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Guaranteed Site Remediation Solutions

Presentation Outline

1) Site Background
2) Project Objectives and Challenges
3) Remedial Strategy Selection
4) Remedial Strategy Implementation
5) Project Results
6) Conclusion / Question Period

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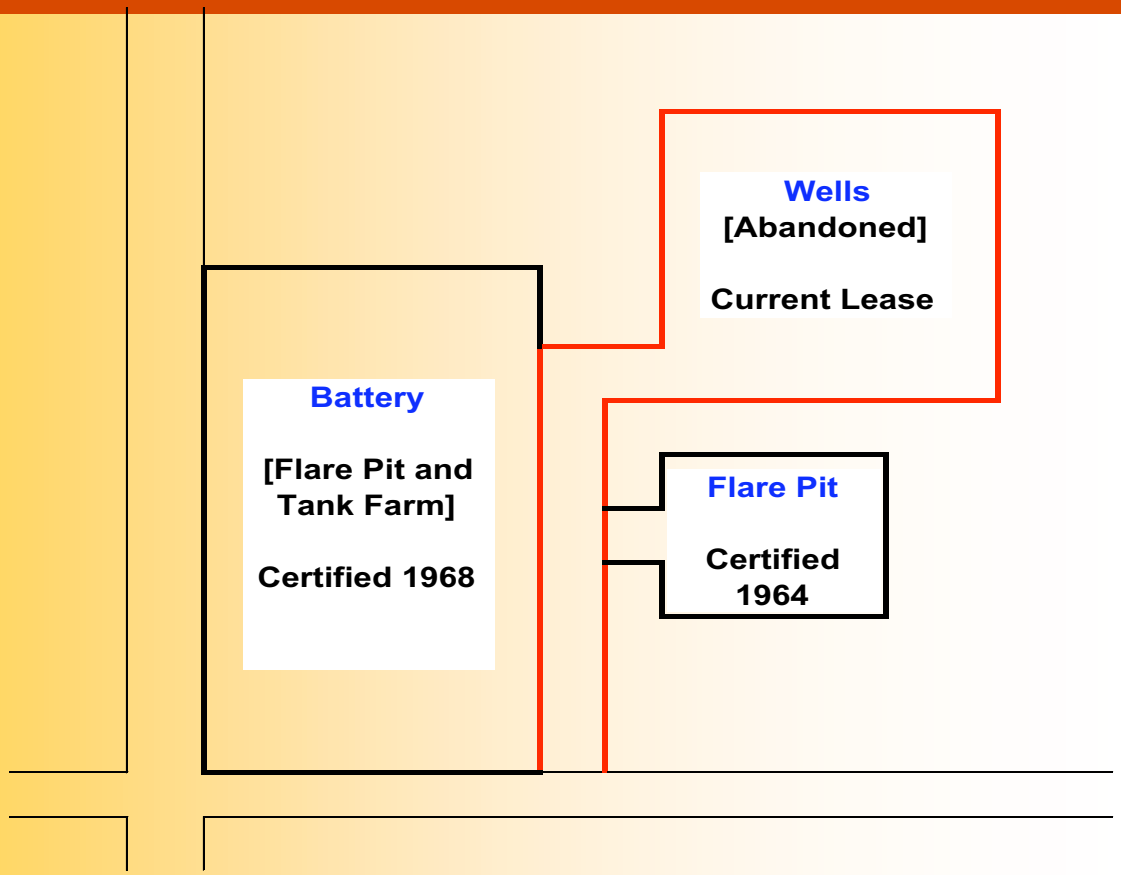
Site Background



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Project Objectives

1) Soil Conservation

2) On-site Treatment (PHC)

- Alberta Soil and Water Quality Guidelines for Hydrocarbons at Upstream Oil and Gas Facilities (Surface, Fine Grain, Agricultural and Potable Water Pathway)

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Challenges

1) Changing PHC Guideline
2) Absence of formally accepted closure sampling method in Alberta
3) Minimal On-site Treatment Experience
4) Project Duration
5) Remediation Contractor Selection

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Challenges

1) Biotreatment of Crude Oil Contamination
2) Prairie Gumbo
3) Weather Conditions
4) New Stringent CWS - CCME (F_3)
5) Guaranteed Results (Lump Sum Contract)

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Remedial Strategy Selection

1) Volume Estimate
   - Supplemental Site investigation (Grid)
   - 3-D Vizualization
2) Treatability Study

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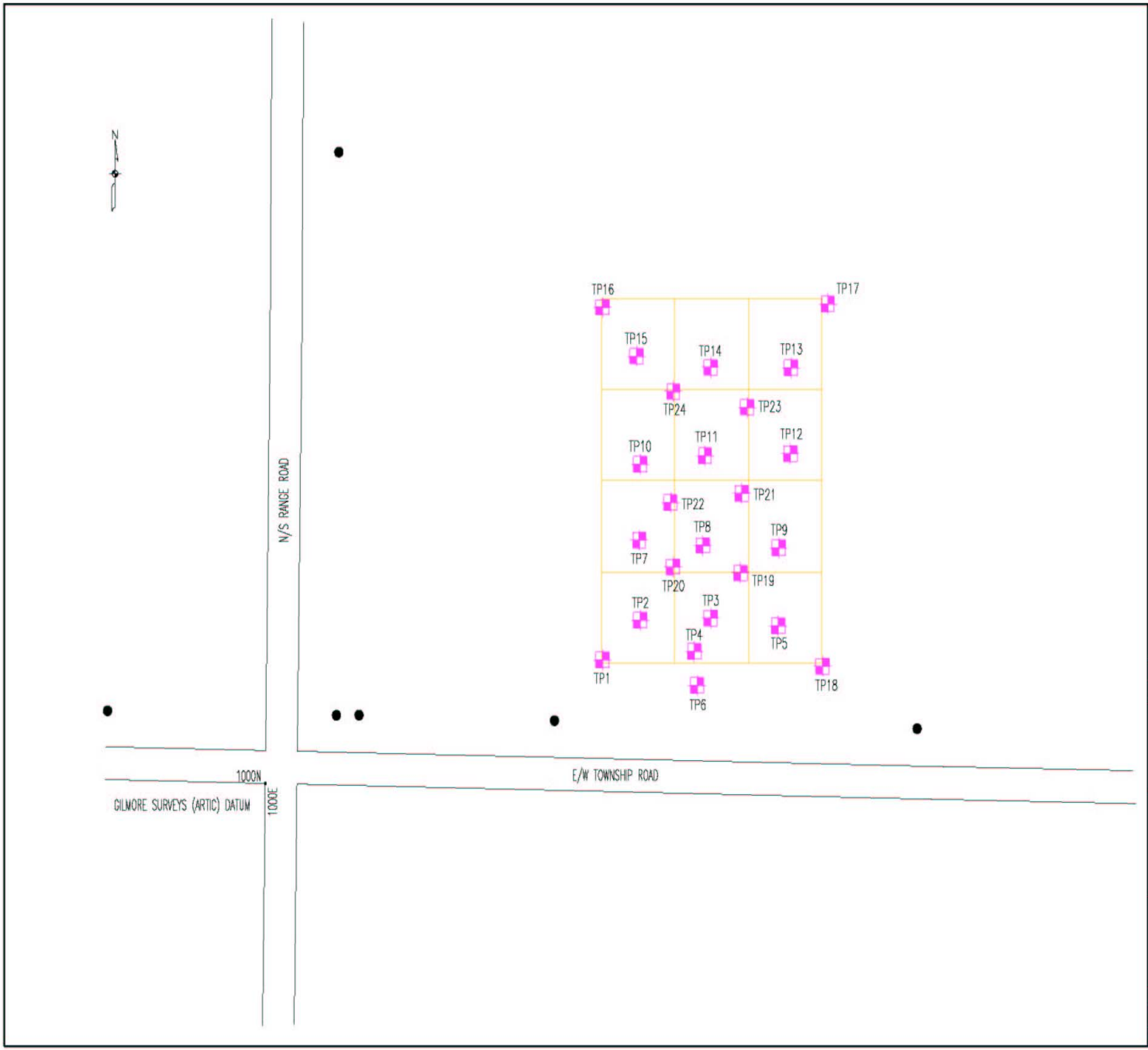

LEGEND

- Test Pit
- Electrical Pole
- Parcel

0 7.5m 15m 22.5m 30m 37.5m

NO.	VERSION	DATE	BY	APPR.
2	FOR APPROVAL	00-07-21	A.S.	F.S.

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FORMER BATTERY SITE 04-05-50-26W4M
CALMAR, ALBERTA

TEST PIT LOCATIONS

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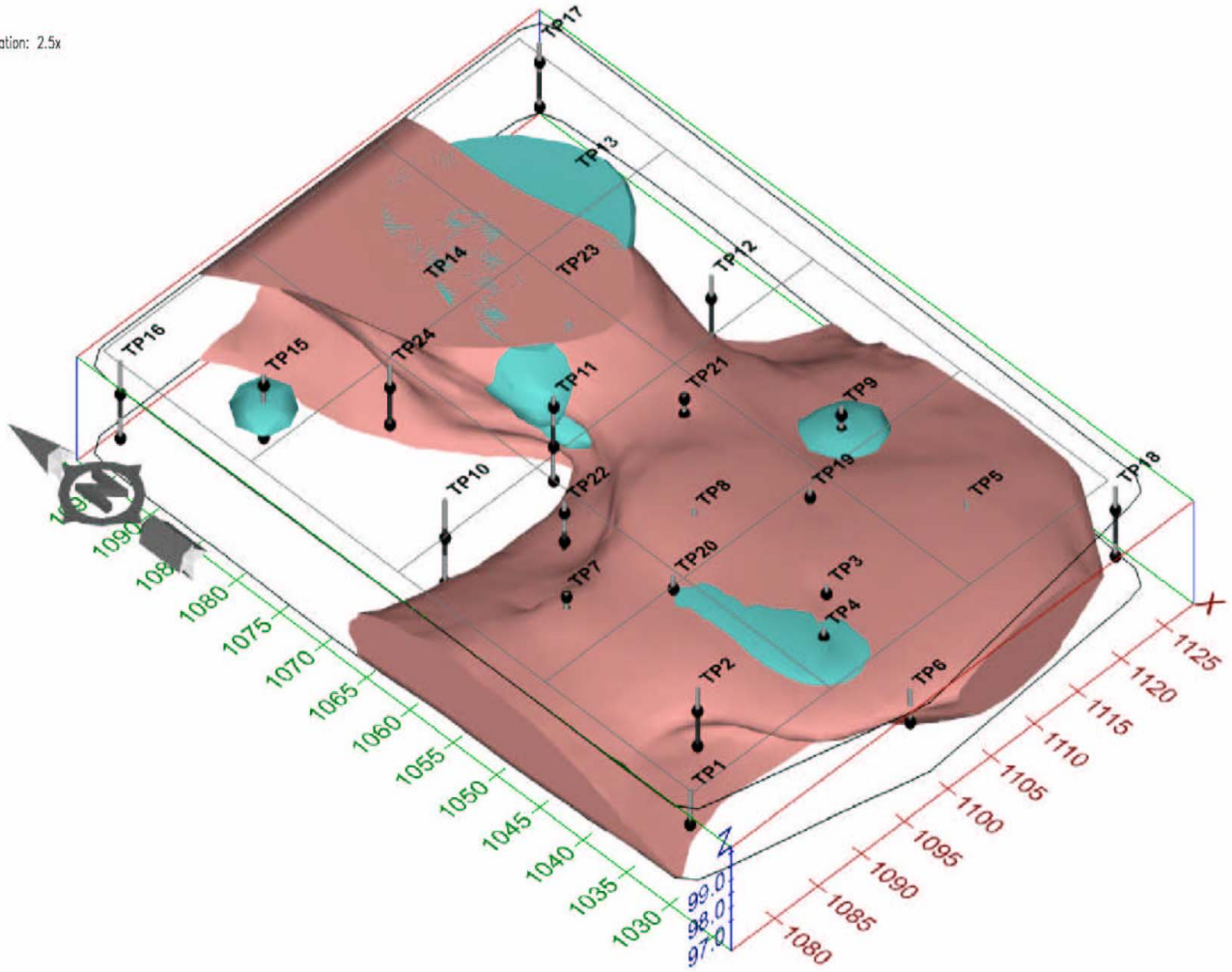
SITE REMEDIATION SERVICES
150 Fraquet Street, Sainte-Foy, (Quebec), CANADA G1P 4P1
Phone.: (418) 653-4422 Fax: (418) 653-3583

UNITS	SCALE	DATE
Meter	1:750	00-07-06
DRAWN BY: M.-A.GIRARD	VERIFIED BY: G. DUBUC	APPR. BY: F. SOUCY
PROJECT: ES-0018	IDENTIFICATION CODE: 1510-300-EN01	DRAWING NO: IS9001-001 VERSION: 2 SHEET: 1/1

FIGURE 2

PLAN VIEW OF MAXIMAL ISOVOLUMES:

Azimuth: 225°
Elevation: 40°
Vertical exageration: 2.5x



NO.	VERSION	DATE	BY	APPR.
1		00-07-21	G.B	F.S.

IMPERIAL OIL RESOURCES LIMITED

FORMER BATTERY SITE 04-05-50-26W4M
CALMAR, ALBERTA

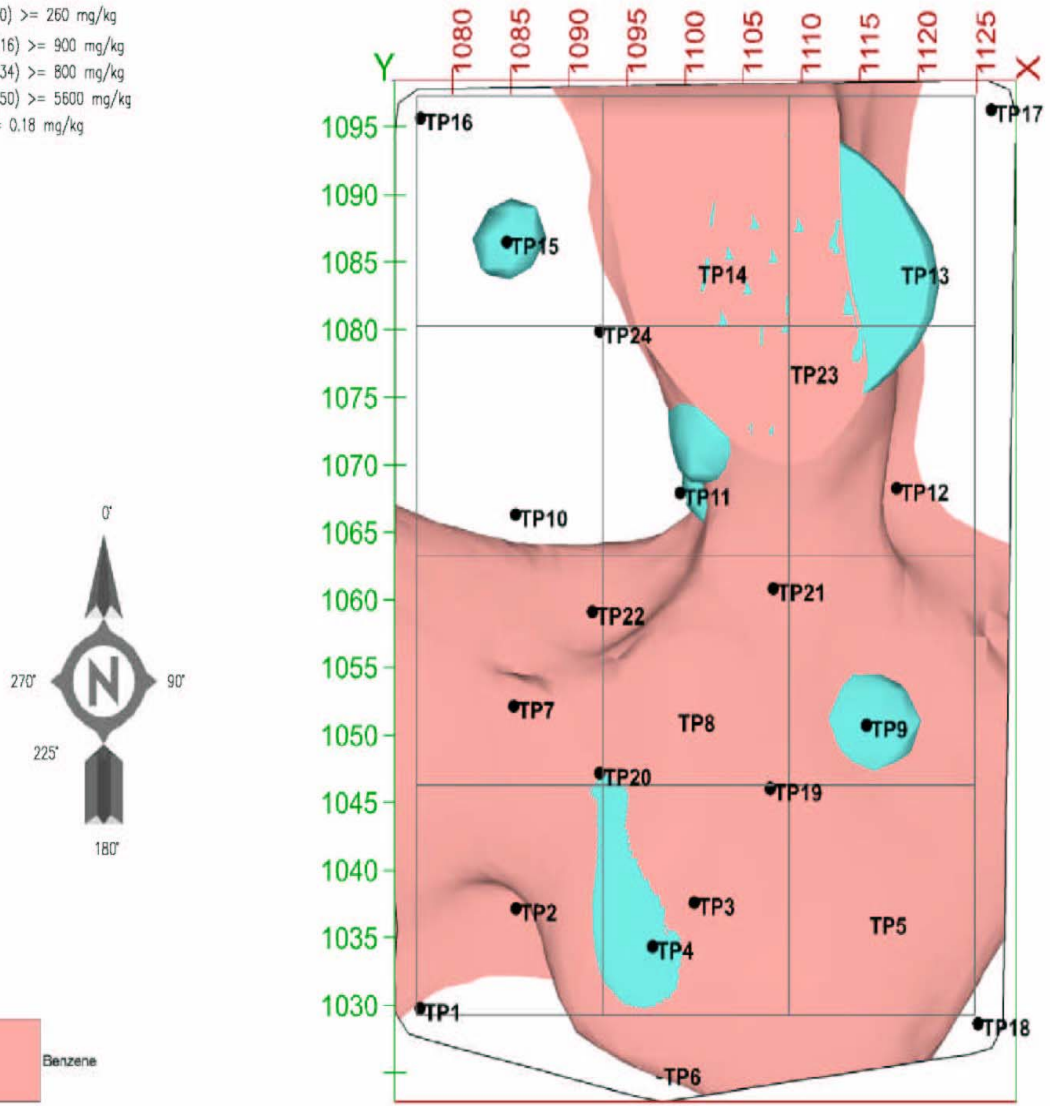
MAXIMAL ISOVOLUME OF
HYDROCARBONS-CONTAMINATED SOIL

Biogénie
SITE REMEDIATION SERVICES
350 Franquet Street, Sainte-Foy, (Québec), CANADA G1P 4P3
Phone.: (418) 653-4422 Fax: (418) 653-3583

UNITS:	SCALE:	DATE:
Meter	NONE	00-07-21
DRAWN BY:	VERIFIED BY:	APPR. BY:
G.Baribeau	J.Blanchet	F.Soucy
PROJECT:	DIGITIZATION CODE:	DRAWING NO: VERSION: SHEET
ES-0018		ES0018MOD-1 1

PLAN VIEW OF MAXIMAL ISOVOLUMES:

PHC (C5-C10) >= 260 mg/kg
PHC (C10-C16) >= 900 mg/kg
PHC (C16-C34) >= 800 mg/kg
PHC (C34-C50) >= 5600 mg/kg
BENZENE >= 0.18 mg/kg



Benzene

PHC (C5-C10;C10-C16;C16-C34;C34-C50)

NO.	VERSION	DATE	BY	APPR.
1		00-07-21	G.B.	F.S.

IMPERIAL OIL RESOURCES LIMITED

FORMER BATTERY SITE 04-05-50-26W4M
CALMAR, ALBERTA

MAXIMAL ISOVOLUME OF
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UNITS	SCALE	DATE
Meter	NONE	00-07-21
DRAWN BY	VERIFIED BY	APPR. BY
G.Baribeau	J.Blanchet	F.Soucy
PROJECT	DESCRIPTION CODE	DRAWING NO. VERSION SHEET
ES-0018		ES0018MOD-1 1

Biogenie's R&D Services - Treatability

Biogenie's R&D Services - Treatability

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Treatability Results

Parameter	Initial Mean* Concentration (mg/kg)	Final Mean* Concentration (mg/kg)	Treatment Efficiency %
PHC – F1 (C6-C10)	---	---	---
PHC – F2 (>C10-C16)	1 244	120	90
PHC – F3 (>C16-C34)	**3 526**	**1 456**	**59**
PHC – F4 (>C34+)	1 330	824	38

*** Triplicate Samples**

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Remedial Strategy Selection

Design Considerations:

- Space available on-site
- High efficiency biotreatment capability required (High F3)
- time available to treat material
- Excavation work under winter conditions

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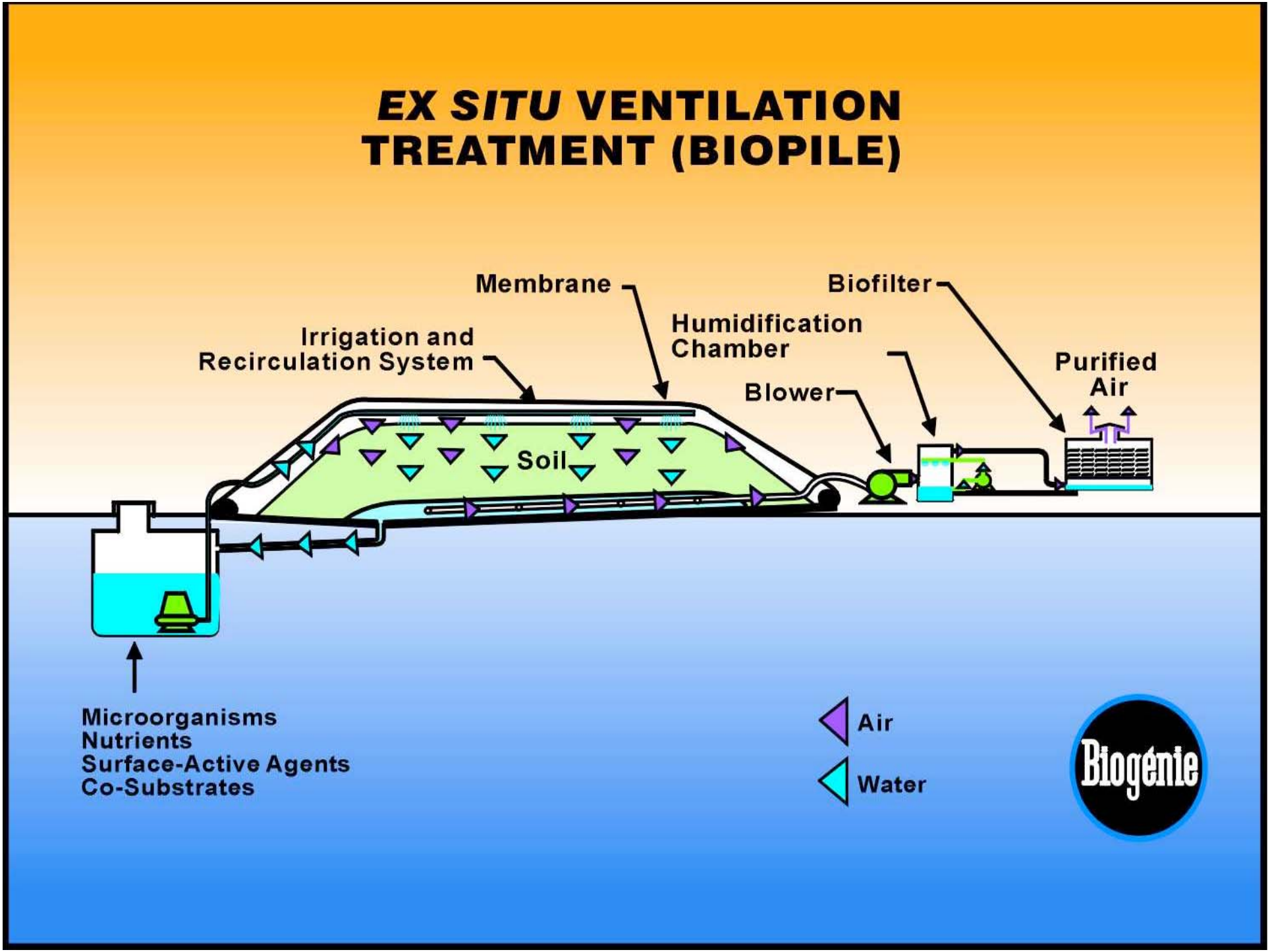
EX SITU VENTILATION TREATMENT (BIOPILE)



Remedial Strategy Implementation

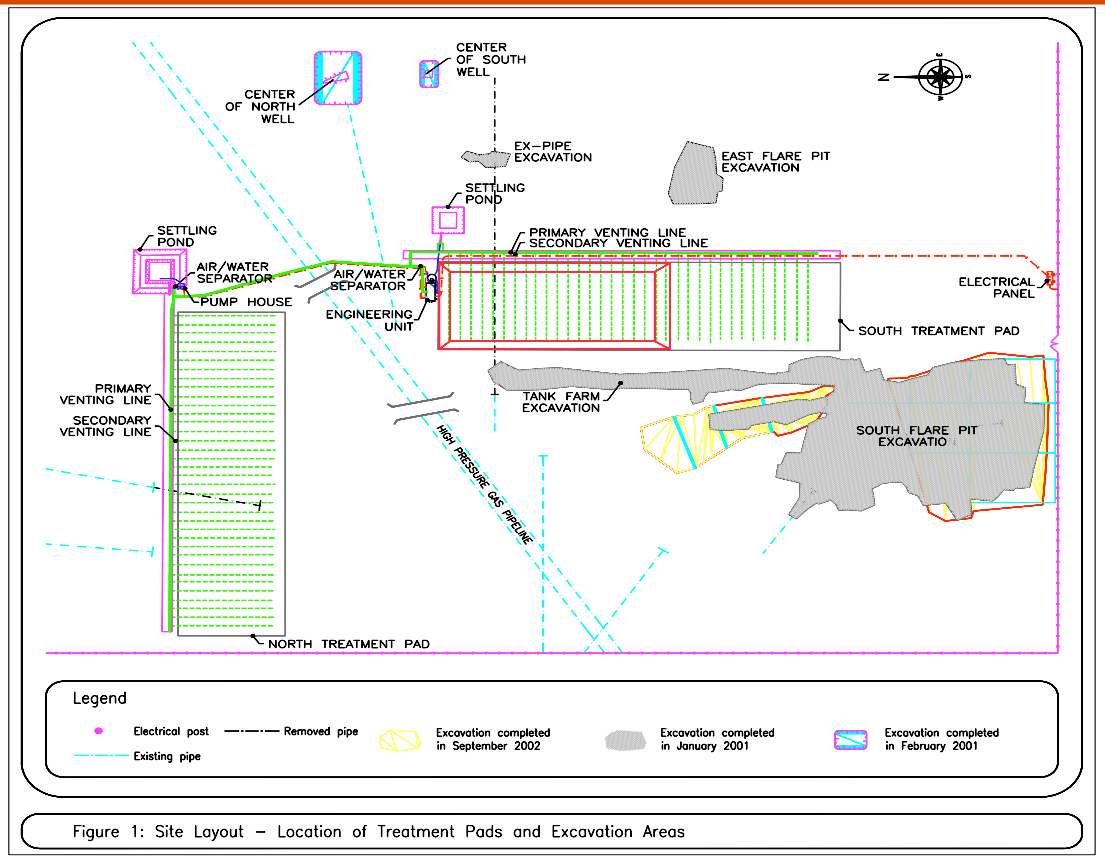


Figure 1: Site Layout – Location of Treatment Pads and Excavation Areas

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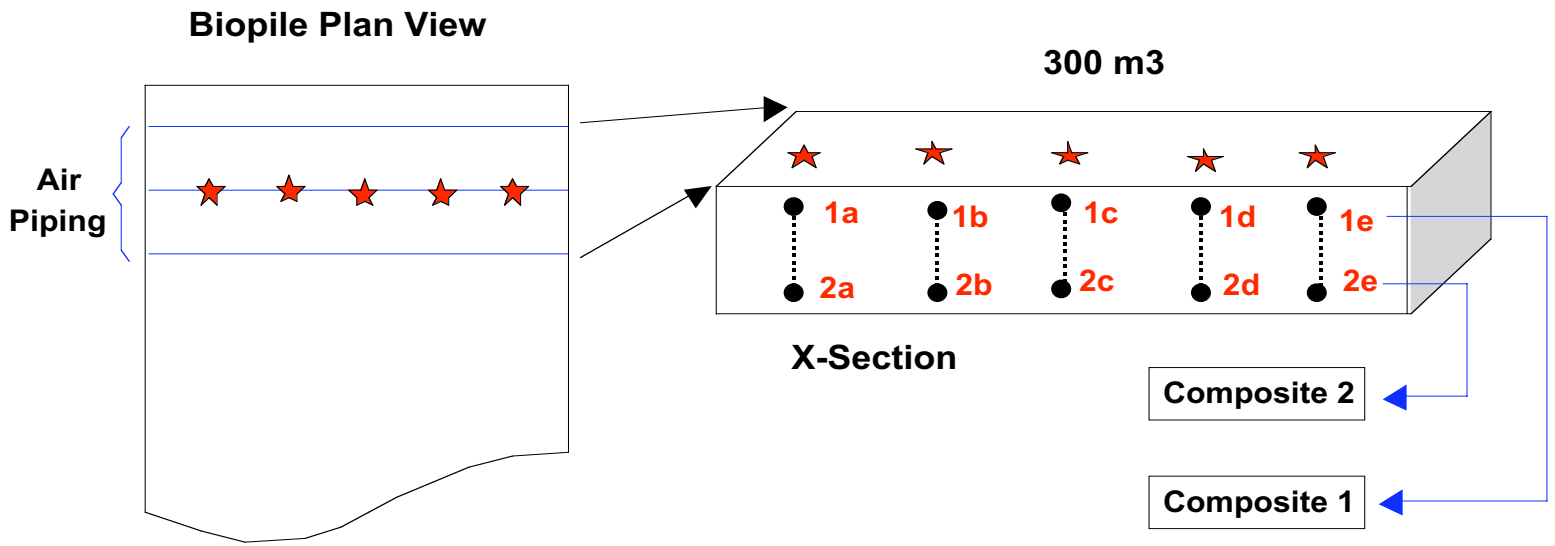
CAT

Project Results



Ref.: - BC
- QC

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Project Results

Parameter	Initial Mean Concentration (mg/kg)	Final Mean Concentration (mg/kg)	Target Criteria
PHC – F1 (C6-C10)	148	21	260
PHC – F2 (>C10-C16)	436	111	900
PHC – F3 (>C16-C34)	**1 274**	**532**	**800**
PHC – F4 (>C34+)	607	232	4 000

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Project Results

1) Biotreatment of 11,150 m^3 to TIER 1 – Surface (fine soil)
2) Segregation of 1,200 m^3 before off-site disposal (Class II)
3) Biotreatment duration period - 6 months
4) Overall Success

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