Darts Hill
Neighbourhood **Concept Plan**

CITY OF SURREY | Community Planning

Darts Hill Neighbourhood Concept Plan
Planning and Development, Engineering,
and Parks, Recreation and Culture
City of Surrey
13450 104 Avenue
Surrey, British Columbia V3T 1V8

Approved By Council May 10, 2021

CITY OF SURREY | Community Planning

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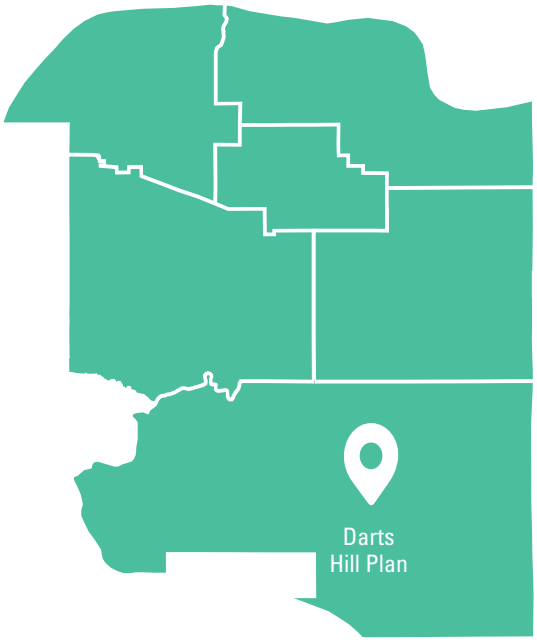
Darts Hill Plan

The Darts Hill Neighbourhood Concept Plan (NCP) provides a comprehensive strategy that will guide growth and development of a new and complete neighbourhood in Grandview Heights. The NCP was developed with extensive public and stakeholder consultation. Preliminary planning, studies and technical analysis established clear context and supported an evidence-based approach to decision making. Leading best practices and market trends were carefully considered and applied.

The result is a context responsive plan that will guide the development of a compact, resilient, and green neighbourhood where nature is integrated into design and daily needs are within walking distance of all residents.



Did You Know?

What's a land use plan?

Land use plans designate what can be built and where. They guide the height, use, and look of new buildings, as well as locations and funding for new streets, parks and other public services.

How will the Plan improve the neighbourhood?

Many public facilities and services are used daily by residents. These include community centres, cultural spaces, childcare facilities and libraries. When new development and rezoning occurs in an area with a land use plan, developers must make contributions to help fund these amenities. They are also required to upgrade sidewalks and other infrastructure.

Darts Hill NCP | Plan Summary

Community Engagement

The Planning process was supported through a comprehensive program of public and stakeholder consultation. A broad range of residents and stakeholders were consulted from across the Plan Area and the surrounding community. Here is a summary of outreach.

5 Years of Engagement

4 Ways People Were Notified

- Mailers
- Website
- Newspaper
- Social Media

4 Ways People Participated

- Public Open Houses
- 1 on 1 Meetings
- Survey
- Email & Phone Conversations

Growth Objectives

The Plan focuses the highest densities and mix of uses around a future urban village at 171 Street and 20 Avenue. This will provide residents with local retail and amenities within walking distance. Building heights and densities generally transition away from the main roads. A network of parks and natural areas spans the Plan Area, highlighted by an expansion of Darts Hill Garden Park and a Biodiversity Corridor that links east to Redwood Park.

Protect Natural Areas

A Green Infrastructure Network extends across Darts Hill and will:

- Protect environmentally sensitive areas such as wetlands, riparian areas;
- Facilitate safe wildlife passage;
- Enhance wildlife biodiversity and protect wildlife habitat; and
- Provide rainwater management, and support climate change adaptation.

Compact Urban Village

A central mixed-use village with neighbourhood commercial will:

- Support neighbourhood walkability and access to transit;
- Encourage local businesses and employment; and,
- Provide opportunities for shops and services close to home.

Local Amenities

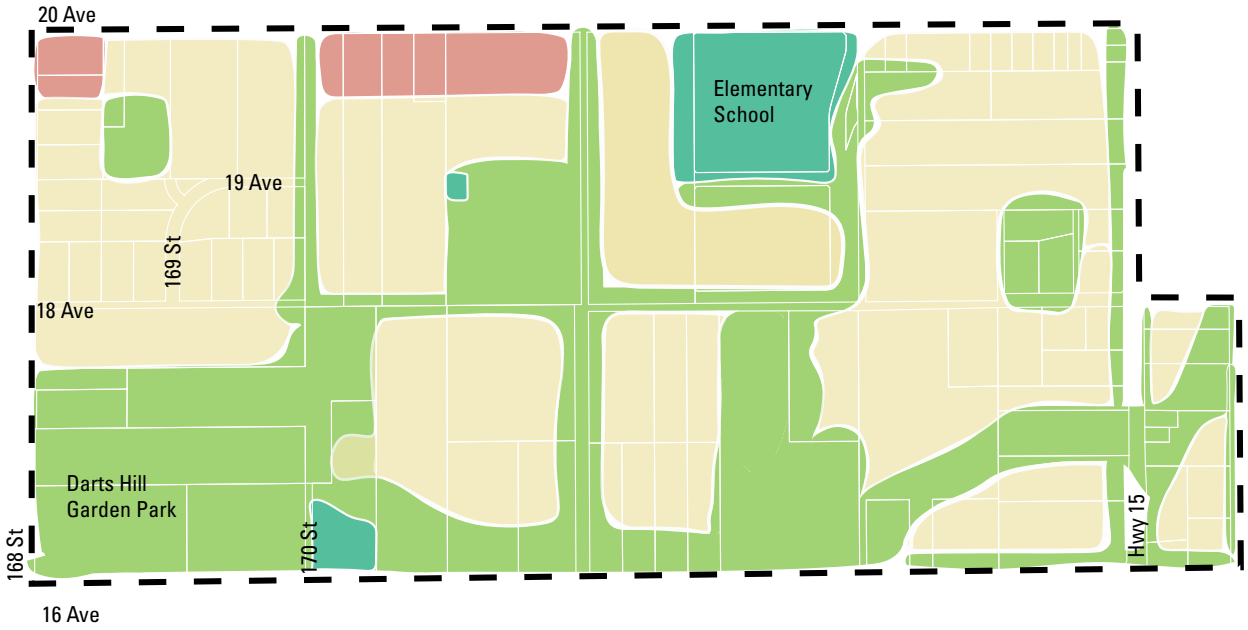
Parks and institutional uses contribute to a high quality of life. The Darts Hill Plan will:

- Provide parks and trails within walking distances of all residents;
- Include a centrally located elementary school; and,
- Encourage opportunities for community institutional uses.

A Variety of Housing

A balanced mix and range of housing will:

- Provide diversity of housing types;
- Improve the balance of housing affordability; and,
- Focus housing within walking distance of amenities and future public transit.



Land Use Strategy

This land use plan shows where and how land uses fit together to create a coordinated and complete neighbourhood. Land use policies reflect the vision and principles of the Plan and set out how Darts Hill will grow. It promotes a balanced approach to growth and defines an appropriate scale of built form and intensity of uses.

Mixed-Use

Mixed use and commercial areas support a healthy and vibrant retail and office environment, while supporting residential uses. Mixed uses are centred on an urban village located at 171 Street and 20 Avenue, supported by future bus service along 20 Avenue and the longer term development of the neighbourhood north of 20 Avenue.

Residential

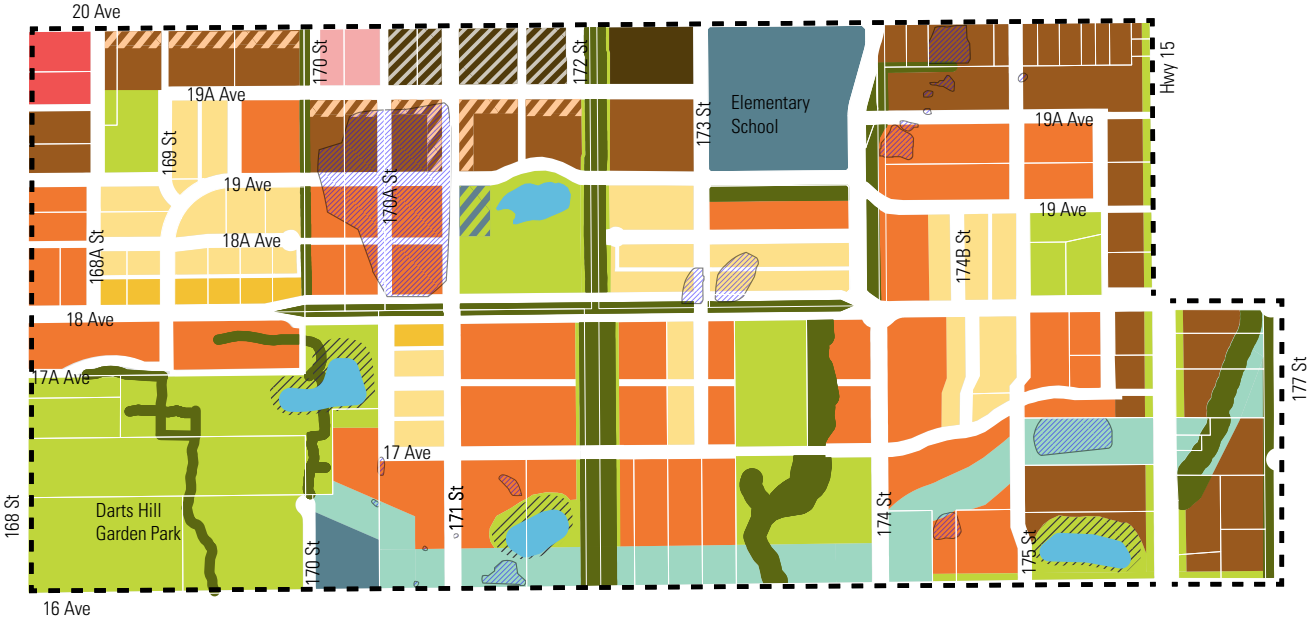
New residential development will provide a variety of housing types to support families, working professionals, and seniors. The highest densities of housing will be located around the urban village and adjacent to main roads. This will attract new residents to support local business and provide housing within closer proximity to transit.

Parks and Natural Areas

New neighbourhood parks are provided within walking distance of all future residents. A biodiversity corridor extends along the southern portion of the Plan Area and Darts Hill Garden Park will be expanded.

LEGEND

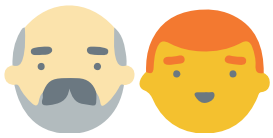
- Low Rise Mixed-Use
- Community Commercial
- Neighbourhood Commercial
- Low Rise Residential
- High Density Townhouse
- Live/Work Townhouse
- Medium Density Townhouse
- Semi-Detached Townhouse
- Detached Residential
- Biodiversity Corridor
- Riparian Area
- Parks and Open Space
- Institutional
- Waterbody
- Detention Pond
- Potential Wetland



Projections

Population Projections

Assuming eventual build-out over many decades, the Plan could result in up to 9,514 residents. To accommodate this increase in population the Plan designates additional parkland and envisions new community amenities.



Existing	Projected
324	9,500 - 10,400

Housing Projections

The Plan supports housing diversity within the broader Grandview Heights community, encouraging a range of building forms from detached and semi-detached homes, townhouses, and apartments.

Existing	Projected (2050)
115	3,901

Employment Projections

It is estimated that the Plan will create between 429 and 860 jobs. These jobs will be focused in the central mixed-use urban village, as well as the commercial node at 168 Street and 20 Avenue. The new elementary school is expected to be the largest single employer in the Plan Area. Significant additional employment is supported in nearby Campbell Heights.

Existing	Projected (2050)
30	645

Parkland Projections

Future residents of Darts Hill will all live within walking distance to parks and opens spaces. The Plan will add 4 new neighbourhood parks covering 8.4 ha, each of which will be designed with a range of park amenities such as playgrounds, pathways, benches, and picnic tables. The Plan also include 3.0 ha of City Parkland expansion to the 8.2 ha exiting Darts Hill Garden Park.

Existing	Projected
8.2 ha	19.6 ha

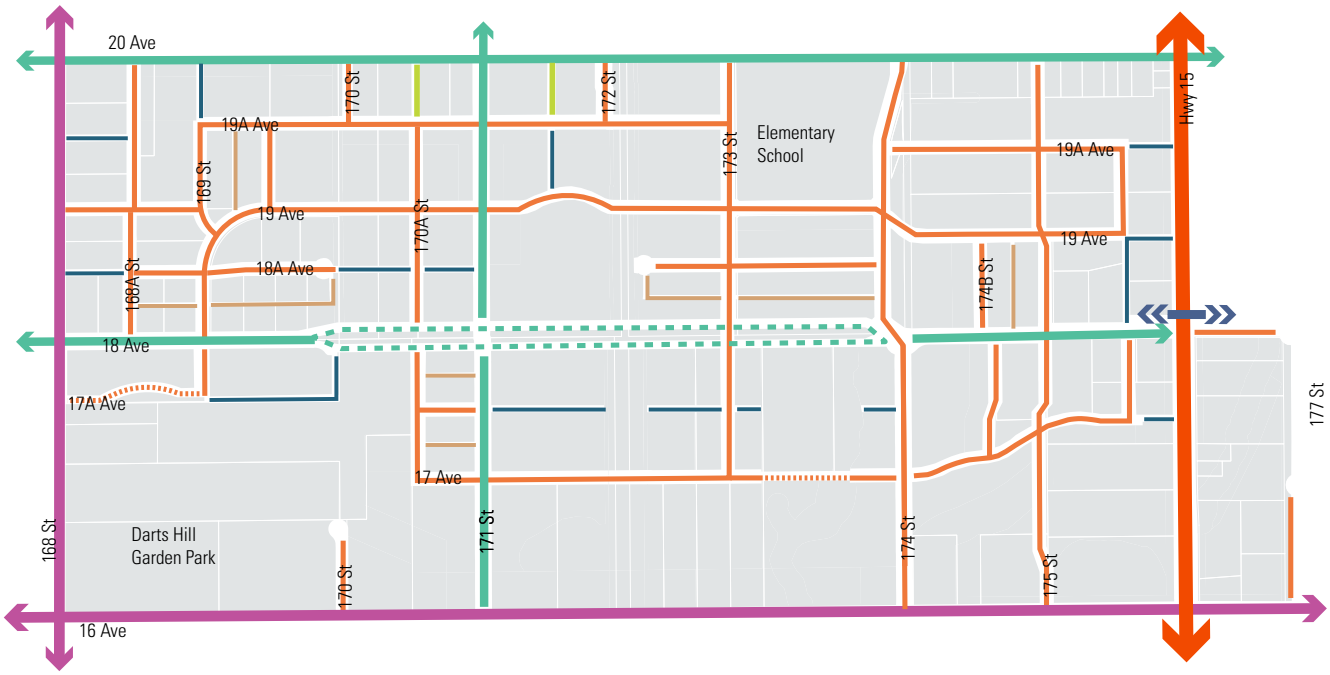
Transportation Strategy

The transportation strategy follows the guiding principles outlined in the City's Transportation Strategic Plan and supplementary plans, including the City's Transport 2050 submission, Walking Plan, Cycling Plan, and Vision Zero Surrey Safe Mobility Plan.

It provides an open, connected, and continuous street network that supports cycling and pedestrian connectivity, transit service, and compact neighbourhood development. The final plan will contain some unique road cross-sections. These unique street typologies may be considered where roads intersect or abut biodiversity corridors, riparian areas, parkland, and in areas of steep slopes or areas of environmental sensitivity.

LEGEND

- Provincial Highway
- Arterial
- Collector (24 m)
- Special Divided Collector
- Local (20 m)
- Unique Local
- Pedestrian Street (10 m)
- Lane
- Green Lane (12 m)
- Pedestrian Bridge

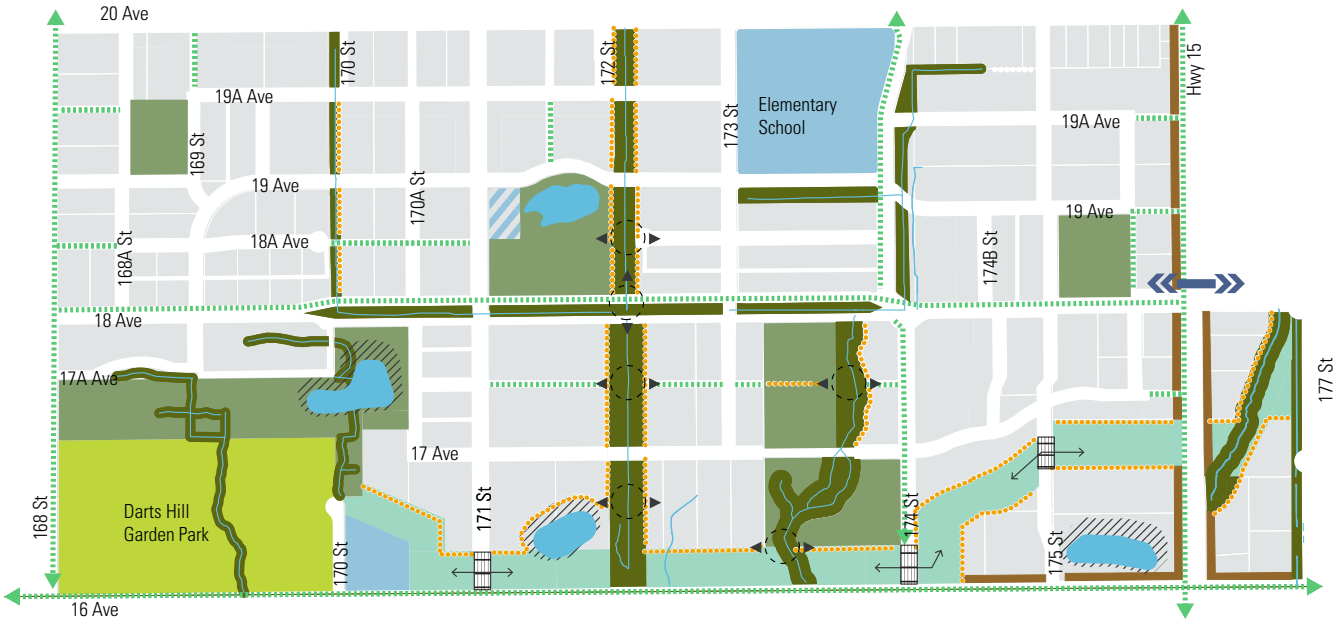


Parks and Open Space Strategy

Parks and natural areas are essential to the overall health and wellness of residents. Providing access to high quality parks is crucial to support daily life, active lifestyles, and opportunities for social interaction. The Plan delivers 4 new active park sites, along with a biodiversity corridor that links to Redwood Park. Streams and riparian areas will be conveyed to the City and protected as natural area parkland. The neighbourhood is also home to its namesake park, Darts Hill Garden Park, a City level park which will be expanded through the Plan.

LEGEND

- Existing Park
- Proposed Park
- Riparian Area
- Biodiversity Corridor
- Wildlife Crossing
- Landscaped Buffer
- Watercourse
- Waterbody
- Detention Pond
- Multi-Use Pathway
- Park Pathway
- Pedestrian Bridge
- Pedestrian Crossing



Introduction

| Why a plan for Darts Hill?

The Darts Hill Neighbourhood Concept Plan (NCP) was developed through extensive consultation with the public, community stakeholders, City staff, project consultants, and the Darts Hill Citizen's Advisory Committee. Preliminary planning, studies and technical analysis established clear context and supported an evidence-based approach to decision making. Leading best practices and market trends were carefully considered and applied. The result is a context responsive plan that will guide the development of a compact, resilient, and green neighbourhood. Where nature is integrated into design and daily needs are within walking distance of all residents.

The Plan is organized into the following sections:

1. **Background & Context** provides an overview of the Planning context and process.
2. **Plan Framework** provides the shared vision, guiding principles, growth concept and projections.
3. **Land Use** outlines each land use and development parameters.
4. **Urban Design** outlines building form and design guidelines.
5. **Transportation** outlines new road connections and active transportation initiatives.
6. **Parks & Open Space** identifies parks and natural areas and outlines development considerations.
7. **Community Amenities** identifies recreation and cultural amenities, schools, and libraries.
8. **Utilities & Servicing** details infrastructure improvements.
9. **Implementation** outlines policies and financing required to build out the Plan.

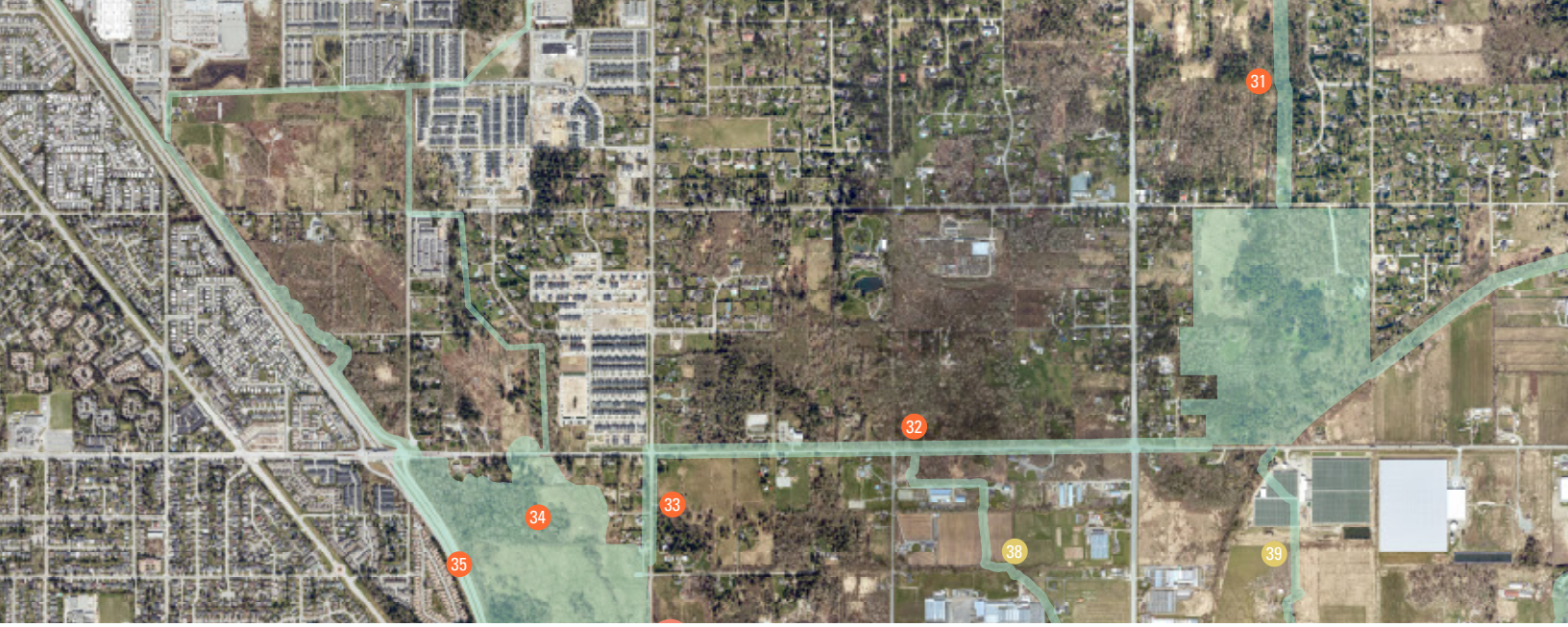
Policy Context

Planning and development in Surrey is guided by social, environmental, and economic contexts. The Official Community Plan (OCP) and Sustainability Charter, together with the City's climate targets and plans[1], provide the policy framework for sustainable growth. They implement broader direction from Metro Vancouver's Regional Growth Strategy (RGS). Other Strategic plans, such as Surrey's Biodiversity Conservation Strategy (BCS), Parks, Recreation and Culture (PRC) Plan and the Transportation Strategic Plan frame the provision of natural and built infrastructure.

Official Community Plan

"The City of Surrey will continually become a greener, more complete, more compact and connected community that is resilient, safer, inclusive, healthier and more beautiful."

1 The OCP includes the City's adopted commitment to reduce community greenhouse gas (GHG) emissions to net zero before 2050, and the Community Climate Action Plan is being updated to outline a road map for reaching this target, as well as incorporating climate change adaptation and absolute zero corporate GHG targets.



The OCP identifies five long-term sustainability goals to help address the challenges of urban growth, climate change and demographic shifts. The OCP also contains the City's target to reduce community GHG emissions to net zero before 2050. These goals are embodied within the Darts Hill Plan.

Long-Term Sustainability Goal 1

Accommodate population growth by maximizing the efficient use of urban land while minimizing the impacts of change in existing neighbourhoods.

Long-Term Sustainability Goal 2

Improve the balance of local jobs to population to reduce commuting time, traffic congestion, greenhouse gas emissions, and the burden of property taxes on residential properties by diversifying the local tax base.

Long-Term Sustainability Goal 3

Reduce automobile reliance by re-orienting land use patterns to include higher density, mixed use developments with access to transit, cycling and walking.

Long-Term Sustainability Goal 4

Promote a compact urban form that supports transit while reducing costly infrastructure extensions and avoiding development in environmentally sensitive areas.

Long-Term Sustainability Goal 5

Serve the needs of the city's population by providing housing diversity and community programs to support all ages and socio-cultural groups.

Climate Context

The global and local impacts of climate change are increasing in severity. In November 2019, the City joined other BC municipalities and declared climate change as an emergency. In March 2020 Council adopted targets to reduce community GHG emissions to net zero before 2050, and corporate emissions to absolute zero before 2050.

The City is updating its Climate Change Action Strategy ("CCAS"). It will identify strategies for community and corporate emissions reduction to reach these targets. The CCAS will also include strategies for addressing climate adaptation. Its aim is to increase the resilience of Surrey's communities to ensure they prepared for the expected changes in the local climate.

Achieving these emissions and resilience targets will be challenging. It will require coordination across the City and partnerships with other levels of government, the community and stakeholders. However, there are many potential benefits for health, well-being and economic development. The ongoing planning, design, and development of the community will need to account for this context by embedding low carbon resilience[2] principles with guidance provided through the updated CCAS.

2 The OCP includes the City's adopted commitment to reduce community greenhouse gas (GHG) emissions to net zero before 2050, and the Community Climate Action Plan is being updated to outline a road map for reaching this target, as well as incorporating climate change adaptation and absolute zero corporate GHG targets.

Sustainability Charter

The Sustainability Charter provides a long-tern vision and overarching framework of how Surrey will become a thriving, green, and inclusive city. Key to implementing the objectives in the Sustainability Charter is the Sustainability Dashboard. The interactive dashboard is a performance-based tool to help staff and the community gauge the City's progress to improving our socio-cultural, economic, and environmental well-being.

Biodiversity Conservation Strategy

Biodiversity is the variety of life on earth. You'll find biodiversity all around you: plants and animals, microscopic organisms, and even habitats they all rely on to survive. Healthy, diverse ecosystems give us "natural services" like clean water to drink, soil to grow our food, and the outdoor spaces we love to live near and play in.

The Biodiversity Conservation Strategy (BCS) recognizes Surrey's existing biodiversity as a key foundation of a healthy, livable, and sustainable community. At its foundation is a 3,900 ha network of interconnected natural areas, green corridors and open space identified as the Green Infrastructure Network ("GIN").

The GIN follows key landscape ecology principals for biodiversity conservation. It is comprised of 'Sites' and 'Hubs' (which represent potential wildlife habitat), which are connected by movement 'Corridors'. This network allows for wildlife movement, while promoting genetic diversity in existing populations. At is foundation, the GIN acts to make the BCS an attainable goal.

Conservation and management of the GIN is critical to preserving the City's clean air and water, maintaining sensitive wildlife habitat, improving health and livability for residents, and reducing infrastructure costs. The Darts Hill Plan identifies key GIN components from the BCS for protection and management.

"Connect greenspaces to not fragment habitat."

Survey Response, Darts Hill Plan Process, 2018-2020

1 Background & Context
| How We Got Here

Land, history, and people frame and define community. They provide context to build upon and set the stage for the future.

This section provides community and site level context and a profile of the existing community. It also provides an overview of the Planning process and community engagement that was undertaken to develop the Plan.

1.1 Plan Area

The Darts Hill neighbourhood is located in the southern portion of the Grandview Heights community. It is generally bounded by 168 Street to the west, 16 Avenue to the south, 20 Avenue to the north and Redwood Park to the east. The area is primarily made up of acreages and rural lots. Existing zoning is RA (One Acre Residential), except for one PA-1 (Public Assembly) lot. The Plan includes an area of approximately 130 hectares (321 acres) and included 93 properties at plan approval.

The existing internal road network consists of paved local roads, largely as rural standard with limited sidewalks. As such the network is disconnected and largely without basic walking and cycling infrastructure.

As of 2019, the Darts Hill NCP area had a population of 324 residents with a population density of 2.7 persons per hectare.

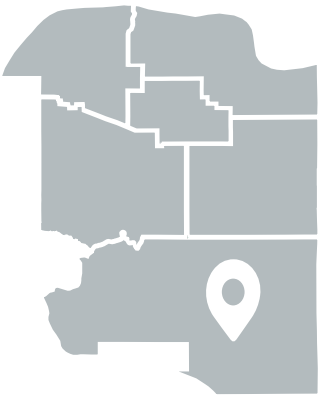
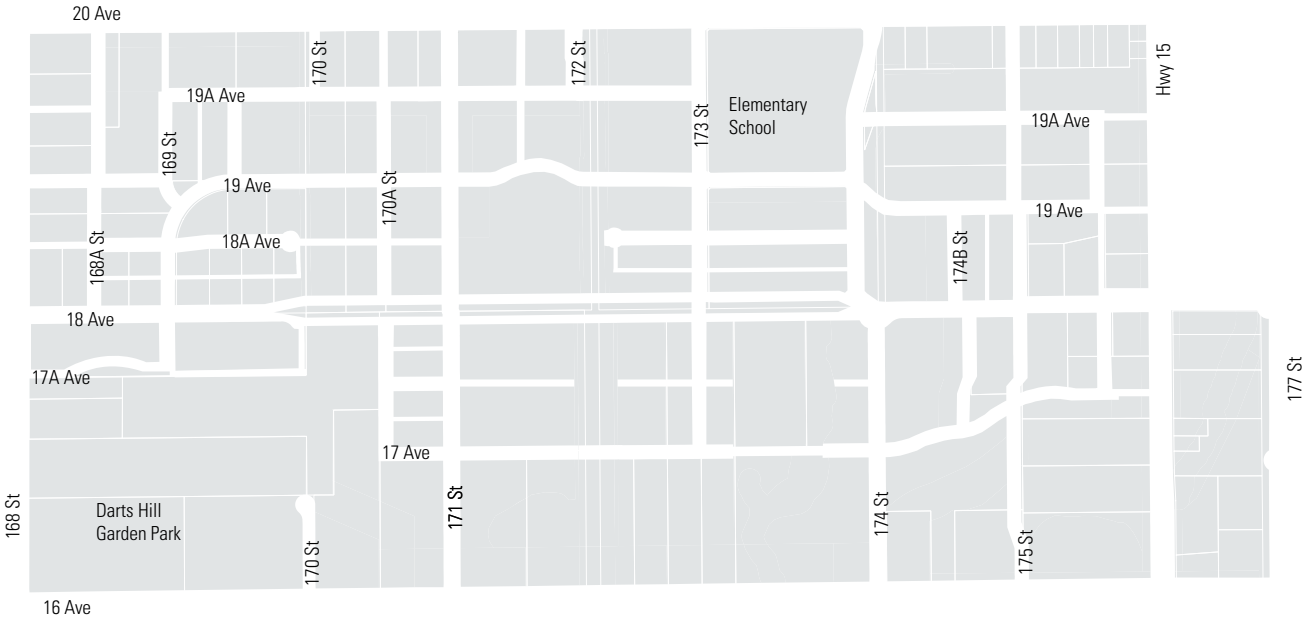


Figure 1.1 Plan Area



1.2 Community Context

History

The land upon which Surrey was established is the unceded traditional lands of the Semiahmoo, Katzie, Kwikwetlem, Kwantlen, Qayqayt and Tsawwassen First Nations (collectively, solely for the purposes of this report, heretofore referred to as the Coast Salish). The continuous habitation of the Coast Salish on the land upon which Surrey was founded extends back thousands of years. Their collective histories, place names, economies, languages, habitation, and spiritual sites reiterate their connection which is held to the present day.

Hunting and fishing served as the centre of community life. The Little Campbell, Nicomekl, and Serpentine Rivers functioned as a network of trade and communication routes.

It is thought that as early as the 1600s overseas infectious diseases had reached the Indigenous people of the West Coast. This may have occurred before direct contact with European explorers through trade networks. Further contact between First Nations and Europeans increased occurrences of measles, smallpox, influenza, and whooping cough. This had detrimental impacts on what remained of the Indigenous populations. Following contact, it is estimated that the Coast Salish people of the Lower Fraser Valley's population declined by two-thirds. Yet even with all the impacts colonialism has brought, the Coast Salish of today still maintain their ancient and ongoing ties to the area.

A long Indigenous narrative predates Surrey and is part of the fabric of Surrey's history. This report recognizes that an in-depth review of Indigenous history was not conducted.

View of the Semiahmoo Bay, White Rock, and beyond, 1960s courtesy of the Surrey Archives.

Timeline

12,000 Before Present

First Nations, including today's Semiahmoo, Kwantlen and Katzie have had permanent and continuous habitation of the land located in the south Surrey landscape.

1860s to 1870s

First logging companies are established in the Area. Many First Nations men are employed by logging companies. Some of the mills operating in Grandview Heights included the Royal City Planning Mills, Brunette Mills, and Campbell River Timber Company.

1886

Royal City Planning Mills established an operation east of Elgin near the Nicomekl River. A logging railway was built east through Grandview heights, opening up the area to further logging.

1887

The Canadian government established the Semiahmoo Reserve, now located on 312 acres between White Rock, the Canada-U.S. boundary and Peace Arch Provincial Park.

Late 1880s

The development of canneries and placing of commercial fish traps greatly impacted subsistence fishing and First Nation access to fishing grounds.

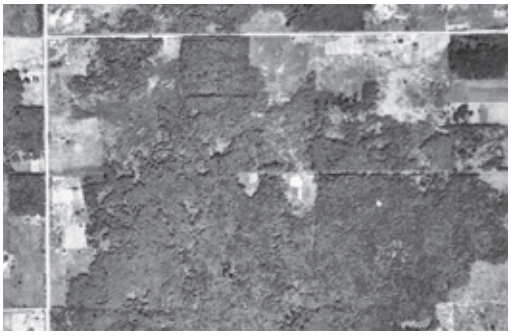
Post WW1

Grandview Heights and Darts Hill experienced growth with the expansion of agricultural land, subdivisions, and construction of Grandview Heights Elementary School at 20th Ave and Highway 15.

Emergence of Agriculture: With the depletion of timber and the construction of Highway 15 South Surrey began experiencing agricultural and non-agricultural settlement in the 1920s. City directories reveal that farming was the primary occupation in the area until the 1950s.

1943

Francisca and Edwin Darts purchases their property, what is now Darts Hill Garden Park on the corner of 16 Avenue and 168 Street. An award-winning orchard was established which today has become home to one of the most diverse collection of mature tree and shrub species in the Pacific Northwest.



1974 to Present

The scale and intensity of agricultural use declined as smaller-lot subdivision became more common throughout the years.

The Darts family gift their 3 hectare (7.5 acre) horticultural garden and orchard to the City for it to be used as a horticultural centre for the preservation, enhancement, and development of plants.

1994

2016 - 2021

In 2003 Council identified Grandview Heights as an area of the City that would be suitable for new development.

Staff undertake a 2-Stage planning process for Grandview Area #3 (Darts Hill) Neighbourhood Concept Plan.

1.3 Site Context

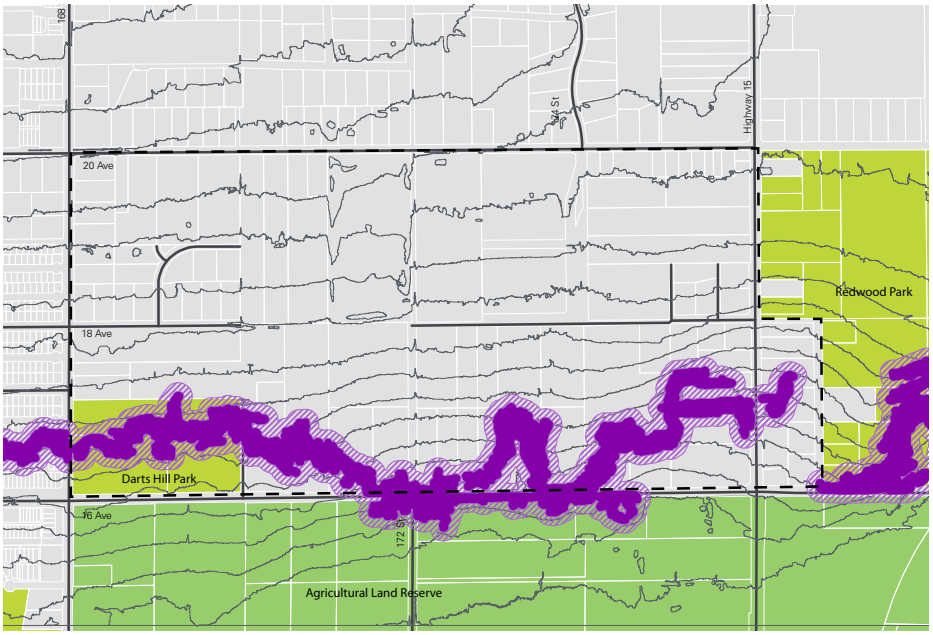
Prior to being logged in the early 20th century, the landscape was comprised of groves of spruce and hemlock with cedar, alder and birch. Today, Darts Hill includes large areas of mixed second growth forest generally consisting of red alder, and big-leaf maple mixed with coniferous trees. The dominant shrub cover consists of deciduous species such as hardhack, Himalayan blackberry, or planted crops which are found in previously logged areas. Evidence of historical agricultural use and logging are present throughout the area.

While past and ongoing land use changes have impacted wildlife habitat in and around the Darts Hill area, large patches of relatively intact forested habitat, meadows and wetlands remain. This mosaic of habitats provides important breeding, foraging and connectivity features for several provincially and federally protected bird, amphibian and small mammal species, including species-at-risk like the Northern Red-legged Frog.

Darts Hill is within the Sam Hill Creek Watershed. Existing watercourses generally flow south and south-east through agricultural lowlands to their confluence with the Little Campbell River. There are five major watercourses into which the Darts Hill Plan Area drains: Upper Sam Hill Creek, Sam Hill Creek, Thomson Creek, Sam Hill Creek Diversion, and an unnamed tributary.

The land within Darts Hill has a south-southeast aspect with many low points and steep slopes along the southern part of the Plan Area . This sloped topography forms part of the headwaters of the upland area of the Little Campbell River. The City defines steep slopes as having a minimum 20% grade. And requires additional studies and/or limitations to ensure development is either not compromised and or that development does not compromise adjacent lands. Investigations into surficial geology and hydrogeology were undertaken as part of the background studies for this plan. An overview of soil conditions and hydrological implications are outlined in Section 8.1 of the Plan.

Figure 1.3 Topography



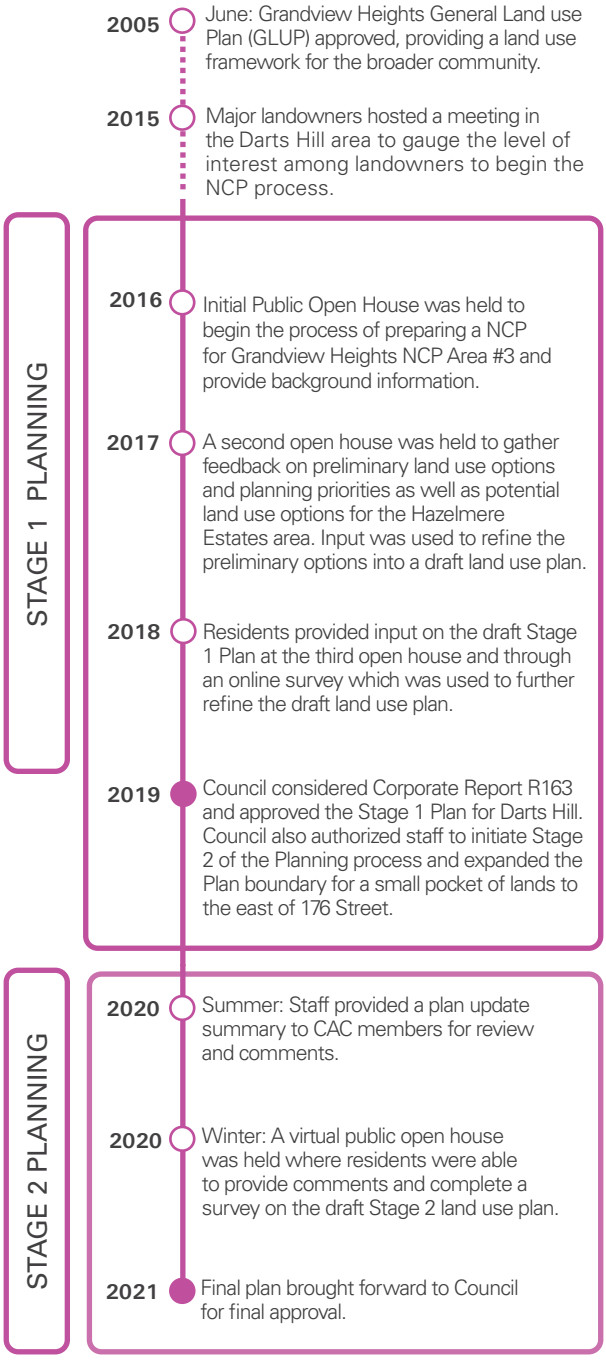
1.4 Planning Process

The process to develop the Darts Hill NCP was initiated by Council in July 2016. It was supported by a petition signed by the majority of land owners, representing 70.5% of the total Plan Area . The resulting planning process was developed using a five step, two stage planning process involving a comprehensive engagement program with stakeholders, consultants, and staff.

In the first stage of planning, background studies were conducted to evaluate and advise on existing vegetation and wildlife habitat, storm water management, and cultural and natural heritage assets. Preliminary servicing reviews and land use options were also developed. These studies informed the draft land use plan which was endorsed by Council in July 2019.

In the second stage of planning, a detailed review was undertaken to support the development of servicing strategies, design guidelines and a financial strategy. Additional environmental studies were also undertaken to confirm creek and wetland classifications. Consultation with external agencies, including the Surrey School District and the Ministry of Transportation continued during this stage. The final land use plan was refined based on these findings before being endorsed by Council in May 2021.

Planning Timeline & Key Milestones



Community Engagement

From the beginning, input from the community has helped shape the Plan. An integrated community and multi-stakeholder approach was used to inform and prioritize decision making. A broad range of residents and stakeholders were consulted from across the Plan Area and the surrounding community. Engagement activities included open houses, online surveys, workshops, stakeholder meetings, inter-agency meetings and City Advisory Committee meetings.

The process was supported by a Citizens Advisory Committee which was formed early in the process. The Committee's role was as an advisory body, which met with staff throughout the Planning process to provide input and comments as the Plan developed. The Committee was comprised of 15 members, including property owners within the Plan Area , community stakeholder groups, and citizens at-large representing the broader interest of the City.

Public open houses and online surveys were held to capture broad public input throughout the Planning process:

- October, 2015: Major landowners hosted a meeting in the Darts Hill area to gauge the level of interest among landowners to begin the NCP process.
- November, 2016: Initial Public Open House was held to begin the process of preparing a NCP for Grandview Heights NCP Area #3 and provide background information.
- November, 2017: A second open house was held to gather feedback on preliminary land use options and planning priorities as well as potential land use options for the Hazelmere Estates area. Input was used to refine the preliminary options into a draft land use plan.
- May, 2018: Residents provided input on the draft Stage 1 Plan at the third open house and through an online survey which was used to further refine the draft land use plan.
- November, 2020: A virtual public open house was held where residents were able to provide comment on the draft Stage 2 land use plan.

1.5 Background Studies

Several background studies were undertaken to provide context and assess existing conditions. These included a stormwater management plan, wildlife and vegetation assessment, wetlands and watercourse studies and a heritage study. These informed the development and refinement of the land use plan. Due to timeline and site access constraints, it is possible that some watercourses, wetlands or wildlife features were not inventoried. As such, individual environmental studies are still required for all development.

Environmental Studies

Environmental studies were undertaken to support the assessment of local watercourses and have helped provide valuable mapping information. These studies identified tributaries which provide direct habitat for fish as well as a source of food and nutrient value to downstream fish populations. Many of these creeks are also associated with wetland habitat.

Wetlands support carbon sequestration, provide added wildlife habitat potential, and improve water quality for fish and wildlife. Wetlands also provide essential water storage, reducing overland flooding for residents and reducing stress on City drainage infrastructure. The headwater portions of several of these creeks include important wetland habitat.

Stormwater Management Studies

In 2017, Associated Engineering Consulting Ltd. (AE) was retained by the City to complete an Integrated Stormwater Management Plan (ISMP) for the Sam Hill Creek watershed. The report assessed existing watercourses and identified wildlife habitat values and resources that informed recommendations for GIN protection. A detailed hydrogeological assessment was also conducted with a summary of outcomes within Section 7.1.

Subsequent watercourse assessments were conducted by ENKON Environmental in 2018 and 2020 to verify and confirm watercourse classifications within the Plan Area . These studies recommended changes to stream classifications as well as stream alignment and connectivity. The 2020 report also noted the presence of several wetlands based on preliminary wetlands evaluation and mapping. In May 2020, McElhanney was retained to develop a comprehensive drainage servicing strategy to address stormwater runoff impacts. The study involved identifying locations for new storm water sewers and detention ponds, cost estimates for infrastructure construction and developing an overall stormwater control plan.

Transportation Studies

A transportation modelling analysis was conducted by WSP. The intent of the modeling work was to provide a detailed analysis on the functionality of the proposed road network, and appropriate network, and adequacy of intersection control. McElhanney was retained to develop a transportation report and conceptual designs of local and collector roads. This will help guide development by providing road profile geometry and plan drawing for all streets, as well as typical cross sections for the road network.

Heritage Study

Denise Cook, heritage consultant, was retained by the City to conduct a neighbourhood heritage context study. The study outlined factors and processes that influenced the evolution of Darts Hill and identified cultural landscapes, and potential for heritage values and resources in the area.

"Surrey needs to improve walkability of neighbourhoods to amenities."

Survey Response, Darts Hill Plan Process, 2018-2020

2 Plan Framework
| The Big Picture

This section outlines the Plan framework that envisions the transformation of Darts Hill into a compact, complete, and green neighbourhood. This planning framework was developed collaboratively through a multi-stage engagement effort to establish the foundation for the Plan.

2.1 Vision

The foundation of the Plan is based on the enduring vision and themes that emerged through community and stakeholder consultation, supported by the City's growth and sustainability goals:

"Darts Hill is a compact, complete, and green neighbourhood where all residents have local parks, amenities, and nature close to home. Its distinct urban village provides a neighbourhood focal point, and a place for residents to access most day-to-day needs. Its accessible network of streets, pathways, and trails supports physical and social health and wellbeing. Residents in Darts Hill feel a strong sense of place and a connection to their community and nature."

Planning Principles

Building from the vision, the Plan is framed around nine planning principles. These principles drive the strategic direction, policy framework, and implementation of the Plan. Combined with the vision they will inform and shape the growth of Darts Hill into a compact and sustainable community.

Provide a Range of Housing

Foster a Multi-modal Transit Supported Community

Ensure Healthy, Protected & Diverse Ecosystems & Biodiversity

Provide a Range of Parks & Community Amenities

Consider Access to and Views of Nature

Ensure Appropriate Servicing, Financing & Infrastructure Improvements

Limit Urban Impacts on the ALR

Promote Neighbourhood Commercial & Local Retail Opportunities

Transition to a Net Zero Carbon Community

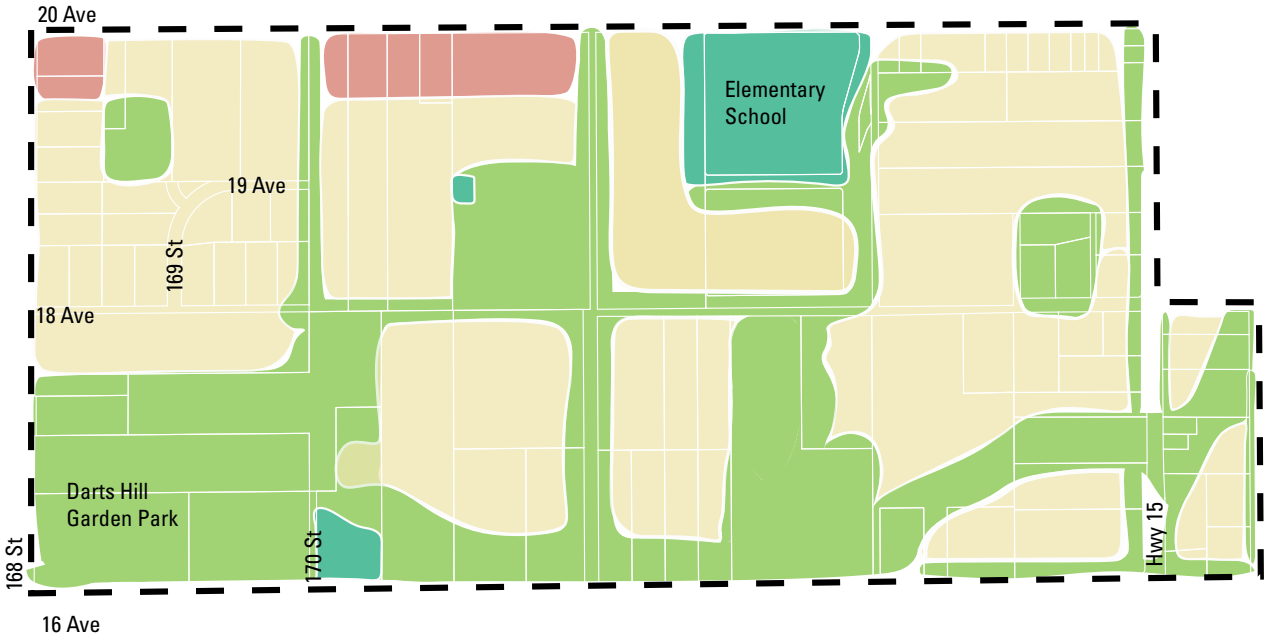
2.2 Growth Concept

The Plan frames an important trade off -- the concentration of density to reduce the footprint of urban development in exchange for more area for biodiversity and parks. The result is a compact and walkable community that will support a transit oriented urban village. And a neighbourhood that provides for many of the daily needs of residents.

Central to the growth concept is an urban village, located at 171 Street and 20 Avenue. This is the focal point for neighbourhood density and activity. The village supports a variety of local commercial and office uses, providing convenient access to goods and services for residents. In the future, the village core will expand north of 20 Avenue. It will form the south end of a commercial street (171 Street) that will extend north to 24 Avenue. This will connect Darts Hill with the Grandview Heights Aquatic Centre and a future adjacent community centre and athletic park.

Development densities are greatest in the village core, and along adjacent arterials roads. This provides residential support for businesses and future bus transit. Densities generally transition way from the village and south through the neighbourhood. In these areas the Plan designates a variety of housing forms.

Another key feature of the neighbourhood is a network of parks and natural areas, highlighted by an expansion of Darts Hill Garden Park, and a Biodiversity Corridor that connects with Redwood Park via a pedestrian overpass over Highway 15.



Protect Natural Areas

The Green Infrastructure Network extends across the neighbourhood and will protect environmentally sensitive areas.

Compact Urban Village

A central mixed-use village with neighbourhood commercial will provide convenient access to transit and shops.

Local Amenities

A range of centrally located parks and institutional uses will encourage being active and provide easy access to community amenities.

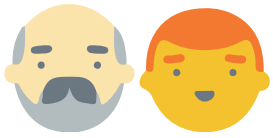
Variety of Housing

A range of housing types will provide housing options, including homes within walking distance of amenities and future public transit.

2.3 Growth Projections

Population Projections

The Plan will accommodate considerable population growth over several decades. Assuming eventual build-out over many decades, the Plan could result in up to 9,514 residents. To accommodate this increase in population the Plan designates additional parkland and envisions new community amenities.



Existing	Projected
324	9,514

Housing Projections

The Plan supports housing diversity within the broader Grandview Heights community, encouraging a range of building forms from detached and semi-detached homes, townhouses, and apartments.

Existing	Projected (2050)
115	3,901

Employment Projections

It is estimated that the Plan will create between 429 and 860 jobs. These jobs will be focused in the central mixed-use urban village, as well as the commercial node at 168 Street and 20 Avenue. The new elementary school is expected to be the largest single employer in the Plan Area . Significant additional employment is supported in nearby Campbell Heights.

Existing	Projected (2050)
30	645

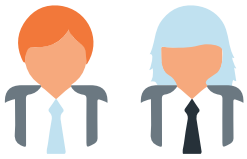
Parkland Projections

Future residents of Darts Hill will all live within walking distance to parks and opens spaces. The Plan will add 4 new neighbourhood parks covering 4.5 ha, each of which will be designed with a range of park amenities such as playgrounds, pathways, benches, and picnic tables.

Existing	Projected
8.2 ha	19.6 ha

Student Projections

It is estimated that between 683 - 801 elementary students and 343 - 403 secondary students will be enrolled in the public-school system from the NCP area once it is fully built out. To meet this demand a new elementary school is planned within the Plan Area at the corner of 20 Avenue and 174 Street.



Existing	Projected (2050)
~35	1,026 - 1,204

"Provide affordable housing options and keep wider swaths of land for paths."

Survey Response, Darts Hill Plan Process, 2018-2020

3 Land Use
| What We Are Doing

The land use strategy reflects the vision and principles of the Plan, providing direction on the form and character of Darts Hill as it grows. Land use designations and policies guide new development. They outline where and how homes, shops, pathways, parks, and natural areas fit together to create a complete community.

Council, staff, and residents expect future development proposals to correspond with the land uses and design direction of the Plan.

3.1 Land Use Strategy

The land use strategy defines future land uses that will develop over time. The land use map shows how future development will fit together and where the City expects growth. Each land use designation outlines what may be possible on sites with that designation. They provide a clear intent and development parameters to guide future growth, as well as specific design guidelines that respond to the Neighbourhood Design Concept. Together, they provide clear direction for development that is consistent with the Plan's vision, principles, and growth concept outlined in Section 2.

Mixed-Use

Mixed use and commercial areas support a healthy and vibrant retail and office environment, while supporting residential uses. Mixed Use designations will allow future residents to live, work, and shop in the same area or building. They contribute to the vision of the Plan by providing local jobs and a range of services to meet the daily needs of future residents. These designations are expected to support a variety of uses, such as a local grocery store, drug store, food and beverage stores, assembly uses, financial institutions, and other commercial retail/office uses. Mixed and commercial uses are separated into three designations (Low-Rise Mixed-Use, Community Commercial and Neighbourhood Commercial) based on intended use, density and building form. Each require, at minimum, commercial or retail uses at grade.

Residential

New residential development should be provided through a variety of housing types to support families, working professionals, and seniors. The highest densities of housing will be located around the urban village and adjacent to main roads. This will attract new residents to support local business and provide housing within closer proximity to bus services. Medium density townhouses are also located adjacent to riparian and biodiversity corridors to support public access to nature. Residential land use designations include Low Rise Residential, High Density Townhouse, Medium Density Townhouse, Semi-Detached Residential and Detached Residential. All development within these designations should meet the design intent, principles and guidelines outlined within the Urban Design Concept (Section 4.1).

Implementation

Implementation of the Plan is intended to take place through applications for rezoning and development permits. Not all sites/properties will be able to meet the development parameters outlined in the designation due to limitations created by context (e.g. road dedications, adjacent uses) and site constraints (e.g. lot size and shape, trees, grade, riparian areas and tree retention). New proposed zoning will be reviewed at the time of development application submissions on a case-by-case basis. Development is subject to the applicable policies and financial considerations outlined within Section 9 (Implementation).

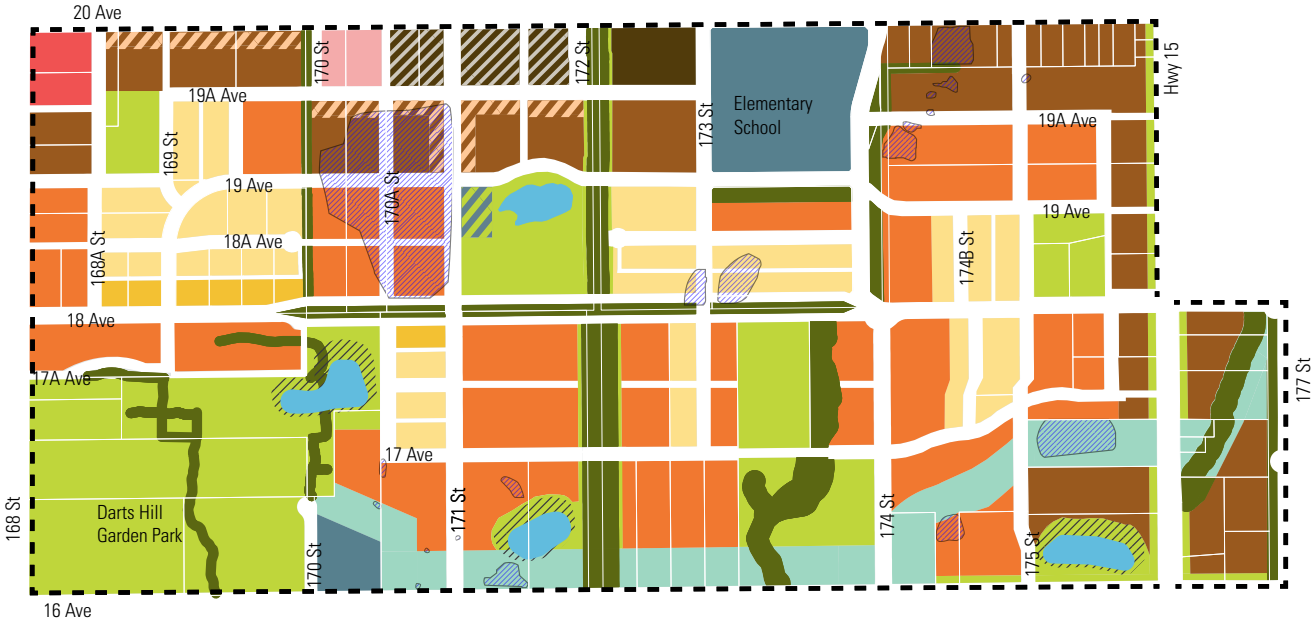
Zero Carbon Incentive

The Plan includes an incentive to encourage the design and construction of zero carbon operation buildings. These buildings use only non-polluting (zero-carbon) energy during operation. Developments seeking to build more units or floor area than the identified base density will be accepted within specified allowances if all buildings are constructed to meet the Zero Carbon Incentive, outlined in Section 9.1.

Land Use Strategy

Illustration - Urban Village Design

Figure 3.1 Land Use Strategy



Low Rise Mixed-Use

Low rise apartments with ground-oriented commercial space.

DENSITY RANGE
Base 1.5 FAR and up to 2.0 FAR with Zero Carbon Incentive.

TYPICAL HEIGHTS
4-5 storeys

Community Commercial

Neighbourhood scale retail and service commercial facilities, office, recreation, assembly and associated uses.

DENSITY RANGE
Base 1.0 FAR and up to 1.5 FAR with Zero Carbon Incentive.

Minimum commercial/office requirements.

TYPICAL HEIGHTS
Minimum 2 storey commercial/ office and up to 5 storeys.

Neighbourhood Commercial

Local scale shopping, commercial, retail and community services node.

DENSITY RANGE
Base 0.5 FAR and up to 0.6 FAR commercial/office with Zero Carbon Incentive.

TYPICAL HEIGHTS
1-2 storeys.

Low Rise Residential

Multi-family housing with ground-oriented units at base.

DENSITY RANGE
Base 1.3 FAR and up to 1.5 FAR with Zero Carbon Incentive.

TYPICAL HEIGHTS
Up to 4 storeys

High Density Townhouse

Higher density townhouse buildings, and ground-oriented multiple residential. Stacked townhouses with underground parking will be considered in urban village area.

DENSITY RANGE
Base 25 UPA and up to 30 UPA with Zero Carbon Incentive.

TYPICAL HEIGHTS
Up to 4 storeys for stacked townhouse in select locations. Up to 3 storeys for townhouse.

Medium Density Townhouse

Lower density townhouses. Duplex and triplex forms to be considered in areas adjacent to Detached Residential.

DENSITY RANGE
Base 20 UPA and up to 24 UPA with Zero Carbon Incentive.

TYPICAL HEIGHTS
2-3 storeys

Semi-Detached Residential

Attached housing or lower density fee-simple row housing or manor homes at key intersections with options for some lane served single-family homes mid-block.

DENSITY RANGE
Base 12 UPA and up to 15 UPA with Zero Carbon Incentive.

TYPICAL HEIGHTS
2 storeys

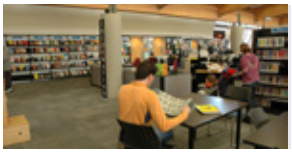
Detached Residential

Compact detached houses with or without secondary suites.

DENSITY RANGE
Base 10 UPA and up to 14 UPA with Zero Carbon Incentive.

TYPICAL HEIGHTS
2 storeys

Institutional



Public and private community spaces such as churches, schools, libraries and community centres.

Institutional /Park

Institutional/recreational uses and/or neighbourhood house and park.

Parks and Natural Areas

Natural areas, recreation and open space with playgrounds within walking distance of local residents and Darts Hill Garden Park that attracts residents from outside the immediate neighbourhood.

Biodiversity Corridor

Passive Parkland and ecologically sensitive areas that provides wildlife habitat and facilitates wildlife movement.

3.2.1 Low Rise Mixed-Use

Located at 171 Street and 20 Avenue, this designation permits multi-family housing with ground-oriented commercial uses. Low rise mixed-use will also support future bus service along 20 Avenue and the longer term development of the neighbourhood north of 20 Avenue. Development within this designation will meet the intent and principles of the Plan, including:

- Principle 1: Provide a Range of Housing
- Principle 2: Foster a Multi-modal Transit Supported Community
- Principle 5: Promote Neighbourhood Commercial and Retail Opportunities
- Principle 9: Transition to a Net Zero Carbon Community

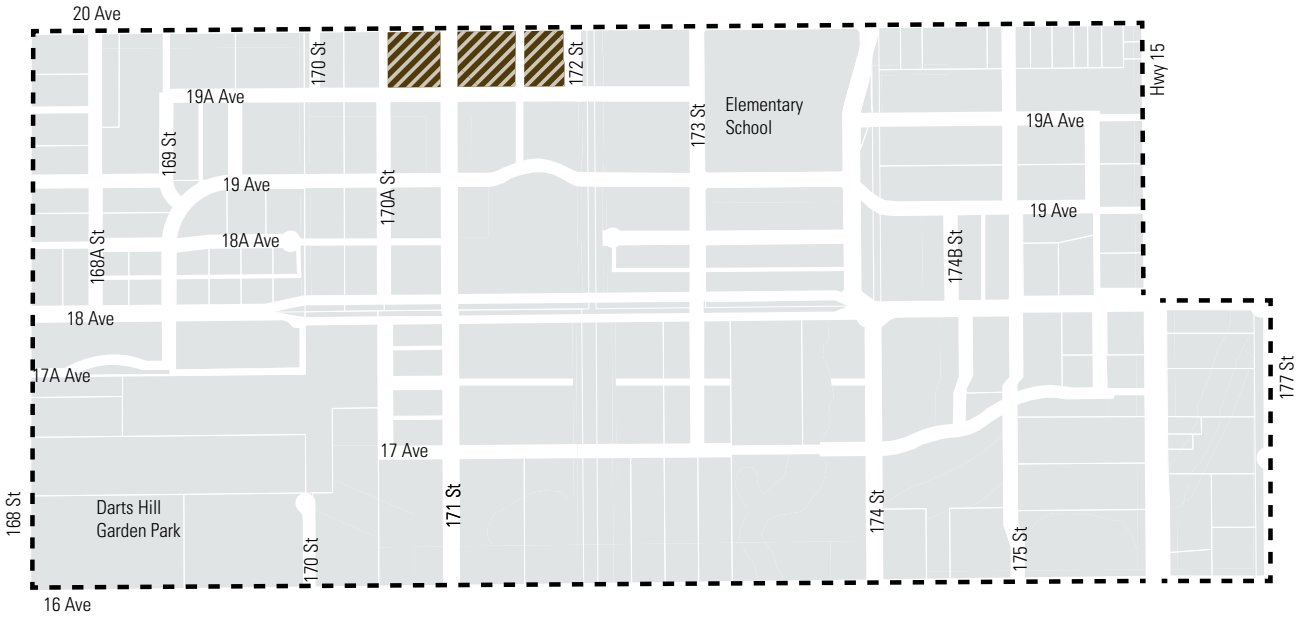
INTENT

Pedestrian-oriented design is the highest objective to achieve. Street-level and street-active commercial and retail uses are required, with residential or office uses above. Frontages should support multiple small-scale commercial units for an active and varied urban village environment. Institutional uses and public facilities may also be supported. Development within this designation is intended as low-rise buildings with underground parking. Surface parking is not supported as it detracts from the vibrancy and quality of the community in this area.

DEVELOPMENT PARAMETERS

Base Density	1.5 FAR
Zero Carbon Incentive	+0.5 FAR
Max Density with Zero Carbon Incentive	Up to 2.0 FAR
Typical Height	4-5 Storeys
Parking	Underground Only*
Note	Provision of family-oriented housing is a priority. Provide a range of unit sizes from 1-3 bedrooms**

*A Hydrogeological assessment should be conducted - See Section 8.1 Groundwater Seepage.
** See Section 9.1 Housing Policies.



3.2.2 Community Commercial

The community commercial designation is located on the periphery of the urban village. The primary intent of this designation is to support office and commercial uses beyond typical ground-oriented retail, such as local medical, dental, accounting, and other local office uses. Development within this designation will meet the intent and principles of the Plan:

- Principle 5: Promote Neighbourhood Commercial and Retail Opportunities
- Principle 9: Transition to a Net Zero Carbon Community

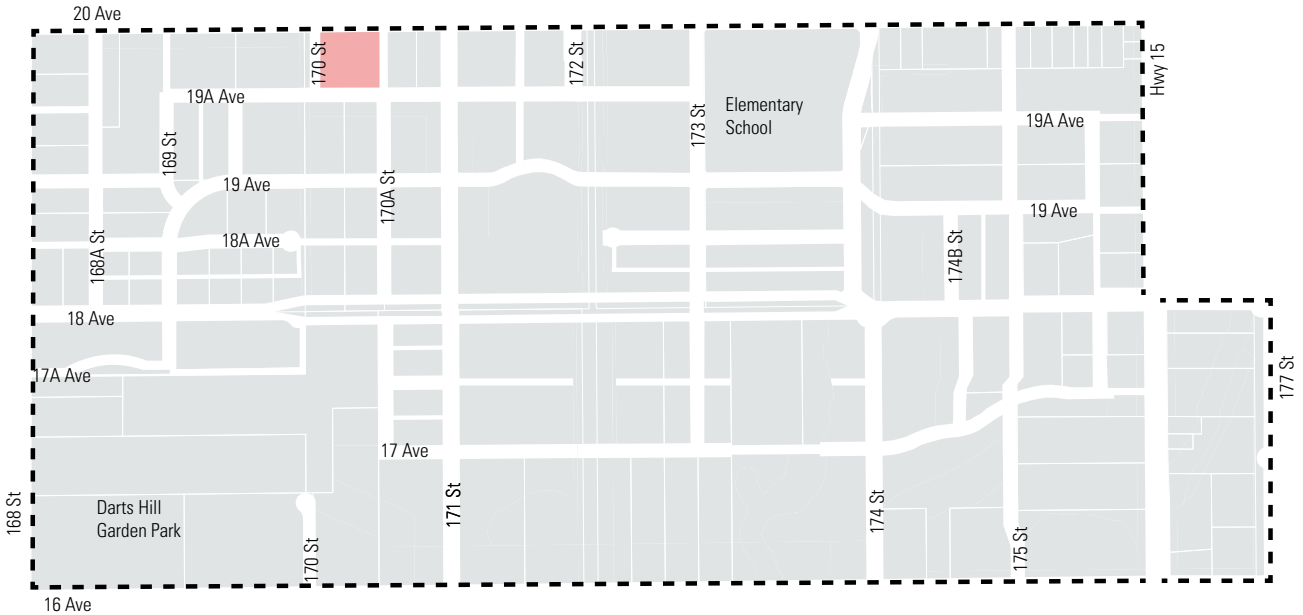
INTENT

Development within this designation is intended as low-rise community serving retail, service commercial facilities, office, recreation, assembly and associated uses. Institutional uses and public facilities may also be supported. Residential uses may be considered in this designation subject to the provision of minimum commercial/office uses and density bonusing provisions.

DEVELOPMENT PARAMETERS

Base Density	1.0 FAR
Zero Carbon Incentive	+0.5 FAR
Max Density with Zero Carbon Incentive	Up to 1.5 FAR (commercial/office only)* *Up to 0.9 residential FAR with minimum 0.6 FAR commercial subject to Low Carbon Incentive and Tier 2 Capital Projects CAC.
Typical Height	Minimum 2 storey commercial/office uses and up to 5 storeys maximum.
Parking	Underground for residential** Some surface parking for commercial uses permitted subject to urban design considerations.
Note	Provision of family-oriented housing is a priority. Provide a range of unit sizes from 1-3 bedrooms***
Design	Refer to Commercial Design Guidelines. Commercial at grade required.

** A Hydrogeological assessment should be conducted - See Section 8.1Groundwater Seepage.
*** See Section 9.1Housing Policies.



3.2.3 Neighbourhood Commercial

A neighbourhood commercial designation is strategically located in the northwest of the Plan Area , at the corner of 168 Street and 20 Avenue. This designation supports local neighbourhood servicing commercial uses and a range of services to meet the daily needs of future residents and visitors. Institutional uses and public facilities may also be supported. Development within this designation will meet the intent and principles of the Plan:

- Principle 5: Promote Neighbourhood Commercial and Retail Opportunities
- Principle 9: Transition to a Net Zero Carbon Community

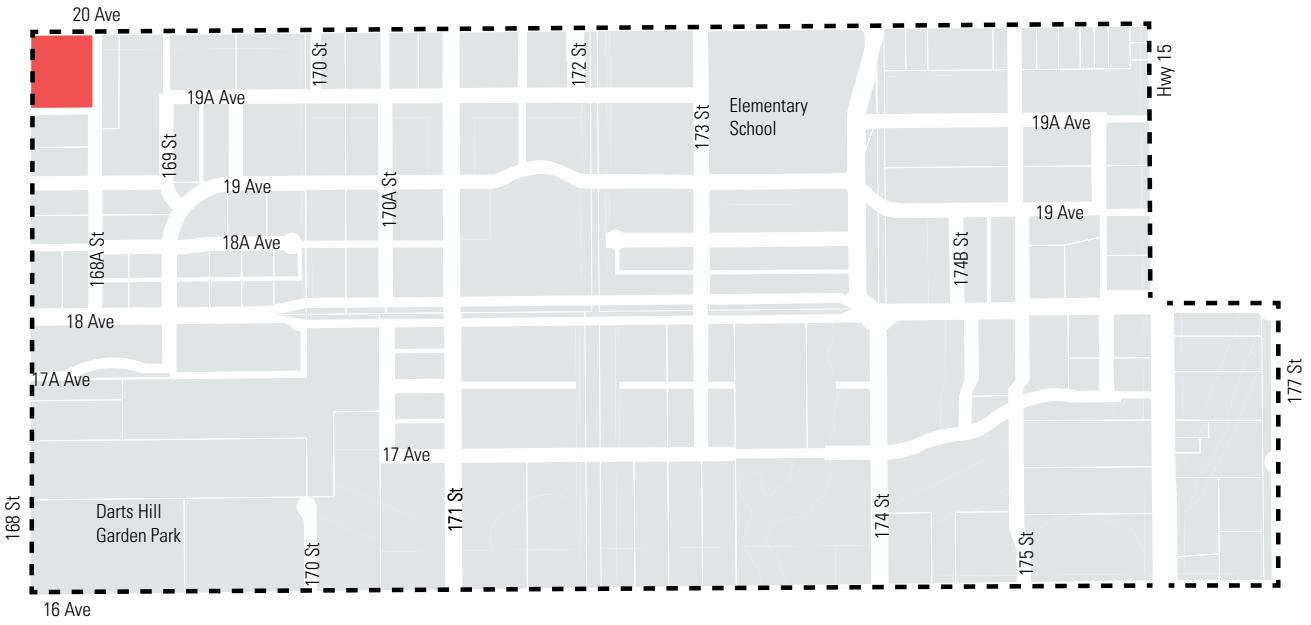
INTENT

Development within this designation is intended as low-density neighbourhood serving commercial and service uses. Second floor office is permitted.

DEVELOPMENT PARAMETERS

Typical Zone	C-5
Base Density	0.5 FAR
Zero Carbon Incentive	+0.1 FAR
Max Density with Zero Carbon Incentive	Up to 0.6 FAR (Commercial/Office)
Typical Height	1-2 Storeys
Parking	Some surface parking permitted in rear of building (off-street) subject to urban design considerations with underground parking for second storey uses*
Design	Refer to Commercial Design Guidelines. Commercial at grade required.

*A Hydrogeological assessment should be conducted - See Section 8.1 Groundwater Seepage.



3.2.3 Low Rise Residential

The low-rise residential apartment designation is located along 20 Avenue between the urban village and elementary school. This designation provides more affordable housing options as well as higher residential density to support nearby commercial uses and local bus service. Development within this designation will meet the intent and principles of the Plan:

- Principle 1: Provide a Range of Housing
- Principle 7: Foster a multi-modal transit supported community
- Principle 9: Transition to a Net Zero Carbon Community

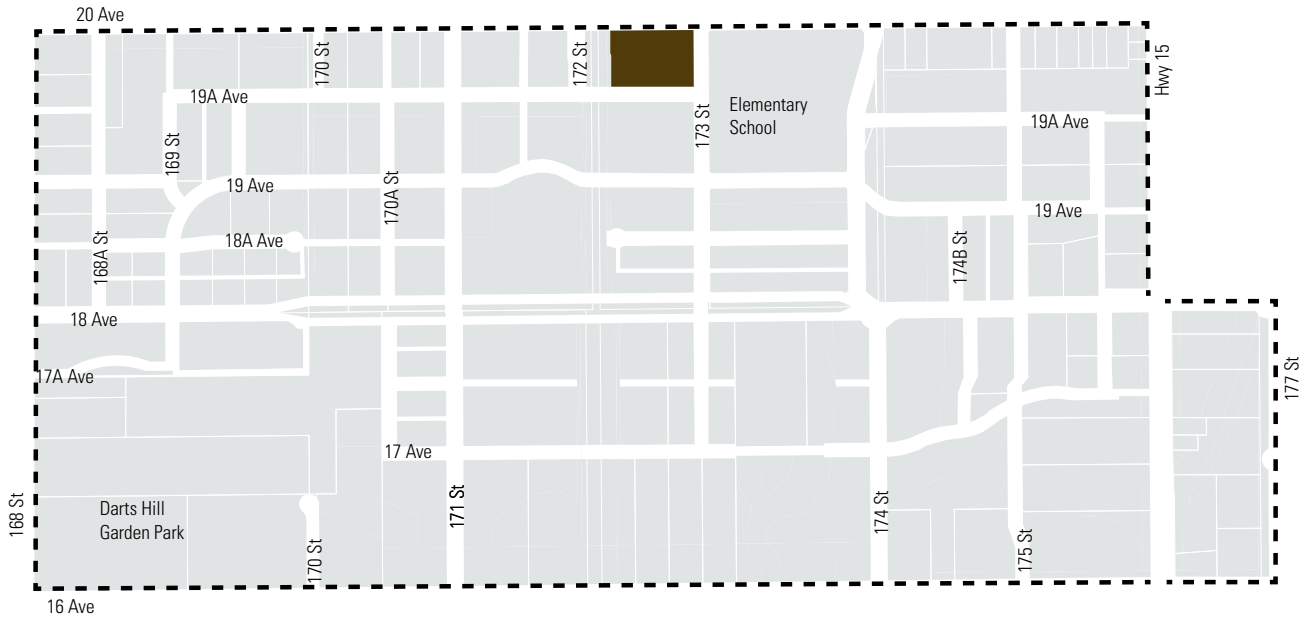
INTENT

Development within this designation is intended as low-rise buildings with underground parking. Primary use should be family-oriented residential apartments with ground-oriented townhouse. Limited ground level commercial (retail) uses or daycare uses are permitted, subject to an appropriate neighbourhood interface. Institutional uses and public facilities may also be supported.

DEVELOPMENT PARAMETERS

Typical Zone	RM-45, CD based on RM-70
Base Density	1.3 FAR
Zero Carbon Incentive	+0.2 FAR
Max Density with Zero Carbon Incentive	Up to 1.5 FAR
Typical Height	Up to 4 Storeys
Parking	Underground only*
Note	Provision of family-oriented housing is a priority. Provide a range of unit sizes from 1-3 bedrooms.**

* A Hydrogeological assessment should be conducted - See Section 8.1 Groundwater Seepage.
** See Section 9.1 Housing Policies.



3.2.4 High Density Townhouse

High density townhouses are generally located around the periphery of Darts Hill and adjacent to major roads and the urban village. The designation will provide a more urban character while adding to the diversity and affordability of family-oriented housing. The designation also serves as a transition between higher and lower density areas. Development within this designation will meet the intent and principles of the Plan:

- Principle 1: Provide a Range of Housing
- Principle 9: Transition to a Net Zero Carbon Community

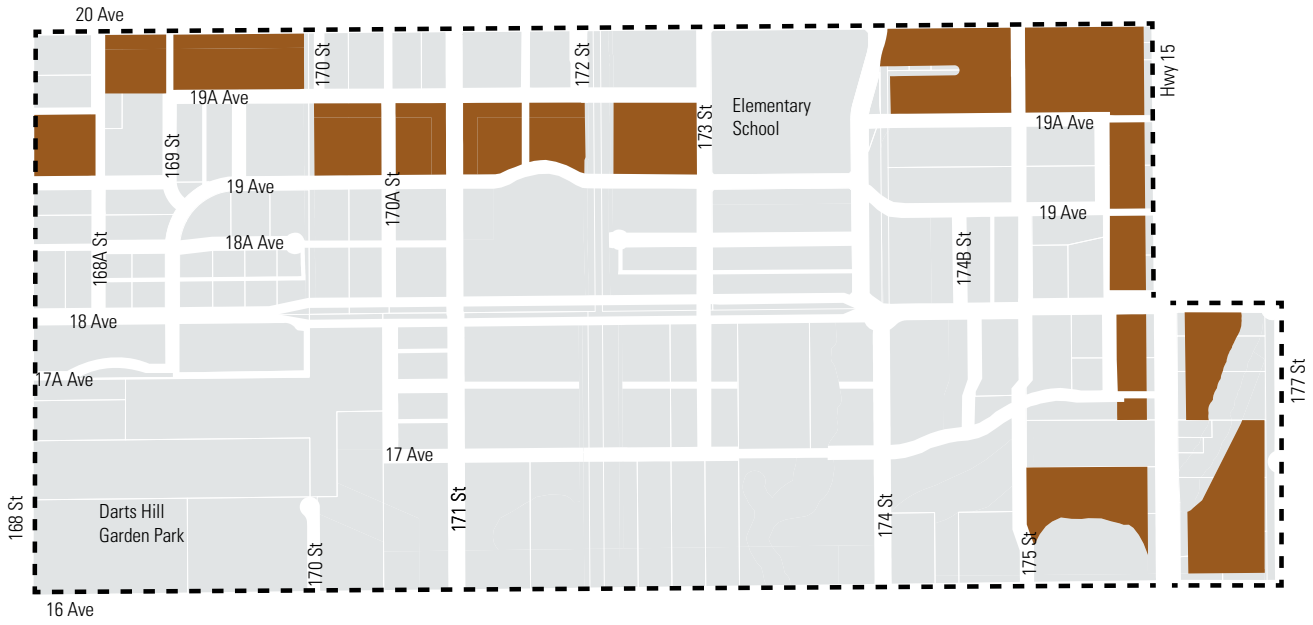
INTENT

Development within this designation is intended for ground-oriented townhouses. The designation also supports stacked townhouse with underground parking and options for live-work components along identified areas of 20 Avenue, 19A Avenue and 171 Street. Complementary institutional uses and public facilities may also be supported.

DEVELOPMENT PARAMETERS

Typical Zone	RM-30
Base Density	25 UPA
Zero Carbon Incentive	+5 UPA
Max Density with Zero Carbon Incentive	Up to 30 UPA
Typical Height	Up to 3 storeys (15m)*
Unit Clustering	Minimum 2 attached units. Maximum 6-units per building.
Parking	Vehicle access restricted to internal driveway or rear lane. Stacked townhouse only permitted with underground parking**
Design	Refer to Townhouse Design Guidelines.

*Additional building height and density above 1.0 FAR will only be considered where additional community benefit is provided in accordance with the City's Density Bonus Policy (Policy O-54) to a maximum of 1.30 FAR. In such cases, development is subject to urban design approval to ensure appropriate interface treatments, consistency with design guidelines and land use designation intent.
**A Hydrogeological assessment should be conducted - See Section 8.1 Groundwater Seepage.



3.2.5 Medium Density Townhouse

The medium density townhouse designation is generally located within the core of the Plan Area. The designation will support larger format townhouse and row housing units, which are more affordable alternatives to detached housing. This designation is located adjacent to riparian and biodiversity corridors to provide unit frontages onto nature, facilitate adjacent public access corridors, and provide strategic design solutions within steeper slope or environmental sensitive areas. Development within this designation will meet the intent and principles of the Plan:

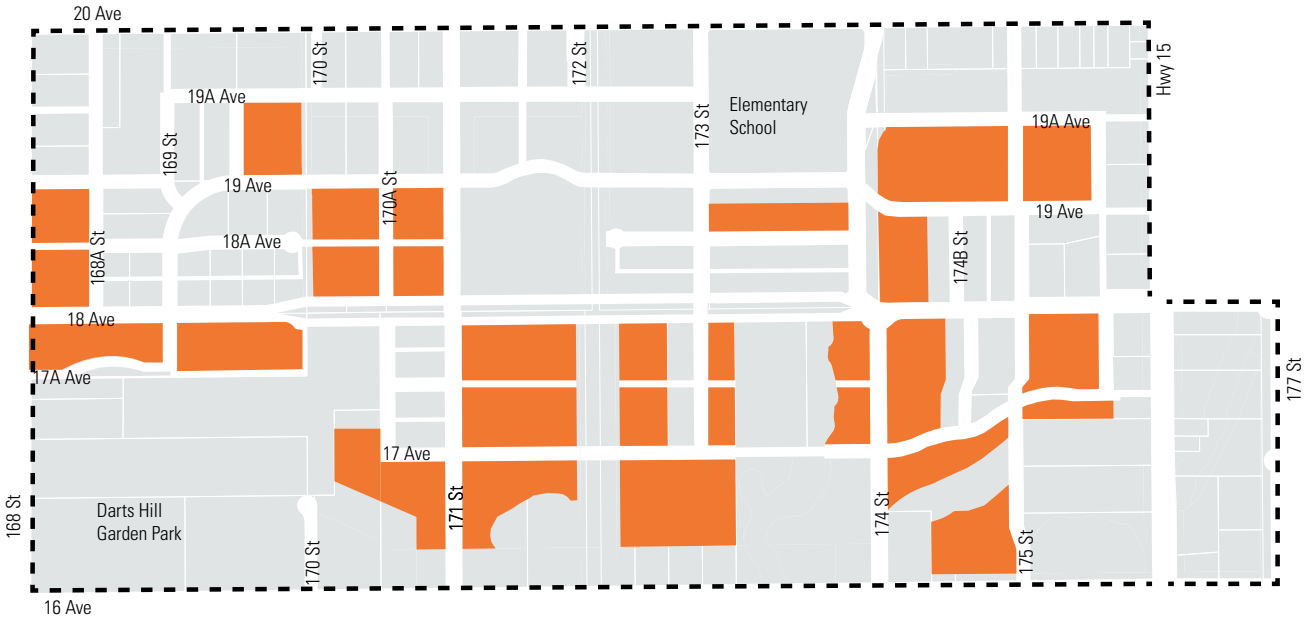
- Principle 1: Provide a Range of Housing
- Principle 3: Ensure Healthy, Protected, Diverse Ecosystems and Biodiversity
- Principle 9: Transition to a Net Zero Carbon Community

INTENT

Development within this designation is intended for family and seniors oriented medium density townhouses. Primary bedrooms located on the same storey as the primary living spaces or single storey units are encouraged for accessibility. Complementary institutional uses and public facilities may also be supported.

DEVELOPMENT PARAMETERS

Typical Zone	RM-15, RM-23, CD based on RM-30
Base Density	20 UPA
Zero Carbon Incentive	+4 UPA
Max Density with Zero Carbon Incentive	Up to 24 UPA
Typical Height	Up to 3 storeys
Unit Clustering	Minimum 2 attached units. Maximum 42m building length.
Parking	No tandem parking spaces permitted. Parking access only from strata lane.
Note	Single or duplex units as part of overall strata complex allowed.



3.2.6 Semi-Detached Residential

The semi-detached residential designation is located primarily along 18 Avenue. Semi-detached development forms are predominantly fee-simple housing forms. Development within this designation will meet the intent and principles of the Plan:

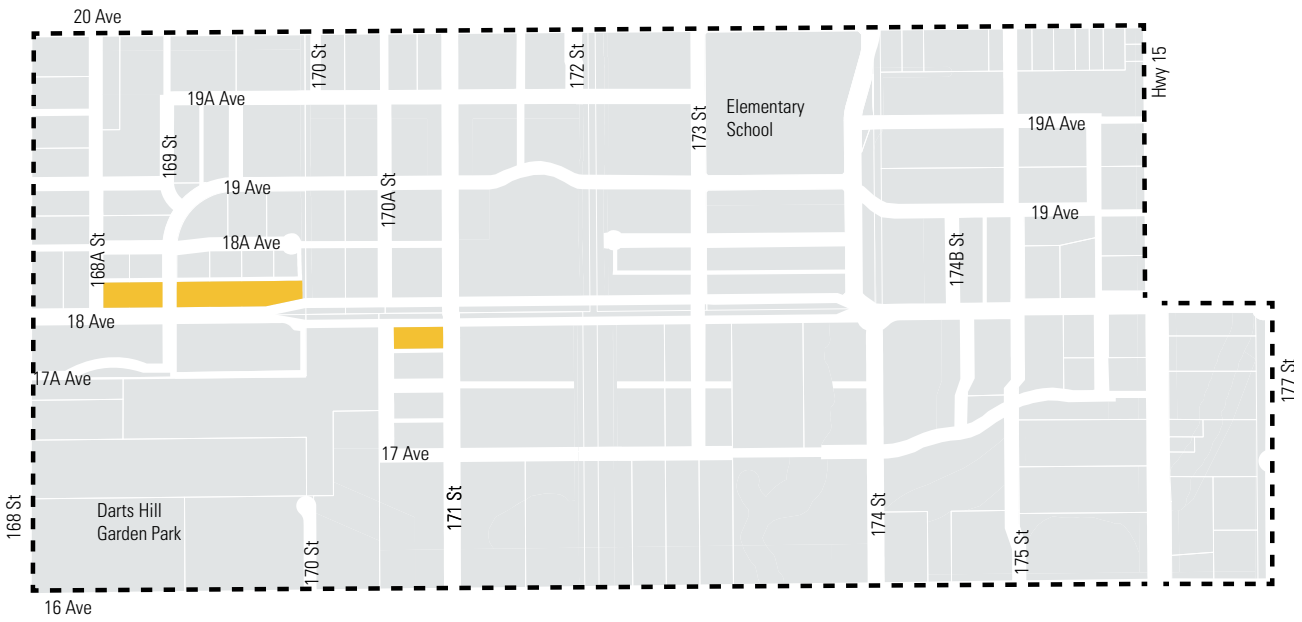
- Principle 1: Provide a Range of Housing
- Principle 9: Transition to a Net Zero Carbon Community

INTENT

Development within this designation is intended for lower density semi-detached housing forms. This may include duplex, triplex, and manor housing. Complementary institutional uses and public facilities

DEVELOPMENT PARAMETERS

Typical Zone	RF-SD, RF-10, RM-15
Base Density	12 UPA
Zero Carbon Incentive	+3 UPA
Max Density with Zero Carbon Incentive	Up to 15 UPA
Typical Height	2 storeys
Parking	Driveway is permitted only from a lane.
Note	Each dwelling should have separate, individual lane access with front doors facing the street.



3.2.7 Detached Residential

Single family homes are generally permitted within the core area of the neighbourhood. This designation will allow new single-detached and urban small-lot single-detached (with the potential for secondary suites or coach houses). Development within this designation will meet the intent and principles of the Plan:

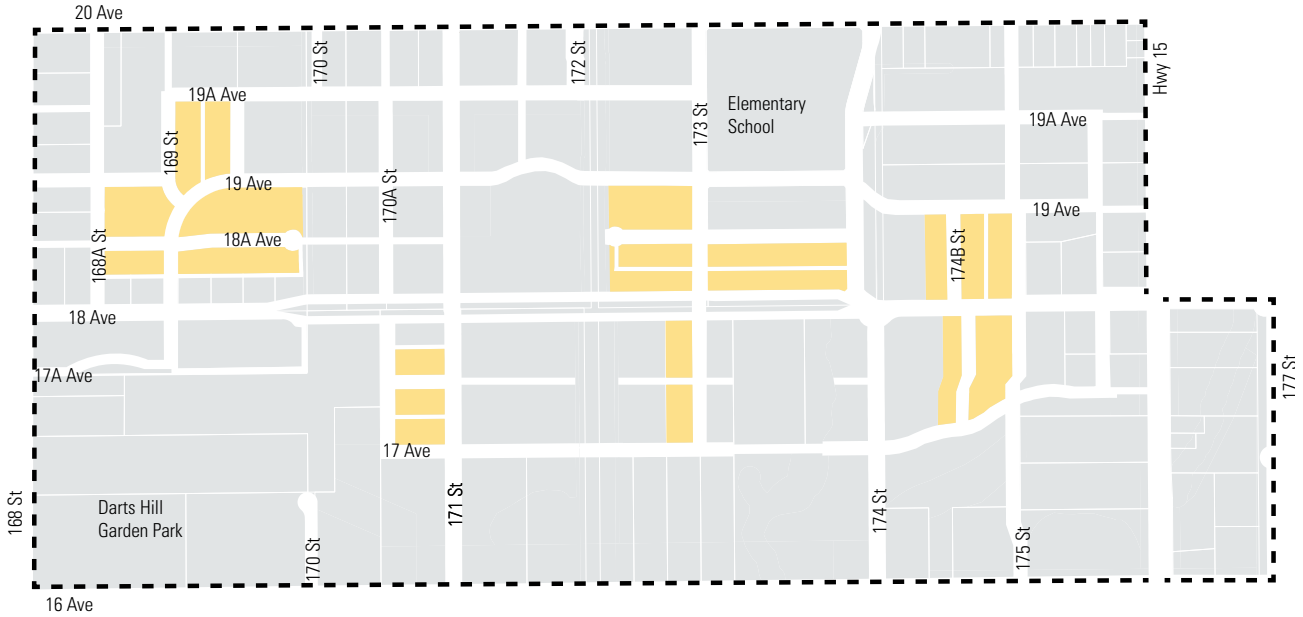
- Principle 1: Provide a Range of Housing
- Principle 9: Transition to a Net Zero Carbon Community

INTENT

Development within this designation is intended for compact single family detached homes on urban sized lots. Lane served coach houses are allowed. Secondary suites are allowed for a maximum of two dwelling units per lot. Complementary institutional uses and public facilities may also be supported.

DEVELOPMENT PARAMETERS

Typical Zone	RF-13, RF-10
Base Density	10 UPA
Zero Carbon Incentive	+4 UPA
Max Density with Zero Carbon Incentive	Up to 14 UPA
Typical Height	2 storeys
Parking	Driveway permitted only from rear lane on collector roads. Front accessed driveways may be considered on local roads only.

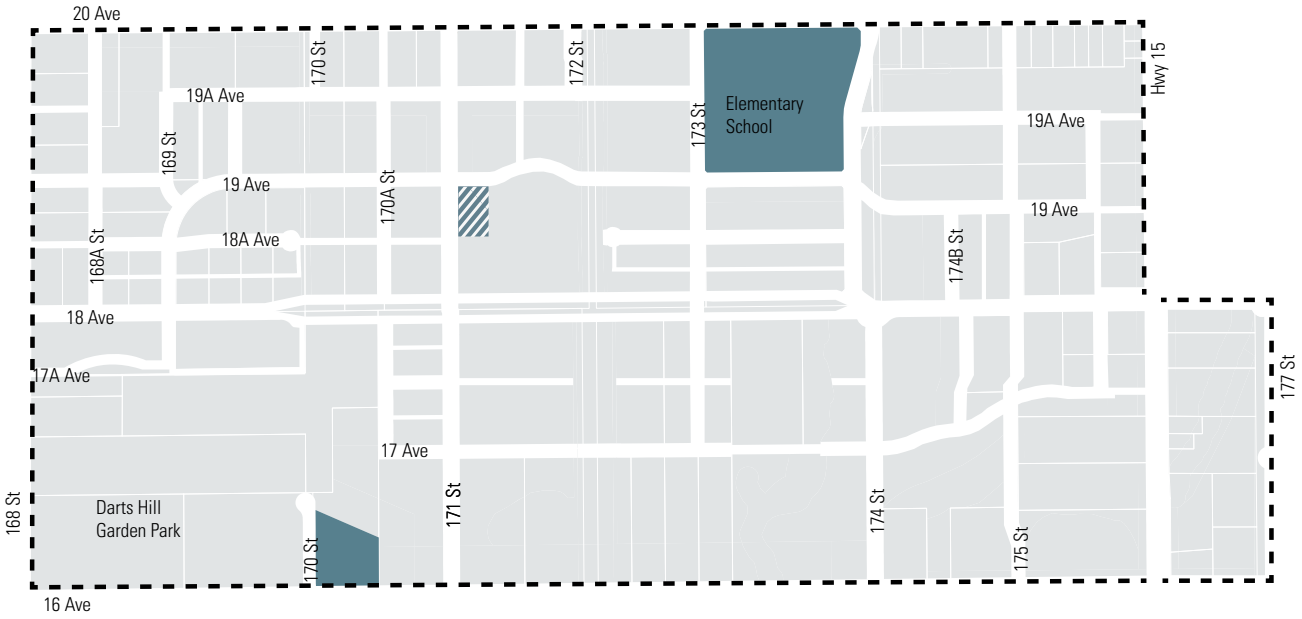


3.2.8 Institutional

Institutional uses service the everyday needs of a community. Schools, places of assembly, and cultural facilities will help contribute to high quality of life and social wellbeing. An elementary school site and future neighbourhood house have been identified to serve the growing community of Darts Hill. The Emmanuel Covenant Church is also designated as institutional. Development within this designation will meet the intent and principles of the Plan:

- Principle 4: Provide a Range of Parks, Recreation, and Community Amenities.

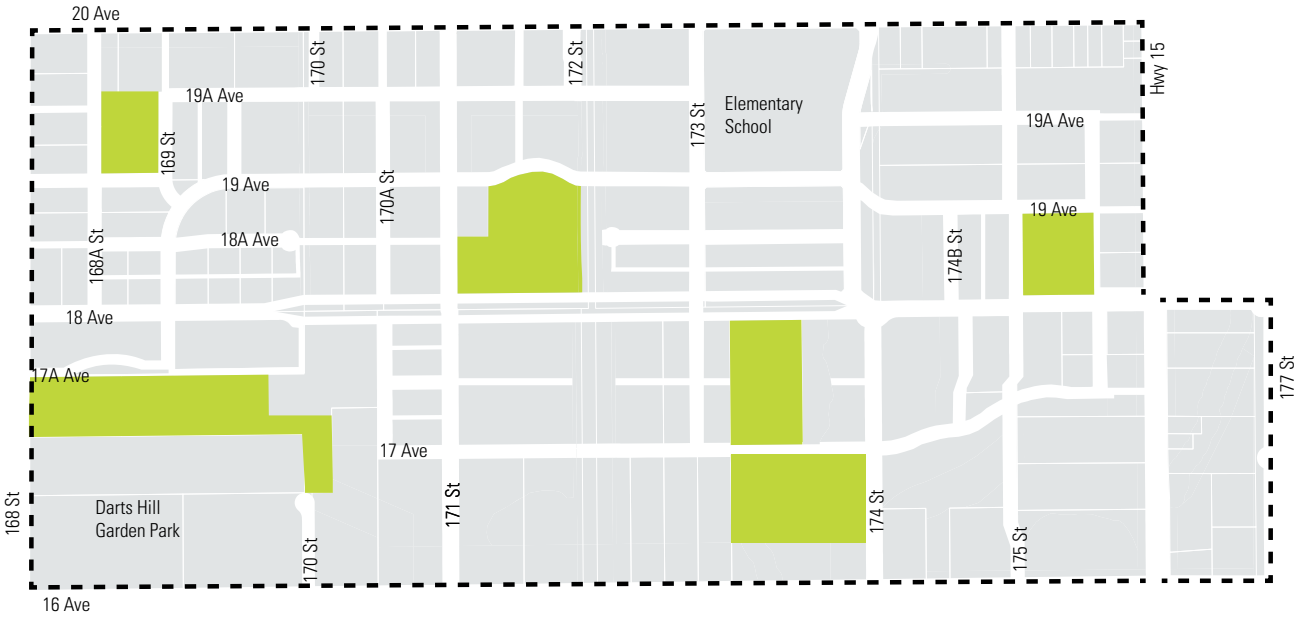
The Neighbourhood House will serve as a welcoming place and important centre for a range of community activities and recreation. It will advance community building and be an important link between residents, organizations, and schools. Day-to-day programs will be available to support a diverse future population including youth, seniors and newcomers.



3.2.9 Active Parkland

Approximately 8.4 ha of new active neighbourhood parkland and 3.0 ha of new City Park expansion to the existing (8.2 ha) Darts Hill Garden Park will contribute to making Darts Hill a complete community and provide opportunities for outdoor leisure and recreation. Development within this designation will meet the intent and principles of the Plan:

- Principle 4: Provide a Range of Parks, Recreation, and Community Amenities.



3.2.10 Riparian Areas, Wetlands and Biodiversity Corridor

Riparian areas and wetlands are important habitat for fish and wildlife. Not only do they support a high level of biodiversity, riparian areas and wetlands are key to protecting water quality and reducing stormwater run-off impacts as they absorb and store rainwater. Some areas will provide passive recreation with trails and areas for sitting along the outer edges.

A 50m+ wide biodiversity corridor is planned along the southern portion of Darts Hill linking to Redwood Park. The corridor serves as essential wildlife habitat and passage, enhancing ecological values and ensuring safe wildlife movement through the NCP. Park paths along some parts of the corridor will provide an important link between people and nature while also complimenting the active transportation network.

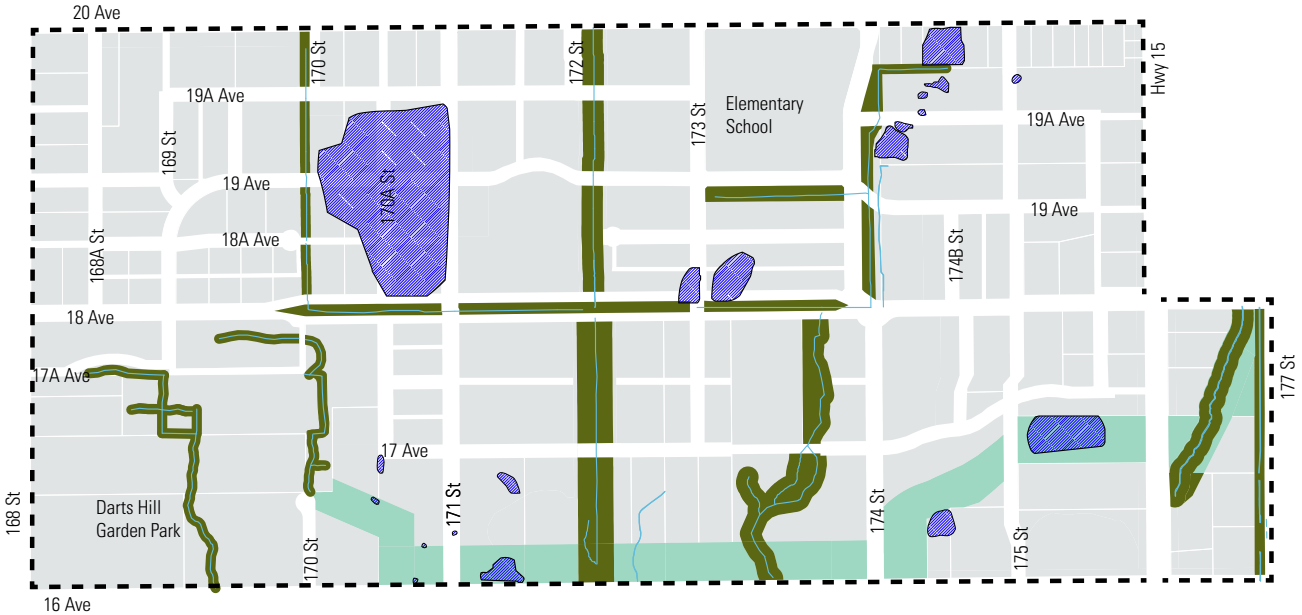
Protection of these lands will meet the intent and principles of the Plan:

- Principle 3: Ensure Healthy, Protected, Diverse Ecosystems and Biodiversity
- Principle 8: Limit Urban Impacts on the Agricultural land Reserve
- Principle 9: Transition to a Net Zero Carbon Community

*Note: Identified wetlands and riparian areas are all subject to confirmation and should not be considered accurate for the purpose of development.

LEGEND

- Biodiversity Corridor
- Riparian Area
- Streams
- Potential Wetland



"Larger green spaces near compact housing to give families space for outside activities."

Survey Response, Darts Hill Plan Process, 2018-2020

4 Urban Design
| Fostering a Sense of Place

Urban design is the process of establishing the physical pattern and character of a neighbourhood. It is a tool used to foster community and sense of place by creating a pleasant environment that facilitates everyday life. The urban design strategy will advance the vision and principles of the Plan through development.

This strategy recognizes that individual projects are the building blocks of great streets and neighbourhoods. Specific design considerations provide a coordinated approach to design at the neighbourhood, block and building scale. Combined, these scales will reflect the unique character and landscape of the Darts Hill neighbourhood.

4.1 Neighbourhood Design Concept

Overall Design

The following design principles apply to all development within the Plan Area. Specific design guidelines are outlined within each land use designation. Together they provide clear expectations for City staff, stakeholders and the development community.

The strategy is to be read in conjunction with related documents, including the OCP Form and Character Development Permit Guidelines. Where there is a conflict between NCP and OCP guidelines, the NCP's Guidelines take precedence.

The overall design of Darts Hill should reflect the distinct character of Darts Hill Garden Park. Buildings should be diverse but cohesive in design. Development should protect sensitive environments and mitigate disturbance of local ecology. Development should seek to integrate the topography and local natural features into the site design after which, the development should be augmented with additional landscaping features.

Design Principles

A. Foster cohesive neighbourhood design through integration of common design styles and complementary transitional scales.
B. Architectural design should reflect the natural heritage of Darts Hill by using natural materials such as wood, brick and stone as principal components.
C. Visual interest along streets should be provided with active building frontages, landscaping, and with high quality building details.
D. Development should incorporate existing natural features and native plants and trees such as Douglas-Fir and Red Cedar (see the City's Biodiversity Design Guidelines).
E. Development should orient itself towards views of parks and natural areas. Wherever possible, connectivity should also be provided.
F. Design of on-site stormwater management should consider natural drainage flows. Systems should maintain base flows to streams, protect watershed health and limit risk and flooding.
G. Provide generous landscaping along public realm frontages.

Top
Traditional form with robust landscape edge

Middle
Contemporary character with a mix of high-quality traditional and modern materials

Bottom
Simple, elegant architecture in a rich landscape

Building Siting, Height, & Massing

Frame and enhance the public realm through careful attention to siting and articulation of building massing. Break up block sizes and increase permeability and access to encourage connectivity and socializing. Articulate building facades and continual massing to create visual interest and harmony. Aim to provide a consistent rhythm along streets while allowing for variety.

Design Principles

Site buildings in a manner that is responsive to the existing topography, including stepping forms on slopes.

A. Provide generous setbacks (minimum 5.0 m) to include natural features, landscaping and trees.
B. Buildings should optimize views towards streets, public spaces and natural areas.
C. Create enjoyable, functional open spaces that take advantage of natural light and contributes to a pleasant micro climate.
D. Promote neighbourhood safety and sociability by designing for overlook and activity along streets, pathways, and natural areas.
E. Design lower floors of multi-storey residential buildings to be in scale with the pedestrian environment.

Building Materials

Building materials should express sustainable design principles. Select materials for appropriateness to the site area while conveying a clear and modern architectural concept.

Design Principles

A. Prioritize local and native and natural materials (e.g. stone and wood) that are durable and visually distinctive.
B. Avoid the use of vinyl siding and fibre cement panels.
C. Use materials that make the building energy efficient and maximize the life of the building.
D. Structural expression is encouraged using mass timber.
E. Colour palettes should be inspired by the region's existing natural environment.

Landscaping

Landscape design should draw inspiration from historical Darts Hill Garden Park. It should distinguish Darts Hill as a unique neighbourhood, enhancing neighbourhood character and contributing to a welcoming public realm. New development should preserve and enhance biodiversity values and support natural systems.

Landscaping in the Public Realm

To foster a unique character in the urban village, distinct trees and landscape treatment should be provided. Plant and tree selection will align with the City's Biodiversity Design Guideline and will be guided by the following strategy:

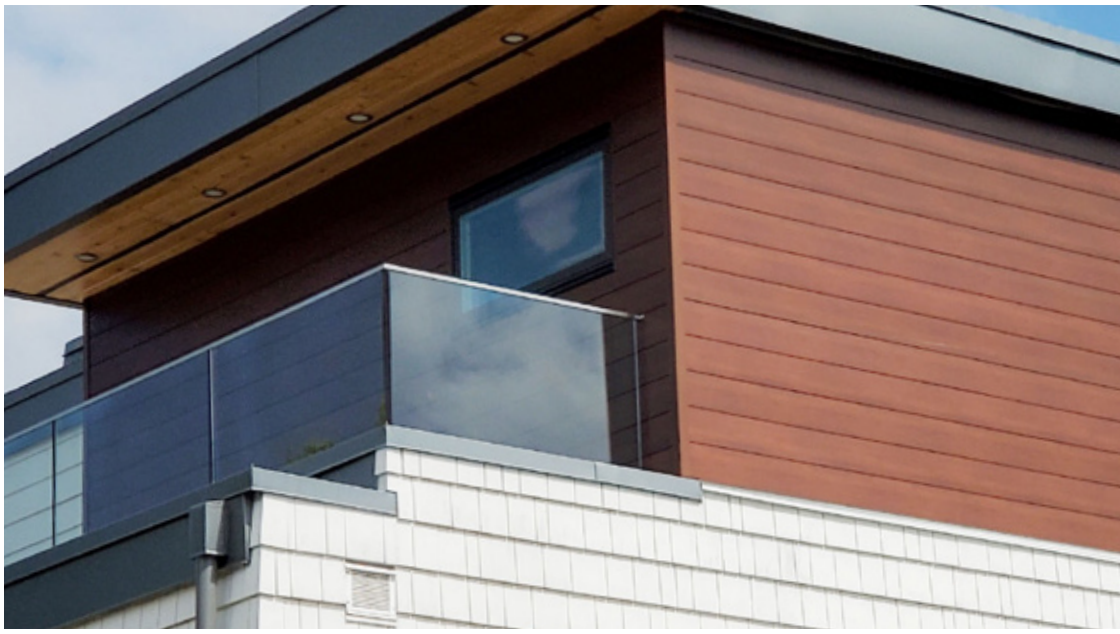
Design Principles

A. Plant selection should draw inspiration from Darts Hill Garden Park and enhance local ecology.
B. Promote biodiversity with a planting palette found in the City's Biodiversity Design Guideline that includes a range of native and non-invasive species.

Top
Form and material create individual unit identity

Middle
High quality material for all building elements

Bottom
Lush and colourful landscaped border



C. Consider seasonal landscaping to maximize seasonal flowering period. And to 'refresh' the scenery while providing a dimension of time.
D. Landscape design should provide soft transitions between built and natural environment.
E. Express architecture and landscape design with clear and cohesive organizing concept.
F. Preserve large trees and existing vegetation that contributes to local ecology.

Streetscape Plantings

To create a free-flowing floriferous planting reminiscent of the English Cottage Border use complementary tones of pink, purple and blue with yellow accents. Inter-plant a mix of species to create a variety of textures, bloom times and seasonal interest attractive to pollinators and promoting biodiversity.

Design Principles

A. Consider sight lines and apply the T.A.C. guidelines to guide the Planting - select smaller, lower growing species near intersections, where sight lines are required.
B. If substitutions are proposed due to lack of availability, ensure the colour palette and design intent is respected - Parks to review any proposed substitutions.
C. All horticulture planting in the boulevard will be the responsibility of the adjacent property owner to maintain.
D. Installation and maintenance should conform to the Canadian Landscape Standard.

Streetscape Plant List

Perennials and Grasses			
Botanic Name	Common Name	Bloom Colouroii	Evergreen
Achillea millefolium*	Yarrow	yellow	
Coreopsis sp.	Tickseed	yellow	
Erica carnea	Winter Heather	purple, pink	yes
Geranium sp.	Cranesbill Geranium	purple, pink, blue	
Lavandula sp.t	Lavender	purple, blue	yes
Liriope muscari	Lily Turf	purple	yes
Lithodora diffusa 'Grace Ward'	Grace Ward Lithodora	purple pink, blue	yes
Perovskia atriplicifolia	Russian Sage	purple	
Rudbeckia fulgida	Black Eyed Susan	yellow	
Carex buchananii	Leatherleaf Sedge		yes
Carex 'Ice Dance'	Japanese Sedge		yes
Carex Comans 'Bronze' & 'Frosted Curls'	New Zealand Hair Sedge		yes
Miscanthus sinensus - Dwarf varieties	Dwarf Maiden Grass		
Deschampsia cespitosa*	Tufted hair grass		yes

Top
Cranesbill Geranium

Middle
Black Eyed Susan

Bottom
Winter Heather

Tree Planting

In the urban village area (commercial frontage), columnar trees with unique characteristics will be selected. Desired special features include coloured leaves, showy flowers or leaf shapes. Such as Nyssa sylvatica 'Afterburner', Nyssa sylvatica 'Tupelo Tower', Fagus sylvatica 'Dawyck Purple', Fagus sylvatica 'Dawyck Gold' or Magnolia galaxy.

Design Principles

A. Tree selection will be based on the most up-to-date knowledge of street varieties that are well adapted to the urban environment, available soil volume and precedent in the area. A cohesive planting is desired to create a sense of place unique to the urban village area.
B. As the trees mature, they should be crown raised to allow for clear sight lines to the adjacent commercial businesses.
C. Throughout the rest of the neighbourhood, the desire to continue with unique and interesting street trees should be pursued. Magnolias are the emblem of Dart Hill Garden; where appropriate, consider utilizing flowering magnolia species.
D. All boulevard trees will be selected, planted and maintained by Park Operations.

Engineering Considerations

i. Continuous topsoil trenches with two or more trees are preferred.
ii. Provide soil cells or structural soil under adjacent hard surfaces to increase the available soil volume and allow for cut-throughs from the road.
iii. Consider the location of the ornamental planting areas against the sight line requirements when designing the boulevard.
iv. Irrigation would improve the growing conditions for ornamental plants - please confirm if irrigation would be accepted in the boulevard.
v. Columnar trees can be planted in closer proximity to each other than typical street trees.
vi. Allow for 6 - 8 m spacing when designing the Planting locations in the treed boulevards in the commercial area.
vii. In the commercial area, collect boulevard trees fees in line with the number of trees that can be accommodated – quantity will be determined through detailed design. For the rest of the NCP, apply the standard approach.
viii. Include planting plan for streetscape in civil scope and collect securities for streetscape planting under the Servicing Agreement.
ix. Parks to review planting plans, cost estimates, and substitution requests.
x. Project Engineer or Landscape Architect to inspect the Plant material, and confirm adequate soil depths and supervise the installation before requesting an inspection by Parks. Parks and Engineering to review plantings prior to being accepted or any release of associated securities.

Top
Magnolia Galaxy Tree

Middle
Dawyck Gold

Bottom
Nyssa Sylvatica

Natural Area Lighting

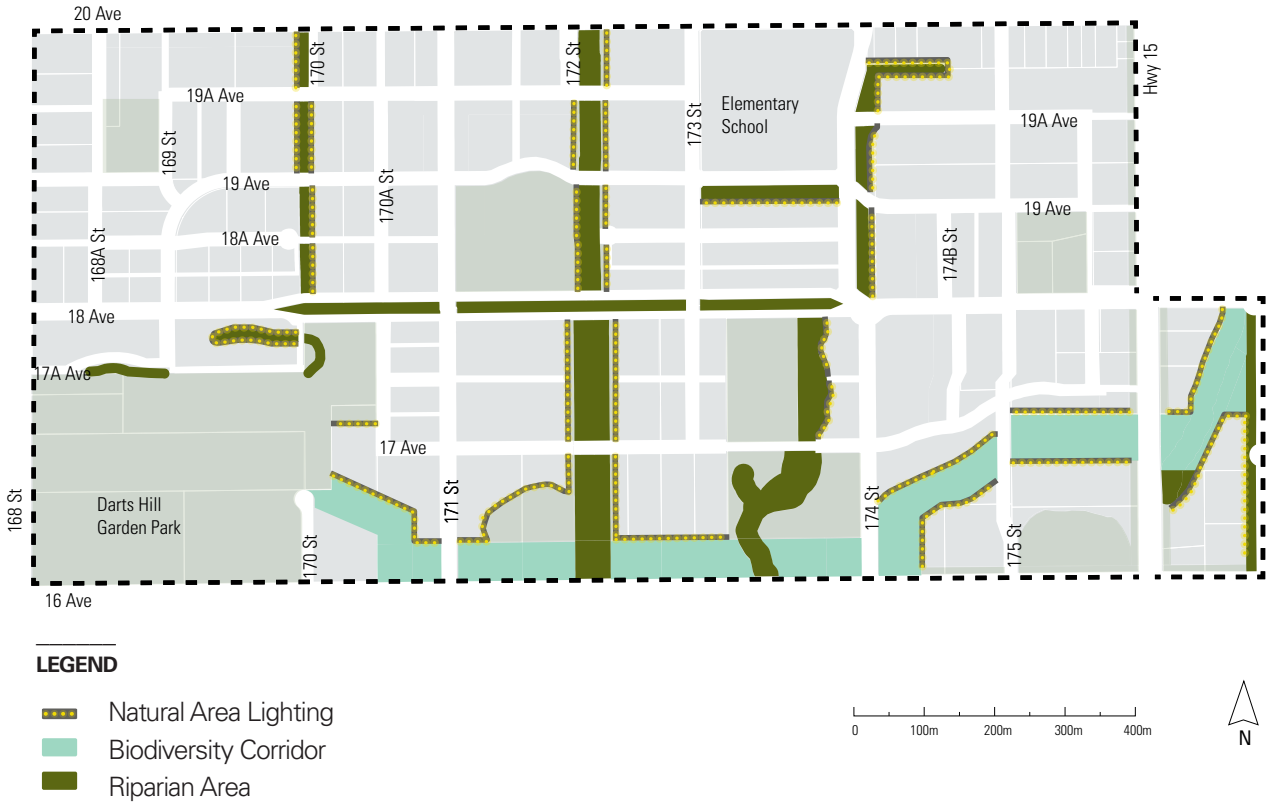
Light pollution can reduce biodiversity in protected areas. Especially in riparian areas where light pollution can cause a 80-90% reduction of biodiversity. Invertebrates, birds, mammals, fish, amphibians, plants and reptiles are all affected by light pollution.

It is critical that development mitigates the negative impact on vulnerable natural areas. Pedestrian lighting along natural area parkland and natural area pathways will not be permitted.

Development near natural areas will adhere to the following lighting requirements:

A. Do not use blue-tinted LED lighting. Use yellow, orange, or red-tinted (warm) lighting which has less negative impact on wildlife.
B. Reduce light pollution and bleeding of light by:
   - Using timed lighting;
   - Directing light to where it needs to go; and,
   - Spacing light sources appropriately
C. Preserve large trees and existing vegetation that contributes to local ecology.

Figure 4.1A Natural Lighting Area

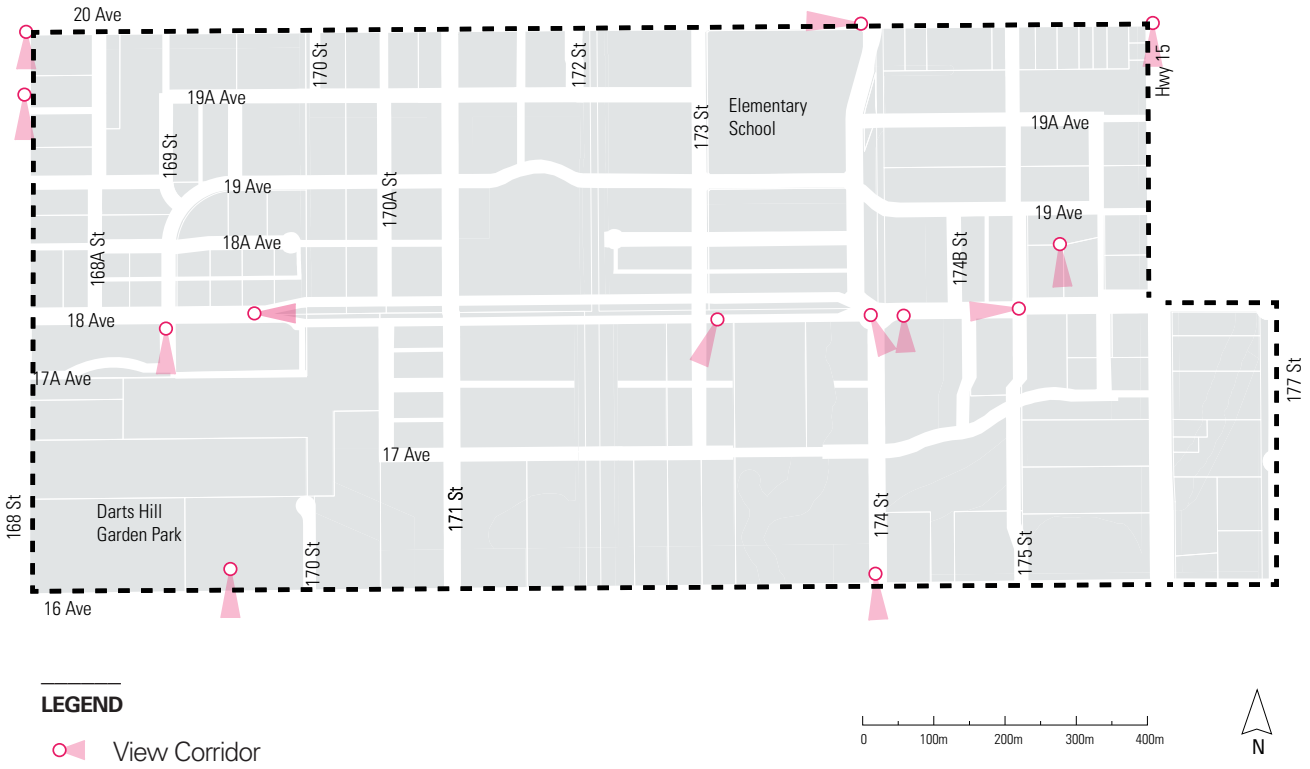


View Corridors

The natural landscape and steep topography of Darts Hill offer several scenic views of the agricultural valley to the south. The preservation of these views will result in a shared community benefit enjoyed by residents and visitors of Darts Hill.

The following map identifies valued view corridors suitable for protection during land development. They are unique to the neighbourhood. Development applications that include or are within these view corridors must consider impacts. A clear report should state what measures have been undertaken to protect these views and how the development limits any negative impact.

Figure 4.1B View Corridors



Active Ground Floor Interface

Frontage is the manner in which a building meets and orients itself towards the public realm. They provide "eyes on the street," and promote a sense of safety while also encouraging pedestrian activity. The Plan identifies areas that require active commercial frontage. Two classifications specify unique commercial interfaces:

A. Active Commercial Frontage

Ground level units along streets and lanes should have direct access entries off the street or lane, associated with patios.

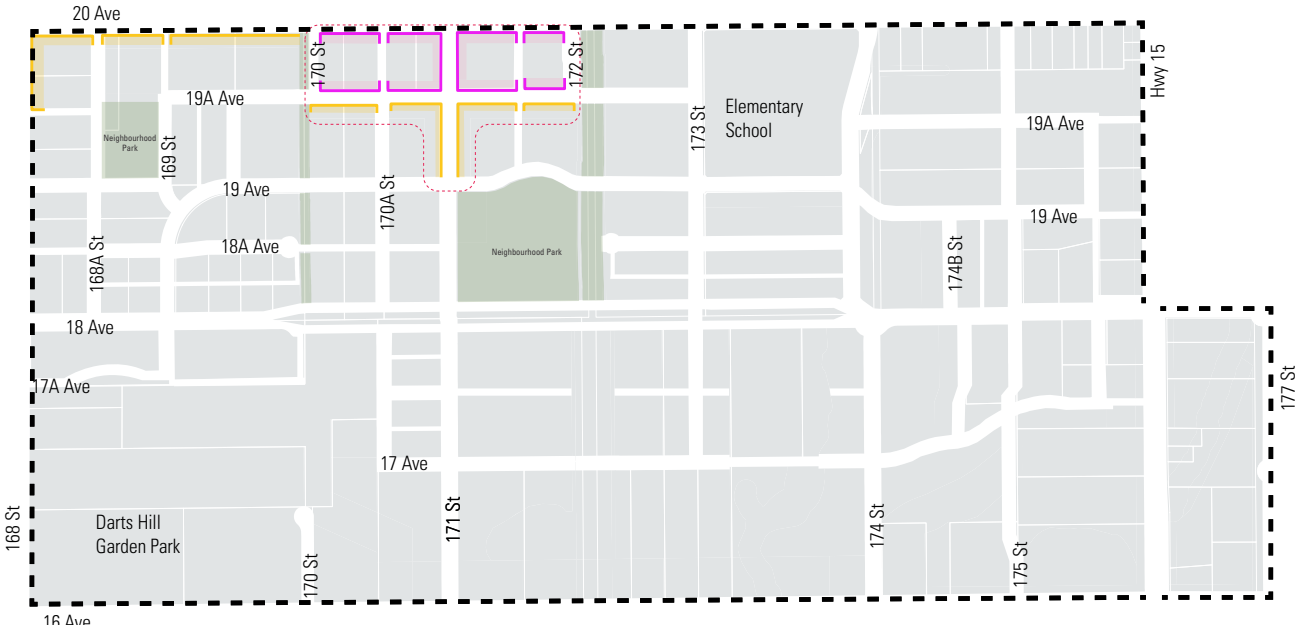
- Generate a high degree of pedestrian activity through smaller scale commercial uses.
- Clearly identifiable and visible building entrances and lobbies open towards the street, ensuring direct access from the sidewalk.
- Active uses at grade serving people: retail, food and beverage, and commercial services. Offices on the second floor.

B. Flex Frontage

In areas outside of the mixed-use urban village, commercial and retail uses should contribute to a consistent street definition and orient towards primary roads and then secondary roads.

- Intended for lower pedestrian volumes and potentially less active commercial uses.
- Flexibility in commercial format and use based on designation.
- Building entrances open towards the street.

Figure 4.1C Ground Floor Interface



LEGEND

- Mixed Use Urban Village
- Active Commercial Frontage
- Flex Frontage

0 100m 200m 300m 400m

N

4.2 Low Rise Mixed-Use Design Guidelines

Scale, Form & Massing

A. High-quality building design should be provided, particularly at street corners. This will contribute to the mixed-use village character and function as neighbourhood landmarks.
B. Integrate publicly accessible open spaces (e.g., pedestrian paths and small plazas) to increase pedestrian permeability and facilitate ease of movement.
C. Buildings should frame the public realm with minimum setbacks.
D. Human scale building proportions and details are encouraged to provide comfort and interest at street-level, facilitating activity and foot traffic.
E. Provide minimum ground floor-to-floor height of 4.5 m for commercial and retail uses.
F. Commercial retail unit depths should be at least 15 m, to ensure commercial viability.
G. There should be a visual distinction between the lower commercial and upper residential portions of the building.
H. Visually scale down the length of the building massing to 50 m by stepping down the roof forms and indenting the façade to segment the building, adding interest and rhythm along the street edge.
I. Control massing bulk by stepping back floors above the 4th storey.
J. The vertical building envelope should generally be along the same continuous plane, other than the floors stepping back above the 4th storey.

Ground Floor Interface

A. Buildings should contribute to an active and inviting street edge condition that encourages pedestrians to engage with the building's edge: walking along it; viewing its inside activities; sitting along it and socializing in its vicinity.
B. Provide publicly accessible open spaces to bridge the public realm with outdoor pedestrian spaces integrated along the building.
C. Locate primary building entrances along important thoroughfares, except that residential entries should be located secondary to commercial entries.
D. Minimize interrupting commercial frontages with the residential lobby.
E. Express residential common entries distinct from commercial entries.
F. Ground floor commercial uses should be prioritized and front along 20 Avenue, 19A Avenue and 171 Street.
G. Multiple small-scale commercial units with individualized storefronts should be prioritized along 20 Avenue to support a higher frequency of active frontages and a competitive retail environment.
H. Storefronts should be visually distinct from each other to create variety of designs.
I. Wrap ground floor retail around building corners along intersecting streets and pedestrian walkways.
J. Maximum frontage of Commercial Retail Units should be no more than 10 m wide to foster interest and rhythm along the street.
K. Set main building entrances at the sidewalk grade without the need for exterior transitions such as steps or ramps.
L. Avoid having columns along commercial frontages.
M. Avoid blank wall conditions, including opaque or obscured glazing along streets.
N. Avoid placing inactive spaces along street frontages, including storage, washrooms, mechanical, utilities or similar with access doors and panels.

Building Elements

A. Use simple, timeless, architectural forms, with contemporary character.
B. Buildings should be clad in durable building materials with a sense of permanence (such as, high-quality masonry, brick, durable wood and glass).
C. Feature fabric awnings (excluding vinyl) to create a less formal appearance. Awnings should have slope (approximately 30 degrees) generally consistent between properties.
D. Cover walkways and storefronts with weather protection canopies at least 1.8 m deep.
E. Storefront design should create distinction between adjacent units by incorporating variety in design elements and materials.
F. Storefront design should introduce pilasters, upstands, and fine-scaled materials at the pedestrian level.
G. Locate active customer spaces along the exterior.
H. Provide architectural treatment of the underside of balconies and soffits to enhance views from below.
I. Screen parking ramps from views above.
J. Use roof tops for roof patios, green roofs, high albedo roofing finishes, energy harvesting arrays, or a combination; avoid contributing to the heat island effect.
K. Screen roof top equipment from street view.
L. Screen and architecturally integrate wireless communication equipment into the building.

Signage & Lighting

A. Integrate signage into building architecture, so that it is complementary, and does not dominate the building elevation or site.
B. Small scale blade signs perpendicular to the sidewalk are encouraged for commercial premises.
C. Back-lit sign boxes and free-standing signs are not supported.
D. Make wayfinding signage non-obstructive to the pedestrian experience.

Top
Active & inviting street edge

Middle
Multiple small-scale retail units

Bottom
High quality commercial streetscape with a transparent street edge

Setbacks & Landscaping

A. Setbacks:
   - 20 Avenue: minimum 2 m
   - 19A Avenue: minimum 2 m
   - 171 Street: 6 m to support linear plaza
   - Side streets: minimum 2 m
   - Green Lanes to non-residential: minimum 4 m to boulevard; or 2 m to sidewalk

B. Building floors should not encroach into the setbacks, neither at ground level nor above.

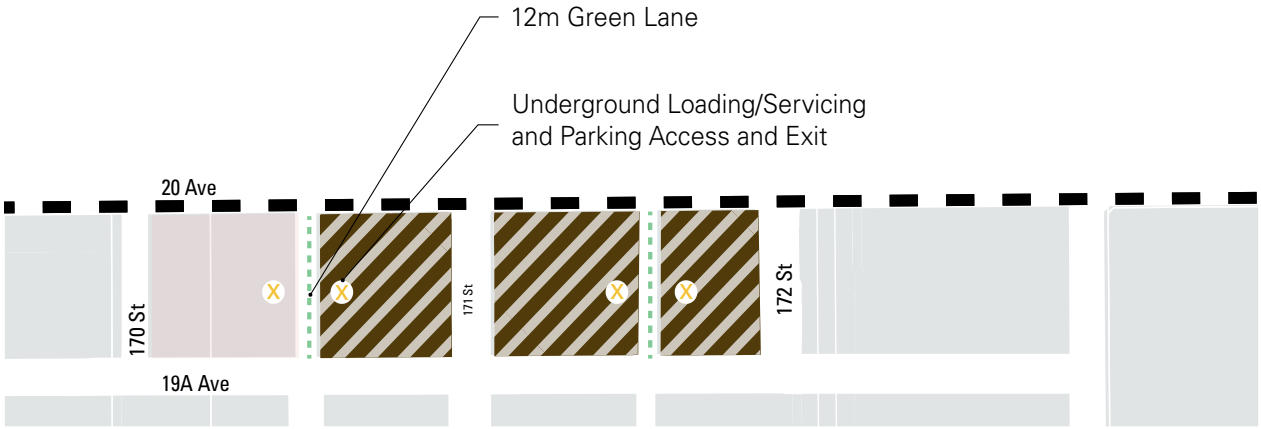
C. Stormwater management features (e.g. rain gardens, permeable paving) should be integrated into landscaping along the sidewalk edge and divert water away from the storm drain as much as possible.

D. Buildings and structures will provide setbacks from sensitive ecosystem areas, such as streamside protection areas and GIN features (as per DP3 guidelines). This is to ensure maintenance and access to all sides of the building without encroachment into protected areas.

Loading Areas & Vehicular Access

A. Provide back of house access, loading, and servicing from lanes and not from 20 Avenue, 19A Avenue, 170 Street, or 171 Street.

Figure 4.2 Mixed-Use Loading Areas



Top
Storefront weather protection

Middle
Generous commercial setback with street trees and seating

Bottom
Pedestrian friendly green lane with a sidewalk and treed boulevard

Illustration - Urban Village Design

4.3 Commercial Design Guidelines

Scale, Form & Massing

A. Buildings at the corner of 168 Street and 20 Avenue should have a distinct form to increase visibility and be easily distinguishable from surrounding buildings.
B. Integrate publicly accessible open spaces (e.g., pedestrian paths and small plazas) to increase pedestrian permeability and facilitate ease of movement.
C. Architecturally screen roof top equipment from street view and overlook from above.

Ground Floor Interface

A. Orient storefronts and principal entries towards 20 Avenue and 168 Street, then onto 168A Street to engage the public realm. Minimize the number of doors oriented towards the parking area and limit its function as secondary access only.
B. Locate parking areas away from the street frontages of 20 Avenue, 168 Street and 170 Street.
C. Locate parking access from lanes to avoid interruption along streets. Use lane access as the primary location.
D. Limit the amount of vision glazing oriented towards the parking area.
E. Locate the lobbies and entrances to upper storeys along important thoroughfares, but secondary to commercial entries in prominence and location.
F. Wrap ground floor retail around building corners along intersecting streets.
G. Set main building entrance flush with the adjacent sidewalk grade without the need for exterior transitions such as steps or ramps.
H. Provide ground floor commercial retail unit heights of at least 4.5 m floor to floor.
I. Cover walkways and storefronts with weather protection canopies at least 1.8 m deep.
J. Avoid having columns along commercial frontages.
K. Avoid blank wall conditions, including opaque or obscured glazing along streets.
L. Avoid placing inactive spaces along street frontages, including storage, washrooms, mechanical, utilities or similar with access doors and panels.

Setbacks & Landscaping

A. Setbacks
   - 20 Avenue: minimum 2 m
   - 168 Street: minimum 4 m
   - 168A Street: 2 m
   - Pedestrian Street: minimum 3 m to commercial building or parking areas.
   - No parking in setbacks.
B. Incorporate at-grade street planters and ensure generous soil volumes for landscaping.
C. Screen parking areas from public view with a landscape buffer at least 3 m wide.

Top
Pedestrian-friendly store-front and plaza

Middle
Safe and attractive pedestrian walkway

Bottom
Weather protection and simple, pedestrian-focused signage

Building Elements

A. Use contemporary architectural forms clad in traditional building materials (such as, brick, durable and high-quality masonry, wood and glass).
B. Feature fabric awnings (excluding vinyl) to create a less formal appearance. Awnings should have slope (approximately 30 degrees) generally consistent between properties.
C. Storefront design should provide a distinction between adjacent units by incorporating variety in design elements and materials.
D. Refuse facilities are encouraged to be housed within the building envelope.
E. Screen and architecturally integrate wireless communication equipment into the building.

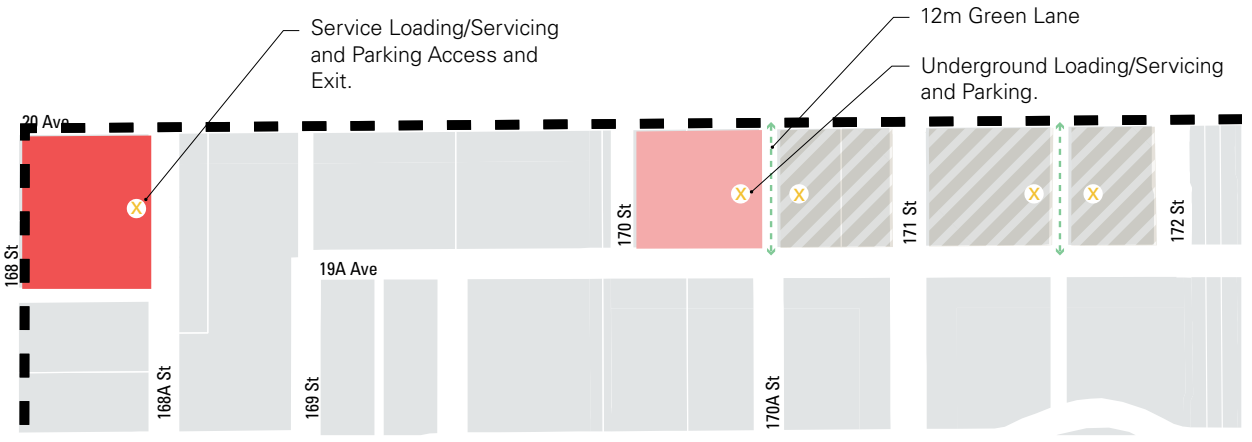
Signage & Lighting

A. Integrate signage into the building architecture, so that it is complementary and does not dominate the building elevation or site.
B. Small scale blade signs perpendicular to the sidewalk are encouraged for commercial premises.
C. Back-lit sign boxes and free-standing signs are not supported.
D. Make wayfinding signage non-obstructive to the pedestrian experience.

Loading Areas & Vehicular Access

A. Back of house access, loading and servicing should be provided from 168A Street.
B. Screen loading from street view or orient away from the street.

Figure 4.3 Commercial Loading Areas



Inviting and attractive commercial street

4.4 Low Rise Residential Design Guidelines

Scale, Form & Massing

A. Contemporary architecture with traditional forms and materials are encouraged.
B. Site buildings to achieve privacy and enjoyable open space between them. Buildings should be separated by at least:
   - 6 m between a building side and another building side.
   - 12 m between a building side and building front.
   - 20 m between a building front and another building in front when one of the buildings is 50 m wide.
   - 24 m between a building front and another building front when one of the buildings is more than 50 m wide.
C. Visually scale down buildings to a length of 50 m. Add scale and visual interest at street level by articulating the building facade and varying the building cladding composition.
D. Design lower floors to be in scale with the pedestrian environment and visually recede upper storeys to visually reduce heavy building massing.

Building Interface

A. Design lower floors to be in scale with the pedestrian environment.
B. Buildings should support a safe, comfortable and attractive public realm.
C. Frame development sites with built edges against all streets.
D. Clearly articulate and express a 2 to 3 storey townhouse appearance at the base of the building, sympathetic towards a residential scale.
E. Front doors and porches of units should face its adjacent street or lane and provide direct walkway access to the adjacent public thoroughfares. Walkways and steps should be oriented straight and not turned to the street or lane.
F. A separate entry porch to each ground unit should be expressed with weather protection over each entrance. This should provide direct access to the street or lane.
G. The paring of entrances or sharing of porches between units is discouraged in favour of separated ones to express the individuality of each unit.
H. Individual entrances should be complemented with landscaping including a flowering tree.
I. Main floor elevations should be set between 0.6 m to 1.2 m above the adjacent sidewalk grade. Step main floor elevation between units to follow the sidewalk grade.
J. Where raised patios are along a public thoroughfare, each tier of retaining wall is limited to 0.6 m high and a minimum of 1 m horizontal staggering. Facing material should be durable, high quality and in character with the building architecture. Each base of wall should include an irrigated landscape strip at least 1 m wide and 0.5 m at the uppermost tier. Any fence or guardrail should be located behind the landscape strips.
K. Active living spaces, such as living, dining rooms and kitchens, should face the street with overlooking windows at grade. Private bedrooms should be located on upper floors or away from unit frontages.
L. Inactive spaces such as indoor amenity rooms and service rooms should be located away from street interfaces.
M. Indoor and outdoor amenity areas should be located together to ensure they can be used together.

Top
Contemporary design with simple form and detailing

Middle
Setback with incorporated landscaping along street frontage

Bottom
Safe and attractive public realm

Materiality & Detailing

A. Materials should vary from building to building to provide variation and diversity in the streetscape. Limit the number of materials used within a single building.
B. Use simple window configurations.
C. Simple and timeless forms and detailing are encouraged; avoid trendy design features that detract from the quality of the neighbourhood.
D. Provide address and building name with fascia or canopy signs. Freestanding signs are not supported.

Setbacks

A. Provide a minimum street frontage setback of 5 m to incorporate landscaping, natural features and trees.
B. Specialty treatments such as gate markers to each unit, should be incorporated into the setback.
C. The exterior stairs, walkway and gate should be aligned with the front door.
D. Avoid fencing along public thoroughfare frontages and instead use layered landscaping, no higher than 0.9 m, comprised of evergreen shrubs and broadleaf low hedges. If fencing is unavoidable, show an open-style fence, no higher than 0.9 m and setback with at least 1 m of landscaping from public thoroughfare property lines.
E. Fencing on the top of wall should be setback 0.5 m from the face of wall and paired with landscaping in front of the fence.
F. Buildings and structures will adhere to setbacks from sensitive ecosystem areas, such as streamside protection areas and GIN features (as per DP3 guidelines). This is to ensure maintenance and access to all sides of the building without encroachment into protected areas.

Top
Landscaped entrances with individual trees

Middle
Modern character with generous landscape setting

Bottom
Clear and pedestrian-scaled townhouse expression at apartment base

4.5 Townhouse Design Guidelines

Scale, Form & Massing

A. Simple traditional architecture with verandas and porches are encouraged.
B. Extended porches and recessed entries should be used to articulate facades and reinforce residential character.
C. Vertical expression and identification of individual units should be emphasized while reinforcing a unified character.
D. Hidden and integrated roof top decks are encouraged within traditional roof forms.

Building Interface

A. A separate porch entrance to each unit should be expressed at the street level with weather protection over each entrance.
B. Incorporate a habitable room associated with the front entrance for units facing a public thoroughfare.
C. Buildings should support a safe, comfortable and attractive public realm. Design lower floors to be in scale with pedestrian environment and visually recede upper storeys to visually reduce the heavy building massing.
D. Corner units with street frontage should equally treat all street exposed sides as a primary facade, showing articulation, windows and doors. Avoid blank walls, while maximizing window opportunities. Verandas sized for seating are encouraged.
E. The paring of entrances or sharing of porches between units is discouraged in favour of separated ones to express the individuality of each unit.
F. Front doors and porches should face the street with steps leading straight to the street (not turned).
G. Individual entrances should be complemented with landscaping inclusive of flowering trees. A consistent approach should be taken on each streetscape while offering a diversity of species throughout the development.
H. Main floor elevations should be set between 0.6 m to 1.2 m above the adjacent sidewalk grade. Step main floor elevation between units to follow the sidewalk grade.
I. Where development is adjacent to natural areas, protection and incorporation of native plans and trees, natural water features, and biodiversity elements (e.g. pollinator meadows) should be provided.
J. Avoid fencing along public thoroughfare frontages and instead use layered landscaping, no higher than 0.9 m, comprised of evergreen shrubs and broadleaf low hedges. If fencing is unavoidable, show an open-style fence, no higher than 0.9 m and setback with at least 1 m of landscaping from public thoroughfare property lines.
K. Where raised patios are along a public thoroughfare, each tier of retaining wall is limited to 0.6 m high and a minimum of 1 m horizontal staggering. Facing material should be durable, high quality and in character with the building architecture. Each base of wall should include an irrigated landscape strip at least 1 m wide and 0.5 m at the uppermost tier. Any fence or guardrail should be located behind the landscape strips.
L. Provide a variety of evergreen and deciduous plantings along interfaces with riparian and park lands.
M. All landscape plantings should refer to the City's Biodiversity Design Guidelines and be either native or non-invasive and species that attract pollinators is desirable. Drought tolerant species selection is highly encouraged. Where selected species will require additional watering, irrigation should be provided.

Top
Pedestrian-friendly and contemporary interpretation of traditional form

Middle
Mature landscape incorporated with new development

Bottom
Individual unit identity with weather protection and a private patio

N. Avoid placing balconies directly above the porch to retain the sense of entry at ground level.
O. Active living spaces, such as living, dining rooms and kitchens, should face the street with overlooking windows at grade. Private bedrooms should be located on upper floors or away from unit frontages.
P. Inactive spaces such as indoor amenity and service rooms should be located away from street interfaces.
Q. Indoor and outdoor amenity areas should be located together to ensure they can be used together.
R. Refer also to 4.7 Urban Transitions.

Materiality & Detailing

A. Building materials should be durable and of high quality.
B. Design of buildings should encourage noise mitigation strategies such as building orientation, the number, size and locations of windows, other acoustic mitigating construction details and dense landscaping.
C. Use simple, thoughtful detailing including intentional transitions between materials.
D. Historic details such as brackets and gable vents are discouraged.
E. Provide address and project name at driveway entries, incorporated into landscape features. Freestanding signs are generally not supported.

Setbacks

A. Provide a minimum street frontage setback of 5 m to incorporate varied landscaping, natural features and trees (refer to the City's Biodiversity Design Guidelines for planting).
B. Provide additional building setback and landscaped buffering along Highway 15, that includes year round robust screening.
C. Provide a minimum of 2.5 m driveway aprons to include trees along drive aisles between garages.
D. Encourage street border planting with evergreen shrubs and low broad-leaf hedges.
E. Each unit should provide a mid-size flowering tree or coniferous tree in the front setback.
F. Fencing is discouraged along the public realm frontages. Use shrubs no higher than 0.9 m in lieu of fencing; however, if still proposing fencing, set it back at least 1 m from the property line and place 0.5 m width of layered shrubs and a 0.5 m width sod strip in front. Fencing should be no higher than 0.9 m.

Top
Traditional form and modern character

Middle
Welcoming landscaped path

Bottom
Attractive and friendly landscaped interface to open space

4.6 Institutional Design Guidelines

Building Interface, Setbacks

A. Prioritize the building connection to the street with pedestrian oriented frontages, door access and circulation over vehicular movement and parking areas.
B. Minimize setbacks without parking in front of the building to frame and engage the street with the building.
C. Expose the day-to-day activities of the building interior to the streetscape to animate the street.
D. Active uses should be located along the street and other public realm interfaces.
E. Avoid placing loading areas along the public realm interfaces.

4.7 Urban Transitions

Special interface cross-sections have been developed to accommodate unique design considerations for areas adjacent to parks, riparian areas, agricultural edges, habitat corridors, landscape buffers, and along hillsides. These unique transition areas are intended to maximize the amenity of public land and natural areas. New development is expected to conform to these urban transitions identified and illustrated in figures 4.7A to 4.7H.

*Note: Where applicable, final road alignment subject to confirmation of design grades.

Top
Detailed and engaging architectural form and elements

Middle
Transparent interactive building edge

Bottom
Contemporary design with welcoming streetscape and comfortable public realm

Transition 1

Highway 15 Transition Buffer & 10 m Road

Transition 1 will provide a buffer between Highway 15 and future development. It is intended as a 10 m road corridor to support a 4 m multi-use pathway and treed boulevard. An additional 11 m setback should be located between the new property line and future development. Development will fund noise reduction features such as berms or walls as required (on private property).

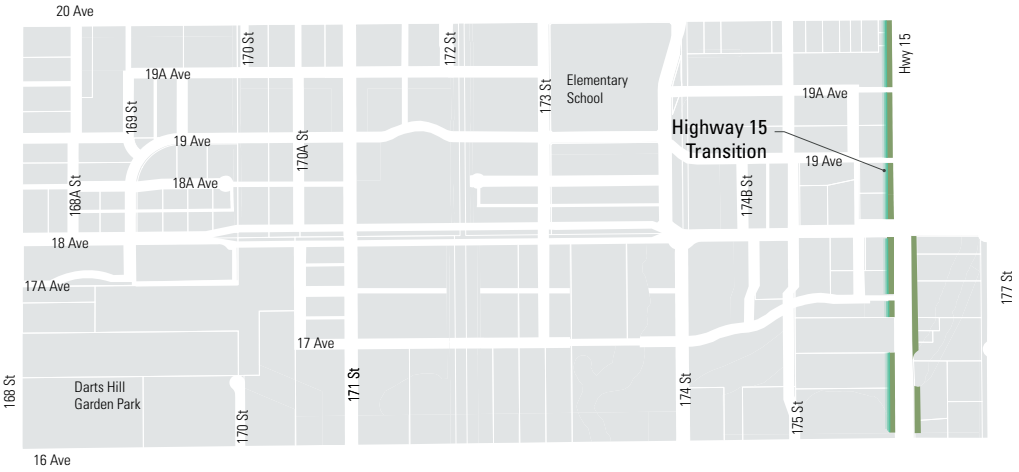
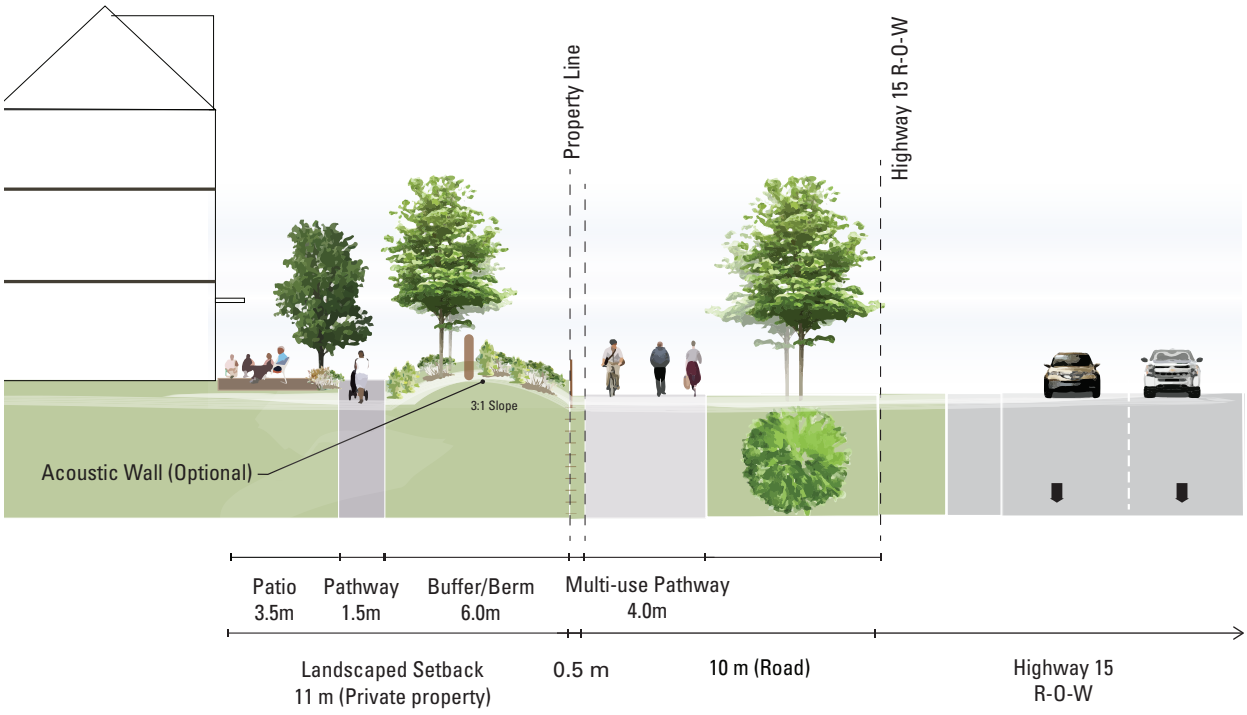


Figure 4.7A
Transition 1
Cross Section

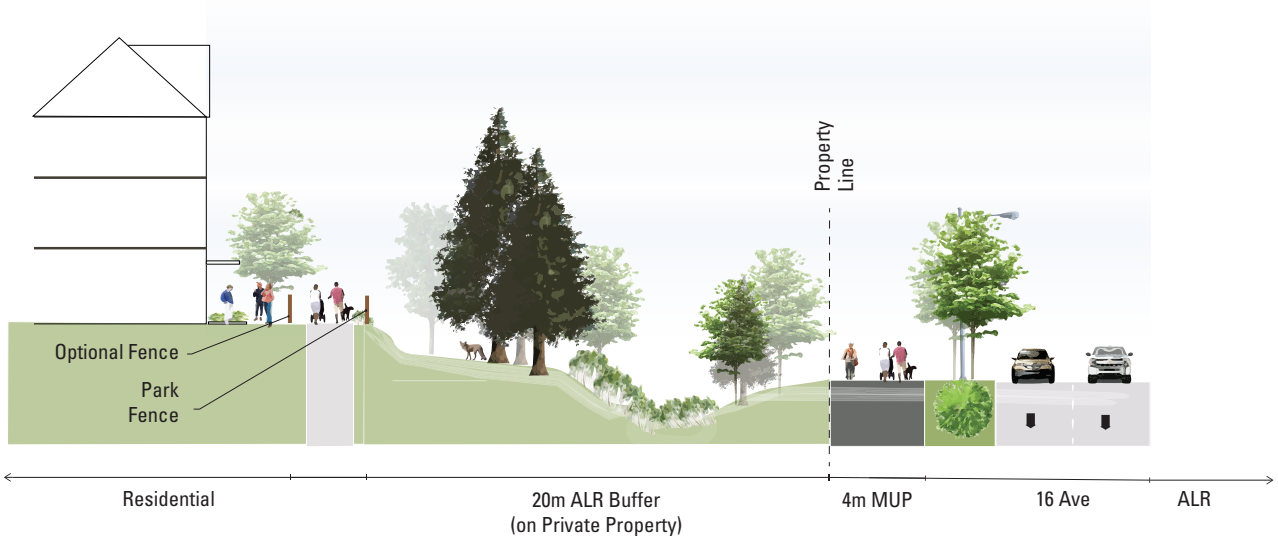


Transition 2

16 Avenue & ALR Transition Buffer

Transition 2 is intended to create a landscaped buffer to lands adjacent to the ALR Boundary. A minimum 20 m landscaped or natural forested buffer along 16 Avenue between 174 Street and 177 Street will provide natural vegetation, trees, berms, noise mitigation features to help reduce urban-rural conflict.

Figure 4.7B
Transition 2
Cross Section

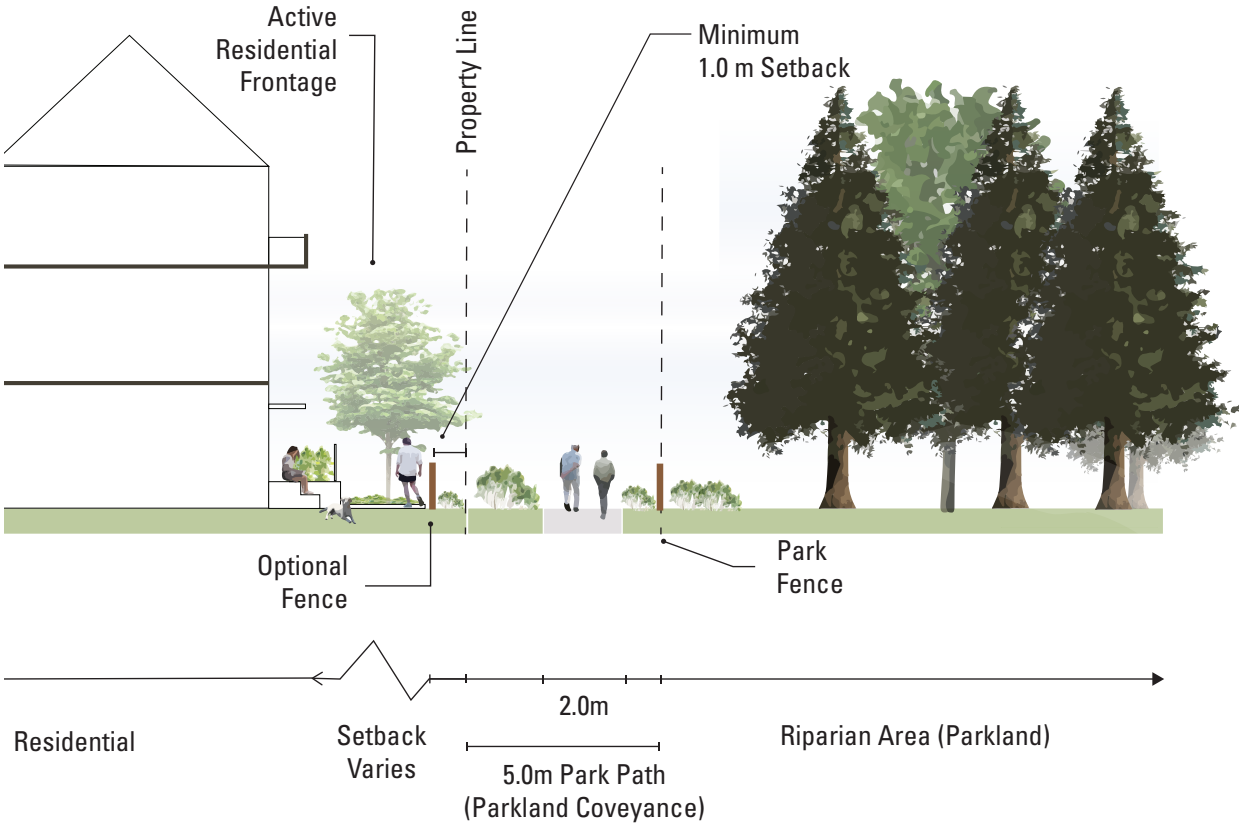


Transition 3

Primary Park Pathway & Central Riparian Area Frontage - 5 m path

Apply Transition 3 to development adjacent to the central North/South riparian area where a primary park pathway is designated (see Section 6.4 for details). Development should front onto the pathway which is adjacent to riparian area with front-facing doors, windows, and porches. Private fencing (optional) should be permeable, no higher than 0.9 m, and located on private property set back a minimum of 1 m from the property line with low planted landscaping in front.

Figure 4.7C
Transition 3
Cross Section



Transition 4

Biodiversity Corridor Pathway Frontage

Apply Transition 4 to development adjacent to areas where a biodiversity corridor pathway is designated (see Section 6.4 for details). Development should front onto the pathway which is within the adjacent biodiversity corridor with front-facing doors, windows, and porches. Private fencing (optional) should be permeable, no higher than 0.9 m, and located on private property set back a minimum of 1 m from the property line with low planted landscaping in front.

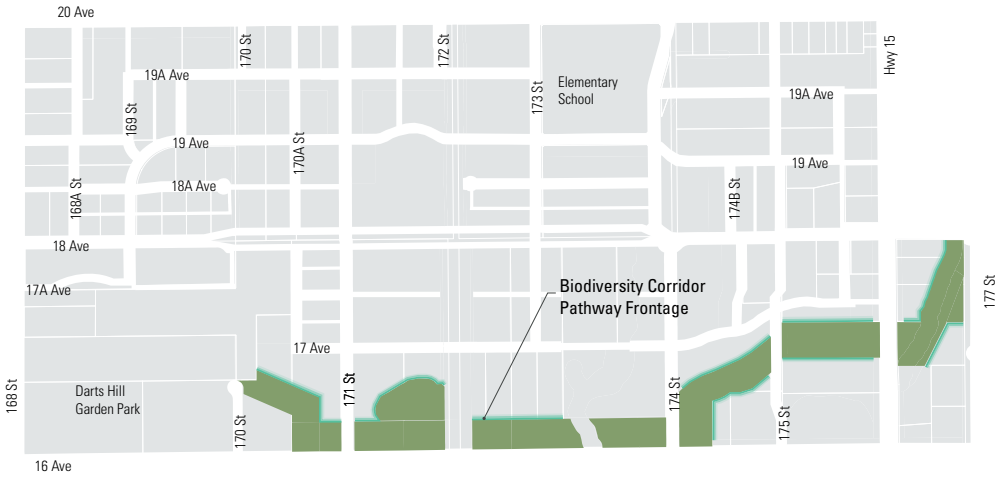
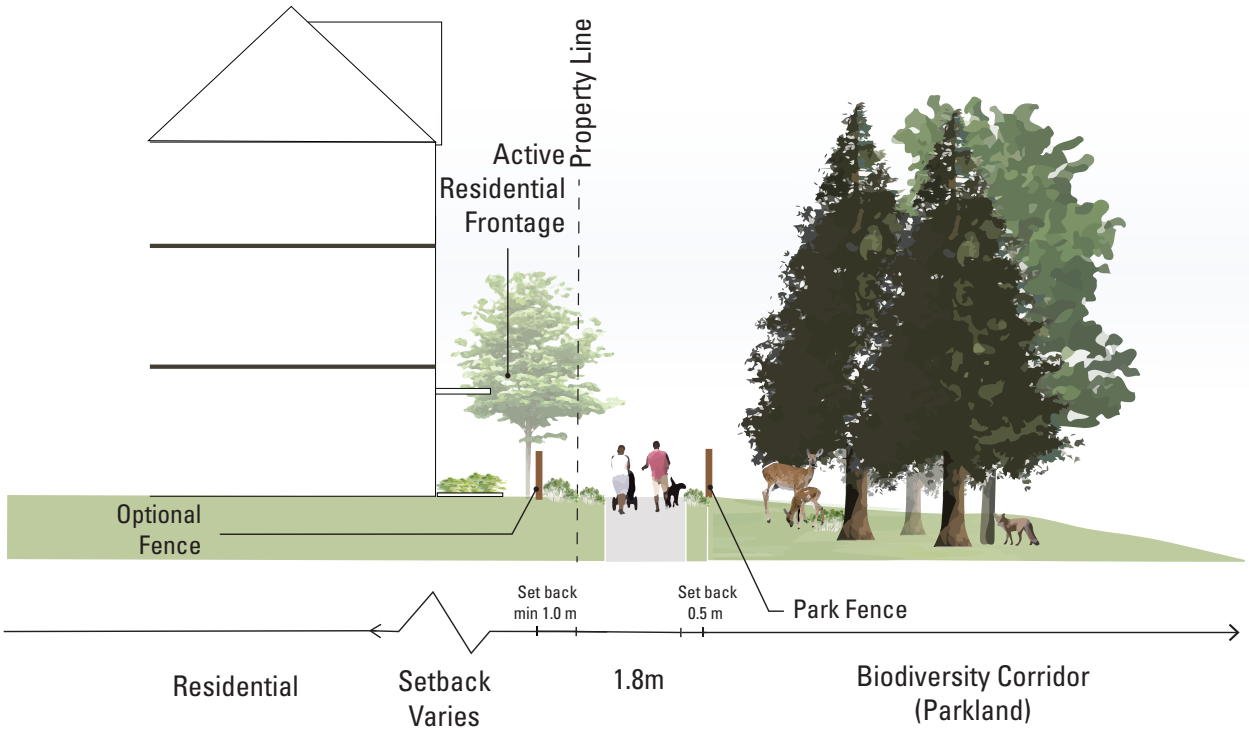


Figure 4.7D
Transition 4
Cross Section



Transition 5

Secondary Public Pathway & Riparian Area Frontage - 3.3 m path

Apply Transition 5 to development adjacent to areas where a secondary park pathway is designated (see Section 6.4 for details). Development should front onto the pathway which is adjacent to riparian areas with front-facing doors, windows, and porches. Private fencing (optional) should be permeable, no higher than 0.9 m, and located on private property set back a minimum of 1 m from the property line with low planted landscaping in front.

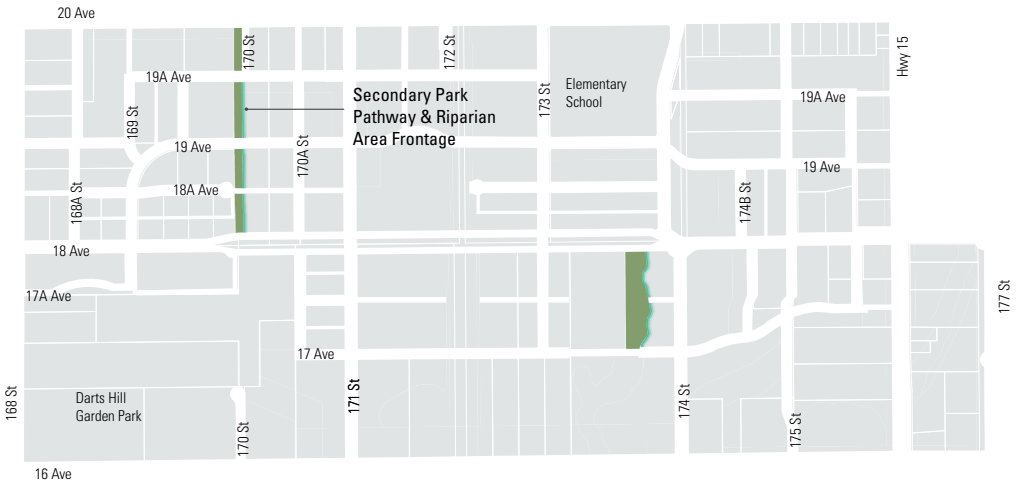
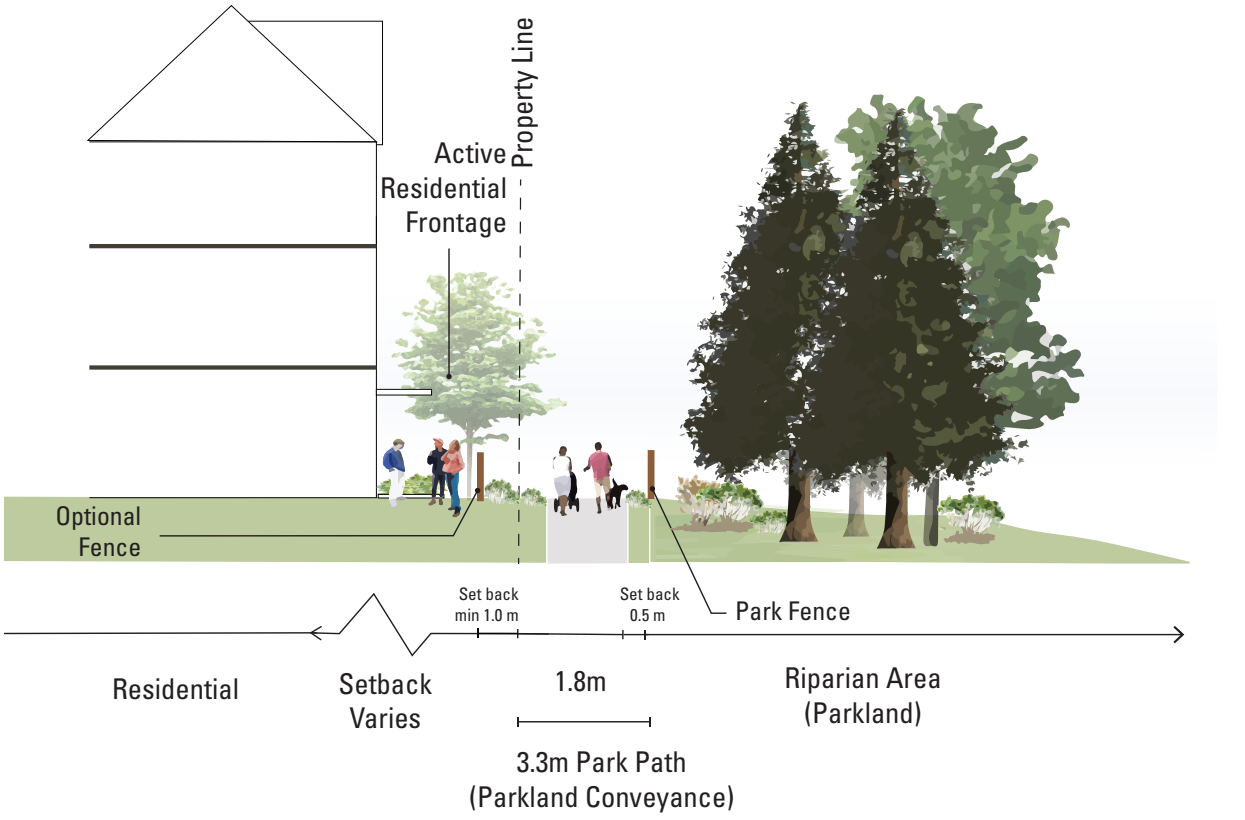


Figure 4.7E
Transition 5
Cross Section



Transition 6

Multi-Use Pathway Frontage -10 m Pedestrian Street

Apply Transition 6 to development adjacent to dedicated multi-use corridors within Pedestrian Street designations (see Section 5.3 for details). Individual units should provide direct front door access onto the pathway, which is dedicated as road right-of-way. Private fencing (optional) should be permeable, no higher than 0.9 m, and located on private property set back a minimum of 1 m from the property line. Adjacent development is responsible for the maintenance of grass or planted boulevards as per the City's Road Maintenance By-law.

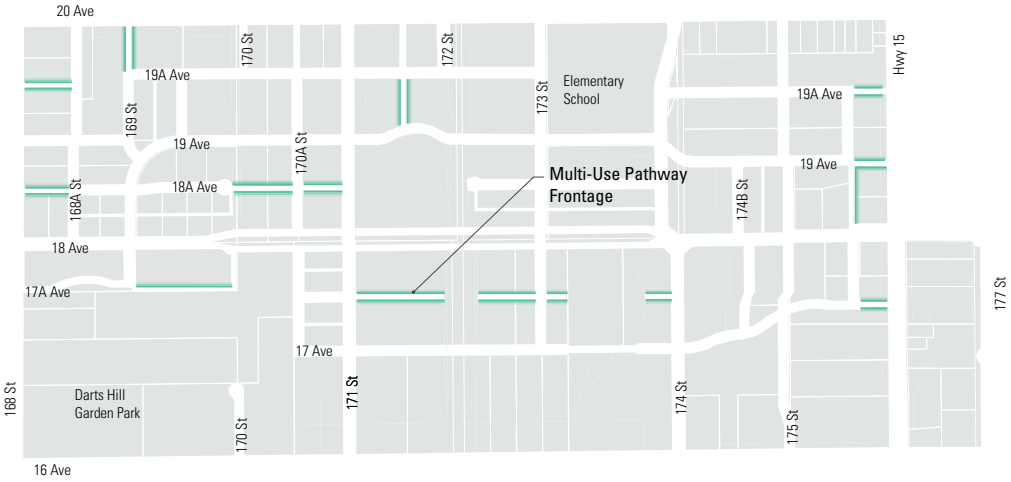
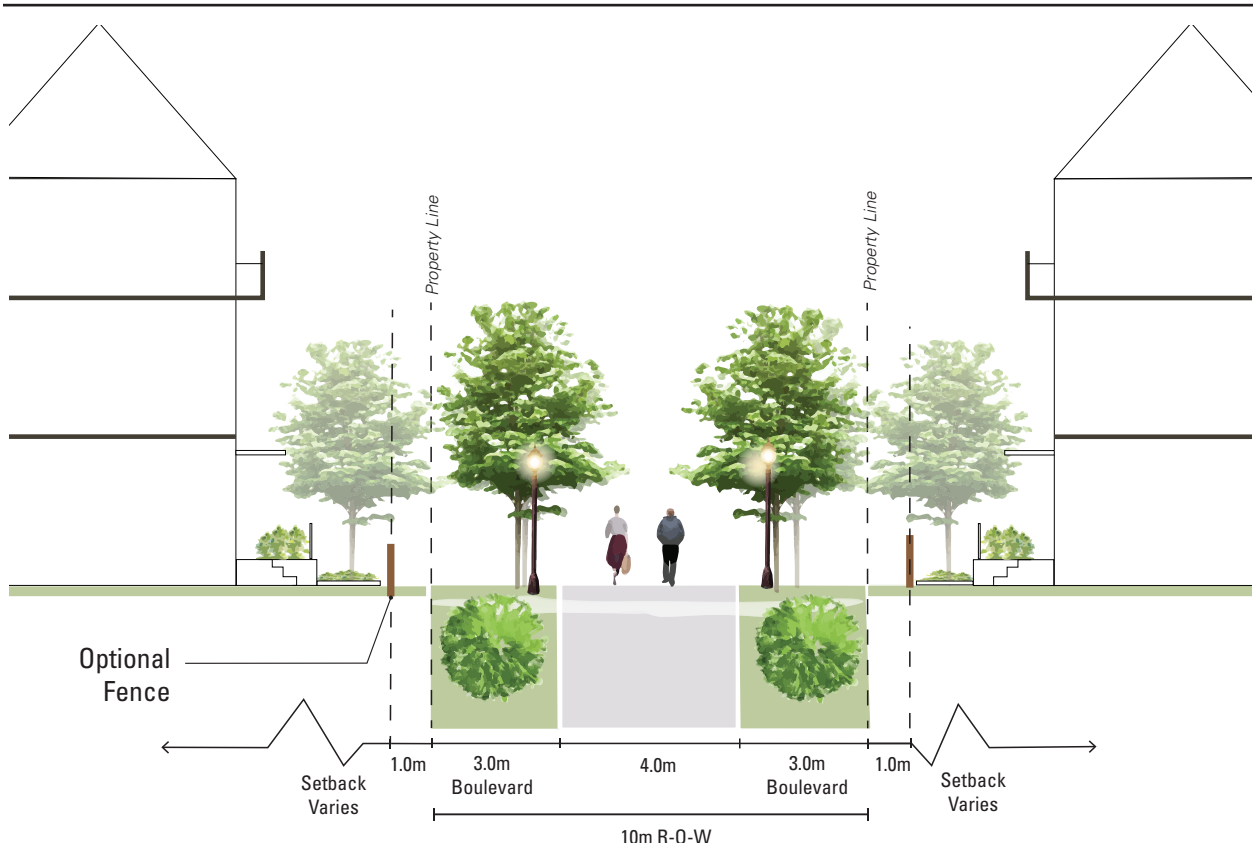


Figure 4.7F
Transition 6
Cross Section

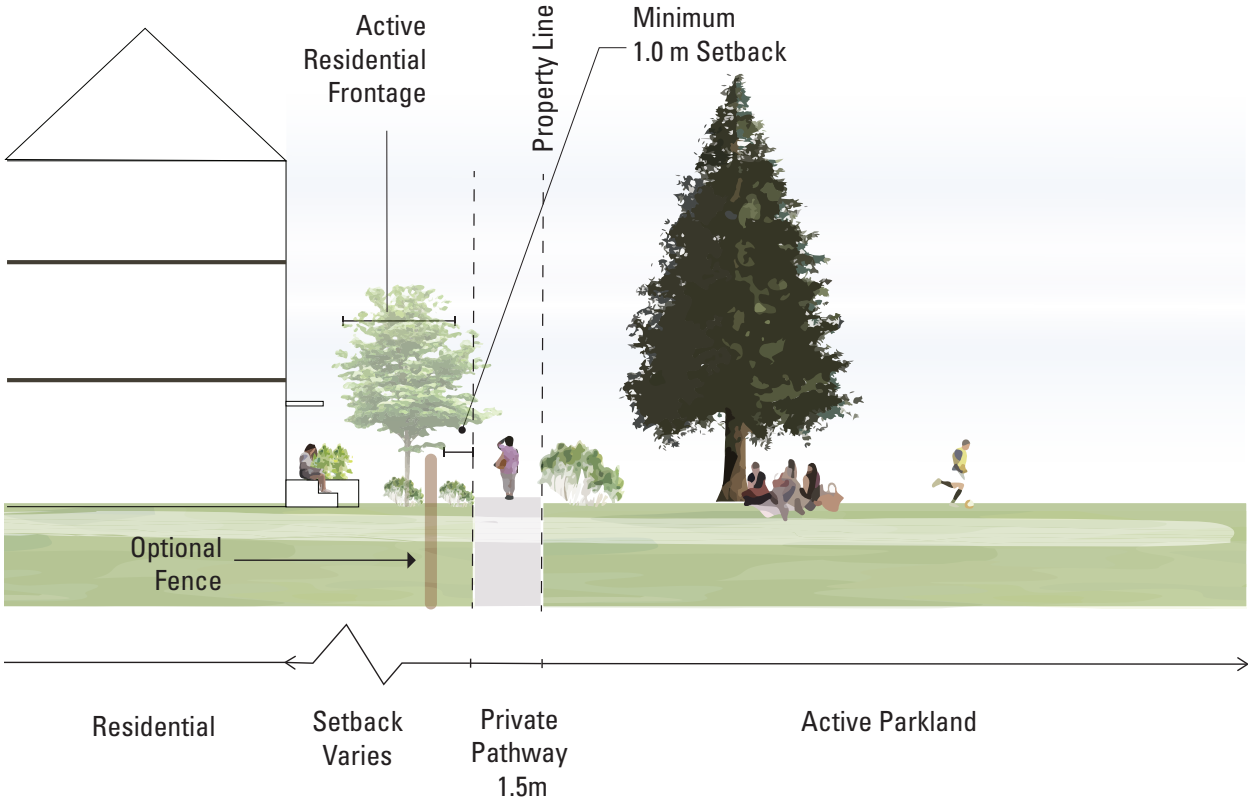


Transition 7

Active Parkland Frontage

Apply Transition 7 to development adjacent to active neighbourhood parkland. Development should front onto active parkland with front facing doors, windows, active rooms, and porches. Development should provide frontage pathway along the park interface located on private property with no fence between the path and parkland. Private fencing (optional) should be permeable, no higher than 0.9 m, and located on private property set-back a minimum of 1 m from a required on-site pathway with layered planting/ landscaping in front.

Figure 4.7G
Transition 7
Cross Section



Transition 8

Private/Public Pathway Frontage

Apply Transition 8 to areas adjacent to riparian areas where a public pathway is not identified. Development is encouraged to provide a minimum 1.8 m pathway on private property setback 0.5 m from the riparian areas. Development should front onto the riparian area with front facing doors, windows, active rooms, and porches. Private fencing (optional) between the residential frontage and the private pathway should be permeable and no higher than 0.9 m, setback 1 m away from the walkway. Fencing is required at the boundary of the riparian area or along the inside of a private property line.

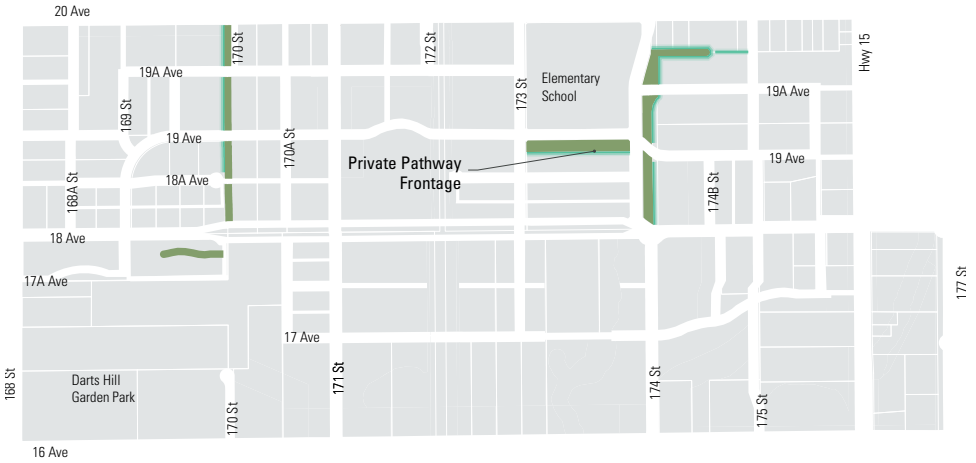
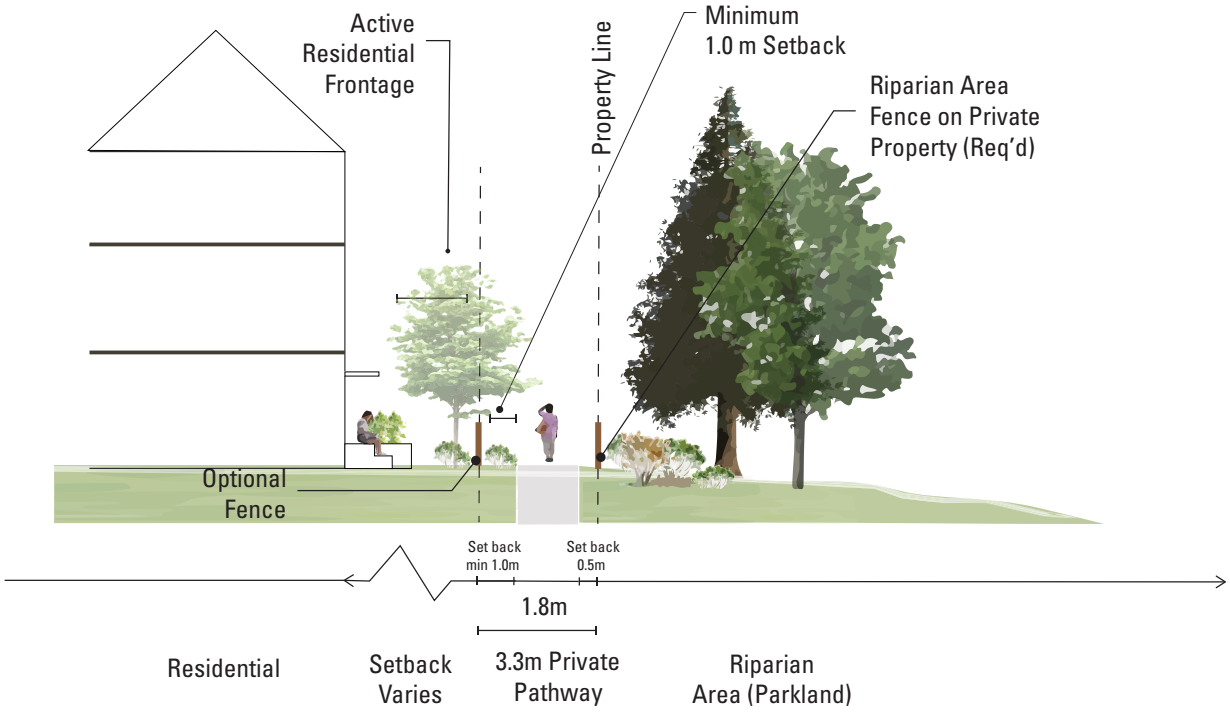


Figure 4.7H
Transition 8
Cross Section



"Create bike lanes and bike routes through this area that have safe road and highway crossings."

Survey Response, Darts Hill Plan Process, 2018-2020

5 Transportation
| How We Get Around

The transportation component for the Plan follows the guiding principles outlined within the City's Transportation Strategic Plan (Surrey Transportation Plan) and supplementary plans, including the Walking Plan, Cycling Plan, and Vision Zero Surrey Safe Mobility Plan. It outlines how a finer grain mobility network will support compact neighbourhood development while delivering safe and efficient travel options for all residents.

5.1 Transportation Strategy

A high-quality multi-modal transportation network will support the neighbourhood's transformation into a compact, complete, and accessible community. The transportation strategy provides an open, connected, and continuous street network that supports cycling and pedestrian connectivity, transit service, and compact neighbourhood development. The street network is complemented by an integrated network of off-street pathways and open spaces. The future concentration of people and activities highlights the importance of:

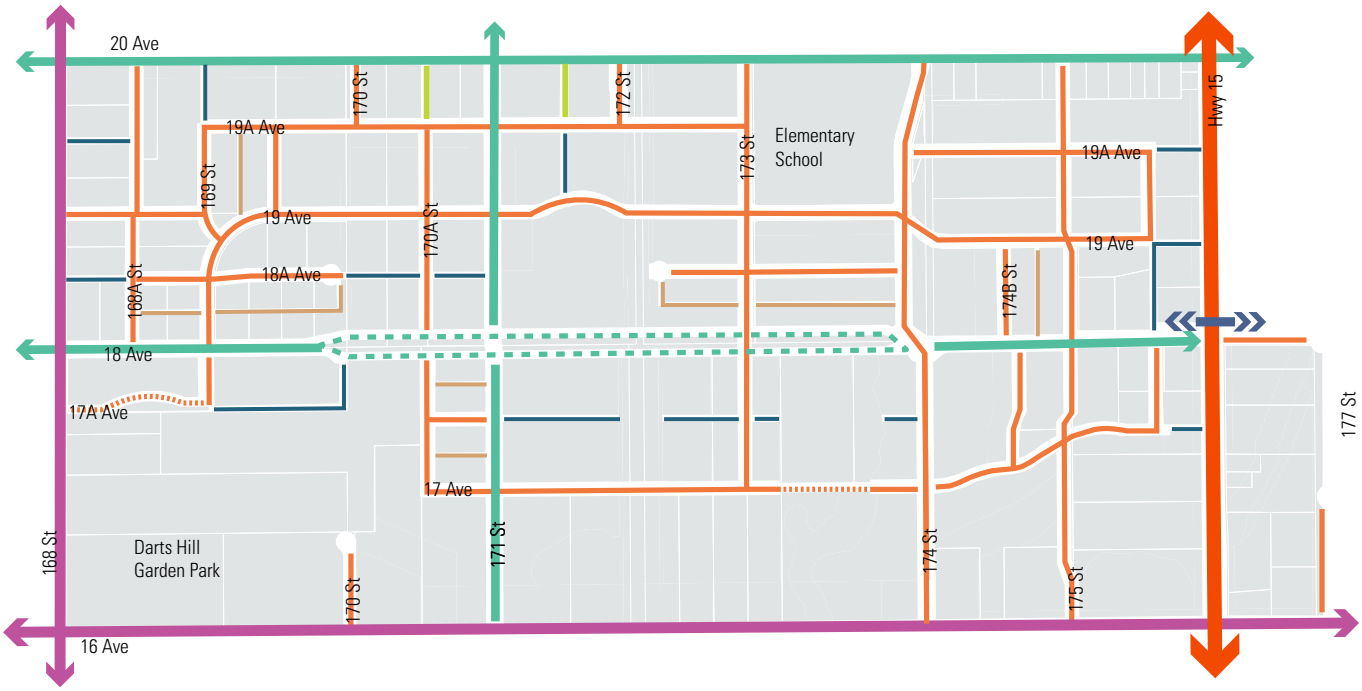
- Creating an efficient transportation system and improving connections to Grow the Transportation Network;
- Using a safe systems approach and applying Complete Streets for Prioritizing Vision Zero;
- Encouraging active transportation and reducing car reliance to Tackle the Climate Crisis;
- Requiring development to innovate through Technology and New Mobility; and,
- Providing transportation solutions for both new and existing residents to Balance Equity

*Note: Final road alignment of 171 Street, 174 Street, and 175 Street subject to confirmation of design grades.

LEGEND

- Provincial Highway
- Arterial
- Collector (24 m)
- Special Divided Collector
- Local (20 m)
- Unique Local
- Pedestrian Street (10 m)
- Lane
- Green Lane (12 m)
- Pedestrian Bridge

Figure 5.1: Transportation Strategy



Street Network

The Plan focuses on a street network that is finer grained, interconnected, and supports a continuous street grid. It emphasizes walking and cycling, while providing for efficient vehicle and goods movement.

The street network will improve connectivity and access, support planned transit service on 20 Avenue, and create smaller blocks that promotes active transportation. With a higher intersection density, protected cycling facilities, and unique and narrowed street sections, the network will also encourage slower vehicle speeds in support of Vision Zero principles to protect all road users.

The street network includes a hierarchy of ministry highways, arterial, collector, and local roads. Pedestrian streets, off-street pathways, parks, and plazas will also provide supplementary connections that support mobility and placemaking. Together, they create a network that meets the transportation demands of anticipated growth.

The street network design was influenced by existing environmental and landscape conditions. Preservation of riparian areas and sensitive ecosystems were prioritized in keeping with the City's commitments to biodiversity conservation and the principles of this plan. Where impacts to riparian areas and other sensitive ecosystems are unavoidable, re-location or compensation will be considered. This work, including 5 years of maintenance and monitoring, is required by the developer as part of road frontage construction.

Much of the street network does not currently exist or exists in rural standard. As such the network is disconnected and largely without basic walking and cycling infrastructure. To complete the Planned network, new collector road connections, local roads, and pedestrian streets will be delivered primarily through development. Arterial road improvements will be delivered by the City through capital road improvement projects.

Road Standards

All typical roads within the Plan Area will follow the City's Engineering Design Criteria and Supplementary Standard Drawings. In addition to typical road standards, a number of unique roads and cross-sections have been identified given the relationship with its existing surrounding context and future land uses. Road cross sections highlight the different roles, function, and character of each street.

5.2 Traffic Analysis

The existing road network of the Plan Area was developed to serve rural and suburban land uses. The absence of a significantly developed local road network means existing traffic relies on a few key roadways.

Modeling study

A consultant, WSP, was retained by the City to provide transportation modelling and analysis for the Plan Area. The methodology for this work included:

- Documenting existing traffic conditions and traffic volumes;
- Developing trip generation for the Plan Area based on the proposed land uses (include commercial and school related trips);
- Distributing Plan Area trips based on the City's travel demand model (EMME/3 Surrey Sub Area Model) and Institute of Transportation Engineers (ITE) Trip Distribution principles;
- Assigning trips to the adjacent road network based on trip distribution;
- Analyzing peak hour traffic volumes;
- Identifying and recommending appropriate infrastructure improvements necessary to accommodate estimated traffic volumes; and,
- Reviewing potential safety issues within the Plan Area.

Trip Generation

The table below summarizes the findings for the PM peak hour trip generation. Trip generation rates used average estimates for each land use category. Based on the standard deviation in rates, the total trips generated range from 1,294 to 2,825 trips in the PM Peak hour. It is expected with a 68% probability that the actual trip generation falls in this range.

Typical elementary school PM trip generation was not included. This was due to school operating hours. Also, it was assumed that approximately 50% of single family dwellings will accommodate a secondary suite. This would represent an increase of 4% in the PM Peak Hour trips generated. These extra trips are not anticipated to have a significant effect on operations.

Table 5.2: Trip Generation

Land Use	Land Use Quantum	Trip Direction		Trip Generation (PM Peak)		
		In	Out	Total	In	Out
Neighbourhood Commercial	54,890 sqft.	43%	52%	349	167	181
Low Rise Mixed-Use	278 Units	70%	30%	100	70	30
Low Rise Apartment	83 Units	61%	39%	37	23	14
Townhouse	887 Units	61%	39%	360	220	140
Multiple Residential	1,459 Units	63%	37%	642	404	237
Semi-Detached Residential	174 Units	63%	37%	173	109	64
Detached Residential	416 Units	63%	37%	399	251	148
Institutional	750 Students	48%	52%	0	0	0
Total				2,060	1,244	815

Results

Ultimate traffic volumes were determined by adding development generated and future background volumes. The proposed development is forecast to generate:

- 1,709 new trips (514 entering and 1,194 exiting) during the weekday AM peak hour
- 2,060 new trips (1,229 entering and 800 exiting) during the weekday PM peak hour.

Modeling indicates no capacity issues at stop controlled or roundabout intersections during both peak hours. This applies up to the 2050 planning horizon. Most signalized intersections also perform without capacity issues during both peak hours. The two signalized intersections that experienced capacity issues are:

- 16 Avenue & 168 Street
- 16 Avenue & 176 Street (Highway 15)

Both intersections would benefit from dual eastbound to northbound left turn bays and a dedicated southbound right turn lane. The 168 Street intersection will be planned and protected for at both intersections. The improvements at Highway 15 will be coordinated with the Ministry of Transportation and Infrastructure (MoTI) as part of future intersection upgrades.

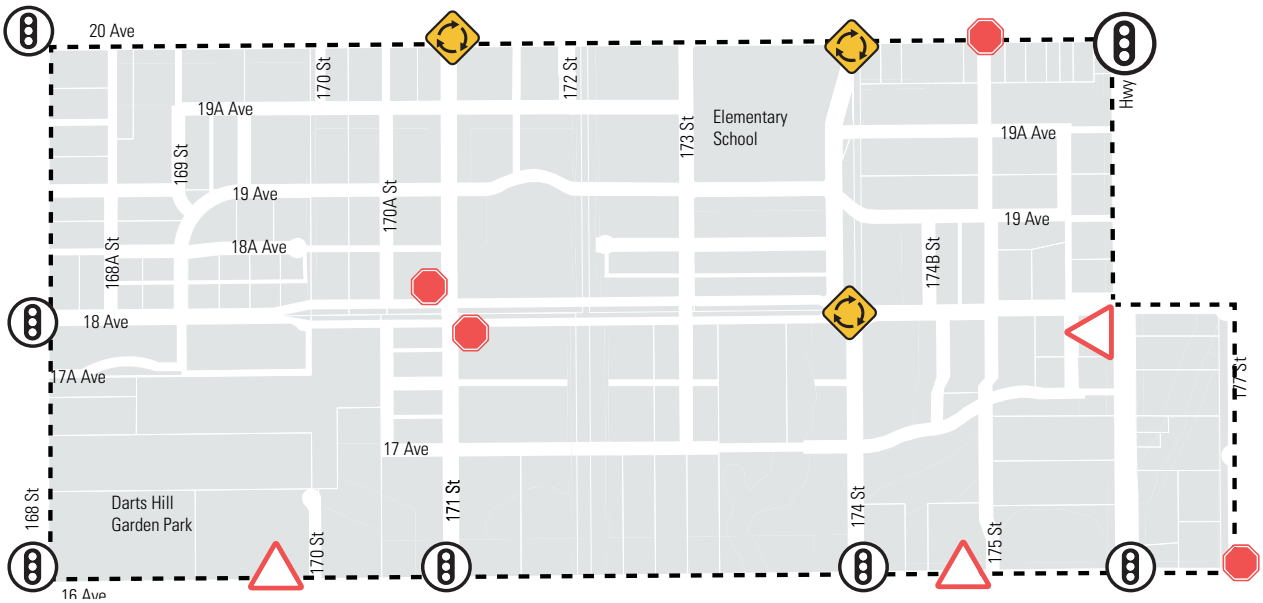
Based on Travel Demand Forecasting from the Surrey Sub Area Model, 16 Avenue will be at or near capacity in 2050 with over 1,400 vehicles per hour in the peak direction. With 10% or greater as heavy trucks protection for additional travel lanes for transit and or goods movements is critical to maintain the efficient movement of people and goods on this regional corridor.

Peak hour left-turn movements at the 168 Street and 16 Avenue intersection are expected to experience capacity issues. These can be addressed through future intersection design and improvements. Future improvements at the intersection of Highway 15 and 16 Avenue will be coordinated with the Ministry of Transportation and Infrastructure (MoTI).

Topography

Due to the presence of the steep slopes in the Plan Area, analysis was also undertaken to support profiles and cross-sections of critical roads. The study scope included potential recommendations for alternative alignments to guide future detailed design and development. The analysis identified that three roads profiles, 171 Street, 174 Street, and 175 Street currently exceed Design Criteria maximums. In consideration of the steep slopes, the road profiles can have a maximum 2% variance and will be confirmed through the detailed design process.

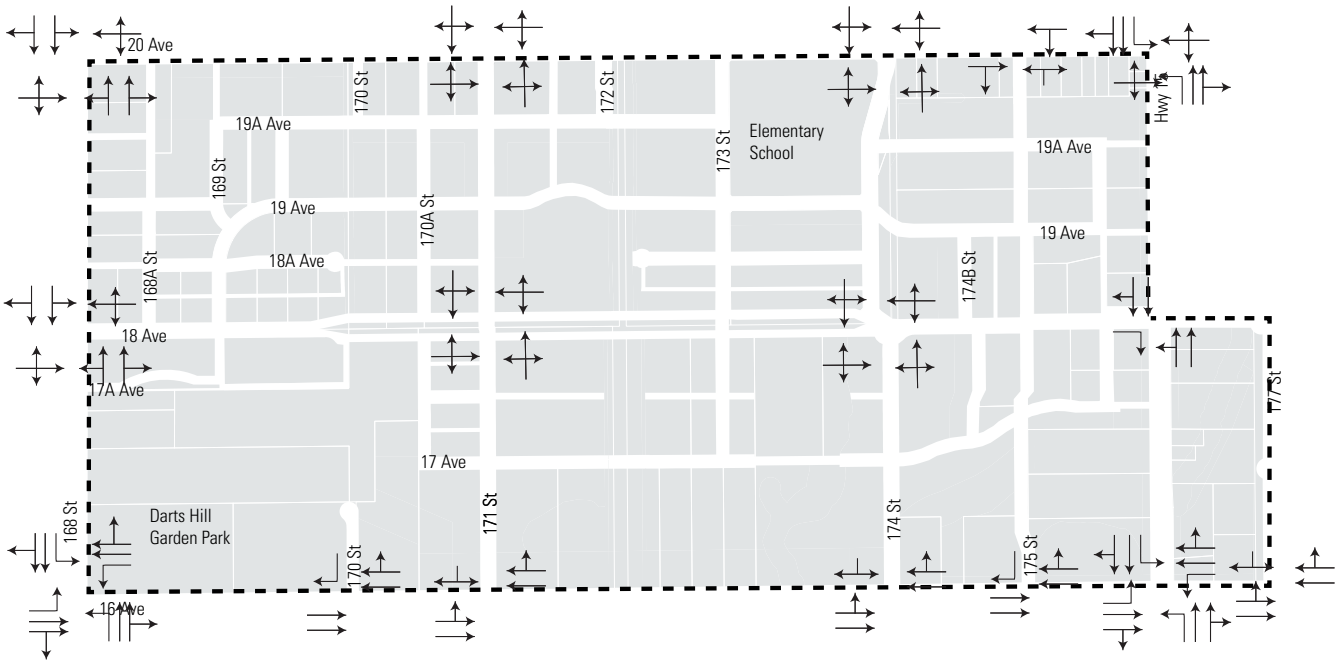
Figure 5.2A: Intersection Controls



LEGEND

- Signalized Intersection
- Stop Control
- Yield Control
- Roundabout

Figure 5.2B: Laning Configuration



5.3 Street Typologies

Arterial Roads

Existing

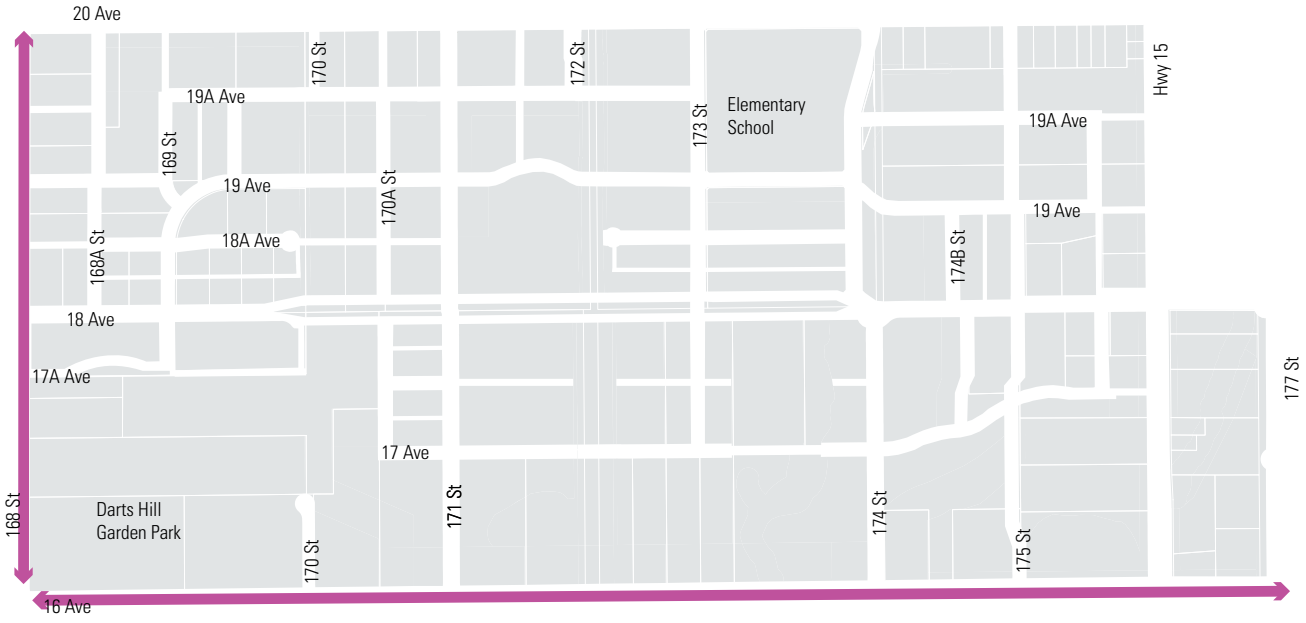
The Plan Area is well defined by the Ministry of Transportation and Infrastructure's (MoTI) Arterial Highway 15 (176 Street) and two City arterial roads; 168 Street and 16 Avenue. The arterial highway and arterials are the key transportation corridors for moving people and goods through the area and across the city.

- 176 Street (Highway 15/Pacific Highway) is a four lane Provincial highway along a portion of the eastern boundary of Darts Hill that connects to Highway 1 in the north and to the Pacific Highway (Truck) border crossing in the south.
- 16 Avenue is an east-west two-lane undivided arterial road along the southern boundary of the Plan Area. It connects from the Semiahmoo Peninsula to the west, to the Township of Langley to the east, including an interchange at Highway 99. It is also part of TransLink's Major Road Network (MRN), and a designated truck route. Riparian areas along 16 Avenue can be significantly improved with fish passage during construction.
- 168 Street is a north-south two-lane undivided arterial road along the western boundary of the Plan Area. It currently connects from 8 Avenue to the south, and up to 96 Avenue in the north.

Planned

To support growth, widening and improvements on 16 Avenue and 168 Street are planned. These improvements include sidewalks, one-way separated bike lanes (cycle tracks) and multi-use pathways. These will encourage active transportation by providing more comfortable, connected, and safer environments. Improvements will also reduce the reliance on cars for shorter trips in the broader Grandview Heights community.

Figure 5.3A: Arterial Roads



The arterial road standard in Surrey is a complete street standard. The standard includes two traffic lanes in each direction, landscaped median/left turn bay, treed grass boulevards, sidewalks, cycling facilities and street lighting. They are also key routes for public transit and emergency services. Typically, improvements to arterial roads are undertaken as part of City capital works and prioritized through the City's 10 Year Servicing Plan.

176 Street (Highway 15/Pacific Highway)

The Ministry of Transportation and Infrastructure (MoTI) are in the process of completing a comprehensive corridor study for Highway 15, which could identify improvements adjacent and through the Plan Area.

16 Avenue

The role of 16 Avenue is significant for both the Plan Area and the Grandview Heights community. It is one of only three east west arterials that spans South Surrey, connecting the Semiahmoo Peninsula with the Township of Langley. As part of TransLink's Major Road Network (MRN), 16 Avenue carries regional traffic and is a designated truck route. It provides connections with multiple provincial highways and the USA Border crossings.

In the long term, 16 Avenue is forecast to require three travel lanes and left turn bays at intersections in each direction due to capacity and operational issues necessary to maintain efficient people and goods movement. Multi-use pathways will support safe active transportation. To achieve these requirements, 16 Avenue is planned with an ultimate 37 m wide road allowance (Figure 5.3E).

The City does not expect to secure the full road allowance within the short to medium term. The lands south of 16 Avenue are within the Agricultural Land Reserve ALR. For this reason, the Plan includes an interim 28.5 m road allowance cross section (Figure 5.3D). This interim condition allows for typical five lane arterial widening for two travel lanes in each direction and left turn bays at intersections and a two-way-left-turn-lane for agricultural access. It also includes a multi-use pathway on the north side and a sidewalk on the south side. An additional unique 24 m cross section is provided adjacent to Darts Hill Garden Park to avoid encroachment into the park (Figure 5.3B & 5.3C).

168 Street

168 Street is a multi-modal road that provides a key route for regional travel, accommodating higher vehicle volumes. It connects north into Cloverdale and Fleetwood, including connections to the Surrey Langley SkyTrain line extension. It also provides local connection to the Grandview Heights Aquatic Centre and Grandview Secondary School.

Future widening of 168 Street will support growth and provide active transportation infrastructure. This will include two travel lanes in each direction and dedicated left turn lanes/landscaped median. A new multi-use pathway (MUP) on the east side will reduce reliance on road crossings. Wide boulevards will allow for the protection of existing significant trees and future large tree plantings. To achieve these requirements, 168 Street is planned with an ultimate road allowance of 34 m (Figure 5.3F). Once the MUP is completed on both sides of 168 Street both sides may be converted to one way cycling facilities with sidewalks. A unique 30.5 m cross section is provided adjacent to Darts Hill Park to avoid encroachment into the park (Figure 5.3G).

Darts Hill Garden Park

Unique cross sections avoid impacts of future road widening to Darts Hill Garden Park. On 16 Avenue no road widening is proposed for the interim section and all road widening will be to the south in the ALR. The interim section will be achieved through reduced road boulevards and a road width of 24 m. For 168 Street, existing fencing and landscaping was set to a previous arterial standard. Most of the elements for the 168 Street can be met with a slightly reduced boulevard.

Figure 5.3B: 16 Avenue Cross Section Adjacent to Darts Hill at 168 Street - 24 m Interim Road Allowance with Left Turn Bay

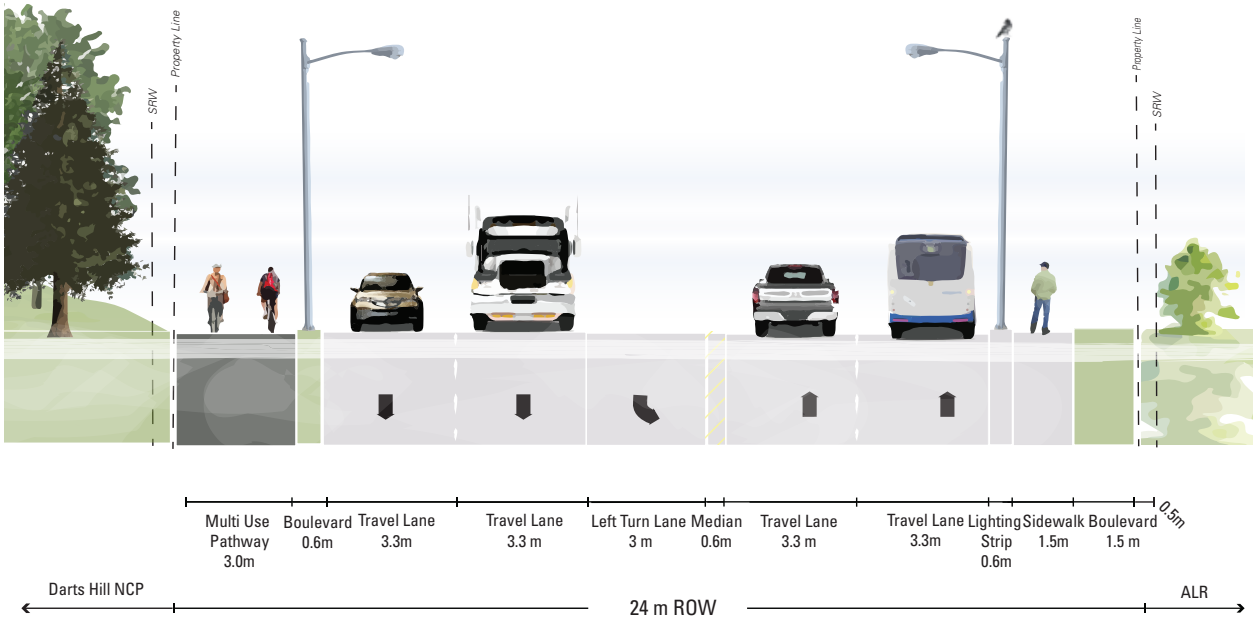


Figure 5.3C: 16 Avenue Cross Section Adjacent to Darts Hill Park - 24 m Interim Road Allowance Without Left Turn Bay

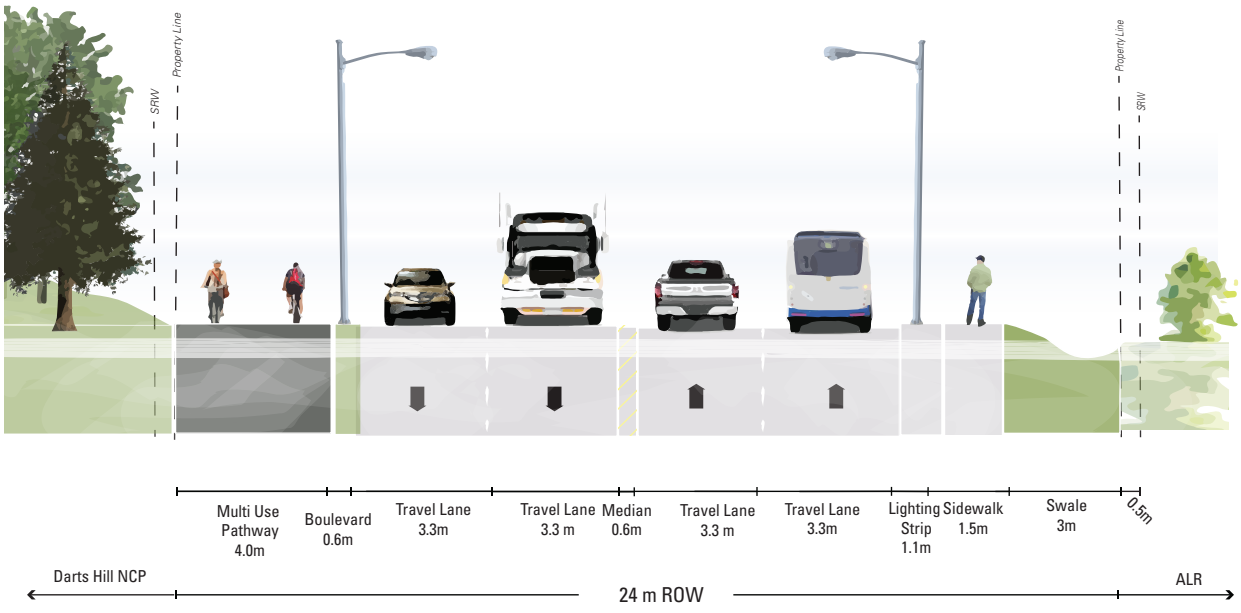


Figure 5.3D: 16 Avenue Cross Section - Interim 28.5 m Road Allowance

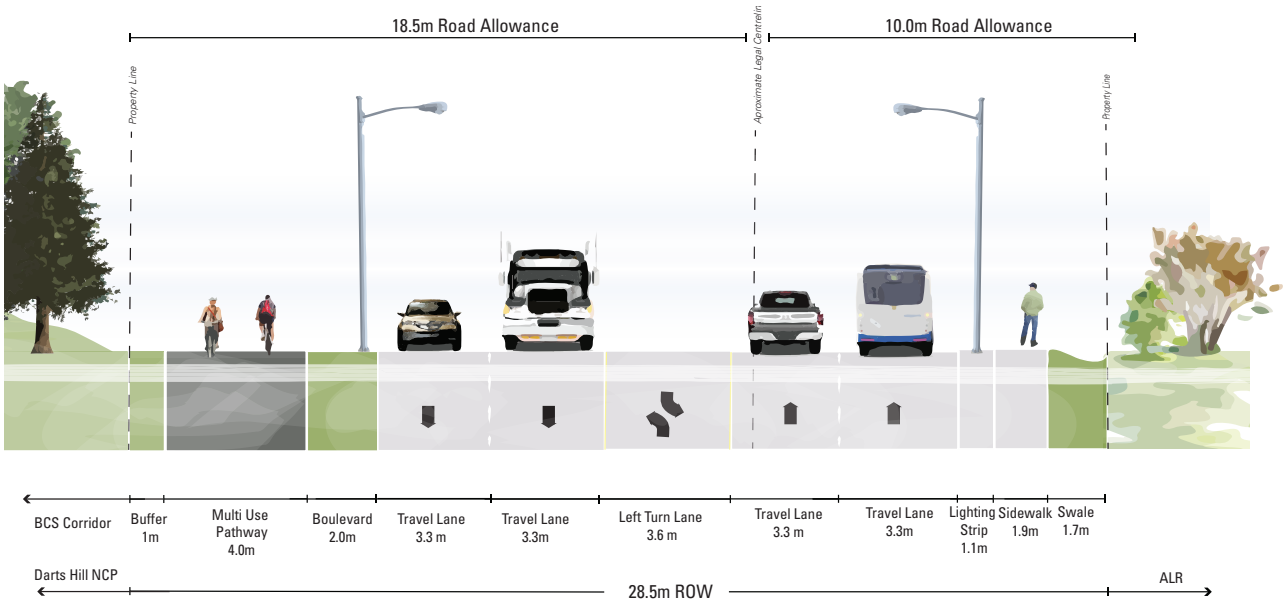


Figure 5.3E: 16 Avenue Cross Section - 37 m Ultimate Road Allowance

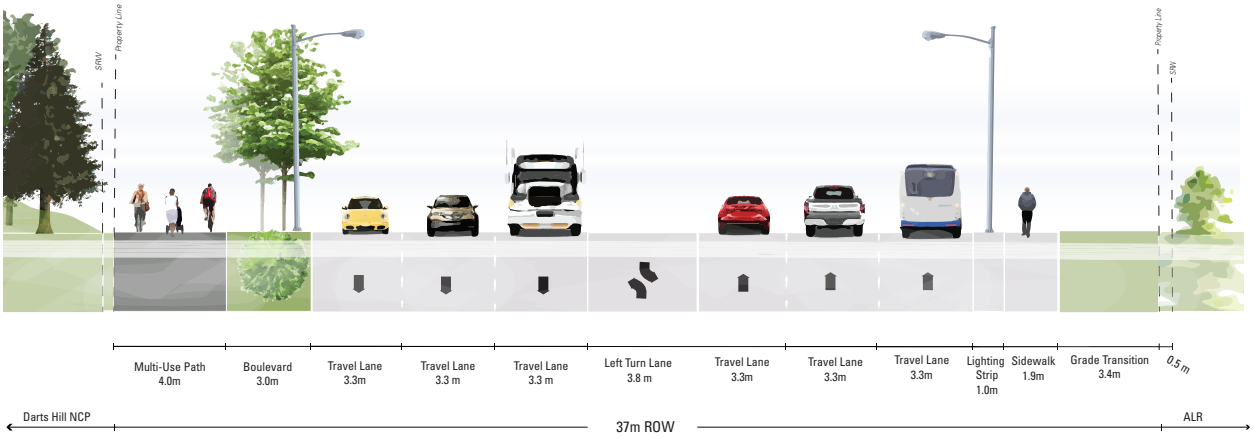


Figure 5.3F: 168 Street Cross Section - 34 m Road Allowance

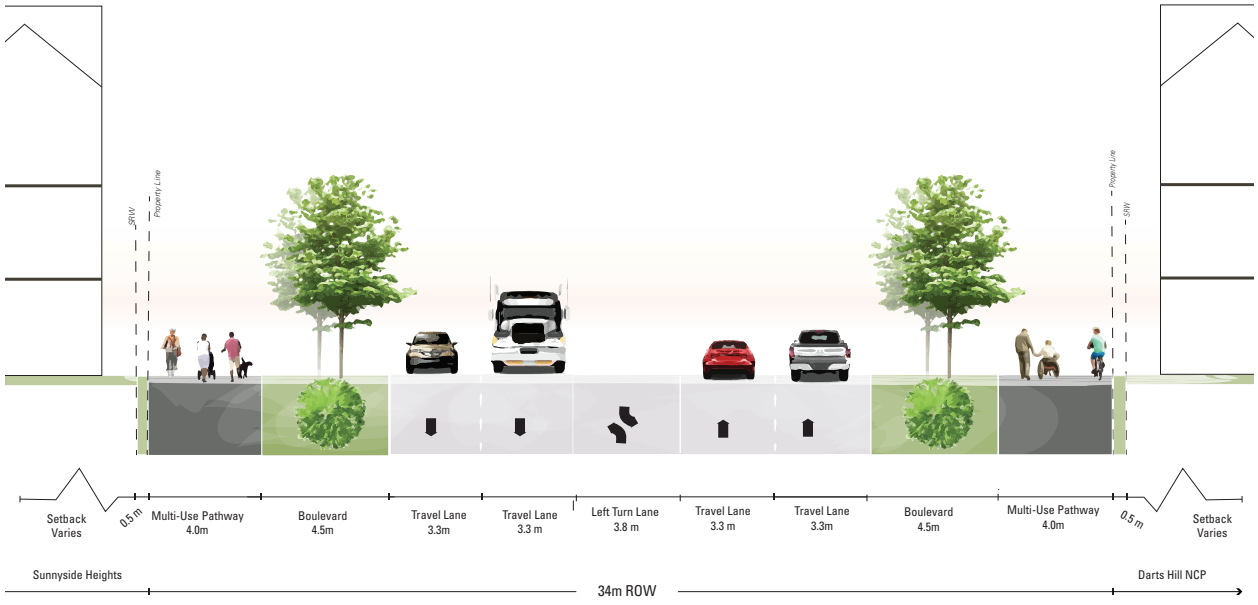
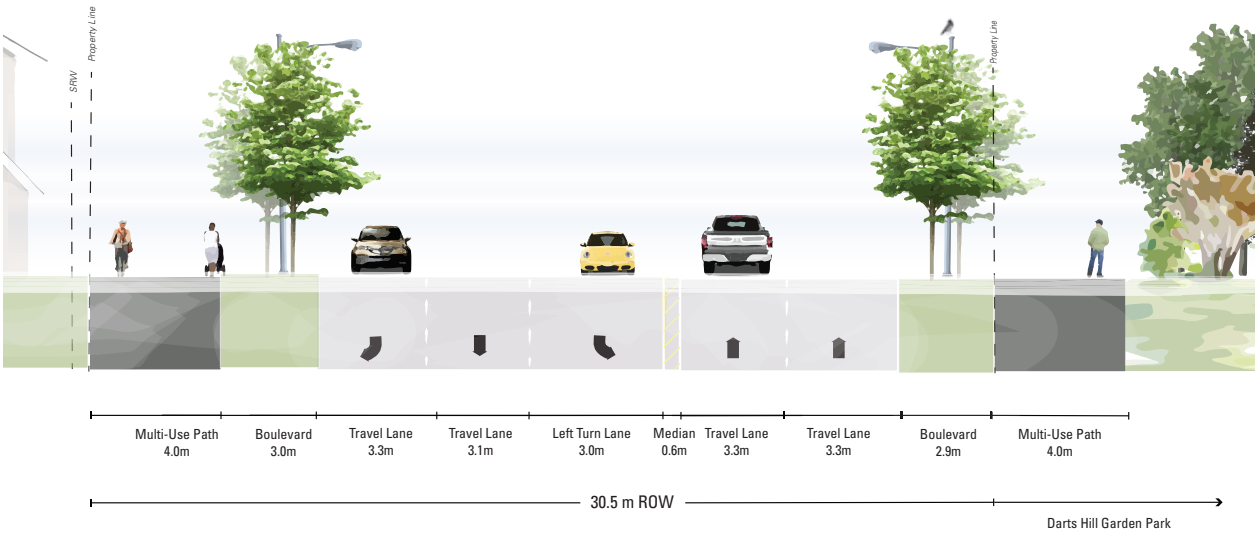


Figure 5.3G: 168 Street Cross Section Adjacent to Darts Hill Park- 30.5 m Road Allowance



Collector Roads

Existing

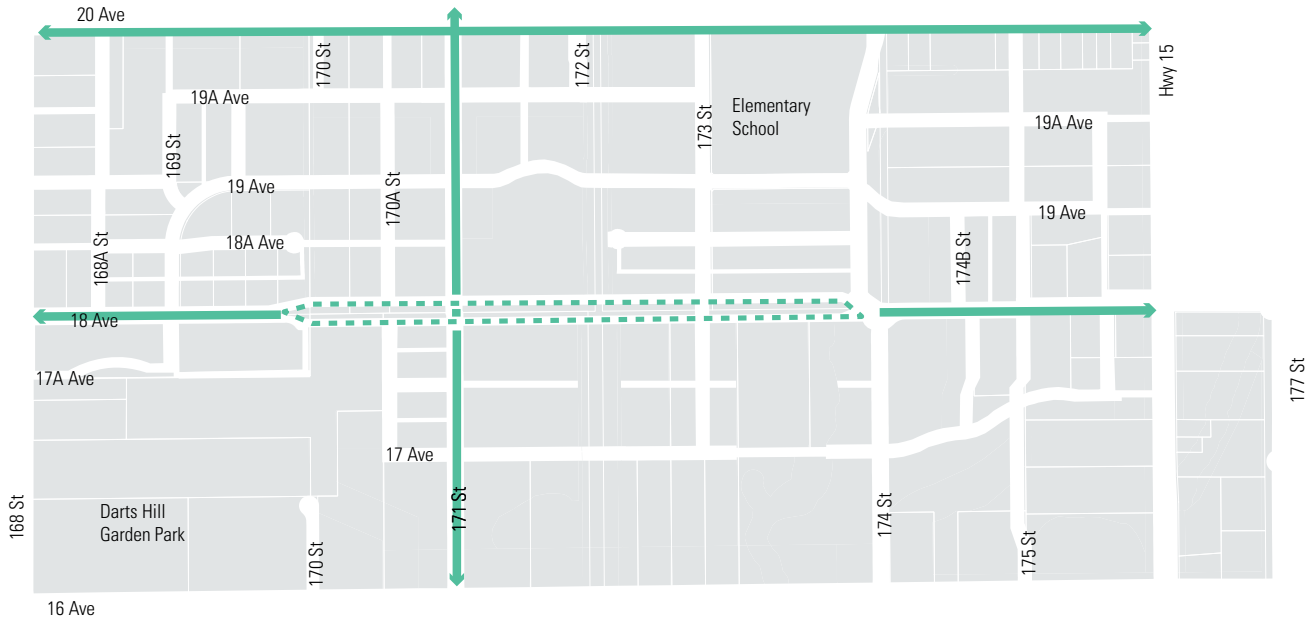
Collector roads distribute traffic between local and arterial roads. 20 Avenue is the current existing collector road that borders the north of the Plan Area. It is a two-lane east-west road that currently terminates at Hwy 99 to the west. To the east, 20 Avenue connects to 184 Street and serves the rural and suburban properties in the area.

However, due to topographic constraints, the intent to minimize earth works and crossing requirements, consideration for 171 Street to have a 2% variance will be provided. This is anticipated to result in a slight change in road alignment that will be identified through detailed design.

Planned

To support growth the Plan proposes improvements to 20 Avenue and introduces two new collector roads. Collectors will require a 24 m road allowance standard unless otherwise noted. Collectors will be constructed to a 'complete streets' standard. The standard includes sidewalks, separated cycling facilities, parking both sides and curb bulges at intersections.

Figure 5.3H Collector Roads



20 Avenue

In the future 20 Avenue will connect to King George Boulevard, and west to the Semiahmoo Peninsula. This will make 20 Avenue an important collector road. It will feature a typical collector road cross section, including on-street parking, separated bike lanes (cycle tracks), and sidewalks (Figure 5.3I). It is also proposed to have community level transit service between neighbourhoods. A commercial frontage applies to the collector standard within the urban village (between 169 Street and 172 Street).

The intent is to support commercial uses and increased pedestrian traffic. Separated cycle facilities enable street furniture pockets within an urban boulevard condition. A minimum two meter building setback provides opportunity for weather protection, patio space and outdoor retail display. Combined, these conditions will help support a vibrant 'main street' standard

171 Street

171 Street will provide improved neighbourhood connectivity parallel to 168 Street. The establishment of this collector road through the Plan Area will be key to regional connectivity. It will extend north through the Grandview Heights Plan Area #5 to 24 Avenue.

A commercial frontage applies to the collector standard within the urban village (between 19A Avenue to 20 Avenue). It will feature the same conditions and building setbacks as 20 Avenue to support a vibrant 'main street' standard (Figure 5.3J).

Figure 5.3I: Standard Collector Cross Section - 24 m Road Allowance

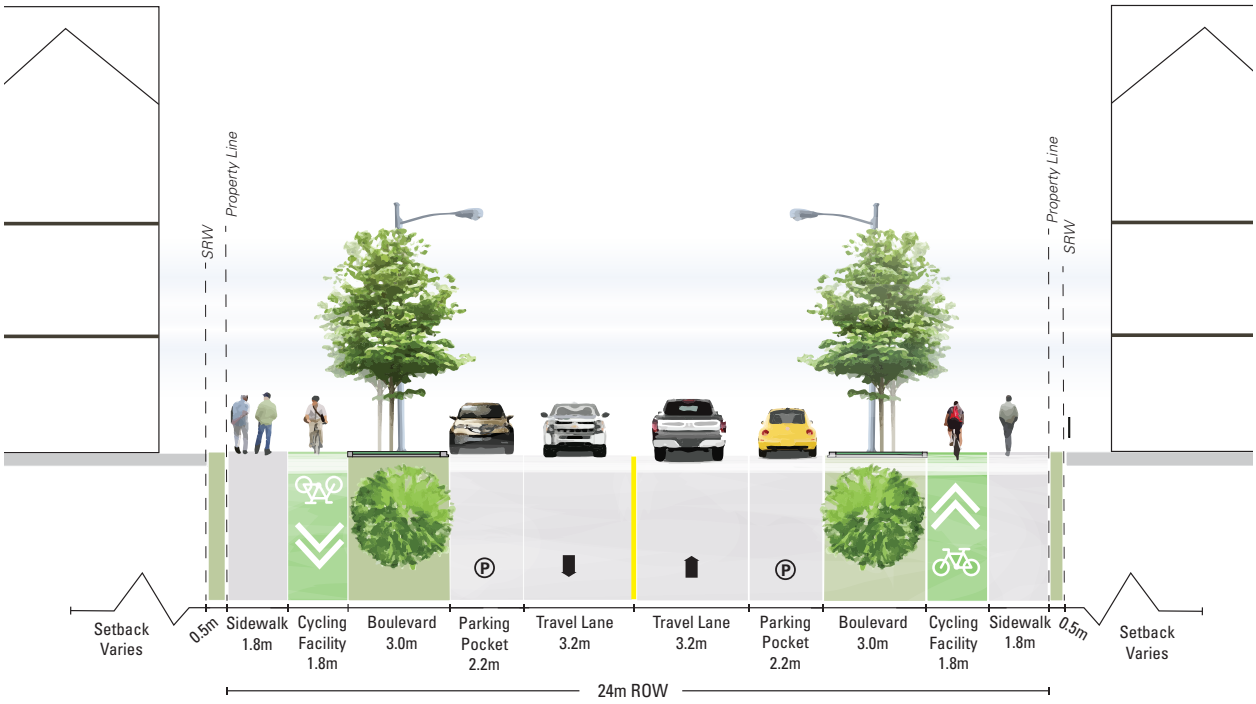


Figure 5.3J: Main Street Collector Cross Section - 24 m Road Allowance with Commercial Frontage

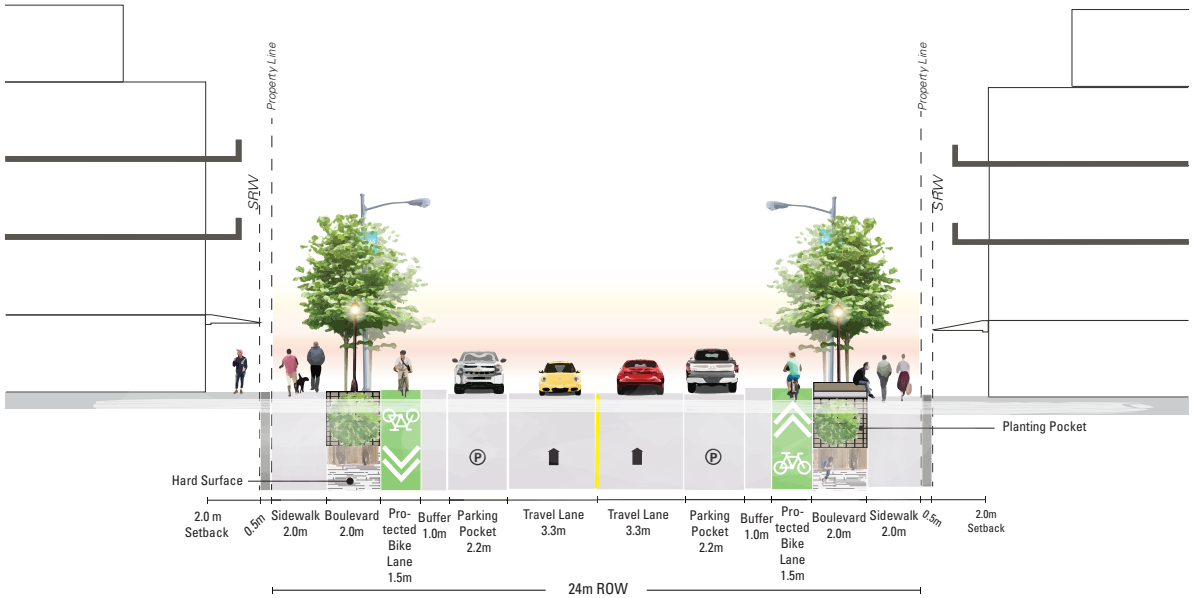
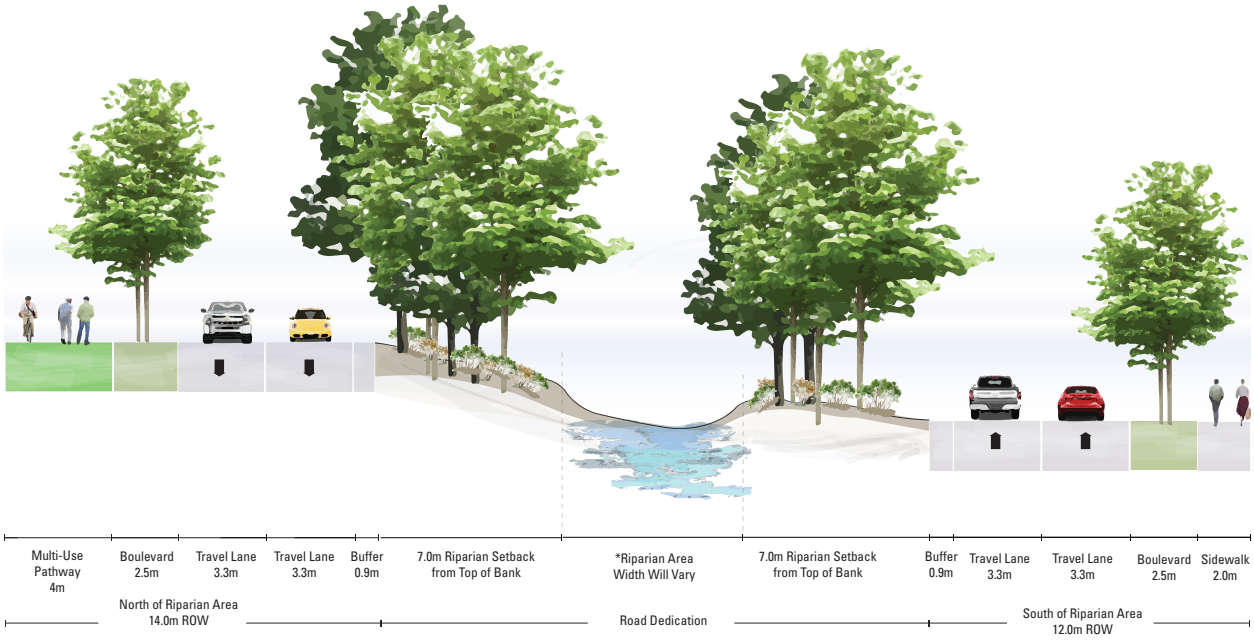


Figure 5.3K: 18 Avenue Grand Boulevard Cross Section



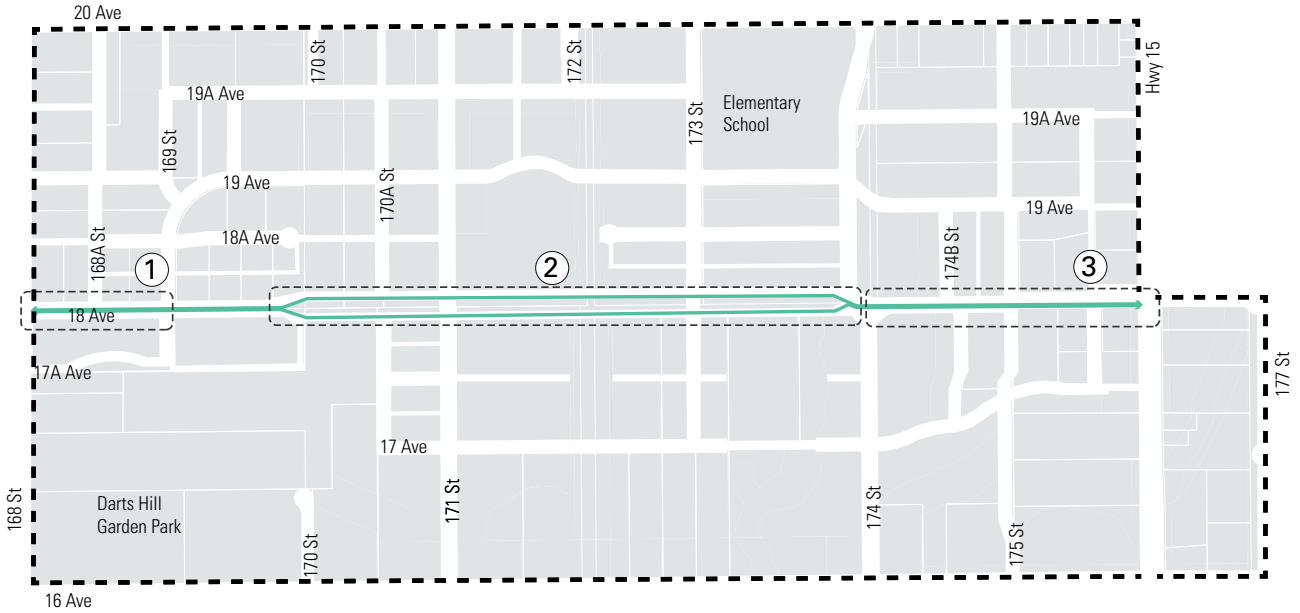
18 Avenue Collector

18 Avenue

18 Avenue is one of the defining neighbourhood features of Darts Hill, functioning as a grand riparian boulevard with a large tree canopy. It will facilitate one-way east-west vehicle traffic with a 4 m multi-use pathway for cyclists and pedestrians north of the riparian boulevard. Buildings are encouraged to front onto 18 Avenue while vehicle access from private property onto 18 Avenue will be limited to prioritize pedestrian safety and enhance the public realm.

Due to site considerations and constraints the Plan organizes alignment into three distinct sections. Each section, outlines the considerations necessary for a complete street standard.

Figure 5.3L: 18 Avenue Collector



1. 168 Street to 169 Street

This western section of 18 Avenue includes a width of 29 m. This maintains the existing 3 m wide entry way treed median. An offset centreline accommodates the necessary infrastructure, including a multi-use path on the north side. This requires a 14 m section on the north and a 12 m section south of the centreline.

2. 170 Street to 174 Street

This central section of 18 Avenue is a unique and defining character street. Given the location of an existing watercourse, the street will function as a grand boulevard supporting the creek and a large tree canopy. It will feature one-way vehicle traffic with a 4 m multi-use pathway for cyclists and pedestrians on the north boulevard (Figure 5.3K).

The cross section incorporates environmental analysis conducted to support the Plan. An existing Class B watercourse runs east to west along existing property lines which align with the 18 Avenue centreline. The Plan retains this watercourse given its environmental and habitat significance and connectivity. It also protects water quality, reduces stormwater run-off impacts and supports tree canopy cover. Significant grade separation for some portions of the eastbound and westbound travel lanes is anticipated. This riparian area will accommodate much of this grade separation.

Based on these conditions, this section of 18 Avenue includes an approximate width of 50 m. Inclusive of riparian area, this results in approximately 14.0 m of road infrastructure north of the watercourse and 12.0 m south of it. An approximate 2.0 m of riparian area protection is required on the south side based on the creek location. The location of a multi-use pathway makes the ultimate dedication area more fair as the watercourse is located approximately 2 m south of the proposed centreline.

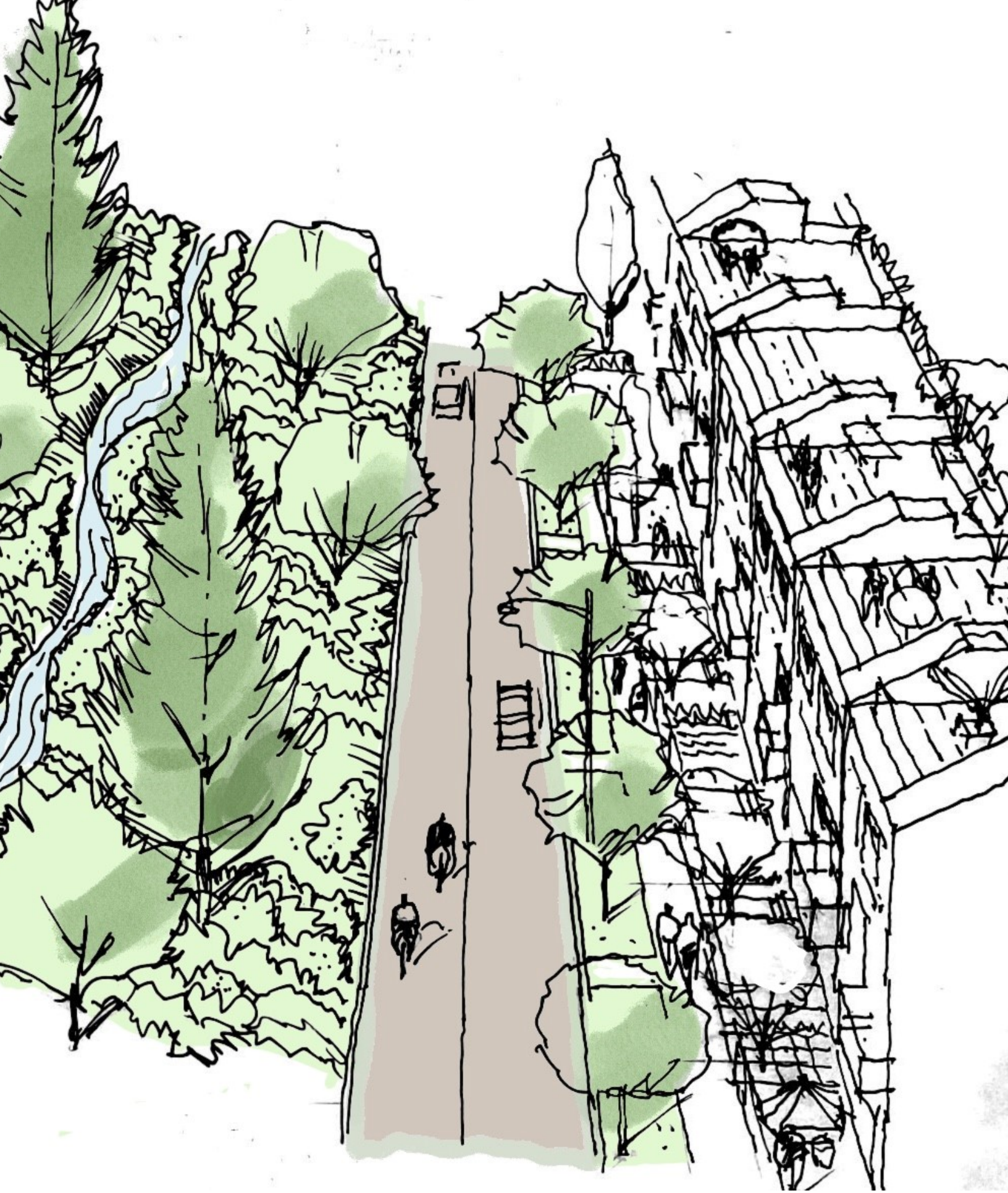
Specific widths will be established through road design based on riparian area setbacks. Design will require a Qualified Environmental Practitioner (QEP) to identify the exact riparian area setback. Road infrastructure will be located completely outside of protected riparian areas. As such, the cross section included in this document is representative only.

Due to the unique conditions of this section of road, an interim road condition will be required. Whichever side of the creek develops first will deliver an interim two-way operation with no on-street parking until such time as both of the road are delivered which it can then be converted to one-way with on-street parking.

3. 174 Street to Highway 15

The eastern section of 18 Avenue includes a width of 26 m. This includes a 14 m section to the north and 12 m section to the south to allow for continuation of the multi-use pathway on the north side of the road. The multi-use pathway will connect to a planned pedestrian and cycling bridge over Highway 15. This infrastructure will connect the neighbourhood east of Highway 15 and provide a key connection with Redwood Park.

Illustration - 18 Avenue Grand Boulevard Design

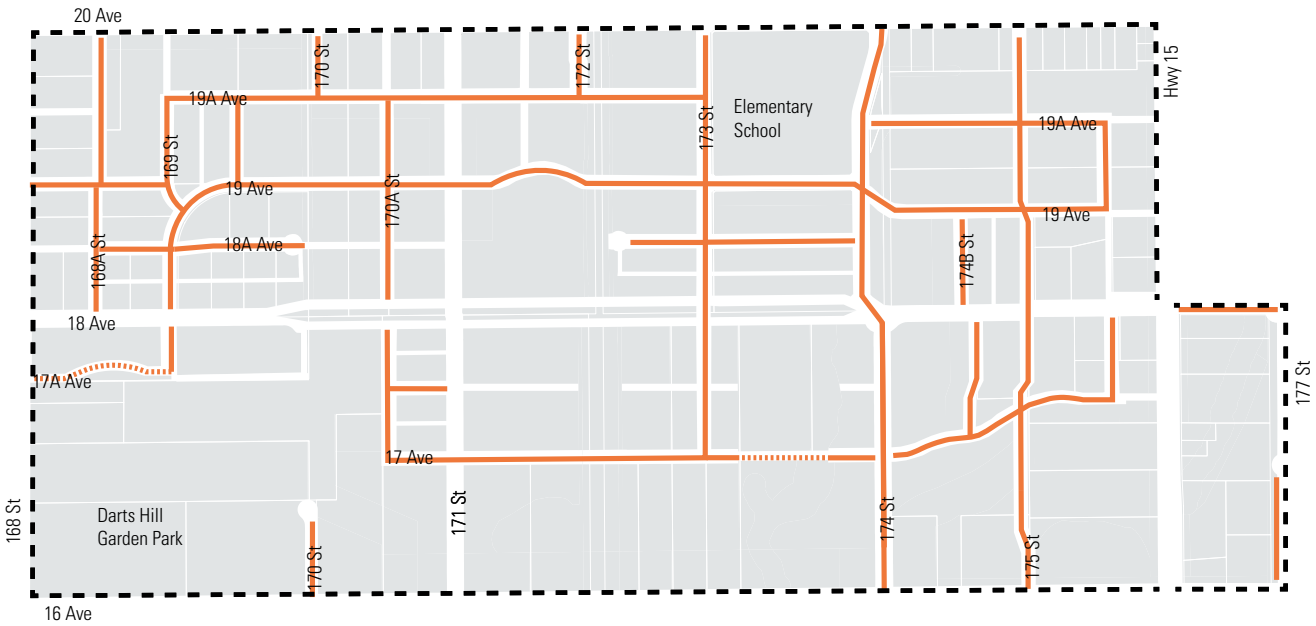


Local Roads

Local roads will complement arterial and collector roads facilitating flow of traffic to and from residential areas. They are vital to supporting a more connected and walkable neighbourhood. Local roads typically provide on-street parking, have lower design speeds, and ensure the safety of pedestrians and cyclists. There are limited existing local roads so many new ones are outlined within the Plan.

An extensive network of local roads will compliment the collector and arterial road network to complete the road grid. Typical local roads will be a 20 m wide road allowance with 10.5 m pavement and parking on both sides with two-way operations. All local roads will have sidewalks on both sides and parking/ pockets. Curb bulges will reduce pedestrian crossing distances at intersections. Dedication, construction, and improvements to local roads are to be fully delivered by development. There are a few unique local road requirements as outlined in the following.

Figure 5.3M: Local Roads



19A Avenue: Wider Sidewalks

This road is intended to support a higher volume of pedestrians. It provides links to key destinations, including the urban village, local parks, and elementary school. To support this a wider than typical sidewalk (3.0 m) will be accommodated on the south side through the entire Plan Area. To achieve this the boulevards will be reduced to 2.5 m on both sides with the centre line off-set (Figure 5.3Q).

173 Street & 175 Street: Road Grades Variances

Due to existing topography, there are challenges to meeting the City's Design Criteria Manual for some portions of the road network. Based on these constraints, an intent to minimize earth works, and crossing requirements, both 173 and 175 Street may have grades between 12% and 14%. These slopes represent acceptable variances to criteria within standard road profile guidelines.

175 Street: Off-Set Alignment

175 Street will be re-aligned 10 m to the west between 16 Avenue and 17 Avenue. This will resulting in full road dedication from the western properties. This is instead of the typical practice to provide roads centred on property lines. The proposed shift is a result of analysis that identified significant grade separation in this part of the roadway. Analysis indicates significant, undesirable and costly cut, fill and retaining walls, would be required. The alignment will shift back to the original right-of-way north of 17 Avenue.

17 Avenue - Reduced Road Allowance

17 Avenue between 173 Street and 174 Street is a unique local road with 6.6 m pavement, sidewalks, and boulevards on both sides. On-street parking is removed through this section for a total width of 13.6 m. The unique cross section will be applied where 17 Avenue is located between park and natural areas (Figure 5.3R).

17A Avenue - Reduced Road Allowance

17A Avenue is a modified local road with 6.5 m pavement, a 3.0 m boulevard and 2.2 m on-street parking on the north side. Sidewalks will be provided on both sides. Road user safety will be emphasized through lower vehicle speeds.

174 Street

174 Street will provide important multi-modal connectivity up to and through the Plan Area and into Grandview Heights. Due to the connectivity that it provides it will continue to have a traffic signal at 16 Avenue and a roundabout on 20 Avenue. A multi-use pathway is planned within the standard road allowance width on the west side. To accommodate this a reduced boulevard is required (Figure 5.3N). Facilitating third party utility requirements will be done through curb extensions to avoid conflicts. Parking is also removed on the west side at the intersection with 16 Ave (Figure 5.3O).

Figure 5.3N: 174 Street with Parking - 20 m Road Allowance

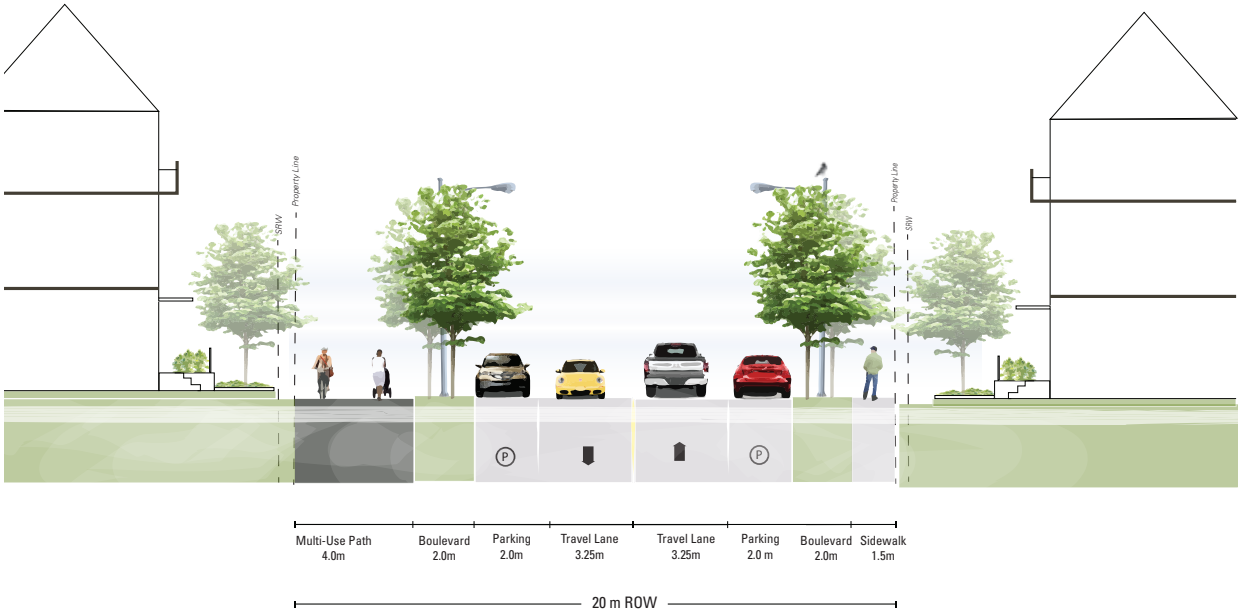


Figure 5.3O: 174 Street at 16 Avenue - 20 m Road Allowance

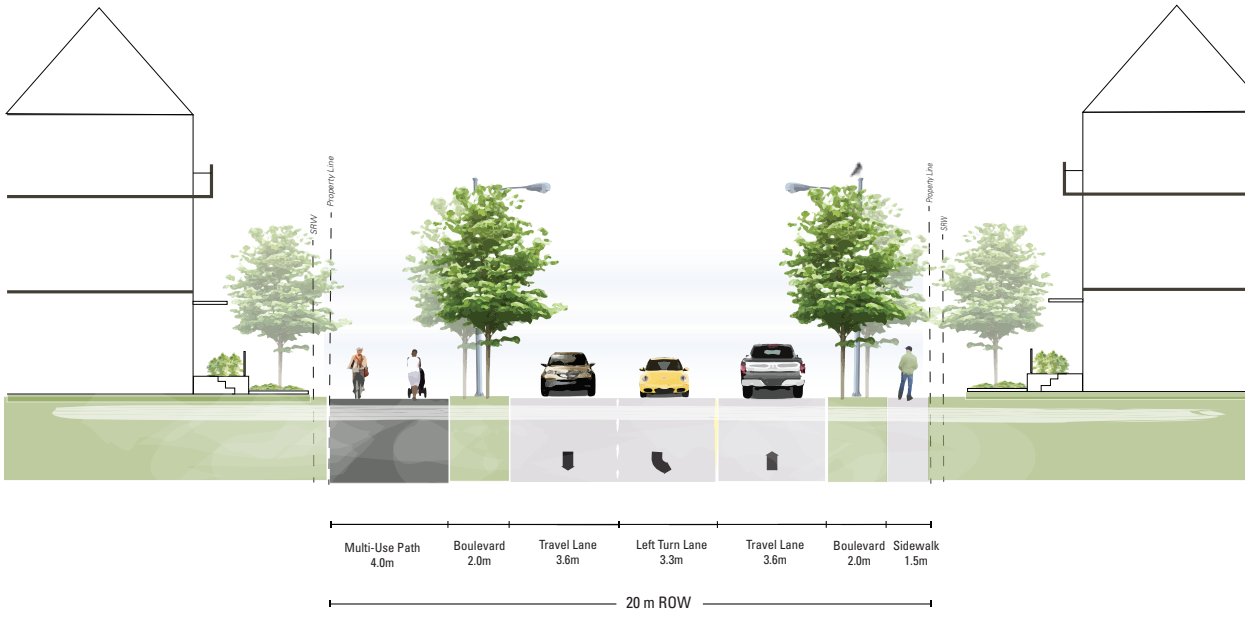


Figure 5.3P: Standard Local Cross Section - 20 m Road Allowance

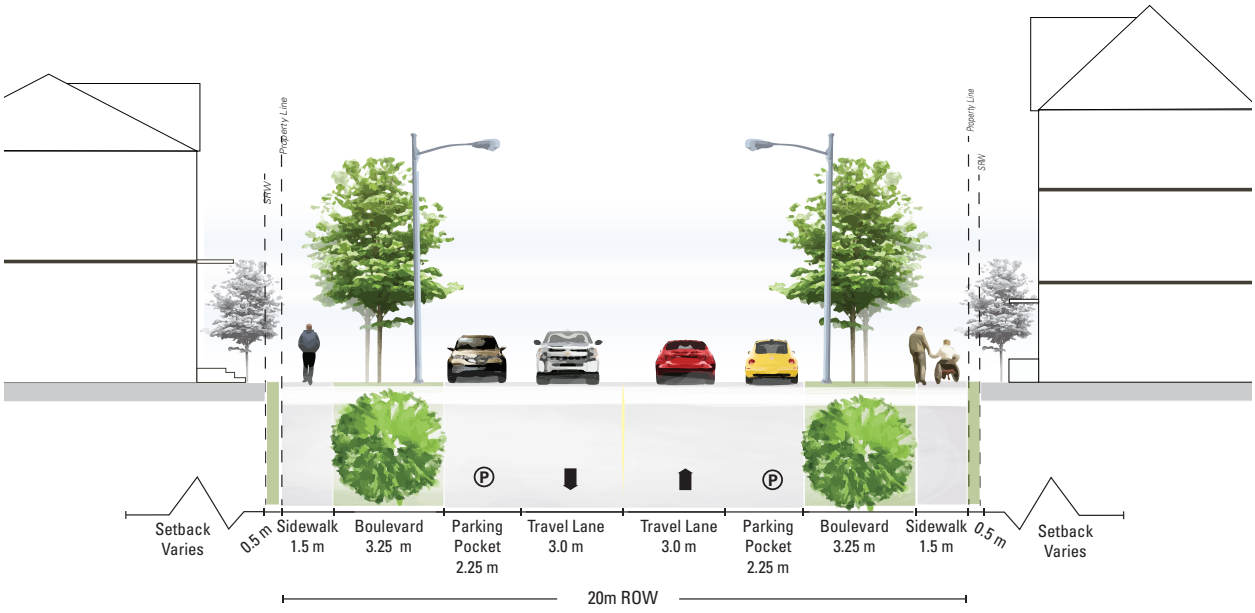


Figure 5.3Q: 19A Avenue Cross Section - 20 m Road Allowance

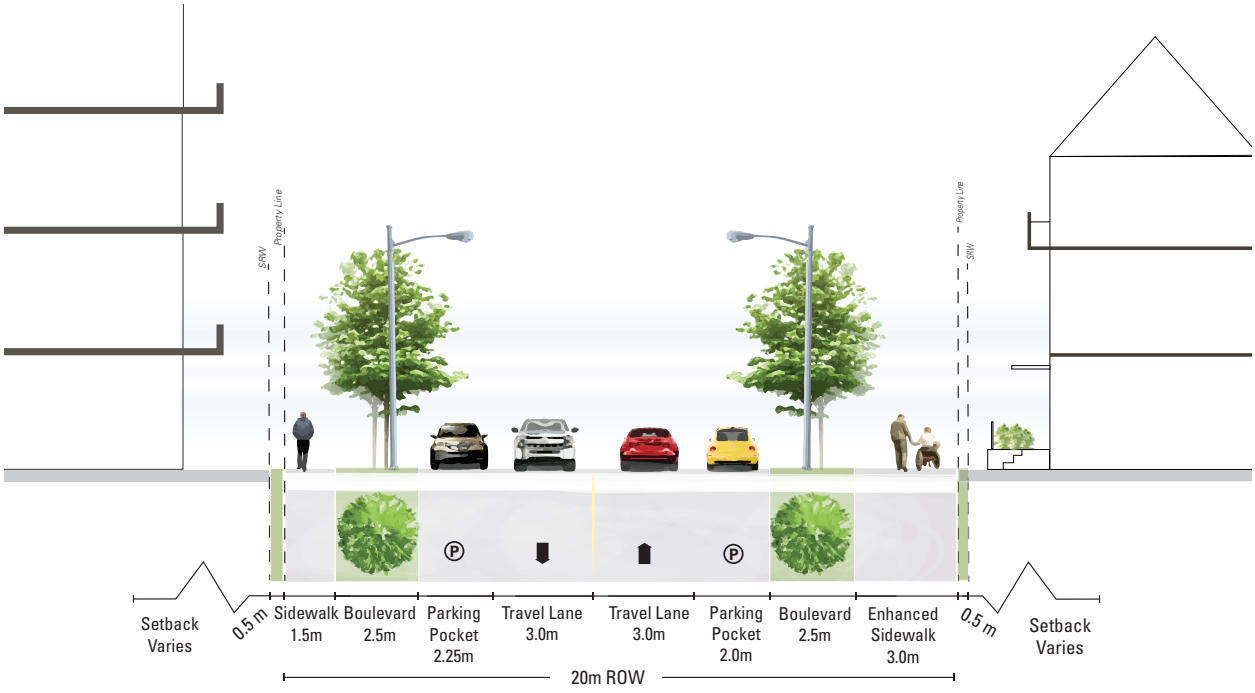


Figure 5.3R: 17 Avenue Unique Local Cross Section - 13.6 m Road Allowance

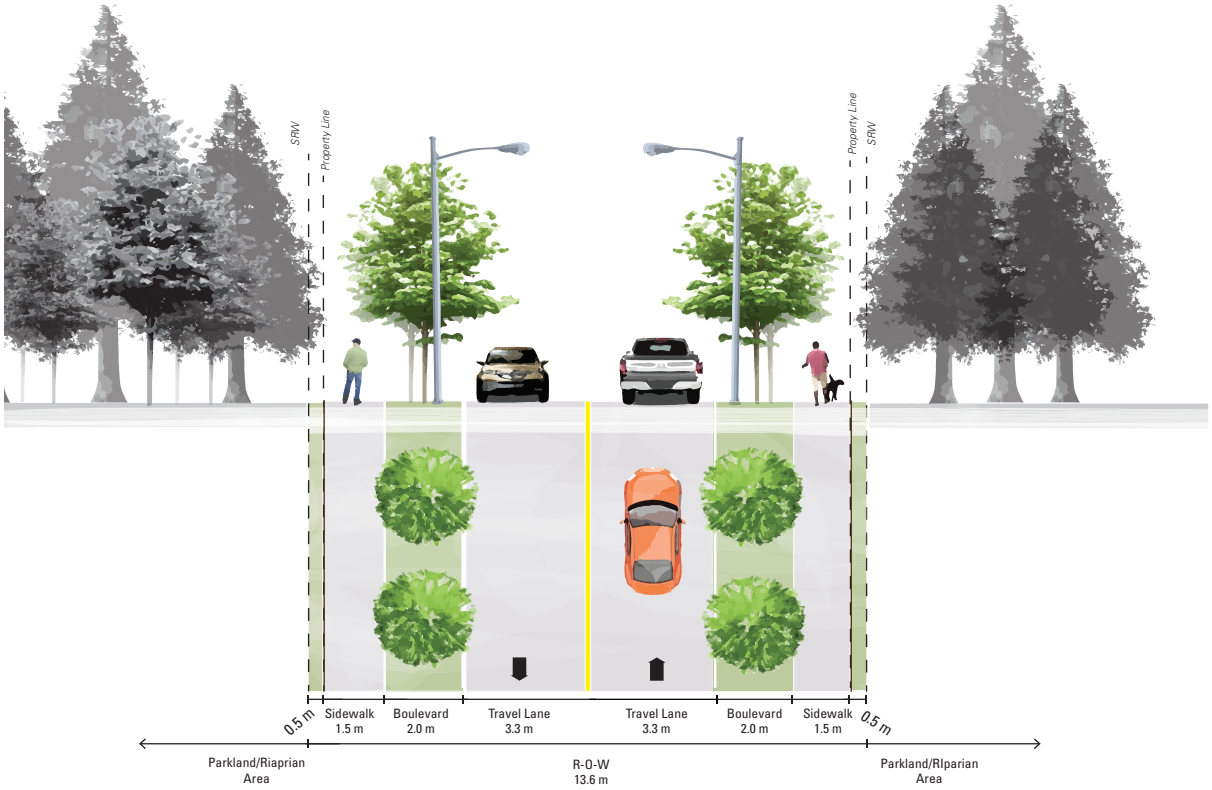
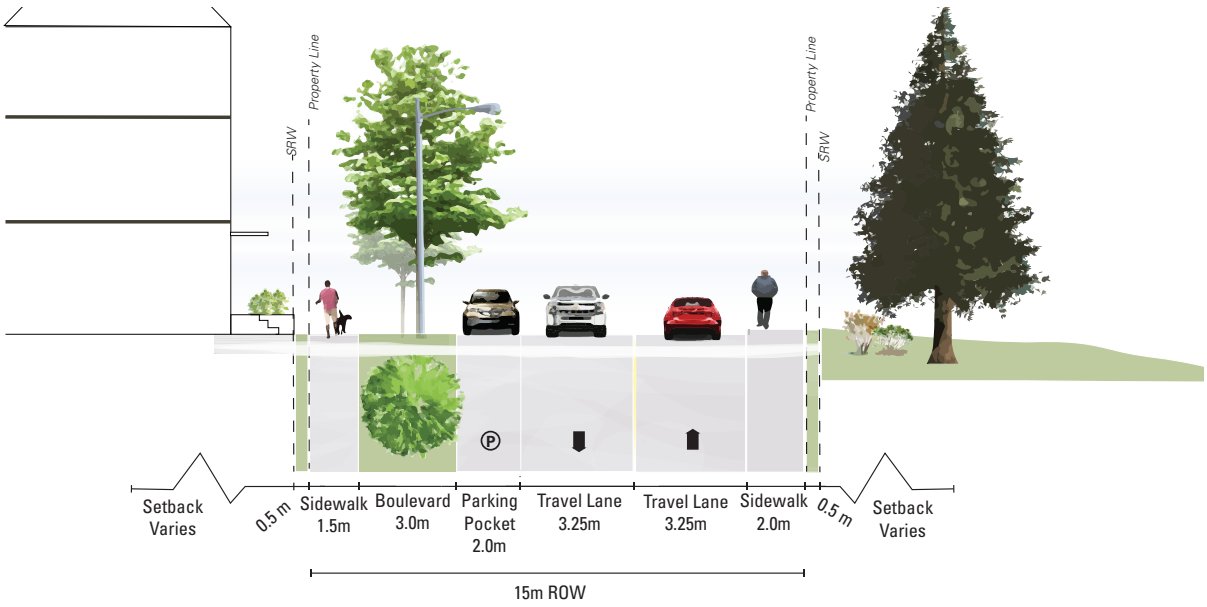


Figure 5.3S: 17A Avenue Unique Local Cross Section - 15 m Road Allowance



Green Lanes

Green Lanes are uniquely designed to facilitate both commercial vehicle access/ loading and mid-block pedestrian connection. Pedestrian safety and comfort are enhanced as Green Lanes will be designed with a sidewalk, pedestrian-scale lighting, and treed boulevards (Figure 5.3T).

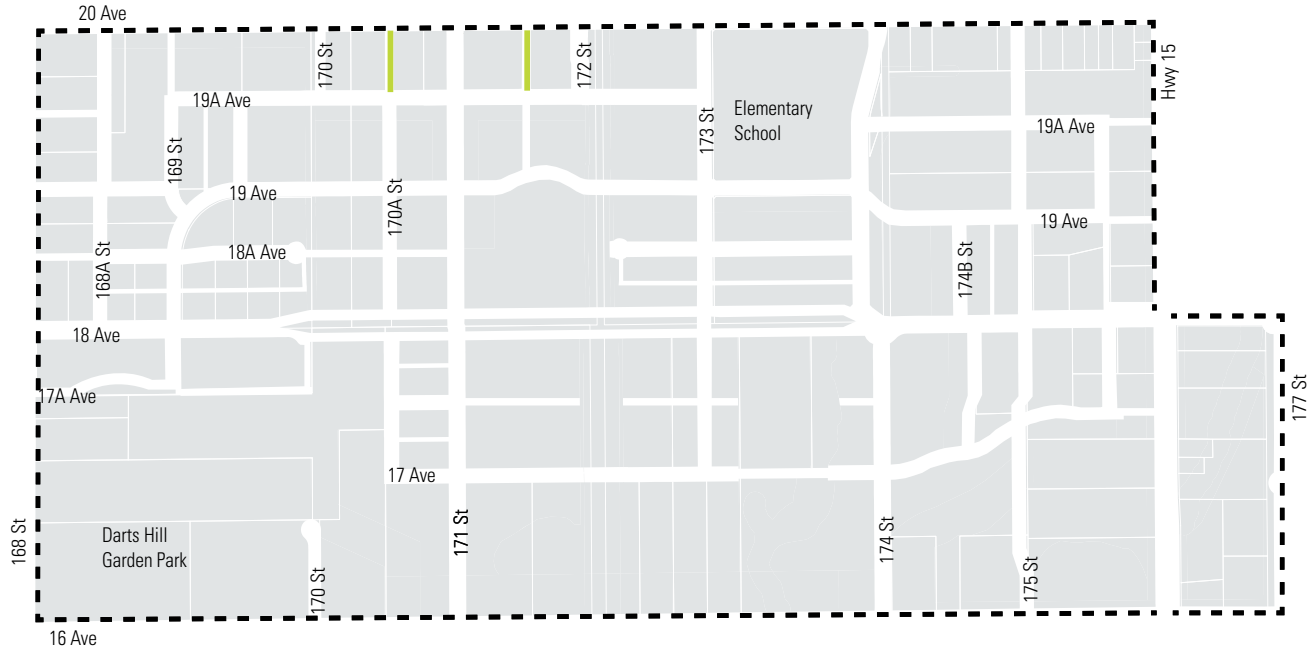
Access management involves locating, spacing and designing appropriate site access. The objectives of access management are to:

- Ensure roadway safety for all road users;
- Provide for efficient transportation operations for all modes; and
- Allow for reasonable access to adjacent land-uses.

Direct access to arterials is not permitted for the land uses planned in Darts Hill. Where lanes are provided, direct access to collector and local roads should be avoided. This is consistent with prioritizing Vision Zero and the safe systems approach to road design for all users. Limiting direct access with lanes minimizes conflicts with vulnerable road users and maintains reasonable vehicle access and loading.

Green Lanes provide access in the commercial nodes of the Plan Area. Their primary role is to provide service and underground parking access and reduce the number of driveways on adjoining streets. Green Lanes are also designed to improve pedestrian connectivity, create greenery, and provide opportunities for stormwater abs option. They include a sidewalk, lighting, and a treed boulevard on both sides.

Figure 5.3T: Green Lanes



Pedestrian Streets

Pedestrian Streets provide key mid-block pedestrian connections that complement the cycling and walking network. They include a 10 m width and accommodate a 4 m wide concrete or asphalt pathway, depending on the purpose, along with lighting and tree boulevards on both sides. Pavement width up to 6 m may be required if the pedestrian street is also needed for fire protection (Figure 5.3U).

Design will maximize safety and comfort in keeping with Crime Prevention Through Environmental Design (CPTED) principles. Direct access to ground oriented residential units is encouraged. Unique features may include visual markers at entrances and street furniture.

Figure 5.3U: Pedestrian Streets

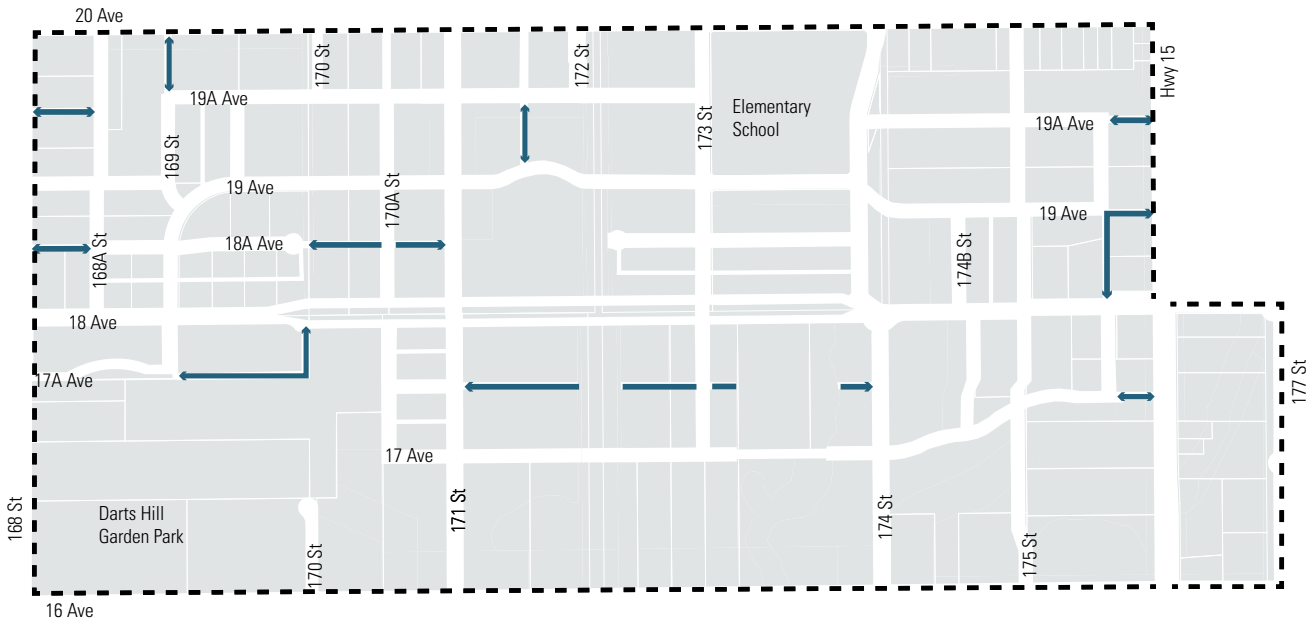


Figure 5.3V: Green Lane Cross Section - 12 m Road Allowance

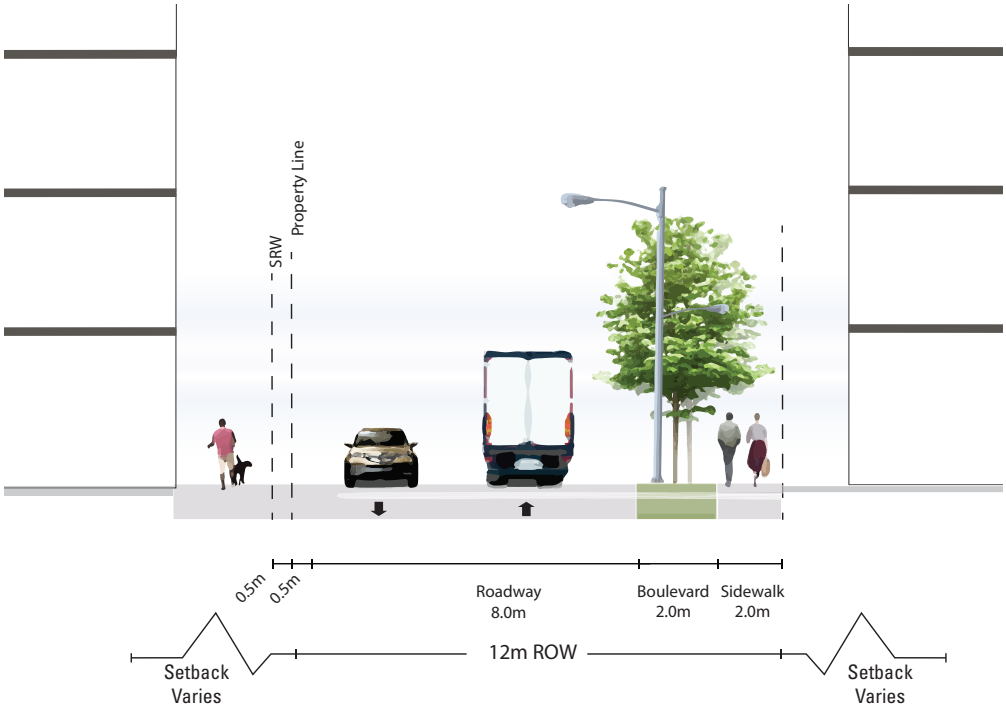
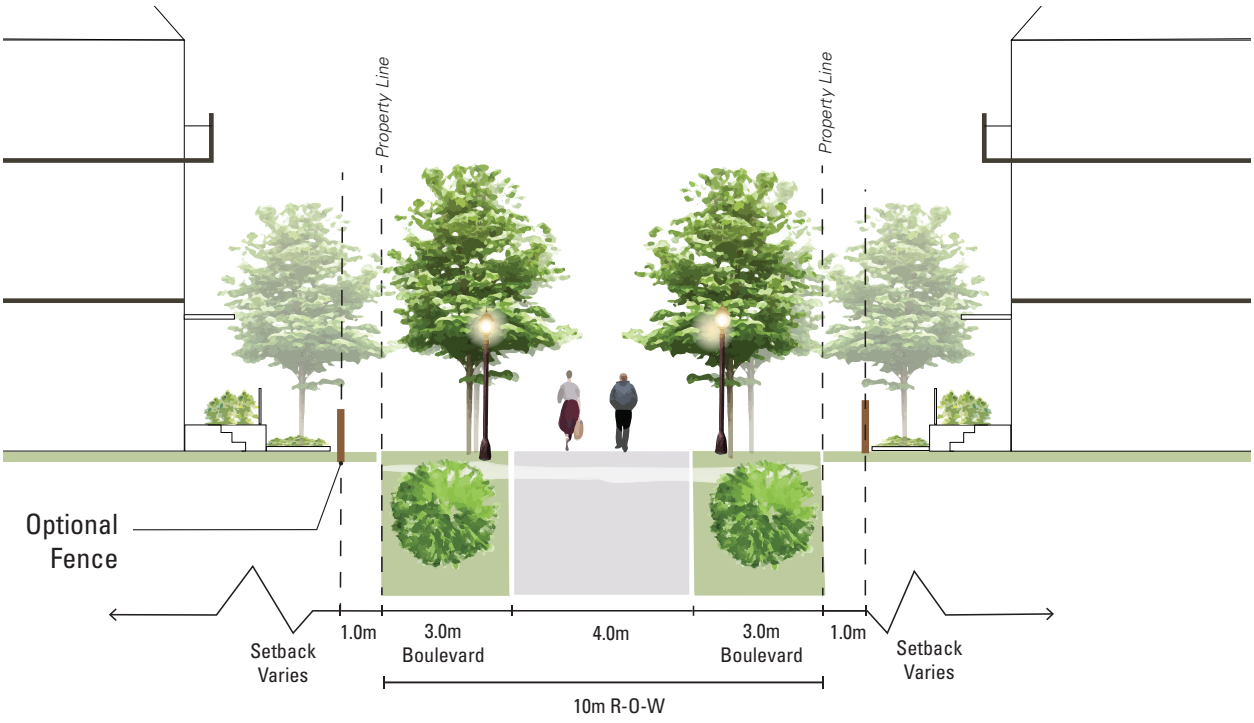


Figure 5.3W: Pedestrian Street Cross Section - 10 m Road Allowance



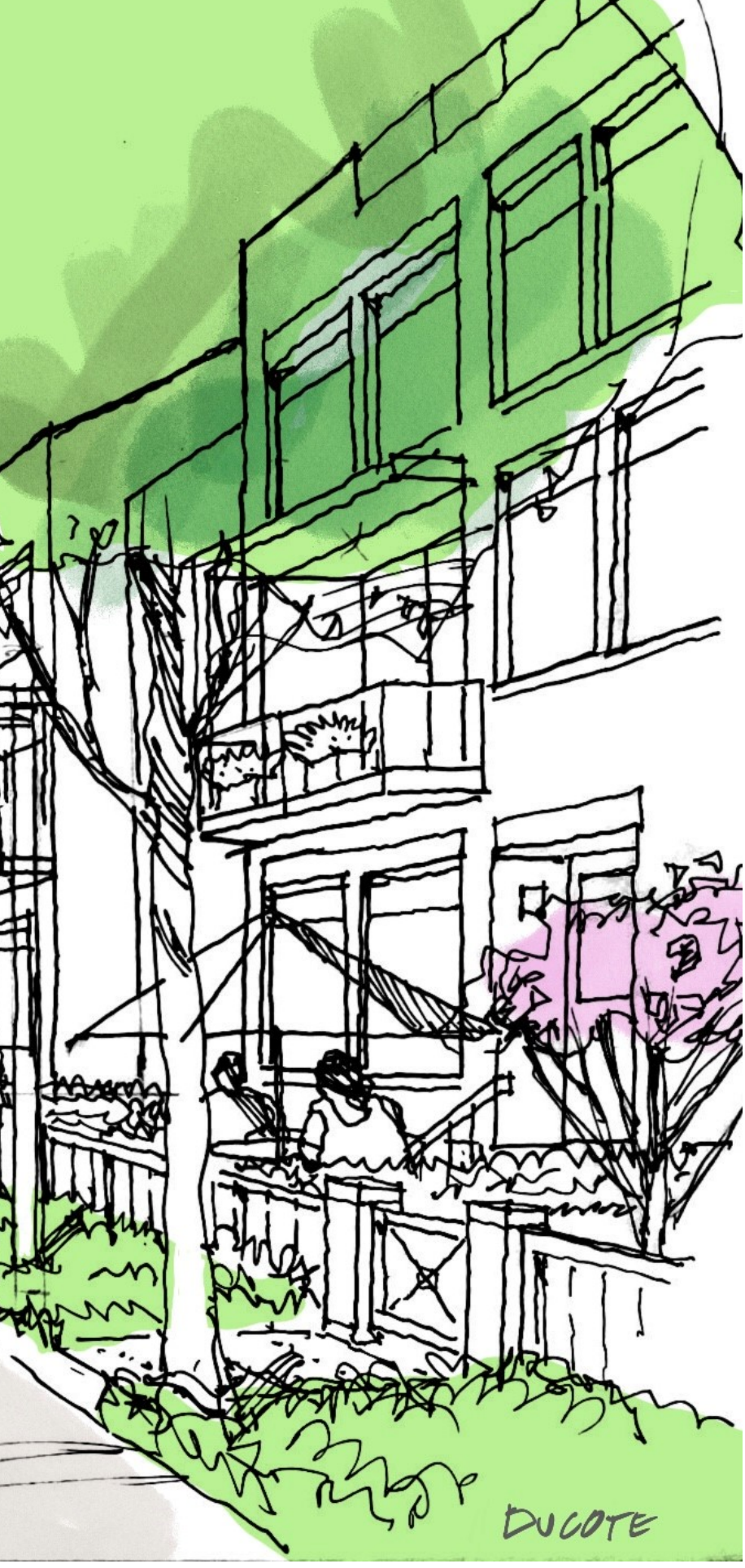


Illustration
Active Path Design

5.4 Active Transportation

Active transportation infrastructure within the Plan Area is currently limited due to the existing suburban and rural conditions. Much of the existing infrastructure was built to previous standards and as a result, the majority of the road network is incomplete. Several existing local roads do not have sidewalks, and where they do exist, they are adjacent to travel lanes without the protection of a boulevard. Cycling infrastructure is limited to on-road use. The limited existing active transportation infrastructure does not currently accommodate all ages and abilities and does not meet the City's Vision Zero objectives.

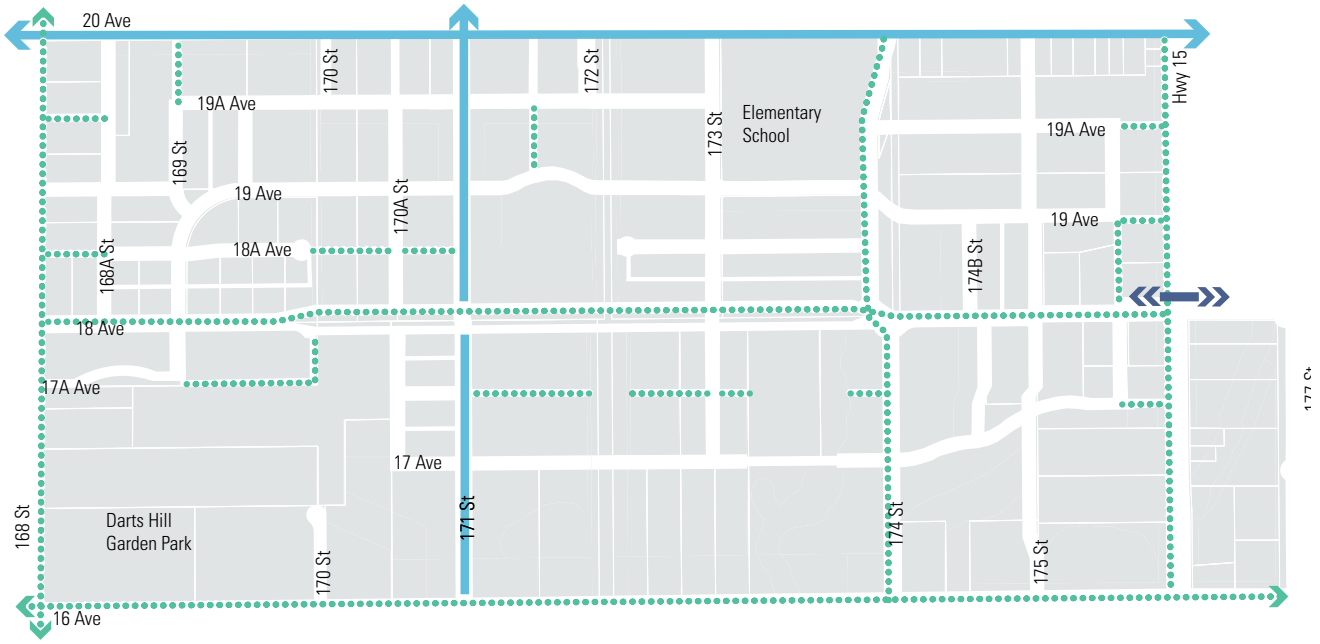
Planned Network

The Planned fine grained road network supports an enhanced and continuous walking and cycling network throughout the NCP. All roads are planned to be Complete Streets with wider sidewalks on both sides separated from traffic by wide treed boulevards. Arterial and collector roads will support one-way protected cycling facilities on both sides of the road, or multi-use pathways. Quieter local roads will support on-street cycling with traffic calming measures such as curb bulges, on-street paint and signage.

LEGEND

- Multi-Use Pathway
- One-Way Protected Cycling Facilities
- Pedestrian Bridge

Figure 5.4A: Active Transportation Strategy



Key components of the Plan that support walking and cycling, and improved safety for pedestrians and cyclists include:

- Smaller block sizes (~100 m spacing) to increase connectivity.
- A Complete Streets approach to road design that prioritizes vulnerable users.
- A continuous and integrated network of protected cycling and multi-use pathway infrastructure.
- A comprehensive network of park pathways to provide finer grained connections and access to community amenities and nature.
- Pedestrian only streets to support connectivity in larger blocks.
- Green lanes with sidewalks to create more walking connections.
- Enhanced sidewalks and building setbacks in high priority pedestrian areas.
- An active transportation overpass on Hwy 15 to provide a safe connection to Redwood Park.
- Accessible design features such as protected cycling and pedestrian intersections.

The Complete Street approach will improve comfort, connectivity, and safety for vulnerable road users which is a key safe systems principle of Vision Zero Surrey. This will encourage active transportation trips within the neighbourhood and throughout the broader Grandview Heights community.

In addition to the on-street pedestrian and cycling network, the Plan includes off-street multi-use pathways and park pathways to further improve connectivity for walking and cycling throughout the neighbourhood and broader community. The walking and cycling network will complement the road network by providing safe and comfortable routes throughout the community. This will promote active lifestyles and wellbeing and help to reduce the need for residents to drive to shops, services, and schools. It will also support access and ridership to future transit service in the area.

New infrastructure will be delivered through development as well as City capital projects. New development and street construction is expected to reflect the road cross sections and active transportation sections outlined in this plan. Additional detail is provided in the Plan's implementation section and design guidelines. These improvements will provide the framework for transforming Darts Hill into a place where active transportation is the first choice for local trips.

Walking

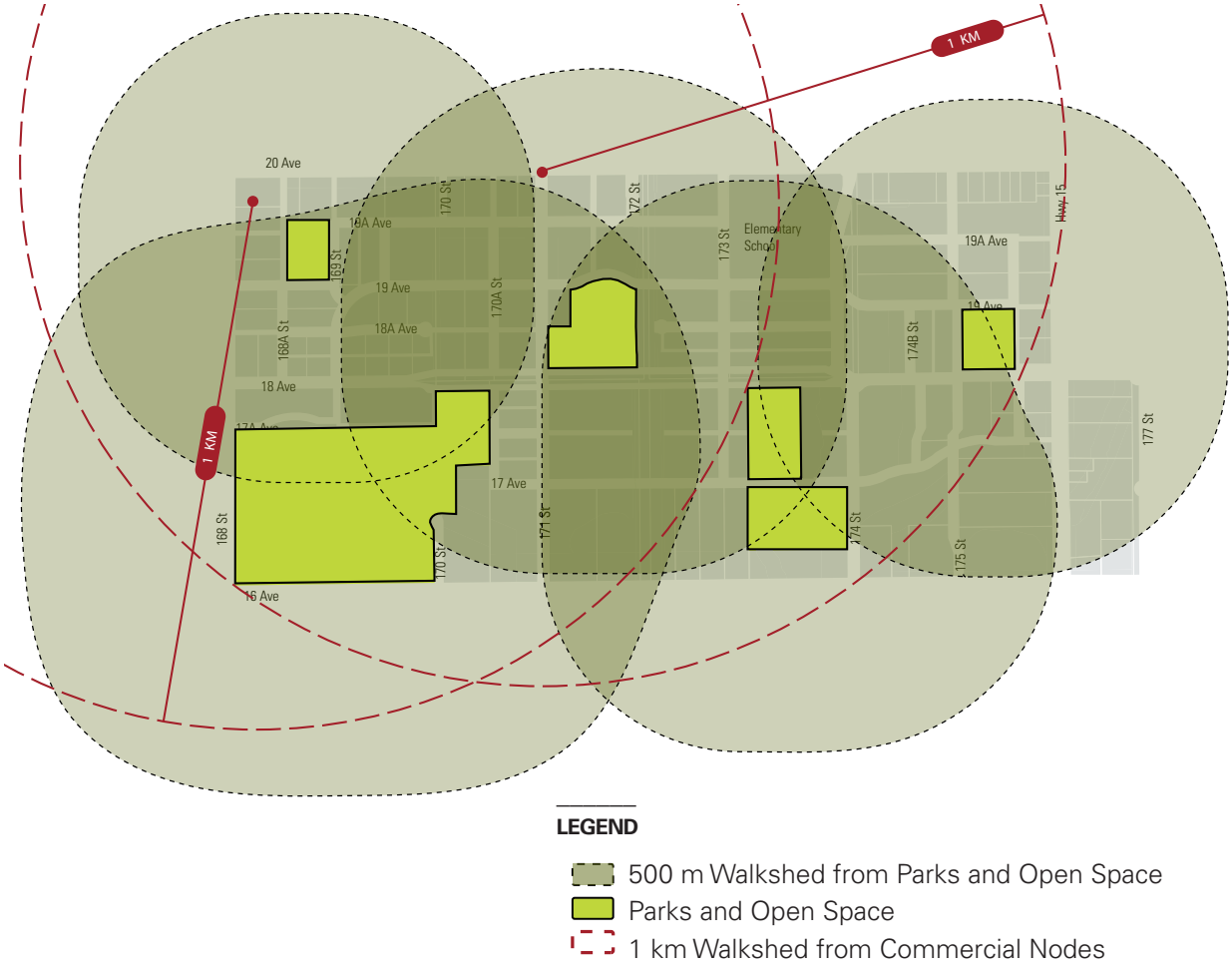
All roads identified within the Darts Hill will support safe and comfortable routes for pedestrians. In addition to road infrastructure, the Plan includes a network of off-street park paths. Together, the Plan will promote walking through the following features:

- All roads will have either concrete sidewalks or asphalt multi-use pathways on both sides.
- Sidewalks and multi-use pathways are separated from vehicle traffic by boulevards with trees.
- 1.5 m sidewalks on both sides of local roads.
- 1.8 m sidewalks on both sides of arterial and collector roads or multi-use pathways.
- 2.0 - 3.0 m sidewalks in areas of high pedestrian demand (e.g. adjacent to schools or commercial areas).
- Pedestrian street lighting along identified multi-use pathways.

- Pedestrian Streets of 10 m dedication to maintain sight lines, accommodate street lighting, and comply with Crime Prevention Through Environmental Design (CPTED) principles.
- Off-street park pathways provide key connections through parkland and across natural barriers.
- Encouraging lane access for single family lots to minimize the number of driveway crossings.
- Where appropriate, curb bulges at intersections to narrow pedestrian crossing distances.

Almost all future residents within Darts Hill NCP will be within a 1.0 km (15 minute) walk of the Mixed Use Urban Village at 20 Avenue and 171 Street, and neighbourhood commercial node at 20 Avenue and 168 Street. The intent of the Plan is to ensure all residents are within a 10-15 minute walk of daily needs, including transit service. The Plan's grid road network and diverse land uses support this intent by supporting walkability. The commercial village and elementary school are within 800 m of most home. All homes are within 500 m of parkland. A pedestrian and cycling bridge connects across Highway 15 at 18 Avenue. This will provide a safe and convenient crossing to connect with the neighbourhood to the east and Redwood Park. This is will also provide approximately 500 residents planned east of Highway 15 with access to the Planned elementary school.

Figure 5.4B: Walkshed Analysis



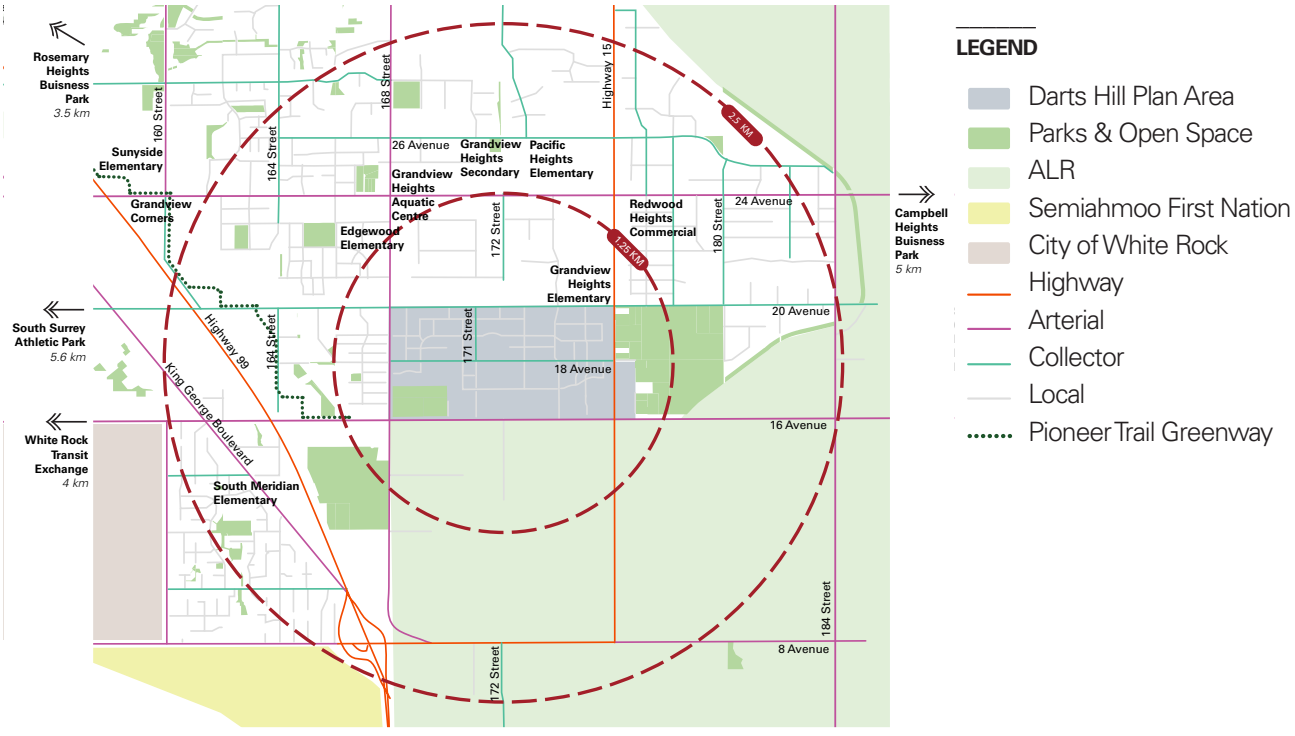
Cycling Network

The Plan includes a network of multi-use pathways and separated cycle tracks. They are proposed along collector and arterial roads within and abutting the Plan Area. This infrastructure will play a significant role in providing connectivity to the broader cycling network

The City's has adopted a Vision Zero Safe Systems approach for road design. This approach identifies that separation for cyclists from vehicles reduces the severity of collisions for vulnerable road users such as cyclists. This is consistent with the Complete Streets design principles to provide physically separated cycling facilities. As a result, all collector and arterial roads accommodate protected facilities. This includes either one-way protected cycling facilities (cycle tracks) or as bi-directional multi-use pathways that are shared by cyclists, pedestrians, and other forms of non-motorized transport. Where cycling facilities intersect, protected intersection design will allow for full movement turns for cyclists.

The protected cycling facilities network will allow for all areas within the Plan to be within a 10 minute, 2.5 km bike ride. The cycling network extends beyond the Plan Area connecting with the broader community. These facilities also accommodate new and innovate micro-mobility technology solutions such as electric assist bikes and e-scooters.

Figure 5.4C: 10 Minute (2.5 km) Cycling Destinations



5.5 Transit

Transit maximizes the mobility and access efficiency of the road network. It allows more goods and people to be moved in the same amount of space while also encouraging walking to complete trips.

Existing Transit Service

Darts Hill is currently serviced by bus route 531 which connects to White Rock and the City of Langley. Currently, due to limited local road connectivity, most of the Plan Area is outside the 10 minute (800 – 1000 m) walking distance from a transit stop.

Future Transit Service

Based on the long term build out of the Grandview Heights community, 20 Avenue and 168 Street are good candidates for increased transit service. They have major destinations along potential routing and are planned with a range of land uses. These corridors will be consistent with TransLink's 6Ds service guidelines for transit service:

- Destinations: There are major destinations anchoring and along the corridor.
- Distance: A well connected street network that is walkable and has a high intersection density exists along the corridor.
- Design: The corridor is multi-modal.
- Density: There is transit supportive densities along the corridor.
- Diversity: There is a mix of land uses along the corridor.
- Demand Management: Transit oriented measures are used to discourage unnecessary driving.

Community Level Service

Two new routes are proposed to service Darts Hill NCP which will allow for 60% of the Plan Area to be within 400 m walking distance to transit. A potential east west route on 20 Avenue would continue into Redwood Heights and extend north to Cloverdale in the future. A future 20 Avenue overpass would connect the service to Semiahmoo Town Centre, White Rock Exchange, and planned R1 King George Rapid Bus service.

Potential north south-service on 168 Street and 16 Avenue would provide alternative connections with Semiahmoo Town Centre and Peach Arch Hospital. To the north routing options could consider service to 32 Avenue or up to Cloverdale and Fleetwood with connections to the Surrey Langley SkyTrain line extension.

LEGEND

- Darts Hill Plan Area
- Parks and Open Space
- Future Frequent Transit Service
- Existing/Potential Bus Stops
- Potential Rapid Bus
- Potential Community Level Transit Service

Figure 5.5: Public Transit

5.6 Traffic Control & Vision Zero

Signals

Major intersection traffic control is typically managed by traffic signals. They are installed at all arterial-arterial and all arterial-collector intersections, and typically on an engineering warrant basis. This includes a criteria of traffic volumes, pedestrian demand, and safety assessments. Proactive planning for traffic signals will occur where road classifications warrant a higher order of intersection control. This includes consideration for safe access and circulation, as well as crossing opportunities for vulnerable road users.

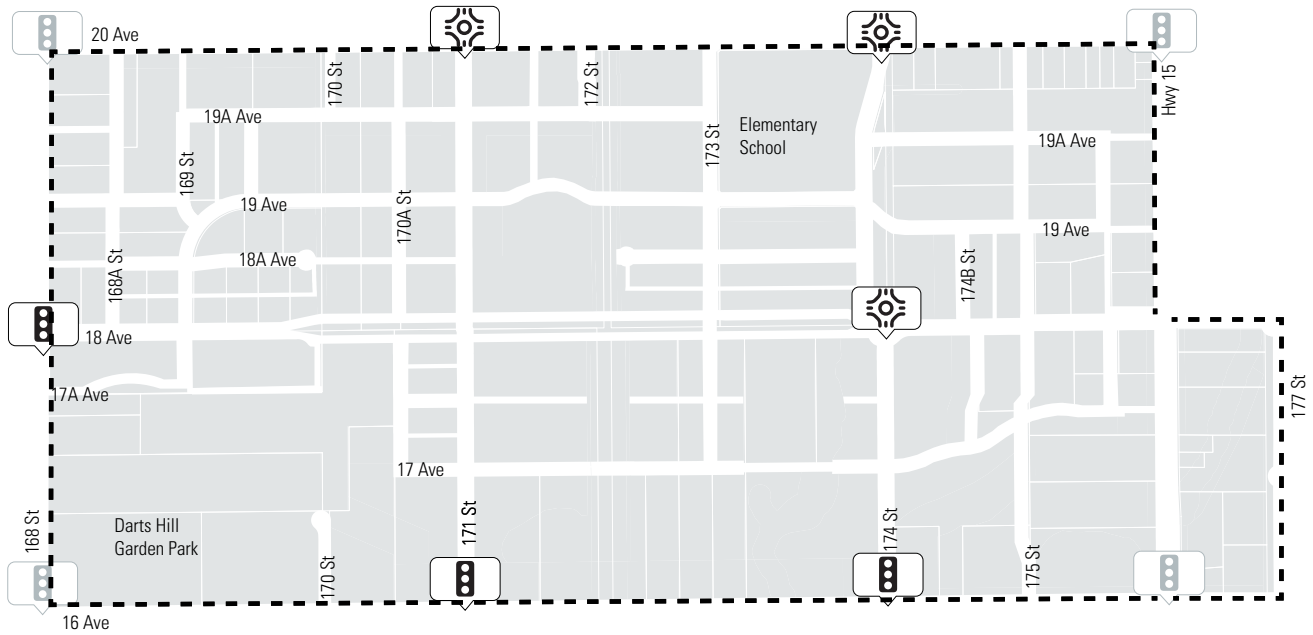
The Plan introduces four new traffic signals in response to the proposed land uses that support safe access, circulation, higher traffic volumes and increased activity. The four new signals are located at:

- 16 Avenue & 171 Street
- 16 Avenue & 174 Street
- 168 Street & 18 Avenue
- 168 Street & 20 Avenue

LEGEND

- Existing Signalized Intersection
- Proposed Signalized Intersection
- New Roundabout

Figure 5.6: Traffic Control



This will result in a typical urban signal spacing of 400 m. The traffic signals will be coordinated through the City's Traffic Management Centre to ensure efficient operations of vehicle movements. As part of the Traffic Impact Analysis a review of 18 Avenue and Hwy 15 was conducted. Although this intersection is under the jurisdiction of MoTI the analysis was done to evaluate whether a new signal could provide benefits to the Plan Area and the operations at 20 Avenue. It concluded that substantial benefits to the 20 Avenue intersection were not achieved from signalization of 18 Avenue.

Roundabouts

Three roundabouts are planned as alternative to traffic signals. They are planned on collector roads at:

- 18 Avenue and 174 Street
- 20 Avenue and 171 Street
- 20 Avenue and 174 Street

They are effective at reducing the number and severity of intersection collision points, and are also generally more efficient. New roundabouts will be installed when the required land is secured through adjacent development.

A unique design is planned for the roundabout at 18 Avenue and 174 Street. These roads have unique conditions where a grade-separated portion of 18 Avenue and off-set road infrastructure on 174 Street meet. This avoids a complicated all-way stop configuration. The roundabout will also provide the ability for U-turn movements for traffic traveling eastbound on the grade-separated 18 Avenue. A conceptual design for the roundabout has been explored and will require dedication beyond typical intersection corner cuts.

Access Restrictions

Left turning movements will be restricted where traffic controls are not anticipated and consistent with the City's Design Criteria requirements for access management. These include highway-local, highway-collector, and arterial-local intersections. Right turns into and out of the local road will be permitted to improve safety and efficiency of these intersections.

Vision Zero

Vision Zero Surrey is a data driven and collaborative approach to road safety. It aims to have zero people killed and seriously injured on roads by valuing human life above all else in the transportation network. A Safe Systems Approach is used for road design. It applies best practices in speed management, intersection safety improvements, and focusing efforts to protect vulnerable road users. Based on safety analysis and site characteristics, Vision Zero measures for the Plan Area include:

- Fully protected left turn only phases;
- Cycle tracks and protected cycling intersections;
- Leading pedestrian intervals (LPI) where pedestrians walk before traffic gets a green light;
- Removal of or redesigned right turn channelization lanes;
- Curb extensions at local road intersections;
- Speed humps, raised crosswalks and other speed management devices;
- Improved street lighting; and
- Enhanced crosswalks.

5.7 Electric Vehicle Infrastructure

EV Charging Stations

Public on-street electric vehicle (EV) charging infrastructure and stations will be established next to select mixed-use developments and parks. Location and design considerations will be made during road design and construction. Level 2 EV charging stations will be provided at the following locations:

- 17A Avenue between 168 Street and 169 Street (north side of street)
- 171 Street between 19A Avenue and 20 Avenue (west side of street)
- 19A Avenue between 170 Street and 170A Street (north side of street)
- 19A Avenue between 171 Street and 172 Street (north side of street)
- 172 Street between 19A Avenue and 20 Avenue (west side of street)

EV Charging Station Design Standard

The City will develop an Electric Vehicle Curbside Charging Station Design Standard. It will be incorporated into the City's Supplementary Master Municipal Construction Documents (MMCD). This Design Standard will include:

- Charging station location criteria
- Concrete bases for attaching the charging station and metered electrical kiosk
- Conduit and wiring to a suitable power source
- Protective bollards to prevent damage to the charging station

The City also requires new development to install EV charging infrastructure. Refer to Section 9.1 for additional details.

LEGEND

EV Charging Location

Figure 5.7: Electric Vehicle Charging Stations

5.8 Wildlife Crossings

Where road and Biodiversity Conservation Strategy (BCS) corridors intersect, road cross sections will be modified to limit impacts to protect natural areas. Measures such as eliminating parking from both sides of the road and minimizing boulevards will be applied at the appropriate locations.

Wildlife crossings structures are also planned to facilitate safe wildlife passage and reduce wildlife and vehicle interactions. It is anticipated that there will be three wildlife crossing structures.

- Three to support the east-west movement along the biodiversity corridor north of 16 Avenue located at 171 Street, 174 Street, and 175 Street.

The type of structures to facilitate crossing will be guided by the City's Biodiversity Design Guidelines and are anticipated to be a form of concrete culvert and or fish culverts with benches. This will facilitate the passage of small wildlife such as raccoons, and coyotes.

Funding of wildlife crossings is to come from the BCS Development Cost Charge and will be applied to capital projects or development coordinated works as required.

Refer to Section 6.3 (Wildlife Crossing Guidelines) for more details.

LEGEND

Biodiversity Corridor

Wildlife Crossing

Figure 5.8: Biodiversity Corridor and Wildlife Crossings

5.9 Road Costs & Financing

Tables 5.9A and 5.9B provides details of the DCC-eligible projects and estimated costs.

Table 5.9A: Arterial Roads - DCC Eligible Transportation Servicing Costs

Project	Location	Unit Price Per Metre	Quantity/ Length	Portion to Darts Hill NCP	Cost to Darts Hill NCP
Arterial Widening - 5 Lane	168 St: 16 Ave - 20 Ave	$6,710	800 m	50%	$2,684,000
	168 St: 20 Ave - 26 Ave	$7,710	1200 m	25%	$2,313,000
	16 Ave: 168 St - Hwy 15	$7,710	1600 m	50%	$6,168,000
	16 Ave: Hwy 15 - 184 St	$11,150	1600 m	25%	$4,460,000
	16 Ave: 184 St - 192 St	$11,150	1600 m	25%	$4,460,000
	24 Ave: 164 St - 168 St	$11,150	800 m	25%	$2,230,000
Traffic Signal Upgrade	16 Ave & 168 St	$488,000	$6,710	50%	$244,000
New Traffic Signals	16 Ave & 171 St	$488,000	$7,710	50%	$244,000
	16 Ave & 174 St	$488,000	$7,710	50%	$244,000
	16 Ave & 168 St	$488,000	$11,150	100%	$488,000
	20 Ave & 168 St	$488,000	$11,150	100%	$488,000
Box Culvert With Arterial Widening	16 Ave @ 17900 Block	$3,660	30	50%	$54,900
	16 Ave @ Sam Hill Creek	$3,660	30	50%	$54,900
	16 Ave @ Upper Sam Hill Creek	$3,660	30	50%	$54,900
Total					**$24,187,700**

Table 5.9B: Collector Roads - DCC Eligible Transportation Servicing Costs

Project	Location	Unit Price Per Metre	Quantity/ Length	Portion to Darts Hill NCP	Cost to Darts Hill NCP
Roundabout	18 Ave & 174 St	$1,037,000	1	100%	$1,037,000
Roundabout	20 Ave & 171 St	$915,000	1	50%	$457,500
Roundabout	20 Ave & 174 St	$915,000	1	50%	$457,500
Collector Upsizing	18 Ave: 168 St - Hwy 15	$1,952	1600 m	100%	$3,123,200
Collector Upsizing	20 Ave: 168 St - Hwy 15	$1,952	1600 m	50%	$1,561,600
Collector Upsizing	171 St: 16 Ave to 20 Ave	$1,952	800 m	100%	$1,561,600
Pedestrian/Cycle Bridge	18 Ave & Hwy 15	$7,320	180 m	100%	$1,317,600
Total					**$9,516,000**

"Provide more connected pedestrian walkways to encourage walking and exercise."

Survey Response, Darts Hill Plan Process, 2018-2020

6 Parks And Open Space
| **Keeping it Green**

Planning for parks follows the guiding principles outlined within the Parks, Recreation and Culture Strategic Plan (PRC Plan). It is also guided by the Biodiversity Conservation Strategy (BCS), and other supplementary plans. They outline how an integrated network of parks, open spaces, and natural areas support a compact and green neighbourhood.

6.1 Parks & Open Space Concept

Public spaces and access to nature provide the backdrop to everyday social life. They are essential to the social wellbeing and health of residents. They help meet the daily needs of residents while fostering neighbourhood walkability.

The foundation of the Parks and Open Space Concept is an accessible and connected network of public parks, natural areas, and pathways. These are supported by smaller public plazas, and the on-site amenities of schools and private developments. Together they support a range of amenities, access to nature, a healthy ecosystem, and climate resiliency.

Key Park Objectives

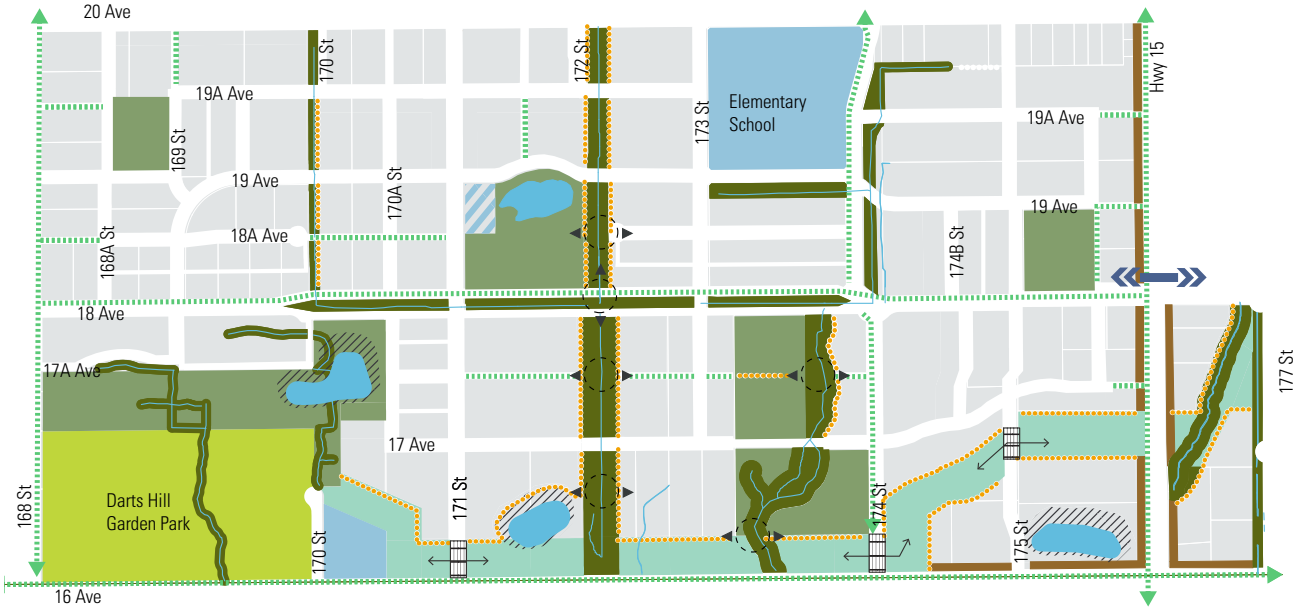
The Parks and Open Space Concept is guided by four key objectives:

- Deliver local, neighbourhood parks for all future residents within a 10-minute walk (500 m). This ensures everyone has access to public open space for relaxation, play and exercise in their day-to-day lives.
- Protect riparian areas and significant biodiversity hubs and corridors identified in the BCS. This ensures the protection of key sensitive habitat and wildlife connectivity.
- Expand Darts Hill Garden Park. This unique garden park is a City level park that provides amenities for a broader population and will serve as key regional destination.
- Provide direct access to Redwood Park. This provides direct connectivity to a key community level park, and sports fields and athletic facilities.

LEGEND

- Existing Park
- Proposed Park
- Riparian Area
- Biodiversity Corridor
- Wildlife Crossing
- Landscaped Buffer
- Watercourse
- Waterbody
- Detention Pond
- Multi-Use Pathway
- Park Pathway
- Pedestrian Bridge
- Pedestrian Crossing

Figure 6.1: Parks and Open Space Concept



6.2 Parks

Neighbourhood parks are the foundation of the parks and open space network. They include amenities to support local recreation and social activities. There are four neighbourhood parks designated within the Plan, located within a short walk of all households.

The Plan also includes an expansion to Darts Hill Garden Park, and is next to Redwood Park (located east of the Plan Area). Direct access will be provided to Redwood Park via a pedestrian overpass over Highway 15. The Parks Recreation & Culture Strategic Plan classifies both of these as City level parks. City parks embody the identity and image of the City and are recognizable by residents as places for city-wide celebration and activity, or of unique natural significance. Festivals and cultural events occur in these parks while also providing opportunities for day-to-day use. They are important sites that are often expanded to support regional growth.

Residents will also be close to the future Grandview Heights Community Park, planned for the area around the Grandview Aquatic Centre on 24 Avenue. This park is envisioned as a destination athletic park with soccer fields, sports courts and youth amenities. Grandview Heights Community Park will be accessed via the future extension of 171 Street north to 24 Avenue.

The City will acquire parkland over time and will work with the community to plan amenities. While each park will be subject to its own detailed design and public engagement process, a general overview of the park network follows.

LEGEND

- Existing Park
- Proposed Park
- Institutional/Park
- Detention Pond
- Pedestrian Bridge

Figure 6.2: Park Sites

Park Sites

Darts Hill Garden Park

Darts Hill Garden Park is a jewel in South Surrey, and a testament to 70 years of dedicated horticultural work by Francisca and Edwin Darts. Once a logged parcel of land, the site was cleared and transformed into an award winning 3 hectare (7.5 acres) ornamental garden. It contains a range of rare and valuable plants from around the world, as well as an orchard that features heirloom apple, pear, apricot, peach, plum and walnuts trees.

In 1994, Francisca and Edwin donated the garden to the City enabling the residents of Surrey to enjoy the garden as a horticultural centre. In the years that followed the City acquired the adjacent lots to the north and east to form the current 8.5 Ha (21 acre) City level park. The garden park is maintained by the City and the Conservancy Trust Society.

Darts Hill Garden Park is currently listed on the City's Heritage Inventory and may be considered for addition to the Community Heritage Register in the future.

Darts Hill Garden Park Plan Extension

In 2018 the City of Surrey and Darts Hill Garden Conservancy Trust Society began a master planning process to guide development of the Garden over the next 20 to 30 years. The Plan envisions an extra 3.0 ha (7.4 ac) north expansion of the park to create a regional destination and a legacy for future generations. The park's expansion will be secured through land acquisition and the conveyance of protected riparian area. A future detention pond will also be located at the eastern portion of the extension area.

New Park A

Located at 19A Avenue and 169 Street, this will be a small 0.8 ha (2.0 ac) neighbourhood park with a range of amenities. This will likely include paths, benches, a playground and other small-scale features. Pedestrian linkages connect the park to 20 Avenue and 168 Street while 19A Avenue provides a direct link to the mixed-use village. It is located next to a neighbourhood commercial node, provides convenient access for shoppers, residents and those passing by to enjoy.

New Park B

Next to the mixed-use urban village and located at 19 Avenue and 171 Street, Park B will serve as a focal point for the neighbourhood. Local amenities will support community gatherings, recreational activities, and special events. The park will also be the potential future home of a neighbourhood house (TBD), providing community services for residents. The 2.4 ha (5.9 ac) park will be accessible to residents given its central location and connectivity to the 171 Street cycle tracks, 18A Avenue multi-use pathway and adjacent park trails. Today, the site of new Park B includes a man made pond area which will be evaluated as part of a future planning and design process.

New Park C

Located at 175 Street and 18 Avenue, Park C will serve the eastern part of the neighbourhood. This 1.1 ha (2.7 ac) park site will be well-connected to the 18 Avenue multi-use pathway and the Highway 15 pedestrian overpass to Redwood Park. The pedestrian bridge will also provide residents on the east side of Highway 15 with safe and convenient access to this park.

New Park D

Approximately 4 ha in size, Park D will be a large neighbourhood park serving the middle part of the neighbourhood. The park features two active sites bisected by a riparian area. The biodiversity corridor bounds the south of the park and provide an east-west link through the neighbourhood. Given steep topography and natural areas, Park D will likely function as a place for passive recreation and gathering.

Park Design Guidelines

Successful parks are the result of meaningful consultation with stakeholders and thoughtful planning and design. It is important that development adjacent to parkland positively contribute to park design and function by complying with the following guidelines:

- Development should meet the existing natural grade of parkland. Retaining walls are discouraged. If required, they must be entirely on private property including any underpinning with all necessary setbacks for maintenance, including machinery access, and appropriate landscape screening. Setbacks for retaining walls should be equal to the wall height.
- Multi-family development next to parks should provide a park adjacent sidewalk within the private property onto which all ground-oriented units will front. Any fencing to delineate private property will be a maximum of 0.9 m tall, permeable and located on the private property side of the frontage sidewalk.
- Any development next to an existing or future park must submit an arborist report including the first 15 meters of adjacent parkland. Removal of any tree on parkland requires advanced written approval from the Parks, Recreation and Culture (PRC) Department.
- If rights-of-way for servicing or any other access (temporary or permanent) is required through existing or future parkland, compensation for the access and a cash-in-lieu payment for the restoration re-planting are required to Parks standard.
- Protection and incorporation of native plans and trees, natural water features, and biodiversity elements (e.g. pollinator meadows) should be considered.
- If any of the detention ponds that are adjacent to existing parkland are relocated through the development process, the equivalent park area outside the footprint of the detention pond must also be relocated or reallocated through the pond relocation process.

All parkland road frontages and amenities will be funded through an area specific parkland amenity contribution, collected on a per unit basis from all applicable development within the Plan Area (see Section 9.2).

6.3 Natural Areas

The Plan is home to a variety of notable sensitive ecosystems, including watercourses, wetlands, and ravines. It also includes a regionally significant corridor of the Green Infrastructure Network (GIN). The identified corridor is required for movement of wildlife between Darts Hill Garden Park and Redwood Park. The protection of these natural features is supported by clear direction in the Biodiversity Conservation Strategy (BCS) as well as Federal, Provincial, and Municipal statutes and by-laws. Through the conservation and management of key natural areas the Plan ensures healthy, protected, diverse ecosystems and biodiversity while incorporating access to and views of nature.

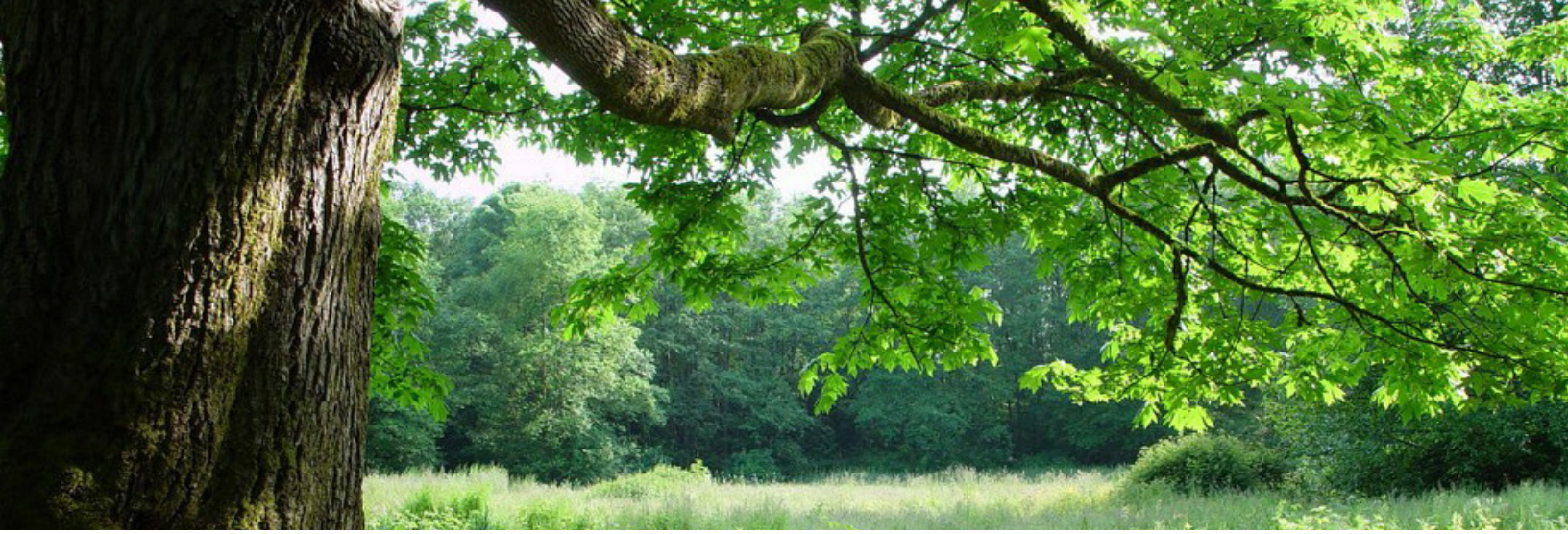
Biodiversity Corridor & Wildlife Crossings

Darts Hill NCP is located within a network of environmentally sensitive corridors, sites and hubs that together form the Green Infrastructure Network (GIN). Key GIN infrastructure is inventoried within the Biodiversity Conservation Strategy (BCS).

GIN Hub F, located southwest of the Plan Area, is a significant and high ecological value biodiversity hub. It is partly protected through the Fergus Watershed Biodiversity Preserve and is home to important aquatic and riparian habitat for species at risk. A second, high ecological value biodiversity hub, is located east of the Plan Area. This hub is protected within the boundary of Redwood Park, and includes large areas of intact mature forest, wetlands and open field habitat.

These two Biodiversity Hubs are connected through the southern part of the Plan Area by GIN Corridor #32. Corridor #32 is identified within the BCS as a regional corridor with a target width of 50 m. It includes fragmented natural areas, such as creeks, riparian areas and wetlands, and provides important edge habitat to ALR field habitat. The BCS calls for the establishment of a protected forested corridor beyond the perimeter of the ALR. It also identifies traffic calming and signage at road crossing, notably at 16 Avenue and 176 Street.

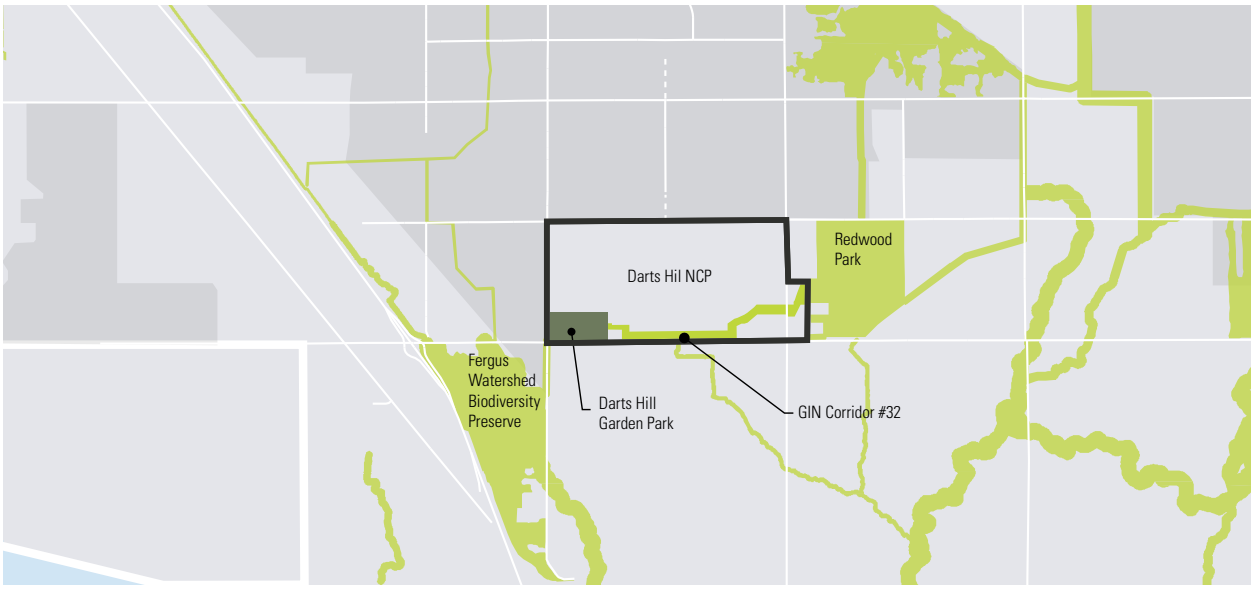
GIN Corridor #32 is designated as nature preserve/habitat corridor within the Plan. This classification is recognized in the Parks, Recreation and Culture Strategic Plan. It is intended to protect the intrinsic value of natural areas with a focus on ensuring habitat connectivity between larger ecosystems. The specific alignment of the corridor considered detailed site analysis, drawing from background studies and direction from environmental professionals.



In total, GIN Corridor #32 protects an area of 7.6 ha (18.7 ac) within the Plan. The corridor will be secured through parkland acquisition, funded through a NCP specific Development Cost Charge (see Section 9.4). It will also be funded through the conveyance of riparian areas and other sensitive ecosystems. It will be managed as a natural area with limited park pathways along the north periphery next to development.

Roads present significant challenges to wildlife. They remove habitat and create fragmentation and barriers to movement. When wildlife is forced to cross the road there is increased risk for vehicle-animal collision which present a major safety concern. Vehicle noise, artificial lighting and road infrastructure can also disrupt wildlife movement and habitat. In addition to species conservation, road user safety is enhanced when wildlife is provided safe crossing points. Increased signage, traffic calming measures, and culverts help with reducing vehicle speed and increasing driver awareness.

Figure 6.3A: Green Infrastructure Network



Wildlife Crossing Guidelines

Three wildlife crossings have been identified in Darts Hill and are subject to detailed study at the development stage (see Section 5.8). The ultimate design of wildlife crossings will be influenced by the City's Biodiversity Design Guidelines and in accordance with the Sam Hill Creek ISMP. Where the GIN corridor crosses 171 Street, 174 Street, and 175 Street, roadways will be reviewed to develop alternative cross sections. Road design must take into account the needs of wildlife to maintain habitat connectivity and reduce human-wildlife conflict. Proper assessment and design shall involve appropriately skilled Qualified Environmental Professionals (QEPs) and transportation engineers to determine appropriate design for each location.

The following design elements should be considered for all wildlife crossing areas:

1. Road narrowing – removal of parking and other opportunities to narrow the road to minimize crossing distance.
2. Wildlife Signage – to notify of wildlife that may be crossing in the area.
3. Fencing – to direct wildlife to a crossing structure or location.
4. Lighting – LED street lighting should be a spectrum designed to minimize negative effects on wildlife.
5. Curbs – roll over curbs should be implemented to allow small mammals and amphibians to cross easier.
6. Wildlife crossing culverts – fisheries culverts should be oversized to accommodate wildlife at low flows. Dry culverts should be installed to facilitate wildlife movement under roadway.
7. Vegetation planting – plant native vegetation to provide maximum cover on either side of the road.
8. Trees – plant trees which provide large overhanging branches across the roadway to allow birds, insects and arboreal animals (e.g. squirrels) easy access across to the canopy.

Water-courses & Wetlands

Several streams, riparian areas and wetlands were identified during the Planning process (see Section 1.5). Many of these watercourses are regulated by Provincial and Federal laws and protected under the City's Streamside Protection Zoning Bylaw (Part 7A of the Zoning Bylaw 12000). The aim of the Bylaw is to protect for the City's unique interests, beyond Provincial and Federal regulations. The Bylaw protects fisheries and biodiversity values. It also protects the public interest by managing flood hazards and slope erosion.

As established by the Zoning Bylaw, riparian areas require a prescribed setback between the watercourse and proposed development. This buffer is to be protected and naturalized with native vegetation. This supports habitat and fisheries values and aids in bank stabilization to reduce erosion and flood potential. This will also support biodiversity and encourage native pollinators and wildlife to occupy riparian spaces.

All streams and riparian areas should be conveyed to the City to be protected and maintained as natural area. In total, the Plan identifies 7.5 ha (18.5 ac) of protected watercourse areas to be conveyed and maintained. Park pathways will be located next to some of these areas, located outside of setbacks. These paths will serve to advance the Plans principles of facilitating connectivity, providing access and views of nature, and opportunities for passive recreation for residents.

Wetlands support important ecological functions for fish and wildlife. They provide essential water quality regulation for aquatic habitat. Invertebrate biodiversity found within wetlands also provide important food resources for fish, birds, and amphibians. Wetlands also mitigate flooding, filter storm water and provide carbon-capturing services. They also act as breeding and gathering areas for wildlife throughout the year and provide essential habitat and food resources.

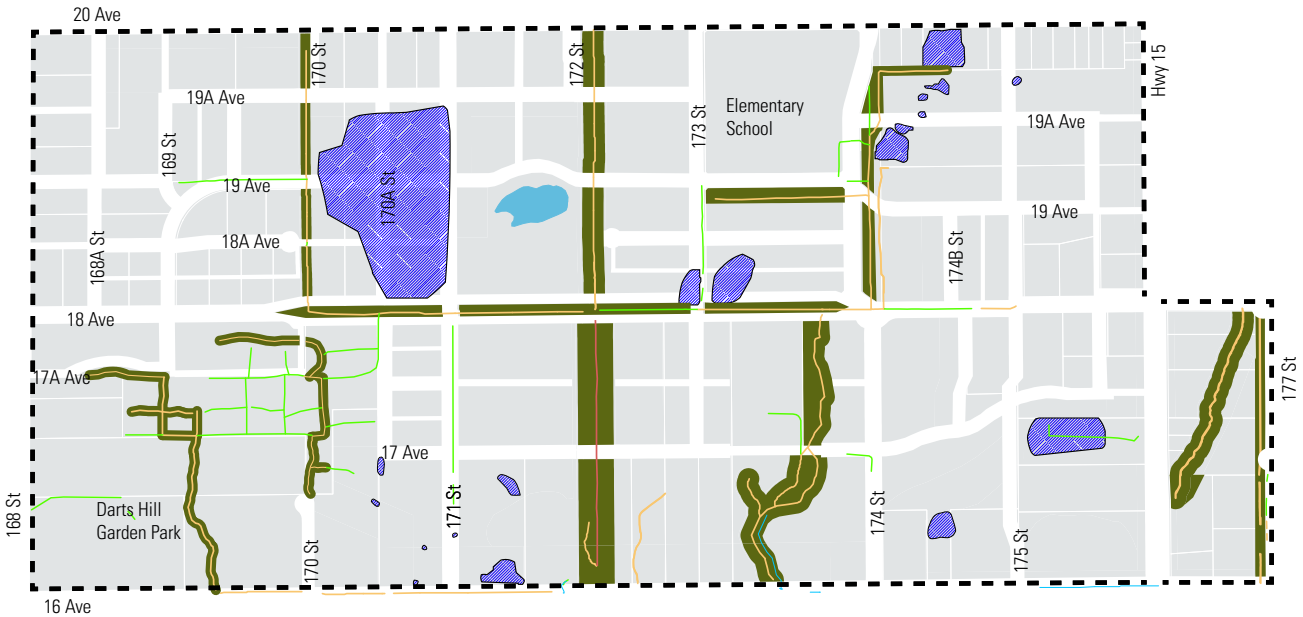
Several wetlands have been identified in the Plan Area. The specific boundaries and locations of identified and potential wetlands are approximate only. There may be wetlands and streams that were not identified within the Planning process. Further detailed studies by an appropriately qualified QEP are required to verify the location and sizes of any wetlands and watercourses before any development can occur.

Besides wetland and watercourse protection, on-site rainwater management throughout built areas is essential to protect the health of these aquatic and riparian ecosystems.

LEGEND

- Class A Watercourse
- Class A/O Watercourse
- Class B Watercourse
- Class C Swale
- Waterbody
- Potential Wetland

Figure 6.3B: Watercourse & Wetlands



6.4 Park Pathways

A network of connected park pathways are planned throughout the neighbourhood to support active travel and pedestrian connectivity while providing key access to parks and natural areas. Paths extend throughout the neighbourhood connecting parks, roads and key amenities. Several pedestrian crossings over riparian areas are located where park pathways intersect creeks. Crossings will be designed to facilitate pathway connectivity while minimizing disturbance to environmentally sensitive areas.

All park pathways and amenities will be funded through an area specific parkland amenity contribution, collected on a per unit basis from all applicable development within the Plan Area (see Section 9.2)

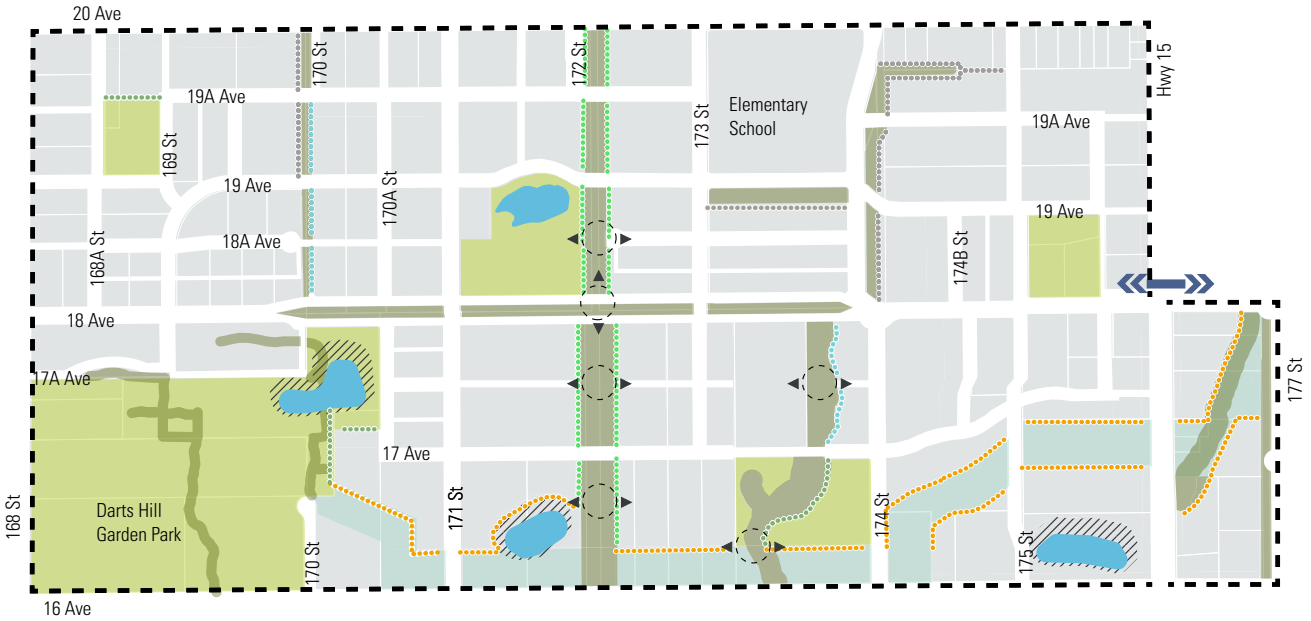
The design of park pathways is important. Adjacent development should provide access and unit frontage along these pathways to provide residents with access to nature and recreation opportunities. The design of park paths will be subject to a future park planning process and guided by the City's Biodiversity Design Guideline. The following design elements should be considered for all park paths:

1. Promote natural edge conditions and support biodiversity along park paths by encouraging pollinator pathways and native gardening.
2. Maximize permeability in trail surfaces.

LEGEND

- Primary Park Pathway
- Biodiversity Corridor Pathway
- Secondary Park Pathway Active
- Active Parkland Pathway
- Private/Public Pathway
- Biodiversity Corridor
- Park
- Riparian Area
- Detention Pond
- Pedestrian Crossing

Figure 6.4: Park Pathways



Types of Pathways

Primary Park Pathways

Primary park pathways run adjacent to the central north/south riparian area connecting the urban village and 20 Avenue in the north with the biodiversity corridor in the south. These pathways are located within a 5 m area of conveyed parkland adjacent to the protected riparian areas.* Development adjacent to these pathways should conform to Transition 3 as detailed within section 4.7.

Secondary Park Pathways

Secondary park pathways run adjacent to identified riparian areas providing a network of pedestrian connectivity throughout the neighbourhood. These pathways are located within a 3.3 m area of conveyed parkland adjacent to the protected riparian areas.* Development adjacent to these pathways should conform to Transition 5 as detailed in section 4.7 and adhere to the City's Biodiversity Design Guidelines.

Biodiversity Corridor Pathways

Biodiversity corridor pathways run along the periphery of the corridor providing east-west connectivity though the Plan. These pathways are located within Biodiversity Corridor adjacent to development sites. Development adjacent to these pathways should conform to Transition 4 as detailed within section 4.7.

Active Parkland Pathways

Active parkland pathways run next to active parks. A 1.5 m pathway is required on the development site along the park or natural area interface. Private fencing (optional) should be permeable and setback 1 m from the pathway (on the development side) complemented with layered planting/landscaping. For active parks, no fencing is permitted on the parkland side of the pathway. For natural areas, a park fence should be installed on the parkland side of the pathway. Development adjacent to these pathways should conform to Transition 7 as detailed within section 4.7.

Private/Public Pathways

Private/Public pathways run adjacent to riparian areas where secondary park pathways are not identified. Development is encouraged to provide a minimum 1.8 m pathway on private property setback 0.5 m from the riparian areas. Development should front onto the riparian area with front facing doors, windows, active rooms, and porches. Private fencing (optional) should be permeable and no higher than 0.9 m, setback 1 m away from the walkway. Development adjacent to these pathways should conform to Transition 8 as detailed within section 4.7.

*Note: For sites adjacent to Primary Park Pathways densities will be calculated on a gross site basis, before conveyance of parkland. Primary and Secondary Park Pathways are to be conveyed to the City and considered as density transfer areas. As such the transfer of density and development potential may be distributed from one location to another on the same site.

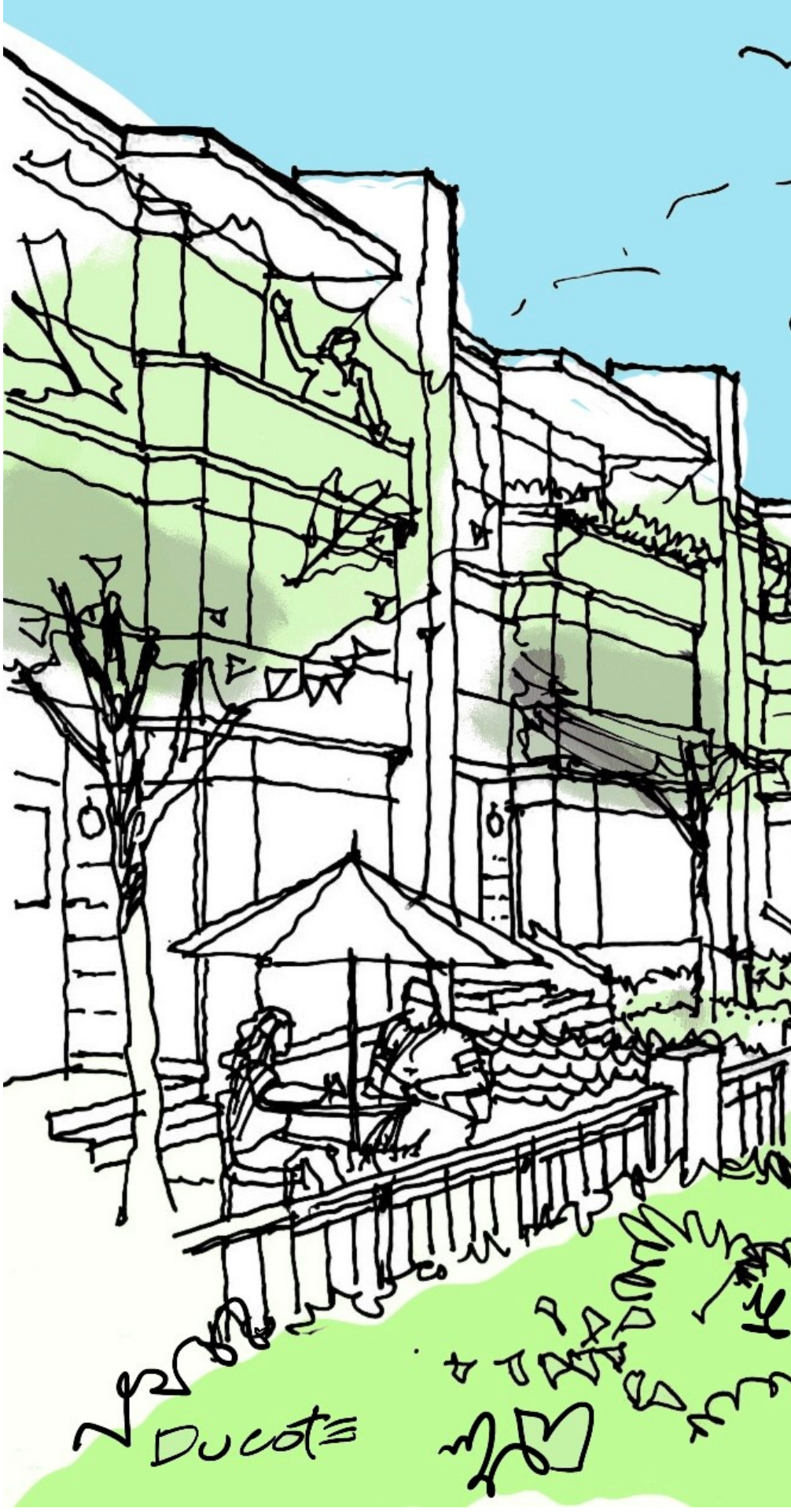
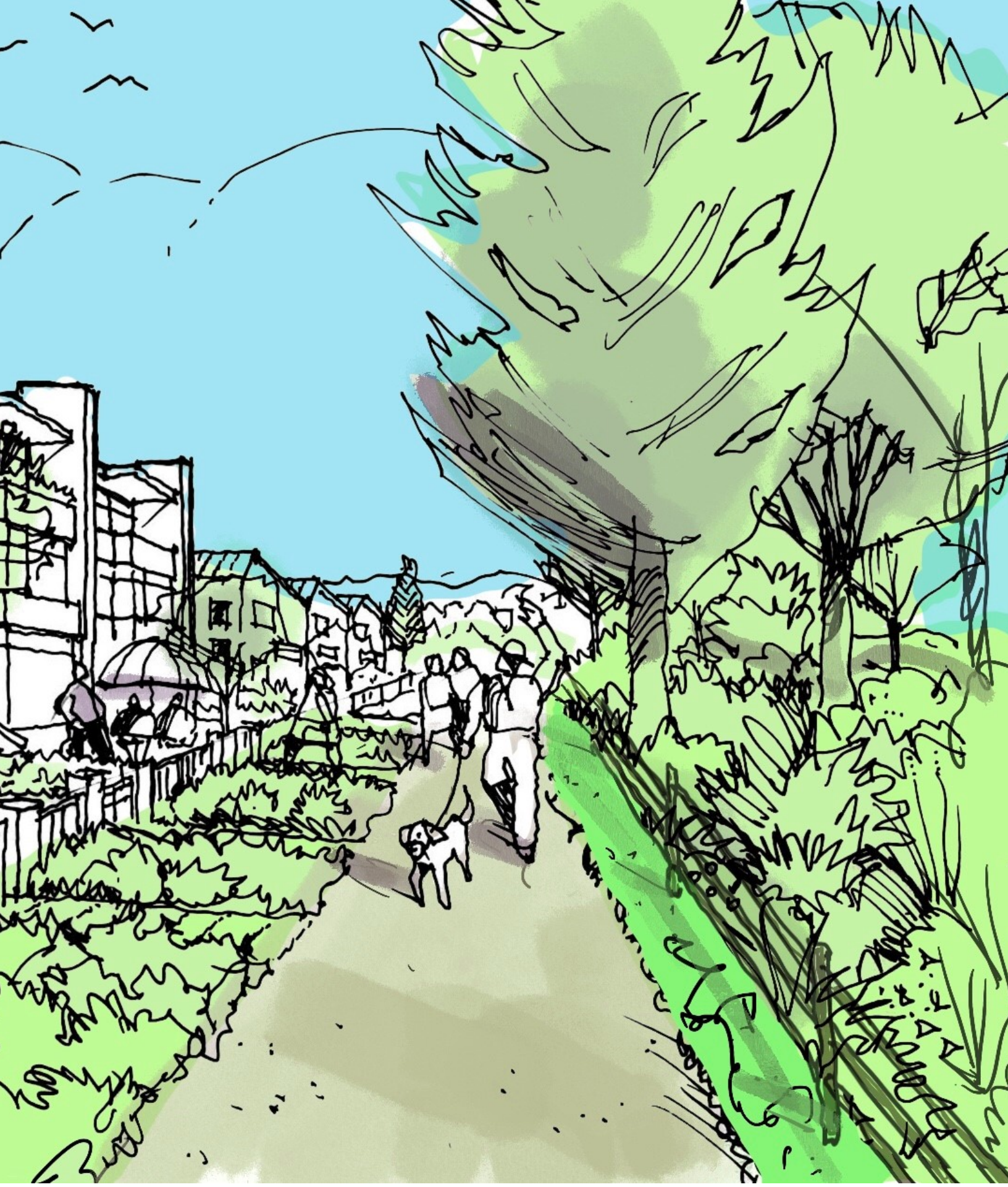


Illustration
Park Path Design



6.5 Plazas

Plazas encourage social interaction and activity that reinforce the public realm. They provide an alternate type of public open space in higher density areas. Activities supported by public plazas, such as socializing, resting, and eating, add to the quality of city living and provide positive social and cultural opportunities.

Plazas can serve as neighbourhood gathering points and landmarks that enhance the character and function of adjacent developments. When animated with public art, seating, and landscaping features, they provide people with a sense of comfort and safety.

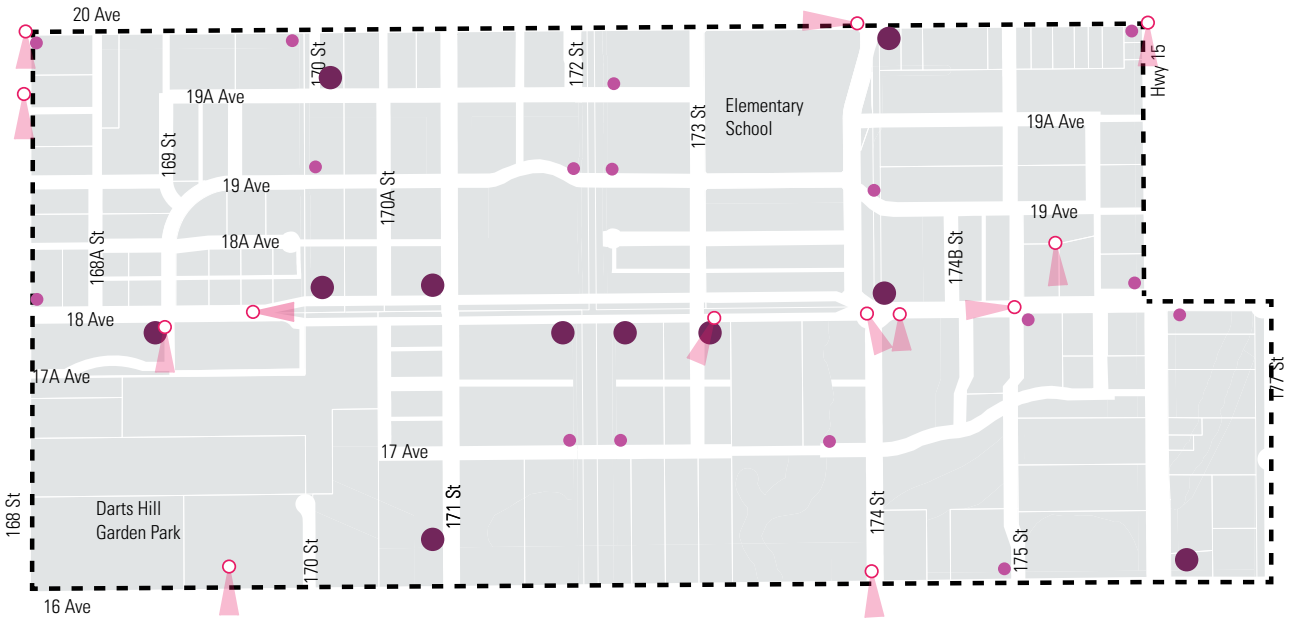
Plazas will be delivered as accessible open space on private property. They are paid for and delivered through development. Individual plazas function best when integrated within the hierarchy of open spaces, serving immediate local needs. All plazas will be secured through adjacent development and enhanced/enlarged with increased setbacks and/or road dedications.

To maximize use and visibility, plazas are located in areas of high pedestrian activity and at corners of important streets and trails to take advantage of sunlight and views. The following designated publicly accessible open space plaza locations do not limit additional publicly accessible open space added elsewhere.

LEGEND

- Plazas - Medium
- Plazas - Large
- View Corridor

Figure 6.5: Plazas



Plaza Sizes

There are two minimum sizes of plazas, depending on the location:

- Small Plaza: Minimum area of 18 sq.m. with minimum dimension of 3 m (e.g. 3 m x 6 m)
- Medium Plaza: Minimum area of 36 sq.m. with minimum dimension of 4.5 m (e.g 4.5 m x 8 m)

Plaza Design Guidelines

Plaza design should be coordinated through urban design review of adjacent development. Designs will be subject to review by Urban Design.

Development next to a designated plaza should contribute to the plaza design and function by complying with the following design guidelines:

A. Provide clear street visibility by having at least two edges with street frontage. Design the space as public to encourage street activity and public safety.
B. Optimize view corridors.
C. Adjacent buildings should minimize overshadowing the plaza.
D. Building entrances, lobbies, commercial and retail units adjacent to a plaza should connect and orientate its frontage onto it.
E. Avoid parking area interfaces with the plaza.
F. Grade plazas to meet sidewalk grades and avoid retaining walls, stairs, and ramps to provide universal accessibility and clear site lines.
G. Maximize accessible and comfortable seating opportunities. Orient seating towards the street, near building entrances, and next to amenities.
H. Consider weather protection for open spaces, seatings and along commercial uses. Such protection should be provided at waiting points and along major pedestrian routes.
I. Furnish with a variety of amenities to encourage public usage and to create a sense of liveliness and excitement. Key amenities can include chairs, tables, public art, games, fountains, and bicycle racks.
J. Use subtle, pedestrian lighting in character with the overall design, while also providing nighttime generalized lighting to enhance safety and nighttime use.
K. Flush in-ground planters should be used instead of raised planters.
L. Integrate landscaping with shade trees and durable planting. Specify plants for the level of maintenance planned at the site, including robust and drought tolerant species wherever possible.
M. Provide natural elements which reflect seasonal change, such as deciduous trees, as well as shrubs, ground covers, and flowers in a variety of colours and textures.
N. Incorporate irrigation and adequate drainage to assure plant survival over time. Integrate stormwater management into landscaping features wherever possible.

"Transit connections, walking paths and bike routes that enable easy non-car movement to other areas in South Surrey."

Survey Response, Darts Hill Plan Process, 2018-2020

7 Community Amenities
Building Community

Community facilities are foundational to a healthy, safe, and complete community. They provide amenities and programming that encourage active living, learning, and well-being. As Darts Hill grows and develops, it's vital that the City secures community spaces and resources to meet the needs of future residents.

7.1 Civic Facilities & Services

Civic facilities are community hubs that bring people together, supporting capacity, volunteerism, and a sense of place. They are wellbeing and social service centres that make positive impacts on real social issues facing the community. Given their scale, civic facilities like libraries, ice rinks, and art centres, serve regional populations. Within Grandview Heights there are several facilities, current and planned, that serve the needs of residents:

- Grandview Aquatic Centre: Located at 24 Avenue and 168 Street, the Grandview Heights Aquatic Centre features a 10-lane Olympic size competition pool and related amenities.
- Grandview Community Centre (future): A new Community Centre planned for next to the Grandview Aquatic Centre. It will provide facilities and services for recreation and sport, wellness, arts, and library services. This new centre will create a new social, cultural and recreational hub for Grandview Heights.
- Grandview Athletic Park (future): Coupled with the future Community Centre, a new community park will be developed to support outdoor recreational needs.
- Grandview Neighbourhood House (future): A Neighbourhood House is planned for Darts Hill. The Neighbourhood House will be an important centre for community and cultural activities, learning, and recreation. It is anticipated as a non-profit facility.

Figure 7.1: Civic Facilities

7.2 Schools

Schools are a critical part of growth planning. Currently there are no schools within the Plan Area. Based on growth projections one new elementary school will be required within the Plan Area. The School District has confirmed that with this extra school the area will meet projected demand in student population.

While schools are exempted from certain Provincial environmental requirements, they are not exempted from the City's Part 7A Streamside Protection Bylaw, nor are they exempted from the expectations of the Green Infrastructure Network (GIN).

Elementary

An elementary school site has been identified within the neighbourhood at 20 Avenue and 173 Street. The School District had completed the acquisition of this school site prior to the completion of this plan. The school will have an anticipated capacity of approximately 650 students when completed. This capacity will sufficiently address the needs of the neighbourhood as currently planned. Future land use amendments to the Plan may impact the capacity of this future school.

Secondary

There is no secondary school within the Plan Area. Secondary students within this neighbourhood will fall within the catchment of Grandview Heights Secondary. Grandview Heights Secondary will have an anticipated capacity of 1,500 students. This capacity will sufficiently address the needs of the neighbourhood as currently planned. Future land use amendments to the Plan may impact the capacity of Grandview Heights Secondary.

Figure 7.2A - Elementary School Catchments

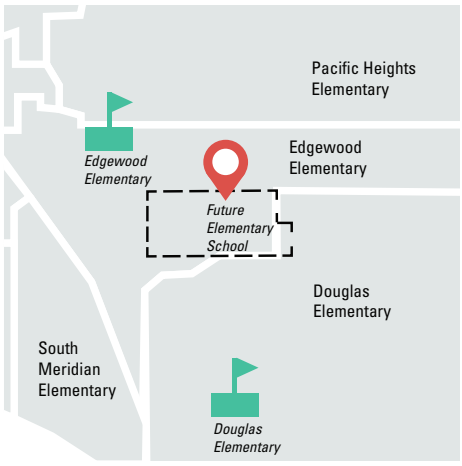
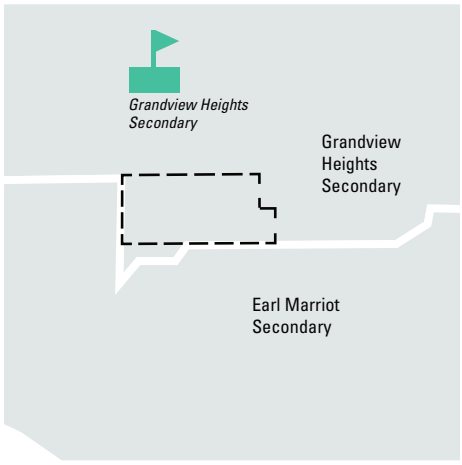


Figure 7.2B - Secondary School Catchments



7.3 Public Art

Public art animates the public realm and contributes to creating a memorable and unique neighbourhood. It also engages residents in the interpretation and expression of what is important and significant to the community. Public art is envisioned to enhance the walkability and unique character of Darts Hill. Sites for future artworks are identified within the Surrey Public Art Master Plan. New development is expected to contribute to public art through the City's Private Development Public Art Policy. See Section 9.2 Community Amenity Contributions for more details.

7.4 Heritage Conservation

Darts Hill Garden Park

Darts Hill Garden is the result of over 75 years of work and dedication guided by the clear vision of Francisca Darts. The Darts family converted a logged piece of land into an award-winning orchard and then into the unique garden that is Darts Hill today. The park's history and garden is valued to the community, and is an important educational site within the horticultural community.

The gardens within the site were established in 1943. They features one of the most diverse collections of mature tree and shrub species in the Pacific Northwest. Many were planted from seed collected from around the world. The gardens also include a pond and various rough cut stone walls built throughout the site's history. A series of pathways connect the different planting sections throughout the garden.

The house was built in 1947 and was the home of the Darts Family for over 60 years. It is a simple two-storey traditional house. The site is now owned by the city of Surrey and is a popular tourist attraction.

Currently listed on the City's Heritage Inventory, Darts Hill Garden Park may warrant addition to Surrey's Community Heritage Register.

Sites Of Potential Heritage Value

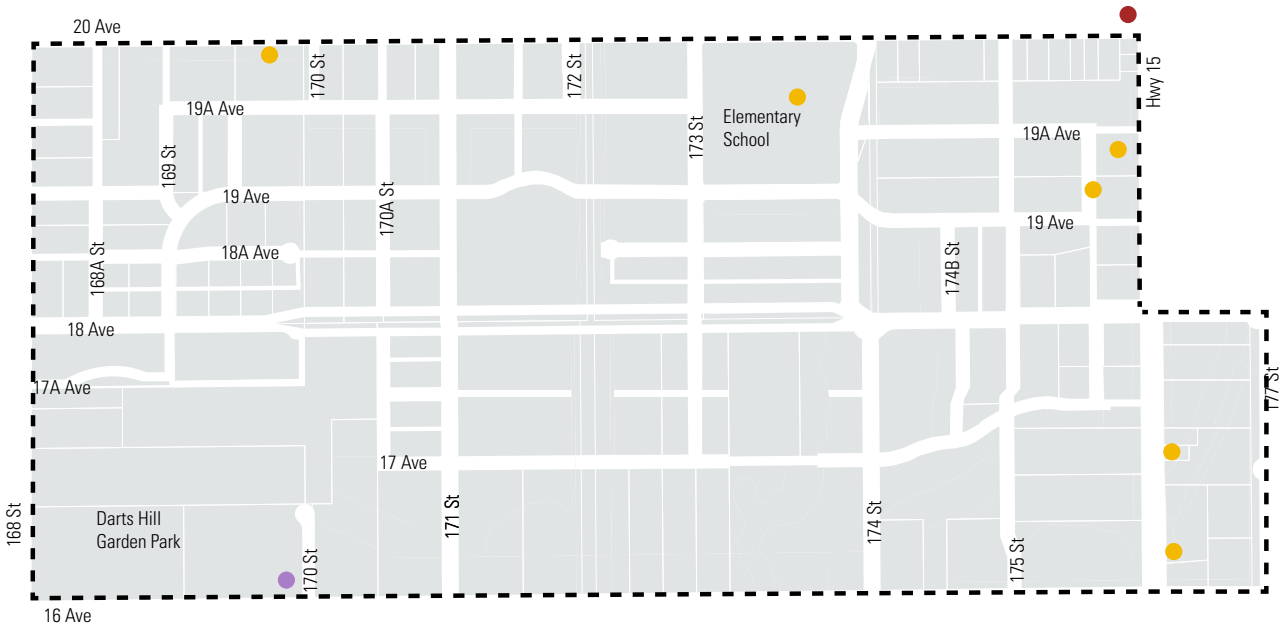
In addition to Darts Hill Garden Park, there are a number of sites and homes that are potentially significant. Before their heritage value can be established and listed on the City's Heritage Inventory, further analysis is required.

- 16982 20 Avenue – Built C. 1938
- 1634 176 Street – Built C. 1944
- 1702 176 Street – Built C. 1949
- 1893 176 Street – Built C. 1945
- 1909 176 Street – Built C. 1945
- 17390 20 Avenue – Pre 1949

LEGEND

- Registered Heritage Site
- Heritage Inventory
- Potential Heritage Site

Figure 7.4 Heritage Conservation



"More bus routes
are needed,
not only for Darts Hill
but the Grandview
Heights area
in general."

Survey Response, Darts Hill Plan Process, 2018-2020

8 Utilities & Servicing
| The Building Blocks

An efficient and reliable infrastructure network is critical for a liveable and thriving neighbourhood. Future land uses and expected growth in the Plan Area will increase demand on utilities and servicing. This section outlines the utility servicing strategies that will support growth in the Plan Area.

8.1 Drainage

The Darts Hill NCP area is located within the Sam Hill Creek watershed. Existing watercourses generally flow south and south-east through agricultural lowlands to their confluence with the Little Campbell River. There are five major watercourses into which the Darts Hill Plan Area drains: Upper Sam Hill Creek, Sam Hill Creek, Thomson Creek, Sam Hill Creek Diversion, and an unnamed tributary.

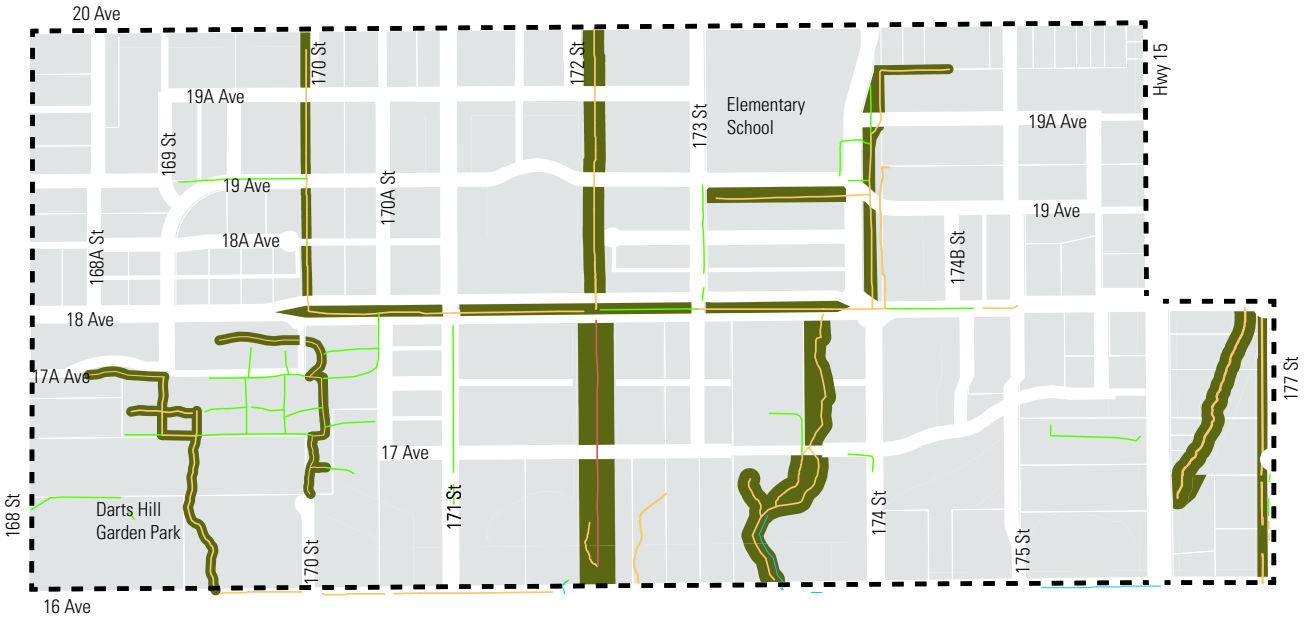
Watercourses are divided into 4 categories and are colour coded to indicate if there is fish habitat present:

- Class A (Red) – Inhabited by fish year-round or potentially inhabited by fish year round. Considered 'streams' as defined by the Provincial Water Sustainability Act and Riparian Areas Protection Regulation. Considered fish habitat as defined by the Federal Fisheries Act.
- Class A(O) (Red dash) – Inhabited by fish primarily during the over-wintering period or potentially inhabited by fish during the over-wintering period with access enhancement. Considered a 'stream' as defined by the Provincial Water Sustainability Act and Riparian Areas Protection Regulation. Considered fish habitat as defined by the Federal Fisheries Act.
- Class B (Yellow) – Provides food/nutrient value to downstream fish habitat. No fish potential present at any time of the year due to the presence of a natural fish barrier. Considered a 'stream' as defined by the Provincial Water Sustainability Act and Riparian Areas Protection Regulation. Considered fish habitat as defined by the Federal Fisheries Act.

LEGEND

- Class A Watercourse
- Class A/O Watercourse
- Class B Watercourse
- Class C Swale
- Riparian Area

Figure 8.1A: Fish Classifications



- Class C (Green) - A water feature that is not considered a 'stream' as defined by the Provincial Water Sustainability Act or the Riparian Areas Protection Regulation. Not considered fish habitat as defined by the Federal Fisheries Act. No fish potential present at any time of the year.

The existing Plan Area is primarily comprised of single-family residential lots, most of which are over one acre in size. The land has significant grass and tree cover, which promotes rainwater capture, infiltration, and natural attenuation of flows.

There is minimal existing drainage infrastructure in the Plan Area. Local drainage servicing is accomplished by roadside ditches and intermittent stormwater sewers and culverts that convey flow to the various watercourses. Stormwater flows south-southeast towards 16 Avenue, then through ALR lowlands into Sam Hill Creek which flows to the Little Campbell River. The ALR lowlands is sensitive to flooding caused by increased flow rates and volumes.

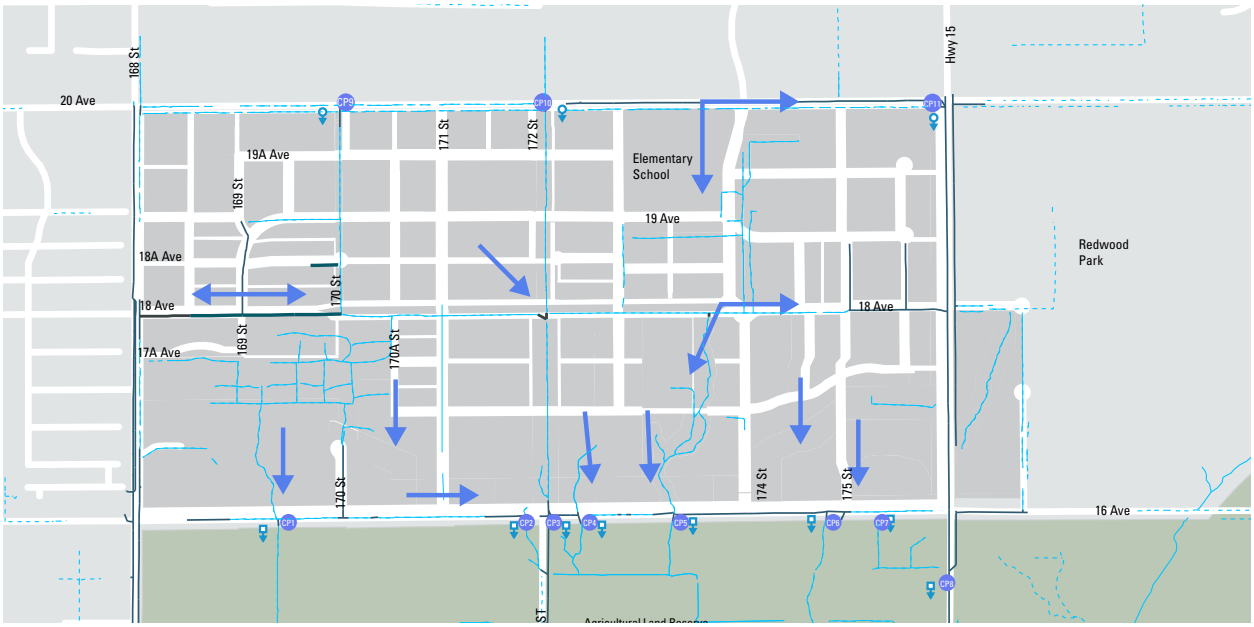
Control Points

To develop a drainage servicing strategy for the NCP, Control Points (CP) were established at the inflow and outflow boundaries of the Plan Area for watercourses and storm sewers. Three (3) inflow and eight (8) outflow locations were designated as CPs, as shown on the map below. The outflow CPs represent locations where concentrated runoff leaves the Plan Area within a classified watercourse.

LEGEND

- Streams
- Existing Storm Sewer
- Inflow
- Outflow
- Drainage Route
- Control Point

Figure 8.1B: Existing Drainage System



Existing Conditions

Hydrogeology

A detailed hydrogeological assessment for the Plan Area was conducted to confirm soil and groundwater conditions and infiltration potential. The assessment included a more focused desktop study of surficial geology and hydrogeology for the Plan Area. The study also included a field investigation which included hand dug test holes and infiltration testing.

The investigation confirmed the presence of Vashon Drift and Pre-Vashon sediments below Capilano sediments and Bose soils within Darts Hill. Infiltrometer testing was performed at nine locations within the NCP area. The infiltration rates from the vertical tests ranged from 1.2 to 25.9 m/day (50 to 1080 mm/hr) with median and geometric mean values of 13.9 and 10.0 m/day (18- to 415 mm/hr), respectively. The recommended short term design infiltration rate is 1.0 m/day (41.67 mm/hr).

The Bose soil type that covers Darts Hill is typically about 1 m deep and often has a high short-term infiltration capacity that is constrained by depth to the water table, particularly during wetter months. To optimize the amount that can be infiltrated, to the extent possible, infiltration features such as swales, rain gardens, buffer strips and porous pavements, should be implemented to distribute stormwater throughout Darts Hill rather than concentrating flows in a few small areas. When they become incapable of infiltrating water at the rate of inflow, drainage systems should have adequate local storage capacity, or should overflow to another infiltration system, and ultimately to a detention system.

Darts Hill NCP represents an important aquifer recharge zone. As development increases, the area covered by hardened surfaces increases; as a result, aquifer recharge rates may be reduced unless care is taken to maintain or enhance infiltration.

Design Criteria & Analysis

Future development will increase the extent of impervious surfaces in the area, thus increasing peak runoff rates as well as runoff volumes. Increased runoff rates and volumes have the potential to overload downstream infrastructure and natural assets, resulting in flooding and/or erosion during storm events. Water quality can also be negatively impacted.

The proposed drainage strategy for the Plan follows the design criteria in the City of Surrey's Design Criteria Manual (2020) and the Sam Hill Creek Watershed ISMP (2019). This includes level of service and release targets for peak flow conveyance, runoff rate control and runoff volume control. These documents and criteria were used for sizing the proposed infrastructure.

Single event and Long-Term Continuous Simulation (LTCS) hydrologic and hydraulic computational modeling were performed to ascertain the hydraulic performance of the proposed drainage system. For determining pond size, the 24-hour rainfall was deemed the governing storm while the 1-hour rainfall governed during the sizing of the conveyance system and culverts. LTCS was also used to evaluate the proposed ponds and Low Impact Development (LID) features.

Conveyance Criteria

The potential for in-ground basements was a consideration for the Plan Area. Where lower building elevation is desired, such as for basements, the City's design criteria require the Minimum Building Elevation (MBE) to be least 0.3 m above the 100-year Hydraulic Grade Line (HGL). This precludes the possibility of using surface flow routes for the 100-year event. The proposed trunk sewer system has therefore been designed to accommodate the 100-year flow with a minimum depth of cover of 2.5 m. This allows for the possibility of in-ground basements in the Plan Area.

Runoff Rate

Controlling the peak runoff rate is typically accomplished by temporarily storing runoff in a detention pond during peak flows and slowly releasing it. A control point was established for each catchment at its downstream point of discharge. These points were used to compare pre- and post-development flow rates and volumes.

For each of the eight control points in Darts Hill, runoff rate targets were established as follows:

- Control the 2-year post-development flow to the 2-year pre-development rate.
- Control the 5-year post-development flow to the 5-year pre-development flow rate.

Control points are generally designed to attenuate peak flows up to the 5-year event unless the downstream conveyance routes do not have sufficient capacity or traverse through private properties without City ROWs. In this case, 100-year post-development flows would have to be controlled to the 100-year pre-development flow rate.

Runoff Volume

Increased runoff volume can increase erosion in downstream channels, pose a flooding risk to downstream agricultural lands, and place additional demand on farmland drainage infrastructure. Decreasing infiltration also reduces summertime baseflows in downstream channels which has a negative impact on its ecosystem.

The Sam Hill Creek Watershed ISMP recommended the adoption of criteria laid out in the Metro Vancouver Source Control Guidelines (2012). These guidelines recommended capture of 72% of the 2-year return period 24-hour rainfall (6-month 24-hour rainfall). For the Darts Hill NCP area, this equates to 38.3 mm, based on rainfall measurements at the White Rock rain gauge station. In the event that rainfall cannot be infiltrated or reused onsite, the guidelines recommend a release rate of 0.25 L/s/ha. This release rate is a requirement for sites that cannot meet the 38.3 mm capture volume target.

Proposed Drainage System

The proposed drainage servicing strategy for Darts Hill consists of:

1. Underground storm sewer system to collect and convey runoff from various lots proposed within Darts Hill.
2. Detention ponds to control post-development flows to established targets for the 2-year and 5-year events at the control points.
3. Low flow diversion structures designed to maintain flows up to 2-year pre-development peak flow to the Class A and B watercourses where necessary.
4. On-lot detention systems to control post-development flows to established targets for the 2-year and 5-year events for areas that are unable to drain to the detention ponds.
5. LID measures located throughout the Plan Area to provide stormwater retention in order to meet runoff volume targets.
6. Safe conveyance of 100-year post-development flows through the storm sewer system, detention ponds and downstream watercourses.

The proposed drainage system is designed to mitigate and reduce the impacts of development on downstream infrastructure and habitat. This is achieved by reducing peak discharge rates and discharge volumes to near or below pre-development levels, and providing water quality treatment. Catchment sizes and boundaries have been kept as similar to existing boundaries as possible in order to maintain existing flow patterns.

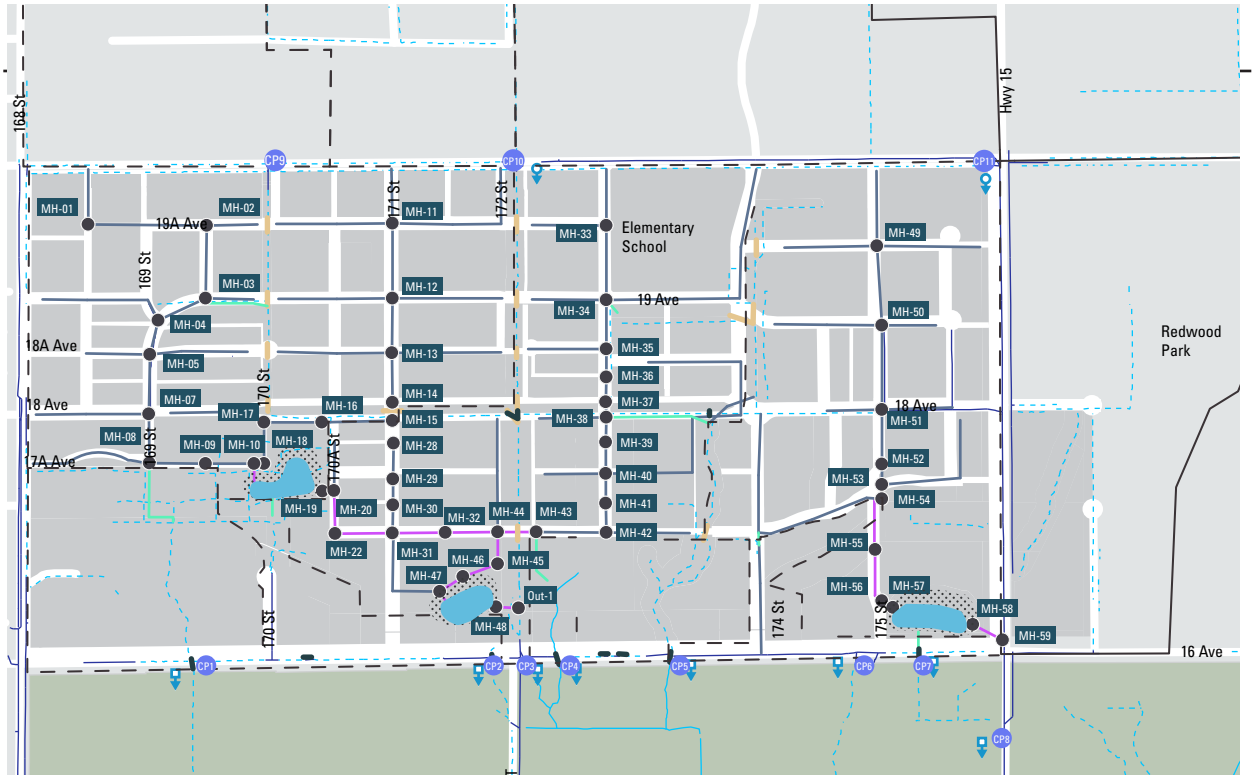
Runoff Rate Control

Stormwater runoff from the majority of the Plan Area will be detained by centralized detention ponds, with the exception of areas requiring on-lot detention, riparian areas, biodiversity corridors, and park land. The table below outlines the pre- and post-development release rates for each control point.

Table 8.1A: Control Points Pre- and Post- Development Release Rates

Control Point	Pre-Development Conditions				Post-Development Conditions			
	Contributing Area (ha)	2-Year (L/s)	5-year (L/s)	100 year (L/s)	Contributing Area (ha)	2-Year (L/s)	5-Year (L/s)	100 Year (L/s)
Outflow								
CP1	14.2	33	45	96	11.3	30	34	44
CP2	11.9	32	45	93	5.4	29	37	60
CP3	92.5	413	559	992	125.7	415	556	1275
CP4	4.0	20	27	49	1.5	18	20	28
CP5	30.9	87	118	213	7.1	88	95	115
CP6	9.5	38	51	95	3.4	37	44	62
CP7	6.0	25	35	68	0.6	25	38	37
CP8	73.6	293	394	691	91.0	299	393	752
Inflow								
CP9	13.8	61	82	144	13.8	61	82	144
CP10	42.7	233	315	555	42.7	233	315	555
CP11	31.6	133	179	319	31.6	133	179	319

Figure 8.1C: Proposed Drainage Infrastructure



LEGEND

Watercourses

- Streams

Existing Drainage

- Storm Sewer
- Inflow
- Outflow
- Control Point

Proposed Drainage

- Catchment Boundary
- Culvert
- Local Storm Sewer
- Trunk Storm Sewer
- Manholes
- Low Flow Diversion Structure
- Detention Pond

Table 8.1B: Post Development Stormwater Control Plan

1. Darts Hill Garden Park Pond

From	To	Tributary Area (ha)	Slope	Length	DIA	Q5	Q100
MH-01	MH-02	5.2	3.1	193	525	0.32	0.64
MH-02	MH-03	8.5	1.2	119	750	0.54	1.10
MH-03	MH-04	12.0	3.2	85	750	0.77	1.55
MH-04	MH-05	12.3	4.6	58	750	0.79	1.59
MH-05	MH-07	15.3	3.5	97	750	0.98	1.98
MH-07	MH-08	16.5	4.7	80	900	1.06	2.15
MH-08	MH-09	18.8	0.6	92	1200	1.18	2.42
MH-09	MH-10	18.8	0.4	80	1200	1.18	2.53
MH-11	MH-12	5.4	5.4	122	600	0.38	0.77
MH-12	MH-13	10.1	5.6	89	600	0.61	1.25
MH-13	MH-14	13.6	5.5	81	750	0.85	1.73
MH-14	MH-15	14.5	3.4	30	900	0.92	1.86
MH-15	MH-16	15.4	0.7	115	1050	0.99	2.00
MH-16	MH-17	15.4	0.8	95	1050	0.97	1.96
MH-17	MH-18	15.4	3.5	67	1050	0.97	1.96
MH-18	MH-10	17.1	5.6	16	1050	1.01	2.03
MH-10*	Pond1	35.9	7.1	37	1200	2.18	4.51

2. 172 Street & 16 Avenue Pond

From	To	Tributary Area (ha)	Slope	Length	DIA	Q5	Q100
MH-19*	MH-20	35.9	5.3	16	525	0.07	0.29
MH-20*	MH-22	35.9	5.5	71	525	0.07	0.29
MH-22*	MH-31	35.9	1.6	94	525	0.07	0.29
MH-28	MH-29	1.2	2.4	58	375	0.08	0.17
MH-29	MH-30	2.8	11.4	42	375	0.19	0.38
MH-30	MH-31	5.0	9.2	46	450	0.32	0.65
MH-31*	MH-32	41.4	2.4	86	600	0.40	0.80
MH-32*	MH-44	41.4	4.0	86	600	0.40	0.80
MH-33	MH-34	7.1	3.3	121	600	0.47	0.98
MH-34	MH-35	9.5	6.9	80	600	0.59	1.26
MH-35	MH-36	9.9	4.8	46	600	0.62	1.31
MH-36	MH-37	10.7	4.7	40	675	0.67	1.40
MH-37	MH-38	10.7	4.8	25	675	0.67	1.40
MH-38	MH-39	11.6	5.5	41	675	0.64	1.41
MH-39	MH-40	12.5	6.8	51	675	0.69	1.51
MH-40	MH-41	17.5	8.8	49	750	1.02	2.19

MH-41	MH-42	18.9	9.6	47	750	1.11	2.37
MH-42	MH-43	19.5	0.9	114	1050	1.15	2.46
MH-43*	MH-44	20.1	1.2	62	1200	1.16	2.50
MH-44*	MH-45	62.0	5.5	52	1200	1.59	3.35
MH-45*	MH-46	64.0	2.3	61	1200	1.73	3.63
MH-46*	MH-47	64.0	4.7	44	1200	1.73	3.63
MH-47*	POND2	65.4	12.6	21	1200	1.82	3.82
MH-48*	OUT-1	65.4	1.3	37	600	0.13	0.87

3. Highway 15 & 16 Avenue Pond

From	To	Tributary Area (ha)	Slope	Length	DIA	Q5	Q100
MH-49	MH-50	9.3	3.9	130	600	0.63	1.28
MH-50	MH-51	14.8	4.8	137	750	0.93	1.89
MH-51	MH-52	15.1	10.6	89	750	0.95	1.94
MH-52	MH-53	18.5	12.4	33	750	1.17	2.38
MH-53	MH-54	18.5	13.2	24	750	1.17	2.38
MH-54*	MH-55	23.1	12.6	82	750	1.45	2.98
MH-55*	MH-56	25.3	13.7	84	750	1.53	3.14
MH-56*	MH-57	27.8	11.7	21	900	1.64	3.37
MH-57*	POND3	29.1	16.2	16	900	1.73	3.54
MH-58*	MH-59	29.1	2.1	27	525	0.05	0.20

STORMWATER DETENTION PONDS

The pond locations were selected based on the following criteria:

1. Maximize contributing area.
2. Minimize developable area lost.
3. Maintain intent and functionality of biodiversity corridors.
4. Maintain existing flow paths and discharge locations.
5. Optimize pond grading by minimizing cut slopes.
6. Allow for connectivity with the proposed trunk sewer system.

The proposed ponds were sized based on the 2-year and 5-year storm events, with an overflow weir discharging the 100-year event. The 2-year and 5-year flows from the ponds were determined so the post development flows at the control points match the pre-development flows. Despite not being detained, the 100-year flows can be conveyed safely downstream as the downstream conveyance routes have sufficient capacity.

The proposed ponds are strategically located to maximize each catchment area while discharging to locations similar to the pre-development conditions. All proposed ponds are designed as wet ponds to promote stormwater treatment through the settling of suspended solids during and between rainfall events. All ponds shall follow the City of Surrey's Design Criteria Manual and Supplementary Master Municipal Construction Documents (2020). Specifically, as 5-year wet ponds with a dead storage of 1.5 metres, maximum active storage of 2.0 metres and freeboard of 0.5 metres for the 100-year rainfall event. While the ponds are 5-year ponds, they are designed to convey the 100-year flows since the contributing storm sewer system delivers 100-year flows to the pond.

A geotechnical assessment is required during detailed design to determine the groundwater table at the pond locations to determine the pond bottom material. Inlet and outlet locations have been situated to maximize detention time and promote settlement of suspended sediments. For maintenance purposes, the ponds shall be designed so they can be drained completely by gravity. Sediment forebays are required at all inlet locations for continued use after completion of the subdivision development. Sufficient width for the biodiversity corridor is to be maintained to provide an effective passage for wildlife. Ponds should not encroach on riparian designated land uses.

Darts Hill Garden Park Pond

This pond is located in the future expansion area of Darts Hill Garden Park. This location was selected to minimize developable area lost and to provide a complementary entry water feature for Darts Hill Garden Park. The pond catchment area encompasses the northwest quadrant of Darts Hill and is approximately 35.8 ha.

The pond outlet trunk flows to the proposed trunk on 17th Ave, eventually flowing to the 172nd St & 16th Ave Pond. Given that these ponds are in series, the larger the release rate from the Darts Hill Garden Park Pond, the larger the downstream pond needs to be. To reduce developable area lost, the pond storage volume was maximized so it can release at a lower release rate, thus reducing the size of the 172nd St & 16th Ave Pond.

172 Street & 16 Avenue Pond

This pond has a catchment area of approximately 29.6 ha which includes the north section of Darts Hill. It receives discharge from the Darts Hill Garden Park Pond as the ponds are in series. This pond was designed to optimize grading and minimize developable area lost, while not cutting into the existing ridge that goes west to east through the biodiversity corridor. The pond outlet discharges into the Class A watercourse on 172 St. The 100-year pond flows are not attenuated, however, downstream conveyance capacity was reviewed down to Sam Hill Creek (at 14th Ave and 172nd St) to confirm sufficient capacity for the flows shown in Table 8.1A.

Highway 15 & 16 Avenue Pond

This pond has a catchment area of approximately 29.1 ha and covers the east quadrant of Darts Hill. It was designed to optimize grading and minimize developable area lost. As a result, the pond shape is linear with a relatively narrow bottom width due to site topography constraints. The inlet and outlet of the pond are located at opposite ends to maximize detention time. The inlet structure can be accessed directly off of 175 Street. A 10 m dedication from the pond grading to Highway 15 is required for future Highway 15 expansion.

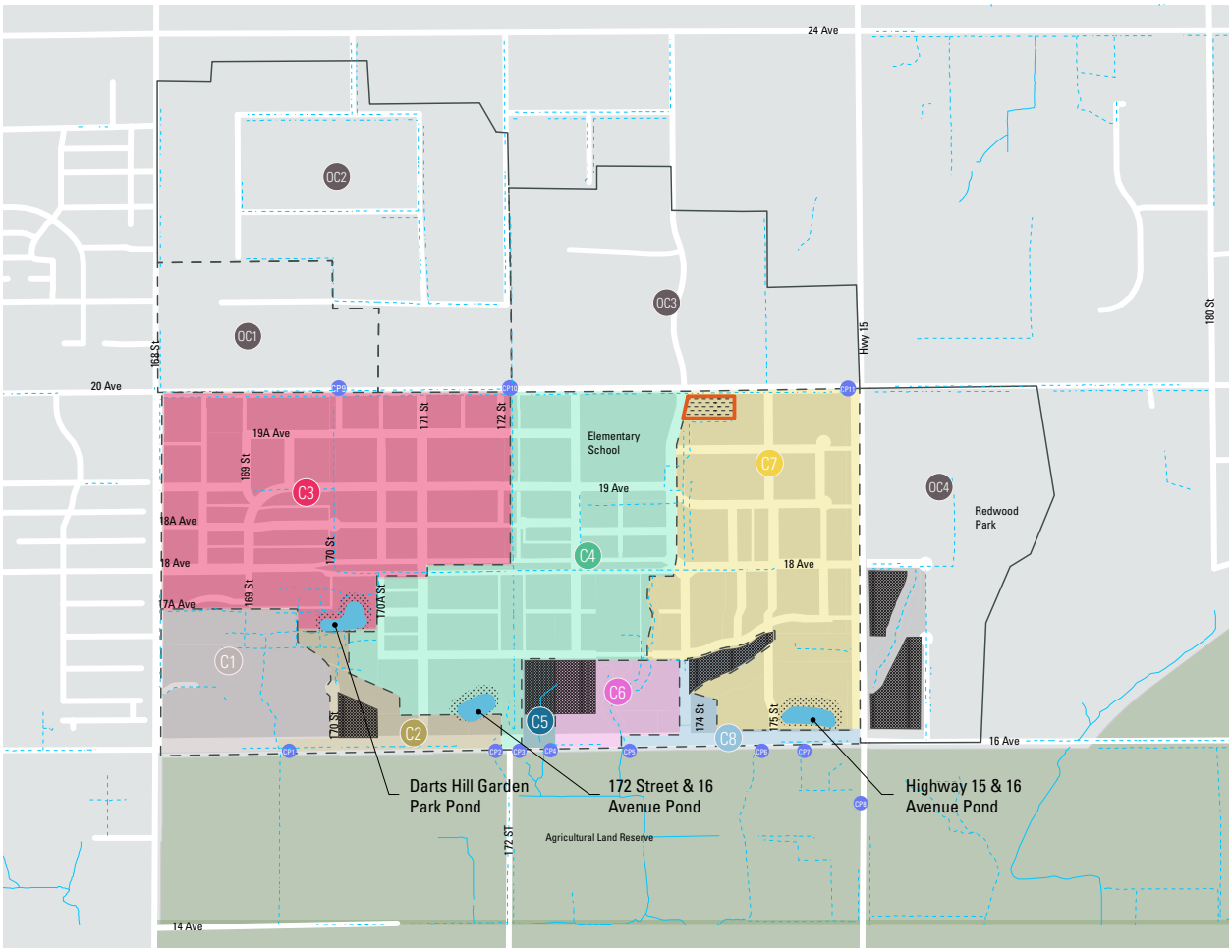
The pond outlet discharges into the existing sewer on Highway 15. The 100-year pond flows are not attenuated, however downstream conveyance capacity was reviewed down to Sam Hill Creek to confirm sufficient capacity for the flows shown in Table 8.1A. While downstream capacity is sufficient in the Highway 15 sewer, the sewer is owned by the Ministry of Transportation and Infrastructure (MOTI) and will require their approval for tie-in.

Detention Pond Design

The final design of the detention ponds will be influenced by the City's Biodiversity Design Guideline and should consider incorporating the following features:

1. Planting Soils: Organic soils should be used for shallow areas within the ponds. These soils generally have high water holding capacities and can serve as a sink for pollutants. They will also facilitate plant growth.
2. Vegetation for Safety and Aesthetics: Plants around the perimeter will discourage people from attempting to access the pond, steep slopes and other hazardous areas. It also prevents shoreline erosion and will filter pollutants from adjacent properties. In addition, vegetation improves aesthetics and enhances the aquatic habitat.
3. Wetland Bench: This is a shallow area around the perimeter of the permanent pool that promotes the growth of aquatic and wetland plants and acts as a biological filter.
4. Wetland Planting: Aquatic plants below the permanent pool of water. These plants will slow water velocities and increase retention time.
5. Low Flow Channel with Inlet/Outlet Forebays: The pond should include inlet and outlet forebay areas connected by a low flow channel. This would minimize stagnant areas and elevated water temperatures during summer months. Wetland benches could be introduced adjacent to the low flow channel.
6. Landscape Features: Additional landscaping features that can be incorporated into the pond to integrate the detention facility as a public amenity includes a multi-use pathway (incorporated into the maintenance pathway), benches, viewing platforms, and interpretive signage.
7. Maintenance Access: Maintenance access roads with 4 metre wide dedications with hammerhead turnarounds are shown in the pond figures for ultimate access. Interim access may be required depending on adjacent lot and road development sequencing.
8. Emergency Overflow Spillway: To be incorporated in all ponds in the event the pond overflows or outlet pipe or conveyance system becomes blocked.

Figure 8.1D: Major Catchments and Proposed Detention Ponds



LEGEND

- Major Catchment Boundary
- Catchment Boundary
- Control Point
- On-Lot Detention Catchment
- Localized Grading
- Stormwater Detention Pond (5-year extents shown)
- Pond Grading

Table 8.1C: Catchment Discharge Locations			
Outflows		Inflows	
Catchment	Discharge Point	Catchment	Discharge Point
C1	CP1	OC1	CP9
C2	CP2	OC2	CP10
C3, C4, OC1, OC2	CP3	OC3	CP11
C5	CP4		
C6	CP5		
C7	CP7		
C7, OC3, OC4	CP8		

Table 8.1D: Pond Discharge Characteristics				
Pond		Darts Hill Garden Park	172 Street & 16 Avenue	Highway 15 & 16 Avenue
Contributing Area* (ha)		35.8	29.6	29.1
Discharge Control Point		CP3	CP3	CP8
5-Year Pond Active Storage Volume (m^3)		7,370	4,350	5,350
5-Year Storage Volume Per Contributing Area (m^3/ha)		206	147	184
Post Development Release Rate	2-Year (L/s)	65	121	97
	5-Year (L/s)	150	255	135

*Pond contributing area does not include the riparian areas within the pond's catchment.

ON LOT LIDS

LIDs were designed using the Long-Term Continuous Simulation PCSWMM computational modeling software. The proposed design specifies LIDs conservatively to account for clogging and loss of function that will occur over time. The table below is a summary of recommended LIDS for each land use.

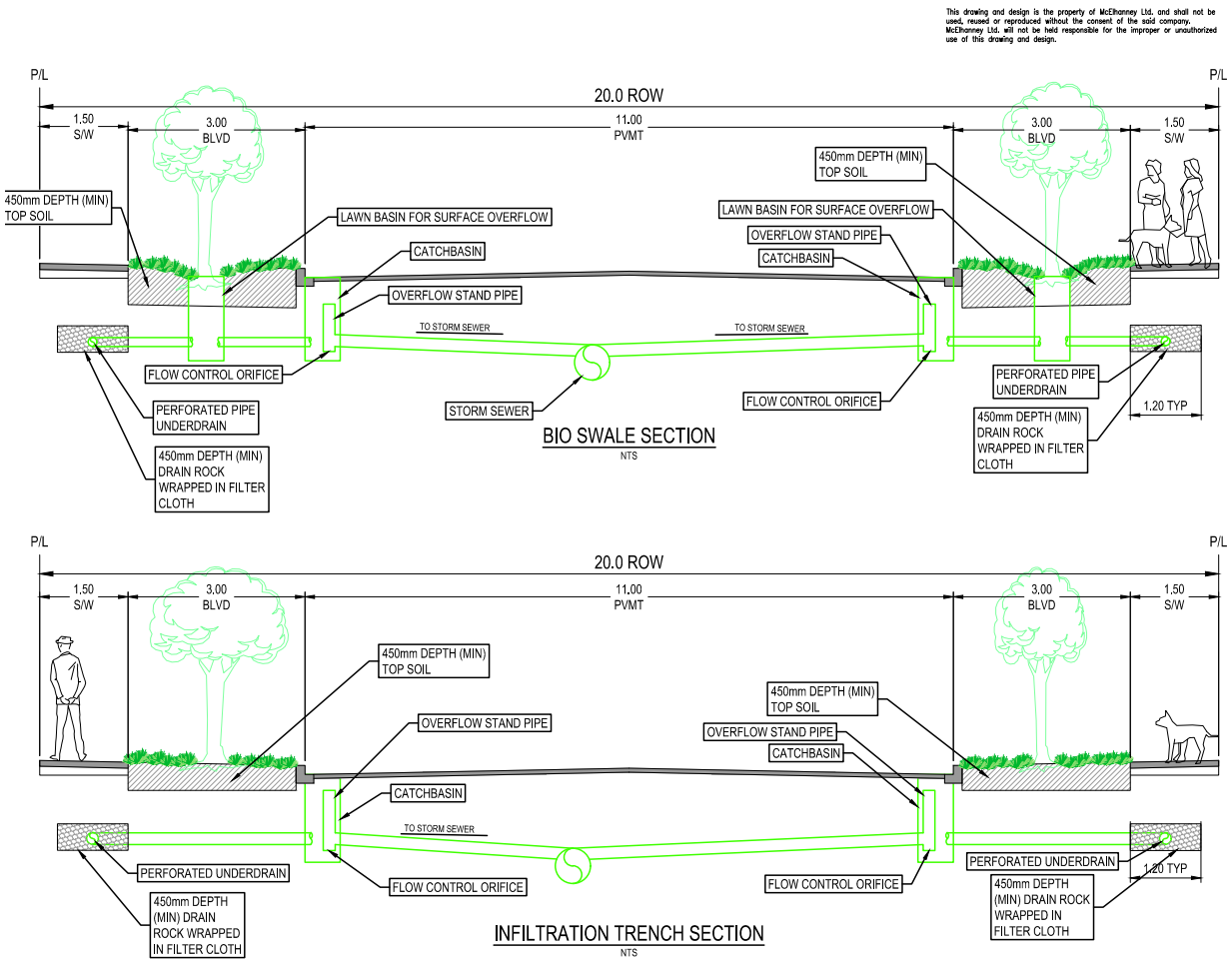
Table 8.1E: LID Requirements by Land Use	
Land Use	Recommended LIDs
Single Family Detached Residential	450 mm thick layer of topsoil of all pervious areas.
Multi-Family Residential	450 mm thick layer of topsoil of all pervious areas. Infiltration trench equal to 3.5% or a bioswale/rain garden area equal to 2.5% of the total area.
Low Rise Mixed Use	450 mm thick layer of topsoil on all pervious areas. Infiltration trench equal to 4% or a bioswale/rain garden area equal to 3% of the total area.
Commercial	
Institutional	

Road LIDs

Road right-of-way LIDs may include any combination of rain gardens, roadside bioswales, and infiltration trenches. All pervious and impervious surfaces must be directly connected to the LID such that no uncontrolled runoff enters the piped system. Note: If proposed, bio-swale treatment may be designed as a sodded swale and may be reviewed during detailed engineering design at the discretion of the City's Parks and Engineering departments.

One of the biggest challenges of incorporating LIDs, such as infiltration trenches, is the limitation of installing flat infiltration trenches or rain gardens on steep roadways. From a practicality standpoint, it is assumed infiltration trenches can be located within the road ROW for roadways that have a maximum longitudinal slope of 6%. This will be feasible to meet on the east-west oriented streets while more difficult on the north-south oriented streets due to topography constraints.

Figure 8.1E: Road ROW LID Example



Groundwater Seepage Collection

Darts Hill experiences horizontal lateral movement of sub-surface water in the upper soils layer due to the presence of more permeable sediments perched and located above till or marine deposits. This is supported by the presence of two springs located along the lower slopes near 16th Avenue.

In the past the City has experienced extensive groundwater emergence after homes are constructed on steep slopes. This is usually a result of structures such as foundations, retaining walls, and roads that are constructed and often cut into highly permeable soil lenses. On-lot localized perched water table conditions exist throughout Darts Hill which tend to cause lateral movement of infiltrated water within the upper soil layer.

As Darts Hill develops, groundwater movement and potential seepage locations will need to be assessed and managed adequately. Future developments will need to consider the implications of shallow groundwater movement during design. For example, in areas of cut where the soil layer exhibiting groundwater movement is transected, horizontal seepage of groundwater would likely occur and would need to be managed. Any seepage that emerges to the surface needs to be collected and conveyed to the municipal system. Alternatively, groundwater collection systems such as sub-drains along retaining walls and French drains in cut-areas may be required to collect groundwater and avoid surface seepage. Confirmation of seepage collection requirements by a geotechnical engineer will be required during detailed design.

Future site-specific geotechnical investigations carried out as development occurs should further investigate groundwater conditions and provide recommendations for controlling any groundwater emergence.

Underground Parking Considerations

All underground parking proposed in Darts Hill should conduct a hydrogeological assessment to:

- Characterize the current geological and hydrogeological conditions at the site, including an evaluation of seasonal variations in the groundwater table and groundwater flow direction, and assess the constraints these variables might have on the proposed development.
- Evaluate pre-development infiltration volumes at the site, assess the impact that proposed land use changes could have on these volumes, and propose mitigation measures to address these potential impacts.
- Assess whether proposed site servicing will intercept the groundwater table and evaluate what mitigation measures could be employed to minimize potential disturbances to groundwater levels and flow patterns; and
- Evaluate the potential need for groundwater dewatering at the site.

Water Quality

The use of wet ponds and LID's has benefits for stormwater quality. LID's such as bioswales, rain gardens, and infiltration trenches can provide water quality benefits through settling-out of suspended solids in storage zones of such LID's and through reduction of water volume through absorption, evapotranspiration, and infiltration.

Literature and analysis undertaken in past studies have shown reported similar benefits to LIDs with respect to removal of total suspended solids. Furthermore, the proposed detention ponds will also provide water quality benefits as they will incorporate a permanent water level to allow both dynamic and quiescent settling of suspended solids. The detention ponds should be optimized during detailed design to provide water quality benefits. Examples include maximization of runoff retention time, prescription plantings to promote water quality, and use of submerged outlets for trapping floatable debris. These water quality benefits will allow for healthy streams and ecosystems.

Storm Water Costs & Financing

Table 8.1F presents a Class 'D' cost estimate for stormwater management infrastructure that services more than 20 ha, including trunk sewers and detention ponds. Land acquisition costs are based on $2,200,000 per acre. DCC eligible drainage infrastructure benefiting Darts Hill consist of several reaches of storm trunk sewers and the three detention ponds, on the basis that they service a contributing area equal or greater than 20 hectares of future development. Non DCC-eligible drainage infrastructure, such as local storm sewers, diversion structures, and LIDs, will be paid for by the development community as part of their frontage upgrade requirements.

Table 8.1F: DCC Eligible Drainage Infrastructure Cost Estimate

Item	Description	Unit Cost	Unit	Quantity	Total Cost
Darts Hill Garden Park Catchment					
1	1200mm Trunk Sewer	$2,135	m	37	$79,000
2	Pond – Excavation & Grading	$40	m^3	22,500	$900,000
3	Landscaping & Finishing	$45	m^2	15,200	$684,000
4	Inlet & Outlet Structures	$150,000	LS	1	$150,000
5	Land Acquisition	$2,200,000	Acre	3.68	$8,096,000
Subtotal			$9,908,000		
172 Street & 16 Avenue Pond Catchment					
6	525mm Trunk Sewer	$1,200	m	182	$218,000
7	600mm Trunk Sewer	$1,400	m	210	$294,000
8	1200mm Trunk Sewer	$2,135	m	190	$406,000
9	Pond – Excavation & Grading	$40	m^3	16,200	$648,000
10	Landscaping & Finishing	$45	m^2	10,700	$480,000
11	Inlet & Outlet Structures	$150,000	LS	1	$150,000
12	Land Acquisition	$2,200,000	Acre	2.45	$5,390,000
Subtotal			$7,586,000		
Highway 15 & 16 Avenue Pond Catchment					
13	525mm Trunk Sewer	$1,200	m	27	$32,000
14	750mm Trunk Sewer	$1,550	m	167	$259,000
15	900mm Trunk Sewer	$1,800	m	37	$67,000
16	Pond – Excavation & Grading	$40	m^3	24,100	$964,000
17	Landscaping & Finishing	$45	m^2	13,900	$626,000
18	Inlet & Outlet Structures	$150,000	LS	1	$150,000
19	Land Acquisition	$2,200,000	Acre	2.84	$6,248,000
Subtotal			$8,346,000		
Grand Total			**$25,840,000**		

8.2 Sanitary

Existing Sanitary System

There is no existing municipal sanitary system in the Darts Hill NCP area. Existing development is currently serviced by individual private septic tanks and septic fields. An existing sanitary sewer system on 168 Street was built for the adjacent Sunnyside Heights NCP area to the west. This sewer system conveys wastewater to the existing Fergus Pump Station at 168 Street and 1400 block.

Design Criteria & Analysis

The proposed sanitary sewer system for the area follows the City's Design Criteria Manual (2020). Key design criteria are summarized as follows:

Sewer Capacity/Sizing

- Sewage Flows: Average daily sanitary flow per person of 350 L/day.
- Peaking factor as per Harmon's formula.
- Groundwater infiltration of 11,200 L per hectare per day.
- Manning coefficient of roughness of 0.013 for all pipes.
- Sewers designed to convey Peak Wet Weather Flow (PWWF).
- Pipe grades less than 0.5% may be used when approved by the General Manager, Engineering, when the flow equal to 0.7 x Peak Dry Weather Flow attains a minimum velocity of 0.6 m/s.
- The sewer flow in local sanitary mains does not exceed 40 l/s.
- Depth of flow in local mains (flows < 40 l/s) should not exceed 50% of the internal diameter.
- Depth of flow in trunk mains (flows > or = 40 l/s) should not exceed 70% of the internal diameter.
- Minimum sewer size shall be 200 mm diameter for single family residential lands and zones with less than 90 ppha, and 250 mm diameter for all other zones.

Low Pressure Sewers

- Q = 0.008xP + 2.1 where Q(flow) is expressed in litres/sec and P is population.
- Maximum Total Dynamic Head in LPS is 35m.

Siphon System (Design Guidelines)

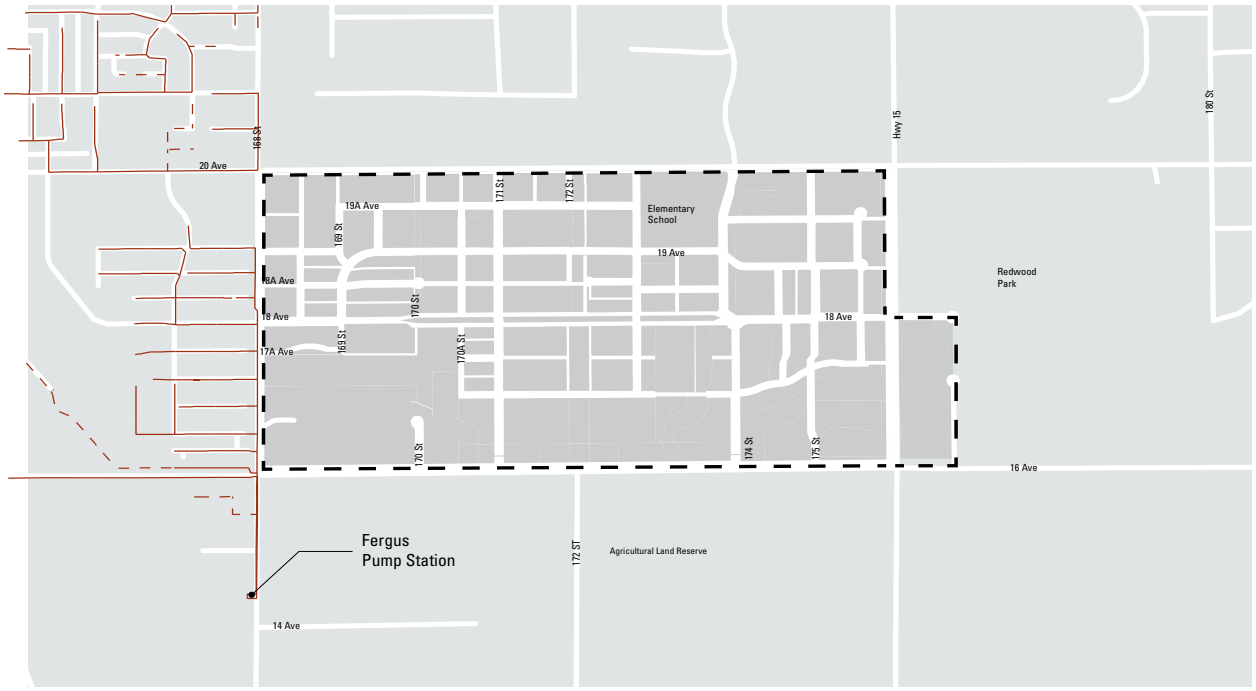
- Use Hazen Williams Equation with a "C" value = 110.
- Minimum flow velocity of 1.0 m/s.
- Blowdown feature at the low point where practice.
- Minimum two pipes, for low flow and high flow.
- Odour mitigation to be provided.

Hydraulic Analysis

Peak flow rates for the NCP sewer catchment were generated and used to size the proposed sanitary infrastructure. Sewer lengths were estimated using GIS and the City's 1 m contour data was used to estimate pipe invert elevations and subsequently the pipe slopes.

For the sanitary analysis, a full buildout scenario was assumed based on the proposed land use plan and upper population ranges, assuming a secondary suite or coach house for each single-family dwelling unit. Future land uses outside the NCP area were estimated for the purpose of the sewer flow calculation.

Figure 8.2A: Existing Municipal Sanitary Infrastructure



LEGEND

- Darts HilL NCP Area
- Existing Sanitary Mains

Proposed Sanitary Servicing

Several background reports and studies reviewed the conceptual sanitary sewer servicing for the NCP area. The most recent is Opus's (2018) Grandview Heights Area 3 – Sanitary Trunk Functional Design report. The report recommended that the Darts Hill NCP area be serviced by a gravity trunk sewer running diagonally across the Agricultural Land Reserve from 172 Street and 16 Avenue to 168 Avenue and 15 Avenue and then south to the Fergus Pump Station. However, this option was not supported by the City's Agriculture and Food Policy Advisory Committee. The alternate recommended option in the report was to install a pump station at 16 Avenue and 174 Street that would pump flows to 16 Avenue and 170 Street, where flows would then be conveyed by gravity to the Fergus Pump Station.

Upon further review, however, it was determined that a siphon system was preferred over the pump station option; as such, the proposed sanitary servicing strategy is based on the siphon system approach. The siphon system consists of twin pipes (300mm and 450mm diameter) that will run south on 172 Street from 16 Avenue to 14 Avenue, then west on 14 Avenue to 168 Street where it will discharge wastewater to the existing 525 mm diameter sewer on 168 Street that leads to the Fergus Pump Station. Flushing and dosing facilities will be incorporated at the siphon inlet to ensure cleansing velocities are being met.

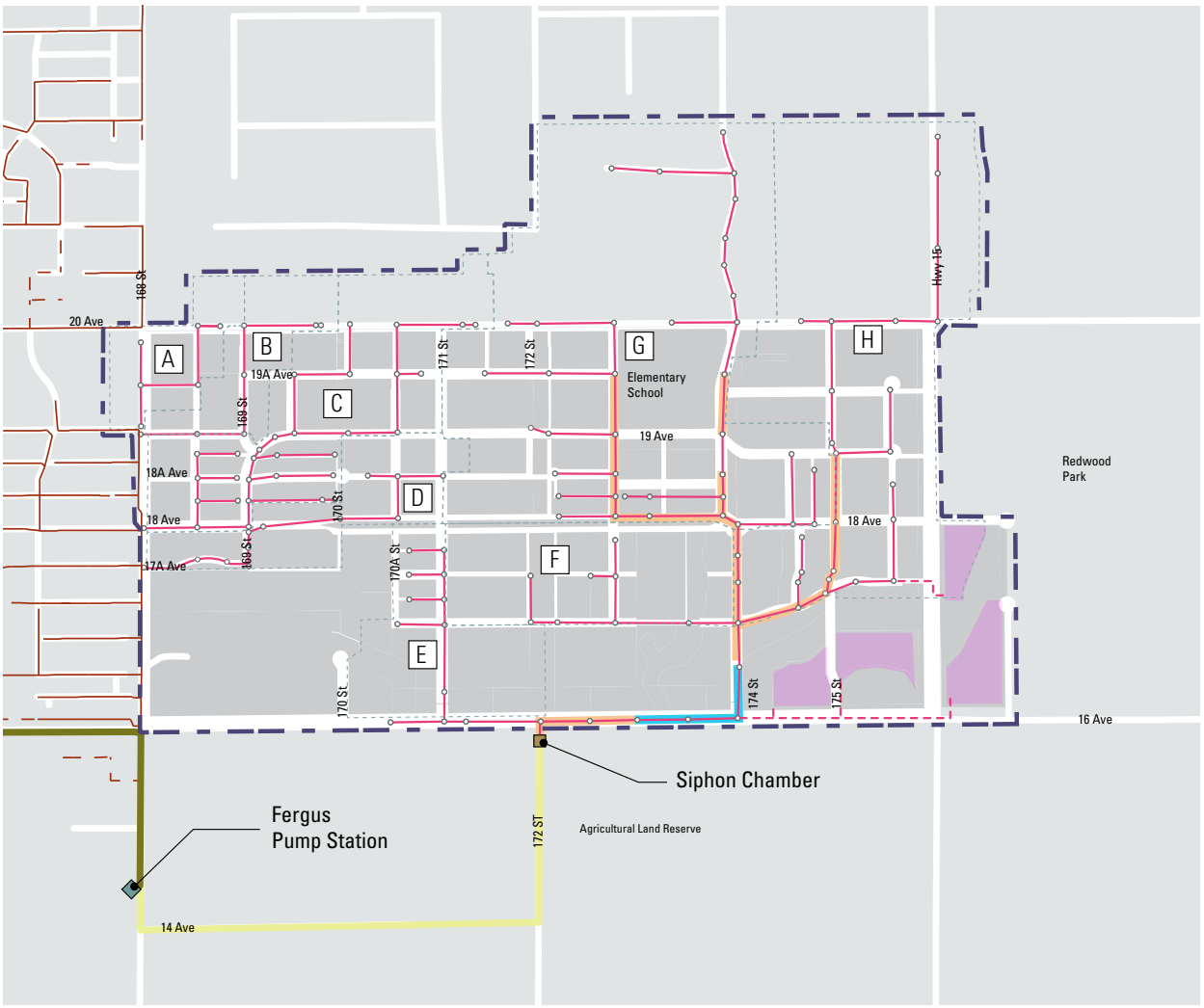
The NCP area is divided into two major catchments: east catchment and west catchment. The east catchment, which includes sub-catchments E,F,G, and H will discharge to the proposed siphon system. The west catchment, which includes sub-catchments A, B, C, and D will discharge to the existing sanitary sewer system on 168 Street. The sewer catchments are shown in Figure 8.2B.

Both the east and west catchments ultimately drain to the Fergus Pump Station. The station pumps wastewater to 24 Avenue and 160 Street, where flows are conveyed by gravity sewer along 160 Street to the existing Grandview Heights Interceptor at 2900 block and 160 Street. From here, the flow goes to Metro Vancouver's Rosemary Heights Pressure Sewer at 152 Street and Croydon Drive.

Figure 8.2B illustrates the proposed sanitary sewer strategy for Darts Hill. While most of the sanitary sewer network consists of gravity sewers, a small portion of the NCP area near 16 Avenue and Highway 15 is too low in elevation to be serviced by gravity. This area will be serviced by Low Pressure Sewer System or individual pump connections. The extent of this servicing area is shown in Figure 8.2B.

Trunk sanitary sewers (conveying flows greater than or equal 40 L/s) are eligible for upsizing DCC reimbursement where a development fronts or flanks the trunk sewer. The upsize will be measured from the required base size (200 mm diameter for single family residential and 250 mm diameter for all other land uses) to the required trunk size. Where the trunk sewer does not front or flank a development, the full cost of the trunk sewer will be DCC eligible.

Figure 8.2B: Proposed Sanitary Infrastructure



LEGEND

- Darts Hill NCP Sub-Catchment Boundary
- Sewer Catchment Boundary
- Areas to be Serviced by Low Pressure System
- Existing Sanitayr Mains
- Manholes
- Existing Forcemain
- Proposed Siphon
- Proposed Sanitary
- Proposed Sanitary Mains (Low Pressure System)
- Proposed DCC Eligible Sanitary Sewer
- Proposed DCC Eligible Sanitary Sewer - Upsize Only

Sanitary Costs & Financing

Trunk sanitary sewers (conveying flows greater than or equal 40 L/s) are eligible for upsizing DCC reimbursement where a development fronts or flanks the trunk sewer. The upsize will be measured from the required base size (200mm diameter for single family residential and 250 mm diameter for all other land uses) to the required trunk size. Where the trunk sewer does not front or flank a development, the full cost of the trunk sewer will be DCC eligible.

Table 8.2: DCC-Eligible Sanitary Infrastructure Cost Estimate

Sewer Section (MH to MH)	Location	Description	Units	Quantity	Unit Rate	Estimate Cost
G7 – G6	174 St: 19A Ave to 19 Ave	Upsize from 200mm to 250mm	m	125	$ 61	$ 7,625
G5A – G5	174 St: 18A Ave to Lane N of 18 Ave	Upsize from 200mm to 250mm	m	46	$ 61	$ 2,806
G5 – G4	174 St: Lane N of 18 Ave to 18 Ave	Upsize from 200mm to 250mm	m	38	$ 61	$ 2,318
G4.6 – G4.5	173 St: 19A Ave to 19 Ave	Upsize from 200mm to 300mm	m	122	$ 122	$ 14,884
G4.5 – G4.4	173 St: 19 Ave to 18A Ave	Upsize from 200mm to 300mm	m	80	$ 12t2	$ 9,760
G4.4 – G4.3	173 St: 18A Ave to Lane N of 18 Ave	Upsize from 200mm to 300mm	m	45	$ 122	$ 5,490
G4.3 – G4.2	173 St: Lane N of 18 Ave to 18 Ave	Upsize from 200mm to 300mm	m	41	$122	$5,002
G4.2 – G4.1	18 Ave: 173 St to 173A St	Upsize from 200mm to 375mm	41	69	$215	$14,835
G4.1 – G4	18 Ave: 173A St to 174 St	Upsize from 200mm to 375mm	m	150	$ 215	$ 32,250
G4 – G3	174 St: 18 Ave to Lane S of 18 Ave	Upsize from 200mm to 450mm	m	34	$ 307	$ 10,438
G3 – G2	174 St: 18 Ave to Lane S of 18 Ave	Upsize from 200mm to 450mm	m	60	$ 307	$ 18,420
G2 – G1	174 St: Lane S of 18 Ave to 17A Ave	Upsize from 200mm to 450mm	m	55	$ 307	$ 16,885
G1 – S7	174 St:17A Ave to 17 Ave	Upsize from 200mm to 450mm	m	87	$ 307	$ 26,709
H6 – H5	175 St: 19 Ave to 18 Ave	Upsize from 200mm to 250mm	m	136	$ 69	$ 9,384
H5 – H4	175 St: 18 Ave to 17A Ave	Upsize from 200mm to 250mm	m	91	$ 61	$ 5,551
H4 – H3	175 St: 18 Ave to 17A Ave	Upsize from 200mm to 250mm	m	29	$ 61	$ 1,769
H3 – H2	175 St: 17A Ave to 17 Ave	Upsize from 200mm to 250mm	m	25	$ 61	$ 1,525
H2 – H1	17 Ave: 175 St to 174A St	Upsize from 200mm to 450mm	m	77	$ 307	$ 23,639
H1 – S7	17 Ave: 174A St to 174 St	Upsize from 250mm to 450mm	m	123	$ 245	$ 30,135
S7 – S6	174 St: 17 Ave to 16A Ave	Upsize from 250mm to 450mm	m	80	$ 245	$ 19,600
S6 – S5	174 St: 16A Ave to 16 Ave	450mm Sewer	m	116	$ 1,585	$ 183,860
S5 – S4	16 Ave: 174 St to 173A St	600mm Sewer	m	100	$ 2,764	$ 276,400
S4 – S3	16 Ave:173A St to 173 St	600mm Sewer	m	100	$ 2,764	$ 276,400
S3 – S2	16 Ave:173 St to 172A St	Upsize from 250mm to 600mm	m	98	$ 671	$ 65,758
S2 – S1	16 Ave: 172A St to 172 St	Upsize from 250mm to 600mm	m	100	$ 671	$ 67,100
S1 – Siphon	From the Intersection of 172 St & 16 Ave to Siphon	600mm Trunk Sewer	m	26.9	$ 2,764	$ 74,352
PS Upgrade	1400 Block and 168 Street	4th pump, pipings, and control at Fergus Pump Station	Lump sum	1	$400,000	$400,000
Siphon	172 St & 16 Ave to Fergus PS[1]	Twin Siphon Sanitary Sewer	Lump sum	1	$ 4,940,000	$4,940,000
					TOTAL	$ 6,543,000

8.3 Water

Existing Water System

The Darts Hill NCP lies within the Grandview water service area, which is supplied by the Grandview reservoir and pump station, located at 16666 24 Avenue. Most of the area is currently within the 142 m pressure zone, as supplied by the Grandview pump station.

There is limited existing water infrastructure within the Plan Area as shown in Figure 8.3A. New water mains and upsizing of the existing water mains will be required to support the proposed development within the Darts Hill NCP. A pressure zone boundary adjustment will also be required to better manage water pressures within the NCP area.

Design Criteria & Analysis

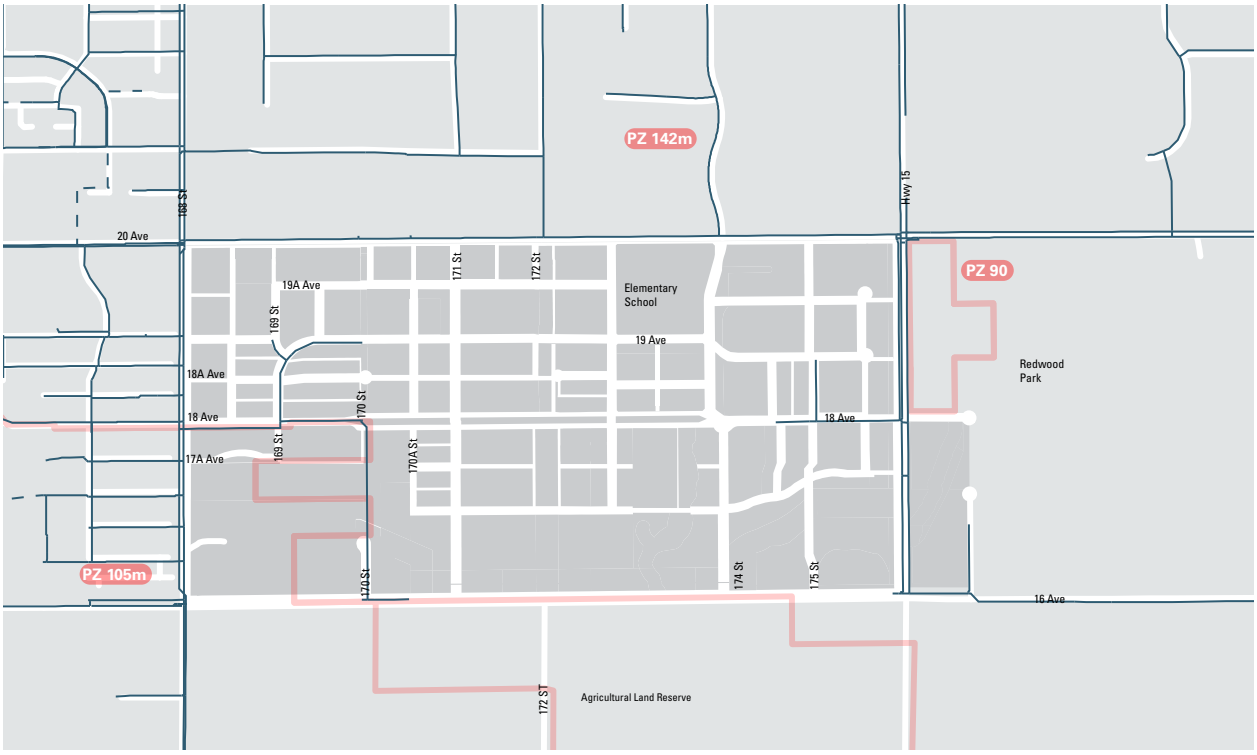
The City's Design Criteria Manual (2020) establishes the standard level of service to be provided for this NCP. The following relevant parameters were considered:

- Maximum Day Demand (MDD) of 1,000 L/capita/day.
- Peak Hour Demand (PHD) of 2,000 L/capita/day.
- Fire Flow design requirement is per Table 3.1.1 of the Design Criteria Manual.
- Minimum size of water main shall be 200 mm, except on dead-ends where a size of 100 mm or less shall be used.
- Minimum residual pressure is 14 m (20 psi) during maximum day plus fire flow conditions.
- Operating Pressure is 28 m (40 psi) at all nodes during peak hour conditions.

Population estimates for each of the development blocks were reviewed to assess the system capacity under future conditions. The full build out scenario with higher population estimates were used for the analysis.

Total population expected from this NCP is roughly 10,300 people which translates to 119 L/s and 238 L/s of MDD and PHD flow, respectively. Hydraulic modeling of the proposed water network was carried out using City's water hydraulic model. The anticipated MDD and PHD water demand from each potential development block is allocated to the closest existing or future water main network in the model. Additionally, fire flow is allocated at critical locations throughout the system, based on the proposed zoning identified.

Figure 8.3A: Existing Municipal Water Infrastructure



LEGEND

- Existing Watermains
- Existing Water Pressure Zones

Proposed Water System

Pressure Zone

Based on the elevations within the NCP area, two pressure zones are proposed: high pressure zone (142 m) and low pressure zone (105 m). About half of the Plan Area will be within the 142m zone, which will be supplied by the Grandview pump station. The rest of the system will be within the 105 m zone, supplied by the Grandview Reservoir.

Feeder Mains

Based on the total PHD flow expected within the Plan, new feeder mains are required to service this NCP. New high pressure and low pressure feeder mains are required along 24 Avenue to convey the water from Grandview Reservoir and pump station to service this NCP. These feeder mains along 24 Avenue will convey water not only to service Darts Hill NCP but also other Grandview NCPs, including Redwood Heights. More discussion on this 24 Avenue feeder main is provided under the Proposed 24 Avenue Feeder Mains section below.

In addition to the new 450 mm feeder mains along 24 Avenue, a new high pressure feeder main is required along 172 Street between 24 Avenue and 20 Avenue, and a new 450 mm low pressure feeder main is required along 174 Street between 24 Avenue and 17 Avenue. These two feeder mains are required to service the Darts Hill NCP alone.

Distribution Mains

The proposed water distribution main network within the Plan Area ranges between 200 mm and 300 mm. Most of the distribution mains will be looped to avoid dead-end pipes that exceed 100 meters in length. To establish the proposed pressure zone boundary, some adjustments are required, including closing currently open pipe connections, adding new PRVs to control the pressure condition, or removing existing PRVs that are no longer needed.

Figure 8.3B shows the proposed Darts Hill water system. Larger distribution main sizes than those shown in Figure 8.3B may be required on certain sections depending on how the development sequencing proceeds within this NCP. Any upsizing requirements for these distribution mains will be assessed on a case-by-case basis during the land development review process.

Proposed 24 Avenue Feeder Mains

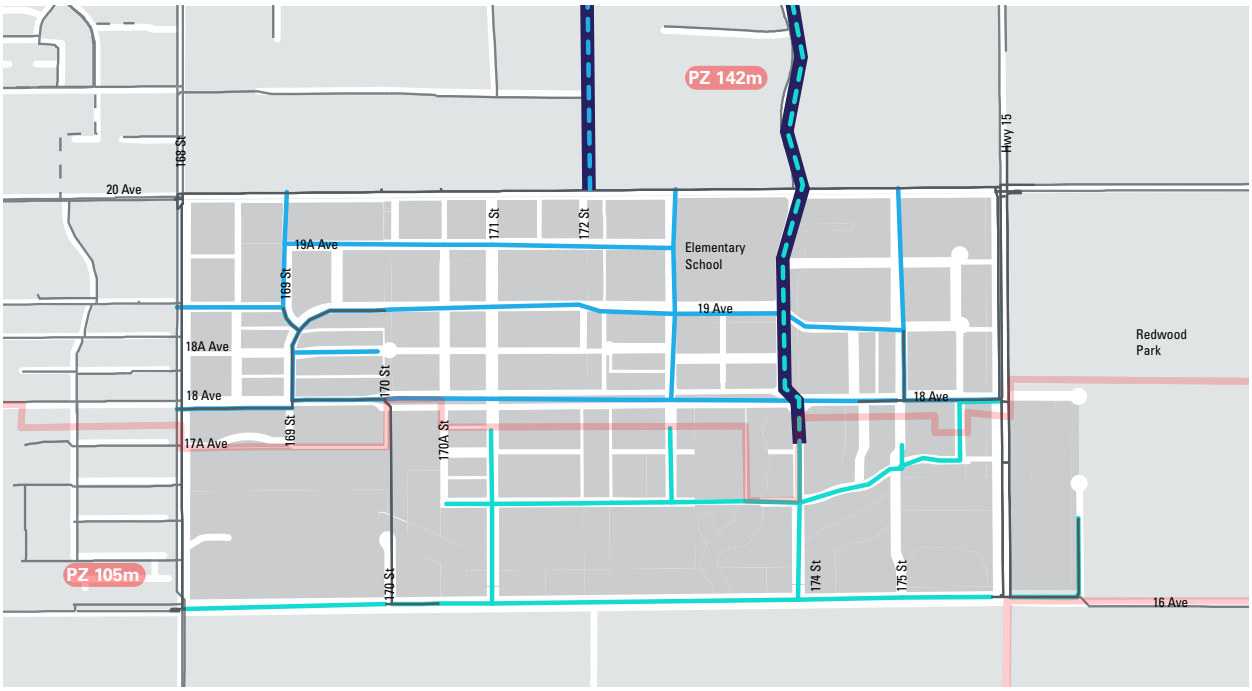
As mentioned in the above section, new feeder mains along 24 Avenue are required to service Darts Hill. These new feeder mains were also identified in the Redwood Heights NCP, as they will service both Redwood Heights, Darts Hill and other future Grandview NCPs.

The projected population density within Darts Hill is estimated at 76 people/ha. Similarly, Redwood Heights NCP is projected at a population density of 70 people/ha. As such, it is reasonable to assume that the average population density for the other surrounding areas to be close to that of Redwood Heights and Darts Hill NCP at around 75 people/ha. For this reason, under this NCP, the estimated future population for the surrounding Grandview NCP areas is revised.

With the increased population density, the upsizing requirement for these feeder mains needs to be adjusted. Nonetheless, the base size to service Redwood Heights NCP is kept as per the Redwood Heights NCP document. Table 8.3A and Figure 8.3C summarize the updated feeder main sizes required along 24 Avenue to service all Grandview area NCPs.

It is important to establish the contribution level from each of the surrounding areas to fund the upsizing costs of the feeder mains. The contribution level is calculated based on the anticipated PHD flow generated by each surrounding area, as well as the general location of each area.

Figure 8.3B: Proposed Municipal Water Infrastructure



LEGEND

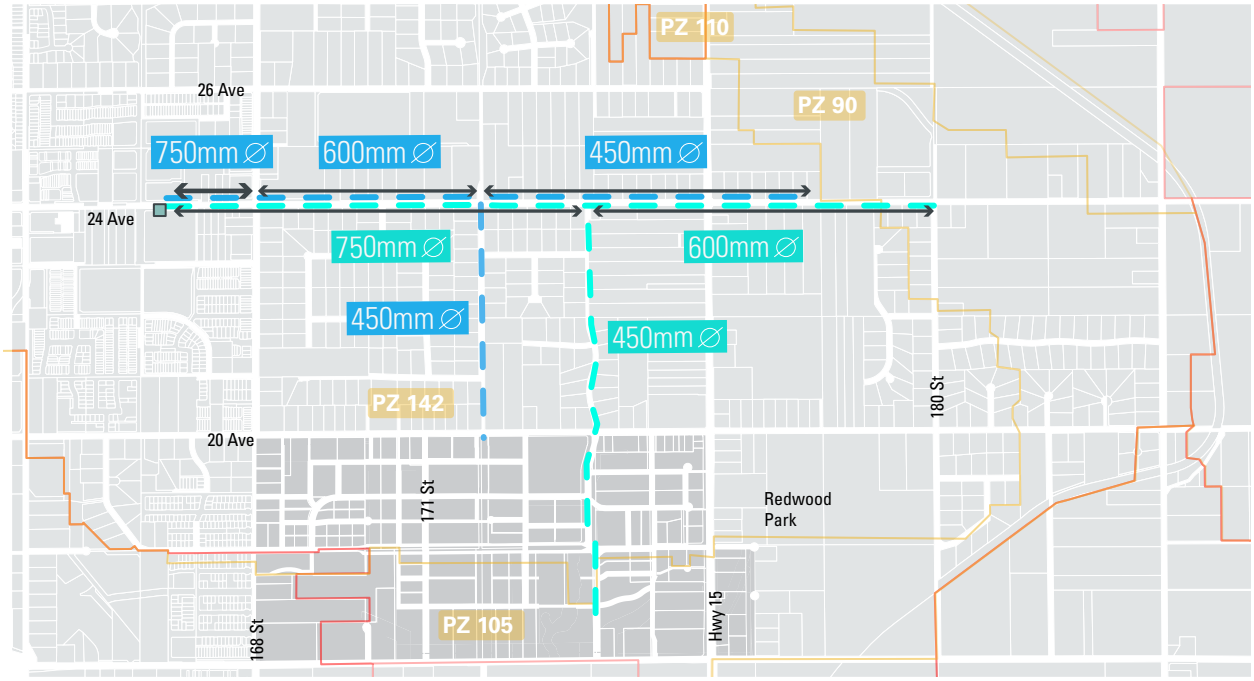
- Existing Watermains
- Proposed High Pressure Watermains (142m)
- Proposed Low Pressure Watermains (105m)
- Proposed DCC Eligible High Pressure Feedermains (142m)
- Proposed DCC Eligible Low Pressure Feedermains (105m)
- Proposed Water Pressure Zone (PZ)

Table 8.3A: Proposed 24 Avenue Feeder Mains

Feeder Main Section	"Updated Feeder Main Size (mm)"		" Upsizing Contribution Level (%)"						
	Base Size To Supply Redwood Only[1]	Upsized to Supply Other Grandview NCP Areas	Darts Hill NCP	Grandview			Kensington		
				A	B	C	A	B	C
High Pressure Mains									
Grandview PS - 168 St	400	750	22%	57%	8%	6%	0%	2%	6%
168 St -172 St	400	600	18%	63%	0%	10%	0%	0%	9%
172 St - HWY 15	400	450	0%	0%	0%	100%	0%	0%	0%
HWY 15 - 178 St	350	450	0%	0%	0%	100%	0%	0%	0%
Low Pressure Mains									
Grandview Res - 172 St	500	750	28%	0%	0%	0%	65%	0%	7%
172 St - 174 St	500	750	30%	0%	0%	0%	70%	0%	0%
174 St - HWY 15	500	600	0%	0%	0%	0%	100%	0%	0%
HWY 15 - 180 St	450	600	0%	0%	0%	0%	100%	0%	0%

[1]Based on Section 6.92 of Redwood Heights NCP

Figure 8.3C: 24 Avenue Feeder Mains



LEGEND

- Grandview Pump Station & Reservoir
- Proposed Feeder Main (High Pressure)
- Proposed Feeder Main (Low Pressure)
- Proposed Water Pressure Zone

Grandview PS Capacity Review

Currently, Grandview PS has one jockey pump at a capacity of 100L/s and 5 duty pumps at a capacity of 200L/s each. This brings the firm capacity of 900L/s or a total capacity of 1,100L/s for Grandview PS. The anticipated High pressure zone PHD flow to be supplied by Grandview PS is 164 L/s and 128 L/s for Darts Hill and Redwood Height NCP, respectively, for a total of 292 L/s. As such, there is no pump station upgrade requirement that attributed to the proposed developments within Darts Hill NCP.

Proposed Phasing of Infrastructure Works

In order to serve the anticipated full build-out demand from Darts Hill NCP, two sets of feeder mains are required to be built: High Pressure and Low Pressure Feeder Mains as shown in Table 8.3A and Figure 8.3C. To meet the requirements in the City's DCM, these feeder mains are required to be in place when the anticipated total flow within Darts Hill high and low pressure zones reaches 30L/s under PHD, which roughly translates to 1,200 people. It should be noted that prior to any feeder mains being commissioned, there will be limited fire flow availability in this area, as follows:

1. High Pressure feeder mains
    - West of 172 Street: any zoning is supported.
    - East of 172 Street: maximum density of RM-45 or equivalent
2. Low Pressure zone
    - Any area: maximum density of a single-family dwelling

Water Costs & Financing

All cost estimates are based on the City's 2021 10 Year Plan unit rate values, and it will be updated regularly. Actual costs may vary depending on unforeseen project design requirements, construction and economic market conditions, local interest in the project(s), currency fluctuation, or other influences.

All feeder main costs are DCC reimbursable items. The development community is responsible to fund any fronting works required to service the site, which may include any upsizing works required above the minimum 200mm water main size, to satisfy the City's Design Criteria Manual.

24 Avenue Feeder Main for All Grandview NCPs
The 24 Avenue feeder main will be used to supply water to all Grandview NCPs, as such it will be funded accordingly.

Redwood Heights NCP is responsible to fund the base size of the feeder mains along 24 Avenue, and the other Grandview NCP areas will fund the upsizing costs proportionally as established in Section 8.3 above.

Redwood Heights NCP had estimated the cost to build the 24 Avenue feeder mains. This (Darts Hill) NCP updates the numbers based on the City's 2021 unit rate values.

Water System
The required feeder mains and distribution mains stations to support the anticipated growth within this NCP have been identified in the above sections. Total costs of infrastructure improvement work required to service this NCP is estimated at $14.3 million with the eligible DCC expenditure of $5 million. The fronting development costs to be funded by the development community are estimated to be $9.3 million. The new feeder mains required for this NCP will be included in the City's next 10 Year Plan document.

Table 8.3B summarizes the overall estimated infrastructure costs attributable to Darts Hill NCP.

Table 8.3B: DCC Eligible Water Infrastructure Cost Estimate

Description	Total Estimated Cost	DCC Eligible Cost Attributed to Redwood Heights[1]	DCC Eligible Cost Attributed to Darts Hill	DCC Eligible Cost Attributed to Other Grandview Areas
High Pressure Main				
24 Ave: Grandview PS - 168 St	$805,000	$480,000	$71,000	$254,000
24 Ave: 168 St -172 St	$1,360,000	$1,096,000	$48,000	$216,000
24 Ave: 172 St - HWY 15	$1,120,000	$1,096,000	-	$24,000
24 Ave: HWY 15 - 178 St	$560,000	$536,000	-	$24,000
172 St: 24 Ave - 20 Ave	$1,120,000	-	$1,120,000	-
Distribution Mains Upsizing	$620,000	-	$620,000	-
Sub-Total	$5,585,000	$3,208,000	$1,859,000	$518,000
Low Pressure Main				
24 Ave: Grandview Res - 172 St	$2,622,000	$1,824,000	$226,000	$572,000
24 Ave: 172 St - 174 St	$920,000	$640,000	$86,000	$194,000
24 Ave: 174 St - HWY 15	$680,000	$640,000	-	$40,000
24 4Ave: HWY 15 - 180 St	$1,360,000	$1,120,000	-	$240,000
174 St: 24 Ave - 17 Ave	$1,876,000	-	$1,876,000	-
Distribution Mains Upsizing	$929,000	-	929,000	-
Sub-Total	$8,387,000	$4,224,000	$3,117,000	$1,046,000
Total	**$13,972,000**	**$7,432,000**	**$4,976,000**	**$1,564,000**

[1]Based on City's 2021 unit rate value.

"I really like the separated bike lanes, greenways and pedestrian pathways."

Survey Response, Darts Hill Plan Process, 2018-2020

9 Implementation
| Making it Work

The Plan will increase development intensity and population. To address the impacts of growth, funding will be required to improve local amenities and infrastructure necessary for a high quality of life. A number of area specific considerations, such as lot consolidation, watercourse and environmental protection, must also be considered.

This section of the Plan outlines development policies and financing required to build out the Plan.

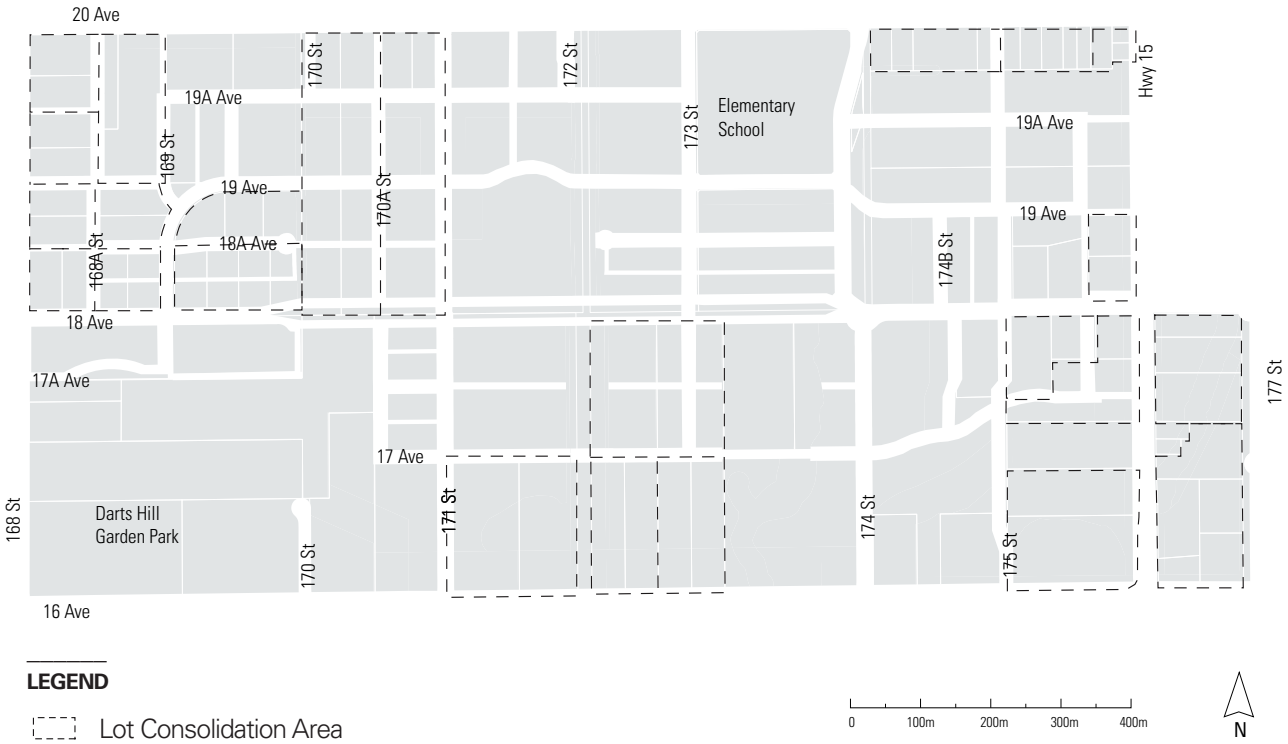
9.1 Development Policies

Lot Consolidation Areas

Lot consolidation areas have been identified to support feasible development and ensure efficient development of properties. These lots should be developed together through coordinated development. Lot consolidations help ensure an equitable distribution of road dedication, land development, and construction costs across properties. If lot consolidation is proven not to be possible or feasible during the development process, a developer must:

- Demonstrate that the development potential of the excluded property is not compromised to the satisfaction of the City;
- Share any required road construction costs amongst properties shown in the land consolidation area; and,
- Provide additional road or lane and pedestrian access dedication to the satisfaction of the City.

Figure 9.1A: Lot Consolidation Map



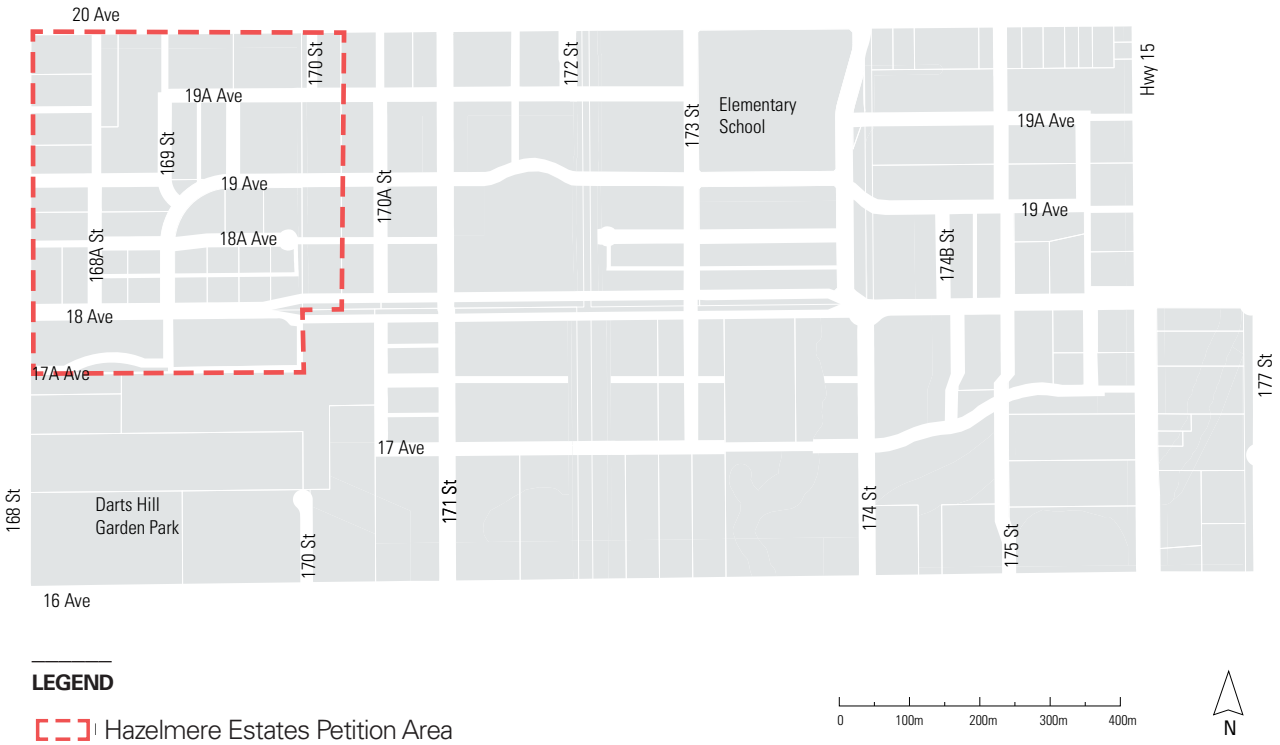
Development Permit Areas

Where development is located in designated Development Permit Areas (DPA), as identified in the OCP (steep slopes, farm protection, environmentally sensitive areas, etc.) as well as in the case of multiple residential or commercial developments, the OCP Design Guidelines will be implemented through the process of reviewing and approving the related Development Permit at the time of development application.

Hazelmere Estates Petition Area

Hazelmere Estates is the residential neighbourhood in the northwest portion of the Plan Area (Figure 9.1B). Not all residents in this area were supportive of development during the Planning process. As a result, a petitioning requirement has been included. A supportive petition of property owners from this area is required before the first rezoning application can be received by the City. A supportive petition is defined as requiring 65% of lots and 75% of land area in support of rezoning. Subsequent development applications would not be required to petition the area residents once the initial threshold is met by the first application.

Figure 9.1B: Hazelmere Estates Special Study Area



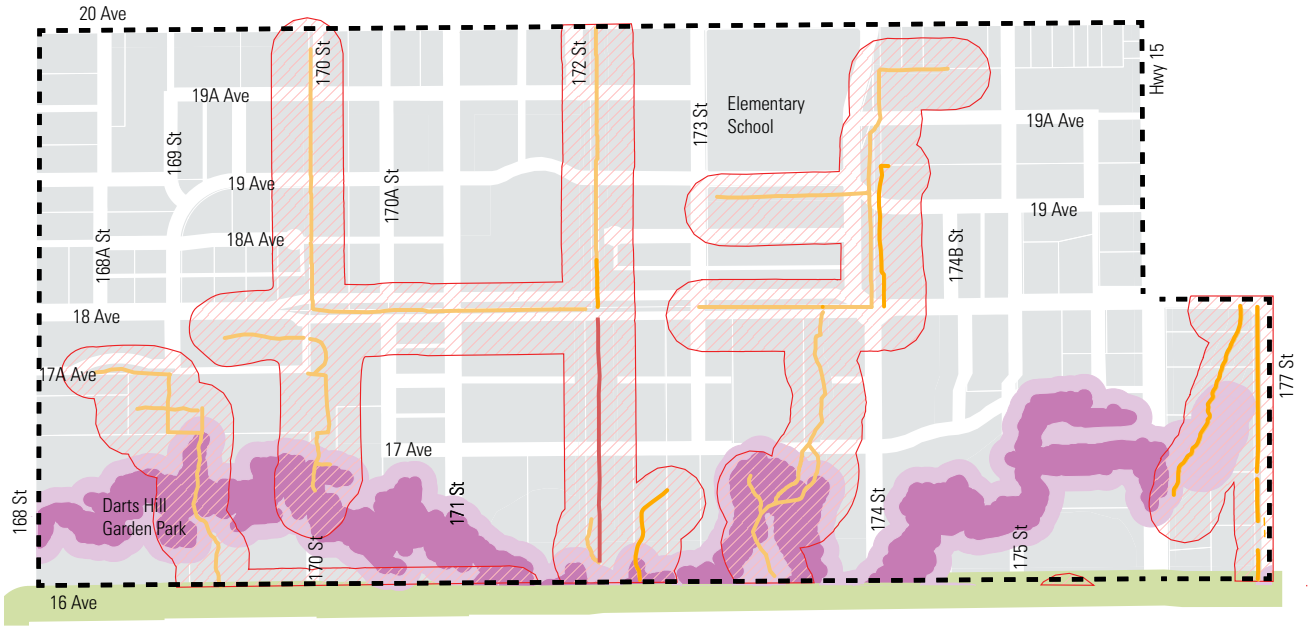
Watercourse Protection

The City of Surrey's Streamside Protection Bylaw requires that a protective buffer be established around any ditch, dyke, watercourse, or wetland that is connected to potential fish habitat. This protects wildlife and aquatic resources. It also provides essential protection to flood-prone areas by providing water storage and flow away from private land.

The Streamside Protection Bylaw is enacted by a Sensitive Ecosystems Development Permit Area (SEDPA) DP3 process, which requires that any potential development within 50 meters of a stream be assessed by a Qualified Environmental Professional (QEP). The QEP should be an aquatics specialist with knowledge of fish habitat requirements. The QEP will be required to write an Ecosystem Development Plan (EDP), in which a setback will be assigned (called the Streamside Protection Area, or SPA) to the stream based on Provincial and Municipal regulation. No disturbance may occur in the SPA.

Habitat enhancement measures may also be required within the SPA. The SPA will need to be protected by either a Registered Covenant (minimum safeguarding) or by conveying the land to the City of Surrey (maximum safeguarding). The intent is to ensure that the SPA is protected and maintained as a natural vegetated buffer in perpetuity. The QEP will also need to address Provincial and geotechnical setbacks which can be larger than the SPA. The largest of all setbacks will apply for development.

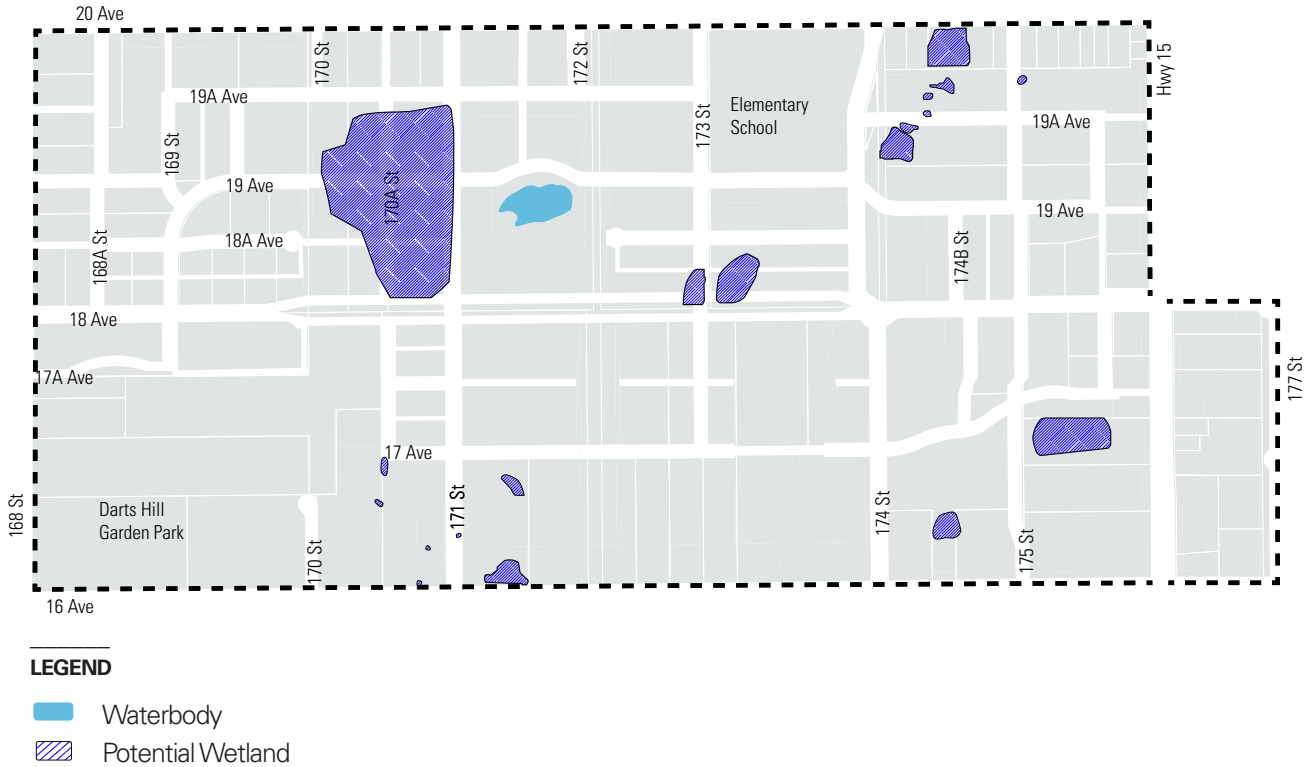
Figure 9.1C: Development Permit Areas



Wetlands

Several identified and potential wetlands have been identified within Darts Hill. The specific boundaries and locations of these wetlands are approximates only. The Provincial Water Sustainability Act (WSA) is the primary legislation that manages and protects BC water resources, including seepage from slopes and the ground. No works or changes to or near a wetland can occur without expressed consent from the Ministry of Forest, Lands, Natural Resource Operations & Rural Development (MFLNRORD). Further detailed studies by a Qualified Environmental Professional (QEP) will be required to verify the location and sizes of any wetlands. This includes wetlands that were not captured by previous environmental studies.

Figure 9.1D: Wetlands



Housing Policies

As a designated growth area, the Plan Area plays an important role in achieving the City's housing goals. A diversity of housing forms and tenure types will support a full range of housing needs for young families, working professionals, older adults, low-income groups, and people living with disabilities. The following housing objectives align with the City's Affordable Housing Strategy, and encourages development that benefits residents of all income groups:

- Focus most new development within walking distance of the urban village and future bus transit;
- Encourage more housing options, which benefits young families, people with disabilities, and seniors; and,
- Plan for a rapidly increasing seniors' population with accessibility challenges.

To support these housing objectives the Plan outlines the following policies that apply to new development within the Plan Area:

Housing Policy 1

A minimum of 30% of new multi-family housing (e.g. apartments) units should be family oriented with 2-bedroom or greater, and at least 10% as 3-bedroom or greater.

Housing Policy 2

All new multiple family residential units within the Plan Area should meet the Adaptable Housing Standards in the BC Building Code.

Housing Policy 3

New residential developments that require a rezoning should provide a per unit contribution to the Affordable Housing Reserve Fund. Refer to Schedule G - Section A of the Zoning By-law for current rates.

Electric Vehicle Charging Infra-structure

As per the Zoning Bylaw, 100% of residential parking spaces in new residential developments are required to have an electrical outlet capable of supporting Level 2 EV charging (e.g. 220V outlet). All new commercial developments are required to provide a minimum 20% of parking spaces that have an electrical outlet capable of supporting Level 2 EV charging. The Zoning Bylaw requirements provide for EV Energy Management Systems to be implemented, where power can be shared between up to four parking spaces and where the minimum performance standard is achieved.

Zero Carbon Incentive

The Zero Carbon Incentive is intended to encourage the design and construction of zero carbon operation buildings. These buildings use only non-polluting (zero-carbon) energy during operation. The objectives for the Zero Carbon Incentive are to:

- Achieve verifiable reduced carbon pollution consistent with adopted City policies.
- Be simple for the City to administer and for the developer to demonstrate compliance.

Development that meets these objectives and the below criteria may be eligible for the applicable additional density allowances. These projects must continue to meet the intent of the land use designation, associated urban design guidelines, parking bylaw, etc.

Criteria

To be eligible for the incentive, buildings must fulfill the following criteria, in addition to any BC Energy Step Code and City of Surrey energy and sustainability provisions already in effect or otherwise required:

Zero-carbon For All Buildings: 100% of site and building operational energy needs are met with non-polluting energy, including heating, hot water, and cooking, as well as other energy needs such as pool heating. The buildings are not connected to a fossil fuel supply grid.

Implementation

Development that meets the objectives and criteria of the Zero Carbon Incentive are eligible for the applicable additional density allowances. The following steps outline the procedure to follow:

Step 1: Those developments seeking to apply the incentive are identified with the applicable file Planner at the pre-application stage and details of the requirements are discussed.

Step 2: A Restricted Covenant is registered at the time of rezoning indicating the requirement that buildings are constructed to the Zero Carbon Incentive requirements.

Step 3: A bond is submitted to the City at the time of building permit application. The value of the bond is set at $10,000 per subdivided single-family lot or 1% of construction hard costs for all other building types.

Step 4: Compliance with all applicable requirements is documented by the applicant through the Building Permit and construction process and verified by Plan Checkers and Inspectors. Plan Checkers verify that all requirements have been met and all necessary documentation has been submitted before granting a Building Permit. Inspectors verify that requirements have been met at the appropriate inspection stage(s) before allowing construction to continue to the next phase.

Step 5: The bond is released once all required documentation has been submitted to the City.

Table 9.1: Zero Carbon Incentive Density Table

Designation	Base Density	Zero Carbon Incentive	Max Density with Zero Carbon Incentive
Neighbourhood Commercial	0.5 FAR	+0.1 FAR	Up to 0.6 FAR (Commercial/Office)
Community Commercial	1.0 FAR	+0.5 FAR	Up to 1.5 FAR (Commercial/Office Only) *Up to 0.9 Residential FAR and minimum 0.6 FAR Commercial when project provides Low Carbon & Tier 2 Capital Project CACs
Low Rise Mixed Use	1.5 FAR	+0.5 FAR	Up to 2.0 FAR
Low Rise Residential	1.3 FAR	+0.2 FAR	Up to 1.5 FAR
High Density Townhouse	25 UPA	+5 UPA	Up to 30 UPA
Medium Density Townhouse	20 UPA	+4 UPA	Up to 24 UPA
Semi-Detached Residential	12 UPA	+3 UPA	Up to 15 UPA
Detached Residential	10 UPA	+4 UPA	Up to 14 UPA

9.2 Community Amenity Contribution

Plan Amendments & Density Bonus Considerations

Growth and development will lead to increased demand for community amenities. An increase to population and units will impact school capacities, parkland provision, civic facilities and services, and infrastructure capacity. To address these impacts, any NCP Amendment or OCP amendment that includes a rezoning with increased density, above base plan densities, will be subject to the City's density bonusing policies and by-laws. These contributions help offset the impacts of growth and help fund new community facilities and services.

Site specific NCP amendments will be considered carefully and weighed against their contribution towards the Plan's vision and principles. Community specific fixed Community Amenity Contribution (CAC's) rates are to be provided for residential development in accordance with Surrey Zoning Bylaw Schedule G Section C. Any Major OCP amendments will be subject to City Density Bonus Policy 0-54.

Minor adjustments to proposed lanes and local roads may be considered where appropriate, and may not trigger a formal NCP Amendment on their own if supported by City Engineering department. Adjustments to lanes and local road alignment may be considered without a formal NCP Amendment if in-keeping with original intent of the Plan.

There are four main categories of Community Amenity Contributions that will be applicable in Darts Hill:

1. Area Specific Secondary Plan CAC's will apply to all residential development seeking increased density in keeping with land use designation (with some exceptions),and are applicable to all proposed residential units and commercial spaces.
2. Universal City-Wide CACs apply to all density bonus rezonings/subdivisions (with some exceptions). Affordable Housing and Public Art contribution rates, exemptions and collection process are to be provided in accordance with applicable policy.
3. Tier 1 Capital Project CAC's will apply to all residential development seeking increased density (with some exceptions) and are applicable to the portion of units that are consistent with the density of the Plan.
4. Tier 2 Capital Project CAC's will apply where residential rezoning's seek increased density above the Plan. Tier 1 Capital Project CAC's are applied up to the Plan designations and Tier 2 is then applied to the portion of density above the Plan. Capital Project CAC rates, phasing, exemptions and collection process are to be provided in accordance with Surrey's Community Specific Density Bonus Policies for Grandview Heights area outlined in Surrey's Zoning Bylaw #12000, as outlined in Schedule G, and Density Bonus Policy O-54.

Area Specific Darts Hill CAC's

To enact the area specific Secondary Plan CAC's noted above, the Zoning By-law will be amended to add Darts Hill NCP to the list of area specific Plan Areas within which monetary amenity contributions are required. The monetary contributions toward parks, police, fire and library materials will offset capital costs of providing services to new development and are applied on a standardized basis in all of Surrey's Secondary Plans. The monetary contributions toward parks, open spaces and pathway development are based upon an estimated capital costs of improvements for this NCP. The total cost is divided by the average anticipated number of dwelling units (acreages in the case of non-residential development) to ensure an equitable contribution.

Parkland Development
The scope of parkland development within the NCP will include four (4) new parks, a Biodiversity Habitat Corridor, and an expansion to Darts Hill Garden Park. The estimated cost of developing park amenities is $15,123,550.50 which results in a $4,204.49 (in 2021 dollars) per dwelling unit. This is captured through the Parks Development CAC. This estimate includes the construction of on-site park amenities, such as playgrounds, washroom buildings, parking lots, sports courts, athletic fields, tree and horticultural plantings, park pathways, seating areas, viewing platforms and passive open spaces. This also includes natural and riparian area management within land acquired by Parks.

Park amenity calculations do not include riparian area works on land conveyed to the City through the development process, such as invasive species removals, fence construction, replanting and naturalization, in-stream works and any other related riparian area costs, including planning and design costs, which are to be accounted for as part of the development process and subject to the Zoning Bylaw.

Parkland Road Frontage
Park road frontage construction is not included within the Parks Development CAC. Road frontages are also not funded through the parkland acquisition DCC. The estimated cost of developing associated park road frontages, included a half road, storm sewer contribution, curb and gutter, sidewalk, boulevard and street lighting is $8,435.00.97. This results in a cost of $2,345.01 (in 2021 dollars) per dwelling unit. This is captured through the Parks Road Frontage CAC.

Library Materials
A study of library requirements in Surrey's new neighbourhoods has established that a contribution of $181.17 (in 2021 dollars) per dwelling unit (non-residential development is exempt) is necessary to cover the capital costs for library materials and services, which is sensitive to population growth. Consequently, a total of approximately $651.668.49 will be collected from Darts Hill towards materials such as books, computers, and electronic media.

Fire Protection
Future development in this neighbourhood will drive the need to upgrade existing fire protection facilities. A study of fire protection requirements in Surrey's new neighbourhoods has established that a contribution of $347.89 per dwelling unit and $2,087.34 per acre of non-residential development (in 2021 dollars) will cover the capital costs for fire protection. This will result in a total capital contribution from Darts Hill of approximately $1,272,233.73 toward fire protection facilities.

Police Protection
Future development in this neighbourhood will drive the need to upgrade existing police protection facilities. A contribution of $80.52 per dwelling unit and $483.12 per acre of non-residential development will cover the capital costs for police protection. This will result in a total capital contribution from Darts Hill of approximately $294,461.64 toward police protection facilities.

Universal City-Wide CAC's

Affordable Housing
The NCP is subject to Affordable Housing CAC's for future rezonings, as identified in Schedule G of Surrey's Zoning Bylaw. The (2021) Affordable Housing contribution rates are $1,000 as outlined in Schedule G of the Zoning Bylaw. Proposed development will provide the bylaw rates that are applicable at the time the future Building Permit is issued. This will result in a total affordable housing contribution from Darts Hill of approximately $3,597,000 toward civic affordable housing projects in the South Surrey area.

Public Art
The NCP is subject to Public Art Contributions. Any re-zoning that includes more than 10 dwelling units, and/or any rezoning for Commercial with a total floor area of greater than 1,000 m², will be subject to Public Art Contributions. The Public Art contribution is a fixed rate of 0.50% of the total project construction cost. Public Art Contributions may also include (in-kind) contributions towards public art.

Tier 1 Capital Project CAC's

The NCP area will be subject to Tier 1 Capital Plan Project CAC's for future rezonings, as identified in Surrey's Zoning Bylaw #12000. The Capital Project contribution rates are phased in, with rates increasing from $1,500, to $2,000 from January 1, 2021 to January 1, 2022 as outlined in Section B.4 of Schedule G of the Zoning Bylaw. The proposed development will provide the phased zoning bylaw rates that are applicable at the time the future Building Permit is issued. This will result in a total capital contribution from Darts Hill of approximately $7,194,000 (2022 rate) toward civic projects such as cultural, sport or recreation facilities within the larger Grandview Heights area.

Tier 2 Capital Project CAC

The NCP is subject to Community Specific Tier 2 Capital Project CACs. It is applicable for any rezoning proposing bonus density where the proposed increase is greater than the maximum density allowed in the Plan. Where applicable the CAC applies after the addtional density of the Zero Carbon Incentive bonus. Any plan amendments proposed by future development will provide the Zoning Bylaw #12000 - Schedule G Community Specific Rates for South Surrey paid before Zoning Bylaw is adopted.

Community specific fixed rates for Grandview Heights are charged on a per square foot basis for apartments, and on a per dwelling unit basis for single family and townhouses that exceed the Plan limits. The Grandview Heights Community Specific contribution rates are phased in, with rates increasing from $15,0000, to $20,000 per dwelling unit from January 1, 2021 to January 1, 2022 for Townhouse and Single family dwellings, and $15/sq. ft to $20/sq. ft for Apartments, as outlined in Section C of Schedule G of the Zoning Bylaw.

Darts Hill NCP CAC Projection Summary

The estimated (2022 Rate) CAC's and total projected revenues from development in Darts Hill is over $36 Million dollars. The specific CAC's for Darts Hill NCP area are summarized below and are documented in Table 9.2.

Table 9.2: CAC's for Darts Hill NCP

Community Amenity Contribution (CAC)	*Per Unit Contribution	Per Acre Contribution All Non-Residential (10 Acres)	Anticipated Total CAC Revenue
Plan Area Specific Amenity Contributions			
Police Protection	$80.52	$483.12	$289,630.44 (Residential) $4,831.20 (Non-Residential) Sub Total: $294,461.64
Fire Protection	$347.89	$2,087.34	$1,251,360.33 (Residential) $20,873.40 (Non-Residential) Sub-Total: $1,272,233.73
Parkland Development Park Road Frontage	$4,204.49 $2,345.01 Sub-Total $6,549.50	N/A N/A N/A	$15,123,550.50 $8,435,000.97 Sub-Total $23,558,51.50
Library Materials	$181.17	N/A	$651,668.49
Citywide Amenity Contributions*			
Capital Projects (Tier 1)	$2,000	N/A	$7,194,000
Affordable Housing	$1,000	N/A	$3,597,000
Total Contribution Revenue	**$10,159.08**	**$4,284.10**	**$36,567,915.40**

*Based on 3,597 (Avg) Projected Units

9.3 NCP Cost Recovery Surcharge

Several consultants were retained to assist with the preparation of the Darts Hill NCP, including heritage, watercourse, transportation, financial, and drainage servicing studies. The total cost of consultant services to the City was $183,427.00. The Fee Imposition By-law is to be amended to provide for the recovery of these NCP preparation costs through the payment of application surcharge fees at time of development.

A per unit surcharge fee will be based on the anticipated 3,597 units at the mid-range density and will result in a per unit fee of $51.55. See Table 9.3 Should the actual number of proposed units fall below the number anticipated on any site, the applicant will be required to make up the shortfall in the surcharge fee to ensure the City's NCP preparation costs are fully recovered.

Table 9.3: NCP Cost Recovery Surcharge

Consultant Study	Study Cost	*Per Unit Surcharge (Based on 3,597 Units)
Darts Hill Transportation Study	$35,173.00	$9.78
Darts Hill Drainage Study	$81,046.00	$22.53
South Surrey Transportation Study	$32,689.00	$9.09
Watercourse Classification Assessment	$14,971.00	$4.16
Watercourse Assessment Update	$14,298.00	$3.98
Heritage Study	$5,250.00	$1.46
TOTAL	**$183,427.00**	**$51.00**

*Based on 3,597(Avg) Projected Units

9.4 Infrastructure Financing

New water, sanitary sewer, storm sewer and transportation infrastructure is required to support development in the NCP. Table 9.4A summarizes the projected DCC revenues and construction costs for each of the major infrastructure systems that will be needed to support build-out.

Revenues are based on the proposed DCC rates that will come into effect on May 15, 2021 and include the DCC municipal assist factor for all DCC-Eligible Costs attributable to the NCP for each asset, as summarized in Table 9.4B.

Included in these costs are road improvements that will be necessary for the development of this NCP but will also benefit development outside of this NCP area. In this regard, the NCP has only been burdened with a proportionate share of the total costs related to the road improvements.

The three drainage ponds in the NCP require acquisition of land, which makes up approximately 76% of drainage costs. Land costs are based on an average land acquisition price of $2,200,000 per acre, as estimated by Realty Services Division staff.

Table 9.4A: Projected DCC Revenues and Construction Costs for Major Infrastructure

Service	Estimated DCC Revenues[1]	DCC Eligible Cost Attributable to Darts Hill NCP	Difference
Drainage	$7,124,000	$25,840,000	-$18,716,000
Sanitary Sewer	$10,133,000	$6,543,000	$3,590,000
Water	$6,765,000	$4,976,000	$1,789,000
Arterial Roads	$40,512,000	$25,506,000	15,006,000
Non-Arterial Roads	$9,525,000	$9,516,000	$9,000
Parkland	$52,283,000	Land Purchase Cost	
TOTAL	**$126,342,000**	**$72,225,000**	

[1]DCC Revenues are based on Surrey's Development Cost Charge Bylaw, 2021, No. 20291 and include a 1% Municipal Assist Factor (MAF)

Table 9.4B: Municipal Assist Factor for Engineering Infrastructure

Service	Municipal Assist Factor	Cost of the Municipal Assist Factor
Drainage	1%	$71,240
Sanitary Sewer		$101,330
Water		$67,650
Arterial Roads		$405,120
Non-Arterial Roads		$95,250
Parkland		$522,830
TOTAL		**$1,263,420**

RECOMMENDED FINANCING APPROACH

Given that there is a DCC funding shortfall for drainage infrastructure, it is recommended that:

1. The Citywide DCC be used as the means to pay for water, sanitary sewer, arterial and non-arterial road infrastructure and for parkland (including BCS) acquisition in the NCP area; and
2. An area-specific DCC will be used as the means to pay for drainage infrastructure, including stormwater detention ponds, to service this NCP.

FINANCING IMPLEMENTATION

The 10-Year Servicing Plan establishes the City's capital expenditure plan for the construction of engineering infrastructure to service existing neighbourhoods and to support new growth across the City. It also forms the basis for establishing the City's DCC rates.

With the completion of this NCP, it is recommended that the infrastructure needs identified in this NCP be added to the next update of the 10-year Servicing Plan.

OPERATION & MAINTENANCE

The development of the NCP area will increase the total length of infrastructure that the City is required to operate, maintain and eventually replace. The increases to the City's major infrastructure categories are shown in Table 9.4C.

The midline build-out population estimate of 9,514 persons in the Plan Area represents a 1.58% increase in the City's population. The infrastructure needed to support this increase in population results in the City's infrastructure inventory increasing by 0.45% to 1.15% Therefore, the added infrastructure to support the development of the Plan Area is positively balanced when compared against the increase in population.

Table 9.4C: Increase to Major Infrastructure Categories for Darts Hill

Infrastructure	Existing Inventory	Increase to Inventory	Increase to Inventory (%)
Sewer mains	1,613 km	12.4 km	0.76 %
Water mains	1,866 km	21.5 km	1.15 %
Drainage mains	2,054 km	9.2 km	0.45%
Local, Collector and Arterial Roads (centre line length)	1,962 km	19.9 km	1.01%