Snohomish County
Planning and Development Services

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County Executive

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October 14, 2015

Kirk Harris
David Evans and Associates, Inc.
415 118th Avenue SE
Bellevue, WA 98005

Subject: Point Wells Transportation Analysis Methods and Assumptions

Dear Mr. Harris,

Thank you for the memo on Transportation Analysis Methods and Assumptions dated July 6, 2015 (Assumptions Memo), regarding the Point Wells Mixed-Use Development Project. These comments reflect input from the Snohomish County department of Planning and Development Services (PDS). The Department of Public Works (DPW) reserves the right to make additional comments on technical issues, likely on the next iteration of this assumptions memo (we expect additional DPW comments to be in conjunction with the peer review comments from our consultant.)

PDS' specific comments appear as tracked changes and sidebar comments in the attached Assumptions Memo (which does not include all of the detailed figures in the original).

Our principal concerns involve:

1. Internal trip capture rates;
2. Transit ridership rates; and
3. Second access.

The internal trip capture rates used in the NCHRP 684 model need to reflect the conditions and uses proposed at Point Wells. Some of the calculations in this tool do not appear to be calibrated to Point Wells and will require additional explanation and/or adjustments based on documented professional judgment.

The project is required to be transit compatible. Given the likely outcome of an inventory of planned transit service by Community Transit, Metro, and Sound Transit, this will probably mean that the project applicant will need to commit to providing some form of private transit service. We have not seen any specific proposal from BSRE on how this would happen.

Unless we receive and approve a plan for private transit from BSRE before the next iteration of the Assumptions Memo, please use a 5% transit ridership assumption for all phases to reflect a minimum level of ridership that must be provided for the project to meet transit compatibility requirements necessary for potential future approval. The next Assumptions Memo may identify additional private service as a mitigation measure to reduce overall traffic impacts.

Our May 27, 2015 letter directed that the model include includes a second access. We also said that the modeling may include sub-scenarios without full second access, i.e. emergency access only. It is not clear in the most recent Assumptions Memo whether a sub-scenario for each alternative contemplated. Please clarify.

We also request clarification of two minor issues:

- The discussion of collision data on page 4 appears to be new. Is this an EIS matter or something for the transportation corridor study required by Shoreline but not necessary for the EIS?
- The discussion on page 5 includes level-of-services (LOS) standards for Snohomish County, Shoreline, Woodway, Edmonds, and WSDOT; however, Attachment A also shows intersections in Mountlake Terrace and Seattle. Please explain why these are not necessary in the discussion of LOS.

Feel free to contact me with any questions.

Respectfully,

Ryan Countryman
Snohomish County Planning and Development Services

DAVID EVANS AND ASSOCIATES INC.

Technical Memorandum

The undersigned parties concur with approach, assumptions and methodologies set forth in the Technical Memorandum—Transportation Analysis Methods and Assumptions for the Point Wells Mixed-Use Development Project attached hereto.

Snohomish County PDS	Snohomish County DPW
_____	_____
Signature	Signature
_____	_____
Title	Title
_____	_____
Date	Date

BSRE Point Wells, LP	David Evans and Associates, Inc.
_____	_____
Signature	Signature
_____	_____
Title	Title
_____	_____
Date	Date

Commented [RMC1]: Please consider deleting this signature page. If there is a need for it, please call Ryan Countryman at 425-388-3311 x2304 to discuss.

DATE: July 6, 2015

TO: Ryan Countryman
Snohomish County

FROM: Min Luo, PE, PTOE and Kirk Harris, PE, PMP
David Evans and Associates, Inc.

SUBJECT: Transportation Analysis Methods and Assumptions

PROJECT: Point Wells Mixed-Use Development Project

PROJECT NO.: PARA0000-0004

Cc: Gary Huff, Karr Tuttle Campbell

The purpose of this memorandum is to summarize the methods and assumptions used for the transportation analysis for the Point Wells Mixed-Use Development Project (Project). Minor changes to the methods and assumptions may be ~~updated, if~~ necessary~~,~~ as the analysis progresses from the existing conditions into the travel forecasting phase of the work. Upon updates, the memorandum will be re-submitted for review and concurrence by Snohomish County.

Commented [RMC2]: Resubmittal of the entire memo seems unnecessary. Could a simpler process be identified for updates to isolated parts of the assumptions?

The following attachments have been included as part of this memo for clarification of the methods and assumptions used in the transportation analysis:

- Attachment A – Study Intersections in Vicinity
- Attachment B – Study Intersections and Control Types
- Attachment C – Corridor Study General Scope and Assumptions from Memorandum of Understanding (MOU) between Shoreline and the Project Owner
- Attachment D – SYNCHRO Level of Service (LOS) Evaluation Assumptions for Signalized and Unsignalized Intersections
- Attachment E – aaSidra LOS Evaluation Assumptions for Roundabouts
- Attachment F – Primary Access Options and Mitigation Strategies Analyzed
- Attachment G – Traffic Analysis Scenarios Analyzed
- Attachment H – Building Heights, Dwelling Units, and Land Use Codes for Build Alternatives
- Attachment I – Urban Center Alternative Site Layout with Land Use Codes and Building Heights
- Attachment J – Urban Village Alternative Site Layout with Land Use Codes and Building Heights
- Attachment K – Urban Center Alternative – Trip Generation Calculations by Project Phase
- Attachment L – Urban Village Alternative – Trip Generation Calculations by Project Phase

- Attachment M – NCHRP 684 Trip Capture Estimation Tool – Blank Template
- Attachment N – NCHRP 684 Trip Capture Estimation Tool – Mode Split Adjustments
- Attachment O – NCHRP 684 Trip Capture Estimation Tool – Calculations for Traffic Analysis Scenarios
- Attachment P – Urban Center Alternative –Summary of Cumulative Trip Generation and Phase Trip Generation by Project Phase
- Attachment Q – Urban Village Alternative –Summary of Cumulative Trip Generation, and Phase Trip Generation by Project Phase
- Attachment R – No Build Alternative, Scenarios A and B – Trip Generation Calculations
- Attachment S – Project Owner's Commitment to Transit Amenities and Services
- Attachment T – Summary of Person-Trips by Transit

1.0 Study Area and Periods

The study area/boundary, or area of influence, is the area in and around the project site for which traffic analysis is required. The practical cordon line follows physical boundaries such as freeways, roadways, and geographical features. For the Project, the study area was created by identifying the most used routes traveling to and from the project site. The study area for the Project extends north to the city of Edmonds and 228th Street SW, east to I-5, and south to N 130th Street.

The traffic analysis study area focuses on a study corridor between the project site and Aurora Avenue N (SR 99) located along Richmond Beach Drive NW – NW 196th Street – NW 195th Street – NW Richmond Beach Road – N 185th Street as well as 64 intersections that are mostly within the jurisdictions of the cities of Shoreline, Edmonds, Woodway, and the Washington State Department of Transportation (WSDOT). The study intersections are documented in **Attachment A** and **Attachment B**.

The land use alternatives for the Project will include the Urban Center Alternative, the Urban Village Alternative, and the No Action Alternative (Scenarios A and B). The Urban Center Alternative and Urban Village Alternative of the Project will be analyzed as they are proposed to be constructed in four (4) phases. Phases I through IV are proposed to be completed in 2020, 2025, 2030, and 2035, respectively. The No Action Alternatives will be evaluated for the same time periods as the Build Alternatives with Scenario A as a continuation of existing conditions and Scenario B as a reuse of existing underutilized industrial facilities.

Intersection level of service (LOS) will be evaluated for 64 study intersections in the weekday AM and PM peak hours for the 2014 Existing condition, 2020 Phase I Build condition, 2025 Phase II Build condition, 2030 Phase III Build condition, 2035 Phase IV Build condition, and the No Action condition for Scenarios A and B for the same forecast years as the Build conditions.

The annual average daily traffic (AADT) and volume-to-capacity (V/C) ratio in the AM and PM peak hours for the 2014 Existing condition, 2020 Phase I Build condition, 2025 Phase II Build condition, 2030 Phase III Build condition, and 2035 Phase IV Build condition, and the No Action condition for Scenarios A and B for the same forecast years as the Build conditions, will be documented on the study corridor roadway segment between the project site and Aurora Avenue N (SR 99) located along Richmond Beach Dr. NW – NW 196th Street – NW 195th Street – NW Richmond Beach Road – N 185th Street.

2.0 Existing Conditions

The following describes how the existing transportation conditions will be documented and evaluated in the study areas.

2.1 Street System Inventory

The study corridor roadway segments and intersections will be inventoried and summarized. The inventories will be based on the data provided by the agencies, aerials maps, and site visits. The roadway system inventories will include roadway functional classifications, number of lanes, speed limits, roadway shoulders, pedestrian/bicycle facilities, transit service and facilities, rail services, intersection geometry, traffic control types, traffic counts, signal timing and phasing.

2.2 Collision Data Evaluation

Collision evaluation will focus only on the primary access corridor, which is between the project site and Aurora Avenue N (SR 99) located along Richmond Beach Dr. NW – NW 196th Street – NW 195th Street – NW Richmond Beach Road – N 185th Street.

The historical collision data for the collision evaluation for a five-year period, from January 2009 to December 2013, was obtained from the city of Shoreline, Washington. Collision data from the 2014 calendar year will be requested of Shoreline and used in lieu of the 2009 calendar year data if it is available and provided prior to the preparation of the transportation analysis. The collision data will be used to identify potential existing transportation safety issues on the primary access corridor and at the intersections along the corridor.

The collision data will be analyzed by years, types, and severity and the five most prevalent reasons for collisions will be identified. Intersection collision rates (collisions per million entering vehicles (MEV)) and roadway collision rates (collisions per million vehicle-miles of travel (MVM)) will be estimated. Collision within the primary access corridor will also be evaluated and ranked upon total number in addition to the frequency rate.

The intersection collision rates will be compared to a typical threshold of concern (1.0 collision per million entering vehicles (MEV)). The roadway collision rates will be compared to the collision rates for urban minor arterials within the Northwest Region in the State of Washington during the analysis period. The intersections and roadway segments with collision rates greater than the threshold of concern or other similar classified arterials will be identified for further review.

2.3 Traffic Volumes

The existing traffic volumes were obtained from intersection turning movement counts collected in both the AM and PM peak hours in 2011, 2013 and 2014. The 2011 and 2013 intersection turning movement counts will be scaled up to the 2014 condition using a straight-line growth rate of 0.25 percent per year.

The annual growth rate of 0.25 percent was provided by the city of Shoreline, Washington based on their recent traffic studies and was included in the Corridor Study General Scope and Assumptions as part of a Memorandum of Understanding (MOU) between Shoreline and the Project owner. See **Attachment C** for a copy of this MOU document for reference. Snohomish County is not bound to the MOU; however, the corridor study is expected to provide information toward mitigation steps identified by the EIS.

The annual average daily traffic (AADT) data was reviewed for locations on SR 99 just north of N 170th Street and on SR 99 south of N 200th Street and zero to negative growth was experienced in the past four years; therefore, the annual growth rate of 0.25 percent provided by the city of Shoreline is a reasonable growth rate to be used for the fully developed area within the city of Shoreline limits, including the SR 99 corridor.

2.4 Traffic Operations

Although the SYNCHRO program (Versions 8 and 9) that applies the 2010 Highway Capacity Manual (HCM 2010) methodology is currently available, the SYNCHO program (Versions 8 and 9) has the following limitations in performing signalized intersections' LOS analysis using the HCM 2010 methodology:

- Intersections with more than four approaches cannot be evaluated.
- Non-NEMA or custom phasing is not supported.
- Clustered intersections cannot be evaluated.
- Turning movement with shared land exclusive lane group cannot be computed.
- U-turn movement cannot be analyzed.

In order to resolve the above limitations present in the SYNCHRO program (Versions 8 and 9), the SYNCHRO program (Version 7) that applies the HCM 2000 methodology will be used for intersection LOS evaluation for signalized intersections and stop-controlled intersection.

The peak hour factors and heavy vehicle percentages obtained from the intersection turning movement count data will be used for intersection LOS analysis.

For signalized intersections, existing signal timing and phasing were obtained from the SYNCHRO model and signal timings sheets provided by the city of Shoreline. LOS will be reported based on overall average control delay (in seconds) per vehicle.

In accordance with HCM 2000, LOS is defined for the overall intersection and will be reported based on the weighted average control delay of all approaches for all-way stop-controlled intersections. For two-way stop-controlled intersections, LOS is not defined for the overall intersection and will be reported based on the worst approach delay of the side streets.

The detailed SYNCHRO intersection LOS evaluation assumptions are shown in **Attachment D**. Similarly, roundabout LOS evaluation assumptions are shown in **Attachment E**.

Intersection LOS and V/C will be checked against each jurisdiction's minimum acceptable standards described as follows:

- **City of Shoreline**: per Shoreline Municipal Code 20.60.140:
    - LOS D for signalized intersections on arterial streets and for unsignalized intersections on arterials; the V/C ratio on one leg of an intersection may exceed 0.90 when the intersection operates at LOS D or better; or
    - A V/C ratio of 0.90 or lower for roadway segments on principal and minor arterials.
- **City of Edmonds**:
    - LOS D for intersections on arterials, LOS C for intersections on collectors, and LOS B for intersections on local streets.
- **City of Woodway**:

- LOS A for all intersections within the city limits, which include Timber Lane and SW 238th Street, 114th Avenue W and SW 238th Street, and Woodway Park Road and Algonquin Road

- **WSDOT**:
  - LOS D for intersections on SR 104 and LOS E for intersections on SR 99 based on the guidance from the Aurora Corridor Improvement Project within Shoreline (City of Shoreline, 2009).

In addition to the adopted standards for each jurisdiction, the MOU between the Project owner and the City of Shoreline, which is included in **Attachment C** will also be checked.

2.5 Pedestrian and Bicycle Facilities

Based upon available mapping, GIS data, existing plans, and field review, existing pedestrian and bicycle facilities within the vicinity of the study area will be documented. This will include existing and planned facilities within the study area.

2.6 Transit and Rail Services

Information on existing transit services and facilities in the vicinity of the study area, including bus routes (location, service frequency, and times of day) and rail service (Sounder service in Edmonds) will be summarized. Park and ride facilities will be documented in the vicinity of the site, as well as high occupancy vehicle lanes or transit signal priority. The inventory of transit services and facilities will be primarily based on information from Metro, Sound Transit, Community Transit, and other agencies, as applicable.

Adopted long-range plans of transit agencies for capital and operational improvements within the Project vicinity will be summarized as part of an inventory of existing and planned transit and rail services.

3.0 Build Condition for Urban Center Alternative and Urban Village Alternative

3.1 Street System with Proposed Improvement Options

The street system in the Build Condition will include the street system in the No Action condition, plus multiple mitigation strategies on the study corridor between the project site and Aurora Avenue N (SR 99) located along Richmond Beach Dr. NW – NW 196th Street – NW 195th Street – NW Richmond Beach Road – N 185th Street. The mitigation strategies may include single or a combination of improvements such as re-striping/re-channelization, intersection improvements and/or control types changed, roadway widening, neighborhood street traffic calming, and an addition of a secondary site access. **Attachment F** includes a list of mitigation strategies for the primary access corridor to the Project site that will be analyzed for the project.

These improvement options will be evaluated for each land use phase in 2020, 2025, 2030, and 2035 in both the AM and PM peak hours for both the Urban Center Alternative and the Urban Village Alternative. **Attachment G** includes the list of Traffic Analysis Scenarios associated with the Build and No Build Alternatives to be analyzed for the Project.

3.2 Land Use Alternatives and Construction Phasing

3.2.1 Urban Center Alternative Land Use /Phasing

Alternative 1 – Urban Center Alternative: The site would be redeveloped as a mixed-use urban center, consistent with the Urban Center land use designation/zoning classification of the site at the time complete applications were submitted to the County in 2011. Development would include 3,081 residential units, approximately 32,262 square feet (SF) of commercial/office uses, approximately 94,300 SF of retail uses, on-site amenities, and parks and open space.

The Urban Center Alternative of the Point Wells project will be constructed in four (4) phases. Phases I through IV will be completed in 2020, 2025, 2030, and 2035, respectively. The total cumulative project land uses by the end of Phase IV for the Urban Center Alternative are:

- 3,081 residential units
  - 307 High-Rise Apartments
  - 1,560 High-Rise Condominiums
  - 114 Townhouses
  - 1,100 Senior Condominiums
- 32,262 square feet of office area
  - 24,762 square feet of General Office
  - 7,500 square feet of Medical-Dental Office
- 74,300 square feet of retail area
  - 30,000 square feet of Specialty Retail
  - 26,300 square feet of Supermarket
  - 18,000 square feet of Quality Restaurants
- 20,000 square feet of On-Site amenities
  - 20,000 square feet of Fitness Center

Commented [RMC3]: This list will need to be reviewed again after BSRE provides an updated submittal.

The land use for each phase and cumulative total by phase is shown in **Table 1**. Land use codes (LUC) for residential uses within the four phases will be applied to buildings identified in the project site layout. **Attachment H** is a list of the residential buildings proposed for the Project that also includes the number of stories, dwelling units, corresponding residential LUC, and other associated information. **Attachment I** is a site layout of the Urban Center Alternative for the Project which illustrates the location of each the proposed residential buildings, their number of stories, and their associated residential LUC.

Averaged heights of similar-sized and adjacent buildings within one of the four development phases may be used to designate a group of residential dwelling units within a High Rise category. Senior Adult Housing dwelling units may be included in high, mid, or low rise buildings as identified in the project site layout.

Health/Fitness Club will provide services to residents only; therefore no trip generation is expected. It is anticipated that the Health/Fitness Club is similar to other multi-family complex amenities and thus employees associated with the facility are already part of the ITE trip generation calculation for that multi-family residential facility. In addition, there is a possibility that development of the Health/Fitness Club will be distributed equally among the four stages of development and four separate areas at the site, rather than it all within Phase 2 of the Project.

Commented [RMC4]: Copied here from the Urban Village section because it applies to this alternative too.

Table 1: Land Use by Project Phase for Urban Center Alternative

Land Use Types	Land Use Code (LUC)	Units	Subtotal in Phase				Cumulative Total by Phase			
			I	II	III	IV	I	I-II	I-III	I-IV
Residential		**DU**	**653**	**254**	**1,271**	**903**	**653**	**907**	**2,178**	**3,081**
High-Rise Apartment	222	DU	53	254	-	-	53	307	307	307
High-Rise Residential Condominium/Townhouse	232	DU	433	-	763	364	433	433	1,196	1,560
Residential Condominium/Townhouse	230	DU	114	-	-	-	114	114	114	114
Senior Adult Housing – Attached (Condo)	252	DU	53	-	508	539	53	53	561	1,100
Commercial Office		**KSF**	**-**	**32.262**	**-**	**-**	**-**	**32.262**	**32.262**	**32.262**
General Office	710	KSF	-	24.762	-	-	-	24.762	24.762	24.762
Medical-Dental Office Building	720	KSF	-	7.5	-	-	-	7.5	7.5	7.5
Retail		**KSF**	**24.0**	**26.3**	**24.0**	**-**	**24.0**	**50.3**	**74.3**	**74.3**
Specialty Retail Center	826	KSF	16.0	-	14.0	-	16.0	16.0	30.0	30.0
Supermarket	850	KSF	-	26.3		-	-	26.3	26.3	26.3
Quality Restaurant(s)	931	KSF	8.0	-	10.0	-	8.0	8.0	18.0	18.0
~~On-Site Amenities~~Other Uses		**KSF**	**-**	**20.0**	**-**	**-**	**-**	**20.0**	**20.0**	**20.0**
Health/Fitness Club*	492	KSF	-	20.0	-	-	-	20.0	20.0	20.0
Police/Fire	730?	KSF	???	-	-	-	???	???	???	???
Beach Park/Public Pier	415	Ac	19.3	-	-	-	19.3	19.3	19.3	19.3

*Health/Fitness Club will provide services to residents only; therefore, no trip generation is expected.

Commented [RMC5]: This table will need to be reviewed again after BSRE provides an updated submittal.

Commented [RMC6]: This figure appears to be inconsistent with the current submittal drawings and will need to be verified with the updated submittal drawings submitted by BSRE. Specifically, the 24,000 sq ft for Phase 1 appears to come from sheet A-103 for the South Village. However, Phase 1 also includes two retail buildings above the police/fire stations in the Urban Plaza (see sheet A-056).

Commented [RMC7]: ITE does not have a good fit for this use. What category is closest?

Commented [RMC8]: Square footage will be provided by BSRE in updated submittal drawings.

Commented [RMC9]: We (SnoCo, DEA, and BSRE) need to discuss the acreage and phasing of this use. The 19.3 acres is based on sheet A-052 and adds the 520,000 sq ft of publicly accessible tidelands with the 319,500 sq ft of contiguous active recreation space. There is some discontiguous active space in the Urban Plaza, but it would appear to meet the open space requirements of Snohomish County Code but not the traffic generating intent of the beach park ITE land use category.

Regarding phasing, the phasing plan on sheet A-056 shows the pier and parts of the tidelands and contiguous active open space in Phase 1, but Phases 3 and 4 would add to the amount of beach park. Unfortunately, the submittal drawings do not allow for a calculation of beach park by phase, so I just put the total in Phase 1. Alternatively, this use could be modeled as only partially open in Phase 1 and then expanded in phases 3 and 4 if additional information is provided by BSRE to support that approach.

3.2.2 Urban Village Alternative Land Use /Phasing

Alternative 2 – Urban Village Alternative: The site would be redeveloped as a mixed-use urban village, with fewer units than the urban center proposal. ~~consistent with the current Urban Village land use designation of the site.~~ The urban village development would include the same site plan as Urban Center Alternative. However, several buildings would shorter in height in the Urban Village Alternative than in the Urban Center Alternative. Approximately 2,600 residential units would be provided under the Urban Village Alternative. The same amounts of commercial/office uses (32,262 SF), retail uses and on-site amenities (94,300 SF), and parks and open space for the Urban Center Alternative is assumed for the Urban Village Alternative.

Commented [RMC10]: The rephrasing here is to reflect that the process and standard for review, i.e. as a smaller urban center proposal or a new urban village proposal, has not been decided for this alternative. In any event, this process matter does not affect the transportation assumptions.

The development will be constructed in four phases in 2020, 2025, 2030, and 2035, respectively. The total cumulative project land uses by the end of Phase IV for the Urban Village Alternative are:

- 2,600 residential units
  - 260 High-Rise Apartments
  - 965 High-Rise Condominiums
  - 397 Townhouses
  - 978 Senior Condominiums
- 32,262 square feet of office area
  - 24,762 square feet of General Office
  - 7,500 square feet of Medical-Dental Office
- 74,300 square feet of retail area
  - 30,000 square feet of Specialty Retail
  - 26,300 square feet of Supermarket
  - 18,000 square feet of Quality Restaurants
- 20,000 square feet of On-Site amenities
  - 20,000 square feet of Fitness Center

Commented [RMC11]: Same comment as in the Urban Center alternative.

The land use for each phase and cumulative total by phase is shown in **Table 2**. Land use codes for residential uses within the four phases will be applied to buildings identified in the project site layout. **Attachment H** is a list of the residential buildings proposed for the Project that also includes the number of stories, dwelling units, corresponding residential LUC, and other associated information. **Attachment J** is a site layout of the Urban Village Alternative for the Project which illustrates the location of each the proposed residential buildings, their number of stories, and their associated residential LUC.

Averaged heights of similar-sized and adjacent buildings may be used to designate a group of residential dwelling units within a High Rise category. Senior Adult Housing dwelling units may be included in high, mid, or low rise buildings as identified in the project site layout.

Health/Fitness Club will provide services to residents only; therefore no trip generation is expected. It is anticipated that the Health/Fitness Club is similar to other multi-family complex amenities and thus employees associated with the facility are already part of the ITE trip generation calculation for that multi-family residential facility. In addition, there is a possibility that development of the Health/Fitness Club will be distributed equally among the four stages of development and four separate areas at the site, rather than it all within Phase 2 of the Project.

Table 2: Land Use by Project Phase for Urban Village Alternative

Land Use Types	Land Use Code (LUC)	Units	Subtotal in Phase				Cumulative Total by Phase			
			I	II	III	IV	I	I-II	I-III	I-IV
Residential		**DU**	**575**	**242**	**1,128**	**655**	**575**	**817**	**1,945**	**2,600**
High-Rise Apartment	222	DU	-	242	18	-	-	242	260	260
High-Rise Residential Condominium/Townhouse	232	DU	253	-	566	146	253	253	819	965
Residential Condominium/Townhouse	230	DU	322	-	75	-	322	322	397	397
Senior Adult Housing – Attached (Condo)	252	DU	-	-	469	509	-	-	469	978
Commercial Office		**KSF**	**-**	**32.262**	**-**	**-**	**-**	**32.262**	**32.262**	**32.262**
General Office	710	KSF	-	24.762	-	-	-	24.762	24.762	24.762
Medical-Dental Office Building	720	KSF	-	7.5	-	-	-	7.5	7.5	7.5
Retail		**KSF**	**24.0**	**26.3**	**24.0**	**-**	**24.0**	**50.3**	**74.3**	**74.3**
Specialty Retail Center	826	KSF	16.0	-	14.0	-	16.0	16.0	30.0	30.0
Supermarket	850	KSF	-	26.3	-	-	-	26.3	26.3	26.3
Quality Restaurant(s)	931	KSF	8.0	-	10.0	-	8.0	8.0	18.0	18.0
~~On-Site Amenities~~Other Uses		**KSF**	**-**	**20.0**	**-**	**-**	**-**	**20.0**	**20.0**	**20.0**
Health/Fitness Club*	492	KSF	-	20.0	-	-	-	20.0	20.0	20.0
Police/Fire	730?	KSF	???	-	-	-	???	???	???	???
Beach Park/Public Pier	415	Ac	19.3	-	-	-	19.3	19.3	19.3	19.3

*Health/Fitness Club will provide services to residents only; therefore, no trip generation is expected.

Commented [RMC12]: Similar to the Urban Center alternative, this table will need to be reviewed again after BSRE provides an updated submittal.

3.3 Trip Generation/Internal Capture for Urban Center and Urban Village Alternatives

Gross trip generation will be estimated for each phase for both the Urban Center and Urban Village Alternatives of the Project for the AM and PM weekday peak hours and on a daily basis using the applicable trip rates or regression equations presented in the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (9th edition, 2012) based on the ITE recommended guidelines and procedures. Calculations of the gross trip generation for the Urban Center and Urban Village Alternatives are included in **Attachment K** and **Attachment L**, respectively.

Gross trip generation will be adjusted to account for internalization for each land use alternative in each construction phase for the AM and PM peak hours. Pass-by trip and diverted-linked trip adjustments will not be calculated for off-site roadways because the project site is at the end of the study corridor and bordered to the west by the Puget Sound.

The internalization adjustments for the AM and PM peak hours will be calculated following the National Cooperative Highway Research Program Report 684 (NCHRP 684) *Trip Capture Estimation Tool* and ITE recommended procedures described in the latest *ITE Trip Generation Handbook –An ITE Proposed Recommended Practice* (3rd Edition, August 2014). The *NCHRP 684 Trip Capture Estimation Tool* estimates AM and PM peak-periods trips to and from six specific land use categories, including office, retail, restaurant, residential, cinema/entertainment, and hotel. An blank copy of the worksheet tool is included as **Attachment M**.

Mode split adjustments are included in the *NCHRP 684 Trip Capture Estimation Tool* for internalized trip capture. The mode split percentage for most land uses will refer to *Appendix C. Person Trip Data for Baseline Sites* in the latest *ITE Trip Generation Handbook –An ITE Proposed Recommended Practice* (3rd Edition, August 2014). The mode split and vehicle occupancy estimates for applicable land uses used in NCHRP 684 Internal Trip Capture Estimation Tool for the AM and PM peak hours for both Urban Center Alternative and Urban Village Alternative in each construction phase are shown in **Attachment N**.

Internal capture calculations using the worksheet tool and the mode split adjustments for each of the Traffic Analysis Scenarios associated with the Build Alternatives (as illustrated in **Attachment G**) are included in **Attachment O**.

The level of transit use assumed for the internal capture rate calculations, correlates to the level of transit amenities and operations that the Project owner is committed to providing to the Project. It is expected that as the Project develops and is completed that the the Project owner will coordinate with public transit agencies to have permanent solution through an interlocal agreement. The commitment by the Project owner to this approach to transit is outlined in **Attachment S.** The forecasted number of person-trips by transit exiting the site during the AM peak hour and entering the site during the PM peak hour is summarized in **Attachment T.**

Table 3 illustrates the transit mode share assumption for the Urban Center Alternative and Urban Village Alternative in the AM and PM peak hour for each construction phase.

Commented [RMC13]: Attachments K and L include the AM and PM peak hour estimates, but are missing the daily trips implied by this phrasing. The daily totals appear to be in Attachment P.

Commented [RMC14]: **Important:** We need to discuss this attachment. Most of the attachment is made of blank worksheets. The part that is of concern is identified as tables 7.1a and 7.1b. These are populated with data from the NCHRP 684 study sites. This data includes assumptions for locations that are not comparable to Point Wells due to differences in the mix of uses and relative amounts of each use; however, some kind of data needs to be used. The estimates to use in these tables will determine the outcome of the internal capture assumptions.

Commented [RMC15]: **Important:** As stated in the previous comment, the tool includes mode split adjustments but these are meant to be illustrative and are not representative for Point Wells. The spreadsheets can be used, but some of the mode splits provided in the tool cannot because they do not reflect likely splits at Point Wells. New and modified mode splits need to be appropriate to the Point Wells site.

Commented [RMC16]: **To Do:** Snohomish County Public Works needs to confirm this statement or offer alternative language. Retain as is for now.

Commented [RMC17]: Four comments on Attachment O:

1.This is a very technical attachment. Please add a preface explaining how different parts of the tables are uses. Explain, for example, which cells are variable inputs and which are calculated outputs so that a lay reader can understand where assumptions are being applied to the form.
2.The transit rates are too high and reflect the previous assumption that has previously been identified as needing modification. Transit rates must be based on the inventory of future transit plans in Section 2.6.

3.The "Average Land Use Interchange Distance (Walking Feet)" must be recalculated at each phase. Currently the ...

Commented [RMC18]: The level of transit use must me consistent with the inventory of agency plans in section 2.6 and Snohomish County requirements for transit compatibility. BSRE is working on a document explaining its commitment to transit and is expected to propose a mechanism to provide private service. Until such a ...

Commented [RMC19]: As of 10/12/15, Attachment S has not been submitted to Snohomish County or agreed to for use by the County. This section will need to be revisited and possibly revised before the assumptions memo is finalized.

Commented [RMC20]: Attachment T will need to be updated per the transit inventory in Section 2.6 and possibly further revised by Attachment S if one is submitted and approved for use.

Table 3: Transit Mode Share in the AM Outbound and PM Inbound Directions

Alternative	% Transit for Residential Land Use in Point Wells Project			
	Phase I in 2020	Phase II in 2025	Phase III in 2030	Phase IV in 2035
Urban Center Alternative 1	7%	12%	17%	22%
Urban Village Alternative 2	7%	11%	15%	19%

The *NCHRP 684 Trip Capture Estimation Tool* for internalized trip capture also takes into consideration of average land use interchange distance (working distance in feet) for the PM peak hour. The working distance between each land use pair will be measured based on the site plan, then used the weighted average distances based on the land use sizes.

The daily external vehicle-trips will instead be estimated using the PM peak hour external trips and a K-factor of 0.107, which will refer to the Highway Capacity Manual 2010 (HCM 2010) for urban arterials with similar annual average daily traffic (AADT) range between 20,000 and 50,000 as on the study corridor between the project site and Aurora Avenue N (SR 99) located along Richmond Beach Drive NW – NW 196th Street – NW 195th Street – NW Richmond Beach Road – N 185th Street.

The daily trip internalization will not be calculated using the same methods as for the AM and PM peak hours because daily internal capture rates are not available in the *NCHRP 684 Trip Capture Estimation Tool* and the latest *ITE Trip Generation Handbook –An ITE Proposed Recommended Practice* (3rd Edition, August 2014).

The net trips generated by the project after consideration of internal trip capture for the Urban Center and Urban Village Alternatives are included in **Attachment P** and **Attachment Q**, respectively.

The AM and PM peak hour external trips will be distributed into the study area via the travel demand model developed for the Project.

3.4 Trip Distribution and Assignment in Build Condition

A Point Wells project-specific computer-based travel demand model in the PM peak hour was originally developed in 2010 using the VISUM program (Version 11) and was updated in August 2014 using the VISUM program (Version 14). The VISUM program, a Windows-based multimodal transportation modeling program, was used to help understand the existing traffic flow patterns, distribute the Point Wells project site trips throughout the project study area, which includes areas in both Snohomish and King Counties.

The Point Wells travel demand model development process includes roadway network-building, four-step modeling procedures, base model validation, and future traffic forecasting.

The roadway network building involves the laying out of roadways, intersections, and zone structure and zone connectors. The roadway network, including city and county boundaries, was built by incorporation of NAVTEQ data, which provided all freeways, principal arterials, minor arterials, collectors, and local

Commented [RMC21]: To comply with transit compatibility requirements, assume a 5% ridership rate for all phases. This may be modified if supported by the inventory in Section 2.6 and possibly further refined by Attachment S when it is received and approved for use by Snohomish County.

Commented [RMC22]: See previous comment on this topic. Weighted average distance should be by phase rather than by the overall project.

Commented [RMC23]: What is a K-factor? (Explain for lay readers.)

Commented [RMC24]: This is confusing. Is it saying that the daily internal capture rate will not be calculated at all because the tools for calculating internal capture are limited to just the peak hours? If daily internal capture is calculated by some other method, then please explain.

Commented [RMC25]: Without an explanation for how daily internal capture is calculated (see previous comment), how are the overall internal capture rates in Attachment P and Q determined?

streets in Snohomish and King Counties. Link capacity, speed, and number of lanes are most relevant for roadway coding. Intersection control type, configuration, and capacity are most critical for intersection coding. The zone structure was based on the adopted PSRC Traffic Analysis Zones (TAZ), to cover all of Snohomish and King Counties, and the zone connectors were manually added into the Point Wells model. The Point Wells project site is represented by TAZ 1001, TAZ 1002, TAZ 1003, and TAZ 1004.

Four-step modeling typically includes trip generation, trip distribution, mode choice, and traffic assignment. The Point Wells model focuses on trip generation, trip distribution, and traffic assignment. Trip generation was only applied for the project development but was not applied for the background traffic modeling. Instead, to be consistent with the PSRC traffic growth forecasting on the roadway network, the background traffic was modeled and interpolated using the PSRC vehicle trip tables for periods between 2006 and 2040 to arrive at the existing 2010 conditions and the future Build scenarios in each development phase. The project-generated trips were consistent with the trips estimated using ITE trip generation methodology. Project trip internalization will be based on the ITE recommended procedures and the NCHRP 684 *Trip Capture Estimation Tool* recently adopted by ITE and described in the latest *ITE Trip Generation Handbook –An ITE Proposed Recommended Practice* (3rd Edition, August 2014). The final trip distribution and traffic assignment procedures combine the project-generated trip table and the background growth trip table to distribute trips to each TAZ and assign trips on the roadway network for the Build scenarios. The total regional background trip table obtained from PSRC was used for modeling the trip distribution and traffic assignment only.

Commented [RMC26]: Explain why this part of a typical four-step approach is not a focus for Point Wells.

Base model validation is a process of comparing the calibrated model's raw volumes against the base-year traffic counts to show the degree of correlation and to determine an acceptable accuracy and degree of confidence to use the base model to forecast future traffic volumes. The most common statistical measure of "goodness of fit" is the R-Squared statistic. This measures how well the model's raw volumes represent the observed count data. The base model validation for the Point Wells 2010 model (the R^2 value) was 0.75, and engineering judgment has concluded that the traffic flow patterns are acceptable. The VISUM model will be used as a tool for site trip distribution and traffic assignment because the model raw volumes were not intended to be used for intersection LOS and delay analysis. Instead, the intersection analysis was specially based on the actual traffic counts plus the background traffic growth plus the project-generated trips; therefore, the R^2 value is not as critical in Point Wells model as in other typical travel demand models.

The future traffic forecasting model in the AM and PM peak hours will be built upon the acceptable 2010 base model in the PM peak hour by updating the land use and future improvement projects/options, and serves exclusively for the Point Wells project trip distribution. Some link speed, capacity, and/or intersection capacity were later adjusted based upon input received from the City of Shoreline staff to represent the City of Shoreline's assumed and desired site trip distribution flow patterns. A special matrix was introduced to capture the traffic stopping at the light-rail stations near the I-5 and 185th street interchange and near the I-5 and 145th Street interchange for the Phase IV full build out scenario. The matrix manually shifts approximately 3 percent of the project site trips that have the origin and destination between the project site and the job center in Seattle to have an intermediate stop at the assumed light rail station near the I-5 and 185th street interchange and near the I-5 and 145th Street interchange, but the total origin and destination trips in the special matrix do not increase. The final project site trip distribution patterns for Phase IV of the Urban Center land use alternative were indicated during coordination meetings as being acceptable to the City of Shoreline.

The VISUM model's raw volumes will not be used for the intersection LOS analysis; instead, the background traffic grew from the counts using the straight-line annual growth rate of 0.25 percent plus the Point Wells project site trips (i.e. derived from the VISUM model) will be used to conduct intersection LOS analysis.

The City of Shoreline's EMME2 model was not used for traffic forecasting as outlined in the MOU (Attachment C) because the City's EMME2 model does not have the level of detail for many local streets and neighborhood streets that are needed to address cut-through traffic as identified in the MOU and as expressed by Shoreline staff and residents.

3.5 Traffic Volumes in Build Condition

Traffic volumes in the Build condition for each phase of each land use alternative will be obtained by adding the background traffic and the Point Wells project site trips. The Point Wells project site trips will be modeled using the VISUM program that is described in the preceding section.

3.6 Traffic Operations in Build Condition

Intersection LOS evaluation will be conducted using the HCM 2000 methods and SYNCHRO program (Version 7) and aaSidra program (Version 5) for both the Urban Center and Urban Village Alternatives.

The mitigation improvements will be incorporated into the SYNCHRO model and the roundabout model for LOS analysis.

Traffic Volumes will be obtained by combining the background traffic, plus the Point Wells project site trips in each phase for each improvement option under each land use Alternative.

Signal Timing and Phasing –Signal split and cycle lengths for future build condition will be optimized using the SYNCHRO program. The minimum green, yellow clearance, red clearance, recalls mode will be kept the same as the existing. Pedestrian walk time and flash don't walk time will be kept unchanged from the existing even after lane conversion on Richmond Beach Road corridor because curb to curb width was unchanged, but if the road way segment is widened, walk time will be 7 seconds, and flash don't walk will be estimated based on walking speed of 3.5 feet per second. For new signalized intersections, signal timing and phasing will be referred to similar signals and will be optimized using the SYNCHRO program.

Peak hour factor and heavy vehicle percentage will be obtained from the default values in HCM 2000, which are the same default values as found in NCHRP 599. The existing bicycle and pedestrian counts will be grown based on 0.25 percent per year -in the future condition.

The detailed SYNCHRO intersection and roundabout LOS evaluation assumptions are shown in **Attachment D** and **Attachment E**, respectively.

Intersection LOS will be calculated for all study intersections for both the Urban Center and Urban Village Alternatives. Project impacts will be identified by comparing intersection delay between the No Action Alternative and Build Condition scenarios.

Roadway segment V/C ratio will be examined and checked against the city of Shoreline roadway segment V/C standard.

3.7 Traffic Safety in Build Condition

High collision locations identified from the historical collision data will be reviewed in each of the build land use alternative and potential safety impacts will be identified due to increasing traffic, control types changed, improvements added, roadways/intersections configuration changed, and any other issues.

3.8 Pedestrian and Bicycle Facilities in Build Condition

Potential project impacts on pedestrian and bicycle facilities will be summarized. The efforts will be focused on the study corridor.

3.9 Transit and Rail Services in Build Condition

Potential project impacts on transit and rail services will be summarized. Consideration will be given on the ability of adding more transit services/rail services to the project study area.

Commented [RMC27]: How does this tie back to Section 2.6?

Commented [RMC28]: What does "consideration" mean? See 7.j of our May 27, 2015 letter.

4.0 No Action Condition

4.1 No Action Street System

The street system for No Action condition will be the same as the existing condition, plus the proposed improvement projects that are fully funded and committed to be constructed by 2035.

4.2 No Action Traffic Volumes

No Action traffic volumes will include the background traffic that will be estimated based on the traffic counts, a straight-line annual growth rate of 0.25 percent for the intersections, and the site traffic generated from the existing industrial use for the forecast years of 2020, 2025, 2030, and 2035. As noted in Section 2.3, Traffic Volumes, background growth rate was based upon input from the City of Shoreline and a review of traffic data and traffic projections used in the analysis for the design of the SR 99 corridor within the Project vicinity. The annual average daily traffic (AADT) data was reviewed for locations on SR 99 just north of N 170th Street and on SR 99 south of N 200th Street and zero to negative growth was experienced in the past four years; therefore, the annual growth rate of 0.25 percent provided by the city of Shoreline is a reasonable growth rate to be used for the fully developed area within the city of Shoreline limits, including the SR 99 corridor. Calculations of the gross trip generation for the two scenarios for the No Build Alternative is included in **Attachment R**.

4.3 No Action Traffic Operations

Similar methods and assumptions used for LOS evaluation in the existing condition will be used for the No Action conditions for the forecast years of 2020, 2025, 2030, and 2035. Signal timings and phasing for signalized intersections will be optimized using the SYNCHRO program.

The detailed SYNCHRO intersection LOS evaluation assumptions are shown in **Attachment E**.

MXLU:

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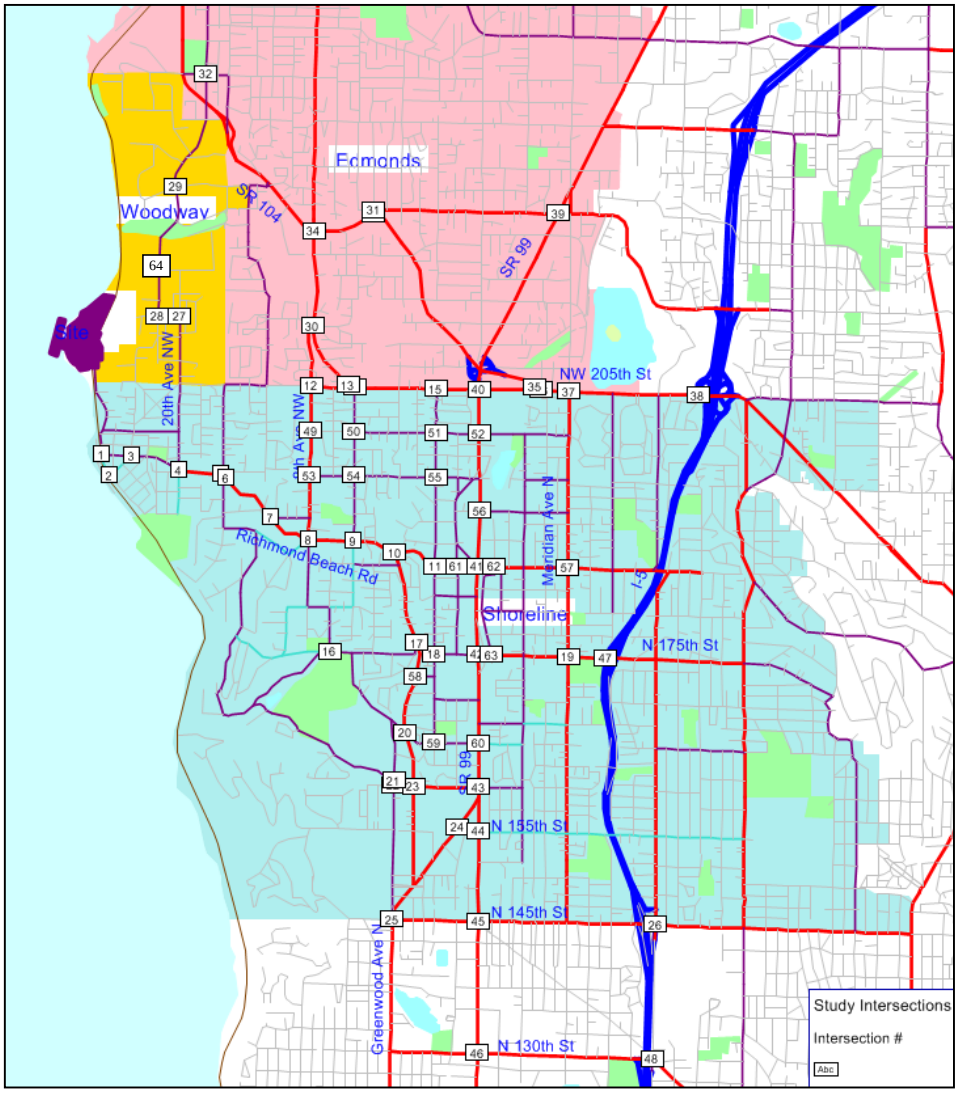
Attachment A – Study Intersections in Vicinity



Attachment B – Study Intersections and Control Types

No.	Intersection	Control Type	Jurisdiction
1	Richmond Beach Drive NW & NE 196th Street	Two-way stop	Shoreline
2	Richmond Beach Drive NW & NW 195th Place	Two-way stop	Shoreline
3	24th Avenue NW & NW 196th Street	Two-way stop	Shoreline
4	20th Avenue NW & NW 195th Street	All-way stop	Shoreline
5	NW 195th Street & 15th Avenue NW	Two-way stop	Shoreline
6	15th Avenue NW & NW Richmond Beach Road	All-way stop	Shoreline
7	NW Richmond Beach Road & NW 190th Street	Two-way stop	Shoreline
8	8th Avenue NW & NW Richmond Beach Road	Signalized	Shoreline
9	3rd Avenue NW & NW Richmond Beach Road	Signalized	Shoreline
10	Dayton Avenue N & NW Richmond Beach Road	Signalized	Shoreline
11	Fremont Avenue N & N 185th Street	Signalized	Shoreline
12	100th Avenue W & 244th Street SW	Two-way stop	Shoreline
13	Firdale Avenue & 244th Street SW	Two-way stop	Shoreline
14	3rd Avenue NW & 244th Street SW	Two-way stop	Shoreline
15	Fremont Avenue N & 244th Street SW	Two-way stop	Shoreline
16	6th Avenue NW & NW 175th Street	Two-way stop	Shoreline
17	Dayton Avenue N & St Luke Place N	Two-way stop	Shoreline
18	Fremont Avenue N & N 175th Street	Signalized	Shoreline
19	Meridian Avenue N & N 175th Street	Signalized	Shoreline
20	Dayton Avenue N & Carlyle Hall Road N	Two-way stop	Shoreline
21	Greenwood Avenue N & N Innis Arden Way	Two-way stop	Shoreline
22	Greenwood Avenue N & N 160th Street	All-way stop	Shoreline
23	Dayton Avenue N & N 160th Street	Signalized	Shoreline
24	Westminster Way N & N 155th Street	Signalized	Shoreline
25	Greenwood Avenue N & SR 523 (N 145th Street)	Signalized	Shoreline
26	5th Avenue NE & SR 523 (N 145th Street)	Signalized	Shoreline
27	Timber Lane & 238th Street SW	All-way stop	Woodway
28	114th Avenue W & 238th Street SW	All-way stop	Woodway
29	Woodway Park Road & Algonquin Road	Two-way stop	Woodway
30	Firdale Avenue & 238th Street SW	Signalized	Edmonds
31	95th Place W & 228th Street SW	Two-way stop	Edmonds
32	3rd Avenue S & Pine Street	Two-way stop	Edmonds
33	95th Place W & SR 104 (Edmonds Way)	Signalized	WSDOT
34	100th Avenue W & SR 104 (Edmonds Way)	Signalized	WSDOT
35	SB SR 104 (Edmonds Way) & WB 244th Street SW	Signalized	WSDOT
36	SB SR 104 (Edmonds Way) & EB 244th Street SW	Signalized	WSDOT
37	76th Avenue W & SR 104 (Lake Ballinger Way)	Signalized	WSDOT
38	SB I-5 Ramps & SR 104 (Lake Ballinger Way)	Signalized	WSDOT
39	SR 99 & 228th Street SW	Two-way stop	WSDOT
40	SR 99 & 244th Street SW	Signalized	WSDOT
41	SR 99 & N 185th Street	Signalized	WSDOT
42	SR 99 & N 175th Street	Signalized	WSDOT
43	SR 99 & N 160th Street	Signalized	WSDOT
44	SR 99 & N 155th Street	Signalized	WSDOT
45	SR 99 & SR 523 (N 145th Street)	Signalized	WSDOT
46	SR 99 & N 130th Street	Signalized	WSDOT
47	SB I-5 Ramps & N 175th Street	Signalized	WSDOT

No.	Intersection	Control Type	Jurisdiction
48	5th Avenue NE & NE 130th Street	Signalized	Others
49	8th Ave NW & NW 200th Street	Two-way stop	Shoreline
50	3rd Ave NW & NW 200th Street	Two-way stop	Shoreline
51	Fremont Ave N & N 200th Street	All-way stop	Shoreline
52	SR 99 & N 200th Street	Signalized	Shoreline
53	8th Ave NW & NW 195th Street	Two-way stop	Shoreline
54	3rd Ave NW & NW 195th Street	All-way stop	Shoreline
55	Fremont Ave N & N 195th Street	All-way stop	Shoreline
56	SR 99 & N 192nd Street	Signalized	Shoreline
57	Meridian Ave N & N 185th Street	Signalized	Shoreline
58	Dayton Ave N & N 172nd Street	Two-way stop	Shoreline
59	Fremont Ave N & N 165th Street	Two-way stop	Shoreline
60	SR 99 & N 165th Street	Signalized	Shoreline
61	Linden Ave N & N 185th Street	Signalized	Shoreline
62	Midvale Ave N & N 185th Street	Signalized	Shoreline
63	Midvale Ave N & N 175th Street	Signalized	Shoreline
64	Woodway Park Road and Wachusett Road	Side street stop	Woodway

Attachment C – Corridor Study General Scope and Assumptions from Memorandum of Understanding (MOU) between Shoreline and the Project Owner

Attachment D – SYNCHRO LOS Evaluation Assumptions for Signalized and Unsignalized Intersections

Check Items	Condition			Updates	
	2014	No Action by Forecast Year	Future Build Condition by Phase/Forecast Year	Date	Change
Roadway Network	1. Network drawn to scale. 2. Link speed verified to speed limits.	The same as existing plus funded projects	The same as No Action plus mitigation improvements.		
Channelization	1. Lane configuration checked against aerial map and field visit notes. 2. Right-turn/left-turn pocket length entered. 3. Right-turn channelization coded. 4. Right-turn on red verified. 5. Two-way left-turn lane verified.	The same as existing plus funded projects	The same as No Action plus mitigation improvements.		
Control Types	Signal or stop control verified.	The same as existing plus funded projects	The same as No Action plus intersection improvements.		
Traffic Volumes	Balance volumes between closely spaced intersections with no accesses in between.	Grew from existing based on 0.25%/year	Background traffic (grew counts using 0.25% per year) + Project site trips by phase		
Factors	Heavy vehicle (HV) percentage and peak hour factors (PHF) entered by approach based on counts or if not available, based on SYNCHRO default values.	HCM default values: PHF=0.92 HV=2%	HCM default values: PHF=0.92 HV=2%		
Signal Timing/Phasing	Signal timing and phasing based on timing sheets from agencies. If not available, use field observation. Parameter entered include: 1. Controller types 2. Cycle length 3. Phasing 4. Minimum green, splits, yellow, and red time 5. Vehicle passage time/gaps 6. Lead/lag phasing, 7. Recall mode, 8. Ped phasing and walk and flash don't walk time 9. Reference phasing	Optimized by the SYNCHRO program.	If timing is not available, use agency standards. If there are no standards, assume: 1. Minimum green = 4 sec for side streets and 8 sec for main streets. 2. Yellow =4 sec; Red = 1 sec 3. Vehicle passage time/gaps = 3 sec 3. Optimize lead/lag phasing 4. Set Min recall mode for main streets, none for minor streets 5. Set walk = 7 sec and flash don't walk = 3.5 feet/ sec 6. "Reference to" beginning of green 7. Optimize Cycle length For existing and future signals: 1.Maintain coordination on corridors 2. Optimize splits or change cycle length if LOS is poor		
Ped./Bicycle Volumes	Pedestrian Bicycle Volumes coded based on counts	grew counts using 0.25% per year	grew counts using 0.25% per year		

Attachment E – aaSidra LOS Evaluation Assumptions for Roundabouts

The aaSidra program (version 5) will be used for roundabout LOS analysis. The following default values that are consistent with WSDOT procedures will be used when roundabout information is not available.

1. **Environment Factor (EF)**: Varied based on analysis period
   - 1.1 for existing condition
   - 1.0 for future years (10 to 20 year out)

2. **Roundabout Capacity Model**: SIDRA Standard.

3. **Delay Model**: SIDRA Standard Delay Model is used. Control delay includes geometric delay.

4. **Gap-Acceptance Capacity**: SIDRA Standard (Akçelik M3D).

5. **LOS method:** Delay using HCM 2000.

6. **Roundabout LOS Method**: Same as Signalized Intersections. Vehicle movement LOS values are based on average delay per movement; Intersection and Approach LOS values are based on average delay for all vehicle movements.

7. **Measure of Effectiveness (MOE)**: Degree of Saturation (V/C) and LOS

8. **Lane Widths**: 13-feet entry or exit lane widths

9. **Roundabout Design Elements**: Refer to WSDOT *Design Manual* Exhibit 1320-1 as shown below

Exhibit 1320-1: Suggested Initial Design Ranges

Design Element	Mini [1]	Single-Lane	Multilane
Number of Lanes	1	1	2+
Inscribed Circle Diameter [2]	45′–80′	80′–150′ [3]	135′
Circulating Roadway Width	N/A	14′–19′	29′
Entry Widths	N/A	16′–18′	25′

Notes:
[1] Reserved for urban/suburban intersections with a 25 mph or less posted speed.
[2] The given diameters assume a circular roundabout; adjust accordingly for other shapes.
[3] Inscribed circle diameters of less than 100 feet may not be appropriate on a state route.

10. Speeds: Recommended Maximum entry design speeds based on Roundabout: *An Informational Guide*, FHWA Exhibit 6-4 shown below.

Exhibit 6-4: Recommended Maximum Entry Design Speeds

Site Category	Recommended Maximum Entry Design Speed
Mini-Roundabout	25 km/h (15 mph)
Urban Compact	25 km/h (15 mph)
Urban Single Lane	35 km/h (20 mph)
Urban Double Lane	40 km/h (25 mph)
Rural Single Lane	40 km/h (25 mph)
Rural Double Lane	50 km/h (30 mph)

11. **Other Items**: Assumption related channelization, traffic volumes, heavy vehicle percentages, and peak hour factors will be consistent with Attachment D for the SYNCHRO LOS evaluation assumptions.

Attachment I – Urban Center Alternative Site Layout with Land Use Codes and Building Heights

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Attachment J – Urban Village Alternative Site Layout with Land Use Codes and Building Heights

Attachment K – Urban Center Alternative
Trip Generation Calculations by Project Phase

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Attachment L – Urban Village Alternative
Trip Generation Calculations by Project Phase

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Attachment M – NCHRP 684 Trip Capture Estimation Tool
Blank Template

Attachment N – NCHRP 684 Trip Capture Estimation Tool
Mode Split Adjustments

Table N1: Mode Split and Vehicle Occupancy Estimates in AM Peak Hour

Land Use	Entering Trips				Exiting Trips		
	Vehicle Occupancy	% Transit	% Non-Motorized		Vehicle Occupancy	% Transit	% Non-Motorized
Office	1.06	1%	0%		1.06	0%	0%
Retail	1.17	0%	0%		1.16	0%	0%
Restaurant	1.62	0%	0%		1.52	0%	0%
Residential	1.13	0%	4%		1.09	Refer to Table 3	2%

Table N2: Mode Split and Vehicle Occupancy Estimates in PM Peak Hour

Land Use	Entering Trips				Exiting Trips		
	Vehicle Occupancy	% Transit	% Non-Motorized		Vehicle Occupancy	% Transit	% Non-Motorized
Office	1.11	0%	0%		1.07	0%	1%
Retail	1.21	0%	0%		1.18	0%	0%
Restaurant	1.62	0%	1%		1.52	0%	1%
Residential	1.15	Refer to Table 3	3%		1.21	0%	4%

Attachment O – NCHRP 684 Trip Capture Estimation Tool
Calculations for Traffic Analysis Scenarios

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Attachment P – Urban Center Alternative
Summary of Cumulative Trip Generation, and Phase Trip Generation by Project Phase

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Attachment Q – Urban Village Alternative
Summary of Cumulative Trip Generation, and Phase Trip Generation by Project Phase

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Attachment R – No Build Alternative, Scenarios A and B
Trip Generation Calculations

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Attachment S – Project Owner's Commitment to Transit Amenities and Services

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