

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

Assessment of the Clean-Up Costs at High Priority Municipal Solid Waste Landfills

Wyoming Department of Environmental Quality

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1.0 Introduction

Per Wyoming Statute §35-11-524, the Wyoming Department of Environmental Quality (Department) was tasked with assessing the needs for municipal solid waste landfill (landfill) monitoring and the necessity for any remediation of landfills in Wyoming. The Department was tasked with establishing a priority list of landfills requiring remediation and preparing this initial report describing an assessment of the clean-up costs at the high priority landfills. The Department's assessment of medium and low priority landfills will continue in the future and annual status reports will be provided to the Joint Minerals, Business, and Economic Development Interim Committee.

2.0 Executive Summary

The Department worked with the Water and Waste Advisory Board (WWAB) to develop ranking criteria and a priority list for landfills that need remediation by augmenting criteria contained in Wyoming Statute §35-11-524. Seventy-four (74) landfills were evaluated using these ranking criteria. Initially, 15 landfills were identified as high priority facilities. The Department re-evaluated the top 15 landfills using more detailed site specific information and has identified 11 landfills as the highest priority for remediation.

The Department conducted an assessment of potential remedial measures for each of the 11 highest priority landfills using site specific information. The cost of each potential remedial action was estimated using Remedial Action Cost Engineering and Requirements (RACER) software. RACER is a cost estimating system that was developed under the direction of the U.S. Air Force for estimating environmental investigation and cleanup costs.

A more detailed description of the remedial action assessment and cost estimation process is provided below. The following table summarizes the 11 highest priority landfills, the remedial actions believed most appropriate at this time, and the estimated costs to implement the remedial actions. Note that the remedial options and cost estimates contained in this report are based upon the information currently available. Before beginning construction or implementing a remedy at any given facility, more detailed site information will be evaluated and more precise cost estimates will be prepared to confirm that the final remedial actions selected are appropriate and cost-effective.

Table 1 Corrective Action Summary

Landfill	Potential Corrective Actions	Estimated Cost of Construction, Operation and Monitoring First 10 Years	Estimated Cost Second 10 Years	Facility Total
Campbell County #1	Capping, Gas System, Monitoring, (Soil Sampling)	\$3,933,321	\$369,795	\$4,303,116
Sheridan #2	Gas System, Monitoring	\$517,387	\$369,795	\$887,182
Casper Balfill	Gas System, Monitoring	\$1,012,831	\$368,716	\$1,381,547
Evanston #1	Monitoring	\$254,597	\$254,598	\$509,195
Sheridan #1	Gas System, Monitoring	\$523,949	\$405,765	\$929,714
Guernsey	Dig & Haul	\$2,661,000	\$0	\$2,661,000
Newcastle #1	Cutoff Wall	\$1,338,487	\$308,844	\$1,647,331
Buffalo	Capping, Monitoring	\$2,335,109	\$516,495	\$2,851,604
Cheyenne	Capping, Gas System, Monitoring	\$8,631,858	\$911,865	\$9,543,723
Riverton #1	Pump & Treat	\$863,301	\$681,696	\$1,544,997
Campbell County #2	Capping, Gas System, Monitoring	\$4,297,881	\$236,725	\$4,534,606
	Total	\$26,369,721	\$4,424,294	
			Estimated Total Cost for 11 High Priority Landfills Over 20 Years	\$30,794,015

3.0 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:

- 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 principal thrust 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.

In the arid west, states like Wyoming believed that our climate 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. 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 these 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. In 2011, Wyoming Statute §35-11-524 required the additional investigations which are summarized in this report.

Pursuant to §35-11-524, the Department was tasked with assessing the needs for landfill monitoring and the necessity for any remediation of landfills in Wyoming. The Department was also tasked with establishing a priority list of landfills requiring remediation and preparing this initial report describing an assessment of the clean-up costs at the high priority landfills. The Department's assessment of medium and low priority landfills will continue. Annual status reports will include monitoring and remediation results, assessments of clean-up costs at high, medium and low priority landfills, sites to be addressed in coming years, and applicable orphan landfill site information.

4.0 Landfill Monitoring and Remediation

The need for groundwater monitoring at landfills is both a regulatory requirement of the Wyoming Solid Waste Rules and Regulations (SWRR) and a measure needed to protect human health and the environment. As noted above, 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.

Existing remediation requirements in the SWRR include provisions for remedy selection to be based upon 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.

5.0 Landfill Prioritization

In conjunction with the WWAB, the Department developed a landfill prioritization form (Appendix A) to rank the landfills with groundwater contamination above groundwater protection standards. An initial ranking was prepared using general site information (Appendix B). The initial Phase I ranking looked at receptors within a specified radius of each landfill,

regardless of the potential for the receptors to be impacted. An analysis of that initial ranking pointed to a natural break in the scoring, above which there were 15 facilities that appeared to represent a highest priority with respect to the necessity for remediation. These 15 facilities were then re-ranked by considering more detailed site specific information regarding the nature of groundwater contamination. In particular, the Department considered the proximity of the landfill to downgradient wells, residences, and surface water. The re-ranking identified 11 facilities that were considered to be the highest priority for the purpose of remediation. They were: Campbell County #1, Sheridan #2, Casper Balfill, Evanston #1, Sheridan #1, Guernsey, Newcastle #1, Buffalo #1, Cheyenne, Riverton #1, and Campbell County #2. See Section 8.0 for a facility summary and Appendices C through M for more detailed individual facility information.

6.0 Assessment of Remedial Actions

Remediation, also commonly referred to as corrective action, corrective measures, or clean-up, can involve one or more of several different measures. The Department evaluated a number of remediation options that could be utilized to mitigate groundwater contamination at the highest priority facilities and selected the following as the most viable options: Capping and Monitoring; Improved Landfill Gas Collection System (a system utilized to reduce landfill gases and their movements, which can contribute to groundwater pollution); Cutoff Wall (utilized to block the subsurface movement of contaminated groundwater); Phytoremediation (the utilization of plant bioprocesses to clean up water); Pump & Treat (utilized to remove and treat contaminated groundwater); Dig and Haul (physical removal of waste to a properly designed disposal facility).

To determine which of these remedial options presented the best solution(s) for a given facility the Department created a Corrective Action Assessment Form (Appendix N) which scored the potential options for a given facility relative to factors such as: depth to groundwater; receptors within 1,000 feet; initial cost; long term cost/operation and maintenance; timeliness in achieving protection; and technical feasibility. Department staff familiar with each landfill considered site specific information to score the remedial options on the Assessment Forms for each of the 11 highest priority landfills. Site knowledge and professional judgment were significant factors affecting final remedy selection. When necessary, the Department worked with the operators of the highest priority landfills to gather the information needed to select remedial options. However, to control costs, the Department utilized existing information as much as possible. The Department will continue working with landfill operators to gather any additional information needed to confirm remedy selection decisions and implementation procedures.

7.0 Remediation Cost Estimates

After selecting 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 and is an industry standard (public and private) for estimating remedial costs. The RACER software can estimate 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 a lined landfill; therefore the Department generated its own cost estimate methodology for that particular scenario.

The remedial options selected for each of the highest priority facilities and the corresponding cost estimates for those options are summarized below. This information is also summarized in Table 1 above. The costs reported do not include markups or contingency fees. The Department did not estimate the cost for all remedial options at every facility because in some cases the option, based on professional judgment, may not have been technically or financially feasible. 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. Note that RACER is a cost estimation tool, and may not fully account for all potential costs. Unforeseen factors may affect actual costs at individual landfills.

8.0 Individual Landfill Remedy Summaries

A brief summary of the Department's remedy evaluation for each of the highest priority landfills is provided below. Note that the remedial options and cost estimates contained in this report are based upon the information currently available. Before beginning construction or implementing a remedy at any given facility, more detailed site information will be collected and evaluated and more precise cost estimates will be prepared to confirm that the final remedial actions selected are appropriate and cost-effective.

8.1 Campbell County #1

This facility ceased disposal of all waste approximately ten years ago. It contains approximately 3.1 million yds³ of waste emplaced over 64 acres. A closure permit was issued in 2004; however, the County has not yet completed all necessary closure activities. Previously, as a part of phased reclamation, the County installed final cover consisting of a 20 mil polyvinylchloride (PVC) cover over approximately 36 acres of the facility. Based on review of groundwater data it appears that the 20 mil PVC cover may not be functioning as intended. The first priority would be to evaluate the efficacy of the existing 20 mil PVC cap. This would

include a leak location survey, with repairs made as indicated by the survey. Soil sampling and analysis should be conducted to determine whether certain groundwater contamination issues could be due to naturally occurring soil chemistry. The existing landfill gas collection system needs to be improved. Should groundwater monitoring indicate continuing problems after any needed repairs are made as noted above, it would then be necessary to reinstall an adequate cap to replace the existing 20 mil PVC liner over 36 acres of the facility. Much of the structural soil and top cover soil for this liner could be obtained on site. On-going groundwater and landfill gas monitoring data would be used to evaluate whether these steps adequately address groundwater contamination and landfill gas exceedances.

Improve Landfill Gas Collection System:	\$201,019
Other (soil sampling to determine if some contamination may be naturally occurring):	\$55,901
Capping (if needed):	\$3,306,607
Monitoring (to check efficacy of existing cap and monitor gas and groundwater)	\$739,589 (20 years)
Total:	<u>\$4,303,116</u>

8.2 Sheridan #2

The Sheridan #2 landfill is currently open. It contains approximately 1.6 million yds³ of waste emplaced over 85 acres. The expected remedial approach for this facility would be to install a landfill gas extraction system in the northwestern portion of the facility to mitigate groundwater contamination from landfill gas. Also, a detailed evaluation of the existing final cover over older parts of the landfill is needed to determine whether it is functioning adequately.

Landfill Gas Collection System:	\$147,593
Monitoring (to check efficacy of existing cap and monitor gas and groundwater):	\$739,589 (20 years)
Total:	<u>\$887,182</u>

8.3 Casper Balefill

The Casper balefill is a closed facility, having ceased operations in 2009. It occupies approximately 100 acres and contains some 3.7 million yds³ of loose and baled trash. Ninety-five (95) of its 100 acres have been capped. The Department believes that the preferred method

to remediate groundwater contamination at the site would initially involve additional monitoring in conjunction with an improved landfill gas collection system. Should that prove ineffective a cutoff wall coupled with a pump and treat system might be necessary.

Monitoring in conjunction with an Improved Landfill Gas Collection System:	\$737,432 (20 years)
Improved Landfill Gas Collection System:	\$644,115
Total:	<u>\$1,381,547</u>

8.4 Evanston #1

The Evanston #1 landfill covers 67 acres with an estimated waste volume of approximately 840,000 yds³. The Department believes that the first priority at this site would be to monitor and evaluate the newly installed evapotranspiration cap. Should groundwater contamination still present itself, the installation of an enhanced landfill gas collection system might be needed. Additional remediation efforts beyond that could involve a pump and treat process if the newly installed cap is ineffective.

Monitoring (to evaluate newly installed ET cap):	\$509,195 (20 years)
Total:	<u>\$509,195</u>

8.5 Sheridan #1

Sheridan #1 is a closed facility that reportedly received waste from the mid-1940s until about 1985. The facility occupies 43 acres with an estimated waste volume of approximately 1.19 million yds³. In at least some portions of the facility there is groundwater in contact with waste. The preferred remedial approach includes installation of a landfill gas collection system, coupled with monitoring to confirm natural attenuation. A cutoff wall installed with a permeable treatment gate for in-situ treatment would be an additional remediation option to consider if natural attenuation is not sufficient. Dig and haul was considered, but this would not be practical because the logical haul site, Sheridan #2, has insufficient capacity remaining to handle the waste material located at Sheridan #1.

Monitoring (to check efficacy of existing cap):	\$811,530 (20 years)
Landfill Gas Collection System:	\$118,184
Total:	<u>\$929,714</u>

8.6 Guernsey

The Guernsey landfill has ceased receipt of waste, but has not installed final cover. The facility covers approximately 8 acres with an estimated waste disposal volume of 100,000 yds³. The Department's evaluation indicated that the preferred remediation option at this facility would be to excavate the waste and remove it to the TDS landfill near Torrington. Based on current information regarding the amount and placement of waste, this appears to be the most cost-effective approach. Should additional site specific research show this to be a non-viable option, capping and monitoring in conjunction with an improved landfill gas collection system would appear to be the best option outside of dig & haul.

Dig & Haul:	\$2,661,000
Total:	<u>\$2,661,000</u>

8.7 Newcastle #1

The Newcastle #1 landfill is a closed facility; waste disposal reportedly began prior to 1945 and ceased in 1989. It occupies approximately 38 acres with an estimated waste volume of approximately 700,000 yds³. Based on available information, it is likely that there is groundwater in contact with waste in at least some portions of the facility, and groundwater at very shallow depths immediately downgradient of the facility. The preferred remedial options for this facility would be the installation of a cutoff wall on the northern boundary of the facility to prevent migration of contaminated groundwater. Groundwater extraction wells or a gravity trench-drain system would then be employed on the up-gradient side of the wall to transport groundwater to the sanitary sewer.

Cutoff Wall:	\$1,029,644
Operational Costs (20 groundwater extraction wells):	\$337,698 (20 years)
Monitoring:	\$279,989 (20 years)
Total:	<u>\$1,647,331</u>

8.8 Buffalo #1

The Buffalo #1 facility is currently operational, with approximately 22 acres of waste disposal and an estimated waste volume of just under one-half million yds³. Disposal operations began in the early 1970s; the current disposal unit will cease waste disposal in 2015, with operations moving to a lined disposal area. The preferred remedial approach at this facility would be the installation of a 22 acre evapotranspiration cap and monitored natural attenuation. For the purpose of cost estimates, structural and cover soils for this cap would be obtained on-site.

Capping:	\$1,818,614
Monitoring:	\$1,032,990 (20 years)
Total:	<u>\$2,851,604</u>

8.9 Cheyenne

The Cheyenne landfill occupies approximately 101 acres and is currently disposing of only construction/demolition waste. It contains approximately 4.2 million yds³ of waste. Other municipal waste is transported to a facility in Ault, CO. However, the City is considering landfill expansion with disposal in a lined expansion area. The Department's evaluation indicated that the installation of a flexible membrane cap over approximately 76 acres of the facility with gas extraction and monitoring for efficacy would be the preferred remediation method. The City has explored excavating waste from approximately 31 acres of the facility that is unlined and where groundwater is near the surface; possibly in contact with waste. A consulting firm hired by the City estimated the cost of this to be over \$35 million. Due to this cost, the Department believes this option should not be considered unless capping, gas extraction, and natural attenuation are ineffective. The Department's evaluation also indicated that pump & treat could be an option, but only if capping and monitoring are ineffective.

Monitoring:	\$1,823,729 (20 years)
Capping:	\$7,494,767
Landfill Gas Collection System:	\$225,227
Total:	<u>\$9,543,723</u>

8.10 Riverton #1

The Riverton #1 landfill is a closed facility occupying 60 acres and containing approximately 650,000 yds³ of waste. High groundwater levels would indicate that additional efforts to improve the facility's cap would not appreciably assist in preventing water from migrating through the trash. The Department believes that the preferred remediation approach would be to install a pump and treat system to intercept contaminated groundwater on the eastern side of the facility and to direct it to the nearby wastewater treatment plant located immediately adjacent to the facility on its south side. A cutoff wall could also be added to enhance groundwater capture if the pump and treat system is ineffective.

Pump & Treat:	\$161,605
Operational Costs (10 groundwater extraction wells):	\$776,837 (20 years)
Monitoring:	\$606,555 (20 years)
Total:	<u>\$1,544,997</u>

8.11 Campbell County #2

The Campbell County #2 facility is currently operational. The unlined area already used for waste disposal occupies approximately 15 acres with an estimated volume of approximately 1.4 million yds³. The preferred remedial measures would be to cap those 15 acres with an evapotranspiration cap coupled with installation of a landfill gas extraction system to prevent landfill gas from contributing to groundwater pollution.

Capping:	\$3,966,231
Improved Landfill Gas Collection System:	\$94,925
Monitoring:	\$473,450 (20 years)
Total:	<u>\$4,534,606</u>

9.0 Summary

During the preparation of this report the Department considered draft legislation prepared to assist local governments with municipal landfill remediation. In particular, the draft legislation includes a provision for the State to cover up to 75% of the cost of remediation for the first 10 years with local governments taking over responsibility thereafter. Cost estimates in this report therefore indicate costs during the first 10 years which include construction, operation, and monitoring of remedial systems and costs for the following 10 years of system operation and monitoring. We hope this information helps legislators and local governments evaluate potential costs related to the legislation. In addition, the draft legislation requires a written agreement between the Department and local landfill operators. We believe this agreement can be used to describe the scope of any additional investigations that might be needed to confirm remedy selection and which entity will be responsible for various aspects of this work.

The estimated remediation cost for the 11 highest priority landfills is \$26,369,721 over the first 10 years and \$4,424,294 over the second 10 years. The total estimated remediation cost for the 11 highest priority landfills over 20 years is \$30,794,015.

Beginning no later than June 30, 2013, and annually thereafter, the Department will submit reports to the Joint Minerals, Business, and Economic Development Interim Committee that include monitoring results, remediation results, assessments of cleanup costs, high priority sites to be addressed in coming years, and work needed and completed at orphan landfill sites.

Appendix A
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 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 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 Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		
					0	
Proximity of Landfill to 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					0	

Appendix B
Phase I and Phase II Landfill Ranking Tables

PHASE I LANDFILL RANKING

FACILITY	PHASE I SCORE	PHASE 1 RANK
Casper Balefill	145	1
Riverton #1	135	2
Sheridan #1 (Old Landfill)	128	3
Sheridan #2 (Expansion)	123	5(T)
Campbell County - Balefill #1	123	5(T)
Uinta County - Evanston #1	111	6
Guernsey	110	9(T)
Campbell County - Balefill #2	110	9(T)
Newcastle #1	110	9(T)
Cheyenne Landfill	108	10
Clearmont #2	105	11
Lusk	102	13(T)
Buffalo #1	102	13(T)
Douglas	100	15(T)
Elk Mountain	100	15(T)

Glenrock #1	97	16
Big Piney #2	91	17
Medicine Bow	90	19(T)
Sweetwater Co. SWDD #1 - Point of Rocks	90	19(T)
Baggs SWDD	87	22(T)
Lincoln Co. - Thayne (Transfer Station, Incinerator & C/D)	87	22(T)
Thermopolis	87	22(T)
Rawlins	86	24(T)
Horsethief Canyon #2 - Transfer Station	86	24(T)
Fremont Co. SWDD - Lander	85	25
Park County - Powell	83	26
Sundance	82	28(T)
Buffalo, Old Dump	82	28(T)
Laramie Landfill	81	29
Park County - Clark #1	80	30

PHASE I LANDFILL RANKING

FACILITY	PHASE I SCORE	PHASE 1 RANK
Park County - Cody	79	32(T)
Rock River #1	79	32(T)
Bairoil #1 / #2	78	35(T)
Moorcroft #2	78	35(T)
Sublette Co. - Marbleton #2	78	35(T)
Lincoln County - Kemmerer #1	75	38(T)
Sinclair #2	75	38(T)
Hulett #1	75	38(T)
Rock River #2	74	39
Reliance, SWDD 1	73	42(T)
Kaycee	73	42(T)
Saratoga, Old Community Dump	73	42(T)
LaBarge - Transfer Station	70	45(T)
Ten Sleep SWDD #1	70	45(T)
Wheatland #2	70	45(T)
Big Horn County - North #1	68	48(T)
Big Horn County - North #2	68	48(T)
LaGrange	68	48(T)
Big Horn County - South	67	49
Big Piney #1	65	52(T)
Hyattville Landfill	65	52(T)
Park County - Kysar	65	52(T)
Park County - Clark #2	64	55(T)
Saratoga	64	55(T)
Moorcroft #1	64	55(T)
Glendo #1 / #2	62	56
Torrington #2	60	57
Sweetwater Co. SWDD #1 - Rock Springs	59	59(T)
High County Joint Powers Board - Hanna	59	59(T)
Newcastle #2	57	61(T)
Eden Valley SWDD	57	61(T)
Eastern Laramie Co. SWDD	56	63(T)
Washakie Co. SWDD - Worland #1 & #2	56	63(T)

PHASE I LANDFILL RANKING

FACILITY	PHASE I SCORE	PHASE 1 RANK
Bosler	54	64
Chugwater	53	65
Lincoln County - Kemmerer #2	52	67(T)
Central Weston Co. SWDD, Osage	52	67(T)
Natrona County Parks - Alcova Landfill	50	69(T)
Uinta Co. - Bridger Valley	50	69(T)
Uinta County - Evanston #2	49	70
Fremont Co. SWDD - Shoshoni	46	71
Sweetwater Co. SWDD - Wamsutter #2	41	72
Natrona County Parks - Alcova #2	40	73
Green River (old) / #1	39	74

Note: In Phase I, the 74 landfills that currently have sufficient data were ranked using general site information. As more data becomes available, remaining landfills will be also be evaluated.

PHASE II LANDFILL RANKING

FACILITY	PHASE II SCORE	PHASE II RANKING
Campbell County - Balefill #1	115	1
Sheridan #2 (Expansion)	113	2
Casper Balefill	112	3
Uinta County - Evanston #1	111	4
Sheridan #1 (Old Landfill)	110	8(T)
Guernsey	110	8(T)
Newcastle #1	110	8(T)
Buffalo #1	110	8(T)
Cheyenne Landfill	108	9
Riverton #1	107	10
Campbell County - Balefill #2	106	11

Note: Landfills were initially ranked using general site information. The 15 facilities above, all with initial scores above 100 points, were reassessed using site specific information, particularly in relation to potentially effected wells and residences downgradient of the landfill. Following this reassessment, the 11 landfills scoring greater than 100 points above, have been identified as the highest priority for remediation.

Appendix C
Campbell County #1 Evaluation Information

Campbell County #1 - 10.065

Priority (Phase I) Criteria

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: Campbell Co. #1		DEQ File Number: 10.065		DATE: 9-1-11		
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 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	10	.08 miles There is an artificial pond or storm water pond, not a perennial pond.
		1				
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1	10	6.91' - Well P-2, 5-11-07
			1			
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	10	Dichlorodifluoromethane Dichloroethene, 1,1 Dichloroethene, cis 1,2 Methylene chloride Trichloroethane, 1,1,1- ; Trichloroethene Nitrogen, Nitrate + Nitrite as N
			1			
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	20	Beryllium - .282 mg/l = 70.5 x gps.
			1			
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	20	26 constituents
			1			
Proximity of Landfill to a Permitted or Otherwise Identified Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2	10	0.00 miles - well located within boundary of landfill per pdf map in groundwater report. Don't know of any water supply wells in landfill. May be due to plotting accuracy.
		1				
Number of Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2	20	103 wells
			1			
Proximity of Landfill to Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1	10	.01 miles to business on west side of facility
			1			
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	10	
			1			
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	3	
	1					
TOTAL POINTS					123	

Priority (Phase II) Criteria

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: Campbell Co. #1 **DEQ File Number: 10.065** **DATE: 9-1-11**

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	2	1.29 miles to irrigation pond
	1					
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1	10	6.91' - Well P-2, 5-11-07
			1			
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	10	Dichlorodifluoromethane Dichloroethene, 1,1 Dichloroethene, cis 1,2 Methylene chloride Trichloroethane, 1,1,1-; Trichloroethene Nitrogen, Nitrate + Nitrite as N
			1			
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	20	Beryllium - .282 mg/l = 70.5 xggs.
			1			
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	20	26 constituents
			1			
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	10	0.00 miles - well located within boundary of landfill per pdf map in groundwater report.
		1				
Number of Downgradient Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2	20	87 wells
			1			
Proximity of Landfill to Downgradient Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1	10	.01 miles to business on west side of facility
			1			
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	10	
			1			
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	3	
	1					
TOTAL POINTS					115	

Plan View Photo – Receptors

Campbell County #1 - 10.065



miles |—————| 1



50N 72W 28

Gwtr Flow Direction = $163^{\circ} > 17^{\circ}$

Closest Well - P144427W - 50N 72W 28 NESW

TD - ?

Static - ?

Distance - ~0'

Closest Downgradient Residence - .07 miles (due W) ★

Closest Downgradient Surface Water (irrigation pond) - > 1,000' (1.29 miles NNE)

No. of Water Supply Wells Downgradient of Facility = 87

Corrective Action Assessment Form

Corrective Action Assessment for the Campbell County #1 Landfill

Date: 10-17-12 DEQ staff M. D. Jennings

Facility information: Acres 64 Waste volume (yds³) 3,080,000

Potential haul distance 12 miles To Campbell County #2

Shallowest depth to groundwater in down gradient wells 6.91' - Well P-2 (DG water well = ?)

Receptors affected or potentially affected: Well located within landfill boundary; DG residence at .07 miles; 6 DG water wells located within 1,000'; ~50 DG residences located within 1,000'; No surface water located within 1,000' DG

Other site specific information: Monitor efficacy of existing cap. Improve the existing landfill Gas System. Dig & Haul is not preferable due to cost and lack of space at the #2 landfill. Conduct soil sampling to evaluate whether elevated metals may be due to naturally occurring low pH conditions.

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater	5	5	4	2	5	4
Receptors within 1,000 feet DG (water supply wells, surface water, residences)	2	3	4	2	5	5
Initial cost	4	4	2	4	1	1
Long term cost / O&M	4	3	2	4	1	5
Timeliness in achieving protection	2	3	2	2	2	5
Technical practicability	4	3	2	1	2	1
Total:	21	21	16	15	16	21

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.

Remediation Cost Assessment

Campbell County #1 (10.065):

Soil Sampling/Testing (low pH) – 10 borings, 90' deep

= \$55,901

Capping – 36 acres with an FML. Construction soils obtained on-site

= \$3,306,607

Gas Collection System – 36 passive gas recovery wells (1 well/acre) – 16" dia. – Depth ~52.5'

= \$201,019

Monitoring – 16 wells (average sample depth = 88') monitored semi-annually for Baseline and Appendix A constituents

20 years = \$739,589

Appendix D
Sheridan #2 Evaluation Information

Sheridan #2 – 10.526

Priority (Phase I) Criteria

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: Sheridan #2		DEQ File Number: 10.526		DATE: 10-7-11		
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 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		.01 miles to seep
			1		20	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		8.01' Well N8
			1		10	
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		Chloroethane Dichlorodifluoromethane Dichloroethane, 1,1-Methylene chloride Trichloroethane, 1,1,1-Trichlorofluoromethane
			1		10	
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		Selenium - .628 mg/l = 31.4 x the gps for Class II water Well M3, 6-28-05.
			1		20	
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		10 constituents.
			1		20	
Proximity of Landfill to a Permitted or Otherwise Identified Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2		.16 miles per pdf map in groundwater report
		1			10	
Number of Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		28 wells
			1		20	
Proximity of Landfill to Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		.31 miles
		1			5	
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		
		1			5	
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		
	1				3	
TOTAL POINTS					123	

Priority (Phase II) Criteria

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: Sheridan #2		DEQ File Number: 10.526		DATE: 10-7-11		
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		Creek located ~1,100' due E
		1			10	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		8.01' - Well N8
			1		10	
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		Chloroethane Dichlorodifluoromethane Dichloroethane, 1,1- Methylene chloride Trichloroethane, 1,1,1- Trichlorofluoromethane
			1		10	
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		Selenium - .628 mg/l = 31.4 x the gps for Class II water Well M3, 6-28-05.
			1		20	
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		10 constituents.
			1		20	
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		~890' to the NW
		1			10	
Number of Downgradient Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		22 wells
			1		20	
Proximity of Landfill to Downgradient Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		.31 miles
		1			5	
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		
		1			5	
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		
	1				3	
TOTAL POINTS					113	

Plan View Photo – Receptors

Sheridan #2 - 10.526



miles |—————| 1

56N 84W 25, 36

Gwtr Flow Direction = $251^{\circ} > 109^{\circ}$

Closest Downgradient Well - P34319 - 56N 84W 25 NWSW

TD - 8'

Static - -4'

Distance - ~890' NW

Closest Downgradient Residence = > 1,000' (.31 miles NW ★)

Closest Downgradient Surface Water (creek) = > 1,000' (~1,100' due E ★)

No. Water Supply Wells Downgradient of Facility = 22



Corrective Action Assessment Form

Corrective Action Assessment for the Sheridan #2 Landfill

Date: 10-17-12 DEQ staff M. D. Jennings

Facility information: Acres 85 Waste volume (yds³) 1,600,000

Potential haul distance .25 miles To Lined area of Sheridan #2 landfill

Shallowest depth to groundwater in down gradient wells 6.35' – N8 (DG well at -4'?)

Receptors affected or potentially affected: ~2 DG water wells located within 1,000'; No DG surface water located within 1,000'; No DG residence located within 1,000'

Other site specific information: Monitor cap to determine if it is functioning as necessary. Install landfill gas system in the NW corner of the facility. Nitrate is the primary problem in the NE.

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater	4	4	3	1	4	3 (6.3')
Receptors within 1,000 feet (water supply wells, surface water, residences)	5	4	5	4	5	5
Initial cost	4	4	1	3	1	1
Long term cost / O&M	3	2	4	4	1	5
Timeliness in achieving protection	2	4	5	3	4	5
Technical practicability	4	4	2	1	3	1
Total:	22	22	20	16	18	20

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.

Remediation Cost Assessment

Sheridan #2 (10.526):

Monitoring – 16 wells (average sample depth ~44') monitored semi-annually for Baseline and Appendix A constituents

20 years = **\$739,589**

Gas System (enhanced) – 40 passive gas recovery wells (1 well/acre) located in the NW portion of the facility – 16" dia. – Depth ~30'

= **\$147,593**

Appendix E
Casper Balefill Evaluation Information

Casper Balefill - 10.070

Priority (Phase I) Criteria

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: Casper Balefill		DEQ File Number: 10.070		DATE: 10-31-11		
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 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		.17 miles to N. Platte River. Seeps located immediately adjacent to the river.
			1		20	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		16.99' - Well M-3, 1-8-02
			1		10	
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		Benzene; Chloroethane; Dichlorodifluoromethane; Dichloroethene, cis-1,2; Dichloroethene, trans-1,2-; Ethylbenzene; Naphthalene; Tetrachloroethene; Trichloroethane, 1,1,1-; Trichloroethene; Vinyl chloride
			1		10	
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		Vinyl chloride - 25.5 ug/l = 12.75 x the MCL. Well AS-3, 6-02
			1		20	
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		11 constituents
			1		20	
Proximity of Landfill to a Permitted or Otherwise Identified Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2		.08 miles per pdf map in groundwater report
		1			10	
Number of Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		32 wells
			1		20	
Proximity of Landfill to Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		.22 miles
			1		10	
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		mostly med to coarse sands
			1		10	
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		groundwater is discharging to the North Platte River.
		1			15	
TOTAL POINTS					145	

Priority (Phase II) Criteria

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: Casper Bafefill **DEQ File Number: 10.070** **DATE: 10-31-11**

CRITERIA	1 Point	5 Points	10 Points	Multiplier	Score	Comments
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		.17 miles to N. Platte River. Seeps located immediately adjacent to the river.
			1		20	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		16.99' - Well M-3, 1-8-02
			1		10	
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		Benzene; Chloroethane; Dichlorodifluoromethane; Dichloroethene, cis -1,2; Dichloroethene, trans -1,2; Ethylbenzene; Naphthalene; Tetrachloroethene; Trichloroethane,1,1,1-; Trichloroethene; Vinyl chloride
			1		10	
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		Vinyl chloride - 25.5 ug/l = 12.75 x the MCL. Well AS-3, 6-02
			1		20	
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		11 constituents
			1		20	
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 wells within 1 mile downgradient
					0	
Number of Downgradient Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		0 downgradient wells within 1 mile
	1				2	
Proximity of Landfill to Downgradient Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		> 1/4 mile
		1			5	
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		Mostly med to coarse sands
			1		10	
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		Groundwater is discharging to the North Platte River.
		1			15	
TOTAL POINTS					112	

Plan View Photo – Receptors

Casper Balefill - 10.070



miles  1

34N 79W 35



Gwtr Flow Direction = $90^\circ > 180^\circ$

Closest Downgradient Well - All Downgradient Wells $> 1,000'$

TD - N/A

Static - N/A

Distance - N/A

Closest Downgradient Residence = $> 1,000'$

Closest Downgradient Surface Water (N. Platte River) = $900'$ (SE) 

No. Water Supply Wells Downgradient of Facility = 0

Corrective Action Assessment Form

Corrective Action Assessment for the Casper Balefill Landfill

Date: 10-17-12 DEQ staff M. D. Jennings

Facility information: Acres 100 (5 need cap) Waste volume (yds³) 3,700,000

Potential haul distance 0.50 miles To Lined area of Central Wyoming Regional landfill

Shallowest depth to groundwater in down gradient wells 16.99' – Well M-3 (avg. = 57'); 24' - M-12; 47' - M-18

Receptors affected or potentially affected: North Platte river (~900' to the SE); No DG water well located within 1,000'; No DG residences located within 1,000'

Other site specific information: There are groundwater seeps immediately adjacent to the N. Platte river to the SE. Note: Capping the remaining 5 acres is not recommended as it would probably have little impact on groundwater contamination. Monitoring would be of benefit. Dig & Haul not deemed practical by project manager. Waste is ~50' below original grade.

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater	5	5	4	2	4	5
Receptors within 1,000 feet DG (water supply wells, surface water, residences)	5	5	5	5	5	4
Initial cost	3	3	2	4	3	1
Long term cost / O&M	4	3	4	4	1	5
Timeliness in achieving protection	2	3	3	3	2	5
Technical practicability	4	3	3	3	4	1
Total:	23	22	21	21	19	21

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.

Remediation Cost Assessment

Casper Balefill (10.070):

Monitoring – 14 wells (average sample depth ~56') monitored semi-annually for Baseline and Appendix A constituents

20 years = **\$737,432**

Gas System (enhanced) – 95 passive gas recovery wells (1 well/acre) – 16" dia. – Depth ~75'

= **\$644,115**

Other Remedies Evaluated:

Cutoff Wall – 2,640' long covering the SE corner of the facility ~ equidistant to the west and north. 70' deep

Installation costs = **\$2,086,375**

Operational costs (20 years) = **\$33,376**

Total (Installation + 20 years Operation) = **\$2,119,751**

Pump & Treat – 12 groundwater extraction wells (average depth = 70')

Installation costs = **\$276,686**

Operational costs (20 years) = **\$81,356**

Total (Installation + 20 years Operation) = **\$358,042**

Appendix F
Evanston #1 Evaluation Information

Evanston #1 – 10.655

Priority (Phase I) Criteria

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: Evanston #1	DEQ File Number: 10.655	DATE: 10-14-11	

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 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		.07 miles
		1			10	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		2.99' - Well EW-10, 4-21-09
			1		10	
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		Benzene; Chloroethane; Dichlorodifluoromethane Dichloroethane, 1,1-; Dichloroethene, cis-1,2- Methylene chloride; Nitrogen, Nitrate+Nitrite as N; Tetrachloroethene; Trichloroethane, 1,1,1-; Trichloroethene; Trichlorofluoromethane; Vinyl chloride
			1		10	
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		Iron - 12.9 mg/l = 43 x the gps for Class 1 water
			1		20	
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		17 constituents
			1		20	
Proximity of Landfill to a Permitted or Otherwise Identified Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2		.002 miles per pdf map in groundwater report
		1			10	
Number of Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		8 wells
		1			10	
Proximity of Landfill to Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		1.33 miles
					1	
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		
		1			5	
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		
		1			15	
TOTAL POINTS					111	

Priority (Phase II) Criteria

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: Evanston #1 **DEQ File Number: 10.655** **DATE: 10-14-11**

CRITERIA	Enter the number one (1) in the box below the applicable criterion.			Multiplier	Score	Comments
	1 Point	5 Points	10 Points			
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	10	.07 miles
		1				
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1	10	2.99' - Well EW-10, 4-21-09
			1			
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	10	Benzene; Chloroethane; Dichlorodifluoromethane Dichloroethane, 1,1-; Dichloroethene, cis-1,2- Methylene chloride; Nitrogen, Nitrate+Nitrite as N; Tetrachloroethene; Trichloroethane, 1,1,1-; Trichloroethene; Trichlorofluoromethane; Vinyl chloride
			1			
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	20	Iron - 12.9 mg/l = 43 x the gps for Class I water
			1			
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	20	17 constituents
			1			
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	10	.002 miles per pdf map in groundwater report
		1				
Number of Downgradient Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2	10	7 wells
		1				
Proximity of Landfill to Downgradient Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1	1	1.33 miles
		1				
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	5	
		1				
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	15	
		1				
TOTAL POINTS					111	

Plan View Photo – Receptors

Evanston #1 - 10.655



miles |—————| 1



15N 120W 23

Gwtr Flow Direction = $214^{\circ} > 249^{\circ}$

Closest Downgradient Well - P49541W - 15N 120W 23 SWNE

TD - 170'

Static - 155'

Distance - ~380' (SW)

Closest Downgradient Residence = $> 1,000'$

Closest Downgradient Surface Water (creek) = .07 miles

No. Water Supply Wells Downgradient of Facility = 7

Corrective Action Assessment Form

Corrective Action Assessment for the Evanston #1 Landfill

Date: 10-17-12 DEQ staff M. D. Jennings

Facility information: Acres 67 Waste volume (yds³) 840,000

Potential haul distance 10 miles To Evanston #2

Shallowest depth to groundwater in down gradient wells 23.5' - EW-5; 15.5' - EW-6

(DG water well at 170')

Receptors affected or potentially affected: Creek located ~470' DG to the S; ~5 DG water wells
located within 1,000'; No DG residence located within 1,000'

Other site specific information: Avg. depth to DG gwtr. = 17' Note: The facility does not require a new
cap, it requires a lysimeter repair. Need to Monitor to evaluate the recently constructed
evapotranspiration cap. Consultant erred on lysimeter calculations. Wait and see if the ET cap is
effective.

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater	5	5	2	1	1	4
Receptors within 1,000 feet DG (water supply wells, surface water, residences)	3	3	3	2	2	5
Initial cost	4	4	2	4	1	1
Long term cost / O&M	4	3	2	5	1	5
Timeliness in achieving protection	3	4	2	2	2	5
Technical practicability	5	5	1	2	2	5
Total:	24	24	12	16	9	25

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.

Remediation Cost Assessment

Evanston #1 (10.655):

Monitoring – 10 wells (average sample depth = 26.6') monitored semi-annually for Baseline and Appendix A constituents

20 years = **\$509,195**

Other Remedies Evaluated:

Gas System (enhanced) – 67 passive gas recovery wells (1 well/acre) – 16" dia. – Depth ~30'

= **\$240,978**

Pump & Treat –

Installation costs = **\$447,207**

Operational Costs (20 years) = **\$664,884**

Total (Installation + 20 years Operation) = **\$1,112,091**

Appendix G
Sheridan #1 Evaluation Information

Sheridan #1 – 10.525

Priority (Phase I) Criteria

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: Sheridan #1		DEQ File Number: 10.525		DATE: 10-5-11		
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 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	20	.01 miles to seep
			1			
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1	10	10.37 (BTOC) - Well M-22R
			1			
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	10	Chlorobenzene; Dichlorobenzene, 1,2-; Dichlorodifluoromethane; Dichloroethane, 1,1-; Dichloroethene, cis-1,2-; Methylene chloride; Nitrogen, Nitrate + Nitrite as N; Tetrachloroethene; Trichloroethane, 1,1,1-; Trichloroethene; Trichlorofluoromethane
			1			
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	20	Chloride - 1230 mg/l = 12.3 x the gps for Class II water Well MW-04, 11-16-10
			1			
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	20	16 constituents. 9 of the 17 are inorganics w/out an MCL.
			1			
Proximity of Landfill to a Permitted or Otherwise Identified Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2	10	.16 miles per pdf map in groundwater report
		1				
Number of Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2	20	54 wells
			1			
Proximity of Landfill to Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1	10	.11 miles
			1			
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	5	
		1				
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	3	
	1					
TOTAL POINTS					128	

Priority (Phase II) Criteria

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: Sheridan

DEQ File Number: 10.525

DATE: 10-5-11

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		~2,350' to a creek (SW)
	1				2	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		10.37 (BTOC) - Well M-22R
			1		10	
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		Chlorobenzene; Dichlorobenzene, 1,2-; Dichlorodifluoromethane; Dichloroethane, 1,1-; Dichloroethene, cis-1,2-; Methylene chloride; Nitrogen, Nitrate + Nitrite as N; Tetrachloroethene; Trichloroethane, 1,1,1-; Trichloroethene; Trichlorofluoromethane
			1		10	
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		Chloride - 1230 mg/l = 12.3 x the gps for Class II water Well MW-04, 11-16-10
			1		20	
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		16 constituents. 9 of the 17 are inorganics w/out an MCL
			1		20	
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		.16 miles per pdf map in groundwater report
		1			10	
Number of Downgradient Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		41 wells
			1		20	
Proximity of Landfill to Downgradient Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		.11 miles
			1		10	
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		
		1			5	
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		
	1				3	
TOTAL POINTS					110	

Plan View Photo – Receptors

Sheridan #1 - 10.525



miles  1

56N 84W 25, 26

Gwtr Flow Direction = $251^{\circ} > 309^{\circ}$

Closest Downgradient Well - P116591W - 56N 84W 26 SWSE

TD - 160'

Static - 52'

Distance - 940' (due W)

Closest Downgradient Residence = .11 miles ★

Closest Downgradient Surface Water (creek) = $> 1,000'$ ($\sim 2,350'$ SW) ★

No. Water Supply Wells Downgradient of Facility = 41



Corrective Action Assessment Form

Corrective Action Assessment for the Sheridan #1 Landfill

Date: 10-17-12 DEQ staff M. D. Jennings

Facility information: Acres 43 Waste volume (yds³) 1,192,000

Potential haul distance .5 miles To Lined area of Sheridan #2

Shallowest depth to groundwater in down gradient wells 10.37' M-22R (DG well at 52')

Receptors affected or potentially affected: ~7 DG water wells located within 1,000'; No DG surface water located within 1,000'; ~26 DG residences located within 1,000'

Other site specific information: Note: Sheridan #2 is too full to accept waste from Sheridan #1. Waste removal would probably require long distance hauling. Prefer Monitor 1st and Gas System 2nd. Cutoff Wall may not be practicable as it would have to stay in place. Cutoff Wall with a treatment gate might be an option if Monitoring and a Gas System are ineffective.

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater	5	5	2	1	3	3
Receptors within 1,000 feet (water supply wells, surface water, residences)	3	4	4	2	4	5
Initial cost	4	4	1	4	1	1
Long term cost / O&M	2	3	5	4	1	5
Timeliness in achieving protection	2	4	5	3	4	5
Technical practicability	5	5	4	1	3	1
Total:	21	25	21	15	16	20

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.

Remediation Cost Assessment

Sheridan #1 (10.525):

Monitoring – 18 wells (average sample depth ~18') monitored semi-annually for baseline and Appendix A constituents

20 years = **\$811,530**

Gas System (enhanced) – 43 passive gas recovery wells (1 well/acre) – 16" dia. – Depth ~18.75'

= **\$118,184**

Other Remedies Evaluated:

Cutoff Wall – Slurry Wall (Permeable Treatment Barrier) – 1,776' long with a 100' long treatment (iron filings) gate. To be emplaced along the downgradient boundary of the facility.

= **\$1,259,655**

Appendix H
Guernsey Evaluation Information

Guernsey – 10.260

Priority (Phase I) Criteria

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: Guernsey	DEQ File Number: 10.260	DATE: 9-12-11	

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 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		.48 miles
	1				2	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		17.63' - Well G-4, 8-12-08
			1		10	
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		Chloroethane; Dichlorobenzene, 1,4-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Methylene chloride Nitrogen, Nitrate + Nitrite as N Tetrachloroethene
			1		10	
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		Iron - 57.1 mg/l = 190 x the gps for Class I water Well G-8, 12-13-06
			1		20	
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		15 constituents
			1		20	
Proximity of Landfill to a Permitted or Otherwise Identified Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2		Water well located at landfill boundary per pdf map in groundwater report
		1			10	
Number of Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		37 wells
			1		20	
Proximity of Landfill to Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		.21 miles
			1		10	
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		Closure Application August 2001
		1			5	
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		
	1				3	
TOTAL POINTS					110	

Priority (Phase II) Criteria

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: Guernsey

DEQ File Number: 10.260

DATE: 9-12-11

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	2	.48 miles
	1					
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1	10	17.63' - Well G-4, 8-12-08
			1			
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	10	Chloroethane; Dichlorobenzene, 1,4-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Methylene chloride Nitrogen, Nitrate + Nitrite as N Tetrachloroethene
			1			
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	20	Iron - 57.1 mg/l = 190 x the gps for Class 1 water Well G-8, 12-13-06
			1			
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	20	15 constituents
			1			
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	10	Water well located at landfill boundary per pdf map in groundwater report
		1				
Number of Downgradient Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2	20	24 wells
			1			
Proximity of Landfill to Downgradient Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1	10	.21 miles
			1			
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	5	Closure Application August 2001
		1				
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	3	
	1					
TOTAL POINTS					110	

Plan View Photo – Receptors

Guernsey - 10.260



miles |—————| 1 2

27N 66W 26, 35



Gwtr Flow Direction = $142^{\circ} > 257^{\circ}$

Closest Downgradient Well - P126743W 27N 66W 35 NWNE

TD - 60'

Static - 14'

Distance - ~0'

Closest Downgradient Residence = > 1,000' (.21 miles)

Closest Downgradient Surface Water (N. Platte) = > 1000' (.48 miles)

No. Water Supply Wells Downgradient of Facility = 24

Corrective Action Assessment Form

Corrective Action Assessment for the Guernsey Landfill

Date: 10-17-12 DEQ staff M. D. Jennings

Facility information: Acres 8 Waste volume (yds³) 100,000

Potential haul distance 115 miles To Central Wyoming Regional Landfill

Shallowest depth to groundwater in down gradient wells 14' – Water well P126743W

Receptors affected or potentially affected: ~3 DG water wells located within 1,000'; No DG residences located within 1,000'; No DG surface water located within 1,000'

Other site specific information: Dig & Haul preferred.

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater	5	5	3	2	4	5
Receptors within 1,000 feet DG (water supply wells, surface water, residences)	4	4	2	2	3	5
Initial cost	4	3	1	3	1	1
Long term cost / O&M	4	3	5	4	1	5
Timeliness in achieving protection	2	3	5	4	4	5
Technical practicability	5	5	3	4	2	5
Total:	24	23	19	19	15	26

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.

Remediation Cost Assessment

Guernsey (10.260):

Dig & Haul –

Off-site option = **\$2,661,000**

Other Remedies Evaluated:

Monitoring – 14 wells (average sample depth = 70') monitored semi-annually for Baseline and Appendix A constituents

20 years = **\$698,678**

Capping – FML cap covering 8 acres. Construction soils obtained off-site

= **\$2,393,506**

Gas System (enhanced) – 8 passive gas recovery wells (1 well/acre) – 16" dia. – Depth ~14.25'

= **\$26,551**

Appendix I
Newcastle #1 Evaluation Information

Newcastle #1 – 10.415

Priority (Phase I) Criteria

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: Newcastle #1		DEQ File Number: 10.415		DATE: 1-12-11		
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 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		.15 miles
			1		20	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		3.06' - Well MMW-14, 9-20-10
			1		10	
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		Nitrogen, Nitrate + Nitrite as N
			1		10	
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		Manganese - 24 mg/l = 480 x gps for Class I water MMW-14, 1-13-10
			1		20	
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		
			1		2	
Proximity of Landfill to a Permitted or Otherwise Identified Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2		.58 miles per pdf map in groundwater report
			1		2	
Number of Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		22 wells
			1		20	
Proximity of Landfill to Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		.10 miles
			1		10	
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		
			1		1	
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		
		1			15	
TOTAL POINTS					110	

Priority (Phase II) Criteria

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: Newcastle #1 **DEQ File Number: 10.415** **DATE: 1-12-11**

CRITERIA	1 Point	5 Points	10 Points	Multiplier	Score	Comments
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		.15 miles
			1		20	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		3.06' - Well MMW-14, 9-20-10
			1		10	
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		Nitrogen, Nitrate + Nitrite as N
			1		10	
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		Manganese - 24 mg/l = 480 x gps for Class I water MMW-14, 1-13-10
			1		20	
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		
			1		2	
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		~.64 miles to the WNW
			1		2	
Number of Downgradient Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		20 wells
			1		20	
Proximity of Landfill to Downgradient Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		.10 miles
			1		10	
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		
			1		1	
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		
		1			15	
TOTAL POINTS					110	

Plan View Photo – Receptors

Newcastle #1 - 10.415



miles |—————| 1



45N 61W 32

Gwtr Flow Direction = $301^{\circ} > 45^{\circ}$

Closest Downgradient Well - P77159W 45N 61W 29 SWSW

TD - 32'

Static - 6'

Distance - ~3,390' (WNW)

Closest Downgradient Residence = .10 miles (due N) ★

Closest Downgradient Surface Water (creek) = .15 miles (NNE) ✦

No. Water Supply Wells Downgradient of Facility = 20

Corrective Action Assessment Form

Corrective Action Assessment for the Newcastle #1 Landfill
 Date: 6-19-12 DEQ staff M. D. Jennings

Facility information: Acres 31.2 (GE) Waste volume (yds³) 710,007
 Potential haul distance 76 miles To Campbell County #2
 Shallowest depth to groundwater in down gradient wells 3.06' MMW-14 (DG well at 32')
 Receptors affected or potentially affected: No DG water wells located within 1,000'; DG creek located ~800' to the NNE; ~32 residences located DG within 1,000'
 Other site specific information: Newcastle #1: Historic landfill starting prior to 1945. Ceased operations in 1989. They filled the ravines at the site and burned them until the 1980s. There were 7 trenches total. The total facility area was around 38 acres. Approximately 21 acres was ravine type fill methods (whole cars, etc.). Based on topographic map, the topography change within the 21 acres is around 100'. In 1977 the population of Newcastle was 4,200 people. Anecdotal information about barrels of anti-freeze dumped into the landfill as well as unknown wastes disposed of by the National Guard over 2-3 weeks. Springs and/or leachate seeps are noted just down gradient of the landfill. There is a limited area of landfill gas. A Cutoff Wall is the preferred remedial action.

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater	5	5	5	2	3	3
Receptors within 1,000 feet (water supply wells, surface water, residences)	2	4	4	3	4	5
Initial cost	4	4	2	4	1	1
Long term cost / O&M	2	3	5	4	1	5
Timeliness in achieving protection	2	3	4	3	3	5
Technical practicability	4	4	4	4	2	2
Total:	19	23	24	20	14	21

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.

Remediation Cost Assessment

Newcastle #1 (10.415):

Cutoff Wall – 3,205' long covering the north, west and east sides of the facility. 30' deep

Installation Costs = **\$1,029,644**

Operational Costs (20 groundwater extraction wells for 20 years) = **\$337,698**

w/ Monitoring – 5 wells (average sample depth = 15.09'). Monitored semi-annually for Baseline and Appendix A constituents

20 years - **\$279,989**

Total (Installation + 20 years Operation + 20 years Monitoring) =
\$1,647,331

Other Remedies Evaluated:

Phytoremediation – Plantings covering an area ¼ mile long covering the north border of the facility and 450' deep to the south up the east and west borders of the facility.

Installation Costs = **\$612,428**

w/ Monitoring (from above) = **\$279,989**

Total (Installation + 20 years Monitoring) = **\$892,417**

Appendix J
Buffalo #1 Evaluation Information

Buffalo – 10.050

Priority (Phase I) Criteria

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: Buffalo #1	DEQ File Number: 10.050	DATE: 8-31-11	

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 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		.47 miles
	1				2	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		27.21' - MW-1S, 4-27-09
			1		10	
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		Chlorobenzene Dichloroethene, cis 1,2 Nitrogen, Nitrate + Nitrite as N Tetrachloroethene
			1		10	
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		Nitrogen, Nitrate + Nitrite as N - 155 mg/l = 15.5 x gps MW-1-S, 7-16-09
			1		20	
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		12 constituents
			1		20	
Proximity of Landfill to a Permitted or Otherwise Identified Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2		0.3 miles based on pdf map in groundwater report
	1				2	
Number of Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		16 wells
			1		20	
Proximity of Landfill to Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		.07 miles
			1		10	
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		
		1			5	
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		
	1				3	
TOTAL POINTS					102	

Priority (Phase II) Criteria

Municipal Landfill Priority List Criteria (July 22, 2011)

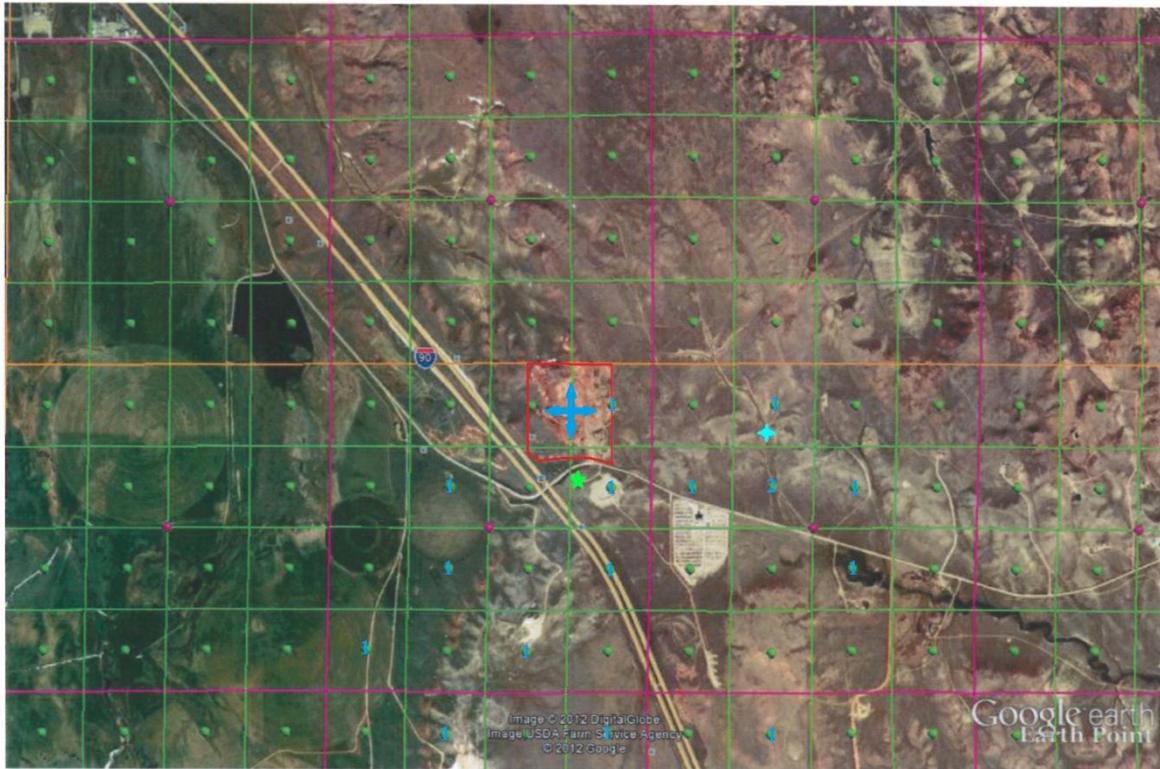
This ranking is used to prioritize municipal landfills where corrective measures are required because contaminant concentrations in downgradient wells statistically exceed groundwater protection standards.

Facility Name: Buffalo #1 **DEQ File Number: 10.050** **DATE: 8-31-11**

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	2	.47 miles
	1					
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1	10	27.21' - MW-1S, 4-27-09
			1			
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	10	Chlorobenzene Dichloroethene, cis 1,2 Nitrogen, Nitrate + Nitrite as N Tetrachloroethene
			1			
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	20	Nitrogen, Nitrate + Nitrite as N - 155 mg/l = 15.5 x gps MW-1-S, 7-16-09
			1			
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	20	12 constituents
			1			
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	10	0.3 miles based on pdf map in groundwater report
		1				
Number of Downgradient Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2	20	16 wells
			1			
Proximity of Landfill to Downgradient Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1	10	.07 miles
			1			
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	5	
		1				
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	3	
	1					
TOTAL POINTS					110	

Plan View Photo – Receptors

Buffalo #1 - 10.050



miles |—————| 1

50N 81W 5



Gwtr Flow Direction = $0^{\circ} > 360^{\circ}$

Closest Downgradient Well - P114928 - 50N 81W 5 NENE

TD - 263'

Static - 202'

Distance - ~0'

Closest Downgradient Residence - .07 miles ★

Closest Downgradient Surface Water (stock pond) - > 1,000' (.47 miles due E) ✦

No. Water Supply Wells Downgradient of Facility = 16

Corrective Action Assessment Form

Corrective Action Assessment for the Buffalo #1 Landfill

Date: 6-15-12, 11-15-12 DEQ staff M.D. Jennings

Facility information: Acres 22 w/ waste Waste volume (yds³) 498,500

Potential haul distance .25 miles To Lined area of Buffalo #1

Shallowest depth to groundwater in down gradient wells 27.21' – MW-1S (DG water well = 202')

Receptors affected or potentially affected: DG homes at .07 miles; water well located on landfill; 2 DG water wells located within 1,000'; 1 DG residence located within 1,000'; No surface water located within 1,000'.

Other site specific information: Preferred remedial approach is to cap unlined disposal area and implement Monitored Natural Attenuation.

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater	5	5	1	1	1	4
Receptors within 1,000 feet DG (water supply wells, surface water, residences)	3	3	4	3	4	4
Initial cost	5	3	1	2	2	1
Long term cost / O&M	2	3	4	4	1	5
Timeliness in achieving protection	2	2	5	1	4	5
Technical practicability	5	5	2	1	3	1
Total:	22	21	17	12	15	20

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.

Remediation Cost Assessment

Buffalo (10.050):

Capping – Evapotranspiration cap covering 22 acres. Construction soil(s) obtained on-site

= \$1,818,614

Monitoring – 21 wells (average sample depth = 126') monitored semi-annually for Baseline and Appendix A constituents

20 years = **\$1,032,990**

Appendix K
Cheyenne Evaluation Information

Cheyenne – 10.080

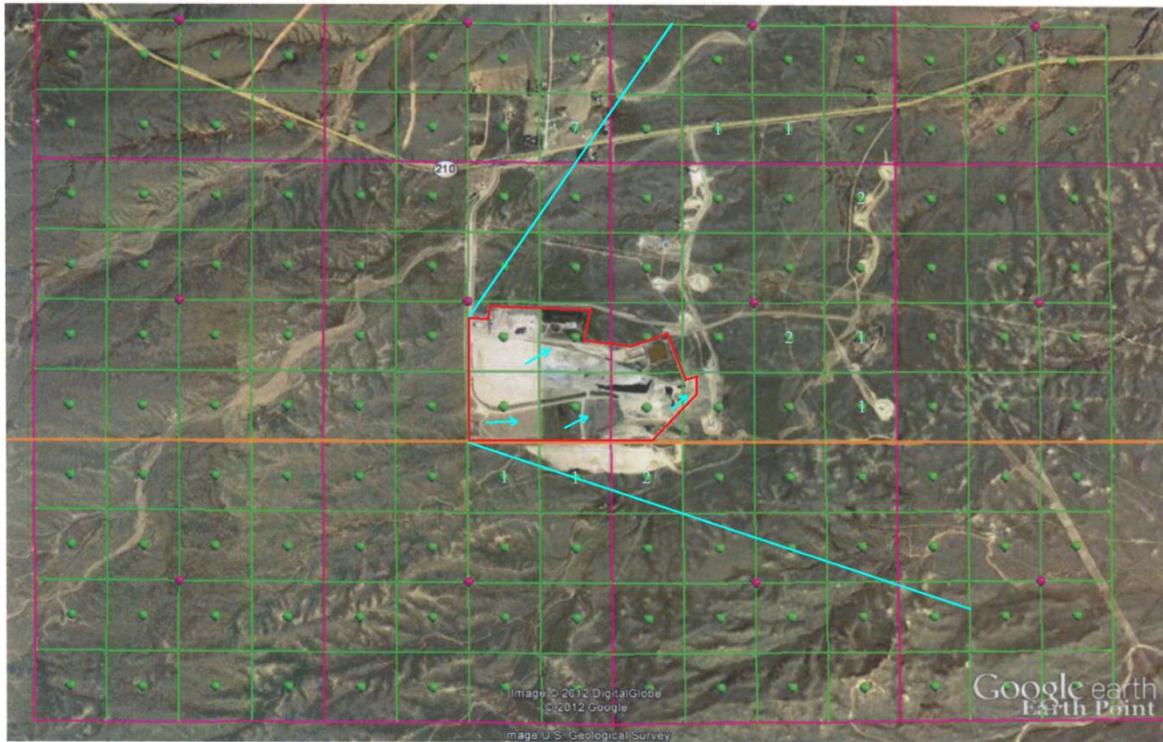
Priority (Phase I) Criteria

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: Cheyenne (Happy Jack)	DEQ File Number: 10.080	DATE: 9-2-11

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 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		2.41 miles
					0	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		.42' - Well P-4, 5-14-03
			1		10	
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		Chloromethane Dichlorodifluoromethane Dichloroethane, 1,1 - Dichloroethene, cis-1,2-; Methylene chloride Tetrachloroethene; Trichloroethene; Vinyl chloride; Trichlorofluoromethane
			1		10	
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		Ammonia as N - 645 mg/l = 1390 x gps for Class 1 water Well NT-2, 4-30-03
			1		20	
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		16 constituents
			1		20	
Proximity of Landfill to a Permitted or Otherwise Identified Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2		.13 miles per pdf map in groundwater report
		1			10	
Number of Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		40 wells
			1		20	
Proximity of Landfill to Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		.54 miles
		1			5	
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		Drilling Report May 2009
			1		10	
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		
	1				3	
TOTAL POINTS					108	

Plan View Photo – Receptors

Cheyenne Landfill - 10.080



14N 68W 33, 34

Gwtr Flow Direction = 33° > 109°

Closest Downgradient Well - P74560 - 13N 68W 4 NWNE

TD - 15'

Static - 12'

Distance - ~700' (due S)

Closest Downgradient Residence = > 1,000'

Closest Downgradient Surface Water = > 1,000'

No. Water Supply Wells Downgradient of Facility = 19



Corrective Action Assessment Form

Corrective Action Assessment for the Cheyenne Landfill

Date: 10-17-12 DEQ staff M. D. Jennings

Facility information: Acres 101 Waste volume (yds³) 4,200,000

Potential haul distance .25 miles To Lined area of Cheyenne landfill

Shallowest depth to groundwater in down gradient wells 12' – Water well P74560

Receptors affected or potentially affected: 19 DG water wells within 1 mile; 3 DG water wells within 1000'; No DG residences within 1000'; No DG surface water within 1000'

Other site specific information: Cap improvements over unlined areas would be preferred. Dig and Haul cost and complex geology for Pump & Treat make those options less viable.

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater	5	5	4	2	4	5
Receptors within 1,000 feet DG (water supply wells, surface water, residences)	4	4	2	2	3	5
Initial cost	4	4	2	4	1	1
Long term cost / O&M	3	3	2	4	1	5
Timeliness in achieving protection	2	3	3	3	2	5
Technical practicability	4	4	2	2	3	5
Total:	22	23	15	17	14	26

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.

Remediation Cost Assessment

Cheyenne (10.080):

Monitoring – 43 wells (average sample depth = 122') monitored semi-annually for Baseline and Appendix A constituents

20 years = **\$1,823,729**

Capping – 40 mil HDPE cap covering 76 acres. Construction soils obtained on-site

= **\$7,494,767**

Gas System (enhanced) – 76 passive gas recovery wells (1 well/acre) – 16" dia. – Depth ~22.5'

= **\$225,227**

Other Remedies Evaluated:

Pump & Treat –

Installation costs = **\$1,817,371**

Operational Costs (20 years) = **\$181,507**

Total (Installation + 20 years Operation) = **\$1,998,878**

Appendix L
Riverton #1 Evaluation Information

Riverton #1 – 10.215

Priority (Phase I) Criteria

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: Riverton #1	DEQ File Number: 10.215	DATE: 9-8-11	

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 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		.11 miles
		1			10	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		2.95' - Well W-8, 5-8-01
			1		10	
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		Dichloroethane, 1,1-Vinyl chloride above MCL.
			1		10	
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		Iron - 50.6 mg/l = 168.66 x the gps for Class I water Well W-6, 2-12-09
			1		20	
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		13 constituents
			1		20	
Proximity of Landfill to a Permitted or Otherwise Identified Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2		.17 miles per pdf map in groundwater report
		1			10	
Number of Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		162 wells
			1		20	
Proximity of Landfill to Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		.07 miles
			1		10	
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		
			1		10	
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		Nature and extent investigation on-going. CAP compromised. Waste buried in groundwater. High priority.
		1			15	
TOTAL POINTS					135	

Priority (Phase II) Criteria

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: Riverton #1 **DEQ File Number: 10.215** **DATE: 9-8-11**

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		~1,000'
		1			10	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		2.95' - Well W-8, 5-8-01
			1		10	
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		Dichloroethane, 1,1-Vinyl chloride above MCL.
			1		10	
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		Iron - 50.6 mg/l = 168.66 x the gps for Class I water Well W-6, 2-12-09
			1		20	
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		13 constituents
			1		20	
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		~130' (due S)
		1			10	
Number of Downgradient Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		2 wells
	1				2	
Proximity of Landfill to Downgradient Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		Appears to be > 3 miles
					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		
			1		10	
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		Nature and extent investigation on-going. CAP compromised. Waste buried in groundwater. High priority.
		1			15	
TOTAL POINTS					107	

Plan View Photo – Receptors

Riverton #1 - 10.215



miles  1

1N 4E 36



Gwtr Flow Direction = $71^{\circ} > 107^{\circ}$

Closest Downgradient Well - P2999P - 1N 4E 36 SWNW

TD - ?

Static - ?

Distance - 130' (due S)

Closest Downgradient Residence = $> 1,000'$

Closest Downgradient Surface Water (creek) = $> 1,000'$

No. Water Supply Wells Downgradient of Facility = 2

Corrective Action Assessment Form

Corrective Action Assessment for the Riverton #1 Landfill
 Date 10-17-12, 10-29-12 DEQ staff M. D. Jennings

Facility information: Acres 60 Waste volume (yds³) 650,000
 Potential haul distance 11.5 miles To Sand Draw

Shallowest depth to groundwater in down gradient wells Well W-8 – 7' Avg. = 8.5'

Receptors affected or potentially affected: ~1DG water well located within 1,000'; No DG surface water located within 1,000'; No DG residence located within 1,000'; River located ~2,500' away.

Other site specific information: Cap & Monitor will not work. Waste is approximately 15' deep. A Cutoff Wall probably would not enhance recovery.

Note: A Cutoff Wall could be utilized, but only after Pump & Treat has been tried.

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater	3	2	5	3	5	2
Receptors within 1,000 feet (water supply wells, surface water, residences)	3	3	4	2	4	5
Initial cost	3	3	2	3	2	1
Long term cost / O&M	3	2	2	4	2	5
Timeliness in achieving protection	3	2	2	2	2	5
Technical practicability	4	3	4	5	5	5
Total:	19	15	19	19	20	23

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.

Remediation Cost Assessment

Riverton #1 (10.215)

Pump & Treat –

Installation Costs = **\$161,605**

Operational Costs (20 years) = **\$776,837**

w/ Monitoring – 12 wells (average sample depth = 8.5') monitored semi-annually for Baseline and Appendix A constituents

Installation costs (2 new wells) = **\$20,000**

20 years = **\$586,555**

Monitoring Total = **\$606,555**

Total (Installation + 20 years Operation + 20 years Monitoring) =
\$1,544,997

Other Remedies Evaluated:

Cutoff Wall – Slurry Wall (1,500' long emplaced along the eastern margin of the facility
- To be installed should Pump & Treat prove insufficient)

Installation Costs = **\$674,724**

Operational Costs (20 years) = **\$776,837**

w/ Monitoring – (As with Pump & Treat)

Monitoring Total = **\$619,888**

Total (Installation + 20 years Operation + 20 years Monitoring) =
\$2,071,449

Appendix M
Campbell County #2 Evaluation Information

Campbell County #2 -10.066

Priority (Phase I) Criteria

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: Campbell Co. #2	DEQ File Number: 10.066	DATE: 9-1-11	

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 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		.33 miles
	1				2	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		4.85' - Well LF2-C, 6-27-10
			1		10	
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		Chloroethane Dichlorodifluoromethane Dichloroethane, 1,1- Methylene chloride Nitrogen, Nitrate + Nitrite as N
			1		10	
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		Iron - 51 mg/l = 170 x gps for Class I water Well CCBF-6, 6-6-02.
			1		20	
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		13 constituents
			1		20	
Proximity of Landfill to a Permitted or Otherwise Identified Water Supply Well	1/4 - 1 mile	< 1/4 mile or unknown	Contamination has been detected in a water supply well	2		0.0 miles - Well located within the landfill boundary per pdf map in groundwater report.
		1			10	
Number of Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		18 wells
			1		20	
Proximity of Landfill to Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		.49 miles. The structure identified may be part of a coal mine and requires further evaluation.
		1			5	
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	1		10	
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		
	1				3	
TOTAL POINTS					110	

Priority (Phase II) Criteria

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: Campbell Co. #2

DEQ File Number: 10.066

DATE: 9-1-11

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		> 1 mile
					0	
Proximity of Leachate to Nearest Groundwater (estimated using the shallowest measured depth to groundwater)	> 80 feet	35 - 80	< 35 feet	1		4.85' - Well LF2-C, 6-27-10
			1		10	
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		Chloroethane Dichlorodifluoromethane Dichloroethane, 1,1- Methylene chloride Nitrogen, Nitrate + Nitrite as N
			1		10	
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		Iron - 51 mg/l = 170 x ggs for Class I water Well CCBF-6, 6-6-02.
			1		20	
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		13 constituents
			1		20	
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		0.0 miles - Well located within the landfill boundary per pdf map in groundwater report.
		1			10	
Number of Downgradient Water Supply Wells Within One Mile of Landfill	<5	5 to 10 or unknown	>10	2		4 wells
	1		1		22	
Proximity of Landfill to Downgradient Residences	1 to 3 miles	1/4 to 1 mile or unknown	< 1/4 mile	1		>1 mile
	1				1	
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	1		10	
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		
	1				3	
TOTAL POINTS					106	

Plan View Photo – Receptors

Campbell County #2 - 10.066



miles  1



51N 72W 15

Gwtr Flow Direction = $343^{\circ} > 17^{\circ}$

Closest Downgradient Well - P7387W - 51N 72W 15 SESE

TD - 460'

Static - 305'

Distance - ~0.0 miles (within landfill boundary)

Closest Downgradient Residence = > 1,000'

Closest Downgradient Surface Water = > 1,000'

No. Water Supply Wells Downgradient of Facility = 4

Corrective Action Assessment Form

Corrective Action Assessment for the Campbell County #2 Landfill
 Date 10-18-12 DEQ staff M. D. Jennings

Facility information: Acres 17 (of unlined waste disposal) Waste volume (yds³) 1,429,460
 Potential haul distance .25 miles To Potential lined area of Campbell County #2
 Shallowest depth to groundwater in down gradient wells 4.85' – Well LF2-C (DG? water well ~ 85')
 Receptors affected or potentially affected: 1 DG water well located within 1,000'; No DG residences located within 1,000'; No surface water located within 1,000'

Other site specific information: The preferred remedial approach would be to cap the unlined disposal area and implement Monitored Natural Attenuation. Installation of a landfill gas extraction system may be needed if Monitored Natural Attenuation is unsuccessful.

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater	5	5	3	1	3	4
Receptors within 1,000 feet DG (water supply wells, surface water, residences)	5	4	4	4	4	5
Initial cost	5	5	2	3	1	1
Long term cost / O&M	2	3	5	3	1	5
Timeliness in achieving protection	4	4	4	3	3	5
Technical practicability	5	4	2	1	3	3
Total:	26	25	20	15	15	23

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.

Remediation Cost Assessment

Campbell County #2 (10.066):

Monitoring – 9 wells (average sample depth = 38.26') monitored semi-annually for Baseline and Appendix A constituents.

20 years = **\$473,450**

Capping – Evapotranspiration (ET) cap covering 17 acres. Construction soils obtained off-site

= **\$3,966,231**

Gas System (enhanced) – 17 passive gas recovery wells (1 well/acre) – 16" dia. – Depth ~45'

= **\$94,925**

Appendix N
Corrective Action Assessment Form

Corrective Action Assessment Form

Corrective Action Assessment for the _____ Landfill

Date: _____ DEQ staff _____

Facility information: Acres _____ Waste volume (yds³) _____

Potential haul distance _____ To _____

Shallowest depth to groundwater in down gradient wells _____

Receptors affected or potentially affected: _____

Other site specific information: _____

Factor	Cap & Monitor	Gas System	Cutoff Wall	Phytoremediation	Pump and Treat	Dig and Haul
Depth to Groundwater						
Receptors within 1,000 feet DG (water supply wells, surface water, residences)						
Initial cost						
Long term cost / O&M						
Timeliness in achieving protection						
Technical practicability						
Total:						

In consideration of site specific factors and relative characteristics of the corrective action method rank each remediation alternative on a scale of 1 – 5; 1 being not good / not desirable / not effective / less protective / more expensive and 5 being good / desirable / effective / more protective / less expensive.