The majority of the site is underlain by competent glacial till and is stable with respect to landslide activity in the current configuration. In our opinion, construction of the residential plat will not increase the potential for landslide activity, primarily due to improved drainage and soil retention near the slope areas.

**Landslide Hazard Area Buffer and Foundation Setbacks**

Test pits excavated at the top of the steep slope ravine feature revealed dense glacial till deposits that are stable with respect to landslide activity. No conditions that would represent a potential slippage plane were observed. No signs of springs or other hydrologic conditions that might reduce slope stability were observed during our fieldwork. In our opinion a minimum building foundation setback of 15 feet from the top of slopes inclined at least 40 percent should be used for site layout. Where space is limited, foundations near the top of slope can be advanced to a depth that will provide a minimum horizontal setback of 15 feet from the face of the slope. In no case should foundations (measured from the foundation face at finish grade) be closer than 10 feet from the top of steep slope areas. Due to the presence of fill at some areas near the steep slopes (TP-1, TP-5 and TP-107), we recommend lowering grades in Lots 15-18 to accommodate the new buildings. In any case, ESNW should review the grading plan to confirm foundation setbacks are suitable for soil conditions anticipated to be exposed. Decks can be constructed off the north side of the new buildings provided the foundations are advanced at least five feet into dense undisturbed native soil and the decks are constructed to collect and convey water away from the slopes.

**Analysis of Proposal**

The current proposal includes redeveloping the properties with a residential plat, egress and associated improvements. While the density of impervious surfaces will increase, the design has been developed to control drainage and protect the steep sensitive areas around the site. In this respect, impacts to surrounding properties or sensitive areas will not increase as a result of the project.

The steeper slope areas off the north and east sides of the development envelope are sensitive and measures should be included to protect them from erosion during construction and after construction. Placing fill near the top of the steep slope areas should be avoided and grading plans should reflect this approach.

**Mitigation Measures**

Protection of the steep slope areas from erosion during construction and on a permanent basis is critical to maintain overall stability. As noted earlier, placement of fill along the top of the slopes or within the buffers should be avoided. Water should not be allowed to flow over or pond above the slopes during construction or on a permanent basis. If decks will be constructed off the north side of the homes, foundation elements should be advanced at least five feet into competent native soil and water should be captured from the deck(s) and conveyed to an approved discharge.

## DISCUSSION AND RECOMMENDATIONS

### General

Based on the results of our study, the proposed development is feasible from a geotechnical standpoint. The primary geotechnical considerations associated with the proposed development include foundation support, suitability of the on-site soils for use as structural fill, and preparation of building subgrade areas.

The soils encountered at the test pit locations generally have a high sensitivity to moisture based on the fines content of the soil. It may be possible to use excavated site native soils elsewhere within the building pads depending on the conditions at the time of placement. The suitability of using the on-site soils as structural fill should be evaluated by ESNW during construction. We understand preliminary grading plans will likely remove the majority of the existing fill areas.

The proposed residential structures can be supported on competent native soil, existing competent fill or new structural fill. We anticipate competent native and fill soil suitable for support of foundations will generally be exposed at a depth of two to four feet below existing grades. ESNW should observe conditions at the design foundation subgrade to confirm adequate conditions are exposed and to provide additional recommendations where necessary.

This study has been prepared for the exclusive use of GGM Investments, LLC and their representatives. No warranty, expressed or implied, is made. This study has been prepared in a manner consistent with the level of care and skill ordinarily exercised by other members of the profession currently practicing under similar conditions in this area.

### Site Preparation and Earthwork

Site preparation will likely include installing temporary erosion control measures and clearing limits and establishing construction entrances and removing existing structural improvements.

### Erosion Control

Temporary erosion control measures should include, at a minimum, silt fencing placed along the downslope perimeter of the construction envelope, and a construction entrance consisting of at least 12 inches of quarry spalls to minimize off-site soil tracking and to provide a firm surface. Surface water should not be allowed to flow over temporary or permanent slopes. Interceptor drains or swales should be considered for controlling surface water flow patterns. ESNW should observe the erosion control measures, and provide supplemental recommendations for minimizing erosion during construction, as necessary.

**In-situ Soils**

The soil encountered at the test pit locations generally have a high sensitivity to moisture based on the fines content of the soil. It may be possible to use excavated native soils elsewhere within the building pads depending on the conditions at the time of placement. The suitability of using the on-site soils as structural fill should be evaluated by ESNW during construction. In our opinion existing unsuitable fill should be removed from new foundation areas and grades restored with structural fill.

Compaction of site soils to the levels necessary for use as structural fill will be difficult or impossible during wet weather conditions. If the moisture content of the soil is near the optimum level, the soil can be used as structural fill. However, the stability of the compacted soil will degrade if exposed to wet weather and/or construction traffic. In our opinion, a contingency should be provided in the project budget to cover export of unsuitable fill soils.

Imported soil intended for use as structural fill within building lot areas should consist of a well graded granular soil with a maximum aggregate grain size of four inches, and a moisture content that is at or near the optimum level. During wet weather conditions, imported soil intended for use as structural fill should consist of a well graded granular soil with a fines content of 5 percent or less defined as the percent passing the #200 sieve, based on the minus three-quarter inch fraction.

**Structural Fill Placement**

Structural fill is defined as compacted soil which is devoid of organic material and deleterious debris placed in foundation, slab-on-grade, and roadway areas. Fills placed to construct permanent slopes and throughout retaining wall, and utility trench backfill areas are also considered structural fill. Soils placed in structural areas should be placed in loose lifts of 12 inches or less and compacted to a relative compaction of 90 percent, based on the maximum dry density as determined by the Modified Proctor Method (ASTM D-1557-02). In pavement areas, the upper 12 inches of the structural fill should be compacted to a relative compaction of at least 95 percent. The subgrade in pavement and slab areas must also be in a stable condition. In order to provide a stable subgrade, it may be necessary to compact more than the upper 12 inches to 95 percent.

**Fill Slope Placement**

Because the site slopes to the east across the majority of the development envelope, structural fill will likely be placed on existing sloped areas. Fill placed on slopes should be provided a keyway and level bench system prior to placement. A slope fill placement detail is provided on Plate 3. Fill should not be placed on the top of steep slope areas located along the northern development envelope.

## Excavations and Slopes

The Federal and state Occupation Safety and Health Administration (OSHA/WISHA) classifies soils in terms of minimum safe slope inclinations. Based on the soil conditions encountered during our fieldwork, the fill soils, weathered native soils and where groundwater is exposed would be classified by OSHA/WISHA as Type C. Temporary slopes over four feet in height in Types C soils should be sloped no steeper than 1.5H:1V (Horizontal:Vertical). The firm, undisturbed native deposits where no groundwater is exposed would be classified by OSHA/WISHA as Type A. Temporary slopes over four feet in height in Type A soils should be sloped no steeper than 0.75H:1V (Horizontal:Vertical). ESNW should observe temporary and permanent slopes to verify that the inclination is appropriate for the conditions exposed, and to provide additional grading recommendations, as necessary. If temporary slopes cannot be constructed in accordance with OSHA/WISHA guidelines, temporary shoring may be necessary.

Permanent slopes should maintain a gradient of 2H:1V, or flatter, and should be planted with vegetation to enhance stability and to minimize erosion.

## Foundations

The proposed residential structures can be supported on conventional spread and continuous footings bearing on competent native soil or structural fill. We anticipate competent native soil suitable for support of foundations will generally be encountered at depths of two to four feet below existing grades across much of the site; however, deeper fill was encountered near proposed Lots 14-18 and should be further evaluated by ESNW during grading. Building pad fill areas should be compacted to the specifications of structural fill previously described in this report. Where loose or unsuitable soil conditions are encountered at foundation subgrade elevations, compaction of the soils to the specifications of structural fill, or overexcavation and replacement with structural fill may be necessary.

The following parameters can be used for foundation design:

- Allowable soil bearing capacity — 2,500 psf
- Passive earth pressure — 300 pcf
- Coefficient of friction — 0.40

The passive earth pressure value provided above assumes the foundations are backfilled with structural fill. A factor-of-safety of 1.5 has been applied to these passive resistance and friction values. For short term wind and seismic loading, a one-third increase in the allowable soil bearing capacity can be assumed.

With structural loading as expected, total settlement in the range of one inch is anticipated, with differential settlement of approximately one-half inch. The majority of the settlements should occur during construction, as dead loads are applied.

**Slab-On-Grade Floors**

Slab-on-grade floors for residential structures should be supported on competent native soil or structural fill. Unstable or yielding areas of the subgrade should be recompacted or overexcavated and replaced with suitable structural fill prior to construction of the slab. A capillary break consisting of a minimum of four inches of free draining crushed rock or gravel should be placed below the slab. The free draining material should have a fines content of 5 percent or less (percent passing the #200 sieve, based on the minus three-quarter inch fraction). In areas where slab moisture is undesirable, installation of a vapor barrier below the slab should be considered. If a vapor barrier is used it should consist of a material specifically designed for that use and be installed in accordance with the manufacturer's specifications.

**Seismic Considerations**

The 2012 IBC recognizes ASCE for seismic site class definitions. If the project will be permitted under the 2012 IBC, in accordance with Table 20.3-1 of ASCE, Minimum Design Loads for Buildings and Other Structures, Site Class D, should be used for design.

In our opinion, liquefaction susceptibility at this site is low. Glacially consolidated soil deposits are typically not susceptible to the effects of liquefaction. The relative density of the site soils and the absence of a uniform, shallow groundwater table is the primary basis for this designation.

**Retaining Walls**

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters can be used for retaining wall design:

- Active earth pressure (unrestrained condition) — 35 pcf
- At-rest earth pressure (restrained condition) — 55 pcf
- Traffic surcharge (passenger vehicles) — 70 psf (rectangular distribution)
- Passive earth pressure — 300 pcf
- Coefficient of friction — 0.40
- Seismic surcharge — 6H*

*Where H equals the retained height for retaining walls at least six feet in height

Additional surcharge loading from adjacent foundations, sloped backfill, or other loads should be included in the retaining wall design. Drainage should be provided behind retaining walls such that hydrostatic pressures do not develop. If drainage is not provided, hydrostatic pressures should be included in the wall design.

Retaining walls should be backfilled with free draining material that extends along the height of the wall, and a distance of at least 18 inches behind the wall. The upper one foot of the wall backfill can consist of a less permeable soil, if desired. A perforated drain pipe should be placed along the base of the wall, and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 4.

**Drainage**

Groundwater seepage should be expected in deeper site excavations, especially at the contact between the weathered and unweathered native soils. Temporary measures to control surface water runoff and groundwater during construction would likely involve passive methods such as interceptor trenches and sumps.

Surface grades must be designed to direct water away from buildings and slopes. The grade adjacent to buildings should be sloped away at a gradient of at least 2 percent for a horizontal distance of ten feet. In our opinion, perimeter footing drains should be installed at or below the invert of the building footings. A typical footing drain detail is provided on Plate 5 of this report.

**Infiltration**

Soils encountered at the majority of the test pit locations at depths typical for lot infiltration facilities consisted primarily of dense to very dense silty sand with gravel. These soils are not well-suited for infiltration.

**Detention Vault Recommendations**

We anticipate a stormwater detention vault or similar stormwater facility will be constructed on the east side of the site. With respect to detention vault construction, competent native soils suitable for support of the vault foundations are anticipated to be exposed at typical vault subgrade elevation. ESNW should review the vault design to confirm the recommendations provided in this report are followed and provide supplemental recommendations if necessary. Groundwater was not observed at the test pit locations within the vault area during the exploration on October 21, 2015. As such, the presence of perched groundwater seepage should be expected in the detention vault excavations, depending on the time of year grading takes place.

With respect to temporary slopes required to construct the vault, in our opinion, the soil should be sloped at a 1H:1V inclination or flatter. ESNW should review detention vault designs, particularly with respect to location relative to sensitive site features and property lines.

A zone of free-draining rock or a sheet drain must be provided behind the vault walls. A four-inch perforated PVC drain pipe must be placed the base of the vault walls. If the drain is too low to gravity flow to an outlet, the drain (and associated drain rock or sheet drain) should be raised to a point where it can gravity flow to an outlet. The portion of the vault walls located below the drain pipe must be designed for hydrostatic pressure.

The following values can be used for design of the vault:

| | |
|---|---|
| • Allowable soil bearing capacity | 5,000 psf* |
| • Active earth pressure (yielding condition) | 35 pcf (equivalent fluid) |
| • Active earth pressure (hydrostatic) | 80 pcf |
| • At-rest earth pressure (restrained condition) | 55 pcf |
| • At-rest earth pressure (hydrostatic) | 95 pcf |
| • Traffic surcharge for passenger vehicles (where applicable) | 70 psf (rectangular distribution) |
| • Passive earth pressure | 300 pcf (equivalent fluid) |
| • Coefficient of friction | 0.40 |
| • Seismic surcharge | 6H |

* Value is for dense native soil anticipated to be exposed at depths of five feet or more below existing grades.

**Utility Support and Trench Backfill**

In our opinion, the soils observed at the test sites are generally suitable for support of utilities. Excessively loose, organic, or otherwise unsuitable soils encountered in the trench excavations should not be used for supporting utilities. In general, the on-site soils observed at the test sites should be suitable for use as structural backfill in the utility trench excavations, provided the soil is at or near the optimum moisture content at the time of placement and compaction. Moisture conditioning of the soils may be necessary at some locations prior to use as structural fill. Utility trench backfill should be placed and compacted to the specifications of structural fill provided in this report, or to the applicable specifications of Kirkland or other applicable jurisdiction or agency.

## Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To provide adequate pavement performance, the subgrade should be in a firm and unyielding condition when subjected to proofrolling with a loaded dump truck. Structural fill in pavement areas should be compacted as recommended in the "Site Preparation and Earthwork" section of this report. It is possible that soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas of unsuitable or yielding subgrade conditions will require remedial measures such as overexcavation, cement treatment, placement of a geotextile and thicker crushed rock or structural fill sections prior to pavement.

For lightly loaded pavement areas subjected primarily to passenger vehicles, the following preliminary pavement sections can be considered:

- Two inches of hot-mix asphalt (HMA) placed over four inches of crushed rock base (CRB), or;
- Two inches of HMA placed over three inches of asphalt treated base (ATB).

For relatively high volume, heavily loaded pavements subjected to occasional truck traffic, the following preliminary pavement sections can be considered:

- Three inches of HMA placed over six inches of CRB, or;
- Three inches of HMA placed over four and one-half inches of ATB.

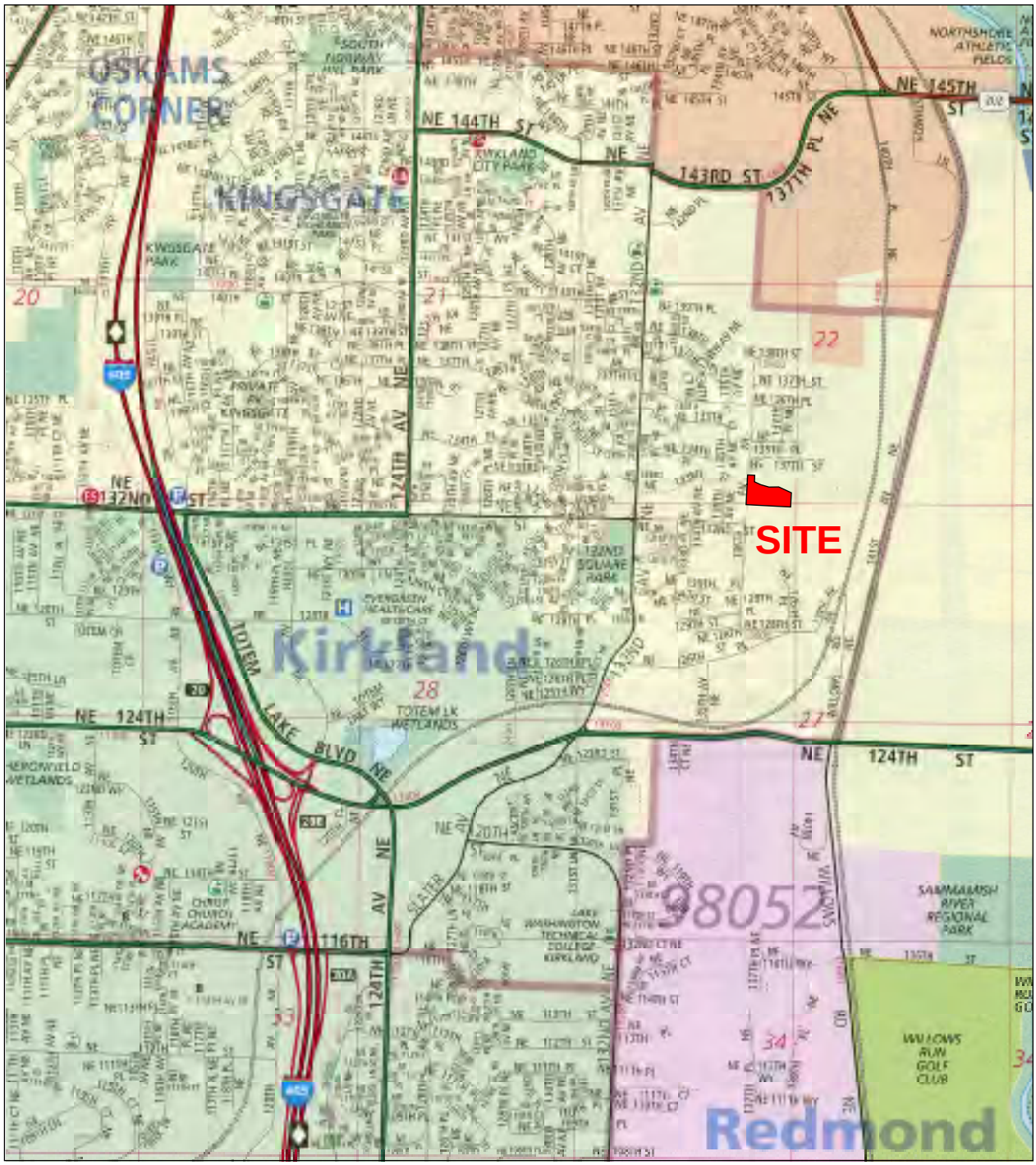
The HMA, ATB, and CRB materials should conform to WSDOT specifications. All soil base material should be compacted to at least 95 percent of the maximum dry density. Final pavement design recommendations can be provided once final traffic loading and frequency has been determined.

# LIMITATIONS

The recommendations and conclusions provided in this geotechnical engineering study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. A warranty is not expressed or implied. Variations in the soil and groundwater conditions observed at the test sites may exist, and may not become evident until construction. ESNW should reevaluate the conclusions in this geotechnical engineering study if variations are encountered.

## Additional Services

ESNW should review the final design with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services during construction.




Reference:
King County, Washington
Map 506
By The Thomas Guide
Rand McNally
32nd Edition

NORTH

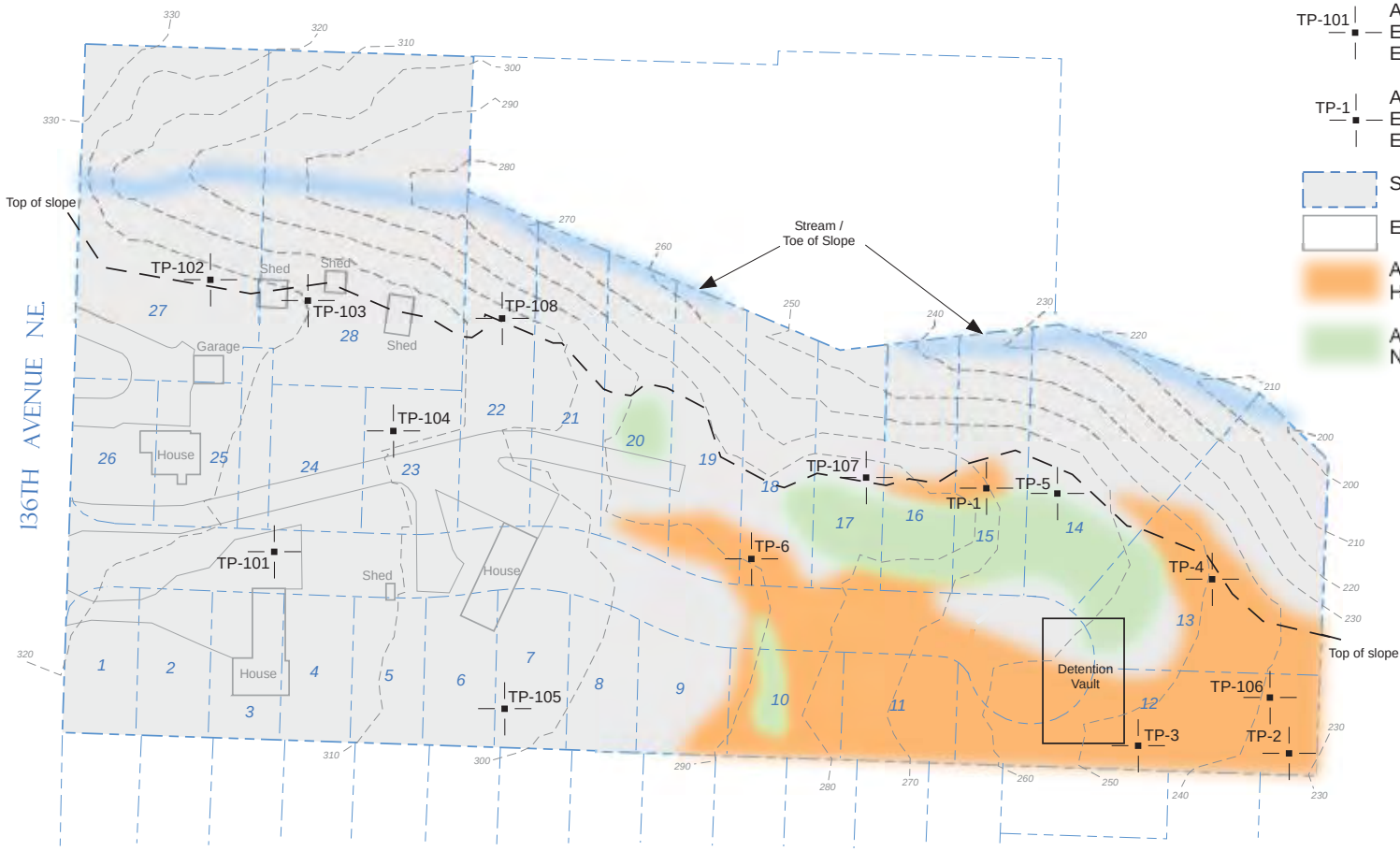
Earth Solutions NW LLC

Geotechnical Engineering, Construction Monitoring and Environmental Sciences

Vicinity Map
Calvert / Anderson Property
King County, Washington

| | | | | | |
|---|---|---|---|---|---|
| Drwn. | MRS | Date | 11/12/2015 | Proj. No. | 2471 |
| Checked | SSR | Date | Nov. 2015 | Plate | 1 |

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.




**LEGEND**

- TP-101 — Approximate Location of ESNW Test Pit, Proj. No. ES-2471.01, Oct. 2015
- TP-1 — Approximate Location of ENSW Test Pit, Proj. No. ES-2471, Aug. 2012
- Subject Site
- Existing Building
- Approximate Erosion Hazard Area
- Approximate Area of Non-Engineered Fill

NORTH

1"=80' 0 40 80 160 Scale in Feet

NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

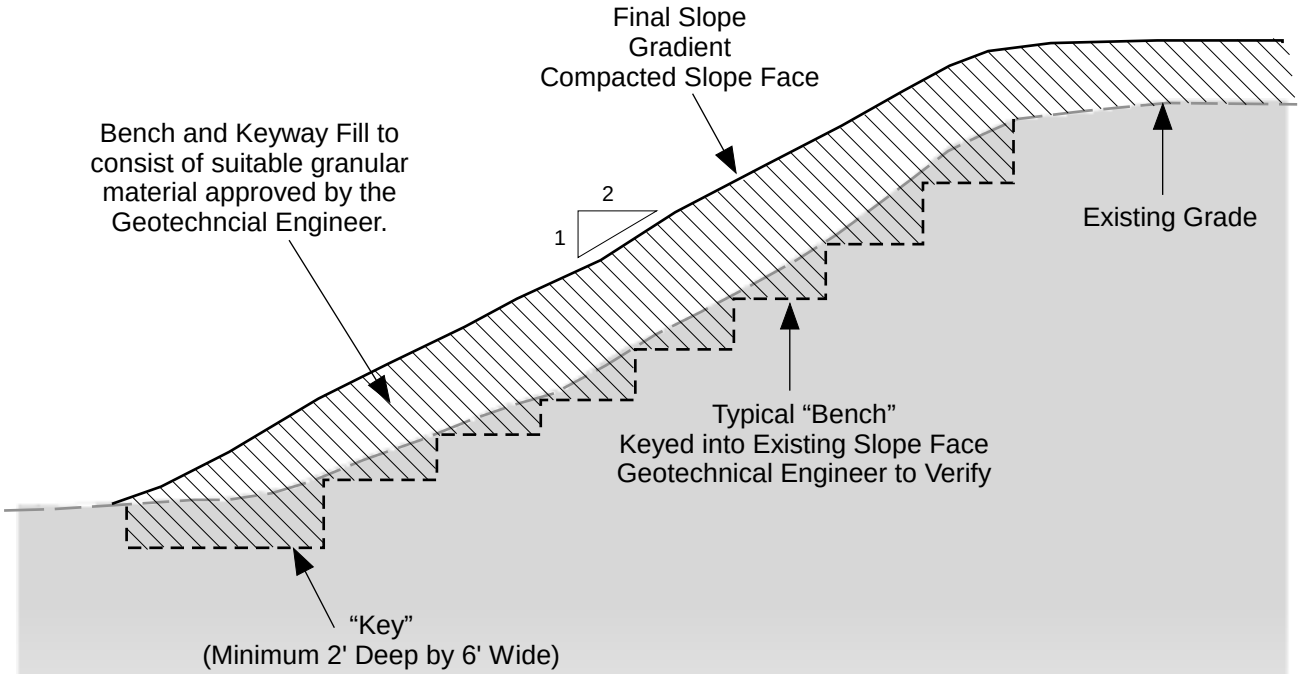
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Test Pit Location Plan
Calvert / Anderson Property
King County, Washington

Earth Solutions NW LLC
Geotechnical Engineering, Construction Monitoring and Environmental Sciences

| | |
|---|---|
| Drwn. By | MRS |
| Checked By | SSR |
| Date | 04/13/2016 |
| Proj. No. | 2471 |
| Plate | 2 |

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING



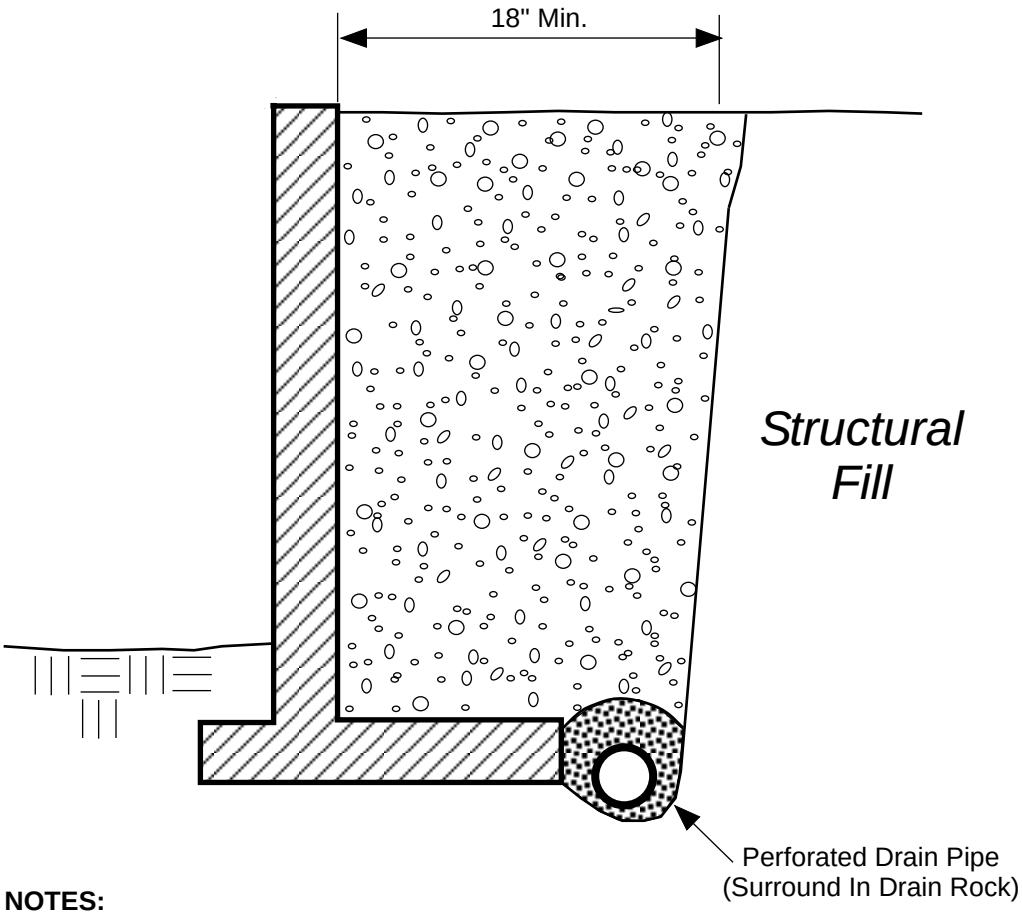

**NOTES:**

- Slope should be stripped of topsoil and unsuitable materials prior to excavating Key Way or benches.
- Benches will typically be equal to a dozer blade width, approximately 8 feet, but a minimum of 4 feet.
- Final slope gradient should be 2 : 1 (horizontal : vertical).
- Final slope face should be densified by over-building with compacted fill and trimming back to shape or by compaction with dozer or roller.
- Planting or hydroseeding slope face with a rapid growth deep rooted vegetative mat will reduce erosion potential of slope area.
- Use of pegged in place jute matting or geotechnical fabric will help maintain the seed and mulch in place until the root system has an opportunity to germinate.
- Structural fill should be placed in thin loose lifts not exceeding 12 inches in thickness. Each lift should be compacted to no less than the degree specified in the "Site Preparation and Earth Work" section of this report. No additional lift should be placed until compaction is achieved.

Earth Solutions NW LLC
Geotechnical Engineering, Construction Monitoring and Environmental Sciences

SLOPE FILL DETAIL
Calvert Properties
King County, Washington

| | | | | | |
|---|---|---|---|---|---|
| Drwn. | GLS | Date | 11/12/2015 | Proj. No. | 2471 |
| Checked | SSR | Date | Nov. 2015 | Plate | 3 |




**NOTES:**

- Free Draining Backfill should consist of soil having less than 5 percent fines. Percent passing #4 should be 25 to 75 percent.
- Sheet Drain may be feasible in lieu of Free Draining Backfill, per ESNW recommendations.
- Drain Pipe should consist of perforated, rigid PVC Pipe surrounded with 1" Drain Rock.

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NOT A CONSTRUCTION DRAWING

**LEGEND:**

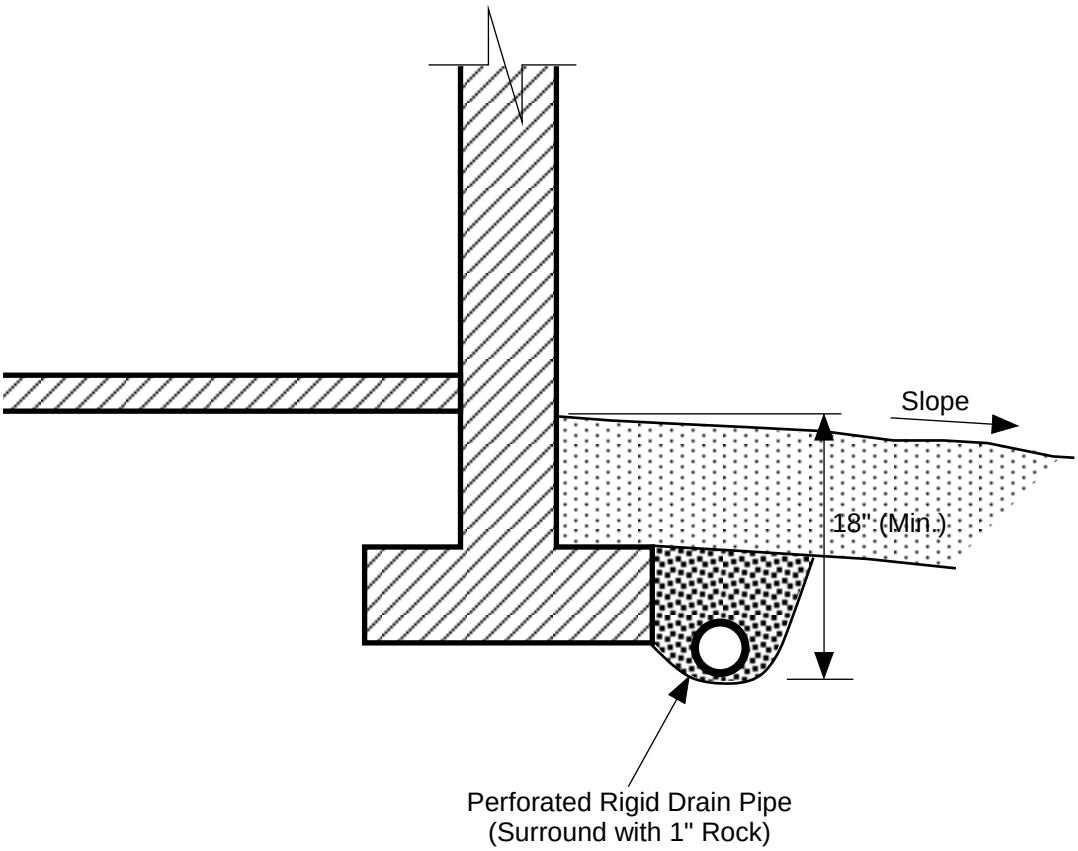
Free Draining Structural Backfill

1 inch Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction Monitoring and Environmental Sciences

RETAINING WALL DRAINAGE DETAIL
Calvert Properties
King County, Washington

| | | | | | |
|---|---|---|---|---|---|
| Drwn. | GLS | Date | 11/10/2015 | Proj. No. | 2471 |
| Checked | SSR | Date | Nov. 2015 | Plate | 4 |




**NOTES:**

- Do NOT tie roof downspouts to Footing Drain.
- Surface Seal to consist of 12" of less permeable, suitable soil. Slope away from building.

**LEGEND:**

Surface Seal; native soil or other low permeability material.

1" Drain Rock

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

Earth Solutions NW LLC
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FOOTING DRAIN DETAIL
Calvert Properties
King County, Washington

| | | | | | |
|---|---|---|---|---|---|
| Drwn. | GLS | Date | 11/10/2015 | Proj. No. | 2471 |
| Checked | SSR | Date | Nov. 2015 | Plate | 5 |

# Appendix A

## Subsurface Exploration

## ES-2471

The subsurface conditions at the site were explored by excavating a total of 10 test pits at the approximate locations illustrated on Plate 2. The test pit logs are provided in this Appendix. The subsurface exploration was completed on July 31, 2012 and October 21, 2015.

The final logs represent the interpretations of the field logs and the results of laboratory analyses. The stratification lines on the logs represent the approximate boundaries between soil types. In actuality, the transitions may be more gradual.

# Earth Solutions NW LLC

## SOIL CLASSIFICATION CHART

| MAJOR DIVISIONS | | | SYMBOLS GRAPH | SYMBOLS LETTER | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|---|
| COARSE GRAINED SOILS<br>MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | GRAVEL AND GRAVELLY SOILS<br>MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE | CLEAN GRAVELS | | GW | WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| | | (LITTLE OR NO FINES) | | GP | POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| | | GRAVELS WITH FINES | | GM | SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES |
| | | (APPRECIABLE AMOUNT OF FINES) | | GC | CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES |
| | SAND AND SANDY SOILS<br>MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE | CLEAN SANDS | | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | (LITTLE OR NO FINES) | | SP | POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES |
| | | SANDS WITH FINES | | SM | SILTY SANDS, SAND - SILT MIXTURES |
| | | (APPRECIABLE AMOUNT OF FINES) | | SC | CLAYEY SANDS, SAND - CLAY MIXTURES |
| FINE GRAINED SOILS<br>MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE | SILTS AND CLAYS | LIQUID LIMIT LESS THAN 50 | | ML | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY |
| | | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS |
| | | | | OL | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY |
| | SILTS AND CLAYS | LIQUID LIMIT GREATER THAN 50 | | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS |
| | | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY |
| | | | | OH | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS |
| HIGHLY ORGANIC SOILS | | | | PT | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS |

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

# TEST PIT NUMBER TP-101



**CLIENT** GGM Investments
**PROJECT NAME** Calvert / Anderson Property
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 10/21/15 **COMPLETED** 10/21/15
**GROUND ELEVATION** **TEST PIT SIZE**
**EXCAVATION CONTRACTOR** NW Excavating
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** ---
**LOGGED BY** AZS **CHECKED BY** SSR
**AT END OF EXCAVATION** ---
**NOTES** Surface Conditions: gravel - 4"
**AFTER EXCAVATION** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | | | |
| | | MC = 7.10% | SM | | Brown silty SAND with gravel, medium dense, moist |
| | | | | | 3.0 |
| | | MC = 13.50% | SM | | Tan gray silty SAND with gravel, dense, moist |
| 5 | | | | | |
| | | MC = 10.50% | | | 7.0 |
| | | | | | Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation. |
| | | | | | Bottom of test pit at 7.0 feet. |

GENERAL BH / TP / WELL 2471-1.GPJ GINT US.GDT 11/12/15

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

# TEST PIT NUMBER TP-102



**CLIENT** GGM Investments
**PROJECT NAME** Calvert / Anderson Property
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 10/21/15 **COMPLETED** 10/21/15
**GROUND ELEVATION** **TEST PIT SIZE**
**EXCAVATION CONTRACTOR** NW Excavating
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** —
**LOGGED BY** AZS **CHECKED BY** SSR
**AT END OF EXCAVATION** —
**NOTES** Depth of Topsoil & Sod 12": wood chips
**AFTER EXCAVATION** —

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | TPSL | | 1.0 |
| | | | | | Brown silty SAND, loose to medium dense, moist |
| | | MC = 6.50% | | | |
| | | | SM | | |
| 5 | | | | | |
| | | MC = 5.90% | | | 6.0 |
| | | | | | Tan gray silty SAND with gravel, medium dense to dense, moist |
| | | MC = 7.90% | | | |
| 10 | | | | | |
| | | | SM | | |
| | | MC = 9.40% | | | |
| 15 | | MC = 6.90% | | | 15.0 |
| | | | | | Test pit terminated at 15.0 feet below existing grade. No groundwater encountered during excavation. |
| | | | | | Bottom of test pit at 15.0 feet. |

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

# TEST PIT NUMBER TP-103



**CLIENT** GGM Investments
**PROJECT NAME** Calvert / Anderson Property
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 10/21/15 **COMPLETED** 10/21/15
**GROUND ELEVATION** **TEST PIT SIZE**
**EXCAVATION CONTRACTOR** NW Excavating
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** ---
**LOGGED BY** AZS **CHECKED BY** SSR
**AT END OF EXCAVATION** ---
**NOTES** Depth of Topsoil & Sod 12": wood chips
**AFTER EXCAVATION** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | TPSL | | 1.0 |
| | | MC = 9.70% | SM | | Brown silty SAND, loose to medium dense, moist<br>-roots<br>4.0 |
| 5 | | MC = 7.70% | SM | | Tan gray silty SAND with gravel, dense, moist |
| | | MC = 7.80% | | | |
| 10 | | MC = 7.70% | | | |
| 15 | | MC = 9.90% | | | 15.0<br>Test pit terminated at 15.0 feet below existing grade. No groundwater encountered during excavation.<br>Bottom of test pit at 15.0 feet. |

GENERAL BH / TP / WELL 2471-1.GPJ GINT US.GDT 11/12/15

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

# TEST PIT NUMBER TP-104



**CLIENT** GGM Investments
**PROJECT NAME** Calvert / Anderson Property
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 10/21/15 **COMPLETED** 10/21/15
**GROUND ELEVATION**
**TEST PIT SIZE**
**EXCAVATION CONTRACTOR** NW Excavating
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** —
**LOGGED BY** AZS **CHECKED BY** SSR
**AT END OF EXCAVATION** —
**NOTES** Depth of Topsoil & Sod 2": grass
**AFTER EXCAVATION** —

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | | | Brown silty SAND, medium dense, moist |
| | | MC = 10.50% | SM | | |
| | | MC = 6.80% | | 3.0 | Tan silty SAND with gravel, dense, moist |
| 5 | | | SM | | |
| | | MC = 7.80% | | 6.5 | Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. |
| | | | | | Bottom of test pit at 6.5 feet. |

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

# TEST PIT NUMBER TP-105



**CLIENT** GGM Investments
**PROJECT NAME** Calvert / Anderson Property
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 10/21/15 **COMPLETED** 10/21/15
**GROUND ELEVATION**
**TEST PIT SIZE**
**EXCAVATION CONTRACTOR** NW Excavating
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** ---
**LOGGED BY** AZS **CHECKED BY** SSR
**AT END OF EXCAVATION** ---
**NOTES** Surface Conditions: grass
**AFTER EXCAVATION** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | | | |
| | | MC = 12.30% | SM | | Brown silty SAND, medium dense, moist (Fill) |
| | | | | | 3.0 |
| | | MC = 11.40% | SM | | Brown silty SAND, medium dense, moist |
| 5 | | | | | |
| | | | | | 5.5 |
| | | MC = 17.00% | SM | | Tan silty SAND, dense, moist<br>-oxidation |
| | | MC = 16.70% | | | 7.0 |
| | | | | | Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation.<br>Bottom of test pit at 7.0 feet. |

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Earth Solutions NW
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Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

# TEST PIT NUMBER TP-106



**CLIENT** GGM Investments
**PROJECT NAME** Calvert / Anderson Property
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 10/21/15 **COMPLETED** 10/21/15
**GROUND ELEVATION** **TEST PIT SIZE**
**EXCAVATION CONTRACTOR** NW Excavating
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** —
**LOGGED BY** AZS **CHECKED BY** SSR
**AT END OF EXCAVATION** —
**NOTES** Depth of Topsoil & Sod 6": grass
**AFTER EXCAVATION** —

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | TPSL | | 0.5 |
| | | MC = 10.30% | SM | | Brown silty SAND, medium dense, moist<br>-roots |
| 5 | | | | | 5.0 |
| | | MC = 6.20% | SM | | Gray silty SAND with gravel, dense, moist |
| | | | | | 8.0 |
| | | | SP-SM | | Gray poorly graded SAND with silt, dense, moist |
| 10 | | MC = 9.70% | | | 10.0 |
| | | | | | Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation.<br>Bottom of test pit at 10.0 feet. |

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Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

# TEST PIT NUMBER TP-107



**CLIENT** GGM Investments
**PROJECT NAME** Calvert / Anderson Property
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 10/21/15 **COMPLETED** 10/21/15
**GROUND ELEVATION** **TEST PIT SIZE**
**EXCAVATION CONTRACTOR** NW Excavating
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** —
**LOGGED BY** AZS **CHECKED BY** SSR
**AT END OF EXCAVATION** —
**NOTES** Depth of Topsoil & Sod 4": grass
**AFTER EXCAVATION** —

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | TPSL | 0.5 | |
| | | MC = 13.90% | SM | | Brown silty SAND, medium dense, moist (Fill)<br>-concrete<br>-plastic, wood, concrete, wire |
| 5 | | | | 8.0 | |
| | | MC = 7.50% | SP-SM | 11.0 | Brown poorly graded SAND with silt, dense, moist |
| 10 | | | | | |
| | | MC = 5.50% | SP | 15.5 | Brown poorly graded SAND, dense, moist |
| 15 | | MC = 4.30% | | | Test pit terminated at 15.5 feet below existing grade. No groundwater encountered during excavation.<br>Bottom of test pit at 15.5 feet. |

GENERAL BH / TP / WELL 2471-1.GPJ GINT US.GDT 11/12/15

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

# TEST PIT NUMBER TP-108



**CLIENT** GGM Investments
**PROJECT NAME** Calvert / Anderson Property
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 10/21/15 **COMPLETED** 10/21/15
**GROUND ELEVATION** ___ **TEST PIT SIZE** ___
**EXCAVATION CONTRACTOR** NW Excavating
**GROUND WATER LEVELS:**
**EXCAVATION METHOD** ___
**AT TIME OF EXCAVATION** ---
**LOGGED BY** AZS **CHECKED BY** SSR
**AT END OF EXCAVATION** ---
**NOTES** Depth of Topsoil & Sod 4": gravel
**AFTER EXCAVATION** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | TPSL | | 0.5 |
| | | MC = 12.60% | SM | | Brown silty SAND, medium dense, moist |
| | | | | | 3.0 |
| | | MC = 7.10% | SM | | Tan gray silty SAND with gravel, dense, moist |
| 5 | | | | | 6.5 |
| | | MC = 8.80% | SP-SM | | Gray poorly graded SAND with silt, dense, moist |
| 10 | | | | | 10.0 |
| | | MC = 8.80% | SP | | Gray poorly graded SAND, dense, moist |
| | | MC = 15.60% | | | 13.0 |
| | | | | | Test pit terminated at 13.0 feet below existing grade. No groundwater encountered during excavation. |
| | | | | | Bottom of test pit at 13.0 feet. |

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Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

# TEST PIT NUMBER TP-1



**CLIENT** PNW Holdings, LLC
**PROJECT NAME** Calvert Properties
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 7/31/12 **COMPLETED** 7/31/12
**GROUND ELEVATION** **TEST PIT SIZE**
**EXCAVATION CONTRACTOR** Universal Land
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** ---
**LOGGED BY** SSR **CHECKED BY** SSR
**AT END OF EXCAVATION** ---
**NOTES** Depth of Topsoil & Sod 2": grass & brambles
**AFTER EXCAVATION** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | | | |
| | | | SM | | Brown silty SAND, loose, moist (Fill)<br>-trace gravel<br>-scattered organics<br>-slight caving<br>-becomes medium dense |
| | | MC = 14.00% | | | |
| 5 | | | | 5.0 | |
| | | | SM | | Dark gray silty SAND with gravel, medium dense, moist (Fill)<br>-scattered organics<br>-trace debris |
| | | MC = 16.20%<br>Fines = 29.00% | | | |
| 10 | | | | | |
| | | | | 14.0 | -abandoned domestic water line |
| | | | SM | | Brown silty SAND, medium dense, moist |
| 15 | | | | 16.0 | |
| | | | | | Test pit terminated at 16.0 feet below existing grade. No groundwater encountered during excavation.<br>Bottom of test pit at 16.0 feet. |

GENERAL BH / TP / WELL 2471.GPJ GINT US GDT 8/9/12

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

# TEST PIT NUMBER TP-2



**CLIENT** PNW Holdings, LLC
**PROJECT NAME** Calvert Properties
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 7/31/12 **COMPLETED** 7/31/12
**GROUND ELEVATION** **TEST PIT SIZE**
**EXCAVATION CONTRACTOR** Universal Land
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** ---
**LOGGED BY** SSR **CHECKED BY** SSR
**AT END OF EXCAVATION** —
**NOTES** Depth of Topsoil & Sod 8": brambles & brush
**AFTER EXCAVATION** —

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | | | Brown silty SAND, loose, moist |
| | | | SM | | |
| | | | | 3.5 | Brown silty SAND with gravel, dense, moist |
| 5 | | | SM | | |
| | | MC = 8.50% | | 6.0 | -becomes very dense |
| | | | | | Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. |
| | | | | | Bottom of test pit at 6.0 feet. |

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Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

# TEST PIT NUMBER TP-3



**CLIENT** PNW Holdings, LLC
**PROJECT NAME** Calvert Properties
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 7/31/12 **COMPLETED** 7/31/12
**GROUND ELEVATION** **TEST PIT SIZE**
**EXCAVATION CONTRACTOR** Universal Land
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** ---
**LOGGED BY** SSR **CHECKED BY** SSR
**AT END OF EXCAVATION** ---
**NOTES** Depth of Topsoil & Sod 6": brambles & scotch broom
**AFTER EXCAVATION** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | | | Brown silty SAND, loose, damp |
| | | | SM | | -becomes medium dense<br>-trace gravel |
| | | | | | 4.5 |
| 5 | | | | | Gray silty SAND with gravel, dense, moist |
| | | | SM | | -trace cobbles |
| | | MC = 8.50% | | | 7.0 |
| | | | | | Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation.<br>Bottom of test pit at 7.0 feet. |

GENERAL BH / TP / WELL 2471.GPJ GINT US.GDT 8/9/12

Earth Solutions NW
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Bellevue, Washington 98005
Telephone: 425-284-3300

# TEST PIT NUMBER TP-4



**CLIENT** PNW Holdings, LLC
**PROJECT NAME** Calvert Properties
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 7/31/12 **COMPLETED** 7/31/12
**GROUND ELEVATION** **TEST PIT SIZE**
**EXCAVATION CONTRACTOR** Universal Land
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** ---
**LOGGED BY** SSR **CHECKED BY** SSR
**AT END OF EXCAVATION** ---
**NOTES** Depth of Topsoil & Sod 8": brambles & scotch broom
**AFTER EXCAVATION** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | | | Brown silty SAND, loose, damp |
| | | | SM | | -becomes medium dense |
| | | | | | 4.5 |
| 5 | | | | | Grayish brown silty SAND with gravel, dense, moist |
| | | MC = 10.50% | | | |
| | | | SM | | -increase gravel content |
| 10 | | | | | |
| | | MC = 6.80%<br>Fines = 14.60% | | | 13.0 |
| | | | | | Test pit terminated at 13.0 feet below existing grade. No groundwater encountered during excavation.<br>Bottom of test pit at 13.0 feet. |

GENERAL BH / TP / WELL 2471.GPJ GINT US GDT 8/9/12

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

# TEST PIT NUMBER TP-5



**CLIENT** PNW Holdings, LLC
**PROJECT NAME** Calvert Properties
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 7/31/12 **COMPLETED** 7/31/12
**GROUND ELEVATION** **TEST PIT SIZE**
**EXCAVATION CONTRACTOR** Universal Land
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** ---
**LOGGED BY** SSR **CHECKED BY** SSR
**AT END OF EXCAVATION** ---
**NOTES** Depth of Topsoil & Sod 2": brambles & brush
**AFTER EXCAVATION** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | | | Brown silty SAND, loose, damp (Fill) |
| | | | SM | | |
| | | | | 3.0 | -old topsoil layer |
| | | | | | Brown silty SAND, medium dense, moist |
| | | | | | -trace gravel |
| 5 | | | SM | | |
| | | | | | -becomes dense |
| | | MC = 9.70% | | 7.0 | |
| | | | | | Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation. |
| | | | | | Bottom of test pit at 7.0 feet. |

GENERAL BH / TP / WELL 2471.GPJ GINT US.GDT 8/9/12

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

# TEST PIT NUMBER TP-6



**CLIENT** PNW Holdings, LLC
**PROJECT NAME** Calvert Properties
**PROJECT NUMBER** 2471
**PROJECT LOCATION** King County, Washington
**DATE STARTED** 7/31/12 **COMPLETED** 7/31/12
**GROUND ELEVATION** **TEST PIT SIZE**
**EXCAVATION CONTRACTOR** Universal Land
**GROUND WATER LEVELS:**
**EXCAVATION METHOD**
**AT TIME OF EXCAVATION** ---
**LOGGED BY** SSR **CHECKED BY** SSR
**AT END OF EXCAVATION** ---
**NOTES** Depth of Topsoil & Sod 3": grass
**AFTER EXCAVATION** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | | | |
| | | | SM | | Brown silty SAND, loose, damp (Fill) |
| | | | | 1.5 | |
| | | | | | Brown fine SAND, loose, moist |
| | | | | | -trace gravel |
| | | MC = 9.90%<br>Fines = 4.80% | | | -becomes medium dense |
| 5 | | | SP | | |
| | | MC = 8.10% | | 8.0 | |
| | | | | | Test pit terminated at 8.0 feet below existing grade. No groundwater encountered during excavation. |
| | | | | | Bottom of test pit at 8.0 feet. |

# Appendix B

## Laboratory Test Results

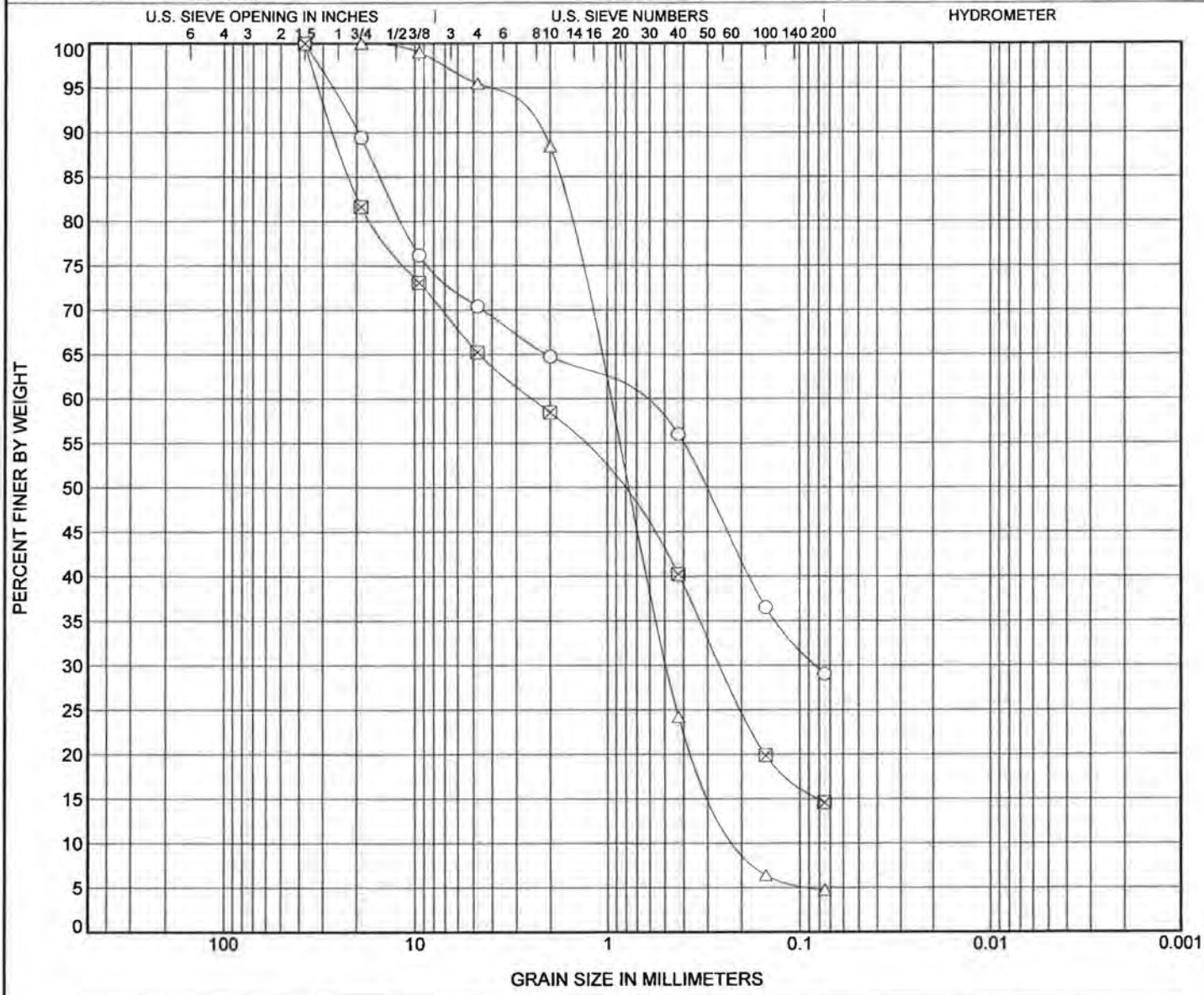
## ES-2471

# GRAIN SIZE DISTRIBUTION

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, WA 98005
Telephone: 425-284-3300

**CLIENT** PNW Holdings LLC **PROJECT NAME** Calvert Property

**PROJECT NUMBER** ES-2471 **PROJECT LOCATION** Kirkland




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | Specimen Identification | | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ○ | TP-1 | 8.0ft. | Brown silty SAND with gravel, SM | | | | | |
| ⊠ | TP-4 | 13.0ft. | Brown silty SAND with gravel, SM | | | | | |
| △ | TP-6 | 4.0ft. | Brown poorly graded SAND, SP | | | | 1.28 | 5.45 |

| | Specimen Identification | | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ○ | TP-1 | 8.0ft. | 37.5 | 0.86 | 0.082 | | 29.6 | 41.4 | 29.0 | |
| ⊠ | TP-4 | 13.0ft. | 37.5 | 2.439 | 0.252 | | 34.8 | 50.6 | 14.6 | |
| △ | TP-6 | 4.0ft. | 19 | 1.008 | 0.489 | 0.185 | 4.5 | 90.7 | 4.8 | |

GRAIN SIZE ES-2471.GPJ GINT US LAB.GDT 8/3/12

**Report Distribution**

**ES-2471**

**EMAIL ONLY**

**GGM Investments, LLC**
**9675 Southeast 36th Street, Suite 105**
**Mercer Island, Washington 98040**

**Attention: Ms. Carol Rozday**

# CALVERT ANDERSON PUD
# TRAFFIC IMPACT ANALYSIS

## CITY OF KIRKLAND

**Prepared for**

**Carol Rozday**
**GGM Investments, LLC.**
**9675 SE 36th St., Suite 105**
**Mercer Island, WA 98040**

**Prepared by**

**11410 NE 124th St., #590**
**Kirkland, Washington 98034**
**Telephone: 425.522.4118**

**April 8, 2016**

TraffEx
NORTHWEST TRAFFIC EXPERTS
11410 NE 124th St., #590 Kirkland, WA 98034
Phone: 425.522.4118 Fax: 425.522.4311

April 8, 2016

Carol Rozday
GGM Investments, LLC.
9675 SE 36th St., Suite 105
Mercer Island, WA 98040

Re: Calvert Anderson PUD – City of Kirkland
Traffic Impact Analysis

Dear Ms. Rozday:

We are pleased to submit this traffic impact analysis for the proposed 28 lot Calvert Anderson PUD located on the east side of 136th Ave. NE in the City of Kirkland. Preliminary trip generation and project information was submitted to the City in a letter report dated November 9, 2015. The project passed the traffic concurrency test. The March 22, 2016 memo extending the concurrency test notice is attached in the technical appendix.

This TIA was prepared based on the City of Kirkland's current Traffic Impact Analysis Guidelines, the concurrency model trip distribution provided by the City and discussions with Thang Nguyen a Transportation Engineer on the City's staff.

## *PROJECT DESCRIPTION*

Figure 1 is a vicinity map showing the location of the site and the surrounding major street network. The proposed Calvert Anderson PUD is located at 13224, 13240 and 13236 136th Ave. NE in the City of Kirkland.

Figure 2 shows a preliminary site plan. The project consists of 28 single family homes. Proposed access is a new street to 136th Ave. NE.

The site is currently occupied by a three family homes and associated outbuildings that will be removed with the development.

The anticipated build out and occupancy year of the Calvert Anderson PUD is 2018.

## *TRIP GENERATION*

The removal of the 3 existing single family homes will result in a net increase of 25 single family homes with this development. The Calvert Anderson PUD is expected to generate the net vehicular trips during an average weekday and during the street traffic peak hours as shown in the following table:

**TRIP GENERATION (NET 25 SINGLE FAMILY HOMES)**

| ***Time Period*** | ***Trip equation*** | ***Trips Entering*** | ***Trips Exiting*** | ***Net New Trips Total*** |
|---|---|---|---|---|
| Average Weekday | Ln(t)=0.92Ln(x) +2.72 | 147<br>50% | 146<br>50% | 293 |
| AM Peak Hour | t=0.7x+9.74 | 7<br>25% | 20<br>75% | 27 |
| PM Peak Hour | Ln(t)=0.90Ln(x) +0.51 | 19<br>63% | 11<br>37% | 30 |

t= number of trips  x=number of units

A vehicle trip is defined as a single or one direction vehicle movement with either the origin or destination (exiting or entering) inside the study site.

The trip generation is calculated using the regression equations in the Institute of Transportation Engineers (ITE) Trip Generation – 9th Edition, for Single Family Detached Housing (ITE Land Use Code 210). These trip generation values account for all site trips made by all vehicles for all purposes, including resident, visitor, and service and delivery vehicle trips.

## *TRIP DISTRIBUTION AND ASSIGNMENT*

Figure 3 shows the PM peak hour site generated traffic volumes and distribution at the study intersections. The trip distribution is based on the concurrency model output provided by the City of Kirkland.  The City requested LOS calculations for the five local intersections shown in figure 3.

## *EXISTING PHYSICAL CONDITIONS*

The existing home and associated structures on the project site will be removed with development.

Street Facilities

The primary roads in the study area are classified per the City of Kirkland, are as follows:

| | |
|---|---|
| 136th Ave NE | Local Street |
| NE 126th Pl. | Local Street |
| NE 132nd St. | Principal Arterial (west of 132nd Ave NE) |
| NE 132nd St. | Local Street (east of 132nd Ave. NE) |
| 132nd Ave NE | Collector |

136th Ave NE, and NE 126th Pl. have a posted speed limit of 25 mph and generally consists of two lanes with shoulders and intermittent sections with curb, gutter and sidewalk.

The speed limit is 35 mph on 132nd Ave. NE and consists of sections varying from 3 to 5 lanes, with curb, gutter and sidewalk on both sides of the street. NE 132nd St. has a speed limit of 35 mph and consists of sections with 2 to 3 lanes with curb, gutter and sidewalk on both sides of the street.

Sight Distance

136th Ave NE at the site access is essentially straight and flat. The sight distance meets current City of Kirkland's recommended, desirable sight distance requirement of 280 feet looking in both the north and south directions from the site access side street. The sight distance requirement is for a posted speed limit of 25 mph with stop sign controlled side streets.

Accident History

WSDOT and City crash data records for the three year time period from 2012 to 2014 at the study intersections and adjoining streets were obtained and reviewed. Eight accidents occurred at the intersection of 132nd Ave. NE/NE 126th Pl., seven occurred at 132nd Ave NE/NE 132nd St., and no accidents at the other study intersections. Four accidents occurred on 132nd St. NE, three on NE 126th Pl. and one on 136th Ave NE. None of the accidents were fatalities. Eight of the accidents were due to driver inattention, four were due to did not grant right of way and the rest were for miscellaneous other factors. There was no discernable pattern of accidents. The crash data is attached in the technical appendix.

We have field reviewed the site and surrounding street system. Based on our field observations, the low level of accident activity and the excellent sight distance, we conclude there are no readily apparent safety issues.

***EXISTING TRAFFIC CONDITIONS***

Traffic Volumes

PM peak hour turning movement counts were performed at the study intersections on January 19, 2016 except for the 132nd Ave NE/NE 132nd St. intersection count which was provided by the City. The volumes at the site access/136th Ave NE intersection were interpolated from the volumes on the north leg of the adjacent 136th Ave NE/NE 132nd St. intersection count. The traffic volume turning movement count sheets are included in the technical appendix. Figure 4 shows the existing PM peak hour traffic volumes at the study intersections.

Level of Service Analysis

LOS is a qualitative measure describing operational conditions within a traffic flow, and the perception of these conditions by drivers or passengers. These conditions include factors such as speed, delay, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. Levels of service are given letter designations, from A to F, with LOS A representing the best operating conditions (free flow, little delay) and LOS F the worst (congestion, long delays). Generally, LOS A and B are high, LOS C and D are moderate and LOS E and F are low.

Table 1 shows calculated levels of service (LOS) for existing conditions at the study intersection. The LOS's were calculated using the procedures in the Transportation Research Board Highway Capacity Manual. The LOS shown indicates overall intersection operation. At intersections, LOS is determined by the calculated average control delay per vehicle. The LOS and corresponding average control delay in seconds are as follows:

| TYPE OF INTERSECTION | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Signalized | ≤ 10.0 | >10.0 and ≤20.0 | >20.0 and ≤35.0 | >35.0 and ≤55.0 | >55.0 and ≤80.0 | >80.0 |
| Stop Sign Control | ≤10.0 | >10 and ≤15 | >15 and ≤25 | >25 and ≤35 | >35 and ≤50 | >50 |

## *FUTURE TRAFFIC CONDITIONS WITHOUT THE PROJECT*

Figure 4 shows projected future PM peak hour traffic volumes without the project. These volumes include the existing traffic volumes plus background traffic growth.

The City of Kirkland requires a 2.0% per year annual background growth factor be applied to existing traffic volumes to estimate future traffic volumes. The background growth rate factor includes traffic volumes generated from other approved but unbuilt developments (pipeline projects), other planned developments, and general growth in traffic traveling through the area.

These 2016 volumes were increased by 2% per year (for a total of 4%) to estimate 2018 horizon year traffic volumes without the project.

## *FUTURE TRAFFIC CONDITIONS WITH PROJECT*

Figure 4 shows the projected PM peak hour traffic volumes with the proposed project. The site-generated peak hour traffic volumes were added to the projected future traffic volumes without project.

The study intersections are calculated to operate at acceptable levels of service in the PM peak hours for future conditions including project generated traffic as shown in Tables 1 except for the 132$^{nd}$ Ave NE/NE 126$^{th}$ Pl. intersection. The eastbound and westbound traffic at the 132$^{nd}$ Ave NE/NE 126$^{th}$ Pl. intersection currently operates at LOS F since the side streets are stop sign controlled and must yield to north and southbound traffic on 132$^{nd}$ Ave SE. The side streets currently operate at LOS F and will continue to do so for future conditions with or without the project. The northbound and southbound traffic operates at LOS A or B.

## *TRAFFIC MITIGATION*

The City of Kirkland requires a transportation impact mitigation fee of $3,942 per each detached single family residential unit. Three existing residential unit will be removed with this development, therefore the net new number of residential units is 25 units. The current road impact fee is therefore estimated to be 25 units X $3,942 = $98,550.

Full width street improvements are required on all internal plat streets and half street improvements to 136$^{th}$ Ave NE frontage to City of Kirkland Standards including curb, gutter and sidewalk.

***SUMMARY, CONCLUSIONS AND RECOMMENDATIONS***

We recommend that the Calvert Anderson PUD be constructed as shown on the site plan with the following traffic impact mitigation measures:

- Construct the full width street improvements on all internal plat streets and half street improvements to the 136th Ave NE frontage to City of Kirkland Standards including curb, gutter and sidewalk.

- Contribute the transportation mitigation impact fee to the City of Kirkland estimated to be $98,550.

No other traffic mitigation should be necessary. If you have any questions, please call 425-522-4118. You may also contact us via e-mail at vince@nwtraffex.com or larry@nwtraffex.com.

Very truly yours,

Vincent J. Geglia
Principal
TraffEx

Larry D. Hobbs, P.E.
Principal
TraffEx

Carol Rozday
GGM Investments, LLC.



**TABLE 1**

**PM PEAK HOUR LEVEL OF SERVICE SUMMARY**

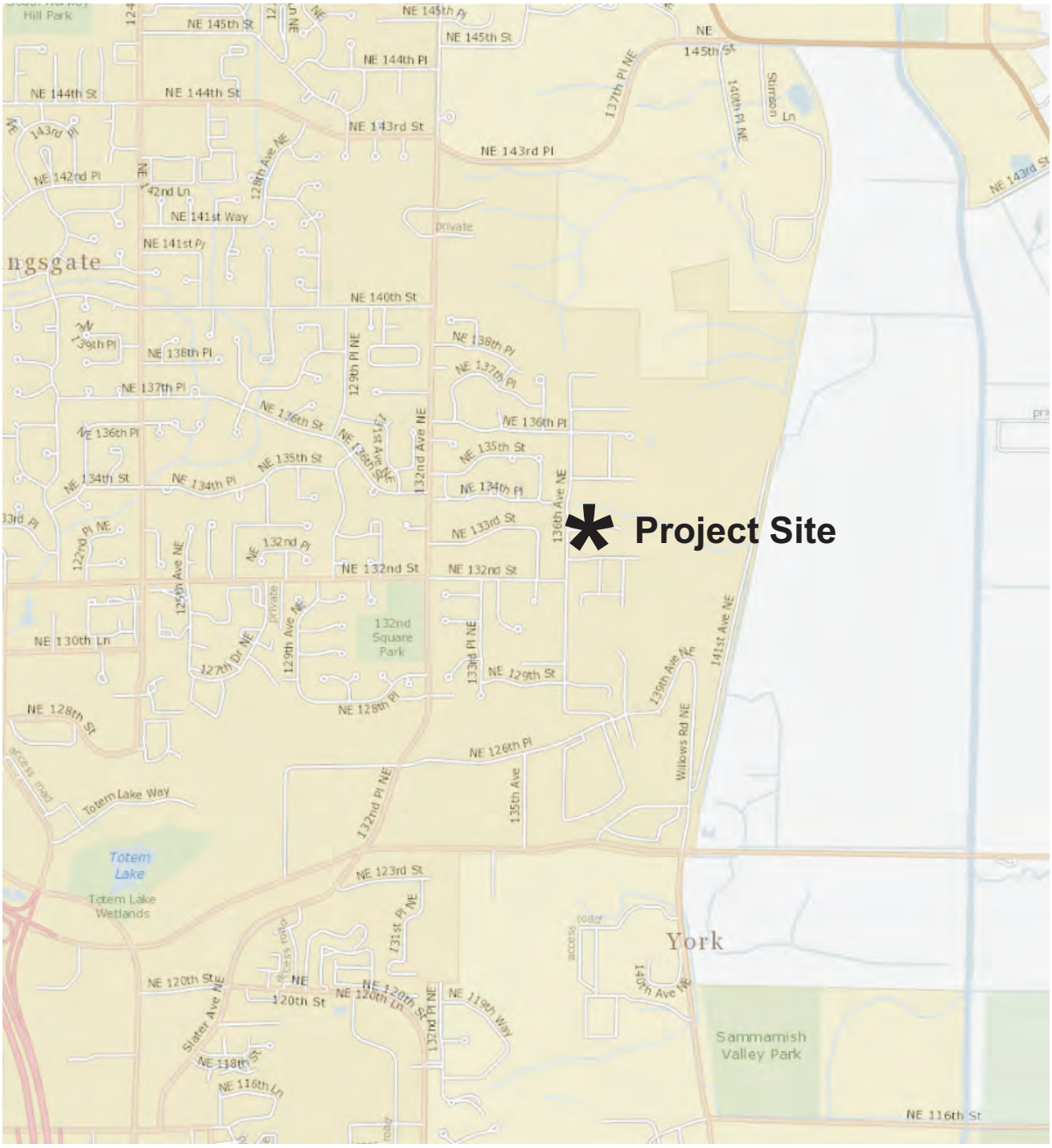
| ***INTERSECTION*** | ***EXISTING*** | ***2018 WITHOUT PROJECT*** | ***2018 WITH PROJECT*** |
|---|---|---|---|
| Site Access/136th Ave NE | NA | NA | A 8.8 WB |
| 136th Ave NE/NE 132nd St. | B 12.1 SB | B 12.3 SB | B 12.6 SB |
| NE 128th St./NE 126th Pl. | B 13.1 SB | B 13.4 SB | B 13.5 SB |
| 132nd Ave NE/NE 126th Pl | F 155.4 WB | F 210.5 WB | F 220 WB |
| 132nd Ave NE/NE 132nd St | C 34.5 | D 38.9 | D 40.0 |

XX Number shown is the average control delay in seconds per vehicle for all vehicles at a signalized intersection and for vehicles on the worst minor approach for unsignalized intersections, which determines the LOS for intersections per the Transportation Research Board Highway Capacity Manual

B Indicates calculated level of service

SB (southbound) Indicates direction of the worst minor approach for the unsignalized intersection

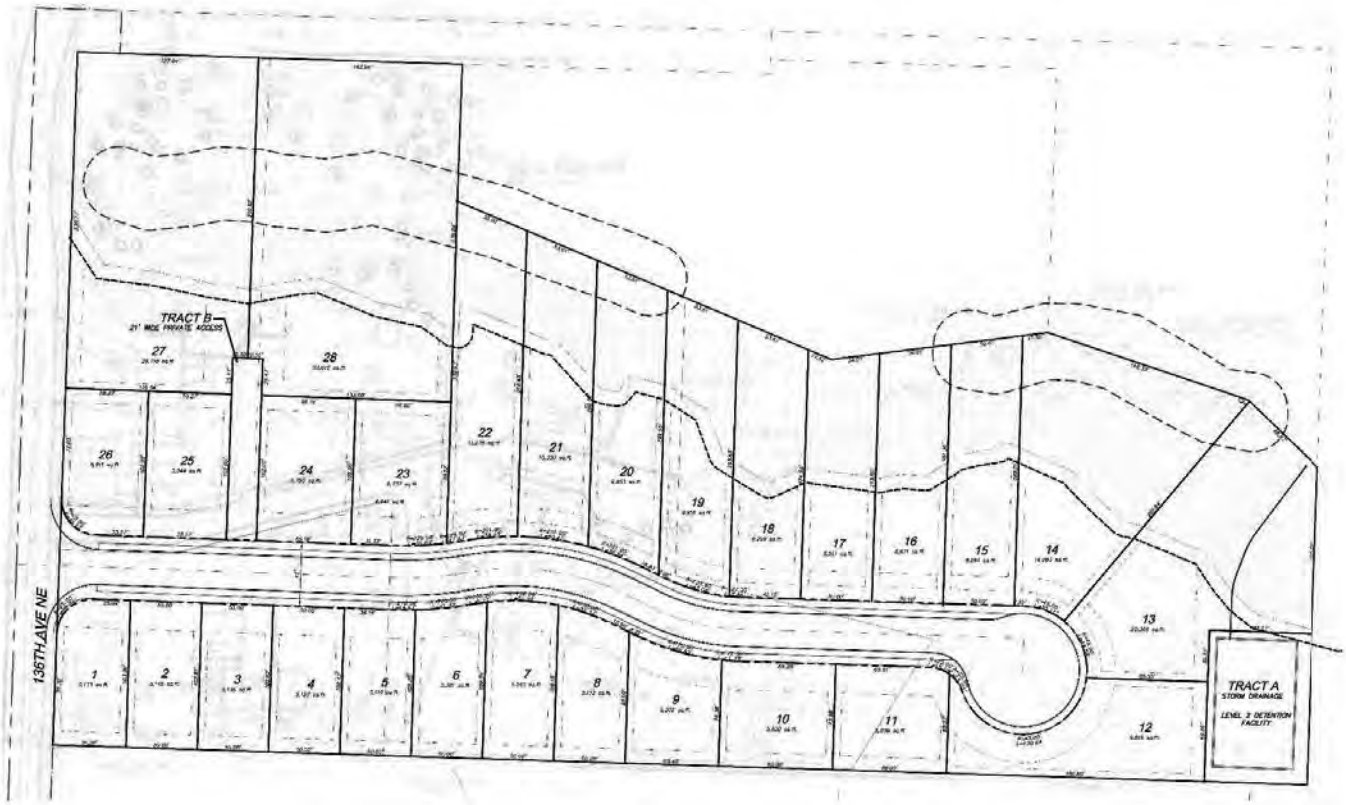
WB (westbound) Indicates direction of the worst minor approach for the unsignalized intersection




**Calvert Anderson PUD**

**Vicinity Map**

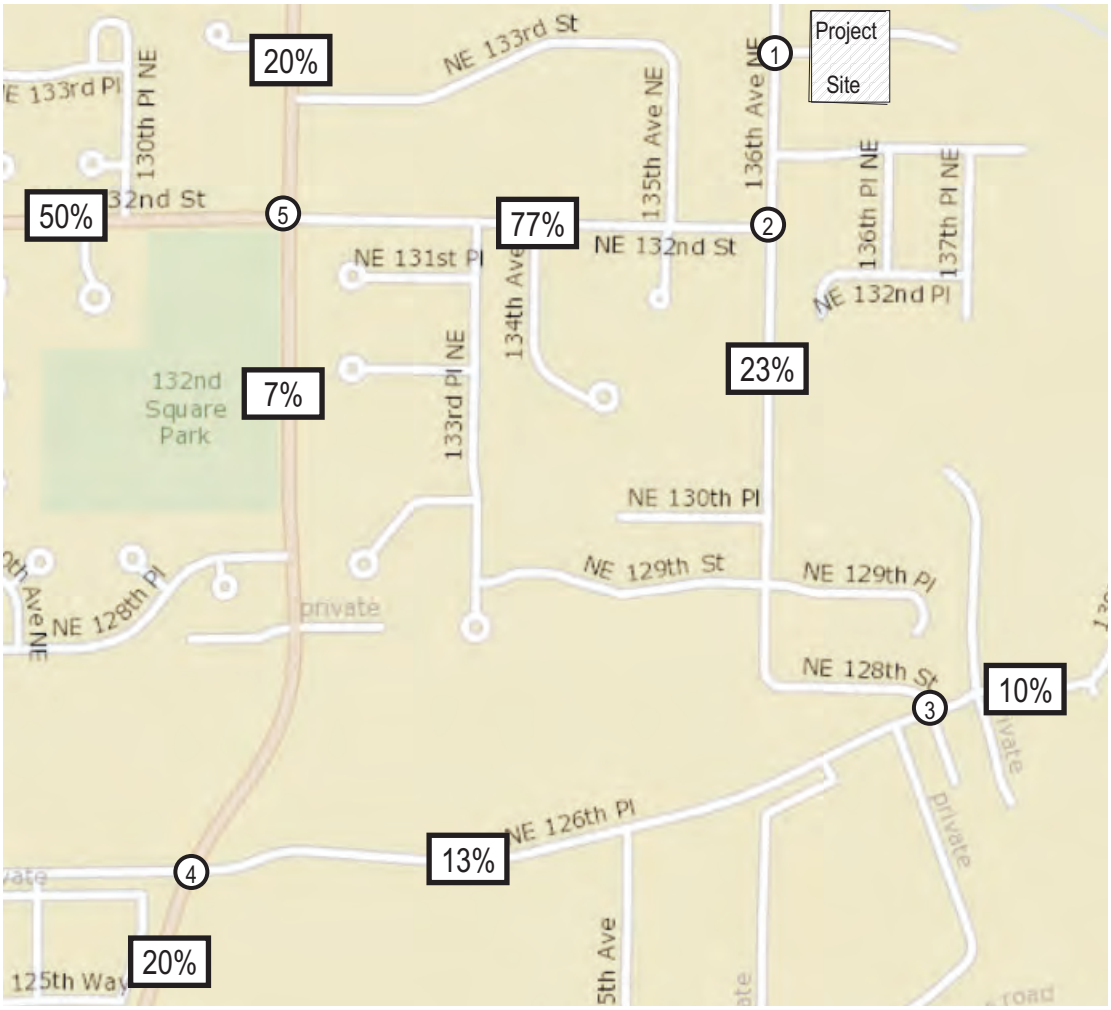
**Figure 1**

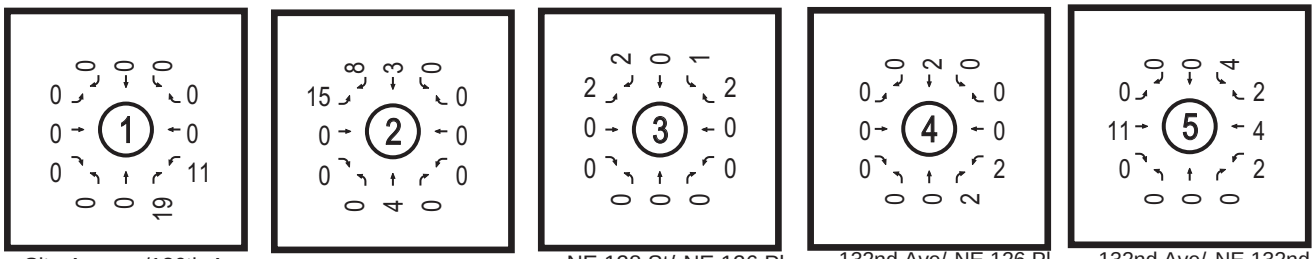



**Calvert Anderson PUD**

**Site Plan**

**Figure 2**




Site Access /136th Ave | 136th Ave /NE 132nd | NE 128 St/ NE 126 Pl | 132nd Ave/ NE 126 Pl | 132nd Ave/ NE 132nd

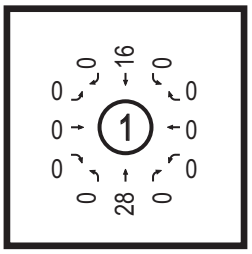
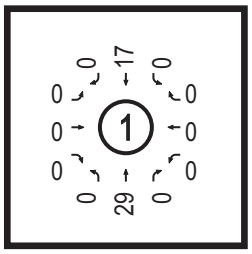
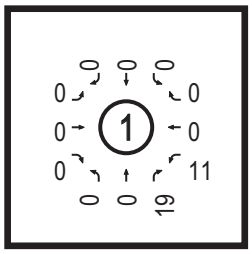
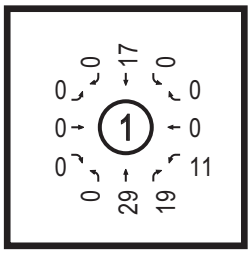
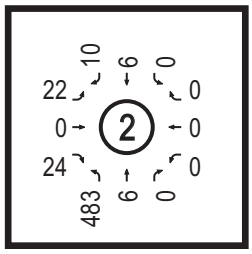
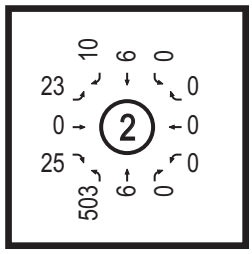
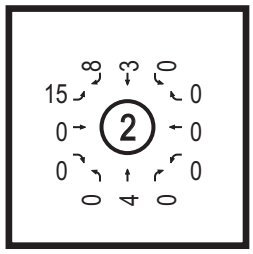
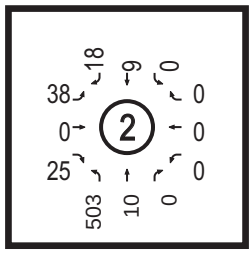
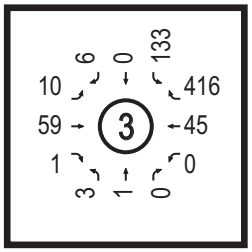
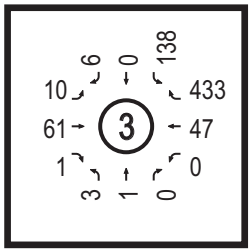
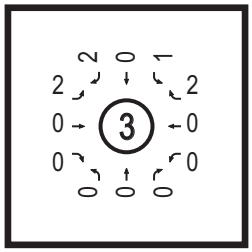
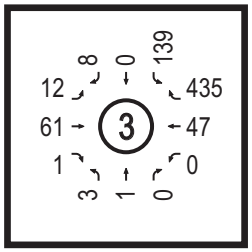
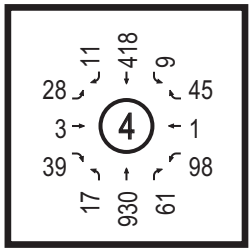
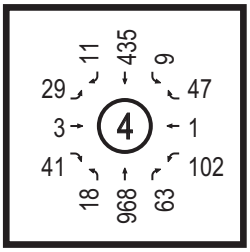
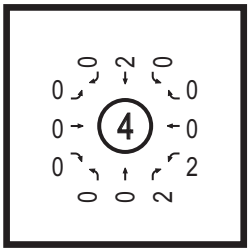
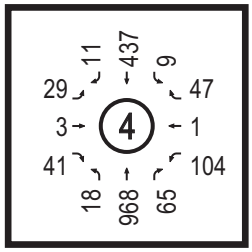
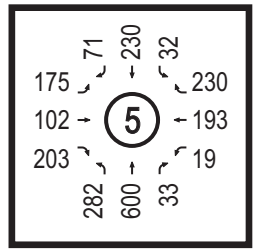
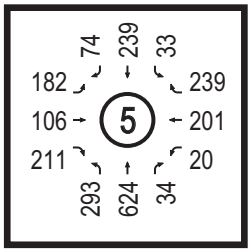
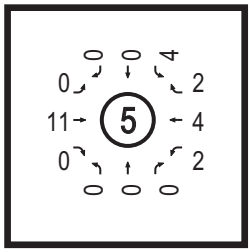
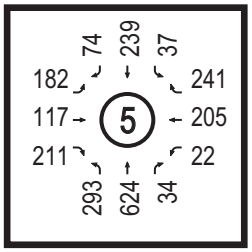
15% Percentage of Project Traffic
←15 PM Peak Hour Traffic Volume and Direction

PM Peak Hour
19 Enter
11 Exit
30 Total

**Calvert Anderson PUD**

**PM Peak Hour Trip Generation and Distribution**

**Figure 3**

| Existing Traffic Volumes | Future Without Project Traffic Volumes | Project Generated Traffic Volumes | Future With Project Traffic Volumes |
|---|---|---|---|
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Calvert Anderson PUD**

**PM Peak Hour Trip Generation and Distribution**

**Figure 4**

# TECHNICAL APPENDIX

**CITY OF KIRKLAND**
**Department of Public Works**
**123 Fifth Avenue, Kirkland, WA 98033 425.587.3800**
**www.kirklandwa.gov**

## MEMORANDUM

**To:** Susan Lauinger, Planner

**From:** Thang Nguyen, Transportation Engineer

**Date:** March 22, 2016

**Subject:** Calvert PUD Development Traffic Concurrency Test Notice Extension, Tran15-02409.

The purpose of this memo is to inform you that Public Works have approved the applicant's request for an extension of the concurrency test notice for the proposed Calvert PUD Development. This memo replaces the December 23, 2015 concurrency test notice for the proposed project. The due date for submitting a traffic impact analysis (TIA) report has been extended from March 22 to May 22, 2016. If a TIA report is not submitted by May 22, 2016, the concurrency test notice extension will expire and the applicant must re-apply for a traffic concurrency test.

### Project Description

The project is located at 13236 136th Avenue Northeast. The applicant proposed to replace three single-family homes with 28 single-family homes. A single project driveway is proposed on 136th Avenue NE.

The proposed project is anticipated to be completely built and fully occupied by the end of 2017. Based on the ITE land use 210 (Single-Family), the project is forecasted to generate 293 daily trips and 30 net new PM peak hour trips and 27 net new AM peak hour trips.

This memo will serve as the concurrency test notice for the proposed project. Per *Section 25.10.020 Procedures* of the KMC (Kirkland Municipal Code), this Concurrency Test Notice will expire in one year (December 23, 2016) unless a development permit and certificate of concurrency are issued or an extension is granted.

### EXPIRATION

The concurrency test notice shall expire and a new concurrency test application is required unless:

1. A complete SEPA checklist, traffic impact analysis and all required documentation are submitted to the City May 22, 2016.

2. A Certificate of Concurrency is issued or an extension is requested and granted by the Public Works Department within one year of issuance of the concurrency test notice. (A Certificate of Concurrency is issued at the same time a development

permit or building permit is issued if the applicant holds a valid concurrency test notice.)

3. A Certificate of Concurrency shall expire six years from the date of issuance of the concurrency test notice unless all building permits are issued for buildings approved under the concurrency test notice.

## APPEALS

The concurrency test notice may be appealed by the public or agency with jurisdiction. The concurrency test notice is subject to an appeal until the SEPA review process is complete and the appeal deadline has passed. Concurrency appeals are heard before the Hearing Examiner along with any applicable SEPA appeal. For more information, refer to the Kirkland Municipal Code, Title 25. If you have any questions, please call me at x3869.

cc: Rob Jammerman, Development Engineer Manager
John Burkhalter, Senior Development Engineer

| | | | |
|---|---|---|---|
| 2017 **Calvert PUD** | | 4) Transportation Concurrency Status | 6) Transportation Concurrency Certificate Date: |
| 2) Project Description: | Replace three existing homes with 25 new single-family homes | **PASS** | |
| | Gross Trips: Enter Exit Enter Exit | 5) Transportation Concurrency Test Date | 7) Certificate of Occupancy Date |
| 3) Build-out Year: 2017 | factor = 1 | Dec. 23, 2015 | |

**SUMMARY OF TRAFFIC IMPACTS**

| 8) Daily Trips | 293 | PM Peak Trips: | 30(19, 11) | Impacted Subarea(s): | N | TAZ: | 305 | Case # | Tran15-02409 |
|---|---|---|---|---|---|---|---|---|---|

**Signalized Intersection PM Peak Traffic Impact**

| | | Project PM Peak Turning Volumes | | | | | | | | | | | | PM Peak | Daily Trips | Sum of | Vol. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Eastbound | | | Westbound | | | Northbound | | | Southbound | | | | | | |
| Code | Intersection | LT | TH | RT | LT | TH | RT | LT | TH | RT | LT | TH | RT | | | | |
| | Project Driveway/ 136th Ave NE | | | | 3 | | 8 | | | 4 | 15 | | | 30 | | | |
| | NE 126th Pl/136th Ave NE | 2 | | | | | 1 | | | | 1 | | 2 | 6 | | | |
| | NE 132nd st/136th Ave NE | | | 15 | | | | 8 | | | | | | 23 | | | |
| | NE 132nd st/132nd Ave NE | | 11 | | 2 | 4 | 2 | | | | 4 | | | 23 | | | |
| | NE 124th St/Slater Ave NE | 1 | | | | | 1 | | | | 1 | 1 | | 4 | | | |
| | NE 132nd Street/124th Avenue NE | | 4 | | 2 | 2 | | | | 4 | 3 | | | 15 | | | |
| | | | | | | | | | | | | | | 0 | | | |
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| | | | | | | | | | | | | | | 0 | | | |

| | *2017 LOS Standards* | | *LOS with Project Impacts* | | | |
|---|---|---|---|---|---|---|
| **Subarea No** | A= Max. Intersection LOS | B=Average 2015 V/C | a=No. exceeding 1.4 | b=Average V/C | **a <= A?** | **b<= B?** |
| ***Southwest (1xx)*** | 1.4 | 0.91 | 0 | 0.67 | yes | yes |
| ***Northwest (2xx)*** | 1.4 | 0.96 | 0 | 0.79 | yes | yes |
| ***Northeast (3xx)*** | 1.4 | 0.94 | 0 | 0.75 | yes | yes |
| ***East(4xx)*** | 1.4 | 1.08 | 0 | 0.82 | yes | yes |
| ***Annex(5xx)*** | 1.4 | n/a | 0 | n/a | yes | n/a |

**TEST RESULTS**

***Result:*** **PASS**

* Based on Critical Movement, Planning Method TRC #212.

1. Number of intersection exceeding Average V/C LOS Standard

1. Sixth Year Target Average V/C ratio, see step 6, part 1 of the guidelines

OFFICER REPORTED CRASHES THAT OCCURRED *at* OR *in the vicinity of* THE FOLLOWING INTERSECTIONS & ROAD SEGMENT IN CITY OF KIRKLAND

132nd AVE @ 126th PL
132nd AVE @ 132nd ST
136th AVE @ 132nd ST - *No Reported Crashes*
136th AVE @ 126th PL - *No Reported Crashes*
136th AVE FROM 132nd ST TO 126th PL - *No Reported Crashes*

**1/1/2012 - 12/31/2014**

*UNDER 23 UNITED STATES CODE – SECTION 409, THIS DATA CANNOT BE USED IN DISCOVERY OR AS EVIDENCE AT TRIAL IN ANY ACTION FOR DAMAGES AGAINST THE WSDOT, OR ANY JURISDICTIONS INVOLVED IN THE DATA*

| JURISDICTION | PRIMARY TRAFFICWAY | BLOCK NUMBER | INTERSECTING TRAFFICWAY | DIST FROM REF POINT | MI or FT | MOST SEVERE INJURY TYPE | # PEDS | VEH 1 ACTION | VEH 2 ACTION |
|---|---|---|---|---|---|---|---|---|---|
| City Street | 132ND AVE NE | 12800 | NE 126TH PL | | | No Injury | 0 | Making Left Turn | Going Straight Ahead |
| City Street | 132ND AVE NE | 12800 | NE 126TH PL | | | No Injury | 0 | Changing Lanes | Stopped in Roadway |
| City Street | 132ND AVE NE | 12800 | NE 126TH PL | | | No Injury | 0 | Making Left Turn | Going Straight Ahead |
| City Street | 132ND AVE NE | 12800 | NE 126TH PL | | | No Injury | 0 | Going Straight Ahead | Stopped for Traffic |
| City Street | 132ND AVE NE | 12800 | NE 126TH PL | | | Evident Injury | 0 | Overtaking and Passing | |
| City Street | 132ND AVE NE | | NE 132ND ST | | | Possible Injury | 0 | Going Straight Ahead | Stopped for Traffic |
| City Street | 132ND AVE NE | 13000 | NE 132ND ST | | | No Injury | 0 | Going Straight Ahead | Stopped at Signal or Stop Sign |
| City Street | 132ND AVE NE | 13000 | NE 132ND ST | | | Evident Injury | 0 | Going Straight Ahead | |
| City Street | 132ND AVE NE | 13200 | NE 132ND ST | | | Possible Injury | 0 | Going Straight Ahead | Making Left Turn |
| City Street | 132ND AVE NE | 12600 | | 250 | F | No Injury | 0 | Going Straight Ahead | Going Straight Ahead |
| City Street | 132ND AVE NE | 12600 | | 50 | F | Evident Injury | 0 | Going Straight Ahead | |
| City Street | 132ND AVE NE | 13000 | | 369 | F | No Injury | 0 | Changing Lanes | Going Straight Ahead |
| City Street | NE 126TH PL | 13200 | 132ND AVE NE | | | Possible Injury | 0 | Making Left Turn | Making Left Turn |
| City Street | NE 126TH PL | 13200 | 132ND AVE NE | | | No Injury | 0 | Going Straight Ahead | |
| City Street | NE 126TH PL | 13200 | 132ND AVE NE | | | No Injury | 0 | Making Left Turn | Making Left Turn |
| City Street | NE 126TH PL | 13200 | | 100 | F | No Injury | 0 | Other* | Legally Parked, Unoccupied |
| City Street | NE 126TH PL | 13200 | | 150 | F | No Injury | 0 | Going Straight Ahead | |
| City Street | NE 126TH PL | 13300 | | 0.1 | M | No Injury | 0 | Going Straight Ahead | |
| City Street | NE 132ND ST | 13100 | 132ND AVE NE | | | Possible Injury | 0 | Going Straight Ahead | Stopped at Signal or Stop Sign |
| City Street | NE 132ND ST | | 132ND AVE NE | | | No Injury | 0 | Going Straight Ahead | Stopped at Signal or Stop Sign |
| City Street | NE 132ND ST | 13100 | 132ND AVE NE | | | Evident Injury | 0 | Making Left Turn | Going Straight Ahead |
| City Street | NE 132ND ST | | | 200 | F | Evident Injury | 0 | Making Left Turn | Going Straight Ahead |

# Corridor Report
## City of Kirkland
Friday, January 22, 2016

**Corridor:** 136TH AVENUE NE from NE 132ND STREET to NE 126TH PLACE
**Report Period:** Sunday, January 01, 2012 to Monday, September 14, 2015

### Between NE 129TH STREET and NE 128TH STREET

| Case Number | Report Number | Day Of Week | Crash Date | Crash Time | Location | Type of Crash | Direction Vehicle 1/Vehilce 2 | Severity Fat | Inj | PDO | Tot Veh |
|---|---|---|---|---|---|---|---|---|---|---|---|

### Between NE 129TH STREET and NE 128TH STREET

| Case Number | Report Number | Day Of Week | Crash Date | Crash Time | Location | Type of Crash | Direction Vehicle 1/Vehilce 2 | Severity Fat | Inj | PDO | Tot Veh |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 15-08276 | 403704 | Thu | 02/26/2015 | 09:20 PM | 136TH AVENUE NE, 30 ft. North of NE 129TH ST | Fixed Object/Parked Vehicle | SB Thru / | | | X | 1 |

Prepared for: **Traffex**

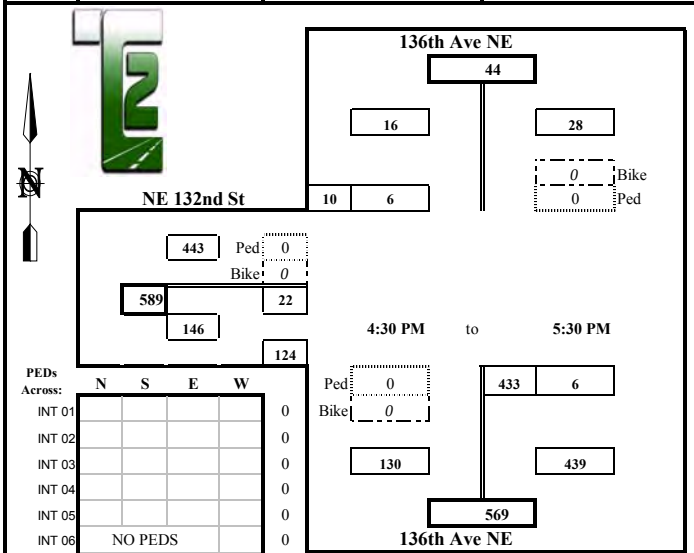
***Traffic Count Consultants, Inc.***

Phone: (253) 926-6009 FAX: (253) 922-7211 E-Mail: Team@TC2inc.com

WBE/DBE

**Intersection:** 136th Ave NE & NE 132nd St
**Location:** Kirkland, Washington
**Date of Count:** Tues 1/19/2016
**Checked By:** Jess

| Time Interval Ending at | From North on (SB) 136th Ave NE | | | | From South on (NB) 136th Ave NE | | | | From East on (WB) 0 | | | | From West on (EB) NE 132nd St | | | | Interval Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | T | L | S | R | T | L | S | R | T | L | S | R | T | L | S | R | |
| 4:45 P | 0 | 0 | 2 | 3 | 1 | 106 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 7 | 0 | 29 | 150 |
| 5:00 P | 1 | 0 | 1 | 3 | 0 | 111 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 31 | 150 |
| 5:15 P | 0 | 0 | 0 | 3 | 0 | 112 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 25 | 144 |
| 5:30 P | 0 | 0 | 3 | 1 | 0 | 104 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 39 | 157 |
| 5:45 P | 0 | 0 | 0 | 4 | 0 | 112 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 0 | 23 | 147 |
| 6:00 P | 0 | 0 | 0 | 6 | 0 | 107 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 26 | 148 |
| 6:15 P | 1 | 0 | 1 | 4 | 0 | 88 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 18 | 122 |
| 6:30 P | 0 | 0 | 0 | 5 | 1 | 81 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 21 | 121 |
| 6:45 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:00 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:15 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:30 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Survey | 2 | 0 | 7 | 29 | 2 | 821 | 23 | 0 | 0 | 0 | 0 | 0 | 2 | 47 | 0 | 212 | 1139 |
| Peak Hour: 4:30 PM to 5:30 PM | | | | | | | | | | | | | | | | | |
| Total | 1 | 0 | 6 | 10 | 1 | 433 | 6 | 0 | 0 | 0 | 0 | 0 | 1 | 22 | 0 | 124 | 601 |
| Approach | 16 | | | | 439 | | | | 0 | | | | 146 | | | | 601 |
| %HV | 6.3% | | | | 0.2% | | | | n/a | | | | 0.7% | | | | 0.5% |
| PHF | 0.80 | | | | 0.97 | | | | n/a | | | | 0.78 | | | | 0.96 |




628 *1.0 PHF Peak Hour Volume*

| | | PHF | %HV |
|---|---|---|---|
| | EB | 0.78 | 0.7% |
| Check | WB | n/a | n/a |
| In: 601 | NB | 0.97 | 0.2% |
| Out: 601 | SB | 0.80 | 6.3% |
| | T Int. | 0.96 | 0.5% |

Conditions:

| PEDs Across: | N | S | E | W | |
|---|---|---|---|---|---|
| INT 01 | | | | | 0 |
| INT 02 | | | | | 0 |
| INT 03 | | | | | 0 |
| INT 04 | | | | | 0 |
| INT 05 | | | | | 0 |
| INT 06 | NO PEDS | | | | 0 |
| INT 07 | | | | | 0 |
| INT 08 | | | | | 0 |
| INT 09 | | | | | 0 |
| INT 10 | | | | | 0 |
| INT 11 | | | | | 0 |
| INT 12 | | | | | 0 |
| | 0 | 0 | 0 | 0 | 0 |

| Bicycles From: | N | S | E | W | |
|---|---|---|---|---|---|
| INT 01 | | | | | 0 |
| INT 02 | | | | | 0 |
| INT 03 | | | | | 0 |
| INT 04 | | | | | 0 |
| INT 05 | | | | | 0 |
| INT 06 | | 1 | | | 1 |
| INT 07 | | | | | 0 |
| INT 08 | | | | | 0 |
| INT 09 | | | | | 0 |
| INT 10 | | | | | 0 |
| INT 11 | | | | | 0 |
| INT 12 | | | | | 0 |
| | 0 | 1 | 0 | 0 | 1 |

Special Notes

There is a stop sign on the north leg only.
From South: Approximately 90% of vehicles were speeding and not signalling when making a left.
From West: Approximately 90% of vehicles were speeding and not signalling when turning.

TRA16010M_01p

Prepared for: **Traffex**

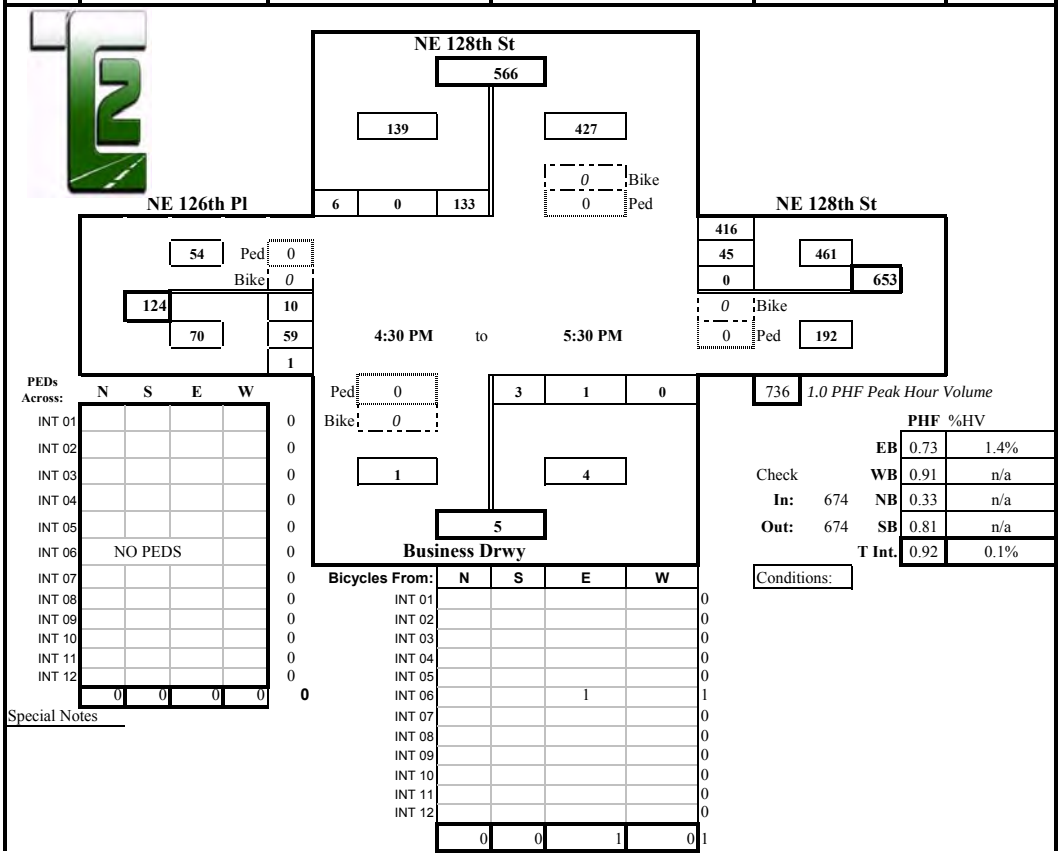
***Traffic Count Consultants, Inc.***

Phone: (253) 926-6009 FAX: (253) 922-7211 E-Mail: Team@TC2inc.com

WBE/DBE

**Intersection:** NE 128th St & NE 128th St/NE 126th Pl **Date of Count:** Tues 1/19/2016
**Location:** Kirkland, Washington **Checked By:** Jess

| Time Interval Ending at | From North on (SB) NE 128th St | | | | From South on (NB) Business Drwy | | | | From East on (WB) NE 128th St | | | | From West on (EB) NE 126th Pl | | | | Interval Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | T | L | S | R | T | L | S | R | T | L | S | R | T | L | S | R | |
| 4:45 P | 0 | 29 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 11 | 99 | 0 | 1 | 16 | 0 | 161 |
| 5:00 P | 0 | 32 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 108 | 1 | 4 | 14 | 0 | 174 |
| 5:15 P | 0 | 29 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 12 | 115 | 0 | 3 | 20 | 1 | 184 |
| 5:30 P | 0 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 94 | 0 | 2 | 9 | 0 | 155 |
| 5:45 P | 0 | 20 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 99 | 0 | 11 | 18 | 0 | 160 |
| 6:00 P | 0 | 23 | 1 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 6 | 107 | 0 | 6 | 8 | 0 | 155 |
| 6:15 P | 0 | 18 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 87 | 0 | 4 | 10 | 0 | 126 |
| 6:30 P | 0 | 16 | 0 | 4 | 0 | 0 | 0 | 0 | 2 | 0 | 7 | 80 | 0 | 5 | 6 | 0 | 118 |
| 6:45 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:00 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:15 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:30 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Survey | 0 | 210 | 1 | 18 | 0 | 3 | 2 | 0 | 2 | 0 | 72 | 789 | 1 | 36 | 101 | 1 | 1233 |
| Peak Hour: 4:30 PM to 5:30 PM | | | | | | | | | | | | | | | | | |
| Total | 0 | 133 | 0 | 6 | 0 | 3 | 1 | 0 | 0 | 0 | 45 | 416 | 1 | 10 | 59 | 1 | 674 |
| Approach | 139 | | | | 4 | | | | 461 | | | | 70 | | | | 674 |
| %HV | n/a | | | | n/a | | | | n/a | | | | 1.4% | | | | 0.1% |
| PHF | 0.81 | | | | 0.33 | | | | 0.91 | | | | 0.73 | | | | 0.92 |



Prepared for: **Traffex**

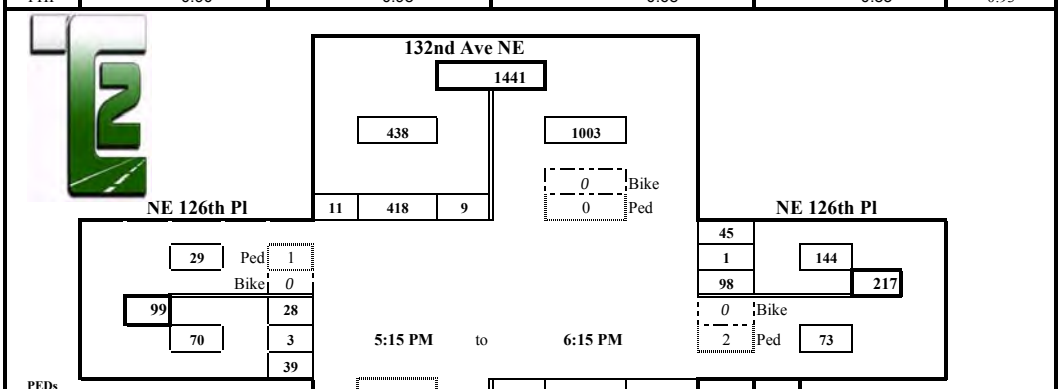
***Traffic Count Consultants, Inc.***

Phone: (253) 926-6009 FAX: (253) 922-7211 E-Mail: Team@TC2inc.com

WBE/DBE

**Intersection:** 132nd Ave NE & NE 126th Pl **Date of Count:** Tues 1/19/2016
**Location:** Kirkland, Washington **Checked By:** Jess

| Time Interval Ending at | From North on (SB) 132nd Ave NE | | | | From South on (NB) 132nd Ave NE | | | | From East on (WB) NE 126th Pl | | | | From West on (EB) NE 126th Pl | | | | Interval Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | T | L | S | R | T | L | S | R | T | L | S | R | T | L | S | R | |
| 4:45 P | 2 | 3 | 117 | 3 | 1 | 6 | 162 | 23 | 1 | 37 | 2 | 10 | 0 | 7 | 2 | 10 | 382 |
| 5:00 P | 2 | 5 | 87 | 7 | 3 | 2 | 192 | 29 | 0 | 33 | 0 | 10 | 0 | 7 | 0 | 5 | 377 |
| 5:15 P | 0 | 7 | 95 | 2 | 2 | 6 | 209 | 15 | 0 | 30 | 4 | 10 | 2 | 3 | 3 | 8 | 392 |
| 5:30 P | 0 | 5 | 105 | 2 | 3 | 7 | 233 | 16 | 0 | 23 | 0 | 9 | 0 | 9 | 1 | 7 | 417 |
| 5:45 P | 0 | 1 | 119 | 2 | 1 | 5 | 232 | 18 | 0 | 34 | 1 | 18 | 0 | 4 | 1 | 9 | 444 |
| 6:00 P | 0 | 2 | 90 | 2 | 1 | 1 | 232 | 17 | 1 | 19 | 0 | 9 | 0 | 7 | 1 | 10 | 390 |
| 6:15 P | 1 | 1 | 104 | 5 | 1 | 4 | 233 | 10 | 0 | 22 | 0 | 9 | 0 | 8 | 0 | 13 | 409 |
| 6:30 P | 1 | 4 | 98 | 4 | 0 | 3 | 247 | 13 | 0 | 13 | 1 | 8 | 1 | 9 | 1 | 11 | 412 |
| 6:45 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:00 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:15 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:30 P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Survey | 6 | 28 | 815 | 27 | 12 | 34 | 1740 | 141 | 2 | 211 | 8 | 83 | 3 | 54 | 9 | 73 | 3223 |
| Peak Hour: 5:15 PM to 6:15 PM | | | | | | | | | | | | | | | | | |
| Total | 1 | 9 | 418 | 11 | 6 | 17 | 930 | 61 | 1 | 98 | 1 | 45 | 0 | 28 | 3 | 39 | 1660 |
| Approach | 438 | | | | 1008 | | | | 144 | | | | 70 | | | | 1660 |
| %HV | 0.2% | | | | 0.6% | | | | 0.7% | | | | n/a | | | | 0.5% |
| PHF | 0.90 | | | | 0.98 | | | | 0.68 | | | | 0.83 | | | | 0.93 |




| PEDs Across: | N | S | E | W | |
|---|---|---|---|---|---|
| INT 01 | | | | | 0 |
| INT 02 | | | | | 0 |
| INT 03 | | | | 1 | 1 |
| INT 04 | | | 1 | | 1 |
| INT 05 | | | 1 | 1 | 2 |
| INT 06 | | | | | 0 |
| INT 07 | | | | | 0 |
| INT 08 | | | | 3 | 3 |
| INT 09 | | | | | 0 |
| INT 10 | | | | | 0 |
| INT 11 | | | | | 0 |
| INT 12 | | | | | 0 |
| | 0 | 0 | 2 | 5 | 7 |

Special Notes

| Bicycles From: | N | S | E | W | |
|---|---|---|---|---|---|
| INT 01 | | | 1 | | 1 |
| INT 02 | | | | | 0 |
| INT 03 | | 1 | | | 1 |
| INT 04 | | | | | 0 |
| INT 05 | | | | | 0 |
| INT 06 | | 2 | | | 2 |
| INT 07 | | | | | 0 |
| INT 08 | | 2 | | | 2 |
| INT 09 | | | | | 0 |
| INT 10 | | | | | 0 |
| INT 11 | | | | | 0 |
| INT 12 | | | | | 0 |
| | 0 | 5 | 1 | 0 | 6 |

1776 *1.0 PHF Peak Hour Volume*

| | | PHF | %HV |
|---|---|---|---|
| | EB | 0.83 | n/a |
| Check | WB | 0.68 | 0.7% |
| In: 1660 | NB | 0.98 | 0.6% |
| Out: 1660 | SB | 0.90 | 0.2% |
| | T Int. | 0.93 | 0.5% |

Conditions:

# Existing PM
## 11: 132nd Ave NE & NE 126th Pl

1/26/2016

| Intersection | |
|---|---|
| Int Delay, s/veh | 15.8 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 28 | 3 | 39 | 98 | 1 | 45 | 17 | 930 | 61 | 9 | 418 | 11 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | 0 | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| Mvmt Flow | 30 | 3 | 42 | 105 | 1 | 48 | 18 | 1000 | 66 | 10 | 449 | 12 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1536 | 1512 | 231 | 1283 | 1518 | 1000 | 461 | 0 | 0 | 1000 | 0 | 0 |
| Stage 1 | 475 | 475 | - | 1037 | 1037 | - | - | - | - | - | - | - |
| Stage 2 | 1061 | 1037 | - | 246 | 481 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.3 | 6.5 | 6.9 | 7.315 | 6.515 | 6.215 | 4.12 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.5 | 5.5 | - | 6.115 | 5.515 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.515 | 5.515 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | 3.5095 | 4.0095 | 3.3095 | 2.21 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 88 | 121 | 777 | 133 | 119 | 296 | 1104 | - | - | 700 | - | - |
| Stage 1 | 545 | 561 | - | 280 | 309 | - | - | - | - | - | - | - |
| Stage 2 | 273 | 311 | - | 739 | 555 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 70 | 114 | 777 | 118 | 112 | 296 | 1104 | - | - | 700 | - | - |
| Mov Cap-2 Maneuver | 70 | 114 | - | 118 | 112 | - | - | - | - | - | - | - |
| Stage 1 | 523 | 550 | - | 269 | 296 | - | - | - | - | - | - | - |
| Stage 2 | 218 | 298 | - | 682 | 544 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 52.7 | 155.4 | 0.1 | 0.3 |
| HCM LOS | F | F | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1104 | - | - | 147 | 145 | 700 | - | - |
| HCM Lane V/C Ratio | 0.017 | - | - | 0.512 | 1.068 | 0.014 | - | - |
| HCM Control Delay (s) | 8.3 | 0 | - | 52.7 | 155.4 | 10.2 | 0.1 | - |
| HCM Lane LOS | A | A | - | F | F | B | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 2.5 | 8.3 | 0 | - | - |

# Existing PM
## 12: driveway & NE 126th Pl & NE 128th St

1/26/2016

| Intersection | |
|---|---|
| Int Delay, s/veh | 3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 10 | 59 | 1 | 0 | 45 | 416 | 3 | 1 | 0 | 138 | 0 | 6 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop | Stop | Stop | Stop | Stop |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 11 | 64 | 1 | 0 | 49 | 452 | 3 | 1 | 0 | 150 | 0 | 7 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 501 | 0 | 0 | 65 | 0 | 0 | 364 | 587 | 65 | 362 | 362 | 275 |
| Stage 1 | - | - | - | - | - | - | 86 | 86 | - | 275 | 275 | - |
| Stage 2 | - | - | - | - | - | - | 278 | 501 | - | 87 | 87 | - |
| Critical Hdwy | 4.11 | - | - | 4.1 | - | - | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - | 6.1 | 5.5 | - | 6.1 | 5.5 | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - | 6.1 | 5.5 | - | 6.1 | 5.5 | - |
| Follow-up Hdwy | 2.209 | - | - | 2.2 | - | - | 3.5 | 4 | 3.3 | 3.5 | 4 | 3.3 |
| Pot Cap-1 Maneuver | 1068 | - | - | 1550 | - | - | 596 | 425 | 1005 | 598 | 569 | 769 |
| Stage 1 | - | - | - | - | - | - | 927 | 827 | - | 736 | 686 | - |
| Stage 2 | - | - | - | - | - | - | 733 | 546 | - | 926 | 827 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1068 | - | - | 1550 | - | - | 586 | 420 | 1005 | 592 | 563 | 769 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 586 | 420 | - | 592 | 563 | - |
| Stage 1 | - | - | - | - | - | - | 917 | 818 | - | 728 | 686 | - |
| Stage 2 | - | - | - | - | - | - | 727 | 546 | - | 915 | 818 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 1.2 | 0 | 11.8 | 13.1 |
| HCM LOS | | | B | B |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 533 | 1068 | - | - | 1550 | - | - | 598 |
| HCM Lane V/C Ratio | 0.008 | 0.01 | - | - | - | - | - | 0.262 |
| HCM Control Delay (s) | 11.8 | 8.4 | 0 | - | 0 | - | - | 13.1 |
| HCM Lane LOS | B | A | A | - | A | - | - | B |
| HCM 95th %tile Q(veh) | 0 | 0 | - | - | 0 | - | - | 1 |

Existing PM
16: NE 132nd St/136 Ave NE & 136th Ave NE

1/26/2016

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.7 |

| Movement | EBL | EBT | WBT | WBR | SWL | SWR |
|---|---|---|---|---|---|---|
| Vol, veh/h | 22 | 24 | 483 | 6 | 6 | 10 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 0 | - |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 96 | 96 | 96 | 96 | 96 | 96 |
| Heavy Vehicles, % | 1 | 1 | 1 | 1 | 1 | 1 |
| Mvmt Flow | 23 | 25 | 503 | 6 | 6 | 10 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 509 | 0 | - | 0 | 577 | 506 |
| Stage 1 | - | - | - | - | 506 | - |
| Stage 2 | - | - | - | - | 71 | - |
| Critical Hdwy | 4.11 | - | - | - | 6.41 | 6.21 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.41 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.41 | - |
| Follow-up Hdwy | 2.209 | - | - | - | 3.509 | 3.309 |
| Pot Cap-1 Maneuver | 1061 | - | - | - | 480 | 568 |
| Stage 1 | - | - | - | - | 608 | - |
| Stage 2 | - | - | - | - | 954 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1061 | - | - | - | 469 | 568 |
| Mov Cap-2 Maneuver | - | - | - | - | 469 | - |
| Stage 1 | - | - | - | - | 608 | - |
| Stage 2 | - | - | - | - | 933 | - |

| Approach | EB | WB | SW |
|---|---|---|---|
| HCM Control Delay, s | 4 | 0 | 12.1 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SWLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1061 | - | - | - | 526 |
| HCM Lane V/C Ratio | 0.022 | - | - | - | 0.032 |
| HCM Control Delay (s) | 8.5 | 0 | - | - | 12.1 |
| HCM Lane LOS | A | A | - | - | B |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | 0.1 |

# Existing PM
## 7: 132nd Ave NE & NE 132nd St

1/26/2016

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 175 | 102 | 203 | 19 | 193 | 230 | 282 | 600 | 33 | 32 | 230 | 71 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1881 | 1881 | 1881 | 1881 | 1881 | 1900 | 1881 | 1881 | 1900 | 1881 | 1881 | 1900 |
| Adj Flow Rate, veh/h | 190 | 111 | 221 | 21 | 210 | 250 | 307 | 652 | 36 | 35 | 250 | 77 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Cap, veh/h | 241 | 645 | 548 | 411 | 221 | 263 | 506 | 764 | 42 | 204 | 452 | 139 |
| Arrive On Green | 0.08 | 0.34 | 0.34 | 0.02 | 0.28 | 0.28 | 0.13 | 0.43 | 0.43 | 0.03 | 0.33 | 0.33 |
| Sat Flow, veh/h | 1792 | 1881 | 1599 | 1792 | 784 | 933 | 1792 | 1766 | 98 | 1792 | 1381 | 425 |
| Grp Volume(v), veh/h | 190 | 111 | 221 | 21 | 0 | 460 | 307 | 0 | 688 | 35 | 0 | 327 |
| Grp Sat Flow(s),veh/h/ln | 1792 | 1881 | 1599 | 1792 | 0 | 1717 | 1792 | 0 | 1864 | 1792 | 0 | 1806 |
| Q Serve(g_s), s | 6.5 | 3.7 | 9.3 | 0.7 | 0.0 | 23.3 | 9.5 | 0.0 | 29.4 | 1.1 | 0.0 | 13.2 |
| Cycle Q Clear(g_c), s | 6.5 | 3.7 | 9.3 | 0.7 | 0.0 | 23.3 | 9.5 | 0.0 | 29.4 | 1.1 | 0.0 | 13.2 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.54 | 1.00 | | 0.05 | 1.00 | | 0.24 |
| Lane Grp Cap(c), veh/h | 241 | 645 | 548 | 411 | 0 | 484 | 506 | 0 | 806 | 204 | 0 | 591 |
| V/C Ratio(X) | 0.79 | 0.17 | 0.40 | 0.05 | 0.00 | 0.95 | 0.61 | 0.00 | 0.85 | 0.17 | 0.00 | 0.55 |
| Avail Cap(c_a), veh/h | 241 | 645 | 548 | 459 | 0 | 484 | 533 | 0 | 806 | 238 | 0 | 591 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 22.9 | 20.4 | 22.2 | 22.0 | 0.0 | 31.2 | 16.2 | 0.0 | 22.6 | 21.3 | 0.0 | 24.5 |
| Incr Delay (d2), s/veh | 16.1 | 0.1 | 0.5 | 0.1 | 0.0 | 28.7 | 1.8 | 0.0 | 11.1 | 0.4 | 0.0 | 3.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 4.2 | 1.9 | 4.2 | 0.4 | 0.0 | 14.9 | 4.9 | 0.0 | 17.6 | 0.6 | 0.0 | 7.1 |
| LnGrp Delay(d),s/veh | 39.0 | 20.5 | 22.7 | 22.0 | 0.0 | 60.0 | 18.1 | 0.0 | 33.7 | 21.7 | 0.0 | 28.2 |
| LnGrp LOS | D | C | C | C | | E | B | | C | C | | C |
| Approach Vol, veh/h | | 522 | | | 481 | | | 995 | | | 362 | |
| Approach Delay, s/veh | | 28.2 | | | 58.3 | | | 28.9 | | | 27.6 | |
| Approach LOS | | C | | | E | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 6.3 | 42.4 | 5.6 | 34.4 | 15.7 | 33.0 | 11.0 | 29.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 4.0 | 38.0 | 4.0 | 28.0 | 13.0 | 29.0 | 7.0 | 25.0 |
| Max Q Clear Time (g_c+I1), s | 3.1 | 31.4 | 2.7 | 11.3 | 11.5 | 15.2 | 8.5 | 25.3 |
| Green Ext Time (p_c), s | 0.0 | 3.5 | 0.0 | 4.2 | 0.2 | 5.8 | 0.0 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 34.5 |
| HCM 2010 LOS | C |

# Future without Project PM
## 11: 132nd Ave NE & NE 126th Pl

1/26/2016

| Intersection | |
|---|---|
| Int Delay, s/veh | 21.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 29 | 3 | 41 | 102 | 1 | 47 | 18 | 968 | 63 | 9 | 435 | 11 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | 0 | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| Mvmt Flow | 31 | 3 | 44 | 110 | 1 | 51 | 19 | 1041 | 68 | 10 | 468 | 12 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1598 | 1573 | 240 | 1335 | 1579 | 1041 | 480 | 0 | 0 | 1041 | 0 | 0 |
| Stage 1 | 493 | 493 | - | 1080 | 1080 | - | - | - | - | - | - | - |
| Stage 2 | 1105 | 1080 | - | 255 | 499 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.3 | 6.5 | 6.9 | 7.315 | 6.515 | 6.215 | 4.12 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.5 | 5.5 | - | 6.115 | 5.515 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.515 | 5.515 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | 3.5095 | 4.0095 | 3.3095 | 2.21 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 79 | 111 | 767 | 122 | 110 | 280 | 1086 | - | - | 676 | - | - |
| Stage 1 | 532 | 550 | - | 265 | 295 | - | - | - | - | - | - | - |
| Stage 2 | 258 | 297 | - | 730 | 545 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 61 | 104 | 767 | ~ 107 | 103 | 280 | 1086 | - | - | 676 | - | - |
| Mov Cap-2 Maneuver | 61 | 104 | - | ~ 107 | 103 | - | - | - | - | - | - | - |
| Stage 1 | 508 | 539 | - | 253 | 281 | - | - | - | - | - | - | - |
| Stage 2 | 201 | 283 | - | 670 | 534 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 67 | 210.5 | 0.1 | 0.3 |
| HCM LOS | F | F | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1086 | - | - | 131 | 133 | 676 | - | - |
| HCM Lane V/C Ratio | 0.018 | - | - | 0.599 | 1.213 | 0.014 | - | - |
| HCM Control Delay (s) | 8.4 | 0 | - | 67 | 210.5 | 10.4 | 0.1 | - |
| HCM Lane LOS | A | A | - | F | F | B | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 3.1 | 9.7 | 0 | - | - |

**Notes**

~: Volume exceeds capacity  $: Delay exceeds 300s  +: Computation Not Defined  *: All major volume in platoon

# Future without Project PM
## 12: driveway & NE 126th Pl & NE 128th St

1/26/2016

| Intersection | |
|---|---|
| Int Delay, s/veh | 2.9 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 10 | 61 | 1 | 0 | 47 | 433 | 3 | 1 | 0 | 138 | 0 | 6 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop | Stop | Stop | Stop | Stop |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 11 | 66 | 1 | 0 | 51 | 471 | 3 | 1 | 0 | 150 | 0 | 7 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 522 | 0 | 0 | 67 | 0 | 0 | 379 | 611 | 67 | 375 | 375 | 286 |
| Stage 1 | - | - | - | - | - | - | 89 | 89 | - | 286 | 286 | - |
| Stage 2 | - | - | - | - | - | - | 290 | 522 | - | 89 | 89 | - |
| Critical Hdwy | 4.11 | - | - | 4.1 | - | - | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - | 6.1 | 5.5 | - | 6.1 | 5.5 | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - | 6.1 | 5.5 | - | 6.1 | 5.5 | - |
| Follow-up Hdwy | 2.209 | - | - | 2.2 | - | - | 3.5 | 4 | 3.3 | 3.5 | 4 | 3.3 |
| Pot Cap-1 Maneuver | 1050 | - | - | 1547 | - | - | 582 | 411 | 1002 | 586 | 559 | 758 |
| Stage 1 | - | - | - | - | - | - | 923 | 825 | - | 726 | 679 | - |
| Stage 2 | - | - | - | - | - | - | 722 | 534 | - | 923 | 825 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1050 | - | - | 1547 | - | - | 572 | 406 | 1002 | 580 | 553 | 758 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 572 | 406 | - | 580 | 553 | - |
| Stage 1 | - | - | - | - | - | - | 913 | 816 | - | 718 | 679 | - |
| Stage 2 | - | - | - | - | - | - | 716 | 534 | - | 912 | 816 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 1.2 | 0 | 12 | 13.4 |
| HCM LOS | | | B | B |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 519 | 1050 | - | - | 1547 | - | - | 586 |
| HCM Lane V/C Ratio | 0.008 | 0.01 | - | - | - | - | - | 0.267 |
| HCM Control Delay (s) | 12 | 8.5 | 0 | - | 0 | - | - | 13.4 |
| HCM Lane LOS | B | A | A | - | A | - | - | B |
| HCM 95th %tile Q(veh) | 0 | 0 | - | - | 0 | - | - | 1.1 |

Future without Project PM
16: NE 132nd St/136 Ave NE & 136th Ave NE

1/26/2016

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.7 |

| Movement | EBL | EBT | WBT | WBR | SWL | SWR |
|---|---|---|---|---|---|---|
| Vol, veh/h | 23 | 25 | 503 | 6 | 6 | 10 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 0 | - |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 96 | 96 | 96 | 96 | 96 | 96 |
| Heavy Vehicles, % | 1 | 1 | 1 | 1 | 1 | 1 |
| Mvmt Flow | 24 | 26 | 524 | 6 | 6 | 10 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 530 | 0 | - | 0 | 601 | 527 |
| Stage 1 | - | - | - | - | 527 | - |
| Stage 2 | - | - | - | - | 74 | - |
| Critical Hdwy | 4.11 | - | - | - | 6.41 | 6.21 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.41 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.41 | - |
| Follow-up Hdwy | 2.209 | - | - | - | 3.509 | 3.309 |
| Pot Cap-1 Maneuver | 1042 | - | - | - | 465 | 553 |
| Stage 1 | - | - | - | - | 594 | - |
| Stage 2 | - | - | - | - | 951 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1042 | - | - | - | 454 | 553 |
| Mov Cap-2 Maneuver | - | - | - | - | 454 | - |
| Stage 1 | - | - | - | - | 594 | - |
| Stage 2 | - | - | - | - | 929 | - |

| Approach | EB | WB | SW |
|---|---|---|---|
| HCM Control Delay, s | 4.1 | 0 | 12.3 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SWLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1042 | - | - | - | 511 |
| HCM Lane V/C Ratio | 0.023 | - | - | - | 0.033 |
| HCM Control Delay (s) | 8.5 | 0 | - | - | 12.3 |
| HCM Lane LOS | A | A | - | - | B |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | 0.1 |

# Future without Project PM
## 7: 132nd Ave NE & NE 132nd St

1/26/2016

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 182 | 106 | 211 | 20 | 201 | 239 | 293 | 624 | 34 | 33 | 239 | 74 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1881 | 1881 | 1881 | 1881 | 1881 | 1900 | 1881 | 1881 | 1900 | 1881 | 1881 | 1900 |
| Adj Flow Rate, veh/h | 198 | 115 | 229 | 22 | 218 | 260 | 318 | 678 | 37 | 36 | 260 | 80 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Cap, veh/h | 225 | 641 | 545 | 407 | 220 | 262 | 500 | 768 | 42 | 189 | 450 | 138 |
| Arrive On Green | 0.08 | 0.34 | 0.34 | 0.02 | 0.28 | 0.28 | 0.14 | 0.43 | 0.43 | 0.03 | 0.33 | 0.33 |
| Sat Flow, veh/h | 1792 | 1881 | 1599 | 1792 | 783 | 934 | 1792 | 1768 | 96 | 1792 | 1381 | 425 |
| Grp Volume(v), veh/h | 198 | 115 | 229 | 22 | 0 | 478 | 318 | 0 | 715 | 36 | 0 | 340 |
| Grp Sat Flow(s),veh/h/ln | 1792 | 1881 | 1599 | 1792 | 0 | 1716 | 1792 | 0 | 1864 | 1792 | 0 | 1806 |
| Q Serve(g_s), s | 6.8 | 3.8 | 9.8 | 0.8 | 0.0 | 24.7 | 9.9 | 0.0 | 31.3 | 1.2 | 0.0 | 13.9 |
| Cycle Q Clear(g_c), s | 6.8 | 3.8 | 9.8 | 0.8 | 0.0 | 24.7 | 9.9 | 0.0 | 31.3 | 1.2 | 0.0 | 13.9 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.54 | 1.00 | | 0.05 | 1.00 | | 0.24 |
| Lane Grp Cap(c), veh/h | 225 | 641 | 545 | 407 | 0 | 482 | 500 | 0 | 810 | 189 | 0 | 588 |
| V/C Ratio(X) | 0.88 | 0.18 | 0.42 | 0.05 | 0.00 | 0.99 | 0.64 | 0.00 | 0.88 | 0.19 | 0.00 | 0.58 |
| Avail Cap(c_a), veh/h | 225 | 641 | 545 | 454 | 0 | 482 | 520 | 0 | 810 | 222 | 0 | 588 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 23.2 | 20.6 | 22.6 | 22.1 | 0.0 | 31.9 | 16.5 | 0.0 | 23.1 | 21.8 | 0.0 | 24.9 |
| Incr Delay (d2), s/veh | 30.8 | 0.1 | 0.5 | 0.1 | 0.0 | 38.8 | 2.4 | 0.0 | 13.4 | 0.5 | 0.0 | 4.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 5.2 | 2.0 | 4.4 | 0.4 | 0.0 | 16.9 | 5.1 | 0.0 | 19.1 | 0.6 | 0.0 | 7.6 |
| LnGrp Delay(d),s/veh | 54.0 | 20.8 | 23.1 | 22.2 | 0.0 | 70.7 | 18.9 | 0.0 | 36.5 | 22.3 | 0.0 | 29.0 |
| LnGrp LOS | D | C | C | C | | E | B | | D | C | | C |
| Approach Vol, veh/h | | 542 | | | 500 | | | 1033 | | | 376 | |
| Approach Delay, s/veh | | 33.9 | | | 68.6 | | | 31.1 | | | 28.4 | |
| Approach LOS | | C | | | E | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 6.4 | 42.7 | 5.7 | 34.3 | 16.0 | 33.0 | 11.0 | 29.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 4.0 | 38.0 | 4.0 | 28.0 | 13.0 | 29.0 | 7.0 | 25.0 |
| Max Q Clear Time (g_c+I1), s | 3.2 | 33.3 | 2.8 | 11.8 | 11.9 | 15.9 | 8.8 | 26.7 |
| Green Ext Time (p_c), s | 0.0 | 2.8 | 0.0 | 4.4 | 0.1 | 5.9 | 0.0 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 38.9 |
| HCM 2010 LOS | D |

# Future with Project PM
# 3: 136th Ave NE & Site Access

1/26/2016

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.3 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Vol, veh/h | 11 | 0 | 29 | 19 | 0 | 17 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 0 | 0 | 1 | 1 | 1 | 1 |
| Mvmt Flow | 12 | 0 | 32 | 21 | 0 | 18 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 60 | 42 | 0 | 0 | 52 | 0 |
| Stage 1 | 42 | - | - | - | - | - |
| Stage 2 | 18 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.11 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.209 | - |
| Pot Cap-1 Maneuver | 952 | 1034 | - | - | 1560 | - |
| Stage 1 | 986 | - | - | - | - | - |
| Stage 2 | 1010 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 952 | 1034 | - | - | 1560 | - |
| Mov Cap-2 Maneuver | 952 | - | - | - | - | - |
| Stage 1 | 986 | - | - | - | - | - |
| Stage 2 | 1010 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 8.8 | 0 | 0 |
| HCM LOS | A | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 952 | 1560 | - |
| HCM Lane V/C Ratio | - | - | 0.013 | - | - |
| HCM Control Delay (s) | - | - | 8.8 | 0 | - |
| HCM Lane LOS | - | - | A | A | - |
| HCM 95th %tile Q(veh) | - | - | 0 | 0 | - |

# Future with Project PM
## 11: 132nd Ave NE & NE 126th Pl

1/26/2016

| Intersection | |
|---|---|
| Int Delay, s/veh | 22.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 29 | 3 | 41 | 104 | 1 | 47 | 18 | 968 | 65 | 9 | 437 | 11 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | 0 | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| Mvmt Flow | 31 | 3 | 44 | 112 | 1 | 51 | 19 | 1041 | 70 | 10 | 470 | 12 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1600 | 1575 | 241 | 1336 | 1581 | 1041 | 482 | 0 | 0 | 1041 | 0 | 0 |
| Stage 1 | 495 | 495 | - | 1080 | 1080 | - | - | - | - | - | - | - |
| Stage 2 | 1105 | 1080 | - | 256 | 501 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.3 | 6.5 | 6.9 | 7.315 | 6.515 | 6.215 | 4.12 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.5 | 5.5 | - | 6.115 | 5.515 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.515 | 5.515 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | 3.5095 | 4.0095 | 3.3095 | 2.21 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 79 | 111 | 766 | 122 | 109 | 280 | 1084 | - | - | 676 | - | - |
| Stage 1 | 530 | 549 | - | 265 | 295 | - | - | - | - | - | - | - |
| Stage 2 | 258 | 297 | - | 729 | 544 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 61 | 104 | 766 | ~ 107 | 102 | 280 | 1084 | - | - | 676 | - | - |
| Mov Cap-2 Maneuver | 61 | 104 | - | ~ 107 | 102 | - | - | - | - | - | - | - |
| Stage 1 | 505 | 538 | - | 253 | 281 | - | - | - | - | - | - | - |
| Stage 2 | 201 | 283 | - | 669 | 533 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 67 | 220.3 | 0.1 | 0.3 |
| HCM LOS | F | F | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1084 | - | - | 131 | 132 | 676 | - | - |
| HCM Lane V/C Ratio | 0.018 | - | - | 0.599 | 1.238 | 0.014 | - | - |
| HCM Control Delay (s) | 8.4 | 0 | - | 67 | 220.3 | 10.4 | 0.1 | - |
| HCM Lane LOS | A | A | - | F | F | B | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 3.1 | 10 | 0 | - | - |

**Notes**

~: Volume exceeds capacity  $: Delay exceeds 300s  +: Computation Not Defined  *: All major volume in platoon

# Future with Project PM
## 12: driveway & NE 126th Pl & NE 128th St

1/26/2016

| Intersection | |
|---|---|
| Int Delay, s/veh | 3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 12 | 61 | 1 | 0 | 47 | 435 | 3 | 1 | 0 | 139 | 0 | 8 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop | Stop | Stop | Stop | Stop |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 13 | 66 | 1 | 0 | 51 | 473 | 3 | 1 | 0 | 151 | 0 | 9 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 524 | 0 | 0 | 67 | 0 | 0 | 385 | 617 | 67 | 381 | 381 | 288 |
| Stage 1 | - | - | - | - | - | - | 93 | 93 | - | 288 | 288 | - |
| Stage 2 | - | - | - | - | - | - | 292 | 524 | - | 93 | 93 | - |
| Critical Hdwy | 4.11 | - | - | 4.1 | - | - | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - | 6.1 | 5.5 | - | 6.1 | 5.5 | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - | 6.1 | 5.5 | - | 6.1 | 5.5 | - |
| Follow-up Hdwy | 2.209 | - | - | 2.2 | - | - | 3.5 | 4 | 3.3 | 3.5 | 4 | 3.3 |
| Pot Cap-1 Maneuver | 1048 | - | - | 1547 | - | - | 577 | 408 | 1002 | 581 | 555 | 756 |
| Stage 1 | - | - | - | - | - | - | 919 | 822 | - | 724 | 677 | - |
| Stage 2 | - | - | - | - | - | - | 720 | 533 | - | 919 | 822 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1048 | - | - | 1547 | - | - | 565 | 403 | 1002 | 574 | 548 | 756 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 565 | 403 | - | 574 | 548 | - |
| Stage 1 | - | - | - | - | - | - | 907 | 811 | - | 715 | 677 | - |
| Stage 2 | - | - | - | - | - | - | 712 | 533 | - | 906 | 811 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 1.4 | 0 | 12.1 | 13.5 |
| HCM LOS | | | B | B |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 513 | 1048 | - | - | 1547 | - | - | 582 |
| HCM Lane V/C Ratio | 0.008 | 0.012 | - | - | - | - | - | 0.275 |
| HCM Control Delay (s) | 12.1 | 8.5 | 0 | - | 0 | - | - | 13.5 |
| HCM Lane LOS | B | A | A | - | A | - | - | B |
| HCM 95th %tile Q(veh) | 0 | 0 | - | - | 0 | - | - | 1.1 |

Future with Project PM
16: NE 132nd St/136 Ave NE & 136th Ave NE

1/26/2016

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.1 |

| Movement | EBL | EBT | WBT | WBR | SWL | SWR |
|---|---|---|---|---|---|---|
| Vol, veh/h | 38 | 25 | 503 | 10 | 9 | 18 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 0 | - |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 96 | 96 | 96 | 96 | 96 | 96 |
| Heavy Vehicles, % | 1 | 1 | 1 | 1 | 1 | 1 |
| Mvmt Flow | 40 | 26 | 524 | 10 | 9 | 19 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 534 | 0 | - | 0 | 634 | 529 |
| Stage 1 | - | - | - | - | 529 | - |
| Stage 2 | - | - | - | - | 105 | - |
| Critical Hdwy | 4.11 | - | - | - | 6.41 | 6.21 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.41 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.41 | - |
| Follow-up Hdwy | 2.209 | - | - | - | 3.509 | 3.309 |
| Pot Cap-1 Maneuver | 1039 | - | - | - | 445 | 552 |
| Stage 1 | - | - | - | - | 593 | - |
| Stage 2 | - | - | - | - | 922 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1039 | - | - | - | 428 | 552 |
| Mov Cap-2 Maneuver | - | - | - | - | 428 | - |
| Stage 1 | - | - | - | - | 593 | - |
| Stage 2 | - | - | - | - | 886 | - |

| Approach | EB | WB | SW |
|---|---|---|---|
| HCM Control Delay, s | 5.2 | 0 | 12.6 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SWLn1 |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1039 | - | - | - | 503 |
| HCM Lane V/C Ratio | 0.038 | - | - | - | 0.056 |
| HCM Control Delay (s) | 8.6 | 0 | - | - | 12.6 |
| HCM Lane LOS | A | A | - | - | B |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | 0.2 |

# Future with Project PM
## 7: 132nd Ave NE & NE 132nd St

1/26/2016

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 182 | 117 | 211 | 22 | 205 | 241 | 293 | 624 | 34 | 37 | 239 | 74 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1881 | 1881 | 1881 | 1881 | 1881 | 1900 | 1881 | 1881 | 1900 | 1881 | 1881 | 1900 |
| Adj Flow Rate, veh/h | 198 | 127 | 229 | 24 | 223 | 262 | 318 | 678 | 37 | 40 | 260 | 80 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Cap, veh/h | 222 | 638 | 542 | 406 | 222 | 260 | 500 | 765 | 42 | 190 | 450 | 138 |
| Arrive On Green | 0.08 | 0.34 | 0.34 | 0.02 | 0.28 | 0.28 | 0.14 | 0.43 | 0.43 | 0.03 | 0.33 | 0.33 |
| Sat Flow, veh/h | 1792 | 1881 | 1599 | 1792 | 790 | 928 | 1792 | 1768 | 96 | 1792 | 1381 | 425 |
| Grp Volume(v), veh/h | 198 | 127 | 229 | 24 | 0 | 485 | 318 | 0 | 715 | 40 | 0 | 340 |
| Grp Sat Flow(s),veh/h/ln | 1792 | 1881 | 1599 | 1792 | 0 | 1717 | 1792 | 0 | 1864 | 1792 | 0 | 1806 |
| Q Serve(g_s), s | 6.8 | 4.3 | 9.8 | 0.8 | 0.0 | 25.0 | 9.9 | 0.0 | 31.4 | 1.3 | 0.0 | 13.9 |
| Cycle Q Clear(g_c), s | 6.8 | 4.3 | 9.8 | 0.8 | 0.0 | 25.0 | 9.9 | 0.0 | 31.4 | 1.3 | 0.0 | 13.9 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.54 | 1.00 | | 0.05 | 1.00 | | 0.24 |
| Lane Grp Cap(c), veh/h | 222 | 638 | 542 | 406 | 0 | 482 | 500 | 0 | 807 | 190 | 0 | 588 |
| V/C Ratio(X) | 0.89 | 0.20 | 0.42 | 0.06 | 0.00 | 1.01 | 0.64 | 0.00 | 0.89 | 0.21 | 0.00 | 0.58 |
| Avail Cap(c_a), veh/h | 222 | 638 | 542 | 451 | 0 | 482 | 520 | 0 | 807 | 220 | 0 | 588 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 23.2 | 20.8 | 22.7 | 22.1 | 0.0 | 32.0 | 16.5 | 0.0 | 23.2 | 21.9 | 0.0 | 24.9 |
| Incr Delay (d2), s/veh | 33.3 | 0.2 | 0.5 | 0.1 | 0.0 | 42.4 | 2.4 | 0.0 | 13.7 | 0.5 | 0.0 | 4.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 5.4 | 2.2 | 4.4 | 0.4 | 0.0 | 17.5 | 5.1 | 0.0 | 19.2 | 0.7 | 0.0 | 7.6 |
| LnGrp Delay(d),s/veh | 56.6 | 21.0 | 23.2 | 22.1 | 0.0 | 74.5 | 18.9 | 0.0 | 37.0 | 22.4 | 0.0 | 29.0 |
| LnGrp LOS | E | C | C | C | | F | B | | D | C | | C |
| Approach Vol, veh/h | | 554 | | | 509 | | | 1033 | | | 380 | |
| Approach Delay, s/veh | | 34.6 | | | 72.0 | | | 31.4 | | | 28.3 | |
| Approach LOS | | C | | | E | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 6.5 | 42.5 | 5.8 | 34.2 | 16.0 | 33.0 | 11.0 | 29.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 4.0 | 38.0 | 4.0 | 28.0 | 13.0 | 29.0 | 7.0 | 25.0 |
| Max Q Clear Time (g_c+I1), s | 3.3 | 33.4 | 2.8 | 11.8 | 11.9 | 15.9 | 8.8 | 27.0 |
| Green Ext Time (p_c), s | 0.0 | 2.7 | 0.0 | 4.5 | 0.1 | 5.9 | 0.0 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 40.0 |
| HCM 2010 LOS | D |

**CITY OF KIRKLAND**
**Department of Public Works**
**123 Fifth Avenue, Kirkland, WA 98033 425.587.3800**
**www.kirklandwa.gov**

## MEMORANDUM

**To:** Susan Lauinger, Planner

**From:** Thang Nguyen, Transportation Engineer

**Date:** June 16, 2016

**Subject:** Calvert PUD Development Traffic Impact Analysis Review, SUB16-00921.

This memo is a summary of Public Works staff review of the Traffic Impact Analysis (TIA) report for the proposed Calvert PUD (also known as Callan Ridge PUD) Single-family Residential Development.

### FINDINGS AND RECOMMENDATIONS

#### Staff Findings

The applicant has provided a traffic impact analysis report that met the City's requirements. The proposed project will not create off-site transportation impacts that warrant SEPA mitigation.

The proposed project passed traffic concurrency. Therefore, no off-site concurrency mitigation is required. The required transportation impact fee is adequate to mitigate the project's traffic impacts.

The applicant is contributing $250,000 towards the improvement to the intersection of NE 132nd Street/136th Avenue NE to provide public benefit toward the PUD. A traffic circle will be installed at the intersection to improve safety and traffic operation. The proposed intersection improvement will be programmed into the City 6-year CIP.

#### Staff Recommendations

*SEPA Mitigation:*

Staff recommends approval the proposed project. SEPA mitigation is not warranted because the project will not create significant off-site traffic impacts.

*Public Works Conditions:*

- The applicant shall maintain a valid concurrency test notice until a concurrency certificate is issued with the building permit. An extension of the concurrency test notice may be requested prior to the December 23, 2016.
- Pay road impact fee per the current Transportation Impact Fee schedule.

- Install a STOP sign at the project entrance connecting to 136th Avenue NE. The STOP sign should be installed behind the pedestrian crossing ramp.
- The developer shall design the project entrance to meet Public Works sight distance requirements.

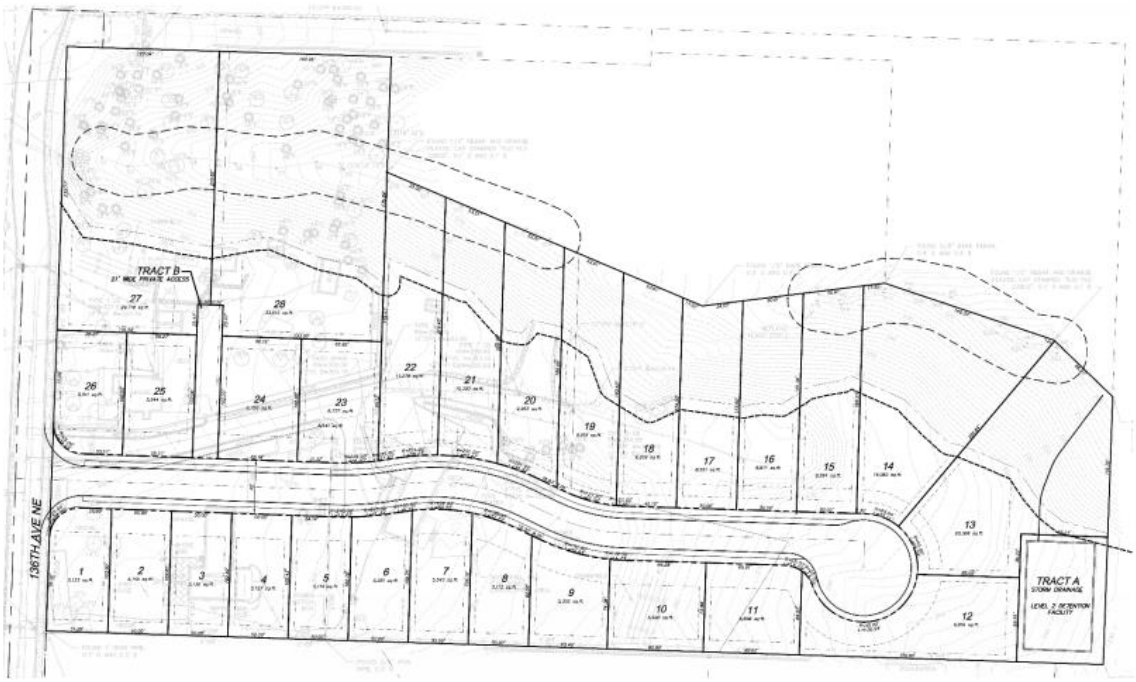
## STAFF REVIEWS

### Project Description

The project is located at 13236 136th Avenue Northeast. The applicant proposed to replace three single-family homes with 28 single-family homes. A single project driveway is proposed on 136th Avenue NE. Figure 1 illustrates the project site plan.

The proposed project is anticipated to be completely built and fully occupied by the end of 2017. Based on the ITE land use 210 (Single-Family), the project is forecasted to generate 293 daily trips and 30 net new PM peak hour trips and 27 net new AM peak hour trips.

Figure 1. Site Plan



**Traffic Concurrency –** The proposed development project passed traffic concurrency. The concurrency test notice is valid until December 23, 2016 at which time the applicant must obtain a development permit and certificate of concurrency or an extension is granted prior to the expiration of the concurrency test notice.

**TRAFFIC IMPACTS & MITIGATIONS**

The traffic report was completed following the City of Kirkland TIA guidelines. The scope of the traffic analysis was approved by the City of Kirkland transportation engineer. The traffic analysis included impacts from all pipeline development projects that have received traffic concurrency approval such as the Vineyard Residential, Momco Residential, Marinwood subdivision, and Vintners West Residential.

The City's Traffic Impact Analysis Guidelines (TIAG) requires a level of service (LOS) analysis using the Highway Capacity Manual Operational Method for intersections that have a proportionate share greater than 1% as calculated using the method in the TIAG.

**Mitigation Threshold- For intersections that have more than 1% proportionate share impact,** the City requires developers to mitigate traffic impacts when one of the following two conditions is met:

1. An intersection level of service is at E and the project has a proportional share of 15% or more at the intersection.
2. An intersection level of service is at F and the project has a proportional share of 5% or more at the intersection.

Four off-site intersections were evaluated for level of services:

1. NE 132nd Street/136th Avenue NE
2. NE 128th Street/NE 126th Place
3. NE 126th Pl/132nd Avenue NE
4. NE 132nd Street/132th Avenue NE

With the exception of the intersection of NE 126th Pl/132nd Avenue NE, all other analyzed intersections are forecasted to operate at a LOS-D or better. The intersection of NE 126th Pl/132nd Avenue NE is forecasted to operate at LOS-F without and with the proposed project. However, it has less than 5% proportional share impact; therefore, off-site intersection mitigation is not warranted.

The site driveway will be controlled with a STOP sign. The project site's driveway is forecasted to operate at LOS-A. The project driveway will be designed to meet intersection sight distance of 280 feet. No other mitigation is required for the project driveway.

**Transportation Impact Fees**- Per City's Ordinance 3685, Transportation Impact Fees is required for all developments. Transportation impact fees are used to construct

transportation improvements throughout the City. The current transportation impact fee rate for single family is $5,009 per single-family unit. The proposed project will have 25 net new single-family units. The calculated transportation impact fee is $125,225 (25 x $5,009). Transportation impact fee is paid at building permit issuance. Final transportation impact fee will be determined at building permit issuance.

**Frontage Improvements**- The project will be required to construct half-street frontage improvements on 136th Avenue NE in accordance to the City of Kirkland standards including curb, gutter and sidewalk.

**PUD Improvements-** The applicant is contributing $250,000 towards the improvement to the intersection of NE 132nd Street/136th Avenue NE to provide public benefit toward the PUD. A traffic circle will be installed at the intersection to improve safety and traffic operation.

cc: Rob Jammerman, Development Engineer Manager
John Burkhalter, Senior Development Engineer

**Sewall Wetland Consulting, Inc.**
PO Box 880
Fall City, WA 98024
Phone: 253-859-0515

November 24, 2015

Carol Rozday
GGM Investments, LLC
9675 SE 36th Street, Suite 105
Mercer Island, WA

RE: Critical Area Report – Callan Ridge PUD
City of Kirkland, Washington
SWC Job #14-160

Dear Carol,

This report describes our observations of jurisdictional wetlands, streams and buffers on or within 200' of the proposed Callan Ridge PUD in the City of Kirkland, Washington (the "site").

*Above: Vicinity Map of site*

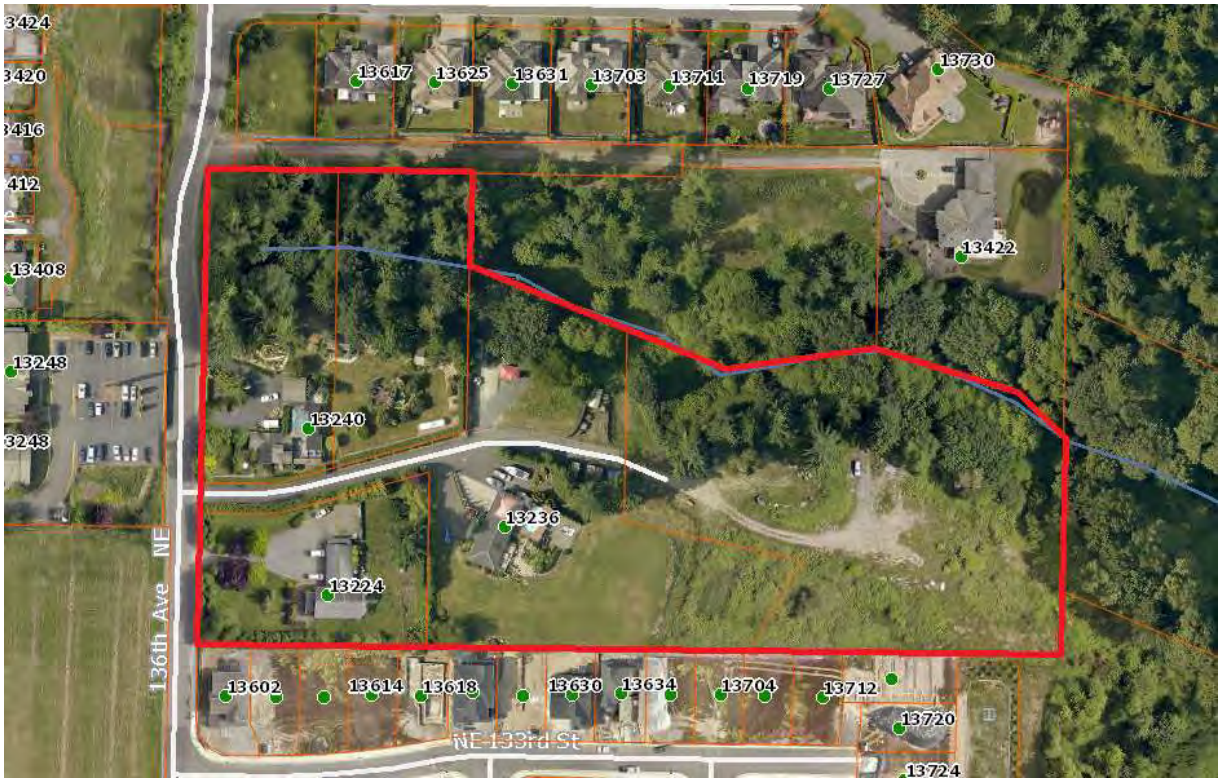
The site consists of an irregular shaped group of 5 parcels with a total area of 7.35 acres located within the SW ¼ of Section 22, Township 26 North, Range 5 East of the W.M.

The site contains three existing single family home with several outbuildings as well as a paved and gravel driveway surfaces and landscaped areas surrounding the homes.

The site is proposed to be subdivided into 28 single family lots with associated infrastructure.

## METHODOLOGY

Ed Sewall of Sewall Wetland Consulting, Inc. inspected the site in March of 2014 as well as October 21, 2015. The site was reviewed using methodology described in the *Washington State Wetlands Identification Manual* (WADOE, March 1997). This is the methodology currently recognized by the City of Kirkland and the State of Washington for wetland determinations and delineations. The site was also inspected using the methodology described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987), and the *Western Mountains, Valleys and Coast region Supplement* (Version 2.0) dated June 24, 2010, as required by the US Army Corps of Engineers. Soil colors were identified using the 1990 Edited and Revised Edition of the Munsell Soil Color Charts (Kollmorgen Instruments Corp. 1990).




*Above: King County iMap Parcel viewer with wetland and stream layers*

## OBSERVATIONS

*Existing Site Documentation.*

Prior to visiting the site, a review of several natural resource inventory maps was conducted. Resources reviewed included the National Wetland Inventory Map and the NRCS Soil Survey online mapping and Data, the King County iMap website with wetland and stream layers activated, the WDNR Fpars water type mapping website, and the City of Kirkland Critical Areas map.

### King County iMap website

According to the King County iMap website (*see Vicinity map page 3 of this report*), there is an unclassified stream on the site.

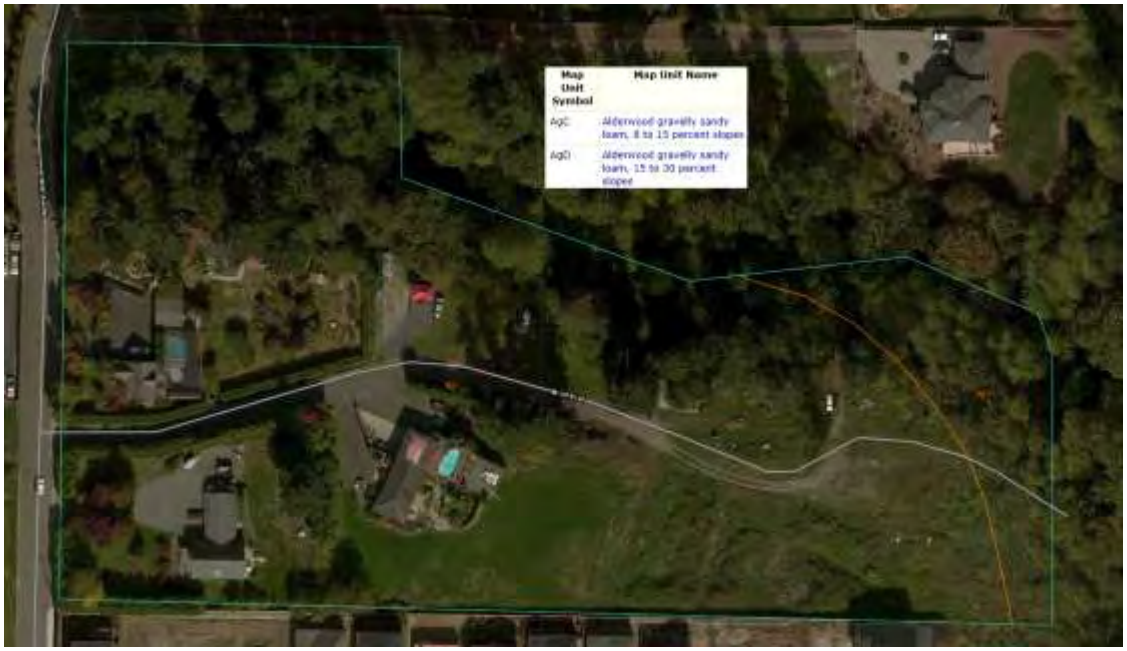
**National Wetlands Inventory (NWI)**

The NWI map depicts no wetlands or streams on or near the site.

*Above: NWI map of the area of the site*

**Soil Survey**

According to the NRCS Soil Mapper website, the west and east sides of the site are mapped as Alderwood gravelly loam (Map units AgC & AgD) with slopes from 8-30%. Alderwood soils were formed in glacial till and are not considered "hydric" soils according to the publication Hydric Soils of the United States (USDA NTCHS Pub No.1491, 1991). The center of the site is mapped as Norma sandy loam, which is a poorly drained hydric soil.




*Above: NRCS Soil mapping of the site*

**City of Kirkland Critical Areas Map**

According to the City of Critical Areas Map, there is a stream that passes through the site.

*City of Kirkland Critical Areas Map*

**WDNR Fpars Mapping**

The WADNR Fpars mapping for the site shows an unclassified stream passing through the site draining to the east.

*Above: WDNR Fpars Water Type Mapping of the site*

**Field observations**

*Uplands*

The site is comprised of an eastern facing hillside with a ravine like feature along the north, and the developed areas to the south. The areas to the north and south are existing residential plats, to the east undeveloped land, and to the west, 136th Avenue SE as well as several storm water ponds and subdivisions.

As previously described, the west end of the site contains three single family homes with associated maintained lawns and landscaped areas as well as several sheds, a decorator pond, gravel and paved driveways and

parking areas. The eastern area south of the ravine is a cleared sloping hillside covered with blackberry, weedy species and grasses.

*Above: Oblique view of site looking north.*

The northern edge of the site contains a well-defined ravine type feature with a small intermittent and discontinuous stream channel. This area is forested with mature douglas fir on the west and red alder, big leaf maple and bitter cherry on the east. An overgrown roadbed crosses through this area of the site and passes to the northeast. Understory species include sword fern, indian plum, elderberry, stinging nettle, hazelnut and Himalayan blackberry. The center of the ravine area on the site is a large thicket of Himalayan blackberry and appears to be heavily disturbed.

Soil pits excavated throughout the site were found to be a gravelly loam soils with colors ranging from 10YR 3/3-10YR ¾. All were found to be dry.

***Wetlands***

No wetlands were found on or near the site.

***Streams***

As previously described, an intermittent, discontinuous stream channel passes through the north side of the site. This feature drains from several storm ponds located north of the site and west of 136th Avenue NE. The stream enters the site cascading out of a debris covered culvert and then passing through a very narrow (12") sand bottom channel that goes subsurface in an area of porous sandy soil near the middle of the site with no defined channel. We have never seen water in the channel but it reportedly flows when there are storm events. The western above ground channel had its south OHWM flagged with orange and black flags S1-S14. At S14 the channel disappears and then resurfaces east of the old road bed in more well defined channel. This portion of the channel was flagged with flags S15-S22 andN1-N9.

We visited the site with Angie Peace of WDFW to determine the status of this drainage as a regulated stream. Angie acknowledged that it looked like the stream was supported primarily by storm water from the ponds to the west of 136th Avenue, but that the natural inputs could not be separated out and that WDFW would call it an intermittent non-fish bearing water (Type Ns) stream.

This stream best meets the criteria of a Class 3 stream as described in KMC 90.30.6:

*6. Class C Streams – Seasonal or ephemeral streams (during years of normal precipitation) not used by salmonids. Class C streams generally correlate with Type 5 streams as defined in the Washington State Hydraulic Code*

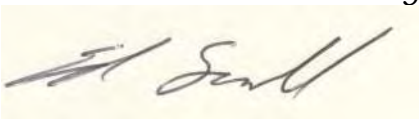
According to KMC 90.90.1, Class C stream typically have a 35' buffer in the Primary basins and a 25' buffer in a secondary basin. The site itself is located within a "secondary basin", so the 25' buffer applies to this site.

**Proposed Project**

The proposed project is the construction of a 28 lot PUD. No impacts are proposed to the stream or its associated buffer area.

If you have any questions in regards to this report or need additional information, please feel free to contact me at (253) 859-0515 or at esewall@sewallwc.com .

Sincerely,
*Sewall Wetland Consulting, Inc.*



Ed Sewall
Senior Wetlands Ecologist PWS #212

Attached: Site Map

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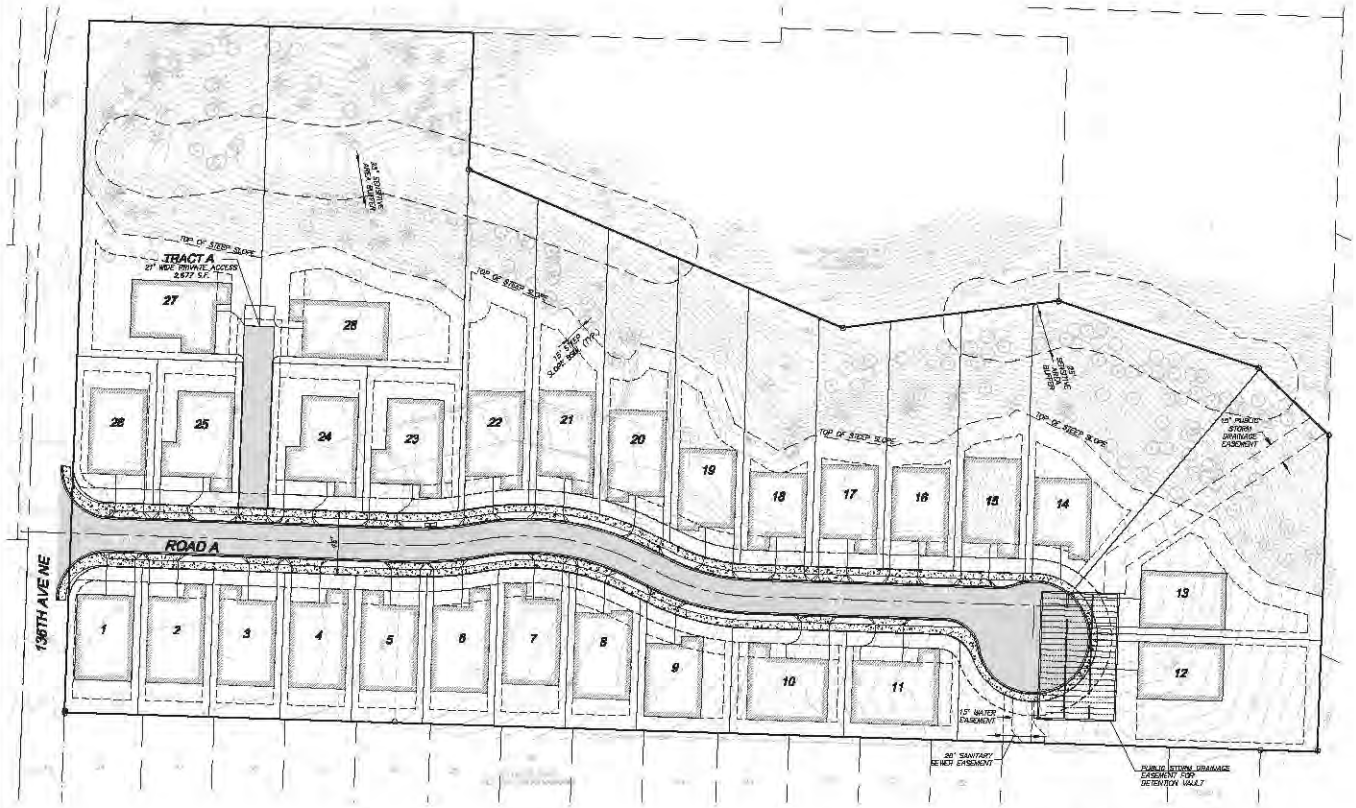
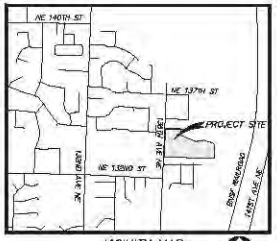
SW 1/4 SECTION 22, TOWNSHIP 26 N, RANGE 5 E, W.M.

# CALLAN RIDGE PUD




VICINITY MAP
SCALE 1"=1000'

NORTH

## PROJECT CONTACTS:

APPLICANT / AGENT: GGM INVESTMENTS, LLC
9675 SE 36TH STREET, SUITE 106
MERCER ISLAND, WASHINGTON 98040
(206) 608-1147
CONTACT: CAROL PEDDAY

CIVIL ENGINEER: D.R. STRONG CONSULTING ENGINEERS, INC.
620 7TH AVENUE
KIRKLAND, WASHINGTON 98033
(425) 827-3063
CONTACT: MAYER A. JOUK, P.E.
MAYER.JOUK@DRSTRONG.COM

SURVEYOR: D.R. STRONG CONSULTING ENGINEERS, INC.
620 7TH AVENUE
KIRKLAND, WASHINGTON 98033
(425) 827-3063
CONTACT: STEPHEN J. SCERCI, P.L.S.
STEVE.SCERCI@DRSTRONG.COM

GEOTECHNICAL ENGINEER: EARTH SOLUTIONS NW, LLC
14616 NORTHEAST 21ST PLACE
BELLEVUE, WASHINGTON 98007
(425) 746-5940
CONTACT: SCOTT E. RIEGEL, L.E.G.

ARBORIST: GREENFOREST INC.
4047 SOUTH LUCILE STREET
SEATTLE, WASHINGTON 98118
(206) 723-0858
CONTACT: FAUSTO GREENFOREST
GREENFOREST@MINDSPRING.COM

TRAFFIC ENGINEER: TRAFFEX
11410 NE 124TH STREET, SUITE 520
KIRKLAND, WASHINGTON 98034
(425) 823-4719
CONTACT: VINCE GROJA
VINCE@TRAFFEX.COM

## PROJECT DESCRIPTION:

ADDRESS OF THE PROPERTY: 13240, 13224, & 13234 136TH AVE NE KIRKLAND, WA

PARCEL NUMBERS: 222605-9089, -9097, -9066, -9074, -9117

EXISTING ZONING: RS3.6

PROPOSED DWELLING UNITS: 29 SINGLE FAMILY HOMES

ACREAGE: 7.35 ACRES (320,087 S.F.) GROSS

R.O.W. DEDICATION: 35,901 S.F.

PROPOSED USE: SINGLE FAMILY DETACHED HOUSING

SEWER DISTRICT: WOODINVILLE WATER DISTRICT

WATER DISTRICT: WOODINVILLE WATER DISTRICT

SCHOOL DISTRICT: LAKE WASHINGTON NO. 414

TELEPHONE SERVICE: VERIZON

POWER SOURCE: PUGET SOUND ENERGY

## TITLE RESTRICTIONS

1. THIS SITE IS SUBJECT TO AN EASEMENT FOR SEWER, POWER AND TELEPHONE SERVICE AND RIGHTS INCIDENTAL THERETO AS DISCLOSED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 7812040482 AND IS SHOWN HEREON.

2. THIS SITE IS SUBJECT TO THE COVENANTS, CONDITIONS, RESTRICTIONS, RECITALS, RESERVATIONS, EASEMENTS, EASEMENT PROVISIONS, DEDICATIONS, BUILDING SETBACK LINES, NOTES AND STATEMENTS, IF ANY, TO THE EXTENT THAT THE SAME ARE PERMITTED BY APPLICABLE LAW AS DISCLOSED BY KING COUNTY SHORT PLAT NUMBER 377147, RECORDED UNDER RECORDING NUMBER 7708170908 AND AMENDED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 7910150941.

3. THIS SITE IS SUBJECT TO THE COVENANTS, CONDITIONS, RESTRICTIONS AND EASEMENTS IF ANY, TO THE EXTENT THAT THE SAME ARE PERMITTED BY APPLICABLE LAW AS DISCLOSED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 7901250806 SAID INSTRUMENT IS A RE-RECORDING OF INSTRUMENT RECORDED UNDER RECORDING NUMBER 7812040634 AND INSTRUMENTS AND/OR MODIFICATIONS OF SAID INSTRUMENT AS DISCLOSED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 7912050918, 8004300838 AND 8008080002(SET). AN AGREEMENT REGARDING PROTECTIVE AND ROAD MAINTENANCE COVENANTS RELATING THERETO WAS RECORDED UNDER RECORDING NUMBER 8008080401(L).

4. THIS SITE IS SUBJECT TO THE COVENANTS, CONDITIONS, RESTRICTIONS, RECITALS, RESERVATIONS, EASEMENTS, EASEMENT PROVISIONS, DEDICATIONS, BUILDING SETBACK LINES, NOTES AND STATEMENTS, IF ANY, TO THE EXTENT THAT THE SAME ARE PERMITTED BY APPLICABLE LAW AS DISCLOSED BY KING COUNTY SHORT PLAT RECORDED UNDER RECORDING NUMBER 8002140004.

5. THIS SITE IS SUBJECT TO THE TERMS AND CONDITIONS OF AN AGREEMENT REGARDING TEMPORARY WATER SERVICE AS DISCLOSED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 7310150411.

6. THIS SITE IS SUBJECT TO THE TERMS AND CONDITIONS OF AN AGREEMENT REGARDING TEMPORARY WATER SERVICE AS DISCLOSED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 7903150733.

7. THIS SITE IS SUBJECT TO THE TERMS AND CONDITIONS OF AN AGREEMENT REGARDING TEMPORARY WATER SERVICE AS DISCLOSED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 7908270718.

8. THIS SITE IS SUBJECT TO THE TERMS AND CONDITIONS OF AN AGREEMENT REGARDING LATECOMER RECOVERY CHARGES AS DISCLOSED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 8103130274.

9. THIS SITE IS SUBJECT TO THE TERMS AND CONDITIONS OF A CONNECTION CHARGE AGREEMENT AS DISCLOSED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 8512201120.

10. THIS SITE IS SUBJECT TO A RECORD OF SURVEY AND MATTERS RELATING THERETO AS DISCLOSED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 8604060906

11. THIS SITE IS SUBJECT TO A RECORD OF SURVEY AND MATTERS RELATING THERETO AS DISCLOSED BY INSTRUMENT RECORDED UNDER RECORDING NUMBER 20100309001005.

12. THIS SITE IS SUBJECT TO A PENDING COURT ACTION AS DISCLOSED BY KING COUNTY SUPERIOR COURT CASE NO.: 14-2-33237-3.

## VERTICAL DATUM:

NAVD 88 PER CITY OF KIRKLAND VERTICAL CONTROL

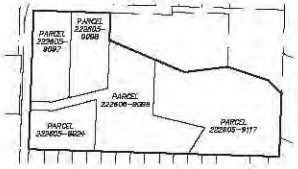
## BENCHMARK:

CITY OF KIRKLAND CONTROL POINT NUMBER 53,
FOUND 4"X4" CONCRETE MONUMENT WITH TACK IN LEAD PLUG DOWN 0.7' IN MONUMENT CASE AT THE INTERSECTION OF 139ND AVENUE NE AND NE 139ND STREET; AKA THE NORTHWEST CORNER OF SECTION 27-26-5, ELEVATION=310.16 FEET.

## TYPICAL BUILDING SETBACKS

UNLESS OTHERWISE NOTED, BUILDING SETBACKS ARE AS FOLLOWS:

| | |
|---|---|
| FRONT YARD SETBACK: | 15 FEET |
| GARAGE SETBACK: | 20 FEET |
| SIDE YARD SETBACK: | 5 FEET |
| REAR YARD SETBACK: | 10 FEET |




KEY MAP
SCALE 1"=200'

NORTH

NORTH
GRAPHIC SCALE
0 20 40 80
1 INCH = 40 FT.

## BASIS OF BEARINGS:

BASED ON THE BEARING BETWEEN THE MONUMENTS FOUND AT THE NORTHWEST CORNER AND THE WEST QUARTER CORNER OF SECTION 27-26-5 PER REFERENCES 1, 2 AND 3.

Call 2 Working Days Before You Dig
811
Utilities Underground Location Center
(WASHINGTON, OREGON)

## SHEET INDEX


| | | |
|---|---|---|
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| C2 | OF 6 | EXISTING CONDITIONS |
| C3 | OF 6 | INTEGRATED TREE PLAN |
| C4 | OF 6 | ROAD & GRADING PLAN |
| C5 | OF 6 | DRAINAGE CONTROL PLAN |
| C6 | OF 6 | ROAD & UTILITY PROFILE |


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T 425.827.3063 F 425.827.4115

CALLAN RIDGE PUD
IDP SUBMITTAL

COVER SHEET

13240, 13224, & 13234 136TH AVE NE
KIRKLAND, WASHINGTON

GGM INVESTMENTS, LLC

9675 SE 36TH STREET, SUITE 106
MERCER ISLAND, WA 98040
(206) 608-1147

| DATE | REVISION | APR |
|---|---|---|

DRAFTED BY: GRD
DESIGNED BY: MAJ
PROJECT ENGINEER: MAJ
DATE: 04.15.16
PROJECT NO.: 12057

DRAWING: C1
SHEET: 1 OF 6

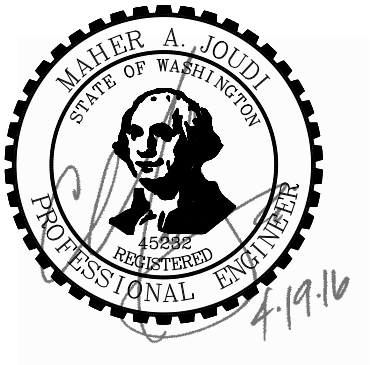
# TECHNICAL INFORMATION REPORT

**for**

## CALLAN RIDGE PUD

## PRELIMINARY PLAT

**13240, 13224 & 13234 136th Ave NE, Kirkland, Washington**




## DRS Project No. 12057

*Owner/Applicant*

GGM Investments, LLC
9675 SE 36th Street, Suite 105
Mercer Island, Washington 98040

*Report Prepared by*

D. R. STRONG Consulting Engineers, Inc.
620 7th Avenue
Kirkland, WA 98033
(425) 827-3063

**Report Issue Date**

**April 19, 2016**

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# TECHNICAL INFORMATION REPORT

# CALLAN RIDGE PUD PRELIMINARY PLAT

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# SECTION I

## PROJECT OVERVIEW

The Project is the proposed subdivision of five existing parcels on approximately 7.35 acres (320097 s.f.) into 28 single-family residential lots. The project site (Site) is located at 13240, 13224, & 13224 136th Avenue NE Kirkland, Washington in Section 22, Township 26 North, Range 5 East, W.M., also known as Tax Parcel numbers 2226059099, -9097, -9098, -9024, and -9117. The Project will meet the requirements of the 2009 King County Surface Water Design Manual (Manual) and the 2009 City of Kirkland Amendments (Manual).

## PREDEVELOPED SITE CONDITIONS

Total site area is approximately 320,097 s.f. (7.35 acres). There are three existing homes on the Site with associated outbuildings, paved driveways, and landscaping. The northern and eastern portions of the Site are along a moderate to heavily vegetated steep slope of up to 65%.

The predeveloped Site is contained within one Threshold Discharge Area (TDA). The TDA has two Natural Discharge Areas (NDAs), NDA 1 and NDA 2. Runoff from NDA 1 discharges near the north end of the eastern property line of the Site. Runoff continues east through a channel and is collected by a Type 2 catch basin (CB) with birdcage inlet. Runoff continues east through a series of ditches and culverts of varying size and material before entering another Type 2 CB with birdcage inlet. Runoff continues east under 141st Ave NE, outlets into a ditch, and moves north. From here, runoff flows east under the railroad before flowing north. Runoff eventually enters a ditch traveling east across a farm (Parcel No. 2226059006) and outlets into the Samammish River. Runoff from NDA 2 sheet flows across the eastern property line near the southeastern corner of the Site before combining with NDA 1 at the first Type 2 CB.

For purposes of hydraulic calculations, the predeveloped site will be modeled as forest.

## DEVELOPED SITE CONDITIONS

The applicant is seeking approval to subdivide 7.35 acres into 28 single-family residential lots with sizes ranging from 5,113 s.f. to 33,589 s.f. The developable area (Project Area) is approximately 5.107 acres (excludes steep slope and sentitive areas from the gross Site area). A total of 146,723 s.f. (3.368 acres) of impervious area is proposed for the Site. The remainder of the Project Area will consist of residential landscaping and other pervious surfaces.

The proposed impervious surface area will include an internal plat road, serving 26 lots directly and 2 lots indirectly through a private access tract (Tract A). The internal plat road proposes a right-of-way width of 45 feet, with 24 feet of pavement, curb/gutter, 5 feet of sidewalk and a 4.5 foot planter strip, with an outside strip varying from 0 to 0.5 feet. The 28 new single-family residences and their driveways combined will create approximately 112,000 s.f. of impervious area (4,000 s.f. per lot). Post-developed impervious areas including tracts, sidewalks, roofs, driveways, and site frontage improvements total approximately 151,413 s.f. Portions of the lots with steep slope and

sensitive areas will remain undisturbed and will not be considered in the drainage calculations The remainder of the TDA will be modeled as till grass (49,192 s.f.).

Runoff will be collected and conveyed to the proposed detention vault, with a StormFilter system downstream to accommodate Basic Water Quality requirements. The vault will provide Level Two Flow Control. Water quality facility design will be further analyzed at the time of final engineering.

See Section III for Level One Downstream Analysis.

**NATURAL DRAINAGE SYSTEM FUNCTIONS:**

A review of the SCS soils map for the area (see Figure 4, Soils) indicates Alderwood gravelly sandy loam with 8 to 15 percent slopes (AgC) and 15 to 30 percent slopes (AgD). Per the 2009 King County Surface Water Design Manual, this soil type is classified as ñTillò material. The SCS Soil series descriptions follow Figure 4.

Topography indicates no upstream tributary area from the south or east. Existing development of the frontage to the west conveys runoff away from the Site. A 12-inch diameter concrete culvert conveys runoff from the existing upstream development under 136th Ave NE and into the on-site stream. The stream is part of the undisturbed area and will not be considered in the drainage calculations. Negligible upstream area from an existing driveway sheet flows from the north into the stream. Therefore, upstream runoff for the Site is considered negligible.

# FIGURE 1
# TIR WORKSHEET

## TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

| Part 1 PROJECT OWNER AND PROJECT ENGINEER | |
|---|---|
| Project Owner: | **GGM Investments, LLC** |
| Phone: | **(206) 588-1147 Ext. 114** |
| Address: | **9675 SE 36th Street, Suite 105**<br>**Mercer Island, WA 98040** |
| Project Engineer: | **Maher A. Joudi, P.E.** |
| Company: | **D. R. STRONG Consulting Engineers Inc.** |
| Phone**:** | **(425) 827-3063** |

| Part 2 PROJECT LOCATION AND DESCRIPTION | |
|---|---|
| Project Name: | **Callan Ridge PUD** |
| City Permit#: | **TBD** |
| Location: | |
| Township: | **26 North** |
| Range: | **05 East** |
| Section: | **22** |
| Site Address: | **13240, 13224 & 13234**<br>**136th Avenue NE**<br>**Kirkland, WA** |

**Part 3 TYPE OF PERMIT APPLICATION**

- ☒ **Landuse Services**
  **Subdivision** / Short Subdivision / UPD
- ☐ Building Services: M/F / Commercial / SFR
- ☒ **Clearing and Grading**
- ☐ Right-of-Way
- ☐ Other:

**Part 4 OTHER REVIEWS AND PERMITS**

- ☐ DFW HPA
- ☐ COE 404
- ☐ DOE Dam Safety
- ☐ FEMA Floodplain
- ☐ COE Wetlands
- ☐ Other: _____
- ☐ Shoreline Mngmt
- ☒ **Structural Rockery/Vault**
- ☐ ESA Section 7

**Part 5 PLAN AND REPORT INFORMATION**

| **Technical Information Report** | | **Site Improvement Plan (Engr. Plans)** | |
|---|---|---|---|
| Type of Drainage Review (circle): | **Full** / Targeted / Large Site | Type (circle one): | **Full** / Modified / : Small Site |
| Date (include revision dates): | March 8, 2016 | Date (include revision dates): | _____ |
| Date of Final: | _____ | Date of Final: | _____ |

**Part 6 ADJUSTMENT APPROVALS**

Type (circle one): **Standard** / Complex / Preapplication / Experimental / Blanket

Description: (include conditions in TIR Section 2)

Drainage adjustment to not utilize site BMPs due to proximity to steep slopes.

Date of Approval:

## Part 7 MONITORING REQUIREMENTS

| | |
|---|---|
| Monitoring Required: **Yes** / No<br>Start Date: TBD<br>Completion Date _____ | Describe: **Monitor discharge location during construction.** |

## Part 8 SITE COMMUNITY AND DRAINAGE BASIN

Community Plan: Kingsgate Slope

Special District Overlays: N/A

Drainage Basin: Sammamish River

Stormwater Requirements: Level 2 Flow Control, Basic WQ

## Part 9 ONSITE AND ADJACENT SENSITIVE AREAS

- ☒ River/ **Stream** Seasonal
- ☐ Lake
- ☐ Wetlands
- ☐ Closed Depression
- ☐ Floodplain
- ☐ Other
- ☒ **Steep Slope**
- ☒ **Erosion Hazard**
- ☒ **Landslide Hazard**
- ☐ Coal Mine Hazard
- ☐ Seismic Hazard
- ☐ Habitat Protection

## Part 10 SOILS

| Soil Type | Slopes | Erosion Potential |
|---|---|---|
| AgC | 8-15% | Moderate |
| AgD | 15-30% | Severe |
| | | |

- ☐ High Groundwater Table
- ☐ other
- ☐ Additional Sheets Attached
- ☐ Sole Source Aquifer
- ☐ Seeps/Springs

| Part 11 DRAINAGE DESIGN LIMITATIONS | |
|---|---|
| REFERENCE | LIMITATION / SITE CONSTRAINT |
| ☐ Core 2 ï Offsite Analysis | |
| ☐ Sensitive / Critical Area | |
| ☐ SEPA | |
| ☐ Other | |
| ☐ | |
| Additional Sheet Attached | |

| Part 12 TIR SUMMARY SHEET | |
|---|---|
| **Threshold Discharge Area:** (name or description) | **TDA 1** |
| **Core Requirements (all 8 apply)** | |
| Discharge of Natural Location **yes** | Number of Natural Discharge Locations: **1** |
| Offsite Analysis | Level: **1** / 2 / 3 dated: **12/11/15** |
| Flow Control (incl. facility summary sheet | Level: 1 / **2** / 3 or Exemption Number _____<br>Small Site BMPS **N/A** |
| Conveyance System | Spill containment located at: **TBD** |
| Erosion and Sediment Control | ESC Site Supervisor: **TBD**<br>Contact Phone: **TBD**<br>After Hours Phone: **TBD** |
| Maintenance and Operation | Responsibility: Private / **Public**<br>If Private, Maintenance Log Required: Yes / No |
| Financial Guarantees and Liability | Provided: **Yes** / No |
| Water Quality (include facility summary sheet) | Type**:** **Basic** / Sens Lake / Enhanced Basic / Bog or exemption No. _____<br>Landscape Management Plan: Yes / **No** |
| **Special Requirements (as applicable)** | |
| Area Specific Drainage Requirements | Type: CDA / SDO / MDP / BP / LMP / Shared / **None**<br>Name: _____ |
| Floodplain/Floodway Delineation | Type: Major / Minor / Exemption / **None**<br>100-year Base Flood Elevation (or range): _____<br>Datum: _____ |
| Flood Protection Facilities | Describe: **N/A** |
| Source Control (comm. / industrial landuse) | Describe Landuse: _____<br>Describe any structural controls: |
| Oil Control | High-use Site: Yes / **No**<br>Treatment BMP: _____<br>Maintenance Agreement: Yes / **No**<br>with whom? _____ |

| **Other Drainage Structures** | |
|---|---|
| Describe: | **Runoff will be collected and conveyed to the detention facility located on Lots 12 and 13, followed by a stormfilter to accommodate water quality requirements.** |

| Part 13 EROSION AND SEDIMENT CONTROL REQUIREMENTS | | |
|---|---|---|
| MINIMUM ESC REQUIREMENTS DURING CONSTRUCTION | | MINIMUM ESC REQUIREMENTS AFTER CONSTRUCTION |
| ☒ **Clearing Limits** | | ☒ **Stabilize Exposed Surfaces** |
| ☒ **Cover Measures** | | ☒ **Remove and Restore Temporary ESC Facilities** |
| ☒ **Perimeter Protection** | | ☒ **Clean and Remove All Silt and Debris, Ensure Operations of Permanent Facilities** |
| ☒ **Traffic Area Stabilization** | | ☒ **Flag Limits of SAO and open space Preservation areas** |
| ☒ **Sediment Retention** | | ☐ Other _____ |
| ☒ **Surface Water Collection** | | |
| ☐ Dewatering Control | | |
| ☒ **Dust control** | | |
| ☒ **Flow Control** | | |

| Part 14 STORMWATER FACILITY DESCRIPTIONS (Note: Include Facility Summary and Sketch | | | | |
|---|---|---|---|---|
| Flow Control | Type/Description | | Water Quality | Type/Description |
| ☒ **Detention** | **Vault** | | ☐ Biofiltration | _____ |
| ☐ Infiltration | _____ | | ☐ Wetpool | _____ |
| ☐ Regional Facility | _____ | | ☒ **Media Filtration** | **Stormfilter** |
| ☐ Shared Facility | _____ | | ☐ Oil Control | _____ |
| ☐ Flow Control BMPs | _____ | | ☐ Spill Control | _____ |
| ☐ Other | | | ☐ Flow Control BMPs | _____ |
| | | | ☐ Other | _____ |

| Part 15 EASEMENTS/TRACTS |
|---|
| ☒ **Drainage Easement** |
| ☐ Covenant |
| ☒ **Native Growth Protection Covenant** |
| ☐ Tract |
| ☐ Other: |

| Part 16 STRUCTURAL ANALYSIS |
|---|
| ☒ **Cast in Place Vault** |
| ☒ **Retaining Wall** |
| ☐ Rockery > 4ôHigh |
| ☐ Structural on Steep Slope |
| ☐ Other: |

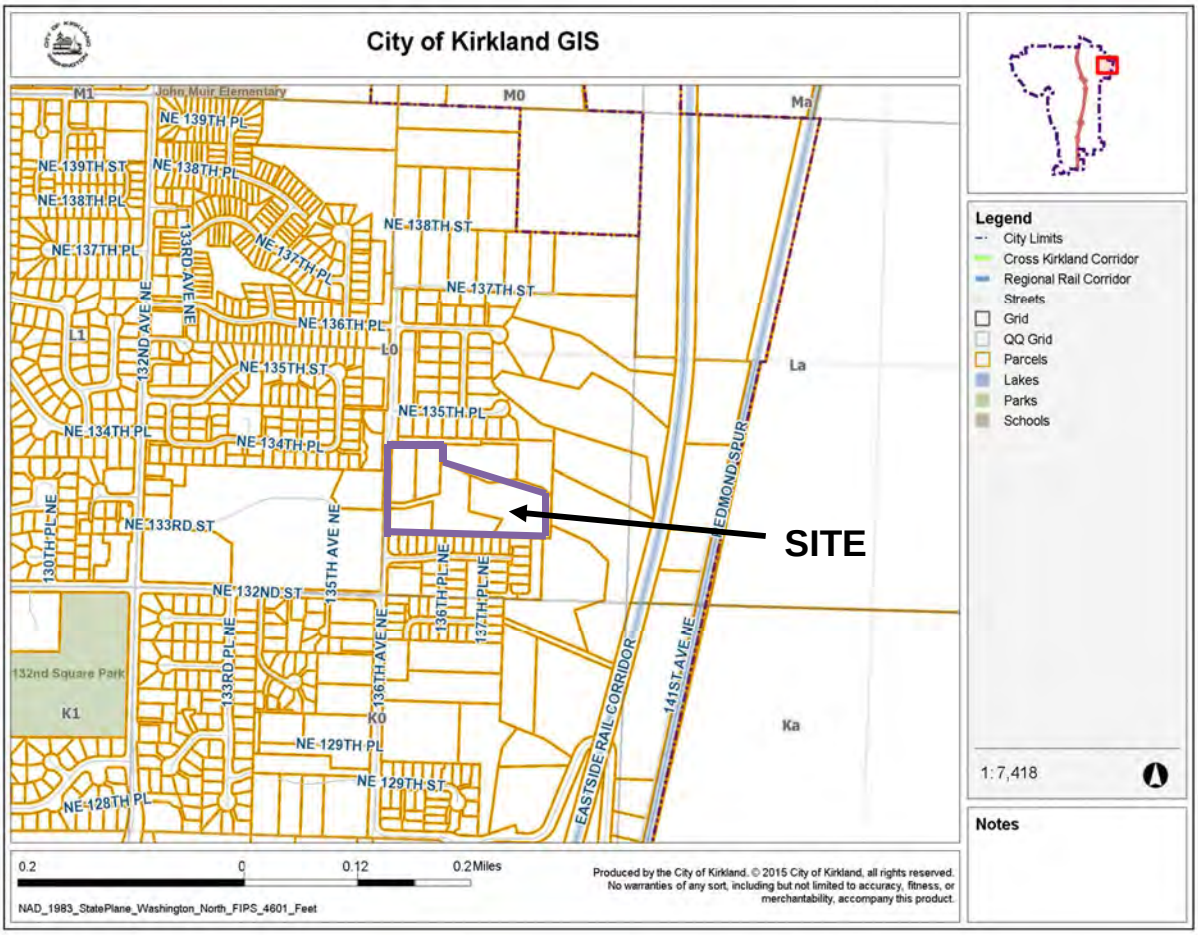
**Part 17 SIGNATURE OF PROFESSIONAL ENGINEER**

I, or a civil engineer under my supervision, have visited the site. Actual site conditions as observed were incorporated into this worksheet and the attached Technical Information Report. To the best of my knowledge the information provided here is accurate.

4.19.16

Signed/Date

# FIGURE 2
# VICINITY MAP



# FIGURE 3
# DRAINAGE BASINS, SUBBASINS, AND SITE CHARACTERISTICS

# FIGURE 4
# SOILS

## King County Area, Washington

AgCð Alderwood gravelly sandy loam, 8 to 15 percent slopes

a) Map Unit Setting

- *National map unit symbol:* 2t626
- *Elevation:* 50 to 800 feet
- *Mean annual precipitation:* 20 to 60 inches
- *Mean annual air temperature:* 46 to 52 degrees F
- *Frost-free period:* 160 to 240 days
- *Farmland classification:* Prime farmland if irrigated

b) Map Unit Composition

- *Alderwood and similar soils:* 85 percent
- *Minor components:* 15 percent
- *Estimates are based on observations, descriptions, and transects of the mapunit.*

c) Description of Alderwood

**Setting**

- *Landform:* Ridges, hills
- *Landform position (two-dimensional):* Shoulder
- *Landform position (three-dimensional):* Nose slope, talf
- *Down-slope shape:* Linear, convex
- *Across-slope shape:* Convex
- *Parent material:* Glacial drift and/or glacial outwash over dense glaciomarine deposits

**Typical profile**

- *A - 0 to 7 inches:* gravelly sandy loam
- *Bw1 - 7 to 21 inches:* very gravelly sandy loam
- *Bw2 - 21 to 30 inches:* very gravelly sandy loam
- *Bg - 30 to 35 inches:* very gravelly sandy loam
- *2Cd1 - 35 to 43 inches:* very gravelly sandy loam
- *2Cd2 - 43 to 59 inches:* very gravelly sandy loam

**Properties and qualities**

- *Slope:* 8 to 15 percent
- *Depth to restrictive feature:* 20 to 39 inches to densic material
- *Natural drainage class:* Moderately well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.06 in/hr)
- *Depth to water table:* About 18 to 37 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Available water storage in profile:* Very low (about 2.7 inches)

**Interpretive groups**

- *Land capability classification (irrigated):* None specified
- *Land capability classification (nonirrigated):* 4s
- *Hydrologic Soil Group:* B
- *Other vegetative classification:* Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XS301WA), Limited Depth Soils (G002XF303WA)

d) Minor Components

**Everett**

- *Percent of map unit:* 5 percent
- *Landform:* Eskers, kames, moraines
- *Landform position (two-dimensional):* Shoulder, footslope
- *Landform position (three-dimensional):* Crest, base slope
- *Down-slope shape:* Convex
- *Across-slope shape:* Convex

**Indianola**

- *Percent of map unit:* 5 percent
- *Landform:* Eskers, kames, terraces
- *Landform position (three-dimensional):* Tread
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear

**Shalcar**

- *Percent of map unit:* 3 percent
- *Landform:* Depressions

- *Landform position (three-dimensional):* Dip
- *Down-slope shape:* Concave
- *Across-slope shape:* Concave

**Norma**

- *Percent of map unit:* 2 percent
- *Landform:* Depressions, drainageways
- *Landform position (three-dimensional):* Dip
- *Down-slope shape:* Concave, linear
- *Across-slope shape:* Concave

## AgDð Alderwood gravelly sandy loam, 15 to 30 percent slopes

e) Map Unit Setting

- *National map unit symbol:* 2t627
- *Elevation:* 0 to 1,000 feet
- *Mean annual precipitation:* 25 to 60 inches
- *Mean annual air temperature:* 46 to 52 degrees F
- *Frost-free period:* 160 to 240 days
- *Farmland classification:* Farmland of statewide importance

f) Map Unit Composition

- *Alderwood and similar soils:* 85 percent
- *Minor components:* 15 percent
- *Estimates are based on observations, descriptions, and transects of the mapunit.*

g) Description of Alderwood

**Setting**

- *Landform:* Ridges, hills
- *Landform position (two-dimensional):* Backslope
- *Landform position (three-dimensional):* Side slope, nose slope, talf
- *Down-slope shape:* Linear, convex
- *Across-slope shape:* Convex
- *Parent material:* Glacial drift and/or glacial outwash over dense glaciomarine deposits

**Typical profile**

- *A - 0 to 7 inches:* gravelly sandy loam
- *Bw1 - 7 to 21 inches:* very gravelly sandy loam
- *Bw2 - 21 to 30 inches:* very gravelly sandy loam
- *Bg - 30 to 35 inches:* very gravelly sandy loam
- *2Cd1 - 35 to 43 inches:* very gravelly sandy loam
- *2Cd2 - 43 to 59 inches:* very gravelly sandy loam

**Properties and qualities**

- *Slope:* 15 to 30 percent
- *Depth to restrictive feature:* 20 to 39 inches to densic material
- *Natural drainage class:* Moderately well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.06 in/hr)
- *Depth to water table:* About 18 to 37 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Available water storage in profile:* Very low (about 2.7 inches)

**Interpretive groups**

- *Land capability classification (irrigated):* None specified
- *Land capability classification (nonirrigated):* 4e
- *Hydrologic Soil Group:* B
- *Other vegetative classification:* Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XF303WA), Limited Depth Soils (G002XS301WA)

Minor Components

**Everett**

- *Percent of map unit:* 5 percent
- *Landform:* Eskers, kames, moraines
- *Landform position (two-dimensional):* Backslope
- *Landform position (three-dimensional):* Side slope
- *Down-slope shape:* Convex
- *Across-slope shape:* Convex

**Indianola**

- *Percent of map unit:* 5 percent
- *Landform:* Kames, terraces, eskers
- *Landform position (three-dimensional):* Tread
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear

**Shalcar**

- *Percent of map unit:* 3 percent
- *Landform:* Depressions
- *Landform position (three-dimensional):* Dip
- *Down-slope shape:* Concave
- *Across-slope shape:* Concave

**Norma**

- *Percent of map unit:* 2 percent
- *Landform:* Drainageways, depressions
- *Landform position (three-dimensional):* Dip
- *Down-slope shape:* Linear, concave
- *Across-slope shape:* Concave

# SECTION II

## CONDITIONS AND REQUIREMENTS SUMMARY

The Project must comply with the following Core and Special Requirements:

- **C.R. #1 – Discharge at the Natural Location**: Runoff from the Site will discharge at the natural location.
- **C.R. #2 – Offsite Analysis**: An Offsite Analysis is included in Section III. The Analysis describes the Siteõs runoff patterns in detail.
- **C.R. #3 – Flow Control**: The Project is located in a Conservation Flow Control Area and will therefore adhere to Level 2 Flow Control Standards, forested conditions. One detention vault will provide flow control as required. The Project is required to õmatch developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50% of the two-year peak flow up to the full 50-year peak flow. Also match developed peak discharge rates to predeveloped peak discharge rates for the 2 and the 10 year return periods. Assum(ing) historic conditions as the predeveloped condition.ò(KCSWDM, Sec. 1.2)
- **C.R. #4 – Conveyance System**: New pipe systems and ditches/channels are required to be designed with sufficient capacity to convey and contain (at minimum) the 25-year peak flow, assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas. Pipe system structures and ditches/channels may overtop for runoff events that exceed the 25-year design capacity, provided the overflow from a 100-year runoff event does not create or aggravate a õsevere flooding problemò or õsevere erosion problemò as defined in C.R. #2. Any overflow occurring onsite for runoff events up to and including the 100-year event must discharge at the natural location for the project site. In residential subdivisions, such overflow must be contained within an onsite drainage easement, tract, covenant or public right-of-way. The proposed conveyance system was analyzed using the KCBW program, and is capable of conveying the 100-year peak storm without overtopping any structures or channels. This analysis will be performed at time of construction plan preparation.
- **C.R. #5 – Erosion and Sediment Control**: The Project provides the seven minimum ESC measures. A temporary erosion and sedimentation control plan will be prepared at time of construction plan preparation.
- **C.R. #6 – Maintenance and Operations**: Maintenance of the proposed storm drainage facilities will be the responsibility of the City. An Operation and Maintenance Manual will be included in Section X at the time of construction plan preparation.
- **C.R. #7 – Financial Guarantees**: Prior to commencing construction, the Applicant must post a drainage facilities restoration and site stabilization financial guarantee. For any constructed or modified drainage facilities to be maintained and operated by the City, the Applicant must: 1) Post a drainage defect and maintenance financial guarantee for a period of two years, and 2) Maintain the drainage facilities during the

two-year period following posting of the drainage defect and maintenance financial guarantee.

- **C.R. #8 – Water Quality**: The Project is located in the Basic Water Quality Treatment area. A media filtration system following the detention vault will be utilitized.
- **S.R. #1 – Other Adopted Area-Specific Requirements**: Not applicable for this Project.
- **S.R. #2 – Floodplain/Floodway Delineation**: Not applicable for this Project.
- **S.R. #3 – Flood Protection Facilities**: Not applicable for this Project.
- **S.R. #4 – Source Control**: Not applicable for this Project.
- **S.R. #5 – Oil Control:** Not applicable for this Project.

## HEARING EXAMINER'S CONDITIONS OF APPROVAL

Hearing Examiner's conditions of approval will be included in this section once received.

# SECTION III

## OFFSITE ANALYSIS

An offsite Level One Downstream Analysis was prepared by D.R. STRONG Consulting Engineers Inc. and is included in this section.

## LEVEL ONE DOWNSTREAM ANALYSIS

**DISCLAIMER:**

*This report was prepared at the request of GGM investments, LLC for the 7.35 acre parcel known as a portion of the Northeast Quarter of Section 22, Township 26 North, Range 5 East, W.M., in King County, Tax Parcel numbers 2226059099, -9097, -9098 and -9117 (site). D. R. Strong Consulting Engineers Inc. (DRS) has prepared this report for the exclusive use of DRS, the owner, and their agents, for specific application to the development project as described herein. Use or reliance on this report, or any of its contents for any revisions of this project, or any other project, or by others not described above, is forbidden without the expressed permission by DRS.*

## TASK 1: DEFINE AND MAP STUDY AREA

This Offsite Analysis was prepared in accordance with Core Requirement #2, Section 1.2.2 of the 2009 King County Surface Water Design Manual (Manual). The Site is located at 13240, 13224 & 13234 136th Avenue NE, Kirkland, Washington ï also known as Tax Parcel No. 2226059099, -9097, -9098, -9024, and -9117.

See Figures 1, 2, 3, and 5 for maps of the study area.

## TASK 2: RESOURCE REVIEW

- Adopted Basin Plans: *None at this time.*
- Floodplain/Floodway (FEMA) Map: *No floodplains exist on site, See Figure 11.*
- Other Offsite Analysis Reports: *Vintner's Ridge - April, 2011.*
- Sensitive Areas Folio Maps: *See Figures 6-10 for documentation of the distance downstream from the proposed project to the nearest critical areas. Included, are sections of the City of Kirkland GIS Mapping Portal and King County iMap which indicate the following:*
    - **Figure 6 Streams and 100-Year Floodplains and Floodway:** *There is a floodplain within 1 mile of the site along the downstream path*.
    - **Figure 7 Wetlands:** *There are several mapped Wetlands that exist within 1 mile of the site along the downstream path*.
    - **Figure 8 Erosion Hazard:** *There are mapped Erosion Hazard Areas onsite as well as along the downstream drainage path.*
    - **Figure 9 Landslide Hazard:** *A portion of the site resides on mapped Landside Hazard Area and continues within one mile of the Site along the downstream path.*
    - **Figure 10 Seismic Hazard:** *There are mapped Seismic Hazard Areas within one mile of the Site along the downstream path.*
- DNRP Drainage Complaints and Studies: A*s shown in Figure 12, there are several drainage complaints within 1 mile of the Site along the downstream path. However, none are applicable or within the past 10 years.*
- Road Drainage Problems: *None noted.*
- USDA King County Soils Survey: *See Figure 4.*
- Wetlands Inventory: *Vol. 1 North (1990) – The wetland inventory revealed no additional wetlands within the downstream path.*
- Migrating River Studies: *None are applicable to the site.*
- Washington State Department of Ecology's latest published Clean Water Act Section 303d list of polluted waters: *A portion of the Sammamish River is listed along the downstream path.*
- King County Designated Water Quality Problems: *No Water Quality complains have been filed within 1 mile downstream of the Site within the past 10 years.*
- Adopted Stormwater Compliance Plans: *City of Kirkland Surface Water Masterplan, November 2014*
- Basin Reconnaissance Summary Reports: *None found at this time*