WEM Waite Environmental Management, LLC.

DRAFT

May 18, 2005

Mr. Nick Warner
Community and Economic Development Office
Room 32, City Hall
Burlington, Vermont 05401

RE: Phase II ESA Report
Former Moran Generating Plant

Dear Nick:

Waite Environmental Management, LLC (WEM) is pleased to present the Phase II Environmental Site Assessment Report for the Former Moran Generating Plant in Burlington, Vermont.

As anticipated, the results of this ESA indicate that the levels of soil and groundwater contamination are lower than might be expected given the former uses of this part of Burlington's waterfront. The ESA was able to rule out significant concerns regarding contaminants such as petroleum compounds, PCBs, and metals. However, there are remaining concerns from polycyclic aromatic hydrocarbons (PAHs) in the shallow soil over much of the Site and chlorinated volatiles in the soil and groundwater in a hot spot north of the Plant. The PAH contamination is likely attributable to the former coal burning operation, and the VOC contamination may be a result of some drum storage that occurred after the Plant closed in the early 1990s. Due to these lingering concerns, WEM has recommended a second phase of investigation.

Please call me if you have questions or concerns, or would like to arrange a meeting to discuss future options. Also, let me know if there will be any meetings or public forums to present the results. I can be reached at (802) 860-9400 or by email at mwaite@waiteenv.com.

Sincerely,

Miles E. Waite, Ph.D.
Principal Hydrogeologist

Enclosure

Cc: Hugo Martinez Cazon, VT DEC
Diane Kelly, EPA Region I

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DRAFT

PHASE II ENVIRONMENTAL SITE ASSESSMENT REPORT

MORAN GENERATING PLANT
Lake Street
Burlington, Vermont

SMS Site #2005-3357

Prepared for:

Community and Economic Development Office
Room 32, City Hall
Burlington, Vermont 05401
(802) 865-7144
Contact: Mr. Nick Warner

Prepared by:

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May 17, 2005

TABLE OF CONTENTS

LIST OF APPENDICES

Moran Generating Plant
Lake Street, Burlington, Vermont
SMS Site #

EXECUTIVE SUMMARY

The following Phase II Environmental Site Assessment (ESA) Report was prepared by Waite Environmental Management, LLC (WEM) for the former Moran Generating Plant at the end of Lake Street in Burlington, Vermont. This report was prepared for the Community and Economic Development Office (CEDO) of the City of Burlington as part of a general effort to redevelop the property.

Elements of this Phase II ESA included the following: 1) installation of six soil borings/groundwater monitoring wells surrounding the existing building and on the grounds; 2) surveying of the soil boring and well locations; 3) an interior building survey to asses the presence of asbestos containing materials and lead paint; 4) sampling of the soil from two different intervals for analysis of several contaminants; 5) sampling of the groundwater for analysis of several contaminants; 6) validation of the soil and groundwater analytical data; and 7) reporting.

Conclusions and recommendations developed by WEM from the Phase II ESA, conducting during March and April 2005, are summarized below.

SOIL QUALITY

Several polycyclic aromatic hydrocarbons (PAHs) were detected at concentration in excess of the soil guidance levels in the shallow soil at locations immediately south, north and northeast of the Moran Plant. The PAHs appear to be related to the presence of coal, and is a concern in the former coal storage area northeast of the Plant and a small area south of the Plant.

The chlorinated VOC Trichloroethene (TCE) was detected at a concentration in excess of the guidance level for soil at one deep sample in the area immediately north of the Moran Plant. The presence of this compound is consistent with previous sampling results. While several other chlorinated VOCs were also reported in this sample and in two others surrounding the Plant, they were all detected at concentrations below the soil guidance levels. Based on discussion with a representative of the Burlington Electric Department (BED), which formerly operated the facility, it is possible that the source of the chlorinated VOCs is drums that were formerly stored in this area for a brief time in 1994, after the Plant was decommissioned.

While arsenic was also detected at concentrations in excess of the soil guidance level in samples collected throughout the Site, this metal appears to be present at concentrations that are within the same order of magnitude as naturally occurring levels in this area and is not a contaminant that merits significant concern. Lastly, trace levels of PCBs were reported at concentrations below the guidance levels at three (3) locations immediately surrounding the building, but are not high enough to merit significant concern.

GROUNDWATER QUALITY

The chlorinated VOC TCE was detected at a concentration in excess of the guidance level for groundwater in one (1) sample in the area immediately north of the Moran Plant. It is possible that a TCE plume has migrated westward/northwestward under a portion of the Plant. The presence of this compound at this location is consistent with previous groundwater sampling results. While several other chlorinated VOCs were also reported in this sample and two others surrounding the building, they were all detected at concentrations below the groundwater enforcement standards. Dissolved PAHs, PCBs, total metals, or petroleum VOCs were not detected in groundwater and do not merit significant concern.

ASBESTOS
Of the 24 samples collected during the asbestos survey, only 3 types of material tested positive for asbestos: 1) exterior window caulk; 2) corrugated window panels; and 3) exterior roof flashing. In each case the asbestos was classified as chrysotile. Because asbestos was found in dust inside the Plant in 1987 and there has been no further mitigation since that time, there continues to be an asbestos hazard to future construction workers during any demolition or cleanup activities.

LEAD PAINT
Lead paint testing results indicate that lead was found to be present in all of the surfaces tested. Lead concentrations ranged from 0.01% to 14.0%.

BIRD DROPPINGS
There is contamination by bird droppings on most of the main and upper levels of the plant. The bird droppings are commingled with dust that has accumulated over the years.

RECOMMENDATIONS: Further definition of the PAH contamination in shallow soil should be conducted using hand-augering methods for the purposes of establishing the extent of these compounds and the best means to mitigate PAH-related health risks to future use of the property. Further definition of the chlorinated VOC contamination in soil and groundwater should also be conducted via soil borings/monitoring wells to pinpoint the source area and the magnitude/extent of contamination for the purposes of determining whether future mitigation is merited. One of the borings should extend to at least 40 ft deep where an underlying clay layer is predicted to be encountered to evaluate the potential presence of DNAPL in soil. The sampling regime should be fine enough to characterize both the lateral and vertical extent of contamination.

No further testing for asbestos is necessary. Abatement/disposal of asbestos containing materials (ACMs) during future demolition or construction activities must be conducted in a manner consistent with state and industry standards. To follow up on a 1987 recommendation, asbestos danger signs should currently be posted throughout the building due to the assumed presence of low levels of asbestos in dust.

No further testing for lead paint is necessary. Abatement of the lead paint during future construction activities must be in accordance with the Vermont Occupational Safety and Health Administration (VOSHA) guidelines, as specified in the “Lead in Construction” standard (OSHA 3142, 1993).

Individuals spending significant amount of time in this building and construction workers who conduct any demolition or renovation must be made aware of the potential risks (pulmonary disorders) associated with bird droppings. Workers need to wear proper protective equipment and cleaning methods should be designed by a person familiar with the cleanup of bird droppings and conditions of the building. While disposal of the bird droppings should not involve hazardous waste issues, the landfill should be consulted to determine whether there may be sampling requirements.

1.0 INTRODUCTION

The following Phase II Environmental Site Assessment (ESA) Report was prepared by Waite Environmental Management, LLC (WEM) for the former Moran Generating Plant at the end of Lake Street in Burlington, Vermont ("Site"; refer to Figure 1 in Appendix A). This report was prepared for the Community and Economic Development Office (CEDO) of the City of Burlington as part of a general effort to redevelop the property.

This work was conducted in accordance with WEM's Work Plan for Phase II ESA dated February 23, 2005 and with WEM's Quality Assurance Project Plan (QAPP) dated March 2005. The scope of work was modified several times at the request of the Vermont Department of Environmental Conservation (VT DEC) and the Region I EPA, with the most recent modification described in the transmittal from WEM to CEDO dated March 25.

Elements of this Phase II ESA included the following: 1) installation of six soil borings/groundwater monitoring wells surrounding the existing building and on the grounds; 2) surveying of the soil boring and well locations; 3) an interior building survey to asses the presence of asbestos containing materials and lead paint; 4) sampling of the soil from two different intervals for analysis of several contaminants; 5) sampling of the groundwater for analysis of several contaminants; 6) validation of the soil and groundwater analytical data; and 7) reporting.

1.1 Site Description

The "Site" is defined as an approximately 600 ft by 350 ft area at the edge of Lake Champlain. The Moran Plant, a 120 ft by 140 ft steel, brick and concrete structure on a mat concrete foundation, is the only building on the Site. While most of the building is vacant, an area in the western end is currently used as the Lake Champlain Community Sailing Center (LCCSC) under agreement with the City. This Site is surrounded to the north and east by open space/parks owned and operated by the City of Burlington. Directly to the south is the Burlington Water Treatment facility and a facility operated by the Burlington Electric Department (BED). Lake Champlain abuts the property to the west. Access to the Site is via Lake Street.

The Moran Plant is constructed on flat lowland terrain at the edge of Lake Champlain; there appears to be less than 5 feet of topographical relief over the Site (refer to Figure 2 in Appendix A). Given the low relief, this Site is within the 100-year floodplain of Lake Champlain. Topographical relief to the east of the Site is much greater, where the ground surface rises steeply to the east.

This part of the Burlington waterfront was constructed through the placement of fill into areas adjacent to the lake; the approximate fill boundary is shown on Figure 2. The soil east of the fill material is mapped as Adams-Windsor series, characterized as deep, loose, and excessively well-drained sandy loams. Bedrock under the site, which was not encountered during any drilling efforts, is mapped as Dunham Dolomite.

The Moran Plant was operated by the BED as a coal-burning power plant from 1953 to 1986. Prior to 1953, this portion of Burlington was used for a wide range of industrial purposes, including railroad, lumber yard and mill, and storage/transportation of petroleum products. Petroleum tanks

were abundant to the north of the Plant until the early 1990s. One of these tanks (#109) was formerly partially located within the Site boundaries (see Figure 2). However, records suggest that there are no in-ground petroleum storage tanks or septic tanks at the Plant [1]. Electric transformers were also abundant at the Plant, and records provided by the BED showed low concentrations of PCBs adjacent to several transformers in the 1980s [1]. Since decommissioning of the Moran Plant in 1986, the building has generally remained vacant, with the exception of the LCCSC occupation of a small area in the west end on the ground level.

1.2 Previous Environmental Work

During decommissioning of the Moran Plant in 1987, the vast majority of the asbestos containing materials (ACMs) were removed. Based on records provided to the State by the asbestos contractor, Eastern Refractories Company, Inc. [3], a total of 236 bags of ACMs were removed from the "condenser", and 128 bags of ACMs were removed from the "deaerator tank". Upon removal, the final air clearance results ranged between 0.0013 and 0.0036 fibers per cubic centimeter. During a survey conducted in March –April 1987 [4], dust samples collected throughout the building were determined positive for asbestos, indicating that there was a "definite asbestos hazard to personnel" working inside the Plant. It was recommended that asbestos danger signs be posted throughout the building.

Regarding subsurface work, four (4) soil borings and four (4) monitoring wells were installed on the property under the supervision of Champlain Consulting Engineers [2] in 1991. The soil borings and monitoring wells focused on the north side of the building and the former coal storage area to the northeast of the plant. Based on soil screening results using a photo-ionization detector (PID), there was no indication of field-detectable volatile organic compounds (VOCs) in the soil. Groundwater sampling results from these wells were not available.

In 2000, several boreholes were installed surrounding the Moran Plant as part of a Phase II ESA of the Urban Reserve [1]. The borings included: seven (7) hand auger borings, two (2) soil gas sampling points, one (1) borehole used for soil quality testing, and one (1) monitoring well used for groundwater quality testing. The results of this subsurface work indicate the following (refer to Figure 3 in Appendix A for sampling locations):

- VOCs were not detected by field screening using a PID in any of the seven hand auger borings (HA-30, 31, 32, 33, 34, 35, 36 or in borehole BH-19. In addition, VOCs were not reported above detection limits in HA-34 or HA-35, which were submitted for laboratory analysis (EPA Method 8260B).
- Polycyclic Aromatic Hydrocarbons (PAHs) were not reported above detection limits in HA-34 or HA-35, which were submitted for laboratory analysis (EPA Method 8270C). In addition, PAH field screening (Hanby samples) revealed no evidence of PAHs in HA-31, 32, 33, or 36.
- Polychlorinated Biphenyls (PCBs) were not reported above detection limits in HA-34 or HA-35, which were submitted for laboratory analysis (EPA Method 8082).
- Of the 13 metals tested in HA-34 and HA-35 (Priority Pollutant Metals), elevated concentrations of arsenic, lead, and zinc were reported.
- Petroleum VOCs (benzene, toluene, ethylbenzene, xylenes, and total petroleum hydrocarbons) were not reported above detection limits in any of the three soil gas sampling locations (SG-19, SG-20, SG-21).

- The following non-petroleum VOCs were reported above detection limits in groundwater from monitoring well MW-14: 1,1-Dichloroethane (1,1-DCA), cis-1,2-Dichloroethene (cis-1,2-DCE), Tetrachloroethene (PCE), Trichloroethene (TCE), and 1,1,1-Trichloroethane (1,1,1-TCA). Only the TCE concentration was above Vermont Groundwater Enforcement Standards (VGES). All of these VOCs are chlorinated compounds associated with solvents and industrial chemicals.

The general conclusions of the Urban Reserve Phase II were that the levels of soil and groundwater contamination observed were lower than expected for this type of site. While some mitigation was deemed to be necessary for select portions of the Urban Reserve, no mitigative measures were recommended for the Moran Plant.

It should also be noted that environmental work has been conducted on the property immediately south of the Site, land now operated by the Burlington Electric Department for their gas turbine. Two (2) USTs were removed from this property in the early 1990s (2,000-gallon diesel and 3,000-gallon gasoline). After evidence of soil contamination was discovered during the tank pulls, the site became active (VT DEC Site #90-0540) and additional work was conducted. Groundwater sampling conducted in 1993 indicated that the effect of the petroleum releases was "minimal". No further work was required by the VT DEC.

2.0 SUBSURFACE INVESTIGATION

2.1 Soil Boring Installation

On March 29, 2005 WEM oversaw the advancement of six soil borings (MW-1, MW-2, MW-3, MW-4, MW-5, and MW-6) at the locations depicted on the Site Plan in Appendix A. Soil borings MW-1 through MW-5 were advanced by Kennedy Drilling, LLC (Kennedy) of Fitzwilliam, New Hampshire with a Geoprobe (direct push) drill rig. Continuous soil samples were collected using a 1¾" O.D. x 36" long steel sampler lined with a clear soil tube. Soil boring MW-6 was installed by WEM and Kennedy using a stainless steel hand auger, as this area was inaccessible to the drill rig. Soil samples were logged by a WEM geologist and classified using the Unified Soil Classification System (USCS) as described in the American Society for Testing and Materials (ASTM) Designation D2487-93. WEM's soil boring logs are contained in the Appendix C.

The borings extended to depths ranging from 10 ft to 6 ft below grade (ft bg). The primary soil type encountered in the soil borings was fine to medium, well sorted sand. Directly north of the Moran Plant at MW-3 the soil was noted to be more gravelly with obvious evidence of fill (concrete and wood chunks), and at the northern margin of the site at MW-6 the sand was noted to be siltier. Saturation was generally noted at a depth of approximately 2.5 – 3.5 ft bg. Also noted in all borings except MW-4 and MW-6 was evidence of coal; either coal dust, coal chunks, or discrete intervals of black staining assumed to be related to coal was observed.

WEM used a photo-ionization detector (PID) to screen the soils for the presence of VOCs during drilling. A plastic bag headspace method was used, wherein a composite soil sample from the 2-foot sampler was placed into a reclosable plastic bag approximately ½ full, and was allowed to equilibrate for at least 2 minutes. After equilibration, the bag was cracked open and the PID probe inserted to

obtain the measurement. The PID was calibrated in the field on the day of drilling to an isobutylene standard. PID readings are all shown in the soil boring logs in Appendix C.

Based on PID readings in parts per million (ppm), there was no field evidence of VOC in any of the borings. Further discussion of VOC contamination is presented in Section 3.0.

2.2 Soil Sampling

Soil samples were collected for laboratory analysis from borings MW-1, MW-2, MW-3, MW-5, and MW-6 during the drilling process. From each boring, an upper-interval sample ("shallow sample") was collected from a depth of 0.5 ft bg and submitted for analysis of PAHs (EPA Method 8270C), PCBs (EPA Method 8082), and Priority Pollutant Metals (EPA Methods 6010, 7471, 200.9 & SM 3113B); these samples were collected in 4 oz clear jars. Also from each boring, a bottom-interval sample ("deep sample') was collected from depths ranging from 9 to 6.5 ft bg and submitted for analysis of VOCs (EPA Method 8260B); these samples were collected in VOA containers with methanol preservative. All samples were placed on ice in a cooler, and transported to Endyne Laboratory in Williston, Vermont under chain-of-custody procedures. Results are discussed in Section 3.1.

2.3 Monitoring Well Installation

Upon completion to the desired depth, each soil boring was fitted with a monitoring well. Wells were constructed of 1.0 inch O.D. PVC plastic with 0.010-inch factory slotted screen. For each well, the screen was surrounded with sand pack, a bentonite seal was placed above the sand pack, native material was placed above the bentonite seal, and the well was finished with a compression fitting and a locking flush-mounted well box or a stickup well guard. Well construction details are provided Table 1 in Appendix B and in the soil boring logs in Appendix C .

2.4 Site Surveying

On March 30, 2005, WEM surveyed the locations of monitoring wells and other site features to update the Site Plan (refer to Appendix A). WEM also surveyed the top of casing elevations of the monitoring wells so that groundwater flow direction and gradient could be evaluated (see following section).

2.5 Groundwater Sample Collection

On April 6, 2005, WEM collected liquid level measurements from monitoring wells all six of the new monitoring wells and also an existing well ("MW-X"; see Site Plan) assumed to have been installed by a previous contractor circa 1991. Depth to groundwater ranged from 2.25 to 4.58 feet below top of casing (TOC). No free product was encountered in any of the monitoring wells.

Following water level measurement on April 6, 2005, WEM collected groundwater samples from all six of the new monitoring wells Monitoring wells were first purged of at least three well volumes using a peristaltic pump via polyethylene tubing dedicated to each well. In each case the tubing was inserted to a depth of 0.5 feet above the bottom of the well, the pump was activated, and each well was allowed to purge at a rate of 300 milliliters/minute. The purgewater was noted to be very clear except for a light silt in MW-6. No visual/olfactory evidence of contamination was noted in any of the wells. All purgewater was discharged to the ground surface.

After purging, all groundwater samples were collected in approved containers, placed on ice in a cooler, and transported to Endyne Laboratory in Williston, Vermont under chain-of-custody procedures. Each sample was analyzed for VOCs via EPA Method 8260B. In addition, the samples from MW-2 and MW-5 were analyzed for PAHs (EPA Method 8270C), PCBs (EPA Method 8082), and Priority Pollutant Metals. Results are discussed in Section 3.3.

3.0 SOIL AND GROUNDWATER SAMPLING RESULTS

Soil and groundwater sampling results are discussed below. Analytical results have been compared to the guidance levels that are being used for this project: soil guidance levels are the EPA Region IX Preliminary Remediation Goals (PRGs), and the groundwater guidance levels are the Vermont Groundwater Enforcement Standards (VGES) from Chapter 12- Groundwater Protection Rule and Strategy. Also note that the analytical results have undergone a modified Tier I completeness review to ensure that the precision is consistent with SW-846 Guidelines.

Sample results are tabulated in detail in Table 3 and Table 4 in Appendix B, in the laboratory reports in Appendix D, and summarized below. A visual summary of results is also provided in Figure 6 in Appendix A.

3.1 Soil Sampling Results

SHALLOW SAMPLES: (0.5-ft depth below surface in MW-1, MW-2, MW-3, MW-5 and MW-6):

MW-1 ***PAHs***: a total of 16 different PAH compounds were reported above detection limits. Of these, the following 5 compounds were reported above the guidance levels: Benzo(a)anthracene, Benzo(b&k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene.

PCBs: a total of 2 PCB compounds were reported at trace estimated concentrations: Arochlor-1254 and Arochlor-1260. These concentrations as well as all method detection limits (MDLs) were below the guidance levels.

Metals: a total of 8 metals were reported above detection limits. With the exception of arsenic, all concentrations and MDLs were below guidance levels.

MW-2 ***PAHs***: a total of 7 different PAH compounds were reported above detection limits. All reported concentrations were below the guidance levels; however, MDLs for Benzo(a)pyrene and Dibenzo(a,h)-anthracene were above the guidance levels.
PCBs: a total of 2 PCB compounds were reported at trace estimated concentrations: Arochlor-1254 and Arochlor-1260. These concentrations as well as all MDLs were below the guidance levels.
Metals: a total of 10 metals were reported above detection limits. With the exception of arsenic, all concentrations and MDLs were below guidance levels.

MW-3 ***PAHs***: a total of 16 different PAH compounds were reported above detection limits. the following 5 compounds were reported above the guidance levels: Benzo(a)anthracene, Benzo(b&k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene.
PCBs: a total of 2 PCB compounds were reported at trace estimated concentrations: Arochlor-1254 and Arochlor-1260. These concentrations as well as all MDLs were below the guidance levels.
Metals: a total of 9 metals were reported above detection limits. With the exception of arsenic, all concentrations and MDLs were below guidance levels.

MW-5 ***PAHs***: a total of 12 different PAH compounds were reported above detection limits. With the exception of Benzo(a)pyrene, all reported concentrations were below the guidance levels. Only the MDL for Dibenzo(a,h)anthracene was above the guidance level.
PCBs: No PCBs were reported above detection limits. All reported MDLs were below the guidance levels.
Metals: a total of 8 metals were reported above detection limits. With the exception of arsenic, all concentrations and MDLs were below guidance levels.

MW-6 ***PAHs***: No PAH compounds were reported above detection limits. However, the MDLs for Benzo(a)pyrene and Dibenzo(a,h)-anthracene were above the guidance levels.
PCBs: No PCBs were reported above detection limits. All reported MDLs were below the guidance levels.
Metals: a total of 6 metals were reported above detection limits. With the exception of arsenic, all concentrations and MDLs were below guidance levels.

DEEP SAMPLES: (6.5 – 9.0-ft depth below surface in MW-1, MW-2, MW-3, MW-5 and MW-6):

MW-1 ***VOCs***: no petroleum VOCs were reported above detection limits. The only non-petroleum VOC reported was a low level 1,4-Dichlorobenzene (fumigant/insecticide/fungicide). All reported VOC concentrations and MDLs were below the guidance levels.

MW-2 ***VOCs***: no petroleum VOCs were reported above detection limits. The only non-petroleum VOCs reported were low levels of 1,1-Dichlorethane (1,1-DCA) and 1,1,1-Trichlorethane (1,1,1-TCA). All reported VOC concentrations and MDLs were below the guidance levels.

MW-3 ***VOCs***: no petroleum VOCs were reported above detection limits. Non-petroleum VOCs reported include: Tetrachloroethene (PCE), Trichloroethene (TCE), Cis-1,2-Dichlroethene (Cis-1,2-DCE), and 1,1,1-TCA. With the exception of TCE, all reported VOC concentrations and MDLs were below the guidance levels. The TCE concentration (253 ppb) in this boring was the only VOC reported in excess of a soil guidance level (53 ppb for TCE) during this Phase II ESA.

MW-5 ***VOCs***: No VOCs were reported above detection limits. All reported MDLs were below the guidance levels.

MW-6 ***VOCs***: No VOCs were reported above detection limits. All reported MDLs were below the guidance levels.

3.2 Groundwater Flow Direction

Water table elevations were plotted and contoured to illustrate the estimated gradient and direction of groundwater flow beneath the site (see Figure 5 in Appendix A). According to the April 6, 2005 data, groundwater is flowing to the west/southwest at an average hydraulic gradient of 0.018 ft/ft, or 1.8% slope. This is an expected gradient given the flat topography of the Site and the presence of Lake Champlain to the west. During the previous Phase II ESA at the Urban Reserve [1], groundwater flow was determined to in the same general direction.

3.3 Groundwater Sampling Results

MW-1 ***VOCs***: no petroleum VOCs were reported above detection limits. The only non-petroleum VOC reported was a low level 1,1-DCA. The reported VOC concentration and all MDLs were below the guidance levels.

MW-2 ***VOCs***: no petroleum VOCs were reported above detection limits. The only non-petroleum VOCs reported were low levels of 1,1-DCA and 1,1,1-TCA. All reported VOC concentrations and MDLs were below the guidance levels.
PAHs: No PAHs were reported above detection limits. None of the MDLs were above the listed guidance levels.
PCBs: No PCBs were reported above detection limits. None of the MDLs were above the listed guidance levels.
Metals: two metals were reported above detection limits: arsenic and zinc. The reported concentrations and all MDLs were below the guidance levels.

MW-3 ***VOCs***: no petroleum VOCs were reported above detection limits. A total of five non-petroleum VOCs were reported: PCE, TCE, Cis-1,2-DCE, 1,1-DCA, and 1,1,1-TCA. With the exception of TCE, all reported VOC concentrations and MDLs were below the guidance levels. The TCE concentration (11.8 ppb) in this well was the only VOC reported in excess of a groundwater enforcement standard (5.0 ppb for TCE) during this Phase II ESA.

MW-4 **VOCs**: No VOCs were reported above detection limits. All reported MDLs were below the guidance levels.

MW-5 ***VOCs***: No petroleum VOCs were reported above detection limits. The non-petroleum compound 1,1,1-TCA was reported at a trace, estimated concentration. The reported concentration and all reported MDLs were below the guidance levels.
PAHs: No PAHs were reported above detection limits. None of the MDLs were above the listed guidance levels.
PCBs: No PCBs were reported above detection limits. None of the MDLs were above the listed guidance levels.
Metals: two metals were reported above detection limits: arsenic and selenium. The reported concentrations and all MDLs were below the guidance levels.

MW-6 ***VOCs***: No VOCs were reported above detection limits. All reported MDLs were below the guidance levels.

3.4 Contaminant Limits and Source Discussion

Based on the soil and groundwater sampling results presented above, the contaminants of concern can be narrowed down to the following: low levels of chlorinated VOCs in groundwater and soil, and PAHs in shallow soil. In particular:

- the chlorinated VOC TCE was detected at above the guidance levels for both soil and groundwater in the area immediately north of the Moran Plant;
- five PAHs (Benzo(a)anthracene, Benzo(b&k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene) were reported above the soil guidance levels at locations immediately south and north of the Moran Plant;
- one PAH (Benzo(a)pyrene) was reported above the soil guidance level in the grassy area northeast of the Moran Plant.

It should be noted that while PCBs were reported at trace levels surrounding the Moran Plant, the concentrations were reported below guidance levels, which eliminates PCBs as a contaminant of concern. The presence of PCBs is not surprising given the land use history of the site.

Also, while the metal arsenic was reported above the soil guidance level at all five sampling locations, this metal is found in many Chittenden County soils and its presence is not surprising. The presence of arsenic may be correlated with the presence of coal in the soil; however, even the boring MW-6, which was far outside of the Plant and coal storage area and had no visual evidence of coal or reported PAHs, had an arsenic concentration that was two orders of magnitude greater than the guidance level.

Considering that there are no significant groundwater quality concerns in wells MW-1 or MW-2, it is unlikely that there is a significant contaminant plume underneath the Plant. However, given the groundwater quality at MW-3 and the west/northwestward groundwater flow, there is a chance that the groundwater underneath the northwestern portion of the Plant has been impacted by chlorinated VOCs.

In regard to contaminant sources, the PAH contamination is very likely due to the years of coal storage and coal combustion at the Site. The presence of the PAHs is an unfortunate side-affect of the former use of the land. The source of chlorinated VOCs is not as obvious. WEM had a discussion with a representative of the BED [5], who was unaware of the regular use of any solvent-type materials as part of the former energy generating operation. However, after the Plant shut down, there was a brief time in 1994 when 52 storage drums were stored on the Site in the area immediately north of the Plant. These drums, possibly planned for use as flotation devices, were not all empty as expected according to the BED representative. Drums were noted to be labeled as containing motor oil, hydraulic oil, acetone, floor cleaner, and isocyanide. It is possible that some of these drums contained the solvent-type materials and may have leaked, which could account for the presence of the chlorinated VOCs found here in the soil and groundwater.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

4.1 Data Verification and Validation

The soil and groundwater analytical results were validated by Phoenix Chemistry Services (PCS) of North Ferrisburg, Vermont. PCS's validation was performed in conformance with Tier I guidelines as defined by USEPA Region I, modified by the QAPP and Brownfields guidance from the Region I office. The modified Tier I validation process evaluates the data package submitted by the laboratory (Endyne) for completeness, and issues pertaining to methodological compliance are noted. Issues pertaining to contractual compliance may be noted where applicable. Issues pertaining to compliance with the National Environmental Laboratory Accreditation Conference (NELAC) standard (effective date July, 2004) may also be noted.

The data validation reporting is presented in Appendix E. Reports were generated by PCS that review both the soil data package (SDG No. 36068) and water data package (SDG No. 36266) submitted by Endyne[1]. In terms of documentation, the tabulated summary forms (sample results, calibration results, blank results, spike sample results, internal standard summaries, etc.), raw data, instrument analytical printouts, chromatograms, calculations, and logbook pages were all present. There were some methodological compliance deficiencies regarding the running of internal standards, the order of semivolatile analyses performed, and the number of a method blanks run for the volatiles analysis. Finally, several improper edits were made in the engineering field notes. While the methodological deficiencies may be pertinent in a litigation situation, they do not affect the usability of the data for the purposes of this ESA.

It should be noted that sample results for two PCB analytes in soil samples MW-1 and MW-2 were classified as estimated by Endyne (see "J" qualifier in Table 4). The Method 8082 spike recoveries

[1] It should be noted that these data packages are not included in this report due to the volume of material, but are available for review at WEM's office.

for PCBs 1254 and 1260 in the laboratory fortified blank (LFB) and for PCB 1254 in the sample matrix spike (MS) were reported as outside laboratory established acceptance criteria. However, given that the estimated concentrations are still one order of magnitude below the guidance levels for these compounds, this is not a significant issue of concern. No other QA/QC issues were noted by Endyne for any other soil or groundwater data.

As part of WEM's quality assurance/quality control (QA/QC) procedure, the following samples were collected: methanol trip blank, soil field duplicate "MW-7" (duplicate of MW-5), deionized water trip blank, deionized water field blank, and groundwater field duplicate "MW-Y" (duplicate of MW-5). There were no reported detections in any of the blanks, indicating that there were no effects of spurious influences on sample quality. The field duplicate results are presented in Table 5 in Appendix B. These results were evaluated using a relative percent difference (RPD) analysis (The RPD is defined as 100 times the difference in reported concentration between sample and duplicate, divided by the mean of the two samples. A small RPD indicates good correlation between sample and duplicate.) Precision in the field duplicate pairs was deemed acceptable, as there was less than 30 % average RPD for each analysis.

4.2 Data Usability

Based on the results of PCS's data validation, there are no documentation or methodological issues that limit the usability of the soil or groundwater data.

However, the reported method detection levels (MDLs) for two compounds in some of the soil samples was above the established guidance level for soil (EPA Region IX PRG), which limits the usability of select data. Specifically, the MDLs for the compounds Benzo(a)pyrene and Dibenzo(a,h)anthracene were above the guidance level of 62 ppb for all samples. This affects the data usability for those samples in which the compound(s) was reported below the MDL, as shown below:

Sample	Compound	MDL (ppb)	Result (ppb)	Guidance (ppb)
MW-2	Benzo(a)pyrene	153	ND<153	62
	Dibenzo(a,h)anthracene	153	ND<153	62
MW-5	Dibenzo(a,h)anthracene	76	ND<76	62
MW-6	Benzo(a)pyrene	84	ND<84	62
	Dibenzo(a,h)anthracene	84	ND<84	62

Typically, when the MDL exceeds the guidance level, the concentration must be assumed to exceed the guidance level unless otherwise documented. It is WEM' professional opinion that for the cases of MW-2 and MW-5, in which several other PAH compounds were reported above MDLs, the concentrations of the two subject compounds should be assumed to exceed the guidance level. However, for sample MW-6, in which there were no other PAH compounds reported and no visual evidence of coal in the soil, it should not be assumed that the concentrations of the two subject compounds exceed the guidance levels. The MDLs for all other compounds in the soil analyses and all of the groundwater analyses were below their respective guidance levels, so there are no other limitations to the usability of data.

5.0 INTERIOR BUILDING SURVEY

5.1 Asbestos Containing Materials (ACMs)

On March 29, 2005, a representative of K-D Associates, Inc. (K-D) visited the Moran Plat to conduct a survey for ACMs. A total of 24 samples of suspect ACMs were collected for analysis by polarized light microscopy (PLM). Interior materials sampled included: gypsum wall board panels, table tops, fiber wall panels, window panels, flooring, and plaster. Exterior materials sampled included: window caulking, window glazing, and roof materials. Further description of the sampling and testing is provided in K-D's report, attached in Appendix E.

The results indicate that of the 24 samples collected, only 3 types of material tested positive for asbestos: 1) exterior window caulk; 2) corrugated window panels; and 3) exterior roof flashing. In each case the asbestos was classified as chrysotile. It should be noted that while K-D made an effort to find materials hidden from view, there may be materials above permanent ceilings, enclosed within walls, or otherwise inaccessible that may not have been sampled.

In regard to the potential presence of asbestos in dust inside the Plant, it was in K-D's opinion that the sampling for dust was impractical and meaningless, since most of the interior surfaces are covered with bird droppings. Also, dust sampling is typically used to determine the nature of an obvious and suspicious dust or debris rather than a screening method for a large area such as the Moran Plant. However, because asbestos was found in dust in 1987 (see Section 1.2 and K-D report) and there has been no further mitigation since that time, there continues to be an asbestos hazard to future construction workers during any demolition or cleanup activities.

5.2 Lead Paint

On March 29, 2005, the K-D scientist also collected 11 paint samples from inside the Moran Plant for analysis of lead. The paint samples were collected from the area occupied by the LCCSC, lower level, main level, and upper level. The samples were submitted for analysis of lead by Flame AAS (SW 846, 7420) by EMSL Analytical. Further description of the sampling and testing is provided in K-D's report, attached in Appendix E.

The results indicate that lead was found to be present in all of the surfaces tested. Lead concentrations ranged from 0.01% to 14.0%.

5.3 Bird Droppings

While bird droppings were not sampled during the building survey, it was pointed out by K-D that these are a form of contamination that must be accounted for during any future construction or demolition. All of the upper levels of the Plant are contaminated with significant amount of bird droppings, primarily pigeon guano. Pigeons as well as their droppings can be a source of dangerous fungi and bacteria. Inhalation of dust from dropping or feathers can cause pulmonary infections. There is a group of pulmonary disorders that can result, the most common being histoplasmosis, an infection caused by the bacteria Histoplasma capsulatum. The susceptibility to these disorders varies from person to persons, but those with compromised immune systems are at particular risk.

From a waste management standpoint, bird droppings are typically considered a non-hazardous material. WEM recommends that the landfill be consulted prior to planning the future disposal to determine whether there are sampling requirements.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations have been developed by WEM after conducting this Phase II ESA during March and April 2005.

Contamination in Shallow Soil

Conclusion: Shallow soil (6"-depth) contaminant concerns include:

- five (5) PAH compounds were detected above the soil guidance levels at locations immediately south and north of the Moran Plant;
- one (1) PAH compound was detected above the soil guidance level in the grassy area northeast of the Moran Plant. In addition, a second PAH compound had an MDL above the guidance level and hence must also be assumed to exceed the guidance level.
- two (2) PAH compound must be assumed to exceed the guidance level at a location immediately east of the building.

The PAHs appear to be related to the presence of coal, which was observed as chunks, fine dust, and black staining in many of the soil samples observed. It is apparent that the coal storage area northeast of the Plant and a small area south of the Plant have been impacted by the coal. It is WEM's opinion that the area east of the plant, given previous sampling results in this area [1] combined with the fact that the area is covered by asphalt, has not been impacted to the same extent as the other areas. Also, the swampy area surrounding MW-6 does not appear to have been impacted by coal or PAH contamination.

While arsenic was also detected above the soil guidance level samples collected throughout the Site and may also be related to the presence of coal, this metal appears to be present at concentrations that are within the same order of magnitude as naturally occurring levels in this area and is not a contaminant that merits significant concern. Lastly, trace levels of PCBs were reported below the guidance levels at three (3) locations immediately surrounding the building; the presence of these PCBs is not surprising given the land use history and the concentrations are not high enough to merit significant concern.

Recommendation: Further definition of the PAH contamination in shallow soil should be conducted for the purposes of establishing the best means to mitigate PAH-related health risks to future use of the property. WEM recommends collecting ten (10) samples via hand auger or soil boring (see Figure 7) for analysis of PAHs by EPA Method 8270C to better define the magnitude and extent of PAH contamination. No further testing for metals or PCBs is merited.

Contamination in Deep Soil

Conclusion: Deep soil (6.5'-9.0'-depth) contaminant concerns include:

- the chlorinated VOC Trichloroethene (TCE) was detected at above the guidance level for soil in one (1) sample in the area immediately north of the Moran Plant. The presence of this compound is consistent with the groundwater results and previous sampling results [1].

While several other chlorinated VOCs were also reported in this sample and in two others surrounding the buildings, they were all detected below the soil guidance levels. Also, there were no petroleum-based VOCs detected in any of the soil samples. Based on discussion with the BED, it is possible that the source of the chlorinated VOCs is drums that were formerly stored in this area for a brief time in 1994, after the Plant was decommissioned.

Recommendation: Further definition of the chlorinated VOCs in soil immediately north of the building should be conducted. WEM recommends the installation of six (6) soil borings (see Figure 7) for analytical testing of VOCs by EPA Method 8260B. One of the borings should extend to at least 40 ft deep where an underlying clay layer is predicted to be encountered to evaluate the potential presence of DNAPL in soil. The sampling regime should be fine enough to characterize both the lateral and vertical extent of contamination.

Contamination in Groundwater

Conclusion: Overburden groundwater contaminant concerns include:

- the chlorinated VOC Trichloroethene (TCE) was detected at above the guidance level for groundwater in one (1) sample in the area immediately north of the Moran Plant. The presence of this chlorinated VOCs at this location is consistent with previous groundwater sampling results. There is a chance that a plume of TCE contamination is present under the northwestern portion of the Plant.

While several other chlorinated VOCs were also reported in this sample and two others surrounding the building, they were all detected below the groundwater enforcement standards. Dissolved PAHs, PCBs and total metals were not detected in groundwater and do not merit significant concern.

Recommendation: Further definition of the chlorinated VOCs in groundwater immediately north of the building should be conducted. WEM recommends that three (3) of soil borings, including the deep boring, should be fitted as groundwater monitoring wells to allow for groundwater sampling. Analytical testing of VOCs in groundwater should be by EPA Method 8260B. Groundwater samples should also be collected again from existing wells MW-1, MW-2, MW-3 and MW-5. No further groundwater testing for PAHs, PCB, or metals is recommended.

Asbestos Inside the Plant

Conclusion: Of the 24 samples collected during the asbestos survey, only 3 types of material tested positive for asbestos: 1) exterior window caulk; 2) corrugated window panels; and 3) exterior roof flashing. In each case the asbestos was classified as chrysotile. Because asbestos was found in dust inside the Plant in 1987 and there has been no further mitigation since that time, there continues to be an asbestos hazard to future construction workers during any demolition or cleanup activities.

Recommendation: No further testing for asbestos is necessary. Because inaccessible materials (e.g. above permanent ceilings, enclosed in walls) may not have been sampled, suspect materials found during renovation or demolition activities should be assumed to be positive for asbestos until laboratory results show otherwise. Abatement/disposal of ACMs during future demolition or construction activities must be conducted in a manner consistent with state and industry standards, and work procedures and engineering controls must be undertaken to minimize dust. To follow up on a 1987 recommendation, asbestos danger signs should currently be posted throughout the building due to the assumed presence of low levels of asbestos in dust.

Lead Paint Inside the Plant

Conclusion: Lead paint testing results indicate that lead was found to be present in all of the surfaces tested. Lead concentrations ranged from 0.01% to 14.0%.

Recommendation: No further testing for lead paint is necessary. While the lead paint does not present a health risk as is, the LCCSC should be made aware of the presence of lead paint and the health risks associated with the ingestion of lead paint chips and the inhalation of lead dust generated by sanding/scraping of the paint. Abatement of the lead paint during future construction activities must be in accordance with the Vermont Occupational Safety and Health Administration (VOSHA) guidelines, as specified in the "Lead in Construction" standard (OSHA 3142, 1993).

Bird Droppings Inside the Plant

Conclusions: There is contamination by bird droppings on most of the main and upper levels of the plant. The bird droppings are commingled with dust that has accumulated over the years.

Recommendations: Individuals spending significant amount of time in this building and construction workers who conduct any demolition or renovation must be made aware of the potential risks (pulmonary disorders) associated with bird droppings. Workers need to wear proper protective equipment including as a minimum: coveralls, latex gloves, and air purifying respirator with HEPA filter. Cleaning methods should be designed by a person familiar with the cleanup of bird droppings and conditions of the building. While disposal of the bird droppings should not involve hazardous waste issues, the landfill should be consulted to determine whether there may be sampling requirements.

Data Validation

Conclusions: Based on the results of PCS's data validation, there are no documentation or methodological issues that limit the usability of the soil or groundwater data for this ESA. Precision in the field duplicate pairs was deemed acceptable, and the field and trip blank results do not indicate any spurious influences in sample quality. While the MDLs for two PAH compounds were too high in several soil samples to confidently rule out the presence of contamination, all data were deemed usable.

7.0 REFERENCES

1. Lamoureux & Dickinson Consulting Engineers, Inc., *Phase II Environmental Site Assessment, North 40 – Urban Reserve, Burlington, Vermont*, May 2000.

2. Champlain Consulting Engineers, *Final Report – Preliminary Subsurface Soils Investigation of the Moran Generating Plant Site in Burlington, Vermont*, October 21, 1991.

3. Letter from Eastern Refractories Company, Inc. to the State of Vermont, Department of Health, re: Burlington Electric Moran Station Asbestos Removal Work, May 25, 1987.

4. Letter from Shelburne Laboratories, Inc. to Burlington Electric Department, re: Moran Generating Plant, April 6, 1987.

5. Telecom between Miles Waite (WEM) and Roger Donnegan (BED), May 6, 2005.

APPENDIX A

FIGURES

Figure 1: USGS Site Location Map
Figure 2: Site Features Map
Figure 3: Previous Sampling Locations Map
Figure 4: Site Plan
Figure 5: Groundwater Elevation Contour Map
Figure 6: Contaminant Concentration Contour Map
Figure 7: Future Sampling Locations

APPENDIX B

TABLES

Table 1: Well Construction Details
Table 2: Liquid Level Monitoring Data
Table 3: Soil Quality Data
Table 4: Groundwater Quality Summary
Table 5: Quality Assurance/Quality Control Summary

APPENDIX C

SOIL BORING LOGS

APPENDIX D

LABORATORY REPORTS

APPENDIX E

SUPPLEMENTAL REPORTS/DOCUMENTATION