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Trojan Nuclear Plant
Docket 50-344
License NPF-1

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

PGE-1061, "Trojan Nuclear Plant Defueled Safety Analysis Report
and License Termination Plan (PGE-1078)," Revision 22, and
<u>Subsequent Deletion as an Active Topical Report and Licensing Basis Document</u>

This letter deletes Portland General Electric Company's PGE-1061, "Trojan Nuclear Plant Defueled Safety Analysis Report and License Termination Plan (PGE-1078)," as an active topical report and licensing basis document for the Trojan Nuclear Plant. Deletion of this document reflects the Nuclear Regulatory Commission's termination of the Trojan Nuclear Plant's 10 CFR 50 Possission Only License, NPF-1. Revision 22 is included with this transmittal for the transition of PGE-1061 to a historical document containing information current at the time of license termination.

No controlled copyholder actions are necessary as a result of this notification and your controlled copy of PGE-1061 may be destroyed. However, if you wish to retain PGE-1061 as a historical document, please incorporate the enclosed revised pages.

If you have any questions concerning this submittal, please contact Mr. Jerry D. Reid, of my staff, at (503) 556-7013.

Sincerely,

Stephen M. Quennoz
Vice President, Generation

Enclosure

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NMSS01

PGE-1061, "TNP Decommissioning Plan"

Revision 22

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The capability to isolate or to mitigate the consequences of a radioactive release will continue to be maintained during decontamination and dismantlement activities. Isolation is the closure of penetrations and openings to restrict transport of radioactivity to the environment. Airborne radioactive particulate emissions will continue to be filtered as applicable, and effluent discharges monitored and quantified. This includes (1) the operation of appropriate portions of building ventilation systems, or approved alternate systems, as necessary during decontamination and dismantlement activities; and (2) use of local high efficiency particulate air (HEPA) filtration systems for activities expected to result in the generation of airborne radioactive particulates (e.g. grinding, chemical decontamination, or thermal cutting of contaminated components).

Work activities are planned to minimize the spread of contamination. Contaminated liquids are contained within existing or supplemental barriers and processed by a liquid waste processing system prior to release. To minimize the potential for spread of contamination, the following considerations will continue to be incorporated into the planning of decommissioning work activities:

1. Covering of openings in internally contaminated components to confine internal contamination;

2. Decontamination and dismantlement of contaminated systems, structures, and components by decontamination in place, removal and decontamination, or removal and disposal;

3. Removal of contaminated supports in conjunction with equipment removal or decontamination of supports in conjunction with building decontamination;

4. Removal of contaminated systems and components from areas and buildings prior to structural decontamination (block shield walls, or portions of other walls, ceilings, or floors may be removed to permit removal of systems and components);

5. Removal or decontamination of embedded contaminated piping, conduit, ducts, plates, channels, anchors, sumps, and sleeves during area and building structural decontamination activities;

6. Use of local or centralized processing and cutting stations to facilitate packaging of components removed in large pieces; and

7. Removal of small or compact plant components and parts intact, where feasible. (This includes most valves, smaller pumps, some small tanks, and heat exchangers. These components could then be decontaminated in whole or part, and reduced to smaller dimensions in preparation for disposal or release.)

Additional details of the policy, methods, frequency, and procedures for effluent monitoring are provided in the ODCM and radiation protection implementing procedures.

3.2.6.3.2 Radiological Environmental Monitoring

The Radiological Environmental Monitoring Program is required by the TNP Nuclear Quality Assurance Program (Reference 3-8) and is incorporated into the ODCM. The Radiological Environmental Monitoring Program is periodically reviewed to address changing plant conditions and regulatory requirements in accordance with plant procedures. Additional details of the policy, methods, and procedures associated with the Radiological Environmental Monitoring Program are provided in the ODCM and radiation protection implementing procedures.

3.2.6.4 Control of Personnel Radiation Exposure

As specified in the TNP Nuclear Quality Assurance Program (Reference 3-8), the procedures for personnel radiation protection are prepared consistent with the requirements of 10 CFR 20 and are approved, maintained, and adhered to for activities involving personnel radiation exposure.

3.2.6.4.1 Access Control and Area Designations

Access to the Industrial Area is controlled by locked gates. Radiologically controlled access within the Industrial Area of the plant is determined by the radiation level, the degree of contamination, or the presence of radioactive materials in the various areas.

A RCA is an area where access is controlled for the purpose of protecting individuals from exposure to radiation. Within the RCA, access to areas of higher radiation or contamination levels is further controlled and defined in accordance with 10 CFR 20 and radiation protection implementing procedures. Plant procedures also describe the requirements for radiological postings advising workers of potential radiological hazards at the entrance and boundaries of radiologically controlled areas.

3.2.6.4.2 Facility Contamination Control

Plant and radiation protection implementing procedures direct the use of various practices and equipment to ensure general plant area contamination is controlled at the source to the greatest extent possible. Additional contamination controls are specified for jobs involving high levels of contamination (e.g., a double step-off pad, additional surveys, etc.). Appropriate contamination controls are used when carrying contaminated tools and equipment between areas. Geiger-Mueller count rate meters (friskers) are located within the plant so that personnel can determine if they have been contaminated prior to entering another area of the plant. The final checkpoint for personnel leaving controlled areas of the plant is the access control point. Temporary exit points may be established at remote control areas as needed.

Airborne contamination is minimized by minimizing loose contamination levels and their sources. The use of installed and temporary ventilation systems prevents the build-up of air contamination concentrations. These systems are described further in Sections 2.2.3.3, 2.3.2.12, 2.3.2.13, and 2.3.2.14.

Additional details on the policy and methods for controlling general area and airborne contamination are contained in radiation protection implementing procedures.

3.2.6.4.3 Personnel Contamination Control

Contamination of personnel is controlled by the use of several types of disposable protective clothing when entering contaminated areas.

Additional details on the policy and methods for controlling personnel contamination are contained in radiation protection implementing procedures.

3.2.6.4.4 Area Surveys

Radiation protection personnel perform routine radiation surveys of accessible areas of the plant. These surveys consist of contamination surveys, air samples, and external radiation measurements as appropriate for the specific area. Additionally, specific surveys are performed as needed for decommissioning and maintenance functions involving potential exposure of personnel to radiation or radioactive materials. Specific activities requiring these non-routine surveys include equipment release to uncontrolled areas, and response to radiation alarms. Additional details on the policy, methods, frequencies, and requirements for conducting both routine and non-routine radiation surveys are contained in radiation protection implementing procedures. These procedures specify the types and suitability of instrumentation and methods to be employed when performing surveys and actions required when abnormal radiological conditions are discovered.

3.2.6.4.5 Personnel Monitoring

TLDs are worn by plant personnel within RCAs.

Additional details on the policy, methods, and frequency of personnel monitoring are contained in radiation protection implementing procedures.

3.2.6.4.6 Radiation Work Permits

Work in RCAs is performed under the authorization of radiation work permits issued by radiation protection personnel. These permits state protective clothing and dosimetry requirements, monitoring requirements, and special notes or cautions pertinent to the job. These permits also specify the maximum contamination level and radiation level for the worker to be entered under that radiation work permit, or will instruct the worker where to obtain such information. Additional details on the use of radiation work permits are contained in radiation protection implementing procedures.

3.2.6.4.7 Training

Personnel who require access to RCAs at TNP receive radiation protection training in accordance with 10 CFR 19, "Notices, instructions and reports to workers: inspection and investigations," and commensurate with the individual's responsibilities. The training process and requirements for general employees and radiation workers are summarized in Section 2.7 and are described in plant and radiation protection implementing procedures.

3.2.6.4.8 Radioactive Materials Safety

Equipment and fluids in certain plant systems became contaminated during plant operation. These contaminated materials, together with radioactive materials contained in spent fuel, sealed sources, and instrument calibration devices, can result in radiation exposure to plant personnel. Procedures, facilities, and equipment for handling, processing, and disposing of radioactive gaseous, liquid, and solid wastes are described in Sections 3.2.6.1, 3.3.2, and 3.3.3.

The materials safety program is defined by written radiation protection procedures. Additional details on the materials safety program are contained in radiation protection implementing procedures.

With regard to sealed sources, each sealed source containing radioactive material either in excess of those quantities of byproduct material listed in 10 CFR 30.71 or ≥ 0.1 microcuries of any other material, including alpha emitters, shall be free of ≥ 0.005 microcuries of removable contamination. Each sealed source shall be tested for leakage and/or contamination by qualified TNP personnel or other persons specifically authorized by the NRC or an Agreement State. Each sealed source shall be tested using a test method having a detection sensitivity of at least 0.005 microcuries per test sample. Each sealed source with removable contamination in excess of the activity limit shall immediately be withdrawn from use and decontaminated, repaired, or disposed of in accordance with NRC regulations.

Sealed sources in use (excluding startup sources previously subjected to core flux), including those with a half-life greater than 30 days (excluding Tritium) and those in any form other than gas, shall be leak tested at least once per six months. Sealed sources not in use shall be tested prior to use or transferred to another licensee unless it has been tested within the previous six months. Sealed sources transferred without a certificate indicating the last test date shall be tested prior to being placed in use. Sealed sources installed in fixed plant equipment shall be tested upon receipt, prior to maintenance on associated equipment, at least once per twelve months, and prior to transfer to another licensee. Sealed source leak test results and the annual physical inventory of all sealed source material of record shall be maintained for at least five years.

3.3 RADIOACTIVE WASTE MANAGEMENT

With spent nuclear fuel no longer located on the TNP site, radioactive waste management activities during the remaining TNP decommissioning period include activities related to gaseous, liquid, and solid radioactive waste processing and disposal. The processing and disposal of gaseous, liquid, and solid radioactive waste will be managed in accordance with the Radiation Protection Program, Process Control Program, ODCM, Radioactive Effluent Controls Program, Radiological Environmental Monitoring Program, and Storage Tank Radioactivity Monitoring Program.

TNP policy for control of radioactive wastes is to minimize the amount of waste material generated, and to maintain the discharge of radioactive material below the design objectives provided in the ODCM. To ensure waste minimization goals are achieved during decommissioning, radiation workers will receive training in waste minimization procedures and practices. The TNP radioactive waste control program defines responsibilities and provides guidance for the minimization of radioactive wastes.

3.3.1 DELETED

3.3.2 RADIOACTIVE WASTE PROCESSING

3.3.2.1 Gaseous Radioactivity

Gaseous radioactivity is expected to be limited primarily to airborne radioactive particulates generated during decontamination and dismantlement activities. Airborne radioactive particulates are filtered through HEPA filters in the portions of building ventilation system(s) that are required to be maintained in operation to support decontamination and dismantlement activities in those buildings (see Sections 2.2.3.3, 2.3.2.12, 2.3.2.13, and 2.3.2.14). With decontamination and dismantlement activities still required in the Fuel and Auxiliary Buildings, the ventilation systems for these buildings are depicted in Figures 3-3 and 3-4.

Local temporary ventilation systems with HEPA filtration, or other approved alternate systems, may be used in lieu of or to supplement building ventilation for activities expected to result in the generation of airborne radioactive particulates. Radioactive gaseous effluents will be monitored and release limits adhered to in accordance with the methodology and parameters in the ODCM.

3.3.2.2 Liquid Radioactive Waste

Liquid radioactive waste will be generated as a result of draining, decontamination, and cutting processes during plant decommissioning. Liquid radioactive waste treatment systems (plant effluent system, clean radioactive waste system, and dirty radioactive waste system) will be maintained as needed during decommissioning to process liquid radioactive wastes by filtering, demineralizing, and providing for holdup or decay of the radioactive wastes for the purpose of reducing the total radioactivity prior to release to the environment (see

Sections 2.3.2.11, 2.3.2.17, and 2.3.2.18). Temporary liquid waste processing systems may also be used to process liquid radioactive waste. Radioactive liquid effluents will be processed in accordance with the ODCM.

3.3.2.3 Solid Radioactive Waste

Solid radioactive waste generated during decommissioning will include neutron-activated materials, contaminated materials, and radioactive wastes. Neutron-activated materials include the reactor pressure vessel, reactor vessel internals components, and the concrete biological shield. Contaminated material and radioactive wastes include pipe sections, valves, tanks, other plant equipment, concrete surfaces, contaminated air filters, wet solid wastes from the processing of contaminated water volumes (ion exchange resins, cartridge filters), and dry solid wastes (rags and wipes, plastic sheeting, contaminated tools, disposable protective clothing).

The solid radioactive waste system spent resin transfer system, filter handling vehicle, solid waste compactor, and spent resin compactor will be maintained in operation as necessary during decommissioning to process solid waste (see Section 2.3.2.17). Temporary solid waste processing systems may also be used.

Solid radioactive waste will be processed in accordance with the TNP Radiation Protection Program, Process Control Program, and plant procedures. The Process Control Program provides requirements to ensure that shipping and burial ground requirements are met. To the maximum extent practicable, solid radioactive waste will be decontaminated and compacted to reduce the volume to be packaged for shipment to an offsite disposal facility.

Waste container selection will be determined by the type, size, weight, classification, and activity level of the material to be packaged. Examples of containers used at TNP include drums, metal boxes, C-vans (container vans), and high-integrity containers. Other special containers may be used as required.

3.3.2.4 Mixed Wastes

Mixed wastes are wastes that contain both a hazardous waste component regulated under Subtitle C of the Resource Conservation and Recovery Act and a radioactive component consisting of source, special nuclear, or byproduct material regulated under the Atomic Energy Act. Plant procedures provide guidance for the minimization, control, and storage of mixed waste in accordance with the Environmental Protection Agency (EPA) and NRC regulations. The use of potentially hazardous materials in radiologically controlled areas will be reviewed to minimize the generation of mixed waste. TNP currently has no known mixed waste stored onsite. In the unlikely event that mixed waste is generated or discovered, it may be stored onsite until a permanent storage or disposal facility becomes available.

3.3.3 RADIOACTIVE WASTE DISPOSAL

Radioactive waste will be appropriately packaged and will either be shipped to an offsite processing facility, shipped directly to a low-level radioactive waste disposal facility, or otherwise handled in accordance with applicable regulations. Packaging, storage, and shipment of radioactive waste generated during decommissioning will be controlled by the TNP Radiation Protection and Process Control Programs, and plant procedures. Plant procedures include requirements for:

1. Sorting and segregation of radioactive waste, and processing to an acceptable form;
2. Classification of radioactive waste in accordance with Department of Transportation (DOT) and NRC requirements;
3. Packaging, labeling, and marking of radioactive waste in accordance with DOT and disposal site criteria;
4. Storage of radioactive waste;
5. Receipt survey of vehicles used to transport radioactive waste;
6. Contamination surveys to ensure packages shipped meet DOT requirements for smearable contamination levels;
7. Radiation surveys, e.g., package contact, vehicle contact, specified distances from the package and the vehicle, and normally occupied positions in the vehicle cab for the material and package and for the transport vehicle depending on the type of shipment (e.g, low-specific activity, exclusive-use low-specific activity, etc.);
8. Shipment of radioactive waste in accordance with DOT and NRC requirements; and
9. Disposal and offsite volume reduction arrangements.

Radioactive waste storage facilities onsite include the Condensate Demineralizer Building, and, depending on the type and radiation levels, may also include areas of the Auxiliary and Fuel Buildings. Other temporary radioactive waste storage areas may be established as necessary.

A projection of radioactive waste generation (projected waste volumes, radionuclide concentrations, waste forms, and classification) is contained in Sections 2.5.2 and/or 3.1.3.

3.4 EVENT ANALYSIS

3.4.1 OVERVIEW

This section presents the results of an analysis (Reference 3-15) that confirms that, considering the current advanced stage of TNP decommissioning and with spent nuclear fuel no longer on the TNP site, the minimal radioactive material resulting from TNP operation and remaining on the TNP site is insufficient for any potential event to result in exceeding dose limits or otherwise involving a significant adverse effect on public health and safety. Specifically, the analysis presented in this section considers the spontaneous release of the radioactive source term remaining at the TNP site in a form releasable through the airborne pathway, and similarly considers the spontaneous release of the radioactive source term remaining at the TNP site in a form immediately releasable through a liquid discharge pathway. These events are non- mechanistic in that there is no credible phenomena that could reasonably be postulated to cause such releases. However, these non-mechanistic events are analyzed to bound any remaining decommissioning events that can still be postulated considering the current advanced stage of TNP decommissioning.

3.4.2 LIMITS AND ASSUMPTIONS

3.4.2.1 Radionuclide Release Limits

The EPA has established protective action guidelines, EPA 400-R-92-001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," October 1991, that specify the potential offsite dose levels at which actions should be taken to protect the health and safety of the public. The EPA protective action guidelines (PAGs) are limiting values based on the sum of the effective dose equivalent resulting from exposure to external sources and from the committed effective dose equivalent incurred from the significant inhalation pathways during the early phase of an event. The EPA PAG limits are:

	EPA PAGs, rem
TEDE	1
Thyroid Committed Dose Equivalent (CDE)	5
Skin CDE	50

The Food and Drug Administration (FDA) has established preventive PAGs for low impact protective actions at projected radiation doses of 0.5 rem TEDE, bone marrow CDE, or other organ CDE and 1.5 rem thyroid CDE. The analysis in this section indicates that there is insufficient releasable radioactive contamination remaining on the TNP site for reasonably conceivable radiological accident scenarios that could result in exceeding the conservative FDA preventative PAGs at the TNP Exclusion Area boundary.

To ensure that the maximum dose at the Exclusion Area Boundary from an airborne release would be maintained less than or equal to these limits, calculations were performed to determine the amount of radioactive material that would have to be released (airborne) to result in a limiting dose of 0.5 rem at the Exclusion Area Boundary. This calculation was performed for three possible release locations.

Release Location	Airborne Activity Limit
Inside a building with filtered ventilation	2,840 Ci
Inside a building without filtered ventilation	34.5 Ci
Outside a building	2.07 Ci

Airborne releases of the magnitude shown above potentially result in radiation exposures of 0.5 rem at the Exclusion Area Boundary using the conservative assumptions discussed in Section 3.4.2.2.

For radioactive liquid releases, this analysis conservatively applies the normal effluent concentration limit of 10 CFR 20, Appendix B, Table 2, Column 2, to the non-mechanistic event involving release of bulk radioactive liquids. As discussed further in Section 3.4.3.2.1, the most significant potential release is assumed to involve tritium, which has a concentration limit of 1E-3 μCi/ml at the nearest water used for human consumption (the City of Rainier water intake).

3.4.2.2 Assumptions

The following assumptions were used to develop the airborne release limits listed above:

1. Airborne releases of radioactive materials are assumed to pass through a HEPA filtration system when the release originates inside a building with filtered ventilation. HEPA filter efficiency is assumed to be 99.97%;

2. For releases that originate inside a building without filtered ventilation, the guidance of Regulatory Guide 1.78, "Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," Revision 0, was used to obtain an activity decay rate of 6.00×10^{-2}/hr;

3. Conservative meteorological conditions (Pasquall class F with wind speed 1.13 m/sec) and release elevations are assumed;

4. Dose conversion factors were taken from EPA-520, Table 2.1, Revision 2.

5. Doses are early phase projections during the first two hours or less.

6. The north sector site boundary at 662 meters is the location for which doses are calculated.

7. Breathing rate is 3.33E-4 m^3/sec.

8. A plume depletion factor of 0.92 is used.

9. Credit was taken for diffusion due to building wake effect.

10. Isotopic concentrations found in the primary side of the Trojan steam generators projected to June 1994 were used for dose predictions. This isotopic mixture is conservative for contaminated components and activation of concrete components. The amount of activity for each isotope was determined as a percentage of the total activity present in the isotopic mixture. This percentage was then normalized to 1 curie, and the projected dose from an airborne release was calculated. The isotopic mixture of activated metallic components was not utilized since credible events did not result in airborne release of these materials.

3.4.3 REMAINING RELEASABLE RADIOACTIVE SOURCE TERM

The amount of radioactive contamination conservatively estimated to remain at the TNP site immediately following the completion of spent nuclear fuel transfer to the ISFSI bounds the amounts present as decommissioning progresses and is completed, and thus is used in this analysis. This analysis separately considers the remaining radioactive contamination that is releasable as airborne contamination, and the remaining radioactive contamination that is immediately releasable as contaminated water.

3.4.3.1 <u>Potential Airborne Radioactive Material Sources</u>

Potential sources of airborne radioactivity that remain at TNP include the following:

1. Radioactivity on surfaces of plant structures, systems, and components, including the Spent Fuel Pool (excludes the Spent Fuel Pool water that is not a significant airborne concern and is addressed in Section 3.4.3.2) and one uncontained spent fuel rack;

2. Sealed and unsealed sources used for instrument calibration;

3. Resins used for Spent Fuel Pool cleanup;

4. Filters used for liquid radwaste cleanup;

5. Assorted tools and equipment used to perform decommissioning activities; and

6. A varying number of radioactive waste containers stored awaiting shipment.

3.4.3.1.1 Radioactivity on Plant Surfaces

The radioactivity on most plant surfaces is conservatively estimated by assuming that the maximum amount of radioactive surface contamination allowed by the Final Survey Plan (i.e., surface DCGL, as detailed in Section 4) is present and releasable. Specifically, it was assumed that radioactivity amounts at the applicable surface DCGL limit are present on floors, walls, and ceilings of the Auxiliary Building, Fuel Building, pipe penetration area, Main Steam Support Structure, electrical penetrations area, Turbine Building, and the Containment Building. Although there are a few plant areas that have not yet been remediated and undergone turnover and/or final surveys, this assumption is still conservative because the vast majority of plant surfaces have been remediated and measured to be well below the applicable DCGL limits, and those few areas that have not are not anticipated to contain excessive surface contamination levels that would adversely impact this assumption.

The estimated radioactivity on the one spent fuel rack that would potentially be uncontained immediately following spent fuel transfer to the ISFSI (such that any radioactive material is assumed to be releasable) is based on the radioactivity levels observed on spent fuel racks previously sent for burial. The radioactivity on the Spent Fuel Pool, Transfer Canal, and Cask Loading Pit surfaces is based on radioactive contamination levels recently measured on the Transfer Canal and Cask Loading Pit doors that had been removed for repairs.

Using the above input and assumptions, approximately 386 mCi of radioactive material is conservatively estimated to be present on plant surfaces and available for airborne release.

3.4.3.1.2 Sealed and Unsealed Sources

Sealed sources are designed specifically to prevent the release of the contents and are not considered in this analysis to be a potential source of releasable radioactive material. Unsealed sources remaining at the TNP are of extremely low radioactivity levels, such that they do not contribute significantly to the total releasable source term considered in this analysis.

3.4.3.1.3 Spent Fuel Pool Cleanup Resins

Radioactive resins are generated as part of Spent Fuel Pool cleanup. The radioactive resins are dried for shipment off site for disposal. The dried resin is a potential fire hazard, which if ignited could result in the airborne release of radioactive material. For this analysis, the last Spent Fuel Pool cleanup resin bed is conservatively assumed to remain on site. This analysis conservatively assumes an estimated quantity of radioactive material in a liner of resin to be 2.05 Ci.

Resin in the demineralizer vessel is wet and not ignitable. The radioactive material is tightly bound to the resin beads and not easily removed/releasable. Once dried, any unlikely event involving release of the radioactive material in the resin would be inside a building with filtered ventilation, such that the total radioactivity contained in the resin is insufficient to exceed the preventive PAG limits. In fact, even with no building ventilation, it is clear from the values presented in Section 3.4.2.1 (i.e., a release of 34.5 Ci inside a building with no ventilation would be required to exceed PAG limits) that the total radioactivity contained in the resin is not nearly sufficient to result in exceeding the preventive PAG limits at the Exclusion Area boundary.

Prior to movement of the resin outside a building in preparation for off-site shipment, it is sealed inside a steel and lead container, such that a potential release of the radioactive material contained by the resin is extremely unlikely. Notwithstanding, it is conservatively assumed in this analysis that approximately ½ of the radioactive material, or approximately 1 Ci, is available for airborne release outside a building.

3.4.3.1.4 Liquid Radwaste Filters

Filters are used to remove radioactive material from radioactive liquids generated from decommissioning activities. The radioactive material in these filters is material that is already accounted for above when considering the contamination contained on plant surfaces. Thus, liquid radioactive waste filters do not result in additional releasable source term beyond that already considered.

3.4.3.1.5 Tools and Equipment

Radioactive material on or within tools and equipment used at the TNP is of extremely low radioactivity levels, such that this material constitutes only a small fraction of the radioactivity on plant surfaces. Thus, tools and equipment do not contribute significantly to the total releasable source term considered in this analysis.

3.4.3.1.6 Radioactive Waste Containers

Radioactive waste containers are used to hold radioactive materials as they are being removed from the plant during decommissioning. The radioactive material in/on these containers is material that is already accounted for above when considering the contamination contained on plant surfaces. Thus, radioactive waste containers do not result in significant additional releasable source term beyond that already considered.

3.4.3.2 Potential Radioactive Liquid Sources

Potential sources of radioactive liquid that remain at TNP include the following:

1. Water in the Spent Fuel Pool, Fuel Transfer Canal, and Cask Loading Pit, until this water is removed from the site; and

2. Water generated during decommissioning/decontamination activities.

3.4.3.2.1 Spent Fuel Pool-Related Water

This analysis assumes that the water in the Spent Fuel Pool, Transfer Canal, and Cask Loading Pit (collectively referred to here as the Spent Fuel Pool) remains as a significant source of radioactive liquid. The total volume of water in these structures is assumed to be

412,000 gallons. The Spent Fuel Pool water radioactivity concentration is considered in this analysis to result from tritium, since the activity from other radioactive contaminants make up only a small fraction of the tritium activity. Based on tritium concentration levels at the time of this analysis, the tritium concentration level in the Spent Fuel Pool water is assumed to be 2E-2 μCi/ml. Based on the assumed volume, the total Spent Fuel Pool activity is approximately 32 Ci. This activity is not releasable as particulate; therefore, inhalation is not considered to be a potential dose pathway.

This analysis assumes a non-mechanistic event in which the entire volume of Spent Fuel Pool water as discussed above is spontaneously released to the Columbia River. The analysis also assumes a dilution factor (996) that is conservatively based on the minimum river flow observed during a five-year period. The analysis results confirm that this event would not result in exceeding even the normal effluent concentration limit of 1E-3 μCi/ml (10 CFR 20, Appendix B, Table 2, Column 2).

3.4.3.2.2 Other Radioactive Liquid Sources

With consideration for the advanced stage of TNP decommissioning, the volumes and radioactivity levels of any radioactive water generated during the remaining decontamination activities would be such that any potential release of this material would be a small fraction (both volumetrically and radioactively) of the levels described in Section 3.4.3.2.1 for the Spent Fuel Pool water release event. Thus, these other sources do not result in significant additional source term beyond that already considered, and the consequences of any associated release would be bounded by the consequences of the non-mechanistic event described in Section 3.4.3.2.1.

3.4.3.3 Total Estimated Releasable Radioactive Material Amounts

From Section 3.4.3.1, the analysis results confirm that the total remaining amount of radioactive material that is potentially available for airborne release is conservatively estimated to be less than 1.4 Ci, which is well below the limit of 2.07 Ci that, if released outside a building, could result in exceeding preventive PAG limits. Thus, the consequences of a non-mechanistic event in which the entire remaining radiological source term that is available for airborne release is released do not involve a significant adverse impact on public health and safety.

From Section 3.4.3.2, the analysis results confirm that a non-mechanistic event, in which the entire volume of Spent Fuel Pool water as discussed above is spontaneously released to the Columbia River, would not result in exceeding even the normal effluent concentration limit of 1E-3 μCi/ml pursuant to 10 CFR 20, Appendix B, Table 2, Column 2. Thus, the consequences of this event do not involve a significant adverse impact on public health and safety.

3.4.4 RADIOLOGICAL OCCUPATIONAL SAFETY

Radiological events could occur which result in increased exposure of decommissioning workers to radiation. However, the occurrences of these events are minimized or the consequences are mitigated through the implementation of the Radiation Protection Program.

The Radiation Protection Program is applied to activities performed onsite involving radioactive materials. A primary objective of the Radiation Protection Program is to protect workers and visitors to the site from radiological hazards during decommissioning. The program requires PGE and its contractors to provide sufficient qualified staff, facilities, and equipment to perform decommissioning activities in a radiologically safe manner.

Activities conducted during decommissioning that have the potential for exposure of personnel to either radiation or radioactive materials will be managed by qualified individuals who will implement program requirements in accordance with established procedures. Radiological hazards will be monitored. The Radiation Protection Program at TNP implements administrative dose guidelines for TEDE to ensure personnel do not exceed federal 10 CFR 20 dose limits for occupational exposure to ionizing radiation.

TNP work control procedures will ensure that work specifications, designs, work packages, and radiation work permits involving potential radiation exposure or handling of radioactive materials incorporate effective radiological controls.

3.4.5 OFFSITE RADIOLOGICAL EVENTS

Offsite radiological events related to decommissioning activities are limited to those associated with the shipment of radioactive materials. Radioactive shipments will be made in accordance with applicable regulatory requirements. The radioactive waste management program and the Nuclear Quality Assurance Program assure compliance with these requirements. Compliance with these requirements ensures that both the probability of occurrence and the consequences of an offsite event do not significantly affect the public health and safety.

3.4.6 NONRADIOLOGICAL EVENTS

Decommissioning TNP may require different work activities than were typically conducted during normal plant operations. However, effective application of the TNP safety program to decommissioning activities will ensure worker safety. No decommissioning events were identified that would be initiated from nonradiological sources that could significantly impact public health and safety.

Hazardous materials handling will be controlled by the Hazardous Material Control Program using approved plant procedures. There are no chemicals stored onsite in quantities which, if released, could significantly threaten public health and safety.

Flammable gases stored onsite include combustible gases used for cutting and welding. Safe storage and use of these gases and other flammable materials is controlled through the Fire Protection Program and plant safety procedures.

Plant safety procedures and off-normal instructions have been established which would be implemented if a nonradiological event occurred at TNP. Implementation of these programs and procedures ensures that the probability of occurrence and consequence of onsite nonradiological events do not significantly affect occupational or public health and safety. Plant safety procedures provide personnel safety rules and responsibilities and control both chemical and hazardous waste identification, inventory, handling, storage, use, and disposal.

3.5 OCCUPATIONAL SAFETY

TNP has, and will continue to maintain, an industrial occupational safety program. The intent of the safety program is to ensure a safe and healthy working environment, maintain employee safety awareness, promote safety as an integral part of facility activities, and comply with occupational safety and health regulatory standards. Safety at TNP is viewed as part of the overall plant performance and is an integral part of the activities at the plant. Individuals requiring unescorted access to the Industrial Area receive training in plant safety and chemical safety as part of General Employee Training.

The TNP safety program is addressed in plant safety procedures, which reflect local, state, and federal safety codes and standards. The safety procedures outline acceptable safe work and housekeeping practices, ensure that employees are adequately trained and prepared to perform their jobs safely, and ensure that employees are adequately informed of chemical hazards they may encounter on the job. Personnel are responsible for maintaining a safe work environment.

Individuals assigned the responsibility for the industrial safety programs at the plant will meet with the plant staff on a periodic basis to discuss safety program activities, procedure changes, accident causes, safe procedures, and other subjects pertinent to promoting safety.

3.6 NONRADIOACTIVE WASTE MANAGEMENT

Nonradioactive regulated waste materials expected to be handled during decommissioning include asbestos, polychlorinated biphenyls (PCBs), mercury, and lead. Other nonradioactive waste materials include steel components (e.g., piping, valves), electrical components (e.g., wiring, motors), and structural materials (e.g., concrete, beams). Handling and disposal of nonradioactive regulated waste materials will be controlled by the TNP chemical safety program. This program provides for evaluation of regulated substances and approval of methods for their handling and disposal. Work will be done in accordance with the TNP work control process. This process ensures that decommissioning activities receive appropriate safety and technical reviews.

Nonradioactive waste materials will be transported by approved or licensed transporters as required, and shipped to permitted solid waste landfills or licensed hazardous waste facilities.

3.6.1 ASBESTOS

Asbestos containing materials include Marinite board, used in the plant as a fire barrier; electrical cable with a wrap containing asbestos; piping systems with a wrap containing asbestos; the cooling tower mist eliminators and distribution piping fabricated from an asbestos cement material; and roof flashing sealant containing asbestos fibers. Other materials that are suspected of containing asbestos will be sampled and analyzed before work is done on the material.

Asbestos material will be removed and disposed of in accordance with plant safety procedures, federal and state OSHA regulations, and federal and state hazardous air pollutant and solid waste regulations.

3.6.2 POLYCHLORINATED BIPHENYLS (PCB)

The rod control cabinet capacitors in the Control Building may contain a small amount (approximately two liters) of PCBs.

PCBs and PCB items will be handled and disposed of in accordance with federal and state PCB regulations.

3.6.3 MERCURY

Mercury is contained in some plant components. Vendor technical manuals and plant walkdowns will be used to identify components that contain mercury metal.

Mercury metal will be collected and sent for recycling as plant equipment is removed. If not sent for recycling or reclamation as scrap metal, the mercury will be disposed of as a hazardous waste in accordance with federal and state hazardous waste regulations.

3.6.4 LEAD

Lead is contained in lead based paints, which may have been used as a primer for some steel surfaces at TNP, and lead sheets used as a radiological shield material.

Lead containing materials will be removed and disposed of in accordance with plant safety procedures, OSHA regulations, and federal and state hazardous waste regulations. Nonradioactive metals with lead based paints or coatings will be sent as scrap metal to a dealer who will accept lead painted metal; otherwise they will be disposed of as hazardous waste. Sandblast materials used to remove lead based paints will be handled and disposed of as hazardous waste unless they pass a toxic characteristic leaching procedure test.

3.6.5 OTHER PLANT WASTE MATERIALS

Other plant waste materials, including batteries (e.g., lead-acid, nicad) and refrigerants from chillers and air conditioners, will be sent to a recycling facility, or disposed of in accordance with normal waste disposal practices for nonradioactive nonregulated solid waste. Some industrial solid wastes (e.g., treated wood poles) may need special permits before disposal in solid waste landfills.

3.7 REFERENCES FOR SECTION 3

3-1 Code of Federal Regulations, Title 10, Part 50.82, "Application for Termination of License," August 28, 1996.

3-2 Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors," January 1999.

3-3 Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors," June 1974.

3-4 NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination," June 1992.

3-5 Draft NUREG/CR-5512, "Residual Radioactive Contamination from Decommissioning," January 1990.

3-6 Code of Federal Regulations, Title 10, Part 20.1402, "Radiological Criteria for Unrestricted Use."

3-7 NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," December 1997.

3-8 Portland General Electric Topical Report PGE-8010, "Trojan Nuclear Plant Quality Assurance Program."

3-9 Portland General Electric "Trojan Nuclear Plant Radiological Site Characterization Report," Revision 0.1, February 8, 1995

3-10 NUREG/CR-0130, "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," June 1978.

3-11 NRC Letter, W. F. Kane to S. M. Quennoz, "Authorization of the Trojan Reactor Vessel Package for Transport," October 29, 1998.

3-12 Portland General Electric, "Trojan Nuclear Plant Updated Final Safety Analysis Report," Amendment 14, Volume 2, October 1990.

3-13 Portland General Electric, "Trojan Nuclear Plant Environmental Report," Amendment 3, July 24, 1972.

3-14 Cornforth Consultants Report to Portland General Electric, "Hydrogeology Evaluation – Trojan Nuclear Plant," October 2000.

3-15 Portland General Electric Memorandum TOM-024-03, "Estimated Radioactivity on Plant Surfaces following Fuel Transfer to ISFSI and Removal of all but One Fuel Rack," dated July 15, 2003.

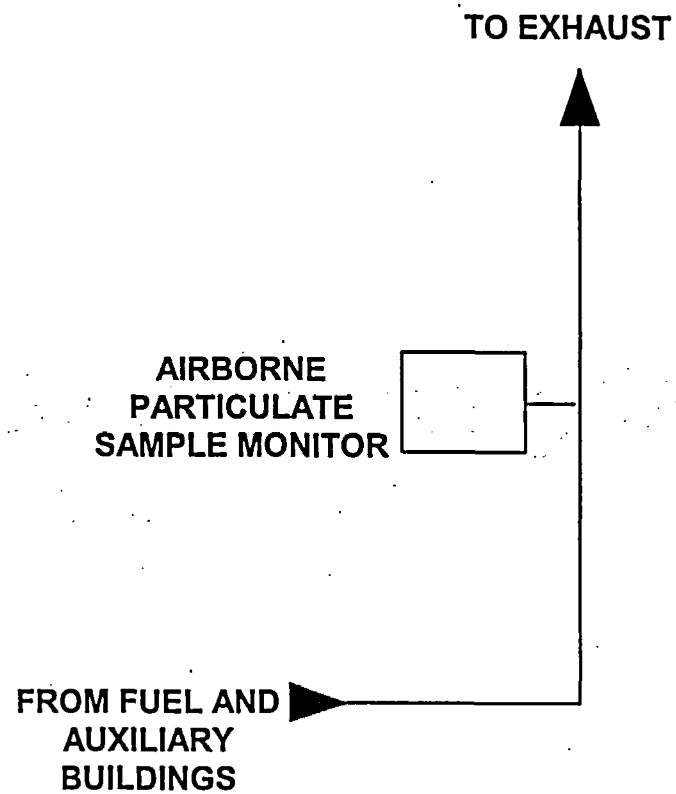

Figure 3-4

Fuel/Auxiliary Building Exhaust Systems

Figure 3-5

Intentionally Deleted