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to: Memorandum to Records

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subject: Waste Parameters for an Alternative TDOP Loading Assumption in the AMW Analysis; Revision 1

This memorandum presents a calculation of waste parameters in a single panel assuming that a ten-drum overpack (TDOP) occupies a space in the WIPP repository equivalent to two seven-packs of 55-gallon drums. The single panel is preferentially loaded with supercompacted debris waste from the Idaho National Engineering and Environmental Laboratory Advanced Mixed Waste Treatment Facility (INEEL AMWTF). Throughout the remainder of this document, this panel will be referred to as Panel X.

Previous calculations (Leigh 2003a, 2003b, 2003c) give waste parameters (masses of cellulose, plastic, rubber, oxyanions, and organic ligands) for Panel X assuming that a TDOP occupies a space in the WIPP repository equivalent to three seven-packs of 55-gallon drums. The EPA has noted a discrepancy between this assumption and the actual loading of TDOPs in the repository where in some cases a seven-pack of 55-gallon drums has been placed on top of a TDOP (EPA 2003). In this memorandum, the waste parameters for Panel X are re-calculated assuming that a TDOP occupies a space in the WIPP repository equivalent to two seven-packs of 55-gallon drums.

The methodology for determining the masses of cellulose, plastic, rubber, oxyanions, and organic ligands in Panel X is given in Leigh 2003a, 2003b, and 2003c. For the realistic case, if one assumes a TDOP occupies a space in the WIPP repository equivalent to two seven-packs of 55-gallon drums, Equations 1 through 5 of Leigh 2003a, 2003b, and 2003c change to:

$$(0.379e)/(0.208a + 4.79b + 1.89c + 0.208d + 0.379e) = 0.135 \quad (1)$$

$$e/(b+c+d+e) = 0.82 \quad (2)$$

WIPP: 1.4.1.2.PA.QA-L:530218

$$b/(b+c+d+e) = 0.11 \quad (3)$$

$$c/(b+c+d+e) = 0.06 \quad (4)$$

$$a/7 + 2b + c + d/7 + e/3 = 12{,}082, \quad (5)$$

where a = 55-gallon drums from other sites, b =TDOPs from INEEL, c = Standard Waste Boxes (SWBs) from INEEL, d = 55-gallon drums from INEEL, and e = 100-gallon drums from INEEL. Solving Equations 1 through 5 indicates that if one assumes a TDOP occupies a space in the WIPP repository equivalent to two seven-packs of 55-gallon drums there are

a = 52,898 55-gallon drums from other sites
b = 897 TDOPs from INEEL
c = 489 SWBs from INEEL
d = 82 55-gallon drums from INEEL and
e = 6,689 100-gallon drums from INEEL

in Panel X. Leigh 2003a, Leigh 2003b, and Leigh 2003c indicate that if one assumes a TDOP occupies a space in the WIPP repository equivalent to three seven-packs of 55-gallon drums there are

a = 49,285 55-gallon drums from other sites
b = 834 TDOPs from INEEL
c = 455 SWBs from INEEL
d = 76 55-gallon drums from INEEL and
e = 6,219 100-gallon drums from INEEL

in Panel X for the realistic case.

For the conservative case, if one assumes that a TDOP occupies a space in the WIPP repository equivalent to two seven-packs of 55-gallon drums, Equations 6 through 10 of Leigh 2003a, 2003b, and 2003c change to:

$$(b+ c+ d +e)/(a+b+c+d+e) = 0.54 \quad (6)$$

$$e/(b+c+d+e) = 0.82 \quad (7)$$

$$b/(b+c+d+e) = 0.11 \quad (8)$$

$$c/(b+c+d+e) = 0.06 \quad (9)$$

$$a/7 + 3b + c + d/7 + e/3 = 12{,}082, \quad (10)$$

Solving Equations 6 through 10 indicates that if one assumes a TDOP occupies a space in the WIPP repository equivalent to two seven-packs of 55-gallon drums there are

a = 15,215 55-gallon drums from other sites
b = 1,965 TDOPs from INEEL
c = 1,072 SWBs from INEEL
d = 179 55-gallon drums from INEEL and
e = 14,646 100-gallon drums from INEEL

in Panel X.

Leigh 2003a, Leigh 2003b, and Leigh 2003c indicate that if one assumes a TDOP occupies a space in the WIPP repository equivalent to three seven-packs of 55-gallon drums there are

a = 13,054 55-gallon drums from other sites
b = 1,691 TDOPs from INEEL
c = 922 SWBs from INEEL
d = 154 55-gallon drums from INEEL and
e = 12,603 100-gallon drums from INEEL

in Panel X for the conservative case.

Tables 1 through 4 show the calculation of the masses of cellulose, plastic, and rubber assuming that a TDOP occupies a space in the WIPP repository equivalent to two seven-packs of 55-gallon drums. Tables 5 through 8 show equivalent calculations for the masses of complexing agents, and Tables 9 through 12 show equivalent calculations for the masses of oxyanions.

Table 13 shows the masses of cellulose, plastic, and rubber in Panel X assuming that a TDOP occupies a space in the WIPP repository equivalent to two seven-packs of 55-gallon drums and compares those masses to the values obtained assuming that a TDOP occupies a space in the WIPP repository equivalent to three seven-packs of 55-gallon drums. Table 14 shows the same comparison for complexing agents in Panel X, and Table 15 shows the same comparison for oxyanions in Panel X. If one assumes that a TDOP occupies a space in the WIPP repository equivalent to two seven-packs of 55-gallon drums, the masses of cellulose, plastic, rubber, oxyanions, and complexing agents are 7% higher in the realistic case and 16% higher in the conservative case than if one assumes that a TDOP occupies a space in the WIPP repository equivalent to three seven-packs of 55-gallon drums.

Table 1. Calculation of Cellulose, Plastic, and Rubber Masses in Panel X for the Realistic Case

Container Type	Number of Containers in Panel X	Mass of Cellulose per Container (kg)	Mass of Plastic Per Container (kg)	Mass of Rubber Per Container (kg)	Mass of Plastic Packaging Per Container (kg)	Mass of Cellulose in Panel X (kg)[e]	Mass of Plastic in Panel X (kg)[f]	Mass of Rubber in Panel X (kg)[g]	Mass of Plastic Packaging in Panel X (kg)[h]
55-Gallon Drums With Waste Mix	52,898	[a]7.00	[a]5.51	[a]1.49	3.73	3.70×10^5	2.91×10^5	7.88×10^4	1.97×10^5
TDOPs from INEEL	897	[b]12.86	[b]16.99	[b]0.04	91.55	1.15×10^4	1.52×10^4	3.59×10^1	8.21×10^4
SWBs from INEEL	489	[c]5.17	[c]6.72	[c]0.02	30.24	2.53×10^3	3.29×10^3	9.78×10^0	1.48×10^4
55-Gallon Drums from INEEL	82	[a]7.00	[a]5.51	[a]1.49	3.73	5.74×10^2	4.52×10^2	1.22×10^2	3.06×10^2
100-gallon Drums from INEEL	6,689	[d]114.71	[d]77.52	[d]30.29	0.00	7.67×10^5	5.19×10^5	2.03×10^5	0.00×10^0
Total Mass in Panel X (kg)						1.15×10^6	8.29×10^5	2.82×10^5	2.95×10^5

[a]From Section 3.2.5 Leigh 2003a; [b]From Section 3.2.2 Leigh 2003a; [c]From Section 3.2.3 Leigh 2003a; [d]From Section 3.2.1 Leigh 2003a; [e]Calculated as the number of containers from Column 2 times the mass of cellulosics per container from Column 3; [f]Calculated as the number of containers from Column 2 times the mass of plastics per container from Column 4; [g]Calculated as the number of containers from Column 2 times the mass of rubbers from Column 5, [h]Calculated as the number of containers from Column 2 times the mass of plastic packaging from Column 6.

Table 2. Calculation of Cellulose, Plastic, and Rubber Masses in Panel X for the Conservative Case

Container Type	Number of Containers in Panel X	Mass of Cellulose per Container (kg)	Mass of Plastic Per Container (kg)	Mass of Rubber Per Container (kg)	Mass of Plastic Packaging Per Container (kg)	Mass of Cellulose in Panel X (kg)[e]	Mass of Plastic in Panel X (kg)[f]	Mass of Rubber in Panel X (kg)[g]	Mass of Plastic Packaging in Panel X (kg)[h]
55-Gallon Drums With Waste Mix	15,215	[a]7.00	[a]5.51	[a]1.49	3.73	1.07×10^5	8.38×10^4	2.27×10^4	5.68×10^4
TDOPs from INEEL	1,965	[b]12.86	[b]16.99	[b]0.04	91.55	2.53×10^4	3.34×10^4	7.86×10^1	1.80×10^5
SWBs from INEEL	1,072	[c]5.17	[c]6.72	[c]0.02	30.24	5.54×10^3	7.20×10^3	2.14×10^1	3.24×10^4
55-Gallon Drums from INEEL	179	[a]7.00	[a]5.51	[a]1.49	3.73	1.25×10^3	9.86×10^2	2.67×10^2	6.68×10^2
100-gallon drums from INEEL	14,646	[d]114.71	[d]77.52	[d]30.29	0.00	1.68×10^6	1.14×10^6	4.44×10^5	0.00×10^0
Total Mass in Panel X (kg)						1.82×10^6	1.26×10^6	4.67×10^5	2.70×10^5

[a]From Section 3.2.5 Leigh 2003a; [b]From Section 3.2.2 Leigh 2003a; [c]From Section 3.2.3 Leigh 2003a; [d]From Section 3.2.1 Leigh 2003a; [e]Calculated as the number of containers from Column 2 times the mass of cellulosics per container from Column 3; [f]Calculated as the number of containers from Column 2 times the mass of plastics per container from Column 4; [g]Calculated as the number of containers from Column 2 times the mass of rubbers from Column 5, [h]Calculated as the number of containers from Column 2 times the mass of plastic packaging from Column 6.

Table 3. Calculation of Cellulose, Plastic, and Rubber Masses in the Rest of Repository for the Realistic Case

	Volume (m^3)	Mass of Cellulose (kg)	Mass of Plastic (kg)	Mass of Rubber (kg)	Mass of Plastic Packaging (kg)
All DOE Generator/Storage Sites	[a]1.69×10^5	[b]9.77×10^6	[b]7.08×10^6	[b]2.36×10^6	2.70×10^6
Panel X	[c]1.88×10^4	1.15×10^6	8.29×10^5	2.82×10^5	2.95×10^5
Rest of Repository	1.50×10^5	8.62×10^6	6.25×10^6	2.08×10^6	2.41×10^6

[a]From the definition of disposal inventory Leigh 2003a; [b]From Table 3 Section 3.2.5 Leigh 2003a
[c]Based on the number of containers and container volumes

Table 4. Calculation of Cellulose, Plastic, and Rubber Masses in the Rest of Repository for the Conservative Case

	Volume (m^3)	Mass of Cellulose (kg)	Mass of Plastic (kg)	Mass of Rubber (kg)	Mass of Plastic Packaging (kg)
All DOE Generator/Storage Sites	[a]1.69×10^5	[b]9.77×10^6	[b]7.08×10^6	[b]2.36×10^6	2.70×10^6
Panel X	[c]2.02×10^4	1.82×10^6	1.26×10^6	4.67×10^5	2.70×10^5
Rest of Repository	1.48×10^5	7.95×10^6	5.82×10^6	1.89×10^6	2.43×10^6

[a]From the definition of disposal inventory Leigh 2003a; [b]From Table 3 Section 3.2.5 Leigh 2003a

[c]Based on the number of containers and container volumes

Table 5. Calculation of Complexing Agent Masses in Panel X for the Realistic Case

Container Type	Number of Containers in Panel X	Mass of Acetic Acid per Container (kg)	Mass of Sodium Acetate Per Container (kg)	Mass of Citric Acid Per Container (kg)	Mass of Sodium Citrate Per Container (kg)	Mass of Oxyalic Acid Per Container (kg)	Mass of Sodium Oxalate Per Container (kg)	Mass of Sodium EDTA Per Container (kg)
55-Gallon Drums With Homogeneous Mix	52,898	[a]1.98×10^{-4}	[a]1.19×10^{-2}	[a]1.66×10^{-3}	[a]5.58×10^{-4}	[a]1.92×10^{-2}	[a]4.73×10^{-2}	[a]3.57×10^{-5}
TDOPs from INEEL	897	[b]4.56×10^{-3}	[b]2.73×10^{-1}	[b]3.82×10^{-2}	[b]1.29×10^{-2}	[b]4.43×10^{-1}	[b]1.09×10^{0}	[b]8.22×10^{-4}
SWBs from INEEL	489	[c]1.80×10^{-3}	[c]1.08×10^{-1}	[c]1.51×10^{-2}	[c]5.07×10^{-3}	[c]1.75×10^{-1}	[c]4.30×10^{-1}	[c]3.25×10^{-4}
55-Gallon Drums from INEEL	82	[a]1.98×10^{-4}	[a]1.19×10^{-2}	[a]1.66×10^{-3}	[a]5.58×10^{-4}	[a]1.92×10^{-2}	[a]4.73×10^{-2}	[a]3.57×10^{-5}
100-gallon Drums from INEEL	6,689	[d]0	[d]0	[d]0	[d]0	[d]0	[d]0	[d]0
	Number of Containers in Panel X	Mass of Acetic Acid in Panel X (kg)[e]	Mass of Sodium Acetate in Panel X (kg)[f]	Mass of Citric Acid in Panel X (kg)[g]	Mass of Sodium Citrate in Panel X (kg)[h]	Mass of Oxyalic Acid in Panel X (kg)[i]	Mass of Sodium Oxalate in Panel X (kg)[j]	Mass of Sodium EDTA in Panel X (kg)[k]
55-Gallon Drums With Homogeneous Mix	52,898	1.05×10^{1}	6.28×10^{2}	8.79×10^{1}	2.95×10^{1}	1.02×10^{3}	2.50×10^{3}	1.89×10^{0}
TDOPs from INEEL	897	4.09×10^{0}	2.45×10^{2}	3.43×10^{1}	1.15×10^{1}	3.98×10^{2}	9.78×10^{2}	7.38×10^{-1}
SWBs from INEEL	489	8.80×10^{-1}	5.28×10^{1}	7.38×10^{0}	2.48×10^{0}	8.55×10^{1}	2.10×10^{2}	1.59×10^{-1}
55-Gallon Drums from INEEL	82	1.62×10^{-2}	9.73×10^{-1}	1.36×10^{-1}	4.58×10^{-2}	1.58×10^{0}	3.88×10^{0}	2.93×10^{-3}
100-gallon Drums from INEEL	6,689	0.00×10^{0}	0.00×10^{0}	0.00×10^{0}	0.00×10^{0}	0.00×10^{0}	0.00×10^{0}	0.00×10^{0}
Total Mass in Panel X (kg)		1.55×10^{1}	9.27×10^{2}	1.30×10^{2}	4.36×10^{1}	1.50×10^{3}	3.70×10^{3}	2.79×10^{0}

[a]From Section 3.2.5 Leigh 2003b; [b]From Section 3.2.2 Leigh 2003b; [c]From Section 3.2.3 Leigh 2003b; [d]From Section 3.2.1 Leigh 2003b; [e]Calculated as the number of containers from Column 2 times the mass of acetic acid per container from Column 3; [f]Calculated as the number of containers from Column 2 times the mass of sodium acetate per container from Column 4; [g]Calculated as the number of containers from Column 2 times the mass of citric acid per container from Column 5. [h]Calculated as the number of containers from Column 2 times the mass of sodium citrate per container from Column 6; [i]Calculated as the number of containers from Column 2 times the mass of sodium oxalate per container from Column 7; [j]Calculated as the number of containers from Column 2 times the mass of oxalic acid per container from Column 8; [k]Calculated as the number of containers from Column 2 times the mass of sodium EDTA per container from Column 9.

Table 6. Calculation of Complexing Agent Masses in Panel X for the Conservative Case

Container Type	Number of Containers in Panel X	Mass of Acetic Acid per Container (kg)	Mass of Sodium Acetate Per Container (kg)	Mass of Citric Acid Per Container (kg)	Mass of Sodium Citrate Per Container (kg)	Mass of Oxyalic Acid Per Container (kg)	Mass of Sodium Oxalate Per Container (kg)	Mass of Sodium EDTA Per Container (kg)
55-Gallon Drums With Homogeneous Mix	15,215	[a]1.98×10^{-4}	[a]1.19×10^{-2}	[a]1.66×10^{-3}	[a]5.58×10^{-4}	[a]1.92×10^{-2}	[a]4.73×10^{-2}	[a]3.57×10^{-5}
TDOPs from INEEL	1,965	[b]4.56×10^{-3}	[b]2.73×10^{-1}	[b]3.82×10^{-2}	[b]1.29×10^{-2}	[b]4.43×10^{-1}	[b]1.09×10^{0}	[b]8.22×10^{-4}
SWBs from INEEL	1072	[c]1.80×10^{-3}	[c]1.08×10^{-1}	[c]1.51×10^{-2}	[c]5.07×10^{-3}	[c]1.75×10^{-1}	[c]4.30×10^{-1}	[c]3.25×10^{-4}
55-Gallon Drums from INEEL	179	[a]1.98×10^{-4}	[a]1.19×10^{-2}	[a]1.66×10^{-3}	[a]5.58×10^{-4}	[a]1.92×10^{-2}	[a]4.73×10^{-2}	[a]3.57×10^{-5}
100-gallon Drums from INEEL	14,646	[d]0	[d]0	[d]0	[d]0	[d]0	[d]0	[d]0
	Number of Containers in Panel X	Mass of Acetic Acid in Panel X (kg)[e]	Mass of Sodium Acetate in Panel X (kg)[f]	Mass of Citric Acid in Panel X (kg)[g]	Mass of Sodium Citrate in Panel X (kg)[h]	Mass of Oxyalic Acid in Panel X (kg)[i]	Mass of Sodium Oxalate in Panel X (kg)[j]	Mass of Sodium EDTA in Panel X (kg)[k]
55-Gallon Drums With Homogeneous Mix	15,215	3.01×10^{0}	1.81×10^{2}	2.53×10^{1}	8.49×10^{0}	2.93×10^{2}	7.20×10^{2}	5.43×10^{-1}
TDOPs from INEEL	1,965	8.96×10^{0}	5.37×10^{2}	7.52×10^{1}	2.53×10^{1}	8.71×10^{2}	2.14×10^{3}	1.62×10^{0}
SWBs from INEEL	1,072	1.93×10^{0}	1.16×10^{2}	1.62×10^{1}	5.44×10^{0}	1.87×10^{2}	4.61×10^{2}	3.48×10^{-1}
55-Gallon Drums from INEEL	179	3.55×10^{-2}	2.13×10^{0}	2.97×10^{-1}	9.99×10^{-2}	3.45×10^{0}	8.48×10^{0}	6.39×10^{-3}
100-gallon Drums from INEEL	14,646	0.00×10^{0}	0.00×10^{0}	0.00×10^{0}	0.00×10^{0}	0.00×10^{0}	0.00×10^{0}	0.00×10^{0}
Total Mass in Panel X (kg)		1.39×10^{1}	8.36×10^{2}	1.17×10^{2}	3.93×10^{1}	1.35×10^{3}	3.33×10^{3}	2.51×10^{0}

[a]From Section 3.2.5 Leigh 2003b; [b]From Section 3.2.2 Leigh 2003b; [c]From Section 3.2.3 Leigh 2003b; [d]From Section 3.2.1 Leigh 2003b; [e]Calculated as the number of containers from Column 2 times the mass of acetic acid per container from Column 3; [f]Calculated as the number of containers from Column 2 times the mass of sodium acetate per container from Column 4; [g]Calculated as the number of containers from Column 2 times the mass of citric acid per container from Column 5. [h]Calculated as the number of containers from Column 2 times the mass of sodium citrate per container from Column 6; [i]Calculated as the number of containers from Column 2 times the mass of sodium oxalate per container from Column 7; [j]Calculated as the number of containers from Column 2 times the mass of oxalic acid per container from Column 8; [k]Calculated as the number of containers from Column 2 times the mass of sodium EDTA per container from Column 9.

Table 7. Calculation of Complexing Agent Masses in the Rest of Repository for the Realistic Case

Panel Type	Volume (m^3)	Mass of Acetic Acid (kg)	Mass of Sodium Acetate (kg)	Mass of Citric Acid (kg)	Mass of Sodium Citrate (kg)	Mass of Oxalic Acid (kg)	Mass of Sodium Oxalate (kg)	Mass of Sodium EDTA (kg)
All DOE Generator/Storage Sites	[a]1.69×10^5	[b]142	[b]8510	[b]1190.5	[b]400	[b]13,796	[b]33,940	[b]25.6
Panel X	[c]1.88×10^4	1.55×10^1	9.27×10^2	1.30×10^2	4.36×10^1	1.50×10^3	3.70×10^3	2.79×10^0
Rest of Repository	1.50×10^5	1.27×10^2	7.58×10^3	1.06×10^3	3.56×10^2	1.23×10^4	3.02×10^4	2.28×10^1

[a]From the definition of disposal inventory Leigh 2003b, [b]Crawford and Leigh 2003 [c]Based on the number of containers and container volumes

Table 8. Calculation of Complexing Agent Masses in the Rest of Repository for the Conservative Case

Panel Type	Volume (m^3)	Mass of Acetic Acid (kg)	Mass of Sodium Acetate (kg)	Mass of Citric Acid (kg)	Mass of Sodium Citrate (kg)	Mass of Oxalic Acid (kg)	Mass of Sodium Oxalate (kg)	Mass of Sodium EDTA (kg)
All DOE Generator/Storage Sites	[a]1.69×10^5	[b]142	[b]8510	[b]1190.5	[b]400	[b]13,796	[b]33,940	[b]25.6
Panel X	[c]2.02×10^4	1.39×10^1	8.36×10^2	1.17×10^2	3.93×10^1	1.35×10^3	3.33×10^3	2.51×10^0
Rest of Repository	1.48×10^5	1.28×10^2	7.67×10^3	1.07×10^3	3.61×10^2	1.24×10^4	3.06×10^4	2.31×10^1

[a]From the definition of disposal inventory Leigh 2003b, [b]Crawford and Leigh 2003

[c]Based on the number of containers and container volumes

Table 9. Calculation of Nitrate, Sulfate, and Phosphate Masses in Panel X for the Realistic Case

Container Type	Number of Containers in Panel X	Mass of Nitrate per Container (kg)	Mass of Sulfate Per Container (kg)	Mass of Phosphate Per Container (kg)	Mass of Nitrate in Panel X (kg)[e]	Mass of Sulfate in Panel X (kg)[f]	Mass of Phosphate in Panel X (kg)[g]
55-Gallon Drums With Waste Mix	52,898	[a]3.31	[a]0.71	[a]2.02	1.75×10^5	3.76×10^4	1.07×10^5
TDOPs from INEEL	897	[b]91.16	[b]1.22	[b]0	8.18×10^4	1.09×10^3	0.00×10^0
SWBs from INEEL	489	[c]36.08	[c]0.60	[c]0	1.76×10^4	2.93×10^2	0.00×10^0
55-Gallon Drums from INEEL	82	[a]3.31	[a]0.71	[a]2.02	2.71×10^2	5.82×10^1	1.66×10^2
100-gallon Drums from INEEL	6,689	[d]0	[d]0	[d]0	0.00×10^0	0.00×10^0	0.00×10^0
Total Mass in Panel X (kg)					2.75×10^5	3.90×10^4	1.07×10^5

[a]From Section 3.2.5 Leigh 2003c; [b]From Section 3.2.2 Leigh 2003c; [c]From Section 3.2.3 Leigh 2003c; [d]From Section 3.2.1 Leigh 2003c; [e]Calculated as the number of containers from Column 2 times the mass of nitrate per container from Column 3; [f]Calculated as the number of containers from Column 2 times the mass of sulfate per container from Column 4; [g]Calculated as the number of containers from Column 2 times the mass of phosphate from Column 5.

Table 10. Calculation of Nitrate, Sulfate, and Phosphate Masses in Panel X for the Conservative Case

Container Type	Number of Containers in Panel X	Mass of Nitrate per Container (kg)	Mass of Sulfate Per Container (kg)	Mass of Phosphate Per Container (kg)	Mass of Nitrate in Panel X (kg)[e]	Mass of Sulfate in Panel X (kg)[f]	Mass of Phosphate in Panel X (kg)[g]
55-Gallon Drums With Waste Mix	15,215	[a]3.31	[a]0.71	[a]2.02	5.04×10^4	1.08×10^4	3.07×10^4
TDOPs from INEEL	1,965	[b]91.16	[b]1.22	[b]0	1.79×10^5	2.40×10^3	0.00×10^0
SWBs from INEEL	1,072	[c]36.08	[c]0.60	[c]0	3.87×10^4	6.43×10^2	0.00×10^0
55-Gallon Drums from INEEL	179	[a]3.31	[a]0.71	[a]2.02	5.92×10^2	1.27×10^2	3.62×10^2
100-gallon drums from INEEL	14,646	[d]0	[d]0	[d]0	0.00×10^0	0.00×10^0	0.00×10^0
Total Mass in Panel X (kg)					2.69×10^5	1.40×10^4	3.11×10^4

[a]From Section 3.2.5 Leigh 2003c; [b]From Section 3.2.2 Leigh 2003c; [c]From Section 3.2.3 Leigh 2003c; [d]From Section 3.2.1 Leigh 2003c; [e]Calculated as the number of containers from Column 2 times the mass of nitrate per container from Column 3; [f]Calculated as the number of containers from Column 2 times the mass of sulfate per container from Column 4; [g]Calculated as the number of containers from Column 2 times the mass of phosphate from Column 5.

Table 11. Calculation of Nitrate, Sulfate, and Phosphate Masses in the Rest of Repository for the Realistic Case

Panel Type	Volume (m^3)	Mass of Nitrate (kg)	Mass of Sulfate (kg)	Mass of Phosphate (kg)
All DOE Generator/Storage Sites	[a]1.69×10^5	[b]2.50×10^6	[b]4.21×10^5	[b]1.05×10^6
Panel X	[c]1.88×10^4	2.75×10^5	3.90×10^4	1.07×10^5
Rest of Repository	1.50×10^5	2.23×10^6	3.82×10^5	9.43×10^5

[a]From the definition of disposal inventory Leigh 2003c; [b]Leigh and Sparks-Roybal 2003 [c]Based on the number of containers and container volumes

Table 12. Calculation of Nitrate, Sulfate, and Phosphate Masses in the Rest of Repository for the Conservative Case

Panel Type	Volume (m^3)	Mass of Nitrate (kg)	Mass of Sulfate (kg)	Mass of Phosphate (kg)
All DOE Generator/Storage Sites	[a]1.69×10^5	[b]2.50×10^6	[b]4.21×10^5	[b]1.05×10^6
Panel X	[c]2.02×10^4	2.69×10^5	1.40×10^4	3.11×10^4
Rest of Repository	1.48×10^5	2.23×10^6	4.07×10^5	1.02×10^6

[a]From the definition of disposal inventory Leigh 2003c; [b]Leigh and Sparks-Roybal 2003 [c]Based on the number of containers and container volumes

Table 13. Cellulose, Plastic, and Rubber Masses in Panel X and the Rest of Repository

	Volume (m^3)	Mass of Cellulosics (kg)	Mass of Plastics (kg)	Mass of Rubbers (kg)	Mass of Plastics Packaging (kg)
Realistic Case – if a TDOP occupies the space of two seven-packs of 55-gallon drums					
Panel X	1.88×10^4	1.15×10^6	8.29×10^5	2.82×10^5	2.95×10^5
Rest of Repository	1.50×10^5	8.62×10^6	6.25×10^6	2.08×10^6	2.41×10^6
Realistic Case – if a TDOP occupies the space of three seven-packs of 55-gallon drums					
Panel X	1.88×10^4	1.07×10^6	7.71×10^5	2.62×10^5	2.74×10^5
Rest of Repository	1.75×10^5	8.70×10^6	6.31×10^6	2.10×10^6	2.43×10^6
Conservative Case- if a TDOP occupies the space of two seven-packs of 55-gallon drums					
Panel X	2.02×10^4	1.82×10^6	1.26×10^6	4.67×10^5	2.70×10^5
Rest of Repository	1.48×10^5	7.95×10^6	5.82×10^6	1.89×10^6	2.43×10^6
Conservative Case - if a TDOP occupies the space of three seven-packs of 55-gallon drums					
Panel X	2.02×10^4	1.56×10^6	1.08×10^6	4.02×10^5	2.32×10^5
Rest of Repository	1.48×10^5	8.21×10^6	6.00×10^6	1.96×10^6	2.47×10^6

Table 14. Complexing Agent Masses in Panel X and the Rest of Repository

Panel X or Rest of Repository	Volume (m^3)	Mass of Acetic Acid (kg)	Mass of Sodium Acetate (kg)	Mass of Citric Acid (kg)	Mass of Sodium Citrate (kg)	Mass of Oxalic Acid (kg)	Mass of Sodium Oxalate (kg)	Mass of Sodium EDTA (kg)
Realistic Case – if a TDOP occupies the space of two seven-packs of 55-gallon drums								
Panel X	1.88×10^4	1.55×10^1	9.27×10^2	1.30×10^2	4.36×10^1	1.50×10^3	3.70×10^3	2.79×10^0
Rest of Repository	1.50×10^5	1.27×10^2	7.58×10^3	1.06×10^3	3.56×10^2	1.23×10^4	3.02×10^4	2.28×10^1
Realistic Case – if a TDOP occupies the space of three seven-packs of 55-gallon drums								
Panel X	1.88×10^4	1.44×10^1	8.63×10^2	1.21×10^2	4.06×10^1	1.40×10^3	3.44×10^3	2.60×10^0
Rest of Repository	1.50×10^5	1.28×10^2	7.65×10^3	1.07×10^3	3.59×10^2	1.24×10^4	3.05×10^4	2.30×10^1
Conservative Case – if a TDOP occupies the space of two seven-packs of 55-gallon drums								
Panel X	2.02×10^4	1.39×10^1	8.36×10^2	1.17×10^2	3.93×10^1	1.35×10^3	3.33×10^3	2.51×10^0
Rest of Repository	1.48×10^5	1.28×10^2	7.67×10^3	1.07×10^3	3.61×10^2	1.24×10^4	3.06×10^4	2.31×10^1
Conservative Case – if a TDOP occupies the space of three seven-packs of 55-gallon drums								
Panel X	2.02×10^4	1.20×10^1	7.19×10^2	1.01×10^2	3.38×10^1	1.16×10^3	2.87×10^3	2.16×10^0
Rest of Repository	1.48×10^5	1.30×10^2	7.79×10^3	1.09×10^3	3.66×10^2	1.26×10^4	3.11×10^4	2.34×10^1

Table 15. Nitrate, Sulfate, and Phosphate Masses in Panel X and the Rest of Repository

Panel X or Rest of Repository	Volume (m^3)	Mass of Nitrate (kg)	Mass of Sulfate (kg)	Mass of Phosphate (kg)
Realistic Case – if a TDOP occupies the space of two seven-packs of 55-gallon drums				
Panel X	1.88×10^4	2.75×10^5	3.90×10^4	1.07×10^5
Rest of Repository	1.50×10^5	2.23×10^6	3.82×10^5	9.43×10^5
Realistic Case – if a TDOP occupies the space of three seven-packs of 55-gallon drums				
Panel X	1.88×10^4	2.56×10^5	3.63×10^4	9.97×10^4
Rest of Repository	1.50×10^5	2.24×10^6	3.85×10^5	9.50×10^5
Conservative Case – if a TDOP occupies the space of two seven-packs of 55-gallon drums				
Panel X	2.02×10^4	2.69×10^5	1.40×10^4	3.11×10^4
Rest of Repository	1.48×10^5	2.23×10^6	$4.07X 10^5$	1.02×10^6
Conservative Case – if a TDOP occupies the space of three seven-packs of 55-gallon drums				
Panel X	2.02×10^4	2.31×10^5	1.20×10^4	2.67×10^4
Rest of Repository	1.48×10^5	2.27×10^6	4.09×10^5	1.02×10^6

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