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JUSTIFICATION TO REMOVE 333 BLDG FIRE SUPPRESSION
SYSTEM

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Justification to Remove 333 Building Fire Suppression System

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Abstract: Justification to remove the 333 Building fire suppression system is provided. The Maximum Possible Fire Loss (MPFL) is provided (approximately \$800K), potential radiological and toxicological impacts from a postulated fire are discussed, Life Safety Code issues are addressed, and coordination with the Hanford Fire Department is assured.

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JUSTIFICATION TO REMOVE 333 BUILDING FIRE SUPPRESSION SYSTEM

1.0 Summary & Conclusions

The consequences of the Fuel Supply Shutdown 333 Building Maximum Possible Fire Loss (MPFL) have been estimated at \$805K, which is less than the threshold requiring a fire suppression system. The associated radiological/toxicological release from the MPFL is less than DOE Guidelines, and Life Safety Code requirements for the few remaining occupants in the northwest corner have been satisfied. The sprinkler system will remain operational for the northwest corner mezzanine and space directly underneath. The Hanford Fire Department has been requested to revise the 333 Building Prefire Plan; this revision will be invoked upon deactivation of the building fire suppression system.

2.0 Criteria

Criteria for deactivating the 333 Building fire suppression system are taken from RLID 5480.7, Fire Protection, Section 8.3, Decommission and Demolition Facilities. These criteria are:

- a) Property book value of the building and contents must be < \$1M. Potential cleanup costs from the MPFL are included in this limit.
- b) The potential radiological/hazardous material release must not exceed DOE guidelines.
- c) Life Safety Code requirements must be satisfied.
- d) The Hanford Fire Department must be apprised of proposed changes to ensure proper response to emergencies.

3.0 Potential Loss

3.1 333 Building Book Value

Book value of the facility has been reduced to zero since it is scheduled for demolition (Letter 95-SNM-069, J. E. Mecca to President, WHC, Devaluation of Building Values to Reduce Fire Protection at the 333 Building, August, 24, 1995).

3.2 Value of 333 Building Contents

WHC Property Accounting has zeroed out the building contents except for the "transient" items associated with the office area. The remaining items "on the books" include three outside storage containers and seven computer system components in nearby MO-052. These items are not at risk from the MPFL and reduce the building contents value to \$213K. These items comprise incidental office equipment for approximately 15 occupants in the northwest corner and three used forklifts. The items for which Kaiser Aluminum, Richland Specialty Extrusion, has expressed interest, including the used and slightly contaminated Loewy hydraulic extrusion press, have been zeroed out. Fair market value for these items is estimated at approximately \$10K. Thus, the total value of the building contents is \$223K.

3.3 Potential Cleanup Cost

Cleanup cost estimates resulting from the postulated fire combine the external soil cleanup cost resulting from dispersion of the source term outside the confines of the building, plus internal cleanup/contamination fixing cost that assumes the source term is spread throughout the building interior and over its internal surfaces.

3.3.1 Exterior Cleanup Cost

Although combustible loading has been greatly reduced and potential ignition sources have been reduced to the maximum practicable extent to minimize the potential of a fire occurring, a standard fire loading was used to predict dispersion of the building radionuclide content outside the confines of the building.

Actual fire loading includes up to ten (10) low-level waste wooden burial boxes which contain miscellaneous LLW waste destined for burial and up to forty (40) wood pallets supporting plastic-wrapped waste. These boxes and pallets occupy approximately 1000 ft² in the middle of the building north of the former Chem Bay. This a high bay area that is at least ten ft from structural columns and over twenty ft below the ceiling. The potential source term from the boxes and pallets is 140 g uranium.

The radionuclide and combustible material inventories associated with the waste packages are summarized below:

Burial Box - Construction & Contents

Wood (box construction)	575 lbs
box plastic liner	15
waste:	
metal	2000
wood	20
plastic	20
paper	20
radionuclides	
U-234 (0.009 wt%)	9.0E-04 g
U-235 (1.25 wt%)	1.25E-01 g
U-236 (0.069 wt%)	6.9E-03 g
U-238 (98.67 wt%)	9.867 g
Tc-99 (10 ppm)	1.0E-04 g

Palletized Waste - Construction & Contents

wood pallet	55 lbs
plastic wrap	2
waste (metal)	500
radionuclides	
U-234 (0.009 wt%)	9.0E-05 g
U-235 (1.25 wt%)	1.25E-02 g
U-236 (0.069 wt%)	6.9E-04 g
U-238 (98.67 wt%)	0.987 g
Tc-99 (10 ppm)	1.0E-05 g

The calculated fire used to model the release was based on a standard fire of 53 kW/m^2 . However, based on the above combustible loading and a burn duration of 140 minutes (NFPA, 1991), a heat release rate of 220 kW/m^2 is possible in the burial box storage area. This is addressed by increasing the area of the burn in the standard fire model. In this model, increasing the area of the burn has the same effect as increasing the heat flux over a constant area, since the model uses a point source. Because of uncertainties regarding the combustible material loading of the residual fixed equipment and facility structure, including a combustible roof covering, the standard fire was conservatively presumed to involve the entire facility. Consequently, another 1.3 kg uranium associated with a Contamination Area in the south end of the building was considered for potential release even though there is no credible mechanism for it to be involved in a fire because the combustible loading in that area is very low. And because the building construction is not fire rated, the presence of the building was discounted, i.e., an unimpeded upward plume of 5 m/sec (Himes, 1994) was assumed to entrain the radionuclide inventory of the waste within the boxes, pallets, and the Contamination Area. This upward plume results in a release fraction of 0.44 and a calculated quantity of uranium dispersed outside the building of 634 g. (The remaining source term, i.e., 56% of the 1440 g, is assumed to remain within the building.) The estimated cleanup cost to remove and bury dirt affected by dispersion of 634 g uranium over 3600 m^2 dirt to the northeast of the building is approximately \$20K (Himes, 1995).

The cost of deconning nearby hard surfaces (parking lot and nearby buildings) needs to be included. If the entire quantity of material dispersed were evenly distributed at the level of detectability (approximately 0.04 g/m^2), (Himes, 1995), 15840 m^2 would require decon. However, because the distribution of material would not be uniform but more concentrated at the source, it seems reasonable to reduce the potential contaminated area by half. Then, the calculated decon cost is estimated to be approximately \$302K ($7920 \text{ m}^2 \times \text{day} / 55 \text{ m}^2 \times \$1400/\text{day} \times 1.5$ (50% contingency) = \$302K (cleanup cost basis assumptions from WHC-SD-FF-FHA-001, Revision 0, Appendix K, Attachment 2)).

3.3.2 Interior Cleanup Cost

The cost to clean up the building interior was then considered. Cleanup cost was calculated using a cleanup rate of $55 \text{ m}^2/\text{day}$, a cost of $\$1400/\text{day}$, and a contingency factor of 50% (baseline cost data from WHC-SD-FF-FHA-001, Revision 0, Appendix K, Attachment 2). Assuming the entire interior surface (estimated at 14200 m^2) required attention, the calculated interior cleanup cost is \$542K. However, since this structure has no beneficial use and is destined for demolition, actual cleanup is not recommended.

Another approach of addressing the building interior consequences is to fix the presumed contamination rather than remove it by decon efforts. In this case, the entire building interior would be sprayed with Polymeric Barrier System™ (PBS)¹, a product specifically designed to control and fix radiological contamination. The estimated cost for this fixative application is \$260K. This cost estimate resulted from using a 4-person crew to coat $3000 \text{ ft}^2/\text{day}$ ($279 \text{ m}^2/\text{day}$) at a cost of $\$2500/\text{day}$ plus the cost of the PBS™ coating ($14200 \text{ m}^2 \times \text{gal} / 9.29 \text{ m}^2 \times \$30/\text{gal} \times 1.5 = \69K), with a 50% contingency.

¹ Polymeric Barrier System™ (PBS), a product of Bartlett Services, Inc., Plymouth, MA 02360

Fixing the internal contamination rather than deconning should have no adverse impact on eventual D&D cost. Because the facility has a history of extended uranium operations that produced many areas with fixed contamination, it is likely that efforts to salvage the structure would be non-productive. Fixing the contamination produced by a fire would also fix contamination already present and result in increased margin of safety by controlling potential contamination spread.

3.4 Total MPFL

The sum of the potential loss of residual equipment assigned to the 333 Building (remaining accountable items plus fair market value of Loewy press and associated items = \$223K), plus the exterior cleanup cost (\$322K), plus the interior contamination fixing (\$260K) is \$805K.

In all cases, substantial conservatism was included in the cost estimates associated with calculating the MPFL. These are summarized below:

- a) The external cleanup cost was based on a release fraction resulting from an unimpeded upward plume velocity of 5 m/s. This translates to a release fraction of 0.44.
- b) The presence of the building in capturing any portion of the release fraction was discounted.
- c) The fire was presumed to involve the entire building simultaneously.
- d) The external hard surface cleanup was added to the cleanup cost associated with dirt removal. Although both types of cleanup may exist, the released material cannot be in two places at once.
- e) The hard surface cleanup area was estimated by halving the maximum potential cleanup area that could exist if the release was uniformly distributed at the level of detectability.
- f) The fraction of uranium not expelled to the environs was presumed to be distributed over the entire building internal surface area which was then treated to fix the contamination.
- g) A contingency factor of 50% was applied to cleanup and contamination fixing estimates.

4.0 Potential Radiological/Toxicological Release

The Fuel Supply Shutdown Interim Safety Basis (Brehm, 1995) concludes that the risk associated with an unmitigated fire in the fuel storage building having the greatest uranium inventory (3712 Building) is within Risk Acceptance Guidelines per WHC-CM-4-46. The 3712 Building fire analysis presumed a uranium inventory of 1122 MTU. The estimated uranium inventory in the 333 Building is $1.44\text{E-}03$ MTU. Thus, the 333 Building fire is bounded by the 3712 Building fire and is also within Risk Acceptance Guidelines.

5.0 Life Safety Code

Life Safety Code requirements are being satisfied in accordance with the NFPA 101 Industrial Occupancy designation for the facility. The remaining personnel in the northwest corner and underneath directly support transition activities for the original mission and thus, are incidental to the original Industrial Occupancy of the building. Because there are no high hazard areas in the building, neither sprinklers nor separation are required anywhere. It should be noted, though, that the sprinkler system in the northwest corner

will remain operational. Adequate egress will be ensured by the additions of an outside stairway from the south end of the mezzanine to the street below and a door at the south end of the area below the mezzanine. As a contingency, either the building will be evacuated or a fire watch will be instituted if the additional egress paths are not in place at the time the sprinkler system is turned off to prevent freeze-up.

6.0 Combustible Loading

Combustible loading has been reduced by removing bulletin boards, lubrication and hydraulic fluids from process equipment, rubber/plastic hoses, office equipment, and other miscellaneous combustible items. Fixed items such as electrical wiring and cable with associated combustible insulation, fiberglass/plastic tanks and exhaust ducts, and wooden partitions were not removed.

7.0 Coordination with HFD

Fuel Supply Shutdown has provided information to the Hanford Fire Department (HFD) and requested them to update the 333 Building Prefire Plan.

8.0 References

NFPA Handbook, Seventeenth Edition, 1991.

D. A. Himes, 1995, *Estimated Ground Contamination Areas and Cleanup Costs for a Postulated Fire in the 333 Building*, WHC-SD-NR-HIE-001, Revision 0, Westinghouse Hanford Company, Richland, Washington.

Himes, D. A. 1994, *A Method for Estimating Ground Areas Contaminated by a Postulated Fire in a Facility Containing Radioactive Material*, WHC-SD-GN-TI-20004, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

C. T. Sadanaga, 1995, *Fire Hazards Analysis for the Fast Flux Test Facility*, WHC-SD-FF-FHA-001, Revision 0, Westinghouse Hanford Company, Richland, Washington.

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