Ecological PRG Table 1
Gasco OU Ecological Surface Soil COCs

Gasco and Siltronic GSA(s) Ecological Surface Soil Contaminants of Concern[1]	Analyte Group	Units	CAS No.	Gasco GSAs Ecological COCs – Bird	Gasco GSAs Ecological COCs – Mammal	Gasco GSAs Ecological COCs – Invertebrate	Gasco GSAs Ecological COCs – Plant	Siltronic GSA Ecological COCs – Bird[2]	Siltronic GSA Ecological COCs – Mammal[2]	Siltronic GSA Ecological COCs – Invertebrate[2]	Siltronic GSA Ecological COCs – Plant[2]	Notes
Cyanide, total	CONV	mg/kg	57-12-5	--	X	--	--	--	X	--	--	3
Sulfide	CONV	mg/kg	18496-25-8	--	X	--	--	--	X	--	--	3
Aluminum	Metals	mg/kg	7429-90-5	--	--	--	--	--	--	--	--	4
Antimony	Metals	mg/kg	7440-36-0	--	X	o	X	--	X	o	o	
Arsenic	Metals	mg/kg	7440-38-2	o	o	o	X	o	o	o	o	
Cadmium	Metals	mg/kg	7440-43-9	o	X	o	o	o	X	o	o	
Chromium	Metals	mg/kg	7440-47-3	o	o	X	--	o	o	X	--	
Copper	Metals	mg/kg	7440-50-8	o	o	X	X	o	o	X	X	
Iron	Metals	mg/kg	7439-89-6	--	--	X	X	--	--	X	X	
Lead	Metals	mg/kg	7439-92-1	X	o	o	X	X	o	o	X	
Manganese	Metals	mg/kg	7439-96-5	--	--	--	--	--	--	--	--	4
Mercury	Metals	mg/kg	7439-97-6	o	o	X	X	o	o	X	o	
Nickel	Metals	mg/kg	7440-02-0	o	o	X	X	o	o	o	o	
Thallium	Metals	mg/kg	7440-28-0	--	X	--	X	--	NT	--	NT	
Vanadium	Metals	mg/kg	7440-62-2	o	o	--	o	X	o	--	X	
Zinc	Metals	mg/kg	7440-66-6	X	o	o	X	X	X	X	X	
1-Methylnaphthalene	PAH	µg/kg	90-12-0	--	X	X	--	--	o	o	--	
2-Methylnaphthalene	PAH	µg/kg	91-57-6	--	X	X	--	--	o	o	--	
Acenaphthene	PAH	µg/kg	83-32-9	--	o	X	X	--	o	o	o	
Acenaphthylene	PAH	µg/kg	208-96-8	--	o	X	--	--	o	o	--	
Anthracene	PAH	µg/kg	120-12-7	--	X	X	--	--	o	o	--	
Benz(a)anthracene	PAH	µg/kg	56-55-3	--	X	X	--	--	o	o	--	
Benzo(a)pyrene	PAH	µg/kg	50-32-8	--	X	X	--	--	o	o	--	
Benzo(b)fluoranthene	PAH	µg/kg	205-99-2	--	X	X	--	--	o	o	--	
Benzo(g,h,i)perylene	PAH	µg/kg	191-24-2	--	X	X	--	--	o	o	--	
Benzo(k)fluoranthene	PAH	µg/kg	207-08-9	--	X	X	--	--	o	o	--	
Chrysene	PAH	µg/kg	218-01-9	--	X	X	--	--	o	o	--	
Dibenz(a,h)anthracene	PAH	µg/kg	53-70-3	--	X	X	--	--	o	o	--	
Fluoranthene	PAH	µg/kg	206-44-0	--	X	X	--	--	o	o	--	
Fluorene	PAH	µg/kg	86-73-7	--	o	X	--	--	o	o	--	
Indeno(1,2,3-c,d)pyrene	PAH	µg/kg	193-39-5	--	X	X	--	--	o	o	--	
Naphthalene	PAH	µg/kg	91-20-3	--	X	X	X	--	o	o	o	
Phenanthrene	PAH	µg/kg	85-01-8	--	X	X	--	--	o	o	--	
Pyrene	PAH	µg/kg	129-00-0	--	X	X	--	--	o	o	--	
Total HPAH	PAH	µg/kg	--	--	X	X	--	--	X	X	--	
Total LPAH	PAH	µg/kg	--	--	X	X	--	--	o	o	--	
Ethylbenzene	VOC	µg/kg	100-41-4	--	X	--	--	--	o	--	--	
Total Xylene	VOC	µg/kg	1330-20-7	--	o	--	X	--	o	--	o	
Gasoline-range hydrocarbons	TPH	mg/kg	8006-61-9	--	o	X	--	--	o	o	--	
Diesel-range hydrocarbons	TPH	mg/kg	68334-30-5	--	X	X	--	--	o	o	--	

Ecological PRG Table 1
Gasco OU Ecological Surface Soil COCs

Notes:
--: Not applicable
o: Contaminant analyzed in surface soil and determined to not be a COC.
X: Ecological COC for surface soil
1. COCs listed have at least one exceedance ratio greater than 1 in surface soil within ecological exposure areas of the Gasco OU.
2. The COCs identified for Doane Creek soils are a limited subset of COCs presented for the Siltronic GSA.
3. No PRG required by DEQ for this COC (DEQ 2021).
4. Metal determined to be at background concentration in soil at Gasco OU.

µg/kg: microgram per kilogram
CAS: Chemical Abstracts Service
COC: contaminant of concern
CONV: conventional
DEQ: Oregon Department of Environmental Quality
GSA: geographic subarea
HPAH: high-molecular-weight polycyclic aromatic hydrocarbon
LPAH: low-molecular-weight polycyclic aromatic hydrocarbon
mg/kg: milligram per kilogram
NT: not tested
OU: operable unit
PAH: polycyclic aromatic hydrocarbon
PRG: preliminary remediation goal
Siltronic: Siltronic Corporation
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.

Ecological PRG Table 2
Gasco OU Ecological Surface Soil PRGs

Gasco and Siltronic GSA(s) Ecological Surface Soil Contaminants of Concern	Analyte Group	Units	CAS No.	Gasco OU Ecological PRGs – Bird[1]	Gasco OU Ecological PRGs – Mammal[1]	Gasco OU Ecological PRGs – Invertebrate[1]	Gasco OUs Ecological PRGs – Plant[1]	Portland Basin Background Value[2]	Natural Background Value	Notes	Gasco OU Ecological Soil PRGs[6]	Gasco OU Ecological Soil Hot Spot Level[7]
Cyanide, total	CONV	mg/kg	57-12-5	--	--	--	--	--	--	4	--	--
Sulfide	CONV	mg/kg	18496-25-8	--	--	--	--	--	--	4	--	--
Aluminum	Metals	mg/kg	7429-90-5	--	--	--	--	--	52,300[3]	5	--	--
Antimony	Metals	mg/kg	7440-36-0	--	2.7	78	11	0.56	--	--	2.7	27
Arsenic	Metals	mg/kg	7440-38-2	32	31	6.8	18	8.8	--	--	6.8	68
Cadmium	Metals	mg/kg	7440-43-9	1.6	4	140	32	0.63	--	--	1.6	16
Chromium	Metals	mg/kg	7440-47-3	73	1,600	--	--	76	--		73	730
Copper	Metals	mg/kg	7440-50-8	43	70	80	70	34	--	--	43	430
Iron	Metals	mg/kg	7439-89-6	--	--	(200*); ~~36,100**~~	(10*); ~~36,100**~~	--	36,100[3]	--	36,100[8]	100[9]
Lead	Metals	mg/kg	7439-92-1	(23*); ~~79**~~	170	1,700	120	79		--	79	230
Manganese	Metals	mg/kg	7439-96-5	--	--	--	--	1,800	--	5	--	--
Mercury	Metals	mg/kg	7439-97-6	(0.13*); ~~0.23**~~	17	0.3	34	0.23	--	--	0.23	1.3
Nickel	Metals	mg/kg	7440-02-0	81	(21*); ~~47**~~	280	38	47	--	--	47	210
Thallium	Metals	mg/kg	7440-28-0	45	(4.2*); ~~5.2**~~	--	(0.05*); ~~5.2**~~	5.2	--	--	5.2	0.5
Vanadium	Metals	mg/kg	7440-62-2	(9.5*); ~~180**~~	610	--	(60*); ~~180**~~	180	--	--	180	95
Zinc	Metals	mg/kg	7440-66-6	(120*); ~~180**~~	980	(120*); ~~180**~~	(160*); ~~180**~~	180	--	--	180	1,200
1-Methylnaphthalene	PAH	µg/kg	90-12-0	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	PAH	µg/kg	91-57-6	--	--	--	--	--	--	--	--	--
Acenaphthene	PAH	µg/kg	83-32-9	--	--	--	250	--	--	--	250	2,500
Acenaphthylene	PAH	µg/kg	208-96-8	--	--	--	--	--	--	--	--	--
Anthracene	PAH	µg/kg	120-12-7	--	--	--	6,800	--	--	--	6,800	68,000
Benz(a)anthracene	PAH	µg/kg	56-55-3	--	--	--	18,000	--	--	--	18,000	180,000
Benzo(a)pyrene	PAH	µg/kg	50-32-8	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	PAH	µg/kg	205-99-2	--	--	--	18,000	--	--	--	18,000	180,000
Benzo(g,h,i)perylene	PAH	µg/kg	191-24-2	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	PAH	µg/kg	207-08-9	--	--	--	--	--	--	--	--	--
Chrysene	PAH	µg/kg	218-01-9	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	PAH	µg/kg	53-70-3	--	--	--	--	--	--	--	--	--
Fluoranthene	PAH	µg/kg	206-44-0	--	--	--	--	--	--	--	--	--
Fluorene	PAH	µg/kg	86-73-7	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	PAH	µg/kg	193-39-5	--	--	--	--	--	--	--	--	--
Naphthalene	PAH	µg/kg	91-20-3	--	--	--	1,000	--	--	--	1,000	10,000
Phenanthrene	PAH	µg/kg	85-01-8	--	--	--	--	--	--	--	--	--
Pyrene	PAH	µg/kg	129-00-0	--	--	--	--	--	--	--	--	--
Total HPAH	PAH	µg/kg	--	900[10]	5590[10]	18,000	--	--	--	--	900[10]	9,000
Total LPAH	PAH	µg/kg	--	67,000	540,000	29,000	--	--	--	--	29,000	290,000
Ethylbenzene	VOC	µg/kg	100-41-4	--	25,800	--	--	--	--	--	25,800	258,000
Total Xylene	VOC	µg/kg	1330-20-7	410,000	1,800	--	100,000	--	--	--	1,800	18,000
TPH (Former Spent Oxide Area RA-1)	TPH	mg/kg	--	--	--	197	--	--	--	11	197	1,970
TPH (Former Lampblack Storage Area RA-2)	TPH	mg/kg	--	--	--	216	--	--	--	11	216	2,160

Ecological PRG Table 2
Gasco OU Ecological Surface Soil PRGs

Gasco and Siltronic GSA(s) Ecological Surface Soil Contaminants of Concern	Analyte Group	Units	CAS No.	Gasco OU Ecological PRGs – Bird[1]	Gasco OU Ecological PRGs – Mammal[1]	Gasco OU Ecological PRGs – Invertebrate[1]	Gasco OUs Ecological PRGs – Plant[1]	Portland Basin Background Value[2]	Natural Background Value	Notes	Gasco OU Ecological Soil PRGs[6]	Gasco OU Ecological Soil Hot Spot Level[7]
TPH (Former Tar Settling Pond Area RA-3)	TPH	mg/kg	--	--	--	214	--	--	--	11	214	2,140
TPH (Former Koppers Land Disposal Area RA-4)	TPH	mg/kg	--	--	--	205	--	--	--	11	205	2,050
TPH (Former Naphthalene Plant Area RA-5)	TPH	mg/kg	--	--	--	185	--	--	--	11	185	1,850

Notes:
~~*: RBCs from 2020 Eco-risk IMD Table 1a (DEQ 2020) or Table A (soils) included as an attachment to the DEQ PRG memorandum (DEQ 2021).~~
~~**: RBC below background levels, and the PRG is based on background level.~~
--: Not applicable
1. The DEQ PRG memorandum indicates that ecological soil PRGs should be selected from the values presented in Table A (soils) included as an attachment to the PRG memorandum (DEQ 2021). Hierarchy of sources for ecological soil PRGs are to apply values from DEQ's RBCs from DEQ's 2020 Eco-risk IMD Table 1a (DEQ 2020) and use of IFS SLVs (Anchor QEA 2018) for COCs without RBCs.
2. Regional default background concentration for Portland Basin based on 95% UPL or 95% Kaplan-Meier UPL (cadmium and selenium) from Table 4 (DEQ 2013).
3. Regional 90th percentile, Clark County, Washington; from Table 1 (Ecology 1994).
4. No PRG required by DEQ for this COC (DEQ 2021).
5. Metal determined to be at background concentration in soil at Gasco OU. No PRG necessary.
6. Ecological soil PRG selected based on systematic comparative approach used for the IFS (Anchor QEA 2018).
7. Ecological soil hot spot level per OAR 340-122-0115 (32) (b) (A) (iii).
8: Surface soil data for iron would exceed this PRG if detected concentration exceeds 36,100 mg/kg PRG and soil pH is <5 or >8.
9. Surface soil data for iron would exceed this hot spot level if detected concentration exceeds 100 mg/kg and soil pH is <5 or >8.
10. NW Natural calculated population-based ground-feeding bird and mammal HPAH RBC based on parameters provided by DEQ.
11. Site-specific TPH RBCs will be applied consistent with the RI/HERA Addendum (Anchor QEA 2019) and as discussed and approved by DEQ on June 27, 2023.

µg/kg: microgram per kilogram
CAS: Chemical Abstracts Service
COC: contaminant of concern
CONV: conventional
DEQ: Oregon Department of Environmental Quality
GSA: geographic subarea
HPAH: high-molecular-weight polycyclic aromatic hydrocarbon
IFS: *Interim Feasibility Study*
IMD: internal management directive
LPAH: low-molecular-weight polycyclic aromatic hydrocarbon
mg/kg: milligram per kilogram
OAR: Oregon Administrative Rule
OU: operable unit
PAH: polycyclic aromatic hydrocarbon
PRG: preliminary remediation goal
RBC: risk-based concentration
RI/HERA Addendum: *Remedial Investigation/Human Health and Ecological Risk Assessment Addendum for the Siltronic GSA*
Siltronic: Siltronic Corporation
SLV: screening level value
TPH: total petroleum hydrocarbons
UPL: upper prediction limit
VOC: volatile organic compound

References:
Anchor QEA (Anchor QEA, LLC), 2018. *Interim Feasibility Study.* Gasco OU. Prepared for NW Natural. November 21, 2018.
Anchor QEA, 2019. *Remedial Investigation/Human Health and Ecological Risk Assessment Addendum for the Siltronic GSA* . Gasco OU. Prepared for NW Natural. November 22, 2019.
DEQ (Oregon Department of Environmental Quality), 2013. *Development of Oregon Background Metals Concentrations in Soil.* Technical Report. Land Quality Division, Cleanup Program. March 2013.
DEQ, 2020. *Conducting Ecological Risk Assessments IMD* . September 14, 2020.
DEQ, 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit.* December 16, 2021.
Ecology (Washington State Department of Ecology), 1994. *Natural Background Soil Metal Concentrations in Washington State.* Publication No. 94-115. October 1994.

Ecological PRG Table 3
Gasco OU Groundwater COCs and PRGs – Source Control
Upland to Willamette River Pathways

Gasco OU Ecological Groundwater Contaminants of Concern[1]	Analyte Group	Ecological Fill WBZ and/or Alluvium WBZ Groundwater COCs (Aquatic Life)[1]	Portland Harbor ROD Table 17 Groundwater CULs/PRGs[2,3] in µg/L
Cyanide, ~~available~~	CONV	X	4
Cyanide, ~~free~~	CONV	X	4
Cadmium	Metals	X	0.094
Chromium	Metals	X	11
Copper	Metals	X	2.74
Lead	Metals	X	0.54
Manganese	Metals	X	430
Vanadium	Metals	X	20
Zinc	Metals	X	36.5
2-Methylnaphthalene	PAH	X	2.1
Acenaphthene	PAH	X	23
Anthracene	PAH	X	0.73
Benzo(a)anthracene	PAH	X	0.0012
Benzo(a)pyrene	PAH	X	0.00012
Benzo(b)fluoranthene	PAH	X	0.0012
Benzo(g,h,i)perylene	PAH	X	0.4
Benzo(k)fluoranthene	PAH	X	0.0013
Chrysene	PAH	X	0.0013
Dibenzo(a,h)anthracene	PAH	X	0.00012
Fluoranthene	PAH	X	6.2
Fluorene	PAH	X	3.9
Indeno(1,2,3-c,d)pyrene	PAH	X	0.0012
Naphthalene	PAH	X	12
Phenanthrene	PAH	X	6.3
Pyrene	PAH	X	10
Total DDx	PEST	X	0.001
1,1-Dichloroethene	VOC	X	7
1,2-Dichloroethene, cis-	VOC	X	70
Benzene	VOC	X	0.44
Ethylbenzene	VOC	X	7.3
Toluene	VOC	X	9.8
Total Xylenes	VOC	X	13
Trichloroethene (TCE)	VOC	X	0.6
C10-C12 Aliphatic Hydrocarbons	TPH	X	2.6

Ecological PRG Table 3
Gasco OU Groundwater COCs and PRGs – Source Control
Upland to Willamette River Pathways

Notes:
1. COCs that have Groundwater Portland Harbor ROD Table 17 CULs/PRGs (EPA 2020) and have at least one exceedance ratio greater than 1 in groundwater at the Gasco OU.
2. Per Portland Harbor ROD Table 17, January 2020 Errata #2 (EPA 2020).
3. Source control PRGs per Wyatt 2023.

µg/L: microgram per liter	OU: operable unit
COC: contaminant of concern	PAH: polycyclic aromatic hydrocarbon
CONV: conventional	PEST: pesticide
CUL: cleanup level	PRG: preliminary remediation goal
DDD: dichlorodiphenyldichloroethane	ROD: Record of Decision
DDE: dichlorodiphenyldichloroethylene	TPH: total petroleum hydrocarbons
DDT: dichlorodiphenyltrichloroethane	VOC: volatile organic compound
DDx: sum of DDT, DDD, and DDE	WBZ: water-bearing zone

References:
EPA (U.S. Environmental Protection Agency), 2020. Errata #2 for Portland Harbor Superfund Site Record of Decision ROD Table 17. January 14, 2020.

Wyatt, Robert, 2023. Regarding: NWN Gasco. Email to: Hunter Young, Elizabeth McKenna, and Stephanie Ebright (U.S. Environmental Protection Agency); Wesley Thomas, Kevin Parrett, and Paul Seidel (Oregon Department of Environmental Quality); Patty Dost (Pearl Legal Group); Michael Zevenbergen (U.S. Department of Justice); and Gary Vrooman (Oregon Department of Justice). Attachment to email: "NW Natural's Framework for EPA Sediment Design and DEQ Source Control Measure FFS and IRAM Design." July 21, 2023

Ecological PRG Table 4
Gasco OU Ecological Groundwater COCs and PRGs – Hot Spot Evaluations
Upland to Willamette River Pathways

Gasco OU Ecological Groundwater Contaminants of Concern[1]	Analyte Group	Gasco OU Ecological Risk Assessments	Water Quality Standards		Portland Harbor ROD Table 17 Groundwater CULs and FS Groundwater PRGs		DEQ PRGs			NW Natural IFS SLVs	Gasco OU FS Upland Groundwater Aquatic Life PRGs[5]
		Ecological Fill WBZ and/or Alluvium WBZ Groundwater COCs (Aquatic Life)[1]	State and Federal Aquatic Life Water Quality Criteria[2] in µg/L	Notes	Table 17 Groundwater CULs and FS Groundwater PRGs CULs[3] in µg/L	Notes	DEQ ~~Proposed~~ Aquatic Life PRGs (DEQ 2020, 2021)[4] in µg/L	Notes	DEQ Water RBCs: Narcosis (DEQ 2020, Table 2)[4] in µg/L	IFS SLVs (Anchor QEA 2018)[4] in µg/L	
Ammonia	CONV	X	1900	6	-	--	1,900	--	--	19	1,900
Cyanide, available	CONV	X	5.2	6	5.2	7	5.2	--	--	5.2	5.2
Cyanide, free	CONV	X	5.2	6	5.2	7	5.2	--	--	5.2	5.2
Sulfate	CONV	X	--	--	--	--	--	--	--	14,830	14,830
Sulfide	CONV	X	2	6	--	--	2	--	--	2	2
Aluminum	Metals	X	320	8	--	--	320	--	--	87	320
Antimony	Metals	X	--	--	--	--	190	--	--	30	190
Barium	Metals	X	--	--	--	--	220	--	--	4	220
Beryllium	Metals	X	--	--	--	--	11	--	--	0.66	11
Boron	Metals	X	--	--	--	--	7,200	--	--	1.6	7,200
Cadmium	Metals	X	0.094	6	0.094	--	0.094	--	--	0.094	0.094
Calcium	Metals	X	--	--	--	--	120,000	--	--	116,000	120,000
Chromium	Metals	X	24	6	11	--	24	9	--	24	24
Cobalt	Metals	X	--	--	--	--	19	--	--	23	19
Copper	Metals	X	1.4	6	2.74	--	1.4	9	--	2.74	1.4
Iron	Metals	X	1000	6	--	--	1,000	--	--	1,000	1,000
Lead	Metals	X	0.54	6	0.54	--	0.54	--	--	0.54	0.54
Magnesium	Metals	X	--	--	--	--	82,000	--	--	82,000	82,000
Manganese	Metals	X	--	--	1,433	7	93	9	--	120	1,433
Mercury	Metals	X	0.012	6	--	--	0.0013	9	--	0.77	0.012
Nickel	Metals	X	16	6	--	--	16	--	--	16.1	16
Selenium	Metals	X	4.6	6	--	--	4.6	--	--	5	4.6
Silver	Metals	X	0.1	6	--	--	0.1	--	--	0.36	0.1
Vanadium	Metals	X	--	--	20	--	27	--	--	20	20
Zinc	Metals	X	36	6	36.5	--	36	--	--	36.5	36
1-Methylnaphthalene	PAH	X	--	--	--	--	6.1	--	75	2.1	6.1
2-Methylnaphthalene	PAH	X	--	--	2.1	--	4.7	--	72	72.1	2.1
Acenaphthene	PAH	X	--	--	23	--	15	--	56	55.85	23
Acenaphthylene	PAH	X	--	--	--	--	13	--	310	307	13
Anthracene	PAH	X	--	--	0.73	--	0.02	--	21	0.73	0.73
Benzo(a)anthracene	PAH	X	--	--	0.03	7	4.7	--	2.2	0.027	0.03
Benzo(a)pyrene	PAH	X	--	--	0.01	7	0.06	--	0.96	0.014	0.01
Benzo(b)fluoranthene	PAH	X	--	--	0.7	7	2.6	--	0.68	0.677	0.7

Ecological PRG Table 4
Gasco OU Ecological Groundwater COCs and PRGs – Hot Spot Evaluations
Upland to Willamette River Pathways

Gasco OU Ecological Groundwater Contaminants of Concern[1]	Analyte Group	Gasco OU Ecological Risk Assessments	Water Quality Standards		Portland Harbor ROD Table 17 Groundwater CULs and FS Groundwater PRGs		DEQ PRGs			NW Natural IFS SLVs	Gasco OU FS Upland Groundwater Aquatic Life PRGs[5]
		Ecological Fill WBZ and/or Alluvium WBZ Groundwater COCs (Aquatic Life)[1]	State and Federal Aquatic Life Water Quality Criteria[2] in µg/L	Notes	Table 17 Groundwater CULs and FS Groundwater PRGs CULs[3] in µg/L	Notes	DEQ Proposed Aquatic Life PRGs (DEQ 2020, 2021)[4] in µg/L	Notes	DEQ Water RBCs: Narcosis (DEQ 2020, Table 2)[4] in µg/L	IFS SLVs (Anchor QEA 2018)[4] in µg/L	
Benzo(g,h,i)perylene	PAH	X	--	--	0.4	--	0.012	--	0.91	0.4391	0.4
Benzo(k)fluoranthene	PAH	X	--	--	0.6	7	0.06	--	0.64	0.6415	0.6
Chrysene	PAH	X	--	--	2	7	4.7	--	2	2.042	2
Dibenzo(a,h)anthracene	PAH	X	--	--	0.3	7	0.012	--	0.28	0.2825	0.3
Fluoranthene	PAH	X	--	--	6.2	--	0.8	--	7.1	7.109	6.2
Fluorene	PAH	X	--	--	3.9	--	19	--	39	3.9	3.9
Indeno(1,2,3-c,d)pyrene	PAH	X	--	--	0.3	7	0.012	--	0.28	0.275	0.3
Naphthalene	PAH	X	--	--	12	--	21	--	190	12	12
Phenanthrene	PAH	X	--	--	6.3	--	2.3	--	19	19.13	6.3
Pyrene	PAH	X	--	--	10	--	4.6	--	10	10.11	10
Total PAH HI	PAH	X	--	--	--	--	HI = 1	10	--	HI = 1	HI = 1
4,4'-DDD (p,p'-DDD)	PEST	X	--	--	--	--	0.01	9	--	0.001	~~0.01~~
Total DDx	PEST	X	--	--	0.001	--	0.001	9	--	0.001	0.001
2-Methylphenol (o-Cresol)	SVOC	X	--	--	--	--	67	--	--	13	67
4-Methylphenol (p-Cresol)	SVOC	X	--	--	--	--	53	--	--	543	53
3,3'-Dichlorobenzidine	SVOC	X	--	--	--	--	4.5	--	--	4.5	4.5
Benzoic acid	SVOC	X	--	--	--	--	42	--	4,400	42	42
bis(2-Ethylhexyl)phthalate	SVOC	X	--	--	--	--	8	--	--	3	8
Carbazole	SVOC	X	--	--	--	--	4	--	--	3.7	4
Dibenzofuran	SVOC	X	--	--	--	--	4	--	61	3.7	4
Dimethyl phthalate	SVOC	X	--	--	--	--	1,100	--	3,300	3	1,100
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	SVOC	X	--	--	--	--	1	--	--	1.3	1
Phenol	SVOC	X	--	--	--	--	160	--	--	4	160
Total phenols (unspecified)	SVOC	X	--	--	--	--	160	--	--	4	160
1,1-Dichloroethene	VOC	X	--	--	25	7	130	--	--	25	25
1,1-Dichloropropene	VOC	X	--	--	--	--	--	--	--	0.055	0.055
1,2,4-Trimethylbenzene	VOC	X	--	--	--	--	15	--	56	33	15
1,2-Dichlorobenzene	VOC	X	--	--	--	--	23	--	120	14	23
1,2-Dichloroethene, cis-	VOC	X	--	--	590	7	620	--	1,600	590	590
1,3,5-Trimethylbenzene (Mesitylene)	VOC	X	--	--	--	--	26	--	56	71	26
1,3-Dichloropropene, trans-	VOC	X	--	--	--	--	1.7	9	--	0.055	1.7
1,4-Dichlorobenzene	VOC	X	--	--	--	--	9.4	--	--	15	9.4
Acetic acid[11]	VOC	X	--	--	--	--	470	--	--	470	--

Ecological PRG Table 4
Gasco OU Ecological Groundwater COCs and PRGs – Hot Spot Evaluations
Upland to Willamette River Pathways

Gasco OU Ecological Groundwater Contaminants of Concern[1]	Analyte Group	Gasco OU Ecological Risk Assessments	Water Quality Standards		Portland Harbor ROD Table 17 Groundwater CULs and FS Groundwater PRGs		DEQ PRGs			NW Natural IFS SLVs	Gasco OU FS Upland Groundwater Aquatic Life PRGs[5]
		Ecological Fill WBZ and/or Alluvium WBZ Groundwater COCs (Aquatic Life)[1]	State and Federal Aquatic Life Water Quality Criteria[2] in µg/L	Notes	Table 17 Groundwater CULs and FS Groundwater PRGs CULs[3] in µg/L	Notes	DEQ Proposed Aquatic Life PRGs (DEQ 2020, 2021)[4] in µg/L	Notes	DEQ Water RBCs: Narcosis (DEQ 2020, Table 2)[4] in µg/L	IFS SLVs (Anchor QEA 2018)[4] in µg/L	
Acetone	VOC	X	--	--	--	--	1,700	--	120,000	1,500	1,700
Acrolein	VOC	X	3	8	--	--	3	--	--	--	3
Benzene	VOC	X	--	--	130	7	160	--	2,200	130	130
Butyric acid[11]	VOC	X	--	--	--	--	610	--	--	610	--
Carbon disulfide	VOC	X	--	--	--	--	15	--	--	0.92	15
Ethylbenzene	VOC	X	--	--	7.3	--	61	--	310	7.3	7.3
Isopropylbenzene (Cumene)	VOC	X	--	--	--	--	4.8	--	98	2.6	4.8
m,p-Xylene	VOC	X	--	--	--	--	27	9	--	13	--
n-Butylbenzene	VOC	X	--	--	--	--	7.3	--	--	7.3	7.3
o-Xylene	VOC	X	--	--	--	--	27	9	--	13	--
Propionic acid[11]	VOC	X	--	--	--	--	500	--	--	500	--
sec-Butylbenzene	VOC	X	--	--	--	--	7.3	--	--	7.3	7.3
Styrene	VOC	X	--	--	--	--	32	--	410	72	32
Toluene	VOC	X	--	--	9.8	--	62	--	790	9.8	9.8
Total Xylenes	VOC	X	--	--	13	--	27	--	260	13	13
Trichloroethene (TCE)	VOC	X	--	--	47	7	220	--	760	47	47
Vinyl chloride	VOC	X	--	--	--	--	930	--	2,300	930	930
C6-C8 Aliphatic Hydrocarbons	TPH	X	--	--	--	--	54	9	--	54	--
C8-C10 Aliphatic Hydrocarbons	TPH	X	--	--	--	--	9.6	9	--	9.5	--
C8-C10 Aromatic Hydrocarbons	TPH	X	--	--	--	--	240	9	--	212	--
C10-C12 Aliphatic Hydrocarbons	TPH	X	--	--	2.6	--	2.6	9	--	2.6	--
C10-C12 Aromatic Hydrocarbons	TPH	X	--	--	--	--	79	9	--	1,000	--
TPH (Former Spent Oxide Area RA-1)	TPH	X	--	--	--	--	160	12	--	--	160
TPH (Former Lampblack Storage Area RA-2)	TPH	X	--	--	--	--	92	12	--	--	92
TPH (Former Tar Settling Pond Area Area RA-3)	TPH	X	--	--	--	--	100	12	--	--	100
TPH (Former Koppers Land Disposal Area RA-4)	TPH	X	--	--	--	--	200	12	--	--	200
TPH (Former Naphthalene Plant Area RA-5)	TPH	X	--	--	--	--	1,200	12	--	--	1,200

Ecological PRG Table 4
Gasco OU Ecological Groundwater COCs and PRGs – Hot Spot Evaluations
Upland to Willamette River Pathways

Notes:
-: COC not included in the PH ROD Table 17 for groundwater.
--: Not applicable
1. COCs listed have at least one exceedance ratio greater than 1 in groundwater at the Gasco OU.
2. Groundwater hot spot criteria per OAR 340-122-0115 (51) (a); the Aquatic Life Water Quality Criteria were determined by selecting the lower value between Oregon and National AWQC, where available.
3. Groundwater hot spot criteria per OAR 340-122-0115 (51) (b); per January 2020 Errata #2 (EPA 2020). Groundwater CULs based on RAO 4 have been replaced by CULs based on RAO 8 per Portland Harbor FS (EPA 2016).
4. Groundwater hot spot criteria per OAR 340-122-0115 (51) (c).
5. Hot spot PRGs per Wyatt 2023: Hierarchy of hot spot criteria sources per OAR 340-122-0155 (51).
6. Oregon National AWQC: OAR 340-041-8033, Table 30, Aquatic Life Water Quality Criteria for Toxic Pollutants, 2019: Calculated AWQC per DEQ 2020 (Table 2).
7. RAO 8 based CULs per Portland Harbor FS Tables 2.2-2c and 2.2-2d (EPA 2016).
8. National AWQC Recommended – Aquatic Life Criteria Table; available at https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table: Aluminum AWQC calculated with default values (pH = 7, hardness = 25, and DOC = 1.25) using the calculator provided on https://www.epa.gov/wqc/aquatic-life-criteria-aluminum.
9. Chronic aquatic life RBCs per DEQ *Conducting Ecological Risk Assessments* (DEQ 2020).
10. The groundwater PRG for total PAHs is based on summing the individual PAH HQs to calculate an HI and compared to an HI = 1.
11. These analytes had exceedance ratios greater than 1, but DEQ has indicated that they do not consider these fatty acids to be groundwater COCs because they are likely associated with the EIB treatment at the Siltronic site (DEQ 2021).
12. Site-specific TPH RBCs will be applied consistent with the RI/HERA Addendum (Anchor QEA 2019) and as discussed and approved by DEQ on June 27, 2023.

µg/L: microgram per liter
AWQC: ambient water quality criteria
COC: contaminant of concern
CONV: conventional
CUL: cleanup level
DDD: dichlorodiphenyldichloroethane
DDE: dichlorodiphenyldichloroethylene
DDT: dichlorodiphenyltrichloroethane
DDx: sum of DDT, DDD, and DDE
DEQ: Oregon Department of Environmental Quality
EIB: enhanced in situ bioremediation
FS: feasibility study
HI: hazard index
HQ: hazard quotient
IFS: *Interim Feasibility Study*
OAR: Oregon Administrative Rule
OU: operable unit
PAH: polycyclic aromatic hydrocarbon
PEST: pesticide
PH: Portland Harbor
PRG: preliminary remediation goal
RAO: remedial action objective
RBC: risk-based concentration
RI/HERA Addendum: *Remedial Investigation/Human Health and Ecological Risk Assessment Addendum for the Siltronic GSA*
ROD: Record of Decision
Siltronic: Siltronic Corporation
SLV: screening level value
SVOC: semivolatile organic compound
TPH: total petroleum hydrocarbons
VOC: volatile organic compound
WBZ: water-bearing zone

References:
Anchor QEA (Anchor QEA, LLC), 2018. *Interim Feasibility Study.* Gasco OU. Prepared for NW Natural. November 21, 2018.
Anchor QEA, 2019. *Remedial Investigation/Human Health and Ecological Risk Assessment Addendum for the Siltronic GSA* . Gasco OU. Prepared for NW Natural. November 22, 2019.
DEQ (Oregon Department of Environmental Quality), 2020. *Appendices for: Conducting Ecological Risk Assessments.* September 14, 2020.
DEQ, 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufactured Gas Plant Operable Unit.* December 16, 2021.
EPA (U.S. Environmental Protection Agency), 2016. *Feasibility Study; Portland Harbor RI/FS.* June 2016.
EPA, 2020. Errata #2 for Portland Harbor Superfund Site Record of Decision ROD Table 17. January 14, 2020.
Wyatt, Robert, 2023. Regarding: NWN Gasco. Email to: Hunter Young, Elizabeth McKenna, and Stephanie Ebright (U.S. Environmental Protection Agency); Wesley Thomas, Kevin Parrett, and Paul Seidel (Oregon Department of Environmental Quality); Patty Dost (Pearl Legal Group); Michael Zevenbergen (U.S. Department of Justice); and Gary Vrooman (Oregon Department of Justice). Attachment to email: "NW Natural's Framework for EPA Sediment Design and DEQ Source Control Measure FFS and IRAM Design." July 21, 2023.

Ecological PRG Table 5
Gasco OU Riverbank Seep COCs and PRGs – Source Control
Upland to Willamette Riverbank Pathway

Gasco OU Ecological Fill WBZ Wildlife Groundwater Contaminants of Concern[1]	Analyte Group	Ecological Fill WBZ Groundwater COCs (Wildlife)[1]	Portland Harbor ROD Table 17 Surface Water CUL~~/PRGs~~[2,3] in µg/L
Cyanide, available	CONV	X	--
Cyanide, free	CONV	X	--
Total Dioxin/Furan TEQ	DIOXFUR	X	5.10E-10
Aluminum	Metals	X	--
Vanadium	Metals	X	--
Benzo(a)pyrene	PAH	X	0.00012
Naphthalene	PAH	X	12
4,4'-DDD (p,p'-DDD)	PEST	X	--
Total DDx	PEST	X	0.01

Notes:
--: Not applicable
1. COCs listed have at least one exceedance ratio greater than 1 in Fill WBZ groundwater at the Gasco OU.
2. Per Portland Harbor ROD Table 17, January 2020 Errata #2 (EPA 2020).
3. Source control PRGs per Wyatt 2023.

µg/L: microgram per liter
COC: contaminant of concern
CONV: conventional
CUL: cleanup level
DDD: dichlorodiphenyldichloroethane
DDE: dichlorodiphenyldichloroethylene
DDT: dichlorodiphenyltrichloroethane
DDx: sum of DDT, DDD, and DDE
DIOXFUR: dioxin/furan
OU: operable unit
PAH: polycyclic aromatic hydrocarbon
PEST: pesticide
PRG: preliminary remediation goal
ROD: Record of Decision
TEQ: toxic equivalents quotient
WBZ: water-bearing zone

References:
EPA (U.S. Environmental Protection Agency), 2020. Errata #2 for Portland Harbor Superfund Site Record of Decision ROD Table 17. January 14, 2020.

Wyatt, Robert, 2023. Regarding: NWN Gasco. Email to: Hunter Young, Elizabeth McKenna, and Stephanie Ebright (U.S. Environmental Protection Agency); Wesley Thomas, Kevin Parrett, and Paul Seidel (Oregon Department of Environmental Quality); Patty Dost (Pearl Legal Group); Michael Zevenbergen (U.S. Department of Justice); and Gary Vrooman (Oregon Department of Justice). Attachment to email: "NW Natural's Framework for EPA Sediment Design and DEQ Source Control Measure FFS and IRAM Design." July 21, 2023.

Ecological PRG Table 6
Gasco OU Ecological Riverbank Seep COCs and PRGs – Hot Spot Evaluations
Upland to Willamette Riverbank Pathway

Gasco OU Ecological Fill WBZ Wildlife Groundwater Contaminants of Concern[1]	Analyte Group	Ecological Fill WBZ Groundwater COCs (Wildlife)[1]	~~DEQ Proposed~~ Wildlife Water Ingestion PRGs for Riverbank Seeps (DEQ 2020,[2] 2021[3]) in µg/L[4]	Notes
Cyanide, available	CONV	X	22	5
Cyanide, free	CONV	X	22	5
Total Dioxin/Furan/PCB TEQ	DIOXFUR	X	0.044	--
Aluminum	Metals	X	86,000	--
Vanadium	Metals	X	18,000	--
Benzo(a)pyrene	PAH	X	44,000	--
Naphthalene	PAH	X	570	--
4,4'-DDD (p,p'-DDD)	PEST	X	--	--
Total DDx	PEST	X	5,300	--

Notes:
--: Not applicable
1. COCs listed have at least one exceedance ratio greater than 1 in Fill WBZ groundwater at the Gasco OU.
2. Per *Conducting Ecological Risk Assessments* (DEQ 2020); Table 1b.
3. Per *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals,* Former Gasco Manufactured Gas Plant Operable Unit (DEQ 2021)*;* Table B.
4. Source control PRGs per Wyatt 2023.
5. Per Anchor QEA (2019) Table 10-7, footnote c.

µg/L: microgram per liter
COC: contaminant of concern
CONV: conventional
DDD: dichlorodiphenyldichloroethane
DDE: dichlorodiphenyldichloroethylene
DDT: dichlorodiphenyltrichloroethane
DDx: sum of DDT, DDD, and DDE
DEQ: Oregon Department of Environmental Quality
DIOXFUR: dioxin/furan
OU: operable unit
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
PEST: pesticide
PRG: preliminary remediation goal
TEQ: toxic equivalents quotient
WBZ: water-bearing zone

References:
Anchor QEA (Anchor QEA, LLC), 2019. *Remedial Investigation/Human Health and Ecological Risk Assessment Addendum for the Siltronic GSA* . Gasco OU. Prepared for NW Natural. November 22, 2019.

DEQ (Oregon Department of Environmental Quality), 2020. *Appendices for: Conducting Ecological Risk Assessments* . September 14, 2020.

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

Wyatt, Robert, 2023. Regarding: NWN Gasco. Email to: Hunter Young, Elizabeth McKenna, and Stephanie Ebright (U.S. Environmental Protection Agency); Wesley Thomas, Kevin Parrett, and Paul Seidel (Oregon Department of Environmental Quality); Patty Dost (Pearl Legal Group); Michael Zevenbergen (U.S. Department of Justice); and Gary Vrooman (Oregon Department of Justice). Attachment to email: "NW Natural's Framework for EPA Sediment Design and DEQ Source Control Measure FFS and IRAM Design." July 21, 2023.

Ecological PRG Table 7
Gasco OU Ecological Fill WBZ Groundwater Migration to Doane Creek and Doane Creek Surface Water COCs

Siltronic GSA Fill WBZ Groundwater Migration to Doane Creek and Doane Creek Surface Water Ecological Contaminants of Concern[1]	Analyte Group	Units	CAS No.	Siltronic GSA Ecological Fill WBZ Migration to Doane Creek and Doane Creek Surface Water COCs	Siltronic GSA Ecological Fill WBZ Groundwater Migration to Doane Creek COCs – Aquatic Life	Siltronic GSA Ecological Fill WBZ Groundwater to Doane Creek COCs – Aquatic Dependent Wildlife	Doane Creek Ecological Surface Water COCs – Aquatic Life	Doane Creek Ecological Surface Water COCs – Aquatic Dependent Wildlife
Cyanide, total	CONV	mg/L	57-12-5	X	X	X	X	o
Cyanide, available	CONV	mg/L	CYANAVAIL	X	X	X	--	o
Cyanide, free	CONV	mg/L	CYANFREE	X	X	o	o	o
Sulfate	CONV	mg/L	14808-79-8	X	X	--	o	--
Aluminum	Metals	µg/L	7429-90-5	X	X	o	X	o
Barium	Metals	µg/L	7440-39-3	X	X	o	X	o
Beryllium	Metals	µg/L	7440-41-7	X	X	o	o	o
Cadmium	Metals	µg/L	7440-43-9	X	X	o	o	o
Calcium	Metals	µg/L	7440-70-2	X	X	--	o	--
Chromium	Metals	µg/L	7440-47-3	X	X	o	o	o
Copper	Metals	µg/L	7440-50-8	X	X	o	X	o
Iron	Metals	µg/L	7439-89-6	X	X	--	X	--
Lead	Metals	µg/L	7439-92-1	X	X	o	X	o
Manganese	Metals	µg/L	7439-96-5	X	X	o	o	o
Nickel	Metals	µg/L	7440-02-0	X	X	o	o	o
Zinc	Metals	µg/L	7440-66-6	X	X	o	o	o
1-Methylnaphthalene	PAH	µg/L	90-12-0	X	X	--	o	--
Anthracene	PAH	µg/L	120-12-7	X	X	--	o	--
Benzo(a)anthracene	PAH	µg/L	56-55-3	X	X	--	X	--
Benzo(a)pyrene	PAH	µg/L	50-32-8	X	X	o	X	o
Benzo(b)fluoranthene	PAH	µg/L	205-99-2	X	X	--	o	--
Benzo(g,h,i)perylene	PAH	µg/L	191-24-2	X	X	--	o	--
Benzo(k)fluoranthene	PAH	µg/L	207-08-9	X	X	--	o	--
Chrysene	PAH	µg/L	218-01-9	X	X	--	o	--
Dibenzo(a,h)anthracene	PAH	µg/L	53-70-3	X	X	--	o	--
Fluoranthene	PAH	µg/L	206-44-0	X	X	--	o	--
Fluorene	PAH	µg/L	86-73-7	X	X	--	o	--
Indeno(1,2,3-c,d)pyrene	PAH	µg/L	193-39-5	X	X	--	o	--
Phenanthrene	PAH	µg/L	85-01-8	X	X	--	o	--
Pyrene	PAH	µg/L	129-00-0	X	X	--	o	--
Total PAH HI	PAH	µg/L	--	X	X	--	X	--
TPH	TPH	mg/L	--	X	X	--	o	--

Notes:
--: Not applicable
o: Contaminant analyzed in Fill WBZ groundwater or Doane Creek surface water and determined to not be a COC.
X: Ecological COC
1. COCs listed have at least one exceedance ratio greater than 1 in Fill WBZ groundwater migrating to Doane Creek or Doane Creek surface water in the Siltronic GSA.

µg/L: microgram per liter
CAS: Chemical Abstracts Service
COC: contaminant of concern
CONV: conventional
GSA: geographic subarea
HI: hazard index
mg/L: milligram per liter
PAH: polycyclic aromatic hydrocarbon
Siltronic: Siltronic Corporation
TPH: total petroleum hydrocarbons
WBZ: water-bearing zone

Ecological PRG Table 8
Gasco OU Ecological Fill WBZ Groundwater Migration to Doane Creek and Doane Creek Surface Water PRGs

Siltronic GSA Fill WBZ Groundwater Migration to Doane Creek and Doane Creek Surface Water Ecological Contaminants of Concern	Analyte Group	Units	CAS No.	Siltronic GSA Ecological Fill WBZ Migration to Doane Creek and Doane Creek Surface Water Aquatic Life PRGs[1]	Notes	Siltronic GSA Ecological Fill WBZ to Doane Creek PRGs – Aquatic Dependent Wildlife
Cyanide, available	CONV	mg/L	CYANAVAIL	0.0052	--	0.022[2]
Cyanide, free	CONV	mg/L	CYANFREE	0.0052	--	0.022[2]
Sulfate	CONV	mg/L	14808-79-8	14,830	--	--
Aluminum	Metals	µg/L	7429-90-5	320	--	--
Barium	Metals	µg/L	7440-39-3	220	--	--
Beryllium	Metals	µg/L	7440-41-7	11	--	--
Cadmium	Metals	µg/L	7440-43-9	0.094	--	--
Calcium	Metals	µg/L	7440-70-2	120,000	--	--
Chromium	Metals	µg/L	7440-47-3	24	--	--
Copper	Metals	µg/L	7440-50-8	1.4	--	--
Iron	Metals	µg/L	7439-89-6	1,000	--	--
Lead	Metals	µg/L	7439-92-1	0.54	--	--
Manganese	Metals	µg/L	7439-96-5	1,433	--	--
Nickel	Metals	µg/L	7440-02-0	16	--	--
Zinc	Metals	µg/L	7440-66-6	36	--	--
1-Methylnaphthalene	PAH	µg/L	90-12-0	6.1	--	--
2-Methylnaphthalene	PAH	µg/L	91-57-6	2.1	--	--
Acenaphthene	PAH	µg/L	83-32-9	23	--	--
Acenaphthylene	PAH	µg/L	208-96-8	13	--	--
Anthracene	PAH	µg/L	120-12-7	0.73	--	--
Benzo(a)anthracene	PAH	µg/L	56-55-3	0.03	--	--
Benzo(a)pyrene	PAH	µg/L	50-32-8	0.01	--	--
Benzo(b)fluoranthene	PAH	µg/L	205-99-2	0.7	--	--
Benzo(g,h,i)perylene	PAH	µg/L	191-24-2	0.4	--	--
Benzo(k)fluoranthene	PAH	µg/L	207-08-9	0.6	--	--
Chrysene	PAH	µg/L	218-01-9	2	--	--
Dibenzo(a,h)anthracene	PAH	µg/L	53-70-3	0.3	--	--
Fluoranthene	PAH	µg/L	206-44-0	6.2	--	--
Fluorene	PAH	µg/L	86-73-7	3.9	--	--
Indeno(1,2,3-c,d)pyrene	PAH	µg/L	193-39-5	0.3	--	--
Naphthalene	PAH	µg/L	91-20-3	12	--	--
Phenanthrene	PAH	µg/L	85-01-8	6.3	--	--
Pyrene	PAH	µg/L	129-00-0	10	--	--
Total PAH HI	PAH	µg/L	--	HI = 1	3	--
TPH (Former Spent Oxide Area RA-1)	TPH	µg/L	--	160	4	--
TPH (Former Tar Settling Pond Area RA-3)	TPH	µg/L	--	100	4	--

Notes:
--: Not applicable
1. Per Anchor QEA Ecological PRG Table 4, "Gasco OU Ecological Groundwater COCs and PRGs – Hot Spot Evaluations Upland to Willamette River Pathways."
2. Per Anchor QEA (2019) Table 10-7, footnote c.
3. The groundwater PRG for total PAHs is based on summing the individual PAH HQs to calculate an HI and compared to an HI = 1.
4. Site-specific TPH RBCs will be applied consistent with the RI/HERA Addendum (Anchor QEA 2019) and as discussed and approved by DEQ on June 27, 2023.

µg/L: microgram per liter
CAS: Chemical Abstracts Service
CONV: conventional
DEQ: Oregon Department of Environmental Quality
GSA: geographic subarea
HI: hazard index
HQ: hazard quotient
mg/L: milligram per liter
PAH: polycyclic aromatic hydrocarbon
PRG: preliminary remediation goal
RI/HERA Addendum: *Remedial Investigation/Human Health and Ecological Risk Assessment Addendum for the Siltronic GSA*
Siltronic: Siltronic Corporation
TPH: total petroleum hydrocarbons
WBZ: water-bearing zone

Reference:
Anchor QEA (Anchor QEA, LLC), 2019. *Remedial Investigation/Human Health and Ecological Risk Assessment Addendum for the Siltronic GSA* . Gasco OU. Prepared for NW Natural. November 22, 2019.

Ecological PRG Table 9
Gasco OU Ecological Doane Creek Sediment COCs

Siltronic GSA Ecological Doane Creek Sediment Contaminants of Concern[1]	Analyte Group	Units	CAS No.	Doane Creek Sediment Ecological COCs	Doane Creek Sediment Ecological COCs – Benthic	Doane Creek Sediment Ecological COCs – Bird Bioaccumulation	Doane Creek Sediment Ecological COCs – Fish Bioaccumulation	Doane Creek Sediment Ecological COCs – Mammal Bioaccumulation	Portland Basin Background Value[2]	Natural Background
Cyanide, total	CONV	mg/kg	57-12-5	X	X	--	--	--	--	--
Arsenic	Metals	mg/kg	7440-38-2	X	X	X	X	X	8.8	
Iron	Metals	mg/kg	7439-89-6	X	X	--	--	--	--	36,100[3]
Lead	Metals	mg/kg	7439-92-1	X	X	o	o	o	79	
1-Methylnaphthalene	PAH	µg/kg	90-12-0	X	X	--	--	--	--	--
2-Methylnaphthalene	PAH	µg/kg	91-57-6	X	X	--	--	--	--	--
Acenaphthene	PAH	µg/kg	83-32-9	X	X	--	--	--	--	--
Anthracene	PAH	µg/kg	120-12-7	X	X	--	--	--	--	--
Benz(a)anthracene	PAH	µg/kg	56-55-3	X	X	--	--	--	--	--
Benzo(a)pyrene	PAH	µg/kg	50-32-8	X	X	--	--	--	--	--
Benzo(b)fluoranthene	PAH	µg/kg	205-99-2	X	X	--	--	--	--	--
Benzo(g,h,i)perylene	PAH	µg/kg	191-24-2	X	X	--	--	--	--	--
Benzo(k)fluoranthene	PAH	µg/kg	207-08-9	X	X	--	--	--	--	--
Chrysene	PAH	µg/kg	218-01-9	X	X	--	--	--	--	--
Dibenz(a,h)anthracene	PAH	µg/kg	53-70-3	X	X	--	o	o	--	--
Fluoranthene	PAH	µg/kg	206-44-0	X	X	--	--	--	--	--
Fluorene	PAH	µg/kg	86-73-7	X	X	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	PAH	µg/kg	193-39-5	X	X	--	--	--	--	--
Naphthalene	PAH	µg/kg	91-20-3	X	X	--	--	--	--	--
Phenanthrene	PAH	µg/kg	85-01-8	X	X	--	--	--	--	--
Pyrene	PAH	µg/kg	129-00-0	X	X	--	X	o	--	--
Total HPAH	PAH	µg/kg	--	X	X	--	--	--	--	--
Total LPAH	PAH	µg/kg	--	X	X	--	--	--	--	--
Total PAHs	PAH	µg/kg	--	X	X	--	--	--	--	--
PAH ESBTU	PAH	µg/kg	--	X	X	--	--	--	--	--
Carbazole	SVOC	µg/kg	86-74-8	X	X	--	--	--	--	--

Ecological PRG Table 9
Gasco OU Ecological Doane Creek Sediment COCs

Notes:
--: Not applicable
o: Contaminant analyzed in sediment and determined to not be a COC.
X: Ecological COC for sediment
1. COCs listed have at least one exceedance ratio greater than 1 in sediments in Doane Creek in the Siltronic GSA.
2. Regional default background concentration for Portland Basin based on 95% UPL from Table 4 (DEQ 2013).
3. Regional 90th percentile, Clark County, Washington; from Table 1 (Ecology 1994).

µg/kg: microgram per kilogram
CAS: Chemical Abstracts Service
COC: contaminant of concern
CONV: conventional
ESBTU: equilibrium partitioning sediment benchmark toxic unit
GSA: geographic subarea
HPAH: high-molecular-weight polycyclic aromatic hydrocarbon
LPAH: low-molecular-weight polycyclic aromatic hydrocarbon
mg/kg: milligram per kilogram
PAH: polycyclic aromatic hydrocarbon
Siltronic: Siltronic Corporation
SVOC: semivolatile organic compound
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.

Ecological PRG Table 10
Gasco OU Ecological Doane Creek Sediment PRGs

Siltronic GSA Ecological Doane Creek Sediment Contaminants of Concern	Analyte Group	Units	CAS No.	Doane Creek Sediment Ecological COCs	Doane Creek Sediment Ecological PRGs – Benthic[1]	Doane Creek Sediment Ecological PRGs – Bird Bioaccumulation[2]	Doane Creek Sediment Ecological PRGs – Fish Bioaccumulation[2]	Doane Creek Sediment Ecological PRGs – Mammal Bioaccumulation[2]	Portland Basin Background Value[3]	Natural Background	Doane Creek Sediment Ecological PRGs – Benthic[4]	Doane Creek Sediment Ecological PRGs – Bioaccumulation[5]	Doane Creek Sediment Ecological Hot Spot Level[6]
Cyanide, total	CONV	mg/kg	57-12-5	X	--[7]	--	--	--	--	--	--	--	--
Arsenic	Metals	mg/kg	7440-38-2	X	(6*); ~~8.8~~**	7	7	7	8.8	--	8.8	7	60
Iron	Metals	mg/kg	7439-89-6	X	(20,000*); ~~36,100~~**	--	--	--	--	36,100[8]	36,100	--	200,000
Lead	Metals	mg/kg	7439-92-1	X	(35*); ~~79~~**	--	--	--	79	--	79	--	350
1-Methylnaphthalene	PAH	µg/kg	90-12-0	X	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	PAH	µg/kg	91-57-6	X	--	--	--	--	--	--	--	--	--
Acenaphthene	PAH	µg/kg	83-32-9	X	--	--	--	--	--	--	--	--	--
Acenaphthylene	PAH	µg/kg	208-96-8	X	--	--	--	--	--	--	--	--	--
Anthracene	PAH	µg/kg	120-12-7	X	--	--	--	--	--	--	--	--	--
Benz(a)anthracene	PAH	µg/kg	56-55-3	X	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	PAH	µg/kg	50-32-8	X	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	PAH	µg/kg	205-99-2	X	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	PAH	µg/kg	191-24-2	X	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	PAH	µg/kg	207-08-9	X	--	--	--	--	--	--	--	--	--
Chrysene	PAH	µg/kg	218-01-9	X	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	PAH	µg/kg	53-70-3	X	--	--	--	--	--	--	--	--	--
Fluoranthene	PAH	µg/kg	206-44-0	X	--	--	--	--	--	--	--	--	--
Fluorene	PAH	µg/kg	86-73-7	X	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	PAH	µg/kg	193-39-5	X	--	--	--	--	--	--	--	--	--
Naphthalene	PAH	µg/kg	91-20-3	X	--	--	--	--	--	--	--	--	--
Phenanthrene	PAH	µg/kg	85-01-8	X	--	--	--	--	--	--	--	--	--
Pyrene	PAH	µg/kg	129-00-0	X	--	--	1,900	--	--	--	--	1,900	19,000
Total HPAH	PAH	µg/kg	--	X	193	--	--	--	--	--	193	--	6,500[9]
Total LPAH	PAH	µg/kg	--	X	76	--	--	--	--	--	76	--	5,300[9]
Total PAHs	PAH	µg/kg	--	X	--	--	--	--	--	--	--	--	--
PAH ESBTU	PAH	µg/kg	--	X	--	--	--	--	--	--	--	--	--
Carbazole	SVOC	µg/kg	86-74-8	X	140	--	--	--	--	--	140	--	1,140

Ecological PRG Table 10
Gasco OU Ecological Doane Creek Sediment PRGs

Notes:
*: Sediment RBC per Table 10-8, "Doane Creek Sediment Ecological Screening Levels" (Anchor QEA 2019) as directed by DEQ (Thomas 2023).
**: RBC below background levels, and the PRG is based on background level.
--: Not applicable
1. Per Table 10-8, "Doane Creek Sediment Ecological Screening Levels" (Anchor QEA 2019) as directed by DEQ (Thomas 2023).
2. Sediment Bioaccumulation RBCs from *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment* (DEQ 2007).
3. Regional default background concentration for Portland Basin based on 95% UPL from Table 4 (DEQ 2013).
4. Ecological sediment PRG for benthic endpoint.
5. Ecological sediment PRG for bioaccumulation endpoint.
6. Ecological sediment hot spot level per OAR 340-122-0115 (32) (b) (A) (iii) with the exception of site-specific LPAH and HPAH hot spot criteria as agreed upon during the October 5, 2023, Ecological PAH PRG meeting with DEQ.
7. Benthic RBC based on free cyanide and no PRG required (DEQ 2021).
8. Regional 90th percentile, Clark County, Washington; from Table 1 (Ecology 1994).
9. Site-specific hot spot criteria based on UET, freshwater sediment (NOAA 1999) as agreed upon during the October 5, 2023, Ecological PAH PRG meeting with DEQ.

µg/kg: microgram per kilogram
CAS: Chemical Abstracts Service
COC: contaminant of concern
CONV: conventional
DEQ: Oregon Department of Environmental Quality
ESBTU: equilibrium partitioning sediment benchmark toxic unit
GSA: geographic subarea
HPAH: high-molecular-weight polycyclic aromatic hydrocarbon
LPAH: low-molecular-weight polycyclic aromatic hydrocarbon
mg/kg: milligram per kilogram
OAR: Oregon Administrative Rule
PAH: polycyclic aromatic hydrocarbon
PRG: preliminary remediation goal
RBC: risk-based concentration
Siltronic: Siltronic Corporation
SVOC: semivolatile organic compound
UET: upper effects threshold

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Anchor QEA (Anchor QEA, LLC), 2019. *Remedial Investigation/Human Health and Ecological Risk Assessment Addendum for the Siltronic GSA* . Gasco OU. Prepared for NW Natural. November 22, 2019.
DEQ (Oregon Department of Environmental Quality), 2007. *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment* . Environmental Cleanup Program. October 2020 update.
DEQ, 2013. *Development of Oregon Background Metals Concentrations in Soil.* Technical Report. Land Quality Division, Cleanup Program. March 2013.
DEQ, 2020. *Conducting Ecological Risk Assessments IMD* . September 14, 2020.
DEQ, 2021. *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals; Former Gasco Manufacturing Gas Plant Operable Unit.* December 16, 2021.
Ecology (Washington State Department of Ecology), 1994. *Natural Background Soil Metal Concentrations in Washington State.* Publication No. 94-115. October 1994.
NOAA (National Oceanic and Atmospheric Administration), 1999. "Screening Quick Reference Tables." Upper Effects Thresholds (UET), Freshwater Sediment. Coastal Resources Coordination Branch. Hazmat Report 99-1. (updated February 2004).
Thomas, Wesley, 2023. Regarding: Gasco OU FS PRGs - Riverbank COC/PRG Tables 5a and 5b. [with comments on Ecological PRG Tables 1 through 13]. Email to: Taku Fuji (Anchor QEA). September 26, 2023.