

# **Soil Sampling Results Former Truck Maintenance Garage**

**Maine Yankee Decommissioning Project  
Corrective Measures Study**

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*Prepared for:*

**Maine Yankee  
321 Old Ferry Road, Bailey Point  
Wiscasset, ME 04578**

*Prepared by:*

**Dickenson & Associates  
45 Falmouth Road  
Falmouth, ME 04105**

*And*

**CH2M Hill  
25 New Chardon Street, Suite 500  
Boston, MA 02114**

*In association with:*

**Jacques Whitford Co., Inc.  
75 Pearl Street, Suite 410  
Portland, ME 04101**

*And*

**Stratex, LLC  
100 Middle Street  
Portland, ME 04101**

## Introduction

The former truck maintenance garage (FTMG) was located east of the Plant Access Road adjacent to the ISFSI (**Figure 1**). The garage was used to conduct maintenance activities on concrete trucks and other vehicles during construction of the Maine Yankee facility. The location of the garage was confirmed by both aerial and project photographs taken during plant construction from 1968 to 1972. The garage was removed prior to operation of the Maine Yankee facility. Although no specific design drawings were available for this structure or the surrounding area, the potential existed for dry wells or floor drains to have been associated with the FTMG, and for fuel handling or storage activities to have been conducted in the area of the FTMG.

To assess the FTMG and the surrounding area, a phased approach was conducted. Initial studies incorporated as part of Phase 1A of the Maine Yankee RFI included the installation of test pit trenches on the east side of the FTMG building and monitoring wells MW-316, MW-303A, and MW-303B (**Figure 1**). Additional test pit trenches in the FTMG building footprint and west of the FTMG were excavated and MW-425 was installed on the east side of the FTMG area during Phase 1B RFI sampling (**Figure 1**). The Phase 1A and 1B studies have demonstrated that petroleum hydrocarbons (PHC) are present in both soil (up to 2,830 mg/kg) and groundwater (up to 650 µg/l) in the FTMG area (References 1 and 2). Examination of chromatograms associated with the PHC analysis indicated that the PHC-impacted soil was associated with lighter, diesel-range constituents, as opposed to the heavier PHC observed at other locations on Bailey Point. The soil sampling activities also identified three areas of PHC-impacted soil; one located on the north side of the FTMG building, and two areas approximately 100 feet east of the FTMG building (**Figure 1**). To support the Corrective Measures Study (CMS) for PHC-impacted soils in the FTMG area, a soil sampling and analysis plan was developed for the FTMG (FTMG Investigation Plan). The plan was submitted to Maine Department of Environmental Protection (MDEP) and approved on September 20, 2003. The study included the installation of geoprobe borings, continuous soil sampling to the water table, field screening using a photoionization detector (PID), and the use of an on-site field analytical laboratory.

## FTMG Investigation Plan Results and Distribution of Soil Contamination

The FTMG Investigation included the installation of 29 geoprobe soil borings (MY05GP207 through MY05GP235) (**Figure 1**). The 29 geoprobe soil borings were continuously sampled from the ground surface to two or three feet into the shallow overburden water table. The depth to the water table varied from 12 to 14 feet below ground surface in the immediate vicinity of the FTMG building to less than 10 feet below ground surface 100 feet east of the FTMG building. Each geoprobe boring was logged in the field, and copies of the soil boring logs are included as **Attachment A**. Each two-foot section of the geoprobe boring was examined, and a representative sample from each two-foot interval was screened in the field with a PID using MDEP-approved headspace techniques consistent with the Maine Yankee Quality Assurance Project Plan (QAPP) (Reference 3). The results of the PID soil screening are included in **Table 1**. Based on the field screening results and visible indications, selected geoprobe soil samples were analyzed in the field laboratory. The field laboratory was set up to conduct MDEP 4.1.25

diesel range organic (DRO) analysis, modified for the field (Reference 1). A total of 43 samples were analyzed for DRO in the field laboratory, and five duplicate samples were analyzed to support QA/QC activities. The results of the field laboratory analysis are included in **Table 2**.

In addition to the field sampling and PID screening, soil samples were also analyzed in a fixed-base laboratory (Katahdin Analytical Services (KAS)). Five duplicate samples were analyzed for DRO (MY05GP212(2-4), MY05GP223(4-6), MY05GP223(12-14), MY05GP228(4-6), and MY05GP209(12-12)), and three samples specifically associated with PHC source areas were characterized for gasoline range organics (GRO) semivolatile organic compounds (SVOCs), RCRA eight metals, and polychlorinated biphenyls (PCBs) (MY05GP212(2-4), MY05GP223(4-6), and MY05GP228(4-6)). Quality Control/Quality Assurance (QA/QC) samples including duplicates, ms/msd, and equipment blanks were also taken to support Tier II validation of the KAS laboratory results consistent with the Maine Yankee QAPP (Reference 3). The laboratory results are included in **Table 3**, and the validation report for the KAS data is included in **Attachment B**.

The subsurface soils in the FTMG area typically have two to four feet of fill that is comprised of silty sand material. Below the fill material, glaciomarine soils comprised of stiff, fissured clay-silt occur and range in thickness from five to 15 feet. The deeper portions of the glaciomarine soils have fine to medium grained lenses of sand which range in thickness from one to two inches up to a foot thick. The sand lenses typically occurred below the water table that ranged from 12 feet below ground surface near the FTMG building to eight to 12 feet below ground surface east of the FTMG building. Bedrock was encountered below the glaciomarine soils in several of the geoprobe borings and ranged from 18 feet below ground surface adjacent to the FTMG to 10 to 14 feet below the ground surface east of the FTMG building. Due to the stiff nature of the shallower portions of the glaciomarine soils, vertical permeability is probably greater than the horizontal permeability, while the sand lenses present in the deeper glaciomarine soils give rise to a higher horizontal permeability.

The FTMG investigation has identified three areas of PHC-impacted soils. PHCs were detected adjacent to and north of the FTMG building and in two areas approximately 100 feet east of the FTMG building. The PHC -impacted soils were typically observed in two scenarios. Massive, thick PHC-impacted soils with visible staining were observed directly beneath the fill material in the clayey glaciomarine soils with a thickness ranging from four to six feet, and in thin sand lenses that occur within the saturated portions of the deeper glaciomarine soils. When elevated PHCs were observed in the thin, saturated sand lenses, the glaciomarine sands had a gray color, in contrast to a reddish brown color associated with non-impacted sand lenses. In many cases very little or no PHCs were observed within the glaciomarine soils located between the massive PHCs observed in the shallow soils and the deeper PHCs associated with the lenses of sand.

The shallow, massive PHC -impacted soils adjacent to the north end of the FTMG building was observed in MY05GP212 and MY05GP213, but were absent in all of the other geoprobe borings in the FTMG area. The shallow PHC -impacted soils were observed between two and six feet below ground surface in the two geoprobe soil borings, and includes an area of 30 feet by 30 feet giving a soil volume of approximately 200 cubic yards. The field laboratory DRO concentrations associated with this area ranged from 160 mg/kg to 210 mg/kg, exceeding the

MDEP cleanup criteria established Baseline 2 (Reference 4) (**Table 2**). The soils were visibly stained and field screening values were elevated in the two soil borings with PID concentrations ranging from 50 parts per million (ppm) to 110 ppm in the soil samples taken in the two to six foot range (**Table 1**). A comparison of the chromatograms associated with the field laboratory DRO results for the soil samples in the FTMG building area with a K-1 kerosene standard analyzed in the field laboratory indicated that all samples taken from the FTMG building area were consistent with a kerosene source for the PHC -impacted soils (**Attachment C**). Deeper soil samples in the area north of the FTMG building also had kerosene-related PHCs that were present in thin sand lenses at or below the water table. PHC concentrations ranging from 88 mg/kg to 780 mg/kg were observed in geoprobe soil borings MY05GP209(10-12), MY05GP212 (10-12 and 12-14), MY05GP213(14-16), and MY05GP214(12-14). Although elevated PHC concentrations occur in the deeper sand lenses, the volume of impacted soil is minimal, as the sand lenses are thin (1 to 3 inches).

The geoprobe sampling results are consistent with the PID screening results from test pits samples MY05TP104L and MY05TP104M (**Figure 1**). Elevated PID readings (65 ppm) from TP104M were observed at approximately five feet below ground surface within silty glaciomarine soils, while low PID values were observed in the fill above the glaciomarine soils (1.9 ppm) and in the sandy glaciomarine soils (2.5 ppm) near the water table approximately 10 feet below ground surface. Elevated PID values and PHC-impacted soil were also observed in TP104L located approximately 20 feet north of TP104M. The elevated PID readings (116 ppm) were only observed in deeper soils near the water table approximately 12 feet below ground surface. Low PID values (3.9 ppm to 4.3 ppm) were reported in the fill and silt-rich glaciomarine soils above the deeper soils at TP104L.

Shallow PHC -impacted soil was also observed at two locations in the unsaturated, clayey glaciomarine soils approximately 100 feet east of the FTMG on both the south and north side of the long east-west trench excavated during the Phase 1A and 1B RFI (**Figure 1**). Field laboratory DRO results for MY05GP223(4-6) located on the south side of the trench were 750 mg/kg and elevated PID readings (16 ppm to 43 ppm) were observed in MY05GP223 through MY05GP224 at depths four to eight feet below ground surface (**Tables 1 and 2**). The shallow glaciomarine soils with elevated DRO were also visibly stained. Deeper soils on the south side of the trench also had elevated PHCs in thin sand lenses, similar to that observed in the deeper soils adjacent to the FTMG building, as 5,000 mg/kg was detected in saturated soils at 12 to 14 feet below ground surface in MY05GP225 (**Table 2**). In contrast to the kerosene PHCs observed in the soil samples adjacent to the FTMG, chromatograms associated with the PHC-impacted soil east of the FTMG building were all consistent with diesel fuel (**Attachment C**).

A second area of PHC-impacted soil was also identified north of the long east-west trench east of the FTMG (**Figure 1**). Glaciomarine soils between four and eight below ground surface and beneath the fill in MY05GP228 and MY05GP231 were visibly stained and had 4,000 mg/kg to 5,600 mg/kg DRO measured in the field laboratory (**Table 2**). Elevated PID readings were also associated with these soil samples as PID values ranged from 28 ppm to 87 ppm (**Table 1**). PHC contamination was also associated with thin sand lenses within the water table at MY05GP231(10-10.2) (1,100 mg/kg) and MY05GP227(14-16) (780 mg/kg), consistent with the deeper detections in thin sand lenses observed at the other two areas of PHC contamination.

The two areas of PHC-impacted soil identified east of the FTMG building are each approximately 20 feet by 20 feet in area and four to six feet thick, giving rise to approximately 180 cubic yards of PHC-impacted soil. These two areas are also consistent with the elevated PHCs observed in the test pit trench samples from Phase 1A and 1B of the RFI program. The elevated PHCs observed in the trench are adjacent to the two shallow areas of soil contamination identified as part of the geoprobe study and include elevated PID readings in both the shallow glaciomarine soils and deeper sand lenses (**Figure 1**). These observations and the consistent diesel source for the PHCs on both sides of the trench suggest that the source areas on either side of the trench were historically related to one continuous area that was interrupted by the trenching activity.

The presence of the three areas of PHC contamination directly beneath the fill material suggests that the kerosene or diesel fuel was originally released at the ground surface during the time period associated with construction activities at Maine Yankee (1968-1972). The area was then covered with two to four feet of fill material. During the 30 years following plant construction activities, infiltration of rainwater and snow melt has leached the soluble fractions of the kerosene and diesel fuels present within the shallow soils. This more soluble material has migrated down through vertical fractures associated with the desiccated, clayey glaciomarine soils, giving rise to the PHCs associated with the deeper, thin sand lenses within the saturated zone beneath each of the shallow source areas. The shallow PHC-impacted glaciomarine soils provide the source material for the deeper PHCs present within the saturated, thin sand lenses.

Soil samples from each of the three identified shallow areas of soil contamination were characterized for the potential presence of waste oil components. Following identification of the three source areas, three additional geoprobe borings (MY05GP212(2-4), MY05GP223(4-6) and MY05GP228(4-6)) were installed to the depth where elevated PHCs were identified, directly adjacent to the initial geoprobe boring locations. The three soil samples were analyzed for GRO, SVOCs, PCBs, and RCRA eight metals. The SVOC and PCB results were all non-detect except for low naphthalene concentrations in MY05GP212(2-4) and MY05GP228(4-6). Low concentrations of GRO were observed in all three samples ranging from 31 mg/kg to 160 mg/kg. All of the metal analyses were consistent with background values established in the Bailey Point RFI report. The low naphthalene and GRO detections are consistent with both kerosene and diesel fuels, as the lighter end of the DRO analysis overlaps with the heavier end of the GRO test. The source area characterization results indicate that no waste oil parameters are included in the PHC contaminated soils and that the source of contamination is related to the release of kerosene (area adjacent to FTMG building) or diesel fuel (areas east of the FTMG building).

## Conclusions

The geoprobe investigation conducted in the FTMG area has identified three areas of PHC-impacted soils. The concentration of PHCs at each of the three locations exceeds the 100 mg/kg MDEP cleanup criteria established for Baseline 2 (Reference 4). Kerosene-contaminated soils are identified in shallow glaciomarine soils adjacent to the north side of the FTMG building. The kerosene PHCs occur in shallow glaciomarine soils directly below fill material. The soils

are visibly stained and include a 30-foot by 30-foot area four to six feet thick. This zone of PHC-impacted soil represents approximately 200 cubic yards of PHC-impacted soil. Deeper PHC-impacted soil is also present in thin sand lenses at or within the water table, but the soil volume associated with the sand lenses is insignificant compared to the volume of PHC-impacted shallower soils. The source of the deeper PHCs present in the thin sand lenses is the shallow PHC –impacted soils present above the deeper sand lenses.

Two areas of PHC-impacted soil were also identified in shallow glaciomarine soils approximately 100 feet east of the FTMG building. In contrast to the kerosene PHCs observed adjacent to the FTMG building, the PHC -impacted soils east of the FTMG building are consistent with diesel fuel. Each of the two shallow areas of diesel PHC-impacted soil have approximately 90 cubic yards (20 feet by 20 feet, 6 feet thick) giving a total of 180 cubic yards of PHC-impacted soil. The results suggest that the two areas were connected prior to the soil disruption associated with trenching activities conducted during the RFI program, and may include an additional 90 cubic yards of impacted soil located between the two areas. PHCs were also observed in the deeper, thin sand lenses at or below the water table. Consistent with the deeper PHCs associated with the kerosene-impacted soil, the volume of PHC-impacted soil present in the deeper sand lenses is insignificant when compared to the volume of PHC-impacted shallow glaciomarine soils. The source of the deeper PHC contamination present in the thin sand lenses is the shallow PHC contamination present above the deeper sand lenses.

## References

1. Former Truck Maintenance Garage Soil Investigation Plan (September, 2003)
2. Bailey Point RCRA RFI Report (2004)
3. Maine Yankee Quality Assurance Project Plan – Revision 1 (June 2001)
4. Procedural Guidelines for Establishing Action Levels and Remediation Goals for the Remediation of Oil Contaminated Soil and Groundwater in Maine (March, 2000)

## Figures

1. Former Truck Maintenance Garage Geoprobe Study

## Tables

1. PID Screening Results – FTMG Geoprobe Investigation
2. Field Laboratory DRO Results - FTMG Geoprobe Investigation
3. Laboratory Analytical Results - FTMG Geoprobe Investigation

## **Attachments**

Attachment A – Geoprobe Boring Logs - FTMG Geoprobe Investigation

Attachment B – Data Validation Report FTMG Geoprobe Investigation

Attachment C – Field Laboratory DRO Chromatograms

## Figures

## **Tables**

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## **Attachment A – Geoprobe Boring Logs - FTMG Geoprobe Investigation**

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