

# Georgia-Pacific Mill Site DTSC Cleanup Update

Special City Council Meeting  
February 2, 2017

Town Hall, Fort Bragg, CA



# Tonight's Agenda

- **Presentation to the City Council - DTSC**
  - Background - who we are, what we do
  - Work Completed Thus Far
  - OU C and D RAP and OUE RAW Implementation
  - OUE with focus on Mill Pond
    - Past Investigation
    - Human and Ecological Risk Assessment
    - OUE Feasibility Study and RAP
- **Q&A with City Council**
- **Q&A with Community Members**

# Department of Toxic Substances Control -

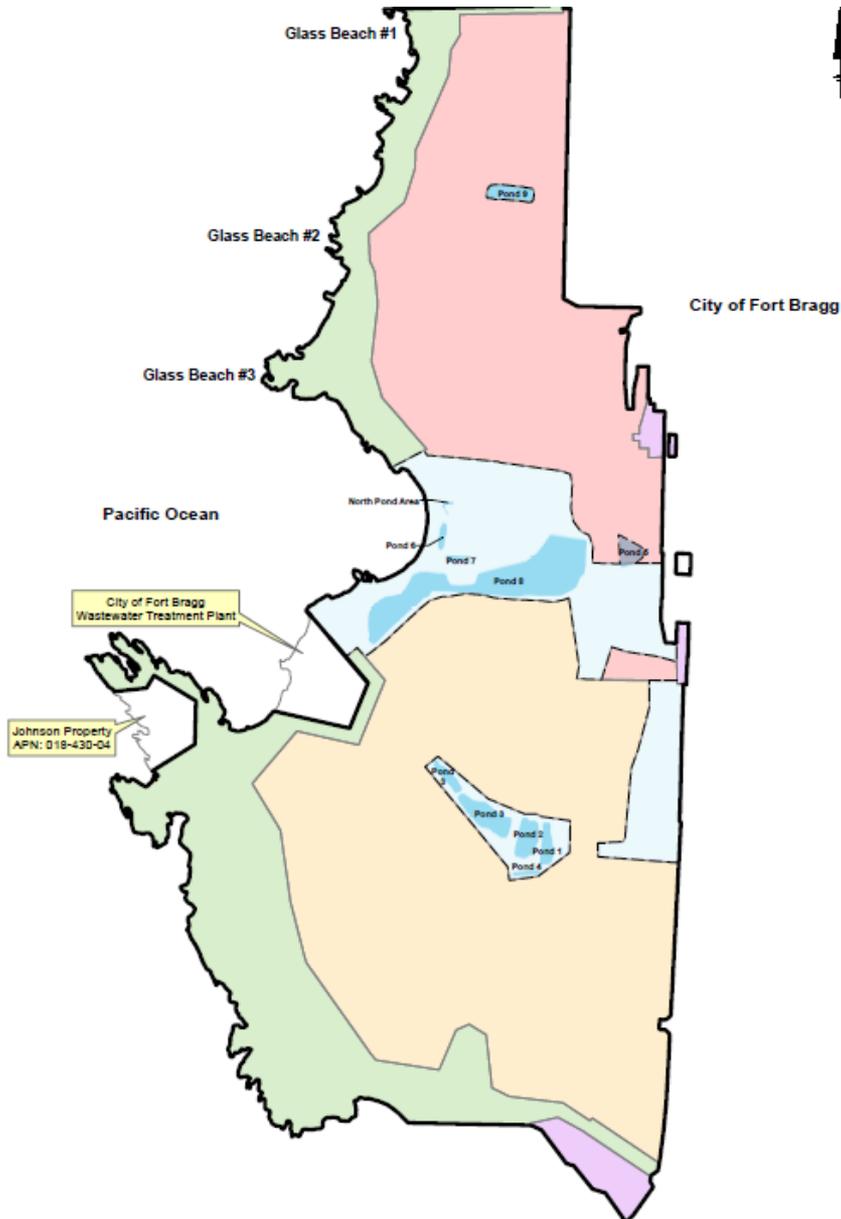
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# DTSC Cleanup Process

- **Site Discovery – Site Assessment**
- **Remedial Investigation - RI**
- **Feasibility Study - FS**
- **Cleanup Actions**
  - **Interim Remedial Action Plan - IRAP**
  - **Removal Action Workplan - RAW**
  - **Remedial Action Plan - RAP**
- **Implementation**
  - **Workplan – Remedial Design and Implementation Plan - RDIP**
  - **Completion Report**
- **Certification**

# DTSC Oversight of GP Mill Site Cleanup

- **2006 DTSC takes lead on cleanup oversight**
- **2007 DTSC issues Site Investigation and Remediation Order**
- **2007 DTSC and City of Fort Bragg partner Environmental Oversight Agreement**
  - **DTSC provides consultation services**
  - **Provides Immunity Protection**
  - **City Fort Bragg Concurs on Cleanup Decisions**
  - **Extended March 2014**



## Former Georgia-Pacific Mill Site Operable Units (OU)

- OU-A: Coastal Trail – 87 acres
- OU-B – Non-Industrial Sites – 9 acres
  - No Further Action July 2008
- OU-C: Northern Industrial Area – 105 acres
- OU-D: Southern Industrial Area – 159 acres
- OU-E:
  - Terrestrial - 45 acres
  - Ponds - 12 acres

# Work Completed Thus Far

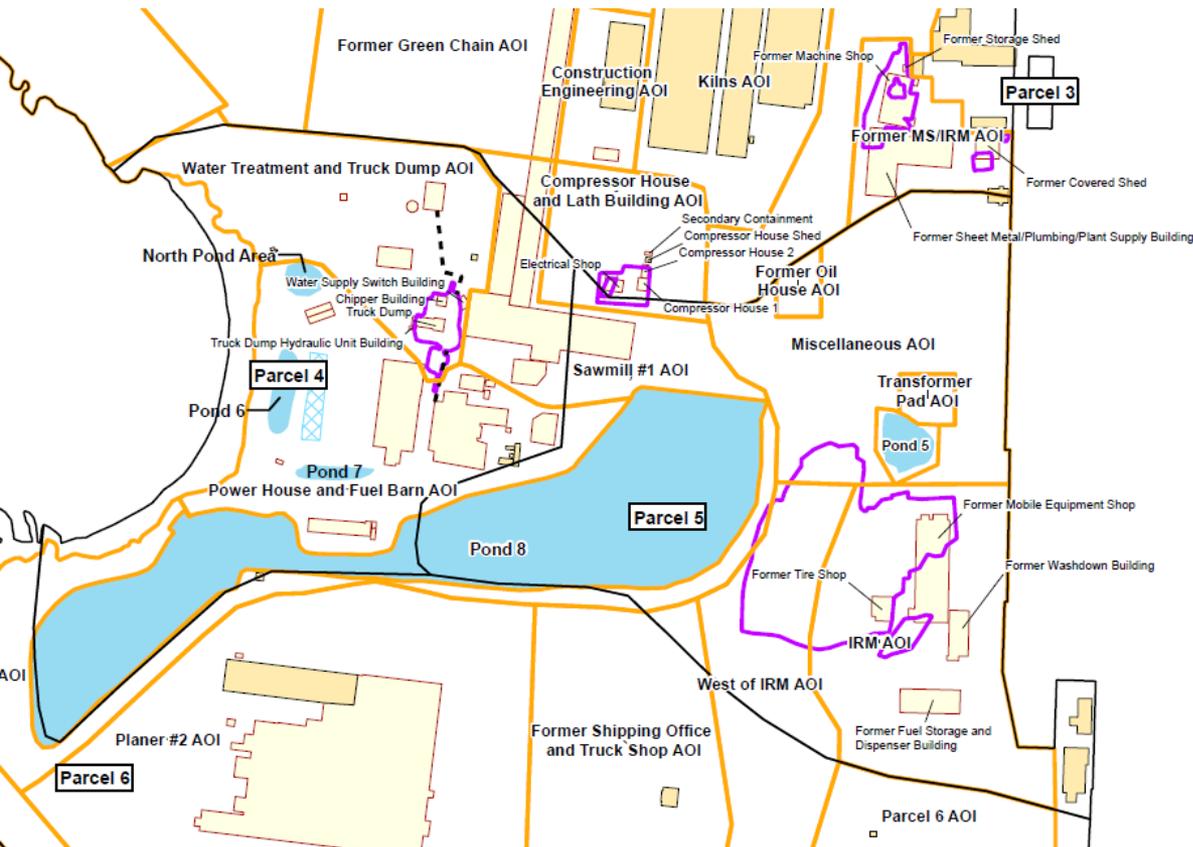


# Cleanup Accomplishments

- **OU-A – Coastal Trail**
  - Remedial Action Plan 2009
  - Cleanup Certified 2011
  - Trail Opens 2015
- **Contaminants – soil removed and disposed off-site**
  - 13,000 cubic yards of dioxin contaminated soil
  - 990 cubic yards of PCB contaminated soil
  - 140 cubic yards of lead contaminated soil



# Cleanup Accomplishments



- Fuel Oil Pipeline & Soil Removal 2007
- Interim Remedial Measures 2009

# Cleanup Accomplishments

## Interim Remedial Actions OUs D and E



- **Petroleum  
Excavation and on-site treatment**
- **Off-Site Disposal of  
1,100 cubic yards of  
PCB and lead  
contaminated soil**

# Cleanup Accomplishments

## Interim Remedial Actions OUs D and E

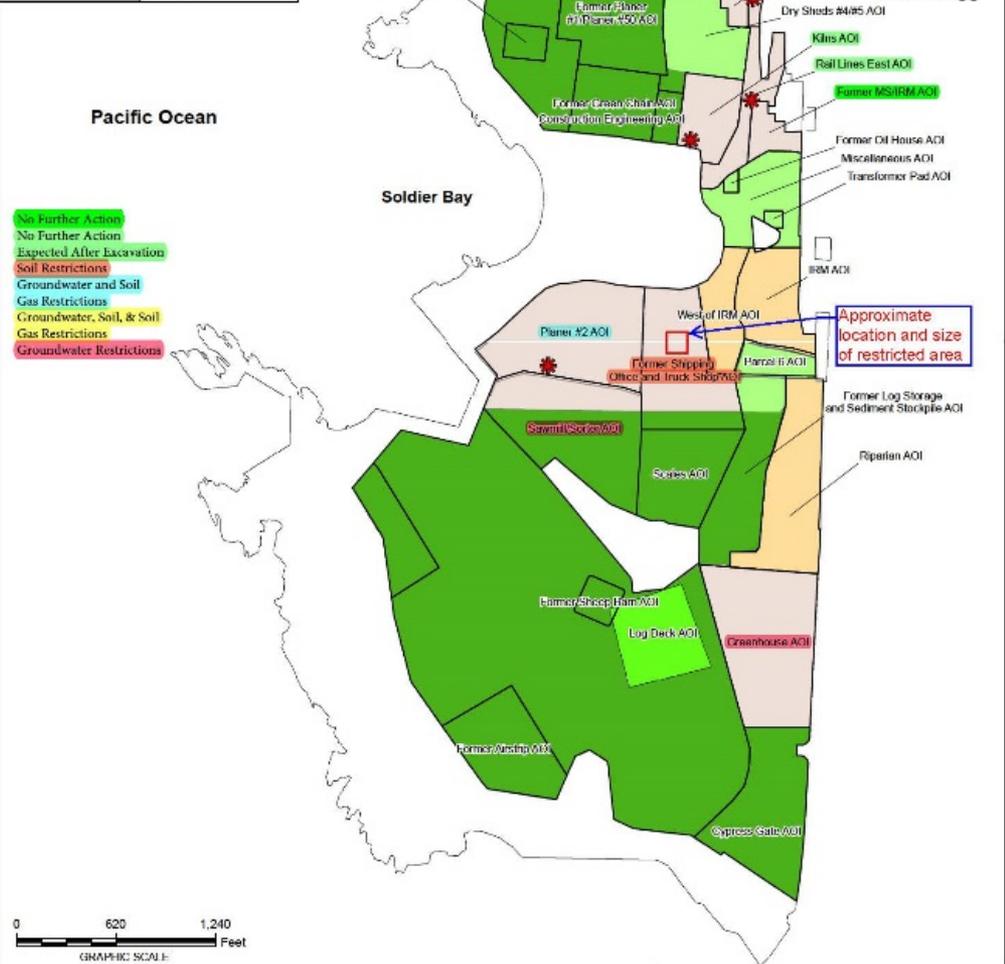
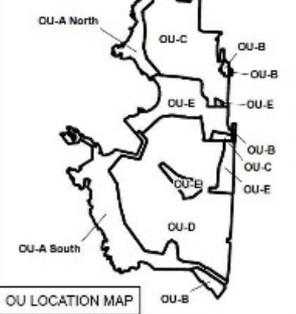


- **On-Site Bio-remediation of approximately 44,000 cubic yards of petroleum contaminated soil**

# Cleanup Accomplishments

## No Further Action (NFA) - OUs C and D

- **OU C and D – 290 total acres**
- **OU C and D Remedial Investigation = 190 Acres**
- **OU C and D Remedial Action Plan = 30 Acres**
- **Additional NFA expected after OUs C and D RAP Implementation**
- **Less than 10 acres is expected to need Land Use Restrictions after completion of cleanup**



**LEGEND:**

	AOI BOUNDARY		EXCAVATION LOCATIONS
	CONSIDERED FOR REMEDIAL ACTION IN RAP		
	DETERMINED NO FURTHER ACTION IN RI REPORT		
	AOI'S NOT INCLUDED IN FEASIBILITY STUDY, RECOMMENDED FOR NFA IN RAP		

FORMER GEORGIA-PACIFIC WOOD PRODUCTS FACILITY  
FORT BRAGG, CALIFORNIA  
REMEDIAL INVESTIGATION OPERABLE UNITS C AND D

**OU-C AND OU-D AREA OF INTEREST STATUS**

ARCADIS | FIGURE

# OUs C, D and E - Cleanup 2017

**Remedial Action Plan Implementation**  
**Removal Action Workplan Implementation**



## OUs C, D and E Excavations - 2017

- Total of 3,200 cubic yards of soil and sediment
- 160 truck loads
- 5 – 6 Weeks
- Mobilization to begin on or about August 15, 2017
- Delay because of Army Corps of Engineers Permit - wetlands

# OUs C and D RAP - Phase I Excavations

## 360 cubic yards of soil

- **Former Dip Tank AOI**
  - Dioxin and Pentachlorophenol (PCP)
  - NFA expected for soil (groundwater still an issue)
- **Kilns AOI**
  - Petroleum and B(a)P
  - NFA expected for soil, no other issues
- **Planer #2 AOI**
  - Petroleum and B(a)P
  - NFA expected for soil (soil gas and groundwater still issues)
- **Rail Lines East**
  - Lead
  - NFA expected for soil, no other issues

# OUs C and D RAP - Phase II Excavations

- **Former Aboveground Storage Tank , Mobile Equipment Shop/Pilot Study AOIs**
  - Not yet scheduled
  - Comingled with Cal Western Railroad contamination
  - Petroleum contaminated soil ( also soil gas, and groundwater)

# OU-E Removal Action Workplan

- **Purpose: to address Hot Spots – areas of higher contamination in soil and sediment**
- **Locations Identified through Risk Assessment and Hot Spot Analysis**
- **Approved by DTSC August 2016**
- **Implementation Plan – draft final February 2017**

# OU-E Removal Action Workplan - Soil Removal

- **Terrestrial Lowland -  
Twelve Areas**
  - 7 Lead
  - 1 Dioxin
  - 3 Benzo(a)Pyrene
  - 1 Petroleum
- **1,510 cubic yards of  
soil excavated and  
disposed of off-site**



# OU-E Removal Action Workplan Sediment Removal

- **Pond 7**
  - Dioxin
  - 1,200 cubic yards
- **Ponds 2 & 3**
  - Dioxin
  - Arsenic
  - 474 cubic yards
- **Riparian Area**
  - Dioxin
  - 16 cubic yards



# Operable Unit-E

## Pond and Soil Investigations

# OU-E Investigations

- **Dioxin Sampling and Analysis Report, July 2006**
- **Data Summary Report Pond Sediment, May 2009**
- **Data Summary Report – Additional Investigation Pond 8 Sediment, February 2011**



# OU-E Investigations

- **Site Investigation Sampling  
Summary Report, March 2011**
  - **Terrestrial Area soil**



# OU-E Investigations

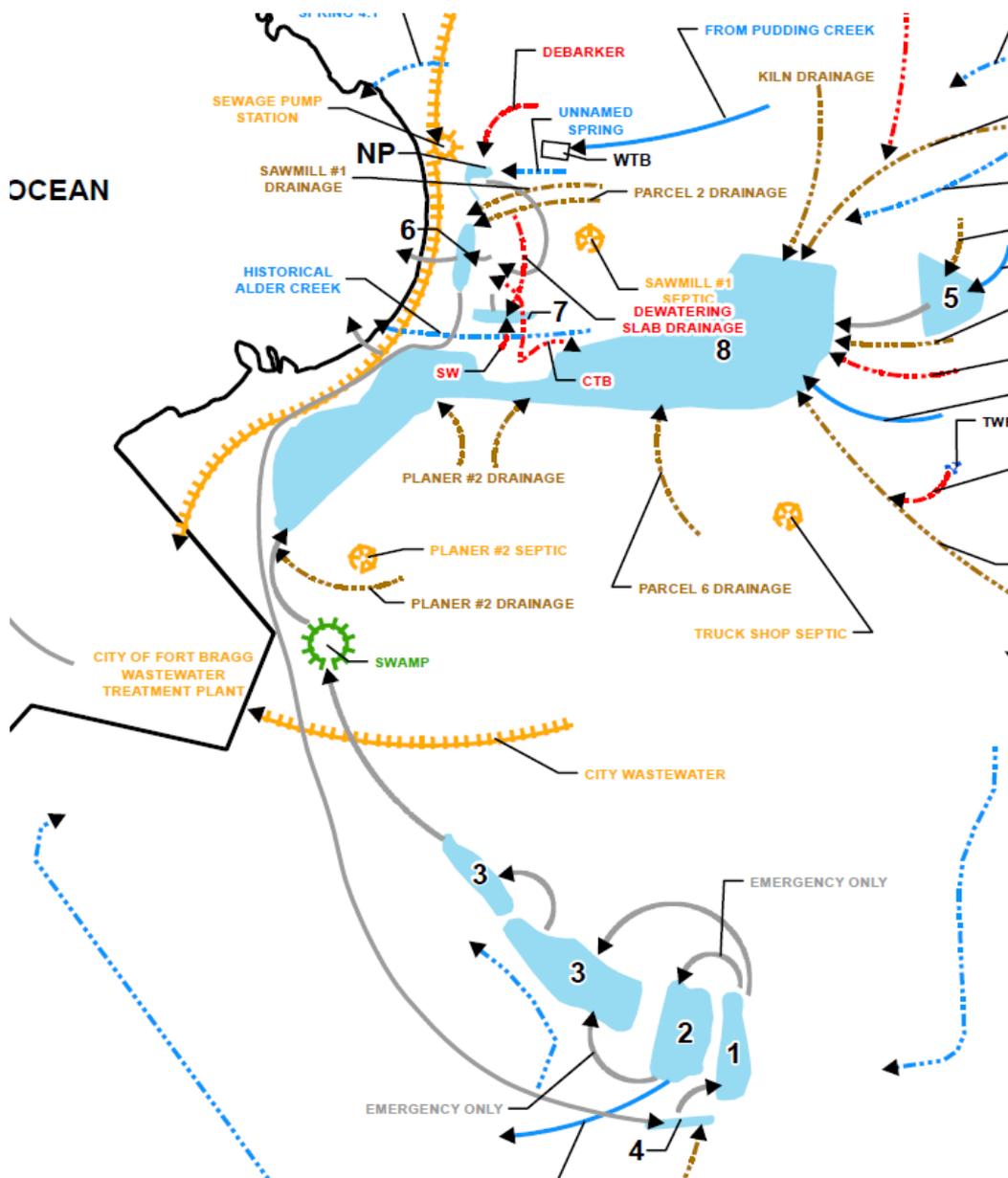
- **Mill Pond (Pond 8) Geotechnical and Chemical Characterization Results, December 2012**
- **Operable Unit E Remedial Investigation – January 2013**
- **Baseline Human Health and Ecological Risk Assessment – July 2015 (additional pore water and sediment sampling)**

# OU-E Soil Contamination Sources

- **Terrestrial Upland Area – some source areas**
  - Sawmill #1
  - Powerhouse and associated fuel lines
  - Open Refuse Fire Area – location of dioxin
  - Compressor House and Lath Building

## OU-E Sediment Contamination Sources

- **Management of Wastewater and Fly Ash from Powerhouse**



## Conceptual Site Model - Waste Water Movement

1970s to 1986

- Scrubber water, with fly ash from boilers placed on dewatering pad
- Water from dewatering pad flowed to Pond 7,
- Pumped to Pond 4
- Flowed to aeration ponds 1 and 2; to pond 3 and then pond 8

1996 to 2002

- Eliminated dewatering pads
- Boiler water conveyed to Pond 7
- Pumped to Pond 4
- Flowed to aeration ponds 1 and 2; to pond 3 and then pond 8



## Conceptual Site Model - Waste Water Movement

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## Conceptual Site Model - Waste Water Movement

1970s - 1986 & 1986 - 2002

- Water pumped from Pond 7 to Pond 4





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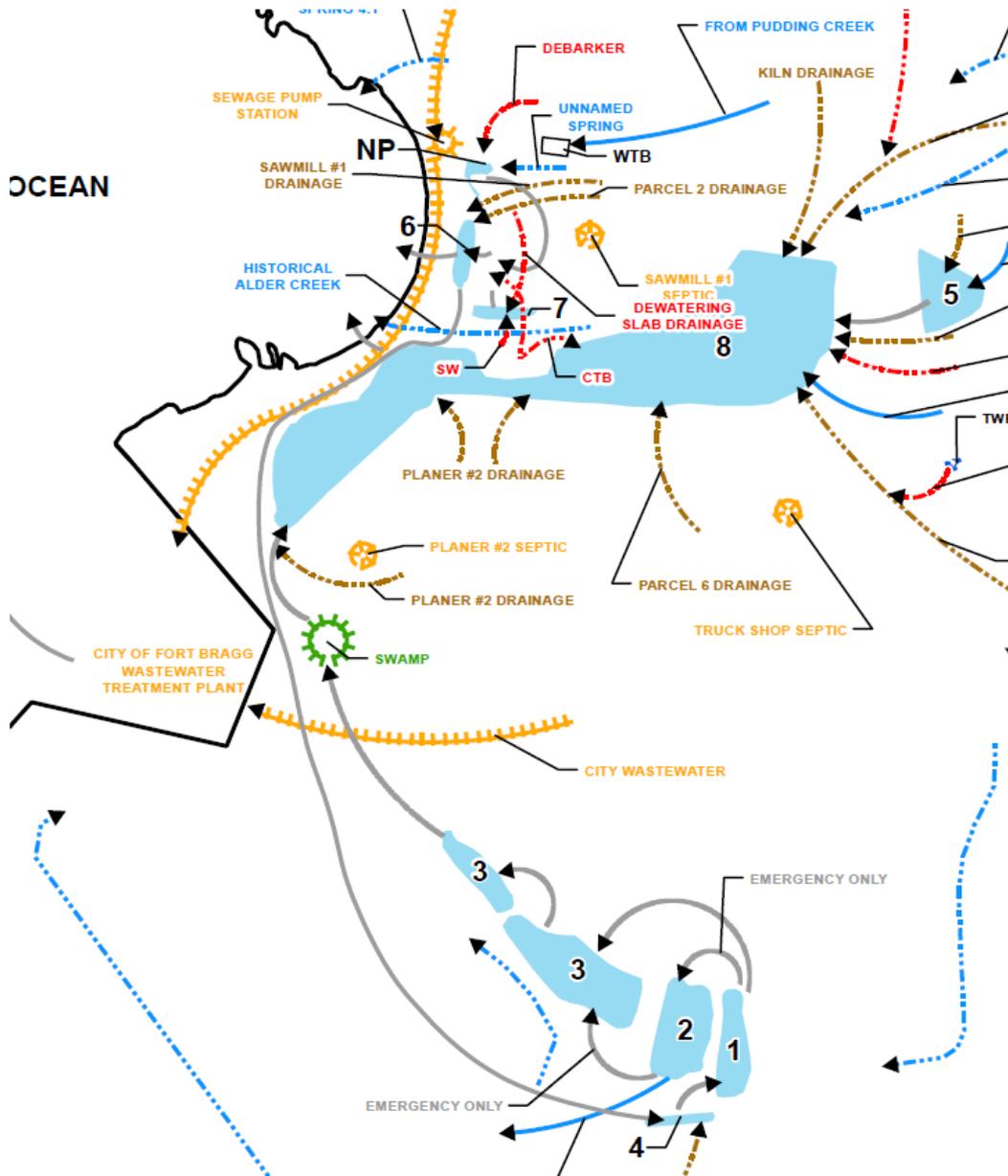
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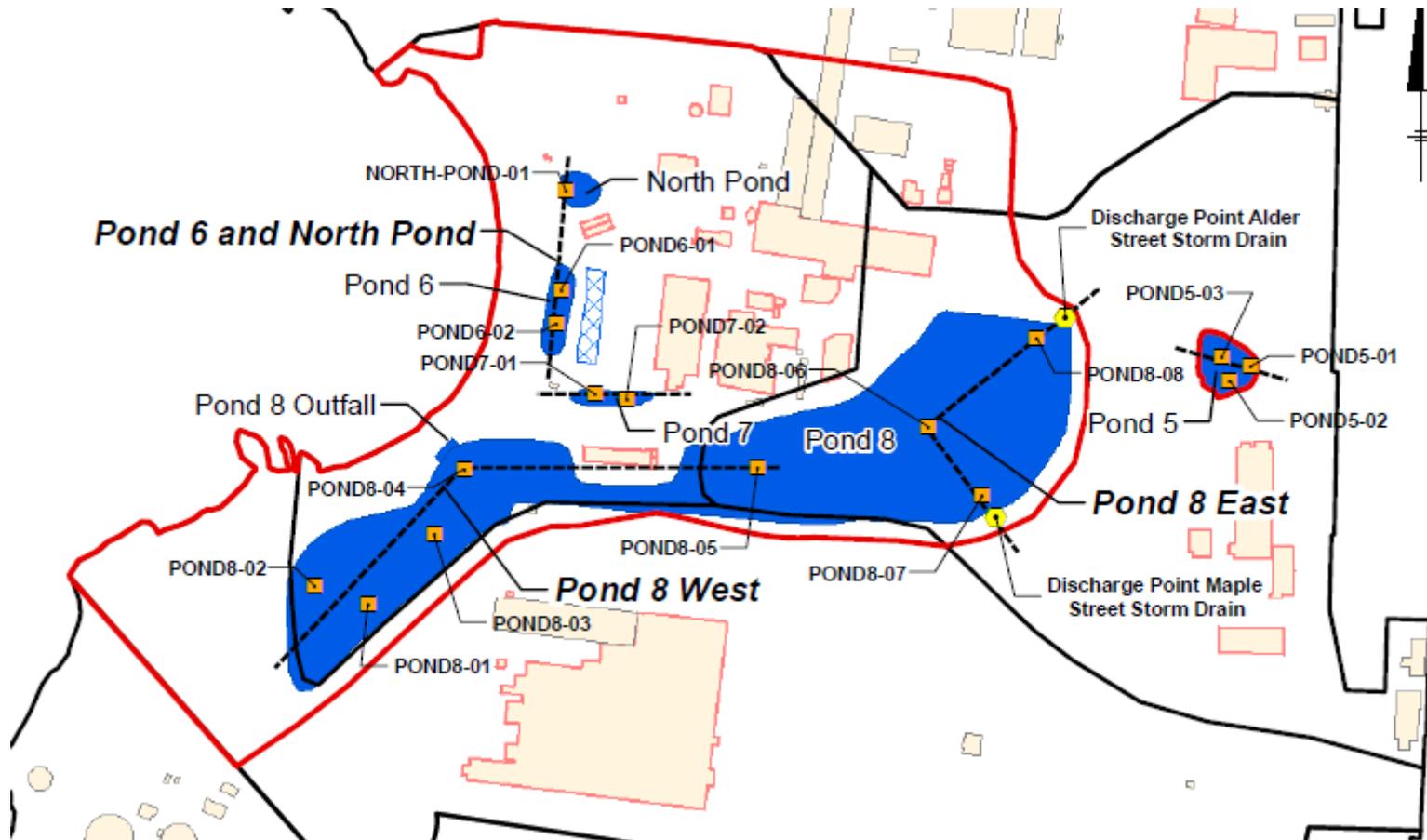
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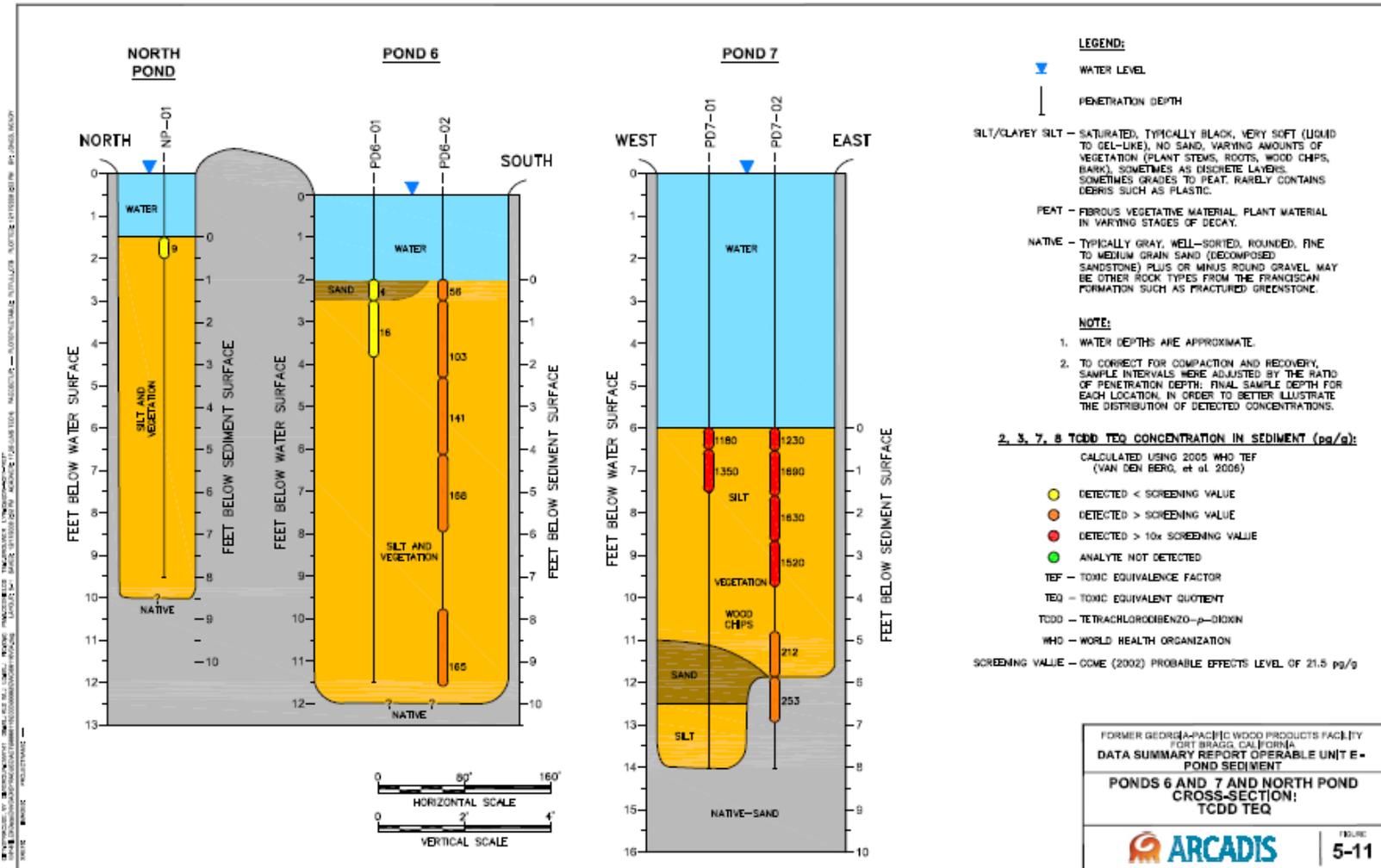
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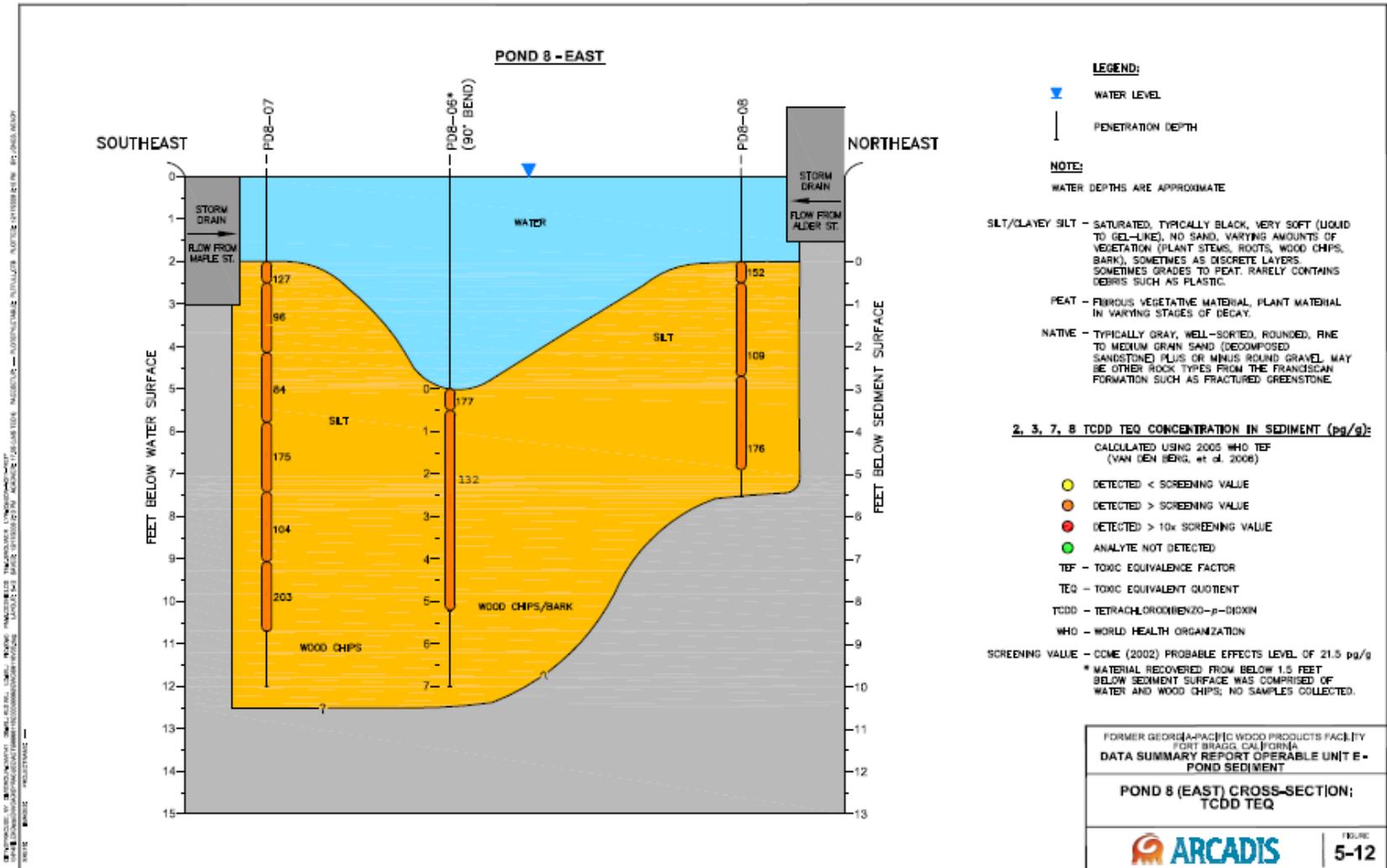
# Data Summary Report Pond Sediment - 2009 - Locations of Cross Sections



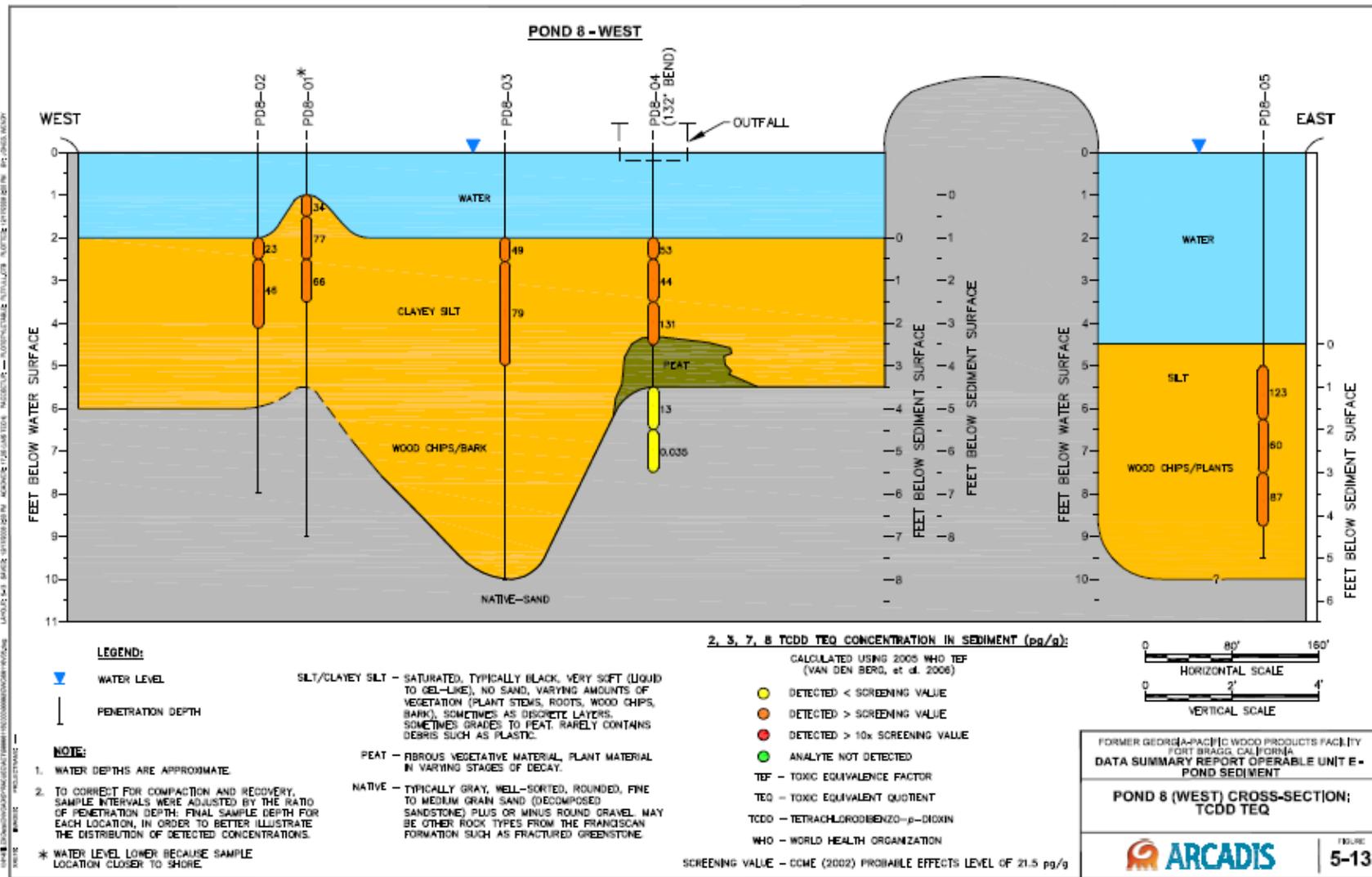
# Dioxin Concentration - Ponds 6, 7 and North Pond



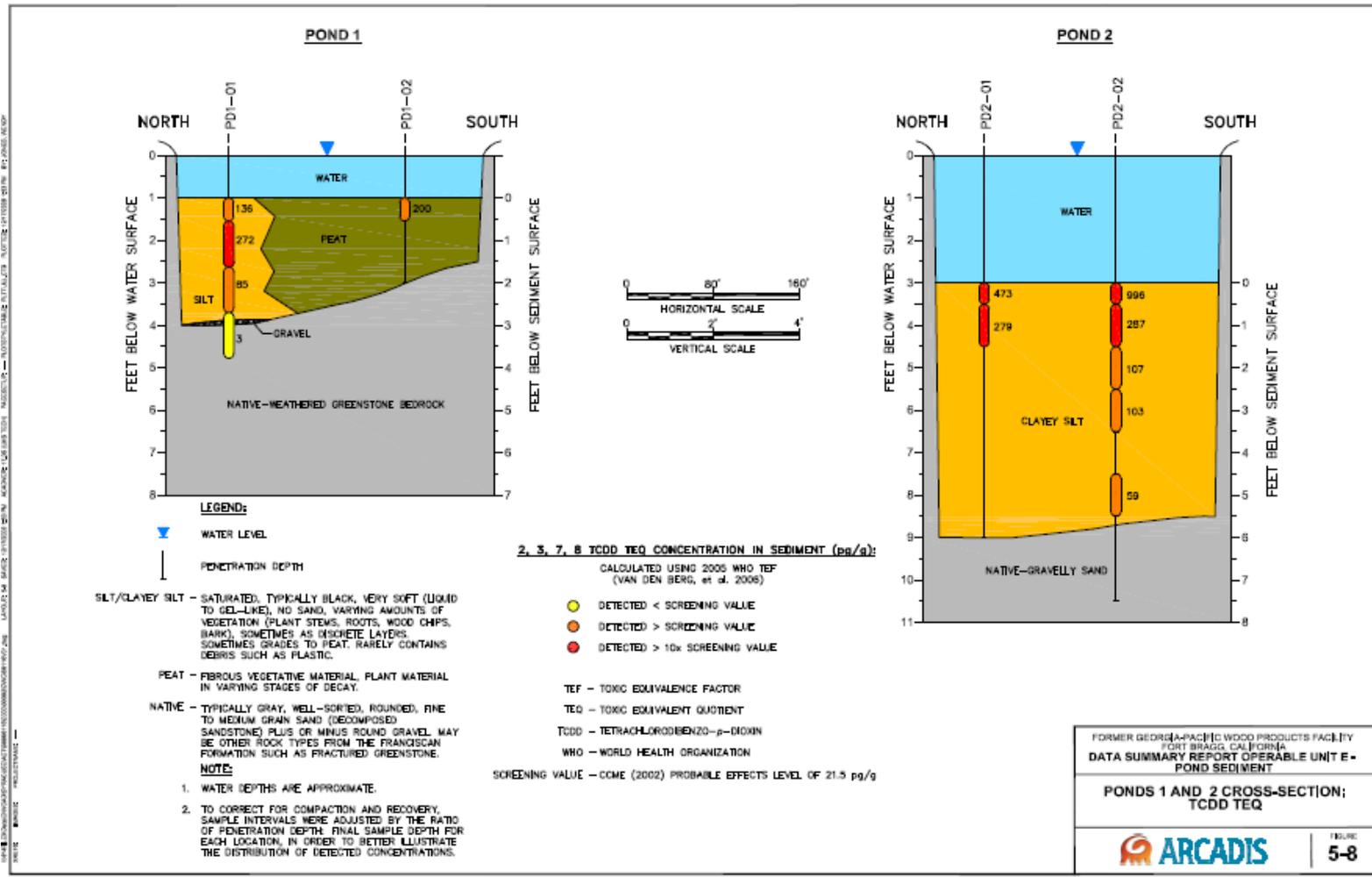
# Dioxin Concentration - Pond 8 East



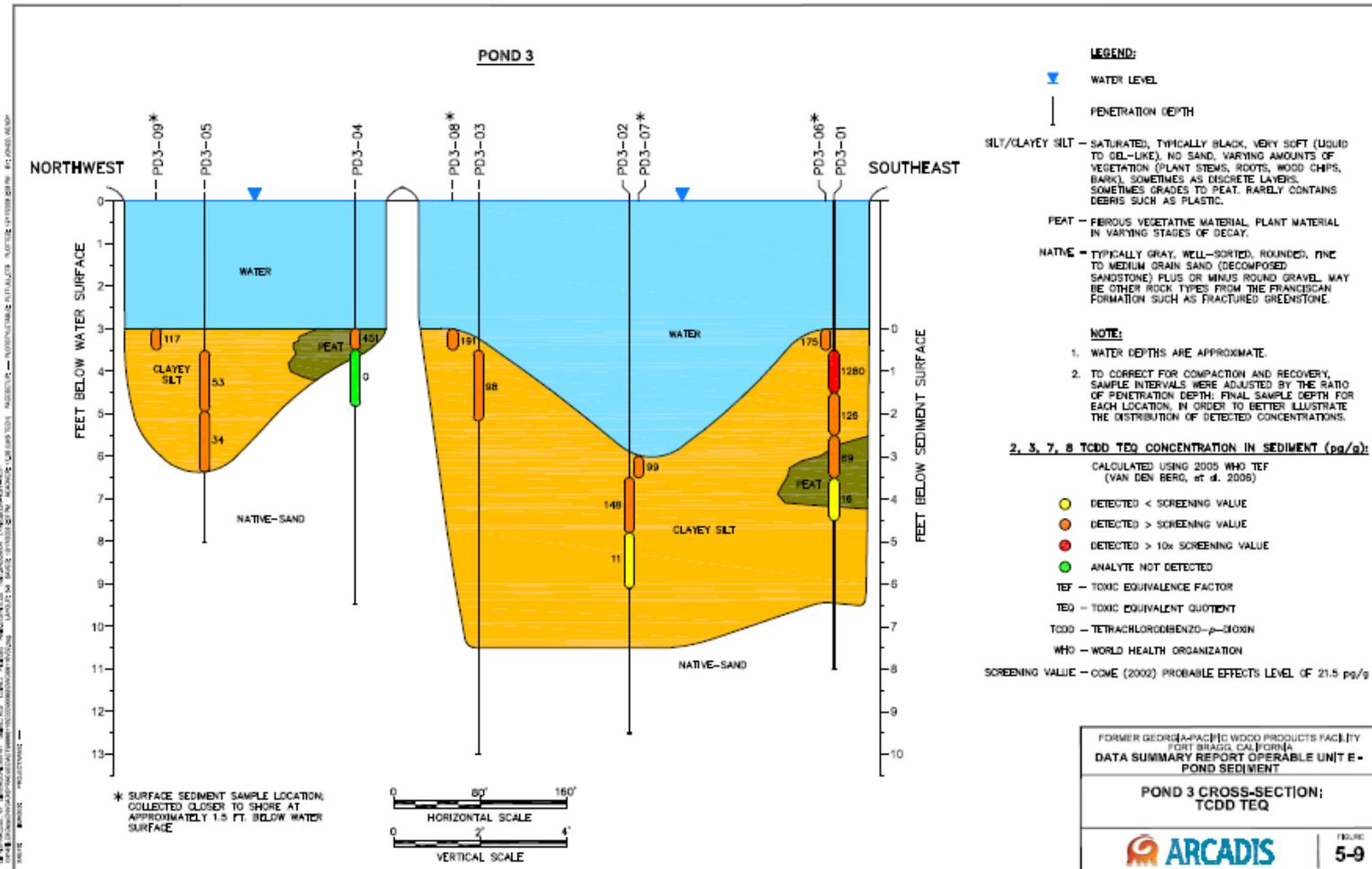
# Dioxin Concentration - Pond 8 West



# Dioxin Concentration - Ponds 1 & 2



# Dioxin Concentration - Pond 3



# Dioxin Sediment Investigation Results - from all investigations

- **Dioxin**
  - Highest in Pond 7, 2 and 3
  - Pond 8
    - Dioxin range from less than 1 pg/g to 231 pg/g
  - Pond 6
    - Dioxin range from less than 1 pg/g to 175 pg/g
- **Arsenic and Lead also in pond sediments**
  - Collocated with high levels of dioxin

# Operable Unit E

## Baseline Human Health and Ecological Risk Assessment



# Exposure Point Concentration & Hot Spot Evaluation

- **95 Upper Confidence Level**
  - **Statistical Distribution**
  - **Average Concentration**
- **Hot Spot**
  - **Geographical Distribution**
  - **Area of high contamination**
  - **Could be hidden in statistical analysis**
  - **Statistical Outlier**

# Baseline Human Health and Ecological Risk Assessment (BHHERA)- Soil

- **Human Health Risk (current levels of contamination)**
  - Recreational visitor – 50 days & 200 days/year
    - Exposure to surface soil
  - Chemicals of concern – Arsenic, dioxins, lead, benzo(a)pyrene, & petroleum
  - Human health cancer risk
    - 50 days/year:  $2 \times 10^{-6}$
    - 200 days/year:  $4 \times 10^{-6}$

# Baseline Human Health and Ecological Risk Assessment - Ecological Receptors

- **Terrestrial - soil**
  - **Plants**
  - **Invertebrates**
  - **Avian**
  - **Mammalian**
- **Aquatic – sediment, pore water, surface water**
  - **Plants**
  - **Invertebrates**
  - **Avian**
  - **Mammalian**

# Baseline Human Health and Ecological Risk Assessment (BHHERA)- Soil

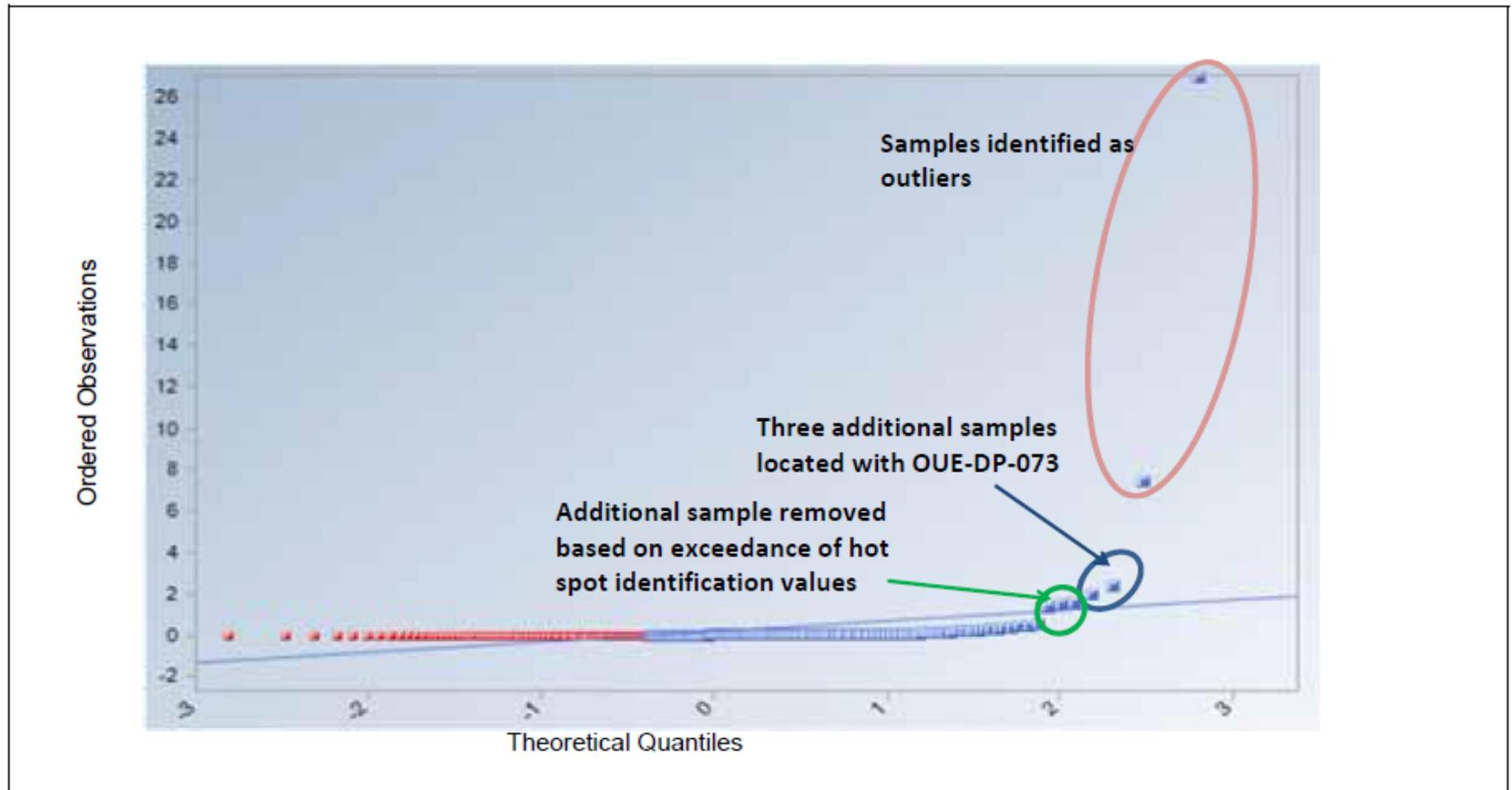
- **Ecological Health Risk**
  - How is risk measured?
    - Lowest Observed Adverse Effect Level
  - Remedial Goals = Safe soil level for Ecological Receptors
    - Dioxin = 1,920 pg/g
    - Lead = 127 mg/kg

# Baseline Human Health and Ecological Risk Assessment (BHHERA)- **Aquatic**

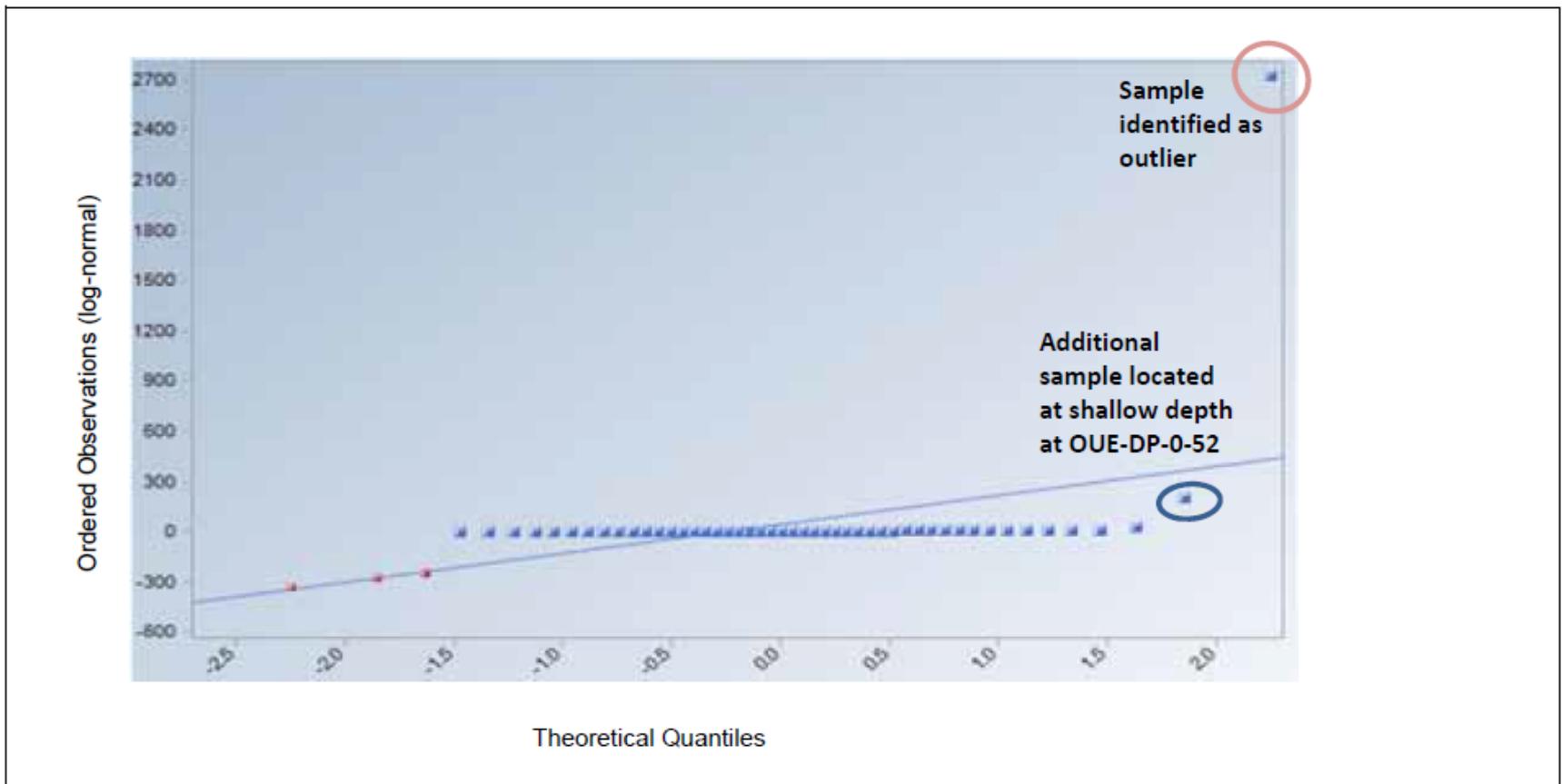
- **Ecological Health Risk**
  - How is risk measured?
    - Relevant Ecological Screening Levels
    - Other information
      - Chemistry of contaminant
      - Bioavailability
        - Porewater
      - Background Concentration
      - Overall Health of the Environment

# Contaminant Distribution Plots - Soil

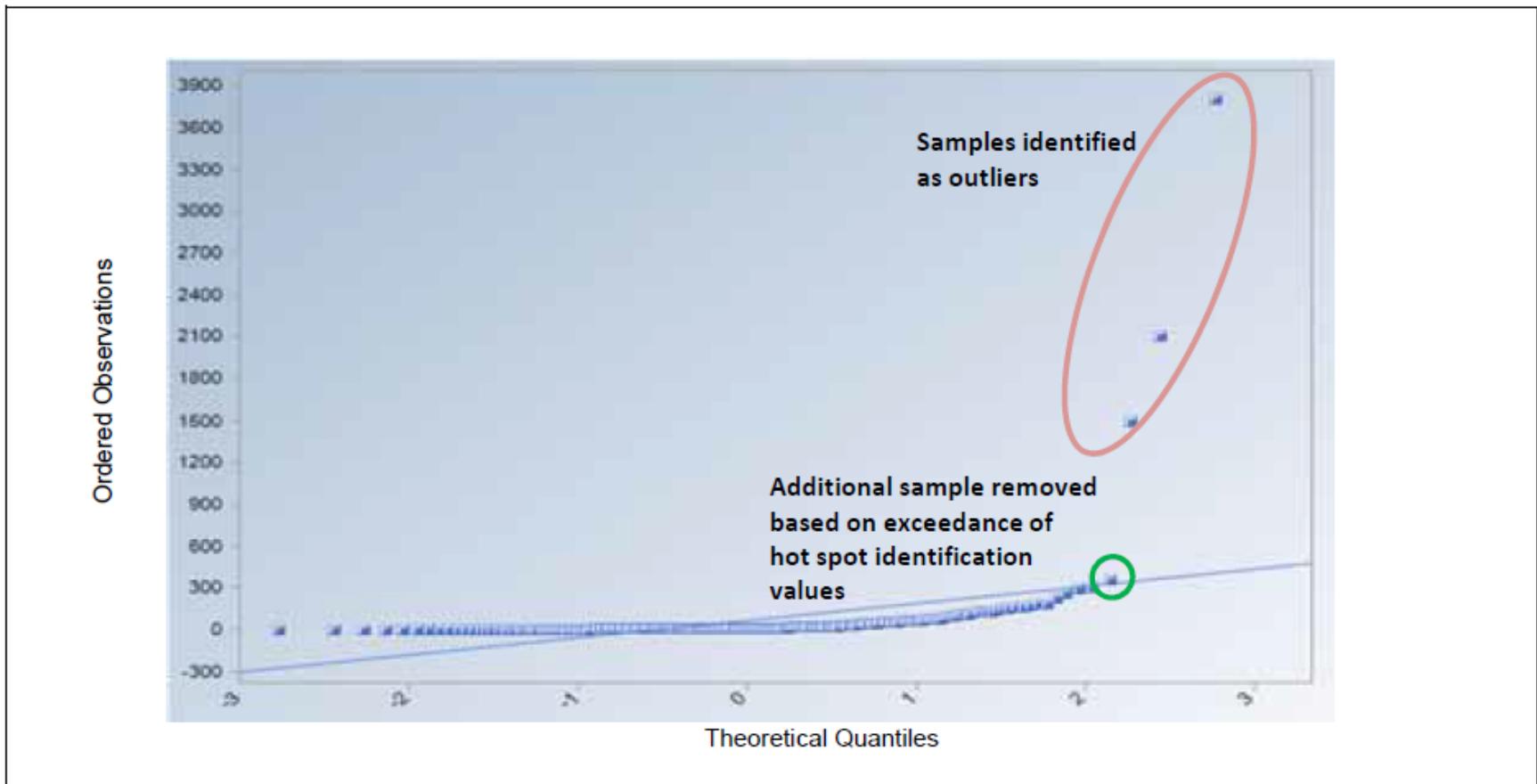
# Benzo(A)Pyrene soil distribution



# Dioxin (TEQ) soil distribution



# Lead soil distribution



# Terrestrial Lowland Soil Removal Action Workplan Goals

<b>Constituent</b>	<b>Recreational Human Health RBTL</b>	<b>Ecological RBTL</b>	<b>Selected RBTL</b>	<b>Not-To-Exceed Value</b>
<b>B(a)P TEQ</b>	0.3 mg/kg	Not applicable	0.3 mg/kg	0.9 mg/kg
<b>Dioxin TEQ</b>	53 pg/g	1,920 pg/g	53 pg/g	160 pg/g
<b>Lead</b>	320 mg/kg	127 mg/kg	127 mg/kg	320 mg/kg

# Expected Results - Soil Exposure Point Concentrations

Constituent	Depth Interval				Residential Screening Levels
	0-0.5 ft bgs	0-2 ft bgs	0-6 ft bgs	0-10 ft bgs	
<b>B(a)P TEQ (mg/kg)</b>	0.04	0.08	0.06	0.06	0.3 mg/kg
<b>Dioxin TEQ (pg/g)</b>	6.31	4.85	7.15	8.52	50 pg/g
<b>Lead (mg/kg)</b>	49.50	39.54	48.65	44.97	80 mg/kg

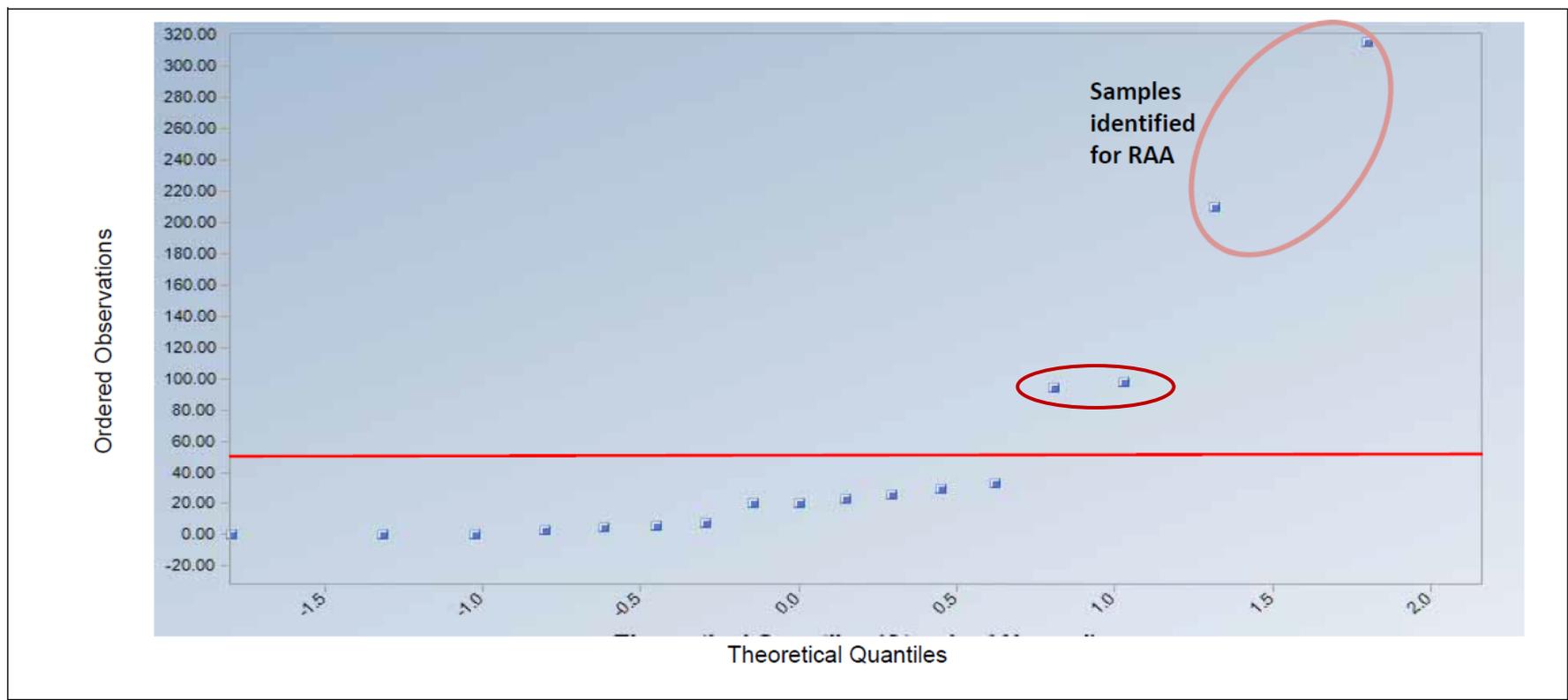
## BHHERA - Aquatic (Sediment) Human Health Risks

- **Recreational visitor – 12 and 50 days/year**
  - **Exposure to surface sediment**
- **Chemicals of concern – dioxins, arsenic**
- **$1 \times 10^{-6}$  = one excess cancer risk in 1 million people**
- **Human Health Risk to pond sediment**

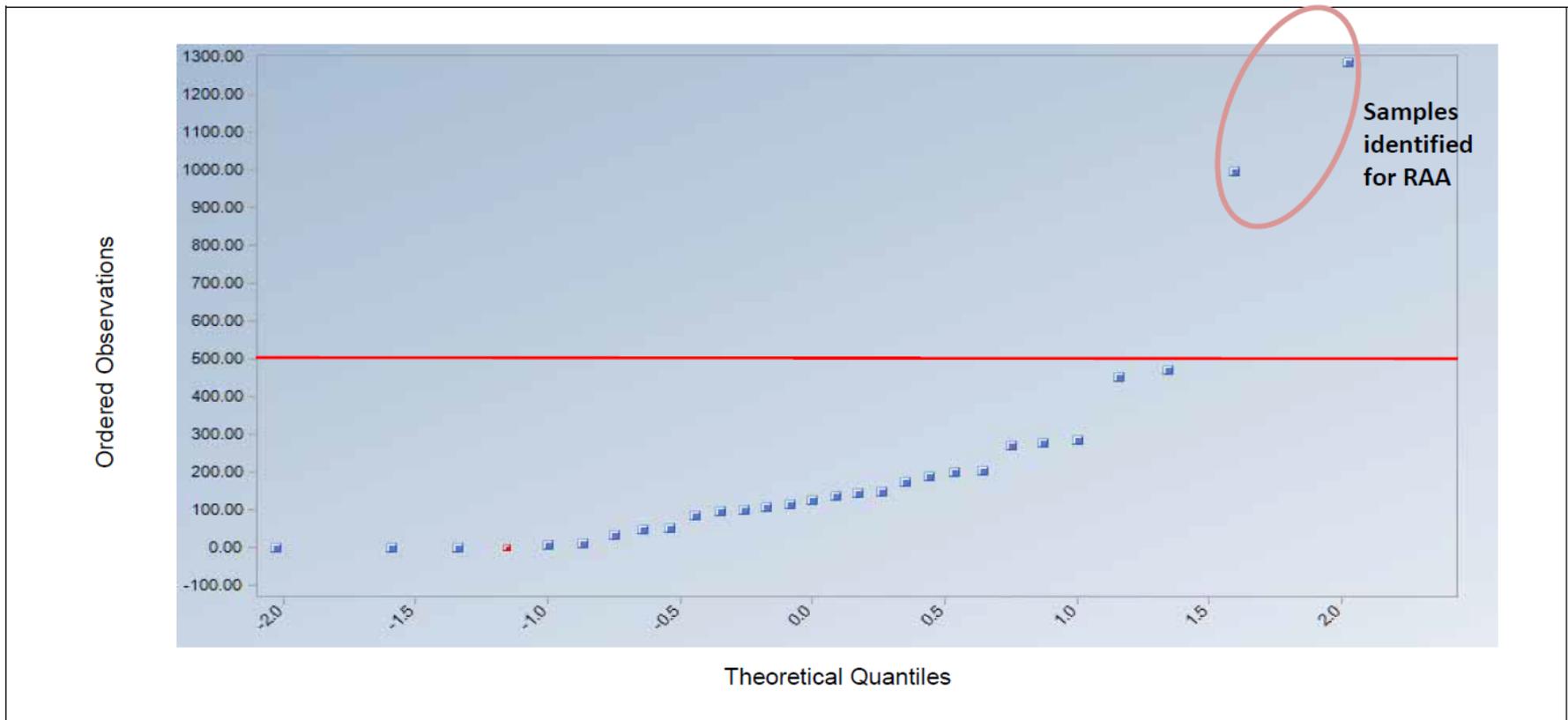
<b>Pond(s)</b>	<b>12 days/year</b>	<b>50 days/year</b>
Ponds 1-4	$2 \times 10^{-6}$	$8 \times 10^{-6}$
Pond 7	<b>about <math>5 \times 10^{-6}</math></b>	$2 \times 10^{-5}$
Pond 8	about $5 \times 10^{-7}$	$2 \times 10^{-6}$

# Contaminant Distribution Plots - Sediment

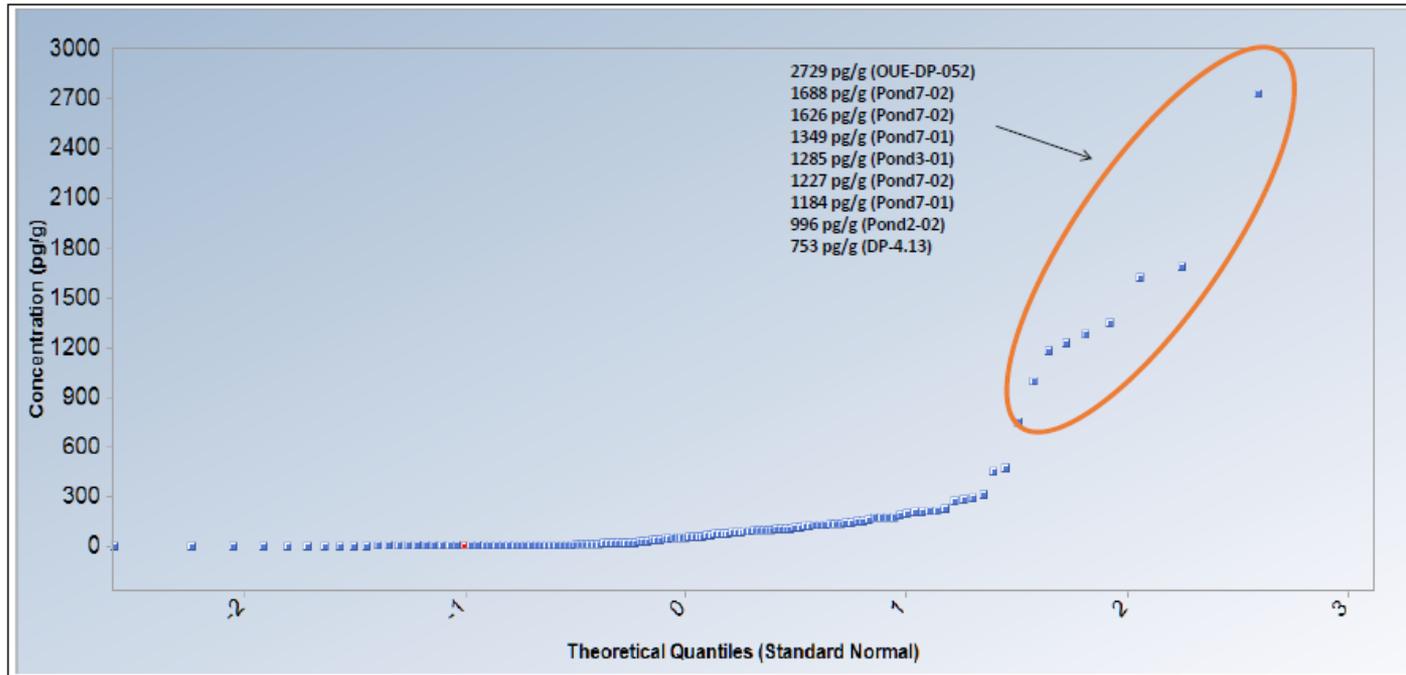
# Riparian Area - dioxin concentrations



# Ponds 1 - 4 dioxin concentrations



# Dioxin Data Sediment and Soil



Design & Consultancy  
for natural and  
built assets

Normal Quantile-Quantile Plot  
 2,3,7,8-TCDD TEQ (Human/Mammal)  
 Terrestrial and Aquatic (0 - 2 ft bgs)  
 Former Georgia-Pacific Wood Products Facility, Fort Bragg, California

Figure  
1

## Notes:

 Sample identified as remedial action area

Normal Q-Q plot generated using ProUCL version 5.0. Reporting limit used for non-detects

2,3,7,8-TCDD = 2,3,7,8-Tetrachlorodibenzo-p-dioxin

ft bgs = feet below ground surface

pg/g = microgram(s) per gram

TEQ = toxic equivalent

# Expected Results - Sediment Exposure Point Concentrations

Constituent	Exposure Point Concentration		Residential Screening Levels	Recreational Screening Levels (1x10 <sup>-6</sup> )
	Ponds 1-4	Riparian Area		
Pre-excavation Dioxin TEQ (pg/g)	441.9	127.1	50 pg/g	501 pg/g (12 days)
Post-Excavation Dioxin TEQ (pg/g)	390	19		120 pg/g (50 days)

# Ecological Risk Summary

- **Terrestrial – soil**
  - Established dioxin and lead goals
  - Dioxin and lead will be removed through the Removal Action Workplan implementation.

# Ecological Risk Summary

- **Aquatic – sediment, pore water, surface water**
  - **Importance of Pore Water**
    - Much better toxicity reference values
    - Biologically available fraction in sediments
    - Better predictor of potential toxicity
  - **No Unacceptable Risk to Ecological Receptors**
    - With the Exception of Pond 7
    - Pond 7 will be removed through the Removal Action Workplan implementation.

# What's next for OU-E

- **Feasibility Study – Spring 2017**
  - Focus on Sites not included in RAW
  - Identify contingency action – restriction to recreational use
- **Removal Action Workplan Completion Report – Late 2017**
  - Could Identify No Further Action sites

# What's next for OU-E

- **Remedial Action Plan – 2018**
  - Evaluates final cleanup options for OUE
    - Areas in the RAW not meeting unrestricted use criteria
    - Sediment Ponds 6, 8, and North Pond
    - Groundwater and Soil
      - Interim Remedial Action Area of Interest
      - West of Interim Remedial Action Area of Interest

# Questions?

