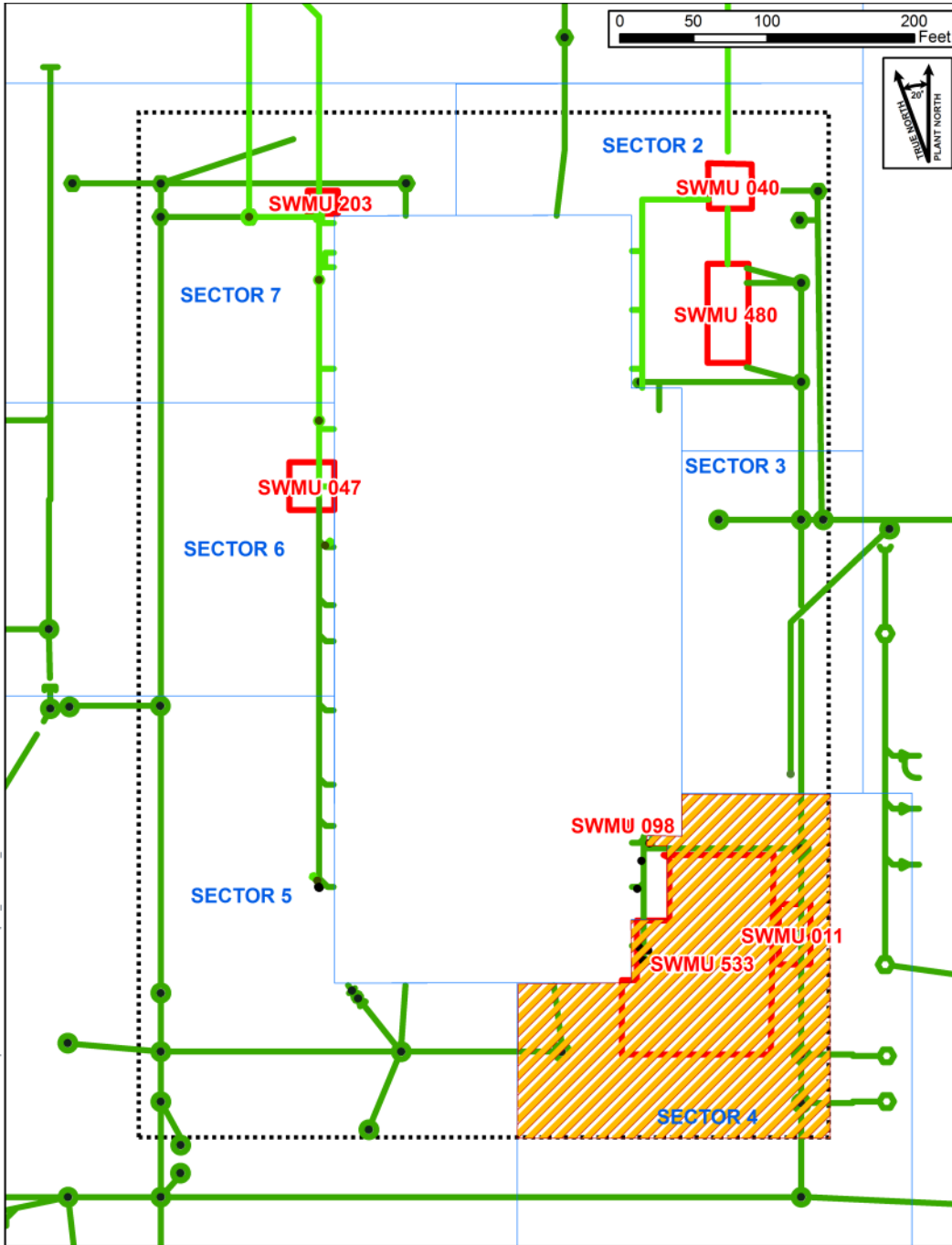




Sampling Plan Strategy Sector 4

DRAFT - FOR DISCUSSION ONLY (5/16/2018)

Location of Sector 4



DRAFT - FOR DISCUSSION ONLY (5/16/2018)



Sector 4 Background

Concrete, asphalt pavement, and gravel covers much of current area of Sector 4

- Area of ~37,000 ft²
- Sector identified to contain two primary release points for TCE
 - Pumps and support lines
 - 11th Street storm sewer
 - Subsurface soils (including upper RGA) treated by ERH
 - 20 ft to 60 ft bgs targeted
- Concrete apron on south end of building is original construction
- Limited area of exposed soil

Key context from WAG 6 RI (Modified by Interim Remedial Action)

- Surface soils are sparsely represented
 - PAHs are present (detects in 2 of 3 samples), locally elevated with a maximum of 2900 µg/kg in the sector
 - PCBs in surface soil in only one sample at 38 µg/kg and one sample of PCB detected at shallow 5' depth at 730 µg/kg
 - (only two detects from 23 samples)
- Subsurface soil samples from locations
 - PAHs widespread in shallow soil <4' bgs up to 23,700 ug/kg with lesser concentrations at depths up to 25-35 ft bgs
 - Widespread TCE
 - Two primary locations: Pumps and Storm Sewer
 - Highest concentration near pump at 11,055 mg/kg at 5-9 ft bgs
 - Metals detected above SQL at 25 of 33 locations (134 samples)
 - Metals included: Antimony, Beryllium, Cadmium, Arsenic, Thallium, Vanadium

DRAFT - FOR DISCUSSION ONLY (5/16/2018)



Sector 4 Background (cont.)

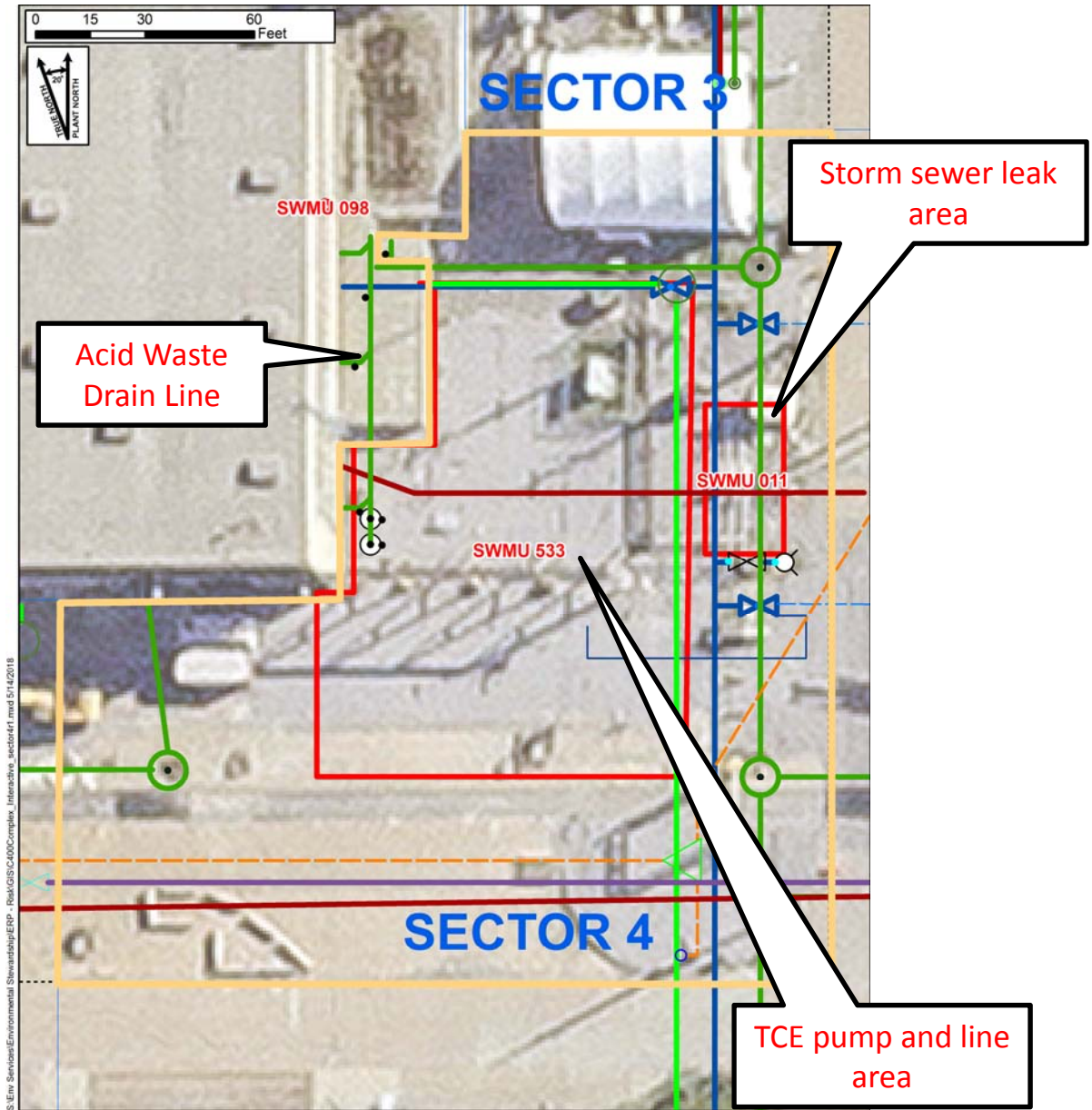
- Subsurface soil samples
 - 144 radionuclides samples from 27 borings with (#) of detects as follows:
 - Neptunium-237 (69)
 - Cesium-137 (22)
 - Americum-241 (14)
 - Uranium-238 (10)
 - Thorium-230 (7)
 - Plutonium-239 (6)
 - Technetium-99 (3)
 - Uranium-235 (2)
 - Uranium-234 (1)



WAG 6 RI

Identified Areas of Contamination

SECTOR 4



DRAFT - FOR DISCUSSION ONLY (5/16/2018)



SECTOR 4

Sampling Strategy: Targeted Sampling Approach

Anticipated remedial action(s)

- Pending

Primary recognized uncertainties

- Nature and extent of shallow soil contamination
- Near-field extent (lateral and vertical) of PAH, metals and radionuclides associated with the Sector

Sample strategy

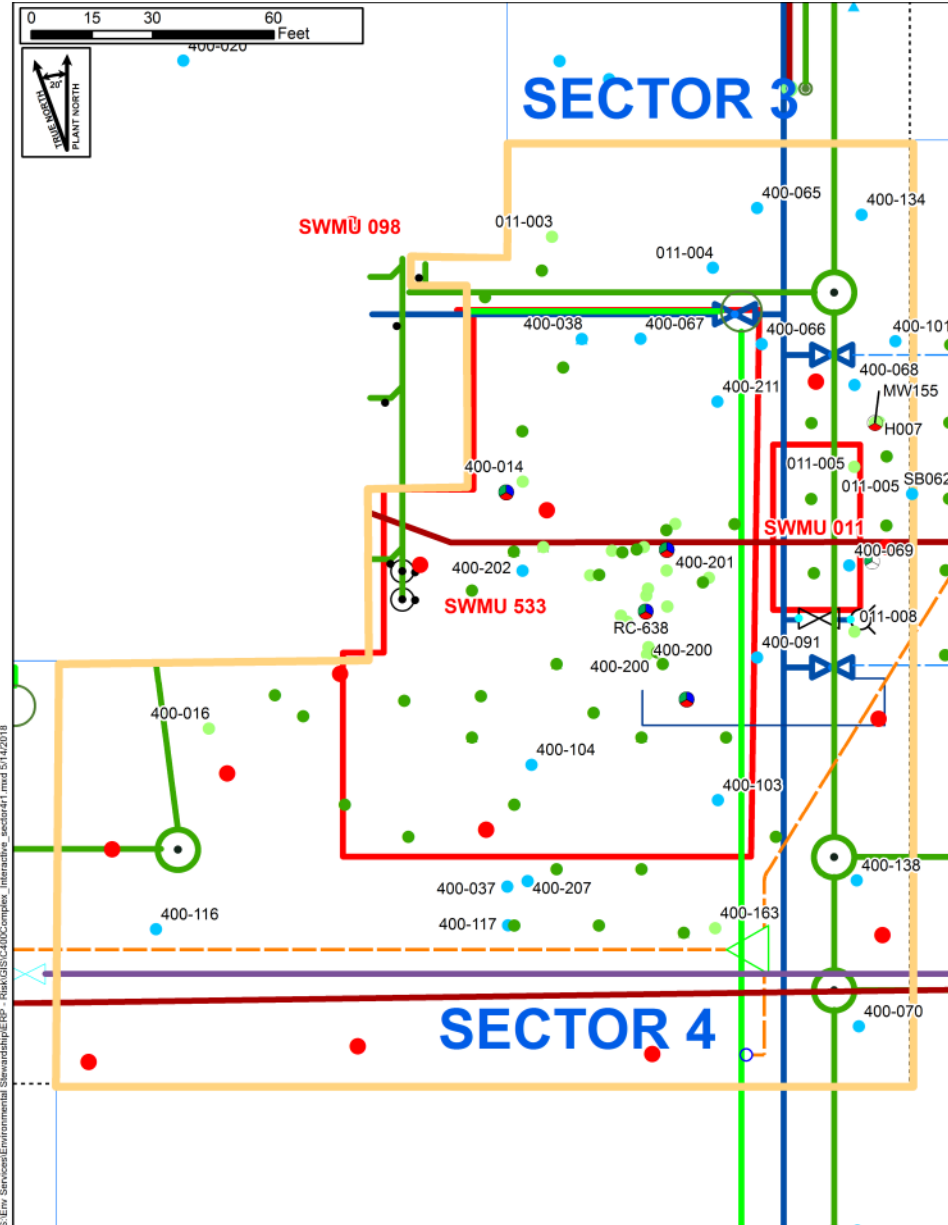
- No surface soil samples collected for targeted sampling approach. Baseline Risk Assessment requires surface soil samples.
- Sample 4 soil horizons
 - Surface
 - HU1: ~ 10 ft depth
 - HU2A: ~ 20 ft depth
 - HU3: ~ 35 ft depth
- Targeted – contaminant sources and COCs from WAG 6 RI Baseline Risk Assessment
 - Sampling to update extent of contaminants

DRAFT - FOR DISCUSSION ONLY (5/16/2018)



SECTOR 4

Targeted Sampling Approach



Example targeted approach:

- Approximates an even distribution around the remaining contaminant sources to define contaminant levels at the contaminant sources and away from the sources
- Samples will be collected from HU1, HU2, and HU3 depths at each proposed sample location
- Total of 12 soil borings/48 soil samples

- WAG 6 Soil Boring
- ▲ Historical Surface Soil Sample
- Recent Historical Soil Boring
- Proposed Soil Boring

Note: Locations shown are conceptual

DRAFT - FOR DISCUSSION ONLY (5/16/2018)



Sector 4 Analyses

Targeted Sampling Approach (based on WAG 6 RI Baseline Risk Assessment)

- Metals (chromium as total chromium)
- PCBs
- Radionuclides
- SVOCs
- VOCs (includes toluene)

Geotechnical samples (in general):

- Engineering properties, transport properties, and risk assessment
- Geotechnical properties likely consistent across C-400 OU Complex
 - 3 per sector to define characteristic value and variability for C-400 OU Complex
 - Samples from minimally affected soil

DRAFT - FOR DISCUSSION ONLY (5/16/2018)



Adaptation of Table 2.1 Significant Chemicals and Radionuclides of Potential Concern at PGDP

from *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
DOE/LX/07-0107&D2/R8/V1

Inorganic Chemicals		Organic Compounds				Radionuclides	
Analyte	CAS Number	Analyte	CAS Number	Analyte	CAS Number	Analyte	CAS Number
Aluminum	7429-90-5	Acenaphthene	83-32-9	Total Dioxins/Furans	1746-01-6	Americium-241	14596-10-2
Antimony	7440-36-0	Acenaphthylene	208-96-8	2,3,7,8 HpCDD	37871-00-4	Cesium-137+D	10045-97-3
Arsenic	7440-38-2	Acrylonitrile	107-13-1	2,3,7,8 HpCDF	38998-75-3	Neptunium-237+D	13994-20-2
Barium	7440-39-3	Anthracene	120-12-7	2,3,7,8 HxCDD	34465-46-8	Plutonium-238	13981-16-3
Beryllium	7440-41-7	Benzene	71-43-2	2,3,7,8 HxCDF	55684-94-1	Plutonium-239	15117-48-3
Boron	7440-42-8	Bromodichloromethane	75-27-4	OCDD	3268-87-9	Plutonium-240	14119-33-6
Cadmium	7440-43-9	Carbazole	86-74-8	OCDF	39001-02-0	Technetium-99	14133-76-7
Chromium III	16065-83-1	Carbon tetrachloride	56-23-5	2,3,7,8 PeCDD	36088-22-9	Thorium-230	14269-63-7
Chromium VI	18540-29-9	Chloroform	67-66-3	1,2,3,7,8 PeCDF	57117-41-6	Uranium-234	13966-29-5
Total Chromium	7440-47-3	1,1-Dichloroethene	75-35-4	2,3,4,7,8 PeCDF	57117-31-4	Uranium-235+D	15117-96-1
Cobalt	7440-48-4	1,2-Dichloroethane	107-06-2	2,3,7,8 TCDD	1746-01-6	Uranium-238+D	7440-61-1
Copper	7440-50-8	1,2-Dichloroethane (mixed)	540-59-0	2,3,7,8 TCDF	5127-31-9		
Fluoride	16984-48-8	trans-1,2-Dichloroethene	156-60-5	Total Carcinogenic PAHs	50-32-8		
Iron	7439-89-6	cis-1,2-Dichloroethene	156-59-2	Benz(a)anthracene	56-55-3		
Lead	7439-92-1	Dieldrin	60-57-1	Benzo(a)pyrene	50-32-8		
Manganese	7439-96-5	Ethylbenzene	100-41-4	Benzo(b)fluoranthene	205-99-2		
Mercury	7439-97-6	Fluoranthene	206-44-0	Benzo(k)fluoranthene	207-08-9		
Molybdenum	7439-98-7	Fluorene	86-73-7	Chrysene	218-01-9		
Nickel	7440-02-0	Hexachlorobenzene	118-74-1	Dibenz(a,h)anthracene	53-70-3		
Selenium	7782-49-2	Naphthalene	91-20-3	Indeno(1,2,3-cd)pyrene	193-39-5		
Silver	7440-22-4	2-Nitroaniline	88-74-4	Total PCBs	1336-36-3		
Thallium	7440-28-0	N-Nitroso-di-n-propylamine	621-64-7	Aroclor 1016	12674-11-2		
Uranium	NA	Pentachlorophenol	87-86-5	Aroclor 1221	11104-28-2		
Vanadium	7440-62-2	Phenanthrene	85-01-8	Aroclor 1232	11141-16-5		
Zinc	7440-66-6	Pyrene	129-00-0	Aroclor 1242	53469-21-9		
		Tetrachloroethene	127-18-4	Aroclor 1248	12672-29-6		
		Toluene	108-88-3	Aroclor 1254	11097-69-1		
		1,1,1-Trichloroethane	71-55-6	Aroclor 1260	11096-82-5		
		1,1,2-Trichloroethane	79-00-5	Vinyl chloride	75-01-4		
		Trichloroethene	79-01-6	Xylenes (Mixture)	1330-20-7		
				p-Xylene	106-42-3		
				m-Xylene	108-38-3		
				o-Xylene	95-47-6		

¹ This list of chemicals, compounds, and radionuclides was compiled from COPCs retained as COCs in baseline risk assessments performed at PGDP between 1990 and 2013 (i.e., DOE 1996a; DOE 1996b; DOE 1999a; DOE 1999b; DOE 2000a; DOE 2001; DOE 2005; DOE 2008; DOE 2010; DOE 2013).

² List may be added to during project scoping based on additional information.

Yellow cells with ~~strikethrough text~~ indicate COPCs that will not be analyzed for C-400 RI/FS.

Green cells indicate additional analytes, not identified as COPCs, that will be analyzed for C-400 RI/FS.

DRAFT - FOR DISCUSSION ONLY (5/16/2018)



Sector 4 - Possible Response Actions

Surface Soil

- Excavation, if required

Subsurface Soil

- Above Water Table
 - Thermal – VOCs/SVOCs
 - Soil Vapor Extraction – VOC/SVOCs
 - Solidification/Stabilization - Inorganics/Radionuclides
 - Enhanced Bioremediation - VOCs/SVOCs/Inorganics (contaminant dependent)
 - Excavation and treatment/disposition – (Treatment - contaminant dependent)
 - Chemical Oxidation - VOCs/SVOCs/Inorganics (contaminant dependent)
 - Barrier/Slurry Wall – VOC/SVOCs/Inorganics
 - Plugging Pipelines & Subsurface/Surface Structure Infrastructure
 - Combination of Technologies
- Below Water Table (UCRS)
 - Thermal – VOCs / SVOCs
 - Dual Phase Extraction – VOC / SVOCs
 - Soil Flushing – VOCs / Inorganics
 - Solidification/Stabilization - Inorganics / Radionuclides
 - Enhanced Bioremediation - VOCs/SVOCs/Inorganics (contaminant dependent)
 - Excavation and treatment/disposition – (Treatment-contaminant dependent)
 - Chemical Oxidation - VOCs/SVOCs/Inorganics (contaminant dependent)
 - Barrier/Slurry Wall – VOC/SVOCs/Inorganics
 - Pump and Treat – Contaminants dependent on treatment system
 - Combination of Technologies

DRAFT - FOR DISCUSSION ONLY (5/16/2018)



Sector 4 – Geotechnical Samples

Geotechnical samples (in general):

- Engineering properties, transport properties, and risk assessment
- Geotechnical properties likely consistent across C-400 OU Complex
 - 1 boring (3 samples) per sector to define characteristic value and variability for C-400 OU Complex
 - Samples from minimally affected soil
- Examples of data needs for potential remedial actions
 - Geochemical and biological parameters that could affect chemical degradation and transformation
 - Modeling parameters including chemical parameters, mineralogy, reduction-oxidation potential, porosity, permeability, and stratigraphy
 - Physical parameters including compaction, grain size, cation exchange, chemical oxygen demand, pH, permeability, genetic profiling, microbial community, NOD, and moisture content of soils

DRAFT - FOR DISCUSSION ONLY (5/16/2018)

