



REPORT

INSPECTION AND MAINTENANCE PLAN FOR CKD RECLAMATION AREA COVERS

Ravensdale Site, Washington

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1.0 BACKGROUND AND PURPOSE

1.1 Background

The Ravensdale Site (Site) is located at 28131 Ravensdale-Black Diamond Road in Ravensdale, Washington.

Cement kiln dust (CKD) was used, in part, for post-mining reclamation in two areas of the Site. The Lower Disposal Area (LDA) encompasses about 7 acres and is located in the northwestern portion of Site. The second area is the Dale Strip Pit (DSP), an area of about 6 acres located in the southeastern portion of the site. These areas are shown on Drawing IM-01 in Appendix A. The Site is currently owned and operated by the Reserve Silica Corporation and is in the reclamation phase. Reserve Silica Corporation is backfilling the remaining historical excavation areas with clean soil from construction sites in the Puget Sound area.

During September and October, 2007, the existing soil cover on the LDA was regraded to provide positive drainage at all locations, reduce overly-steep slope areas, and place a minimum 2-foot-thick clean soil cover over the entire area, including locations where CKD was exposed at the surface. In addition, a diversion ditch was constructed around the upper elevations of the LDA to intercept and divert surface water and shallow seepage. A culvert system was installed to carry flow from this diversion ditch under the main site access road to the discharge location. The toe ditch along the base of the LDA was cleaned out and reshaped, and the entrance to an existing culvert under the access road was also cleared. These features are shown on Drawing IM-02 in Appendix A. Details of the LDA cover construction, including as-built drawings, are presented the *Construction Summary Report* (Golder 2008).

Cover upgrade activities began at the DSP in November 2010 and were completed in July 2011. Cover upgrade activities included stripping surficial vegetation and topsoil, regrading the existing surface to establish positive drainage, placing low permeability soil to provide a minimum 2-foot-thick layer at all locations, filling the existing ditch along the northeast side of the DSP, replacing topsoil, and revegetating the cover surface. In addition, shallow V-ditches were constructed on either side of the access road along the east perimeter of the DSP cover to intercept and divert surface water and shallow seepage. Drainage culverts were installed under the gravel access road on the east perimeter of the DSP to allow surface water to drain away from the DSP cover to the east side drainage ditch along the access road. An existing access road that was located across the top of the DSP cover was resurfaced with gravel. These features are shown on Drawing IM-03 in Appendix A. Details of the DSP cover construction, including as-built drawings, are presented the *Construction Summary Report* (Golder 2013).



1.2 Purpose

This plan has been prepared to establish the procedures for inspecting and maintaining the covers and surface water management systems at the CKD reclamation sites to ensure that they continue to function as designed on an ongoing basis.



2.0 INSPECTION ACTIVITIES

2.1 Covers

The primary concern related to the soil covers is loss of integrity that could expose CKD to the environment or increase the amount of infiltration into the CKD. Loss of integrity could result from erosion or slope instability. Inspection activities will therefore focus on identifying the signs of these types of problems.

The reclamation area will be visually inspected by personnel walking around the perimeter and across the cover in at least one longitudinal and two transverse sections. The inspector will look for the following types of features:

1. Gullies or bare spots due to sheet erosion, indicating excessive erosion.
2. Ponding or damp areas, including the presence of wetland vegetation, indicating significant local settlement.
3. Cracks, slumps, or scarps, indicating localized differential settlement or slope failure.
4. Areas of sparse vegetation that may need re-seeding for continued erosion control.

2.2 Surface Water Management System

The purpose of the surface water management system is direct runoff away from the covers. Inspection activities will therefore focus on identifying conditions that reduce the flow capacity of the system or disrupt its integrity.

The surface water management system will be visually inspected by personnel walking along all ditches, culvert entrances, and culvert discharge locations. The inspector will look for the following types of features:

1. Lack of vegetation, scour in grass-lined channels.
2. Loss of quarry spalls in rock-lined channels and discharge aprons.
3. Localized settlement and ponding.
4. Excessive sediment accumulation.
5. Blockage by debris.
6. Bank sloughing.
7. Excessive debris at culvert entrances.
8. Damage to or deterioration of trash racks and grates.
9. Culvert cross section significantly deformed.
10. Culvert pipe exposed at ground surface.



2.3 Security Facilities

The inspector will verify that gates are locked and in working order and will identify any damaged or missing signs as applicable.

2.4 Documentation

Inspection documentation will include a completed inspection checklist, marked-up drawings, and digital photographs. The results of the inspection will be recorded on the forms presented in Appendix B. Areas of concern and photo locations will be sketched on copies of the drawings included with this plan. Digital photographs will be taken during each inspection at specific locations and at areas of concern. Specific locations are shown on Drawings IM-02 and IM-03 and have been selected to include overall views of the cover slopes and drainage ditches. Other photos will be taken of any areas requiring maintenance and to document the condition of key, small-scale features such as culvert inlets, if necessary.

Copies of the inspection documents will be retained in the project files for a period of 5 years.

2.5 Frequency

Inspections will begin after cover construction has been completed and initially will be performed twice each year, generally at the end of the winter and summer seasons. After 2 years of semi-annual inspection, the observations will be reviewed, and, if conditions are stable and acceptable, the frequency will be decreased to once annually with agency approval.



3.0 MAINTENANCE

3.1 Periodic Maintenance

The only regular maintenance required for the covers is mowing to prevent trees and large bushes from becoming established. This type of vegetation could send roots down through the cover or blow over in a wind storm, disrupting the cover surface. The covers will be mowed at least once each year.

3.2 As-Needed Maintenance

Maintenance of the soil covers and surface water management facilities will be performed on an as-needed basis when the results of the inspections indicate that repairs are necessary. The nature of the maintenance will depend on the type of problem. The following activities are typical examples of minor maintenance that could be required. These should be used as general guidelines for maintenance activities and can be modified as necessary to accommodate the actual field conditions. If uncertain, contact the Project Manager who will consult with a qualified engineer as necessary.

3.2.1 Covers

1. **Erosion**: Replace eroded soil to grade. Revegetate, using jute matting or other material to keep seed in place until established. If erosion is a repeated problem, add crushed gravel to replacement soil, retaining sufficient fine soil to support vegetation (typically 50% to 75% fine soil).
2. **Inadequate vegetation**: Reseed, using jute matting or other material to keep seed in place until established. If vegetation fails to establish, consult qualified specialist to obtain recommendations for evaluating soil chemistry, seed mix, and other factors. Modify revegetation procedures accordingly.
3. **Ponding**: Regrade cover surface to provide positive drainage and reseed. If necessary to achieve grade, add fine-grained soil containing a minimum of 25% by dry weight of material passing the U.S. No. 200 sieve.
4. **Instability**: Offsets or deformation in the cover that reflect deep-seated failure should be evaluated by a qualified engineer and appropriate remedial measures implemented to stabilize the subgrade. After these measures have been completed, the cover surface should be repaired as described above.

3.2.2 Surface Water Management System

1. **General**: Obtain the advice of a qualified engineer prior to making significant changes in materials or geometry of the surface water facilities. All repair and replacement work should be performed in accordance with the original plans and specifications, unless approved otherwise.
2. **Excess sediment**: Remove excess sediment from ditches, inlet structures, culverts and pipes, and other facilities. When removing sediment, take care not to disturb the underlying rock lining or other parts of the facility. If these components are disturbed, restore them to their original condition. Dispose of sediment only in approved locations where it will not re-enter the surface water drainage system. Identify sediment source and mitigate, if feasible.



3. **Debris**: Clear debris from ditches, culvert trash racks, and other facilities. Dispose of garbage off site in a permitted disposal facility. Place vegetation debris on site in approved locations only.
4. **Loss of rock ditch lining**: Replace rock ditch lining other protective layers that have been lost. Use rock of similar quality, size, and gradation to original material; place to nominal design thickness. If protective layer is lost again, use larger rock, grouted riprap, or other more resistant material.
5. **Loss of soil ditch lining**: Replace soil in scoured sections of swales to original grade. Revegetate, using jute matting or other material to keep seed in place until established. If scour is a repeated problem, add crushed gravel to replacement soil, retaining sufficient fine soil to support vegetation (typically 50% to 75% fine soil).
6. **Damage to inlet structures**: Replace or repair metal portions of inlet structures that are damaged or corroded. Where appropriate, prevent future corrosion by fabricating from stainless steel, galvanizing, coating with epoxy, or similar approach.
7. **Damage to culverts**: Replace damaged culverts and pipes that have lost flow capacity. If damage was caused by crushing, use heavier pipe. During replacement, ensure that pipe is placed on suitable granular bedding material and that backfilling is complete and continuous, particularly under pipe haunches.

3.2.3 Security

Repair or replace gates, locks, warning signs, and other security features as required.

3.3 Documentation

Maintenance reports will be prepared to provide a comprehensive documentation of all maintenance activities, using the form presented in Appendix B. Each report will reference the inspection report that triggered the maintenance activity. The report will include a summary of the maintenance activity, the date of the activity, the contractor, sources and descriptions of materials used, and other pertinent information. A complete chronology of maintenance activities will be maintained.

Copies of the maintenance reports will be retained in the project files for a period of 5 years.



4.0 POINTS OF CONTACT

The points of contact at the time of preparing this inspection and maintenance plan are:

The Designer for this project is:

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The Project Manager for this project is:

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Colorado Springs, CO 80903
Mr. Joel Bolduc

Note that personnel may change; if the above individuals are not available, inquire from the associated organization as to their successors.



5.0 REFERENCES

Golder Associates Inc., (Golder). 2008. Construction Summary Report, Lower Disposal Area Cover Upgrade, Reserve Silica Site, Ravensdale, Washington, July 25.

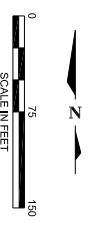
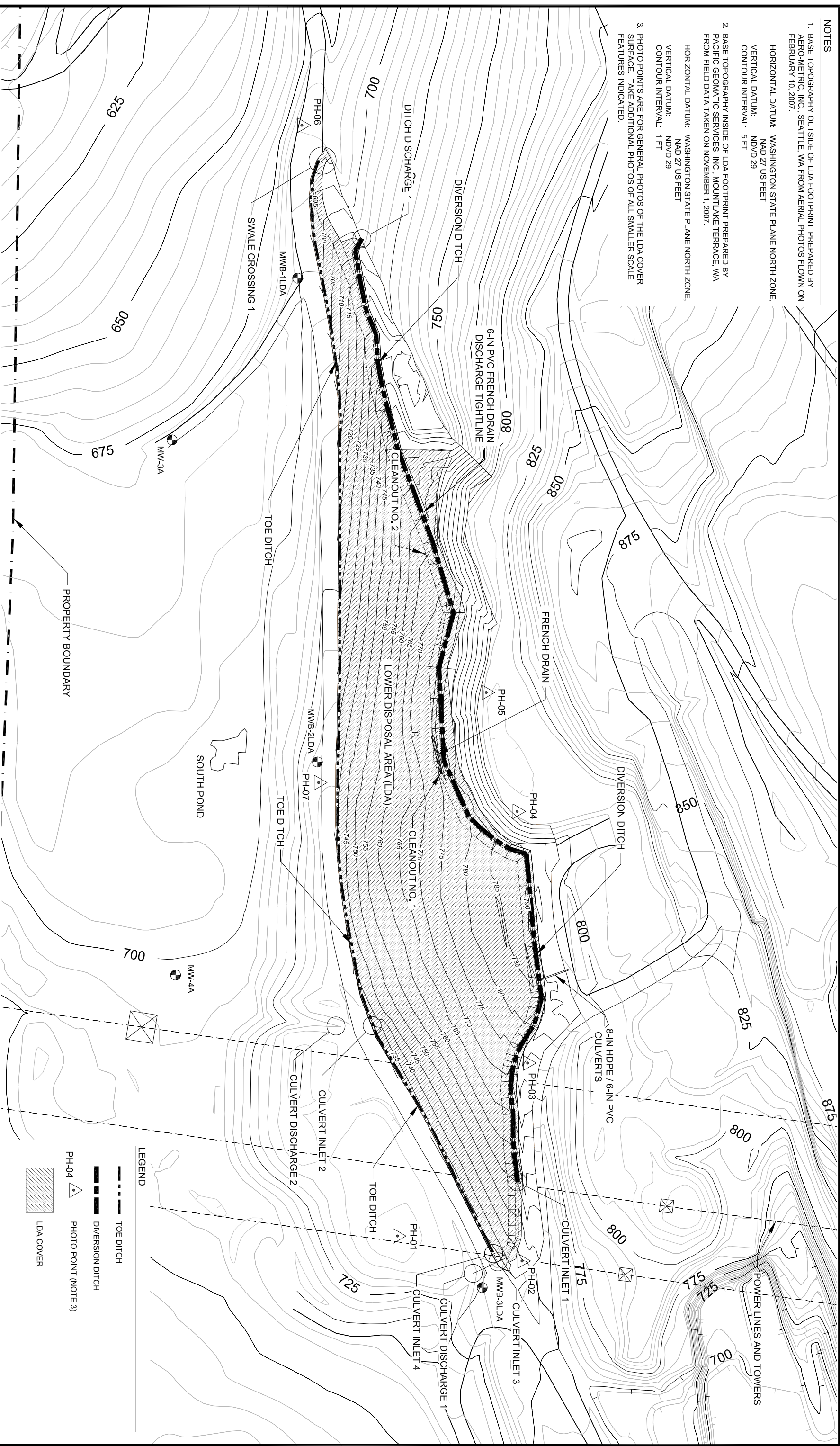
Golder. 2013. Construction Report, Dale Strip Pit Cover Upgrade Project, Ravensdale Site. August 30.



APPENDIX A
DRAWINGS

NOTES

1. BASE TOPOGRAPHY OUTSIDE OF LDA FOOTPRINT PREPARED BY AERO-METRIC, INC., SEATTLE, WA FROM AERIAL PHOTOS FLOWN ON FEBRUARY 10, 2007.
 HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE,
 VERTICAL DATUM: NAD 27 US FEET
 CONTOUR INTERVAL: 5 FT
2. BASE TOPOGRAPHY INSIDE OF LDA FOOTPRINT PREPARED BY PACIFIC GEOMATIC SERVICES, INC., MOUNTLAKE TERRACE, WA FROM FIELD DATA TAKEN ON NOVEMBER 1, 2007.
 HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE,
 VERTICAL DATUM: NAD 27 US FEET
 CONTOUR INTERVAL: 1 FT
3. PHOTO POINTS ARE FOR GENERAL PHOTOS OF THE LDA COVER SURFACE. TAKE ADDITIONAL PHOTOS OF ALL SMALLER SCALE FEATURES INDICATED.



LEGEND

	TOE DITCH
	DIVERSION DITCH
	PH-04 PHOTO POINT (NOTE 3)
	LDA COVER

FIGURE IM-02
LDA INSPECTION LOCATIONS
 HOLCIM / RAVENSDALE PROJECT / WA
Golder Associates

NOTES

1. BASE TOPOGRAPHY OUTSIDE OF DSP FOOTPRINT PREPARED BY AERO-METRIC, INC., SEATTLE, WA FROM AERIAL PHOTOS FLOWN ON FEBRUARY 10, 2007.
 HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE,
 VERTICAL DATUM: NAD 27 US FEET
 CONTOUR INTERVAL: 5 FT
2. BASE TOPOGRAPHY INSIDE OF DSP FOOTPRINT PREPARED BY PARAMETRIX, INC., BELLEVUE, WA FROM FIELD DATA TAKEN JULY 6, 2011.
 HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE,
 VERTICAL DATUM: NAD 27 US FEET
 CONTOUR INTERVAL: 1 FT
3. PHOTO POINTS ARE FOR GENERAL PHOTOS OF THE DSP COVER SURFACE. TAKE ADDITIONAL PHOTOS OF ALL SMALLER SCALE FEATURES INDICATED.



LEGEND


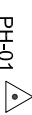

-  DIVERSION DITCH
-  PHOTO POINT (NOTE 3)
-  DSP COVER

FIGURE IM-03
DSP INSPECTION LOCATIONS
 HOLCIM / RAVENSDALE PROJECT / WA
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**APPENDIX B
INSPECTION AND MAINTENANCE FORMS**

**Reserve Silica Site - CKD Disposal Areas
MAINTENANCE RECORD**

Maintenance Record No.: _____

Date(s) of Maintenance: _____

Weather Conditions: _____

Feature: _____

Cross-Reference Inspection Checklist No.: _____

Maintenance Contractor:

Name _____

Address _____

Phone _____

Maintenance Activities: (describe in detail, including any problems or unforeseen conditions;
use additional sheets as necessary)

Materials and Products: (list and describe all materials and products used for the maintenance activity,
including supplier name and location; use additional sheets as necessary)

**Reserve Silica Site - CKD Disposal Areas
MAINTENANCE RECORD**

Maintenance Record No.: _____

Maintenance Documentation: (list all photos and / or drawings of maintenance activity, during and after completion of maintenance; attach photos and / or drawings to this record)

Did Maintenance Require Changes from Recommended Procedures?

Yes

No

If yes, describe changes: (use additional sheets as necessary)

Additional Maintenance Activities Required for this Feature?

Yes

No

If yes, describe changes: (use additional sheets as necessary)

Maintenance Inspected by (print name): _____

Organization: _____

Signature of Maintenance Inspector: _____

Date: _____

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