Humboldt Bay Power Plant (HBPP)

Historical Site Assessment

2011 Update

July 2011

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Humboldt Bay Power Plant Pacific Gas & Electric

Company Eureka, California

2011 Update Prepared by:
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Summary of Changes

This Historical Site Assessment (HSA) is issued as a controlled document. Revisions to this plan will be tracked. Changed sections will be identified by special demarcation in the margin. A summary description of each revision or addenda will be noted in the following table:

Revision Number	Date	Comments
Revision 0	December 2006	Original Issue
Revision 1	January 2007	Revised the Initial MARSSIM Classification Drawings in Appendix B
Revision 2	September 2008	Minor grammatical changes in Section 8. Spelling corrections, Summary of Changes page added.
2009 Update	December 2009	Major update to incorporate site specific DCGLs and to incorporate new characterization data. Includes update to the current site status. Area and building descriptions were also added in Section 7. Additional appendices were developed t o display historic photographs and to present characterization result drawings.
2011 Update	July 2011	Updated site conditions, added section relating to underground piping, sumps and structures, added a section pertaining to hazardous and chemical material that could be encountered during decommissioning work activities. Fixed multiple document layout and font inconsistencies.

Table of Contents

1 Glossary of Terms, Acronyms and Abbreviations'

AEC - Atomic Energy Commission

Am - Americium

Co - Cobalt

CWT - Concentrated Waste Tank

Cs - Cesium

DCGL - Derived Concentration Guideline Level

DP - Decommissioning Plan

DPR - Demonstration Power Reactor

DSAR - Defueled Safety Analysis Report

Fe - Iron

FSAR - Final Safety Analysis Report

HBGS - Humboldt Bay Generating Station

HBPP - Humboldt Bay Power Plant

HSA - Historical Site Assessment

ISFSI - Independent Spent Fuel Storage Installation

MARSSIM - Multi-Agency Radiation Survey and Site Investigation Manual

MEPP - Mobile Emergency Power Plants

NEI - Nuclear Energy Institute

Ni - Nickel

NRC - Nuclear Regulatory Commission

NWP - Northwestern Pacific

ODCM - Offsite Dose Calculation Manual

PG&E - Pacific Gas and Electric Company

PSDAR - Post Shutdown Safety Analysis Report

Pu - Plutonium

RCA - Radiation Controlled Area

SWMU - Solid Waste Management Unit

SAFSTOR - Safe Storage

2 Executive Summary

The Humboldt Bay Power Plant (HBPP) site, owned by Pacific Gas and Electric (PG&E), consists of 143 acres on the southern edge of Humboldt Bay four miles southwest of the town of Eureka, in Humboldt County, in the state of California. PG&E maintained four electrical generating units at the HBPP site that ran on fossil type fuels and one nuclear reactor (Unit 3). PG&E is the holder of a Nuclear Regulatory Commission License (DPR-7) for the Unit 3 site. The electricity demands of northern California required the four non-nuclear power units to operate until the new fossil plant, known as the Humboldt Bay Generating Station (HBGS), was constructed and placed into service. In 2011 the HBGS was placed into service and the Unit 1 and Unit 2 fossil fuel plants were dismantled.

On July 16, 1985, the NRC issued Amendment No. 19 to the HBPP Unit 3 Operating License to a Possess-but-not-Operate License. The unit was then placed into a SAFSTOR status. Prior to the license amendment, the plant operated commercially from 1963 to 1976. On July 2, 1976, Humboldt Bay Power Plant (HBPP) Unit 3 was shut down for annual refueling and to conduct seismic modifications. In 1983, the updated economic analyses indicated that restarting Unit 3 would not be cost-effective, and in June of 1983 PG&E announced its intention to decommission the unit.

PG&E and HBPP personnel are planning the decommissioning of Unit 3 and subsequently terminate the NRC license. The spent fuel was transferred to the Independent Spent Fuel Storage Installation (ISFSI) in 2008. Prior to construction of the ISFSI, a final status survey was performed of the ISFSI lands. No significant radiological remedial actions in these areas were required.

In 2010, construction of the new power generation facility was completed. Prior to construction of the HBGS, a final status survey in this area was performed by the licensee. No significant radiological remedial actions were required.

The NRC, with staff from ORISE, performed confirmatory surveys prior to the HBGS construction.

License Amendment #40 was made to the DPR-7 license and approved by the NRC on September 11th, 2007, which states;

> "Paragraph 2.C.4:
> To demonstrate compliance with the NRC License Termination Rule, the Final Status Survey for Humboldt Bay Power Plant, Unit No. 3 license termination may utilize the results of the licensee's surveys of the area underlying the new fossil generation facility, (referred to as the Humboldt Bay Repowering Project), provided a "Cross-contamination P revention and Monitoring Plan" is maintained."

Data from the HSA investigation suggests that the land and structures with high probability of requiring remediation (Class 1) are within the Unit 3 Radiological Controlled Area (RCA), the western section of the intake canal, the discharge canal sediments, and the soils around the discharge tubes. The migration of surface and subsurface contamination appears to be limited due to the clay type soils in the area. Sub-surface investigations showed no migration of contamination.

3 Purpose of the Historical Site Assessment

The Historical Site Assessment (HSA) is the site's first step in NUREG – 1575 (MARSSIM) "Multi-Agency Radiation Survey and Site Investigation Manual" process. MARSSIM provides guidance to assemble a statistically accurate final status survey plan to support the termination of the NRC License at the HBPP site.

The intent of this HSA is to document a comprehensive investigation that identifies, collects, organizes, and evaluates historical information relevant to the HBPP site. The HSA ensures a complete discovery of events involving spills, leaks or other operational occurrences which might have an effect on the radiological and chemical status of the site. The HSA also ensures the collection of data during characterization of the site met the Data Quality Objectives (DQO) of NUREG-1575 (MARSSIM), "Multi-Agency Radiation Survey and Site Investigation Manual" (Ref. 8.1).

This HSA

- identifies potential, likely, or known sources of radioactive material and radioactive
- contamination based on existing or derived information.
- identifies sites that need further action as opposed to those posing no threat to human health.
- provides an assessment for the likelihood of contaminant migration.
- provides information useful to scoping and characterization surveys.
- provides initial classification of the site or survey unit as impacted or non-impacted.

The data collected during the Characterization Survey in support of the HSA is vital in developing the plan for License Termination.

The HSA uses this historical information to provide initial classifications based on guidance contained in MARSSIM, and to determine the chemical hazards that may impact decommissioning work. The classifications will be used to guide characterization and remediation efforts.

The HSA describes the sites physical configuration, identifies the radioactive constituents of site contamination, assesses the migration of contaminants, identifies contaminated media, identifies non-impacted and impacted areas, and classifies impacted areas. As part of this HSA, units 1, 2 and 3 will be evaluated since some of the plant systems were shared between the three units.

To ensure potential contaminates throughout the site are not overlooked, a detailed review of the HSA report for internal consistency and as a quality-control mechanism will be performed. A second reviewer with considerable site assessment experience will examine the entire information package to assure consistency and to provide an independent evaluation of the HSA conclusions. The second reviewer also evaluates the package to determine if special circumstances exist where radioactivity may be present but not identified in the HSA. Both the first reviewer and a second independent reviewer should examine the HSA written products to ensure internal consistency in the report's information, summarized data, and conclusions. The site review ensures that the HSA's recommendations are appropriate for the commencement of site characterization, remediation, final status survey, and license termination.

4 Property Identification

4.1 Physical Characteristics

4.1.1 License Holder & Site Owner

PG&E is the Site Owner and holder of the "Possession Only License" DPR-7.

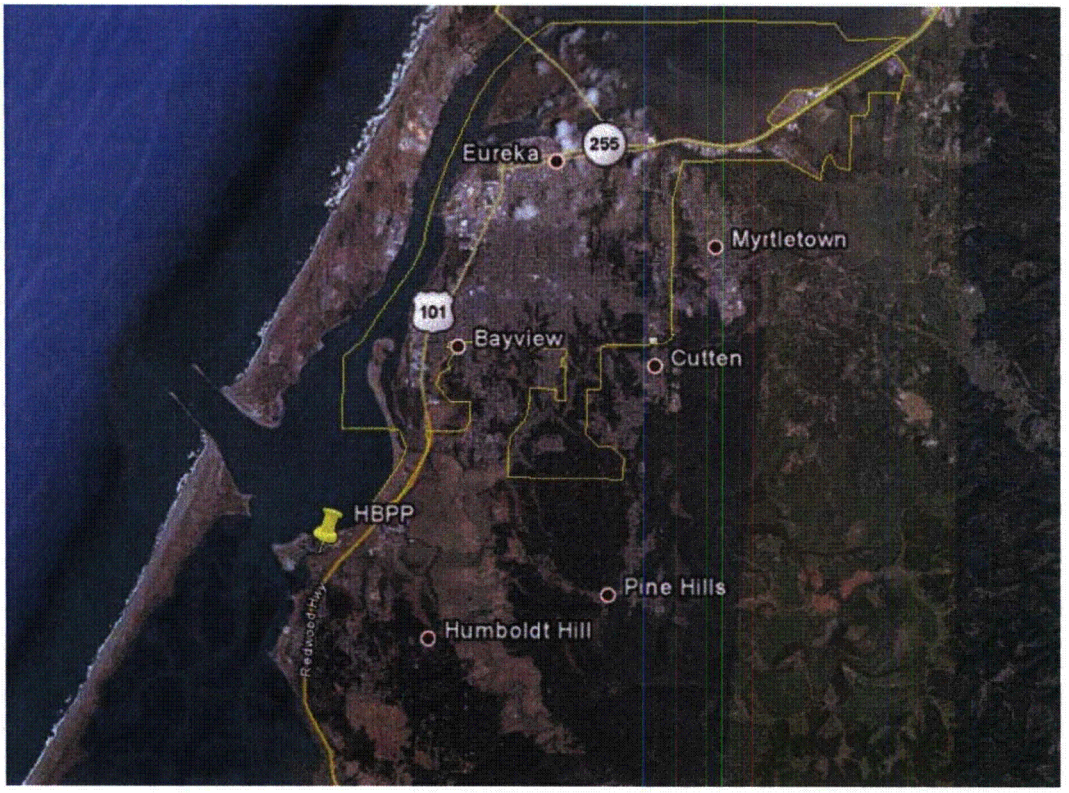
Pacific Gas & Electric
245 Market Street, Room 750-N9B
San Francisco, California

4.1.2 Location

Humboldt Bay Power Plant
1000 King Salmon Avenue
Eureka, California

HBPP is located about four miles true southwest of the city of Eureka, Humboldt County, California, and consists of 142.9 acres of land. The geographical coordinates of the centerline of the reactor containment structure are as follows:

Latitude: North 40 degrees, 44 minutes, 29 seconds
Longitude: West 124 degrees, 12 minutes, 36 seconds



4.1.3 Topography

Terrain of the site varies from submerged and low tidal land, protected by dikes and tide gates, to a high precipitous bluff along the south western boundary. Elevations range from approximately -3 feet to +75 feet based on a datum of the mean lower low water level.

4.1.4 Stratigraphy

The geology in the region is presented and discussed in Section 2.6.3 of the ISFSI Final Status Safety Report (FSAR). This detailed information may be viewed in the Master Reference List on the CD included with this document.

4.2 Environmental Setting

An extensive study of the environmental setting was performed for the ISFSI license application. The following sections paraphrase the applicable sect ions. Detailed information may be found in Section 2.0 of the ISFSI FSAR (Ref. 10.3). This detailed information may be viewed in the Master Reference List on the CD included with this document.

4.2.1 Geology

HBPP lies in the Northern California Coast Ranges geomorphic province. This province consists of a system of longitudinal mountain ranges (2,000 to 4,000 foot elevations with occasional 6000 feet peaks) and valleys with a trend of N 30 degrees to 40 degrees W.

The immediate vicinity of the site consists of sand and alluvial soil and strata of the Hookton and Carlotta sedimentary formations. These formations are primarily consolidated sands, gravels, and clays and conglomerates with good engineering properties. HBPP buildings have their foundations in these strata.

The principal rocks in the area range in age from late Jurassic to early Upper Cretaceous. These rocks are in two groups:

- Clastic sedimentary rocks, consisting of sandstone, mudstone, and conglomerate
- Volcanic and associated rocks, consisting of greenstone, basalt, chert, and minor amounts of limestone

In the site area, younger rocks overlie the volcanic strata. These rocks are dominantly marine sandstone, mudstone, and conglomerates ranging in age from the late Cretaceous to early Pleistocene. Recent alluvium forms the shallow strata in the valleys and in areas along the coast.

4.2.2 Hydrogeology

Groundwater supplies all domestic, industrial, and agricultural needs in Humboldt County except that which is supplied by the Ruth Reservoir. A groundwater stud y made in the area of HBPP prior to Unit 3 construction (Morliave, 1960) identified the following important features of the groundwater system:

- Movement of all groundwater is generally toward the bay.
- Vertical rates of groundwater movement in the area of the plant are a few inches per day in the light surface alluvium.
- Horizontal movement in aquifers beneath the site ranges from several feet to hundreds of feet per day.
- Groundwater elevation in the area near the bay is similar to sea level and may be somewhat affected by tidal action.
- Both a groundwater and slight to pographic divide appear to exist between HBPP and Elk River. These features reduce the probability of liquid discharges or leakage from the plant site to this stream either by surface or groundwater flow.
- Southwest of the plant, an area exists which has slight landward groundwater gradients under some conditions. However, this area lies within an area that is affected by tidal action. Negligible inland flow is estimated to occur.
- Any migration of materials of plant origin into the soils beneath or near the plant would move vertically quite slowly until reaching the saturation zone. Migration would then be horizontal, toward the bay.
- The surface runoff from the site is directed into drains discharging into the plant cooling water intake canal, through the plant, and into Humboldt Bay via the discharge canal. Outside the area served by the plant drain system, surface runoff drains into Buhne Slough, the natural drainage for the area, which drains into Humboldt Bay.
- The nearest streams to the site are Salmon Creek and Elk River, which are within a mile south and north of the site, respectively, and which discharge into Humboldt Bay. These streams are used for watering livestock, but are not used as potable water supply.
- The Mad River flows west approximately 13-15 miles northeast of the site. The Ruth reservoir, the source of the city's water supply, is located on this river.
- To the south, the Eel River discharge s to the Pacific Ocean 8-10 miles from HBPP. This river is not used for potable water within 25 miles of HBPP.

Due to the nature of surface sheet water-flow across and through the Humboldt Bay site, remediation and FSS activities will require a starting point and coordination such that previously surveyed areas are not cross-contaminated from the migration of contamination from upstream areas of the site and to ensure contamination is not inadvertently released offsite.

4.2.3 Meteorology

The climate at HBPP is me sic oceanic, characteristic of the northwestern coast of the continental United States. The area has two distinct seasons differentiated by precipitation rather than temperature. The wet season extends roughly from November through March and yields approximately 75 percent of the average annual precipitation. The dry season, extending from May through September, contributes only 10 percent of the average annual precipitation. The transitional months, April and October, contribute the balance. The mean annual precipitation is 39 inches.

The range of air temperatures is minimal, averaging 52°F annually, 46°F in winter and 5 6°F in summer.

The prevailing wind direction is from the north. The wind distribution is 24.3 percent off-shore, 57 percent on-shore and 18.7 percent light and variable. Average wind speeds are strongest for the north winds (16 mph) and the southeast winds (12.5 mph) during the wet seasons. These are lower during the dry season. During the rainy seasons, the wind from the south-southwest dominates slightly.

Prevailing winds can be expected to carry airborne effluents from the plant south and inland 55 percent of the time. Approximately 20 percent of the effluents would be distributed across the bay entrance to the ocean.

Approximately 25 percent of the effluents would be discharged into calm air and distributed randomly.

During site remediation activities the potential exists for suspension and re-suspension of radioactive particulates in air as structures are decontaminated and dismantled. Therefore, specific criteria will be established prior to building demolition activities to ensure that any off-site release of particulate radioactive material will not exceed the dose limits specified in the Humboldt

Bay "Off-site Dose Calculation Manual" (ODCM). A technical basis document establishing contamination limits on structures and building surfaces prior to demolition would be sufficient to ensure offsite dose limits are not exceeded.

Final Status Survey activities would be coordinated such that previously surveyed areas would not be impacted by the suspension /re-suspension of residual contamination in air as a result of building demolition process.

5 Historical Site Assessment Methodology

5.1 Approach and Rationale

Historical information, including employee interviews, radiological incident files, spill reports, special surveys, operational survey records, SAFSTOR Activities, Radioactive Effluent Release Reports, Annual Radiological Environmental Monitoring Reports to the NRC, and the Radiological Characterization Report, HBPP-RPT-001 Revision 1, were reviewed and compiled into the Historical Site Assessment (HSA) to identify areas where contamination existed, remained or had the potential to exist.

This HSA documents those events and circumstances occurring during the history of the facility that contributed to the contamination of portions of the site environs above background levels. Information relevant to changes in the radiological status of the site following publication of the HSA will be considered a part of the ongoing characterization evaluations and decommissioning activities. The HSA may be updated as necessary to include new information collected during characterization efforts. These ongoing activities include the expansion of the site groundwater investigation and evaluations of subsurface contamination. The results of the ongoing investigations into the extent of subsurface contamination will drive continuing remediation and/or mitigation efforts as appropriate.

The HSA information was used to bound and classify survey areas. The boundaries of the identified survey areas, as depicted in Appendix A, are based on operational history, including recorded significant events and common radiological profiles from previous characterization efforts. The preliminary survey area classifications are listed in Appendix B for structures and open land areas. Survey areas for structures and land will be broken into multiple survey units where appropriate in order to meet the survey unit size limitations recommended by NUREG-1575 (Ref. 1) prior to final status surveys.

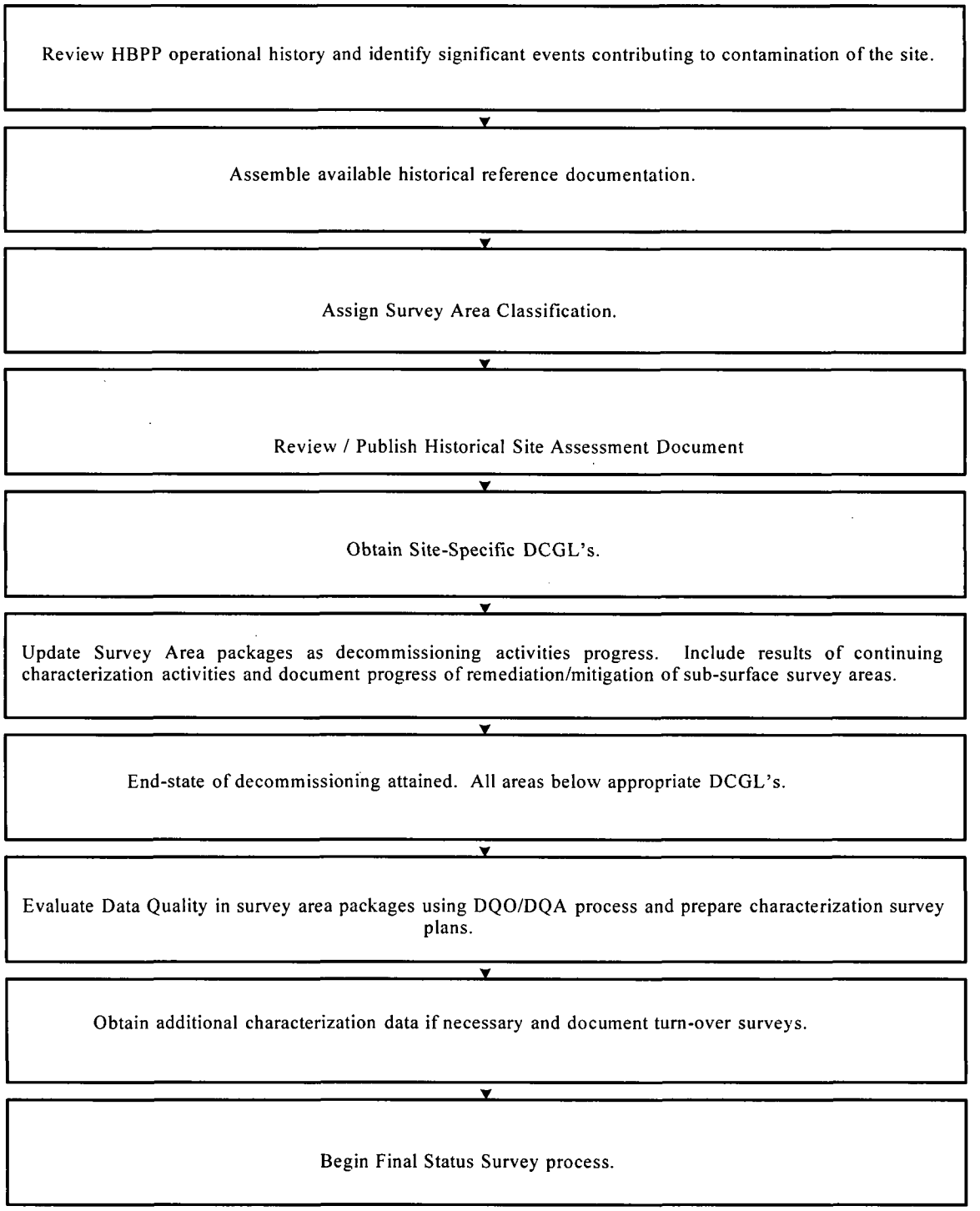
The general criteria used to classify the survey areas were drawn from NUREG-1575 (MARSSIM):

> **Non-impacted Area:** Areas where there is no reasonable possibility (extremely low probability) of residual contamination and are typically off-site and may be used as background reference areas.
>
> **Impacted Area:** Areas that could possibly contain residual radioactive material in excess of natural background or fallout levels. All impacted areas are classified as either a Class 1, 2 or 3 (NUREG-1575).
>
> **Class 1 Area:** Impacted areas that have, or had prior to remediation, a potential for radioactive contamination (based on site operating history) or known contamination (based on previous radiological surveys) above the anticipated Derived Concentration Guideline Level (DCGL).
>
> **Class 2 Area:** Impacted areas that have a potential for radioactive contamination or known contamination, but are not expected to exceed the anticipated DCGL.
>
> **Class 3 Area**: Impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the anticipated DCGL, based on site operating history and previous radiological surveys.

Information collected for each survey area includes a description of the survey area, an operational history, an evaluation of past and current translocation pathways, and a description of the status of decommissioning work. The findings section for each survey area includes an assessment of radiological contaminants, contaminated media, current radiological status, results of any subsurface mitigation or remediation efforts, and remaining decommissioning activities.

The general process for integrating the HSA with continuing characterization, DCGL Development, and the Final Status Survey is shown in the following flowchart.

PROCESS FOR INTEGRATING HSA WITH CHARACTERIZATION AND FSS



5.2 Boundaries of Site

The HBPP site consists of about 143 acres on the southern edge of Humboldt Bay four miles southwest of the town of Eureka, in Humboldt County, in the state of California.

PG&E owns the land located within the licensed site property boundary, however, California State Law dictates the public must have access to all beaches in the state of California. Therefore, a public trail lies between the northern fence line and Humboldt Bay. PG&E property is generally an arrow-shaped parcel of land pointing to the northeast. The wedge portion of the arrow has boundaries provided by Humboldt Bay to the north, Northwestern Pacific (NWP) Railroad (abandoned) to the southeast, and King Salmon Avenue to the southwest. PG&E property extends out 2200 feet towards the southwest along the central one-third of the King Salmon Avenue boundary to provide the tail of the arrow.

The owner controlled area, land inside of the main fence line, i s approximately 13 acres of the total 143 acres. The northern boundary of the owner controlled area is paralleled by a public access trail. The southeast boundary is bordered by the abandoned NWP railroad, while the southwestern boundary is bordered by wetlands.

5.3 Documents Reviewed

In performing the HBPP HSA, the following documents were reviewed:

- Site Characterization Plan, HBPP-PP-003
- Radiological Characterization Reports HBPP-RPT-001, HBPP-RPT-002
- "Documenting Site Radioactive Contamination", HBAP D-500 Revision 7, August 25, 2010
- Environmental Reports
- Radiological Environmental Monitoring Reports
- Radioactive Effluent Release Reports
- Licensee Event Reports
- Construction Photographs
- Historical Photographs
- Topographical Maps
- Construction Drawings
- As Built Drawings
- Plant Operating Reports
- Plant Safety Analyses
- Radiological Surveys
- Plant Operating Logs
- Aerial Photographs

5.4 Property Inspections

The HBPP site is in the early stages of the decommissioning process for Unit 3. The only decommissioning activities to date at the Unit 3 site have been the removal of the 250 foot stack, completed asbestos removal, transfer of the spent fuel to the ISFSI, and the removal of the Unit 3 generator. Areas inside of Unit 3 have undergone decontamination to control occupational exposure, but not for the site decommissioning purposes.

At the time of this 2011 Update, the dismantlement of Unit 1 and Unit 2 above grade structures is complete. The HBPP site continues to generate electricity through the New Gen or HBGS. Plant operations, maintenance and security personnel continue to occupy the site in support of HBPP site operations and maintenance.

The ISFSI is complete and fully operational. The ISFSI and HBGS are at risk to the license termination process unless procedural controls and administrative controls are instituted.

Prior to construction of the HBGS and ISFSI, a final status survey was performed. No significant radiological remediation of these areas was required prior to construction. Radiological surveys of the area of the new plants were performed by the licensee. The NRC, with staff from ORISE, conducted confirmatory surveys prior to construction. License Amendment #40 was made to the DPR-7 license and approved by the NRC on September11, 2007 which states;

> "Paragraph 2.C.4:
> To demonstrate compliance with the NRC License Termination Rule, the Final Status Survey for Humboldt Bay Power Plant, Unit No. 3 license termination may utilize the results of the licensee's surveys of the area underlying the new fossil generation facility, referred to as the Humboldt Bay Repowering Project, provided cross contamination prevention and monitoring plan is maintained."

These controls, along with integrated planning and communication among the different organizations, are necessary to ensure a minimal risk of spreading contamination and/or placing structures on soils that have contamination greater than anticipated DCGLs.

As of 2009, HBPP has instituted an excavation permit program that allows the HBPP Radiation Protection group to specify where soils may be moved to on site. Additionally, all soil that is removed from site is sampled to ensure the soil activity is less than the site established background of 0.5 pCi/gram Cesium-137.

Specific controls are in place to track the location of excavated soils for construction purposes from the point of origin (excavation) through temporary onsite storage to final disposition. Disturbed / excavated soils that are evaluated and verified to have radiological constituents at non- detectable levels (below environmental Lower Limit of Detection for soils) could be used as backfill in some excavated areas.

5.5 Personal Interviews

Personal interviews of current and former HBPP site personnel were held during the site inspection and via telephone during the HSA process. Personnel were selected based on their employment history at the HBPP site. Interview efforts were focused on personnel who were employed during the time that Unit 3 was in operation. Personnel were interviewed that held positions in maintenance, qualified reactor operators, and radiation protection. Undocumented events were not discovered during this process, but the interviews did prove helpful in assessing the historical operations.

6 History

The HBPP site has undergone many changes in its 55 plus years of existence. A chronological photographic history of the site transitions is shown in Appendix C. The photographs begin in 1954 when there were no PG&E buildings on the site and transition all the way to 2011 with the ISFSI and the HBGS facility constructed. Many of the photographs were collected by and purchased from Environmental Data Resources, Inc. in Milford, CT.

6.1 Licensing History

PG&E is the holder of the Humboldt Bay Power Plant Unit 3 NRC License, DPR-7. Unit 3 was granted a construction permit by the Atomic Energy Commission (AEC) on October 17, 1960, and construction began in November 1960. The AEC issued Provisional Operating License No. DPR-7 for Unit 3 in August 1962. Unit 3 achieved initial criticality on February 16, 1963, and began commercial operation in August 1963.

On July 2, 1976, Unit 3 was shut down for annual refueling and to conduct seismic modifications. In December 1980 it became apparent that the cost of completing required upgrades made the possibility of restarting Unit 3 uneconomical. Work was suspended at that time awaiting further guidance regarding modification requirements. In 1983, updated economic analyses indicated that restarting Unit 3 would not be cost effective, and in June 1983 PG&E announced its intention to decommission the unit. A possession only license amendment was issued in 1985 and the plant was placed in a SAFSTOR status.

PG&E received approval by the NRC for its decommissioning plan (DP) in Jul y 1988. However, since this was subsequent to the 1996 NRC decommissioning rule, the licensee converted the DP into its Defueled Safety Analysis Report (DSAR) which is updated every two years.

In February 1998, PG&E issued a Post Shutdown Safety Analysis Report (PSDAR). The plant is currently in SAFSTOR with incremental decommissioning activities ongoing.

PG&E received approval, November 2005, from the NRC to construct an ISFSI onsite under a 10CFR72.48 License. PG&E has since transferred all spent fuel bundle assemblies from the spent fuel pool to the dry cask storage installation, thus allowing decommissioning activities to proceed on Unit 3.

6.2 Current Site Status

The HBPP site is undergoing a complex transition process that entails numerous activities to run concurrently. To get Unit 3 through decommissioning and to the goal of license termination, PG&E is in the process of the following tasks:

- Planning of Decommissioning Activities, i. e. DCGL Development characterization, remediation, demolition, final status surveys, and license termination plan.
- Operation of the new power plant (placed in service 2011).
- Operation of the Independent Spent Fuel Storage Installation (placed in operation 2008).
- Decommission and dismantlement of the Units 1 and 2 fossil fuel plants (completed in 2011).

6.3 Fossil Power Units

PG&E maintained 4 operational electrical generating units at the HBPP site, which consisted of two

oil and/or natural gas fueled units (Unit 1 rated at 52 MWe and Unit 2 rated at 53 MWe) and two diesel-fueled gas turbine Mobile Emergency Power Plants (MEPPs), each rated at 15 MWe. With the operation of the new fossil plant (HBGS), the remaining fossil units have been dismantled.

6.4 Nuclear Power Unit

HBPP Unit 3 was a natural circulation boiling water reactor and associated turbine-generator operated by PG&E. To simplify plant design, Unit 3 included certain features that were not typical of nuclear plants of that era. Natural circulation within the reactor vessel eliminated the need for recirculation pumps, a direct cycle design eliminated the need for heat transfer loops between the reactor and turbine-generator, and as a joint effort between PG&E and General Electric Company, the pressure suppression containment system was developed to eliminate the need for the large containment structures that had been used at earlier nuclear plants. The pressure suppression containment design permitted the reactor to be located below ground level. The reactor has been in cold shutdown and SAFSTOR since 1976. Major decommissioning of the Unit 3 nuclear reactor will begin once the Unit 1 and Unit 2 fossil plants have been dismantled to reduce the risk of cross contamination.

There are ten systems that are either shared by Units1, 2 and 3 or the system was supplied from Units 1 and/or 2. The systems relevant to the HSA are the Oil-Water Separators and the Yard Drain System because of cross contamination issues. The Oil-water separator and sump for Unit

2 was contaminated by an accidental spill of the Closed Cooling Water system and the Yard

Drain system has been contaminated by several accidental liquid releases of radioactive waste.

The service water system of Unit 2 is supplied from the site intake channel where the Yard Drain System is discharged into. Therefore the Service Water System of the non-nuclear units has the potential to contain radioactive contaminants due to its intake from the site intake channel.

6.4.1 Description of Circumstances Impacting Site Radiological Status

During the operation of Unit 3 and during SAFSTOR, certain events occurred that affected plant conditions and have to be considered during decommissioning. The following paragraphs describe some these events and how they relate to the decommissioning effort. None of these events caused conditions that would prevent Unit 3 or the HBPP site from being decommissioned with current technologies and work practices. HBPP radiation protection department continually investigates and documents spills and incidents through procedure, HBAP D-500, Documentation of Site Radioactive Contamination. Information on minor spills/incidents and more detailed information on the incidents listed may be found in this document.

Reactor Fuel Releases

- When Unit 3 began operation, the fuel utilized stainless steel cladding. In 1964 and 1965, fuel cladding failures began to occur and it was determined that the cause of the failures was stress corrosion cracking of the stainless steel cladding. In 1965, the stainless steel-clad fuel was replaced with zircaloy-clad fuel.
- The early fuel cladding failures resulted in contamination of the reactor vessel, spent fuel storage pool, and plant systems with fission products and transuranic nuclides. These failures have also resulted in transuranic nuclide contamination on concrete surfaces within Unit 3. All stainless steel-clad fuel was shipped offsite for reprocessing during the years 1969 through 1971.
- In 1975, a fuel assembly was dropped into the spent fuel pool cask loading pit, and several fuel rods separated from the assembly. A special container was fabricated to contain the assembly. The assembly and the loose rods was retrieved and stored in the container in the spent fuel storage pool fuel storage racks until all fuel was transferred to the ISFSI in 2008.

Liquid Releases

- In March 1966, it was discovered that a leak in the spent fuel storage pool liner had developed. It was estimated that the spent fuel pool liquid inventory decreased by approximately 55 gallons per day. Operating procedures were developed to minimize leakage. Investigations were conducted to determine the magnitude of any groundwater contamination that could have occurred. At that time samples of groundwater from the plant wells, the reactor caisson sump, and two of three test wells did not reveal signs of contamination. One test well drilled north of the spent fuel storage pool (between the pool and the bay) revealed evidence of contamination, but the levels were a factor of 100 below allowable drinking water limits.

  Water and soil samples collected from the French Drain did reveal levels of Zn-65 that were comparable with the Zn-65 levels of the Spent Fuel Pool water. Tritium was identified at a later date in the Caisson Sump during a sampling effort to re-check the spent fuel pool leakage rate. Samples were collected on 2/20/97, 3/17/2000 and in 8/2000.

  The test wells have been monitored regularly since the identification of the leak and results of the surveillance have indicated no increase in activity.

  A review is currently underway to assess the groundwater monitoring program, specifically for tritium, in support of a Nuclear Energy Institute (NEI) Industry Action Plan for tritium in groundwater for nuclear plants in operation or undergoing decommissioning.
- On 1/26/73, concentrated radiological waste was found to be leaking through a piping penetration from the Concentrated Waste Tank (CWT) Vault to the radioactive waste tankage area, into the tankage area sump, and through the sump drain line to the outfall canal. After valving the sump to send the water to the radioactive waste system, investigation found that a valve from the concentrator to the #2 CWT had been left partially open. As a result, contaminated water filled the #2 CWT, and the subsequent overflow filled the bottom of the vault to the level of the wall penetration. To evaluate the event for reporting to the NRC and the NCRWQCB, it was assumed that all of the liquid entering the sump (less than 50 gallons) reached the outfall canal through the sump drain line.

- On 9/7/73, after a sudden rain shower, contaminated liquid came up through openings in a manhole cover to an electric pull box located at the southwest corner of the liquid radioactive waste tankage area. The contaminated liquid flowed across the pavement into the yard drains in the Unit 3 yard, North of Unit 2 fans, and between the #2/3 condensate storage tanks. The liquid also followed a ditch along the bank North of Unit 2, going through drain rock and a perforated pipe into the yard drain system. This is the "North Loop" part of the yard drain system, which discharges into the intake canal.

  The contamination originated from the overflow of the CWT vault on 1/26/73, and it reached the electric pull boxes and conduits because their drains were in common with the drain from the tankage area sump to the outfall canal. The source of the water which flushed the contamination from the pull box to the yard was the rainwater draining from the hill north of the plant, which at that time was routed to the radioactive waste tankage area. It is likely that most of the water that was assumed to reach the outfall canal on 1/26/73 was actually collected in the pull boxes and conduits because their drains were in common with the drain from the tankage area sump to the outfall canal. The pavement in this area was decontaminated from loose surface contamination and was repaved to entrap any remaining contamination since the dose rates from the radioactive waste tanks did not permit direct measurements for release of this area.

  Final decontamination of these areas to acceptable levels for unrestricted use will be accomplished as part of the final decommissioning process.

Gaseous Releases

- Unplanned gaseous releases to the atmosphere have not occurred based on current documentation, operating reports, radioactive effluent monitoring reports submitted to the NRC, and personal interviews. There have been documented airborne releases inside of Unit 3. These releases may have affected Units 1 & 2.

6.4.2 Waste Handling Procedures

The DSAR, Section 2.3.2, describes the systems and equipment for handling radioactive waste generated as a byproduct of prior plant operation and maintenance of the spent fuel pool. Section 3.4.2 of the DSAR establishes the radioactive waste processing and disposal methods. HBPP waste handling procedures are intended to contain, adequately treat, and dispose of these radioactive byproducts consistent with the ALARA Design Objectives delineated from 10CFR50 Appendix I. The waste disposal system uses several basic methods to treat and dispose of radioactive material:

- Retention in storage to allow natural decay of short lived radioactive isotopes.
- Filtration and ion exchange to remove radioactive constituents from liquids.
- Evaporation to concentrate radioactive constituents.
- Filtration by charcoal and high efficiency particulate air filters for gaseous discharge.
- Dilution of low-activity liquid and gaseous discharges.

Spent fuel was removed from the site and shipped to a reprocessing facility in the early years of plant operation. The last spent fuel shipments from HBPP occurred in 1971. All of the stainless steel clad fuel that was prone to integrity failure was remove from site during this timeframe. After that date, spent fuel remained on site in the SFP. This spent fuel has since been transferred to the ISFSI.

Construction of buildings, roads and railways during and after nuclear operations at the HBPP site involved excavation of contaminated soils. By site procedure, contaminated soils were sent to an NRC licensed disposal facility. Soil that was deemed non-contaminated by site procedures using gamma scans with a GM detector were placed onsite either west or east of the discharge canal. This was also the case for soil that

was excavated for the construction of the ISFSI and for the new fossil plant or HBGS.

6.4.3 Adjacent Land Usage

The following paragraphs describe the features and uses of land within 5 miles of the plant. Included is a summary of the population centers within 10 miles of the HBPP site.

6.4.3.1 Bodies of Water

As an integral component of the ISFSI Design, a detailed evaluation of the geologic strata was completed. This assessment reported that HBPP lies in the Eureka Plain Sub-basin of the North Coast Basin. The Eureka plain drainage basin is within the hydrologic unit defined as the Redwood Creek-Mad River-Humboldt Bay Unit. With respect to the site, the watersheds of Humboldt Bay and the bay itself are the most relevant surface water bodies. The four major creeks that drain into Humboldt Bay are Fresh water Creek, Elk River, Salmon Creek, and Jacoby Creek. Several smaller tributaries also drain into the Bay. Salmon Creek and Elk River are the nearest streams to the site, within a mile south and north of the site respectively. Salmon Creek and Elk River are used for watering livestock, but are not used as a potable water supply.

Several acres of wetlands are in the immediate vicinity of PG&E property as well as on PG&E owned property. In the main section of PG&E property, the area northeast of King Salmon Avenue, there are approximately 70 acres of land south of the bay. The Army Corps of Engineering has deemed about 21 of the 70 acres as wetlands. An additional 6 acres have been designated as California coastal Wetlands.

6.4.3.2 Land Use

The HBPP site is located on the northern California coast in Humboldt County, approximately 4.8 km (3 mi) southwest of the city of Eureka. PG&E owns 143 acres of land area along the mainland shore of Humboldt Bay and the inter tidal areas extending approximately 150 m (500 ft.) into Humboldt Bay from this land area. At the HBPP, PG&E has full authority to control all activities within its property lines.

Humboldt Bay and the surrounding lowlands comprise the region south, east, and west of the site. The lowland areas around the site are primarily vacant land and are used to a limited extent for grazing beef cattle. Humboldt Hill is the dominant feature southeast of the site. Most of the mountainous area east and southeast of the site is inaccessible.

The City of Eureka, with a population of approximately 26,000, is the largest population center in Humboldt County. Within 8 k m (5 mi) of the HBPP site, there are several small residential communities including: King Salmon, Humboldt Hill, Fields Landing, and the suburban communities surrounding Eureka. King Salmon is located to the west of the HBPP site, adjacent to the site location, while Fields Landing is located approximately 0.4 mile south. No major new developments are currently planned for the area within 8 km (5 mi) of the HBPP site.

A total of nine farms and ranches and one community vegetable garden have been identified within 8.0 km (5 mi) of the HBPP site. The primary local farming products are dairy products, cattle, goats, and llamas. Most of the dairies are located along the Elk River to the north of the HBPP Site, while the coastal lowlands are used primarily for cattle grazing and ranching. The nearest dairy, which produces approximately 3028 liters (800 gallons) of milk per day, is located 2.9 km (1.8 mi) east of the site. The nearest vegetable garden i s the Wiyot Tribe community vegetable garden located approximately 6.8 km (4.2 mi) southwest of the site.

The primary industry in the area, and in Humboldt County, is lumber and lumber/paper manufacturing. Lumber production in Humboldt County in 2000 was valued at $285.5 million. A lumber-loading shipyard is located on Humboldt Bay less than 1.6 km (1 mi) south of the HBPP site.

The HBPP site is located in the vicinity of several ports that support commercial and sport fishing activities, and a public trail to access a breakwater for recreational fishing. Among the fish harvested are sole, rockfish, salmon, and tuna, along with crabs and shrimp and prawns.

Visitors are attracted to the area by the numerous state and county parks both along the coast and in the inland forests. In addition to the small beach on the western side of the peninsula, there are public beaches located along Humboldt Bay and the Pacific Ocean coast that are popular with local residents as well as tourists. Much of the coastal area on the inside of the bay falls within the boundaries of the Humboldt Bay National Wildlife Refuge, which is within 8 k m (5 mi) of the HBPP site.

Demography

The population distribution and projections for areas around the proposed HBPP site are based on the Year 2000 census and on estimates prepared by the California Department of Finance (California Department of Finance, 20 04). The area within 80.5 km (50 mi) of the HBPP Site includes most of Humboldt County and a small portion of Trinity County. Approximately 50 percent of the area within the radius is on land, with the balance being Humboldt Bay and the Pacific Ocean. In general, the portion of California that lies within 80.5 km (50 mi) of the HBPP Site is relatively sparsely populated, with the exception of a few urbanized areas along the coast.

According to the 2000 Census (U.S. Census Bureau, 2004), the population of Humboldt County was 126,518 and the population of Trinity County was 13,022. Humboldt County has seven incorporated cities ranging in size from approximately 300 to 26,000 persons. Approximately 67,000 of county residents reside in unincorporated communities. The nearest population center to the HBPP site, the City of Eureka, had a population of 26,128 in 2000.

There are numerous schools located within 16.1 km (10 mi) of the HBPP site, particularly in the population centers. Several K-12 school s are located within 8 km (5 mi) of the site, serving the City of Eureka and neighboring communities. Humboldt State University, with an enrollment of approximately 7,500 students, is located in the City of Arcata approximately 24.1 km (15 mi) northeast of the HBPP site. The College of the Redwoods is located within 8 km (5 mi) of the site just south of the City of Eureka and has an enrollment of approximately 5,000 full and part-time students.

In addition to the resident population, there is a seasonal influx of vacation and weekend visitors within an 80.5-km (50-mi) radius, especially during the summer months. The influx is heaviest in the area around Humboldt Redwoods State Park (located about 72.4 km (45 mi) south-southeast of Eureka) and along the Pacific Ocean coast north of the site in the area around the City of Trinidad. An estimated 2.1 to 2.2 million people visit the county per year (PG&E, 2003a).

Land Access

The only access to the HBPP site is from the south via King Salmon Avenue, which also serves the community of King Salmon situated on the western part of the peninsula. A public-access trail runs along the shoreline and along the fence to the northwest of the PG&E-controlled area.

The major travel access in the vicinity of the HBPP site and other communities of Humboldt County is via US Highway 101, which generally traverses north-south through Humboldt County. This highway passes about 0.48 km (0.3 mi) southeast of the HBPP site and is accessible approximately 0.56 km (0.35 mi) to the southeast of the site. Highway 101 continues north into Oregon and south to San Francisco and Los Angeles.

A set of North Coast Railroad tracks runs gene rally north-south along the southeastern PG&E property line. This rail system has been out of service since 1997. Presently, there are no existing plans to repair and reuse the tracks; however, the railroad owner and Humboldt County are considering this possibility.

Air Access

Commercial air traffic into and out of Humboldt County is primarily through the Arcata Airport, located in McKinleyville, approximately 25.75 km (16 mi) north of the HBPP site. The air transportation system in Humboldt County serves a range of aircraft types and aeronautical uses. Nine public-use airports are located in Humboldt County. Scheduled passenger service, typically turbo-prop planes, is only available from the Arcata Airport.

Sea Access

The Port of Humboldt Bay is the largest marine shipping facility between San Francisco Bay, located 225 nautical miles to the south, and Coos Bay, Oregon, located 156 nautical miles to the north. Humboldt Bay can accommodate vessels up to 213.4 m (700 ft.) long and 33.5 m (110 ft.) wide, and weighing a total of 50,000 dead weight tons. On-board cranes and manpower are used to load and off-load cargo, as there are currently no dockside cranes in use. Seven port terminals are located on Humboldt Bay, with five of them located to the north of Eureka. The nearest terminal to the HBPP site is the Humboldt Bay Forest Product Dock, located just to the south of King Salmon, approximately 0.64 km (0.4 mi) from the HBPP. The Fields Landing lumber shipyard lies another 1.2 km (0.75 mi) or so further south along the shoreline.

There are several boat landings in the community of King Salmon, located just west of the entrance gate to the PG&E-controlled area. The community of King Salmon serves frequent commercial and recreational boat traffic.

7 Data Quality Objectives & Radiological Findings

The HBPP Characterization activities were to assess the radiological status of the HBPP site in accordance with MARSSIM guidance. The ENERCON characterization activities were guided by HBPP-PP-003, Site Characterization Plan, which used the MARSSIM Data Quality Objective (DQO) process to establish high quality characterization data.

In the following sections, the results of the various characterization efforts are summarized as necessary to describe certain radiological impacted land areas, buildings, or structures. Results of particular importance in determining the radiological status of the site are the characterization of the HBGS footprint area, subsurface borings around Unit 3, and sediment sampling in the discharge canal. The reports for the various characterization efforts are available onsite from the HBPP RP Department and are listed in Section 10. Appendix E contains the Subsurface and Sediment Characterization drawings from the 2008 Characterization effort.

7.1 Potential Contaminates

The primary contaminants of concern for the HBPP site are Fe^{55}, Co^{60}, Cs^{134}, Cs^{137}, Ni^{63}, $Pu^{238\text{-}241}$, Am^{241} and H^{3}. Since the plant has been in cold shutdown and SAFSTOR since 1976, the more abundant activation and fission products, Fe^{55} and Co^{60}, have decayed to 0.1% and 1.6%, respectively, of their total activity because of their short half-life. After 7 half-lives, only 1% of the original activity remains, leaving Cs^{137} and Ni^{63} as the most abundant radionuclides in the HBPP inventory as shown in Appendix D. (PNL-4628)

Personnel at HBPP have seen an increase in Am^{241} since the shutdown of Unit 3. The increase is most likely from the beta decay of Pu^{241} to Am^{241}. The radionuclide inventory performed in 1981 did not include analysis for Pu^{241}, possibly due to detection limits. Plutonium-241 decays by a very weak beta at 20.8 KeV. It also decays by alpha emission to Neptunium-237. However, this mode of decay has a relative abundance of less than 1%. No equilibrium point will be reached between Pu^{241} and Am^{241} because of their short to long half-lives, 14.4 years and 432.7 years, respectively. The increase of Am^{241} should reach 90% of its maximum in approximately 48 years from the date of the last fuel cladding failure, which occurred in 1965. This will occur around the year 2013 and the maximum should occur about 73 years after the last fuel failure or 2038.

7.2 Potentially Contaminated Areas

7.2.1 Impacted Areas – Known and Potential

All areas and structures were classified according to available radiological characterization data, historical site operations, and personal interviews. All areas, or sections of an area, can and may be changed when new radiological sample data becomes available. Appropriate documentation should be provided for the justification of changes. Appendix B contains a summary of all buildings and structures on site during the development of the HSA.

Since the initial development of the HSA in 2006, several characterization efforts have been initiated on the buildings and structures as well as the surface and subsurface soils. In addition, the original MARSSIM classifications were developed using available data in 2006 along with the assumption that a Resident Farmer scenario may be selected as the release scenario for the development of the site specific DCGLs. However, the site has decided to pursue an industrial release scenario which increases the DCGLs that may be used (if approved by the NRC) therefore, the MARSSIM classifications were slightly modified.

7.2.1.1 Class 1 Buildings, Structures, and Land Areas.

All buildings, systems and structures associated with the Unit 3 nuclear reactor or associated with radioactive material handling meet the MARSSIM Class 1 definition. (See Appendix B-3) These areas have been designated as Class1 due to elevated levels of radioactive contamination, or the high potential for elevated levels, that will require remediation and/or disposal at an NRC licensed disposal facility. A list and summary of these building, systems and structures is contained in Appendix B, while detailed information is contained in Section 2.0 of the HBPP DSAR.

During the early operations of the HBPP Unit 3, there was a substantial history of fuel cladding failures associated with the use of stainless steel clad fuel in its initial core loadings. The history of fuel failure, along with more than 13 years of commercial operation, lead to the accumulation of fission an d activation products in the piping, in nuclear plant system components, the spent fuel pool and on all concrete surfaces. Painted surfaces in Unit 3 should be investigated further for alpha emitting radionuclides due to contamination control efforts to affix loose contamination. This characterization effort should be performed prior to release or disposal of building materials in Unit 3.

The primary contaminants of concern for systems of Unit 3 are Fe ^{55}, Co^{60}, Cs^{134}, Cs^{137}, Ni^{63}, $Pu^{238-241}$, and Am^{241}per reference 9.11; however, since the plant has been in cold shutdown and SAFSTOR since 1976, the more abundant activation and fission products, $Fe^{55}$and Co^{60}, have decayed to 0.1% and 1.6%, respectively, of their total activity because of their short half–life leaving Cs^{137} and Ni^{63} as the most abundant radionuclides in the HBPP inventory as shown in the updated table in Appendix D. Additionally Tritium (H^3) has been detected in some of the test wells near the spent fuel pool and in the Caisson Sump.

PNL-4628, *Residual Radionuclide Distribution and Inventory at the Humboldt Bay Nuclear Plant,* a thorough radionuclide inventory performed in 1981 by Pacific Northwest Laboratories, describe in detail the percent distribution in various systems and structures in Unit 3. Additional radionuclide sample data for systems in Unit 3 and relevant radiation safety calculations have been captured in HBPP technical basis document TBD-204, *Selection of Derived Air Concentration Limits for Airborne Radioactivity at HBPP* (Ref. 10.16). These documents provide important data for decommissioning activities in Unit 3 in the areas of radiation protection, remediation, and waste disposal.

From the information reviewed, radiological contamination at the HBPP site has been kept to the few acres surrounding the Unit 3 Nuclear Unit. All of the land within the RCA fence line meets the MARSSIM Class 1 definition due to elevated levels of radioactive contamination, or the high potential for elevated levels. These areas should require remediation and/or disposal at an NRC licensed disposal facility. In addition, the land north of Units 1 and 2 up to the Secondary Gas Regulators meets the Class 1 definition due to known elevated contamination levels in the north branch of the Yard Drain System and known contamination below the Unit 2 Fan. The Northwest section of the North Yard Drain system was an open trench in the early years of operation until the unit was placed in SAFSTOR and the Unit 3 yard had asphalt installed.

Other land areas that meet the MARSSIM Class 1 definition due to known elevated contamination levels are the sediments around the Yard Drain discharge near the Intake Structure, the discharge canal sediments, and the land area in the vicinity of waste discharge piping from Unit 3 to the discharge canal. (See Appendix A-2)

The primary contaminant of concern is Cs137 due to its longer half-life. Transuranic contaminants of reactor origin have been detected in the discharge canal, but at levels below potential DCGLs for transuranic radionuclides. Subsurface soils will have H3 (Tritium), as an additional contaminant of concern, but may be below DCGL s. Tritium has been detected in groundwater monitoring wells southwest and southeast of Unit 3. The root cause of this contamination is not currently known, but it is hypothesized that it has migrated from either the spent fuel pool or from an overflow of the condensate demineralizer tank in 1974 that may have contaminated a French drain line along the old

abandoned rail spur.

A review of the groundwater monitoring program was completed in 2006. The review was specifically for tritium in support of a NEI Industry Action Plan for tritium in groundwater for nuclear plants in operation or undergoing decommissioning (Ref. 10.5). Seven new groundwater monitoring wells were constructed and placed into service in 2008.

Discharge Canal (Characterization Survey Package #086SD1)

History:
The discharge canal was dug in the middle 1950's as part of the service water for the HBPP units 1 and 2. When unit 3 was built, a radioactive waste discharge line was built from the liquid radioactive waste treatment building (LRWT) to the cooling water discharge pipe near the hot machine shop. This line discharged into the discharge canal. For SAFSTOR, the original radioactive waste discharge line was abandoned in place and a new line was installed. The new radioactive waste line begins in the LRWT building and ends at the discharge structure in the southeast end of the discharge canal.

Description of Characterization efforts:
In 2008, nineteen sediment sampling borings were advanced to characterize radiological and environmental chemical soil conditions in the HBPP discharge canal and to determine the environmental impacts at the plant. The reasoning and rational for the locations of the sample borings was to provide a sufficient spatial characterization of the discharge canal soils for decision making purposes. The samples collected in 1997 by IT/Duratek *(Structural Characterization Report for Humboldt Bay Power Plant, M arch,* 1998) were all collected down the centerline of the discharge canal. Several samples had elevated concentrations of Cs-137 at the lowest depth of sample, about 1.7 feet into the native sediment.

The sampling in 2008 included samples down both sides of the discharge canal as well as along its centerline. Samples were also taken near pipes and drains. The vertical and horizontal extent and quantity of any radiological and/or environmental contamination in the subsurface soils will be determined based on the data collected from the discharge canal. See Appendix E-13 for results.

Classification Statement:
Based upon the current/best information concerning the radiological conditions and the conditions and events identified in the operating history, the southern 90% of the Discharge Canal is designated as a Class 1 area.

Radioactive Waste Piping Below Grade (Characterization Survey Package #088SB1)

Description of 2008 Characterization Effort:
This survey unit included subsurface soil near two radioactive waste discharge pipes and two drain pipes. Sampling was performed near the abandoned and current liquid radioactive waste discharge pipe, near the laundry water drain pipe, the Liquid Radioactive Waste Treatment Building's (LRWTB's) Tankage Area Sump Drain pipe, the North Yard drain system and three other areas of interest which require further delineation based on previous characterizations. The locations of the samples collected, as well as the results of the radiological analyses, are shown in Appendix E-2 through E-4. A utility line locating company was used to determine the location of the below grade piping. Samples were collected within 3 feet of the pipes.

History:
During past operations of Unit 3, liquid radioactive waste was released into the Discharge Canal via the Unit 3 Discharge Tube. The radioactive waste came from the liquid radioactive waste discharge pipe located in the Liquid Radioactive Waste Treatment Building (LRWTB). This pipe drained due south of the LRWTB alongside Unit 3, next to the Radioactive Waste Tankage Drain Line shown in E-2, until

it connected into the Unit 3 Discharge Tube. This pipe was abandoned when Unit 3 was placed into SAFSTOR. The Radioactive Waste Tankage Drain Line was involved in a liquid radioactive waste spill as described in Section 6.4.1, Liquid Releases.

During the initial phase of the HBGS construction in 2008, utilities and obstructions were removed or relocated from the HBGS footprint area to prepare for the HBGS builder to begin construction. While a utility line was being relocated to an area outside of the HBGS foot print area, the soil was removed from the top of the discharge tubes in the area of sample location RWT-24 as shown on the drawing in Appendix A-2. An access portal or man-hole was discovered in this area. The Radioactive Waste Tankage Drain line connected into this concrete monolith. The line then exited the monolith towards the Discharge Canal as shown in Appendix E-2. The drain line as well as the concrete monolith was significantly contaminated. The concrete monolith was removed as well as most of the drain line towards the Unit 3 RCA. Soil samples in the area were greater than 50pCi/g. The soil was removed to near background levels. The area above the Discharge Tubes and around the Radioactive Waste Tankage Drain Line is designated a Class 1 area.

The North Yard Drain System was also affected by the Tankage Area Sump Drain spill as stated in Section 6.4.1 Liquid Releases.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history the subsurface soils within 3 feet of each side of the piping and drain lines identified in this survey package are a MARSSIM Class 1 area. The soils around the Radioactive Waste Tankage Drain Line and the Discharge Tubes are also Class 1 areas as shown in Appendix A-2.

7.2.1.2 Class 2 Buildings, Structures and Land Areas

Buildings and Structures

The structures that meet the Class 2 definition are Unit 1, Unit 2, the Water Intake System, the Welding Shop and the Machine Shop. Units 1 and 2 may require limited amounts of remediation due to their proximity to Unit 3. Access to and egress from Unit 3 was primarily through these units. Detectable amounts of contamination have been measured in these units and may be above DCGL levels in pathways and in isolated areas. In addition, reactor origin contamination has been detected on the Unit 1 and Unit 2 ventilation intake structure. The machine shop may require limited remediation based on historical accounts of work on contaminated items. The items had fixed contamination that was made removable by machining methods. The machine shop was decontaminated in accordance with site procedures when work was completed. However, residual contamination may still be present above DCGL levels.

Land Areas

Land areas that meet the MARSSIM Class 2 definition are the areas surrounding the Class 1 land areas and Class 1 building and structures. Land areas designated as Class 2 provide a buffer zone between land areas designated Class 1 and land areas designated Class 3 where the boundary of contamination is not evident. Land areas may also be designated Class 2 if the data does not definitively show, until DCGLs have been established, that remediation will be required.

There are several distinct areas that have been put into the Class 2 category. These areas are the surface and subsurface soils surrounding Units 1, 2, and 3, the Yard Drain System Soils, the Spoils Area, areas surrounding the Discharge Canal, sediments in the Intake Canal surrounding the Class 1Yard Drain discharge area, and the asbestos SWMU.

Soil excavations that occurred at the HBPP site were scanned for contamination. Soils with levels below

the contaminated threshold, but greater than the clean threshold were placed in a spoils area west of the Discharge Canal (see Appendix A-2). All the surface soils around Units 1, 2, & 3 (Characterization Survey Package #001SS2, 002SS2, 003SS2, 004SS4) were characterized in 2007 to prove they were not Class 2, but Class 3. The subsurface soils in these same areas, however, were not characterized and therefore remain classified as Class 2. Since the characterization in 2007, HBPP has used the spoils area to place dirt excavated on site that was expected to contain radioactive materials at levels greater than background. Some soils were placed in this area that exceeded 50pCi/g. This area has been compacted and capped with a pad to
store containers and equipment. The top six inches of surface soil and/or other material such as asphalt or offsite fill brought in to cap the spoils area is designated as a Class 3.

Unit 1 Ventilation Intake (Characterization Survey Package #009BS2)

Description/History:
The Unit I Ventilation Intake and Discharge system takes outside air, preheats it, feeds it to the boiler and discharges it back to the outside environment. The area consists of a forced draft fan which drives air through a large air duct, past a first pre-heater then through the cold side of six rotating pre-heater drums. The air is then ducted into the boiler firebox for combustion. It is then ducted over the hot side of the rotating pre-heater drums through an induction fan and up the discharge stack.

Classification Statement:
Based upon the current/best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 009BS2 is designated as a Class 2 area.

The area is classified as a Class 2 MARSSIM area due to the potential for radiological contamination above release limits to be present. Unit 1 was in operation when Unit 3 was operating. Therefore the primary route of potential contamination is airborne deposition from the Unit 3 discharges which were then drawn into Unit 1.

Unit 2 Ventilation Intake (Characterization Survey Package #010BS2)

Description/History:
The Unit 2 Ventilation Intake and Discharge system takes outside air, preheats it, feeds it to the boiler and discharges it back to the outside environment. The system consists of a forced draft fan which drives air through a large air duct, past a first pre-heater then through the cold side of six rotating pre-heater drums. The air is then ducted into the boiler firebox for combustion. It is then ducted over the hot side of the rotating pre-heater drums and up the discharge stack.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 010BS2 is designated as a Class 2 area.

The area is classified as a Class 2 MARSSIM area due to the potential for radiological contamination above release limits to be present. Unit 2 was in operation when Unit 3 was operating. Therefore the primary route of potential contamination is airborne deposition from the Unit 3 discharges which were then drawn into Unit 2.

Unit 1 Ground Floor (+12 ft. elevation) (Characterization Survey Package #011BS2)

Description:
The HBPP Unit 1 Ground Floor, and the hallway area north of the 2.4 KV room consists of bare concrete floors and ceiling; walls are comprised of painted cinder blocks.

History:
The Unit 1 Ground Floor area contains the bottom of the Unit 1 Firebox in a curbed containment area made of cinder blocks with 3 floor drains. This curbed area dimensions are 20' x 29' x 2'. The remaining area contains the following Unit 1 components: Lube Oil Tank and Filter (Bowser Unit); Fuel Oil Pumps and associated piping; Load Center Breaker Cabinets; Air Compressors, Dryer and Tanks; Boiler Chemical Addition Station; Floor Pipe Trenches; Storage Lockers and miscellaneous portable equipment. Eight floor drains empty to the yard drain system. The elevated area under the ceiling consists of many pipe chases, cable trays, and support I- beams.

The hallway North of the 2.4 KV room connects the Unit I and Unit 2 ground floors. Ventilation Exhaust Ducts from the 2.4 KV Room extends across the ceiling area to the North wall.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 011BS2 is designated as a Class 2 area.

These areas are classified as a Class 2 MARSSIM area due to the potential presence of radiological contamination above release limits. Potential routes of contamination are cross contamination from personnel traffic patterns between the three HBPP units and by airborne deposition.

Unit 1 Second Floor (+27 ft elevation) (Characterization Survey Package #012BS2)

Description/History:
The HBPP Unit I Second Floor area (+27 ft.) consists of bare concrete floors. The ceiling is corrugated steel. The walls are comprised of painted asbestos-cement corrugated siding. The south wall has 6 feet of windows; the remaining height to ceiling is asbestos-cement siding. The Unit 1 Second Floor contains the Shift Fore man's Office; Number 1 Evaporator; Control Cubicle; Control Panels; Boiler Feed Pumps; Cover of turbine steam valve control on the south wall; Unit 1 Firebox on the north wall with both oil and natural gas feeds.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 012BS2 is designated as a Class 2 area.

The area is classified as a Class 2 MARSSIM area due to the potential for radiological contamination above release limits to be present. Potential routes of contamination are cross contamination from traffic patterns between the three HBPP units and by airborne deposition.

Unit 2 Ground Floor (+12 ft elevations) (Characterization Survey Package #013BS2)

Description/History:
The HBPP Unit 2 Ground Floor area consists of bare concrete floors and ceiling; walls are comprised of painted cinder blocks. The Unit Two Ground Floor area contains the bottom of the Unit 2 Firebox in a curbed containment area made of cinder blocks with 3 floor drains. The curbed area is 20' x 29' x 2'. The remaining area contains the following Unit 2 components: Lube Oil Tank and Filter (Bowser Unit); Fuel Oil Pumps and associated piping; Load Center Breaker Cabinets; Air Compressors, Dryer and Tanks; Boiler Chemical Addition Station; AMERTAP (condenser cleaner) control cabinets; and Floor Pipe Trenches; Storage Lockers and miscellaneous portable equipment. Eight floor drains empty to the yard drain system. The elevated area under the ceiling consists of many pipe chases, cable trays, and support I beams.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 013BS2 is designated as a Class 2 area.

These areas are classified as a Class 2 MARSSIM area due to the potential presence of radiological contamination above release limits. Potential routes of contamination are cross contamination from personnel traffic patterns between the three HBPP units and by airborne deposition.

Unit 2 Second Floor (+27 ft. elevations (Characterization Survey Package #014BS2)

Description/History:
The HBPP Unit 2 Second Floor area (+27 ft.) consists of bare concrete floors. The ceiling is corrugated steel and the walls are comprised of painted asbestos-cement corrugated siding. The south wall has 6 feet of windows with the remaining height to the ceiling covered with asbestos- cement siding. The Unit Two Second Floor contains the #2 Evaporator; Control Room; Control Panels; Boiler Feed Pumps; Cover of turbine steam valve controls on the South wall; Unit 2 Firebox on North wall with oil and natural gas feeds. A Carbon Dioxide storage tank is in the northeast corner.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 014BS2 is designated as a Class 2 area.

The area is classified as a Class 2 MARSSIM area due to the potential for radiological contamination above release limits to be present. Potential routes of contamination are cross contamination from traffic patterns between the three HBPP units and by airborne deposition.

Unit 2 Seal Oil Room (Characterization Survey Package #015BS2)

Description/History:
The HBPP Unit 2 seal oil system functions to seal the electrical generator from leakage of the hydrogen which cools its rotor. The area consists of painted concrete floors and inner and outer walls of bare concrete. The bottom of the generator housing forms the ceiling for most of the room. There are no floor drains or trenches in the room. There are four surface drains on the top of the concrete slab which forms the roof of the building. The Unit 2 Lube Oil Room contains the High voltage Cabinets; Lube Oil Tanks and Pumps and a Hydrogen Analyzer. The elevated area under the ceiling consists of many pipe chases, cable trays, and support I beams.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 015BS2 is designated as a Class 2 area.

The area is classified as a Class 2 MARSSIM area due to the potential for radiological contamination above release limits to be present. Potential routes of contamination are cross contamination from traffic patterns between the three HBPP units and by airborne deposition.

2.4 KV Room (Characterization Survey Package #018BS2)

Description/History:
The HBPP Unit 1 2.4 KV area consists of bare concrete floors and ceiling. The walls are comprised of bare cinder blocks. The Unit 1 Ground Floor 2.4 KV room contains a number of high voltage cabinets. Two floor drains empty to the yard drain system. The elevated area under the ceiling consists of many pipe chases, cable trays, and support I beams.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 018BS2 is designated as a Class 2 area.

These areas are classified as a Class 2 MARSSIM area due to the potential presence of radiological contamination above release limits. Potential routes of contamination are cross contamination from personnel traffic patterns between the three HBPP units and by airborne deposition.

Unit 2 Building Structures (Characterization Survey Package #019BS2)

Description:
The HBPP Unit 2 building support structures consists of six floor elevations beginning at the 47.5 ft. elevation. The floor elevations are as follows 47. 5 ft., 56 ft., 64 ft., 73 ft., 80 ft. and 97.5 ft.. The structure consists primarily of structural steel, steel grate flooring and asbestos cement siding on outer walls above the 80 ft. level. The structure also contains intake and exhaust ventilation ducts, the fire box and the exhaust stacks.

History:
The Unit 2 building structures include structural steel, steel grate flooring and asbestos cement siding on outer walls above the 80 ft. level. The structure also contains intake and exhaust ventilation ducts, the fire box and the exhaust stacks.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 019BS2 is designated as a Class 2 area.

The area is classified as a Class 2 MARSSIM area due to the potential for radiological contamination above release limits to be present. Potential routes of contamination are primarily airborne deposition from past unit 3 exhaust stack releases. Based on the former location of the Unit 3 stack, wind-rose data and operational experience, airborne deposition of radioactivity was more likely to occur on the plant north and east sides of Unit 2 with roof and upper floor elevations having a higher probability of deposition.

Unit 1 Seal Oil Room (Characterization Survey Package #020BS2)

Description/History:
The HBPP Unit 1 seal oil system functions to seal the electrical generator from leakage of the hydrogen which cools its rotor. The area consists of painted concrete floors and inner and outer walls of bare concrete. The bottom of the generator housing forms the ceiling for most of the room. There are no floor drains and no trenches in the room. There are four surface drains on the top of the concrete slab which forms the roof of the building. The Unit 1 Seal Oil Room contains high voltage cabinets; seal oil tanks, pumps and piping, steam lines and a hydrogen analyzer. The elevated area under the ceiling consists of many pipe chases, cable trays, and support beams.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 020BS2 is designated as a Class 2 area.

The area is classified as a Class 2 MARSSIM area due to the potential for radiological contamination above release limits to be present. The *GTS Duratek, Inc. Report, March* 1998, does not address the seal oil room as a separate entity for radiological characterization. Potential routes of contamination are cross contamination from traffic patterns between the three HBPP units and by airborne deposition.

Unit 1 Building Structures (Characterization Survey Package #023BS2)

Description/History:
The HBPP Unit 1 support structures consist of six floor elevations beginning at the 47.5 ft. elevation. The floor elevations are as follows 47.5 ft., 56 ft., 64 ft., 73 ft., 80 ft. and 97.5 ft. The structure consists primarily of structural steel, steel grate flooring and asbestos cement siding on outer walls above the 80 ft. level. The structure also contains intake and exhaust ventilation ducts, the fire box and the exhaust stacks. Horizontal Surfaces (piping, ducts, conduits, chases and support beams) are significant components of the total surfaces.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 023BS2 is designated as a Class 2 area.

The area is classified as a Class 2 MARSSIM area due to the potential for radiological contamination above release limits to be present. Potential routes of contamination are primarily airborne deposition from past exhaust stack releases.

Cold Machine Shop (Characterization Survey Package #025BS2)

Description/History:
The HBPP Machine Shop is utilized as an active machine shop. The area consists of bare concrete floors and the ceiling is corrugated steel. Walls are comprised of cinder blocks. Horizontal surfaces include support I-beams and a ceiling crane. The exterior roof has multiple tar and rubber like overlays.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 025BS2 is designated as a Class 2 area.

The area is classified as a Class 2 MARSSIM area due to the potential for radiological contamination above release limits to be present. Potential routes of contamination are cross contamination from traffic patterns between the three HBPP units and by airborne deposition as well as work on potentially contaminated equipment and components.

Welding Shop (Characterization Survey Package #026BS2)

Description/History:
The HBPP Welding Shop is an active welding shop. The area consists of bare concrete floors and the ceiling is corrugated steel. Walls are comprised of corrugated steel. The exterior roof is corrugated steel and has no material overlays.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 026BS2 is designated as a Class 2 area.

The area is classified as a Class 2 MARSSIM area due to the potential for radiological contamination above release limits to be present. Potential routes of contamination are cross contamination from traffic patterns between the three HBPP units and by airborne deposition as well as work on potentially contaminated equipment and components.

Oily Water Sump (Characterization Survey Package #029BS2)

Description:
The Oily Water Sump is located below ground level a few feet east of the Unit 2 condenser. This survey package consists of Unit 2 oily water pumps and the sump in which they sit. The sump is approximately 6 feet E-W and 10 feet N-S and approximately nine feet deep. The surface curbing is five feet zero inches E-W by five feet five inches on the N-S. The concrete curbing extends ten inches above grade. The pipes, control box, pipe supports and pumps and valves are a maximum of six feet five inches above grade. The drive shafts and associated piping extend for at least nine feet to the bottom of the sump.

History:
The radiological significance of the oily water sump/pump is that the floor and equipment drains for unit 2 buildings as well as from the area around the unit 3 turbine lube oil system all drain to the same oily water sump. Therefore any radioactively contaminated oil or water which made its way out of the unit 3 Turbine was transferred to the common sump and likely contaminated it. The pumps which moved the oily water to the oil/water separators would also likely be contaminated.

Classification Statement:
Based upon the current/best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 029BS2 is designated as a Class 2 area.

The area is classified as a Class 2 MARSSIM area due to the potential for radiological contamination above release limits to be present. Potential routes of contamination are from the floor drains in unit 2 and leakage of turbine lube oil from unit 3 into the floor drains. The floor drain line from Unit 3 is presently blocked. Survey results from the oil/water separation tanks which would receive the contaminated material, if any, from the sump pump, were reported in the March, 1998 *Structural Characterization Report for Humboldt Ba y Power Plant.* No statistically significant radioactive contamination was found. However, there was radioactive contamination in the original oil/water separators and their associated sump, now no longer in service. The original sump in the separator was filled with concrete to suppress the transfer of radioactive contaminants. Therefore there is a potential for radioactive contamination in the oily water sump/pump.

7.2.1.3 Class 3 Buildings, Structures, and Land Areas

All building and systems outside of the RCA, and not listed in Sections 7.2.1.1 and 7.2.1.2, meet the definition of a MARSSIM Class 3 designation based on historical operations at the HBPP site. Appendix B provides a list and description of the building and structure designated as Class 3 structures. Further investigation should be made into the possible contamination of old roof layers on all buildings. Contamination has been detected in old surveys, but layers have been added to the roofs. Contamination, if found, should be limited to the roofing materials only.

All PG&E property outside of the controlled area and the land area within the controlled area, except the areas delineated in Sections 7.2.1.1 and 7.2.1.2, meet the MARSSIM Class 3 definition based on the site operating history, characterization data, and personnel interviews. The primary contaminant of concern for the Class 3 land areas inside the controlled area is Cs137 and Co60.

HBPP procedures for excavated soils involved screening soils with Geiger Mueller detectors to scan for contamination. Soils that were deemed clean by site procedures were placed east of the Discharge Canal. The old site procedures were not available. However, previous characterization efforts did not indicate levels of contamination that would be greater than anticipated DCGLs.

Soils in the New Gen/HBRP/HBGS Areas (Characterization Survey Package #005SS3)

There are several names that have been placed on this area since the original HSA was developed in 2006. Originally the area was called the New Gen area in reference to the New Generating plants that were going to be constructed. The official name of the construction project was the Humboldt Bay Repowering Project (HBRP). The most recent name associated with the area is the official name for the facility when it became operational in 2010 which is the Humboldt Bay Generating Station (HBGS). These three names may be used interchangeably.

Description/History:
The HBGS area was not involved in typical plant work activities during operation of the HBPP Unit 3 Nuclear Reactor. The northern portion of this area is downwind of the Unit 3 stack, for the typical winter south to southeast winds. A large portion of this area has been covered by fill material with about one third of the fill material placed prior to Unit 3 operation and about half of the fill material placed since the beginning of Unit 3 operation. The historical activities in filled portions of this survey area are related to landscaping, operation of the Mobile Electric Power Plants (MEPPs), diesel oil storage, material/equipment storage, painting (and sandblasting to prepare for painting), office space and employee parking. The area has underground piping and electrical conduits. Items of interest in the survey area include the original sanitary sewer leach field for Unit 3 (south of the Oily Water Separator), and the filled drainage ditch/drainpipe that was constructed parallel to the rail spur roadbed. In 2006, approximately 50% of the land area where the construction is occurring was covered by asphalt and/or rock. The remaining surface soil was covered with grass and other natural vegetation. However, during preparation for construction, most of the surface soils were moved away and/or disposed.

Radiological Characterizations
There have been three separate radiological characterizations that have occurred in this area. The highlights from the different sampling efforts specific to the area are as follows:

- IT/Duratek Characterization (1997) – Subsurface borings were advanced to a depth of 4 feet in 9 locations in the HBRP area. Samples were collected at 1-foot intervals beginning at 0.5 feet. One location in particular had 6 additional borings in the immediate area. This grouping of samples was to determine the extent of contamination located at the end of a drainage pipe that ran along the northern edge of the train tracks. The tracks and the drain line had been covered by fill and gravel. All samples in the HBGS area were less than the accepted site background of 0.5 pCi/g Cs-137, except the one location with close grouping of borings had three samples at a depth of 3.0 to 3.5 feet with concentrations ranging from 1.34 pCi/g to 1.84 pCi/g and three samples had detectable Co-60 with a maximum concentration of 0.9 pCi/g. The location with detectable Co-60 and elevated Cs-137 is on the northern edge of the HBRP boundary and is not near the foundation of the actual generating plants or ancillary equipment. Additional samples were not collected to confirm or determine the extent of the elevated radioactive material since the concentrations were less than the potential release criteria.

A drawing with IT/Duratek sample data from samples collected in the HBGS area is included in Attachment E.

- ENERCON Characterization (2008) – The survey of the area indicated no significant detectable contamination from HBPP Unit 3 nuclear reactor operations. One surface soil sample result indicated a Cs-137 concentration of 0.653pCi/g with a two-sigma uncertainty of ± 0.084pCi/g. All other samples Cs-137 results were less than the HBPP site established background of 0.5pCi/g for Cs-137. All results for Co-60, Am-241,

  Pu-239/240, Cm-242/244, Sr-90, and Tritium were below the laboratory minimum detectable activity ranges. The result of the soil gamma radiation surveys indicated no levels of gamma radiation greater than twice background. Laboratory analysis reports from General Engineering Laboratories are attached as well as drawings of the surface soil sample locations and the gamma walkover measurement locations. Additional samples were not collected to confirm or determine the extent of the elevated radioactive material since the concentrations were less than potential release criteria. A summary of the ENERCON sample collection process, drawings depicting the sample locations, and laboratory analysis results are included in Attachment E.

- TRC Characterization (2008) – TRC Solutions Inc. advanced 44 borings with approximately 3 samples per boring in the HBGS area in support of their Environmental Remedial Investigations in July 2008. In addition to the remedial investigation analyses for non-radiological materials, all samples were submitted for gamma spectroscopy analysis to gain additional knowledge of the subsurface soils in the HBGS area. It was necessary to determine whether or not the soils could be released off site for disposal without restriction, i.e. no radionuclide concentrations derived from Unit 3 operations.

  All subsurface samples collected from the borings in HBGS were less than the site background of 0.5pCi/g Cs-137, except for one sample with a concentration of 1.23pCi/g ± 0.146pCi/g at a depth of 4.5 feet. Additional samples were not collected to confirm or determine the extent of the elevated radioactive material since the concentrations were less than potential release criteria. A drawing of the sample locations is included in Attachment E.

In addition, PG&E has screened all soils that have left the site from this area. The screening process involves the calibration of a single channel analyzer to the Cs-137 gamma peak (0.662 MeV). Soil samples are placed in a Marinelli beaker and counted for a duration sufficient enough to obtain an MDC less than 0.5pCi/g which is the HBPP established site specific background for Cs-137. Over one thousand samples have been collected with this process from the HBGS area since the excavation work started in October 2008. Every truckload was sampled as well as multiple samples collected from the bottom of any excavation of soil in the area.

Classification Statement:
Based upon the current/best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 005SS3 is designated as a Class 3 area.

This area has been initially classified as a MAR SSIM Class 3 area due to the very low potential for radiological contamination to be present based off of soil sample data from the IT/Duratek 1997 Characterization effort.

Relay Building (Characterization Survey Package #060BS3)

Description:
The HBPP Relay Building consists of concrete floors and the ceiling is corrugated steel. Walls are comprised of cinder blocks. The exterior roof has multiple tar and rubber like overlays.

History:
The HBPP Relay Building is currently operational. The electrical cabinets contain high voltage, and electrical system relays that are sensitive to vibration.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 060BS3 is designated as a Class 3 area.

The area is classified as a Class 3 MARSSIM area due to the low potential for radiological contamination above release limits to be present. Potential routes of contamination are airborne deposition on the roof and cross contamination from personnel and equipment movement.

Oil/Water Separators (Characterization Survey Package #062BS3)

Description:
The Oil/Water Separators are located south of the RCA fence. The area is approximately 75 feet east to west and 13 feet north to south. There are two large pits that run most of the length east to west at a depth of 4ft. The oil and water separating system components and oily sludge tanks lie within the pits. The system is used to separate water from oil, and petroleum based solvents.

History:
The separators have been used for the past 30 years to separate oil and other insoluble liquids from water. The yard drainage system is designed in a way that allows pipes to be rerouted by valves to drain into the Oil/Water Separators. Radiological contamination may have been spread in this manner of operation since the Yard Drain System was known to be contaminated with radioactive constituents from radioactive spill events.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 062BS3 is designated as a Class 3 area.

Assembly Building (Characterization Survey Package #063BS3)

Description/History:
The Assembly Building is a double wide trailer that is primarily used for site meetings and training classes. It is a wood frame structure on concrete perimeter foundation, constructed in early 1960s.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 063BS3 is designated as a Class 3 area.

Training Building (Characterization Survey Package #064BS3)

Description/History:
The Training Office Building is used by the Training Coordinator. It is a concrete block structure, constructed about 1974, originally intended to be a security search area. It has been used for training and is now office space for the training department.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 064BS3 is designated as a Class 3 area.

Out of Stock Warehouse (Characterization Survey Package #065BS3)

Description/History:
The Out of Stock Warehouse is a concrete block structure, constructed about 1974, originally intended to be a security alarm station/badge issue area. It is now storage space.

Classification Statement:
Based upon the current/best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 065BS3 is designated as a Class 3 area.

Intake Structure (Characterization Survey Package #066BS3)

Description:
The Intake Structure consists of the Unit 1 and Unit 2 Intake Structures, Trash Racks, exteriors of the Screens, Screen Wash Pumps, Sluice Gates, Circulators, piping, supporting steel beams, trenches and pits. It is approximately 53 feet east to west and 50 feet north to south. It supplies cooling water to the plant condensers. Sea water from Humboldt Bay is mechanically cleaned of debris by machinery at the water intake structure. The Circulating Pumps then provide cooling water to the condensers and heat exchangers used to cool the generator bearings. The Circulating Pumps are mounted in pits that protrude below grade.

History:
The North and South Yard Drain Systems funnel into the Intake Canal a few feet from the Intake Structure. The North Yard Drain System was involved in a liquid release incident as described in Section 6.4.1 which left contamination in the Intake Canal. Some contamination may remain in the bottom of the Intake Tubes; however, the structure itself is not expected to be radiologically contaminated above expected release limits.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 066BS3 is designated as a Class 3 area.

Switchyard Structures (Characterization Survey Package #067BS3)

Description:
The Unit 3 Transfer Yard Structures are located south of Unit 3 adjacent to the Hot Shop and Calibration Lab and located outside of the Radiological Control area. It contains three transformers and transformer towers mounted on concrete slabs. The transformers are surrounded by stone. There is an energized House Bank on the northwest side of the yard.

History:
The Unit 3 Transfer Yard structures were built with Unit 3. They are located south of the stack and were shielded from most of the fallout from the stack by the Unit 3 structures. The area to the north is part of the Radiological Controlled area. It is the pathway that leads to the Unit 3 Seal Oil room. To the east is the Hot Shop and Calibration facility. The yard has been de-energized except for an energized House Bank on the northwest side of the yard.

Classification Statement:
Based upon the current/best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 067BS3 is designated as a Class 3 area.

The area is classified as a Class 3 MARSSIM area due to the potential for radiological contamination above release limits to be present. Potential routes of contamination are cross contamination from radioactive fallout from the Unit 3 stack.

Fuel Oil Service Tanks (Characterization Survey Package #069BS3)

Description:
This survey package consists of two identical Fuel Oil Service Tanks. As cited in the Unit 1 and Unit 2 Plant Data documents, they are 30 feet in inside diameter and 24 feet tall. Their capacity is 2,860 barrels.

History:
With a time capacity ranging from 28 hours at maximum demand to 109 hours at average demand these tanks served as backups for the fossil units in case fuel from the much larger (65,000 barrel capacity) Fuel Oil Storage Tanks was unavailable for a few days.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 069BS3 is designated as a Class 3 area.

Hydrogen Bottle Storage (Characterization Survey Package #070BS3)

Description:
The Hydrogen Bottle Storage Building area i s a concrete block building with concrete floors and the ceiling is corrugated steel. Walls are comprised of cinder blocks. The exterior roof is composed of rubber and has multiple tar and rubber like overlays. There are two sections to the building. The west side is an open storage used to store hydrogen bottles. The east side is enclosed and used to store flammable materials.

History:
The Hydrogen Bottle Storage area is a building that lays situated north and west of the Unit 3 stack. Part of it has been used for storage of bottles of hydrogen. The enclosed portion has been used as storage area for various materials over the years.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 070BS3 is designated as a Class 3 area.

The area is classified as a Class 3 MARSSIM area due to the potential for radiological contamination above release limits to be present. Potential routes of contamination are cross contamination from radioactive fallout from the Unit 3stack.

Propane Tank (Characterization Survey Package #071BS3)

Description/History:
The Propane Tank area consists of a 15 ft. long tank that is 5 ft. diameter in diameter and is located north of Unit 2 on the hill. The Propane Tank is a tank that lays situated north and slightly west of the Unit 3 stack. It has been used for the storage of propane.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 071BS3 is designated as a Class 3 area.

The area is classified as a Class 3 MARSSIM area due to the potential for radiological contamination above release limits to be present. Potential routes of contamination are cross contamination from radioactive fallout from the Unit 3 stack.

Fresh Water Tank (Characterization Survey Package #072BS3)

Description:
The Fresh Water Tank, also known as the Domestic Water Tank or the Fire Water Tank is 36 feet in diameter and 42 feet tall, with a capacity of 300,000 gallons. To allow precipitation to drain, the top of the tank is pitched downward from the center to the wall.

History:
When HBPP was originally built two wells fed this fresh water tank which supplied all the fresh water used at the plant. This is the origin of the tank's name. One of the original wells is now permanently shut and all of the potable water used at the plant is supplied by the public water system. The other well supplies fresh water for all other plant uses including fire water. Since this tank is located immediately adjacent to the fire water pump house to which it is plumbed, it is known on site as the fire water tank.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 072BS3 is designated as a Class 3 area.

Fire Water Pump House (Characterization Survey Package #073BS3)

Description/History:
The HBPP Fire Water Pump House consists of concrete floors and the ceiling is corrugated steel. Walls are comprised of cinder blocks. The exterior roof has multiple tar and rubber like overlays.

The HBPP Fire Water Pump House is currently operational. Automatic pump starts may generate high noise levels.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 073BS3 is designated as a Class 3 area.

The area is classified as a Class 3 MARSSIM area due to the low potential for radiological contamination above release limits to be present. Potential routes of contamination are by airborne deposition, potential of contaminated water entering the fire water piping and system from potential backpressure created during a core flood of Unit 3, and a low potential for cross contamination from personnel and equipment movement.

Office Annex (Characterization Survey Package #074BS3)

Description/History:
The Office Annex consists is a concrete block structure for administrative offices constructed in 1980s.

Classification Statement:
Based upon the current/best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 074BS3 is designated as a Class 3 area.

MEPPs 2 and 3 Building (Characterization Survey Package #075BS3)

Description:
The MEPPS 2 and 3 Enclosure Buildings are two essentially identical buildings sitting side by side and housing the two MEPP Units as well as two identical trailers housing mobile control machinery for the MEPPS.

There is one common trench between the two enclosure buildings. This trench is connected on each end to two openings in the floor which are covered with steel grates. This floor opening and trench system was originally designed to carry hydraulic control lines between the MEPP units. Hydraulic controls are no longer used so the trench has been blocked and abandoned in place. An electrical cable trench connects between the two mobile control trailers.

History:
Two trailer-based Mobile Electric Power Plants (MEPPs) were located at HBPP about 1978. Each MEPP consists of two trailers, one for a jet turbine and generator, the other for operating controls, and a gasoline auxiliary power unit (APU). Each of the turbine/generator trailers had a concrete pad installed and has been enclosed in a sheet metal soundproofing structure, constructed in the 1990s.

Classification Statement:
Based upon the current /best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 075BS3 is designated as a Class 3 area.

Security Building (Characterization Survey Package #077BS3)

Description/History:
This survey package consists of the Security Building which is a small concrete block building that houses the security officers and the site entry port. It was constructed about 1974 and originally intended to be a security search area. Has been used for training, is now office space for the plant security force.

Classification Statement:
Based upon the current/best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 077BS3 is designated as a Class 3 area.

Fuel Oil Storage Tanks (Characterization Survey Package #082BS3)

Description/History:
The Fuel Oil Storage Tanks, tanks 1 and 2 have a storage capacity of 65,000 barrels each as cited in the Plant Data - Unit 1 and Unit 2 documents. They are 100 feet in inside diameter and 48 feet tall. They

each measure 100 feet inside diameter and stand 48 feet tall to the top of their vertical walls. The roof is pitched upward to its center by just over 3 feet. Each tank has a storage capacity of 65,000 barrels or almost 2,820,000 gallons. They were used to store C-grade bunker oil to fire Units 1 and 2. Tank #2 has been emptied with the oil pumped into tank #1. Tank #2 was demolished in the fall of 2008. Minor amounts of radiological contamination were found on the roof and the sides of the tank.

Classification Statement:
Based upon the current/best information concerning the radiological conditions and the conditions and events identified in the operating history, survey area 082BS3 is designated as a Class 3 area.

7.2.2 Non-Impacted Areas

HBPP property areas that extend into Humboldt Bay to the north of the owner controlled areas have been determined to be a non-impacted area. Zero contamination has been detected in the sediments at the confluence of Humboldt Bay and the discharge canal as well as across the width of the PG&E owned area of the bay. Conservative planning and cautions should be used during remediation of the discharge canal to prevent the Humboldt Bay sediments from being impacted by site operations. (GTS Duratek, 1998)

The only HBPP buildings and/or structures that are deemed as non-impacted are the temporary trailers that have been setup onsite since 2006 and the new HBGS facilities. HBPP has developed and implemented a Cross-Contamination Prevention and Monitoring Plan to help ensure the HBGS facility is not impacted by the decommissioning of Unit 3. The temporary trailers will most likely be removed from the site before FSS is completed.

7.2.3 Initial Classification of Basements, Embedded Piping, and Buried Piping

Based on measurements made during the site characterization and the information evaluated as part of the Historical Site Assessment, any basements, below grade structures, sumps or piping, which may remain after decommissioning were assigned an initial classification. Appendix A list the survey area classifications for buildings, basements, structure foundation footprints, land areas possibly augmented by structure footprints, embedded piping, and buried piping.

Basements and Structural Foundation Footprints:
Survey areas for structures that are demolished will either be applied to the remaining footprint (if the foundation is removed) or the building basement. The soil below removed foundations will undergo final survey prior to back- fill depending on survey area classifications. The need to survey soil in excavated footprints before backfill will be evaluated on a case by case basis and documented in the Final Survey Package. The soil in the excavated footprint of several structures may be combined into a single survey area and/or survey unit if final survey is required prior to backfill. Each survey unit will be comprised of one or more structural foundation foot-print, will meet the size constraints for the associated structure or structures and will possess generally uniform characteristics.

A conservative approach of classifying the excavated foundation footprints will be to classify the footprints as one class lower than would have been assigned to the foundation concrete surface. For example, if contamination below the DCGL were identified on a given foundation surface that would have resulted in the concrete surface being Class 2, the soil remaining after the foundation is removed would be given a Class 3 designation. The intent of classifying the building footprints as one classification lower (than that for the foundation concrete surface) is based on the assumption that there was no evidence of external contamination and that the only potential for soil contamination would be building demolition. If there were any evidence of soil contamination or sub-slab contamination, such information would form the basis for the footprint classification. Absent such information, the footprint would be classified at one classification below the footprint structure. Following the satisfactory

performance of FSS on the excavated foundation footprint surface, if required, the excavation area would be backfilled.

Embedded and Buried Piping

Prior to performing the FSS, the embedded/buried piping will be decontaminated as necessary.. Following decontamination, the leg of embedded piping will be surveyed for gross removable contamination. Scan surveys of the piping will then be conducted at the accessible ends along with surveys for loose surface contamination. The surface area scanned will be a small percentage of the total area of the system. The location of measurements will be determined by dividing the length of the pipe by the number of measurements to be collected. The systematic spacing of the survey measurements is in keeping with the guidance of NUREG-1575 and NUREG-1727.

Building Foundation Drains

Building Foundation Drain piping is not expected to require decontamination. Samples water collected around the building foundations and wells have not detected any plant-derived radionuclide other than tritium. Scan surveys for the Foundation Drain piping will be limited to accessible portions of the piping from the Foundation Drain Sump Pump well. Scan surveys will be performed on 10 to 100% of the interior surfaces of the piping and pump well. The number of measurements will be determined using the sign test and will be applied to the total accessible surface area of the pipe and pump well. The systematic spacing of the survey measurements is in keeping with the guidance of NUREG-1575 and NUREG-1727. Total Surface Contamination measurements will be collected using a manually deployed detector. When direct sample locations fall upon surfaces which are not amenable to surface detection (e.g., moisture saturated surfaces or pipe access restricted by calcium build-up), the volumetric samples of concrete or internal pipe scale will be taken and analyzed for plant derived activity.

Yard Drain System Piping

Prior to performing FSS on the survey units containing yard drain piping, the Yard Drain pipes and catch basins will be decontaminated or removed. The decontamination will consist of removing the sand and sediment from the piping low points and access (the manholes) and scan surveys will be performed.

Although this is Class 1 piping, physical access limits available measurement locations and scan survey locations. Therefore, scan surveys for the Storm Drain piping will be limited to accessible portions of the piping Scan surveys will be performed in areas with the highest potential for contamination. For this reason, the scan survey will be biased to piping low points and interfaces and the scan survey will be performed in the vicinity of the Total Surface Contamination measurements identified for the piping. Scan surveys will be performed on as much of the interior surfaces of the piping as possible. Survey measurements for the Storm Drain piping will be collected at existing access points. The locations will be selected based on engineering judgment and biased to areas expected.

7.3 Related Environmental Concerns

An environmental concern during remediation will be a Solid Waste Management Unit (SWMU) of buried chemical waste, along with heavy metals, that was used to clean out items from Unit 2 and is buried north of this unit. This area is marked and managed according to site procedures. PG&E's Corporate Environmental Remediation Department has begun the process to investigate the non-radiological impacts at HBPP from the operation of Unit 1, Unit 2, and the MEPPS.

7.3.1 Hazardous and Chemical Material Contamination

Decommissioning of the plant includes removal of additional known contaminants in plant systems and structures. Mercury switches, lead components, and PCB light ballasts are some examples of hazardous

materials that can be present along with plant components and structures.

Polychlorinated biphenyls (PCBs) found at other nuclear facilities can also be present at Humboldt Bay Facilities and are typically limited to painted surfaces and in some cable insulation material.

Asbestos abatement continues to play a part in the removal of various components and building materials used at nuclear facilities to prevent heat loss from buildings and systems. For the Humboldt Bay Site locations and structures containing asbestos are, but not limited to;

- Unit 1 & Unit 2 Building Support Structures contain asbestos cement siding on the outer walls above the 80 ft. level.
- Unit I & Unit 2 Second Floor area (+27 ft.) consists of walls that are comprised of painted asbestos-cement corrugated siding. The south wall has 6 feet of windows; the remaining height to ceiling is asbestos-cement siding.

Potential Explosive Atmosphere is another hazard associated with the decommissioning and demolition of Units 1 & 2. The second floors of both units have a Firebox on the north wall with both oil and natural gas feeds. Additionally, a Carbon Dioxide storage tank is located in the northeast corner on the second floor of Unit 2.

Other hazardous chemicals that have the potential to be encountered are sodium hydroxide and chromates from the water in the neutron shield and other plant systems. A Safety Hazard Analysis for each work activity is a good practice to ensure the safety of personnel associated with the Decommissioning & Dismantlement Project of the nuclear and non-nuclear units.

8 Conclusions

Data from the HSA investigation suggests that the land and structures that may require remediation lie very near to the Unit 3 nuclear reactor. The Unit 3 reactor and buildings will require remediation before they are demolished to ensure the offsite dose limits delineated in the station's ODCM are not exceeded and remediated such that FSS can be achieved. All material above the DCGL's would be disposed of at an NRC licensed waste disposal facility

The migration of surface and subsurface contamination appears to be limited to areas within close proximity to Unit 3. The areas of concern for the HBGS facility and the ISFSI show little to no affect from operations at HBPP and the available data suggests that these areas do not require remediation.

All classifications are subject to change if new data becomes available. Proper documentation, i.e., a Characterization Report or HSA revision, must occur for a change in classification to a building, structure, system, or land area.

9 Future Decommissioning Actions

Since 2006, the site has been characterized and incremental decommissioning activities have begun. For the MARSSIM process, the next step is to document ongoing characterization that will occur during the planning phase and during the decommissioning. The additional data will then be included in the FSS survey packages for each building, structure, and land area that remains at the time of license termination.

Final Status Survey packages will consist of the following

- Final Status Survey Quality Assurance Plan
- Survey Area Classification
- Establishing the Survey Unit Size.
- Developing the Survey Unit.
- Selection of Instrumentation and Survey Methods
- Investigation Levels and Action Levels
- Access Control Measures for Survey Areas
- Data Collection and Processing
- Remediation / Reclassification / Resurvey Efforts (as necessary)
- Data Assessment and Compliance Against Site DCGL's
- Reporting Format
- Submittal to NRC

These activities require close planning and coordination across several organizations to ensure the efforts of Final Status Survey are not compromised and will not impact the License Termination of the Unit 3 site.

10 References

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22. Radiological Characterization Report", HBPP-RPT-002, September 1, 2009
23. Site Characterization Plan, HBPP-PP-003

11 Appendices

A. Site Diagrams Showing MARSSIM Classifications

   1. Surface Soil Classifications
   2. Subsurface Soil Classifications
   3. Buildings and Structures Classifications (includes Basements, Embedded Piping, and Buried Piping)

B. Table of Impacted Areas and Classifications

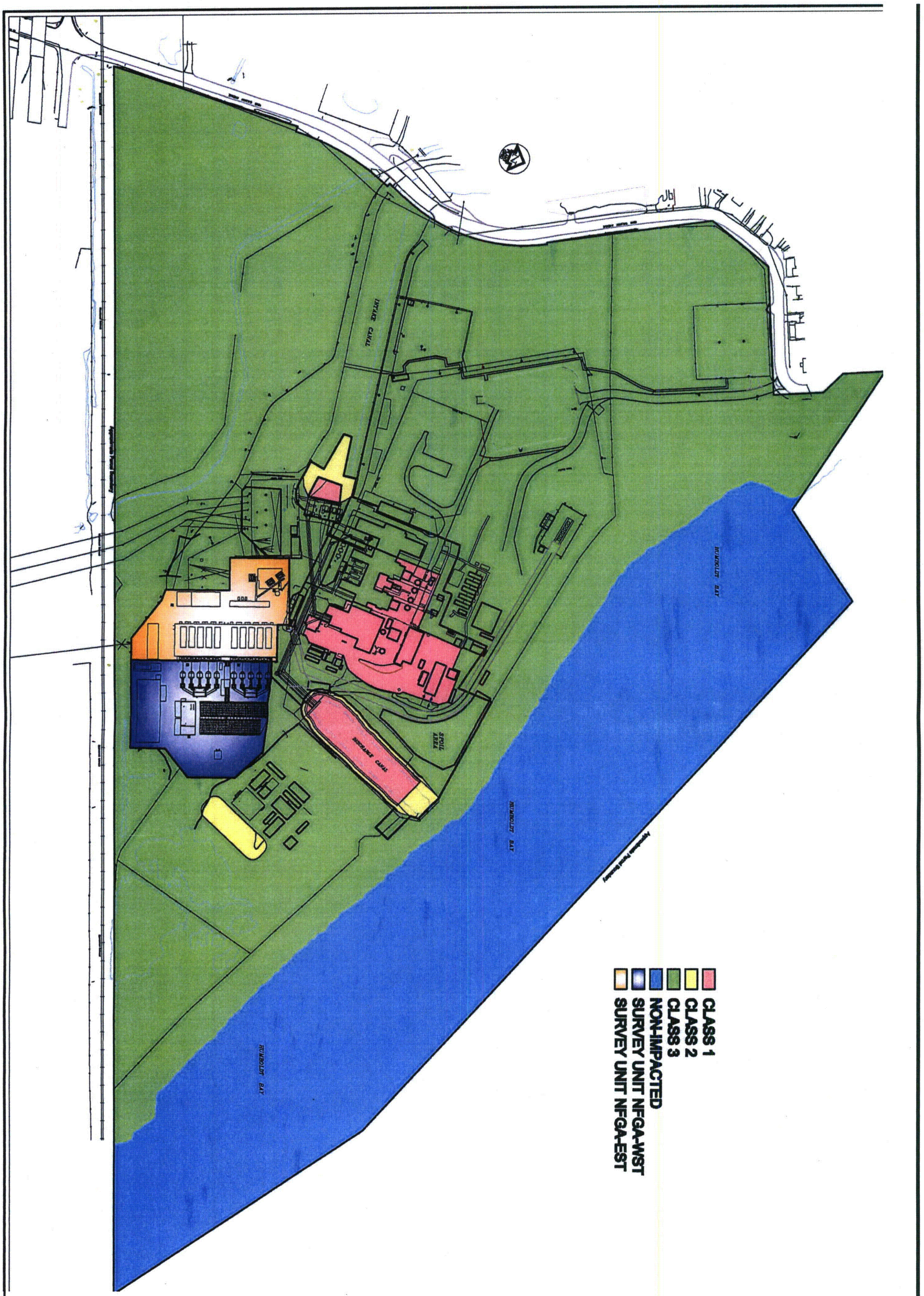
C. Aerial Photographs

D. Decay Corrected Radionuclide Inventory

E. 2008 Characterization Results of Surface and Subsurface Soils

APPENDIX A

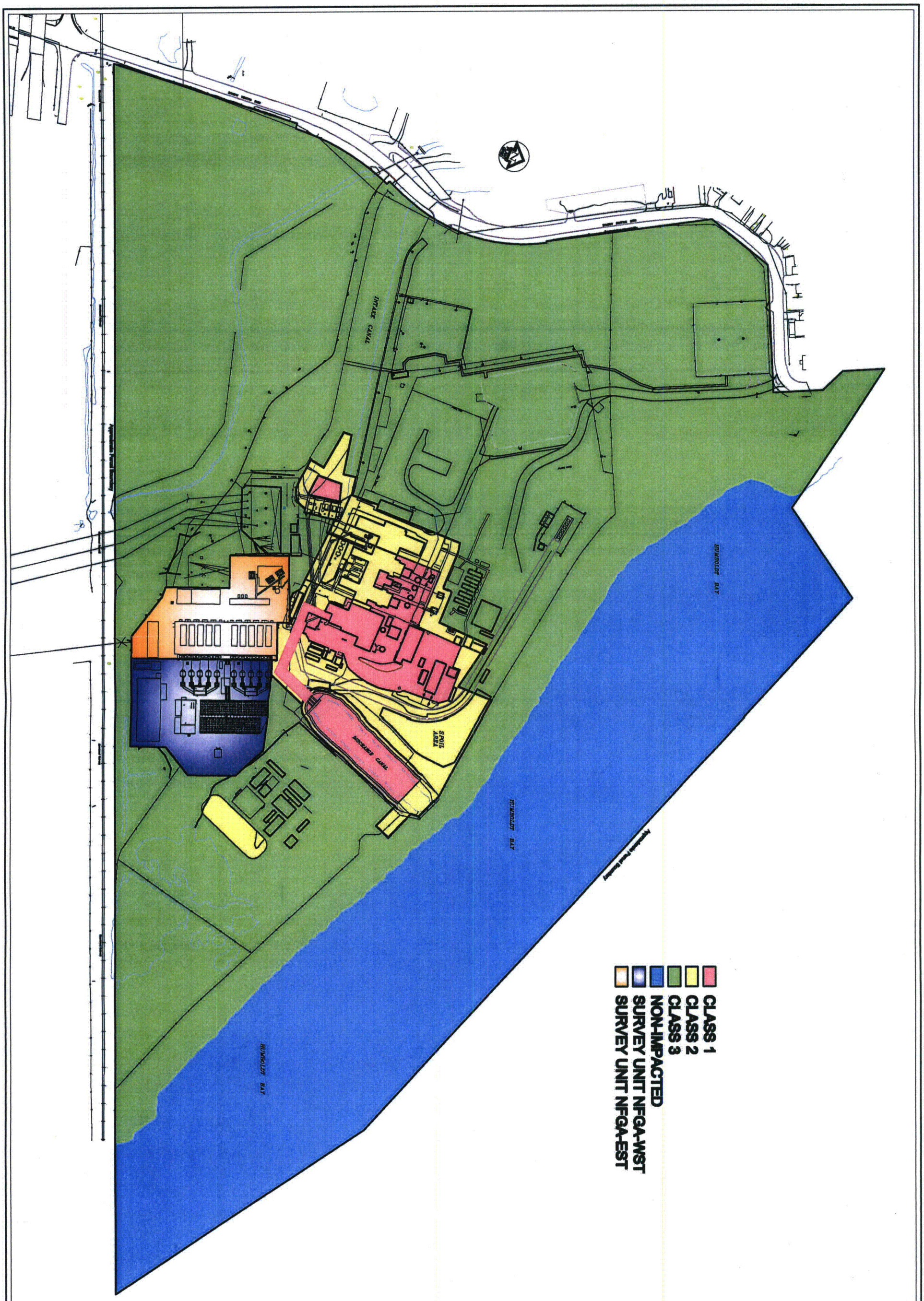
SITE DIAGRAMS SHOWING MARSSIM CLASSIFICATIONS



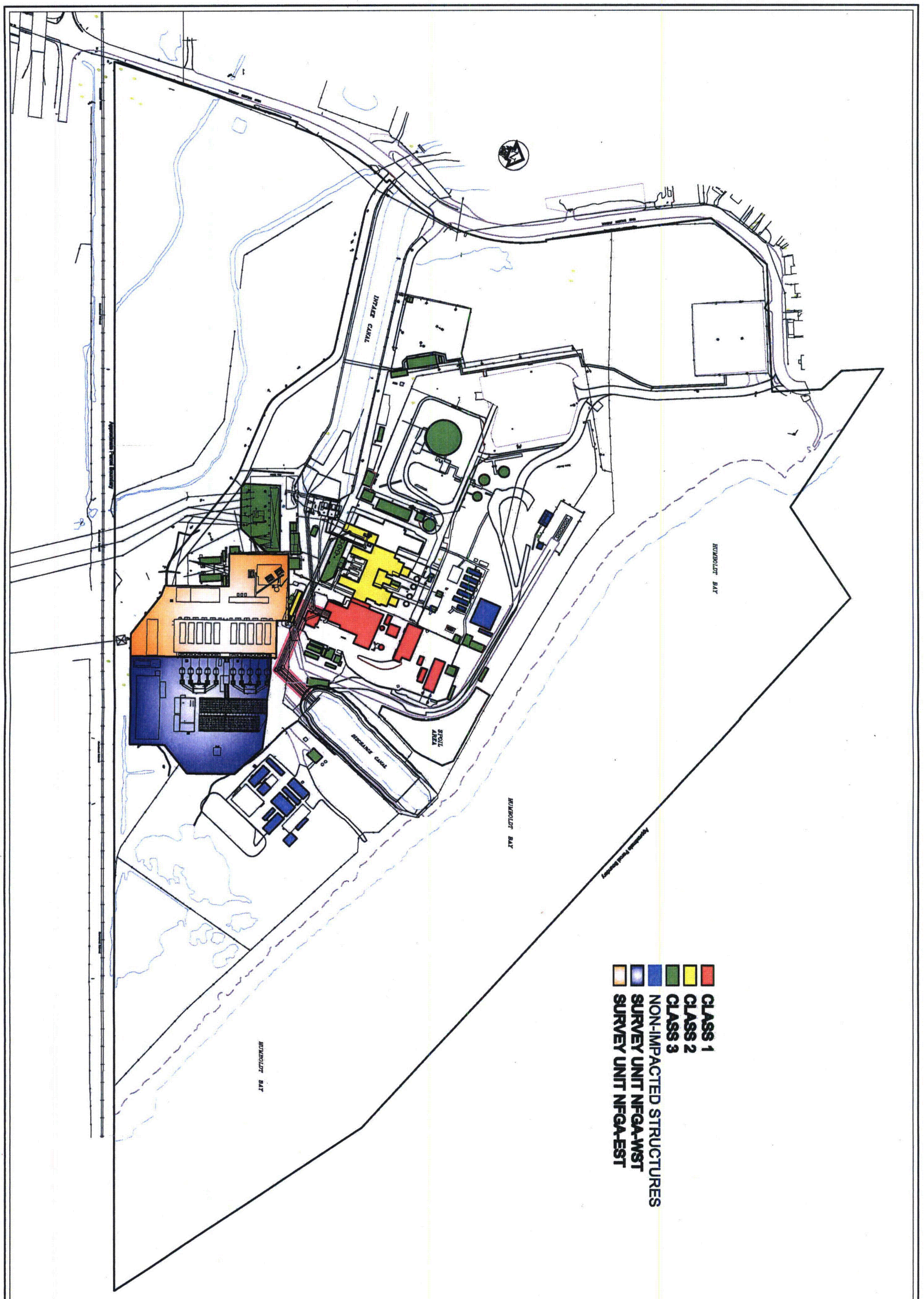
DWG. NO. 09-PGE-097 REV.	SHEETNAME: SURFACE SOIL MARSSIM CLASSIFICATIONS--	HUMBOLDT BAY POWER PLANT HISTORICAL SITE ASSESSMENT PACIFIC GAS & ELECTRIC COMPANY SAN FRANCISCO, CALIFORNIA

REVISION	DATE	DESCRIPTION

N



DWG. NO. 09-PGE-097 REV.	SHEET NAME: SUBSURFACE SOIL MARSSIM CLASSIFICATIONS	HUMBOLDT BAY POWER PLANT HISTORICAL SITE ASSESSMENT	REVISION / DATE / DESCRIPTION
SCALE: N.T.S.		PACIFIC GAS & ELECTRIC COMPANY SAN FRANCISCO, CALIFORNIA	
DRAWN BY: TPM			
CHECKED BY:			
APPROVED BY:			
DATE: 8/19/09			
SHEET NO. 2 OF 3			



DWG. NO. 09-PGE-097 REV.	SHEET NAME: BUILDINGS & STRUCTURES MARSSIM CLASSIFICATIONS	HUMBOLDT BAY POWER PLANT HISTORICAL SITE ASSESSMENT PACIFIC GAS & ELECTRIC COMPANY SAN FRANCISCO, CALIFORNIA	ENERCON

SCALE: N.T.S.
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REVISION	DATE	DESCRIPTION

APPENDIX B

BUILDING AND STRUCTURE SUMMARY

Appendix B

HBPP Building Summary Table

Building Name	Approx. Grid Location	Description	MARSSIM Class
Paint & Materials Storage Radiation	E5611 N8883	Three Sea/Land Containers (covered area between two), for storage of coatings and scaffolding.	3
Protection & Decommissioning Project Offices MEPP Generator	E5661 N8967	Office space consisting of five trailers assembled side by side (AKA "five-wide"). Gravel pad was recycled from pad under crane (on top of clean pavement in Radwaste Yard) used for stack removal project.	3
Storage	E5722 N9028	Relatively new sheet metal structure on concrete pad, used for storage of spare MEPP generator.	3
RP Storage	E5692 N8989	Two Sea/Land containers for materials storage, on concrete pad. Concrete pad was probably placed about 1975 as floor of wooden building for seismic upgrades by Wismer/Becker (AKA "wizbiz building"). Wooden structure later removed.	3
Sandblast & Paint Facility	E5503 N8933	Sheet metal building on concrete pad, contains sandblast booth, paint booth, storage and office space. PG&E# 8780	3
Diesel Fuel Storage Tank Area	E5344 N8897	Two diesel fuel tanks for MEPPs, in concrete curbed area	3
Warehouse C-Vans	E5408 N9008	Three Sea/Land containers (Fire Equipment, Spill Equipment, spare MEPP jet turbine)	3
OCB U-#3	E5308 N9000	Unit 3 circuit breakers. Original oil-filled breakers replaced with Sulfur Hexafloride breakers. Now used for MEPPs.	3
Storage Building 7069	E5208 N8972	Concrete block building for equipment and material storage, probably constructed mid-1960s.	3
Relay Building	E5164 N9039	Concrete block structure for relays controlling plant circuit breakers. Probably constructed in late 1950s. PG&E# 6375	3
Storage Building 8048	E5236 N8986	Sheet metal building on concrete pad, for equipment and material storage, probably constructed in early 1970s.	3
Steam Cleaning Station	E5250 N9064	Concrete pad with surrounding waist-high wood walls, to provide contained work area for steam cleaning oily equipment. Probably constructed in early 1980s.	3
Oil/Water Separators	E5256 N9083	One for each of Units 1 and 2. Original separators were concrete. New separator tanks were installed about 1990, using the original separator structure as secondary containment. The original oil collection sumps were cleaned and then filled with concrete.	3
Assembly Building	E4503 N9142	Wood frame structure on concrete perimeter foundation, probably constructed in early 1960s. Used for meetings, training, etc.	3

Training Building	E4867 N9136	Concrete block structure, constructed about 1974, originally intended to be a security search area. Has been used for training, is now office space. PG&E# 8318.	3
Drawing Control Building	E4914 N9144	Concrete block structure, constructed about 1974, originally intended to be a security alarm station/badge issue area. Is now office space. PG&E# 7881.	3
Intake Structure	E4969 N9047	Concrete structure for screens and circulating water pumps for Units 1, 2 & 3. Miscellaneous concrete pieces have been used for riprap in the area near E5000N8958.	3
Switchyard Structures	E5075 N8897	Graveled area, includes switching structure, circuit breakers and transformers for Units 1 & 2.	3
Rigger's Shed	E5056 N9050	Sheet metal structure on concrete pad, used for sling and rigging equipment storage. PG&E# 8321	3
Fuel Oil Service Tanks	E4747 N9431 and E4706 N9472	Insulated steel tanks for fuel oil. Probably constructed in late 1950s.	3
Hydrogen Bottle Storage	E5039 N9372	Concrete block structure partially embedded in dirt bank. Stores Hydrogen for Unit 1/2 generators. Probably constructed in late 1950s.	3
Propane Tank	E5169 N9506	Steel tank on concrete footings, used for Unit 3 emergency generator. Originally also used for Units 1/2 oil fire igniters. Tank was relocated from E4983N9350 in the mid 1970s.	3
Fresh Water Tank	E4925 N9342	Steel tank for plant fresh water (and fire water) supply. Probably constructed in late 1950s.	3
Fire Pump House	E4914 N9303	Concrete block structure for fire pumps (one diesel, two electric). Fire system was also water source for Unit 3 low pressure core flooding.	3
Office Annex	E4919 N9233	Concrete block structure for administrative offices. Probably constructed in 1980s.	3
MEPPS 2 & 3	E5269 N8825	Two trailer-based Mobile Electric Power Plants (MEPPs) were located at HBPP about 1978. Each MEPP consists of two trailers, one for a jet turbine and generator, the other for operating controls, and a gasoline auxiliary power unit (APU). Each of the turbine/generator trailers has had a concrete pad installed and has been enclosed in a sheet metal soundproofing structure, constructed in the 1990s.	3
MEPP Control Building	E5222 N8869	Built to contain a new compressed air start system and controls for the MEPPs. Sheet metal structure on concrete pad. Constructed within the last 5 years.	3
Security Building	E4867 N9136	See "Training Building"	3
FFD Trailer	E4725 N9111	Trailer, containing offices and restroom connected to sanitary sewer system, for collecting "Fitness for Duty" (FFD) samples. Located here about 2005.	3

Effluent Ponds	E5783 N9194	The ponds were installed in the mid 1970s to "treat" (neutralize the acidity of) Units 1/2 "boiler blowdown" (smaller pond) and "metal cleaning waste (larger pond)." The metal cleaning waste was generated from two processes, acid cleaning the water side of the boiler tubes, and water washing the fire side of the boiler tubes. Trace radioactive contamination was transferred to the metal cleaning waste pond with water from the boiler fire side washes. Initially, the ponds were concrete with a single Hypalon fabric liner. The ponds were later modified to add layers of gravel and thicker plastic liners.	2
Caustic Storage Area	E5833 N9258	Sea/Land container modified with internal partition. One end is for sampling equipment, one for storage of Sodium Hydroxide solution for neutralizing the Effluent Pond water.	3
Hazardous Waste Storage	E5650 N9289	Sheet metal building on concrete pad. Partitioned into two sections, one for waste solvents, the other for solid hazardous waste. Probably constructed in 1980s.	3
Fuel Oil Storage Tanks	E4686 N9283 and E4503 N9517	"Bunker C" fuel oil storage tanks for Units 1/2. Currently, No. 1 is empty and cleaned. Constructed in the late 1950s.	2
Diesel Fuel Tank	E4800 N9433	Steel tank for diesel oil storage. Probably constructed in late 1950s.	3
Distilled Water Tanks	From E5075 N9365 to E5156 N9365	Steel tanks for Units 1/2, constructed in late 1950s.	2
Lube Oil Tanks	E5117 N9328	Steel tanks for Units 1/2, constructed in late 1950s.	2
Liquid Rad Waste Building	E5247 N9414	Sheet metal structure over original concrete structure was constructed for SAFSTOR to provide ventilation control and to enclose the tanks.	1
Low Level Storage Building	E5322 N9478	Concrete block building constructed for Unit 3 solid radioactive waste storage in the mid 1960s. Is divided into two sections. Note that the side toward Unit 2 was used for a project to encapsulate the highly (alpha) contaminated filters from the High Level Storage Vault.	1
Solid Rad Waste Storage / Handling Building	E5308 N9514	Sheet metal structure on concrete pad, with concrete truck ramp, constructed in mid 1980s. Used for preparing packaged radioactive waste for shipment.	1
High Level Storage Vaults	E5289 N9458	A concrete structure constructed below grade (early 1960s) for storage of high dose rate solid radioactive materials. Divided into three sections. The section nearest the canal was used to store unpackaged contaminated filters. The other two vaults were used to store drummed wastes. All sections are currently empty.	1

The Rad Waste Area Kelly Building	E5281 N9550	A sheet metal structure, temporarily anchored. It was used in the mid-1990s to package sections of the Unit 3 stack for disposal.	1
Alternate Access Control	E5364 N9244	This is a pair of "office" trailers, severely modified with a common roof and supports for heavy equipment. The trailers were located here in the mid-1990s to provide access for the Caisson Inleakage Repair Project.	1
Decon Office	E5342 N9219	This is a small "office" trailer. It was placed here in the mid 1980s to be used as a counting room for RCA samples for the SAFSTOR environmental report.	1
Refueling Building	E5269 N9294	Concrete structure, part of Unit 3, constructed about 1960.	1
Condensate Demineralizer Room	E5275 N9261	Concrete structure, part of Unit 3, constructed about 1960.	1
Hot Shop & Calibration Facility	E5289 N9136	Concrete block structure, part of Unit 3, constructed about 1960.	1
Seal Oil Room	E5239 N9175	Concrete structure, part of Unit 3, constructed about 1960.	1
Pipe Tunnel	E5244 N9239	Concrete structure, part of Unit 3, constructed about 1960.	1
Reactor Feed Pump Area	E5208 N9239	Structure is part concrete block, part cast concrete, part of Unit 3, constructed about 1960.	1
Security Area	E5281 N9247	Part of Unit 3. Concrete floor, concrete wall toward refueling building, otherwise asbestos cement exterior walls, plaster over metal lath or concrete block interior walls. Composite on sheet metal roof. Was originally used for make-up Demineralizer equipment.	1
Access Control	E5258 N9253	Part of Unit 3. Concrete floor, concrete block walls, to support counting room pad above. Asbestos cement walls and composite on sheet metal roof. Was the transition between contaminated and uncontaminated areas during operation. Part of the wall was lined with steel in the mid 1970s to provide seismic support.	1
Washdown Area	E5272 N9214	Part of Unit 3. Concrete floor with waist high concrete block walls, no roof. Was used for Unit 3 turbine overhauls.	1
Laundry Area	E5261 N9244	Part of Unit 3. Concrete floor, concrete block walls, to support concrete equipment pad above. Was used for contaminated laundry during operation. Walls were lined with steel in the mid 1970s to provide seismic support.	1
Multi-zone Fan Area	E5261 N9244	Part of Unit 3. Concrete slab over Laundry Area, for ventilation supply unit.	1
Counting Room	E5247 N9256	Part of Unit 3. Concrete slab over part of Access Control. This area was the original battery room for Unit 3.	1
Locker Room	E5256 N9278	Part of Unit 3. Concrete floor. Wall is concrete toward the refueling building, otherwise plaster over metal lath.	1

Unit 3 Control Room	E5231 N9239	Part of Unit 3. Concrete floor, concrete wall toward refueling building and turbine enclosure, otherwise asbestos cement walls. Composite on sheet metal roof.	1
Instrument Repair Shop	E5217 N9281	Part of Unit 3. Concrete floor, concrete wall toward refueling building, otherwise concrete block walls. Composite on sheet metal roof.	1
Propane Engine Generator Area	E5217 N9281	Part of Unit 3. Area was originally outdoors, below Instrument Repair shop. Was enclosed in concrete block walls in mid 1970s.	1
Turbine	E5247 N9219	The Unit 3 turbine is inside the concrete turbine enclosure (for radiation shielding).	1
Generator/Exciter	E5242 N9183	The Unit 3 generator and exciter are outdoors. This area was usually considered "clean" during operation.	1
Recombiner Vault	E5236 N9356	The recombiner vault is a concrete structure built in the mid 1970s, to contain equipment for reducing the stack radioactivity releases. The facility was completed after the unit last operated in 1976, so the equipment was not contaminated. The equipment was removed about 2002.	1
U-3 Building Structures	E5242 N9247	Structure mostly steel reinforced cast concrete with portions of concrete block, asbestos cement panel walls and . Composite on sheet metal roof, constructed in early 1960s.	1
U-2 Seal Oil Room	E5158 N9178	Part of Unit 2. Area is part of concrete pedestal for turbine/generator above, containing generator seal oil system.	2
U-2 Condenser	E5158 N9194	Part of Unit 2, constructed below turbine.	2
U-2 Boiler	E5164 N9289	Part of Unit 2. The air/gas/fire side has been subject to traces of contamination from unit 3 windblown soils.	2
2.4 KV Room	E5114 N9231	Common breaker room (and battery room) for Units 1 and 2. Concrete block walls.	2
U-2 Building Structures	E5158 N9231	Structure mostly girders, concrete floors, with some concrete block or asbestos cement walls. Composite on sheet metal roof, constructed about 1960.	2
U-1 Seal Oil Room	E5067 N9186	Part of Unit 1. Area is part of concrete pedestal for turbine/generator above, containing generator seal oil system.	2
U-1 Condenser	E5064 N9206	Part of Unit 1, constructed below turbine.	2
U-1 Boiler	E5072 N9292	Part of Unit 1. The air/gas/fire side has been subject to traces of contamination from unit 3 windblown soils, to a lesser degree than Unit 2.	2
U-1 Building Structures	E5078 N9244	Structure mostly girders, concrete floors, with some concrete block or asbestos cement walls. Composite on sheet metal roof, constructed in the late 1950s.	2
Cold Machine Shop	E5019 N9186	Constructed in the late 1950s, to support Units 1/2, with concrete block walls and a composite on sheet metal roof. Was occasionally used to machine contaminated components from Unit 3.	2

Welding Shop	E5017 N9117	Added to the Cold Machine Shop perhaps in the 1970s, sheet metal walls on concrete slab.	2
Warehouse	E4992 N9175	Constructed in the late 1950s, to support Units 1/2, with concrete block walls and a composite on sheet metal roof.	2
Office and Shop Structures	E5003 N9244	Constructed in the late 1950s, to support Units 1/2, with concrete block walls and a composite on sheet metal roof.	2
Storm Water Drains	E5322 N9339 to E4969 N9342 to E4936 N9094 and E5317 N9247 to E5261 N9117 to E4936 N9094	Routes rainwater runoff from all three units, including roof drains, to the intake canal. Mostly constructed of corrugated metal pipe between concrete drain sumps, with a few connected section of perforated drain pipe in drain rock. Was contaminated during Unit 3 operation.	2
Oily Water Separators		See Oil/Water separators, above…	2
U-2 Oily Water Sump	E5189 N9186	Collects floor and equipment drains from within the unit 2 buildings and from the area around the unit 3 turbine lube oil system.	2

APPENDIX C

AERIAL PHOTOGRAPHS

DWG. NO. 09-PGE-100 REV.	SHEET NAME: HISTORICAL SITE VICINITY PHOTOGRAPHS (1940)	HUMBOLDT BAY POWER PLANT EUREKA, CALIFORNIA	PREPARED BY: ENERCON	REVISION	DATE / DESCRIPTION
SCALE: N.T.S.		PREPARED FOR: PACIFIC GAS & ELECTRIC COMPANY SAN FRANCISCO, CALIFORNIA			
DRAWN BY: TPM					
CHECKED BY:					
APPROVED BY:					
DATE: 10/7/09					
SHEET NO. 1 OF 7					

DWG. NO. 09-PGE-100 REV.

SHEET NAME: HISTORICAL SITE VICINITY PHOTOGRAPHS (1954)

SCALE: N.T.S.

DRAWN BY: TPM

CHECKED BY:

APPROVED BY:

DATE: 10/7/08

SHEET NO. 1 OF 7

HUMBOLDT BAY POWER PLANT
EUREKA, CALIFORNIA

PACIFIC GAS & ELECTRIC COMPANY
SAN FRANCISCO, CALIFORNIA

ENERCON

REVISION:	DATE	DESCRIPTION

DWG. NO. 09-PGE-100 REV.	SHEET NAME: HISTORICAL SITE VICINITY PHOTOGRAPHS (1972)	HUMBOLDT BAY POWER PLANT EUREKA, CALIFORNIA	PREPARED BY: ENERCON	REVISION:	DATE: DESCRIPTION:
SCALE: N.T.S.		PREPARED FOR: PACIFIC GAS & ELECTRIC COMPANY SAN FRANCISCO, CALIFORNIA			
DESIGNED BY: TPM					
CHECKED BY:					
APPROVED BY:					
DATE: 10/7/09					
SHEET NO. 1 OF 1					

DWG. NO. 09-PGE-100 REV.

SCALE: N.T.S.
DRAWN BY: TPN
CHECKED BY:
APPROVED BY:
DATE: 10/7/09
SHEET NO. 1 OF 1

SHEET NAME:
HISTORICAL SITE
VICINITY PHOTOGRAPHS
(1982)

PREPARED FOR:
HUMBOLDT BAY POWER PLANT
EUREKA, CALIFORNIA

PACIFIC GAS & ELECTRIC COMPANY
SAN FRANCISCO, CALIFORNIA

PREPARED BY:
ENERCON

REVISION:	DATE	DESCRIPTION

DWG. NO. 09-PGE-100 REV.	SHEET NAME: HISTORICAL SITE VICINITY PHOTOGRAPHS (1989)	HUMBOLDT BAY POWER PLANT EUREKA, CALIFORNIA	PREPARED BY: ENERCON	REVISION	DATE / DESCRIPTION
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DRAWN BY: TPM					
CHECKED BY:					
APPROVED BY:					
DATE: 10/7/08					
SHEET NO. 1 OF 1					

DWG. NO. 09-PGE-100 REV.	SCALE: N.T.S.	SHEET NAME: HISTORICAL SITE VICINITY PHOTOGRAPHS (2001)	HUMBOLDT BAY POWER PLANT EUREKA, CALIFORNIA
DRAWN BY: TPM CHECKED BY: APPROVED BY: DATE: 10/7/09 SHEET NO. 1 OF 1			PACIFIC GAS & ELECTRIC COMPANY SAN FRANCISCO, CALIFORNIA

ENERCON

REVISION	DATE	DESCRIPTION

DWG. NO. 09-PGE-100 REV.	SCALE: N.T.S.	SHEET NAME: HISTORICAL SITE VICINITY PHOTOGRAPHS (2006)	HUMBOLDT BAY POWER PLANT EUREKA, CALIFORNIA
SHEET NO. 1 OF 1	DRAWN BY: TPM CHECKED BY: APPROVED BY: DATE: 10/7/09		PACIFIC GAS & ELECTRIC COMPANY SAN FRANCISCO, CALIFORNIA

ENERCON

REVISION	DATE	DESCRIPTION

DWG. NO. 09-PGE-100 REV.	SHEET NAME: HISTORICAL SITE VICINITY PHOTOGRAPHS (2009)	HUMBOLDT BAY POWER PLANT EUREKA, CALIFORNIA	REVISION / DATE / DESCRIPTION
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DRAWN BY: TPM			
CHECKED BY:			
APPROVED BY:			
DATE: 10/7/09			
SHEET NO. 1 OF 7			

APPENDIX D

DECAY CORRECTED RADIONUCLIDE INVENTORY

APPENDIX D

DECAY CORRECTED RADIONUCLIDE INVENTORY

The following table displays the radionuclides of concern for the HBPP Site. The "July 1981" quantities are from PNL-4628, *Residual Radionuclide Distribution and Inventory at the Humboldt Bay Nuclear Plant* (ref. 9.X) report. The values were then decay corrected to September 2006. The inventory focuses on the systems and surfaces in Unit 3 and associated buildings and does not focus on quantities in the environs, land and water, surrounding the power plant.

Decay Corrected Radionuclide Inventory

Radionuclide	Half-Life (years)	Inventory (millicuries)	2006 Decay Corrected
55Fe	2.7	149000	243.5
60Co	5.27	18000	672.3
137Cs	30.2	2200	1239.6
63Ni	100	1400	1177.3
54Mn	0.855	337	5.3E-07
90Sr	28.5	17.9	9.7
241Am*	432	12.1	11.6
238Pu	87.7	7	5.7
239-240Pu	24110	6.1	6.1
244Cm	18.1	4.9	1.9
242Cm	0.446	0.12	1.6E-18

*Inventory does not account for potential increase of Am-241 due to the radioactive decay of Pu-241.