

September 2006

EVALUATION OF CLOSURE, POST-CLOSURE, AND PERPETUAL CARE AND MAINTENANCE FOR COMMERCIAL HAZARDOUS WASTE AND COMMERCIAL RADIOACTIVE WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

September 2006

Prepared for
Utah Solid and Hazardous Waste Control Board
and
Utah Radiation Control Board

by

R. D. Baird, PE, CCE
L.S. Berta
A.R. Jones, RPT
K. K. Nielson, PhD

URS Corporation
756 East Winchester, Street, Suite 400
Salt Lake City, Utah 84107

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

EXECUTIVE SUMMARY	xi
1. OVERVIEW	1-1
1.1 LEGISLATIVE DIRECTIVE	1-1
1.2 COMMERCIAL HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL IN UTAH	1-2
1.3 COMMERCIAL RADIOACTIVE WASTE TREATMENT AND DISPOSAL IN UTAH.....	1-3
1.4 OVERVIEW OF THE EVALUATION.....	1-4
2. COMMERCIAL HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES	2-1
2.1 What commercial facilities has the State of Utah permitted to treat, store, and/or dispose of hazardous waste?.....	2-2
2.2 What is the “life cycle” of a commercial hazardous waste management facility?.....	2-3
2.3 What is facility “closure?”	2-3
2.4 Who performs a facility closure?.....	2-4
2.5 What is “post-closure care?”	2-4
2.6 Who provides post-closure care?.....	2-5
2.7 What forms of closure and post-closure care financial assurances (financial assurance mechanisms or financial sureties) are allowed by the rules?.....	2-5
2.8 What are the estimated costs to close Utah’s permitted commercial hazardous waste management facilities and to provide post-closure care?.....	2-5
2.9 How much financial assurance must be provided to close a facility and provide post-closure care?.....	2-7
2.10 What closure and post-closure financial assurances are currently being provided for Utah’s permitted facilities?.....	2-7
2.11 Who is responsible for overseeing the closed facility after the permit is terminated?	2-8
2.12 What financial assurances or funds are provided to cover the costs that might be incurred after the permit is terminated?	2-8
2.13 What is “perpetual care and maintenance”?.....	2-8
2.14 Do the Utah Hazardous Waste Management Rules provide for perpetual care and maintenance of closed hazardous waste management facilities?	2-9
2.15 What will be the value of a hazardous waste perpetual care fund in the future?	2-9
2.16 What might be the future value of a hazardous waste perpetual care fund if greater annual fees were imposed?.....	2-10
2.17 What might be the consequences of imposing greater annual fees for a Hazardous Waste Perpetual Care Fund?	2-11

September 2006

2.18	Are sufficient financial assurances provided to cover the costs of closure, post-closure care, and unplanned and unanticipated events?.....	2-12
2.19	What other costs might be anticipated following post-closure permit termination?	2-13
2.20	Should funds be required for costs that might be incurred for major events following post-closure permit termination?	2-13
2.21	Beyond financial assurances, what else provides assurance that commercial hazardous waste management facilities will be properly closed and will perform as required?.....	2-14
2.22	How can the State help ensure against unanticipated costs of long-term care and maintenance?	2-20
2.23	Are sufficient financial assurances provided for adequate funding for costs of unplanned and unanticipated events?.....	2-20
2.24	How do the financial assurances required for closure and post-closure care of commercial hazardous waste management facilities permitted in the State of Utah compare with those required in other states?	2-20
2.25	Do any States have financial assurance for costs and other burdens that might develop or evolve after the permit is terminated?.....	2-26
2.26	What legal or regulatory revisions should be made to provide for the costs associated with perpetual care?	2-28
3.	LOW-LEVEL RADIOACTIVE WASTE TREATMENT AND DISPOSAL FACILITIES	3-1
3.1	What facilities has the State of Utah licensed to treat and/or dispose of LLRW?.....	3-2
3.2	What is the “life cycle” of a commercial LLRW management facility?	3-3
3.3	What is facility “closure and stabilization”?	3-3
3.4	Who performs a facility closure and stabilization?.....	3-4
3.5	What is “institutional control”?	3-4
3.6	Who provides institutional control and who pays for it?	3-6
3.7	Who is responsible for overseeing the closed facility at the end of 100 years of institutional control?	3-6
3.8	What forms of financial assurances for closure and institutional control (financial assurance mechanisms or financial sureties) are allowed by the rules?.....	3-7
3.9	What are the estimated costs to close a facility and provide institutional control?.....	3-8
3.10	What financial assurances are currently being provided for closure and institutional control?	3-10
3.11	What is “perpetual care and maintenance”?	3-10
3.12	What is the Radioactive Waste Perpetual Care and Maintenance Fund?	3-11
3.13	What will be the costs of monitoring and maintaining the closed facility following 100 years of institutional control?	3-12

September 2006

3.14	What will be the value of the Radioactive Waste Perpetual Care and Maintenance Fund in the future?	3-12
3.15	What might be the future value of the Perpetual Care Fund if greater annual fees were imposed?	3-14
3.16	What would be the effect of fewer years of future operations or need for funds earlier than 100 years after facility closure?.....	3-14
3.17	What might be the consequences of imposing greater annual fees for the Perpetual Care Fund?.....	3-15
3.18	Beyond financial assurances, what else provides assurance that licensed commercial LLRW management facilities will be properly closed and will perform as required	3-16
3.19	How might closure, institutional control, and other costs be greater than the funding provided by financial assurances and the Perpetual Care Fund?.....	3-21
3.20	How large could the increases of closure, institutional control, and other costs be?	3-22
3.21	What are the probabilities of occurrence of the increases of closure, institutional control, and other costs?.....	3-23
3.22	Considering both the probability and magnitude of possible cost increases, which possibilities pose the greatest risk for increased costs?	3-24
3.23	Are sufficient financial assurances provided to protect against increased costs of closure, institutional control, and unplanned and unanticipated events?.....	3-26
3.24	How do the financial assurances required for closure and post-closure care of commercial LLRW management facilities licensed in the State of Utah compare with those required in other states?.....	3-27
3.25	Do any States have financial assurance for costs and other burdens that might develop or evolve after facility closure?	3-34
3.26	What legal or regulatory revisions should be made to better assure against unfunded costs?.....	3-35
4.	SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	4-1
4.1	HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES	4-1
4.2	RADIOACTIVE WASTE DISPOSAL FACILITIES	4-1
	REFERENCES	R-1
	APPENDIX A: UC 19-1-307: EVALUATION OF CLOSURE, POST-CLOSURE, AND PERPETUAL CARE AND MAINTENANCE FOR HAZARDOUS WASTE AND RADIOACTIVE WASTE TREATMENT AND DISPOSAL FACILITIES – REPORT	A-2
	APPENDIX B: DESCRIPTIONS OF SELECTED HAZARDOUS WASTE LANDFILLS PERMITTED AND OPERATING IN OTHER STATES	B-1
B.1	Clean Harbors Grassy Mountain at Tooele, Utah.....	B-2
B.2	Chemical Waste Management at Kettleman City, California	B-4
B.3	Clean Harbors Buttonwillow at Buttonwillow, California.....	B-5

September 2006

B.4	Clean Harbors Westmorland at Westmorland, California	B-6
B.5	Envirosafe Services of Ohio at Oregon, Ohio	B-8
B.6	Clean Harbors Lone Mountain at Waynoka, Oklahoma.....	B-10
B.7	U.S. Ecology at Beatty, Nevada	B-10
B.8	Waste Control Specialists Inc. at Andrews, Texas	B-12
B.9	Texas Ecologists at Robstown, Texas.....	B-13
B.10	Clean Harbors Deer Park at Deer Park, Texas	B-15
B.11	Pinewood Trust at Pinewood, South Carolina.....	B-16
References		B-21
APPENDIX C: DESCRIPTIONS OF SELECTED LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITIES LICENSED AND OPERATING IN OTHER STATES.....		
C.1	OPERATING AND PROPOSED COMMERCIAL LLRW DISPOSAL FACILITIES	C-2
C.1.1	EnergySolutions, LLC at Clive, UT	C-2
C.1.2	US Ecology Inc. at Hanford, WA.....	C-9
C.1.3	Chem-Nuclear Systems, LLC at Barnwell, SC	C-15
C.1.4	Waste Control Specialists, LLC at Andrews, TX.....	C-18
C.2	CLOSED COMMERCIAL LLRW DISPOSAL FACILITIES.....	C-22
C.2.1	US Ecology Inc. at Beatty, NV.....	C-23
C.2.2	US Ecology Inc. at Maxey Flats, KY.....	C-26
C.2.3	US Ecology Inc. at Sheffield, IL.....	C-31
C.2.4	Nuclear Fuel Services, Inc. at West Valley, NY	C-35
References		C-40

TABLES

Table	Page
Table ES-1. Financial assurances presently provided by commercial hazardous waste management facility Owners/Permittees in Utah.....	xi
Table ES-2. Financial assurances presently provided by commercial radioactive waste management facility Owners/Licensees in Utah.....	xiii
Table 1-1. Commercial hazardous waste management facilities permitted in the State of Utah.....	1-2
Table 1-2. Commercial radioactive waste management facilities licensed in the State of Utah.....	1-3
Table 2-1. Commercial hazardous waste management facilities permitted in the State of Utah.....	2-2
Table 2-2. General phases of commercial hazardous waste management facility	2-3
Table 2-3. Summary of estimated facility closure and post-closure care costs for commercial hazardous waste management facilities permitted by the State of Utah	2-6
Table 2-4. Financial assurances presently provided by Permittees in Utah.....	2-7
Table 2-5. Projected future values of Hazardous Waste Perpetual Care and Maintenance Fund.....	2-10
Table 2-6. Dependence of Perpetual Care Fund future value on annual fee.....	2-11
Table 2-7. Summary of approximate costs of unplanned and unanticipated future events	2-13
Table 3-1. Commercial radioactive waste management facilities licensed in the Utah.....	3-3
Table 3-2. General phases of commercial LLRW facility	3-3
Table 3-3. Summary of estimated facility closure and institutional control costs for commercial radioactive waste management facilities licensed by the State of Utah.....	3-8
Table 3-4. Financial assurances presently provided by Owners/Licensees in Utah.....	3-10
Table 3-5. Projected future values of Radioactive Waste Perpetual Care and Maintenance Fund	3-13
Table 3-6. Dependence of Perpetual Care Fund future value on annual fee.....	3-14
Table 3-7. Summary of approximate costs of unplanned and unanticipated future events	3-23
Table 3-8. Order of magnitude probabilities for unplanned and unanticipated future events...	3-24
Table 3-9. Highly uncertain financial risks from unplanned and unanticipated future events.	3-25
Table B-1. Summary of hazardous waste management facility characteristics and information.....	B-19
Table C-1. Approximate volumes of EnergySolutions' embankments, December 31, 2004	C-7

FIGURES

Figure	Page
Figure B-1. Location of Grassy Mountain Facility.....	B-3
Figure B-2. Grassy Mountain Disposal Cell Configuration.....	B-3
Figure B-3. Location of Kettleman City Facility.....	B-4
Figure B-4. Location of Buttonwillow Facility.....	B-6
Figure B-5. Location of Westmorland Facility.....	B-7
Figure B-6. Aerial Photo Kettleman City Facility (Undated).....	B-7
Figure B-7. Location of Envirosafe Facility.....	B-8
Figure B-8. Envirosafe Disposal Cell Configuration.....	B-9
Figure B-9. Location of Lone Mountain Facility.....	B-10
Figure B-10. Location of Beatty Facility.....	B-11
Figure B-11. Beatty Disposal Cell Configurations.....	B-11
Figure B-12. Disposal in Cell 11, Beatty.....	B-12
Figure B-13. Location of Waste Control Specialists Facility.....	B-13
Figure B-14. Location of Robstown Facility.....	B-14
Figure B-15. Robstown Disposal Cell Configuration.....	B-14
Figure B-16. Disposal at Robstown.....	B-15
Figure B-17. Location of Deer Park Facility.....	B-16
Figure B-18. Location of Pinewood Facility.....	B-17
Figure B-19. Aerial Photo Pinewood Facility (Undated).....	B-17
Figure C-1. Location of the Operating EnergySolutions facility at Clive, UT.....	C-3
Figure C-2. Clive, UT Geology - Well GW-108.....	C-5
Figure C-3. Clive, UT Trench Configuration Viewed from Southwest.....	C-6
Figure C-4. Clive, UT Railcar Rollover.....	C-7
Figure C-5. Clive, UT Mixed Waste Liner Placement.....	C-7
Figure C-6. Location of the Operating US Ecology Facility at Richland, WA.....	C-10
Figure C-7. Hanford, WA Geology.....	C-11
Figure C-8. Hanford, WA Trench Configuration.....	C-12
Figure C-9. Hanford, WA Unlined Operating Trench 18.....	C-12
Figure C-10. Hanford, WA Unlined Stable Storage Trench.....	C-13
Figure C-11. Location of the Operating Chem-Nuclear Facility at Barnwell, SC.....	C-15
Figure C-12. Barnwell, SC Geology.....	C-16
Figure C-13. Barnwell, SC Trench Configuration.....	C-17
Figure C-14. Barnwell, SC Concrete Vault Placement.....	C-17
Figure C-15. Location of the Proposed Waste Control Specialists Facility at Andrews, TX...	C-19
Figure C-16. Andrews, TX Geology.....	C-20
Figure C-17. Andrews, TX Proposed Trench Configuration.....	C-20
Figure C-18. Andrews, TX Proposed CWF Waste Array.....	C-21
Figure C-19. Andrews, TX Proposed FWF Waste Array.....	C-21
Figure C-20. Andrews, TX Proposed Cover System.....	C-21
Figure C-21. Location of the Former US Ecology Facility at Beatty, NV.....	C-23
Figure C-22. Beatty, NV Geology.....	C-24
Figure C-23. Beatty, NV Undated Photo.....	C-25
Figure C-24. Location of the Former US Ecology Facility at Maxey Flats, KY.....	C-26

September 2006

Figure C-25. Maxey Flats, KY Geology	C-28
Figure C-26. Maxey Flats, KY Trench Configuration.....	C-29
Figure C-27. Maxey Flats, KY Unlined Trench Burial of Waste During 1975	C-29
Figure C-28. Maxey Flats, KY During Fall 2001	C-30
Figure C-29. Maxey Flats, KY Articulated Concrete Block in Drainage	C-30
Figure C-30. Location of the Former US Ecology Facility at Sheffield, IL	C-31
Figure C-31. Sheffield, IL Geology	C-32
Figure C-32. Sheffield, IL Trench Configuration	C-33
Figure C-33. Sheffield, IL Unlined Trench Burial of Waste during 1960s.....	C-34
Figure C-34. Location of the Former NFS Facility at West Valley, NY	C-35
Figure C-35. West Valley, NY Geology - Vertical Exaggeration Approximately 2.5:1	C-36
Figure C-36. West Valley, NY Trench Configuration.....	C-37
Figure C-37. West Valley, NY SDA in 1998	C-38

LIST OF ACRONYMS AND INITIALISMS

ALARA	As low as is reasonably achievable
EPA	Environmental Protection Agency
HSMF	Hazardous Substances Mitigation Fund
LLRW	Low-level radioactive waste
mrem	millirem; 0.001 of a “roentgen equivalent <u>man</u> ”
NAC	Nevada Administrative Code
NYSDEC	New York State Department of Environmental Conservation
OAC	Oklahoma Administrative Code
OIG	Office of Inspector General
PRP	Potentially Responsible Parties
URCB	Utah Radiation Control Board
SCCR	South Carolina Code of Regulations
UAC	Utah Administrative Code
UCA	Utah Code Annotated
UDRC	Utah Division of Radiation Control
UDSHW	Utah Division of Solid and Hazardous Waste
USHWCB	Utah Solid and Hazardous Waste Control Board
US DOE	United State Department of Energy
US EPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

COMMERCIAL HAZARDOUS WASTE MANAGEMENT FACILITIES

Financial Assurances for Commercial Hazardous Waste Management Facilities

- ü The amounts of financial assurance required and provided for closure and post-closure care of commercial hazardous waste treatment, storage, and disposal facilities under Section 19-6-108 are judged to be adequate at current levels and with current rules, controls, and practices.
- ü No financial assurance or funds are currently required by rule, and are therefore not provided for the perpetual care of, maintenance of, or corrective actions at commercial hazardous waste land disposal facilities should the need arise following the post-closure periods.

Commercial Hazardous Waste Treatment, Storage, and Disposal Facilities

Commercial hazardous waste management facilities¹ permitted in the State of Utah and the financial assurances they presently provide are summarized in Table ES-1.

Table ES-1. Financial assurances presently provided by commercial hazardous waste management facility Owners/Permittees in Utah				
Facility	Closure Financial Assurance Mechanism	Closure Financial Assurance Provided	Post-Closure Financial Assurance Mechanism	Post-Closure Financial Assurance Provided
Clean Harbors Grassy Mountain	Insurance	\$17.7 million	Insurance	\$13.2 million
EnergySolutions Mixed Waste Facility ²	Insurance	\$13.6 million	Insurance	\$2.7 million
Clean Harbors Aragonite	Insurance	\$11.3 million	Not Applicable	Not Applicable
Northeast Casualty Real Property	Insurance	\$7.5 million	Not Applicable	Not Applicable

¹ Commercial hazardous waste treatment, storage, and disposal facility means a facility that receives, for profit, hazardous waste for treatment, storage, or disposal. Numerous noncommercial hazardous waste management facilities exist in Utah but are not addressed in this report.

² Permitted in connection with Utah Radioactive Materials License UT #23000249.

September 2006

Table ES-1. Financial assurances presently provided by commercial hazardous waste management facility Owners/Permittees in Utah				
Facility	Closure Financial Assurance Mechanism	Closure Financial Assurance Provided	Post-Closure Financial Assurance Mechanism	Post-Closure Financial Assurance Provided
Safety-Kleen Pioneer Road	Insurance	\$0.2 million	Not Applicable	Not Applicable
Ashland Chemical Company	Financial Test	\$0.3 million	Not Applicable	Not Applicable

Need for Legal/Regulatory Revisions for Commercial Hazardous Waste Land Disposal Facilities

The Utah Solid and Hazardous Waste Control Board (USHWCB) has identified the following areas in which improvements might be made to address the issue of perpetual care at closed commercial hazardous waste disposal facilities:

- ü The USHWCB recommends that a perpetual care fund be created and funded to provide for ongoing monitoring and maintenance of commercial hazardous waste land disposal facilities after termination of the post-closure permit.
- ü The USHWCB recommends that the creation of any such fund should take into account the financial impact on current facilities.
- ü The USHWCB recommends that additional funds not be required at this time to cover potential catastrophic failure of the landfill cells, ground water corrective action or major maintenance at commercial hazardous waste land disposal facilities. This determination is based on the engineering controls employed to build the landfill cells to current regulatory standards. All phases of landfill construction are reviewed, monitored, and approved by the State. The design and construction of landfill cells provide reasonable assurance that wastes are contained as a means to prevent additional superfund sites. Other factors include the remote location of current facilities, the lack of a nearby population center, the location of the facilities in the Tooele County Hazardous Waste Corridor, which prevents residential development in the area, the non-potable groundwater, the lack of precipitation, and the restricted access to the facilities. More details are provided in Question 2-20.

COMMERCIAL RADIOACTIVE WASTE MANAGEMENT FACILITIES

Financial Assurances for Commercial Radioactive Waste Management Facilities

- ü The amounts of financial assurance required and provided for closure and institutional control of commercial radioactive waste disposal facilities under UC 19-3-104(12) are judged to be adequate at current levels and with current rules, controls, and practices.
- ü The future value of the Radioactive Waste Perpetual Care and Maintenance Fund at the end of 100 years of the institutional control period is projected to be \$93 million, assuming that the EnergySolutions facilities continue active operations for at least 20 more years, that such funds are invested to produce a minimum 2 percent per year real return, and that no monies are paid out from the Fund prior to the end of the 100-year institutional control period.
- ü The bounds of estimated probable costs (or financial risk) for unplanned or unexpected events above the minimal maintenance and monitoring for reasonable risks that may occur following closure of a commercial radioactive waste treatment or disposal facilities could range from \$1 million to \$60 million. The financial risk ranges most probably between \$5 and \$32 million.
- ü The Radioactive Waste Perpetual Care and Maintenance Fund is judged to be adequately funded at current levels and with current rules, controls, and practices.

Radioactive Waste Disposal Facilities

Low-level radioactive waste (LLRW) management facilities licensed in the State of Utah and the financial assurances they presently provide are summarized in Table ES-2.

Table ES-2. Financial assurances presently provided by commercial radioactive waste management facility Owners/Licensees in Utah				
Facility	Closure Financial Assurance Mechanism	Closure Financial Assurance Provided	Institutional Control Financial Assurance Mechanism	Institutional Control Financial Assurance Provided
EnergySolutions; LLRW Facility	Insurance	~\$28.0 million ³	Insurance	~\$5.1 million ³
EnergySolutions Mixed Waste Facility ⁴	Insurance	\$13.6 million	Insurance	\$2.7 million

³ Closure and Institutional Control Financial Assurances total \$33,119,957 as of December 31, 2005.

September 2006

Table ES-2. Financial assurances presently provided by commercial radioactive waste management facility Owners/Licensees in Utah				
Facility	Closure Financial Assurance Mechanism	Closure Financial Assurance Provided	Institutional Control Financial Assurance Mechanism	Institutional Control Financial Assurance Provided
EnergySolutions; 11e.(2) Facility	Insurance	\$4.5 million	Not Applicable	US DOE Long-Term Stewardship Program ⁵

Need for Legal/Regulatory Revisions for Commercial Radioactive Waste Management Facilities

It is the intent of URCB that payments into the Radioactive Waste Perpetual Care and Maintenance Fund be accelerated to better protect against the possibility that EnergySolutions might not remain in operations for 20 additional years, as assumed in Chapter 3 of this report. Therefore, URCB recommends and strongly urges the following:

- ü The annual contribution to the Radioactive Waste Perpetual Care and Maintenance Fund should be based on the amount of the disposal capacity depleted each year. Also, an immediate one-time contribution should be required to the Radioactive Waste Perpetual Care and Maintenance Fund to bring the fund to an adequate level. At closure of the facility, the value of the Radioactive Waste Perpetual Care and Maintenance Fund, in constant 2006 dollars, should be no less than \$13 million. If the facility closes before 2026, the currently required annual payment will be insufficient to meet the \$13 million target.
- ü The Legislature should specifically address the ambiguities created by the present exemptions from the land ownership requirements of Utah rules, as they relate to long-term responsibility for monitoring and maintaining the closed and stabilized facility.
- ü The Legislature should resist any pressure to divert funds from the Perpetual Care Fund to other applications.

⁴ The Mixed Waste Facility at EnergySolutions is covered under the Radioactive Waste Perpetual Care and Maintenance Fund, which is considered to be adequately funded considering current controls and practices. Licensed in connection with Utah Hazardous Waste Permit UTD991301748.

⁵ Under provisions of the Nuclear Waste Policy Act of 1982, the US Department of Energy must by law provide long-term care of 11e.(2) facilities that have been closed and stabilized in compliance with US Nuclear Regulatory commission requirements. An additional condition of accepting such facilities is that funds sufficient to cover all long-term care costs must be transferred to the US DOE. Two facilities might be transferred to DOE’s care under these provisions: the Vitro embankment and EnergySolution’s 11e.(2) embankments at South Clive, Utah.

September 2006

1. OVERVIEW

1.1 LEGISLATIVE DIRECTIVE

The Utah Legislature stipulated by Utah Senate Bill 24, dated February 1, 2005 and signed February 25, 2005 that the Utah Solid and Hazardous Waste Control Board (USHWCB) and the Utah Radiation Control Board (URCB) prepare and submit a report evaluating adequacy of funding and financial assurances provided for the closure, post-closure, and perpetual care and maintenance of hazardous waste and radioactive waste treatment, storage, and disposal facilities (UC 19-1-307, reproduced in Appendix A).

For commercial hazardous waste management facilities, the Legislature requires the following questions be addressed:

- ü Are adequate financial assurances or funds required for perpetual care and maintenance following the closure and post-closure period of a commercial hazardous waste treatment, storage, or disposal facility, if found necessary?
- ü Are adequate financial assurances or funds required for perpetual care and maintenance following the closure and post-closure period of a commercial hazardous waste treatment, storage, or disposal facility, if found necessary following the evaluation under Subsection (1)(c) of UC 19-1-307?
- ü What funds might be necessary (above maintenance and monitoring) for addressing groundwater corrective action, differential settlement failure, or major maintenance of a cell or cells following termination of the post-closure permit of commercial hazardous waste land disposal facilities?
- ü Are financial assurances or funds necessary for perpetual care and maintenance following termination of the post-closure permit of a commercial hazardous waste land disposal facility to protect human health and the environment?

The Legislature requires essentially the same questions be addressed for commercial radioactive waste management facilities:

- ü Are adequate financial assurances required for closure and post-closure care of commercial radioactive waste treatment or disposal facilities under Subsection 19-3-104(12)?
- ü Does the Radioactive Waste Perpetual Care and Maintenance Fund provide adequate protection following the institutional care period?
- ü What are the costs above the minimal maintenance and monitoring for reasonable risks [including groundwater corrective action; differential settlement failure; or major maintenance of a cell or cells] that may occur during closure, post-closure, and perpetual care and maintenance of commercial radioactive waste treatment or disposal facilities?
- ü What are the costs under Subsection 19-3-106.2(5)(b) of using the Radioactive Waste Perpetual Care and Maintenance Fund during the period before the end of 100 years following final closure of the facility for maintenance, monitoring, or corrective action in the event that the owner or operator is unwilling or unable to carry out the duties of post-closure maintenance, monitoring, or corrective action?

September 2006

This report has been prepared for the two boards named above by URS Corporation, a contractor to the Utah Department of Environmental Quality. The two boards have reviewed and concurred with the results and conclusions expressed herein and have developed the recommendations stated herein upon their review of this report.

1.2 COMMERCIAL HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL IN UTAH

The Utah Division of Solid and Hazardous Waste (UDSHW) has permitted six commercial hazardous waste management facilities to treat, store, and/or dispose of hazardous waste. The six facilities and the activities they are permitted to conduct are listed in Table 1-1.

Table 1-1. Commercial hazardous waste management facilities permitted in the State of Utah⁶	
Facility	Permitted to:
Clean Harbors Grassy Mountain	Treat, Store, and Dispose
EnergySolutions Mixed Waste Facility ⁷	Treat, Store, and Dispose
Clean Harbors Aragonite	Treat and Store
Northeast Casualty Real Property	Store
Safety-Kleen Pioneer Road	Store
Ashland Chemical Company	Store

After the operating life of the facility, the closure of each disposal facility is followed by a post-closure care period. The duration of this period is stated in the rules as 30 year contingent upon specified UDSHW facility-specific determinations. Once the closed facility is determined by the UDSHW to satisfy applicable criteria, the post-closure permit is terminated.

The rules that govern the management of hazardous waste at facilities within the State of Utah are found in Section R315 of the Utah Administrative Code (Utah Hazardous Waste Management Rules). These rules require that each commercial hazardous waste land disposal facility's Permittee provide financial assurances sufficient for a third-party contractor to close the facility and to provide post-closure care of the facility following closure.

The amount of funding for financial assurance is determined and updated annually by the UDSHW through review and revision of cost estimates updated and submitted by the Permittee. The financial assurances are intended to cover the costs of facility closure and post-closure care.

⁶ Numerous non-commercial hazardous waste management facilities exist in Utah but are not addressed in this report.

⁷ Permitted in connection with Utah Radioactive Materials License UT #23000249.

September 2006

No financial assurances are provided for care of the facility following post-closure permit termination.

Only commercial hazardous waste land disposal facilities are required to provide funds for post-closure care. Currently, only two commercial hazardous waste land disposal facilities exist in Utah that meet this requirement. These are EnergySolutions' Mixed Waste Facility and Clean Harbors' Grassy Mountain Facility. EnergySolutions' Mixed Waste Facility is covered beyond the post-closure care period under the Radioactive Waste Perpetual Care and Maintenance Fund. Thus, creation of a perpetual care fund for commercial hazardous waste land disposal facilities would only affect the Clean Harbors Grassy Mountain Facility.

1.3 COMMERCIAL RADIOACTIVE WASTE TREATMENT AND DISPOSAL IN UTAH

The Utah Division of Radiation Control (UDRC) has licensed three commercial radioactive waste management facilities to treat, store, and/or dispose of radioactive waste. The three facilities and the activities they are licensed to conduct are listed in Table 1-2.

Table 1-2. Commercial radioactive waste management facilities licensed in the State of Utah	
Facility⁸	Licensed to:
EnergySolutions; LLRW Facility	Dispose
EnergySolutions; 11e.(2) Facility	Dispose
EnergySolutions Mixed Waste Facility	Treat ⁹ , Store, and Dispose

The closure of each facility is followed by 100 years of institutional controls (comparable to the post-closure period in the hazardous waste rules). During this time, the facility is actively maintained, custodial care is provided, and its performance is monitored. Following the 100-year institutional control period, monies of the Radioactive Waste Perpetual Care and Maintenance Fund cover all costs that might be incurred in maintaining, caring for, monitoring, and taking corrective actions required for the closed facility.

The rules that govern the management of radioactive waste at facilities within the State of Utah are found in Section R313 of the Utah Administrative Code (Utah Radiation Control Rules). These rules require that each commercial radioactive waste management facility Owner/Licensee provide financial assurances sufficient for a third-party contractor to close the facility and to provide for institutional control of the facility following closure.

⁸ All three facilities are located at South Clive, Utah.

⁹ Permitted in connection with Utah hazardous waste permit UTD991301748.

September 2006

The amount of financial assurances required are determined and updated annually by the UDRC through review and revision of cost estimates updated and submitted by the Owner/Licensee. The financial assurances are intended to cover the costs of closure and post-closure care of the facilities.

1.4 OVERVIEW OF THE EVALUATION

As the Legislature has directed, the USHWCB and the URCB have reviewed this report and concur with its results and findings. The two boards submit this report in fulfillment of the Legislature's charge.

Issues associated with commercial hazardous waste management facilities are discussed in Chapter 2, while Chapter 3 addresses issues associated with commercial radioactive waste management facilities. Recommendations are presented in Chapter 4 of this report. Appendices convey information that provides perspective on financial assurances provided for Utah facilities and those permitted or licensed in Utah and other states.

September 2006

2. COMMERCIAL HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

Treatment, storage, and disposal of hazardous waste in the State of Utah are regulated under provisions of the Utah Hazardous Waste Management Rules (Utah Administrative Code, Section R315). Individual hazardous waste management facilities must submit applications for a permit to construct and operate such a facility. The UDSHW reviews permit applications and ensures that all technical and regulatory issues are resolved in accordance with regulatory requirements and guidance.

The purpose of UDSHW's review is to develop reasonable assurance that applicable regulatory requirements will be satisfied during all phases of facility life, including construction, operation, closure, and for typically 30 years of post-closure care following facility closure. Given that applicable regulations are satisfied, confidence exists that human health and the environment will be properly protected.

Once all regulatory issues are resolved to ensure compliance with regulatory provisions, the UDSHW prepares a draft permit, notifies the public of its intention to issue a permit, receives and responds to public comments, and finally issues the permit. The regulations provide the outline for the more detailed facility-specific requirements given in the permit.

The UDSHW maintains regulatory surveillance during all phases of facility life to ensure compliance with regulatory requirements and all permit conditions. The UDSHW regularly conducts compliance inspections of all aspects of facility operations covered by regulations and permit conditions. Departures from required conditions and performance are addressed through a range of enforcement actions to ensure safe operation and that human health and the environment are properly protected.

The Permittee is required to provide financial assurances to protect against the possibility that it may not be able to meet all costs associated with facility closure and post-closure care.

No mechanism is presently required to cover possible costs associated with minor facility failures and maintenance that might occur after the post-closure care period, except for the EnergySolutions Mixed Waste Facility, which is covered by the Radioactive Waste Perpetual Care and Maintenance Fund. The Mixed Waste Facility is covered because mixed waste contains both hazardous and radioactive contaminants.

In this section, the following are addressed:

- ü Commercial facilities permitted by the State of Utah to treat, store, and/or dispose of hazardous waste are identified
- ü Commercial facilities required to maintain financial assurances are identified and the nature of assurances they provide are briefly described
- ü Representative closure and post-closure activities are described
- ü Closure and post-closure financial assurances provided as required are identified and described
- ü Potential need for care and maintenance after the post-closure care period

September 2006

- ü Adequacy of current requirements for providing financial assurances for commercial hazardous waste management facility closure and post-closure care
- ü Recommendations for revisions to current legal and regulatory requirements

Information regarding the financial assurance available for commercial hazardous waste disposal facilities is presented in a question and answer format below:

2.1 WHAT COMMERCIAL FACILITIES HAS THE STATE OF UTAH PERMITTED TO TREAT, STORE, AND/OR DISPOSE OF HAZARDOUS WASTE?

Table 2-1. Commercial hazardous waste management facilities permitted in the State of Utah		
Facility	Permitted to:	Provides financial assurances for:
Clean Harbors Grassy Mountain	Treat, Store, and Dispose	Closure and Post-Closure
EnergySolutions Mixed Waste Facility ¹⁰	Treat, Store, and Dispose	Closure and Post-Closure
Clean Harbors Aragonite	Treat and Store	Closure
Northeast Casualty Real Property	Store	Closure
Safety-Kleen Pioneer Road	Store	Closure
Ashland Chemical Company	Store	Closure

The owner of any facility that will manage (that is treat, store, or dispose of) hazardous waste must ensure that funds are available for any costs associated with closing or maintaining the facility during the post-closure care of that facility. These facility owners provide legally enforceable financial assurances required under hazardous waste regulations. Financial assurances must be sufficient to cover all cost associated with facility closure and post-closure care.

Only two of the six commercial facilities permitted for hazardous waste management in the State of Utah are required to provide financial assurances for care of the facility following closure because the wastes are disposed of at the site and are not removed after closure. Accordingly, these two, as shown in Table 2-1, provide financial assurances to cover not only closure costs, but also costs expected during post-closure care. In addition, the EnergySolutions Mixed Waste Facility is covered under the Radioactive Waste Perpetual Care and Maintenance Fund.

¹⁰ Permitted in connection with Utah Radioactive Materials License UT #23000249.

September 2006

2.2 WHAT IS THE “LIFE CYCLE” OF A COMMERCIAL HAZARDOUS WASTE MANAGEMENT FACILITY?

The life cycle of a commercial hazardous waste management facility consists of the phases or periods shown generally in Table 2-2.

Table 2-2. General phases of commercial hazardous waste management facility		
Phase or Period	Typical Duration (years)	Applicability
Permitting and Initial Development	2 to 5 years	Treatment, Storage, and Disposal Facilities
Operating	15 to 40 years	Treatment, Storage, and Disposal Facilities
Closure	1 to 5 years	Treatment, Storage, and Disposal Facilities
Post-Closure Care	30 years	Disposal Facilities
Following Permit Termination	Unlimited	Disposal Facilities

2.3 WHAT IS FACILITY “CLOSURE?”

When the decision is made that the facility will no longer actively operate, it must go through a formal procedure known as facility closure. The purpose of facility closure is to remove all hazardous wastes associated with hazardous waste management operations, to the extent achievable. If waste is left in place, then post-closure financial assurances are required to cover costs of post-closure care. Such is typically the case only for facilities permitted to dispose of hazardous waste.

Facility closure activities include:

- ü Disposing of any waste received but not yet disposed of at the time closure commences
- ü Decontaminating support structures and operating equipment
- ü Dismantling and disposing of support structures, support systems, and equipment as required and appropriate
- ü Continuing the operational environmental monitoring program
- ü Closing and stabilizing all disposal units, once all waste has been disposed of

Facility closure activities do not include such activities as:

- ü Conducting environmental corrective actions
- ü Repairing facility components

September 2006

2.4 WHO PERFORMS A FACILITY CLOSURE?

Under expected conditions, the Permittee will conduct facility closure at its own expense. Closure activities must be pursued until the UDSHW determines that the facility has been successfully closed and that all hazardous wastes have been removed (or appropriately addressed where wastes remain in place). When the Permittee pays costs associated with facility closure, the terms and conditions for exercising the financial assurances are not fulfilled and no funds are disbursed from the financial assurance fund for closure. Once closure is completed by the facility and the funds for closure are no longer required, the financial assurance mechanism is returned to the permittee.

Under unusual conditions, the Permittee may be unable to close the facility. Under these conditions, and in accordance with applicable terms of the mechanism used to provide the required financial assurances, the State may conduct the closure using an independent third-party contractor. To cover the costs of such closure, the State would exercise the financial assurances provided for closure.

2.5 WHAT IS “POST-CLOSURE CARE?”

Following facility closure, the facility and the surrounding environment are monitored for a period of time long enough to develop confidence that the hazardous waste management units are performing as required and as expected. This period of time is referred to as the post-closure care period and its exact duration is determined by the UDSHW. At the end of the post-closure care period, the permit is terminated.

The duration of the post-closure care period is not fixed under Utah’s regulations. The post-closure care period is typically expected to last for 30 years following facility closure. The UDSHW may, however, shorten this duration if justification to do so is provided and approved. In contrast, however, the duration of post-closure care may also be extended beyond 30 years if environmental and physical monitoring data reveal that unstable or other unfavorable conditions exist or that residual risks are not or will not likely remain within acceptable limits.

Post-closure care activities include such activities as:

- ü Conducting an environmental monitoring program and reporting results
- ü Performing periodic surveillance
- ü Providing custodial care and maintenance
- ü Maintaining records
- ü Reporting periodically to the Regulatory Agency
- ü Carrying out other equivalent activities as determined by the Executive Secretary
- ü Administering funds to cover the costs for these activities
- ü Conducting corrective actions for failed components or the failed facility

September 2006

2.6 WHO PROVIDES POST-CLOSURE CARE?

Under expected conditions, the Permittee will provide post-closure care of the closed facility at its own expense. Post-closure activities must be pursued until the UDSHW determines that the facility is performing acceptably and that the post-closure permit can be terminated. In this case, the conditions for using the post-closure care financial assurances are not fulfilled and no funds are disbursed for post-closure care. Once post-closure is completed by the facility and the funds for closure are no longer required, the financial assurance mechanism is returned to the permittee.

Under unusual conditions, the Permittee may be unable to provide post-closure care. Under these conditions, and in accordance with applicable terms of the financial mechanism used to provide the financial assurances, the State may provide post-closure care using an independent third party contractor. To cover the costs of such post-closure care under these circumstances, the State would exercise the financial assurances provided for post-closure care.

2.7 WHAT FORMS OF CLOSURE AND POST-CLOSURE CARE FINANCIAL ASSURANCES (FINANCIAL ASSURANCE MECHANISMS OR FINANCIAL SURETIES) ARE ALLOWED BY THE RULES?

A Permittee may satisfy the requirements for providing financial assurance for closure and post-closure care of a facility permitted to manage hazardous waste by using one or a more of the following. The reference in parentheses provides exact wording for each form of financial assurance.

- ü Trust fund (40 CFR 264.151(a)(1))
- ü Surety bond guaranteeing payment into a closure trust fund (40 CFR 264.151(b))
- ü Surety bond (40 CFR 264.151(b))
- ü Letter of credit (40 CFR 264.151(d))
- ü Insurance (40 CFR 264.151(e))
- ü Financial test (40 CFR 264.151(f))
- ü Corporate guarantee that meets the certain specifications (40 CFR 264.151(h)(1))

Specific requirements are stated in the regulations for each form of financial assurance, as noted parenthetically above.

2.8 WHAT ARE THE ESTIMATED COSTS TO CLOSE UTAH'S PERMITTED COMMERCIAL HAZARDOUS WASTE MANAGEMENT FACILITIES AND TO PROVIDE POST-CLOSURE CARE?

The costs estimated for the closure and post-closure care of commercial hazardous waste management facilities permitted by the State of Utah are presented in Table 2-3. These estimated

September 2006

costs are the most recent closure costs revised and updated by Permittees, reviewed by the UDSHW, and accepted as adequate basis for determining required closure financial assurances.

Table 2-3. Summary of estimated facility closure and post-closure care costs for commercial hazardous waste management facilities permitted by the State of Utah		
Facility	Estimated Facility Closure Cost	Estimated Post-Closure Care Cost
Clean Harbors Grassy Mountain	\$17.7 million	\$13.2 million
EnergySolutions Mixed Waste Facility	\$13.6 million	\$2.7 million
Clean Harbors Aragonite	\$11.3 million	Not Applicable
Northeast Casualty Real Property	\$7.5 million	Not Applicable
Safety-Kleen Pioneer Road	\$0.2 million	Not Applicable
Ashland Chemical Company	\$0.3 million	Not Applicable

Estimated costs are influenced by such factors as:

- ü Specifics of plans to close and provide post-closure care
- ü Changes in unit costs of items or activities required to close or provide post-closure care (such as the price of fuel, reduced availability of materials, and changes in qualified labor supply)
- ü Site-specific conditions (such as geotechnical and hydraulic characteristics of soils, meteorological conditions, and characteristics of waste managed at the facility) available at or near the facility
- ü Recent developments in technologies that could improve the conduct of any activity required during closure or post-closure care

Closure costs must be estimated making allowances for applicable requirements. For example:

- ü The Permittee must close the facility so that the need for further maintenance is minimized.
- ü The Permittee must close the facility so that the potential for post-closure release of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products is controlled, minimized, or eliminated.
- ü The estimated closure cost must be determined at the time in the facility's active life when the extent and manner of operation would make the closure most expensive.

September 2006

- ü The cost estimate must assume that an independent third party will be hired to perform all closure activities and post-closure care.
- ü The closure cost estimate must take no credit for any salvage value of hazardous waste, non-hazardous waste, structures, equipment, land, or other assets associated with the hazardous waste management facility.

2.9 HOW MUCH FINANCIAL ASSURANCE MUST BE PROVIDED TO CLOSE A FACILITY AND PROVIDE POST-CLOSURE CARE?

Financial assurances must be provided in an amount equal to or greater than those estimated to be associated with closing a facility and providing post-closure care. The Permittee must estimate closure and post-closure costs and submit them for regulatory review as part of the initial permitting process. These cost estimates must account for all activities and costs that will be required to close the facility and to care for it during the post-closure care period.

After the permit is issued, the Permittee must update and submit the closure and post-closure care cost estimates and submit them for review by the UDSHW annually. Having considered effects of any changes in closure plans, technological developments, and inflation, the UDSHW will determine what financial assurances must be provided for the coming year, until the next revised cost estimates will be submitted and reviewed.

If the facility modifies its permit to bring new hazardous waste management units on line, financial assurances must be provided within 60 days of modification approval.

2.10 WHAT CLOSURE AND POST-CLOSURE FINANCIAL ASSURANCES ARE CURRENTLY BEING PROVIDED FOR UTAH'S PERMITTED FACILITIES?

As of 2006, closure financial assurances listed in Table 2-4 cover the costs of closing and providing post-closure care at Utah's permitted commercial hazardous waste management facilities.

Table 2-4. Financial assurances presently provided by Permittees in Utah				
Facility	Closure Financial Assurance Mechanism	Closure Financial Assurance Provided	Post-Closure Financial Assurance Mechanism	Post-Closure Financial Assurance Provided
Clean Harbors Grassy Mountain	Insurance	\$17.7 million	Insurance	\$13.2 million
EnergySolutions Mixed Waste Facility	Insurance	\$13.6 million	Insurance	\$2.7 million
Clean Harbors Aragonite	Insurance	\$11.3 million	Not Applicable	Not Applicable
Northeast Casualty Real Property	Insurance	\$7.5 million	Not Applicable	Not Applicable

September 2006

Table 2-4. Financial assurances presently provided by Permittees in Utah				
Facility	Closure Financial Assurance Mechanism	Closure Financial Assurance Provided	Post-Closure Financial Assurance Mechanism	Post-Closure Financial Assurance Provided
Safety-Kleen Pioneer Road	Insurance	\$0.2 million	Not Applicable	Not Applicable
Ashland Chemical Company	Financial Test	\$0.3 million	Not Applicable	Not Applicable

2.11 WHO IS RESPONSIBLE FOR OVERSEEING THE CLOSED FACILITY AFTER THE PERMIT IS TERMINATED?

Once the permit is terminated, the State of Utah continues to monitor the performance of the closed facility. Although the State and Federal government could seek reimbursement from responsible parties, no financial assurances or other funds are provided for costs that might be incurred after permit termination.

2.12 WHAT FINANCIAL ASSURANCES OR FUNDS ARE PROVIDED TO COVER THE COSTS THAT MIGHT BE INCURRED AFTER THE PERMIT IS TERMINATED?

No financial assurance or other funds are explicitly provided for the perpetual care of, maintenance of, or corrective actions at commercial hazardous waste land disposal facilities should the need arise following the closure and post-closure care periods and termination of the post-closure permit.

2.13 WHAT IS “PERPETUAL CARE AND MAINTENANCE”?

For commercial hazardous waste land disposal facilities, perpetual care and maintenance activities that might be necessary following permit termination include:

- ü Maintaining appropriate levels of site security
- ü Providing minor repairs to components whose failure could compromise the stability and safety of the closed facility
- ü Performing routine maintenance of site and support structures and systems (such as landscaping, painting, maintaining fences, and repairing minor damage to cover systems
- ü Complying with applicable regulatory or legal requirements
- ü Pumping and treating groundwater contaminated beyond acceptable levels by the closed facility
- ü Restoring groundwater systems contaminated beyond acceptable levels by the closed facility
- ü Excavating and re-disposing of waste previously disposed of at the closed facility

September 2006

2.14 DO THE UTAH HAZARDOUS WASTE MANAGEMENT RULES PROVIDE FOR PERPETUAL CARE AND MAINTENANCE OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES?

Utah's rules are based on rules developed and promulgated by the US Environmental Protection Agency (EPA). Neither EPA's rules nor the Utah Hazardous Waste Management Rules provide for the perpetual care and maintenance of closed commercial hazardous waste management facilities following post-closure permit termination.

EPA's financial assurance requirements for hazardous waste management facilities have not explicitly addressed the need for maintenance, monitoring, or corrective actions following the facility's post-closure period and permit termination. EPA's rules assume that each facility's post-closure care period is not complete and the permit is not terminated until the facility has demonstrated that it is meeting and is likely to continue to meet applicable standards and requirements. Moreover, EPA's rules also implicitly assume that once the permit has been terminated, the disposal unit will continue to perform as designed so that no continuing attention is required.

See also the response to the Question 2-25 below. What are the estimated costs of monitoring and maintaining the closed facility following 30 years of post-closure care?

Current estimates of the annual costs of monitoring and maintaining the closed Grassy Mountain facility total about \$50,000¹¹ per year. Approximately \$2.5 million invested at 2 percent per year real interest rate will generate sufficient interest earnings to cover these costs.

2.15 WHAT WILL BE THE VALUE OF A HAZARDOUS WASTE PERPETUAL CARE FUND IN THE FUTURE?

Monies deposited into a hazardous waste perpetual care fund would be invested according to Utah Treasurer rules. Investments must be made in secure financial instruments that have very small probability of failure or loss. Typically, such investments include US Treasury notes and bonds. Over the past century, these financial instruments have produced interest earnings of about 2 percent per year over and above prevailing inflation rates (RFF 2002, MSDW 1999). That is, they have a real interest rate of about 2 percent per year. Investments in such financial instruments grow faster than inflation by about 2 percent per year.

Given annual deposits of \$45,000 to and interest earnings of a hazardous waste perpetual care fund, Table 2-5 presents projected future values of the fund. Knowing the number of years from now that the facility closes and the time after that when the fund might be required, the value at the time of need can be determined. For example, if the facility terminates operations and is properly closed 24 years from now (shaded below) and the fund is required after 30 years of post-closure care (shaded below), its value is projected to be \$2.6 million (shaded below), as shown in Table 2-5, assuming no monies are prematurely withdrawn from the fund.

¹¹ This cost is based on sampling and analyzing groundwater once every five years, annual inspection of the facility, and annual minor maintenance of the landfill cover.

September 2006

Table 2-5. Projected future values of Hazardous Waste Perpetual Care and Maintenance Fund					
	Time of Facility Closure (years from today)				
	0 yr	5 yr	10 yr	20 yr	24 yr
Collections Through Closure (\$ million)	0.0	0.2	0.5	0.9	\$1.1
Future Value (\$ million)	\$0.0	\$0.3	\$0.5	\$1.2	\$1.4
Time of Need (years after Closure)	Value at Time of Need (\$ million)				
5 Years	\$0.0	\$0.3	\$0.6	\$1.3	\$1.6
10 Years	\$0.0	\$0.3	\$0.7	\$1.4	\$1.8
15 Years	\$0.0	\$0.4	\$0.7	\$1.6	\$1.9
20 Years	\$0.0	\$0.4	\$0.8	\$1.7	\$2.1
30 Years	\$0.0	\$0.5	\$1.0	\$2.1	\$2.6
50 Years	\$0.0	\$0.8	\$1.5	\$3.1	\$3.9
75 Years	\$0.0	\$1.2	\$2.4	\$5.1	\$6.4

In general, the value of the fund grows faster than costs inflate. As a general rule, the future value of a hazardous waste perpetual care fund grows:

- ü When the facility continues to operate so that deposits continue to be made into the fund
- ü When the need for the fund is delayed
- ü If annual deposits to the fund increase

2.16 WHAT MIGHT BE THE FUTURE VALUE OF A HAZARDOUS WASTE PERPETUAL CARE FUND IF GREATER ANNUAL FEES WERE IMPOSED?

If larger annual fees were required to be deposited into a hazardous waste perpetual care fund, more monies would be available after 24 additional years of operations and 30 years of post-closure care, as shown in Table 2-6, assuming no monies were prematurely withdrawn from the fund.

Annual Fee (\$ per year)	Future Value¹² (\$ million)
\$15,000	\$0.9
\$25,000	\$1.4
\$35,000	\$2.0
\$45,000	\$2.6
\$75,000	\$4.3
\$100,000	\$5.8

2.17 WHAT MIGHT BE THE CONSEQUENCES OF IMPOSING GREATER ANNUAL FEES FOR A HAZARDOUS WASTE PERPETUAL CARE FUND?

At least two consequences might result from more aggressively accumulating monies within a hazardous waste perpetual care fund. These consequences are:

- ü Higher fees discourage commercial activity
- ü Greater accumulations without current need might allow funds to be diverted for other purposes

Higher fees that would generate greater deposits to a hazardous waste perpetual care fund may have one of two commercial effects:

- ü Decrease the facility's profit margin because they do not or cannot raise the price of their services
- ü Decrease competitiveness with facilities offering similar service because the Utah facility has raised the price of their services

Both of these effects encumber the commercial viability of such facilities. Without raising prices, the facility's profitability is reduced and the company's ability to attract capital is diminished.

Increased prices mean the facility is less able to sell its service to those who require them, as long as alternative facilities are available. Because hazardous waste treatment, storage, and disposal services are available at numerous facilities throughout the US, facilities permitted and offering such services in Utah are subject to significant competitive pressures. Thus, increasing its prices to cover any annual fees would probably weaken their commercial viability.

¹² After 24 more years of deposits (disposal operations) and 30 years of post closure care at a real interest rate of 2 percent per year.

September 2006

Another down side to accumulating funds in any publicly owned and administered fund is the susceptibility of the fund to political expediency. History has proven that publicly owned and administered funds established for one purpose deliver their monies, upon appropriate legislative revision, to fund other purposes.

More to the point, the states of South Carolina and Washington have both transferred monies from funds expressly established to ensure the closure and long-term maintenance of Low-Level Radioactive Waste (LLRW) disposal facilities. These transfers occurred during years when these state governments were encountering significant difficulties balancing their budgets and when additional funds were required. These closure and long-term maintenance funds appeared to provide a relatively painless means of supplementing current tax revenues without increasing the tax rate or base on current taxpayers.

Provisions have, in some cases, been made to repay monies borrowed from LLRW disposal facility closure and long-term maintenance funds. Nevertheless, the public act of diverting the assets of these funds for other purposes, may create a funding deficiency, should the need arise before the borrowings are repaid. Moreover, if the funds are never repaid and the need for their monies arises, the costs might have to be met by taxpayers at the time of need.

2.18 ARE SUFFICIENT FINANCIAL ASSURANCES PROVIDED TO COVER THE COSTS OF CLOSURE, POST-CLOSURE CARE, AND UNPLANNED AND UNANTICIPATED EVENTS?

The amount of financial assurance required and provided for closure and post-closure care of commercial hazardous waste treatment, storage, or disposal facilities is judged to be adequate.

The State currently does not require financial assurances nor has it established a fund to cover costs associated with closed hazardous waste management facilities following post-closure care.

As noted above, a minimum fund balance of about \$2.5 million, when invested at 2 percent per year real interest rate, should provide sufficient interest earnings to cover the costs of routine monitoring and maintenance. With an annual fee of \$45,000, the fund could amount to approximately \$2.6 million, assuming 24 additional years of operations and 30 years of post-closure care, during which time no monies are withdrawn from the fund.

A hazardous waste perpetual care fund balance of \$2.6 million invested at 2 percent real per year would produce interest earnings of more than \$52,000 per year, without reducing the value of the fund. This would be sufficient to cover the costs of routine monitoring and maintenance. Additional funds would be required to cover the costs associated with unplanned and unanticipated events.

The financial and competitive effects of imposing fees on Clean Harbors to fund this account at the rate of \$45,000 per year should be evaluated. If it causes the facility to terminate active operations, based on this estimate, no money will be available for any perpetual care, though the possibility of the need of such funds will persist.

September 2006

2.19 WHAT OTHER COSTS MIGHT BE ANTICIPATED FOLLOWING POST-CLOSURE PERMIT TERMINATION?

Significant uncertainties are associated with determining costs associated with major maintenance of cells, differential settlement failure or groundwater corrective action at closed commercial hazardous waste land disposal facilities. However, an effort has been made to approximate a range of costs if one of these events occurred. These estimated costs are summarized in Table 2-7.

Table 2-7. Summary of approximate costs of unplanned and unanticipated future events	
Potential Future Event	Approximate Cost Range¹³
Major Maintenance of Cells	\$1 to \$50 million
Differential Settlement Failure	\$10 to \$70 million
Groundwater Corrective Action	\$10 to \$50 million
Aggregate Probability-Weighted Total	\$5 to \$30 million

2.20 SHOULD FUNDS BE REQUIRED FOR COSTS THAT MIGHT BE INCURRED FOR MAJOR EVENTS FOLLOWING POST-CLOSURE PERMIT TERMINATION?

Substantial regulatory effort has been, continues to be and will in the future be committed to provide assurance that the hazardous waste disposal facilities permitted in the State of Utah will perform as required and as planned (refer to Question 2-21). Furthermore, additional funds for the potential events and conditions identified above are not considered necessary at this time for the following reasons:

- Ü Engineering controls employed to construct the landfill cells: When EPA developed the rules for landfill construction it took into consideration that landfill cells would need to be stable for many years. The landfill cells are required to have a compacted clay liner upon which multiple synthetic liners are placed to contain the waste and prevent ground water contamination. The waste is treated before it can be placed in a landfill cell to reduce its concentration and to stabilize it so that it minimizes the chance of migration. The waste is placed in the cell in compacted layers to minimize the chance of differential settlement after cell closure. The cell cap is designed to encompass the waste, shed precipitation, prevent erosion, and to withstand natural degradation.
- Ü Design and monitoring prior to permit termination: The cap design and corresponding ground water monitoring ensure that no leachate is being generated and that the ground

¹³ Rounded to the nearest \$10 million or one figure of significance because of extreme uncertainty.

September 2006

water contamination risk approaches zero. The leachate generation risk of zero is expected to be achieved in the first 10 years. Consequently, more than 20 years of cap performance are verified by the absence of leachate production and ground water monitoring.

- ü Remote location of the facility: The Grassy Mountain Facility is located approximately 80 miles west of Salt Lake City in a remote area of Tooele County.
- ü Lack of nearby population center: The nearest population center to the Grassy Mountain Facility is Grantsville, which is located approximately 40 miles away.
- ü Location of the facility is in the Tooele County Hazardous Waste Corridor: This area was created by the Tooele County Commission to provide a remote area for the location of commercial waste management facilities. Residential development is prohibited in this corridor. This further prevents the possibility of any population center being located near Grassy Mountain Facility in the future.
- ü Non-potable groundwater: The quality of the groundwater at the facility is very poor (total dissolved solids concentration greater than 40,000 ppm) and is not suitable for human or animal consumption or for other agricultural uses.
- ü Aridity: The amount of precipitation for a typical year is only about six to nine inches. This limits the amount of erosion and leachate creation for a closed landfill cell.
- ü Restricted access to the facility: The Grassy Mountain Facility is surrounded by a six-foot chain-link fence with warning signs and locking gate to discourage unauthorized access.

2.21 BEYOND FINANCIAL ASSURANCES, WHAT ELSE PROVIDES ASSURANCE THAT COMMERCIAL HAZARDOUS WASTE MANAGEMENT FACILITIES WILL BE PROPERLY CLOSED AND WILL PERFORM AS REQUIRED?

The comprehensive system for regulating the management of hazardous waste includes numerous features that limit the probability that closure, post-closure, and other costs would exceed those covered through financial assurance. These features include:

- ü General Facility Standards
- ü Preparedness and Prevention
- ü Contingency Plan and Emergency Procedures
- ü Manifest System, Recordkeeping, and Reporting
- ü Groundwater Protection
- ü Use and Management of Containers
- ü Tanks
- ü Landfills
- ü Land Disposal Restrictions

September 2006

These requirements are briefly and necessarily incompletely summarized below:

General Facility Standards (UAC R315-8-2)

- ü Identification Number; Every facility owner or operator must obtain an EPA identification number.
- ü General Waste Analysis; The requirements of 40 CFR 264.13, 1996 ed., must be satisfied.
- ü Security; A facility owner or operator must prevent the unknowing entry, and minimize the possibility for the unauthorized entry, of persons or livestock onto the active portion of his facility.
- ü General Inspection Requirements; Facility owners or operators must inspect their facilities for malfunctions and deterioration, operator errors, and discharges, which may cause or lead to release of hazardous waste constituents to the environment or pose a threat to human health.
- ü Personnel Training; Facility personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures the facility's compliance with applicable requirements.
- ü General Requirements For Ignitable, Reactive, Or Incompatible Wastes; The owner or operator must take precautions to prevent accidental ignition or reaction of ignitable or reactive wastes.
- ü Location Standards; Sites at which hazardous waste management facilities will be developed must satisfy siting requirements that address seismic considerations and avoid floodplains.
- ü Construction Quality Assurance Program; A CQA program must be implemented for the construction of certain facility units to ensure that the constructed unit meets or exceeds all design criteria and specifications in the permit.

Preparedness and Prevention (UAC R315-8-3)

- ü Design and Operation of Facility; Facilities must be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden discharge of hazardous waste or hazardous waste constituents to air, soil, groundwater, or surface water which could threaten the environment or human health.
- ü Required Equipment; All facilities must be equipped with the following:
 - Internal communications or alarm system.
 - Device capable of summoning external emergency assistance from local law enforcement agencies, fire departments, or State or local emergency response teams.
 - Portable fire extinguishers, fire control equipment, including special extinguishing equipment.
 - Water at adequate volume and pressure to supply water hose streams, or foam producing equipment, or automatic sprinklers, or water spray systems.

September 2006

- ü Testing and Maintenance of Equipment; all facility communications or alarm systems, fire protection equipment, safety equipment, discharge control equipment, and decontamination equipment must be tested and maintained to assure its proper operation in time of emergency.
- ü Access to Communications or Alarm System; whenever hazardous waste is being poured, mixed, spread, or otherwise handled, all employees involved in the operation must have immediate access to an internal alarm or emergency communication device.
- ü Required Aisle Space; the facility owner or operator must maintain aisle space to allow the unobstructed movement of personnel, fire protection equipment, discharge control equipment, and decontamination equipment to any area of facility operation in an emergency.
- ü Arrangements with Local Authorities; the owner or operator must attempt to make arrangements with law enforcement agencies, fire departments, and emergency response teams to enable them to provide emergency services appropriate to potential hazards at the facility.

Contingency Plan and Emergency Procedures (UAC R315-8-4)

- ü Purpose and Implementation of Contingency Plan; Each owner or operator must have a contingency plan for his facility to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden discharge of hazardous waste or hazardous waste constituents to air, soil, groundwater, or surface water.
- ü Content of Contingency Plan; The plan must describe the actions facility personnel must take in response to fires, explosions or any unplanned sudden or non-sudden discharge of hazardous waste or hazardous waste constituents to air, soil, or surface water at the facility.
- ü Emergency Coordinator; At all times at least one employee with the responsibility for coordinating all emergency response measures must either present on the facility premises or on call.
- ü Emergency Procedures; Whenever there is an imminent or actual emergency situation, the facility's emergency coordinator or his designee must immediately take certain actions to contain hazardous substances and minimize the effects of the situation on workers and the environment.

Manifest System, Recordkeeping, and Reporting (UAC R315-8-5)

- ü Use of Manifest System; A facility that receives hazardous waste must implement a manifest management system to ensure that all wastes received at the facility are documented.
- ü Operating Record; The record keeping requirements of 40 CFR 264.73, 2000 ed., must be satisfied.
- ü Manifest Discrepancies; the owner or operator must attempt to reconcile discrepancies between waste received and descriptions provided in manifests.

September 2006

- ü Availability, Retention, and Disposition of Records; Records of waste disposal locations and quantities must maintained in compliance with 40 CFR 264.73(b)(2).
- ü Biennial Report; Owners or operators of facilities that treat, store, or dispose of hazardous waste must prepare and submit a biennial report to the Board by March 1 of each even numbered year.
- ü Unmanifested Waste Report; If a facility accepts for treatment, storage, or disposal any hazardous waste from an off-site source without an accompanying manifest, the owner or operator must prepare and submit a report to the Board within 15 days of the receipt of the waste.
- ü Additional Reports; A facility owner operator must report discharges, fires, and explosions to the Board.

Groundwater Protection (UAC R315-8-6)

- ü Required Programs; Owners and operators of land disposal facilities must conduct a monitoring and response program described in UAC R315-8-6).
- ü Groundwater Protection Standard; The owner or operator must comply with conditions specified in the facility permit to ensure that hazardous constituents detected in the groundwater from a regulated unit do not exceed applicable concentration limits in the uppermost aquifer underlying the waste management area beyond the point of compliance during the compliance period.
- ü Hazardous Constituents; The Executive Secretary has specified in the facility permit the hazardous constituents to which the groundwater protection standard applies.
- ü Concentration Limits; The Executive Secretary has specified in the facility permit concentration limits in the groundwater for hazardous constituents.
- ü Point of Compliance; The Executive Secretary has specified in the facility permit the point of compliance at which the groundwater protection standard applies and at which monitoring must be conducted.
- ü Compliance Period; The Executive Secretary has specified in the facility permit the compliance period during which the groundwater protection standard applies.
- ü General Groundwater Monitoring Requirements; The owner or operator must comply with the requirements stated in UAC R315-8-6.8 for any groundwater monitoring program
- ü Detection Monitoring Program; An owner or operator required to establish a detection monitoring program must, at a minimum, discharge the responsibilities stated in UAC R315-8-6.9.
- ü Compliance Monitoring Program; An owner or operator required to establish a compliance monitoring program must, at a minimum, discharge the responsibilities stated in UAC R315-8-6.10.

September 2006

- ü Corrective Action Program; An owner or operator required to establish a corrective action program must, at a minimum, discharge the responsibilities started in UAC R315-8-6.11.
- ü Corrective Action for Solid Waste Management Units; The owner or operator of a facility seeking a permit for the treatment, storage or disposal of hazardous waste must institute corrective action as necessary to protect human health and the environment for all releases of hazardous waste or constituents from any solid waste management unit at the facility, regardless of the time at which waste was placed in the unit.

Use and Management of Containers (UAC R315-8-9)

- ü Condition of Containers; If a container holding hazardous waste is not in good condition, the owner or operator must transfer the hazardous waste from this container to a container that is in good condition or manage the waste in some other way.
- ü Compatibility of Waste with Containers; The owner or operator must use a container made of or lined with materials which will not react with, and are otherwise compatible with, the hazardous waste to be stored, so that the ability of the container to contain the waste is not impaired.
- ü Management of Containers; A container holding hazardous waste must always be closed during storage (except when it is necessary to add or remove waste) and must not be opened, handled, or stored in a manner which may rupture the container or cause it to leak.
- ü Inspections; At least weekly, the owner or operator must inspect areas where containers are stored, for leaks and container or containment system deterioration.
- ü Containment; Container storage areas must have a containment system designed and operated in accordance with R315-8-9.6(b).
- ü Special Requirements for Ignitable or Reactive Waste; Containers holding ignitable or reactive waste must be located at least 50 feet from the facility's property line.
- ü Special Requirements for Incompatible Wastes; Incompatible wastes must satisfy requirements stated in UAC R315-8-9.8.
- ü Closure; At closure, all hazardous waste and hazardous waste residues must be removed from the containment system. Containers, liners, bases, and soil containing or contaminated with hazardous waste or hazardous waste residues must be decontaminated or removed.
- ü Air Emission Standards; The owner or operator must manage all hazardous waste placed in a container in accordance with the applicable requirements of R315-8-17.

Tanks (UAC R315-8-10)

- ü In general, the requirements as of 40 CFR 264, subpart J, 264.190 - 264.200, 1996 ed., as amended by 61 FR 59931, November 25, 1996, must be satisfied.

September 2006

Landfills (UAC R315-8-14)

- ü Design and Operating Requirements; Any landfill that is not exempted must have a liner system for all portions of the landfill. The liner system must satisfy the requirements of UAC R315-8-14.2.
- ü Monitoring and Inspection; During construction or installation, liners and cover systems (e.g., membranes, sheets, or coatings) must be inspected for uniformity, damage, and imperfections (e.g., holes, cracks, thin spots, or foreign materials).
- ü Surveying and Recordkeeping; The owner or operator of a landfill must maintain the items listed in UAC R315-8-14.4 in the operating record.
- ü Closure and Post-Closure Care; At final closure of the landfill or upon closure of any cell, the owner or operator must cover the landfill or cell with a final cover designed and constructed to satisfy requirements of UAC R315-8-14.5.
- ü Special Requirements for Ignitable or Reactive Waste; Ignitable or reactive waste must not be placed in a landfill, except under conditions stated in UAC R315-8-14.6.
- ü Special Requirements for Incompatible Wastes; Incompatible wastes, or incompatible wastes and materials must not be placed in the same landfill cell, except as required by UAC R315-8-2.8(b).
- ü Special Requirements for Liquid Waste; Effective May 8, 1985, the placement of bulk or non-containerized liquid hazardous waste or hazardous waste containing free liquids, whether or not sorbents have been added, in any landfill is prohibited.
- ü Special Requirements for Containers; Unless they are very small, such as an ampoule, containers must either be at least 90 percent full when placed in the landfill; or be crushed, shredded, or similarly reduced in volume to the maximum practical extent before burial in the landfill.
- ü Disposal of Small Containers of Hazardous Waste in Overpacked Drums; Small containers of hazardous waste in overpacked drums may be placed in a landfill if the requirements stated in UAC R315-8-14.10 are met.
- ü Special Requirements for Hazardous Wastes F020, F021, F022, F023, F026, and F027; Hazardous Wastes F020, F021, F022, F023, F026, and F027 must not be placed in a landfill except as provided by UAC R315-8-14.11

Land Disposal Restrictions (UAC R315-13)

- ü In general the requirements regarding land disposal restrictions as found in 40 CFR 268, 2000 ed., as amended by 65 FR 67068, November 8, 2000; 66 FR 27266, May 16, 2001; 66 FR 58258, November 20, 2001; 67 FR 17119, April 9, 2002; and 67 FR 62618, October 7, 2002 must be satisfied. Wastes need to be treated to a specific level prior to land disposal.

September 2006

Agency Inspections

- ü DSHW Facility Inspections
- ü EPA Off-site Rule Inspections
- ü EPA Oversight Inspections

2.22 HOW CAN THE STATE HELP ENSURE AGAINST UNANTICIPATED COSTS OF LONG-TERM CARE AND MAINTENANCE?

Ensuring against the unanticipated costs listed above could involve a range of possible actions. Each unanticipated cost might involve one or more actions such as:

- ü Increase financial assurance requirements
- ü Impose more stringent and costly siting, construction, operating, and closure requirements
- ü Require a perpetual care fund

2.23 ARE SUFFICIENT FINANCIAL ASSURANCES PROVIDED FOR ADEQUATE FUNDING FOR COSTS OF UNPLANNED AND UNANTICIPATED EVENTS?

In general, funds are available to cover the costs expected to close and provide post-closure care of commercial hazardous waste management facilities permitted in the State of Utah. Funds are not provided to manage the costs of care at closed facilities after the permit has been terminated.

2.24 HOW DO THE FINANCIAL ASSURANCES REQUIRED FOR CLOSURE AND POST-CLOSURE CARE OF COMMERCIAL HAZARDOUS WASTE MANAGEMENT FACILITIES PERMITTED IN THE STATE OF UTAH COMPARE WITH THOSE REQUIRED IN OTHER STATES?

EPA Financial Assurance Requirements

The need for financial assurances for closure and post-closure care of hazardous waste management facilities was demonstrated historically by instances of abandonment or delayed closure, often occurring after the economic value of the facilities was diminished or nonexistent. The EPA recognized that post-closure care might be necessary for decades after the operating period, and that the facility owners or operators may lack funds for the required closure and/or care unless they provided for them during the operating period.

EPA first established financial responsibility standards for owners and operators of hazardous waste management facilities under the Resource Conservation and Recovery Act of 1976. The standards are contained in 40 CFR Parts 264 and 265 for facility permitting and interim status, respectively. EPA's original standards, proposed December 18, 1978 (43 FR 58995, 59006-7), provided (1) assurance that funds would be available when needed to properly close hazardous

September 2006

waste management facilities; (2) assurance that funds would be available when needed to monitor and maintain the facilities for a 20-year Post-Closure Period; and (3) liability coverage for injuries resulting from operation of the facilities. The initial closure and post-closure financial assurance required lump-sum deposits into trust funds in the amount of the closure and post-closure cost estimates multiplied by “present value factors” that accounted for growth of the fund during the operating life of the facility.

EPA revised its financial assurance rules on May 19, 1980 (45 FR 33260-33273) to (1) allow the closure trust fund to accumulate to its required value throughout the operating period (or for up to 20 years); (2) allow other financial assurance funding mechanisms besides the trust fund; and (3) extend the post-closure period from 20 years to 30 years. The stated purpose for extending the post-closure period to 30 years was to eliminate leachate monitoring requirements. Since it takes longer for contaminant migration to reach ground-water monitoring points than it would have taken to reach leachate detection monitoring points, it is necessary to monitor for a longer period.

EPA provides flexibility in the 30-year post-closure period via case-by-case reviews (45 FR 33197). If an owner or operator can demonstrate that there is no need to monitor and maintain his closed facility for the entire 30-year period, the period can be shortened. On the other hand, representatives of the public can petition to have the monitoring period extended for cause.

EPA believes that certain organic chemicals persist longer than 30 years and that heavy metals remain toxic forever, requiring careful management to limit mobilization. However, EPA deemed it impossible for many small single facilities to finance perpetual care after their revenues cease. While EPA advocated some form of national insurance to ensure perpetual monitoring of facilities with detected or imminent contamination, its near-term solution was to enable EPA’s Regional Administrators to extend some or all of the post-closure care requirements for causes of detected or imminent groundwater contamination.

With respect to a possible perpetual care period, EPA appeared to seek a balance between perpetual monitoring and maintenance, where deemed necessary, and the financial burden imposed on the owner or operator of the individual facilities. EPA interpreted the RCRA statute to require measures to be taken, for as long as necessary, to ensure that land disposal facilities do not pose a threat to human health or the environment. However, they stopped short of imposing financial assurance requirements for the perpetual care period, citing the potential default of many facilities if faced with such a requirement.

As recently as 2001, an EPA Office of Inspector General (OIG) audit of RCRA financial assurance for closure and post-closure care found that there is insufficient assurance that funds will be available in all cases to adequately cover post-closure monitoring and maintenance (EPA 2001). The audit included nine of the ten EPA regions but excluded Region 8 (which includes Utah, Colorado, Wyoming, Montana, North Dakota and South Dakota). Although states may require more than 30 years of post-closure care, the audit found that (a) most state agencies had not developed a policy or process to determine whether Post-Closure care should be extended beyond 30 years and (b) there is no EPA guidance on determining the appropriate length of post-closure care. The OIG recommended that EPA develop appropriate post-closure care time frames.

September 2006

The OIG report (EPA, 2001) summarized an audit survey of post-closure care needs among privately-owned hazardous waste landfills in nine states (AL, CA, CT, MO, NY, OH, TX, VA, and WA). State officials indicated that 20 percent of the 178 hazardous waste facilities then in post-closure will need care beyond the 30-year period; 6 percent of them will not; and the remaining 74 percent of them have yet to be evaluated for possibly needing to extend the post-closure care period. The audit survey identified only three facilities for which the post-closure period was extended beyond 30 years: two in New York and one in Ohio. However, officials in five of the nine states surveyed (AL, CA, CT, MO, and NY indicated that 30 years was insufficiently long for the post-closure care period and those in two of the other states (OH and TX) have not yet evaluated the adequacy of the 30-year period. The officials also expressed concern that if they extend the post-closure period beyond 30 years without supporting federal criteria, they may become involved in legal battles with facility owners and operators.

The OIG audit survey found that the projected annual monitoring and maintenance costs for the last (30th year) of the post-closure period ranged from \$400 to more than \$1 million, averaging more than \$96,000 per facility. The drop from this level to zero funding in the 31st year could adversely affect state programs and the environment. Further projecting the post-closure costs past the 30th year, based on equivalence to the costs in the 30th year (assuming no unexpected cleanup), the un-funded liability that could fall to the nine states surveyed totals \$2.8 million by the year 2017 and \$19 million by 2030.

The OIG audit also addressed financial assurance funding mechanisms and found that captive insurance companies do not provide an adequate level of assurance for closure and post-closure care. Although some risks were also found with other mechanisms, many cases were also found where the other financial assurance mechanisms work as intended.

The accuracy of closure and post-closure cost estimates was found to often be inadequate in the nine-state OIG survey. Underestimated costs, leading to insufficient financial-assurance funding, are difficult to identify because reviewer judgments rely on different review criteria, reviewer experience, and differing levels of detail in the Closure and Post-Closure plans. An EPA Region IV study found that of 100 facilities in its eight states that submitted cost estimates, 89 had underestimated financial assurance costs by a total of \$450 million. In one of the states, with 35 facility-submitted cost estimates, underestimated closure costs totaled \$91 million and underestimated post-closure costs totaled \$1.7 million.

EPA Region IV developed a software tool to improve state reviews of Subtitle C facility closure and post-closure cost estimates. Based on standard costing information such as published by the R.S. Means Company, the software expedites and standardizes the review process. Prior to its use, several very-similar fuel blender facilities submitted closure cost estimates ranging from \$100,000 to \$5,000,000. Because the estimates were documented so inconsistently, it was difficult for individual states even to challenge the wide discrepancies for like facilities. Several states reported in the OIG survey that they used the software while four of the nine states surveyed were unaware that it existed.

State of Utah

The Utah financial assurance requirements for Hazardous Waste Landfills that correspond to EPA regulations are contained in R315-8-6.12(b) and R315-8-8, which incorporate by reference

September 2006

the corresponding EPA requirements in 40 CFR 264.101 and 40 CFR 264.142. However, the Utah regulations go beyond the EPA requirements in several respects.

Utah does not require financial assurance if the facility is owned or operated by the State of Utah or the Federal government [R315-8-7; 40CFR264.140(c)]. Utah requires that a financial assurance mechanism be put in place for closure [R315-8-7; 40CFR 264.143] and post closure [R315-8-7; 40CFR 264.145] for hazardous waste facilities. Assurances of financial responsibility for completion of corrective actions at solid waste management units must be provided [R315-8-6.12(b); 40CFR 264.552; 40CFR 264.553].

The minimum contents for a permit modification application to establish a corrective action program [R315-8-6.10(h)(2)] does not explicitly include the financial assurance mechanism or the assurances of financial responsibility specified in R315-8-6.12(b).

Owners and operators of surface impoundments, landfills, land treatment units, and waste pile units that received waste after July 26, 1982, or that certified closure, according to R315-7-14, which incorporates by reference 40 CFR 265.115, after January 26, 1983, must have post-closure permits, unless they demonstrate closure by removal or decontamination as provided under R315-3-1.1(e)(5) and (6), or obtain an enforceable document in lieu of a post-closure permit, as provided under R315-3-1.1(e)(7). If a post-closure permit is required, the permit must address applicable R315-8 groundwater monitoring, unsaturated zone monitoring, corrective action, and post-closure care requirements of R315. The denial of a permit for the active life of a hazardous waste management facility or unit does not affect the requirement to obtain a post-closure permit under R315-3-1.1 [R313-3-1.1(e)].

Utah requires the same 30-year post-closure care period for hazardous waste disposal facilities [R315-3-1.1(e) that refers to R315-302-3(5)] as EPA [40 CFR 264.117 that is incorporated by reference into R315-8-7] but Utah explicitly requires monitoring of gases, water, and land during the period. Utah is more explicit than EPA in defining a stable site, for purposes of terminating post-closure care, as one with little or no settlement, gas production, or leachate generation. Also, the monitoring period may be as long as the Executive Secretary deems necessary.

Utah's guidelines for closure and post-closure cost estimates follow EPA's requirements by incorporating them by reference (R315-8-8; 40CFR264.142; 40CFR264.143). The cost basis is also to include costs of obtaining, moving, and placing the cover material, final grading, moving and placing topsoil, fertilizing, seeding, and mulching, and removing any stored items, materials, buildings, equipment, or unnecessary items and materials [R315-3-1.1(e) that refers to R315-302-3(3)(a)].

Utah's insurance requirements are identical to those of EPA by incorporating the EPA requirements in 40 CFR 264.145 by reference in R315-8-8. Utah also requires that proof of insurance coverage be provided to the state [R315-3-2.5(b)(17) and R315-3-2.5(b)(18)]. Utah's notification requirements are made identical to those of EPA by incorporating the EPA requirements in 40 CFR 264.148 by reference in R315-8-8.

State of California

California financial assurance regulations are contained in Title 22 (Social Security) of the California Code of Regulations, Division 4.5, Chapter 14, Article 6. The CA regulations are

September 2006

numbered identically to EPA regulations, with the prefix §66 (§66264.101 corresponds to 40 CFR 264.101). The California regulatory requirements correspond to those of EPA regulations in 40 CFR 264.101, 40 CFR 264.117, 40 CFR 264.142, 40 CFR 264.143, 40 CFR 264.144, 40 CFR 264.145, 40 CFR 264.147, and 40 CFR 264.148.

California indicated to the EPA OIG that 30 years is not enough time for the post-closure care period for hazardous waste facilities. However, California had not extended its post-closure care requirement beyond the 30-year length for any of its hazardous waste landfills as of the 2001 EPA OIG survey.

State of Nevada

Nevada hazardous waste and associated financial assurance regulations are identical to those of EPA because they incorporate the EPA hazardous waste land disposal regulations (40 CFR 264.101, 40 CFR 264.117, 40 CFR 264.142, 40 CFR 264.143, 40 CFR 264.144, 40 CFR 264.145, 40 CFR 264.147, and 40 CFR 264.148) by reference. Nevada Administrative Code (NAC) Chapter 444.8632(1) incorporates 40 CFR Parts 260 to 270, inclusive, except as modified by NAC 444.86325, 444.8633, and 444.8634.

NAC 444.86325(2)(h) modifies 40 CFR parts 264.143(g), 264.143(h), 264.145(g), and 264.145(h) to delete the sentence: “If the facilities covered by the mechanism are in more than one Region, identical evidence of financial assurance must be submitted to and maintained with the Regional Administrators of all such Regions.” NAC 444.8633 modifies references in 40 CFR to refer to state-specific rules and organization.

NAC 444.8634 defines other meanings to certain terms referred to in 40 CFR, including references for payment and deposit of certain fees.

State of Oklahoma

Oklahoma hazardous waste and associated financial assurance regulations are identical to those of EPA because they incorporate the EPA hazardous waste land disposal regulations (40 CFR 264.101, 40 CFR 264.117, 40 CFR 264.142, 40 CFR 264.143, 40 CFR 264.144, 40 CFR 264.145, 40 CFR 264.147, and 40 CFR 264.148) by reference. Oklahoma Administrative Code (OAC) Title 252, Chapter 205-3-2(f) incorporates all of the above-listed parts of 40 CFR Part 264.

State of Ohio

Ohio financial assurance regulations are contained in Ohio Administrative Code Chapters 3745-54 and 3745-55. The Ohio regulations are similar to EPA regulations, with the prefix OAC 3745-55-nn (e.g., nn is 17 in OAC-3745-55-17 that corresponds to 40 CFR 264.117). The Ohio regulations generally correspond to EPA regulations in 40 CFR 264.117, 40 CFR 264.142, 40 CFR 264.143, 40 CFR 264.144, 40 CFR 264.145, 40 CFR 264.147, and 40 CFR 264.148.

One significant difference occurs in financial assurance for corrective action. While OAC-3745-54-100 and OAC-3745-54-101 prescribe the requirements for corrective action, they do not require that financial assurance for corrective action be set aside beforehand in trusts or other accounts.

September 2006

Ohio indicated to the EPA OIG that it had not yet evaluated the adequacy of the 30-year period that it presently requires for post-closure care. Ohio had only extended its post-closure care requirement beyond the 30-year length for one hazardous waste landfill as of the 2001 EPA OIG survey.

State of Texas

Texas financial assurance regulations for commercial hazardous waste landfills are contained in Title 30, Texas Administrative Code, Chapters 37 and 335. The Texas regulations generally correspond to EPA regulations in 40 CFR 264.101, 40 CFR 264.117, 40 CFR 264.142, 40 CFR 264.143, 40 CFR 264.144, 40 CFR 264.145, and 40 CFR 264.147. One significant difference is in the basis for the closure cost estimate, where Texas requires, in 30 TAC §335.178, that the closure cost estimate include removing, shipping, and handling all site wastes and costs for off-site disposal.

Texas indicated to the EPA OIG that they had not yet evaluated the adequacy of the 30-year period that is presently required for post-closure care. However, Texas had not extended its post-closure care requirement beyond the 30-year length for any of its hazardous waste landfills as of the 2001 EPA OIG survey.

State of South Carolina

South Carolina financial assurance regulations for commercial hazardous waste landfills are contained in the South Carolina Code of Regulations (SCCR), Section 28-61-79. The South Carolina regulations generally correspond to EPA regulations in 40 CFR 264.101, 40 CFR 264.117, 40 CFR 264.142, 40 CFR 264.143, 40 CFR 264.144, 40 CFR 264.145, and 40 CFR 264.147. They explicitly call for financial assurance for corrective action [SCCR 28-61-79.264.101(b)], and allow for the closure cost estimate to include on-site disposal, as in the EPA regulation [SCCR 28-61-79.264.142].

Comparison of Utah Requirements with other State and EPA Requirements

Utah's requirement for financial assurance for corrective actions is equivalent to EPA's, which requires the financial assurance commitment to be contained in the operating permit with the closure financial assurance commitment. However, Utah adds qualifiers that the financial assurance for corrective action is only required in cases of known releases, and that it is not required for facilities operated by the federal or state (Utah) government. California, Nevada, Oklahoma, Texas, and South Carolina have similar requirements for corrective-action financial assurance to those of EPA. However, Ohio does not include financial assurance for corrective actions in their rules for corrective actions.

The 30-year post-closure period specified by EPA is adopted by all of the six other states reviewed here for maintenance, monitoring, and reporting. The states are virtually identical to the EPA rule, except in specifying the appropriate state administrator or department instead of the EPA administrator for either shortening or extending the 30-year post-closure period depending on site conditions. Utah's rule for the post-closure care period is more specific than the others in specifying criteria for altering the length of the post-closure period. The criteria require stability in landfill settlement, gas production and leachate generation.

September 2006

The cost estimates for closure in Utah and the other six states correspond to EPA's basis: that the closure be done by a third party, that it is based on the worst-case time or condition for the site, and that the cost estimates be updated annually for inflation, changing site conditions, and changed operating and closure plans. Texas departs from the EPA and other state positions in requiring off-site disposal of all site wastes. Utah specifies more detail than most other states in requiring that the closure estimate include costs of cover material, grading, and topsoil stabilization.

The financial assurance mechanisms allowed by all seven states for site closure and for post-closure care are the same as those allowed by EPA. Similarly, the cost estimates for post-closure care, the liability insurance coverage, and the financial incapacity requirements of all seven states are also the same as those required by EPA.

2.25 DO ANY STATES HAVE FINANCIAL ASSURANCE FOR COSTS AND OTHER BURDENS THAT MIGHT DEVELOP OR EVOLVE AFTER THE PERMIT IS TERMINATED?

Although not the result of an exhaustive search in this evaluation, the UDSHW has identified the following states that have protected themselves against financial and other burdens that might be realized following permit termination for any hazardous waste management facility:

State of Ohio

Envirosafe Services of Ohio operates a facility in Oregon, OH. The facility began operations in 1954 as a family-owned and -operated municipal and industrial solid waste landfill. The land area of the facility is 133 acres.

In 1988, the facility received a Federal RCRA permit, followed by issuance of a State permit in 1991. To comply with the financial assurance requirements, Envirosafe has established a trust fund for the closure and post-closure costs for the facility. In addition to the closure and post closure funding, the 1991 permit issued by the State of Ohio required Envirosafe to establish a perpetual care fund. This fund was designed to ensure funding for corrective measures for as long as waste remains on site. The ESIO trust fund combines all these and was fully funded to specified levels by 1995. The current estimated value of this trust fund is about \$56 million dollars.

State of New York

The owner of several hazardous waste landfills in western New York has voluntarily committed to a financial mechanism that effectively ensures the landfills will be protected against costs that might be incurred following permit termination. The CWM Model City hazardous waste management facility is located on the boundary between the towns of Lewiston and Porter in Niagara County. The facility uses fully permitted, state-of-the-art technologies to store, treat and dispose of a variety of liquid, solid and semisolid organic and inorganic hazardous waste and industrial non-hazardous waste.

The New York State Department of Environmental Conservation (DEC) has modified the operating permit of CWM Chemical Services, Inc. L.L.C. to incorporate an agreement that

September 2006

ensures that their Model City facility will always receive adequate long-term care without relying on state funds.

The possible presence of radioactive contaminants at this site may have had some influence in the decision to provide this additional financial protection. That is, it is unclear whether such financial protections would have been provided, were that waste constituents limited strictly to hazardous constituents.

The agreement provides perpetual monitoring and maintenance of all landfills at the site and perpetual operation and maintenance of the remedial systems that address releases from past waste management practices. The company also agreed to a financial mechanism that provides funds for perpetual stewardship of the site even if CWM were no longer financially viable.

Under current regulations, 30 years of care beyond facility closure is the standard financial requirement. By accepting responsibility for the long-term management of the Model City facility, CWM has accepted a higher standard for stewardship that generally expected within the hazardous waste land disposal industry.

As early as 1989, DEC took steps to ensure long-term management of wastes disposed at the site by including provisions for perpetual care of any new landfill developed at the site. The recent agreement expands that concept by including perpetual care for the closed landfills and for the remedial systems which have already been installed.

State of Kansas

Title 8 of the Kansas Administrative Regulations, Article 31 (Kansas Hazardous Waste Management Standards and Regulations) provides that each active hazardous waste land disposal facility must pay a monthly perpetual care trust fund fee, based on the number of pounds of hazardous waste disposed of at the facility.

The perpetual care trust fund fee is \$0.005 per pound of hazardous waste disposed in landfills, \$0.00000455 per for pound of hazardous waste disposed by deep well injection, and \$0.001 per for pound of hazardous waste disposed by other methods.

State of Mississippi

Although it appears that its provisions were repealed after December 31, 1996, the Mississippi Code of 1972 as amended (revised through the 2003 legislature), Section 17-17-53(4)(a) provided that thirty-five percent (35 percent) of all monies received by the State Tax Commission under provisions of the named section would be appropriated to and utilized by the Department of Environmental Quality for the perpetual care and maintenance account of commercial facilities that manage hazardous or nonhazardous solid waste.

The amount paid by the Permittee to the State Tax Commission was determined as follows:

- ü Ten Dollars (\$10.00) per ton for hazardous waste generated and disposed of in the state by landfilling or any other means of land disposal and for hazardous waste generated and stored for one year or more in the state;

September 2006

- ü Two Dollars (\$2.00) per ton for hazardous waste generated and treated in the state and for hazardous waste generated and stored for less than one year in the state; and
- ü One Dollar (\$1.00) per ton for hazardous waste generated and recovered in the state.

2.26 WHAT LEGAL OR REGULATORY REVISIONS SHOULD BE MADE TO PROVIDE FOR THE COSTS ASSOCIATED WITH PERPETUAL CARE?

The Utah Solid and Hazardous Waste Control Board (USHWCB) has identified the following areas in which improvements might be made to address the issue of perpetual care at closed commercial hazardous waste disposal facilities:

- ü The USHWCB recommends that a perpetual care fund be created and funded to provide for ongoing monitoring and maintenance of commercial hazardous waste land disposal facilities after termination of the post-closure permit.
- ü The USHWCB recommends that the creation of any such fund should take into account the financial impact on current facilities.
- ü The USHWCB recommends that additional funds not be required at this time to cover potential catastrophic failure of the landfill cells, ground water corrective action or major maintenance at commercial hazardous waste land disposal facilities. This determination is based on the engineering controls employed to build the landfill cells to current regulatory standards. All phases of landfill construction are reviewed, monitored, and approved by the state. The design and construction of landfill cells ensure containment of wastes as a means to prevent additional superfund sites. Other factors include the remote location of current facilities, the lack of a nearby population center, the location of the facilities in the Tooele County Hazardous Waste Corridor, which prevents residential development in the area, the non-potable groundwater, the lack of precipitation, and the restricted access to the facilities. (More details are provided in Section 2 under the heading “Should funds be required for costs that might be incurred for major events following post-closure permit termination?”)

September 2006

3. LOW-LEVEL RADIOACTIVE WASTE TREATMENT AND DISPOSAL FACILITIES

The commercial management of LLRW in the State of Utah is regulated under provisions of the Utah Radiation Control Rules (Utah Administrative Code, Section R313). Individual commercial LLRW management facilities must submit applications for a license to construct and operate such a facility.

The UDRC reviews the license application and ensures that all technical and regulatory issues are resolved in accordance with regulatory requirements and guidance. The purpose of UDRC's review is to develop reasonable assurance that applicable regulatory requirements will be satisfied during all phases of facility life, including construction, operation, closure, and institutional control (100 years after facility closure). Given that applicable regulations are satisfied, confidence exists that the public health and the environment will be properly protected.

Once all regulatory issues are resolved to ensure compliance with regulatory provisions, UDRC prepares a draft license, notifies the public of its intention to issue a license, receives and responds to public comment, and finally issues the license. The license contains requirements beyond those contained in regulations to ensure that commitments the applicant made during the application review process and assumed design conditions are achieved in practice.

UDRC maintains regulatory surveillance during all phases of facility life to ensure compliance with regulatory requirements and all license conditions. UDRC regularly conducts compliance inspections of all aspects of facility operations covered by regulations and license conditions. Departures from required conditions and performance are addressed through a range of enforcement actions to ensure safe operation and that the environment is properly protected.

Regulatory requirements provide assurance that funds will be available to meet the costs of operating, decommissioning, maintaining, or monitoring the facility. The Owner/Licensee is required to provide financial assurances to protect against the possibility that it may not be able or willing to meet all such potential costs.

Utah rules required that the licensee must provide legally enforceable financial assurances (sureties) to cover all costs associated with facility closure and institutional control. These financial assurances are intended to cover anticipated costs through the facility operating life and nominally for the 100 years that following closure. These funds are available to the Executive Secretary under stated conditions and ensure that the State will not fund closure, maintenance, and institutional control costs from public sources. In addition to financial assurances provided by the licensees, the State of Utah has established a Radioactive Waste Perpetual Care and Maintenance Fund (referred to in this report as the "Perpetual Care Fund") whose purpose is to provide for the care of closed disposal facilities following the institutional control period and to protect against the possibility of shortfall during the institutional control period.

Contributions to the Perpetual Care Fund are made annually by each licensee in the amount of \$400,000 per year of active facility operation. The fund, including contributions and earnings, totals about \$1.7 million as of April 30, 2006.

September 2006

In this assessment, only those facilities currently licensed to manage LLRW are considered. No consideration is given to the possibility that existing facilities might be expanded to provide additional services and additional disposal capacity.

In this section, the following are addressed:

- ü Facilities licensed by the State of Utah to treat and/or dispose of LLRW are identified and generally described.
- ü Facilities required to maintain financial assurances are identified and the nature of assurances they provide are briefly described.
- ü Representative closure and institutional control activities are described.
- ü Closure and institutional control financial assurances provided as required are identified and described.
- ü Ways in which closed commercial LLRW management facilities might fail are identified and the orders of magnitude of their costs, their probabilities, and their financial risks bracketed.
- ü Changes to current legal and regulatory requirements recommended.

Answers to several questions are relevant and instructive. These questions and their answers follow.

3.1 WHAT FACILITIES HAS THE STATE OF UTAH LICENSED TO TREAT AND/OR DISPOSE OF LLRW?

The owner of any facility that will manage (that is, treat or dispose of) LLRW must ensure that funds are available to cover the costs associated with closing or maintaining the facility following closure of that facility. These facility owners provide legally enforceable financial assurances required under LLRW management regulations. Financial assurances must be sufficient to cover all cost associated with facility closure and institutional control.

The facilities licensed for LLRW management in the State of Utah involve hazards that will persist after successful closure and stabilization. Such hazards are associated with LLRW that remain at the facility following closure and stabilization (because they are disposed of at and not removed from the site). Accordingly, these facilities, as shown in Table 3-1, provide financial assurances to cover not only closure and stabilization costs, but also costs expected during institutional control.

September 2006

Table 3-1. Commercial radioactive waste management facilities licensed in the Utah		
Facility¹⁴	Licensed to:	Provides financial assurances for:
EnergySolutions; LLRW Facility	Dispose	Closure and Institutional Control
EnergySolutions; 11e.(2) Facility	Dispose	Closure ¹⁵
EnergySolutions Mixed Waste Facility	Treat ¹⁶ , Store, and Dispose	Closure and Institutional Control

3.2 WHAT IS THE “LIFE CYCLE” OF A COMMERCIAL LLRW MANAGEMENT FACILITY?

The life cycle of a LLRW facility consists of the phases or periods shown generally in Table 3-2.

Table 3-2. General phases of commercial LLRW facility		
Phase or Period	Typical Duration (years)	Applicability
Licensing and Initial Development	2 to 5 years	Treatment, Storage, and Disposal Facilities
Operating	15 to 40 years	Treatment, Storage, and Disposal Facilities
Closure and Stabilization	1 to 5 years	Treatment, Storage, and Disposal Facilities
Institutional Control	Up to 100 years	Disposal Facilities
Following Institutional Control	Unlimited	Disposal Facilities

3.3 WHAT IS FACILITY “CLOSURE AND STABILIZATION”?

When the decision is made that the facility will no longer actively operate, it must go through a formal procedure to decontaminate, dismantle, close, decommission, and stabilize the facility and any components that remain. The purpose of facility closure and stabilization is to eliminate the need for ongoing active maintenance to the extent practicable so that only minor custodial care, surveillance, and monitoring are required following closure and stabilization.

¹⁴ All three facilities are located at South Clive, Utah.

¹⁵ Under provisions of the Nuclear Waste Policy Act of 1982, the US Department of Energy must by law provide long-term care of 11e.(2) facilities that have been closed and stabilized in compliance with US Nuclear Regulatory commission requirements. An additional condition of accepting such facilities is that funds sufficient to cover all long-term care costs must be transferred to the US DOE. Two facilities might be transferred to DOE’s care under these provisions: the Vitro embankment and EnergySolution’s 11e.(2) embankments at South Clive, Utah.

¹⁶ Licensed in connection with Utah Hazardous Waste Permit UTD991301748.

September 2006

If all such hazards cannot be eliminated, then financial assurances for institutional control will be required to cover costs associated with the residual hazards (that is, to cover costs of institutional control).

Facility closure and stabilization activities include:

- ü Decontaminating support structures and operating equipment.
- ü Dismantling and disposing of support structures, support systems, and equipment as required and appropriate.
- ü Disposing of any waste received but not yet disposed of at the time closure commences.
- ü Continuing the operational environmental monitoring program.
- ü Closing and stabilizing all disposal units, once all waste has been disposed of.

Facility closure and stabilization activities do not include such activities as:

- ü Conducting environmental corrective actions.
- ü Providing major repair or replacement of facility components.

3.4 WHO PERFORMS A FACILITY CLOSURE AND STABILIZATION?

Under expected conditions, the Owner/Licensee will conduct facility closure and stabilization at its own expense. Closure activities must be pursued until the UDRC determines that the facility has been successfully closed and that all hazards have been eliminated (or appropriately addressed where residual hazards remain). In this case, the terms and conditions for exercising the financial assurances would not be fulfilled and no funds would be disbursed from the financial assurance for closure.

Under unusual conditions, the Owner/Licensee may be unable or unwilling to conduct the closure. Under these conditions, and in accordance with applicable terms of the mechanism used to provide the required financial assurances, the State may conduct the closure using an independent third-party contractor. To cover the costs of such closure under these circumstances, the State would exercise the financial assurances provided for closure. Thus, the State is protected from the financial liabilities that might otherwise be associated with facility closure.

3.5 WHAT IS “INSTITUTIONAL CONTROL”?

Following facility closure, the responsibilities for controlling the site and for monitoring and maintaining the facility lie with the landowner or a custodial entity. This period of time is referred to as the institutional control period. The duration of the institutional control period will be determined by the Executive Secretary, but institutional controls may not be relied upon for more than 100 years following facility closure under provisions of Utah rules. The criteria for terminating the Institutional control period are not defined or stated in Utah statute or rule.

September 2006

The landowner or custodial entity will conduct an institutional control program, including activities such as:

- ü Controlling physical access to the closed facility
- ü Conducting an environmental monitoring program at the disposal site
- ü Performing periodic surveillance
- ü Providing minor custodial care
- ü Maintaining records
- ü Reporting periodically to the Regulatory Agency
- ü Carrying out other equivalent activities as determined by the Executive Secretary
- ü Administering funds to cover the costs for these activities

Custodial care, as used above, includes such activities as:

- ü Repairing fencing
- ü Repairing or replacing monitoring equipment
- ü Reestablishing or controlling vegetation on stabilized disposal unit areas
- ü Performing minor repair of disposal unit covers
- ü Providing general disposal site upkeep

Active maintenance is also allowed during the institutional control period and may include:

- ü Pumping and treating water from a disposal unit
- ü Replacing a disposal unit cover
- ü Taking other episodic or continuous measures

Institutional control activities do not include such activities as environmental restoration activities or corrective actions made necessary because of the failure of design features and components. Pumping and treating water found contaminated with radioactive constituents released from the closed and stabilized disposal site is an example of such remedial activities and corrective actions. Such remedial activities or corrective actions could be paid by appropriation of the Perpetual Care Funds, upon passage by the Legislature and signing into law by the governor (refer to Questions 3.11 through 3.13).

Termination of the Institutional Control period before the Perpetual Care Funds grows to a future value of \$40 to \$60 million (in 2006 dollars) might jeopardize the adequacy of the Institutional Control financial assurances under assumptions of this evaluation. Specifically, the monies in the Perpetual Care Fund are assumed be invested and to grow at rates that exceed the rate at which costs escalate by 2 percent per year. Under these conditions, the real value of Perpetual Care Fund grows faster than the costs of the potential demands grow. By the time the value of the Perpetual Care Fund has grown to \$35 to \$60 million, it is judged to have sufficient capacity to cover the estimated costs of unplanned or unexpected events for which other financial assurances are not available (refer to Questions 3-14, 3-19, and 3-23).

September 2006

3.6 WHO PROVIDES INSTITUTIONAL CONTROL AND WHO PAYS FOR IT?

Under expected conditions, the landowner or a custodial entity will provide care and maintenance of the closed facility during the institutional control period. In the case of the EnergySolutions facility at Clive, Utah, the facility Licensee (EnergySolutions) is the landowner. No custodial entity has been identified at this time and the state has not defined to process by which the custodial agency would be identified.

The costs of institutional control activities will be funded by financial assurances that the Licensee has provided for this purpose. The adequacy of these financial assurances are revised and submitted to the Division annually. Annually, the Division reviews and approves the proposed financial assurances once the proposed provisions are determined to satisfy applicable requirements.

3.7 WHO IS RESPONSIBLE FOR OVERSEEING THE CLOSED FACILITY AT THE END OF 100 YEARS OF INSTITUTIONAL CONTROL?

Under the current regulatory structure and license conditions for the currently licensed facilities, the responsibility for monitoring and maintenance continues with the licensee upon successful closure of the facility for the (100-year) institutional control period. Of course, laws and regulatory requirements might evolve over such a long period of time, not to mention the possibility that the licensee might cease to exist at any time.

The Hazardous Waste Task Force of the Utah Legislature evaluated responsibility for the facility following closure and other issues during the interims of 2003 and 2004. State and federal regulations require transfer of a LLRW disposal site to either a state or federal government entity. In the case of Envirocare (now Energy Solutions), the URCSB granted an exemption from the provisions of this rule based on meeting alternate criteria including placement of deed restrictions on the property.

During discussions of this issue, it was pointed out that it is unlikely that a licensee such as Energy Solutions would want to continue maintaining and monitoring a closed facility. It is reasonable to assume that at a future point, either the federal government or perhaps the state would assume responsibility for the site. As pointed out in this report and discussed in the task force, the federal government already has responsibility under the Uranium Mill Tailings Radiation Control Act to assume care of two facilities “forever” on the existing Energy Solution site. These facilities are the 100-acre Vitro Tailings pile that has already been transferred to the Department of Energy (DOE) for perpetual care and the operating uranium mill tailings disposal unit that will eventually be transferred to DOE as well. Federal statute allows the Department of Energy to become the custodian of a LLRW disposal site. DOE indicates that a process by rule does not now exist to allow such a site transfer to move forward. One scenario that was discussed was since DOE has the perpetual care responsibility for two significant waste management units at the Energy Solutions facility that DOE could be encouraged to use their federal ability to take over the “entire” site by the State providing the incentive through monies available at the time in the Radioactive Waste Perpetual Care Fund (estimated to be as high as \$93 million).

September 2006

The other option would be for the State of Utah to assume the responsibility for care of the site following the institutional control period. During the discussions of the task force, a motion was made at the September 14, 2004 meeting to defer any recommendation on site ownership legislation. Since there were many issues under consideration at the time, the site ownership issue was not viewed as a priority for legislation.

In order for either of these scenarios to be realized, a new statutory provision would have to be passed and signed into law. If the Legislature were to decide that the State would assume site ownership, the statute could address the following issues:

- ü The state may assume ownership of a closed LLRW disposal facility for purposes of providing perpetual care at the end of 100 years after the date of the final closure of the facility unless the federal government has already taken ownership of the facility. The Legislature may appropriate monies from the Radioactive Waste Perpetual Care and Maintenance Fund for the state to assume perpetual care responsibilities.
- ü The state may assume ownership of the facility for purposes of other than providing perpetual care. In this case, the Radioactive Waste Perpetual Care and Maintenance Fund may be appropriated by the Legislature to cover costs incurred by the state for closure or institutional control of the facility above any monies obtained by the Executive Secretary as a result of actions relating to required financial assurance by rule.
- ü If the US DOE or another federal agency were willing to take ownership of the facility, the funds in the Radioactive Waste Perpetual Care and Maintenance fund established under Section 19-3-106.2 might be used to support relevant functions of the agency taking ownership of the facility

3.8 WHAT FORMS OF FINANCIAL ASSURANCES FOR CLOSURE AND INSTITUTIONAL CONTROL (FINANCIAL ASSURANCE MECHANISMS OR FINANCIAL SURETIES) ARE ALLOWED BY THE RULES?

An owner or operator may provide financial or surety arrangements that are generally acceptable to the URCB Executive Secretary, including:

- ü Surety bonds
- ü Cash deposits
- ü Certificates of deposit
- ü Deposits of government securities
- ü Escrow accounts
- ü Irrevocable letters or lines of credit
- ü Trust funds
- ü Combinations of the above or other types of arrangements, including commercial insurance, as may be approved by the URCB Executive Secretary.

September 2006

Self-insurance, or an arrangement which essentially constitutes self-insurance, does not satisfy the surety requirement for private sector applicants under Utah rules.

The financial or surety arrangement must be written for a specified period of time. The surety arrangement must be automatically renewed unless the person who issues the surety notifies the URCB Executive Secretary; the beneficiary, the site owner; and the principal, the Licensee, not less than 90 days prior to the renewal date of its intention not to renew. In such a situation, the Licensee must submit a replacement surety within 30 days after notification of cancellation. If the Licensee fails to provide a replacement surety acceptable to the Executive Secretary, the beneficiary may collect on the original surety.

Proof of forfeiture is not necessary to collect the surety. Thus, in the event that the Licensee is unable to provide an acceptable replacement surety within the required time, the beneficiary may automatically collect the surety before it expires. The conditions described above must be clearly stated on surety instruments.

3.9 WHAT ARE THE ESTIMATED COSTS TO CLOSE A FACILITY AND PROVIDE INSTITUTIONAL CONTROL?

The costs estimated for the closure and institutional control of commercial LLRW management facilities licensed by the State of Utah are presented in Table 3-3. These estimated costs are the most recent costs revised and updated by Owners/Licensees and reviewed by UDRC. Following UDRC's independent review to ensure that applicable requirements were satisfied, the Executive Secretary accepted them as an adequate basis for determining required financial assurances. Such costs are revised and independently reviewed by Division Staff annually and revisions made until applicable requirements are satisfied. Estimates of these costs were not further independently reviewed in the preparation of this report.

Table 3-3. Summary of estimated facility closure and institutional control costs for commercial radioactive waste management facilities licensed by the State of Utah		
Facility	Estimated Facility Closure Cost	Estimated Institutional Control Cost
EnergySolutions; LLRW Facility	~\$28.0 million	~\$5.1 million ¹⁷
EnergySolutions Mixed Waste Facility	\$13.6 million	\$2.7 million
EnergySolutions; 11e.(2) Facility	\$4.5 million	US DOE Long-Term Stewardship Program ¹⁸

¹⁷ Closure and Institutional Control Financial Assurances total \$33,119,957 as of December 31, 2005.

¹⁸ Under provisions of the Nuclear Waste Policy Act of 1982, the US Department of Energy must by law provide long-term care of 11e.(2) facilities that have been closed and stabilized in compliance with US Nuclear Regulatory commission requirements. An additional condition of accepting such facilities is that funds sufficient to cover all long-term care costs must be transferred to the US DOE. Two facilities might be transferred to DOE's care under these provisions: the Vitro embankment and EnergySolution's 11e.(2) embankments at South Clive, Utah.

September 2006

These cost estimates must account for all activities and costs that will be required to close the facility and to care for it during the post-closure care period. The costs estimates must also be based on the assumption that an independent contractor performs the required work.

The approach to estimating closure and institutional costs involves the following steps:

- ü Identify all necessary activities
- ü Estimate all required levels of effort, equipment, materials, supplies, and subcontractor support
- ü Determine unit costs for each cost item (labor, equipment, materials, and supplies)
- ü Calculate individual costs and aggregate
- ü Determine suitable contingency allowances
- ü Submit for Division Staff review and revised to address their concerns
- ü Receive formal approval

Estimated costs and their updates must account for such factors as:

- ü Specifics of plans to close and provide institutional control.
- ü Current site-specific conditions (such as geotechnical and hydraulic characteristics of soils, meteorological conditions, and characteristics of waste managed at the facility) available at or near the facility.
- ü Recent developments in technologies that could improve the conduct of any activity required during closure or institutional control.
- ü Changes in unit costs of items or activities required to close or provide institutional control (such as the price of fuel, reduced availability of materials, and changes in qualified labor supply).

Closure and stabilization costs must be estimated making allowances for applicable requirements:

- ü The Owner/Licensee must close the facility so that the need for ongoing active maintenance is eliminated to the extent practicable and so that only minor custodial care, surveillance, and monitoring are required following closure.
- ü The cost estimate must assume that an independent third party will be hired to perform all closure and stabilization work.

September 2006

3.10 WHAT FINANCIAL ASSURANCES ARE CURRENTLY BEING PROVIDED FOR CLOSURE AND INSTITUTIONAL CONTROL?

As of 2005, closure financial assurances listed in Table 3-4 for the costs of closing licensed commercial LLRW management facilities and maintaining institutional control.

Table 3-4. Financial assurances presently provided by Owners/Licensees in Utah				
Facility	Closure Financial Assurance Mechanism	Closure Financial Assurance Provided	Institutional Control Financial Assurance Mechanism	Institutional Control Financial Assurance Provided
EnergySolutions; LLRW Facility	Insurance	~\$28.0 million	Insurance	~\$5.1 million
EnergySolutions Mixed Waste Facility	Insurance	\$13.6 million	Insurance	\$2.7 million
EnergySolutions; 11e.(2) Facility	Insurance	\$4.5 million	Not Applicable	US DOE Long-Term Stewardship Program ¹⁹

As required by URRC R313-25-31(3), these cost estimates and the resulting financial assurance arrangements are updated, critically reviewed, revised as necessary, and approved each year. Annually revised costs estimates account for changes in prevailing site conditions; the closure plan; institutional control plan; technologies available to accomplish closure and provide institutional control; and the effects of inflation.

3.11 WHAT IS “PERPETUAL CARE AND MAINTENANCE”?

The concept of providing for the perpetual care and maintenance of a facility is well established and accepted where the obligation to care for a facility is expected to persist beyond the lives of the individuals and entities involved in developing and operating the facility. In the context of commercial LLRW management facilities, the costs of providing perpetual care and maintenance at a closed commercial LLRW management facility are paid through legislative appropriations from the Perpetual Care Fund.

In general terms, perpetual care and maintenance would typically include activities that might be necessary following cessation of institutional control activities, such as:

¹⁹ Under provisions of the Nuclear Waste Policy Act of 1982, the US Department of Energy must by law provide long-term care of 11e.(2) facilities that have been closed and stabilized in compliance with US Nuclear Regulatory commission requirements. An additional condition of accepting such facilities is that funds sufficient to cover all long-term care costs must be transferred to the US DOE. Two facilities might be transferred to DOE’s care under these provisions: the Vitro embankment and EnergySolution’s 11e.(2) embankments at South Clive, Utah.

September 2006

- ü Maintaining appropriate levels of site security.
- ü Providing repairs to components whose failure has compromised or could compromise the stability and safety of the closed facility.
- ü Performing routine maintenance of site and support structures and systems (such as landscaping, painting, maintaining fences, and repairing minor damage to cover systems).
- ü Complying with applicable regulatory or legal requirements.
- ü Managing perpetual care and maintenance activities.
- ü Administering any perpetual care and maintenance fund, were they available.

3.12 WHAT IS THE RADIOACTIVE WASTE PERPETUAL CARE AND MAINTENANCE FUND?

The Radioactive Waste Perpetual Care and Maintenance Fund (Perpetual Care Fund) was created by the Utah Legislature and is stated in UCA 19-3-106.2. Its purpose is to provide funding for the care of closed disposal facilities following the institutional control period and to protect against the possibility of funding shortfall during the institutional control period.

The sources of revenue for the Perpetual Care Fund include annual fees paid by the owner or operator of any active commercial radioactive waste treatment or disposal facility and investment earning produced by the fund. The fee paid by each owner or operator is \$400,000 per year. Monies in the fund are invested by the Utah Treasurer. The current balance of the Perpetual Care Fund is about \$1.7 million, with current investment earnings of about \$75,000 per year.

Only the Legislature may authorize use of monies in the Perpetual Care Fund by appropriating funds for the stated purposes. The purposes and authorized uses of these funds under current law include the following.

- ü Perpetual care and maintenance of a commercial radioactive waste treatment or disposal facility, excluding sites within the facility used for the disposal of byproduct material, beginning 100 years after the date of final closure of the facility (after the institutional control period).
- ü Maintenance, monitoring, or implementing corrective action at a commercial radioactive waste treatment or disposal facility, excluding sites within the facility used for the disposal of byproduct material, within the 100 years immediately following the date of final facility closure, provided that:
 - Owner or operator is unwilling or unable to carry out post-closure maintenance, monitoring, or corrective action; and
 - Financial surety arrangements made by the owner or operator, including any required under applicable law, are insufficient to cover the costs of post-closure maintenance, monitoring, or corrective action.

The Perpetual Care Fund does not explicitly allow funds to be used for corrective action following end of institutional control, although the explicitly stated purpose of providing for the

September 2006

care and maintenance of the facility might be construed to include taking any required corrective actions.

The statute (UCA 19-3-106.2) also provides that the “attorney general shall bring legal action against the owner or operator or take other steps to secure the recovery or reimbursement of the costs of maintenance, monitoring, or corrective action, including legal costs, incurred”

3.13 WHAT WILL BE THE COSTS OF MONITORING AND MAINTAINING THE CLOSED FACILITY FOLLOWING 100 YEARS OF INSTITUTIONAL CONTROL?

Current estimates of the annual costs of monitoring and maintaining the closed EnergySolutions LLRW facilities total between \$80,000 and \$83,000 per year (EnergySolutions 2006). The UDRC has independently reviewed the licensee’s estimates of costs during the Institutional Control period. These estimates adequately reflect the cost of continuing maintenance and monitoring following the end of Institutional Control period. Funds of about \$4.2 million invested at 2 percent per year real interest rate²⁰ will generate sufficient interest earning to cover these costs.

3.14 WHAT WILL BE THE VALUE OF THE RADIOACTIVE WASTE PERPETUAL CARE AND MAINTENANCE FUND IN THE FUTURE?

As noted above, the monies deposited into the Perpetual Care Fund are invested according to Utah Treasurer rules. Investments must be made in secure financial instruments that have very small probability of failure or loss. Typically, such investments include US Treasury notes and bonds. Over the past century, these financial instruments have produced interest earnings of about 2 percent per year over and above prevailing inflation rates (RFF 2002, MSDW 1999)). That is, they have a real interest rate of about 2 percent per year. Investments in such financial instruments grow faster than inflation by about 2 percent per year.

Given the current value of the annual deposits to and earnings of the Perpetual Care Fund, Table 3-5 presents projected future values of the fund. Knowing the number of years in the future when the facility closes and the time when the fund might be required, the value at the time of need can be determined. For example, if the facility terminates operations and is properly closed 20 years from now (shaded below) and the fund is required 100 years after facility closure (shaded below), its value is projected to be \$93 million (shaded below), as shown in Table 3-5, assuming no monies are previously withdrawn from the fund.

In general, the value of the fund grows faster than costs inflate. As a general rule, the future value of the Perpetual Care Fund grows:

- ü When the facility continues to operate so that deposits continue to be made into the fund
- ü When the need for the fund is delayed

²⁰ Real interest rate is the difference of the nominal (or current market) interest rate and the current inflation rate.

September 2006

ü If annual deposits to the fund increase

If the Perpetual Care Fund balance were \$93 million and invested at 2 percent real interest rate, it would produce interest earnings of nearly \$1.9 million per year without diminishing the balance itself. Under these conditions, annual care costs could total as much as about \$1.9 million per year without diminishing the potential of the Perpetual Care Fund to cover annual care costs of a closed LLRW disposal facility.

Table 3-5. Projected future values of Radioactive Waste Perpetual Care and Maintenance Fund					
	Time of Facility Closure (years from today)				
	0 yr	5 yr	10 yr	15 yr	20 yr
Collections Through Closure (\$ million)	\$1.7	\$3.7	\$5.7	\$7.7	\$9.7
Future Value (\$ million)	\$1.7	\$4.4	\$7.0	\$9.8	\$12.9
Time of Need (years after Closure)	Value at Time of Need (\$ million)				
10 years	\$2	\$5	\$8	\$12	\$16
20 years	\$3	\$7	\$10	\$15	\$19
50 years	\$5	\$12	\$19	\$26	\$35
100 years	\$12	\$32	\$50	\$71	\$93
200 years	\$89	\$232	\$365	\$512	\$675
300 years	\$646	\$1,681	\$2,646	\$3,711	\$4,887
400 years	\$4,683	\$12,182	\$19,169	\$26,884	\$35,402
500 years	\$33,929	\$88,251	\$138,874	\$194,766	\$256,476

September 2006

3.15 WHAT MIGHT BE THE FUTURE VALUE OF THE PERPETUAL CARE FUND IF GREATER ANNUAL FEES WERE IMPOSED?

If larger annual fees were required to be deposited into the Perpetual Care Fund, more monies would be available in the future, as shown in Table 3-6, assuming no monies were previously withdrawn from the fund.

Table 3-6. Dependence of Perpetual Care Fund future value on annual fee	
Annual Fee (\$ per year)	Future Value²¹ (\$ million)
\$400,000	\$93
\$500,000	\$112
\$600,000	\$130
\$700,000	\$149
\$800,000	\$168
\$900,000	\$186
\$1,000,000	\$205

3.16 WHAT WOULD BE THE EFFECT OF FEWER YEARS OF FUTURE OPERATIONS OR NEED FOR FUNDS EARLIER THAN 100 YEARS AFTER FACILITY CLOSURE?

The financial assurances provided by the licensees for institutional control might be insufficient to cover all costs ultimately incurred following facility closure. This would be the case if the facility does not operate for an additional 20 years, as the Licensee currently projects. It could also occur if unplanned and unanticipated events were to occur earlier than the end of the 100 years of the institutional control period. Under either of these conditions, the Perpetual Care Fund might be inadequate to cover all costs. If, for example, the disposal facility were to operate for only another 10 years and the need for funds were to arise by 50 years after facility closure, the value of the Perpetual Care Fund would be only about \$19 million, as shown in Table 3-5.

²¹ After 20 more years of deposits (disposal operations) and 100 years of institutional control at a real interest rate of 2 percent per year.

September 2006

3.17 WHAT MIGHT BE THE CONSEQUENCES OF IMPOSING GREATER ANNUAL FEES FOR THE PERPETUAL CARE FUND?

At least two consequences might result from more aggressively accumulating monies within the Perpetual Care Fund. These consequences are:

- ü Higher fees potentially increase the price of services and decrease the facility's price competitiveness
- ü Greater accumulations without current need might allow funds to be diverted for other purposes

Higher fees that would generate greater deposits to the Perpetual Care Fund will have one of two commercial effects:

- ü Decrease the facility's profit margin because they do not or cannot raise the price of their services
- ü Decrease competitiveness with facilities offering similar service because they have raised the price of their services

Both of these effects encumber the commercial viability of such facilities. Without raising prices, the facility's profitability is reduced and the company's ability to attract capital is diminished.

Increased prices mean the facility is less able to sell its service to those who require them, as long as alternative facilities are available. Within the next few years, only one facility will exist in the US that is licensed to offer LLRW disposal services to all generators throughout the US – EnergySolutions' Clive LLRW disposal facility. Thus, for the disposal of Class A LLRW, EnergySolutions' disposal facility does not currently or in the foreseeable future compete with other facilities offering disposal services. Thus, increasing its prices might not immediately weaken their commercial viability.

However, one other organization has applied for a license to develop a full-service commercial LLRW disposal facility in the State of Texas. Under present state and federal laws, this facility, if licensed, would provide disposal services to generators in only two states (Texas and Vermont). However, reason exists to suspect that this feature of state law might be changed to make disposal services available to generators in other states, thus applying greater commercial pressure to the EnergySolutions facility.

Another down side to accumulating funds in any publicly owned and administered fund is the susceptibility of monies in the fund to be diverted for other purposes. History has proven that publicly owned and administered funds established for one purpose deliver their monies, upon appropriate legislative revision, to fund other purposes.

More to the point, the states of South Carolina and Washington have both transferred monies from funds expressly established to ensure the closure and long-term maintenance of commercial LLRW disposal facilities. These transfers occurred during years when these state governments were encountering significant difficulties balancing their budgets and when additional funds were required. These closure and long-term maintenance funds appeared to provide a relatively painless means of supplementing current tax revenues without increasing the tax rate or base on current taxpayers and voters.

September 2006

Provisions have, in some cases, been made to repay monies borrowed from commercial LLRW disposal facility closure and long-term maintenance funds. Nevertheless, the public act of transferring the assets of these funds for other purposes, may create a funding deficiency, should the need arise before the borrowings are repaid.

3.18 BEYOND FINANCIAL ASSURANCES, WHAT ELSE PROVIDES ASSURANCE THAT LICENSED COMMERCIAL LLRW MANAGEMENT FACILITIES WILL BE PROPERLY CLOSED AND WILL PERFORM AS REQUIRED

The comprehensive system for licensing and regulating commercial LLRW management facilities includes numerous requirements and features that limit the probability that closure and institutional control costs would exceed those covered through financial assurance. These requirements and features are divided among:

- ü Performance objectives
- ü Waste characteristics requirements
- ü Siting requirements
- ü Design requirements
- ü Operating and closure requirements
- ü Environmental monitoring requirements

These requirements and features as summarized below:

Performance Objectives (URCR R313-25-19)

- ü Concentrations of radioactive material that may be released to the general environment in ground water, surface water, air, soil, plants or animals must not result in an annual dose exceeding an equivalent of 25 millirem (mrem) to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ of any member of the public.
- ü No greater than 4 mrem committed effective dose equivalent or total effective dose equivalent to any member of the public may come from groundwater.
- ü Reasonable efforts should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable (ALARA).
- ü Operations at the land disposal facility must be conducted in compliance with the standards for radiation protection set out in URCR R313-15, except for release of radioactivity in effluents from the land disposal facility, which are governed as stated immediately above.
- ü Every reasonable effort should be made to maintain radiation exposures ALARA.

September 2006

- ü Design, operation, and closure of the land disposal facility must ensure protection of any individuals inadvertently intruding into the disposal site and occupying the site or contacting the waste after active institutional controls over the disposal site are removed.
- ü The disposal facility must be sited, designed, used, operated, and closed to achieve long-term stability of the disposal site and to eliminate, to the extent practicable, the need for ongoing active maintenance of the disposal site following closure so that only surveillance, monitoring, or minor custodial care are required.

Waste Characteristics Requirements (URCR R313-15-1008(2)(a))

- ü Wastes must be packaged in conformance with the conditions of the license issued to the site operator to which the waste will be shipped. Where the conditions of the site license are more restrictive than the provisions of URCR R313-15, the site license conditions are controlling.
- ü Wastes must not be packaged for disposal in cardboard or fiberboard boxes.
- ü Liquid waste must be packaged in sufficient absorbent material to absorb twice the volume of the liquid.
- ü Solid waste containing liquid must contain as little free-standing and non-corrosive liquid as is reasonably achievable, but in no case may the liquid exceed one percent of the volume.
- ü Waste must not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water.
- ü Waste must not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste.
- ü Waste must not be pyrophoric. Pyrophoric materials contained in wastes must be treated, prepared, and packaged to be nonflammable.
- ü Wastes in a gaseous form must be packaged at an absolute pressure that does not exceed 1.5 atmospheres at 68 degrees Fahrenheit. Total activity must not exceed 100 curies per container.
- ü Wastes containing hazardous, biological, pathogenic, or infectious material must be treated to reduce to the maximum extent practical the potential hazard from the non-radiological materials.

Siting Requirements (URCR R313-25-23)

- ü The primary emphasis in disposal site suitability is given to isolating wastes and to disposal site features that ensure that the long-term performance objectives are met.
- ü The disposal site must be capable of being characterized, modeled, analyzed, and monitored.
- ü Within the region where the facility is to be located, a disposal site should be selected so that projected population growth and future developments are not likely to affect the ability of the disposal facility to meet the performance objectives of URCR R313-25-19.

September 2006

- ü Areas must be avoided having known natural resources which, if exploited, would result in failure to meet the performance objectives of URCR R313-25-19.
- ü The disposal site must be generally well drained and free of areas of flooding or frequent ponding.
- ü Waste may not be disposed of in a 100-year flood plain, coastal high-hazard area or wetland, as defined in Executive Order 11988, "Floodplain Management Guidelines."
- ü Upstream drainage areas must be minimized to decrease the amount of runoff that could erode or inundate waste disposal units.
- ü The disposal site must provide sufficient depth to the water table that ground water intrusion, perennial or otherwise, into the waste will not occur.
- ü The hydrogeologic unit used for disposal must not discharge ground water to the surface within the disposal site.
- ü Areas must be avoided where tectonic processes such as faulting, folding, seismic activity, vulcanism, or similar phenomena may occur with such frequency and extent to significantly affect the ability of the disposal site to meet the performance objectives of URCR R313-25-19 or may preclude defensible modeling and prediction of long-term impacts.
- ü Areas must be avoided where surface geologic processes such as mass wasting, erosion, slumping, landsliding, or weathering occur with sufficient such frequency and extent to significantly affect the ability of the disposal site to meet the performance objectives of URCR R313-25-19, or may preclude defensible modeling and prediction of long-term impacts.
- ü The disposal site must not be located where nearby facilities or activities could adversely impact the ability of the site to meet the performance objectives of URCR R313-25-19 or significantly mask the environmental monitoring program.

Design Requirements (URCR R313-25-24)

- ü Site design features must be directed toward long-term isolation and avoidance of the need for continuing active maintenance after site closure.
- ü The disposal site design and operation must be compatible with the disposal site closure and stabilization plan and lead to disposal site closure that provides reasonable assurance that the performance objectives of URCR R313-25-19 will be met.
- ü The disposal site must be designed to complement and improve, where appropriate, the ability of the disposal site's natural characteristics to assure that the performance objectives of URCR R313-25-19 will be met.
- ü Covers must be designed to minimize, to the extent practicable, water infiltration, to direct percolating or surface water away from the disposed waste, and to resist degradation by surface geologic processes and biotic activity.

September 2006

- ü Surface features must direct surface water drainage away from disposal units at velocities and gradients that will not result in erosion that will require ongoing active maintenance in the future.
- ü The disposal site must be designed to minimize to the extent practicable the contact of water with waste during storage, the contact of standing water with waste during disposal, and the contact of percolating or standing water with wastes after disposal.

Operating and Closure Requirements (URCR R313-25-25)

- ü Disposal of only Class A LLRW is allowed in the State of Utah.
- ü Wastes must be emplaced in a manner that maintains the package integrity during emplacement, minimizes the void spaces between packages, and allows the void spaces to be filled.
- ü Void spaces between waste packages must be filled with earth or other material to reduce future subsidence within the fill.
- ü Waste must be placed and covered in a manner that limits the radiation dose rate at the surface of the cover to levels that at a minimum will allow the Licensee to comply with all standards against radiation protection at the time the facility is closed and stabilized.
- ü The boundaries and locations of disposal units must be accurately located and mapped by means of a land survey.
- ü Near-surface disposal units must be marked in such a way that the boundaries of the units can be easily defined. Three permanent survey marker control points, referenced to United States Geological Survey or National Geodetic Survey control stations, must be established on the site to facilitate surveys.
- ü Horizontal and vertical controls must be provided by United States Geological Survey or National Geodetic Survey control stations as checked against United States Geological Survey or National Geodetic Survey record files.
- ü A buffer zone of land must be maintained between any buried waste and the disposal site boundary and beneath the disposed waste. The buffer zone must be of adequate dimensions to carry out environmental monitoring activities and take mitigative measures if needed.
- ü Closure and stabilization measures as set forth in the approved site closure plan must be carried out as the disposal units are filled and covered.
- ü Active waste disposal operations must not have an adverse effect on completed closure and stabilization measures.
- ü Only wastes containing or contaminated with radioactive material may be disposed of at the disposal site.

September 2006

Environmental Monitoring Requirements (URCR R313-25-26)

- ü When a license application is first submitted (emphasis added), the applicant must have conducted a preoperational monitoring program to provide basic environmental data on the disposal site characteristics. The applicant must obtain information about the ecology, meteorology, climate, hydrology, geology, geochemistry, and seismology of the disposal site. For those characteristics that are subject to seasonal variation, data must cover at least a 12-month period.
- ü During the land disposal facility site construction and operation, the Licensee must maintain an environmental monitoring program. Measurements and observations must be made and recorded to provide data to:
 - Evaluate the potential health and environmental impacts during both the construction and the operation of the facility
 - Enable the evaluation of long-term effects and need for mitigative measures
 - Provide early warning of releases of waste from the disposal site before they leave the site boundary
- ü After the disposal site is closed, the Licensee responsible for post-operational surveillance of the disposal site must maintain a monitoring system based on the operating history and the closure and stabilization of the disposal site. The post-operational monitoring system must also be capable of providing early warning of releases of waste from the disposal site before they leave the site boundary.
- ü The Licensee must have plans for taking corrective measures if the environmental monitoring program detects migration of waste which would indicate that the performance objectives may not be met.

In addition to these universally applicable requirements, the UDRC is authorized and empowered to impose license conditions that must also be met to protect facility workers, the general public, and the environment. UDRC maintains surveillance, monitors all activities related to the facility, and periodically performs inspections to ensure compliance with regulatory requirements and license conditions.

The Owner/Licensee periodically prepares and submits environmental monitoring, operating, and other reports to the UDRC. UDRC reviews and evaluates all reports submitted by Owners/Licensees to assess whether the facility is being operated as required and as planned and whether changes should be made to provide greater assurance that the facility will perform as required and as planned.

The Owner/Licensee maintains records of all activities that indicate and document the performance of the commercial LLRW management facility. Each Owner/Licensee must also implement and maintain Quality Assurance and Quality Control programs to provide documentary evidence that required activities are performed properly.

All of these requirements and features help provide substantial assurance that LLRW disposed of in the State of Utah will remain in a safe and secure condition that will not threaten or degrade public health or environmental media.

September 2006

3.19 HOW MIGHT CLOSURE, INSTITUTIONAL CONTROL, AND OTHER COSTS BE GREATER THAN THE FUNDING PROVIDED BY FINANCIAL ASSURANCES AND THE PERPETUAL CARE FUND?

The requirements for estimating closure and institutional control costs have been determined to minimize the potential that actual closure or institutional control costs will exceed the value of financial assurances provided (NRC 1981). Moreover, the Utah Legislature created the Perpetual Care Fund to cover costs incurred later than 100 years after facility closure²², whether they are associated with monitoring, maintaining, repairing, conducting corrective actions, or other conditions.

Notwithstanding the precautions taken to ensure safe operation, closure, and acceptable long-term maintenance, closure and institutional control cost estimates are merely projections of the costs of reasonably well-known but still uncertain future events, conditions, circumstances, and environment. To the extent that future conditions differ from those assumed and expected to exist, actual costs will likely vary from those estimated. Thus, actual costs could be either less than or greater than expected costs.

Uncertainties about the future might produce the following effects. These lists are limited only by human imagination and our collective judgment of what is “reasonable” to consider. Many of these effects are sufficiently ambiguous that no reasonable, warranted, or justifiable approach to dealing with them is possible.

Natural Conditions Worse Than Expected

- ü Climatic conditions change and produce excessive precipitation, run-on, or runoff
- ü Climatic conditions change and produce extreme aridity
- ü Earthquake ground motions are greater than projected
- ü Vegetation or burrowing animals intrude more aggressively than expected

Human Activities Not Anticipated

- ü Aircraft impacts the closed facility
- ü Waste constituents are dispersed by a terrorist attack or disgruntled employee
- ü Critical material, fuel, labor, or other prices are higher than projected
- ü Claims of health impacts attributable to the closed facility create new financial liabilities
- ü Laws and/or regulatory requirements change to create unanticipated financial liabilities

²² Or during the first 100 years following closure under conditions limited by UC 19-3-106.2(5)(b).

September 2006

- ü Litigation delays or extends needed actions
- ü Incompetence, dereliction of duty, or ignorance within any entity involved with the licensed facility (Owner/Licensee, regulatory agency, financial institution, contractor, special interest groups, or members of the general public)

Facility Components Fail to Perform As Planned

- ü Water infiltration is greater than anticipated
- ü Water accumulates within disposal unit
- ü Water or wind erosion is greater than anticipated
- ü Excessive differential settlement damages the cover system
- ü Waste or constituents are exposed at the surface of the facility
- ü Wastes interact with unanticipated deleterious effects
- ü Construction flaws compromise facility performance

The probabilities of the outcomes listed above vary widely, as do their potential cost impacts. Both probabilities and financial (and other) impacts should be considered in identifying and evaluating any proposals to address them.

For example, an event with a huge financial impact might appear to justify some effort. However, if its probability of occurrence is vanishingly small, the public interest might be better served instead by addressing events with smaller costs but a greater probability that it might occur. Without more detailed information about the possible events and outcomes listed above, any attempt to manage these risks would be based on simple speculation.

3.20 HOW LARGE COULD THE INCREASES OF CLOSURE, INSTITUTIONAL CONTROL, AND OTHER COSTS BE?

As noted above, many of the ways in which post-closure costs might be larger than expected are so poorly defined that no effort to manage them is justified without further definition and information. In other cases that result in the facility failing to perform as required, reasonable estimates can be made of their costs and information developed in support of decision making. Even in these cases, however, substantial uncertainties exist about what might actually happen and what the resulting costs might be.

Notwithstanding the ambiguity and uncertainties associated with conditions that increase costs of monitoring and maintaining closed LLRW treatment and disposal facilities, an effort has been made to state the upper and lower bounds of the associated costs using a combination of realistic approximations and inference. These estimated costs are summarized in Table 3-7. A rigorous development of costs should be prepared as a basis for final decision making.

September 2006

Table 3-7. Summary of approximate costs of unplanned and unanticipated future events

Potential Future Event	Approximate Cost ²³ (\$million)		
	Plausible Minimum	As Estimated	Plausible Maximum
Cover System Failures	\$10	\$20	\$70
Excessive Water Enters Disposal Unit	\$10	\$30	\$50
Surface Contamination Observed	\$1	\$3	\$20
Wastes Interact with Unanticipated Deleterious Effects	\$10	\$30	\$50
Aircraft Impacts the Closed Facility or Waste Constituents Are Dispersed by a Terrorist Attack	\$5	\$10	\$30
Claims of Health Impacts Create New Financial Liabilities	\$10	\$40	\$50
Laws/Regulations Create Unanticipated Financial Liabilities	Unknown	Unknown	Unknown
Litigation Delays or Extends Needed Actions	Unknown	Unknown	Unknown

These costs were estimated using industry accepted practices and relying upon the judgment of professionals with extensive experience in the radioactive waste management industry. Where possible activities were identified; quantities (for example areas, volumes, and labor requirements) were calculated; unit costs determined (relying on such sources as Means 2005); and costs calculated and aggregated. Plausible minimum costs were estimated as ¼ to ½ of the calculated cost. Plausible maximum costs were estimated as 5 to 7 times the calculated cost.

Again, these cost estimates are based on very poorly defined characteristics and conditions. They are, therefore, highly uncertain and great caution should be exercised in making any decisions based on information presented in Table 3-7.

3.21 WHAT ARE THE PROBABILITIES OF OCCURRENCE OF THE INCREASES OF CLOSURE, INSTITUTIONAL CONTROL, AND OTHER COSTS?

Quantifying the probability of any individual cause of excess closure and institutional control costs is beyond the scope of this report. Still, it is possible, for the purpose of placing these events and their impacts in relative perspective, to state realistic and upper bounds of probabilities. These probability bounds were developed as the combined judgment of professionals technically informed and experienced in the radioactive waste management industry. A rigorous development of both costs and probabilities would provide a better basis for final decision making. Such probabilities for unplanned and unanticipated future events are listed in Table 3-8.

²³ Rounded to the nearest \$10 million or one figure of significance because of extreme uncertainty.

September 2006

Table 3-8. Order of magnitude probabilities for unplanned and unanticipated future events		
Potential Future Event	Order of Magnitude Probability	
	Realistic	Overstated
Cover System Failures	Less than 10 in 1,000	200 in 1,000
Excessive Water Enters Disposal Unit	Less than 10 in 1,000	200 in 1,000
Surface Contamination Observed	Less than 10 in 1,000	200 in 1,000
Wastes Interact with Unanticipated Deleterious Effects	Less than 1 in 1,000	50 in 1,000
Aircraft Impacts the Closed Facility or Waste Constituents Are Dispersed by a Terrorist Attack	Less than 1 in <u>10,000</u>	1 in 1,000
Claims of Health Impacts Create New Financial Liabilities	100 in 1,000	500 in 1,000
Laws/Regulations Create Unanticipated Financial Liabilities	100 in 1,000	500 in 1,000
Litigation Delays or Extends Needed Actions	500 in 1,000	1,000 in 1,000

Again, these order of magnitude probabilities are based on very poorly defined characteristics and conditions and are, therefore, highly uncertain. Great caution should be exercised in using the results presented in Table 3-8.

3.22 CONSIDERING BOTH THE PROBABILITY AND MAGNITUDE OF POSSIBLE COST INCREASES, WHICH POSSIBILITIES POSE THE GREATEST RISK FOR INCREASED COSTS?

Based on the descriptions of probability and the relative magnitude of possible cost increases stated approximately above, the order of magnitude of expected costs or financial risks was scoped. A rigorous development of both costs and probabilities should be prepared as a basis for final decision making.

Financial risk is the product of the estimated cost and the probability that the cost would be incurred. The range of risks based on values presented in Table 3-7 and Table 3-8 are depicted in Table 3-9.

September 2006

Table 3-9. Highly uncertain financial risks from unplanned and unanticipated future events				
Potential Future Event	Financial Risk (\$ million)			
	Minimum²⁴	Realistic²⁵	Overstated²⁶	Maximum²⁷
Cover System Failures	\$0.1	\$0.2	\$4	\$14
Excessive Water Enters Disposal Unit	\$0.1	\$0.3	\$6	\$10
Surface Contamination Observed	\$0.01	\$0	\$1	\$4
Wastes Interact with Unanticipated Deleterious Effects	\$0.01	\$0	\$2	\$3
Aircraft Impacts the Closed Facility or Waste Constituents Are Dispersed by a Terrorist Attack	\$0	\$0	\$0	\$0
Claims of Health Impacts Create New Financial Liabilities	\$1	\$4	\$20	\$25
Laws/Regulations Create Unanticipated Financial Liabilities	Unknown	Unknown	Unknown	Unknown
Litigation Delays or Extends Needed Actions	Unknown	Unknown	Unknown	Unknown
Total Financial Risk	\$1	\$5	\$32	\$56

Table 3-9 shows that, based on these highly uncertain analyses, the financial risk might likely range between \$5 and \$32 million. Based on these very uncertain estimated costs and probabilities, the total financial risk of unplanned or unanticipated events is unlikely to be less than about \$1 million and unlikely to be more than about \$60 million.

²⁴ Based on plausible minimum cost and realistic probabilities.

²⁵ Based on estimated cost and realistic probabilities.

²⁶ Based on estimated cost and overstated probabilities.

²⁷ Based on plausible maximum cost and overstated probabilities.

September 2006

3.23 ARE SUFFICIENT FINANCIAL ASSURANCES PROVIDED TO PROTECT AGAINST INCREASED COSTS OF CLOSURE, INSTITUTIONAL CONTROL, AND UNPLANNED AND UNANTICIPATED EVENTS?

In general, funds are available to cover costs expected to close and provide institutional control of commercial LLRW management facilities licensed in the State of Utah as shown in Table 3-7, Table 3-8, and Table 3-9. Funds are also available to cover the costs of monitoring and maintaining closed commercial LLRW management facilities following the institutional control period.

As noted above, a minimum fund balance of about \$4.2 million, when invested at 2 percent per year real interest rate, will provide sufficient interest earnings to cover the costs of routine monitoring and maintenance. This amount would produce interest earnings of about \$84,000 per year, without depleting the principal balance of the fund.

Table 3-5 shows the value of the Perpetual Care Fund after 20 more years of operations (and deposits to the fund) and 100 years of institutional control following facility closure (without withdrawals from the fund) to be about \$93 million. Maintaining a minimum balance of \$4 million to cover the costs of routine monitoring and maintenance would leave about \$89 million available at that time to cover other costs. Finally, Table 3-9 reveals that the most likely financial risks (probability-weighted costs) of unplanned and unanticipated events, with substantial uncertainty, should range between \$5 and \$32 million following 100 years of institutional control. Moreover, under worst conditions, the financial risk should total no more than about \$60 million following 100 years of institutional control and might be as small as \$1 million. Thus, based on the very rough estimates of costs and probabilities presented in Table 3-7 through Table 3-9, it confidence appears to exist that sufficient monies would be available from the Perpetual Care Fund to cover the probable costs of expected as well as unplanned and unanticipated events.

If the value of the Perpetual Care Fund were \$93 million and its funds were invested at 2 percent per year real interest rate, it would be capable of sustaining considerable maintenance and repair activities at the closed LLRW management facility. The Perpetual Care Fund would generate annual interest earnings of nearly \$1.9 million per year, under stated conditions, without diminishing its principal balance.

The financial assurances provided by the licensees for institutional control might be insufficient to cover all costs ultimately incurred following facility closure. This would be the case if the facility does not operate for an additional 20 years, as the Licensee currently projects. It could also occur if unplanned and unanticipated events were to occur earlier than the end of the 100 years of the institutional control period. Under either of these conditions, the Perpetual Care Fund might be inadequate to cover all costs. If, for example, the disposal facility were to operate for only another 10 years and the need for funds were to arise by 50 years after facility closure, the value of the Perpetual Care Fund would be only about \$19 million, as shown in Table 3-5.

September 2006

3.24 HOW DO THE FINANCIAL ASSURANCES REQUIRED FOR CLOSURE AND POST-CLOSURE CARE OF COMMERCIAL LLRW MANAGEMENT FACILITIES LICENSED IN THE STATE OF UTAH COMPARE WITH THOSE REQUIRED IN OTHER STATES?

State of Utah

The State of Utah under USC 19-3-106.2 defines the creation, funding, and use of the Radioactive Waste Perpetual Care and Maintenance Fund. The fund's purpose is to finance the perpetual care and maintenance of commercial LLRW disposal facilities after final closure of the facility. Commercial LLRW disposal or treatment facilities are assessed an annual fee of \$400,000. This fee is the main source of funding, along with investment income generated by the fund.

The legislature may release monies from this fund to conduct perpetual care and maintenance of the facility beginning 100 years after final closure. Appropriations from the Radioactive Waste Perpetual Care and Maintenance Fund may also be made to maintain, monitor or implement corrective action at a commercial radioactive waste disposal facility prior to 100 years after its final closure if the owner/operator is unable or unwilling to carry out post-closure maintenance, monitoring, or corrective action or if the financial surety arrangements made by the owner/operator are insufficient to cover such costs. If either condition occurs, the State will initiate legal action against the facility owner or operator to recover or reimburse the costs paid by this fund.

Utah's regulations for financial assurances for the closure, stabilization, and institutional control of radioactive waste disposal facilities are addressed in Rule 313-25 "License Requirements for Land Disposal of Radioactive Waste". These financial assurance requirements are virtually identical to the NRC requirements stated in 10 CFR 61.

Rule 313-25-10 requires the Licensee to be financially qualified to conduct the operations for which they are requesting a license. A similar requirement is included in R313-25-30 which requires the facility have sufficient funds to carry out facility construction and operations.

Financial assurance requirements for the closure and post-closure periods are addressed under R313-25-31. These assurances are required to be in place prior to commencement of operations. The applicant must submit cost estimates that are used to determine the adequacy of proposed financial sureties. The cost estimates must take into consideration the costs for an independent contractor to perform the required decontamination, closure, and stabilization work, and are revised annually. Using these cost estimates the State determines whether the proposed financial surety mechanisms are sufficient. Acceptable financial assurance arrangements include surety bonds, cash deposits, certificates of deposit, deposits of government securities, escrow accounts, irrevocable letter or lines of credit, trust funds, and other arrangements with the approval of the Executive Secretary. Self-insurance or comparable arrangements are not acceptable for these purposes.

Financial assurances for the Institutional Control period are addressed in the Utah Radiation Control Rules R313-25-32. This requires that a binding arrangement be established between the applicant and disposal site owner before the license is issued. The Executive Secretary reviews

September 2006

this agreement annually to ensure that changes in technology, facility operations, and inflation are addressed. Any changes to this agreement must be submitted to the Executive Secretary for review and approval.

The owner of the only commercial LLRW disposal facility in Utah is EnergySolutions, LLC, who is also the Licensee and applicant referred to in the regulations. EnergySolutions' predecessor organizations were exempted from the ownership requirements of URCR R313-25. This exemption allowed site ownership to remain with the facility operator, whereas the regulations, as written, require ownership to rest with a public agency. Thus, the regulatory requirements, as stated in URCR R313-25-32 provide the State no assurance since the resulting binding arrangement would be between Energy Solutions and itself.

State of Washington

The State of Washington initially passed the Radioactive Waste Act in 1983. Under RCW 43.200.080(2) the State assumed the responsibilities for the perpetual care agreement between the State and the federal government that was executed in 1965. As part of this agreement and the sublease between the State and the operator of the Hanford LLRW disposal site, the Washington Department of Ecology was directed to assess and collect fees to ensure acceptable site closure. RCW 43.200.080 created a Site Closure Account (Fund 125) and a Perpetual Surveillance and Maintenance Account (Fund 500) within the State Treasury. The purposes of these funds were to finance perpetual surveillance and maintenance and to ensure site closure under the lease with the federal government.

The Site Closure Account is funded through the collection of fees to defray the estimated costs of closure. This fee is called the "perpetual care and maintenance fee" and amounts to \$1.75 per cubic foot of waste disposed of (WAC 173-44-040). These funds are used to reimburse the site operator, the State Licensing agency, or contracted agencies for costs (and reasonable profit, as appropriate) associated with the final closure and decommissioning of the Hanford LLRW disposal facility. Any funds remaining in the Site Closure Account after the final closure has been completed will be transferred to the Perpetual Surveillance and Maintenance Account.

The Perpetual Surveillance and Maintenance Account is funded through the collection of the same fees described in connection with the Site Closure Account. Funds in the Perpetual Surveillance and Maintenance Account are to be used exclusively to meet post-closure and maintenance costs or to otherwise satisfy surveillance and maintenance obligations.

Section 43.200.200 of the Radioactive Waste Act requires the Washington Department of Ecology periodically to review the potential for injury and property damaging resulting from the transportation and disposal of radioactive waste under state issued licenses. Financial assurance requirements maintained by licensees must be sufficient to protect the State from all claims, suits, legal fees, damages, or expenses resulting from these licensed activities. Acceptable financial assurances are identified. The appropriate level of financial assurances must consider the potential cost of decontamination, treatment, disposal, decommissioning and cleanup of facilities and equipment; federal cleanup and decommissioning requirements; and legal defense costs, if any (RCW 70.98.098).

Washington regulations pertaining to the licensing of commercial LLRW disposal facilities are found in WAC 256. The regulatory requirements pertaining to financial qualifications, financial

September 2006

assurances provided for site closure and stabilization, and financial assurances provided for institutional control correlate closely with the requirements of 10 CFR 61. A minor difference between the State of Washington and NRC regulations requires that surety have a specific time period and be automatically renewable.

State of South Carolina

The Atlantic Interstate LLRW Compact Implementation Act established South Carolina as a member of Atlantic LLRW Compact. This Act in Section 48-46 of the South Carolina Code defines the Decommissioning Trust Fund and the Extended Care and Maintenance Fund.

The Decommissioning Trust Fund was established under a trust agreement between Chem-Nuclear Services, Inc, and the South Carolina Budget and Control Board, with the South Carolina State Treasurer as the trustee. This fund was created to ensure that adequate funding would be available for closure and decommissioning of the disposal site. The Decommissioning Trust Fund receives fees from the disposal of radioactive waste at the rate of \$4.20 per cubic foot of waste disposed of.

The Extended Care and Maintenance Fund is an escrow fund for perpetual care of the site. This fund provides custodial care, surveillance, and maintenance during the institutional control and post-closure observations periods. These activities are specified by the South Carolina Department of Health and may also include activities associated with site closure. Facility disposal fees include surcharges that are deposited into the Extended Care and Maintenance Fund. The Extended Care and Maintenance Fund receives fees from the disposal of radioactive waste at the rate of \$2.80 per cubic foot of waste disposed of.

Similar to its meaning in 10 CFR 61, the term “maintenance” at the South Carolina LLRW disposal facility means active maintenance activities including pumping and treatment of groundwater and the repair and replacement of disposal unit covers. Consistent with NRC regulations contained in 10 CFR 61, South Carolina regulations define the term “active maintenance” similarly not including custodial activities such as repair of fencing, repair or replacement of monitoring equipment, revegetation, minor additions to soil cover, minor repair of disposal unit covers, and general disposal site upkeep such as mowing grass.

If the revenues generated by current disposal fees are less than the allowable site operator reimbursement for care and maintenance activities conducted, the operator is reimbursed from the Extended Care and Maintenance Fund. This condition might prompt the facility to suspend operations until the volume of waste is sufficient to generate revenues for operations. If facility operations were suspended, monies from the Extended Care and Maintenance Fund could be used to reimburse the site operator for qualifying expenses and allowable profits. During such suspensions, funds may also be used to support the activities of the South Carolina Budget and Control Board (the Board), the Public Service Commission, and the Compact Commission as necessary based on revised budgets. The Board must also ensure that the fund remains adequate to defray costs for future maintenance or other obligations.

Once all funds in the Decommissioning Trust Fund have been exhausted, the Extended Care and Maintenance Fund will be used for custodial care, surveillance, monitoring, and maintenance for the post-closure and institutional control periods.

September 2006

South Carolina regulations for radioactive waste land disposal facilities are part of the Radiological Health Regulation 61-63, Part 7. These regulations mirror the NRC regulations with one notable difference. The requirement for open-ended surety mechanism has been removed but mechanisms with a specific term require automatic renewal.

State of Texas

The Texas Health and Safety Code (THSC), Section 401.003(11) identifies the Perpetual Care Account, also referred to as the Radiation and Perpetual Care Account. Securities provided by LLRW disposal license holders are deposited in the Perpetual Care Account. Funds in the Perpetual Care Account may be used to cover the costs of decontamination, decommissioning, stabilization, reclamation, surveillance, control, storage, and disposal of radioactive material reasonably required to protect the public health and safety and the environment and the costs of perpetual maintenance, surveillance, and corrective measures to remedy spills or contamination by radioactive materials. Funds in the Perpetual Care Account derive from securities (financial assurances) provided by license holders and the excess of fees collected by the Texas Commission on Environmental Quality (TCEQ, see THSC 401.303(g)). The TCEQ is required to seek reimbursement of security from the Radiation and Perpetual Care Account its uses to pay for actions permitted for the use of account funds.

The Texas regulations for licensing requirements for LLRW disposal are contained in Title 30 of the Texas Administrative Code, Part 1, Chapter 336, Subchapter H. Specific rules pertaining to liability and funding are addressed in R336.736. These rules are very similar to the corresponding NRC regulations with some exceptions but impose additional financial burdens on the license applicant.

Texas regulations require that the financial assurances for closure and stabilization be in place 60 days before the receipt of waste at the facility. Texas regulations require financial assurance not only for closure and stabilization of the facility, as required by 10 CFR 61, but also to provide liability coverage for sudden and non-sudden accidental occurrence involving bodily injury and property damage. Texas rules also require that cost estimates and financial assurances be reviewed and evaluated annually in meeting open to the public. No fees are presently authorized to fund the closure and stabilization of the disposal facility.

Institutional control funding is addressed under 30 TAC 336.737, this section differs significantly from the NRC regulations. Under this rule the Licensee is required to pay into a perpetual care account. The required value of this account is determined by the TCEQ Executive Director and must include the funding necessary to provide perpetual surveillance, monitoring, required maintenance, and fund administration costs. The total amount of this assurance must be in place 60 days prior to the receipt of waste. As with the closure financial assurances, the annual review must be conducted in an open meeting. No fees are presently authorized to fund the institutional control of the disposal facility or protect against any liabilities that might accrue to the State.

Financial assurances must also be provided to cover the costs of possible corrective actions. Such corrective actions could result from unplanned events that might pose a risk to public health, safety, and the environment that might occur after the decommissioning and closure of the disposal facilities. The amount of financial assurance must be no less than \$20 million at the time

September 2006

the disposal facility is decommissioned. TCEQ must annually review that basis for determining the amount of financial assurances required for corrective action.

Authorized financial assurance mechanisms for closure, stabilization, and institutional control, are defined in 30 TAC 37, Subchapter T. These mechanisms include a fully funded trust, surety bonds, irrevocable standby letter of credit, external sinking fund, or insurance. A combination of these mechanisms may also be used.

State of New York

LLRW disposal in the State of New York is not presently being pursued. However, in the 1980's LLRW disposal was a possibility, for which commercial LLRW disposal facility licensing rules were promulgated. These regulations are contained in 6 NYCRR Subchapter C, "Radiation". The financial assurance requirements differ extensively from those required by 10 CFR 61.

Financial assurance for closure, post-closure, and institutional control for land disposal facilities are addressed in 6 NYCRR, Part 383. The State financial assurance requirements corresponding to those contained in 10 CFR 61 are included in subpart 6 NYCRR 383-6. Under 6 NYCRR 383-6.4 a LLRW fund consisting of 3 separate trust funds must be established by the Licensee. These three funds are identified as:

- ü Closure, Post Closure, and Institutional Control Trust;
- ü Remedial Action/Third-Party Compensations Trust (Operation, Closure, Post-Closure periods); and
- ü Remedial Action/Third-Party Compensation Trust (Institutional Control Period).

These trusts must be established 60 days before the receipt of waste. The fund trustees will determine the pay-in amounts for each fund using the required costs, the number of years remaining before closure (not to exceed 30 years) and the number of payments required per year. These trust values and calculations must be reviewed annually.

The Closure, Post Closure, and Institutional Control Trust, is for reimbursement of costs that are in agreement with the approved closure, post-closure or institutional control plan. 6 NYCRR 383-6.8 requires that cost estimates for closure are based on the decontamination and dismantlement of disposal facilities, closure of the facility so that only minor custodial care is necessary, implementation of the closure plan by a third party, and implementation of the plan when closure would be most expensive. The cost estimate must not include salvage of equipment or other disposal facility assets. Also included in the estimate for closure, post-closure and institutional controls are considerations of the size, type and location of the facility, along with volume and nature of waste, any completed closure activities and the duration of health risks.

The Remedial Action/Third-Party Compensations Trust (Operation, Closure, Post-Closure Periods) is for remediating failures, and compensating third parties for injury or property damage that occur during the operations, closure, or post closure periods and that are caused by operation of the disposal facility. The Remedial Action/Third-Party Compensation Trust (Institutional Control period) covers the same failures and liabilities but only those that occur during the institutional control period.

September 2006

Under 6 NYCRR 383-6.9 the applicant is required to submit proposed levels of coverage for the costs of remediation for each time period, as well as third party compensation. These cost estimates must take into considerations the following;

- ü Analysis of facility location including natural characteristics, geology, hydrology.
- ü Site demographics
- ü Disposal technology used at the site
- ü The type and concentration of radionuclides
- ü Probability analysis
- ü Major natural phenomenon
- ü Inadvertent intrusion
- ü Location specific and technology specific considerations
- ü Performance assessments
- ü Risk assessments
- ü Dose assessment modeling
- ü Expected radiation exposures
- ü Potential (stochastic and non-stochastic) health effects

In addition to the established trust funds, alternative financial assurance mechanisms must be provided to address the difference between actual value of the trusts and the current cost estimates. These alternative mechanisms may include alternate trusts, surety bonds, letter of credit, liability insurance, written guarantee or a combination of these mechanisms.

State of Illinois

No commercial LLRW disposal facility is expected to be developed in the State of Illinois.

LLRW disposal in the State of Illinois is not presently being pursued. However, in the 1980's LLRW disposal was a possibility, for which commercial LLRW disposal facility licensing rules were promulgated. These regulations are contained in Title 32 of the Illinois Administrative code (IAC), Part 601. The financial assurance portions of Illinois regulation for licensing requirements for land disposal of radioactive waste 32 IAC Part 601 are the same as those contained 10 CFR 61.

The Illinois Low-Level Radioactive Waste Management Act defines policy for developing and operating a commercial LLRW disposal facility within the State of Illinois. This act created the Low-Level Radioactive Waste Facility Closure, Post-Closure Care, and Compensation Fund. This fund provided for decommissioning, closing, monitoring, inspecting, caring for, taking remedial actions, purchasing facility and third party liability insurance during the institutional control period, mitigating the impacts of suspended or interrupted disposal operations, compensating persons suffering damages or losses caused by a release from the proposed

September 2006

commercial LLRW disposal facility, and fulfilling obligations under a [host] community agreement.

The Low-Level Radioactive Waste Facility Closure, Post-Closure Care, and Compensation Fund was to be funded with waste fees imposed on all waste received for disposal. The waste fee was projected to grow to \$3.00 per cubic foot of waste disposed of by 1985. Additional fees were charged owners of nuclear power plants. Twenty percent of fees collected were to be transferred to the Low-Level Radioactive Waste Facility Closure, Post-Closure Care, and Compensation Fund and used for purposes identified above.

State of Nevada

Since the Beatty LLRW disposal facility was closed in the 1980's, only surveillance and maintenance activities are presently conducted at this site. No revenues, except interest income, accrue to the Fund for Care of Sites for Disposal of Radioactive Wastes.

The Nevada Revised Statutes (NRS) 459.231 creates special revenue fund in the State treasury a Fund for Care of Sites for Disposal of Radioactive Wastes. The fund is administered by the Director of Health and Human Services. The Director may use annual income for the purpose for which the fund was created, although no purpose is mentioned (except as inferred from the name of the fund) in NRS 459.231 which created the fund.

Nevada regulations for the disposal of radioactive waste are contained in NAC 459.800 through 459.826. Nevada regulatory requirements for financial assurances are generally comparable to those of 10 CFR 61. Provisions of NAC 459 are essentially the same as those of 10 CFR 61, but consist of different language owing to the fact that these regulations have not been revised since 1984.

Commonwealth of Pennsylvania

No commercial LLRW disposal facility is expected to be developed in Pennsylvania.

Requirements governing the disposal of LLRW in the Commonwealth of Pennsylvania are contained in Title 25 of the Pennsylvania Code, Chapter 236, with financial assurance and liability requirements stated in Section 236.601 through 236.607. Pennsylvania's financial assurance requirements address:

- ü Onsite cleanup during operations
- ü Liability for bodily injury and property damage during operations
- ü Site closure and decommissioning
- ü Long-term care
- ü Liability for bodily injury and property damage following site closure

September 2006

3.25 DO ANY STATES HAVE FINANCIAL ASSURANCE FOR COSTS AND OTHER BURDENS THAT MIGHT DEVELOP OR EVOLVE AFTER FACILITY CLOSURE?

State of Texas

The State of Texas requires financial assurances for closure and institutional control of the facility. In addition, Texas rules require that financial assurances be provided to protect against the possibility that the commercial LLRW disposal facility might be found at some future time to have failed to perform as planned and required (30 TAC 336.738). As presently being implemented, the following costs are being considered in determining what financial assurances should be provided for these worst case corrective action costs:

- ü Determining the nature of the failure
- ü Designing a response to the failure
- ü Implementing the planned response including:
 - Excavating cover system over affects areas
 - Removing waste (contained in reinforced concrete canisters)
 - Transferring retrieved waste and contaminated materials to another commercial LLRW disposal facility for final disposal
 - Backfilling the hole from which waste was retrieved and cover system was excavated
 - Restoring surface conditions and reestablishing cover system
 - Monitoring the newly closed and stabilized disposal facility to ensure acceptable performance

One company has estimated the cost of this worst-case corrective action scenario to total about \$20 million for its proposed facility design.

Texas rules also provide that the Licensee of a commercial LLRW disposal facility must provide financial assurance for bodily injury and property damage to third parties caused by sudden and non-sudden accidental occurrences arising from operations of the disposal facility (30 TAC 336.736). One company proposing to develop a commercial LLRW disposal facility in the State of Texas has provided an insurance policy with coverage limits of \$5 million per occurrence and \$10 million in the aggregate to protect against claims of bodily injury and property damage.

State of Washington

As noted above, Washington rules require that the Licensee maintain financial assurances sufficient to protect the State from all claims, suits, legal fees, damages, or expenses resulting from these licensed activities.

September 2006

3.26 WHAT LEGAL OR REGULATORY REVISIONS SHOULD BE MADE TO BETTER ASSURE AGAINST UNFUNDED COSTS?

The URCB concludes that the financial assurances provided for closure and institutional control of the closed LLRW disposal facilities are adequate at current levels and with current, rules, controls and practices.

It is the intent of URCB that payments into the Radioactive Waste Perpetual Care and Maintenance Fund be accelerated to better protect against the possibility that EnergySolutions might not remain in operations for 20 additional years, as assumed in Chapter 3 of this report. Therefore, URCB recommends and strongly urges the following:

- ü The annual contribution to the Radioactive Waste Perpetual Care and Maintenance Fund should be based on the amount of the disposal capacity depleted each year. Also, an immediate one-time contribution should be required to the Radioactive Waste Perpetual Care and Maintenance Fund to bring the fund to an adequate level. At closure of the facility, the value of the Radioactive Waste Perpetual Care and Maintenance Fund, in constant 2006 dollars, should be no less than \$13 million. If the facility closes before 2026, the currently required annual payment will be insufficient to meet the \$13 million target.
- ü The Legislature should specifically address the ambiguities created by the present exemptions from the land ownership requirements of Utah rules, as they relate to long-term responsibility for monitoring and maintaining the closed and stabilized facility.
- ü The Legislature should resist any pressure to divert funds from the Perpetual Care Fund to other applications.

THIS PAGE INTENTIONALLY LEFT BLANK

September 2006

4. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

4.1 HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

The USHWCB concludes that the amount of financial assurance required and provided for closure and post-closure care of commercial hazardous waste treatment, storage, or disposal facilities under Section 19-6-108 is judged to be adequate at current levels and with current rules, controls and practices.

The USHWCB recommends the following changes to address the issue of perpetual care at closed commercial hazardous waste land disposal facilities:

- ü The USHWCB recommends that a perpetual care fund be created and funded to provide for ongoing monitoring and maintenance of commercial hazardous waste land disposal facilities after termination of the post-closure permit.
- ü The USHWCB recommends that the fund be created in such a way so as to not place current facilities under an unreasonable financial burden.
- ü The USHWCB recommends that no additional funds be required at this time to cover potential catastrophic failure of the landfill cells, ground water corrective action or major maintenance at commercial hazardous waste land disposal facilities. This determination is based on the engineering controls employed to build the landfill cells, the remote location of current facilities, the lack of a nearby population center, the location of the facilities in the Tooele County Hazardous Waste Corridor which prevents residential development in the area, the non-potable groundwater, the lack of precipitation, and the restricted access to the facilities.

4.2 RADIOACTIVE WASTE DISPOSAL FACILITIES

The URCB concludes that the financial assurances provided for closure and institutional control of the closed LLRW disposal facilities are adequate at current levels and with current, rules, controls and practices.

It is the intent of URCB that payments into the Radioactive Waste Perpetual Care and Maintenance Fund be accelerated to better protect against the possibility that EnergySolutions might not remain in operations for 20 additional years, as assumed in Chapter 3 of this report. Therefore, URCB recommends and strongly urges the following:

- ü The annual contribution to the Radioactive Waste Perpetual Care and Maintenance Fund should be based on the amount of the disposal capacity depleted each year. Also, an immediate one-time contribution should be required to the Radioactive Waste Perpetual Care and Maintenance Fund to bring the fund to an adequate level. At closure of the facility, the value of the Radioactive Waste Perpetual Care and Maintenance Fund, in constant 2006 dollars, should be no less than \$13 million. If the facility closes before 2026, the currently required annual payment will be insufficient to meet the \$13 million target.

September 2006

- ü The Legislature should specifically address the ambiguities created by the present exemptions from the land ownership requirements of Utah rules, as they relate to long-term responsibility for monitoring and maintaining the closed and stabilized facility.
- ü The Legislature should resist any pressure to divert funds from the Perpetual Care Fund to other applications.

September 2006

REFERENCES

- EPA 2001 US Environmental Protection Agency, Office of Inspector General, "RCRA Financial Assurance for Closure and Post-Closure; U.S. Environmental Protection Agency OIG Audit Report," 2001-P-007, March 30, 2001.
- EnergySolutions 2006 EnergySolutions, LLC, "LLRW Surety; 2005 Annual Review," Revision 21, March 13, 2006. Means 2005 "Building Construction Cost Data", 63rd Edition, R.S. Means, 2005.
- MSDW 1999 Morgan Stanley Dean Witter, "Getting Real," MoneyTalk, Vol. 16, No. 1, 1999.
- NRC 1981 US Nuclear Regulatory Commission, "Draft Environmental Impact Statement on 10 CFR Part 61 'Licensing Requirements for Land Disposal of Radioactive Waste', NUREG-0782, September 29, 1981.
- ORFF 2002 Resources for the Future, "Discounting the Benefits of climate change Policy Using Uncertain Rules," Resources, Issue 146, Winter 2002.
- UAC R315 Utah Administrative Code, Section R315, "Utah Hazardous Waste Management Rules."
- UAC R313 Utah Administrative Code, Section R313, "Utah Radiation Control Rules."
- 10 CFR 61 Code of Federal Regulations, Title 10, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."

THIS PAGE INTENTIONALLY LEFT BLANK