



Design and Implementation PFAS Source Control Project

FIRE FIGHTING TRAINING AREA

CFB COMOX

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Public Services and
Procurement Canada

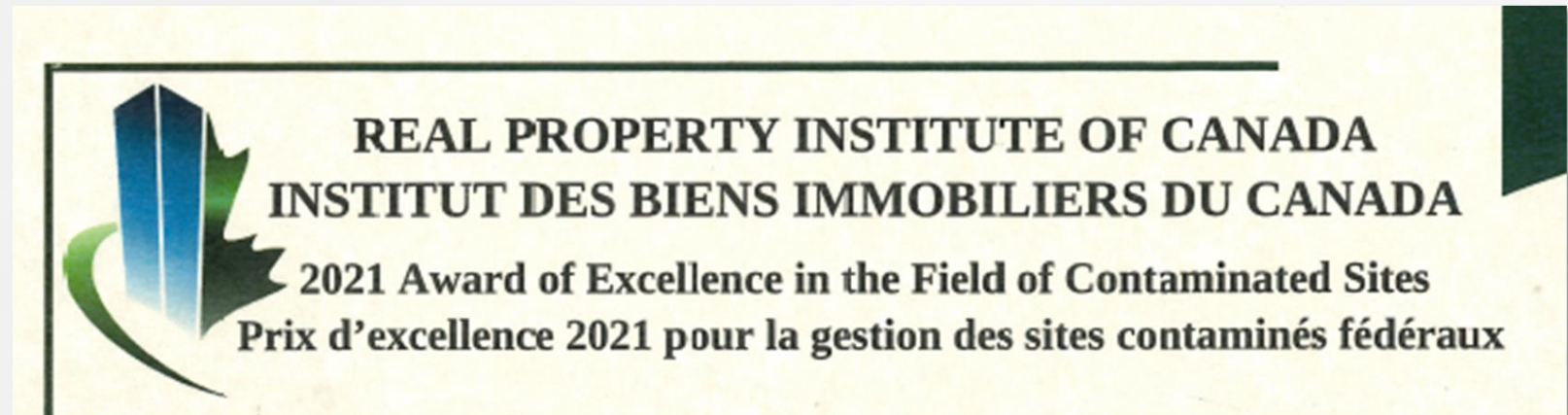
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Overview

- **Introduction**
- **Project Objectives**
- **Project Components**
- **Remediation to Source Control / Dual Approach**
 - Site Specific Remedial Target
 - Destruction Approach / Metrics
 - Stabilization Approach / Metrics
- **Civil Components – New FFTA**



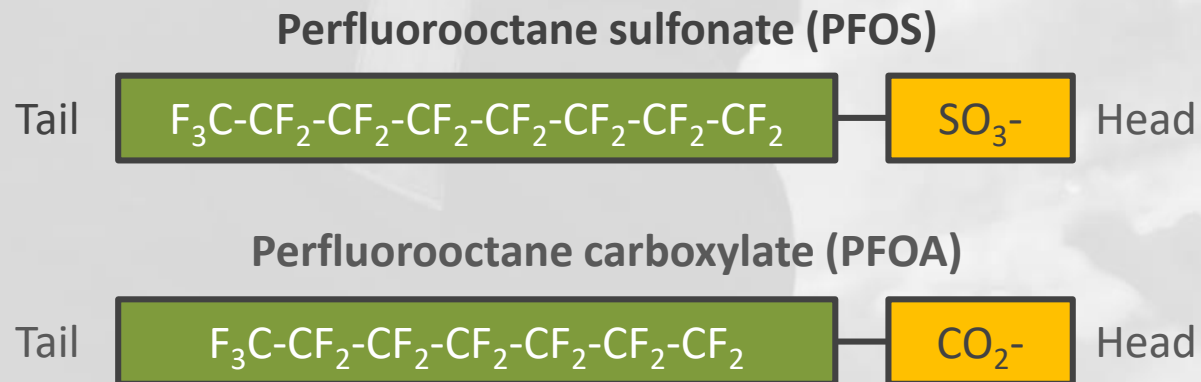
Comox Fire Fighter Training Area

- CFB Comox, Comox, Vancouver Island, BC
- FFTA: what is a FFTA?
- AFFF used from early 1970s to mid-2000s
- PFAS (mostly PFOS) concentrations > federal environmental criteria - soil, sediment, groundwater and surface water



PFAS 101

- Fluorinated carbon-chain compounds
- Variable physical and toxicological properties, and environmental impacts
- Some are persistent, bioaccumulative and toxic
- Exposures can be prolonged because they don't degrade under environmental conditions
- Migration potential is far greater than most other contaminants at FCSAP sites
- May affect human health including development, growth, cancer and more



The tail and head structure of PFOS and PFOA molecules.

Project Objectives

1. Environmental
2. DND Operational
3. Financial



1. Remediation / Source Control Components
2. Civil Components
3. Novel PFAS Treatment

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- The map shows a topographic view of a site. A dashed red line outlines a large area, and a dashed green line outlines a smaller area. A blue-shaded area is labeled 'Retention Pond'. A small white square is labeled 'FLAG POLE'. A larger white square is labeled 'B276: GAS HUT'. Two small white squares are labeled 'CONCRETE PADS'. The map includes contour lines and a label 'Northwest Swale' on the left side. A label '18.0' is visible near the pond.

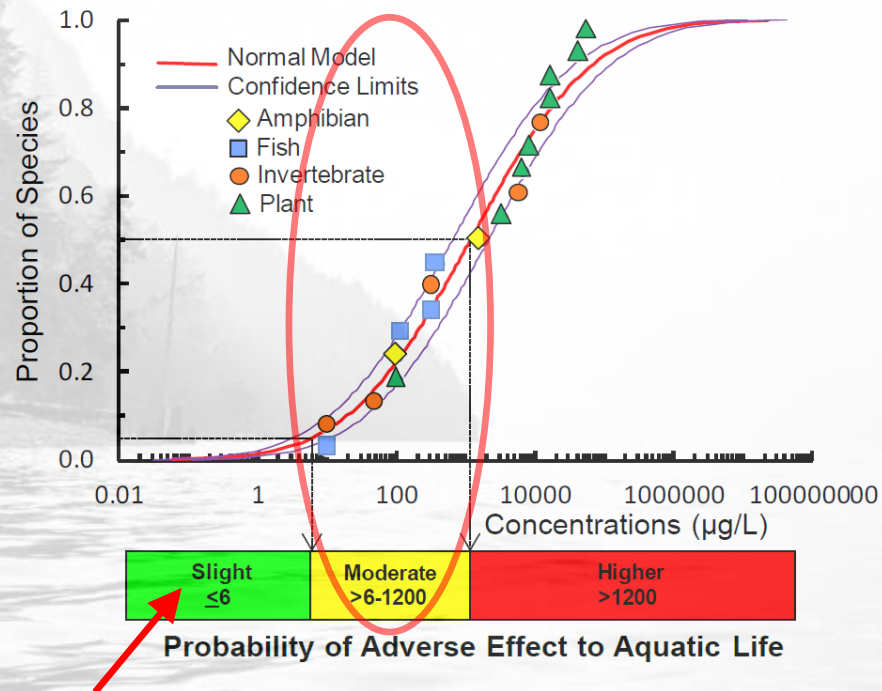


Remediation to Source Control / Dual Approach

- **Technical Issues**
- **Remedial Options**
- **Initial assumptions**
 - Destroying all soil was too costly
 - Landfilling all soil was insufficiently protective
- **SLR dual approach**
 - The worst PFAS contaminated material could be destroyed off site
 - The rest remained on site with amendments to stabilize

Site Specific Remedial Target

- SSRT—segregates destruction vs stabilization
- FSQG—define excavation limit
- Back calculated soil concentrations using different adverse effect assumptions



Regulatory Setting

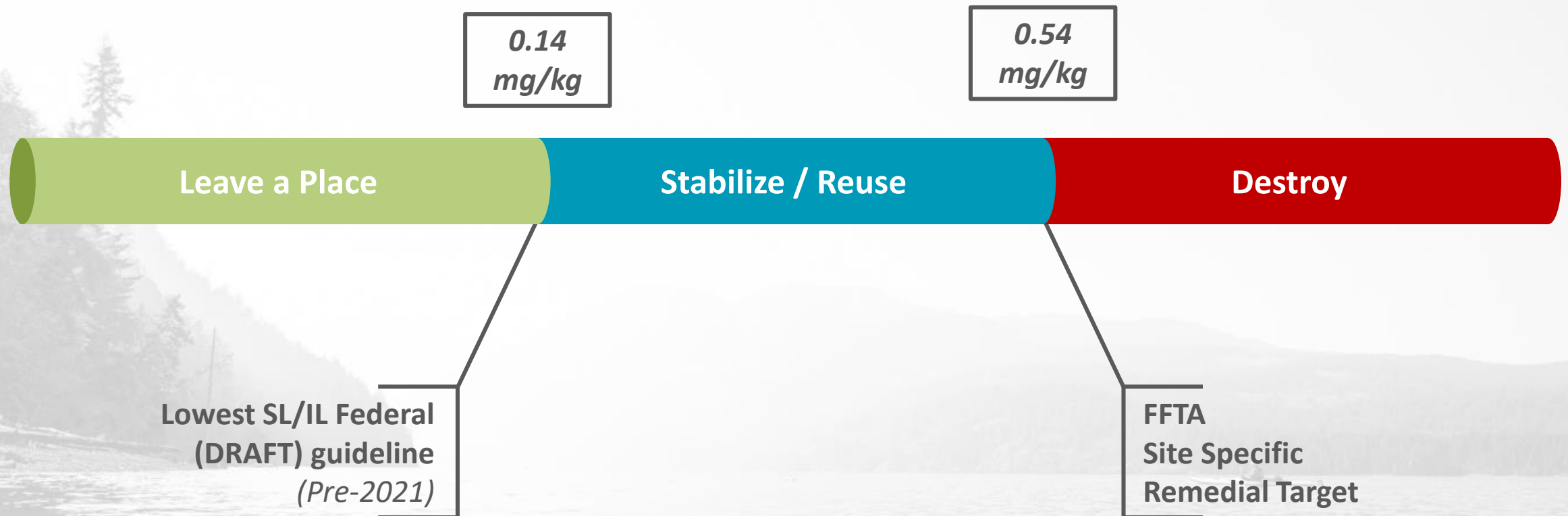
- Industrial Land Use
- AW (marine and freshwater) within 500m
- No DW use on Base, off site DW risks have been evaluated

Soil Quality

- Soil < Health Canada Industrial Land Use human health direct contact screening values
- Soil < draft FSQG protective of direct contact by ecological receptors on commercial/industrial lands

SSRTs were established specifically for the FFTA and balanced CSCP objectives and constraints (e.g., technology, space, and costs). The SSRTs should only be used for this FFTA CSCP and are not appropriate for wider application.

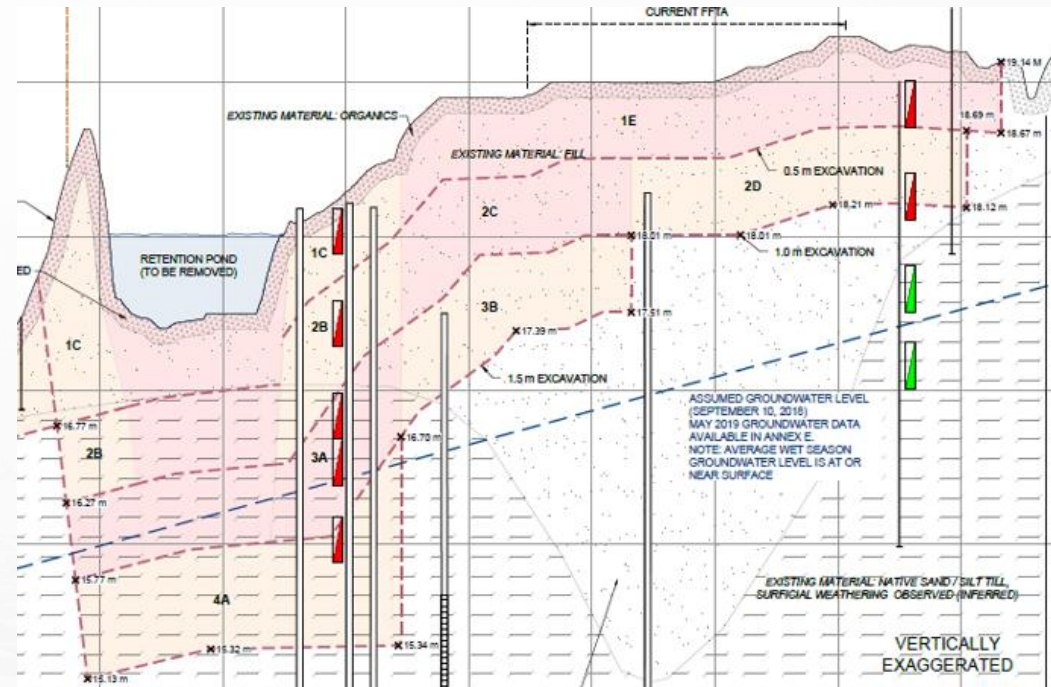
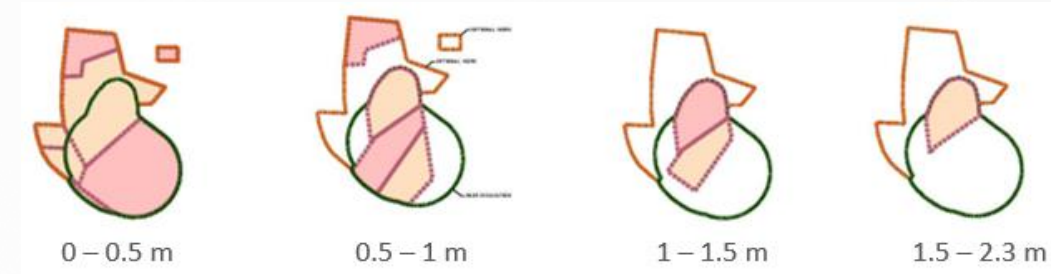
Soil Quality Categories



Excavation

- Defined limits, no chasing
- Defined slices
- Shallow excavation mostly < 1 m; max 2.3 m
- Limited confirmatory sampling

Excavated (volume)	23,500 m ³
Excavated (area)	21,900 m ²
Destroyed	23,800 t
Stabilized	22,100 t
Days on Site	111 days



Mid August

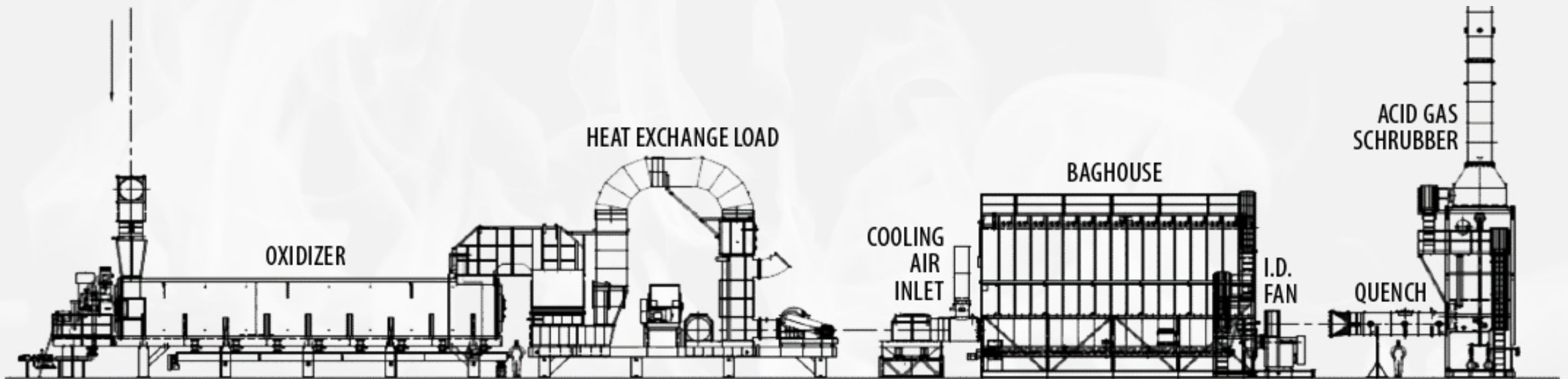


Destruction

- PFOS concentrations >0.54 mg/kg
- Thermal Treatment - Application of high temperature
- Permanent disposal

QP-PFAS to confirm

- Temperature (>1100°C)
- Concentration Reduction
- Process control requirements



PFAS Stabilization via Amendment

- Reduce PFAS mobility, bind contaminants in place, and reduce groundwater and surface water concentrations
- Soil with PFOS > than 0.14 mg/kg and \leq 0.54 mg/kg.
- Amendment application rate 1-2% FS200 (per Arcadis Comox bench scale study, 2020)
- Supervised by a QP-PFAS.
- Certified and warranted by QP-PFAS

Project Metrics:

- Dosage Rate
- Mixing time
- Photographic evidence
- Compacted



Field Challenges



Drought Conditions

Dust through mid-Sept



Extreme Rain

Flooding / Siltation
after mid-Sept

Soil Quality Improvement

Before

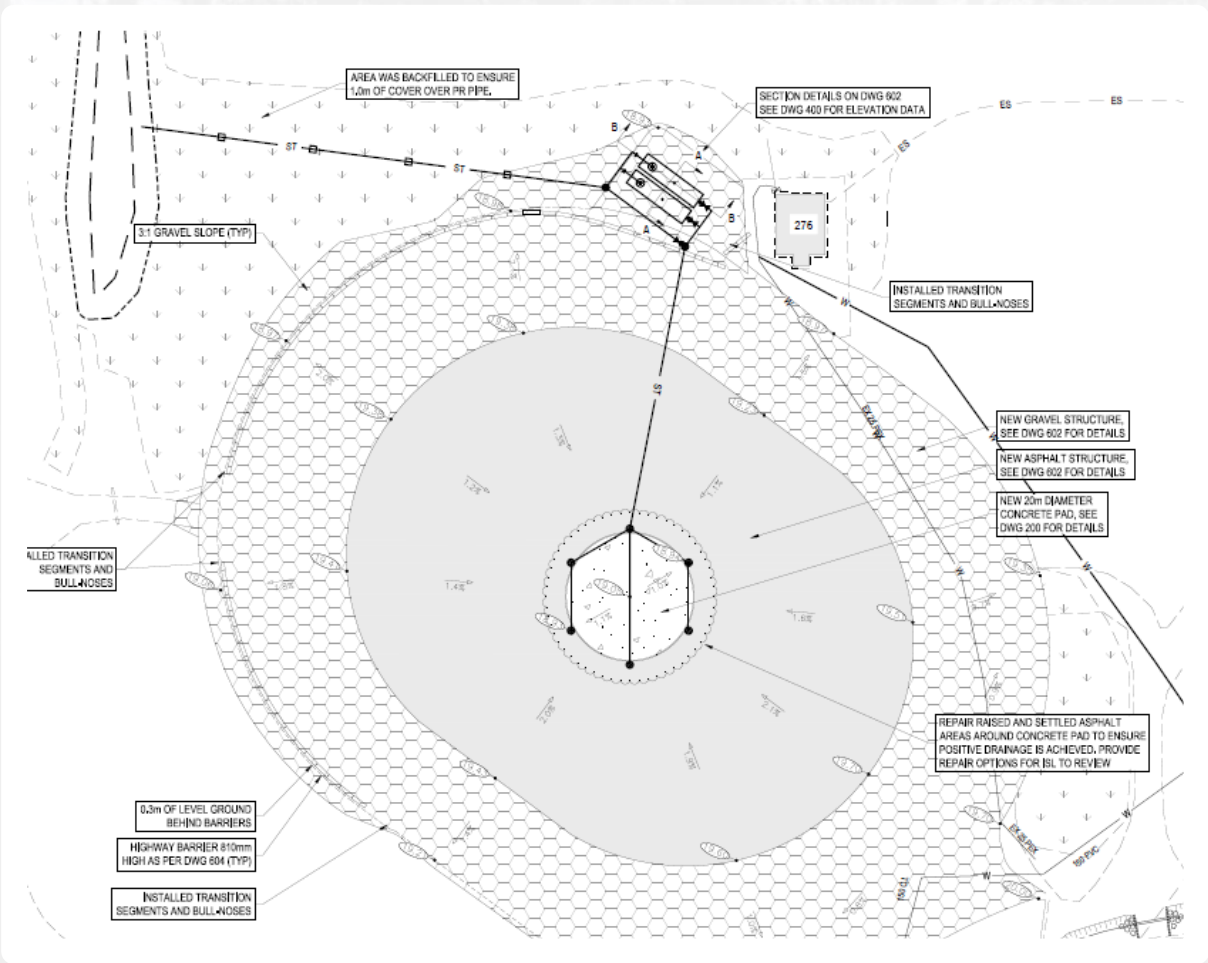
- Max PFOS = 3.7 mg/kg
- Avg PFOS = 0.39 mg/kg
- Std Dev = 0.78 mg/kg

After

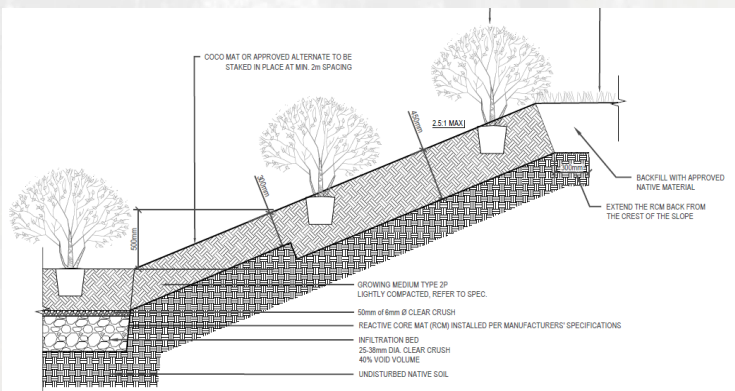
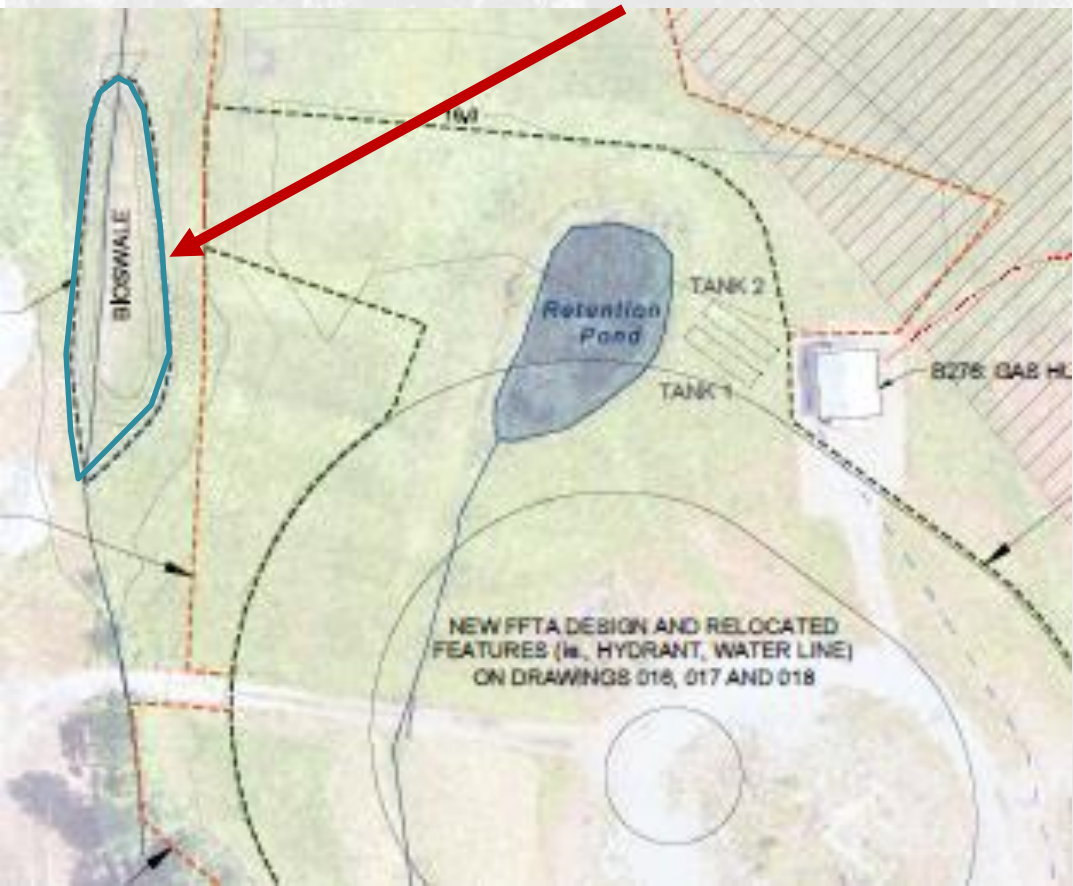
- Max PFOS = 0.93 mg/kg
- Avg PFOS = 0.22 mg/kg
- Std Dev = 0.24 mg/kg

- 44% PFOS Reduction (avg)
- ~18 kg PFOS Mass Reduction

Civil Component – New FFTA



Bioswale



Summer 2022



Next Steps

- Stockpile management and compaction monitoring
- Final restoration
- Post remediation drilling/monitoring
- Pore water sampling

Thank You!

Questions?



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