PERIODIC REVIEW

Southwest Harbor Project Remediation Area 1
Burlington Northern Buckley Yard Site

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1.0 INTRODUCTION

This document is a review by the Washington State Department of Ecology (Ecology) of post-cleanup site conditions and monitoring data at the Burlington Northern Buckley Yard (BNBY) portion of Southwest Harbor Project Remediation (SWHP) Area 1 (Site). Cleanup at this Site was implemented under the Model Toxics Control Act (MTCA) regulations, Chapter 173-340 Washington Administrative Code (WAC)

The purpose of this periodic review is to determine whether the cleanup remedy at the Site continues to be protective of human health and the environment.

Cleanup actions at this Site were conducted in accordance with the requirements of Consent Decree 95-2-31522-4 dated December 5, 1995 entered into between the Port of Seattle (Port) and Ecology. The remedy involved the containment of hazardous materials. Concentrations of arsenic, lead, diesel-range petroleum hydrocarbons (TPH-D), poly chlorinated biphenyls (PCBs), carcinogenic polycyclic aromatic hydrocarbons (cPAHs) remain in soil at concentrations exceeding MTCA Method A cleanup levels. Additionally, other hazardous materials typically found in municipal solid waste landfills may remain at the Site. The MTCA Method A cleanup levels for soil are established under WAC 173-340-740 and the MTCA Method C cleanup levels for soil are established under WAC 173-340-745. The MTCA cleanup levels for ground water are established under WAC 173-340-720.

WAC 173-340-420 (2) requires that Ecology conduct a periodic review of a site every five years under the following conditions:

(a) Whenever the department conducts a cleanup action
(b) Whenever the department approves a cleanup action under an order, agreed order or consent decree
(c) Or, as resources permit, whenever the department issues a no further action opinion;
(d) and one of the following conditions exists:
    1. Institutional controls or financial assurance are required as part of the cleanup
    2. Where the cleanup level is based on a practical quantitation limit
    3. Where, in the department's judgment, modifications to the default equations or assumptions using site-specific information would significantly increase the concentration of hazardous substances remaining at the site after cleanup or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment.

When evaluating whether human health and the environment are being protected, the factors the department shall consider include [WAC 173-340-420(4)]:

- The effectiveness of ongoing or completed cleanup actions, including the effectiveness of engineered controls and institutional controls in limiting exposure to hazardous substances remaining at the site;

- New scientific information for individual hazardous substances of mixtures present at the site;
- New applicable state and federal laws for hazardous substances present at the site;
- Current and projected site use;
- Availability and practicability of higher preference technologies; and
- The availability of improved analytical techniques to evaluate compliance with cleanup levels.

The department shall publish a notice of all periodic reviews in the Site Register and provide an opportunity for public comment.

2.0 SUMMARY OF SITE CONDITIONS

2.1 Site History

The SWHP comprises approximately 185 acres of land generally bordered by Harbor Avenue and non-Port industrial and commercial properties on the west, SW Spokane Street and non-Port commercial properties on the south, Elliot Bay and Florida Street on the north, and the original Terminal 5 area on the east. Most of the SWHP overlies former tideflats that have been filled and used for various industrial purposes, including railroad yards, wood treatment, steel scrap storage, and municipal and wood waste landfilling.

The purpose of the SWHP is to redevelop and enlarge an existing container shipping terminal for American President Lines and other Port of Seattle customers in order to meet projected container service demands here and abroad. Much of the project area land has contaminated soils and sediments that require remediation. The project to facilitate cleanup and pollution prevention on more than 200 acres, restore and enhance habitat and natural resources, and increase water-dependent maritime uses and public use of shoreline.

For the purposes of upland cleanup, the project area has been divided into five remediation areas (RAs), RA1 through RA5. The remediation areas were defined based on previous ownership and land use. RA1 was divided into two subareas: Spokane Street Properties (cleanup being performed under an independent cleanup action) and BNBY.

The Site Plan available as Appendix 6.1 shows the SWHP area and the boundaries of each RA. The five RAs within the SWHP are as follows:

- The Spokane Street Properties and BNBY (RA-1),
- The former Salmon Bay Steel Property (RA-2),
- The former West Seattle Landfill and Purdy Scrap/former Seattle Steel Inc. property (RA-3),
- The Pacific Sound Resources Superfund site (RA-4), and
- The former Lockheed Yard 2 (RA-5).

The BNBY is located at the center of the SWHP. It consists of a narrow strip of land that was formerly used as a rail yard. BNBY is bounded on the north by SW Florida Street and on the south by 26th Avenue SW. RA-4 is adjacent to the northeast side of the yard, and RA2 and RA3 are adjacent to the southwest and northwest sides, respectively. The only features on the Site are five sets of railroad tracks and a small storage shed, which is located in the southwest corner of the yard.

Historical documentation for the BNBY area indicates that extensive filling has occurred since the early 1900s. Much of the fill material was derived from local sources, but some was derived from Seattle regrade projects. Depending on the original sources, it is possible that contaminated soil and hazardous materials were deposited at the Site during filling operations. Standard

practices at the time the sites were filled (1895 to 1960s) were performed with no concern for the chemical quality of fill materials.

In 1974, the Municipality of Metropolitan Seattle installed a 96-inch-diameter pipe to divert Longfellow Creek south of the subject Site to a discharge point in the West Waterway. The 96-inch pipe is now called the Longfellow Main Line, and a 72-inchdiameter pipe along the eastern boundary of the subject Site is the Longfellow Overflow Line. The Longfellow Overflow Line receives overflow storm water from the Longfellow Main Line, storm water runoff, cooling water and groundwater infiltration from the Salmon Bay Steel Facility south of Spokane Street, and discharges into Elliott Bay to the north of the Site. The Longfellow Overflow Line also receives shallow groundwater that flows from RA-1.

Burlington Northern has periodically used the BNBY to stage railcars containing industrial chemicals (acids, bases, etc.), hydrocarbons, and nonhazardous materials. In addition, the yard was reportedly used by Burlington Northern for railcar cleaning. During the environmental investigations, no patterns of contamination were found consistent with this activity.

All the land included in the Site area is zoned for industrial use. Zoning in the Site vicinity is implemented by the City of Seattle, which is conducting land-use planning under the Growth Management Act.

2.2 Early Site Investigations

2.2.1 Bethlehem Steel Geotechnical Assessment

A geotechnical study was performed in 1969 to assess the feasibility of a proposed property development. Four subsurface borings were advanced within and adjacent to the BNBY Site. Chemical testing was not performed. Visual observations during the advancement of the borings indicated that sanitary landfill debris were present in borings west of BNBY and within RA-3. Wood, concrete, logs, and other debris were observed in borings advanced within the BNBY Site at depths down to approximately 10 feet below ground surface.

2.2.2 Renton Effluent Transfer System Geotechnical Exploration

In 1985, a geotechnical and environmental investigation was performed on behalf of the Municipality of Metropolitan Seattle to evaluate the proposed corridor for the Renton Effluent Transfer System (RETS) pipeline. The proposed pipeline route paralleled the western boundary of the BNBY Site within the adjoining properties. During this investigation, 14 soil borings were constructed along this route from the south boundary to the northern boundary of the BNBY Site. The borings were advanced on a property immediately west of the present BNBY Site. Thus, none of the borings were representative of the yard itself.

2.2.3 Phase I Environmental Site Assessments of BNBY

In June of 1993, Phase I environmental site assessments were performed on the BNBY Site by Burlington Northern Railroad and the Port of Seattle. The Burlington Northern Phase I site assessment described the Site history and potential sources of contamination. The Site uses included lubrication of railroad switches and a rail car cleaning area. According to Burlington

Northern sources, procedures during railcar cleaning included hauling rinse materials off site for disposal. A specific area designated for railcar cleaning was not identified during these previous investigations. The Port of Seattle Phase I report reviewed aerial photographs and the Site history and recommended intrusive sampling to develop a better understanding of environmental conditions within the yard.

2.2.4 Preliminary Soil Investigation of BNBY

A preliminary soil investigation was conducted by the Port of Seattle in the Fall of 1993. Soil samples were collected from eight test pits, two locations within stormwater equalization basins, and from two stained areas along the Burlington Northern Railroad tracks.

All soils encountered in the test pits were fill materials consisting typically of sand and gravel. Variable amounts of debris, including concrete, wood, bricks, plastic, glass, and metal, were encountered in the fill material test pits; minor amounts of slag were encountered in test pits in the southern portion of the Site. Detected PCBs and cPAH compounds were found at concentrations below 1 milligram per kilogram (mg/kg) in the test pits sampled. Arsenic was the only compound found in excess of MTCA Method C cleanup levels for industrial soils and this was only at one location. This sample also exceeded the Dangerous Waste rule for carcinogenic mixtures. No chlorinated herbicides were detected. Concentrations of total petroleum hydrocarbons (TPH) were found in four test pits ranging between 250 and 2,000 mg/kg.

Sampling and testing of the two samples from the North Equalization Basins indicated the presence of TPH and PCBs. One sample contained extremely high concentrations of TPH (180,000 mg/kg) and relatively moderate concentrations of PCBs (10.4 mg/kg). The second sample from the North Equalization Basin contained 1,100 mg/kg of TPH and less than 1 mg/kg of PCBs.

During sampling of oil-stained areas at switches between the tracks at the BNBY, soil staining was observed to be limited to depths of less than six inches below ground surface. Based on visual observations, the extent of hydrocarbons was determined to be limited to areas immediately surrounding the switches one to three feet in diameter. Since lubrication of switches is a necessary operating procedure for a railroad yard and application of oils did not appear to have a detrimental effect on the soils below one foot, these potential source areas were not targeted for further sampling or testing. Future investigations focused on areas that were accessible and distributed across the large Site area.

2.3 BNBY Remedial Investigation/Feasibility Study

The Remedial Investigation (RI) for BNBY was conducted in two phases, beginning in November 1993 and completed in June 1994. The objectives of the RI were to characterize potential contamination in the surface and subsurface soils and groundwater at the Site. The investigation consisted of installing one monitoring well, excavating nine test pits, and testing surface water and soil samples collected from the North Equalization Basins. Because of the constraints of working within an active railroad yard, sampling and testing were confined to areas that were accessible and would not prohibit Burlington Northern's use of the yard.

In addition, adjacent studies for RA-3 and RA-1 along West Marginal Way were performed during the Summer of 1994. The RA-3 investigation included the installation of two monitoring wells within the north section of BNBY. Investigations along West Marginal Way included advancement of five soil borings along the eastern boundary of the Site, five soil borings around the Maintenance & Repair (M&R) building, and the installation of one monitoring well (MW-140) approximately 50 feet east of BNBY.

2.3.1 RI/FS Soil Quality

During the RI/Feasibility Study (FS) twenty-eight soil samples were collected from soil borings and test pits located throughout the Site. These samples were analyzed for volatile organic compounds, semivolatile organic compounds, PCBs, pesticides, TPH, metals, pH, total organic carbon, and TCLP metals. PCBs, cPAHs, TPH, arsenic, and lead were found at concentrations in soils exceeding the MTCA Method C industrial soil cleanup level (or Method A level where no Method C value exists) in localized areas.

Arsenic was of particular concern in soil as it was detected in all twelve soil samples collected in near-surface soils from BNBY. The maximum detected concentration was 2,700 mg/kg with an average concentration of 246 mg/kg, exceeding the MTCA Method A and C cleanup level of 20 mg/kg. Arsenic was also detected in all fifteen subsurface soil samples collected from BNBY. The maximum concentration was 238 mg/kg and the average concentration was 22.9 mg/kg, also exceeding the MTCA Method A and C cleanup level of 20 mg/kg.

The highest levels of organic contamination occurred in a thin stratum of black, oily soil encountered greater than five feet below ground surface in two discrete locations. The findings of the preliminary soil investigation support the conclusion that contaminants were related to zones containing debris materials and were more likely present within the fill materials at the time of their placement on the Site, and not related to spills originating in the areas around the railroad tracks. Findings during the remedial investigation also support the conclusion that contamination is related to the historical quality of the fill material underlying BNBY. Isolated areas of relatively high petroleum and cPAH contamination were observed within the test pits. However, the horizontal and vertical extent of the contamination appeared to be random and not related to one specific, identifiable source.

Because of the lack of discernible sources of contamination in the yard, the estimated quantity and extent of contaminated soils in BNBY contains a high degree of uncertainty. It is highly likely that other contaminated zones exist outside of the specific locations investigated during the RI. Based on the results of the RI, at a minimum approximately 2,000 cubic yards of soils were estimated as potentially exceeding the MTCA Method C or Method A cleanup levels for industrial soils.

2.3.2 RI/FS Sediment Quality

The sediment quality observed in the North Equalization Basins tested during the RI conducted at BNBY was consistent. PCBs ranged between 0.26 and 1.1 mg/kg; TPH between 1,200 and 2,600 mg/kg; Arsenic between 28 and 46 mg/kg; Lead between 328 and 389 mg/kg; and cPAH (total) between 3 and 4 mg/kg. The relatively high TPH and PCB concentrations detected in one

sample collected during the preliminary soil investigation were not duplicated during the RI. Hence, the sampling results obtained during the preliminary soil investigation are believed to be isolated and more reflective of bias during sample collection than representative of an average measure of contamination for the basin soils.

2.3.3 RI/FS Groundwater Quality

Three monitoring wells were installed in the BNBY Site. Two in the shallow fill aquifer (MW105 and MW306A) and one in the deeper estuarine aquifer (MW306B). Additional monitoring wells were precluded by the limited access in the operating railyard and the long narrow nature of the property. Numerous monitoring wells have been installed in adjacent properties as part of the SWHP RIs on RA-2, RA-3, and RA-4.

Based on information from the on-site and adjacent monitoring wells, the shallow fill aquifer was encountered underlying the BNBY Site at depths ranging between 6 and 8 feet below the ground surface. The estuarine aquifer was encountered at depths between 15 and 20 feet below the ground surface. These aquifers are separated by a thin silt layer which appears to thin toward the east. Groundwater flow in the shallow fill aquifer underlying the BNBY Site is influenced by the presence of the LOL. The LOL acts as a groundwater sink; therefore, groundwater in the shallow aquifer flows toward the LOL or to the west. Groundwater flow in the estuarine aquifer is less impacted by the presence of the LOL and, therefore, flows from the uplands to the east toward Elliott Bay and the West Waterway.

Ecology made the determination that the groundwater underlying the SWHP and, therefore, the BNBY property is not considered a drinking water aquifer. Therefore, groundwater quality was screened against the most restrictive criteria for surface water and, in particular, marine surface water. This was referred to in the RA-1 RI/FS as the surface water quality criteria (SWQC) and is used in the RI/FS and the Cleanup Action Plan (CAP) as reference screening levels only.

Monitoring wells MW306A and MW306B were located along the LOL immediately south of the northern equalization basins. Based on groundwater elevation contours generated during the RI/FS, the mean groundwater gradient within the shallow fill aquifer underlying the BNBY Site is toward the LOL corridor. Therefore, MW306A is downgradient of the shallow fill aquifer that underlies the BNBY Site. Groundwater from monitoring well MW306A, screened in the shallow fill aquifer, and MW306B, screened in the deeper estuarine aquifer, was analyzed for total and dissolved metals, semivolatile organics, volatile organics, pesticides and PCBs, and inorganic parameters.

The analytical results showed that nitrate/nitrite concentrations in the shallow fill aquifer and estuarine aquifer slightly exceeded the SWQC in these wells. Monitoring well MW105 was located in the southern portion of the BNBY property and was screened within the shallow fill aquifer. Groundwater flow in this area was generally toward the northeast with a portion of the flow moving toward the LOL corridor and a portion flowing toward the existing Terminal 5 property. Groundwater results from MW105 showed levels of copper, lead, nickel, PCBs, 1,1-dichloroethene, and bis(2-ethyhexyl)phthalate which were slightly above the SWQC screening levels. These compounds were not identified as contaminants of concern in the soil of the BNBY

property. Monitoring wells MW204 and MW204B are located approximately 100 feet northwest of MW105 within RA-2. Groundwater samples from these wells also showed low concentrations of volatile organics and PCBs. Soil samples from soil borings and test pits in RA-2 near MW105 did detect low concentrations of volatile organics and PCBs within the fill in this area. However, these detections were randomly located and did not indicate a discrete source area.

The primary contaminants of concern in the soil on the BNBY Site were determined to be TPH and cPAHs. Groundwater collected from the three wells on Site and adjacent downgradient wells MW204 and MW206 did not show exceedances of the SWQC screening levels for these compounds. Groundwater samples were not analyzed for arsenic during the RI/FS.

2.3.4 Selected Remedial Action

Three remedial action alternatives were developed for the Site. They included:

1. No Action
2. Containment of Soils Above Capping Levels and Institutional Controls
3. Longfellow Overflow Line Equalization Basin Improvements

A combination of alternative 2 and 3 was selected. Alternatives 2 and 3 consisted of measures that cap all contaminated materials above and below capping action levels, and reduce infiltration in areas of highest known contamination within BNBY, while removing unsuitable materials from the Longfellow Overflow Line Equalization Basins. This alternative consisted of installing surface covers related to the current design for the expansion of Terminal 5 at BNBY. All contaminated soil located under the proposed pavement and railroad ballast areas was shown in the RI/FS to not pose a threat to human health or the environment as long as pavement or soil covers are maintained to minimize infiltration and institutional controls are in place.

The RI/FS determined that PCB, cPAH, TPH, arsenic, and lead contamination with concentrations greater than MTCA Method C (or Method A) cleanup levels for soil required remediation. The redevelopment cover along with institutional controls (which are required under MTCA whenever compounds are left on Site at concentrations greater than Method A or Method B cleanup levels) was determined to provide adequate protection for human health and the environment for all contaminants at known concentrations in these areas. The redevelopment plans, which call for paving some areas of soil contamination found on BNBY, would provide a relatively impermeable cap over those areas that have soil contamination above excavation action levels. Maintenance of the cap would be required.

The asphalt pavement design for BNBY includes 8 inches of asphaltic concrete and 12 inches of crushed base course. In areas where railroad tracks are to be constructed, a minimum of 24 inches of ballast were placed below railroad ties. The proposed pavement and ballast cover designs are considered adequate to minimize human exposure through all pathways with a secondary benefit of limiting downward migration of contaminants into groundwater in paved areas and lateral migration of contaminated particles in stormwater runoff.

Institutional controls and monitoring included deed restrictions to limit public access, to prevent use of groundwater as a drinking water source, and to control future excavation activity in contaminated areas. Long-term groundwater monitoring was conducted at BNBY as part of a regional SWHP groundwater monitoring program.

All known soil contamination in the BNBY was evaluated for impact to downgradient marine water based on implementation of asphalt pavement and railroad ballast capping measures. This evaluation found soil contaminant concentrations at BNBY below action levels protective of downgradient surface water receptors. Furthermore, the contaminants found in the soils were not found at significant levels in groundwater. Hence, no excavation or removal actions were planned.

2.4 Cleanup Levels and Points of Compliance

2.4.1 Soil Cleanup Levels

Capping action levels were defined in the CAP for the Site instead of soil cleanup levels. Capping action levels for the BNBY Site are equivalent to MTCA Method C Industrial soil cleanup standards for arsenic, PCBs, and carcinogenic PAH compounds , and MTCA Method A cleanup levels for industrial soils for lead and diesel. These action levels focus on exposure to contaminants in the soil through ingestion or direct contact. Therefore, soils which exceed these capping action levels will require a soil cover and institutional controls to cut off these exposure pathways.

For the purpose of this review, the capping action levels will be used as cleanup levels for the Site. MTCA Method C cleanup levels may be used at industrial Sites, provided that:

- Hazardous substances remaining at the property after remediation do not pose a threat to human health or the environment in adjacent nonindustrial areas.
- The Site is not converted to nonindustrial use without approval from Ecology, which may require further cleanup at that time.
- Institutional controls are implemented that require industrial use at the Site.

BNBY is an industrial property that meets these criteria. BNBY is zoned for industrial use (classification IG2) by the City of Seattle, which is a municipality conducting land use planning under Chapter 36.70A RCW. BNBY has been used for industrial purposes since it was developed. Institutional controls were implemented on BNBY as a part of the remedial action. A deed restriction requires that the Port to maintain industrial uses at the Site and notify and receive approval from Ecology of any changes to nonindustrial use. Therefore, BNBY meets all the requirements for using industrial soil Method C cleanup levels.

The cleanup action levels are available as Appendix 6.3.

For the purpose of this review, MTCA Method C cleanup levels will be used to determine whether the remedy is protective of human health and the environment. When no MTCA Method C cleanup level exists, MTCA Method A, and Method A industrial cleanup levels will

be used. Because cleanup actions were initiated in 1995, this review will use cleanup standards applicable at that time.

2.4.2 Groundwater Cleanup Levels

Because the Consent Decree for the Site did not address groundwater, groundwater cleanup levels were not established for the Site. As part of the groundwater monitoring program conducted between 2008 and 2011 (discussed in Section 2.6.1), screening levels were used to evaluate concentrations of contaminants of concern.

The remediation activities completed at each of the RAs were intended to be protective of groundwater quality whose highest beneficial use is discharge to surface water. Therefore, screening levels for ground water were established based on protection of surface water. Groundwater at the Site is not potable, and will never be used for domestic purposes.

Screening levels were selected by choosing the most stringent Applicable or Relevant and Appropriate Requirements (ARARs) for surface water for each contaminant of concern. These ARARs were identified from the Clean Water Act (Section 304), the National Toxics Rule (40 CFR 131), Washington State Water Quality Standards (WAC 173-201a), and MTCA Method B surface water cleanup standards.

The selected screening levels are available in the table below:

Analyte	Screening Level (ug/L)
TPH	
Diesel range	500
Heavy oil range	500
Total Metals	
Total antimony	640
Total arsenic, inorganic	0.14
Total chromium	50
Total copper	2.4
Total lead	8.1
Total nickel soluble salts	8.2
cPAHs	
Benzo(a)anthracene	0.018
Benzo(a)pyrene	0.018
Benzo(b)fluoranthene	0.018
Benzo(k)fluoranthene	0.018
Chrysene	0.018
Dibenzo(a,h)anthracene	0.018
Indeno(1,2,3-cd)pyrene	0.018
sVOCs	

bis(2-ethylhexyl) phthalate	2.2
PCBs	
Aroclor 1016	0.0058
Aroclor 1254	0.0017
Aroclor 1260	0.03
Total PCBs	0.000064
VOCs	
Tetrachloroethane;1,1,2,2-	4
Trichloroethane;1,1,1-	420000
Trichloroethane;1,1,2-	16
Dichloroethane;1,2-	37
Tetrachloroethene	0.39
Trichloroethene	6.7
Dichloroethene;1,1-	3.2
Dichloroethene;1,2-,trans	10000
Vinyl Chloride	2.4

For the purpose of this review, these screening levels represent the most stringent ARARs for surface water at the Site and they will be used as cleanup levels to determine whether the remedy is protective of human health and the environment.

2.4.3 Ground Water Point of Compliance

For groundwater, the point of compliance is the point or points where the groundwater cleanup levels must be attained for a Site to be in compliance with the cleanup standards. The groundwater standard point of compliance is established throughout the Site form the uppermost levels of the saturated zone extending vertically to the lowest most depth which could potentially be affected by the Site.

2.4.4 Soil Point of Compliance

For soil, the point of compliance is the area where the soil cleanup levels shall be attained. For soil cleanup levels based on the protection of groundwater, as they are for this Site, the point of compliance is established as soils throughout the Site.

2.5 Long-Term Compliance Monitoring and Maintenance

2.5.1 Compliance Monitoring

As part of the CAP, groundwater monitoring was required to be performed on a quarterly basis for a period of five years. Later, the groundwater monitoring plan was modified as part of the Phase II Groundwater Confirmation Monitoring Program in 2008. Per this program, groundwater sampling was required to take place twice annually for three years. Sampling was required to take place during the periods of seasonal low (September/October) and seasonal high (December/January/February) groundwater levels. At the end of three years, the monitoring program was evaluated to determine whether redevelopment and remedial actions in the area

have provided sufficient protection to groundwater at BNBY and to determine whether the monitoring strategy should be revised. An evaluation of groundwater compliance monitoring data is available in Section 3.1.2.

In an October 31, 2011 letter from Ecology to the Port of Seattle, Ecology stated that:

> "Ecology agrees that the groundwater monitoring data collected in October 2008, March 2009, September 2009, June 2010 October 2010 and February 2011 do not show any contaminants exceeding MTCA cleanup standards. The six rounds of groundwater data appear to satisfy the Phase II groundwater monitoring plan. The groundwater monitoring program for RA-1, -2, -3 and -5 are now complete under the Consent Decrees for RA-1, -2, -3 and -5."

It was determined that monitoring data had demonstrated that the Site was not impacting groundwater, and the groundwater monitoring program was terminated with Ecology's concurrence.

2.5.2 Inspections and Maintenance

Requirements for post remediation inspection and maintenance of the Site were described in an Operations and Maintenance Plan. On a semi-annual basis, Port staff inspect the RA2 and RA1-BNBY area. The integrity of the cover (pavement and ballast) areas, surface water collection systems, and Site security measures are inspected and recorded.

The Site is inspected to determine the condition of pavement and ballast covers including: locations of penetrations; cracks, tears, or gouges in Site covers; persistent ponding of water on pavement and ballast covers or around surface water collection system components; additional surface water drainage problems including siltation in catch basins; recent repair work and/or recent excavation activities, damaged security fencing, and adequacy of security measures.

The most recent available inspection form was from December 9 and December 17 2011. The inspection determined that the cap appeared to be generally intact with some exceptions noted. The complete inspection report is available as Appendix 6.4.

3.0 PERIODIC REVIEW

3.1 Effectiveness of completed cleanup actions

3.1.1 Soil and Direct Contact

Based upon the Site visit conducted on March 8, 2012, the Site remains owned by the Port and is used for industrial purposes. The Site has many active uses that are generally dedicated toward shipping container storage and transfer. Site infrastructure allows for loading and unloading of containers from ships, transfer of shipping containers to truck and rail, and general use as a railyard. The Site surface covers appear in excellent condition. Site personnel regularly perform Site inspections, maintenance on the cap surface, fence maintenance and Site security control.

The impermeable Site surfaces continue to eliminate direct exposure pathways (ingestion, contact) to contaminated soils. Site maintenance employees continue to conduct asphalt cap repairs and maintenance as necessary, as Site surfaces must be maintained to allow for Site operations. A photo log is available as Appendix 6.5.

Because soils remain at the Site with concentrations of hazardous materials exceeding MTCA Method A cleanup levels, institutional controls are required as part of the final remedy.

3.1.2 Ground Water

Groundwater monitoring was conducted for three years at the Site on a semi-annual schedule between October 2008 and February 2011. Four wells within the groundwater monitoring network were considered relevant to the BNBY portion of the project. CMP-5 is located west of the Site boundary and is considered a background well, CMP-4 is located directly beneath BNBY and RA-1, and MW-308N and MW-308S are located downgradient from the BNBY to the north. MW-308N is located in the fill aquifer and MW-308S is located in the estuarine aquifer and has both saltwater intrusion and tidal influence.

The background well, CMP-5, contained concentrations of arsenic exceeding the selected MTCA Method A cleanup level of 5 micrograms per liter (ug/L) in four of six monitoring events with a maximum concentration of 14.2 ug/L in October 2008. MW-308N contained concentrations of arsenic exceeding MTCA Method A cleanup levels in all six monitoring events with a maximum concentration of 25.4 ug/L. MW-308S contained arsenic at 8 ug/L in October 2008, but did not contain arsenic at concentrations exceeding MTCA Method A cleanup levels for the final five monitoring events. A table containing arsenic concentrations in groundwater is available below.

Arsenic Concentrations in Groundwater (ug/L)

	10/13/2008	4/1/2009	9/2/2009	6/3/2010	10/5/2010	2/9/2011
Upgradient Wells						
CMP-5	**14.2**	1.9	**12.9**	3.6	**13.3**	**7.1**
CMP-4	2.8	1.1	3.8	1.4	2.5	1
Downgradient Wells						
MW-308N	**25.4**	**16.8**	**15.3**	**16.2**	**22.8**	**16.4**
MW-308S	**8**	3	3	2	0.5	2

Red indicates concentrations exceed MTCA Method A cleanup level

Arsenic concentrations in groundwater at concentrations exceeding MTCA Method A cleanup levels are common in the Puget Sound region; however, concentrations of arsenic are slightly elevated downgradient from the Site when compared to upgradient concentrations. This indicates the Site may be a contributing source of arsenic contamination to groundwater.

Remaining concentrations of arsenic in groundwater are not likely to pose a threat to human health or the environment for several reasons, including:

- Groundwater downgradient from the Site is not potable and will never be used for domestic purposes.
- Property implemented institutional controls will restrict groundwater use at the Site for all future uses.
- Samples collected at the Site were analyzed for total arsenic, while cleanup standards use dissolved arsenic. Dissolved arsenic concentrations at the Site area likely lower than measured total arsenic concentrations.
- MW-308S does not contain arsenic at elevated concentrations, indicating the Site is not likely contributing to contamination in the estuarine aquifer or surface waters of the Puget Sound.
- Arsenic may be becoming mobilized beneath the Site due to reducing groundwater conditions as a result of the former landfill located immediately west of the BNBY area. This mobilized arsenic will likely become fixed and biologically unavailable as soon as it encounters oxidizing conditions near Elliot Bay.
- Arsenic concentrations in groundwater do not exceed Clean Water Act Marine Standards protective of aquatic life of 36 ug/L.

There are no apparent exposure pathways to arsenic contaminated groundwater through current Site uses; however, to assure that the remedy remains protective of human health and the environment for future uses, institutional controls should be implemented to incorporate the area north of RA-4 that includes MW-308N and MW-308S. This may not be necessary if the Port is

able to demonstrate, through further groundwater analysis, that *dissolved* arsenic concentrations in groundwater are below the Site cleanup level of 5 ug/L.

3.1.3 Institutional Controls

Institutional controls are required at the Site per the Consent Decree and CAP, and as a result of the use of MTCA Method C Industrial cleanup levels for soil. As stated in the CAP, these institutional controls should include:

- Site Fencing and Security
- Health and Safety guidance for future excavation work
- Conformational monitoring requirements and procedures
- Procedures for periodic inspection and maintenance of facility constructed cover
- Restriction of Site use to industrial only

These institutional controls have been implemented at the Site. A restrictive covenant was recorded in 2012 with the following restrictions:

1. No groundwater may be taken for domestic purposes from any well in the area encompassed by the SWHP.
2. Any activity on the Site that may interfere with the Cleanup Action is prohibited. Any activity on the Site that may result in the release to the environment of a hazardous substance that was contained as a part of the Cleanup Action is prohibited unless approved by Ecology or in compliance with the approved Operations and Maintenance Plan.
3. The Site shall not be used for any activities other than traditional industrial uses, as described in RCW 70.105D.020(23), and defined in and allowed under the City of Seattle's zoning regulations.
4. The owner of the Site must give written notice to the Department of Ecology, or to a successor agency, of the owner's intent to convey any interest in the Site.
5. The owner must notify and obtain approval from the Department of Ecology, or from a successor agency, prior to any use of the Site that is inconsistent with the terms of this Restrictive Covenant.
6. The owner shall allow authorized representatives of Ecology the right to enter the Site at reasonable times for the purpose of evaluating compliance with the Cleanup Action Plan and the Consent Decree, to take samples, to inspect Cleanup Actions conducted at the Site and to inspect records that are related to the Cleanup Action.
7. The owner of the Site and the owner's assigns and successors in interest reserve the right under WAC 173-340-440 (1991 ed.) to record an instrument which provides that this Restrictive Covenant shall no longer limit use of the Site or be of any further force or effect.

Based on evaluation of groundwater monitoring data collected at the Site between 2008 and 2011, the coverage area of institutional controls should extend beyond the footprint of the remediation areas to include the property in the vicinity of MW-308N and MW-308S where arsenic concentrations in groundwater exceed Site cleanup levels; however, this does not prevent the remedy from being protective of human health and the environment. This was discussed in more detail in Section 3.1.2.

Additionally, the restrictive covenant recorded in 2012 does not meet the requirements of the Uniform Environmental Covenant Act (UECA). UECA was enacted in Washington State in 2007 and requires specific content for covenants. Specifically, the covenant for this Site lacks the following requirements:

- It was not signed by Ecology;
- it is not described as an environmental covenant executed under Chapter 64.70 RCW; and
- Ecology did not consult with local land use and planning authorities in the development of the land use or activity restrictions in the covenant.

While this covenant does not comply with UECA, it does not prevent the remedy from being protective of human health and the environment in the short term.

3.1.4 Summary

Fencing and an impermeable Site surface serve as engineered controls to prevent the exposure and release of capped contaminated soils. However, groundwater contamination remains outside the coverage area Site institutional and engineered controls. The Port and Ecology should evaluate whether the restrictive covenant should be amended as an environmental covenant that meets the requirements of the UECA, and whether the coverage area of institutional controls should include the property in the vicinity of the MW-308 wells.

The remedy at the Site is currently protective of human health and the environment. Institutional controls have been implemented for the Site, but should be modified to prevent future exposure to contaminated groundwater remaining beneath the Site.

3.2 New scientific information for individual hazardous substances for mixtures present at the Site

There is no new relevant scientific information for the contaminants related to the Site.

3.3 New applicable state and federal laws for hazardous substances present at the Site

Screening levels at the Site are based on current primary and secondary ground water standards, and MTCA Method A, B and C cleanup levels. There are no new relevant state or federal standards applicable to the Site, with the exception of standards for petroleum hydrocarbons. MTCA petroleum hydrocarbon cleanup levels have generally increased since the CAP was written for the Site; however, these changes do not impact whether the remedy is protective of human health and the environment.

3.4 Current and projected Site use

The Site is an active railyard with container storage, tractor trailer and forklift traffic. These uses are not likely to have a negative impact on the risk posed by hazardous substances contained at the Site as long as the Site surface is actively maintained.

3.5 Availability and practicability of higher preference technologies

The remedy implemented included containment of hazardous substances and it continues to be protective of human health and the environment. While higher preference cleanup technologies may be available, they are still not practicable at this Site.

3.6 Availability of improved analytical techniques to evaluate compliance with cleanup levels

The analytical methods used at the time of the remedial actions were capable of detection below cleanup levels for contaminants of concern at the Site. The presence of improved analytical techniques does not affect decisions or recommendations made for the Site.

4.0 CONCLUSIONS

- The cleanup remedy implemented at the Site is currently protective of human health and the environment.
- Unrestricted use soil cleanup levels have not been met at the Site; however, under WAC 173-340-740(6) (f), the cleanup action is determined to comply with cleanup standards, since the long-term integrity of the containment system is ensured.
- There are two issues that should be evaluated to ensure long-term protectiveness:
    - The coverage area of institutional controls should include the waterfront property containing MW-308N.
    - The restrictive covenant that was recorded for the property in 2012 does not meet the requirements of UECA.

  These two issues will be re-evaluated during the next periodic review to be conducted in five years.

Based on this review, additional actions may be required to assure that the remedy for the Site remains permanently protective. Additionally, it is the property owner's responsibility to continue to inspect the Site to assure that the integrity of the cap is maintained.

4.1 Next Review

The next review for the Site will be scheduled five years from the date of this periodic review. In the event that additional cleanup actions or institutional controls are required, the next periodic review will be scheduled five years from the completion of those activities.

5.0 REFERENCES

URS Consultants, Inc. *Final Remedial Investigation/Feasibility Study*. September 1995.

URS Consultants, Inc. *Final Cleanup Action Plan.* October 1995.

Ecology. *Consent Decree No. 95-2-31522-4.* December 5, 1995.

Aspen Environmental, Ltd. *UST Site Assessment Report.* February 14, 1996

The Black and Veatch Team. *Final Compliance Monitoring Plan.* April 1996.

The Black and Veatch Team. *Final Operations and Maintenance Plan. April 1996.*

URS Consultants, Inc. *Independent Cleanup Action Report.* June 1996.

Aspect Consulting, LLC. *Phase II Groundwater Confirmation Monitoring Program.* October 6, 2008.

Hart Crowser. *Draft Groundwater Quality Monitoring Evaluation Report.* September 23, 2010.

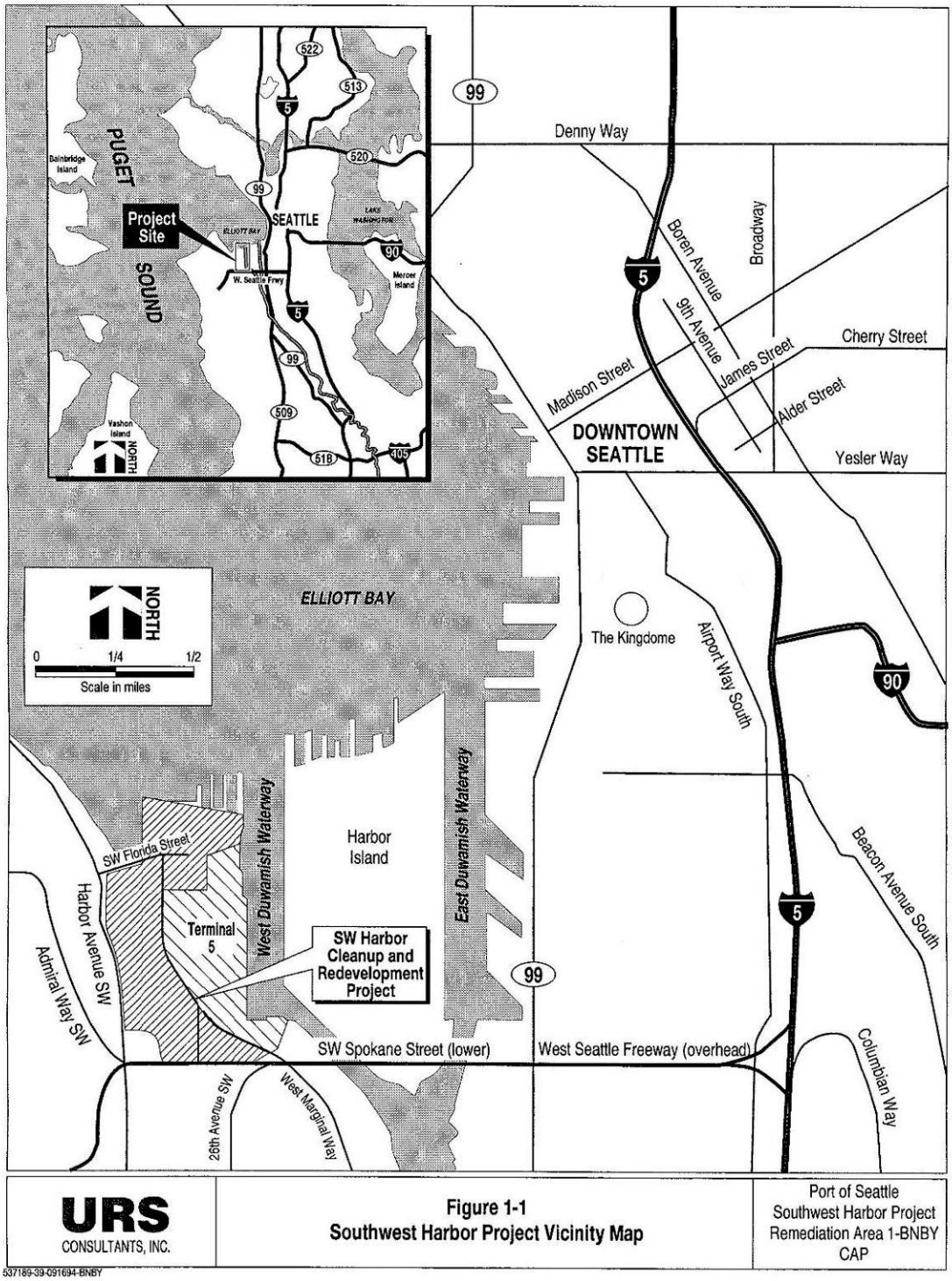
Port of Seattle. *Remediation Progress Report Letter.* April 20, 2011.

Ecology. *Groundwater Monitoring Program Completion Letter.* October 31, 2011.

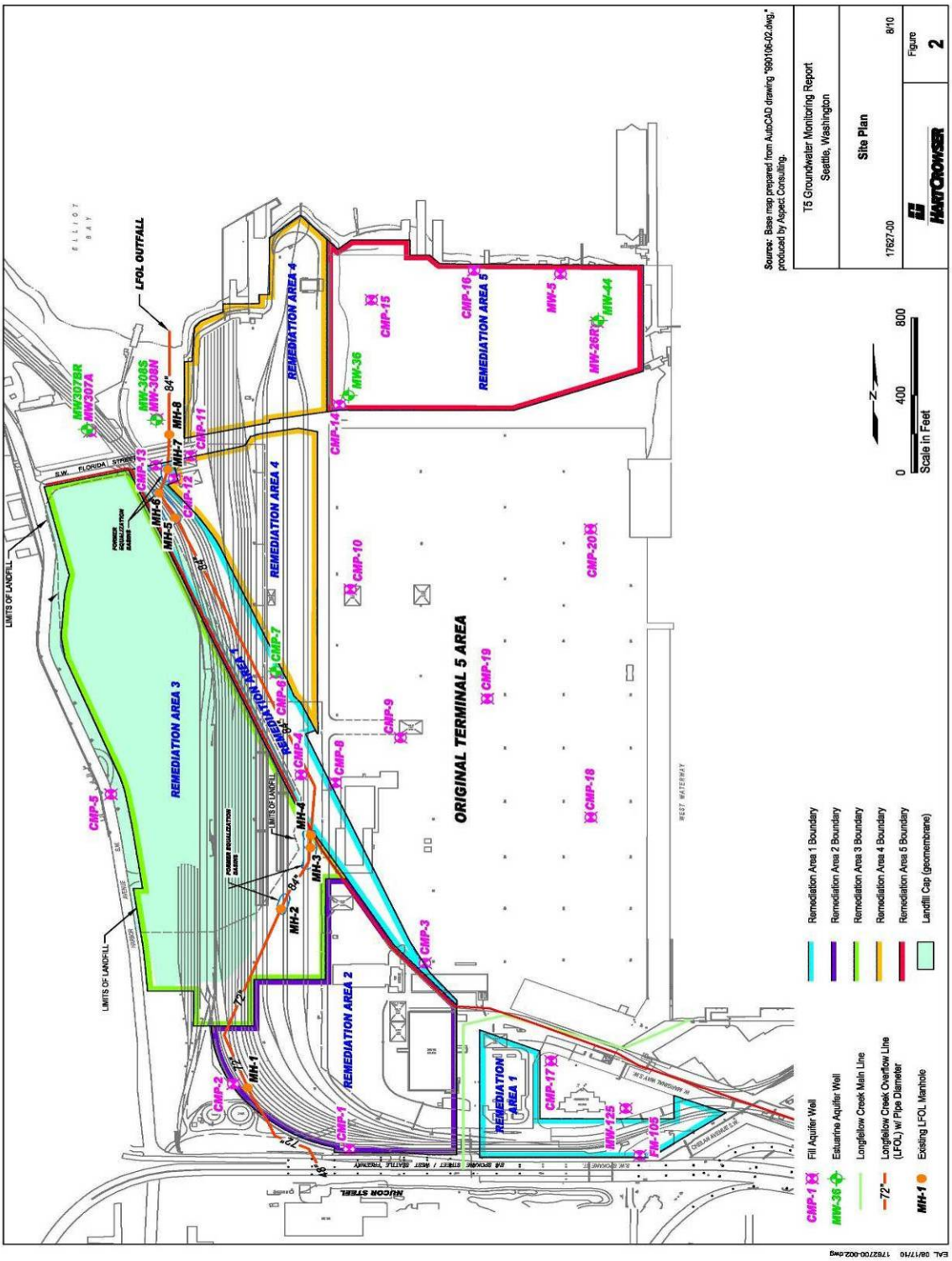
Ecology. *Site Visit.* March 8, 2012.

6.0 APPENDICES

6.1 Vicinity Map



6.2 Site Plan


LFOL OUTFALL
REMEDIATION AREA 1
REMEDIATION AREA 2
REMEDIATION AREA 3
REMEDIATION AREA 4
REMEDIATION AREA 5
ORIGINAL TERMINAL 5 AREA
LIMITS OF LANDFILL
S.W. FLORIDA STREET
NUCOR STEEL
Scale in Feet
Remediation Area 1 Boundary
Remediation Area 2 Boundary
Remediation Area 3 Boundary
Remediation Area 4 Boundary
Remediation Area 5 Boundary
Landfill Cap (geomembrane)
Fill Aquifer Well
Estuarine Aquifer Well
Longfellow Creek Main Line
Longfellow Creek Overflow Line (LFOL) w/ Pipe Diameter
Existing LFOL Manhole
T5 Groundwater Monitoring Report
Seattle, Washington
Site Plan
17627-00
8/10
Figure
2

6.3 Cleanup Action Levels

Table 4-1
Proposed Cleanup Action Levels—BNBY Soils
(all concentrations in mg/kg)

Compound	Existing Contaminant Level (95% UCL)			Proposed Capping Action Level	Proposed Excavation Action Level[c]	
	Paved Soil	Unpaved Soil	Unpaved Sediments		Paved Soil	Unpaved Soil/Sediments
Arsenic	327	2.9	46.3	188[a]	744,000	12,400
Lead	391	ND	389	1,000[b]	>1,000,000	1,000,000
TPH-Diesel	2,510	17	2,700	200[b]	No Free Phase	29,000
Benzo(a)anthracene	75	ND	0.6	18[a]	250,000	4,160
Benzo(a)pyrene	71	ND	0.6	18[a]	997,000	16,660
Benzo(b)fluoranthene	89	ND	0.92	18[a]	99,700	1,660
Benzo(k)fluoranthene	57	ND	1	18[a]	99,700	1,660
Chrysene	128	ND	1	18[a]	36,200	603
Dibenz(a,h)anthracene	12	ND	0.2	18[a]	598,000	9,950
PCB (total)	0.50	ND	2.0	17[a]	155	2.58

[a]MTCA Method C Industrial Standard
[b]MTCA Method A Industrial Standard
[c]The existing soil contaminant level will not impact groundwater at levels which would adversely effect adjacent surface waters.

6.4 Maintenance and Inspection Report

Date of Inspection Dec 09 and Dec 17, 2011 Name of Inspector: Warren Hansen

Time of Inspection: 9:00 AM to 11:00 AM Weather Conditions: Cold and clear-broken clouds
Note: Inspections should be conducted in early morning per section 3.2.1 of the I&M Plan

Overall Cap Inspection

Cap Damage – Location and Description: Cap appears to be generally intact with exceptions noted below.

Is Standing Water Visible? Some in vicinity of tail track. Does not exceed depth limits.

- Are catch basins functioning? Yes.

The following items are noted:

1. The cap continues show some aging relative to surface wear and development of alligator cracking in places. This highlights the need to plan and execute a maintenance project for the next dry season (patching, sealcoat and restriping). Some surficial "cupping" of alligator cracked areas is now evident (see photos) – probably due to drying out of the original sealcoat surface. These areas consist of small, individual seal-coated surfaces (approximately the size of a playing card), each circumscribed by alligator cracks. The edges of each small area are turning up slightly (several millimeters) at the boundary with the crack, creating a cupping effect. This surface degradation will need to be ground off before sealcoat is applied.

2. Seal coat is worn in high traffic areas and many of the boundary labels are no longer legible – these need to be repainted after the seal coat is restored. Caulk is portions of the repaired cracks resulting from the 2001 Nisqually Earthquake is loose and needs to be restored. Integrity of caulk materials appears to be holding up except in small limited areas (less than 6-ft).

3. The joint between the cap structure and steel rails and concrete foundations is still sufficiently "tight" through the overall cap cross-section. However, as can be seen in the photographs of the inspection stations, The asphalt side of the upper portion of these joints is now degrading in places, although this phenomenon only penetrates no more than ¼ to ½ inch below the surface. As part of the sealcoat project, these joints should be cleaned and a sealant should be applied – similar to the material previously applied along either side of the tail track rails. This will control water influx and reduce the potential for cap damage due to freezing. This recommendation applies to all areas of the cap (IY and Storage Track areas)

CAP STRIPING AND EDGE DETAILS

Is Striping/Painting Visible and Legible?

Environmental Cap Boundary: Many of the pavement labels are now obscured through surface wear and weathering. They will need to be repainted as soon as the sealcoat is restored.

- East Side: No – wording is typically obscured but white backgrounds are still evident
- West Side: Yes
- South Side: No – wording is typically obscured but white backgrounds are still evident

8" – 4" Thickness Boundary: Some. Many are now obscured (yellow lettering on white background has faded. Need to be repainted (see photos).
Slurry Wall Demarcation: Some: additional markings are obscured. White background is still evident.

Edge Details: Edge condition is good – some slight breakage of aging asphaltic concrete around switch pits and along edge, but nothing sufficient to compromise overall cap performance.

- North Side: Public access area soil cover intact? Yes

- S.W. Side: Condition of pavement at ballast interface? Good

Conditions Along Structures

Is gap greater than 1-inch wide visible? No

- Width of gap NA
- Depth of gap NA
- Continuous along structure? NA
- Location of cracks NA

Notes: Conditions along structures are generally good. Next dry season should include some spot caulking around concrete light standard foundations and some of the strip drains as asphalt/concrete joints have opened slightly in some locations. This should be part of the cap reconditioning project for the next dry season. See general note at top of this form.

HIGH IMPACT AREA FOCUSED INSPECTIONS

1) 8-inch Cap: Gantry Crane runway and adjacent truck roadway by middle leg of RTG runway

Surface Conditions

Are cracks greater than ¼-inch wide visible? Not if caulked. NOTE: Seaport Maintenance conducted a round of crack sealing during the previous summer. Crack maintenance appears to be good.

- Width of cracks: caulked and/or less than gap requiring corrective action
- Depth of cracks: NA
- Length of cracks: NA
- Spacing of cracks: NA
- Location of cracks: As described above – base of light foundation.

Is Settlement Visible? Slight but minor -- in tail track area

Is Settlement greater or less than 3 inches? Less.

- Dimension of settlement area: Approximately 5 ft x 15 ft
- Depth of Settlement: Less than 1 inch
- Location of cracks: No cracks associated with settlement.

Notes: The cap appears to be in generally good condition with some surface wear. There are small ponding areas observable after rainfall, but these are less than 1 inch deep, and the water evaporates rapidly. Standing water is not an issue. Surficial alligator cracking appears to be increasing on the upper surface of the pavement (cracking in the seal coat only -- does not appear to extend into the pavement to any appreciable depth). However, these cracks are allowing moss to take hold. These areas will require thorough cleaning before a seal coat is applied.

2) 4-inch Cap: 10" wide area along western rail

Surface Conditions

Are Cracks greater than ¼-inch wide visible? No, except as repaired after 2001 earthquake

- Width of cracks: NA

- Depth of cracks: NA
- Length of cracks: NA
- Spacing of cracks: NA
- Location of cracks: NA
-

Notes: Surficial alligator cracking appears to be increasing on the upper surface of the pavement (cracking in the seal coat only – does not appear to extend into the pavement to any appreciable depth). However, these cracks are allowing moss to take hold. These areas will require thorough cleaning (or surface grinding) before a seal coat is applied.

Is Settlement Visible: Some slight settlement between tracks in vicinity of Station 4 (minor – has not increased since last year)

Is Settlement greater or less than 3 inches? Less than 3 inches

- Dimension of settlement area: 3 ft x 20 ft (between rails)
- Depth of settlement: 1 inch
- Location of cracks: NA

Notes: Slight settlement of asphalt between rails near inspection station 4 does not appear to be impacting cap performance

Cap Damage – Describe Conditions and Location:

3) Conditions Along Railroad Tracks

Inspection of one rail of the tail track and one rail of the middle leg of RTG runway

Is a gap greater than 1 inch wide visible? No

- Location of gap: NA
- Width of gap: NA
- Depth of gap: NA
- Continuous along railroad track: NA

Notes: Conditions have not changed appreciably from previous inspection. There are still minor points of asphalt breakage along the track/pavement boundary (very small, within the upper ½ inch of the pavement). The seal between the rail and pavement is still intact throughout the depth of the cross section. However, these joints should be cleaned and sealed at the surface (see general note at beginning of this form).

Follow-up Inspections of Repaired Areas:

Location: 2001 Earthquake crack repair areas

Notes: See above. These were serviced during the previous summer (dry) period.

Location: Access Road north of Storage Track Area – Derailment Repair Area

Notes: The derailment repair area was inspected and all pavements and fences are intact (see photos in folder)

6.5 Photo log

Photo 1: Southwest Harbor Project – from the north

Photo 2: West Side of RA-1 with Former Landfill to the West – from the north

Photo 3: RA-1 Container Storage and Asphalt Surface - from the north

Photo 4: Waterfront on North Edge of Site – from the west