

Annual Report to the Joint Minerals,
Business, and Economic
Development Interim Committee

Municipal Solid Waste Landfill
Prioritization, Monitoring, and Remediation

June 2014



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1.0 Introduction

This report is presented to the Joint Minerals, Business and Economic Development Interim Committee pursuant to Wyoming Statute § 35-11-524 which directed the Wyoming Department of Environmental Quality (Department) to establish a priority list of landfills requiring remediation and to follow up with annual reports detailing monitoring results, remediation results, assessments of clean-up costs, and landfill sites to be addressed in the coming year and orphan landfill site information. This report will provide an update on the status of the Municipal Solid Waste Landfill Remediation Program and provide a priority list for the Committee's consideration and approval.

2.0 Background Information

Subtitle D of the Resource Conservation and Recovery Act (RCRA) was proposed by the U.S. Environmental Protection Agency (EPA) in August of 1988 and became effective in October of 1991, although various implementation deadline extensions ran through 1997. The Subtitle D rules established minimum criteria for municipal landfills for:

- Location;
- Operation, including daily waste cover requirements;
- Design, including liners and leachate collection systems;
- Groundwater monitoring;
- Corrective action (remediation);
- Closure and post-closure care; and
- Financial assurance.

The primary objective of the regulations is waste containment through liner requirements, daily cover, and a final cap. Subtitle D established the minimum landfill management requirements states had to meet. Each state was required to submit plans proving that it met the minimum criteria and Wyoming did so.

Previously, it was believed that the climate in the arid west would prevent the generation of significant quantities of landfill leachate (liquid that has passed through or emerged from solid waste and contains soluble, suspended or miscible materials removed from such wastes) and the migration of leachate to groundwater. Therefore, landfill design standards in Wyoming and other arid states included provisions whereby landfill operators could demonstrate that liners would not be necessary. For almost 20 years after the promulgation of regulations under Subtitle D, landfills in Wyoming operated without liners.

Regulations promulgated under the authority of Subtitle D require groundwater monitoring at landfills. The regulations are found in 40 CFR Part 258 published in the Federal Register. Over time, groundwater monitoring at Wyoming landfills began to reveal evidence of

groundwater contamination, indicating that landfills in Wyoming are generating leachate in quantities sufficient to pollute groundwater. The Department and the Wyoming Solid Waste and Recycling Association (WSWRA) realized that pollution and other factors were increasing waste management costs and believed Wyoming needed to investigate ways to minimize those cost increases. The need to address existing groundwater contamination, line new landfill units to prevent future contamination, and other factors contributing to rising costs were brought to the attention of Governor Freudenthal in late 2003. At the Governor's request, the Department formed a Citizens' Advisory Group to study solid waste issues.

Legislation passed in 2006 required the Department to work with landfill operators to install or upgrade monitoring systems to monitor or detect releases of pollutants from landfills. The Department evaluated all available monitoring data and prepared a report in June of 2010, describing the extent to which such facilities cause or contribute to pollution of groundwater. The report included an estimate of the statewide groundwater remediation cost obligation faced by local governments. The potential cost estimated in the 2010 report was \$226 million. This estimate was for additional costs related to remediation such as improvements to previously capped disposal areas, improvements to the minimum cap design anticipated by operators, additional monitoring wells to assess the progress of remediation, and systems to clean-up contaminated groundwater. In 2011, Wyoming Statute § 35-11-524 required additional investigations to determine the need for landfill monitoring and remediation. The Department was required to establish a priority list of landfills requiring remediation and prepare an initial report by December 2012, describing an assessment of the clean-up costs at the highest priority landfills.

In 2013, the Legislature passed HB No. 0065, Enrolled Act No. 43, which created the Municipal Solid Waste Landfill Remediation Program (Program). Under this Program, the Department would oversee and fund up to seventy five percent (75%) of the cost of investigating and remediating contamination at municipal solid waste landfills for up to ten (10) years.

In October of 2013, the Department initiated the rulemaking process to develop regulations to implement the Program and begin conducting remediation at eligible facilities. The Department conducted a robust outreach effort, holding public meetings in Green River, Casper, and Cody, in order to solicit input from the regulated community. Through this process, the Department was able to develop Chapter 17 of the Wyoming Solid Waste Rules and Regulations. The Department presented these regulations to the Wyoming Water and Waste Advisory Board in December of 2013 and to the Environmental Quality Council for final approval in February of 2014. Legislation passed in 2014, directed that the Legislature shall approve the prioritized list of qualified projects prior to the expenditure of funds. Therefore, no remediation or monitoring activities have been funded under the Remediation Program.

This report constitutes the second annual report required by Wyoming Statute §35-11-524 on monitoring and remediation results, clean-up cost assessments, landfill sites to be

addressed in the coming year and orphan landfill sites. This report also categorizes the landfill priority list into high, medium and low priorities.

3.0 Landfill Prioritization

To date, 113 landfills have been included in the landfill assessment program. Evidence of impacts has been detected at 85 of these landfills. Impacts have not been detected at 14. The Department is awaiting additional information at an additional 14 in order to determine if there are impacts.

The Department worked with the Water and Waste Advisory Board (WWAB) to develop ranking criteria. The ranking criteria included the nature and extent of contamination at the facility as well as the proximity to wells, residences, and surface water. An initial priority list was prepared using the ranking criteria for landfills with groundwater contamination above groundwater protection standards. The initial ranking considered general site information regarding receptors within a specified radius of each landfill. The ranking/prioritization form with the criteria that the Department considered is included in Appendix A.

A second ranking was then conducted for each facility using more detailed site specific information, including proximity to wells, residences, and surface water downgradient of the landfills. This second ranking identified 11 facilities whose scores were noticeably higher than the next facilities on the list. These 11 were considered to be the “highest priority” and the Department estimated the cost associated with the anticipated remediation for each facility. For this 2014 report, the Department has divided the priority list into three classifications; highest priority, medium priority, and low priority (Tables 1, 2 and 3 respectively).

4.0 Assessment of Remediation Cost Estimates

With regard to the highest priority landfills, after the Department anticipated the remedial option(s) for each facility, the potential cost of remediation was estimated. Costs were primarily estimated through the use of Remedial Action Cost Engineering and Requirements (RACER) software. RACER software is a Windows-based environmental remediation/corrective action cost-estimating system developed under the direction of the U.S. Air Force for estimating environmental investigation and cleanup costs. The RACER software estimates costs for all phases of environmental remediation projects; from site investigation through site closeout. However, RACER lacked some of the options necessary to determine costs to dig & haul waste from a leaking landfill to another lined landfill; therefore the Department generated its own cost estimate methodology for that particular scenario. Costs for capping were estimated at \$100,000 per acre based on Wyoming information and the Department’s research into Financial Assurance requirements in surrounding states.

The costs presented are not engineers' estimates and do not include engineering, permitting and design fees, costs to formally assess potential corrective measures, markups, contingency fees, or the effects of inflation. The Department did not estimate the cost for all remedial options at every facility because a number of options did not appear to be technically or financially feasible, or were not warranted given the scope or nature of the contamination. Consistent with past Department reports, the cost estimates in this report are based on remedial systems operating for 20 years. If systems are operated for shorter or longer periods, costs would change accordingly. The Department will update these numbers as more information becomes available.

Table 1 below summarizes the current remediation cost estimates for the highest priority landfills. Cost estimates are based on the remedial actions believed most appropriate at this time. It is very important to note that the remedial options and cost estimates contained in this report are preliminary in nature. More accurate cost estimates can only be obtained after investigations have been conducted at each landfill site to understand the nature and extent of contamination, evaluate potential remedial actions, and selection of the remedy determined to be most appropriate.

Table 1 – Remedial Action Summary Highest Priority Landfills					
Landfill	Landfill Rank	Potential Remedial Actions	Estimated Cost of Construction, Operation and Monitoring First 10 Years	Estimated Cost Second 10 Years	Facility Total
Campbell County - Balefill #1	1	Capping, Gas System, Monitoring, (Soil Sampling)	\$3,933,321	\$369,795	\$4,303,116
Sheridan #2	2	Monitoring, Gas System	\$517,387	\$369,795	\$887,182
Casper Balefill	3	Monitoring, Gas System, Cut-off Wall w/ Pump & Treat	\$3,433,258	\$426,082	\$3,859,340
Evanston #1	4	Monitoring, Gas System, Pump & Treat	\$1,275,224	\$587,040	\$1,862,264

**Table 1 – Remedial Action Summary
Highest Priority Landfills**

Landfill	Landfill Rank	Potential Remedial Actions	Estimated Cost of Construction, Operation and Monitoring First 10 Years	Estimated Cost Second 10 Years	Facility Total
Sheridan #1	5	Monitoring, Gas System, Cut-off Wall w/ Permeable Treatment Barrier	\$1,783,604	\$405,765	\$2,189,369
Guernsey	6	Capping, Gas System, Monitoring	\$2,769,396	\$349,339	\$3,118,735
Newcastle #1	7	Cut-off Wall W/ Pump & Treat, Monitoring	\$1,338,487	\$308,844	\$1,647,331
Buffalo #1	8	Capping, Monitoring	\$2,335,109	\$516,495	\$2,851,604
Cheyenne	9	Capping, Gas System, Monitoring	\$8,631,859	\$911,865	\$9,543,724
Riverton #1	10	Pump & Treat, Monitoring	\$863,301	\$681,696	\$1,544,997
Campbell County #2	11	Capping, Gas System, Monitoring	\$4,297,881	\$236,725	\$4,534,606
		Total	\$31,178,827	\$5,163,441	
Estimated Total Cost for the Highest Priority Landfills (Ranked 1-11) Over 20 Years					**\$36,342,268

****The costs presented are not engineers' estimates and do not include engineering, permitting and design fees, costs to formally assess potential corrective measures, markups, contingency fees, or the effects of inflation. These costs will be updated as more information becomes available.**

Table 2 below identifies the medium priority landfills. These landfills are those where contaminant concentrations exceed groundwater protection standards, but the priority ranking scores did not elevate them into the high priority list. Anticipated remedial activities and estimated costs for medium priority landfills have not been provided due to the uncertainty

associated with the costs and likelihood that these costs will change by the time these projects are in line to receive funds.

Table 2 – Medium Priority Landfills Landfills Ranked 12-49	
Landfill	Priority Rank
Lusk	12
Clearmont #2	13
Douglas	14
Glenrock #1	15
Rawlins	16
Lincoln Co. - Thayne (Transfer Station, Incinerator & C/D)	17
Buffalo, Old Dump	18
Big Piney #2	19
Pine Bluffs	20
Fremont Co. SWDD – Lander	21
Thermopolis	22
Park County – Cody	23
Horsethief Canyon #2 - Transfer Station	24
Baggs SWDD	25
Rock River #1	26
Torrington #1	27
Sundance	28
Elk Mountain	29
Medicine Bow	30
Sublette Co. - Marbleton #2	31
Park County – Meeteetse	32
Sinclair #2	33
Laramie Landfill	34
Park County - Kysar	35
Reliance, SWDD 1	36
Eden Valley SWDD	37
Encampment	38
Saratoga, Old Community Dump	39
Sweetwater Co. SWDD #1 - Point of Rocks	40

**Table 2 – Medium Priority Landfills
Landfills Ranked 12-49**

Landfill	Priority Rank
High Country Joint Powers Board - Hanna	41
Hanna (Old Site)	42
Hulett #1	43
Bairoil # 1	44
Bairoil #2	45
Big Horn County - North #1	46
Rock River #2	47
Big Horn County - South	48
Sweetwater Co. SWDD #1 - Rock Springs	49

Table 3 below identifies the low priority landfills. These landfills are those where contaminant concentrations exceed groundwater protection standards, but the priority ranking scores did not elevate them to the medium priority landfills. Anticipated remedial activities and estimated costs for low priority landfills have not been provided due to the uncertainty associated with the costs and likelihood that these costs will change by the time these projects are in line to receive funds.

**Table 3 – Low Priority Landfills
Landfills Ranked 50-85**

Landfill	Priority Rank
Park County - Powell	50
Big Piney #1	51
Hyattville Landfill	52
Superior	53
Saratoga	54
Park County - Clark #1	55
Big Horn County - North #2	56
Lincoln County - Kemmerer #1	57
Torrington #2	58
Moorcroft #2	59
Newcastle #2	60
Manville #1	61

**Table 3 – Low Priority Landfills
Landfills Ranked 50-85**

Landfill	Priority Rank
Ten Sleep SWDD #1	62
Kaycee	63
Uinta County - Evanston #2	64
Washakie Co. SWDD - Worland #1	65
Washakie Co. SWDD - Worland #2	66
Fremont Co. SWDD - Shoshoni	67
Chugwater	68
Lincoln County - Kemmerer #2	69
LaGrange	70
Park County - Clark #2	71
Central Weston Co. SWDD, Osage	72
Superior	73
Moorcroft #1	74
Bosler	75
Natrona County Parks - Alcova Landfill	76
Wheatland #2	77
Green River (old) #1	78
Green River (old) #2	79
Glendo #1	80
Glendo #2	81
Sweetwater Co. SWDD - Wamsutter #2	82
Eastern Laramie Co. SWDD	83
Natrona County Parks - Alcova #2	84
LaBarge - Transfer Station	85

The following table contains the list of landfills where additional information is needed in order to determine whether they require remediation and therefore need to be placed on the priority list.

Table 4 – Need More Information Landfills

Landfill	Status
Burns	Historic
Cokeville # 1	Closed

Table 4 – Need More Information Landfills	
Landfill	Status
Emblem Burlington	Closed
Lingle Municipal	Closed
Park County - Cody (Old Site)	Closed
Sundance, Old Dump	Historic
Upton #1	Historic
Upton #4	Open
Boulder	Historic
Daniel Junction	Historic
Fremont Co. SWDD - Dubois	Open
Midwest-Edgerton #1	Closed
Midwest-Edgerton #2	Open
Pinedale #2 - Transfer Station	Closed
Total	14

The following landfills are those which at this time have no detection of contamination and are not included in the landfill remediation priority list.

Table 5 – No Contamination Detected	
Landfill	Status
Casper Regional Landfill	Open
City of Cody – Town Dump	Historic
Evansville	Historic
Fort Laramie	Historic
Fort Laramie #2	Closed
Hartville	Historic
Lincoln County – Cokeville # 2	Open
Manderson SAN #1	Closed
Manville #2	Open
Moorcroft #3	Open
Pinedale #1	Closed
Ranchester Dump	Historic
Rock Springs (old site)	Historic
Shell	Closed

Table 5 – No Contamination Detected	
Landfill	Status
Total	14

5.0 Landfill Monitoring and Remediation

The need for groundwater monitoring at landfills is both a regulatory requirement and a measure needed to protect human health and the environment. The regulatory basis for monitoring is in 40 CFR Part 258, Subpart E. These Federal requirements are incorporated into Wyoming’s Solid Waste Rules and Regulations. In addition to the regulatory requirements, there is now documentation that pollution from Wyoming landfills can be present at concentrations that exceed health based groundwater protection standards. Groundwater monitoring helps ensure that the nature and extent of contamination are understood and that potential threats to human health and the environment can be addressed. This is especially important as rural development in Wyoming encroaches upon landfill sites.

Remediation requirements are also included in 40 CFR Part 258, Subpart E. These Federal requirements are also incorporated into Wyoming’s Solid Waste Rules and Regulations. 40 CFR Part 258, Subpart E includes provisions for remedy selection to be based upon numerous site specific factors, such as groundwater quality and characteristics, and proximity to wells and other receptors that may be affected by the contamination. Remedy selection determinations also take into consideration the nature (severity and type of contaminants) and extent (horizontal and vertical) of contamination. In consideration of these factors, the remedy or remedies selected for an individual landfill can be tailored to the specific conditions at the landfill. Remedies can range from relatively passive measures, such as caps and monitoring, to more aggressive measures, such as systems that pump contaminated groundwater to the surface for treatment. Site specific factors were taken into consideration by the Department in the assessment and selection of remedial actions contained in this report.

Legislation passed in 2014, directed that the Legislature shall approve the prioritized list of qualified projects prior to the expenditure of funds. Therefore, no remediation or monitoring activities have been funded under the Remediation Program. When remediation and monitoring is initiated at these facilities, the Department will make it available to the Committee.

6.0 General Permit Status and DEQ Outreach and Assistance

Pursuant to Wyoming Statute § 35-11-531(d), the Department must report on the status of the development of a general permit for facilities with less than 30 acres of disposal area and the assistance provided by the Department to facilities seeking to close. After the passage of Wyoming Statute § 35-11-531 in 2013, the Department initiated the rulemaking process in order to set forth the regulations by which the general permit would be issued.

Concurrent with the rulemaking process, the Department also began developing a concept for the general permit which would allow one closure plan to be used across the State. The Department developed a closure design that would utilize a flexible membrane liner and soil cover to close landfills. The Department's position is that this closure design minimizes engineering costs for landfills as well as reduces long term costs associated with monitoring.

In October of 2013, the Department conducted four public outreach meetings in Green River, Casper, Cody and Gillette to discuss the development of the rules as well as the draft general permit. On December 5, 2013, the Department presented the rules and general permit to the Wyoming Water and Waste Advisory Board for its consideration and input. After receiving a favorable recommendation from the Advisory Board, the rules were presented to the Environmental Quality Council for its approval on February 25, 2014. These rules became effective May 7, 2014.

After the rules were approved, the Department conducted additional public outreach in March of 2014 on the general closure permit. The Department presented a revised general permit to the Water and Waste Advisory Board in April of 2014. The Department addressed public input and revised the draft general permit, which was advertised for public comment June 17, 2014. If no comments are received by close of the public comment period on July 24, 2014, the Department may issue the general closure permit.

In addition to the development of the general permit, the Department continues to provide assistance to operators of municipal solid waste landfills with less than 30 acres of disposal area by providing guidance and encouraging participation in the Cease and Transfer Program as well as the Landfill Remediation Program.

7.0 Summary

The current remediation cost estimate for the 11 highest priority landfills is \$36,342,268. Due to the uncertainties in estimating remediation costs years into the future and a lack of site specific information, the Department has not estimated costs for medium and low priority landfills. The Department will update this information when more accurate data becomes available.

Appendix A
Phase II Landfill Prioritization Form

Municipal Landfill Priority List Criteria (July 22, 2011)

This ranking is used to prioritize municipal landfills where corrective measures are required because contaminant concentrations in downgradient wells statistically exceed groundwater protection standards.

Facility Name:

DEQ File Number:

DATE:

CRITERIA	1 Point	5 Points	10 Points	Multiplier	Score	Comments
	Enter the number one (1) in the box below the applicable criterion.					
Proximity of Leachate to Nearest Potentiometric Downgradient Surface Water (perennial lakes, ponds, rivers and streams)	1/4 to 1 mile	< 1/4 mile or unknown	Seeps identified or contamination detected in surface water	2	0	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1	0	
Nature of Contaminants: Whether a Contaminant is Naturally Occurring or Manmade	N/A	No volatile organic constituent or nitrate detected above background concentrations	Anthropogenic constituents detected above background concentrations	1	0	
Nature of Contaminants: (Constituent with the greatest concentration relative to its groundwater protection standard)	Concentration < 5 X the Groundwater Protection Standard	Concentrations 5-10 X the Groundwater Protection Standard	Concentration > 10 X the Groundwater Protection Standard	2	0	
Maximum Contaminant Levels	MCL/Groundwater protection standards are not exceeded for a VOC	MCL/Groundwater protection standard exceeded for 1-4 constituents	MCL/Groundwater protection standard exceeded for 5 or more constituents	2	0	
Proximity of Landfill to a Permitted or Otherwise Identified Downgradient Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2	0	
Number of Downgradient Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2	0	
Proximity of Landfill to Downgradient Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1	0	
Soil Types (the primary soil type between waste and groundwater)	Fine silts and clays	Medium silt to medium sand	Coarse sands, gravels, or fractures identified	1	0	
Type of Leachate (This criteria is augmented by other criteria and is typically assumed to be about the same at each landfill.)				1	0	
Volume of Leachate (This criteria is augmented by other criteria and may be difficult to determine.)				1	0	
Ability of the responsible municipality to remediate contamination (The Board and DEQ believe this criterion may be difficult to evaluate and the Board recommended this issue be addressed in the DEQ's initial report to the Legislature.)				1	0	
Other/Professional Judgement (specify):	Nothing noted (default)	Considered of moderate significance	Significant issue	3	0	
TOTAL POINTS						