Consumers Energy

A CMS Energy Company

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

Kurt M. Haas
General Manager

August 10, 2000

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

SUBJECT: **BIG ROCK POINT PLANT**
DOCKET 55-155/LICENSE DPR-6
LICENSE AMENDMENT REQUEST
REVISION TO DEFUELED TECHNICAL SPECIFICATIONS (DTS)
BULK MATERIALS CONTROL PROGRAM (BMCP)

Gentlemen:

A request for amendment of the Big Rock Point Defueled Technical Specifications in accordance with 10 CFR 50.90 is enclosed. The amendment proposes to revise the DTS to incorporate a Bulk Materials Control Program. The Bulk Materials Control Program as proposed defines the radiological survey criteria and licensing requirements for removal and burial of demolition debris from the Big Rock Point site during the decommissioning process.

This submittal is similar to the process provided by the NRC for implementation of NRC Generic Letter 89-01, Implementation of Programmatic and Procedural Controls for Radiological Effluent Technical Specifications. Generic Letter 89-01 allowed implementation of programmatic controls for the Radiological Effluent Technical Specifications (RETS) and Radiological Effluent Monitoring Program (REMP) in the Administrative Controls section of the Technical Specifications. Procedural details of the RETS and REMP were relocated from the Technical Specifications to an Offsite Dose Calculation Manual (ODCM).

Detailed criteria and methodology to implement the proposed Bulk Materials Control Program is contained in a Bulk Materials Control Manual (BMCM). The manual also contains the dose modeling assumptions and bases supporting this amendment request. The BMCM is being submitted along with this amendment in Enclosure 1 for NRC review and approval.

The BMCM is similar in format and level of detail to the existing Big Rock Point ODCM. It is divided into five parts: Part 1 gives the Specifications for implementation of the Bulk Materials Control Program; Part 2 provides the basis, including a detailed description of the methodology, pathways modeling, and radiological assessment; Part 3 lists the record keeping requirements to demonstrate compliance with the Bulk Materials Control Program requirements; Part 4 lists the quality assurance and quality control considerations; and Part 5 gives the reporting requirements for changes to the BMCM.

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Consumers Energy requests approval of the proposed amendment within 12 months of the date of this letter, to be implemented within 60 days of the issuance of the license amendment. These dates have been chosen to ensure that the site can be released for unrestricted use, the environment will not be significantly impacted, and that adequate funds will be available to complete the decommissioning.

In accordance with 10 CFR 50.91, Consumers Energy has made a determination that the proposed amendment request involves no significant hazards consideration. Also, in accordance with 10 CFR 50.82, Consumers Energy has evaluated potential environmental impacts associated with this submittal, and has concluded that there are no significant impacts.

Should you have any questions, please contact Mr. George Petitjean, Licensing Lead and point of contact for NRR at 231-547-8355.

Sincerely,

Kurt M. Haas
Site General Manager

Attachment(s)
1. Affidavit
2. Changes, Discussion, No Significant Hazards/Environmental Impact Determination.
3. Markup of DTS pages to show the proposed changes.
4. Retyped DTS pages.
5. Markup of DTS Bases pages to show the proposed changes.
6. Retyped DTS Bases pages.

Enclosure
1. Bulk Material Control Manual

cc: Regional Administrator, Region III, USNRC
NRC Reactor Decommissioning Inspector, Region III - BRP
NRC Project Manager - OWFN, USNRC

ATTACHMENT 1
CONSUMERS ENERGY COMPANY

Request for Amendment to the Defueled Technical Specifications - Bulk Materials Control Program (BMCP)

Affidavit

CONSUMERS ENERGY COMPANY
LICENSE DPR-6
DOCKET 50-155

Request for amendment to the Defueled Technical Specifications (DTS)

CONSUMERS ENERGY COMPANY

To the best of my knowledge, information and belief, the contents of this submittal are truthful and complete.

By Kurt M. Haas
Site General Manager

Sworn and subscribed to before me this day August 10, 2000.

Jennifer Lynn Helms, Notary Public
Charlevoix County, Michigan

My commission expires August 29, 2003

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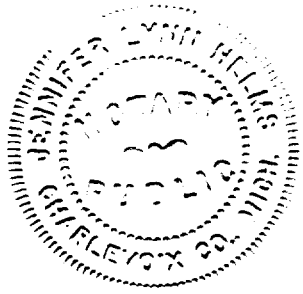

ATTACHMENT 2
CONSUMERS ENERGY COMPANY

Request for Amendment to the Defueled Technical Specifications - Bulk Materials Control Program (BMCP)

Changes, Discussion, No Significant Hazards/Environmental Impact Determination

NUCLEAR REGULATORY COMMISSION
BIG ROCK POINT PLANT
DEFUELED TECHNICAL SPECIFICATION CHANGE REQUEST - BMCP

For the reasons hereinafter set forth, it is requested that the Defueled Technical Specifications (DTS) incorporated in Facility Operating License DPR-6, Docket 50-155, issued to Consumers Energy on May 1, 1964, for the Big Rock Point Plant be changed as described in Section I below:

I. CHANGES

Revised DTS pages are provided in Attachment 3. The proposed changes are shown utilizing the "strikeout" and "shadow" method. The proposed new pages of the DTS are provided in Attachment 4 to this letter. Proposed changes are shown by a vertical line in the right-hand margin.

A. Add a new Definition 1.2 for a BULK MATERIALS CONTROL MANUAL to read:

The BULK MATERIALS CONTROL MANUAL (BMCM) contains the methodology and parameters to control the authorized removal of DEMOLITION DEBRIS for State of Michigan licensed landfill disposal during the decommissioning process. This methodology helps ensure that only RADIOLOGICALLY CLEAN materials are contained in the DEMOLITION DEBRIS released from the site. The BMCM shall also contain the Bulk Materials Control Program required by Section 6.6.2.11.

B. Add a new Definition 1.8 for DEMOLITION DEBRIS to read:

DEMOLITION DEBRIS consists of solid materials associated with demolition of site structures; i.e., concrete debris including rebar, structural steel, sheet metal, roofing materials, foundation concrete and minor amounts of associated dug-up soil. DEMOLITION DEBRIS does not include plant systems or components.

C. Add a new Definition 1.9 for DETECTION CAPABILITY to read:

The DETECTION CAPABILITY is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a bulk container of DEMOLITION DEBRIS that will yield a net count, above system background, for principal gamma emitters that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

D. Add a new Definition 1.17 for RADIOLOGICALLY CLEAN to read:

The term RADIOLOGICALLY CLEAN applies to DEMOLITION DEBRIS which has been radiologically surveyed and determined to be free of licensed radioactive

material (10 CFR Part 20). Material determined to be RADIOLOGICALLY CLEAN shall be disposed of at a State of Michigan licensed landfill in accordance with the Bulk Materials Control Program required by Section 6.6.2.11.

E. Add a new Section 3/4.5 entitled "DEMOLITION DEBRIS Disposal".

F. Add a new LCO Section 3.5.1 with requirements that:

DEMOLITION DEBRIS shall be surveyed prior to release for disposal in a State of Michigan licensed landfill with a bulk container assay system having a DETECTION CAPABILITY for principal gamma emitters of 6 pCi/g for Cobalt-60 or 14 pCi/g for Cesium-137. The DEMOLITION DEBRIS survey shall be in accordance with the Bulk Materials Control Program requirements and the specifications and methodology of the BMCM as required by Section 6.6.2.11.

APPLICABILITY: At all times.

ACTION:

1. With the bulk container assay system DETECTION CAPABILITY less sensitive than required by the above specification, IMMEDIATELY suspend surveying of DEMOLITION DEBRIS by the system and revise the required minimum count time to ensure that the DETECTION CAPABILITY is adequate to meet the requirements of 3.5.1.

2. IF the bulk container assay system detects licensed radioactive material at or above the DETECTION CAPABILITY in a bulk container of DEMOLITION DEBRIS, THEN:

   a. Survey the DEMOLITION DEBRIS to identify the licensed radioactive material, remove the licensed material and re-assay the bulk container, or

   b. Transport the contents of the bulk container as radioactive material to an offsite contractor for secondary waste processing and disposal, or

   c. Dispose of the contents of the bulk container as radioactive waste.

G. Add a new Surveillance Section 4.5.1 with requirements that:

When DEMOLITION DEBRIS is being surveyed, the detection capability shall be verified to be within the limits of this specification as follows:

a. Daily by performing a CHANNEL CHECK.

b. Daily by performing a mathematical CHANNEL CALIBRATION.

H. On line 1 of Section 6.6.2.5.a, revise the word "operability" to the all caps version, "OPERABILITY".

I. On line 1 of Section 6.6.2.5.f, revise the word "operability" to the all caps version, "OPERABILITY".

J. Add a new Section 6.6.2.11 entitled "Bulk Materials Control Program" with requirements that:

A program shall be established, implemented and maintained to control the removal of DEMOLITION DEBRIS from the site for State of Michigan licensed landfill disposal during the decommissioning process. The program shall be contained in the BULK MATERIALS CONTROL MANUAL (BMCM) and shall be implemented and controlled by facility procedures. The program shall include the following elements:

a. Screening requirements for surface contamination levels of bulk materials.

b. Bulk material surveying requirements to ensure that DEMOLITION DEBRIS removed from the site has been determined to be RADIOLOGICALLY CLEAN.

c. Count time requirements for bulk container assay system instrumentation.

d. Record requirements to demonstrate that only RADIOLOGICALLY CLEAN DEMOLITION DEBRIS is released for State of Michigan licensed landfill disposal.

e. Bulk container assay system instrumentation requirements.

f. Administrative controls.

K. Add a new Section Header 6.6.2.12 entitled "BULK MATERIALS CONTROL MANUAL (BMCM)".

L. Add a new Section 6.6.2.12.1 entitled "Changes to the BMCM" with requirements that:

Changes to the BMCM shall become effective after approval by the Site General Manager.

M. Add a new Section 6.6.2.12.2 entitled "Reports" with requirements that:

Changes to the BMCM shall be submitted to the Commission in the Radioactive Effluent Release Report for the period in which the changes were made effective. This submittal shall contain sufficiently detailed information to support the rationale for each change. It shall also include a determination that the change will not result in a decrease in the effectiveness of determining that DEMOLITION DEBRIS is RADIOLOGICALLY CLEAN.

N. Add an additional sentence to Section 6.7.3 entitled "ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT" with requirements that:

Changes to the ODCM, PCP and BMCM shall also be submitted along with the Radioactive Effluent Release Report for the period in which the changes were made effective.

O. Add a new BASES Section Header 3/4.5 entitled "DEMOLITION DEBRIS DISPOSAL".

P. Add a new BASES Section 3.5.1 to read:

10 CFR 20.2001 requires that licensed radioactive material be disposed of only through (1) transfer to an authorized recipient, (2) decay in storage, (3) release in effluents within the limits in §20.1301, or (4) as authorized under §§20.2002, 20.2003, 20.2004, or §20.2005. This Limiting Condition for Operation establishes the DETECTION CAPABILITY for surveying DEMOLITION DEBRIS prior to disposal in a State of Michigan licensed landfill to demonstrate compliance with 10 CFR 20.2001 requirements in accordance with controlled program requirements.

The DETECTION CAPABILITIES established for Cobalt-60 and Cesium-137 are single radionuclide values for either Cobalt-60 or Cesium-137 present at these concentrations. The Cobalt-60 and Cesium-137 radionuclides were chosen because they are the principal gamma emitters most likely to be detected by the bulk container assay system instrumentation. The potential radiological consequence of disposal of DEMOLITION DEBRIS in a State of Michigan licensed landfill with either

Cobalt-60 or Cesium-137 present at the DETECTION CAPABILITY will result in 1 mrem/year or less total effective dose equivalent (TEDE) to an average member of the critical group from all exposure pathways.

The Bulk Materials Control Program (BMCP) established in Section 6.6.2.11 provides additional assurance and an added degree of conservatism beyond the DETECTION CAPABILITY requirements of the bulk container assay system that DEMOLITION DEBRIS released for disposal in a State of Michigan licensed landfill will not contain licensed radioactive material. Under program requirements of the BMCP, structural surfaces will be surveyed for both total and removable contamination by licensed radioactive material prior to demolition of the structures. Also, record requirements to demonstrate that only RADIOLOGICALLY CLEAN DEMOLITION DEBRIS is released for State of Michigan landfill disposal, bulk container assay system instrumentation requirements and administrative controls are established by the BMCP. Section 6.6.2.11 also requires that the BMCP be contained in a BULK MATERIALS CONTROL MANUAL (BMCM).

The BMCM contains the specifications and methodology to ensure that the Limiting Condition for Operation and the BMCP program requirements are appropriately implemented. Part 1 of the BMCM contains the specifications which are to be implemented and controlled by facility procedures. Part 2 contains the methodology for specification implementation. Part 3 contains record requirements, Part 4 QA/QC considerations and Part 5 reporting requirements for changes to the BMCM.

Bulk container assay system instrumentation requirements are established in Part 1 of the BMCM. The bulk container assay system is provided to implement the guidance of Information Notice No. 85-92, Surveys of Wastes Before Disposal from Nuclear Reactor Facilities, for bulk materials monitoring. When DEMOLITION DEBRIS is collected in a bulk container, the accumulation of small amounts of contamination that have escaped detection during the surface contamination surveying may be detected using a bulk container assay system that is sensitive to gamma radiation (e.g., by using sensitive high purity germanium detectors in a low-background area).

The bulk container assay system consists of three high purity germanium detectors and gamma spectroscopy operating system hardware and software. Part 1 of the BMCM establishes bulk container assay system instrumentation channel OPERABILITY requirements and surveillance requirements.

The methodology contained in Part 2 of the BMCM ensures that the bulk container assay system meets the DETECTION CAPABILITY specified in the Limiting Condition for Operation. The DETECTION CAPABILITY specified for Cobalt-60

and Cesium-137 assumes that only one of these radionuclides are potentially present in the DEMOLITION DEBRIS. If more than one radionuclide are potentially present in the DEMOLITION DEBRIS, the BMCM Part 2 methodology requires the calculation of new minimum detectable concentrations of principal gamma emitters for the bulk container assay system to ensure that the potential radiological consequence of disposal of DEMOLITION DEBRIS will not result in a TEDE dose of 1 mrem/year or more to an average member of the critical group from all exposure pathways. This methodology also accounts for the potential presence of hard-to-detect radionuclides such as low energy beta and/or alpha emitters which may also contribute to TEDE dose in the presence of gamma emitters detectable by the bulk container assay system.

The BMCM Part 2 methodology is based on an evaluation of potential exposure to an average member of the critical group from three potential exposure pathway scenarios. These three scenarios include a resident/farmer scenario which could develop after closure of the State of Michigan licensed landfill (50 years after disposal of the DEMOLITION DEBRIS), landfill worker potential exposure during DEMOLITION DEBRIS disposition at the landfill and a transportation scenario for potential driver exposure during transportation of the DEMOLITION DEBRIS to the State of Michigan licensed landfill.

The ACTION requirements of this specification ensure that no licensed radioactive material at or above the DETECTION CAPABILITY of the bulk container assay system is included in containers of DEMOLITION DEBRIS released for disposal in a State of Michigan licensed landfill. Any licensed radioactive material identified at or above the DETECTION CAPABILITY will be appropriately dispositioned as radioactive waste in accordance with the requirements of 10 CFR 20, Subpart K.

Q. Add a new BASES Section 4.5.1 to read:

This specification ensures that the detection capability is verified daily when DEMOLITION DEBRIS is being surveyed.

R. Renumber or re-letter paragraphs as shown in Attachment 3 and/or 4.

II. DISCUSSION

A. **Add a new Definition 1.2 for a BULK MATERIALS CONTROL MANUAL.**

The addition of this new definition is needed to support the establishment of a new Bulk Materials Control Program (BMCP) in Administrative Controls Section 6.6.2.11. The Bulk Materials Control Manual (BMCM) contains the methodology and parameters to control the authorized removal of demolition debris for State of Michigan licensed landfill disposal during the decommissioning process. This methodology ensures that only radiologically clean materials are contained in the demolition debris released from the site.

B. **Add a new Definition 1.8 for DEMOLITION DEBRIS.**

The addition of this new definition is needed to define the scope of materials to which this applies.

C. **Add a new Definition 1.9 for DETECTION CAPABILITY.**

The addition of this new definition is needed to provide minimum performance criteria on the bulk container assay system's capability to identify principal gamma emitters. The definition that the DETECTION CAPABILITY is "the smallest concentration of radioactive material in a bulk container of DEMOLITION DEBRIS that will yield a net count, above system background, for principal gamma emitters that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal" is an industry accepted performance standard for gamma emitter identification. This DETECTION CAPABILITY has also been provided in NRC guidance documents.

D. **Add a new Definition 1.17 for RADIOLOGICALLY CLEAN.**

The addition of this new definition is needed to support the establishment of a new BMCP in Administrative Controls Section 6.6.2.11. The existing regulations established in 10 CFR 20 do not define the conditions under which demolition debris that has resided or been utilized within a Restricted Area of a nuclear power plant may be determined to be clean (i.e., absent of licensed radioactive material). The term radiologically clean is defined to apply to demolition debris which has been surveyed and approved for removal to State of Michigan licensed landfill disposal in accordance with the BMCP required by Section 6.6.2.11.

E. **Add a new Section 3/4.5 entitled "DEMOLITION DEBRIS Disposal".**

F. **Add a new LCO Section 3.5.1.**

This Limiting Condition for Operation (LCO) establishes DETECTION CAPABILITIES for Cobalt-60 and Cesium-137 in DEMOLITION DEBRIS. The concentration values are for either Cobalt-60 or Cesium-137 present at these concentrations. The Cobalt-60 and Cesium-137 radionuclides were chosen because they are the principal gamma emitters most likely to be detected by the bulk container assay system instrumentation. The potential radiological consequence of disposal of DEMOLITION DEBRIS in a State of Michigan licensed landfill with either Cobalt-60 or Cesium-137 present at the DETECTION CAPABILITY will result in 1 mrem/year or less total effective dose equivalent (TEDE) to an average member of the critical group from all exposure pathways.

The ACTION requirements of this specification ensure that no licensed radioactive material at or above the DETECTION CAPABILITY of the bulk container assay system is included in containers of DEMOLITION DEBRIS released for disposal in a State of Michigan licensed landfill. Any licensed radioactive material identified at or above the DETECTION CAPABILITY will be appropriately dispositioned as radioactive waste in accordance with the requirements of 10 CFR 20, Subpart K.

G. **Add a new Surveillance Section 4.5.1.**

This specification ensures that the surveillance activities associated with the LCO have been performed for each container of DEMOLITION DEBRIS prior to release for disposal in a State of Michigan licensed landfill. Furthermore, the additional specifications contained in Part 1 of the BMCM ensure that structural surfaces are surveyed for both total and removable contamination by licensed radioactive material prior to demolition and the generation of containers of DEMOLITION DEBRIS.

H. **On line 1 of Section 6.6.2.5.a, revise the word "operability" to the all caps version, "OPERABILITY".**

This is an editorial change.

I. **On line 1 of Section 6.6.2.5.f, revise the word "operability" to the all caps version, "OPERABILITY".**

This is an editorial change.

J. **Add a new Section 6.6.2.11 for a Bulk Materials Control Program.**

The existing regulations established in 10 CFR 20 do not define the conditions under which demolition debris that has resided or been utilized within a Restricted Area of a nuclear power plant may be determined to be clean (i.e., absent of licensed radioactive material). The requirements contained in proposed Section 6.6.2.11 ensure that a program will be established, implemented and maintained to control the removal of demolition debris from the site for State of Michigan licensed landfill disposal during the decommissioning process. The program is to be contained in the BMCM and implemented and controlled by facility procedures.

K. **Add a new Section Header 6.6.2.12 for BULK MATERIALS CONTROL MANUAL (BMCM).**

L. **Add a new Section 6.6.2.12.1 for Changes to the BMCM.**

This section allows changes to be made to the BMCM by the Big Rock Point Plant after appropriate review and approval by the Site General Manager. The process is consistent with the existing DTS controls for changes to the Offsite Dose Calculation Manual (ODCM) and the Process Control Program (PCP).

M. **Add a new Section 6.6.2.12.2 for Reports.**

This section requires that changes made to the BMCM be submitted to the Commission on an annual basis along with submittal of the Radioactive Effluent Release Report for the period in which the changes were made effective. The submittal is required to contain sufficiently detailed information to support the rationale for each change and it is also required to include a determination that the change will not result in a decrease in the effectiveness of determining that demolition debris is radiologically clean.

N. **Add an additional sentence to Section 6.7.3 for Annual Radioactive Effluent Release Report.**

This additional requirement assures that changes to the ODCM, PCP and BMCM will be submitted along with the Radioactive Effluent Release Report for the period in which the changes were made effective.

O. **Add a new BASES Section Header 3/4.5 entitled "DEMOLITION DEBRIS DISPOSAL".**

P. **Add a new BASES Section 3.5.1.**

This section provides the BASES for establishing a LCO for bulk container assay system DETECTION CAPABILITY and for surveying DEMOLITION DEBRIS in accordance with the Bulk Materials Control Program requirements. It also provides the BASES for actions to be taken if the LCO requirements cannot be achieved.

Q. **Add a new BASES Section 4.5.1.**

This section provides the BASES for SURVEILLANCE REQUIREMENTS of bulk containers of DEMOLITION DEBRIS.

R. **Renumber or re-letter paragraphs as shown in Attachment 3 and/or 4.**

It logically follows that existing paragraphs will require renumbering or re-lettering as shown in Attachment 3 and/or 4 to accommodate introduction of the new sections identified above.

S. Description of the Change Request

For the reasons hereinafter set forth, Consumers Energy requests that the Defueled Technical Specifications incorporated in the Facility Operating License DPR-6, Docket 50-155, for the Big Rock Point Plant be amended as proposed.

The amendment allows Consumers Energy to establish a Bulk Materials Control Program in the Administrative Controls section of the DTS for the removal of demolition debris originating from decommissioning activities at the Big Rock Point Plant to a State of Michigan licensed landfill for disposal. The BMCP contributes to the assurance that only radiologically clean materials are released from the site. The request is justified in the analysis discussed in the later sections of this document. The BMCP is technically supported by the Bulk Materials Control Manual (BMCM), which defines the methodology and the technical basis for implementation of the BMCP. The BMCM also provides calculated Clean Disposal Levels (CDLs) for individual radionuclides in the demolition debris. The analysis ensures that there is a 95% probability that materials released from the site do not contain licensed radioactive material. Furthermore, the analysis shows that, if all materials were released at the proposed DTS limit of 6 pCi/g for Cobalt-60 or 14 pCi/g for Cesium-137, maximum potential dose to an average member of the critical group will not exceed 1 mrem/y total effective dose equivalent (TEDE).

Both surficial screening of structural surfaces prior to demolition and volumetric monitoring requirements for demolition debris are contained in the BMCM. The surficial screening requirements address the surface monitoring guidance for materials to be released from nuclear power plants contained in IE Circular 81-07, Control of Radioactively Contaminated Material. The volumetric monitoring requirements are specified in terms of CDLs derived and based on the analyses contained in the BMCM. The bulk container assay system, used to assure that the CDLs are not exceeded, provides a final volumetric measurement of aggregated wastes and serves as the final release survey for landfill disposal of the demolition debris. This serves to address the recommendation of Information Notice No. 85-92, Surveys of Wastes Before Disposal From Nuclear Reactor Facilities, that final measurements of aggregated wastes be performed to ensure that there has not been an accumulation of licensed material resulting from a buildup of multiple, nondetectable quantities.

T. Background

By letters dated June 18, 1997, and June 26, 1997, Consumers Energy notified the NRC, pursuant to 10 CFR 50.82(a)(1)(i), that Big Rock Point Plant would permanently cease operation on August 30, 1997. On August 29, 1997, the reactor was permanently shutdown, ending 35 years of electric power generation. On September 22, 1997, another letter was forwarded to the NRC certifying that the fuel has been removed from the reactor vessel and placed in the spent fuel pool for storage.

The Big Rock Point Nuclear Plant site is located on the northeast shore of Lake Michigan in Charlevoix County in the northern part of Michigan's Lower Peninsula. The site is approximately 60 miles northeast of Traverse City, Michigan, and about 4 miles north of the small town of Charlevoix along US Route 31.

The reactor at the Big Rock Point Plant was of relatively small size (67 MWe) and contained a significantly small radioactive source term, only about 10% that of a standard boiling water reactor (BWR). Consumers Energy's goal is to dismantle the Big Rock Point Plant in a safe, environmentally conscious, and cost effective manner. This action will result in the timely removal of the existing nuclear plant in accordance with the DECON option found acceptable to the NRC in its Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, NUREG-0586. Decommissioning activities started in June 1997, and are expected to culminate at the end of year 2004 after which its Part 50 license will be terminated.

As a part of the decommissioning process, Consumers Energy plans to dismantle the individual structures when they are empty and when they have been decontaminated

and radiologically surveyed, as required. It is estimated that a total 84.5 million lb of concrete debris will originate from the decommissioning project. Approximately one half of this is non-impacted (i.e., has never had the potential for neutron activation or to be exposed to licensed radioactive materials). The other half has a potential to contain residual surface activity and/or neutron activation products in a limited quantity. This submission deals with the disposition of demolition debris from the Big Rock Point decommissioning.

U. Justification

In 10 CFR 20, Subpart K, §20.2001 requires that licensed radioactive material be disposed of only through (1) transfer to an authorized recipient, (2) decay in storage, (3) release in effluents within the limits in §20.1301, or (4) as authorized under §§20.2002, 20.2003, 20.2004, or §20.2005. Subpart K does not provide a regulatory basis for demonstrating the absence of licensed radioactive materials when they could potentially exist. This proposed DTS amendment establishes the detection capability for surveying demolition debris to demonstrate compliance with 10 CFR 20.2001 requirements in accordance with controlled program requirements prior to disposal in a State of Michigan licensed landfill.

At the present, there are no NRC-defined environmental release levels for solid effluents similar to the liquid and gaseous effluents. The NRC has been engaged in evaluating the need for rulemaking or additional guidance; however, it is not certain if or when a rulemaking process may be completed. In the interim, applications to the NRC are made and reviewed (by the NRC) on a case-by-case basis. As published by the NRC staff in SECY-94-221 and endorsed by the Commission, "release of material and equipment from licensed facilities is determined on a case-by-case basis using the following existing guidance and practices: radiation surveys to document the absence of licensed radioactive material; the general guidance contained in Regulatory Guide 1.86 or the similar guidance issued by NMSS; and site-specific technical specifications and license conditions." ... "The staff continues to review such requests on a case-by-case basis with the general objective of ensuring individual doses to workers and members of the public would remain a small fraction of the public dose limit in 10 CFR Part 20 (e.g., no more than a few millirem/yr dose to the average member of the Critical Population Group) and collective doses that are suitably small and As Low As is Reasonably Achievable."

For demolition debris at Big Rock Point (BRP), there are basically three decommissioning options.

(1) License termination with structures intact

This option would involve removal of licensed radioactive materials from the existing structures to residual radioactivity levels acceptable for termination of the license. Verification of achieving these residual radioactivity levels would require conducting a final status survey (FSS) for license termination on the remaining structures as well as the site environs. Specific disadvantages for application of this option at the Big Rock Point Plant include a delay in our management's environmental stewardship goal and commitment for restoration of the site. This option would also result in an increased expenditure of ratepayer decommissioning funds necessary to perform a much expanded FSS and demobilization followed by remobilization of the construction work force necessary for ultimate removal of site structures.

(2) Demolition followed by license termination

This option is similar to license termination with structures intact. Removal of licensed radioactive materials from existing structures to residual radioactivity levels acceptable for license termination with unrestricted access would still be performed. However, prior to performing the FSS, the remaining structures would be demolished and the concrete rubble left on site. The FSS would then be performed on the site environs. After license termination, the concrete rubble could be used as construction fill or disposed of in a State of Michigan licensed landfill facility. While this methodology appears to be able to meet all NRC requirements and public health and safety goals, the disadvantages are that the debris is not stabilized over the long-term context. Furthermore, redevelopment of the site after license termination for other uses will also mean that debris may have to be removed at some later date and relocated to another location on-site or off-site.

Specific disadvantages for application of this option are similar to those for Option (1) but with somewhat of a reduced increase in expenditure of ratepayer decommissioning funds.

(3) Demolition and disposal followed by license termination

This option would also involve removal of licensed radioactive materials from the existing structures to residual radioactivity levels acceptable for termination of the license. However, prior to performing the FSS, the remaining structures would be demolished and the concrete rubble disposed of in a State of Michigan licensed landfill facility. After removal of all

demolition debris, the FSS would then be performed on the site environs, the license terminated by the NRC and the site released for unrestricted future use. This option is the most cost-effective use of ratepayer decommissioning funds and will result in the most expedient environmental restoration of the site.

While the structures can be left on-site and included in the final status survey and site license termination, the option that is most attractive to Consumers Energy and the public stakeholders is the disposition of demolition debris in a landfill prior to license termination, i.e., Option (3). Big Rock Point has selected Option (3) as the preferred option. The criteria used in the License Termination Rule for termination of the site license is a TEDE of 25 mrem/y. In comparison, the TEDE of this submission for Option (3)(demolition debris disposal in a State of Michigan licensed landfill) is 1 mrem/y. Therefore, selection of Option (3) is protective of the public health and safety, is consistent with As Low as Reasonably Achievable (ALARA), as well as being most cost-effective.

Consumers Energy is committed to conducting and completing decommissioning safely, cost efficiently and consistent with all regulatory requirements. Furthermore, Consumers Energy has determined that it is in the best interest to restore the site to greenfield conditions. The decision related to restoring the site to greenfield conditions is based on what is required by the regulations and what is good for the public health and safety. In addition, given the location of the site on the shore of Lake Michigan, the land is a valuable resource to the company and to the citizens of the area.

The commitment to restore the site to greenfield conditions also means that when the decommissioning process has been completed, all former structures will have been removed and the site will be available for future use without any radiological restrictions. The demolition debris that will originate from the demolition and removal of structures at the Big Rock Point Plant are included in this submission. These consist of demolition concrete debris including rebar, the roofing materials and the soils associated with digging up the foundations.

While Options (1) and (2) can be conducted under 10 CFR 20, Subpart E, Option (3) has to be conducted under Subpart K. Although Subpart E allows small quantities of detectable licensed material to be left onsite for license termination, until the license is terminated, no amount of licensed material may be released from the site unless it is authorized under Subpart K. This license amendment is a practical way for disposition of the demolition debris. It is consistent with protecting the public health and safety, keeping any potential exposures ALARA, and decommissioning the Big Rock Point Plant.

The planned final disposition of the demolition debris approved for release is a State of Michigan licensed landfill. Licensed landfills in Michigan have to meet certain State of Michigan standards which are strict in their requirements with respect to capping and long-term stability. These standards include but are not limited to:

- location restrictions,
- composite liner,
- leachate collection and removal systems,
- leak detection systems,
- daily 6 inch interim soil covers,
- explosive gas control and monitoring,
- groundwater monitoring,
- final cover composite liner designed to minimize infiltration and erosion, and
- post closure care and monitoring for not less than 30 years.

State of Michigan landfills are engineered, maintained and controlled to preclude adverse impact on public health and safety or the environment.

Consumers Energy has determined that Option (3) is the most conservative option from public health and safety perspective and potential impact on the environment. About half of the concrete rubble is estimated to be clean and below the minimum detection levels of available bulk assay radiation detection systems. In addition, comprehensive analyses were conducted in the program and are included in the BMCM. These analyses ensure that the concrete rubble disposed of in a State of Michigan licensed landfill meeting BMCM dose modeling assumptions would not lead to a TEDE of greater than 1 mrem/y to an individual member of the critical group, even if very conservative assumptions are made as described in the BMCM. This determination supports the proposed amendment establishing an LCO for bulk container assay system detection capability and follows the NRC staff guidance presented in SECY-94-221.

V. Consultation with the State of Michigan

The State of Michigan was included early on in the development process for the approach taken in the BMCM through consultation with the Michigan Department of Environmental Quality. The state has been supportive of the concepts embodied within the BMCM.

Relevant state laws (Michigan Public Acts 434, 435, and Act 113 (and the Amendment, Act 12)) were considered by Consumers Energy in the development of this license amendment and establishment of the BMCP. With an approved DTS

revision and the approved clean disposal level methodology, the demolition debris that meets the CDL requirements will be released from the site and will be considered satisfying the requirements of relevant State of Michigan laws.

Both municipal and industrial landfills have to meet State of Michigan standards, which are strict in their requirements with respect to capping, leachate collection, and long-term stability. These standards are described in the BMCM and were used in the pathways dose analysis for this submittal.

III. ANALYSIS OF NO SIGNIFICANT HAZARDS EVALUATION

Consumers Energy finds, that activities associated with this change request involve no significant hazards (10 CFR 50.92(c)). The following evaluation in conjunction with the foregoing discussion supports that finding.

1. Will the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   The proposed amendment involves only the removal of radiologically clean demolition debris from the site for disposal in a State of Michigan licensed landfill and does not affect the probability or consequences of an accident previously analyzed. No highly contaminated or irradiated materials that can result in significant releases will be handled by this program. As stated in the Big Rock Point Updated Final Hazards Summary Report (UFHSR), with the reactor shutdown and permanently defueled, fuel handling accidents bound all other categories of accidents with respect to the potential for offsite doses. Non-fuel related events which could occur as a result of decommissioning operations were assessed, compared against the Generic Environmental Impact Statement (GEIS) and found to be within the bounds of the generic analysis.

   Demolition debris released from the site for landfill disposal will have to meet both surficial screening acceptance criteria of 5000 dpm/100 cm^2 total activity and 1000 dpm/100 cm^2 removable contamination as well as bulk monitoring volumetric requirements. The bulk monitoring volumetric requirements implement the proposed detection capability limiting condition for operation and are established by clean disposal level (CDL) radionuclide concentrations potentially present in demolition debris. These CDLs are derived based on very conservative pathway analyses and ensure that total effective dose equivalent (TEDE) to an individual member of the critical group will not exceed 1 mrem/y. The pathways analyzed include a resident/farmer scenario becoming effective after landfill closure, a landfill worker scenario during demolition debris disposition and a demolition debris transportation (for up to 100 miles) scenario.

   Demolition debris will not be processed or recycled for any other use. It will be removed from the site only for disposal in a State of Michigan licensed landfill located within 100 miles of the Big Rock Point site. The landfill will meet certain

State of Michigan standards which are strict in their requirements with respect to capping and long-term stability. These standards include but are not limited to:

- location restrictions,
- a composite liner,
- leachate collection and removal systems,
- leak detection systems,
- daily 6 inch interim soil covers,
- explosive gas control and monitoring,
- groundwater monitoring,
- final cover composite liner designed to minimize infiltration and erosion, and
- post closure care and monitoring for not less than 30 years.

These conditions ensure that any activities related to the removal of demolition debris will fall within the analysis boundaries of the Bulk Materials Control Manual (BMCM).

2. Will the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   The proposed change does not modify any systems. It does not involve fuel handling. It involves only the demolition debris and its removal from the site for landfill disposal if it meets the radiologically clean material criteria contained in the proposed detection capability limiting condition for operation Technical Specification Change and based on the analyses in BMCM.

   Any potential exposure hazards related to a landfill worker and a transportation worker have been analyzed in the BMCM. From these results, it is concluded that there is no possibility of new or different kind of accident from any accident previously analyzed.

3. Will the proposed change involve a significant reduction in the margin of safety?

   The proposed change only deals with the radiological survey and disposal of demolition debris and does not involve the plant systems. The potential exposure hazards have been analyzed in the BMCM and the implementation procedures will ensure that the requirements are strictly followed. There is no reduction in the margin of safety as described in the facilities licensing basis or generic material/information applicable to this submittal.

IV. ANALYSIS OF NO SIGNIFICANT ENVIRONMENTAL IMPACTS EVALUATION

Consumers Energy finds, in compliance with 10 CFR 50.82(a)(6)(ii), that activities associated with this change request involve no significant environmental impacts. The following evaluation in conjunction with the foregoing discussion supports that finding.

1. Will the proposed change result in significant environmental impacts not previously reviewed?

   No significant environmental impacts are expected from the disposal of radiologically clean demolition debris in a State of Michigan licensed landfill. Total volume of waste projected for Big Rock Point Plant decommissioning is 612,100 cubic feet including 72,100 cubic feet of radioactive waste and 540,000 cubic feet of demolition debris. In comparison, NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" (GEIS) lists a volume for the reference boiling water reactor (BWR) of 662,500 cubic feet, including disposable containers.

   Although the GEIS evaluation of waste disposal volumes did not address the removal and disposal of non-radioactive structures and materials beyond that necessary to terminate the NRC license, the volume of waste evaluated in the GEIS (662.500 cubic feet) exceeds the total waste volume (including demolition debris and radioactive waste) projected for Big Rock Point Plant decommissioning of 612,100 cubic feet.

   Non-radiological environmental impacts evaluated in the GEIS included:

   - demography and human activities in the area,
   - hydrology,
   - aquatic resources/ecosystems in the area surrounding the plant site,
   - terrestrial resources,
   - endangered and threatened species,
   - land use,
   - air pollution control requirements,
   - water pollution control requirements,
   - hazardous materials and waste control,
   - occupational safety, and
   - public safety.

Radiological environmental impacts evaluated in the GEIS included:

- occupational radiation exposure,
- radiation exposure to the public,
- radioactive waste management systems,
- liquid radioactive effluents, and
- airborne radioactive effluents.

The GEIS concludes that the major environmental impact of decommissioning is the commitment of small amounts of land for waste burial in exchange for reuse of the facility and site for other purposes. Since in many instances, such as at a reactor facility, the land is a valuable resource, return of this land to the commercial or public sector is highly desirable. Therefore, the GEIS evaluation bounds disposal of all Big Rock Point Plant demolition debris including the clean demolition debris verified by this program.

V. CONCLUSION

The Big Rock Point Safety Review Committee has reviewed this request for amendment of the Defueled Technical Specifications and has determined that this proposed change does not involve significant hazards consideration. This proposed change has also been reviewed and approved by the Nuclear Performance Assessment Department. A copy of this proposed change request has also been sent to the State of Michigan official designated to receive such proposed Amendments to Appendix A of the Big Rock Point Facility Operating License.

ATTACHMENT 3
CONSUMERS ENERGY COMPANY

Request for Amendment to the Defueled Technical Specifications - Bulk Materials Control Proram (BMCP)

Markup of DTS pages to show the proposed changes

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1.0 DEFINITIONS

1.1 ACTION

ACTION shall be that part of a specification which prescribes remedial measures required under designated conditions.

1.2 BULK MATERIALS CONTROL MANUAL (BMCM)

The BULK MATERIALS CONTROL MANUAL (BMCM) contains the methodology and parameters to control the authorized removal of DEMOLITION DEBRIS for State of Michigan licensed landfill disposal during the decommissioning process. This methodology helps ensure that only RADIOLOGICALLY CLEAN materials are contained in the DEMOLITION DEBRIS released from the site. The BMCM shall also contain the Bulk Materials Control Program required by Section 6.6.2.11.

~~1.2~~ 1.3 CERTIFIED FUEL HANDLER

CERTIFIED FUEL HANDLER, is an individual who is qualified in accordance with BRP Program D25.1, "Certified Fuel Handler Initial Certification Program."

~~1.3~~ 1.4 CHANNEL CALIBRATION

A CHANNEL CALIBRATION is the adjustment as necessary, of the channel output such that the channel responds with the necessary range and accuracy to known values of the parameter which the channel monitors. The CHANNEL CALIBRATION shall encompasses the entire channel including the sensor and alarm and/or trip functions, and includes the CHANNEL FUNCTIONAL TEST. The CHANNEL CALIBRATION may be performed by any series of sequential, overlapping, or total channel steps such that the entire channel is calibrated.

~~1.4~~ 1.5 CHANNEL CHECK

A CHANNEL CHECK is the qualitative assessment of channel behavior during operation by observation. This assessment shall include, where possible comparison of the channel indication and/or status with other indications and/or status derived from independent instrumentation channels measuring the same parameter.

1.0 DEFINITIONS

~~1.5~~ 1.6 CHANNEL FUNCTIONAL TEST

A CHANNEL FUNCTIONAL TEST is the injection of a simulated signal into the channel as close to the sensor as practicable to verify OPERABILITY, including alarm and trip functions.

~~1.6~~ 1.7 CONTAINMENT CLOSURE

CONTAINMENT CLOSURE is that condition of containment in which there are no direct paths from containment atmosphere to the outside atmosphere, except for the containment ventilation inlet and exhaust valves, which may be open if at least one exhaust fan is in operation. Leak tightness is not required for CONTAINMENT CLOSURE to exist.

1.8 DEMOLITION DEBRIS

DEMOLITION DEBRIS consists of solid materials associated with demolition of site structures; i.e., concrete debris including rebar, structural steel, sheet metal, roofing materials, foundation concrete and minor amounts of associated dug-up soil. DEMOLITION DEBRIS does not include plant systems or components.

1.9 DETECTION CAPABILITY

The DETECTION CAPABILITY is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a bulk container of DEMOLITION DEBRIS that will yield a net count, above system background, for principal gamma emitters that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

~~1.7~~ 1.10 DIRECT PATH

A DIRECT PATH is a visually observable opening which permits the free exchange of air between containment and the environs. Equipment configurations or an engineered feature such as a closed valve, check valve, water seal, closed door, membrane layer, or securely fastened plate may be used to preclude direct paths. Redundancy of engineered features to eliminate direct paths is not required.

~~1.8~~ 1.11 FUEL HANDLING

FUEL HANDLING means the activities associated with moving spent nuclear fuel, including moving the 24 ton fuel transfer cask when it contains spent fuel. When spent nuclear fuel is contained in a closed and sealed permanent storage cask or

associated transfer device, the activities associated with moving the cask or device when it is outside the Spent Fuel Pool Area are not to be considered FUEL HANDLING.

~~1.9~~ 1.12 IMMEDIATELY

When "IMMEDIATELY" is used as a completion time for a required ACTION, the ACTION should be pursued without delay and in a controlled manner.

~~1.10~~ 1.13 MONITORING STATION

The MONITORING STATION is the facility which has monitoring, alarming, data archiving and limited control capabilities for selected system parameters during the decommissioning process. The Control Room shall remain the MONITORING STATION until such time as a new facility is activated to serve this function.

~~1.11~~ 1.14 OFFSITE DOSE CALCULATION MANUAL (ODCM)

The OFFSITE DOSE CALCULATION MANUAL (ODCM) contains the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm and trip setpoints, and in the conduct of the Radiological Environmental Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring programs required by Sections 6.6.2.5 and 6.6.2.6 and (2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Annual Radioactive Effluent Release Reports required by Specifications 6.7.2 and 6.7.3.

~~1.12~~ 1.15 OPERABLE - OPERABILITY

A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s) and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its safety function(s) are also capable of performing their related support function(s).

~~1.13~~ 1.16 PROCESS CONTROL PROGRAM (PCP)

The PROCESS CONTROL PROGRAM contains the methods and determinations which ensure that the processing and packaging of wet solid radioactive wastes will

be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61 and 71, State regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.

1.17 RADIOLOGICALLY CLEAN

The term RADIOLOGICALLY CLEAN applies to DEMOLITION DEBRIS which has been radiologically surveyed and determined to be free of licensed radioactive material (10 CFR Part 20). Material determined to be RADIOLOGICALLY CLEAN shall be disposed of at a State of Michigan licensed landfill in accordance with the Bulk Materials Control Program required by Section 6.6.2.11.

~~1.14~~ 1.18 REPORTABLE EVENT

A REPORTABLE EVENT is any of those conditions specified as reportable in Specification 6.9.

~~1.15~~ 1.19 SHIFT

A SHIFT shall be the duration of the normal work period, which will be either 8 or 12 hours in length as determined by the Site General Manager. For purposes of determining the maximum allowable time between surveillances, when the specified surveillance interval is "once per SHIFT," the maximum allowable extension not to exceed 25 percent of the specified surveillance interval described in Surveillance Requirement 4.0.2 shall be based upon the SHIFT duration approved by the Site General Manager at that time.

3/4.5 DEMOLITION DEBRIS DISPOSAL

LIMITING CONDITIONS FOR OPERATION

3.5.1 DEMOLITION DEBRIS shall be surveyed prior to release for disposal in a State of Michigan licensed landfill with a bulk container assay system having a DETECTION CAPABILITY for principal gamma emitters of 6 pCi/g for Cobalt-60 or 14 pCi/g for Cesium-137. The DEMOLITION DEBRIS survey shall be in accordance with the Bulk Materials Control Program requirements and the specifications and methodology of the BMCM as required by Section 6.6.2.11.

APPLICABILITY: At all times.

ACTION:

1. With the bulk container assay system DETECTION CAPABILITY less sensitive than required by the above specification, IMMEDIATELY suspend surveying of DEMOLITION DEBRIS by the system and revise the required minimum count time to ensure that the DETECTION CAPABILITY is adequate to meet the requirements of 3.5.1.

2. IF the bulk container assay system detects licensed radioactive material at or above the DETECTION CAPABILITY in a bulk container of DEMOLITION DEBRIS, THEN:

   a. Survey the DEMOLITION DEBRIS to identify the licensed radioactive material, remove the licensed material and re-assay the bulk container, or

   b. Transport the contents of the bulk container as radioactive material to an offsite contractor for secondary waste processing and disposal, or

   c. Dispose of the contents of the bulk container as radioactive waste.

SURVEILLANCE REQUIREMENTS

4.5.1 When DEMOLITION DEBRIS is being surveyed, the detection capability shall be verified to be within the limits of this specification as follows:

   a. Daily by performing a CHANNEL CHECK.

   b. Daily by performing a mathematical CHANNEL CALIBRATION.

6.6.2.4 Offsite Dose Calculation Manual (ODCM)

6.6.2.4.1 Changes to the ODCM

Changes to the ODCM shall become effective after approval by the Site General Manager.

6.6.2.4.2 Reports

Changes to the ODCM shall be submitted to the Commission in the Radioactive Effluent Release Report for the period in which the changes were made effective. This submittal shall contain sufficiently detailed information to support the rationale for each change and a determination that the change did not reduce the accuracy or reliability of dose calculations or setpoint determinations.

6.6.2.5 Radioactive Effluent Controls Program

A program, conforming with 10 CFR 50.36a, for the control of radioactive effluents and for maintaining doses from radioactive effluents to members of the public as low as reasonably achievable. The program (1) shall be contained in the ODCM, (2) shall be implemented by facility procedures, and (3) shall include remedial actions to be taken whenever program limits are exceeded. The program shall include the following elements:

a. Limitations on the OPERABILITY of radioactive liquid and gaseous monitoring instrumentation including surveillance tests and setpoint determination in accordance with the methodology in the ODCM;

b. Limitations conforming to 10 times the concentration values specified in Appendix B, Table 2, Column 2, to 10 CFR 20.1001 – 20.2402 for the radioactive material release in liquid effluents to unrestricted areas.

c. Monitoring, sampling and analysis of radioactive liquid and gaseous effluents in accordance with 10 CFR 20.1302 and with the methodology and parameters in the ODCM;

d. Limitations conforming to Appendix I to 10 CFR Part 50 on the annual and quarterly doses or dose commitment to a member of the public from radioactive materials in liquid effluents released from the facility to unrestricted areas;

e. Determination of cumulative and projected dose contributions from radioactive effluents for the current calendar quarter and current calendar year in accordance with the methodology and parameters in the ODCM at least every 31 days;

f. Limitations on the OPERABILITY and use of the liquid and gaseous effluent treatment systems to ensure that the appropriate portions of these systems are used to reduce releases of radioactivity when the projected doses in a 31-day period would exceed 2 percent of the guidelines for the annual dose or dose commitment conforming to Appendix I to 10 CFR Part 50.

g. The dose rate due to radioactive materials released in gaseous effluents from the site to areas at or beyond the site boundary (see Figure 5.1-1) shall be limited to the following:

(a) For noble gases: Less than or equal to 500 mrems/yr to the total body and less than or equal to 3000 mrems/yr to the skin, and

(b) For tritium and for all radionuclides in particulate form with half lives greater than 8 days: Less than or equal to 1500 mrems/yr to any organ.

h. Limitations conforming to Appendix I to 10 CFR Part 50 on the annual and quarterly air doses resulting from noble gases released in gaseous effluents from the facility to areas beyond the SITE BOUNDARY; and

I. Limitations conforming to 40 CFR Part 190 on the annual dose or dose commitment to any member of the public due to releases of radioactivity and to radiation from uranium fuel cycle sources.

j. The dose to a member of the public from tritium and all radionuclides in particulate form with half lives greater than 8 days in gaseous effluents released to areas at or beyond the site boundary (see Figure 5.1-1) shall be limited to the following:

(a) During any calender quarter: Less than or equal to 7.5 mrems to any organ, and

(b) During any calender year: Less than or equal to 15 mrems to any organ.

6.6.2.9 Spent Fuel Pool Water Chemistry Program

This program uses procedures to provide controls for monitoring Spent Fuel Pool water chemistry.

6.6.2.10 Inservice Inspection and Testing Program

a. Applicability

Applies to Inservice Inspection and Testing of ASME Code Class 1, Class 2 and Class 3 piping systems and components.

b. Objective

To insure integrity of the Class 1, Class 2 and Class 3 piping systems and components.

c. Specifications

1. Inservice Inspection of ASME Code Class 1, 2 and 3 components and Inservice Testing of ASME Code Class 1, 2 and 3 pumps and valves shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda as required by 10 CFR 50, Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50, Section 50.55a(g)(6)(I), and where provisions of Sections 11.4.1.4, 4.1.5 and 11.4.3.4 take precedence.

2. Sufficient records of each inspection shall be kept to allow comparison and evaluation of future tests.

3. The Inservice Inspection program shall be reevaluated as required by 10 CFR 50, Section 50.55a(g)(5) to consider incorporation of new inspection techniques that have been proven practical, and the conclusions of the evaluation shall be used as appropriate to update the inspection program.

6.6.2.11 Bulk Materials Control Program

A program shall be established, implemented and maintained to control the removal of DEMOLITION DEBRIS from the site for State of Michigan

licensed landfill disposal during the decommissioning process. The program shall be contained in the BULK MATERIALS CONTROL MANUAL (BMCM) and shall be implemented and controlled by facility procedures. The program shall include the following elements:

a. Screening requirements for surface contamination levels of bulk materials.

b. Bulk material surveying requirements to ensure that DEMOLITION DEBRIS removed from the site has been determined to be RADIOLOGICALLY CLEAN.

c. Count time requirements for bulk container assay system instrumentation.

d. Record requirements to demonstrate that only RADIOLOGICALLY CLEAN DEMOLITION DEBRIS is released for State of Michigan licensed landfill disposal.

e. Bulk container assay system instrumentation requirements.

f. Administrative controls.

6.6.2.12 BULK MATERIALS CONTROL MANUAL (BMCM)

6.6.2.12.1 Changes to the BMCM

Changes to the BMCM shall become effective afterapproval by the Site General Manager.

6.6.2.12.2 Reports

Changes to the BMCM shall be submitted to the Commission in the Radioactive Effluent Release Report for the period in which the changes were made effective. This submittal shall contain sufficiently detailed information to support the rationale for each change. It shall also include a determination that the change will not result in a decrease in the effectiveness of determining that DEMOLITION DEBRIS is RADIOLOGICALLY CLEAN.

6.0 ADMINISTRATIVE CONTROLS

6.7 REPORTING REQUIREMENTS

The reports identified in this section shall be submitted in accordance with 10 CFR 50.4.

6.7.1 ANNUAL OCCUPATIONAL RADIATION EXPOSURE REPORT

An annual report of radiation exposures received during the previous calendar year shall be submitted prior to March 1 of each year. This report shall tabulate the numbers of facility, utility and other personnel (including contractors) receiving exposures greater than 100 millirem during the year, along with their associated dose according to work and job functions, for example, operations and surveillance, routine maintenance, special maintenance (identify), and waste processing. The dose assignments to various duty functions may be estimated based on pocket dosimeter, TLD or film badge measurements. Small exposures totaling less than 20 percent of the individual total dose need not be accounted for. In the aggregate, at least 80 percent of the total whole body dose received from external sources should be assigned to specific major work functions.

6.7.2 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

An annual radiological environmental operating report covering operation of the facility during the previous calendar year shall be submitted prior to May 1 of each year. The report shall include summaries, interpretations, and statistical evaluation of the results of the Radiological Environmental Monitoring Program for the reporting period. The material provided shall be consistent with the objectives outlined in the ODCM and Sections IV.B.2, IV.B.3 and IV.C of Appendix I to 10 CFR 50.

6.7.3 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

An annual radioactive effluent release report covering operation of the facility during the previous calendar year shall be submitted prior to May 1 of each year. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the facility. The material provided shall be consistent with the objectives outlined in the ODCM and the PROCESS CONTROL PROGRAM, and shall comply with the requirements of 10 CFR 50.36a and Section IV.B.1 of Appendix I to 10 CFR Part 50. Changes to the ODCM, PCP and BMCM shall also be submitted along with the Radioactive Effluent Release Report for the period in which the changes were made effective.

ATTACHMENT 4
CONSUMERS ENERGY COMPANY

Request for Amendment to the Defueled Technical Specifications - Bulk Materials Control Program (BMCP)

Retyped DTS pages

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CERTIFIED FUEL HANDLER, is an individual who is qualified in accordance with BRP Program D25.1, "Certified Fuel Handler Initial Certification Program."

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The DETECTION CAPABILITY is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a bulk container of DEMOLITION DEBRIS that will yield a net count, above system background, for principal gamma emitters that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

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A DIRECT PATH is a visually observable opening which permits the free exchange of air between containment and the environs. Equipment configurations or an engineered feature such as a closed valve, check valve, water seal, closed door, membrane layer, or securely fastened plate may be used to preclude direct paths. Redundancy of engineered features to eliminate direct paths is not required.

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FUEL HANDLING means the activities associated with moving spent nuclear fuel, including moving the 24 ton fuel transfer cask when it contains spent fuel. When spent nuclear fuel is contained in a closed and sealed permanent storage cask or

associated transfer device, the activities associated with moving the cask or device when it is outside the Spent Fuel Pool Area are not to be considered FUEL HANDLING.

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The OFFSITE DOSE CALCULATION MANUAL (ODCM) contains the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm and trip setpoints, and in the conduct of the Radiological Environmental Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring programs required by Sections 6.6.2.5 and 6.6.2.6 and (2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Annual Radioactive Effluent Release Reports required by Specifications 6.7.2 and 6.7.3.

1.15 OPERABLE - OPERABILITY

A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s) and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its safety function(s) are also capable of performing their related support function(s).

1.16 PROCESS CONTROL PROGRAM (PCP)

The PROCESS CONTROL PROGRAM contains the methods and determinations which ensure that the processing and packaging of wet solid radioactive wastes will

be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61 and 71, State regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.

1.17 RADIOLOGICALLY CLEAN

The term RADIOLOGICALLY CLEAN applies to DEMOLITION DEBRIS which has been radiologically surveyed and determined to be free of licensed radioactive material (10 CFR Part 20). Material determined to be RADIOLOGICALLY CLEAN shall be disposed of at a State of Michigan licensed landfill in accordance with the Bulk Materials Control Program required by Section 6.6.2.11.

1.18 REPORTABLE EVENT

A REPORTABLE EVENT is any of those conditions specified as reportable in Specification 6.9.

1.19 SHIFT

A SHIFT shall be the duration of the normal work period, which will be either 8 or 12 hours in length as determined by the Site General Manager. For purposes of determining the maximum allowable time between surveillances, when the specified surveillance interval is "once per SHIFT," the maximum allowable extension not to exceed 25 percent of the specified surveillance interval described in Surveillance Requirement 4.0.2 shall be based upon the SHIFT duration approved by the Site General Manager at that time.

3/4.5 DEMOLITION DEBRIS DISPOSAL

LIMITING CONDITIONS FOR OPERATION

3.5.1 DEMOLITION DEBRIS shall be surveyed prior to release for disposal in a State of Michigan licensed landfill with a bulk container assay system having a DETECTION CAPABILITY for principal gamma emitters of 6 pCi/g for Cobalt-60 or 14 pCi/g for Cesium-137. The DEMOLITION DEBRIS survey shall be in accordance with the Bulk Materials Control Program requirements and the specifications and methodology of the BMCM as required by Section 6.6.2.11.

APPLICABILITY: At all times.

ACTION:

1. With the bulk container assay system DETECTION CAPABILITY less sensitive than required by the above specification, IMMEDIATELY suspend surveying of DEMOLITION DEBRIS by the system and revise the required minimum count time to ensure that the DETECTION CAPABILITY is adequate to meet the requirements of 3.5.1.

2. IF the bulk container assay system detects licensed radioactive material at or above the DETECTION CAPABILITY in a bulk container of DEMOLITION DEBRIS, THEN:

   a. Survey the DEMOLITION DEBRIS to identify the licensed radioactive material, remove the licensed material and re-assay the bulk container, or

   b. Transport the contents of the bulk container as radioactive material to an offsite contractor for secondary waste processing and disposal, or

   c. Dispose of the contents of the bulk container as radioactive waste.

SURVEILLANCE REQUIREMENTS

4.5.1 When DEMOLITION DEBRIS is being surveyed, the detection capability shall be verified to be within the limits of this specification as follows:

   a. Daily by performing a CHANNEL CHECK.

   b. Daily by performing a mathematical CHANNEL CALIBRATION.

6.6.2.4 Offsite Dose Calculation Manual (ODCM)

6.6.2.4.1 Changes to the ODCM

Changes to the ODCM shall become effective after approval by the Site General Manager.

6.6.2.4.2 Reports

Changes to the ODCM shall be submitted to the Commission in the Radioactive Effluent Release Report for the period in which the changes were made effective. This submittal shall contain sufficiently detailed information to support the rationale for each change and a determination that the change did not reduce the accuracy or reliability of dose calculations or setpoint determinations.

6.6.2.5 Radioactive Effluent Controls Program

A program, conforming with 10 CFR 50.36a, for the control of radioactive effluents and for maintaining doses from radioactive effluents to members of the public as low as reasonably achievable. The program (1) shall be contained in the ODCM, (2) shall be implemented by facility procedures, and (3) shall include remedial actions to be taken whenever program limits are exceeded. The program shall include the following elements:

a. Limitations on the OPERABILITY of radioactive liquid and gaseous monitoring instrumentation including surveillance tests and setpoint determination in accordance with the methodology in the ODCM;

b. Limitations conforming to 10 times the concentration values specified in Appendix B, Table 2, Column 2, to 10 CFR 20.1001 - 20.2402 for the radioactive material release in liquid effluents to unrestricted areas.

c. Monitoring, sampling and analysis of radioactive liquid and gaseous effluents in accordance with 10 CFR 20.1302 and with the methodology and parameters in the ODCM;

d. Limitations conforming to Appendix I to 10 CFR Part 50 on the annual and quarterly doses or dose commitment to a member of the public from radioactive materials in liquid effluents released from the facility to unrestricted areas;

e. Determination of cumulative and projected dose contributions from radioactive effluents for the current calendar quarter and current calendar year in accordance with the methodology and parameters in the ODCM at least every 31 days;

f. Limitations on the OPERABILITY and use of the liquid and gaseous effluent treatment systems to ensure that the appropriate portions of these systems are used to reduce releases of radioactivity when the projected doses in a 31-day period would exceed 2 percent of the guidelines for the annual dose or dose commitment conforming to Appendix I to 10 CFR Part 50.

g. The dose rate due to radioactive materials released in gaseous effluents from the site to areas at or beyond the site boundary (see Figure 5.1-1) shall be limited to the following:

(a) For noble gases: Less than or equal to 500 mrems/yr to the total body and less than or equal to 3000 mrems/yr to the skin, and

(b) For tritium and for all radionuclides in particulate form with half lives greater than 8 days: Less than or equal to 1500 mrems/yr to any organ.

h. Limitations conforming to Appendix I to 10 CFR Part 50 on the annual and quarterly air doses resulting from noble gases released in gaseous effluents from the facility to areas beyond the SITE BOUNDARY; and

I. Limitations conforming to 40 CFR Part 190 on the annual dose or dose commitment to any member of the public due to releases of radioactivity and to radiation from uranium fuel cycle sources.

j. The dose to a member of the public from tritium and all radionuclides in particulate form with half lives greater than 8 days in gaseous effluents released to areas at or beyond the site boundary (see Figure 5.1-1) shall be limited to the following:

(a) During any calender quarter: Less than or equal to 7.5 mrems to any organ, and

(b) During any calender year: Less than or equal to 15 mrems to any organ.

6.6.2.9 Spent Fuel Pool Water Chemistry Program

This program uses procedures to provide controls for monitoring Spent Fuel Pool water chemistry.

6.6.2.10 Inservice Inspection and Testing Program

a. Applicability

Applies to Inservice Inspection and Testing of ASME Code Class 1, Class 2 and Class 3 piping systems and components.

b. Objective

To insure integrity of the Class 1, Class 2 and Class 3 piping systems and components.

c. Specifications

1. Inservice Inspection of ASME Code Class 1, 2 and 3 components and Inservice Testing of ASME Code Class 1, 2 and 3 pumps and valves shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda as required by 10 CFR 50, Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50, Section 50.55a(g)(6)(I), and where provisions of Sections 11.4.1.4, 4.1.5 and 11.4.3.4 take precedence.

2. Sufficient records of each inspection shall be kept to allow comparison and evaluation of future tests.

3. The Inservice Inspection program shall be reevaluated as required by 10 CFR 50, Section 50.55a(g)(5) to consider incorporation of new inspection techniques that have been proven practical, and the conclusions of the evaluation shall be used as appropriate to update the inspection program.

6.6.2.11 Bulk Materials Control Program

A program shall be established, implemented and maintained to control the removal of DEMOLITION DEBRIS from the site for ~~local~~ State of Michigan

licensed landfill disposal during the decommissioning process. The program shall be contained in the BULK MATERIALS CONTROL MANUAL (BMCM) and shall be implemented and controlled by facility procedures. The program shall include the following elements:

a. Screening requirements for surface contamination levels of bulk materials.

b. Bulk material surveying requirements to ensure that DEMOLITION DEBRIS removed from the site has been determined to be RADIOLOGICALLY CLEAN.

c. Count time requirements for bulk container assay system instrumentation.

d. Record requirements to demonstrate that only RADIOLOGICALLY CLEAN DEMOLITION DEBRIS is released for State of Michigan licensed landfill disposal.

e. Bulk container assay system instrumentation requirements.

f. Administrative controls.

6.6.2.12 BULK MATERIALS CONTROL MANUAL (BMCM)

6.6.2.12.1 Changes to the BMCM

Changes to the BMCM shall become effective after approval by the Site General Manager.

6.6.2.12.2 Reports

Changes to the BMCM shall be submitted to the Commission in the Radioactive Effluent Release Report for the period in which the changes were made effective. This submittal shall contain sufficiently detailed information to support the rationale for each change. It shall also include a determination that the change will not result in a decrease in the effectiveness of determining that DEMOLITION DEBRIS is RADIOLOGICALLY CLEAN.

6.0 ADMINISTRATIVE CONTROLS

6.7 REPORTING REQUIREMENTS

The reports identified in this section shall be submitted in accordance with 10 CFR 50.4.

6.7.1 ANNUAL OCCUPATIONAL RADIATION EXPOSURE REPORT

An annual report of radiation exposures received during the previous calendar year shall be submitted prior to March 1 of each year. This report shall tabulate the numbers of facility, utility and other personnel (including contractors) receiving exposures greater than 100 millirem during the year, along with their associated dose according to work and job functions, for example, operations and surveillance, routine maintenance, special maintenance (identify), and waste processing. The dose assignments to various duty functions may be estimated based on pocket dosimeter, TLD or film badge measurements. Small exposures totaling less than 20 percent of the individual total dose need not be accounted for. In the aggregate, at least 80 percent of the total whole body dose received from external sources should be assigned to specific major work functions.

6.7.2 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

An annual radiological environmental operating report covering operation of the facility during the previous calendar year shall be submitted prior to May 1 of each year. The report shall include summaries, interpretations, and statistical evaluation of the results of the Radiological Environmental Monitoring Program for the reporting period. The material provided shall be consistent with the objectives outlined in the ODCM and Sections IV.B.2, IV.B.3 and IV.C of Appendix I to 10 CFR 50.

6.7.3 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

An annual radioactive effluent release report covering operation of the facility during the previous calendar year shall be submitted prior to May 1 of each year. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the facility. The material provided shall be consistent with the objectives outlined in the ODCM and the PROCESS CONTROL PROGRAM, and shall comply with the requirements of 10 CFR 50.36a and Section IV.B.1 of Appendix I to 10 CFR Part 50. Changes to the ODCM, PCP and BMCM shall also be submitted along with the Radioactive Effluent Release Report for the period in which the changes were made effective.

ATTACHMENT 5
CONSUMERS ENERGY COMPANY

Request for Amendment to the Defueled Technical Specifications - Bulk Materials Control Program (BMCP)

Markup of DTS Bases pages to show the proposed changes

3/4.5 DEMOLITION DEBRIS DISPOSAL

BASES

3.5.1 10 CFR 20.2001 requires that licensed radioactive material be disposed of only through (1) transfer to an authorized recipient, (2) decay in storage, (3) release in effluents within the limits in §20.1301, or (4) as authorized under §§20.2002, 20.2003, 20.2004, or §20.2005. This Limiting Condition for Operation establishes the DETECTION CAPABILITY for surveying DEMOLITION DEBRIS prior to disposal in a State of Michigan licensed landfill to demonstrate compliance with 10 CFR 20.2001 requirements in accordance with controlled program requirements.

The DETECTION CAPABILITIES established for Cobalt-60 and Cesium-137 are single radionuclide values for either Cobalt-60 or Cesium-137 present at these concentrations. The Cobalt-60 and Cesium-137 radionuclides were chosen because they are the principal gamma emitters most likely to be detected by the bulk container assay system instrumentation. The potential radiological consequence of disposal of DEMOLITION DEBRIS in a State of Michigan licensed landfill with either Cobalt-60 or Cesium-137 present at the DETECTION CAPABILITY will result in 1 mrem/year or less total effective dose equivalent (TEDE) to an average member of the critical group from all exposure pathways.

The Bulk Materials Control Program (BMCP) established in Section 6.6.2.11 provides additional assurance and an added degree of conservatism beyond the DETECTION CAPABILITY requirements of the bulk container assay system that DEMOLITION DEBRIS released for disposal in a State of Michigan licensed landfill will not contain licensed radioactive material. Under program requirements of the BMCP, structural surfaces will be surveyed for both total and removable contamination by licensed radioactive material prior to demolition of the structures. Also, record requirements to demonstrate that only RADIOLOGICALLY CLEAN DEMOLITION DEBRIS is released for State of Michigan landfill disposal, bulk container assay system instrumentation requirements and administrative controls are established by the BMCP. Section 6.6.2.11 also requires that the BMCP be contained in a BULK MATERIALS CONTROL MANUAL (BMCM).

The BMCM contains the specifications and methodology to ensure that the Limiting Condition for Operation and the BMCP program requirements are appropriately implemented. Part 1 of the BMCM contains the specifications which are to be implemented and controlled by facility procedures. Part 2 contains the methodology for specification implementation. Part 3 contains

record requirements, Part 4 QA/QC considerations and Part 5 reporting requirements for changes to the BMCM.

Bulk container assay system instrumentation requirements are established in Part 1 of the BMCM. The bulk container assay system is provided to implement the guidance of Information Notice No. 85-92, Surveys of Wastes Before Disposal from Nuclear Reactor Facilities, for bulk materials monitoring. When DEMOLITION DEBRIS is collected in a bulk container, the accumulation of small amounts of contamination that have escaped detection during the surface contamination surveying may be detected using a bulk container assay system that is sensitive to gamma radiation (e.g., by using sensitive high purity germanium detectors in a low-background area).

The bulk container assay system consists of three high purity germanium detectors and gamma spectroscopy operating system hardware and software. Part 1 of the BMCM establishes bulk container assay system instrumentation channel OPERABILITY requirements and surveillance requirements.

The methodology contained in Part 2 of the BMCM ensures that the bulk container assay system meets the DETECTION CAPABILITY specified in the Limiting Condition for Operation. The DETECTION CAPABILITY specified for Cobalt-60 and Cesium-137 assumes that only one of these radionuclides are potentially present in the DEMOLITION DEBRIS. If more than one radionuclide are potentially present in the DEMOLITION DEBRIS, the BMCM Part 2 methodology requires the calculation of new minimum detectable concentrations of principal gamma emitters for the bulk container assay system to ensure that the potential radiological consequence of disposal of DEMOLITION DEBRIS will not result in a TEDE dose of 1 mrem/year or more to an average member of the critical group from all exposure pathways. This methodology also accounts for the potential presence of hard-to-detect radionuclides such as low energy beta and/or alpha emitters which may also contribute to TEDE dose in the presence of gamma emitters detectable by the bulk container assay system.

The BMCM Part 2 methodology is based on an evaluation of potential exposure to an average member of the critical group from three potential exposure pathway scenarios. These three scenarios include a resident/farmer scenario which could develop after closure of the State of Michigan licensed landfill (50 years after disposal of the DEMOLITION DEBRIS), landfill worker potential exposure during DEMOLITION DEBRIS disposition at the

3/4.5 DEMOLITION DEBRIS DISPOSAL

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landfill and a transportation scenario for potential driver exposure during transportation of the DEMOLITION DEBRIS to the State of Michigan licensed landfill.

The ACTION requirements of this specification ensure that no licensed radioactive material at or above the DETECTION CAPABILITY of the bulk container assay system are included in containers of DEMOLITION DEBRIS released for disposal in a State of Michigan licensed landfill. Any licensed radioactive material identified at or above the DETECTION CAPABILITY will be appropriately dispositioned as radioactive waste in accordance with the requirements of 10 CFR 20, Subpart K.

4.5.1 This specification ensures that the detection capability is verified daily when DEMOLITION DEBRIS is being surveyed.

ATTACHMENT 6
CONSUMERS ENERGY COMPANY

Request for Amendment to the Defueled Technical Specifications - Bulk Materials Control Program (BMCP)

Retyped DTS Bases pages.

3/4.5 DEMOLITION DEBRIS DISPOSAL

BASES

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The DETECTION CAPABILITIES established for Cobalt-60 and Cesium-137 are single radionuclide values for either Cobalt-60 or Cesium-137 present at these concentrations. The Cobalt-60 and Cesium-137 radionuclides were chosen because they are the principal gamma emitters most likely to be detected by the bulk container assay system instrumentation. The potential radiological consequence of disposal of DEMOLITION DEBRIS in a State of Michigan licensed landfill with either Cobalt-60 or Cesium-137 present at the DETECTION CAPABILITY will result in 1 mrem/year or less total effective dose equivalent (TEDE) to an average member of the critical group from all exposure pathways.

The Bulk Materials Control Program (BMCP) established in Section 6.6.2.11 provides additional assurance and an added degree of conservatism beyond the DETECTION CAPABILITY requirements of the bulk container assay system that DEMOLITION DEBRIS released for disposal in a State of Michigan licensed landfill will not contain licensed radioactive material. Under program requirements of the BMCP, structural surfaces will be surveyed for both total and removable contamination by licensed radioactive material prior to demolition of the structures. Also, record requirements to demonstrate that only RADIOLOGICALLY CLEAN DEMOLITION DEBRIS is released for State of Michigan landfill disposal, bulk container assay system instrumentation requirements and administrative controls are established by the BMCP. Section 6.6.2.11 also requires that the BMCP be contained in a BULK MATERIALS CONTROL MANUAL (BMCM).

The BMCM contains the specifications and methodology to ensure that the Limiting Condition for Operation and the BMCP program requirements are appropriately implemented. Part 1 of the BMCM contains the specifications which are to be implemented and controlled by facility procedures. Part 2 contains the methodology for specification implementation. Part 3 contains

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The bulk container assay system consists of three high purity germanium detectors and gamma spectroscopy operating system hardware and software. Part 1 of the BMCM establishes bulk container assay system instrumentation channel OPERABILITY requirements and surveillance requirements.

The methodology contained in Part 2 of the BMCM ensures that the bulk container assay system meets the DETECTION CAPABILITY specified in the Limiting Condition for Operation. The DETECTION CAPABILITY specified for Cobalt-60 and Cesium-137 assumes that only one of these radionuclides are potentially present in the DEMOLITION DEBRIS. If more than one radionuclide are potentially present in the DEMOLITION DEBRIS, the BMCM Part 2 methodology requires the calculation of new minimum detectable concentrations of principal gamma emitters for the bulk container assay system to ensure that the potential radiological consequence of disposal of DEMOLITION DEBRIS will not result in a TEDE dose of 1 mrem/year or more to an average member of the critical group from all exposure pathways. This methodology also accounts for the potential presence of hard-to-detect radionuclides such as low energy beta and/or alpha emitters which may also contribute to TEDE dose in the presence of gamma emitters detectable by the bulk container assay system.

The BMCM Part 2 methodology is based on an evaluation of potential exposure to an average member of the critical group from three potential exposure pathway scenarios. These three scenarios include a resident/farmer scenario which could develop after closure of the State of Michigan licensed landfill (50 years after disposal of the DEMOLITION DEBRIS), landfill worker potential exposure during DEMOLITION DEBRIS disposition at the

3/4.5 DEMOLITION DEBRIS DISPOSAL

BASES

landfill and a transportation scenario for potential driver exposure during transportation of the DEMOLITION DEBRIS to the State of Michigan licensed landfill.

The ACTION requirements of this specification ensure that no licensed radioactive material at or above the DETECTION CAPABILITY of the bulk container assay system are included in containers of DEMOLITION DEBRIS released for disposal in a State of Michigan licensed landfill. Any licensed radioactive material identified at or above the DETECTION CAPABILITY will be appropriately dispositioned as radioactive waste in accordance with the requirements of 10 CFR 20, Subpart K.

4.5.1 This specification ensures that the detection capability is verified daily when DEMOLITION DEBRIS is being surveyed.

ENCLOSURE 1
CONSUMERS ENERGY COMPANY

Request for Amendment to the Default Technical Specifications - Bulk Materials Control Program (BMCP)

Bulk Materials Control Manual

BIG ROCK POINT RESTORATION PROJECT

BULK MATERIALS CONTROL MANUAL

BULK MATERIALS CONTROL MANUAL

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DEFINITIONS

Clean Disposal Level (CDL) - A concentration level which ensures that the probability of undetected contamination is negligible and can be disregarded when considering the practicality of detecting and controlling such contamination and that also ensures any potential exposure is limited to a negligible level.

Demolition Debris - Solid materials associated with demolition of site structures; i.e., concrete debris including rebar, structural steel, sheet metal, roofing materials, foundation concrete and minor amounts of associated dug-up soil. Demolition debris does not include plant systems or components.

Hard-to-Detect - Radionuclides which are pure low energy beta emitters such as H-3, C-14, and Pu-241 as well as pure alpha emitters.

In Situ Gamma Spectrometry - The assessment of the ambient gamma ray flux that is collected in the field (i.e., *in situ*), and analyzed to identify and quantify the radionuclides present.

Radiologically Clean - The term radiologically clean applies to demolition debris which has been radiologically surveyed and determined to be free of licensed radioactive material (10 CFR Part 20). Material determined to be radiologically clean shall be disposed of at a State of Michigan licensed landfill in accordance with the Bulk Materials Control Program required by Defueled Technical Specification 6.6.2.11.

Readily Detectable - Radionuclides which are gamma or medium to high energy beta emitters such as Co-60, Cs-137 or Mn-54 that are easily detected using common field survey instruments.

Remediation - The process and associated activities resulting in removal of contamination. Remediation is sometimes used interchangeably with the term decontamination.

Removable Activity - Surface activity that can be readily removed and collected for measurement by wiping the surface with moderate pressure.

Surface Area - Those surface areas of structural materials having the potential of containing surface contamination and which are readily accessible by portable contamination survey instruments. Surface areas do not include subsurface areas such as cracks which may penetrate into structural materials from the surface area.

Surface Contamination - Residual radioactivity found on structural surfaces and expressed in units of activity per surface area (dpm/100 cm^2). Surface contamination does not include residual radioactivity which may have migrated to areas below surfaces; e.g., migration in cracks, etc.

Surrogate Radionuclide - Radionuclide A is a surrogate for radionuclide B if there is an established ratio between their concentrations. The concentration of radionuclide B can then be inferred from the measured concentration of radionuclide A.

Unity Rule - A rule applied when more than one radionuclide is present at a concentration that is distinguishable from background and where a single concentration comparison does not apply. In this case the mixture of radionuclides is compared against default concentrations by applying the unity rule. This is accomplished by determining (1) the ratio between the concentration of each radionuclide in the mixture and (2) the concentration for that radionuclide in an appropriate listing of default values. The sum of the ratios for all radionuclides in the mixture should not exceed 1.

BMCM PART 1

PROCEDURAL AND SURVEILLANCE REQUIREMENTS

1.0 SURFACE CONTAMINATION SCREENING

1.1 TOTAL CONTAMINATION

1.1.1 Requirement:

Structural surfaces shall be screened for total activity prior to final demolition. Contamination monitoring shall be performed with instrumentation and techniques (i.e., survey scanning speed, counting times, *in situ* gamma spectrometry, background radiation levels, sample size, statistics etc.) sufficient to detect 5000 dpm/100 cm^2 total (readily detectable) beta/gamma contamination averaged over a one square meter area.

1.1.2 Action:

a. If radiological screening survey data show contamination levels at or above 5000 dpm/100 cm^2 total activity, remediation shall be performed and the structural surface shall be resurveyed following remediation, or

b. The structural component shall be removed and transported as radioactive material to an offsite contractor for secondary waste processing and disposal, or

c. The structural component shall be removed and disposed of as radioactive waste.

1.1.3 Surveillance Requirements:

Instrumentation used to perform the required surveys shall be source checked and calibrated before and after screening surveys in accordance with established procedures.

1.1.4 Basis:

IE Circular 81-07, Control of Radioactive Material, (ref. 1) provides guidance on radiation survey instrumentation and techniques for evaluating and control of potential radioactive contamination.

The Circular holds the premise that while analytical capabilities are available to distinguish very low levels of contamination from natural background levels, these capabilities are often very elaborate, costly, and time consuming making their use impractical from an operational point of view. Therefore, guidance is provided to establish operational detection levels below which the probability of any remaining, undetected contamination is negligible and can be disregarded when considering the practicality of detecting and controlling such potential contamination and the associated negligible radiation doses to the public.

Studies performed have concluded that for discrete particle low-level contamination, about 5000 dpm/100 cm^2 of beta activity is the minimum level of activity that can be routinely detected under a surface contamination control program using direct survey methods.

Screening surveys will be performed such that the detection levels used ensure that the probability of any undetected contamination is negligible and can be disregarded when considering the practicality of detecting and controlling such potential contamination.

1.2 REMOVABLE CONTAMINATION

1.2.1 Requirement:

Structural surfaces shall be screened for removable contamination in accordance with BMCM implementing procedures prior to final demolition. Contamination monitoring shall be performed with instrumentation and techniques (smears, counting times, background radiation levels, etc.) necessary to detect 1000 dpm/100 cm^2 or greater (readily detectable) removable beta/gamma contamination.

1.2.2 Action:

a. If radiological survey data show removable contamination at levels of 1000 dpm/100 cm^2 or greater, remediation shall be performed and the structural surface shall be resurveyed following remediation, or

b. The structural component shall be removed and transported as radioactive material to an offsite contractor for secondary waste processing and disposal, or

c. The structural component shall be removed and disposed of as radioactive waste.

1.2.3 Surveillance Requirements:

Instrumentation used to perform the required surveys shall be source checked and calibrated before and after screening surveys in accordance with established procedures.

1.2.4 Basis:

IE Circular 81-07, Control of Radioactive Material, provides guidance on radiation survey instrumentation and techniques for evaluating and control of potential radioactive contamination.

The indirect method of contamination monitoring (smear survey) provides a method of evaluating removable (loose, surface) contamination at levels below those that can be detected by the direct survey method. For smears of a 100 cm^2 area, about 1000 dpm of beta activity is the minimum level of activity that can be

routinely detected under a surface contamination control program using indirect survey methods.

2.0 BULK MATERIALS MONITORING

2.1 BULK MATERIALS MONITORING INSTRUMENTATION

2.1.1 Requirement:

The bulk container assay system instrumentation channels shown in Table 1-1 shall be operable with a system clean disposal level (CDL) count time established to ensure that the requirements of this Bulk Materials Control Manual (BMCM) Part 1, Requirement 2.2.1 are not exceeded.

2.1.2 Action:

a. With less than the minimum number of bulk container assay system instrumentation channels operable, take the action shown in Table 1-1.

2.1.3 Surveillance Requirements:

Each bulk container assay system instrumentation channel shall be demonstrated operable by performance of the Channel Check and Channel Calibration at the frequencies shown in Table 1-2.

2.1.4 Basis:

The bulk container assay system is provided to implement the guidance of Information Notice No. 85-92, Surveys of Wastes Before Disposal from Nuclear Reactor Facilities, for bulk materials monitoring. While performing the surface contamination screening required by Part 1, Requirements 1.1.1 and 1.2.1 of this BMCM, there is the potential that some contamination will not be detected or that the total surface areas will not be monitored completely.

When demolition debris is collected in a bulk container, the accumulation of small amounts of contamination that have escaped detection during the surface contamination monitoring may be detected using a bulk container assay system that is sensitive to gamma radiation (e.g., by using sensitive high purity germanium detectors in a low-background area). Such measurements of containerized demolition debris before disposal will reduce the possibility that contaminated waste will be disposed of as clean waste in a Class II Michigan landfill.

TABLE 1-1

BULK CONTAINER ASSAY SYSTEM INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	ACTION
1. BULK CONTAINER ASSAY SYSTEM		
a. High purity germanium detector	(3)	1
b. Gamma spectroscopy operating hardware	(1)	1
c. Gamma spectroscopy operating software	(1)	1

ACTION 1 - With less than the required minimum number of channels operable, suspend the monitoring of demolition debris until the required minimum number of channels have been returned to an operable status.

TABLE 1-2

BULK CONTAINER ASSAY SYSTEM SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	CHANNEL CALIBRATION
1. BULK CONTAINER ASSAY SYSTEM		
a. High purity germanium detector	D	D[a]
b. Gamma spectroscopy operating hardware	NA	NA
c. Gamma spectroscopy operating software	NA	NA

Note: [a]The detector system is mathematically calibrated by the gamma spectroscopy operating software using MCNP Monte Carlo modeling to derive a set of polynomial coefficients that describe the detector/source efficiency data for differing density and geometry. The user interfaces these coefficients through the operating software to determine the efficiency.

The MCNP geometric and material calibration will be performed initially. This is a "theoretical" calibration method. The calibration will compensate for various densities and counting geometries.

A daily source efficiency and background check will be performed and tracked for QC purposes. This is a more conventional method that incorporates a multi-line energy source that is traceable to NIST.

An annual source efficiency determination will be performed to determine a set of detector efficiencies to be used for comparison purposes through out the year (for comparing the daily efficiency checks).

TABLE NOTATION

NOTATION	FREQUENCY
D	At least once per 24 hours during system operation
NA	Not applicable

2.2 CLEAN DISPOSAL LEVEL DETERMINATION

2.2.1 Requirement:

The CDL for the bulk container assay system shall be determined in accordance with the methodology and parameters of Part 2, Section 1.3 of this BMCM. Minimum count time for each bulk container shall be established based on the mass and density of the demolition debris and the container geometry to assure achievement of the CDL for each bulk container.

2.2.2 Action:

a. With the bulk container assay system CDL less conservative than required by the above specification, suspend monitoring of demolition debris by the system and revise the required minimum count time to ensure that the CDL is adequate to meet Requirement 2.2.1 above.

b. IF the bulk container assay system detects licensed radioactive material at or above the CDL in a bulk container of demolition debris, THEN:

   1. Survey the demolition debris to identify the licensed radioactive material, remove the licensed material and re-assay the bulk container, or

   2. Transport the contents of the bulk container as radioactive material to an offsite contractor for secondary waste processing and disposal, or

   3. Dispose of the contents of the bulk container as radioactive waste.

2.2.3 Surveillance Requirements:

Each bulk container assay system instrumentation channel shall be demonstrated operable by performance of the Channel Check and Channel Calibration at the frequencies shown in Table 1-2.

2.2.4 Basis:

The CDL for the bulk container assay system shall be calculated and the assay count time adjusted in accordance with the methodology and parameters of Part 2, Section 1.3 of this BMCM to ensure that the consequences of any potential licensed radioactive material present below the calculated CDL will not result in a potential annual total effective dose equivalent (TEDE) dose to an average member of the critical group greater than 1 mrem through all potential pathways of exposure.

BMCM PART 2

METHODOLOGIES FOR REQUIREMENTS IMPLEMENTATION

1.0 METHODOLOGY FOR REQUIREMENT IMPLEMENTATION

This section describes the methodology that will be used to establish that demolition debris is clean of radioactive contamination and may be removed from the site for local landfill disposal during the decommissioning process. The basic criterion used to establish that demolition debris is radiologically clean is a risk based determination that potential dose from licensed radioactive material to an average member of the critical group shall not exceed 1 mrem/y TEDE. The scope of the manual is limited to solid demolition debris materials at the site; i.e., concrete debris including rebar, roofing materials, foundation concrete and minor amounts of associated dug-up soil. The scope of the manual does not include metal piping or valves, machinery, or large or small components. It also excludes the naturally occurring radioactive materials.

The BMCM has been developed based on the following fundamental assumptions:

a. Concrete (and other demolition debris) will not be processed for any other use or recycled. The BMCM calculations assume that the demolition debris is only sent to the landfill.

b. The disposition site will be at minimum a Class II landfill that fulfills the State of Michigan requirements for such a landfill.

c. The landfill will be local to the area within a transportable distance of 100 miles from the plant site.

1.1 MATERIALS STREAM ANALYSIS

This section describes how the materials stream flow is envisioned and the determination of the requirements. Prior to demolishing structures, direct and indirect radiological surveys will ensure that the structure surfaces meet the requirements specified in Sections 1.0 and 2.0 of Part 1 of this manual.

The materials flow is shown in Figure 1.1.1. The steps include:

Step 1 Remove residual surface radioactivity if required,

Step 2 Survey structures to Section 1.2 screening acceptance criteria,

Step 3 Demolish structures,

Step 4 Bulk assay materials,

Step 5 Determine accept/reject status, and

Step 6 Send to appropriate facility.

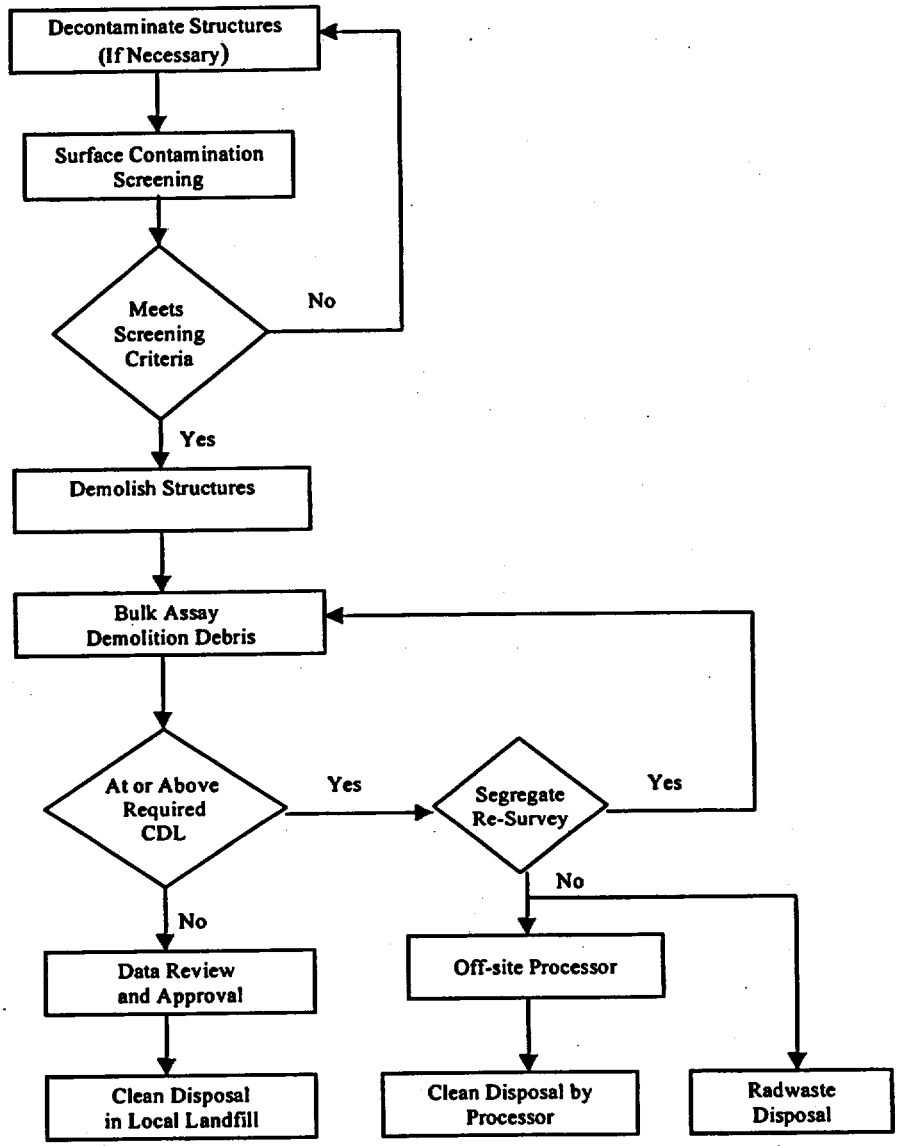

Figure 1.1.1 Bulk Materials Flow Diagram

1.2 SURFACE CONTAMINATION SCREENING

The surface contamination screening level in the BMCM is derived from NRC IE Circular 81-07, Control of Radioactive Material (ref.1), which provides guidance for surface monitoring of Materials to be released from restricted areas at the nuclear power reactor facilities. The Circular addresses the problems associated with minute levels of contamination and provides guidance on survey techniques and control of radioactive contamination. The Circular holds the premise that while analytical capabilities are available to distinguish very low levels of contamination from natural background levels, these capabilities are often very elaborate, costly, and time consuming making their use impractical from operational point of view. This necessitates the establishing of detection levels below which the probability of any remaining, undetected contamination is negligible and can be disregarded when considering the practicality of detecting and controlling such potential contamination and associated negligible radiation doses to public.

The surface detection sensitivity levels given in IE Circular 81-07 are as follows:

Direct Survey	5000 dpm/100 cm^2
Indirect Monitoring	1000 dpm/100 cm^2

The value of 5000 dpm/100 cm^2 is based on the studies that for discrete particle low-level contamination, this is the minimum level of beta activity that can be routinely detected using direct survey methods. The indirect method of monitoring, such as smear surveys, provide a way of evaluating removable contamination at levels much below the levels of direct survey method. For smears of a 100 cm^2 area, using a thin window detector and a fixed sample geometry, the corresponding detection capability is of the order of 1000 dpm. The IE Circular 81-07 states that taking into consideration the practicality of conducting surface contamination surveys, contamination control limits should not be set below those mentioned above.

Surveys may be performed to demonstrate the absence of radioactive material at or above the direct survey screening level of 5000 dpm/100 cm^2, averaged over a one square meter surface area, through the use of any of the following techniques:

a. Direct surface scans, or

b. *In Situ* Gamma Spectrometry Measurements, or

c. Statistically based direct surface measurements.

The level of effort applied to surface contamination screening surveys (i.e., the fraction of total surface area to be surveyed) will be determined commensurate with the potential for surface contamination to be present.

1.2.1 Direct Survey Methods

1.2.1.1 Direct Surface Scans

Scanning is performed during radiological surveys in support of decommissioning to identify the presence of any locations of elevated direct radiation. The probability of detecting residual contamination in the field is affected not only by the sensitivity of the survey instrumentation when used in the scanning mode of operation, but also by the surveyor's ability. The surveyor must decide whether the signals represent only the background activity, or whether they represent residual contamination in excess of background.

The minimum sensitivity of a scan survey depends on the intrinsic characteristics of the detector (efficiency, window area, etc.), the nature (type and energy of emissions) and relative distribution of the potential contamination (point versus distributed source and depth of contamination), scan rate and other characteristics of the survey performance. Direct surface scan surveys may be designed following the guidance contained in NUREG-1505, A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys (ref. 2).

1.2.1.2 *In Situ* Gamma Spectrometry Measurements

The use of spectrometric techniques to assess radioactivity may produce a significant increase in sensitivity as compared to radiation measurements that rely on gross instrument counts. Spectrometry allows a specific radionuclide to be measured, relying on characteristic energies of the radionuclide of concern to discriminate from all sources present. *In situ* gamma spectrometry refers to the assessment of the ambient gamma ray flux that is collected in the field (i.e., *in situ*), and analyzed to identify and quantify the radionuclides present.

The Environmental Measurements Laboratory (EML) has performed detailed and quantitative evaluations of portable gamma spectrometry systems. NUREG-1506, Measurement Methods for Radiological Surveys in Support of New Decommissioning Criteria (Draft Report for Comment, ref. 3) provides detailed guidance, based on the EML evaluations, on how to employ *in situ* gamma spectrometry during survey activities. *In situ* gamma spectrometry surveys may be designed using the guidance of NUREG-1506.

1.2.1.3 Statistically Based Direct Surface Measurements

NUREG-1505 also provides a nonparametric statistical methodology for the design and analysis of direct surface measurement surveys. This methodology is used to design surveys to implement the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) guidance for license termination surveys (ref. 4). Nonparametric statistical methods for testing compliance survey criteria are provided in NUREG-1505. The tests described are the Sign test, the Wilcoxon Rank Sum test, and a Quantile test.

These tests, performed in conjunction with an Elevated Measurement Comparison[1], may be adapted to provide confidence that the screening level criteria of 5000 dpm/100 cm^2 is met. The Data Quality Objectives process is used in this survey design and includes methods for determining the number of samples needed to obtain statistically valid comparisons with the direct survey screening level criteria and the methods for conducting the statistical tests with the resulting survey data.

1.2.2 Indirect Monitoring

The indirect method of contamination monitoring (smear survey) provides a method of evaluating removable (loose, surface) contamination at levels below those that can be detected by the direct survey method. For smears of a 100 cm^2 area, about 1000 dpm of beta activity is the minimum level of activity that can be routinely detected under a field measurement surface contamination control program using indirect survey methods.

[1]An Elevated Measurement Comparison is performed by comparing each measurement from the survey unit to the screening level criteria.

Smears for removable surface activity are obtained by wiping an area of approximately 100 cm^2, using a dry filter paper, such as Whatman 50 or equivalent while applying moderate pressure.

1.3 METHODOLOGY FOR BULK MATERIALS MONITORING CDL DETERMINATION

The bulk container assay system is provided to address the guidance of Information Notice No. 85-92, Surveys of Wastes Before Disposal from Nuclear Reactor Facilities (ref. 5). While performing the surface contamination screening required by Part 1, Requirements 1.1.1 and 1.2.1 of this BMCM, there is some potential that contamination will not be detected or that the total surface areas will not be monitored completely. Because of this, IEN 85-92 recommends that final measurements of aggregated wastes be performed to ensure that there has not been an accumulation of licensed material resulting from a buildup of multiple, nondetectable quantities.

The bulk container assay system provides a final volumetric measurement of aggregated wastes which serves as the final release survey for landfill disposal of the demolition debris. When demolition debris is collected in a bulk container, the accumulation of small amounts of contamination, potentially present below the surface screening acceptance criteria, may be identified at or above the clean disposal level for demolition debris. This is accomplished by using a bulk container assay system that is sensitive to gamma radiation (e.g., by using sensitive high purity germanium and scintillation detectors in a low-background area).

The concept of a clean disposal level (CDL), specific to the Big Rock Point Restoration Project, is used to establish the bulk container assay system minimum counting time based on an individual radionuclide or a mixture of radionuclides potentially present in the demolition debris. The CDL is defined as the concentration level which ensures that the probability of undetected contamination is negligible and can be disregarded when considering the practicality of detecting and controlling such contamination and that also ensures any potential exposure is limited to a negligible level.

1.3.1 Basis of Bulk Container Assay System CDL

The bulk container assay system is based on isotopic analysis of gamma emitting radionuclides potentially present in the demolition debris. Selection of minimum system counting time is dependent on mass of debris in the container and the most restrictive CDL of the gamma emitting radionuclides potentially present.

The demolition debris CDL is based on a guideline concentration limit (GCL) calculated through pathways analysis for the landfill where the demolition debris will be disposed. The methodology used in the BMCM for this landfill pathways analysis is based on the following:

a. The individual radionuclide GCLs required to ensure annual dose does not exceed 1 mrem TEDE from each radionuclide derived based on a comprehensive pathways analysis.

b. The pathways analysis is conducted for different scenarios including an upper bound scenario for landfill disposal with conservative assumptions. A transport scenario is also analyzed for potential dose during debris transportation to the landfill.

c. Hard-to-detect (HTD) radionuclides are scaled to easily detectable radionuclides.

d. For a mixture of radionuclides, the unity rule applies.

The details of the analyses are given in Section 2.0.

The landfill GCL is limited to a concentration that ensures the potential annual dose is not exceeded. Because mixing of demolition debris with normal landfill materials will occur, the demolition debris CDLs for individual radionuclides are derived from the landfill GCLs assuming that potential radionuclides contained in the demolition debris are evenly dispersed throughout normal landfill materials within a given disposal cell. It is assumed that a large scale Class II landfill accepting industrial waste will have a minimum disposal cell intake volume of 160,000 m^3. Considering an estimated volume of 16,000 m^3 for the demolition debris, and assuming uniform density between demolition debris and normal landfill materials, a ratio of 10:1 can be applied for a mixture of normal landfill materials and demolition debris. Hence, the bulk container assay system minimum counting time for demolition debris will be based on CDL values that are 10 times the landfill GCLs for individual radionuclides.

The most conservative CDL values (which correspond to the landfill GCL values required to not exceed 1 mrem/y TEDE) for anticipated individual radionuclides determined through pathway analyses, derived in Section 2.1, are given in Table 1.3.1. The corresponding modified dose to soil concentration ratios (DSRs) are also provided. If radionuclides not listed in Table 1.3.1 are identified through

material sampling and laboratory analysis or if the assumptions contained in Section 2.1 are revised, the data contained in Table 1.3.1 must be recalculated.

Table 1.3.1
Big Rock Point Demolition Debris CDLs and Modified DSRs
for Individual Radionuclides

Radionuclide	Demolition Debris CDL (pCi/g)	Modified DSR (mrem/y per pCi/g)
Ac-227	3.668E+00	2.727E-01
Ag-108m	1.106E+00	9.045E-01
Ag-110m	1.311E+01	7.629E-02
Am-241	5.361E-01	1.865E+00
C-14	1.542E+00	6.485E-01
Cd-109	5.741E+00	1.742E-01
Ce-144	6.145E+02	1.627E-03
Cm-243	5.079E+01	1.969E-02
Cm-244	6.909E+01	1.447E-02
Co-60	5.891E+00	1.698E-01
Cs-134	1.087E+01	9.197E-02
Cs-135	1.890E+02	5.291E-03
Cs-137	1.385E+01	7.218E-02
Eu-152	1.738E+01	5.753E-02
Eu-154	1.564E+01	6.392E-02
Fe-55	1.667E+05	5.999E-06
H-3	2.414E+02	4.142E-03
I-129	5.051E-02	1.980E+01
Mn-54	3.176E+01	3.148E-02
Nb-94	1.788E+00	5.592E-01
Ni-59	6.018E+03	1.662E-04
Ni-63	2.807E+03	3.562E-04
Pm-147	5.663E+04	1.766E-05
Pu-238	3.753E+01	2.665E-02
Pu-239	2.289E+01	4.368E-02
Pu-241	1.631E+01	6.130E-02
Ru-106	4.019E+00	2.488E-01
Sb-125	9.445E+00	1.059E-01
Sr-90	2.424E+00	4.126E-01
Tc-99	7.928E+00	1.261E-01
U-238	1.034E+01	9.674E-02
Zn-65	7.477E+00	1.337E-01

1.3.2 Derivation of Bulk Container Assay System CDL

Defueled Technical Specification 6.6.2.11.d requires that the potential dose to an average member of the critical group from licensed radioactive material which may be present but at levels below the minimum monitoring sensitivity shall not exceed 1 mrem/y TEDE. If more than one radionuclide potentially contribute to public dose, then the sum of the dose contribution from each individual radionuclide shall not exceed 1 mrem/y TEDE or:

$$D_1 + D_2 + \ldots + D_n \leq 1 \ mrem/y \qquad (1)$$

where

D_1 = dose contribution from radionuclide *1*,
D_2 = dose contribution from radionuclide *2*,

and

D_n = dose contribution from radionuclide *n*.

Note: The radionuclides to be considered in the above equation include all radionuclides present, both readily detected gamma emitters and HTD radionuclides (e.g., pure beta emitters such as H-3, C-14, and Pu-241 as well as pure alpha emitters). Identification of potential radionuclides is performed through laboratory analyses, such as alpha and gamma spectrometry and wet chemistry separations. These analyses are used to determine the relative ratios of the identified contaminants.

Each individual radionuclide dose contribution is a product of the dose to soil concentration ratio (DSR) determined from the pathway analysis results given in Table 1.3.1 for the radionuclide and the concentration of the radionuclide present. Therefore, ensuring that TEDE does not exceed 1 mrem/y requires that:

$$DSR_1 \times C_1 + DSR_2 \times C_2 + \ldots DSR_n \times C_n \leq 1 \ mrem/y \qquad (2)$$

where

DSR_1 = TEDE dose to soil concentration ratio for radionuclide *1* in mrem/y / pCi/g,
DSR_2 = TEDE dose to soil concentration ratio for radionuclide *2* in (mrem/y) / (pCi/g),
C_1 = concentration of radionuclide *1* in pCi/g,
C_2 = concentration of radionuclide *2* in pCi/g,
DSR_n = dose to soil concentration ratio for radionuclide *n* in (mrem/y) / (pCi/g),

and

C_n = concentration of radionuclide *n* in pCi/g.

IF laboratory analyses identify potential radionuclides whose individual dose contribution in equation (2) above is less than 5 percent of the total dose, THEN that radionuclide may be disregarded providing that the sum of these percentages for all of the radionuclides disregarded in the mixture does not exceed 10 percent.

When multiple radionuclides are potentially present, it is possible to assay for just one of the radionuclides using the bulk container assay system and still demonstrate compliance with equation (2) for all of the contaminants through the use of surrogate measurements. Based on laboratory analyses of representative samples, a surrogate ratio may be determined to scale a hard to detect radionuclide to a gamma emitting radionuclide easily detected by the assay system. Using this approach, a modified surrogate CDL may be determined using the following equation:

$$CDL_{sur,\mathrm{mod}} = CDL_{sur} \times \frac{CDL_{HTD}}{[(C_{HTD}/C_{sur}) \times CDL_{sur}] + CDL_{HTD}} \qquad (3)$$

where

CDL_{HTD} = CDL of the hard to detect radionuclide in pCi/g,
CDL_{sur} = CDL of the surrogate radionuclide in pCi/g,

and

C_{HTD}/C_{sur} = surrogate ratio of the hard to detect radionuclide to the surrogate radionuclide.

If there is an established ratio among the concentrations of the *n* radionuclides in a mixture of radionuclides that may contribute dose to an average member of the

critical group, then the concentration of every radionuclide can be expressed in terms of any one of them, e.g., radionuclide 1. For example,

$C_2 = R_2C_1$, $C_3 = R_3C_1$,..., $C_i = R_iC_1$,..., $C_n = R_nC_1$ where R_n is the surrogate ratio of the concentration C_n of radionuclide n to the concentration C_1 of radionuclide 1.

Applying this concept to individual radionuclide dose contributions in equation (2) and setting the value for equation (2) equal to 1 (mrem/y) yields the following:

$$DSR_1 \times C_1 + DSR_2 \times R_2C_1 + \ldots + DSR_n \times R_nC_1 = 1\ mrem/y \quad (4)$$

or

$$C_1 \times (DSR_1 + DSR_2 \times R_2 + \ldots + DSR_n \times R_n) = 1\ mrem/y \quad (5)$$

and

$$C_1 = \frac{1\ mrem/y}{DSR_1 + DSR_2 \times R_2 + \ldots + DSR_n \times R_n} \quad (6)$$

Since C_1 represents the concentration of radionuclide 1 which would result in an average member of the critical group TEDE dose of 1 mrem/y, the bulk container assay system CDL is established as being equal to C_1 for radionuclide 1.

Since the bulk container assay system is capable of determining the concentration of more than one gamma emitting radionuclide which may be present, the surrogate DSR value for each gamma emitter must be determined using equation (6) and the most appropriate surrogate radionuclide DSR value chosen for the system.

Surrogate ratios are determined by sampling followed by laboratory analysis of structural materials prior to demolition. Detailed guidance for conducting this sampling and analysis will be contained in BMCM implementing procedures.

1.3.3 Conversion of Minimum CDL Value to System Count Time

Achievement of the appropriate CDL value selected above by the bulk container assay system is implemented by determining a minimum count time to perform the assay. Since achievement of the appropriate CDL value is a factor of three variables; i.e., count time, background radiation level and mass of the bulk container, the minimum count time must be determined for each bulk container after the mass of the container and the background have been determined. Detailed guidance for this determination will be contained in BMCM implementing procedures.

2.0 PATHWAYS MODELING AND RADIOLOGICAL ASSESSMENT

2.1 HYPOTHETICAL RESIDENT/FARMER

Highly conservative CDLs are derived using an upper bound scenario and highly conservative assumptions. The upper bound exposure scenario involves a resident on the site of a Michigan Class II landfill unit after the completion of the post-closure monitoring period. The scenario is upper bound because it describes an unlikely situation potentially occurring many years in the future.

Section 2.2 discusses a more realistic (yet conservative) scenario and describes the potential exposure of a worker involved with disposing of materials in a landfill.

In the resident/farmer scenario, potential exposures are assessed to a member of the general public who may establish residence at the landfill after closure of such a landfill. The person occupies a house with a basement and maintains a vegetable garden on the site of a closed landfill that contains concrete demolition debris. The exposure pathways modeled are listed in Table 2.1.1 (this table also denotes the pathways used in the worker scenario analysis in Section 2.2).

2.1.1 Analysis Method

The analysis was conducted with the RESRAD code (ref. 6). RESRAD provides pathway analysis methodology for deriving soil criteria or assessing radiological risk from disposal of residual radioactivity in soil or soil like material. The code was developed by Argonne National Laboratory for the Department of Energy and it is the only code designated by DOE in Order 5400.5 for the evaluation of radioactively contaminated sites.

NRC has approved the use of RESRAD for dose evaluation by licensees involved in decommissioning, NRC staff evaluation of waste disposal requests, and dose evaluation of sites being reviewed by NRC staff. The EPA Science Advisory Board has also reviewed the RESRAD model and EPA has used RESRAD in their rulemaking on radiation site cleanup regulations. RESRAD has already been applied to over 300 sites in the U.S. and other countries. The code has been verified and has undergone several benchmarking analyses, and has been included in the IAEA's VAMP and BIOMOVS II projects to compare environmental transport models. Details of the mathematical modeling, associated dose conversion factors, environmental transport factors, and guidance on applying the guidelines is available in reference 6.

2.1.2 Exposure Pathways

Exposure pathways used in the analysis are listed in Table 2.1.1. These can be grouped into four headings corresponding to the four exposure pathways by which radionuclides could enter the body or cause external exposure. These are described below along with the factors on which they are dependent.

2.1.2.1 External Radiation

This exposure pathway consists of penetrating radiation from volume soil sources while indoors and/or outdoors. Factors that affect this pathway include volume sources, surface sources, and air (dust and airborne radionuclides).

2.1.2.2 Inhalation

The inhalation pathway includes exposure to suspended soil while indoors and/or outdoors and to suspended surface sources of soil tracked indoors. Factors that affect this pathway include dust and airborne radionuclides.

2.1.2.3 Ingestion of Food and Soil

Ingestion exposure includes plant products grown in contaminated soil, soil contaminated by irrigation (direct and inadvertent), and plant products irrigated with contaminated ground water only. Ingestion exposure also includes inadvertent soil ingestion as secondary ingestion. Factors that affect this pathway include intake parameters for plant foods, meat, milk, aquatic foods, and the parameters for inadvertent ingestion of soil.

2.1.2.4 Ingestion of Water

This pathway is limited to ingestion of drinking water from a ground water source.

Table 2.1.1
Exposure Pathways

Pathway	Resident/Farmer Scenario	Landfill Worker Scenario
External Exposure	Yes	Yes
Inhalation	Yes	Yes
Ingestion of Ground Water	Yes	No
Ingestion of Plants	Yes	No
Ingestion Of Meat	Yes	No
Ingestion of Milk	Yes	No
Ingestion of Aquatic Food	Yes	No
Ingestion Of Soil	Yes	No
Radon	No	No

Some exposure pathways were not analyzed because they are considered insignificant. For example, air submersion may be an important pathway to consider when evaluating the potential consequences of airborne releases from some facilities. Several studies of residual soil contamination following nuclear facility decommissioning have concluded that external doses from air submersion are trivial compared with external doses from surface or volume sources. Since these residential scenarios are similar to residual contamination in soil, left after decommissioning a nuclear facility, air submersion doses are considered insignificant and are not evaluated.

Similarly, internal exposures from puncture wounds or from dermal absorption may be important when evaluating sources of exposure to workers in licensed nuclear facilities. But most dose assessments using these pathways are retrospective (after the fact) and rely on bioassay results to help establish the magnitude of internal deposition that occurred for specific situations. The frequency of occurrence of puncture wounds, although unpredictable, is assumed to be low. Dermal absorption may be important for only a few radionuclides, most notably H-3. Potential dermal absorption is generally accounted for in the increased inhalation conversion in models in accordance with the ICRP guidance in this area. The dose that could result from dermal absorption is considered to be too low compared with inhalation and ingestion doses. Thus, internal doses from

puncture wounds and dermal absorption are not generally included in the scenario analysis.

Both of the potential pathways are inapplicable to the scenario analysis because the demolition debris is primarily concrete, a major portion of which is expected to be free from any contamination. The potential residual contamination on the concrete is minute and occurs through the activation products in the matrix or ingressed radionuclides.

2.1.3 Analysis Assumptions

2.1.3.1 General Assumptions

General assumptions for the resident/farmer scenarios are listed below. Assumptions specific to a particular exposure pathway are discussed following this listing of general assumptions.

a. For the landfill operation, the following assumptions are used:

   1. Landfill operates for 40 years.

   2. Bulk materials from the decommissioning of Big Rock Point are placed in the landfill at the midpoint of the landfill operation period.

   3. Post-closure monitoring (non-radiological environmental monitoring) of landfill required by the State of Michigan for any industrial landfill is performed for 30 years, during which time public access is restricted.

   4. The disposal site is released for potential residential use after post-closure monitoring ends.

   From discussions with landfills in the vicinity of Big Rock Point, these assumed conditions are appropriate.

b. The demolition debris is assumed to be soil like material even though its density is much higher than soils. Additionally, resuspension of potential demolition debris radioactivity is not expected to vary significantly from that for soil. Therefore, the RESRAD default soil parameters are considered appropriate for use in this analysis.

c. For landfill pathways analysis to calculate GCL values using RESRAD, it is assumed that the total potential activity in the waste is dispersed uniformly throughout the volume of material originating at Big Rock Point. For calculating the bulk container assay system CDL, dispersion of this activity is assumed throughout the estimated total landfill volume in a cell where the demolition debris will be deposited. This dispersion is assumed to occur at a mass ratio of 10 parts of typical landfill waste to 1 part of BRP demolition debris.

d. By a non-specific and unidentified means, the radionuclides potentially in the waste are assumed to be dispersed evenly throughout the soil (demolition debris).

e. Contamination in the soil decays normally and continues to leach until the time that activity is depleted.

f. For the Resident/Farmer scenario, it is assumed that the resident spends 50% of the time indoors, 25% outdoors but at the site, and 25 % of the time away from the site. These are consistent with those suggested in the NRC Policy and Guidance Directive PG-8-08, Scenarios for Assessing Potential Doses Associated with Residual Radioactivity (ref. 7).

2.1.3.2 Specific Assumptions

a. The volume of the demolition debris at BRP is estimated to be 16,000 m^3. As a model for calculating landfill GCL values, it is assumed that the material is deposited in a 2 m thick layer, a default value in RESRAD. Nevertheless, the area of contaminated material is assumed to be 10,000 m^2 which is the default parameter in RESRAD.

b. In a Michigan Class II landfill, the waste emplacement is required to be covered by a 6 inch (0.15 m) soil layer on a daily basis after emplacement. With continued emplacement, there will be several such layers. The demolition debris will likely be covered by additional landfill material, perhaps several meters, and eventually covered by a 5 foot (1.5 m) soil cap. As a highly conservative assumption, the analysis assumes only the presence of a 6 inch (0.15 m) layer and only for 50 years. Through use of enhanced erosion, the soil layer is assumed to disappear at time 50 years from emplacement, thus uncovering the deposited BRP debris. During the combined 50 year operational and monitoring period after disposal of BRP

demolition debris, no resident can take up residence at the landfill site. However, in this assessment, the minimum GCL value for radionuclides is selected irrespective of the time period. Therefore, if the minimum GCL value occurs at some point in time after emplacement but prior to 50 years from emplacement when the resident/farmer scenario take effect, that value is used for the GCL provided in Table 2.1.2.

c. The analysis includes all radionuclides that have historically been included as part of the 10 CFR Part 61 waste stream analyses even though (except for some predominant radionuclides) most of these radionuclides were not found above the laboratory detection limits. To provide a comprehensive listing of all potential radionuclides for application of this methodology, all radionuclides are included in this evaluation except those that are considered to have decayed away by the time demolition debris disposition occurs. In addition, Eu-152 and Eu-154 are also included as potential concrete neutron activation products.

d. Radionuclides that have a half-life shorter that 180 days are not included in the analysis. Rationale for this is because the final reactor shut down occurred in 1997 and by the time disposition occurs in 2002 or later, these radionuclides would have decayed away.

2.1.3.3 Exposure Pathway-Specific Assumptions

a. External

The soil radioactivity concentration at the time a resident is assumed to move onto the landfill site consists of the radioactivity remaining in the contaminated layer after radioactive decay occurring during the post-closure monitoring period. However, as stated earlier in this assessment, the minimum guideline for radionuclides is selected irrespective of the time period.

A resident on the contaminated soil would spend his/her time indoors, outdoors, and off-site. The time spent off-site is the fraction of the year that no external exposure occurs. Therefore, the annual dose for the external exposure pathway results from outdoor activities and indoors activities on-site.

b. Inhalation

Similar to the external exposure pathway, the inhalation exposure pathway involves a person that spends time indoors, outdoors, and off-site. Because the original contamination occurs as soil contamination, the inhalation dose only includes the suspension of contaminated soil from the ground.

c. Groundwater Use

The resident/farmer is assumed to use the groundwater from a contaminated well for drinking and irrigation of plants. The resident/farmer is also assumed to consume fish caught from a pond fed by contaminated groundwater.

d. Ingestion of Food and Soil

The resident is assumed to consume plants grown in a home garden. This individual would also be exposed to secondary (inadvertent) ingestion of soil.

The ingestion exposure pathway includes irrigation models and growing of plants in contaminated soil and irrigating with contaminated water.

2.1.4 Analysis Results

The results of the RESRAD analysis are described in this section. Table 2.1.2 gives the calculated landfill dose to soil concentration ratios (DSRs) as well as the minimum landfill guideline concentration limit (GCL) in soil for each individual radionuclide. If only one radionuclide was present, the concentration must be below the individual radionuclide GCL for maintaining public dose to below 1 mrem/y. For a mixture of radionuclides, the unity rule to the sum of fractions applies as stated in Section 1.3. A summary report from the RESRAD analysis is provided as Appendix IA.

Table 2.1.2
Landfill Disposal Resident/Farmer GCLs and DSRs
for Individual Radionuclides

Radionuclide	Landfill Guideline GCL (pCi/g per mrem/y)	Landfill DSR (mrem/y per pCi/g)
Ac-227	3.668E-01	2.727E+00
Ag-108m	1.106E-01	9.045E+00
Ag-110m	1.311E+00	7.629E-01
Am-241	5.361E-02	1.865E+01
C-14	1.542E-01	6.485E+00
Cd-109	5.741E-01	1.742E+00
Ce-144	6.145E+01	1.627E-02
Cm-243	5.079E+00	1.969E-01
Cm-244	6.909E+00	1.447E-01
Co-60	5.891E-01	1.698E+00
Cs-134	1.087E+00	9.197E-01
Cs-135	1.890E+01	5.291E-02
Cs-137	1.385E+00	7.218E-01
Eu-152	1.738E+00	5.753E-01
Eu-154	1.564E+00	6.392E-01
Fe-55	1.667E+04	5.999E-05
H-3	2.414E+01	4.142E-02
I-129	5.051E-03	1.980E+02
Mn-54	3.176E+00	3.148E-01
Nb-94	1.788E-01	5.592E+00
Ni-59	6.018E+02	1.662E-03
Ni-63	2.807E+02	3.562E-03
Pm-147	5.663E+03	1.766E-04
Pu-238	3.753E+00	2.665E-01
Pu-239	2.289E+00	4.368E-01
Pu-241	1.631E+00	6.130E-01
Ru-106	4.019E-01	2.488E+00
Sb-125	9.445E-01	1.059E+00
Sr-90	2.424E-01	4.126E+00
Tc-99	7.928E-01	1.261E+00
U-238	1.034E+00	9.674E-01
Zn-65	7.477E-01	1.337E+00

2.2 DISPOSAL FACILITY OPERATOR

In this scenario, the potential dose is assessed to the most exposed individual working at the landfill site. This scenario is similar to an industrial use scenario. The pathways that are not applicable to the worker include ingestion of drinking water, plant foods, fish, or meat or milk from livestock at the site. The only relevant pathways are direct exposure and inhalation of dust. During the landfill operation and the following monitoring period, no farming is allowed and the barriers in place to protect groundwater and to collect leachate from the burial trenches are assumed to remain effective.

2.2.1 Analyses Method

The analysis was conducted with RESRAD code. The code was briefly described earlier in Section 2.1.1.

2.2.2 Analysis Assumptions

Conservatively, the following assumptions were made in the analysis:

a. The most exposed individual at the landfill is the bulldozer operator, positioning and spreading the demolition debris and placing a soil cap on it at the end of the day.

b. The worker is assumed to work 10 hour days to disposition the material.

c. Based on the volume estimates of demolition debris (16,000 m^3) and the landfill disposition rate of 1600 m^3 per day, the total exposure hours are limited to 100 hours. For this analysis, the exposure time was increased by an additional 20 percent and is assumed to be 120 hours over a one year duration. Since only the direct exposure and inhalation RESRAD pathways are active for the landfill scenario, exposure is expected to occur only while the worker is positioning and spreading the demolition debris (i,e., no exposure occurs while the worker is at other location adjacent to the location of the demolition debris) and no exposure is expected to occur to other workers adjacent to the location where the demolition debris is being deposited.

d. Conservatively, it is assumed that all the demolition debris is dispositioned by the same landfill worker.

e. A 0.15 m soil cover (which is the daily cover requirement and practice) was assumed; however, it was degraded to zero cover through enhanced erosion by the end of 50 years after emplacement. No credit was taken for the more realistic layers, several meters deep, of other materials that will be deposited on top of the demolition debris in routine operations. Also, because the 0.15 m soil cover is placed on a daily basis, no exposure to the landfill worker is assumed on subsequent days when the worker may be placing other landfill materials above the location where the demolition debris was placed. The 0.15 m soil cover is sufficient to effectively shield exposure from the direct exposure pathway and to seal off exposure from the inhalation pathway.

2.2.3 Potential Landfill Worker Exposure Assessment

Recognizing that resident/farmer provides the upper bound scenario and that GCLs were conservatively selected based on this scenario, these GCLs were applied to assess potential exposure to a landfill worker along with the assumptions listed in Section 2.2.2.

In this assessment two cases were analyzed. These cases were defined as follows:

a. Case 1

In this case, the radionuclide mixture representative of the demolition debris was assumed. From past Part 61 laboratory analyses of composite smears taken around the plant, the radionuclide breakdown is as follows:

Co-60	81.0 %
Cs-137	3.2 %
Mn-54	3.9 %
Fe-55 (and Fe-59)	9.1 %
Zn-65	2.1 %
Ni-63	0.7 %

This mixture breakdown along with the individual radionuclide GCLs determined as described in Section 2.2.3.1 and the unity rule for sum of fractions were used to calculate the dose to the landfill operator. For Fe, the data are equally split between Fe-55 and Fe-59. Even though Fe-59 is not expected to be present at the time of disposition of demolition debris because of a short half life, in the analysis it was conservatively assumed that Fe-55 represents the combined fraction.

Only a cover of 0.15 m, which is a requirement for covering the disposal material on a daily basis, was assumed. No dilution factors were assumed.

The results of the assessment are shown in Table 2.2.1.

Table 2.2.1
Dose Assessment for Landfill Worker
(with a 0.15 m soil cover)

Radionuclide	Ground Dose (mrem/y)	Inhalation Dose (mrem/y)
Co-60	1.696E-02	6.660E-10
Cs-137	2.081E-04	8.338E-12
Fe-55	0.000E+00	2.286E-08
Mn-54	6.288E-05	2.639E-13
Ni-63	0.000E+00	8.308E-11
Zn-65	3.359E-05	4.447E-13
Total	1.726E-02	2.362E-08

The total potential dose to the landfill worker is less than 0.02 mrem/y TEDE.

An additional calculation was performed to assess the effects of the removal of even the minimum soil cover of 0.15 m. Results of the calculation with no cover on the demolition debris is shown in Table 2.2.2. Even in this implausible case, the potential dose is predicted to be 0.1 mrem/y TEDE.

Table 2.2.2
Dose Assessment for Landfill Worker
(without a soil cover)

Radionuclide	Ground Dose (mrem/y)	Inhalation Dose (mrem/y)
Co-60	9.998E-02	2.043E-07
Cs-137	1.767E-03	2.511E-09
Fe-55	0.000E+00	7.165E-06
Mn-54	4.647E-04	9.139E-11
Ni-63	0.000E+00	2.495E-08
Zn-65	2.247E-04	1.872E-10
Total	1.024E-01	7.397E-06

b. Case 2

Since external exposure pathway is the only dominant pathway, as an upper bound case assessment, it was assumed that all activity is due to Co-60. As past Part 61 analysis has shown Co-60 to account for over 80 % of the surface activity at BRP site; in this scenario, 100 % of the activity was attributed to Co-60. Other assumptions were similar to Case 1.

The results of the analysis are shown in Table 2.2.3 for the assumptions of a minimal 0.15 m cover and with the demolition debris totally uncovered. Again, even in this unrealistically conservative case, the predicted dose is only 0.12 mrem/y TEDE. External radiation is the only pathway that contributes to exposure.

Table 2.2.3
Dose Assessment for Co-60 for Landfill Worker

Assumptions	Total Dose (mrem/y)
0.15 m Soil Cover	2.035E-02
No Soil Cover	1.200E-01

2.3 TRANSPORTATION

Truck transportation is the only mode of transport available to Big Rock Point for carrying demolition debris for disposal at a local landfill. Analysis in the BMCM assumes that truck transport will be used for transporting demolition debris from the site to a nearby available landfill. In this analysis, three types of truck transport systems, which are generally the common practice for carrying demolition debris, have been assessed. These transport systems include:

a. Roll-off Container System,

b. Dual-trailer Mule System, and

c. Wide-bodied Demolition Hauler.

2.3.1 Exposure pathways

The only pathway that is relevant to the analysis in the truck transport is the external radiation pathway. This is the only exposure pathway included in this assessment.

2.3.2 Analysis Method

The dose assessment was conducted using the code MicroShield, Version 5, from Grove Engineering (ref. 8).

Calculations were done for three truck transport models as mentioned above. The results of these calculations are presented in Table 2.3.1. The MicroShield runs are provided in Appendix II of this manual.

Potential doses to the truck driver are bounding for this scenario. Bystanders and persons along the transportation path may be theoretically exposed to radiation from the material but such potential exposure is extremely small and immeasurable as the time of exposure is very short (as the truck passes by). Any worker assisting in the loading or unloading will also be potentially exposed to radiation from the material much less than the truck driver. Hence only potential dose to the truck driver is analyzed in the transportation scenario.

2.3.3 Analysis Assumptions

For the three transport systems described above, following parameters have been used:

a. Roll-off Container System

Dimensions: 21.5 feet L x 8 feet W x 3.5 feet H

b. Dual-trailer Mule System

Dimensions: 50 feet L x 8 feet W x 5 feet H

c. Wide-bodied Demolition Hauler

Dimensions: 30 feet L x 8 feet W x 6 feet H

In the analysis results section, these transport systems are represented by Cases 1 to 3.

In addition to the above, the following assumptions were also applied to the analysis. In each case, the driver's seat is assumed to be 1 foot away from the cabin wall, which is conservatively assumed to be 0.12 inches thick, made of iron. The material hauler part of the truck is assumed to be made of iron with 0.25 inch thick sides, floor and tailgates. The distance between the hauler part and the driver's cabin is assumed to be 4 feet, 5 feet and 7 feet for the three cases a, b, and c, respectively. In the case of dual-trailer, case b, a total length of 50 feet was assumed and no credit was taken for the air gap between the two trailers.

It is assumed that three truck drivers will be used for the total duration of the project and that the number of loads transported will be divided equally between each driver. Given the anticipated volumes of the demolition debris (20,000 cubic yards), combined with the assumptions of standard load volumes and the driving time of 2 hours per load to the landfill, each truck driver will be potentially exposed to radiation from residual radioactivity for 600 hours in Case 1, 180 hours in Case 2 and 252 hours in Case 3.

For calculating input radionuclide concentrations for MicroShield analysis, it was assumed that the radionuclides are present in the bulk materials in the same overall distribution as the 10 CFR Part 61 analysis distribution, given in Section

2.2.3. This combined with the individual radionuclide CDL values given in Table 1.3.1, were used to calculate the concentrations in pCi/g, which were then converted into $\mu Ci/cm^3$, assuming the concrete demolition debris density of 2.4 g/cm^3.

An additional upper bound scenario was analyzed where Co-60 was assumed as the only radionuclide present and using its single radionuclide CDL value, the input concentration was calculated and applied in the MicroShield analyses.

2.3.4 Analysis Results

Analyses were conducted with MicroShield for each of the three cases for two scenarios. In the first scenario, a mixture of radionuclides is assumed. Based on the 10 CFR Part 61 distribution and the individual radionuclide CDLs from Table 1.3.1 along with the assumptions discussed in Section 2.3.3, the concentrations were calculated and input into the analysis.

In the second scenario, conservatively it was assumed that only Co-60 was present at the CDL level.

The results are shown in Tables 2.3.1 and 2.3.2. The maximum potential transportation dose predicted for the duration of the project and assuming a mixture of radionuclides is 0.89 mrem. Using the bounding assumption of only Co-60 present at the CDL level, the maximum potential transportation dose is 1.00 mrem. Therefore, the Resident/Farmer scenario discussed in Section 2.1 is the bounding analysis for potential dose to a critical member of the public from local landfill disposal of demolition debris during the decommissioning process.

Table 2.3.1
Doses to Truck Driver for Scenario with Mixture of Radionuclides

MICROSHIELD EXPOSURE RATES AND POTENTIAL DOSES FOR THE TRANSPORT SCENARIO		
Case	Exposure Rate (mR/h)	Potential Total Dose to Driver (mrem)
Case 1	1.49E-3	0.89
Case 2	1.07E-3	0.19
Case 3	1.14E-3	0.29

Table 2.3.2
Dose to Truck Driver for Scenario With Co-60

MICROSHIELD EXPOSURE RATES AND POTENTIAL DOSES FOR TRANSPORT SCENARIO		
Case	Exposure Rate (mR/h)	Potential Total Dose to Driver (mrem)
Case 1	1.66E-3	1.00
Case 2	1.22E-3	0.22
Case 3	1.28E-3	0.32

BMCM PART 3

RECORD REQUIREMENTS

1.0 RECORD REQUIREMENTS

Records shall be retained in accordance with Defueled Technical Specification 6.8 and established implementing procedures.

As a minimum, these records shall include:

a. Surface contamination monitoring reports which clearly describe:

1. Date and time the survey was performed,
2. Individual(s) who performed the survey,
3. Serial number and calibration due date for each instrument used in performing the survey,
4. Location of the survey,
5. Direct survey results in units of dpm/100 cm^2, and
6. Indirect survey (smear) results in units of dpm/100 cm^2.
7. Individual(s) who reviewed survey results.

b. Bulk container assay records for each container which include:

1. Date and time the assay was performed,
2. Individual(s) who performed the assay,
3. Source of the demolition debris,
4. Mass, volume and composition of the demolition debris,
5. Radionuclide selected to establish the CDL, and
6. Count time used by the assay system to achieve the established CDL based on the container's mass of demolition debris, and
7. Landfill destination for the demolition debris.

8. Material container identification number.

9. Offsite laboratory analysis (10 CFR Part 61) results.

10. Calibration source certifications and records.

11. Individual(s) who reviewed survey results.

c. Bulk container assay system source efficiency determinations shall include:

1. Daily source efficiency and background checks.

2. Annual source efficiency determination.

BMCM PART 4

QA/QC CONSIDERATIONS

1.0 CONTROLLING REQUIREMENTS

The Consumers Energy Quality Assurance Program Description for Operational Nuclear Power Plants, CPC-2A, contains the Quality Assurance requirements for the Big Rock Point Plant.

2.0 DOCUMENTATION REQUIREMENTS

All aspects of the screening surveys and bulk materials assays shall be documented in detail. For certain field or laboratory activities, consensus or industry-wide procedures may be either adopted in whole or adapted to meet the requirements of the specific demolition debris disposal action. These procedures become part of the administrative record of the survey or assay.

3.0 AUDITS

Periodic audits should be performed to verify that survey/assay activities comply with established procedures and other aspects of the QA Program and to evaluate the overall effectiveness of the QA Program. The audits should be conducted in accordance with written guidelines or checklists, and should be performed by individuals not actively participating in the activities being audited. Audit results should be reported to management in writing and actions to resolve identified deficiencies should be tracked and appropriately documented. Requirements for onsite and offsite reviews and audits are described in CPC-2A.

4.0 PROCEDURES

Written procedures shall be established, implemented and maintained to implement the Bulk Materials Control Program. These procedures shall meet or exceed the requirements of ANSI N18.7-1976, as endorsed by the Quality Program Description (CPC-2A).

BMCM PART 5

REPORTING REQUIREMENTS

1.0 REPORTS

Changes to the BMCM shall be submitted to the Commission in the Radioactive Effluent Release Report for the period in which the changes were made effective. This submittal shall contain sufficiently detailed information to support the rationale for each change. It shall also include a determination that the change will not result in the release of demolition debris for landfill disposal which is not radiologically clean and that any potential release of licensed radioactive material below the bulk materials assay system CDL will not exceed potential annual dose to an average member of the critical group of 1 mrem/y TEDE.

REFERENCES

REFERENCES

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4. Nuclear Regulatory Commission, The Multi Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG-1575, Washington, DC, December, 1997.

5. Nuclear Regulatory Commission, Information Notice No. 85-92, Surveys of Wastes Before Disposal from Nuclear Reactor Facilities, Washington, DC, 1985.

6. Argonne National Laboratory, RESRAD code, Version 5.95, October 1999; A Manual for Implementing Residual Radioactive Material Guideline, ANL/ES-160 (DOE/CH/8901), Argonne, 1989.

7. Nuclear Regulatory Commission, Policy and Guidance Directive PG-8-08, Scenarios for Assessing Potential Doses Associated with Residual Radioactivity, Washington, DC, May, 1994.

8. Grove Engineering, MicroShield Version 5, Rockville, 1996.

APPENDIX I

RESRAD ANALYSIS DATA