

A CMS Energy Company

Big Rock Point Nuclear Plant
10269 US-31 North
Charlevoix, MI 49720

Kurt M. Haas
General Manager

November 16, 2006

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

**DOCKETS 50-155 AND 72-043 – LICENSE DPR-6 – BIG ROCK POINT PLANT –
REQUEST TO RELEASE SITE LAND**

All physical demolition and restoration work at Big Rock Point (BRP) has been completed in accordance with the BRP License Termination Plan (LTP). The BRP site has been restored to a "Greenfield" condition, as defined in the LTP, Section 1.5. By this letter, we request that you release BRP site land from the terms of its 10 CFR Part 50 license in accordance with approved LTP sections 1.4.2 and 5.1.2. We refer to the land requested to be released from the operating license as the Release Area. The Release Area consists of all land encompassed by the licensed site boundary, with the exception of approximately 30 acres of land associated with the operation of the Independent Spent Fuel Storage Installation (ISFSI) and an additional 75 acres of land surrounding the ISFSI, including the ISFSI access road. The attached site boundary drawing shows the Release Area (noted as "Remainder") and the area to remain under the license (described as "Parcel A").

Also attached to this letter is the Final Status Survey Report (FSSR) covering the Release Area. The FSSR demonstrates that the Release Area meets the radiological criteria for license termination.

We request the NRC review and approve this request by year end 2006 to ensure a smooth transition to ISFSI-only operation and transfer of license activities associated with the ISFSI to Entergy Nuclear Palisades, LLC, in early 2007.

If you should have any questions regarding this submittal, please contact me at (231) 547-8388.


Kurt M. Haas
Site General Manager

ATTACHMENTS

cc: Administrator, Region III, USNRC
NRC Decommissioning Inspector, Big Rock Point
NRC NMSS Project Manager, James Shepherd
NRC NMSS FSS Reviewer, Bruce Watson
Michigan Department of Environmental Quality, Thor Strong

NMSS01

ATTACHMENT 1

CONSUMERS ENERGY
BIG ROCK POINT

DOCKET NUMBERS 50-155 AND 72-043

SKETCH OF BOUNDARY

November 16, 2006

1 Page

ATTACHMENT 2

CONSUMERS ENERGY
BIG ROCK POINT

DOCKET NUMBERS 50-155 AND 72-043

FINAL STATUS SURVEY REPORT

November 16, 2006

39 Pages

Big Rock Point Restoration Project
Final Status Survey Report

Consumers Energy Company
November 16, 2006

Table of Contents

EXECUTIVE SUMMARY

1.0 Overview

- 1.1 Purpose and Scope
- 1.2 Description of Survey Areas
- 1.3 Site Release Criteria
 - 1.3.1 Application of Site Release Criteria
 - 1.3.2 Derived Concentration Guideline Levels
 - 1.3.3 Tritium in Soils
- 1.4 Discussion of Changes to the Final Status Survey Plan

2.0 Final Status Survey Methodology

- 2.1 Survey Units
 - 2.1.1 Classification
 - 2.1.2 Survey Unit Size
 - 2.1.3 Survey Unit Nomenclature
- 2.2 Instrumentation
 - 2.2.1 Calibration and Maintenance
 - 2.2.2 Instrument Response
 - 2.2.3 Minimum Detectable Concentration
- 2.3 Survey Methods
 - 2.3.1 Scan Measurements
 - 2.3.2 Volumetric Measurements
- 2.4 Survey Performance
 - 2.4.1 Procedures
 - 2.4.2 Training
 - 2.4.3 Sample Handling
 - 2.4.4 Data Investigation
 - 2.4.5 Data Management
 - 2.4.6 Quality Control Measurements
 - 2.4.7 Control of Vendor Services

3.0 Final Status Survey Results

- 3.1 Open Land Area Surface Surveys
 - 3.1.1 Class 1 Survey Units
 - 3.1.2 Class 2 Survey Units
 - 3.1.3 Class 3 Survey Units
- 3.2 Supporting Surveys
 - 3.2.1 Excavated Surface Surveys
 - 3.2.2 Relocated Soil Surveys
- 3.3 Groundwater Monitoring
- 3.4 Survey Unit Investigations
- 3.5 Survey Unit Anomalies

4.0 Final Status Survey Data Assessment

- 4.1 Data Verification and Validation
- 4.2 Summary of Changes from Initial Assumptions on Residual Radioactivity
- 4.3 Release Criteria Verification
- 4.4 ALARA Evaluation
- 4.5 Memorandum Of Understanding Between NRC and EPA

5.0 Final Status Survey Conclusions

6.0 References

Appendices

- Appendix A – Big Rock Point Impacted and Non-Impacted Areas**
- Appendix B – Big Rock Point Final Status Survey Units**
- Appendix C – Big Rock Point Tritium Plume Map**
- Appendix D – Groundwater Monitoring Well Locations**
- Appendix E – Final Status Survey Submittal Matrix**

List of Tables

- 1-1 Site-Specific Industrial Area DCGLs
- 2-1 FSS Instrumentation Characteristics
- 2-2 Procedures Applicable to Final Status Survey Activities
- 3-1 Class 1 Land Area Final Status Survey Results Summary
- 3-2 Class 2 Land Area Final Status Survey Results Summary
- 3-3 Class 3 Land Area Final Status Survey Results Summary
- 3-4 Excavated Surface Supporting Survey Results Summary
- 3-5 Relocated Soil Supporting Survey Results Summary
- 3-6a Tritium Monitoring Well Historical Data (Wells Installed in 1994)
- 3-6b Tritium Monitoring Well Historical Data (Wells Installed in Post-Shutdown)
- 3-6c Tritium Monitoring Well Historical Data (Wells Installed in 2004)
- 3-7 Summary of Data Investigation Results and Actions Taken
- 3-8 Design Parameter Comparison Survey Unit CWC_{q1}
- 4-1 Comparison of BRP Maximum Single Sample Concentration to NRC/EPA MOU Table 1

EXECUTIVE SUMMARY

Consumers Energy Company has decommissioned the Big Rock Point Nuclear Plant to a Greenfield condition as defined in the approved Big Rock Point License Termination Plan (LTP) [Reference 1]. The final Greenfield condition of the site involved removal of all site buildings, foundations, buried piping, utilities and asphalt surfaces inside the Industrial Area. Office and storage buildings and underground utilities (conduit, storm drains, domestic piping, etc) outside the Industrial Area were also removed. Since no building structures supporting the former operating facility remain on site, final status surveys of the site consist of open land areas at or below original plant grade along with supporting surveys of excavated surfaces and relocated excavated soils.

All Final Status Surveys and supporting surveys were performed in accordance with the final status survey plan described in Chapter 5 of the LTP. The impacted areas [Appendix A] were divided into 34 final status survey units and classified according to their potential for containing residual radioactivity. Sixteen open land area final status survey units are classified as Class 1, twelve open land area final status survey units as Class 2, and six open land area final status areas as Class 3. All supporting survey data for excavated surfaces and relocated soils are also presented in this report.

Survey data were collected from each survey unit according to data collection patterns and frequencies established for each classification. The final status survey data demonstrate that each survey unit meets the radiological criteria supporting release for unrestricted use as specified in 10 CFR 20.1402. Based on the results of the final status and supporting surveys, Consumers Energy Company concludes that all land areas contained in this report meet requirements for unrestricted use and is suitable for release from the 10 CFR 50 license.

OVERVIEW

1.1 Purpose and Scope

This report provides information required by 10 CFR 50.82(a)(11), which demonstrates that Big Rock Point land areas meet the radiological criteria for unrestricted use specified in 10CFR 20.1402. The final Greenfield condition of the site includes demolition and offsite disposal of all site buildings, foundations, subsurface piping components and utilities that supported the former operating facility.

This report also documents that Final Status Surveys were performed in accordance with the final status survey process described in the Big Rock Point License Termination Plan (LTP, Chapter 5). Final Status Surveys were conducted on open land areas at or below original plant grade elevations for the survey unit. Supporting surveys include release records for surveys of excavated surfaces upon removal of building foundation materials and surveys of relocated soil designated for backfill upon completion of demolition activities. All Final Status Survey release records have previously been submitted for review [see Appendix E].

1.2 Description of Survey Areas

Final Status Survey units at Big Rock Point [Appendix B] include Class 1, 2 and 3 open land area surveys. Decommissioning activities conducted in preparation for the Final Status Survey include historical site assessment, radiological characterization, dismantlement and demolition, remediation, readiness surveys and supporting surveys.

Supporting Surveys are defined as surveys of excavated surfaces and soils relocated from excavations during removal of building foundations and below-grade components. Supporting Surveys conducted for excavated surfaces include areas where the Turbine Building, Plant Stack, Screenhouse, Containment, Solid Radwaste Vault, Liquid Radwaste Vault, and the Condenser Circulating Water piping were formerly located. Relocated soils consist of soil removed for building foundation and subsurface component demolition/removal activities. All supporting surveys of excavated surfaces and relocated soils were conservatively designed and executed to the requirements specified for Class 1 areas in accordance with the Big Rock Point Final Status Survey Plan (LTP Chapter 5).

Appendix B contains a map of the individual survey units.

1.3 Site Release Criteria

The site release criteria applied to each final status survey unit corresponds to the radiological criteria for unrestricted use provided in 10 CFR 20.1402 and as approved in the BRP LTP. These criteria are:

- i. Dose Criterion: The residual radioactivity that is distinguishable from background radiation results in a Total Effective Dose Equivalent (TEDE) to an average member of the critical group that does not exceed 25 mrem/yr, including that from groundwater sources of drinking water; and
- ii. ALARA Criterion: The residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA).

1.3.1 Application of the Site Release Criteria

Levels of residual radioactivity that correspond to the allowable radiation dose and ALARA levels of the site release criteria were derived by analysis of various scenarios and pathways (e.g., direct radiation, inhalation, ingestion) through which exposures could occur. These derived levels, referred to as Derived Concentration Guideline Levels (DCGLs), form the basis for the following four conditions which, when met, satisfy the site release criteria:

1. The average residual radioactivity is equal to or below the DCGL;
2. Individual measurements, representing small areas of residual radioactivity which exceed the DCGL, do not exceed the elevated measurement comparison DCGL;
3. Where one or more individual static measurements exceed the DCGL, the average residual radioactivity passes the statistical Sign Test; and
4. Remediation is performed where it is ALARA to reduce the levels of residual radioactivity below the concentrations necessary to meet the DCGLs.

The manner in which these conditions were met is described in Section 2.0.

1.3.2 Derived Concentration Guideline Levels

The residual radioactivity concentration levels for surface and subsurface soils in the Industrial Areas (Class 1 and Class 2 areas) and outlying Class 3 areas were compared to the site-specific DCGLs developed specifically for volumetric residual radioactivity as provided in the LTP using the unity rule. These site-specific DCGLs are provided in the following table:

Table 1-1. Site-Specific Industrial Area DCGLs

Radionuclide	25 mrem/yr Limit Open Land Areas ** (Surface and Subsurface Soils, pCi/g)
H-3	3.27 E+02
Mn-54	1.37 E+01
Fe-55	3.58 E+05
Co-60	3.21 E+00
Sr-90	2.48 E+00
Cs-137	1.32 E+01
Eu-152*	7.35 E+00
Eu-154*	6.78 E+00
Eu-155*	2.87 E+02

* Europium is included to address potential contamination of soil from concrete demolition activities.

** Including contribution of 0.054 mrem/y from discounted radionuclides and 0.766 mrem/y for groundwater tritium

DCGLs for Cs-137 and Co-60 presented above were modified to account for the presence of hard-to-detect (HTD) nuclides, Sr-90 and Fe-55, respectively, using surrogate ratios developed from characterization. The modified DCGL for Cs-137 is 11.93 pCi/g and for Co-60 is 3.21 pCi/g.

1.3.3 Tritium in Soils

Tritium analyses on 10% of samples in survey areas impacted by the tritium plume [Appendix C] were required (LTP Section 5.4.2.4). These areas included the Turbine Building, Liquid Radwaste Vault, Containment, and Screenhouse excavations. Additionally, tritium analysis for 10% of the samples taken from excavated soils in the defined plume area was performed. As a conservative measure, tritium analysis was performed on 10% of samples from all excavated soils (relocated soils) to ensure acceptability of the soil as backfill

Investigation was required for any sample that exceeded 10% of the tritium DCGL (32.7 pCi/g) and complete resampling, with analysis of all soil samples for tritium was required if investigation showed that 50% of the tritium DCGL (164 pCi/g) was exceeded. No soil samples exceeded these investigation levels.

All soil tritium samples were protected from moisture loss in the interval between sampling and analysis and analyzed by an accredited laboratory (LTP Section 5.2.1.3).

1.4 Discussion of Changes to the Final Status Survey Plan

No changes to the Final Status Survey Plan, as approved in Chapter 5 of the LTP (revision 2), were identified during conduct of supporting surveys or final status surveys at the Big Rock Point site. Changes to initial survey area units were anticipated and implemented during survey design in accordance with the LTP [Appendix B]. Additional Class 1 survey units were designed in response to decommissioning activities.

2.0 FINAL STATUS SURVEY METHODOLOGY

Final Status Surveys were designed and performed as described in the LTP, Chapter 5 and in accordance with NUREG-1575 [Reference 2]. The Data Quality Objective (DQO) process was used to ensure that each final status survey was of sufficient quality to support future unrestricted release of the site property. Land areas were divided into survey units, which were categorized and classified according to the type and potential for residual radioactivity. Characterization and remediation data were used to design surveys and these survey designs were reviewed then translated into field instructions for data collection. Instrumentation and survey methods, appropriate to the type of radiation being measured, were used to collect measurements in accordance with site procedures and quality controls instituted to ensure accurate results.

2.1 Survey Units

Impacted land areas were divided into 34 survey units based on physical characteristics and the potential for elevated residual radioactivity [Appendix B].

2.1.1 Classification

Survey units were classified as Class 1, Class 2, or Class 3 based on the potential for residual radioactivity. Areas with residual radioactivity that had the potential to exceed the DCGLs prior to remediation were divided into Class 1 survey units. Areas with residual radioactivity that were not expected to exceed the DCGL prior to remediation were divided into Class 2 survey units. Areas with a low probability of containing residual radioactivity detectable above background levels were divided into Class 3 survey units.

2.1.2 Survey Unit Size

Survey units were sized in accordance with NUREG-1575 guidance. They were designed to have relatively simple shapes unless an unusual shape was appropriate for the operational history of the area or as a result of decommissioning activities, i.e., excavation footprints. Class 1 survey areas were typically sized to a maximum of 2000 m² unless survey conditions warranted a larger area; one supporting survey unit exceeded the recommended 2000 m² size. A technical justification for size deviation of that Class 1 survey was provided as part of the completed survey package in accordance with Chapter 5 Section 5.2.3.1 of the LTP and in this report in Section 3.5, Survey Unit Anomalies. Class 2 survey areas were all less than 10,000 m² in size. While a maximum size guideline for Class 3 survey units does not exist, the largest Class 3 survey unit at BRP was 204,676 m².

2.1.3 Survey Unit Nomenclature and Location

A unique survey identification was utilized for each survey unit. The nomenclature for identification of final status and supporting surveys is described in general by the following:

NNT_TC Example: 09C_{Q1}1

Where:

NN - Unique alphanumeric survey unit identifier

T_T - Survey type

C_Q - Final survey of excavated (quarry) surface

C_x - Final survey relocated soil

C - Final Status Survey of open land area

i - Survey iteration (1, 2, 3 ...)

C - Survey unit initial classification (1, 2 or 3)

Survey units were identified by reference to an established site grid plan. The site grid plan was referenced to longitude and latitude coordinate locations by a licensed survey and confirmed by Global Positioning System (GPS). The southwest corner of each area represents the identifying origin of each survey unit. The site grid plan, with reproducible field locations, facilitated survey management and design, ensured accurate location of survey measurements, and permitted the replication of survey areas for remediation and measurement verification as necessary.

2.2 Instrumentation

Radiation detection and measurement instrumentation for the FSS was selected to provide both reliable operation and adequate sensitivity to detect the radionuclides identified at the site at levels sufficiently below the DCGLs. Site history and characterization efforts identified Cs-137 and Co-60 as the predominant radionuclides present in BRP site soils. Soil sampling and analysis have demonstrated that direct measurements of Cs-137 and Co-60 can be used as surrogates for estimating levels of other contaminants that may be present in BRP soils. Detector selection was based on detection sensitivity, operating characteristics and expected performance in the field. Portable instruments, laboratory instruments and bulk assay equipment were used to perform FSS measurements. Final Status Survey instrumentation characteristics are provided in Table 2-1.

Table 2-1. FSS Instrumentation Characteristics

Instrument and Detector	Measurement Type	Instrument Efficiency	MDC
2" x 2" NaI	Gamma*	1200 cpm/mR/hr (Cs-137)	Class 1 < DCGL _{EMC} ** Class 2&3 < DCGL _w
Canberra Genie	Laboratory Gamma	44.1%	< 5% of DCGL _w
Bulk Assay	Gamma	20%	< 15% of DCGL _w

* Scan for gamma emitting nuclides using the Ludlum 2350-1 rate meter or equivalent.

** MDC values for varying background values are provided in LTP - Appendix 2-D.

2.2.1 Calibration and Maintenance

Instrumentation used for the FSSs were calibrated and maintained in accordance with site procedures. Radioactive sources used for calibration are traceable to the National Institute of Standards and Technology (NIST) and have been obtained in standard geometries to match the type of samples being counted.

2.2.2 Instrument Response

Instrumentation response checks for field instruments were conducted daily before and after each use to ensure proper instrument response and operation. Laboratory instruments were checked daily in accordance with instrument procedures. An acceptable response for field and laboratory instrumentation was an instrument reading within ± 3 sigma as documented on a control chart. Source checks use source energies consistent with the nuclides encountered at the BRP site. If an instrument failed response check, it was appropriately identified and withheld from use until the problem was corrected in accordance with applicable procedures. If a failure occurred in the post-use check, data validation was required and documented in the survey release record.

2.2.3 Minimum Detectable Concentration

A minimum detectable concentration (MDC) was determined for each type of instrument and measurement method used for survey data collection. Instruments used for surface scanning were capable of detecting radioactive material at levels below the DCGL in Class 1 areas. MDC values for scanning instruments used in Class 1 and 2 areas were capable of detecting residual radioactivity below the DCGL_w.

Laboratory gamma spectroscopy instruments used for soil volumetric sample analyses were capable of residual radioactivity detection at values less than 5% of the DCGL_w using a one-liter marinelli geometry. The laboratory counting system had software controlled count times which were set to meet a maximum MDC of 0.13 pCi/g for Cs-60 in soil.

Where appropriate, radiological measurements were performed using the Gardian Mobile Assay System (GMAS) for large container analysis of soil-like materials (gravel, small stone, etc.) (LTP Section 5.4.2.4). This survey methodology is the same as that approved for the 10 CFR 20.2002 demolition debris disposal process. The GMAS system provided spectroscopy analyses over 100% of the survey population with software controlled count times that resulted in a detection sensitivity less than 15% of the DCGL_w.

2.3 Survey Methods

Survey methods, as described in the following sections, were applied to collect scan and volumetric measurements of residual radioactivity of land areas. The techniques for performing survey measurements and collecting samples are specified in approved site procedures. Final status survey measurements included field scans and gamma spectroscopy analysis of soil samples.

2.3.1 Scan Measurements

Scan measurements of open land areas were performed to identify potentially elevated areas of residual radioactivity that required further investigation. Sodium Iodide detectors were used for scanning open land areas at the BRP site.

Scan measurements of Class 1 survey units were performed over 100% of the surface/land area. Scan measurements of Class 2 survey units were performed over 10 to 100% of the surface/land area. For Class 3 survey units, scan measurements were performed over 10% or less of the surface/land area. In Class 2 and Class 3 survey units, those areas with the highest potential for elevated residual radioactivity, based on historical judgment, were selected for scanning. The extent of scan coverage was determined based upon classification, historical knowledge, and physical limitations of the survey unit.

2.3.2 Soil Sample Measurements

Measurement locations of soil samples were specified in the survey design process using a random-start, systematic spacing methodology for Class 1 and Class 2 survey units in accordance with site procedures and NUREG-1575. For Class 3 survey units, measurement locations were selected using a random selection process. Scale drawings or maps were prepared for each survey unit depicting all data collection locations measured from the survey unit origin (Class 1 and 2 areas) or located by GPS (Class 3 areas).

Soil sample size was sufficient to fill a one-liter marinelli container, nominally 1600 grams. Surface samples were collected from the top 15 cm of soil. Sample preparation included removing extraneous material, homogenizing, and drying the soil for gamma isotopic analysis. Separate containers were used for each sample and each container was tracked through the analysis process using a chain-of-custody record. Laboratory gamma spectroscopy was used to analyze collected soil samples. Samples were split when required by the applicable QC procedures.

Tritium analyses on 10% of the final status survey samples for all survey areas impacted by the tritium plume were required (LTP Section 5.4.2.4). Off-site laboratory facilities were utilized for tritium and QC measurements as specified in applicable survey design and associated site procedures. Analytical methods for offsite laboratory facilities were established to ensure minimum detection levels of 10% to 50% of the DCGL value (LTP Section 5.4.1).

2.4 Survey Performance

This section describes procedures and processes applicable to final survey design, data collection, review, and record keeping requirements for final status surveys.

2.4.1 Procedures

Final survey activities were implemented and controlled using approved site procedures. A list of applicable procedures is provided in the following table.

Table 2-2. Procedures Applicable to Final Status Survey Activities

Procedure Number	Title
D5.1	Radiation Protection and Environmental Services Policy and Program Description
D5.3	Big Rock Point Radiological Environmental Program
D5.19	Radiation Detection Instrumentation Calibration Facility and Source Control
D5.26	Final Status Survey Program
CIP-46	Operation of Canberra "Genie"
CIP-50	Calibration, Functional Check and Use of Acculab V-4kg Balance

Procedure Number	Title
RIP-59	Scan Measurements
RIP-60	Calibration and Operation of the Canberra Genie 2000 (In-Situ Gamma Spectroscopy)
RM-72	Sample Chain of Custody
RM-76	Final Status Survey Design
RM-77	Final Status Survey Implementation
RM-78	Final Status Survey Assessment
RM-79	Final Status Survey Quality Control
Volume 25	BRP Offsite Dose Calculation Manual
Volume 34 & 34a	Quality Program Description for Big Rock and Implementing Procedures

2.4.2 Training

Final status survey technicians and technical support staff were trained and qualified in the procedures performed under each respective job responsibility. Additional training was provided if any of the above procedures changed significantly. Personnel performing final status survey measurements were trained and qualified in procedures governing the conduct of the FSS, operation of field and laboratory instrumentation used in the FSS, and collection of final status survey measurements and samples. Qualification was obtained upon satisfactory demonstration of proficiency in implementation of procedural requirements. The extent of training and qualification was commensurate with the education, experience and proficiency of the individual and the scope, complexity and nature of the activity performed by that individual. Records of training and qualification are maintained in accordance with approved site procedures.

2.4.3 Sample Handling

A chain-of-custody record accompanied each volumetric sample from the point of collection through obtaining the final results to ensure the validity of the sample data. Sample tracking records were controlled and maintained in accordance with procedure RM-72, Sample Chain of Custody.

2.4.4 Data Investigation

Locations, identified by scan or volumetric measurements, with residual radioactivity that exceeded the DCGL were marked and investigated. Scan measurements were performed over 100 percent of the area being investigated. Where scan measurements were performed, the gross activity value of 1818 cpm above background was used to identify areas that may have contained elevated residual radioactivity. A soil sample was collected at locations that exceeded the gross activity value and the results reviewed to determine whether the residual radioactivity exceeded the DCGL. Depending on the results of the investigation, the identified areas within the survey unit were remediated, reclassified, and/or resurveyed in accordance with LTP Section 5.3.6.2.

2.4.5 Data Management

Final survey measurements were performed only after verification that isolation measures to prevent recontamination were effective and that the survey unit was in its survey configuration. Measurement results of statistical samples and scan data for final status and supporting surveys were included in the data set for each survey unit to determine compliance with the criteria for unrestricted release. Measurement records include, at a minimum, the surveyor's name, the location of the measurement, the instrument used, measurement results, the date and time of the measurement, any surveyor comments, and records of applicable reviews. All data records are maintained in accordance with site procedures and are stored as a quality record in the final survey package release record.

2.4.6 Quality Control Measurements

Procedures governing final survey design and implementation have built-in QC checks for the survey process, instrumentation, field, and laboratory measurements. A minimum of 5% of final survey soil, water, and sediment samples were evaluated through the QC program. Quality Control measurements consisted of one or more of the following: in-house recounts, split samples, third party analysis, and/or statistical comparisons. Acceptance criteria were based on NRC Inspection Procedure 84750. Procedures provide that unacceptable QC comparisons receive a documented investigation and reanalysis, resurvey, or resample, as necessary.

2.4.7 Control of Vendor Services

Vendor laboratory services were utilized for analysis of QC measurement and tritium analyses. These services were secured in accordance with purchasing requirements for quality related services, to ensure the same level of quality.

3.0 Survey Results

The survey unit package release record contains the number of measurements taken, a survey map, sample concentrations, statistical evaluations, including power curves, where applicable, and judgmental and miscellaneous data sets for each final status or supporting survey conducted. Each survey package also contains a summary of anomalous data if applicable. Tables 3-1 to 3-5 in this section also present a summary of these parameters.

3.1 Open Land Area Surface Surveys

3.1.1 Class 1 Survey Units

Class 1 Final Status Survey results for open land areas are presented in each survey package and are summarized in Table 3-1, Class 1 Open Land Area Final Status Survey Results Summary.

All final status survey release records for Class 1 survey units have previously been submitted for review [Appendix E].

3.1.2 Class 2 Survey Units

Class 2 Final Status Survey results for open land areas are presented in each survey package and are summarized in Table 3-2, Class 2 Open Land Area Final Status Survey Results Summary.

All final status survey release records for Class 2 survey units have previously been submitted for review [Appendix E].

3.1.3 Class 3 Survey Units

Class 3 Final Status Survey results for open land areas are presented in each survey package and are summarized in Table 3-3, Class 3 Open Land Area Final Status Survey Results Summary.

All final status survey release records for Class 3 survey units have previously been submitted for review [Appendix E].

3.2 Surveys Supporting Final Evaluation

3.2.1 Excavated Surface Surveys

Surveys of excavated surface areas were completed to demonstrate that all structural materials of plant origin were removed and that the exposed surface area met the criteria for unrestricted release prior to backfill. All excavated surface survey designs met the requirement of Class 1 area surveys as specified in NUREG-1575 and were also performed following the guidance in NUREG-1727 Appendix E Section 11.1.

Excavated surface areas include former locations of the Screenhouse, Turbine Building, Containment, Liquid Radwaste Vault, and Gaseous Effluent Stack foundations, and the Solid Radwaste Vault and Circulating Water excavation. Excavated surface survey units were established based on physical location, i.e., excavation footprint of removed foundations/structures, and Class 1 survey size limitations.

Excavated Surface Survey results are presented in each survey package and are summarized in Table 3-4, Excavated Surface Supporting Survey Results Summary.

All Excavated Surface Survey release records have previously been submitted for review [Appendix E].

3.2.2 Relocated Soil

Excavated soil supporting removal of building foundations and subsurface components was relocated to a designated area for final evaluation prior to use as onsite backfill material. Prior to relocation, soils were evaluated (characterized) to determine suitability for transport to the area dedicated for excavated soils. Controls were instituted to prevent mixing of soils from different survey areas prior to evaluation. Once relocated, these soils were graded to a maximum depth of one meter.

The primary method for evaluation of relocated soils originating from Class 1 and Class 2 areas followed the guidance provided in NUREG-1575 for final status survey of Class 1 areas. Relocated soil surveys met the design criteria for Class 1 area. Volumetric samples for laboratory analysis were homogenized over the total 1 meter depth of soil. Soils satisfying the criterion for unrestricted release were stockpiled for use as onsite backfill material.

Alternatively gamma spectroscopy using the large container assay system was also utilized for evaluation of small amounts of relocated soils (LTP Section 5.4.2.4).

Relocated Soil Survey results are presented in each survey package and are summarized in Table 3-5, Relocated Soil Supporting Survey Results Summary.

All Relocated Soil Survey release records have previously been submitted for review [Appendix E].

3.2.3 Tritium in Soils

In accordance with the LTP section 5.2.1.3 tritium in soils is addressed by tritium analyses on 10% of the FSS samples for all survey areas impacted by the tritium plume (Appendix C). There were no samples in any survey unit that exceeded 10% of the tritium DCGL.

Tritium in soil analyses results are presented in each survey package and are summarized in Tables 3-1 through 3-5.

3.3 Groundwater Monitoring

Groundwater monitoring wells were sampled periodically, dependent on availability based on demolition and decommissioning activities, throughout the decommissioning project. Groundwater monitoring well data through 2004 was provided in the LTP (see Section 2.4.5.3). Monitoring wells within the tritium plume (wells MW-5 and MW-6 and piezometric wells PZ-3MA, PZ-3MB, PZ-3D and PZ-5S) were maintained until the FSSs were completed in the Industrial Area. All groundwater monitoring well sample data at the conclusion of Final Status Survey were below the drinking water Maximum Contaminant Level (MCL) for tritium of 20,000 pCi/L. No upward trends in this data were indicated ensuring that the hydrogeologic evaluation and stated conclusions in the LTP are valid. No groundwater contamination exists above the tritium MCL and monitoring wells have been abandoned in accordance with the LTP and State of Michigan criteria (LTP Sections 5.4.2.5). Tables 3-6a, 3-6b and 3-6c contain tritium data for the site groundwater monitoring wells. Appendix D, Groundwater Monitoring Well Locations provides location and depths of the wells.

3.4 Survey Unit Investigations

The results of the data investigations are summarized in Table 3-7. The details of the investigations are included in survey unit package release records. Depending on the results of the investigation, the identified areas within the survey unit was determined to have met the criteria for unrestricted release or remediated, and resurveyed in accordance with LTP Section 5.3.6.2.

3.5 Survey Unit Anomalies

Survey Unit CWC_{q1}1, Base Elevation of Circulating Water Piping Excavation was designed at 2935 m². This excavation surface area exceeded the maximum size requirement of 2000 m² for a Class 1 survey area. However, with potentially unstable embankments, considerations for worker safety, weather, and groundwater management/removal led to the conclusion that the excavation should be surveyed as one unit. As this was a supporting survey it was determined that Class 1 survey design requirements would be satisfied by maintaining sample size spacing and density consistent with values established for a standard Class 1 area of 2000 m². A comparison of the design parameters for development of Survey Unit CWC_{q1}1 with regulatory guidance, as shown in the table below, demonstrates verification that the design values in the survey unit met or exceeded Class 1 survey requirements.

Table 3-8
Design Parameter Comparison
Survey Unit CWC_{q1}1

Survey*	Sample Size	Spacing	Sample Density
Standard Requirements Class 1 Area 2000 m ²	15	11.5	0.75 samples/100 m ²
Survey CWC _{q1} 1 Class 1 Area 2935 m ²	32	8	1.09 samples/100 m ²

*Survey Unit Relative Shift = 2.0

3.6 Survey Quality Control Measurement Results

All Quality Control Measurement comparisons were acceptable, no investigations were required.

Table 3-1. Class 1 Open Land Area Final Status Survey Results Summary

Survey ID	Description	Survey Area (m ²)	Scan Coverage (% of area)	Number of Samples	Soil Sample Measurements (pCi/g)									Mean Weighted Sum of the Ratios (Cs-137, Co-60)
					Max	Cs-137 Mean	Std Dev	Max	Co-60 Mean	Std Dev	Max	H ₃ Mean	Std Dev	
01C ₁	South West Protected Area	1952	100	20	0.3733	0.0738	0.0813	0.0635	0.0093	0.0176	0.0120	0.006	0.0055	0.0091
02C ₁	West Central Protected Area	1982	100	20	0.0900	0.0356	0.0237	0.0244	0.0086	0.0105	0.0100	0.0067	0.0031	0.0057
03C ₁	North West Protected Area	1956	100	20	0.3983	0.1056	0.0955	0.0552	0.0135	0.0157	0.0250	0.0170	0.0072	0.0131
04C ₁	North Central Protected Area	1957	100	20	0.2277	0.0468	0.0577	0.0306	0.0033	0.0136	0.0080	0.0050	0.0030	0.0050
05C ₁	Central Protected Area	1924	100	19	0.1357	0.0468	0.0356	0.0404	0.0054	0.0129	1.2270	0.4163	0.7021	0.0056
06C ₁	South Central Protected Area	1977	100	20	0.0918	0.0503	0.0224	0.0566	0.0176	0.0210	0.0240	0.0153	0.0085	0.0097
07C ₁	South East Protected Area	1875	100	18	0.1186	0.0484	0.0281	0.0198	0.0118	0.0130	0.0280	0.0123	0.0138	0.0077
08C ₁	East Central Protected Area	1997	100	20	0.1167	0.0510	0.0225	0.0384	0.0081	0.0161	0.0220	0.0147	0.0064	0.0068
09C ₁	North East Protected Area	1989	100	20	0.1235	0.0429	0.0303	0.0350	0.0061	0.0144	0.0510	0.0318	0.0285	0.0055
10C ₁	East Protected Area	1907	100	17	0.4428	0.0674	0.0985	0.0296	0.0117	0.0121	0.2110	0.0810	0.1129	0.0093
North 11C ₁	North Radwaste Staging Area	1339	100	15	0.1581	0.0556	0.0416	0.0456	0.0106	0.0179	0.0560	0.0407	0.0146	0.0080
South 11C ₁	South Radwaste Staging Area	1346	100	15	0.2016	0.0748	0.0454	0.1132	0.0264	0.0341	0.0120	0.0100	0.0020	0.0145
15(2R)C ₁	Woods Road Storage Area	18	100	18	2.6970	0.8124	0.7998	0.0451	0.0046	0.0315	-	-	-	0.0695
20C ₁	East Radwaste Staging Area	600	100	15	0.0712	0.0327	0.0268	0.0227	0.0016	0.0116	0.0100	0.0077	0.0021	0.0032
23C ₁	North Protected Area	1995	100	23	1.1350	0.3184	0.3276	0.0718	0.0180	0.0228	0.0480	0.0133	0.0302	0.0323
24C ₁	South Protected Area	1956	100	20	0.3432	0.0899	0.0830	0.1333	0.0226	0.0341	0.8030	0.2703	0.4613	0.0146

Table 3-2. Class 2 Open Land Area Final Status Survey Results Summary

Survey ID	Description	Survey Area (m ²)	Scan Coverage (% of area)	Number of Samples	Soil Sample Measurements (pCi/g)									Mean Weighted Sum of the Ratios (Cs-137, Co-60)
					Cs-137			Co-60			H ₃			
					Max	Mean	Std Dev	Max	Mean	Std Dev	Max	Mean	Std Dev	
12C ₁ ,2	Shoreline North Of The Protected Area	7242	10	19	0.3696	0.1539	0.0956	0.0374	0.0090	0.0105	1.6550	0.5573	0.9506	0.0157
15(1)C ₁ ,2	Eastern Section Woods Road Area	9998	10	17	0.4421	0.2279	0.1833	0.0470	0.0109	0.0150	0.0150	0.0140	0.0017	0.0225
15(2)C ₁ ,2	Central Section Woods Road Area	8671	10	18	0.8712	0.3551	0.2696	0.1033	0.0082	0.0263	-	-	-	0.0323
16C ₁ ,2	Shoreline East Of Breakwall	8193	10	15	0.5759	0.2352	0.1684	0.0929	0.0398	0.0348	0.0170	0.0130	0.0061	0.0321
North 19C ₁ ,2	North West Transport Route	6643	10	17	0.7641	0.1606	0.2107	0.0397	0.0046	0.0181	0.0340	0.0150	0.0168	0.0149
South 19C ₁ ,2	South West Transport Route	6608	10	19	1.7150	0.4914	0.5133	0.0499	0.0178	0.0159	0.1950	0.1753	0.0211	0.0467
North 21C ₁ ,2	North East Transport Route	9963	10	16	0.6717	0.1314	0.1898	0.0351	0.0107	0.0136	0.0420	0.0210	0.0187	0.0143
South 21C ₁ ,2	South East Transport Route	9936	10	21	0.9021	0.2406	0.2768	0.0442	0.0067	0.0172	-	-	-	0.0223
East 22C ₁ ,2	East Powerline Corridor	9794	10	17	0.0729	0.0420	0.0233	0.0449	0.0056	0.0198	-	-	-	0.0053
West 22C ₁ ,2	West Powerline Corridor	9009	10	15	0.7400	0.1713	0.2114	0.0421	0.0072	0.0173	-	-	-	0.0166
26C ₁ ,2	Storm Water Drainage Ditch	2781.6	10	21	0.6637	0.1956	0.1404	0.0441	0.0113	0.0170	0.0380	0.0240	0.0123	0.0199
DFC ₁ ,2	Septic Drain Field	1320	100	15	0.2900	0.1636	0.0551	0.0249	0.0000	0.0131	-	-	-	0.0137

Table 3-3. Class 3 Open Land Area Final Status Survey Results Summary

Survey ID	Description	Survey Area (m ²)	Scan Coverage (% of area)	Number of Samples	Soil Sample Measurements (pCi/g)									Mean Weighted Sum of the Ratios (Cs-137, Co-60)
					Cs-137			Co-60			H ₃			
					Max	Mean	Std Dev	Max	Mean	Std Dev	Max	Mean	Std Dev	
13C,3	Shoreline East Of The Industrial Site	49,370	1.4	15	1.7940	0.5134	0.4643	0.0764	0.0313	0.0281	-	-	-	0.0528
14C,3	Shoreline West Of The Industrial Site	43,334	2	15	0.4185	0.1101	0.1288	0.0279	0.0087	0.0130	-	-	-	0.0119
17C,3	East Woods Boundary	204,676	1.71	15	0.9808	0.4651	0.3015	0.0292	0.0060	0.0139	-	-	-	0.0409
18C,3	Wooded Area West Of The Industrial Site	105,690	0.2	15	0.7792	0.3576	0.1891	0.0234	0.0081	0.0102	-	-	-	0.0325
25C,3	South Woods Boundary	5739	10	15	1.5650	0.5663	0.3415	0.0643	0.0090	0.0237	-	-	-	0.0503
59C,3	Soil Storage Area South Of US 31	39,061	1.02	15	0.3236	0.1887	0.0571	0.0367	0.0051	0.0157	-	-	-	0.0174

Table 3-4. Excavated Surface Supporting Survey Results Summary

Survey ID	Description	Survey Area (m ²)	Scan Coverage (% of area)	Number of Samples	Soil Sample Measurements (pCi/g)									Mean Weighted Sum of the Ratios (Cs-137, Co-60)
					Cs-137			Co-60			H ₃			
					Max	Mean	Std Dev	Max	Mean	Std Dev	Max	Mean	Std Dev	
09C _{q1} 1	Screenhouse Area Excavation	1820	100	20	1.0740	0.1317	0.2925	0.0912	0.0162	0.0264	0.4800	0.1650	0.2149	0.0161
11C _{q1} 1	Solid Radwaste Vault Excavation	228	100	20	0.4322	0.0840	0.1143	0.1333	0.0249	0.0314	-	-	-	0.0148
CSC _{q1} 1	Base Elevation Of Containment Structure Excavation	1924	100	23	0.0999	0.0217	0.0301	0.0453	0.0087	0.0163	2.7930	1.1470	1.4505	0.0045
CWC _{q1} 1	Base Elevation Of Circulating Water Piping Excavation	2935	100	32	0.0846	0.0139	0.0281	0.0276	0.0007	0.0179	0.1140	0.0647	0.0428	0.0014
East TBC _{q1} 1	Base Elevation Of Turbine Building Excavation	1776	100	18	0.2399	0.0270	0.0590	0.0615	0.0106	0.0269	0.8390	0.5260	0.2711	0.0106
West TBC _{q1} 1	Base Elevation Of Turbine Building Excavation	1988	100	19	1.7710	0.1951	0.3942	0.2435	0.0707	0.0825	2.7660	1.3110	1.3037	0.0384
Canal C _{q1} 1	Discharge Canal	1300	100	19	1.6700	0.7200	0.6500	1.6100	0.3600	0.4800	0.0230	0.0103	0.0130	0.1520

Table 3-5. Relocated Soil Supporting Survey Results Summary

Survey ID	Description	Survey Area (m ²)	Scan Coverage (% of area)	Number of Samples	Soil Sample Measurements (pCi/g)									Mean Weighted Sum of the Ratios (Cs-137, Co-60)
					Cs-137			Co-60			H ₃			
					Max	Mean	Std Dev	Max	Mean	Std Dev	Max	Mean	Std Dev	
02C _{x1} 1	Excavated Soil From Retention Pond Construction	150	100	19	0.1040	0.0542	0.0189	0.0254	0.0056	0.0098	-	-	-	0.0063
08C _{x1} 1	Excavated Soil From Turbine Building Subfloor	368	100	20	0.2618	0.1357	0.0561	0.2632	0.1397	0.0596	19.0800	12.6600	6.8028	0.0549
09C _{x1} 1	Excavated Soil From Screenhouse Area	1610	100	18	0.2501	0.0687	0.0802	0.0732	0.0192	0.0245	0.0100	0.0067	0.0058	0.0120
09C _{x2} 1	Excavated Soil From Screenhouse Area	1120	100	18	0.4516	0.1672	0.1396	0.0679	0.0193	0.0184	0.0800	0.0533	0.0379	0.0200
09C _{x3} 1	Excavated Soil from Screenhouse Area	825	100	18	0.0870	0.0279	0.0226	0.0500	0.0014	0.0156	0.0000	0.0000	0.0000	0.0028
09C _{x4} 1	Excavated Soil from Screenhouse Area	1200	100	18	0.0617	0.0163	0.0180	0.0247	0.0048	0.0157	0.2400	0.1133	0.1102	0.0029
09C _{x5} 1	Excavated Soil from Screenhouse Area	840	100	18	0.1146	0.0157	0.0283	0.0542	0.0100	0.0187	0.2600	0.2333	0.0379	0.0044
09C _{x6} 1	Excavated Soil from Screenhouse Area	1200	100	18	0.0659	0.0139	0.0216	0.0248	0.0029	0.0093	0.1500	0.1233	0.0306	0.0021
09C _{x7} 1	Excavated Soil from Screenhouse Area	105	100	18	0.1596	0.0270	0.0426	0.0607	0.0169	0.0190	-0.0100	-0.0167	0.0058	0.0075
11C _{x1} 1	Excavated Soil from Radwaste Storage Vaults	572	100	18	0.0919	0.0344	0.0255	0.0590	0.0140	0.0180	-	-	-	0.0072
12C _{x1} 2	Excavated Soil From Building Construction	192	100	18	0.5771	0.2883	0.1166	0.0475	0.0095	0.0146	0.5490	-1.1503	1.4852	0.0271
19C _{x1} 2	Excavated Soil From Stormdrain Modification	165	100	18	0.1199	0.0910	0.0357	0.0337	0.0113	0.0125	-	-	-	0.0111
SWC _{x1} 1	Excavated Soil From Slurry Wall Construction	1800	100	24	0.4550	0.0468	0.0950	0.0251	0.0035	0.0127	0.0173	0.0720	0.0880	0.0050
SWC _{x2} 1	Excavated Soil From Slurry Wall Construction	1800	100	24	0.4088	0.0995	0.1111	0.0297	0.0090	0.0158	0.0348	0.0185	0.0142	0.0111
TBC _{x1} 1	Excavated Soil From Turbine Building Demolition Area	3100	100	22	0.1343	0.0768	0.0366	0.0766	0.0311	0.0243	1.2400	0.6090	0.5556	0.0161

Survey ID	Description	Survey Area (m ²)	Scan Coverage (% of area)	Number of Samples	Soil Sample Measurements (pCi/g)									Mean Weighted Sum of the Ratios (Cs-137, Co-60)
					Cs-137			Co-60			H ₃			
					Max	Mean	Std Dev	Max	Mean	Std Dev	Max	Mean	Std Dev	
TBC _{x2} 1	Excavated Soil From Turbine Building Demolition Area	1080	100	17	0.1135	0.0630	0.0247	0.0793	0.0256	0.0246	0.3120	0.1791	0.1313	0.0133
TBC _{x3} 1	Excavated Soil From Turbine Building Demolition Area	1365	100	26	0.0086	0.0024	0.0022	0.0022	0.0003	0.0016	1.1400	0.4548	0.5956	0.0003
TBC _{x4} 1	Excavated Soil From Turbine Building Demolition Area	1935	100	21	0.0570	0.0299	0.0169	0.0431	0.0108	0.0141	0.3750	0.2362	0.1473	0.0059
TBC _{x5} 1	Excavated Soil From Turbine Building Demolition Area	1800	100	20	0.1205	0.0659	0.0256	0.0832	0.0087	0.0387	0.3670	0.1906	0.1683	0.0082
TBC _{x6} 1	Soil Excavated From Turbine Building Demolition Area	1990	100	19	0.3496	0.1256	0.1019	0.1125	0.0386	0.0335	0.4070	0.3705	0.0516	0.0226
TBC _{x7} 1	Soil Excavated From Turbine Building Demolition Area	1990	100	19	0.0814	0.0337	0.0228	0.0350	0.0139	0.0118	0.0420	0.0350	0.0061	0.0071
TBC _{x8} 1	Relocated Soils From Turbine Building/Containment Demolition	1990	100	19	0.0643	0.0241	0.0201	0.0376	0.0041	0.0165	0.0280	0.0227	0.0084	0.0033
TBC _{x9} 1	Relocated Soils From Turbine Building/Containment Demolition	1990	100	19	0.0493	0.0165	0.0153	0.0328	0.0046	0.0169	0.1660	0.1027	0.0569	0.0028
TBC _{x10} 1	Relocated Soils From Turbine Building/Containment Demolition	1990	100	19	0.0915	0.0393	0.0229	0.2234	0.0246	0.0518	0.0520	0.0400	0.0159	0.0110
TBC _{x11} 1	Relocated Soils From Turbine Building/Containment Demolition	1990	100	19	0.5695	0.0652	0.1243	0.0363	0.0086	0.0135	0.0070	0.0067	0.0006	0.0081
TBC _{x12} 1	Relocated Soils From Turbine Building/Containment Demolition	1990	100	19	0.1073	0.0555	0.0231	0.0764	0.0130	0.0230	0.0180	0.0130	0.0056	0.0087
TBC _{x13} 1	Relocated Soils From Turbine Building/Containment Demolition	1990	100	19	0.1040	0.0489	0.0290	0.0420	0.0089	0.0134	0.0130	0.0093	0.0040	0.0069
TBC _{x14} 1	Relocated Soils From Turbine Building/Containment Demolition	1990	100	19	0.0829	0.0325	0.0174	0.0371	0.0071	0.0133	0.0130	0.0073	0.0051	0.0049
TBC _{x15} 1	Relocated Soils From Turbine Building/Containment Demolition	1800	100	15	0.0706	0.0354	0.0189	0.0319	0.0044	0.0161	0.0070	0.0057	0.0015	0.0043

Table 3-6a. Tritium Monitoring Well Historical Data (in pCi/l) - (Wells Installed in 1994)

Sampled	MW #1	MW #2	MW #3	MW #4	MW #5	MW #6	MW #7	MW #8	MW #9
08/1994	<1250	<1250	<1250	<1250	11,300	40,600	<1250	<1250	<1250
09/1994	<504	<504	<503	<503	10,500	27,000	<502	<503	<522
04/1996					23,800	46,900			
07/1996	<721				23,200	16,000	<721	<721	536
10/1996	<804	<804		<804	22,600	22,300	<804	<804	<804
04/1997	<149	<149	<149		22,700	36,800	<149	<149	<149
10/1997	<706	<706			14,400	24,700	<706	<706	<706
04/1998	<602	<602	<602		13,900	9,100	<602		<602
10/1998	<524	<524		<524	15,800	23,100	<524		628
03/1999	<523	<523		<523	10,500	13,900	<523		<523
07/1999	184	<150		<150	10,100	2,730	<150		598
10/1999	<183	<183	<183	<183	16,500	1,900	<183		510
04/2000	<175	<157	<157	<157	17,392	5,276	<157		430
10/2000		<156	<156	<156			<156		
10/2000	191				26,000	5,057			
03/2001					9,600	5,160			
04/2001	170	<186		<186	8,820	5,280	<186		
10/2001	<168	<168	<168	<168	9,160	2,420	<168		422
03/2002					3,860	1,747			
04/2002	<141	<141	<164	<164	2,860	5,150	<164		357
10/2002	<150	<150	<146	<146	4,910	4,320	<146		<150
04/2003	188	<133	<133	<133	3,490	2,960	<133		269
10/2003		<169	<169	<169	4,870	5,080	<169		349
12/2003						2,326			341
05/2004	<157	<154			4,081	1,362	<154		324
07/2004	280				5215	2730	<157		367
09/2004					3923	2090			
11/2004						2828			
04/2005						4918			
05/2005					4436				
10/2005					5254	4987			
05/2006		<1000	<1000	<1000	3023	2037	<1000		
07/2006					<733	<733			
09/2006					2719	<763			

Table 3-6b. Tritium Monitoring Well Historical Data (Wells Installed in Post-Shutdown)

Sampled	PZ-1D	PZ-1M	PZ-1S	PZ-2D	PZ-2M	PZ-2S	PZ-3D	PZ-3Ma	PZ-3Mb	PZ-3S	PZ-4S	PZ-5S	PZ-6S
01/2002				<126			290						
02/2002	<96												
03/2002	<96		<96	<96		<96	1,423			<96	<96	957	<96
05/2002		<97			<97			2,105	595				
06/2002							1,560						
10/2002	<177	<177	<177	<177	<177	<177	768	2,060	808	<177	<177	2,650	<177
04/2003	<163		<163	<163	<163	<163	798	3,165	383	<163	<163	1,069	<163
11/2003	<174		<174	<174	<174		919	3,342	380			737	<174
12/2003							942	3,183	361			315	
05/2004					<154		373	2,667	279	<159	<154	892	
07/2004	<157	<157		172	<157		403	2671	724	203		2656	
09/2004				<993	<993							1888	
11/2004							<1000	2107	<1000			1957	
04/2005				<1000	<1000		1405	2141	1745			4842	
10/2005							2813	2961	4248			2222	
03/2006				<157	<157								
05/2006	<1000	<1000	<1000	<1000	<1000		1095	1845	1592			1793	
07/2006							<733	<733	<733			<733	
09/2006							1334	1355	<763			1227	

Table 3-6c. Tritium Monitoring Well Historical Data (Wells Installed in 2004)

Sampled	PZ-7M	PZ-7Ma	PZ-8M	PZ-8Ma	PZ-9M	PZ-9Ma
06/2004	<162	<162	<182	<162	523	<162
07/2004	<157	<157	<157	<157	408	199
09/2004	<993	<993	<993	<993	408	<993
11/2004			<1000	<1000	<1000	<1000
04/2005			<1000	<1000	<1000	<1000
10/2005			<1000		1477	<1000
03/2006	<157	<157	<157	<157		<157
05/2006	<1000	<1000	<1000	<1000	<1000	<1000

Table 3-7. Summary of Data Investigation Results and Actions Taken

Survey Unit	Class	Identified Locations		Description	Actions Taken
		Scan	Soil Sample		
11C _{q1} 1	1	Investigation Level Exceeded	N/A	Solid Radwaste Vault Excavated Surface	1. Isolated and initiated survey investigation. 2. DCGL concentrations were NOT exceeded. 3. Survey unit satisfied the criteria for unrestricted use.
West TBC _{q1} 1	1	Investigation Level Exceeded	N/A	Turbine Building Excavated Surface	1. Isolated and initiated survey investigation. 2. Residual radioactivity exceeded the scan DCGL. 3. Remediated and resurveyed. 4. Survey unit satisfied the criteria for unrestricted use.
CanalC ₁ 1	1	Investigation Level Exceeded	N/A	Discharge Canal Surface	1. Isolated and initiated survey investigation. 2. Residual radioactivity exceeded the scan DCGL. 3. Remediated and resurveyed. 4. Survey unit satisfied the criteria for unrestricted use.
SWCx ₂ 1	1	Investigation Level Exceeded	N/A	Relocated Soil From Slurry Wall Excavation	1. Isolated and initiated survey investigation. 2. Residual radioactivity exceeded the scan DCGL. 3. Remediated and resurveyed. 4. Survey unit satisfied the criteria for unrestricted use.

4.0 Final Status Survey Data Assessment

4.1 Data Verification and Validation

Data were reviewed to verify that Data Quality Objectives (DQOs) established in each of the survey designs were met. When appropriate, graphical representations and statistical comparisons of the data were made to provide both qualitative and quantitative information about the survey data. An assessment was performed to verify the data supported the underlying assumptions necessary for statistical tests if applicable.

4.1.1 Data Quality Review

Final status survey and supporting survey data were reviewed to ensure that they were complete, fully documented, and technically acceptable. The review criteria for data acceptability included the following items:

- The instrumentation MDC for fixed or volumetric measurements was below the $DCGL_{EMC}$ for Class 1, below the $DCGL_w$ for Class 2, and below 0.5 $DCGL_w$ for Class 3 survey units;
- The instrument calibration was current and traceable to NIST standards;
- The field instruments were source checked with satisfactory results each day data was collected or data was evaluated if instruments did not pass a response check;
- The MDCs and assumptions used to develop them were appropriate for the instruments and techniques used to perform the survey;
- The survey methods used to collect data were proper for the types of radiation involved and for the media being surveyed;
- "Special methods" for data collection were properly applied for the survey unit under review, if applicable;
- The chain-of-custody was tracked from the point of sample collection to the point of obtaining results;
- The data set is comprised of qualified measurement results collected in accordance with the survey design which accurately reflect the radiological status of the facility; and
- The data were properly recorded.

If the data review criteria were not met, the discrepancy was evaluated and the decision to accept or reject the data documented in accordance with approved site procedures.

4.1.2 Graphical Data Review

Survey data were graphed to identify patterns, relationships or possible anomalies that would not be evident using other methods of review. As a minimum a posting plot was used for each survey unit and is included in each survey package.

4.1.3 Statistical Analysis

License Termination Plan Chapter 5, Section 5.6 provides guidance for the use of statistical analysis to determine whether the survey unit meets the release criteria. As all survey units met the release criteria, statistical analysis as provided in the LTP was not required.

4.2 Summary of Changes from Initial Assumptions on Residual Radioactivity

4.3 There were no changes from the initial assumptions on residual radioactivity as described in the LTP.

4.4 Release Criteria Verification

An assessment was performed on all final status or supporting survey data to ensure that they were adequate to support the determination that the survey unit met the criteria for unrestricted release. For each survey unit three tests or evaluations were performed to ensure that the release criteria were met. These tests are summarized below in Table 4-1.

4.3.1 Condition #1 – Mean Test

This condition requires that the mean residual radioactivity was less than the $1.0 \times \text{DCGL}_W$. To determine if this condition was met, the mean of the final survey unit data set for each survey unit was compared to the DCGL_W (applying the unity rule). In all cases the mean residual radioactivity was less than $0.0549 \times \text{DCGL}_W$. Therefore, each survey unit satisfied Condition #1.

4.3.2 Condition #2 – Elevated Measurement Comparison

The Elevated Measurement Comparison (EMC) test requires that individual measurement representing small areas of residual radioactivity exceeding the DCGL_W did not exceed the DCGL_{EMC} . Since all measurements were less than the DCGL_W , an EMC was not required for any survey unit and Condition #2 was automatically satisfied for all survey units.

4.3.3 Condition #3 – Sign Test

This condition requires that where one or more soil sample measurements in a survey unit exceed the DCGL_W , the average residual radioactivity passes the Sign statistical test. Since all soil sample measurements were less than DCGL_W , the Sign statistical test was not applied to any survey unit data set and all survey units satisfied Condition #3.

4.4 ALARA Evaluation

In accordance with the release criteria (Section 1.3) an evaluation was required to determine if it is ALARA to reduce the levels of residual radioactivity to below concentrations necessary to meet the DCGL_w. The License Termination Plan, Section 4.4 contains the ALARA evaluation for Big Rock Point. This evaluation previously determined that both the site specific DCGLs for Class 1 and Class 2 areas and the screening DCGLs for Class 3 areas are considered ALARA for the land areas to be release for unrestricted use.

4.5 Memorandum Of Understanding Between NRC and EPA On Cleanup Of Radioactively Contaminated Sites

4.5.1 Soil

Final Status Survey data was compared to the NRC and EPA MOU Table 1 Consultation Triggers for Residential and Commercial/Industrial Soil Contamination Concentrations. The more restrictive "Residential Soil Concentration" data was utilized. Final Status Survey sample data provides that the trigger concentrations for contamination were not exceeded.

Table 4-1
Comparison of BRP Maximum Single Sample Concentration
to NRC/EPA MOU Table 1

Nuclide	BRP Maximum Concentration in a Sample (pCi/g)	MOU Table 1 Residential Soil Concentration (pCi/g)	Fraction
H ₃	19.0800	228	0.0837
Co-60	1.6100	4	0.4025
Cs-137+D	2.6970	6	0.4495
		Sum of the fractions. If less than one, consultation not required.	0.9357

4.5.2 Groundwater

All groundwater monitoring well sample data post remediation were below the EPA drinking water MCL for tritium of 20,000 pCi/L. No upward trends in the data provided in this report were indicated, demonstrating that the hydrogeologic evaluation and stated conclusions in the LTP are valid.

5.0 Final Status Survey Conclusions

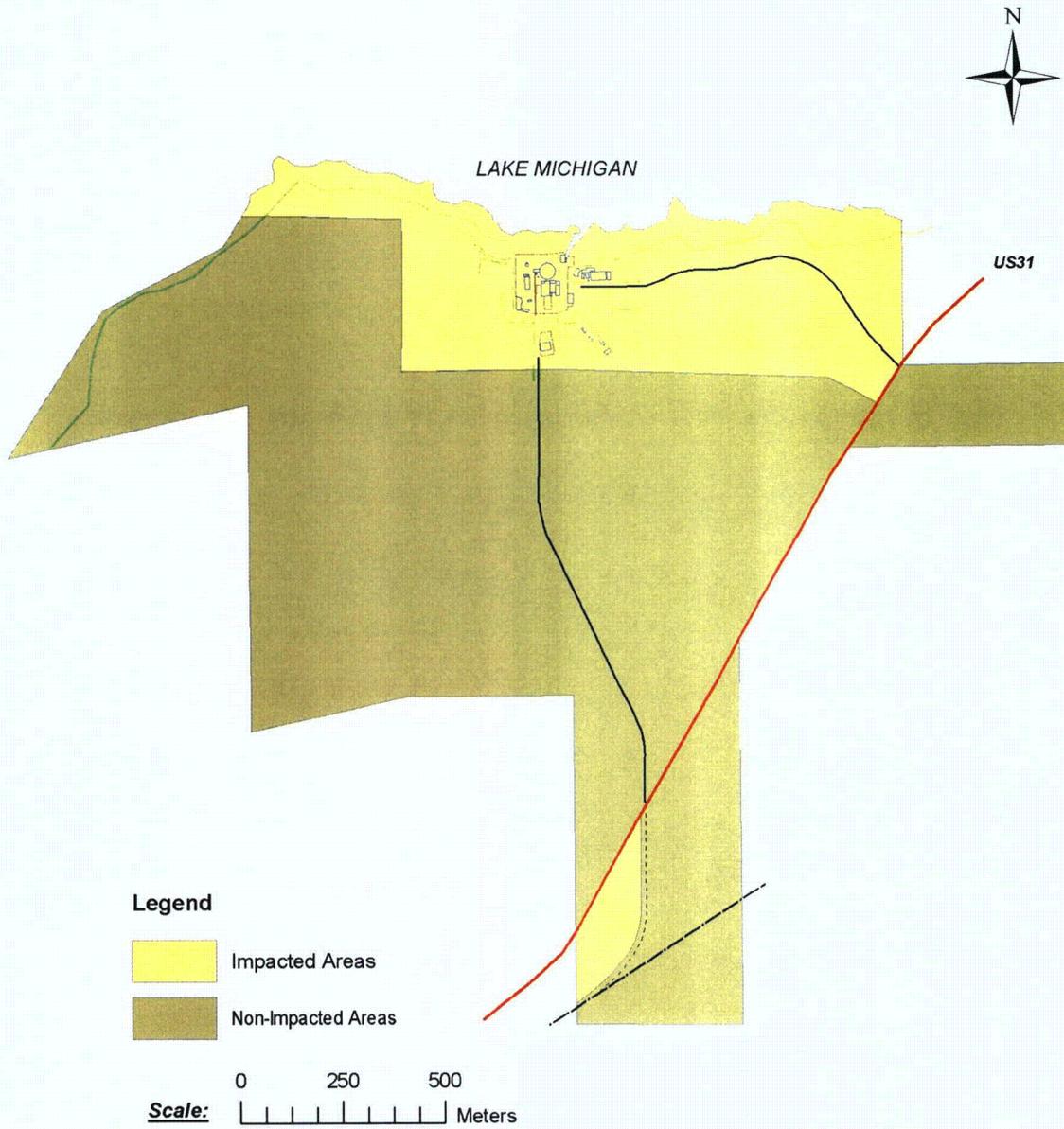
Scan and volumetric measurement data collected during final status surveys confirmed that the classification for each of the survey units was accurate. Final Status Surveys and supporting surveys demonstrate licensed radioactive materials were removed from BRP property to the extent that any remaining residual radioactivity is below the radiological criteria for unrestricted release and that all remaining surface and associated subsurface land areas were evaluated against the criteria for unrestricted release. The final survey data presented in this summary report demonstrate compliance with 10 CFR 20.1402 and the site impacted and non-impacted land areas meet the criteria for unrestricted release.

The information contained in this submittal, together with the information provided in prior submittals is sufficient for the NRC to make a determination equivalent to 10 CFR 50.82(a)(11) regarding the lands to be released from the license. Once these lands are so released, it is understood that the NRC will not require any additional surveys or decontamination of these areas unless the NRC determines that the criteria of 10 CFR Part 20, Subpart E were not met and that residual activity remaining on the land could result in a significant threat to public health and safety.

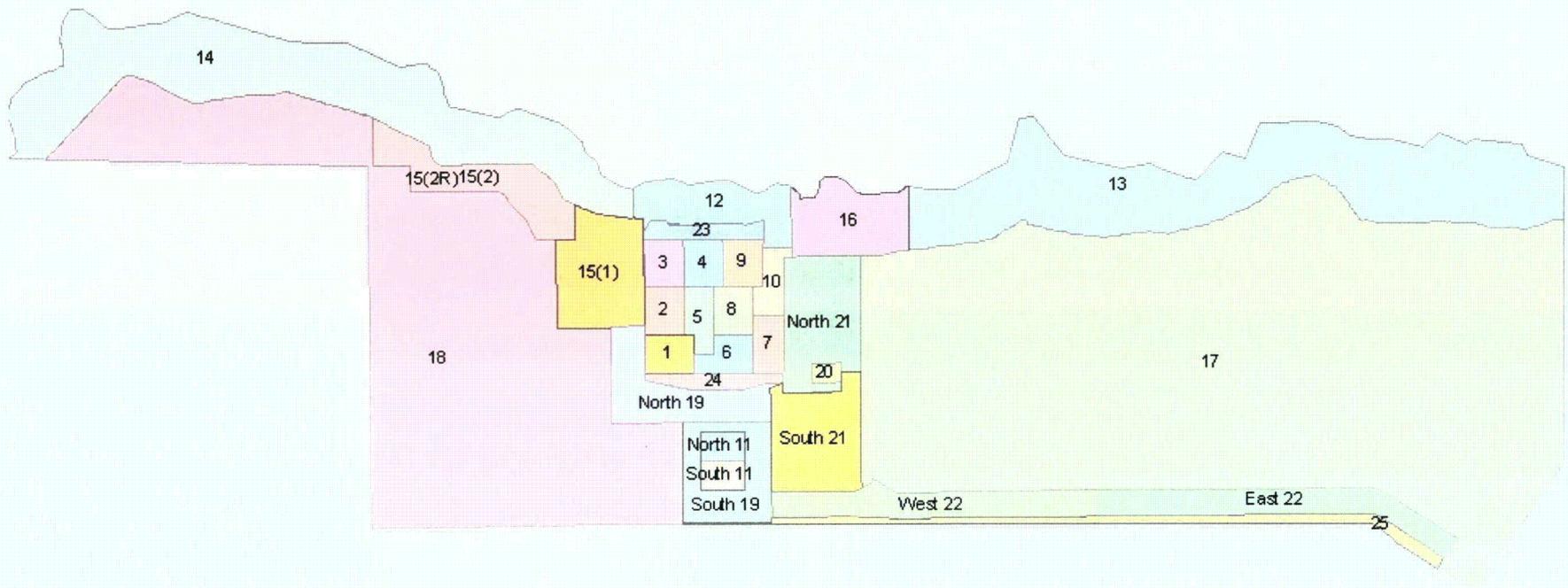
6.0 References

1. Big Rock Point License Termination Plan
2. U.S. Nuclear Regulatory Commission NUREG-1575, Multi-Agency Radiation Survey And Site Investigation Manual (MARSSIM)
3. U.S. Nuclear Regulatory Commission NUREG-1727, NMSS Decommissioning Standard Review Plan

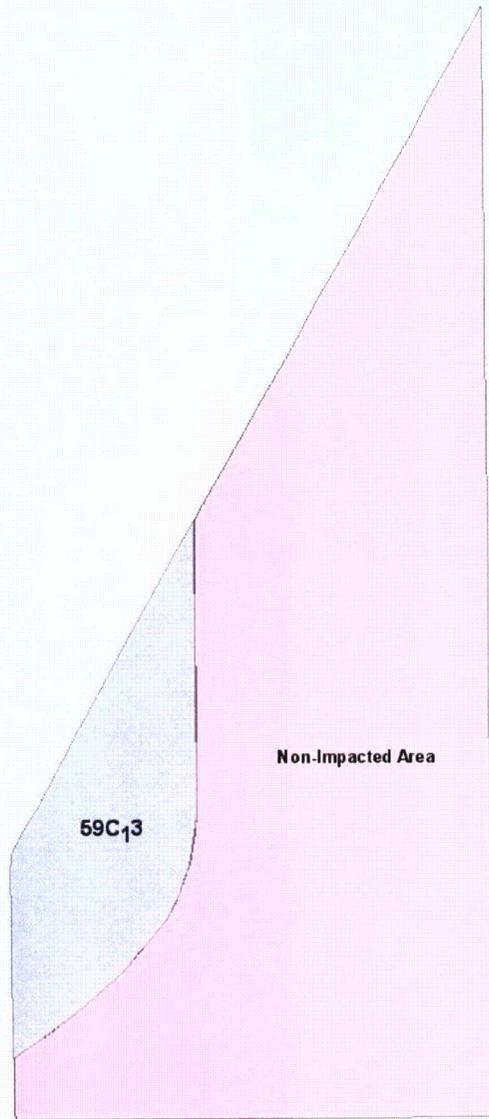
Appendix A – Big Rock Point Impacted and Non-Impacted Areas



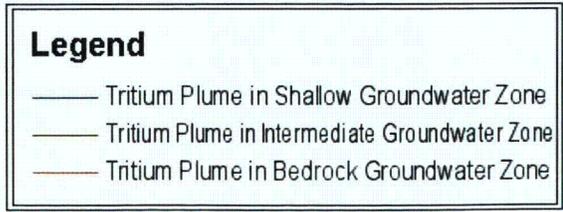
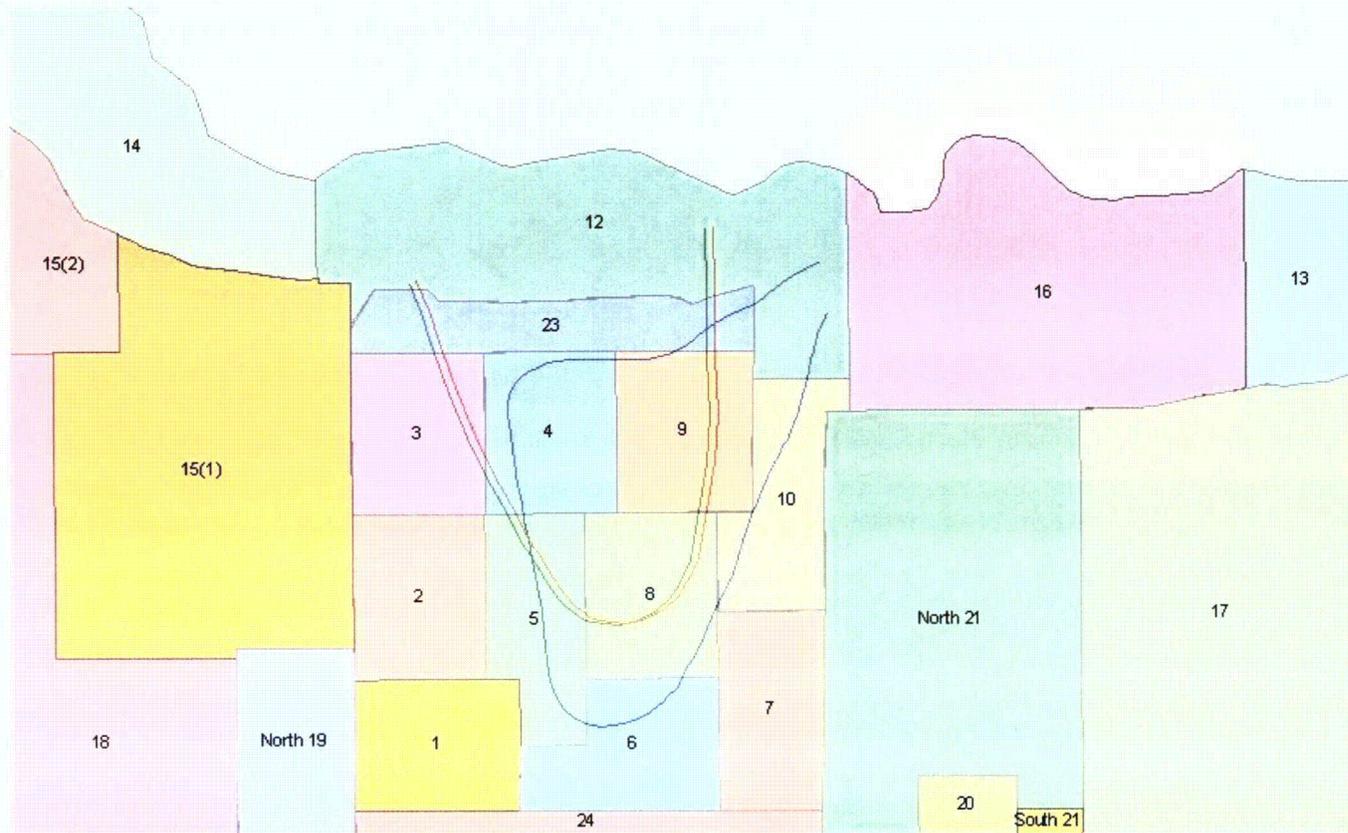
Appendix B – Big Rock Point Final Status Survey Units
1 of 2



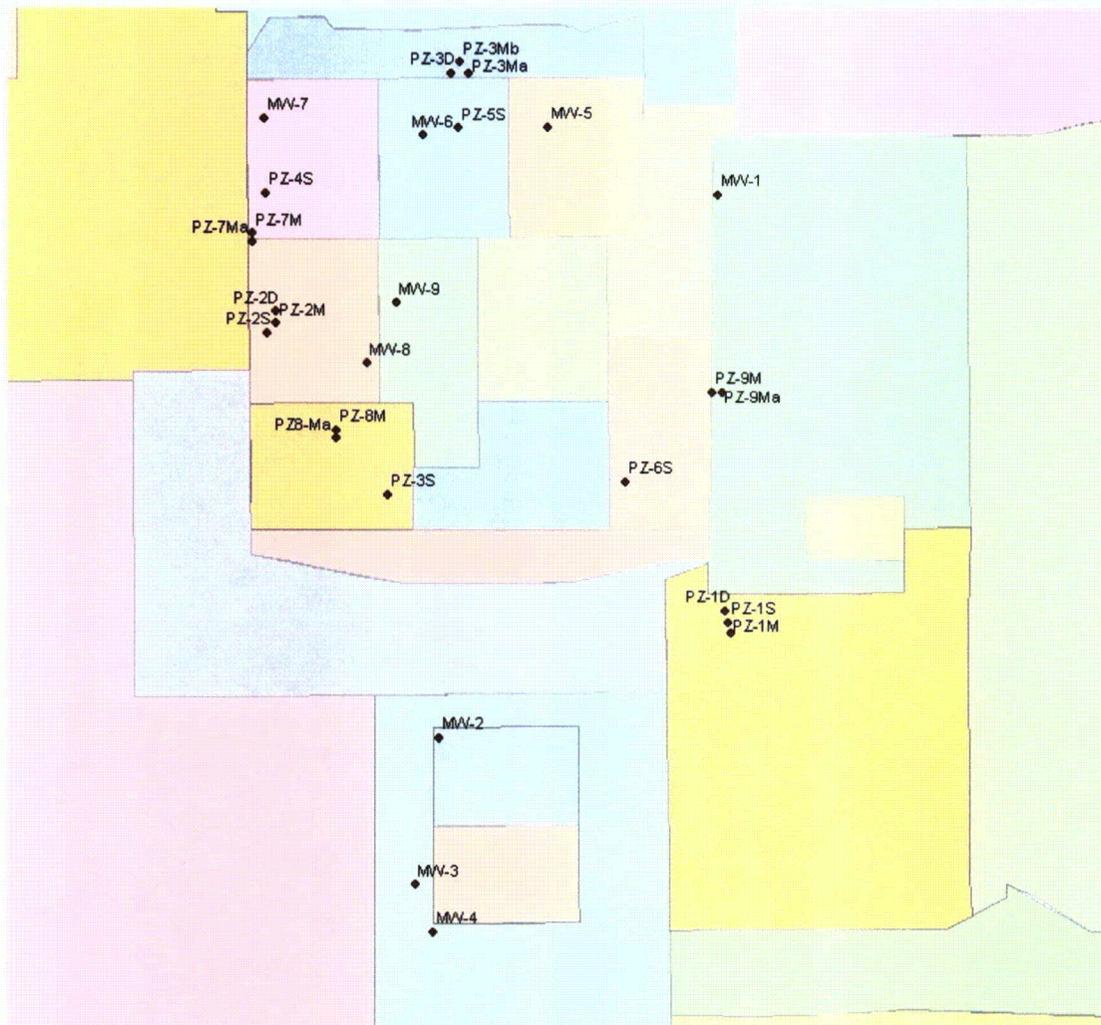
Appendix B – Big Rock Point Final Status Survey Units
2 of 2



Appendix C – Big Rock Point Tritium Plume Map



Appendix D – Groundwater Monitoring Well Locations



Well	Feet (BGL)	Well	Feet (BGL)	Well	Feet (BGL)
MW 1	19.0	PZ-1S	12.0	PZ-1D	86.0
MW 2	24.0	PZ-2S	8.0	PZ-2D	50.0
MW 3	20.0	PZ-3S	9.0	PZ-3D	51.5
MW 4	24.0	PZ-4S	11.5	PZ-7M	23.0
MW 5	24.0	PZ-5S	13.0	PZ-7Ma	33.5
MW 6	19.0	PZ-6S	13.0	PZ-8M	35.0
MW 7	29.0	PZ-1M	30.5	PZ-8Ma	44.0
MW 8	45.0	PZ-2M	25.0	PZ-9M	28.0
MW 9	16.0	PZ-3Ma	32.1	PZ-9Ma	41.0
		PZ-3Mb*	20.0		

* PZ-3Mb also identified as PZ-3M

Appendix E – Final Status Survey Submittal Matrix

Page 1 of 3

SURVEY AREA ¹	RECORD ² NUMBER	SURVEY AREA DESCRIPTION	LETTER DATE
CLASS 1 AREAS – FINAL STATUS SURVEY OF SURFACES			
1	01C ₁ 1	Class 1 Final Status Release Record, South West Protected Area	10/13/06
2	02C ₁ 1	Class 1 Final Status Release Record, West Central Protected Area	10/13/06
3	03C ₁ 1	Class 1 Final Status Release Record, North West Protected Area	10/24/06
4	04C ₁ 1	Class 1 Final Status Release Record, North Central Protected Area	10/10/06
5	05C ₁ 1	Class 1 Final Status Release Record, Central Protected Area	10/24/06
6	06C ₁ 1	Class 1 Final Status Release Record, South Central Protected Area	10/24/06
7	07C ₁ 1	Class 1 Final Status Release Record, South East Protected Area	10/27/06
8	08C ₁ 1	Class 1 Final Status Release Record, East Central Protected Area	10/27/06 Errata 11/2/06
9	09C ₁ 1	Class 1 Final Status Release Record, North East Protected Area	10/13/06
10	10C ₁ 1	Class 1 Final Status Release Record, East Protected Area	10/27/06
11 ³	North11C ₁ 1	Class 1 Final Status Release Record, North Radwaste Staging Area	10/27/06
11	South11C ₁ 1	Class 1 Final Status Release Record, South Radwaste Staging Area	10/31/06
15	15(2R)C ₁ 1	Class 1 Final Status Release Record, Woods Road Storage Area	10/9/06
20	20C ₁ 1	Class 1 Final Status Release Record, East Radwaste Staging Area	10/31/06
23	23C ₁ 1	Class 1 Final Status Release Record, North Protected Area	10/10/06 Errata 11/2/06
24	24C ₁ 1	Class 1 Final Status Release Record, South Protected Area	11/08/06
CLASS 1 AREAS- EXCAVATED SOIL FINAL STATUS SURVEYS⁴			
2	02Cx ₁ 1	Class 1 Final Status Survey, Excavated Soil from Retention Pond Construction	10/9/06
8	08Cx ₁ 1	Class 1 Final Status Survey, Excavated Soil from Turbine Building Subfloor	10/9/06
9	09Cx ₁ 1	Class 1 Final Status Survey, Excavated Soil from Screenhouse Area	10/9/06
9	09Cx ₂ 1	Class 1 Final Status Survey, Excavated Soil from Screenhouse Area	10/9/06
9	09Cx ₃ 1	Class 1 Final Status Survey, Excavated Soil from Screenhouse Area	10/9/06
9	09Cx ₄ 1	Class 1 Final Status Survey, Excavated Soil from Screenhouse Area	10/9/06
9	09Cx ₅ 1	Class 1 Final Status Survey, Excavated Soil from Screenhouse Area	10/9/06
9	09Cx ₆ 1	Class 1 Final Status Survey, Excavated Soil from Screenhouse Area	10/9/06
9	09Cx ₇ 1	Class 1 Final Status Survey, Excavated Soil from Screenhouse Area	10/9/06
11	11Cx ₁ 1	Class 1 Final Status Survey, Excavated Soil from Radwaste Storage Vaults	10/9/06
Slurry ⁵ Wall	Slurry Wall Cx ₁ 1	Class 1 Final Status Survey, Excavated Soil from Slurry Wall Construction	10/9/06
Slurry Wall	Slurry Wall Cx ₂ 1	Class 1 Final Status Survey, Excavated Soil from Slurry Wall Construction	10/9/06
Turbine Building ⁶	TBCx ₁ 1	Class 1 Supporting Survey– Soil Excavated from Turbine Building Demolition Area, Supporting Subsurface Structure and Component Removal	10/9/06

¹ Survey Area Map – Big Rock Point License Termination Plan, Chapter 5, figure 5-3, Initial Land Area Survey Units

² Record Number nomenclature is defined in Procedure RM-76, Final Status Survey Design, step 6.2, Survey Unit Nomenclature

³ Surface of survey unit 11 was divided into North and South areas due to intermediate use of land between the quarry survey and the final surface survey (served as solid Radwaste storage yard in interim.)

⁴ Soils removed from Class 1 Area excavations

⁵ Slurry Wall crossed several survey areas on the east, south, and west sides of the protected area.

⁶ Turbine building excavation was beneath survey areas 5, 6, and 8

Appendix E – Final Status Survey Submittal Matrix
Page 2 of 3

SURVEY AREA¹	RECORD² NUMBER	SURVEY AREA DESCRIPTION	LETTER DATE
Turbine Building	TBCx ₂ 1	Class 1 Supporting Survey– Soil Excavated from Turbine Building Demolition Area, Supporting Subsurface Structure and Component Removal	10/9/06
Turbine Building	TBCx ₃ 1	Class 1 Supporting Survey– Soil Excavated from Turbine Building Demolition Area, Supporting Subsurface Structure and Component Removal	10/9/06
Turbine Building	TBCx ₄ 1	Class 1 Supporting Survey– Soil Excavated from Turbine Building Demolition Area, Supporting Subsurface Structure and Component Removal	10/9/06
Turbine Building	TBCx ₅ 1	Class 1 Supporting Survey– Soil Excavated from Turbine Building Demolition Area, Supporting Subsurface Structure and Component Removal	10/9/06
Turbine Building	TBCx ₆ 1	Class 1 Supporting Survey– Soil Excavated from Turbine Building Demolition Area, Supporting Subsurface Structure and Component Removal	10/9/06
Turbine Building	TBCx ₇ 1	Class 1 Supporting Survey– Soil Excavated from Turbine Building Demolition Area, Supporting Subsurface Structure and Component Removal	10/9/06
Turbine Building	TBCx ₈ 1	Class 1 Supporting Survey – Relocated Soil from Turbine Building/Containment Demolition	10/9/06
Turbine Building	TBCx ₉ 1	Class 1 Supporting Survey – Relocated Soil from Turbine Building/Containment Demolition	10/9/06
Turbine Building	TBCx ₁₀ 1	Class 1 Relocated Soil Supporting Survey Release Record – Relocated Soils from Turbine Building/Containment Demolition	8/24/06
Turbine Building	TBCx ₁₁ 1	Class 1 Relocated Soil Supporting Survey Release Record – Relocated Soils from Turbine Building/Containment Demolition	8/24/06
Turbine Building	TBCx ₁₂ 1	Class 1 Relocated Soil Supporting Survey Release Record – Relocated Soils from Turbine Building/Containment Demolition	9/20/06
Turbine Building	TBCx ₁₃ 1	Class 1 Relocated Soil Supporting Survey Release Record – Relocated Soils from Turbine Building/Containment Demolition	9/20/06
Turbine Building	TBCx ₁₄ 1	Class 1 Relocated Soil Supporting Survey Release Record – Relocated Soils from Turbine Building/Containment Demolition	10/10/06
Turbine Building	TBCx ₁₅ 1	Class 1 Relocated Soil Supporting Survey Release Record – Relocated Soils from Turbine Building/Containment Demolition	10/24/06
CLASS 1 AREAS – FINAL STATUS SURVEY – SUBSURFACE (QUARRY)			
9	09Cq ₁ 1	Class 1 Final Status Survey, Screenhouse Area Excavation	10/9/06
11	11Cq ₁ 1	Class 1 Final Status Survey, Solid Radwaste Storage Area Excavation	10/9/06
Containment ⁷	CSCq ₁ 1	Excavated Surface Supporting Survey Release Record – Base Elevation Survey of Containment Structure Excavation	8/24/06
Circulating Water Piping	CWCq ₁ 1	Excavated Surface Supporting Survey Release Record – Base Elevation Survey of Circulating Water Piping Excavation	8/24/06
Turbine Building	East TBCq ₁ 1	Class 1 Final Status Release Record, Turbine Building East Excavation Surface	4/03/06
Turbine Building	West TBCq ₁ 1	Excavated Surface Supporting Survey Release Record – Base Elevation Survey of the Turbine Building Excavation Following Removal of West-Side Foundations and Subsurface Components	8/24/06
Discharge Canal ⁸	Canal C _{q1} 1	Class 1 Final Status Survey, Discharge Canal	10/9/06

⁷ Containment quarry was beneath survey areas 4, 5, 8, and 9. Circulation Water quarry was beneath survey areas 7, 8, 9, and 10. Turbine Building quarry was beneath survey areas 5, 6, and 8

⁸ Discharge Canal is North East of the Protected Area

Appendix E – Final Status Survey Submittal Matrix
Page 3 of 3

SURVEY AREA¹	RECORD² NUMBER	SURVEY AREA DESCRIPTION	LETTER DATE
CLASS 2 AREAS – FINAL STATUS SURVEY OF SURFACE			
12	12C ₁ 2	Class 2 Final Status Survey Release Record, Shoreline North of the Protected Area	8/24/06
15	15(1)C ₁ 2	Class 2 Final Status Survey Release Record, Eastern Section Woods Road Area	10/30/06
15	15(2)C ₁ 2	Class 2 Final Status Survey Release Record, Central Section Woods Road Area	8/24/06
16	16C ₁ 2	Class 2 Final Status Survey Release Record, Shoreline East of Breakwall	8/24/06
19	North19C ₁ 2	Class 2 Final Status Survey Release Record, North West Transport Route	10/30/06
19	South19C ₁ 2	Class 2 Final Status Survey Release Record, South West Transport Route	11/08/06
21	North21C ₁ 2	Class 2 Final Status Survey Release Record, North East Transport Route	11/08/06
21	South21C ₁ 2	Class 2 Final Status Survey Release Record, South East Transport Route	11/08/06
22	East22C ₁ 2	Class 2 Final Status Survey Release Record, East Powerline Corridor	11/08/06
22	West22C ₁ 2	Class 2 Final Status Survey Release Record, West Powerline Corridor	11/08/06
26	26C ₁ 2	Class 2 Final Status Release Record, Drainage Ditch, South and West of the Industrial Area	1108/06
Septic Drain Field ⁹	DFC ₁ 2	Class 2 Final Status Survey Release Record, Septic Field Drain	8/24/06
CLASS 2 AREAS – EXCAVATED SOIL FINAL STATUS SURVEYS			
12	12Cx ₁ 2	Class 2 Final Status Survey Record, Excavated Soil from Building Construction	10/9/06
19	19Cx ₁ 2	Class 2 Final Status Survey Record, Excavated Soil from Storm Drain Modification	10/9/06
CLASS 3 AREAS – FINAL STATUS SURVEY OF SURFACE			
13	13C ₁ 3	Class 3 Final Status Survey Release Record, Shoreline East of the Industrial Site	8/24/06
14	14C ₁ 3	Class 3 Final Status Survey Release Record, Shoreline West of the Industrial Site	8/24/06
17	17C ₁ 3	Class 3 Final Status Survey Release Record, East Woods Boundary	10/30/06
18	18C ₁ 3	Class 3 Final Status Survey Release Record, Wooded Area West of Industrial Site	10/9/06
25	25C ₁ 3	Class 3 Final Status Survey Release Record, South Woods Boundary	11/08/06
59	59C ₁ 3	Class 3 Final Status Survey Release Record, Soil Storage Area South of US 31	10/9/06

⁹ Septic Field Drain survey area is contained within survey area 15(1)