

TABLE S-6 Summary Comparison of Potential Environmental Consequences of the Alternatives^a

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
<i>Human Health and Safety — Normal Facility Operations</i>				
Radiation exposure				
Construction				
Involved workers	Potential external radiation exposures (above background) because of proximity to cylinder storage yards. Estimated maximum annual individual worker dose of 35 mrem/yr over a 2-year construction period.	Background	Potential external radiation exposures (above background) because of proximity to cylinder storage yards. Estimated maximum annual individual worker dose of 40 mrem/yr over a 2-year construction period.	Potential external radiation exposures (above background) to construction workers for yard reconstruction because of proximity to cylinder storage yards. Estimated maximum total individual worker dose is 230 mrem/yr.
Operations				
Involved workers				
Average dose to individual involved workers	Conversion facility: 75 mrem/yr Cylinder yards: 430–690 mrem/yr	Same as Location A	Same as Location A	740 mrem/yr
Collective dose to involved workers	Conversion facility: 10.7 person-rem/yr Cylinder yards: 3–6 person-rem/yr	Same as Location A	Same as Location A	33 person-rem/yr

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Total health effects among involved workers for the life of the project (through 2039 for no action)	1 in 7 chance of 1 latent cancer fatality (LCF)	Same as Location A	Same as Location A	1 in 2 chance of 1 LCF
Noninvolved workers				
Maximum dose to noninvolved worker maximally exposed individual (MEI)	1×10^{-5} mrem/yr	Same as Location A	Same as Location A	0.15 mrem/yr
Collective dose to noninvolved workers	$<1.9 \times 10^{-5}$ person-rem/yr	Same as Location A	Same as Location A	0.003 person-rem/yr
Total health effects among noninvolved workers for the life of the project (through 2039 for no action)	<1 in 1 million chance of 1 LCF	Same as Location A	Same as Location A	<1 in 100,000 chance of 1 LCF
General public				
Maximum dose to the general public MEI	$<3.9 \times 10^{-5}$ mrem/yr	Same as Location A	Same as Location A	<0.1 mrem/yr (during storage) <0.5 mrem/yr (long-term)
Collective dose to the general public within 50 mi (80 km)	4.7×10^{-5} person-rem/yr	Same as Location A	Same as Location A	0.008 person-rem/yr
Total health effects among members of the public over the life of the project (through 2039 for no action)	<1 chance in 1 million of 1 LCF	Same as Location A	Same as Location A	1 chance in 7,000 of 1 LCF

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Chemical exposure of concern^b (concern = hazard index >1)				
Noninvolved worker MEI	Well below levels expected to cause health effects (hazard index <0.1).	Same as Location A	Same as Location A	Well below levels expected to cause health effects (hazard index <0.1).
General public MEI	Well below levels expected to cause health effects (hazard index <0.1).	Same as Location A	Same as Location A	Well below levels expected to cause health effects (hazard index <0.1).
<i>Human Health and Safety — Facility Accidents^c</i>				
Physical hazards (involved and noninvolved workers)				
Construction: on-the-job fatalities and injuries	0 fatalities; 11 injuries	Same as Location A	Same as Location A	0 fatalities; 2 injuries
Operations: on-the-job fatalities and injuries	0 fatalities/yr; 8 injuries/yr	Same as Location A	Same as Location A	0 fatalities/yr; 2 injuries/yr

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Accidents involving chemical or radiation releases, low frequency-high consequence accidents				
Bounding chemical accident	Anhydrous ammonia (NH ₃) tank rupture	Same as Location A	Same as Location A	Cylinder ruptures – fire (high for adverse effects); corroded cylinder spill, wet conditions (high for irreversible adverse effects).
Release amount	29,500 lb (13,400 kg) of NH ₃	Same as Location A	Same as Location A	24,000 lb (11,000 kg) of DUF ₆ (fire); 96 lb (44 kg) of HF (spill, wet conditions)
Estimated frequency	<1 time in 1,000,000 years	Same as Location A	Same as Location A	≈1 time in 100,000 years (both accidents)
Probability – life of the project (through 2039 for no action)	<1 chance in 40,000	Same as Location A	Same as Location A	≈1 chance in 2,500
Consequences (per accident) ^d				
Chemical exposure – public				
Adverse effects	26–4,800 persons	14–4,900 persons	17–6,700 persons	0–2,000 persons
Irreversible adverse effects	2–370 persons	0–320 persons	1–220 persons	0–1 person
Fatalities	0–7 persons	0–6 persons	0–4 persons	0 persons

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Chemical exposure – noninvolved workers ^e				
Adverse effects	1,100–1,600 persons	1,100–1,400 persons	1,400–1,600 persons	4–910 persons
Irreversible adverse effects	600–1,600 persons	730–1,400 persons	130–1,600 persons	1–300 persons
Fatalities	0–30 persons	0–30 persons	0–30 persons	0–3 persons
Accident risk (consequence × probability)				
General public	0 fatalities	Same as Location A	Same as Location A	0 fatalities
Noninvolved workers ^e	0 fatalities	Same as Location A	Same as Location A	0 fatalities
Bounding radiological accident	Earthquake accident damages U ₃ O ₈ storage building containing 6 months’ of product.	Same as Location A	Same as Location A	Cylinder ruptures – fire
Release amount	180 lb (82 kg) of depleted U ₃ O ₈	Same as Location A	Same as Location A	24,000 lb (11,000 kg) of UF ₆
Estimated frequency	≈1 time in 100,000 years	Same as Location A	Same as Location A	≈1 time in 100,000 years
Probability – life of the project (through 2039 for no action)	≈1 chance in 4000	Same as Location A	Same as Location A	≈1 chance in 2,500
Consequences (per accident)				
Radiation exposure – public				
Dose to MEI	2–40 rem	Same as Location A	Same as Location A	15 mrem
Risk of LCF	1 chance in 50	Same as Location A	Same as Location A	7 in 1 million
Total dose to population	13–73 person-rem	Same as Location A	Same as Location A	29 person-rem
Total LCFs	1 chance in 40 of 1 LCF	Same as Location A	Same as Location A	1 chance in 70 of 1 LCF

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Radiation exposure – noninvolved workers ^e				
Dose to MEI	2–40 rem	Same as Location A	Same as Location A	20 mrem
Risk of LCF	1 chance in 50	Same as Location A	Same as Location A	8 in 1 million
Total dose to workers	0.2–530 person-rem	0.5–1,300 person-rem	0.1–300 person-rem	15 person-rem
Total LCFs	1 chance in 5 of 1 LCF	1 chance in 2 of 1 LCF	1 chance in 8 of 1 LCF	1 chance in 170 of 1 LCF
Accident risk (consequence × probability)				
General public	0 LCFs	Same as Location A	Same as Location A	0 LCFs
Noninvolved workers ^e	0 LCFs	Same as Location A	Same as Location A	0 LCFs
Human Health and Safety — Transportation				
Transportation impacts during normal operations				Negligible impacts due to small number of shipments (1 shipment/yr) and low concentration of expected contamination.
Total fatalities from exposure to vehicle exhaust emissions				
Maximum use of truck	20 (30 if hydrogen fluoride [HF] is neutralized to calcium fluoride [CaF ₂] for disposal)	Same as Location A	Same as Location A	Negligible
Maximum use of rail	<1 (1 if HF is neutralized to CaF ₂)	Same as Location A	Same as Location A	Negligible

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Total fatalities from exposure to external radiation				
Maximum use of truck	<1	Same as Location A	Same as Location A	Negligible
Maximum use of rail	<1	Same as Location A	Same as Location A	Negligible
Maximum radiation exposure to a person along a route (MEI)	Negligible (<0.045 mrem)	Same as Location A	Same as Location A	Negligible
Traffic accident fatalities (life of the project); (physical hazards, unrelated to cargo)				
Maximum use of truck	2 (4 if CaF ₂ shipped for disposal)	Same as Location A	Same as Location A	Negligible
Maximum use of rail	1 (including CaF ₂)	Same as Location A	Same as Location A	Negligible
Traffic accidents involving radiation or chemical releases				
Low frequency-high consequence cylinder accidents				NA ^f
Bounding accident scenario	Urban rail accident involving DUF ₆ cylinders (only if East Tennessee Technology Park [ETTP] cylinders are shipped to Paducah by rail).	Same as Location A	Same as Location A	NA
Release	Uranium, HF	Same as Location A	Same as Location A	NA

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Probability – life of the project	≈1 chance in 120,000	Same as Location A	Same as Location A	NA
Consequences (per accident)				
Chemical exposure – all workers and members of general public				
Irreversible adverse effects	4	Same as Location A	Same as Location A	NA
Fatalities	0	Same as Location A	Same as Location A	NA
Radiation exposure – all workers and members of the general public				
Total LCFs	60	Same as Location A	Same as Location A	NA
Accident risk (consequence × probability)				
Workers and the general public	0 fatalities	Same as Location A	Same as Location A	NA
Low frequency-high consequence accidents with all other materials				NA
Bounding accident scenario	Urban rail accident involving anhydrous NH ₃	Same as Location A	Same as Location A	NA
Release	Anhydrous NH ₃	Same as Location A	Same as Location A	NA
Probability – life of project	≈1 chance in 200,000	Same as Location A	Same as Location A	NA
Consequences (per accident)				
Chemical exposure – all workers and members of the general public				
Irreversible adverse effects	5,000	Same as Location A	Same as Location A	NA

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Fatalities	100	Same as Location A	Same as Location A	NA
Accident risk (consequence × probability)				
Irreversible adverse effects	0	Same as Location A	Same as Location A	NA
Fatalities	0	Same as Location A	Same as Location A	NA
<i>Air Quality and Noise</i>				
Pollutant emissions during conversion facility construction	Total (modeled plus background) concentrations for particulate matter (PM) with an aerodynamic diameter of less than or equal to 10 and 2.5 μm, respectively (PM ₁₀ and PM _{2.5}), would exceed standards at the construction site boundary because of the high background concentrations; construction-related concentrations would be negligible at the nearest residence. Other criteria pollutants are well within standards.	Same as Location A	Same as Location A	For yard reconstruction, the maximum 24-hour PM ₁₀ concentration is up to 90% of the standard; other criteria pollutants are well within standards.

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Pollutant emissions during conversion facility operations	<p>Average-annual PM_{2.5} concentrations close to standards because of high background concentrations; operations-related concentrations would be negligible at the nearest residence. Other criteria pollutants would be well within standards.</p> <p>No concentration increment would exceed applicable prevention of significant deterioration (PSD) increments at the site boundary (for Class II area), and all increments would well below the PSD increment for the nearest Class I area.</p>	Same as Location A	Same as Location A	<p>Under the controlled cylinder corrosion scenario, the maximum 24-hour HF concentration would be less than 3% of the Commonwealth of Kentucky secondary standard; criteria pollutants would be well within standards.</p> <p>Under the uncontrolled cylinder corrosion scenario, the maximum 24-hour HF concentration at the site boundary could be up to 69% of the Commonwealth of Kentucky secondary standard.</p>

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Estimated noise levels at the nearest residence	Below the U.S. Environmental Protection Agency (EPA) guideline of 55 dB(A) as day-night average sound level (DNL) during construction and operation.	Same as Location A	Same as Location A	Below the EPA guideline of 55 dB(A) as DNL during construction and operation.
<i>Water and Soil</i>				
Surface water Construction	Negligible impacts from changes to runoff, from floodplains, or from water use and discharge.	Same as Location A	Same as Location A	Negligible impacts from changes to runoff, from floodplains, or from water use and discharge.
Operations	Negligible impacts from water use and discharge.	Same as Location A	Same as Location A	Negligible impacts from water use and discharge.
Groundwater Construction	No direct impacts to groundwater recharge, depth, or flow direction; impacts to groundwater quality unlikely.	Same as Location A	Same as Location A	No direct impacts to groundwater recharge, depth, or flow direction; impacts to groundwater quality unlikely.

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Operations	No direct impacts to groundwater recharge, depth, or flow direction; impacts to groundwater quality unlikely.	Same as Location A	Same as Location A	<p>Under the controlled corrosion case, maximum uranium groundwater concentration (occurring in around 2070) of 6 µg/L, below the guideline of 20 µg/L.^g</p> <p>Under the uncontrolled corrosion case, cylinder breaches occurring before 2020 could result in groundwater concentrations exceeding the guideline sometime after 2100.</p>
Soils Construction	Local and temporary increase in erosion; impacts to soil quality unlikely. Potentially contaminated soil associated with solid waste management unit (SWMU) 194 could be excavated.	Same as Location A	Local and temporary increase in erosion; impacts to soil quality unlikely.	Local and temporary increase in erosion; impacts to soil quality unlikely.
Operations	No direct impacts to soil.	Same as Location A	Same as Location A	Negligible impacts to soils.



TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
<i>Socioeconomics</i>				
Construction	Direct employment of 190 people in peak year; 290 total jobs in the region of influence (ROI); total personal income of \$9.5 million in peak year; marginal impacts on public services. Two-year duration of impacts.	Same as Location A	Same as Location A	Direct employment of 30 people; 110 total jobs in ROI; total personal income of \$3.2 million; no significant impacts on public services.
Operations	Direct employment of 160 people; 330 total jobs in ROI; total personal income of \$13 million per year; no significant impacts on public services.	Same as Location A	Same as Location A	Direct employment of 90 people; 130 total jobs in ROI; total personal income of \$3.8 million per year through 2039; no significant impacts on public services.

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
<i>Ecology</i>				
Ecological resources (habitat loss, vegetation, wildlife)	Total area disturbed during construction: 45 acres (18 ha). Vegetation and wildlife communities impacted and potential loss of habitat; impacts could be minimized by facility placement.	Same as Location A	Same as Location A	Negligible impact to ecological resources; all activities would occur in previously developed areas; however, there is a potential for impacts to aquatic biota from cylinder yard runoff during painting activities.
Concentrations of chemical or radioactive materials	Well below harmful levels; negligible impacts on vegetation and wildlife.	Same as Location A	Same as Location A	Potential for adverse impacts to aquatic biota associated with cylinder painting.
Wetlands	Potential direct and indirect impacts to wetlands from facility construction; impacts could be minimized by facility placement.	Same as Location A	Same as Location A	Negligible impacts

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Threatened or endangered species	No direct impacts from construction or operations; destruction of trees with exfoliating bark could indirectly impact the Indiana bat by destroying roosting habitat.	Same as Location A	Same as Location A; in addition; construction in the eastern portion of Location C could impact potential habitat for wild indigo and compass plant.	Negligible impacts

Waste Management

Construction	Minimal impacts to site waste management capabilities from construction-generated waste. Potentially contaminated soil associated with SWMU 194 could be excavated and require management and disposal.	Same as Location A	Same as Location A, except contaminated soil unlikely.	Negligible impacts from yard reconstruction.
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TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Operations	<p>Negligible impacts to site management capabilities from low-level radioactive waste (LLW) and hazardous waste generation.</p> <p>The triuranium octaoxide (U₃O₈) produced would generate about 7,850 yd³ (6,000 m³)/yr of LLW. This is 83% of Paducah's annual projected volume; potentially large impact on site LLW management.</p> <p>If HF is neutralized to CaF₂, generation of about 4,900 yd³/yr (3,800 m³/yr) of CaF₂.</p> <p>Generation of transuranic (TRU) waste unlikely under current proposals.</p>	Same as Location A	Same as Location A	<p>No impacts from LLW generation; less than 1% of annual site totals for each.</p> <p>Low-level radioactive mixed waste (LLMW) generated from cylinder stripping and painting operations could generate less than a 1% increase in site LLMW, resulting in a negligible impact to on-site waste operations.</p>

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
<i>Resource Requirements^h</i>				
Construction and operations	No effects on local, regional, or national availability of materials required are expected.	Same as Location A	Same as Location A	No effects on local, regional, or national availability of materials required are expected.
<i>Land Use</i>				
Construction and operations	Up to 45 acres (18 ha) would be disturbed, with 10 acres (4 ha) permanently altered, representing about 1% of available land already developed for industrial purposes, resulting in negligible impacts to land use.	Same as Location A	Same as Location A	Reconstruction of one existing cylinder storage yard within the boundaries of existing yards is planned; negligible impacts to land use.
<i>Cultural Resources</i>				
Construction and operations	Impacts to cultural resources are possible; archaeological and architectural surveys have not been completed and must be initiated prior to initiation of the proposed action.	Same as Location A	Same as Location A	Impacts would be unlikely because the storage yards are located in previously disturbed areas already dedicated to cylinder storage.

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
<i>Environmental Justice</i>				
Construction and operations	No disproportionately high and adverse impacts to minority or low-income populations in the general public during normal operations or from accidents.	Same as Location A	Same as Location A	No disproportionately high and adverse impacts to minority or low-income populations in the general public during normal operations or from accidents.
<i>Conversion of ETPP Cylinders at Paducah (option)</i>				
Cylinder preparation				
Location of cylinder preparation activities	ETTP: approximately 5,900 ETPP cylinders prepared for shipment to Paducah.	Same as Location A	Same as Location A	NA
Impacts from using cylinder overpacks	No facility construction required; operational impacts limited to external radiation exposure of involved workers; total collective dose to the worker population of 69 to 85 person-rem at ETPP, with no LCFs expected.	Same as Location A	Same as Location A	NA

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Impacts from using cylinder transfer facility	<p>Construction of a transfer facility would be required at ETPP.</p> <p>Operational impacts would generally be small and limited primarily to external radiation exposure of involved workers; total collective dose to the worker population of 440 to 480 person-rem at ETPP, with no LCFs expected.</p>	Same as Location A	Same as Location A	NA
Impact of extended conversion operations	<p>If ETPP cylinders were transported to Paducah, the operational period would extend to 28 years. Annual impacts would be the same as discussed for each technical discipline. No significant increase in overall impacts is expected.</p>	Same as Location A	Same as Location A	NA



TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
<i>Decontamination and Decommissioning</i>				
Activities involved	Disassembly and removal of all radioactive and hazardous components, equipment, and structures, with the objective of completely dismantling the various buildings and achieving greenfield (unrestricted use) conditions.	Same as Location A	Same as Location A	NA
Human health and safety impacts	Decontamination and decommissioning (D&D) impacts primarily limited to external radiation exposure of involved workers; expected exposures would be a small fraction of operational doses; no LCFs expected. No fatalities from occupational accidents expected; up to 5 injuries.	Same as Location A	Same as Location A	NA

TABLE S-6 (Cont.)

Environmental Consequence	Proposed Action			
	Location A (Preferred)	Location B	Location C	No Action
Other impacts	Generation of LLW, LLMW, and hazardous waste; approximately 90% of D&D materials generated are expected to be clean.	Same as Location A	Same as Location A	NA
<i>Impacts Associated with Conversion Product Sale</i>				
Products potentially marketed	HF and/or CaF ₂	Same as Location A	Same as Location A	NA
Annual Paducah production	55% HF solution: 11,000 t/yr (12,000 tons/yr)	Same as Location A	Same as Location A	NA
	CaF ₂ : 24 t/yr (26 tons/yr)	Same as Location A	Same as Location A	NA
CaF ₂ produced if HF is neutralized	11,800 t/yr (13,000 tons/yr)	Same as Location A	Same as Location A	NA
Maximum estimated radiation dose to a worker from HF or CaF ₂ use	<1mrem/yr	Same as Location A	Same as Location A	NA
Potential socioeconomic impacts from use	Negligible socioeconomic impacts	Same as Location A	Same as Location A	NA

Footnotes on next page.

TABLE S-6 (Cont.)

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- ^a Potential environmental impacts are summarized and compared in this table for the no action alternative and the action alternatives. For the action alternatives, impacts are presented for the three alternative locations within the site; annual impacts are based on the assumption of a 25-year operational period. For the no action alternative, annual impacts are based on the assumption of a 40-year operational period. Potential impacts associated with expanding throughput through process improvements and with extending the operational period would be similar to those presented for the base design.
- ^b Chemical exposures for involved workers during normal operations were not estimated; the workplace environment would be monitored to ensure that airborne chemical concentrations were below applicable exposure limits.
- ^c On the basis of calculations performed for this EIS, the accidents that are listed in this table have been found to have the highest consequences of all the accidents analyzed. In general, accidents that have lower probabilities have higher consequences.
- ^d The ranges in accident impacts reflect differences in possible atmospheric conditions at the time of the accident.
- ^e In addition to noninvolved worker impacts, chemical and radiological exposures for involved workers under accident conditions (workers within 100 m [328 ft] of a release) would depend in part on specific circumstances of the accident. Involved worker fatalities and injuries resulting from the accident initiator or the accident itself are possible.
- ^f NA = not applicable.
- ^g The guideline concentration used for comparison with estimated surface water and groundwater uranium concentrations is the former proposed EPA maximum concentration limit (MCL) of 20 µg/L; a revised value of 30 µg/L became effective in December 2003. These values are applicable for water “at the tap” of the user and are not directly applicable for surface water or groundwater (no such standard exists). The guideline concentration used for comparison with estimated soil uranium concentrations is a health-based guideline value for residential settings of 230 µg/g.
- ^h Resources evaluated include construction materials (e.g., concrete, steel, special coatings), fuel, electricity, process chemicals, and containers (e.g., drums and cylinders).