systems/components not necessary for assuring safe spent fuel storage in the spent fuel pool; and maintaining safe spent fuel storage. PGE will also conduct detailed decommissioning project planning, prepare engineering specifications and procedures, procure special equipment needed to support decommissioning, and negotiate service contracts required for decommissioning activities.

Major activities scheduled to occur following Decommissioning Plan approval during the transition period include system deactivations and system/component removal not necessary for safe storage of fuel; reactor vessel internals removal or reactor vessel with internals intact removal; decontamination and dismantlement planning; licensing and constructing an ISFSI; and transferring the fuel from the spent fuel pool to the ISFSI.

Spent fuel will be transferred from the spent fuel pool to facilitate decontamination and dismantlement. Once the spent fuel is transferred to the ISFSI, the transition period ends and the decontamination and dismantlement period begins.

1.2.1.2 Decontamination and Dismantlement

Major activities planned during the decontamination and dismantlement period include removing remaining contaminated systems and components, decontaminating structures, and a final radiation survey to verify radioactivity has been reduced to sufficiently low levels to allow for unrestricted release of the site.

Contaminated systems, components, and structural material will be decontaminated or removed and packaged. The packaged material will either be shipped to an off-site processing facility, shipped directly to a low-level radioactive waste disposal facility, or otherwise handled in accordance with applicable regulations.

Decontaminating plant structures may be completed concurrent with removing equipment and systems and may include the use of a variety of techniques ranging from water washing to surface material removal. Demolishing certain buildings may be necessary based on degraded structural integrity as a result of decontamination efforts and/or removal of systems and components, surrounding walls, or other barriers.

A final radiation survey will be performed to determine the final condition of the site after decontamination activities are complete. The purpose of the final radiation survey is to demonstrate radiological conditions at TNP are within the final site release criteria to support license termination. Upon completing the final survey, a final survey report will be submitted to the NRC.

1.2.1.3 Site Restoration

Nonradiological site remediation activities are scheduled to be completed following termination of the Facility Operating (Possession Only) License NPF-1. Nonradiological site remediation activities are scheduled to begin around 2018 and conclude in 2019. Some site restoration activities may be completed during the decontamination and dismantlement period of decommissioning.

1.2.2 FINAL RELEASE CRITERIA

TNP decommissioning will safely reduce radioactivity at the site to acceptable levels thereby allowing release of the site for unrestricted use. Release criteria are discussed in Section 4.2.

1.2.3 SCHEDULE FOR DECOMMISSIONING/SITE RESTORATION ACTIVITIES

A detailed schedule for decommissioning/site restoration activities is presented in Section 2.2. The following is an overview of the current TNP decommissioning/site restoration project schedule.

January 1993 - Mid 1998	Transition period
Late 1994 - Late 1995	Large Component Removal Project
Late 1996 - Mid 1998	Decontamination and dismantlement planning
Late 1996 - Mid 1998	Complete planning/building an ISFSI
Early 1997 - ~~Early~~Mid 1998	Reactor Vessel and Internals Removal (RVAIR)
Mid 1998	Transfer spent nuclear fuel to the ISFSI
Mid 1998 - Late 2001	Full-scale decontamination and dismantlement
Late 1998 - Early 2000	Reactor Vessel Internals Removal (In the event the RVAIR Project is cancelled)
Late 1999	Submit application for termination of the license
Late 2001	Complete final radiation survey
Late 2001 - Mid 2018	Caretaking
Mid 2018 - Late 2019	Demolish buildings

2.2 DECOMMISSIONING ACTIVITIES, TASKS, AND SCHEDULES

2.2.1 INTRODUCTION

This section presents a description of activities and tasks associated with TNP decommissioning. Included is a schedule for implementation of decommissioning activities, estimates of associated occupational radiation dose, and projected volumes of radioactive waste. The information presented reflects initial planning for decommissioning activities. Detailed planning will precede initiation of these activities, and will include engineering design, as low as is reasonably achievable (ALARA) planning, and refinement of the cost, schedule, and required resources.

2.2.2 SCHEDULE OF DECOMMISSIONING/SITE RESTORATION ACTIVITIES

A decommissioning/site restoration schedule is presented in Figure 2-11. This schedule was used in the preparation of the decommissioning cost estimate discussed in Section 5. PGE will perform task-specific scheduling as part of the detailed planning for decontamination and dismantlement.

TNP decommissioning can be divided into two broad periods:

1. Transition period; and

2. Decontamination and dismantlement period.

Nonradiological site restoration activities, involving the final disposition of structures, systems, and components, are scheduled to be completed following the termination of Facility Operating (Possession Only) License NPF-1. Some site restoration activities may be completed during the decontamination and dismantlement period of decommissioning.

Major activities planned during the transition period include:

1. Lay-up of plant systems;

2. Removal of the steam generators and pressurizer;

3. Removal of the reactor vessel internals or reactor vessel with internals intact; |

4. Development of specific work plans and procedures;

5. Licensing and construction of an ISFSI; and

component removal. Prior to removal of the components from the Containment Building, low-density cellular concrete was placed inside each steam generator and the pressurizer. The concrete fixed internal contamination and provided additional shielding.

Each component was moved via an internal rail system out of the Containment Building, loaded by a gantry crane onto a multi-wheeled transporter, moved to a preparation area within the TNP Industrial Area, and prepared for river barge shipment to the Port of Benton, Washington. The component, transport cradle assembly, and transporter was then moved as an integral unit by river barge from the TNP barge slip to Benton, Washington, on the Columbia River. The multi-wheeled transporter was used to off-load the barge and move the component to the US Ecology facility on the Hanford reservation.

Piping systems that were opened during component removal were closed and/or isolated as appropriate. The Containment Building door will be controlled in accordance with the TNP security plan.

The reactor vessel may be removed with the internals intact. If performed, removal of the reactor vessel and internals will commence after approval of the Decommissioning Plan and is scheduled to be completed in 1998.

Alternatively, the reactor vessel internals may be removed separately. If performed, removal of the internals will commence after NRC approval of the Decommissioning Plan and is scheduled to be completed in 1998. ~~Removal of the reactor vessel internals is scheduled to commence after NRC approval of the Decommissioning Plan.~~ Segmentation of the components will be performed underwater in the reactor cavity. Segmented components that are classified as greater than Class C waste in accordance with 10 CFR 61, "Licensing requirements for land disposal of radioactive waste," will be transferred to the spent fuel pool for storage pending disposal.

Additional activities that were completed or are in process during the transition period include, but are not limited to the following:

1. Assessment of the functional requirements for plant systems, structures, and components.

   Plant systems, structures, and components needed to support safe storage of the spent fuel, support spent fuel pool cooling, and facilitate ongoing plant activities have been identified.

2. Deactivation/removal of plant systems, structures, and components.

   Systems, structures, and components not required to support safe storage of the spent fuel, support spent fuel pool cooling, or support of

2.2.5 DECONTAMINATION AND DISMANTLEMENT: SYSTEMS, STRUCTURES, AND COMPONENTS

2.2.5.1 Overview

This section of the Decommissioning Plan presents a brief, general description of TNP systems, components, and structures that are known or considered to be internally contaminated or that may be used to support decommissioning activities. Discussion of activities and tasks associated with decommissioning internally contaminated systems, structures, and components is presented. Also discussed are systems or components that may be used to support decommissioning. Because external contamination is generally considered to exist on systems, structures and components located in the radiologically controlled areas (RCAs) of the plant, it is not specifically noted in the following system discussions. However, systems, components, and structures that are externally contaminated will be decontaminated for release or disposed of as radioactive waste. Plant layout and general arrangement drawings are provided in Figures 2-1 through 2-9.

The considerations identified in this section are based on preliminary planning and will be used during detailed planning in the development of specific work packages. With the exception of the removal of the steam generators, pressurizer, ~~and~~ reactor vessel with internals intact, and some dismantlement activities, full-scale dismantlement of the facility radioactive systems, structures, and components is scheduled to begin after completion of the transfer of spent fuel to the ISFSI. If the reactor vessel with the internals intact removal option is cancelled, the option of removing the internals by segmentation will be performed during late 1998 to early 2000 time frame.

This section of the Decommissioning Plan describes the major components of contaminated plant systems and, in some cases, a description of equipment removal considerations for system components. The section is intended to provide general information and guidance for work package planning and is not required to be updated to reflect equipment removal. Table 2.2-5 provides a list of major components described in the subsections of 2.2.5 that are removed each year (beginning in 1996).

2.2.5.2 Reactor Coolant System

The reactor coolant system (RCS) has four parallel stainless steel piping loops connected to the reactor vessel. The major components of the RCS are the reactor vessel, four steam generators, the pressurizer, four reactor coolant pumps, and associated valves, piping, fittings, and instrumentation. The removal of the reactor vessel is addressed separately in Section 2.2.5.4.

The RCS is located inside the Containment Building. The system is not required to support decommissioning or safe spent fuel storage. The system is internally contaminated. The following specific considerations apply.

Piping sections can be removed through open steam generator cubicles, reactor coolant pump access hatches, or other accessways using carts or skids. The resistance temperature detector (RTD) bypass loops were removed during the transition period.

2.2.5.3 Reactor Vessel Internals

The reactor vessel internals consist of an upper internals assembly and a lower internals assembly.

The upper internals assembly provided structural support to the fuel assemblies, as well as orientation and guidance for control rod assemblies and incore instrumentation. The upper internals assembly consists of an upper instrumentation conduit and support assembly, upper support plate, control rod guide tubes, and the upper core plate.

The lower internals assembly (lower core support structure) consists of a core barrel, core baffles, lower core plate and support columns, neutron shield pads and specimen holders, and lower core support plate.

Neutron irradiation from reactor operation generated activation products in the reactor vessel internals. ~~Based on the neutron activation analysis, portions of the reactor vessel internals are expected to be greater than Class C radioactive waste per 10 CFR 61.~~ The reactor vessel internals are also contaminated. ~~The portions of the reactor vessel internals that are classified greater than Class C (GTCC) wastes will be segmented and stored in containers fabricated to standard fuel assembly size for interim storage in the existing spent fuel racks. The lower level wastes will be packaged and shipped to the radioactive waste disposal facility near Richland, Washington, for burial.~~

The reactor vessel internals will either be removed intact with the reactor vessel or removed separately and segmented. Removal of the reactor vessel internals intact with the reactor vessel is discussed in Section 2.2.5.4. The following discussion addresses the separate removal and segmentation of the reactor internals.

Based on the neutron activation analysis, portions of the reactor vessel internals are expected to be greater than Class C radioactive waste per 10 CFR 61. If removed separately, portions of the reactor vessel internals that are classified greater than Class C (GTCC) wastes will be segmented and stored in containers fabricated to standard fuel assembly size for interim storage in the existing spent fuel racks. The lower level wastes will be packaged and shipped to the radioactive waste disposal facility near Richland, Washington, for burial.

To support separate reactor vessel internal removal and segmentation, the reactor vessel head will be removed and a refueling cavity seal will be seal welded in place. The transfer tube blank flange will be removed to allow for later transfer of segmented components to the spent fuel pool for storage. Unsegmented components or large segments in casks may also be transferred through

2.2.5.4 Reactor Vessel

The reactor vessel supported and contained the reactor core, directed coolant flow through the core, and facilitated operation, control, and handling of reactor components. The reactor vessel is a fabricated cylinder with a hemispherical bottom head and a removable hemispherical upper head. It contains the core support and other internal structures. The reactor vessel has four inlet and four outlet nozzles located in a horizontal plane below the upper head flange. The reactor vessel is carbon steel with weld deposited austenitic stainless steel on surfaces that were exposed to the reactor coolant.

The vessel is contaminated and activated. The reactor vessel may be removed with the reactor vessel internals intact or the internals may be separately removed. Separate reactor vessel internals removal is discussed in Section 2.2.5.3. The following specific considerations apply.

The reactor vessel upper head can be disposed of intact, ~~or~~ in segments, or with the reactor vessel. If it is disposed of intact, a cover plate will be installed over the bottom flange. Control rod drive mechanism (CRDM) housings and other attachments to the head will be removed and the penetrations sealed. If the reactor vessel upper head is disposed of in segments, the upper head can be processed using cutting methods suitable for cutting thick, highly activated components. The sections can then be packaged and shipped. If disposed of with the reactor vessel, the upper head will be attached to the vessel by means of tensioned studs. The number of studs will be sufficient to maintain the integrity of the vessel package under transport conditions.

The reactor vessel may also be removed intact, with or without the internal or upper head, or sectioned. The method selected will be based on an evaluation of the ease of execution, personnel exposure, schedule impact, transportation availability, and cost.

High dose rates from the activated surfaces of the reactor vessel may require the use of special shielding and handling methods to ensure that personnel exposure is maintained ALARA.

Neutron irradiation from the reactor operation generated activation products in the reactor vessel. Based on the neutron activation analysis shown in Tables 3.1-8 and 3.1-9, the reactor vessel can be disposed of as 10 CFR Part 61, Class A waste (vessel wall) and Class C waste (vessel clad). The reactor vessel and reactor internals, packaged together, can be disposed of as Class C waste. The radionuclide content estimates will be verified with a radiation survey of the reactor vessel ~~after reactor vessel internals removal~~. Detailed classification evaluations will be completed as a part of detailed planning of the reactor vessel removal activity.

Intact vessel removal would involve shipping the vessel, with or without the internals, to a low-level radioactive waste disposal facility in one piece. This may require certification of an exclusive use shipping container for transporting the vessel, or the vessel may serve as its own shipping container. If removed together, the reactor vessel and internals will be shipped as a NRC

approved Type B package. A safety analysis report will be prepared to support NRC approval of the package. The following items will be considered if the vessel, with or without the internals, is removed intact:

1. Removal of support attachments;

2. Removal of piping up to the nozzles and capping the nozzles;

3. Installation of a cover over the vessel flange to reduce dose rate and control airborne radioactivity;

4. Removal of water from the vessel;

5. Application of a fixative coating or grouting to stabilize remaining internal surface contamination;

6. Reconfiguration of the polar crane to its 400 ton capacity;

7. Selection of an appropriate lifting point on the vessel;

8. Attachment of a skid box or upending device for handling the vessel; and

9. Routing the vessel through the construction opening and loading it onto a transporter.

Segmented vessel removal would involve shipping vessel sections to a low-level radioactive waste disposal facility inside appropriate shipping containers.

Sectioning of the vessel can be performed by appropriate cutting or machining processes. The vessel is lined with stainless steel which limits methods for sectioning. However, removal of the stainless steel lining with machining, grinding, or other techniques would expose the carbon steel vessel wall. The carbon steel could then be sectioned using appropriate thermal or mechanical cutting techniques. Alternatively, the vessel could be filled with grout and sliced into sections using a diamond wire saw. The following items will be considered if the vessel is removed in sections:

1. Shipping the lower hemispherical head in one piece after removal and plugging of incore detector sleeves;

2. Use of a water purification system and/or an underwater vacuum cleaner in the proximity of the cutting to minimize contamination levels in the water and to maintain clarity when water is in the vessel during cutting operations;

5. Estimated personnel exposure due to the transfer of fuel to the ISFSI is approximately 1.6 person-rem for each of the estimated 36 casks.

2.2.7 DECOMMISSIONING RADIOACTIVE WASTE PROJECTIONS

The radioactive waste management program (Section 3.3) will be used to control the generation, processing, handling, shipping, and disposal of radioactive waste during decommissioning. Activated and contaminated systems, structures, and components represent the largest volume of low-level radioactive waste expected to be generated during decommissioning. Other forms of waste generated during decommissioning include:

1. Contaminated water;
2. Used disposable protective clothing;
3. Expended abrasive and absorbent materials;
4. Expended resins and filters; and
5. Contamination control materials (e.g., strippable coatings, plastic enclosures).

Tables 2.2-2, 2.2-3, and 2.2-4 provide projections of waste volumes for decommissioning. The waste volume projections are conservative estimates obtained from the decommissioning cost estimate, removal of the steam generators and pressurizer, and removal of the reactor vessel with internals or removal of the reactor vessel internals. Included in this estimate is 340 ft^3 of greater than Class C radioactive waste from the reactor vessel internals if they are removed separately and segmented. This waste ~~will~~would be disposed of with the spent fuel.

The decommissioning cost estimate (Section 5) assumes that cost effective waste volume reduction methods are limited. It also assumes significantly contaminated or activated materials are sent directly to a disposal facility. However, alternative processing methods will be evaluated during decommissioning.

Table 2.2-1

Radiation Exposure Projections

Activity	Exposure (person-rem)
Steam generators and pressurizer removal	138
Reactor vessel internals removal [a]	50
Dismantlement	
Reactor vessel [a]	35
Nuclear steam supply system	51
Spent fuel racks	19
Balance of plant systems	165
Structures	46
Miscellaneous	20
Subtotal	336
Normal plant operations	9
Fuel transfer to ISFSI	58
Total	591

a These exposure projections assume the reactor vessel internals are removed separate from the reactor vessel and segmented. The radiation exposure projection for the intact removal of the reactor vessel and the internals together is approximately 67 person-rem.

Table 2.2-2 Page 1 of 3

Decommissioning Waste Classification and Volume Projections

Item	Class A Burial Volume (ft^3)	Class B Burial Volume (ft^3)	Class C Burial Volume (ft^3)
Reactor coolant piping	5,894	0	0
Pressurizer relief tank	625	0	0
Reactor coolant pumps and motors	3,044	0	0
CRDMs/incore instrumentation/service structure removal	1,726	0	0
Reactor vessel [a]	3,799	0	3,013
Spent fuel racks	16,551	0	0
120 V ac preferred instrument ac	1,400	0	0
125 V dc power	175	0	0
4.16 kV ac power	726	0	0
480 V ac auxiliary load center	5,080	0	0
480 V ac motor control center	8,426	0	0
Chemical and volume control	10,968	0	0
Clean radwaste	5,423	0	0
Containment Building penetrations	188	0	0
Control rod drive	85	0	0
Dirty radwaste	1,613	0	0
Electric heat tracing	164	0	0
Electrical (Cables/Tray/Conduit)	60,139	0	0
Fuel handling system	339	0	0
Fuel pool cooling and demineralizer	4,632	0	0

Table 2.2-2 Page 2 of 3

Decommissioning Waste Classification and Volume Projections

Item	Class A Burial Volume (ft^3)	Class B Burial Volume (ft^3)	Class C Burial Volume (ft^3)
Fuel and Auxiliary Building heating, ventilation, and air conditioning (HVAC)	3,661	0	0
Gaseous radwaste	2,529	0	0
HVAC	6,635	0	0
Hydrogen recombiners	576	0	0
Integrated leak rate test instrument line	106	0	0
Instrument and service air	1,327	0	0
Lighting panel supply	997	0	0
Miscellaneous components	1,936	0	0
Miscellaneous reactor coolant	3,418	0	0
Nuclear instrumentation	193	0	0
Oily waste and storm drains	1,882	0	0
Containment HVAC	18,869	0	0
Primary makeup water	3,615	0	0
Primary sampling	114	0	0
Radiation monitoring	134	0	0
Reactor nonnuclear instruments	245	0	0
Reactor vessel system	116	0	0
Residual heat removal	7,649	0	0
Safety injection system	7,149	0	0
Solid radwaste	370	0	0
Spent fuel pool	754	0	0

Table 2.2-2 Page 3 of 3

Decommissioning Waste Classification and Volume Projections

Item	Class A Burial Volume (ft^3)	Class B Burial Volume (ft^3)	Class C Burial Volume (ft^3)
Steam generator system	3,562	0	0
Turbine Building sump pumps and miscellaneous	639	0	0
Component cooling water	6,115	0	0
Condensate demineralizer	2,262	0	0
Discharge and dilution	3,834	0	0
Containment spray	1,563	0	0
Containment Building	13,458	0	0
Auxiliary Building	2,650	0	0
Fuel Building	4,711	0	0
Main steam supply system and electrical penetration area	629	0	0
Turbine Building	1,054	0	0
Process liquid radwaste	0	3,686	0
Disposal of dry active waste generated	5,942	0	0
Total	239,691	3,686	3,013

a This waste projection assumes the reactor vessel internals are removed separate from the reactor vessel and segmented. The burial volume projection for the intact removal of the reactor vessel and the internals together is approximately 8341 cubic feet of Class C waste.

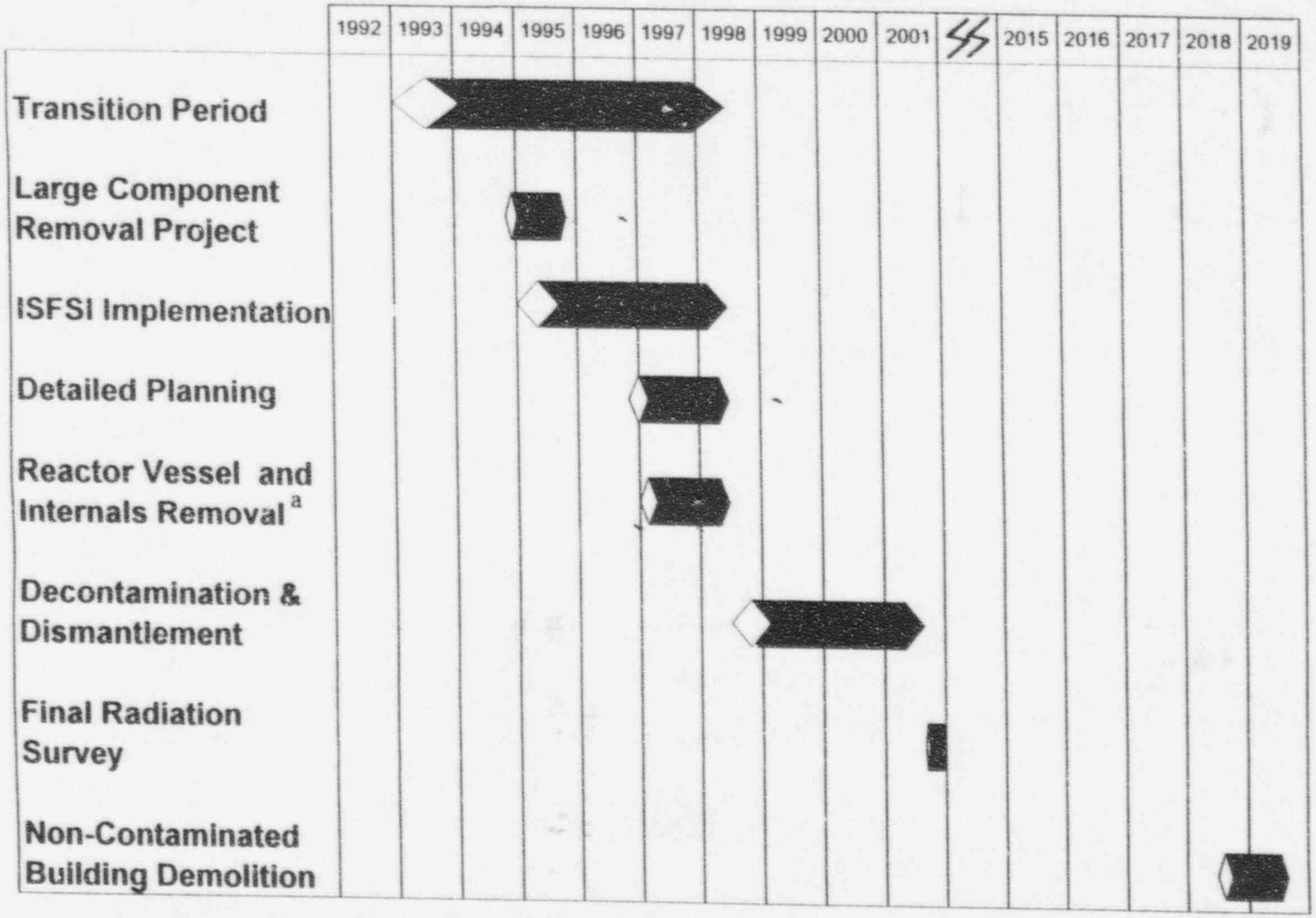
Table 2.2-4

Reactor Vessel Internals Removal Volume Projections

Item	Class A Burial Volume (ft^3)	Class B Burial Volume (ft^3)	Class C Burial Volume (ft^3)	>Class C Volume (ft^3)
Reactor vessel internals [a]	2,889	231	1,500	340
Filters, etc.	2,272	0	0	0
Dry activated waste	4,276	0	0	0
Total	9,437	231	1,500	340

a This waste projection assumes the reactor vessel internals are removed separate from the reactor vessel and segmented. The burial volume projection for the intact removal of the reactor vessel and the internals together is approximately 8341 cubic feet of Class C waste.

Figure 2-11 Decommissioning / Site Restoration Schedule



a This schedule reflects the option of intact removal of the reactor vessel and internals. If this project is canceled and the option of separate removal and segmentation of the reactor vessel and internals is selected, then completion of the project is scheduled for late 1998 to early 2000.

major structural material compositions including Type 304 stainless steel, pressure vessel carbon steel, concrete, and plate/rebar carbon steel.

A listing of 10 CFR 61 classification by component, one and five years after shutdown, is included in Tables 3.1-8 and 3.1-9. One year following shutdown, the radioactivity content of activated components was estimated at 4.2×10^6 Ci. Five years following shutdown, the calculated activity of the activated components was approximately 2×10^6 Ci. Predominant radionuclides include ^{55}Fe, ^{60}Co, and ^{63}Ni.

If disposed of separately of the reactor internals, it is anticipated that most parts of the reactor vessel will meet Class A burial waste criteria. If the reactor internals are removed separate from the reactor vessel and segmented, the core baffle, core formers, and lower core plate are expected to be greater than Class C waste and prohibited in shallow land waste disposal. Portions of the reactor vessel internals that are greater than Class C waste will be stored in the ISFSI. Intact disposal of the reactor internals with the reactor vessel will meet Class C burial waste criteria.

~~It is anticipated that most parts of the reactor vessel will meet Class A burial waste criteria. The core baffle, core formers, and lower core plate are expected to be greater than Class C waste and prohibited in shallow land waste disposal. Portions of the reactor vessel internals that are greater than Class C waste will be stored in the ISFSI.~~

3.1.2.4 Environment

The environmental survey, which included representative outdoor areas, focused on the impact of TNP operation on the environment due to the release of radioactive material. Operational and preoperational environmental monitoring data were used to measure and evaluate the impact. Additional sampling was conducted to augment, or better define, areas requiring biased surveys. Survey results were compared to background data to determine the overall consequences of TNP operation.

During Phase I of the site characterization plan, soil, sediment, and surface water were sampled. Exposure rates were measured wherever soil was sampled, except where exposure rates were influenced by onsite structures. Paved areas onsite were scanned for beta contamination or sampled and analyzed for gamma emitters. A general site map, enclosed at the end of Section 3 as Figure 3-3, shows the site divided into zones. Survey maps depicting sample points by grid location are provided in Figures 3-4 through 3-14. Survey maps were not included for zones where no samples were collected (i.e., Zones 4, 13, 15, and 16).

Biased sample locations were determined from reviewing plant records that documented radiological events at TNP from 1975 to 1993 (see Section 3.1.1.2 and Appendix 3.1 A). Corrective action programs were reviewed and interviews conducted with PGE personnel to help determine potential sample locations.

First, plant structures contain radioactive material which will require removal prior to license termination. The contamination consists of radioactive material incorporated (fixed) into the upper layer of concrete/block and deposited on the surface (loose). Although the levels of radioactivity are generally low, structures, including building surfaces and piping, are considered potentially contaminated and will require, as a minimum, a wipe/wash down.

Second, some plant systems contain deposited radioactive material due to plant operation. The majority of the radioactive material is contained in reactor system piping and systems directly connected to the reactor coolant system (e.g., CVCS, safety injection system, and residual heat removal system). Although some systems contain contamination, the systems are not expected to be greater than Class A waste.

Third, activated components contain the vast majority of the radioactive material not contained in fuel. Most activity is primarily concentrated in the vessel internals and shield wall. The reactor vessel lower internals contain the highest activity including subcomponents that, if removed separately from the reactor vessel and segmented, are estimated to contain concentrations of radioactive material greater than Class C limits. If the internals are segmented, portions of these components will be stored initially in the spent fuel pool and later in the ISFSI. Neutron activation products have been found in samples of containment concrete in various structures, including the reactor vessel shield wall, steam generator missile shields, and the containment wall itself. Remediation of the activated components will be required to meet the site release criteria and facilitate license termination.

Fourth, and finally, the environmental survey results indicated that no radioactive material requiring remediation is present in the various materials sampled. The final survey will require additional background data for a number of the sample media. Soil and sediment data are indicative of at least two background populations indicating that characterization of the sample location as to the soil type will be required. Data for direct radiation measurements will require remediation of site structures to remove interfering radiation sources. Preliminary results indicate no radioactivity at TNP has been spread to the environment outside plant systems or structures in quantities requiring remediation.

a.d 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 approximately 60 ft^3 of mixed waste stored onsite. Mixed waste will continue to be stored onsite until a permanent storage or disposal facility becomes available.

3.3.3 RADIOACTIVE WASTE DISPOSAL

TNP is located within the Northwest Compact. Radioactive solid waste will be shipped to the US Ecology site near Richland, Washington. If removed separately from the reactor vessel and segmented, several of the reactor vessel internals components have radionuclide concentrations in excess of the 10 CFR 61 Class C limits, and thus are not suitable for near surface burial. They will be stored in the spent fuel pool pending transfer to the ISFSI. Intact disposal of the reactor internals with the reactor vessel will meet Class C burial waste criteria.

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.);

Segmentation of components or structures by cutting or other destructive methods (e.g., sawing, grinding, or plasma cutting) can result in releasing airborne activation products in addition to dislodging contamination. Detailed planning of dismantlement activities will ensure that systems, structures, and components that are contaminated or activated will be dismantled using methods that minimize the release and spread of contamination.

Although activated metallic components contain the greatest activity levels, the potential for airborne release is limited to small fractions of material directly affected by cutting operations. The reactor vessel internal components contain the largest quantity of activated materials. The reactor vessel internals will either be disposed of intact with the reactor vessel or removed separately and segmented. Due to the highly radioactive nature of these components, their dismantling will be performed underwater if the segmentation option is chosen. The water will not only provide shielding from direct radiation exposure but will also provide a retention media for the small particulate material released during segmentation. Although the potential for release of airborne activity is considered remote, administrative controls will be established to ensure that airborne activity generated during segmentation will not exceed a small fraction of the activity limits corresponding to an Exclusion Area Boundary dose of 0.5 rem as discussed in Section 3.4.3.1. These controls are discussed in Section 2.2.5.3.

The dismantlement of the RCS piping is considered to provide the bounding analysis for generation of airborne activity. Dismantlement activities cannot be performed underwater, as ~~will~~may be done with the reactor vessel internals, and the RCS piping contains the greatest contamination of the systems to be dismantled, 221 Ci. The guidance provided by NUREG/CR-0130 was used to determine the amount of activity that could be generated during segmentation. To determine the total activity generated from segmentation the following equation was used:

Total Activity Generated = (Surface Contamination Level)(Kerf width) x
π(Length of ID per cut)(Number of Cuts)

To determine the maximum generated activity the following values were used:

Surface contamination activity for the RCS was 55 $\mu Ci/cm^2$. This is the highest activity level calculated for the RCS and was used for determining contamination levels of CRDMs and reactor coolant pumps.

Kerf width was 0.95 cm. This is conservative since it is the largest kerf of possible cutting methods that may be employed.

The length of ID per cut 78.7 cm (31.7 in). This is conservative since it is the largest sized section of piping.

Table 3.1-6

System Burial Volume and Surface Activity Projections

System	Volume (ft^3)	Activity[a] (Ci)
Reactor coolant piping	5,894	221
Pressurizer relief tank	625	<1
Reactor coolant pumps and motors	3,044	134
Control rod drive mechanisms/incore instrumentation/service structure	1,726	83
Reactor vessel	6,812[e]	112
Reactor vessel internals	4,960[e]	245.9
Spent fuel pool and racks	17,305	150+
120-V ac preferred instrument ac	1,400	<1
125-V dc power	175	<1
4.16-kV ac power	726	<1
480-V ac auxiliary load center	5,080	<1
480-V ac motor control center	8,426	<1
Chemical and volume control	10,968	25
Clean radwaste	5,423	14
Containment building penetrations	188	<1
Control rod drive	85	<1
Dirty radwaste	1,613	<1
Electric heat tracing	164	<1
Electrical (Cable/Tray/Conduit)	60,139	<1
Fuel handling system	339	[b]
Fuel pool cooling and demineralizer	4,632	5.6

Table 3.1-6 Page 2 of 3

System Burial Volume and Surface Activity Projections

System	Volume (ft^3)	Activity[a] (Ci)
Fuel and auxiliary building heating, ventilation, and air conditioning (HVAC)	3,661	<1
Gaseous radwaste	2,529	<1
HVAC	6,635	<1
Hydrogen recombiners	576	<1
Integrated leak rate test instrument line	106	<1
Instrument and service air	1,327	<1
Lighting panel supply	997	<1
Miscellaneous components	1,936	<1
Miscellaneous reactor coolant	3,418	<1
Nuclear instrumentation	193	<1
Oily waste and storm drains	1,882	<1
Containment HVAC	18,869	<1
Primary makeup water	3,615	<1
Process sampling	114	4
Radiation monitoring	134	<1
Reactor nonnuclear instruments	245	<1
Reactor vessel system	116	[c]
Residual heat removal	7,649	36
Safety injection system	7,149	7
Solid radwaste	370	<1
Steam generator system	3,562	<1
Turbine building sump pumps and miscellaneous	639	<1
Component cooling water[d]	6,115	<1

Table 3.1-6 Page 3 of 3

System Burial Volume and Surface Activity Projections

System	Volume (ft^3)	Activity[a] (Ci)
Condensate demineralizers[d]	2,262	<1
Discharge and dilution[d]	3,834	<1
Containment spray[d]	1,563	<1
Total	219,220	1070.5

a Does not include activation.
b To be determined.
c Activity included with reactor coolant piping.
d Site characterization survey results identified these systems as contaminated.
e These waste projections assume the reactor vessel internals are removed separate from the reactor vessel and segmented. The burial volume projection for the intact removal of the reactor vessel and the internals together is approximately 8341 cubic feet of Class C waste.

NRC decommissioning activity costs are separately identified in Table 5.1-2 as large component removal activities and other radiological decommissioning costs, the latter of which are incorporated into the column entitled "DECON Planning/DECON/License Termination." With the exception of costs associated with radiological waste burial, reactor vessel internals removal and segmentation, reactor vessel with internals intact removal, and decommissioning plan preparation, the DECON Planning/DECON/License Termination column costs are derived from the TLG Services, Inc. decommissioning cost analysis methodology. Burial costs were derived from PGE modeling and analysis of low-level radioactive waste disposal costs in July 1994, which more conservatively reflect projected burial rates. PGE also used site-specific data to independently analyze and project costs associated with the separate removal and segmentation of the reactor vessel internals, the intact removal of the reactor vessel and internals, and development of the decommissioning plan. The decommissioning costs incorporated into Tables 5.1-1 and 5.1-2 reflect the estimated costs associated with the option of removal of the reactor vessel with the separate removal and segmentation of the reactor vessel internals. The estimated costs associated with the option of intact removal of the reactor vessel and internals area approximately 38% less than those for the separate removal option. Controls exist to ensure funds are expended consistent with the provisions of 10 CFR 50.82(a)(8).

The rule will be met by executing standard ongoing financial controls. Throughout the budgetary process and budget year, costs associated with new projects or activities are evaluated to determine their correct cost classification, ie, fuel management, radiological, nonradiological decommissioning, capital, etc. As a result, only costs which meet the intent of the Decommissioning Plan are submitted for reimbursement from the decommissioning trust. The activities described in the Decommissioning Plan satisfy the definitions of "decommission" and "major decommissioning activity" from 10 CFR 50.2.

Periodic reports are also prepared and submitted to the ODOE that compares costs by major classification to the decommissioning cost estimate. Plant personnel review variances and impacts, if any, are examined.

Corporate finance personnel review PGE's trust fund activity and balance periodically and for Trojan Co-owners. Any significant activity which is inconsistent with the Decommissioning Plan would be brought to the attention of Trojan management.

During 1996, the decommissioning cost estimate was recast in such a manner that actual costs can be related more easily to the cost estimate. Information will be available to access the validity of the cost estimate and/or Trojan's ability to complete decommissioning tasks within cost estimate totals. Periodically, variances between the estimate and actual costs will be reviewed as they relate to the total cost estimate to provide assurance that the cost estimate continues to be reasonable. This complies with 10 CFR 50.82(a)(8)(i)(A).