Appendix C

Disposal Cell Contents

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Table C−1. Contents of the Weldon Spring, Missouri, Disposal Cell

Work Zone Per WP437 and Material Description	Cell Placement Considerations	Occupied Cell Volume (cy)
Raffinate Pits Work Zone		
CSS Grout	Produced in CSS Plant and pumped to cell. Volume as determined at the plant.	188,443.00
Raffinate Pit 4 residual sludge	Stabilized in situ with grout then mixed with TSA aggregates. Conversion calculated assuming aggregates alone would not shrink and the mix ratio was 2.5 to 1.	2,530.00
Raffinate Pit 3 residual sludges	Mixed with > or = 3 parts contaminated soil. Conversion factor calculated assuming that soil alone will shrink with 0.965.	10,277.00
Raffinate Pit 3 soils	Conversion factor bank/fill for soils is 0.965.	52,365.73
Raffinate Pit 4 soils	Conversion for soils is 0.965.	65,649.92
Raffinate Pits 1 and 2 soils (some residual sludge mixed with the soils)	Conversion factor is 0.950.	58,197.95
Raffinate Pits metal debris	Mixed with soil in the cell. Conversion loose/fill for metal is 10 to 1.	21.00
Raffinate Pit 1 interceptor trench	North and east of Raffinate Pit 1. Estimated at 481 + 489 + 1894 = 3274 cy. Use 0.90 for conversion.	2,946.60
Trench for the 2 inch PVC line	Estimated at 133 cy. Use 0.900.	119.70
Entrance ramp in Raffinate Pits 1 and 2	Aggregate surface estimated at 100 cy. Use conversion of 1 to 1.	100.00
Raffinate Pit 3 overflow line and manhole	Estimated at 726 cy of soil. Use 0.900 conversion.	653.40
Intermediate dike in Raffinate Pit 4	Estimated at 8366 cy. Conversion is 0.965 to 1.	8,073.19
Interceptor trench east of Raffinate Pit 3	Estimated at 2198 cy. Conversion is 0.900 to 1.	1,978.20
Aggregate on SW corner of Raffinate Pit 4 dike	Estimated at 370 cy. Conversion is 0.900.	333.00
TSA Work Zone		
Soil stockpiles from Quarry cleanup	Used alone or in various mixes. Conversion factor for soils is 0.965.	99,332.28
Nitro soil pile, Quarry origin	Previously treated with cement/fly ash. Conversion factor for this mix is 1.00.	25,100.00
Soil pile NW of TSA	Created during excavations for SWTP basins and TSA construction (1992). Conversion factor is 0.965.	19,029.80
Rubble pile from Quarry cleanup	Conversion factor loose/fill is 0.900.	16,290.00
Metal stockpiles	Resulted from site demolitions. Conversion for metals is 10 to 1.	220.00
HEPA filters	From site demolitions. Entombed in concrete and soil under the CSS monolith. Volume includes concrete and soil.	452.00
B-25 boxes	Unreleasable content. Grouted with clean grout on a grout pad and under the CSS monolith. 36 boxes @ 5 cy each.	180.00
Containers, 20-cy each	Boxes with process pipe from site demolitions. Grouted with clean grout on a clean grout base, then entombed under the CSS monolith. 117 containers @ (20cy + 5cy base) = 2925 cy.	2,925.00
Filter cake from SWTP in 4-cy boxes	Total volume is 800 cy.	800.00
TSA facility (construction gravel and sand, liners)	Mostly mixed with Raffinate Pit 4 stabilized soil. Conversion factor assuming aggregates were placed alone is 1.0.	37,700.00
TSA in situ soil excavations	Conversion factor for these soils is 0.965.	26,540.40
TSA concrete transfer station	Estimated at 162 cy. Use 1.67 for bulking at placement.	270.54
TSA transfer station metal debris	Estimated at 30 cy. Use 10 to 1 conversion.	3.00

Table C−1 (continued). Contents of the Weldon Spring, Missouri, Disposal Cell

Work Zone Per WP437 and Material Description	Cell Placement Considerations	Occupied Cell Volume (cy)
TSA aggregates under transfer station	Estimated at 797 cy. Use 1 to 1 conversion.	797.00
TSA transfer station underlying soils	Estimated at 142 cy. Use 0.965 conversion.	137.03
TSA decontamination station concrete	Estimated at 125 cy. Use 1.67 for bulking in cell.	208.75
TSA various liners (basin, decontamination station, etc)	All liners (HDPE, geotextile) generated from the TSA were shredded and entombed in soil. Total occupied volume is below 50 cy. Use 50 cy.	50.00
Brine tanks from SWTP	Mixed with soil. Est. conversion factor is 0.430.	25.80
Contaminated Jersey barriers	27 each at 0.5 cy.	13.50
TSA equalization basin sediment	estimated at 1800 cy mixed with soil in the cell. Conversion factor is 0.43.	774.00
PCB contaminated concrete	200 cy. Conversion is .900 to 1.	180.00
PCB contaminated aggregates	Estimated at 108 cy. Conversion 1 to 1.	108.00
TSA scrap metal, wood and debris	Estimated at 430 cy. Conversion is 1 to 10.	43.00
20-cy rolloffs	Emptied in cell then crushed. Misc. materials estimated to 180 cy. Conversion is 1 to 5.	36.00
PMC stored equipment	Estimated at 50 cy. Entombed in CSS or soil. Conversion is .66 to 1.	33.00
Ash Pond Work Zone		
Soil stockpiled from cell foundation, including Ash Pond capping	From WP420 excavations. Factor bank to fill is 0.965.	437,310.98
Soil stockpiled from Raffinate Pit 4 excavations	Conversion factor is 0.965.	47,478.00
Soil stockpiled from VP−9 cleanup	Conversion factor is 0.80 due to presence of vegetation and roots.	2,680.00
Wood piles from site	Mixed with 3 parts of soil. Volumetric conversion factor is 0.50.	910.00
Rubble	from site foundations removal. Conversion factor is 0.900.	65,419.20
In-situ soils	Conversion factor is 0.965.	108,461.18
Buried rubble	Conversion 0.9.	292.50
Sediments in sedimentation basins	Mixed with several soil parts for drying. Conversion factor is 0.2.	785.00
Soil under DHO equipment parking area	Conversion is 0.965.	11,469.03
Nitro-contaminated soils	Estimated at 370 cy. Conversion is 1 to 1.	370.00
Root balls from VP−9	Estimated at 300 cy. Conversion is 1 to 0.5 because were mostly placed in CSS grout.	150.00
Various debris (concrete, bricks, rocks, gravel)	Estimated at 8185 cy. Conversion is 0.8 to 1.	6,548.00
Contaminated soil under cell footprint	Estimated at 8000 cy. Conversion is 0.965.	7,720.00
MSA Work Zone		
Structural metal piles	Entombment in soil. Conversion is 5 to 1 between loose and fill cy.	3,260.00
Shreddable metal piles	Same as above.	6,860.00
Aluminum piles	Same as above.	336.00
Copper piles	Entombed in CSS grout. Conversion assumes 30% of voids filled, thus a factor of 0.7 applies.	634.90
Window frames	Entombed in soil. Conversion is 5 to 1.	55.00
ACM siding bundles	Placed directly in cell.	650.00
Intact metal objects	Big pieces placed in CSS. Some void filling and crushing is assumed. Conversion loose to fill is 0.5.	1,660.00
Drums	Placed intact and crushed. Assume 0.5 of volume is reduced.	351.50

Table C−1 (continued). Contents of the Weldon Spring, Missouri, Disposal Cell

Work Zone Per WP437 and Material Description	Cell Placement Considerations	Occupied Cell Volume (cy)
Sling bags with cemented filter cake and brine from SWTP	Placed to block CSS flow. Bulking of 10% assumed due to uneven voids when placed.	715.00
13 cy roll-off containers	Content emptied in the cell and grouted or covered with soil. Assume 50% voids filled with soil.	338.00
4-cy roll-off containers	Entombed in CSS grout. Add 1 cy per box for the clean grout base. 36 boxes @ 5cy = 180 cy.	180.00
20-cy roll-off containers	Contents placed in the cell. Assume 50% voids filled with soil or compacted.	1,670.00
PCB contaminated concrete	Placed near or within CSS monolith. Assume voids remain as in the stockpile.	500.00
MSA trash and rubble	Estimated at 700 cy. Conversion is 1 to 5.	140.00
Transite pipe	Crushed and entombed in soil. Assume reduction of 5 to 1.	166.00
MSA pad and facility	Assumed factor of 1.0 in-situ to placed in the cell.	14,800.00
MSA in situ soils	Conversion factor in-situ to placed in the cell is 0.965.	4,855.88
Frog Pond Work Zone		
Frog Pond in situ soils	Conversion is 0.965.	15,721.78
Sediments	Conversion after mixing with soil is 1 to 0.43.	2,290.61
Soil under the sediments	Conversion is 0.965.	2,068.00
Frog Pond outlet	Estimated at 473 cy. Conversion is 1 to 1.	473.00
SWTP and 434 Work Zones		
Soil excavated in this work zone	Conversion is 0.965.	7,047.40
Sediments	Conversion is 1 to 0.43.	206.40
Boxes	Content mixed with soil. Conversion is 1 to 0.43.	87.72
SWTP foundations	Estimated at 582 cy. Bulking factor of 1.67.	971.94
SWTP debris	Estimated at 220 cy. Use 0.2 conversion factor.	44.00
SWTP liners	Total of 175,000 sq. ft HDPE, 43,000 sq. ft geonet and 43,000 GCL. Shredded and entombed in soil. Estimated total volume is approximately 500 cy.	500.00
Building 434 foundations	Estimated at 635 cy concrete. Conversion factor for bulking is 1.67.	1,060.45
CSS Plant Work Zone		
CSS pilot plant concrete debris	Estimated at 222 cy Conversion is 1 to 1.	222.00
CSS pilot plant metal debris	Estimated at 100 loose cy. Conversion is 10:1.	10.00
Road at the CSS Pilot plant	Estimated at 500 cy aggregates. Conversion is 1 to 1.	500.00
CSS Plant metal debris	Estimated at 3700 cy. Due to size and volume, placement requirements are as for the MSA metal. Conversion loose to fill is 5 to 1.	740.00
CSS Plant concrete debris	Estimated at 676 cy. Conversion is 1 to 1.	676.00
Contaminated aggregate under the CSS Plant	Per estimates. Conversion is 1 to 1.	1,686.00
in situ contaminated soils in this area	Conversion is 0.965.	3,638.05
Administration Area Work Zone		
Concrete foundations (decontamination pad and others)	Estimated at 100 cy. Conversion 1.67 to 1.	167.00
Storm sewer removal, metal, concrete and soil	Estimated at approximately 200 cy. Factor of conversion 1 to 1.	200.00

Table C−1 (continued). Contents of the Weldon Spring, Missouri, Disposal Cell

Work Zone Per WP437 and Material Description	Cell Placement Considerations	Occupied Cell Volume (cy)
ASA Work Zone		
In situ soils	Conversion is 0.965.	2,080.54
Aggregate pad	Estimated at 3009 cy.	3,009.00
Sea-Land containers	Emptied, covered with soil and demolished. Conversion is 1 to 1.	3,987.00
Misc. Contaminated Items		
Access road aggregate from DHO equipment staging area to north decontamination pad	Estimated at 300 cy. Conversion is 1 to 1.	300.00
Aggregate surface at north decontamination pad and DHO shop	Estimated at 1,700 cy. Conversion factor is 1 to 1.	1,700.00
Sediments in the DHO recirculation pond (north decontamination pad)	Estimated at 350 cy. Conversion factor is 1 to 2.27.	150.50
Liners, pipelines, soil around pipes at north DHO decontamination pad	Estimated at 150 cy. Conversion 1 to 0.8.	3,320.00
Concrete foundations at DHO north decontamination pad and shop	Estimated at 294 cy. Bulking factor is 1.67.	490.98
Debris at north DHO decontamination pad	Estimated at 150 cy. Conversion factor is 1 to 5.	30.00
Contaminated soils around north DHO decontamination pad	Estimated at 150 cy. conversion is 0.965.	144.75
Resurfacing of contaminated haul roads	Estimated at 4,489 cy. Conversion is 1 to 1.	4,489.00
DHO equipment staging area	Estimated at 2,900 cy aggregates. Conversion is 1 to 1.	2,900.00
SWTP filter cake boxes directly to cell	129 4-cy boxes = 496 cy. Conversion is 1 to 0.43.	213.28
Sling bags	48 bags.	48.00
SWTP brine as grout pumped placed in the cell	3,697.5 cy. Conversion is 1 to 1.	3,698.00
General hot spots on Chemical Plant site	1,2098 cy. Conversion is 0.965.	11,674.57
Sediments from CMSA basin	4,617 cy. Conversion factor is 0.43.	1,985.31
Clean Items Used In Cell Waste Containment Area		
6-inch soil cushion on the upper 3:1 slope	Per design, 4,600 cy.	4,600.00
Rock on the CSS haul routes inside the cell	As built, 4,950 cy.	4,950.00
Pads for pumps between Phase 1 and 2	As built, 60 cy.	60.00
Erosion berms on the LCRS sand	As built, 30 cy.	30.00
Separation berm Phase 1 from Phase 2	As built, 3,160 cy.	3,160.00
North low-permeability berm	As built, 140 cy.	140.00
East rebuilt Penetration	As built, 50 cy.	50.00
Gravel on west entrance berm	As built, 1,200 cy.	1,200.00
Overbuilt within tolerances on the LCRS sand layer	As built, 2,600 cy.	2,600.00
Select soil waste built of clean common fill	1,020 cy. Used in covering the cell dimple = 1,150 cy.	2,270.00
Peat used for the geochemical barrier	Per purchase and 1/4 mix ratio with soil.	9,295.00
Army Waste		
Waste from army property	As received, 26,220 cy. Conversion is 0.9.	23,598.00
Wastes in the Cell Dimple		
Quarry geonet	Entombed in clean grout.	175.00
Quarry Water Treatment Plant tanks and metal debris	Entombed in clean grout.	570.00
Quarry HDPE liners	Entombed in clean grout.	30.00
Quarry soils, sediments, filter and media	Placed and compacted in the cell dimple.	1,875.00

Table C−1 (continued). Contents of the Weldon Spring, Missouri, Disposal Cell

Work Zone Per WP437 and Material Description	Cell Placement Considerations	Occupied Cell Volume (cy)
Quarry concrete debris	Placed and compacted in the cell dimple.	304.00
Quarry wood and railroad ties	Placed and compacted in the cell dimple.	20.00
Admin. Area asphalt and metal debris	Placed and compacted in the cell dimple.	310.00
Various trash generated on site	Placed and compacted in the cell dimple.	70.00
Admin. Area concrete debris	Placed and compacted in the cell dimple.	77.00
Waste from army property	Placed and compacted in the cell dimple.	50.00

Key:
ACM = asbestos containing material
ASA = asbestos storage area
CMSA = construction material staging area
CSS = chemical stabilization/solidification
cy = cubic yard(s)
DHO = direct hire organization
GCL = geosynthetic clay liner
HEPA = high-efficiency particulate air
LCRS = leachate collection and removal system
PCB = polychlorinated biphenyls
MSA = material staging area
PMC = Project Management Contractor
SWTP = site water treatment plant
TSA = temporary storage area
WP = work package
VP = vicinity property

Table C−2. Weldon Spring Site Disposal Cell Total Activity Final Estimate

Waste Stream[a]	Volume (cy)	Mass (g)[c]	Radiological Profile[d]	Nuclide Activity (Ci)[e]									Total Activity (Ci)	% of Total (if > 1%)
				U-238	U-234	U-235	Th-228	Th-230	Th-232	Ra-226	Ra-228	Rn-222[f]		
Raffinate Pits Work Zone														
Raffinate processed through CSS Plant[b]	159990	1.49E+11	Raffinate	6.12E+01	6.12E+01	2.84E+00	8.95E+00	4.03E+03	4.78E+01	1.25E+02	9.10E+00	1.47E+02	4.49E+03	68.44%
Pit 4 residual sludge	2530	2.36E+09	Raffinate	9.68E-01	9.68E-01	4.48E-02	1.42E-01	6.37E+01	7.55E-01	1.98E+00	1.44E-01	2.33E+00	7.11E+01	1.08%
Pit 3 residual sludge	10277	9.59E+09	Raffinate	3.93E+00	3.93E+00	1.82E-01	5.75E-01	2.59E+02	3.07E+00	8.05E+00	5.85E-01	9.47E+00	2.89E+02	4.40%
Pit 3 soil	52366	6.74E+10	Raffinate pit soils	2.76E+00	2.76E+00	1.35E-01	4.04E-01	1.82E+02	2.16E+00	5.66E+00	4.11E-01	6.66E+00	2.03E+02	3.09%
Pit 4 soil	65650	8.45E+10	Raffinate pit soils	3.46E+00	3.46E+00	1.69E-01	5.07E-01	2.28E+02	2.70E+00	7.10E+00	5.15E-01	8.35E+00	2.54E+02	3.88%
Pits 1 & 2 soil	58198	7.49E+10	Raffinate pit soils	3.07E+00	3.07E+00	1.50E-01	4.49E-01	2.02E+02	2.40E+00	6.29E+00	4.57E-01	7.40E+00	2.26E+02	3.44%
Pit 1 Interceptor Trench	2947	3.79E+09	Site soils	3.94E-01	3.89E-01	2.20E-02	1.67E-02	4.13E-02	4.25E-02	1.86E-02	1.52E-02	1.86E-02	9.58E-01	
Pit 3 Overflow & Manhole	653	8.40E+08	Site soils	8.72E-02	8.62E-02	4.87E-03	3.70E-03	9.16E-03	9.41E-03	4.12E-03	3.36E-03	4.12E-03	2.12E-01	
Pit 4 Intermediate Dike	8073	1.04E+10	Site soils	1.08E+00	1.07E+00	6.03E-02	4.57E-02	1.13E-01	1.16E-01	5.09E-02	4.16E-02	5.09E-02	2.62E+00	
Interceptor Trench east of Pit 3	1978	2.55E+09	Site soils	2.64E-01	2.61E-01	1.48E-02	1.12E-02	2.77E-02	2.85E-02	1.25E-02	1.02E-02	1.25E-02	6.43E-01	
TSA Work Zone														
Quarry soils stockpiles	99332	1.28E+11	TSA bulk waste	2.53E+01	2.53E+01	1.16E+00	1.23E+01	4.19E+01	3.29E+00	1.39E+01	1.23E+01	1.39E+01	1.50E+02	2.28%
Nitro soils pile	25100	3.23E+10	TSA bulk waste	6.40E+00	6.40E+00	2.94E-01	3.11E+00	1.06E+01	8.30E-01	3.52E+00	3.11E+00	3.52E+00	3.78E+01	
B-25 boxes	180	2.32E+08	TSA non-filter cake	7.41E-01	7.41E-01	3.48E-02	2.23E-02	5.33E+00	1.99E+01	2.50E-02	2.23E-02	2.50E-02	2.69E+01	
20 cy rolloffs	2925	3.76E+09	TSA non-filter cake	1.20E+01	1.20E+01	5.65E-01	3.63E-01	8.66E+01	3.24E+02	4.07E-01	3.63E-01	4.07E-01	4.37E+02	6.65%
SWTP filter cake	800	7.65E+08	TSA filter cake	1.19E+00	1.19E+00	5.58E-02	6.12E-04	4.48E-02	8.72E-03	4.82E-03	4.05E-03	4.82E-12	2.50E+00	
TSA in-situ soil	26540	3.42E+10	Site soils	3.55E+00	3.50E+00	1.98E-01	1.50E-01	3.72E-01	3.83E-01	1.67E-01	1.37E-01	1.67E-01	8.63E+00	
TSA Transfer Station underlying soil	137	1.76E+08	Site soils	1.83E-02	1.81E-02	1.02E-03	7.76E-04	1.92E-03	1.97E-03	8.64E-04	7.05E-04	8.64E-04	4.45E-02	
TSA Equalization Basin sediment	774	9.96E+08	Site soils	1.03E-01	1.02E-01	5.78E-03	4.38E-03	1.09E-02	1.12E-02	4.88E-03	3.98E-03	4.88E-03	2.52E-01	
Ash Pond Work Zone														
Soil stockpile	426737	5.49E+11	Site soils	5.70E+01	5.64E+01	3.19E+00	2.42E+00	5.99E+00	6.15E+00	2.69E+00	2.20E+00	2.69E+00	1.39E+02	2.11%
Vicinity Properties	10575	1.36E+10	Site soils	1.41E+00	1.40E+00	7.89E-02	5.99E-02	1.48E-01	1.52E-01	6.67E-02	5.44E-02	6.67E-02	3.44E+00	
Soils stockpiled from Pit 4 excavations	47478	6.11E+10	Site soils	6.34E+00	6.27E+00	3.54E-01	2.69E-01	6.66E-01	6.84E-01	2.99E-01	2.44E-01	2.99E-01	1.54E+01	
Soils from VP 9 cleanup	2680	3.45E+09	Site soils	3.58E-01	3.54E-01	2.00E-02	1.52E-02	3.76E-02	3.86E-02	1.69E-02	1.38E-02	1.69E-02	8.71E-01	
In-situ soil	108461	1.40E+11	Site soils	1.45E+01	1.43E+01	8.10E-01	6.14E-01	1.52E+00	1.56E+00	6.84E-01	5.58E-01	6.84E-01	3.52E+01	
Sedimentation basin sediments	785	1.01E+09	Site soils	1.05E-01	1.04E-01	5.86E-03	4.45E-03	1.10E-02	1.13E-02	4.95E-03	4.04E-03	4.95E-03	2.55E-01	
Soil under DHO equip parking area	11469	1.48E+10	Site soils	1.53E+00	1.51E+00	8.56E-02	6.50E-02	1.61E-01	1.65E-01	7.23E-02	5.90E-02	7.23E-02	3.73E+00	
Nitro soils	370	4.76E+08	Site soils	4.94E-02	4.89E-02	2.76E-03	2.10E-03	5.19E-03	5.33E-03	2.33E-03	1.90E-03	2.33E-03	1.20E-01	
Soil under cell footprint	7720	9.94E+09	Site soils	1.03E+00	1.02E+00	5.76E-02	4.37E-02	1.08E-01	1.11E-01	4.87E-02	3.97E-02	4.87E-02	2.51E+00	
MSA Work Zone														
SWTP filter cake	715	6.83E+08	MSA filter cake	6.18E+01	6.18E+01	2.84E+00	2.88E-03	4.00E-02	7.79E-03	1.20E-01	4.44E-02	1.20E-01	1.27E+02	1.93%
13 cy rolloffs	338	4.35E+08	MSA containerized waste	2.28E+00	8.61E-02	5.66E-03	1.31E-03	6.96E-03	1.22E-02	1.31E-03	0	1.31E-03	2.39E+00	
4 cy rolloffs	180	2.32E+08	MSA containerized waste	1.21E+00	4.59E-02	3.01E-03	6.95E-04	3.71E-03	6.49E-03	6.95E-04	0	6.95E-04	1.28E+00	
20 cy rolloffs	1670	2.15E+09	MSA containerized waste	1.13E+01	4.26E-01	2.79E-02	6.45E-03	3.44E-02	6.02E-02	6.45E-03	0	6.45E-03	1.18E+01	
Drums	352	4.53E+08	MSA containerized waste	2.37E+00	8.97E-02	5.89E-03	1.36E-03	7.25E-03	1.27E-02	1.36E-03	0	1.36E-03	2.49E+00	
Waste Piles	13622	NA	MSA waste piles	6.16E-02	6.16E-02	2.89E-03	0	0	0	0	0	0	1.26E-01	
MSA in-situ soil	4856	6.25E+09		6.49E-01	6.41E-01	3.63E-02	2.75E-02	6.81E-02	7.00E-02	3.06E-02	2.50E-02	3.06E-02	1.58E+00	

Table C−2 (continued). Weldon Spring Site Disposal Cell Total Activity Final Estimate

Frog Pond Work Zone													
In-situ soil	15722	2.02E+10	Site soils	2.10E+00	2.08E+00	1.17E-01	8.90E-02	2.21E-01	2.27E-01	9.92E-02	8.09E-02	9.92E-02	5.11E+00
Sediments	2291	2.95E+09	Site soils	3.06E-01	3.03E-01	1.71E-02	1.30E-02	3.21E-02	3.30E-02	1.44E-02	1.18E-02	1.44E-02	7.45E-01
Soil under sediments	2068	2.66E+09	Site soils	2.76E-01	2.73E-01	1.54E-02	1.17E-02	2.90E-02	2.98E-02	1.30E-02	1.06E-02	1.30E-02	6.72E-01
Frog Pond Outlet	473	6.09E+08	Site soils	6.32E-02	6.25E-02	3.53E-03	2.68E-03	6.64E-03	6.82E-03	2.98E-03	2.44E-03	2.98E-03	1.54E-01
SWTP & Bldg 434 Work Zones													
Soil excavated from these zones	7047	9.07E+09	Site soils	9.41E-01	9.31E-01	5.26E-02	3.99E-02	9.89E-02	1.02E-01	4.44E-02	3.63E-02	4.44E-02	2.29E+00
Sediments - Train 1	155	1.99E+08	Site soils	2.07E-02	2.05E-02	1.16E-03	8.78E-04	2.17E-03	2.23E-03	9.78E-04	7.98E-04	9.78E-04	5.04E-02
Sediments - Train 2	52	6.69E+07	Site soils	6.95E-03	6.87E-03	3.88E-04	2.94E-04	7.30E-04	7.50E-04	3.28E-04	2.68E-04	3.28E-04	1.69E-02
CSS Plant Work Zone													
In-situ soil	3638	4.68E+09	Site soils	4.86E-01	4.80E-01	2.72E-02	2.06E-02	5.10E-02	5.24E-02	2.29E-02	1.87E-02	2.29E-02	1.18E+00
ASA Work Zone													
In-situ soil	2081	2.68E+09	Site soils	2.78E-01	2.75E-01	1.55E-02	1.18E-02	2.92E-02	3.00E-02	1.31E-02	1.07E-02	1.31E-02	6.76E-01
Miscellaneous													
DHO decon pad recirculation pond	150	1.93E+08	Site soils	2.00E-02	1.98E-02	1.12E-03	8.49E-04	2.10E-03	2.16E-03	9.46E-04	7.72E-04	9.46E-04	4.87E-02
Soils around DHO decon pad	145	1.87E+08	Site soils	1.94E-02	1.91E-02	1.08E-03	8.21E-04	2.03E-03	2.09E-03	9.14E-04	7.47E-04	9.14E-04	4.71E-02
SWTP filter cake	213	2.74E+08	Site soils	2.85E-02	2.81E-02	1.59E-03	1.21E-03	2.99E-03	3.07E-03	1.34E-03	1.10E-03	1.34E-03	6.92E-02
Hot spots	11675	1.50E+10	Site soils	1.56E+00	1.54E+00	8.72E-02	6.61E-02	1.64E-01	1.68E-01	7.36E-02	6.01E-02	7.36E-02	3.79E+00
CMSA basin sediments	1985	2.55E+09	Site soils	2.65E-01	2.62E-01	1.48E-02	1.12E-02	2.78E-02	2.86E-02	1.25E-02	1.02E-02	1.25E-02	6.45E-01
Cell Dimple Items													
Quarry soils, sediments, filter & media	1875	2.41E+09	Site soils	2.50E-01	2.48E-01	1.40E-02	1.06E-02	2.63E-02	2.70E-02	1.18E-02	9.65E-03	1.18E-02	6.09E-01
Totals	1206028			2.95E+02	2.78E+02	1.38E+01	3.09E+01	5.12E+03	4.17E+02	1.77E+02	3.08E+01	2.04E+02	6.57E+03
% of Total				4.5%	4.2%	0.2%	0.5%	78.0%	6.4%	2.7%	0.5%	3.1%	

Summed for All Listed Nuclides = 6,57E+03 Ci

Notes:
[a]Waste streams with < 0.01 Ci not included.
[b]Source: *Chemical Plant Operable Unit Remedial Action Report* (DOE/OR/21548-909) Rev. A, September 2002, p. 13.
[c]mass (g) = volume (cy) x density (g/cy). See Density Calculations worksheet for raffinate, soil, and filter cake density calculations.
[d]See Radiological Profiles worksheet.
[e]Nuclide Activity (Ci) = mass (g) x Nuclide Activity Concentration (pCi/g) [from Radiological Profiles worksheet] x (1E-12 Ci/pCi).
[f]Rn-222 assumed to be in equilibrium with Ra-226 when Rn-222 concentration not reported in reference.

Table C−3. Contamination Profiles for the Various Waste Streams

Profile	Nuclide Activity Concentration (pCi/g)									Source
	U-238	U-234	U-235	Th-228	Th-230	Th-232	Ra-226	Ra-228	Rn-222[a]	
Site soils	103.8	5.8	102.6	4.4	10.9	11.2	4.9	4	4.9	Table C-4
TSA bulk waste	198	198	9.1	96.4	328	25.7	109	96.4	109	Ref. 1 Tbl 2-2
Raffinate[b,c]	410	410	19	60	27000	320	840	61	988	Ref. 1 Tbl 2-10
Raffinate pit soils[c,d]	41	41	2	6	2700	32	84	6.1	98.8	Ref. 1 Tbl 2-2 footnote (e)
MSA waste piles[c,e]	Total surficial activity = 0.126 Ci									Ref. 1 Tbl 2-15
MSA containerized waste	5239	198	13	3	16	28	3	0	3	Ref. 1 Tbl 2-16
MSA WTP filter cake	90420	90420	4159	4.22	58.6	11.4	175	65	175	Ref. 1 Tbl 2-17
TSA filter cake[2]	1563	1563	73	0.8	58.6	11.4	6.3	5.3	6.3	Ref. 2 Tbl 3-3
TSA non-filter cake containerized waste[2]	3200	3200	150	96.4	23000	86000	108.8	96.4	108.8	Ref. 2 Tbl 3-5

References:
1. *Hazard Categorization for the Disposal Cell* (DOE/OR/21548-579) Rev. 2, September 1997
2. *Interim Facility Safety Documentation for the Temporary Storage Area* (DOE/OR/21548-513) Rev. 3, December 1997

Notes:
[a]Rn-222 assumed to be in equilibrium with Ra-226 when Rn-222 concentration not reported in reference.
[b]This is raffinate concentrations, not grout (i.e. first column of Table 2-10).
[c]Reference provides either total U only, or U-238 only. Natural U ratios assumed to calculate isotopic i.e. U-238 = U-234 = total U/2.047, and U-235 = total U x (0.047/2.047).
[d]Raffinate pit soils activity is assumed to be equivalent to 10% of raffinate activity.
[e]MSA waste piles were building components surficially contaminated with uranium. Total (surficial) uranium activity is 0.126 Ci.

Table C−4. Site Soils Radiological Profile Calculation

Source[a]	Source Vol (cy)	Wtd Vol[b]	Activity Concentration (pCi/g)							
			U-238	U-235	U-234	Th-228	Th-230	Th-232	Ra-226	Ra-228
Imhoff Tank sludge Tbl 3-1	510	0.001972	843.0	35.9	831.1	5.6	26.0	5.2		
Weighted Activity (pCi/g)[c]			1.7	0.1	1.6	0.0	0.1	0.0		
Decon sump Tbl 3-2	56	0.000217	256.4	10.9	252.7					
Weighted Activity (pCi/g)[c]			0.1	0.0	0.1					
Bldg demo waste Tbl 3-3	73270	0.283327	250.0	15.0	246.0	2.7	25.7	28.0	3.4	
Weighted Activity (pCi/g)[c]			70.8	4.2	69.7	0.8	7.3	7.9	1.0	
Vicinity prop. soils Tbl 3-4	3640	0.014075	20.0	0.9	20.0	1.4	1.2	0.8	1.3	1.4
Weighted Activity (pCi/g)[c]			0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Bldg found. soils Tbl 3-5	170000	0.657371	42.3	2.0	42.3	5.5	5.4	5.0	6.0	6.0
Weighted Activity (pCi/g)[c]			27.8	1.3	27.8	3.6	3.5	3.3	3.9	3.9
Bldg found. conc. Tbl 3-6	11130	0.043038	73.3	3.4	73.3					
Weighted Activity (pCi/g)[c]			3.2	0.1	3.2					
Total waste volume (cy)	258606									
Sum of Weighted Activities			103.8	5.8	102.6	4.4	10.9	11.2	4.9	4.0

Notes:
[a]From *Interim Facility Safety Documentation for the Ash Pond Storage Area* (DOE/OR/21548-551) Rev. 1, December 1996
[b]Weighted volume = source volume / total waste volume
[c]Weighted Activity = weighted volume x activity concentration

Table C−5. Density Calculations

From *Hazard Categorization for the Chemical Stabalization and Solidification Facility* (DOE/OR/21548-570) Rev. 4, November 1997:

1. Section 2.1, p. 4: maximum sludge concentration (i.e. dry sludge solids in water) in raffinate pits before dredging = 27%
2. Section 2.1, p. 5: density of dry sludge solids = 1.8148 g/cu cm

in-situ sludge density = [fractional sludge concentration x density of dry sludge solids] + [fractional water concentration x density of water]
= [0.27 x 1.8148] + [0.73 x 1.00]
= 1.22 g/cu cm

= 1.22 g/cu cm x [2.54 cm/(1/12) ft]^3 x (27 cf/cy)
= 932754 g/cy
76 lb/cf

From e-mail from Serban Grozescu to David Fleming dated 9-9-02, subject "sludge":

Soil density = 105 lb/cf
= 105 lb/cf x (454 g/lb) x (27 cf/cy)
= 1287090 g/cy

From *Interim Facility Safety Documentation for the Temporary Storage Area* (DOE/OR/21548-513) Rev. 3, December 1997, p. 10:

Density of filter cake = 1.25 g/cu cm
= 1.25 g/cu cm x [2.54 cm/(1/12) ft]^3 x (27 cf/cy)
= 955694 g/cy