

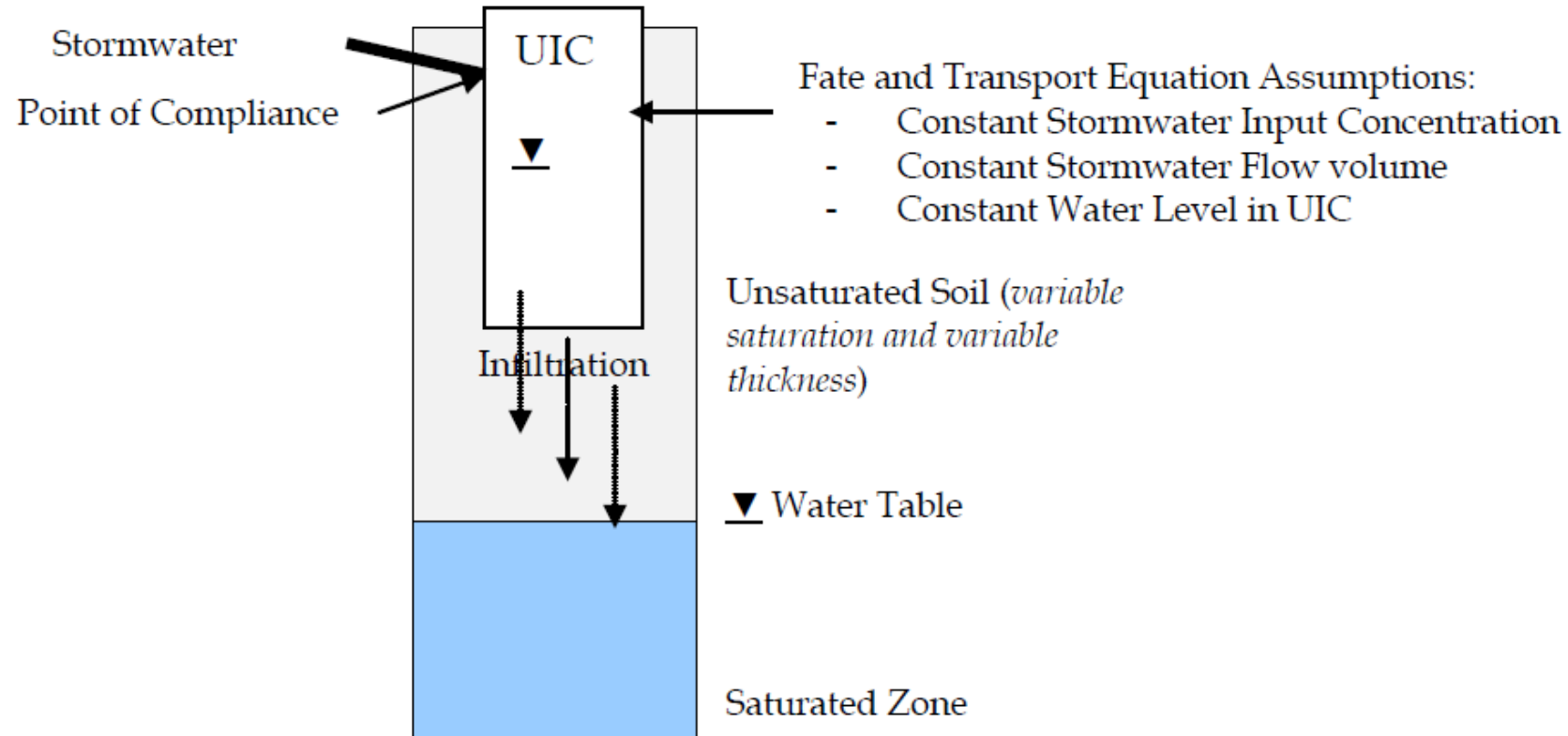
# Pesticides in Gresham's WPCF Permit

Expiration Date: November 30, 2022  
Permit #: WPCF-DOM-UIC-103043  
File Number: 112110  
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<b>Monitoring Parameter</b>	<b>Action Level at Injection Point (µg/L)</b>	
Benzo(a)pyrene	2	
Di(2-ethylhexyl)phthalate	300	
Pentachlorophenol	10	Drinking water MCL = 1 ug/L
Antimony(Total)	60	
Lead (Total)	500	
Zinc (Total)	50,000	
Copper (Total)	1300	
2,4-D	4	Drinking water MCL = 70 ug/L

# Why Action Level not same as MCLs

- Goal = protect groundwater
- Groundwater Protectiveness Demonstration showed some pollutants more mobile in subsurface



# Model input/output

Parameter	Symbol	Units	PAHs	SVOCs		Pesticides/ Herbicides	VOCs	
			Naphthalene	PCP	di-(2-ethylhexyl) phthalate	2,4-D	Toluene	
			Average Scenario	Average Scenario	Average Scenario	Average Scenario	Average Scenario	
<i>UIC Properties</i>	Transport Distance	y	m	3.05	3.05	3.05	3.05	3.05
		y	ft	10.00	10.00	10.00	10.00	10.00
	Proposed EDL	C <sub>0</sub>	mg/L	0.01 <sup>1</sup>	1.00E-02 <sup>1</sup>	6.00E-02 <sup>1</sup>	4.14E-03 <sup>1</sup>	9.64E-03 <sup>1</sup>
	Infiltration Time	t	d	14.24 <sup>2</sup>	14.24 <sup>2</sup>	14.24 <sup>2</sup>	14.24 <sup>2</sup>	14.24 <sup>2</sup>
<i>Chemical Properties</i>	First-Order Rate Constant	k	d <sup>-1</sup>	7.50E-02 <sup>3</sup>	2.21E-02 <sup>4</sup>	1.50E-02 <sup>3</sup>	5.30E-03 <sup>3</sup>	3.30E-01 <sup>3</sup>
	Half-Life	h	d	9.2 <sup>5</sup>	31.4 <sup>5</sup>	46.2 <sup>5</sup>	130.8 <sup>5</sup>	2.1 <sup>5</sup>
<i>Physical and Chemical Soil Properties</i>	Soil Porosity	η	-	0.325 <sup>6</sup>	0.325 <sup>6</sup>	0.325 <sup>6</sup>	0.325 <sup>6</sup>	0.325 <sup>6</sup>
	Soil Bulk density	ρ <sub>b</sub>	g/cm <sup>3</sup>	1.79 <sup>7</sup>	1.79 <sup>7</sup>	1.79 <sup>7</sup>	1.79 <sup>7</sup>	1.79 <sup>7</sup>
	Fraction Organic Carbon	f <sub>oc</sub>	-	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>
	Organic Carbon Partition Coefficient	K <sub>oc</sub>	L/kg	1,300 <sup>9</sup>	822 <sup>10</sup>	12,200 <sup>9</sup>	201 <sup>11</sup>	162 <sup>12</sup>
	Distribution Coefficient	K <sub>d</sub>	L/kg	9.4 <sup>13</sup>	5.9 <sup>13</sup>	87.8 <sup>13</sup>	1.4 <sup>13</sup>	1.2 <sup>13</sup>
	Pore Water Velocity	v	m/d	1.00 <sup>14</sup>	1.00 <sup>14</sup>	1.00 <sup>14</sup>	1.00 <sup>14</sup>	1.00 <sup>14</sup>
<i>Calculations</i>	Retardation Factor	R	-	53	33.6	484	9.0	7.4
	Dispersion Coefficient	D	m <sup>2</sup> /d	1.52E-01	1.52E-01	1.52E-01	1.52E-01	1.52E-01
	B <sub>2</sub>	-	-	8.18E+00	6.83E+00	2.30E+01	4.71E+00	4.76E+00
	e <sup>B<sub>1</sub></sup>	-	-	6.08E+08	5.19E+08	5.08E+08	4.93E+08	1.27E+09
	erfc(B <sub>2</sub> )	-	-	0.00E+00	0.00E+00	0.00E+00	2.61E-11	1.64E-11
	Concentration Immediately Above Water Table	C	mg/L	0.00E+00	1.45E-15	0.00E+00	1.00E-04	5.00E-04
<i>MRL</i>	Concentration	C	mg/L	2.00E-05	4.00E-05	1.00E-03	1.00E-04	5.00E-04
<i>Regulatory Standards</i>	EDLs		mg/L	NA	1.00E-03 <sup>15</sup>	6.00E-03 <sup>15</sup>	7.00E-02 <sup>15</sup>	1.00E+00 <sup>15</sup>

# Key things to note

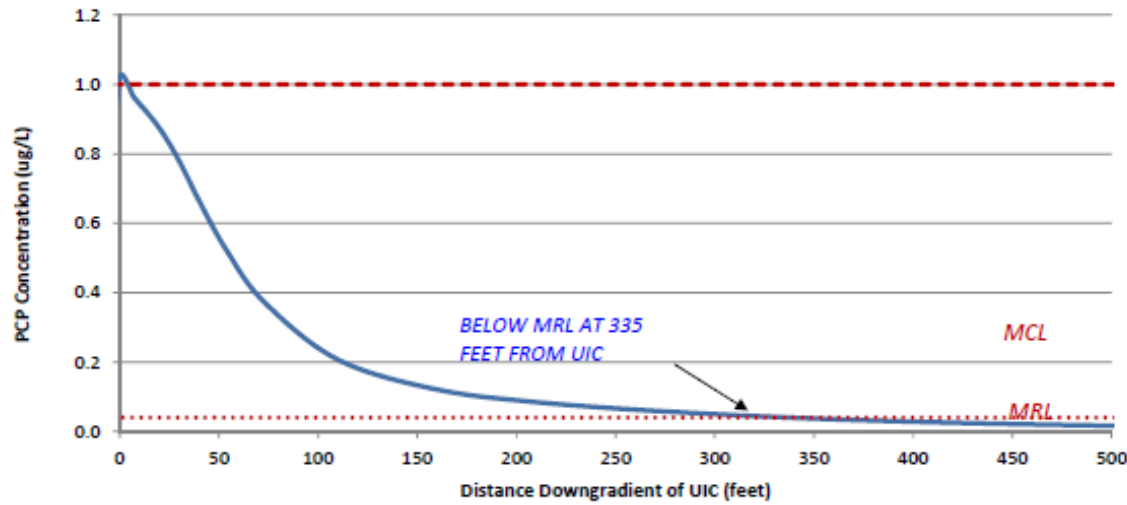
Parameter	Symbol	Units	PAHs	SVOCs			Pesticides/ Herbicides	VOCs
			Naphthalene	PCP	di-(2-ethylhexyl) phthalate	2,4-D	Toluene	
			Average Scenario	Average Scenario	Average Scenario	Average Scenario	Average Scenario	
10' separation distance to GW								
UIC Properties	Transport Distance	y	3.05	3.05	3.05	3.05	3.05	
		y	10.00	10.00	10.00	10.00	10.00	
	Proposed EDL	C <sub>0</sub>	0.01 <sup>1</sup>	1.00E-02 <sup>1</sup>	6.00E-02 <sup>1</sup>	4.14E-03 <sup>1</sup>	9.64E-03 <sup>1</sup>	
	Infiltration Time	t	14.24 <sup>2</sup>	14.24 <sup>2</sup>	14.24 <sup>2</sup>	14.24 <sup>2</sup>	14.24 <sup>2</sup>	
Chemical Properties	First-Order Rate Constant	k	7.50E-02 <sup>3</sup>	2.21E-02 <sup>4</sup>	1.50E-02 <sup>3</sup>	5.30E-03 <sup>3</sup>	3.30E-01 <sup>3</sup>	
	Half-Life	h	9.2 <sup>5</sup>	31.4 <sup>5</sup>	46.2 <sup>5</sup>	130.8 <sup>5</sup>	2.1 <sup>5</sup>	
Physical and Chemical Soil Properties	Soil Porosity	η	0.325 <sup>6</sup>	0.325 <sup>6</sup>	0.325 <sup>6</sup>	0.325 <sup>6</sup>	0.325 <sup>6</sup>	
	Soil Bulk density	ρ <sub>b</sub>	1.79 <sup>7</sup>	1.79 <sup>7</sup>	1.79 <sup>7</sup>	1.79 <sup>7</sup>	1.79 <sup>7</sup>	
	Fraction Organic Carbon	f <sub>oc</sub>	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>	
	Organic Carbon Partition Coefficient	K <sub>oc</sub>	1,300 <sup>9</sup>	822 <sup>10</sup>	12,200 <sup>9</sup>	201 <sup>11</sup>	162 <sup>12</sup>	
	Distribution Coefficient	K <sub>d</sub>	9.4 <sup>13</sup>	5.9 <sup>13</sup>	87.8 <sup>13</sup>	1.4 <sup>13</sup>	1.2 <sup>13</sup>	
	Pore Water Velocity	v	1.00 <sup>14</sup>	1.00 <sup>14</sup>	1.00 <sup>14</sup>	1.00 <sup>14</sup>	1.00 <sup>14</sup>	
Calculations	Retardation Factor	R	53	33.6	484	9.0	7.4	
	Dispersion Coefficient	D	1.52E-01	1.52E-01	1.52E-01	1.52E-01	1.52E-01	
	B <sub>2</sub>	-	8.18E+00	6.83E+00	2.30E+01	4.71E+00	4.78E+00	
	e <sup>B<sub>1</sub></sup>	-	6.08E+08	5.19E+08	5.08E+08	4.93E+08	1.27E+09	
	erfc(B <sub>2</sub> )	-	0.00E+00	0.00E+00	0.00E+00	2.61E-11	1.64E-11	
	Concentration Immediately Above Water Table	C	0.00E+00	1.45E-15	0.00E+00	1.00E-04	5.00E-04	
MRL	Typical MRL	C	2.00E-05	4.00E-05	1.00E-03	1.00E-04	5.00E-04	
Regulatory Standards	EDLs	mg/L	NA	1.00E-03 <sup>15</sup>	6.00E-03 <sup>15</sup>	7.00E-02 <sup>15</sup>	1.00E+00 <sup>15</sup>	

Gresham soil and  
stormwater data

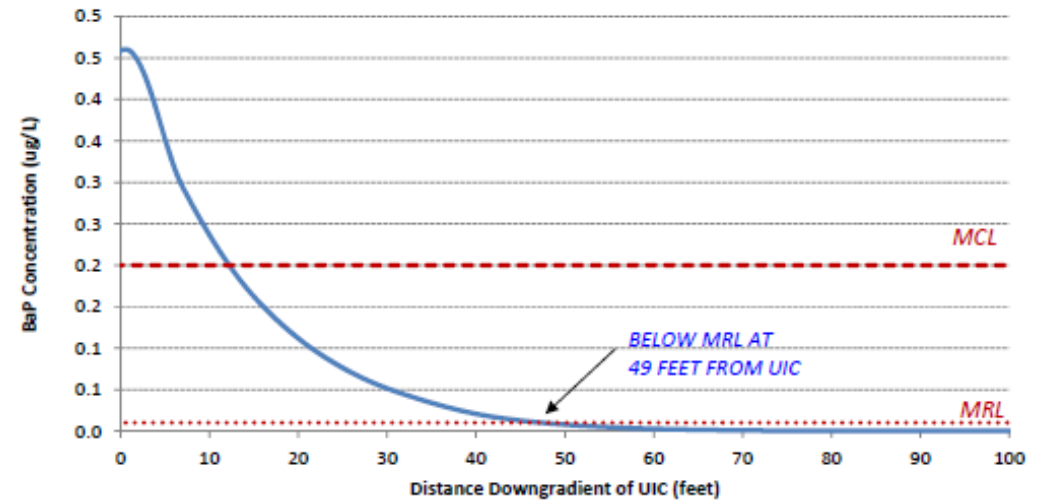
# Why PCP higher and 2,4-D lower

Parameter	Symbol	Units	PAHs	SVOCs			Pesticides/ Herbicides	VOCs
			Naphthalene	PCP	di-(2-ethylhexyl) phthalate	2,4-D	Toluene	
			Average Scenario	Average Scenario	Average Scenario	Average Scenario	Average Scenario	
<b>UIC Properties</b>	Transport Distance	y	m	3.05	3.05	3.05	3.05	3.05
		y	ft	10.00	10.00	10.00	10.00	10.00
	Proposed EDL	C <sub>0</sub>	mg/L	0.01 <sup>1</sup>	1.00E-02 <sup>1</sup>	6.00E-02 <sup>1</sup>	4.14E-03 <sup>1</sup>	9.64E-03 <sup>1</sup>
	Infiltration Time	t	d	14.24 <sup>2</sup>	14.24 <sup>2</sup>	14.24 <sup>2</sup>	14.24 <sup>2</sup>	14.24 <sup>2</sup>
<b>Chemical Properties</b>	First-Order Rate Constant	k	d <sup>-1</sup>	7.50E-02 <sup>4</sup>	Input = 10 ug/L	1.50E-02 <sup>4</sup>	Input = 4.14 ug/L	3.30E-01 <sup>3</sup>
	Half-Life	h	d	9.2 <sup>5</sup>	46.2 <sup>5</sup>	46.2 <sup>5</sup>	2.1 <sup>5</sup>	2.1 <sup>5</sup>
<b>Physical and Chemical Soil Properties</b>	Soil Porosity	η	-	0.325 <sup>6</sup>	0.325 <sup>6</sup>	0.325 <sup>6</sup>	0.325 <sup>6</sup>	0.325 <sup>6</sup>
	Soil Bulk density	ρ <sub>b</sub>	g/cm <sup>3</sup>	1.79 <sup>7</sup>	1.79 <sup>7</sup>	1.79 <sup>7</sup>	1.79 <sup>7</sup>	1.79 <sup>7</sup>
	Fraction Organic Carbon	f <sub>oc</sub>	-	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>	0.0072 <sup>8</sup>
	Organic Carbon Partition Coefficient	K <sub>oc</sub>	L/kg	1,300 <sup>9</sup>	822 <sup>10</sup>	12,200 <sup>9</sup>	201 <sup>11</sup>	162 <sup>12</sup>
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	Pore Water Velocity	v	m/d	1.00 <sup>14</sup>	1.00 <sup>14</sup>	1.00 <sup>14</sup>	1.00 <sup>14</sup>	1.00 <sup>14</sup>
<b>Calculations</b>	Retardation Factor	R	-	53	33.6	484	9.0	7.4
	Dispersion Coefficient	D	m <sup>2</sup> /d	1.52E-01	1.52E-01	1.52E-01	1.52E-01	1.52E-01
	B <sub>2</sub>	-	-	8.18E+00	Output <<< MRL	2.30E+01	Output = MRL	4.76E+00
	e <sup>B<sub>1</sub></sup>	-	-	6.08E+08	6.08E+08	5.08E+08	5.08E+08	1.27E+09
	erfc(B <sub>2</sub> )	-	-	0.00E+00	0.00E+00	0.00E+00	2.61E-11	1.64E-11
Concentration Immediately Above Water Table	C	mg/L	0.00E+00	1.45E-15	0.00E+00	1.00E-04	5.00E-04	
<b>MRL</b>	Concentration	C	mg/L	2.00E-05	4.00E-05	1.00E-03	1.00E-04	5.00E-04
<b>Regulatory Standards</b>	EDLs		mg/L	NA	1.00E-03 <sup>15</sup>	6.00E-03 <sup>15</sup>	7.00E-02 <sup>15</sup>	1.00E+00 <sup>15</sup>

### PCP

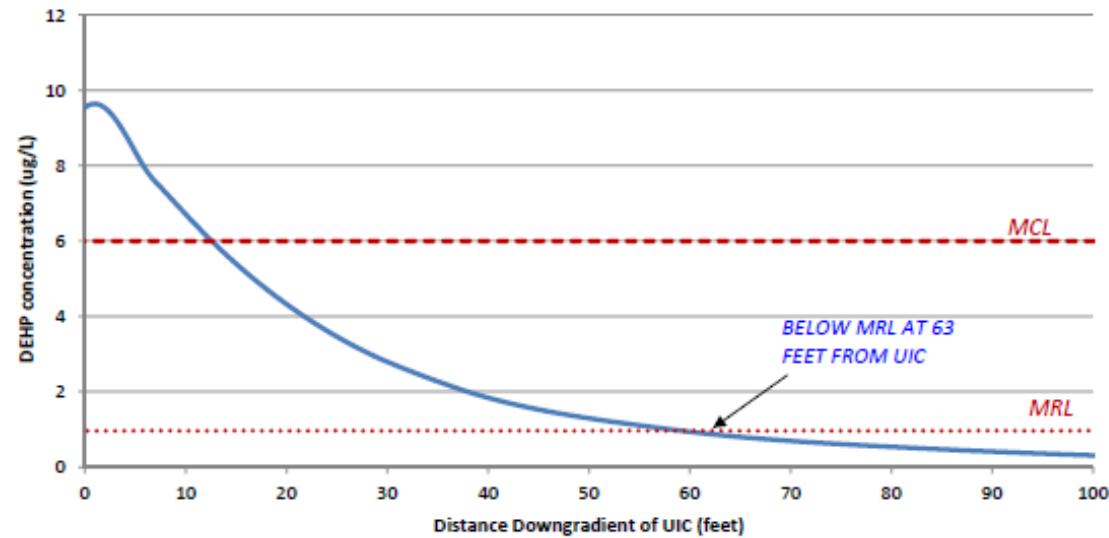


### BaP



Under saturated conditions (no vertical separation), PCP travels furthest before dispersing/attenuating < MRL

### DEHP





# Exceedances

## Pentachlorophenol

- 136 of 154 samples (88%) above detection limits
- 23 of 154 samples (~15%) above MCL for drinking water
  - Up to 9 times higher
- 0 of 154 samples above action level
  - Up to 0.9 of action level



## 2,4-D

- 37 of 96 samples above detection limits
- 0 of 96 samples above MCL
  - Up to 0.5 of MCL
- 3 of 96 samples above action level
  - Up to 8 times higher
- All samples above action level were in late spring
  - In one spring 2016 event, two of four residential samples had 2,4-D detected above action level

