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1.0 INTRODUCTION

Maine Yankee is a former nuclear power electrical generating plant that, since ceasing generating electricity in August 1997, is being decommissioned and dismantled. This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report supports closure of the industrial (Bailey Point) portion of the plant site in accordance with RCRA regulations (06-096 Code of Maine Regulations (CMR) Chapter 851, Section 11, and Title 40 Code of Federal Regulations (CFR) Part 265). This RFI Report presents the field investigation results and assessments used for decision-making in order to close the Bailey Point area in a manner appropriate for the protection of human health and the environment.

The entire Maine Yankee Site is about 820 acres, of which about 150 acres lies within the Bailey Point area, the portion of the site most impacted by construction and operation of the facility. This RFI Report presents the field investigation within this portion of the site, including an investigation beneath buildings, remaining concrete foundations and along shoreline areas. Risk assessments for human health and the environment were performed and are included as part of this RFI Report. A Backlands RFI Report, based on an investigation of the remaining 670 acres, was prepared separately to allow Maine Yankee the ability to expedite ownership transfer of the backlands portion of the site.

RFI planning, which consisted of developing project plans and outlining field investigation activities, was initiated in September 1999. Specifically, a Site History Report (SHR), Building Assessment Plan (BAP) and Quality Assurance Project Plan (QAPP) were developed that outlined areas of the site potentially contaminated, summarized the environmental and geologic investigations performed at the site, and the investigation plan. The QAPP, which describes all field, laboratory and validation activities to be completed as part of the RFI, was granted final approval by Maine Department of Environmental Protection (MDEP) on December 11, 2001. QAPP Change Orders were processed during the RFI to document changed conditions encountered in the field, additional sampling activities, and/or revised sampling and analytical procedures.

The majority of the RFI sampling program was performed in two major field mobilizations (Phase 1A and 1B) to coordinate investigation activities with ongoing decommissioning and demolition work, and to allow work in favorable weather. The majority of the sampling program was implemented in Phase 1A, which was conducted between September and December 2001. Shoreline sediment sampling was performed early in Phase 1A to support decision making, and consisted of a tiered approach for evaluating the sediment bulk chemistry, toxicity and the benthic community. To support ongoing decommissioning and permitting activities, deep-water sediments were collected prior to the RFI using divers in and around the submerged diffuser pipes, and soil and groundwater samples were collected prior to construction of the spent fuel storage area in the central portion of the Bailey Point area.

The Phase 1B sampling program, conducted from April through November 2002, was enhanced several times to add sampling and analytical scope based on a preliminary assessment of Phase 1A data. The additional sampling scope was discussed with MDEP and the United States Environmental Protection Agency (USEPA) and documented using the QAPP change order process. Some sampling activities outlined in the QAPP were deferred beyond Phase 1B as a result of ongoing decommissioning and demolition work, sub-grade remediation work, or inability to access active building sumps and energized transformer yards. These sampling activities will be performed prior to final site closure as areas become available or as confirmatory samples following removal.

Following completion of the RFI, a Corrective Measures Study (CMS) will be developed to identify potential areas to be remediated and methods of remediation. Several areas were remediated prior to and during the RFI to support decommissioning and demolition work. These remedial activities will be documented in the CMS. Following MDEP-approval of the CMS, areas that remain to be remediated will be performed as part of Corrective Measures Implementation (CMI), leading to final RCRA site closure of the Maine Yankee site.

1.1 Purpose

The purpose of this report is to present the results of the RFI activities conducted in the Bailey Point portion of the Maine Yankee site to support site closure. The RFI was conducted to characterize the Maine Yankee site to support RCRA (non-radiological) closure; radiological closure is addressed in Maine Yankee's License Termination Plan (MY, 2002k). The goals of this RFI were to complete the sampling program and apply the project quality objectives (PQOs) identified in the QAPP (Stratex, 2001d). The PQOs include the generation of data to characterize contaminant sources, determine nature and extent of contamination, support fate and transport analysis, conduct risk assessments for human health and the environment, and support future remedial activities, if necessary, to minimize potential risk.

1.2 Scope of Work

As outlined in the QAPP, the RFI activities included collection of soil, concrete, sediment, biota, surface water, and groundwater samples from specific areas of Bailey Point. The RFI characterizes the potential impacts to site media, and assesses risk to human health and the environment. To ensure that quality data was collected to support PQOs and project decision-making, Quality Assurance/Quality Control (QA/QC) samples were collected and evaluated as outlined in the QAPP. Following sample collection, the locations were surveyed to determine the horizontal and vertical location of the sampling points.

The RFI was implemented in two major field mobilizations, Phase 1A and Phase 1B. The field program was split primarily to coordinate with demolition work in the area of the former Turbine Hall and to allow work in favorable weather conditions. Phase 1A was performed between September and December 2001, while Phase 1B was completed

between April and November 2002. Some sampling activities identified in the QAPP have been deferred as a result of ongoing decommissioning and demolition work, sub-grade concrete paint removal, and inability to access active building sumps and transformer yards. These areas will be sampled as the decommissioning and demolition schedule allows and documentation will be included in final closure documents. Later phases of sampling will be relegated to filling identified data gaps and confirmatory sampling in areas where remediation was performed as part of RCRA closure activities.

The Bailey Point RFI included the following activities:

1. Surface soil sampling;
2. Subsurface soil sampling using soil borings, geoprobes, hand augers and test pits;
3. Sub-slab soil sampling;
4. Sub-grade concrete sampling;
5. Subtidal and intertidal sediment sampling;
6. Biota collection for analysis of tissue;
7. Surface water and groundwater-seep sampling;
8. Installation of monitoring wells in soil and bedrock;
9. Sampling of groundwater from monitoring wells;
10. Laboratory analysis of soil, concrete, sediment, tissue, surface water, and groundwater samples; and
11. Data validation of soil, concrete, sediment, tissue, surface water, and groundwater sample results.

Soil, sediment, biota, and groundwater samples were also collected from reference locations sited away from impacted areas for comparison purposes.

Once validated, the data was uploaded to a web-based Geographical Information System (GIS)/Oracle database system and correlated with its location-survey information. The validated data were available to view, to sort and examine spatial variability, and to provide input for assessment of risk to human health and the environment.

1.3 Site Description

The Maine Yankee plant site is located on Montsweag Bay in Wiscasset, Maine (**Figure 1-1**). The site is located approximately one and one-half miles east of Route 1 and one-half mile west, across Back River, from Westport Island (**Figure 1-2**). The land owned by Maine Yankee is divided by Old Ferry Road, the closest public road, which terminates on the shore of Back River (**Figure 1-3**). The main plant facilities are located on Bailey Point, which is surrounded by tidal waters of Montsweag Bay, a part of the Sheepscot River estuary system (**Figure 1-4**).

The entire Maine Yankee site is about 820 acres, of which approximately 670 undeveloped acres commonly referred to as the Backlands, exist west of Bailey Cove/Young's Brook and north of Old Ferry Road. The remaining approximately 150 acres lie south of Old Ferry Road within the Bailey Point area, which is bounded by

Bailey Cove to the west and Back River on the east (**Figure 1-4**). This RFI Report focuses on the Bailey Point area, which is the portion of the site where most construction, operation and decommissioning activities have taken place.

Notable features within the Bailey Point area (**Figure 1-4**) include Foxbird Island, a 12-acre peninsula within Montsweag Bay south of the plant forebay; the Independent Spent Fuel Storage Installation (ISFSI), an 8-acre area north of the plant area and south of Old Ferry Road; and the industrial area, a 12-acre area within security fencing where the majority of the industrial plant buildings were located. The remaining plant area includes two electrical switchyards and transmission lines, warehouse complexes, administration buildings, and the Bailey Farm House and Barn.

Following decommissioning, most above-grade structures will be demolished. Several structures were demolished during RFI activities, including the Circulating Water Pumphouse, Sewage Treatment Plant, Turbine Hall, Service Building, Information Center, and the Fire Pond and Pumphouse. At the current time, above-grade structures to remain following RFI activities include the ISFSI, the two electrical switchyards (115 kV and 345 kV) and transmission lines, the construction transformer (X-5) and the barge slip and dolphins. The road that travels west of the ISFSI will remain in place, terminating near the 115 kV switchyard. The original plant access road will remain but will terminate between the ISFSI and the former location of the Information Center. The existing railroad that travels the west side of the ISFSI and its two spurs will remain in place. Some below-grade structures and systems will remain following any required surveys and remediation.

During plant operation the site was divided into 15 drainage sub areas, which lead to shoreline areas surrounding Bailey Point via overland or piped storm water systems. There are over 12,000 feet of shoreline around Bailey Point (south of Old Ferry Road), of which approximately 2,500 feet surround the main plant area where industrial activity and licensed industrial discharges occurred. The licensed water discharge pathway during plant operation was the Forebay and the submerged diffuser system extending into Montsweag Bay. The final disposition of stormwater outfalls, including the diffuser forebay and piping, was coordinated with the MDEP through the Site Location and Natural Resources Protection Act (NRPA) regulations (MDEP, 2002a). The diffuser piping will remain in place, both offshore and beneath Foxbird Island. The diffuser forebay was investigated and, as a result of radiological contamination, it will be remediated and restored as a high marsh-wetland (MDEP, 2003a).

1.4 Site History and Basis for RFI Program

Prior to construction of the Maine Yankee facility, the Bailey Point area was used for residential and farming activities. During construction and operation of Maine Yankee, this portion of the site was used to support industrial activities associated with nuclear power generation. The Bailey Point area includes terrestrial, fresh and saltwater wetlands and intertidal environments.

Construction of the Maine Yankee facility began in 1968 and commercial operation commenced in December 1972. The plant generated electricity for approximately 26 years; the plant was taken offline December 1996 and permanently ceased operation in August 1997. The plant is in the process of being decommissioned, with most plant structures scheduled to be demolished and removed.

For a brief period in the early 1980s Maine Yankee held an Interim Hazardous Waste Storage Facility License issued by the MDEP. After terminating that license in 1985, Maine Yankee continued to operate as a hazardous waste generator. Since Maine Yankee was a generator of hazardous waste, the site must be investigated and remediated, if necessary, in accordance with the RCRA (06-096 CMR Chapter 851, Section 11, and CFR 40 CFR Part 265), in order to close the site in a manner appropriate for future use and protection of human health and the environment. The RFI was performed to support an assessment of risk to human health and the environment and to support site closure; the QAPP was prepared as a blueprint for the RFI (Stratex, 2001d). A separate plan was submitted to MDEP for closure of the former Interim Hazardous Waste Storage Facility, the Lube Oil Storage Room (Stratex, 2001a).

1.5 Previous Investigations and Remediations

Numerous environmental and geologic investigations have been conducted at Maine Yankee prior to and since construction of the power generating facility. Section 5 of the QAPP details the assessments and investigations previously performed at the site, which form the basis for the RFI sampling approach (Stratex, 2001d). RCRA-related assessments included a RCRA Facility Assessment (RFA) prepared by MDEP (MDEP, 1992a and 1999), and a Site History Report (SHR), Building Assessment Plan (BAP) and visual site inspection performed by Maine Yankee (S&W, 1999c, Stratex, 2000a, 2001c, and MY, 2001d and 2002m). Several investigations were performed prior to the RFI to support decommissioning and demolition activities, including an assessment prior to enlargement of the barge access road (S&W, 2000a) and construction of the ISFSI (MY, 2000d). An investigation of deep-water sediment in and around the submerged diffuser system was also performed to support NRPA permitting activities (MDEP, 2002a). The Lube Oil Storage Room was evaluated to support closure of Maine Yankee's Interim Hazardous Waste Storage License (Stratex, 2002c). **Table 1-1** summarizes the environmental investigations that have been conducted at Maine Yankee. A summary of geologic investigations is provided in Section 3 of this RFI Report.

Several targeted remediation activities were performed at Maine Yankee prior to the RFI to support decommissioning and demolition work, including removal of kerosene-contaminated soil prior to construction of the ISFSI, removal of petroleum stained soil during excavation work, and removal of paint from the sub-grade concrete surfaces that would remain following demolition. A summary of these remedial activities is also included in **Table 1-1**.

During the RFI, Maine Yankee continued implementation of its MDEP-approved Spill Plan (MY, 2002o). In accordance with the plan, all spills are addressed and remediated,

if necessary, in a timely manner. For several larger spills, remedial plans were developed and implemented. **Table 1-1** includes a summary of remedial activities performed as a result of spills reported during the RFI.

Following an assessment of data collected during the RFI, further remedial activity will be planned, evaluated and implemented, as necessary, as part of the Corrective Measures Study (CMS) and Corrective Measures Implementation (CMI) phases. Results of this remedial activity will be documented in final site closure documents.

1.6 Project Organization

RCRA Closure is one of several activities being conducted by Maine Yankee as part of decommissioning, which required support from multiple Maine Yankee groups and contractors as outlined in **Figure 1-5**.

The Maine Yankee Site Restoration/Remediation Group, managed by Mr. Stephen Evans coordinated implementation of the RFI. Mr. Evans was supported by the Nuclear Safety and Regulatory Affairs Group, directed by Mr. Thomas Williamson. Mr. John Rendall of CH2M Hill, the RCRA Program Manager, coordinates the programs leading to RCRA closure of the site: RFI, Risk Assessments, CMS and CMI. Key contributors to implementation of the RFI were Mr. Robert Gerber of Stratex (Project Geologist), Ms. Lauri Gorton of CH2M Hill (QA Officer), Mr. Brian Couture of Sequoia (RFI Manager), Dr. Melville Dickenson of Dickenson & Associates (Project Chemist), and Mr. Nick Sabatine of Jacques Whitford (Field Manager). Jacques Whitford and CH2M Hill provided additional qualified field personnel, such as environmental engineers and geologists, on an as-needed basis throughout the RFI.

The risk assessments performed for this project were managed by Mr. John Lowe of CH2M Hill. The assessment of risk to human health (Section 5) was conducted by Ms. Elizabeth Walter of Dickenson & Associates and the ecological risk assessment (Section 6) was completed by Dr. Jamie Maughan of CH2M Hill.

Data management was the responsibility of Jacques Whitford, which included development of the web-based GIS database and production of graphics to support the RFI.

Several subcontractors supported the RFI organization. Subcontracted services included soil and rock boring, well installation, geoprobes, test pitting, surveying, laboratory analysis, and data validation. The following is a list of primary subcontractors supporting this project:

- Katahdin Analytical Services, Inc.– Prime Laboratory for Sample Analysis
- Southwest Research Institute – Prime Laboratory for Radiological Samples
- EA Engineering, Science, and Technology, Inc. – Sediment Toxicity Analysis
- Aquatec Biological Sciences – Sediment Benthic Community Structure Analysis
- Arthur D. Little – Tissue Analysis

- Research and Productivity Council – Tissue Metal Analysis
- ICF Consulting, Inc. – PCB Congener/Homologue Analysis
- Northeast Test Laboratory – Asbestos Sample Analysis
- Kestrel Environmental Technologies, Inc. – Analytical Data Validation
- Northeast Diamond Drilling Company, Inc. – Soil and Rock Borings and Well Installation
- ESN - Geoprobe Drilling
- Survey and Geodetic Consultants – Surveying

Production of this RFI Report was a collaborative effort of the above-named organizations, as outlined in **Figure 1-5**.

1.7 Project Coordination and Planning

Maine Yankee has been in regular contact with the MDEP and EPA since the beginning of site decommissioning, and with RCRA closure planning since September 1999. As outlined in the QAPP, project personnel have met on numerous occasions to discuss project and data quality objectives, problem delineation, suitability of existing data, data gaps, and data needs to complete the RFI (Stratex, 2001d).

During RFI activities, the core RFI team members communicated daily and met at least weekly to ensure that work was conducted efficiently, in a technically appropriate manner, and in accordance with the QAPP. Communication with MDEP and EPA occurred at least weekly to discuss ongoing RFI work, upcoming activities and issues that arose in the field. Project status reports were prepared monthly and submitted to project personnel to document communication with MDEP, summarize work completed for the previous month, outline anticipated future work, and transmit quality assurance assessments performed during the RFI. A summary of project meetings and monthly project status reports is provided in **Table 1-2**.

As summarized in **Table 1-2**, a coordination meeting was held with MDEP on March 19, 2002, to discuss preliminary results from Phase 1A prior to initiating Phase 1B work. Modifications and enhancements were made to the Phase 1B program based on these initial findings and upon requests made by MDEP. A similar meeting was held on September 12, 2002, following substantial completion of Phase 1B. Data gaps were identified at this stage and were addressed with additional sampling scope to be conducted prior to submitting this RFI Report.

QAPP Change Orders were developed and submitted to MDEP during the RFI program. Change orders were submitted to the appropriate project personnel as outlined in the QAPP, and were implemented following project and/or MDEP approval. The majority of the changes were enhancements to the program, which improved data quality. These changes included the addition of an analytical laboratory to receive radioactive samples, eliminating or relocating sample locations to address conditions encountered in the field, revising field sampling and analytical procedures, and modifying sampling activities

based on preliminary findings. A summary of the change orders is provided in **Table 1-3**.

1.8 Report Organization

The remainder of this RFI Report is organized as follows:

- **Section 2** describes the site characterization methods utilized to complete the RFI field program and develop an understanding of current site conditions.
- **Section 3** provides the environmental setting, which presents interpretations of site geology, hydrology, hydrogeology, and ecological areas.
- **Section 4** presents the data generated from the RFI field program, maps of sampling locations and investigative studies and tables of sampling results. The subsequent fate and transport of site-related constituents are addressed at the conclusion of this section.
- **Section 5** presents an assessment of risk to human health by comparing the results to appropriate screening standards.
- **Section 6** presents an assessment of ecological risk by comparing the results to appropriate screening standards.
- **Section 7** includes the summary and conclusions developed from the site investigation and risk assessments.