

LEGEND

- | | | | |
|--|----------------------------------|--|---|
| | Single Detached (2 upa) | | Existing Public Road |
| | Larger Transition Lots (2-3 upa) | | Proposed Public Road (local road location subject to detailed design) |
| | Single Detached (4-6 upa) | | Approximate Intersection Location (Subject to detailed design) |
| | Cluster Housing (6-8 upa) | | Round-about |
| | Multiple Residential (15-25 upa) | | Amendment Area |
| | Environmental Area | | North Grandview Heights Area Boundary |
| | Neighbourhood Park | | North Grandview Gravity Sewer Interceptor |
| | Linear Park / Multi-use Trail | | |
| | Enhanced Sidewalk / Walkway | | |
| | Landscaped Buffer | | |
| | Elementary School | | |

Notes:

- (1) This plan is conceptual in nature and is intended to reflect a general pattern of land uses. Land use boundaries will be confirmed within the context of detailed rezoning and subdivision applications.
- (2) Density refers to units per-gross acre of land.
- (3) All development should obtain an Arborist report to determine the number of trees that can be preserved.



NORTH GRANDVIEW HEIGHTS
NEIGHBOURHOOD CONCEPT PLAN

**2005 NCP amendment area
land use concept plan**

2

ACKNOWLEDGEMENTS

The proponents and the consultant team acknowledge the contributions and participation of the following people and organizations in the North Grandview Heights Neighbourhood Concept Plan amendment process:

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EXECUTIVE SUMMARY

The North Grandview Heights Neighbourhood Concept Plan (NGH NCP) was adopted by Council on January 11, 1999. The plan covers a total area of approximately 342 hectares / 845 acres. Since 1999 there has been limited 0.4 hectare / one-acre development activity within the NCP area, however, there is significant development interest for other types of housing both in this area and in the surrounding areas.

In early 2004, Beech Developments Ltd. and Southtrac Holdings Inc., on behalf of a number of property owners in the North Grandview Heights NCP area, applied to the City of Surrey for an amendment to the existing NCP designations in the western part of the plan. The amendment is generally to allow for low and medium density residential development between 28 Avenue and 32 Avenue and 168 Street and Highway 99, an area covering approximately 114 hectares / 281 acres.

Of the approximately 114 hectares included in the NCP Amendment (NCPA) area, the proponents own and / or have written authorization to act on behalf of the owners for approximately 79 hectares / 194 acres which represents 69% of the total area and 60% of the total number of individual parcels.

In response to evolving residential market conditions and land use patterns in the area since the plan was approved in 1999, the NGH NCP has been amended to allow for the area within the NCPA to be developed at a higher overall residential density. The amended NCPA will change approximately 33% the NCP area's existing 0.4 hectare / one-acre or larger residential lots to a range of housing including Multiple Residential, Cluster Housing, urban and suburban Single Detached lots. This Report applies to only the NCPA area. The remaining 67% of the NGH NCP, covering approximately 228 hectares / 564 acres, will continue to be designated for the 0.4 hectare / one acre or one acre gross density residential lots and are subject to the policies contained in the original NGH NCP Report. **Figure 1** illustrates the NCP and NCPA areas for North Grandview Heights.

The planning rationale for the proposed NCPA is based on recent and evolving development patterns in the area, including the proximity of Highway 99 to the immediate west, which provides access to Greater Vancouver. Given the location of Morgan Creek Golf Course and low and medium density residential housing to the immediate north and commercial / business designations to the west, the densification of the western part of the NGH NCP is appropriate and complements neighbouring land uses while providing needed housing and appropriate open spaces.

The NCPA preserves environmentally sensitive lands adjacent to watercourses. The planning approach for the NCPA is to include the key factors, such as parks and open space and road network from the 1999 NGH NCP while increasing the residential densities where appropriate to reflect and respond to evolving development patterns in the area and to provide for economically viable development, which is at the same time in harmony with the local landscape and existing homes.

The NCPA will serve as the basis for two comprehensively planned residential communities on either side of 164 Street and provide for a multi-phased subdivision/development program over the next several years which will result in approximately 1,400 to 2,000 new low and medium density homes with a future resident population in the range of 3,400 to 4,800 persons. The resulting overall density within the NGH NCP area west of 168 Street will be a relatively low approximately 8.9 - 9.9 unit per hectare (uph) / 3.6 - 4.0 units per acre (upa). The neighbourhood plan also provides for a possible elementary school, appropriate active neighbourhood parks and linear parks, multi-use trails, and natural open space / preservation areas.

The overall neighbourhood planning vision is that the new residential areas be realized in a manner that both complements and is in harmony with both the area's landscape features and existing homes.

Note that this North Grandview Heights (NGH) Neighbourhood Concept Plan Amendment (NCPA) Report is an addendum to the NGH NCP approved by Council on January 11, 1999. This NCPA applies to the lands within the 2005 Amendment Area, which includes most of the western part of the North Grandview Heights Neighbourhood Concept Plan. All lands within the NGH NCP that are outside of the 2005 Amendment Area are subject to the conditions outlined in the 1999 NGH NCP Report. Figure 1 illustrates the NCP and NCPA areas.

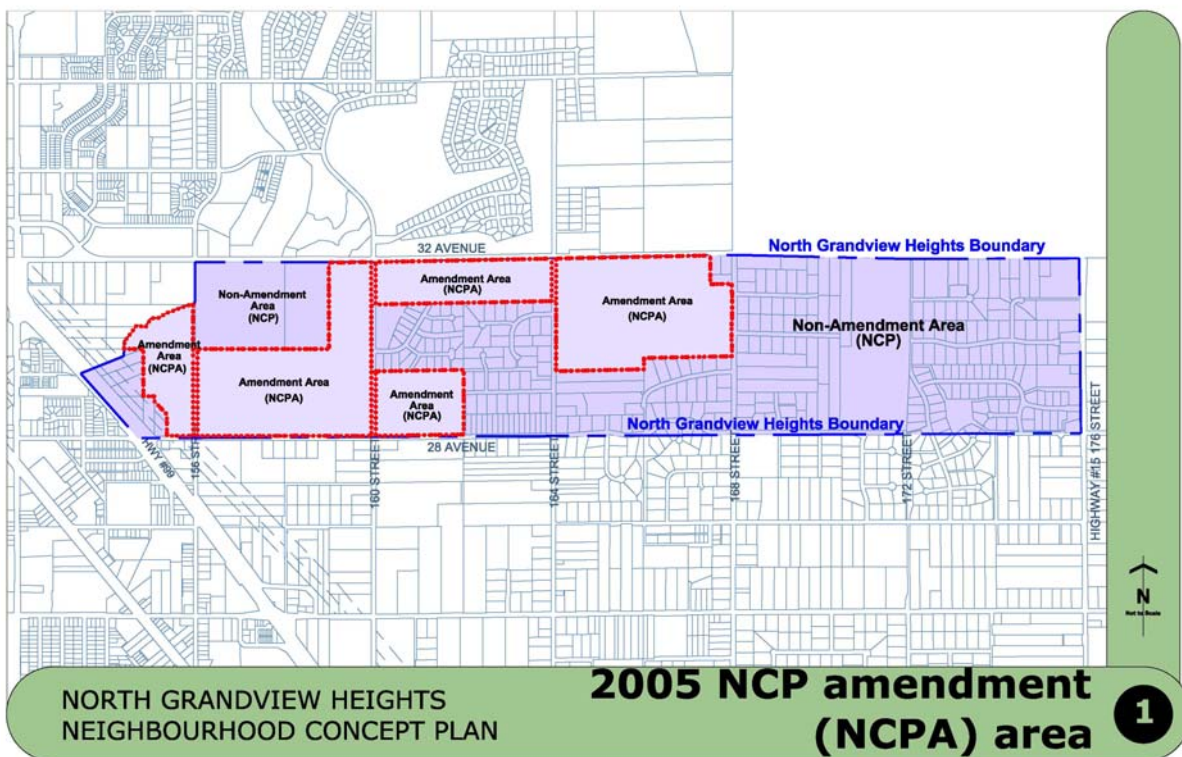


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1.0 INTRODUCTION

This 2005 North Grandview Heights Neighbourhood Concept Plan Amendment (NCPA) Report represents an amendment to the original North Grandview Heights Neighbourhood Concept Plan (NGH NCP), which was adopted by Surrey City Council on January 11, 1999. See **Figure 1** for the extent of the 2005 NCPA area.

This NGH NCPA Report applies to most of the western part of the North Grandview Heights Neighbourhood Concept Plan. All other lands within the NGH NCP area, but outside of the 2005 Amendment area, are subject to the conditions outlined in the 1999 NGH NCP Report.

This Report contains the following components for the NCPA area:

- Background information, existing conditions and the policy framework;
- An analysis of the impacts on all aspects of the existing NCP, including land uses, population, densities, schools, parks, amenities, landscape and environmental features and heritage resources;
- The NCPA Land Use Concept Plan (presented in **Figure 2**) and supporting policies intended to guide development as it is implemented through rezoning, subdivision and development permit applications;
- Strategies to make certain that new development interfaces with properties adjacent to and within the amendment area to ensure compatibility among uses and to minimize negative impacts;
- Principles, criteria, schematics, and general guidelines to guide the preparation of detailed Design Guidelines for residential development;
- An overview of the existing traffic conditions and a general transportation strategy;
- An overview of the existing conditions and strategies for providing sanitary sewer, water services and stormwater management;
- Detailed engineering utilities, infrastructure, transportation and funding strategies to support the land use amendments; and
- Implementation and phasing strategies.

This NGH NCPA Report was prepared by Aplin & Martin Consultants Ltd. on behalf of the two major proponents of the amendment application, Beech Developments Ltd. and Southtrac Holdings Inc.

Note: **Figure 1** refers to the entire North Grandview Heights NCP area and illustrates the location of the NCP and NCPA areas.

2.0 BACKGROUND

2.1 THE NEIGHBOURHOOD CONCEPT PLAN AND AMENDMENT AREA

2.1.1 North Grandview Heights NCP Area

The North Grandview Heights Neighbourhood Concept Plan, a portion of which this Report amends, covers a long, narrow rectangular-shaped area of south Surrey approximately 1.0 kilometres north-south by approximately 4.0 kilometres east-west. The total NCP area covers approximately 342 hectares / 845 acres and is generally bounded by 32 Avenue on the north, 28 Avenue on the south, Highway 99 on the west and 176 Street (Highway 15) on the east. The North Grandview Heights NCP (1999) designated lands within this NCP area for 0.4 hectare / one-acre and one-acre gross density lots along with some greenways, natural areas and institutional uses (the existing cemetery lands).

2.1.2 The 2005 NGH NCP Amendment Area

This NCP Amendment (NCPA) applies to the westerly portion of the North Grandview Heights NCP area between Highway 99 and 168 Street. The lands under application for the amendment are identified in **Figure 1**. The NCPA applies to approximately 114 hectares (281 acres) which includes approximately 77 hectares (189 acres) west of 164 Street and 37 hectares (92 acres) east of 164 Street. The NCPA constitutes approximately 33% of North Grandview Heights. The remaining 67% of the NGH NCP area, covering approximately 228 hectares / 564 acres, will continue to be designated for the larger residential lots and is subject to the original NGH NCP document (1999).

2.2 STATEMENT OF JUSTIFICATION: WHY AN AMENDMENT TO THE NORTH GRANDVIEW HEIGHTS NEIGHBOURHOOD CONCEPT PLAN?

Since approval of the North Grandview Heights NCP in 1999, very little development has occurred in the NCP area despite the relatively good availability of servicing and strong residential real estate market conditions. In addition, since the inception of the original NCP, considerable urban development has occurred to the north of the area in Rosemary Heights (both east and west of 152 Street) and in Morgan Creek. A large commercial development in close proximity to this area (at 24 Avenue and 160 Street) coupled with a proposed urban community immediately south of this NCP area (Morgan Heights - the first NCP in Grandview Heights) makes this area naturally conducive to densities higher than one dwelling unit per acre.

In addition to the limited market for larger lots, subdivision of the land into 0.4 hectare / one-acre lots as per the current NCP designations is no longer environmentally, socially or economically viable particularly when measured against an increasing public and municipal awareness of the need for more sustainable growth and development. There is an increasing belief that more efficient / effective use of land through the provision of smaller residential lots and a wider housing choice is more appropriate. There is also a need to move toward more sustainable and environmentally-friendly forms of development that preserve the existing landscape, use less energy and minimize stormwater run-off. A one-acre development pattern in this area of North

Grandview Heights does not efficiently utilize the City's infrastructure, services and community facilities, particularly given the surrounding urban development and higher residential densities.

In response to evolving residential market conditions and land use patterns since 1999, and as evidenced by the background and assessments provided in this Report, it is appropriate that the North Grandview Heights NCP be amended to accommodate higher densities and a development form to blend with the surrounding urban area while at the same time to appropriately interface with and be compatible with the existing larger lot subdivisions in the vicinity, especially those in the easterly portion of the NCP closer to the Agricultural Land Reserve.

2.3 HOW WAS THIS NCP AMENDMENT INITIATED?

In September 2003, the City received an application from Beech Developments Ltd. for an amendment to the North Grandview Heights NCP (Surrey File: 7903-0264-00). The application entailed a proposed change in the land use designation for about 11 hectares / 28 acres of land along 32 Avenue from one-acre residential to a mix of cluster townhouse, half-acre and one-acre lots. This application was put on hold while the City contemplated how to coordinate this application in the context of other planning initiatives in the larger Grandview Heights area.

Since 2003, Council received two petitions from Beech Developments Ltd. and Southtrac Holdings Inc. respectively, on behalf of more than 70 property owners representing about 79 hectares / 194 acres or approximately 69% of the total area and 60% of the total number of individual parcels. These totals represent a significant commitment and support by property owners within the defined area to proceed with an amendment to the North Grandview Heights NCP. The petitioners were requesting that urban Single Detached and medium density residential development be allowed in the area.

In response to these petitions, on March 10, 2004, City Staff hosted a meeting involving the property owners in the North Grandview Heights area to select representatives to sit on the Grandview Heights General Land Use Plan Citizens Advisory Committee (CAC) and to hear the opinions of residents about potentially increasing the densities in the area. Approximately 100 individuals attended this meeting. It was concluded at that time by City staff that attendees had very strong opinions about the proposed changes, both for and against.

On May 10, 2004, City staff reported the nature of the petitions and the results of the community meeting to City Council. The **Corporate Report No. R115, 2004** entitled “**Requests to Review and Amend the North Grandview Heights Neighbourhood Concept Plan**” was approved by City Council.

The NCP amendment application process was consistent with the approved Council position, which directed that the proponents were to coordinate one NCP amendment application in accordance with the NCP amendment process as outlined in Surrey's Official Community Plan. While this NCP amendment entails two applications, as directed by City Council, the reports, analyses, stakeholder consultation and public open houses for the various properties under application have been managed in a coordinated fashion and consolidated into one single coordinated NCP amendment submission.

City Council reviewed the Stage I Report and on May 18, 2005 unanimously approved the land use strategy in concept and directed that preparation of the Stage II Report proceed.

2.4 EXISTING POLICY FRAMEWORK

The North Grandview Heights area is currently designated 'Suburban' in the City's Official Community Plan (OCP). This designation is intended to support a semi-rural and suburban lifestyle on a range of larger sized lots.

The 1999 North Grandview Heights Neighbourhood Concept Plan designates the area for large lot Single Detached residential, including: 'Proposed One-Acre Residential (RA)', 'Proposed One Acre Residential Gross Density (RA-G)', and 'Existing One Acre and Half Acre Lots'. Open space and linear parks are proposed along the existing watercourses and future Grandview Trunk Interceptor. The existing Gardens of Gethsemani Cemetery are shown as an institutional land use.

The 1999 North Grandview Heights NCP projected approximately 610 Single Detached homes on large lots with a future population of approximately 2,000 persons.

Section 4 of Surrey's OCP directs how a proposed amendment to an NCP is to occur. This amendment to the North Grandview Heights NCP was undertaken in accordance with this policy, by providing a complete qualitative and quantitative analysis of the proposed changes and undertaking an appropriate public consultation process.

The OCP also contains a series of policies about building complete and compact communities, promoting sustainable development and others. The land uses and sustainable forms and development practices in this NCP amendment, respond to these OCP policies.

Some of the lands within the NCPA area (east of 164 Street) are located adjacent to the Agricultural Land Reserve (ALR) and as such will be subject to the City's policies respecting development adjacent to the ALR.

2.5 EXISTING LAND USES / ZONING

North Grandview Heights is currently characterized by a variety of lot sizes and low density development including one-acre enclaves and larger lots ranging from 0.4 hectares / 1 acre to 4.0 hectares / 10 acres in size. There is considerable tree cover and several watercourses along with a limited number of linear park spaces. A predominant use is the existing Gardens of Gethsemani Cemetery on 32 Avenue, which adds to the open space ambiance of the area.

The majority of the North Grandview Heights NCP is currently zoned as RA (One-Acre Residential), PC (Institutional) to accommodate the Gardens of Gethsemani Cemetery and an elementary school, A-1 (General Agricultural) and A-2 (Intensive Agricultural), and about thirty RA-G (Acreage Residential Gross Density) zoned lots. The RA zoned lots generally range in size from approximately 0.4 to 1.2 hectares (one to three acres).

2.6 ADJACENT NCP AREAS AND DEVELOPMENT / DENSITY CONTEXT

The planning rationale for the NCPA is based on recent and emerging development patterns in the area as well as the proximity of the area to Highway 99 to the immediate west which provides good access to the Greater Vancouver area. Given the location of Morgan Creek Golf Course and medium density residential housing to the north and commercial / business designations to the west, the proposed densification of the western part of North Grandview Heights is appropriate and complements neighbouring land uses while providing a variety of housing types in South Surrey and preserving adequate open space.

The North Grandview Heights NCP is surrounded by existing and proposed NCPs to the north-west, west, and south. It is the objective of the NCPA process to develop a plan that is designed to stand alone, but also reflect and complement the adjacent existing and proposed land uses. In this context, the NCPA will feature a gradual decrease in densities moving away from Highway 99 toward the eastern suburban area and ALR. Similarly, from north to south, the NCPA will act as a suitable transition area in between lower density lots in Morgan Creek to high density in the future Morgan Heights. The NCPA also provides for proper interfaces between land uses and densities along its boundaries.

The following municipal plans apply to lands adjacent to the North Grandview Heights NCPA area:

- West: Rosemary Heights Business Park NCP (adopted by Council July 21, 1999);
- North: Rosemary Heights Central NCP (adopted by Council May 6, 1999);
- Northwest: Rosemary Heights West NCP (adopted by Council January 26, 1999);
- Southwest: Highway 99 Corridor (adopted by Council on December 11, 2003);
- South: Proposed future Grandview Heights NCP #1 or Morgan Heights (currently in process); and
- Southeast: Proposed future Grandview Heights NCP #4.

These abutting Neighbourhood Concept Plans provide for a variety of land use designations, including:

- Business Park, live / work and commercial;
- Cluster Housing, apartments, townhouses, compact Single Detached lots and suburban Single Detached lots;
- A seniors care home; and
- A variety of open space preservation areas, parks and schools.

2.7 SITE FEATURES AND ASSESSMENT

Landscape features, including watercourses, tree stands and topography in the NCPA area are shown in **Figure 3**.

2.7.1 Topography

The North Grandview Heights NCPA area slopes to the north towards 32 Avenue. The highest elevation is about 65 metres on lands adjacent to 28 Avenue, falling to about 15 metres adjacent to 32 Avenue. The land falls away along a ridge with slopes in the range of about 5% to 15%.

2.7.2 Watercourses and Aquatic Resources

The following summarizes the Environmental Overview Study prepared by **Coast River Environmental Services Ltd** and **Enkon Environmental Ltd** which is included in **Appendix I**. The strategies recommended in this study were incorporated into the land use concept and accompanying policies and guidelines contained in this NCPA.

There are a number of south-north watercourses identified in the easterly portion of the NCPA area, including April Creek and Old Logging Ditch between 164 Street and 168 Street which flow north. These watercourses provide important rearing habitat for juvenile salmonids. While both creeks are identified as red-coded by the City of Surrey, recent field surveys indicate that except for a small lower reach of logging creek near 32 Avenue, these streams should be yellow-coded as they are ephemeral and not accessible to upstream migrant fish due to barriers in their lower reaches. Other appropriate adjustments and corrections to mapped watercourses have also been incorporated. **Figure 3** outlines the updated stream classifications. There are also minor watercourses in the area that provide food and nutrients to downstream fish populations. These watercourses apparently originate from artesian upwelling, and are yellow-coded by the City of Surrey.

The main watercourses on the western part of the area are Morgan Creek (alias Titman Creek) and Wills Brook which are both identified on the City of Surrey's watercourse classification map as fish bearing streams with headwaters classified as significant food and nutrient sources. Field surveys and watercourse classification maps indicate the presence of juvenile Coho within Wills Brook and fish within ponds in Morgan Creek. Based upon field surveys, appropriate adjustments have also been made to the location and coding of these watercourses.

The riparian plant communities for both Morgan Creek and Wills Brook are well established. A review of recent aerial photographs illustrates a near contiguous riparian community throughout the length of both creeks with the exception of existing road and driveway crossings. Riparian re-vegetation will be completed for the recently completed detention pond and environmental channels associated with the development at Wills Brook Road south east of 160 Street and 32 Avenue.

2.7.3 Trees and Vegetation

A detailed analysis of the existing tree resource, including classifying the levels of tree retention viability, was prepared by **Arbortech Consulting Ltd** (North Grandview Heights NCP Tree Stand Delineation and Retention Concepts, March 23, 2005). The strategies recommended in this study are summarized below and were incorporated into the land use concept and accompanying policies and guidelines contained in this NCPA. **Figure 3** shows the landscape features of the area, including the existing tree resources.

The tree resource covering the area varies with the existing land uses. Clearings for existing roads, surrounding homes and in hobby farmyards exist along with separate pioneer deciduous stands and remnant second growth coniferous stands and groves.

The pioneer deciduous forest stands are predominantly paper birch (*Betula papyrifera*), red alder (*alnus rubra*) and black cottonwood (*Populus trichocarpa*), with occasional bigleaf maple (*Acer macrophyllum*) trees in densely spaced codominant structural classes. These are short lived species that typically colonize disturbed soils. As a result of their relatively fast succession rates, they develop inherent structural weaknesses as they mature and the stand naturally thins. Examples of defects observed on this site include heart rot, sap rot and root rot diseases, shallow rooting due to shallow and wet soils, and poor stem to height ratio (spindly trunks) as a result of the very dense and competitive growing environment. These attributes make them candidates for retention in riparian or background landscapes only. Retaining such trees in close proximity to active land uses results in high risk of tree failures resulting in personal injury or property damage.

By contrast, the coniferous stands are more stable and have much longer life spans, making them higher value for retention, and better candidates for successful and safe retention. The coniferous tree stands were observed to consist of predominantly Douglas-fir (*Pseudotsuga menziesii*) and western red cedar (*Thuja plicata*), in the form of small clusters of 2 to 50 trees, to large stands of several hundred trees. The many clearings and individual groves expose many of the trees to wind buffeting and sunlight. As a result, these edge trees were consistently found to have developed good structural form. In addition, the remnant stands were observed to have moderate to sparse densities, allowing the interior stand trees to develop stronger tapered trunks and more robust crowns than their counterparts in the dense deciduous stands. While some disease was noted (during the environmental consultant's cursory field review), the coniferous stands are rated as good candidates for retention.

In addition to the natural forest type of resource, some planted landscape shade and ornamental trees were found in yard areas of existing homes. There are limited quantities of such trees, however most are likely suitable for retention consideration in development applications.

2.7.4 Wildlife and Wildlife Habitat

Wildlife usage and habitat is restricted to existing stream corridors. West of 164th Street, landscapes with higher habitat value are found within the Morgan Creek and Wills Brook riparian corridors. Riparian areas provide feeding and breeding areas, movement corridors, and security cover for birds, raptors, herptiles, small mammals and large mammals. Provided that watercourse protection is in place, these high rated wildlife habitats would be retained and continue to provide life requisites to resident and transient wildlife.

The larger NGH NCP area has been historically impacted by past logging and farming activities and is currently suburban in context due to the surrounding developments; consequently it does not retain any 'natural' characteristics. Surrounding development, including major road networks, have effectively divided existing habitat into blocks and restricted movement. The

watercourses and roadside ditch networks, however, have provided important salmonid habitat, indicating that accessibility to original and created habitats has been maintained.

Intact woodland habitat also warrants a high wildlife rating in theory, but the quality of the woodland habitat is highly dependent on the size of the woodland and whether it is connected to adjacent woodlands or riparian habitat. West of 164 Street to 160 Street, very little intact woodland habitat still exists. The most significant stand of woodlands is a band of deciduous forest west of 160 Street and north of 28 Avenue.

Moderate rated wildlife habitats are found adjacent to riparian areas. These areas may be smaller patches of woodland or shrub dominated areas that provide partial life requisites (e.g. food) but are lacking other habitat qualities (e.g., security cover). Much of the woodland habitats of NGH NCPA area would be evaluated as moderate, not high, due to their size and lack of connectivity to high rated habitat.

Low ratings would be assigned to the majority of the landscapes in North Grandview Heights NCP. Landscapes that have undergone a great deal of alteration due to human disturbances generally have low habitat value. For example, agricultural land and landscaped land do not provide nesting habitat for birds, nor do they provide security cover for deer. These landscapes do, however, provide ideal hunting grounds for raptors.

Listed species at risk have been identified on the basis of their reported ranges, which extend beyond this site. Therefore, on this basis, it is possible for these species to occur at the site from time to time. Blue Heron, in particular, have been observed to visit aquatic areas in the neighborhood, where fish are present, to take advantage of feeding opportunities. Barn owls may occur as wildlife rescue personnel have apparently released rehabilitated individuals into the area. Red leg frog and pacific watershrew have ranges that extend beyond the site and therefore are considered to have the potential to occur, although neither of these species have been observed or documented on this site. Invasive and exotic species have encroached along the various watercourses. To date, no specific benthic invertebrate or shrew trapping studies have been conducted to assess the potential presence of protected species.

2.7.5 Agricultural Land Reserve

Agricultural lands within the Agricultural Land Reserve (ALR) are located to the north and east of the easterly portion of the larger NCP area. A buffer along 32 Avenue will serve to separate proposed residential land uses from existing agricultural activities in the NCPA area. This buffer will consist of the 32 Avenue road right-of-way (ultimately 27 metres wide) and an environmental dedication for the identified watercourse and utility corridor between 164 Street and 168 Street (20 metres wide total). The proposed development on the south side of 32 Avenue is 5 uph / 2 upa Single Detached residential housing. The proposed buffer and distances between the ALR and the proposed residential development (47 metres) exceeds the minimum separation between these two land uses as required in the **City of Surrey Policy No. 0-23 “Residential Buffering Adjacent to the ALR / Agricultural Boundary.”**

2.7.6 Community Heritage Features

An assessment of the heritage resources in North Grandview Heights was undertaken by **Donald Luxton and Associates** in connection with the NCP amendment analysis (North Grandview Heights Heritage Study, March 2005).

The first settlements in the area were in the last part of the nineteenth-century in association with logging and agricultural activities. Initial development was small lot agricultural in the first half of the twentieth-century and large estate lot development in the second half of the twentieth-century.

There are only a limited number of sites in North Grandview Heights NCP area that have been identified by the City of Surrey as having heritage value and are listed on the Heritage Registry:

- Kensington Prairie Elementary School located at 16842 - 32 Avenue which was constructed in 1914; and
- Larsen House & Garage located at 3071 - 176 Street which was constructed in 1935 - 37.

Another site with possible heritage value is the Gardens of Gethsemani Cemetery which opened in 1965. All three of these sites are outside of the NCPA area. There are few heritage buildings in the area because there was limited early development and the modest buildings that were constructed have not been preserved or retained. The main heritage features in the area are natural which includes significant landscaping, trees and a semi-rural character. No archaeological sites have been identified in the area.

2.7.7 Existing Road Network and Traffic Conditions

Appendix II presents the complete **Traffic Review** conducted by **T.J. Ward Consultants Ltd.** Following is an extract of the highlights related to the existing road network traffic conditions, transit service and pedestrian facilities. **Figure 4** presents the existing traffic conditions determined in the traffic review for the larger area.

The main east-west roads in the area are 32 Avenue, which bounds the larger NGH NCP to the north, and 28 Avenue, which bounds the NCP to the south. These roads access and cross Highway 99 west of the NCP area via the 32 Avenue Diversion. The main north-south roads through the area are 160 Street, 164 Street, 168 Street, and 176 Street (Highway 15). **Appendix II** provides a full summary of the existing road network and traffic conditions in and around the NCP area.

The key arterial road in this neighbourhood is 32 Avenue which runs in an east-west direction along the north side of the neighbourhood. It currently varies from a five lane cross-section west of 154 Street transitioning to a two lane cross-section east of 160 Street. It is also a designated truck route. Other highways and arterial roads on the fringe include Highway 99, which is a four lane freeway, 152 Street, which is a four and two lane arterial road running in a north-south direction, King George Highway, which is a two lane arterial to the west of Highway 99, 168 Street, which is another two lane arterial towards the east side of the neighbourhood, and

176 Street / Highway 15 on the very east side. 164 Street and 28 Avenue west of 168 Street are designated as collector roads. 168 Street is designated as an arterial through road.

The traffic assessment indicates that the four signalized intersections bounding the amendment area (32 Avenue at 152 Street, 160 Street and 176 Street) as well as 24 Avenue at 176 Street all operate at an acceptable level of service in both the a.m. and p.m. peak hours. Of the three un-signalized intersections (32 Avenue at 164 Street and 168 Street and 28 Avenue at 156 Street) the 32 Avenue / 168 Street intersection is most in need of an improvement during both peak hours.

2.7.8 Existing Transit

Currently there are no transit services within the North Grandview Heights area. The closest is Route 354 which travels north on 152 Street from the south and then turns west on 32 Avenue destined for the temporary South Surrey Park and Ride lot on the west side of Highway 99 south of the 32 Avenue Diversion. Consequently, there are bus stops at this intersection and this is the closest stop to the area. From this same Park and Ride facility, this route and two other bus routes run express service to Downtown Vancouver, these being Routes 351 and 352. Another bus runs to the King George Station of the Sky Train line, this being Route 345.

TransLink uses 400 metres as the maximum walking distance to define the area served by transit routes within residential neighbourhoods. The minimum walking distance to the existing Park and Ride facility from the most westerly point of the North Grandview neighbourhood is 800 metres, which far exceeds this acceptable distance. The Park and Ride facility will eventually be moved to a permanent location at King George Highway and Highway 99 near 40 Avenue, which is even farther away.

2.7.9 Existing Pedestrian Facilities

There are a few isolated short segments of sidewalk in front of new developments in the area, however no comprehensive pedestrian network is currently found within the North Grandview Heights NCPA.

2.8 NEIGHBOURHOOD DESIGN CONSIDERATIONS

Based on an evaluation of the existing conditions, a number of design considerations in formulating the amended land use concept were identified. These design considerations are described below and identified in **Figure 5**.

- View potentials to the North Shore mountains;
- Existing significant trees and vegetation;
- Proximity to Morgan Creek Golf Course;
- Development of linear park / trail networks, including a greenway along the Grandview Interceptor right-of-way;
- Proximity to Highway 99;

- Proximity to servicing and infrastructure, and ability to facilitate the acquisition of right-of-ways for the Grandview Interceptor sanitary sewer;
- Existing grid road network and good access;
- Proximity to Southridge School and a future public elementary school;
- Potential for infill opportunities and more efficient use of land;
- Opportunities to use low impact development techniques to preserve the natural landscape, retain native soils and utilize at-source controls for stormwater infiltration;
- Existence of relatively undeveloped and under-utilized larger parcels of land;
- Desirability among property owners to collaborate in preparing a plan and creating a sustainable, attractive neighbourhood; and
- Desirable part of Surrey.
- Watercourses and required environmental setbacks;
- Agricultural Land Reserve and required buffers;
- North sloping away from sun; and
- Integrating and blending new development with existing homes.

2.9 THE PLANNING AND PUBLIC CONSULTATION PROCESS

In late 2004, the proponents of the NCPA engaged a consulting team to undertake a traffic / transportation assessment, environmental studies, a heritage assessment, and an urban design and land use planning and engineering review.

A reflected noise assessment to determine potential noise impacts on existing homes in Morgan Creek was also undertaken by **Brown Strachan Associates** (Traffic Noise Assessment, North Grandview Heights, March 16, 2005). This assessment was undertaken in response to enquiries from representatives from the Morgan Creek area that attended two Community Representative Committee (CRC) meetings in March, 2005. Several schematics contained in this noise assessment report illustrate that reflective noise from the new buildings on the south side of 32 Avenue will have less than audible noise impacts on the existing development on the north side.

As part of this process, input was also obtained, on an ongoing basis, from staff of the City of Surrey Planning & Development, Engineering, and Parks & Recreation Departments, and the Surrey School District, who also participated in an on-site tour of the NCPA area. There were also ongoing consultations with property owners on an individual or small group basis. Considerable consultation and coordination with the proponents of the NCP to the south of 28 Avenue were undertaken to ensure that the two areas would be compatible and to address the interface along common boundaries.

A land use option was drafted for review by the participating property owners and City staff. The draft land use concept and supporting materials such as the vision, design principles and

background were presented to the public at an Open House on January 27, 2005. As per City policy, this meeting was advertised twice in the local newspapers and an invitation letter was sent to all owners within the NCPA area and those within 100 metres of the area. At this meeting, the public had the opportunity to comment on the proposals and have any questions or concerns considered and addressed.

Over 200 people attended the first Open House and 113 comment sheets were received. The comments received were compiled and dealt with through subsequent stages of the planning process, along with the School District's requirement for an elementary school site to be located in or near this NCPA area. Parks issues and interface considerations were also reviewed and site-specific development designs for some proposed Cluster Housing areas were undertaken by the consulting architectural firm, the landscape architect and the arborist. It is noted that a large majority of the comment sheet respondents were in support of the NCP amendment land use concept proposed.

Under direction by City staff, a committee of local residents was formed to comment on the proposal and to provide more input into the NCPA process. This committee, known as the North Grandview Heights Community Representative Committee (CRC), met during March 2005. The meetings also involved the proponents and members of the consulting team. The committee reviewed the land use plan, the planning principles and had the opportunity to make suggestions and comments on the plans and supporting materials.

The Stage I Report presenting the proposed land use plan and supporting materials were refined to reflect the concerns and comment received. This land use concept and supporting information was presented to the public at a second Open House on April 13, 2005. Again, comments were received at the meeting both on a one-on-one basis and via comment sheets. These comments were reviewed and incorporated, as appropriate, into the NCPA land use concept and supporting policies. While most of the property owners within the amendment area were in favour of the proposal, the overall majority of residents who submitted comment sheets (most of whom lived outside the amendment area) did not support it.

City Council reviewed the Stage I Report and on May 18, 2005 unanimously approved the land use strategy in concept and directed that Stage II of the amendment process proceed.

A third Open House was held on June 23, 2005. This Open House focused on the specific issues identified by City staff and council based on the previous Open Houses, such as transition buffers between differing land uses, open space, and urban Design Guidelines. Over a hundred people attended the event and it was generally well received, with the majority of written comments submitted expressing support for the proposal.

3.0 PLANNING OBJECTIVES, LAND USE PLAN, AND POLICIES

3.1 PLAN PURPOSE

The purpose of this section of the NCPA Report is to describe the vision, objectives, land uses and associated policies to guide the future development of the neighbourhood. It is intended to be used as a basis for development proponents and the City to plan and evaluate development proposals in the NCPA area.

3.2 VISION AND OBJECTIVES

The overall vision for the NCPA area is:

“To build a residential community and balanced neighbourhood that includes sustainable design features in harmony with the existing homes and the natural landscape of North Grandview Heights.”

The planning objectives for the NCPA area are:

- To enhance neighbourhood character.
- To provide new parks, trail networks, open spaces and amenities close to the neighbourhood.
- To preserve important environmental features through conservation and innovative forms of development.
- To provide a variety of housing choices.
- To improve infrastructure systems and the transportation network in an environmentally responsible way.
- To explore and implement sustainable development practices designed to create a livable neighbourhood while minimizing impacts on both the environment and existing homes through natural and practical low-impact means.
- To manage growth and to ensure adequate provision of facilities and amenities to cater to the needs of the existing and new population.
- To plan for adequate provision of services, including water, sanitary sewer, storm sewer, drainage facilities, other major utility infrastructure and roads, to meet the demand of existing and new developments by determining servicing requirements and staging and financing of service provisions.

3.3 PLANNING PRINCIPLES

This NCPA is based upon a series of principles that guided preparation of the land use concept and supporting policies and development guidelines. In summary, the principles reflect the following key ideas:

- Reflect existing and proposed land uses and densities both within and surrounding the area;
- Harmonize with the local landscape and existing homes in the area;
- Transition densities from the highway to the Agricultural Land Reserve and from north to south;
- Protect existing one-acre lots and other existing land uses and be sensitive to the rural suburban ambiance of the area through Design Guidelines, clustered development and minimizing impermeable areas;
- Implement Surrey's OCP policies respecting complete, compact and sustainable communities;
- Introduce an enhanced and sustainable transportation and pedestrian / bicycle circulation system;
- Preserve natural features and wildlife habitat and encourage sustainable building and development systems;
- Provide a variety of different types of parks and an elementary school; and
- Maintain the natural beauty and view opportunities.

3.4 OVERVIEW OF PROPOSED LAND USES

The proposed land use concept provides for a gradual transition from medium density development closer to the Highway 99 to lower density residential development to the east and adjacent to the Agricultural Land Reserve. An extensive network of greenways, linkages and several neighbourhood parks is proposed. There are a number of natural open spaces surrounding the important watercourses and wildlife habitat areas. The housing types proposed will ensure that the trees and natural areas are maximized both within and around the future residential precincts. **Figure 2** presents the land use concept and land use designations for the NCPA area.

The NCPA provides for larger lot Single Detached development in the central part of the NCPA east of 164 Street. These lower density residential developments will also allow for the preservation of watercourses, create an abundance of natural open space and facilitate the gradual transition into rural and agricultural land uses to the east. The eastern two-fifths of the NCP east of 168 Street will retain its current land use designations as per the 1999 North Grandview NCP.

The following section describes the nature of each of the land uses proposed and prescribes policies and guidelines to achieve the goal and objectives for the North Grandview Heights NCPA area.

3.5 RESIDENTIAL DEVELOPMENT

3.5.1 Overview

As shown on **Figure 2**, the proposed residential land uses in the North Grandview Heights NCPA are:

- Multiple Residential (15-25 units per acre) residential closest to Highway 99 (along 156 Street).
- Cluster Housing (6-8 upa) on the western part of the NCPA area and in the vicinity of the intersection of 32 Avenue and 160 Street adjacent to the cemetery.
- A variety of sizes of Single Detached lots east of 160 Street, including regular Single Detached (4-6 upa), transition lots (2-3 upa), and half-acre gross density (2 upa) between 164 Street and 168 Street.

All densities (units per hectare / units per acre) in this Report refer to gross site areas unless otherwise noted.

The residential component of this area will be designed and constructed to high standards to take full advantage of the existing natural beauty of the area and to complement the existing homes. In addition, low-impact development standards will be applied to residential developments, which are described later in this Report.

Specific policies respecting Cluster Housing will ensure that the maximum number of trees (both natural and existing landscaping or ornamental trees, natural mixed deciduous / coniferous tree stands, and single species stands), as prescribed by arborist reports, are retained and incorporated into the developments. Cluster Housing will provide landowners with the ability to construct a variety of attached homes with private roads at Single Detached densities, with the objective of preserving environmental features and the rural neighbourhood character of the area.

The following policies will apply to residential developments within the NCPA area that have densities greater than 2.5 units per hectare / 1 unit per acre:

3.5.2 General Policies

- Single Detached developments will be subject to Registered Design Guidelines and will feature architecturally designed buildings and extensive site landscaping.
- All development will incorporate the principle of “eyes on all public spaces” (i.e., roads, linear park spaces and trails), as prescribed in common CPTED (Crime Prevention Through Environmental Design) practices.
- Privacy features, such as buffers and landscaping will be incorporated into new developments (see Interface, Buffering and Transitional Policies Section).

- Residential buildings along multi-use trails and public spaces will be articulated to focus attention to the design of building sides and rear yards.
- All Cluster Housing and Multiple Residential development will be subject to Development Permit standards contained in Surrey's OCP and supplemental Design Guidelines contained in this Report (See **Appendix III**)
- Residential developments will be encouraged to incorporate sustainable development practices such as on-site stormwater management and infiltration measures, limited impermeable surfaces, solar orientation, alternative energy and other low-impact development features through the development of Builders Requirements and / or Home Owner's Manual at the time of development.
- Impermeable areas will be minimized in new developments through the application of sustainable development design and practices. Permeable surface materials such as permeable pavers and asphalt will be encouraged in all developments, especially where common parking areas, lanes and driveways are components of the development, and on pedestrian routes / pathways.
- Developments will be encouraged to utilize enhanced and sustainable stormwater and energy systems where possible.
- To facilitate innovative measures to promote the retention of trees, protection of watercourses and open space, the density allocations allowed are based on the gross areas including roads and environmental areas.

3.5.3 Single Detached Residential Policies

- The Single Detached residential developments (at 5 uph / 2 upa) east of 164 Street will be designed to respond to the existing suburban homes in the area. New houses will be designed to a high quality standard styled upon the adjacent Morgan Creek community. It is anticipated that these suburban Single Detached residential areas would be developed under a comprehensive development (CD) type zoning with special regulations developed to reflect the suburban density and environmental / open space preservation goals for the area.
- Transition Single Detached lots (5-7 uph / 2-3 upa) are located along the boundaries with existing one acre lots between 160 and 164 Streets. **Figure 6** presents a plan view of the treatment of transition lots in relation to existing one acre lots to demonstrate that lots of this size can provide a successful transition from larger to smaller lots. Design Guidelines will ensure the new homes are compatible with and complement existing houses in the neighbourhood.
- The Single Detached residential developments (10-15 uph / 4-6 upa) west of 164 Street will similarly be designed to be compatible with and complement the existing homes in the neighbourhood.
- Design Guidelines for the Single Detached developments will address such features as site landscaping and buffering, building sitting on the lot and relationship to the road, house size, building materials and colours, roof pitch and garage design. **Appendix III**

provides a more detailed list of the considerations that will be addressed in the preparation of detailed Design Guidelines for the Single Detached homes, Cluster Housing, and Multiple Residential developments.

- No individual driveways will be permitted onto arterial roads such as 160 Street, 168 Street, and 32 Avenue.

3.5.4 Cluster Housing Residential Policies

- The purpose of the Cluster Housing designation is to preserve significant natural environmental features and open space by providing flexibility in land use and the siting of buildings. Residential units within land designated as Cluster Housing shall be grouped to minimize their impact on the existing landscape and to preserve as much open space as possible. The Cluster Housing designation is targeted at 6 to 8 units per gross acre. Achievable density may be below these targets depending on the site features. **Figure 52** demonstrates one example of how Cluster Housing developments differ from traditional residential developments.
- The target amount of natural open space recommended to be preserved on privately owned property (excluding required public park space) is 35-40% of the gross site area. This natural open space is to be protected through a Restrictive Covenant or Easement for maintenance purposes and to prevent the removal of trees or the construction of structures.
- Cluster Housing developments should include a mix of unit sizes and types, including single units, duplex units, triplex units, and quad-plex units. The variety of units should reflect the location of trees, site features, and environmental watercourses. The illustrations in **Figures 7, 8, and 9** illustrate potential Cluster Housing built forms.
- It is anticipated that the Cluster Housing residential areas could be developed under a comprehensive development (CD) zone with special regulations developed to reflect the purpose of the Cluster Housing concept. This CD zone could be based on RM-10 / RM-15 and RC zones and include elements to preserve appropriate open spaces.
- The minimum recommended parent parcel size for Cluster Housing is 2 hectares / 5 acres, unless the proponent can demonstrate that a land assembly of this size is not feasible or that development located on a smaller site can be designed to properly reflect the site topography, preserve environmental features and trees, provide suitable site access, and achieve the recommended minimum target of 35-40% for natural open space.
- All Cluster Housing developments will require Development Permits to reinforce design and environmental objectives. The **General Residential Design Guidelines in Appendix III** of this NGH NCPA provide design guidelines and site assessment and tree preservation guidelines for Cluster Housing.
- A Cluster Housing development application will include a site assessment analysis by a qualified professional(s), which will identify (based upon site terrain, environmental / landscape features and site grading / servicing requirements) potential areas to be preserved on a site.

- To encourage a similar street-oriented appearance with no direct access to individual units on both sides of 28 Avenue, development in NGH NCPA will be coordinated with developments in the Morgan Heights NCP to the south of 28 Avenue.

3.5.5 Multiple Residential Policies

- Medium density Multiple Residential development (at 37-62 units per hectare / 15 - 25 units per acre) will also be clustered to allow for the preservation of significant open space and environmentally sensitive lands such as watercourses and important habitat.
- Multiple Residential development will primarily be in the form of ground-oriented townhouses, stacked townhouses and / or row townhouses. Where feasible, small 3 storey apartment buildings may be included on less sensitive sites.
- Design, treatment, and massing of Multiple Residential units along 156 Street and 28 Avenue will be designed to consider the change in density interfaces with adjacent uses.
- Unit designs, locations, and yields will reflect the individual site environmental features.

3.6 GENERAL RESIDENTIAL DESIGN GUIDELINES

One purpose of this NCPA is to advocate and encourage development of a variety of housing types either within comprehensively designed Cluster Housing residential or Multiple Residential sites or as Single Detached homes on a range of lot sizes aimed at complementing and preserving the existing residential character of North Grandview Heights.

Appendix III contains the **General Residential Design Guidelines** that will serve as the basis for the preparation of detailed Design Guidelines to accompany specific development rezoning and subdivision applications. Also included are proposed architectural features and design specifics that must be addressed in the detailed Design Guidelines aimed at preserving, complementing and enhancing the multi-faceted residential character of North Grandview Heights.

3.7 INTERFACE, BUFFERING AND TRANSITION POLICIES

3.7.1 Overview

The NCPA recognizes that there are a number of existing one-acre enclaves within North Grandview Heights and that it is important that these established areas are appropriately buffered and that new development respects the existing ambiance and character of the area. The graduated Single Detached lot densities from larger lots to smaller promote compatibility, however additional buffering and transition policies are proposed below.

3.7.2 Buffering and Transition Policies

The following policies will apply to new residential developments within the NCPA area:

32 Avenue & Morgan Creek Community West of 164 Street

- An appropriate buffer of approximately 15 metres will be established between proposed residential uses along 32 Avenue and existing residential development to the north in the Morgan Creek community. This buffer will be located outside of the proposed 32 Avenue right-of-way widening. A sidewalk will be constructed within the increased road right-of-way. The buffer will be located on private property and assist with noise attenuation (both direct and reflected), provide a 'green' ambiance to the street with a berm and landscaping, and protect future and existing residents from any negative impacts from traffic. **Figure 10** illustrates the interface conditions for both Single Detached lots and Cluster Housing conditions along 32 Avenue. The buffer will be included in the backs of private Single Detached lots and as part of the Cluster Housing strata development. An appropriate Restrictive Covenant or Easement will be placed upon the buffer area to prevent the removal of trees or construction of structures.

32 Avenue & Agricultural Land Reserve East of 164 Street

- Agricultural lands within the Agricultural Land Reserve (ALR) are located to the north and east of the easterly portion of the NCPA area. A buffer along 32 Avenue east of 164 Street will serve to separate proposed residential land uses from existing agricultural activities. This buffer will consist of the 32 Avenue road right-of-way (ultimately 27 metres wide) and a public environmental / utility corridor dedication to accommodate the identified watercourse (20 metres wide). (See Section 2.7.5 of this Report)

Existing Homes on 30B Avenue Between 160 Street and 164 Street

- A buffer area (approximately 10-15 metres in width) will be established adjacent to the north side of the existing 0.4 hectare / one-acre lots on 30B Avenue between 160 Street and 164 Street. The buffer will incorporate a row of existing trees with additional planting, where appropriate. This planting buffer will be protected either in the form of a Restrictive Covenant or an easement placed on the new lots at the time of subdivision approval to prevent the removal of trees or construction of structures. The proposed transition Single Detached lots in this area will be deepened to 45+ metres to incorporate the buffer. Given the location of existing homes to the south, with the proposed building setback (7.5 metres) beyond the buffer, a significant and effective separation distance of approximately 75 metres is achieved between existing and new homes. **Figure 6** illustrates this buffer and relationship.

Proposed Homes on 31 Avenue Between 160 Street and 164 Street

- A 6 metre buffer will be incorporated into the new Cluster Housing development to provide a buffer between the proposed 4-6 upa Single Detached homes to the east on 31 Avenue between 160 Street and 162 Street. This buffering relationship is illustrated on **Figure 11**.
- The location of new homes on new lots adjacent to existing 0.4 hectare / one-acre enclaves will mimic the existing development pattern. Changes in residential densities proposed will occur at the rear or side of property lines rather than on the street face. This will be accommodated by having flared rear yards with private buffers that back onto established one-acre lots in order to best match existing lot sizes. **Figure 6** illustrates this concept.

Proposed Homes Between 164 Street and 168 Street

- A 5-15 metre buffer strip consisting of existing and planted trees will be provided along the southern boundary of the 5 uph / 2 upa Single Detached lots east of 164 Street. The buffer will be 5 metres wide between 164 Street and 166 Street and 15 metres wide between 166 Street and 168 Street. It will be located either in a private buffer area or incorporated into the Grandview Interceptor right-of-way / linear greenway depending on the final location of the Interceptor. If the buffer is located within a private lot, it will be protected in the form of either a Restrictive Covenant or an easement placed on the lots at the time of subdivision approval. The final location will be determined when the interceptor right-of-way is confirmed. Any Restrictive Covenants or easements put in place on private property will be removed when the lands to the immediate south are developed and the interceptor ROW secured, as a buffer will no longer be required between similar land uses. Additional buffering in this area will be provided by the proposed neighbourhood park.
- **Figure 12** illustrates the proposed buffering between environmental areas and Single Detached areas.
- As identified in preliminary watercourse analyses for April Creek, as part of the 32 Avenue widening plan it was proposed that the portion of April Creek adjacent to 32 Avenue, between 164 Street and Old Logging Ditch be relocated to the north side of the road. This NCPA makes provision for April Creek on the south side of 32 Avenue with a public 20 metre wide green belt, which will also act as a significant buffer, between the road and the proposed Single Detached large lots. This buffer will be wide enough to accommodate an enhanced April Creek and utility corridor on the south side of the road.

Existing Lots Between 162 Street and 164 Street

- At 28 Avenue and 162 Street, there is an interface from the side lot lines of existing 0.2 hectare / half acre and 0.4 hectare / one acre lots east of 162 Street and the new development. The lot sizes in the new development in the western interface area along 162 Street will be approximately 0.2 hectare / half-acre in size and mimic the existing development pattern.

Entry Features, Round-Abouts, and Traffic Circles

- Provide a major entry feature into the development on the south side of the 32 Avenue and 160 Street intersection. This entry feature, including appropriate landscaping, would be designed to match the existing entry feature on the north side of this intersection into Morgan Creek. Entry features will be located on private strata lands and will be constructed and funded by the developer. **Figure 13** conceptually illustrates the proposed design and landscaping elements of this major entry feature. **Figure 14** presents a concept for a minor entry feature at 28 Avenue and 158 Street; similar minor entry features could potentially be located at other intersections.
- Round-abouts will be provided along the new east-west local roads in the two new neighbourhoods; one between 156 Street and 160 Street and one between 164 Street and 168 Street. See **Figure 15** for details. Any landscape / water features in the round-about will have to be maintained under either a strata agreement or by a local homeowners

association; the City will not be responsible for maintaining landscape / water features. The particular design and maintenance arrangements will be determined at the application approval stage.

- Several traffic circles are proposed throughout the development to serve as traffic calming features.

3.8 LAND USE COMPARISONS, STATISTICS AND PROJECTED POPULATION

Based on the proposed NCPA area (the approximate western three-fifths of the North Grandview Heights NCP area), the proposed land use areas and densities are summarized in **Table 3.8.1** below.

The NCPA area will provide for between approximately 1,400 and 2,000 residential units with a total population of between about 3,400 and 4,800 residents. The overall density within this amendment area of 114 hectares / 281 acres will be in the range of 12.3 - 17.5 units per hectare / 5.0 - 7.0 units per acre. The ultimate density of the entire North Grandview Heights NCP area west of 168 Street will be approximately 9.0 - 9.9 units per hectare / 3.6 - 4.0 units per acre including both the proposed and existing development areas.

Table 3.8.1 presents the Land Use Inventory for the designated land use areas as per **Figure 2** Land Use Plan. The areas shown for designated residential uses include potential public and private roads within the NCPA area.

Table 3.8.1 – Land Use Inventory

Land Use Category	Area (approx) (ha)	Area (approx) (ac)	% of Amendment Area	% of Total NCP Area
Environmental Open Space	13.2	32.6	12%	
Neighbourhood Parks (2)	3.4	8.4	3%	
Linear Open Space	2.4	6.0	2%	
Elementary School	2.5	6.1	2%	
Single Detached Residential (2 upa) (3)	29.1	71.9	25%	
Single Detached Residential (3) - Urban (4 - 6 upa) / Transitional (2 - 3 upa)	19.4	47.9	17%	
Cluster Housing Residential (6 - 8 upa) (3)	33.8	83.5	30%	
Multiple Residential (15 - 25 upa) (3)	10.0	24.7	9%	
NCP AMENDMENT AREA (rounded)	114	281	100%	33%
EXISTING NCP OUTSIDE AMENDMENT AREA (unchanged)	228	564		67%
NGH NCP: TOTAL	342	845		100%

- Notes: (1) UPA = units per acre
(2) Neighbourhood Parks include Linear Open Space in areas where the two types of parks overlap.
(3) Residential areas within NCP Amendment (NCPA) Area include public and private roads.

Table 3.8.2 presents the Estimated Residential Unit Yield for the NCPA area. Estimated yields are based upon application of the proposed density ranges for each residential density.

Table 3.8.2 – Estimated Residential Unit Yield

Land Use Category	Gross Area (approx ac)	Gross Area (approx ha)	UNIT YIELDS					
			low range	upa	high range	upa	mid range	upa
Single Detached Residential (2 upa)	89.80	36.36	180	2	180	2	180	2
Transition Areas (2-3 upa)	7.26	2.94	15	2	22	3	22	3
Single Detached Residential (4-6 upa)	41.78	16.91	167	4	251	6	209	5
Cluster Housing Residential (6-8 upa)	100.13	40.54	601	6	801	8	601	6
Multiple Residential (15-25 upa)	28.03	11.35	420	15	701	25	560	20
TOTAL	267.00	108.10	1,383		1,955		1,572	

Notes:

- (1) "Gross Area" includes proposed public roads, potential private roads, environmental open space, linear open space; excludes neighbourhood parks, the school site, and existing public roads.
- (2) Estimated unit yields based on allowable density for gross area. Land use categories only include residential land uses. Including non-residential uses, total NCPA Area equals 114 hectares / 281 acres.

Estimated yields include an upper and lower forecast based upon minimum/maximum gross density limits established in the NCPA for each land use category. A mid range estimated yield is also provided which serves as the basis for calculating anticipated amenity contribution levies and Development Cost Charges (DCC) revenues.

For the purposes of calculating estimated unit yield, the high, low, and mid range density factors have been applied to the gross area of each residential use type. Gross areas include proposed public and potential private roads as well as environmental / open space and linear open space areas associated with each residential area.

Based upon the Land Use Concept Plan, the development within the NCPA area will result in approximately 1,400 (1,383) to 2,000 (1,955) residential units in the area. The mid range yield is just under 1,600 (1,572) residential units.

Note that the number of residential units actually achieved on each site will depend on individual site characteristics, including site terrain, open space dedication requirements, and parcel size and shape. The land use category densities are a target range for each site and are anticipated to be achieved for the overall land use plan, however individual smaller parcels may not achieve the target densities depending on individual site characteristics.

3.9 SCHOOLS AND COMMUNITY AMENITIES

3.9.1 Overview – Schools

The North Grandview Heights NCP area currently contains one school – Kensington Prairie Elementary School located at the southeast corner of 32 Avenue and 168 Street. Staff of Surrey School District No. 36 report that this school will soon be closed and that a new elementary school site is required to serve the future students of North Grandview Heights and the NCP area in Grandview Heights south of 28 Avenue (Morgan Heights).

A centrally located and physically appropriate elementary school site located northwest of 28 Avenue and 160 Street has been identified as potentially suitable to adequately meet the school needs for the area. The school site – about 6.1 acres in area – has been designated as such in the NCPA. The site will have good access via a proposed through local road immediately adjacent to the west and adjacent to the site. It will be the responsibility of the School District to acquire either this site or another suitable property in the catchment area and provide necessary on-site and off-site infrastructure. Off-site services will be designed to accommodate the school's needs.

If the land currently designated for an elementary school is determined to not meet the requirements of the School District for the needs of the new local residential population, it may be developed under the provisions of the Cluster Housing designation in this NCPA document, subject to the designation of an alternative school site in the catchment area to the satisfaction of the School District and the City of Surrey.

Secondary students in the NCPA area attend either Semiahmoo Secondary School (located at 148 Street and 18 Avenue) or Earl Marriott Secondary School (located at 158 Street and 16 Avenue). Both of these secondary schools are located about 3 - 4 kilometres to the southwest of the North Grandview NCPA area. There is also Southridge School (private) located south of 28 Avenue on 160 Street. Southridge School has a current enrollment of about 660 students who live throughout the region. The Grandview Heights area will ultimately require an additional secondary school.

3.9.2 Overview – Community Amenities

Due to its relatively undeveloped nature, the North Grandview Heights NCPA area contains a limited number of community facilities and amenities. Residents obtain most of their everyday shopping and service needs from the South Pointe shopping area and Semiahmoo Town Centre, which has a library and recreational facilities. There is also a semi-public golf course immediately to the north of this area along with the cemetery lands along 32 Avenue which contribute substantially to the 'green' ambiance in the area. Civic facilities and services may also be established in the greater Grandview Heights area to the south as the area builds out over the next 10-15 years.

The North Grandview Heights NCPA will bring a number of new parks and protected natural areas and a multi-use trail network into the area. It will also facilitate the construction of the Grandview Interceptor and completion of the area's road network.

3.9.3 School and Community Amenities Policies

The following policies will guide development of the future school and community amenities within the NCPA area:

- As shown on **Figure 2**, a new elementary school site of approximately 2.5 hectares / 6.1 acres in size has been identified near the corner of 160 Street and 28 Avenue. The school site and associated passive environmental spaces (see Section 3.10 below) will also be interconnected with the community through linear parks, trails and pathways. An Open Space and Pedestrian / Bicycle Circulation Plan including linkages to the Pioneer Greenway west of 156 Street and route along the proposed sewer interceptor is shown in **Figure 16**.
- Access to the school site will be via local roads internal to the new residential area between 156 Street, 160 Street and 28 Avenue.
- It will be encouraged that the school naming committee consider naming the new school in consideration of the local pioneer families who settled in the area.
- A new school should be constructed to complement the natural beauty of the area and incorporate low impact development features.
- Each new development in the NCP area will be required, as per the City's amenity contribution policy, to contribute toward the capital costs for police, fire and library facilities, and for the development of public parks and open spaces within the NCPA area.
- Access to a school site will be via a public road. In addition, the existing pedestrian walkway over Highway 99 will be used for students coming from west of the highway.
- A school site will be included in the early phases of the development to ensure public road access to the site.

3.10 PARKS AND OPEN SPACE

3.10.1 Overview

As shown on **Figure 16**, a number of open spaces and linear parks in conjunction with preservation areas and environmental management setbacks from designated watercourses have been identified. The lands identified for parks and environmental management total approximately 19 hectares / 47 acres, or nearly 17% of the amendment area.

The location, size and function of these parks and open spaces enhances the open space systems proposed in the 1999 North Grandview Heights NCP. In particular, the east-west multi-use corridor along the future Grandview Interceptor (sewer) right-of-way will remain and be enhanced by three neighbourhood parks.

The NGH NCPA area will feature linear parks and multi-use trails connecting the main activity areas within the community and connecting the active park areas with the natural protected areas.

In addition, there are linear pathways linking the various existing and future subdivisions allowing many pedestrian and bicycling route options throughout the area.

In addition to parks, the area has significant green space in the form of natural treed areas within and adjacent to future development, through clustering and tree preservation, the cemetery and Morgan Creek Golf Course to the north. Some of this open space may be privately held but publicly accessible.

3.10.2 Parks and Open Space Policies

The policies to guide the location and development of parks and open spaces within the NCPA area are as follows:

- Through right-of-way acquisition / dedication, partly in conjunction with new development, a multi-use trail with a minimum pathway width of 4.0 metres will be established along the Grandview Interceptor right-of-way, which will link Rosemary Heights in the west to 172 Street in the east. North-south connections will provide convenient access for residents to the multi-use trail. This multi-use corridor along the future Grandview Interceptor (sewer) right-of-way will be enhanced by small neighbourhood parks along its length within the NCPA area. **Figure 17** provides a conceptual illustration of the main design elements and dimensions of the multi-use trail. The detailed right-of-way and multi-use trail design and landscaping requirements will be determined at the time of development applications.
- A sidewalk will be provided along the south side of 32 Avenue between the cemetery and 168 Street within the road ROW. See **Figure 18**.
- Where a walkway or multi-use trail is also utilized as a municipal utility corridor, an adequate width will be determined to accommodate the necessary utilities at the time of development.
- Watercourse environmental setback requirements will be provided as per Fisheries and Oceans Canada (DFO) standards. Setbacks may be expanded to address the topography and will be considered on a case-by-case basis at the time of development. Any walkways along environmentally sensitive areas will have to be provided as an additional open space dedication beyond required environmental setbacks. The width of this additional open space will be determined in relation to required walkway / trail and buffer requirements.
- While open space dedicated for riparian setbacks can be counted towards the required 5% park dedication area for the entire NGH NCP development area in conformance with City policies, approximately 2.6 hectares / 6.4 acres of the NGH NCPA area is also provided as dedicated neighbourhood park specifically to serve Single Detached development areas. Park dedication requirements for Cluster Housing and Multiple Residential development will be reviewed at the application stage. Open space on Cluster Housing and Multiple Residential development sites typically remains under the ownership and management of a strata or homeowners organization.

- An active neighbourhood park of about 0.7 hectares / 1.7 acres in size will be located at about 159 Street and 30 Avenue and will provide some active parkland.
- An active neighbourhood park of about 0.7 hectares / 1.7 acres in size (excludes through Linear Park area) will be located in the vicinity of 162 Street and 29 Avenue and will be connected to the linear park system. Including the Linear Park area the total open space area is approximately 1.1 hectares / 2.7 acres.
- An active neighbourhood park of about 1.2 hectares / 3.0 acres in size (excludes through Linear Park area) will be located within the 5 uph / 2 upa residential developments east of 164 Street and will be connected to the linear park system. Including the Linear Park area the total open space area is approximately 1.6 hectares / 4.0 acres.
- Linear parks will connect the main activity areas within the community and the active and natural park areas.
- Detailed park designs will be finalized with input from the local community through a public planning process prior to park development.
- Significant private green space will be provided in the form of natural treed areas within future developments, through clustering and tree preservation, retention of the cemetery and Morgan Creek Golf Course to the north.
- Open space will be set aside in conjunction with the Single Detached residential developments east of 164 Street.
- Parks and walkways will meet Crime Prevention Through Environmental Design (CPTED) standards, including walkways being visually open, located away from rear yard property lines, and feature low fencing to allow for visual access or surveillance. These walkways will be located along roads and public areas where possible. **Figure 19** conceptually illustrates this relationship.
- Each new residential development in the NCPA area will be required, as per the City's amenity contribution policy, to contribute toward the capital costs for the development of public parks and open spaces.
- Impermeable areas will be minimized in all park and open space development through the application of sustainable development design and practices. Permeable surface materials such as permeable pavers and asphalt will be encouraged in common parking areas, lanes and driveways, and on pedestrian routes / pathways. Infiltration measures such as topsoil management will be encouraged in the design of all parks and public open spaces.

3.10.3 Pedestrian Connections Policies

As shown on **Figure 16**, pedestrian connections will be provided throughout the residential neighbourhood in the form of interlinking multi-use trails in linear parks on the sewer interceptor right-of-way and sidewalks within road rights-of-ways. The main west-east road between 156 Street and 160 Street will contain sidewalks on both sides of the road. This enhanced sidewalk will be in the form of a wider sidewalk surface, possibly meandering, and extra planting within the road right-of-way.

Pedestrian access will also be provided along the edges of the neighbourhood in the form of a walkway along 32 Avenue and a sidewalk along 160 Street. Where access to these walkways is provided through Single Detached lots on a cul-de-sac, the public walkways will be wide enough to accommodate underground municipal utilities.

Pedestrian walkways along 32 Avenue will be designed to consider the road right-of-way needs of the City, private property yards, environmental features, and pedestrian enjoyment.

3.11 ENVIRONMENTAL MANAGEMENT

3.11.1 Overview

An environmental assessment was undertaken for the NCPA area. This assessment and the associated recommendations will be adhered to as development proceeds.

In addition to protecting the natural watercourses and associated wildlife habitat, the essence of this NCPA is to provide for innovative, environmentally-sensitive development through development form (i.e., clustering), at-source stormwater control, tree-retention, and through general neighbourhood design.

The North Grandview Heights NCPA incorporates watercourse and environmentally sensitive area protection measures, land use planning, parks and open space designations and stormwater management strategies that have all been designed to respect the aquatic and wildlife values found in the area.

The following policies will guide development in the NCPA area in the context of environmental management and protection:

3.11.2 General Environmental Policies

- The recommendations made by the environmental consultants will be adhered to in the development of the North Grandview Heights NCPA area.

3.11.3 Watercourse Protection

- The riparian zone setbacks from watercourses will be provided as required by Fisheries and Oceans Canada (DFO). **Figure 12** shows an example of Single Detached development and watercourse protection setbacks. Expansion of the DFO recommended riparian zone setbacks may be considered at the time of development by City staff on a case by case basis to appropriately address issues of topography and flooding.
- Riparian setbacks requirements will be determined at the time of development application and abide by the applicable legislation in effect at that time. The riparian setback regulations are currently being reviewed and updated by the City of Surrey in conjunction with the Ministry of Environment and Department of Fisheries and Oceans.

- Watercourse crossings will be minimized.
- Open bottom structures (which may have granular bases) will be used where road crossings of watercourses are necessary.
- Watercourse base flows will be maintained.
- A stormwater management plan will be followed to increase the use of pervious surfaces and utilize landscaping and other techniques as a means to retain stormwater.
- Riparian habitat setbacks will be fenced as per Fisheries and Oceans Canada standards.

3.11.4 Wildlife Protection

- Green space corridors will be retained to permit wildlife movement throughout the larger area and reduce the potential for habitat fragmentation. The recommended minimum corridor width for wildlife movement is 30 metres.
- Significant trees identified through arborist reports will be retained, and if raptor nests are found, active raptor nest trees will be retained and buffered according to Provincial Best Management Practices.
- Nest boxes or nest platforms for raptor nests may be installed along with bat houses for insectivorous bats such as the little brown bat.

3.11.5 Vegetation

- Invasive and exotic plant species will be removed and re-vegetated with native species, including landscaped areas within the community.

3.12 TREE PRESERVATION

3.12.1 Overview

The land use concept proposed for this NCPA area incorporates design features based upon sound principles to achieve maximum tree retention. These features include:

- Identifying on-site tree stands and locating building envelopes and clusters of development to accommodate these stands (this analysis to be undertaken by a qualified professionals prior to detailed subdivision and development design);
- Protecting riparian habitat;
- Locating higher residential densities in areas that are already clear or that contain predominantly pioneer deciduous forest cover;
- Utilizing existing roadway corridors for upgraded roads and services;
- Using water infiltration and soil management techniques to retain the natural conditions to the greatest degree possible; and

- Designing Cluster Housing and Multiple Residential housing to respect the retention of coniferous and other high retention value tree resources.

3.12.2 Tree Retention Policies

The following policies will guide development in the NCPA in the context of tree retention and protection:

- The selection of trees for retention will consider the health and structure of the trees and their location and proximity to infrastructure and building elements. A detailed qualitative assessment of the resource will be undertaken to guide the planning of specific sites, park, greenway, and landscape elements in order to maintain the mature forest character of the site, and to meet City of Surrey Tree Preservation Bylaw requirements as amended from time to time.
- The densities and building form in areas where significant tree stands exist will reflect the available space in context with the tree resource.
- The following opportunities and concepts for retention of trees will be encouraged in the Multiple Residential areas of the NCPA:
 - Density trade-offs - i.e., mixed densities within a site to accommodate areas for tree retention;
 - Increased building massing - i.e., increase building height in one part of the site to make up for potential loss in developable land where tree retention is proposed;
 - General detailed design efforts for all building and infrastructure items that include consideration for the tree resource and the protection needs of proposed retention trees;
 - Soft surface pathway specifications; and
 - Innovative stormwater runoff controls - i.e., swale and drainage pipe infrastructure requirements relaxed so that the controls are implemented on the uphill side of tree retention areas only; not at the downhill property line as conventional civil design requirements prescribe.

4.0 IMPLEMENTATION

There are a number of ways that this NCPA will be implemented, including through policy, regulations, and funding approaches. The following sections outline these implementation approaches.

4.1 SURREY'S OFFICIAL COMMUNITY PLAN

The area in the North Grandview Heights NCP is currently designated as 'Suburban' in Surrey's Official Community Plan (OCP). To implement the plans and policies of the NCP amendment, the applicable lands west of 164 Street will require a change in the OCP designation to 'Urban'. The portion of the NCPA area affecting lands east of 164 Street will not require an OCP amendment because the densities (5 units per hectare / 2 units per acre) are allowable within the 'Suburban' designation.

Due to the number of properties involved and the uncertainty regarding the timing of development, applications to amend the OCP designation will occur concurrent with applications to rezone and / or subdivide property in the NCPA area.

4.2 PHASING

It is anticipated that the land within the NCPA area designated for five or more units per hectare / two or more units per acre will build out over a period of 5-10 years. Development will occur as rezoning and subdivision applications are submitted by property owners. Due to the proximity to servicing, it is expected that the first phases of development will be north of the future Grandview Interceptor (future linear greenway). The latter phases would be the areas south of the Grandview Interceptor which could be developed once the Interceptor is extended east to 160 Street. The possible elementary school site, which is also north of the Grandview Interceptor, will be included in the early phases of the development to ensure access to the site and allow for the funding and construction of the school facility to coincide with the school needs of the area.

4.3 NEW OR REVISED ZONING MECHANISMS

The implementation of this NCPA area may require new or amended zones to accommodate the innovative building forms and development proposed. In particular, a zone to accommodate urban Cluster Housing and suburban development may be required to ensure that the objectives of this NCPA are achieved. It may be possible to develop such a zone in connection with the first development applications received by the City.

4.4 REZONING, SUBDIVISION, AND DEVELOPMENT PERMITS

Development proposals within the NGH NCPA will be planned and evaluated pursuant to the land use concept and policies contained in this NCPA Report.

4.5 AMENITY CONTRIBUTIONS

4.5.1 Overview

Consistent with the City's policy regarding Neighbourhood Concept Plans and the provision of amenity contributions for new urban development, the amenity needs of the North Grandview Heights NCPA area are to be addressed through monetary contributions payable at the time of rezoning, or subdivision approvals. The monetary contribution is necessary to fund the costs of the capital requirements for the provision of additional police, fire protection and library services as well as the development of new park / open space required as a result of the new development.

The original North Grandview Heights NCP made provision only for contributions toward specific expenditure associated with developing parks, open space and pathways. Contributions toward the costs of capital works required for fire, police and library facilities were not required. The total contribution for park, open space and pathway development covered the following capital works:

- Development of a multi-use pathway (gravel surface) on the North Grandview Sewer Interceptor right-of-way (2,600 linear metres);
- Staging area for multi-use pathway under the Hydro right-of-way; and
- Urban forest management (along creek setbacks and forested dedicated parks).

It is intended that, in addition to the park development costs and due to the more urban densities in the NCPA area, monetary contributions toward police, fire and library materials should be required to offset the capital costs of providing these services as applied on a standardized basis to all NCPs in Surrey.

4.5.2 Amenity Contributions Toward Parks / Open Space and Pathway Development

Monetary contributions toward park development are derived by the specific open space needs of the NCPA area. The costs are divided among residential units or on the basis of acreage (for non-residential uses) to ensure an equitable contribution among all new development. Non-residential uses are exempted from contributing towards park amenities and library materials because these uses have minimal impact on these services as they do not directly require them. The estimated cost of developing parks and related amenities within the North Grandview Heights NCPA area is approximately \$1,365,000. This figure is based on the following estimated costs of development / construction provided by City staff:

- A park approximately 1.7 acres in area between 156 and 160 Streets - \$211,000;
- A park approximately 1.7 acres in area between 160 and 164 Streets - \$228,000;
- A park approximately 3.0 acres in area between 164 and 168 Streets - \$259,000;
- Development of a linear park and off-street multi-use pathway (gravel or paved surface) connecting these parks on the North Grandview Sewer Interceptor right-of-way (1,300 linear metres) - \$496,000; and
- Urban forest management and restoration (along creek setbacks and forested dedicated parks) - \$171,000.

New development at 0.4 hectare / one-acre densities outside of the NCPA area will continue to be subject to the amenity requirements for park / open space / pathway development as contemplated in the original NGH NCP adopted in 1999.

4.5.3 Amenity Contributions Toward Police, Fire and Library Facilities

New development within the NCPA area will be required to contribute toward the capital costs of providing additional police, fire and library facilities. These contributions are applied on a standardized basis for all NCPs within the City of Surrey.

4.5.4 Summary of Amenity Contributions

A summary of the applicable amenity contributions (per dwelling unit / lot or per acre) and the estimated revenue the City can expect to receive from the NCPA area at build out is outlined in the following table. All figures are in 2005 dollars.

Table 4.5.4 – Amenity Contributions

Amenity	Residential Contribution (per dwelling unit) (± 1,400-2,000 units)	Non-Residential Contribution (per acre) (1)	Anticipated Revenue at Built Out (Based Upon 1,572 New Residential Units) (2)
Parks, Open Space & Pathway Development	\$868.32 / unit	N/A	\$1,365,000
Police Protection	\$56.89 / unit	\$227.56 / acre	\$89,431.08
Fire Protection	\$245.71 / unit	\$982.84 / acre	\$386,256.12
Library Materials	\$127.97 / unit	N/A	\$201,168.84
Total	\$1,298.89 per unit	\$1,210.40 / acre	\$2,041,856.04

Notes:

- (1) Does not apply to any proposed development in the NGH NCPA area.
- (2) For the purposes of calculating anticipated amenity contribution revenues, build out is assumed to be 1,572 residential units which corresponds to the figure applied in Section 6.3.2 of this Report to determine Development Cost Charges (DCC) revenues. This figure represents a conservative assumption at the lower end of the 1,400 to 2,000 residential units that will result from the density ranges established in the NGH NCPA area for each of the residential uses.

4.6 DESIGN GUIDELINES

Detailed Design Guidelines will be prepared in conjunction with development applications and will be based on the **General Residential Design Guidelines** contained in **Appendix III**.

4.7 LOW-IMPACT DEVELOPMENT PRACTICES AND STANDARDS

One of the most prominent characteristics of this NCPA is the multiple approaches proposed to accomplish sustainability features through several 'green' initiatives. In addition to the innovative development forms to retain tree and vegetation and the high proportion of open space, a series of low-impact development standards will be prescribed for new development.

For urban areas, some of the practices to be explored and implemented may include:

- Rain gardens within developments and on boulevards, parks or roundabouts.
- Bio-filtration swales.
- Permeable surface materials.
- Various forms of infiltration trenches and pits.
- Greener road designs.
- A set of Builders Requirements and / or a Home Owner's Manual to ensure effective implementation of the low-impact practices to be created by the developers.

4.8 UTILITY CORRIDORS

Public utility corridors will be provided within the development as required to properly service the area. As an example, where residential cul-de-sacs are located at the bottom of a hill, a necessary utility corridor will be provided between lots. The width of the utility corridor will be determined at the time of detailed infrastructure design. Where possible, the utility corridor will be combined with a public walkway.

4.9 INDEPENDENT DEVELOPMENT WITHIN 5 UPH / 2 UPA DENSITIES

In areas designated as Single Detached and Larger Transition Lots, it is encouraged that larger assemblies of properties be developed cooperatively to efficiently accommodate the required watercourse/environmental preservation, road layout, and parks requirements as identified in the North Grandview Heights Amendment area. All applications will be reviewed pursuant to the NCPA polices on a case-by-case basis.

4.10 CLUSTER HOUSING MINIMUM PARCEL SIZE DEVELOPMENT

To achieve NCPA objectives, it is recommended that Cluster Housing developments be a minimum of five acres in area. Proposals with less than five acres may be considered on a case-by-case basis subject to the proponent demonstrating how Cluster Housing objectives, such as reflecting the terrain of the land, preserving at least 35-40% of the land in an open space tract that contains environmental features and providing suitable site access can be achieved. Other factors to consider a smaller Cluster Housing development parcel include the character of adjacent Cluster Housing development, potential remainders of land designated as Cluster Housing, the amount of environmental features on the site, and the feasibility of assembling the minimum parcel size.

4.11 TEMPORARY ACCESS

Temporary access from within the Single Detached developments in the central / eastern part of the NCPA area may be required if through access is not immediately available. This temporary access could be in the form of right in / right out roads onto 32 Avenue at approximately mid-block between 160 Street and 164 Street and mid-block between 164 Street and 168 Street. A temporary access will not be permitted, however, unless a three lane cross section, including the middle turning lane, has been constructed for 32 Avenue at the location of the temporary access point. Once the ultimate road network for the area is provided, these temporary access roads will be closed.

4.12 ALTERNATIVE ROAD NETWORK

In the event that properties are developed in a different phasing order than envisioned in this Report or are independently developed, alternative road networks may be considered for internal roads subject to approval by the City Planning and Engineering Departments.

5.0 TRANSPORTATION AND INFRASTRUCTURE SERVICING

5.1 INTRODUCTION

The North Grandview Heights Neighbourhood Concept Plan Amendment Stage I Report, submitted in May 2005, provided a general outline of the engineering servicing necessary to service the NGH NCPA area. This section will supplement the Stage I Report and provide greater detail and analysis with regard to the transportation, water, sanitary, storm drainage, and utility infrastructure required to service these lands.

The servicing strategy outlined within this Report is consistent with the 1999 NGH NCP Stage II Report, the NCP Amendment Stage I Report, and the City of Surrey's long range plans. It identifies those works proposed under the City's 10-Year Servicing and provides cost estimates for the additional work required as a result of this Amendment. Under the context of the "Developer-Pay" principle, the majority of the funding for the servicing will come from the development community. With the exception of specific proposed additions to the City's 10-year Servicing Plan, the City will not front-end any previously unidentified engineering infrastructure as a result of this NCP Amendment.

It is proposed that the NCPA area be developed in a sustainable and environmentally responsible manner. All infrastructure will incorporate Best Management Practices (BMPs) and Low-Impact Development strategies as outlined in section 5.3.3. In cases where these strategies conflict with City standards, justification for their implementation is presented. The intent is that this NCPA area can be developed to enhance the natural systems and habitat without adversely affecting adjacent infrastructure, properties, or watercourses.

The servicing concepts within this report are only indicative of the general servicing needs. Lotting, where shown, is preliminary and subject to change. These details are not, in any way, to be construed as a detailed and accurate specification of the final subdivision and rezoning needs for individual applications within the NCP area.

5.2 TRANSPORTATION

This section describes the transportation system within the North Grandview Heights NCPA area, comprising local, collector, and arterial roads, pedestrian and bicycle facilities, transit services, on-street parking, and traffic calming measures.

5.2.1 Traffic Impact Study

In August 2005 **T.J. Ward Consulting Group Inc.** prepared a report entitled Traffic Review of North Grandview Heights NCP. This traffic and transportation impact study analyzed the implications of the proposed land use changes on the area road network. The recommendations contained within the report help ensure that increases in population are accommodated through the increased capacity of adjacent roadways. The detailed study is included as part of **Appendix II**. The major findings and recommendations are summarized below.

5.2.2 Existing Road Network

The existing road network consists of a controlled-access freeway (Highway 99), and an arterial highway (176 Street / Highway 15), which are both under provincial jurisdiction, in addition to a series of arterial, collector, and local roadways which are under City jurisdiction. Under existing conditions, PM peak hour traffic volumes along critical reaches can be summarized as follows:

- 32 Avenue east of 152 Street – maximum of 770 westbound and 1,100 eastbound;
- 32 Avenue east of 168 Street – maximum of 400 westbound and 620 eastbound (roughly half of the volume east of 152 Street);
- 24 Avenue west of 160 Street – maximum of 600 westbound and 680 eastbound;
- 24 Avenue west of 168 Street – maximum of 340 westbound and 490 eastbound; and
- Most north-south roads – roughly 200 vehicles in the peak direction.

The single-lane capacity for an arterial road is approximately 800 vehicles, a collector road 600 vehicles, and a local road 400 vehicles. Consequently three intersections currently exhibit unsatisfactory Levels of Service (LoS). LoS is based upon the volume to capacity ratio (v/c) and the average delay per vehicle. The following intersections currently operate with a LoS of F:

- 32 Avenue at 168 Street – AM Westbound Movement, PM Eastbound Movement (Kensington Prairie Elementary);
- 24 Avenue at 160 Street – AM Northbound Movement, PM Southbound Movement (Commercial Development); and
- 24 Avenue at 168 Street – PM Eastbound Movement (Corner Store).

All three of these intersections are already slated for signalization within the City's 10-year Servicing Plan, (Projects #7642, 7643 and 7655). Once signalized, these intersections will all operate at an acceptable level of service under current traffic conditions. In addition, the intersection of 32 Avenue at 160 Street was recently signalized under Project #7625. Under current conditions, traffic signals coupled with left turn lanes are appropriate for the remaining stop-controlled intersections.

5.2.3 Proposed Major Road Network Changes

Within the study area, the proposed road and pedestrian network is based on the principle of creating an interconnected grid of roads to allow multiple routes for travel by foot, bicycle, or car. The proposed road network pattern is very similar to the pattern proposed in the 1999 NGH NCP. It has been designed to limit the number of road crossings over identified watercourses while both efficiently servicing local residents and avoiding excessive through traffic in internal residential areas.

Immediately west of the study area, one of the key components of the existing road network is the partial interchange on Highway 99 at 32 Avenue / 152 Street. This allows for northbound traffic to enter the highway from 32 Avenue and southbound traffic to exit the highway at both 32 Avenue – both directions – and 152 Street southbound. Additional ramps are currently

proposed at this interchange to allow northbound traffic on 152 Street to enter the highway northbound directly as well as for northbound traffic on Highway 99 to exit to 152 Street northbound.

In addition to the proposed interchange upgrades, the City is currently planning to extend the 5-laning of 32 Avenue east from Croydon Drive to 160 Street (Project #3213) and upgrade the section from this point to 168 Street to a three lane facility (Project #7447) by 2010. Beyond 168 Street it will be upgraded to a three lane section by 2015. The City is also proposing to upgrade 24 Avenue to a five lane cross-section between 152 Street and 162 Street and to upgrade the King George Highway to a five lane cross-section between the 32 Avenue Diversion and 16 Avenue, (Project #7492). New traffic signals will be installed on 24 Avenue at 168 Street, 160 Street, and 156 Street (Projects #7642 and 7643). Although these proposed timelines are current, they are subject to change at the discretion of the City.

5.2.4 Proposed Traffic Volumes

The proposed traffic volume analysis assumes that the future interchange will be in place on Highway 99 at 24 Avenue, as directed by City staff. It also includes the additional ramps proposed on 32 Avenue / 152 Street, and considers the implications of the Highway 99 Corridor NCP. As a result of these improvements, a significant portion of the growth in traffic takes place on 24 Avenue with a lesser amount on 32 Avenue. The development p.m. peak hour traffic generation, in addition to those existing counts above, can be summarized as follows:

- 32 Avenue east of 152 Street – maximum of 70 westbound and 330 eastbound;
- 32 Avenue east of 168 Street – maximum of 100 westbound and 20 eastbound; and
- 24 Avenue west of 168 Street – maximum of 70 westbound and 10 eastbound.

Analysis of the development traffic generation combined with the background volumes, (which includes updated population data for the Morgan Heights area) under 2021 conditions reveal only two intersections anticipated to operate with a LoS of E:

- 32 Avenue at 176 Street – PM Eastbound Left, Northbound Through, and Southbound Left Movements; and
- 24 Avenue at 160 Street – PM Eastbound Left, Westbound, Northbound Left, and Southbound Left Movements.

With regard to road capacity, two critical sections have been identified. 168 Street, with a peak direction peak hour volume of 710 vehicles northbound is under the 800 vehicle capacity for arterial lanes; however, 160 Street with up to 840 vehicles northbound is just above the 800 vehicle capacity for an arterial road. The intersection of 160 Street and 28 Avenue will need to be signalized.

Figure 20 presents the forecast traffic generated by the NCPA area in 2021. **Figure 21** presents the forecast traffic in 2021 when all the surrounding areas are built-out.

5.2.5 Future Laning

Based on the interchange assumptions, laning configuration, and ultimate projected traffic volumes for the entire area based upon the Highway 99 Corridor, Grandview Heights #1, and this North Grandview Heights NCPA, 32 Avenue needs to be upgraded to a five lane cross-section from 152 Street east to 160 Street as is currently proposed, but also continuing east to 164 Street. 164 Street to 176 Street should be widened to three lanes. A three-lane cross-section means one travel lane in each direction plus a centre left turn lane at the intersections and other accesses. 160 Street, 164 Street, and 168 Street, all need to be three lanes, i.e., one travel lane in each direction plus left turn lanes at all intersections. For all other roads, a two lane cross-section with allowance for on-street parking is adequate.

Outside of this NCPA area, and primarily as a result of the other two NCPs, 24 Avenue is required to be five lanes from 152 Street to 162 Street initially, but ultimately all the way east to 176 Street. 160 Street needs to be five lanes between 24 Avenue and 26 Avenue and three lanes north. Croydon Drive needs to be three lanes from 32 Avenue through to 24 Avenue. As these upgrades are primarily the result of other development, the costs of upgrading these roads is not included in the financial analysis of this NCPA.

5.2.6 Neighbourhood Road Network Design

The proposed neighbourhood road network design shown on **Figure 22** provides for a logical and effective road hierarchy to serve the area. It is to incorporate the BMPs and Low-Impact Development strategies where appropriate. Consequently all local roads are designed with curbs-and-gutters and a standard 2% boulevard crossfall underlain by drain-rock trenches behind the curbs to provide infiltration, retention, and quality enhancement. Boulevards incorporate 450 mm of topsoil to increase infiltration where possible. Sidewalks, multi-use pathways, and street parking are incorporated where feasible.

Collector, arterial, and local roads need to be designed to accommodate the high ground water table identified in the area. Based upon geotechnical investigations to be undertaken at the detailed design stage, it may be necessary to incorporate subdrains into the road design to allow for proper drainage of the subgrade and help ensure the long-term durability of the roadways.

5.2.6.1 Limited Locals

- All limited locals within the NCPA area would be designed to Surrey's Neo-traditional standard.
- The low density limited locals would have a road dedication of 17.0 metres and a pavement width of 8.0 metres with a 2.5% one-way crossfall. This one-way crossfall would enable stormwater to be collected from the roadway into catch basins and drain rock trenches within the boulevard area. Sidewalks would be located on one side of the street for roads shorter than 220 metres, and on both sides for longer roadways. Street Lights, Hydro, Telus and Shaw systems would be located on the high side of the cross fall and on the opposite side of the road from the sidewalks on these shorter roads. A 0.5 metre right-of-way is required adjacent to the road dedication for the location of storm and sanitary inspection chambers and the water curb stops. See **Figure 23**.

- The high density limited locals would have a road dedication of 18.0 metres and a pavement width of 8.5 metres with a 2.5% one-way crossfall. This one-way crossfall would enable stormwater to be collected from the roadway into catch basins and drain rock trenches within the boulevard area. Sidewalks would be located on both sides of the street. Street Lights, Hydro, Telus and Shaw systems would be located on the high side of the cross-fall and the opposite side of the road from the sidewalks on these shorter roads. A 0.5 metre right-of-way is required adjacent to the road dedication for the location of storm and sanitary inspection chambers and the water curb stops. See **Figure 24**.

5.2.6.2 Through Locals

- The extension of Mountain View Drive, 161 Street, and 30A Avenue would each be classified as a through local and designed to Surrey's neo-traditional standard.
- The low density through locals would have a road dedication of 20.0 metres and a pavement width of 6.25 metres plus a 2.25 metre paved parking strip. Utilizing a 2.5% one-way crossfall, a drain rock trench can be incorporated into the design to provide a sustainability feature. Sidewalks would be located on each side of the street. Street lights, Hydro, Telus and Shaw systems would be located within the boulevards on the high side of the cross-fall. A 0.5 metre right-of-way is required adjacent to the road dedication for the location of storm and sanitary inspection chambers and the water curb stops. See **Figure 25**.
- The high density through locals would have a road dedication of 20.0 metres and a pavement width of 10.5 metres with a 2.5% one-way crossfall. This would allow for a 2.25 metre parking pocket on both sides with a 6.0 metre centre drive aisle. The through locals with entry features will require a 22.0 metre right-of-way at the intersection. The one-way crossfall would enable stormwater to be collected from the roadway into catch basins and drain rock trenches within the boulevard area. Sidewalks would be located on each side of the street. Street Lights, Hydro, Telus and Shaw systems would be located within the boulevards on the high side of the cross-fall. A 0.5 metre right-of-way is required adjacent to the road dedication for the location of storm and sanitary inspection chambers and the water curb stops. See **Figure 26**.

5.2.6.3 Collectors

- 164 Street and 28 Avenue have both been designated as Collector Roads.
- 28 Avenue will need to be constructed between 160 and 162 Street, and widened along the remaining length to a 12.2 metre pavement within a 22.0 metre road dedication. This ultimate pavement width would allow for a 2.5 metre parking lane in the eastbound direction, 3.35 metre vehicular lanes in each direction, and 1.5 metre bicycle lanes in both directions. These lanes will include a signed and paint-delineated bicycle width as per City standard. Left turn lanes will be required at intersections with Arterial and other Collector Roads. Street lights and sidewalks will be located on both sides of the roadway. See **Figures 27 and 28**.

- 164 Street will be constructed with a road dedication of 22.0 metres and a 12.2 metre ultimate pavement width allowing for a 4.3 metre shared vehicular / bicycle lane in each direction centered by a 3.6 metre left-turn lane. Streetlights and sidewalks will be located on both sides of the roadway. See **Figure 29**.

5.2.6.4 Arterial

- 160 Street, 168 Street, and 32 Avenue are all designated as Arterial Roads.
- All arterial roads will be constructed with a road dedication of 27.0 metres to a divided arterial standard.
- Streetlights and sidewalks will be located on both sides of the roadway.
- The pavement widening of 32 Avenue from 160 Street to 168 Street has been identified as an Interim Arterial Widening item under the City’s 10-year Servicing Plan (Project #7447).
- Arterial widening including pavement, curb and gutter, sidewalk, and streetlights, may be required by the City. Arterial road works are eligible for DCC reimbursements up to, but not exceeding, the Arterial DCCs paid under each application.

The following table summarizes the various road cross-sections for the various classifications within the NCP area and as presented on **Figure 22**.

Table 5.2.6a – Road Classifications

Classification	Road Dedication	Pavement Width	Streetlights	Sidewalk	Parking	Drain Rock Trench
Limited Local						
▪ Low Density	17.0	8.0	One side	One / Two	One side	Yes
▪ High Density	18.0	8.5	One side	Two	One side	Yes
Through Local						
▪ Low Density	20.0	8.5	One side	Two	One side	Yes
▪ High Density	20.0	10.5	One side	Two	Two sides	Yes
Major Collector 28 Avenue	22.0	12.2	Both sides	Two	One side	No
Major Collector 164 Street	22.0	12.2	Both sides	Two	No	No
Arterial	27.0	19.0	Both sides	Two	No	No

5.2.7 Public Transit

Currently there are no transit services within the North Grandview Heights area and TransLink has indicated that the existing low-density residential developments are not sufficiently dense to support conventional transit services. TransLink uses 400 metres as the maximum walking distance to define the area served by transit routes within residential neighbourhoods. There are bus stops at the intersection of 152 Street and 32 Avenue which lead to the South Surrey Park-and-Ride lot on the west side of Highway 99 south of the 32 Avenue diversion, approximately 800 metres west of the westerly edge of the Amendment area.

However, proposed Cluster Housing and Multiple Residential development west of 160 Street will be sufficient for transit service to be considered. TransLink has in past advised that their 'usual practice is to treat any roadway of collector status or higher as potential roadways for transit service'. The proposed road network and land use densities are designed to accommodate public transit services. Subject to TransLink providing service, all residents in North Grandview Heights should be within a 400 metre walking distance of a transit serviced road. Both fixed route and community service could be examined to provide the appropriate level of public transit service.

5.2.8 Bicycle and Pedestrian Circulation

Roads within North Grandview Heights NCPA are designed to accommodate pedestrians and cyclists with such features as wide curb lanes, marked bicycle lanes, and sidewalks and pathways where appropriate. All roadways including cul-de-sacs will provide at least one sidewalk. Additional off-street pathways will be incorporated for pedestrians and cyclists.

By City of Surrey standards, roadways less than 11.0 metre in pavement width do not incorporate dedicated bicycle travel areas. Therefore, only perimeter roads of 160 Street, 164 Street, 168 Street, 28 Avenue, and 32 Avenue will have dedicated bicycle travel. By providing comfortable and safe alternative means of transportation within the neighbourhood, residents will be encouraged to walk and cycle. **Figure 30** illustrates the Bicycle and Pedestrian Circulation Plan.

5.2.9 On-Street Parking

- On-street parking would be permitted on one side of limited and low density through local streets, and on two sides of the through locals.
- For the limited local roads, parking will be restricted to one side of the roadway through the use of "No Parking" signage to ensure emergency services accessibility.
- The 28 Avenue collector would ultimately be constructed to a 12.2 metre pavement width, which is not wide enough to permit parking on both sides and still allow two 3.35 metre travel lanes and two bicycle lanes. Thus, parking on this collector roadway has been designated for the south side only.

- 164 Street would be designed for one lane of northbound travel, one lane of southbound travel and a center lane dedicated to left turn movement. It is, therefore, insufficiently wide enough to allow for parking on either side.
- **Figure 31** illustrates the Parking Management Plan and outlines the parking restrictions on all streets.
- Parking would not be permitted on the 32 Avenue, 160 Street or 168 Street arterials.

5.2.10 Traffic Calming Devices

Traffic calming is defined in the context of this report as vertical or horizontal deflections designed to slow the speed of traffic or to reduce the likelihood of cut-through traffic or unwanted traffic, which should not be using the roads through a neighbourhood. Special design measures to calm traffic could include traffic circles, speed humps, and raised intersections and crosswalks. Traffic calming measures will be introduced as part of finalizing of the detailed road designs and when located on through locals would be located at 100-200 metre intervals

Figure 31 illustrates the Traffic Calming Plan.

5.2.11 Geometric Design

Curb Extensions

Curb extensions would be utilized on:

- one side of all through local roads (8.5 metres pavement);
- south side of 28 Avenue;
- mid-block curb extensions could be included on the south side of 28 Avenue where blocks are greater than 120 metres long. This limits the length of parking pockets to the recommended 8-10 stalls or 50-70 metres, which would significantly enhance the traffic calming capabilities of parking pockets;
- curb extensions at “T” intersections shall extend completely through the intersection to the opposite side.

The design of the curb extensions shall meet the following criteria:

- 2.25 metre (minimum) deep parking pocket on local roads, 2.50 metre on major collector roads.
- 9 metre radius curb return at the intersections.
- 3 metre radius reverse curb returns for the start / end of the parking pocket.
- 3 metre minimum (typically 6 metre) long tangent requirement between the curb returns of the intersection and the start of the reverse curb of the parking pocket. A mid-block curb extension requires a minimum 6.0 metre tangent between stop and start of the parking pockets. The tangent length must be adjusted to ensure transition does not occur across a driveway.

See **Figure 32** for a typical curb extension details.

Intersection Design

The through local roads when intersecting with a major collector or Arterial road must provide an 8.5 metre clear width for a length of 20 metre (from curb face) in order to accommodate the turning movement of single unit trucks off the major road. See **Figure 33** for a detail of the interface between the through local and arterial / collector. This figure shows both the approach to the intersection and the departure from the intersection.

Roundabouts & Traffic Circles

Two roundabouts are proposed: one on Mountain View Drive west of 160 Street and one on 30B Avenue approximately halfway between 164 and 168 Streets. **Figure 34** illustrates the proposed roundabouts which will serve both as a traffic calming measure and as a major entry / focal point within each neighbourhood.

Several traffic circles are proposed along 161 Street to serve as traffic calming measures. **Figures 35** and **36** illustrate these circles.

5.2.12 Street Lighting

Street lighting will be of a type similar to that used in Morgan Creek, but instead of the Stress-Crete concrete pole, a more standard metal pole will be used.

- Luminaries: King K118 Series or approved equivalent
- Pole: Butler Pole Structures of West Coast Engineering Group Ltd. or approved equivalent

Detailed City approved specifications are available for the proposed standards as per the Rosemary Heights Community Street Lighting Concept.

5.2.13 Noise Attenuation: 32 Avenue

Although the proposed upgrading of 32 Avenue by the City of Surrey includes noise attenuation measures (wall) for existing developments to the north, the matter of reflected noise from proposed new development to the south was assessed by **Brown Strachan Associates**. The physical distance between proposed new homes and existing residences is considerable. Reflective noise will travel a total distance of approximately 165 metres from a vehicle source on 32 Avenue south to the new homes and then north to existing homes in Morgan Creek. The net addition of direct and potential reflected signals is a nominal 1-2 decibel increase which is considered not to be noticeable in relation to the forecast reductions due to proposed noise attenuation measures for the road.

Additionally, a planted berm along portions of the south side of 32 Avenue may be constructed as a component of the proposed sidewalk. The combined influence of the berm and noise

absorbent landscaping materials will further mitigate any real or perceived impact of reflected noise either from the new homes north to Morgan Creek or south from the new noise attenuation wall to the new homes.

5.2.14 DCC Revenues and Expenditures

The cost of the Major Collector and Arterial works is estimated to be \$643,500 and \$4,777,500 respectively while revenues are anticipated to be \$1,624,200 and \$6,454,800 respectively. The transportation DCC revenues and expenditures result in a net surplus of \$980,700 for major collectors and \$1,677,300 for arterial roads.

5.2.15 Summary of Recommended Improvements

The following recommended road improvements are required in relation to future development within the proposed NCPA area:

- Widen 32 Avenue to a 5-lane cross-section between 156 Street and 164 Street and to a 3-lane cross-section as far as 176 Street (10-Year Capital Works Project #3213 and 7447).
- Construct 28 Avenue as a continuous collector road between 168 Street and Croydon Drive. This involves the construction of the uncompleted section between 160 and 162 Streets, and stop controls on 28 Avenue to provide uninterrupted through movements on 164 Street and 168 Street. 28 Avenue and 160 Street will be signalized.
- Upgrade 164 Street to a 3-lane standard in order to accommodate one lane of travel in each direction, plus left turn lanes at intersections and key exit points.
- Ultimately eliminate all direct access to 32 Avenue, limiting such access to the main intersections of 156 Street, 160 Street, 164 Street and 168 Street. Interim access along 32 Avenue shall require left turn provisions to be addressed.
- Signalize the intersection of 32 Avenue / 164 Street – it is assumed that 32 Avenue / 168 Street will be signalized regardless of the proposed development (10-Year Capital Works Project #7655).
- Develop the pedestrian trail through the neighbourhood as proposed.
- Implement appropriate traffic calming measures as identified in **Figure 31**.

5.3 INFRASTRUCTURE SERVICING

In order to service the additional residents proposed as part of this NGH NCPA, it is essential that sufficient capacity exist within the water, sanitary, and storm drainage infrastructure. Generally, the strategies proposed within the original NGH NCP Report are being followed; however, there are some modifications for the areas immediately west of 168 Street and south of 32 Avenue.

This report analyses the infrastructure requirements and proposes detailed solutions to allow for the additional development proposed within this amendment. **Appendices IV, V and VI** provide supplementary information including analysis and data to confirm the viability of the proposed servicing strategies.

5.3.1 Water

In August 2005 **Kerr Wood Leidel Associates Limited (KWL)** issued a technical memorandum to outline the existing water distribution system and develop interim and ultimate water servicing strategies for the NGH NCPA area. The detailed study is included as **Appendix IV** and the recommendations are summarized below.

The existing water distribution system in the North Grandview Heights area is contained within three pressure zones: the westernmost subzone of the Kensington 110 metre zone, one of the eastern subzones of the Kensington 110 metre zone, and the 80 metre Morgan Creek Zone as shown on **Figure 37**. The western 110 metre and the 80 metre zones are supplied via City supply mains from the Sunnyside Reservoir. The Kensington eastern subzone is fed from the existing Grandview Pump Station. This existing station has limited excess capacity as it must provide maximum day flows concurrently with fire flows and peak hour flows as there is no balancing or fire storage currently available.

To address this issue, the Grandview Reservoir, completed in 1998 by the GVRD, was constructed to provide balancing storage for the Grandview area. Located at the high point of the 142 metre Grandview Zone on 24 Avenue, the reservoir was constructed to allow for the future City of Surrey Grandview Pump Station which will service the 142 metre Grandview pressure zone and for gravity-based low-pressure supply mains to supply the Kensington and Morgan Creek zones, alleviating demand on the Sunnyside reservoir. These mains are part of the City's ultimate servicing plan for this area, but have not yet been constructed. Until the low pressure mains from the Grandview Reservoir are constructed, there is no additional capacity to service this development.

Water main construction and upgrades to service the ultimate conditions of the NGH NCPA area and the existing Morgan Creek area are illustrated in **Figure 38** and summarized as follows:

- Low-pressure (110 m HGL) 750 mm diameter supply main on 24 Avenue from the reservoir westward to 160 Street;
- Low-pressure (110 m HGL) 600 mm diameter supply main on 160 Street from 24 Avenue to the Kensington Zone (north of 28 Avenue ±, also feeder main to Morgan Creek);
- Low-pressure 500 mm diameter supply main on 160 Street from 28 Avenue to 32 Avenue and the Morgan Creek Zone;
- 28 Avenue water main (300 mm diameter) linking 160 Street to 162 Street;
- 162 Street water main (200 mm diameter) linking 28 Avenue to 29 Avenue;
- 164 Street water main upgrade (152 mm to 250 mm diameter) linking 29 Avenue and 30 Avenue;

- 164 Street water main upgrade (152 mm to 200 mm diameter) from existing PRV Station at 164 Street and 30 Avenue;
- Upgrade water main on Helc Place (152 mm to 250 mm diameter);
- Construct 160 Street and 30 Avenue PRV Station;
- Decommission 164 Street and 29 Avenue PRV Station;
- 28 Avenue water main upgrade (321 mm to 400 mm diameter) between 158 Street and 160 Street;
- 156 Street water main upgrade (160 mm to 200 mm diameter) north of 28 Avenue and Mountain View Drive; and
- On-site 200 mm diameter water mains.

These upgrades have been determined using the City of Surrey Design Criteria for water mains. It would provide the necessary supply, storage, and pressure to serve the 110 m Kensington Zone, the 80 m Morgan Creek zone, and allow for the creation of a new 90 m zone to service the lands between 164 and 168 Street, south of 32 Avenue using existing PRV stations.

KWL has also proposed an interim solution that will allow for the servicing of additional lands south of 28 Avenue in the Grandview Heights #1 NCP area from the 110 m Kensington zone until the new Grandview Pump Station is constructed. This interim solution will require some modifications to the piping and valves at the intersection of 28 Avenue and 164 Street in order to temporarily accommodate the zone boundary change. This interim solution will be reversed upon completion of the new Grandview Pump Station scheduled for 2006 / 2007. These alterations are illustrated in **Figure 39**.

Within the NGH NCPA area, the internal looping of 200-mm diameter water mains will facilitate adequate fire flow delivery and provide a well looped system having no dead-end trunk mains.

It is noted that this ultimate water servicing infrastructure incorporates connections to the Morgan Creek lands north of 32 Avenue designed to meet the City's ultimate servicing strategy, but which are beyond the servicing requirements of the NGH NCPA area. The City will review the Morgan Creek servicing strategy upon application by the first proponent. Should the City decide against incorporating Morgan Creek into the area, then the following pipes should be downsized:

- 750 mm diameter on 24 Avenue to a 500 mm diameter;
- 600 mm diameter on 160 Street to a 400 mm diameter; and
- 500 mm diameter on 160 Street to a 200 mm diameter.

However, interim development conditions dictate that some of the above pipes need to be a minimum 600 mm in diameter. Therefore, should the City decide not to incorporate the Morgan Creek lands and / or the Developer decides to proceed prior to completion of the Grandview Pump Station, then the Developer will be required to fund the difference between the ultimate servicing (excluding Morgan Creek) and the interim requirements.

DCC Funding and Expenditures

The proposed water distribution infrastructure services the 110 metre Kensington and 80 metre Morgan Creek pressure zones, as well as the new 90 metre zone. These zones service lands within the Grandview Heights #1, North Grandview, and Morgan Creek areas. Therefore, the cost of the water infrastructure has been pro-rated between the Grandview NCPs based upon their respective populations, and additional funds should be made available by the City of Surrey to fund the Morgan Creek lands. The following table outlines the allocations whereas Section 6 illustrates the cost and revenue breakdowns based on the anticipated phasing. The cost of DCC eligible water infrastructure is also shown in the table. The financing of the DCC water components allocated to the NGHHA area is estimated to cost \$2,274,600 before the addition of the Morgan Creek lands, and an additional \$1,022,300 if the Morgan Creek lands are included. The revenues from DCCs are projected to be \$1,353,000. The water DCC revenues and expenditures (excluding Morgan Creek) results in a net shortfall of \$921,600.

Table 5.3.1a - Method of Pro-rating of Water System Costs Within the 110m Kensington Zone

NCP Area	Population	% Share
North Grandview Heights NCP	4,223	85%
Grandview Heights #1 NCP	743	15%

Table 5.3.1b - North Grandview Cost Sharing of Water System Plus Upgrading Costs

Description	Location	Scope (Type & Size of Works)	Phasing	Total Costs	North Grandview Heights NCP Share Amount
24 Avenue Low Pressure Water Main	From Reservoir to 160 Street	1310 m - 500 mm Ø	Phase 1	\$1,375,500 *	\$1,169,200
160 Street Low Pressure Water Main	From 24 Avenue to 28 Avenue	820 m - 400 mm Ø	Phase 1	\$664,200 *	\$564,600
28 Avenue Installation	From 160 Street to 162 Street	405 m - 200 to 300 mm Ø	Phase 1	\$56,700 *	\$48,200
28 Avenue Upgrade	From 160 Street to 158 Street	405 m - 400mm Ø	Phase 1	\$324,000 *	\$275,400
164 Street	From 29 Avenue to 30 Avenue	205 m - 200 to 250mm Ø	Phase 1	\$14,400 *	\$12,200
Pressure Reducing Valve (PRV)	164 Street and 29 Avenue (Decommission)	PRV	Phase 1	\$50,000 *	\$42,500
Pressure Reducing Valve (PRV)	160 Street and 30 Avenue (Construct)	PRV	Phase 1	\$162,500	\$162,500
				\$2,647,300	\$2,274,600

* Water works common to both Grandview Heights #1 NCP and North Grandview Heights NCP Amendment

Table 5.3.1c - Upsizing Costs Occurring from adding Morgan Creek to the system

Description	Location	Scope (Type & Size of Works)	Phasing	Total Costs	North Grandview Heights NCP Share Amount
24 Avenue Low Pressure Water Main	From Reservoir to 160 Street	1310 m - 500 to 750 mm Ø	Phase 1	\$353,700 *	\$300,600
160 Street Low Pressure Water Main	From 24 Avenue to 28 Avenue	820 m - 400 to 600mm Ø	Phase 1	\$229,600 *	\$195,200
160 Street Upsizing	From 28 Avenue to 32 Avenue	810 m - 200 to 500 mm Ø	Phase 1	\$526,500	\$526,500
				\$1,109,800	\$1,022,300

Table 5.3.1d - North Grandview Heights NCP Amendment Water DCC Revenue and Expenditures

	# of Units	DCC Revenues	DCC Expenditures	Difference
Phase 1	980	\$866,700	\$2,274,600	-\$1,407,900
Phase 2	592	\$486,300	\$0	\$486,300
Total	1572	\$1,353,000	\$2,274,600	-\$921,600

Table 5.3.1e - North Grandview Heights NCP Amendment Water DCC Revenue and Expenditures with Addition of Morgan Creek Infrastructure

	# of Units	DCC Revenues	DCC Expenditures	Difference
Phase 1	980	\$866,700	\$3,296,900	-\$2,430,200
Phase 2	592	\$486,300	\$0	\$486,300
Total	1572	\$1,353,000	\$3,296,900	-\$1,943,900

Summary

The ultimate servicing plan for the Grandview area is sufficient to service the increased demand resulting from this Amendment. The water DCC revenues and expenditures result in a net shortfall of \$921,600. This shortfall will necessitate a water levy on all lots serviced by this infrastructure, as shown in **Figure 40**. The ultimate servicing plan is also dependent upon an upsizing contribution from the City in the amount of \$1,022,300 for the inclusion of the Morgan Creek lands. Should the City decide against funding the oversizing of these pipes, the smaller diameter mains required as a result of the development of the NGH NCPA shall be constructed. The City of Surrey will determine the amount of the levy on each site prior to development.

5.3.2 Sanitary Sewers

The North Grandview Heights Neighbourhood Concept Plan (NGH NCP) area is generally serviced by septic tanks and drain fields. As identified in the 1999 North Grandview Heights NCP the ultimate concept for extending sanitary sewer service through this area utilizes gravity and pumped connections to the existing Morgan Creek system and the new Grandview North Gravity Interceptor. The new Interceptor will bisect the NCP area crossing from east to west within a corridor that was identified as a part of the original NCP servicing plan. The sanitary services will be designed to accommodate basement homes throughout the Amendment area. The general sanitary servicing concept is as follows:

- Areas to the north of the Grandview North Gravity Interceptor alignment and between 156 Street and 170 Street would connect by gravity into the Morgan Creek sanitary sewer system, with the exception of a small area at the northeast corner. This area is referred to as the NGH Phase One.
- The Grandview North Gravity Interceptor will service all of Grandview south from the Interceptor alignment to the watershed south of 24 Avenue, with the exception of Southridge School and a small residential development south of the Interceptor alignment that already have gravity connections to the Morgan Creek sewer catchment. These areas are referred to as NGH Phase Two and cannot proceed until Phase One of the Interceptor is built to 160 Street.
- The areas north of the Interceptor and west of 156 Street within the NCPA area will pump back south to the interceptor to avoid deep creek crossings.
- Areas east of 168 Street and below the 55 m contour line would connect by gravity to the proposed East Grandview Pump Station sanitary sewer system. The East Grandview Pump Station catchment would pump to the Grandview North Gravity Interceptor
- There is an area of approximately 9.5 hectares immediately south of 32 Avenue and west of 168 Street that would require pumping to the internal gravity sewers tributary to the Morgan Creek sanitary sewer system based on the site topography. With the few number of lots affected they could individually pump into a low pressure sewer system.

Figure 41 identifies the existing sanitary catchment areas and key components of the existing sanitary system. **Appendix V** illustrates the detailed sanitary catchment calculations.

The proposed NCPA area will impact the proposed Grandview North Gravity Interceptor Phase One (west of 160 Street) and the Morgan Creek sanitary sewer system. The East Grandview Pump Station sanitary sewer service area and Interceptor Phase Two (160 Street to 168 Street) is not affected by the proposed NCPA.

Morgan Creek Sanitary Sewer Service Area

Sewage from the North Grandview Heights area bound by 32 Avenue in the north, the Grandview North Gravity Interceptor in the south, 170 Street in the east and 156 Street in the west will feed into the Morgan Creek sanitary sewer system with the exception of an area in the northeast corner. Sewage will flow by gravity to Morgan Creek Sewage Pump Station #1. Sewage from Morgan Creek Pump Station #1 is pumped to Morgan Creek Pump Station #2 from which it is in turn pumped to the GVS&DD Crescent Road pressure sewer leading to the siphon sewer crossing the Nicomekl River at approximately 135A Street and Crescent Road.

The area bound by the Grandview North Gravity Interceptor in the south and west, 156 Street in the east and Morgan Creek (Titman Creek) in the north was originally included in the design catchment area for Morgan Creek Pump Station #2. Due to environmental and topographical constraints in constructing a gravity sewer to connect to the Morgan Creek Pump Station #2 sewer system, this area may require a pump station to pump sewage into the Grandview North Gravity Interceptor. The lands north of Morgan Creek and south of 32 Avenue remain in the analysis of the Morgan Creek system

Within the Morgan Creek system, Pump Station #1 has a duplex submersible pumping station configuration (two pumps installed, one duty, and one standby) with an existing capacity of 46.7 Litres/sec. The existing theoretical design flows the Morgan Creek catchment based on the original NCP densities are 46.7 Litres/sec; however, with the increased density associated with the proposed Amendment, the theoretical total design flows increase to 73.5 Litres/sec. The capacity of Pump Station #1 can be increased to 73.5 Litres/sec by replacing the existing pumps, installing new starters, and replacing the control kiosk. Installation of a standby generator and creation of additional emergency storage capacity is required at this station.

Pump Station #2 has a triplex submersible pumping station configuration (two pumps installed with provision for a third identical pumping unit in future). The existing capacity with one duty pump, one standby, is 130 Litres/sec. The existing theoretical design flows from the Morgan Creek catchment based on the original NCP densities are 176 Litres/sec. Consequently a third pump is to be installed under the City of Surrey 10-year Servicing Plan Project ID #7733. With the third pump installed the capacity will increase to 215 Litres/sec. The increased density in the NCPA area results in a design flow of 208.3 Litres/sec. Therefore, upon completion of the previously identified upgrade, Pump Station #2 will have the required capacity to service the projected design flows for the current NGH NCP as well as this Amendment.

Analysis of the existing pressure sewers suggest that there is adequate capacity in the existing force mains pumping from both pump stations to accommodate these flows. However, there are five segments of gravity sewer, two tributary to PS#1 and three to PS#2, totaling 392 metres, that would exceed the City's design target of 70% depth of flow. Segments from S60 to S68 and S8

to S7 may exceed the capacity of the existing pipes, with surcharges of 55 and 33 mm respectively. Segments from S15 to S16, S16 to S17, S3A to S2 would operate up to 79% depth, though would still be capable of conveying the theoretical peak flows.

Since the computed flows marginally exceed the Surrey design criteria, are generally located within existing subdivisions, are installed at substantial depths, and are in difficult soils, monitoring is recommended to confirm the adequacy of these sections under actual flow conditions. If monitoring determines that upgrading or replacement is required, alternative technologies such as pipe bursting should be considered.

Grandview North Gravity Interceptor

Sewage from the North Grandview Heights Amendment area, bound by the Grandview North Gravity Interceptor in the north, 28 Avenue in the south, 168 Street in the east and Croydon Drive in the west, will be serviced by the proposed first two phases of the Interceptor. The Grandview Heights NCP #1 Proponent is planning to construct the first phase of the Grandview North Gravity Interceptor from 152 Street to 160 Street. The timing for the second phase of the Interceptor will likely be driven by the market demand for housing, the availability of rights-of-ways, and funding.

The Grandview North Gravity Interceptor design recognized that the densities from the Official Community Plan were likely to increase based on initiatives that were underway, including Neighbourhood Concept Plans as well as proposed amendments to the NCP. Provision has been made to provide the required capacity to support the proposed increased density in the entire Grandview Heights and North Grandview Heights area. Detailed design of the first phase of the interceptor is scheduled for completion by 2005/2006 subject to further right-of-way acquisition, environmental, and geotechnical work.

The sanitary sewer servicing strategy is based on Phase 1 of the Grandview North Gravity Interceptor being completed prior to the areas south of the Interceptor within the North Grandview Heights NCP being developed. Phase 1 of the Interceptor will connect to the portion of the Rosemary Heights Pressure Sewer at 32 Avenue and 152 Street which is presently under construction by the City through the Rosemary Heights subdivision, and will extend westward to 160 Street north of 28 Avenue. This east end point would be the connection point for the NGH NCP Phase #2 area, south of the Interceptor alignment. Subject to the approval of this NCP Amendment, the owner / developer may have to front-end the cost of construction of this first phase to coincide with the proposed phasing of the development within the NCP area. This Interceptor will be a DCC element.

Local Sewer Design

A preliminary layout of the sewers throughout the Amendment area is shown on **Figures 42 and 43**. A network of 200 and 250 mm diameter sanitary mains will service these lands. Designers are to ensure that minimum pipe grades of 0.5% and maximum pipe depths of 3.5m, as per City of Surrey design criteria, are maintained wherever possible.

As the topography of these lands varies significantly, and in order to accommodate basement homes, alterations in the roadway or lot design grades to may be required to achieve these depths. Several creek crossings will require attention as to the best method of installing the sewers. In one such instance a pipe-bridge is proposed. Any variation from the City design criteria will require approval from the Operation department.

As above, there are areas west of 168 Street and south of 32 Avenue that will require pressurized sewers. These lots will be serviced with pumped connections and local low-pressure sewers that outlet into adjacent gravity sewers.

DCC Funding and Expenditures

The proposed Grandview Interceptor services the North Grandview Heights NCPA area as well as the Grandview Heights #1 and Highway #99 Corridor areas. Therefore, the cost of infrastructure has been pro-rated between the NCPs based upon the calculated flows of the first two NCPs with the financial contribution from the Hwy 99 area. The following table outlines the allocations, including the cost of DCC eligible infrastructure whereas Section 6 illustrates the cost and revenue breakdowns based on the anticipated phasing. The financing of the DCC sanitary components allocated to the NGHHA area is estimated to cost \$2,285,700 while the revenues from DCCs are projected to be \$1,315,000. The sanitary DCC revenues and expenditures result in a net shortfall of \$970,700.

Table 5.3.2a - Method of Pro-Rating of Grandview Interceptor Costs

NCP Area	Sanitary Flow	% Flow
North Grandview Heights NCP	34.4 L/s	30%
Grandview Heights #1 NCP	81.6 L/s	70%

Table 5.3.2b - Cost Sharing of Grandview Heights Interceptor Sewer Costs Plus Upgrading Costs

Description	Location	Scope (Type & Size of Works)	Phasing	Total Costs	North Grandview Heights NCP Share Amount
Phase 1 Grandview Interceptor	From 152 Street/32 Avenue to 160 Street/2800 Block	2015 m - 1050 mm Ø	Phase 2	\$3,959,000 *	\$1,187,700
Morgan Creek Pump Station #1	36 Avenue and 160 Street	Upgrading	Phase 1	\$257,500	\$257,500
Morgan Creek Pump Station #2	37A avenue and 159 Street	Upgrading	Phase 1	\$340,200	\$340,200
Pipe Upgrading:					
-36 Avenue	From 160 Street to 161 Street	211 m -375 mm to 450 mm	Phase 1	\$232,100	\$232,100
-37A Avenue	From 159 Street to 160 Street	65 m - 450 mm to 525 mm	Phase 1	\$91,700	\$91,700
-Morgan Creek Golf Course	From Canterbury Drive to Golf Course	46 m - 300 mm to 450 mm	Phase 1	\$48,900	\$48,900
-164 Street	From 33 Avenue to 34 Avenue	110 m - 200 mm to 250 mm	Phase 1	\$127,600	\$127,600
				\$5,057,000	\$2,285,700

* Sanitary Works are common to both Grandview Heights #1 NCP and North Grandview Heights NCP Amendment

Total Cost of Phase 1 Grandview Interceptor is based on the following:

Value from the Grandview North Gravity Interceptor Report =	2,116,000
25% Inflation Factor =	<u>529,000</u>
Subtotal =	2,645,000
35% Fee and Contingency Factor =	925,800
**Land Cost for ROW Acquisition =	268,200
***Legal Fees =	<u>120,000</u>
TOTAL =	3,959,000

***Legal Fees = \$5,000/Lot * 24 Lots

**Land Costs for ROW Acquisition = 11,175 sq.m. * \$24/sq.m.

(This is based on a discount of the fee simple value for the undersurface rights and was provided by Surrey's Realty Department)

Table 5.3.2c North Grandview Heights NCP Amendment Sanitary DCC Revenue and Expenditures

	# of Units	DCC Revenues	DCC Expenditures	Difference
Phase 1	980	\$741,400	\$1,098,000	-\$356,600
Phase 2	592	\$415,300	\$1,187,700	-\$772,400
Highway 99 Corridor (30% of \$527,700)		\$158,300		\$158,300
Total	1572	\$1,315,000	\$2,285,700	-\$970,700

The Highway 99 Corridor NCP identifies a contribution of \$527,745 toward Phase 1 of the Interceptor

Summary

The City's long-term sanitary servicing plans for the North Grandview Heights NCPA area involves sewer infrastructure in both the Morgan Creek and Grandview Interceptor systems. To accommodate the sewage flows from the increased population associated with the proposed North Grandview Heights NCPA, the upgrades and additions to the sanitary sewer system as shown on **Figure 43**, are required:

- Increase the capacity of Morgan Creek Pump Station #1 to 73.5 Litres/sec by replacing the existing pumps, providing a standby generator, and additional emergency storage. This will service the area bound by 32 Avenue in the north, the Grandview North Gravity Interceptor in the south, 170 Street in the east and 156 Street in the west, with the exception of the lands in the northeast quadrant. This upgrade would be a requirement of the approval for applications within the North Grandview Heights NCPA area.
- Install the third pump and standby generator at Morgan Creek Pump Station #2 to increase the capacity to 215 Litres/sec. The timing for this upgrade will be driven by measured inflow to this pump stations from within the entire catchment area. Funding will be from the City current DCC 10-year Servicing Plan Project ID #7733.
- Construct Phase 1 of the Grandview North Gravity Interceptor. (Proponent driven, either as part of the Grandview Heights #1 or North Grandview NCPs) This will service the area bound by the Grandview North Gravity Interceptor in the north, 28 Avenue in the south, 162 Street in the east and Croyden Drive in the west within the North Grandview Heights NCP area, as well areas to the south of 28 Avenue. Development of the area west of 156 Street and east of the BC Hydro right-of-way, which will likely have a pumped sewage system, is dependent on the construction of the Interceptor.
- Construct the network of 200 and 250 mm internal sanitary mains to direct flows to the Morgan Creek catchment or the future Interceptor stub at 160 Street. These mains will be designed to accommodate basement homes throughout the Amendment area.

The sanitary DCC revenues and expenditures result in a net shortfall of \$970,700. This shortfall will necessitate a sanitary levy on all lots tributary to the Interceptor, as shown in **Figure 44**. The City of Surrey will determine the amount of the levy on each site prior to development.

5.3.3 Drainage & Stormwater Management

The objective of this section is to summarize the effects of the proposed development on existing downstream drainage systems and to present the conceptual design for the required drainage and stormwater management infrastructure. The detailed Drainage Analysis is attached as **Appendix VI**.

The 1996 Morgan Creek / Old Logging Ditch Master Drainage Plan (MDP) and the 1999 North Grandview Heights NCP have been utilized as key resources in the development of the stormwater management strategy for this NCP. Some alterations, as outlined below, have been made to reflect the specific site and development conditions being proposed for the catchment area.

Although the NCP area is confined between 32 Avenue and 28 Avenue, the boundary used to evaluate the drainage infrastructure requirements extends beyond to the study area of the MDP, accounting for all upland drainage that may impact infrastructure sizing. The study area of the Morgan Creek / Old Logging Ditch Master Drainage Plan included both the uplands and lowlands between 152 Street and 168 Street, from the watershed at approximately 24 Avenue extending to the Nicomekl River in the north. While the North Grandview Heights NCP also evaluated the Burrow's ditch catchment to the east of 168 Street this catchment is not included in the proposed NCPA areas. **Figure 45** identifies the existing storm drainage catchment areas and key components of the existing drainage system.

The stormwater concept presented in the 1999 servicing plan for the North Grandview Heights NCP was based on future land uses within the NCP ranging from some existing gross half acre to predominately one acre residential densities and was suitable for either density. It was assumed that the land parcels greater than one acre south of 28 Avenue may be redeveloped to an urban density in the future, with existing one acre or smaller parcels remaining.

Although this NCPA is proposing increased densities in some areas which would otherwise result in increased runoff, the stormwater concepts presented in the 1999 servicing plan for the North Grandview Heights NCP can still be applied with some modifications. The proposed servicing concepts that will accommodate this NCPA are summarized in the following sections. The proposed drainage infrastructure is shown in **Figure 46**.

Minor and Major Servicing

Minor servicing will be designed to support runoff from the 1:5 year storm event. The major servicing will be for runoff exceeding the 1:5 year level and to provide safe conveyance of runoff up to the 1:100 year storm event to minimize damage to life and property.

Due to steep gradients along the north-south trunk drainage routes within the NCPA area, closed conduit systems will be designed for the 1:100 year event. To facilitate the construction of basements the concept of accommodating the 1:100 year event in closed conduits will be extended to the east-west trunk drainage routes and the minor drainage systems as well. This becomes a requirement for servicing houses with basements. Where this is not feasible major events will generally be conveyed overland, either within the roadway or along other specified drainage routes, provided that flooding of adjacent lands can be prevented. For trunk storm sewers with steep slopes, high capacity inlets and laterals will be required to ensure major runoff enters the trunk storm sewers.

Existing storm sewers will be utilized where possible, and twinned or replaced as required to provide additional capacity. The main trunk drainage sewers, north-south on 164 Street and 160 Street, and east-west are on 32 Avenue from 160 Street, will need to be constructed in order for development to proceed in the NCPA area.

Watercourse Diversions

April Creek, Wills Brook, and their tributaries currently exhibit ongoing erosion due to steep gradients south of 32 Avenue. It is proposed that diversion structures (within the storm sewer) be constructed at the heads of these water sources to provide necessary base flows, up to the two-year event, while diverting higher flows to the trunk storm drain system to prevent erosion and provide silt control. These diversion structures will be designed to allow a controlled amount of flow into the watercourse to replicate the natural pre-development flows. Bio-filtration may be provided at the outlets of the storm sewers to assist in capturing pollutants prior to discharge to the natural watercourse.

The 32 Avenue widening plan in the original 1999 North Grandview NCP Report proposed that a portion of April Creek adjacent to 32 Avenue, between 164 Street and Old Logging Ditch be relocated to the north side of the road. However, the proposed North Grandview NCPA makes provision for a green belt that is wide enough to accommodate an enhanced April Creek on the south side of the road, between the road and the proposed residential housing. April Creek is to be enhanced but remain on the south side of 32 Avenue.

Once constructed, the proposed storm infrastructure and watercourse diversions will help eliminate high runoff rates in these natural drainage courses and consequently reduce stream bank erosion while maintaining the natural stream hydrology and promoting higher water quality.

Lowland Drainage

The further development of the uplands will not increase erosion to low gradient water courses in the lowlands. However the increased runoff volumes would otherwise increase flooding potential. While flooding in the lowland area is inevitable and unavoidable due to the nature of the floodplain and the dynamic of the lowland area, the agricultural design criteria (ARDSA) used for the Nicomekl lowlands requires that flooding be limited to 2 days during a 2 day 1:10 year summer storm event, and 5 days during a 5 day 1:10 year winter storm event. Further, the City of Surrey has further reduced the 2 days to 1.8 days in the summer event. Future development must ensure that these criteria, or a better level of service if it currently exists, are upheld.

The City is planning to upgrade the Old Logging Ditch and drainage pump station in 2005 / 2006. The storm drainage model for the lowland drainage system was re-run to take into account the increased flows resulting from the proposed increased densities as shown in the 2005 NCPA. With the proposed upgrades to the Old Logging Ditch and drainage pump station there was little impact in the depth and duration of flooding. In all instances the results were well within the limitations of the ARDSA criteria and a significant improvement on the current levels of service.

On only one instance was the city limit of 1.8 days exceeded, and that was a result of pump settings intentionally providing water for irrigation. This scenario still met ARDSA criteria. The upgrades to the Old Logging Ditch and drainage pump station can proceed without change as planned in 2005 / 2006.

All lowland drainage modeling must be verified by UMA Group Ltd. on behalf of the City of Surrey upon acceptance of this report and prior to development applications.

The underground storm sewer system along 32 Avenue will discharge base flows into Wills Brook at the 32 Avenue crossing. This will require the upgrading of the Wills Brook crossing of 32 Avenue and the upgrading of the Wills Brook channel from 164 Street to the Old Logging Ditch as previously identified in the Old Logging Ditch Master Drainage Plan. Within private property, it may not be possible to upgrade the section of channel east of 164 Street. An alternative is to divert any flows in excess of the existing channel's capacity north along 164 Street to 36 Avenue and then east into the existing ditch within the 36 Avenue corridor that flows east to the Old Logging Ditch. (The channel upgrade is proposed for inclusion into the City's 10-year plan. Costs in excess of this amount resulting from diversion will be borne by the developer)

The proposed detention and infiltration systems recommended for this NCPA will further reduce the peak flows. Erosion remediation and outfall reconstruction is required at the 32 Avenue crossing of the Old Logging Ditch. The Old Logging Ditch Pump Station upgrades and proposed improvements for the lowland drainage should be implemented prior to development proceeding in the uplands area, wherever possible.

Stormwater Detention

The 1999 North Grandview Heights NCP recommended the construction of two communal detention facilities within the area affected by the NCPA: one situated adjacent to Titman Creek and the other adjacent to Wills Brook. The detention proposed adjacent Titman Creek is included as originally proposed in this NCPA. The Wills Brook facility has been modified.

Due to the NCPA proximity to the Lowlands, it is not necessary to size detention facilities strictly based on the City design criteria. Rather, it is critical that detention be provided to effectively control peak flows through the Lowlands. Based on the detailed analysis contained in **Appendix VI**, detention in the Uplands was found to effectively reduce the peak flows for the 2 and 5 year return period 1 hour and 2 hour storm events, although it was less effective in reducing peak flows for the 6 hour and longer duration storm events. It did have a significant effect on the flooding volumes when the capacity of the ditches were exceeded thus mitigating the extent and frequency of flooding in the lowlands.

Protection of the lowlands and Old Logging Ditch was attained by restricting post-development runoff rates to 9L/s/ha during the two-year event and 15L/s/ha during the five-year event. Detention for minor storm events, up to the 5-year event, must be provided within each development as illustrated in **Figure 46**. If the chosen form of detention is the communal

detention pond, interim detention will only be acceptable once the land has been secured for the communal facility.

Stormwater Quality Control

As the NCPA area is primarily residential, with no commercial or industrial lands, the potential for negative stormwater quality impacts is therefore minimized. The use of BMPs as outlined below will significantly increase the quality of stormwater runoff.

As each component of the Amendment area will need to provide stormwater detention, it is recommended that consideration be given to creating facilities with extended detention that provide additional levels of quality treatment. The land for these facilities must be allocated and the facilities constructed at the outset of the first application within each catchment.

Development Best Management Practices

The NGH NCPA area will incorporate BMPs in all aspects of infrastructure design and construction. Standard BMPs would include at-source controls, conveyance controls, public education, erosion and sediment control practices during construction, and ongoing maintenance of these BMPs. Due to the proximity of the development to watercourses, and the existing conditions throughout this area, designers and contractors must exercise diligence in ensuring the development proceeds in a responsible and integrated manner. The intent is to create a sustainable and green development respecting the natural attributes and environmental habitat of these lands.

The implementation of BMPs in this area should be designed in accordance with:

- Department of Fisheries and Oceans (DFO) *Land Development Guidelines for the Protection of Aquatic Habitat*
- Ministry of the Environment *Stormwater Planning: A Guidebook for British Columbia; and Urban Runoff Quality Control Guidelines for the Province of British Columbia*
- Greater Vancouver Regional District (GVRD) *Stormwater Source Controls: Preliminary Design Guidelines; Best Management Practices Guide for Stormwater; and Construction Site Erosion and Sediment Control Guide*
- Master Municipal Construction Document (MMCD): *Green Design Guidelines Manual* (To be released in the Fall of 2005)

The local area exhibits steep hillsides and very shallow groundwater. In fact, artesian wells are common, and groundwater regularly becomes surface water. As a result, there is already an intricate network of cut-off channels and drainage ditches throughout this area. This network must not be interrupted until the appropriate proposed drainage controls are in place. Further, designers must be cognizant of this and consider the hydrogeologic impacts of infiltration. They must be responsible for, and satisfy themselves that upwelling does not become a problem downstream.

Once constructed, the proposed storm infrastructure, and watercourse diversions will help eliminate high runoff rates in these natural drainage courses and consequently reduce stream bank erosion while maintaining the natural stream hydrology and promoting higher water quality.

The intent throughout this development is to reduce flow volumes and runoff rates from post-development minor storm events. This can be achieved, even with an increase in impermeable area, through the integration of Low Impact Development practices both at-source and through conveyance measures. Stormwater modeling has confirmed that both peak flows and total volumes are extremely sensitive to pervious depression storage, which infiltration systems provide. A representative hydrograph is included as **Figure 47** which illustrates the relative reduction in peak flows and total volume of stormwater runoff as a result of select BMPs. Although these infiltration systems and devices do not replace the need for conventional drainage service systems, and the conventional systems are sized without reductions resulting from these BMPs, they are a valuable component to the overall Stormwater Management (SWM) system.

The BMPs outlined below are considered prescriptive and are to become part of every development within the NCPA. Designers may, on a case-by-case basis, discuss alternatives if certain measures are considered ineffective on specific sites. However, the intent of these BMPs is to infiltrate at least 25mm of rainfall within 24 hours, and match post-development flows, volumes, and durations to pre-development conditions. If alternative BMPs are recommended, the designer must provide supporting analysis, in the form of continuous simulation using SWMM or XP-SWMM, using “full-record” rainfall data for Municipal Hall, or alternatively, historical data as directed by City staff. The model must incorporate the detailed site layout and percolation rates determined from a site geotechnical investigation. The model must account for the impacts of infiltration of the Best Management Practices as well as the impacts of the other Low Impact Development Strategies, and must demonstrate an equivalent level of infiltration. If designers incorporate the BMPs as outlined below, no additional modeling will be required.

Riparian Setbacks

As there are many watercourses traversing these lands, all developments will follow the Department of Fisheries and Oceans and Ministry of Environment regulations with regard to riparian setbacks and the treatment of the riparian areas. New Riparian Assessment Regulations anticipated for adoption in March 2006 are forthcoming. Developers are to ensure that proposed developments are in accordance with the applicable setback policies.

Roads

Conveyance controls within the street rights-of-way not only present an opportunity to integrate sustainable development approaches to reduce peak volumes and flow rates, but also provide water quality control. For urban areas, it is proposed to direct street runoff into lawn drains connected to drain rock trenches as illustrated in **Figures 48 - 51**. For small rainfall events these trenches will treat and infiltrate the runoff through a pervious soil base. The infiltration capacity of these trenches may be supplemented with the installation of perforated lawn drains which will

ensure safe conveyance of excess runoff to storm sewers at the discretion of the City of Surrey. Additional BMPs that will be applied include providing suitable shade trees to promote evapotranspiration, and preserving and supplementing topsoil on street rights-of-way to a depth of 450 mm to promote infiltration. The public and natural areas, such as parks, pedestrian and bicycle routes, dedicated greenways, water courses and preservation areas throughout the NCPA area are all conducive to promoting infiltration and reducing runoff. In private areas, reduced roadway width and permeable pavement methodologies may be considered.

Single Detached Development

Single Detached uses traditionally increase the impervious area of a development; however the incorporation of Low Impact Development strategies will ensure that the post-development rates and volumes more closely resemble pre-development levels.

Single-detached developments will be required to provide stormwater detention of 45 m³/ha. This detention can be provided as communal detention ponds as is currently proposed, or may take the form of lot-level detention combined with infiltration facilities.

The strategies to be implemented in the design of Single Detached developments include:

- Disconnected roof leaders draining to splash pads and ultimately to pervious areas;
- Minimum 300 mm of topsoil on each lot. Topsoil is to be non-compacted, free-draining, predominantly organic material;
- Rear-yard swales draining to lawn-basin drywells with drain rock bases and perforated pipe connections;
- Lots adjacent creeks will direct surface drainage the watercourse;

Wherever feasible, designers are recommended to implement:

- Increased vegetation and tree planting; and
- Reduced lot grading to infiltrate stormwater. This entails standard 2% grades within 5m of the building envelope but 0.5-1.0% elsewhere as applicable.

Cluster Housing

Cluster Housing is an innovative approach to preserving natural features. The retention of vegetation and trees, as well as the creation of open space is of significant benefit in the reduction of impervious areas throughout a site. As shown in **Figure 52**, relative to a Single Detached development of similar gross land density, Cluster Housing creates an imperviousness of 39% compared with a Single Detached imperviousness of 54%.

Cluster Housing will be required to provide stormwater detention of 85 m³/ha. This detention can be provided as communal or strata-operated detention ponds, or may take the form of underground retention, detention, and infiltration facilities.

The strategies to be implemented in the design of Cluster Housing developments include:

- Retention of vegetation and natural ground cover;
- Disconnected roof leaders draining to splash pads and ultimately to pervious areas;
- Minimum 300 mm of topsoil in landscaped areas. Topsoil is to be non-compacted, free-draining, predominantly organic material;
- Swales draining to lawn-basin drywells with drain rock bases and perforated pipe connections;

Wherever feasible, designers are recommended to implement:

- Biofiltration landscaping;
- Reduced lot grading to infiltrate stormwater , which entails standard 2% grades within 5m of the building envelope but 0.5-1.0% elsewhere as applicable;
- Reduced pavement widths in laneways;
- Permeable pavers; and
- Underground infiltration measures.

Multiple Residential

Multiple Residential developments traditionally have the most significant increase in impervious area of a development as a result of their densities. Consequently, they have the most significant opportunity to incorporate Low Impact Development strategies and ensure that the post-development rates and volumes more closely resemble pre-development rates.

Multiple Residential housing will be required to provide stormwater detention of 120 m³/ha. This detention can be provided as communal detention ponds, surface ponding, or underground retention, detention, and infiltration facilities.

The strategies to be implemented in the design of Multiple Residential developments include:

- Disconnected roof leaders draining to splash pads and ultimately to pervious areas. Designers should consider the use of cisterns or infiltration / biofiltration areas;
- Minimum 300 mm of topsoil in landscaped areas. Topsoil is to be non-compacted, free-draining, predominantly organic material;
- Swales draining to lawn-basin drywells with drain rock bases and perforated pipe connections;

Wherever feasible, designers are recommended to implement:

- Biofiltration landscaping;
- Reduced lot grading to infiltrate stormwater , which entails standard 2% grades within 5m of the building envelope but 0.5-1.0% elsewhere as applicable;
- Reduced pavement width;
- Permeable pavers; and

- Underground infiltration measures.

An example of On-Site Lawn Basin & Swale Details are included as **Figure 53**.

Public Education

One of the critical components of effective BMPs is public education of both the contractor and the homeowner. The construction of the drain rock trenches requires that the contractor understand the intent of the catch basin connections. Homeowners will need to be shown that rainwater retention is beneficial, and infiltration can supplant lawn watering requirements. These systems are not to be circumvented.

Erosion and Sediment Control

Some of the most important BMPs are erosion and sediment control measures. These measures are to be installed at the outset of all construction activities and must be maintained throughout the duration of the work. Basic measures to be used within this area include stabilized construction entrances, silt fences, storm drain inlet protection, vegetation stabilization of topsoil stockpiles, and sediment control ponds. These ponds should be appropriately sized, (1-2% of land area), maintained, and drain via a perforated riser pipe surrounded by clean gravel. Further, particularly within the Cluster Housing and Single Detached portions of these lands, designers are to retain natural vegetation on-site, clear areas on an as-needed basis, and provide slope drains and cut-off swales to stabilize exposed slopes. Overland flow routes will include straw or gravel barriers. Ongoing maintenance BMPs proposed for this area include: street sweeping; manhole, catch basin, and lawn drain sump cleaning; and the removal of excess sediment from ponds.

DCC Funding and Expenditures

The proposed drainage infrastructure system services both the North Grandview Heights NCPA area as well as the Grandview Heights #1 NCP area. Therefore, the cost of drainage infrastructure has been pro-rated between the two NCPs based upon their respective catchment areas. The following table outlines the allocations whereas Section 6 illustrates the cost and revenue breakdowns based on the anticipated phasing. The cost of DCC eligible infrastructure of storm trunk sewers and detention ponds also shown in the table. The financing of the DCC drainage components allocated to the NGHA area is estimated to cost \$4,965,400 while the revenues from Drainage DCCs are projected to be \$3,404,500. The drainage DCC revenues and expenditures result in a net shortfall of \$1,560,900.

Table 5.3.3a - Method of Pro-rating of Drainage System Costs

NCP Area	Storm Catchment Area	% Share
North Grandview Heights NCP	102 Ha	55%
Grandview Heights #1 NCP	84 Ha	45%

Table 5.3.3b - Cost Sharing of Drainage System and Other Drainage Works

Description	Location	Scope (Type & Size of Works)	Phasing	Total Costs	North Grandview Heights NCP Share Amount
160 Street Storm Trunk Sewer	From 28 Avenue to 32 Avenue	400 m - 750 mm Ø	Phase 1	\$398,000 *	\$218,900
160 Street Storm Trunk Sewer	From 28 Avenue to 32 Avenue	415 m - 1200 mm Ø	Phase 1	\$680,600 *	\$374,300
32 Avenue Storm Trunk Sewer	From 160 Street to Wills Brook	300 m - 1200 mm Ø	Phase 1	\$492,000 *	\$270,600
32 Avenue Culvert	At Wills Brook	20 m - 1500 mm Ø	Phase 1	\$43,300 *	\$23,800
32 Avenue Storm Trunk Sewer	From 164 Street to 166 Street	20 m - 900 mm Ø	Phase 1	\$24,200	\$24,200
32 Avenue Storm Trunk Sewer	From 164 Street to 166 Street	110 m - 1200 mm Ø	Phase 1	\$180,400	\$180,400
32 Avenue Storm Trunk Sewer	From 164 Street to 166 Street	20 m - 1500 mm Ø	Phase 1	\$43,300	\$43,300
32 Avenue Creek Enhancement	From 164 Street to 166 Street	350 m	Phase 1	\$175,000	\$175,000
34 Avenue Ditch Upgrade	From 164 Street to Old Logging Ditch	770 m	Phase 1	\$388,900 *	\$213,900
Detention Pond A	156 Street	4500 cu.m.	Phase 1	\$1,540,000	\$1,540,000
Detention Pond B	Between 156 Street and 160 Street	2200 cu.m.	Phase 1	\$753,000	\$753,000
Detention Pond C	32 Avenue and 160 Street	450 cu.m.	Phase 1	\$154,000	\$154,000
Detention Pond D	South of 32 Avenue, east of Wills Brook	600 cu.m.	Phase 1	\$206,000	\$206,000
Detention Pond E	32 Avenue and 164 Street	500 cu.m.	Phase 1	\$172,000	\$172,000
Detention Pond F	April Creek	1800 cu.m.	Phase 1	\$616,000	\$616,000
				\$5,866,700	\$4,965,400

* Drainage works common to both Grandview Heights #1 NCP and North Grandview Heights NCP Amendment

Table 5.3.3c - North Grandview Heights NCP Amendment Drainage DCC Revenue and Expenditures

	# of Units	DCC Revenues	DCC Expenditures	Difference
Phase 1	980	\$2,409,200	\$4,965,400	-\$2,556,200
Phase 2	592	\$995,300	\$0	\$995,300
Total	1572	\$3,404,500	\$4,965,400	-\$1,560,900

Summary

The downstream drainage system, comprised of the Wills Brook, April Creek, Morgan Creek, and Old Logging Ditch, is tributary to the Nicomekl River. Both Wills Brook and April Creek exhibit ongoing erosion due to the steep gradients and recent increases in runoff. It is proposed to maintain the base flows and divert some of the higher flows from both creeks into the proposed storm sewer system. Biofiltration will be used to reduce pollutants at the discharge points.

The drainage system will be designed to accommodate both minor and major flows. In order to avoid further erosion, it will be necessary to construct the sections of storm trunk sewer on 160 Street and 32 Avenue such that they will be completed prior to development proceeding. These storm sewers direct flows to the Old Logging Ditch and the Old Logging Ditch Pump Station, discharging to the Nicomekl River. Improvements may be required to the Wills Brook channel from the 164 Street crossing to Old Logging Ditch. However, due to the section being located in private lands, the capacity of the channel cannot be determined at this time. As an alternative, a conduit along 164 Street north of 36 Avenue and east along 36 Avenue to 165 Street may be built to convey the excess flows if a right-of-way cannot be attained. The existing ditch on 36 Avenue from 165 Street to Old Logging ditch may require upgrading and maintenance. The channel upgrade is proposed for inclusion into the City's 10-year plan. Costs in excess of this amount resulting from diversion will be borne by the developer.

With respect to lowland drainage, the runoff modeling has confirmed that the ARDSA criteria limiting flooding to 2 days during a 2-day 1:10-year summer storm event will be met.

BMPs are proposed to create a sustainable and green development. It is proposed to construct local roads with a drain rock trench to promote infiltration, provide detention, and ensure a high quality of stormwater runoff. On building sites, infiltration and reduced runoff rate and volume can be achieved by reducing the total impervious surfaces and by routing the drainage from impervious areas through grass to pervious areas.

It has been confirmed that detention is effective in controlling the peak flows minimizing the downstream impact of this development. Detention will be required on all developments as quantified in **Figure 46**.

However, downstream infrastructure cannot be downsized based on the implementation of BMPs. To accommodate the storm runoff from the increased density associated with the proposed North Grandview Heights NCPA the upgrades and additions to the sewer system as shown on the attached **Figure 46** are required. Timing of implementation would be dependent on development phasing.

- Upgrade the Old Logging Ditch and drainage pump station. The City is planning on undertaking this in 2005 / 2006. This needs to be completed for development in the upland areas to proceed.
- Upgrade the crossings of Wills Brook and Old Logging Ditch at 32 Avenue or the alternative high-flow alternative if necessary. (10-Year Capital Works Project ID #6551-6559).

- Construct the main trunk drainage sewers north-south on 160 Street and east-west on 32 Avenue from 160 Street in order for development to proceed in the NGH NCPA area. (10-Year Capital Works Project ID #6199, 6579).
- Within each phase of development construct the east-west trunk drainage routes and the minor drainage systems as required to accommodate the phased development.
- Construct diversion structures at the heads of April Creek and Wills Brook to provide necessary base flows, while diverting higher flows to the trunk storm drain system.
- Provide detention storage for each phase of development within the NGH NCPA area.

The drainage works required for this NGH NCPA also service the Grandview Heights NCP area. As such, expenditures have been proportionately allocated between the two NCPs based upon tributary area. The drainage DCC revenues and expenditures result in a net shortfall of \$1,560,900. This shortfall will necessitate a drainage levy on all lots as shown in **Figure 54**. The City of Surrey will determine the amount of the levy on each site prior to development.

5.3.4 Utilities (BC Hydro, Tel, Gas, Cable)

Power

The City of Surrey, as policy, allows for overhead systems along the ½ mile (800 m) grid, i.e. 28 Avenue, 32 Avenue, 160 Street, 164 Street. There is an existing 69kV feeder on the west side of 160 Street, therefore, the ½ mile system must be located on the east side of this road. All other new hydro services, including service connections to developments on the opposite side of the pole line must be located underground. Aerial crossings are to be eliminated. The exceptions to this are noted in the City's Subdivision and Development Bylaw #8830. It is anticipated, based upon analysis of the proposed servicing corridors, that within the NCP area underground servicing is possible. The City will require, as development incrementally grows, that all new hydro services are placed underground.

It is worth noting that some of the City's current road cross-sections require hydro and gas services in smaller corridors than currently supported by the utilities companies. This is an on-going issue with the City, BC Hydro, Telus and Terasen Gas. The NCP can accommodate the City's standards.

Telus and Cable TV

As with power, the present telephone system within the area is overhead on poles. The City's Subdivision and Development Bylaw 8830 states that, except for the ½ mile grid, all telecommunications wiring must be installed underground. To comply with this requirement, existing telecommunications wiring will be relocated underground in conjunction with the overhead power lines as development proceeds.

Terasen Gas

The gas system which presently exists within the NCP area will be improved and expanded as development proceeds. To promote the preservation of existing trees near properties, the gas mains may need to be located outside of the traditional 0.8-metre property line offset.

6.0 INFRASTRUCTURE PHASING AND FUNDING

6.1 DEVELOPMENT PHASING

As most of the major servicing infrastructure has to be installed prior to development taking place, the phasing will be primarily market driven. The owners / developers will have to bear very high initial costs for water mains, sanitary sewers and stormwater trunks and outfalls. They will want to market areas likely to develop in order to recover costs through DCC rebates and levys. The phasing has, therefore, been staged based on discussions with the owners / developers and what they perceive as their priorities in marketing.

The overall phasing of the NGH NCPA area is divided between those lands north of the proposed sanitary interceptor which can develop first as Phase One: those lands south must wait as Phase Two until the interceptor is extended to 160 Street. The detailed major infrastructure servicing requirements are broken down by phase.

In summary, the broad staging strategy is as follows:

- Staging strategy has been largely influenced by the need to minimize short term cash flow issues in the provision of services. Other factors such as the availability of existing services and capacity constraints are also relevant and should not be neglected.
- Two major stages of development are proposed.
- The proposed staging of development is not to be interpreted legalistically. Development in subsequent stages of development can occur provided that developers in those stages “front end” all required services to allow development to proceed in that particular stage of development.
- With the current City DCC reimbursement policy, developers will have to build proposed major DCC elements at their costs. It may be possible for a number of developers to establish arrangements among themselves to jointly share the expense as required.

6.2 INFRASTRUCTURE FINANCING AND FUNDING

The City of Surrey has taken the following approach to infrastructure funding in the NCP area.

- The long term DCC revenues and expenditures for major collector roads, water, sanitary and drainage works in general balance or show a positive cash flow at build-out. This is for DCC revenues and expenditures within the NCPA area. If the NCP’s total DCCs are less than the expenditures, the proponent is able to front-end these costs, or levys may be considered.
- The short term annual DCC revenues and expenditures must also balance or the NCPA development community must address the short term cash flow situation.
- City Council has stated that sequencing of the various NCPs in this area will not be supported at this time.

- The City will not fund interim works.
- The City-wide based DCC collection and expenditure program is the basis of all DCC capital works.
- The City of Surrey has endorsed the use of DCC Frontender Agreements as a method of reimbursing developers for frontending the cost of major engineering infrastructure that is in the 10-Year Capital Servicing Plan.
- A Development Works Agreement can be considered to cover the cost of major infrastructure items that are not covered by DCCs.

Much of the required major infrastructure for the NCPA is not in the current City 10 Year Plan. The development of the NCPA will require a significant expenditure to support the proposed land use. Given the financial position of the City, this major expenditure will have to come from the development community. This section of the report describes the DCC works required, DCC revenues and expenditures, financial options and cash flow analysis.

6.3 DCC ELEMENTS

The City of Surrey's 10 Year Capital Plan includes engineering works which are required for both the existing and future needs of the community. Typically the existing needs are funded from general revenue or utility monies or grants and infrastructure required for growth is principally (90%) funded by Developers through Development Cost Charges (DCCs).

The City will only fund works which are included in the 10 year plan and DCC program. DCC works can either be built by the City or Developers. Given the huge size of the DCC program and the time requirements for infrastructure to be built, Developers typically build many DCC works and receive DCC reimbursements for the works they build.

The City has specific criteria for a work to be included as a DCC element in their program. **Tables 6.3a** through **6.3e** list each proposed eligible DCC item by service. Each item is broken down to show the estimated cost, type of proposed funding, suggested method of construction (by Surrey or Developers) and the time period the work is required.

The tables also note whether the item is an addition to the current 10 Year Servicing Plan or a substitution. Substitution in this document for example, means an item which was shown in the 10 Year Servicing Plan on Road A but through refinement of the NCP servicing plan the item was moved to Road B. The purpose and scope of the work would not have changed. Only the alignment or length has been modified. All additional costs are noted.

A description of how each item is proposed to be funded is listed in the tables. The phase that each item is required is included to clarify when works are necessary, based on the needs of the NCP area development.

**TABLE 6.3a
NORTH GRANDVIEW HEIGHTS AMENDMENT AREA
INFRASTRUCTURE FINANCING AND FUNDING
(Items Recommended for Inclusion into the New 10 Year Plan)**

Water

Item Location	Cost (\$)	Current, Removal or Addition	ID # Current 10 Yr Plan	Amount in Current Program	Additions to Program	Phase	Notes
24 Avenue: (Low Pressure) Grandview Reservoir to 160 St	1,375,500 (500 Ø)	Addition	-	-	1,169,200 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
24 Avenue: (Low Pressure) Grandview Reservoir to 160 St	353,700 (500 to 750 Upsizing)	Addition	-	-	300,600 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
160 St: (Low Pressure) 24 Ave to 28 Ave	387,400 ⁽¹⁾ (450 Ø)	Current/Removal	5116	329,300 ⁽²⁾	-	-	Amount current in the 10 Year Plan to be removed
160 St: (Low Pressure) 24 Ave to 28 Ave	664,200 (400 Ø)	Addition	-	-	564,600 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
160 St: (Low Pressure) 24 Ave to 28 Ave	229,600 (400 to 600 Upsizing)	Addition	-	-	195,200 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
160 St: (Low Pressure) 28 Ave to 32 Ave	473,600 ⁽¹⁾ (450 Ø)	Current/Removal	5116	473,600	-	-	Amount current in the 10 Year Plan to be removed
160 St: (Low Pressure) 28 Ave to 32 Ave	526,500 (200 to 500 Upsizing)	Addition	-	-	526,500	Phase 1	-
164 St: 29 Ave to 30 Ave	14,400 (200 to 250 Upsizing)	Addition	-	-	12,200 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
28 Ave.: 160 St. to 162 St.	56,700 (200 to 300 Upsizing)	Addition	-	-	48,200 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
28 Ave.: 160 St. to 158 St.	324,000 (400 Ø)	Addition	-	-	275,400 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
PRV @ 164 St & 29 Ave	50,000 (Remove from service)	Addition	-	-	42,500 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
PRV @ 160 St & 30 Ave	162,500	Addition	-	-	162,500	Phase 1	-

- (1) The amount shown was taken from 2001 dollar values provided in the current City of Surrey 2001-2010 Servicing Plan. The total amount of \$861,000 was also divided between 24 to 28 Avenue and 28 to 32 Avenue, \$387,400 and \$473,600 respectively.
- (2) The cost of this infrastructure was pro-rated between Grandview #1 NCP and North Grandview Amendment Area NCP based on population, flows or catchment area. See **Tables 5.3.1a to 5.3.1e**

The cost breakout for each item shown above may be found in **Table 6.3.2b**

**TABLE 6.3b
NORTH GRANDVIEW HEIGHTS AMENDMENT AREA
INFRASTRUCTURE FINANCING AND FUNDING
(Items Recommended for Inclusion into the New 10 Year Plan)**

Sanitary

Item Location	Cost (\$)	Current, Removal or Addition	ID # Current 10 Yr Plan	Amount in Current Program	Additions to Program	Phase	Notes
Interceptor: 152 St to 160 St	3,959,000 (Trunk)	Addition	-	-	1,187,700 ⁽²⁾	-	Amount pro rated between NGH & GH #1
Morgan Cr. P.S. #1	257,500 (Upgrade)	Addition	-	-	257,500	Phase 1	-
Morgan Cr. P.S. #2	150,000 ⁽¹⁾ (Upgrade)	Current/Removal	7733	150,000	-	-	-
Morgan Cr. P.S. #2	340,200 (Upgrade)	Addition	-	-	340,200	Phase 1	-
36 Ave: 160 St to 161 St	232,100 (Upgrade)	Addition	-	-	232,100	Phase 1	-
37 A Ave: 159 St to 160 St	91,700 (Upgrade)	Addition	-	-	91,700	Phase 1	-
Through Golf Course	48,900 (Upgrade)	Addition	-	-	48,900	Phase 1	-
164 St.: 33 Ave to 34 Ave	127,600 (Upgrade)	Addition	-	-	127,600	Phase 1	-

- (1) The amount shown was taken from 2001 dollar values provided in the current City of Surrey 2001-2010 Servicing Plan.
- (2) The cost of this infrastructure was pro-rated between Grandview #1 NCP and North Grandview Amendment Area NCP based on either population or catchment area. See **Tables 5.3.2a to 5.3.2c**

**TABLE 6.3c
NORTH GRANDVIEW HEIGHTS AMENDMENT AREA
INFRASTRUCTURE FINANCING AND FUNDING
(Items Recommended for Inclusion into the New 10 Year Plan)**

Storm

Item Location	Cost (\$)	Current, Removal or Addition	ID # Current 10 Yr Plan	Amount in Current Program ⁽¹⁾	Additions to Program	Phase	Notes
160 St: 28 Ave to 32 Ave	400,000 ⁽¹⁾ 75,000 ⁽¹⁾ 10,000 ⁽¹⁾ 680,000 ⁽¹⁾	Current/Removal	1739 6884 6560 6579	220,000 ⁽²⁾ 41,200 ⁽²⁾ 5,500 ⁽²⁾ 374,000 ⁽²⁾	-	-	Amount current in the 10 Year Plan to be removed
160 St: 28 Ave to 32 Ave	1,078,600 (Trunk)	Addition	-	-	593,200 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
32 Ave: 161 Street	50,000 ⁽¹⁾ (Culvert Upgrading)	Current/Removal	6558 6559	27,500 ⁽²⁾	-	-	Amount current in the 10 Year Plan to be removed
32 Ave: 160 St to Wills Brook	492,000 (Trunk)	Addition	-	-	270,600 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
32 Ave Culvert at 161 St	20,000 ⁽¹⁾ (Culvert Upgrading)	Current/Removal	6557	11,000 ⁽²⁾	-	-	Amount current in the 10 Year Plan to be removed
32 Ave Culvert at Wills Brook	43,300 (Culvert Upgrading)	Addition	-	-	23,800 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
32 Ave: 164 St to 166 St	610,000 ⁽¹⁾ (Trunk & Creek)	Current/Removal	6551 to 6556 6198 6199	150,000 400,000 60,000	-	-	Amount current in the 10 Year Plan to be removed
32 Ave: 164 St to 166 St	422,900 (Trunk & Creek)	Addition	-	-	422,900	Phase 1	Amount pro rated between NGH & GH #1
34 Ave: 164 St to 166 St	110,000 ⁽¹⁾ (Creek Improvement)	Current/Removal	6550	60,500 ⁽²⁾	-	-	Amount current in the 10 Year Plan to be removed
34 Ave: 164 St to 166 St	388,900 (Trunk & Ditch Upgrade)	Addition	-	-	213,900 ⁽²⁾	Phase 1	Amount pro rated between NGH & GH #1
Pond on 156 St	848,400	Current/Removal	6565	848,400	-	-	Amount current in the 10 Year Plan to be removed
Pond A on 156 St	1,540,000	Addition	-	-	1,540,000	Phase 1	Amount pro rated between NGH & GH #1

Item Location	Cost (\$)	Current, Removal or Addition	ID # Current 10 Yr Plan	Amount in Current Program ⁽¹⁾	Additions to Program	Phase	Notes
Pond Between 156 St and 160 St	262,000	Current/Removal	6574	262,000	-	-	Amount current in the 10 Year Plan to be removed
Pond B Between 156 St and 160 St	753,000	Addition	-	-	753,000	Phase 1	Amount pro rated between NGH & GH #1
Pond C @ 32 Ave and 160 St	154,000	Addition	-	-	154,000	Phase 1	-
Pond D south of 32 Ave and east of Wills Brook	206,000	Addition	-	-	206,000	Phase 1	-
Pond E @ 32 Ave and 164 St	172,000	Addition	-	-	172,000	Phase 1	-
Pond F @ April Creek	616,000	Addition	-	-	616,000	Phase 1	-

- (1) The amount shown was taken from 2001 dollar values provided in the current City of Surrey 2001-2010 Servicing Plan.
- (2) The cost of this infrastructure has been pro-rated between Grandview #1 NCP and North Grandview Amendment Area NCP based on either population or catchment area. See **Tables 5.3.3a to 5.3.3c**

TABLE 6.3d
NORTH GRANDVIEW HEIGHTS AMENDMENT AREA
INFRASTRUCUTURE FINANCING AND FUNDING
(Items Recommended for Inclusion into the New 10 Year Plan)

Major Collector

Item Location	Cost (\$)	Current or Addition	ID # Current 10 Yr Plan	Amount in Current Program	Additions to Program	Phase
164 St: 29 Ave to 32 Ave	108,000 (Widening)	Addition	-	-	108,000	Phase 1
28 Ave: 160 St to 162 St	405,000 (Half Road)	Addition	-	-	405,000	Phase 2
28 Ave: Croydon to 160 St.	121,500 (Widening)	Addition	-	-	121,500	Phase 2
28 Ave: East of Croydon to 156 St.	9,000 (Widening)	Addition	-	-	9,000	Phase 2

TABLE 6.3e
NORTH GRANDVIEW HEIGHTS AMENDMENT AREA
INFRASTRUCUTURE FINANCING AND FUNDING
(Items Recommended for Inclusion into the New 10 Year Plan)

Arterial

Item Location	Cost (\$)	Current or Addition	ID # Current 10 Yr Plan	Amount in Current Program	Additions to Program	Phase Requested
168 St: 30A Ave. to 31 Ave.	495,000 (Widening)	Addition	-	-	495,000	Phase 1
32 Ave: 159 St. to 167A St.	2,692,500 (Widening)	Addition	-	-	2,692,500	Phase 1
160St: 29 Ave. to 32 Ave.	1,365,000 (Widening)	Addition	-	-	1,365,000	Phase 1
160 St.: 28 Ave. to 29 Ave.	150,000 (Widening)	Addition	-	-	150,000	Phase 2
160 St and 28 Ave	75,000 ⁽³⁾ (Traffic Signal)	Addition	-	-	75,000	Phase 2

Note that the proposed timing shown is based on projected development needs. The actual timing of construction may differ. The NCPA proponents recognize that Surrey is currently reviewing its 10 Year Plan. Following Council acceptance of the plan, specific timing will be provided in the revised plan. Only those DCC elements in the current 10 Year Plan (DCC elements) will receive DCC reimbursements as per the current City policy. The proposed works in the NCP will be eligible if they are added to the 10 Year Plan (DCC elements).

6.3.1 Financing Options

While various projects meet the criteria established by the City of Surrey for DCC projects, the City is not in a financial position to “front end” the infrastructure projects in the short term which are required for development to proceed in this area. In the long term, sufficient DCC revenues could be generated to offset the servicing cost of the majority of the major servicing projects (DCC projects). The developers could request the City to consider approving them to recover “front ended” costs by means of a DCC Frontender Agreement.

6.3.2 DCC Revenues and Expenditures

Each NCP DCC revenues and expenditures must balance. The implication is that should a large expenditure be required for any infrastructure required to service a development, the NCP must have contributed enough revenues to fund that infrastructure or develop an alternative new revenue source.

Due to the short time frame of construction and build-out, (a growth projection anticipating build-out of the NCPA area within 5 to 10 years based on between 1,400 and 2,000 units), revenues and expenditures are only broken down by phase. The DCC revenues based on the various land uses for the two phases are summarized for each of the services in **Tables 6.3.2a**.

The capital costs used for the analysis are included in **Table 6.3.2b**.

A phase by phase analysis was completed for each service to determine whether a positive cash flow was attainable. The projected DCC revenues and expenditures by phase for each service are summarized in **Table 6.3.2c**.

While major collector projects will generate surplus funds, arterial roads, water, sanitary and drainage infrastructure projects generate deficits, indicating that an alternative source of revenue would be required. As discussed, the costs could be “front ended” by developers who could recoup their costs by means of a DCC Frontender Agreement or Development Works Agreement, or by levy assessed by the City.

TABLE 6.3.2a
DCC Revenues Based on the Various Land Uses for the Two Phases

Water Revenue

	RH \$951		RF \$951		RC \$0.54/ft. ²		RM-30 \$0.54/ft. ²		TOTAL UNITS	TOTAL REVENUE
	# Units	Revenue	# Units	Revenue	# Units ⁽¹⁾	Revenue ⁽²⁾	# Units ⁽³⁾	Revenue ⁽⁴⁾		
Phase One	201	\$191,150	111	\$105,560	401	\$389,770	267	\$180,230	980	\$866,700
Phase Two	1	\$950	98	\$93,200	200	\$194,400	293	\$197,780	592	\$486,300
Total at Buildout									1572	\$1,353,000

- (1) Based on 6 Units/Acre
- (2) Based on 1,800 Ft.²/Unit
- (3) Based on 20 Units/Acre
- (4) Based on 1,250 Ft.²/Unit

DCC Revenues Based on the Various Land Uses for the Two Phases

Sanitary Revenue

	RH \$820		RF \$820		RC \$0.46/ft. ²		RM-30 \$0.46/ft. ²		TOTAL UNITS	TOTAL REVENUE
	# Units	Revenue	# Units	Revenue	# Units ⁽¹⁾	Revenue ⁽²⁾	# Units ⁽³⁾	Revenue ⁽⁴⁾		
Phase One	201	\$164,820	111	\$91,020	401	\$332,030	267	\$153,530	980	\$741,400
Phase Two	1	\$820	98	\$80,360	200	\$165,600	293	\$168,480	592	\$415,300
Total at Buildout									1572	\$1,156,700

- (1) Based on 6 Units/Acre
- (2) Based on 1,800 Ft.²/Unit
- (3) Based on 20 Units/Acre
- (4) Based on 1,250 Ft.²/Unit

TABLE 6.3.2a (Continued)

DCC Revenues Based on the Various Land Uses for the Two Phases

Drainage Revenue

	RH \$5,236		RF \$2,618		RC \$1.01/ft. ²		RM-30 \$1.01/ft. ²		TOTAL UNITS	TOTAL REVENUE
	# Units	Revenue	# Units	Revenue	# Units ⁽¹⁾	Revenue ⁽²⁾	# Units ⁽³⁾	Revenue ⁽⁴⁾		
Phase One	201	\$1,052,440	111	\$290,600	401	\$729,020	267	\$337,090	980	\$2,409,200
Phase Two	1	\$5,240	98	\$256,560	200	\$363,600	293	\$369,910	592	\$995,300
Total at Buildout									1572	\$3,404,500

- (1) Based on 6 Units/Acre
- (2) Based on 1,800 Ft.²/Unit
- (3) Based on 20 Units/Acre
- (4) Based on 1,250 Ft.²/Unit

DCC Revenues Based on the Various Land Uses for the Two Phases

Major Collectors

	RH \$1,394		RF \$1,394		RC \$0.59/ft. ²		RM-30 \$0.59/ft. ²		TOTAL UNITS	TOTAL REVENUE
	# Units	Revenue	# Units	Revenue	# Units ⁽¹⁾	Revenue ⁽²⁾	# Units ⁽³⁾	Revenue ⁽⁴⁾		
Phase One	201	\$280,190	111	\$154,730	401	\$425,860	267	\$196,910	980	\$1,057,700
Phase Two	1	\$1,390	98	\$136,610	200	\$212,400	293	\$216,090	592	\$566,500
Total at Buildout									1572	\$1,624,200

- (1) Based on 6 Units/Acre
- (2) Based on 1,800 Ft.²/Unit
- (3) Based on 20 Units/Acre
- (4) Based on 1,250 Ft.²/Unit

TABLE 6.3.2a (Continued)

DCC Revenues Based on the Various Land Uses for the Two Phases

Arterial

	RH \$5,517		RF \$5,517		RC \$2.35/ft. ²		RM-30 \$2.35/ft. ²		TOTAL UNITS	TOTAL REVENUE
	# Units	Revenue	# Units	Revenue	# Units ⁽¹⁾	Revenue ⁽²⁾	# Units ⁽³⁾	Revenue ⁽⁴⁾		
Phase One	201	\$1,108,920	111	\$612,390	401	\$1,696,230	267	\$784,310	980	\$4,201,900
Phase Two	1	\$5,520	98	\$540,670	200	\$846,000	293	\$860,690	592	\$2,252,900
Total at Buildout									1572	\$6,454,800

- (1) Based on 6 Units/Acre
- (2) Based on 1,800 Ft.²/Unit
- (3) Based on 20 Units/Acre
- (4) Based on 1,250 Ft.²/Unit

DCC Revenues Based on the Various Land Uses for the Two Phases

Park Acquisition

	RH \$2,065		RF \$5,575		RC \$5.11/ft. ²		RM-30 \$5.11/ft. ²		TOTAL UNITS	TOTAL REVENUE
	# Units	Revenue	# Units	Revenue	# Units ⁽¹⁾	Revenue ⁽²⁾	# Units ⁽³⁾	Revenue ⁽⁴⁾		
Phase One	201	\$415,070	111	\$618,830	401	\$3,688,400	267	\$1,705,460	980	\$6,427,800
Phase Two	1	\$2,070	98	\$546,350	200	\$1,839,600	293	\$1,871,540	592	\$4,259,600
Total at Buildout									1572	\$10,687,400

- (1) Based on 6 Units/Acre
- (2) Based on 1,800 Ft.²/Unit
- (3) Based on 20 Units/Acre
- (4) Based on 1,250 Ft.²/Unit

Table 6.3.2b
North Grandview Heights Amendment Area
Cost Estimate of DCC Infrastructure

Location	Size	Length (m)	Cost (/m)	Total	Pro-Rated Total ⁽¹⁾	Required
WATER						
24 Avenue: Grandview Reservoir - 160 Street (low pressure system)	500mm	1,310	\$1,050	\$1,375,500	\$1,169,200 ⁽³⁾	Phase 1
24 Avenue: Grandview Reservoir - 160 Street (low pressure system)	500 to 750	1,310	\$270	\$353,700	\$300,600 ⁽³⁾	Phase 1
160 Street: 24 Avenue to 28 Avenue (low pressure system)	400mm	820	\$810	\$664,200	\$564,600 ⁽³⁾	Phase 1
160 Street: 24 Avenue to 28 Avenue (low pressure system)	400 to 600	820	\$280	\$229,600	\$195,200 ⁽³⁾	Phase 1
160 Street: 28 Avenue to 32 Avenue	200 to 500	810	\$650	\$526,500	\$526,500	Phase 1
164 Street: 29 Avenue to 30 Avenue	200 to 250	205	\$70	\$14,400	\$12,200 ⁽³⁾	Phase 1
28 Avenue: 160 Street to 162 Street	200 to 300 mm	405	\$140	\$56,700	\$48,200 ⁽³⁾	Phase 1
28 Avenue: 160 Street to 158 Street	400mm	400	\$810	\$324,000	\$275,400 ⁽³⁾	Phase 1
PRV Station: 164 Street and 29 Avenue (Decommission)				\$50,000	\$42,500 ⁽³⁾	Phase 1
PRV Station: 160 Street and 30 Avenue (Construct)				\$162,500	\$162,500	Phase 1
Subtotal Phase 1				\$3,757,100	\$3,296,900	
Subtotal Phase 2				\$0	\$0	
TOTAL WATER without Morgan Creek Upgrade				\$2,647,300	\$2,274,600	
TOTAL WATER with Morgan Creek Upgrade				\$3,757,100	\$3,296,900	
SANITARY						
Interceptor: 152 Street to 160 Street	1050 mm	2,015	\$1,965	\$3,959,000	\$1,187,700 ⁽³⁾⁽⁴⁾	Phase 2
Morgan Creek Pump Station #1	Upgrade			\$257,500	\$257,500	Phase 1
Morgan Creek Pump Station #2	Upgrade			\$340,200	\$340,200	Phase 1
Various Locations for Pipe Upgrading:						
36 Avenue : 160 Street to 161 Street	375 to 450 mm	211	\$1,100	\$232,100	\$232,100	Phase 1
37A Avenue: 159 Street to 160 Street	450 to 525 mm	65	\$1,410	\$91,700	\$91,700	Phase 1
Through Golf Course from Canterbury Dr.	300 to 450 mm	46	\$1,064	\$48,900	\$48,900	Phase 1
164 Street: 33 Avenue to 34 Avenue	200 to 250 mm	110	\$1,160	\$127,600	\$127,600	Phase 1
Subtotal Phase 1				\$1,098,000	\$1,098,000	
Subtotal Phase 2				\$3,959,000	\$1,187,700	
TOTAL SANITARY				\$5,057,000	\$2,285,700	
STORM						
160 Street: 28 Avenue to 32 Avenue	750 mm	400	\$995	\$398,000	\$218,900 ⁽³⁾	Phase 1
160 Street: 28 Avenue to 32 Avenue	1,200 mm	415	\$1,640	\$680,600	\$374,300 ⁽³⁾	Phase 1
32 Avenue: 160 Street to Wills Brook	1,200 mm	300	\$1,640	\$492,000	\$270,600 ⁽³⁾	Phase 1
Wills Brook Culvert at 32 Avenue	1,500 mm	20	\$2,165	\$43,300	\$23,800 ⁽³⁾	Phase 1
32 Avenue: 164 Street to 166 Street	900 mm	20	\$1,210	\$24,200	\$24,200	Phase 1
32 Avenue: 164 Street to 166 Street	1,200 mm	110	\$1,640	\$180,400	\$180,400	Phase 1
32 Avenue: 164 Street to 166 Street	1,500 mm	20	\$2,165	\$43,300	\$43,300	Phase 1
32 Avenue: 164 Street to 166 Street	Creek Enhancement	350	\$500	\$175,000	\$175,000	Phase 1
34 Ave: From 164 Street to Old Logging Ditch Pond A (on 156 Street)	Ditch Re & Re	770	\$505	\$388,900	\$213,900 ⁽³⁾	Phase 1
Construction				\$540,000	\$540,000	
Land Costs				\$1,000,000	\$1,000,000	

TABLE 6.3.2b (Continued)
North Grandview Heights Amendment Area
Cost Estimate of DCC Infrastructure

Location	Size	Length (m)	Cost (/m)	Total	Pro-Rated Total ⁽¹⁾	Required
Pond B (between 156 Street and 160 Street)	2200 cu.m.					Phase 1
Construction			\$264,000	\$264,000	\$264,000	
Land Costs			\$489,000	\$489,000	\$489,000	
Pond C (32 Avenue and 160 Street)	450 cu.m.					Phase 1
Construction			\$54,000	\$54,000	\$54,000	
Land Costs			\$100,000	\$100,000	\$100,000	
Pond D (south of 32 Avenue, east of Wills Brook)	600 cu.m.					Phase 1
Construction			\$72,000	\$72,000	\$72,000	
Land Costs			\$134,000	\$134,000	\$134,000	
Pond E (32 Avenue and 164 Street)	500 cu.m.					Phase 1
Construction			\$60,000	\$60,000	\$60,000	
Land Costs			\$112,000	\$112,000	\$112,000	
Pond F (April Creek)	1,800 cu.m.					Phase 1
Construction			\$216,000	\$216,000	\$216,000	
Land Costs			\$400,000	\$400,000	\$400,000	
TOTAL STORM				\$5,866,700	\$4,965,400	
MAJOR COLLECTORS⁽²⁾						
164 Street:						
29 Avenue to 30B Avenue	1.85 m widening	320	\$150	\$48,000	\$48,000	Phase 1
30B Avenue to 32 Avenue	3.7 m widening	200	\$300	\$60,000	\$60,000	Phase 1
28 Avenue:						
160 Street to 162 Street	6.1 m	405	\$1,000	\$405,000	\$405,000	Phase 2
156 Street to 160 Street	1.85 m widening	810	\$150	\$121,500	\$121,500	Phase 2
East of Croydon Drive to 156 Street	0.6 m widening	120	\$75	\$9,000	\$9,000	Phase 2
Subtotal Phase 1				\$108,000	\$108,000	
Subtotal Phase 2				\$535,500	\$535,500	
TOTAL MAJOR COLLECTORS				\$643,500	\$643,500	
ARTERIALS						
168 Street from ±30A Avenue to ±32 Avenue	6.1 m widening	330	\$1,500	\$495,000	\$495,000	Phase 1
32 Avenue						
East of 164 Street	6.0 m widening	765	\$1,500	\$1,147,500	\$1,147,500	Phase 1
West of 164 Street	5.7 m widening	1,030	\$1,500	\$1,545,000	\$1,545,000	Phase 1
160 Street from 29 Avenue to 32 Avenue						
West Side	6.0 m widening	710	\$1,500	\$1,065,000	\$1,065,000	Phase 1
East Side	6.0 m widening	200	\$1,500	\$300,000	\$300,000	Phase 1
160 Street from 28 Avenue to 29 Avenue	12.0 m widening	100	\$1,500	\$150,000	\$150,000	Phase 2
160 Street and 28 Avenue	Traffic Light	L.S	\$150,000	\$150,000	\$75,000 ⁽³⁾	Phase 1
Subtotal Phase 1				\$4,702,500	\$4,627,500	
Subtotal Phase 2				\$150,000	\$150,000	
TOTAL ARTERIAL				\$4,852,500	\$4,777,500	

⁽¹⁾ Provides for a 50% increase factor for engineering and contingency.

⁽²⁾ Recognizes Surrey's New Major Collector Development Related Works.

⁽³⁾ The cost of this infrastructure has been pro-rated between Grandview #1 NCP and North Grandview Amendment NCP, based on either population or catchment area. See Table 5.3.2b

TABLE 6.3.2b (Continued)

**NORTH GRANDVIEW HEIGHTS AMENDMENT AREA
COST ESTIMATE OF DCC INFRASTRUCTURE**

Unit Costs

The above per unit costs were based on figures supplied by Surrey.

Roads	Cost (\$)
New Arterial Construction	3,500/m
Ultimate Arterial Widening	3,000/m
Interim Arterial Widening	1,800/m
New Major Collector Construction	2,000/m
Major Collector Upsizing (8.5 m to 12.2 m)	300/m
Major Collector Upsizing (11.0 m to 12.2 m)	150/m

Storm

Pipe (mm)	Cost (\$)
750	995
900	1210
1050	1405
1200	1640
1500	2165

Sanitary

Pipe (mm)	Cost (\$)
200	1,185
250	1,255
300	1,340
375	1,440
450	1,550

Above costs are based on construction within collector roads.

A 20% increase has been added to those areas that are within arterial roadways

Water

Pipe (mm)	Cost (\$)
200	570
250	640
300	710
400	810
500	1050
600	1090
750	1320

TABLE 6.3.2c

North Grandview Heights NCP Amendment

Projected DCC Revenues and Expenditures

Water without Morgan Creek Upgrade

	# of Units	DCC Revenues	DCC Expenditures	Difference	Cummulative Balance
Phase 1	980	\$866,700	\$2,274,600	-\$1,407,900	-1,407,900
Phase 2	592	\$486,300	\$0	\$486,300	-921,600
Total	1572	\$1,353,000	\$2,274,600		-921,600

Water with Morgan Creek Upgrade

	# of Units	DCC Revenues	DCC Expenditures	Difference	Cummulative Balance
Phase 1	980	\$866,700	\$3,296,900	-\$2,430,200	-2,430,200
Phase 2	592	\$486,300	\$0	\$486,300	-1,943,900
Total	1572	\$1,353,000	\$3,296,900		-1,943,900

Sanitary

	# of Units	DCC Revenues	DCC Expenditures	Difference	Cummulative Balance
Phase 1	980	\$741,400	\$1,098,000	-\$356,600	-356,600
Phase 2	592	\$415,300	\$1,187,700	-\$772,400	-1,129,000
Hwy. 99		\$158,300	\$0	\$158,300	-970,700
Total	1572	\$1,315,000	\$2,285,700		-970,700

Drainage

	# of Units	DCC Revenues	DCC Expenditures	Difference	Cummulative Balance
Phase 1	980	\$2,409,200	\$4,965,400	-\$2,556,200	-2,556,200
Phase 2	592	\$995,300	\$0	\$995,300	-1,560,900
Total	1572	\$3,404,500	\$4,965,400		-1,560,900

Major Collector

	# of Units	DCC Revenues	DCC Expenditures	Difference	Cummulative Balance
Phase 1	980	\$1,057,700	\$108,000	\$949,700	949,700
Phase 2	592	\$566,500	\$535,500	\$31,000	980,700
Total	1572	\$1,624,200	\$643,500		980,700

TABLE 6.3.2c (Continued)
North Grandview Heights NCP Amendment
Projected DCC Revenues and Expenditures

Arterials

	# of Units	DCC Revenues	DCC Expenditures	Difference	Cummulative Balance
Phase 1	980	\$4,201,900	\$4,627,500	-\$425,600	-425,600
Phase 2	592	\$2,252,900	\$150,000	\$2,102,900	1,677,300
Total	1572	\$6,454,800	\$4,777,500		1,677,300

Park Acquisition

	# of Units	DCC Revenues	DCC Expenditures	Difference	Cummulative Balance
Phase 1	980	\$6,427,800			
Phase 2	592	\$4,259,600			
Total	1572	\$10,687,400	\$10,500,000		187,400

Note:

The Water, Sanitary and Storm Infrastructure Expenditures have been prorated between Grandview #1 NCP and North Grandview Amendment Area NCP based on either population or catchment area

Additional Revenues have been added to the Sanitary DCC from the Highway 99 Corridor based on area contribution

The deficits identified are primarily due to the high cost of major servicing infrastructure for this area. The Grandview North Gravity Interceptor Phase 1 is integral to the entire Grandview Heights area and has been sized accordingly, but carries significant cost. The low-pressure gravity mains from the Grandview Reservoir are essential to servicing growth in the Kensington 110 m zone, but are very expensive. The drainage infrastructure requires significant upgrades to create capacity for post-development flows. This infrastructure warrants special consideration.

A summary of projected DCC revenues and expenditures at build-out is shown in **Table 6.3.2d**.

It is recognized that the City of Surrey collects DCCs on a community basis, not on a NCP or area basis. The revenues and expenditures in the section are presented to show the financial impact of the NCP on the current 10 Year Plan. They also show the magnitude of additional works or refined construction costs required to service the NCP area as compared to the 2003 - 10 Year Servicing Plan.

In summary, the following funding strategy is required for implementing the Phase 1 Development:

- Water infrastructure may require a levy on all developments within the Kensington 110 m zone to fund the DCC deficit.
- Sanitary infrastructure may require a levy on all developments tributary to the Interceptor to fund the DCC deficit.
- Drainage infrastructure may require a levy on all developments within the subwatershed to fund the DCC deficit.

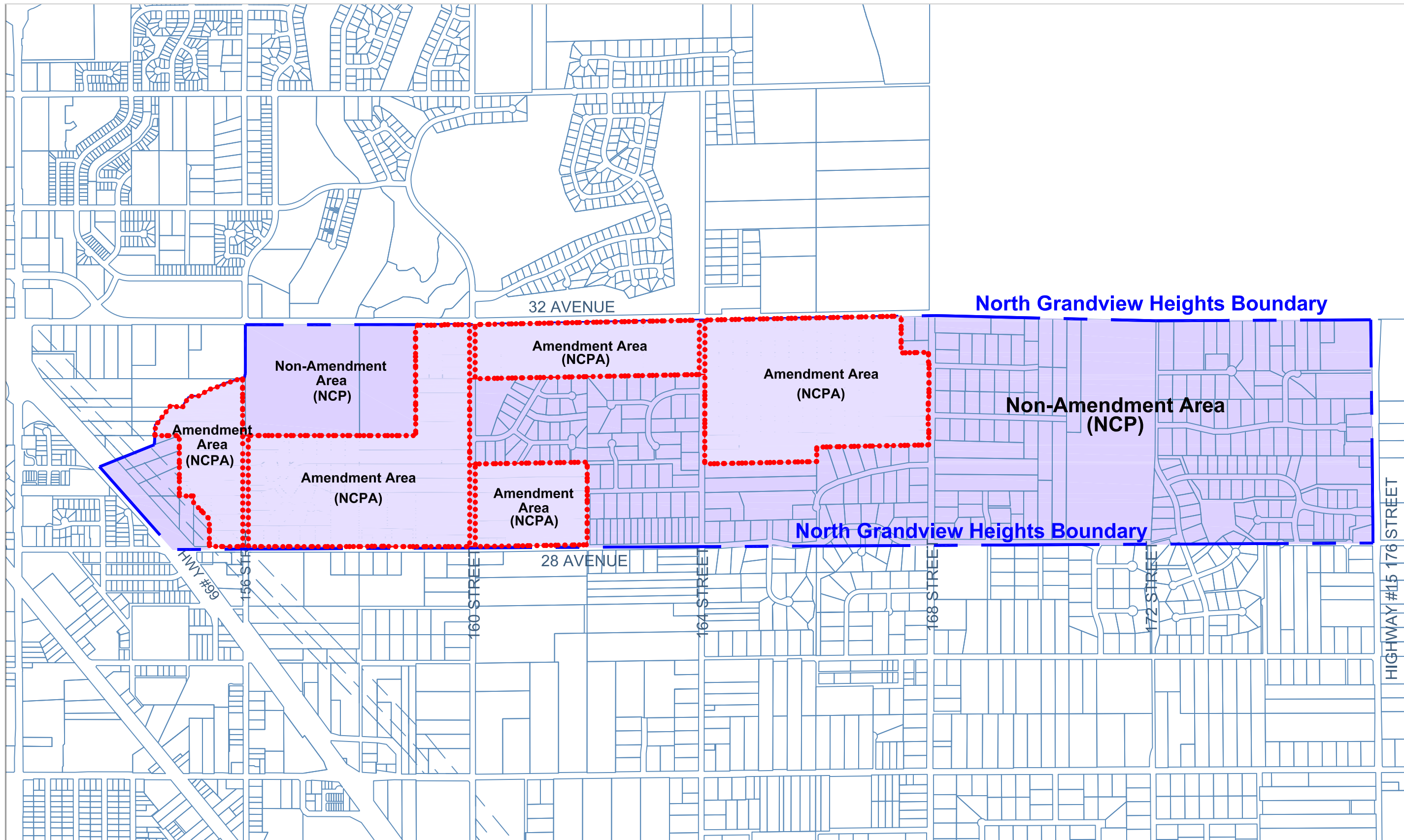
TABLE 6.3.2d

**North Grandview Heights Amendment Area
Projected DCC Revenues and Expenditures at Buildout**

	Projected DCC Revenue	Projected DCC Expenditures	Surplus Balance
Water without Morgan Creek Upgrade	1,353,000	2,274,600	-921,600
Water with Morgan Creek Upgrade	1,353,000	3,296,900	-1,943,900
Sanitary Sewer	1,315,000	2,285,700	-970,700
Storm Sewer	3,404,500	4,965,400	-1,560,900
Major Collector	1,624,200	643,500	980,700
Arterial	6,454,800	4,777,500	1,677,300
Park Acquisition	10,687,400	10,500,000	187,400

Although the North Grandview Amended Area shows deficits in all categories except roads, portions of the Grandview Heights #1 NCP DCC revenues and the remainder of the North Grandview Heights DCC revenues need to be factored in.

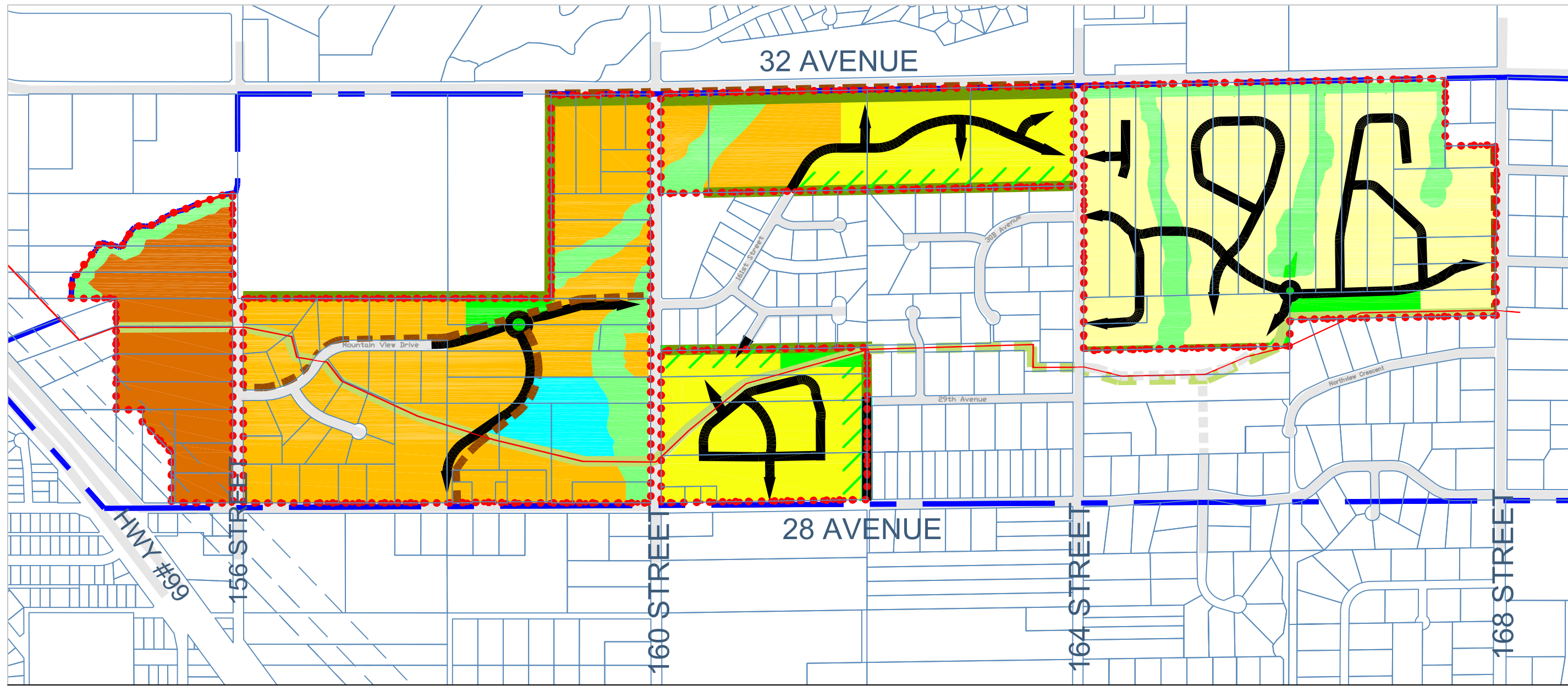
FIGURES



NORTH GRANDVIEW HEIGHTS
NEIGHBOURHOOD CONCEPT PLAN

**2005 NCP amendment
(NCPA) area**

1



LEGEND

- Single Detached (2 upa)
- Larger Transition Lots (2-3 upa)
- Single Detached (4-6 upa)
- Cluster Housing (6-8 upa)
- Multiple Residential (15-25 upa)
- Environmental Area
- Neighbourhood Park
- Linear Park / Multi-use Trail
- Enhanced Sidewalk / Walkway
- Landscaped Buffer
- Elementary School
- Existing Public Road
- Proposed Public Road (local road location subject to detailed design)
- Approximate Intersection Location (Subject to detailed design)
- Round-about
- Amendment Area
- North Grandview Heights Area Boundary
- North Grandview Gravity Sewer Interceptor

Notes:

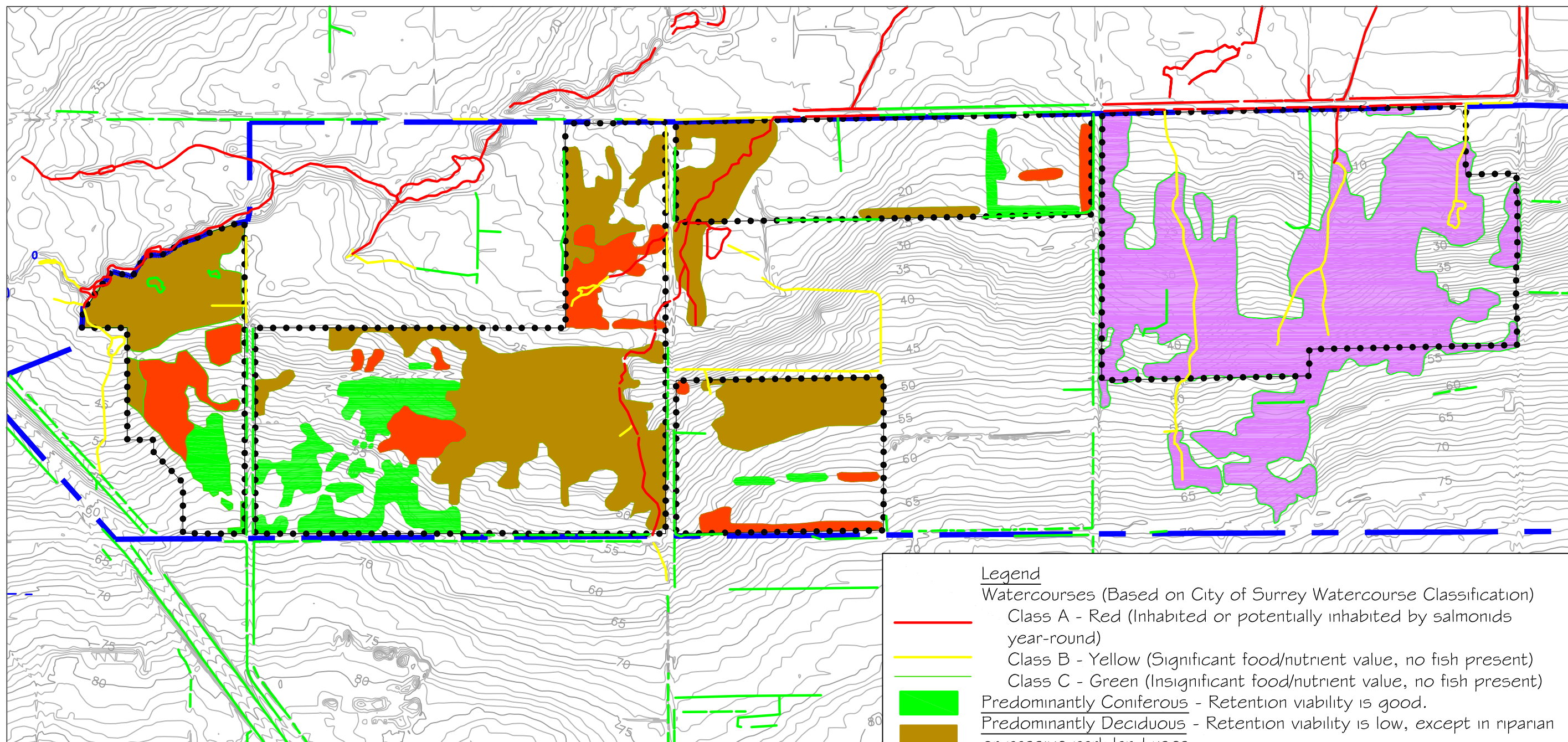
- (1) This plan is conceptual in nature and is intended to reflect a general pattern of land uses. Land use boundaries will be confirmed within the context of detailed rezoning and subdivision applications.
- (2) Density refers to units per-gross acre of land.
- (3) All development should obtain an Arborist report to determine the number of trees that can be preserved.



NORTH GRANDVIEW HEIGHTS
NEIGHBOURHOOD CONCEPT PLAN

**2005 NCP amendment area
land use concept plan**

2

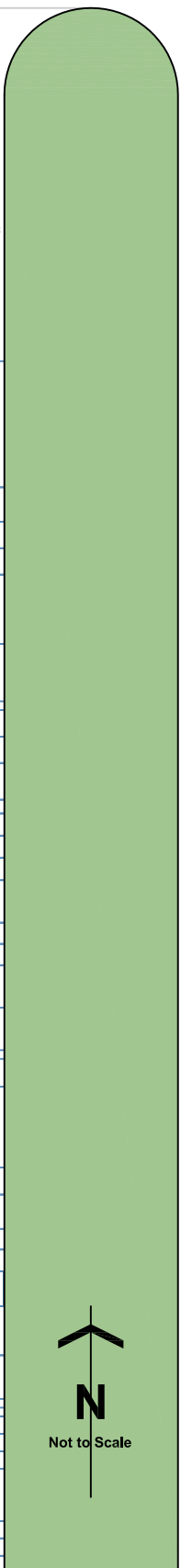
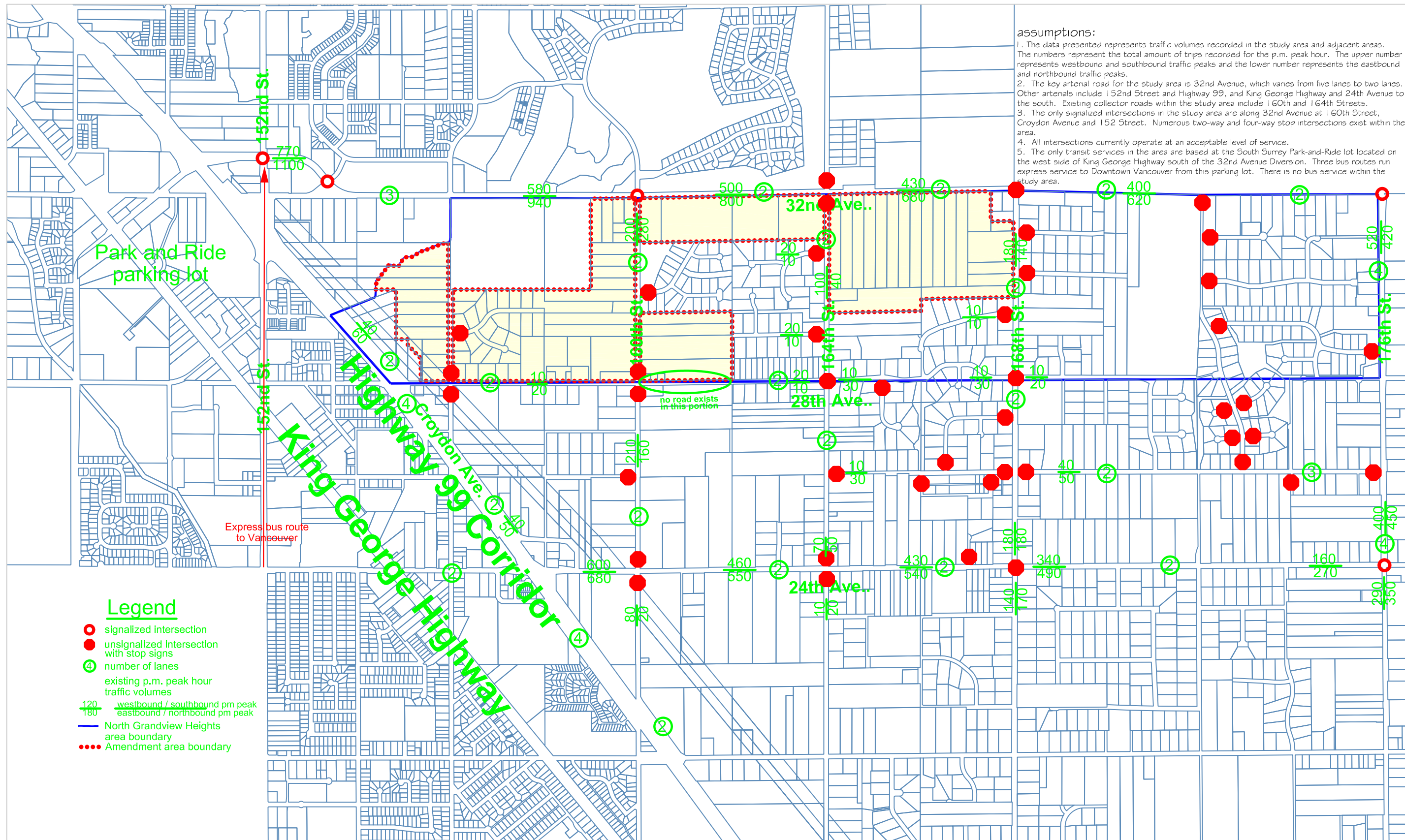


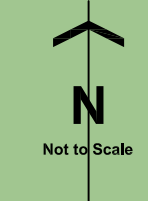
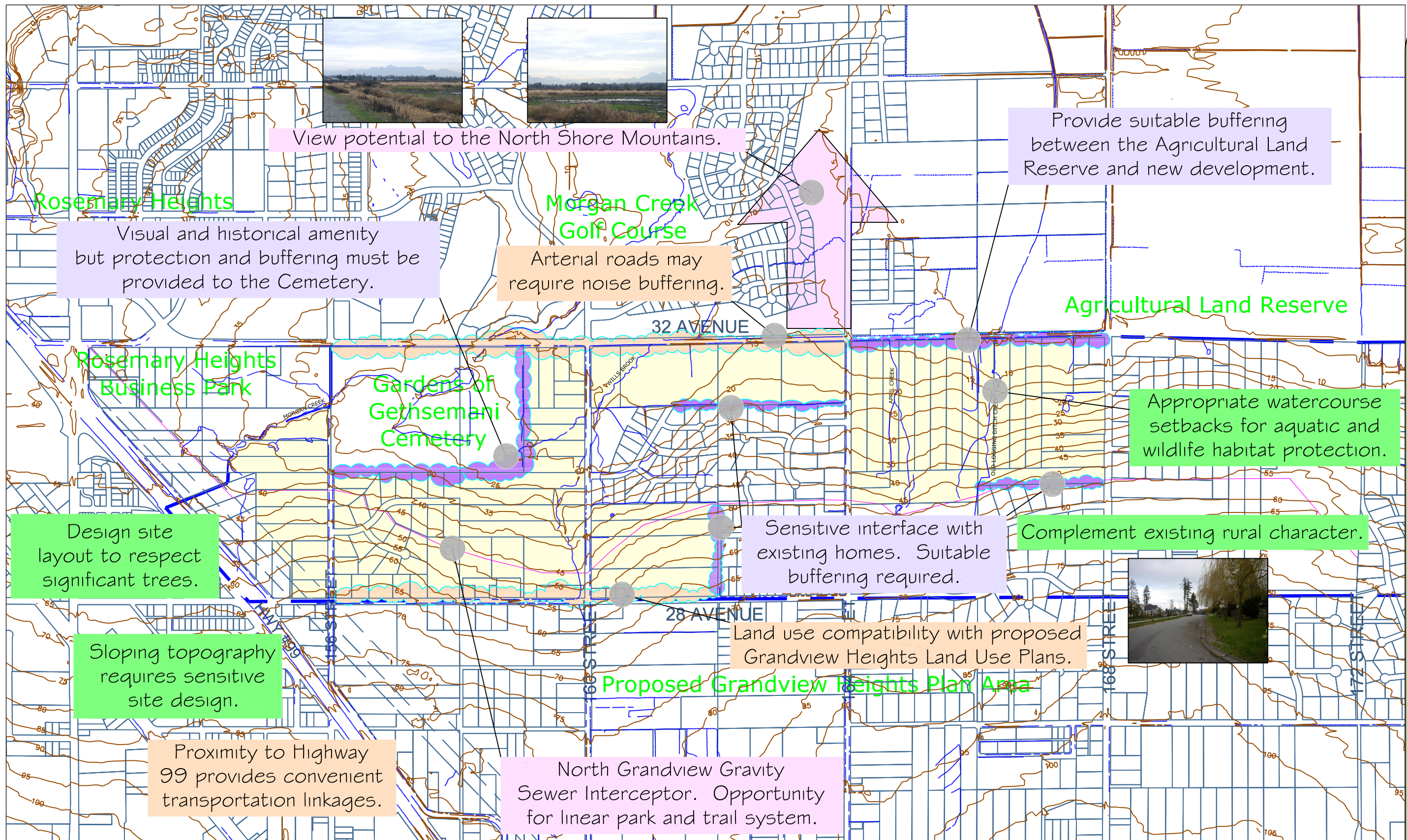
NOTE: Watercourse locations and classifications based on an environmental review completed by ENKON Environmental Ltd. and Coast River Environmental Services Ltd. The location and class of watercourses shown is subject to detailed survey, environmental review, and refinement at the subdivision stage. Reclassification may result in changes to the extent of the watercourse system, proposed setbacks, required preservation areas, and environmental management measures which will affect the final location of land use boundaries.
 Tree study west of 164 Street based on findings from Arbortech Consulting Ltd.
 Tree study east of 164 Street based on aerial photograph.

- Legend**
- Watercourses (Based on City of Surrey Watercourse Classification)
 - Class A - Red (Inhabited or potentially inhabited by salmonids year-round)
 - Class B - Yellow (Significant food/nutrient value, no fish present)
 - Class C - Green (Insignificant food/nutrient value, no fish present)
 - Predominantly Coniferous - Retention viability is good.
 - Predominantly Deciduous - Retention viability is low, except in riparian or passive park land uses.
 - Mixed Coniferous/Deciduous - Retention viability is moderate, depending on land use and stand composition.
 - General Tree Stands (Based on McElhanney Orthophotos April 2004)
 - Topography (Based on City of Surrey Contours)
 - 1 Metre Contours
 - 5 Metre Contours
 - 2005 Amendment Area Boundary
 - NGH Plan Boundary



landscape features





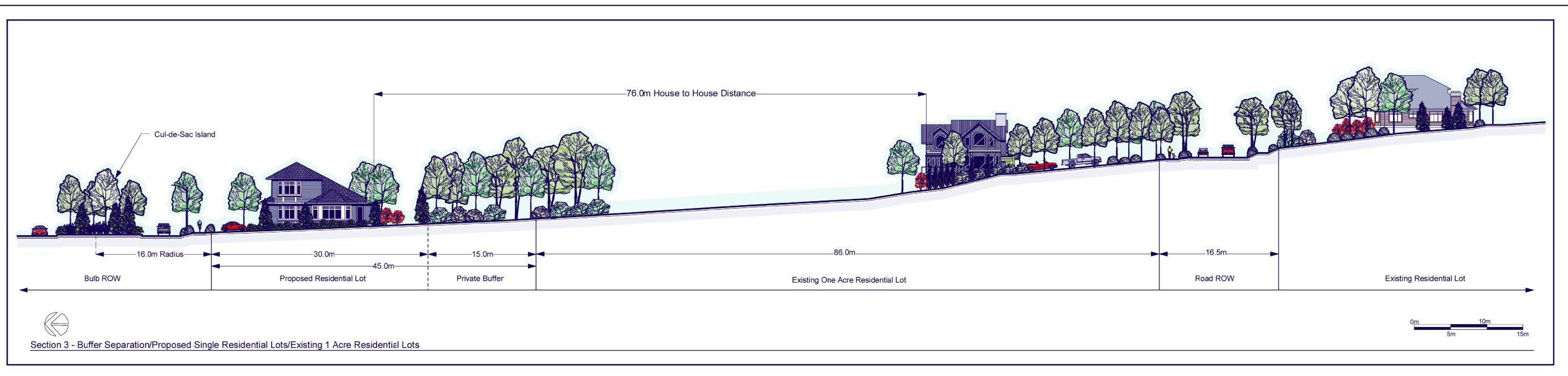
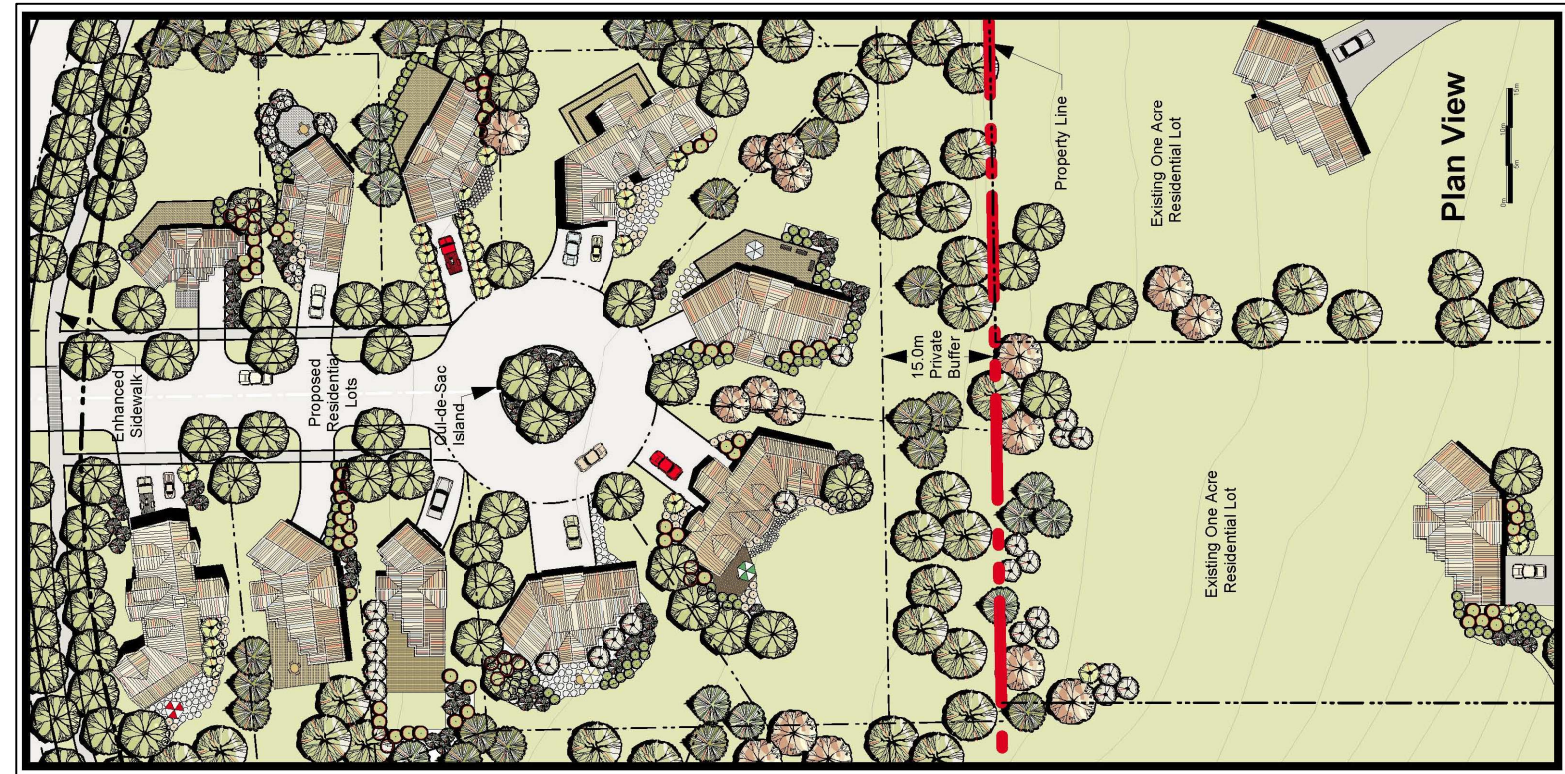
**NORTH GRANDVIEW HEIGHTS
NEIGHBOURHOOD CONCEPT PLAN**

neighbourhood design considerations

5

transition buffer

A private buffer will also be established to provide a transition from the existing one-acre lots (1 upa) to the proposed single family detached lots (4 - 6 upa). This transition area will be at 2-3 upa density. Buffer use will be restricted by either a Restrictive Covenant or Easement.



NORTH GRANDVIEW HEIGHTS
NEIGHBOURHOOD CONCEPT PLAN

**built form transition:
4-6 upa to existing 1 upa**

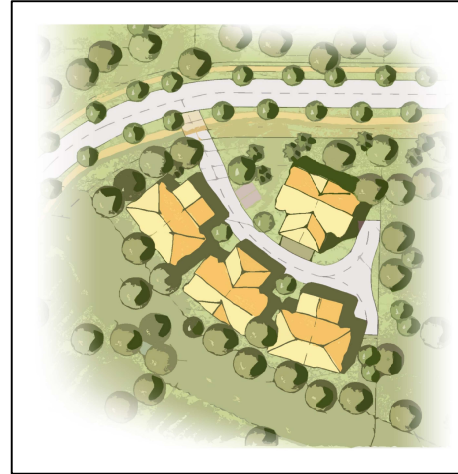
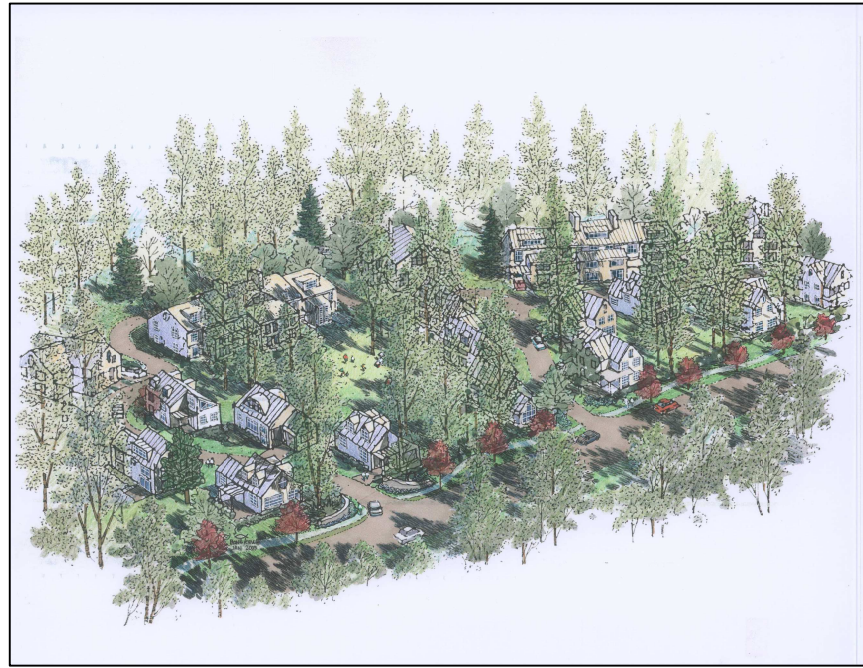
6



NORTH GRANDVIEW HEIGHTS
NEIGHBOURHOOD CONCEPT PLAN

built form: cluster housing
6-8 upa density

7



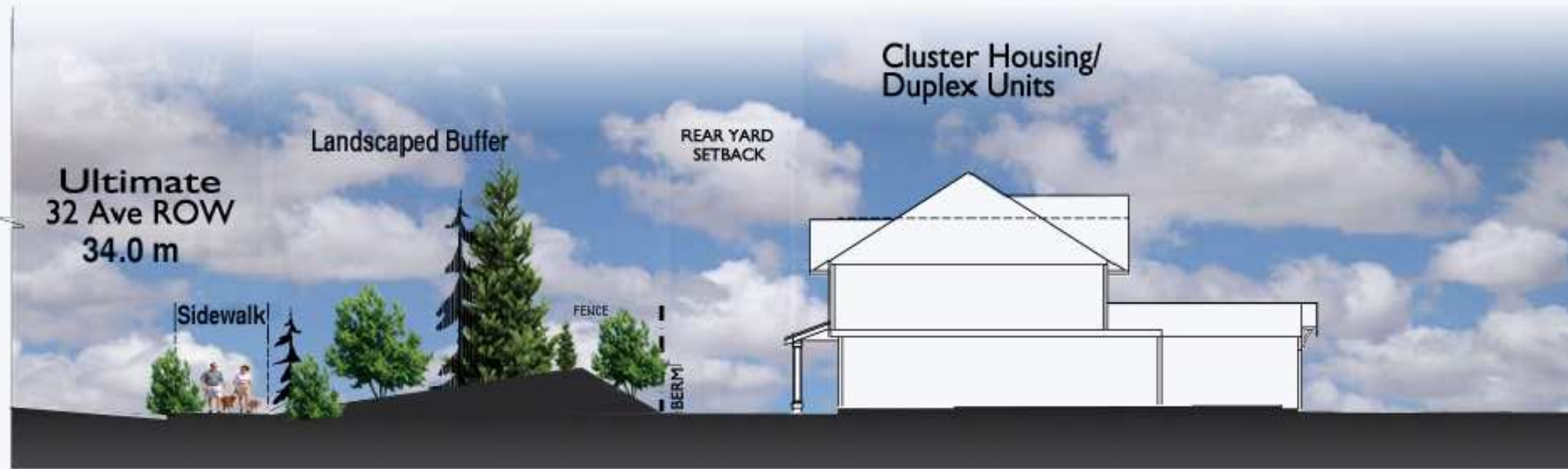
NORTH GRANDVIEW HEIGHTS
NEIGHBOURHOOD CONCEPT PLAN

**built form: cluster housing
(30 Avenue - west of 160 Street)**

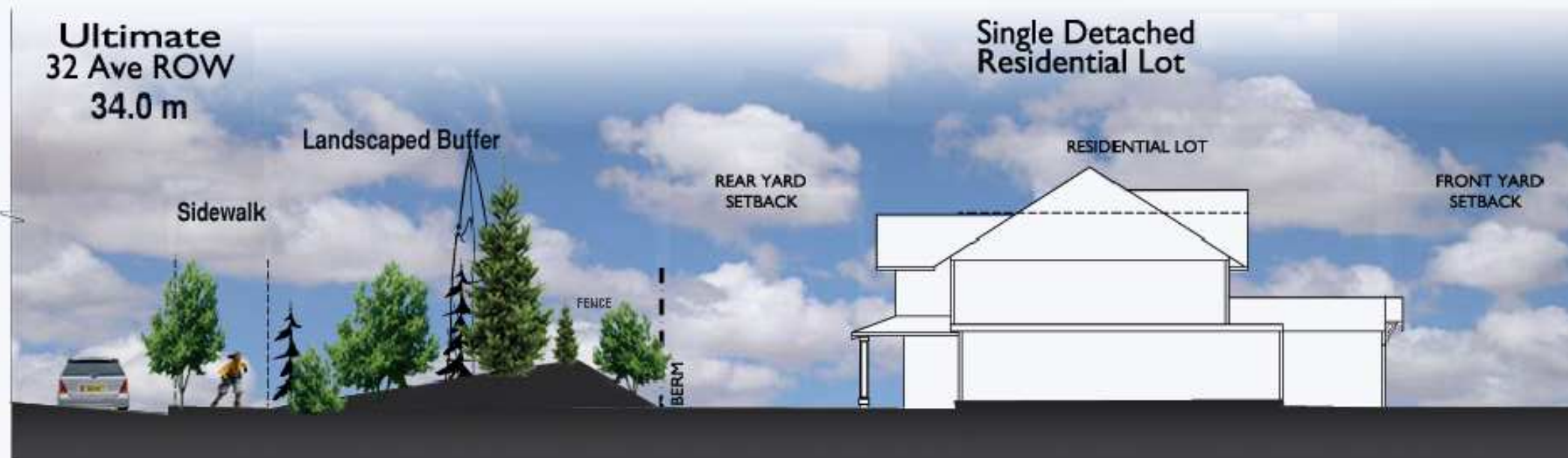


NORTH GRANDVIEW HEIGHTS
NEIGHBOURHOOD CONCEPT PLAN

**built form: cluster housing
(32 ave / 160 st site)**



Cross Section of Cluster Housing (6-8 UPA) to 32nd Ave. at 160th Str.



Cross Section of Single Detached (4-6 UPA) to 32nd Ave. between 160th & 164th Str.

Not to Scale

