INTERSTATE 405 Corridor Program
Congestion Relief & Bus Rapid Transit Projects

APPENDIX O1-A

STORMWATER DESIGN DECISION INFILTRATION INVESTIGATIONS

I-405, SR520 to SR522 Stage 1 (Kirkland Stage 1)

Draft RFP
March 22, 2005

Washington State
Department of Transportation

INTERSTATE 405 Project Team

Congestion Relief & Bus Rapid Transit Projects

600 – 108th Avenue NE, Suite 405
Bellevue, WA 98004
Main 425-456-8500
Fax 425-456-8600
MS: NB82-250

Stormwater Design Decision Infiltration Investigations I-405 Nickel Projects

August 1, 2004

Author: K. Hixson

Washington State Department of Transportation

Introduction

The purpose of this paper is to formalize and document the decision to use a concept level geotechnical investigation procedure for determining stormwater infiltration rates for the I-405 Corridor Nickel Projects.

Background

The initial baseline drainage concept designs for the Kirkland Nickel Project contained no infiltration provisions. A value engineering (VE) study was done in April 2004, which suggested that the geology and soils condition along the Kirkland Section should be able to accommodate runoff infiltration, along with cost savings in detention structures. Old soil boring records in the vicinity generally confirm this conclusion, but are not specific enough to establish detailed design parameters for ground water or infiltration rates.

Incorporating the VE recommendations, the I-405 drainage designers remodeled the detention volumes to include infiltration where feasible. Lacking better geotechnical information, a default (minimum) as recommended in the Highway Runoff Manual, infiltration rate of 0.5 inches per hour was used. This modeling reduced the detention volumes by 42 %, with a corresponding 37% savings in the detention construction costs.

The designers expect that a detailed geotechnical investigation will show that long-term infiltration rates of 1.5 to 3.0 inches per hour are feasible for most of the area. These higher rates will more than halve the current concept detention volumes and costs. However, detention facilities should be designed from a detailed geotechnical investigation (WSDOT Highway Runoff Manual [HRM], Section 4-5).

The HRM criteria involves a detailed geotechnical investigation including sample testing for every strata in bore holes or pits at 100' spacing along infiltration trenches, and one for every 5,000 sq. ft of pond infiltrating surface, plus specific infiltration tests and long term ground water monitoring wells to determine ground water movement/levels through at least one winter season. If left to the design-builder to perform, complying with the long-term ground water monitoring criteria may delay the start of project, as typically drainage work is one of the first things to be designed and installed in a design-build project.

It is proposed that a "concept level" type geotechnical investigation be performed in lieu of a detailed geotechnical investigation. This investigation would provide additional boreholes to supplement existing bore hole logs, perform specific in-situ infiltration tests and install ground water monitoring wells (piezometers). The additional investigation pits/bore holes and infiltration tests provide indications of general infiltration values that the design-build contractor can use for bid costing purposes. The ground water monitoring wells will provide the longer-term observations through one wet season, ready for use when the design-build

contracts are awarded. This "concept level" type investigation is sufficient to provide a general indication of ground water patterns and regional infiltration values

After award of the contract, the design-builder will supplement this investigation with additional boreholes/pits/testing. The supplemental geotechnical investigation plan's purpose is to complete the data needed by the design-builder's designers. The supplemental geotechnical investigation will follow the general guidelines contained in the HRM, modified as necessary per the professional judgment of the project geotechnical engineer. Final stormwater treatment, including the infiltration facilities, will be designed using the combined information from the existing borehole logs and results of the concept level and supplemental geotechnical investigations.

Summary

This paper concludes the I-405 Nickel Projects will perform concept level geotechnical investigations.

It is further concluded that the concept drainage design to be included in the I-405 Nickel Projects Request for Proposals (RFP) will include stormwater detention and infiltration facilities based on the default design rate of 0.5 inches per hour. The geotechnical bore hole/pit logs and test data from the concept level geotechnical investigation will be included with the RFP documents for the bidders use in refining the runoff treatment design for bid costing purposes. The long-term ground water monitoring data will be provided by WSDOT to the successful bidder for use in final design and construction, per criteria. The design-builder will be required to perform additional supplemental geotechnical investigations as required by the project geotechnical engineer per the general guidelines of the HRM, for design and construction of functional stormwater infiltration facilities. However, additional long term ground water monitoring is not required by the design-builder.

We based this decision on information we gatherd dealing with three main factors:

- overall benefit to the environment ,
- significant decrease in project costs to follow this approach, and
- improvement of the project schedule.

Decision Basis

Proceeding with a "conceptual level" geotechnical investigation decision for I-405 Nickel Projects was based on the following:

Overall benefit to the environment:

Be able to produce a more refined stormwater runoff treatment design utilizing infiltration to better mimic the natural condition for both treatment through percolating through the soil and maintenance of base flows for streams and wet lands.

Significant decrease in project costs:

Incorporating infiltration into the runoff flow control facility designs will decrease the required detention volumes, reducing and in some cases eliminating the need for the large and expensive concrete vault structures.

Improvement of the project schedule:

The HRM requires that infiltration facility geotechnical investigations include installation of ground water monitoring wells and observations be taken through at least one winter season. It the design-builder is required to meet these criteria, he will not be able to complete the stormwater treatment designs until the following year. The stormwater system is one of the first things to be designed and installed in a typical design-build contract. However, by WSDOT proceeding with the installation and observations of the ground water wells early on in the program, this criteria condition will be completed and available for use by the design-builder expediting design and construction of storm water facilities during the scheduled construction season.

Decision Summary

Each project team within WSDOT has been given the discretion within their project area to make a determination of what approach best fits their circumstances and determines the best path for that specific project. ESO supports this process and ESO has agreed that setting a precedent has not been considered a significant factor for any one project's decision affecting another project's decision

Based on this paper's above discussion, the determination has been made to allow the I-405 Nickel Projects to proceed with implementing a "conceptual level" geotechnical investigation.

Concurring Approvals:

Tony Allen,	8/13/04
WA State Geotech Engineer	Date