



# ENVIRONMENTAL STUDY REPORT

Northwest Whalley Infill Concept Plan Area  
Surrey, B.C.

Prepared for:

City of Surrey  
Community Planning Division  
Planning & Development Services

Prepared by:

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## EXECUTIVE SUMMARY

Phoenix Environmental Services Ltd. (Phoenix) has conducted a baseline environmental assessment (Environmental Study) as an initial step in a planning process leading to a small-scale infill area concept plan in the Northwest Whalley area of Surrey. This Environmental Study of the Northwest Whalley Infill Concept Plan Study Area has addressed key environmental attributes existing within the Study Area including watercourses and drainage, soils and topography, vegetation, trees, and wildlife habitat with emphasis on view protection and preservation, terrain assessment, slope stability, and tree canopy cover analysis.

The Study Area for the Northwest Whalley Infill Concept Plan (ICP) is generally bounded by Old Yale Road to the north, 128<sup>th</sup> Street to the east, 104<sup>th</sup> Avenue to the south and 125B Street to the west (see Figure 1, Appendix A for a location map of the ICP Study Area). The Study Area has been developed for primarily single family residential lots averaging 1695 m<sup>2</sup> (0.4 acre) in size. Recent redevelopment and several applications for more dense single family residential development have occurred in the Study Area, which is characterized as being very well treed with mature conifers that are clearly visible from New Westminster, the SkyTrain Bridge, the Pattullo Bridge, and other routes into Surrey; as well as offering views of the Fraser River and North Shore Mountains. The Study Area also is steeply sloped, particularly along the north and west portions. The Northwest Whalley Infill Concept Plan is being prepared, supported by this baseline environmental assessment, to address the possibilities for further redevelopment of the Study Area while also retaining the forest and view values of the neighbourhood.

The watercourses in the Study Area are classified as Class C watercourses, and are not considered to be fish and aquatic habitats requiring protection (see Figure 2, with mapping updates). Overland drainage in open watercourses over the steep slopes would pose risks for slope instability. Loss of groundwater recharge and changes in the hydrologic regime are significant impacts associated with urban development and densification of impervious ground surfaces, which can be mitigated by constructing stormwater infiltration and water quality enhancement facilities (e.g. bioswales) in conjunction with infill development of more gently sloping areas in the ICP Area.

The west, northwest and north edges of the Study Area are characterized by steep slopes that are steeper than 15%; and in some parts slopes are as steep as 39% - 49% (Figure 3). Most of the steep slopes have remained forested or otherwise densely vegetated, but houses have been erected near the crest and on constructed benches at or near the base of these prominently steep parts of the ICP Study Area. Detailed geotechnical investigation and engineering is recommended for all redevelopment of properties with slopes close to or greater than 15%. It is recommended that infill redevelopment involving increased single residence density avoid steep slopes and be directed elsewhere in the Study Area by the Infill Concept Plan.

It is also recommended that steep slopes on the west, northwest and north edges of the ICP Area be retained as predominantly forested, and enhanced with fir and cedar planting in existing disturbed portions. These are priority tree retention and protection areas for several objectives including: slope stability, wildlife habitat and movement corridor conservation, and preservation



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of the expansive mature forest-dominated distant views into the City that distinguish the Northwest Whalley neighbourhood from surrounding areas.

Mature stands of fir-dominated forest have been mapped within the Study Area (Figure 6), where trees around 60 m high and over 100 years in age remain in very good condition and health. Some are already protected on the City's Heritage Tree list, such as those around St. Helen's Church. There is also a distinctive stand of these trees between 127<sup>th</sup> and 128<sup>th</sup> Streets. It is recommended that re-development of some of the deep lots between 128<sup>th</sup> and 127<sup>th</sup> Streets, especially where mature, fir-dominated stands exist with the tallest and oldest trees, include retained bands or clusters of 20-30 m width, or preferably equal to the height of the tallest trees in the stand to be retained.

It is acknowledged in this Environmental Study, however, that there will be practical limitations to retention of an urban forest within an area where infill development is to be planned to comprise increased detached residential density. For planning purposes, priority areas for tree stand, wildlife habitat and view preservation under the Northwest Whalley Infill Concept Plan are the ridge and slopes of steep areas within the Study Area, in the vicinity of St. Helen's Church, and the mature, fir-dominated stand of 100+ year old trees between 127<sup>th</sup> Street and 128<sup>th</sup> Street.



## 1. INTRODUCTION

Phoenix Environmental Services Ltd. (Phoenix) has been retained by City of Surrey, Planning & Development Services, Community Planning Division (Surrey Planning) to conduct a baseline environmental assessment (Environmental Study) of the Northwest Whalley Infill Concept Plan Study Area with emphasis on view protection and preservation, terrain assessment, slope stability, and tree canopy cover analysis. By addressing key environmental attributes existing within the Study Area as a foundation for community planning, this Environmental Study is an initial step in a planning process leading to a small-scale infill area concept plan in the Northwest Whalley area of Surrey.

The Study Area for the Northwest Whalley Infill Concept Plan (ICP) is generally bounded by Old Yale Road to the north, 128<sup>th</sup> Street to the east, 104<sup>th</sup> Avenue to the south and 125B Street to the west, as shown in Figure 1 in Appendix A.

### 1.1 ENVIRONMENTAL STUDY OBJECTIVES

Before land use and development scenarios are formed for the Northwest Whalley Infill Concept Plan, Surrey Planning has commissioned a baseline environmental assessment of the Study Area with the primary objectives being view protection and preservation, terrain assessment, slope stability, and tree canopy preservation. Based on the Terms of Reference issued by the City (February 13, 2013), the Environmental Study for the Northwest Whalley ICP is intended to address areas with high arboriculture values, showing tree canopy coverage, as well as the identification of environmentally sensitive areas such as riparian areas, rare vegetation types, steep slopes, soil conditions, and connections to critical wildlife hubs, sites and corridors.

To address these objectives, this Environmental Study has entailed three key components:

- identification of retention priorities of specific trees or tree stands and canopy cover for arboricultural values and preservation of forest views from a distance while entering Surrey by routes from New Westminster, the Patullo Bridge and Skytrain;
- identification of retention priorities of specific trees or tree stands for wildlife habitat and movement corridors in support of the City's Green Infrastructure Network; and
- assessment of slope stability hazard risk areas by terrain analysis (e.g. >15% slopes), available soil mapping and reports, and observing evidence of slope instability (e.g. sloughing, tension cracks, soil creep). However, it is understood that a geotechnical engineering investigation is beyond the scope and budget for the requested environmental study.

The Environmental Study also has included assessment of fisheries watercourse classifications, areas of groundwater seeps or springs, rare and endangered species, ecologically significant and environmentally sensitive areas; and provides recommendations for protection and/or restoration of key environmental features, as well as arboricultural values.



## 1.2 STUDY AREA

The Northwest Whalley ICP Study Area (Figure 1) comprises approximately 30.86 hectares (76.26 acres) developed for primarily single family residential lots ranging from approximately 700 m<sup>2</sup> up to 4 acres, and averaging 1,695 m<sup>2</sup> in size. The ICP Study Area is characterized as being very well treed with mature conifers that are clearly visible from New Westminster, the SkyTrain Bridge, the Pattullo Bridge, and other routes into Surrey; as well as offering views of the Fraser River and North Shore Mountains. The Study Area also is steeply sloped, particularly along the north and west portions.

## 1.3 METHODOLOGY

The methodology for this Environmental Study has included use of existing information resources and reports, as well as extensive field reconnaissance, to conduct an inventory and assessment of arboricultural values including significant tree stands and specimens; fish, aquatic and wildlife habitats; and steep slopes and associated soil conditions within the ICP Study Area.

To conduct this Environmental Study, Phoenix has collaborated with Micheal. J. Mills Consulting, Certified Arborist (Arboricultural Values). The other consultant team members for this Study include: Megan Turnock, M.Sc., MLA, (Project Landscape Designer, View Assessment), Stephen Sims, R.P.Bio. (Fish Habitat and AutoCAD), Claudio Bianchini, R.P.Bio. (Wildlife Specialist), and Ken Lambertsen, R.P.Bio. (Senior Consultant and Project Manager).

### 1.3.1 Scope

The scope of work for this Environmental Study has entailed:

1. Reviewing available information resources (e.g. City Planning Report File: 7911-0192-00, City of Surrey Ecosystem Management Study Inventory Maps), aerial photography, COSMOS mapping resources, and other reports that available from the City.
2. Conducting an inventory of environmental features using a combination of a desktop review of existing information, aerial photography interpretation, extensive field study, data syntheses, and reporting including: steep slopes and terrain analysis, environmentally and arboriculturally significant trees and tree stands, existing mapped and unmapped watercourses, general and specific wildlife habitat features at the Site (e.g. wildlife trees, raptor nests), and prominent forested views into and within the Study Area.
3. Updating the City's existing aquatic/fisheries resources inventory and watercourse classification map, and compile a broad-based terrestrial resources inventory database, including a description of ecological features and functions.
4. Assessing and mapping significant trees, tree stands and canopy with potential for preservation of distant and local view resources. Arboricultural assessment has included identification of trees of unique character, large size and heritage value, as well as trees deemed to represent an immediate hazard to residents of the area to the extent possible.





5. Identifying and assessing terrestrial and aquatic wildlife habitats, including rare and endangered species, valued ecosystem components (e.g. raptor nests), wildlife movement corridors, and other key ecosystem features.
6. Assessing and mapping steep slopes (e.g. slopes >15%) using COSMOS topography, identifying specific areas where slope stability issues have been identified by field observation, and describing soil and slope stability risks based on available information.
7. Liasing with City staff, and meeting with City staff to update progress.
8. Producing this Environmental Study report.

### 1.3.2 Background Information Search

Prior to the field reconnaissance, pertinent background information (e.g. planning reports, existing development application sites, public information presentation materials) and online mapping resources (COSMOS) provided by the City were reviewed in order to focus field observations on fish and wildlife habitats, steep slopes, significant tree stands, viewpoints, and other pertinent features. The Surficial Geology Map for New Westminster (Map 1484A) was referenced for soil characteristics in the Study Area. Ravine Stability Assessments, which have been carried out (2002 – 2009) for the City along the North Bluff escarpment areas nearby the Study Area (e.g. Bridgeview and South Westminster) also were referenced.

A literature search was conducted covering the Northwest Whalley ICP area, including BC Conservation Data Centre (BCCDC) searches, Wildlife Tree Stewardship Program (WiTS) and local knowledge. Past reports of the Study Area including the City of Surrey Ecosystem Management Study (HB Lanarc and Raincoast 2011) were also reviewed. The BCCDC website was searched for all species listed under the Species at Risk Act (SARA), Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Provincial Identified Wildlife, and the Provincial Wildlife Act that are suspected to occur within habitats identified within the Study Area. In addition, species listed as Red and Blue-listed by the BCCDC, but not specifically covered under legislation, were also included. BCCDC data within the Study Area were also reviewed. Aerial photographs of the Study Area were examined and all potential habitats and wildlife corridors were stratified.

### 1.3.3 Field Surveys

Field observations of the Northwest Whalley ICP Study Area have been conducted on April 12, 15, 17, 23, and 24, and May 15 2013. The April 15 field observations pertained to watercourse assessments, steep slope assessments and initial arboricultural observations. Wildlife and habitat field surveys occurred on April 12. The viewpoint assessment field work was carried out on April 24. Additional arboricultural field work was conducted on April 17, 23 and May 15.

Watercourses were observed after a few days without rainfall and also during the time of year when shallow groundwater is still a source of baseflows. Watercourses were also examined in relation to their connectivity to downstream aquatic habitats with reference to existing drainage mapping (COSMOS) by the City.



Steep slopes were traversed along the north and west sides of the Study Area by accessing forested portions between existing lots, and from individual lots with owner permission. Steep slope were observed for signs of erosion, sloughing, soil creep, tension cracks and other slope instability indicators; however, a geotechnical engineering investigation has been beyond the scope of this Environmental Study.

The forested blocks and residential properties within the Study Area were assessed for wildlife and vegetation values during the April 12 field visit. General habitat types, plant and wildlife species occurrences, and environmentally sensitive areas were identified during the wildlife field visit. Wildlife were identified by visual observation, calls, tracks and other sign. Transects were walked throughout the identified habitats. Due to limited access to private properties only vegetation species at select sites were identified and recorded. The presence of coarse woody debris (CWD), wildlife trees, dens, burrows and other habitat features were also included in field Potential raptor/heron nest trees were scanned visually with binoculars. All wildlife and wildlife sign encountered was recorded. Utilization by wildlife not observed during the field surveys was inferred from available habitats, local information, and known distributions of wildlife.

Observations of the Study Area from New Westminster, the Patullo Bridge, and other viewpoints while entering the City were conducted for the view assessment, including observations within the Study Area.

Field observations for arboricultural values have been carried out over several days starting with general observations to more site-specific observations. Trees and tree stands within the Study Area were assessed in general terms based on visual review only. None of the existing trees were reviewed in detail (i.e. dissected, cored, probed or climbed). Tree stand delineation has been based on observations and aerial photographs. Observations of specific specimens of note have been included during field visits, including indications of tree health, tree form, and development impacts.

## 2. WATERCOURSES

The watercourses observed within the Study Area are constructed drainage watercourses. These watercourses are typically shallow, roadside drainage ditches that primarily convey stormwater runoff for limited periods, and generally go dry quickly after rainfall ends. These ditches typically do not convey groundwater, and have insignificant fish habitat value. However, a few drainage watercourses were observed to be flowing from shallow groundwater sources during the April 15 2013 field surveys.

### 2.1 WATERCOURSE CLASSIFICATIONS

The City of Surrey has classified watercourses according to their ability to support fish populations, together with colour coding for mapping purposes. The classifications include:

- Class A – watercourses that support fish populations year round, or have the potential to support fish populations year round if migration barriers are removed (red coded, solid lines).



- Class A(O) – watercourses that support fish populations generally only during the winter months; often roadside or farm ditches that have low flows, low dissolved oxygen, and warm temperatures in the summer (red coded, dashed lines).
- Class B – are not inhabited by fish populations, but provide food and nutrients to downstream fish populations and commonly provide flows most of the year by groundwater sources (yellow coded, solid lines).
- Class C – do not support fish populations and generally only convey flows associated with rainfall events; often roadside and property line ditches and shallow swales that go dry within 48-72 hours after a rainfall event (green coded, solid lines).

The colour-coding is also indicative of the level of protection warranted for each class of watercourse if changes in or about the watercourse are being considered; where red-coding is intended to signal stop, yellow-coding signals caution, and green-coding signals okay to proceed. For Class A and Class B watercourses, streamside protection setbacks between 15-30 m in width are commonly applicable, and alteration to the watercourse requires assessment, approval and replacement or restoration of fish habitat losses or damage. For Class C watercourses, no protection buffers or setbacks are required, and modification to Class C watercourses can proceed without further environmental assessment or approvals.

## 2.2 PROPOSED WATERCOURSE RE-CLASSIFICATIONS

All of the watercourses within the Northwest Whalley ICP Study Area are currently shown on the City's online mapping facility (COSMOS) as Class C watercourses (green-coded). Phoenix has observed each of the watercourses within Study Area for this Environmental Study, and has determined that these watercourses are Class C (i.e. not fish habitats). There have not been any other aquatic habitats (e.g. ponds, wetlands) found in the Study Area. The Watercourse Update Map for this assessment is presented in Appendix A, Figure 2.

During the field assessment, Phoenix noted a number of minor COSMOS watercourse mapping inaccuracies, and Figure 2 shows the current watercourse locations and areas where changes have been determined by the field assessment for this Environmental Study. For example, watercourses shown on COSMOS along 127<sup>th</sup> St. and 107A Ave. have been enclosed in storm sewers. There is also a previously unmapped Class C watercourse on 125B St. near the intersection with Old Yale Road, and two short Class C watercourses near the base of the slope at 12662 Old Yale Road.

During the April 15 2013 field assessment, several indications of shallow groundwater discharging into remaining roadside watercourses along 127<sup>th</sup> St. were observed. However, most of the Study Area is serviced with storm sewers for drainage, including along Old Yale Road (COSMOS drainage mapping). Storm sewers also extend well beyond the Study Area before drainage from within the Study Area discharges to surface water with aquatic habitat value. (e.g. Old Yale Rd. sewers drain to a pump station at the Fraser River, Phoenix 2013). If a watercourse receiving drainage from the Study Area was closer to the Study Area, the classification to Class B of some of the watercourses along 127<sup>th</sup> St. observed to be conveying shallow groundwater



(i.e. nutrient-contributing fish habitat values) could be warranted. Rather, it is apparent that groundwater baseflows from the Study Area that may otherwise be conveyed in roadside drainage ditches, especially near the base of steep slopes along 125B St. and Old Yale Rd., are collected in storm sewers or utility trenches, as well as individual lot drainage systems. Evidence of this was observed from substantial flows entering a catch basin on Old Yale Road at the north edge of 12701 - 107A Ave. after several days without rainfall. The small watercourses shown at 12662 Old Yale Road on Figure 2 receive flows from a remnant perimeter drain for a demolished house at that property, and near the base of the slope along a driveway extending to 12640 Old Yale Road. Flows from a plastic (Big-O) pipe draining a residence driveway around 10608/10630 - and 10660 - 125B St. were observed flowing down the 125B St. road surface to the short, shallow (previously unmapped) Class C watercourse near 125B St. and Old Yale Road.

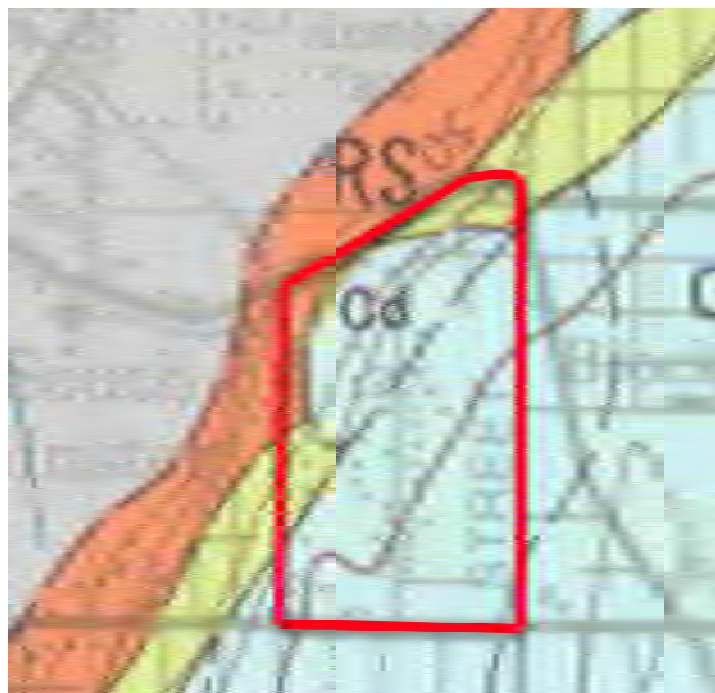
For reasons discussed above, some watercourses that might qualify as Class B habitat watercourses have been assessed as Class C watercourses under this Environmental Study.

### 3. STEEP SLOPES

The ICP Study Area predominantly slopes down to the northwest. From a local topographic height of land near the southeast corner of the Study Area near 128<sup>th</sup> St. and 104<sup>th</sup> Ave., westward and northwestward slopes along 128<sup>th</sup> St. and 127<sup>th</sup> St. are relatively gentle. However, the west, northwest and north edges of the Study Area are characterized by steep slopes that are steeper than 15%. Some parts of the steep slopes east of 125B St. and south of Old Yale Rd. have slopes of 39% - 49%. Terrain mapping based on topography available on COSMOS is presented on Figure 3 in Appendix B for more detailed reference. Most of the steep slopes have remained forested, but houses have been erected on constructed benches at or near the base of these prominently steep parts of the ICP Study Area.

#### 3.1 SOIL MAPPING

Surficial geology mapping of the ICP Study Area indicates that most of the Study Area native soils are Capilano Sediments (Cd), which are marine and glaciomarine deposits of stony silt and clay with minor sand content similar to glacial till. Soils along the steeper escarpment parts of the Study Area are Vashon Drift (Va) sandy till with lenses of stony silt. The RS soil mapping zone along the steep slopes of the Study Area shown in this Figure are earlier river (fluvial) and floodplain interbeds of sand and silt deposits before glaciation, referred to as Pre-





Vashon Deposits (PVa,c). The RS indicates areas of recorded landslides.

### 3.2 SLOPE INSTABILITY POTENTIAL

Ravine Stability Assessments have been carried out (2002 – 2009) for the City in the North Bluff escarpment areas, including the main ravine streams near the ICP Study Area. Areas of past and continuing localized bank failure and erosion have been documented at numerous locations along Bolivar Creek (east of King George Highway) and Robson Creek nearby to the west of the ICP Study Area. The creek ravines have steeply cut-down (incised) channels and banks through the same surficial native till-like soils extending along the North Bluff escarpment within the Study Area.

These creek ravine formations and slope features with evidence of past erosion and bank failure are indicative of the potential for slope failure from surface runoff erosion. Although the till-like native soils appear to be hard (e.g. commonly referred to as hardpan), water draining over and into these soils can result in more coarsely-grained lenses or interbeds to erode faster than overlying fine-textured deposits; resulting in collapse of the overlying soils and sloughing or a landslide/landslip. A prominent example of a suspected landslip is immediately adjacent to the ICP Study Area on the west side of 125B Street immediately north of 10541 – 125 B Street. A Class B watercourse drains from the base of the historic landslip, and the landslip location is shown by Note 3 on Figure 4: Slope Assessment Notes (Appendix A).

### 3.3 SLOPE ASSESSMENT OBSERVATIONS

Much of the steep sloped areas along the north and west sides of the Study Area were traversed and examined during the field assessment for overt indications of slope instability and potential geotechnical concerns. It must be noted, however, that a geotechnical investigation (e.g. borehole or test pit analysis) has not be part of the scope of work for this Environmental Study. Field observations for slope assessment purposes under this Study have included visual evidence of soil creep (e.g. curved base of tree trunks), tension cracks, localized sloughing, surface erosion, and other potential slope instability indicators commonly utilized for environmental and stream (e.g. Riparian Areas Regulation) assessments. The key field observations for slope assessment purposes are shown on Figure 4 (Appendix A) with specific notes provided.

While most of the areas with greater than 15% slopes (Figure 3) have been observed, two slope assessment polygons are shown on Figure 4 as representative areas of the Study Area. The steep slopes in the Study Area are predominantly well vegetated with native trees and shrub cover, with houses generally on less steeply sloped areas near the top of the escarpment (e.g. west of 127<sup>th</sup> St.) or along the base of the steep slopes (Old Yale Rd. & 125B St.). The largest slope assessment polygon (see Note 8, Figure 4) with slopes around 15-30% appeared to be stable and well vegetated with deciduous and mixed coniferous-deciduous tree cover, and was interspersed with previously disturbed/cleared areas along the northwest side of the Study Area, as well as re-graded slopes for benched house locations (see Photo 1, Appendix B). No evidence of soil creep, tension cracks or sloughing has been observed in these areas. On the densely forested steep slopes west of St. Helen's Church, much of the forest understorey appears to be cleared and maintained, but no soil creep or evidence of erosion or instability was observed; which is



considered to be attributable to the dense, closed-canopy tree cover stabilizing soil with root structure and minimizing rainfall runoff.

Another soil assessment polygon (Note 6, Figure 4) is also well vegetated with extensive tree cover; however, much steeper with about 49% slopes and evidence of soil creep among mature trees. Tension cracks were not observed, nor indications of sloughing. Although well vegetated, the ground surface in the very steep slope polygon displayed evidence of significant sheet flows over the slopes (Note 5, Figure 4). Gravel was exposed on these steep ground surfaces (i.e. surrounding finer texture soils washed away); however, there was no indication of minor channel erosion (e.g. rilling). It is evident that more significant erosion has not occurred due to the presence of extensive vegetated ground cover over the very steep slopes. The owner of 10592 – 125B St. (Note 4, Figure 4, Photo 2) indicated she has resided there for over 20 years and there has not been any slides on the very steep slopes behind her house, but that there is substantial water flowing off the slopes around her yard and her neighbour's yard to the north. A house and benched rear yard are located above the steep slope, which may contribute to the runoff. The very steep slopes in the smaller polygon (Note 6, Figure 4) are similar to those across 125B St. to the west next to the former landslip (Note 3, Figure 4).

Indications of soil movement in landscaped areas along steep slopes of the Study Area also have been observed. Where soil has been excavated and re-graded for residential development, the deposited soil and imported topsoil can slowly move over the undisturbed, more consolidated native till soils. Examples of soil creep from these activities have been observed with cracked and collapsing retaining walls along 125B St. (Notes 1 & 2, Figure 4, Photo 3).

The potential movement of more loosely consolidated fill deposits over steeper sloped native soils also can be influenced by drainage over and through these soils. Recently developed pan-handle lots located at 10677 & 10681 – 127<sup>th</sup> St. have exposed soil surfaces pending residential construction on these lower lots. Near the downslope edge of the lots, groundwater seepage was observed to be discharging from the exposed fill and appeared to be intercepted by a cross-gradient perforated drain pipe set at the ground surface near the crest of the steeper forested edge. The need for drainage runoff erosion control and retention of vegetation appears to be incorporated into recent residential re-developed in this location of the Study Area.

A potentially higher risk slope instability hazard has been observed on a single lot re-development site situated at 10721 – 107A Ave. (see Notes 10 & 11, Figure 4). The west edge of this property has been previously disturbed for installation of storm sewers and sanitary sewers extending to the base of the steep slope to manholes and sewer connection on Old Yale Road. More recently, about two-thirds of this residential lot has been excavated, and re-graded into benches and switch-back access road with exposed gravelly sandy silt soils over exceedingly steep slopes. At the base of the excavation, a partially constructed lock-block retaining wall and a possible house foundation excavation was observed on April 15 2013 (see Photos 5 & 6). A small settling pond also was observed at the edge of the retained forested slope down to Old Yale Road. The banks of the benches constructed over this lot were nearly vertical and had not been stabilized; however, it appeared that construction activity had not occurred for some time, possible to avoid wet weather construction challenges. At the base of the excavation for the suspected lower level of house foundations, groundwater seepage was observed. It also appeared that retained mature trees had been buried by about +1 m of fill. Geotechnical engineering



analysis and remediation recommendations appear to be required at this re-development site to complete the development without further risk of slope failure. Another house under construction on steep slopes has been observed at 12612 Old Yale Rd. (Note 7, Figure 4).

### 3.4 SLOPE ASSESSMENT

It is apparent that steeply sloped portions of the ICP Study Area have generally been left undisturbed excepted for a small number of benched residential properties. Although there has been evidence of slope instability potential, the steeper sloped portions of the Study Area appear to remain stable due to retention of dense vegetation ground cover and drainage runoff control (e.g. storm sewers along 125B St.). Past development of benched residential houses and yards has taken place without overt indications of slope failure, which indicates that slope instability hazard potential has been managed in the past and can likely be accomplished in selective areas of steep slopes for re-development within the Study Area with geotechnical engineering.

## 4. WILDLIFE HABITATS

The Study Area is located in the Dry Maritime subzone of the Coastal Western Hemlock biogeoclimatic zone (CWHdm) within the Georgia Depression Ecoprovince, Lower Mainland Ecoregion, Fraser Lowland Ecoregion. The Study Area was mainly urban residential with a small forested block situated west of St. Helen's Anglican Church. Lot sizes averaged 0.5 acres and most had mature coniferous trees.

An overview wildlife and vegetation assessment has been conducted as part of this Environmental Study. The assessment has focused on federally and provincially listed terrestrial wildlife and vegetation species and potential wildlife corridors that may be affected by redevelopment of the Northwest Whalley ICP area.

The City of Surrey's Ecosystem Management Study (HB Lanark and Raincoast Applied Ecology, 2011) has mapped Ecosystem Hubs and Ecosystem Sites within the Study Area. Hubs are areas of semi-natural or better vegetation of greater than 10 hectares in size. Sites are other natural areas that range in size from 0.25-10 hectares. The forested areas along the sloped escarpment west of 127<sup>th</sup> St. and the north edge of the Study Area are part of a large Ecosystem (Terrestrial) Hub mapped under the EMS Study, which extends further north along forested escarpment areas adjacent to the ICP area. Ecosystem Sites have been mapped within the Study Area generally where existing forest stands occur between 127<sup>th</sup> St. and 128<sup>th</sup> St. and near the St. Helen's Anglican Church site. The EMS Mapping for the area also shows an Ecosystem Corridor to the west of 125B St. angling across the north edge of the ICP Study Area.

This Environmental Study has identified existing wildlife movement corridors (i.e. wildlife observations) along the west and northwest side of the ICP Study Area, consistent with the EMS Hub mapping. The forests within the Ecosystem Sites between 127<sup>th</sup> St. and 128<sup>th</sup> St. are fragmented by existing residential development; however wildlife movement through these forested areas to the more contiguous forests along the escarpment may also occur. Refer to the Wildlife Corridor Map presented as Figure 5 in Appendix A.



## 4.1 VEGETATION OVERVIEW

Two vegetation types were identified within the Study Area:

- Forested Blocks Vegetation Type
- Residential Vegetation Type

The vegetation observed during the field survey is presented in Table 1.

### 4.1.1 Forested Blocks

The Forested Blocks Vegetation Type was associated with many of the back yards and vacant sites within the Study Area. Most forested areas were conifer dominated with western red cedar (*Thuja plicata*), Douglas-fir (*Pseudotsuga menziesii*) and western hemlock (*Tsuga heterophylla*) commonly encountered. Patches of deciduous trees were also observed including red alder (*Alnus rubra*), bigleaf maple (*Acer macrophyllum*) and paper birch (*Betula papyrifera*). The understory was composed generally of sparse to moderate (5 - 50%) cover of shrubs including salmonberry, vine maple (*Acer circinatum*) and red huckleberry (*Vaccinium parvifolium*). Sword fern typically dominated the herb layer. Less disturbed areas were observed west of St. Helen's Anglican Church while the understory of forested blocks within residential backyards were heavily modified. (Photos 7 – 9, Appendix B).

### 4.1.2 Residential

The Residential Vegetation Type was situated mainly along the frontages of all streets within the Study Area. The vegetation within these locations were dominated by maintained grass lawns and ornamental vegetation (Photo 10). Much of the vegetation of the residences along Old Yale Road were dominated mainly by invasive species such as Himalayan blackberry (Photo 12).

## 4.2 WILDLIFE TREES

A wildlife tree is any standing dead or living tree with special features that provides present or future critical habitats for the maintenance or enhancement of wildlife. There are nine classifications of coniferous and six classes of deciduous wildlife trees in various successions from live and healthy with no decay, to stumps and debris (Fenger et al. 2006). All of these wildlife tree stages provide important habitat, and are known to support more than 90 animal species in British Columbia, including cavity nesting birds and mammals (Backhouse 1993). Some of the uses include nesting, feeding, territoriality (i.e. bear mark trees, bird singing sites, etc.), roosting, shelter, and overwintering (Backhouse 1993).

There are nine decay classes of coniferous trees and six decay classes of deciduous trees within British Columbia (Fenger et al. 2006). Most of the trees observed in the Study Area were identified as Class 1 wildlife trees. Class 1 wildlife trees are described as live healthy trees with no decay. Class 7 and 8 wildlife trees were also identified within the Study Area. A Class 7 wildlife tree was observed at 10681 127th Street and a Class 8 wildlife tree was observed at





10628 - 127th Street (Photo 13). A figure with a description of each of the decay classes is presented in Table 2 of this report.

**Table 1:** Vegetation species detected within the Study Area (April 12, 2013)

Species	Scientific Name*	Forested Blocks	Residential
<b>Tree Layer<sup>1</sup>:</b>			
Bigleaf Maple	<i>Acer macrophyllum</i>	X	X
Cherry	<i>Prunus</i> sp.		X
Douglas-fir	<i>Pseudotsuga menziesii</i>	X	X
Larch	<i>Larix</i> sp.		X
Red Alder	<i>Alnus rubra</i>	X	X
Sequoia	<i>Sequoia sempervirens</i>	X	
Sitka Spruce	<i>Picea sitchensis</i>	X	
Western Hemlock	<i>Tsuga heterophylla</i>	X	X
Western Redcedar	<i>Thuja plicata</i>	X	X
<b>Shrub Layer<sup>2</sup>:</b>			
Blue Spruce	<i>Picea pungens</i>		X
Butterfly Bush	<i>Buddleja</i> sp.		X
Common Snowberry	<i>Symphoricarpos albus</i>	X	X
Douglas-fir	<i>Pseudotsuga menziesii</i>	X	X
English Holly	<i>Ilex aquifolium</i>	X	X
Himalayan Blackberry	<i>Rubus discolor</i>	X	X
Indian-plum	<i>Oemleria cerasiformis</i>	X	
Japanese knotweed	<i>Polygonum cuspidatum</i>	X	X
Lilac	<i>Syringa vulgaris</i>	X	
Magnolia	<i>Magnolia</i> sp.	X	
Red Alder	<i>Alnus rubra</i>	X	X
Red Elderberry	<i>Sambucus racemosa</i>	X	X
Red-flowering Currant	<i>Ribes sanguineum</i>	X	
Rhododendron	<i>Rhododendron</i> spp.	X	X
Salmonberry	<i>Rubus spectabilis</i>	X	
Western Hemlock	<i>Tsuga heterophylla</i>	X	X
Western Redcedar	<i>Thuja plicata</i>	X	X



**Table 1:** Vegetation species detected within the Study Area (cont'd)

Species	Scientific Name*	Forested Blocks	Residential
<b>Herb Layer:</b>			
Bleeding Heart	<i>Dicentra formosa</i>	X	X
Common Dandelion	<i>Taraxacum officinale</i>	X	X
Common Horsetail	<i>Equisetum arvense</i>		X
Creeping Buttercup	<i>Ranunculus acris</i>	X	
Curled Dock	<i>Rumex crispus</i>		X
English Ivy	<i>Hedera helix</i>	X	X
False Lily-of-the-valley	<i>Maianthemum dilatatum</i>	X	
Grasses	<i>Graminoid spp.</i>	X	X
Great Mullein	<i>Verbascum thapsus</i>		X
Ground-ivy	<i>Glechoma hederacea</i>	X	X
Lady Fern	<i>Athyrium filix-femina</i>	X	
Mint	<i>Mentha sp.</i>		X
Pineapple Weed	<i>Matricaria discoidea</i>		X
Periwinkle	<i>Vinca minor</i>		X
Red Clover	<i>Trifolium pratense</i>		X
Reed Canarygrass	<i>Phalaris arundinacea</i>		X
Sword Fern	<i>Polystichum munitum</i>	X	X
Western Trillium	<i>Trillium ovatum</i>	X	
White Clover	<i>Trifolium repens</i>		X
Yarrow	<i>Achillea millefolium</i>		X
Yellow Lamium	<i>Lamium galeobdolon</i>	X	X

<sup>1</sup> Tree Layer: Woody plants >2m in height

<sup>2</sup> Shrub Layer: Woody plants 0-2m in height







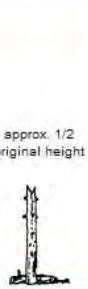
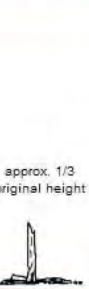

\* Scientific and common names from Klinkenberg 2006 (E-Flora BC)



Due to survey timing (early spring), no active nests were observed within the Study Area during the field program. Potential nest cavities (likely from the previous breeding season) were detected in one of the wildlife trees observed. A number of old cavities were also observed in the wildlife trees encountered. Pileated Woodpecker (*Dryocopus pileatus*) foraging sign was observed in trees within the forested blocks during the field assessment. These trees also provided habitat for many bird and mammal species including songbirds, squirrels and bats.

No Great Blue Heron or raptor nests were observed within the Study Area during the field investigation.

**Table 2:** Nine decay classes of coniferous wildlife trees (Fenger et al 2006).

LIVE		DEAD					DEAD FALLEN	
Decay class								
1	2	3	4	5	6	7	8	9
								
Description								
Live/healthy; no decay; tree has valuable habitat characteristics such as large, clustered or gnarled branches, or horizontal, thickly moss-covered branches.*	Live/unhealthy; internal decay or growth deformities (including insect damage, broken tops); dying tree.*	Dead; needles or twigs may be present; roots sound.	Dead; no needles/twigs; 50% of branches lost; loose bark; top usually broken; roots stable.	Dead; most branches/bark absent, some internal decay; roots of larger trees stable.	Dead; no branches or bark; sapwood/heartwood sloughing from upper bole; decay more advanced; lateral roots of larger trees softening; smaller ones unstable.	Dead; extensive internal decay; outer shell may be hard; lateral roots completely decomposed; hollow or nearly hollow shells.		Debris; downed trees or stumps.
Uses and users								
Nesting (e.g., Bald Eagle, Great Blue Heron colonies, Marbled Murrelet); feeding; roosting; perching.	Nesting/roosting <sup>1</sup> —strong PCEs <sup>2</sup> (woodpeckers); SCU <sup>3</sup> ; large-limb and platform nests (Ospreys); insect feeders.	Nesting/roosting—strong PCEs; SCU; bats.	Nesting/roosting—PCEs; SCU; insect feeders.	Nesting/roosting—weak PCEs (nuthatches, chickadees); SCU; bats; insect feeders.	Weaker PCEs; SCU; insect feeders; salamanders; small mammals; hunting perches.	Insect feeders; salamanders; small mammals; hunting perches; occasionally used by weak cavity excavators such as chickadees.		Insect feeders; salamanders; small mammals; drumming logs for grouse; flicker foraging; nutrient source.
<sup>1</sup> Large witches' brooms provide nesting/denning habitat for some species (e.g., fisher, squirrels). <sup>2</sup> PCE = primary cavity excavator <sup>3</sup> SCU = secondary cavity user * This classification system does not recognize root disease trees specifically. Such trees become unstable at or before death.								

### 4.3 COARSE WOODY DEBRIS

Limited coarse wood debris (CWD) cover occurred within the forested block situated to the west of St. Helen's Anglican Church, where much of the herb layer appears to be absent. No CWD cover was recorded within the remainder of the Study Area. Wildlife within the Study Area would benefit from the addition of CWD in strategic locations.



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#### 4.4 RARE VEGETATION

Due to Study timing (early spring) and limited access to private properties, observation of the presence of many herbaceous vegetation species was limited during the field survey. Based on the habitats observed, aerial imagery and BCCDC records, no rare vegetation species are anticipated to occur within the Study Area.

#### 4.5 ECOLOGICAL COMMUNITIES

The BC Conservation Data Centre (BCCDC) has listed ecological communities defined as natural plant communities and plant associations that include a wide range of known ecosystems with their environmental site requirements such as soil moisture and nutrients, climate, physiographic features and energy cycles.

The forested portions within the Study Area are predominately second growth stands. Most of the forested stands within the residential have modified understories and were not classified. The forested blocks west of St. Helen's Anglican Church and the two vacant lots situated 10628 and 10630 127th Street were identified as the Blue-listed Western Redcedar Sword Fern (Site Series 05) ecological community. It is likely that most of the Study Area was also part of the Site Series 05 ecological community prior to development.

Invasive vegetation species were encountered at many of the habitats and ecological communities observed within the Study Area and included species such as Himalayan blackberry, Japanese knotweed and English ivy (Photos 12 and 14). These invasive plant species were regularly encountered along interfaces of forested and disturbed or developed sites.

#### 4.6 WILDLIFE OBSERVATIONS

Wildlife activity was recorded throughout the Study Area. Songbirds were observed flying and feeding in vegetation throughout the Study Area. Suitable nesting habitat for raptors such as Bald Eagle, Red-tailed Hawk, Cooper's Hawk and owls were observed in most forested areas. Sign of coyote was detected within the northwest portion of the Study Area. The Yellow-listed (not at risk) northern Pacific tree frog (*Pseudacris regilla*) were heard calling within the Study Area. All animal species detected are listed in Table 3.



**Table 3:** Wildlife species detected within the Study Area (April 12, 2013).

Species	Scientific Name	Forested Blocks	Residential
<b>Amphibians:</b>			
Northern Pacific Tree Frog <sup>1</sup>	<i>Pseudacris regilla</i>	X	
<b>Birds:</b>			
American Robin <sup>1,2</sup>	<i>Turdus migratorius</i>	X	X
Bewick's Wren <sup>1</sup>	<i>Thryomanes bewickii</i>	X	
Black-capped Chickadee <sup>1,2</sup>	<i>Poecile atricapillus</i>	X	X
Chestnut-backed Chickadee <sup>1,2</sup>	<i>Poecile rufescens</i>	X	X
Dark-eyed Junco <sup>1,2</sup>	<i>Junco hyemalis</i>	X	X
Golden-crowned Kinglet <sup>1</sup>	<i>Regulus satrapa</i>	X	
Northwestern Crow <sup>1,2</sup>	<i>Corvus caurinus</i>	X	X
Pacific Wren <sup>1</sup>	<i>Troglodytes pacificus</i>	X	
Pileated Woodpecker <sup>3</sup>	<i>Dryocopus pileatus</i>	X	
Pine Siskin <sup>1,2</sup>	<i>Spinus pinus</i>	X	
Red-tailed Hawk <sup>4</sup>	<i>Buteo jamaicensis</i>		
Red-breasted Nuthatch <sup>1</sup>	<i>Sitta canadensis</i>	X	X
Ruby-crowned Kinglet <sup>1</sup>	<i>Regulus calendula</i>	X	
Steller's Jay <sup>1,2</sup>	<i>Cyanocitta stelleri</i>	X	X
Song Sparrow <sup>1,2</sup>	<i>Melospiza melodia</i>	X	X
Spotted Towhee <sup>1,2</sup>	<i>Pipilo maculatus</i>	X	X
Yellow-rumped Warbler <sup>1</sup>		X	
<b>Mammals:</b>			
Coyote <sup>2,5</sup>	<i>Canis lantrons</i>	X	X
Douglas Squirrel <sup>1</sup>	<i>Tamiasciurus douglasii</i>	X	
Eastern Grey Squirrel <sup>1,2</sup>	<i>Sciurus carolinensis</i>	X	X

<sup>1</sup>Heard <sup>2</sup>Seen <sup>3</sup>Forage Sign <sup>4</sup>Soaring Above <sup>5</sup>Scats

#### 4.7 WILDLIFE SPECIES OF CONCERN

Based on a review of existing literature and an assessment of suitable habitats, habitats within the Study Area were assessed for the two wildlife species that are included in federal (Species at Risk Act – SARA) and provincial (BCCDC) lists for Species of Concern.



#### 4.7.1 Great Blue Heron

In addition to being listed on Schedule 1 (Special Concern) of SARA, the Great Blue Heron *fannini* subspecies (*Ardea herodias fannini*) is also listed on the Provincial Blue List (BCCDC, 2013). No Great Blue Heron nests were detected during the field survey. The mature trees within the Study Area provide potential nesting habitat for this subspecies; however, human disturbance is a significant limiting factor within the Study Area.

#### 4.7.2 Pacific Sideband

The Pacific sideband snail (*Monadenia fidelis*) is Blue-listed by the BCCDC. This large snail species live in deciduous, coniferous or mixed forests, as well as in open forests and grassy areas.

No Pacific sideband snails were detected within the Study Area. Pacific sideband snails are typically dormant in the early spring, which limited their detection during the field survey. The forested blocks with relatively undisturbed understories within the Study Area provide potential habitat for Pacific sideband snail.

### 4.8 WILDLIFE CORRIDORS

A coyote was observed travelling along the slope near the corner of 125B Street and Old Yale Road within the Study Area. A cottontail rabbit was observed along the forest edge behind residences west of 127<sup>th</sup> St. near the northwest corner of the Study Area. Grey squirrels (*Sciurus carolinensis*) were also observed throughout the Study Area. In addition to coyotes, these corridors are likely used by many species of small mammals, birds, amphibians and reptiles.

## 5. ARBORICULTURAL VALUES

The assessment of arboricultural values in the ICP Study Area has been based on several field observations in April and May 2013, as well as aerial photo interpretation, to identify and map tree stand characteristics and individual trees of high value. Although extensively developed for residential properties, it is estimated that about one half of the Study Area is presently forested with native trees; many of which are over 100 years old. In general terms, native tree species dominate the forested areas and introduced species dominate in the developed areas. There are also many larger lots where development has incorporated both native and introduced species (Photos 15 & 16).

For the purposes of this Study, the ICP Study Area has been classified using general categories in order to better describe the Study Area conditions. These categories, primarily based on tree stand species characteristics, include: Mature Stand, Fir Dominated (about 16% of the Study Area), Semi-Mature Stand, Mixed Species (~20%), Deciduous Stands (~11%), and Developed Areas (~53% of the Study Area). The approximate locations of tree stand categories identified for this Study are presented in Figure 6: Stand Map in Appendix A. A copy of the arborist report by Michael J. Mills Consulting is presented in Appendix C and should be referenced for more detail.



## 5.1 MATURE STAND, FIR DOMINATED

There are several areas where Douglas Fir trees of relatively large size and maturity predominate. The most significant stand of trees is located to the rear of St Helens Church. The stand is dominated by Douglas Fir of very good quality with Western Red Cedar and Big Leaf Maple intermixed. Many of the largest trees in the Study Area, and several estimated to be in excess of 100 years old, are found within this stand. The understory vegetation is open and there are numerous trails that appear to be used frequently. Tree quality in this area is considered to be excellent.

Another stand of high quality trees is located within two large lots at 10628 & 10630 – 127<sup>th</sup> Street. This mature stand is comprised of large Firs and Cedars; some of which are estimated to be over 60 metres in height and could be as old as 120 years. This group of trees extends to a limited degree into the surrounding properties and across 127<sup>th</sup> Street into the properties to the west.

There is a small cluster of Firs located at the intersection of Old Yale Road and 125B Street that are notable for their tall height. Located on a height of land, this small cluster of tall Firs is clearly visible from the Skytrain and Patullo bridges and New Westminster to the west.

## 5.2 SEMI-MATURE STAND, MIXED SPECIES

There are several distinct areas where a mix of native trees has been largely unaffected by the current level of development. Much of the area defined as mixed species is actually dominated by Western Red Cedars, but with a significant component of Douglas Fir, Big Leaf Maple and Alder. Age class is estimated to average 60 – 80 years old. Within these areas, the Fir and the Cedar are typically of a more moderate scale than the Fir dominated stands, but still contain trees of good quality. Tree density tends to be sparser and the condition of the deciduous trees is variable with many of the Alder nearing maturity.

## 5.3 DECIDUOUS STANDS

There are several areas where tree cover is dominated by Alder, Big Leaf Maple and Cottonwood. The trees tend to be of moderate size and appear to be the result of natural re-vegetation after previous site disturbance. Tree quality in these areas tends to be moderate to poor. Selective preservation of trees in these areas would not generally be recommended.

## 5.4 DEVELOPED AREAS

There are several areas where smaller lots have been developed such that the preservation of trees has been limited. These areas generally occur along 104<sup>th</sup> Ave, 104A Ave, 107<sup>th</sup> Ave, 127A Street and 128<sup>th</sup> Street. There is also a strip through the centre of the area in alignment with 105A Ave. that has recently been developed into small lots. These areas generally share an absence of larger mature native trees. Landscape trees with a size and age correlated to the age of the development prevail. Within these areas, there are many quality high value landscape trees (e.g.



Japanese Maple). Bylaw protected trees species such as Monkey Puzzle Tree, Redwood and Dogwoods are present in small number.

## 5.5 SIGNIFICANT TREE SPECIMENS

There are many impressive trees within the Study Area, measured both by size and by landscape value. The largest tree by trunk diameter within the Study Area is a Western Red Cedar located in the parking area to the immediate rear of the St Helens Church. The trunk is estimated to be close to 2 m in diameter and the tree remains in good health. There are also several other large open-grown Firs and Cedars surrounding the main church building. It is reasonable to assume that these trees would date back to at least the construction of the church in 1911. There are nine Firs and Cedars surrounding the Church building that have been listed in the City of Surrey Heritage Tree inventory.

The tallest trees are considered to be those located within the two lots currently proposed for re-development at 10628 & 10630 - 127<sup>th</sup> Street. As noted previously, it is estimated that several trees within this stand exceed 60 metres in height. There are also several very tall firs at the intersection of Old Yale Road and 125B Street.

There is a Heritage Tree listed for the residential lot at 10648 – 127<sup>th</sup> Street. The tree is reported to be a Red Cedar with a trunk diameter of 138 cm. The rear yard of this lot was not accessed during the field visit to confirm the condition of this tree. It is noted, however, that the tree is not readily visible from the street frontage.

Other trees of note are as follows:

- There is a Giant Redwood located in the rear yard at 10579 – 127<sup>th</sup> Street that has a breast height diameter (dbh) close to 1 metre.
- Along the western edge of 127<sup>th</sup> Street in front of 10621 - 127<sup>th</sup> Street, there are several English Oak trees of large size.
- Several large and impressive Japanese Maples are located within the developed lots. Of note are the specimens found at 12704 – 107A Ave., 12728 - 104A Ave. and 10451 - 128<sup>th</sup> Street.
- Monkey Puzzle Trees of relatively small size are located at 10706 - 127A Street, 10450 - 127<sup>th</sup> Street and 10525 - 128<sup>th</sup> Street.
- A Chinese Fir (*Cunninghamia lanceolata*), which is a species rare in Surrey, forms part of the landscape in the front yard at 10507 - 128<sup>th</sup> Street.
- The Magnolia tree in the front yard of 12701 - 127A Street was in full bloom at the time of the field visits. This specimen has been reduced in value by poor pruning, but it remains a large specimen that is impressive when in bloom.





## 5.6 TREE HEALTH

Overall, the trees within the Study Area have been observed to be in good health. A few minor problems that have affected the health of a limited number of trees have been identified.

### 5.6.1 Development / Construction Impact

Where new development has occurred without adequate tree protection, decline and death has resulted. There are a number of lots throughout the Study Area where tree protection has not been adequate to protect the trees that have apparently been designated for retention.

At a relatively recent infill development at 10645 & 10649 – 127<sup>th</sup> Street, selective trees have been retained in relative close proximity to the new homes (Photo 18). It cannot be confirmed if or to what extent development activity impacted the trees; however, there is visible decline in a number of the retained trees, such that it can be expected that several trees will likely decline and require removal in the relative near future.

### 5.6.2 Disease and Insect Problems

Overall, the extent of disease and insect problems within the Study Area is minor.

There is a dead Lawson Cypress located in the front yard of 12759 - 107A Ave. The symptoms suggest that this tree has succumbed to the Phytophthora root disease (*P. lateralis*), which is very common to this species. The extent of the problem is not considered to be significant, due to the fact that there are only a few Lawson Cypress within the inventory of Study Area trees. There was one other dead Lawson Cypress within the Study Area in the rear yard of 10556 – 127<sup>th</sup> Street. It is difficult to determine if this tree was infected by *P. lateralis*, or if construction associated with the new home on this lot was the cause. It has been established that construction impact can result in increased susceptibility of Lawson Cypress to this disease.

One dead Douglas Fir, and another Fir that is under stress and in decline, have been observed during field visits. The dead tree is located to the rear of 10471 – 127<sup>th</sup> Street. The dead tree is located within a forested area where no recent disturbance has occurred. Visual evidence suggests that the tree has died due to Douglas Fir Bark Beetle infestation; however, evident tree disease observed for this Study has not been confirmed by lab testing. This problem is not common in Surrey, but it does occur from time to time. A tree under aggressive attack from this beetle will defoliate within a matter of several weeks. Typically, a healthy Douglas Fir will survive the attack; but in some cases, the trees do not recover. There was one other Fir located in the rear yard of 10519 – 128<sup>th</sup> Street that appears to be in decline with symptoms that are similar to typical beetle attack.

The City has indicated that for a recent development application at 10628 & 10630 - 127<sup>th</sup> Street an arborist report suggested laminated root rot may be present in the Douglas Firs. As the trees at this location and nearby have been outstanding in terms of height and age, this forested area was examined in some detail. Typical symptoms of disease of any kind in any of the trees on these lots have not been detected.



### 5.6.3 *Invasive Plants*

The ICP Study is similar to many areas of Surrey where invasive plant species have become a problem. English Ivy, Lamium, Vinca, Blackberry and Knotweed were all found to varying degrees within the forested areas. The only invasive plant with potential to harm trees is the English Ivy. Removal and eradication of the ivy should be encouraged whenever possible.

### 5.6.4 *Inappropriate Tree Retention*

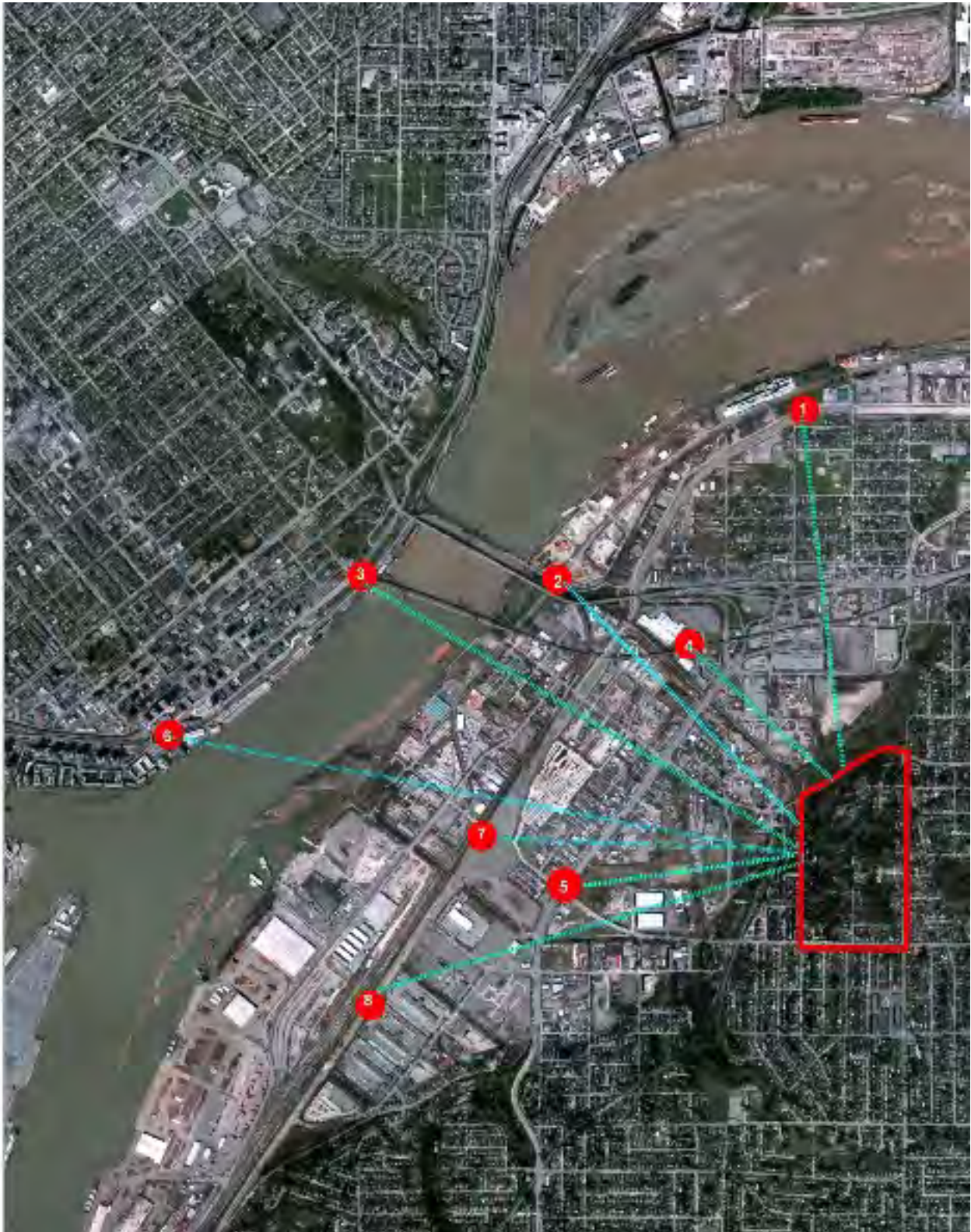
Not all trees are suitable for preservation in the context of residential development. In Surrey, the retention of trees is strongly promoted, and in some situations, this can result in the preservation of trees based solely on spatial consideration. Several trees have been observed in the Study Area that have been retained in conjunction with new development, but which should not have been retained. For example, a tree retained as a solitary tree from a previous forested situation can result in the retained tree potentially representing a risk to the residents due to dead limbs falling. Grown to maturity protected from wind by surrounding trees, a newly solitary tree would not be as windfirm as an open-grown tree.

## 6. VIEW ASSESSMENT

The view assessment for this Environmental Study is intended to address the valued viewscales in the Study Area that are also most susceptible to loss or deterioration through infill re-development without a guiding plan. A key objective of this view assessment has been to suggest how to protect and preserve the beauty and accessibility of the area and its landscapes, while providing for sustainable growth and development.

The potential visual impact of infill development within the Northwest Whalley ICP Area has been assessed by first establishing the baseline condition of the existing Study Area character and vegetation and the context of adjacent development patterns. The key viewpoints identified by the City of Surrey during preliminary planning have been taken into account to determine the likely impact of vegetation removal and development. In evaluating the impact from key viewpoints, the following components were taken into consideration:

- The distance of the viewpoint from the site
- The prominence of the neighbourhood within the overall view
- The type of user likely to view the site from that point (i.e. resident, recreational user, driver, workers, etc.)
- The number of observers likely to view the site from that point, in general
- The likely duration of observations.



Viewpoints to the Study Area identified by the City of Surrey during preliminary planning



A preliminary set of mitigation strategies are proposed, which may lessen the visual impact of infill development from the key viewpoints and will help maintain the existing neighbourhood character and views from within the neighbourhood.

## 6.1 NEIGHBOURHOOD CHARACTER, VEGETATION AND CONTEXT

Overall, the Northwest Whalley ICP area (neighbourhood) has a high percentage of forest cover and many mature coniferous and deciduous trees, as noted previously in this report. Although the neighbourhood has been extensively developed for residential uses, a majority of the lots are large and have only a single house; so the development is essentially invisible when looking at the site from the key viewpoints. The rear yards of many of the lots have stratified vegetation layers (trees, shrubs, and ground covers), which can contribute significantly to the biodiversity of an area by providing a wide variety of habitats, food sources, nesting opportunities and other wildlife benefits.

In contrast, adjacent neighbourhoods have almost no mature native trees or forest habitat. When observed from the same viewpoints, the adjacent homes are in plain view, and what little vegetation is present is comprised of small non-native trees and shrubs.

The character of the Northwest Whalley neighbourhood is intricately tied to the existing vegetation not only from the key viewpoints to the north of the neighbourhood, but also from within it. Two typical examples of the character are shown in the photos below. In each, the vegetation dominates the view, and only one or two homes are visible, even from a close distance.



View looking North down 127<sup>th</sup> Street from near the intersection with 104<sup>th</sup> Avenue.



View looking North down 127<sup>th</sup> Street from near the centre of the neighbourhood.

## 6.2 VIEWPOINT ASSESSMENT

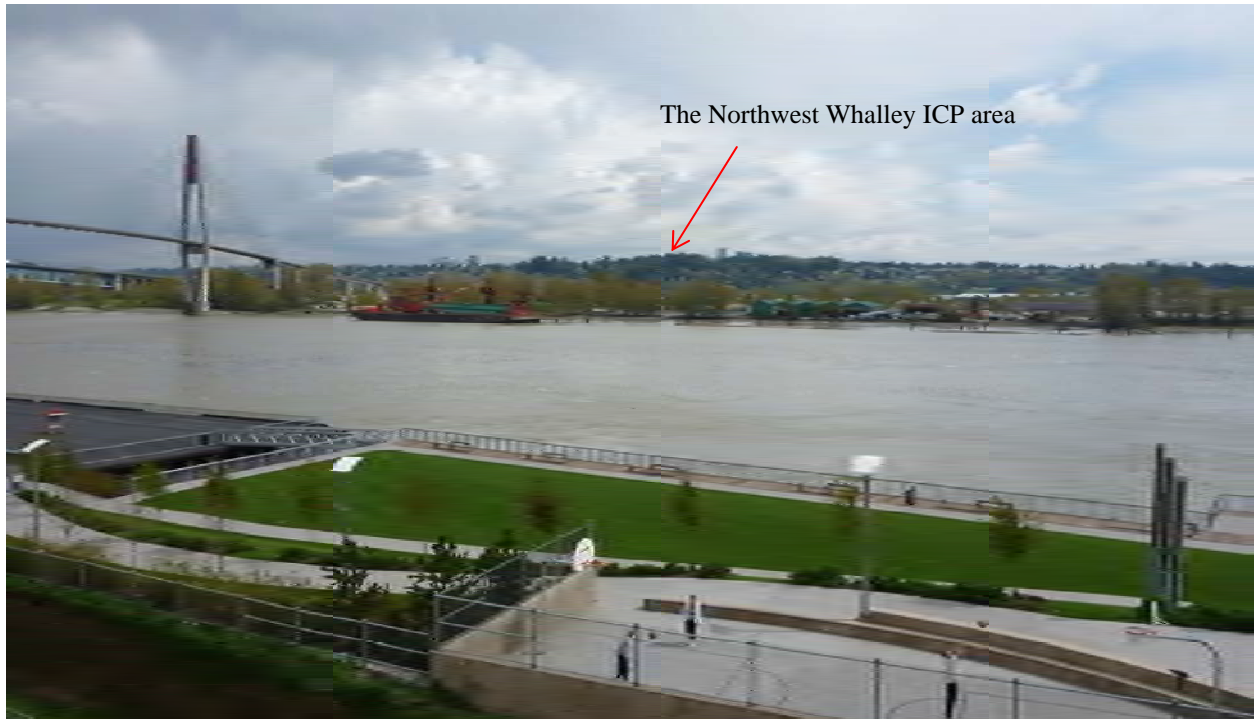
The following major viewpoints into the Northwest Whalley ICP Area have been assessed.

### 6.2.1 *New Westminster*

The viewpoints from across the Fraser River in New Westminster are relatively distant, and while the tall and dense forest along the ridgeline can be seen, the Northwest Whalley neighbourhood can be overlooked. The views that likely attract more attention are closer, directly along the river and include the riparian tree habitats, boats, and industrial activities. The distant views into Surrey are dominated by the industrial landscape in the foreground, on the south bank of the river. Nevertheless, the Northwest Whalley ICP area remains distinctive as a prominent forest among adjacent residential areas and new highrises beyond (e.g. Central City); not the houses within the neighbourhood.

Most viewpoints from New Westminster are along roadways and provide only temporary views of the Northwest Whalley ICP area and are also more likely to be peripheral views. There are several waterfront residential and commercial developments, which may have better stationary views of the Study Area.

To preserve the distant views from New Westminster, the main feature visible from that distance is the ridgeline of trees, and the mix of mature trees along the west and north slopes. While priority should be given to as much retention as possible with re-development in the ICP area, those trees that form the ridge and the slope could be thinned while still retaining good overall visual vegetation coverage from a long distance. In other words, the visual impact of tree loss in those parts of the ICP is likely to be less noticeable from a distance.



Stationary view opportunity of the Northwest Whalley ICP area from New Westminster

### 6.2.2 *Pattullo Bridge and SkyTrain Bridge*

The journey across the river by automobile or SkyTrain offers the most prominent views of the neighbourhood due to the elevation and the direct line of both bridges toward the southeast with the neighbourhood visible straight ahead or just to the right. A large number of people travel across the river daily. The portion of the journey where the neighbourhood is visible is relatively short (about 1 minute), but the predominant forest character of the view from both bridges remains distinctive relative to surrounding areas. Extensive clearing of the existing forested slopes would certainly be noticed.

To mitigate changes to the view, retention of most of the mature trees along the ridge, over the escarpment slope, and the west and north perimeter of the ICP area should be considered.



View from the Pattullo Bridge

### 6.2.3 *Scott Road and Old Yale Road*

The closer viewpoints are along Scott Road, within the industrial area between the neighbourhood and the Fraser River. There are some areas of residential development, but the existing trees in those areas block a majority of the long views. Conversely, even at close proximity, existing houses and roads are not visible.

A majority of the viewers in close proximity are likely moving or are inside buildings and do not have prolonged periods of time with the neighbourhood in view. There were no major recreation areas or parks in the area, although there is a school at the intersection of Old Yale Road and 124<sup>th</sup> Street.

The loss of any of the tall tree stands would be most conspicuous from the closer views of the ICP area from the adjacent relatively flat Scott Road area. While a close view does not afford the opportunity to distinguish the prominence of the forest slopes of the ICP area from surrounding neighbourhoods, removal of numerous large trees in one area would be the far more noticeable than from distant views.



Old Yale Road at 124<sup>th</sup> Street – looking southeast

Of the three viewed zones, the primary concern based on this initial view assessment is the Pattullo Bridge and SkyTrain views. As previously stated, maintaining the ridgeline is important for the long views and retention of as many mature trees along the western and northern slopes as possible will likely mitigate the clearing within the flatter portions of the interior neighbourhood. It should also be noted that retention of clusters or individual mature trees, both evergreens and deciduous native species, within each lot will contribute to maintaining the overall character of the neighbourhood as viewed within the ICP area.

## 7. IMPACT ASSESSMENT AND MITIGATION

This Environmental Study of the Northwest Whalley area of Surrey has addressed key environmental attributes existing within the Study Area including watercourses and drainage, soils and topography, trees, vegetation and wildlife habitat with emphasis on terrain assessment, slope stability, tree canopy cover analysis and view protection and preservation. The main findings of this Environmental Study are applied to the following assessment of the potential impacts associated with small-scale infill development proposed for the Study Area, and recommendations for mitigation of potential impacts, to assist in the development of the Northwest Whalley Infill Concept Plan by the Surrey Planning.





## 7.1 WATERCOURSES

The watercourses observed within the Study Area are constructed roadside drainage ditches that primarily convey stormwater runoff for limited periods, and generally go dry quickly after rainfall ends. As such, the watercourses in the Study Area are classified as Class C watercourses, and are not considered to be fish and aquatic habitats requiring protection. Most of the stormwater drainage within the Study Area is collected in storm sewers, which in turn drain to an extensive network of storm sewers draining to the Fraser River through a pump station at the foot of Old Yale Road. While there are Class B and Class A watercourses providing fish habitat nearby the Study Area (Figure 2), and some existing ditches within the Study Area have been observed to convey groundwater baseflows, the watercourses in the Study Area do not drain to those adjacent fish habitats.

With the topographic gradient to the west and north across the Study Area extending to steep slopes around the western and northern edges of the Study Area, drainage via open watercourses over the steep slopes would pose risks for slope instability. Accordingly, storm sewers have been extended down the steep slope near the 127<sup>th</sup> St. and 107A Ave. intersection, along Old Yale Road, and along 125B Street. Therefore, “daylighting” existing storm sewers and converting existing private property into a creek ravine in order to expand fish and aquatic habitat values within the Study Area is not considered to be feasible or acceptable.

Infiltration of rainwater to groundwater within forested and vegetated portions of the Study Area (i.e. groundwater recharge) that are not steeply sloped, such as in the southeastern part of the ICP Study Area, is important to consider with re-development of the ICP area. Loss of groundwater recharge and changes in the hydrologic regime are significant impacts associated with urban development and densification of impervious ground surfaces. To mitigate these impacts, constructed stormwater infiltration facilities that can also provide stormwater quality treatment (e.g. bioswales) should be considered in the less steeply sloped portions of the ICP area.

## 7.2 STEEP SLOPES

From a local topographic height of land near the southeast corner of the Study Area, westward and northwestward slopes along 128<sup>th</sup> St. and 127<sup>th</sup> St. are relatively gentle. However, the west, northwest and north edges of the Study Area are characterized by steep slopes that are steeper than 15%; and in some parts slopes are as steep as 39% - 49% (Figure 3).

Most of the steep slopes have remained forested or otherwise densely vegetated, but houses have been erected near the crest and on constructed benches at or near the base of these prominently steep parts of the ICP Study Area. Past development of benched residential houses and yards has taken place without overt indications of slope failure. However, slope instability concerns such as failing retaining walls and areas with curved tree trunks (e.g. soil creep) have been observed, as well as a nearby historical landslide. Recent landslides elsewhere nearby have been recorded on surficial geology mapping for the area. A current example of overly steep excavation and filling of steep slopes at 12701 – 107A Ave. is representative the potential risks for slope failure with re-development over the most steeply sloped portions of the ICP Area. Nevertheless, it is evident that slope instability hazard potential has been managed in the past and can likely be



accomplished in selective areas of steep slopes for re-development within the Study Area with geotechnical engineering.

Aside from the obvious requirement for detailed geotechnical investigation and engineering for all re-development of properties with slopes close to or greater than 15%, it is recommended that steep slopes be retained as predominantly forested. It is recommended that infill re-development involving increased single residence density avoid steep slopes and be directed elsewhere in the Study Area by the Infill Concept Plan. Consideration could be given to increasing the size of existing housing in selective locations subject to geotechnical assessment. To further mitigate slope instability potential, restoration planting of disturbed areas with native tree species such as fir and cedar is recommended.

### 7.3 WILDLIFE HABITAT

This Environmental Study has identified existing wildlife movement corridors (i.e. wildlife observations) along the west and northwest side of the ICP Study Area, consistent with the EMS Terrestrial Hub mapped within the ICP Area (Figure 5). The forests within the Ecosystem Sites between 127<sup>th</sup> St. and 128<sup>th</sup> St. are fragmented by existing residential development; however wildlife movement through these forested areas to the more contiguous forests along the escarpment may also occur.

The forested stands provide important nesting habitat for raptors such as Bald Eagle, Red-tailed Hawk and Cooper's Hawk; however, no raptor nests have been detected within the Study Area. Wildlife sign encountered during the field observations included coyote, rabbit and squirrel; and existing forest habitat can support several other small mammal and wildlife species tolerant of human disturbance. The forested habitats also provide important habitat for many songbird species. No rare or endangered plants or animals (e.g. Species at Risk) have been detected in the Study Area.

The loss of mature forest habitat through infill redevelopment and increased human disturbance will degrade the abundance and quality of existing wildlife habitat within the ICP area. These impacts can be mitigated by retention of large contiguous stands of treed habitat that can continue to provide wildlife habitat and movement corridors to other remnant forest wildlife habitat along the City's North Bluff escarpment area.

It is recommended that broad areas of existing mature forest vegetation, especially along the steep slopes on the west, northwest and north edges of the ICP area be retained. Control and removal of invasive plant species (e.g. blackberry, knotweed) by dense planting of shade-promoting tree species (e.g. alder) supplemented with fir and cedar is also recommended. The placement of bird nest boxes, bat boxes and coarse woody debris at strategic locations would benefit many wildlife species.

### 7.4 ARBORICULTURAL VALUES

The existing trees within the Study Area represent a significant part of the urban forest in Northwest Whalley. In observing aerial photos of the City, and viewed from a distance, it is



immediately apparent that the Study Area represents the most densely forested portion of the northwest corner of the City.

Where past development and the more recent infill projects have occurred, the pre-existing trees have generally been removed; with some exceptions (Photos, Appendix B). Some of the more established developed areas were re-planted, and as the new trees have grown, the density of tree cover has re-established. However, the new trees tend to more non-native ornamental varieties that lack the ecological values of native tree stands. Other recent infill projects where selective tree retention has been attempted appear to have resulted in mixed success with tree decline and construction abuse evident on many of the recent or in progress developments.

The effect on slope stability resulting from tree removals from steep sloped areas should be studied in detail as part of any development application associated with west, northwest and north edges of the ICP area. The on-going development work at 12701 - 107A Ave is an example of how the removal of the trees can potentially affect slope stability. Retention of mature trees over existing steep slopes is also important for mitigating wind effects (i.e. windthrow, hazard trees) on remaining retained trees where infill development occurs in other parts of the ICP area.

#### **7.4.1 Tree Preservation**

The preservation of forest grown mature trees in relation to residential development presents many challenges. Selective preservation of trees from the protected confines of a forest stand often results in unpredictable tree behaviour. The typical tall and thin form of forest grown trees can result in unsuitable candidates for tree retention. There have been significant failures from selective and thin clusters of forest grown trees where preservation has been attempted in the past. Douglas Fir is known to release large limbs when under strong wind loading. The loss of limbs is how the tree responds to wind as opposed to full tree failure. When large Firs shed large limbs, the branches tend to be end weighted and can fall in a vertical spear-like orientation. As a result, residential development directly under large mature Firs is not recommended.

Various studies and experience on the Greater Vancouver North Shore slopes has resulted in a guideline recommendation that the width of leave strips of forest grown trees should at a minimum equal the height of the tallest trees in the group. The wider the leave strip, the more stable trees within the retained group tend to be. It is recommended that redevelopment of some of the deep lots between 128<sup>th</sup> and 127<sup>th</sup> Streets, especially where mature, fir-dominated stands exist with the tallest and oldest (100 years) trees, include bands or clusters of 20-30 m width. It is recommended that tall, mature trees along the crest of the steep slopes in the ICP Study Area, such as along pan-handle lots west of 127<sup>th</sup> St. be retained in a wider strip.

The location of existing trees should be considered in the design of development. Trees of high quality or those with wildlife, cultural or heritage value should be identified before the site plan has been completed.

#### **7.4.2 Tree Protection**

The City of Surrey has a well established system for ensuring trees are protected during development. While the City typically does a good job of enforcing its policies on tree



protection, observations of the Study Area suggest that the system has weaknesses. Where development is presently active within the Study Area, tree protection measures are either missing or in poor condition.

### **7.4.3 Tree Replacement**

Where development is approved, a policy of no net loss of trees through the planting of replacement trees should be encouraged. Surrey's current policy of two-for-one replacement is supported. However, when development is approved for forested site, it is often not feasible to achieve this goal due to the high number of trees that need to be removed.

### **7.4.4 Tree Enhancement**

Encouraging the planting of additional trees to enhance development properties and streetscapes beyond the requirements of boulevard trees is suggested. The developed areas with no immediate development plans should also be encouraged to add trees and landscape where appropriate. Whenever possible, Douglas Fir and Western Red Cedar should be encouraged, as these are the native climax species of trees for this area of Surrey.

Reference should be made to the full Tree Assessment Report presented in Appendix C of this report for other recommendations to protect arboricultural values within the ICP area. Those general recommendations include that a detailed arboricultural assessment by a qualified expert should be undertaken for any redevelopment applications. Trees on steep slopes should be retained, wherever possible. Where trees of large size are retained, large groups or wide leave strips (e.g. 20-30 m) are preferred.

## **7.5 VIEW ASSESSMENT**

It is considered that the primary viewpoints of concern based on this initial assessment are the views from the Pattullo Bridge and SkyTrain Bridge. While the predominance of forested landscape at the Northwest Whalley ICP is valuable from all viewpoints, the potential for visual impacts from extensive development within the ICP could be most evident in terms of scale from these vantage points. It is possible that selective thinning of trees for low density residential development, and retention of as many of the tallest and oldest trees, within the central areas of the ICP area could occur with low visual impact to views of the ICP area. This is demonstrated by the current views, even with recent infill developments completed or underway.

Retention of as much of the tall trees and prominent tree stands along the crest of the escarpment (ridgeline) and across the steep slopes on the west, northwest and north edges of the ICP area is the key to preserving the dominant forest viewscape looking toward the neighbourhood from approaches and entrances to the City from the north and west of Surrey.



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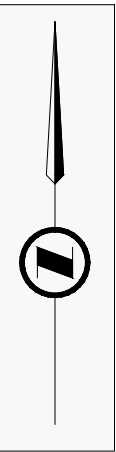
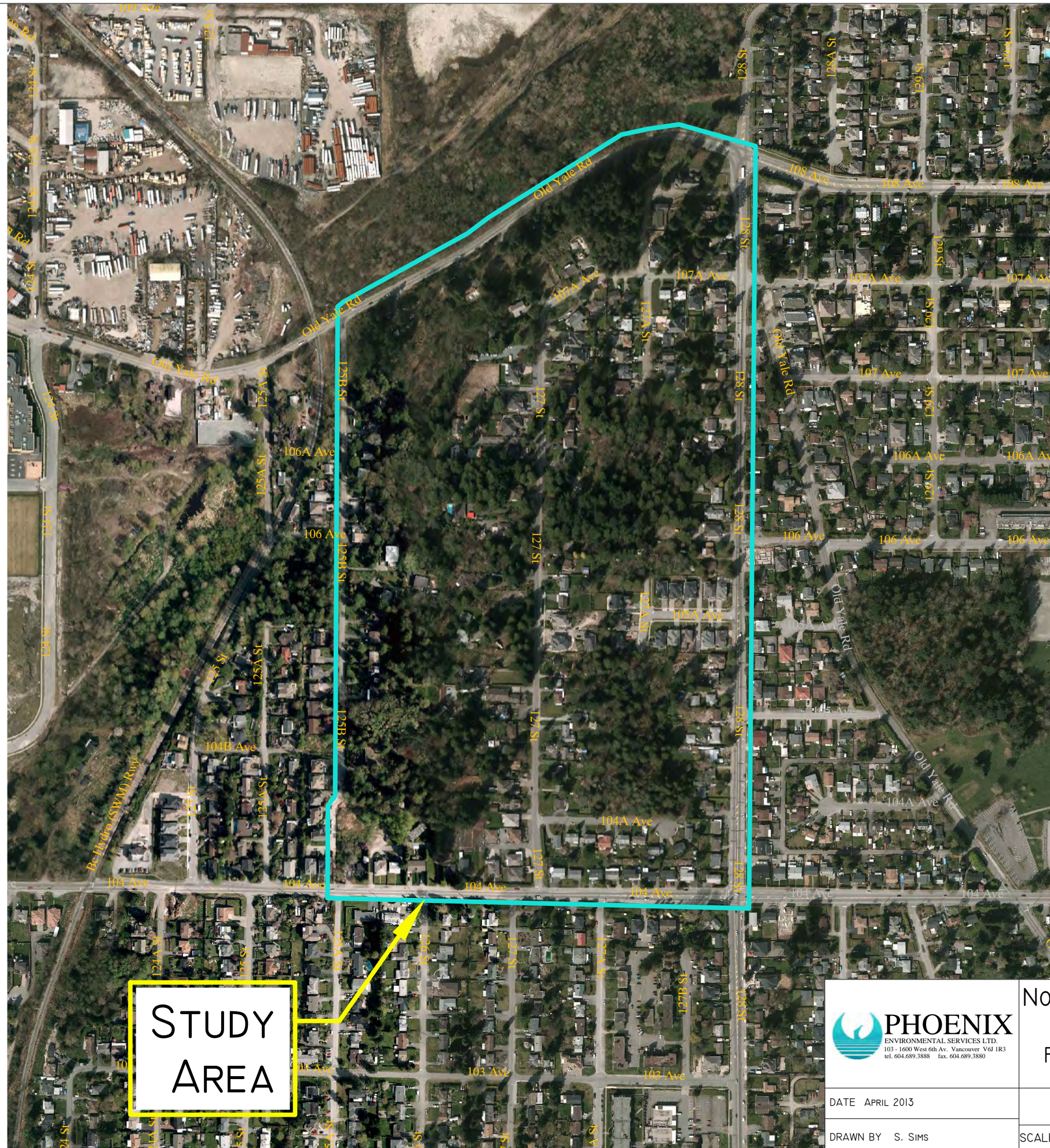
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## APPENDIX A

### **Figures**



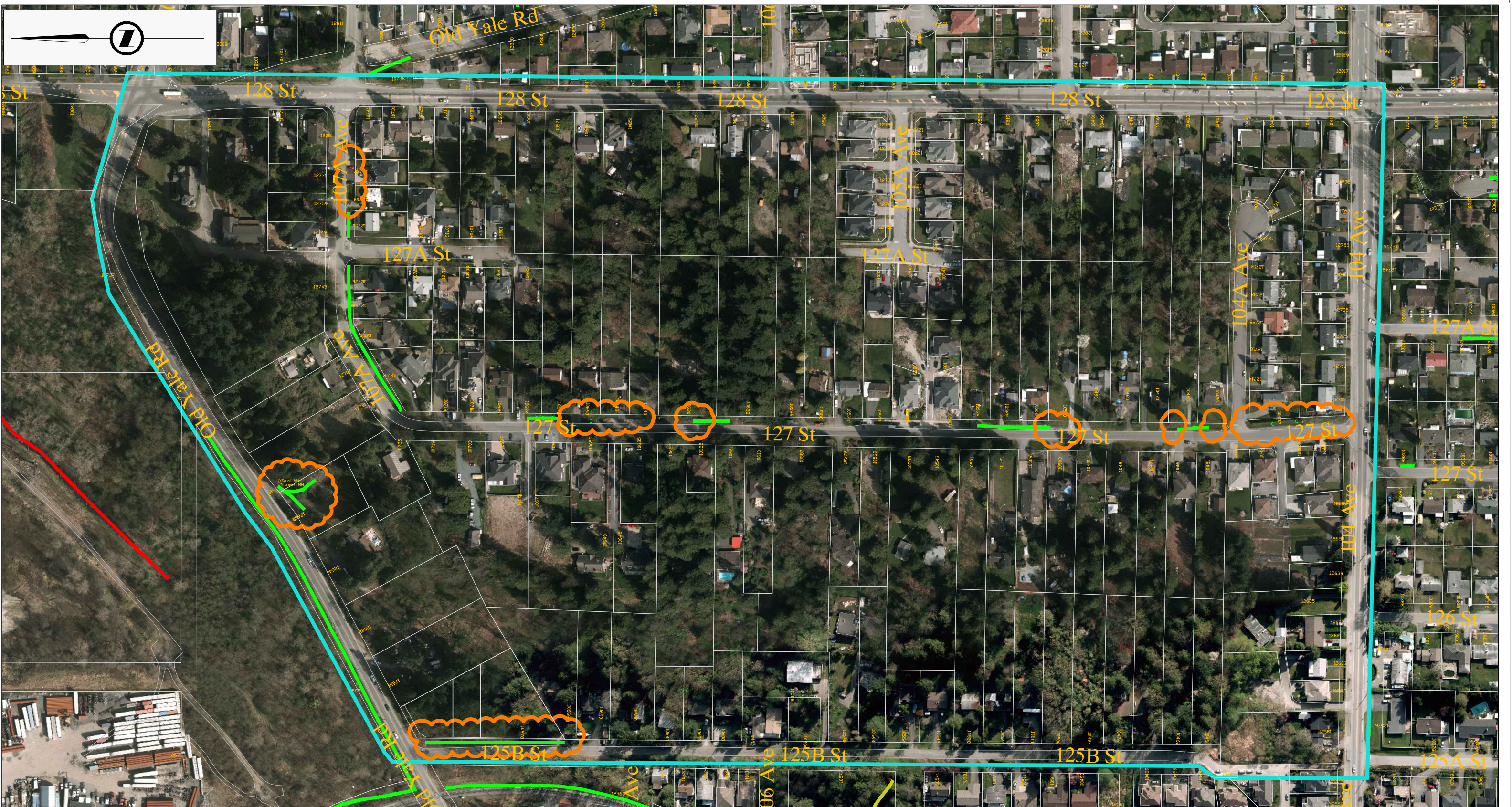
**STUDY  
AREA**



**NORTHWEST WHALLEY INFILL CONCEPT  
PLAN ENVIRONMENTAL STUDY  
FIGURE I - STUDY AREA LOCATION MAP**

DATE APRIL 2013  
DRAWN BY S. SIMS

SCALE 1:5,000	DRAWING NO. NW WHALLEY_INFILL_CONCEPT_STUDY.DWG	REV 00
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- CLASS "A" WATERCOURSE
- CLASS "A(0)" WATERCOURSE
- CLASS "B" WATERCOURSE
- CLASS "C" WATERCOURSE
- WATERCOURSE MAPPING CHANGES
- STUDY AREA

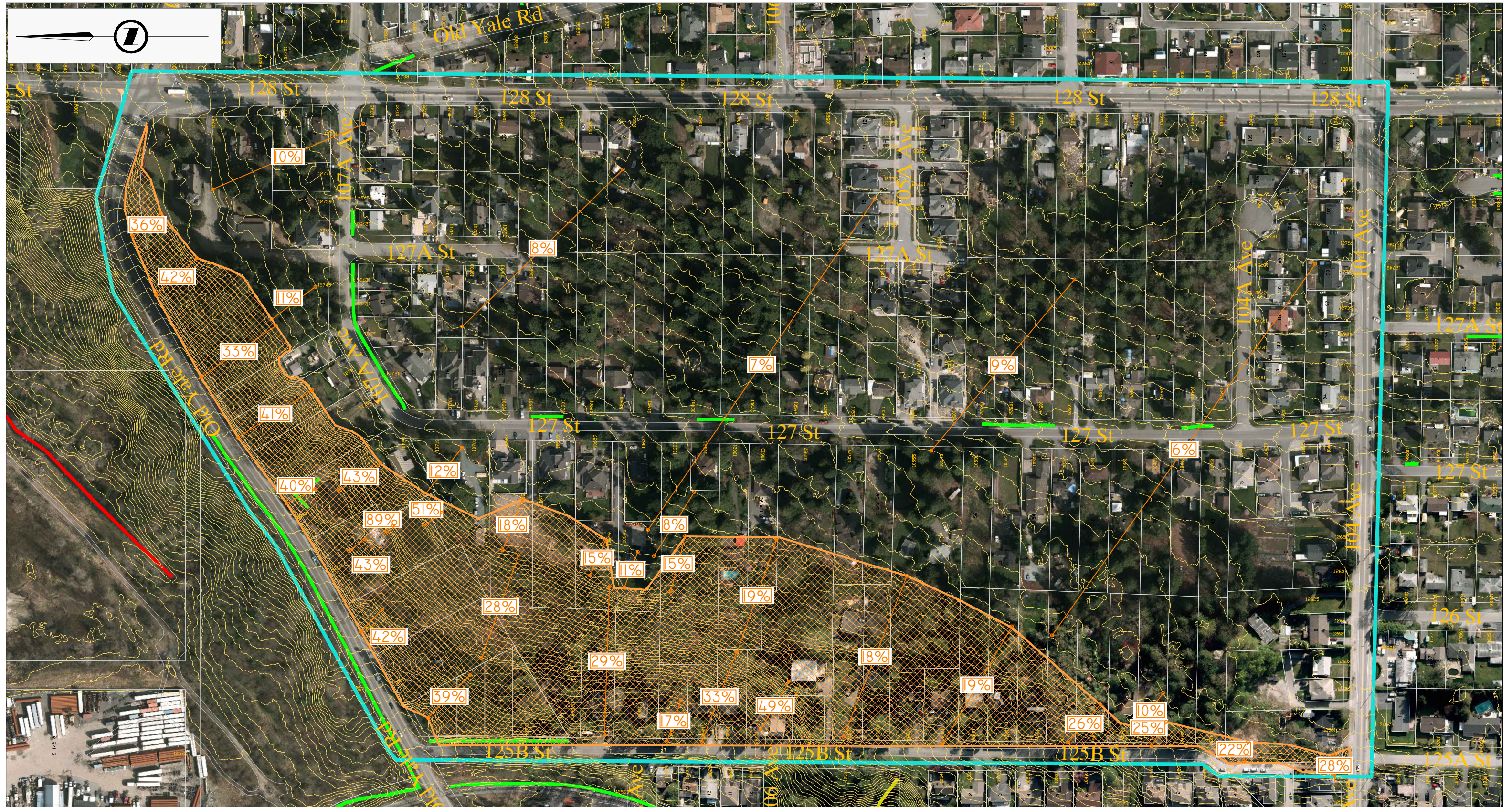




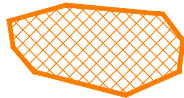



**NORTHWEST WHALLEY INFILL CONCEPT  
PLAN ENVIRONMENTAL STUDY  
FIGURE 2 - WATERCOURSE UPDATE MAP**


\*NOTE\* BASE LAYERS AND CREEK CLASSIFICATIONS COURTESY OF CITY OF SURREY COSMOS MAPPING (2012).

DATE APRIL 2013		REV 00
DRAWN BY S. SIMS	SCALE 1:2500	DRAWING NO. NW_WHALLEY_INFILL_CONCEPT_STUDY.DWG



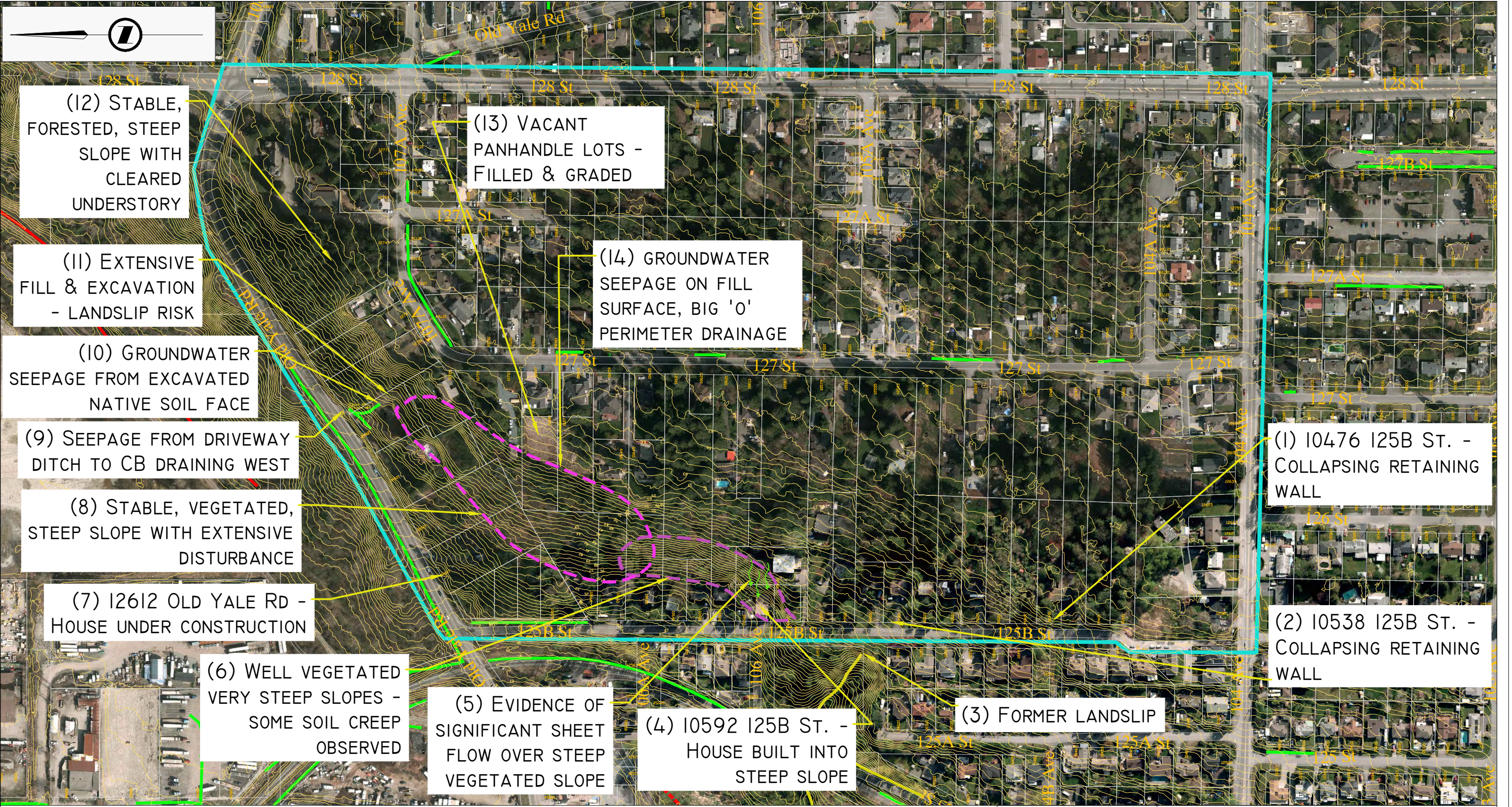


	CLASS "A" WATERCOURSE		CLASS "B" WATERCOURSE		STEEP SLOPES >15%
	CLASS "A(0)" WATERCOURSE		CLASS "C" WATERCOURSE		STUDY AREA

 <p><b>PHOENIX</b> ENVIRONMENTAL SERVICES LTD. 1103 - 1600 West 6th Av. Vancouver V6I 1R3 tel. 604.689.3888 fax. 604.689.3880</p>	<p><b>NORTHWEST WHALLEY INFILL CONCEPT PLAN ENVIRONMENTAL STUDY</b></p> <p><b>FIGURE 3 - STEEP SLOPES</b></p>	
	<p>DATE APRIL 2013</p>	<p>REV 00</p>

\*NOTE\* BASE LAYERS AND CREEK CLASSIFICATIONS COURTESY OF CITY OF SURREY COSMOS MAPPING (2012).

<p>DRAWN BY S. SIMS</p>	<p>SCALE 1:2500</p>	<p>DRAWING NO. NW_WHALLEY_INFILL_CONCEPT_STUDY.DWG</p>
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(12) STABLE, FORESTED, STEEP SLOPE WITH CLEARED UNDERSTORY

(11) EXTENSIVE FILL & EXCAVATION - LANDSLIP RISK

(10) GROUNDWATER SEEPAGE FROM EXCAVATED NATIVE SOIL FACE

(9) SEEPAGE FROM DRIVEWAY DITCH TO CB DRAINING WEST

(8) STABLE, VEGETATED, STEEP SLOPE WITH EXTENSIVE DISTURBANCE

(7) 12612 OLD YALE RD - HOUSE UNDER CONSTRUCTION

(6) WELL VEGETATED VERY STEEP SLOPES - SOME SOIL CREEP OBSERVED

(5) EVIDENCE OF SIGNIFICANT SHEET FLOW OVER STEEP VEGETATED SLOPE

(4) 10592 125B ST. - HOUSE BUILT INTO STEEP SLOPE

(13) VACANT PANHANDLE LOTS - FILLED & GRADED

(14) GROUNDWATER SEEPAGE ON FILL SURFACE, BIG 'O' PERIMETER DRAINAGE

(1) 10476 125B ST. - COLLAPSING RETAINING WALL

(2) 10538 125B ST. - COLLAPSING RETAINING WALL

(3) FORMER LANDSLIP

- CLASS "A" WATERCOURSE
- CLASS "B" WATERCOURSE
- CLASS "A(0)" WATERCOURSE
- CLASS "C" WATERCOURSE



SLOPE ASSESSMENT POLYGON  
STUDY AREA



NORTHWEST WHALLEY INFILL CONCEPT PLAN ENVIRONMENTAL STUDY  
FIGURE 4 - SLOPE ASSESSMENT NOTES

DATE APRIL 2013

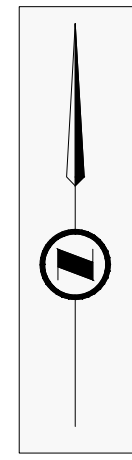
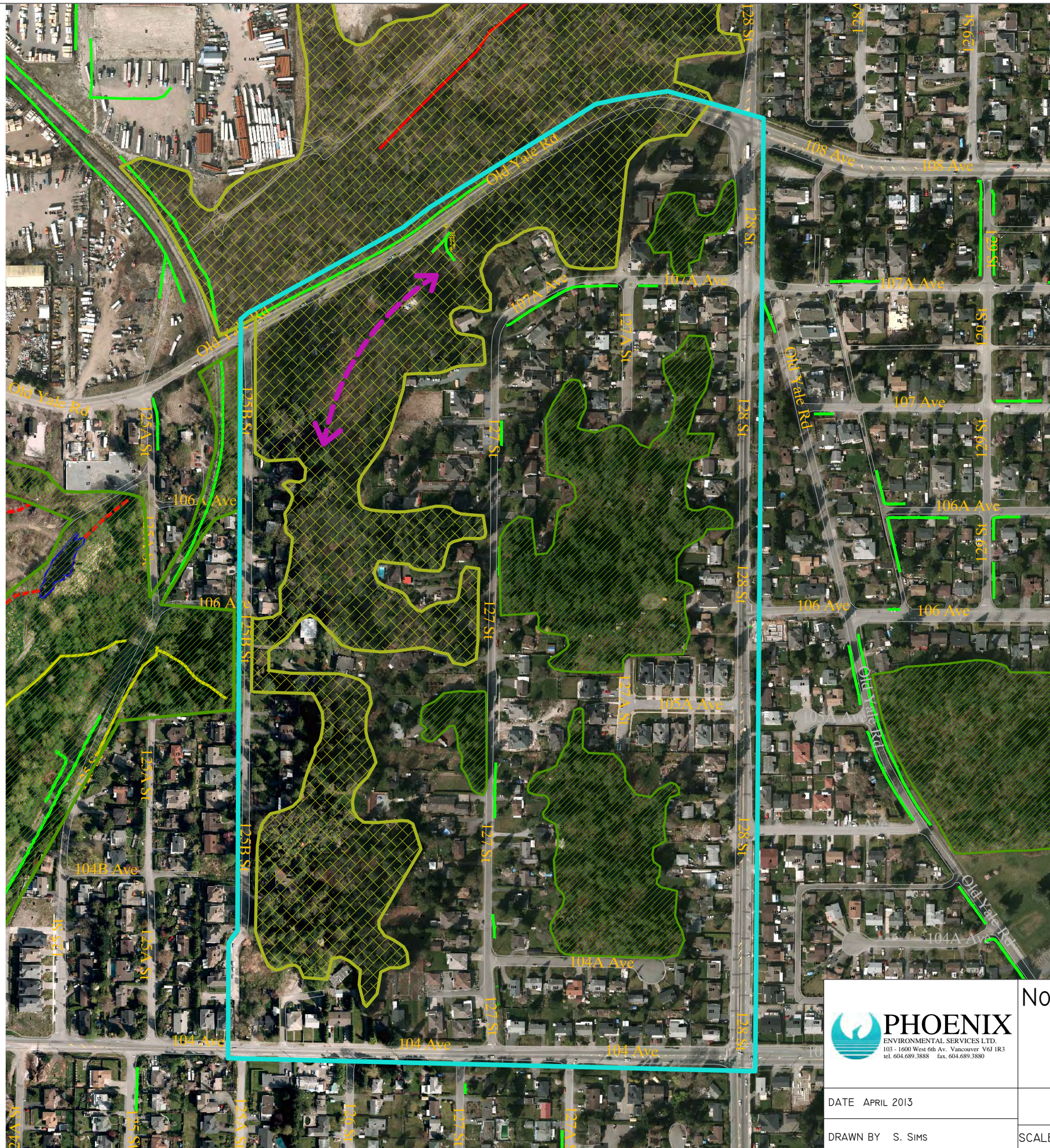
DRAWN BY S. SIMS

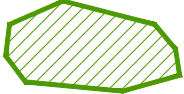







SCALE 1:3000

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\*NOTE\* BASE LAYERS AND CREEK CLASSIFICATIONS COURTESY OF CITY OF SURREY COSMOS MAPPING (2012).



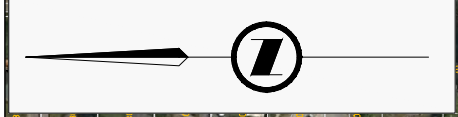
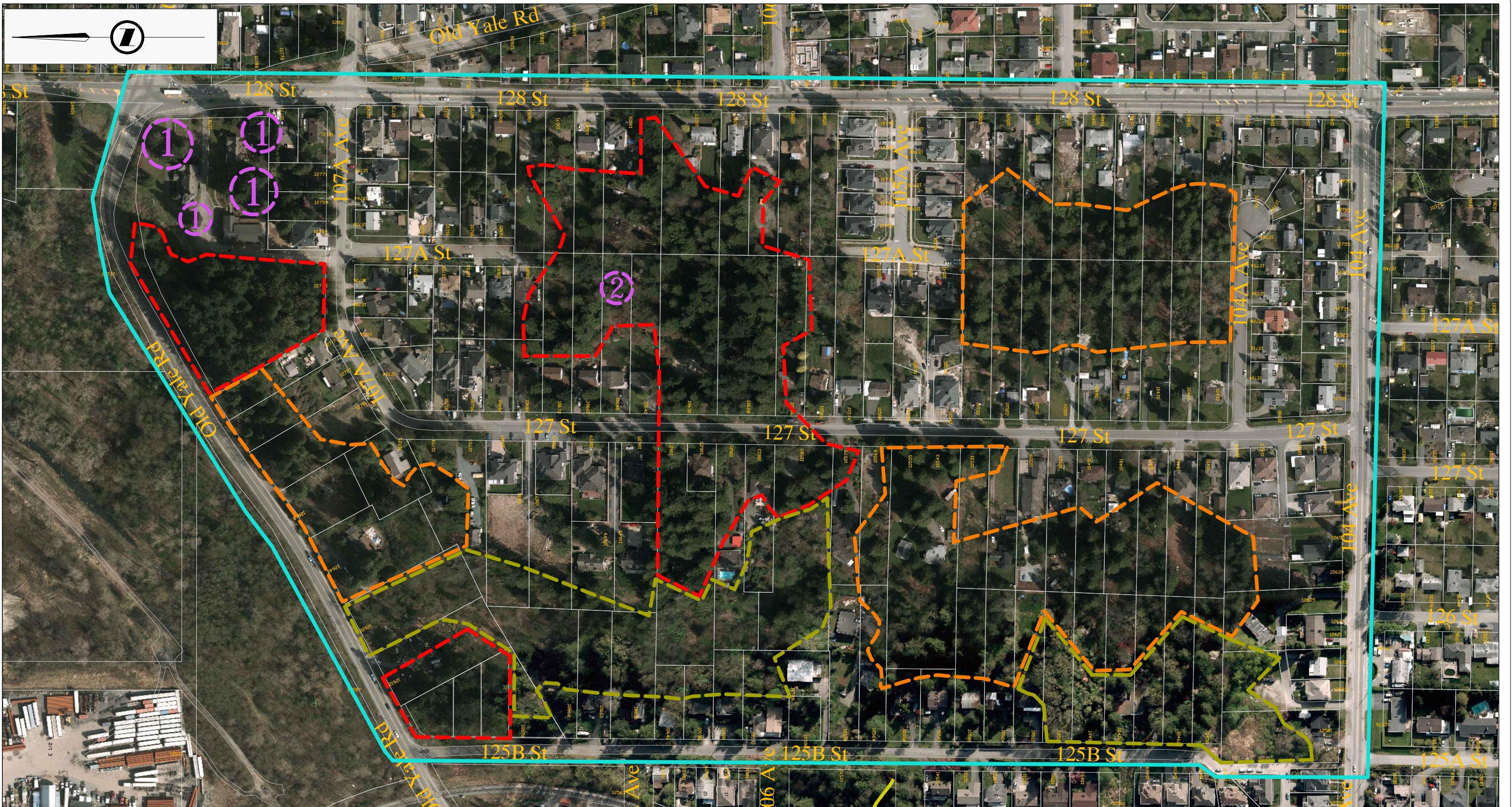
-  ECOSYSTEM SITES
-  TERRESTRIAL HUB
-  WILDLIFE CORRIDOR
-  STUDY AREA
-  CLASS "A" WATERCOURSE
-  CLASS "A(0)" WATERCOURSE
-  CLASS "B" WATERCOURSE
-  CLASS "C" WATERCOURSE



NORTHWEST WHALLEY INFILL CONCEPT  
 PLAN ENVIRONMENTAL STUDY  
 FIGURE 5 - WILDLIFE CORRIDOR MAP

DATE APRIL 2013  
 DRAWN BY S. SIMS

SCALE 1:4,000	DRAWING NO. NW WHALLEY_INFILL_CONCEPT_STUDY.DWG	REV 00
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MATURE STAND, FIR DOMINATED



SEMI MATURE STAND, MIXED SPECIES



DECIDUOUS STAND



SIGNIFICANT TREES NEAR ST. HELEN'S CHURCH (9 IN TOTAL)



LISTED HERITAGE TREE AT 10648 - 127TH ST.



STUDY AREA

\*NOTE\* BASE LAYERS AND CREEK CLASSIFICATIONS COURTESY OF CITY OF SURREY COSMOS MAPPING (2012).



DATE APRIL 2013

DRAWN BY S. SIMS

NORTHWEST WHALLEY INFILL CONCEPT PLAN ENVIRONMENTAL STUDY  
FIGURE 6 - STAND MAP

SCALE 1:2500

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## APPENDIX B

### **Site Photos**

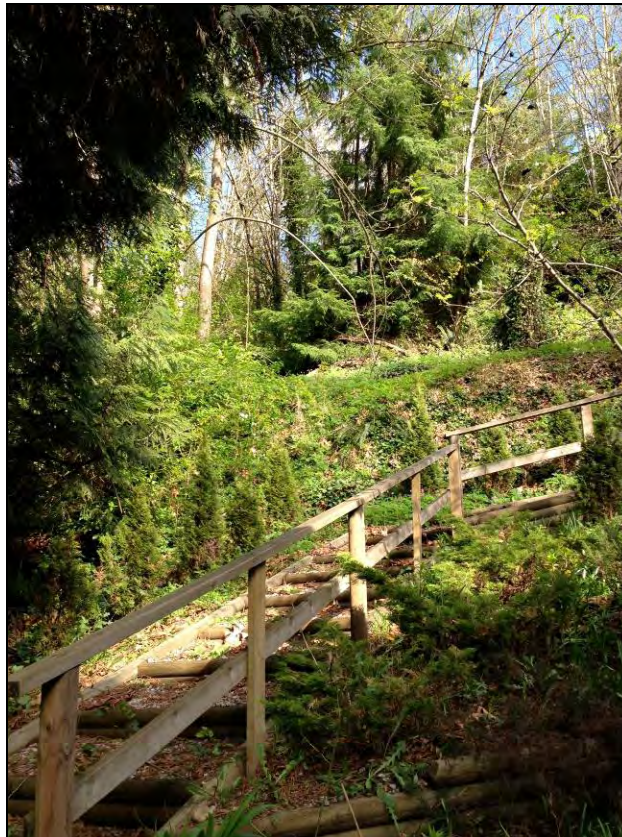


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**Photo 1.** Forested steep slopes with disturbed areas (large polygon, Figure 4)



**Photo 2:** Very steep forested slope at 10592 125B Street.





**Photo 3:** Retaining wall failure along 125B Street.



**Photo 4:** House under construction at 12512 Old Yale Road.





**Photo 5:** Excavations on steep slope for re-developments at 12701 – 107A Avenue.



**Photo 6:** Slope failure risk from steeply excavated fill and native soil with evident erosion.







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**Photo 7:** Typical forest composition of the forested block situated west of St. Helen's Anglican Church (April 12, 2013)



**Photo 8:** Typical understory vegetation composition of the forested block situated west of St. Helen's Anglican Church (April 12, 2013).





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**Photo 9:** Typical backyard vegetation beneath forested blocks observed within residential backyards (April 12, 2013).



**Photo 10:** Existing residential area with maintained lawn and ornamental vegetation observed within the Northwest Whalley ICP Area (April 12, 2013).





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**Photo 11:** Recently cleared lot (10681 127th St.) observed within the residential area of the Northwest Whalley Infill Area. A coyote was also observed traveling along the forested interface of this site (April 12, 2013).



**Photo 12:** Invasive species that dominated the frontages of many of the residential properties along Old Yale Road (April 12, 2013).





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**Photo 13:** Class 8 wildlife tree observed at the vacant lot on 127th Street (April 12, 2013).



**Photo 14:** Invasive English ivy on the ground and on mature trees observed within the forested block situated to the west of the St. Helen's Anglican Church (April 12, 2013).





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**Photo 15:** An older house with existing trees incorporated into the site plan



**Photo 16:** A newer house developed with the existing trees





**Photo 17:** Newer homes developed with no trees retained



**Photo 18:** View showing declining condition of trees retained within a recent panhandle infill project





## APPENDIX C

### **Tree Assessment Report Michael J. Mills Consulting**

Existing Tree Assessment Report  
Northwest Walley Infill Concept Plan Area

Prepared for Phoenix Environmental Services  
May 31<sup>st</sup> 2013

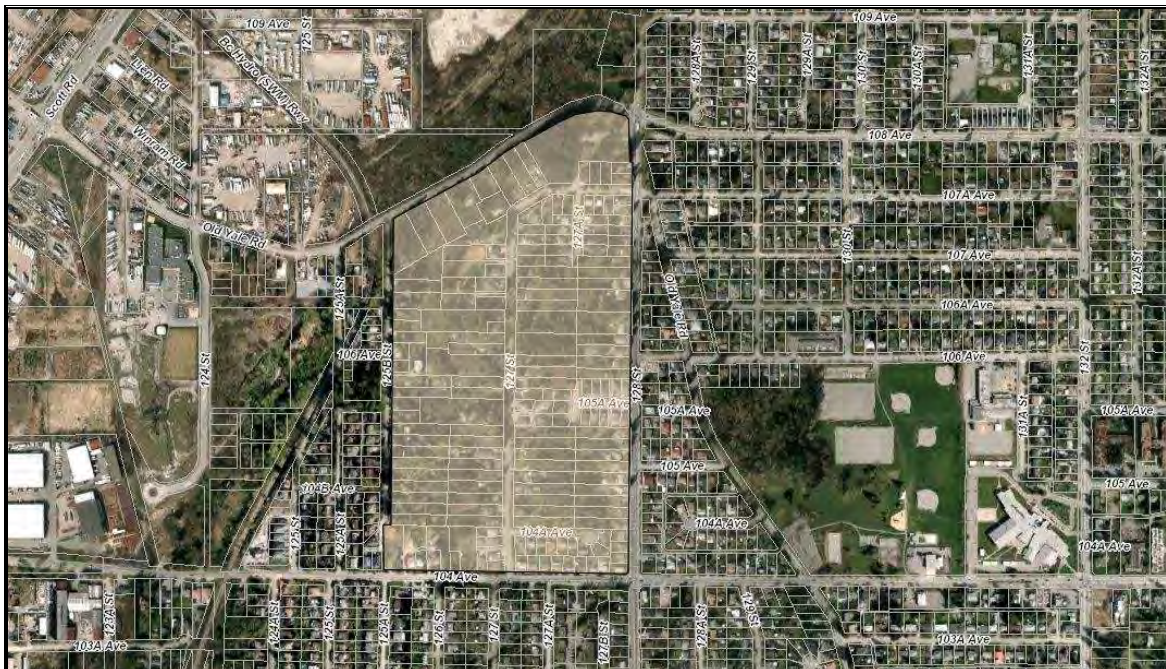
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**Introduction:**

The following report has been prepared to address the terms of reference associated with Arboricultural issues as part of the greater Environmental Study prepared by Phoenix Environmental Services for the Northwest Walley Infill Concept Plan Area (ICPA).

We were asked to assess and map the Arboricultural values associated with the study area. We visited the site on April 17<sup>th</sup> with the Phoenix team to gain an appreciation for the study methodology and again on our own on April 23<sup>rd</sup> and May 15<sup>th</sup> to review the site in greater detail. Tree survey information for the ICPA was not available to us and as such we have developed a generalized stand delineation map utilizing the available aerial photos of the area to assist in identification of stand characteristics and individual trees of high value.

The ICPA comprises approximately 30.86 Hectares. The study area is bounded by Old Yale road to the north, 128<sup>th</sup> Street to the east, 104<sup>th</sup> Avenue to the south and 125B Street to the west.





**Observations:**

In general terms, the study area is comprised of 178 legal lots of varying size. The largest lot is located in the north east corner and is associated with the St Helens Anglican church. The smallest lots are associated with recent infill development along 105A Ave. The majority of the lots are larger in size and are generally occupied with single family homes.

Within the ICPA there is a wide range of tree species. In general terms, native tree species dominate the forested areas and introduced species dominate in the developed areas. There are also many larger lots where development has incorporated both native and introduced species. We estimate that +/- 65% of the study area is presently forested with native trees. We observed the following tree species:

**Native Trees**

- Douglas Fir
- Western Red Cedar
- Western Hemlock
- Big Leaf Maple
- Red Alder
- Mountain Ash
- Hawthorne
- Sitka Spruce
- Pin Cherry
- Dogwood
- Black Cottonwood
- Shore Pine
- Larch

**Introduced Trees**

- Cedrus (deodara and atlantica)
- Austrian Pine
- Monkey Puzzle (3 specimens in total)
- Serbian Spruce, Blue Spruce, Norway Spruce
- Juniper
- Chinese Fir (Cunninghamia lanceolata)
- Lawson Cypress)
- Giant Redwood
- Japanese Maple (many different cultivars)
- Horse Chestnut
- Ornamental Cherry (several different varieties)
- Magnolia (several different varieties)
- Norway Maple
- English Oak
- Paper Bark Maple
- European Beech
- English Holly
- Black Walnut
- Lombardy Poplar
- Weeping willow
- Dogwood (ornamental varieties)

The only formal street trees within the subject area are limited to several Norway Spruce that have been installed along a short section of 105A Ave as part of a recent small lot infill project.

For discussion purposes, we have broken the site into several categories in order to better describe the site conditions: Refer to the appended stand map for the approximate location of the areas referred to.

**Developed Areas:** (approximately 53% of the ICPA)

There are several areas where smaller lots have been developed such that the preservation of trees has been limited. These areas generally occur along 104<sup>th</sup> Ave, 104A Ave, 107<sup>th</sup> Ave, 127A Street and 128<sup>th</sup> Street. There is also a strip through the centre of the area in alignment with 105A Ave that has recently been developed into small lots. These areas generally share an absence of larger mature native trees. Landscape trees with a size and age correlated to the age of the development prevails. Within these areas, there are many quality high value landscape trees. Bylaw protected trees species such as Monkey Puzzle Tree, Redwood and Dogwoods are present in small number. Several high value Japanese Maples grace the front yards of several homes.

**Mature Stand, Fir Dominated:** (approximately 16% of the ICPA)

There are several areas where Douglas Fir trees of relative large size and maturity predominate. The most significant stand of trees is located to the rear of St Helens Church. The stand is dominated by Douglas Fir of very good quality with Western Red Cedar and Big Leaf Maple intermixed. Many of the largest trees in the study area and several estimated to be in excess of 100 years old are found within this stand. The understory vegetation is open and there are numerous trails that appear to be used frequently. Tree quality in this area is considered to be excellent.

Another stand of high quality trees is located within two large lots (10628 & 10630 127<sup>th</sup> Street) that are under development application. This mature stand is comprised of large Firs and Cedars, some of which are estimated to be over 60 metres in height and could be as old as 120 years old. This group of trees extends to a limited degree into the surrounding properties and across 127<sup>th</sup> Street into the properties to the west.

There is a small cluster of Firs located at the intersection of Old Yale Road and 125B Street that are notable for their tall height. Located on a height of land, this small cluster of tall Firs is clearly visible from the bridges and New Westminster to the west.

**Semi Mature Stand, Mixed Species:** (approximately 20% of the ICPA)

There are several distinct areas where a mix of native trees has been largely unaffected by the current level of development. Much of the area defined as mixed species is actually dominated by Western Red Cedars but with a significant component of Douglas Fir, Big Leaf Maple and Alder. Age class is estimated to average 60 – 80 years old. Within these areas, the Fir and the Cedar are typically of a more moderate scale than the Fir dominated stands but still contain trees of good quality. Tree density tends to be sparser and the condition of the deciduous trees is variable with many of the Alder nearing maturity.

**Deciduous Stands:** (approximately 11% of the ICPA)

There are several areas where tree covered is dominated by Alder, Big Leaf Maple and Cottonwood. The trees tend to be of moderate size and appear to be the result of natural re vegetation after previous site disturbance. Tree quality in these areas tends to be moderate to poor. Selective preservation of trees in these areas would not generally be recommended.

**Trees of Note:**

There are many impressive trees within the study area, measured both by size and by landscape value. The largest tree by trunk diameter within the study area is a Western Red Cedar located in the parking area to the immediate rear of the St Helens church. The trunk is estimated to be close to 2m diameter and the tree remains in good health. There are also several other large open grown Firs and Cedars surrounding the main church building. We can reasonably assume that these trees would date back to at least the construction of the church in 1911. There are nine Firs and Cedars surrounding the Church building that have been listed in the City of Surrey /Heritage tree inventory.

The tallest trees are considered to be those located within the two lots under development application at 10628 – 10630 127<sup>th</sup> Street. We have estimated that several trees within this stand exceed 60 metres. There are also several very tall firs at the intersection of Old Yale Road and 125B Street.

- There is a heritage tree listed for the residential lot at 14407 – 127<sup>th</sup> Street. The tree is reported to be a Red Cedar with a trunk diameter of 138cm. The rear yard of this lot was not accessed during our review to confirm the condition of this tree. We comment that the tree is not readily visible from the street frontage.
- There is a Giant Redwood located in the rear yard at 10579 – 127<sup>th</sup> Street that is close to 1 metre dbh.
- Along the western edge of 127<sup>th</sup> Street in front of 10621, there are several English Oak trees of large size.
- Several large and impressive Japanese Maples are located within the developed lots, of note are the specimens found at 12704 – 107A Ave, 12728 104A Ave and 10451 128<sup>th</sup> Street.
- Monkey Puzzle Trees of relative small size were located at 10706 127A Street, 10450 127<sup>th</sup> Street and 10525 - 128<sup>th</sup> Street.
- A Chinese Fir (*Cunninghamia lanceolata*). This species is rare in Surrey, it forms part of the landscape in the front yard at 10507 - 128<sup>th</sup> Street.
- The Magnolia tree in the front yard of 12701 127A Street was in full bloom at the time of our review. This specimen has been reduced in value by poor pruning but it remains a large specimen that is impressive when in bloom.

Photos:



Overview of the subject area as seen from the New Westminster side of the Fraser River.



View of the western slope looking east from the base of Old Yale Road.



View showing the forest conditions to the rear of St Helens church.



Example of an older home with existing trees incorporated into the site plan.



Example of a newer home developed within the existing trees.



Example of newer homes developed with no trees retained.

**Tree Health Issues:**

Overall, the trees within the study area were observed to be in good health. We did identify a few minor problems that have affected the health of a limited number of trees.

- **Development / Construction Impact:** Where new development has occurred without adequate tree protection, decline and death has resulted. There are a number of lots throughout the study area where tree protection has not been adequate to protect the trees that have apparently been designated to be retained.



Development in progress at 10521 - 127<sup>th</sup> Street.

At the relative recent infill development at 10645 & 10649, selective trees have been retained in relative close proximity to the new homes. We cannot confirm if or to what extent development activity impacted the trees, however, there is visible decline in a number of the retained trees, such that we can expect that several trees will likely decline and require removal in the relative near future.



View showing the declining condition of trees retained within recent infill projects.

- **Disease and insect problems:** Overall, the extent of disease and insect problems within the study area is quite minor. We observed two problems,
  - There is a dead Lawson Cypress located in the front yard of 12759 - 107A Ave. The symptoms suggest that this tree has succumbed to the Pytopthera root disease (P laterallis) that is very

common to this species. The extent of the problem is not considered to be significant due to the fact that there are only a few Lawson Cypress within the inventory of ICPA trees.



Dead Lawson Cypress  
in front of 12759 –  
107A Ave.

- There was one other dead Lawson Cypress within the study area in the rear yard of 10556 – 127<sup>th</sup> Street. It is difficult to determine if this tree was infected by *P lateralis* or if construction associated with the new home on this lot was the cause. It has been established that construction impact can result in increased susceptibility of Lawson Cypress to this disease.



Dead Lawson Cypress  
in the rear yard of  
10556 – 127<sup>th</sup> Street.

- We observed one dead Douglas Fir and another Fir that is under stress and in decline. The dead tree is located to the rear of 10471 – 127<sup>th</sup> Street. The dead tree is located within a forested area where no recent disturbance has occurred. Visual evidence suggests that the tree has died due to Douglas Fir Bark Beetle infestation. This problem is not common in Surrey but it does occur from time to time. A tree under aggressive attack from this beetle will defoliate within a matter of several weeks. Typically a healthy Douglas Fir will survive the attack, but in some cases, the trees do not recover.



View showing the dead Fir in the rear yard of 10471 – 127<sup>th</sup> Street.

- There was one other Fir located in the rear yard of 10519 – 128<sup>th</sup> Street that appears to be in decline with symptoms that are similar to typical beetle attack.

\* Note: the presence of P laterallis or Douglas Fir Bark Beetle has not been confirmed by lab testing. Our comment related to these problems is based solely on experience on other trees in the area over the past 20 years.

We were provided with commentary that as part of a previous submission to the city for a development application at 10628 / 10630 – 127<sup>th</sup> Street that the arborist report suggested laminated root rot may be present in the Douglas Firs. We examined this forested area in some detail and could not detect any typical symptoms of disease of any kind in any of the trees on these lots.

- **Invasive plants:** The ICPA is not dissimilar to many areas of Surrey where invasive plant species have become a problem. English Ivy, Lamium, Vinca, Blackberry and Knotweed were all found to varying degrees within the forested areas. The only invasive with potential to harm trees is the English Ivy. Removal and eradication of the ivy should be encouraged whenever possible.



Illustration of problems, disposal of garbage within forested areas, fire damage and invasive plant species.



- **Inappropriate Tree Retention:** Not all trees are suitable for preservation in the context of residential development. In Surrey, the retention of trees is strongly promoted by city staff and in some situations this can result in the preservation of trees based solely on spatial consideration. We observed several trees that have been retained in conjunction with new development that quite simply should not have been retained. In the photo below, it is clear that the retained tree was removed from a previous forested situation where the condition of the foliage when exposed as a stand-alone tree was not fully considered. As a result, the retained tree is rather unattractive and potentially represent a risk to the residents due to dead limbs falling.



**Comment and General Recommendation:**

The existing trees within the study area represent a significant part of the urban forest in North West Walley. In viewing the aerial photos of the City, it is immediately apparent that the study area represents the most densely forested portion of the North West corner of the City.

Future development planning for the area should promote tree conservation to the extent possible. Tree Preservation, Protection, Replacement and Enhancement are the four cornerstones of a sustainable urban forest.

**Tree Preservation:**

Where past development and the more recent infill projects have occurred, the pre-existing trees have generally been removed. Some of the more established developed areas were re-planted and as the new trees have grown, the density of tree cover has re-established however the new trees tend to more non-native ornamental varieties that lack the bio mass of native tree stands. Other recent infill projects where selective tree retention has been attempted appear to have resulted in mixed success with tree decline and construction abuse evident on many of the recent or in progress developments.

There are a number of steep slopes associated with this area of Surrey, in general to the north of 107A Ave down to Old Yale Road and west of 127<sup>th</sup> Street down to 125B Street. The effect on slope stability resulting from tree removals should be studied in detail as part of any development application associated with the sloped areas. The on-going development work at 12701 107A Ave is an example of how the removal of the trees can potentially affect slope stability.

The preservation of forests grown mature trees in relation to residential development presents many challenges. Selective preservation of trees from the protected confines of a forest stand often results in unpredictable tree

behaviour. The typical tall and thin form of forest grown trees can result in unsuitable candidates to be retained. There have been significant failures from selective and thin clusters of forest grown trees where preservation has been attempted in the past. Douglas Fir is known to release large limbs when under strong wind loading. The loss of limbs is how the tree responds to wind as opposed to full tree failure. When large Firs shed large limbs, the branches tend to be end weighted and can fall in a vertical spear like orientation. As a result, residential development directly under large mature Firs is not recommended.

Various studies and experience on the north shore slopes has resulted in a base recommendation that the width of leave strips of forest grown trees should at a minimum equal the height of the tallest trees in the group. The wider the leave strip, the more stable trees within the retained group tend to be.

The location of existing trees should be considered in the design of development. Trees of high quality or those with wildlife, cultural or heritage value should be identified before the site plan has been completed.

#### Tree Protection:

The City of Surrey has a well established system for ensuring trees are protected during development. While the City typically does a good job of enforcing its policies on tree protection, a drive through the study area would suggest that the system has weaknesses. Where development is presently active within the study area, tree protection measures are either missing or in poor condition.

#### Tree Replacement:

Where development is approved, a policy of no net loss of trees through the planting of replacement trees should be encouraged. Surrey's current policy of two to one replacement is supported, however, when development is approved for forested site, it is often not feasible to achieve this goal due to the high number of trees that need to be removed.

#### Tree Enhancement:

Encouraging the planting of additional trees to enhance development properties and streetscapes beyond the requirements of boulevard trees is suggested. The developed areas with no immediate development plans should also be encouraged to add trees and landscape where appropriate. Whenever possible, Douglas Fir and Western Red Cedar should be encouraged as these are the native climax species of trees for this area of Surrey.

#### General Recommendations:

- A detailed assessment by a qualified expert should be undertaken for any development applications. Tree survey and topographic information must accompany the assessment report.
- Trees on steep slopes, watercourses, ravines and un-developable areas should be retained wherever possible.
- Preserve existing trees, woodlots and natural features wherever possible. Where trees of large size are retained, large groups or wide leave strips are preferred.
- Provide and enhance landscaping at the street level which contributes to the continuity of landscaping between adjacent properties.
- Stabilize steep embankments (where existing) with ground cover and trees
- Select plant materials that are ecologically sound, appropriate for the existing and future site conditions and suitable for all seasons.
- Encouraging the consideration of the location of existing trees in the design of development plans prior to the submission of development applications.
- Encouraging and enforcement of tree protection measures during development.
- Encouraging no net loss of trees through the planting of replacement trees.

**Limitations:**

Due to the limits of our terms of reference, trees within the defined area have been reviewed only in general terms, no detailed assessments of any of the site trees has been included in this study. The stand delineation map provided is intended only to serve as a reference for the general comment provided and should not be relied upon for actual planning decisions. Detailed mapping, survey and tree assessment studies should be provided for each individual site in conjunction with any proposed land use changes.

We attach the following clauses to this document to ensure you are fully aware of what is technically and professionally realistic in the assessment and preservation of trees.

This Arboricultural field review report is based only on site observations on the date noted. Effort has been made to ensure that the opinions expressed are a reasonable and accurate representation of the trees reviewed, however, conditions influencing the opinion and recommendation as provided in this report can change quickly and without warning. Any trees retained should be reviewed on a regular basis to ensure reasonable safety and to minimize the associated risk.


The assessment was completed based on visual review only and none of the existing trees were reviewed in detail. None of the trees were dissected, cored, probed or climbed. All trees or groups of trees have the potential to fail. No guarantees are offered or implied by Michael J Mills Consulting or their employees that the trees are safe given all conditions. Trees can be managed, but they cannot be controlled. To live work or play near trees is to accept some degree of risk. The only way to eliminate all risk associated with trees is to eliminate all trees.

The comments provided are intended only to offer general information with respect to an overall study of the issues that might affect future development planning for this area of Surrey. No information with respect to the form of development proposed for any of the properties within the study area was provided to us.

The information provided in this report is for the exclusive use of our client, the City of Surrey and may not be reproduced or distributed without permission of Michael J Mills Consulting.

Feel free to contact me if you have any questions or concerns.

Regards



Michael Mills  
ISA Certified Arborist PN0392