L/L-soil	θ_T	0.375							
	Water-filled porosity	L/L-soil	θ_w	0.054							
	Air-filled porosity	L/L-soil	θ_a	0.321							
	Residual saturation	L/L-soil	θ_r	0.053							
	Hydraulic conductivity	cm/s	**K**	7.4E-03							
	Dynamic viscosity of water	g/cm-s	μ_w	0.01307							
	Density of water	g/cm^3	ρ_w	1.0							
	Gravitational acceleration	cm/s^2	**g**	980.7							
	Intrinsic permeability	cm^2	**k**	9.9E-08							
	Relative saturation	unitless	S_e	0.004							
	van Genuchten N	unitless	**N**	3.177							
	van Genuchten M	unitless	**M**	0.685							
	Relative air permeability	unitless	k_{rg}	0.998							
	Permeability to vapor	cm^2	k_v	9.89E-08							
	Distance from building foundation to source	m	$L_{T\text{-}gw}$	3.56							
	Bldg foundation thickness	m	L_{crack}	0.1							
	Bldg foundation length	m		10.00							
	Bldg foundation width	m		10.00							
	Bldg occupied height	m		2.44							
	Bldg occupied volume	m^3		244.00							
	Occupied depth below ground	m		0.0							
	Bldg area for vapor intrusion	m^2	A_B	100.0							
	Ratio of A_{crack} to A_B		η	4E-04							
	Area of cracks	m^2	A_{crack}	4E-02							
	Air exchange rate	$hour^{-1}$	**ach**	0.45							
	Building ventilation rate	m^3/day	Q_{bldg}	2.64E+03							
	Pressure difference between outdoors-indoors	kg/m-s^2	ΔP	1.0							
	Viscosity of air	kg/m-s	μ_a	1.8E-05							
	Crack length (bldg perimeter)	m	X_{crack}	40							
	Crack depth below ground	m	Z_{crack}	0.10							
	Crack radius	m	r_{crack}	1E-03							
	Soil gas flow rate into bldg	m^3/day	Q_{soil}	7.20							
	Indoor air concentrations resulting from groundwater vapor intrusion into a building are estimated using the relationships described by Johnson and Ettinger (Heuristic model for predicting the intrusion rate of contaminant vapors into buildings, 1991), which USEPA recommends for screening level calculations, as discussed in Appendix A, Section 3.3.1 of the ADEQ-approved Revised Risk Management Plan, which was used as the basis for the ADEQ Remedial Action Decision.										
	The effective diffusion term DeffT is calculated based on a silty clay soil, as discussed in Appendix A, Section 3.3.1 of the ADEQ-approved Revised Risk Management Program.										

Attachment A.5: Cancer Risk and Hazard Index Calculations for Vapor Intrusion into a Residential Building (Slab on Grade) from Groundwater in Off-Site Wells Whirlpool, Fort Smith, Arkansas

							Cancer				Noncancer	
Chem Group	**Chemical**	**CASRN**	**Carc Class**	**ADAF**	**C_{gw}** (mg/L)	**C_{air}** (mg/m^3)	**URF** (m^3/mg)	**f_{inh}**	**Risk**		**RfC** (mg/m^3)	**HQ**
VOC	Acetone	67-64-1	ID	N	7.00E-03	1.48E-06					3.1E+01	4.6E-08
VOC	Benzene	71-43-2	A	N	1.20E-04	1.65E-07	7.8E-03		5.3E-10		3.0E-02	5.3E-06
VOC	Bromoform	75-25-2	B2	N	2.53E-02	5.88E-06	1.1E-03		2.7E-09			
VOC	Carbon Disulfide	75-15-0		N	2.60E-04	7.51E-07					7.0E-01	1.0E-06
VOC	Chlorobenzene	108-90-7	D	N	2.40E-04	2.32E-07					5.0E-02	4.5E-06
VOC	Chloroform	67-66-3	B2	N	2.60E-04	3.30E-07	2.3E-02		3.1E-09		5.0E-02	6.3E-06
VOC	Dibromochloromethane	124-48-1	C	N	9.30E-04	2.99E-07						
VOC	1,1-Dichloroethene	75-35-4	C	N	1.90E-03	5.11E-06					2.0E-01	2.5E-05
VOC	cis-1,2-Dichloroethene	156-59-2	ID	N	1.80E-02	2.20E-05						
VOC	trans-1,2-Dichloroethene	156-60-5	ID	N	8.70E-04	1.55E-06						
VOC	Methylene Chloride	75-09-2	LC	Y	2.90E-04	3.21E-07	1.0E-05	1	3.3E-12		6.0E-01	5.1E-07
VOC	Tetrachloroethene	127-18-4	LC	N	1.40E-04	2.49E-07	2.6E-04		2.7E-11		4.0E-02	6.0E-06
VOC	Toluene	108-88-3	ID	N	1.10E-03	1.47E-06					5.0E+00	2.8E-07
VOC	1,1,1-Trichloroethane	71-55-6	ID	N	3.10E-04	5.97E-07					5.0E+00	1.1E-07
VOC	Trichloroethene	79-01-6	HC	Y	5.18E-01	8.31E-04	4.1E-03	0.244	1.9E-06		2.0E-03	4.0E-01
VOC	Vinyl Chloride	75-01-4	A	N	7.60E-04	2.51E-06	4.4E-03		1.6E-08		1.0E-01	2.4E-05
							Cumulative Risk:		2E-06		**HI:**	4E-01
Note:												
f_{inh} is the fraction of the inhalation toxicity value that USEPA identified as having a mutagenic mode of action.												
Only VOCs detected in the 2nd Quarter 2014 off-site groundwater samples are shown.												
Residential risks were calculated assuming residents could be exposed to soil vapor intrusion into indoor air for 24 hours per day and 350 days per year for 30 years.												

Attachment A.6: Cancer Risk and Hazard Index Calculations for Vapor Intrusion into a Residential Building (Slab on Grade) from Groundwater at MW-71 Whirlpool, Fort Smith, Arkansas

							Cancer				Noncancer	
Chem Group	**Chemical**	**CASRN**	**Carc Class**	**ADAF**	**C_{gw}** (mg/L)	**C_{air}** (mg/m^3)	**URF** (m^3/mg)	**f_{inh}**	**Risk**		**RfC** (mg/m^3)	**HQ**
VOC	1,1-Dichloroethene	75-35-4	C	N	1.40E-03	3.77E-06					2.0E-01	1.8E-05
VOC	cis-1,2-Dichloroethene	156-59-2	ID	N	5.30E-03	6.49E-06						
VOC	Trichloroethene	79-01-6	HC	Y	1.64E-01	2.63E-04	4.1E-03	0.244	6.1E-07		2.0E-03	1.3E-01
VOC	Vinyl Chloride	75-01-4	A	N	3.30E-04	1.09E-06	4.4E-03		6.8E-09		1.0E-01	1.0E-05
							Cumulative Risk:		6E-07		**HI:**	1E-01
Note:												
f_{inh} is the fraction of the inhalation toxicity value that USEPA identified as having a mutagenic mode of action.												
Only VOCs detected in the 2nd Quarter 2014 groundwater sample at MW-71 are shown.												
Residential risks were calculated assuming residents could be exposed to soil vapor intrusion into indoor air for 24 hours per day and 350 days per year for 30 years.												

Attachment A.7: Cancer Risk and Hazard Index Calculations for Intrusion into a Residential Building (Slab on Grade) from Soil Vapor Whirlpool, Fort Smith, Arkansas

							Cancer			Noncancer	
Chem Group	**Chemical**	**CASRN**	**Carc Class**	**ADAF**	**C_{sv}** (mg/m^3)	**C_{air}** (mg/m^3)	**URF** (m^3/mg)	**Risk**		**RfC** (mg/m^3)	**HQ**
VOC	1,2-Dichloroethane	107-06-2	B2	N	2.30E-04	6.90E-06	2.6E-02	7.4E-08		7.0E-03	9.5E-04
VOC	Tetrachloroethene	127-18-4	LC	N	4.20E-04	1.26E-05	2.6E-04	1.3E-09		4.0E-02	3.0E-04
						Cumulative Risk:		8E-08		**HI:**	1E-03
Note:											
Only VOCs detected in the 2nd Quarter 2014 soil vapor sample at VP-1D are shown.											

Residential risks were calculated assuming residents could be exposed to soil vapor intrusion into indoor air for 24 hours per day and 350 days per year for 30 years.

Indoor air concentrations due to intrusion of soil vapor were calculated using USEPA's 95th percentile subslab soil gas attenuaion factor of 0.03 (EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compouns and Residential Buildings, 2012), as discussed in Appendix A, Section 6.8.2 of the ADEQ-approved Revised Risk Management Plan, which was used as the basis for the ADEQ Remedial Action Decision.

Attachment B

Modeled Indoor Air Concentrations and Calculated Cancer Risks and Non-cancer Hazards for Residential Soil Vapor Results

Parcel #1: VP-5

Detected VOC	Modeled indoor air concentration (µg/m^3)	Cancer Risk	Cumulative Cancer Risk	Non-Cancer Hazard	Cumulative Non-Cancer Hazard
1,2-Dichloroethane	6.00E-03	6.4E-08	1E-06	8.2E-04	1E-02
1,1-Dichloroethene	2.55E-02			1.2E-04	
cis-1,2-Dichloroethene	2.52E-03				
trans-1,2-Dichloroethene	4.50E-03				
Tetrachloroethene	2.37E-02	2.5E-09		5.7E-04	
Trichloroethene	2.52E-02	5.8E-08		1.2E-02	
Vinyl Chloride	1.38E-01	8.6E-07		1.3E-03	

Cancer risk and non-cancer hazard presented in March 19 letter: 1E-06 and 0.01

Parcel #2: VP-7

Detected VOC	Modeled indoor air concentration (µg/m^3)	Cancer Risk	Cumulative Cancer Risk	Non-Cancer Hazard	Cumulative Non-Cancer Hazard
1,2-Dichloroethane	6.00E-03	6.4E-08	5E-07	8.2E-04	4E-02
1,1-Dichloroethene	1.26E-02			6.0E-05	
cis-1,2-Dichloroethene	7.50E-03				
Tetrachloroethene	1.32E-02	1.4E-09		3.2E-04	
Trichloroethene	8.40E-02	1.9E-07		4.0E-02	
Vinyl Chloride	4.50E-02	2.8E-07		4.3E-04	

Cancer risk and non-cancer hazard presented in March 19 letter: 5E-07 and 0.04

Parcel #3: VP-9					
Detected VOC	Modeled indoor air concentration (µg/m^3)	Cancer Risk	Cumulative Cancer Risk	Non-Cancer Hazard	Cumulative Non-Cancer Hazard
1,1-Dichloroethane	1.08E-02			2.1E-05	
1,2-Dichloroethane	6.90E-02	7.4E-07		9.5E-03	
1,1-Dichloroethene	5.10E-02			2.4E-04	
cis-1,2-Dichloroethene	4.20E-03				
trans-1,2-Dichloroethene	4.20E-03		4E-06		5E-01
Tetrachloroethene	8.70E-03	9.3E-10		2.1E-04	
1,1,1-Trichloroethane	1.35E-03			2.6E-07	
Trichloroethene	9.30E-01	2.2E-06		4.5E-01	
Vinyl Chloride	1.23E-01	7.6E-07		1.2E-03	

Cancer risk and non-cancer hazard presented in March 19 letter: 4E-06 and 0.5

Attachment C

Resident Approval / Disapproval Documentation

Whirlpool - Fort Smith, Arkansas

Please check the box below if you wish to have follow-on environmental sampling completed at your property:

- ☐ By checking this box, the property owner identified below requests that supplemental crawl space and indoor air sampling be performed at the property identified below.
- ☒ By checking this box, the property owner identified below does not desire the performance of supplemental crawl space and indoor air sampling at the property identified below. The property owner may request supplemental crawl space and indoor air sampling at a later date by contacting Whirlpool at (800) 923-9745 or ENVIRON at (314) 590-2967.

DATE: March 17, 2015

OWNER: Ms. Scroggins

PROPERTY ADDRESS: 1809 Jacobs Avenue, Fort Smith, Arkansas

CONTACT PHONE NUMBER: 479-650-5880

PROPERTY OWNER SIGNATURE: Carol L. Scroggins

WITNESS: [signature] DATE: 3-17-15

Please return this form at your earliest convenience in the enclosed addressed stamped envelope.