GEODESIGN INC

LONG-TERM MONITORING, MAINTENANCE, AND CONTINGENCY PLAN

Ross Island Sand & Gravel

4315 SE McLoughlin Boulevard

Portland, Oregon

For

Ross Island Sand & Gravel

April 29, 2011

GeoDesign Project: RossIsland-2-04-04

GeoDesign INC

April 29, 2011

Oregon Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201

Attention: Ms. Jennifer Sutter

Long-Term Monitoring, Maintenance, and Contingency Plan
Ross Island Sand & Gravel
4315 SE McLoughlin Boulevard
Portland, Oregon
GeoDesign Project: RossIsland-2-04-04

On behalf of RIS&G, GeoDesign, Inc. is pleased to submit this LTMMCP for the RIS&G facility (project site) on Ross and Hardtack islands in Portland, Oregon. Remedial actions at the project site have been conducted under DEQ's VCP, and the Order of Consent and Supplemental to the Order of Consent (DEQ No. WMCVC-NWR-99-09), dated November 9, 1999 and May 24, 2006, respectively. With the completion of the sediment cap, remedial actions for the upland and in-water areas identified in the Feasibility Study have been completed in accordance with the remedial design plans and specifications. This LTMMCP incorporates comments from DEQ approval letter dated March 14, 2011 and outlines the long-term monitoring, maintenance, and contingency responses that will be performed to verify that the engineering controls remain in place and protective over the long term.

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We appreciate your assistance on this project. Please call if you have questions regarding this document.

Sincerely,

GeoDesign, Inc

Craig W. Ware, R.G.
Principal Geologist

cc: Mr. Aaron Courtney, Stoel Rives, LLP (via email only)
Mr. Charles Steinwandel, Ross Island Sand & Gravel (two copies)
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Attachments
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1.0 INTRODUCTION

This LTMMCP has been prepared in accordance with the DEQ-approved Remedial Design and Remedial Action Work Plan (GeoDesign, 2006a) for the RIS&G facility located on Ross and Hardtack islands in Portland, Oregon (project site). A draft LTMMCP was submitted to DEQ in January 2008. This LTMMCP incorporates DEQ's March 18, 2008 comments to the draft LTMMCP, incorporates Dr. Danny Reible's comments to the monitoring protocols, and includes updates to reflect the current complete status of the remedial actions. Furthermore, this LTMMCP includes the following:

- A description of the long-term monitoring and maintenance program for the upland and in-water remedial actions completed at the project site.
- A contingency plan if results of the monitoring and maintenance program indicate that the remedial actions are not meeting the RAOs identified in the ROD and Remedial Design/Remedial Action Work Plan.

The project site is shown relative to surrounding physical features on Figure 1. A site plan of the project site is shown on Figure 2.

For your reference, definitions of all acronyms used in this plan are attached at the end of this document.

2.0 BACKGROUND

2.1 PROJECT SITE LOCATION AND DESCRIPTION

The project site is located at approximately river mile 15 of the Willamette River, approximately 1 mile upstream of downtown Portland, Oregon (as shown on Figure 1). As shown on Figure 2, the Willamette River flows to the west of the project site and the Holgate Slough flows to the east of the project site.

For documentation purposes, the project site has been divided into two geographical areas: the uplands and the lagoon. The uplands include the Process Operations Area and the Fill Area (as shown on Figure 3). Currently, the Process Operations Area includes the aggregate processing plant, an office, and maintenance sheds. The Fill Area is vegetated with a variety of shrubs, conifers, cottonwood trees, and vine maples, except along the shoreline areas where reclamation is ongoing. The lagoon was created by a dike created in the 1920s connecting Ross and Hardtack islands. Typical seasonal low and high water in the lagoon ranges from approximate elevation -1.0 to +15.0 feet RID.

2.2 PROJECT SITE HISTORY

The RIS&G facility is a major supplier of aggregate in the Portland area. Mining and processing of sand and gravel from the Willamette River at the project site began in the 1920s and continued until 2001. Aggregate processing activities by RIS&G continue on Hardtack Island and will continue for the foreseeable future.

A Conditional Use Permit was issued in 1979 by COP, which formally established the need for RIS&G to reclaim uplands and in-water mined areas. From 1979 through 1999, RIS&G began importing fill material under the Conditional Use Permit. Fill was accepted from various outside sources and used to backfill mined areas of the lagoon. Available documentation indicated fill accepted between the early 1980s and 1998 originated primarily from the following sources:

- Non-commercial material generated from on-site processing
- Material dredged from other local sites as part of maintenance activities
- Waste rock from a U.S. Army Corps of Engineers navigation project at Bonneville Locks

The 1979 Reclamation Plan was updated in 2002 based on a more current and complete scientific understanding of the river, the island complex, and surrounding habitat. The strategies in the updated reclamation plan (Landau, 2002a) reinforced existing public policies by using clean fill to achieve the reclamation and to create diverse habitat development on an accelerated basis. The 2002 reclamation approach estimated that placement of approximately 4 to 4.6 million cubic yards of reclamation fill over a 10-year period would achieve habitat creation objectives described in the 2002 Reclamation Plan. Fill placed at the project site (both in-water and upland) between approximately 1979 and 2002 is documented in the RI/RA report (Landau, 2002b).

Since 2003, approximately 4.5 million cubic yards have been placed in the remedial action and reclamation areas as documented in the Annual Monitoring Reports (GeoDesign 2005a, 2005b, 2006b, 2007a, 2008, 2009, 2010b, 2011) submitted to DSL in accordance with the DSL Removal Fill Permit No. 26. In addition, monthly progress reports submitted to DEQ have provided interim summaries of fill quantities and sources.

Reclamation will continue at the project site until the reclamation goals have been achieved. Future fill sources and volumes will continue to be documented in annual monitoring reports.

2.3 PREVIOUS INVESTIGATIONS AND FEASIBILITY STUDY

Numerous investigations have been completed at the project site since 1998 and are discussed in detail in the RI/RA report (Landau, 2002b) and the FS (GeoDesign, 2005c), which are on file at DEQ's Northwest Region office. A summary of these investigations is as follows:

- Investigation of the breached CAD cell in 1998
- Baseline characterization investigation of "clear zones" in the lagoon and uplands area in 1999
- Turbidity study of the lagoon and the Willamette River in 1999
- Biological assessment of the lagoon and uplands in 1999 and 2000
- Investigation of the material previously dredged from the Port of Portland shipyards and contained in the CAD cells in 1999 and 2000
- Phase I and Phase II RIs between 1999 and 2001

The above investigations evaluated:

1. the effectiveness of the CAD cells in isolating contaminants from the aquatic environment (buried sediment deemed unsuitable for unconfined open water disposal).
2. the contaminants present in other fill material and in surface sediments in the southern portion of the lagoon, particularly in the vicinity of the CAD Cell No. 5 breach.
3. the extent of contamination in the uplands areas.

Results of these investigations indicated the following contaminants present at the project site:

- Metals (lead, arsenic, copper, chromium, nickel, and zinc)
- PAHs
- TBTs
- PCBs
- Pesticides
- Petroleum hydrocarbons

Identified likely sources of this contamination included imported dredged material from the Port of Portland shipyards at Swan Island and Terminal 4 facilities and other dredge projects, legacy contaminants present in sediment deposited at the project site through natural processes, and on-site operation and maintenance of gravel processing equipment. In addition, elevated pH was detected at various locations along the southern shoreline of the lagoon, believed to result from historical disposal of concrete truck cleanout residues.

In August 2005, GeoDesign completed an FS for the project site (GeoDesign, 2005c), which identified areas warranting remedial actions and evaluated various remedial action alternatives to address the contaminants of concern. The identified remedial action areas included five upland areas identified as Remedial Action Area A1, Remedial Action Area A2 (comprised of three sub-areas), and Remedial Action Area C; and three in-water areas identified as Remedial Action Areas D, E, and F. Subsequent to the FS, DEQ's ROD (DEQ, 2005a) established the remedial action requirements based on the results of previous investigations and the FS. The remedial action areas are shown on Figure 3. Section 4.0 of this plan summarizes the selected remedies for each remedial action area.

In 2007, the final design reports and addendums for the upland remedial action areas (GeoDesign, 2007b, 2007d) and the in-water remedial action areas (GeoDesign, 2007c, 2007e, and 2007f) were submitted to and approved by DEQ. Upland remedial actions were implemented and completed in 2007 with the exception of Sub-Area A2-2, as documented in the Construction Completion Report for Remedial Action Areas A1, A2, and C (GeoDesign, 2007g). The remedial action for upland Sub-Area A2-2 was implemented in the fall of 2007 and completed in early 2008. The in-water remedial actions have essentially been on-going since the 2002 reclamation goals were established. The in-water remedial actions were substantially completed in December 2009. However, in-water filling in Remedial Action Areas D, E, and F continued in 2010. Completion of Remedial Action Areas D, E, and F and Upland Remedial

Action Sub-Area A2-2 are documented in the Construction Completion Report for Remedial Action Areas A2-2, D, E, and F (GeoDesign, 2010a) and Addendum Nos. 1 and 2 (GeoDesign, 2010c and 2010d).

3.0 PURPOSE AND OBJECTIVES

The purpose of this LTMMCP is to provide the basis for long-term monitoring, maintenance, and contingency activities for the remedial actions/controls implemented at the project site.

The objectives of this LTMMCP are to ensure the remedial actions are effective and remain effective in achieving the RAOs. This LTMMCP describes regular monitoring of containment and stabilization areas and includes mechanisms to repair or re-evaluate remedial components if warranted based on this monitoring. Periodic review of all the monitoring requirements will be conducted to evaluate their adequacy and necessity over time.

4.0 REMEDIAL ACTION AREAS

The following provides a summary of the remedial action areas, the contaminated media, and the remedy that will be monitored and maintained (as necessary) with this LTMMCP.

Area	Contaminated Media	Remedial Action	Reference Figure
A1	Arsenic and zinc in surface soil	Excavated soil and contained in Area B; backfilled with clean soil	Figures 3 and 4
A2-1	Soil along access road impacted with PAHs	Drainage berms and erosion BMPs manage surface water to help prevent erosion to the lagoon	Figures 3 and 5
A2-2	Soil along dike between settling pond and lagoon impacted with PAHs	Slope stabilization with ecology blocks and fill to prevent erosion to the lagoon	Figures 3 and 6
A2-3	Soil along gravel road with PAHs	Erosion control BMPs to control surface water runoff and erosion to the lagoon	Figures 3 and 7
B	Former settling pond containing TBT-impacted soil from CAD Cell No. 5 breach and arsenic- and zinc-impacted soil from Area A1	Containment cell capped with 3 feet of clean soil	Figures 3 and 4
C	Groundwater impacted with benzo(a)pyrene, manganese, and elevated pH	Groundwater monitoring confirmed no unacceptable risk	Figures 3 and 8
D	Sediment impacted with metals, TBT, PCBs, and PAHs as a result of CAD Cell No. 5 breach	Constructed a minimum 3-foot-thick sediment cap	Figures 3 and 6

Area	Contaminated Media	Remedial Action	Reference Figure
E	Southern lagoon shoreline areas with elevated pH	Constructed a 3-foot-thick sediment cap	Figures 3 and 6
F	CAD Cell Nos. 1 through 5	Contained and stabilized slopes adjacent to CAD cells	Figures 3 and 9 through 12

The remainder of Remedial Action Area A2 (as shown on Figure 3) currently contains stockpiled fill, which will be incorporated into the riparian and emergent wetland habitat as part of the reclamation in the southern lagoon. Once reclamation activities are completed, the area will be graded to relatively flat slopes, covered with clean fill, and vegetated, preventing future erosion into the lagoon.

5.0 INSTITUTIONAL CONTROLS

Institutional controls in the form of an EES will be recorded in the real property records of Multnomah County. Prior to recording with Multnomah County, a draft EES was submitted to DEQ for review and approval. Once executed, DEQ will receive a certified copy of the recorded statement.

The EES restricts site uses in the remedial action areas. The EES will generally prohibit invasive activities on or around upland remedial action areas. DEQ approval of any activities that involve excavation or dredging in the containment areas is required. Site uses will not change in the foreseeable future. However, Section 8.0 of this plan outlines procedures to help facilitate changes to site uses that may occur in the future.

6.0 LONG-TERM MONITORING AND MAINTENANCE PLAN

6.1 GENERAL

Long-term monitoring and maintenance will be performed by RIS&G or a designated representative for each remedial action area, with the exception of Area C where further monitoring was determined to be unnecessary and Area A1 where contaminated material was removed and placed in Area B. Monitoring, monitoring frequency, and maintenance of the remedial actions in the uplands and lagoon will include the following:

- Routine monitoring of upland capped area (annually)
- Routine monitoring of upland stabilized slopes (annually and following 0.5 inch of rain in 24 hours)
- Routine monitoring of upland BMPs (annually and following 0.5 inch of rain in 24 hours)
- Additional monitoring and/or evaluation of the remedial actions following significant events, which include:
  - A rain event of 3.4 inches in 24 hours
  - A river flood stage of 18-feet RID or greater
  - A seismic event of 6.0 or greater
- Periodic bathymetric surveys of Remedial Action Areas D, E, and F (annually)
- Periodic pH monitoring in Remedial Action Area E (annually)

DEQ will be notified a minimum of two weeks prior to each monitoring even, with the exception of significant events warranting additional monitoring (4th bullet above) in which case DEQ will be notified as soon as possible.

Upland monitoring and maintenance will be documented using the Upland Monitoring and Maintenance Form presented in Appendix A. Documentation will include a description of the general conditions of the remedial action areas and maintenance performed during the reporting period. Observations will be documented with photographs and follow-up actions to help ensure the remedial action remains protective. If the remedial action fails or is no longer protective, DEQ will be notified immediately as discussed in Section 7.0 of this plan. Following each monitoring and maintenance event, a completed monitoring and maintenance form with supporting documentation will be submitted to DEQ within one month of the event. If necessary, follow-up monitoring and maintenance will be conducted to re-evaluate problem areas or to confirm the completion and success of repairs.

Long-term maintenance and monitoring will be conducted annually or following the events described above for five years. The frequency and requirements of the long-term monitoring and maintenance will be re-evaluated by RIS&G at the end of the fifth year. Any modification to the monitoring plan will require DEQ concurrence. The first monitoring event will be conducted within one year after the Certificate of Completion has been issued by DEQ.

Significant events such as heavy rainfall, earthquakes, and flooding will warrant additional monitoring beyond the frequency established above. The criteria for these significant events are as follows:

- Rainfall of greater than 3.4 inches in a 24-hour period (COP, 2008) will warrant monitoring of established BMPs and stabilized slopes.
- A seismic event of 6.0 or greater on the Richter scale will warrant a site-wide assessment of the sediment cap, side slopes adjacent to the CAD cells, soil caps, and stabilized slopes adjacent to the lagoon.
- A river flood stage of 18 feet, RID (NOAA, 2011a) that inundates any portion of the upland remedial actions will warrant an assessment of these areas once water levels subside.
- A river flood stage of 24 feet, RID (NOAA, 2011b) will warrant a site-wide assessment of the in-water remedial actions and the upland remedial actions impacted by the flood waters. The assessment will be completed after water levels subside.

These flood elevations are based on flood stages of the Willamette River that will cause localized flooding in the Portland area according to NOAA. The 18-foot elevation will submerge portions of the lowest upland remedial action. The 24-foot elevation could change the flow dynamics in the lagoon and compromise the stabilized slopes and the sediment cap.

Specific long-term monitoring and maintenance for the remedial actions are described in the following sections.

6.2 UPLAND

The effectiveness of the upland remedial action elements is dependent upon limiting human and ecological receptor exposure to contaminated soils and limiting erosion of contaminated soils into the lagoon. Contingency responses will be implemented if site observations identify potential failures. These responses include immediate DEQ notification and implementing the contingency measures described in Section 7.0 of this plan.

Routine monitoring and maintenance protocols for the upland remedial actions are described below.

6.2.1 Remedial Action Areas A1 and B

As described in Section 4.0 of this plan, contaminated soil from Remedial Action Area A1 is now located within Remedial Action Area B. The contaminated media are contained by a soil cap intended to prevent exposure to the underlying contaminants. The locations of each area are shown on Figures 3 and 4. The soil cap must remain a minimum of 3 feet thick. The soil removal area of Remedial Action Area A1 will not require long-term monitoring or maintenance as the contaminated media was removed.

Routine soil cap monitoring for Remedial Action Area B will occur annually. The routine monitoring will include visual observations of the integrity of the soil cap. The observer will look for signs of erosion, holes, ruts, rills, vandalism, and rodent burrowing. In addition, the observer should note the condition of the vegetation over the soil cap. Vegetation stress or dead spots should be noted on the monitoring form. The same monitoring will also be conducted following significant events noted in Section 6.1.

Routine maintenance will include placing additional soil where needed to maintain cap integrity. In areas exhibiting frequent erosion or damage, vegetation or erosion BMPs may be considered. Alternatives will be discussed with DEQ prior to implementing. Reporting requirements are described in Section 6.4.

6.2.2 Remedial Action Sub-Areas A2-1 and A2-3

As shown on Figure 5, Remedial Action Sub-Area A2-1 includes drainage berms and trenches to manage surface water runoff. The drainage berms slow and redirect runoff toward an existing vegetated area to the east and a series of biofilter bags to the west. This area was covered with gravel to further reduce erosion of soil. As shown on Figure 7, Remedial Action Sub-Area A2-3 includes gravel placed on the road and a filter trench to reduce and detain soil entrained in surface runoff.

For both remedial action areas, routine monitoring will occur annually or following a rain event of 0.5 inch in 24 hours. The monitoring will include observing the area for rills, ruts, sediment accumulation, sloughing, or damage. Also for Remedial Action Sub-Area A2-1, monitoring will include observing the conditions of the ecology blocks, biofilter bags, and vegetated area. In addition, the same monitoring will be conducted following the significant events described in Section 6.1.

Routine maintenance will include placing additional gravel on the road, replacing the biofilter bags (as necessary), and realigning or replacing the ecology blocks (if necessary). In addition, the vegetated area in Remedial Action Sub-Area A2-1 may be replanted or reseeded, as necessary. Reporting requirements are described in Section 6.4.

6.2.3 Remedial Action Sub-Area A2-2

Routine monitoring of the stabilized slope at Remedial Action Sub-Area A2-2 will occur annually or following a rain event of 0.5 inch in 24 hours. The monitoring will include visually observing the area for signs of erosion such as minor rills and sloughing. If possible, routine monitoring will be scheduled during low water and/or low tide conditions in an attempt to observe the condition of the ecology blocks and associated fill material. As noted by DEQ, erosion adjacent to these hard surfaces can be significant as result of wave action. The same monitoring will be conducted after the significant events described in Section 6.1.

Routine maintenance will include replacing fill material or implementing other BMPs to help prevent erosion. Significant erosion or slope failures are addressed in Section 7.0 of this plan. Reporting requirements are described in Section 6.4.

6.3 LAGOON

The effectiveness of the lagoon remedial action elements is dependent upon limiting/preventing aquatic receptor contact with contaminated sediments. This has been accomplished by stabilizing the slopes adjacent to the CAD cells and constructing a 3-foot-thick sediment cap over the identified contaminated areas. Contingency responses may be required if routine monitoring and maintenance identify potential failures of the remedial actions. In the event that a compromise is identified, DEQ will be notified immediately and contingency measures will be implemented as described in Section 7.0 of this plan.

The specific long-term monitoring and maintenance program for Remedial Action Areas D, E, and F is described below.

6.3.1 Sediment Cap Thickness Monitoring and Maintenance

Sediment cap thickness will be monitored through bathymetric surveys. A bathymetric survey will be completed on an annual basis. Bathymetric surveys will be compared to the 2001 bathymetry (pre-remedial action) and the October 2010 (post-remedial action) to evaluate potential material loss. Minor losses of 0.5 to 1 foot will be addressed by placing fill material over the loss areas. Losses greater than 1 foot will warrant further monitoring, which may include sampling to evaluate the potential sediment cap breach. DEQ will be notified immediately upon discovery of sediment loss of greater than 1 foot to discuss the proper course of action. Section 7.0 of this plan discusses management of a cap breach in further detail.

6.3.2 Slope Stability

The slopes adjacent to the CAD cells have been buttressed through the remedial actions and reclamation completed to date. Slopes ranging from approximately 1.75H:1V to 2H:1V were observed prior to 2002 adjacent to the CAD cells. Slope stability will be monitored using annual bathymetry as discussed in Section 6.3.1. Based on the October 2010 bathymetry, the slopes adjacent to the CAD cells range from approximately 2H:1V to 5H:1V. The final slopes will be at

least 3H:1V based on previous slope stability studies. Until reclamation is complete, slopes no steeper than approximately 2H:1V will be maintained. Surficial sloughing may be expected, but significant slope failures observed through the bathymetric surveys will require DEQ notification and contingency measure implementation as described in Section 7.0 of this plan. In addition, a flood stage of 24 feet RID (NOAA, 2011b) or a seismic event of magnitude 6 on Richter scale will prompt an evaluation of the slope stability.

6.3.3 Remedial Action Area E - pH Monitoring and Maintenance

Baseline and supplemental baseline monitoring indicated that the sediment cap was adequately mitigating pH. Long-term pH monitoring will include annual pH testing in areas where pH has historically exceeded 8.5 (Zones 1 through 4). These areas are shown on Figure 6.

Pore water pH monitoring will be conducted using a Henry probe along the shoreline in the vicinity of Zones 1 through 4 as shown on Figure 6. In deeper water, pH monitoring will be conducted from sediment samples collected using Ponar grab sampler. The use of the Ponar grab samples will be limited to the extent practicable and will decline over time as reclamation filling continues. The pH in pore water or sediment will be field measured using a calibrated pH probe (WTW Model 340i). Field procedures and protocols are described in Appendix B. In addition, the pH of the ambient water in the lagoon will be measured and recorded. Field pH measurements that exceed 8.5 will warrant DEQ notification and additional monitoring and contingency measures as discussed in Section 7.0 of this plan.

6.4 SCHEDULING AND REPORTING

Long-term monitoring will be conducted on an annual basis or as otherwise noted above after the Certificate of Completion is issued by DEQ. The first monitoring event is anticipated for the fall of 2011 to coincide with low-water conditions for Remedial Action Sub-Area A2-2. The monitoring as established in this LTMMCP will continue for five years. The monitoring requirements, monitoring frequency, and maintenance requirements will be re-evaluated after the fifth year. Any changes in monitoring/maintenance frequency will require written approval by DEQ.

An annual monitoring and maintenance summary report will be submitted to DEQ within one month of completing one year of monitoring. The first monitoring event will establish the annual basis, and each report will be submitted on this date thereafter and will incorporate rain event routine monitoring as described above. The report will summarize monitoring and maintenance activities performed for the reporting period. The report will include the monitoring and maintenance forms, photo-documentation logs, site maps, monitoring data, and maintenance and repair records (if applicable). Template forms are included in Appendix A.

For significant events (e.g., heavy rainfall, seismic event, or flood), a supplemental report will be prepared and submitted to provide documentation to DEQ that the remedial actions are intact and the RAOs are maintained. If a significant event causes a remedial action to fail, contingency measures will be implemented with associated work plans to address the problem.

7.0 CONTINGENCY PLAN

As discussed herein and in referenced reports, the upland and in-water remedial actions are complete and baseline monitoring indicates that they are protective of human health and the environment. This LTMMCP establishes the basis to help ensure that the remedial actions remain protective in the long term. As such, contingency measures are established in the following sections in the event the monitoring indicates the remedial actions are no longer protective.

7.1 GENERAL PROCEDURES

As discussed above, routine monitoring and maintenance may indicate one or more of the remedial actions are not functioning as intended. Within 24 hours of the monitoring event, DEQ will be notified of the identified conditions either verbally or e-mail. DEQ notification will include a description of the recognized condition and measures taken to stabilize, control, and/or help prevent contaminant migration. In addition, appropriate repair measures will be discussed with DEQ and, if significant cap or slope repair is required, a work plan will be prepared and submitted to DEQ for approval. With DEQ's concurrence or approval, repairs will be implemented as soon as possible given the limitations of available suitable fill material, labor, and equipment.

The goal of any repair is to restore the remedial action element to its original design/specifications and to meet the requirements of the ROD. Repairs will be documented in a report and submitted to DEQ. Design improvements may be required if recurring problems or repairs are observed. Improvements will be discussed with DEQ and implemented with DEQ's concurrence. A work plan describing the design improvements will be prepared and implemented, if necessary. Specific contingency measures for the uplands and lagoon are presented in the following sections.

7.2 UPLAND REMEDIAL ACTION AREAS

7.2.1 Remedial Action Areas A1 and B (Soil Caps)

If a soil cap is damaged or breached, it will be documented on the Upland Monitoring and Maintenance Form provided in Appendix A. Notification procedures described in Section 7.1 of this plan will be followed, as necessary, and damaged areas will be documented in photographs. The cap will be repaired by placing clean fill over the damaged area or breach, restoring the cap to its design condition. Re-vegetation of the damaged area will also be conducted, if necessary, to help prevent erosion and future compromise. Repairs will begin as soon as practicable, depending on the availability of additional fill material and available labor, resources, and equipment. If evidence indicates contaminants were released, DEQ will be notified, attempts will be made to stabilize the area, and a work plan will be prepared to address the apparent release.

7.2.2 Remedial Action Area A2 and Sub-Areas (Erosion Control and Slope Stability)

If the stabilized or improved banks appear compromised (slumping, rills, or other signs of erosion or failure are observed), it will be documented on the Upland Monitoring and Maintenance Form provided in Appendix A. Photo-documentation will be included and DEQ will be notified if warranted. The slopes will be restored through the placement of additional fill and/or upgraded BMPs. Upgraded BMPs will be selected from DEQ's Erosion and Sediment Control Manual (DEQ, 2005b). Repairs will begin as soon as practicable, depending on the availability of additional fill material and available labor, resources, and equipment.

7.3 LAGOON

7.3.1 Slope Failure

Slope failures will be evaluated based on bathymetry. Evidence of a slope failure will trigger immediate DEQ notification. The greatest concern for slope failure is adjacent to the CAD cells. If slope repair is required, a geotechnical engineer will provide recommendations for repairs and improved slope stability. A work plan with the recommendations and methods to repair the slope will be prepared and submitted to DEQ for review and approval. With DEQ approval, the repairs will be implemented accordingly to the extent practicable.

If the bathymetric survey indicates a breach of the sediment cap, the work plan will include recommendations for sampling and analysis to evaluate the nature and extent of the release.

7.3.2 Compromise to Sediment Cap

DEQ will be notified immediately when bathymetry indicates sediment cap thickness is less than 3 feet, and the actions described below will be implemented.

- Losses of material resulting in a 0.5 to 1 foot reduced thickness in cap (based on the 2010 bathymetric surface), or reduced thickness up to 2.5 feet over an area constituting less than 2 percent of the overall cap surface, will require cap repair. The compromised area would be repaired by placing Class A fill (DEQ, 2007) over the identified area. Fill will be placed in a controlled manner to not exacerbate conditions. Bathymetric data collected during and after the repair will be used to document repair progress and to confirm that the sediment cap was restored.
- If the bathymetry indicates more significant loss (i.e., greater than 1 foot but less than 3 feet) over an area constituting more than 2 percent of the overall cap surface, a work plan will be prepared for DEQ review describing the repair strategy.

Any loss of cap thickness greater than 3 feet will constitute a cap breach. A work plan will be prepared describing the proposed response to evaluate if contaminants were released as a result of the breach. Sediment samples will be collected in the vicinity of the breach using the methods outlined in Appendix B and analyzed for the following contaminants:

- Metals (arsenic, chromium, copper, lead, nickel, and zinc) by EPA 6000/7000 Series Methods
- TBT by Krone Method (Krone, 1989)
- PCBs by EPA Method 8082
- PAHs by EPA Method 8270C-SIM

Repairs will be implemented after the breach is adequately delineated and DEQ approves the work plan.

7.3.3 pH Contingency Measures

Initial contingency measures for detection of pH levels exceeding 8.5 will include DEQ notification and preparation of a work plan for additional sampling to delineate the areal extent of the impact. An evaluation of the bathymetry and a proposal for responding to the exceedances will be submitted to DEQ for review. DEQ review and approval of the work plan is necessary prior to implementation. Responses may include placement of additional fill to reduce

pH levels in surface sediment, but may also include sediment amendments, dredging to remove a possible source, or a reconfiguration of the habitat areas to maintain compliance with the reclamation goals.

8.0 CONTAMINATED MEDIA MANAGEMENT PROVISIONS

As discussed in Section 5.0 of this plan, institutional controls in the form of an EES are part of the remedial actions at the project site. The EES will restrict site uses to help ensure the remedial actions remain protective of human health and the environment in the long term. Project site uses are not expected to change in the foreseeable future. However, in the event of a change in project site uses that would affect the integrity of any remedial action, the following provisions have been included to help facilitate the process.

8.1 WORKER SAFETY

Prior to any site activities affecting the remedial action areas, the property owner, operator, or contractor must prepare and implement a site-specific HCP. The HCP fulfills "worker right to know" requirements (29 Code of Federal Regulations 1926.59). If completed by the contractor, a copy of the HCP must be submitted to the owner prior to the start of work on the project. During work on the project, the HCP must be posted at the project site. The owner is responsible for notifying subcontractors of pertinent environmental conditions. Subcontractors may either adopt the contractor's HCP or must prepare their own HCP. This document should be used in conjunction with, not in place of, the HCP and the project specifications. Each contractor and subcontractor is responsible for the safety of its employees, including compliance with applicable Oregon OSHA regulations, and compliance with all specifications in the technical specifications manual for the project.

In addition to implementation of an HCP, the property owner, operator, or contractor must prepare and implement a site-specific Health and Safety Plan in accordance with OSHA requirements to ensure adequate protection for their workers while on site.

8.2 UPLAND SOIL MANAGEMENT

The project site owner, operator, contractors, on-site workers, or any others involved with potential grading, excavation, or other earthwork activities that may breach the soil caps should be familiar with this plan and the locations of contaminated soil. Furthermore, depending on the activity, regulatory involvement may be necessary prior to beginning earthwork activities. An overview of soil management and options are provided below.

Contaminated soil underneath the soil caps in the locations shown on Figure 4 is impacted with arsenic, zinc, PAHs, and TBT. Construction of the soil caps included a demarcation layer separating the clean soil cap and the contaminated media. Disturbance of the underlying contaminated soil can be managed in two ways: (1) excavation and off-site disposal at an appropriate disposal facility or (2) excavation, on-site relocation, and engineering controls. Any necessary regulatory approvals for either option will be obtained.

8.3 SEDIMENT MANAGEMENT

Similar to Section 8.2 of this plan, the project site owner, operator, contractors, on-site workers, or any others involved with in-water construction, dredging, or activities that would breach the sediment cap should be familiar with this plan and the locations of contaminated sediment as shown on Figure 3. Depending on the type of in-water activity, regulatory involvement might be necessary prior to beginning in-water activities. An overview of sediment management options are provided below.

Although not contemplated at this time, future in-water work that includes sediment penetration will trigger regulatory approvals and appropriate engineering design and management. Depending on the activity, the following regulatory agencies might have regulatory authority over the in-water activities:

- DEQ - Cleanup
- DEQ - Water Quality
- DSL
- U.S. Army Corps of Engineers
- Oregon Department of Fish and Wildlife
- National Marine Fisheries Service

Contaminated media management for general cap penetrations will most likely require pre- and post-construction sediment sampling. In addition, surface and subsurface sediment sampling and chemical analysis will be necessary to evaluate potential vertical migration of contaminants. Water quality monitoring during construction might be necessary to evaluate impacts as a result of construction.

If contaminated sediment is removed from the lagoon, special handling and disposal protocols might be necessary. Particularly for off-site disposal, characterization sampling will likely be necessary. As previously noted, work plans will need to be prepared prior to all such activities and receive appropriate regulatory approvals

♦ ♦ ♦

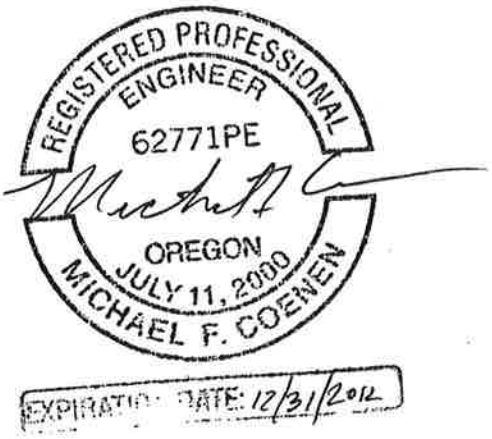
We appreciate your continued support on this project. Please call if you have questions concerning this plan.

Sincerely,

GeoDesign, Inc.

Mike F. Coenen, P.E.
Senior Project Engineer

Craig W. Ward, R.G.
Principal Geologist



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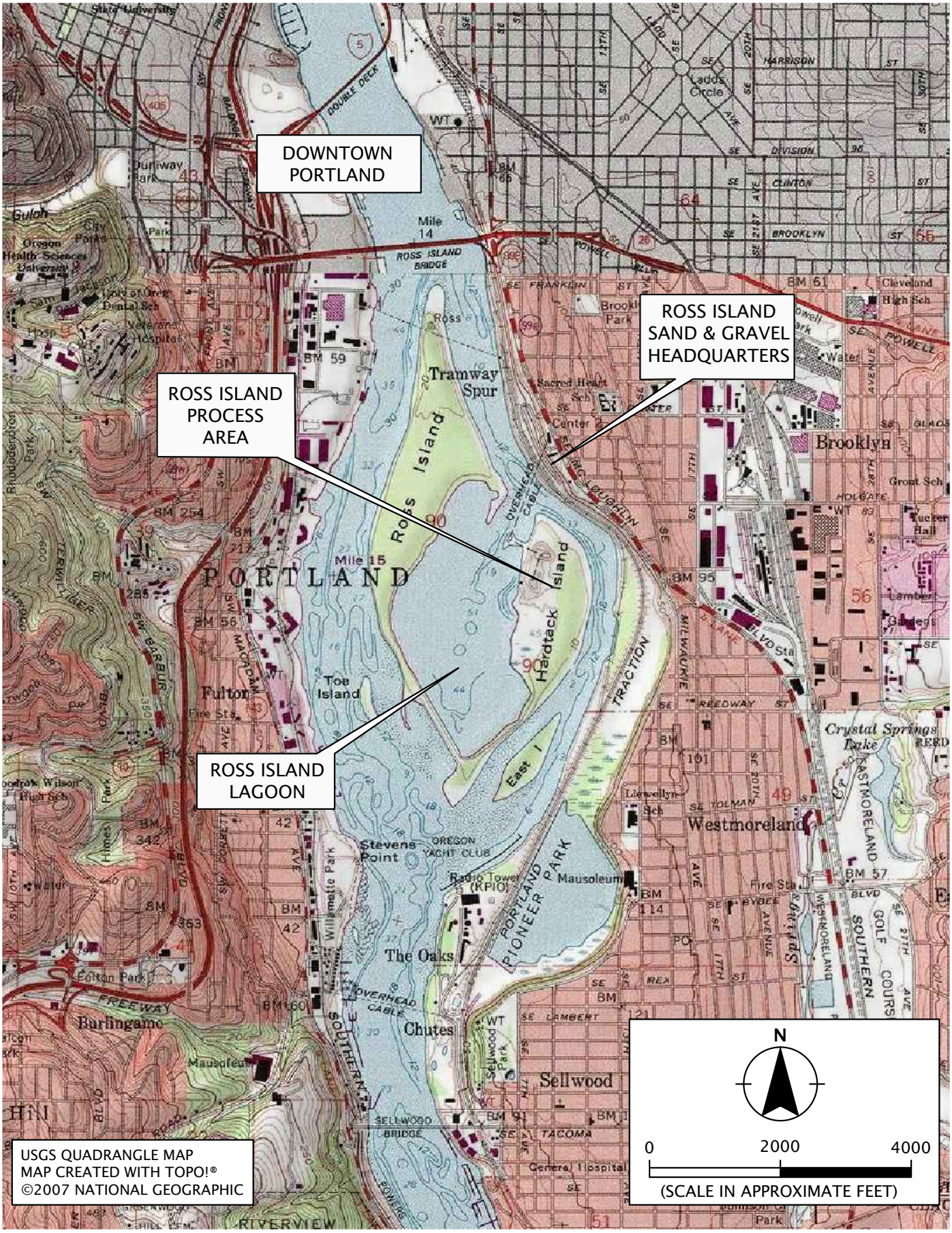
NOAA, 2011b, *http://water.weather.gov, Advanced Hydrologic Prediction Service,* Morrison Bridge Gauge, Moderate Flood Stage

FIGURES



GEODESIGN INC 15575 SW Sequoia Parkway - Suite 100 Portland OR 97224 Off 503.968.8787 Fax 503.968.3068	ROSSISLAND-2-04-04	**VICINITY MAP**
	APRIL 2011	ROSS ISLAND SAND & GRAVEL PORTLAND, OR — **FIGURE 1**

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SITE PLAN BASED ON AERIAL PHOTOGRAPH
OBTAINED FROM GOOGLE EARTH PRO®,
APRIL 20, 2010

N

0 550 1100
(SCALE IN FEET)

SITE PLAN

ROSS ISLAND SAND & GRAVEL
PORTLAND, OR

FIGURE 2

ROSSISLAND-2-04-04

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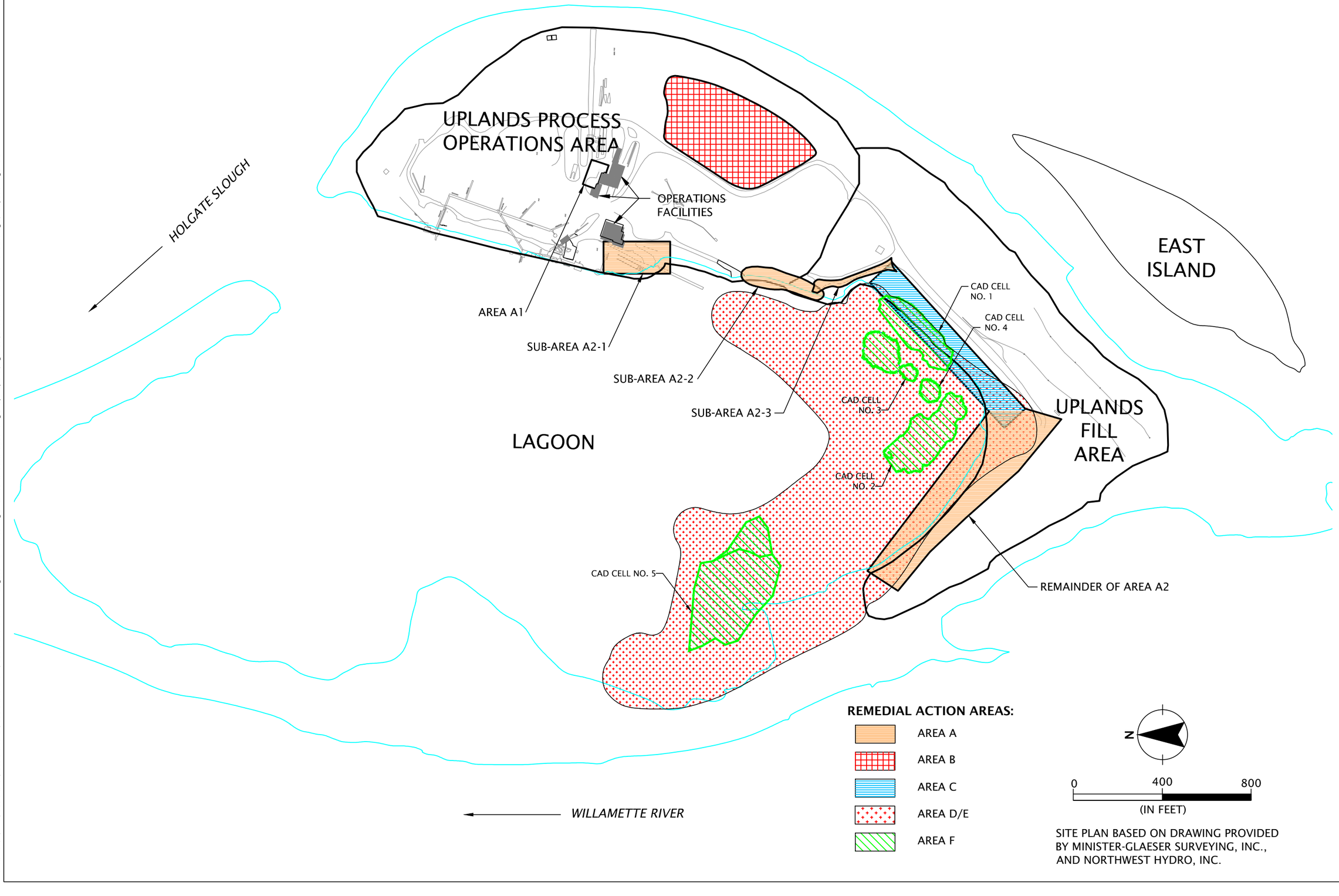

SITE PLAN BASED ON DRAWING PROVIDED BY MINISTER-GLAESER SURVEYING, INC., AND NORTHWEST HYDRO, INC.

UPLAND GEOGRAPHICAL AND REMEDIAL ACTION AREAS

ROSS ISLAND SAND & GRAVEL
PORTLAND, OR

FIGURE 3

ROSSISLAND-2-04-04

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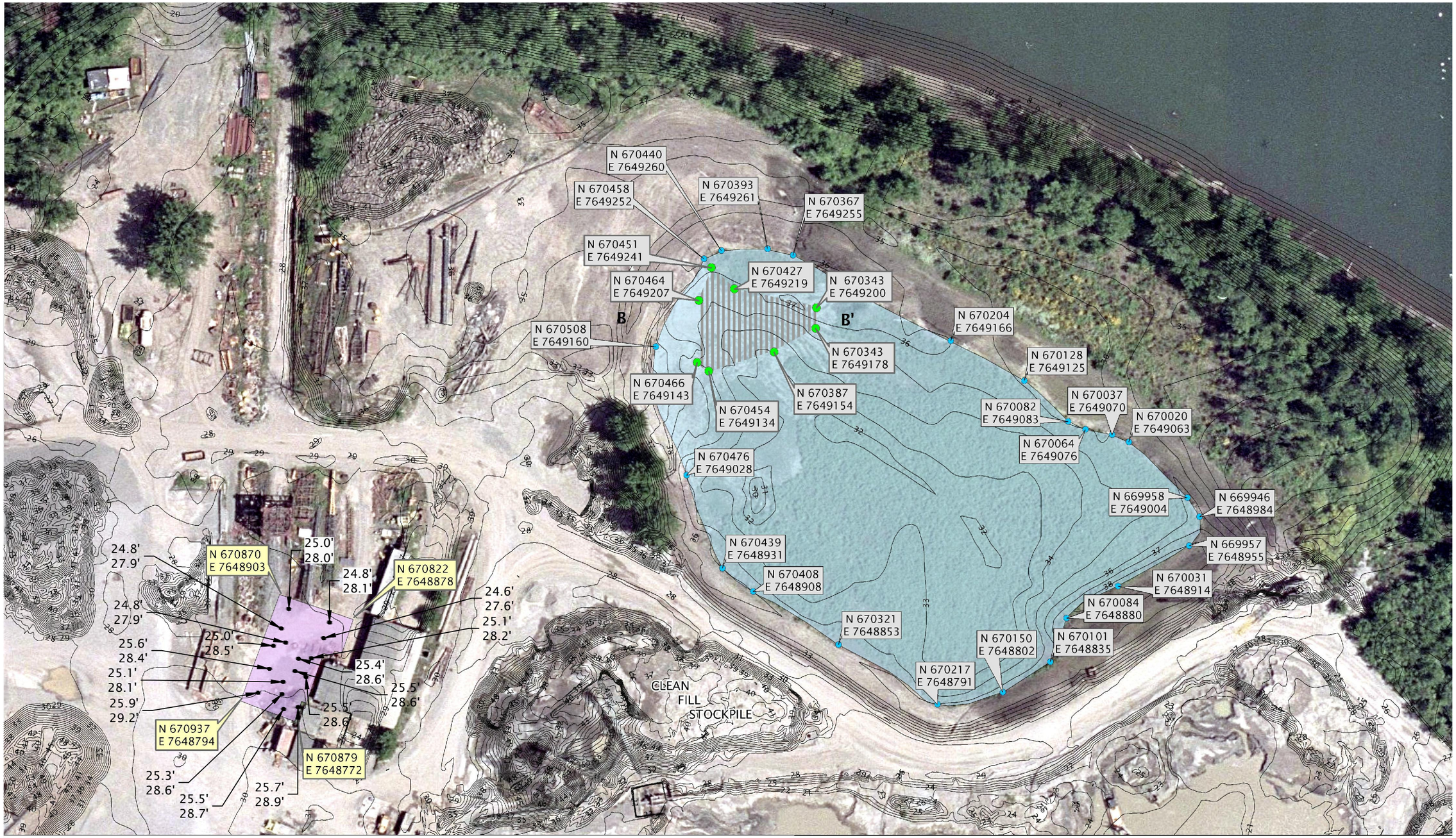

LEGEND:

- SURVEY POINT
- 24.8' EXCAVATION BOTTOM ELEVATION
- 28.1' FINISHED GRADE ELEVATION
- 1 FOOT TOPOGRAPHIC CONTOURS
- CONTAINMENT AREA
- N 690369 E 7587476 — GEODESIGN GPS WAYPOINTS; NORTHING AND EASTING
- N 670937 E 7648794 — EXCAVATION AREA A1 CORNER COORDINATES
- AREA B
- LIMITS OF EXCAVATION AREA A1
- N 670354 E 7649083 — REFERENCE POINT FOR LATERAL EXTENT OF AREA B

SITE PLAN BASED ON IMAGE OBTAINED FROM USGS, FEBRUARY 2005

N

0 100 200

(SCALE IN FEET)

UPLAND REMEDIAL ACTION AREAS A1 AND B

ROSS ISLAND SAND & GRAVEL
PORTLAND, OR

FIGURE 4

ROSSISLAND-2-04-04

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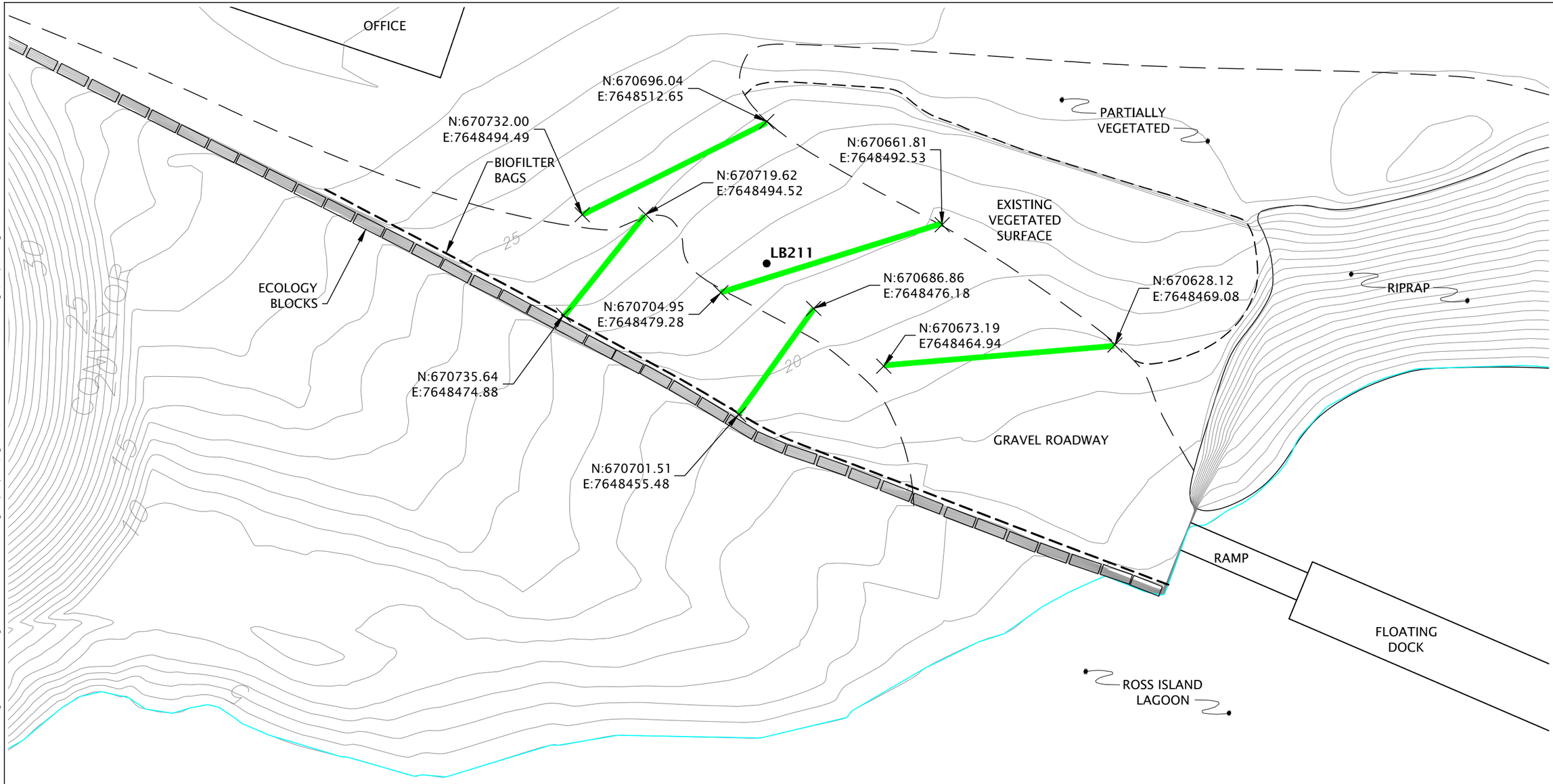

NOTES:

1. TOPOGRAPHY FROM (3DI), EUGENE, OR AND MINISTER-GLAESER SURVEYING, INC.,VANCOUVER, WA, DECEMBER 2005.
2. HORIZONTAL DATUM = NAD83 OR SPS N ZONE, INTERNATIONAL FEET.
3. VERTICAL DATUM = ROSS ISLAND DATUM (NGVD -1.55 FEET).

LEGEND:

- LB211 ● SAMPLE LOCATION (2001)
- DRAINAGE BERM
- BIOFILTER BAG
- 2005 TOPOGRAPHIC NAD83 UPLAND
- APPROXIMATE SHORELINE DURING 2005 SURVEY

N

0 20 40
(IN FEET)

SITE PLAN BASED ON DRAWING PROVIDED BY MINISTER-GLAESER SURVEYING, INC.

UPLAND REMEDIAL ACTION SUB-AREA A2-1

ROSS ISLAND SAND & GRAVEL
PORTLAND, OR

FIGURE 5

ROSSISLAND-2-04-04

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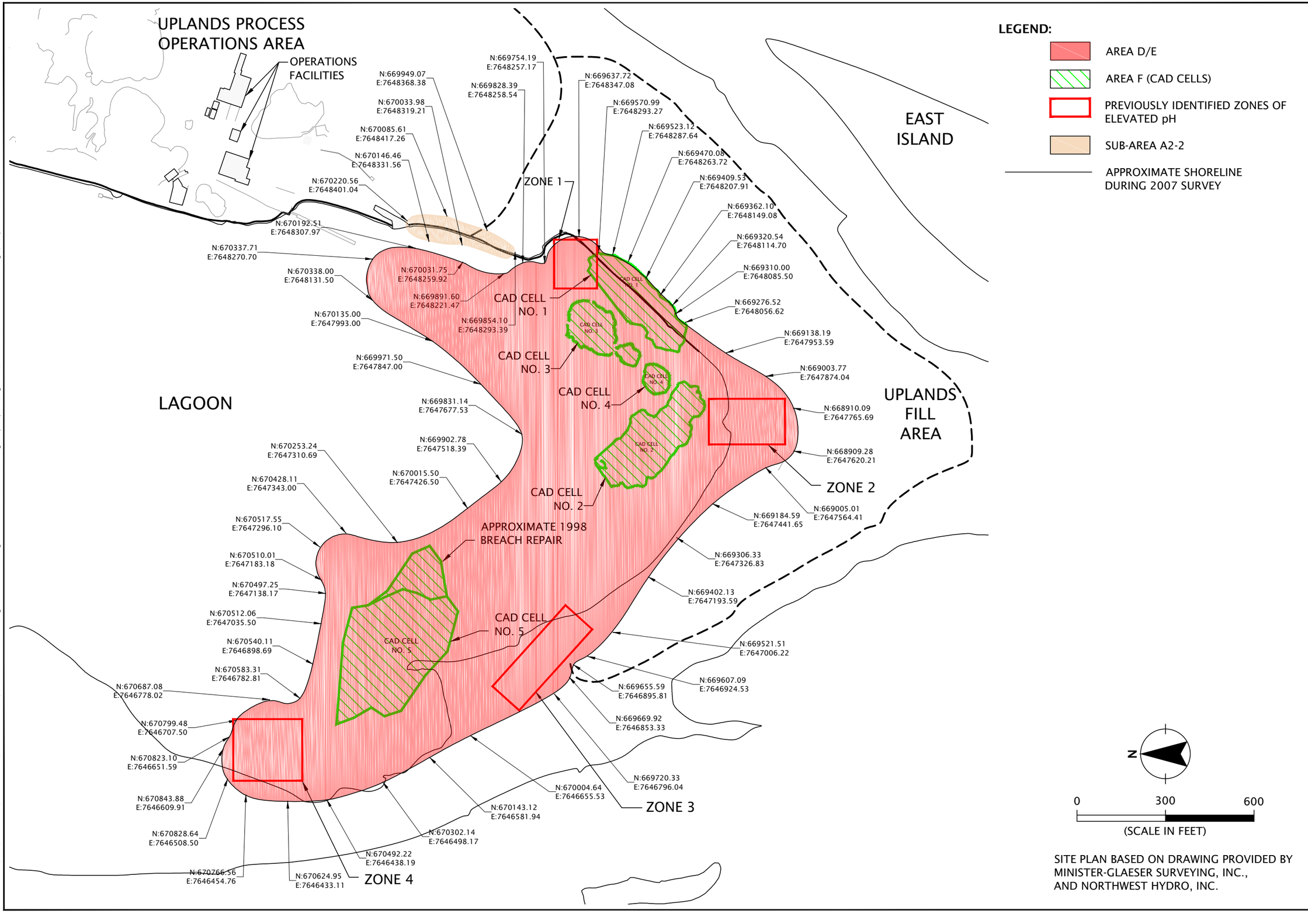
LAGOON REMEDIAL ACTION SUB-AREA A2-2 AND AREAS D, E, AND F

FIGURE 6

ROSS ISLAND SAND & GRAVEL
PORTLAND, OR

ROSSISLAND-2-04-04

APRIL 2011



SITE PLAN BASED ON DRAWING PROVIDED BY MINISTER-GLAESER SURVEYING, INC., AND NORTHWEST HYDRO, INC.

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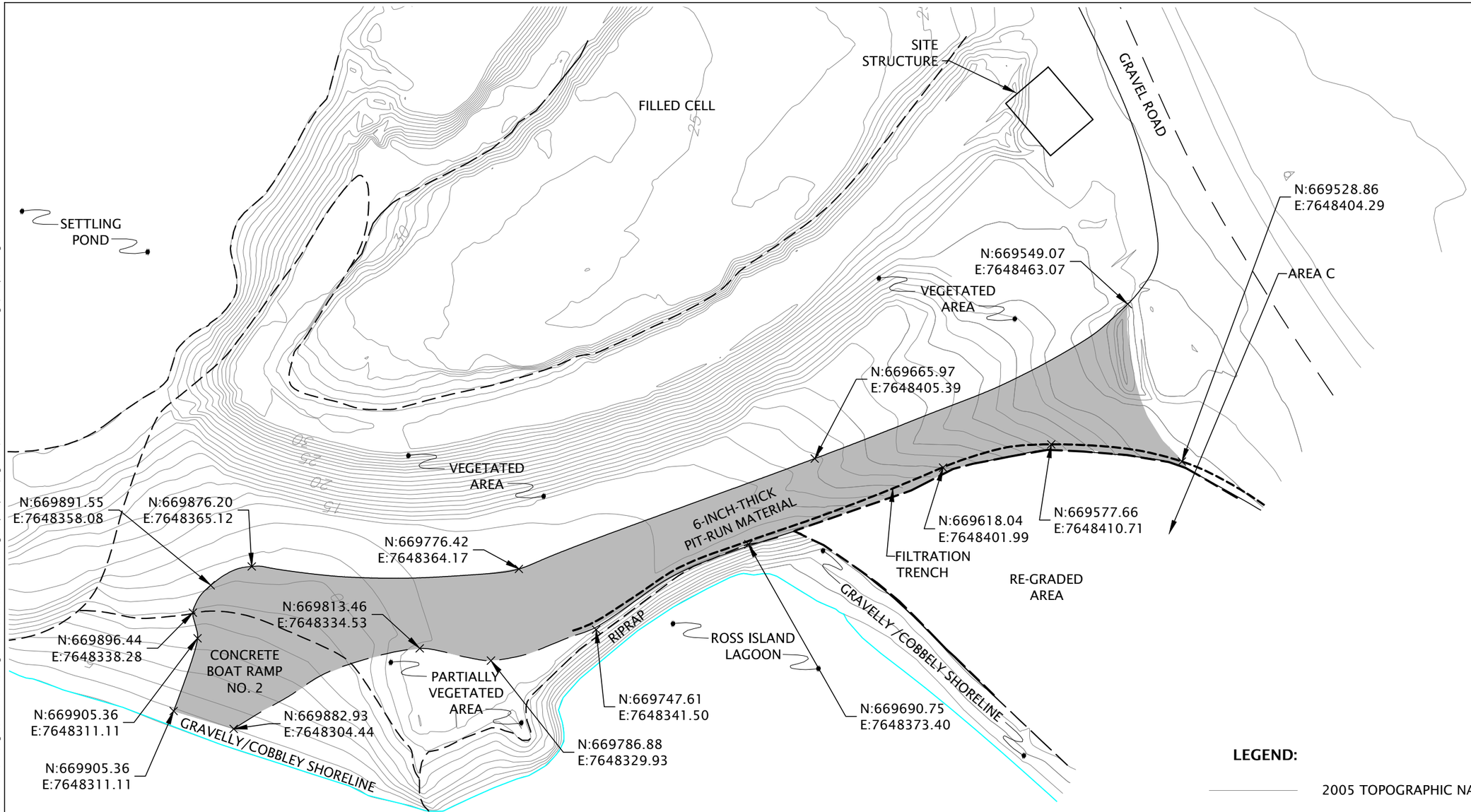

LEGEND:

- 2005 TOPOGRAPHIC NAD83 UPLANDS
- APPROXIMATE SHORELINE DURING 2005 SURVEY

NOTES:

1. TOPOGRAPHY FROM (3DI), EUGENE, OR AND MINISTER-GLAESER SURVEYING, INC.,VANCOUVER, WA, DECEMBER 2005.
2. HORIZONTAL DATUM = NAD83 OR SPS N ZONE, INTERNATIONAL FEET.
3. VERTICAL DATUM = ROSS ISLAND DATUM (NGVD -1.55 FEET).

N

0 40 80

(IN FEET)

SITE PLAN BASED ON DRAWING PROVIDED BY MINISTER-GLAESER SURVEYING, INC.

UPLAND REMEDIAL ACTION SUB-AREA A2-3 AND NORTH PORTION OF AREA C

ROSS ISLAND SAND & GRAVEL
PORTLAND, OR

FIGURE 7

ROSSISLAND-2-04-04

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LEGEND:

- **MW02A** SHALLOW MONITORING WELL
- ASPHALT REMOVAL AREA
- RE-GRADED AREA
- 1 FOOT TOPOGRAPHIC CONTOURS
- N 690369 E 7587476 GEODESIGN GPS WAYPOINTS; NORTHING AND EASTING

NOTES:

1. TOPOGRAPHY FROM (3DI), EUGENE, OR AND MINISTER-GLAESER SURVEYING, INC., VANCOUVER, WA; DECEMBER 2005
2. HORIZONTAL DATUM = NAD83 OR SPS N ZONE, INTERNATIONAL FEET
3. VERTICAL DATUM = ROSS ISLAND DATUM (NGVD - 1.55 FEET)

SITE PLAN BASED ON IMAGE OBTAINED FROM USGS, MAY 2002`

N

0 80 160

(SCALE IN FEET)

UPLAND REMEDIAL ACTION AREA C

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FIGURE 8

ROSSISLAND-2-04-04

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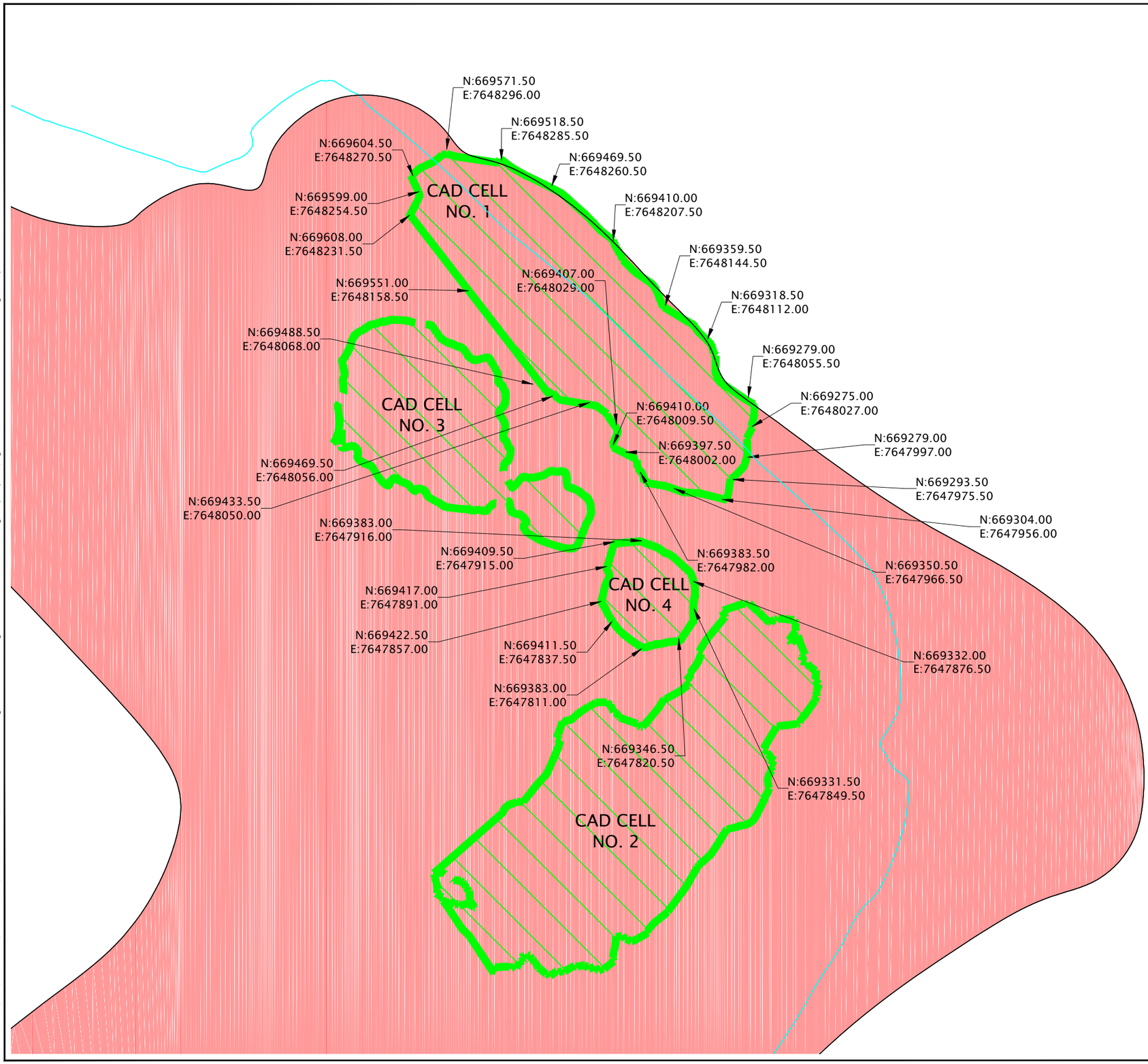

SITE PLAN BASED ON DRAWING PROVIDED BY MINISTER-GLAESER SURVEYING, INC., AND NORTHWEST HYDRO, INC.

LAGOON REMEDIAL ACTION AREA F - CAD CELL NOS. 1 AND 4

FIGURE 9

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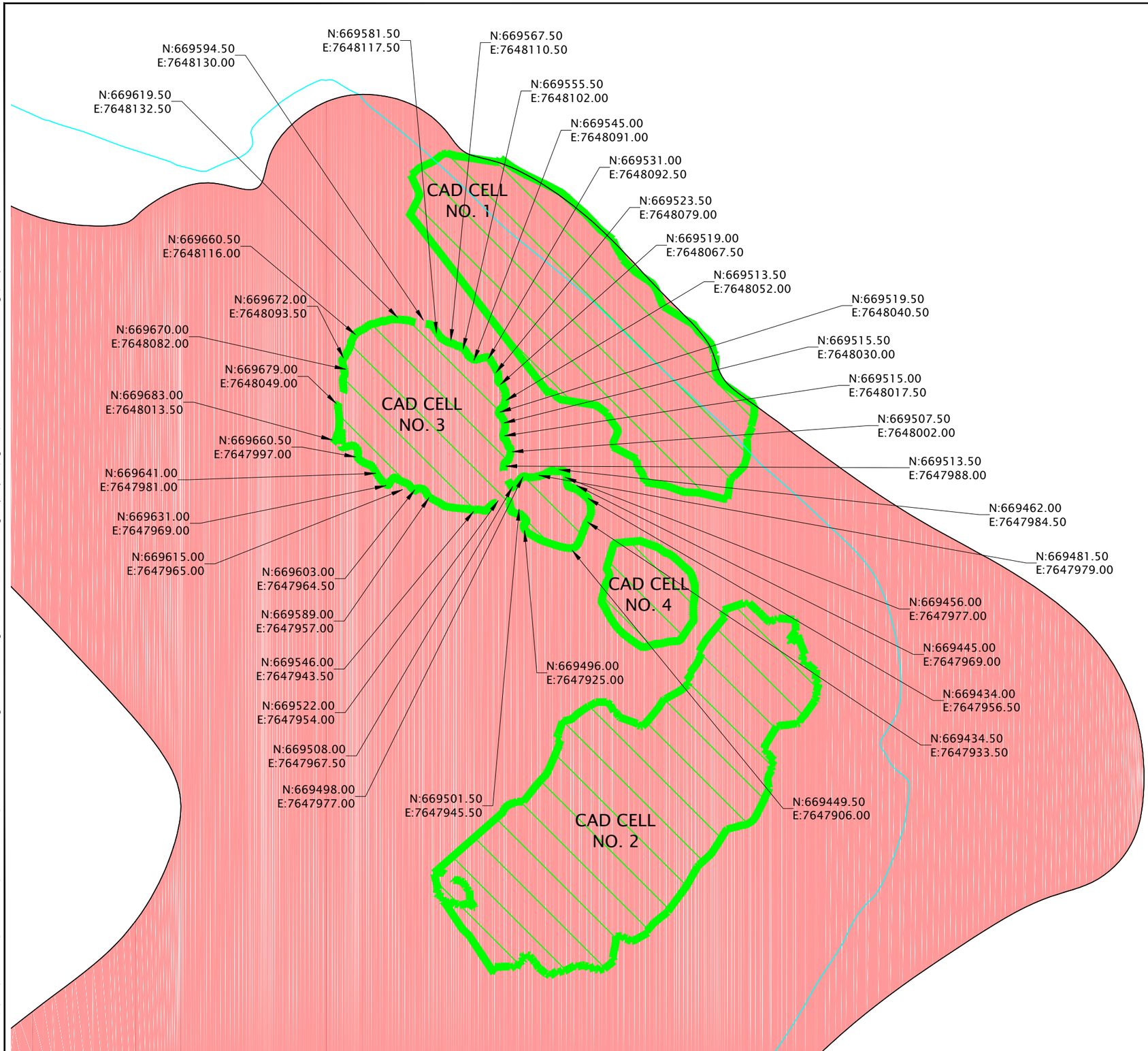

SITE PLAN BASED ON DRAWING PROVIDED BY
MINISTER-GLAESER SURVEYING, INC.,
AND NORTHWEST HYDRO, INC.

LAGOON REMEDIAL ACTION AREA - CAD CELL NO. 3

FIGURE 10

ROSS ISLAND SAND & GRAVEL
PORTLAND, OR

ROSSISLAND-2-04-04

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nce_and_contingency_report\Figures\CRossIsland-2-04-04-SP09.dwg | Layout: FIGURE 10

CAD CELL NO. 1

CAD CELL NO. 3

CAD CELL NO. 4

CAD CELL NO. 2

N:669337.00
E:7647784.00

N:669324.00
E:7647811.50

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E:7647846.00

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E:7647764.50

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N:669248.50
E:7647736.50

N:669230.00
E:7647742.50

N:669215.00
E:7647765.00

LEGEND:

AREA D/E

AREA F

APPROXIMATE SHORELINE DURING 2007 SURVEY

N

0 100 200

(SCALE IN FEET)

SITE PLAN BASED ON DRAWING PROVIDED BY MINISTER-GLAESER SURVEYING, INC., AND NORTHWEST HYDRO, INC.

LAGOON REMEDIAL ACTION AREA - CAD CELL NO. 2

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ROSSISLAND-2-04-04

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FIGURE 11

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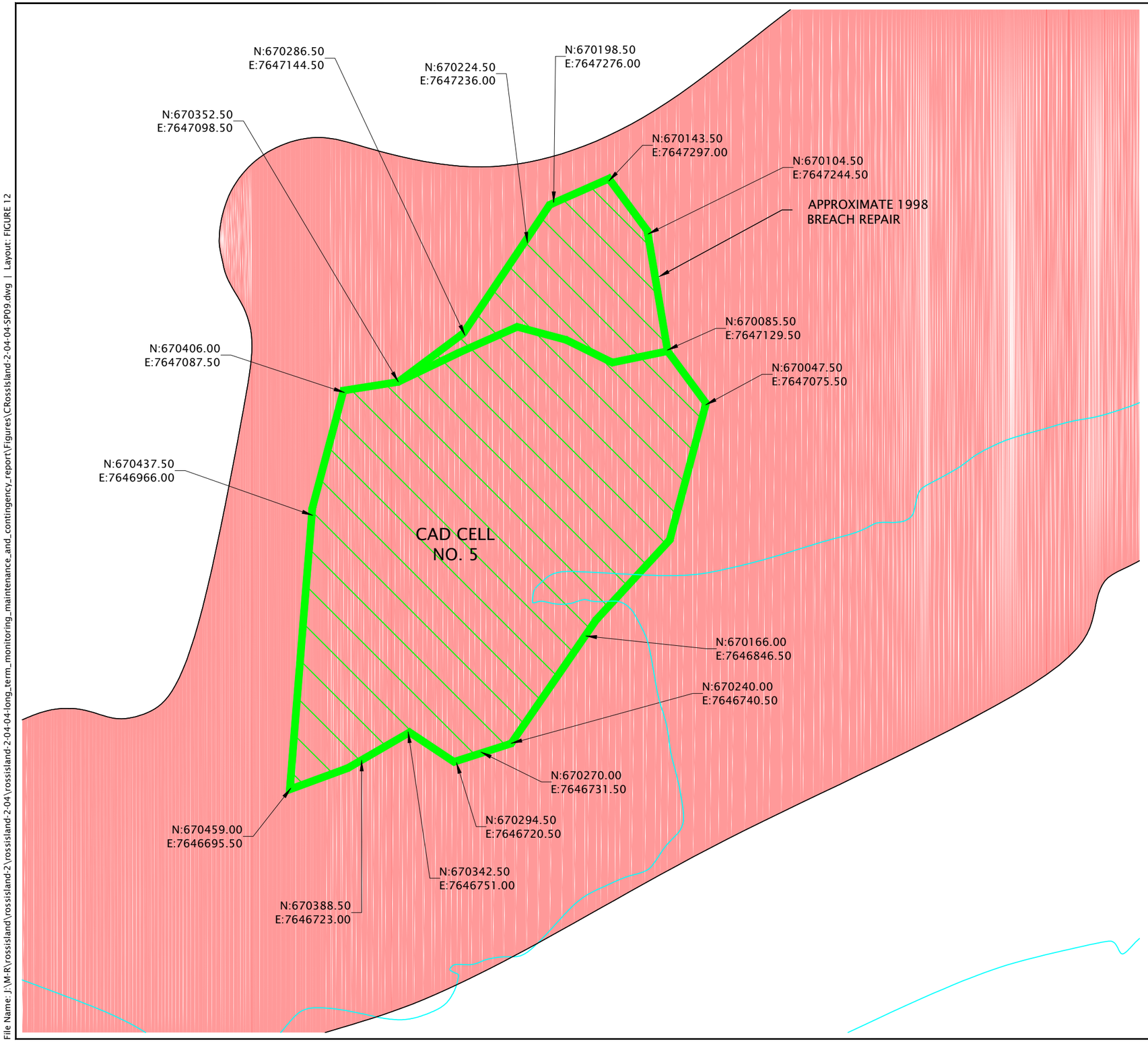

LEGEND:

- AREA D/E
- AREA F
- APPROXIMATE SHORELINE DURING 2007 SURVEY

N

0 100 200

(SCALE IN FEET)

SITE PLAN BASED ON DRAWING PROVIDED BY MINISTER-GLAESER SURVEYING, INC., AND NORTHWEST HYDRO, INC.

LAGOON REMEDIAL ACTION AREA - CAD CELL NO. 5

ROSS ISLAND SAND & GRAVEL
PORTLAND, OR

FIGURE 12

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APPENDIX A

APPENDIX A

LONG-TERM MONITORING AND MAINTENANCE FORMS

UPLAND MONITORING AND MAINTENANCE FORM
Remedial Action Area B

Date and Time:_____ Weather:_____

Name:_____ Signature _____

Other Parties Present During Monitoring Event: _____
_____

Date DEQ notified: _____

Reason for Monitoring Event: Routine/Significant Event
Describe significant event (e.g., 3.4 inches of rain in 24 hours, Flood stage of 18 feet RID, Flood stage of 24 feet, RID, Seismic event 6.0 or greater):_____
_____
_____

This form documents field observations of the remedial actions. Areas of concern and sample locations, if collected, are identified on the attached site maps. Photo-documentation of each remedial action area is also attached.

Remedial Action Area B Soil Cap (Includes soil from Remedial Action Area A1)

*General condition of soil cap:*_____
_____
_____

Cracks, Settlement? YES ☐ NO ☐
Location:_____
_____
Maintenance required? YES ☐ NO ☐

Holes, Penetrations? YES ☐ NO ☐
Location:_____
_____
Maintenance required? YES ☐ NO ☐

Animal intrusion, burrowing? YES ☐ NO ☐
Location:_____
_____
Maintenance required? YES ☐ NO ☐

Erosion, rills? YES ☐ NO ☐
Location: _____

_____

Maintenance required? YES ☐ NO ☐

Subsurface soil (>3 feet) exposed? YES ☐ NO ☐
Location: _____

_____

Maintenance required? YES ☐ NO ☐

Ponding? YES ☐ NO ☐
Location: _____

_____

Maintenance required? YES ☐ NO ☐

Dead/dying vegetation? YES ☐ NO ☐
Location: _____

_____

Maintenance required? YES ☐ NO ☐

Do any observations warrant urgent attention? YES ☐ NO ☐
If yes, describe: _____

_____

_____

Are contingency measures necessary? YES ☐ NO ☐
If yes, describe: _____

_____

_____

UPLAND MONITORING AND MAINTENANCE FORM
Remedial Action Sub-Areas A2-1, A2-2, and A2-3

Date and Time:_____ Weather:_____

Name:_____ Signature _____

Other Parties Present During Monitoring Event: _____
_____

Date DEQ notified: _____

Reason for Monitoring Event: Routine/0.5 inch of rain in 24 hours/Significant Event
Describe significant event (e.g., 3.4 inches of rain in 24 hours, Flood stage of 18 feet RID, Flood stage of 24 feet, RID, Seismic event 6.0 or greater):_____
_____
_____

This form documents field observations of the remedial actions. Areas of concern and sample locations, if collected, are identified on the attached site maps. Photo-documentation of each remedial action area is also attached.

REMEDIAL ACTION SUB-AREAS A2-1 and A2-3 - EROSION CONTROL BMPS

Remedial Action Sub-Area	BMP	Describe Condition of BMP	Maintenance/Action Needed
A2-1	Drainage Berms		Yes ☐ No ☐
	Biofilter Bags		Yes ☐ No ☐
	Gravel		Yes ☐ No ☐
	Ditches		Yes ☐ No ☐
	Vegetation		Yes ☐ No ☐
	Ecology Block		Yes ☐ No ☐
A2-3	Gravel		Yes ☐ No ☐
	Filter Trench		Yes ☐ No ☐

Do any observations warrant urgent attention? YES ☐ NO ☐
If yes, describe: _____

Are contingency measures necessary? YES ☐ NO ☐
If yes, describe: _____

REMEDIAL ACTION SUB-AREA A2-2

General condition of slope _____

Are there signs of erosion on the slope (e.g., sloughing, rivelets, or rills)? YES ☐ NO ☐
If yes, provide description: _____

Are the ecology blocks intact and aligned? YES ☐ NO ☐
If no, provide description: _____

Are there signs of erosion adjacent to the ecology blocks? YES ☐ NO ☐
If yes, provide description: _____

Do any observations warrant urgent attention? YES ☐ NO ☐
If yes, describe: _____

Are contingency measures necessary? YES ☐ NO ☐
If yes, describe: _____

UPLAND MONITORING AND MAINTENANCE FORM
PHOTO-DOCUMENTATION LOG

(Please print out all photographs as 3 x 5 or larger and attach to form)

Photo I.D.	Direction	Date and Time	Location and Description

SEDIMENT SAMPLING AND pH MONITORING FORM

Date and Time:_____ Weather:_____

Name:_____ Signature _____

Other Parties Present During Monitoring Event: _____

_____

Date DEQ notified: _____

Reason for Monitoring Event: Routine/Significant Event
Describe significant event (e.g., 3.4 inches of rain in 24 hours, Flood stage of 18 feet RID, Flood stage of 24 feet, RID, Seismic event 6.0 or greater):_____

_____

_____

Equipment Used and Calibration Method: _____

_____

_____

_____

Sampling should be completed in accordance with Appendix B – Field Procedures and Protocols for Sampling in Water.

Sample I.D.	Sample Location (northing/easting)	Date	Time	Depth Sounding (feet)	Sampling Method (Ponar/Vibracore)	Field Measurement

Sample I.D.	Sample Location (northing/easting)	Date	Time	Depth Sounding (feet)	Sampling Method (Ponar/Vibracore)	Field Measurement

BATHYMETRY REVIEW FORM

Survey completed by:_____ Review Date: _____
Equipment used:_____ Reviewer(s) _____
_____ Signature:_____

The lagoon bathymetry data has been reviewed. Lagoon bathymetric elevations have been summarized on the attached figure.

Lagoon Bathymetry

General Condition of Sediment Cap:_____
_____
_____
_____
_____

General Condition of slopes: _____
_____
_____
_____

Are there any signs of erosion or thinning of sediment cap? YES ☐ NO ☐
If yes, provide description:_____
_____
_____

Are there any signs of slope failure? YES ☐ NO ☐
If yes, provide description:_____
_____
_____

Do any observations warrant urgent attention? YES ☐ NO ☐
If yes, provide description:_____
_____
_____

Are contingency measures necessary based on review? YES ☐ NO ☐
If yes, provide description:_____
_____
_____

Maintenance performed since last reporting period: _____
_____
_____

APPENDIX B

APPENDIX B

FIELD PROCEDURES AND PROTOCOLS FOR SAMPLING IN WATER

SURFACE SEDIMENT GRAB SAMPLING

The locations and coordinates will be selected prior to the field activities. Once in the field, the sampling vessel will be located as close as possible to the selected waypoints using a GPS unit with sub-meter accuracy. The northing, easting, water depth, and time will be recorded at the time each sample is collected. Depth soundings will be converted to elevations based on water depth, sample time, and the Ross Island tide board or readily available tide charts.

Grab samples will be collected from the surface of the fill material placed in the lagoon using a Ponar grab sampler suspended from a hoist. The sampler will be lowered to the sediment surface of the lagoon from a skiff or barge. Once the Ponar device hits bottom, a spring-loaded pin will disengage from the sampling device and allow the "jaws" of the device to capture sediment as the sampler is retrieved.

The sediment sample will be placed into a clean, 5-gallon bucket and homogenized for approximately three minutes using a mixing tool attached to a portable drill. The pH of the homogenized sediment sample will be measured by inserting a calibrated pH probe (WTW Model 340i) into the sediment. Sample identifications, locations, and the corresponding pH data will be documented on the Sediment Sampling and pH Monitoring Form (Appendix A).

For chemical analyses, similar procedures will be followed, except samples will be placed in laboratory-certified, clean sample containers. Grab samples for chemical analyses will not be homogenized. Multi-incremental sampling procedures may be implemented if compositing is necessary. The appropriate methods will be discussed with DEQ prior to sampling events. The sample locations and results will be presented in the annual monitoring reports or supplemental reports to document contingency measures are complete.

SEDIMENT CORE SAMPLING

The locations and coordinates will be selected prior to the field activities. Once in the field, the sampling vessel will be located as close as possible to the selected waypoints using a GPS unit with sub-meter accuracy. The northing, easting, water depth, and time will be recorded at the time each sample is collected. Depth soundings will be converted to elevations based on water depth, sample time, and the Ross Island tide board or readily available tide charts.

When necessary, core samples will be used to evaluate contaminant conditions and pH in surface and subsurface sediment. Core samples will be collected using a vibracore. The vibracore barrel with a transparent butyrate liner will be driven to the approximate mid-depth of the sediment cap but no greater than 4 feet if fill thickness is greater than 8 feet. The liner and recovered sample will be removed from the barrel and laid flat on the deck of the sampling vessel. Recovered sediment from discrete intervals will be placed in an appropriate sample container for the testing required (i.e., ph, chemical analytical, archive).

Sample identifications, locations, and the corresponding pH data will be documented on the Sediment Sampling and pH Monitoring Form (Appendix A). The sample locations and analytical results will be presented in the annual monitoring reports or supplemental reports to document contingency measures are complete.

SHALLOW PORE WATER SAMPLING

In shallow water near the shoreline, pore water samples may be collected to evaluate pH in surface and subsurface sediment. Shoreline monitoring in shallow water (less than 1 foot deep) will utilize a 72-inch-long Henry Sampler. The locations and coordinates will be selected prior to the field activities. Samples will be collected as close as possible to the selected waypoints using a GPS unit with sub-meter accuracy. The northing, easting, water depth (if applicable), and time will be recorded at the time each sample is collected. Sample elevations will be calculated from tide stage or Ross Island tide board, sample collection time, and depth to sample.

The Henry Sampler will be driven to the desired depth or until refusal. A dedicated sampling syringe and tubing will be used to extract between 20 and 50 milliliters of pore water at a slow rate to limit dilution of the collected pore water sample with water from above or below the depth sampled. After the pore water is collected in the syringe, the plunger for the syringe will be removed and the collected pore water will immediately be measured for pH using a calibrated pH probe (WTW Model 340i). This process will be repeated with measurements collected at maximum depths (up to 72 inches below the sediment surface), an intermediate depth (approximately 36 inches below the sediment surface), and a shallow depth (approximately 4 inches [or 10 centimeters] below the sediment surface).

In addition to the pH testing, the hydrostatic head will be measured (only at sampling points within the shallow water), which can be used to evaluate groundwater discharge or recharge at the time of sampling. Sample identifications, locations, and pH results will be documented on the Sediment Sampling and pH Monitoring (Appendix A).

EQUIPMENT DECONTAMINATION QUALITY ASSURANCE

Prior to the start of sampling, the Ponar clam shell sampling device, the 5-gallon bucket, the mixing tool, and the probes will be rinsed with deionized (preferable option) or distilled water. During sampling, the equipment will be rinsed with fresh lagoon water between each event. If a high pH (<8.5) reading has been measured, the equipment will be cleaned with Liquinox and rinsed with deionized or distilled water prior to taking the next sample. Portable pH instruments will be properly calibrated prior to each field day and cleaned with distilled water between each event.

SAMPLE DESIGNATION AND LABELING

Each sample collected during field activities will be identified with the following:

- Sample labeling protocol as follows:
  - pH samples: pH-1(3-4) = Sample I.D. with sample depth interval in parentheses
- Date of sample collection (month/day/year)
- Time of sample collection (hours:minutes)
- Chemical analyses to be conducted

- Sample preservation, if appropriate
- Initials of sampler

DOCUMENTATION OF FIELD ACTIVITIES

Field activities documented on the forms provided in Appendix A, a field report, or field logbook. Photo-documentation of field activities will be performed, as appropriate. Field documentation will include, at a minimum, the following:

- Date
- Time of arrival and departure
- Weather conditions (including temperature, precipitation [sunny, rainy, snow, hail], approximate wind speed and direction
- Field team members
- Daily activities and times conducted
- Observations
- Record of samples collected with sample designations and locations specified
- Photographic log
- Field monitoring data
- Equipment used and calibration method
- List of additional data sheets and maps completed
- Signature of personnel completing field record

ACRONYMS

ACRONYMS

BMP	Best Management Practice
CAD	Confined Aquatic Disposal
COP	City of Portland
DEQ	Oregon Department of Environmental Quality
DSL	Department of State Lands
EES	Equitable Easement and Servitude
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
GPS	global positioning system
HCP	hazard communication plan
H:V	horizontal to vertical
LTMMCP	Long-Term Monitoring/Maintenance Contingency Plan
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
RA	risk assessment
RAO	remedial action objective
RI	remedial investigation
RID	Ross Island Datum
RIS&G	Ross Island Sand & Gravel Company
ROD	Record of Decision
TBT	tributyltin
USGS	U.S. Geological Survey
VCP	Voluntary Cleanup Program