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August 10, 2001

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VIA FIRST CLASS MAIL

Mr. Ken Berg, Manager
Western Washington Office
U.S. Fish and Wildlife Service
510 Desmond Drive, S.E., Suite 102
Lacey, WA 98503

RE: Master Plan Update Endangered Species Act Consultation, Reference # 1-3-00-F-1420

Dear Mr. Berg:

On May 22, 2001, the U.S. Fish and Wildlife Service (FWS) issued a final biological opinion (BO) evaluating the effects of relevant Master Plan Update actions on listed species occurring in the action area. The May 22, 2001, BO requires the Port of Seattle to submit to FWS for its review and approval a plan to monitor the quality of seepage from the drainage layer beneath Third Runway embankment fill. In accordance with this requirement, the Port submits for your review and approval a draft embankment monitoring plan.

Please feel free to contact me if you or your staff have any questions concerning this document.

Sincerely,

James M. Lynch, Esq.
Attorney for the Port of Seattle

Enclosure

AR 031416

Exhibit-2045

Cc: Ms. Nancy Brennan-Dubbs, FWS
Mr. Karl Lewis, FAA
Ms. Elizabeth Leavitt, Port of Seattle
Mr. Tom Newlon, Port of Seattle
Ms. Beth Clark, Port of Seattle
Ms. Linn Gould, ERDA Environmental

EMBANKMENT SEEPAGE MONITORING PLAN

1.0 Introduction and Background

In accordance with the Fish and Wildlife (FWS) Biological Opinion (BO) regarding the effects of the proposed Sea-Tac Airport Master Plan Update Improvements on listed bull trout, marbled murrelets, and bald eagles, the Port of Seattle (Port) has agreed to prepare a seepage quality monitoring plan (MP) for the proposed Third Runway embankment (Exhibit 1). The Port has agreed to submit a draft MP to the FWS for its review and approval within 120 days of the issuance of the BO, dated May 22, 2001.

The purpose of the MP is to develop a program to track the quality of seepage from the embankment to ensure that infiltrate is not causing adverse impacts to aquatic life in neighboring Miller and Walker Creeks. Seepage quality monitoring will commence following completion of the entire embankment. This MP is prepared using a conceptual site model that predicts the water flow regime through the embankment; the embankment itself will not be completed for several years. Therefore, it is anticipated that some of the sections in this document may require modification upon implementation. Any modifications will be submitted to the FWS in the form of an MP addendum.

2.0 Conceptual Site and Flow Model

This section describes the embankment fill and how water is anticipated to flow through it. The embankment is designed to create an elevated, relatively flat surface upon which the Third Runway will be built. As shown on Figure 1, the total length of the embankment will extend approximately 8,700 feet, bounded by the relocated S. 154th Street to the north and extending beyond S. 176th Street to the south. The width of the fill ranges from 40 feet at its narrowest point in the south end, to approximately 1,400 feet at its widest point. The east margin of the fill will abut the existing airfield; the west margin of the fill will either be sloped or bounded by a mechanically stabilized earth (MSE) wall, depending on the location. Fill thickness will range from several feet to 165 feet. The volume of the fill that is required for the construction of the Third Runway embankment is approximately 17 million cubic yards. Embankment soil placement is designed to be both geotechnically suitable as foundation material for the Third Runway and to accommodate infiltration of water through the fill in all seasons. Fill will consist of approximately 40 percent sand and gravel that is relatively silt-free and about 60 percent silty sand and gravel mixtures.

A bottom drain layer, consisting of an approximate 3-foot thickness of free-draining sand and gravel has been included in the fill embankment design (Figure 2). This drain layer will generally be laid on the existing ground surface. It will prevent groundwater pressures from building up within the embankment and direct groundwater flow away from the embankment fill. Water may enter the drainage layer from above and below, due to infiltration through the embankment fill, and ground water inflow.

To provide protection for both aquatic resources and surface water quality in neighboring Miller and Walker Creeks, the Port has agreed in the FWS BO to establish a zone of "ultra-clean" fill directly above the drainage layer, referred to as the "drainage layer cover" (Figure 2). The drainage layer cover will measure at least 40 feet thick at the face of the embankment and its top surface will slope downwards to the east at a rate of 2 percent. The overall thickness of the drainage layer cover will decrease away from the face of the embankment and will vary based on underlying topography (Figure 1). The southern section of the embankment south of S. 170th Street will be less than 40 feet high and will be composed primarily of "ultra clean" fill consistent with the requirements of the BO.

A portion of the rainfall that falls on the Third Runway embankment will infiltrate through the fill materials and percolate down to the drainage layer. As water percolates through the fill, the concentrations of dissolved constituents may potentially change due to leaching of naturally occurring minerals or other chemical constituents (if present) in the fill. The water that flows through the fill will enter the drainage layer and either flow laterally to discharge at the toe of the embankment, or percolate downward into the subsoils and enter the groundwater (Figure 2).

The first of these flow paths consists of embankment seepage that discharges from the drainage layer and then flows along the toe of the embankment in a drainage swale. Near the western wall, seepage in the drainage swale will be discharged to riparian wetlands associated with Miller Creek via flow dispersal trenches. Over the rest of the embankment area, flow in the drainage swale will be directed to stormwater detention ponds for controlled release to Miller or Walker Creeks. The second flow path consists of embankment seepage that percolates down through the drainage layer to the water table and mixes with the natural groundwater, which flows slowly through the subsoil to discharge as baseflow to the creeks.

3.0 Tiered Location Monitoring Strategy

In accordance with the BO, the location monitoring strategy will be conducted in a "tiered" or "phased" approach. We discuss this approach below.

Tier 1. Tier 1 utilizes a conservative sampling procedure by collecting water directly discharged along the toe of the embankment without consideration of mixing or attenuation processes that occur between the embankment and the creeks. Drainage layer seepage will therefore be most representative of the water percolating through the embankment fill. Monitoring of representative seepage locations will be performed as described below in Section 4.0. The methods to evaluate the data are described below in Section 7.0.

Tier 2. If it is determined over time that seepage is exceeding screening criteria (as described in Tier 1) at the toe of the embankment, then Tier 2 monitoring will be conducted. Tier 2 will consist of sampling in locations closer to the respective creeks in order to understand the fate of the seepage as it is transported away from the embankment. The selection of monitoring points in either surface water and/or ground water locations will depend on the observed nature of the flow regime. In the event that Tier 2 monitoring is determined necessary, the MP will be revised to describe the Tier 2 monitoring locations and an MP addendum will be submitted to FWS. The methods to evaluate the data in Tier 2 are similar to those employed for Tier 1 and are described below in Section 7.0.

Tier 3. If the results of Tier 2 monitoring exceed screening criteria, direct monitoring of surface waters in Miller and Walker Creeks will be implemented to demonstrate protection of aquatic biota. In this case, a monitoring program will be designed to implement the Tier 3 sampling strategy under a new Tier 3 MP to be submitted to the FWS for its review.

4.0 Tier 1 Monitoring Locations

The Tier 1 monitoring points for the Embankment Seepage Monitoring Program will be placed at locations where seepage discharges from the drainage layer. Since the elevation of the drainage layer will not be uniform, and will vary with existing topography, seeps are expected to occur mainly in topographic low spots along the toe of the embankment. Monitoring points will be selected based on the seepage flow rate, the estimated volume of fill material contributing seepage to each selected location, proximity to the adjacent creek, and locations of flow dispersal to wetlands.

Representative monitoring of the embankment fill will be achieved by selecting between 10 and 20 seepage locations for Tier 1 monitoring. A review of current land surface topography beneath the proposed embankment fill area has been performed to identify locations where seepage is most likely to occur. Tentative locations are shown on Figure 1. A revised list of monitoring locations will be provided in a plan addendum issued following completion of the Third Runway embankment. Sample locations will be numbered, documented, and photographed, with location and elevation surveyed by the Port. Monitoring locations may be moved if it is determined that the seepage expression changes over time or modifications are made to the drainage channel to improve flow dispersal to wetlands.

5.0 Monitoring Schedule

In accordance with the BO, the MP provides for a minimum of three years of monthly monitoring with the monitoring period commencing upon detection of seepage from the drainage layer of the completed embankment. It is likely that some or all seeps may be dry from time to time on a seasonal or other precipitation related basis, as will be recorded. After at least one year of monthly monitoring, the Port may request that the monitoring interval be extended to quarterly monitoring, if the data collected demonstrate that quarterly monitoring will be sufficiently representative of seep constituent variability. At the end of the three-year monitoring period, the Port and FWS will re-evaluate the need to modify or continue the monitoring program.

6.0 Chemical Constituents

Eight RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury [inorganic], selenium, and silver) are being screened to meet specific soil fill criteria for the drainage layer cover as shown in Table 9 of the BO. Water samples will be analyzed for these same eight metals during the Embankment Seepage Monitoring Program. Samples will initially be analyzed for both total and dissolved metals. Field parameters measured will include pH, temperature, electrical conductivity, and dissolved oxygen. Other parameters analyzed will include hardness, alkalinity, total organic carbon, and dissolved organic carbon.

7.0 Tier 1 Seepage Quality Screening

Sample results from seepage that is collected from the Tier 1 monitoring locations will be screened using a staged approach. Data evaluation will become progressively more sophisticated if seepage quality at the embankment toe is determined to be of potential concern. Results that exceed screening levels defined in Tier 1 do not directly equate to adverse effects to listed species or critical habitat; rather, such exeedances provide an indication that further review and analysis is warranted to protect against the occurrence of such adverse effects.

Stage 1: Surface Water Quality Criteria. Samples of seepage collected from each selected location will be analyzed for the eight RCRA metals and compared to freshwater ambient water quality criteria according to guidelines outlined in WAC 173-201A-40 and adjusted for the Practical Quantitation Limits when necessary (Table 1). The Port may elect to screen seepage against background surface water data collected from the neighboring creeks but would notify the FWS of this screening modification.

The constituent concentrations as determined from Tier 1 monitoring will be compared to applicable ambient water quality criteria multiplied by a dilution factor of 10. This default dilution factor is presented in NOAA's Screening Quick Reference Tables and is based on the fact that dilution is expected to occur during migration and upon discharge of groundwater to surface water. The actual dilution factor which would occur between the seepage at the toe of the embankment to the underlying ground water or adjacent surface water drainage systems and then transport to the creeks is likely to be much greater, as discussed in Stage 2 below.

Stage 2: Site-specific dilution/attenuation factor. As constituents in the embankment seepage move through surface water drainage systems or through soils and groundwater, they are subjected to physical, chemical, and biological processes that tend to reduce the original concentration of the constituent as it is transported between the embankment and the receptor point (adjacent creeks). These processes include adsorption onto soil and aquifer media, chemical transformation, biological degradation, and dilution due to mixing of the seepage with surface waters and underlying groundwater. The reduction in constituent concentrations between the toe of the embankment and the creeks can be predicted by developing a site-specific dilution/attenuation factor. As an alternative to the default dilution factor discussed in Stage 1, the Port may elect to derive a site-specific dilution/attenuation for application to the embankment seepage monitoring results. The Port will discuss any proposed site-specific dilution factors with FWS prior to their implementation.

Stage 3: Bioassay Testing. If the Port determines that Tier 1 seepage samples are exceeding appropriate water quality criteria, the Port may elect to conduct aquatic bioassays on seepage samples using Washington Department of Ecology-approved methods. There are many circumstances where numerical water quality criteria can be exceeded, but where bioassay testing shows the sample to be non-toxic. This is because many naturally-occurring parameters exist, such as particulate matter, organic carbon, inorganic ligands, that bind up the chemicals making them unavailable for uptake, and hence, nontoxic. If the Port elects to conduct bioassay testing, the Port will submit a proposed bioassay testing plan to FWS for review prior to implementation. Bioassay test results would contribute to a weight-of-evidence evaluation on the probability of impact from embankment seepage to listed species or designated critical habitat.

- The Port may elect to skip Stages 2 and 3 of the Tier 1 screening process and move directly to Tier 2 sampling if it becomes evident that sampling at locations between the embankment toe and the creeks is a more appropriate approach.

8.0 Sampling Methods

To enable collection of consistent representative samples, discharge pipes may be installed in active seeps. Seepage flow rates will be measured by timing flow into a graduated cylinder; only seeps with flowrates in excess of 0.5 L/min will be sampled. Samples will be collected using clean sampling techniques appropriately adapted from EPA 1669 methods. Field parameters will be measured once each using appropriate collection vessels. In addition, one field replicate per sampling event will be collected. Field observations and seepage flow rates will be recorded on a seepage sampling data sheet.

Samples will be clearly labeled to indicate the sample number, date, sampler's initials, parameters to be analyzed, preservative added (if any), and any pertinent comments. Sample nomenclature will consist of the sample type (ES for embankment seepage), and the drainage layer seep ID number (e.g., DS-1). The blind field replicate will be labeled without the seep ID number, followed by -REP (e.g., ES-DS-REP).

Standard Chain of Custody procedures will be employed to maintain and document sample possession. Custody records completed by the sampler will accompany all shipments of samples. Each sample cooler will have a custody form listing the samples in the cooler. The purpose of these forms is to document the transfer of a group of samples traveling together. The original custody record always travels with the samples; the initiator of the record keeps a copy.

Once collected, samples will be placed with the custody form(s) in coolers for shipment to the designated analytical laboratory. Ice will be placed in each cooler to maintain a temperature of 4° C to meet sample preservation requirements. All samples will be delivered to the laboratory within 24 hours of collection.

9.0 Sample Analysis Methods

The groundwater samples and field replicates will be submitted to an analytical laboratory accredited by the WDOE for analysis under the following prescribed analytical methodologies: Total and Dissolved Metals (As, Ba, Cd, Cr, Pb, Se, Ag; EPA Method 6020; Hg: EPA Method 7470); Hardness (EPA Method 6010); and Total and Dissolved Organic Carbon (EPA Method 415.1).

Details of analytical methods and recommended reporting limits are presented in Table 1. Sample preservation and holding time requirements are presented in Table 2. To maintain laboratory comparability, the same analytical laboratory will be used for the analysis of all seepage sampling events. Analytical methods will be utilized and/or modified to the extent necessary to appropriately measure constituents relative to the screening criteria.

10.0 Quality Assurance/Quality Control

Quality assurance/quality control procedures provide the means of controlling the precision and bias of the results. Adherence to established procedures for sample collection, preservation, and storage will minimize errors resulting from sampling and sample instability. Analytical and measurement systems must be in statistical control, which means that errors have been reduced to acceptable levels and then documented.

Field quality control procedures will include the collection of field replicate samples and field equipment blanks. The laboratory quality control procedures used for this project will include: instrument calibration and standards as defined by EPA; laboratory blank measurements; and accuracy and precision measurements including laboratory control samples, matrix spikes, and duplicate analyses. The laboratory quality control officer is responsible for assuring that the laboratory implements all routine internal quality assurance and quality control procedures.

11.0 Reporting

Data reports will be prepared by the Port to record all water quality data collected and analyzed during a reporting period. Appropriate statistical methods will be used to define the range of variability present in the analytical results, and to help identify if an exceedence of the screening criteria can be verified. Summary tables and charts will be developed as appropriate. Laboratory QA/QC reports and data validation documentation will be included. All data and reports will be provided to FWS upon request.

At the end of the three year monitoring period, an Embankment Seepage Monitoring Report will be prepared and submitted to the FWS to summarize and analyze the monitoring results. In the event that modifications to the MP are warranted based on the data collected (e.g., location changes to monitoring points, revisions to monitoring schedule), the Port will submit a modification memorandum to the FWS to explain such alterations. Further, in the event that monitoring data indicate that adverse effects may occur to listed species or designated critical habitat, the Port will contact FWS and reinitiate consultation as appropriate.

References:

FWS, 2001 Biological Opinion on Proposed Master Plan Update improvement projects at Sea-Tac Airport. US Fish and Wildlife Service, May 22, 2001.

Attachments:

Exhibit 1. Text of Embankment Seepage Monitoring Commitment

Table 1. Methods of Analysis, Screening Criteria, and Reporting Limits
Table 2. Sample Containers, Preservation, and Holding Times

Figure 1. Approximate Tier 1 Embankment Seepage Sampling Locations
Figure 2. Typical Embankment Cross-Section Showing Seepage Pathway

Exhibit 1 – Text of Embankment Seepage Monitoring Commitment

From the FWS Biological Opinion, May 22, 2001; Attachment A, Item 3:

"The Port of Seattle shall prepare a water quality monitoring plan to track the quality of seepage from the drainage layer beneath the Third Runway embankment fill. Such a plan shall be prepared to address the amount of monitoring in a tiered or phased approach. For example, if it is determined that water flowing through the new embankment is exceeding designated surface water quality criteria, new monitoring points may be established between the embankment and Miller Creek to evaluate the fate and transport of the impacted fill water. Monitoring Miller Creek would represent the final phase of a monitoring program if it were determined that constituents in embankment fill water were reaching the creek. The Port shall develop a monitoring plan in consultation with FWS. The Port shall submit a draft monitoring plan to FWS for its review and approval within 120 days after FWS' issuance of a biological opinion or concurrence letter. The monitoring plan shall provide for a minimum of three years of monthly monitoring, with the monitoring period commencing upon detection of seepage from the drainage layer of the completed embankment. At the end of the three-year monitoring period, the Port and FWS shall reevaluate the need to modify or continue the monitoring program. In the event seepage is not detected within six years after completion of embankment construction, the Port and FWS shall likewise reevaluate the need to modify or continue the monitoring program. In the event monitoring detects unforeseen adverse impacts to aquatic life in the project area, the Port shall reinitiate consultation as appropriate and implement measures to address such impacts."

Table 1 – Methods of Analysis, Stage 1 Screening Criteria, and Reporting Limits

Analyte	State FW Chronic (1)	State FW Acute (1)	Lab Reporting Limit Goal	Analytical Method
Hardness in mg/L	NA	NA	0.2	EPA Method 6010
Total Organic Carbon in mg/L			1	EPA Method 415.1
Dissolved Organic Carbon in mg/L			1	EPA Method 415.1
Dissolved/Total Metals in µg/L				
Arsenic	190	360	1	EPA Method 6020
Barium	NA	NA	1	EPA Method 6020
Cadmium*	0.62	1.75	0.5	EPA Method 6020
Chromium (total)	10	15	1	EPA Method 6020
Lead*	1.17	30	0.5	EPA Method 6020
Mercury	0.012	2.1	0.1	EPA Method 7470
Selenium	5	20	3	EPA Method 6020
Silver*	NA	1.05	0.5	EPA Method 6020

* - Surface Water criteria assume hardness of 50 mg/L and may be altered depending on site-specific hardness criteria collected at site.

Notes:

(1) WAC Chapter 173-201A to be multiplied by a dilution factor of 10 per NOAA SquiRT.

Table 2 – Sample Containers, Preservative, and Holding Times

Chemical Analysis	Sample Container	Preservative (1)	Holding Time
Total Metals	1 L P	HNO_3	28/180 days (2)
Dissolved Metals	1 L P	HNO_3	28/180 days (2)
Hardness	1 L P	HNO_3	180 days
Total Organic Carbon	250 mL AG	H_2SO_4	28 days
Dissolved Organic Carbon	250 mL AG	H_2SO_4	28 days

Sample Containers: P – Plastic; AG - Amber glass

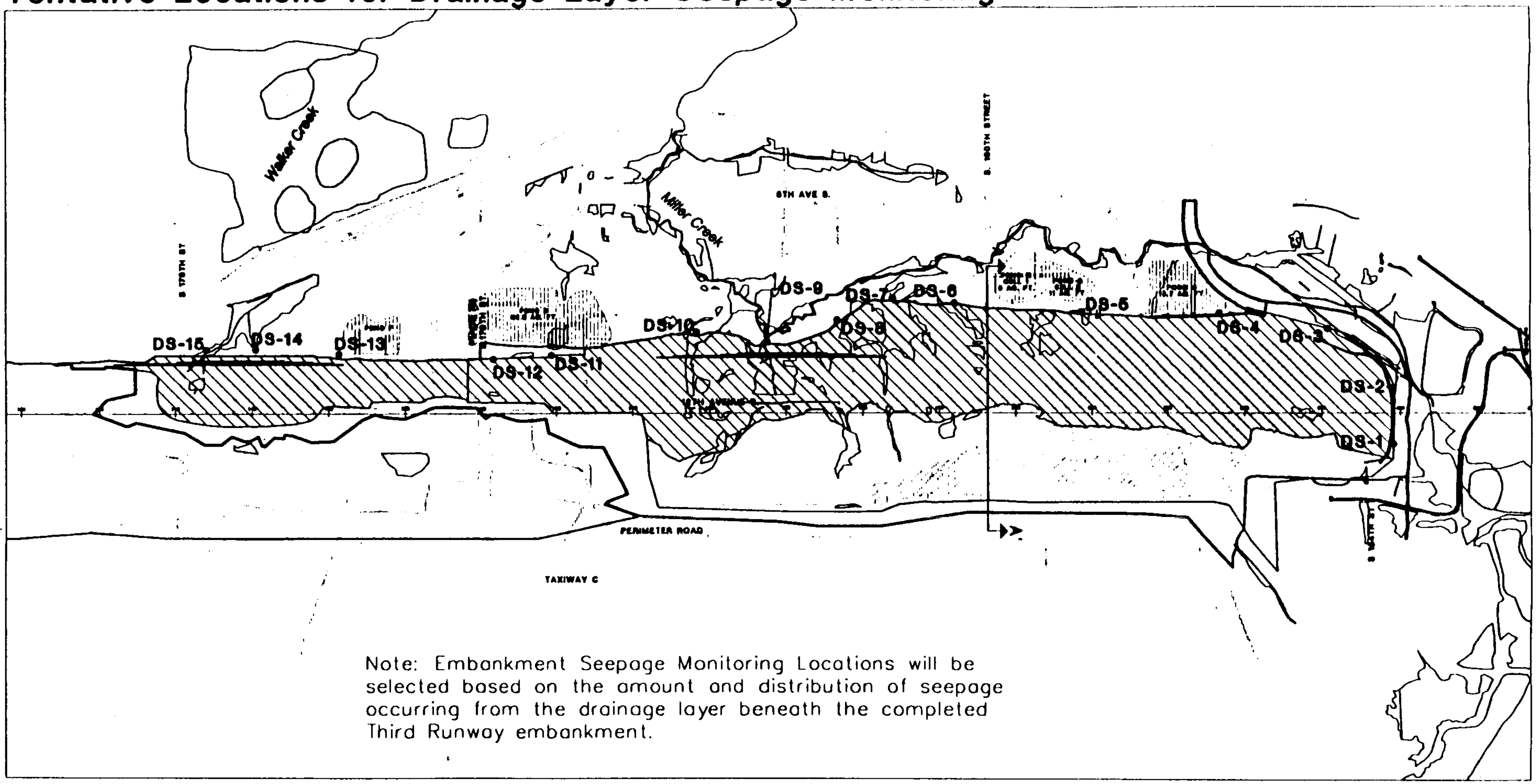
Notes:

(1) All samples shall be maintained at 4°C. Trace metal grade nitric acid will be used to preserve metals samples.

(2) Holding time for mercury/remaining metals .

Third Runway - Embankment Seepage

Tentative Locations for Drainage Layer Seepage Monitoring



Drainage Layer Cover

Existing Embankment Fill

Maximum Extent of Drainage Layer

Riparian Wetland

Stormwater Pond

•DS-1 Drainage Layer Seepage Monitoring Location and Number (Tentative)

AA' Cross Section Location and Designation (See Figure 2)

N

0 1000 2000

Scale in Feet

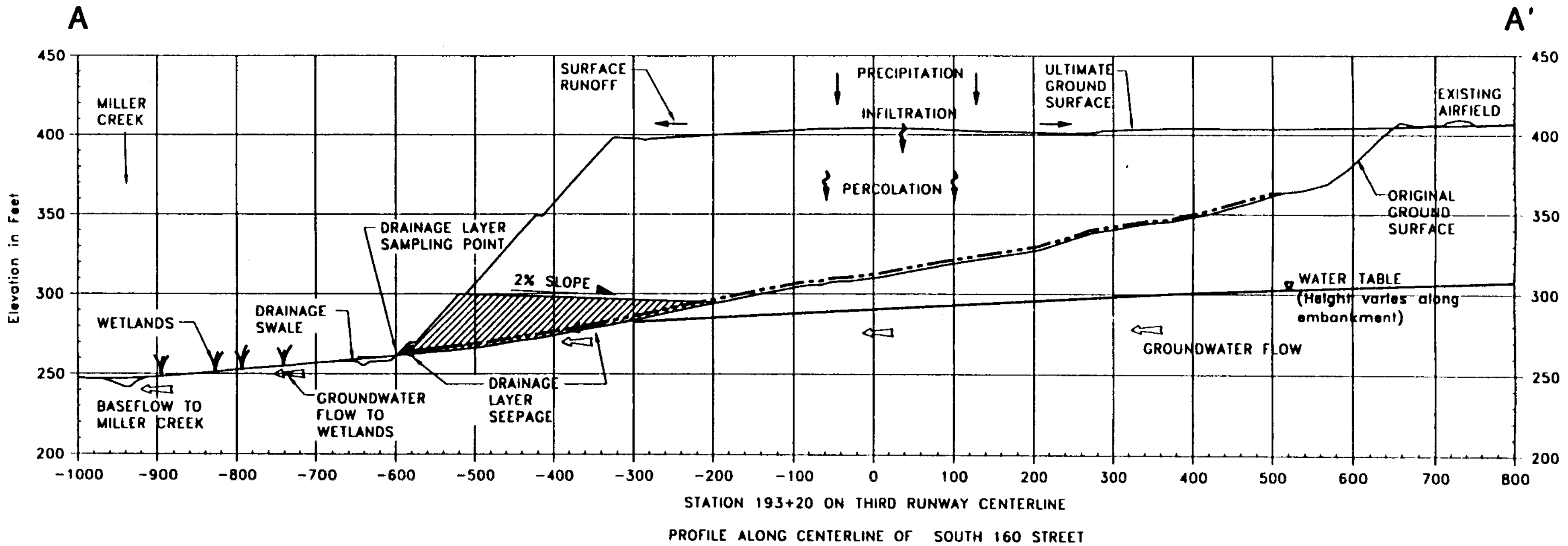
J-4978-43 7/01

Figure 1

DIN 8/9/01 1=1 charlie.pc2 49784309

Third Runway - Embankment Seepage

Cross Section A-A' - Conceptual Model



LEGEND:

J-4978-43 7/01
Figure 2

AR 031427