

Human Health PRG Table 1
Surface Soil COCs – Human Health

Gasco and Siltronic GSA(s) Contaminants of Concern	Analyte Group	Units	CAS No.	Gasco GSAs Human Health COCs – Occupational Worker	Gasco GSAs Human Health COCs – Construction Worker	Gasco GSAs Human Health COCs – Outdoor Air Volatilization	Gasco GSAs Human Health COCs – Soil Leaching to Groundwater	Notes	Siltronic GSA Surface Soil COCs – Occupational Worker	Siltronic GSA Surface Soil COCs – Construction Worker	Siltronic GSA Human Health COCs – Outdoor Air Volatilization	Siltronic GSA Human Health COCs – Soil Leaching to Groundwater	Notes
Cyanide, total*	CONV	mg/kg	57-12-5	X	X	o	o	1	o	o	o	o	--
Arsenic	Metals	mg/kg	7440-38-2	X	o	o	o	--	X	o	o	o	--
Lead*	Metals	mg/kg	7439-92-1	o	o	o	X	2	o	o	o	o	--
Thallium*	Metals	mg/kg	7440-28-0	o	X	o	o	--	o	o	o	o	--
1-Methylnaphthalene	PAH	µg/kg	90-12-0	X	X	o	X	--	o	o	o	o	--
2-Methylnaphthalene*	PAH	µg/kg	91-57-6	o	X	o	o	--	o	o	o	o	--
Benz(a)anthracene	PAH	µg/kg	56-55-3	X	X	o	o	3	X	X	o	o	3
Benzo(a)pyrene TEQ	PAH	µg/kg	50-32-8	X	X	o	o	3	X	X	o	o	3
Benzo(b)fluoranthene	PAH	µg/kg	205-99-2	X	X	o	o	3	X	X	o	o	3
Benzo(k)fluoranthene	PAH	µg/kg	207-08-9	X	X	o	o	3	o	o	o	o	--
Chrysene	PAH	µg/kg	218-01-9	X	o	o	o	3	o	o	o	o	--
Dibenz(a,h)anthracene	PAH	µg/kg	53-70-3	X	X	o	o	3	X	X	o	o	3
Indeno(1,2,3-c,d)pyrene	PAH	µg/kg	193-39-5	X	X	o	o	3	X	X	o	o	3
Naphthalene	PAH	µg/kg	91-20-3	X	X	X	X	--	o	o	o	X	--
Benzene	VOC	µg/kg	71-43-2	X	o	o	X	--	o	o	o	o	--
Ethylbenzene	VOC	µg/kg	100-41-4	X	o	o	X	--	o	o	o	o	--
TPH*	TPH	mg/kg	--	X	X	o	o	--	X	X	o	o	--

Notes:

*: Non-cancer COC

--: Not applicable

o: Contaminant analyzed in surface soil and determined to not be a COC.

X: Human health COC for surface soil

1: No PRG required by DEQ for this COC (DEQ 2021).

2: Not a direct contact pathway COC. No PRG required by DEQ for this COC (DEQ 2021).

3: Component of B(a)P TEQ

µg/kg: micrograms per kilogram

B(a)P: benzo(a)pyrene

CAS: Chemical Abstracts Service

COC: contaminant of concern

CONV: conventional

DEQ: Oregon Department of Environmental Quality

GSA: geographic subarea

mg/kg: milligrams per kilogram

PAH: polycyclic aromatic hydrocarbon

PRG: preliminary remediation goal

Siltronic: Siltronic Corporation

TEQ: toxic equivalence quotient

TPH: total petroleum hydrocarbons

VOC: volatile organic compound

Reference:

DEQ (Oregon Department of Environmental Quality), 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit*. December 16, 2021.

Human Health PRG Table 2
Surface Soil PRGs – Human Health

Gasco and Siltronic GSA(s) Contaminants of Concern	Analyte Group	Units	CAS No.	Gasco GSAs Human Health PRGs – Occupational Worker	Gasco GSAs Human Health PRGs – Construction Worker ¹	Siltronic GSA Surface Soil PRGs – Occupational Worker	Siltronic GSA Surface Soil PRGs – Construction Worker ¹	Natural Background	Human Health PRG – Occupational Worker	Human Health PRG – Construction Worker ¹	Notes
Cyanide, total*	CONV	mg/kg	57-12-5	--	--	--	--	--	--	--	2
Arsenic	Metals	mg/kg	7440-38-2	1.9	--	1.9	--	8.8 ³	8.8	--	3
Lead*	Metals	mg/kg	7439-92-1	--	--	--	--	79 ³	--	--	4
Thallium*	Metals	mg/kg	7440-28-0	--	14	--	--	5.2 ³	--	14	--
1-Methylnaphthalene	PAH	µg/kg	90-12-0	77,000	600,000	--	--	--	77,000	600,000	--
2-Methylnaphthalene*	PAH	µg/kg	91-57-6	--	1,000,000	--	--	--	--	1,000,000	--
Benz(a)anthracene	PAH	µg/kg	56-55-3	--	--	--	--	--	--	--	5
Benzo(a)pyrene TEQ	PAH	µg/kg	50-32-8	2,100	17,000	2,100	17,000	--	2,100	17,000	5
Benzo(b)fluoranthene	PAH	µg/kg	205-99-2	--	--	--	--	--	--	--	5
Benzo(k)fluoranthene	PAH	µg/kg	207-08-9	--	--	--	--	--	--	--	5
Chrysene	PAH	µg/kg	218-01-9	--	--	--	--	--	--	--	5
Dibenz(a,h)anthracene	PAH	µg/kg	53-70-3	--	--	--	--	--	--	--	5
Indeno(1,2,3-c,d)pyrene	PAH	µg/kg	193-39-5	--	--	--	--	--	--	--	5
Naphthalene	PAH	µg/kg	91-20-3	23,000	580,000	--	--	--	23,000	580,000	--
Benzene	VOC	µg/kg	71-43-2	37,000	--	--	--	--	37,000	--	--
Ethylbenzene	VOC	µg/kg	100-41-4	150,000	--	--	--	--	150,000	--	--
TPH* (Former Spent Oxide Area RA-1)	TPH	mg/kg	--	2,100	2,400	2,100	2,400	--	2,100	2,400	6
TPH* (Former Lampblack Storage Area RA-2)	TPH	mg/kg	--	12,000	21,000	--	--	--	12,000	21,000	6
TPH* (Former Tar Settling Pond Area RA-3)	TPH	mg/kg	--	9,000	14,000	9,000	14,000	--	9,000	14,000	6
TPH* (Former Koppers Land Disposal Area RA-4)	TPH	mg/kg	--	7,200	10,000	--	--	--	7,200	10,000	6
TPH* (Former Naphthalene Plant Area RA-5)	TPH	mg/kg	--	7,800	9,400	--	--	--	7,800	9,400	6

- Notes:
- *: Non-cancer COC
 - : Not applicable
 - 1: Subchronic toxicity factor was used for the following Construction Worker PRGs: thallium and TPH.
 - 2: No PRG required by DEQ for this COC (DEQ 2021).
 - 3: Oregon DEQ Regional Default Background Concentrations for Metals in Soil; Portland Basin (DEQ 2018).
 - 4: Not a direct contact pathway COC. No PRG required by DEQ for this COC (DEQ 2021).
 - 5: Component of B(a)P TEQ
 - 6: Site-specific TPH RBCs will be applied to Waste Management Areas or designated areas of the Siltronic GSA consistent with the HERA and HERA Addendum as discussed at the February 8, 2023 meeting with DEQ.

µg/kg: micrograms per kilogram
 mg/kg: milligrams per kilogram
 B(a)P: benzo(a)pyrene
 PAH: polycyclic aromatic hydrocarbon
 CAS: Chemical Abstracts Service
 PRG: preliminary remediation goal
 COC: contaminant of concern
 RBC: risk-based concentration
 CONV: conventional
 Siltronic: Siltronic Corporation
 DEQ: Oregon Department of Environmental Quality
 TEQ: toxic equivalence quotient
 GSA: geographic subarea
 TPH: total petroleum hydrocarbons
 HERA: human health and ecological risk assessment
 VOC: volatile organic compound

References:

DEQ (Oregon Department of Environmental Quality), 2018. *Background Levels of Metals in Soils for Cleanups; Fact Sheet*. 2018 Update.

DEQ, 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit*. December 16, 2021.

Human Health PRG Table 3

Subsurface Soil COCs – Human Health

Gasco and Siltronic GSA(s) Contaminants of Concern	Analyte Group	Units	CAS No.	Gasco GSAs Human Health COCs – Construction Worker	Gasco GSAs Human Health COCs – Excavation Worker	Gasco GSAs Human Health COCs – Outdoor Air Volatilization	Gasco GSAs Human Health COCs – Indoor Air Vapor Intrusion	Gasco GSAs Human Health COCs – Soil Leaching to Groundwater	Notes	Siltronic GSA Subsurface Soil COCs – Construction Worker	Siltronic GSA Subsurface Soil COCs – Excavation Worker	Siltronic GSA Subsurface Soil COCs – Outdoor Air Volatilization	Siltronic GSA Subsurface Soil COCs – Indoor Air Vapor Intrusion	Siltronic GSA Human Health COCs – Soil Leaching to Groundwater	Notes
Cyanide, total*	CONV	mg/kg	57-12-5	X	X	o	o	o	1	X	o	o	o	o	1
Arsenic	Metals	mg/kg	7440-38-2	o	o	o	o	o	--	X	o	o	o	o	--
Lead*	Metals	mg/kg	7439-92-1	o	o	o	o	X	--	X	X	o	o	o	--
Thallium*	Metals	mg/kg	7440-28-0	X	o	o	o	o	--	o	o	o	o	o	--
1-Methylnaphthalene	PAH	µg/kg	90-12-0	X	o	o	o	X	--	o	o	o	o	X	--
2-Methylnaphthalene*	PAH	µg/kg	91-57-6	X	o	o	o	o	--	o	o	o	o	o	--
Benz(a)anthracene	PAH	µg/kg	56-55-3	X	X	o	o	o	2	X	X	o	o	o	2
Benzo(a)pyrene TEQ	PAH	µg/kg	50-32-8	X	X	o	o	o	2	X	X	o	o	o	2
Benzo(b)fluoranthene	PAH	µg/kg	205-99-2	X	X	o	o	o	2	X	X	o	o	o	2
Benzo(k)fluoranthene	PAH	µg/kg	207-08-9	X	o	o	o	o	2	X	o	o	o	o	2
Dibenz(a,h)anthracene	PAH	µg/kg	53-70-3	X	X	o	o	o	2	X	X	o	o	o	2
Indeno(1,2,3-c,d)pyrene	PAH	µg/kg	193-39-5	X	X	o	o	o	2	X	X	o	o	o	2
Naphthalene	PAH	µg/kg	91-20-3	X	o	X	X	X	--	X	o	X	X	o	--
1,2-Dichloroethane	VOC	µg/kg	107-06-2	o	o	o	o	o	--	o	o	o	X	X	3
Benzene	VOC	µg/kg	71-43-2	o	o	o	X	X	3	o	o	X	X	X	3
Ethylbenzene	VOC	µg/kg	100-41-4	o	o	o	X	X	3	o	o	o	X	X	3
TPH*	TPH	mg/kg	--	X	X	o	X	o	--	X	o	o	o	o	--

Notes:

*: Non-cancer COC

--: Not applicable

o: Contaminant analyzed in subsurface soil and determined to not be a COC.

X: Human health COC for subsurface soil

1: No PRG required by DEQ for this COC (DEQ 2021).

2: Component of B(a)P TEQ

3: Not a direct contact pathway COC. No PRG required by DEQ for this COC (DEQ 2021).

µg/kg: micrograms per kilogram

B(a)P: benzo(a)pyrene

CAS: Chemical Abstracts Service

COC: contaminant of concern

CONV: conventional

DEQ: Oregon Department of Environmental Quality

GSA: geographic subarea

mg/kg: milligrams per kilogram

PAH: polycyclic aromatic hydrocarbon

PRG: preliminary remediation goal

Siltronic: Siltronic Corporation

TEQ: toxic equivalence quotient

TPH: total petroleum hydrocarbons

VOC: volatile organic compound

Reference:

DEQ (Oregon Department of Environmental Quality), 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit*. December 16, 2021.

Human Health PRG Table 4

Subsurface Soil PRGs – Human Health

Gasco and Siltronic GSA(s) Contaminants of Concern	Analyte Group	Units	CAS No.	Gasco GSAs Human Health PRGs – Construction Worker ¹	Gasco GSAs Human Health PRGs – Excavation Worker ¹	Siltronic GSA Subsurface Soil PRGs – Construction Worker ¹	Siltronic GSA Subsurface Soil PRGs – Excavation Worker ¹	Natural Background	Human Health PRG – Construction Worker ¹	Human Health PRG – Excavation Worker ¹	Notes
Cyanide, total*	CONV	mg/kg	57-12-5	--	--	--	--	--	--	--	2
Arsenic	Metals	mg/kg	7440-38-2	--	--	15	--	8.8 ³	15	--	--
Lead*	Metals	mg/kg	7439-92-1	--	--	800	800	79 ³	800	800	--
Thallium*	Metals	mg/kg	7440-28-0	14	--	--	--	5.2 ³	14	--	--
1-Methylnaphthalene	PAH	µg/kg	90-12-0	600,000	--	--	--	--	600,000	--	--
2-Methylnaphthalene*	PAH	µg/kg	91-57-6	1,000,000	--	--	--	--	1,000,000	--	--
Benz(a)anthracene	PAH	µg/kg	56-55-3	--	--	--	--	--	--	--	4
Benzo(a)pyrene TEQ	PAH	µg/kg	50-32-8	17,000	490,000	17,000	490,000	--	17,000	490,000	4
Benzo(b)fluoranthene	PAH	µg/kg	205-99-2	--	--	--	--	--	--	--	4
Benzo(k)fluoranthene	PAH	µg/kg	207-08-9	--	--	--	--	--	--	--	4
Dibenz(a,h)anthracene	PAH	µg/kg	53-70-3	--	--	--	--	--	--	--	4
Indeno(1,2,3-c,d)pyrene	PAH	µg/kg	193-39-5	--	--	--	--	--	--	--	4
Naphthalene	PAH	µg/kg	91-20-3	580,000	--	580,000	--	--	580,000	--	--
1,2-Dichloroethane	VOC	µg/kg	107-06-2	--	--	--	--	--	--	--	5
Benzene	VOC	µg/kg	71-43-2	--	--	--	--	--	--	--	5
Ethylbenzene	VOC	µg/kg	100-41-4	--	--	--	--	--	--	--	5
TPH* (Former Spent Oxide Area RA-1)	TPH	mg/kg	--	2,400	>Max	2,400	>Max	--	2,400	>Max	6
TPH* (Former Lampblack Storage Area RA-2)	TPH	mg/kg	--	21,000	>Max	--	--	--	21,000	>Max	6
TPH* (Former Tar Settling Pond Area RA-3)	TPH	mg/kg	--	14,000	>Max	14,000	>Max	--	14,000	>Max	6
TPH* (Former Koppers Land Disposal Area RA-4)	TPH	mg/kg	--	10,000	>Max	--	--	--	10,000	>Max	6
TPH* (Former Naphthalene Plant Area RA-5)	TPH	mg/kg	--	9,400	>Max	--	--	--	9,400	>Max	6

Notes:

*: Non-cancer COC

--: Not applicable

>Max: The constituent RBC for this pathway is greater than 100,000 mg/kg. The TPH RBC is greater than the maximum amount that would be present if all of the initial air space is filled with petroleum product. DEQ believes it is highly unlikely that such concentrations will ever be encountered.

1: Subchronic toxicity factors were used for the following PRGs: thallium and TPH.

2: No PRG required by DEQ for this COC (DEQ 2021).

3: Oregon DEQ Regional Default Background Concentrations for Metals in Soil; Portland Basin (DEQ 2018).

4: Component of B(a)P TEQ

5: Not a direct contact pathway COC. No PRG required by DEQ for this COC (DEQ 2021).

6: Site-specific TPH RBCs will be applied to Waste Management Areas or designated areas of the Siltronic GSA consistent with the HERA and HERA Addendum as discussed at the February 8, 2023 meeting with DEQ.

µg/kg: micrograms per kilogram

mg/kg: milligrams per kilogram

B(a)P: benzo(a)pyrene

PAH: polycyclic aromatic hydrocarbon

CAS: Chemical Abstracts Service

PRG: preliminary remediation goal

COC: contaminant of concern

RBC: risk-based concentration

CONV: conventional

Siltronic: Siltronic Corporation

DEQ: Oregon Department of Environmental Quality

TEQ: toxic equivalence quotient

GSA: geographic subarea

TPH: total petroleum hydrocarbons

HERA: human health and ecological risk assessment

VOC: volatile organic compound

References:

DEQ (Oregon Department of Environmental Quality), 2018. *Background Levels of Metals in Soils for Cleanups; Fact Sheet*. 2018 Update.

DEQ, 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit*. December 16, 2021.

Human Health PRG Table 5
Fill WBZ COCs – Human Health

Gasco and Siltronic GSA(s) Contaminants of Concern	Analyte Group	Units	CAS No.	Gasco GSAs Human Health COCs – Construction / Excavation Worker	Gasco GSAs Human Health COCs – Volatilization to Outdoor Air	Gasco GSAs Human Health COCs – Indoor Air Vapor Intrusion	Notes	Siltronic GSA COCs – Construction / Excavation Worker	Siltronic GSA COCs – Volatilization to Outdoor Air	Siltronic GSA COCs – Indoor Air Vapor Intrusion	Notes
Cyanide, total*	CONV	mg/L	57-12-5	o	o	o	--	X	o	o	--
1-Methylnaphthalene	PAH	µg/L	90-12-0	X	o	o	--	o	o	o	--
2-Methylnaphthalene*	PAH	µg/L	91-57-6	X	o	o	--	o	o	o	--
Benz(a)anthracene	PAH	µg/L	56-55-3	X	o	o	1	X	o	o	1
Benzo(a)pyrene TEQ	PAH	µg/L	50-32-8	X	o	o	1	X	o	o	1
Dibenz(a,h)anthracene	PAH	µg/L	53-70-3	X	o	o	1	X	o	o	1
Naphthalene	PAH	µg/L	91-20-3	X	X	X	--	X	o	X	--
Carbazole*	SVOC	µg/L	86-74-8	X	o	o	--	o	o	o	--
Dibenzofuran*	SVOC	µg/L	132-64-9	X	o	o	--	o	o	o	--
Benzene	VOC	µg/L	71-43-2	X	X	X	--	X	o	X	--
Trichloroethene (TCE)	VOC	µg/L	79-01-6	o	o	o	--	X	o	X	--

Notes:

*: Non-cancer COC

--: Not applicable

o: Contaminant analyzed in Fill WBZ groundwater and determined to not be a COC.

X: Human health COC for Fill WBZ Groundwater.

1: Component of B(a)P TEQ.

µg/L: micrograms per liter

B(a)P: benzo(a)pyrene

CAS: Chemical Abstracts Service

COC: contaminant of concern

CONV: conventional

GSA: geographic subarea

mg/L: milligrams per liter

PAH: polycyclic aromatic hydrocarbon

PRG: preliminary remediation goal

Siltronic: Siltronic Corporation

SVOC: semivolatile organic compound

TCE: trichloroethene

TEQ: toxic equivalence quotient

VOC: volatile organic compound

WBZ: water-bearing zone

Human Health PRG Table 6
Fill WBZ PRGs – Human Health

Gasco and Siltronic GSA(s) Contaminants of Concern	Analyte Group	Units	CAS No.	Gasco GSAs Human Health PRGs – Construction / Excavation Worker ¹	Siltronic GSA PRGs – Construction / Excavation Worker ¹	Human Health PRG – Construction / Excavation Worker ¹	Notes
Cyanide, total*	CONV	mg/L	57-12-5	--	0.19	0.19	--
Cyanide, available*	CONV	mg/L	CYANAVAIL	--	0.19	0.19	--
Cyanide, free*	CONV	mg/L	CYANFREE	--	0.19	0.19	--
1-Methylnaphthalene	PAH	µg/L	90-12-0	2,200	--	2,200	--
2-Methylnaphthalene*	PAH	µg/L	91-57-6	3,600	--	3,600	--
Benz(a)anthracene	PAH	µg/L	56-55-3	--	--	--	2
Benzo(a)pyrene TEQ	PAH	µg/L	50-32-8	>S	>S	>S	2
Dibenz(a,h)anthracene	PAH	µg/L	53-70-3	--	--	--	2
Naphthalene	PAH	µg/L	91-20-3	500	500	500	--
Carbazole*	SVOC	µg/L	86-74-8	>S	--	>S	--
Dibenzofuran*	SVOC	µg/L	132-64-9	2,900	--	2,900	--
Benzene	VOC	µg/L	71-43-2	1,800	1,800	1,800	--
Trichloroethene (TCE)	VOC	µg/L	79-01-6	--	430	430	--
TPH* (Former Spent Oxide Area RA-1)	TPH	mg/L	--	820	820	820	3
TPH* (Former Lampblack Storage Area RA-2)	TPH	mg/L	--	1,700		1,700	3
TPH* (Former Tar Settling Pond Area RA-3)	TPH	mg/L	--	1,500	1,500	1,500	3
TPH* (Former Koppers Land Disposal Area RA-4)	TPH	mg/L	--	2,500		2,500	3
TPH* (Former Naphthalene Plant Area RA-5)	TPH	mg/L	--	12,000		12,000	3

Notes:
 *: Non-cancer COC
 --: Not applicable
 1: Subchronic toxicity factors were used for the following PRGs: carbazole, dibenzofuran, and TPH.
 2: Component of B(a)P TEQ
 3: Site-specific TPH RBCs will be applied to Waste Management Areas or designated areas of the Siltronic GSA consistent with the HERA and HERA Addendum as discussed at the February 8, 2023 meeting with DEQ.

µg/L: micrograms per liter
 B(a)P: benzo(a)pyrene
 CAS: Chemical Abstracts Service
 COC: contaminant of concern
 CONV: conventional
 GSA: geographic subarea
 mg/L: milligrams per liter
 PAH: polycyclic aromatic hydrocarbon
 PRG: preliminary remediation goal
 RA: risk area
 RBC: risk-based concentration
 Siltronic: Siltronic Corporation
 SVOC: semivolatile organic compound
 TCE: trichloroethene
 TEQ: toxic equivalence quotient
 TPH: total petroleum hydrocarbons
 VOC: volatile organic compound
 WBZ: water-bearing zone

Human Health PRG Table 7
Alluvium WBZ COCs – Human Health

Contaminants of Concern	Analyte Group	Units	CAS No.	Gasco GSAs Human Health Uplands COCs – Occupational Use	Notes	Siltronic GSA COCs – Occupational Use	Notes
Cyanide, total*	CONV	mg/L	57-12-5	X	--	X	--
Cyanide, available*	CONV	mg/L	CYANAVAIL	X	--	X	--
Cyanide, free*	CONV	mg/L	CYANFREE	X	--	X	--
Phosphorus*	CONV	mg/L	7723-14-0	^	--	X	1
Thiocyanate*	CONV	mg/L	302-04-5	X	2	^	--
Total Dioxin/Furan TEQ	DIOXFUR	ng/L	tDioxFurM_LNQ	^	--	X	3
Antimony*	Metals	µg/L	7440-36-0	X	2	o	--
Arsenic	Metals	µg/L	7440-38-2	X	--	o	--
Barium*	Metals	µg/L	7440-39-3	X	2	o	--
Lead*	Metals	µg/L	7439-92-1	X	2	o	--
Manganese*	Metals	µg/L	7439-96-5	X	--	o	--
Thallium*	Metals	µg/L	7440-28-0	X	2	o	--
1-Methylnaphthalene	PAH	µg/L	90-12-0	X	--	X	--
2-Methylnaphthalene*	PAH	µg/L	91-57-6	X	--	o	--
Benz(a)anthracene	PAH	µg/L	56-55-3	X	--	o	--
Benzo(a)pyrene	PAH	µg/L	50-32-8	X	2	o	--
Benzo(b)fluoranthene	PAH	µg/L	205-99-2	X	2	o	--
Dibenz(a,h)anthracene	PAH	µg/L	53-70-3	X	2	o	--
Naphthalene	PAH	µg/L	91-20-3	X	--	X	--
Carbazole*	SVOC	µg/L	86-74-8	X	--	o	--
Dibenzofuran*	SVOC	µg/L	132-64-9	X	--	o	--
Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)*	SVOC	µg/L	534-52-1	X	2	o	--
Hexachlorobutadiene(Hexachloro-1,3-butadiene)	SVOC	µg/L	87-68-3	o	--	X	--
Pentachlorophenol	SVOC	µg/L	87-86-5	X	--	o	--
1,1,1,2-Tetrachloroethane	VOC	µg/L	630-20-6	o	--	X	--
1,1,2-Trichloroethane	VOC	µg/L	79-00-5	o	--	X	--
1,2,3-Trichloropropane	VOC	µg/L	96-18-4	o	--	X	--
1,2,4-Trimethylbenzene*	VOC	µg/L	95-63-6	X	2	o	--
1,2-Dibromo-3-chloropropane	VOC	µg/L	96-12-8	o	--	X	--
1,2-Dichloroethane	VOC	µg/L	107-06-2	o	--	X	--
1,2-Dichloroethene, cis-*	VOC	µg/L	156-59-2	X	2	X	--
1,2-Dichloropropane	VOC	µg/L	78-87-5	o	--	X	--
1,4-Dichlorobenzene	VOC	µg/L	106-46-7	o	--	X	--
Acrylonitrile*	VOC	µg/L	107-13-1	X	--	o	--
Benzene	VOC	µg/L	71-43-2	X	--	X	--
Bromoform (Tribromomethane)	VOC	µg/L	75-25-2	o	--	X	--
Carbon tetrachloride (Tetrachloromethane)	VOC	µg/L	56-23-5	o	--	X	--
Chloroform	VOC	µg/L	67-66-3	o	--	X	--
Dichloromethane (Methylene chloride)	VOC	µg/L	75-09-2	X	2	o	--
Ethylbenzene	VOC	µg/L	100-41-4	X	--	X	--
Trichloroethene (TCE)	VOC	µg/L	79-01-6	o	--	X	--
Vinyl chloride	VOC	µg/L	75-01-4	X	--	X	--
Total Xylene	VOC	µg/L	1330-20-7	X	--	o	--

Notes:

*: Non-cancer COC

--: Not applicable

^: Contaminant not analyzed in Alluvium WBZ groundwater.

o: Contaminant analyzed in Alluvium WBZ groundwater and determined to not be a COC.

X: Human health COC for Alluvium WBZ groundwater

1: No further consideration of phosphorus is necessary in Gasco OU FS (DEQ 2021).

2: These COIs were identified as COCs in the HERA (Anchor QEA 2014) based on the occupational worker exposure to Alluvium WBZ groundwater RBCs for the ingestion and inhalation exposure pathways. These COIs are not COCs based on the Alluvium WBZ groundwater occupational worker scenario RBCs for the HERA Addendum and FS based on the dermal and inhalation exposure pathways as discussed at the February 8, 2023, meeting with DEQ.

3: DEQ considers dioxins/furans in the lower and deep lower alluvium to be attributable to off-site sources and are not a COC for the Gasco OU (DEQ 2021).

µg/L: micrograms per liter

B(a)P: benzo(a)pyrene

CAS: Chemical Abstracts Service

COC: contaminant of concern

COI: contaminant of interest

CONV: conventional

DIOXFUR: dioxins/furans

GSA: geographic subarea

HERA: human health and ecological risk assessment

mg/L: milligrams per liter

ng/L: nanogram per liter

OU: operable unit

PAH: polycyclic aromatic hydrocarbon

PRG: preliminary remediation goal

RBC: risk-based concentration

Siltronic: Siltronic Corporation

SVOC: semivolatle organic compound

TCE: trichloroethene

TEQ: toxic equivalence quotient

VOC: volatile organic compound

WBZ: water-bearing zone

References:

Anchor QEA (Anchor QEA, LLC), 2014. *Human Health and Ecological Risk Assessment Report*. NW Natural Gasco Site. December 2014.

DEQ (Oregon Department of Environmental Quality), 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit*. December 16, 2021.

Human Health PRG Table 8
Alluvium WBZ PRGs – Human Health

Contaminants of Concern	Analyte Group	Units	CAS No.	Gasco GSAs Human Health Alluvium WBZ PRGs – Occupational Use ¹	Siltronic GSA Human Health Alluvium WBZ PRGs – Occupational Use ¹	Human Health Alluvium WBZ PRGs – Occupational Use ¹	Notes
Cyanide, total*	CONV	mg/L	57-12-5	0.00701	0.00701	0.00701	--
Cyanide, available*	CONV	mg/L	CYANAVAIL	0.00701	0.00701	0.00701	--
Cyanide, free*	CONV	mg/L	CYANFREE	0.00701	0.00701	0.00701	--
Phosphorus*	CONV	mg/L	7723-14-0	--	--	--	2
Thiocyanate*	CONV.	mg/L	302-04-5	--	--	--	3
Total Dioxin/Furan TEQ	DIOXFUR	ng/L	tDioxFurM_LNQ	--	--	--	4
Antimony*	Metals	µg/L	7440-36-0	--	--	--	3
Arsenic	Metals	µg/L	7440-38-2	107	--	107	--
Barium*	Metals	µg/L	7440-39-3	--	--	--	3
Lead*	Metals	µg/L	7439-92-1	--	--	--	3
Manganese*	Metals	µg/L	7439-96-5	54,800	--	54,800	--
Thallium*	Metals	µg/L	7440-28-0	--	--	--	3
1-Methylnaphthalene	PAH	µg/L	90-12-0	20.1	20.1	20.1	--
2-Methylnaphthalene*	PAH	µg/L	91-57-6	846	--	846	--
Benz(a)anthracene	PAH	µg/L	56-55-3	0.409	--	0.409	5
Benzo(a)pyrene	PAH	µg/L	50-32-8	--	--	--	3
Benzo(b)fluoranthene	PAH	µg/L	205-99-2	--	--	--	3
Dibenz(a,h)anthracene	PAH	µg/L	53-70-3	--	--	--	3
Naphthalene	PAH	µg/L	91-20-3	0.721	0.721	0.721	--
Carbazole*	SVOC	µg/L	86-74-8	308	--	308	--
Dibenzofuran*	SVOC	µg/L	132-64-9	168	--	168	--
Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)*	SVOC	µg/L	534-52-1	--	--	--	3
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	SVOC	µg/L	87-68-3	--	0.891	0.891	--
Pentachlorophenol	SVOC	µg/L	87-86-5	0.534	--	0.534	--
1,1,1,2-Tetrachloroethane	VOC	µg/L	630-20-6	--	3.22	3.22	--
1,1,2-Trichloroethane	VOC	µg/L	79-00-5	--	1.52	1.52	--
1,2,3-Trichloropropane	VOC	µg/L	96-18-4	--	0.233	0.233	--
1,2,4-Trimethylbenzene*	VOC	µg/L	95-63-6	--	--	--	3
1,2-Dibromo-3-chloropropane	VOC	µg/L	96-12-8	--	0.00408	0.00408	--
1,2-Dichloroethane	VOC	µg/L	107-06-2	--	0.939	0.939	--
1,2-Dichloroethene, cis-*	VOC	µg/L	156-59-2	--	4,720	4,720	--
1,2-Dichloropropane	VOC	µg/L	78-87-5	--	6.45	6.45	--
1,4-Dichlorobenzene	VOC	µg/L	106-46-7	--	2.21	2.21	--
Acrylonitrile*	VOC	µg/L	107-13-1	0.36	--	0.36	--
Benzene	VOC	µg/L	71-43-2	3.05	3.05	3.05	--
Bromoform (Tribromomethane)	VOC	µg/L	75-25-2	--	22	22	--
Carbon tetrachloride (Tetrachloromethane)	VOC	µg/L	56-23-5	--	3.74	3.74	--
Chloroform	VOC	µg/L	67-66-3	--	1.06	1.06	--
Dichloromethane (Methylene chloride)	VOC	µg/L	75-09-2	--	--	--	3
Ethylbenzene	VOC	µg/L	100-41-4	9.1	9.1	9.1	--
Trichloroethene (TCE)	VOC	µg/L	79-01-6	--	5.67	5.67	--
Vinyl chloride	VOC	µg/L	75-01-4	0.409	0.409	0.409	--
Total Xylene	BTEX	µg/L	1330-20-7	868	--	868	--
TPH*	TPH	mg/L	--	0.03	0.03	0.03	6

Notes:

*: Non-cancer COC

--: Not applicable

1: The HH Occupational Worker Alluvium WBZ PRGs apply to the Lower Alluvium and Deep Lower Alluvium WBZs.

2: No further consideration of phosphorus is necessary in Gasco OU FS (DEQ 2021a).

3: These COIs were identified as COCs in the HERA (Anchor QEA 2014) based on the occupational worker exposure to Alluvium WBZ groundwater RBCs for the ingestion and inhalation exposure pathways. These COIs are not COCs based on the Alluvium WBZ groundwater occupational worker scenario RBCs for the HERA Addendum and FS based on the dermal and inhalation exposure pathways as discussed at the February 8, 2023 meeting with DEQ.

4: DEQ considers dioxins/furans in the lower and deep lower alluvium to be attributable to off-site sources and are not a COC for the Gasco OU (DEQ 2021a).

5: Benz(a)anthracene is the only carcinogenic PAH for which an Alluvium WBZ screening level could be calculated for. No benzo(a)pyrene (B[a]P equivalents) aggregate chemical class screening level is available.

6: DEQ TPH RBC for Former Spent Oxide Area RA-1 (DEQ 2021b)

µg/L: micrograms per liter

B(a)P: benzo(a)pyrene

CAS: Chemical Abstracts Service

COC: contaminant of concern

COI: contaminant of interest

CONV: conventional

DEQ: Oregon Department of Environmental Quality

DIOXFUR: dioxins/furans

FS: feasibility study

GSA: geographic subarea

HERA: human health and ecological risk assessment

mg/L: milligrams per liter

ng/L: nanogram per liter

OU: operable unit

PAH: polycyclic aromatic hydrocarbon

PRG: preliminary remediation goal

RA: risk area

RBC: risk-based concentration

Siltronic: Siltronic Corporation

SVOC: semivolatiles organic compound

TCE: trichloroethene

TEQ: toxic equivalence quotient

VOC: volatile organic compound

WBZ: water-bearing zone

References:

Anchor QEA (Anchor QEA, LLC), 2014. *Human Health and Ecological Risk Assessment Report*. NW Natural Gasco Site. December 2014.

DEQ (Oregon Department of Environmental Quality), 2021a. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit*. December 16, 2021.



DEQ, 2021b. *Derivation of Risk-Based Concentrations for Total Petroleum Hydrocarbons; Former Gasco Manufacturing Gas Plant Operable Unit*. November 4, 2021.

Human Health PRG Table 9
Gasco OU Soil Background Evaluation

Chemical Name	CAS RN	Units	Portland Basin Background Value ¹	Natural Background	Gasco GSAs Surface and Subsurface Soil				Siltronic GSA Surface and Subsurface Soil (Excluding Doane Creek)				Doane Creek Soil and Sediment (All Depths)			
					Maximum Detected Result	Maximum Detected Result Less than Background Value?	Total Number of Detected Results	% of Detected Results > Background	Maximum Detected Result	Maximum Detected Result Less than Background Value?	Total Number of Detected Results	% of Detected Results > Background	Maximum Detected Result	Maximum Detected Result Less than Background Value?	Total Number of Detected Results	% of Detected Results > Background
Aluminum	7429-90-5	mg/kg	--	52,300 ²	25,400	Yes	129	0%	43,000	Yes	89	0%	24,000	Yes	28	0%
Antimony	7440-36-0	mg/kg	0.56	--	28.9	No	46	91%	11.8	No	53	45%	3.29	No	1	100%
Arsenic	7440-38-2	mg/kg	8.8	--	30	No	215	7%	103	No	104	2%	16.1	No	26	54%
Barium	7440-39-3	mg/kg	790	--	401	Yes	149	0%	312	Yes	58	0%	224	Yes	19	0%
Beryllium	7440-41-7	mg/kg	2.0	--	0.537	Yes	4	0%	1.71	Yes	46	0%	0.983	Yes	18	0%
Cadmium	7440-43-9	mg/kg	0.63	--	46.5	No	126	15%	28.7	No	47	28%	1.3	No	15	7%
Chromium	7440-47-3	mg/kg	76	--	87.9	No	217	0.5%	73.3	Yes	112	0%	32.3	Yes	27	0%
Cobalt	7440-48-4	mg/kg	--	18 ³	NT	NT	NT	NT	15.7	Yes	9	0%	NT	NT	NT	NT
Copper	7440-50-8	mg/kg	34	--	6,810	No	201	15%	3,770	No	112	7%	111	No	29	7%
Iron	7439-89-6	mg/kg	--	36,100 ²	104,000	No	129	6%	63,100	No	97	24%	61,600	No	29	69%
Lead	7439-92-1	mg/kg	79	--	1,280	No	220	10%	2,420	No	82	13%	208	No	29	3%
Manganese	7439-96-5	mg/kg	1,800	--	1,710	Yes	129	0%	1,070	Yes	98	0%	1,440	Yes	29	0%
Mercury	7439-97-6	mg/kg	0.23	--	5.46	No	70	27%	1.72	No	82	11%	0.142	Yes	1	0%
Nickel	7440-02-0	mg/kg	47	--	1,440	No	199	16%	1,520	No	112	5%	28.1	Yes	29	0%
Selenium	7782-49-2	mg/kg	0.71	--	0.1	Yes	4	0%	0.716	No	1	100%	ND	ND	ND	ND
Silver	7440-22-4	mg/kg	0.82	--	0.132	Yes	4	0%	3.63	No	7	100%	ND	ND	ND	ND
Thallium	7440-28-0	mg/kg	5.2	--	7.6	No	31	3%	ND	ND	ND	ND	0.246	Yes	12	0%
Titanium	7440-32-6	mg/kg	--	5,000 ³	NT	NT	NT	NT	1,920	Yes	9	0%	NT	NT	NT	NT
Vanadium	7440-62-2	mg/kg	180	--	1,280	No	125	8%	1,890	No	107	2%	135	Yes	29	0%
Zinc	7440-66-6	mg/kg	180	--	5,180	No	200	9%	21,300	No	112	13%	433	No	28	4%

Human Health PRG Table 9
Gasco OU Soil Background Evaluation

Notes:

-  Maximum detected soil concentrations from the Gasco GSAs and Siltronic GSA are less than the background value.
-  Additional Doane Creek metals with maximum concentrations less than background or that were non-detect in all samples.

--: not applicable

1. Regional 95% UPL default background concentration, Portland Basin; from Table 4 (DEQ 2013).
2. Regional 90th percentile, Clark County, Washington; from Table 1 (Ecology 1994).
3. 90th percentile, Western United States (Shacklette and Boerngen 1984). 90th percentile = $GM \times GSD \times 1.282$, where GM = geometric mean, GSD = geometric standard deviation, and 1.282 = Z statistic for p = 0.90.

CAS RN: Chemical Abstracts Service Registry Number

DEQ: Oregon Department of Environmental Quality

mg/kg: milligrams per kilogram

ND: not detected

NT: not tested

OU: operable unit

Siltronic: Siltronic Corporation

UPL: upper prediction limit

References:

DEQ (Oregon Department of Environmental Quality), 2013. *Development of Oregon Background Metals Concentrations in Soil*. Technical Report. Land Quality Division, Cleanup Program. March 2013.

Ecology (Washington State Department of Ecology), 1994. *Natural Background Soil Metal Concentrations in Washington State*. Publication No. 94-115. October 1994.

Shacklette, H.T., and J.G. Boerngen, 1984. *Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States*. U.S. Geological Services Professional Paper 1270. Washington D.C.: United States Government Printing Office.

Human Health PRG Table 10
Summary of TPH RBCs from Different Workbooks

TPH Risk Area	TPH RBCs			
	Soil Ingestion, Dermal Contact, and Inhalation (RBCss)			Groundwater in Excavation (RBCwe)
	Occupational Worker (mg/kg)	Construction Worker (mg/kg)	Excavation Worker (mg/kg)	Construction & Excavation Worker (µg/L)
Gasco Site-Specific TPH RBCs (2021)¹				
Former Spent Oxide Area (RA-1)	2,100	1,600	>Max	810
Former Lampblack Storage Area (RA-2)	12,000	5,500	>Max	1,600
Former Tar Settling Pond Area (RA-3)	9,000	4,600	>Max	1,400
Former Koppers Land Disposal Area (RA-4)	7,200	3,900	>Max	2,200
Former Naphthalene Plant Area (RA-5)	7,800	3,600	130,000	5,600
Gasco Site-Specific TPH RBCs (2018)²				
Former Spent Oxide Area (RA-1)	2,100	1,600	150,000	780
Former Lampblack Storage Area (RA-2)	12,000	5,500	>Max	1,500
Former Tar Settling Pond Area (RA-3)	9,000	4,600	>Max	1,300
Former Koppers Land Disposal Area (RA-4)	7,200	3,900	>Max	2,100
Former Naphthalene Plant Area (RA-5)	7,800	3,600	130,000	5,500
Gasco Site-Specific TPH RBCs (2014)³				
Former Spent Oxide Area (RA-1)	1,900	1,500	140,000	810
Former Lampblack Storage Area (RA-2)	11,000	4,900	>Max	1,600
Former Tar Settling Pond Area (RA-3)	8,200	4,200	>Max	1,400
Former Koppers Land Disposal Area (RA-4)	6,600	3,500	>Max	2,200
Former Naphthalene Plant Area (RA-5)	7,100	3,200	120,000	5,500
Generic DEQ RBCs⁴				
Generic Gasoline	20,000	9,700	>Max	14,000
Generic Diesel/Heating Oil	14,000	4,600	>Max	>S
Generic Mineral/Insulating Oil	36,000	11,000	>Max	>S

Notes:

2021 TPH RBC that are different from 2018 TPH RBC

>Max: The constituent RBC for this pathway is greater than 100,000 mg/kg. The TPH RBC is greater than the maximum amount that would be present if all of the initial air space is filled with petroleum product. DEQ believes it is highly unlikely that such concentrations will ever be encountered.

- 2021 TPH RBCs workbooks (DEQ 2021).
- 2018 TPH RBC workbooks (Anchor QEA 2018).
- Gasco site-specific TPH RBCs as presented in the HERA (Anchor QEA 2014).
- DEQ's Generic Risk-Based Concentrations for Individual Chemicals (DEQ 2018).

µg/L: micrograms per liter
 DEQ: Oregon Department of Environmental Quality
 HERA: human health and ecological risk assessment
 mg/kg: milligrams per kilogram
 RA: risk area
 RBC: risk-based concentration
 TPH: total petroleum hydrocarbons
 WBZ: water-bearing zone

References:

- Anchor QEA (Anchor QEA, LLC), 2014. *Human Health and Ecological Risk Assessment Report*. NW Natural Gasco Site. December 2014.
 Anchor QEA, 2018. Email to: Mike Poulsen, DEQ. Regarding: Site-specific TPH RBC Calculations - Questions. July 19, 2018.
 DEQ (Oregon Department of Environmental Quality), 2018. *Risk-Based Concentrations for Individual Chemicals*. May 2018 Revision.
 DEQ, 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit*. December 16, 2021.

**Human Health PRG Table 11
Chemical Data Comparison**

2021 DEQ RBC Workbook for Petroleum Hydrocarbons¹

Fuel Fraction (Individual Chemicals)	Vol Class	MW (g/mol)	S (mg/L)	P ($\mu\text{g}/\text{m}^3$)	KH ($\text{m}^3\text{-atm}/\text{mol}$)	H'	Log Koc	Koc (cm^3/g)	Dair (cm^2/s)	Dw (cm^2/s)
n-Hexane	v	86.00	9.5E+00	7.1E+08	1.8E+00	74.828	2.95	8.9E+02	7.3E-02	8.2E-06
Benzene	v	78.00	1.8E+03	4.13E+08	5.6E-03	0.231	1.77	5.9E+01	9.0E-02	1.0E-05
Toluene	v	92.00	5.3E+02	1.45E+08	6.6E-03	0.276	2.26	1.8E+02	7.8E-02	9.2E-06
Ethylbenzene	v	106.00	1.7E+02	5.54E+07	7.9E-03	0.328	2.56	3.6E+02	6.8E-02	8.5E-06
Total Xylenes	v	106.00	1.1E+02	2.92E+07	6.6E-03	0.276	2.59	3.9E+02	6.9E-02	8.5E-06
1,2,4-trimethylbenzene	v	120.00	5.7E+01	1.46E+07	6.2E-03	0.256	3.57	3.7E+03	6.1E-02	7.9E-06
1,3,5-trimethylbenzene	v	120.00	4.8E+01	1.76E+07	8.8E-03	0.365	2.91	8.2E+02	6.0E-02	7.8E-06
Naphthalene	v	128.00	3.1E+01	5.67E+05	4.4E-04	0.018	3.30	2.0E+03	6.0E-02	8.4E-06

2018 DEQ RBDM Workbook for Individual Chemicals²

Fuel Fraction (Individual Chemicals)	Vol Class	MW (g/mol)	S (mg/L)	P (mg/m^3)	KH ($\text{m}^3\text{-atm}/\text{mol}$)	H'	Log Koc	Koc (cm^3/g)	Dair (cm^2/s)	Dw (cm^2/s)
n-Hexane	--	--	--	--	--	--	--	--	--	--
Benzene	v	78.12	1.8E+03	4.04E+08	5.6E-03	0.227	--	1.5E+02	9.0E-02	1.0E-05
Toluene	v	92.13	5.3E+02	1.45E+08	6.6E-03	0.271	--	2.3E+02	7.8E-02	9.2E-06
Ethylbenzene	v	106.16	1.7E+02	5.54E+07	7.9E-03	0.322	--	4.5E+02	6.8E-02	8.5E-06
Xylenes	v	106.16	1.1E+02	4.90E+07	5.2E-03	0.212	--	3.8E+02	6.9E-02	8.5E-06
1,2,4-trimethylbenzene	v	120.2	5.7E+01	1.35E+07	6.2E-03	0.252	--	6.1E+02	6.1E-02	7.9E-06
1,3,5-trimethylbenzene	v	120.2	4.8E+01	1.60E+07	8.8E-03	0.359	--	6.0E+02	6.0E-02	7.8E-06
Naphthalene	v	128.2	3.1E+01	6.23E+05	4.4E-04	0.018	--	1.5E+03	6.0E-02	8.4E-06

Notes:

Blue highlighting indicates 2021 TPH RBC workbook chemical data values that are different from 2018 RBDM workbook chemical data values.

--: Not available

1. Chemical data values from the ChemData tab of the 2021 RA-1-COMP-2021deq.xlsm workbook provided with DEQ's December 16, 2021 PRG Memo (DEQ 2021).
2. Chemical data values from the ChemData tab of DEQ's 2018 RBDM workbook (DEQ 2018).

$\mu\text{g}/\text{m}^3$: micrograms per cubic meter

cm^2/s : square centimeter per second

cm^3/g : cubic centimeter per gram

Dair: diffusion coefficient in air

DEQ: Oregon Department of Environmental Quality

Dw: diffusion coefficient in water

g/mol: grams per mole

H': Henry's constant (unitless)

KH: Henry's constant ($\text{m}^3\text{-atm}/\text{mol}$)

Koc: organic-carbon partition coefficient

Log: logarithm

$\text{m}^3\text{-atm}/\text{mol}$: atmospheres cubic meter per mole

mg/L: milligrams per liter

mg/m^3 : milligrams per cubic meter

MW: molecular weight

P: vapor pressure

RBC: risk-based concentration

RBDM: risk-based decision making

S: solubility

v: volatile

Vol Class: volatility classification

References:

DEQ (Oregon Department of Environmental Quality), 2018. *Spreadsheet for Site-Specific Risk-Based Concentrations for Individual Chemicals*. Available at: <https://www.oregon.gov/deq/Hazards-and-Cleanup/env-cleanup/Pages/Risk-Based-Decision-Making.aspx>

DEQ, 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit*. December 16, 2021.

Human Health PRG Table 12

Construction and Excavation Worker Chronic and Subchronic TPH RBCs

TPH Risk Area	TPH RBCs		
	Soil Ingestion, Dermal Contact, and Inhalation (RBCss)		Groundwater in Excavation (RBCwe)
	Construction Worker (mg/kg)	Excavation Worker (mg/kg)	Construction & Excavation Worker (µg/L)
Gasco Site-Specific TPH RBCs (2021) – Subchronic Toxicity Values¹			
Former Spent Oxide Area (RA-1)	2,400	>Max	820
Former Lampblack Storage Area (RA-2)	21,000	>Max	1,700
Former Tar Settling Pond Area (RA-3)	14,000	>Max	1,500
Former Koppers Land Disposal Area (RA-4)	10,000	>Max	2,500
Former Naphthalene Plant Area (RA-5)	9,400	>Max	12,000
Gasco Site-Specific TPH RBCs (2021) – Chronic Toxicity Values			
Former Spent Oxide Area (RA-1)	1,600	>Max	810
Former Lampblack Storage Area (RA-2)	5,500	>Max	1,600
Former Tar Settling Pond Area (RA-3)	4,600	>Max	1,400
Former Koppers Land Disposal Area (RA-4)	3,900	>Max	2,200
Former Naphthalene Plant Area (RA-5)	3,600	130,000	5,600

Notes:

>Max: The constituent RBC for this pathway is greater than 100,000 mg/kg. The TPH RBC is greater than the maximum amount that would be present if all of the initial air space is filled with petroleum product. DEQ believes it is highly unlikely that such concentrations will ever be encountered.

1. Site-specific TPH RBCs calculated using subchronic toxicity values included in the TPH RBC workbooks provided with DEQ's December 16, 2021, PRG memorandum (DEQ 2021).

µg/L: micrograms per liter

DEQ: Oregon Department of Environmental Quality

mg/kg: milligrams per kilogram

RA: risk area

RBC: risk-based concentration

TPH: total petroleum hydrocarbons

Reference:

DEQ (Oregon Department of Environmental Quality), 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit*. December 16, 2021.

Human Health PRG Table 13

Summary of Differences Between 2018 and 2021 RBC TPH Workbooks and 2018 RBDM

TPH RBC Workbook Tab and Parameter	2021 TPH RBC (DEQ 2021) ¹	2018 TPH RBC (Anchor QEA 2018) ²	2018 RBDM (DEQ 2018) ³	Notes
Product Data				
Aliphatic C5-C6 adjusted data mg/kg (ppm)	populated	not populated	--	calculated
Aliphatic C5-C6 weight fraction	populated	not populated	--	calculated
n-hexane raw data (ppm)	not populated	populated	--	calculated
n-hexane adjusted data mg/kg (ppm)	not populated	populated	--	calculated
n-hexane weight fraction	not populated	populated	--	calculated
Raw Data Total (ppm)	different value	different value	--	calculated
Chem Data				
TPH*MW (g/mol)	different value	different value	--	calculated
TPH* Density (g/cm ³)	different value	different value	--	calculated
Xi*MWi	different values	different values	--	calculated
Xi*MWi/rpi	different values	different values	--	calculated
MW	same	same	different values	can manually update
P (μg/m ³)	same	same	different values and units	calculated
KH (m ³ -atm/mol)	same	same	different values	can manually update
H'	same	same	different values	calculated
Log Koc	same	same	different values	can manually update
Koc (cm ³ /g)	same	same	different values	calculated
Dair (cm ² /s)	same	same	different values	can manually update
Dw (cm ² /s)	same	same	different values	can manually update
Tox Data				
Ethylbenzene subchronic RfD	same	same	no value	can manually update
1,2,4-trimethylbenzene subchronic RfD	same	same	no value	can manually update
1,2,4-trimethylbenzene subchronic RfC	same	same	no value	can manually update
1,3,5-trimethylbenzene subchronic RfD	same	same	different value	can manually update
1,3,5-trimethylbenzene subchronic RfC	same	same	no value	can manually update
Naphthalene subchronic RfD	same	same	no value	can manually update
τ (hr)	same	same	different values	can manually update
t* (hr)	same	same	different values	can manually update
B	same	same	different values	can manually update
Transport				
DA (cm ² /s)	different values	different values	--	calculated
Rsw (L/kg)	different values	different values	--	calculated
LF (kg/L)	different values	different values	--	calculated
Calculations				
All calculated fields	different values	different values	--	calculated

Notes:

This table summarizes noted differences between the 2018 and 2021 TPH RBC workbooks (based on evaluation of the site-specific workbooks for RA-1-COMP) and differences between the RBDM workbook. This table may not be comprehensive of all differences between workbooks.

- 2021 TPH RBCs workbooks provided with DEQ's December 16, 2021, PRG memorandum (DEQ 2021).
- 2018 TPH RBC (Anchor QEA 2018).
- DEQ's 2018 RBDM workbook (DEQ 2018).

--: not applicable

μg/m³: micrograms per cubic meter

t: lag time

B: relative hydrophobicity

cm²/s: square centimeter per second

cm³/g: cubic centimeter per gram

DA: apparent diffusion coefficient

Dair: diffusion coefficient in air

DEQ: Oregon Department of Environmental Quality

Dw: diffusion coefficient in water

g/cm³: grams per cubic centimeter

g/mol: grams per mole

H: Henry's constant (unitless)

hr: hour

kg/L: kilograms per liter

KH: Henry's constant (m³-atm/mol)

Koc: organic-carbon partition coefficient

L/kg: liter per kilogram

LF: leaching factor

Log: logarithm

m³-atm/mol: atmospheres cubic meter per mole

mg/kg: milligrams per kilogram

MW: molecular weight

MWi: molecular weight of constituent "i"

P: vapor pressure

ppm: parts per million

RBDM: risk-based decision making

RCB: risk-based concentration

RfC: reference concentration

RfD: reference dose

rpi: density (g/cm³)

Rsw: soil sample/pore water concentration ratio for a 4-phase systems

t*: time to reach steady state

TPH: total petroleum hydrocarbons

Xi: mole fraction of constituent "i"

References:

Anchor QEA (Anchor QEA, LLC), 2018. Email to: Mike Poulsen, DEQ. Regarding: Site-specific TPH RBC Calculations - Questions. July 19, 2018.

DEQ (Oregon Department of Environmental Quality), 2018. *Spreadsheet for Site-Specific Risk-Based Concentrations for Individual Chemicals*. Available at:

<https://www.oregon.gov/deq/Hazards-and-Cleanup/env-cleanup/Pages/Risk-Based-Decision-Making.aspx>

DEQ, 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit*. December 16, 2021.