North SeaTac Roadways Study

Prepared for
The City of SeaTac
The Port of Seattle

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EXECUTIVE SUMMARY

The City of SeaTac and Port of Seattle conducted the North SeaTac Roadways Study to assess opportunities for future development of noise-impacted properties north of the Seattle-Tacoma International Airport. The planning addresses corridor improvements along S 142nd Street, S 142nd Pl, and S 144th Street between Des Moines Memorial Drive and 24th Avenue S. It evaluates potential traffic impacts and mitigation alternatives associated with development of a Port of Seattle property known as the 55-Acre Parcel near the North SeaTac Park. The 55-Acre parcel is located north of S 142nd Street between 18th Avenue S and 24th Avenue S.

Studying site access and preferred truck routes will allow the City to identify solutions that best meet the roadway needs of the community as well as existing and future development in the area. The project is intended to address site access needs and provide safe pedestrian, bicyclist and motorist access and measures to minimize traffic impacts on nearby residential neighborhoods. While there are no specific site plans for the 55-Acre Parcel, the City and the Port have agreed to cooperate on future site development, including access.

The North SeaTac Roadways project has been identified in the City's 2008-2017 Transportation Improvement Program (TIP). The results of this study include recommended roadway and pedestrian/bicycle improvements along with mitigation measures to offset potential traffic impacts associated with the future development of the 55-Acre Parcel.

The City of SeaTac has established a budget of approximately $11 million to complete the construction of this project. Based on a preliminary engineering effort, an estimate of construction costs for the North SeaTac Roadways project is $12.8 million in year of expenditure dollars. This includes design work, permitting, right-of-way acquisition and construction costs for the roadway realignment and pedestrian/bicycle facilities described below. Construction is estimated to occur in 2010.

The recommended roadway improvements to S 142nd Street, S 142nd Place and S 144th Street between Des Moines Memorial Drive S and 20th Lane S include a realignment of the existing horizontal and vertical curves to provide for a design speed of 35 miles per hour. Larger curve radii and flatter grades will also improve truck operations on S 142nd Street.

Continuous pedestrian and bicycle facilities will be provided along S 142nd Street with sidewalks and five-foot striped bicycle lanes on both sides of S 142nd Street east of 20th Avenue S. West of 20th Avenue S, a 12-foot wide pedestrian and bicycle shared use path will be built south of S 142nd Street, providing access to the proposed Westside Trail.

Stormwater from the re-aligned portions of S 142nd Street will be collected and treated with a stormwater pond that will be constructed in the southwest corner of the 55-Acre Parcel. Further engineering and design will be needed to minimize impacts to wetland and wetland buffer areas in the vicinity of Tub Lake.

Improvements to the intersection of S 144th Street and Des Moines Memorial Drive will be necessary to accommodate increased traffic volumes related to future development of the 55-Acre

Parcel. Intersection improvements will also be needed to accommodate large trucks turning to and from Des Moines Memorial Drive. The addition of a left turn lane on the eastern leg of this intersection will provide acceptable intersection Level of Service and improved truck traffic operations. The addition of a westbound left-turn lane and larger curb radii to ease truck turning movements will likely require additional right-of-way in the northeast and southeast quadrants of this intersection.

A marketability study for the 55-Acre Parcel showed it is likely that this site could be developed to support Seattle's seaport operations because of its proximity to SR 509, the South Seattle industrial area and the Duwamish and Elliott Bay marine terminals. Currently a designated truck route directly connecting the 55-Acre Parcel and SR 509 is not available.

The most direct truck route between the 55-Acre Parcel and SR 509 would utilize S 128th Street and Des Moines Memorial Drive. Another option would be to use S 160th Street and Des Moines Memorial Drive. A new truck route designation will need to be coordinated between the City of SeaTac and the City of Burien to provide site access.

PROJECT DESCRIPTION

The North SeaTac Roadways project consists of improvements to S 142nd/S 144th Streets between Des Moines Memorial Drive and 24th Avenue S, to facilitate its use for access to existing and future development north of Seattle-Tacoma International Airport (Sea-Tac Airport) and mitigate impacts to nearby neighborhoods. Property in the vicinity of this corridor has been acquired by the Port of Seattle through Federally-funded programs to mitigate noise impacts in the airport vicinity. Residences formerly occupying these properties have been removed, and residential development is prohibited due to airport land use compatibility considerations. The Port of Seattle plans to lease the land for development of warehouse, light industrial and truck terminal uses, which would be compatible with airport operations.

The corridor will be reconstructed with flatter curves and reduced grades to permit 30 to 35 mph operation. Lane widths and turning radii will be enhanced to provide for operation of large trucks. Provisions for pedestrians and bicycles would be provided to form a continuous route between Des Moines Memorial Drive and 24th Avenue S.

The existing roadway is an east-west, two-lane collector arterial route serving nearby industrial and commercial uses, and is a designated truck route. Posted speed is 30 mph, with short-radius reverse curves along 142nd Place S necessitating an advisory speed of 25 mph. Grades up to 10 percent also are encountered in this segment. The intersection of S 144th Steet at Des Moines Memorial Drive is signalized, and two-way stop control is provided at 24th Avenue S. Average weekday traffic (2005) is estimated to be about 5,200 vehicles per day (vpd) near Des Moines Memorial Drive and 2,350 vpd near 24th Avenue S.

Background

In 2004, the New Economic Strategy Triangle (NEST) Study was commissioned to investigate the feasibility of industrial development on several noise mitigation properties in the Cities of SeaTac, Burien, and Des Moines, with the objective of stimulating economic growth and

augmenting local tax revenues. The 55-Acre Parcel, located north of S 142nd Street and west of 24th Avenue S in the City of SeaTac, was among those identified in the study.

Potential development of several of the properties identified in NEST has been anticipated by their incorporation into the Comprehensive Plans of SeaTac and Burien. Additional study of the 55-Acre Parcel was conducted in support of Sea-Tac Airport's Comprehensive Development Plan (CDP). Zoning for the 55-Acre Parcel is listed as Aviation Commercial in the City's zoning map. The project to reconstruct S 142nd /S 144th Streets has been identified in the City's 2008-2017 Transportation Improvement Program (TIP) as project ST 137, North SeaTac Roadways.

Project Limits

The project would extend along S 144th Street, S 142nd Place, and S 142nd Street between Des Moines Memorial Drive and 24th Avenue S. Roadway reconstruction would extend over a total length of approximately 2,800 feet, west of the Boeing Spares Distribution Center driveway (approximately on the 21st Avenue S alignment). A new sidewalk would be provided along the north side of S 142nd Street eastward to 24th Avenue S. Traffic calming features also could be provided at the S 142nd Street/24th Avenue S intersection.

Development of a stormwater pond facility would occur outside the existing street right-of-way on a portion of the Port's 55-Acre Parcel south of Tub Lake (see Figure 2 in Appendix B, Preliminary Geotechnical Services). Modifications to the Des Moines Memorial Drive and S 144th Street intersection could involve acquisition of additional private right-of-way in several quadrants of the intersection.

Access to the 55-Acre Parcel would be provided on the north side of S 142nd Street in the vicinity of 20th and 21st Avenues S. Site access would be provided at the time of development; it is not part of the current design effort or cost estimates.

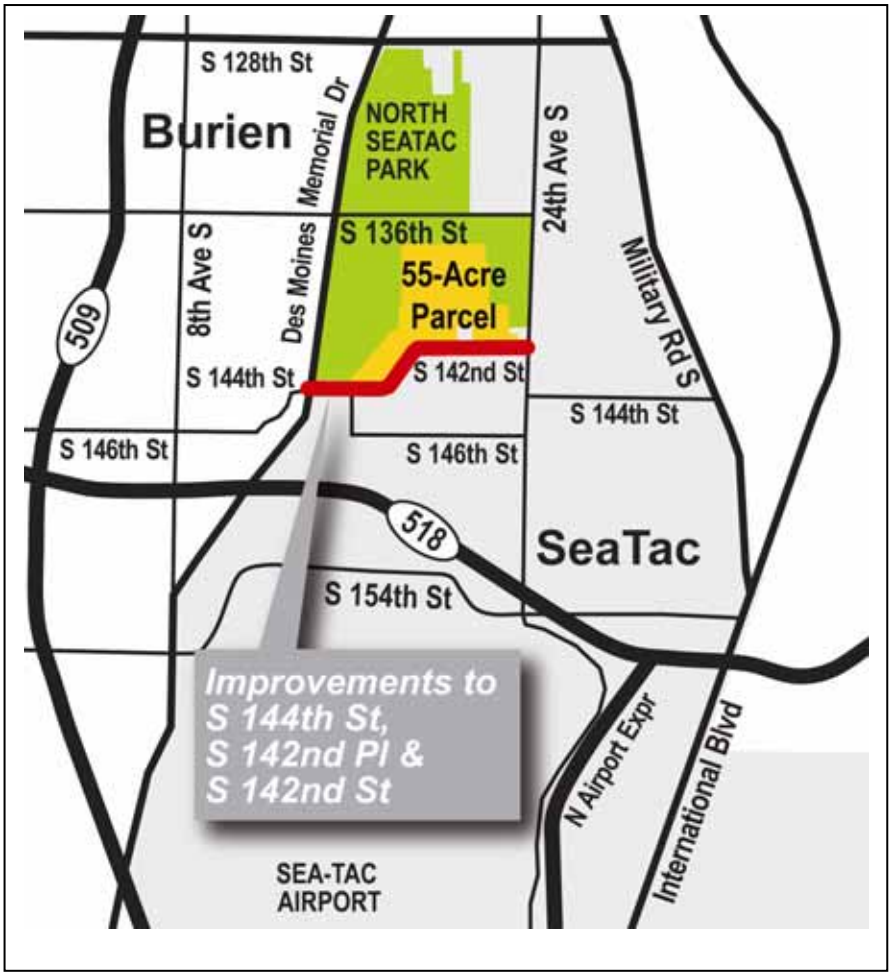


Figure 1: Project Vicinity

Alignment and Cross-Section

The existing horizontal alignments of S 142nd Street and S 144th Street are generally east-west, with S 142nd Place connecting diagonally on a northeast-southwest alignment. The connecting curves provide radii of 82 and 125 feet, insufficient for 30 mph operation. Elevations drop from about 400 feet above mean sea level (MSL) near 20th Avenue S to about 320 feet at 16th Avenue S and Des Moines Memorial Drive. Vertical alignment in the area of the reverse curves includes grades over 10 percent.

The reconstructed facility will provide for a design speed of 35 mph. It is classified as an Urban Collector Arterial Street in the City's Adopted King County Road Design Standards. A number of alternatives for alignment and cross-section types were analyzed in arriving at the preferred concept.

The roadway would be reconstructed using curve radii of 750 to 850 feet in the connecting curves. Entering sight distance limitations at one access point may require posting of an advisory

speed or other signing in the easternmost curve. Maximum grades will be reduced to about seven percent.

The project cross-section will consist of two 11-foot lanes, and two five-foot striped bicycle lanes next to the curb east of 20th Avenue S (the Boeing Spares driveway). With the gutter pan on each side, the width between curb faces would be 34 feet. In the reconstructed portion west of the Boeing driveway, two 14-foot wide curb lanes would be provided, for a curb-to curb width of 28 feet. A 12-foot-wide pedestrian and bicycle shared use path would also be provided on the south side west of the Boeing driveway, including a planting strip 4½ feet wide. See Figure 10 for typical cross sections of this project.

Modifications would be required at the signalized intersection of Des Moines Memorial Drive with S 144th Street to provide a westbound left-turn lane and to accommodate the movement of trucks. The added lane would provide for operation within the City's Level Of Service E guideline in the design year (2024). At this location curb-to-curb width of the traveled way would reach 36 feet. Acquisition of additional right-of-way would be required in three quadrants of the intersection to provide curb radii that meet the needs of turning trucks.

Design deviations would be required for several elements of the geometric design, including roadway width, maximum driveway width, sidewalk and landscaping widths, and entering sight distance. These deviations are addressed in the Design Deviations section of this study.

Non-Motorized Facilities

The project will provide continuous facilities for pedestrian and bicycle travel in the corridor, and will provide a connection to the proposed Westside Trail on the east side of Des Moines Memorial Drive. In this location, it will also connect nearby residential neighborhoods with recreational opportunities at North SeaTac Park.

A sidewalk of six feet in width will be constructed along the north side of S 142nd Street from 21st to 24th Avenue S, with no planting strip. On the south side, an existing sidewalk and planting strip are provided adjacent to the Boeing Spares site.

On the south side of the roadway, west of the Boeing Spares driveway, a 12-foot wide pedestrian and bicycle shared use path will be provided, separated from the roadway by a 4½ foot planting strip. No sidewalk would be provided on the north side of the roadway due to the proximity of wetland areas near 16th Avenue S.

Bicycles will be accommodated in the five-foot wide designated bike lanes east of the Boeing Spares driveway and on the shared-use trail west of the Boeing driveway. Bicycles also may choose to operate in the wide curb lane. The corridor will be signed as a bicycle facility.

A mid-block bicycle and pedestrian crossing is planned to be located near and east of the Boeing Spares driveway. It would provide for connections to and from the shared use path on the south side of the roadway. Several alternative concepts are evaluated for this crossing, with a final determination to be made as design advances.

Drainage and Stormwater

The project and the 55-Acre Parcel are located within the Miller Creek drainage basin. The upper tributaries of Miller Creek flow under S 144th Street on the west side of 16th Avenue S through a 36-inch culvert. Several delineated wetland areas are located north of S 144th Street near this location.

The entire length of roadway between 24th Avenue S and Des Moines Memorial Drive is proposed to have a curb and gutter roadway section. A new conveyance system is proposed to capture and convey stormwater runoff either to a treatment pond or discharge directly to a ditch. The water quality facility proposed for this project is a wet pond/detention pond located on the 55-Acre Parcel near the realigned roadway.

Utilities

Gas, water and sewer lines are located within the project right-of-way. Power distribution and communications use overhead lines along the south side of the corridor.

GOALS, OBJECTIVES, AND DESIGN CRITERIA

Project Goals

Specific goals for the project are:

- Minimize impacts to nearby neighborhoods
- Minimize disruption to existing City streets
- Separate truck traffic from neighborhood traffic
- Provide an acceptable level of service at the design year
- Minimize environmental impacts of project
- Maximize development opportunities

Design Criteria

Design of the project corridor is controlled by the Urban Collector Arterial classification established for S 144th Street, S 142nd Place, and S 142nd Street in the City's Comprehensive Plan. Design criteria are based on the City's adopted *King County Road Design and Construction Standards – 2007*. Documents from the American Association of Highway and Transportation Officials (AASHTO) and Washington State Department of Transportation (WSDOT) also were consulted, including *A Policy On Geometric Design of Highways and Streets* (AASHTO, 2004) and the *Design Manual* (WSDOT, 2006). The project design criteria are summarized in Table 1.

Table 1 Design Criteria

Urban Collector Arterial	
Design Vehicle	WB 50
Minimum intersection level of service.	E
Design speed (mph)	35 (1)
Maximum allowable grade (pct.).	12 (2)
Maximum Superelevation (pct.)	6
Horizontal curvature, radius (ft.)	380
Stopping sight distance (ft.)	250
Entering sight distance (ft.)	390
Typical Roadway Width (ft.)	36 – 44
Typical Curb Lane Width (ft)	14 (3)
Curb Type	Vertical
Pedestrian requirements.	5 feet both sides with planting strip, 6.5 feet without
Bicycle requirements.	Bike lane or wide curb lane
Drainage requirements for water quality and detention.	Wet Pond, Sediment Pond, Basic Treatment
Structural live loads.	HS - 20
Structural seismic criteria	UBC Chapter 16.
Illumination standards.	Street poles required.
Signal criteria, including CCTV and interconnect systems.	Interconnect signals within 0.50 miles.
Landscape requirements.	5-feet wide

1. Design speed is a basis for determining geometric elements and does not imply posted or legally permissible speed.
2. Maximum grade may be exceeded for short distances.

Several of the criteria are discussed below in relation to their pertinence to conditions in the corridor:

1. Minimum Intersection Level of Service

The City of SeaTac Comprehensive Plan (December 2006 revision) Policy 3.2A establishes a level of service (LOS) E or better standard as being acceptable on Principal or Minor Arterials and LOS D or better on Collector Arterials and lower classification streets. In the project area, level of service is assumed to be controlled by intersection capacity. Level of service (LOS) is evaluated as control delay per vehicle (in seconds per vehicle). Control delay is the time lost when a vehicle has to reduce speed or stop at an intersection. The control delays corresponding to LOS D and E are shown in Table 2. Delay at signalized and all-way stop-controlled intersections

is calculated as a volume-weighted average delay for all approaches. Delay at two-way stop-controlled intersections is reported for the approach with the longest delay and lowest level of service.

Table 2 Intersection Level of Service Criteria

LOS	Signalized Intersections Control Delay per Vehicle (seconds))	Unsignalized Intersections Average Control Delay per Vehicle (seconds)
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50

Source: 2000 Highway Capacity Manual

2. Design Vehicle

The design vehicle for the project is a WB 50 combination truck trailer. Trucks of this configuration use the corridor today and development of the 55-Acre Parcel with light industrial, warehouse, and truck terminal uses will generate additional truck traffic in the design year. This parameter influences the turning radii and curb return radii at intersections and junctions. Conditions for the larger trucks (WB 67) are also evaluated in terms of lane encroachment, but these larger trucks are not used as the basis of design.

The estimated truck percentage for the existing condition is about seven percent trucks on S 144th Street near the Des Moines Memorial Drive intersection. The future truck percentage is expected to increase to about nine percent trucks in the design year. Average weekday traffic volume would increase from 5,200 vehicles per day (vpd) in 2005 to 8,500 vpd in the design year (2024).

3. Design Speed

Design Speed (DS) for the proposed commercial/industrial access street will be 35 miles per hour established according to the King County Road Standards (2007). The proposed roadway is classified as an urban collector street with curbed section according to Table 2.03(A) of the County standards.

For existing intersections and connecting streets requiring modifications or improvements as a part of this project, the design speed will be established according to the appropriate roadway classification and associated table.

The existing advisory speed on the S 142nd Place curves transitioning between S 144th Street and S 142nd Street is 25 miles per hour.

4. Maximum Allowable Grade

The maximum allowable grade is 12 percent for urban collector streets, consistent with the King County Roads Standards Table 2.03(A).

5. Minimum Sight Distance

The minimum entering sight distance is 390 feet. The entering sight distance is evaluated for a stopped passenger vehicle turning left onto a two-lane roadway with no median and grades three (3) percent or less. For other conditions, the time gap must be adjusted and required sight distance recalculated according to the AASHTO Intersection Control. For left turns onto two-way roadways with more than two lanes, add 0.50 seconds for passenger cars or 0.70 seconds for trucks for each additional lane from the left, in excess of one, to be crossed by the turning vehicle. For minor approach grades, if the approach grade is an upgrade that exceeds three percent, add 0.2 seconds for each percent grade for left turns. The evaluation criteria source is King County Roads Standards (2007).

The entering sight distance applies to both driveways and street approaching intersections with the exception of sub-accesses and commercial minor access streets. The entering sight distance is measured 10 feet back from the edge of traveled way or face of curb. The approach vehicle height is 4.25 feet and the entering vehicle height is 3.5 feet high.

Where a significant number of trucks will be using the approach road, the entering sight distance requirements may be increased by 30% for single-unit trucks and 70% for semi-trailer combinations, from the King County Roads Standards (2007).

The stopping sight distance is established per King County Roads Standards (2007) Table 2.1.

Adjustment factors are applied to the stopping sight distance based upon road profile grades and may increase the required distance by as much as 40 feet. The minimum stopping sight distance on proposed intersection approaches for all other access to intersecting roadways is 125 feet.

Sag vertical curves are evaluated during the profile design to accommodate stopping sight distance requirements. If the minimum stopping sight distance cannot be met, additional illumination requirements will be necessary according to the King County Roads Standards (2007).

6. Roadway and Lane Widths

Typical roadway widths for the urban collector classification range from 36 to 44 feet, from Table 2.03(A) of the 2007 King County standards. Individual lanes are typically considered to be 11 feet in width, with 12 feet required for right- and left-turn lanes. Typical width for a wide curb lane includes an 11-foot lane and a 3-foot paved section, consistent with Figure 3-021 in the standards.

7. Pedestrian Requirements

Concrete sidewalks are required on both sides of urban collector arterial streets under the 2007 King County standards. The requirement specifies sidewalks of 5 feet in width for facilities separated from the curb with a planting strip, and 6½ feet for sidewalks adjacent to the curb.

A trail option for shared use by pedestrians and cyclists is also available. Minimum trail width for shared use is 12 feet. Standard landscape width is specified to be 5 feet.

Crosswalks are required at all intersections controlled with traffic signals. Curb ramps and crosswalks are designed according to Figures 3-010 – 3-013 of the King County Roads Standards (2007). Different curb ramp configurations are available for design consideration. The landing will be a minimum of 4-feet wide, and the particular style will be determined in conjunction with the channelization and right-of-way analysis.

8. Bicycle Requirements

The standards provide for several different types of treatment to accommodate bicycle travel. For exclusive bicycle lanes, the standards require 5 feet of width adjacent to the travel lane, with striping provided for delineation. A wide curb lane is also available as a design treatment, requiring a total width of 14-feet without parking. The 14-feet includes an 11-foot lane and 3-foot paved bike zone. The bike lane is not required to be delineated using this configuration.

A shared use trail, with minimum width of 12 feet, also fulfills the requirement for bicycle facilities.

9. Drainage Requirements for Water Quality and Detention

The existing drainage pattern is a catch basin and storm drainage system and ditches conveying storm water downhill along the existing S 142nd Place. On the north side of the road, the water drains behind a natural berm and out into the Tub Lake basin. The edge of water is approximately 250 feet away from the pond location. Based on field observations, the water infiltrates or drains toward the exiting culvert at 16th Avenue South and does not drain into Tub Lake. The existing culvert crossing S 144th Street at 16th Avenue S is the natural discharge location for the project and will need to be replaced in kind (the same diameter). The hydraulics of the pipe will not change or be affected by the project because the existing drainage patterns and discharge characteristics will be maintained. A downstream analysis will need to be performed south of this location to determine the conditions of the existing natural drainage path as well as additional tributary sources that may be affected. The project is in the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Region "X" flood zone meaning that flood occurrences are possible but no flood elevation has been established in the area. The region south of the project, in the vicinity of the ballpark southeast of 16th Avenue S and S 146th Street, does experience some occasional flooding, but does not have a City history flood elevation documented and continues to drain south into Lake Reba. For the purposes of this design, the proposed project will discharge the same volume of water at the same discharge rate as the existing condition and not affect the downstream flooding patterns or the hydro-period of Tub Lake.

The preliminary pond design has been performed to determine an approximate type, size, and location for 15 percent design and impacts of the pond in relation to the road and wetland. The design has been based upon the current available information for the area and may need modification as new information becomes available. The preliminary pond analysis has been performed according to the King County Surface Water Design Manual (SWDM), and the King County Run Time Series (KCRTS) program with the following criteria. Selection of the design, supporting information, documentation guidelines, and assumptions are included as backup documentation to support the 15 percent preliminary design package.

The pond is located in Climate Region 13, Puget East 40 in a soil stratum consisting of Glacial Outwash and Till with a shallow groundwater table (see the geotechnical test pit data in Appendix B). The pond evaluation was completed assuming no infiltration (Till soil condition) and elevations below 312 will not be able to gravity drain into the pond and are treated as un-detained bypass.

The proposed design will meet the requirements established in the SWDM according to the eight core requirements that apply to all projects unless specific exemptions apply:

Core requirement #1: Discharge at the Natural Location (Section 1.2.1)

It should be noted that projects that "do not discharge all project site runoff at the natural location will require an approved adjustment of this requirement. This adjustment may be waived for projects in which only a small portion of the project site does not discharge runoff at the natural location and the runoff from that portion is un-concentrated and poses no significant adverse impacts to downstream properties." This core requirement and condition will need to be analyzed and documented post 15 percent design for the discharge between stations 12+00 and 17+00 (Des Moines Memorial Drive and 16th Avenue S). This water cannot be conveyed into the treatment facility due to grades and elevation differences and it is our current assumption that this is an insignificant effect posing no adverse impacts to downstream facilities.

Core Requirement #2: Offsite Analysis (Section 1.2.2)

This project will require an offsite analysis report that assesses potential offsite drainage impacts associated with the development of the project site and proposes appropriate mitigation of those impacts. At a minimum, a Level 1 Downstream Analysis will need to be completed and documentation for the downstream flooding of the ballpark and impacts to the surrounding wetlands will need to be documented. At this time it is our assumption that we will meet discharge requirements at the S 144th Street and 16th Avenue S culvert.

Core Requirement #3: Flow Control (Section 1.2.3)

This project must meet the flow control requirements established in the SWDM and meet the criteria established in exemption #2 (Impervious Surface Exemption for Transportation Redevelopment Projects). This project is a "Transportation Redevelopment Project" and the new impervious surface area is less than 50 percent of the existing impervious area. The existing impervious area existed prior to January 8, 2001 and the replaced impervious surface does not require mitigation. Therefore, the Non-Targeted existing impervious surface (including replaced surfaces) is included in predevelopment conditions (SWDM 1-35). The non-targeted pavement area was reduced from 1.9 acres to 1.2 acres to comply with SWDM Section 1.2.3.2 F (Bypass from non-targeted surfaces).

Sizing of the detention facilities has been performed using Level 1 Criteria requiring the developed peak discharge rates to match the existing peak discharge rates for the 2- and 10-year return periods.

Core Requirement #4: Conveyance System (Section 1.2.4)

The conveyance system is designed to meet the 25-year peak flow. The storm drainage inlet spacing shall be established according to Chapter 7, page 2, section (A) of the King County

Roads Standards (2007) Manual. Post 15 percent design, the inlet spacing, pipe diameters, and pipe slopes will be modified and optimized to address pipe velocities, 80 percent flowing full conditions, and utility conflicts. Currently, the proposed conveyance system is estimated to establish type, size, and locations to establish a preliminary cost of impact and potential utility conflicts.

The current assumption for the culvert replacement is that it meets the 100-year peak flow and may be replaced in kind. According to the Miller and Walker Creek Basin Salmon Planning Project, there are no salmonoid fish species north of Lake Reba (downstream of the project site).

Core Requirement #5: Erosion and Sediment Control (Section 1.2.5)

Erosion and Sediment Control (ESC) measures will be employed on this project to protect the wetlands and forested areas according to the King County Erosion and Sediment Control Standards.

Core Requirement #6: Maintenance and Operations (Section 1.2.6)

A maintenance plan will be developed and included in the storm water report identifying the "owner" (responsible party providing maintenance), types of facilities to be checked and how they should be maintained.

Core Requirement #7: Financial Guarantees and Liability (Section 1.2.7)

This will need to be established for the storm drainage report prepared for the 30 percent design.

Core Requirement #8: Water Quality (Section 1.2.8)

This project will be required to provide water quality treatment for the new and replaced pollution-generating impervious surfaces and new pollution generating pervious surfaces. This requirement will need to be explored further post 15 percent design to address the conveyance system and spill control provisions. Current assumptions exclude linings in the ditches to prevent groundwater contamination and exclude oil control facilities. The ditch linings and oil control facilities have not been included in the project because the project meets exemption #2 as well as stays well under the threshold for providing oil water separator requirements for intersections based on the Washington State Department of Ecology requirements. However, this may be overruled by the Special Requirement #5 (oil control).

It is also assumed that Tub Lake is not a sensitive lake and does not need the water quality protection or treatment established for Sensitive Lake Water Quality Treatment Areas. It is also assumed that Tub Lake does not contain sphagnum bogs or require sphagnum bog water quality treatment.

None of the special requirements have been addressed for this analysis and will need to be analyzed post 15 percent design. Also, netting to cover the proposed pond has not been addressed in the plans but may need to be provided if the pond is within the wildlife hazard control region for the airport. The need for the netting will be determined post 15 percent design.

10. Structural live loads

The roadway alignment and vertical profile will be designed and evaluated to minimize excessive cut and fill conditions. AASHTO HS-20 is the loading criteria for the traveled way.

11. Structural seismic criteria

Structural seismic criteria will be based on the WSDOT Bridge Design Manual and Chapter 16 of the Universal Building Code on an as needed basis.

Walls must be a minimum of 10 feet from the edge of traveled way and provide fall protection if the drop-off exceeds 18 inches.

12. Illumination Standards

Illumination design will be in conformance with the County Standards, National Electric Code, the National Electric Safety Code, and Washington State Electrical Code Chapter 296-44 WAC.

For arterial streets, County standards are 1.2 maintained foot candles, with a 3:1 uniformity ratio. Intersections require 1.5 foot-candles with an average to minimum uniformity ratio of 3:1.

Sag vertical curves require 0.4 foot-candle within the limits of the sag curve with a maximum average foot-candle value of 1.0. (Chapter 5, page 9 of the King County Roads Standards (2007).

13. Signal criteria, including CCTV and Interconnect System

All traffic control devices, such as traffic signals, traffic signs, or channelization will be designed according to Manual of Uniform Traffic Control Devices (MUTCD) – Millennium Edition, subject to approval by the City of SeaTac and King County. Interconnection is recommended when adjacent signalized intersections lie within one-half mile of a proposed signal installation.

14. Landscape requirements

The County Standards specify a width of five feet between the back of curb and the sidewalk for arterial facilities. (Section 5.03 D (1).

ALIGNMENT ALTERNATIVES

Eight alignment alternatives were developed for this project. Four alternatives utilized existing Port property. The other four alternatives utilized existing City rights-of-way and would have required varying amounts of additional right-of-way acquisition and/or easements.

These eight alignment alternatives were screened and evaluated based on the project goals. The resulting preferred alternative was to make geometric improvements to the existing S 142nd Street, S 142nd Place, S 144th Street facility between Des Moines Memorial Drive and 20th Avenue S.

Alternatives Development

Three alignment corridor alternatives were prepared for a June 27, 2007 open house and public involvement meeting: Corridors A, B1 and B2. A fourth alignment, Corridor C, was shown as not under further consideration.

Corridor C would have included improvements to 24th Avenue S from S 154th Street to S 142nd Street and S 142nd Street from 24th Avenue S to 20th/21st Avenue S. The use of this corridor for 55-Acre Parcel access was rejected due to the project goal of minimizing impacts to nearby neighborhoods.

Corridor A would utilize existing Port of Seattle property to build a new north/south roadway from S 146th Street to S 142nd Street between 20th and 21st Avenue S, near the Boeing Spares Distribution Center. Access to and from SR 518 would use 24th Avenue S south of S 146th Street. A preliminary cost estimate for this alignment was $11.7 million.

Corridor B1 would consist of improvements to S 146th Street between 19th Avenue S and 18th Avenue S, S 142nd Place and S 142nd Street from S 142nd Place to 20th/21st Avenue S. A new north/south roadway would be built between S 146th Street and S 144th Street at 18th Avenue S. Truck operations would improve on S 142nd Place, but steep hills (14% grade) would still remain on S 146th Street near 18th Avenue S. Access to and from SR 518 would use 24th Avenue S south of S 146th Street. A preliminary cost estimate for this alignment was $13.8 million.

Corridor B2 is similar to Corridor B1 except the existing 16th Avenue S between S 146th Street and S 144th Street would be improved instead of constructing a new 18th Avenue S. Other improvements would include upgrades to S 144th Street east of 16th Avenue S, S 142nd Place and S 142nd Street from S 142nd Place to 20th/21st Avenue S. Truck operations would improve on S 144th Street and S 142nd Place, but the steep hill (14% grade) would still remain on S 146th Street near 18th Avenue S. A preliminary cost estimate for this alignment was $13.7 million.

Figure 2: Corridor C (considered but rejected)

Figure 3: Corridor A

Figure 4: Corridor B1

Figure 5: Corridor B2

Following the June 27, 2007 open house, at the request of the Port of Seattle, three additional alignment corridors were created as extensions to Corridor A. Corridors D1, D2 and E would use portions of the North Employee Parking Lot (NEPL) and connect to 24th Avenue S at S 148th Street or S 150th Street.

Corridor D1 would construct a new north/south roadway from S 142nd Street to S 146th Street and then convert the northeast section of the NEPL into a roadway and connect to 24th Avenue S south of S 148th Street. The existing intersection of 24th Avenue S and S 148th Street would be moved approximately 100 feet south to line up with the northeast corner of the employee parking lot. This intersection would be skewed relative to 24th Avenue S. Truck traffic would access SR 518 via 24th Avenue S south of S 148th Street. Extensive earthwork would be required to build this alignment through the NEPL. A preliminary cost estimate for this alignment was $27.9 million.

Corridor D2 would include improvements similar to Corridor D1 except for the connection of the new roadway to 24th Avenue S and S 148th Street. This alignment would construct a cul-de-sac on S 148th Street at 24th Avenue S and built a new intersection approximately 100 feet south. This new intersection would be a standard four-leg intersection without the skewed roadway shown in Corridor D1. Extensive earthwork would be required to build this alignment through the NEPL. A preliminary cost estimate for this alignment was $28.4 million.

Corridor E would have similar characteristics as Corridors D1 and D2 except this alignment would connect to 24th Avenue S at S 150th Street instead of S 148th Street. This connection to 24th Avenue S would overlap with the existing access to NEPL at S 150th Street. This alignment would pose the most disruption to NEPL operations and would create several separate parking lots. This alignment would move truck traffic further south of nearby neighborhoods than Corridors D1 and D2. A preliminary cost estimate for this alignment was $26.6 million.

Figure 6: Corridor D1

Figure 7: Corridor D2

Figure 8: Corridor E

An additional alignment alternative, Corridor DMMD, was created to show roadway improvements that would allow truck access to the 55-Acre Parcel via Des Moines Memorial Drive instead of 24th Avenue S. Corridor DMMD was presented with Corridors A, B1, B2, D1, D2 and E at an August 10, 2007 meeting with the City and Port.

Corridor DMMD would consist of improvements to existing roadways. S 144th Street east of Des Moines Memorial Drive, S 142nd Place and S 142nd Street from S 142nd Place to 20th/21st Avenue S would be upgraded to current design standards to improve truck operations. This alignment would separate 55-Acre Parcel truck traffic from the neighborhoods near 24th Avenue S. A preliminary cost estimate for this alignment was $12.3 million.

Figure 9: Corridor DMMD

Evaluation and Screening

The alignment corridors were evaluated and screened based on the project goals and the preliminary cost estimate for each alignment. No alignments were generated for Corridor C because this corridor was screened out based on project goal to minimize impacts to nearby neighborhoods. Table 3 shows the screening results for the seven alignments. Costs are in 2007 dollars based on preliminary quantities for the alignment concepts.

Of the six project goals, separating truck traffic from neighborhood traffic, minimizing impacts to nearby neighborhoods and minimizing environmental impacts were given the most consideration.

Table 3 Corridor Alignment Screening Results

Project Goal	Alignment						
	DMMD	A	B1	B2	D1	D2	E
Minimize impact to adjacent neighborhoods	●	◒	◒	◒	○	○	●
Minimize disruption to existing City streets	○	●	○	○	◒	◒	◒
Separate truck traffic from neighborhood traffic	●	○	◒	◒	◒	◒	●
Provide an acceptable Level of Service at the design year	●	●	●	●	●	●	●
Minimize environmental impacts of project	○	●	◒	○	●	●	●
Maximize development opportunities	●	◒	●	●	◒	◒	◒
Cost ($ Millions)							
Development and Construction	$5.7	$6.6	$7.6	$7.3	$14.1	$14.7	$12.6
Right-of-Way	$6.6	$5.1	$6.2	$6.4	$13.8	$13.7	$14.0
Total	$12.3	$11.7	$13.8	$13.7	$27.9	$28.4	$26.6

High Performing	●	Average Performing	◒	Low Performing	○

Preferred Alternative

Corridor DMMD was selected as the preferred alignment due to its relatively low cost and high performance with project goals related to minimizing neighborhood impacts and separating truck traffic from neighborhood traffic.

The preliminary cost estimates for Corridors D1, D2 and E were high compared to the project budget to be considered further. Corridors A, B1 and B2 did not perform as well as Corridor DMMD when considering the project goals of separating truck traffic from neighborhood traffic and minimizing impacts to nearby neighborhoods.

CONCEPT DESIGN

The concept design is developed at a 15 percent level of design.

Geometric Features

Geometric elements of the proposed reconstruction of S 142nd Street, S 142nd Place, and S 144th Street are described below with respect to the design criteria adopted for the project.

Horizontal and Vertical Alignment

Reconstruction of the corridor will extend over about 2,800 feet of length, between Des Moines Memorial Drive and the Boeing Spares Distribution Center driveway. East of this location, improvements will be limited to construction of curb, gutter, retaining walls and sidewalk along the north side of S 142nd Street.

Reconstruction of the roadway requires that the existing centerline be matched at the east (20th Lane S) and west (Des Moines Memorial Drive) ends of the project. The tangent portions of the roadway east and west of the reverse curves on S 142nd Place would remain on the existing centerline, though shortened by the reconstruction of the curves. Curve radii of 750 and 850 feet are provided in the concept design, meeting the minimum radius of 380 feet for the proposed design speed. A maximum of about 5 percent superelevation would be achieved on the curves. These curves would be connected with a tangent section of about 200 feet in length, sufficient for the runout of superelevation in each direction.

The number and length of crest and sag vertical curves will be revised with the realignment proposed with the conceptual design. Maximum grade in the corridor will be reduced to 6.7 percent, compared to over 11 percent today. A stopping sight distance analysis was conducted for three vertical curves, as shown in Table 4. Stopping sight distances are adequate for the crest curve and the two sag curves, where stopping sight distance is primarily affected by headlight illuminance at night.

Table 4 Stopping Sight Distances

	PVC Sta. 15+25.00	PVC Sta. 27+75.00	PVC Sta. 35+25.00
Type	Sag	Sag	Crest
Design Speed (mph)	35	35	35
G_1 (percent)	-0.78	4.18	6.69
G_2 (percent)	4.18	6.69	-0.29
A (percent)	4.96	2.51	6.98
Length of Vertical Curve (feet)	350	500	550
Actual SSD (feet)	333	1089	324
K_c (unitless)	N/A	N/A	79
K_s (unitless)	71	199	N/A
Standards Required SSD (feet)	261 (downgrade) 235 (upgrade)	286 (downgrade) 223 (upgrade)	286 (downgrade) 223 (upgrade) 125 (ABS)
WSDOT Required SSD (feet)	260 (down grades) 215 (up grades)	280 (down grades) 215 (up grades)	295 (down grades) 215 (up grades)
Adequate (Y/N)	Y	Y	Y

Entering sight distances were evaluated at four locations where cross streets or driveways join the corridor. The King County standards require a minimum of 390 feet for entering sight distance for a 35 mph design speed. This requirement is satisfied at three of the four locations. A driveway on the south side of S 142nd Street and on the inside of the easternmost curve would provide entering sight distance of only 280 feet. Mitigation for this condition could include posting an advisory speed of 30 mph in this curve.

Superelevation

The roadway will have a normal crowned section in the tangent portions and will have full superelevation in the two curves. The standards allow superelevation up to a maximum of 6 percent for this design speed and class of roadway. The actual superelevation rate for the curves reaches about 5 percent for the proposed design speed and curve radii.

Cross-Section

The proposed project will provide a single lane in each direction of travel along S 144th Street, S 142nd Place, and S 142nd Street between Des Moines Memorial Drive and 24th Avenue S. Several cross-section alternatives were considered, but the recommended cross-section is influenced by the existing available 60-foot right-of-way. Illustrated in Figure 10 are the cross-sections near the western terminus (A), typical two-lane segment (B), and the sidewalk completion east of 20th Avenue S.

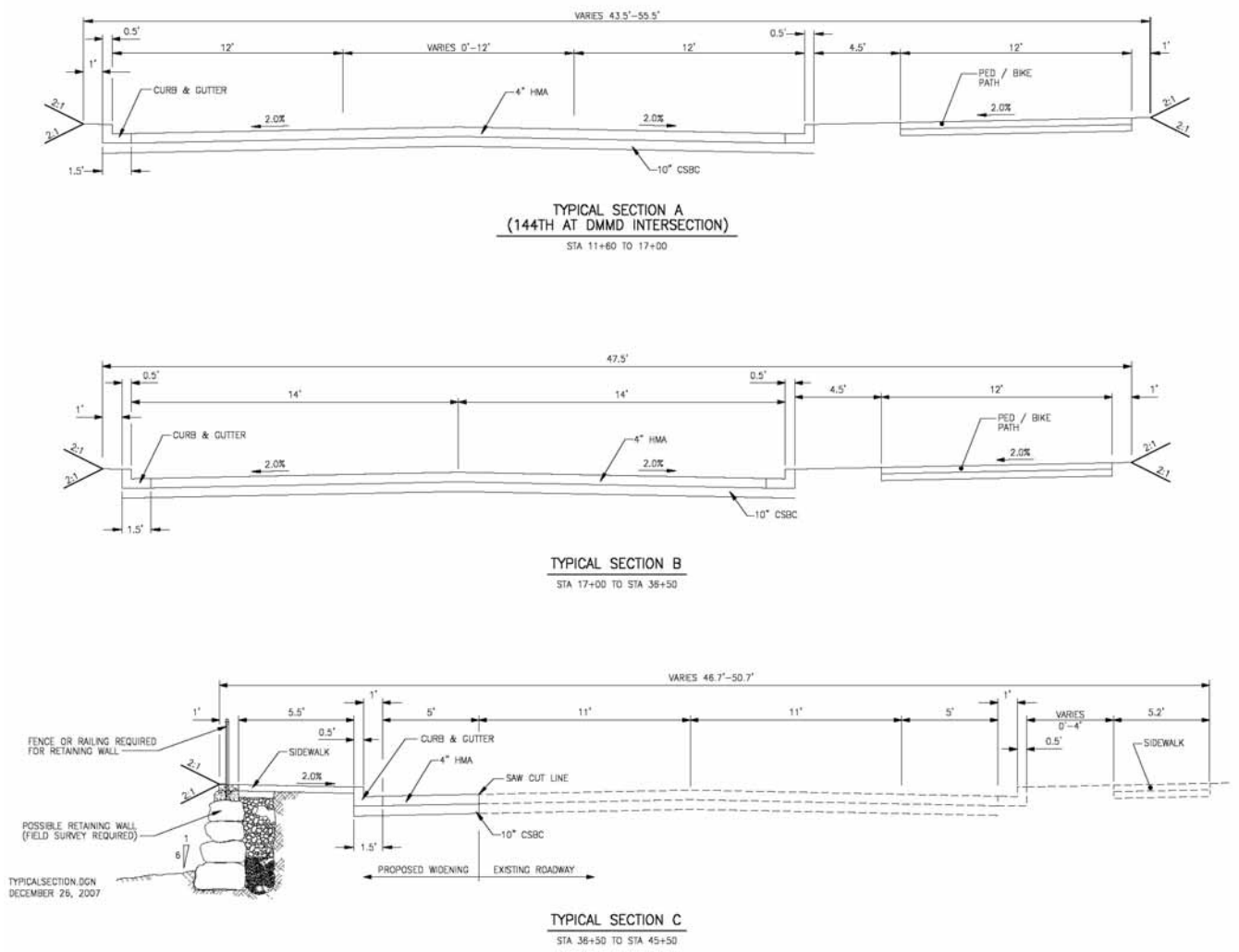


Figure 10 Typical Cross Sections

Travel lanes 11 feet wide would be provided with 5-foot designated bike lanes east of 20th Avenue S. West of 20th Avenue S, two wide curb lanes would each provide 14 feet of width to support truck operation. Near the Des Moines Memorial Drive intersection, three 12-foot lanes would be provided.

Bicycles would operate in designated bike lanes east of 20th Avenue S, and could operate in a wide curb lane or shared use path west of this point. The shared use path would be 12 feet wide for use by non-motorized modes. A planting strip of 4½ feet adjacent to the path would be considered non-standard for arterial facilities.

No sidewalk would be provided along the north side of the street west of 20th Avenue S because wetland impacts would result. New sidewalk construction would be provided on the north side of S 142nd Street east of 20th Avenue S. A width of 6 feet for this sidewalk would be considered non-standard for an arterial application.

Intersection Modifications

The intersection of Des Moines Memorial Drive with S 144th Street lies at the west end of the North SeaTac Roadways project. At this location, an exclusive left-turn lane and a single through/right lane are provided on the north, south and west legs, with a single lane serving all movements on the east leg. The intersection is signalized, with split-phase operations for the east and west approaches.

The proposed design includes widening for an exclusive westbound left-turn lane from S 144th Street onto southbound Des Moines Memorial Drive. Without the added turn lane, intersection operations would deteriorate to Level of Service (LOS) E by the design year (2024). With this improvement, intersection operations can be maintained at LOS C in the design year.

The City of Burien has adopted a Comprehensive Plan amendment to allow retail uses on the Northeast Redevelopment Area properties west of Des Moines Memorial Drive. Additional traffic associated with this action would produce LOS F at the Des Moines Memorial Drive/S 144th Street intersection during the 2020 PM peak hour. With the added westbound left-turn lane, LOS E is projected for these conditions.

The present study considers the development impacts of the 55-Acre Parcel, not including the Burien NESPA properties. The Burien development may require additional improvements along Des Moines Memorial Drive not identified in the current effort.

The S 144th/S 142nd Street corridor serves as a designated truck route for the commercial properties north of Sea-Tac Airport and SR 518, with Des Moines Memorial Drive providing the truck route connecting to SR 518 south of S 144th Street. Trucks also may turn to and from the north on Des Moines Memorial Drive at this intersection to access northbound SR 509 from S 128th Street or to continue north to the Duwamish industrial area in south Seattle. The presence of turning trucks at this location will influence the geometric design of the intersection improvements.

Using a WB-50 design vehicle, AutoTURN® software was used to investigate truck turning movements at the study intersection. With the existing intersection channelization, a westbound WB-50 turning left would encroach on a portion of the northbound left turn lane. A northbound

WB-50 turning right would encroach on a portion of the westbound lane. These two turning movements would likely not be able to occur simultaneously because they produce a conflict area on the east leg of the intersection. With the proposed intersection improvements, including a westbound left turn lane and larger curb return radii, these turning movements could occur simultaneously.

With the existing intersection channelization, a westbound WB-50 would not be able to make a right turn to northbound Des Moines Memorial Drive without encroaching on a portion of the southbound left turn lane. A southbound WB-50 turning left would encroach on a portion of the southbound shared thru-right lane and a portion of the pavement outside the eastbound lane striping on the east leg of the intersection. These two turning movements would likely not be able to occur simultaneously because they produce a conflict area on the north leg of the intersection. With the proposed intersection improvements, these turning movements could occur simultaneously.

Conditions for larger trucks (WB 67) were evaluated with respect to lane encroachment, but these larger trucks were not used as the basis of design. With the proposed intersection improvements, a westbound WB-67 turning right would encroach on the proposed curb, sidewalk and bicycle lane on the northeast corner of the intersection, or onto the westbound left-turn lane. With the proposed intersection improvements a northbound WB-67 turning right onto S 144th Street would encroach on the northbound left-turn lane.

If truck movement limitations necessitate east/west split phase operations with the addition of a westbound left turn lane, intersection operations in the design year would remain at LOS C. LOS C also would be maintained if right turns on red were prohibited for westbound and northbound movements.

The turning template analyses indicate that the movement of WB-50 traffic can be supported with the proposed intersection design with minimal encroachment on adjacent lanes or curbs. The movement of WB-67 trucks would result in more extensive encroachment, but is manageable with the continued use of split-phase signal operations or prohibitions of right turns on red.

The proposed intersection improvements would require acquisition of right-of-way to serve the turning paths of WB-50 semi-trailers. Larger curb radii would place the back of the curb closer to the businesses in the northeast, southeast, and southwest corners of the intersection. The impact of the larger radii will be most severe on the auto repair shop in the northeast quadrant of the intersection. The distance between the corner of the Precision Auto Service building and the back of curb would reduce from 20 feet to seven feet. Property acquisition also would be affected by the proposed shared use path extending along the south side of S 144th Street near the Sunnydale Tavern. The Port has acquired the restaurant property on the southwest quadrant of the intersection. Reconstruction on this corner is required to support westbound-to-southbound truck movements without encroaching on the northbound left-turn lane.

Traffic signal modifications at the Des Moines Memorial Drive/S 144th Street intersection would include the replacement of several mast arms and poles, signal and pedestrian heads, and underground conduit. Depending on the age and condition of the controller cabinet and signal control hardware, these features also could be replaced. The nearby trail connections may justify pedestrian countdown timer displays. Supplementary pedestal pushbutton mounting could be required where multiple curb ramps are provided. Interconnection to traffic signals at nearby intersections is required in the King County Road Standards for distances up to one-half mile,

which would include the signal at the Des Moines Memorial Drive/S 136th Street intersection to the north. Details of the signal modification will be explored fully in the next phase of design development.

Design Deviations

Several design deviations would need to be documented as design advances:

- Entering Sight Distance at the commercial driveway south of S 142nd Street provides only 280 feet of entering sight distance to the left, compared to 390 feet required. Mitigation could be accomplished with posting of a 30 mph advisory speed in the easternmost horizontal curve.

- Typical Roadway Width of 36 to 44 feet would not be satisfied with the 28-foot and 34-foot roadway widths proposed east of 16th Avenue S.

- Maximum Driveway Widths are exceeded at two existing locations in the corridor. These two driveways are located at the eastern and western horizontal curves in the alignment, both on the south side of the roadway. A deviation could be avoided by reconstructing these driveways to the standard 35-foot width required by the standards.

- Minimum Sidewalk Width on the north side of S 142nd Street east of 20th Avenue S would not meet the standard width of 6½ feet required without a planting strip. The preliminary design provides for a 6-foot sidewalk.

- Minimum Landscape Width of 5 feet behind the curb would not be met between the proposed shared use trail and the south roadway edge.

Stormwater Conveyance and Treatment

The entire length of roadway between 24th Avenue S and Des Moines Memorial Drive is proposed to have a curb and gutter roadway section. A new conveyance system is proposed to capture and convey stormwater runoff either to a treatment pond or discharge directly to a ditch. Between Des Moines Memorial Drive (Station 10+00) and Station 20+25, runoff will be collected and discharge directly to the ditches at the intersection with 16th Avenue S. Between Station 20+25 and the crest vertical curve near the Boeing Spares access driveway (Station 37+75), the runoff will be routed into the stormwater treatment pond located on the north side of the roadway. East of Station 37+75 the runoff will need to be collected and conveyed to another stormwater treatment facility as yet undefined.

The water quality facility proposed for this project is a wet pond/detention pond. A preliminary grading and hydrology analysis was performed to investigate the possibility of using a Stormwater Wetland Treatment Pond to match the existing site characteristics and provide some measure of low impact development for the project. However, physical site characteristics of the elevation differences between the existing drainage outfall path, pond bottom, and groundwater elevations, cause the pond size to be wide and shallow affecting a large region of area within the wetland buffer. The proposed wet pond/detention pond is sized to reduce the wetland and wetland buffer impacts as well as maximize the site area that can physically drained into it. The pond will

be situated and graded to allow for an access road into the pond, a drivable surface around the pond for maintenance access, mowing, and fencing, as well as maximize the distance of the water surface from the existing bank/hill. The proposed location and elevations have been established based upon current survey data to allow a positive 0.4% (cleaning velocity) hydraulic gradient to a water surface assumed equal to the water table occurring at the culvert (natural drainage path elevation) during the wet season.

Geotechnical Considerations

Existing Conditions

General geologic information for the project area was obtained from Geology of the Des Moines Quadrangle, Washington (Waldron 1962). According to this source, near-surface deposits in the vicinity of the project alignment consist of recessional outwash and advance outwash. Soil defined as recessional outwash typically consists of stratified sand or sand and gravel with variable amounts of silt and cobbles. This unit was transported by meltwater emanating from the face of a retreating glacier and deposited in streams and pools. This unit typically exhibits high permeability and moderate shear strength, and is susceptible to erosion, especially when exposed on steep slopes.

Soil defined as advance outwash typically consists of clean sand with an increasing gravel content higher in the section. Silt and fine-grained sand are common in portions of the unit. Sorting, cross and horizontal stratification, and cut and fill structures are distinctive features of outwash. Advance outwash is transported by meltwater and deposited in streams and pools emanating from the face of an advancing glacier. This unit has been glacially overridden, typically exhibits moderately high permeability, and is susceptible to erosion, especially when exposed on steep slopes.

No obvious evidence of recent or historic slope movement, such as irregular topography, bare soil scarps, and/or groups of toppled trees, was observed along the project alignment. However, surveyors have identified a slide area or utility blowout in the vicinity of the project alignment. This area is located on the north side of S 142nd Place, downslope and approximately 150 feet from the edge of the roadway (see Appendix B, Figure 2).

Subsurface conditions along the project alignment were explored on December 21, 2007. The exploration program consisted of advancing and sampling five exploratory test pits (TP-1 through TP-5). The test pits were excavated to depths ranging from about 12 to 17-½ ft below the ground surface (BGS) using a tracked excavator. The approximate locations of the exploratory test pits are shown on Appendix B Figure 2. A discussion of field exploration procedures, together with edited logs of the exploratory test pits, is presented in Appendix B. A discussion of laboratory test procedures and the test results are also presented in Appendix B.

Additional information regarding subsurface conditions along the project alignment was obtained from a review of available geotechnical information for the project area (MFG 2003). The results of the previous explorations by others generally confirm conditions observed in our explorations and are consistent with our local experience. Summary logs of the previous explorations are included for reference purposes in Appendix B. The approximate locations of the previous explorations are shown on the figures that precede the summary logs.

Based on the results of the field exploration program and our review of available geotechnical information, the project alignment is interpreted to be generally underlain by glacial outwash deposits that in areas are overlain by fill. At test pit TP-2, glaciolacustrine deposits were observed beneath the glacial outwash.

Fill was observed at the ground surface at test pits TP-3 through TP-5. Where encountered, the fill extends to depths ranging from about ¾- to 4½-feet BGS. The fill was observed directly over either glacial outwash (at test pits TP-3 and TP-5) or buried topsoil (at test pit TP-4). In general, the fill observed in the explorations consists of moist to wet, loose sand with varying amounts of silt and gravel. The fill at test pit TP-5 contained concrete rubble and metal debris.

Glacial outwash was observed in all of our explorations either at the ground surface or beneath fill. Where explored, the glacial outwash generally consists of moist to wet, loose to dense sand with varying amounts of silt and gravel. Except at test pit TP-2, the test pits did not penetrate through the glacial outwash. Soil interpreted to be glaciolacustrine deposits was encountered beneath the glacial outwash at test pit TP-2. At this location, the glaciolacustrine was observed to consist of moist, very stiff to hard, silt with slickensides and fractures. Test pit TP-2 did not penetrate through the glaciolacustrine deposits.

At the time of the field investigation in late December 2007, groundwater was observed in test pits TP-1 through TP-3 at depths ranging from about 2 to 16 ft BGS. Groundwater was not observed within the depths explored at test pits TP-4 and TP-5. Given the difference in elevation (about 60 ft) between the location of test pits TP-1 through TP-3 and the location of test pits TP-4 and TP-5, we expect that the regional groundwater level in the vicinity of test pits TP-4 and TP-5 to be well below the bottom of these test pits.

The groundwater conditions reported herein are for the specific locations and dates indicated and, therefore, may not necessarily be indicative of other locations and/or times. Furthermore, it is anticipated that groundwater conditions will vary depending on local subsurface conditions, the weather, and other factors. It is likely that higher groundwater levels would occur in the winter/spring months.

Preliminary Conclusions and Recommendations

The following sections present preliminary geotechnical conclusions and recommendations related to environmentally sensitive areas, earthwork, stormwater infiltration, slope stability considerations, and pavement design. These preliminary recommendations are presented with the understanding that a supplemental design-phase geotechnical study will be conducted once the preferred design approach has been selected and the preferred roadway alignment has been identified.

Environmentally Sensitive Areas

On January 11, 2008, Landau Associates accessed King County's iMap website (King County website 2007) for the purpose of determining if King County has identified certain environmentally sensitive areas along the project alignment that could impact the selection of a preferred roadway alternative. The types of environmentally sensitive areas that we searched for included wetlands, landslide, coal mine, seismic, and erosion areas. At the time we accessed King County's website, none of the above-referenced environmentally sensitive areas was

mapped along either side of the project alignment. However, King County has identified the area in the vicinity of the project alignment as being susceptible to groundwater contamination.

Earthwork

Earthwork to accommodate construction of the proposed roadway improvements and adjustments to the horizontal and vertical alignment is expected to consist of clearing, grubbing, and stripping of areas where improvements are planned; cuts and fills along portions of the roadway; and subgrade preparation for new pavement areas. The following sections present our preliminary conclusions and recommendations related to these activities.

Soil generated from cuts along S 142nd Place is likely to consist primarily of sand with varying amounts of glacial outwash or glaciolacustrine silt. Glaciolacustrine deposits are considered to be highly sensitive to moisture, whereas the glacial outwash deposits are considered to be less sensitive to moisture. Therefore, it may be possible to use some of the glacial outwash excavated along the project corridor for embankment material, provided that grading occurs during dry weather periods, and the moisture content is near optimum.

It is anticipated that some of the existing embankments along S 142nd Place will need to be widened in areas. Embankments should be constructed at slopes of 2H:1V or flatter in accordance with Section 2-03 of the 2006 WSDOT Standard Specifications. In general, existing embankments, currently sloped flatter than 2H:1V, may be steepened to a finished maximum slope of 2H:1V. The fill associated with widened embankments should be keyed and benched into the existing embankment in order to reduce the potential for slope instability between the new and existing fill.

Stormwater Infiltration

A fundamental design requirement for an infiltration facility is there must be at least three feet of permeable soil below the bottom of the proposed facility and at least three feet between the bottom of the facility and the maximum wet-season water table.

The results of the field exploration program suggest that the western portion of the site proposed for the stormwater pond is underlain by low permeability native soils (glaciolacustrine), whereas the eastern portion appears to be underlain by more permeable soils (glacial outwash). Furthermore, the depth to groundwater at the time of the field investigation was observed to range from about 2 to 8 feet BGS. Given the subsurface conditions observed in our test pits, it is our opinion that the likelihood of there being a minimum of three feet of permeable soil between the bottom of the stormwater pond and the maximum wet-season water table is relatively small. We, therefore, do not consider site conditions at the currently proposed stormwater pond location to be suitable for infiltrating stormwater.

Pavement Design

Landau Associates developed preliminary recommendations regarding flexible pavement sections for the proposed realigned portion of South 142nd Place. The preliminary flexible pavement section recommendations are based on traffic data provided by HNTB, the results of our field explorations, and an assumed 15-year performance period. Design pavement sections were

determined using the 1993 American Association of State Highway and Transportation Officials (AASHTO) design method (AASHTO 1993).

The results of our subsurface investigation program suggest that South 142nd Place is underlain by glacial outwash that in areas is overlain by fill. Based on these anticipated soil types and our experience on sites with similar subgrade soils, it is our opinion that a California Bearing Ratio (CBR) of about 10 percent could be used for preliminary design of flexible pavements. The preliminary design CBR value assumes that the new pavement section will be constructed over a subgrade that has been compacted to a dense and unyielding condition, or on properly compacted fill placed directly on a subgrade that has been compacted to a dense and unyielding condition. For use in preliminary pavement design, the estimated CBR value was converted to an approximate equivalent Resilient Modulus of 15,000 pounds per square inch.

HNTB provided traffic loading information for South 142nd Place. The provided information suggests that our preliminary pavement design for the realigned portion of S 142nd Place could assume a maximum initial two-way average daily traffic count of 5,220 vehicles, of which up to 7 percent could be assumed to be heavy trucks (Federal Highway Administration Class 5 or greater). An annual traffic volume growth rate of about 3.3 percent and an annual heavy truck volume growth rate of about 1.7 percent were also provided by HNTB. We assumed an initial truck factor of 1 and an annual truck factor growth rate of 0.5 percent. Based on these assumptions, the assumed traffic loading conditions would generate approximately 1,200,000 ESALs (18-kip equivalent single axle loads) during a 15-year performance period.

Using the AASHTO design methodology and the traffic information provided by HNTB, the preliminary flexible pavement section recommendations presented below were developed for the realigned portion of South 142nd Place.

Table 5 Preliminary Flexible Pavement Section Recommendations

Material Description	Preliminary Recommended Minimum Thicknesses (inches)	WSDOT Standard Specification
HMA	4	9-03.8
CSBC	10	9-03.9(3)
Gravel Borrow	As Needed	9-03.14(1)

HMA = Hot Mix Asphalt, Plant-mixed. CSBC = Crushed Surfacing Base Course. The upper 2 inches of Crushed Surfacing Base Course may be replaced by Crushed Surfacing Top Course (CSTC). WSDOT = Washington State Department of Transportation, 2006, Standard Specifications for Road, Bridge, and Municipal Construction.

Utilities

The roadway realignment requires the relocation of the utilities on this corridor. According to King County standards, the water and gas lines will be located 1.5 feet behind the back of curb on opposite sides of the road. The water line will replace the existing 8-inch ductile iron pipe. The gas line replacement is a 6-inch line.

The sanitary sewer line will be relocated to a 5-foot offset from the roadway centerline. Manholes will be required within the roadway and at points where the new line must be connected to the existing line.

The City will require the undergrounding of the existing power and communication overhead utilities along this collector arterial corridor. Roadway illumination as well as buried power, telephone and cable conduit will be located at the back of sidewalk on the north side of the roadway. High ground water levels near the wetland may influence the location and design of the buried power.

A metering station for high-pressure natural gas transmission pipes is located on the south side of S 144th Street west of 16th Avenue S. The trail alignment will be adjusted as necessary to reflect the continued presence of this facility.

Right-of-Way Acquisition

Additional right-of-way will be required in the area of the reverse curves where the alignment is shifted onto nearby property owned by the Port of Seattle. The proposed detention pond also would be located on Port of Seattle property. These properties may the acquired through a land swap between the City and Port and may also be made available through an easement.

Additional right-of-way also would be required in the northeast, southeast, and southwest quadrants of the Des Moines Memorial Drive/S 144th Steet intersection. Parking loss on these properties also is a consideration. The northeast corner acquisition is considered to be a total take. Right-of-way required in the southwest quadrant has been acquired by the Port of Seattle.

Curb extensions for traffic calming at the S 142nd Street/24th Avenue S intersection would require acquisition of right-of-way or a construction and operation easement in the northeast quadrant of this intersection. The property corner closest to the intersection would be affected. If determined feasible, the treatment would be similar to that at the S 144th Street/24th Avenue S intersection.

MITIGATION OF TRAFFIC IMPACTS

Adverse impacts of the proposed redevelopment of the 55-Acre Parcel include potential truck traffic incursion into residential neighborhoods, added commute traffic, and impacts on pedestrians and bicyclist. Mitigation of these impacts has been considered in the design development, as described below.

Truck Routing

Truck routes serving the site include SR 518, SR 509, Des Moines Memorial Drive, and S 144th/S 142nd Streets east to 24th Avenue S. The truck route network is intended to discourage truck use of 24th Avenue S near residential areas. Truck use of S 136th Street also would be prohibited. Trucks turning to and from S 144th Street from Des Moines Memorial Drive would require expanded turning radii compared to that offered by the existing condition.

A marketability study conducted for the 55-Acre Parcel development site showed that this site could function as support for Seattle seaport operations given the site's good access to the Elliott Bay and Duwamish Waterway marine terminals and South Seattle industrial area via SR 509. Currently, there is not a designated truck route through the City of Burien that would provide direct access between the 55-Acre Parcel and SR 509.

The most direct route to and from the north on SR 509 would be to use Des Moines Memorial Drive and S 128th Street. This would require the designation of S 128th Street as a truck route between SR 509 and Des Moines Memorial Drive. It is currently designated by the City of Burien as a minor arterial between SR 509 and Des Moines Memorial Drive.

Another possible route would be to designate S 160th Street between Des Moines Memorial Drive and SR 509 as a truck route. It provides a full interchange at SR 509, although it is circuitous for trips to and from the north. S 156th Street is also designated by Burien as a minor arterial route, but provides no freeway connections.

Decisions regarding a designated truck route from the 55-Acre Parcel to SR 509 will require coordination with the City of Burien. Burien will likely require similar revisions of their truck route plan to serve the nearby NESPA properties in Burien. Prior to development of the 55-acre or NESPA properties, resolution of the preferred truck routes should be achieved among the Cities and the Port.

For truck traffic circulating between the 55-Acre Parcel and the Seattle Tacoma International Airport, Des Moines Memorial Drive would remain the preferred route, connecting to truck routes along S 156th Way and S 154th Street on the south side of SR 518. Enforcement of these routes would minimize the potential for truck traffic to use 24th Avenue S.

The truck routing plan would be incorporated into development approvals as a commitment by owners and tenants to inform truck drivers and dispatchers of the proper truck routes, and enforce these provisions.

Traffic Calming

A primary concern with the redevelopment of the 55-Acre Parcel is the potential for truck traffic or commute traffic to intrude into nearby residential neighborhoods east of 24th Avenue S. Commute trips from the 55-Acre Parcel would initially distribute among the collector arterial facilities such as S 142nd Street, S 144th Street, S 136th Street, and 24th Avenue S. Most longer trips would use the minor arterial connections at Des Moines Memorial Blvd, S 154th Street, S 128th Street, and Military Road S to reach principal arterial or freeway routes. Some shorter commute trips might use the local street system to reach nearby residential destinations.

Truck traffic would be restricted to designated routes which are intended to reduce neighborhood noise and nuisance intrusion. Several streets in the neighborhood are signed for a 10,000 pound weight restriction, and this practice could be extended as needed. Site tenants would be expected to make their delivery drivers aware of the truck restrictions. The development conditions accompanying occupancy of the 55-Acre Parcel also could incorporate these provisions.

Several continuous east-west local streets provide opportunities for cut-through traffic between 24th Avenue S and Military Road S, including S 142nd Street, S 146th Street and S 148th Street.

Other cut-through routes could be formed by using various intermittent east-west streets in combination with north-south streets. Further to the north, S 133rd/S 132nd Street, S 135th Street and S 138th Street also provide continuous connections between 24th Avenue S and Military Road S. The traffic analysis indicates that 5 to 10 hourly commute trips might use S 138th Street including some with local destinations in these residential neighborhoods.

Cut-through traffic would generally be attracted to use local streets only if congestion were encountered on the collector and arterial streets. Traffic operations on the arterial routes are projected to remain generally at LOS D or better, with isolated instances of LOS E on the principal arterial system.

The City's Neighborhood Traffic Safety Program includes guidelines for the development of traffic calming approaches to address problems of volume or speeding on the City street system. It provides for application of a variety of specific techniques in three-phases of deployment. The first phase includes signing, enforcement, radar speed boards, speed and traffic studies, and pavement markings. In the second phase, physical barriers are authorized, including speed humps, traffic circles, curb extensions, and chicanes. Physical barriers normally would not be constructed where they would adversely affect emergency access, metro or school bus routes, drainage, or pedestrian/bicycle routes. A third phase of control would require programming a project through the City's Capital or Transportation funding mechanisms.

King County Metro buses utilize S 144th Street (24th Avenue S to Military Road S) and 24th Avenue S (north of S 144th Street) as part of Route 170. School buses also use these collector streets and portions of numerous local streets in their pickup and dropoff operations, including S 142nd Street, S 148th Street, S 150th Street, S 152nd Street and 30th Avenue/Place S.

Emergency response in this area of the City is served from a fire station along S 152nd Street east of the 34th Avenue S intersection. Service is provided by King County Fire District #2.

Signing for large truck prohibition and local traffic could be enhanced at S 142nd Street east of 24th Avenue S, where project traffic would first encounter neighborhood cut-through opportunities. Physical barriers may be difficult at this location because it also serves connections to the collector street system by local residents. Curb extensions or pavement markings could be effectively used to emphasize the local nature of S 142nd Street east of 24th Avenue S.

A concept for traffic calming similar to the treatment at the S 144th Street/24th Avenue S could be considered at this intersection. It would consist of curb extensions on the northeast and southeast quadrants of the intersection. The proposed curb extensions would require curb return radii of 35 to 40 feet on the northeast and southeast corners to accommodate school bus movements. Pedestrian crossing distances would be reduced with this design on three of the intersection legs. Additional signing or other safety enhancements could be provided at these marked crosswalks, with details to be considered as design advances.

Mid-Block Pedestrian Crossing

A mid-block pedestrian crossing would be developed along S 142nd Street in the vicinity of the Boeing Spares driveway to connect sidewalks on the north side of the street with the eastern terminus of the proposed trail. A location on the east side of the Boeing Spares driveway would

place the crossing at the crest of a long vertical curve. In this position, driver visibility of pedestrians and traffic control devices would be optimal.

Existing pedestrian and bicycle traffic at this location is light, with fewer than 10 pedestrian movements expected during the weekday commute peak hours. Activity may be higher during weekday and weekend midday hours with pleasant weather. Additional activity may be attracted by the creation of a shared use path, and its connection to the Westside Trail scheduled to be constructed by the City in 2008.

Several design concepts are available for the mid-block crossing:

- An Unmarked Crosswalk with standard crossing signing to alert road users to locations where pedestrians and bicyclists may unexpectedly enter the roadway. Warning signs W 11-1 and W11-2 from the Manual on Uniform Traffic Control Devices (MUTCD) would typically be installed. This concept could be accompanied with enhanced illumination and advance signing.

- A Marked Crosswalk installation is allowable at crossings away from traffic signals and stop signs, but must be accompanied by an engineering study under these conditions. Recent research indicates that, for crossings of two-lane roads, marked and unmarked crosswalks exhibit no differences in safety effects. Higher crash rates with marked versus unmarked crosswalks reported in earlier research were frequently attributed to a lack of caution on the part of pedestrians. These effects are now attributed to methodological difficulties in representing pedestrian exposure in the research.

  The safety of marked crosswalk installations can be enhanced with advance stop lines with supplemental signing (for example, “Stop Here for Crosswalk” or “Yield to Pedestrians in Crosswalk”), rumble strips on the crossing approaches, enhanced illumination, overhead signing, or combinations of these various passive measures.

- A Marked Crosswalk installation with active features would include lighted overhead signing, actuated flashing beacons, or in-pavement flashing crosswalk lights. All these concepts have been effective in reducing pedestrian collisions at identified high-accident locations. These applications could be combined with other passive measures described above.

- A Traffic Signal installation would provide positive control of vehicle/pedestrian conflicts, but probably would not meet established pedestrian and vehicle volume warrants to justify its application at this site.

The marked crosswalk is recommended for further consideration as design advances. An engineering study will be required to identify the detailed crossing plan at this location. At a minimum, overhead signing and advance signing to motorists should be included.

CONSTRUCTION COSTS AND PROJECT BUDGET

has been prepared, based on the 15 percent level of conceptual design established in the study process. The Engineer’s Opinion of Probable Construction Cost includes a tabulation of

quantities, unit costs, and total construction cost, based on 2007 construction costs and inflated to an expected 2010 construction year. A contingency of 30 percent has been included to reflect items and requirements that cannot be anticipated at the conceptual level of design. The cost estimate includes a 20 percent allowance for completion of design, and 12½ percent for construction management, legal services, and inspection.

It is understood that the cost opinion or engineer's estimate is based on professional experience and judgment. Because the preparer exerts no control over market conditions or bidding procedures, no warranty of guarantee of the cost estimate can be provided.

Construction Costs

The construction cost includes the realignment of proposed facility, with earthwork, paving, sidewalks, stormwater pond, drainage revisions, intersection improvements, traffic signal modifications, and illumination. The estimate includes allowances for signal interconnection along Des Moines Memorial Drive and for safety enhancements at the proposed mid-block pedestrian crossing. It does not include the cost of curb extensions at the eastern terminus of the project.

Right-of-way costs include allowances for acquisition in the Des Moines Memorial Drive/S 144th Street intersection vicinity, including a total take of the northeast quadrant parcel, easements or partial takes along the south project limit west of 16th Avenue S, and acquisition of Port property along S 142nd Place. No right-of-way cost is included for potential traffic calming treatment at the S 142nd Street/24th Avenue S intersection.

Project Budget

A budget of approximately $11 million has been established for construction of the project.

A primary influence on the budget is the acquisition of required right-of-way nearby to the project. A land swap with the Port of Seattle may be available to reduce the costs of acquisition of Port-owned land.

A wetland avoidance alternative could reduce the costs and potential schedule delays associated with permitting of wetland impacts north of S 144th Street near the Miller Creek crossing. These wetland impacts have been reduced by omitting sidewalk from the north side of the street west of 20th Avenue S.

Table 6 Opinion of Probable Construction Cost

Construction		
1.	Grading and Drainage	965,000
2.	Structures	8,500
3.	Surfacing and Paving	655,000
4.	Roadside Development	588,000
5.	Traffic Services and Safety	1,860,000
6.	Miscellaneous	574,500
7.	Construction Subtotal	4,651,000
8.	Inflation (2007 to 2010) at 15.8%	735,000
9.	Subtotal	5,386,000
10.	Mobilization at 10%	539,000
11.	Subtotal	5,925,000
12.	Sales Tax at 8.9%	527,000
13.	Subtotal	6,452,000
14.	Construction Engineering at 12.5%	807,000
15.	Contingencies at 30%	1,936,000
16.	Construction Total	9,195,000
Design and Right-of -Way		
17.	Design Contingency (15% of 9)	808,000
18.	PS&E (20% of 16)	1,839,000
19.	Right-of-Way	956,000
Total Estimated Cost		**$12,798,000**

Notes:
Item #7 – Construction cost is inflated at 5% per year from 2007 to 2010.
Item #19 – Right-of-Way cost is inflated at 4% per year from 2007 to 2010.

ENVIRONMENTAL CONSIDERATIONS

Natural Resource Permitting

This section provides a preliminary assessment of the potential natural resource related permits required for the proposed improvements to S 144th/142nd Street. Natural resource issues considered in this analysis include wetlands, streams, fish habitats, and wildlife habitats. The assessment provided in this section is preliminary because of the preliminary nature of the design. As design of the improvements proceeds, a more definitive analysis of the permit requirements will be made, and a permit acquisition plan and schedule can be developed.

Impact Assessment

The existing 144th Street crosses Miller Creek and lies immediately south of a wetland[1], both located just west of 16th Avenue South. The planned improvements result in minor impacts to the Miller Creek and the wetland, as identified in Table 7.

Table 7 Summary of Natural Resource Impacts

Miller Creek	Miller Creek is a Type F fish bearing stream. In this location, the stream channel is dry during summer months. In winter months, it is expected to provide rearing habitat to juvenile coho salmon and support cutthroat trout. According to the City of SeaTac Environmentally Sensitive Areas regulations (Zoning Code Section Chapter 15) the creek meets the criteria of a Class II stream and requires a 100-ft buffer.	
	Creek Crossing	An existing 60 linear feet corrugated steel culvert passes beneath the existing S 144th Street. This culvert must be replaced due to structural failures and other design issues. Potential stream habitat and water quality impacts could result from the culvert replacement and associated construction if required environmental procedures are not followed.
	Creek Buffer	Small areas of the 100-ft creek buffer (estimated to be less than 3,500 ft^2) would be converted from poorly vegetated stream buffer to street improvements (primarily a new trail). By omitting the sidewalk from the north side of the street west of 20th Avenue S, this impact can be reduced.
Wetland N3	Wetland N3 is a higher quality wetland estimated to be about 18 acres in size. The wetland encompasses Tub Lake, a high quality bog wetland. The wetland is estimated to meet the Department of Ecology Criteria for a Category I/II and a City of SeaTac Class I (Zoning Code Section Chapter 15). Ecology buffer requirements for this wetland type could vary between 150 and 300 ft. The City of SeaTac buffer requirements are 100 ft.	
	Wetland	Impacts to the wetland can be avoided by excluding sidewalk from the north side of the street west of 20th Avenue S. This action avoids filling of 1,800 ft^2 (estimated) of wetland to the north side of S 144th Street.
	Buffer	Impacts to the wetland buffer can be avoided by omitting sidewalk from the north side of the corridor west of 20th Avenue S. This approach would avoid about 3,900 ft^2 (estimated) of poorly vegetated buffer impact (this analysis assumes that areas on the south side of S 144th Street that lie within 100 ft of the wetland edge are not considered functional buffer because the existing road eliminated significant buffer functions from these areas).
Floodplain	Wetland areas north of S 144th Street are mapped by FEMA as Zone A floodplain. The SeaTac Environmentally Sensitive Areas regulations (Chapter 15.30.210-250) regulate development activities in floodplains.	

	Impact	Excluding the sidewalk from the north side of the street west of 20th Avenue S would eliminate about 1,800 ft^2 (estimated) of fill within the floodplain
Fish/Wildife Conservation Areas	Wetlands and streams are identified as fish and wildlife habitat conservation areas by the SeaTac Environmentally Sensitive Areas regulations (Chapter 15.30.210-370).	
	Impact	As noted for Miller Creek and Wetland N3.

[1] This wetland is designated as Wetland N3 in Port of Seattle documents, and is contiguous with Tub Lake, located several hundred feet north of S 144th Street.

Impact areas listed in the above table are estimated based on available information and preliminary project designs. Prior to completing project designs, additional studies including wetland delineation, wetland boundary survey, and flagging and survey of ordinary high water mark of Miller Creek should be completed.

Permitting Requirements

Several environmental permits are required to construct the road improvements as currently designed. These permit approvals include:

- Environmentally Sensitive Areas for Streams, Wetlands, Floodplains, Fish and Wildlife Habitat Conservation Areas, (City of SeaTac)
- Section 404 of the Clean Water Act (Army Corps of Engineers)
- Section 401 of the Clean Water Act (Department of Ecology)
- Hydraulic Project Approval (Washington Department of Natural Resources)

The general requirements of these permits, relevant to the current project are discussed below. This analysis is preliminary, because final project design may change in a manner that alters permitting requirements.

SeaTac Environmentally Sensitive Areas

Wetlands

The SeaTac Environmentally Sensitive Areas Ordinance regulates development in and near wetlands (Zoning Code Chapters 15.30.290-330). Generally, the ordinance permits alterations of wetlands for road crossings subject to several conditions (Chapter 15.30.300(N)). These requirements and recommended actions to demonstrate they are met are listed below:

1. *The City determines that no alternative access is practical* – Alternatives to crossing the wetland with the proposed sidewalk and any other improvements should be evaluated, specifically, the evaluation should determine if movement of the road to the south, at the wetland crossing can be accomplished to avoid wetland and buffer impacts.

2. *All crossings minimize impact to the wetland and provide mitigation for unavoidable impacts through restoration, enhancement or replacement of disturbed areas* – Evaluating condition 1 above will also address minimizing wetland impacts and the identification of unavoidable wetland impacts. If impacts are allowed, wetland mitigation must be planned.

3. *Crossings do not change the overall wetland hydrology* – The overall wetland hydrology is unlikely to change as a result of this project since the new culvert will be adequately sized and planned stormwater detention will be constructed.

4. *Crossings do not diminish the flood storage capacity of the wetland* - A small amount of flood storage may be lost, and mitigation may need to replace this lost volume. and

5. *All crossings are constructed during summer low water periods* – This requirement should be assessed and considered when scheduling the project.

Mitigation for wetland fill is required, and is addressed in Chapter 15.30.320. The City's preference for mitigation is to provide wetland and buffer enhancement, on-site, at a 2:1 ratio for fill of Class I wetlands. It would be ecologically beneficial to conduct mitigation (enhancement) within Wetland N3 or its associated buffer. This approach would require approvals from the Port of Seattle and the Federal Aviation Administration. FAA approvals are required as this agency is required to mange and eliminate potential wildlife hazards to aviation (e.g. potential bird-aircraft collisions) near SeaTac Airport.

Streams

Chapter 15.30.350 identifies permitted alterations to streams, which includes stream crossings. Several conditions apply, most relevant for a culvert replacement is the requirement for:

- All road crossings use bridges or other construction techniques which do not disturb the stream bed or bank, except that bottomless culverts or other appropriate methods demonstrated to provide fisheries protection may be used for Class 2 and 3 streams if the applicant demonstrates that such methods and their implementation will pose no harm to the stream or inhibit migration of fish – These requirements can be met through proper selection of culvert type and engineering design.

- All crossings are constructed during the summer low flow and are timed to avoid stream disturbance during periods when use is critical to salmonids – It is likely the required in-water construction can be completed during periods when critical salmonid use does not occur.

- Crossings do not diminish the flood-carrying capacity of the stream – A properly sized culvert and design will prevent alterations of flood-carrying capacity

- Underground utility crossings are laterally drilled and located at a depth of four (4) feet below the maximum depth of the scour for the base flood predicted by a civil engineer licensed by the State of Washington – This evaluation must be completed.

Chapter 15.30.360 identifies mitigation for stream impacts and requires the replacement or enhancement of stream buffers when modified as part of a development proposal. No net loss of stream functions is allowed.

Flood Hazard Areas

Chapter 15.30.210-250 addresses floodplain issues. Compliance with this section must be evaluated by a qualified hydrologist and/or engineer.

Section 404 of the Clean Water Act

Section 404 of the Clean Water Act regulates the fill and modification of Waters of the U.S., including streams and Wetlands. For small wetland fills, a series of Nationwide Permits are often used, and this project appears to meet the requirements of the Nationwide 14 permit for linear transportation projects. Application for this permit will require (among other requirements) final design drawings, a wetland delineation, a biological evaluation of potential impacts to endangered species, and an assessment of wetland avoidance. The project would also need to follow the formal Corps public Notification Process. Mitigation for wetland fill and buffer impacts would likely be required.

Section 401 of the Clean Water Act

Clean Water Act-Section 401 Water Quality Certifications are needed prior to issuance of Corps Section 404 approvals. Issuance of this permit would likely require wetland mitigation planning that is incompliance with the Ecology wetland management standards and compliance with the Ecology stormwater management standards (either the most recent Ecology stormwater manual or functional equivalent).

Hydraulic Project Approval

Hydraulic project approvals (HPA) are issued by the Washington Department of Fish and Wildlife (WDFW) for work completed below the ordinary high water mark (OHWM) of State waters. The culvert replacement will require an HPA from WDFW. Requirements of the HPA will include meeting the state's fish passage guidelines for culverts, and the culvert design must be planned accordingly. Meeting the HPA requirements will also likely meet the City of SeaTac requirements for stream crossings.

Mitigation

Based on the above analysis, mitigation for wetland fill and mitigation for stream and wetland buffer fill will be required. For wetland impacts (1,800 sqaure feet) could be required at ratios between 2:1 (City) to 4:1 (Ecology), or up to 7,200 square feet. Buffer mitigation could require about 7,400 square feet of mitigation. Mitigation costs can be highly variable, dependent on the various permit requirements, design approaches, site limitations, and other factors. Some recent costs for wetland mitigation have approached $250,000/acre (excluding land acquisition and real estate costs). Using this value, costs for wetland mitigation could be about $43,000. Costs for buffer mitigation would be less because substantial grading to establish wetland hydrology is not

required. Buffer mitigation costs reach $34,000. Not included in these preliminary estimates are specific site conditions that affect costs and site acquisition (land and transaction costs). Also not included in the costs are costs associated with permit acquisition, which could range from $50,000 to $75,000. Thus potential costs for obtaining permits and constructing mitigation could be $152,000. A substantial portion of these costs could be avoided by excluding sidewalk improvements along the north side of the street west of 20th Avenue S.

Design Modifications and Mitigation Costs

As noted above, Federal and City regulations require evaluation of the minimization and avoidance of wetland impacts. For this project, the evaluation of approaches to minimize and avoid impacts to wetlands should include alignment alternatives that shift the road location to the south, such that wetland fill does not occur. As a result, the design was modified to eliminate sidewalk from the north side of the corridor west of 20th Avenue S. This would greatly reduce the permit process and mitigation costs. Under this scenario, mitigation would be limited to wetland and stream buffer impacts. The cost of buffer mitigation and permitting this scenario could be $34,000 and $25,000 respectively ($59,000 total).

Hazardous Materials

A limited environmental report data review was done at the time geotechnical reports were collected. New subsurface environmental investigation were not made, although Figure 11 shows property in the project vicinity that has Phase I and limited Phase II environmental site assessments.

Figure 11: Previous Environmental Investigations

Figure 11 Location	Reference	Summary
A, B, C	Landau Associates, Inc., Phase I and Limited Phase II Environmental Site Assessment, March 15, 1994.	
B	Landau Associates, Inc., Phase I and Limited Phase II Environmental Site Assessment, March 15, 1994.	Underground home heating oil tanks removed from the site.
E	Landau Associates, Inc., page 4.	Texaco gas station and Burien Fuel. Underground storage tanks removed in 1991 with some removal of petroleum-contaminated soil.
F	Landau Associates, Inc., pages 6-8.	King County Sunset Park maintenance shop site. Confirmed groundwater, soil and surface water contamination include metals, cyanides, PCBs and petroleum products.

CITY OF SEATAC

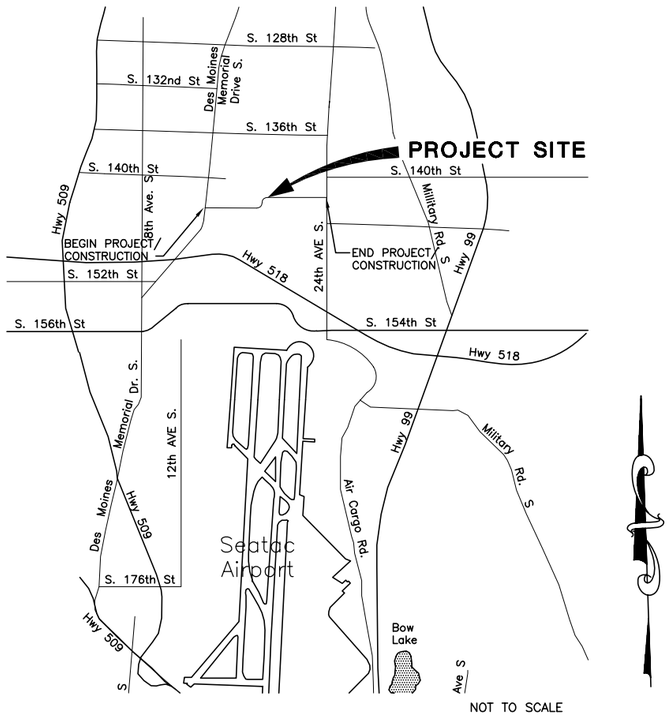
NORTH SEATAC ROADWAYS STUDY

S.144th ST./S.142nd PL./S.142nd ST.

FEDERAL AID

Project No.

VICINITY MAP



SEATAC CITY COUNCIL

MAYOR:	GENE FISHER
DEPUTY MAYOR:	RALPH SHAPE
COUNCIL MEMBERS:	DON DEHAN
	TERRY ANDERSON
	CHRIS WYTHE
	TONY ANDERSON
	JOE BRENNAN

INDEX TO DRAWINGS

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CITY CONCURRENCE OF PLANS

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NO.	DATE	BY	APPR.	REVISION

HNTB

DRN. XXX | DSGN. XXX | CHKD. XXX

Public Works Department
Dale Schroeder, P.E., Public Works Director
Tom Gut, P.E., City Engineer
4800 South 188th Street, SeaTac, Wa 98188–8605
Telephone: (206) 973–4730, Engineering Division

CITY OF SEATAC

COVER SHEET

DATE: 04/11/2008 | JOB # 44820 | SCALE: X'–XX"

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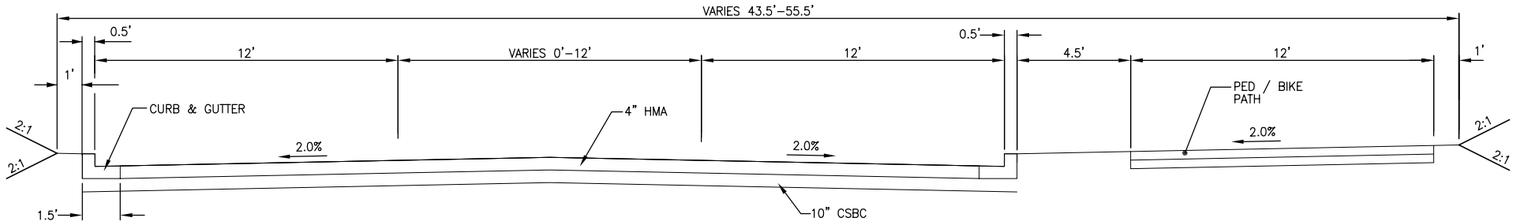
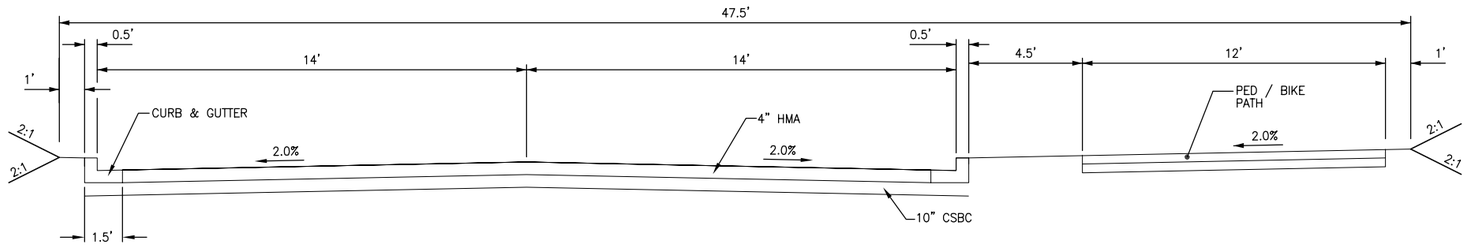
COV1
XX OF XX



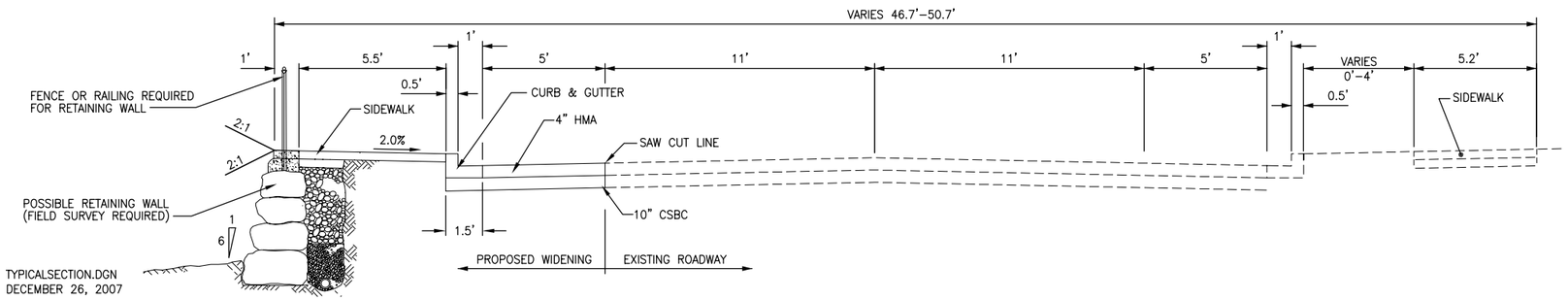
TYPICAL SECTION A
(144TH AT DMMD INTERSECTION)

STA 11+60 TO 17+00



TYPICAL SECTION B

STA 17+00 TO STA 36+50



TYPICAL SECTION C

STA 36+50 TO STA 45+50

LEGEND

EXISTING	PROPOSED	
CB	■	CATCH BASIN/CURB INLET
SSMH	●	SANITARY SEWER MANHOLE
FH		FIRE HYDRANT
WM		WATER METER
WV	⋈	WATER VALVE
GV		GAS VALVE
TJB		TELEPHONE JUNCTION BOX
SJB		SIGNAL JUNCTION BOX
UP		UTILITY POLE
⟵		GUY ANCHOR
		YARD LIGHT
		STREET LIGHT
MB		MAIL BOX
		SIGN
156		SURVEY CONTROL
x		TREE AS NOTED
		STEEL POST
		CURB & GUTTER
		GRAVITY BLOCK WALL
		FENCE
		EDGE OF PAVEMENT
SS	SS	SANITARY SEWER
SD	SD	STORM DRAIN
T		TELEPHONE
T(B)		BURIED TELEPHONE LINE
W	W	WATER LINE
P		EXISTING POWER LINE
P(B)	P	BURIED POWER LINE
G	G	UNDERGROUND GAS
		CULVERT WITH TRASH RACK, SEE DETAIL
		PAVEMENT SAWCUT
C C		OVERHEAD COMMUNICATION LINE
P P		OVERHEAD POWER LINE
		RIGHT–OF–WAY
		PROPERTY LINE
		STOP LINE
		PEDESTRIAN CROSSWALK
		QUARRY SPALLS, 2'x2'x1.5' THICK PAD

CONSTRUCTION NOTES:

(X) CONSTRUCTION NOTE

(X) SIGNING NO. NOTE

PHONE NUMBERS:

FIRE/MEDIC 1/POLICE	911
PHONE COMPANY (AT&T)	(425) 896–9835
PHONE COMPANY (QWEST)	(206) 345–3399
ELECTRIC (SEATTLE CITY LIGHT)	(206) 386–1672
CABLE TV (COMCAST)	(206) 288–7352
PUGET SOUND ENERGY (GAS)	(253) 476–6304
SPU (WATER)	(206) 684–5969
SW SUBURBAN SEWER DISTRICT	(206) 244–9575
SEATAC PUBLIC WORKS	(206) 973–4730
WATER DISTRICT #20 (WD20)	(206) 243–3990
WATER DISTRICT #49 (WD49)	(206) 242–8535
WATER DISTRICT #125 (WD125)	(206) 242–9547

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HNTB

DRN. XXX | DSGN. XXX | CHKD. XXX

CITY OF SEATAC

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Tom Gut, P.E., City Engineer

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CITY OF SEATAC

TYPICAL SECTION AND LEGEND

DATE: 04/11/2008 | JOB # 44820 | SCALE: X'–XX"

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RS1
XX OF XX

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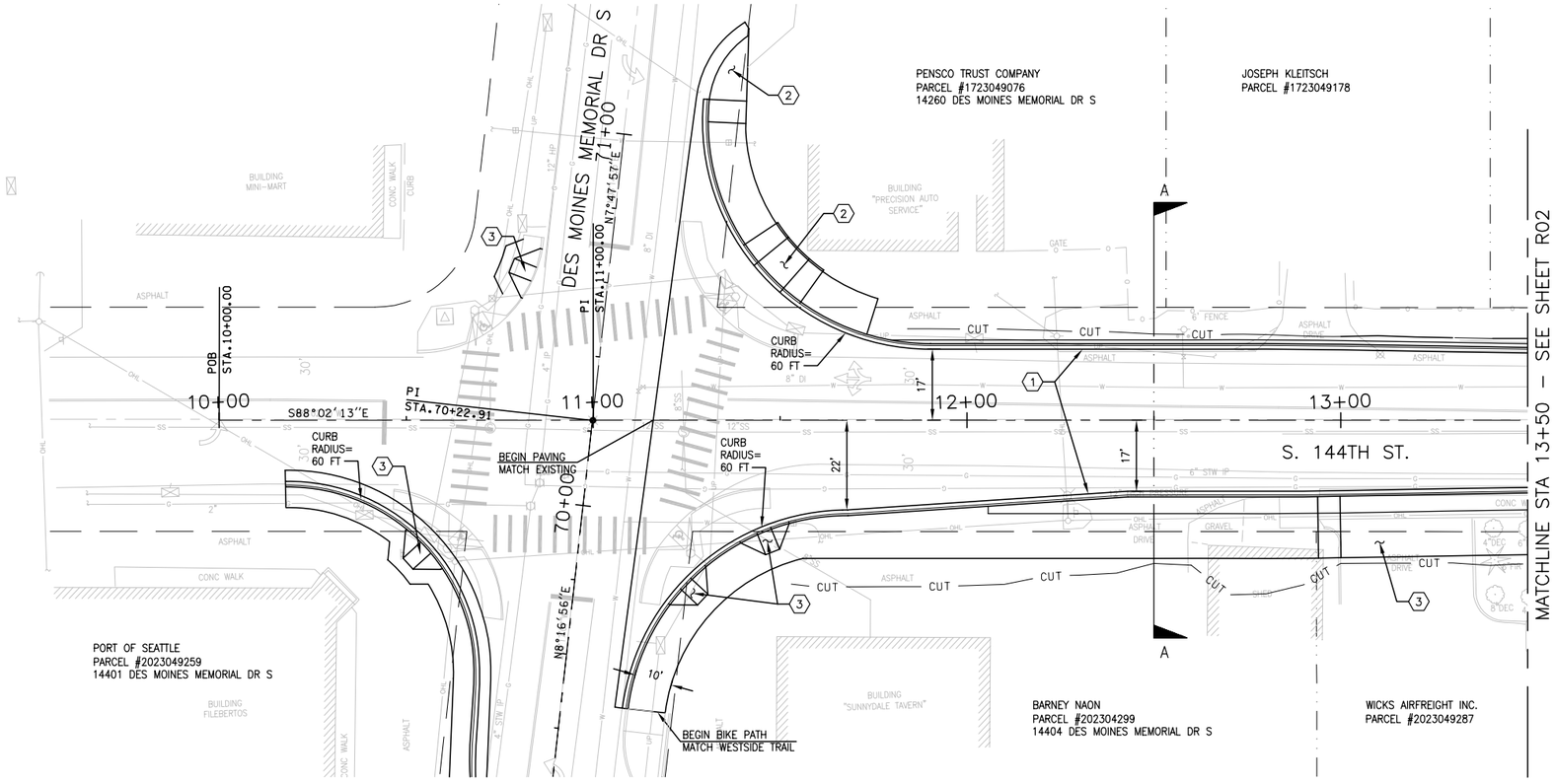


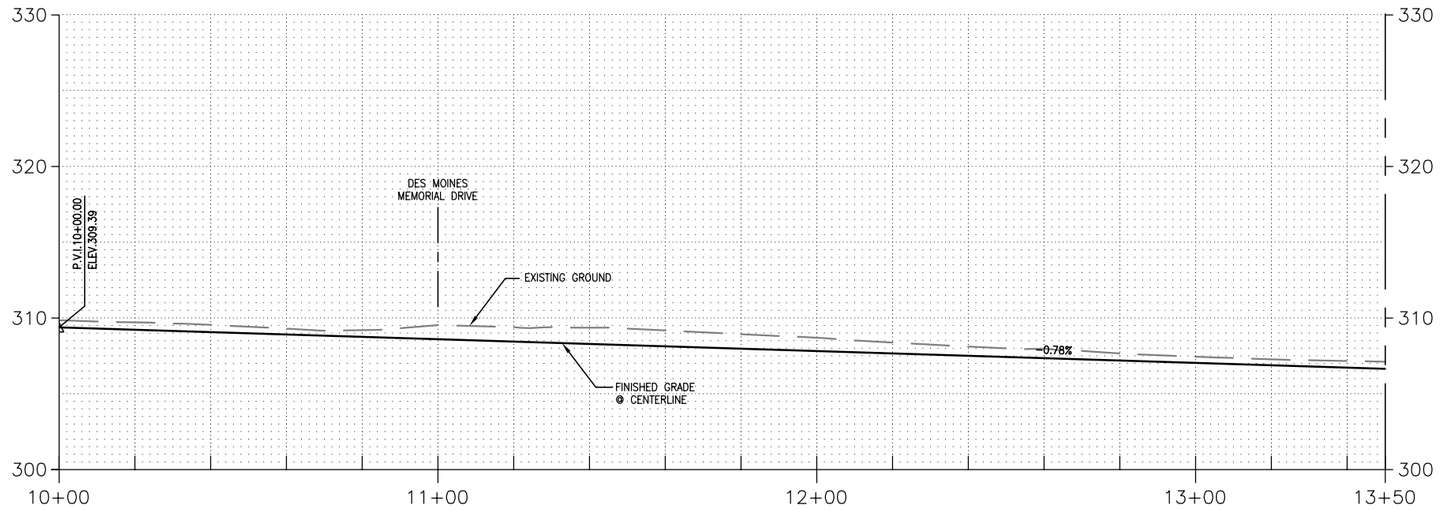
GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet

AT INTERSECTION OF DES MOINES MEMORIAL DR S. AND S. 144TH ST, REDUCE CURB RADII TO 35 FT IF TRUCK TURNING MOVEMENTS ARE NOT REQUIRED.



NOTES:

1. CONSTRUCT CEMENT CONCRETE CURB AND GUTTER
2. CONSTRUCT CEMENT CONCRETE CURB RAMP
3. CONSTRUCT DRIVEWAY APPROACH WITH SIDEWALK/BIKEPATH RAMPS

PRELIMINARY

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HNTB

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CITY OF SEATAC

PLAN AND PROFILE

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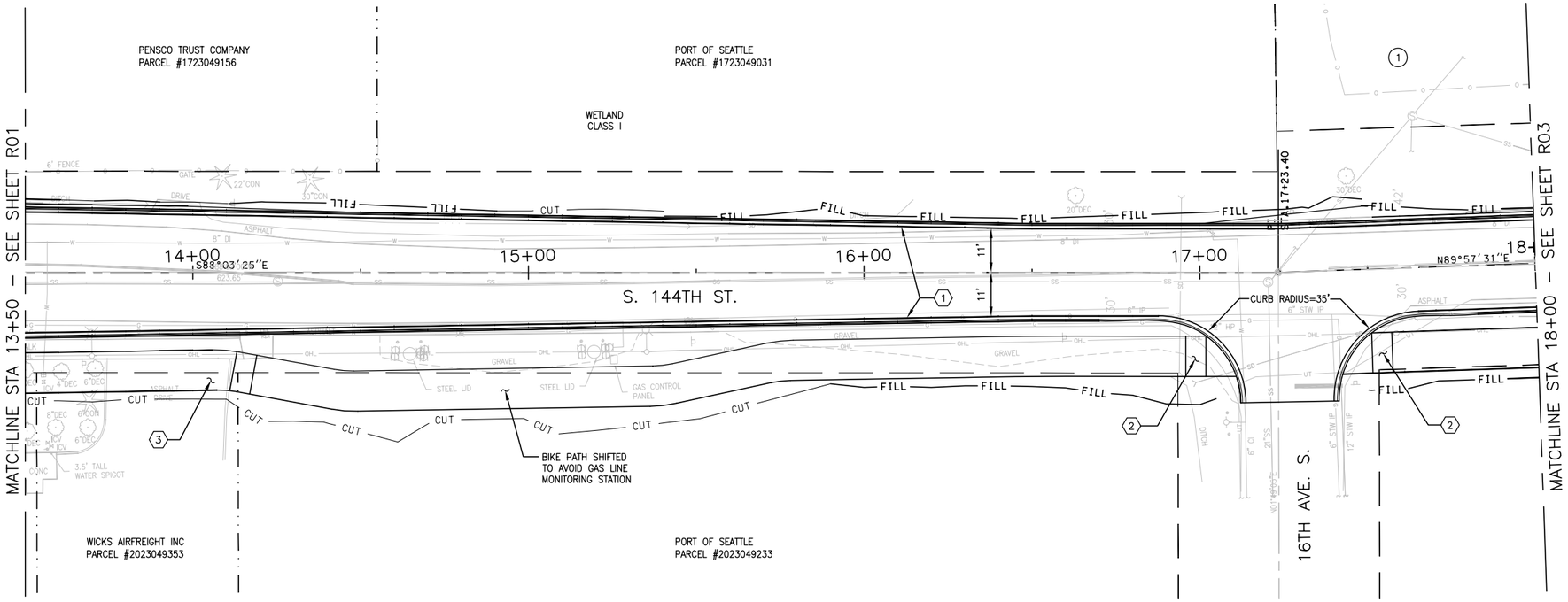
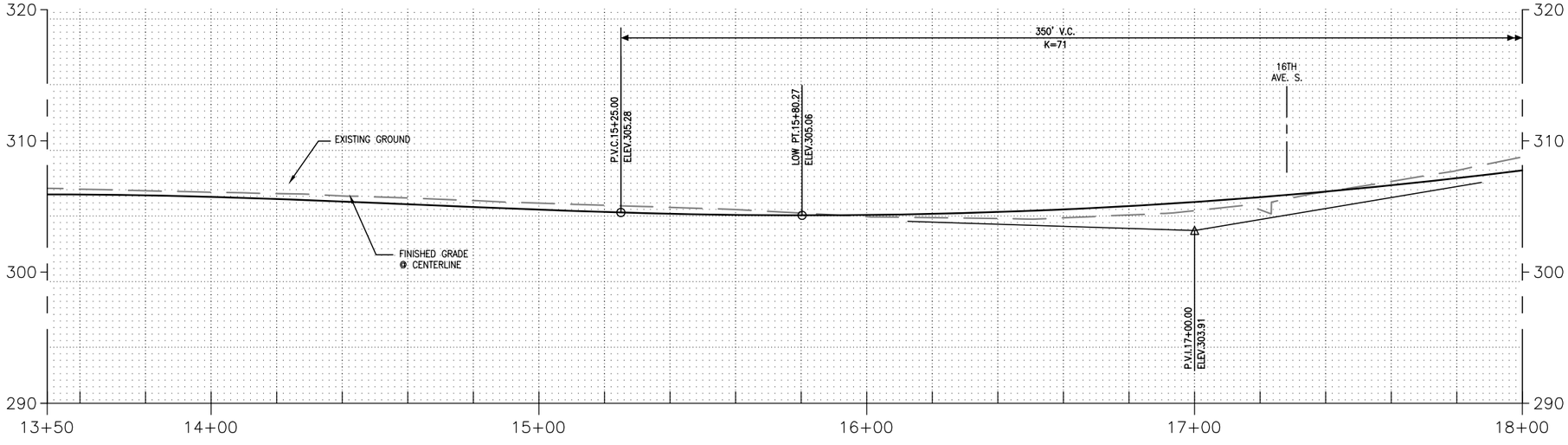
R01

XX OF XX





NOTES:

1. CONSTRUCT CEMENT CONCRETE CURB AND GUTTER
2. CONSTRUCT CEMENT CONCRETE CURB RAMP
3. CONSTRUCT DRIVEWAY APPROACH WITH SIDEWALK/BIKEPATH RAMPS
1. PORT OF SEATTLE PARCEL #3114000005

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HNTB

DRN. RMJ | DSGN. MOF | CHKD. XXX

Public Works Department
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Tom Gut, P.E., City Engineer
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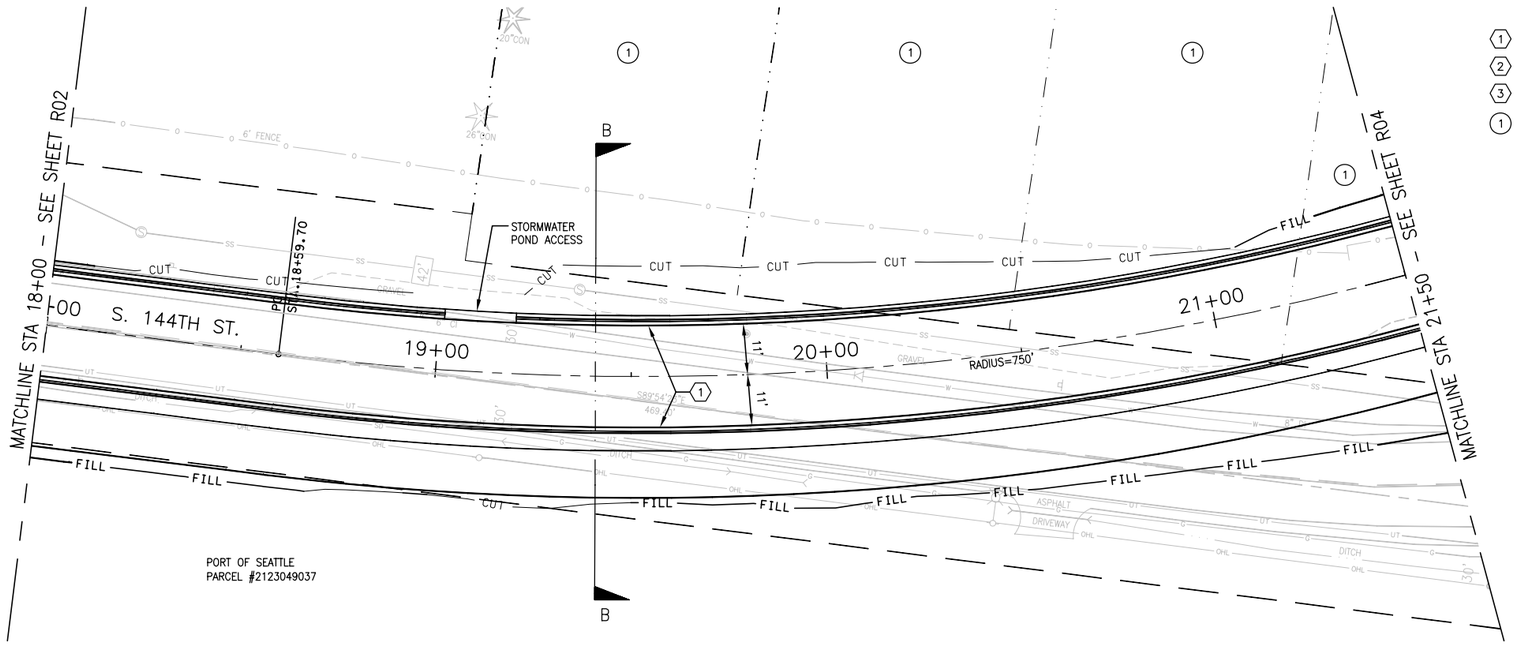
Telephone: (206) 973–4730, Engineering Division

CITY OF SEATAC

PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

SHEET NO:
R02
XX OF XX



NOTES:

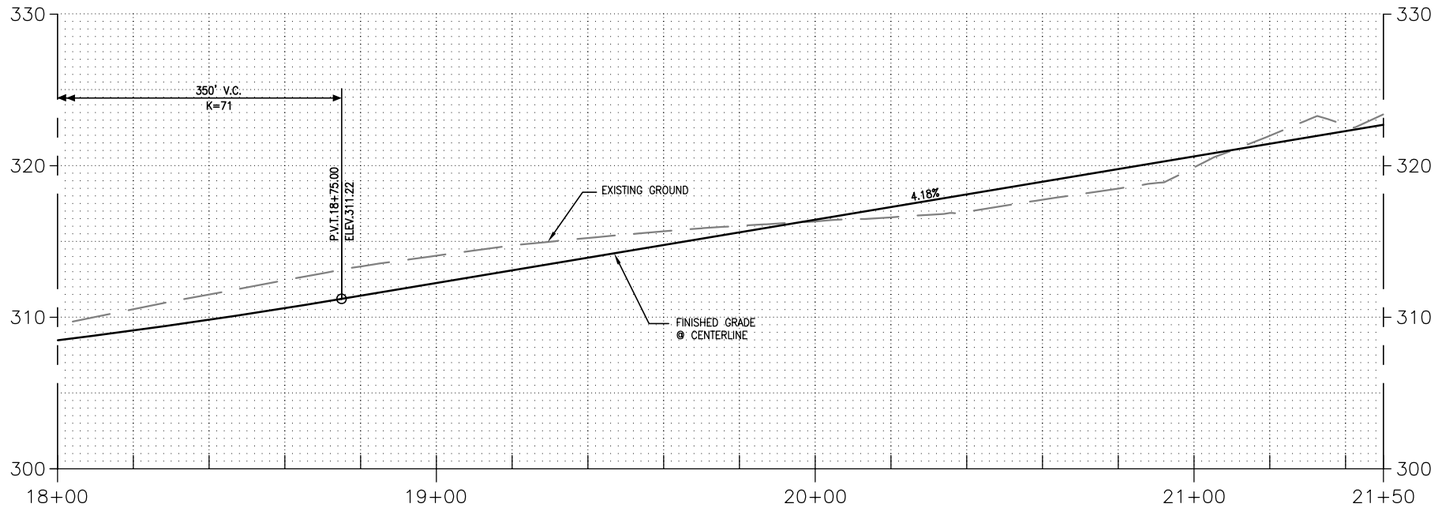
1. CONSTRUCT CEMENT CONCRETE CURB AND GUTTER
2. CONSTRUCT CEMENT CONCRETE CURB RAMP
3. CONSTRUCT DRIVEWAY APPROACH WITH SIDEWALK/BIKEPATH RAMPS
1. PORT OF SEATTLE PARCEL #3114000005

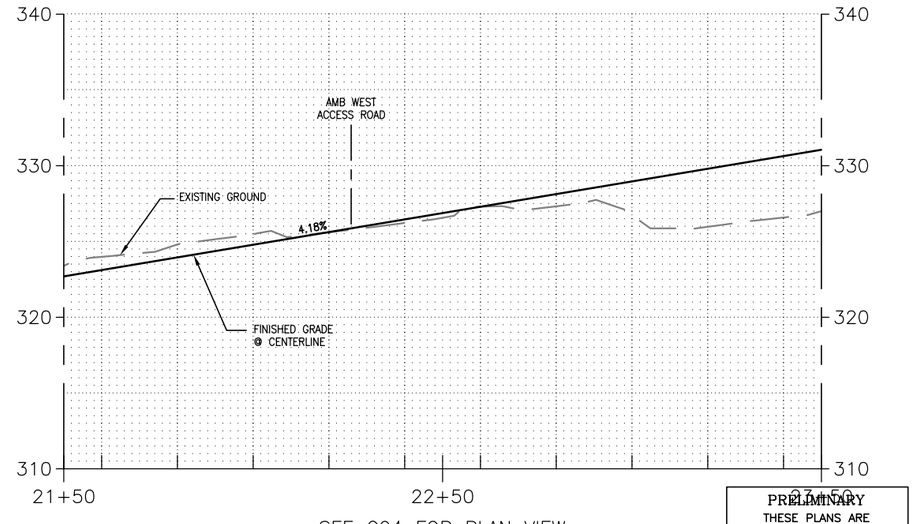
GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet





SEE C04 FOR PLAN VIEW

PRELIMINARY

THESE PLANS ARE BASED ON AVAILABLE INFORMATION AND ARE SUBJECT TO REVISION ON FINAL DESIGN

NO.	DATE	BY	APPR.	REVISION

HNTB

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CITY OF SEATAC

PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"-20'

SHEET NO: R03

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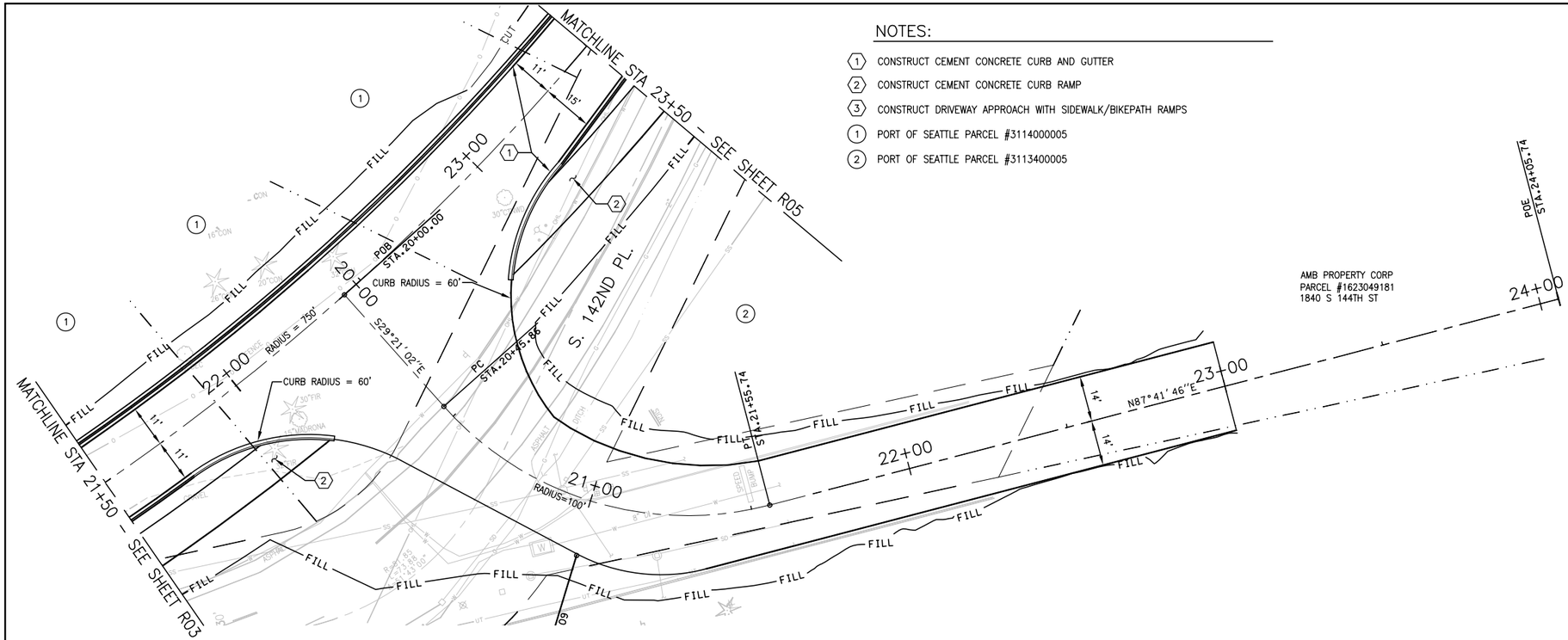
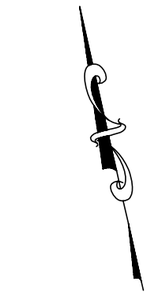
NOTES:

1. CONSTRUCT CEMENT CONCRETE CURB AND GUTTER
2. CONSTRUCT CEMENT CONCRETE CURB RAMP
3. CONSTRUCT DRIVEWAY APPROACH WITH SIDEWALK/BIKEPATH RAMPS
1. PORT OF SEATTLE PARCEL #3114000005
2. PORT OF SEATTLE PARCEL #3113400005



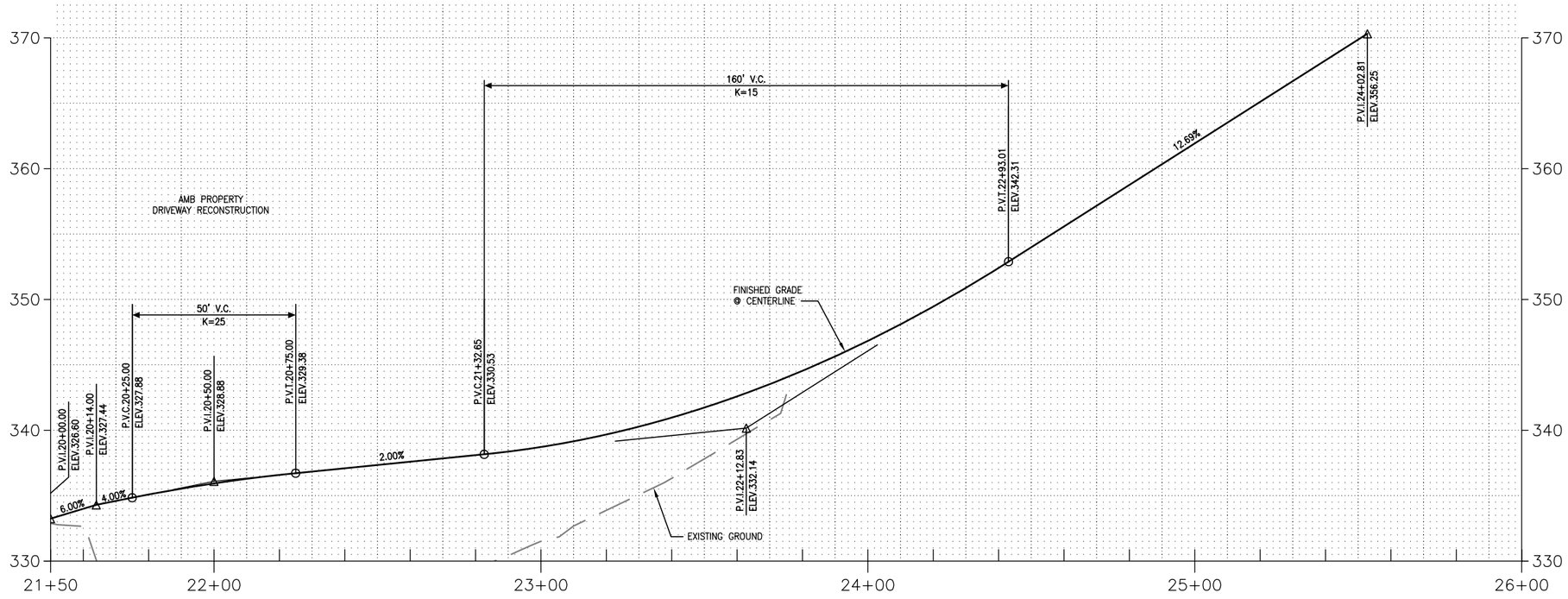


GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet



PRELIMINARY

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CITY OF SEATAC

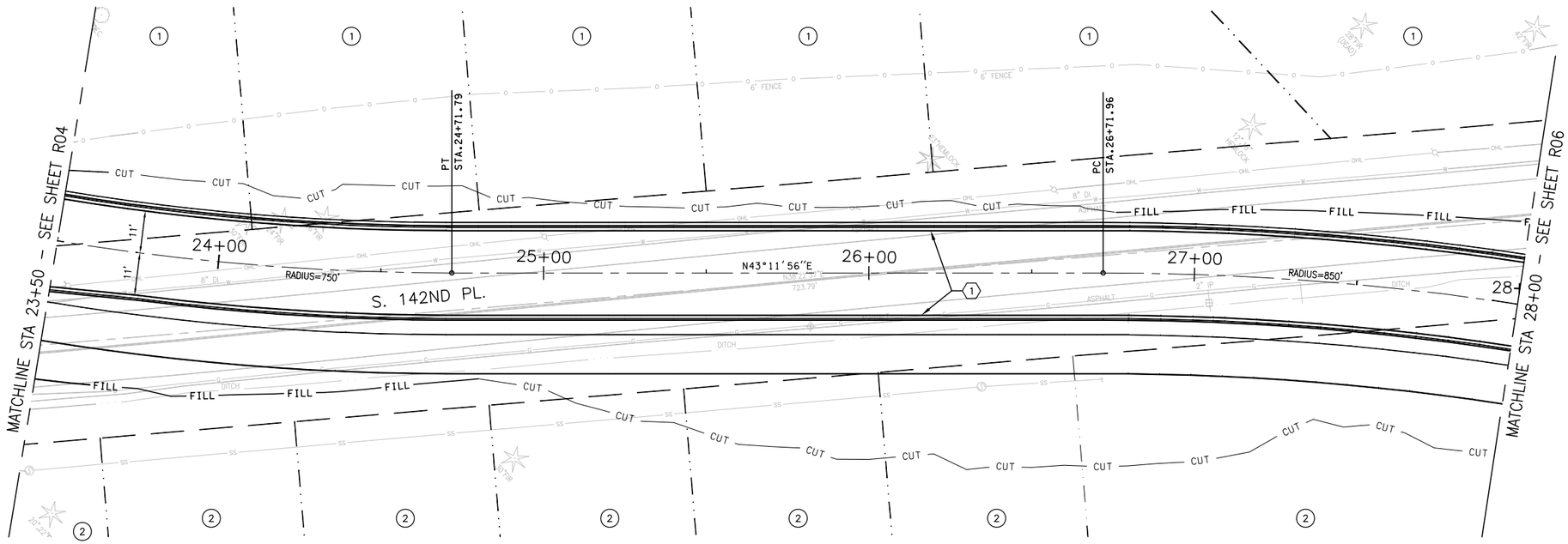
PLAN AND PROFILE

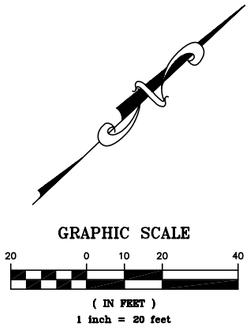
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"=20'

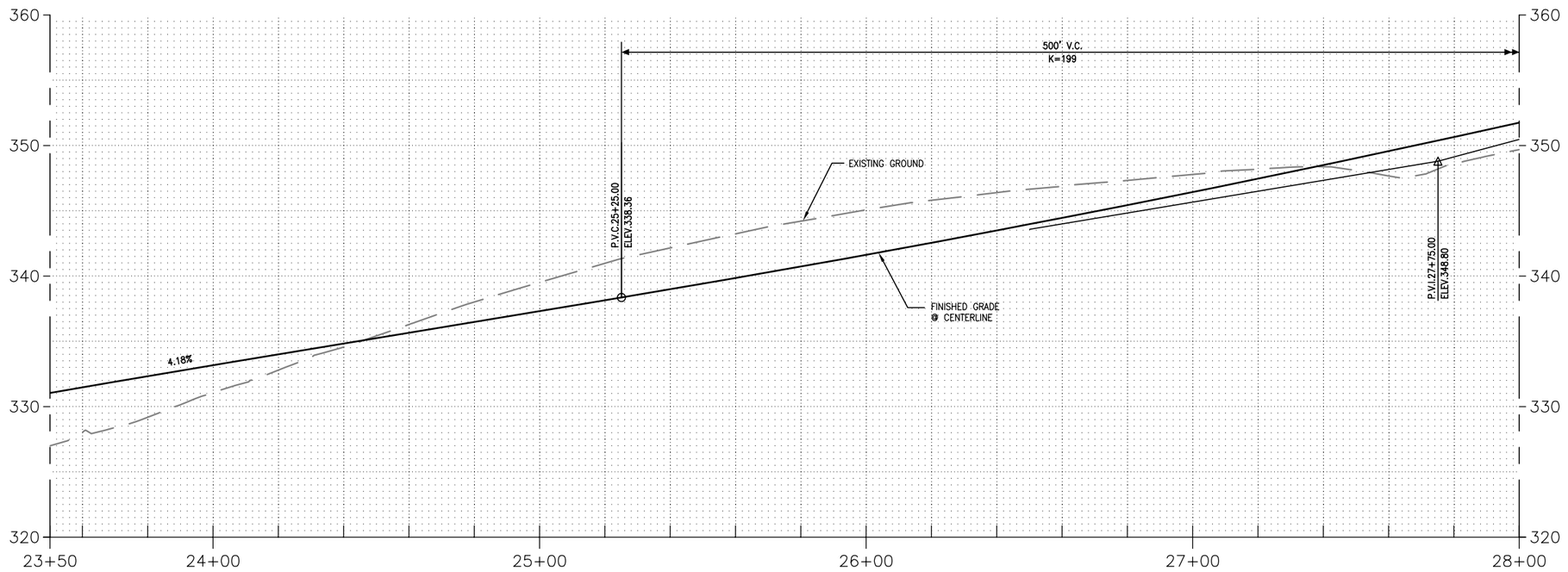
SHEET NO:

R04

XX OF XX







NOTES:

1. CONSTRUCT CEMENT CONCRETE CURB AND GUTTER
2. CONSTRUCT CEMENT CONCRETE CURB RAMP
3. CONSTRUCT DRIVEWAY APPROACH WITH SIDEWALK/BIKEPATH RAMPS
1. PORT OF SEATTLE PARCEL #3114000005
2. PORT OF SEATTLE PARCEL #3113400005

PRELIMINARY
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CITY OF SEATAC

PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"-20'

SHEET NO: R05

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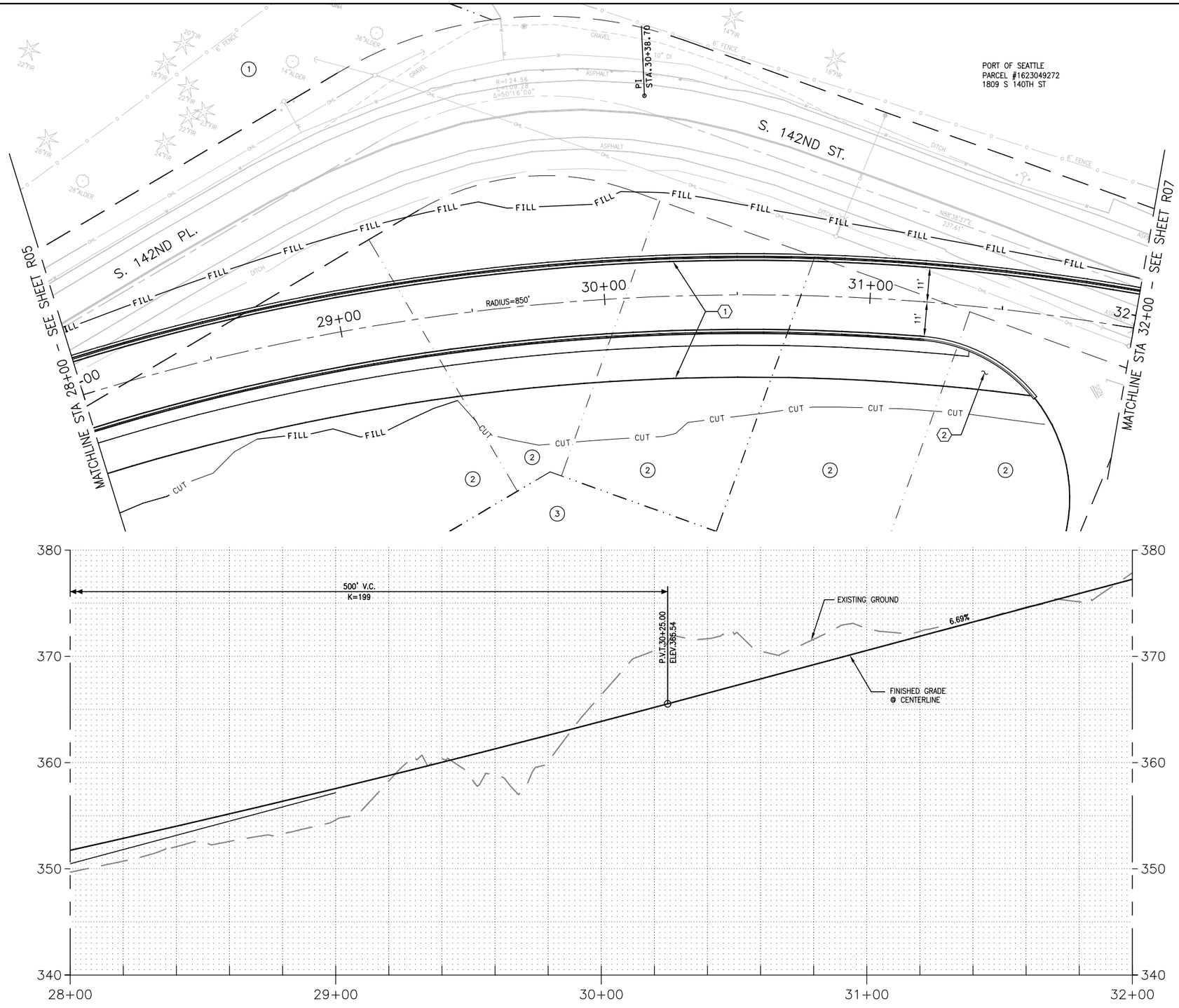

GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet

NOTES:

1. CONSTRUCT CEMENT CONCRETE CURB AND GUTTER
2. CONSTRUCT CEMENT CONCRETE CURB RAMP
3. CONSTRUCT DRIVEWAY APPROACH WITH SIDEWALK/BIKEPATH RAMPS
1. PORT OF SEATTLE PARCEL #3114000005
2. PORT OF SEATTLE PARCEL #3113400005
3. AMB PROPERTY CORP PARCEL #1623049181
1840 S 144TH ST

PRELIMINARY

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HNTB

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CITY OF SEATAC

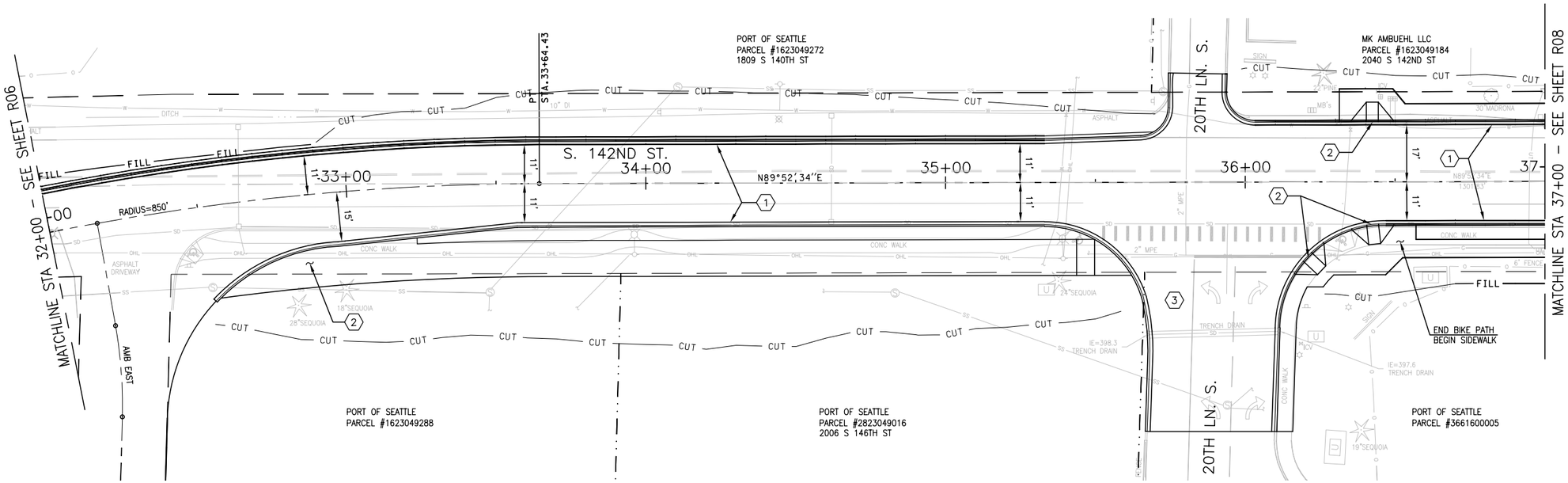
PLAN AND PROFILE

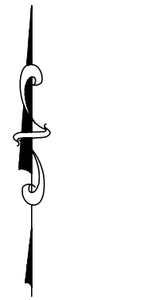
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"=20'

SHEET NO:

R06

XX OF XX





GRAPHIC SCALE

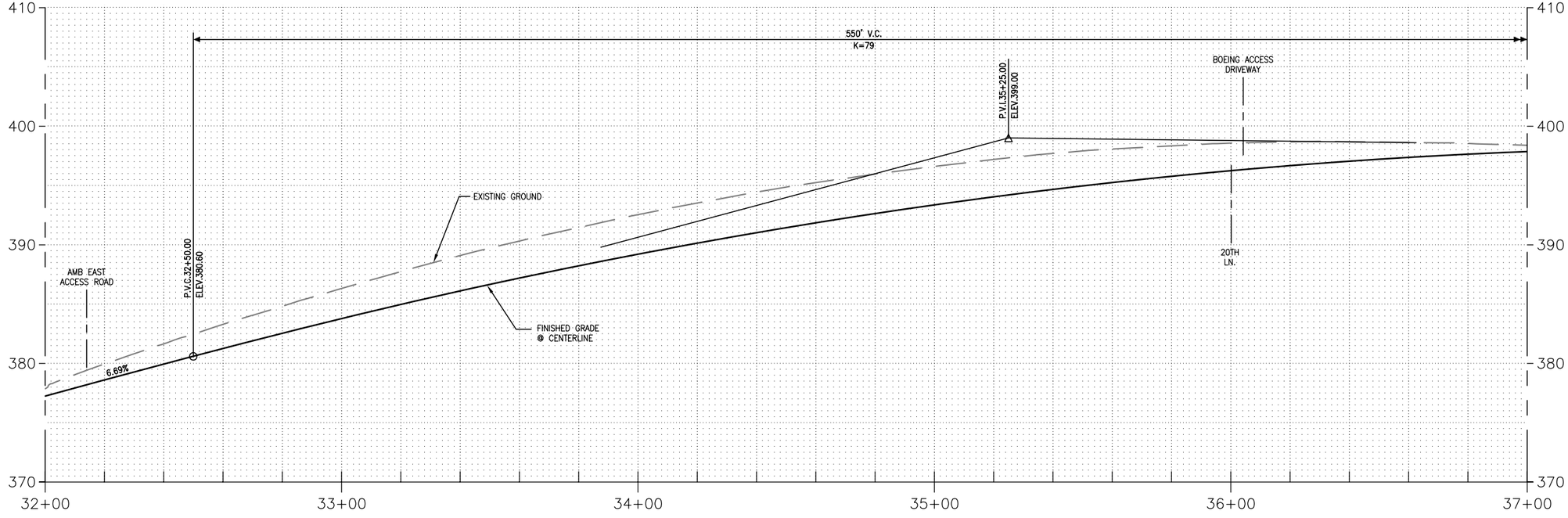
20 0 10 20 40

(IN FEET)

1 inch = 20 feet

NOTES:

1. CONSTRUCT CEMENT CONCRETE CURB AND GUTTER
2. CONSTRUCT CEMENT CONCRETE CURB RAMP
3. CONSTRUCT DRIVEWAY APPROACH WITH SIDEWALK/BIKEPATH RAMPS



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CITY OF SEATAC

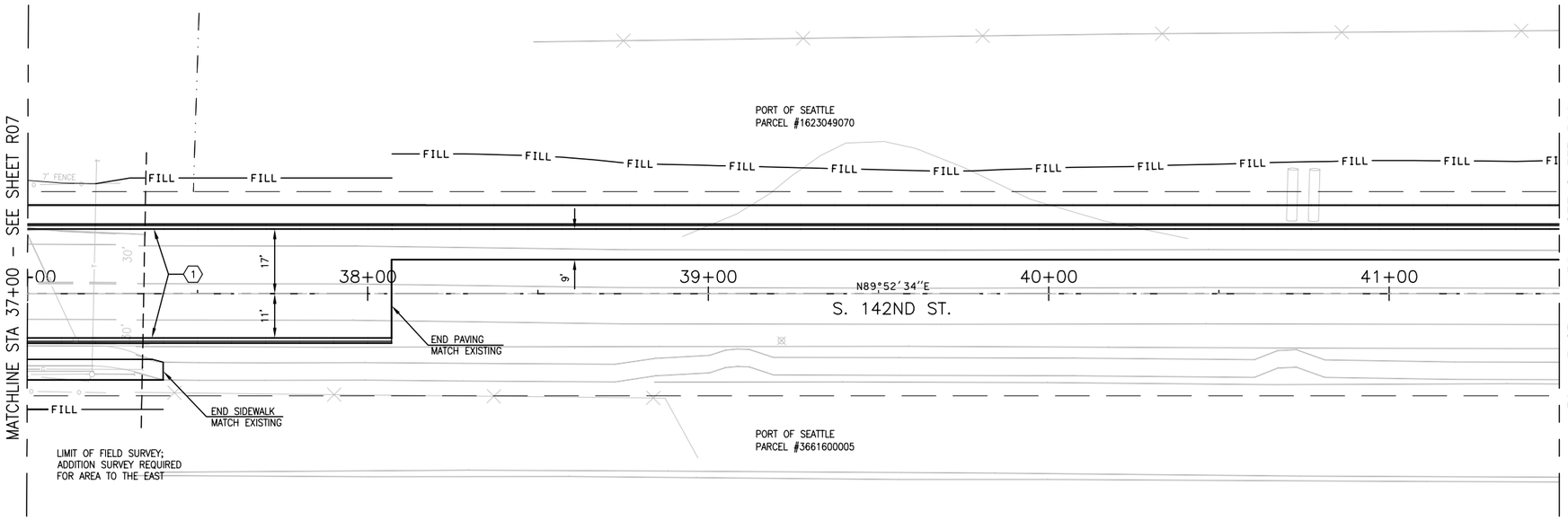
PLAN AND PROFILE

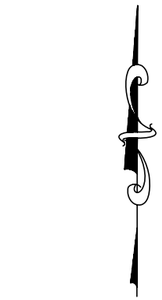
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

SHEET NO:

R07

XX OF XX



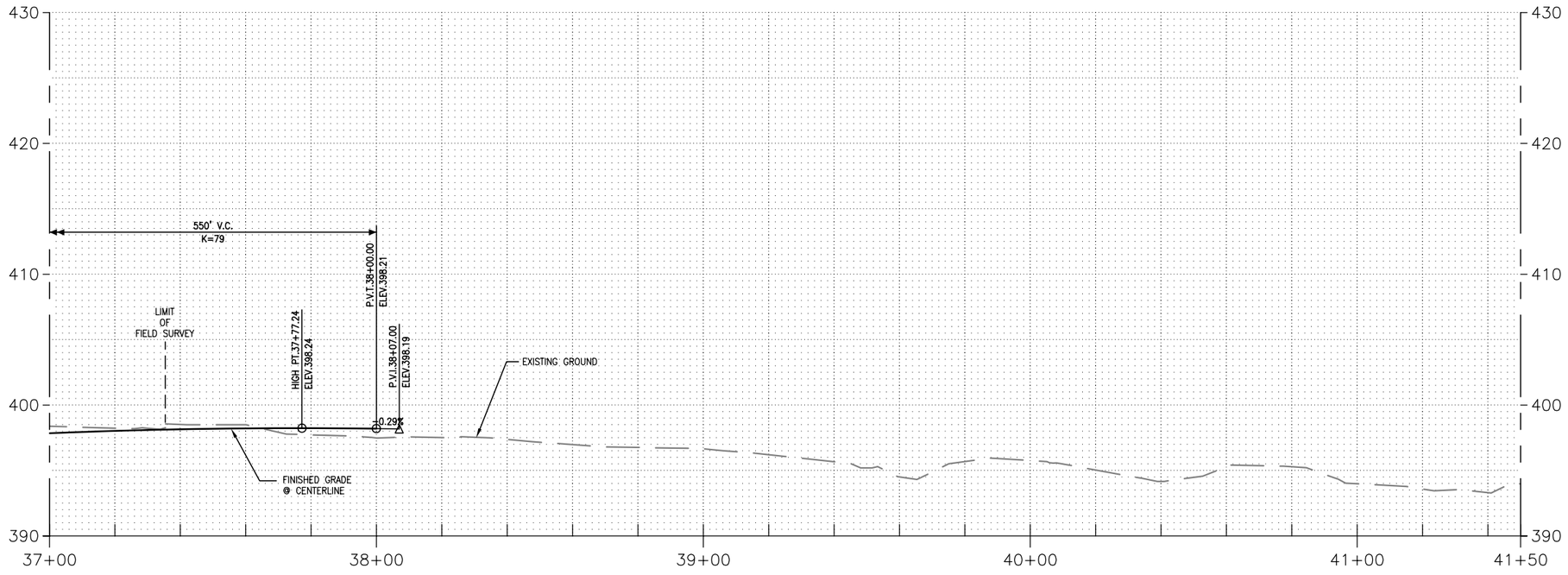


GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet



NOTES:

1. CONSTRUCT CEMENT CONCRETE CURB AND GUTTER
2. CONSTRUCT CEMENT CONCRETE CURB RAMP
3. CONSTRUCT DRIVEWAY APPROACH WITH SIDEWALK/BIKEPATH RAMPS

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CITY OF SEATAC

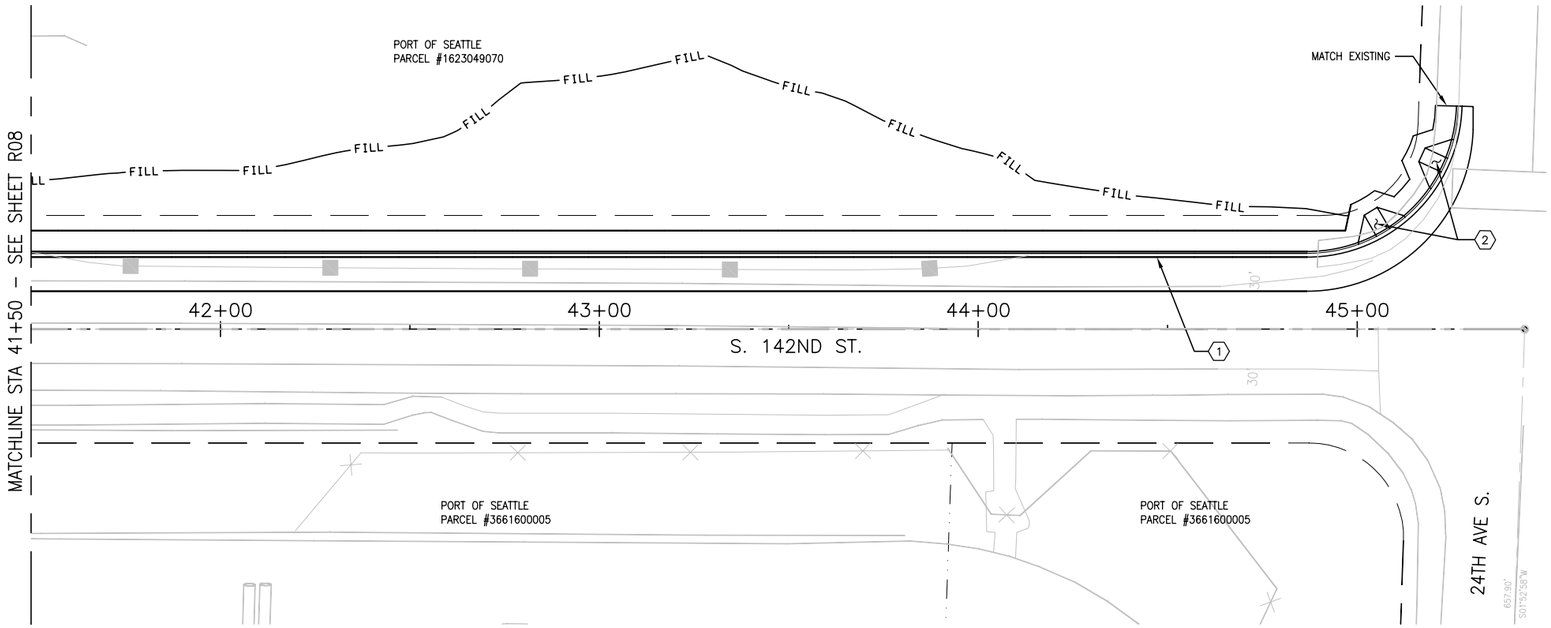
PLAN AND PROFILE

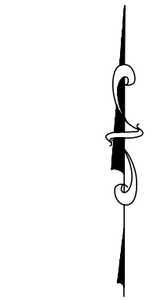
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

SHEET NO:

R08

XX OF XX



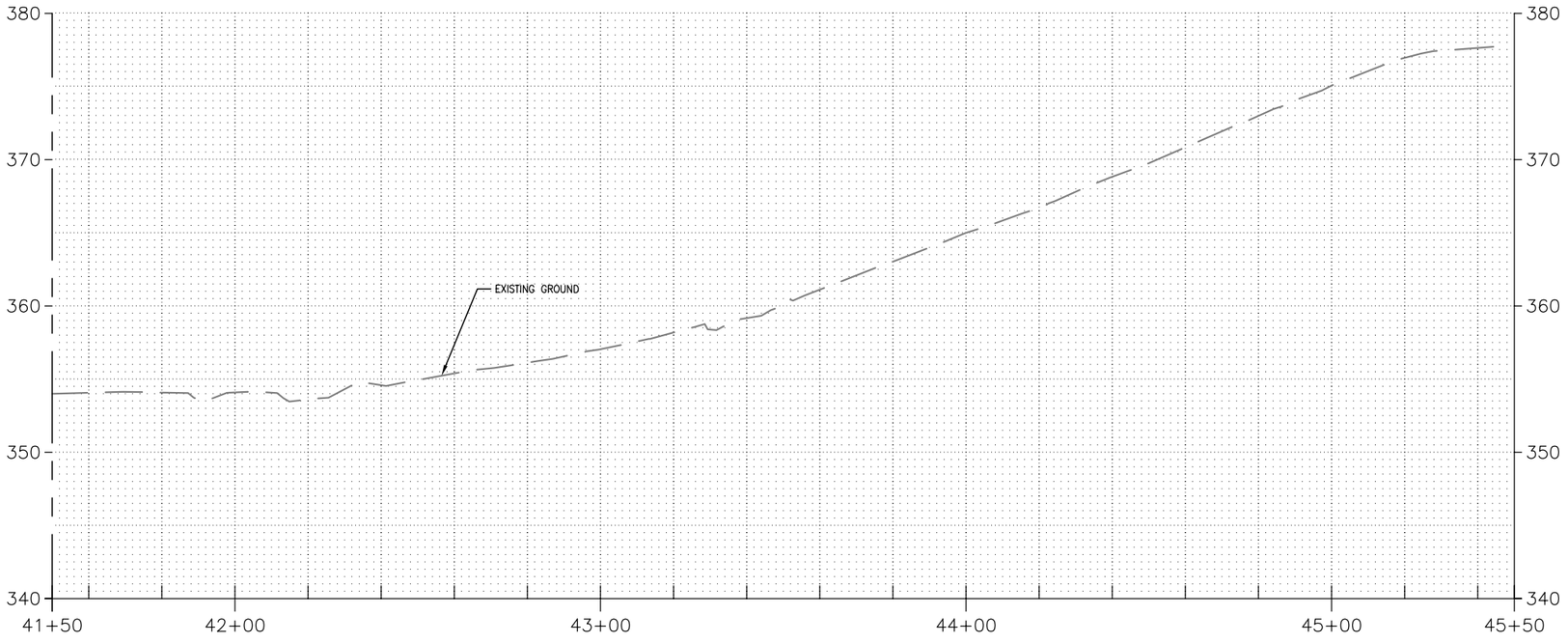


GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet



TRAFFIC CALMING IMPROVEMENTS TO BE CONSIDERED AT INTERSECTION OF 24TH. AVE. S. AND S. 142ND ST.

NOTES:

1. CONSTRUCT CEMENT CONCRETE CURB AND GUTTER
2. CONSTRUCT CEMENT CONCRETE CURB RAMP
3. CONSTRUCT DRIVEWAY APPROACH WITH SIDEWALK/BIKEPATH RAMPS

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CITY OF SEATAC

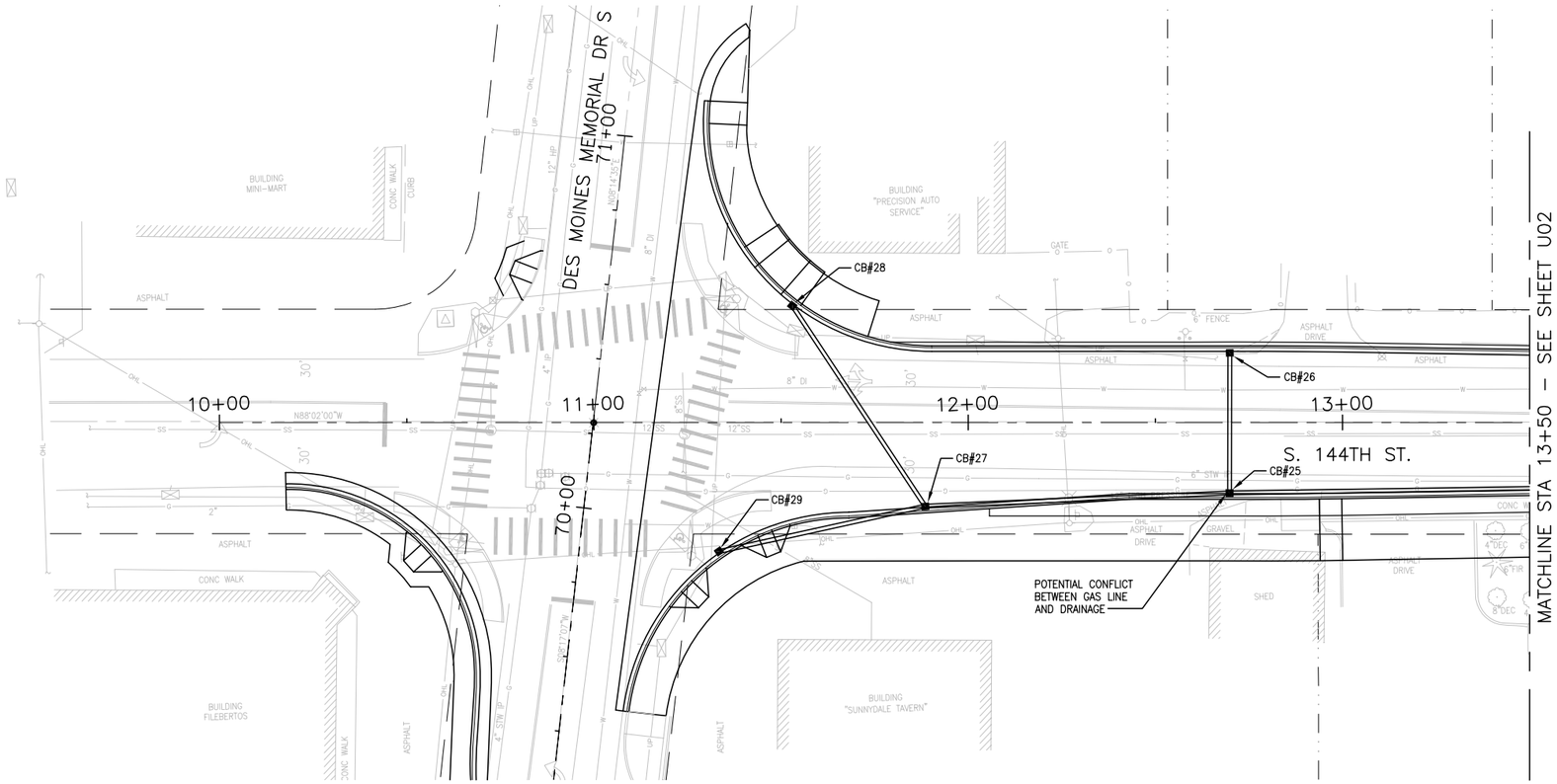
PLAN AND PROFILE

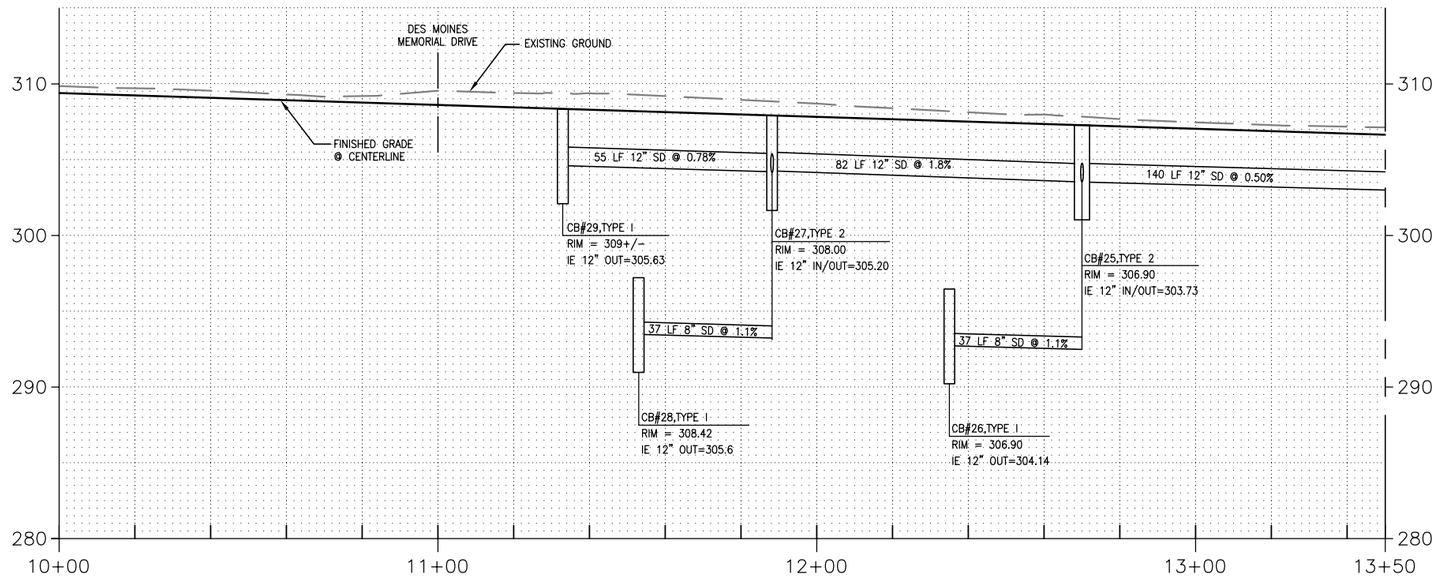
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

SHEET NO:

R09

XX OF XX





GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet

NOTES:

1. SEE CHANNELIZATION PLAN FOR ILLUMINATION, POWER, TELEPHONE AND CABLE.

PRELIMINARY

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HNTB

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CITY OF SEATAC

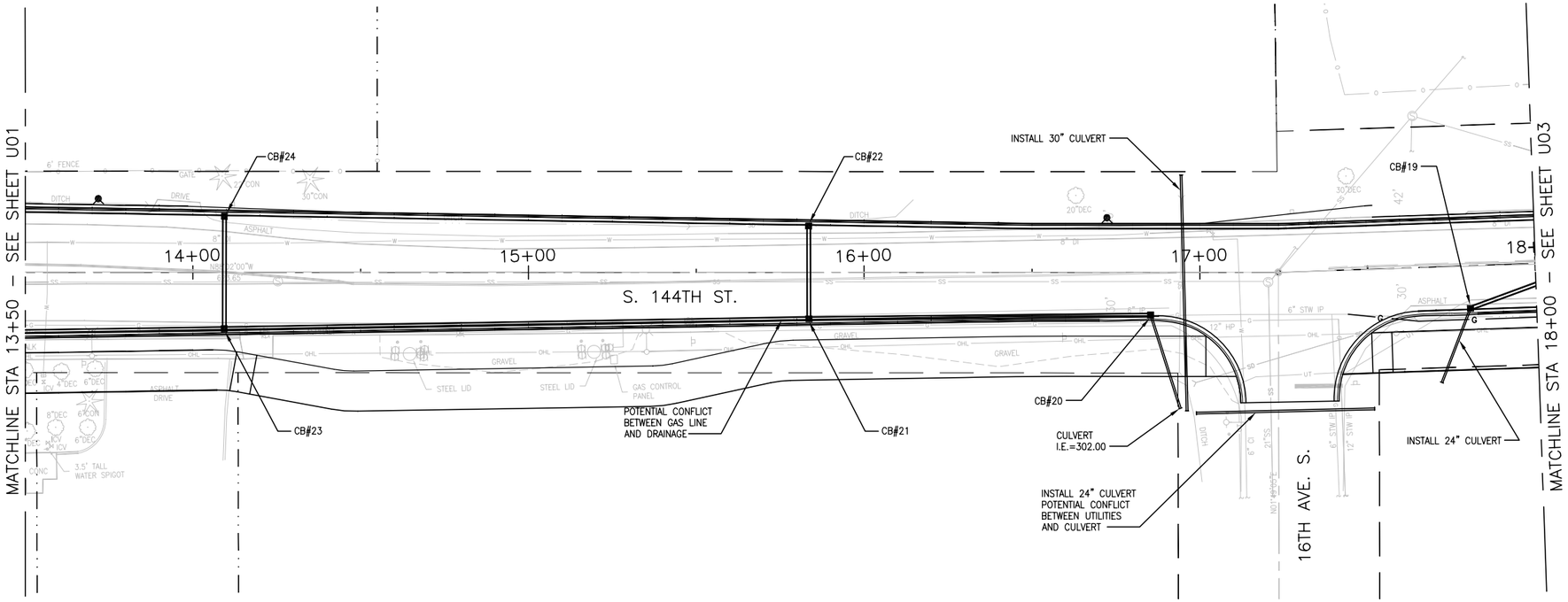
UTILITY PLAN AND PROFILE

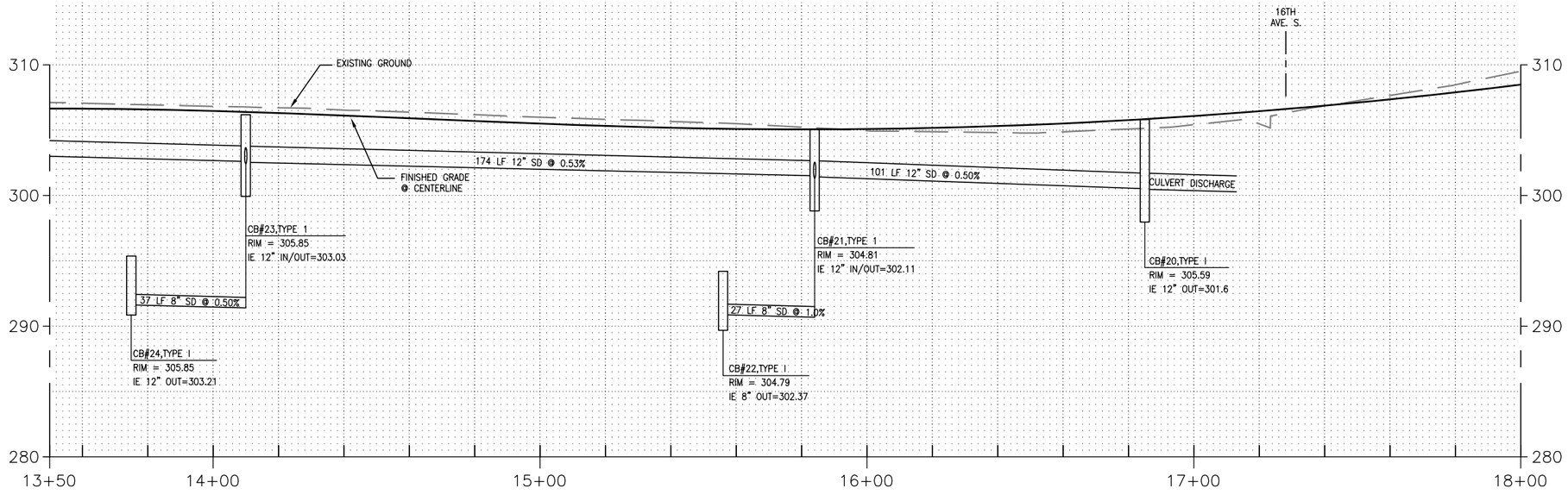
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"=20'

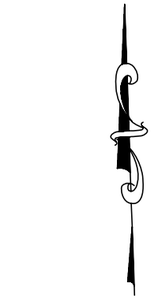
SHEET NO:

U01

XX OF XX







GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

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NOTES:

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CITY OF SEATAC

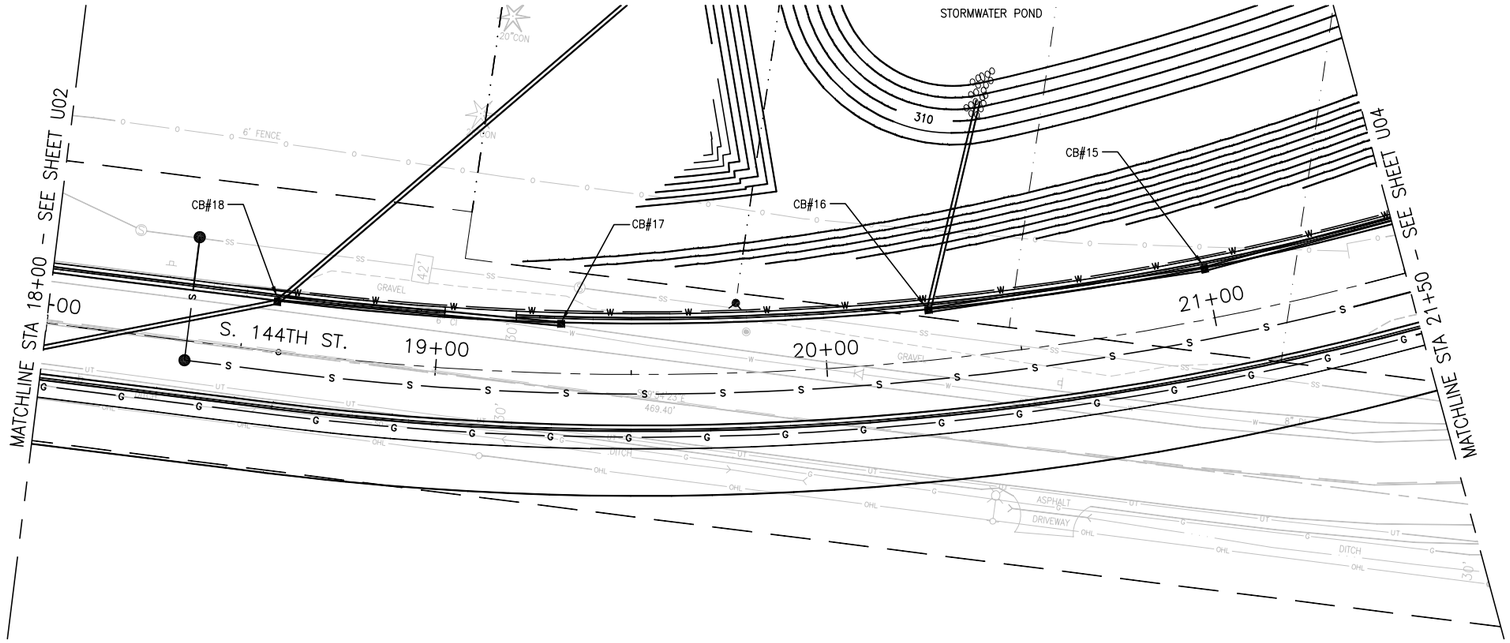
UTILITY PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

SHEET NO:

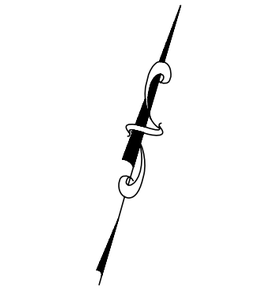
U02

XX OF XX



NOTES:

1. SEE CHANNELIZATION PLAN FOR ILLUMINATION, POWER, TELEPHONE AND CABLE.



GRAPHIC SCALE

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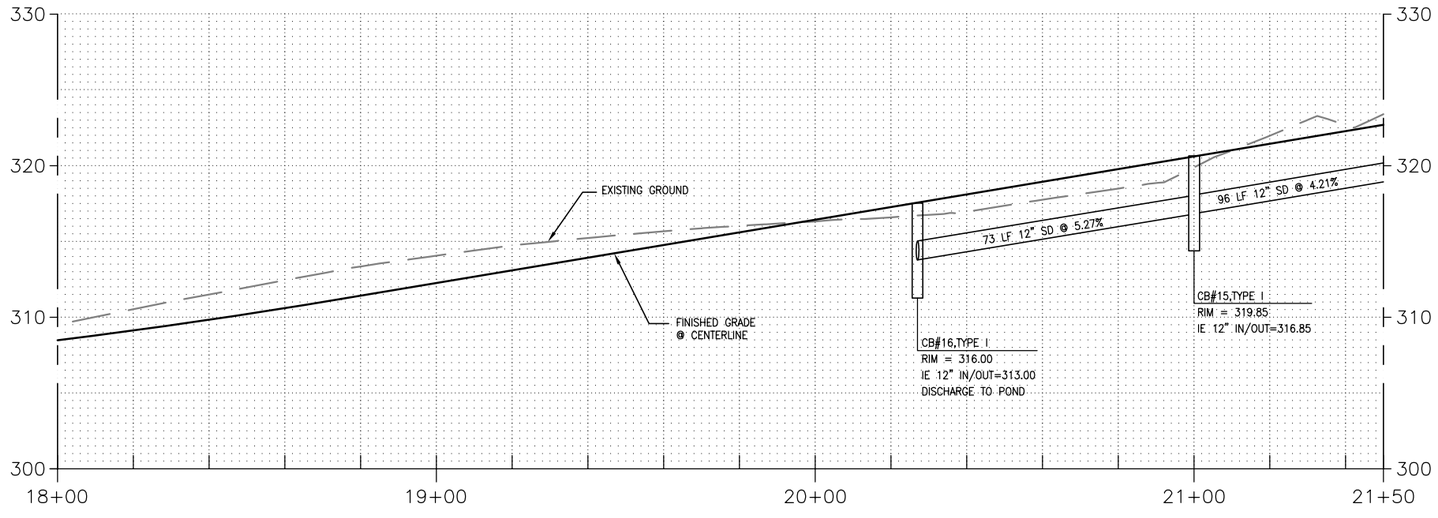
(IN FEET)

1 inch = 20 feet



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CITY OF SEATAC

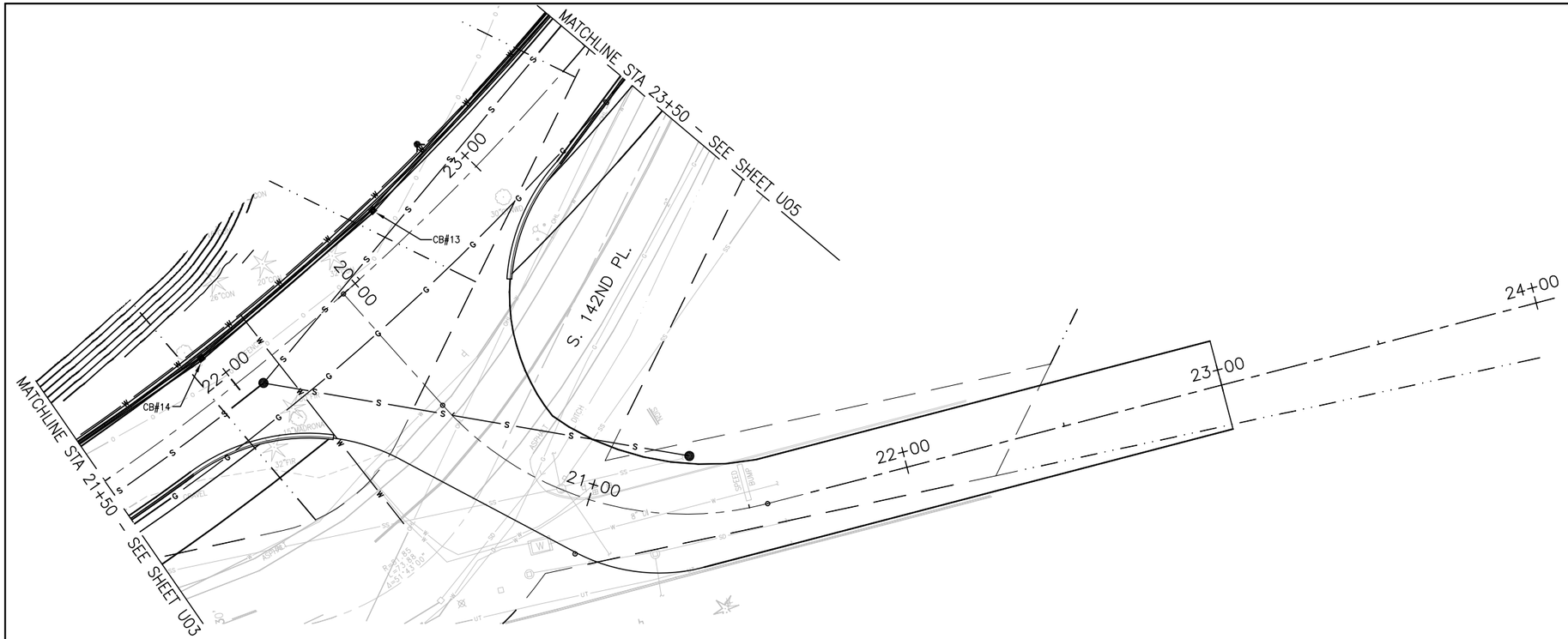
UTILITY PLAN AND PROFILE

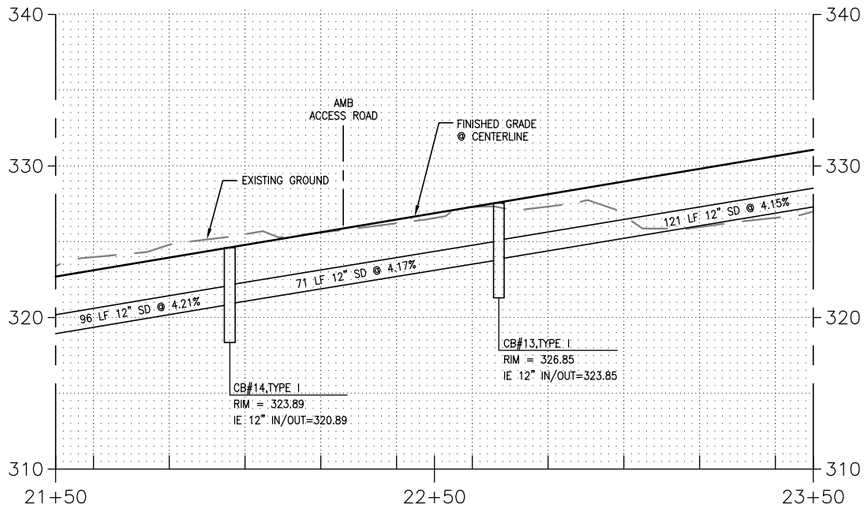
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"-20'

SHEET NO:

U03

XX OF XX





GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet

NOTES:

1. SEE CHANNELIZATION PLAN FOR ILLUMINATION, POWER, TELEPHONE AND CABLE.

PRELIMINARY

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NO.	DATE	BY	APPR.	REVISION SEE C04

FOR PLAN VIEW

HNTB

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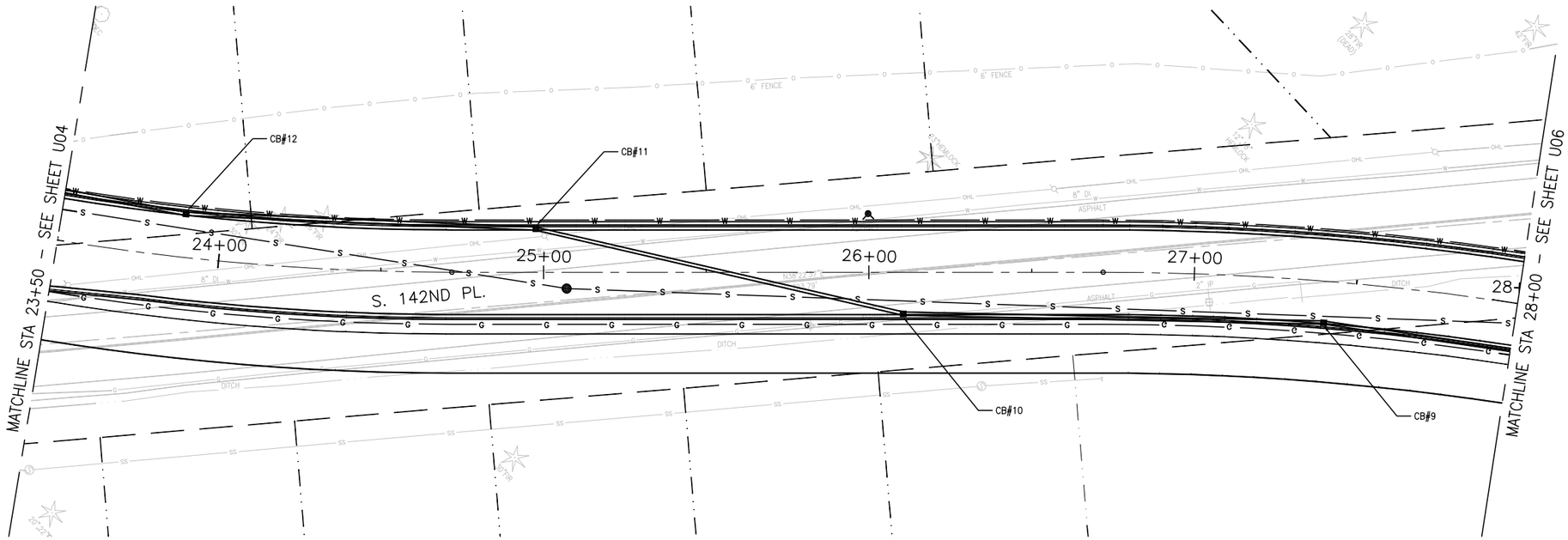
UTILITY PLAN AND PROFILE

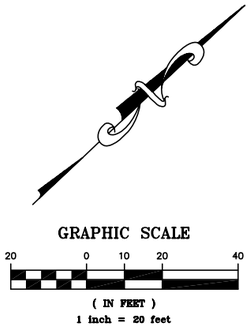
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

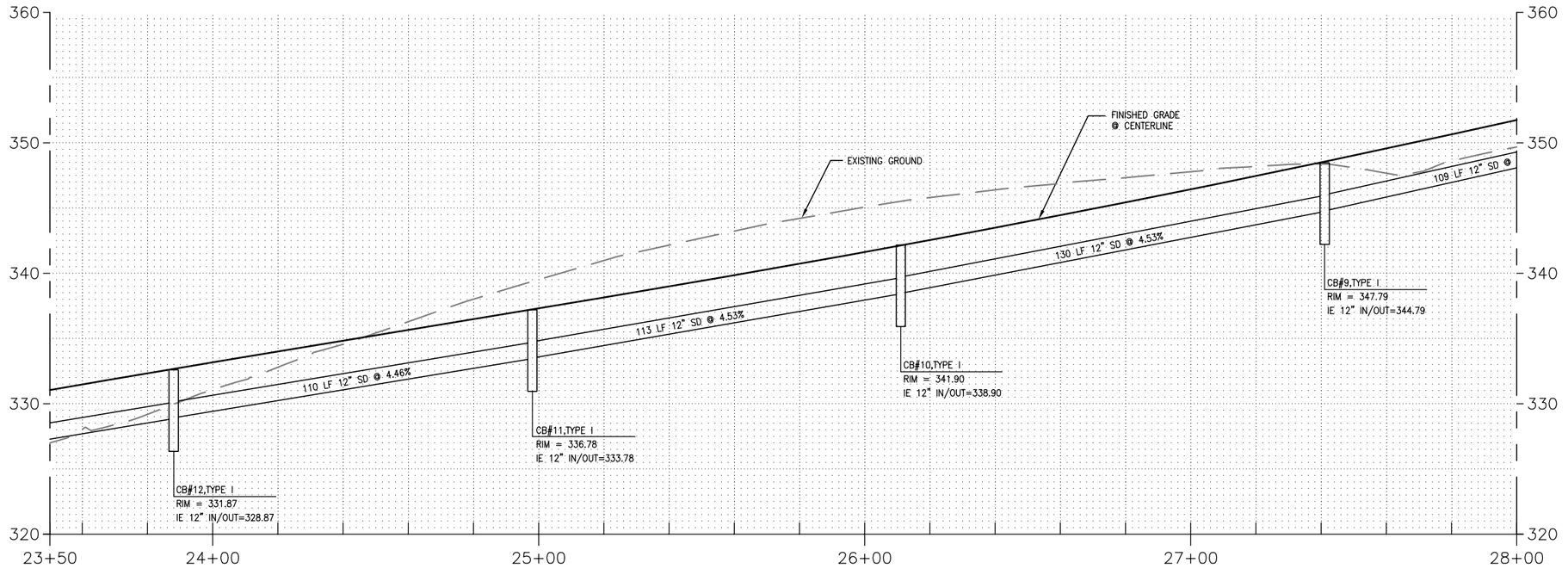
SHEET NO:

U04

XX OF XX







NOTES:

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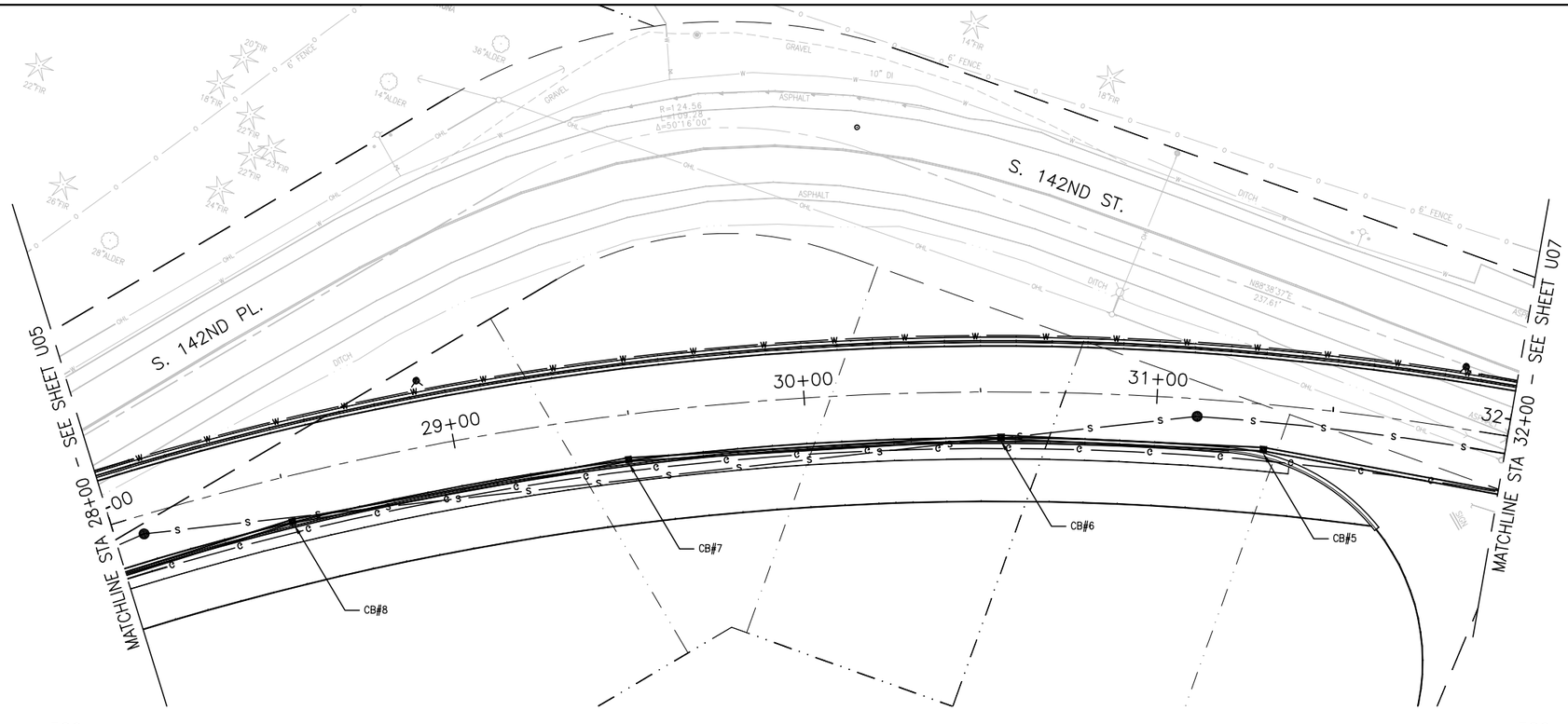
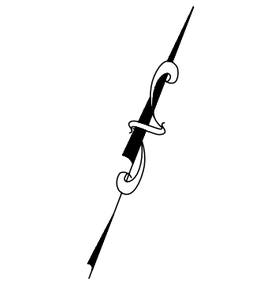
CITY OF SEATAC

UTILITY PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"=20'

SHEET NO:
U05
XX OF XX



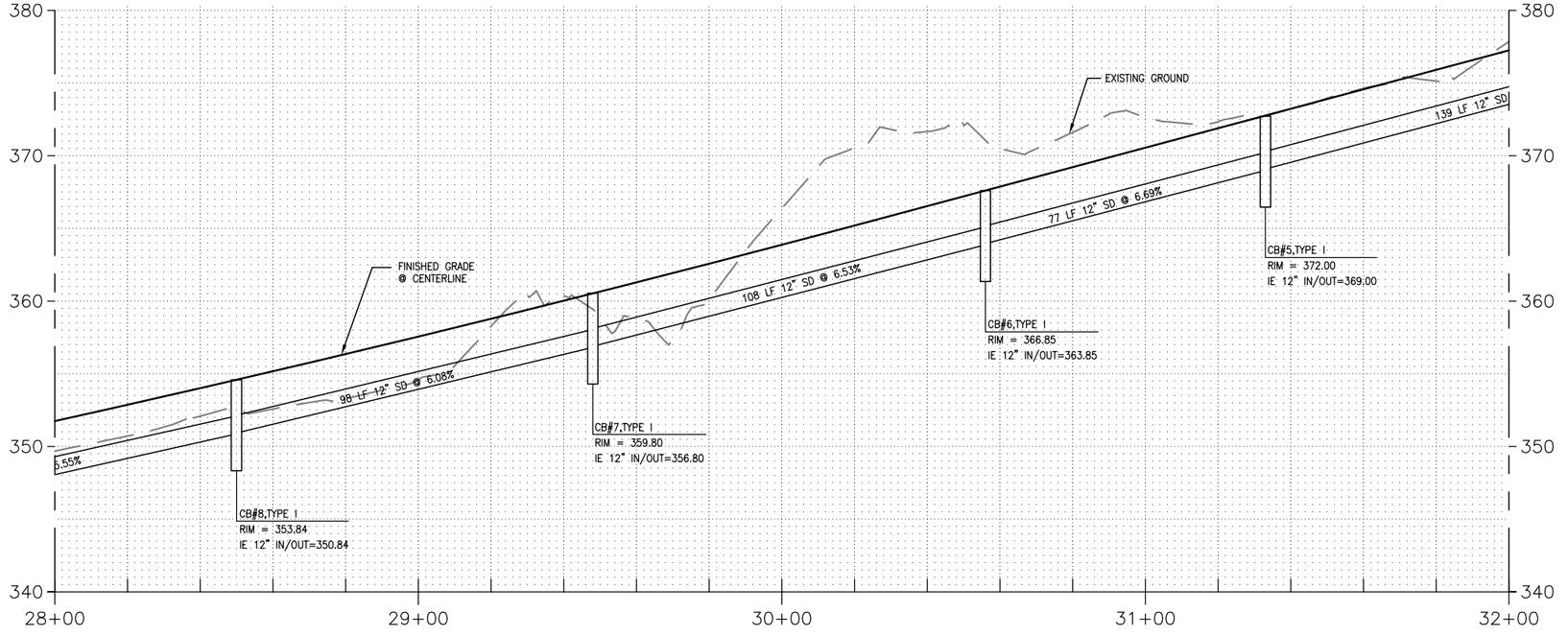


GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet



NOTES:

1. SEE CHANNELIZATION PLAN FOR ILLUMINATION, POWER, TELEPHONE AND CABLE.

PRELIMINARY

THESE PLANS ARE BASED ON AVAILABLE INFORMATION AND ARE SUBJECT TO REVISION ON FINAL DESIGN

NO.	DATE	BY	APPR.	REVISION

HNTB

DRN. RMJ | DSGN. MOF | CHKD. XXX

Public Works Department
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Tom Gut, P.E., City Engineer
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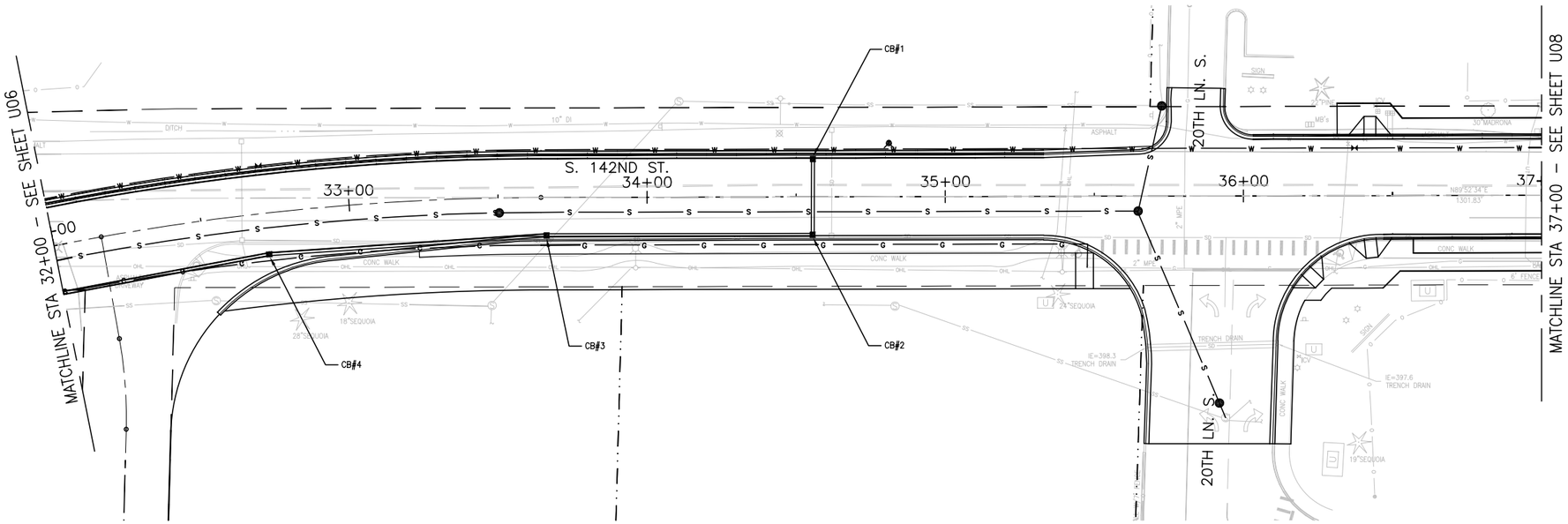
CITY OF SEATAC

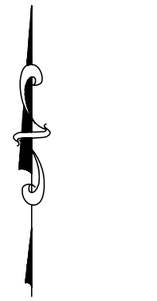
UTILITY PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"=20'

SHEET NO: U06

XX OF XX





GRAPHIC SCALE

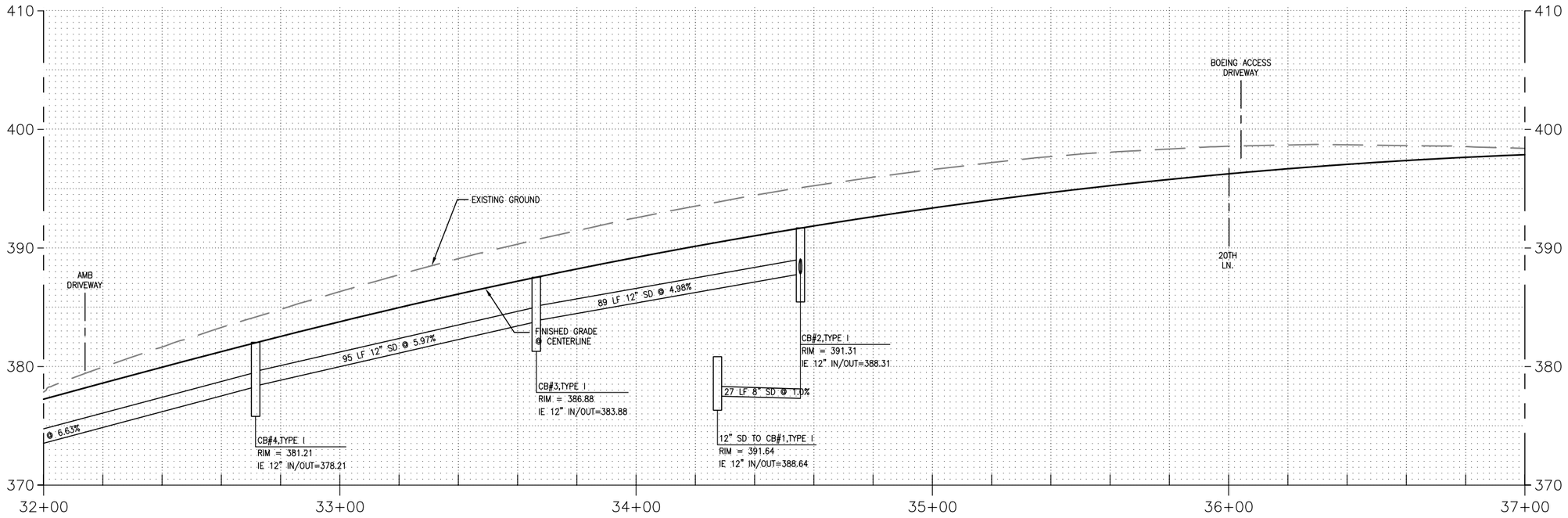
20 0 10 20 40

(IN FEET)

1 inch = 20 feet

NOTES:

1. SEE CHANNELIZATION PLAN FOR ILLUMINATION, POWER, TELEPHONE AND CABLE.



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CITY OF SEATAC

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CITY OF SEATAC

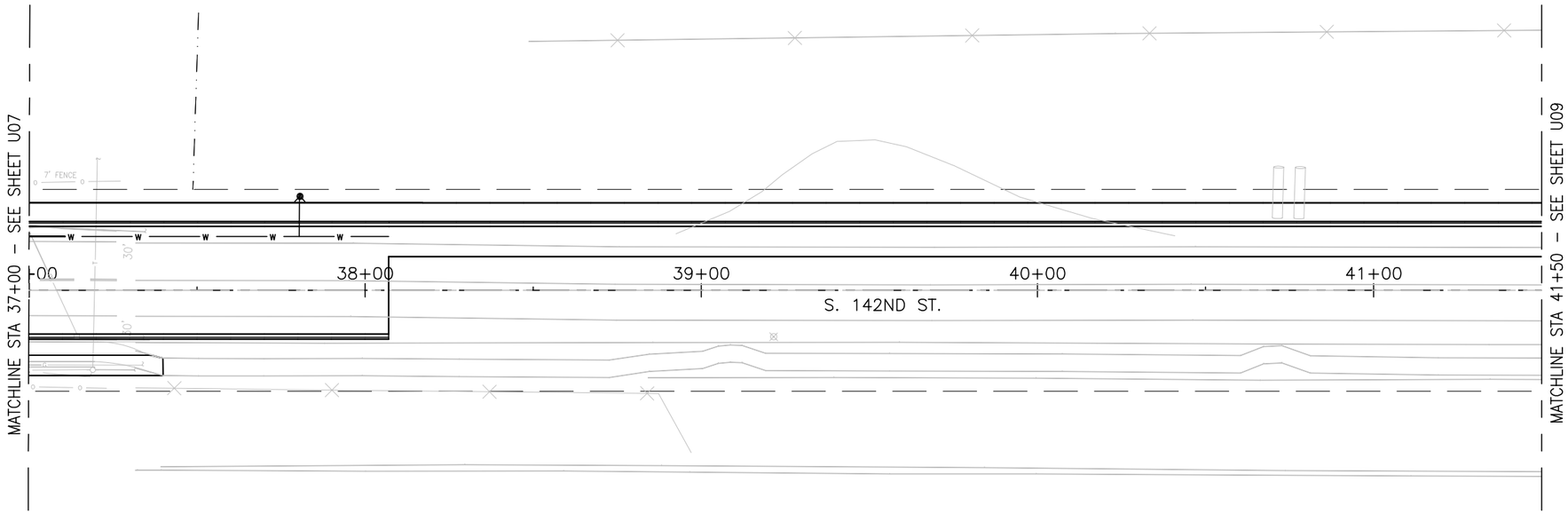
UTILITY PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

SHEET NO:

U07

XX OF XX

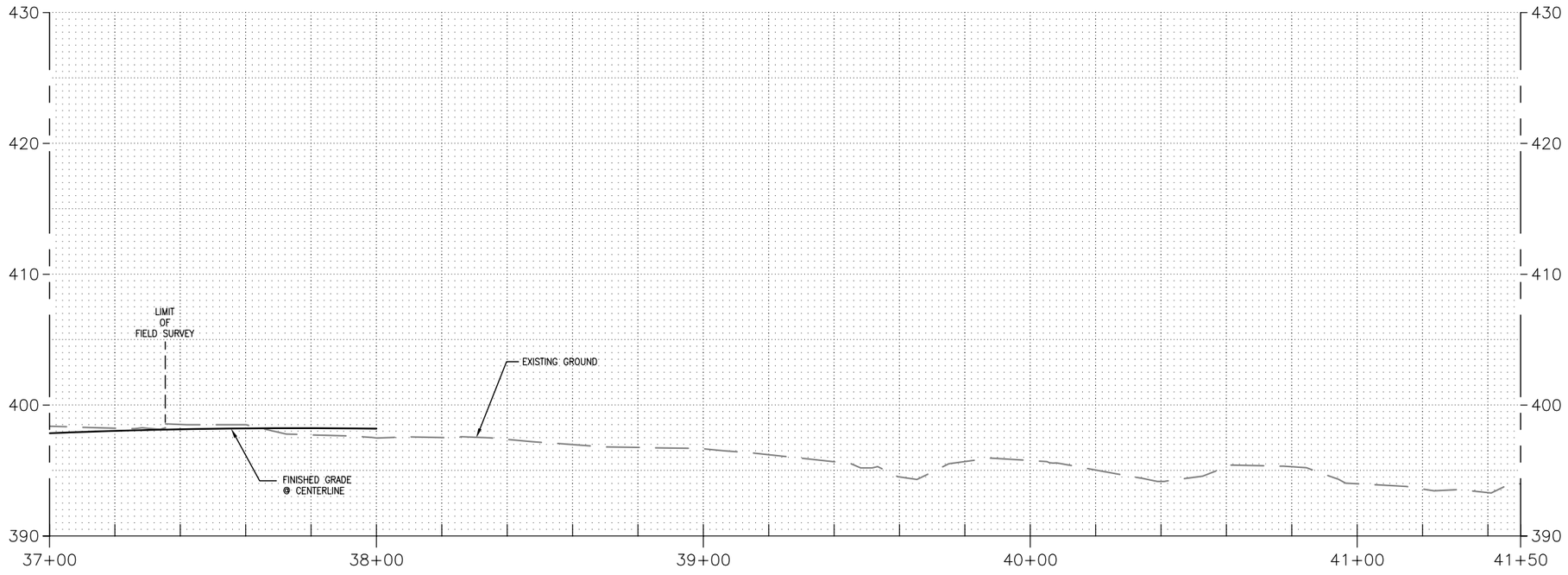


GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet



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CITY OF SEATAC

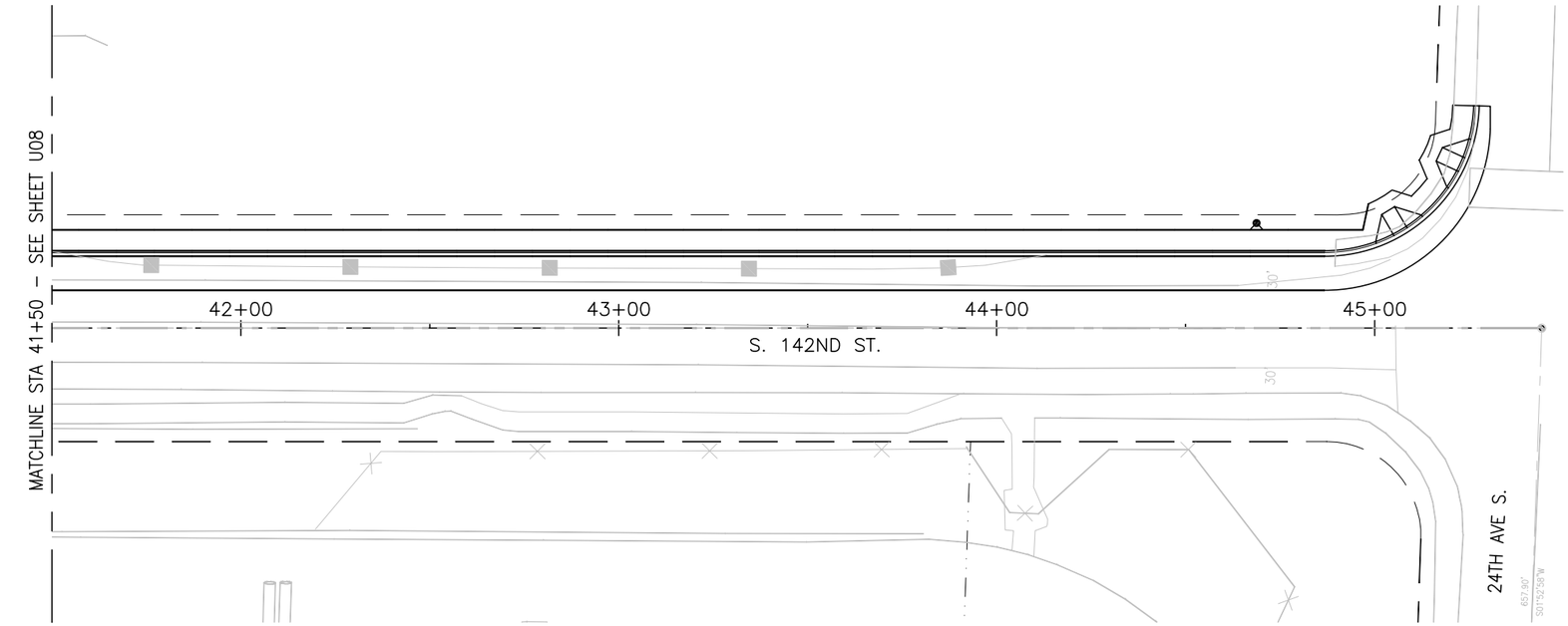
UTILITY PLAN AND PROFILE

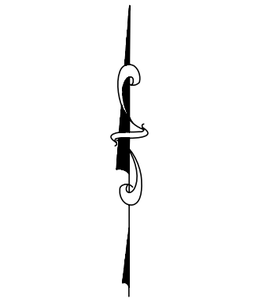
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

SHEET NO:

U08

XX OF XX



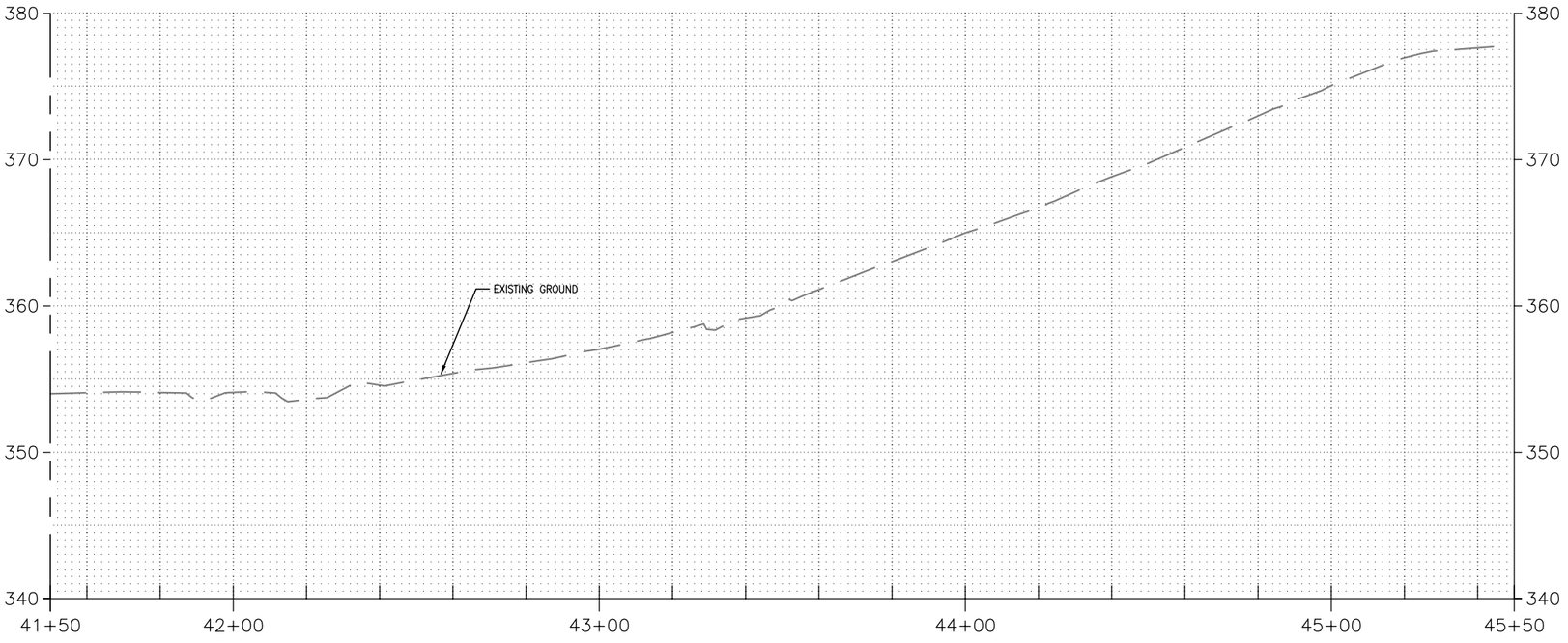


GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet



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CITY OF SEATAC

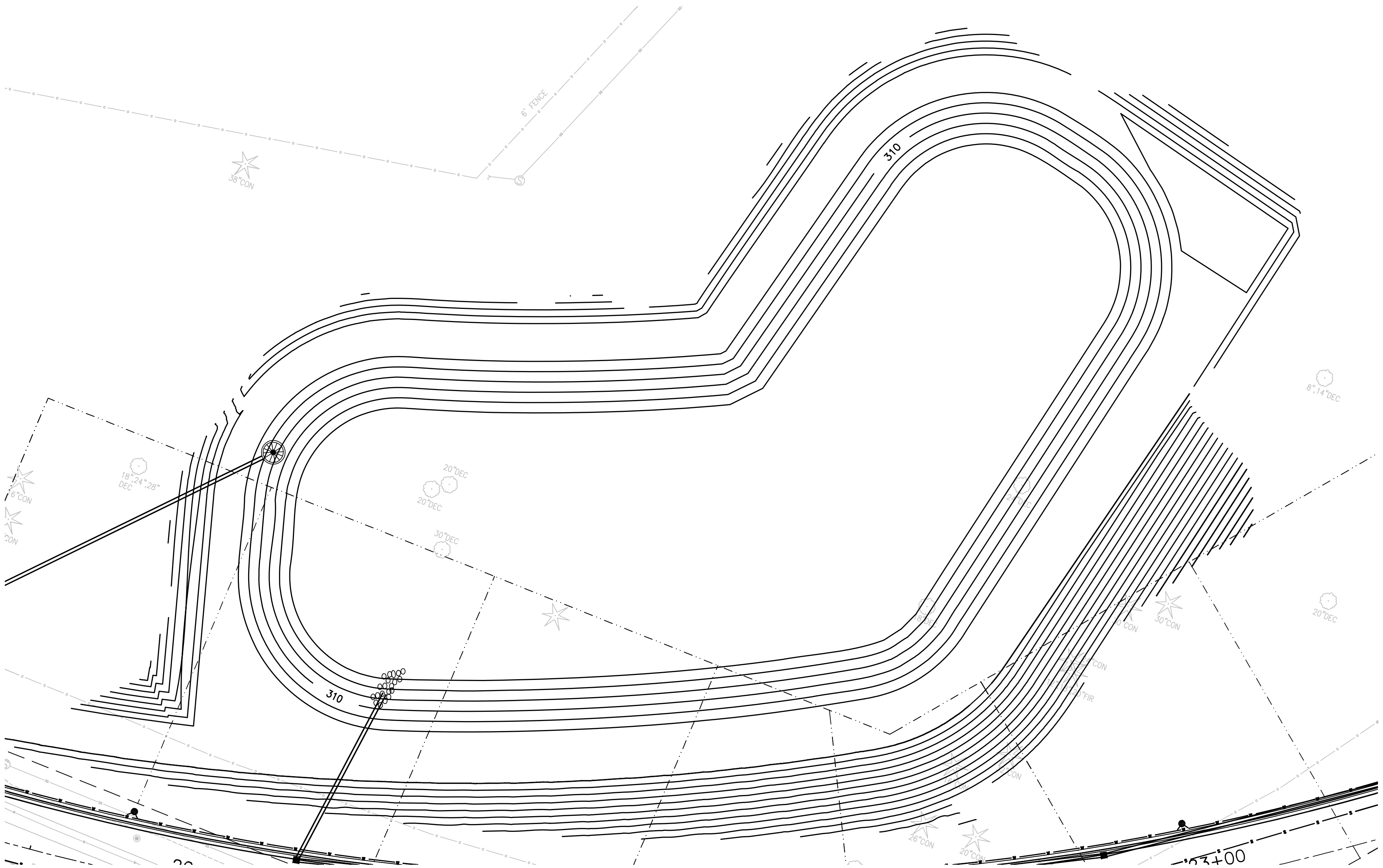
UTILITY PLAN AND PROFILE

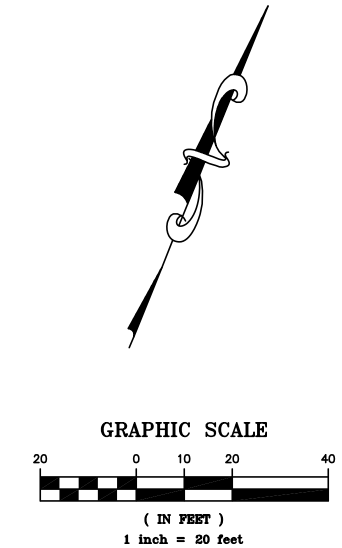
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

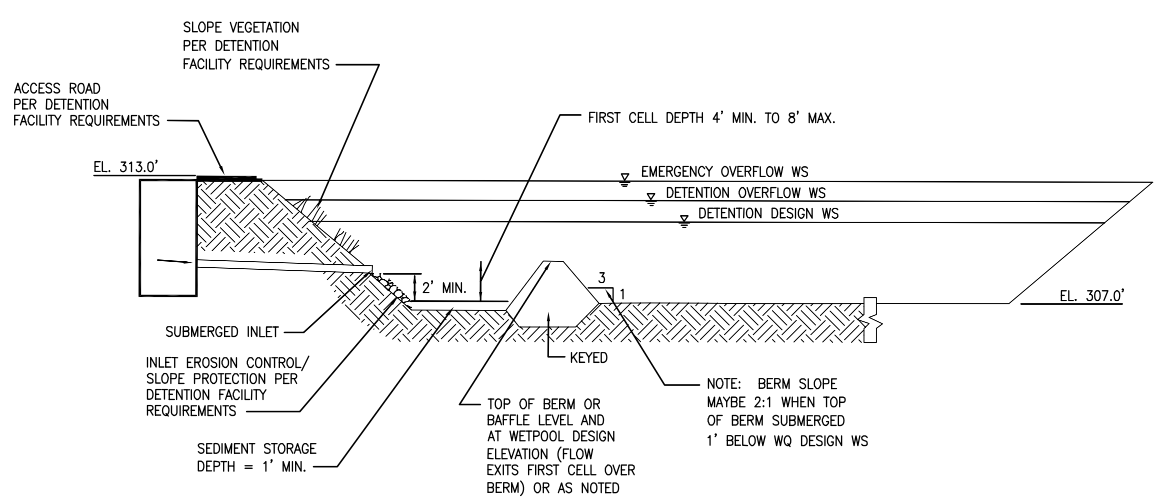
SHEET NO:

U09

XX OF XX







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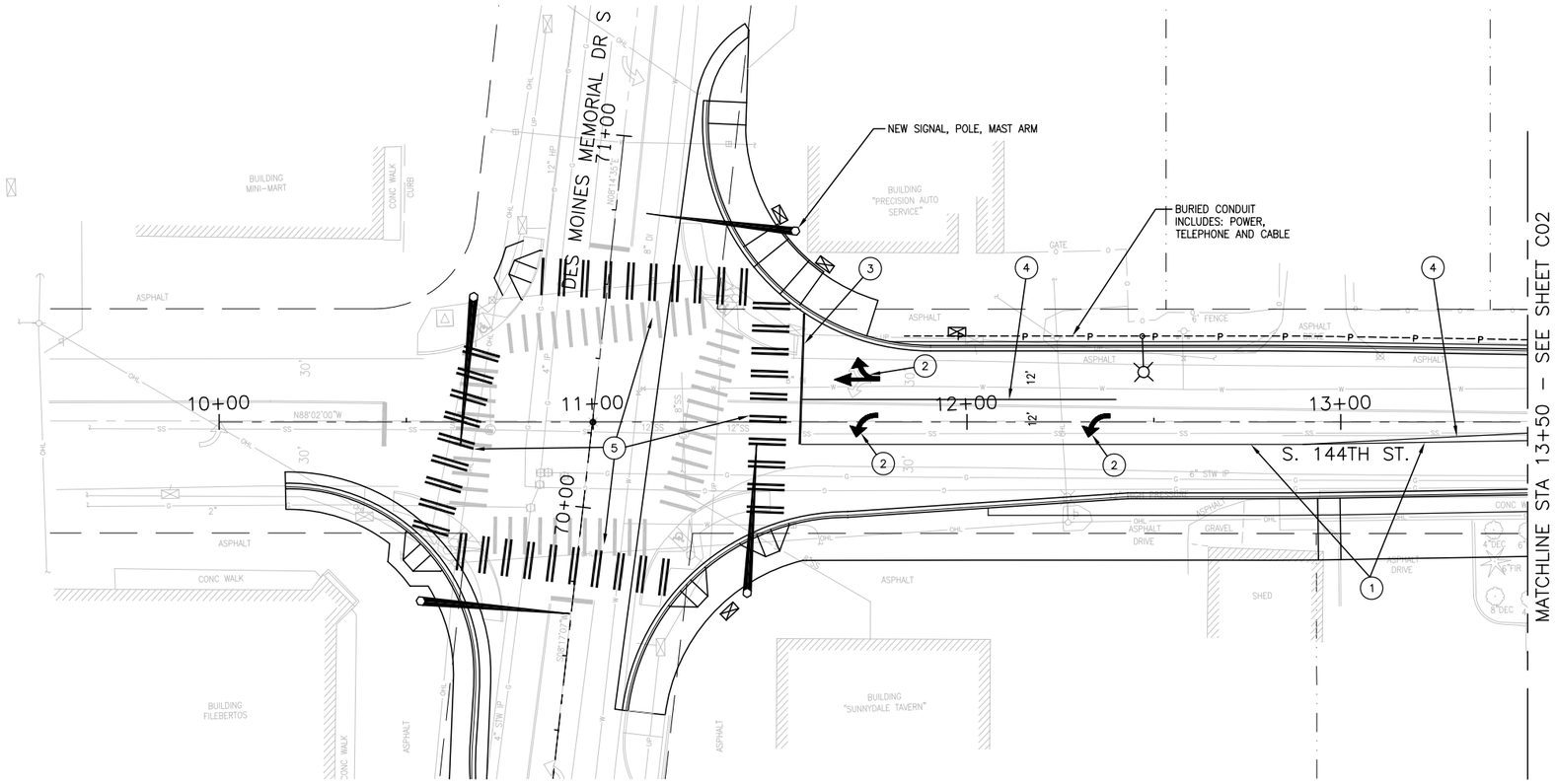
CITY OF SEATAC

POND PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"-20'

SHEET NO:
P01
XX OF XX

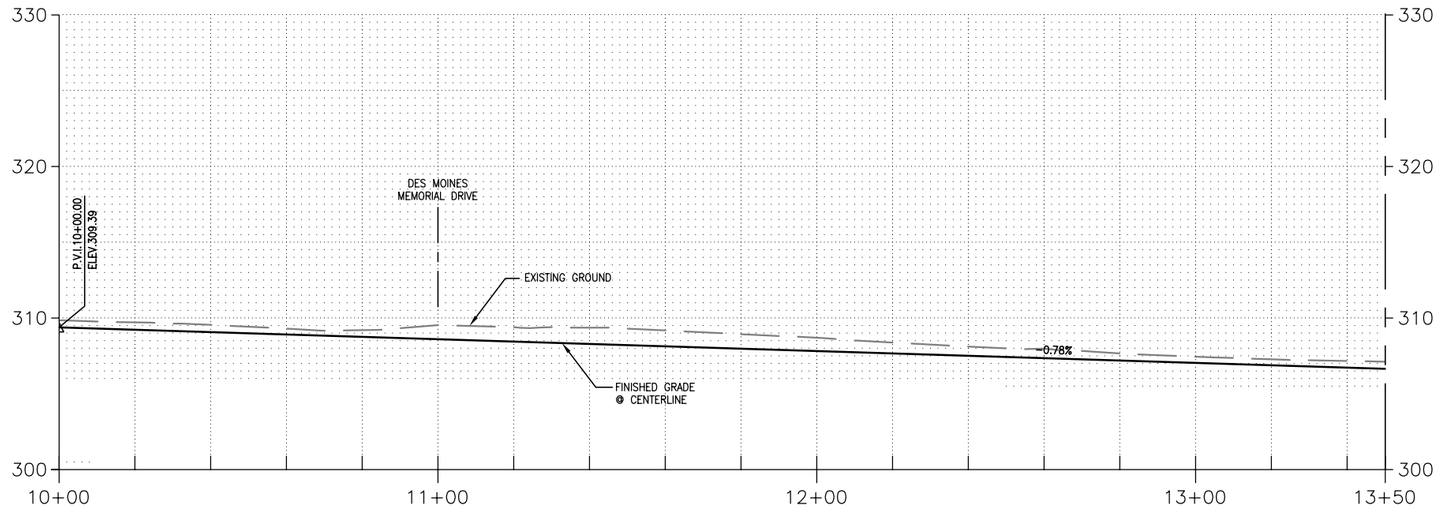


GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet



NOTES:

1. DOUBLE YELLOW CENTERLINE
2. TRAFFIC ARROW
3. STOP LINE
4. WIDE LINE
5. CROSSWALK

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CITY OF SEATAC

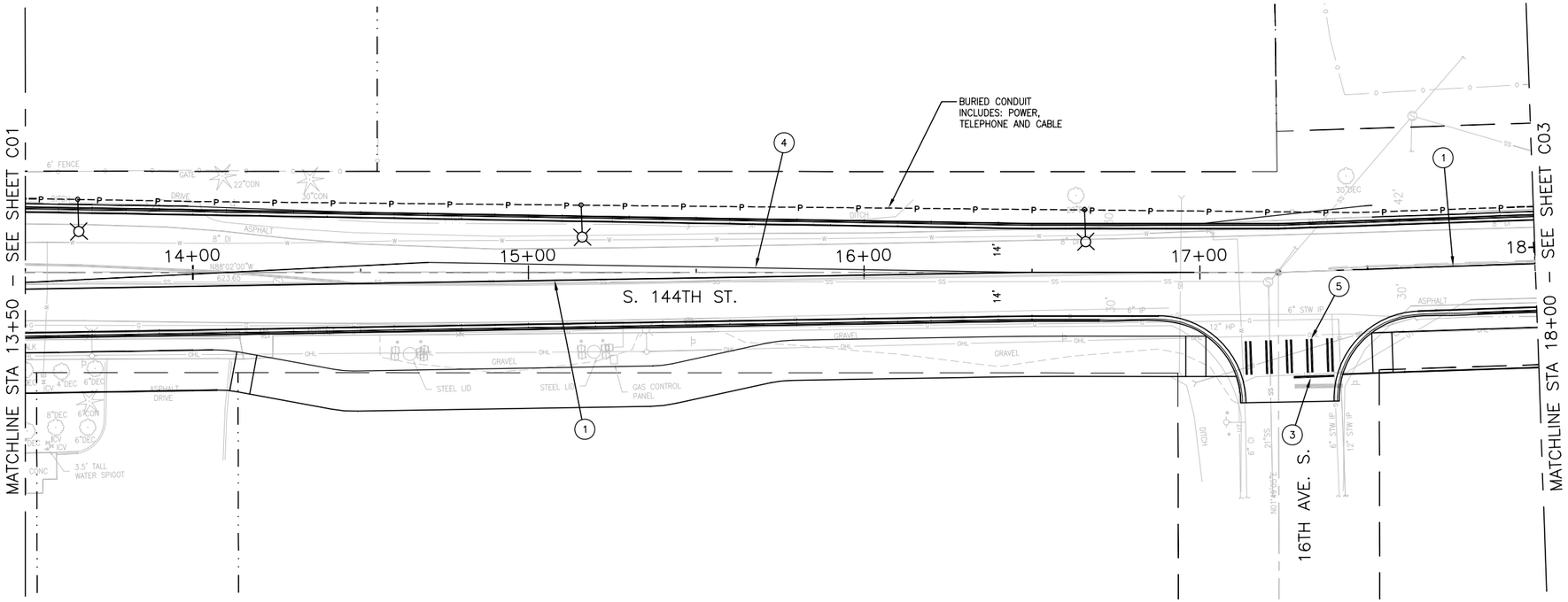
CHANNELIZATION PLAN AND PROFILE

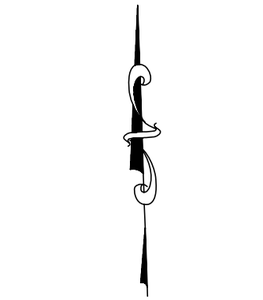
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"=20'

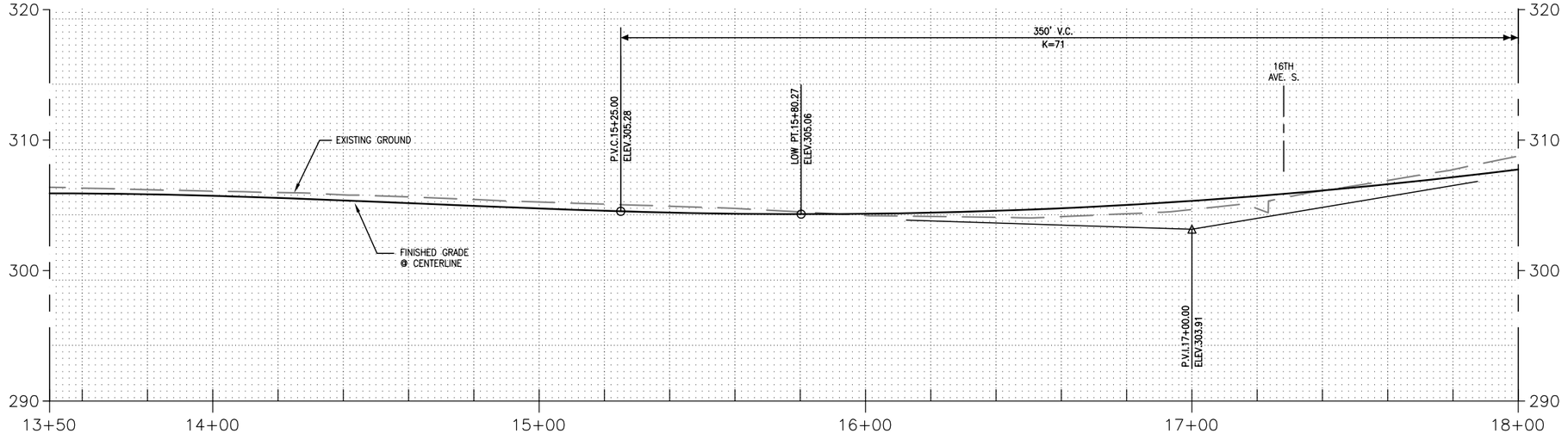
SHEET NO:

C01

XX OF XX







NOTES:

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2. TRAFFIC ARROW
3. STOP LINE
4. WIDE LINE
5. CROSSWALK

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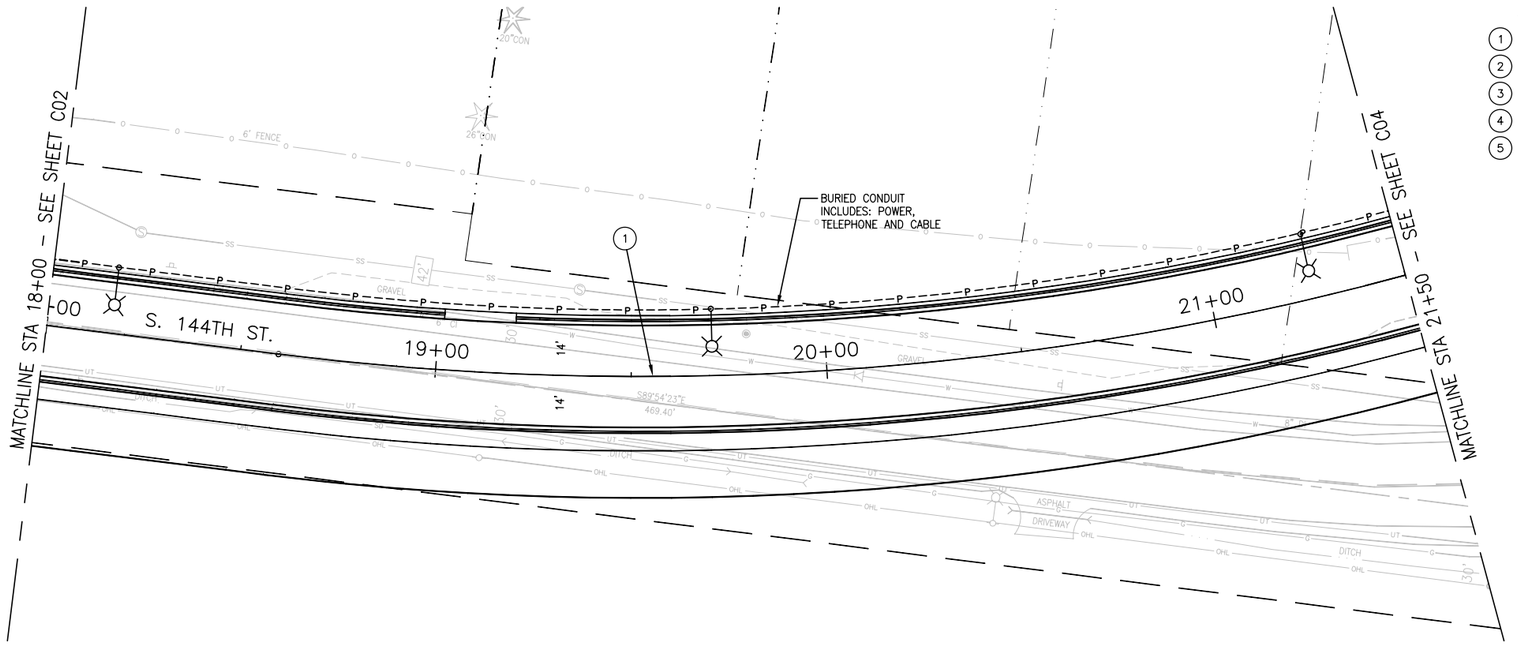
CITY OF SEATAC

CHANNELIZATION PLAN AND PROFILE

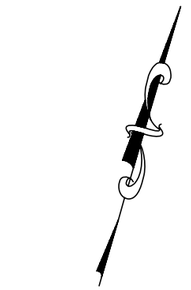
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

SHEET NO:
C02
XX OF XX



NOTES:

1. DOUBLE YELLOW CENTERLINE
2. TRAFFIC ARROW
3. STOP LINE
4. WIDE LINE
5. CROSSWALK

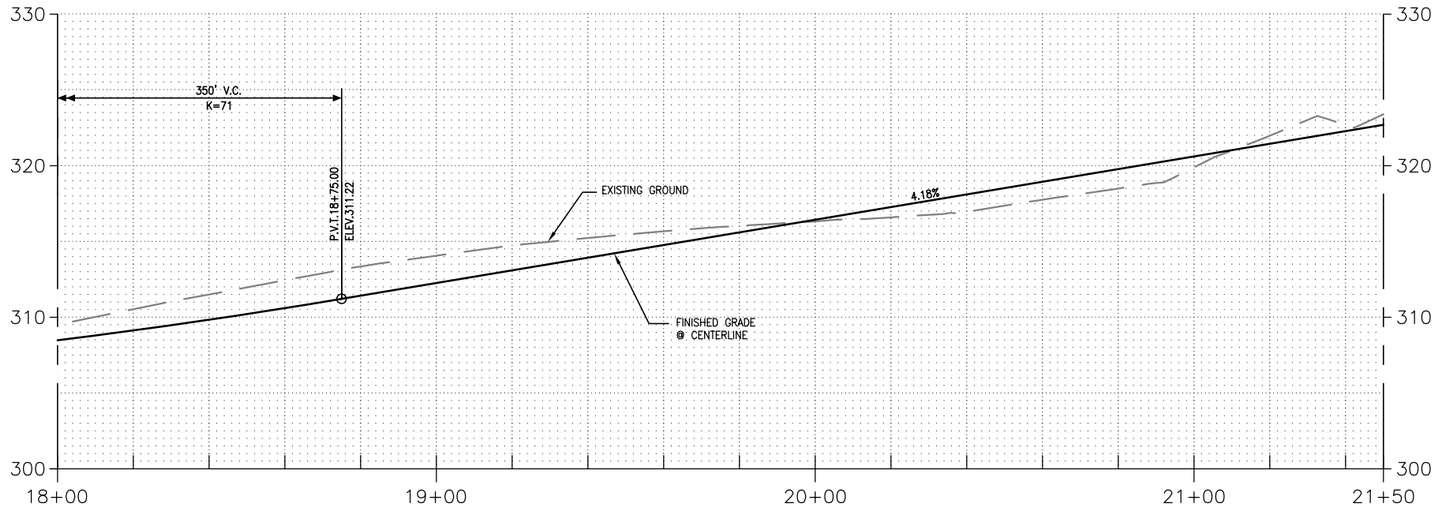


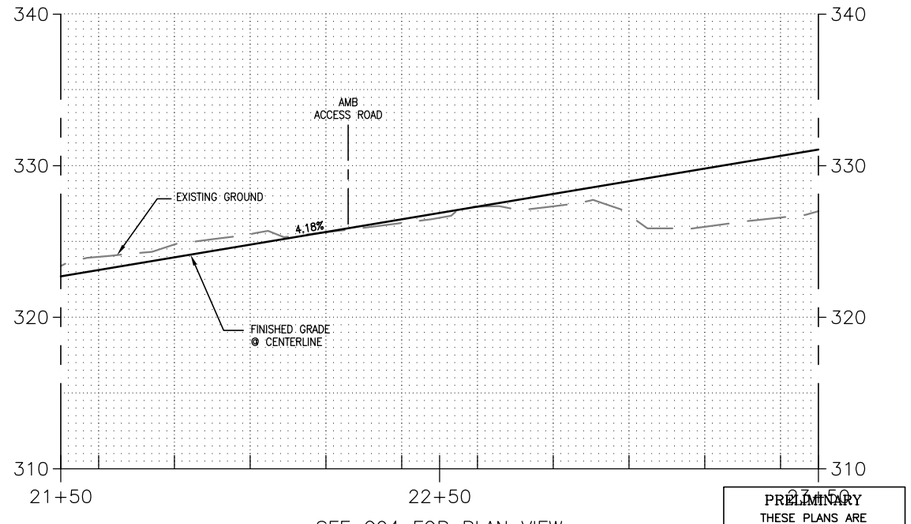
GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet





SEE C04 FOR PLAN VIEW

PRELIMINARY

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CITY OF SEATAC

CHANNELIZATION PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

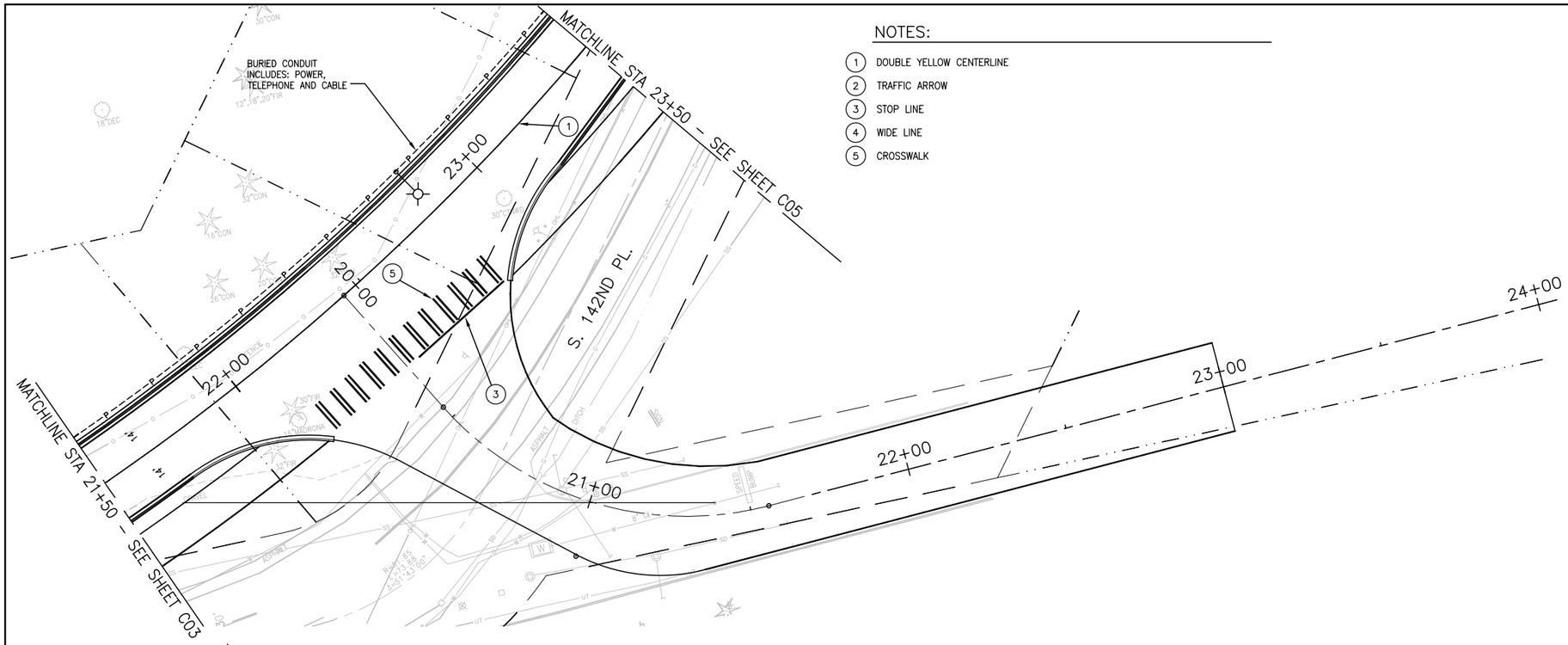
SHEET NO:

C03

XX OF XX

NOTES:

1. DOUBLE YELLOW CENTERLINE
2. TRAFFIC ARROW
3. STOP LINE
4. WIDE LINE
5. CROSSWALK

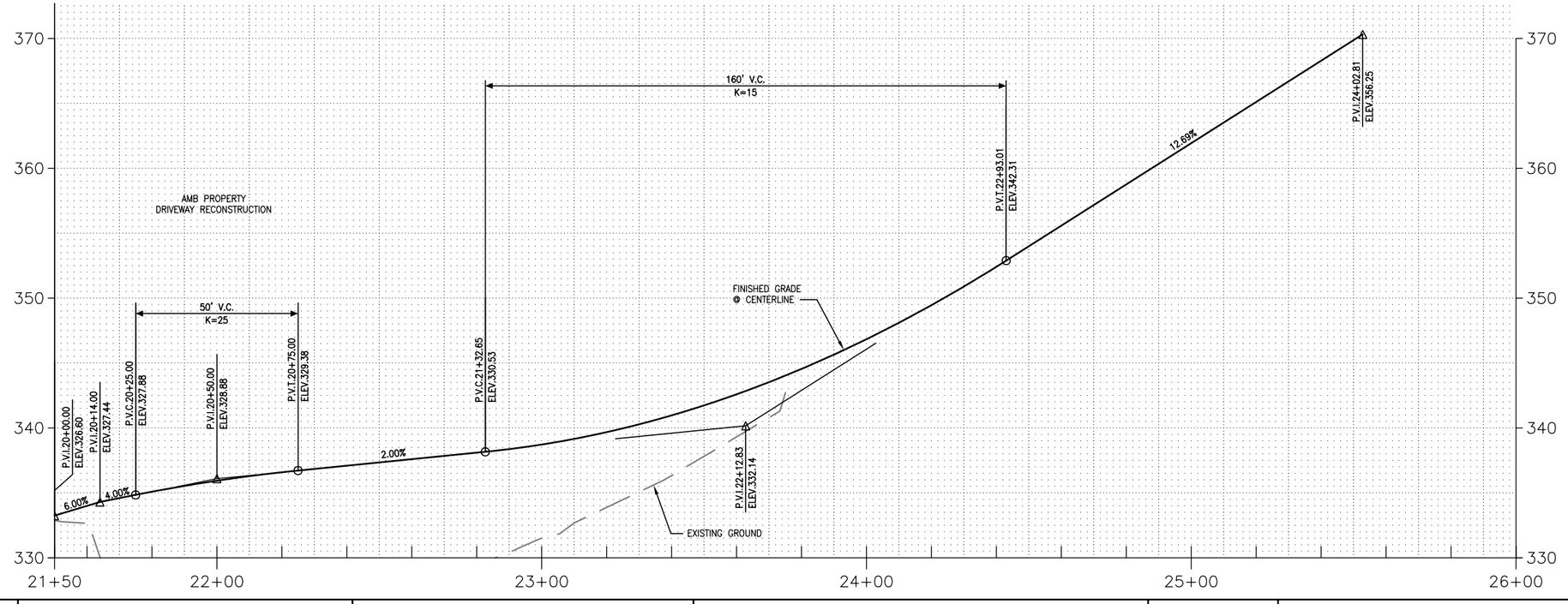


GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet



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CITY OF SEATAC

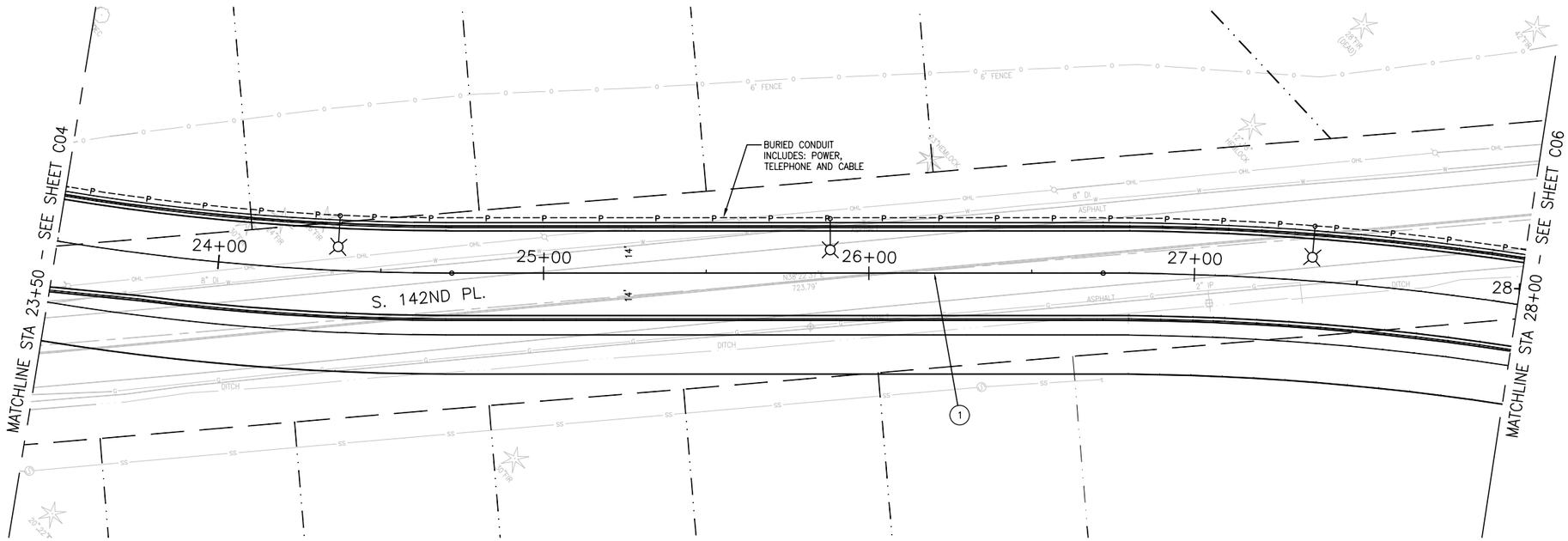
CHANNELIZATION PLAN AND PROFILE

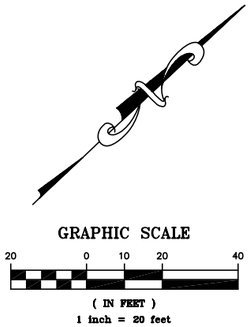
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"=20'

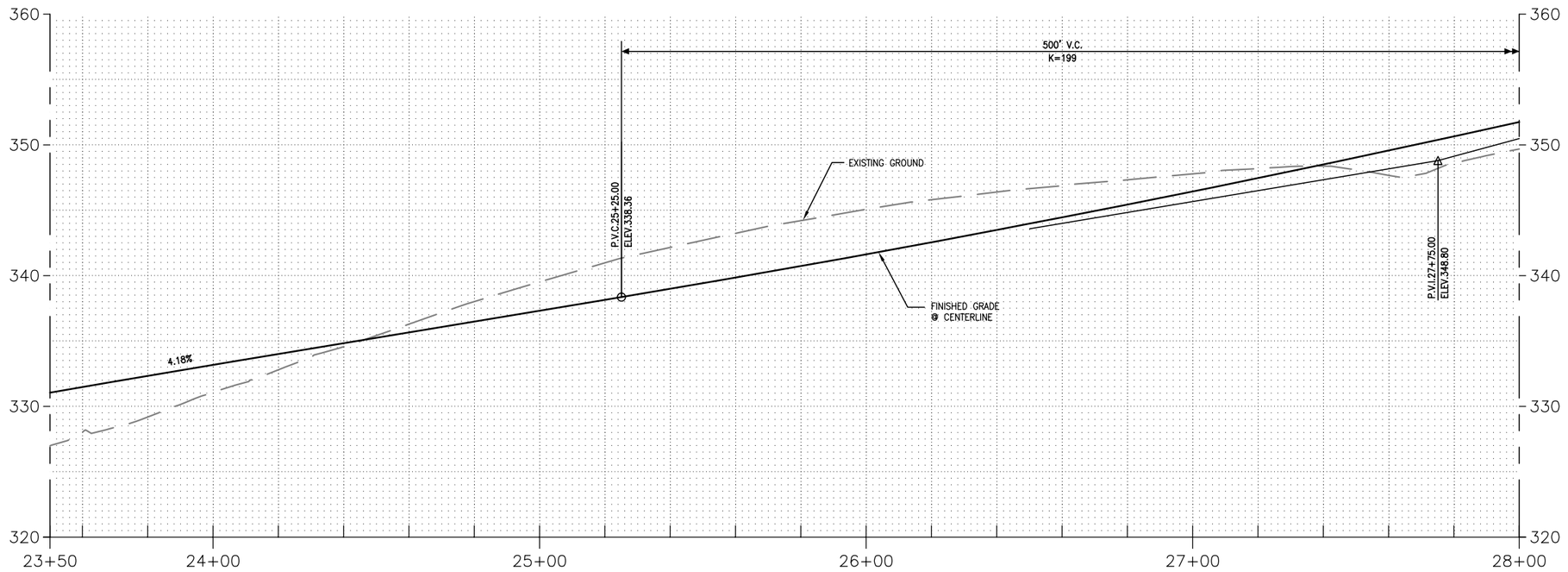
SHEET NO:

C04

XX OF XX







NOTES:

1. DOUBLE YELLOW CENTERLINE
2. TRAFFIC ARROW
3. STOP LINE
4. WIDE LINE
5. CROSSWALK

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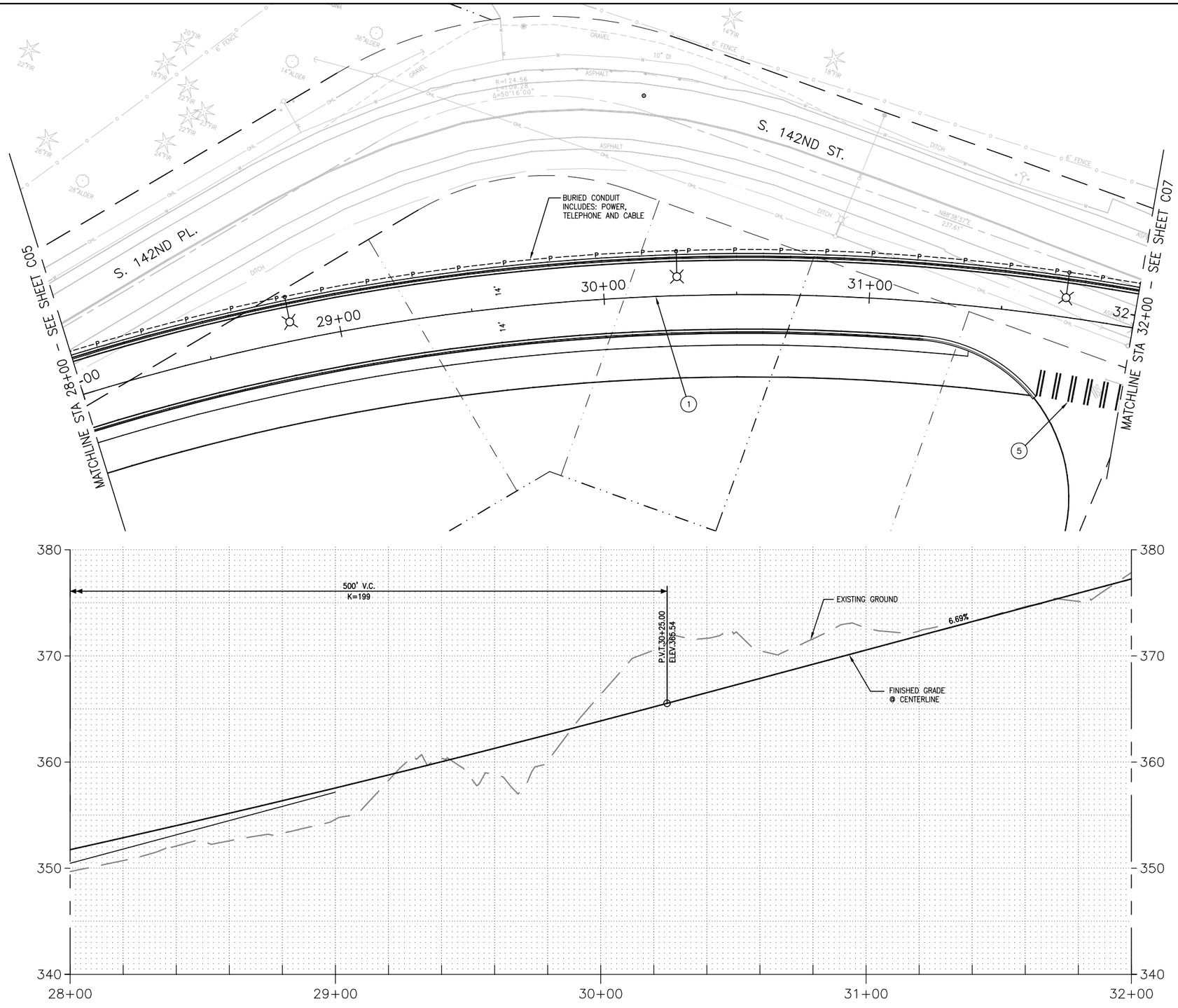
CITY OF SEATAC

CHANNELIZATION PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"=20'

SHEET NO:
C05
XX OF XX



GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet

NOTES:

1. DOUBLE YELLOW CENTERLINE
2. TRAFFIC ARROW
3. STOP LINE
4. WIDE LINE
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CITY OF SEATAC

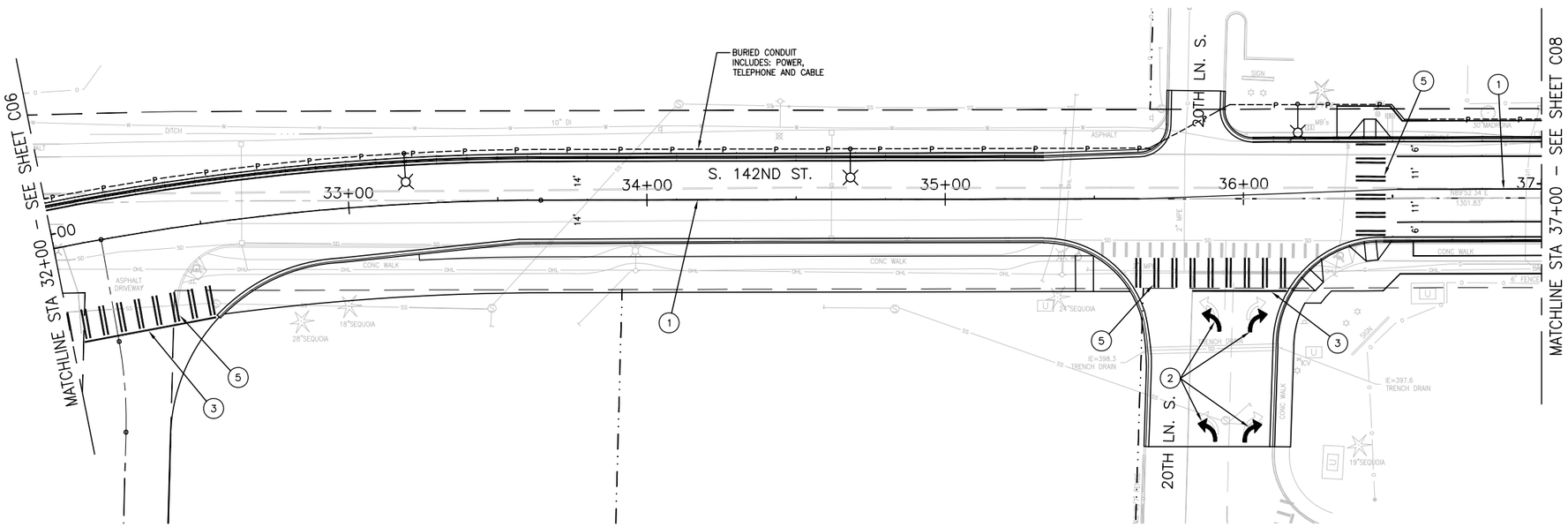
CHANNELIZATION PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"=20'

SHEET NO:

C06

XX OF XX



GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

1 inch = 20 feet

NOTES:

1. DOUBLE YELLOW CENTERLINE
2. TRAFFIC ARROW
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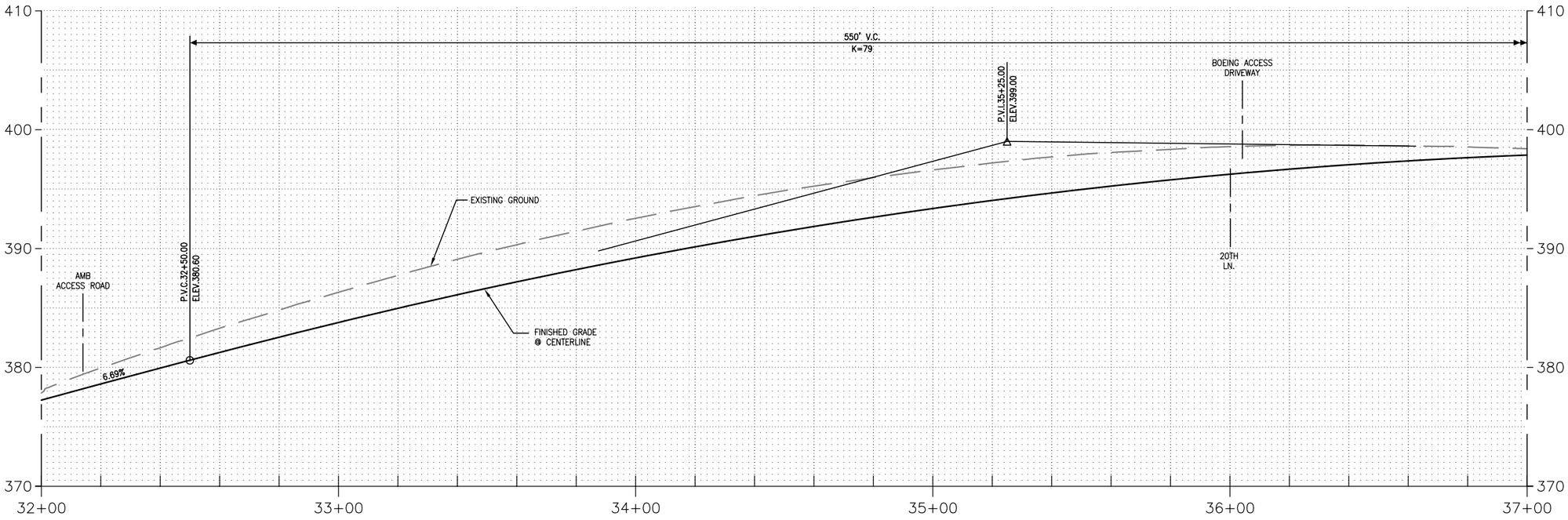

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CITY OF SEATAC

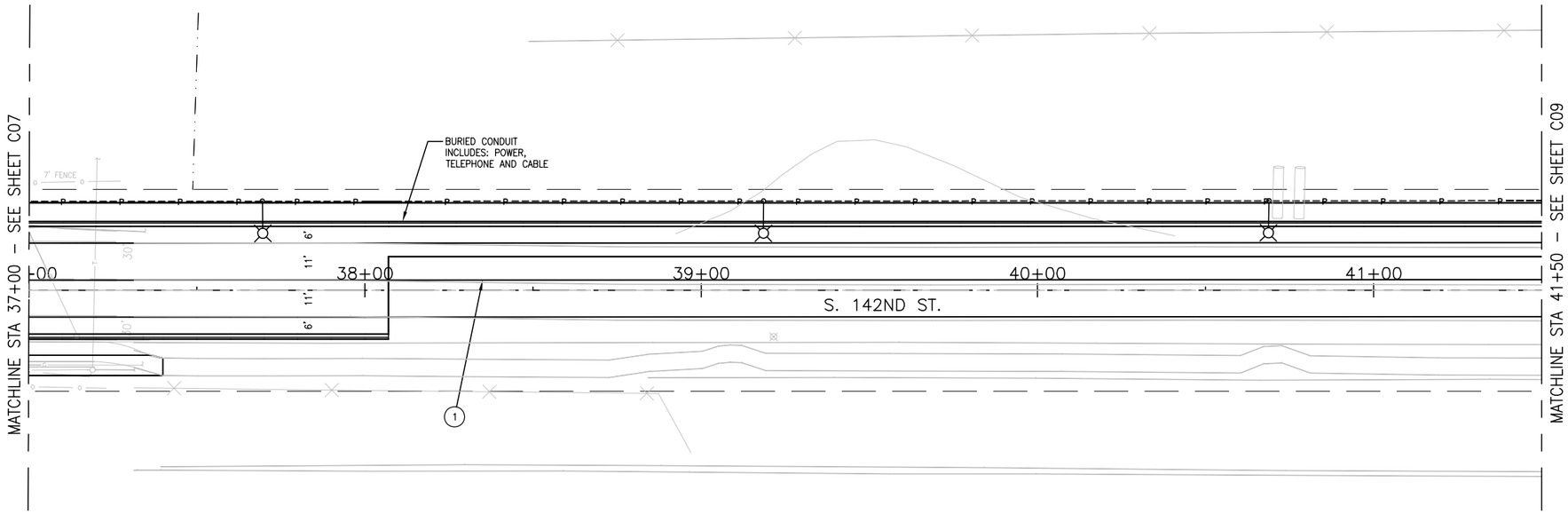
CHANNELIZATION PLAN AND PROFILE

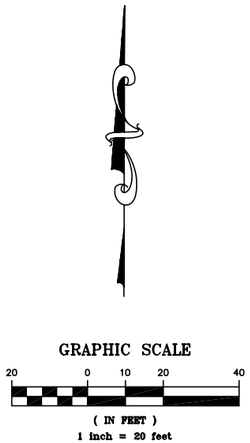
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

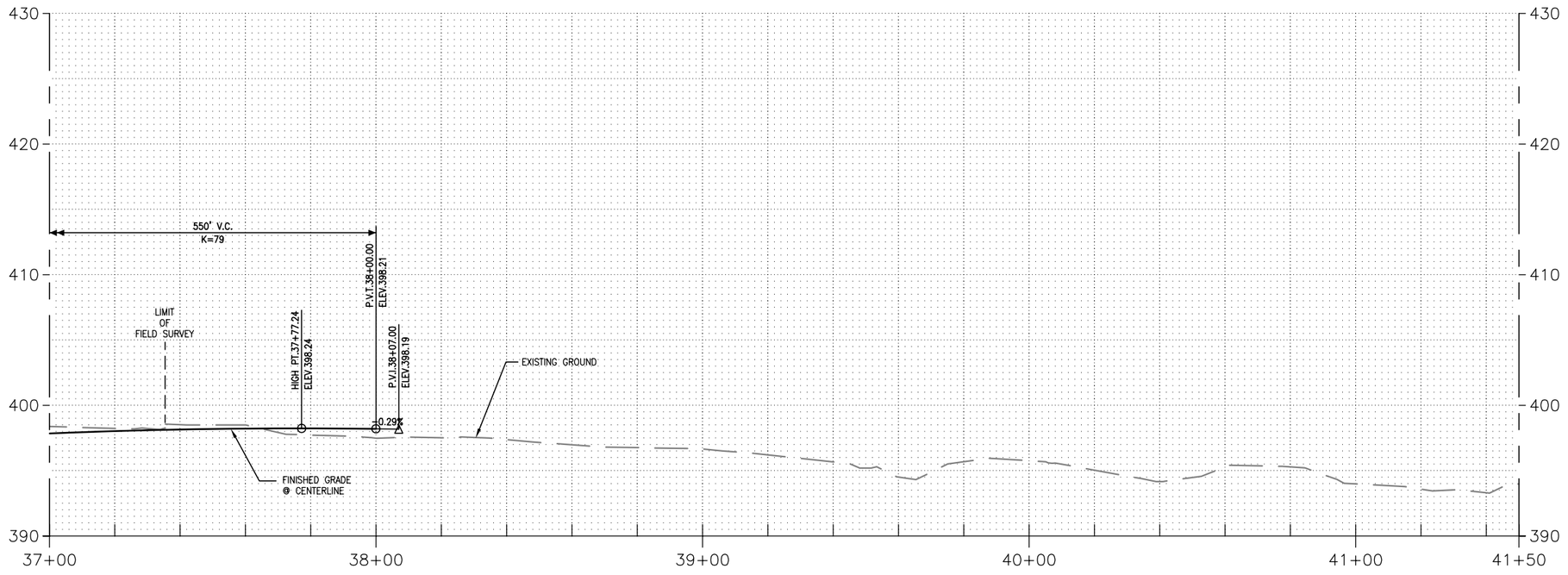
SHEET NO:

C07

XX OF XX







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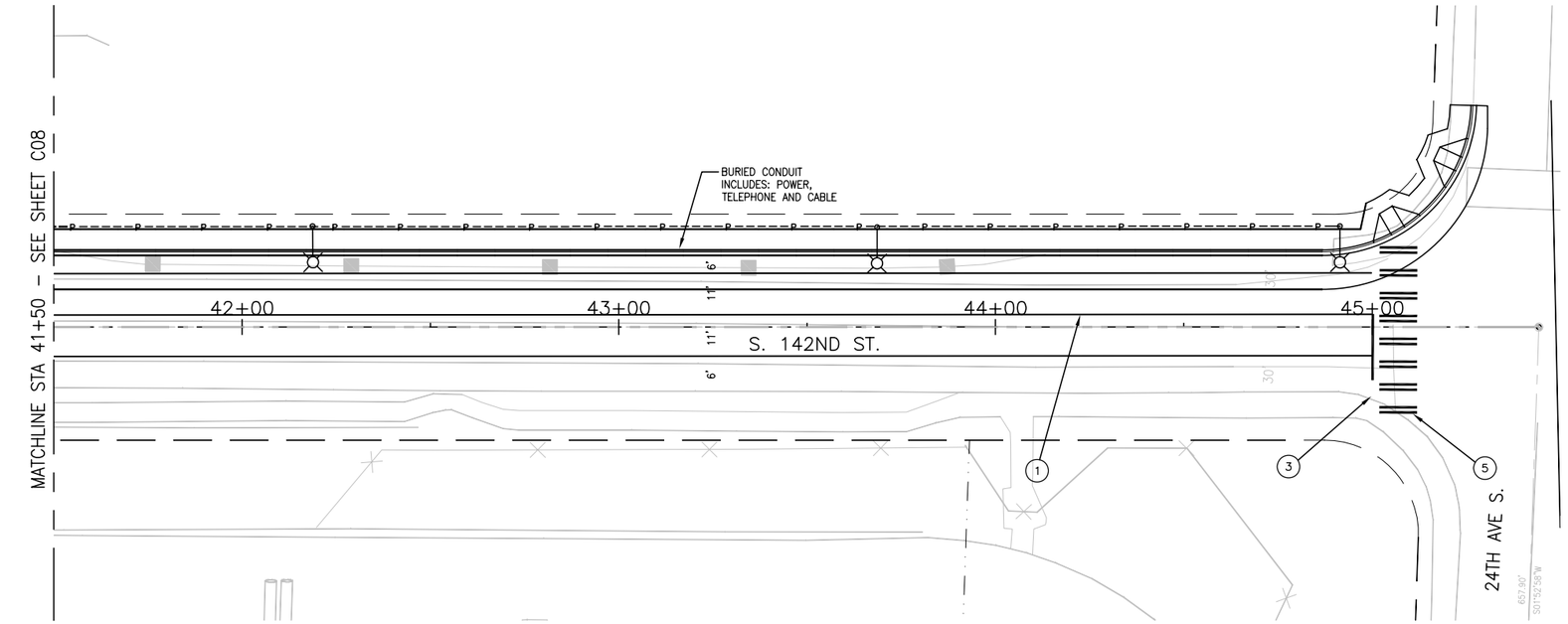
CITY OF SEATAC

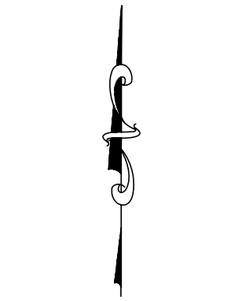
CHANNELIZATION PLAN AND PROFILE

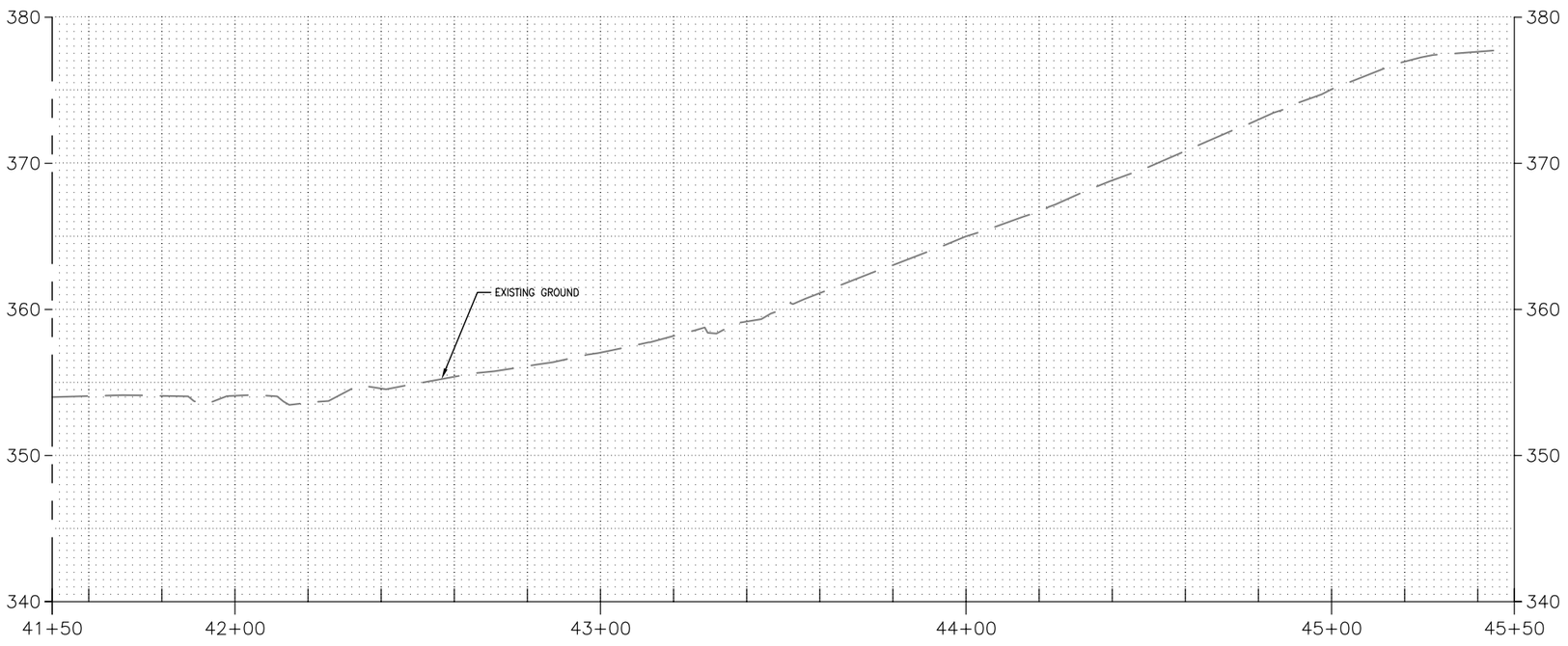
DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

SHEET NO: C08

XX OF XX







NOTES:

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2. TRAFFIC ARROW
3. STOP LINE
4. WIDE LINE
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CITY OF SEATAC

CHANNELIZATION PLAN AND PROFILE

DATE: 04/11/2008 | JOB # 44820 | SCALE: 1"–20'

SHEET NO:
C09
XX OF XX

North SeaTac Roadways Study

Appendix A
Traffic Operations Report

North SeaTac Roadways Study
Traffic Operations Report

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INTRODUCTION

A planning and access study has been conducted to support future development of the 55-Acre Parcel north of Seattle-Tacoma (Sea-Tac) International Airport. This parcel was acquired by the Port of Seattle through Federally-funded programs to mitigate noise impacts in the airport vicinity. Residences formerly occupying this parcel have been removed, and residential development is prohibited due to land use compatibility considerations. The Port of Seattle plans to develop the land for warehouse, light industrial and truck terminal purposes.

In 2004, the New Economic Strategy Triangle (NEST) Study was commissioned to investigate the feasibility of development of several noise mitigation properties in the Cities of SeaTac, Burien, and Des Moines, with the objective of stimulating economic growth and augmenting local tax revenues. The 55-Acre Parcel, located north of S 142nd Street and west of 24th Avenue S in the City of SeaTac, was among those identified in the study.

Additional study of the 55-Acre Parcel was conducted in the airport's Comprehensive Development Plan (CDP). A cumulative analysis of surface transportation impacts of all the CDP projects was published in the Draft Environmental Assessment in April, 2007. Development of the North Freight Cargo Complex is also included among the CDP projects, and would be located on noise mitigation properties in the north airport vicinity.

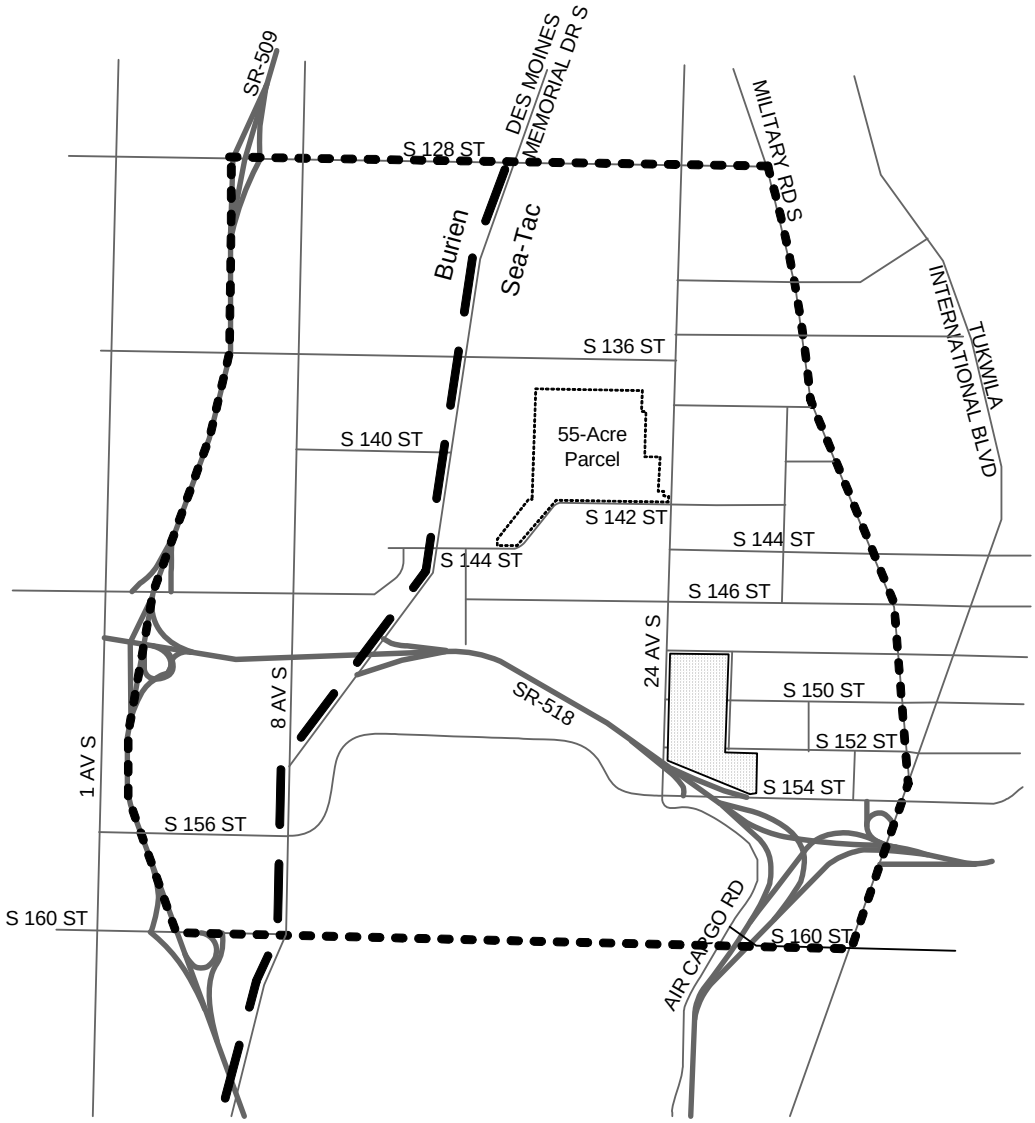
This report discusses access and circulation in the vicinity of the 55-Acre Parcel site, and considers connections to the regional network, surface street operations, safety, transit, non-motorized modes, freight movement, and neighborhood impacts.

Project Description

The project consists of improvements to the S 142nd/144th Street corridor to facilitate its use for access to existing and future development in the 55-Acre Parcel. The corridor will be reconstructed with broader curves and reduced grades to permit 30 to 35 mph operation, compared to the existing 25-mph limit. This project will also provide continuous pedestrian and bicycle facilities through the corridor.

In the long term, intersection and signalization modifications would be required at the Des Moines Memorial Drive/S 144th Street intersection. This would consist of the addition of a westbound left turn lane from westbound S 144th Street onto southbound Des Moines Memorial Drive.

Figure 1 shows the vicinity of the project and outlines the study area for the traffic planning study.



North SeaTac Roadway – Study Area

SeaTac City Limits

Study Area Boundary

Future North Air Cargo Complex

55-Acre Parcel

Figure 1: Project Vicinity Map

Site Access

The 55-Acre Parcel is located in the northern portion of the City of SeaTac, bounded approximately by S 142nd Street, 18th Avenue S, S 138th Street, and 24th Avenue S. Primary access would be along S 142nd and S 144th Streets S from Des Moines Memorial Drive. This corridor would serve employee, visitor, and truck traffic related to the site. The ramps serving Des Moines Memorial Drive at SR 518 serve connections to and from the east, including the I-5 and I-405 freeways.

Truck travel to and from the west, including SR 509 access, is currently not served by a designated truck route. The City wishes to discourage additional truck traffic on 24th Avenue S adjacent to residential uses remaining east of 24th Avenue S. Truck routing options are reviewed for coordinated action by the Cities to designate truck route connections to SR 509 and 1st Avenue S.

Access to the site would be provided at the time of development in the vicinity of 20th/21st Avenue S, extending north from S 142nd St. Consideration also was given to an extension of the 20th Ave S corridor to S 146th St as a means of reducing trips on 24th Ave S.

Access for employee and visitor trips also would be provided with a driveway connection to S 136th Street in the vicinity of 20th or 21st Avenues S. Truck use of this route would be prohibited.

METHODOLOGY

The transportation analysis included development of future traffic forecasts and operational evaluation of affected intersections in the study area. These tasks built upon earlier analysis of the cumulative impacts of projects proposed in the Sea-Tac Airport Comprehensive Development Plan (2006) and the Burien Comprehensive Plan Update (2003).

Travel Forecasts

Travel demand forecasting for the project was accomplished with the TModel 2 software package recently used in the Sea-Tac Comprehensive Development Plan, City of Burien Comprehensive Plan Update, and the City of SeaTac's North End Arterial Study, a review of alternative street systems to serve the L-shaped parcel The model developed for the Joint Transportation Study (JTS), using the EMME2 software, was applied in the south airport vicinity for the CDP forecasts, but is not sufficiently detailed for application to the north airport vicinity.

The forecasting effort provided baseline (No Action) and Build (55-Acre Parcel) conditions for 2010 and 2024. Forecasts were prepared for PM peak hour conditions at approximately 30 intersections in the study area. Forecasts for AM peak hour conditions were derived from the PM forecasts, but no model validation was undertaken. Subsequent traffic operations analysis will focus on 10 to 12 of the intersection locations where impacts are greatest.

The model was used for distribution and assignment of the non-truck component of traffic, consisting primarily of employee and visitor trips. Truck traffic was explicitly assigned in the post-processing effort to designated truck routes.

Select link and select zone analyses were prepared to trace the various routes used by site traffic and their contribution to individual roadway links.

2010 Analysis

The 2010 CDP Build condition will serve as the baseline (No Action) condition for the opening-year forecasts of the North SeaTac Roadway planning effort. Development of the 55-Acre Parcel or the NESPA sites in Burien were not included as 2010 CDP projects.

The 2010 CDP analysis includes the effects of air cargo development on the L-shaped parcel and other CDP projects in the south airport vicinity, as well as various network modifications that both precede and accompany the CDP improvements. These include:

- Relocation of the SR 518 westbound on ramp, from S 154th Street to 24th Avenue S, and associated channelization revisions (northbound left-turn lane on 24th Avenue S)
- Addition of a third eastbound lane on SR 518 from the North Airport Expressway (NAE) to I-5.
- Revised channelization at the SR 518 interchange with the NAE, including a new northbound on-ramp from S 160th Street.
- Addition of a third southbound through lane on International Boulevard (SR 99) from the SR 518 loop ramp to S 160th Street.
- Revised channelization at the International Boulevard/S 154th Street intersection, as part of the Sound Transit project.
- S 150th Street will be closed at the L-shaped parcel between 24th Avenue S and 26th Avenue S, and a new street on the 26th Avenue alignment will replace local circulation.

2024 Analysis

The 2024 CDP Build condition served as the baseline for the horizon-year forecasts for the North SeaTac Roadways planning effort, with the following adjustments:

- Development of the 55-Acre Parcel as office park was included on a programmatic basis in the CDP Build analysis for 2024. Trips associated with office park development were removed to provide baseline (No Action) conditions for this parcel, and the network links representing project access points were removed.
- Redevelopment of the Tukwila Station area is included at its full build-out level in the No Action alternative. Assignment of trips related to the redevelopment was accomplished in a manual post processing of the model output. This process also accounted for the revised ramp geometrics proposed at the SR 518/SR 99 interchange.
- The 2003 Burien Comprehensive Plan contemplates the development of the NESPA parcels by 2020. The NESPA sites in Burien also were assumed to develop at office park densities in the 2024 CDP travel demand model. This land use was carried forward in the 2024 No Action alternative.

Network Structure

The 2024 No Action model includes the extension of SR 509 from its current terminus to I-5, with a new airport South Access roadway and a new interchange at 24th/28th Avenue S. All the 2010 network elements also are included.

The Build alternative tested a new north-south roadway on the 20th/21st Avenue S alignment, connecting between S 142nd Street and S 146th Street as an extension of the site access drive.

Trip Generation, Zone Activity and Analysis

The estimate of trip generation is taken directly from the 2004 NEST study, reflecting a mix of warehouse, light industrial, and truck terminal land uses, and using the 5th Edition of *Trip Generation* from the Institute of Transportation Engineers. Use of updated trip rates from subsequent editions—the 7th Edition is the most current—would indicate reduced trips for the same mix of land uses, but no updating has been undertaken. Use of the NEST trip estimates represents a conservative condition for the traffic analysis.

Traffic Operations

Intersection operations were analyzed for the locations listed in Table 1. PM peak hour operations at 12 intersections shown in Figure 2 were used in a 'screening-level' analysis of several possible corridor alignment concepts.

The opening year for the development of the 55-Acre Parcel is 2010 and the design year used for corridor traffic operations forecasts is 2024. Traffic operations are characterized by Level of Service in the PM peak hour for existing, 2010 and 2024 conditions. AM peak hour operations (for 2024 only) are characterized by the vehicular volume-to-capacity ratio on a roadway segment, using a typical lane capacity of 800 vehicles per hour (vph).

Table 1
Study Area Intersections

Intersection Location	Existing	In Use by 2010
24th Ave S / S 136th St	✓	✓
24th Ave S / S 142nd St	✓	✓
24th Ave S / S 144th St	✓	✓
24th Ave S / S 146th St	✓	✓
24th Ave S / S 152nd St	✓	✓
24th Ave S / S 150th St	✓	
24th Ave S / N. Air Cargo Access		✓
24th Ave S / Employee Parking Access		✓
24th Ave S / SR 518 WB on-ramp		✓
24th Ave S / S 154th St	✓	✓
DMM Dr S / S 128th St	✓	✓
DMM Dr S / S 136th St	✓	✓
DMM Dr S / S 144th St	✓	✓
DMM Dr S / SR 518 WB off-ramp	✓	✓
DMM Dr S / SR 518 EB on-ramp	✓	✓
Military Rd S / S 144th St	✓	✓
Military Rd S / S 150th St	✓	✓
S 154th St / International Blvd S	✓	✓
S 154th St / SR 518 WB off-ramp	✓	
S 154th St / SR 518 WB on-ramp	✓	
S 154th St / 32nd Ave S / SR 518 WB off-ramp		✓
S 154th St / SR 518 EB off-ramp	✓	✓
SR 99 / SR 518 EB on-ramp	✓	✓

Source: HNTB Corporation, 2007

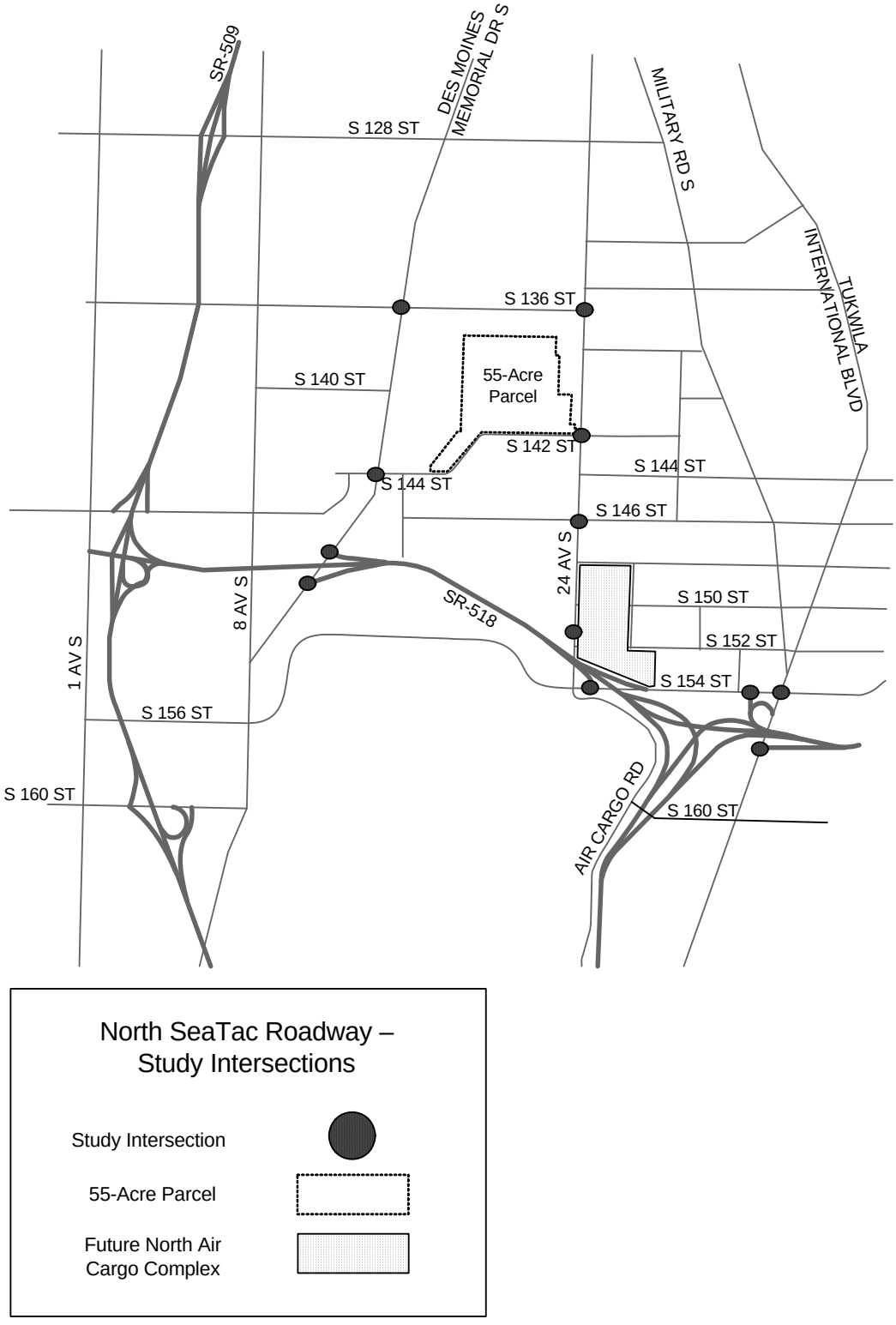


Figure 2: Study Intersections

EXISTING CONDITIONS

Roadway Network

A network of freeway and arterial street facilities serves the study area, providing regional connections and access and circulation for local residential and commercial/industrial traffic. Figure 3 shows the functional classifications for the study area roadway network.

SR 518 is a four/six-lane freeway facility extending east-west between I-5 and 1st Avenue in Burien, with a speed limit of 60 mph. Interchanges are located at 51st Avenue S (partial), SR 99 (partial), North Airport Expressway (full), S 154th Street (partial), Des Moines Memorial Drive (partial), and SR 509 (full).

SR 509 is a four-lane freeway facility extending south from Seattle to a terminus at S 188th Street, continuing to Tacoma as an arterial route. In the project vicinity, there are interchanges at S 128th Street (full), S 146th Street (partial), SR 518 (full), and S 160th Street (full).

Des Moines Memorial Drive South is generally a two-lane minor arterial that runs north and south. Transit stops are provided, and the speed limit is 35 MPH. Much of the street has soft shoulders, but shoulders are paved, or sidewalks are provided, near intersections and turn lanes are provided at major intersections.

South 142nd Street, 142nd Place South, and South 144th Streets, between Des Moines Memorial Drive South and 24th Avenue South, form a two-lane collector arterial that runs east and west. The speed limit is 30 MPH and paved shoulders are provided. Advisory signing for 25 mph is provided in two curves along 142nd Pl S. West of Des Moines Memorial Drive, South 144th Street continues as a two-lane collector arterial, becoming South 146th Street between Eighth and First Avenues South. East of 24th Avenue South, South 144th Street is a two-lane collector arterial with sidewalk on one side and paved shoulder on the other.

24th Avenue South, between South 154th Street and South 128th Street, is a two/three-lane collector arterial that runs north and south with a speed limit of 35 MPH and intermittent curb-lane parking, and sidewalks on both sides of the street. Transit stops are located along the street, and a striped bicycle lane is provided southbound south of S 136th Street.

Air Cargo Road is a three/four-lane minor arterial that runs north and south between South 154th and 170th Streets. The speed limit is 30 MPH, turn lanes and sidewalks are not provided, and transit stops are located throughout.

Military Road is a two-lane minor arterial that runs north and south, with a speed limit of 35 MPH. Paved shoulders are provided.

International Boulevard, alternatively known as State Route 99 and Pacific Highway South, is generally a five-lane principal arterial that runs north and south, some sections are four-lane with a center median. Left-turn lanes are provided throughout. Right-turn lanes are provided at some intersections, the speed limit is 40 MPH, and transit stops and pedestrian facilities are located throughout. Traffic signals are located at all intersections with major cross-streets.

South 128th Street, between First Avenue South and SR-509, is a four-lane minor arterial that runs east and west. The speed limit is 35 MPH, turn lanes are provided at major intersections, sidewalks are provided on both sides of the street, and limited curb-lane parking. East of SR-509,

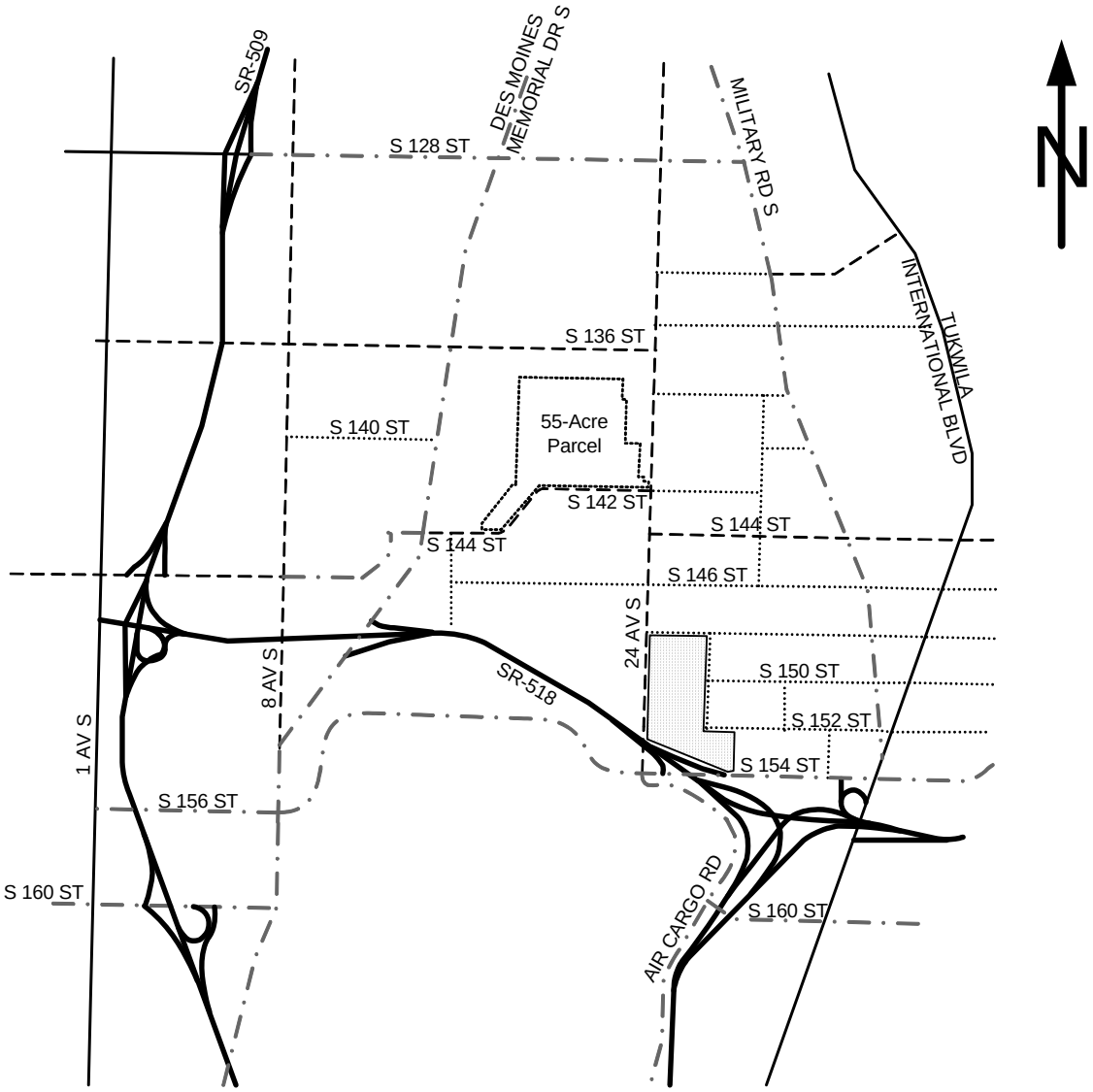
128th Street is a wide two-lane minor arterial with no turn lanes, sidewalks on both sides and curb-lane parking.

South 136th Street is a two-lane collector arterial that runs east and west, with a speed limit of 35 MPH and sidewalks on both sides of the street. Turn lanes are provided only at the intersection with First Avenue South.

South 146th Street extends between 16th Avenue S and International Blvd as a two-lane local street with unpaved shoulders and intermittent sidewalks, and a 25 MPH speed limit.

South150th and 152nd Streets, between 24th Avenue South and Military Road, are local streets with unpaved shoulders and intermittent sidewalks, a 25 MPH speed limit, and vehicle weight restrictions of 10,000 pounds.

East of 24th Avenue South, South 154th Street is a two-lane minor arterial with paved shoulders and a speed limit of 35 MPH. Turn lanes and sidewalks are provided at major intersections. West of 24th Avenue South, South 154th Street becomes South 156th Way and then South 156th Street, with similar characteristics.



North SeaTac Roadway Study - Roadway Functional Classification

- Freeway
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Future North Air Cargo Complex
- 55-Acre Parcel

Sources:
City of SeaTac Comprehensive Plan, 2006
City of Burien Comprehensive Plan, 2006

Figure 3: Roadway Functional Classification

Traffic Operations

Daily and hourly traffic volumes for the surface street network were obtained from WSDOT, the Port of Seattle, and adjacent city jurisdictions. Additional data was provided in the form of turning movement counts for many intersections.

Table 2 summarizes the intersection operations in the study area under existing conditions. LOS and average delay per vehicle are presented. For unsignalized intersections, operations are characterized by the intersection leg with the longest delay.

Table 2
Intersection Operations – Existing Conditions

Signalized Intersection	2005 Existing LOS and (Average Delay)
DMMD & S 128 St	B (14.1)
DMMD & S 136 St	A (8.1)
DMMD & S 144 St	D (36.6)
DMMD & S 156 St	B (15.9)
IB & SR-518 EB On-Ramp	A (6.2)
IB & S 154 St	D (39.1)
24 Ave S & S 154 St	B (10.1)
Unsignalized Intersection	**2005 Existing LOS and (Average Delay)**
DMMD & SR-518 WB Off-Ramp	E (39.0)
DMMD & SR-518 EB On-Ramp	A (2.5)
DMMD & 8 Ave S	D (25.5)
S 154 St & SR-518 WB Off-Ramp	F (54.1)
S 154 St & SR-518 EB Off-Ramp	C (22.3)
24 Ave S & S 146 St	C (15.4)
24 Ave S & S 146 St	B (13.9)
24 Ave S & S 144 St	B (11.8)
24 Ave S & S 142 St	C (16.5)
24 Ave S & S 136 St	B (11.0)
Military Rd & S 150 St	C (15.2)
Military Rd & S 144 St	E (42.6)

Note: IB: International Boulevard, DMMD: Des Moines Memorial Drive
Source: HNTB Corporation, 2007

Accident History

Accident data from 2002 through 2004 were collected for intersections in the surface traffic study area. The accidents were analyzed and summarized for each intersection, and the average number of annual accidents at intersections in the study area was found to vary from zero to 27. Table 3 summarizes the average number of annual accidents at signalized intersections in the study area.

Table 3
Signalized Intersection Accident History, 2002-2004

Signalized Intersection	Total Number of Accidents	Annual Average Number of Accidents
S 136 St & DMMD	1	1
S 144 St & DMMD	0	0
S 154 St & 24 Ave S	10	4
S 154 St & IB	8	3
S 128 St & DMMD	4	2
S 136 St & 8 Ave S	0	0
SW 160 St & 8 Ave S	0	0
SR-518 EB On-Ramp & IB	11	4
S 160 St & IB	40	14

Note: IB: International Boulevard, DMMD: Des Moines Memorial Drive
Source: Cities of SeaTac, Burien, Des Moines

Table 4 summarizes the average number of annual accidents at unsignalized intersections in the study area.

Table 4
Unsignalized Intersection Accident History, 2002-2004

Signalized Intersection	Total Number of Accidents	Annual Average Number of Accidents
S 140 St & DMMD	2	1
SR-518 WB Off-Ramp & DMMD	14	5
SR-518 EB On-Ramp & DMMD	1	1
S 152 St & DMMD	1	1
8 Ave S & DMMD	2	1
S 156 Way & DMMD	15	5
S 142 St & 24 Ave S	6	2
S 144 St & 24 Ave S	3	1
S 146 St & 24 Ave S	9	3
S 150 St & 24 Ave S (From East)	0	0
S 152 St & 24 Ave S	1	1
SR-518 EB Off-Ramp & S 154 St	8	3
SR-518 WB On-Ramp & S 154 St	0	0
SR-518 WB Off-Ramp & S 154 St	4	2
S 150 St & Military Rd	1	1
S 144 St & Military Rd	2	1
S 140 St & 8 Ave S	0	0
S 146 St & 8 Ave S	0	0
S 160 St & Air Cargo Rd	0	0
S 150 St & 24 Ave S (From West)	0	0

Note: IB: International Boulevard, DMMD: Des Moines Memorial Drive
Source: Cities of SeaTac, Burien, Des Moines

Planned and Programmed Improvements

A list of capacity-related planned and programmed roadway improvements was assembled following a review of Transportation Improvement Programs for the jurisdictions in the surface traffic study area. The projects that appear to have funding, and are likely to be completed by the close of the year 2010 are:

- SR 518 westbound entrance ramp at S 154th Street will be relocated to enter from 24th Avenue S, so that it will be accessible from Air Cargo Road and the North Freight Cargo Complex.

- International Boulevard/S 154th Street intersection channelization and signal phasing modifications will be constructed.

- International Boulevard Widening (SR 518 Loop Ramp to S 160th Street) – Create an additional southbound lane on International Boulevard, originating at the loop ramp from westbound SR 518, and extending across the bridge to S 160th Street. This project is a mitigation measure associated with development of the Consolidated Rental Car Facility.

- International Boulevard/S 160th Street – An additional right-turn lane for eastbound traffic will be developed at this intersection to accommodate impacts associated with development of the Consolidated Rental Car Facility. In the long term, double left-turn lanes would be provided for north bound traffic turning onto westbound S 160th Street.

- A new entrance ramp at S 160th Street onto the northbound Airport Expressway would be provided in association with the Consolidated Rental Car Facility.

- Airport Link Light Rail – Sound Transit is in the process of constructing light rail facilities to connect Sea-Tac Airport with downtown Seattle. The project includes modification of channelization at the International Boulevard/S 154th Street intersection near the proposed Tukwila Station.

Arterial street projects likely to be completed by 2024 were identified from the long-range needs identified by individual cities. Funding for these projects generally has not been specifically allocated, except to define these projects as priorities of local jurisdictions, and development schedules are uncertain. The following projects are included in the future roadway networks:

- Extension of SR 509 to I-5 from its current terminus at S 188th Street, as a six-lane facility including HOV lanes and a collector-distributor system along I-5.

- Construction of the 28th Avenue S corridor across the SR 509 extension to connect with 24th Avenue S. This will consist of a four-to-five-lane street with curb, gutter, sidewalk, and bike lanes.

- The SR 518/SR 99 interchange would be modified to relocate the exit ramp from westbound SR 518 to S 154th Street, with signalization, and to add a westbound exit ramp connecting directly to International Boulevard, serving right turns.

- Des Moines Memorial Drive will be widened to provide a two-way center left turn lane between S 128th Street and S 200th Street.

- Military Road will be widened from S 128th Street to International Boulevard to provide drainage, bicycle lanes and pedestrian facilities. Left turn lanes would also be provided at S 128th Street, S 133rd Street, S 144th Street and the entrance to the Riverton Hospital.

- S 144th Street will be reconstructed between Military Road and 24th Avenue S. Improvements would provide drainage and pedestrian facilities as well as channelization improvements.

Transit Service and Facilities

Public services currently consist of bus transit, with a future light-rail transit connection under construction. The Port of Seattle operates an employee shuttle service connecting the employee parking lots to airport employment destinations.

King County Metro Transit operates several bus routes within the project study area. Routes 121, 122, and 123 operate on SR 509. Route 128 travels on Military Road, north of S 144th Street. Route 131 travels on 1st Avenue S. Route 132 operates on Des Moines Memorial Drive between S 146th Street and S 128th Street and Military Road north of S 128th Street. Route 140 operates on SW 156th Street, S 154th Street and Air Cargo Road. Route 170 operates on S 144th Street, 24th Avenue S, Military Road and International Boulevard. Route 174 also operates on S 144th Street (east of Military Road), Military Road and International Boulevard. Sound Transit route 560 operates on SR 518 in the project study area.

Metro Transit also maintains a 28 space Park and Ride lot near S 148th Street and Pacific Highway S.

Figure 4 shows the public transit services in the vicinity of the project.

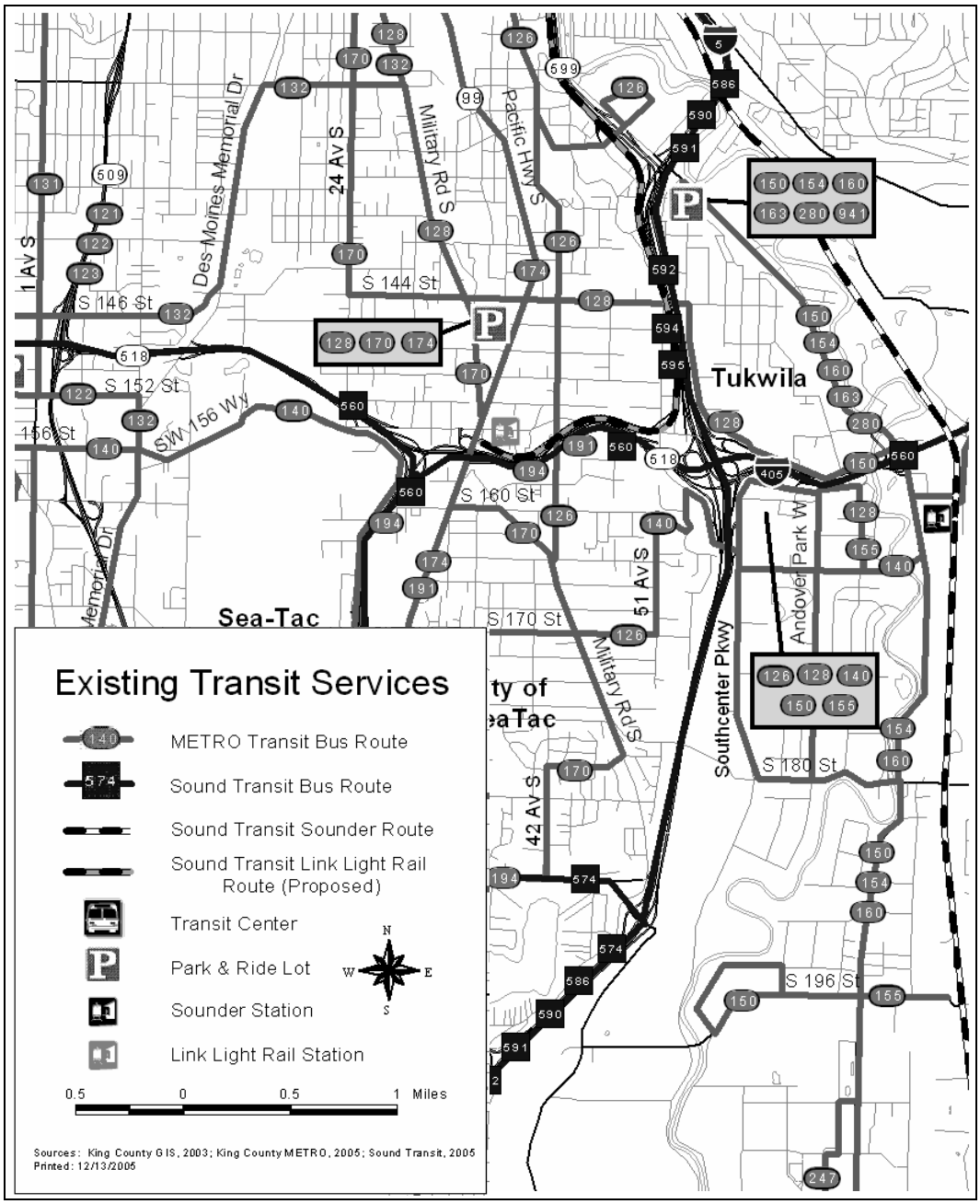


Figure 4: Existing Transit Facilities

Planned and Programmed Improvements

Sound Transit's Link light rail transit station and track facilities are currently under construction along the north side of the SR-518 alignment in Tukwila, and will begin service to Seattle, SeaTac and Sea-Tac Airport in 2009. In July 2009, the Sound Transit Central Link light rail system is scheduled to open for service, which will bring light rail service to a new Tukwila International Boulevard Station planned at the northeast corner of South 154th Street and Tukwila International Boulevard. In December 2009, the Airport Link section, extending the light rail service from the Tukwila International Boulevard Station to a new SeaTac/Airport Station to be

located on the east side of the Sea-Tac Airport Parking Garage, just south of South 170th Street on International Boulevard. When operational, the Link light rail service will provide patrons with a 33-minute travel time between the Airport and downtown Seattle. Trains will run every 6-10 minutes, and patrons will be able to access the Airport terminal via a four-minute walk through the Sea-Tac Airport Parking Garage. A new pedestrian bridge across International Boulevard will connect the station to commercial land uses to the east.

After 2015, the Sound Transit Link project would be extended south of the airport to a new terminus near S 200th Street. A park-and-ride lot with 630 spaces would be developed in conjunction with the station.

In November, 2006, King County voters approved the Transit Now initiative to improve the frequency and reliability of bus service in the County. The ten-year program includes additional service hours for existing high-ridership corridors, and new bus rapid transit service in five busy corridors, including Pacific Highway S (International Boulevard). Implementation of the service improvements began in February, 2007. Planning for the Pacific Highway S RapidRide service was initiated in November, 2007.

Freight

Roadways in the study area serve heavy vehicle movement of freight associated with air cargo activity at the airport, together with background heavy vehicle traffic on the regional network.

Roadway facilities within the State are classified according to their role in serving the movement of truck freight (*Freight and Goods Transportation System 2003 Update*, WSDOT). Facilities which serve movements in excess of 10 million tons annually are classified as T-1 routes, and facilities serving the movement of 4 to 10 million tons annually are categorized as T-2 routes. Additional classifications cover routes with lesser levels of freight movement.

Facilities designated as T-1 routes include I-5, I-405, SR 99, and SR 518 east of SR 99. Between SR 99 and SR 509, SR 518 is designated as a T-2 route. SR 509 is also classified as a T-2 route north of SR 518.

Local governments have established truck routes within their jurisdictions. The Cities of SeaTac and Burien both include SR 518 and SR 509 as freeway truck routes. In SeaTac, International Boulevard, S 160th Street, S 154th Street, and parts of Des Moines Memorial Drive are indicated as arterial truck routes. Truck routes in the project study area vicinity are shown on Figure 5.

Levels of heavy vehicle traffic on roadway facilities adjacent to the airport were obtained from traffic count and vehicle classification data provided by WSDOT (State highway facilities), intersection turning movement counts conducted for this analysis, and annual counts conducted by the Port.

Heavy vehicles are estimated to comprise about 7 percent of total weekday traffic on SR 518 between SR 99 and I-5, and about 4 percent of weekday traffic between SR 509 and SR 99. On SR 509, heavy vehicles constitute 3 percent of volume north of SR 518.

On International Boulevard (SR 99), heavy vehicles compose about 7 percent of the traffic stream north of S 188th Street, with truck volumes of about 100 vph in each direction. North of S 170th Street, truck volumes average 35 to 45 trucks per hour in each direction, or about 3 ½ percent of PM peak traffic.

On Air Cargo Road, peak-hour heavy vehicle volumes range between 50 to 115 vph, or 30 to 40 percent of weekday PM peak traffic with buses representing 4 to 5 percent. Along S 160th Street, heavy vehicle volumes reach about 60 vph, comprising almost 40 percent of all weekday PM traffic.

On Des Moines Memorial Drive, background truck volumes are about 10 trucks in each direction between S 156th Street and the SR 518 ramps. With the upcoming completion of the Third Runway project, a temporary interchange modification at the SR 518 interchange will be removed. North of the SR 518 ramps, PM peak hour truck volumes are about 15 trucks in each direction.

Hourly truck traffic on S 154th Street ranges up to 30 trucks in each direction east of 24th Avenue S, and 10 trucks each direction west of 24th Avenue S.

Up to 20 trucks hourly travel in each direction on 24th Avenue S north of S 154th Street.

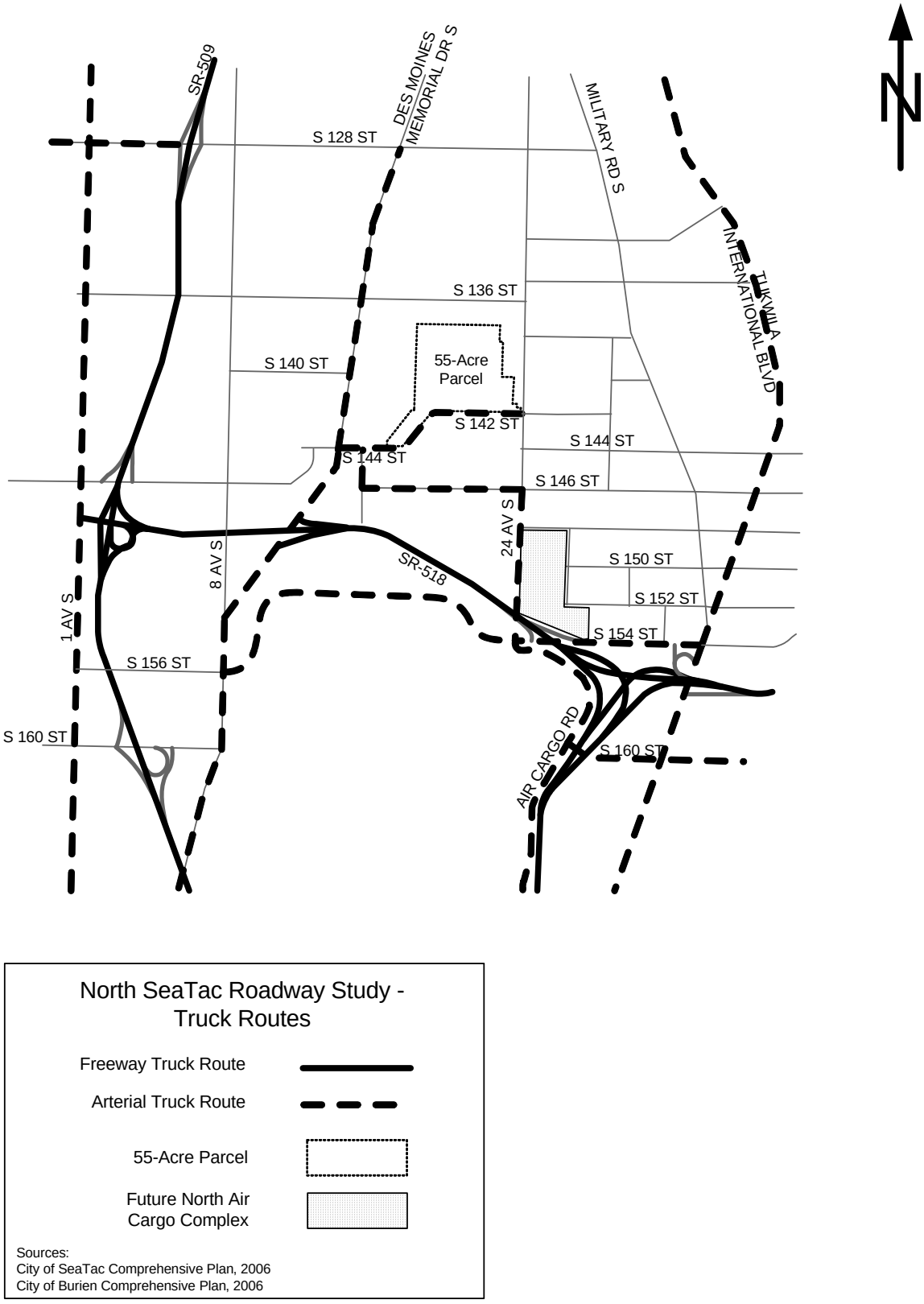


Figure 5: Truck Routes

Data related to truck movement of air cargo was obtained in an e-mail and telephone survey of six firms during December, 2004, in support of a grant request from the Freight Mobility Strategic Investment Board (FMSIB). About 27 percent of daily air cargo truck trips occur in the 9 AM – noon period, and 17 percent occur in the 3 – 6 PM peak. Eighteen percent of truck trips occur between the hours of 6 PM and midnight. All these periods overlap with times of high passenger activity at the airport terminal. Most air cargo truck traffic currently uses the North Airport Expressway and SR 518 for access to the regional freeway system.

Non-Motorized Transportation

Pedestrians and bicyclists are served by a network of sidewalks, crosswalks, and street shoulders within the study area. Continuous sidewalks are provided along International Boulevard, S 154th Street, and Air Cargo Road, and intermittent sidewalks and shoulders along other streets. Crosswalks with pedestrian push buttons are provided at most signalized intersections.

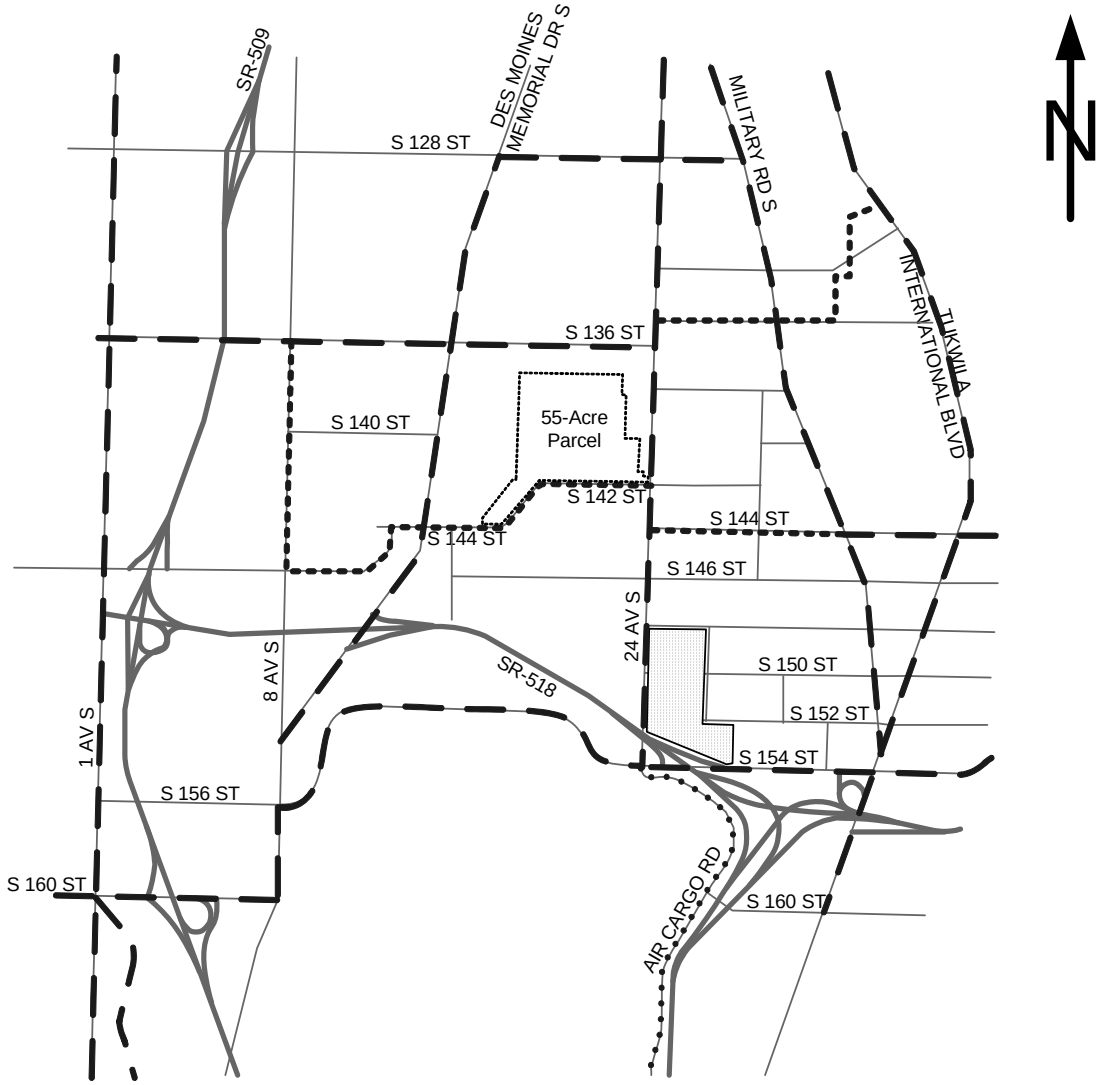
Sidewalks are provided on both sides of International Boulevard. International Boulevard also provides wide curb lanes or shoulders to serve bicycle travel in the airport vicinity. Similar provisions are made for bicycle travel along portions of S 154th Street, Military Road, and 24th Avenue S. Bike lanes are provided on segments of Air Cargo Road.

The King County Department of Transportation Road Services division publishes the Bicycling Guide Map, which recommends bicycle routes in the vicinity of the project study area. Routes can be either striped bicycle lanes on arterials, trails, or low-volume streets. The County-recommended routes in the study area are summarized in Figure 6.

Pedestrian activity within the City of SeaTac is oriented to the sidewalks and crosswalks along the major arterial street routes. Areas of highest activity are along International Boulevard, where some intersections experience up to about 35 pedestrian and bicycle crossings in the PM peak hour. Away from this corridor, pedestrian and bicycle volumes fall to under 10 observations hourly.

Improvements to the non-motorized system are planned to accompany several planned and programmed transportation projects:

- The reconstruction of S 154th Street in 2009 between International Boulevard and 32nd Avenue S will include sidewalks, as part of the Tukwila Station development
- The reconstruction of S 154th Street between 24th Avenue S and 32nd Avenue S by the City of Seatac in 2009/2010 will include bike lanes and sidewalks
- The reconstruction of S 144th Street between Military Road and 24th Avenue S, planned after 2014, will include sidewalks
- Reconstruction of Des Moines Memorial Drive, planned after 2014, would include sidewalks and bicycle facilities
- Reconstruction of Military Road between S 128th Street and International Boulevard after 2014 would include pedestrian and bicycle facilities



North SeaTac Roadways Study-
Existing Bicycle Routes

- Street with Wide Curb Lane or Paved Shoulder
- Low Traffic Street
- On-Street Bicycle Lane
- Future North Air Cargo Complex
- 55-Acre Parcel

Source: KCDOT, 2005
City of SeaTac, 2006

Figure 6: Existing Bicycle Routes

FUTURE CONDITIONS

Future traffic operations were examined for No Action and Build alternatives. The Build alternative would include commercial/industrial development of the 55-Acre Parcel and a north/south roadway corridor to provide access to the development site. Vehicular trips associated with the development were distributed onto the study area roadway network using TModel2. A graphical representation of the distribution of site-related trips is appended to this document.

Trip Generation

The NEST partnership identified four possible development scenarios for the 55-Acre Parcel. Warehousing, truck terminal, a mix of warehousing and truck terminal and a mix of warehousing, truck terminal and light industrial. This final land use scenario was used determine the number of daily vehicular trips generated by the site.

ITE's *Trip Generation*, 7th Edition was used to obtain 24 hour, AM peak hour and PM peak hour trip generation rates. It was determined by NEST that the parcel contained 27.2 acres of developable land and could support a building size of 436,000 square feet. This resulted in 2,933 new daily trips, 339 trips in the AM peak hour and 313 trips in the PM peak hour.

Based on tables presented in Appendix A of the ITE *Trip Generation Handbook* 2nd edition, truck trip generation rates were applied to the site trips, producing an estimate of 410 daily truck trips and 26 truck trips in both the AM and PM peak hours. Table 5 summarizes the vehicular trip generation for the 55-Acre Parcel.

Table 5
Vehicular Trip Generation

	Daily Trips			AM Peak Hr			PM Peak Hr		
	In	Out	Total	In	Out	Total	In	Out	Total
New Trips	1,467	1,467	2,933	258	81	339	72	241	313
Truck Trips	205	205	410	18	8	26	9	17	26
Auto Trips	1,262	1,262	2,523	240	73	313	63	224	287

Source: HNTB Corporation, 2007

Project Trip Distribution and Assignment

The distribution of project-related employee and visitor trips is expected to shift in response to the future completion of the extension of SR 509 to I-5. In the 2010 distribution, approximately 14 percent of all project trips will be oriented to/from the east on SR 518. A similar percentage will be oriented to/from the north on Des Moines Memorial Drive S. Nearly 15 percent of all project trips are forecasted to be to/from local destinations within a 2-4 mile radius of the site.

In the 2024 distribution, nearly 30 percent of outbound vehicles would travel east on SR-518, 13 percent would travel north or south on SR-509 and 15 percent would be destined to Burien. The majority of remaining outbound trips have local destinations within a 2-4 mile radius of the site. The inbound trip distribution shows 20 percent of trips arriving from the east on SR-518, 36 percent of trips arrive from the north, with a majority of these trips using Des Moines Memorial

Drive, 16 percent arriving from the south, 7 percent arriving from Burien and 20% of inbound trips have local origins.

Truck trips were distributed on routes designated for truck travel as described in the Freight Movement chapter.

A potential new corridor along the 20th /21st Ave S alignment between S 142nd St and S 146th St did not attract significant traffic volumes. Neither project traffic nor through traffic is likely to use this route as an alternative to travel along 24th Ave S. It is not recommended for advancement into the design stage.

Figure 7 shows PM peak hour midblock volumes for roadways near the site. Existing volumes are shown along with build and no-build conditions for 2010 and 2024.

Intersection Operations

Traffic operations were analyzed using Synchro 6 software. In the opening year, all signalized intersections in the study area would operate at an acceptable level (LOS E or better). Of the fourteen unsignalized intersections in the study area, three would operate at LOS F in the 2010 No Action and Build scenarios. All unsignalized intersections that would operate at an acceptable level in the No Action scenario, would also operate at an acceptable level in the Build scenario.

In the design year under the No Action scenario, one signalized intersection (Des Moines Memorial Drive and S 156th Street) would operate at LOS F. All other signalized intersections would operate at LOS E or better. LOS grades at signalized intersections do not deteriorate under the Build scenario.

In the design year under the No Action scenario, five unsignalized intersections would operate at LOS F. The intersections that would deteriorate to LOS F between 2010 and 2024 are Des Moines Memorial Drive at 8th Avenue S, S 154th Street at the SR-518 EB Off-Ramp and Military Road at S 150th Street. The remaining unsignalized intersections would operate at LOS D or better. Under the Build scenario, operations at unsignalized intersections in the study area would not change significantly from the No Action scenario.

If the intersections of Des Moines Memorial Drive at 8th Avenue S and Des Moines Memorial Drive at the SR-518 WB Off-Ramp were signalized by the year 2024, operations at these intersections would improve to LOS A and LOS C respectively. This would reduce the number of unsignalized intersections operating at LOS F to three and one signalized intersection would remain operating at LOS F.

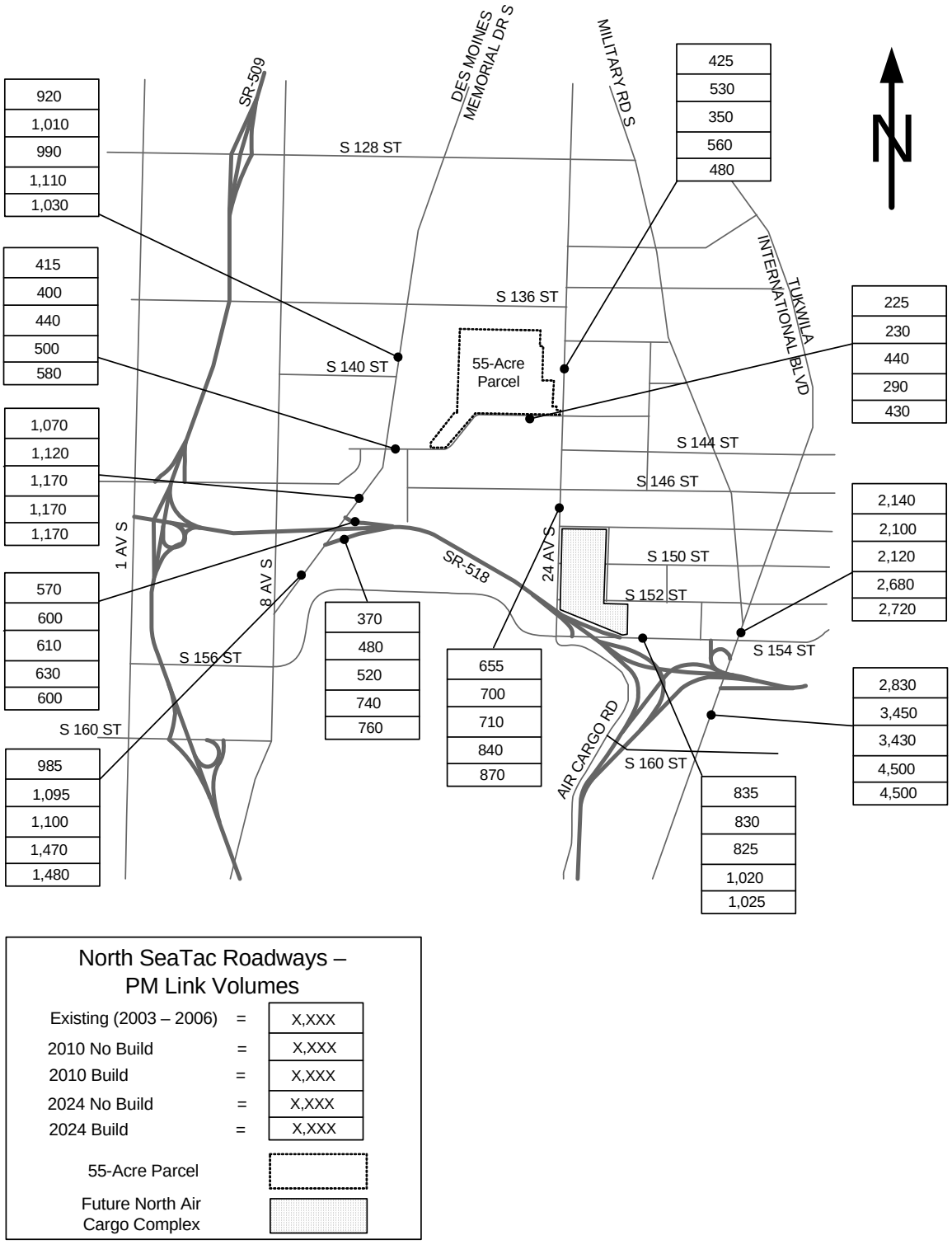


Figure 7: PM Peak Hour Mid-block Volumes

Table 6 summarizes the operations of signalized intersections in the study area. LOS grades are shown along with the associated value for average seconds of delay per vehicle in parentheses.

Table 6
Signalized Intersection Operations: LOS (Average Delay)

Intersection	2005 Existing	2010 No Action	2010 Build	2024 No Action	2024 Build w/o new DMMD signals	2024 Build with new DMMD signals
DMMD & S 128 St	B (14.1)	B (15.0)	B (14.9)	B (16.2)	B (18.6)	B (18.6)
DMMD & S 136 St	A (8.1)	A (9.1)	A (9.0)	B (11.5)	A (9.5)	A (9.5)
DMMD & S 144 St	D (36.6)	D (44.4)	D (48.1)	E (67.7)	E (66.7)	E (66.7)
DMMD & SR-518 WB Off-Ramp	--	--	--	--	--	C (21.3)
DMMD & 8 Ave S	--	--	--	--	--	A (9.8)
DMMD & S 156 St	B (15.9)	B (13.7)	B (13.7)	F (136.5)	F (141.6)	F (141.6)
IB & SR-518 EB On-Ramp	A (6.2)	A (8.2)	A (8.4)	B (10.4)	B (10.6)	B (10.6)
IB & S 154 St	D (39.1)	C (25.9)	C (26.1)	D (41.6)	D (44.8)	D (44.8)
S 154 St & SR-518 WB Off-Ramp	--	--	--	C (20.9)	C (21.3)	C (21.3)
24 Ave S & S 154 St	B (10.1)	A (9.4)	A (9.5)	C (20.8)	C (22.7)	C (22.7)

Note: IB: International Boulevard, DMMD: Des Moines Memorial Drive
Source: HNTB Corporation, 2007

Des Moines Memorial Drive/S 144th Street Intersection Modifications

Traffic operations at the Des Moines Memorial Drive/S 144th Street intersection would deteriorate below LOS D in the design year. LOS C could be achieved in the 2024 PM peak hour at this location with the addition of a westbound left-turn lane on S 144th Street, serving the movement to southbound Des Moines Memorial Drive. The added westbound left-turn lane would provide a benefit to traffic operations by eliminating the east-west split-phase signal control and reducing delay for westbound through/right movements. Queues in the southbound direction during the PM peak hour would also be reduced from 1,400 feet to 550 feet with the addition of a westbound left turn lane and protected east/west left turn signal phasing.

Retiming the signal while retaining the existing channelization would result in LOS D with 36.2 seconds of delay. This would be an acceptable level of service, but significant queue length reductions and improvements to truck movements would not be achieved by timing revisions alone.

The existing right-of-way width is sufficient to accommodate the added lane, but the configuration of parking for adjacent businesses may be disrupted by the widening. At the auto repair shop on the northeast corner of the intersection, two garage entrances on the south edge of the building are accessed from S 144th Street. It is estimated that the intervening distance to the north right-of-way line of S 144th Street is about 15 feet. This depth may be insufficient to continue the practice of perpendicular parking on the outside of the garage entrances, without intrusion onto the future sidewalk. Reconfiguration of the parking and access for the tavern southeast of the intersection also could be required.

Channelization for the added westbound left-turn lane would be adjusted to align with the lane layout on the west leg of this intersection. Intersection modification would be needed to

accommodate the turning movements of large trucks at the Des Moines Memorial Drive/S 144th Street intersection. With the existing truck route designations, trucks would be turning primarily between the south and east legs of the intersection. Trucks also might be expected to turn between the north and east legs of the intersection. Right-of-way acquisition could be expected for widening of the corner radii to serve turning trucks.

The City of Burien is currently considering a Comprehensive Plan amendment to allow retail uses on the NESPA noise mitigation properties west of Des Moines Memorial Drive. Additional traffic associated with this action would produce LOS F at the Des Moines Memorial Drive/S 144th Street intersection during the 2020 PM peak hour. With the added westbound left-turn lane, LOS E is projected for these conditions.

Table 7 summarizes the intersection operations for unsignalized intersections in the study area. LOS grades are shown along with values for average seconds of delay per vehicle in parentheses. For all unsignalized intersections, LOS and delay values are reported for the worst intersection approach leg.

Table 7
Unsignalized Intersection Operations: LOS (Average Delay)

Intersection	2005 Existing	2010 No Action	2010 Build	2024 No Action	2024 Build w/o new DMMD signals	2024 Build with new DMMD signals
DMMD & SR-518 WB Off-Ramp	E (39.0)	F (117.5)	F (133.3)	F (>50)	F (>50)	--
DMMD & SR-518 EB On-Ramp	A (2.5)	A (3.2)	A (3.6)	A (4.3)	A (4.8)	A (4.8)
DMMD & 8 Ave S	D (25.5)	D (28.8)	D (33.4)	F (139.4)	F (135.1)	--
S 154 St & SR-518 WB Off-Ramp	F (54.1)	F (60.2)	F (54.9)	--	--	--
S 154 St & SR-518 EB Off-Ramp	C (22.3)	C (23.2)	C (22.6)	F (64.5)	F (64.3)	F (64.3)
24 Ave S & SR-518 WB On-Ramp	--	A (4.0)	A (3.9)	A (5.0)	A (5.1)	A (5.1)
24 Ave S & Employee Parking	--	C (15.2)	C (15.3)	C (18.1)	C (18.5)	C (18.5)
24 Ave S & N Air Cargo Complex	--	C (18.5)	C (19.3)	C (23.5)	C (23.9)	C (23.9)
24 Ave S & S 146 St	B (13.9)	B (13.8)	C (15.4)	D (29.7)	D (29.3)	D (29.3)
24 Ave S & S 144 St	B (11.8)	C (15.1)	C (15.5)	C (21.6)	D (25.1)	D (25.1)
24 Ave S & S 142 St	C (16.5)	C (18.2)	C (22.6)	C (21.9)	D (29.6)	D (29.6)
24 Ave S & S 136 St	B (11.0)	B (12.6)	B (12.0)	B (14.4)	B (12.9)	B (12.9)
Military Rd & S 150 St	C (15.2)	C (24.6)	C (24.7)	F (>50)	F (>50)	F (>50)
Military Rd & S 144 St	C (16.6)	C (20.2)	C (19.9)	F (115.3)	F (129.1)	F (129.1)
N SeaTac Rd & S 136 St	--	--	B (10.6)	--	B (13.6)	B (13.6)
N SeaTac Rd & S 142 St	--	--	A (9.9)	--	C (16.6)	C (16.6)
N SeaTac Rd & S 146 St	--	--	B (10.6)	--	B (10.9)	B (10.9)

Note: IB: International Boulevard, DMMD: Des Moines Memorial Drive
Source: HNTB Corporation, 2007

Table 8 shows AM peak hour traffic operations for year 2024 under the build scenario. Level of service grades were assigned based on roadway volume-to-capacity (v/c) ratios as outlined in *Transportation Research Circular 212* published by the Transportation Research Board. All the roadway segments shown in Table 8 would operate at LOS D or better. 88% of the listed facilities would operate at LOS A.

Mitigation for the LOS F condition at the SR 518 eastbound off-ramp to S 154th Street was identified in the CDP EA. The two mitigation options identified were (a) signalize the ramp terminal intersection, or (b) extend an additional westbound lane from the ramp terminal intersection to 24th Avenue S, where it could drop as a right-turn lane. Either of these options would produce LOS D or better.

Table 8
2024 AM Peak Hour Roadway Volume and LOS

			Directional Volume and LOS			
Name	**From**	**To**	**NB**	**LOS**	**SB**	**LOS**
DMMD	S 128th St	S 136th St	295	A	219	A
DMMD	S 136th St	S 144th St	422	A	215	A
DMMD	S 144th St	SR518 WB Off-Ramp	521	B	208	A
DMMD	SR518 WB Off-Ramp	SR 518 EB On-Ramp	196	A	423	A
24th Ave S	S 136th St	S 142nd St	112	A	131	A
24th Ave S	S 142nd St	S 144th St	267	A	197	A
24th Ave S	S 144th St	S 146th St	249	A	213	A
24th Ave S	S 146th St	S 148th St	338	A	246	A
IB	SR518 EB On-Ramp	S 154th St	1292	C	932	A
IB	S 154th St	Military Road	942	A	880	A

			Directional Volume and LOS			
Name	**From**	**To**	**EB**	**LOS**	**WB**	**LOS**
S 144th St	DMMD	20th/21st	116	A	192	A
S 144th St	12th Pl S	DMMD	89	A	160	A
S 142nd St	20th/21st	24th Ave S	91	A	216	A
S 136th St	DMMD	24th Ave S	194	A	140	A
S 136th St	8th Ave S	DMMD	279	A	136	A
S 142nd St	24th Ave S	29th Ave S	29	A	65	A
S 144th St	24th Ave S	29th Ave S	82	A	102	A
S 146th St	Employee Parking	24th Ave S	70	A	109	A
S 146th St	24th Ave S	29th Ave S	41	A	24	A
S 154th St	24th Ave S	SR 518 EB Off-ramp	323	A	414	A
S 154th St	SR 518 EB Off-Ramp	29th Ave S	466	A	262	A
S 154th St	29th Ave S	32nd Ave S	177	A	656	D
S 154th St	32nd Ave S	IB	303	A	467	A
S 154th St	IB	40th Ave S	366	A	232	A

		Ramp Volume and LOS	
Name	**To**	**Vph**	**LOS**
SR518 WB Off-Ramp	S 154th St	161	A
SR518 EB Off-Ramp	S 154th St	295	A
SR518 WB Off-Ramp	DMMD	540	A

Note: IB: International Boulevard, DMMD: Des Moines Memorial Drive
Source: HNTB Corporation, 2007

Traffic Calming Applications

A primary concern with the redevelopment of the noise mitigation properties is the potential for truck traffic or commute traffic to intrude into adjacent residential neighborhoods east of 24th Avenue S. Commute trips from the 55-Acre Parcel would initially distribute among the adjacent collector arterial facilities such as S 142nd Street, S 144th Street, S 136th Street, and 24th Avenue S. Most longer trips would use the minor arterial connections at Des Moines Memorial Drive, S 154th Street, S 128th Street, and Military Road to reach principal arterial or freeway routes. Some shorter commute trips might use the local street system to reach nearby residential destinations.

Truck traffic would be restricted to designated routes which are intended to reduce neighborhood noise and nuisance intrusion. Several streets in the neighborhood are signed for a 10,000 pound weight restriction, and this practice could be extended as needed. Site tenants would be expected to make their delivery drivers aware of the truck restrictions. The development conditions accompanying occupancy of the 55-Acre Parcel also could incorporate these provisions.

The select zone analysis plot for the 55-Acre Parcel was used to identify potential commuter routes in the site vicinity. Along the project roadway (S 142nd Street/142nd Pl S/S 144th Street), commute traffic would add 60 to 100 vph during the PM peak hour between 24th Avenue and Des Moines Memorial Drive, and representing an increase of up to 29 percent in traffic volume compared to the 2010 No Action condition. On S 144th Street between 24th Avenue S and Military Road, about 45 peak-hour trips would be added, comprising about 16 percent of all site trips. This represents an increase of about 19 percent in traffic volume compared to 2010 No Action conditions. Most of the eastbound traffic on S 144th Street would use Military Road as a route to International Boulevard and eastbound SR 518. About 40 added trips would use 24th Avenue S at the SR 518 overcrossing, representing an increase of about seven percent attributable to project trips.

The trip distribution would shift slightly in the 2024 design year with the influence of the completion of SR 509. In this setting, more site traffic is attracted to Des Moines Memorial Drive as a route to and from the south compared to 2010 conditions. In 2024, the increase in volume along S 144th Street between 24th Avenue S and Millitary Road would be about 35 vph, representing a 12 percent increase during the PM peak hour compared to the No Action condition. Again, about 70 percent of the eastbound volume on S 144th Street would be using Military Road and International Boulevard to reach the on-ramp to eastbound SR 518. On 24th Avenue S at the SR 518 overcrossing, site traffic would add about 60 vph to the PM peak volume, representing a nine percent increase compared to No Action conditions.

Several continuous east-west local streets provide opportunities for cut-through traffic between 24th Avenue S and Military Road, including S 142nd Street, S 146th Street, and S 148th Street. Other cut-through routes could be formed by using various intermittent east-west streets in combination with north-south streets. Generally, fewer than 5 trips hourly are projected to use the local street routes at full site development.

Further to the north, S 133rd/S 132nd Street, S 135th Street, and S 138th Street also provide continuous connections between 24th Avenue S and Military Road. The traffic analysis indicates that up to 10 hourly commute trips might use S 138th Street, some with local destinations in these residential neighborhoods.

Cut-through traffic would generally be attracted to use local streets only if congestion were encountered on the collector and arterial streets. Traffic operations on the arterial routes are

projected to remain generally at LOS D or better, with isolated instances of LOS E on the principal arterial system.

The City's Neighborhood Traffic Safety Program includes guidelines for the development of traffic calming approaches to address problems of volume or speeding on the City street system. It provides for application of a variety of specific techniques in three-phases of deployment. The first phase includes signing, enforcement, radar speed boards, speed and traffic studies, and pavement markings. In the second phase, physical barriers are authorized, including speed humps, traffic circles, curb extensions, and chicanes. Physical barriers normally would not be constructed where they would adversely affect emergency access, metro or school bus routes, drainage, or pedestrian/bicycle routes. A third phase of control would require programming a project through the City's Capital or Transportation funding mechanisms.

Metro buses utilize S 144th Street (24th Avenue S to Military Road) and 24th Avenue S (north of S 144th Street) as part of Route 170. Curb extensions have been used successfully on other collector arterials in the City, without difficulty for buses or emergency vehicles. School buses also use these collector streets and portions of numerous local streets in their pickup and dropoff operations, including S 142nd Street, S 148th Street, S 150th Street, S 152nd Street, and 30th Avenue/Pl S.

Emergency response in this area of the City is served from a fire station along S 152nd Street east of the 34th Avenue S intersection. Service is provided by King County Fire District #2.

Signing for large truck prohibition and local traffic could be enhanced at S 142nd Street east of 24th Avenue S, where project traffic would first encounter neighborhood cut-through opportunities. Physical barriers may be difficult at this location because it also serves connections to the collector street system by local residents. Curb extensions or pavement markings could be effectively used to emphasize the local nature of S 142nd Street east of 24th Avenue S. Curb radii would need to accommodate the movement of school buses in this area.

Transit

The 55-Acre Parcel would be accessible from two public transit routes. Metro Routes 132 and 170 would place site employees within walking distance (about ¼ mile) of the 55-Acre Parcel. Both of these routes connect to downtown Seattle, but Route 170 provides peak period, peak-direction service only. Metro Route 132 connects to the Burien Transit Center, serving transfers to several other Metro routes and Sound Transit Regional Express Route 570. Metro Route 170 also connects to the Tukwila Station vicinity, potentially serving connections with Sound Transit Link light-rail system, and the proposed Rapid Ride service along Pacific Highway S. A longer walk (over ½ mile) would be required to reach Metro Route 128, which operates along Military Road, with connections between West Seattle and Southcenter Mall.

Freight Movement

The 55-Acre Parcel would generate about 410 truck trips daily, with about 25 trips occurring during each of the AM and PM peak hours. All truck trips would enter and exit the site along S 142nd Street in the vicinity of 20th or 21st Avenue S, then using Des Moines Memorial Drive to reach SR 518 and the regional freeway system.

Under existing conditions at the intersection of Des Moines Memorial Drive at S 144th Street, trucks account for about four percent of all traffic. Development of the 55-Acre Parcel would likely increase the truck percentage to about seven percent. Increases in truck traffic at locations more remote from the site could be expected to be modest. The effects of increased truck traffic volume are reflected in the intersection operations results.

Truck Routing Options

Development of the noise mitigation properties requires that impacts to adjacent neighborhoods be minimized. Truck traffic is intended to be confined to designated truck routes as represented in the Comprehensive Plans of SeaTac and Burien. Truck traffic would be prohibited on other streets, including those in the neighborhoods east and west of the site.

Accessing the site from SR-518 is straightforward with the ramps at Des Moines Memorial Drive serving trips to and from the east. This is expected to comprise the direction with the highest volume of approaching trucks (80 percent) because it includes those from I-5 and I-405. These trucks would use S 144th/S 142nd Street for site access.

Truck access to and from the west is problematic because it is not currently served by any designated truck route within the Cities of SeaTac or Burien. About 20 percent of truck traffic is anticipated to arrive and depart in this direction, primarily connecting to SR 509. The proximity of the site to SR 509, however, has suggested that it could support Seaport operations, with the result that a higher fraction of truck traffic may use this route.

For the North Freight Cargo Complex, truck traffic to and from the west would be served by the SR 518 ramps at S 154th Street (existing eastbound exit ramp) and 24th Avenue S (modified westbound entrance ramp). In this way, air cargo truck trips would use 24th Avenue S to connect to these ramps (about 5 trucks hourly). For truck trips destined east, air cargo truck trips would use 24th Avenue S to reach S 142nd Street and Des Moines Memorial Drive. About 20 to 25 air cargo truck trips hourly would be added along this route. In the long term, these impacts could be reduced by extending the proposed 20th/21st Avenue S corridor south from S 142nd Street to S 146th Street.

Altering the current truck routes to include access to SR 509 from S 128th Street or S 160th Street would be required to support the marketability of the site. For trips destined north on SR 509, the interchange at S 128th Street offers the best travel time for trucks. The connecting streets, S 128th Street and Des Moines Memorial Drive, are designated as minor arterial streets by the City of Burien and SeaTac, respectively. SeaTac has also designated Des Moines Memorial Drive as a truck route throughout its length within the City.

The City of Burien will require a truck route connection for the development of the NESPA properties for office, industrial, or retail uses. S 128th Street also may provide the best connection to SR 509 for these properties.

For truck traffic oriented to the south on SR 509, the S 160th Street interchange also could provide a candidate for designation as a truck route. It would provide the best travel time for trucks to and from the south, and this advantage could be improved when the SR 509 extension is completed. S 160th Street is designated as a minor arterial street by the City of Burien, and it connects both to 1st Avenue S and to Des Moines Memorial Drive. Designation of S 160th Street as a truck route would be accomplished by the City of Burien.

Another candidate route for truck use would be S 156th Street between 1st Avenue S and Des Moines Memorial Drive in Burien. This is designated as a minor arterial street, but it provides no direct connection to SR 509. Connecting traffic would be required to use 1st Avenue S and SR 518 to reach SR 509, with a substantial travel time penalty.

Truck use of S 146th Avenue S between 1st Avenue S and Des Moines Memorial Drive in the City of Burien is not recommended. It is designated as a collector arterial route, but is characterized by steep grades, sharp curves, and adjacent residential uses. It provides connections to SR 509 to and from the north only, but is otherwise unsatisfactory for truck movement.

The designation of S 146th Street and 16th Avenue S as truck routes by the City of SeaTac conflicts with their local street status in the functional classification plan. This route is narrow and steep, with a right-angle bend adjacent to a park entrance. Its use by truck traffic as a route to the North Freight Cargo Complex would be inappropriate.

Truck access to the North Freight Cargo Complex could be served by restoring the truck route designation on 24th Avenue S between S 154th Street and S 142nd Street, where it is designated as a minor arterial route. Alternatively, trucks could be routed south to S 154th Street and S 156th Way to Des Moines Memorial Drive and the SR 518 ramps. Travel times are equivalent along these two routes. These latter streets are already designated for truck use.

Non-Motorized Modes

The project would add sidewalks and a shared use path along S 144th Street, 142nd Pl S, and S 142nd Street between Des Moines Memorial Drive and the Boeing Spares driveway. Sidewalks would be six feet in width on the north side, with a 12-foot shared use path on the south side, and widened curb lanes would be provided on both directions of travel. In the long term, systems of continuous sidewalks would be developed along Des Moines Memorial Drive by other City transportation projects.

Safety

The proposed improvements along S 144th Street/142nd Pl S/S 142nd Street will provide a collector arterial street consistent with current design standards. A 35 mph design speed will be applied for corridor geometric elements. An advisory speed of 30 mph will be signed in the easternmost curve, reflecting an entering sight distance issue. Grades would be limited to about seven percent.

A westbound left-turn lane would be provided on S 144th Street at Des Moines Memorial Drive in response to capacity and truck turning issues. Provisions for dedicated pedestrian and bicycle facilities are included in the project.

Actions that reduce congestion and improve roadway geometrics are generally associated with improved records of safety performance. The historic record shows no crashes in the corridor or the signalized intersection at Des Moines Memorial Drive between 2002 and 2004. Unsignalized intersections along 24th Avenue S generally experience fewer than three crashes each year. None of these sites would qualify as a high-accident location.

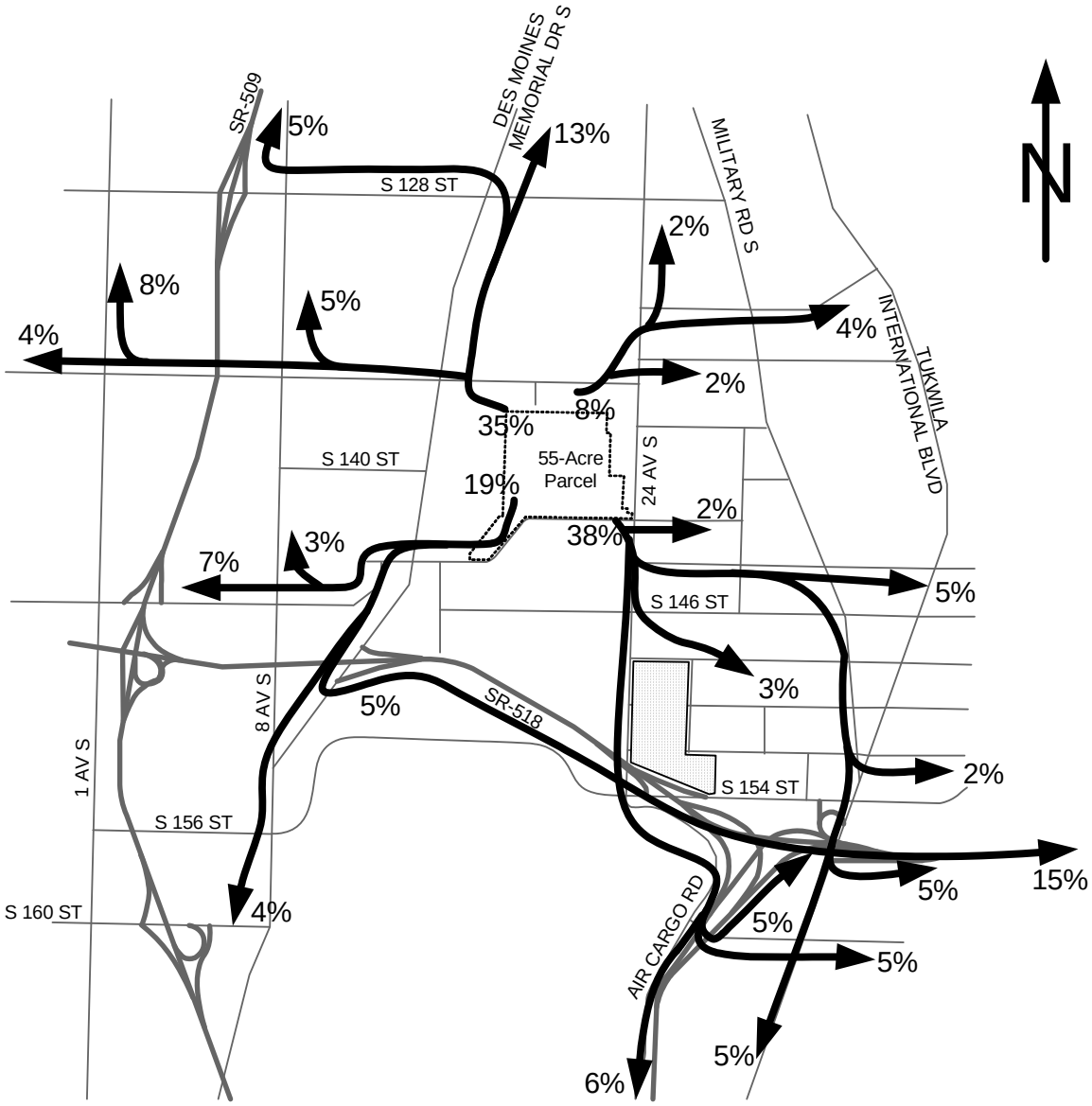
CONCLUSIONS AND RECOMMENDATIONS

Transportation impacts associated with development of the 55-Acre Parcel have been estimated, including the effects on intersection operations, truck routes, neighborhood intrusion, and safety. Planning for access and circulation related to site development should incorporate the following elements:

- Provide site access along S 142nd Street and S 136th Street, at specific locations to be identified in a future development application.
- Provide truck access to the site along S 142nd Street west of the proposed site driveway.
- Provide a westbound left-turn lane at the Des Moines Memorial Drive/S 144th Street intersection, together with geometric modifications to serve the movement of large trucks. Modify mast-arm supports, signal displays, signal phasing, and auxiliary features as necessary.
- Acquire necessary right-of-way or easements in the northeast, southeast, and southwest quadrants of the Des Moines Memorial Drive/S 144th Street intersection to construct the intersection modifications.
- Investigate with the City of Burien alternative truck route connections between the site and SR 509, including S 128th Street or S 160th Street. Modify truck route designations in the Comprehensive Plan as required.
- Revise the City truck route plan to eliminate the truck route designations along 16th Avenue S and S 146th Street.
- Develop a sidewalk and bicycle lane system to serve non-motorized travel in the corridor.
- Investigate traffic calming applications at the 24th Avenue S intersection at S 142nd Street to reduce traffic intrusion east of 24th Avenue S, including signing, pavement marking, curb extensions, chokers, or chicanes.
- At the time of site development, contribute to improvement projects at the SR 518 WB off-ramp to Des Moines Memorial Drive (signalization), and the SR 518 EB off-ramp to S 154th Street (signalization or intersection modifications), through the City's impact fee or development review processes.
- The studies indicate that development of a new corridor along 20th/21st Ave S between S 142nd St and S 146th St offers few benefits relative to reducing traffic on 24th Ave S.

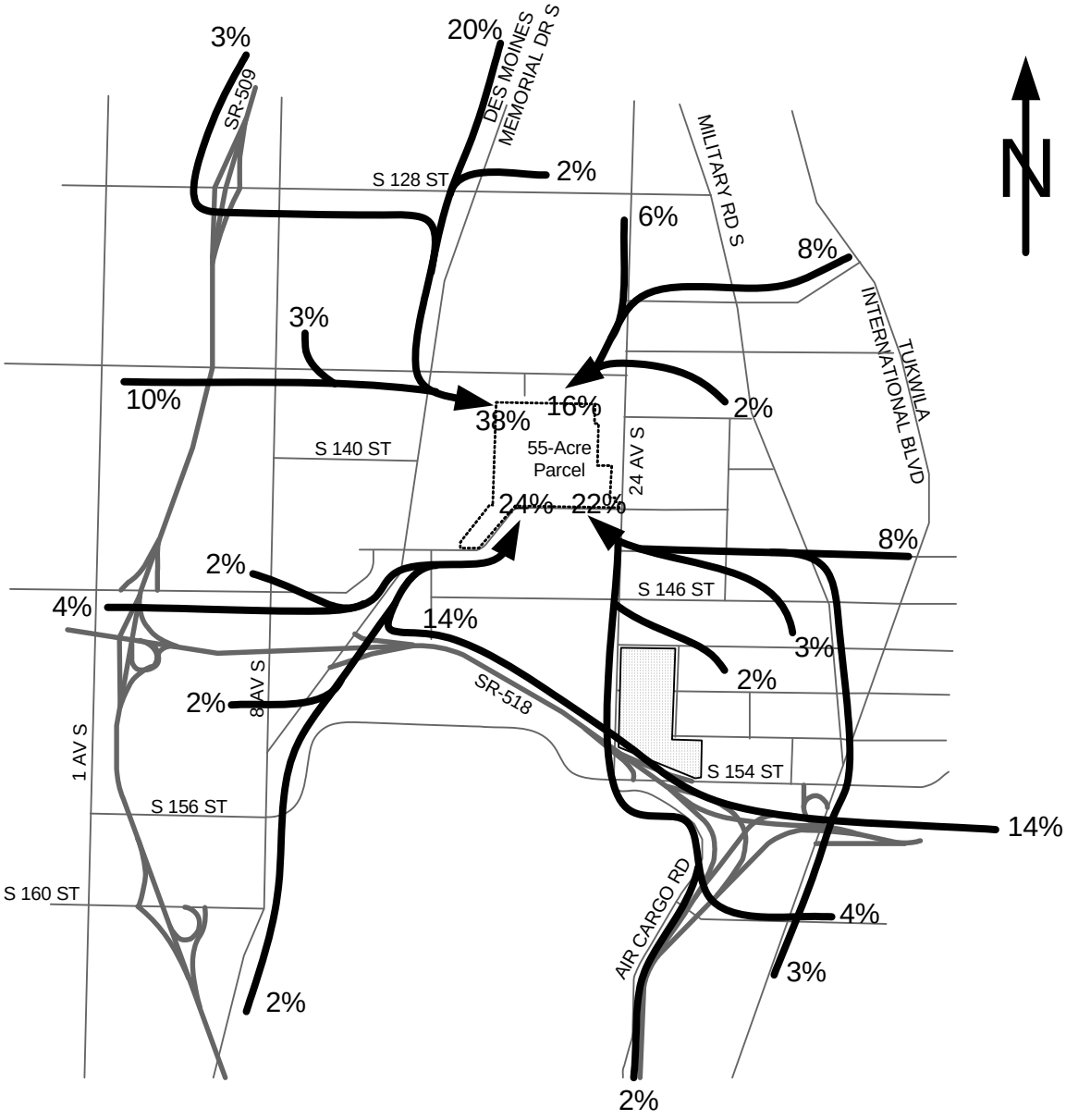
APPENDIX A

Site Traffic Distribution



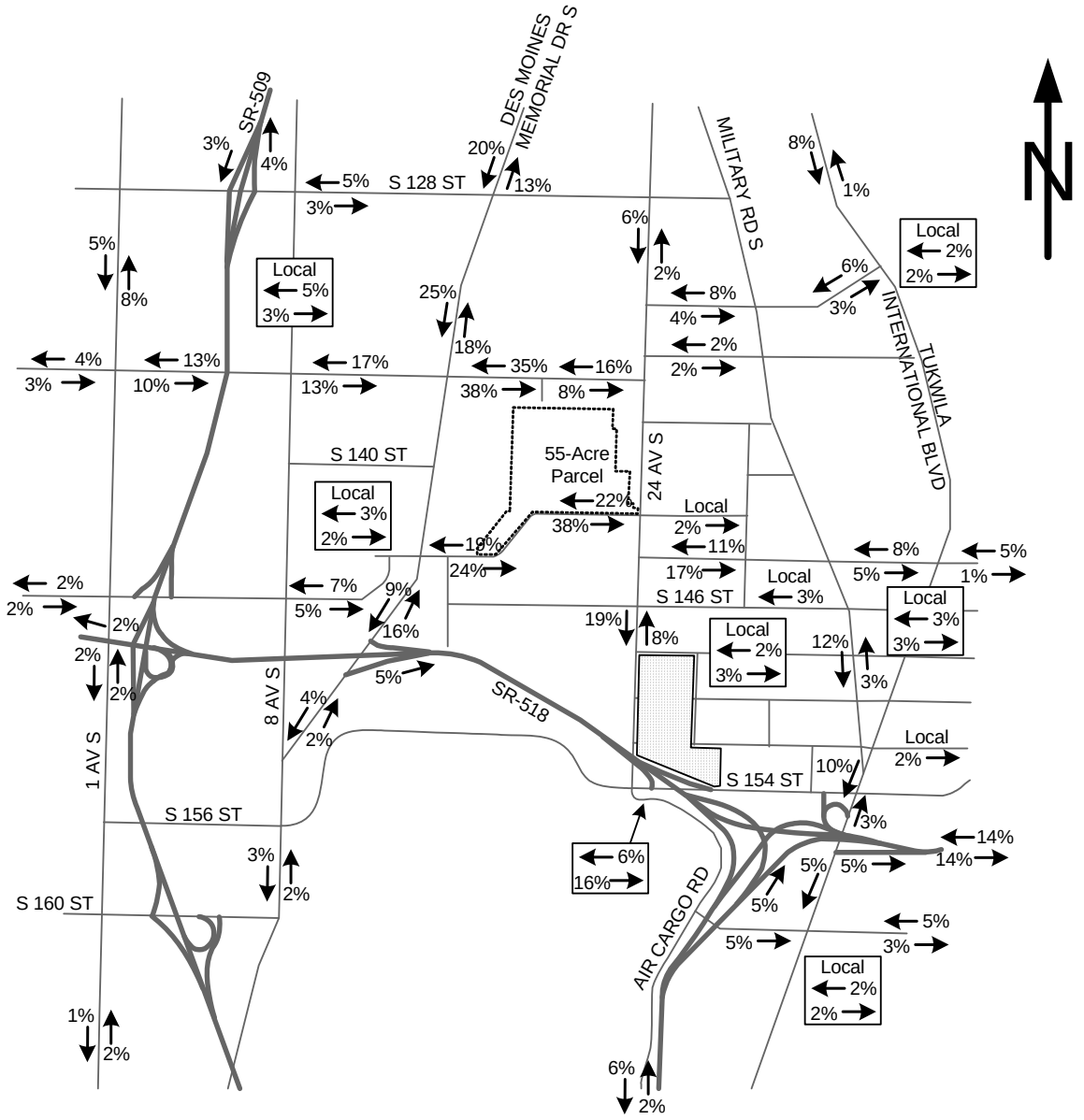
North SeaTac Roadway Study -
55-Acre Project Trip Distribution
(2010 PM Auto Trips)

Future North Air Cargo Complex



North SeaTac Roadway Study -
55-Acre Project Trip Distribution
(2010 PM Auto Trips)

Future North Air Cargo Complex



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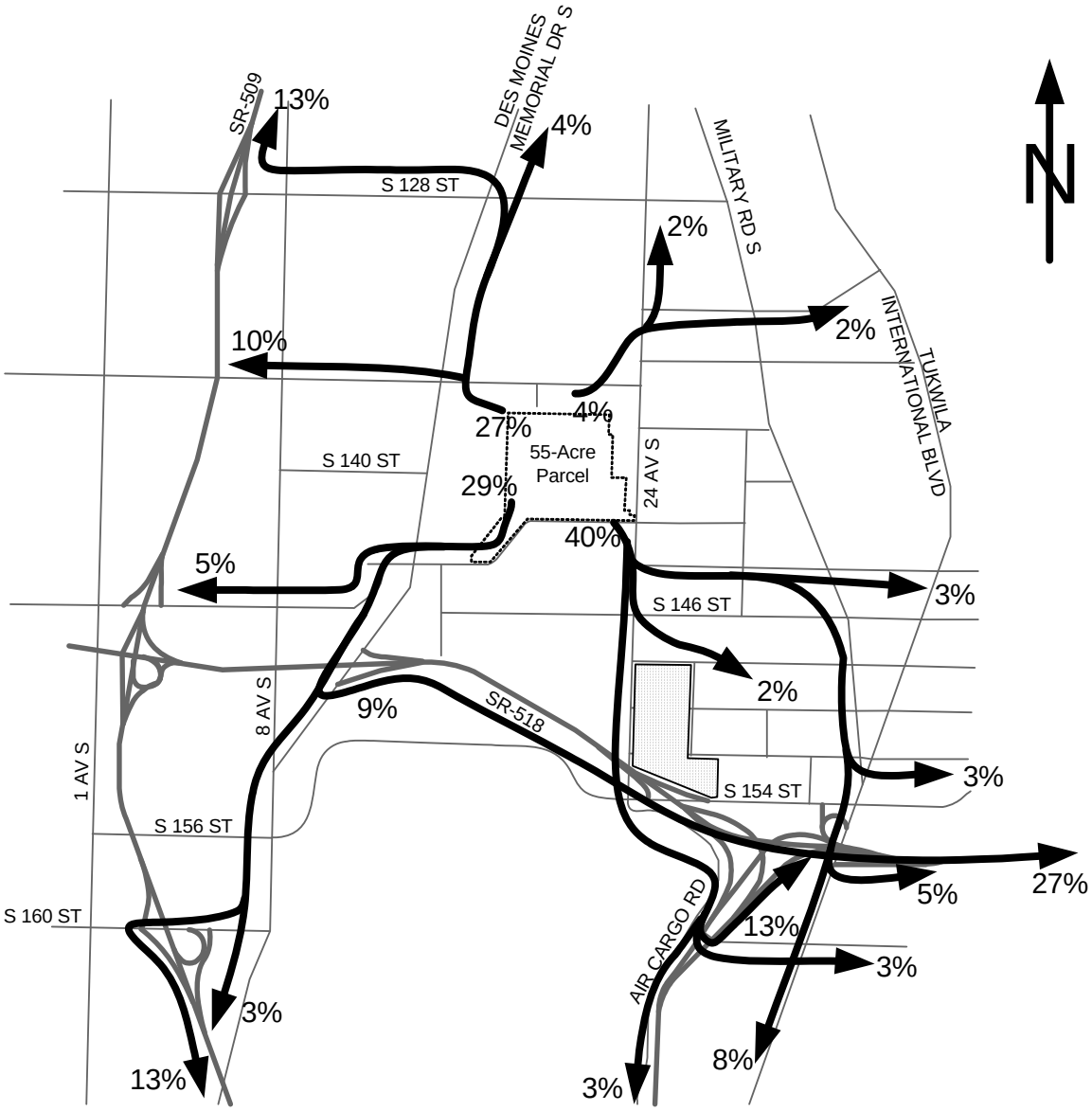
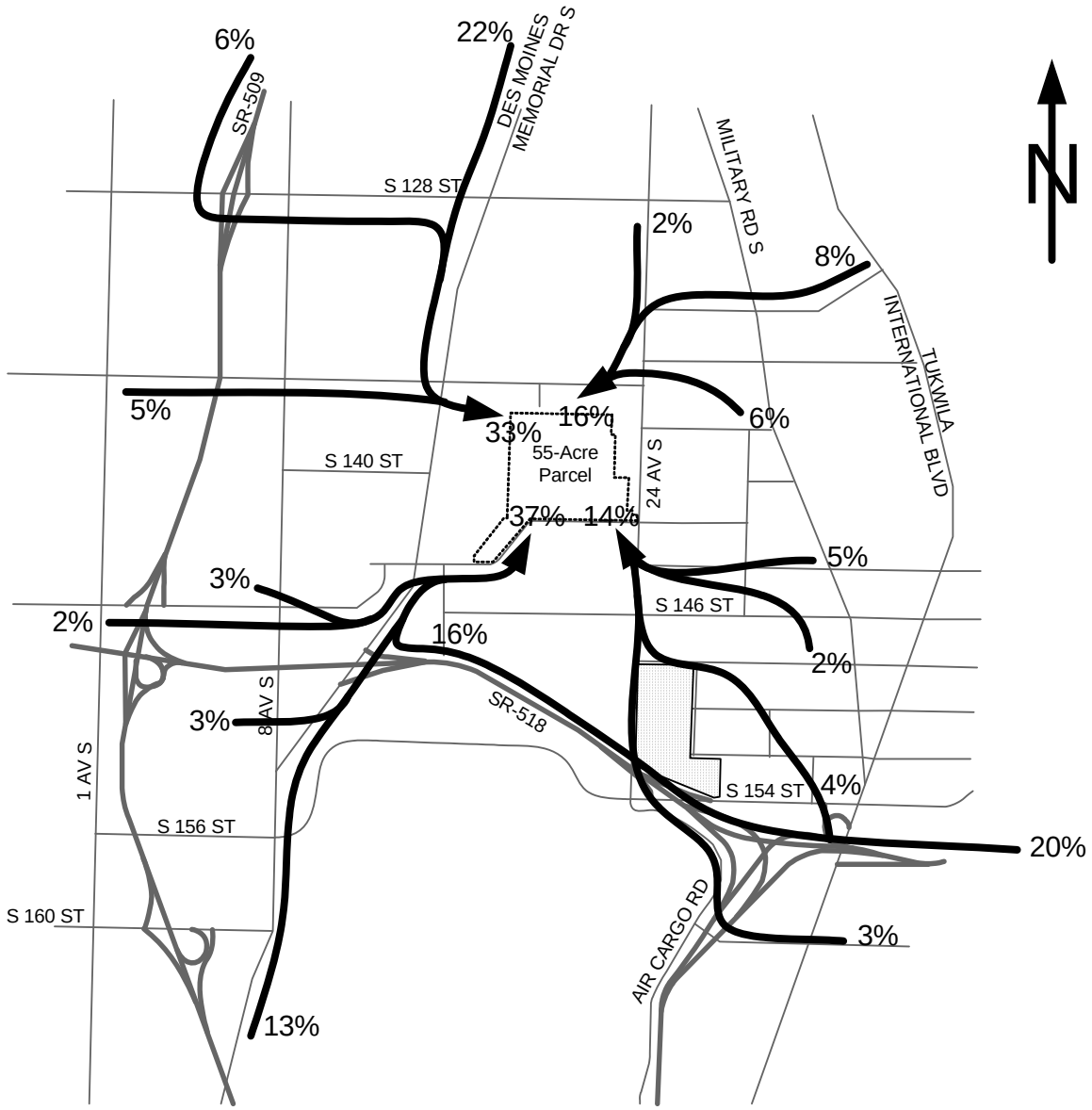
55-Acre Project Trip Distribution
(2010 PM Auto Trips)

Future North Air Cargo Complex



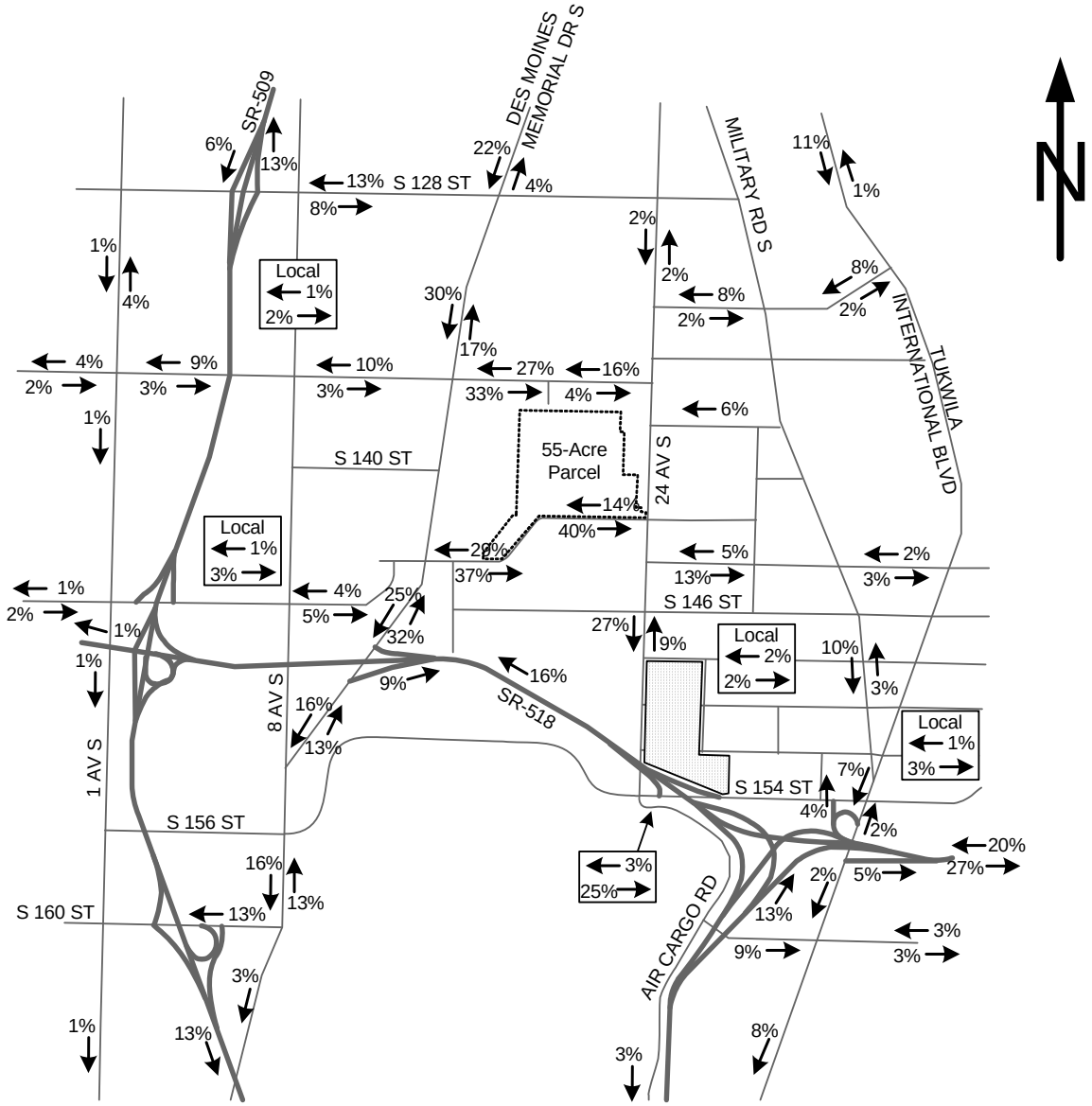
North SeaTac Roadway Study -
55-Acre Project Trip Distribution
(2024 PM Auto Trips)

Future North Air Cargo Complex



North SeaTac Roadway Study -
55-Acre Project Trip Distribution
(2024 PM Auto Trips)

Future North Air Cargo Complex



North SeaTac Roadway Study -
55-Acre Project Trip Distribution
(2024 PM Auto Trips)

Future North Air Cargo Complex

North SeaTac Roadways Study

Appendix B
Preliminary Geotechnical Services

Report
Preliminary Geotechnical Services
North SeaTac Roadway Study
SeaTac, Washington

March 26, 2008

Prepared for

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1.0 INTRODUCTION

This report summarizes the results of our preliminary geotechnical engineering services conducted to support Phase 1 of the City of SeaTac's (City) proposed North SeaTac Roadway Study. The general project location is shown on the Vicinity Map (Figure 1). The general configuration of the project alignment that is the subject of this report and some surrounding existing site features are shown on the Site and Exploration Plan (Figure 2).

This report has been prepared based on our discussions with representatives of HNTB Corporation (HNTB); a base map of the project alignment provided by HNTB; data collected during our field exploration and laboratory testing programs; a review of available subsurface data collected by others in the vicinity of the project alignment; our familiarity with geologic conditions within the vicinity of the project alignment; and our experience on similar projects.

1.1 PROJECT DESCRIPTION

The Port of Seattle (Port) currently owns property in two locations relevant to the North SeaTac Roadway Study. One of these properties, which is referred to as the "L-Shaped Parcel," is located along the east side of 24th Avenue South and is bounded by South 148th Street on the north and State Route 518 (SR 518) on the south. The other property, which is referred to as the "55-Acre Parcel," is located between South 142nd Street and South 136th Street. In support of the Port's desire to develop these properties, which are zoned for Aviation Commercial use, the City seeks to evaluate a number of possible roadway networks to select preferred alignments that provide the greatest flexibility in accommodating development, while protecting the existing neighborhoods and local streets from traffic accessing the commercial sites. The "55-Acre Parcel" will be the focus of the development access provided by the roadway network improvements recommended in the North SeaTac Roadway Study, whereas the Port's Comprehensive Development Plan is developing access improvements for the "L-Shaped Parcel."

Phase 1 of the North SeaTac Roadway Study will consist of preparing and evaluating a number of circulation alternatives and the corresponding vertical and horizontal components. From the alternatives studied, a preferred alternative will be selected and developed to a conceptual level of design (approximately 15 percent). The work performed under this phase will serve as the basis of design for subsequent phases.

This report provides preliminary geotechnical engineering recommendations for a portion of one roadway located within the project area: South 142nd Place. The section of South 142nd Place that is the subject of this report is located between 16th Avenue South to the west and 20th Avenue South to the east. This section of South 142nd Place extends northeast/southwest and connects to South 144th Street on the

west and South 142nd Street on the east. Along this section of South 142nd Place, the design team is considering the possibility of improving site distances and increasing the design speed of the roadway by realigning portions of the roadway. Figure 2 shows the new alignment of the roadway that is currently being considered. Figure 2 also shows the possible location of the stormwater pond that is associated with this alternative. Establishment of grades for the realigned section of roadway and stormwater pond will require cuts and fills. At the time this report was prepared, the heights of these cuts and fills were not known; however, we anticipated that cuts and fills with maximum heights of up to about 10 to 12 ft could be required.

1.2 SCOPE OF SERVICES

HNTB retained Landau Associates to provide preliminary geotechnical engineering services to support Phase 1 of the City's proposed North SeaTac Roadway Study. Our services were provided in general accordance with the scope of services outlined in, and the terms of, a Consultant Agreement between HNTB and Landau Associates dated July 10, 2007. Our scope of services included the following specific services:

- Reviewing existing subsurface information for adjacent private properties provided by the City
- Coordinating the location of underground utilities prior to conducting field activities
- Excavating and sampling strategically located test pits along the proposed roadway alignment
- Logging soil and groundwater conditions observed in the test pits
- Conducting limited laboratory testing
- Evaluating data derived from the subsurface investigation program
- Preparing and submitting this written report summarizing the results of our findings, conclusions, and preliminary recommendations for the project. This report includes:
  - A site plan showing the approximate locations of the explorations completed for this study
  - Descriptive logs of the explorations and the results of geotechnical laboratory testing
  - A discussion of the near-surface soil and groundwater conditions anticipated along the project alignment
  - A discussion related to environmentally sensitive areas that have been documented by others in the vicinity of the project alignment
  - Preliminary recommendations related to earthwork activities

- Preliminary recommendations related to stormwater infiltration
- Preliminary slope stability considerations
- Preliminary pavement design recommendations
- Recommendations for design-phase geotechnical services.

2.0 EXISTING CONDITIONS

This section discusses the general geologic setting of the project area and describes the surface and subsurface conditions observed in the vicinity of the project alignment at the time of our field investigation. Interpretations of the site conditions are based on the results of our site reconnaissance and review of available information.

2.1 GEOLOGIC SETTING

General geologic information for the project area was obtained from *Geology of the Des Moines Quadrangle, Washington* (Waldron 1962). According to this source, near-surface deposits in the vicinity of the project alignment consist of recessional outwash and advance outwash. Soil defined as recessional outwash typically consists of stratified sand or sand and gravel with variable amounts of silt and cobbles. This unit was transported by meltwater emanating from the face of a retreating glacier and deposited in streams and pools. This unit typically exhibits high permeability and moderate shear strength, and is susceptible to erosion, especially when exposed on steep slopes.

Soil defined as advance outwash typically consists of clean sand with an increasing gravel content higher in the section. Silt and fine-grained sand are common in portions of the unit. Sorting, cross and horizontal stratification, and cut and fill structures are distinctive features of outwash. Advance outwash is transported by meltwater and deposited in streams and pools emanating from the face of an advancing glacier. This unit has been glacially overridden, typically exhibits moderately high permeability, and is susceptible to erosion, especially when exposed on steep slopes.

Though not shown on the above-referenced geologic map, fill associated with construction of South 142nd Place and nearby existing improvements should be anticipated in the vicinity of the project alignment.

2.2 SURFACE CONDITIONS

The section of South 142nd Place that is the subject of this report is located about ¾ mile north of the north end of Seattle-Tacoma International Airport. South 142nd Place consists of a two-lane, asphalt-paved road that provides connection between Des Moines Memorial Drive to the west and Military Road South to the east. Along the project alignment, South 142nd Place generally has paved shoulders and open drainage ditches (i.e., no curbs, gutters, or sidewalks). South 142nd Place appears to have been constructed mostly near the original surrounding ground surface, or within cuts and fills as evidenced by the cut slopes and embankments that were observed along the project alignment. The overall topography along the project alignment slopes to the northeast, with existing elevations ranging

from about Elev. 320 ft at the intersection of South 142nd Place and 16th Avenue South to about Elev. 400 ft at the intersection of South 142nd Place and 20th Avenue South. Vegetation within the project right-of-way consists primarily of low-growing grasses and blackberry bushes. Beyond the project right-of-way, vegetation consists primarily of coniferous and deciduous trees with a heavy undergrowth of brush. The property on the north side of South 142nd Place is currently undeveloped, whereas some of the property on the south side of South 142nd Place has been developed to support aviation commercial use.

No obvious evidence of recent or historic slope movement, such as irregular topography, bare soil scarps, and/or groups of toppled trees, was observed along the project alignment. However, others have identified a slide area in the vicinity of the project alignment. This slide area is located on the north side of South 142nd Place, downslope and approximately 150 ft from the edge of the roadway (see Figure 2).

During our subsurface investigation, a roughly 3- to 4-ft high rockery wall was observed in the vicinity of test pits TP-4 and TP-5 (see Figure 2). This rockery supports the toe of a fill slope that was placed to accommodate construction of the existing commercial development (or previous development) located south of test pits TP-4 and TP-5. When this report was prepared, the length of this rockery wall was not known.

2.3 SUBSURFACE SOIL CONDITIONS

Subsurface conditions along the project alignment were explored on December 21, 2007. The exploration program consisted of advancing and sampling five exploratory test pits (TP-1 through TP-5). The test pits were excavated to depths ranging from about 12 to 17½ ft below the ground surface (BGS) using a tracked excavator. The approximate locations of the exploratory test pits are shown on Figure 2. A discussion of field exploration procedures, together with edited logs of the exploratory test pits, is presented in Appendix A. A discussion of laboratory test procedures and the test results are also presented in Appendix A.

Additional information regarding subsurface conditions along the project alignment was obtained from a review of available geotechnical information for the project area (MFG 2003). The results of the previous explorations by others generally confirm conditions observed in our explorations and are consistent with our local experience. Summary logs of the previous explorations are included for reference purposes in Appendix B. The approximate locations of the previous explorations are shown on the figures that precede the summary logs.

Based on the results of our field exploration program and our review of available geotechnical information, the project alignment is interpreted to be generally underlain by glacial outwash deposits that

in areas are overlain by fill. At test pit TP-2, glaciolacustrine deposits were observed beneath the glacial outwash.

Fill was observed at the ground surface at test pits TP-3 through TP-5. Where encountered, the fill extends to depths ranging from about ¾ to 4½ ft BGS. The fill was observed directly over either glacial outwash (at test pits TP-3 and TP-5) or buried topsoil (at test pit TP-4). In general, the fill observed in our explorations consists of moist to wet, loose sand with varying amounts of silt and gravel. At test pit TP-5, the fill contained concrete rubble and metal debris.

Glacial outwash was observed in all of our explorations either at the ground surface or beneath fill. Where explored, the glacial outwash generally consists of moist to wet, loose to dense sand with varying amounts of silt and gravel. Except at test pit TP-2, our test pits did not penetrate through the glacial outwash. Soil interpreted to be glaciolacustrine deposits was encountered beneath the glacial outwash at test pit TP-2. At this location, the glaciolacustrine was observed to consist of moist, very stiff to hard, silt with slickensides and fractures. Test pit TP-2 did not penetrate through the glaciolacustrine deposits.

2.4 GROUNDWATER CONDITIONS

At the time of our field investigation in late December 2007, groundwater was observed in test pits TP-1 through TP-3 at depths ranging from about 2 to 16 ft BGS. Groundwater was not observed within the depths explored at test pits TP-4 and TP-5. Given the difference in elevation (about 60 ft) between the location of test pits TP-1 through TP-3 and the location of test pits TP-4 and TP-5, we expect that the regional groundwater level in the vicinity of test pits TP-4 and TP-5 to be well below the bottom of these test pits.

The groundwater conditions reported herein and on the summary logs contained in Appendices A and B are for the specific locations and dates indicated and, therefore, may not necessarily be indicative of other locations and/or times. Furthermore, it is anticipated that groundwater conditions will vary depending on local subsurface conditions, the weather, and other factors. It is likely that higher groundwater levels would occur in the winter/spring months.

3.0 PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

The following sections present preliminary geotechnical conclusions and recommendations related to environmentally sensitive areas, earthwork, stormwater infiltration, slope stability considerations, and pavement design. These preliminary recommendations are presented with the understanding that a supplemental design-phase geotechnical study will be conducted once the preferred design approach has been selected and the preferred roadway alignment has been identified.

3.1 ENVIRONMENTALLY SENSITIVE AREAS

On January 11, 2008, Landau Associates accessed King County's iMap website (King County website 2007) for the purpose of determining if King County has identified certain environmentally sensitive areas along the project alignment that could impact the selection of a preferred roadway alternative. The types of environmentally sensitive areas that we searched for included wetlands, landslide, coal mine, seismic, and erosion areas. At the time we accessed King County's website, none of the above-referenced environmentally sensitive areas was mapped along either side of the project alignment. However, King County has identified the area in the vicinity of the project alignment as being susceptible to groundwater contamination.

3.2 EARTHWORK

Earthwork to accommodate construction of the proposed roadway improvements and adjustments to the horizontal and vertical alignment is expected to consist of clearing, grubbing, and stripping of areas where improvements are planned; cuts and fills along portions of the roadway; and subgrade preparation for new pavement areas. The following sections present our preliminary conclusions and recommendations related to these activities.

3.2.1 WET WEATHER CONSTRUCTION CONSIDERATIONS

Site preparation activities, as well as other earthwork-related construction, will be influenced by weather conditions. Some of the existing near-surface soil along the project alignment contains a significant amount of silt (glaciolacustrine), which will make these soils sensitive to moisture. Site grading activities should therefore occur during the relatively warmer and drier period between about mid-summer and early fall. Completing these activities outside of this construction window could lead to a significant increase in construction costs due to weather-related delays, repair of disturbed areas, and the increased use of "all-weather" imported fill materials.

Due to the moisture-sensitive nature of some of the site soil, unprotected soil (in either a compacted or uncompacted state) will degrade quickly to a slurry-like consistency in the presence of water and construction traffic. If subgrade or fill soil becomes loosened or disturbed, additional excavation to expose undisturbed soil and replacement with properly compacted structural fill will be required. For wet weather construction, the contractor may reduce the potential for disturbance of subgrades by:

- Protecting exposed subgrades from disturbance by construction activities by constructing gravel working mats
- Using a trackhoe with a smooth-bladed bucket to limit disturbance of the subgrade during excavation
- Suspending earthwork and other construction activities that may damage subgrades during periods of rainy weather
- Limiting and/or prohibiting construction traffic over unprotected soil
- Providing designated haul roads for construction equipment
- Sloping excavated surfaces to promote stormwater runoff
- Sealing the exposed surface by rolling with a smooth drum compactor or rubber-tire roller at the end of each working day and removing wet surface soil prior to commencing filling each day.

3.2.2 REUSE OF SITE SOIL

Soil generated from cuts along South 142nd Place is likely to consist primarily of sand with varying amounts of silt (glacial outwash) or silt (glaciolacustrine). Glaciolacustrine deposits are considered to be highly sensitive to moisture, whereas the glacial outwash deposits are considered to be less sensitive to moisture. Therefore, it may be possible to use some of the glacial outwash excavated along the project corridor for embankment material, provided that grading occurs during dry weather periods, and the moisture content is near optimum. However, during periods of wet weather, the glaciolacustrine deposits and the interbeds of silty sand within the outwash will be difficult to compact to the required density. If the onsite soil cannot be used as fill, it should be disposed off site at an approved location, or within City-designated locations within the right-of-way. Import material needed to construct embankments should meet the requirements for Gravel Borrow in Section 9-03.14(1) of the 2008 WSDOT *Standard Specifications* (WSDOT 2008). If imported fill is placed during periods of wet weather or under wet conditions, the amount of fines (material passing the U.S. Standard No. 200 sieve) should not exceed 5 percent, by dry weight, based on the fraction passing the ¾-inch sieve.

3.2.3 PERMANENT CUT SLOPES

It is anticipated that the proposed improvements to South 142nd Place will require modifications to existing cut slopes along the project corridor. Depending on the heights of cuts required and available right-of-way, it may be desirable to use walls to retain cuts and limit the amount of excavation. Mechanically stabilized earth, cantilevered concrete, and soldier pile and lagging walls are all considered to be feasible retaining wall types. For planning purposes we recommend that permanent cut slopes not supported by retaining walls be designed for inclinations of 2 horizontal to 1 vertical (2H:1V) or flatter.

3.2.4 EMBANKMENTS

It is anticipated that some of the existing embankments along South 142nd Place will need to be widened in areas. Embankments should be constructed at slopes of 2H:1V or flatter in accordance with Section 2-03 of the 2008 WSDOT *Standard Specifications* (WSDOT 2008). In general, existing embankments currently sloped flatter than 2H:1V may be steepened to a finished maximum slope of 2H:1V. The fill associated with widened embankments should be keyed and benched into the existing embankment in order to reduce the potential for slope instability between the new and existing fill.

Embankments should be founded on either undisturbed native soil or recompacted existing fill. Soft, and/or disturbed soil, and organic-rich soil, if encountered, should be overexcavated within the embankment footprint to expose the underlying inorganic soil. The exposed soil beneath embankments will need to be prepared prior to embankment construction. Prior to fill placement, the exposed subgrade should be rolled with a heavy, rubber-tired piece of construction equipment (such as a front loader, scraper, or similar heavily wheeled construction equipment) to produce a firm and non-yielding surface. A qualified geotechnical engineer should observe the exposed subgrade to check that it has been properly prepared. If the foundation soil is loose or disturbed, and there is no free water present, then the disturbed soil should be moisture-conditioned and recompacted to a firm and non-yielding surface. If the disturbed soil cannot be moisture-conditioned and recompacted, the disturbed soil should be removed and replaced with foundation material meeting the requirements for Gravel Borrow in Section 9-03.14(1) of the 2008 WSDOT *Standard Specifications* (WSDOT 2008). Foundation material should be compacted in accordance with Method C in Section 2-03.3(14)C of the 2008 WSDOT *Standard Specifications*.

Embankment materials should be placed and compacted in accordance with Section 2-03.3(14)C, Method C of the 2008 WSDOT *Standard Specifications* (WSDOT 2008). Compaction and moisture control tests should be done in accordance with Section 2-03.3(14)D of the 2008 WSDOT *Standard Specifications* (WSDOT 2008). The maximum dry density and optimum moisture content may also be determined by the American Society for Testing and Materials (ASTM) Test Method D 1557.

3.3 STORMWATER INFILTRATION

A fundamental design requirement for an infiltration facility is there must be at least 3 ft of permeable soil below the bottom of the proposed facility and at least 3 ft between the bottom of the facility and the maximum wet-season water table.

The results of our field exploration program suggest that the western portion of the site proposed for the stormwater pond is underlain by low permeability native soils (glaciolacustrine), whereas the eastern portion appears to be underlain by more permeable soils (glacial outwash). Furthermore, the depth to groundwater at the time of our field investigation was observed to range from about 2 to 8 ft BGS. Given the subsurface conditions observed in our test pits, it is our opinion that the likelihood of there being a minimum of 3 ft of permeable soil between the bottom of the stormwater pond and the maximum wet-season water table is relatively small. We, therefore, do not consider site conditions at the currently proposed stormwater pond location to be suitable for infiltrating stormwater.

3.4 SLOPE STABILITY CONSIDERATIONS

As previously mentioned, no obvious evidence of recent or historic slope movement was observed along the project alignment. However, others have identified a slide area in the vicinity of the project alignment that is located on the north side of South 142nd Place, downslope and approximately 150 ft from the edge of the roadway. It is our opinion that the slide area that was identified by others is located too far away from the proposed roadway improvements to adversely impact the roadway.

In the vicinity of test pits TP-4 and TP-5, we anticipate that it will be necessary to remove an existing rockery and cut into an existing slope located along the south side of the proposed roadway alignment. This slope is interpreted to consist of fill that was placed to accommodate construction of the existing commercial development (or previous development) located south of test pits TP-4 and TP-5. At the locations of our test pits, the density of the fill was estimated to be loose. Given the density of the soils that comprise at least the outer edge of the fill slope, it is our opinion that the fill slope could become unstable if the existing rockery is removed and the existing fill slope is oversteepened during construction of the proposed roadway improvements. The appropriate mitigation measures for this anticipated condition will, in part, depend on the depth of cut needed along this portion of the project alignment, but could include constructing a new retaining wall to retain the fill slope and/or flattening the inclination of the fill slope.

The current design concept includes constructing a stormwater pond in the vicinity of test pits TP-1 through TP-3. As currently envisioned, the pond would be constructed on a north-facing slope by cutting into this slope along the south side of the proposed pond and constructing an embankment along

the remainder of the pond perimeter. However, the results of our field investigation indicate that the currently proposed site of the stormwater pond is not desirable from an infiltration standpoint. As a result, we understand the design team is considering the possibility of relocating the proposed pond to a different location along the project alignment. Once a new pond location is selected, Landau Associates will provide additional consultation related to slope stability considerations associated with the proposed stormwater pond.

3.5 PAVEMENTS

Landau Associates developed preliminary recommendations regarding flexible pavement sections for the proposed realigned portion of South 142nd Place. The preliminary flexible pavement section recommendations are based on traffic data provided by HNTB, the results of our field explorations, and an assumed 15-year performance period. Design pavement sections were determined using the 1993 American Association of State Highway and Transportation Officials (AASHTO) design method (AASHTO 1993).

The results of our subsurface investigation program suggest that South 142nd Place is underlain by glacial outwash that in areas is overlain by fill. Based on these anticipated soil types and our experience on sites with similar subgrade soils, it is our opinion that a California Bearing Ratio (CBR) of about 10 percent could be used for preliminary design of flexible pavements. The preliminary design CBR value assumes that the new pavement section will be constructed over a subgrade that has been compacted to a dense and unyielding condition, or on properly compacted fill placed directly on a subgrade that has been compacted to a dense and unyielding condition. For use in preliminary pavement design, the estimated CBR value was converted to an approximate equivalent Resilient Modulus of 15,000 pounds per square inch.

HNTB provided traffic loading information for South 142nd Place. The provided information suggests that our preliminary pavement design for the realigned portion of South 142nd Place could assume a maximum initial two-way average daily traffic count of 5,220 vehicles, of which up to 7 percent could be assumed to be heavy trucks (Federal Highway Administration Class 5 or greater). An annual traffic volume growth rate of about 3.3 percent and an annual heavy truck volume growth rate of about 1.7 percent were also provided by HNTB. We assumed an initial truck factor of 1 and an annual truck factor growth rate of 0.5 percent. Based on these assumptions, the assumed traffic loading conditions would generate approximately 1,200,000 ESALs (18-kip equivalent single axle loads) during a 15-year performance period.

Using the AASHTO design methodology and the traffic information provided by HNTB, the preliminary flexible pavement section recommendations presented below were developed for the realigned portion of South 142nd Place.

TABLE 1
PRELIMINARY FLEXIBLE PAVEMENT SECTION RECOMMENDATIONS

Material Description	Preliminary Recommended Minimum Thicknesses (inches)	WSDOT Standard Specification
HMA	4	9-03.8
CSBC	10	9-03.9(3)
Gravel Borrow	As Needed	9-03.14(1)

HMA = Hot Mix Asphalt, Plant-mixed.

CSBC = Crushed Surfacing Base Course. The upper 2 inches of Crushed Surfacing Base Course may be replaced by Crushed Surfacing Top Course (CSTC).

WSDOT = Washington State Department of Transportation, 2008, *Standard Specifications for Road, Bridge, and Municipal Construction*.

4.0 DESIGN-PHASE GEOTECHNICAL SERVICES

A supplemental design-phase geotechnical study should be conducted once the preferred design approach has been selected and the preferred roadway alignment has been identified. The purpose of the design-phase study will be to develop recommendations for earthwork details, cut and fill slopes, retaining wall design (if necessary), drainage, stormwater infiltration, and pavement design. We would be pleased to conduct a design-level geotechnical study for the project when appropriate.

5.0 USE OF THIS REPORT

Landau Associates prepared this preliminary geotechnical report for the exclusive use of HNTB Corporation and the City of SeaTac to support Phase 1 of the City of SeaTac's proposed North SeaTac Roadway Study. This report is not intended to be sufficient for final design; however, the information in this report could form the basis of the design-phase geotechnical recommendations. Any use of this report by others, or for purposes other than intended, is at the user's sole risk. Within the limitations of scope, schedule, and budget, our services have been conducted in accordance with generally accepted practices of the geotechnical engineering profession; no other warranty, express or implied, is made as to the professional advice included in this report.

The preliminary conclusions and recommendations contained in this report are based in part on the data obtained from explorations completed for this study and subsurface data collected by others for nearby projects. There may be some variation in subsurface soil and groundwater conditions at the site, and the nature and extent of the variations may not become evident until construction. An appropriate contingency should be included in the preliminary- and design-phase budgets to accommodate potential variability of ground conditions. As the project enters the design stage and a preferred design approach is selected, Landau Associates should be advised so that we can review our preliminary recommendations to see if they are consistent with specific project plans.

We appreciate the opportunity to provide geotechnical services on this project and look forward to assisting you during the design and construction phases of the project. If you have any questions or comments regarding the information contained in this report, or if we may be of further service, please call.

LANDAU ASSOCIATES, INC.

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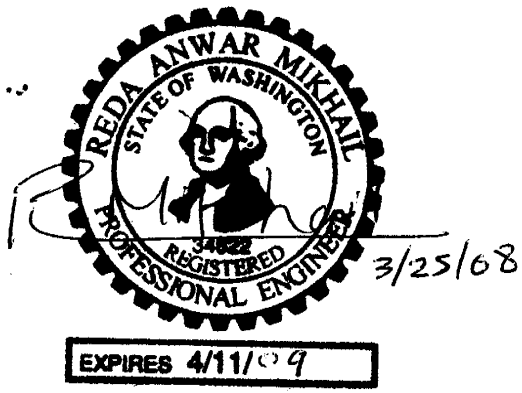
Reda A. Mikhail, P.E.
Principal



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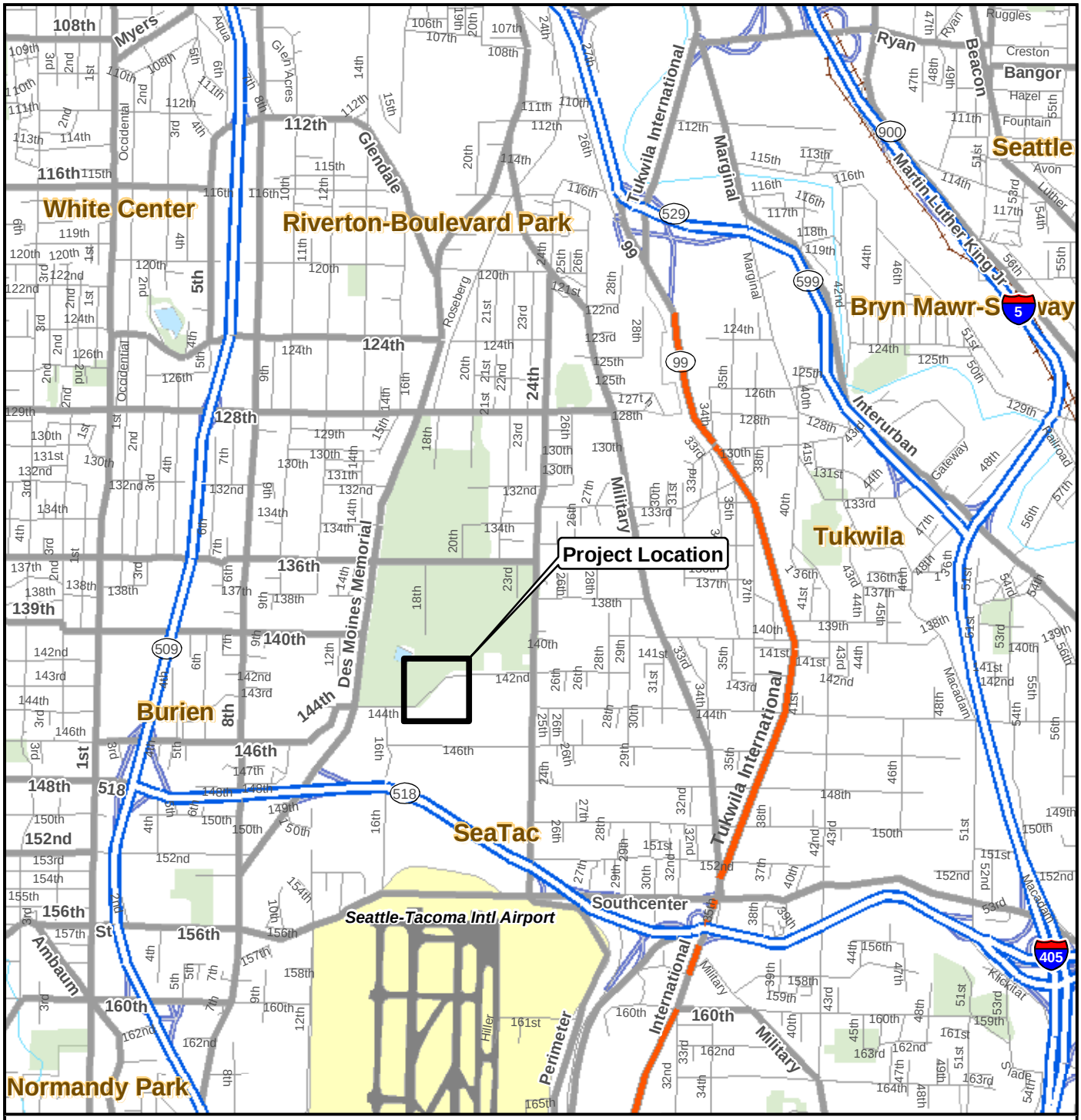

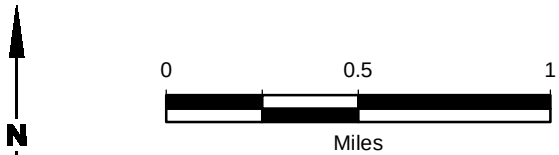

Data Source: ESRI 2006

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LANDAU ASSOCIATES

North Seatac Roadway Study SeaTac, Washington	**Vicinity Map**	Figure 1

N

Slide Area

Existing Rockery

Proposed Roadway Alignment

Top of Proposed Pond, EL 313.0

Bottom of Proposed Pond, EL 307.0

TP-1

TP-2

TP-3

TP-4

TP-5

12" DI

10" DI

8" DI

6" CI

SD

8" PVC

6" PVC

340

330

320

310

S. 142nd PL.

16th Ave S.

Legend

TP-1 Approximate Test Pit Location and Designation

0 100 200

Scale in Feet

Base map source: HNTB 2007, Google Earth Pro 2007

LANDAU ASSOCIATES

North SeaTac
Roadway Study
SeaTac, Washington

Site and Exploration Plan

Figure
2

Geotech Report | V:\1042\010\D\GeoTech\Fig2.dwg (A) "Figure 2" 1/15/2008

APPENDIX A

Field Explorations and Laboratory Testing

APPENDIX A
FIELD EXPLORATIONS AND LABORATORY TESTING

Subsurface conditions along the project alignment were explored on December 21, 2007. The exploration program consisted of excavating and sampling five exploratory test pits (TP-1 through TP-5) at the approximate locations illustrated on the Site and Exploration Plan (Figure 2 of this report). The test pits were excavated to depths ranging from about 12 to 17½ ft below the ground surface (BGS) using a tracked excavator. Northwest Excavating & Trucking Co., Inc. excavated the test pits under subcontract to Landau Associates. The explorations were located approximately in the field by hand-taping from existing physical features and referenced to a site plan provided by HNTB Corporation. The ground surface elevations at the exploratory test pit locations were not available at the time of excavation.

The field explorations were coordinated and monitored by a geologist from our staff who also obtained representative soil samples, maintained a detailed record of observed subsurface soil and groundwater conditions, and described the soil encountered by visual and textural examination. Each representative soil type observed was described using the soil classification system shown on Figure A-1, in general accordance with American Society for Testing and Materials (ASTM) D 2488, *Standard Recommended Practice for Description of Soils (Visual-Manual Procedure)*. Logs of the test pit explorations are presented on Figures A-2 through A-6. These logs represent our interpretation of subsurface conditions identified during the field explorations. The stratigraphic contacts shown on the individual test pit logs represent the approximate boundaries between soil types; actual transitions may be more gradual. Also, the soil and groundwater conditions depicted are only for the specific date and locations reported and, therefore, are not necessarily representative of other locations and times.

Disturbed bag samples of the soil encountered in the test pit explorations were obtained at selected intervals and taken to our laboratory for further examination and testing. Laboratory tests were conducted on representative soil samples to characterize certain physical properties of the site soil. The laboratory testing program was limited to visual inspection to confirm our field soil descriptions, and determine natural moisture content and grain size distribution. The natural moisture contents of selected soil samples were determined in general accordance with ASTM D 2216 test procedures. The results from the moisture determinations are indicated on the summary logs, adjacent to the corresponding samples. Grain size analyses of selected soil samples were conducted in general accordance with ASTM D 422 test procedures. The results are presented in the form of grain size distribution curves on Figure A-7.

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL[1]	TYPICAL DESCRIPTIONS [2][3]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*, outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the *Standard Test Method for Classification of Soils for Engineering Purposes*, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

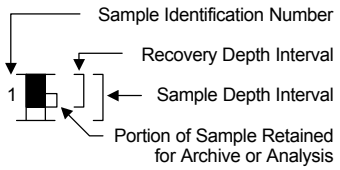
Primary Constituent:	> 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:	> 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
	> 15% and ≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents:	> 5% and ≤ 15% - "with gravel," "with sand," "with silt," etc.
	≤ 5% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

Drilling and Sampling Key

SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Single-Tube Core Barrel
f	Double-Tube Core Barrel
g	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Rotosonic
5	Air Rotary (Rock)
6	Wash Rotary (Rock)
7	Other - See text if applicable

SAMPLE NUMBER & INTERVAL



Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

▽ ATD — Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

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North Seatac Roadway Study SeaTac, Washington

Soil Classification System and Key

Figure A-1

TP-1

SAMPLE DATA			SOIL PROFILE			NOTES/GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): Not Determined	
0					PT	Forest Duff	
	S-1	d	W = 10		SM	Brown, gravelly, silty, fine to medium SAND with numerous roots (loose, moist to wet) **(Outwash)**	
	S-2	d	W = 9		SM	Mottled reddish brown and light brown, silty, fine to medium SAND with gravel and some roots (dense, moist to wet)	Slight groundwater seepage encountered at 2.0 ft.
	S-3	d			SP-SM	Gray, fine to medium SAND with silt (dense, moist)	
5	S-4	d			SP-SM	Gray to light brown, fine to medium SAND with silt and gravel (dense, moist to wet)	
					SW	Gray to light brown, very gravelly, fine to coarse SAND (dense, wet)	
					SP	Gray to light brown, fine to medium SAND (dense, wet)	Moderate groundwater seepage encountered at 9.0 ft.
10	S-5	d					
15							
20							

Test Pit Completed 12/21/07
Total Depth of Test Pit = 12.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Log of Test Pit TP-1

Figure
A-2

TP-2

SAMPLE DATA			SOIL PROFILE			NOTES/GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): Not Determined	
0					PT	Forest Duff	
	S-1	d			SM	Dark brown, gravelly, silty, fine SAND with abundant roots (loose, moist)	
					SM	**(Outwash)**	
	S-2	d	W = 4			Reddish brown, silty, very gravelly, fine to medium SAND with roots (medium dense, wet)	
					SM/ ML	Mottled light brown and reddish brown, very silty, fine SAND to fine sandy SILT (stiff and medium dense, wet)	
	S-3	d					
	S-4	d	W = 18		SM	Light brown, silty, fine SAND (medium dense, wet)	
5					SP	Light brown, fine to medium SAND (dense, moist)	
	S-5	d					
					ML	Light brown, SILT (very stiff to hard, moist) **(Glaciolacustrine)**	
	S-6	d					
	S-7	d			ML	Gray, SILT with slickensides and fractures and occasional silty fine SAND interbeds (very stiff to hard, moist)	Moderate groundwater seepage encountered at 8.0 ft.
10	S-8	d					
	S-9	d					Moderate groundwater seepage encountered at 16.0 ft.
15							
20							

Test Pit Completed 12/21/07
Total Depth of Test Pit = 17.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1042001.01 1/15/08 \\EDMDATA\GINT\GINT7\PROJECTS\1042001.010.GPJ SINGLE TEST PIT LOG

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Log of Test Pit TP-2

Figure
A-3

TP-3

SAMPLE DATA			SOIL PROFILE			NOTES/GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): Not Determined	
0					PT	Forest Duff	
	S-1	d			SM	Dark brown, very silty, fine SAND with abundant roots and trace plastic debris (loose, wet)	
	S-2	d	W = 8 GS		SP-SM	**(Fill)**	
					SM	Light reddish brown, very gravelly, fine to medium SAND with silt and some roots (loose, moist)	
						(Outwash)	
	S-3	d	W = 6			Light brown, silty, gravelly, fine to medium SAND (medium dense, moist)	
	S-4	d	W = 4		GW/SW	Light brown, very gravelly, SAND to sandy, GRAVEL (medium dense to dense, moist to wet)	Moderate groundwater seepage encountered at 5.0 ft.
5							
	S-5	d					
10							
15							
20							

Test Pit Completed 12/21/07
Total Depth of Test Pit = 12.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1042001.01 1/15/08 \\EDMDATA\GINT\GINT7\PROJECTS\1042001.010.GPJ SINGLE TEST PIT LOG

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Log of Test Pit TP-3

Figure
A-4

TP-4

SAMPLE DATA			SOIL PROFILE			NOTES/GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): Not Determined	
0					PT	Forest Duff	Groundwater not encountered.
					SP-SM	Light brown, fine to medium SAND with silt and gravel and roots (loose, moist) **(Fill)**	
	S-1	d	W = 7 GS				
5					SM	Dark brown, silty, fine SAND with organics and roots **(Buried Topsoil)**	
	S-2	d	W = 7		SM	Light brown to reddish brown, silty, fine SAND with gravel and trace roots (medium dense, moist) **(Outwash)**	
					SP-SM	Light brown, fine SAND with silt to trace silt (medium dense, moist)	
	S-3	d					
10					SP	Light brown, fine SAND (dense, damp)	
	S-4	d					
	S-5	d					
15							
20							

Test Pit Completed 12/21/07
Total Depth of Test Pit = 14.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1042001.01 1/15/08 \\EDMDATA\GINT\GINT7\PROJECTS\1042001.010.GPJ SINGLE TEST PIT LOG

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Log of Test Pit TP-4

Figure
A-5

TP-5

SAMPLE DATA			SOIL PROFILE			NOTES/GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): Not Determined	
0	S-1	d			SM	Light brown, silty, fine SAND to fine SAND with silt and abundant concrete (footings, slabs) and metal debris (loose, moist) **(Fill)**	Groundwater not encountered.
	S-2	d	W = 7 GS		SP	Light brown, gravelly, fine to coarse SAND, trace silt (dense, moist) **(Outwash)**	
5					SP	Light brown, gravelly, fine to medium SAND grading to fine to medium SAND with gravel (dense, moist)	
	S-3	d	W = 10		SP-SM	Light brown, fine SAND with silt to trace silt (dense, damp)	
10					SP	Light brown, fine SAND (dense, damp)	
	S-4	d					
15							
20							

Test Pit Completed 12/21/07
Total Depth of Test Pit = 13.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1042001.01 1/15/08 \\EDMDATA\GINT\GINT7\PROJECTS\1042001.010.GPJ SINGLE TEST PIT LOG

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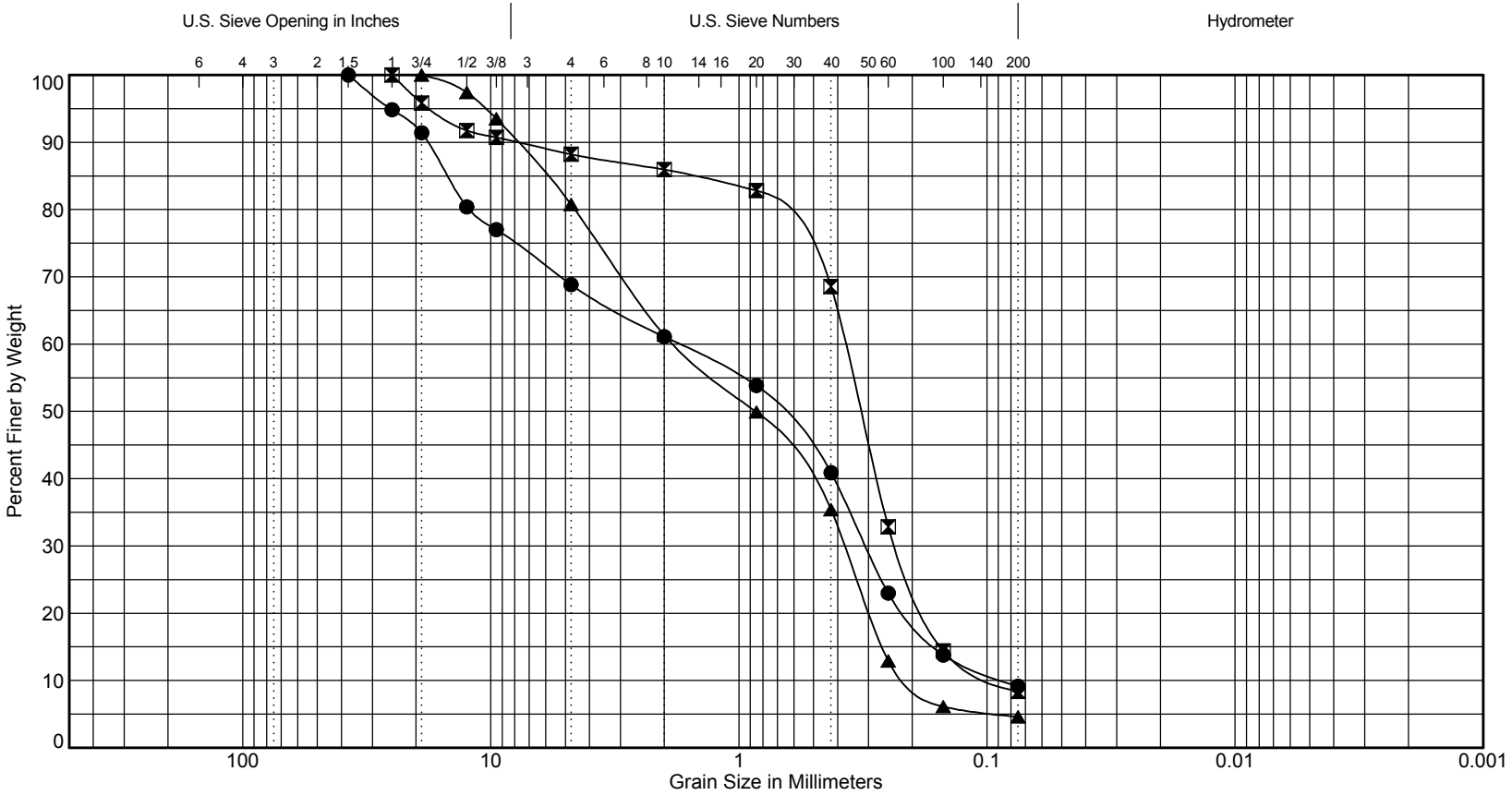
Log of Test Pit TP-5

Figure
A-6



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

Symbol	Exploration Number	Sample Number	Depth (ft)	Natural Moisture (%)	Soil Description	Unified Soil Classification
●	TP-3	S-2	1.0	8	Very gravelly, fine to medium SAND with silt	SP-SM
⊠	TP-4	S-1	2.0	7	Fine to medium SAND with silt and gravel	SP-SM
▲	TP-5	S-2	3.0	7	Gravelly, fine to coarse SAND, trace silt	SP

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SeaTac, Washington

Grain Size Distribution

Figure
A-7

APPENDIX B

Logs of Nearby Explorations

APPENDIX B
LOGS OF NEARBY EXPLORATIONS

To supplement our site explorations, Landau Associates reviewed available geotechnical information for the project area (MFG 2003). The summary logs from the previous explorations are attached herein. The approximate locations of the previous explorations are illustrated on the figures that precede the summary logs. The attached exploration logs are provided for background information only, as conditions may have changed since the time of exploration.

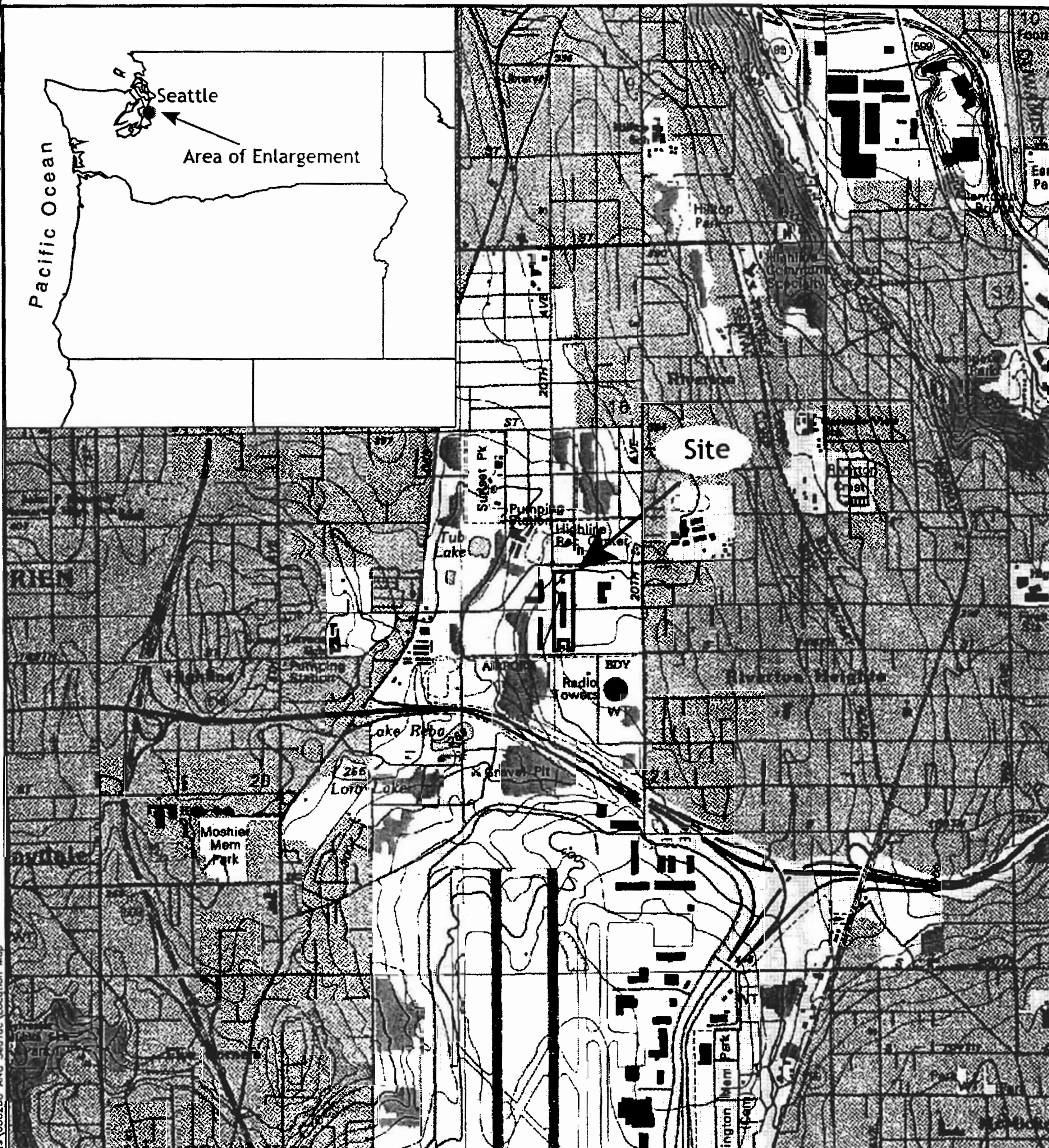
REFERENCE

MFG. 2003. *Phase I/II Environmental Site Assessment, Boeing Leasehold Property, 2206 South 146th Street, Seatac, Washington 98168*. July 1.

MFG, Inc.

Phase I/II Environmental Site Assessment
Boeing Leasehold Property
2206 South 146th Street
SeaTac, Washington 98168

July 1, 2003



Source: USGS 24k Digital Raster Graph, Des Moines Quadrangle, Year - 1995

N

Site Boundary

Scale

2,000 0 2,000

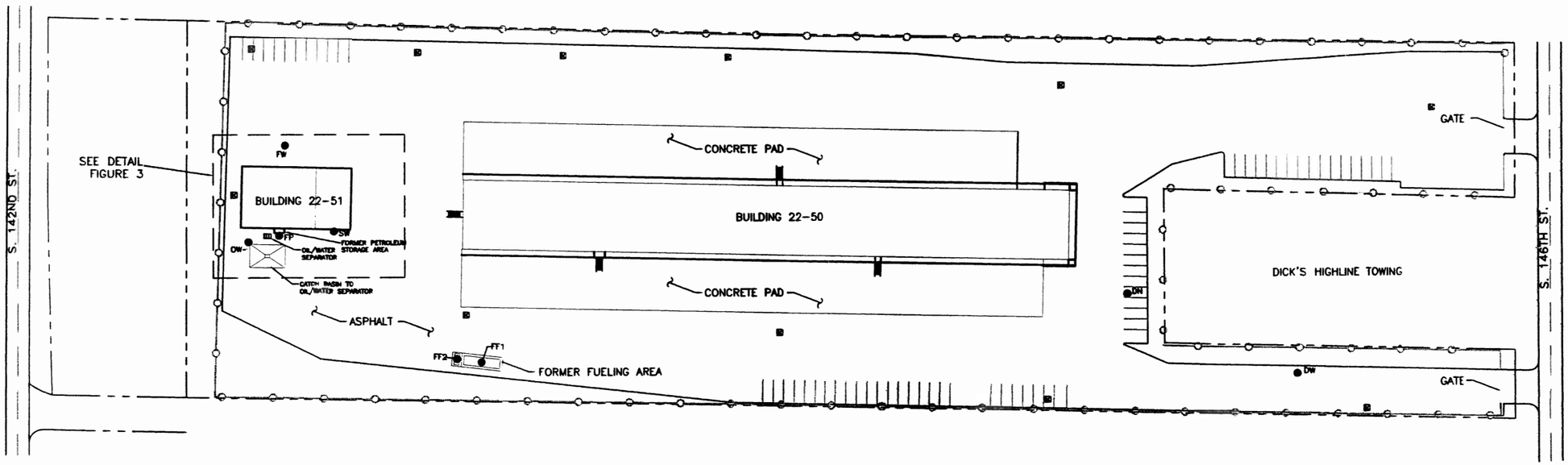
Feet

Date: 06/23/2003 Filename: H:\Projects\030236

ANC RENTAL CORPORATION ANC - SEATAC ESA	
FIGURE 1 **LOCATION MAP**	
PROJECT: 030236	DATE: 6/23/03
REV:	BY: ISP CHECKED: JIS
MFG, Inc. *consulting scientists and engineers*	

LEGEND:

- FP ● BORING LOCATION
- ⊠ CATCH BASIN DRAIN TO STORMWATER UNLESS NOTED
- PROPERTY LINE
- FENCE



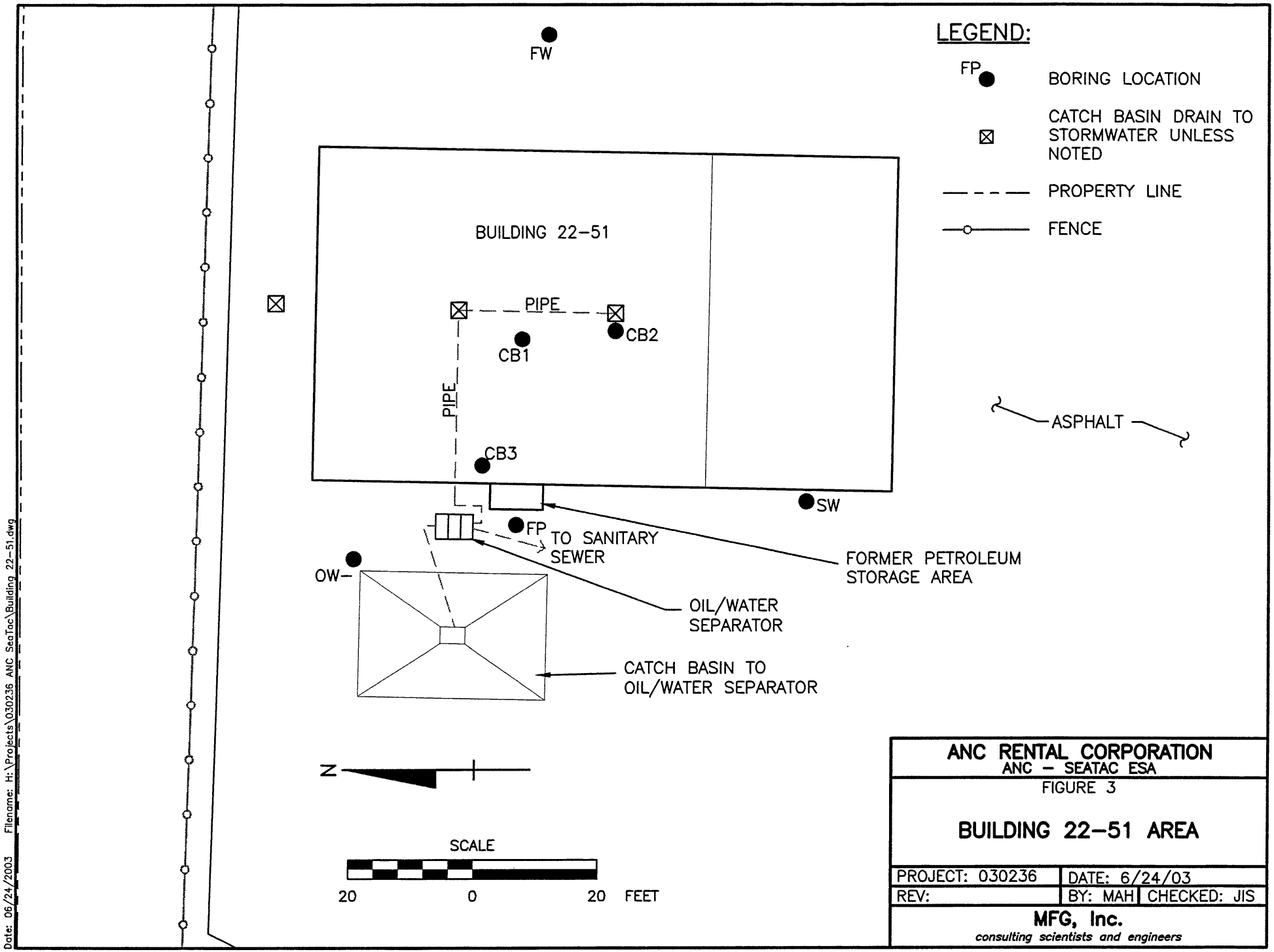
N

SCALE

100 0 100 FEET

ANC RENTAL CORPORATION ANC – SEATAC ESA	
FIGURE 2 **SITE PLAN**	
PROJECT: 030236	DATE: 6/24/03
REV:	BY: MAH CHECKED: JIS
MFG, Inc. *consulting scientists and engineers*	

Date: 06/24/2003 Filename: H:\Projects\030236 ANC SeaTac\Site Plan.dwg



Date: 06/24/2003 Filename: H:\Projects\030236 ANC SeaTac\Building 22-51.dwg

ANC RENTAL CORPORATION
ANC – SEATAC ESA

FIGURE 3

BUILDING 22-51 AREA

PROJECT: 030236	DATE: 6/24/03	
REV:	BY: MAH	CHECKED: JIS

MFG, Inc.
consulting scientists and engineers

A TETRA TECH COMPANY

19203 36th Ave. W., Suite 101
Lynnwood, WA 98036-5707
(425) 921-4000
(425) 921-4040

LOG OF BORING DN

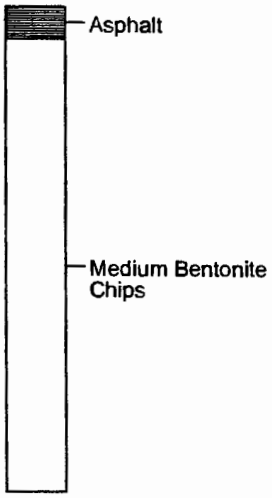
ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 5/23/03
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: Continous 2-foot		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS
0							
1	SANDY SILT WITH GRAVEL. Brown, dense silt, with some (about 30 percent) fine to medium sand and little (about 15 percent) gravel; moist; no odor	ML		1	24"	0.0	
2							Sample DN-SB-02 collected at 16:30
3							
4							Refusal at 3.75 feet
5							
6							
7							
8							
9							
10							

Well:
Elev.:



06-24-2003 D:\DN.BOR

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(425) 921-4040

LOG OF BORING DW

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 5/23/03
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: Direct Push		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS
0							
1	SILTY GRAVEL WITH SAND. Gray-brown dense gravel with about 20 to 30 percent silt and 5 to 15 percent fine sand; dry; no odor	GM		1	22"	0.0	
2	SILT WITH SAND. Gray to brown silt with about 10 to 20 percent subangular sand and trace gravel (up to 1-inch in diameter); trace wood chips; dry; no odor.	ML					Sample DW-SB-02 collected at 7:51
3				2	21"	0.0	
4							Refusal at 4.0 feet Started hole with 4-foot macrocore sampler. Switched to 2-foot sampler due to hard drilling conditions.
5							
6							
7							
8							
9							
10							

Well:
Elev.:

06-24-2003 D:\DW.BOR

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Lynnwood, WA 98036-5707
(425) 921-4000
(425) 921-4040

LOG OF BORING FP

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 5/23/03
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: 2-foot direct-push		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS
0							
4	SANDY SILT WITH GRAVEL. Mottled gray-brown silt with some fine to coarse sand, trace gravel; moist; no odor; small amount of wood chips present.	ML		1	18"	0.0	Sample FP-SB-06 collected at 11:34
9	SILT WITH GRAVEL. Mottled silt with some (about 5 to 20 percent) gravel (1/4 to 1/2-diameter), little sand; trace wood chips; moist; no odor; 2-inch thick layer of concrete debris;			2	21"	0.0	
13	POORLY GRADED SAND. Light brown, medium subangular, poorly graded sand; moist; no odor	SP		3	21"	0.0	
15							

Well:
Elev.:

06-24-2003 D:\FP.BOR

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(425) 921-4040

LOG OF BORING FP

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 5/23/03
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: 2-foot direct-push		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS	Well: Elev.:
15				3				
16								
17								
18								
19	POORLY GRADED SAND. Light brown, medium to coarse, subangular, poorly graded sand with trace fine gravel, moist; no odor; 1/2-inch thick silt lense at 20 feet bgs.	SP		4	22"	0.0		Medium Bentonite Chips
20								
21								
22								
23				5	20"	0.0		
24	POORLY GRADED SAND. Light brown, poorly graded medium to coarse, subangular sand with trace gravel (up to 1-inch in diameter), trace silt; no odor; moist to wet							
25	Total depth = 25.0 feet bgs.							
26								
27								
28								
29								
30								

06-24-2003 D:\FP.BOR

A TETRA TECH COMPANY

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Lynnwood, WA 98036-5707
(425) 921-4000
(425) 921-4040

LOG OF BORING FF1

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 5/23/03
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: Direct Push		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS
0	SILTY GRAVEL WITH SAND. Gray to brown gravel (1/4" to 1-inch in diameter) with about 30 percent sand and 10 to 20 percent silt; dry; no odor.			1	20"	0.0	
2	Same as above.			2	18"	0.0	Switched from 4-foot macrocore to 2-foot sampler at 2.5 feet bgs due to difficult drilling conditions.
4	SILTY GRAVEL WITH SAND. Gray to black gravel (up to about 2.5 inches in diameter) with about 20 percent medium to coarse sand and about 10 to 20 percent sillt; moist; no odor	GM		3	10"	0.0	
6	Same as above.			4	14"	0.0	
7	No recovery. A few water droplets on sampler.			5	0"	NA	
10	SILTY GRAVEL WITH SAND. Brown to rust gravel with some (about 25 percent) silt and about 10 to 15 percent sand; moist"no odor						
11	SANDY SILT. 6-inch layer of sandy silt; moist; no odor. Brown to gray poorly graded sand in tip of sampler.	ML		6	18"	0.0	Sample FF1-SB-12 collected at 10:00
12	POORLY GRADED SAND. Light olive-brown, medium coarse, subangular, poorly graded sand with trace gravel; moist; no odor.	SP		7	13"	0.0	Sample FF1-SB-14 collected at 10:10
14	Refusal at 14 feet bgs						
15							

Well:
Elev.:

Asphalt

Medium Bentonite Chips

06-24-2003 D:\FF1.BOR

A TETRA TECH COMPANY

19203 36th Ave. W., Suite 101
Lynnwood, WA 98036-5707
(425) 921-4000
(425) 921-4040

LOG OF BORING FF2

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Split-Spoon
Drilling Method	: Hollow-stem	Installation Date	: 6/5/2003
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: CME rig		
Sample Method	: Dames & Moore		

Depth in	DESCRIPTION	USCS	Samples	Recovery	PID (ppm)	REMARKS
0						Boring started on 5/23/03 using direct-push methods. Met refusal immediately below asphalt in silty gravel and abandoned hole. Came back with hollow-stem auger to complete drilling.
5	SILTY SAND WITH GRAVEL. Brown, medium to coarse, sand with about 20 to 30 percent gravel (up to 1-inch in diameter) and 10 to 20 percent silt; dry; no odor	SM	1	6"	39.4	
10	SILTY SAND WITH GRAVEL. Brown, fine to coarse sand with some gravel (up to 1-inch in diameter) and silt; dry; no odor. 1-inch thick layer has minor petroleum(?) staining.		2	12"	47.1	Sample FF2-SB-11 collected at 8:18
15	POORLY GRADED SAND. Light brown, medium to coarse sand, with about 5 to 10 percent fine gravel and trace silt; moist; no odor.	SP	3	6"	0.0	
19		SW				

Well:
Elev.:

Asphalt

Medium Bentonite Chips

06-25-2003 D:\FF2.BOR

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LOG OF BORING FF2

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Split-Spoon
Drilling Method	: Hollow-stem	Installation Date	: 6/5/2003
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: CME rig		
Sample Method	: Dames & Moore		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS	Well: Elev.:
20	WELL GRADED SAND. Light brown, fine to coarse, subangular, sand with trace fine gravel (up to 1/2-inch in diameter), moist; no odor.	SW		4	11"	0.0		
22								
25	POORLY GRADED SAND. Light brown, poorly greded medium to coases subangular sand with trace gravel (up to 1-inch in diameter), trace silt; no odor; moist to wet	SP		5	12"	0.0		
30	POORLY GRADED SAND WITH GRAVEL. Light brown, poorly graded medium subangular sand with about 20 to 30 percent subrounded gravel (up to 1.5-inch in diameter);moist; no odor			6	6"	0.0		Medium Bentonite Chips
32								
35	WELL GRADED SAND. Brown, medium to coarse semiangular sand with trace fine (up to 1/2-inch diameter) gravel and trace silt; moist; no odor.	SW		7	12"	0.0		
37								
40		SP						

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LOG OF BORING FF2

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Split-Spoon
Drilling Method	: Hollow-stem	Installation Date	: 6/5/2003
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: CME rig		
Sample Method	: Dames & Moore		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS	Well: Elev.:
40	POORLY GRADED SAND. Light olive-brown, medium to coarse subangular sand with trace silt; moist; no odor.			8	12"	0.0		
41								
42								
43								
44								
45	POORLY GRADED SAND. Light brown, medium subangular sand with about 10 percent gravel (up to 1-inch in diameter); moist; no odor.	SP		9	12"	0.0		Medium Bentonite Chips
46								
47								
48								
49								
50	POORLY GRADED SAND WITH GRAVEL. Light brown, poorly graded sand with about 20 percent subrounded gravel (up to 1-inch in diameter); moist; no odor.			10	12"	0.0		
51								
52								
53	Total depth = 51.0 feet bgs							
54								
55								
56								
57								
58								
59								
60								

06-25-2003 D:\FF2.BOR

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LOG OF BORING FW

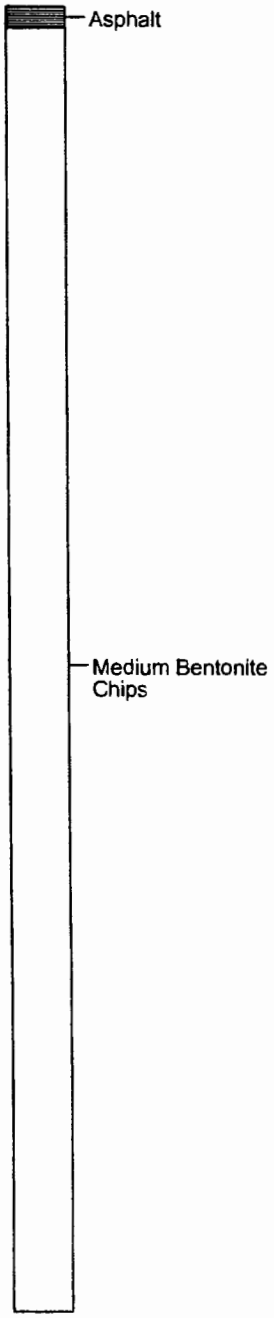
ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 5/23/03
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: 2-foot direct push		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS
0							
4	SANDY SILT WITH GRAVEL. Brown silt with about 20 to 30 percent sand and 20 percent fine (1/4 to 1/2-inch diameter) gravel; moist; no odor	ML		1	8"	0.0	
9	Same as above. Light brown, poorly graded sand in tip of sampler at 10.5 feet bgs.			2	12"	0.0	Sample FW-SB-11 collected at 15:37
10		SP					
14	POORLY GRADED SAND. Light olive-brown poorly graded sand with trace subrounded gravel(up to 1-inch in diameter); moist; no odor			3	13"	0.0	
15							

Well:
Elev.:



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LOG OF BORING FW

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 5/23/03
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: 2-foot direct push		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS	Well: Elev.:
15								
16		SP		3				
17								Medium Bentonite Chips
18								
19	Refusal at 18.5 feet bgs.							
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

06-24-2003 D:\FW.BOR

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LOG OF BORING SW

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 5/23/03
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: 2-foot direct push		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS	Well: Elev.:
0	SANDY SILT WITH GRAVEL. Brown silt with about 20 to 30 percent fine to coarse sand and about 10 to 20 percent fine (1/4-inch to 1/2-inch) gravel; moist; no odor.			1	10"	0.0	Checked PID with isobutylene result was OK.	Asphalt
4	SANDY SILT WITH GRAVEL. Brown silt with about 25 to 35 percent fine to coarse sand and 10 to 20 percent gravel; moist to wet; no odor			2	13"	0.0	Sample SW-SB-06 collected at 14:43	Medium Bentonite Chips
9	SANDY SILT with GRAVEL. Dark brown, dense silt with about 20 to 30 percent sand, and 20 to 30 percent gravel; moist; no odor.			3	12"	0.0	Sample SW-SB-11 collected at 14:55	
11	Refusal at 11.5 feet bgs							

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LOG OF BORING OW (Shallow)

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 5/23/03
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: 2-foot direct push		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS	Well: Elev.:
0								Asphalt
1							Location was redrilled on 6/5/03 using hollow-stem auger techniques to achieve desired depths.	
2								
3								
4	SANDY SILT WITH GRAVEL. Brown silt with about 20 percet sand and 10 percent fine gravel; moist; no odor							
5				1	8"	0.0	Sample OW-SB-06 collected at 13:15	
6		ML						
7								
8								Medium Bentonite Chips
9	SANDY SILT WITH GRAVEL. Mottled gray-brown silt with some (about 20 to 30 percent) sand and trace gravel; moist to wet; no odor							
10				2	12"	0.0	Sample OW-SB-11 collected at 13:35	
11								
12								
13		SP						
14	POORLY GRADED SAND. Light brown poorly graded sand with trace gravel; moist; no odor			3	12"	0.0		
15								

06-25-2003 D:\OW.BOR

A TETRA TECH COMPANY

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LOG OF BORING OW (Shallow)

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 5/23/03
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: 2-foot direct push		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS	Well: Elev.:
15				3				
16								
17								
18		SP						Medium Bentonite Chips
19	POORLY GRADED SAND. Light olive-brown, medium to coarse, subangular, poorly graded sand with trace fine (1/4-inch to 1/2-inch diameter) subangular to subrounded gravel, trace silt; moist, no odor.							
20				4	12"	0.0		
21	Refusal at 21.0 feet bgs.							
22								
23								
24								
25								
26								
27								
28								
29								
30								

06-25-2003 D:\IOW.BOR

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LOG OF BORING OW

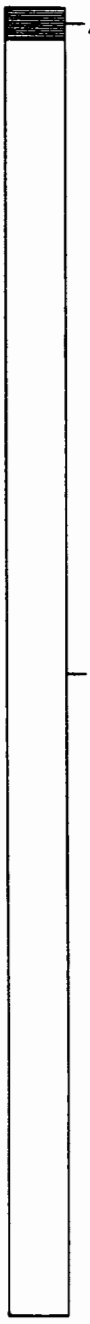
ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Split-Spoon
Drilling Method	: Hollow-stem	Installation Date	: 6/5/2003
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade CME rig		
Sample Method	: Dames & Moore		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS
0	Hand-dug with post-hole digger to 3' bgs. SILTY GRAVEL WITH SAND. Brown, fine to medium gravel (up to 1.5-inches in diameter), with some (about 30 percent) silt and little sand; dry; no odor.	GM					Boring originally started on 5/23/03 using direct-push methods. Met refusal @ 21 feet bgs. Sampled and abandoned hole. (refer to OW [shallow] log). Drilled with hollow-stem auger to complete characterization between 20 and 50 feet bgs.
3	1-foot long piece of metal debris at 4 to 5 feet bgs.						
5	SANDY SILT WITH GRAVEL. Brown, mottled silt with about 20 to 30 percent sand and 10 to 15 percent gravel,; moist; no odor.	ML		1	12"	0.0	
10	SANDY SILT WITH GRAVEL. Gray-brown, mottled silt with about 5 to 25 percent fine sand and 5 to 15 percent gravel (up to 2-inches in diameter); moist; no odor. Sand present at tip of sampler.			2	12"	0.0	
15	POORLY GRADED SAND WITH GRAVEL. Light brown, poorly graded, medium to coarse sand, with about 10 to 15 percent subrounded gravel (to 2-inches in diameter) and trace silt; moist; no odor.	SP		3	12"	0.0	

Well:
Elev.:



06-25-2003 D:\OW2.BOR

A TETRA TECH COMPANY

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Lynnwood, WA 98036-5707
(425) 921-4000
(425) 921-4040

LOG OF BORING OW

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Split-Spoon
Drilling Method	: Hollow-stem	Installation Date	: 6/5/2003
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade CME rig		
Sample Method	: Dames & Moore		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS	Well: Elev.:
20	POORLY GRADED SAND. Light brown, poorly graded, medium to coarse, subangular, sand with about 5 to 10 percent gravel (up to 1-inch in diameter) trace fines and clay, moist; no odor.	SP		4	6"	0.0		Medium Bentonite Chips
25	POORLY GRADED SAND. Light brown, poorly graded, medium to coarse, subangular sand with trace gravel (up to 1/2-inch in diameter), trace fines; no odor; moist.			5	12"	0.0		
30	POORLY GRADED SAND. Light olive-brown, poorly graded medium sand with about 5 to 10 percent fines and trace subrounded gravel (up to 1/2-inch in diameter);moist; no odor			6	12"	0.0		
35	POORLY GRADED SAND. Brown, poorly graded medium, subangular sand with trace fines and gravel (up to 1-inch in diameter); moist; no odor.			7	6"	0.0		
38		GW						
40								

06-25-2003 D:\OW2.BOR

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LOG OF BORING OW

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Split-Spoon
Drilling Method	: Hollow-stem	Installation Date	: 6/5/2003
Drill Bit Size	: 2-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade CME rig		
Sample Method	: Dames & Moore		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS
40	WELL GRADED GRAVEL WITH SAND. Brown well graded, subrounded gravel (up to 1.5-inch in diamenter) with about 30 to 40 percent subangular sand and trace fines; moist; no odor.	GW		8	6"	0.0	
41							
42							
43							
44							
45	POORLY GRADED SAND. Light brown, medium subangular sand with trace gravel (up to 1-inch in diameter) and fines; moist; no odor.	SP		9	6"	0.0	
46							
47							
48							
49							
50	POORLY GRADED SAND. Light brown, poorly graded, fine to medium, subangular sand with trace subrounded gravel (up to 1/2-inch in diameter); moist; no odor.			10	6"	0.0	
51							
52	Total depth = 50.5 feet bgs						
53							
54							
55							
56							
57							
58							
59							
60							

Well:
Elev.:

Medium Bentonite Chips

06-25-2003 D:\OW2.BOR

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LOG OF BORING CB1

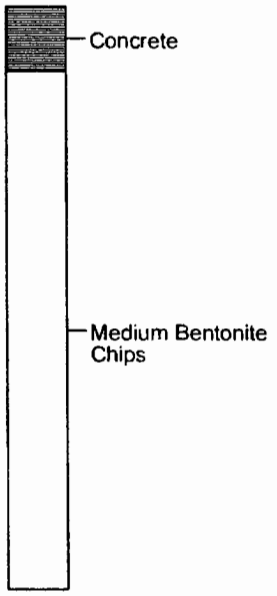
ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 6/6/03
Drill Bit Size	: 4-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: 4-foot macrocore		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS
0	GRAVELLY SILT WITH SAND. Brown, dense silt with some (about 20percent) fine gravel (up to 1-inch in diameter) and 10 to 15 percent sand; dry; no odor.	ML		1	42"	0.0	This is the northern catchbasin in building 22-51. Sample CB1-SB-04 collected at 7:58. Sample collected from 3.0 to 4.0 feet bgs.
1							
2							
3							
4							
5							Total depth = 4.5 feet bgs
6							
7							
8							
9							
10							

Well:
Elev.:



06-25-2003 D:\WCB1.BOR

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LOG OF BORING CB2

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 6/6/03
Drill Bit Size	: 4-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: 4-foot macrocore		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS	Well: Elev.:
0	SILTY GRAVEL WITH SAND. Brown gravel (up to 1.5-inches in diameter) with about 20 to 30 percent silt and little (about 10 to 20 percent) fine to coarse sand; dry; no odor.	GM		1	44"	0.0	This is the southern catchbasin in building 22-51. Sample CB2-SB-04 collected at 8:30 Sample collected from 3.0 to 4.0 feet bgs.	Concrete Medium Bentonite Chips
1								
2								
3								
4								
5							Total depth = 4.5 feet bgs	
6								
7								
8								
9								
10								

06-25-2003 D:\WCB2.BOR

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LOG OF BORING CB3

ANC Phase I/II
2206 S. 146th St.
SeaTac, Washington

MFG Project# 030236

Drilling Agency	: Cascade Drilling	Sample Type	: Soil
Drilling Method	: Direct Push	Installation Date	: 6/6/03
Drill Bit Size	: 4-foot	Logged By	: Ben Farrell
Drill Rig	: Cascade DPT Rig		
Sample Method	: 4-foot macrocore		

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Recovery	PID (ppm)	REMARKS
0	GRAVELLY SILT WITH SAND. Brown silt with some (about 30 percent) medium to coarse sand and little fine (up to 3/4-inch diameter) gravel; dry; no odor; old concrete fragments near top of sample; minor petroleum (?) staining at about 3 feet bgs.	ML		1	40"	0.0	This boring is situated along the west wall of building 22-51 along catchbasin piping alignment. Sample CB3-SB-04 collected at 8:15 Sample collected from 3.0 to 4.0 feet bgs. Total depth = 4.5 feet bgs
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Well:
Elev.:

06-25-2003 D:\WCB3.BOR

North SeaTac Roadways Study

Appendix C
Summary of Community Open House
June 27, 2007

City of SeaTac
North SeaTac Roadways Study

Summary of Community Open House #1

June 27, 2007

Contents

Appendices

Open House Attendees

City of SeaTac
Susan Sanderson
Karen Spencer
Tom Gut
Todd Cutts

Port of Seattle
Peter Lindsay
Tom Hooper
Marco Milanese

Project Staff
Peter Smith, HNTB
Jim Soukup, HNTB
Andrea Imler, PRR

Attendees*
Melvin Ambuehl
Barbara Bader
Karri Baker
Mary Baugg
Chris Brewer
Laura Buckmaster
Tracy Carlson
Mabel Coeyer
Phyllis Dickey
Shirley Dolloff
Calla Elliot
Mandy Engelker
Jordan Fairchild
Terry Fairhurst
George Fernald
Rick Forschler
DA Gaiser
Ric Hall
Eric Helland
Doris Jones
Lisa Jorgensen
Mary Kelly
Mike Kelly
Mary Koork
Barbara Laubacher
Mark Laubacher
Jim Martin
Barb Martin
John Powell
Tracie Sarsfield
Todd Schmitt
PJ Seidenstricker
Norm Spokedale
Eric Strayer
Larry Tannenbaum
Val Tannenbaum
Stanet Teem
Darleene Thompson
John Thompson
Kalau W
Gordon Wittrock
Sue Woolworth
Chris Wythe
Tracy Wythe

*The above attendees signed in at the open house. Actual meeting attendance was approximately 60.

Overview

The City of SeaTac is preparing a roadways study to evaluate and prepare for potential traffic changes and impacts that may stem from future development of a Port of Seattle-owned property adjacent to North SeaTac Park. The currently undeveloped property is referred to as the "55-Acre Parcel" and is located between South 142nd Street and South 136th Street. The North SeaTac Roadways Study will evaluate possible roadway connections to the site, identify preferred alignments and determine what infrastructure services must be provided to accommodate development. The City's primary objectives for completing this study are to provide transportation infrastructure that will accommodate future uses on the site and minimizes traffic impacts in the surrounding neighborhoods.

The City of SeaTac is preparing preliminary options that focus on:

- Minimizing traffic impacts to local streets and in adjacent neighborhoods
- Optimal site access and egress locations
- Separating truck traffic from neighborhood traffic
- Minimizing environmental impacts

In early 2007, the project team reviewed various corridor options, considering area topography and natural resources, existing traffic information and projections, planning history for the area, and previous traffic concerns and wishes voiced by area residents and commercial interests. This information was used to develop three preliminary roadway corridor options to accommodate access and egress to the 55-Acre Parcel. Upon further review in early June, the project team eliminated one of the corridor options that allowed truck access to the site via 24th Ave S and 142nd Street, due to possible impacts to residential areas.

A community open house was held at the SeaTac Community Center on June 27, 2007 to introduce the North SeaTac Roadways Study, present the preliminary roadway corridor design options; identify key community concerns and interests regarding traffic access to and from the 55-Acre Parcel; increase general awareness and understanding about the project and future Port of Seattle development plans; and collect feedback on the proposed corridor options. Approximately 60 members of the public attended the meeting. This report details the meeting's proceedings and results.

Open House Format

The project team held an open house at the SeaTac Community Center on June 27, 2007 from 5:30 pm to 7:30 pm. A brief presentation was scheduled at 6:00 pm. The open house purpose was to introduce the North SeaTac Roadways Study, present the preliminary roadway corridor options; identify key community concerns and interests regarding traffic access to and from the 55-Acre Parcel; increase general awareness and understanding about the project and future Port of Seattle development plans; and collect feedback on the proposed roadway corridors.

Three roadway options were presented on display boards throughout the room, one of which was no longer under consideration. The eliminated option was included in the displays to inform the public that this corridor had been studied but was removed, and to ask attendees whether the City should continue to study this option.

Attendees were asked to focus on two of the corridor options and provide comments and feedback to the City of SeaTac. Project team members were present to answer questions and explain how the team arrived at the preliminary options. Flip charts placed next each display allowed attendees to note their feedback, preferences, concerns and suggestions specific to each corridor option. Attendees could also draw transportation suggestions on large maps, or fill out a comment form

The comments gathered at this meeting will be used to further refine the roadway corridor options.

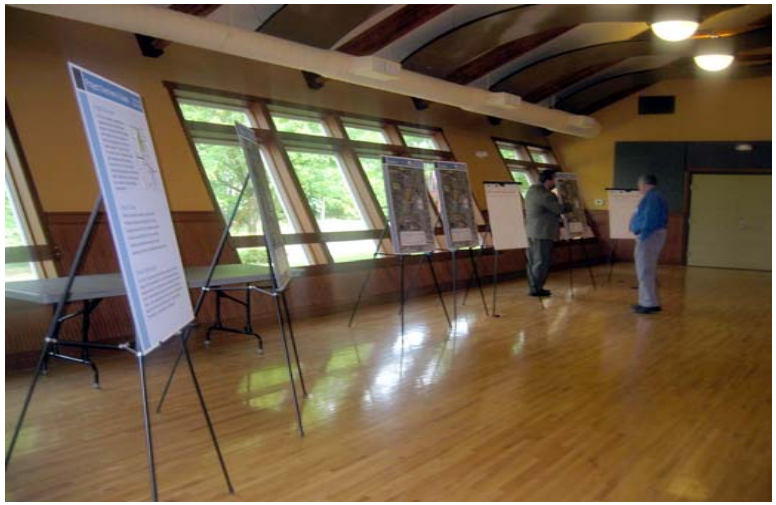
Open House Presentation

At 6 pm, City of SeaTac Project Manager Susan Sanderson welcomed the attendees and explained the open house purpose. Susan introduced the project team, provided a brief project overview, and encouraged attendees to review the corridor options, talk with staff, and provide comments and thoughts.

Peter Lindsay of the Port of Seattle presented the Port's development intentions of the 55-Acre Parcel and noted that the Port does not yet have development plans for the site. Peter also noted that once development plans take shape, a separate public involvement and environmental review processes will be completed by the Port of Seattle to inform and engage the community.

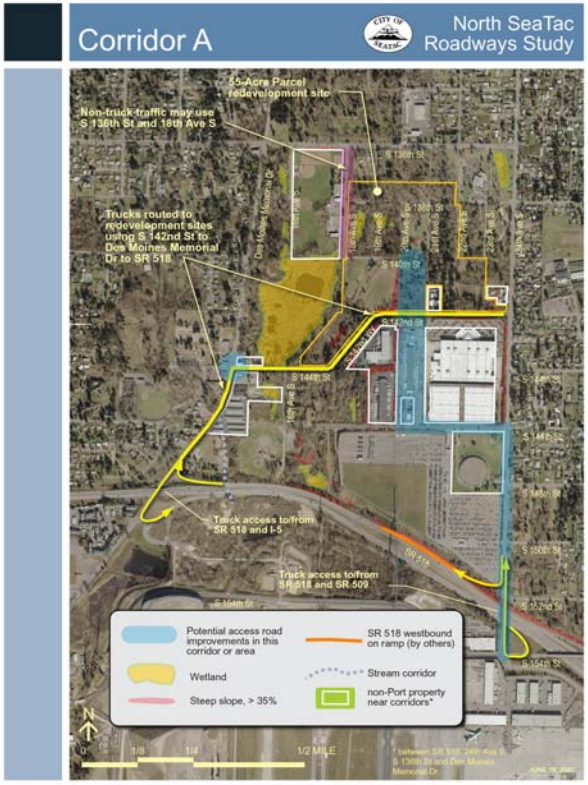
Jim Soukup and Peter Smith of engineering firm HNTB provided an overview of the corridor options and noted why the two preliminary options had been identified as the primary corridor options to accommodate access and egress to the 55-Acre Parcel. Jim touched on some of the environmental constraints in the project area and the challenges of circulating truck traffic to and from SR 509 and SR 518.

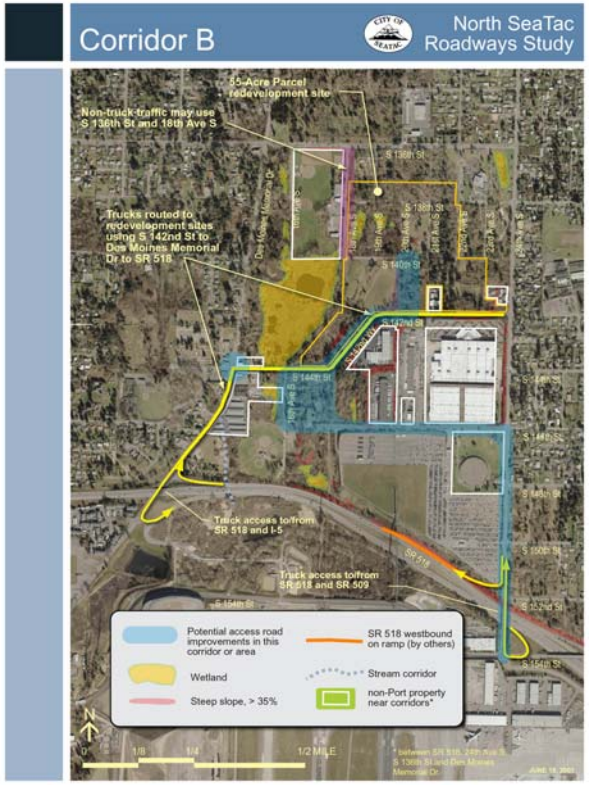
Upon completion of the presentation, attendees were asked to return to the open house displays and ask staff any questions they might have. Several attendees voiced their concern about the Port's future development of the 55-Acre Parcel and several questions were asked and addressed by the project team.

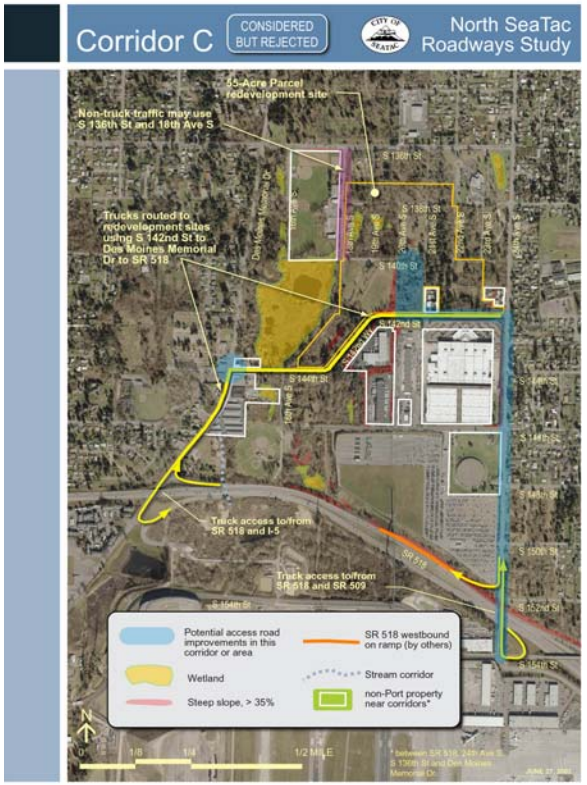


Preliminary Corridor Options

The three preliminary corridor design options were presented on display boards at the Open House. Corridor C was presented with the note that it was no longer under consideration.







Flip Chart Question for Corridors A and B:
Which corridor option do you prefer?

Flip Chart Question for Corridors C:
Should the City reconsider this option?

Open House Comments and Feedback Themes

The primary themes among the comments received at the Open House and on comment forms and through verbal communication are as follows. A total number of 19 comment forms were received at the open house.

- There was no clear favorite corridor option, although most attendees commented that they support those options that best move traffic away from 24th.
- Safety was an important issue. Attendees commented that current truck traffic on 24th Ave. S. is dangerous, especially since there are children present in the surround neighborhoods. An increase of truck traffic due to development would make the situation more dangerous.
- Attendees suggested that no trucks should be allowed on 24th or in the vicinity of the Community Center. Truck and semi traffic should be routed via Des Moines Memorial Drive and the major highways.
- Trucks/semis are currently using the neighborhoods as shortcuts to their destinations. Traffic calming techniques could be used to hinder trucks from using neighborhood streets.
- Several attendees had safety concerns caused by poor lighting and inadequate traffic signals on the intersections near the 55-Acre Parcel.
- There is already too much traffic on 24th and the facilities cannot accommodate additional vehicles caused by the Port development.

While the North SeaTac Roadways Study is separate from the development process of the 55-Acre Parcel, the following themes emerged regarding development of the site:

- Most attendees the open house were primarily concerned about the Port of Seattle's future development of the 55-Acre Parcel and losing the open space uses they have enjoyed on the 55-Acre Parcel.
- 55-Acre Parcel is a green zone, buffer, recreational site, and wildlife refuge and should not be developed.
- Equestrians, BMX racers, archery, soccer and rugby players all use areas in the 55-Acre Parcel and are very concerned with being displaced from the site.
- Many people see the 55-Acres Parcel as part of North SeaTac Park and would like it to continue to be part of the park.

Mailed In Comments and Feedback Themes

The following are primary themes among the comments from mailed in comment forms. Mailed comments were due for inclusion in the summary by July 10, 2007. Individuals received comment forms via mail, the project website and at the open house. A total of 22 mailed in comment forms were received.

- There was no clear favorite corridor option, although most attendees commented that they support those options that best move traffic away from 24th and creates the least amount of impact on the surrounding neighborhoods. Three people identified Concept A as their preferred option, while one person identified Concept B as their preferred option.

- Many people feel that Des Moines Memorial Blvd. should be used to direct traffic to the 55-Acre Parcel from Highways 518 and 509 instead of using arterial streets such as 24th Ave. S.

- Safety was an important issue. A number of respondents mentioned that traffic improvements such as stop lights, stop signs and speed reductions around 24th Ave. S. are necessary. Many noted that vehicles, including trucks, driving on 24th Ave. S. and surrounding streets speed and ignore traffic signs.

- A number of people are concerned with an increase in noise from additional vehicles using the streets once development begins at the 55-Acre Parcel.
  While the North SeaTac Roadways Study is separate from the development process of the 55-Acre Parcel, the following themes emerged regarding development of the site:

  - The majority of people are concerned about the Port of Seattle's future development of the 55-Acre Parcel and do not want to lose the open space uses they have enjoyed on the 55-Acre Parcel.

  - A number of people have environmental concerns with developing the 55-Acre Parcel.

  - Many people see the 55-Acres Parcel as part of North SeaTac Park and would like it to continue to be part of the park.

APPENDIX A: Open House Comments & Feedback

The following verbatim comments were received on the flip charts, maps, verbally, and on the comment forms.

A) Flip Chart Verbatim Feedback

Flip Chart – *What concept do you prefer?*
None! No more traffic in our neighborhood, on 24th Ave.

Explore closing access from SIEPL *(sic)* at 150th and convert 146th west of 24th to one way westbound.

SR 518 westbound to S. 154th, left turn to 24th.

B) Verbatim Comments Written on Project Maps

Horses are not allowed in the north side [of S. 136th].

C) Verbal Comment Summary at the Open House

The 55-Acre Parcel acts as a natural park, green belt and buffer zone.

In Phase II of the North SeaTac Plan, the 55-Acre Parcel is listed as a park.

Citizens want the 55 acres to be kept as is and can self-maintain it as a park.

Equestrians use the 55-Acre Parcel heavily. Approximately 30 horses use the arena and trails.

The impact that development of the 55 acres would be on the community is much more important than anything that could be built there.

No trucks (semis) or increase of car traffic should be allowed on 24th.

The intersection at 24th and 142nd is constantly clogged, making it difficult for residents to leave their homes.

Citizens are concerned with the displacement of people and wildlife that development at the 55-Acres would bring.

Keep development and traffic south of 142nd.

Mitigation of the loss of use for citizens from the 55-Acre Parcel development is necessary by the City of SeaTac and the Port of Seattle.

Many attendees commented that the Port of Seattle should and could donate the 55-Acre Parcel to the community as a show of good faith and neighborliness.

D) Verbatim Comment Form Feedback

The comment form included four questions regarding traffic improvements to service the 55-Acre Parcel, likes and dislikes of the current traffic system, how trucks should be routed to and from the 55-Acre Parcel and what option was preferred by the attendee.

1. What's most important to you regarding traffic improvements to service the 55-Acre Parcel?

Please, no more traffic on 24th!

My students, because, I am a school bus driver for Highline School District #401 and I live on 128th at Military Road South.

4 way stop at 144th and 24th. No semi on 24th, north of 144th. If semi on 136th, 4 way stop needs to be in place.

Need proper lights at cross streets of proposed areas (more protection of speeding traffic).

Leave it the way it is – the 55-Acre Parcel should be Phase II of North SeaTac Park.

That the streets be wide and safe.

Mixing tractor trailers (semis) near community center is a recipe to have children and or adults being ran over. Persons walking, riding bikes, or horses should not be subject to this type of development in this area. The zoning needs to be changed to not allow this to happen. No enforcement of where or when trucks can travel will keep this community from being adversely affected. Keep this area as a park.

What's most important to me is being able to keep the horseback riding tradition alive. We need our parks to keep our riders and horses safe.

No more traffic on 24th Ave. South!

Don't put in anything commercial, as we will have a lot more traffic. Why can't the Port donate the property so there won't be a larger traffic problem.

Keeping traffic off 24th Ave. S. Too many children and residents.

That our children and community are safe and protected from industrial development. If this area must be develope (*sic*), please leave area for walking, even riding trails and please don't develop (*sic*) the arena area, it's only a small portion that benefits this community greatly.

You can't control traffic going from north end of SeaTac through McMckin Heights now. Girl gets killed on bike from truck one block east of International Blvd.

Keeping truck traffic out of the neighborhoods and on freeways and Des Moines Memorial Drive.

That the city gets a good amount of recreation space. I am not opposed to warehouses but too many will have a negative affect.

Too much traffic on 24th Ave now.

Preventing large tractor trailer truckers from zooming through residential streets such as 148th between 24th and Military and parking overnight on the streets.

2. What do you like/dislike about the current traffic system in this area?

Need more police presence.

Too much traffic on 24th and 154th.

Too much traffic on 24th already – community center and bus routes – a kid will get hurt. Light up the crosswalk at the community center.

[Dislike] lack of flow from SB 509 to EB 518.

How many people do you want to suffer for your tax revenue?

This area would benefit greatly from develop (*sic*) this area to improve the present use of the property for sports and equestrian facility. Even membership fees for the use of this equestrian use and promoting the area for equestrian use to bring in revenue.

Too much traffic (truck) on 24th.

Years ago we were promised a children's park and it's now an industrial park. You do what you want and these meetings are a farce.

Dislike the increasing traffic and speeders!

I like it the way it is. If the horse arenas and trails go, you will force at least 30 horses and riders out of SeaTac.

There are semis getting off of the freeways and getting lost in the neighborhoods. Keep them out of this area and the community as a whole will benefit. What little tax collection the city looks to receive from this development will come at a great cost from those that live and use this area.

4 way stop at 22nd South and 136th St. Does more harm than good – nobody stops!

Drivers driving too fast and no watching cross traffic.

Is 136th from 1st South to 24th, 4 lane or 2 lane? Roads not marked four land. Traffic light at 24th at 136th. 3 way at 136th and 22nd South, really needed? Is 128th from Des Moines Memorial Drive to Military Road 2 or 4 lane? Road not marked for 4 lane traffic, people drive it like it is. Four way traffic light at Military Rd at 128th with left-turn lanes needed. Blind

corners, lots of Metro transit, school bus and pedestrians to hospital.

Constant traffic now, with too many young children in the neighborhood.

It stinks.

3. How should trucks be routed to and from the 55-Acre Parcel?

Down Des Moines [Memorial Way]!

Yes! No more "air freight", stupid drivers that don't understand "rules of the road," we have two deal [with] them on 188th at 8th Ave. South. Air Freight get what they pay for $$$.

[Des Moines] Memorial Way and 144th only. If you go ahead with the 55-Acre, I need to talk about bounties – fences – retaining walls, noise and wetlands.

As shown on Section A charts.

Should not be allowed – 55 Acres are in the buffer zone that was suppose to be green space. Not warehouses – where does the buffer start when its already close to the neighborhood?

No trucks should be allowed in any area six blocks from the north end of SeaTac runway. They already travel residential streets through McMckin Heights to get from FedEx (Airport) to southbound I-5. People will get ran over if you develop this property.

They shouldn't.

Don't want any more trucks routed here. Period.

Whatever, don't touch 24th for their access.

Through Des Moines [Memorial Drive] or the Port should pay and build a 518 exit to the development area.

Keep all traffic south of 142nd. Route to Des Moines Memorial Drive.

Elevated roadway like what port put in on west side of Duwamish River – keeps people separate from trucks.

Using freeways and Des Moines Memorial Drive.

The freeway access needs to be improved:
1. From Des Moines Memorial Drive to 518 – on and off ramps.
2. Access from 154th to 518
3. Access from 509 to 518.
4. Get rid of lights at 518 and 509.
5. Put local access only on 142nd West to 509 and Burien.

Only on major street with major fines for using residential streets.

Not on 24th.

4. Which option do you like best? Why?

None – you need to direct traffic from residential to freeways (ie. Des Moines Memorial Drive).

None. Traffic needs to stay out of neighborhoods.

Keep area are green space.

Leave it as it is. Save $, time and effort, we can live with the traffic as it is. We would have to move it you develop this area.

Des Moines Memorial Drive.

None. No more traffic!

I think that we need to leave our arena and our park alone.

Cancel the whole plan and develop area as a park or something more community friendly. Anyone involved in promoting this plan is not looking out for the residents of SeaTac.

5. Do you have any additional questions, suggestions, or concerns?

How about the Port donating the property to our community so we can keep our community from being further industrialized.

Please consider alternatives to light industrial development. Recreational development also can be economically advantageous, especially when leveraged by Seattle area's growing global reputation. The rugby pitch for example is the only dedicated facility of its kind in the region. It's proximity to the BMX trails and equestrian center make for a really interesting mix of sporty and recreational use.

24th Ave. South has heavy emergency vehicle traffic. We don't need any more traffic.

Where do the horses go? To the streets with the semis! Its now a safety issue!

20 years ago. How do you blend a international airport into a neighboring community the port said it would create a buffer zone. And then Bill Bouland and others said lets build a park (a grand park) give some green space to the people of the area. It was an award winning idea that has since been forgotten. 220 acres is now 170 and 70 acres of that is still sticker bushes and scotchbroom in Phase 1 area. The equestrian facility was part of Phase 2 as well as archery, BMX racing, rugby and soccer. All or most will be displaced or in our case out riding on the streets with increased truck traffic. This becomes a safety issue senior center will be impacted by the lax of everyone stopping at the 4 way stop at 136th and 22nd South. The traffic doesn't stop now! Westside Trail is suppose to be multi-use. Every time a project is done the no horses sign comes out. I still feel we need to revisit the completion of Phase 1 and 2 of the park and stop turning this buffer area into a revenue thing. The neighbors at the end of this runway deserve this park.

Yes. It bothers me that most of this North SeaTac park area is cluttered with bush which are potentially hiding places for predators. I would like to see all trees trimmed limbless from ground up to 10! The scrub bushes should be taken out. In other words, make it predator proof!! There is no way I would let me children walk or play there.

Why would you consider putting in this type of development next to a community center where children walk or ride their bikes to. Don't ruin the area by asphalting it over and bringing in all of the problems that this will create.

No more traffic on 24th Ave! No more industrial. This is our neighborhood.

Where is the Highline aquifer?

I have 5 horses and use this 55 acres 5-7 days a week. I have a half dozen people who also ride with me. We value this property greatly and would be heartsick to have this traffic project affect our much treasured land. Once it's destroyed, there's no going back.

Don't take land from residents and later force something bad on people still living in the area.

Suggestion – do what you can to encourage the state to build a better connection from southbound 509 to EB 518 so that the trucks will stop using the South 146th Street exit and going through my neighborhood. There also needs to be an exit to Des Moines Memorial Drive from EB 518.

Make intersection larger at Des Moines Memorial Way by 142nd St. – make it local access only and weight limit on trucks. At 142nd leading to 509 – it's an easy access to the freeway for trucks.

What we need is to listen to the people, not the Port.

North SeaTac Roadways Study

Appendix D
55-Acre Access – Market Assessment

601 Union Street, Suite 4720
Seattle, Washington 98101
Tel: 206.296.9600
Fax: 206.296.9629
www.gvakm.com

Memo

To: Melinda Miller & Todd Cutts

From: Blair Howe

Date: November 12, 2007

Re: Port of Seattle/City of SeaTac, 55-Acre Access – Market Assessment

Alliance

For their mutual interests, the Port of Seattle and the City of SeaTac are working to facilitate the development of the property commonly known as the 55-Acre property, located in the City of SeaTac. Melinda Miller, Real Estate Manager for the Port of Seattle and Todd Cutts, Economic Development Manager for the City of SeaTac have been tasked with evaluating access alternatives for the property. Blair Howe, GVA Kidders Mathews' real estate consultant, has been retained to facilitate the effort.

Purpose & Scope of Work

The purpose of the assignment is to assess the impacts of proposed road improvements on the development potential and marketability of the 55-Acre Property located north of South 142nd Street and west of 24th Avenue South, in the City of SeaTac.

The scope of work involved interviews with market participants to gain market perspective on proposed access alternatives. A total of six interviews were conducted. The participants included three real estate agents who specialize in the Southend markets and three real estate developers familiar with airport operations and the local marketplace.

The participants were:

- Craig Hogan, Vice President, GVA Kidder Mathews
- Dan Mathews, Vice President, GVA Kidder Mathews
- Al Robertson, Senior Vice President, GVA Kidder Mathews
- Mike Ruhl, Vice President – Real Estate, Opus Northwest
- Dan Johnson, Principal, International Airport Centers
- Tim Sharman & J. Patrick Cavenaugh, Prologis

Property Description

The property is an irregular shaped parcel situated to the north of South 142nd Street as shown on the attached image. The property measures roughly 25 acres, however, a large portion is constrained, leaving perhaps 10 to 12 acres of what would be considered typical developable area. The constraints include wetlands, uneven topography, and FAA land use restrictions related to airport noise and safety.

An Interlocal Agreement between the City and the Port specifies permitted uses. The uses are commercial in nature, generally described as industrial, office, and retail.

Summary

The following conclusions and questions resulted from the work:

Access Conclusions:

- Completion of the 509 Extension will benefit the neighborhood.
- None of the access proposals provide adequate access to SR 509.
- The preferred route to access the air cargo facilities at the airport utilizes 24th Ave South between the 55-Acre Property and Air Cargo Road.
- To best serve the downtown/seaport market the property must have access to SR 509.
- Access to and from I-5 and SR 509 have equal importance.

Market Conclusions:

- The North SeaTac/Burien neighborhood has the potential to be a center for commerce. The highest and best use for the property is for industrial purposes; warehousing, manufacturing, and distribution.
- The property is well situated to serve two markets: the air cargo market and downtown/seaport market.
- The air cargo market, while limited in size, is growing.
- The inventory of developable land within close proximity to the air-cargo terminals is limited.
- Downtown businesses and the sea port are currently served by the Close-In Industrial Market (situated in the Duwamish Valley between SODO and Tukwila). The Close-in market is substantially undersupplied, inventory is declining, and vacancies are very low. In addition the existing inventory consists of old buildings that are functionally deficient.
- The demand for space at the subject will come from smaller users seeking 30,000 to 50,000 square feet.
- Air freight and logistics buildings are generally in the 50,000 to 200,000 square feet range.
- Rental rates for industrial buildings north of Spokane Street are as high as $1.00 per square foot per month, triple net. Further south along the Duwamish River rates drop off to $.50 per square foot. Rental rates in the Kent Valley range from $.37 to $.40/sf.
- Ownership of land is preferred to ground leasing by market participants. Value and returns will be discounted for ground leasing. Owner/users are not interested in ground leasing.
- Construct the on-site improvements, as shown in the access improvement alternatives, in conjunction with the on-site development activities.
- Finished land value ranges from $10 to $12 per square foot (includes mass grading in the $3 to $4 per square foot range).
- Consider stormwater facilities that are shared between new off-site roads and on-site improvements.

Questions:

- How will the SR 509 Extension impact the travel patterns in the neighborhood?
- What are the traffic count projections for South 142nd Street? Will the traffic volumes necessitate all of the proposed road improvements? Would it be possible to improve only the intersections?
- Could South 128th Street and South 160th Streets interchanges be acceptable access points to SR 509?
- Is South 154th Street to 16th Avenue South to South 150th Street a viable route between the 55-Acre Property and the airfield air cargo facilities?

Scope or Work and Nature of the Assignment

It is important to note the preliminary nature of the assignment. The information provided is based on the available information and the consultant's professional judgment. The outcome of the study is impacted to a degree by the limited nature of the scope of work. The information supplied herein is from sources deemed reliable. It is provided without any representation, warranty or guarantee, expressed or implied as to its accuracy. Given the preliminary nature of the investigations, further study and investigation is required to verify all matters deemed to be material.

The real estate analysis has been completed as a "Broker's Price Opinion" and is not an appraisal. Chapter 18.140 of the revised Code of Washington defines a "Broker's Price Opinion" as an oral or written report of property value that is prepared by a real estate broker or salesperson licensed under 18.85 RCW. As such, the limited level of investigation and analysis may affect the conclusions presented in this report.

Attachments:

1) Interview Summaries
2) Area Image
3) Proposed Road Improvement Plans

Interview Summaries

Craig Hogan, GVA Kidder Mathews

The close-in Seattle industrial market is under extreme pressure with inventory declining and vacancy virtually non-existent (3% today). Rents for properties north of Spokane Street are currently exceeding $1.00 per square foot per month for older buildings, many would consider functionally obsolete. South of Spokane Street rents are in the $.50 to $.60 per square foot range. It is not uncommon for buildings in the Close-in market to have limited parking, truck circulation, and sometimes 100% site coverage. Retail and office space is very limited.

Users seeking space with access to the Seattle CBD and the Sea Port have limited choices and are forced to look south. The competition for the subject is located in the Kent Valley, were rents are in the $.37 to $.40 per square foot per month for new shell space. The property is well located to compete with Georgetown locations.

The target market is for users who would occupy 10,000 to 30,000 square feet. Users seeking larger spaces, measuring more than 50,000 square feet, want to be located further south on less expensive land.

Improving access to SR 509 is important if the subject is to compete with and attract Close-in space users. Without improved access to 509 the property competes with Kent Valley properties.

The market views ground leasing and fee ownership differently. Users often like to own their property outright and discount ground lease opportunities accordingly. Owners prefer to capture appreciation and depreciation. Developers on the other hand are less averse to ground leases, believing if a project's cash flows result in market returns, the ground lease can be attractive

Dan Mathews, GVA Kidder Mathews

The neighborhood north of the airport can be known as the next expansion area for industrial, distribution, manufacturing and assembly uses. Inventory in the Close-in market is declining and users are being pushed out. The subject is a natural to accommodate these space users, but there is currently no critical mass of development in the area.

The property can be made available to the end user or to developers who will act as intermediaries. If the development is configured to accommodate the end users the financial returns can be substantially higher. For example, creating a cold storage campus could garner higher returns than typical warehouse or distribution uses. Owner/users are a segment of the space user market that, as the name implies, want to own their own land and building, and are not inclined to ground lease.

The demand for the property will be from smaller users, in part driven by the sites constraints. Trucks typically need to be close to buildings.

The topography of the site will require substantial grading and that will impact land value. The preparation of a grading plan(s) will clarify the sites limitations and establish costs.

Space users who move products rely on efficient transportation and access to remain competitive. With the congestion found on roadways throughout our region, users like to have more than one way to access their facilities.

In the big picture the completion of the 509 extension will substantially improve circulation in the area. The biggest improvement to the transportation system serving the subject would be a two sided interchange at Des Moines Memorial Drive (DMMD) and SR 518. It would provide access to and from the sea port, close-in industrial area, and the Seattle CBD.

With respect to the proposed road improvements (the improved South 142nd Street to DMMD and the north/south connector located east of Boeing Spares), the on site improvements should part of the development road infrastructure system. Planned road improvements are hard for prospective users to visualize and better serve a property if they are complete.

Al Robertson, GVA Kidder Mathews

From a marketability standpoint, the site is less desirable than Lora Lake and Des Moines Creek, given access and topography. The subject is well situated to serve air-cargo road uses. The Christen Faith Center (CFC)/Prologis development will provide efficient, next generation buildings that will be superior to the other product in the SeaTac market.

Land in the Close-in Seattle market sells for $25 to $50 per square foot and for more North of Spokane Street. While the CFC/Prologis property sold for $15 per square foot, it is more reasonable that land that is suitable for industrial uses in the SeaTac market would trade for between $10 and $12 per square foot. Land suitable for office buildings in a campus setting would demand $20 to $25 per square foot (Boeing Long Acres and Segale are examples). In the SeaTac market land for office development would like be in the $15 to $18 per square foot. Land offered for lease would be discounted from these figures, roughly 15% to 20%.

With respect to the proposed transportation improvements – Does South 142nd Street really need to be improved? The traffic is currently light on the street and development of the 55 Acre property would not place a large demand on the roadway. Intersection improvements at DMMD may be warranted. West bound access to SR 509 is important and a ramp at 24th and SR 518 would provide the needed access, in which case the connector adjacent to Boeing Spares is necessary.

Mike Ruhl & Travis Hale, Opus Northwest

If the site were available today, Opus would like to be in the running to develop it. It is primarily an industrial site and not an office site. The target is smaller airfreight users, with space requirements less than 50,000 square feet. The target is not in competition with the Kent Valley, where rental rates are less, buildings larger and cater to pure distribution. The competition is older boxes. Rental rates for new product developed on the subject would be roughly $.40 per square foot per month, versus $.35 per square foot in the Kent Valley.

Ground leases are discounted by roughly 50 basis points when contrasted to a fee simple acquisition. Developers are typically interested only in the cash flow, with the ground lease having the benefit of the no upfront costs. Opus develops about 10% of its product on ground leases. They prefer a minimum term of 50 years.

Land value for the subject including finished mass grading costs is roughly $10 to $12 per square foot. Grading could range from $3 to $4 per square foot for the subject, depending on product type. It would be wise to have an experienced civil engineer, working with a developer or broker, prepare preliminary mass grading plans to determine how much developable area is available.

With respect to road improvements, the new development would not generate a significant amount of traffic and all the improvements proposed on South 142nd Street may not be required. It is likely that the target market would have smaller trucks with more trips. What are the traffic counts on South 142nd? Focus on intersection improvements. It would be better to spend the money on interior road systems within the development. These improvements would likely cost $1000/lf and include the roadway, curb, gutter, sidewalks, and lighting. Stormwater detention and filtration can be expected to consume 10% of the site area. The stormwater system for the road improvements could be placed on the property and oversized to accommodate future on-site development.

The distribution of trips between I-5 and SR 509 might be 60% to/from I-5 and the balance to/from SR 509.

Dan Johnson, International Airport Centers

The market is for buildings developed for airfreight and logistics users who interact regularly with the airfreight operations at the airport. These are users who want to be at the back door to the airport. The 55 Acre parcel can meet the same purposes as the Lora Lake property. The site would compete primarily with older buildings in the area. The challenges for the property are access and lack of exposure.

The airfreight and logistics market place has seen a recent consolidation and as a result there are fewer players exist today than a few years ago. Consequently, the buildings are and tenant spaces are larger, bay depths deeper, truck courts deeper, more clear height, and enhanced fire systems. Nation-wide the largest buildings measure roughly 400,000 square feet, however, in most situations the buildings are still smaller than modern general purpose distribution buildings. Most new airfreight and logistics buildings fit into the 50,000 to 200,000 square feet range. Shared truck courts range from 175 to 200 feet and single loaded truck courts measure 120 to 130 feet.

Developers always prefer fee simple acquisitions, with ground leases being doable, but less desirable. Minimum lease terms need to be a minimum of 50 years.

The distribution of trips generated from the site would be roughly 50% from the airfreight terminal, 25% I-5 north and south bound, and 25% to SR 509 north bound.

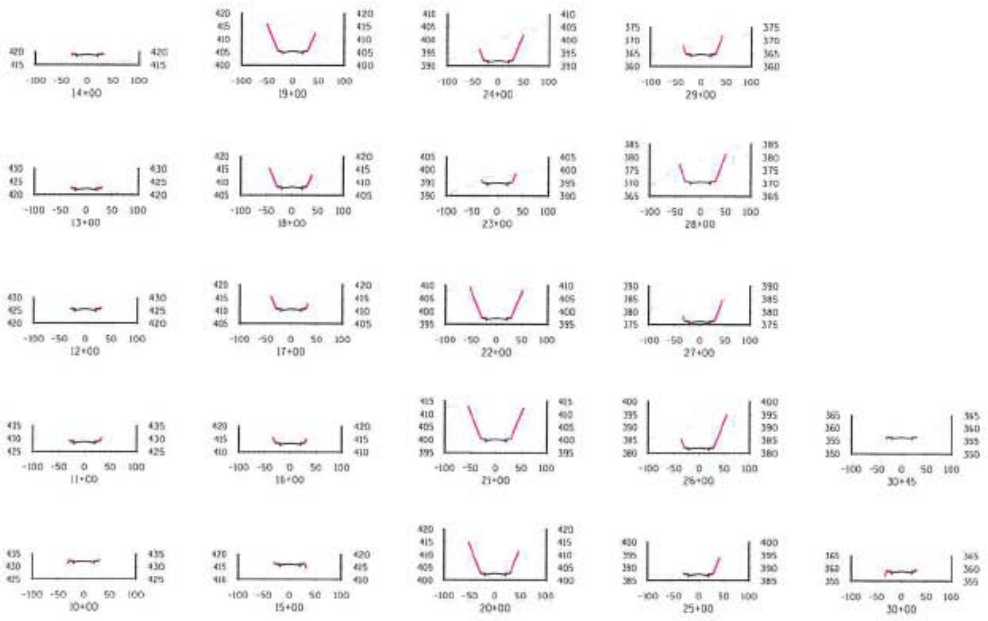
With respect to the access proposals, the South 146th Street improvements would enhance access. The Alignment "A" proposal appears to be a little complicated, but does provide good access to and from the airfreight terminal.

Tim Sharman & J. Patrick Cavenaugh, Prologis & Chris Corr, Senior VP GVA Kidder Mathews

The targets for the subject are the Downtown/SeaPort and Air Freight markets. Access split between I-5 and SR 59 is 50%/50% or 60%/40%. Improving the intersections on South 142nd may be adequate to serve develop on the subject.


South 135th Street
South 136th Street
South 138th Street
South 140th Street
South 142nd Street
South 143rd Place
South 144th Street
South 146th Street
South 148th Street
South 150th Street
South 152nd Street
South 156th Street
South 161st Street
Airport Service Road


North SeaTac Roadways Study
DRAFT FOR DISCUSSION
August 10, 2007
ALIGNMENT
DMMD
S 142ND ST
S 144TH ST
100' WETLAND BUFFER
SCALE IN FEET
PROFILE
ELEVATION
20+00
32+00
18+00
30+00
39+66
16+00
28+00
38+00
14+00
26+00
36+00
12+00
24+00
34+00
10+00
22+00



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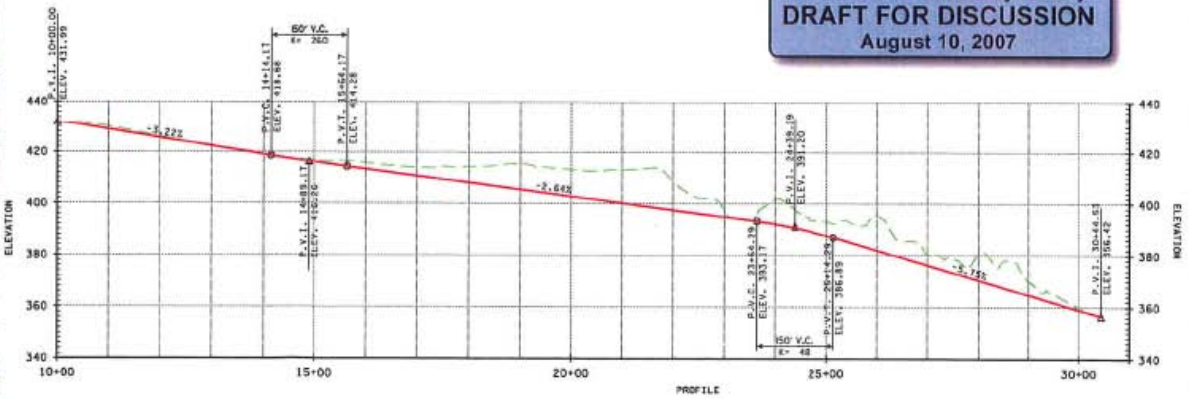

ALIGNMENT A