King County

1200 King County Courthouse
516 Third Avenue
Seattle, WA 98104

KING COUNTY

Signature Report

July 26, 2016

Motion 14691

Proposed No. 2016-0097.2 **Sponsors** Dembowski

A MOTION accepting receipt of a report related to the plan to stabilize closed landfills in accordance with the 2015/2016 Biennial Budget Ordinance, Ordinance 17941, Section 55, Proviso P1.

WHEREAS, the 2015/2016 Biennial Budget Ordinance, Ordinance 17941, Section 55, Proviso P1, states that fifty thousand dollars shall not be expended or encumbered until the executive transmits a plan to stabilize closed landfills and a motion that accepts receipt of the report and the motion is passed by the council, and

WHEREAS, the plan shall include, but not be limited to, the required steps to achieve the level of stability necessary to complete and conclude monitoring and maintenance requiremeents, including:

A. A summary of the current status of each of the retired landfills;

B. Specific actions required to achieve environmental stability for each landfill;

C. A timeline for achieving environmental stability and projected conclusion of monitoring and maintenance responsibility;

D. A financial plan to support necessary actions, including any anticipated rate impacts; and

E. A summary of any lessons learned that may be applicable to the Cedar Hills landfill, and

WHEREAS, the executive has transmitted to the council the requested report and a motion;

NOW, THEREFORE, BE IT MOVED by the Council of King County:

The report related to the plan to stabilize closed landfills submitted as Attachment A to this motion in accordance with the 2015/2016 Biennial Budget Ordinance, Ordinance 17941, Section 55, Proviso P1, is hereby accepted.

Motion 14691 was introduced on 2/8/2016 and passed by the Metropolitan King County Council on 7/25/2016, by the following vote:

Yes: 8 - Mr. von Reichbauer, Ms. Lambert, Mr. Dunn, Mr. McDermott, Mr. Dembowski, Mr. Upthegrove, Ms. Kohl-Welles and Ms. Balducci
No: 0
Excused: 1 - Mr. Gossett

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

J. Joseph McDermott, Chair

ATTEST:

Anne Noris, Clerk of the Council

Attachments: A. Report on Plan to Stabilize Closed Landfills, July 19, 2016

ATTACHMENT A - 14691

Report on the Plan to Stabilize Closed Landfills

Prepared in accordance with the 2015/2016 Biennial Budget Ordinance 17941, Ordinance 17941, Section 55, Proviso P1

July 19, 2016

King County
Department of Natural Resources and Parks
Solid Waste Division

Contents

Executive Summary

The following report is in response to a budget proviso in the 2015/2016 Biennial Budget Ordinance, Ordinance 17941, Section 55, Proviso P1 on the plan to stabilize and end post-closure activities at closed landfills. It summarizes the current state of each of the landfills (page 7), current and planned actions to achieve stability (pages 8-9), and a current financial plan to support necessary actions (page 10). Public Health-Seattle & King County (Public Health) and the Washington State Department of Ecology (Ecology) will ultimately make the decision on ending post-closure activities based on the demonstration that the landfill is stable. The Solid Waste Division of the Department of Natural Resources and Parks is working closely with Ecology to clarify and determine the path and timeline for closure, but the decision ultimately lies with Ecology. Discussions are becoming more productive between the division and Ecology as Ecology works to define when stability has occurred and a landfill is deemed to no longer be a potential hazard to public health and environmental protections. This is an ongoing process as the science continues to evolve.

A landfill will be deemed stable when Ecology determines that little or no settlement, gas production, or leachate generation is detected. The division is aware of only one landfill in the state, the Horsethief Landfill located in eastern Washington, which has submitted a report to Ecology demonstrating that the landfill is stable. Ecology, however, still has not determined if the findings are adequate to cease postclosure activities. As Ecology has discretion on when a closed landfill can be considered stabilized, and they have yet to provide that guidance on the more than 60 closed landfills in the state, it is currently not possible to set a firm timeline for ending post closure activities.

The division is responsible for maintaining and monitoring seven closed landfills that were constructed under different standards than those that guide landfill development today. Depending on the year the landfill closed, a minimum maintenance and monitoring post-closure period of five to 30 years is specified in the Washington Administrative Code (WAC), but the timeline is not definite in state law. Although most of the closed landfills have reached the end of the required minimum post-closure period, regulations and the understanding of closure requirements have changed, requiring ongoing maintenance and monitoring. Data is being collected to develop the rate proposal for the next biennial budget and the division is analyzing how to best fund continued maintenance and monitoring costs through that process.

The division has studies underway at the Vashon, Cedar Falls, Hobart, and Enumclaw landfills to determine what additional actions are needed for these landfills to reach a stable state. When a stable state has been reached, post-closure activities at these landfills may be reduced or terminated, if Ecology approves. Decisions on these locations by Ecology will allow the division to better create a timeline and plan for the remainder of the closed landfills.

Introduction

This report has been developed in accordance with the requirements of the 2015/2016 Biennial Budget Ordinance 17941, Section 55, Proviso P1 which states:

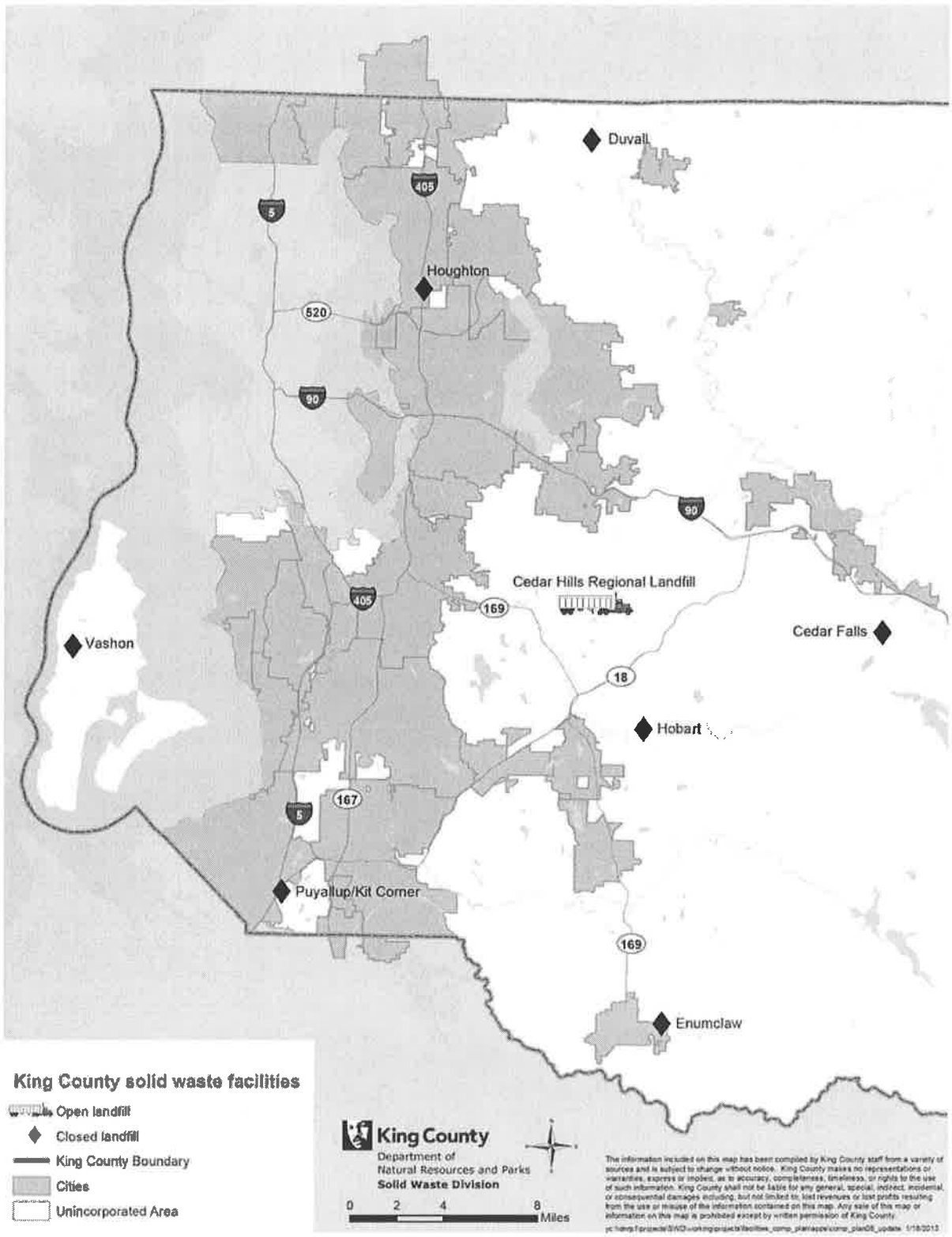
> *Of this appropriation, $50,000 shall not be expended or encumbered until the executive transmits a plan to stabilize post-closure ("retired") landfills to protect human health and the environment and a motion that accepts the report and the motion is passed by council. The motion shall reference the subject matter, the proviso's ordinance, ordinance section, and proviso number in both the title and body of the motion.*
>
> *The plan shall include, but not be limited to, the required steps to achieve the level or stability necessary to complete and conclude monitoring and maintenance requirements, including:*
>
> A. *A summary of the current status of each of the retired (closed) landfills;*
> B. *Specific actions required to achieve environmental stability for each landfill;*
> C. *A timeline for achieving environmental stability and projected conclusion of monitoring and maintenance responsibility;*
> D. *A financial plan to support necessary actions, including any anticipated rate impacts; and*
> E. *A summary of any lessons learned that may be applicable to the Cedar Hills landfill.*

King County Maintains Seven Closed Landfills

The division is responsible for maintaining and monitoring seven closed landfills (see Figure 1) that closed between the mid-1960s and 2002. The closed (retired) landfills were constructed under different standards than those that guide landfill development today. With the exception of portions of the Vashon Landfill constructed after 1989, they are unlined and, in some cases, do not incorporate all of the environmental control systems present in a modern landfill. The division maintains the environmental control systems at the landfills and routinely monitors groundwater, surface water, wastewater, and landfill gas levels to ensure that they do not pose a risk to human health or the environment.

Since most of the closed landfills have reached the end of their required minimum post-closure periods, evaluations are required to determine what level of ongoing maintenance and monitoring will be needed. The division has studies underway at the Vashon, Cedar Falls, Hobart, and Enumclaw landfills to determine what additional actions are needed for these landfills to reach a stable state. When a stable state has been reached, post-closure activities at these landfills may be reduced or terminated, if Ecology approves. Decisions on these locations by Ecology will allow the division to better create a timeline and plan for the remainder of the closed landfills.

Figure 1: Location of Closed Landfills



Closure Date Determines Which Regulations Apply

Since 1972, federal (Resource Conservation and Recovery Act Title 40, Subtitle D, Part 258, Subpart F – Closure and Post-Closure Care) and state (Washington Administrative Code 173-301, 304, and 351) requirements for the management of closed landfill sites have become more specific, resulting in changes to the division's environmental monitoring programs and reporting requirements.

Under the current monitoring program, sampling data is collected from more than 180 groundwater, surface water, and wastewater monitoring stations and approximately 100 landfill gas monitoring stations at all seven landfills. The data is summarized quarterly and annual reports are submitted to the Ecology and Public Health.

Closure of a landfill "means those actions taken by the owner or operator of a mixed solid waste landfill unit or facility to cease disposal operations and to ensure that a mixed solid waste landfill unit or facility is closed in conformance with applicable regulations at the time of such closures and to prepare the site for the post-closure period. Closure is considered part of operation (Chapter 173-351 WAC).

Post-closure" means the requirements placed upon disposal sites after closure to ensure their environmental safety for at least a twenty-year period or until the site becomes stabilized (i.e., little or no settlement, gas production, or leachate generation)" (Chapter 173-304 WAC).

Post-closure" means those actions taken by an owner or operator of a facility or MSWLF unit after closure". (Chapter 173-351 WAC).

According to current regulations under Chapter 173-351 WAC, a plan for funding and post-closure maintenance is required to be developed while the landfill is still operating. Currently, the landfills are also required to plan for a minimum thirty year post-closure period. However, these regulations were different or not in place during the closure of landfills prior to 2002. (see Table 1)

Regardless of the post-closure period specified in the regulations, Public Health and Ecology are required to determine if the division can end post-closure activities based on the demonstration that the landfill has reached a stable state as determined by Ecology.

Table 1: Projected minimum maintenance and monitoring post-closure periods

Site	Year closed	Regulation	Planned Post-Closure Period
Puyallup/Kit Corner	Mid-1960's	Chapter 173-301 WAC	N/A
Houghton	1965	Chapter 173-301 WAC	N/A
Duvall	1981	Chapter 173-301 WAC	N/A
Cedar Falls	1989	Chapter 173-304 WAC	1989-2005
Enumclaw	1993	Chapter 173-304 WAC	1993-2013
Hobart	1994	Chapter 173-304 WAC	1994-2014
Vashon	2002	Chapter 173-351 WAC	2002-2032

How will the End of Post-Closure be Determined?

The division is working with Public Health and Ecology to reduce the frequency and amount of monitoring conducted at the closed landfills. Statewide, there are about 60 landfills that were closed under Chapter 173-304 WAC, but still have post-closure activities. None of these closed landfills have

demonstrated to Ecology that they are stable and therefore post-closure activities continue. The division is aware of only one landfill in the state, the Horsethief Landfill in Eastern Washington, which submitted a report in 2014 to Ecology demonstrating that the landfill is stable. Ecology, however, still has not determined if the findings are adequate to cease post-closure activities.

The division is working with consultants to assess what types of projects and systems need to be completed at each landfill to ultimately make the demonstration to Public Health and Ecology that the landfills are stable. The division also is negotiating a "Termination of Post-Closure" demonstration scope with Public Health and Ecology for the Enumclaw Landfill since the groundwater quality meets the stability criteria with no detections of leachate impacts. The process agreed to with the regulatory agencies will be used to support similar demonstrations at the other landfills once the evaluations at those landfills are completed and the needed improvements are implemented. In addition, the monitoring of groundwater and air will need to demonstrate that the stability criteria have been achieved. The division will continue to negotiate and implement efficiencies to the monitoring programs until the landfills demonstrate stable conditions.

Summary of the Current Status of the Closed Landfills

Duvall

The 13-acre Duvall Landfill closed in 1981 with clay and tree cover, a passive leachate collection system around the perimeter, and a flared, passive gas (no vacuum) monitoring system. There is no bottom liner. An emergency radio tower is located on the property. Groundwater treatment, groundwater and landfill gas monitoring, and a poplar tree landfill cover are all in place.

Houghton

The 16-acre Houghton Landfill closed in the mid-sixties with a soil cover, but with no leachate or gas collection systems. An active gas collection and treatment system was installed in the mid 1990's. There is a soil cover, but no bottom liner. Groundwater and landfill gas monitoring are in place. In 1999, the division partnered with the City of Kirkland to construct ballfields on the closed landfill.

Puyallup/Kit Corner

The 20-acre Puyallup/Kit Corner Landfill closed in the mid-sixties with a soil and tree cover and no leachate or gas collection systems in place and no bottom liner. An active gas collection system using carbon treatment was installed, but was subsequently replaced with dispersion venting in 2014. An engineered grass and tree cover system was subsequently installed to enhance the cover performance. Groundwater treatment and monitoring and landfill gas monitoring are in place.

Cedar Falls

The 12-acre Cedar Falls Landfill closed in 1985 with a composite cover, gas collection and a bio-berm for gas treatment. There is no leachate system and no bottom liner. Groundwater, surface water, and landfill gas monitoring are in place.

Enumclaw

The 39-acre Enumclaw Landfill closed in 1993. The engineered cap consists of a clay liner, a synthetic membrane layer, geotextiles used to hold soil in place, and soil cover planted with grass and trees. An active gas collection system with a flare was installed at closure. There is no leachate system and no bottom liner. Stormwater control and groundwater, surface water, and landfill gas monitoring are in place.

Hobart

The 35-acre Hobart Landfill closed in 1994. The landfill has an engineered composite cover and an active flared gas collection system. A leachate containment and extraction system is installed. Leachate pumping was discontinued in 1995. Groundwater and landfill gas monitoring are in place. A model airplane community group uses the property to fly model planes.

Vashon

The 24-acre Vashon Landfill closed in 1999 with an engineered composite liner, leachate collection (gravity pipes with an aeration pond), and gas collection with activated carbon filters. A portion of the landfill has a bottom liner. Stormwater drainage and groundwater, surface water, and landfill gas monitoring are in place.

Actions Required for Landfill Stabilization

Landfill post-closure monitoring and stabilization began in the 1980s and around 60 landfills statewide have closed since that time. However, Ecology has not determined that any are considered stable. As regulations change to address emerging issues, new requirements push former projected timelines further out. Due to these ongoing changes, defining a firm timeline and firm plan is not prudent. The division will continue to work closely with Ecology and Public Health to ensure all closed landfills meet current regulations and can be safely closed when stabilization is determined by Ecology. Based on current regulations and current conversations, the division is taking the following actions to hopefully move the landfills closer to a determination of stabilization by Ecology.

Duvall

- Current plans detailed below are to evaluate the environmental control systems. Evaluation may lead to capital projects budget requests to be included in the 2017/2018 biennium budget cycle, which would likely take approximately five years to complete after appropriation.
- Address low-level contaminants in an area prone to saturation.
- Improve the grass and tree cover to reduce water infiltration.
- Potential installation of a gas collection and control system, as passive flare is no longer sufficient.
- Evaluate landfill gas control system and leachate control system improvements for stabilization. Work to be completed by 2021.

Houghton

- Current plans detailed below are to evaluate the environmental control systems. Evaluation may lead to capital projects budget requests to be included in the 2017/2018 biennium budget cycle, which would likely take approximately five years to complete after appropriation.

- Further reduce greenhouse gases by evaluating the replacement of activated carbon treatment with a bio-filter for effectiveness.
- Address low levels of contaminants in the groundwater.

Puyallup/Kit Corner

- Current plans detailed below are to evaluate the environmental control systems. Evaluation may lead to capital projects budget requests to be included in the 2017/2018 biennium budget cycle, which would likely take approximately five years to complete after appropriation.
- Monitor new groundwater treatment system to ensure continued decrease in groundwater impacts.

Cedar Falls

- Install enhancements to improve gas collection on the northeast side of the landfill. Evaluation of enhancements is scheduled to be completed in 2017.
- Determine if improvements to the cover and landfill gas control and treatment systems will address a seasonal groundwater table that saturates a small portion of the landfill. This project is scheduled to be completed in 2019, contingent upon budget approval.

Enumclaw

- Work with Public Health and Ecology on their request for an evaluation of the environmental control systems and a demonstration that there are no potential future risks that these systems will fail and result in impacts to the groundwater and air. This project will be completed in 2016 and steps will then be taken to authorize termination of post-closure.
- Install a new flare to better handle the decreasing levels of landfill gas. This project will be completed in 2016.

Hobart

- Evaluate existing cutoff wall and groundwater extraction wells to determine performance in isolating groundwater beneath the waste from groundwater external to the waste.
- Install a new flare to better handle the decreasing levels of landfill gas. This project will be completed in early 2017.

Vashon

- Determine if improvements to the cover and landfill gas systems address impacts to groundwater. This project will be completed in 2016 with recommendations for needed improvements.
- Complete evaluation of bio-filter or smaller sized flare to reduce greenhouse gases. This evaluation will be completed in 2017.

Rate Impacts, and the Post-Closure Maintenance Fund

The Post-Closure Maintenance (PCM) fund was established in accordance with King County Code 4A.200.390 *Landfill reserve fund* and 4A.200.710 *Solid waste post-closure landfill maintenance fund*. When post-closure activities began, it was assumed that the Post-Closure Maintenance Fund (PCM) would fully fund complete stabilization. However, changing regulations and the need for additional time and work to stabilize closed landfills have nearly exhausted the fund, which is now forecasted to be at a deficit by 2021. Because of this projected deficit, on-going post-closure maintenance activities are still funded from the PCM fund, but remedial projects are being funded through the Capital Improvement Program budget including work at Cedar Falls, Enumclaw, Hobart, and Vashon landfills. Data is being collected to develop the rate proposal for the 2017/2018 biennial budget and the division is analyzing how to best fund the ongoing maintenance and monitoring costs through that process.

Post-closure costs for ongoing operations for all seven landfills have averaged $1.3 million per year over the last four years. These costs generally focus on maintenance, monitoring, permits, project management, and electrical utility and electrical utility fees and costs. The anticipated costs for needed actions for stabilization are listed below.

The 2015/2016 Adopted Financial Plan begins flat contributions to the Post Closure Maintenance Fund of $1,500,000 per year for 2017/2018 and $2,200,000 per year for 2019/2020. The effective per ton rate would be $1.79, $1.70, $2.52, and $2.41 for years 2017 through 2020. Beginning in 2021, contributions of $0.31 per ton would fund the currently anticipated needs for custodial landfill monitoring, maintenance, and other projects.

Anticipated costs for needed actions

Projected total costs for actions at Duvall, Houghton, and Puyallup/Kit Corner are estimated to be $4.5 million over the 2017-2018 biennium. These actions would add $0.45 per ton to the rate

Actions at the other landfills are already included in the 2015/2016 biennium budget. The locations and totals are below:

Cedar Falls
Improvements currently in the 2015/2016 biennium budget at $2,245,167.

Enumclaw
Improvements currently in the 2015/2016 biennium budget at $947,099.

Hobart
Improvements currently in the 2015/2016 biennium budget at $921,278.

Vashon
Improvements currently in the 2015/2016 biennium budget at $2,350,881.

Lessons Learned Applicable to Cedar Hills

As noted throughout this report, regulations for post-closure have changed through the years as the division, Ecology, and Public Health have learned more about what is needed to stabilize a landfill, such as the length of time to treat groundwater impacts and the availability of new technologies in flares and bio-filters to address gases. The division will be responsive to regulators and changing regulations as Ecology continues to learn and decide what is needed to stabilize a landfill. The division also will be an active partner with Ecology and Public Health in determining regulations.

When the Cedar Hills Regional Landfill reaches capacity and closes, the bottom liner, capped top, and extensive gas and water control systems will inhibit releases to the environment for many years. Applicable regulations will define the minimum post-closure period based on findings that the landfill is functionally stable and does not pose a risk to human health and the environment. Based on experience with the landfills closed under Chapter 173-301 and 304 WAC, the division will pursue the following:

- Work to reach agreement now with Public Health and Ecology to define how functional stability of the landfill will be determined given changing regulations. This could include a negotiated stepdown of monitoring requirements based on defined parameters.
- Budget for funding beyond what is required by the current PCM regulation.

Next Steps

- Continue to partner with Public Health and Ecology to define the process for terminating post-closure and/or implementing monitoring efficiencies while systems are reaching stability.
- Complete planned improvements and evaluations to determine whether additional funding is needed to improve performance of engineering control systems at Cedar Falls, Hobart and Vashon landfills.

- Request budget for similar projects at Duvall, Puyallup/Kit-Corner and Houghton in the 2017/2018 biennial budget.
- Continue to evaluate secondary uses at the closed landfills that could generate revenue, such as recreational activities and selective logging.
- Investigate whether or not individual cells at Cedar Hills that were closed under earlier regulations could have separate post-closure plans compliant with those earlier regulations.