ENCLOSURE 2

DECOMMISSIONING COST ESTIMATE (W/O FIGURES AND DRAWINGS SECTION)

(PUBLIC VERSION)

Decommissioning Cost Estimate

Prepared for:

Honeywell

Honeywell Metropolis Works
2768 North U.S. State Route 45
Metropolis, IL 62960

Prepared by:

ENERCON

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Revision 0
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EXECUTIVE SUMMARY

Enercon Services, Inc. (ENERCON) prepared this report to document the triennial update of the independent Decommissioning Cost Estimate (DCE) required for financial assurance purposes for the Honeywell Metropolis Works Plant (MTW) located in Metropolis, Illinois. As required by 10 Code of Federal Regulations (CFR) 40.36(d)(2) and License Condition 25, Honeywell must update the DCE at intervals not to exceed three years. To prepare this DCE, an evaluation was made of the MTW building by building, area by area, and system by system. Current industry standards for demolition and waste disposal rates available to Honeywell were applied to this evaluation to reflect 2021 costs. This update accounts for changes in costs and for the events identified in 10 CFR 40.36(d)(2). The following is a chronological history of the previous DCEs prepared for the Honeywell MTW:

- Site Reclamation Cost Estimate for Plant Located in Metropolis, Illinois, Revision 0 dated May 2006 (2006 Site Reclamation Cost Estimate Report)
- Decommissioning Cost Estimate for Honeywell Metropolis Works, Revision 1 dated July 27, 2010 (2009 Decommissioning Cost Estimate)
- Decommissioning Cost Estimate for Honeywell Metropolis Works, Revision 0 dated August 15, 2012 (2012 Decommissioning Cost Estimate)
- Decommissioning Cost Estimate for Honeywell Metropolis Works, Revision 1 dated April 20, 2016 (2015 Decommissioning Cost Estimate)
- Decommissioning Cost Estimate for Honeywell Metropolis Works, Revision 1 dated June 1, 2020 (2018 Decommissioning Cost Estimate)

Data and information were obtained from the Honeywell plant radiation protection department for this update to evaluate the events identified in 10 CFR 40.36(d)(2) that might affect the level of contamination.

Processing operations at the MTW plant have not occurred since the previous cost estimate. Routine maintenance operations and planned modifications are the only changes that have taken place.

A significant portion of the overall decommissioning cost is attributed to the processing, transportation, and disposal/burial of radioactive waste. The disposal rate used for most of the material in this estimate is based on shipping a large volume of waste to US Ecology of Idaho as unimportant quantities of source material (less than 500 parts per million [ppm] or 0.05 percent by weight) based on the current rates available to Honeywell. The balance of the material requiring disposal will be sent as low-level radioactive waste to Energy*Solutions* of Utah based on current rates available to Honeywell.

This DCE includes itemized costs for manpower and equipment resources, radioactive waste packaging, shipping and burial activities, and the performance of final status surveys for buildings and structures and land areas. The estimated decommissioning cost is approximately $209,526,451 in 2021 dollars.

1.0 INTRODUCTION

1.1 Purpose

Enercon Services, Inc. (ENERCON) is providing this report to document the triennial update of the independent Decommissioning Cost Estimate (DCE) required for financial assurance purposes for the Honeywell Metropolis Works Plant (MTW) located in Metropolis, Illinois as required by 10 Code of Federal Regulations (CFR) 40.36(d)(2) and License Condition 25.

1.2 Background

The volumes of materials and/or building rubble to be sent to disposal have been estimated for each structure and the anticipated pathway for disposal considered to determine the cost for disposal.

A radiological characterization survey of surface and subsurface soils was performed as documented in the 2009 Radiological Characterization Report to determine the horizontal and vertical extent of radionuclide concentrations in soil. The data from this characterization report were used as the basis for determining the volume of surface and subsurface soils to be removed and the pathway for disposal of soils.

1.3 Changes Since the 2018 Update

The work breakdown structure (WBS) of the DCE has been revised to more logically group areas of the plant together along the following operational lines:

- Administrative Areas (WBS 1.1)
- Asbestos Removal and Disposal (WBS 1.2)
- Additional soil plant areas P1-P25 (WBS 1.3)
- Decommissioning Planning (WBS 1.4)
- Drum Storage Pads and Ponds (WBS 1.5)
- Misc. Non-labor Costs (WBS 1.6)
- Outdoor Areas, Drains, & Sewers (WBS 1.7)
- Oversight, Reporting & Licensing (WBS 1.8)
- Main Production Buildings (WBS 1.9)
- Misc. Production Buildings (WBS 1.10)
- Planning, Training & Mobilization (WBS 1.11)

Organizing the WBS this way also allows an easier cost roll-up, which aligns with the Table 4-1 cost summary.

Closure and removal of the calcium fluoride surface impoundments is the primary change at the facility. Survey and sample data was collected to meet data quality objectives equivalent to a final status survey so the data may be utilized in the future to demonstrate compliance with unrestricted release criteria. Evaluation of the gamma scan and soil sample results do not indicate the need for further investigation, remediation, or final status survey within the area of the surface impoundments and adjacent berms at this time.

This DCE was completed utilizing a unit cost factors (UCF) approach for field remediation activities. Data published on the RS Means online application was used as reference to provide appropriate labor, equipment and production rate cost basis for decontamination and demolition activities, when available. When published labor, equipment, and production rates were not available, such as for specialized operations and/or technical labor, internal costs were developed and used. Previous revisions of the DCE primarily used UCF for labor and equipment rates. This current revision expands use of UCF for utilized equipment, crew personnel, and task duration in accordance with industry practice. Expansion of the UCF cost analysis approach has the following additional benefits:

- Reduces error by using industry standard labor and equipment durations for standard tasks
- Reduces effort for future cost estimates by applying standard factors that require less manipulation

An effect of the expanded use of the UCF method is shifting some costs from one WBS item to another more appropriate classification. Therefore, a cost that previously appeared in one WBS or category may now appear elsewhere. This results in a more accurate representation of the costs by task or category than appeared in previous DCE revisions. These cost effects are summarized in Table 1-1.

Table 1-1: Summary of Operation Cost Adjustments

Changed Item	Justification
Table format remained the same except for folding the Illinois radioactive waste fee into the waste disposal cost of the applicable WBS items.	The Illinois radioactive waste fee is a waste cost, and therefore made most sense to incorporate with the waste costs of the WBS item for accurate tracking.
Total cost of "Additional soil plant areas P1-P25" increased.	Soil mass density was standardized for the estimate, this operation item increased since a low-density assumption was previously used.
"Asbestos Removal and Disposal" combined into one WBS.	Asbestos subcontracts were previously located in "Oversight, Reporting and Licensing" and have been moved to this WBS.
Total cost of "Drum Storage Pads and Ponds" increased.	Applying the UCF for shaving concrete resulted in additional labor and material costs necessary to account for the large surface area of concrete necessary to shave.
Total cost of "Main Production Buildings" and "Misc. Production Buildings" increased.	This increase is a factor of incorporating the Illinois radioactive waste fee within the waste disposal cost.
Total cost of "Outdoor Areas, Drains, & Sewers" increased.	This increase is the result of adjustments to travel and living, standardized unit costs, and incorporation of the Illinois radioactive waste fee.
Total cost of "Oversight, Reporting and Licensing" decreased.	Asbestos subcontracts were appropriately moved to "Asbestos Removal and Disposal." Redundant management oversight was found and removed as part of this update.

Travel and living costs in this revision are applied to 50 percent of the field workforce. Previously the travel and living costs were applied to the entire workforce. The local workforce is therefore assumed to staff half of the required labor force for decommissioning.

The Illinois radioactive waste fee of $3 per cubic foot is a waste cost that has been incorporated into the unit disposal cost for materials disposed at Energy*Solutions*. This ensures the Illinois radioactive waste fee is only applied to Low-Level Radioactive Waste.

Disposition of waste has been updated to reflect a greater portion of the waste properly disposed at US Ecology to realize cost savings over disposal at Energy*Solutions*. Despite unit rates for waste disposal increasing approximately 25 percent, this approach results in a lower overall waste disposal cost increase from $99,554.222 to $102,029,098, i.e., an approximate 2.5 percent total increase.

1.4 Scope

The scope of this report is to present the triennial update for site decommissioning costs of the Honeywell MTW. The specific areas covered by this estimate include:

- FMB (BD-29)
- Fluorine Plant (BD-3, BD-4, BD-5)
- Ion Exchange Building (BD-37)
- Liquid Fluorine (BD-14) and Nitrogen Facilities (BD-83)
- Sodium Removal Building (BD-17)
- Potassium Hydroxide (KOH) Muds Building (BD-20)
- Calcium Fluoride Building (BD-11)
- Uranium Recovery Building (BD-19)
- Surface Treatment Facility (BD-42)
- FMB Pads
- Administrative Areas (BD-1)
- Sampling Plant (BD-23)
- Sanitary Wastewater Treatment Plant (U-1041)
- Ore Storage Pads
- Ore Storage Building (BD-18)
- Drum Storage Pad
- Bed Materials and Filter Fines Building (BD-33)

- Waste Storage Pad
- Pond Muds Filter Calciner Building (BD-16)
- Drains and Sewers
- Cylinder Wash Building (BD-15)
- Outdoor Areas
- Drum Crusher Building (BD-24 and BD-41)
- Discharge Ditch to River
- Open areas inside and outside the Security Fence
- Landfill and Kickback Area

Decommissioning costs are directly related to the degree of remediation required and the amount of radioactive waste generated. The extent of remediation is based on radiological data, application of proven decontamination processes, and data from similar projects.

1.5 Assumptions and Bases

The following are assumptions and bases utilized in creating this DCE:

- The uranium inventory stored at Honeywell is customer owned and the customers are responsible for the retrieval of the material.
- The estimate includes only activities and cost factors necessary to reduce residual radioactivity to levels that will permit unrestricted release of the associated structures, buildings, and grounds.
- Decommissioning activities will be completed sequentially building by building and area by area.
- Costs associated with the demolition and removal of non-contaminated equipment or structures are not included in this cost estimate unless such activities are required to support decommissioning. An actual date to perform the site decommissioning has not been selected. Therefore, the cost estimate provided herein is in 2021 dollars.
- The older, more contaminated structures will be removed completely. Structures with minimal or no contamination may remain in place after decommissioning. These structures will be decontaminated as required and free released. No building refurbishment is included.
- Uncontaminated processing equipment may have intrinsic value. No credit was taken for any salvage value. Contaminated equipment will be sent directly to an authorized waste disposal site.
- Molyflush cylinders will be shipped off-site for processing.

- Waste meeting the definition of unimportant quantities (UQ) will be sent to US Ecology.
- Waste not meeting the waste acceptance criteria of US Ecology qualify for disposal at Energy*Solutions* under their current license and waste acceptance criteria as Low-Level Radioactive Waste (LLRW). No Class B or C radioactive wastes are present on-site.
- Removal and packaging of asbestos will be done by an independent contractor licensed to perform this work in the State of Illinois.
- For disposal of asbestos, the applicable waste acceptance criteria require the material to be double bagged.
- The costs for disposal for both Energy*Solutions* and US Ecology are based on pounds per rail car. This results in volumes of waste not being a factor of cost. Where volumes of material have been developed, this has been converted to pounds for each material considered.
- The independent third-party site remediation contractor will provide the demolition equipment and survey instrumentation at prevailing rates.
- The data developed in the 2009 Radiological Characterization Report have been incorporated in this DCE.
- The site-specific release criterion used as the basis in this report is 110 picocuries per gram (pCi/g) which would support achieving the unrestricted release criterion of 25 millirems per year (mrem/yr). This value is consistent with the site-specific release criteria approved by the U.S. Nuclear Regulatory Commission (NRC) at the closed Sequoyah Fuels Corporation (Sequoyah Fuels) UF6 conversion plant.
- Of the materials excavated from the 11-acre radiological portion of the Landfill and Kickback area, 10 percent is assumed to be UQ waste to be shipped to US Ecology.
- To account for the volume contributed by miscellaneous items such as office equipment and supplies, forklifts, golf carts, tools, and other unspecified materials anticipated to be present at the beginning of decommissioning, 10 percent of the gross weight of waste for that structure was added to the total. This weight was added to the metals waste volumes when present. If no metals were present, the percentage was added to the soil weights.
- As a method to account for items such as booties, gloves, disposable coveralls, filters, blades, empty lockdown containers, and similar items to be disposed of as dry active waste, an additional 50 pounds was added to estimated waste for various structures.
- Miscellaneous Non-Labor Costs total $31,912,340.
  - For the cost of NRC oversight, the NRC billing rate of $288 per hour was applied.
  - For NRC review of the Decommissioning Plan, the estimate is 400 hours at $288 per hour for a total of or $115,200 (miscellaneous non-labor cost).

  - NRC quarterly inspection was assumed to be two inspectors for five days, ie., 40 hours each for a total of $92,160 per year (miscellaneous non-labor cost).
  - The annual cost for security ($1,000,000), taxes ($615,000), and insurance ($1,950,000) are listed as miscellaneous non-labor costs that total $30,852,340 for the duration of the decommissioning (miscellaneous non-labor cost).
- Travel and living (per diem) costs were estimated at $180.00 per workday for 50% of full time equivalent (FTE) field labor. This rate includes GSA standard rates for lodging and meals and incidental expenses plus taxes and fees for lodging.
- The rail spur constructed to support closure of the calcium fluoride surface impoundments will remain through decommissioning activities and be available for use in loading and transporting equipment and waste.
- To the extent practical, waste that is ineligible to be disposed at a local C&D facility will be sent as UQ to US Ecology with materials determined to be LLRW sent to Energy*Solutions*.

2.0 MTW LOCATION, HISTORY, AND CURRENT STATUS

2.1 MTW Location and Description

MTW is the holder of NRC License No. SUB-526. The plant address listed on the license is as follows:

Honeywell
2768 N U.S Route 45
Metropolis, IL 62960-6700

The plant is located on U.S. Highway 45, approximately 1.8 miles northwest of downtown Metropolis, Illinois. MTW is located on approximately 1,000 acres of land in Massac County at the southern tip of Illinois (Figure 1). The primary site perimeter is formed by U.S. Highway 45 to the north, the Ohio River to the south, an industrial coal blending plant to the west, and privately-owned, developed land to the east. Plant operations are conducted in a fenced, restricted area covering approximately 59 acres in the north-central portion of the site. MTW also owns approximately 100 acres of land directly across U.S. Highway 45, north-northeast of the plant.

2.2 MTW History

Initial construction of the facility was completed in 1958, and the first UF_6 was produced in 1959 as part of a five-year contract for conversion services with the former Atomic Energy Commission (AEC). The AEC conversion contract expired in 1964 and the conversion process was placed in an idle state. Continued increase in demand for conversion services resulted in rehabilitation of the UF_6 facility in 1967, and commercial conversion started in 1968. In 1968-1969, capacity for the facility was expanded to 9,000 metric tons. Capacity was increased to 11,500 metric tons and 12,700 metric tons in 1975 and 1995, respectively. Re-engineering in 2001 increased capacity to approximately 14,000 metric tons. Additional re-engineering in 2007 further increased the capacity to approximately 15,000 metric tons. To date, the highest production has been approximately 13,000 metric tons.

2.3 MTW Physical Description

Figure 3 (Drawing No. MTW-2800) shows the approximate location of the following areas on the MTW site.

2.3.1 Main Production and Plant Operations Buildings

Main production buildings include the following: FMB (BD-29), Ion Exchange Building (BD-37), Sodium Removal Building (BD-17), KOH Muds Building (BD-20), Uranium Recovery Building (BD-19), Sampling Plant (BD-23), Fluoride Production Facility (BD-3, BD-4, BD-5, and BD-35), Waste Treatment Plant, and UF_6 Cylinder Storage Area. The plant operations buildings include the Administration Building (BD-1), Laboratory and HP Building (BD-2), Maintenance Shop/Store/Office Building (BD-6), and Powerhouse (BD-7).

2.3.2 Miscellaneous Production Buildings

The miscellaneous production buildings include the Ore Storage Building (BD-18), Bed Materials and Filter Fines Building (BD-33), Pond Muds Filter Calciner Building (BD-16), Cylinder Wash Building (BD-15), Drum Crusher Building (BD-41), Liquid Fluorine Facility (BD-14), and Calcium Fluoride Building (BD-11).

2.3.3 Drum Storage Pads and Uranium Settling Ponds

The Drum Storage Pads and Uranium Settling Ponds are in the (plant) eastern portion of the restricted area and include the five Ore Storage Pads, the Drum Storage Pads, the Waste Storage Area, and Uranium Settling Pond Nos. 3 and 4.

2.3.4 Outdoor Areas, Drains, and Sewers

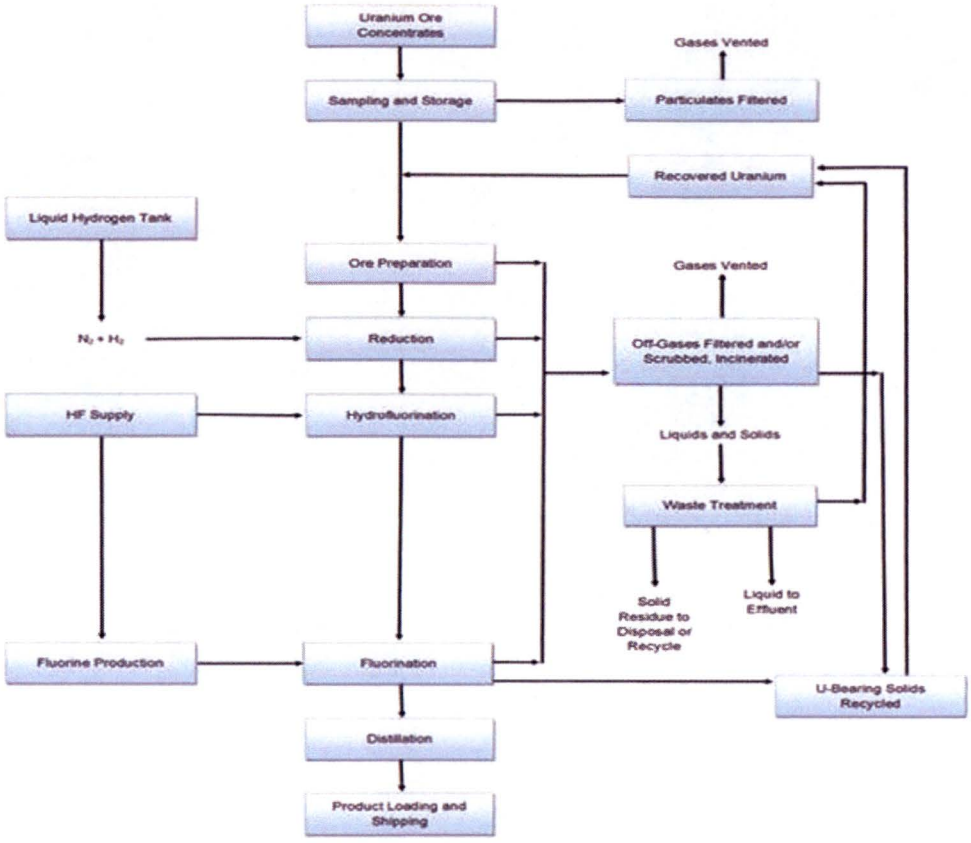
The outdoor areas, drains, and sewers include the employee parking lot, paved roads on-site, Railroad Spur Nos. 1 through 5, the land between two parallel property exclusion fences, site drains/sewers/underground process lines, and MTW land outside the fenced operations area.

2.4 MTW Process Operations

MTW was designed to convert uranium ore concentrates into UF_6, which is then shipped to U.S. and foreign plants for enrichment of the Uranium-235 (U-235) isotope. The facility, which uses the fluoride volatility process, has the capacity to convert approximately 15,000 metric tons of uranium per year from ore concentrates into UF_6. Assays of the uranium ore concentrates show approximately 75 percent uranium. The distilled UF_6 product contains less than 300 parts per million (ppm) impurities. A process flow diagram of the conversion process is provided, and each significant step of the conversion process is described in the following sections of this report.

2.4.1 Uranium Hexafluoride Conversion Process Flow Diagram

The UF_6 conversion process flow diagram for the plant operations is as follows.



The plant receives uranium ore concentrates in 55-gallon drums. Each drum of ore concentrate is weighed and then stored on storage pads until accountability procedures and the uranium and impurity analyses are completed.

2.4.2 Pretreatment and Ore Concentration Preparation

Uranium compounds from the uranium recovery processes contain contaminants that must be minimized before the concentrates are converted to UF_6. The method of pretreatment used is a two-stage sulfuric acid leach followed by aqueous ammonia precipitation. After precipitation, the uranium-bearing solids are settled and filtered into a calciner prior to introduction into the ore preparation process.

The pretreatment facility is also equipped to process ore concentrates that have absorbed moisture or become hard. These drums cannot be processed through the normal drum dumping station.

Incoming ore concentrates are charged into the system through a drum dumping station and then a calciner. Following the calciner, the ore concentrates are blended, agglomerated, dried, crushed, and sized for uniformity. In the agglomeration step, water, sulfuric acid, magnesium hydroxide, and/or sodium hydroxide

are used depending on the concentrate characteristics. Dusts and fumes from this process are controlled by use of dust collectors.

2.4.3 Uranium Reduction

The sized uranium concentrates enter one of two fluid-bed reactors (reductors). In the reductor, the mixed uranium oxides (U_3O_8) are reduced to a uranium dioxide (UO_2) form utilizing hydrogen. A liquid hydrogen system is used as a source of hydrogen. This system, located within a gated enclosure south of the Maintenance Building (BD-6), consists of a cryogenic storage tank and vaporizers. This system is owned and maintained by the vendor. Outside the liquid hydrogen system's fence, a nitrogen/hydrogen mixing station provides the appropriate fluidizing and reactive gas mixtures to the Green Salt reductors. The reductor off-gas (principally nitrogen, water vapor, hydrogen, and hydrogen sulfide) is passed through filters to remove particulate uranium and the residual gas is then incinerated to convert the hydrogen sulfide into sulfur dioxide and water and to burn the excess hydrogen.

2.4.4 Uranium Hydrofluorination

The UO_2 from the reductor is fed into one of two fluid-bed hydrofluorinators operated in series; two trains are available for operation. A counter-current flow of anhydrous hydrogen fluoride (HF) fluidizing gas, supplied from on-site rail cars, converts the UO_2 into uranium tetrafluoride (UF_4). Through a system of vaporizers and heat exchangers, the HF is changed to a gaseous form and brought to the proper reaction temperature before being introduced into the fluid-bed reactors.

The off-gas is filtered to remove particulate uranium and scrubbed with water and a potassium hydroxide solution to remove HF before being vented to the atmosphere. The HF scrubber liquors are pH-adjusted and treated to remove fluoride. This waste fluoride is subsequently converted into a recyclable synthetic calcium fluoride product.

2.4.5 Uranium Fluorination

The UF_4 is fed into a fluid-bed fluorinator that also contains inert bed material. Elemental fluorine is used as the fluidizing gas to convert solid UF_4 to gaseous UF_6 which is volatilized from the fluorinator. A cobalt catalyst may be used to enhance the reactivity and improve the fluorine yields. The cobalt is added during ore preparation. Some residual uranium, non-volatile impurities, and uranium daughter products remain in the bed material, which is recycled and reused until the buildup of contaminants prohibits further use. The bed material is then retired for radioactive decay and subsequently shipped to a contractor for reprocessing of the uranium. The volatilized gas containing UF_6, excess fluorine, and HF is passed through a series of filters for particulate removal and through a series of cold traps for UF_6 desublimation.

2.4.6 Cold Traps and Off-Gas Cleanup

The bulk of the UF_6 is desublimated in a series of primary cold traps which are operated at approximately -20 degrees Fahrenheit to 0 degrees Fahrenheit. The secondary and tertiary traps operate at lower

temperatures and remove essentially all the remaining UF_6. The secondary and tertiary cold traps are not essential for the process. One or both could be bypassed without adversely affecting the operation. Crude UF_6 is removed from the cold traps intermittently following liquefaction by heating and then transferred to still feed tanks to await purification by fractional distillation.

Uncondensed gas from the cold traps, consisting of fluorine, air, HF, nitrogen, and traces of UF_6, is routed into scrubbers where contact with potassium hydroxide solution removes fluorides and traces of uranium prior to release to the atmosphere. The spent scrubbing solutions are routed through wet process, where the potassium diuranate is precipitated and filtered. The filtrate (spent KOH) is sent to the Environmental Protection Facility (BD-10) where it is regenerated and subsequently reused.

The potassium diuranate is further treated and the uranium is then re-introduced into the ore preparation process.

2.4.7 Uranium Hexafluoride Distillation

Crude UF_6 from the still feed tanks is fed into a low boiler distillation column. The UF_6 that has been stripped of low boiling impurities is then fed into a high boiler distillation column where high boiling impurities are eliminated. The product, which meets or exceeds purity requirements, is condensed and packaged into approved product cylinders. Gaseous effluents from this process are fed back to fluorination and are treated along with the fluorination off-gas.

2.4.8 Uranium Recovery

Different types of uranium-bearing liquors are processed in wet process/uranium recovery to recover as much uranium as possible. These include FMB (BD-29) and cylinder wash liquors, rainwater from certain storage pads, and fluorination scrubber liquors. Regardless of the origin of the uranium-bearing liquors, the uranium is precipitated from solution by pH adjustment, separated from the solution using rotary drum vacuum filtration at the Pond Muds Calciner and drummed for future use in ore preparation. The liquors in each case are treated in the Environmental Protection Facility (BD-10) to remove fluorides and then discharged into the plant effluent. Fluorination scrubbing liquors, which contain potassium diuranate solids, may also be shipped to a mill for toll reprocessing.

2.4.9 Uranium Hexafluoride Cylinder Cleaning

Periodically, UF_6 product cylinders must be washed and pressure-tested to assure that there has been no significant degradation of design integrity and to comply with the recertification requirements of American National Standards Institute N14.1, "Packaging of Uranium Hexafluoride for Transport. The cylinders are washed with sodium carbonate or sodium hydroxide solution to recover uranium. The leach liquors are then filtered, and the uranium-bearing liquid transferred to the uranium recovery facility. The filter residue, which contains daughter products of uranium, principally ^{234}Th and ^{234}Pa, is stored on-site and eventually disposed of at a licensed waste disposal facility.

2.4.10 Fluorine Production

Fluorine, which is one of the raw materials required for the UF_6 process, is produced on-site by electrolysis using HF as the source.

2.4.11 Plant and Non-Plant Area Delineation

In 2009, ENERCON assessed the plant and non-plant areas at MTW as part of the Historical Site Assessment, Revision 0 dated April 2009. The plant area was divided into 29 separate areas or systems of interest. Non-plant areas were divided into 5 separate areas or systems. Table 2-1 provides a list of the 34 areas of interest (Figures 1 and 2).

Table 2-1: Listing of Plant and Non-Plant Areas

Area Designation	Description
P-1	Administration Building and Parking Lot
P-2	Laboratory Building and Adjacent Storage Area
P-3	Former Cold Trash Storage Area
P-4	Fluorination Preparation
P-5	Ore Staging Area/Drum Dumping Area/Sodium Removal Building/KOH Muds Building/Wet Process Building/Calciner
P-6	FMB and South Pad
P-7	Powerhouse, Nitrogen Generation, Laundry, Flammable Storage Building, and Storage Area
P-8	Liquid Fluorine Facility, Sulfur Hexafluoride Plant, Antimony Pentafluoride, Iodine Pentafluoride Plant, and the Loading Docks
P-9	Ore Sampling Area
P-10	Ore Storage Building
P-11	Ore Storage Pads
P-12	Tank Farm, Pond Muds Filter Calciner, and Fuel Oil Storage
P-13	Cylinder Wash Area
P-14	Uranium Settling Ponds
P-15	Bed Materials and Filter Fines Building
P-16	Drum Storage Pad
P-17	Waste Storage Area
P-18	UF_6 Cylinder Storage Area
P-19	Drum Crushing Facility
P-20	Environmental Protection Facility
P-21	Calcium Fluoride Ponds (closed and surveyed in 2020)
P-22	Maintenance Storage Area/Trash Compactor/Switchyard/Fuel Depot
P-23	Maintenance Shop/Stores/Loading Dock
P-24	Liquid Propane Gas Area
P-25	Roadways and Ground Surface
P-26	Plant Exclusion Area
P-27	Sanitary Drain Lines
P-28	Process Drain Lines

Area Designation	Description
P-29	Storm Water Drain Lines
NP-1	Non-Plant Area 1 – NPDES Outfalls
NP-2	Non-Plant Area 2 – Surface Drainage Pathways to the Ohio River
NP-3	Non-Plant Area 3 – On-Site Landfill and Kickback Area
NP-4	Non-Plant Area 4 – River Road
NP-5	Non-Plant Area 5 – Remainder of the Property

The 2009 site characterization activities evaluated the site soils in 26 (P-1 through P-26) of the 29 designated plant areas and 5 (NP-1 through NP-5) designated non-plant areas. Plant Areas P-27, P-28, and P-29 were not characterized due to the inability to access the various subsurface lines due to ongoing plant operations. Details are provided in the *Historical Site Assessment, Revision 0* and the 2009 Radiological Characterization Report.

3.0 ASSESSMENT OF PLANT RADIOLOGICAL CONDITIONS

3.1 Radiological Criteria for License Termination

The overall objective of MTW decommissioning is to remediate the site to an unrestricted use condition that corresponds to a calculated dose to the public that is less than 25 mrem/yr from applicable dose pathways. The site can then be used without any radiological restrictions. The 25 mrem/yr dose limit is codified at 10 CFR 20.1402, Radiological Criteria for Unrestricted Use.

The Derived Concentration Guideline Level (DCGL) is defined in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) as the radionuclide-specific concentration within a survey unit corresponding to the release criterion. The DCGL is dependent upon several factors, including the radionuclides of concern (ROCs), applicable dose pathways, area occupancy, and the future use of the facility. The DCGL assumes a uniform level of residual radioactivity across the survey unit. For the Honeywell MTW, it was assumed that site-specific release criteria would be developed. The 2009 Radiological Characterization Report cited as an example the release criterion of 110 pCi/g for the Sequoyah Fuels facility. The Sequoyah Fuels facility was a uranium conversion plant similar to MTW that closed in the 1990s. ENERCON believes that 110 pCi/g is a reasonable DCGL for planning purposes.

The NRC criteria for acceptable surface contamination levels historically were 5,000 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) average for natural uranium (U-nat) and 1,000 dpm/100 cm^2 removable for U-nat as stated in Policy and Guidance Directive FC 83-23, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Byproduct, Source, or Special Nuclear Materials Licenses." These acceptable levels are presented in Table 3-1. The current NRC guidance for acceptable activity levels for specific radionuclides is presented in NUREG-1757, Volume 1, Appendix B, Table B.1. The NRC declined to provide specific guidance for alpha emitting radionuclides, including U-nat. ENERCON expects that MTW will apply for site-specific release criteria using the guidance in NUREG-1757, Volume 2, Appendix I and the As Low As Reasonably Achievable (ALARA) analysis guidance in NUREG-1757, Volume 2, Appendix N.

Table 3-1: Acceptable Surface Contamination Levels

Nuclides[a]	Average[b,c,f] (dpm/100 cm^2)	Maximum[b,d,f] (dpm/100 cm^2)	Removable[b,e,f] (dpm/100 cm^2)
U-nat, U-235, U-238, and associated decay products	5,000 (α)	15,000 (α)	1,000 (α)
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	300	20
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 (βɣ)	15,000 (βɣ)	1,000 (βɣ)

[a] Where surface contamination by both alpha- and beta-gamma emitting nuclides exists, the limits established for alpha- and beta-gamma emitting nuclides should apply independently.

[b] As used in this table, dpm means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such subject.

[d] The maximum contamination level applies to an area not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per cm^2 of total absorber.

3.2 Prior Assessment of Plant Radiological Conditions

Based on a review of NRC criteria, the following conclusions regarding potential release criteria for MTW are provided:

- NRC criterion for residual depleted uranium (DU) in soil was formerly 35 pCi/g.
- NRC guidance for acceptable license termination screening values for specific radionuclides was available in NUREG-1757, Volume 1, Appendix B, Table B.2.
- Honeywell will apply for site-specific release criteria using the guidance in NUREG-1757, Volume 2, Appendix I and the ALARA analysis guidance in NUREG1757, Volume 2, Appendix N. The outcome of this effort would be a release criterion for residual DU in soil in excess of 35 pCi/g.

Other sites have performed evaluations and obtained site-specific release criteria using a DCGL for soil in excess of 35 pCi/g. For example, the DCGL for uranium at the Sequoyah Fuels site was 110 pCi/g for a release criterion of 25 mrem/yr. A corresponding ALARA evaluation indicated an ALARA action level of 4,780 pCi/g uranium, thus demonstrating that the 110 pCi/g value was ALARA. Therefore, it is assumed that a site-specific release level of 110 pCi/g or greater for soils could be established using the release criteria for surface contamination levels discussed in the following sections.

3.3 Identification of Potential Radionuclides of Concern

A list of potential ROCs has been developed.

The ROCs in incoming ore concentrate and the plant-specific waste streams were assessed. Evaluating the various forms of uranium found in the incoming ore concentrate and the plant waste streams, the following was concluded:

- Dose exposure from the incoming ore concentrate is primarily (more than 90 percent) driven by the presence of Radionuclides Uranium-234 (U-234), U-235, and Uranium-238 (U-238).
- Dose exposure based on on-site and off-site environmental air monitoring data is primarily driven (more than 90 percent) by the presence of Radionuclides U-234, U-235, and U-238.
- Dose exposure based on uranium recovery solid wastes is primarily driven by the presence of Radionuclides Radium-226 (Ra-226), Thorium-230 (Th-230), and Thorium-232 (Th-232).
- Dose exposure based on water effluent monitoring data is primarily driven by the presence of Radionuclides Ra-226, U-234, and U-238.

Radionuclides U-234, U-235, and U-238 were identified as the base ROC group. Radionuclides Ra-226, Th-230, and Th-232 were designated as modified ROC Group 1. Radionuclides Ra-226, U-234, and U-238 were designated as modified ROC Group 2.

Within the plant operational processes, the uranium recovery process occurs in the following locations:

- FMB (BD-29) (P-6)
- Cylinder Wash Area (BD-15) (P-13)
- Bed Materials and Filter Fines Building (BD-33) (P-15)
- Waste Storage Area (BD-80) (P-17).

Thus, 4 of the 29 plant areas were assessed using the base ROC group and modified ROC Group 1. The remaining plant operational areas (25 of the 29 plant areas) were assessed using the base ROC group.

The water effluent location is the National Pollutant Discharge Elimination System (NPDES) outfall (NP-1), and this area was assessed using the modified ROC Group 2. All remaining non-plant areas (NP-2 through NP-5) were assessed using the base ROC group.

3.4 Characterization Data for Prior Assessments of Radiological Conditions

Available data and previous experience were used to estimate the extent of remediation that will be required during decommissioning. The characterization data used to estimate the decommissioning costs in the *Site Reclamation Cost Estimate for Plant Located in Metropolis, Illinois, Revision 0* dated May 2006 (2006 Site Reclamation Cost Estimate Report) included removable activity survey data and environmental sampling data.

The removable activity survey data were utilized to help determine which buildings and indoor areas required remediation. Fixed activity data were not available. The average and maximum activity levels measured for each building were provided in the 2006 Site Reclamation Cost Estimate Report. The limit used for removable activity for U-nat was 1,000 dpm/100 cm^2. No additional data from buildings and indoor areas were collected during this evaluation.

This report uses data collected during the 2009 Radiological Characterization Report site characterization assuming a site-specific soil release level of 110 pCi/g.

3.4.1 Main Production Buildings

Survey data included in the 2006 Site Reclamation Cost Estimate Report for the main production buildings indicated that (in general) these buildings were contaminated and would require remediation. Specifically, the FMB (BD-29), Uranium Recovery Building (BD-19), KOH Muds Building (BD-20), and Sampling Plant (BD-23) exceeded the release level assumed for the 2006 Site Reclamation Cost Estimate Report. This DCE assumes no change in the radiological status of these buildings.

3.4.2 Miscellaneous Production Buildings

Survey data included in the 2006 Site Reclamation Cost Estimate Report for the miscellaneous production buildings indicated that (in general) these buildings were not contaminated and would not require extensive remediation.

Based on prior history, the Pond Muds Filter Calciner Building (BD-16) is assumed to require remediation in the 2006 Site Reclamation Cost Estimate Report. This DCE assumes no change in the radiological status of these buildings.

3.4.3 Drum Storage Pads and Ponds

The Drum Storage Pad, the former KOH Muds Storage Pad (which now serves as a Drum Storage Pad), the Waste Storage Pad, and the Ore Storage Pads were assumed in the 2006 Site Reclamation Cost Estimate Report to require remediation. Uranium Settling Pond Nos. 3 and 4 were assumed in the 2006 Site Reclamation Cost Estimate Report to require remediation based upon data from Uranium Settling Pond Nos. 1 and 2 that required remediation at closure. This DCE assumes no change in the radiological status of these areas.

3.4.4 Outdoor Areas, Drains, and Sewers

Prior to the 2009 site characterization, there were limited data available for surface and subsurface soils in the plant and non-plant areas. The site characterization completed in 2009 focused on plant and non-plant surface and subsurface soils. Characterization activities excluded subsurface piping systems to eliminate disruptions to plant operations. Assumptions were made to estimate the potential impacts to subsurface piping systems. A significant volume of impacted soil was identified beyond the volume estimated in the 2006 Site Reclamation Cost Estimate Report.

The volume of impacted soil in Plant Areas P-1 through P-25 estimated during the 2009 characterization is as follows:

- Plant area soil impacted to a depth of approximately 1 foot below grade was identified in an estimated footprint area of 489,435 square feet (ft^2). Therefore, an additional 489,435 ft^3 of impacted soil was added to the 2009 DCE.
- Plant area soil impacted to a depth of approximately 3 feet below grade was identified in an estimated footprint area of 69,609 ft^2. Therefore, an additional 139,218 ft^3 (69,609 ft^2 by 2 feet) of impacted subsurface soil was added to the 2009 DCE.
- Plant area soil impacted to a depth of approximately 6 feet below grade was identified in an estimated footprint area of 30,013 ft^2. Therefore, an additional 90,039 ft^3 (30,013 ft^2 by 3 feet) of impacted subsurface soil was added to the 2009 DCE.

The volume of impacted soil in the non-plant areas (NP-1 through NP-5 and P-26) estimated during the 2009 characterization is as follows:

- NP-1 – Impact of 7,649 ft^3 of soil was estimated based on the 2009 characterization.
- NP-2 – No additional impacts were discovered based on the 2009 characterization.
- NP-3 – Impact of 16,020 ft^3 of soil was estimated based on the 2009 characterization.
- NP-4 – Impact of 37,500 ft^3 of soil was estimated based on the 2009 characterization.
- P-26 and NP-5 – Impact of 49,025 ft^3 of soil was estimated based on the 2009 characterization.

In summary, the volume of impacted soil adjacent in the non-plant areas (NP-1 through NP-5 and P-26) was estimated during the 2009 characterization to be approximately 110,194 ft^3.

The volume of impacted soil adjacent to subsurface piping was estimated during the 2009 characterization to be approximately 129,622 ft^3.The additional impacted soil volume for plant areas (P-1 through P-25), non-plant areas (P-26 and NP-1 through NP-5), and impacted soil adjacent to subsurface piping identified in the 2009 DCE was estimated to be 718,692 ft^3, 110,194 ft^3, and 129,622 ft^3, respectively. Routine

characterization surveys performed since 2009 do not indicate that the amount of impacted surface and subsurface soil material needs to be revised.

3.4.5 Administrative Areas

The Administration Building (BD-1), the Laboratory and HP Building (BD-2), the Maintenance Shop/Store/Office Building (BD-6), and the Powerhouse (BD-7) were previously identified as not contaminated. Because radioactive materials were used in the Laboratory and HP Building (BD-2), some remediation in this area would be required. This DCE assumes the Laboratory and HP Building (BD-2) in its entirety will be demolished and the resulting debris will be sent for disposal. At the same time, the roof above the laundry in the Administration Building (BD-1) will be removed if found to be contaminated.

3.4.6 Roads

Based on the 2009 characterization data, the subgrade material under the roads (P-25) inside the restricted area was characterized as having little or no radiological impact. Therefore, no adjustment to the impacted volume of soil was made.

In 2012, Honeywell replaced most of the asphalt roads inside the restricted area with concrete. The project required removal of approximately 6 inches of asphalt and subgrade material so that the concrete roadway could be constructed.

Prior to the removal of the asphalt paving material, a walkover survey was performed. The walkover survey results showed little to no radiological impact to the asphalt paving material. Therefore, the material which was removed was managed as non-impacted material. Subsequently, Honeywell used the asphalt and subgrade material as fill within the plant.

3.4.7 Aisle No. 5 of the Uranium Hexafluoride Pad

In August 2011, ENERCON performed a radiological survey of Aisle No. 5 of the UF_6 pad. The details of this survey are provided in *Radiological Characterization Report of the UF_6 Pad* (prepared by ENERCON). This survey was performed because the existing concrete in Aisle No. 5 was scheduled to be removed so that the areas could be repaved. The results of the survey showed some elevated activity in the concrete and no impacts to the aggregate beneath the existing concrete pad. The clean concrete in Aisle No. 5 was removed, crushed, and utilized as fill in the Waste Storage Area.

3.4.8 Support Trailers

In 2011, Honeywell installed a 12-wide trailer (BD-69) and an additional training trailer (BD-58) in the old Liquid Petroleum Gas Area (northwestern corner of the restricted area) to provide office space to support ongoing site operations. The administrative activities being conducted in the trailers are not expected to result in any impacts to building surfaces or soil. Therefore, no adjustments were made to the DCE due to the installation of these trailers.

3.4.9 RCRA KOH Muds Drums Storage Building

In 2009, Honeywell installed the RCRA KOH Muds Storage Building (BD-26) (an opened wall structure) in the southern portion of the Ore Storage Pad area. The location of BD-26 is depicted in Figure 3 (Drawing No. MTW-2800, Rev AF). The original concrete pad is still in place and was only cut at the footer/foundation locations for the building column installation. The Ore Storage Pads are considered impacted, and the volume of impacted concrete was not adjusted for this update. The building is comprised of steel columns, trusses, and a sheet metal roof. It is assumed for this DCE that the building will be demolished.

3.4.10 Sheet Metal Buildings

In 2012, Honeywell installed two sheet metal buildings. The Waste Sorting Building (BD-92) was installed west of the Surface Treatment Facility. The Capital Fabrication Building (BD-93) was installed south of the Sampling Plant (BD-23). It has a poured concrete floor with industrial coating to prevent migration of contamination into the concrete. Based on historical knowledge of the activities that occur in these buildings and contamination control measures, it is assumed that there will be no radiological impacts.

3.4.11 Rail Spur

In preparation for load out of the calcium fluoride ponds, a new rail spur was installed parallel to and outside the western fence line from the main rail line to a point west of the main facility. This section of rail spur has a fenced security impoundment. Rail cars can be pulled into this impoundment, loaded with materials or waste, undergo the necessary radiological and security evaluations, and then be released for transport.

4.0 DECOMMISSIONING COST ESTIMATION METHODS

This section of the DCE report documents the considerations and factors used to prepare this DCE.

The estimated cost to decommission the Honeywell MTW is approximately $209,526,451. Appendix A–1 provides a summary of the costs and duration for each area of the facility; Appendix A–2 provides a summary of the waste volume and disposal cost; Appendix A–3 provides a summary of the labor effort in man-hours; Appendix A–4 provides a summary of the equipment cost, and Appendix A–5 provides a summary of the UCFs along with application of productivity loss factors (PLF).

4.1 Cost Escalation Factor

The cost escalation methodology specified in NUREG-1307, Revision 15, was not utilized.

4.2 Summary of Decommissioning Costs

The summary of decommissioning costs is shown in Table 4-1.

Table 4-1: Decommissioning Cost Summary – Honeywell Facility

Operation	Man-hours	Labor Plus Travel & Living	Waste Disposal Cost*	Equipment, Supplies & Subcontracts	Total Cost
Additional soil plant areas P1-P25	7,884	$802,654	$20,672,237	$677,623	$22,152,515
Administrative Areas	1,802	$188,058	$224,200	$61,701	$473,959
Asbestos Removal and Disposal	0	$0	$0	$2,686,560	$2,686,560
Decommissioning Planning	552	$68,597	$0	$0	$68,597
Drum Storage Pads and Ponds	10,908	$1,071,487	$590,626	$350,024	$2,012,136
Main Production Buildings	38,738	$4,023,207	$47,964,832	$1,518,750	$53,506,789
Misc. Non-labor Costs	0	$0	$0	$31,912,340	$31,912,340
Misc. Production Buildings	41,830	$4,291,982	$5,827,308	$1,630,249	$11,749,539
Outdoor Areas, Drains, & Sewers	8,580	$873,020	$26,749,896	$717,723	$28,340,638
Oversight, Reporting & Licensing	118,924	$12,907,406	$0	$329,940	$13,237,346
Planning, Training & Mobilization	11,740	$995,742	$0	$485,000	$1,480,742
Totals	240,958	$25,222,153	$102,029,098	$40,369,910	$167,621,161
			25%	**Contingency:**	**$41,905,290**
				GRAND TOTAL:	**$209,526,451**

*Note: Illinois radioactive waste fee is now captured as a waste disposal cost. See Section 1.3 for additional discussion.

4.3 Waste Disposal Cost

This report reflects the current estimated waste on-site and expected disposal at either US Ecology or Energy*Solutions*. The following sections describe the costs provided to Honeywell for the various disposal pathways.

For purposes of the DCE, the following were applied for terms of disposal:

- Lidded low-sided gondola cars for disposal at US Ecology with 75,000 pounds per gondola car, including asbestos at $0.30 per pound disposal cost.
- Lidded high-sided gondola rail cars for disposal to Energy*Solutions* with 150,000 pounds per gondola car and $1.95 per pound disposal cost.
- Local transport trucks for disposal of C&D waste to local landfills at $59 per ton of waste

In addition, a $3 per cubic foot Illinois radioactive waste fee is assessed to the high-sided gondola rail cars (each car is estimated to be 6,000 cubic feet) for disposal at Energy*Solutions*. This fee is not applied to the UQ waste sent for disposal at US Ecology.

4.4 Remediation Methods

Remediation methods considered contamination levels, degree of penetration of contamination into substrate material, equipment cost, support equipment costs, material and chemical costs, the generation of secondary waste volumes (waste in addition to the removed contaminated material), processing rates, labor requirements, and applicability to various tasks. The process consists of removing all components and equipment with items and materials contaminated with unimportant quantities placed in rail cars for disposal primarily at US Ecology facilities.

This is followed by survey of the remaining structures and areas in a manner consistent with requirements for final status survey. For the main production buildings, the process is the same except that the structures will also be demolished along with the components placed in rail cars. All the remaining pads throughout the site will be scabbled to remove residual surface contamination, and the resulting material is anticipated to meet the definition of unimportant quantities and will be disposed at US Ecology.

Productivity loss factors (PLF) shown in Table 4-2 have been applied to demolition tasks to adjust for various conditions that adversely affect productivity.

Table 4-2: Productivity Loss Factors

	No Factor	Height	Respiratory Protection	Rad/ ALARA	Subtotal 1	Protective Clothing	Subtotal 2	Breaks	TOTAL PLF
		15.00%	38.00%	15.00%		23.00%		15.00%	
All factors	1.0	0.15	0.38	0.15	1.68	0.23	2.07	0.15	2.38
All except Height	1.0		0.38	0.15	1.53	0.23	1.88	0.15	2.16
Protective Clothing, Radiological Work, and Respirator only	1.0		0.38	0.15	1.53	0.23	1.88		1.88
All factors except Respirator	1.0	0.15		0.15	1.30	0.23	1.60	0.15	1.84
Height, Protective Clothing, and Radiological Work only	1.0	0.15		0.15	1.30	0.23	1.60	0.15	1.84
Protective Clothing, Radiological Work, and Breaks	1.0			0.15	1.15	0.23	1.41	0.15	1.63
Protective Clothing and Rad only	1.0			0.15	1.15	0.23	1.41		1.41
Height and Breaks only	1.0	0.15			1.15		1.15	0.15	1.32
Height only	1.0	0.15			1.15		1.15		1.15
Breaks only	1.0				1.00		1.00	0.15	1.15
PLF included in NESP output	1.0				1.00		1.00	0.00	1.00

Source: AIF/NESP-036

Productivity loss factors calculate a cumulative reduction in productivity. In Table 4-2, subtotal 1 sums the loss factors associated with height (15%), respiratory protection (38%), and ALARA (15%) and adds them to the baseline no factor condition represented by 1.0. The loss factor for protective clothing, if applicable, is then applied as a 23% increase over subtotal 1 to get subtotal 2. Lastly, the loss factor for requiring breaks, if applicable, is then applied as a 15% increase over subtotal 2 to get the total PLF for each UCF.

Applied PLF can be found in Appendix A–5.

4.5 Labor Unit Cost

Labor unit cost rates are shown in Table 4-3.

Table 4-3: Labor Unit Cost

Labor Category	2021 Unit Cost	Units
Administrative Assistant	$50.00	Hour
Asbestos Worker	$95.12	Hour
Assistant Project Manager	$88.92	Hour
Boilermaker	$104.40	Hour
Carpenter	$83.28	Hour
Cost & Schedule Specialist	$88.92	Hour
EH&S Manager	$113.28	Hour
Electricians	$96.54	Hour

Labor Category	2021 Unit Cost	Units
Engineer	$113.28	Hour
Environmental Scientist	$113.28	Hour
Equipment Operator, Crane or Shovel	$93.38	Hour
Equipment Operator, Light Equipment	$84.35	Hour
Equipment Operator, Medium Equipment	$89.66	Hour
Foreman	$122.81	Hour
Junior Health Physics Technician	$75.00	Hour
Laborer	$67.58	Hour
Millwrights	$86.60	Hour
Oiler/Rigger	$79.82	Hour
Plumbers	$103.07	Hour
Project Manager	$146.28	Hour
Quality Assurance Professional	$113.28	Hour
Radiation Safety Officer/Certified Health Physicist	$146.25	Hour
Senior Engineer/Consultant	$146.25	Hour
Senior Health Physics Technician	$113.28	Hour
Steamfitters or Pipefitters	$104.04	Hour
Superintendent	$146.25	Hour
Surveyor/GPS Technician	$113.28	Hour
Truck Drivers, Heavy	$78.23	Hour
Truck Drivers, Light	$74.46	Hour
Waste Manager	$113.28	Hour
Welders	$95.17	Hour

4.6 Equipment Costs

A summary of the equipment cost by area is included in Appendix A–4.

4.7 Final Status Surveys

This report assumes that a post-remediation survey of each structure or area is completed. These post-remediation surveys are to be performed in such a manner that if no contamination is found, the results may be used as final status survey data or to augment final survey data.

5.0 DESCRIPTION OF THE DECOMMISSIONING PROCESS

Decommissioning of the Honeywell facility will require that residual radioactive materials be removed or remediated to meet the unrestricted release criteria to allow removal of the decommissioned facilities from the site's radioactive materials license. The unrestricted release means no restrictions are imposed upon the site after license termination. Numerous structures will remain after license termination. These structures will not have had their structural soundness compromised by decommissioning activities.

5.1 Asbestos Removal

The initiating event for decommissioning is to remediate all the asbestos sitewide utilizing the services of an asbestos abatement contractor licensed to perform work in the State of Illinois. After a structure has been remediated or identified as asbestos free, the radiological decommissioning tasks can begin. All waste generated during the asbestos remediation is anticipated to go to US Ecology for disposal.

5.2 Wipe Down and Application of Fixative

After the asbestos removal has been completed for a structure or area, a crew will wipe down all the interior surfaces of the buildings and equipment in each of the structures. For the structures designated for demolition, a fixative will be applied to all accessible surfaces of the buildings and equipment.

5.3 Lead Survey

After the wipe down and fixative application has been completed, an equipment and structure evaluation will take place to determine if there is any lead-based paint present.

5.4 Characterization Surveys

Areas of the facility that are not anticipated to be demolished and have a history of radioactive materials use or storage will have radiological surveys conducted. Survey results will determine the extent of remediation, if any, required to achieve release of these areas for unrestricted use. Characterization surveys are normally performed in such a manner that if no contamination is found, the results may be used as final status survey data or to augment final survey data.

5.5 Remediation

The general remediation approach assumes that source material and waste will be removed from process areas and that no remediation is required in administrative areas except for the Laboratory and HP Building (BD-2).

Further discussion of the individual remediation tasks follows.

5.5.1 Main Production Buildings

The entire FMB (BD-29) structure, concrete slab, building pads, and all the equipment are considered contaminated. The building and associated encased equipment will be demolished and removed from the site for processing or disposal at an authorized waste disposal facility.

The Ion Exchange Building (BD-37), Sodium Removal Building (BD-17), KOH Muds Building (BD-20), Uranium Recovery Building (BD-19), Drum Dumping Area and Sampling Plant (BD-21), the Production Offices on the eastern side of SGF2/Anode Prep Building (BD-3), the Safety Building (BD-28), FMB South Pad, and H2S Incinerators Control (BD-89) will be demolished. The structures and all the equipment housed within are considered contaminated and will be demolished and removed from the site for disposal at an authorized waste disposal facility.

After all the buildings are removed to the concrete slab, the slabs and the basement of the FMB (BD-29) will be removed along with the subsurface soil to a depth of 3 feet. It is anticipated that these materials will go to US Ecology.

5.5.2 Production Support Buildings

The Ore Storage Building (BD-18), Bed Materials and Filter Fines Building (BD-33), Pond Muds Filter Calciner Building (BD-16), Cylinder Wash Building (BD-15), and Drum Crusher Building (BD-34) are considered contaminated. The Pond Muds Filter Calciner Building (BD-16) and associated equipment will be demolished and removed from the site for processing or disposal at an authorized waste disposal facility. Building concrete slabs will be left in place after being decontaminated using surface removal methods.

The South GF2 Plant Building (BD-3), GF2 Plant (BD-4), Liquid Fluorine Facility (BD-14), Surface Treatment Facility (BD-42), and Calcium Fluoride Building (BD-25) are not anticipated to require remediation. The duct work associated with the heating, ventilation, and air conditioning (HVAC) system for these buildings will be surveyed and, if contaminated, will be removed and disposed of at the appropriate waste site.

5.5.3 Miscellaneous Building and Structures to be Demolished

In the footprint of the Environmental Protection Facility Building (BD-10), three tanks (801, 804, and 915) will be demolished based on their use during operation and disposed at an authorized waste disposal facility.

The Drum Wash Building (BD-79), Break Room Shed (BD-80), Bed Materials and Filter Fines Building (BD-33), Drum Crusher Building (BD-34), Ion Exchange Building (BD-37), and Drum Crusher Building (BD-41) all will be demolished, and their debris treated as radioactive waste.

5.5.4 Drum Storage Pads and Uranium Settling Ponds

The Ore Storage Pads, the former KOH Muds Storage Pad (which now serves as a Drum Storage Pad), Drum Storage Pad, and Waste Storage Pad are considered contaminated. The concrete slabs will be left in place after surface contamination is mechanically removed.

Uranium Settling Pond Nos. 3 and 4 are contaminated and will be remediated by removing the pond sediments, pond liner, and contaminated soil under the ponds for disposal at an authorized waste disposal facility.

The balance of miscellaneous equipment, piping, and tanks associated with Uranium Settling Pond Nos. 3 and 4 is assumed to be contaminated and will be demolished and disposed. Waste from this area is assumed to be primarily LLRW sent to Energy*Solutions* for disposal with a small fraction able to be disposed as UQ at US Ecology.

5.5.5 Outdoor Areas, Drains, and Sewers

The sanitary system is assumed to be impacted; therefore, it will require demolition.

The entire process system and portions of the storm water system were assumed to be impacted.

No characterization was performed near subsurface piping systems during the 2009 site characterization due to ongoing production at the site. The determining factor for the storm water system was based on whether the piping was located downgradient of an area that had impacts to surface and subsurface soils. If a subsurface piping system was assumed to be impacted, remediation was assumed to consist of removing the piping and associated backfill. A typical cross section (3 feet wide by 5 feet deep) was used to estimate the removal volume. The disposition of the impacted piping and backfill was assumed to be disposal at an authorized waste disposal facility.

The drainage swale from Outfall 002 (formerly referred to as "The Discharge Ditch to River" in the 2006 Site Reclamation Cost Estimate Report) is contaminated and will be remediated by removing the ditch sediments and surrounding impacted soil for disposal at an authorized waste disposal facility. The typical cross section assumed was a 2-foot-deep trapezoidal-shaped channel with a 3-foot bottom and 2 horizontal to 1 vertical side slopes. The total length was estimated to be approximately 2,770 feet. No changes were made to these assumptions in this update of the DCE.

The other four notable impacts to areas outside the restricted area include east of the Ore Storage Pads, along River Road, the road to the inactive landfill, and the landfill. The impacts along River Road were detected approximately 25 feet on either side of the center of River Road over approximately 750 feet. The impacts east of the Ore Storage Pads were in a drainage swale located east of the Ore Storage Pads. The typical cross section assumed a 1-foot-deep rectangular-shaped channel with a 3-foot-wide bottom. Approximately 675 feet of drainage swale was assumed to be impacted. The impacts along the road to the

inactive landfill were isolated. Due to limited sampling, which did not allow for extensive delineation, an area that was assumed to be impacted was used.

The 38-acre area on the eastern perimeter west of the eastern rail spur along the Honeywell property line is known as the Landfill and Kickback area. This location was known to be used by a previous owner for creosote processing. Additionally, Honeywell used this space as a subsurface disposal area from the late 1950s through to the mid-1980s.

The process to remediate this area is as follows:

- All known files and historical documents in the public and private domain concerning this area are to be reviewed.
- A ground penetrating radar survey will be performed to determine the approximate boundaries of the area in question and to determine the nature of the near-surface materials.
- An electromagnetic survey of the area will be conducted to determine materials that appear to be below the range of the ground penetrating radar. This technique will allow for evaluation to a depth of 30 feet if needed. The results of the electromagnetic survey will also be used to assist in the determination of the nature of landfill materials.
- After an understanding of the boundaries, depth, and subsurface materials present are established, the next evolution is to begin the excavation of the identified area and to load the materials into suitable containers for transport and disposal. The containers will be staged for sampling and analysis.
- Sampling will occur for each 25 cubic yards of excavated materials. After the sample results are received, the containers can be loaded in suitable transport for disposal.

5.5.6 Final Status Surveys

Final status surveys will be performed using the guidance provided in NUREG-1575, MARSSIM. The surveys will be performed in accordance with specifically developed plans and procedures in parallel with other decommissioning activities.

5.5.7 Survey Instrumentation

Selection and use of instrumentation will ensure sensitivities are sufficient to detect the identified nuclides at the minimum detection requirements. A list of typical final status survey instrumentation, radiation detected, and calibration sources is provided in Table 5-1.

Table 5-1: Typical Final Status Survey Instrumentation

Instrument/Detector	Detector Type	Radiation Detected	Calibration Source	Use
Ludlum Model 2350 with 43-68, 43-98, 43-94 or 43-106 detector	Gas-flow proportional (126 cm^2)	Alpha or Beta	230Th (α) 99Tc (β)	Direct alpha and direct beta surveys; Beta scans on solid surfaces.
Ludlum Model 2350/ SP-1133m or SP-175-3m	GM Pipe Detector	Alpha or Beta	230Th (α) 99Tc (β)	Direct beta pipe survey.
Ludlum Model 2350 with 44-40 detector	Shielded GM (15.5 cm^2)	Beta	99Tc (β)	Direct beta surveys; Beta scans on solid surfaces.
Ludlum Model 2350 with 44-2 or 44-10 detector	NaI (Tl) Scintillator	Gamma	137Cs	Gamma exposure rate and gamma scans.
Eberline Teletector Model 6112B	Ion Chamber	Gamma	60Co (γ)	Gamma exposure rate
Ludlum Model 3030E with 43-10-1 detector or equivalent	ZnS scintillator	Alpha and Beta	230Th (α) 99Tc (β)	Smear counting
Tennelec Planchette Counter or equivalent	Shielded Gas-flow proportional	Alpha and Beta	230Th (α) 99Tc (β)	Smear counting
Canberra ISOCS Gamma Spectrometer or equivalent	HPGe	Gamma energy and intensity	Mixed gamma	Nuclide identification and quantification of soil and sand samples.

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FIGURES (NOT INCLUDED IN PUBLIC VERSION)

APPENDIX A–1: Cost Estimate Summary

Appendix A-1: Cost Estimate Summary

WBS #	Level 3 Name	Labor			Equipment				Waste Disposal	Subcontracts	Total	Activity Duration (days)
		LOE Labor	UCF Labor	Per Diem	UCF Equipment	UCF Consumables	LOE Materials	UCF Materials				
1.1.1	BD - 1 Administrative Building		$59,778	$7,020	$10,579	$3,326			$7,935		$88,637	12
1.1.2	BD - 43 and BD - 76 Contractor Security Entrance		$4,676	$540	$817	$256			$315		$6,603	1
1.1.3	BD - 58 Learning Resource Center		$9,351	$1,080	$1,633	$512			$241		$12,818	2
1.1.4	BD - 6 Shop and Stores Building		$42,513	$5,130	$9,509	$2,430			$165,008		$224,591	12
1.1.5	BD - 69 Admin - Nuclear Compliance Trailer		$34,718	$4,388	$20,565	$2,079			$48,394		$110,143	5
1.1.6	BD - 87 Janitorial Storage Building		$10,713	$1,328	$4,905	$629			$863		$18,438	2
1.1.7	BD - Sub - 11 CIPS Sub Station								$2		$2	
1.1.8	BD-80 Break Room and Shed		$6,037	$788	$4,089	$373			$1,442		$12,728	1
1.2.1	Asbestos Removal and Disposal									$2,686,560	$2,686,560	
1.3.1	Land Area P-21 and P-24								$2		$2	
1.3.2	Landfill and Kickback Area		$452,406	$56,340	$415,635	$26,693			$17,558,310		$18,509,384	86
1.3.3	Non-Impacted Outside Plant Areas											
1.3.4	Outfall 002		$215,784	$26,640	$80,644	$12,621		$103,601	$1,915,320		$2,354,611	49
1.3.5	P-23 Fuel Depot		$9,797	$1,215	$2,688	$576			$45		$14,321	2
1.3.6	Roadways and Ground Areas (P-25)											
1.3.7	Security Exclusion Area (P-26)		$35,972	$4,500	$33,033	$2,132			$1,198,560		$1,274,197	7
1.4.1	Preparatory Plans and Procedures	$68,597									$68,597	23
1.5.1	BD - 48 UF6 Cylinder Storage		$194,138	$25,110	$59,726	$11,897			$69,188		$360,058	62
1.5.2	Drum Storage Pads		$34,444	$4,455	$10,596	$2,111			$11,391		$62,997	11
1.5.3	Ore Storage Pads		$720,190	$93,150	$221,562	$44,132			$510,047		$1,589,082	230
1.6.1	Misc. Non-labor costs									$31,912,340	$31,912,340	23
1.7.1	2009 Subsurface Soils		$707,784	$88,200	$650,213	$41,787			$26,721,396		$28,209,379	135
1.7.2	Parking Lot											
1.7.3	U-1040 and U-1041 Sanitary Treatment System		$68,712	$8,325	$21,779	$3,944			$28,500		$131,259	12
1.8.3	FSS Surveys and Samples	$339,144								$329,940	$669,084	60
1.8.4	Final Project Report	$247,393									$247,393	60
1.8.5	Project Management	$12,320,869									$12,320,869	2561
1.9.1	BD - 15 Cylinder Wash Building		$45,903	$5,558	$12,323	$2,633			$110,108		$176,524	7
1.9.2	BD - 16 Pond Muds Calciner Area & Uranium Ponds Equipment Area		$100,406	$12,060	$30,028	$5,714			$3,263,531		$3,411,738	16
1.9.3	BD - 17 Iodium Removal and BD-19 Uranium Recovery		$372,944	$45,158	$116,409	$21,395			$266,625		$822,530	59
1.9.4	BD - 20 KOH Muds Building		$42,440	$5,153	$17,812	$2,441			$57,692		$125,538	7
1.9.5	BD - 21 Ore Drum Dumper, Washer & Crusher Building		$65,730	$7,965	$19,172	$3,774			$57,271		$153,911	10
1.9.6	BD - 23 (ORE) Sampling Plant		$182,955	$22,028	$41,056	$10,436			$110,628		$367,103	28
1.9.7	BD - 29 Feed Materials Building		$1,521,264	$183,510	$440,668	$86,943			$18,812,942		$21,045,328	270
1.9.8	BD - 3 GF2 South Cell Room and Production Offices		$210,703	$25,740	$94,887	$12,195			$4,080,565		$4,424,090	34
1.9.9	BD - 89 Feed Materials Building South Pad East Side		$51,162	$6,143	$12,853	$2,910			$346,468		$419,536	9
1.9.10	FMB Post Demolition Concrete Pads Survey		$568,976	$71,663	$434,621	$33,952			$20,771,103		$21,880,315	88
1.9.11	Tank Yard		$424,920	$50,828	$92,448	$24,081			$87,900		$680,176	72
1.10.1	BD - 10 FPF Area Building		$209,429	$25,110	$45,153	$11,897			$137,199		$428,787	33
1.10.2	BD - 101 Storage Tent		$26,897	$3,240	$5,473	$1,535			$1,980		$39,125	4
1.10.3	BD - 11 CAF2 Recovery Area Building		$150,296	$18,000	$32,838	$8,528			$70,765		$280,428	24
1.10.4	BD - 14 Liquid Flourine Facility		$109,356	$13,118	$22,974	$6,215			$44,483		$196,145	18
1.10.5	BD - 18 Ore Storage Building		$51,485	$6,480	$13,738	$3,070			$11,374		$86,147	13
1.10.6	BD - 2 Laboratory Equipment Building		$593,634	$74,385	$309,802	$35,242			$810,802		$1,823,865	86
1.10.7	BD - 22 Scale House Area BD - 36		$29,105	$3,645	$7,553	$1,727			$9,221		$51,251	7
1.10.8	BD - 25 CFX Building		$53,794	$6,480	$10,946	$3,070			$30,769		$105,059	8
1.10.9	BD - 26 RCRA Large Drum Storage Area		$69,349	$8,910	$20,635	$4,221			$46,015		$149,131	21
1.10.10	BD - 27 Switch House Building											
1.10.11	BD - 28 Safety Building		$13,668	$1,688	$5,481	$800			$8,200		$29,836	2
1.10.12	BD - 32 Supply Storage Building for BD - 69											
1.10.13	BD - 33 Fines Storage Building		$623,062	$78,840	$353,084	$37,353			$1,704,765		$2,797,103	98
1.10.14	BD - 34 Drum Crusher Building		$272,362	$34,155	$128,886	$16,182			$606,284		$1,057,869	45
1.10.15	BD - 35 GF2 Cell Cond and Maintenance		$115,494	$13,860	$24,629	$6,567			$94,174		$254,723	18
1.10.16	BD - 37 Ion Exchange and Potassium Removal Building		$144,364	$17,708	$54,805	$8,389			$235,427		$460,692	22
1.10.17	BD - 39 Sand Blast Building		$29,841	$3,578	$9,034	$1,695			$11,329		$55,477	5
1.10.18	BD - 4 GF2 C Cell Room, ABC South Pad and A&B Rect		$149,115	$17,910	$31,470	$8,485			$115,229		$322,209	23
1.10.19	BD - 41 Drum Crusher Building		$48,385	$6,075	$26,046	$2,878			$106,884		$190,269	7
1.10.20	BD - 42 STF Area Building		$101,946	$12,443	$19,664	$5,895			$138,461		$278,409	18
1.10.21	BD - 44 KPA Bioassembly Lab Urine Analysis Trailer											
1.10.22	BD - 49 Storage Shed For Cylinder Hauler		$26,897	$3,240	$5,473	$1,535			$1,980		$39,125	4

Appendix A-1: Cost Estimate Summary

WBS #	Level 3 Name	Labor			Equipment				Waste Disposal	Subcontracts	Total	Activity Duration (days)
		LOE Labor	UCF Labor	Per Diem	UCF Equipment	UCF Consumables	LOE Materials	UCF Materials				
1.10.23	BD - 5 GF2 North Cell Room, D&E Rect and D&E South Pad		$206,622	$24,885	$42,681	$11,790			$208,119		$494,098	32
1.10.24	BD - 50 Storage Building											
1.10.25	BD - 52 Control Room Building for HF Railcar Off Loading		$13,448	$1,620	$2,737	$768			$1,320		$19,893	2
1.10.26	BD - 7 Power House Building		$523,878	$62,910	$110,830	$29,805			$120,386		$847,809	81
1.10.27	BD - 79 Drum Wash Building		$25,506	$3,173	$13,156	$1,503			$47,213		$90,550	4
1.10.28	BD - 8 Paint Building											
1.10.29	BD - 83 Liquid Nitrogen Building											
1.10.30	BD - 84, BD-85, BD-86 and BD-100 Structures		$69,216	$8,708	$38,385	$4,125			$169,410		$289,844	10
1.10.31	BD - 9 Dealkalization Building											
1.10.32	BD - 92 Waste Sorting Building		$13,448	$1,620	$2,737	$768			$1,943		$20,515	2
1.10.33	P-1052 Diesel Compressor Trailer South of the Power House		$42,492	$5,400	$6,841	$2,558			$12,000		$69,291	5
1.10.34	Portable Steam Supply Trailer East of the Power House		$51,745	$6,210	$10,395	$2,942			$13,200		$84,492	8
1.10.35	Waste Storage Area		$56,562	$7,200	$51,849	$3,411			$1,068,375		$1,187,396	12
1.11.1	Develop D&D Plan	$57,012									$57,012	40
1.11.2	Lockdown	$435,743					$485,000				$920,743	110
1.11.3	Pre-Mobilzation	$265,436									$265,436	15
1.11.4	Mobilization	$69,962									$69,962	
1.11.5	Demobilization	$167,588									$167,588	30
Subtotals		**$13,971,744**	**$10,015,811**	**$1,234,598**	**$4,267,544**	**$584,925**	**$485,000**	**$103,601**	**$102,029,098**	**$34,928,840**	**$167,621,161**	**4,763**
Group Subtotals			**$25,222,153**			**$5,441,070**			**$102,029,098**	**$34,928,840**	**$167,621,161**	

TOTAL ALL COSTS:	$167,621,161
25% Contingency:	$41,905,290
TOTAL WITH CONTINGENCY:	$209,526,451

APPENDIX A–2: Waste Volume Summary

Appendix A-2: Waste Volume Summary

WBS #	Level 3 Name	Weight of C&D (lbs)	C&D Disposal Volume (cy)	Weight of LLRW (lbs)	LLRW Disposal Volume (cy)	IM Containers (LLRW)	Weight of UQ (lbs)	UQ Disposal Volume (cy)	IM Containers (UQ)	Total Weight (lbs)	Total Cost	Weight by Waste Type (lbs)		
												Concrete	Soil	Miscellaneous
1.1.1	BD - 1 Administrative Building						26,450	24	0	26,450	$7,935			50
1.1.2	BD - 43 and BD - 76 Contractor Security Entrance						1,050	1	0	1,050	$315			1,050
1.1.3	BD - 58 Learning Resource Center	5,273	5				278	0	0	5,550	$241			5,550
1.1.4	BD - 6 Shop and Stores Building	500,025	462				500,025	446	7	1,000,050	$165,008			1,000,050
1.1.5	BD - 69 Admin - Nuclear Compliance Trailer	1,056,875	559				55,625	50	1	1,112,500	$48,394			
1.1.6	BD - 87 Janitorial Storage Building	28,615	15				15	0	0	28,630	$863			150
1.1.7	BD - Sub - 11 CIPS Sub Station	48	0				3	0	0	50	$2			50
1.1.8	BD-80 Break Room and Shed	48,060	25							48,060	$1,442			
1.2.1	Asbestos Removal and Disposal													
1.3.1	Land Area P-21 and P-24	48	0				3	0	0	50	$2			50
1.3.2	Landfill and Kickback Area						58,527,700	52,210	780	58,527,700	$17,558,310		58,527,700	
1.3.3	Non-Impacted Outside Plant Areas													
1.3.4	Outfall 002						6,384,400	5,695	85	6,384,400	$1,915,320		6,384,400	
1.3.5	P-23 Fuel Depot	1,500	1							1,500	$45			
1.3.6	Roadways and Ground Areas (P-25)													
1.3.7	Security Exclusion Area (P-26)						3,995,200	3,564	53	3,995,200	$1,198,560		3,995,200	
1.4.1	Preparatory Plans and Procedures													
1.5.1	BD - 48 UF6 Cylinder Storage						230,625	206	3	230,625	$69,188	230,625		
1.5.2	Drum Storage Pads						37,969	34	1	37,969	$11,391	37,969		
1.5.3	Ore Storage Pads						1,700,158	1,517	23	1,700,158	$510,047	1,700,158		
1.6.1	Misc. Non-labor costs													
1.7.1	2009 Subsurface Soils						89,071,319	79,457	1,188	89,071,319	$26,721,396		89,071,319	
1.7.2	Parking Lot													
1.7.3	U-1040 and U-1041 Sanitary Treatment System						95,000	85	1	95,000	$28,500		88,000	
1.8.3	FSS Surveys and Samples													
1.8.4	Final Project Report													
1.8.5	Project Management													
1.9.1	BD - 15 Cylinder Wash Building						367,025	327	5	367,025	$110,108			
1.9.2	BD - 16 Pond Muds Calciner Area & Uranium Ponds Equipment Area			1,564,650	868	10	82,350	73	1	1,647,000	$3,263,531		1,539,000	
1.9.3	BD - 17 Iodium Removal and BD-19 Uranium Recovery			89,773	79	1	269,318	240	4	359,091	$266,625			
1.9.4	BD - 20 KOH Muds Building			19,425	18	0	58,275	52	1	77,700	$57,692			
1.9.5	BD - 21 Ore Drum Dumper, Washer & Crusher Building			19,283	17	0	57,849	52	1	77,132	$57,271			
1.9.6	BD - 23 (ORE) Sampling Plant						368,761	329	5	368,761	$110,628			
1.9.7	BD - 29 Feed Materials Building			6,803,853	4,223	45	15,763,223	14,062	210	22,567,076	$18,812,942	2,742,831	18,150,000	
1.9.8	BD - 3 GF2 South Cell Room and Production Offices			1,373,928	744	9	4,121,783	3,677	55	5,495,710	$4,080,565	5,243,130		
1.9.9	BD - 89 Feed Materials Building South Pad East Side			143,191	107	1	166,875	149	2	310,066	$346,468			
1.9.10	FMB Post Demolition Concrete Pads Survey			6,993,638	3,698	47	20,980,913	18,716	280	27,974,550	$20,771,103	11,718,750	16,255,800	
1.9.11	Tank Yard						293,000	261	4	293,000	$87,900			
1.10.1	BD - 10 FPF Area Building			17,658	12	0	335,493	299	4	353,150	$137,199			
1.10.2	BD - 101 Storage Tent						6,600	6	0	6,600	$1,980			
1.10.3	BD - 11 CAF2 Recovery Area Building			9,108	6	0	173,043	154	2	182,150	$70,765			
1.10.4	BD - 14 Liquid Flourine Facility			5,725	5	0	108,775	97	1	114,500	$44,483			
1.10.5	BD - 18 Ore Storage Building						37,912	34	1	37,912	$11,374	34,375		
1.10.6	BD - 2 Laboratory Equipment Building	5,184,000	2,741	34,296	19	0	1,947,629	1,737	26	7,165,925	$810,802			
1.10.7	BD - 22 Scale House Area BD - 36						30,736	27	0	30,736	$9,221	25,938		
1.10.8	BD - 25 CFX Building			3,960	2	0	75,240	67	1	79,200	$30,769			

Appendix A-2: Waste Volume Summary

WBS #	Level 3 Name	Weight of C&D (lbs)	C&D Disposal Volume (cy)	Weight of LLRW (lbs)	LLRW Disposal Volume (cy)	IM Containers (LLRW)	Weight of UQ (lbs)	UQ Disposal Volume (cy)	IM Containers (UQ)	Total Weight (lbs)	Total Cost	Weight by Waste Type (lbs)		
												Concrete	Soil	Miscellaneous
1.10.9	BD - 26 RCRA Large Drum Storage Area						153,384	137	2	153,384	$46,015	139,440		
1.10.10	BD - 27 Switch House Building													
1.10.11	BD - 28 Safety Building	53,400	28	334	0	0	19,691	18	0	73,425	$8,200			
1.10.12	BD - 32 Supply Storage Building for BD - 69													
1.10.13	BD - 33 Fines Storage Building	15,793,050	8,351	5,984	3	0	4,061,956	3,624	54	19,860,990	$1,704,765	106,641		
1.10.14	BD - 34 Drum Crusher Building	4,934,160	2,609	11,351	6	0	1,449,209	1,293	19	6,394,720	$606,284	73,063		
1.10.15	BD - 35 GF2 Cell Cond and Maintenance			12,120	7	0	230,284	205	3	242,404	$94,174			
1.10.16	BD - 37 Ion Exchange and Potassium Removal Building	1,602,000	847	8,651	6	0	564,865	504	8	2,175,516	$235,427			
1.10.17	BD - 39 Sand Blast Building	1,408	1	1,439	1	0	27,694	25	0	30,541	$11,329			
1.10.18	BD - 4 GF2 C Cell Room, ABC South Pad and A&B Rect			14,830	8	0	281,770	251	4	296,600	$115,229			
1.10.19	BD - 41 Drum Crusher Building	996,800	527	286	0	0	254,628	227	3	1,251,714	$106,884			
1.10.20	BD - 42 STF Area Building			17,820	16	0	338,580	302	5	356,400	$138,461			
1.10.21	BD - 44 KPA Bioassembly Lab Urine Analysis Trailer													
1.10.22	BD - 49 Storage Shed For Cylinder Hauler						6,600	6	0	6,600	$1,980			
1.10.23	BD - 5 GF2 North Cell Room, D&E Rect and D&E South Pad			26,785	15	0	508,915	454	7	535,700	$208,119			
1.10.24	BD - 50 Storage Building													
1.10.25	BD - 52 Control Room Building for HF Railcar Off Loading						4,400	4	0	4,400	$1,320			
1.10.26	BD - 7 Power House Building			15,494	9	0	294,381	263	4	309,875	$120,386			
1.10.27	BD - 79 Drum Wash Building	448,560	237	15	0	0	112,419	100	1	560,994	$47,213			
1.10.28	BD - 8 Paint Building													
1.10.29	BD - 83 Liquid Nitrogen Building													
1.10.30	BD - 84, BD-85, BD-86 and BD-100 Structures	1,602,000	847				404,500	361	5	2,006,500	$169,410			
1.10.31	BD - 9 Dealkalization Building													
1.10.32	BD - 92 Waste Sorting Building			250	0	0	4,750	4	0	5,000	$1,943			
1.10.33	P-1052 Diesel Compressor Trailer South of the Power House						40,000	36	1	40,000	$12,000			
1.10.34	Portable Steam Supply Trailer East of the Power House						44,000	39	1	44,000	$13,200			
1.10.35	Waste Storage Area						3,561,250	3,177	47	3,561,250	$1,068,375		3,561,250	
1.11.1	Develop D&D Plan													
1.11.2	Lockdown													
1.11.3	Pre-Mobilzation													
1.11.4	Mobilization													
1.11.5	Demobilization													
Total		**32,255,821**	**17,257**	**17,193,843**	**9,870**	**115**	**218,233,893**	**194,679**	**2,910**	**267,683,557**	**$102,029,098**	**22,052,920**	**197,572,669**	**1,006,950**

APPENDIX A–3: Labor Summary (Man-Hours)

Appendix A-3: Labor Summary (man-hours)

WBS #	Level 3 Name	Administrative Assistant	Assistant Project Manager	Cost & Schedule Specialist	EH&S Manager	Engineer	Environmental Scientist	Equipment Operator, Crane or Shovel	Equipment Operator, Medium Equipment	Foreman	Junior Health Physics Technician	Laborer	Millwrights	Oiler/Rigger	Project Manager	Quality Assurance Professional	Radiation Safety Officer/Certified Health Physicist	Senior Engineer/Consultant	Senior Health Physics Technician	Superintendent	Truck Drivers, Heavy	Waste Manager	Total Man-Hours
1.1.1	BD - 1 Administrative Building				48				104	96		120	104	8					96		24	24	624
1.1.2	BD - 43 and BD - 76 Contractor Security Entrance				4				8	8		8	8						8		2	2	48
1.1.3	BD - 58 Learning Resource Center				8				16	16		16	16						16		4	4	96
1.1.4	BD - 6 Shop and Stores Building				48				96	96		96	96								24		456
1.1.5	BD - 69 Admin - Nuclear Compliance Trailer				20				80	40		120	40						40		40	10	390
1.1.6	BD - 87 Janitorial Storage Building				8				24	16		32	16						8		10	4	118
1.1.7	BD - Sub - 11 CIPS Sub Station																						
1.1.8	BD-80 Break Room and Shed				4				16	8		24	8								8	2	70
1.2.1	Asbestos Removal and Disposal																						
1.3.1	Land Area P-21 and P-24																						
1.3.2	Landfill and Kickback Area						220		688	688	440	688							440		1,624	220	5,008
1.3.3	Non-Impacted Outside Plant Areas																						
1.3.4	Outfall 002						100		392	392	392	392							200		400	100	2,368
1.3.5	P-23 Fuel Depot				8				32	16		16	16	16							4		108
1.3.6	Roadways and Ground Areas (P-25)																						
1.3.7	Security Exclusion Area (P-26)						16		56	56	32	56							32		136	16	400
1.4.1	Preparatory Plans and Procedures					184										92	184					92	552
1.5.1	BD - 48 UF6 Cylinder Storage								248	124		992							496		248	124	2,232
1.5.2	Drum Storage Pads								44	22		176							88		44	22	396
1.5.3	Ore Storage Pads								920	460		3,680							1,840		920	460	8,280
1.6.1	Misc. Non-labor costs																						
1.7.1	2009 Subsurface Soils						340		1,080	1,080	680	1,080							680		2,560	340	7,840
1.7.2	Parking Lot																						
1.7.3	U-1040 and U-1041 Sanitary Treatment System				40		4		148	96	8	128	80	64					88		60	24	740
1.8.3	FSS Surveys and Samples								240		1,920	960							960				4,080
1.8.4	Final Project Report	240	240			480									120	240	480	120				240	2,160
1.8.5	Project Management	20,488	10,244	10,244		10,244									20,488	10,244	20,488					10,244	112,684
1.9.1	BD - 15 Cylinder Wash Building				28				112	56		72	88	48					56		20	14	494
1.9.2	BD - 16 Pond Muds Calciner Area & Uranium Ponds Equipment Area				56		8		240	128	16	128	160	112					128		60	36	1,072
1.9.3	BD - 17 Iodium Removal and BD-19 Uranium Recovery				236				920	472		656	576	368					472		196	118	4,014
1.9.4	BD - 20 KOH Muds Building				28				96	56		88	56	32					56		32	14	458
1.9.5	BD - 21 Ore Drum Dumper, Washer & Crusher Building				40				152	80		104	136	64					80		32	20	708
1.9.6	BD - 23 (ORE) Sampling Plant				112				448	224		240	376	216					224		62	56	1,958
1.9.7	BD - 29 Feed Materials Building				972		68		2,746	2,160	136	3,080	2,416	1,096					2,080		1,004	554	16,312
1.9.8	BD - 3 GF2 South Cell Room and Production Offices				136				488	272		528	328	128					272		68	68	2,288
1.9.9	BD - 89 Feed Materials Building South Pad East Side				36				100	72		104	88	32					72		24	18	546
1.9.10	FMB Post Demolition Concrete Pads Survey				252		64		1,208	704	128	1,712	504						632		976	190	6,370
1.9.11	Tank Yard				288				998	576		664	640	488					576		144	144	4,518
1.10.1	BD - 10 FPF Area Building				132				528	264		264	384	264					264		66	66	2,232
1.10.2	BD - 101 Storage Tent				16				64	32		32	64	32					32		8	8	288
1.10.3	BD - 11 CAF2 Recovery Area Building				96				384	192		192	256	192					192		48	48	1,600
1.10.4	BD - 14 Liquid Flourine Facility				72				246	144		168	200	120					144		36	36	1,166
1.10.5	BD - 18 Ore Storage Building				12				88	44		184	48	24					104		46	26	576
1.10.6	BD - 2 Laboratory Equipment Building				344				1,376	688		1,808	816	128					688		592	172	6,612
1.10.7	BD - 22 Scale House Area BD - 36				8				52	26		96	32	16					56		24	14	324
1.10.8	BD - 25 CFX Building				32				128	64		64	128	64					64		16	16	576
1.10.9	BD - 26 RCRA Large Drum Storage Area				4				96	48		328	16	8					168		82	42	792
1.10.10	BD - 27 Switch House Building																						
1.10.11	BD - 28 Safety Building				8				32	16		32	24	8					16		10	4	150
1.10.12	BD - 32 Supply Storage Building for BD - 69																						
1.10.13	BD - 33 Fines Storage Building				332				1,388	694		2,216	672	8					784		718	196	7,008

Appendix A-3: Labor Summary (man-hours)

WBS #	Level 3 Name	Administrative Assistant	Assistant Project Manager	Cost & Schedule Specialist	EH&S Manager	Engineer	Environmental Scientist	Equipment Operator, Crane or Shovel	Equipment Operator, Medium Equipment	Foreman	Junior Health Physics Technician	Laborer	Millwrights	Oiler/Rigger	Project Manager	Quality Assurance Professional	Radiation Safety Officer/Certified Health Physicist	Senior Engineer/Consultant	Senior Health Physics Technician	Superintendent	Truck Drivers, Heavy	Waste Manager	Total Man-Hours
1.10.14	BD - 34 Drum Crusher Building				140				600	300		856	352	72					360		266	90	3,036
1.10.15	BD - 35 GF2 Cell Cond and Maintenance				72				288	144		144	224	144					144		36	36	1,232
1.10.16	BD - 37 Ion Exchange and Potassium Removal Building				88				352	176		320	216	104					176		98	44	1,574
1.10.17	BD - 39 Sand Blast Building				20				64	40		48	56	24					40		16	10	318
1.10.18	BD - 4 GF2 C Cell Room, ABC South Pad and A&B Rect				92				368	184		184	304	184					184		46	46	1,592
1.10.19	BD - 41 Drum Crusher Building				28				112	56		152	64	8					56		50	14	540
1.10.20	BD - 42 STF Area Building				72				162	144		288	152	72					144		36	36	1,106
1.10.21	BD - 44 KPA Bioassembly Lab Urine Analysis Trailer																						
1.10.22	BD - 49 Storage Shed For Cylinder Hauler				16				64	32		32	64	32					32		8	8	288
1.10.23	BD - 5 GF2 North Cell Room, D&E Rect and D&E South Pad				128				484	256		288	432	240					256		64	64	2,212
1.10.24	BD - 50 Storage Building																						
1.10.25	BD - 52 Control Room Building for HF Railcar Off Loading				8				32	16		16	32	16					16		4	4	144
1.10.26	BD - 7 Power House Building				324				1,296	648		648	1,056	648					648		162	162	5,592
1.10.27	BD - 79 Drum Wash Building				16				56	32		80	32						32		26	8	282
1.10.28	BD - 8 Paint Building																						
1.10.29	BD - 83 Liquid Nitrogen Building																						
1.10.30	BD - 84, BD-85, BD-86 and BD-100 Structures				40				160	80		224	88	8					80		74	20	774
1.10.31	BD - 9 Dealkalization Building																						
1.10.32	BD - 92 Waste Sorting Building				8				32	16		16	32	16					16		4	4	144
1.10.33	P-1052 Diesel Compressor Trailer South of the Power House				20				80	40		120	120	40					40		10	10	480
1.10.34	Portable Steam Supply Trailer East of the Power House				32				120	64		64	120	56					64		16	16	552
1.10.35	Waste Storage Area						16		96	96	32	96							32		256	16	640
1.11.1	Develop D&D Plan					320										80		80					480
1.11.2	Lockdown										880	3,520							880	220			5,500
1.11.3	Pre-Mobilzation					120		240	480		480	960				120			480	120			3,000
1.11.4	Mobilization					120			120		120	240				60			120				780
1.11.5	Demobilization										960	480					60		480				1,980
Total		20,728	10,484	10,244	4,532	11,468	836	240	21,048	12,550	6,224	30,120	11,736	5,200	20,608	10,836	21,212	200	16,432	340	11,544	14,376	240,958

APPENDIX A–4: Equipment Summary

Appendix A-4: Equipment Summary

WBS #	Level 3 Name	Rent backhoe-loader 40 to 45 HP 5/8 CY capacity, Incl. Hourly Oper. Cost.	Rent crane truck mounted, hydraulic, 12 ton capacity, Incl. Hourly Oper. Cost.	Rent dozer, crawler, torque converter, diesel 200 HP, Incl. Hourly Oper. Cost.	Rent excavator attachment, shear/grapples, Incl. Hourly Oper. Cost.	Rent excavator attachment, hydraulic hammer, 12,000 ft lbs, Incl. Hourly Oper. Cost.	Rent excavator diesel hydraulic crawler mounted 3.5 CY capacity, Incl. Hourly Oper. Cost.	Rent front end loader, 4WD, art. frame, diesel, 2.5 - 3.5 CY 145 HP, Incl. Hourly Oper. Cost.	Rent loader, skid steer, wheeled, 1 CY 78 HP, diesel, Incl. Hourly Oper. Cost.	Rent trash pump self-prime 2" diameter gas drive, Incl. Hourly Oper. Cost.	Rent truck dump 3 axle 16 ton, 12 C.Y. payload, 400 H.P., Incl. Hourly Oper. Cost.
1.1.1	BD - 1 Administrative Building		$552						$6,209		
1.1.2	BD - 43 and BD - 76 Contractor Security Entrance								$517		
1.1.3	BD - 58 Learning Resource Center								$1,035		
1.1.4	BD - 6 Shop and Stores Building								$6,209		
1.1.5	BD - 69 Admin - Nuclear Compliance Trailer				$776		$12,660	$3,700			$2,807
1.1.6	BD - 87 Janitorial Storage Building				$155		$2,532	$740	$517		$561
1.1.7	BD - Sub - 11 CIPS Sub Station										
1.1.8	BD-80 Break Room and Shed				$155		$2,532	$740			$561
1.2.1	Asbestos Removal and Disposal										
1.3.1	Land Area P-21 and P-24										
1.3.2	Landfill and Kickback Area			$54,626			$139,265	$40,704		$9,619	$113,956
1.3.3	Non-Impacted Outside Plant Areas										
1.3.4	Outfall 002	$7,756						$17,762		$2,684	
1.3.5	P-23 Fuel Depot		$1,103						$1,035		
1.3.6	Roadways and Ground Areas (P-25)										
1.3.7	Security Exclusion Area (P-26)			$5,286			$10,128	$2,960		$783	$9,543
1.4.1	Preparatory Plans and Procedures										
1.5.1	BD - 48 UF6 Cylinder Storage								$16,039		
1.5.2	Drum Storage Pads								$2,846		
1.5.3	Ore Storage Pads								$59,501		
1.6.1	Misc. Non-labor costs										
1.7.1	2009 Subsurface Soils			$88,107			$215,228	$62,907		$15,100	$179,635
1.7.2	Parking Lot										
1.7.3	U-1040 and U-1041 Sanitary Treatment System		$4,413	$1,762			$2,532	$740	$5,174	$224	$2,807
1.8.3	FSS Surveys and Samples										
1.8.4	Final Project Report										
1.8.5	Project Management										
1.9.1	BD - 15 Cylinder Wash Building		$3,310		$155		$2,532	$740	$3,104		$561
1.9.2	BD - 16 Pond Muds Calciner Area & Uranium Ponds Equipment Area		$7,723				$5,064	$1,480	$7,244	$224	$2,245
1.9.3	BD - 17 Iodium Removal and BD-19 Uranium Recovery		$25,375		$2,018		$32,917	$9,621	$23,800		$7,298
1.9.4	BD - 20 KOH Muds Building		$2,206		$466		$7,596	$2,220	$2,070		$1,684
1.9.5	BD - 21 Ore Drum Dumper, Washer & Crusher Building		$4,413		$310		$5,064	$1,480	$4,139		$1,123
1.9.6	BD - 23 (ORE) Sampling Plant		$14,894		$155		$2,532	$740	$13,970		$561
1.9.7	BD - 29 Feed Materials Building		$75,572	$17,621	$155	$8,182	$65,834	$19,242	$121,072	$3,020	$40,979
1.9.8	BD - 3 GF2 South Cell Room and Production Offices		$8,826			$14,319	$35,449	$10,361	$10,348		$7,859
1.9.9	BD - 89 Feed Materials Building South Pad East Side		$2,206		$155		$2,532	$740	$4,139		$561
1.9.10	FMB Post Demolition Concrete Pads Survey			$15,859		$64,437	$200,035	$58,466		$2,796	$68,486
1.9.11	Tank Yard		$33,649						$37,253		
1.10.1	BD - 10 FPF Area Building		$18,203						$17,074		
1.10.2	BD - 101 Storage Tent		$2,206						$2,070		
1.10.3	BD - 11 CAF2 Recovery Area Building		$13,239						$12,418		
1.10.4	BD - 14 Liquid Flourine Facility		$8,274						$9,313		
1.10.5	BD - 18 Ore Storage Building		$1,655						$4,139		
1.10.6	BD - 2 Laboratory Equipment Building		$8,826		$10,865		$177,246	$51,806	$8,278		$39,295
1.10.7	BD - 22 Scale House Area BD - 36		$1,103						$2,328		
1.10.8	BD - 25 CFX Building		$4,413						$4,139		
1.10.9	BD - 26 RCRA Large Drum Storage Area		$552						$5,691		
1.10.10	BD - 27 Switch House Building										
1.10.11	BD - 28 Safety Building		$552		$155		$2,532	$740	$517		$561

Appendix A-4: Equipment Summary

WBS #	Level 3 Name	Rent backhoe-loader 40 to 45 HP 5/8 CY capacity, Incl. Hourly Oper. Cost.	Rent crane truck mounted, hydraulic, 12 ton capacity, Incl. Hourly Oper. Cost.	Rent dozer, crawler, torque converter, diesel 200 HP, Incl. Hourly Oper. Cost.	Rent excavator attachment, shear/grapples, Incl. Hourly Oper. Cost.	Rent excavator attachment, hydraulic hammer, 12,000 ft lbs, Incl. Hourly Oper. Cost.	Rent excavator diesel hydraulic crawler mounted 3.5 CY capacity, Incl. Hourly Oper. Cost.	Rent front end loader, 4WD, art. frame, diesel, 2.5 - 3.5 CY 145 HP, Incl. Hourly Oper. Cost.	Rent loader, skid steer, wheeled, 1 CY 78 HP, diesel, Incl. Hourly Oper. Cost.	Rent trash pump self-prime 2" diameter gas drive, Incl. Hourly Oper. Cost.	Rent truck dump 3 axle 16 ton, 12 C.Y. payload, 400 H.P., Incl. Hourly Oper. Cost.
1.10.12	BD - 32 Supply Storage Building for BD - 69										
1.10.13	BD - 33 Fines Storage Building		$552		$12,728		$207,631	$60,687	$4,398		$46,032
1.10.14	BD - 34 Drum Crusher Building		$4,965		$4,036		$65,834	$19,242	$7,244		$14,595
1.10.15	BD - 35 GF2 Cell Cond and Maintenance		$9,929						$9,313		
1.10.16	BD - 37 Ion Exchange and Potassium Removal Building		$7,171		$1,397		$22,789	$6,661	$6,726		$5,052
1.10.17	BD - 39 Sand Blast Building		$1,655		$155		$2,532	$740	$2,070		$561
1.10.18	BD - 4 GF2 C Cell Room, ABC South Pad and A&B Rect		$12,687						$11,900		
1.10.19	BD - 41 Drum Crusher Building		$552		$931		$15,193	$4,440	$517		$3,368
1.10.20	BD - 42 STF Area Building		$4,965						$9,313		
1.10.21	BD - 44 KPA Bioassembly Lab Urine Analysis Trailer										
1.10.22	BD - 49 Storage Shed For Cylinder Hauler		$2,206						$2,070		
1.10.23	BD - 5 GF2 North Cell Room, D&E Rect and D&E South Pad		$16,549						$16,557		
1.10.24	BD - 50 Storage Building										
1.10.25	BD - 52 Control Room Building for HF Railcar Off Loading		$1,103						$1,035		
1.10.26	BD - 7 Power House Building		$44,681						$41,909		
1.10.27	BD - 79 Drum Wash Building				$466		$7,596	$2,220	$517		$1,684
1.10.28	BD - 8 Paint Building										
1.10.29	BD - 83 Liquid Nitrogen Building										
1.10.30	BD - 84, BD-85, BD-86 and BD-100 Structures		$552		$1,397		$22,789	$6,661	$517		$5,052
1.10.31	BD - 9 Dealkalization Building										
1.10.32	BD - 92 Waste Sorting Building		$1,103						$1,035		
1.10.33	P-1052 Diesel Compressor Trailer South of the Power House		$2,758						$2,587		
1.10.34	Portable Steam Supply Trailer East of the Power House		$3,861						$4,139		
1.10.35	Waste Storage Area			$14,097			$10,128	$2,960		$1,342	$17,964
1.11.1	Develop D&D Plan										
1.11.2	Lockdown										
1.11.3	Pre-Mobilization										
1.11.4	Mobilization										
1.11.5	Demobilization										
Total		**$7,756**	**$358,553**	**$197,360**	**$36,632**	**$86,939**	**$1,278,705**	**$391,502**	**$514,037**	**$35,792**	**$575,394**

Appendix A-4: Equipment Summary

WBS #	Level 3 Name	Rent truck pickup 3/4 ton 4 wheel drive, Incl. Hourly Oper. Cost.	Rent truck tractor 4 x 2 drive, 330 HP, Incl. Hourly Oper. Cost.	Rent truck, dump, 4 axle, 25 ton, 18 C.Y. payload, 450 H.P., Incl. Hourly Oper. Cost.	Rent vibratory plate compactor gas 18" plate 3000 lb blow, Incl. Hourly Oper. Cost.	Tandem axle roll-off truck	Concrete Grinding Equipment and Appurtenances	Cutting/Welding Equipment	Frisker - Ludlum Model 3 w/44-9	Gamma - Ludlum Model 2221 w/44-10	GPS - Trimble ProXR or similar	Hoisting Equipment	Totals
1.1.1	BD - 1 Administrative Building					$2,100		$1,200	$38	$180		$300	$10,579
1.1.2	BD - 43 and BD - 76 Contractor Security Entrance					$175		$100	$4	$20			$817
1.1.3	BD - 58 Learning Resource Center					$350		$200	$9	$40			$1,633
1.1.4	BD - 6 Shop and Stores Building					$2,100		$1,200					$9,509
1.1.5	BD - 69 Admin - Nuclear Compliance Trailer							$500	$21	$100			$20,565
1.1.6	BD - 87 Janitorial Storage Building					$175		$200	$4	$20			$4,905
1.1.7	BD - Sub - 11 CIPS Sub Station												
1.1.8	BD-80 Break Room and Shed							$100					$4,089
1.2.1	Asbestos Removal and Disposal												
1.3.1	Land Area P-21 and P-24												
1.3.2	Landfill and Kickback Area	$17,630				$38,500			$234	$1,100			$415,635
1.3.3	Non-Impacted Outside Plant Areas												
1.3.4	Outfall 002	$10,045		$21,842	$889	$17,500			$208	$980	$978		$80,644
1.3.5	P-23 Fuel Depot					$350		$200					$2,688
1.3.6	Roadways and Ground Areas (P-25)												
1.3.7	Security Exclusion Area (P-26)	$1,435				$2,800			$17	$80			$33,033
1.4.1	Preparatory Plans and Procedures												
1.5.1	BD - 48 UF6 Cylinder Storage		$15,833				$26,350		$264	$1,240			$59,726
1.5.2	Drum Storage Pads		$2,809				$4,675		$47	$220			$10,596
1.5.3	Ore Storage Pads		$58,734				$97,750		$978	$4,600			$221,562
1.6.1	Misc. Non-labor costs												
1.7.1	2009 Subsurface Soils	$27,675				$59,500			$361	$1,700			$650,213
1.7.2	Parking Lot												
1.7.3	U-1040 and U-1041 Sanitary Treatment System	$410				$2,450		$1,000	$47	$220			$21,779
1.8.3	FSS Surveys and Samples												
1.8.4	Final Project Report												
1.8.5	Project Management												
1.9.1	BD - 15 Cylinder Wash Building					$1,050		$700	$30	$140			$12,323
1.9.2	BD - 16 Pond Muds Calciner Area & Uranium Ponds Equipment Area	$410				$3,850		$1,400	$68	$320			$30,028
1.9.3	BD - 17 Iodium Removal and BD-19 Uranium Recovery					$8,050		$5,900	$251	$1,180			$116,409
1.9.4	BD - 20 KOH Muds Building					$700		$700	$30	$140			$17,812
1.9.5	BD - 21 Ore Drum Dumper, Washer & Crusher Building					$1,400		$1,000	$43	$200			$19,172
1.9.6	BD - 23 (ORE) Sampling Plant					$4,725		$2,800	$119	$560			$41,056
1.9.7	BD - 29 Feed Materials Building	$5,535				$52,850		$24,300	$1,105	$5,200			$440,668
1.9.8	BD - 3 GF2 South Cell Room and Production Offices					$3,500		$3,400	$145	$680			$94,887
1.9.9	BD - 89 Feed Materials Building South Pad East Side					$1,400		$900	$38	$180			$12,853
1.9.10	FMB Post Demolition Concrete Pads Survey	$5,125				$11,200		$6,300	$336	$1,580			$434,621
1.9.11	Tank Yard					$12,600		$7,200	$306	$1,440			$92,448
1.10.1	BD - 10 FPF Area Building					$5,775		$3,300	$140	$660			$45,153
1.10.2	BD - 101 Storage Tent					$700		$400	$17	$80			$5,473
1.10.3	BD - 11 CAF2 Recovery Area Building					$4,200		$2,400	$102	$480			$32,838
1.10.4	BD - 14 Liquid Flourine Facility					$3,150		$1,800	$77	$360			$22,974
1.10.5	BD - 18 Ore Storage Building		$2,554			$525	$4,250	$300	$55	$260			$13,738
1.10.6	BD - 2 Laboratory Equipment Building					$2,800		$8,600	$366	$1,720			$309,802
1.10.7	BD - 22 Scale House Area BD - 36		$1,277			$350	$2,125	$200	$30	$140			$7,553
1.10.8	BD - 25 CFX Building					$1,400		$800	$34	$160			$10,946
1.10.9	BD - 26 RCRA Large Drum Storage Area		$5,107			$175	$8,500	$100	$89	$420			$20,635
1.10.10	BD - 27 Switch House Building												
1.10.11	BD - 28 Safety Building					$175		$200	$9	$40			$5,481

Appendix A-4: Equipment Summary

WBS #	Level 3 Name	Rent truck pickup 3/4 ton 4 wheel drive, Incl. Hourly Oper. Cost.	Rent truck tractor 4 x 2 drive, 330 HP, Incl. Hourly Oper. Cost.	Rent truck, dump, 4 axle, 25 ton, 18 C.Y. payload, 450 H.P., Incl. Hourly Oper. Cost.	Rent vibratory plate compactor gas 18" plate 3000 lb blow, Incl. Hourly Oper. Cost.	Tandem axle roll-off truck	Concrete Grinding Equipment and Appurtenances	Cutting/Welding Equipment	Frisker - Ludlum Model 3 w/44-9	Gamma - Ludlum Model 2221 w/44-10	GPS - Trimble ProXR or similar	Hoisting Equipment	Totals
1.10.12	BD - 32 Supply Storage Building for BD - 69												
1.10.13	BD - 33 Fines Storage Building		$3,830			$175	$6,375	$8,300	$417	$1,960			$353,084
1.10.14	BD - 34 Drum Crusher Building		$2,554			$1,575	$4,250	$3,500	$191	$900			$128,886
1.10.15	BD - 35 GF2 Cell Cond and Maintenance					$3,150		$1,800	$77	$360			$24,629
1.10.16	BD - 37 Ion Exchange and Potassium Removal Building					$2,275		$2,200	$94	$440			$54,805
1.10.17	BD - 39 Sand Blast Building					$700		$500	$21	$100			$9,034
1.10.18	BD - 4 GF2 C Cell Room, ABC South Pad and A&B Rect					$4,025		$2,300	$98	$460			$31,470
1.10.19	BD - 41 Drum Crusher Building					$175		$700	$30	$140			$26,046
1.10.20	BD - 42 STF Area Building					$3,150		$1,800	$77	$360			$19,664
1.10.21	BD - 44 KPA Bioassembly Lab Urine Analysis Trailer												
1.10.22	BD - 49 Storage Shed For Cylinder Hauler					$700		$400	$17	$80			$5,473
1.10.23	BD - 5 GF2 North Cell Room, D&E Rect and D&E South Pad					$5,600		$3,200	$136	$640			$42,681
1.10.24	BD - 50 Storage Building												
1.10.25	BD - 52 Control Room Building for HF Railcar Off Loading					$350		$200	$9	$40			$2,737
1.10.26	BD - 7 Power House Building					$14,175		$8,100	$344	$1,620			$110,830
1.10.27	BD - 79 Drum Wash Building					$175		$400	$17	$80			$13,156
1.10.28	BD - 8 Paint Building												
1.10.29	BD - 83 Liquid Nitrogen Building												
1.10.30	BD - 84, BD-85, BD-86 and BD-100 Structures					$175		$1,000	$43	$200			$38,385
1.10.31	BD - 9 Dealkalization Building												
1.10.32	BD - 92 Waste Sorting Building					$350		$200	$9	$40			$2,737
1.10.33	P-1052 Diesel Compressor Trailer South of the Power House					$875		$500	$21	$100			$6,841
1.10.34	Portable Steam Supply Trailer East of the Power House					$1,400		$800	$34	$160			$10,395
1.10.35	Waste Storage Area	$2,460				$2,800			$17	$80			$51,849
1.11.1	Develop D&D Plan												
1.11.2	Lockdown												
1.11.3	Pre-Mobilzation												
1.11.4	Mobilization												
1.11.5	Demobilization												
Total		**$70,725**	**$92,697**	**$21,842**	**$889**	**$288,400**	**$154,275**	**$113,300**	**$7,268**	**$34,200**	**$978**	**$300**	**$4,267,544**

APPENDIX A–5: PLF to UCF Application

Appendix A-5: PLF to UCF Application

Name	Reference (RS Means, et al)	Description	Daily Output without PLF:	PLF Type	PLF	Daily Output adjusted for PLF	Unit of Measure
Erosion Control	312514161000	Synthetic erosion control, silt fence, install and maintain, remove, 3' high	650.0	Breaks only	1.15	565.2	Feet
Excavate Trench, down to 3 feet	312316130060	Excavate trench, common earth, backhoe, 0 to 3 feet deep, assume material is potentially contaminated, excludes sheeting or dewatering	200.0	Protective Clothing, Radiological Work, and Breaks	1.63	123.0	Cubic Yard
Excavate Trench, down to 6 feet	312316130120	Excavate trench, common earth, 1.5 C.Y. excavator, 0 to 6 feet deep, assume material is potentially contaminated, excludes sheeting	400.0	Protective Clothing, Radiological Work, and Breaks	1.63	245.9	Cubic Yard
Excavate Deep Trench, down to 24 feet	312316131386	Excavate trench, common earth, 1 C.Y. excavator, down to 24 feet deep, assume material is potentially contaminated	271.0	All factors except Respirator	1.84	147.4	Cubic Yard
Remove Contaminated Utility Pipe	024113233200	Utility removal, pipe, sewer/water, steel, welded connections, 4" diameter, remove, excludes excavation, hauling	160.0	All Factors	2.38	67.3	Feet
Remove Contaminated Catch Basin or Manhole	024113230020	Remove contaminated catch basin or manhole	4.0	All Factors	2.38	1.7	Each
Trench Backfill	312323160050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, assume backfill occurs at same time.	150.0	Breaks only	1.15	130.4	Cubic Yard
Excavate Bulk	312316420200	Excavating to 16 feet, bulk bank measure, includes minimal dewatering	800.0	Protective Clothing, Radiological Work, and Breaks	1.63	491.8	Cubic Yard
Bulk Backfill	312323170020	Fill, dumped material, spread, by dozer, excludes compaction. Assume material is from on-site stockpile.	1,000.0	Breaks only	1.15	869.6	Cubic Yard
Bulk Compaction	312323235060	Compaction, riding, vibrating roller, 2 passes, 12" lifts , assume material is from on-site stockpile.	5,200.0	Breaks only	1.15	4,521.7	Cubic Yard
Topsoil Placement	329119131000	Topsoil placement and grading, loam or topsoil, fine grading and seeding, with equipment	1,000.0	Breaks only	1.15	869.6	Square Yard
Seeding	329219130310	Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	1,000.0	Breaks only	1.15	869.6	Square Yard
Synthetic Erosion Control	312514160120	Synthetic erosion control, revegetation mat, webbed	1,000.0	Breaks only	1.15	869.6	Square Yard
Characterization Survey 1	ENERCON records	Scan Survey	5,000.0	Protective Clothing, Radiological Work, and Breaks	1.63	3,073.8	Square Yards
Characterization Survey 2	ENERCON records	Static Survey	200.0	Protective Clothing, Radiological Work, and Breaks	1.63	123.0	Square Yards
Radiological Sample, Soil	ENERCON records	Radiological soil sample. Does not include costs for laboratory analysis.	16.0	Protective Clothing, Radiological Work, and Breaks	1.63	9.8	Per Day
Remove clean concrete anchored steel liner	NESP Table 3.5b-1	Clean concrete anchored steel liners will be removed by cutting steel plates and prying the plates from the wall. Cutting and prying of the adjacent pieces is assumed. The pieces will be moved to the packaging area.	133.0	Breaks only	1.15	115.7	Square Feet
Remove clean free standing steel liner	NESP Table3.5b-3	Clean concrete free steel liners will be removed by cutting steel plates and prying the plates from the wall. Each section will be 3.5' x 7.5' or 26.25 sq. ft. and 2.00" thick. Cutting and prying of the adjacent pieces is assumed. The pieces will be moved to the packaging area	168.0	Breaks only	1.15	146.1	Square Feet
Remove clean steel grating	055313700504	Steel floor gating will be removed in the same manner as it was installed.	450.0	Height and Breaks only	1.32	340.3	Square Feet
Bulk removal clean standard (<2 feet thick) reinforced concrete.	024116172500	Removal of standard reinforced concete will be performed with an excavator mounted demolition hammer. Rubble will be removed with a front end loader.	2,500.0	Breaks only	1.15	2,173.9	Cubic Feet
Bulk removal clean monolithic (> 2 feet thick) reinforced concrete.	030505100060	Removal of standard reinforced concete will be performed with an excavator mounted demolition hammer. Rubble will be removed with a front end loader.	432.0	Breaks only	1.15	375.7	Cubic Feet
Remove clean block wall	040505100360	Removal of standard concete block will be performed with an excavator mounted demolition hammer. Rubble will be removed with a front end loader.	950.0	Breaks only	1.15	826.1	Cubic Feet
Remove clean slab-on-grade concrete	024113304300	Removal of standard slab-on-grade concrete will be performed with an excavator mounted demolition hammer. Rubble will be removed with a front end loader.	1,215.0	Breaks only	1.15	1,056.5	Cubic Feet
Remove clean structural steel	050505100270	Removal of clean structural steel will be performed with an excavator mounted hydraulic shear. Steel includes structural beams and miscellaneous steel components.	180.0	Height and Breaks only	1.32	136.1	Ton
Remove clean building by volume	024116130100	Miscellaneous site structures (warehouses, small buildings, etc.) will be removed by disassembly of the structure.	20,100.0	Breaks only	1.15	17,478.3	Cubic Feet
Remove clean built-up roof	070505103720	Remove built up roof, with gravel from building.	890.0	Height and Breaks only	1.32	673.0	Square Feet
Remove clean metal siding	070505105320	Remove metal siding from building.	10,000.0	Breaks only	1.15	8,695.7	Square Feet

Appendix A-5: PLF to UCF Application

Name	Reference (RS Means, et al)	Description	Daily Output without PLF:	PLF Type	PLF	Daily Output adjusted for PLF	Unit of Measure
Wire Saw Clean Concrete		Removal of clean concete (standard reinforcement) will be performed by wire sawing. Concrete blocks will be rigged, lifted, and removed from the structure. Daily output is based on area of cut face.	225.8	Breaks only	1.15	196.4	Square Feet
Removal of Clean Window and Frame	080505201040 (rate doubled to account for larger crew size)	Window demolition, steel, remove old mesh	400.0	Height and Breaks only	1.32	302.5	Square Feet
Remove contaminated concrete anchored steel liner	NESP Table 3.5b-2	Contaminated concrete anchored steel liners will be removed by cutting steel plates and prying the plates from the wall. Cutting and prying of the adjacent pieces is assumed. The pieces will be moved to the packaging area.	133.0	Protective Clothing, Radiological Work, and Breaks	1.63	81.8	Square Feet
Remove contaminated free standing steel liner	NESP Table3.5b-3	contaminated concrete free steel liners will be removed by cutting steel plates and prying the plates from the wall. Each section will be 3.5' x 7.5' or 26.25 sq. ft. and 2.00" thick. Cutting and prying of the adjacent pieces is assumed. The pieces will be moved to the packaging area	168.0	Protective Clothing, Radiological Work, and Breaks	1.63	103.3	Square Feet
Remove contaminated steel grating	055313700504	Steel floor gating will be removed in the same manner as it was installed.	450.0	All factors except Respirator	1.84	244.7	Square Feet
Bulk removal contaminated standard (< 0.6m thick) reinforced concrete.	024116172500	Removal of standard reinforced concete will be performed with an excavator mounted demolition hammer. Rubble will be removed with a front end loader.	2,500.0	Protective Clothing, Radiological Work, and Breaks	1.63	1,536.9	Cubic Feet
Bulk removal contaminated monolithic (> 2 feet thick) reinforced concrete.	030505100060	Removal of standard reinforced concete will be performed with an excavator mounted demolition hammer. Rubble will be removed with a front end loader.	432.0	Protective Clothing, Radiological Work, and Breaks	1.63	265.6	Cubic Feet
Remove contaminated block wall	040505100360	Removal of standard concete block will be performed with an excavator mounted demolition hammer. Rubble will be removed with a front end loader.	950.0	Protective Clothing, Radiological Work, and Breaks	1.63	584.0	Cubic Feet
Remove contaminated slab-on-grade concrete	024113304300	Removal of standard slab-on-grade concrete will be performed with an excavator mounted demolition hammer. Rubble will be removed with a front end loader.	1,215.0	Protective Clothing, Radiological Work, and Breaks	1.63	746.9	Cubic Feet
Remove contaminated structural steel	050505100270	Removal of contaminated structural steel will be performed with an excavator mounted hydraulic shear. Steel includes structural beams and miscellaneous steel components.	180.0	All factors except Respirator	1.84	97.9	Ton
Remove contaminated building by volume	024116130100	Miscellaneous site structures (warehouses, small buildings, etc.) will be removed by disassembly of the structure.	20,100.0	All factors except Respirator	1.84	10,930.7	Cubic Feet
Remove contaminated built-up roof	070505103720	Remove built up roof, with gravel from building.	890.0	All factors except Respirator	1.84	484.0	Square Feet
Remove contaminated metal siding	070505105320	Remove metal siding from building.	10,000.0	Protective Clothing, Radiological Work, and Breaks	1.63	6,147.5	Square Feet
Wire Saw contaminated Concrete		Removal of contaminated concete (standard reinforcement) will be performed by wire sawing. Concrete blocks will be rigged, lifted, and removed from the structure. Daily output is based on area of cut face.	225.8	PLF included in NESP output	1.00	225.8	Square Feet
Scarify (Scabble) Concrete Walls and Ceiling	NESP Table 3.7c-2	Contaminated concrete surfaces can be decontaminated using a scarifying tool called a scabbler This equipment will remove a total depth of 0.5 inches by making two passes at 0.25 inches.	774.0	PLF included in NESP output	1.00	774.0	Square Feet
Shave Concrete Floors	NESP Volume 2 Table 3.7c-2	Contaminated concrete surfaces can be decontaminated using a scarifying tool called a scabbler This equipment will remove a total depth of .5 inches by making two passes at 0.25 inches.	1,944.0	Protective Clothing, Radiological Work, and Breaks	1.63	1,195.1	Square Feet
Surface decontamination of large surfaces using water lance	NESP Table 3.7a-2	Decontamination of large volume components will be done by hand using aa high pressure water lance. The waste water runoff will be directed to the building drain system and then to the facility treatment system.	119.0	Protective Clothing, Radiological Work, and Breaks	1.63	73.2	Square Feet
Surface decontamination of equipment manually	NESP Volume 2 Table 3.7a-1	Low-level radioactively contaminated equipment will be surface decontaminated using brushes and/or rags.	480.0	Protective Clothing, Radiological Work, and Breaks	1.63	295.1	Square Feet
Removal of Window and Frame	080505201040 (rate doubled to account for larger crew size)	Window demolition, steel, remove old mesh	400.0	All factors except Respirator	1.84	217.5	Square Feet
Remove clean pipe 0 to 2.5 inches	NESP Table 3.1a-1	Unit cost factor is based on the removal of clean pipe.	160.0	Breaks only	1.15	139.1	feet
Remove clean pipe 2.5 to 8 inches	NESP Table 3.1a-2	Unit cost factor is based on the removal of clean pipe.	100.0	Breaks only	1.15	87.0	Feet
Remove clean pipe > 8 inches	NESP Table 3.1a-3	Unit cost factor is based on the removal of clean pipe.	64.0	Breaks only	1.15	55.7	Feet
Remove clean valves 2.5 to 8 inches	NESP Table 3.1b-1	Unit cost factor is based on the removal of clean valves.	8.0	Breaks only	1.15	7.0	Each
Remove clean valves > 8 inches	NESP Table 3.1b-2	Unit cost factor is based on the removal of clean valves.	5.6	Breaks only	1.15	4.9	Each

Appendix A-5: PLF to UCF Application

Name	Reference (RS Means, et al)	Description	Daily Output without PLF:	PLF Type	PLF	Daily Output adjusted for PLF	Unit of Measure
Remove clean pumps < 300 pounds	NESP Table 3.3a-1	Unit cost factor is based on the removal of clean < 300 pound pumps with chain falls or small hoists.	7.4	Breaks only	1.15	6.4	Each
Remove clean pumps 300 to 1,000 pounds	NESP Table 3.3a-2	Unit cost factor is based on the removal of clean 300 to 1,000 pound pumps with chain falls or small hoists.	2.6	Breaks only	1.15	2.3	Each
Remove clean pumps 1,000 to 10,000 pounds	NESP Table 3.3a-3	Unit cost factor is based on the removal of clean 1,000 to 10,000 pound pumps with small crane.	0.5	Breaks only	1.15	0.4	Each
Remove clean pumps > 10,000 pound	NESP Table 3.3a-4	Unit cost factor is based on the removal of clean > 10,000 pumps with small crane.	0.4	Breaks only	1.15	0.3	Each
Remove clean turbine driven pumps < 10,000 pounds	NESP Table 3.3b-1	Unit cost factor is based on the removal of clean < 10,000 pound turbine driven pumps with small crane.	0.5	Breaks only	1.15	0.4	Each
Remove clean turbine driven pumps > 10,000 pound	NESP Table 3.3b-2	Unit cost factor is based on the removal of clean > 10,000 pound turbine driven pumps with large crane.	0.3	Breaks only	1.15	0.3	Each
Remove clean heat exchangers < 10,000 pound	NESP Table 3.3c-1	Unit cost factor is based on the removal of clean < 10,000 pound heat exchangers using small crane.	1.6	Breaks only	1.15	1.4	Each
Remove clean heat exchangers > 10,000 pound	NESP Table 3.3c-2	Unit cost factor is based on the removal of clean > 10,000 pound heat exchangers using crane.	0.7	Breaks only	1.15	0.6	Each
Remove clean tanks < 300 gallon	NESP Table 3.3e-1	Tanks with a volume of less than 300 gallon will be removed in one piece.	4.0	Breaks only	1.15	3.5	Each
Remove clean tanks 300 - 3,000 gallon	NESP Table 3.3e-2	Tanks with a volume of 300 - 3,000 gallons will be removed in one piece.	2.0	Breaks only	1.15	1.7	Each
Remove clean tanks > 3,000 gallons	NESP Table 3.3e-3	Tanks with a volume > 3,000 gallons will be removed in plate-like sections (26.25 square feet) with torch cutting. Based on a 10,000 gallon storage tank (823 square feet surface area)	0.3	Breaks only	1.15	0.3	Each
Remove clean miscellaneous equipment < 300 pounds	NESP Table 3.3f-1	Small equipment will be disconnected and removed.	6.0	Breaks only	1.15	5.2	Each
Remove clean miscellaneous equipment 300 to 1,000 pounds	NESP Table 3.3f-2	Components weighing 300 to 1,000 pounds will be de-energized, disconnected and removed.	3.0	Breaks only	1.15	2.6	Each
Remove clean miscellaneous equipment 1,000 to 10,000 pounds	NESP Table 3.3f-3	Components weighing 1,000 - 10,000 pounds will be de-energized, disconnected and removed.	2.0	Breaks only	1.15	1.7	Each
Remove clean miscellaneous equipment > 10,000 pounds	NESP Table 3.3f-4	Components weighing > 10,000 pounds will be de-energized, disconnected and removed.	0.7	Breaks only	1.15	0.6	Each
Remove clean electrical cable tray	NESP Table 3.3g-1	The cable in the trays will be removed in 50 foot lengths. The trays will be cut into 10 feet lengths.	800.0	Height and Breaks only	1.32	604.9	Feet
Remove clean electrical conduit	NESP Table 3.3g-2	The clean conduit will be cut into 10 foot length and the cable removed.	320.0	Height and Breaks only	1.32	242.0	Feet
Remove clean HVAC ductwork	NESP Table 3.3h	Removal of clean HVAC ductwork will be removed at a rate of approximately 1,000 pounds per day. Based on 18-gauge steel the removal rate will be 125 feet per day.	124.6	Height and Breaks only	1.32	94.2	Feet
Remove electrical transformers < 30 ton	NESP Table 3.3i-1	Tranformers up to 30 tons will be de-energized, disconnected, and removed.	1.3	Breaks only	1.15	1.1	Each
Remove clean electrical transformers 30 - 600 ton	NESP Table 3.3i-2	Tranformers 30 - 600 tons will be moved on-site with a multi-wheel transporter, to distribute the roadbed load. The transformer will be de-energized, disconnected, and removed to the staging area	0.5	Breaks only	1.15	0.4	Each
Remove clean overhead cranes/monorails < 10 ton	NESP Table 3.3j-1	Small cranes and hoists of less than 10 tons will be removed in one piece. Any steeel used as rails or a monorail will be removed with the structure.	3.2	Height and Breaks only	1.32	2.4	Each
Remove clean overhead cranes/monorails > 50 ton capacity	NESP Table 3.3j-2	Large cranes and/or hoists of 50 tons capacity or greater will be broken down into major sections for removal. These large cranes will be removed after the building housing has been opened and access for an exterior boom crane is possible.	0.4	Height and Breaks only	1.32	0.3	Each
Remove clean gantry cranes > 50 ton capacity	NESP Table 3.3j-3	Gantry cranes of 50 ton capacity or greater will be broken down into major sections for removal. These large cranes will be removed after the building housing has been opened and access for an exterior boom crane is possible.	0.2	Height and Breaks only	1.32	0.1	Each
Remove clean standby diesel generator	NESP Table 3.3l-1	Deisel generators weighing 20-40 tons must be removed onsite with a multi-wheel transporter. The diesel generator will be de-energized, disconnected, and removed to the staging area. Removal of the diesel generators are assumed to coincide with removal of the diesel-generator building.	0.3	Breaks only	1.15	0.3	Each
Remove contaminated pipe 0 to 2.5 inches	NESP Table 3.2a-1	Unit cost factor is based on the removal of contaminated pipe.	120.0	Protective Clothing, Radiological Work, and Breaks	1.63	73.8	feet

Appendix A-5: PLF to UCF Application

Name	Reference (RS Means, et al)	Description	Daily Output without PLF:	PLF Type	PLF	Daily Output adjusted for PLF	Unit of Measure
Remove contaminated pipe 2.5 to 8 inches	NESP Table 3.2a-2	Unit cost factor is based on the removal of contaminated pipe.	74.0	Protective Clothing, Radiological Work, and Breaks	1.63	45.5	Feet
Remove contaminated pipe > 8 inches	NESP Table 3.2a-3	Unit cost factor is based on the removal of contaminated pipe.	40.0	Protective Clothing, Radiological Work, and Breaks	1.63	24.6	Feet
Remove contaminated valves 2.5 to 8 inches	NESP Table 3.2b-1	Unit cost factor is based on the removal of contaminated valves.	6.0	Protective Clothing, Radiological Work, and Breaks	1.63	3.7	Each
Remove contaminated valves > 8 inches	NESP Table 3.2b-2	Unit cost factor is based on the removal of contaminated valves.	4.0	Protective Clothing, Radiological Work, and Breaks	1.63	2.5	Each
Remove contaminated pumps < 300 pounds	NESP Table 3.4a-1	Unit cost factor is based on the removal of contaminated < 300 pound pumps with chain falls or small hoists.	6.0	Protective Clothing, Radiological Work, and Breaks	1.63	3.7	Each
Remove contaminated pumps 300 to 1,000 pounds	NESP Table 3.4a-2	Unit cost factor is based on the removal of contaminated 300 to 1,000 pound pumps with chain falls or small hoists.	2.0	Protective Clothing, Radiological Work, and Breaks	1.63	1.2	Each
Remove contaminated pumps 1,000 to 10,000 pounds	NESP Table 3.4a-3	Unit cost factor is based on the removal of contaminated 1,000 to 10,000 pound pumps with small crane.	0.5	Protective Clothing, Radiological Work, and Breaks	1.63	0.3	Each
Remove contaminated pumps > 10,000 pound	NESP Table 3.4a-4	Unit cost factor is based on the removal of contaminated > 10,000 pumps with small crane.	0.3	Protective Clothing, Radiological Work, and Breaks	1.63	0.2	Each
Remove contaminated turbine driven pumps < 10,000 pounds	NESP Table 3.4b-1	Unit cost factor is based on the removal of contaminated < 10,000 pound turbine driven pumps with small crane.	0.4	Protective Clothing, Radiological Work, and Breaks	1.63	0.3	Each
Remove contaminated turbine driven pumps > 10,000 pound	NESP Table 3.4b-2	Unit cost factor is based on the removal of contaminated > 10,000 pound turbine driven pumps with large crane.	0.3	Protective Clothing, Radiological Work, and Breaks	1.63	0.2	Each
Remove contaminated heat exchangers < 3,000 pound	NESP Table 3.4c-1	Unit cost factor is based on the removal of contaminated < 3,000 pound heat exchangers using small crane.	1.1	Protective Clothing, Radiological Work, and Breaks	1.63	0.7	Each
Remove contaminated heat exchangers > 3,000 pound	NESP Table 3.3c-2	Unit cost factor is based on the removal of contaminated > 3,000 pound heat exchangers using crane.	0.5	Protective Clothing, Radiological Work, and Breaks	1.63	0.3	Each
Remove contaminated tanks < 300 gallon	NESP Table 3.4e-1	Tanks with a volume of less than 300 gallon will be removed in one piece.	2.7	Protective Clothing, Radiological Work, and Breaks	1.63	1.7	Each
Remove contaminated tanks > 300 gallon	NESP Table 3.4e-2	Tanks with a volume > 300 gallons will be removed in plate-like sections (26.25 square feet) with torch cutting. Based on a 10,000 gallon storage tank (823 square feet surface area)	0.2	Protective Clothing, Radiological Work, and Breaks	1.63	0.1	Each
Remove contaminated miscellaneous equipment < 300 pounds	NESP Table 3.4f-1	Small equipment will be disconnected and removed.	3.8	Protective Clothing, Radiological Work, and Breaks	1.63	2.4	Each
Remove contaminated miscellaneous equipment 300 to 1,000 pounds	NESP Table 3.4f-2	Components weighing 300 to 1,000 pounds will be de-energized, disconnected and removed.	2.2	Protective Clothing, Radiological Work, and Breaks	1.63	1.4	Each
Remove contaminated miscellaneous equipment 1,000 to 10,000 pounds	NESP Table 3.4f-3	Components weighing 1,000 - 10,000 pounds will be de-energized, disconnected and removed.	1.2	Protective Clothing, Radiological Work, and Breaks	1.63	0.8	Each
Remove contaminated miscellaneous equipment > 10,000 pounds	NESP Table 3.4f-4	Components weighing > 10,000 pounds will be de-energized, disconnected and removed.	0.5	Protective Clothing, Radiological Work, and Breaks	1.63	0.3	Each
Remove contaminated electrical cable tray	NESP Table 3.4g-1	The cable in the trays will be removed in 50 foot lengths. The trays will be cut into 10 feet lengths.	600.0	All factors	2.38	252.5	Feet
Remove contaminated electrical conduit	NESP Table 3.4g-2	The contaminated conduit will be cut into 10 foot length and the cable removed.	69.0	All factors	2.38	29.0	Feet
Remove contaminated HVAC ductwork	NESP Table 3.4h	Removal of contaminated HVAC ductwork will be removed at a rate of approximately 1,000 pounds per day. Based on 18-gauge steel the removal rate will be 125 feet per day.	124.6	All factors	2.38	52.4	Feet
Remove overhead cranes/monorails < 10 ton	NESP Table 3.3j-1	Small cranes and hoists of less than 10 tons will be removed in one piece. Any steeel used as rails or a monorail will be removed with the structure.	3.2	All factors	2.38	1.3	Each
Remove overhead cranes/monorails > 50 ton capacity	NESP Table 3.3j-2	Large cranes and/or hoists of 50 tons capacity or greater will be broken down into major sections for removal. These large cranes will be removed after the building housing has been opened and access for an exterior boom crane is possible.	0.4	All factors	2.38	0.2	Each
Remove gantry cranes > 50 ton capacity	NESP Table 3.3j-3	Gantry cranes of 50 ton capacity or greater will be broken down into major sections for removal. These large cranes will be removed after the building housing has been opened and access for an exterior boom crane is possible.	0.2	All factors	2.38	0.1	Each

Appendix A-5: PLF to UCF Application

Name	Reference (RS Means, et al)	Description	Daily Output without PLF:	PLF Type	PLF	Daily Output adjusted for PLF	Unit of Measure
Placement of scaffolding in clean areas	015423700090	Scaffolding will be erected in designated buildings and areas in an amount dependent on surface area. Cost also includes removal.	800.0	Height and Breaks only	1.32	604.9	Square Feet
Placement of scaffolding in contaminated areas	015423700090	Scaffolding will be erected in designated buildings and areas in an amount dependent on floor surface area.	800.0	All factors except Respirator	1.84	435.1	Square Feet
Size reduce debris from clean area	024116172500	Size reduction of clean debris will be completed at the same rate of the corresponding demolition. Excavator mounted tools and manual cutting equipment will be used.	2,500.0	Breaks only	1.15	2,173.9	Cubic Feet
Size reduce debris from contaminated area	024116172500	Size reduction of contaminated debris will be completed at the same rate of the corresponding demolition. Excavator mounted tools and manual cutting equipment will be used.	2,500.0	Protective Clothing, Radiological Work, and Breaks	1.63	1,536.9	Cubic Feet
Clean waste packaging and transportation	ENERCON estimate	Clean waste will be loaded onto tri-axle dump trucks and transported to an onsite disposal facilty. Assumed capacity of tri-axle dump truck is 12 cubic yards.	5,140.0	Breaks only	1.15	4,469.6	Cubic Feet
Contaminated bulkwaste loading and transportation	ENERCON estimate	Contaminated bulk low-level waste will be loaded onto tri-axle dump trucks and transported to the onsite disposal facilty. Assumed capacity of tri-axle dump truck is 12 cubic yards.	5,145.0	Protective Clothing, Radiological Work, and Breaks	1.63	3,162.9	Cubic Feet
Characterization surveys - contaminated miscellaneous equipment < 1,000 pounds	ENERCON estimate	Survey of smaller items of equipment in a square foot area or linear foot. Examples include for square foot area: gauges, valves, small bore piping connected such as on a panel; small pumps, motors. Examples include for linear foot: conduit banks, electrical cabling, service air/water/drainage lines in banks	165.0	All factors except Respirator	1.84	89.7	ft2 or linear feet
Characterization surveys - contaminated miscellaneous equipment 1000 pounds - 4540 pounds	ENERCON estimate	Survey of larger items of equipment square foot area or linear foot. Examples include for area: pumps, motors, larger valves & operators. Examples include for linear foot: larger bore piping ventilation ductwork	82.5	All factors except Respirator	1.84	44.9	ft2 or linear feet
Characterization surveys - contaminated miscellaneous equipment > 10,000 pounds	ENERCON estimate	Survey of indivdual large components. Examples include: heat exchangers, large pumps, motors, cranes, flasks	2.0	All factors except Respirator	1.84	1.1	each
Contaminated Surface characterization surveys (not at height)	ENERCON estimate	Survey of surface areas	1,700.0	Protective Clothing, Radiological Work, and Breaks	1.63	1,045.1	ft2
Surface characterization surveys (at height)	ENERCON estimate	Survey of surface areas	1,700.0	Height, Protective Clothing, and Radiological Work only	1.84	924.5	ft2
Bulk asbestos removal, from beams with web height less than 8 inch (including flange thickness)	028213430100	Bulk asbestos removal, from beams, includes disposable tools & 2 suits & 1 respirator filter/day/worker	235.0	Height and Breaks only	1.32	177.7	Feet
Bulk asbestos removal, from beams with web height 8.5 to 20 inches (including flange thickness)	028213430140	Bulk asbestos removal, from beams, includes disposable tools & 2 suits & 1 respirator filter/day/worker	140.0	Height and Breaks only	1.32	105.9	Feet
Bulk asbestos removal, from beams with web height greater than 20 inches (including flange thickness)	028213430170	Bulk asbestos removal, from beams, includes disposable tools & 2 suits & 1 respirator filter/day/worker	72.1	Height and Breaks only	1.32	54.5	Feet
Bulk asbestos removal, from ducts or AHU insulation	028213430400	Bulk asbestos removal, from duct or air-handling unit insulation, includes disposable tools & 2 suits & 1 respirator filter/day/worker	440.0	Height and Breaks only	1.32	332.7	Square Feet
Bulk asbestos removal, pipe insulation, 0 to 3 inch diameter pipe	028213430600	Bulk asbestos removal, from pipe insulation, includes disposable tools & 2 suits & 1 respirator filter/day/worker	900.0	Height and Breaks only	1.32	680.5	Feet
Bulk asbestos removal, pipe insulation, 4 to 8" mm diameter pipe	028213430610	Bulk asbestos removal, from pipe insulation, includes disposable tools & 2 suits & 1 respirator filter/day/worker	800.0	Height and Breaks only	1.32	604.9	Feet
Bulk asbestos removal, pipe insulation, > 8" diameter pipe	028213430630	Bulk asbestos removal, from pipe insulation, includes disposable tools & 2 suits & 1 respirator filter/day/worker	550.0	Height and Breaks only	1.32	415.9	Feet
Bulk asbestos removal, scrape foam fireproofing from flat surface	028213432000	Bulk asbestos removal, scrape fireproofing frrom flat surface, includes disposable tools & 2 suits & 1 respirator filter/day/worker	2,400.0	Height and Breaks only	1.32	1,814.7	Square Feet
Bulk asbestos removal, scrape foam fireproofing from irregular surface	028213432100	Bulk asbestos removal, scrape fireproofing frrom irregular surface, includes disposable tools & 2 suits & 1 respirator filter/day/worker	1,200.0	Height and Breaks only	1.32	907.4	Square Feet
Bulk asbestos removal, remove cementitious material from flat surface	028213433000	Bulk asbestos removal of cemetious material from flat surface, includes disposable tools & 2 suits & 1 respirator filter/day/worker	1,800.0	Height and Breaks only	1.32	1,361.1	Square Feet
Bulk asbestos removal, remove cementitious material from irregular surface	028213433100	Bulk asbestos removal of cemetious material from irregular surface, includes disposable tools & 2 suits & 1 respirator filter/day/worker	1,000.0	Height and Breaks only	1.32	756.1	Square Feet

Appendix A-5: PLF to UCF Application

Name	Reference (RS Means, et al)	Description	Daily Output without PLF:	PLF Type	PLF	Daily Output adjusted for PLF	Unit of Measure
Bulk asbestos removal, scrape acoustical coating/fireproofing from ceiling	028213434000	Bulk asbestos removal, scrape acoustical coating/fireproofing from ceiling, includes disposable tools & 2 suits & 1 respirator filter/day/worker	3,200.0	Height and Breaks only	1.32	2,419.7	Square Feet
Bulk asbestos removal, remove Vinyl/Asbestos Tile (VAT) and mastic from floor by hand	028213435000	Bulk asbestos removal, remove Vinyl/Asbestos Tile and mastic by hand, includes disposable tools & 2 suits & 1 respirator filter/day/worker	2,400.0	Breaks only	1.15	2,087.0	Square Feet
Bulk asbestos removal, remove cement-asbestos transite board and cement wall board	028213438000	Bulk asbestos removal, remove cement-asbestos transite board and cement wall board, includes disposable tools & 2 suits & 1 respirator filter/day/worker	1,000.0	Breaks only	1.15	869.6	Square Feet
Bulk asbestos removal, shingle roofing, built-up, no gravel, non friable	028213438250	Bulk asbestos removal, remove shingle roofing, built-up, no gravel, non-friable, includes disposable tools & 2 suits & 1 respirator filter/day/worker	1,400.0	Height and breaks only	1.32	1,058.6	Square Feet
Bulk asbestos removal, bituminous flashing	028213438260	Bulk asbestos removal, remove bituminous flashing, includes disposable tools & 2 suits & 1 respirator filter/day/worker	300.0	Breaks only	1.15	260.9	Square Feet
Removal of lead-based paint, by chemicals, per application, pipes, to 4 inches diameter	028319264400	Removal of lead-based paint, by chemicals, per application, pipes, to 4 inches diameter	90.0	Height and breaks only	1.32	68.1	Feet
Removal of lead-based paint, by chemicals, per application, pipes, 4 to 8 inch diameter	028319264420	Removal of lead-based paint, by chemicals, per application, pipes, 76 to 205 mm diameter	50.0	Height and breaks only	1.32	37.8	Feet
Removal of lead-based paint, by chemicals, per application, pipes, > 8 inch diameter	028319264460	Removal of lead-based paint, by chemicals, per application, pipes, > 8 inch diameter	20.0	Height and breaks only	1.32	15.1	Feet
Removal of lead-based paint on building surfaces, by chemicals per application	028319264800	Removal of lead-based paint on building surfaces, by chemicals per application	90.0	Height and breaks only	1.32	68.1	Square Feet
Lead paint removal, hand scraping and HEPA vacuum	028319267000	Lead paint removal, hand scraping and HEPA vacuum	32.0	Height and breaks only	1.32	24.2	Square Feet
Removal of Asbestos Containing Material from around window frames	028213433100:	Bulk asbestos removal of asbestos containing material from around window frame, includes disposable tools & 2 suits & 1 respirator filter/day/worker	3,030.0	Height and Breaks only	1.32	2,291.1	Feet