

Dave Favero

From: Dave Favero
Sent: Thursday, June 5, 2014 3:32 PM
To: Ramanauskas, Peter
Cc: Mike Coram, CRA; Tom Kinney, CRA
Subject: RE: PCC West DUCO Stores CRA Memo
Attachments: Updated AOI50 Figures and Tables-20140605.pdf; CRA GSI DECISION TREE.pdf

Peter,

Please see below and attached for responses to your questions/requests. If we missed any questions you have for Pontiac West please let me know.

USEPA Comment

- *On page 2 of the summary, CRA references that the Act 190 amendments to Part 201 substantially changed the manner in which this condition can be addressed. Can CRA fortify the explanation that the GSI pathway is not relevant by comparing the sections of Michigan's 324.20120e(3) regulation to the available site information that show how the lines of evidence available at the site render the pathway not relevant?*

Response:

In the letter we do not exclude the GSI pathway from comparison to soil and groundwater analytical results (results were compared to GSIPC and GSI criteria). However, based upon evaluation per 324.20120e(3)(a-h), it is appropriate to conclude it is not a relevant pathway. The Act 190 amendments rely on multiple lines of evidence for determination of the relevance of the GSI pathway. Per the new statute, the pathway addressed by GSI criteria under subsection (1) is considered a relevant pathway when a remedial investigation or application of best professional judgment leads to the conclusion that a hazardous substance in groundwater is reasonably expected to vent to surface water in concentrations that exceed the generic GSI criteria. Since the only impacted groundwater at DUCO came from borehole water collected from SB-3-08 (located 100 feet east of the storm line) and SB-4-09 (located 40 feet east of the storm line) and down gradient groundwater wells are below GSI, it is reasonable to conclude that the impacted groundwater is defined (on-Site) and will not vent to Murphy Creek located approximately 4,200 feet north of DUCO Stores at concentrations above GSI criteria. In addition, groundwater in the area of DUCO stores is intermittent (discontinuous) and unlikely connected to groundwater venting to Murphy Creek. Even so, assuming groundwater flow direction to the north/northeast, it is unlikely substances in the impacted groundwater would arrive at and vent to Murphy Creek at concentrations exceeding GSI (even following the bedding material for the storm sewers) as a result of releases at DUCO Stores. These multiple lines of evidence fall directly into line with the following sections of the statutes and compliance can be met by meeting any of the following, singly or in combination:

- 324.20120e(3)(a) which states that there must be a hydraulic connection between groundwater and the surface water in question. Murphy Creek has been identified as the nearest down-gradient surface water resource, but the presence of a direct hydraulic connection from the DUCO Stores area 4,200 ft to the south is unlikely
- 324.20120e(3)(b) which identifies proximity of source areas to surface water as a relevant factor to be considered.
- 324.20120e(3)(c) which specifies the receiving surface water in question must be a water of the state per Part 31. Murphy Creek is acknowledged as a surface water of the state; however, surface water does not include water in enclosed sewers or water in sub-grade utility runs, utility lines and/or permeable fill in and around them.
- 324.20120e(3)(d) which identifies the direction of groundwater movement as a factor to be considered. The groundwater flow direction is to the north/northeast.

- 324.20120e(3)(e) states that the presence of artificial structures be taken into account. Artificial structures such as storm sewers and their bedding are present in the area and therefore could provide preferential pathways for groundwater movement to surface water. However, there is no basis to believe such a preferential path would be present solely for groundwater of a plume originating at the DUCO stores location (if any), and any such plume flow would be combined with other groundwater entering the preferential flow path. Conservatively, it may be estimated that a plume emanating from the DUCO stores location reflects no more than approximately 3.2 % of the lateral area from which groundwater could seep into the storm sewer. The 3.2 % was calculated by the area of DUCO stores potential impacts that potentially could seep into storm sewers (approx. 270 feet wide by 40 feet to the sewer) divided by the total area where groundwater could seep into the storm sewer (4,200 feet long by 80 feet (40 feet on either side of storm sewer)). The 3.2 % is conservative based on not including potential groundwater seepage into the sewers up-gradient of the DUCO Stores and encompassing the entire DUCO Stores area instead of just the area with impacted groundwater, which in all likelihood is much smaller than the 270 feet wide used in the evaluation. Even at times of low flow (no recent/new precipitation input to the preferential pathway (storm sewers)) assuming any impacts from the DUCO stores area makes it into a storm sewer, it would only account for 3.2% of the total groundwater associated with the storm sewer which would greatly reduce contaminant concentrations (through dilution) to below generic GSI criteria prior to release into Murphy Creek.
- 324.20120e(3)(f) which identifies the mass of hazardous substances present at the facility that may affect groundwater as a factor to be considered. Only a limited and finite mass of hazardous substance remains present at the facility as the main mass of hazardous substances at DUCO Stores was removed during remedial actions leaving only incidental residual detections above generic GSI protection criteria for groundwater and soil at some sample locations.
- 324.20120e(3)(g) which identifies facility specific documentation of natural attenuation as a factor to be considered. Natural attenuation of residual hazardous substances at the source area has not been evaluated; however, natural bio/geo chemical activity that likely is present would only serve to further reduce the concentrations of the residual hazardous substances.
- 324.20120e(3)(h) which discusses the structural integrity of the storm sewer near SB-4-09. This is not relevant because even if (which is unlikely) impacted groundwater entered the sewer, it would not vent at concentrations exceeding GSI based on dilution (as discussed in 324.20120e(3)(e)).

Per 324.20120e(3)(a-h), based upon investigation and professional judgment, no hazardous substances will vent to surface water at concentrations exceeding GSI values; therefore, the GSI pathway is not relevant. Attached is a chart that provides a generic overview of evaluating GSI pathway per Part 201.

USEPA Comment

- Referencing pages 4 and 5 some of the criteria listed under Soil and Groundwater are not listed in the corresponding Tables or Figures (e..g. Soil DCC & Csat are not listed in Table 1 or Figure 5). Please verify the correct screening criteria are listed in the Tables & Figures.

Response:

See attached for updated figures and tables compared against all current Part 201 Cleanup Criteria with criteria listed.

Thanks,

David Favero

Deputy Cleanup Manager - Michigan

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From: Ramanauskas, Peter [mailto:ramanauskas.peter@epa.gov]

Sent: Monday, May 05, 2014 5:32 PM

To: Dave Favero

Subject: PCC West DUCO Stores CRA Memo

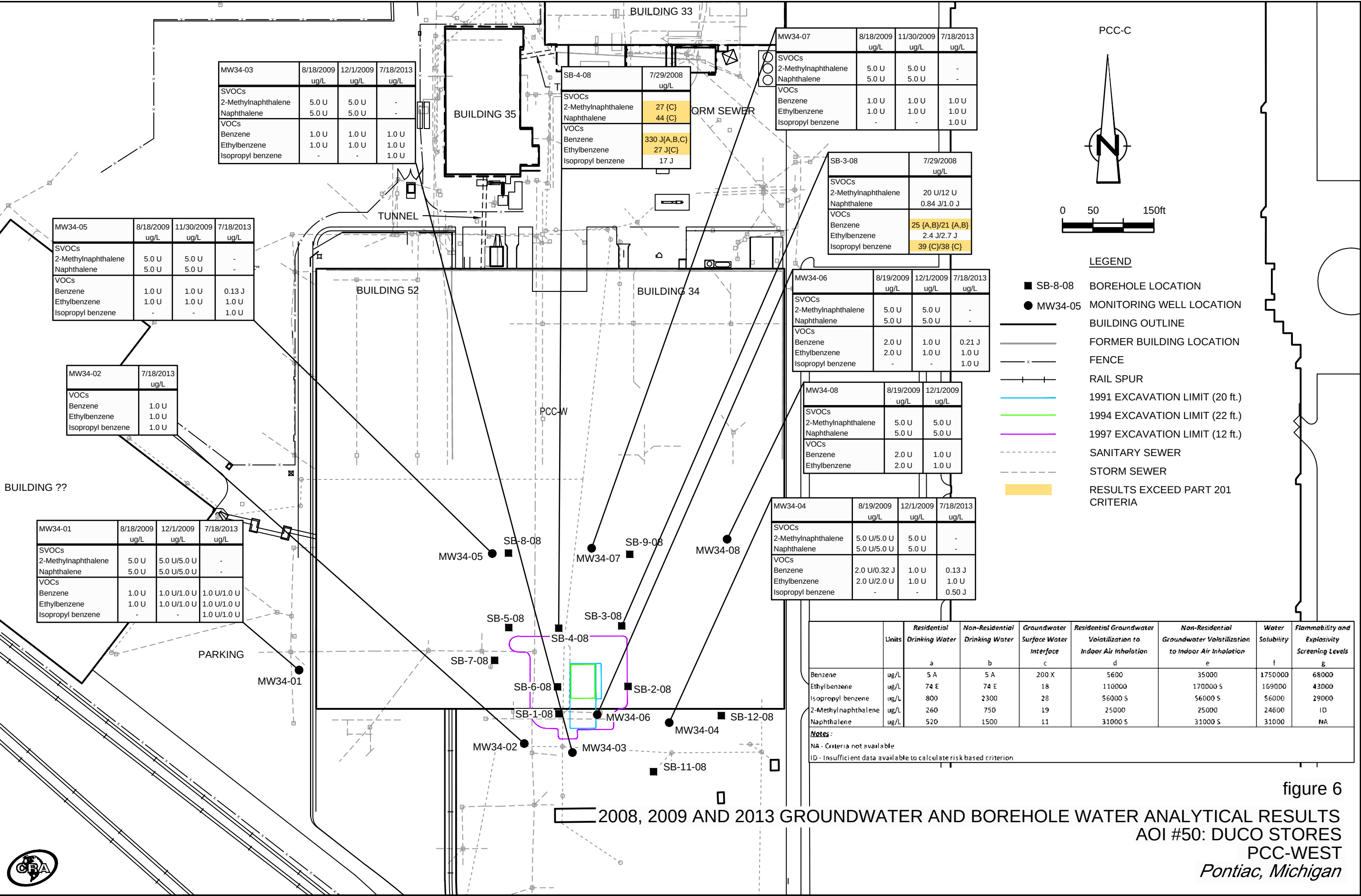
Dave,

I've reviewed the February 6, 2014 Summary for AOI#50 – DUCO Stores.

- On page 2 of the summary, CRA references that the Act 190 amendments to Part 201 substantially changed the manner in which this condition can be addressed. Can CRA fortify the explanation that the GSI pathway is not relevant by comparing the sections of Michigan's 324.20120e(3) regulation to the available site information that show how the lines of evidence available at the site render the pathway not relevant?
- Referencing pages 4 and 5 some of the criteria listed under Soil and Groundwater are not listed in the corresponding Tables or Figures (e.g. Soil DCC & Csat are not listed in Table 1 or Figure 5). Please verify the correct screening criteria are listed in the Tables & Figures.

Thanks,
Peter

FIGURES



TABLES

TABLE 1																				
SOIL ANALYTICAL RESULTS 2007-2012																				
DUCO STORES																				
PCC-WEST																				
PONTIAC, MICHIGAN																				
MDEQ Generic Cleanup Criteria: Residential and Nonresidential (1)																				
Sample Location: Sample Depth: Sample Date: Sample Type: Parameters	Statewide Default Background a	Drinking Water Protection b	Nonresidential Drinking Water Protection c	Groundwater Surface Water Interface Protection d	Soil Volatilization to Indoor Air Inhalation e	Nonresidential Soil Volatilization to Indoor Air Inhalation f	Infinite Source Volatile Soil Inhalation g	Nonresidential Infinite Source Volatile Soil Inhalation h	Finite VSIC for 5 Meter Source Thickness i	Nonresidential Finite VSIC for 5 Meter Source Thickness j	Finite VSIC for 2 Meter Source Thickness k	Nonresidential Finite VSIC for 2 Meter Source Thickness l	Particulate Soil Inhalation m	Nonresidential Particulate Soil Inhalation n	Direct Contact o	Nonresidential Direct Contact p	Soil Saturation Concentration Screening Levels q	MW34-04 0-2 ft bgs 11/20/2007	MW34-04 6-8 ft bgs 11/20/2007	
Units	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q			
VOCs*																				
1,1,1-Trichloroethane	ug/kg	NA	4000	4000	1800	250000	460000	3800000	4500000	12000000	15000000	28000000	31000000	67000000000	29000000000	500000000 C	1000000000 C	460000	46 U	48 U
1,1,2-Trichloroethane	ug/kg	NA	100	100	6600 X	4600	24000	17000	57000	21000	57000	44000	120000	190000000	250000000	180000	840000	920000	46 U	48 U
1,1-Dichloroethane	ug/kg	NA	18000	50000	15000	230000	430000	2100000	2500000	5900000	6000000	14000000	14000000	33000000000	15000000000	270000000 C	87000000 C	890000	46 U	48 U
1,1-Dichloroethene	ug/kg	NA	140	140	2600	62	330	1100	3700	5300	15000	13000	37000	62000000	78000000	200000	660000 C	570000	46 U	48 U
1,2,4-Trichlorobenzene	ug/kg	NA	4200	4200	5900 X	9600000 C	18000000 C	28000000	34000000	28000000	34000000	28000000	34000000	25000000000	11000000000	990000 DD	5800000 C,DD	1100000	230 U	240 U
1,2,4-Trimethylbenzene	ug/kg	NA	2100	2100	570	4300000 C	8000000 C	21000000	25000000	500000000	600000000	500000000	600000000	82000000000	36000000000	32000000 C	100000000 C	110000	36 J	80 J
1,3,5-Trimethylbenzene	ug/kg	NA	1800	1800	1100	2600000 C	4800000 C	16000000	19000000	380000000	460000000	380000000	460000000	82000000000	36000000000	32000000 C	100000000 C	94000	91 U	60 J
1,3-Dichlorobenzene	ug/kg	NA	170	480	680	26000	48000	79000	94000	79000	110000	110000	94000	200000000	8800000	200000 C	660000 C	170000	91 U	95 U
1,4-Dichlorobenzene	ug/kg	NA	1700	1700	360	19000	100000	77000	260000	77000	110000	340000	450000000	570000000	400000	1900000	NA	91 U	95 U	
2-Butanone (Methyl ethyl ketone) (MEK)	ug/kg	NA	260000	760000	44000	54000000 C	99000000 C	29000000	35000000	29000000	35000000	36000000	67000000000	29000000000	120000000 C,DD	700000000 C,DD	27000000	680 U	710 U	
Benzene	ug/kg	NA	100	100	4000 X	1600	8400	13000	45000	34000	99000	79000	230000	380000000	470000000	180000	840000 C	400000	46 U	14 J
cis-1,2-Dichloroethene	ug/kg	NA	1400	1400	12000	22000	41000	180000	210000	420000	430000	990000	1000000	2300000000	1000000000	2500000 C	8000000 C	640000	46 U	48 U
cis-1,3-Dichloropropene	ug/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	46 U	48 U
Ethylbenzene	ug/kg	NA	1500	1500	360	87000	460000 C	720000	2400000	1000000	3100000	2200000	6500000	10000000000	13000000000	22000000 C	71000000 C	140000	46 U	18 J
Methyl tert butyl ether (MTBE)	ug/kg	NA	800	800	140000 X	9900000 C	18000000 C	25000000	30000000	39000000	41000000	87000000	89000000	200000000000	88000000000	1500000	7100000 C	5900000	230 U	240 U
PNAs*																				
Styrene	ug/kg	NA	2700	2700	2100 X	250000	1600000 C	970000	3300000	970000	3300000	1400000	4200000	5500000000	6900000000	400000	1900000 C	520000	46 U	48 U
Tetrachloroethene	ug/kg	NA	100	100	1200 X	11000	21000	170000	210000	480000	490000	1100000	1100000	27000000000	12000000000	200000 C	930000 C	88000	46 U	48 U
Toluene	ug/kg	NA	16000	16000	5400	330000 C	610000 C	2800000	3300000	5100000	36000000	12000000	36000000	27000000000	12000000000	50000000 C	160000000 C	250000	91 U	95 U
trans-1,2-Dichloroethene	ug/kg	NA	2000	2000	30000 X	23000	43000	280000	330000	830000	840000	2000000	2000000	47000000000	21000000000	3800000 C	120000000 C	1400000	46 U	48 U
trans-1,3-Dichloropropene	ug/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	46 UJ	48 UJ
Trichloroethene	ug/kg	NA	100	100	4000 X	1000	1900	11000	14000	25000	25000	57000	58000	130000000	59000000	110000 DD	660000 C,DD	500000	46 U	48 U
Vinyl chloride	ug/kg	NA	40	40	260 X	270	2800	4200	29000	30000	170000	73000	420000	350000000	890000000	3800	34000	490000	36 U	38 U
Xylenes (total)	ug/kg	NA	5600	5600	820	6300000 C	12000000 C	46000000	54000000	61000000	65000000	130000000	130000000	290000000000	130000000000	410000000 C,D	1000000000 C,D	150000	140 U	130 J
SVOCs*																				
2-Methylnaphthalene	ug/kg	NA	57000	170000	4200	2700000	4900000	1500000	1800000	1500000	1800000	1500000	1800000	6700000000	2900000000	8100000	26000000	NA	300 U	6300 U
Acenaphthene	ug/kg	NA	300000	880000	8700	190000000	350000000	81000000	97000000	81000000	97000000	81000000	97000000	14000000000	6200000000	41000000	130000000	NA	300 U	6300 U
Anthracene	ug/kg	NA	41000	41000	ID	1000000000 D	1000000000 D	1400000000	1600000000	1400000000	1600000000	1400000000	1600000000	67000000000	29000000000	230000000	730000000	NA	300 U	6300 U
Benzo(a)anthracene	ug/kg	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	ID	ID	20000	80000	NA	300 U	6300 U
Benzo(a)pyrene	ug/kg	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	1500000	1900000	2000	8000	NA	300 U	6300 U
Benzo(b)fluoranthene	ug/kg	NA	NLL	NLL	NLL	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	20000	80000	NA	300 U	6300 U
Benzo(g,h,i)perylene	ug/kg	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	800000000	350000000	2500000	7000000	NA	300 U	6300 U
Benzo(k)fluoranthene	ug/kg	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	ID	ID	200000	800000	NA	300 U	6300 U
Chrysene	ug/kg	NA	NLL	NLL	NLL	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	2000000	8000000	NA	300 U	6300 U
Dibenz(a,h)anthracene	ug/kg	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	ID	ID	2000	8000	NA	300 U	6300 U
Fluoranthene	ug/kg	NA	730000	730000	5500	1000000000 D	1000000000 D	740000000	890000000	740000000	880000000	740000000	880000000	9300000000	4100000000	46000000	130000000	NA	300 U	6300 U
Fluorene	ug/kg	NA	390000	890000	5300	580000000	1000000000 D	130000000	150000000	130000000	150000000	130000000	150000000	9300000000	4100000000	27000000	87000000	NA	300 U	6300 U
Indeno(1,2,3-cd)pyrene	ug/kg	NA	NLL	NLL	NLL	NLV	NLV	NLV	NLV	NLV	NLV	NLV	NLV	ID	ID	20000	80000	NA	300 U	6300 U
Naphthalene	ug/kg	NA	35000	100000																

TABLE 1
SOIL ANALYTICAL RESULTS 2007-2012
DUCO STORES
PCC-WEST
PONTIAC, MICHIGAN

Sample Location:		SB-21-12	SB-22-12	SB-22-12
Sample Depth:		10-12 ft BGS	5.5-7.5 ft BGS	10-12 ft BGS
Sample Date:		10/02/2012	10/02/2012	10/02/2012
Sample Type:				
Parameters	Units			
VOCs*				
1,1,1-Trichloroethane	ug/kg	45 U	44 U	45 U
1,1,2-Trichloroethane	ug/kg	45 U	44 U	45 U
1,1-Dichloroethane	ug/kg	45 U	44 U	45 U
1,1-Dichloroethene	ug/kg	45 U	44 U	45 U
1,2,4-Trichlorobenzene	ug/kg	230 U	220 U	230 U
1,2,4-Trimethylbenzene	ug/kg	18 J	87 U	71 J
1,3,5-Trimethylbenzene	ug/kg	90 U	87 U	21 J
1,3-Dichlorobenzene	ug/kg	90 U	87 U	91 U
1,4-Dichlorobenzene	ug/kg	90 U	87 U	91 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/kg	680 U	650 U	680 U
Benzene	ug/kg	45 U	44 U	45 U
cis-1,2-Dichloroethene	ug/kg	45 U	44 U	45 U
cis-1,3-Dichloropropene	ug/kg	45 U	44 U	45 U
Ethylbenzene	ug/kg	45 U	44 U	45 U
Methyl tert butyl ether (MTBE)	ug/kg	230 U	220 U	230 U
PNAs*	ug/kg			
Styrene	ug/kg	45 U	44 U	45 U
Tetrachloroethene	ug/kg	45 U	44 U	45 U
Toluene	ug/kg	90 U	87 U	91 U
trans-1,2-Dichloroethene	ug/kg	45 U	44 U	45 U
trans-1,3-Dichloropropene	ug/kg	45 U	44 U	45 U
Trichloroethene	ug/kg	45 U	44 U	45 U
Vinyl chloride	ug/kg	36 U	35 U	120 ^{bc}
Xylenes (total)	ug/kg	140 U	130 U	140 U
SVOCs*				
2-Methylnaphthalene	ug/kg	--	--	--
Acenaphthene	ug/kg	--	--	--
Anthracene	ug/kg	--	--	--
Benzo(a)anthracene	ug/kg	--	--	--
Benzo(a)pyrene	ug/kg	--	--	--
Benzo(b)fluoranthene	ug/kg	--	--	--
Benzo(g,h,i)perylene	ug/kg	--	--	--
Benzo(k)fluoranthene	ug/kg	--	--	--
Chrysene	ug/kg	--	--	--
Dibenz(a,h)anthracene	ug/kg	--	--	--
Fluoranthene	ug/kg	--	--	--
Fluorene	ug/kg	--	--	--
Indeno(1,2,3-cd)pyrene	ug/kg	--	--	--
Naphthalene	ug/kg	--	--	--
Phenanthrene	ug/kg	--	--	--
Pyrene	ug/kg	--	--	--
Metals*				
Aluminum	ug/kg	--	--	--
Arsenic	ug/kg	--	--	--
Chromium	ug/kg	--	--	--
Copper	ug/kg	--	--	--
Iron	ug/kg	--	--	--
Lead	ug/kg	--	--	--
Manganese	ug/kg	--	--	--
Mercury	ug/kg	--	--	--
Silver	ug/kg	--	--	--
Zinc	ug/kg	--	--	--
PCBs				
Aroclor-1016 (PCB-1016)	ug/kg	--	--	--
Aroclor-1221 (PCB-1221)	ug/kg	--	--	--
Aroclor-1232 (PCB-1232)	ug/kg	--	--	--
Aroclor-1242 (PCB-1242)	ug/kg	--	--	--
Aroclor-1248 (PCB-1248)	ug/kg	--	--	--
Aroclor-1254 (PCB-1254)	ug/kg	--	--	--
Aroclor-1260 (PCB-1260)	ug/kg	--	--	--
Petroleum Hydrocarbons				
Ethylene glycol	ug/kg	--	--	--
Propylene glycol	ug/kg	--	--	--
Notes:				
NA - Criteria not available				
NLL - Not likely to leach				
ID - Insufficient data available to calculate risk based criterion				
U - Not present at or above the associated value.				
J - Indicates an estimated value.				
UB - The analyte / compound was detected in the associated blank.				
(1) Cleanup criteria identified by MDEQ RRD Op Memo No. 1, updated 9/28/2012, pursuant to 1994 PA 451 as amended.				
-- Not analyzed				
ug/kg - microgram per kilogram				
* - Not all VOCs, PNAs or SVOCs shown because results were either ND or not analyzed (--)				

TABLE 2

GROUNDWATER ANALYTICAL RESULTS (2008-2013)																
DUCO STORES																
PCC-WEST																
PONTIAC, MICHIGAN																
Sample Location:	MDEQ Generic Groundwater Cleanup Criteria: Residential and Nonresidential (1)															
Sample Date:	Residential	Non-Residential	Groundwater	Residential Groundwater	Non-Residential	Water	Flammability and	SB-3-08	SB-3-08	SB-4-08	MW34-01	MW34-01	MW34-01	MW34-01	MW34-01	MW34-01
Sample Type:	Drinking Water	Drinking Water	Surface Water	Volatilization to	Groundwater Volatilization	Solubility	Explosivity	07/29/2008	07/29/2008	07/29/2008	08/18/2009	12/01/2009	12/01/2009	12/01/2009	07/18/2013	07/18/2013
Parameters			Interface	Indoor Air Inhalation	to Indoor Air Inhalation		Screening Levels		Duplicate			Duplicate	Duplicate	Duplicate	Duplicate	
Units	a	b	c	d	e	f	g									
VOCs*																
1,2,4-Trimethylbenzene	ug/L	63 E	63 E	17	56000 S	56000 S	55890	56000 S	1.5	0.79 J	17 U	0.41 J	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromoethane (Ethylene dibromide)	ug/L	0.05 A	0.05 A	5.7 X	2400	15000	4200000	ID	1.0 U	1.0 U	17 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	ug/L	600 A	600 A	13	160000 S	160000 S	156000	NA	1.0 U	1.0 U	17 U	--	--	--	1.0 U	1.0 U
1,3,5-Trimethylbenzene	ug/L	72 E	72 E	45	61000 S	61000 S	61150	ID	1.0 U	0.22 J	17 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Benzene	ug/L	5 A	5 A	200 X	5600	35000	1750000	68000	21 ^{ab}	25 ^{ab}	330 J ^{abc}	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	70 A	70 A	620	93000	210000	3500000	530000	1.0 UJ	1.0 UJ	17 UJ	--	--	--	1.0 U	1.0 U
Ethylbenzene	ug/L	74 E	74 E	18	110000	170000 S	169000	43000	2.4 J	2.7 J	27 J ^c	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl benzene	ug/L	800	2300	28	56000 S	56000 S	56000	29000	38 ^c	39 ^c	17 J	--	--	--	1.0 U	1.0 U
Toluene	ug/L	790 E	790 E	270	530000 S	530000 S	526000	61000	0.88 J	1.1	7.4 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	ug/L	2 A	2 A	13 X	1100	13000	2760000	33000	1.0 U	1.0 U	17 UJ	--	--	--	1.0 U	1.0 U
Xylenes (total)	ug/L	280 E	280 E	41	190000 S	190000 S	186000	70000	2.0	2.0	11 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
SVOCs*																
2-Methylnaphthalene	ug/L	260	750	19	25000	25000	24600	ID	20 U	12 U	27 ^c	5.0 U	5.0 U	5.0 U	--	--
Acenaphthene	ug/L	1300	3800	38	4200 S	4200 S	4240	ID	20 U	12 U	1.0 J	5.0 U	5.0 U	5.0 U	--	--
Acenaphthylene	ug/L	52	150	ID	3900 S	3900 S	3930	ID	20 U	12 U	10 U	5.0 U	5.0 U	5.0 U	--	--
Anthracene	ug/L	43 S	43 S	ID	43 S	43 S	43.4	ID	20 U	12 U	10 U	5.0 U	5.0 U	5.0 U	--	--
Benzo(a)anthracene	ug/L	2.1	8.5	ID	NLV	NLV	9.4	ID	4.0 U	2.5 U	2.0 U	1.0 U	1.0 U	1.0 U	--	--
Benzo(a)pyrene	ug/L	5 A	5 A	ID	NLV	NLV	1.62	ID	4.0 U	2.5 U	2.0 U	1.0 U	1.0 U	1.0 U	--	--
Benzo(b)fluoranthene	ug/L	1.5 S,AA	1.5 S,AA	ID	ID	ID	1.5	ID	4.0 U	2.5 U	2.0 U	1.0 U	1.0 U	1.0 U	--	--
Benzo(g,h,i)perylene	ug/L	1 M	1 M	NA	NLV	NLV	0.26	ID	4.0 U	2.5 U	2.0 U	1.0 U	1.0 U	1.0 U	--	--
Benzo(k)fluoranthene	ug/L	1 M	1 M	NA	NLV	NLV	0.8	ID	4.0 U	2.5 U	2.0 U	1.0 U	1.0 U	1.0 U	--	--
Chrysene	ug/L	1.6 S	1.6 S	ID	ID	ID	1.6	ID	4.0 U	2.5 U	2.0 U	1.0 U	1.0 U	1.0 U	--	--
Dibenz(a,h)anthracene	ug/L	2 M	2 M	ID	NLV	NLV	2.49	ID	8.0 U	5.0 U	4.0 U	2.0 U	2.0 U	2.0 U	--	--
Fluoranthene	ug/L	210 S	210 S	1.6	210 S	210 S	206	ID	4.0 U	2.5 U	2.0 U	1.0 U	1.0 U	1.0 U	--	--
Fluorene	ug/L	880	2000 S	12	2000 S	2000 S	1980	ID	20 U	12 U	10 U	5.0 U	5.0 U	5.0 U	--	--
Indeno(1,2,3-cd)pyrene	ug/L	2 M	2 M	ID	NLV	NLV	0.022	ID	8.0 U	5.0 U	4.0 U	2.0 U	2.0 U	2.0 U	--	--
Naphthalene	ug/L	520	1500	11	31000 S	31000 S	31000	NA	1.0 J	0.84 J	44 ^c	5.0 U	5.0 U	5.0 U	--	--
Phenanthrene	ug/L	52	150	2 M	1000 S	1000 S	1000	ID	8.0 U	5.0 U	1.8 J	2.0 U	2.0 U	2.0 U	--	--
Pyrene	ug/L	140 S	140 S	ID	140 S	140 S	135	ID	20 U	12 U	10 U	5.0 U	5.0 U	5.0 U	--	--
Metals																
Lead	ug/L	4 L	4 L	G,X	NLV	NLV	NA	ID	--	--	--	3.0 U	3.0 U	3.0 U	--	--
Petroleum Hydrocarbons																
Ethylene glycol	ug/L	15000	42000	190000 X	NLV	NLV	1000000000	NA	10000 U	10000 U	10000 U	--	--	--	--	--
Propylene glycol	ug/L	150000	420000	290000	NLV	NLV	1000000000	ID	10000 U	10000 U	10000 U	--	--	--	--	--

Notes :
NA - Criteria not available
NLV - Not likely to volatilize

ID - Insufficient data available to calculate risk based criterion
ND () - Not present at or above the associated value.
2.6^{ab} Exceeded Criteria

(1) Cleanup criteria identified by MDEQ RRD Op Memo No. 1, updated 9/28/2012, pursuant to 1994 PA 451 as amended.
-- Not analyzed
* - Not all VOCs, Metals and SVOCs shown because results were either ND or not analyzed (--)
Quals:
J - Indicates an estimated value.
UB - The analyte / compound was detected in the associated blank.

TABLE 2

GROUNDWATER ANALYTICAL RESULTS (2008-2013)
DUCO STORES
PCC-WEST
PONTIAC, MICHIGAN

Sample Location:																		
Sample Date:		MW34-03	MW34-03	MW34-03	MW34-04	MW34-04	MW34-04	MW34-04	MW34-05	MW34-05	MW34-05	MW34-06	MW34-06	MW34-06	MW34-07	MW34-07	MW34-07	MW34-08
Sample Type:		08/18/2009	12/01/2009	07/18/2013	08/19/2009	08/19/2009	12/01/2009	07/18/2013	08/18/2009	11/30/2009	07/18/2013	08/19/2009	12/01/2009	07/18/2013	08/18/2009	11/30/2009	07/18/2013	08/19/2009
Parameters						Duplicate												12/01/2009
	Units																	
VOCs*																		
1,2,4-Trimethylbenzene	ug/L	1.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,2-Dibromoethane (Ethylene dibromide)	ug/L	1.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,2-Dichlorobenzene	ug/L	--	--	1.0 U	--	--	--	1.0 U	--	--	1.0 U	--	--	1.0 U	--	--	1.0 U	--
1,3,5-Trimethylbenzene	ug/L	1.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Benzene	ug/L	1.0 U	1.0 U	1.0 U	2.0 U	0.32 J	1.0 U	0.13 J	1.0 U	1.0 U	0.13 J	2.0 U	1.0 U	0.21 J	1.0 U	1.0 U	1.0 U	2.0 U
cis-1,2-Dichloroethene	ug/L	--	--	1.0 U	--	--	--	1.0 U	--	--	1.0 U	--	--	1.3	--	--	1.0 U	--
Ethylbenzene	ug/L	1.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Isopropyl benzene	ug/L	--	--	1.0 U	--	--	--	0.50 J	--	--	1.0 U	--	--	1.0 U	--	--	1.0 U	--
Toluene	ug/L	1.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Vinyl chloride	ug/L	--	--	1.0 U	--	--	--	1.0 U	--	--	1.0 U	--	--	1.0 U	--	--	1.0 U	--
Xylenes (total)	ug/L	2.0 U	2.0 U	2.0 U	4.0 U	4.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	4.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	4.0 U
SVOCs*																		
2-Methylnaphthalene	ug/L	5.0 U	5.0 U	--	5.0 U	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U
Acenaphthene	ug/L	5.0 U	5.0 U	--	5.0 U	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U
Acenaphthylene	ug/L	5.0 U	5.0 U	--	5.0 U	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U
Anthracene	ug/L	5.0 U	5.0 U	--	5.0 U	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U
Benzo(a)anthracene	ug/L	1.0 U	1.0 U	--	1.0 U	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U
Benzo(a)pyrene	ug/L	1.0 U	1.0 U	--	1.0 U	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U
Benzo(b)fluoranthene	ug/L	1.0 U	1.0 U	--	1.0 U	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U
Benzo(g,h,i)perylene	ug/L	1.0 U	1.0 U	--	1.0 U	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U
Benzo(k)fluoranthene	ug/L	1.0 U	1.0 U	--	1.0 U	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U
Chrysene	ug/L	1.0 U	1.0 U	--	1.0 U	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U
Dibenz(a,h)anthracene	ug/L	2.0 U	2.0 U	--	2.0 U	2.0 U	2.0 U	--	2.0 U	2.0 U	--	2.0 U	2.0 U	--	2.0 U	2.0 U	--	2.0 U
Fluoranthene	ug/L	1.0 U	1.0 U	--	1.0 U	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U	1.0 U	--	1.0 U
Fluorene	ug/L	5.0 U	5.0 U	--	5.0 U	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U
Indeno(1,2,3-cd)pyrene	ug/L	2.0 U	2.0 U	--	2.0 U	2.0 U	2.0 U	--	2.0 U	2.0 U	--	2.0 U	2.0 U	--	2.0 U	2.0 U	--	2.0 U
Naphthalene	ug/L	5.0 U	5.0 U	--	5.0 U	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U
Phenanthrene	ug/L	2.0 U	2.0 U	--	2.0 U	2.0 U	2.0 U	--	2.0 U	2.0 U	--	2.0 U	2.0 U	--	2.0 U	2.0 U	--	2.0 U
Pyrene	ug/L	5.0 U	5.0 U	--	5.0 U	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U	5.0 U	--	5.0 U
Metals																		
Lead	ug/L	3.0 U	3.0 U	--	3.0 U	3.0 U	3.0 U	--	3.0 U	3.0 U	--	3.0 U	3.0 U	--	3.0 U	3.0 U	--	3.0 U
Petroleum Hydrocarbons																		
Ethylene glycol	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Propylene glycol	ug/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes :
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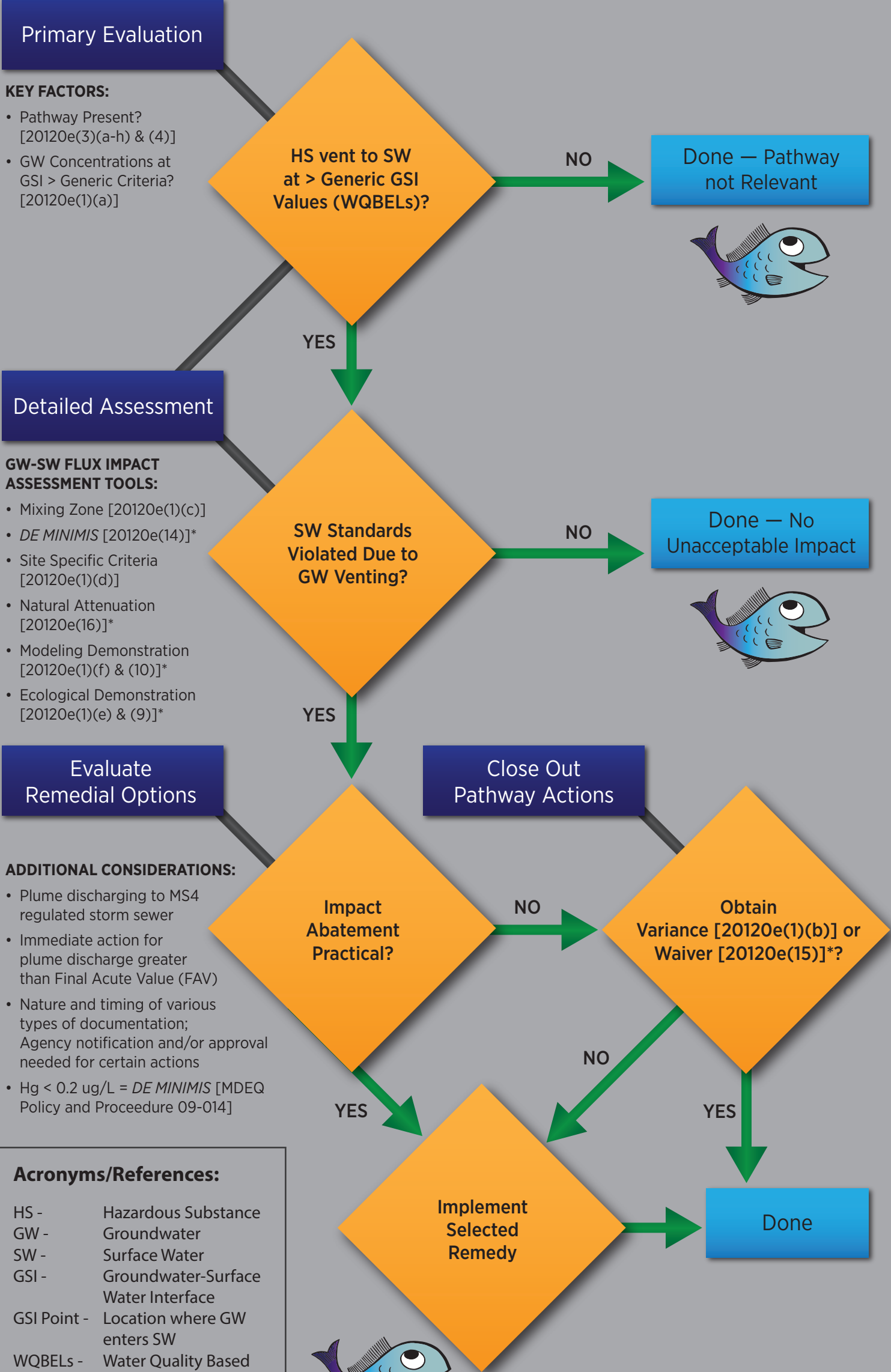
ID - Insufficient data available to calculate risk based criterion
ND () - Not present at or above the associated value.

2.6 ^{ab}	Exceeded Criteria
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⁽¹⁾ Cleanup criteria identified by MDEQ RRD Op Memo No. 1, updated 9/28/2012, pursuant to 1994 PA 451 as amended.
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Quals:
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UB - The analyte / compound was detected in the associated blank.

Addressing Groundwater Impact on Surface Water

Per Part 201 of Michigan Act 451



Acronyms/References:

HS -	Hazardous Substance
GW -	Groundwater
SW -	Surface Water
GSI -	Groundwater-Surface Water Interface
GSI Point -	Location where GW enters SW
WQBELs -	Water Quality Based Effluent Limits

* Tool added by 2012 Amendment



CONESTOGA-ROVERS & ASSOCIATES