WEST CLOVERDALE SOUTH

NEIGHBOURHOOD CONCEPT PLAN

CITY OF SURREY

PLANNING & DEVELOPMENT DEPARTMENT

SURREY
CITY OF PARKS

WEST CLOVERDALE SOUTH

NEIGHBOURHOOD CONCEPT PLAN

WEST CLOVERDALE SOUTH NEIGHBOURHOOD CONCEPT PLAN (NCP)

This Neighbourhood Concept Plan was prepared by Stanley Consulting for the City of Surrey and the property owners of West Cloverdale.

PLEASE NOTE:

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It was Moved by Councillor Hunt
Seconded by Councillor Lewin
That the Planning & Development Department bring forward a policy as to how to deal with properties in proposed parks and school areas.

RES.R97-601 Carried

Item No. C340 West Cloverdale South Neighborhood Concept Plan:
South of 60 Avenue - Stage 2 Report
(2350-005/002)

It was Moved by Councillor Hunt
Seconded by Councillor Villeneuve
That Council phase the NCP with 75% of the development having to wait until the West Cloverdale North NCP is approved. On a phased basis, the NCP can be adopted subject to the following:

- That only phases 1 through 2B (comprising approximately 150 units) be allowed to develop until the West Cloverdale North NCP is approved by Council or the cashflow deficit for the water supply is resolved.

- That approvals for the proposed drainage system be received from Ministry of the Environment and the Department of Fisheries and Oceans by the NCP consultant.

- That the area draining north of 60 Avenue be required to provide interim and/or permanent detention facilities. This requirement will be reviewed upon approval of the West Cloverdale North NCP.

- That the NCP consultant completes a major flood path plan for each catchment area to ensure an overall coordinated approach.

- That interim detention be provided until the ultimate downstream drainage solution is constructed.

- That full payment of Drainage and Water DCCs be made at the time of servicing agreement.

- That development follow the Phasing as proposed in the Stage 2 Report or the developer prepare a revised phasing plan to the City's approval.

- That developments follow the servicing and road layouts as proposed in the Stage 2 Report or as revised by the applicant to meet with the City's approval.

- That it is understood that the report is based upon the best information currently available and costs estimated based upon this information. As such, solutions and costs may change as more details become available leading to revisions to report.

- That financing of the NCP infrastructure will be provided by the developers with no funds being provided by the City other than Development Cost Charges collected from developers of benefiting properties.

- Council include the proposed changes to the new 10 Year Servicing Plan to be completed in 1997.

- All developments must comply with all City By-laws, Standards, Specifications and Policies.

- That the heritage preservation of the Five Corners be maintained.

RES.R97-602 Carried

Item No. C340.1 West Cloverdale South Neighborhood Concept Plan (NCP) - Stage 2 - Final Report (2350-005/2)

It was Moved by Councillor Hunt
Seconded by Councillor Villeneuve
That Council:

1. Approve the final and complete Neighborhood Concept Plan (NCP) for the south neighborhood of West Cloverdale (Appendix I).

2. Approve the arrangements, terms and conditions specified in the West Cloverdale South NCP (Appendix I) as a means of managing the development and general provision of services, amenities and facilities for this new neighborhood.

3. Amend the West Cloverdale Local Area Plan to reflect the recommendations contained in the West Cloverdale South Neighborhood Concept Plan.

4. Authorize staff to draft the following by-laws to implement the provisions of the Neighborhood Concept Plan:

(a) an amendment to Zoning By-law, 1993 No. 12000, as amended, to enact the approved bonus density provision for the West Cloverdale South Neighborhood Concept Plan area;

(b) an amendment to the City of Surrey Land Use and Development Application Fees Imposition By-law, 1993, No. 11631, as amended, to authorize the payment of additional application fees to recover the costs of preparing the West Cloverdale South Neighborhood Concept Plan; and

(c) a by-law to adopt the West Cloverdale South Neighborhood Concept Plan (NCP) as an Official Community Plan.

RES.R97-603 Carried

3. **William B. Stewart, President and CEO**
The YMCA of Greater Vancouver
(0065-012; 8035-001)

It was Moved by Councillor Hunt
Seconded by Councillor Villeneuve
That Council support, in principle, the concept of the development of a YMCA in Surrey.

RES.R97-604 Carried

5. **Chris Silvester, Bruce Tuckwood,**
Kristian Cox, Dave Ennis, and Rob Danyluk
(0065-012; 0310-001)

It was Moved by Councillor Hunt
Seconded by Councillor Villeneuve
That funding of $2,500 from the unallocated youth allowance be referred to the Finance Committee.

RES.R97-605 Carried

WEST CLOVERDALE SOUTH NCP

STAGE 2 REPORT

Prepared for:

City of Surrey

Prepared by:

Stanley Associates Engineering Ltd.

January 1997
69-104-00

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1.0 INTRODUCTION

The City of Surrey has adopted the Neighbourhood Concept Plan (NCP) approach for planning newly developing residential areas. There are three major objectives for this NCP process. They are the effective implementation of policy defined in higher order plans such as the Official Community Plan (OCP) and Local Area Plans (LAP) as well as other municipal policy; the participation of stakeholders (developers, residents, landowners, the public, agencies, etc.) in plan preparation; and the coordinated and timely provision of community services and facilities by developers/owners in an equitable and expedient manner.

The plan proponents received Council's approval of the Stage 1 NCP land use concept in December, 1995, enabling additional planning steps to be undertaken. This includes the Stage 2 Report which addresses development costs, as well as the subdivision and rezoning process that will lead up to actual development.

In this case, the *West Cloverdale Local Area Plan* has already been approved by City Council as an overall guide to land use, servicing, and development in the general area. This NCP has been prepared to provide more detail, on a neighbourhood basis, on how the area should be developed for the future benefit of landowners, future residents, and the City of Surrey as a whole. ***Appendix B*** includes details on servicing and costing as a Stage 2 NCP report.

1.1 LOCATION

The NCP area is defined by roadways and the Serpentine River. ***Figure 1: Location*** shows the boundaries of the NCP area. It is the southern neighbourhood within the West Cloverdale LAP. The NCP area is bounded by 60 Avenue on the north and 168 Street on the east. These two roads intersect with Old McLellan Road at the northeast corner of the plan area in what is referred to as *"5 Corners."* The south boundary is Highway #10 (56 Avenue) as far west as Old McLellan Road, then the boundary follows the Serpentine River northwest back to 60 Avenue. The NCP area contains 92 ha.

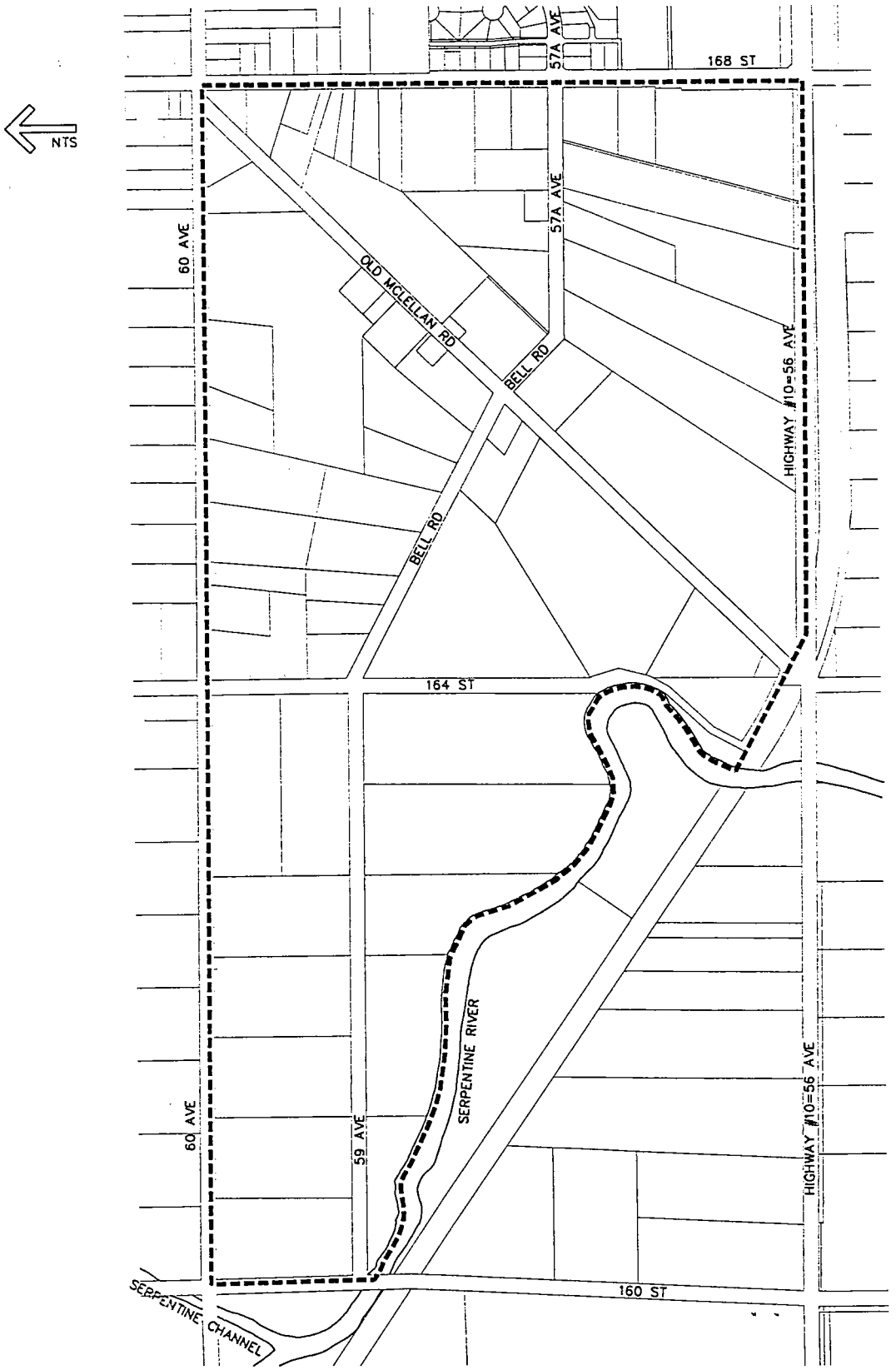


FIGURE 1: LOCATION

1.2 PROCESS

This plan was prepared by Stanley Associates, a Surrey consulting firm of planners and engineers, on behalf of the landowners. The process was directed by a Steering Committee of landowners with the advice of Surrey planning and engineering staff.

The consultants met with the Steering Committee on numerous occasions. The Steering Committee was selected by the City to represent approximately 60 owners in the area. Steering Committee members liaised with other land owners in the NCP area. As such, there were informal discussions and meetings with individual owners by both the consultant and Steering Committee members.

Property owners in and near the NCP were invited to a public meeting held in June, 1995. Approximately 73 people were in attendance. The plan, and the process of plan preparation, was presented. There was a discussion period. A summary of written comments received from attendees is included in ***Appendix A***. As the plan had been *"fine-tuned"* in consultation with owners, there was very significant support. The need for land dedication, in exchange for density increases, to protect the treed slopes of the Serpentine River Valley was raised as a concern. As a result, an additional meeting was held with owners affected by this proposal. Most, but not all, indicated support at this meeting. Since that time, there have been additional meetings and discussions to further refine, on a very localized basis, the local road layout. Two owners requested increased density that has not been incorporated into the NCP.

A second public meeting was held on October 1, 1996 to discuss the Stage 2 report. There were approximately 40 people at that meeting. There was general support for the plan. However, there was a concern from some owners over the issue of land dedication relative to the RC zoning designation. Comments from that meeting are documented in Appendix A. Changes were made in response.

A third public meeting, attended by 35, was held January 8, 1997 to explain final changes. All comment forms indicated endorsement for the plan proposals related to infrastructure funding and staging.

2.0 LAP PRINCIPLES

As noted earlier, one of the purposes of an NCP is to bring the policies of the LAP closer to implementation by their refinement, on a more local basis, with the benefit of more detailed analysis and design. However, the LAP remains the central guiding policy document.

General goals set by the LAP are to create a high quality residential environment that generates a sense of community, promotes interaction, preserves the rural character and natural environment, and meets the needs of future residents for community facilities, schools, and parks.

The *West Cloverdale Local Area Plan*, prepared through a community consultation process and approved in February 1993, outlines the following principles that the NCP generally conform to:

- A "*main street*" along 60 Avenue which includes a mixed use node to anchor the east end, with a higher density street oriented residential area along the Avenue. This NCP provides the south side of "*main street.*" The land use and transportation section of this NCP further describe the concept.

- From here, to the south and west edges of the neighbourhood, there is a gradual transition of density towards the forested slopes, the floodplain, and the Agricultural Land Reserve. Uses vary from street oriented townhouses, to standard single family enclaves, with low density clustering generally at the top of slopes.

- Inherent in the LAP, is respect for the protection of the environment, open space, existing vegetation, and the existing character and heritage as represented by the rural ambiance, the history of "*5 Corners*", the landmark church, and the cemetery.

- The LAP defines the pedestrian and roadway connections with adjacent neighbourhoods.

Figure 2: Local Area Plan shows the approved land use concept for the entire West Cloverdale area. This NCP area includes the southwestern part of the LAP area.

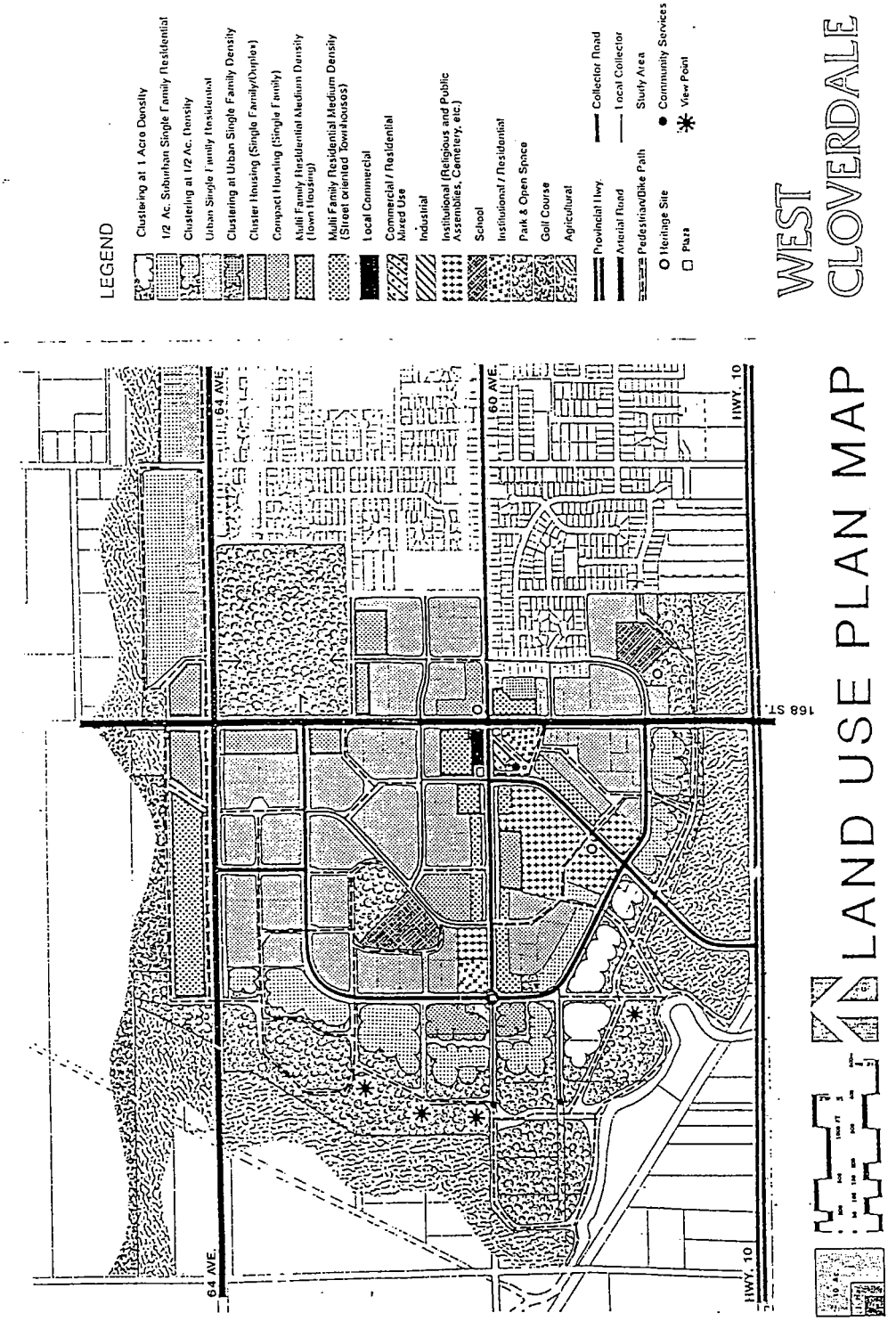


FIGURE 2: LOCAL AREA PLAN

3.0 LAND USE CONCEPT

There are factors, such as existing physical conditions and the policies of the municipality, particularly those of the LAP, and those of the Agricultural Land Commission, that were influential in formulating the NCP.

The topography, shown on ***Figure 3: Topography***, is a major influence, not only on the staging because of the servicing implications, but because the plan responds to the policy implications of the topography. The high point of land is where a gentle ridge crosses 60 Avenue just east of 164 Street. From the ridge, the land slopes gently to the northeast and more steeply towards the south and west toward the Serpentine River. The limit of development caused by the floodline has been defined by other consultants for the City of Surrey at an elevation of 2.4 m. ***Figure 4: ALR*** shows the boundary of the Agricultural Land Reserve. It roughly follows the edge of the floodplain.

The land use and transportation concept for the NCP is shown as ***Figure 5: Land Use Concept.*** It has the following key land use characteristics:

- ***Existing Uses:*** The NCP calls for the continued use of certain established uses. These include the cemetery and existing churches, including the heritage Christ Church. The existing Surrey Centre Elementary School is to be retained on a temporary basis until the school to the north of 60 Avenue is built and this school site can be redeveloped for row housing. The cemetery, in its central location, will add to the ambiance and openness of the area, as well as being an important part of the pedestrian network. While a development site has been shown on the northeast corner of the cemetery lands, its development will not be confirmed until the completion of a cemetery master plan, possibly in 1996, by the City of Surrey.

- ***Main Street:*** 60 Avenue is designated in the LAP as a central community axis or "main street" intended for street oriented townhousing in a pedestrian oriented environment. Row housing at 15 units/acre is intended, except for areas of 10 units/acre behind as a transition to adjacent single family areas. Development will be limited to two storeys, individual units along 60 Avenue should be oriented to

the street, large and columnar street trees should be used, and an architectural style to reflect the heritage value of the area should be implemented.

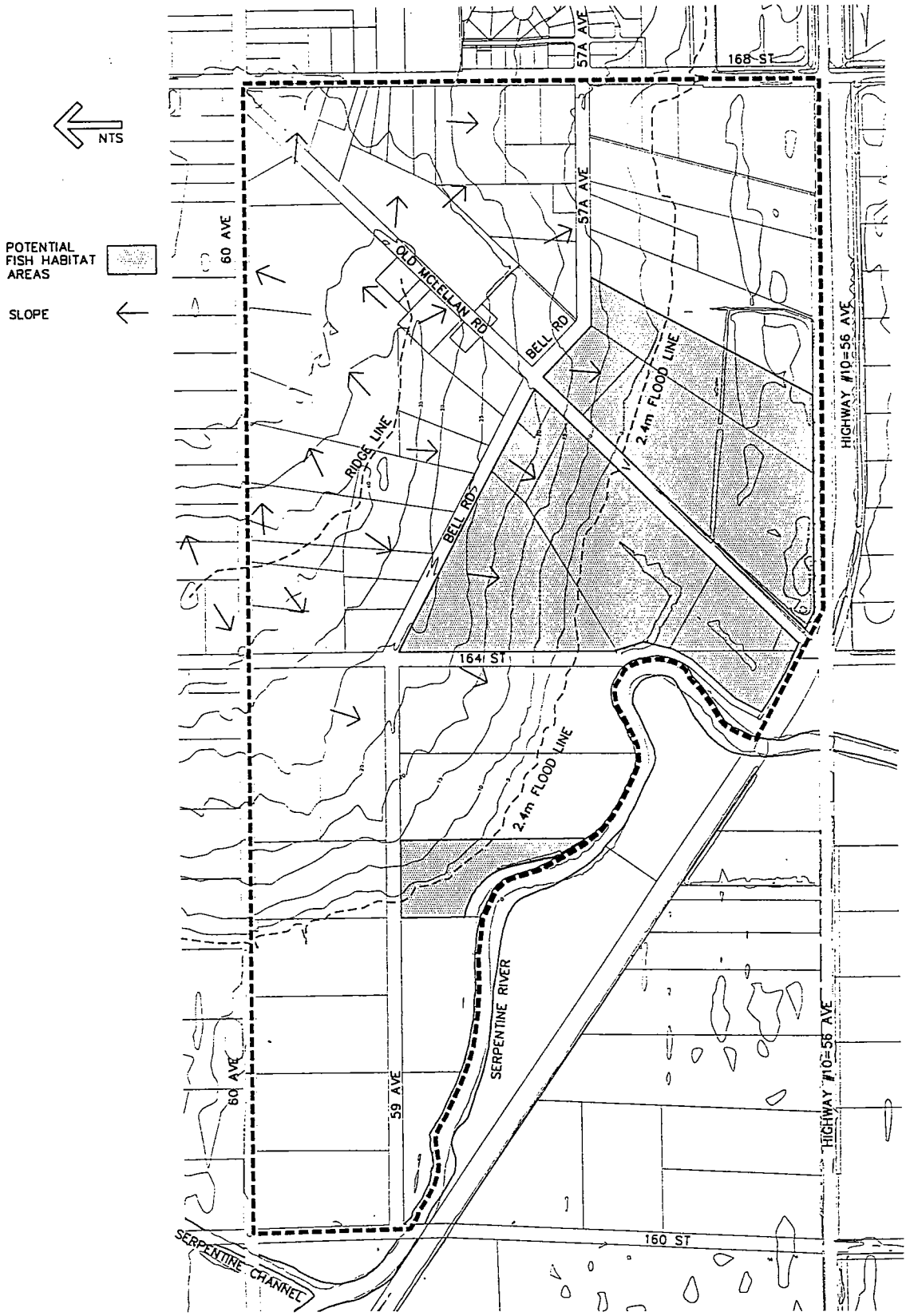


FIGURE 3: TOPOGRAPHY

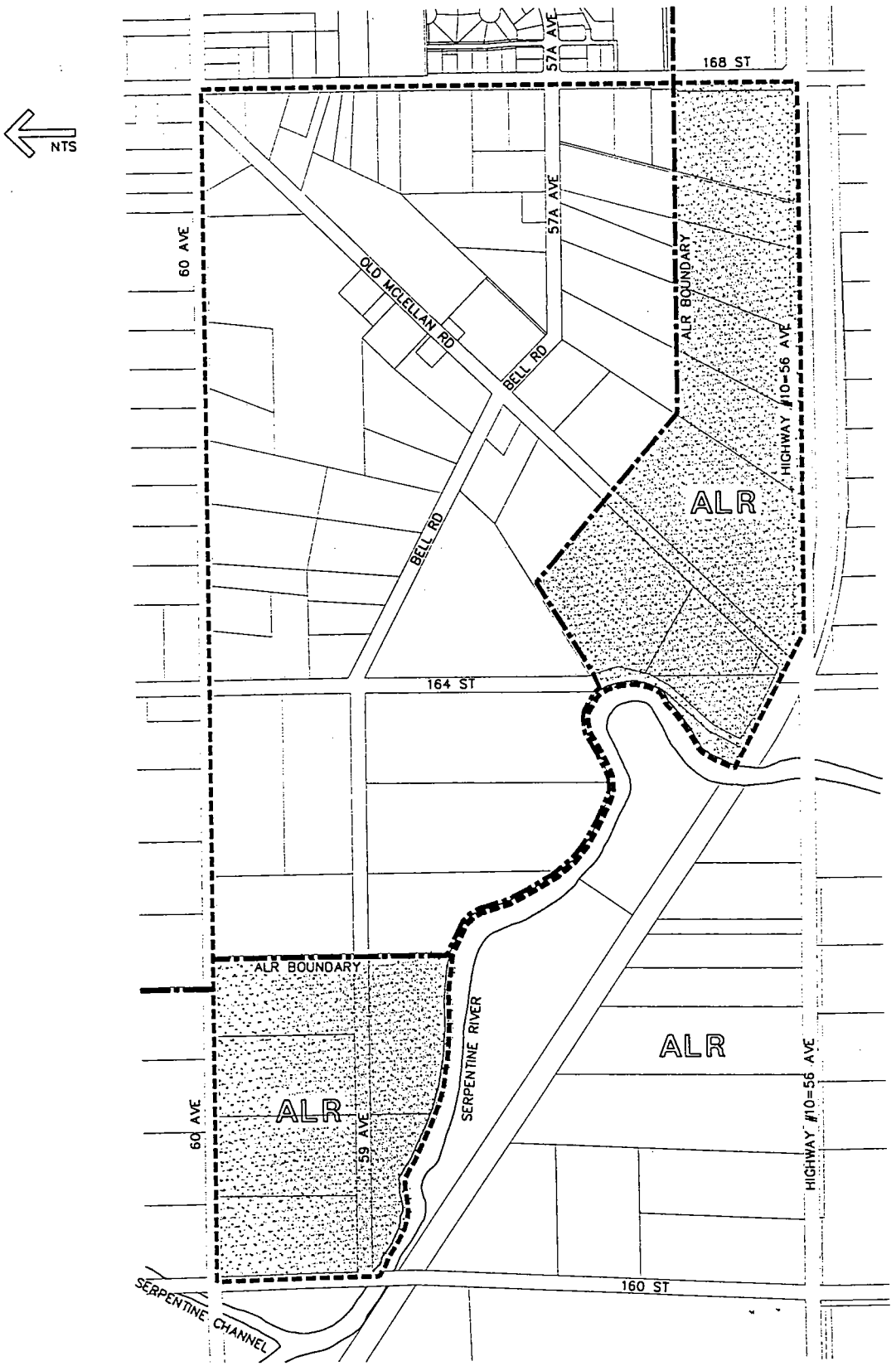

NTS
168 ST
57A AVE
60 AVE
OLD MCLELLAN RD
BELL RD
ALR BOUNDARY
HIGHWAY #10-56 AVE
ALR
164 ST
SERPENTINE RIVER
59 AVE
160 ST
SERPENTINE CHANNEL

FIGURE 4: ALR

WEST CLOVERDALE SOUTH NCP

LAND USE & SUBDIVISION CONCEPT
PROPOSED LAND USE PLAN

SURREY
CITY OF PARKS

Mixed Use Core: The *"5 Corners"* area, because of its historical significance to Surrey and its prominent location, is designated for special treatment. It is to focus local convenience commercial and higher density residential, at apartment densities, along the open space corridor of that part of Old McLellan Road that is to be closed. The commercial component should be a mixed use development with dominant commercial, implemented through a CD-Comprehensive Development Zone, to avoid the development of a typical strip mall. It is suggested in the LAP that the residential component should be used for seniors oriented housing with an institutional focus. This can be accommodated by the proposed zoning. The commercial component can accommodate various community services, such as day care. Development in this area should follow guidelines which have an architectural style reflecting the heritage character of the area and an orientation which maximizes the location adjacent to the *"5 Corners"* plaza area. The Planning Department has prepared a set of design principles to address the heritage aspects of this NCP area and for common issues for the area to the north. They are included in ***Appendix D***.

- ***Old McLellan Road Row Housing:*** This area, anchored by the mixed use core on the north and the churches on the south, is to be developed for row housing similar to that along 60 Avenue. This, as noted above, requires an alternative elementary school north of 60 Avenue. Part of the cemetery may be developed for row housing, but this is dependent upon completion of a management plan for the cemetery.

- ***Affordable Housing:*** There are potential sites for affordable housing. These sites would be those that may be large enough to accommodate a 30 or 40 unit family oriented project, located within 0.75 km of an elementary school/park site, within 0.5 km of a potential transit stop, and where the number of adjoining single detached lots are minimal. The site on the northeast corner of the cemetery, primarily because of City ownership, may be a suitable candidate for a small scale affordable housing site. Development in this area will require a social housing contribution by developers in accordance with City Council policy.

- ***Single Family Areas:*** Consistent with the LAP policy of a transition in density towards the south and west, there are two standard single family enclaves in the NCP area.

- ***Clustering:*** Areas south and west of 164 Street, Bell Road, and 57 A Avenue are intended to be developed as single family housing, generally on the basis of half acre density, but with the maintenance of substantial open space, usually 50%. If not dedicated to the City, the land could be held by one owner or owners in the cluster area, but with an easement and restrictive covenant to ensure rights of public passage for a walkway/bikeway and to prohibit construction on it. If these options are used, 5% land dedication, or cash in lieu, is required. This should contribute approximately 16 ha of open space. The major intent is to preserve the slopes and trees as an aesthetic and recreation resource, as wildlife habitat, and as a buffer for adjacent agricultural lands, and to maintain the "pristine rural character" of the community. Lands within the floodplain will not be developed. It should be noted that the boundary of developable land will be determined based on topographic survey and geotechnical testing which will define the detailed alignment of the sanitary sewer and pathway. Calculations for clustering will not incorporate any ALR lands in determining appropriate density levels. In some cases, it may not be possible to obtain the number of units suggested by the density calculations because of other site constraints.

  It should be noted that the layout shows a ***Figure 5: Land Use Concept*** in schematic and the actual development pattern will be determined through the application of the new RC Zone (which Council has approved in principle) and will be dependent on more site specific evaluations (such as tree assessments) undertaken at the time of development application.

  In some extenuating circumstances, the application of the RH(G) - ½ Acre Residential Gross Density or a Comprehensive Development (CD) Zone may be considered where the above stated intent of preserving slopes and trees as an aesthetic and recreational resource, as wildlife habitat, and as a buffer for adjacent agricultural lands and to maintain the *"pristine rural character"* of the community are achieved. All *"clustering"* development proposals shall address the following principles:

  i) There must be a substantial buffer adjacent to the Agricultural Land Reserve.

  ii) The buffer shall be at least 20 m wide.

  iii) All undevelopable land and the buffer must be retained as open space.

iv) Buildable area(s) and public passage will be identified and protected through the use of rights-of-way (for other than public lands) and restrictive covenants.

v) All subdivision designs will incorporate the priority of maximum preservation of trees.

vi) Geotechnical reports may be required for proposals which are located on or near slopes.

vii) All applications will demonstrate how development on adjacent properties is not precluded and how the proposal can achieve the stated intent. All proposals must be compatible with adjacent development in terms of frontage and density.

viii) No proposal can compromise the approved servicing and road plan contained in this NCP.

ix) In no case shall the density exceed that prescribed in the *Official Community Plan*; for the SUBURBAN designation, which is a maximum of 2 units per acre.

- ***Agricultural:*** Lands, generally in the Serpentine River floodplain including those along the Highway #10 corridor, currently within the ALR are designated for long term agricultural use. This area contains approximately 30 ha.

- ***Open Space/Recreation:*** The major open space areas on the slopes of the Serpentine Valley, and at other strategic locations, will be obtained primarily through the clustering mechanism. In addition, there is a small park located on 164 Street for a small active play area, consolidation with the closed section of Old McLellan Road (to be developed in a manner to acknowledge the historic settlement of Surrey Centre and to provide neighbourhood open space), as well as the walkway system that effectively links the area internally and externally to the adjacent areas (including the school site to the north). In addition, there are connections to the Serpentine Dyke pathway system. A small vehicle parking area, accessed from Old McLellan Road, should be provided for users of the open space and pathway. Because of the extensive community park space nearby (Cloverdale Athletic Park and on the Serpentine valley slopes), the small size of this neighbourhood, and the absence of a permanent school site, there are no major park spaces provided in this neighbourhood.

- ***Environmental:*** With respect to aquatic habitat, preliminary watercourse data being compiled by the City of Surrey suggests that, in addition to the Serpentine River immediately adjacent to the NCP area, there are watercourses located within

this NCP area that may be inhabited by salmonids (primarily during the overwintering period) or potentially inhabited (during the overwintering period) with access enhancement. These watercourses are located in the area south of Bell Road/57A Road both east and west of Old McLellan Road. The properties in question are shown in ***Figure 3: Topography***.

The exact location of these watercourses and the associated requirements for preservation/enhancement will be required to be addressed at the time of rezoning application. In particular, any development proposal for these sites must adequately conform to the *Land Development Guidelines for the Protection of Aquatic Habitat* (published by the Ministry of Environment, Lands and Parks and by the Fisheries and Oceans). These *Guidelines* address leave strips, erosion and sediment control and site development practices, stormwater management, in stream work, fish passage, culverts, implementation.

An environmental analysis may be required when development proposals are received on the affected sites. This analysis will address the presence, species and distribution of fish in the stream, potential habitat enhancement opportunities, conducting a bio-inventory and habitat enhancement assessment of the stream, identifying, among other requirements, the top of bank and related setbacks or *"leave strips"*, and approvals from relevant environmental agencies and the City of Surrey.

Where the presence of trees containing the permanent nests of eagles, ospreys and herons are identified in conjunction with a development application, the trees must be retained, whether or not the nest is occupied in any given year. The proponent may be required to engage the services of a qualified environmental consultant to determine if the trees containing raptor nests and heron colonies are present at the site proposed for development.

Tree preservation has been a significant factor in the preparation of the NCP. In addition to the use of unique zoning mechanisms (e.g. RC Zone), and special development standards, trees will generally be managed by Surrey's Tree Preservation, Removal and Replacement Bylaw. It is noted that a heritage Oak has been identified on the property line of 167 Street and 60 Avenue near the Church. This tree will be subject to protection under the above Bylaw.

The population and students generated by the proposed land uses are described in ***Table 1: Population*** and ***Table 2: Students.*** They are rounded and are estimates only.

Table 1: Population

Proposed Zone	Use	Units	People/Unit	Population
RF	Single Family	120	3.5	420
RHG	Cluster	10	3.5	35
RC (Half Acre)	Cluster	100	3.5	350
RC (One Acre)	Cluster	5	3.5	20
RM-10	Row Housing	50	2.8	140
RM-15	Row Housing	180	2.8	500
RM-30, 45	Apartments	20	2.0	40
RMS-1	Residential/Care	120	2.0	240
TOTALS		**605**		**1,745**

Table 2: Students

Proposed Zone	Units	Elementary Students	Secondary Students
RF	120	70	50
RHG	10	5	5
RC (Half Acre)	100	60	40
RC (One Acre)	5	5	5
CD(RM-10)	50	25	15
CD(RM-15)	180	90	60
CD(C-5)	20	5	0
CD(45)	120	-	-
TOTALS	**605**	**260**	**175**

4.0 TRANSPORTATION

One of the key components of the viability of the NCP area is the transportation system, both internally and in relation to the adjacent neighbourhoods. The transportation system for the area provides for automobiles, pedestrians, bicycles, and transit. Each of these modes, to varying degrees, uses the road network for mobility. Therefore, developing a safe and efficient road network is essential for all of the different modes of transportation. In addition, treatment of the roadways goes a long way in determining neighbourhood character and, as a result, is as important consideration in maintaining the existing rural and heritage character of the neighbourhood. A traffic impact analysis was completed to determine transportation requirements. A summary of its recommendations are included in ***Appendix C***.

4.1 ROADS

The West Cloverdale South NCP area is well served by both municipal and provincial roads. The area is bounded by 168 Street, designated an arterial road, on the east side; 60 Avenue on the north; and, Highway #10, a provincial highway, under the jurisdiction of the Ministry of Transportation and Highways (MoTH) to the south. Internal to the NCP area are two roads: Bell Road/57 A Avenue and Old McLellan Road. Proposed roadway classifications are shown on ***Figure 6: Roadways***.

- ***Bell Road/57 A Avenue:*** This should be a limited collector which, according to typical Surrey standards, has a 22.0 m RoW and 11.0 m of pavement. This classification is consistent with that recommended in the Traffic Impact Study prepared for the LAP area. It is also based on the intended function of the roadway to collect traffic from the local roads and carry it to the arterial grid network.

  The difficulty with compliance with the City's standard for collector roadways for Bell Road/57 A Avenue is that there are a number of significant trees located in close proximity to the centreline of the existing roadway. It is recommended that the RoW dedication be maintained at 22.0 m for this roadway, but that the actual pavement width be narrowed in order to preserve the trees and to preserve the existing rural character of the roadway. This may require a DVP at the subdivision

and rezoning stage when the tree survey and assessment is complete. This work is not part of the NCP *Terms of Reference*.

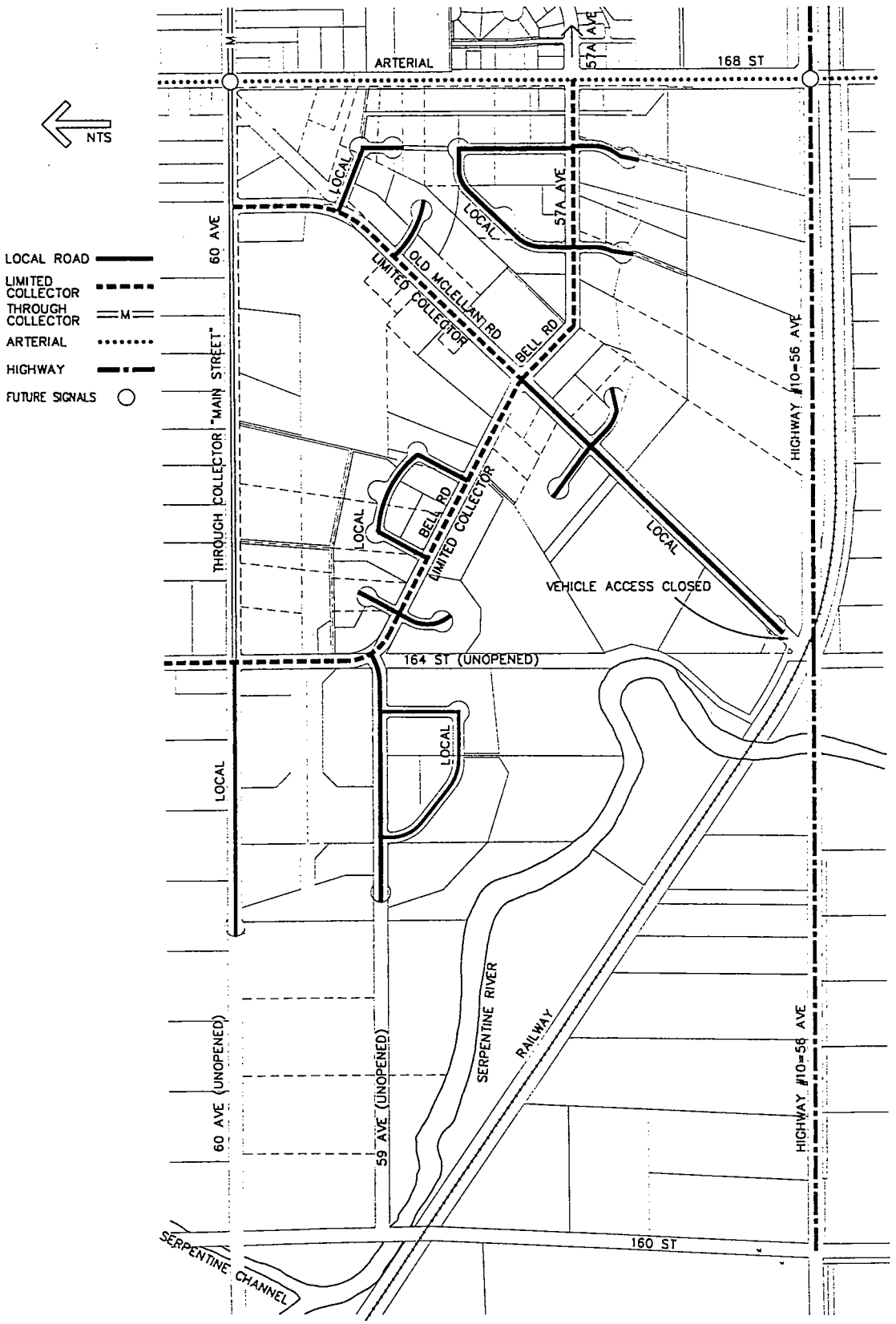


FIGURE 6: ROADWAYS

Old McLellan Road: Old McLellan Road is proposed to have a reduction in classification from major collector to limited collector and limited local south of Bell Road. In conjunction with reclassification, it is also recommended that Old McLellan Road be both closed at Highway #10 and realigned at 60 Avenue. The realignment at 60 Avenue is consistent with what is shown in the LAP; the LAP recommended realigning the road approximately 100 m east, where it will align with a proposed road to the north. Bicycle and pedestrian access will be maintained there.

The LAP proposes realigning the Old McLellan Road intersection with Highway #10 to the east. However, MoTH would prefer to close the access of Old McLellan Road to Highway #10 in keeping with their policy of limiting access to highways. In addition, the present access alignment is very poor in that it is less than 50 m from the Southern B.C. Railway line that crosses the Highway at a skewed angle. The confluence of the railway, the Highway and Old McLellan Road makes the intersection quite unsafe. While the safety issue could be improved somewhat with realignment, the land use and development pattern does not require another major collector. Adequate access will be maintained to agricultural parcels, primarily through lot consolidation, but also from the local road network off of Bell Road/57A Avenue in some instances. The amount of traffic there is expected to be minimal.

With 168 Street nearby to provide access to the Highway, it is recommended Old McLellan Road be closed to through vehicular traffic near the Highway. This closure will also prevent traffic from "short-cutting" through the neighbourhood and will help to preserve the rural character of the north end of Old McLellan Road. The north half of Old McLellan Road, from Bell Road to 60 Avenue is designated as a limited collector and the south half as a limited local. A DVP will also be required to ensure the RoW width, curbs, and sidewalks, take Christ Church, the cemetery, trees, and the existing street ambiance into consideration. This will be determined at the subdivision stage when tree locations are surveyed and tree preservation areas are identified. This will allow a site specific response should Surrey not have a suitable roadway standard at that time.

A small vehicle parking area, accessed off Old McLellan Road, should be provided for users of the pathways and open space along the Serpentine River.

- ***60 Avenue:*** Between 164 and 168 Streets, 60 Avenue is currently classified by the LAP as a collector. It is proposed that 60 Avenue west of 168 Street be classified as a through collector (22 m with a 12.2 m pavement, standard right-of-way based on one lane in each direction, left turn lanes, and on-street parking). The intent is to have 60 Avenue function as a local *"main street"*. Combined with plantings, the streetscape of reduced setbacks, the use of paving stones at crosswalks, narrowing of pavement at intersections, four way stops, and on street parking will provide a pedestrian and bicycle friendly environment while still allowing adequate, albeit calmed, vehicular capacity. The conceptual design for a *"roundabout"* in the LAP at the intersection with 164 Street is included in ***Appendix C***. Both this NCP, and the NCP to the north, are based on the same road cross-section.

- ***168 Street:*** This is classified as an arterial road with an ultimate RoW of 27.0 m with 4 through travel lanes and left turn bays. The final design should provide bicycle lanes to promote bicycle use. Left turn bays will be provided on 168 Street at the intersection with 57A Avenue and 60 Avenue when 168 Street is constructed to its ultimate cross section. Signals are to be installed at 168 Street intersections with Highway #10 and at 60 Avenue. As it is an arterial, direct access from abutting properties is not permitted, therefore, a rear lane is proposed.

  It is recognized that 168 Street between 57 A Avenue and 59 Avenue have sightline and grade problems that need to be addressed at the detailed design stage. In order to rectify these problems, significant earthworks (both cuts and fills) and retaining walls, will be required. Lot grading plans for adjacent lots shall be designed to minimize retaining wall requirements.

- ***Other Roads:*** There are a number of cul-de-sacs, crescents and one P-loop. Each of these roads in this NCP is to be classified as a limited local road with a 16.5 m RoW and 8.0 m of pavement because they only provide access to low density residential.

  The P-Loop at 59 Avenue exceeds the maximum allowed under the Bylaw, so a DVP will be required. The Bylaw calls for P-loops to be not more than 400 m long and the proposed P-loop is approximately 650 m. The cul-de-sac at the west end of 60 Avenue will exceed the maximum length set out in the Bylaw (220 m) by approximately 130 m. It is also proposed for a DVP. This, like the P-loop, is dictated by a combination of the existing subdivision layout and topographic

constraints. However, safety features such as sprinklers may be necessary to reduce risk.

4.2 PEDESTRIANS

The pedestrian is a very important consideration in the design of the subdivision given the topography, opportunities for views, the Serpentine River, and the need to access both existing and future schools, parks, transit routes, and commercial areas. The walkways were laid out to maximize the view potential and minimize the grades on the walkways. The walkways were laid out with the intent of providing a *"linear park"* system and to ensure connectivity to adjacent neighbourhoods. The cemetery will be an important link in the walkway system. The system of pathways and sidewalks is shown conceptually on ***Figure 7: Pedestrian Circulation.*** Pathways are intended to accommodate bicycles as well. All off-street routes are considered recreational routes. Section 8.0 of ***Appendix B*** identifies contributions for seating and bicycle racks at strategic locations.

Sidewalks will be constructed on the collector and arterial roads only. On 168 Street and on 60 Avenue, sidewalks will be constructed on both sides. Sidewalks are proposed for both sides of 60 Avenue in keeping with the proposed *"main street"* urban streetscape. The limited collectors (Bell Road and Old McLellan Road) will have sidewalks on only one side of the road, in accordance with City of Surrey standards. No sidewalks are proposed for many of the minor roads because of low demand and a desire to maintain their more rural character. The toe-of-slope route should generally follow the proposed sewer alignment.

4.3 BICYCLES

Bicycles, as a part of the transportation system for the area will be accommodated by bicycle lanes on the arterial and wide travel lanes on the collector road network. 168 Street has been identified in the City of Surrey's *Bicycle Blueprint* as being a Stage 2 component of the network. As well, the bicycle route on 60 Avenue east of 168 Street will connect to the routes in this NCP. Signals at the intersection of 168 Street with 60 Avenue and the Highway will facilitate safe bicycle and pedestrian crossings. For safety reasons, a designated bicycle crossing of Highway #10 at 164 Street has been rejected as there will not be signals there. However, there will be

bicycle access from Old McLellan Road to Highway #10. This could be combined with an emergency vehicle access at this location.

In addition, in the *Bicycle Blueprint,* it is suggested that the City consider that the shoulder of 168 Street be paved to accommodate bicycles since constructing 168 Street to the ultimate arterial cross section is not in the *10 Year Servicing Plan.* The Traffic Impact Study recommends the construction of the ultimate cross section by the year 2004, which will include provision for bicycles. ***Figure 7: Pedestrian Circulation*** shows that 60 Avenue and 168 Street are designated bicycle routes. Given low traffic volumes on other routes, they will all accommodate bicycles. Commuter routes should be constructed to the *Bicycle Blueprint* standards (4.0 m. asphalt on a 5.0 m. RoW). Recreational routes can be to a 3.0 m surface width and will be constructed by developers at the subdivision development stage.

End of trip locations are indicated for bicycle racks at, for example, *"5 Corners"* and at a viewpoint at the unopened 164 Street. These will require the installation of bicycle racks through amenity contributions identified in Section 8.0 of ***Appendix B***.

4.4 TRANSIT

As shown on ***Figure 8: Transit***, transit can be provided by 60 Avenue through the collector roadway (A) or via the 164 Street/Bell Road limited collector roadway (B) The 60 Avenue route has the advantage of providing high quality access to the more urban forms of the multi-family housing there. A substantial portion of the remainder of the development area also falls within a 450 m walking distance of the bus route.

The 164 Street/Bell Road alignment offers better transit penetration of the neighbourhood making all of the bus stops accessible within the 450 m walking distance. The disadvantage of this routing is that the higher density urban forms are not provided with the same level of service as would be offered in the 60 Avenue routing.

While this NCP favours alternative A to support the pedestrian emphasis of "*main Street"*, the final routing will only be developed in conjunction with B.C. Transit (who favor Alternative A) as the neighbourhood, and the surrounding ones, develop. Suggested bus stop locations are shown.

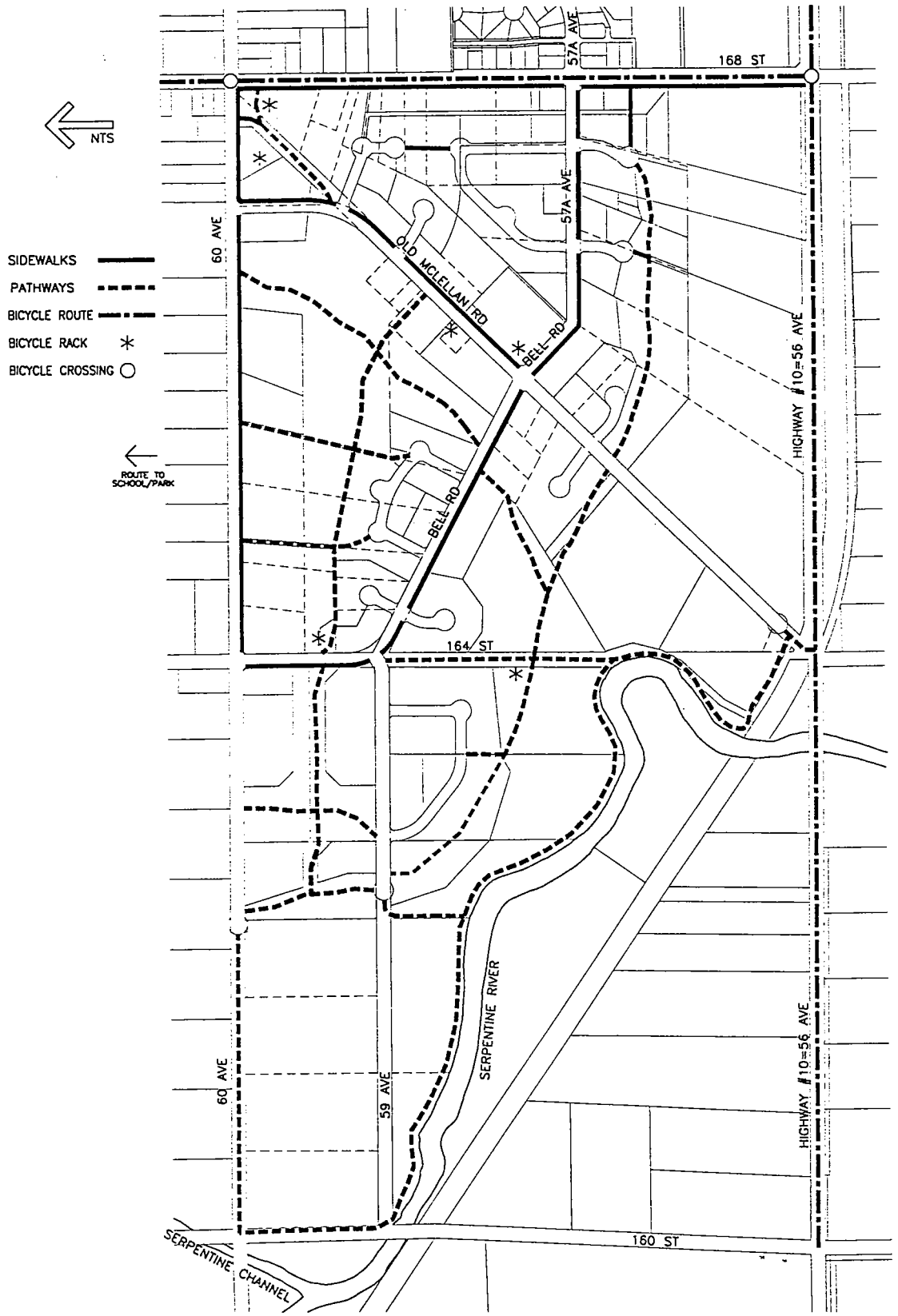


FIGURE 7: PEDESTRIAN CIRCULATION

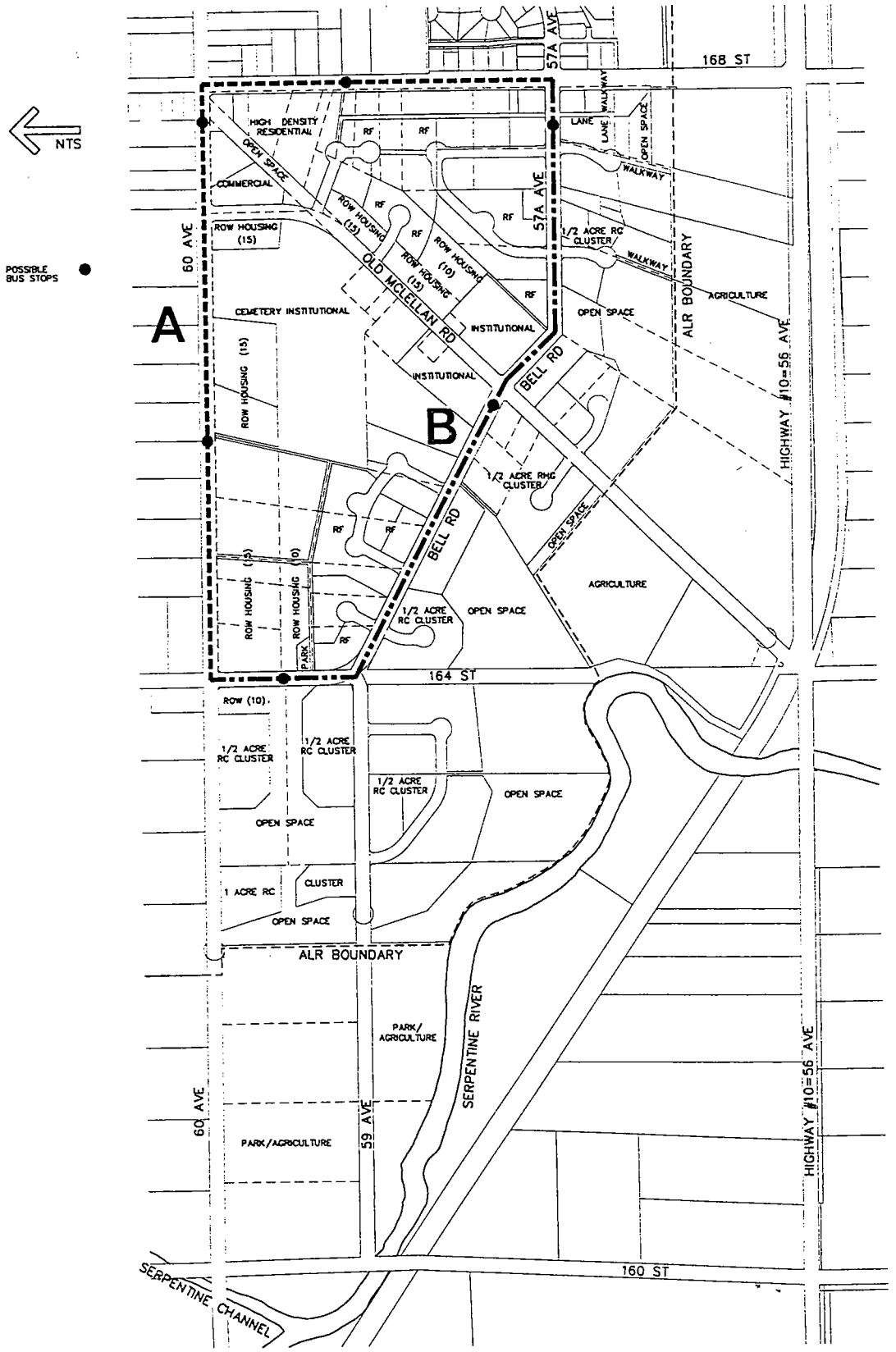


FIGURE 8: TRANSIT

5.0 SERVICING

5.1 WATER

The West Cloverdale South NCP area is serviced by a 500 mm ∅ high pressure feedermain on 176 Street. This feedermain is fed by the GVRD's Whalley Clayton main on the Fraser Highway. Water is put into the distribution network through a pressure reducing station (PRV) located at the 176 Street and 68 Avenue intersection. At the project initiation stage, discussions were held with the City of Surrey regarding anticipated watermain grid concepts for the NCP area. Additional reviews and computer modelling would be required to substantiate watermain grid sizing to provide for the anticipated land use. This will ensure adequate water supply and fire protection to the central, higher density zones located in the upper reaches of the NCP area.

A waterworks computer model was set up using City of Surrey water demand and fire flow design criteria. The overall grid system modelled included allowances for a significant watermain grid extensions through adjacent areas (i.e., West Cloverdale North NCP). The details of watermain demand and fire flow design criteria can be found in ***Appendix B*** **(1.0 Watermain)** of this report.

- ***Water Supply Options (Off-Site)***

Two options for off-site water supply were considered. This analysis was based on a single source node (PRV station) and demands from existing developments and NCP areas north and south of 60 Avenue.

Option 1) Option 1 considered the installation of off-site grid watermains. These grids are generally located east of the NCP development area and are as follows;

1) 168 Str. - 805 ± m - 350 mm ∅ watermain from 64 to 60 Avenue (parallel existing 200 mm ∅ watermain)

2) 168 Str. - 480 ± m - 350 mm ∅ watermain from 60 Avenue to ± 400 m south (parallel existing 200 mm ∅ watermain)

3) 172 Str. - 390 ± m - 300 mm ∅ watermain located south of 64 Avenue and north of 60 Avenue (parallel existing 200 mm ∅ watermain)

4) 60 Ave. - ± 810 m- 350 mm ∅ watermain from 168 to 172 Street (parallel existing 200 mm ∅ watermain)

5) 60 Ave - ± 810 m - 350 mm ∅ watermain from 172 to 176 Street (parallel existing 200 mm ∅ watermain)

Items 1 to 4 are in the June, *1993 10 Year Servicing Plan* for the area. Item 5 is not in this plan, but represents a logical grid main extensions to ensure adequate domestic and fire protection for the area. Exclusion from the *1993 10 Year Servicing Plan* has been regarded as a possible misprint regarding project limits. In addition to the above, a future 350 mm ∅ grid watermains was proposed along 68 Avenue (168 to 176 Street). Although itemized in the *10 Year Servicing* Plan, construction of a watermain at this location is not anticipated or warranted in the near future as it extends through largely undeveloped and low lying agricultural lands.

The estimated construction cost of Option 1 is $1,515,000. This excludes any future 300 mm ∅ watermain extensions west of 168 Street. Detailed cost estimates for each section of watermain can be found in ***Appendix B*** of this report.

Option 2) Option 2 is similar to Option 1, except works identified under Items 4 and 5, as listed in Option 1 above, are excluded. Items 4 and 5 represent 350 mm ∅ grid watermain along 60 Avenue (from 168 to 176 Street). Alternate grid watermains considered to be installed for Option 2 are as follows;

6) 168 Str. - 430 ± m of 300 mm ∅ watermain from 64 to 66 Avenue (recently constructed as part of Northview Golf Course)

7) 66 Ave. - 810 ± m of 300 mm ∅ watermain from 168 to 172 Street (new watermain)

8) 65A Ave. - 910 ± m of 300 mm ∅ watermain from 172 to 176 Street (new watermain)

Items 7 and 8 are not specifically in the City of Surrey's *1993 10 Year Servicing Plan* for the area. However, as previously noted, a watermain along 68 Avenue (168 - 176 Street) is in the *10 Year Servicing Plan*. We feel that the 66 and 65A Avenue would present a more logical alignment based on development patterns known to date for the area. As previously noted, a watermain along 66th and 65A Avenue would extend through largely lands and is not required at this time.

The estimated construction cost of Option 2 is $1,665,000. Please note, this cost also excludes any 300 mm ∅ watermain extensions west of 168 Street.

It should be noted that both options put a heavy load on existing 500 mm ∅ watermain along 176 Street as it is the primary water supply source for the area. The estimated pipe velocities, under ultimate development are marginally under the 2.0 m/sec maximum allowable velocity. Although this may be viewed as borderline or high, the completion of future grid watermains and secondary supply from other watermain grids will add additional reliability and reduce velocities in the 500 mm ∅ main to more acceptable levels.

Two specific areas of improvements to the existing water system planned by the City of Surrey warrant clarification.

- PRV Station Abandonment/Relocation

  Two PRV stations are to be abandoned; 64 Avenue/168 Street and 64 Avenue/176 Street (see "Intersection Water Details" sheets 065-01 and 066-01 in Appendix B). These PRV stations are to be replaced by a single PRV station at 68 Avenue/176 Street. Our analysis was based on the new PRV station at 68th Avenue and 176th Street.

- Tie-in to existing 300 ∅ main at 64 Avenue/172 Street

  This main was formerly a high pressure main (prior to above noted works) feeding the PRV station at 64 Avenue/168 Street and was not tied in to the 300 ∅ grid main at 172nd Street. We recommend completing this tie-in in addition to the existing 200 ∅ connection at this intersection. (See "Intersection Water Detail" sheet 066-02 in Appendix B).

The watermain network models in this report have all been created assuming both works are already in place.

In summary, the main components of the recommended off-site water improvements to serve the NCP area are as described in Option 1. Option 1 is estimated to be approximately $150,000 less expensive than Option 2 and represents a logical

watermain grid extension. This watermain grid extension is central to the NCP developments north and south of 60 Avenue and has the advantage of significantly improving the level of domestic peak hour service and fire protection for existing areas adjacent to 168 Street and 60 Avenue.

- *NCP Watermains*

Critical fire nodes were selected in the NCP area. The intersection of 164 Street and 60 Avenue (fire demand of 200 l/sec for institutional/residential is also the localized high spot for the area with an elevation of 40 ± m. Hydraulic analysis has indicated that larger diameter grid watermains (300 mm diameter) are required along 60 Avenue, 164 Street, Bell Road, and 57 A Avenue. An existing 200 mm watermain is already in place and extends along 168 Street from 57 A Avenue north to 60 Avenue. This watermain is to be paralleled with a 350 mm ∅ watermain sized for future developments and grid watermain extensions to the south. Short sections of 150 mm diameter watermain also exist along 60 Avenue, 57 A Avenue, Old McLellan Road, and 164 Street. These watermains will have to be replaced with 200 mm ∅ local watermains to meet current City of Surrey design criteria. Preliminary pipe sizes and locations illustrated in ***Figure 9: Water***, are based on a total development scenario, with an established watermain grid in place. In absence of the overall watermain grid, pipe sizing may vary. Additional review will be required for each phase of development to ensure that an adequate domestic water supply and fire protection is available.

Although fire flows are based upon the City of Surrey's Design Criteria Manual, individual applicants for multi-family sites may find that the City of Surrey's Building Division and Fire Department requirements for on-site fire protection exceed the capacity of the proposed watermain. Prior to submission for Building Permit, the applicant must confirm the on-site fire flow requirements. This is a function of site specific building layout, materials, and construction. In cases where the grid system cannot provide sufficient flow volumes to conform to *the "Fire Underwriters Survey Guide to Recommended Practice"*, the applicant shall demonstrate through alternative construction techniques, materials, or secondary on-site fire suppression systems (i.e. building sprinklers) that the proposed development can be made to conform to these guidelines.

- ***Ten Year Servicing Plan***

A total of 8 projects adjacent to the West Cloverdale South NCP area have been identified in the City of Surrey's June 1993 10 Year Servicing Plan. Section 7.0, Infrastructure Financing and Funding provides an update to the 10 Year Servicing Plan complete with development thresholds and projected DCC Revenues and Expenditures for the NCP south of 60th Avenue and the combined NCP areas. Section 1.4 of Appendix B contains the detail Waterworks Network Analysis computer runs that were completed for this project.

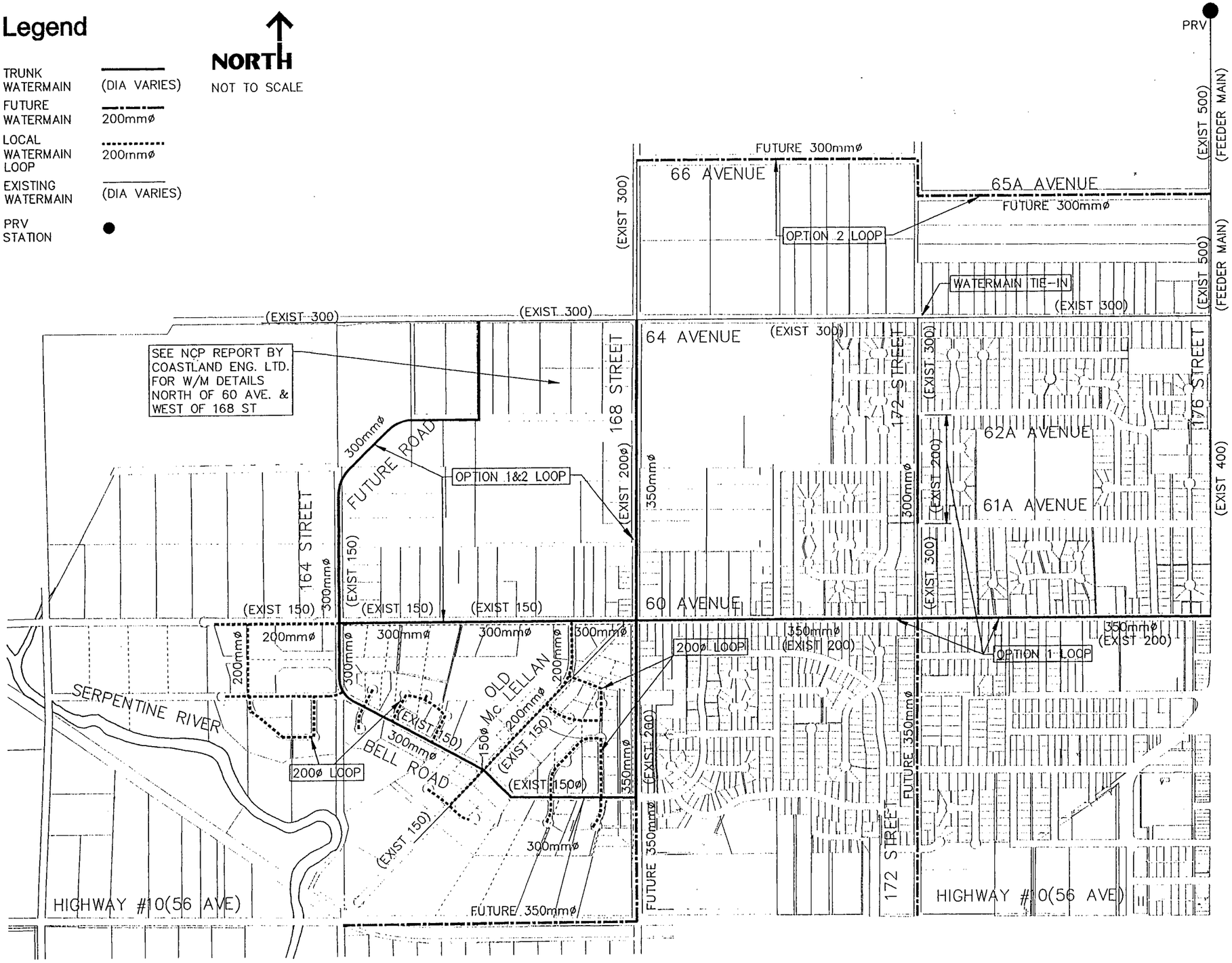


FIGURE 9: WATER

5.2 STORM DRAINAGE

The West Cloverdale South NCP area drains in three directions. The major catchment areas were defined from 1 m contour information obtained from the City of Surrey and are detailed in ***Figure 10A: Storm Drainage, Option 1*** and ***Figure 10B: Storm Drainage, Option 2.***.

5.2.1 Option 1

Catchment Area A (51 ± ha), is the largest of the three areas. The majority of the area currently sheet flows down 10-15% wooded slopes onto the Serpentine River floodplain. Smaller ditches along 60 and 59 Avenue direct flows to flood boxes and into the Serpentine River. The remainder of the area drains to the north ditch of Bell Road, and then southward along Old McLellan Road to the Highway #10 drainage ditch and eventually into the Serpentine River via a flood box.

Catchment Area B drains to the northeast down 1-6% grassed and partially treed slopes to 60 Avenue and through the West Cloverdale North NCP area. This area is the smallest of the three catchment areas (14 ± ha).

Catchment Area C is the triangular parcel located east of Old McLellan Road, west of 168 Street and north of Highway #10. This area includes 29 ± ha and drains to an recently upgraded storm water pump station south of Highway #10. The area west of 168 Street drains down 6-15% grassed and partially treed slopes and is collected by the Bell Road/57A Avenue drainage ditch. The area south of Bell Road/57A Avenue sheet flows overland to the lower floodplains area located north of Highway #10.

Existing storm sewers in the area consist of a short length of 300 mm ∅ sewer located adjacent to the *"5 Corners"* intersection. This sewer drains north along 168 Street to 60 Avenue. An existing 450 to 675 mm sewer drains south along 168 Street to a point approximately 160 m south of 57A Avenue. This storm sewer also collects drainage from outside the NCP area (i.e: east of 168 Street).

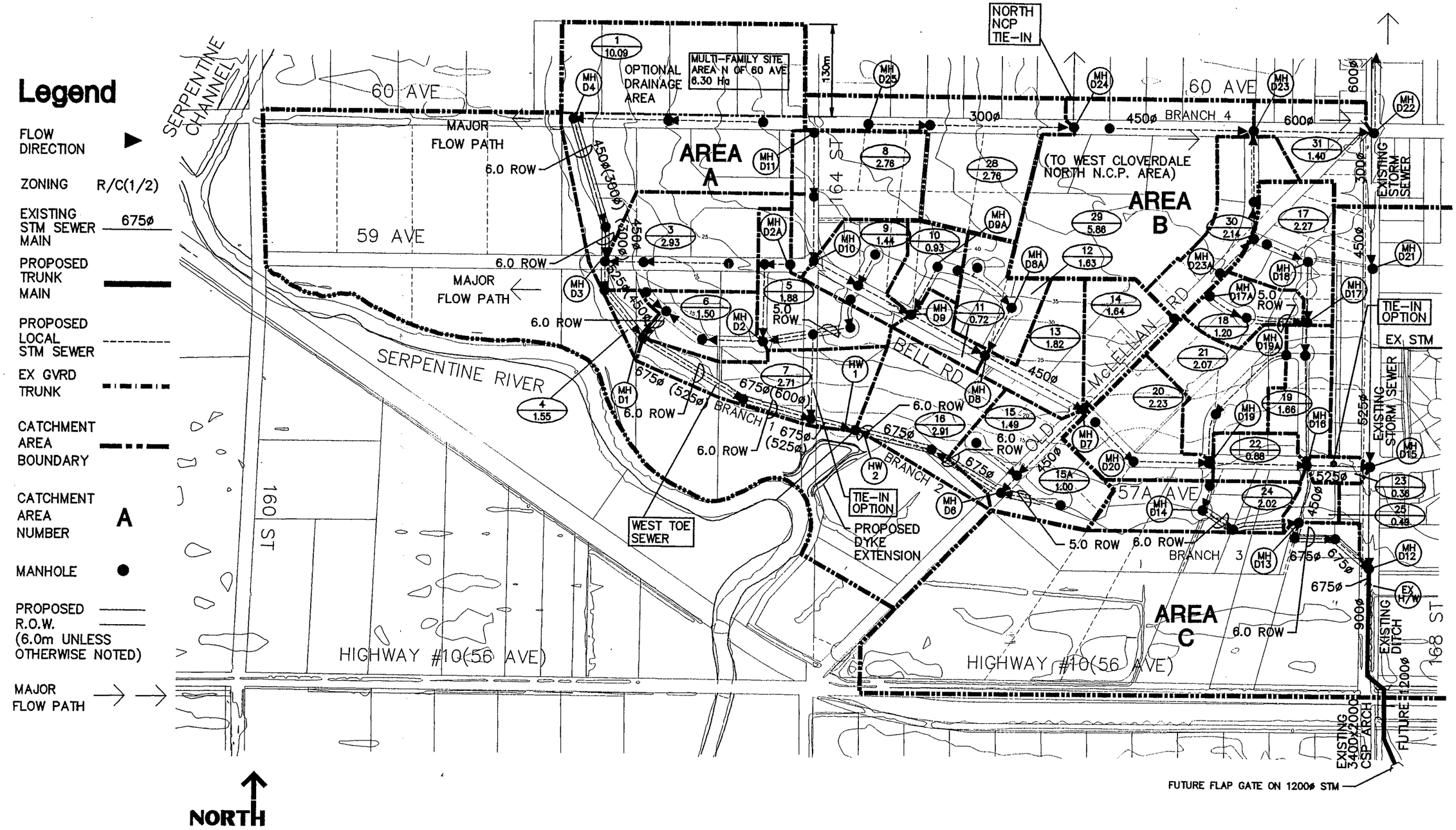


FIGURE 10A: STORM DRAINAGE OPTION 1

The Rational Method was used in the preliminary storm sewer sizing and is based on City of Surrey Design Criteria for the 1:5 year storm event. Provisions were also made to define the 1:100 year major flow paths for the NCP area. **Appendix B,** 2.0 - Storm Drainage provides additional details on design storm criteria, system modelling, cost estimates, design calculation sheets and reference drawings and details.

- ***Area A - Proposed Drainage***

Approximately 29 ± ha or 57% of Area A is anticipated to be redeveloped. Of this, 6.0 ± ha is located north of 60 Avenue. This area has been identified as an optional drainage parcel that could be included within the overall catchment boundary for the west toe trunk sewer. The NCP report for the lands north of 60 Avenue currently defines this area as draining northward and then west to a stormwater pump station. The remaining 22 ± ha are ALR lands with no anticipated change in land use. Future land uses in areas to be redeveloped include half acre RC cluster, standard single-family development and open space. Denser townhouse units are anticipated for the development area north of 60 Avenue.

Figure 10A: Storm Drainage, Option 1 details the proposed storm collection system for Area A. Local drainage would be collected in small diameter storm sewers and directed to toe of slope cut-off mains. Two separate storm sewer branches have been identified in Area A.

Branch 1 extends from 60 Avenue southeast paralleling the toe of the slope to the 164 Street RoW. Pipe diameters range from 450 to 675 mm with projected 5 and 100 year flows 0.62 and 1.17 m^3/sec respectively. The smaller pipe size indicated in brackets on ***Figure 10A: Storm Drainage, Option 1*** for the west toe trunk sewer makes no provision for the 6.0 ± ha optional drainage area north of 60 Avenue.

Branch 2 collects drainage from the Bell and Old McLellan Road area and directs it northeast to the 164 Street RoW. Pipe diameters range from 450 to 675 mm. Projected 5 and 100 year flows are estimated to be 0.48 and 0.91 m^3/sec respectively.

A dyke tie-in at the Serpentine River has been proposed adjacent to the 164 Street RoW. This will enable unrestricted post-development flows to enter directly into the Serpentine River. The Serpentine River dyke system would have to be modified to extend northward to the steeper sloped areas. During peak flow times, the water level

in this area would fluctuate in accordance with the Serpentine River levels. No flow restrictions have been proposed on the Branch 1 and 2 systems. It is envisioned that the dyke tie-in can incorporate features to attenuate a range of low flows, provide a water quality feature, and assist in siltation control during development (requires approval from the City Engineering Department). Major system flows would still be routed overland via roadways and storm sewer RoW's to the lowland areas. See ***Appendix B*** for additional details on the proposed Serpentine River dyke tie-in.

The construction of a stormwater detention pond facility at the location of the proposed dyke tie-in was not considered a viable alternative. Although it would be effective in reducing peak post-development flows down to a pre-development level, the overall benefits of a facility immediately adjacent to a larger water course such as the Serpentine River would be minimal. It is conceivable that a detention pond facility at this location would also require the construction of a storm water pump station to accommodate periods of high flow in the Serpentine River. It should be noted that during the construction stage, the NCP proponents will be responsible for all costs to effectively monitor stormwater flow and erosion impacts that may result between the pre-development stage to the fully developed condition. The proposed dyke tie-in area may present a feasible location. This will have to be confirmed with the City of Surrey Engineering Department at the detail design & construction stage.

It is our understanding, through discussions with representatives from the City of Surrey, that a dyke tie-in to the Serpentine River is the preferred stormwater management concept for this NCP area. No discussions have been held by Stanley Associates with approving agencies to date. It is our understanding that liaison with the dyking authority and Ministry of Environment will be completed by the City of Surrey to ensure acceptance.

The estimated cost of the dyke tie-in is $245,000. This estimate includes land acquisition of $0.35 \pm$ ha, which may be required to facilitate the previously noted stormwater management feature.

Branches 1 and 2 service parcels of land less than 20 ha in size and as such are not eligible for consideration for a DCC rebate or as classification as a stormwater trunk sewer.

- ***Area B - Proposed Drainage***

The future land use of Area B retains the majority of existing cemetery area. Pockets of future commercial and multi-family developments are also proposed. Approximately 36% (5 ± ha) of Area B will remain unchanged.

Proposed drainage for the area includes small diameter storm sewers along 60 Avenue and Old McLellan Road. Two drainage options were initially considered for Area B. Option 1 considered splitting drainage from Area B at the future 166 Street RoW. It is proposed that the area west of 166 Street and south of 60 Avenue will convey flows at the proposed 166 Street RoW and into the NCP area to the north. The remaining area (east of 166 Street and south of 60 Avenue) will drain east along 60 Avenue and south along 168 Street. In Option 2, the total flows were to be routed east along 60 Avenue and north along 168 Street. Option 1 has been confirmed as the preferred alternative with the NCP study north of 60 Avenue. Larger diameter stormsewers (450 mm - 600 mm Ø) have been proposed along 60 Avenue (166 to 168 Street). This stormsewer is sized to incorporate the 100 year flows in order to direct them to 168 Street. Pipe oversizing for the 100 year flow was considered more desirable than having a RoW for the 100 year overland flow path in the area. This RoW would have had to extend through a proposed multi-family area located north of 60 Avenue.

In addition, drainage from Area B, south of 60 Avenue requires the construction of significant downstream works north of 60 Avenue. The details of downstream works can be found in the *West Cloverdale North NCP Report* completed by Coastland Engineering and Surveying Ltd.

- ***Area C - Proposed Drainage***

The proposed land uses for Area C includes single family, half acre RC cluster and some denser multi-family unit developments. This entails 13 ± ha of lands or 46% of the total Area C. The remaining 16 ± ha of land are to remain as ALR. Proposed drainage for Area C includes small diameter local storm collection system sewers that are routed through the proposed cul-du-sac located south of 57A Avenue and to an existing 675 mm storm sewer along 168 Street. The area south of 57A Avenue drains south to the floodplain.

Two storm sewer tie-in options exist for the area adjacent to 57A Avenue and 168 Street. Currently, 57A Avenue dips down about 2 m to 3 m in elevation west of 168 Street. As such, it would appear necessary to route a storm sewer south, midway between 168 Street and Old McClellan Road, and through a RoW to the existing stormsewer on 168 Street. Alternately, a storm sewer tie-in at 57A Avenue and 168 Street may be accomplished by raising the 57A Avenue road grades and twinning the existing storm sewer along 168 Street to a point where it can tie into the existing 525 mm ∅ stormsewer. Both options are feasible and are development phasing dependent. Specific storm sewer routing details should be confirmed at the detail design stage.

Major system overflows would be routed overland via the roadways and along the storm sewer RoW's to the 168 Street ditch. Assuming that all flows would be routed south of 57A Avenue through a RoW to 168 Street, the 5 year and 100 year flows from Area C would be limited to one common route.

The Branch 3 storm sewer drains 12.2 ± ha and is not classified as a trunk sewer.

A 900 mm dia. storm sewer is proposed to be extended from the existing headwall located south of MHD12 to an existing 3400 x 2000 CMP arch culvert at 56th Avenue. This storm sewer is proposed to operate as a surcharged sewer to overcome the hydraulic grade line restrictions that will result during peak water levels in the 168th Street canal system. This 900 mm ∅ storm sewer extension is estimated to cost $151,705 (see **Table B2.3 in Appendix B**) and is to be completed in conjunction with arterial roadworks along 168th Street. The 900 mm diameter storm sewer is estimated to drain ± 31.8 ha of land east and west of 168th Street.

- ***Drainage South of 56 Avenue (Highway #10)***

Initial discussions with the City of Surrey regarding stormwater management catchment areas, dated back to project initiation and follow-up review meetings, and referred to a March 31, 1994 drainage study completed by Dayton & Knight Ltd. This report, entitled *"Advance Design Project D2102, Southwest Cloverdale Drainage Stage 1 - Concept Studies"* was passed on to Stanley Associates and was to be used as a base reference to confirm the drainage areas relative to 168 Street and future works south of 56 Avenue. This report was reviewed and comments were incorporated into the June 21, 1996 Stage 2, NCP report. Subsequent to this, Stanley was informed that

the details of this report are no longer valid and have been superseded by a series of pre-design report updates completed by Associated Engineering in conjunction with their stormwater pumpstation and canal design for the area. Updated stormwater concepts, pre-design reports, and preliminary construction drawings have been received. A summary of the more significant stormwater management concepts proposed for the area are as follows:

1. Construction of a new stormwater pump station for the area (south of Highway #10 and east of 168 Street).

2. Construction of a new dyked canal system located south of Highway #10 and the B.C. Southern Railway line from 168 Street to 300 ± m east of 172 Street (elevation of canal invert = - 2.00 m).

3. Construction of a new dyked canal system located east of 168 Street from Highway #10 south to 50 Avenue (elevation of canal invert = - 2.00 m)

4. Construction on a 15 ± m of twin 1800 mm ∅ CSP beneath B.C. Rail (located 300 ± m south of Highway #10).

5. Construction of 83 ± m of 1200 mm ∅ CSP extending from the northeast ditch of 168 Street and Highway #10 south to a new canal located south of the B.C. Railway line. The proposed 1200 mm ∅ CSP is to be placed within an existing 3400 x 2000 mm arch culvert (span x rise) which currently extends beneath Highway #10 and the railway line. Provisions have also been made for extension of a 300 mm ∅ waterline through the existing CSP arch culvert to avoid open cutting of Highway #10 in the future. The remaining void in the existing arch CSP is to incorporate a hydraulic sandfill. A flap gate is also to be constructed at the end of the proposed 1200 mm ∅ culvert at the canal outlet. Preliminary details of these works are included in ***Appendix B, 2.0 Storm Drainage*** of this report.

5.2.2 Option 2

At the request of the City of Surrey Engineering Department, Stanley Associates has investigated the feasibility of reducing the drainage area to 168 Street (Area C) and thus maximizing drainage areas proposed to the Serpentine River Dyke tie-in (Area C) as shown on ***Figure 10B: Storm Drainage, Option 2***.

The following Table summarizes projected flows for Options 1 and 2 for Areas A and C. Option 2 increases Area A drainage from 16.34 ± ha to 24.01 ha. Branch 3, in Area C is reduced from 13.18 ± ha to 5.41 ha. Thus, the Branch 2 stormsewer now becomes eligible for a DCC rebate, as it services land in excess of 20 ha. The estimated construction cost of the Branch 2 stormsewer is $153,000. Please refer to ***Appendix B, 2.2 Cost Estimates*** for a detailed cost estimate breakdown.

ITEM/DESCRIPTION	OPTION 1			OPTION 2		
Catchment Area	Area (Ha)	Q_5 m^3/sec	Q_{100} m^3/sec	Area (Ha)	Q_5 m^3/sec	Q_{100} m^3/sec
• Area A (Branch 2)	16.34	0.478 (675 ∅)	0.908	24.01	0.762 (750 ∅)	1.431
• Area C (Branch 3)	13.18	0.503 (675 ∅)	0.967	5.41	0.199 (450 ∅)	0.383
• Area C (Branch 5)	--	--	--	8.77	0.328 (450 ∅)	0.626

Predevelopment flow for Area C, Option 1 = $Q_5 = 0.215\ m^3/sec$

$Q_{100} = 0.403\ m^3/sec$

The recommended stormsewer routing is Option 2. This option has a key advantage in reducing post development flows for Area C to predevelopment levels (ie: Q_5 (pre) = 0.215 m^3/sec, Q_5 (post) = 0.199 m^3/sec). The main disadvantage is that drainage north of 57A Avenue is to be rerouted to the proposed Branch 2 stormsewer and the Serpentine River Dyke tie-in. As such, construction of the Serpentine River Dyke tie-in and the Branch 2 stormsewer will be required at a much earlier stage. This routing option will alleviate any concerns regarding capacity in the recently constructed stormwater pump station along 168 Street. In summary, the development of the West Cloverdale South NCP Area (Area C) will not result in any increase of stormwater flows to the 168 Street ditch and downstream pumpstation with stormsewer routing Option 2.

5.2.3 Development Impact and Best Management Practices (BMP)

The proposed stormwater collection system for Areas A, B, and C should alleviate some of the current flooding that is due to the sheet flow drainage from the highland areas onto the floodplain. The proposed collection system has established key

discharge points and makes provision for the 100 year flow path. This will minimize areas of uncontrolled stormwater discharge.

Utility RoW's are needed to insure future maintenance access to storm sewers. Approximate locations and widths have been identified on ***Figure 10 A & B: Storm Drainage, Option 1 and 2***. Specific RoW widths will vary with location and depend on depth of sewer, adjacent utilities, or pedestrian corridor features. This should be confirmed at the more detailed design stage for the specific utility.

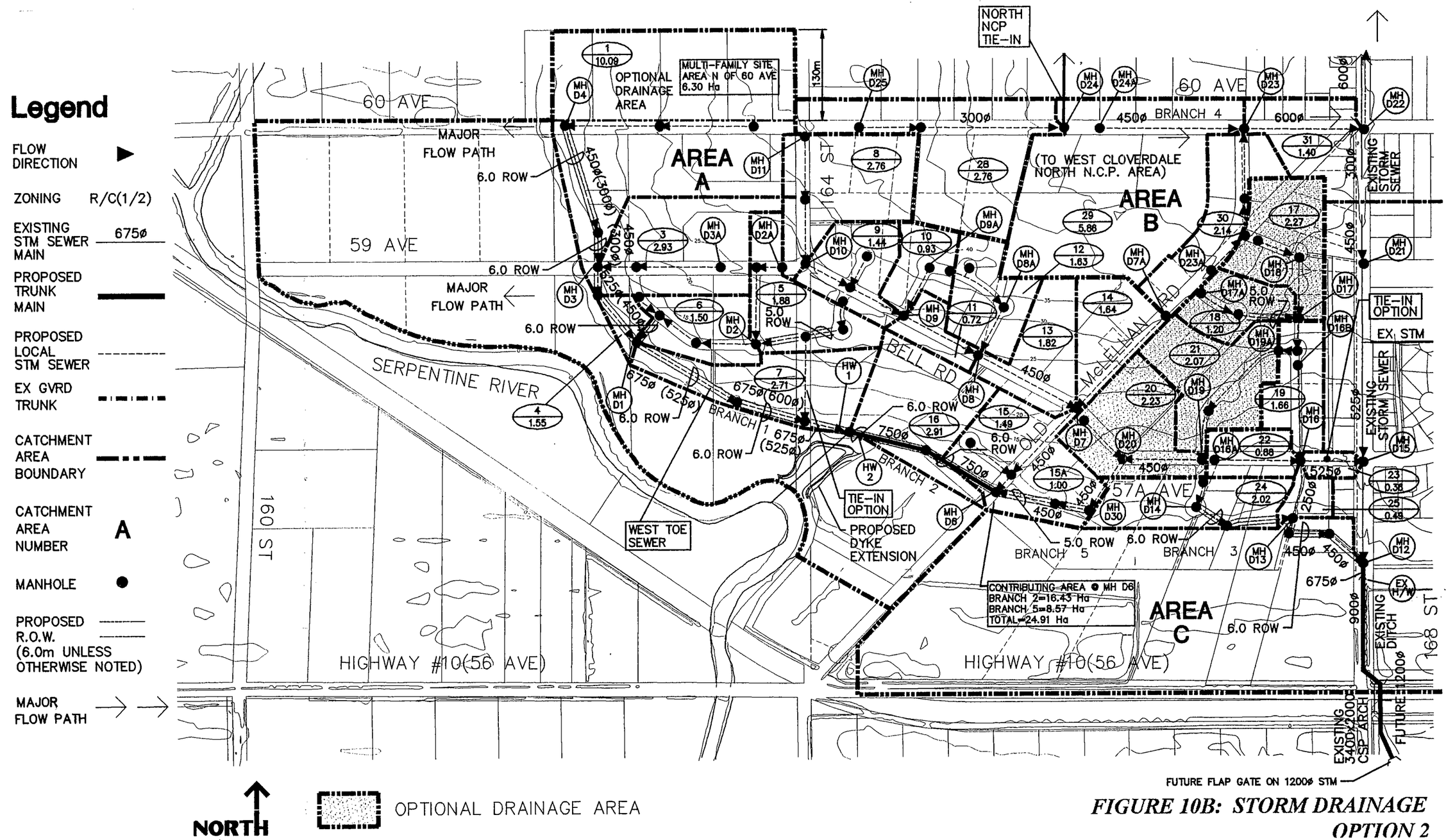


FIGURE 10B: STORM DRAINAGE OPTION 2

The Best Management Practices (BMP) proposed for this NCP involve the construction of the Serpentine River Dyke tie-in and maximizing the drainage catchment area entering this feature. Various plantings and landscaping will ensure some physical and biological pollutant removal prior to entering the Serpentine River. The stormsewer outfall will also incorporate energy dissipaters to insure acceptable discharge level velocities. Source control remains as one of the most effective means of reducing pollutants. Storm drain marking and regular street cleaning programs will aid in pollutant reduction into downstream facilities. Prohibiting direct connection of roof leaders to storm sewers will reduce peak runoff rates and filter pollutants that may collect on roof tops. One of the key BMP requires provision and enforcement of a detailed sediment and erosion control strategies during construction to minimize potential discharge of eroded soils.

The catchment areas and control and control facilities put forth in this report have been developed based on land use and topography and do not take into account politics associated with land ownership or absence of downstream stormwater management facilities. Interim stormwater detention ponds would be required in the absence of downstream works. Depending on development timing, this may be a requirement in catchment areas A, B, or C. Interim on-site detention requirements are detailed in a November 3, 1995 letter from the City of Surrey (***Appendix B, 2.1 Design Criteria and System Modelling***) and are described in more detail in Section 7.0 of this report. A copy of ***Section 7: Regulation under British Columbia's Water Act*** for works and changes in and about a stream has also been included in ***Appendix B, Section 2.5***.

5.2.4 Ten-Year Servicing Plan

DCC funded works identified in the City of Surrey's 1993 10 Year Servicing Plan for the area is limited to one item, a dyke tie-in at 164 Street at 59 Avenue. This is consistent with the previously noted Serpentine River dyke tie-and the proposed Branch 1 and 2 outfall into the Serpentine River. DCC funded storm sewer works are to be considered for land parcels exceeding 20 ha or areas requiring special mitigation or cost sharing works as agreed to by the City of Surrey. As such, the dyke tie-in and the Branch 2 stormsewer for Option 2 are eligible. ***Appendix B*** of this report provides additional cost estimate details and Section 7.0 provides an Updated 10 Year

Servicing Plan for the area and details on stormsewer and detention pond infrastructure financing and funding.

5.3 SANITARY SEWER

The West Cloverdale South NCP area drains in three directions and into two existing sanitary trunk sewers. The major catchment areas and pipeline routing were defined from 1 m digital contour information obtained from the City of Surrey and are detailed in ***Figure 11: Sanitary Sewer***.

Catchment Areas 1 and 2 define the eastern half of the NCP area. Area 1 parallels 60 Avenue, northwest of Old McLellan Road and east of 164 Street. Area 2 is located south of Old McLellan Road, west of 168 Street and north of the Highway. Catchment Area 3 encompasses the western half of the NCP area and generally includes lands south of 60 Avenue and north of Old McLellan Road. A parcel of land north of 60 Avenue has also been included in catchment Area 3. This is discussed in more detail in the following sections of this report.

Existing sanitary sewer in the area consists of a short length of 200 mm sewer along 60 Avenue. A recently constructed 300 mm main on 168 Street extends from 57A to 60 Avenue and the 450 mm Richardson trunk sewer is located along 168 Street from the Highway #10 to 57A Avenue.

Generally, the majority of existing land parcels are currently on septic field systems. An exception would be the lots fronting 168 Street. Catchment areas 1 and 2 are within the overall Richardson trunk sewer servicing area while catchment Area 3 is proposed to drain to the 1200 mm GVS&DD trunk sewer upstream of the lift station at 164 Street and the Highway #10 or alternatively to 168th Street following the toe of escarpment.

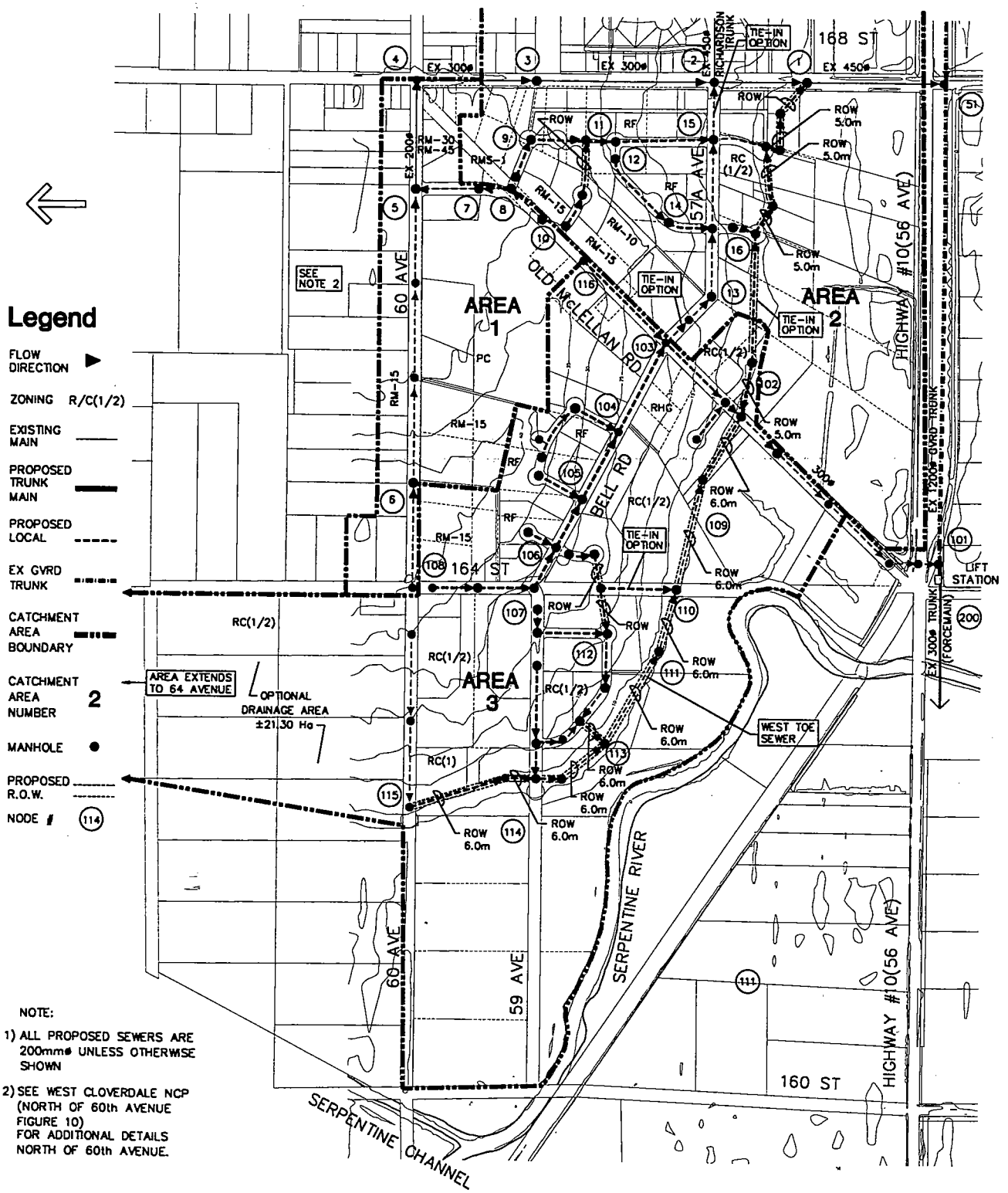


FIGURE 11: SANITARY SEWER

The SANSYS computer model was used in preliminary flow calculations and pipe sizing for this area. Input data corresponded to the projected land use for each parcel and design parameter identified in the City of Surrey Design Criteria Manual. Typically this includes the Manning friction coefficient factor of 0.013, minimum pipe diameter of 200 mm, residential flows of 350 L/capita/day and infiltration allowances of 283 L/mm/km/day. The Harmon Peaking factor used projected populations for the area which were derived from densities and zoning previously detailed in this report. No flow allowances were made for the low lying agricultural lands. In addition, in a absence of more detail survey information, all pipes grades and sizing can be considered preliminary only.

- ***Catchment Area 1***

This area consists of the upland portions of the NCP area fronting 60 Avenue from 164 to 168 Street. The primary land use for this area includes maintaining the existing cemetery with some surrounding denser townhouse developments (estimated at 15 units/acre). There is an overlap of this catchment area with the NCP project to the north. Population projections for this area were reviewed with Coastland Engineering to account for development along both sides of 60 Avenue and were estimated to be 915 people in 401 units. This results in a peak flow of 15.1 ± litres/sec into the 168 Street sewer at 60 Avenue.

It is proposed that a 200 mm sanitary sewer will extend east along 60 Avenue from 164 Street and connect to the existing 300 mm sewer at 168 Street.

- ***Catchment Area 2***

The primary land use for Catchment Area 2 includes single family residential lots. It is proposed that this catchment area drain south and then east to the existing 450 mm Richardson trunk sewer along 168 Street. An optional tie-in point has been identified at 57A Avenue but may require some fill and regrading to facilitate. The preferred sanitary sewer tie-in would be through the eastern cul-du-sac located south of 57A Avenue through a dedicated utility RoW/walkway to 168 Street.

The estimated equivalent population for this area is estimated to be 515 people in 139 units generating a peak flow of 8.4 ± L/sec.

- ***Catchment Area 3***

Catchment Area 3 includes the southwest sloped lands located west of 164 Street. Provisions have been made for this catchment area extending north of 60 Avenue into the West Cloverdale North NCP Area. Original servicing concepts for the areas envisioned a *"west-toe-trunk"* sewer extending and servicing lands as far north as 64 Avenue. The overall servicing concept and catchment areas for this trunk sewer has since been drastically reduced. Allowances have been made to include potential servicing of a 21.3 ± ha parcel north of 60 Avenue. This parcel extends between 60 - 64 Avenue, west of 164 Street and is designated as future single family cluster units (24) and RC (½) units (134). This area has also been proposed to be pumped into a sanitary collection system draining east of 164 Street (from West Cloverdale North NCP report). In absence of any infrastructure east of 164 Street being in place at the time of development, provisions have been made for the west-toe trunk sewer to potentially service an area north of 60 Avenue. Compensation for oversizing or increased depth for areas south of 60 Avenue will be considered by the City of Surrey at the time of development. It is our understanding that the West Cloverdale North NCP Consultant is working with the City of Surrey in securing letters of understanding from the various land owners regarding sanitary sewer servicing options for the area north of 60 Avenue.

The "west-toe-trunk" sewer has potential to extend as far east as 168 Street and connect to the Richardson trunk sewer. An unwillingness in land owners east of Old McLellan Road, to accommodate sewers for other development areas east of Old McLellan Road was expressed at the initial open house held in June, 1995. Other servicing options were thus considered and included a sanitary sewer extension southwest along Old McLellan Road and connection to an existing 1200 mm dia. GVS&DD trunk sewer located adjacent to the 164 Street/Highway #10 lift station. The main advantage of this option is that it adds flexibility in development staging due to sanitary sewer rerouting options. Future development areas northwest of Old McLellan Road would no longer be restricted to a single pipeline route along the toe-of-slope RoW extending to 168 Street.

Although both pipeline routing options are hydraulically feasible, the recommended sanitary sewer routing for catchment area 3 is along Old McLellan Road to Highway #10. A toe-of-slope sewer extension through land parcels east of Old McLellan Road will require a detail topographic survey and detailed negotiations with effected land

owners for a municipality R.O.W. It is our understanding that a toe-of-slope sewer extension to 168th Street may receive endorsement from the City of Surrey Engineering Department providing a municipal R.O.W. can be secured through effected land parcels and peak flows are less than 40 L/sec. This routing option is to be confirmed at the more detailed design stage.

The estimated equivalent population for Catchment Area 3 (**Figure 11**) is 1097 people with a peak flow of 17.9 ± L/sec. The preliminary sizing of the sanitary sewer along Old McLellan Road indicates a 300 mm diameter sewer. The capacity of the 300 mm sanitary sewer at 50% pipe depth is 68.4 litres/sec. This should be reviewed in more detail with more accurate survey information. Geotechnical and topographic investigations should also be initiated to review soil conditions along Old McLellan Road and the location of the Branch 1 & 2 toe of slope sewers. This will clarify the impact it may have on sanitary sewer construction and development area potential. It is our understanding (City of Surrey - R59/96 Geotechnical Investigation) that there may be significant layers of peat through the lowland areas which may affect construction costs and the feasibility of any proposed sewer through this area.

- ***GVS&DD Approval***

A letter to the GVS&DD requesting *"approval in principle"* for allowing a tie-in to the existing 1200 mm ∅ sewer along Highway #10 at Old McLellan Road, adjacent to the existing pump station has been sent. A copy of this letter and GVS&DD letter of response is included in ***Appendix B*** of this report.

- ***Ten Year Servicing Plan***

DCC funded capital works in the *1993 10 Year Servicing Plan* included the west toe trunk sewer from 164 Street at Highway #10 northward to 62 Avenue. This project has been identified as being eligible for upsizing contributions estimated at 40%.

As a result of revised servicing concepts for the NCP area north of 60 Avenue, none of the sewers analyzed in the NCP south of 60th Avenue generated the 40 L/sec peak flow necessary to be classified as a trunk sewer. Hence, these sewers are not eligible for DCC credits or cost sharing by the City of Surrey.

Section 7.5 of this report details the sanitary sewer infrastructure financing and funding.

6.0 IMPLEMENTATION

6.1 PLANNING STEPS

There are numerous steps that are required to bring these lands to development, including the following:

The approval of this plan by Surrey City Council is required.

- However, this needs the preceding approval of an OCP amendment for one area should the City of Surrey's new OCP not accommodate this change. This area, on the north side of Bell Road, is proposed for amendment from *"Suburban"* to *"Urban."* This amendment area is shown on ***Figure 12: OCP Amendment***. This proposal is justified as it maintains the transition between the higher density uses on *"main street"* and the lower densities towards the Serpentine River valley. Given the uses that will result from clustering on the south side of Bell Road, this amendment will maintain a consistent streetscape on both sides of Bell Road. Should the new OCP incorporate this change, an amendment becomes unnecessary.

- Multiple family and commercial areas should be designated in the OCP as development permit areas to ensure compliance with the intent of the various municipal plans.

- Upon approval of the Stage 2 NCP, a *Zoning Bylaw* amendment will be introduced to require developer contributions towards amenities. These amenities are the development of the local park space (at 164 Street, the closed alignment of Old McLellan Road where the former Orange Hall could be relocated to function as a community house, and a viewpoint location overlooking the Serpentine Valley near 164 Street). In addition, the contributions for police, fire, and library amenities need to be agreed upon between the City of Surrey and the landowners. As well, City of Surrey's municipal-wide policy with respect to affordable housing will have to be met by future development. This is addressed in ***Section 8.0*** of ***Appendix B*** which address details of agreements and costs.

- Because of the fragmentation of ownership, it is highly likely that owners will have to work with their neighbours at the subdivision stage to create economical servicing units and to deal with the situation where partial lots may be created. In some cases, land exchanges between owners will be necessary. Easements may be required depending on staging patterns.

- Rezoning will be required on a staged basis as subdivision occurs. Existing zoning is shown on ***Figure 12: Existing Zoning***. Proposed zoning is shown on ***Figure 13: Proposed Zoning***. The Zoning Bylaw amendment, now in process for the proposed RC half acre clustering, will need to be adopted by City Council. This zone, along with restrictive covenants, or a CD zone can be used for the RC one acre clustering zone should owners wish to develop the one area proposed for development. Some areas indicated as CD may need site specific development control zones to accommodate the particular requirements of the site. This could include the street orientation of the row housing along 60 Avenue and Old McLellan Road, the density limit and transition provisions for the 10 units/acre row housing areas, and the special design guidelines required for the mixed use commercial and residential areas at *"5 Corners"*.

  At the subdivision stage, tree surveys will be required to conform with the tree preservation requirements and to help better define the boundaries of areas to be set aside as open space in the clustering areas. Density will be granted for all privately owned clustering lands, even below the floodline except for ALR lands, provided that they are set aside with rights of public access and restrictions on development.

  Development variance permits will be required at the subdivision stage to deal with the road widths and cul-de-sac and P-loop lengths. Neighbourhood character studies shall be completed as part of the subdivision and rezoning process. These guidelines should address siting requirements, building form and character (especially for street oriented housing and at *"5 Corners"*). Primary considerations are for the housing on 60 Avenue to be coordinated, in form and character, with lands to the north across "main street," and to respect the heritage nature of Old McLellan Road.

Also at the subdivision stage, access into the ALR lands east of Old McLellan Road must be provided from local roads to the north (and possibly some ALR lands need to be consolidated) as access from Highway #10 to the abutting parcels is not desirable.

- Lands south of Bell Road/57 Avenue will dedicate open space in accordance with the relevant clustering district. The NCP land use concept shows the general intent to obtain space in the corridor along the valley slope and in other strategic locations. Adjustments can be made at the detailed subdivision stage when tree preservation opportunities are further defined.

  Lands adjacent to *"5 Corners"*, if required by provisions of the *Municipal Act*, may dedicate 5% to be consolidated with the closed section of Old McLellan Road. Here, property lines should be adjusted, by owners working in concert, to allow maximum flexibility for the consolidation of open space. Otherwise land may be purchased through the provision of money-in-lieu from other lands. The 5% dedication from the multiple housing lands along 60 Avenue, and the single detached land north of Bell Road should be dedicated to maximize the width of the walkways and size of the local park on 164 Street and at the west corner of the cemetery. Other lands, upon subdivision, should dedicate the 5% requirement as money-in-lieu.

6.2 DEVELOPMENT STAGING

Staging is normally dictated by servicing considerations which are, in turn, largely dependent upon topography and the location of available capacity. The general staging pattern is shown on ***Figure 14: Development Staging.***

The overwhelming criteria driving the staging is the high short term cost to develop. Unless development proceeds from 168th Street and concentrates on single family development areas (RF), very high initial costs will have to be borne by developers for watermains, and storm sewer trunks and outfalls. If development incrementally moves westward from 168th Street, much of the initial costs can be postponed until the latter years of development in the area or to coincide with the NCP north of 60th Avenue. As development proceeds a combination of DCC rebates and smaller developer financed infrastructure costs will help defer the initial high short term costs. This does

preclude development out of phase, but the costs and financing charges will likely make out of phase development cost prohibitive.

In summary, the broad development staging strategy is as follows:

1. The staging strategy is driven by the need to minimize short term cash flow issues for DCC rebateable infrastructure. This maximizes existing municipal services. Other factors are also relevant and should not be neglected.

2. Five development stages have been proposed to avoid major cash flow problems.

3. The proposed staging of development is not to be interpreted legalistically. Development in subsequent stages of development can occur provided that developers in those stages *"front end"* all required services to allow development to proceed in that particular stage of development.

4. The anticipated growth is ± 60 units/stage, assuming one stage per year, with a build out of approximately 605 units for the NCP area south of 60 Avenue.

5. With the current City of Surrey DCC rebate policy, developers will have to build the proposed major DCC elements at their cost. The City will only fund works which are included in the *10 Year Servicing Plan* as a "growth" item. The cost of specific works and services shall be reimbursed from only the applicable development cost charges (DCC) element only after being initially paid by the developer. The rebate amount is currently limited to DCC's collected. It may be possible for a number of developers to establish arrangements amongst themselves to jointly share the expenses as required and maximize DCC rebates.

6. Projected DCC revenues for watermains total $518,130 for an estimated 605 units. Expenditures for off-site watermain improvements and oversizing is $1,262,025. A revenue deficit of $743,895-ve has been identified when considering the NCP south of 60th Avenue as a stand-alone NCP. In absence of the NCP north of 60 Avenue being in place, development will be limited to ± 150 single family (RF) units along 57A Avenue and Bell Road.

7. Development of multi-family areas, (i.e. along 60 Avenue and Old McLellan Road) and areas west of 164 Street will require the construction of significant off-site grid watermain extensions. Assuming the NCP north of 60 Avenue is not in place,

it is unlikely development in these areas will occur unless off-site grid watermains are installed by the City of Surrey. City of Surrey policy is not to front end any works within any NCP to allow development to proceed. Thus, the City will only construct off-site grid watermains at their priority. Therefore, these watermains will not be constructed by the City in the foreseeable future and will result in delays in future development.

8. It should be noted that the cashflow analysis is only a model. Market conditions, densities, capital costs and other variables can adjust both the revenue and expenditure sides of the equation. The NCP has demonstrated that on a short term basis (4 years) as a stand alone NCP development, the DCC revenues and expenditures are positive for the City of Surrey. This is on the assumption that only 151 single family units are developed in the first four (4) years.

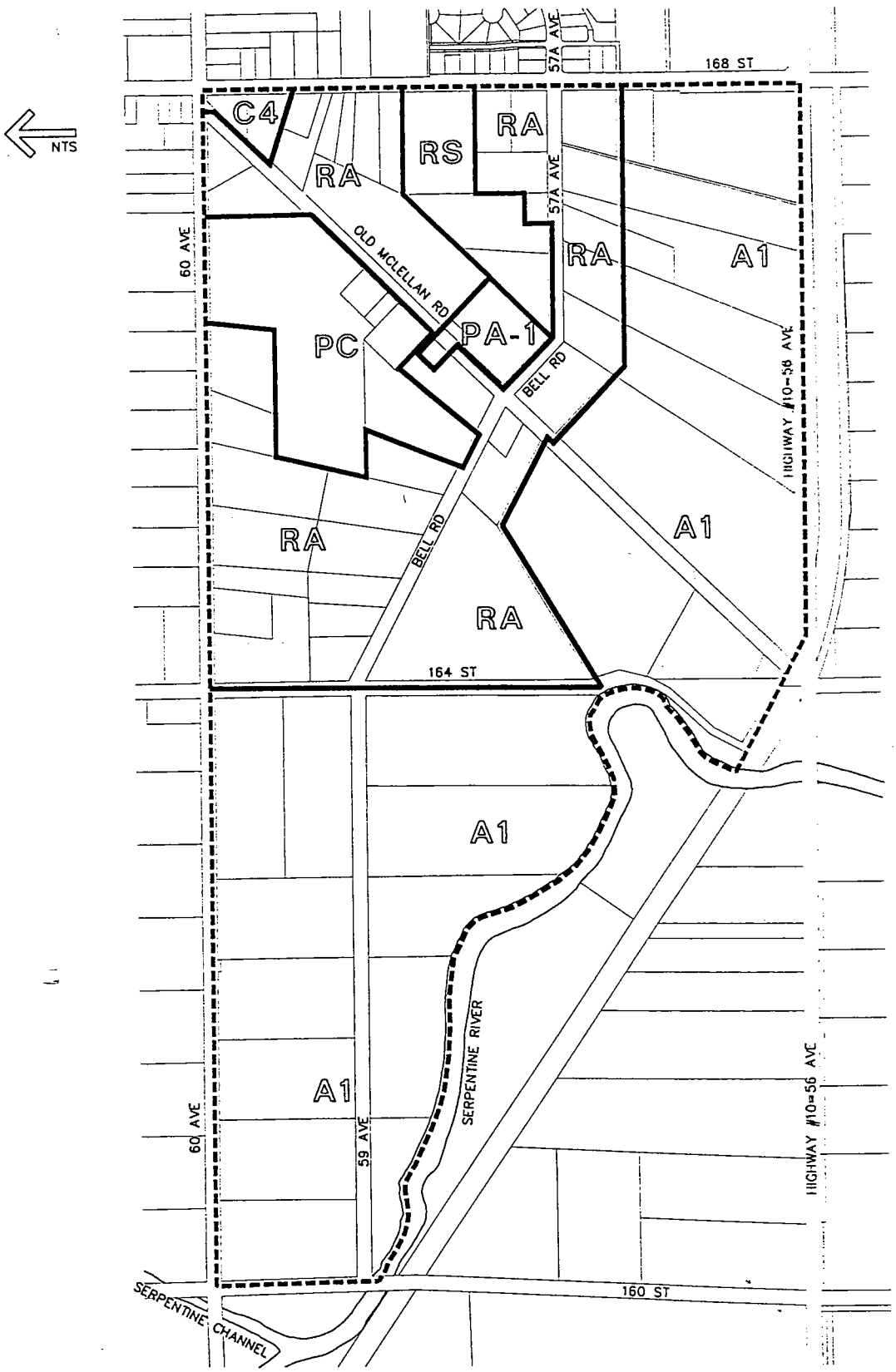


FIGURE 12: EXISTING ZONING

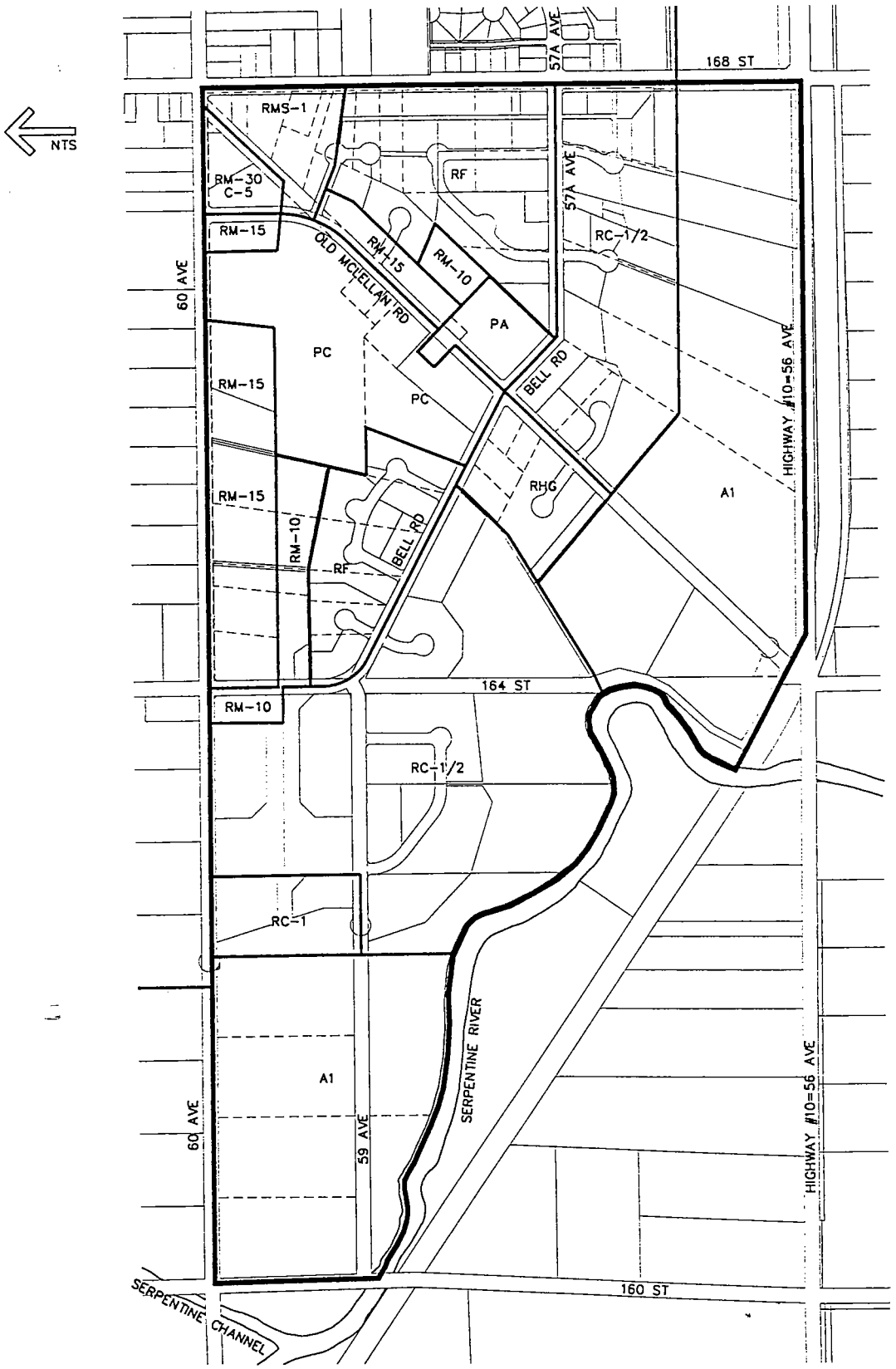


FIGURE 13: PROPOSED ZONING

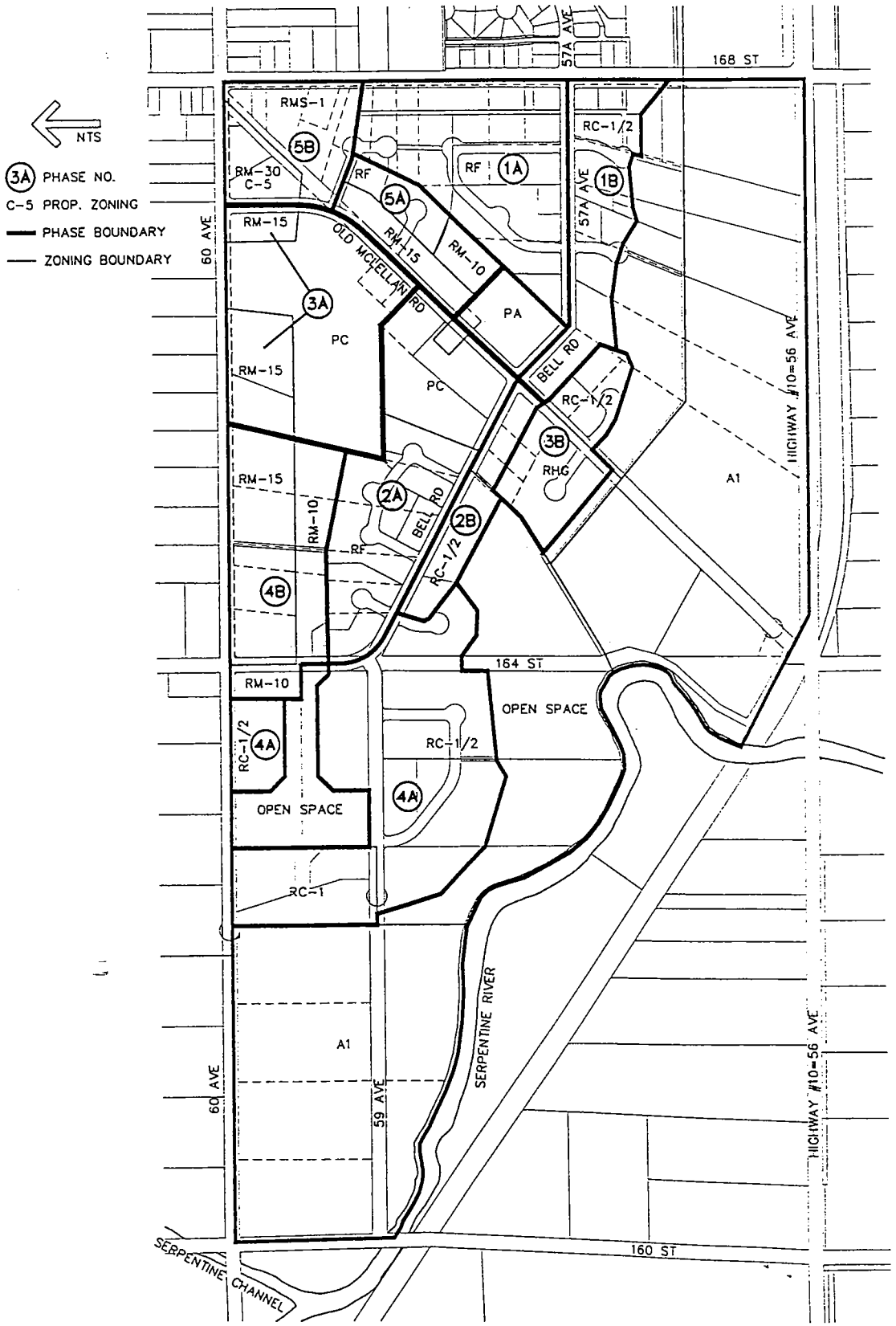


FIGURE 14: DEVELOPMENT STAGING

7.0 INFRASTRUCTURE FINANCING AND FUNDING

7.1 OVERVIEW

The following was developed as part of the NCP process regarding the City of Surrey's approach to infrastructure funding within NCP areas.

1. The long term DCC revenues and expenditures for major collector roads, water, sanitary and drainage works will likely balance or show a positive cash flow at buildout. This is for DCC revenues and expenditures within the NCP area. If the NCP's total DCC's are less than the expenditures, the NCP may still go ahead (subject to Council approval) but the costs above the NCP DCC's will only be provided by the City when it meets with the City's priorities.

2. The short term annual DCC revenues and expenditures must also balance or the NCP development community must address the short term cash flow situation.

3. City Council has stated that sequencing of the various NCP's will not be supported at this time.

4. The City will not fund interim works.

5. The City-wide based DCC collection and expenditure program is the basis of all DCC capital works.

6. The City of Surrey is investigating a flexible approach to rebate DCC's to developers who front end significant DCC elements. The approach has been accepted in principle by Council and a practice is currently being formulated for its implementation. The policy is not in place at this time and therefore cannot be the basis of the financial viability of this NCP.

Much of the required major infrastructure for the West Cloverdale South NCP is in the current *10 Year Servicing Plan*. The development of the NCP will require approximately **$1,660,025** of expenditure by the City of Surrey to support the proposed land use. The projected DCC revenues (stand-alone NCP) total **$2,603,170**

(**Table 7.8A**). This gives us a projected revenue surplus of **$943,145** at project buildout. The current 10 Year Servicing Plan has allowances for **$3,490,190** for various works in the area. A reduction in municipal servicing requirements for the City of Surrey have been achieved in sanitary sewer ($256,000), drainage and stormwater detention ($52,000), watermains ($697,975) and major collector roads ($824,190) or for a total of **$1,618,485**; thus reducing projected City of Surrey expenditures from **$3,490,190** to **$1,660,025**. This is a direct result of more detailed planning and engineering studies.

It should be noted that there is a significant cash shortfall for the watermain component of this NCP (**$743,895-ve**) (**Table 7.8A**). To achieve a positive cash flow for the watermain it was necessary to consider the combined revenue and expenditures for two NCP projects (North and South of 60th Avenue). **Table 7.8B** illustrates projected DCC revenues (combined NCP's for watermain only) which total **$4,166,610** with a revenue surplus of $2,294,905+ve at project buildout. The following section of this report describes the DCC works required, DCC revenues and expenditures, financial options and the cash flow analysis. ***Appendix B*** defines the current funding methods available at the City of Surrey and the NCP Infrastructure Financing Corporate Report as agreed to by City of Surrey council.

7.2 DCC ELEMENTS

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

The City will only fund works which are included in the *10 Year Servicing Plan* and DCC Program. DCC works can either be built by the City or the developer. Given the significant size of the DCC program and the time requirements for infrastructure to be built, developers typically build many DCC works and receive DCC rebates for the works they build.

The City has specific criteria for a work to be included as a DCC element in their program. Various tables in the following section list each proposed eligible DCC item by service. Each item is broken down to show the estimated cost, type of proposed

funding, suggested method of construction (City of Surrey or developers) and the estimated time period when the work is required. These tables also note whether the item is an addition to the current *10 Year Servicing Plan* or a substitution. Substitution generally means an item which was shown in the *10 Year Servicing Plan* at one location, but through refinement of the NCP servicing plan the item was moved to another location. The purpose and scope of the work do not change, only the alignment, length or specific location has been modified. All additional costs are noted.

Definition of the funding methods noted on the tables are located in ***Appendix B.***

A description of how each item is proposed to be funded is also listed in the tables. The anticipated year each item is required has also been included to clarify when works are necessary, based on the specific needs of the NCP area development.

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

7.3 WATER

7.3.1 10 Year Servicing Plan (June 1993)

Works included in the *City of Surrey, June 1993 10 Year Servicing Plan* for waterworks are as follows:

TABLE 7.3A
WATER - 10 YEAR SERVICING PLAN (JUNE 1993)

REFERENCE NO.	LOCATION (FROM/TO)	DESCRIPTION	ESTIMATED COST (3)	START BEFORE	PAGE NO. IN 10 YEAR PLAN	GROWTH RELATED
MAJOR GRID WORKS PROJECTS						
#2415	68th Ave. (168-176 Str.)	350 mm Ø (40% share)	$224,000	1997	89	Yes
#2416	60th Ave. (162-172 Str.)	350 mm Ø	$700,000	2002	89	Yes
#2417	56th Ave. (164-168 Str.)	350 mm Ø	$280,000 (1)	2002	89	Yes
#2418	162nd Str. (60-64 Ave.)	350 mm Ø (40% share)	$96,000	2002	89	Yes
#2419	168th Str. (56-68 Ave.)	350 mm Ø	$840,000 (2)	1997	89	Yes
#2420	172nd Str. (56-64 Ave)	350 mm Ø	$560,000 (1)	1997	89	Yes
#3605	164th Str. (56-60 Ave.)	300 mm Ø	$240,000	2002	89	Yes
#947	168th Str. (56-57A Ave.)	200 mm Ø	$75,000 (1)	2002	86	Yes
SUBTOTAL			**$3,015,000 (3)**	N/A	N/A	N/A

Notes:

1) Not required for this development.
2) Only 2,000 of 2400 l.m. are required for this development (83%) or $700,000.
3) The total cost of the works required for this development are as follows: #2415 ($224,000) + #2416 ($700,000) + #2418 ($96,000) + #2419 ($700,000) + #3605 ($240,000) = $1,960,000.

7.3.2 10 Year Servicing Plan (Update)

The method for allocation of funds is dependent upon the existing and future requirements for water improvements within the Study Area. There are two initial conditions that will determine the manner in which funding is applied.

1. Existing road allowances with adequate water supply for the proposed development:

   The installation of grid mains in these areas would be DCC rebateable since, based on current Design Criteria requirements, existing mains will accommodate the proposed zoning, and;

2. New road allowances with no existing watermains:

   Funding for the installation of grid mains in these areas would be based on current Surrey policy for oversizing from the main size required by the applicant, to the grid main size proposed as part of the overall system. Reimbursements will not be considered for incomplete systems within interim conditions requiring mains larger than the nominal requirement. Any upsizing to accommodate development based on interim flows would be at the developer's expense.

Where mains have been identified as *"DCC rebateable"*, it is understood that, in accordance with Surrey policy, these costs are refunded to developers from Development Cost Charges provided that main size is not a requirement to deliver interim fire flows to the applicant's site. It is further understood that the recovery of DCC's by development cannot exceed the total DCC's paid for that particular utility under each separate application, and that costs incurred in excess of this recovery are the responsibility of the development.

It should be noted that, as watermains are extended progressively within the study area without looping, individual developments may require mains larger than the nominal size to meet fire flow demands. In such instances, upsizing contributions would be based upon the difference between the larger size required by the applicant, and the ultimate grid size with the result that total upsizing costs might be less than the values noted herein once servicing has been completed.

Conversely, where individual applications do not include multi-family or other high demand components, upsizing would be based on the difference between the smaller size required by the applicant and the ultimate grid size, with the result that total upsizing costs may be greater than the values noted herein on completion of servicing.

Table 7.3B summarizes projected DCC revenues for watermain. The initial cash flow analysis for a stand-alone NCP revealed a significant revenue shortfall for the watermain ($743,895-ve). As a result it was necessary to explore other financing options for the watermain. Since this NCP was adjacent to another NCP project, revenues and expenditures for off-site watermain improvements were anticipated to be similar. **Table 7.3C** explores DCC revenues and expenditures based on the 605 unit NCP development south of 60th Avenue. An updated staging plan was developed and a cash flow balance was achieved for the first four years (Phase 1A, 1B, 2A & 2B) or ± 150 units of single family development. Phases 3A, 4B, 5A, and 5B require the construction of significant off-site grid watermains. **Table 7.3D** reviews total watermain expenditures relative to DCC revenues generated for the two NCP developments (North and South of 60th Avenue). A positive cash flow was achieved for all phases.

7.3.3 Development Thresholds

Construction of various offsite grid watermains are dependent on development timing. In order to appreciate the sensitivity we have developed a development unit *"threshold"*. Once exceeded, various offsite watermain grids have to be constructed. ***Tables 7.3E and 7.3F*** provide development unit thresholds for the NCP area south of 60 Avenue assuming it to be a stand alone project and also for the combined NCP areas.

TABLE 7.3B
WATER - PROJECTED DCC REVENUES

PROPOSED ZONE	USE	UNITS	WATER	
			DCC/UNIT	REVENUE
RF	Single Family	120	$1,070	$128,400
RHG	Cluster	10	$1,070	$10,700
RC (Half Acre)	Cluster	100	$1,070	$107,000
RC (One Acre)	Cluster	5	$1,070	$5,350
RM-10	Row Housing	50	$940	$47,000
RM-15	Row Housing	180	$940	$169,200
RM-30, 45	Apartments	20	$940	$18,800
RMS-1	Residential/ Care (800 ft^2/Unit)	120	$264/800 ft^2	$31,680
TOTALS		**605**	**N/A**	**$518,130**

TABLE 7.3C
WATER - PROJECTED DCC REVENUES & EXPENDITURES FOR WEST CLOVERDALE NCP SOUTH OF 60 AVENUE

Phase/Year	NCP South of 60 Avenue			Cumulative No. of Units	Cumulative DCC Revenue	Watermains to be Constructed	Revenue Surplus (+ve)/ Shortfall (-ve)
	Zone/Units	DCC Rate $/Unit	Revenue A			Cost/Description	Cumulative (+ve/-ve)
Phase 1A - 1997	RF - 65	$1,070	$69,550			• N/A	($12,430+ve)
Subtotal	65 Units	N/A	$69,550	65 Units	$69,550	• N/A	($12,430+ve)
Phase 1B - 1998	RC (½)-25	$1,070	$26,750			• N/A	($16,370+ve)
	RF - 6	$1,070	$6,420				
Subtotal	31 Units	N/A	$33,170	96 Units	$102,720	• N/A	($28,800+ve)
Phase 2A - 1999	RF - 41	$1,070	$43,870			• N/A	($43,870+ve)
Subtotal	41 Units	N/A	$43,870	137 Units	$146,590	• N/A	($146,590+ve)
Phase 2B - 2000	RHG - 2	$1,070	$2,140			• N/A	($14,980+ve)
	RC (½)-12	$1,070	$12,840				
Subtotal	14 Units	N/A	$14,980	151 Units	$161,570	• N/A	($161,570+ve)
Phase 3A - 2001	RM (15)-52	$940	$48,880			• 805 l.m. - 350 ∅ W.M. 168th Str. (60 - 64 Ave) #2419B ($374,325) • 450 l.m. - 300 ∅ W.M. 60 Ave (166 - 168 Str.) #2416A ($75,600)	($401,045-ve)
Subtotal	52 Units	N/A	$48,880	203 Units	$210,450	• $449,925	($239,475-ve)
Phase 3B - 2002	RHG - 8	$1,070	$8,560			• N/A	($14,980+ve)
	RC (½)-6	$1,070	$6,420				
Subtotal	14 Units	N/A	$14,980	217 Units	$225,430	• N/A	($224,495-ve)
Phase 4A - 2003	RC (1)-5	$1,070	$5,350			• N/A	($66,340+ve)
	RC (½)-57	$1,070	$60,990				
Subtotal	62 Units	N/A	$66,340	279 Units	$291,770	• N/A	($158,155-ve)
Phase 4B - 2004	RM (15)-97	$940	$91,180			• 350 l.m. - 300 ∅ W.M. 60 Ave (164 - 166 Str.) #2416A ($58,800)	($68,100+ve)
	RM (10)-38	$940	$35,720				
Subtotal	135 Units	N/A	$126,900	414 Units	$418,670	• $58,800	($90,055-ve)
Phase 5A - 2005	RF - 8	$1,070	$8,560			• 810 l.m. - 350 ∅ W.M. 60 Ave (168 - 172 Str.) #2416B ($376,650)	($327,670-ve)
	RM (10)-12	$940	$11,280				
	RM (15)-31	$940	$29,140				
Subtotal	51 Units	N/A	$48,980	465 Units	$467,650	• ($376,650)	($417,725-ve)
Phase 5B - 2006	RM (30)-20	$940	$18,800			• 810 l.m. - 350 ∅ W.M. 60 Ave (172 - 176 Str.) #2416C ($376,650)	($326,170-ve)
	RMS-1-120	$214	$31,680				
Subtotal	140 Units	N/A	$50,480	605 Units	$518,130	• ($376,650)	($743,895-ve)
TOTAL	**605 Units**	**N/A**	**$518,130**	**605 Units**	**$518,130**	• **$1,262,025**	**($743,895-ve)**

TABLE 7.3D
WATER - PROJECTED DCC REVENUES & EXPENDITURES FOR WEST CLOVERDALE NCP NORTH AND SOUTH OF 60 AVENUE

	NCP South of 60 Avenue			NCP North of 60 Avenue			Total No.	Cumulative No.	Total Revenue	Cumulative DCC	Watermains to be Constructed	Revenue Surplus (+ve)/ Shortfall (-ve)
Phase/Year	**Zone/Units**	**DCC Rate $/Unit**	**Revenue A**	**Zone/Units**	**DCC Rate $/Unit**	**Revenue B**	**of Units**	**of Units**	**A & B**	**Revenue**	**Cost/Description**	**Cumulative (+ve/-ve)**
Phase 1A - 1997	RF - 65	$1,070	$69,550	S.F. 120 M.F. 265	$1,070 $940	$128,400 $249,100					• 430 l.m. - 350∅ W.M. 168 Str. (60 - 64 Ave) #2419B ($199,950) • 340 l.m. - 300 ∅ W.M. (40% share) 57A Ave (Old McLellan - 168 Str.) #3605C ($57,120)	($189,980+ve)
Subtotal	65 Units	N/A	$69,550	385 Units	N/A	$377,500	450 Units	450 Units	$447,050	$447,050	• $257,070	($189,980+ve)
Phase 1B - 1998	RC (½)-25 RF - 6	$1,070 $1,070	$26,750 $6,420	S.F. 87 M.F. 104	$1,070 $940	$93,090 $97,760					• 170 l.m. - 350 ∅ W.M. 168 Str. (60 - 64 Ave) #2419B ($79,050) • 100 l.m. - 300 ∅ W.M. (40% share) 57A Ave (Old McLellan Rd - 168 Str.) #3605C ($16,800)	($128,170+ve)
Subtotal	31 Units	N/A	$33,170	191 Units	N/A	$190,850	222 Units	672 Units	$224,020	$671,070	• $95,850	($318,150+ve)
Phase 2A - 1999	RF - 41	$1,070	$43,870	S.F. 86 M.F. 37	$1,070 $940	$92,020 $34,780					• 500 l.m. - 300 ∅ W.M. (40% share) Bell Rd (164 Str. - Old McLellan) #3605B ($84,000)	($86,670+ve)
Subtotal	41 Units	N/A	$43,870	123 Units	N/A	$126,800	164 Units	836 Units	$170,670	$841,740	• $84,000	($404,820+ve)
Phase 2B - 2000	RHG - 2 RC (½)-12	$1,070 $1,070	$2,140 $12,840	S.F. 85 M.F. 40	$1,070 $940	$90,950 $37,600					• 205 l.m. - 350 ∅ W.M. 168 Str. (60 - 64 Ave) #2419B ($95,325) • 300 ∅ W.M. 164 Str./63 Ave. (60 Ave - 166 Str.), #2418 ($30,240) from Coastland Engineering Ltd.	($17,965+ve)
Subtotal	14 Units	N/A	$14,980	125 Units	N/A	$128,550	139 Units	975 Units	$143,530	$985,270	• $125,565	($422,785+ve)
Phase 3A - 2001	RM (15)-52	$940	$48,880	S.F. 75 M.F. 141	$1,070 $940	$80,250 $132,540					• 810 l.m. - 350 ∅ W.M. 60 Ave (168 - 172 Str.) #2416B ($376,650) • 450 l.m. - 300 ∅ W.M. (40% share) 60 Ave (166 - 168 Str) #2416A ($75,600)	($190,580-ve)
Subtotal	52 Units	N/A	$48,880	216 Units	N/A	$212,790	268 Units	1,243 Units	$261,670	$1,246,940	• $452,250	($232,205+ve)
Phase 3B 2002	RHG - 8 RC (½)-6	$1,070 $1,070	$8,560 $6,420	S.F. 54 M.F. O	$1,070 $940	$57,780 $0.00					• N/A	($72,760+ve)
Subtotal	14 Units	N/A	$14,980	54 Units	N/A	$57,780	68 Units	1,311 Units	$72,760	$1,319,700	• N/A	($304,965+ve)
Phase 4A - 2003	RC (1)-5 RC (½)-57	$1,070 $1,070	$5,350 $60,990	S.F. 0 M.F. 247	$1,070 $940	$0.00 $232,180					• N/A	($298,520+ve)
Subtotal	62 Units	N/A	$66,340	247 Units	N/A	$232,180	309 Units	1,620 Units	$298,520	$1,618,220	• N/A	($603,485+ve)
Phase 4B - 2004	RM (15)-97 RM (10)-38	$940 $940	$91,180 $35,720	S.F. 64 M.F. 0	$1,070 $940	$68,480 $0.00					• 810 l.m. - 350 ∅ W.M. 60 Ave (172 - 176 Str.) #2416C ($376,650) • 350 l.m. - 300 ∅ W.M. (40% share) 60 Ave (64 Str. to 166 Str.) #2416A ($58,800) • 140 l.m. - 300 ∅ W.M. (40% share) 164 Str. (60 Ave - Bell Rd) #3605A ($23,520)	($263,590-ve)
Subtotal	135 Units	N/A	$126,900	64 Units	N/A	$68,480	199 Units	1,819 Units	$195,380	$1,813,600	• $458,970	($339,895+ve)
Phase 5A - 2005	RF - 8 RM (10)-12 RM (15)-31	$1,070 $940 $940	$8,560 $11,280 $29,140	S.F. 67 M.F. 0	$1,070 $940	$71,690 $0.00					• N/A	($120,670+ve)
Subtotal	51 Units	N/A	$48,980	67 Units	N/A	$71,690	118 Units	1,937 Units	$120,670	$1,934,270	• N/A	($460,565+ve)
Phase 5B - 2006	RM (30)-20 RMS-1-120	$940 $264	$18,800 $31,680	S.F. 0 M.F. 103	$1,070 $940	$0.00 $96,820					• N/A	($147,300+ve)
Subtotal	140 Units	N/A	$50,480	103 Units	N/A	$96,820	243 Units	2,180 Units	$147,300	$2,081,570	• N/A	($607,865+ve)
TOTAL	**605 Units**	**N/A**	**$518,130**	**1,575 Units**	**N/A**	**$1,563,440**	**2,180 Units**	**2,180 Units**	**$2,081,570**	**$2,081,570**	• **$1,473,705**	**($607,865+ve)**

TABLE 7.3E
DEVELOPMENT THRESHOLD - NCP SOUTH OF 60 AVE.

Unit Threshold Range (1)	Offsite Grid Watermain Construction Requirements		Anticipated Year of Construction
	I.D. #	Description/Location	
0 to 151 Units	#2419B	805 l.m. - 350 ∅ W.M. 168 Str. (60 - 64 Ave.)	Phase 3A - (2001)
152 to 414 Units	#2416B	810 l.m. - 350 ∅ W.M. 60 Ave. (168 - 172 Str.)	Phase 5A - (2005)
415 to 605 Units	#2416C	810 l.m. - 350 ∅ W.M. 60 Ave. (172 - 176 Str.)	Phase 5B - (2006)

Note: 1) Various assumptions were made regarding location and timing of proposed multi-family unit developments. As such, a periodic review of the unit threshold ranges should be completed to ensure domestic and fire protection requirements are not compromised.

TABLE 7.3F
DEVELOPMENT THRESHOLD - NCP NORTH & SOUTH OF 60 AVE.

Unit Threshold Range (1)	Offsite Grid Watermain Construction Requirements		Anticipated Year of Construction
	I.D. #	Description/Location	
0 to 975 Units	#2419B	805 l.m. - 350 ∅ W.M. 168 Str. (60 - 64 Ave.)	Phase 1A - 2B (1997-2000)
976 to 1723 Units	#2416B	810 l.m. - 350 ∅ W.M. 60 Ave. (168 - 172 Str.)	Phase 3A - (2001)
1724 to 2180 Units	#2416C	810 l.m. - 350 ∅ W.M. 60 Ave. (172 - 176 Str.)	Phase 4B - (2004)

Note: 1) Various assumptions were made regarding location and timing of proposed multi-family unit developments. As such, a periodic review of the unit threshold ranges should be completed to ensure domestic and fire protection requirements are not compromised.

7.3.4 NCP Infrastructure Financing and Funding (Watermain)

The following section provides Tables and site location plans detailing the various watermain infrastructure improvements.

TABLE 7.3G
WATER SUPPLY & DISTRIBUTION
NCP INFRASTRUCTURE FINANCING AND FUNDING (#2415)

ITEM (LOCATION)	TYPE OF WORK	CURRENT OR ADDITIONAL	ID # IN 1993 10 YEAR PLAN	AMOUNT IN CURRENT PROGRAM ($)	UPDATED PROGRAM COST ($)	ELIGIBLE FOR DCC PROGRAM (Y/N)	REFINEMENT OF DCC PROGRAM (Y/N)	ADDITION TO DCC PROGRAM (Y/N)	TYPE OF FUNDING (1)		CONSTRUCTION BY (SURREY/ DEVELOPER)	YEAR REQUESTED
									EXISTING METHOD	PROPOSED METHOD		
68th Ave. (168-176 Str)	**350 mm ϕ (40% share)**	**Current**	**#2415**	**$224,000**		Y			UPS			
66th Ave. (168-172 Str)	300 mm ϕ (40% share)	Update	#2415A (6)	$105,000 (2)	$136,000 (4)	Y	Y	N		UPS	–	2006 (See Note 7)
65A Ave. (172-176 Str.)	300 mm ϕ (40% share)	Update	#2415B (6)	$119,000 (3)	$153,000 (5)	Y	Y	N		UPS	–	2006 (See Note 7)
TOTAL				$224,000	$289,000							

NOTE: (1) Funding Methods (Current):

- DCC Rebate — DCCR
- Development Coordinated Works (Drainage, Arterial, Non-Arterial) — DCW
- Upsizing (Water, Sanitary) — UPS
- Frontage Latecomer — FLAT
- Area Latecomer (Sanitary Pump Station and Force Main) — ALAT

(2) Prorated by Length
810/1720 = 0.47 x $224,000 = $105,000 (rounded)

(3) Prorated by Length
910/1720 = 0.53 x $224,000 = $119,000 (rounded)

(4) 810 l.m. x $420 l.m. x 40% share = $136,000 (rounded)

(5) 910 l.m. x $420 l.m. x 40% share = $153,000 (rounded)

(6) Project limits have been updated and subdivided

(7) Not required for this NCP

TABLE 7.3H
WATER SUPPLY & DISTRIBUTION
NCP INFRASTRUCTURE FINANCING AND FUNDING (#2416)

ITEM (LOCATION)	TYPE OF WORK	CURRENT OR ADDITIONAL	ID # IN 1993 10 YEAR PLAN	AMOUNT IN CURRENT PROGRAM ($)	UPDATED PROGRAM COST ($)	ELIGIBLE FOR DCC PROGRAM (Y/N)	REFINEMENT OF DCC PROGRAM (Y/N)	ADDITION TO DCC PROGRAM (Y/N)	TYPE OF FUNDING (1)		CONSTRUCTION BY (SURREY/ DEVELOPER)	YEAR REQUESTED
									EXISTING METHOD	PROPOSED METHOD		
60th Ave. (162-172 Str)	**350 mm ϕ**	**Current**	**#2416**	**$700,000**		Y			DCCR			
60th Ave. (164-168 Str)	300 mm ϕ (40% Share)	Update	#2416A (5)	$235,000 (2)	$134,400 (3)	Y	Y	N		UPS	Developer	See Note 8
60th Ave. (168-172 Str.)	350 mm ϕ	Update	#2416B (5)	$235,000 (2)	$376,650 (4)	Y	Y	N		DCCR	Surrey	See Note 6
60th Ave. (172-176 Str.)	350 mm ϕ	Update	#2416C (5)	$230,000 (2)	$376,650 (4)	Y	Y	N		DCCR	Surrey	See Note 7
TOTAL				$700,000	$887,700							

NOTE: (1) Funding Methods (Current):

- DCC Rebate — DCCR
- Development Coordinated Works (Drainage, Arterial, Non-Arterial) — DCW
- Upsizing (Water, Sanitary) — UPS
- Frontage Latecomer — FLAT
- Area Latecomer (Sanitary Pump Station and Force Main) — ALAT

(2) Funding Prorated for each section

(3) Upsizing cost is based on 800 l.m. of 300 W.M. x $420/l.m. x 40% share = $134,400

(4) 350 ϕ W.M. cost is $376,650

(5) Projects limits have been updated and subdivided

(6) Phase 3A - 2001 for combined NCP's
Phase 5A - 2005 for NCP south of 60 Avenue only

(7) Phase 4B - 2004 for combined NCP's
Phase 5B - 2006 for NCP South of 60 Avenue only

(8) Phase 3A - 450 l.m. - 2001 &
Phase 4B - 350 l..m. - 2004
(for combined NCP's)

TABLE 7.3I
WATER SUPPLY & DISTRIBUTION
NCP INFRASTRUCTURE FINANCING AND FUNDING (#2419)

ITEM (LOCATION)	TYPE OF WORK	CURRENT OR ADDITIONAL	ID # IN 1993 10 YEAR PLAN	AMOUNT IN CURRENT PROGRAM ($)	UPDATED PROGRAM COST ($)	ELIGIBLE FOR DCC PROGRAM (Y/N)	REFINEMENT OF DCC PROGRAM (Y/N)	ADDITION TO DCC PROGRAM (Y/N)	TYPE OF FUNDING (1)		CONSTRUCTION BY (SURREY/ DEVELOPER)	YEAR REQUESTED
									EXISTING METHOD	PROPOSED METHOD		
168th Str. (56-68 Ave.)	350 mm ϕ	Current	#2419	$840,000					DCCR			
168th Str. (66-64 Ave.)	300 mm ϕ (40% Share)	Update	#2419A	$177,000 (2)	N/A	Y	Y	N		DCW	Developer	See Note 9
168th Str. (64-60 Ave.)	350 mm ϕ	Update	#2419B	$332,000 (3)	$374,325 (6)	Y	Y	N		DCCR	Developer	See Note 10
168th Str. (60 Ave-480 m south)	350 mm ϕ	Update	#2419C	$198,000 (4)	$223,200 (7)	Y	Y	N		DCCR	Surrey	2006 (See Note 11)
168th Str. (56 Ave-320 m north)	350 mm ϕ	Update	#2419D	$133,000 (5)	$148,800 (8)	Y	Y	N		DCCR	Surrey	2006 (See Note 11)
TOTAL				$840,000	$746,325							

NOTE: (1) Funding Methods (Current):

- DCC Rebate
- Development Coordinated Works (Drainage, Arterial, Non-Arterial)
- Upsizing (Water, Sanitary)
- Frontage Latecomer
- Area Latecomer (Sanitary Pump Station and Force Main)

DCCR
DCW
UPS
FLAT
ALAI

(2) Prorated by Length
430/2035 = 0.21 x $840,000 = $177,000 (rounded)

(3) Prorated by Length
805/2035 = 0.40 x $840,000 = $332,000 (rounded)

(4) Prorated by Length
400/2035 = 0.24 x $840,000 = $198,000 (rounded)

(5) Prorated by Length
320/2035 = 0.15 x $840,000 = $133,000 (rounded)

(6) 805 l.m. x $465/l.m. = $374,325

(7) 480 l.m. x $465/l.m. = $223,200

(8) 320 l.m. x $465/l.m. = $148,800

(9) Recently constructed as part of the Northview Golf & Country Club

(10) Phase 1A - 2B (1997-2000) for combined NCP's
Phase 3A (2001) for NCP South of 60 Avenue only

(11) Not required for this NCP. Construct when determined to be a priority by the City of Surrey

TABLE 7.3J
WATER SUPPLY & DISTRIBUTION
NCP INFRASTRUCTURE FINANCING AND FUNDING (#2420)

ITEM (LOCATION)	TYPE OF WORK	CURRENT OR ADDITIONAL	ID # IN 1993 10 YEAR PLAN	AMOUNT IN CURRENT PROGRAM ($)	UPDATED PROGRAM COST ($)	ELIGIBLE FOR DCC PROGRAM (Y/N)	REFINEMENT OF DCC PROGRAM (Y/N)	ADDITION TO DCC PROGRAM (Y/N)	TYPE OF FUNDING (1)		CONSTRUCTION BY (SURREY/ DEVELOPER)	YEAR REQUESTED
									EXISTING METHOD	PROPOSED METHOD		
172nd Str. (56-64 Ave.)	**350 mm ϕ**	**Current**	**#2420**	**$560,000**					DCCR			
172nd Str. (61A-62A Ave.)	300 mm ϕ	Update	#2420A	$280,000	$163,800	Y	Y	N		DCCR	Surrey	2006 (See Note 2)
172nd Str. (56-60 Ave.)	350 mm ϕ	Update	#2420B	$280,000	$376,650	Y	Y	N		DCCR	Surrey	2006 (See Note 3)
TOTAL				$560,000	$540,450							

NOTE: (1) Funding Methods (Current):

- DCC Rebate — DCCR
- Development Coordinated Works (Drainage, Arterial, Non-Arterial) — DCW
- Upsizing (Water, Sanitary) — UPS
- Frontage Latecomer — FLAT
- Area Latecomer (Sanitary Pump Station and Force Main) — ALAT

(2) Not required for this NCP, however remains future watermain improvement

(3) Not required for this NCP, future watermain grid improvement

TABLE 7.3K
WATER SUPPLY & DISTRIBUTION
NCP INFRASTRUCTURE FINANCING AND FUNDING (#3605)

ITEM (LOCATION)	TYPE OF WORK	CURRENT OR ADDITIONAL	ID # IN 1993 10 YEAR PLAN	AMOUNT IN CURRENT PROGRAM ($)	UPDATED PROGRAM COST ($)	ELIGIBLE FOR DCC PROGRAM (Y/N)	REFINEMENT OF DCC PROGRAM (Y/N)	ADDITION TO DCC PROGRAM (Y/N)	TYPE OF FUNDING (1)		CONSTRUCTION BY (SURREY/ DEVELOPER)	YEAR REQUESTED
									EXISTING METHOD	PROPOSED METHOD		
164th Str. (56-60 Ave.)	**300 mm ϕ**	**Current**	**#3605**	**$240,000**					DCCR			
164th Str. (60 Ave-Bell Rd)	300 mm ϕ (40% Share)	Update	#3605A	$33,600 (4)	$23,520 (7)	Y	Y	N		DCW	Developer	See Note 8
Bell Road (164 Str.- Old McLellan)	300 mm ϕ (40% Share)	Update	#3605B	$110,400 (3)	$84,000 (6)	Y	Y	N		DCW	Developer	See Note 9
57A Ave. (Old McLellan-168 Str.)	300 mm ϕ (40% Share)	Update	#3605C	$96,000 (2)	$73,920 (5)	Y	Y	N		DCW	Developer	See Note 10
TOTAL				$240,000	$181,440							

NOTE: (1) Funding Methods (Current):
- DCC Rebate
- Development Coordinated Works (Drainage, Arterial, Non-Arterial)
- Upsizing (Water, Sanitary)
- Frontage Latecomer
- Area Latecomer (Sanitary Pump Station and Force Main)

(2) Prorated - 440/1080 = 0.40 x $240,000 = $96,000 (rounded)

(3) Prorated - 500/1080 = 0.46 x $240,000 = $110,400 (rounded)

(4) Prorated - 140/1080 = 0.14 x $240,000 = $33,600 (rounded)

(5) 440 l.m. x $420/l.m. x 40% = $73,920

(6) 500 l.m. x $420/l.m. x 40% = $84,000

(7) 140 l.m. x $420/l.m. x 40% = $23,520

DCCR
DCW
UPS
FLAT
ALAT

(8) Phase 4B - (2004) for combined NCP's

(9) Phase 2A - (1999) for combined NCP's

(10) Phase 1A & 1B - (1997 & 1998) for combined NCP's

TABLE 7.3L
WATER SUPPLY & DISTRIBUTION
NCP INFRASTRUCTURE FINANCING AND FUNDING (#2417)

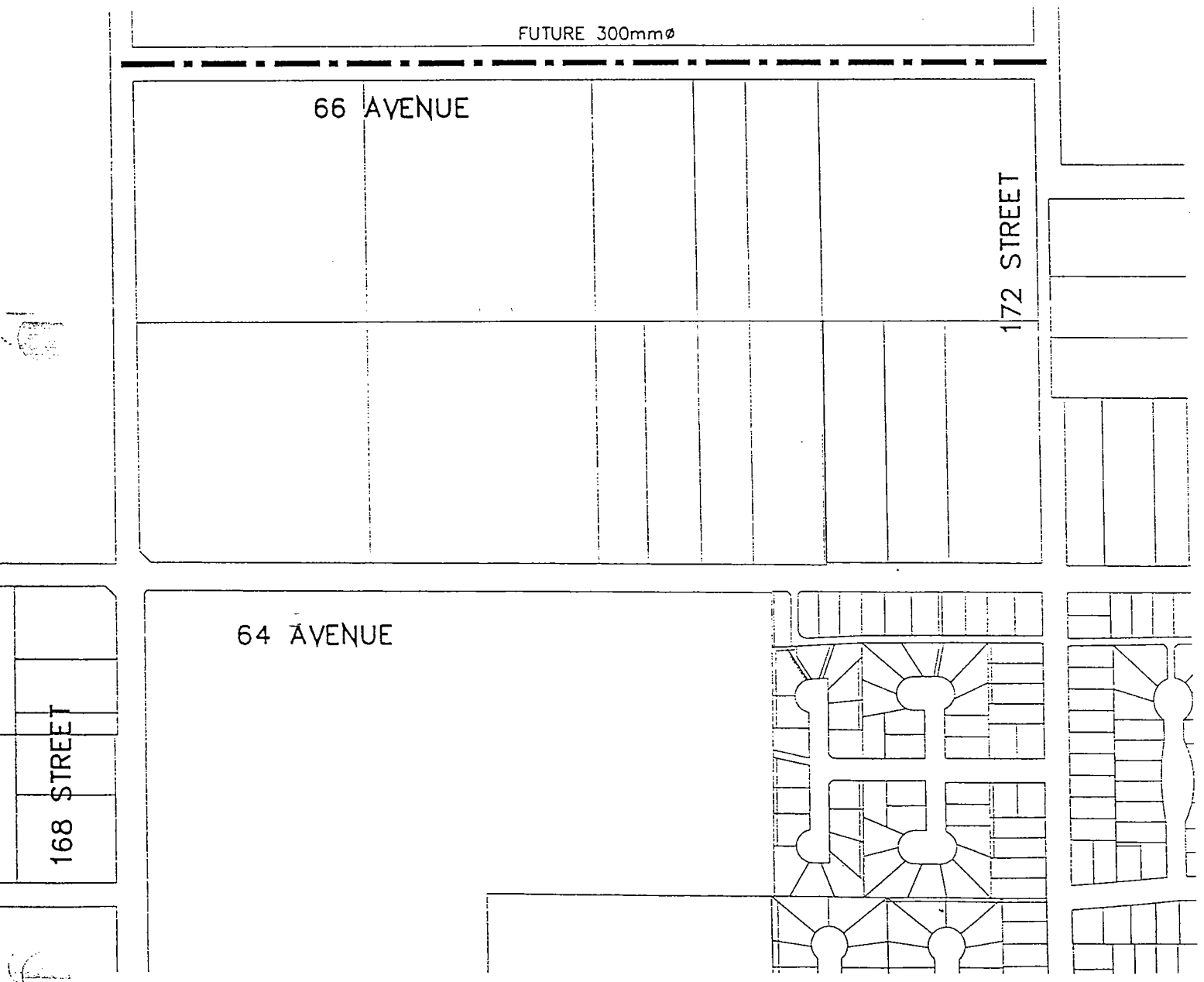
ITEM (LOCATION)	TYPE OF WORK	CURRENT OR ADDITIONAL	ID # IN 1993 10 YEAR PLAN	AMOUNT IN CURRENT PROGRAM ($)	UPDATED PROGRAM COST ($)	ELIGIBLE FOR DCC PROGRAM (Y/N)	REFINEMENT OF DCC PROGRAM (Y/N)	ADDITION TO DCC PROGRAM (Y/N)	TYPE OF FUNDING (1)		CONSTRUCTION BY (SURREY/ DEVELOPER)	YEAR REQUESTED
									EXISTING METHOD	PROPOSED METHOD		
56th Ave. (164-168 Str)	350 mm ϕ	Current	#2417	$280,000					DCCR		–	
56th Ave. (164-168 Str)	350 mm ϕ	Update	#2417		$372,000 (2)	Y	Y	N		DCCR		2006 (See Note 3)
TOTAL				$280,000	$372,000							

NOTE: (1) Funding Methods (Current):

- DCC Rebate — DCCR
- Development Coordinated Works (Drainage, Arterial, Non-Arterial) — DCW
- Upsizing (Water, Sanitary) — UPS
- Frontage Latecomer — FLAT
- Area Latecomer (Sanitary Pump Station and Force Main) — ALAT

(2) 800 l.m. x $465/l.m. = $372,000

(3) Not required for this NCP; update budget for future works



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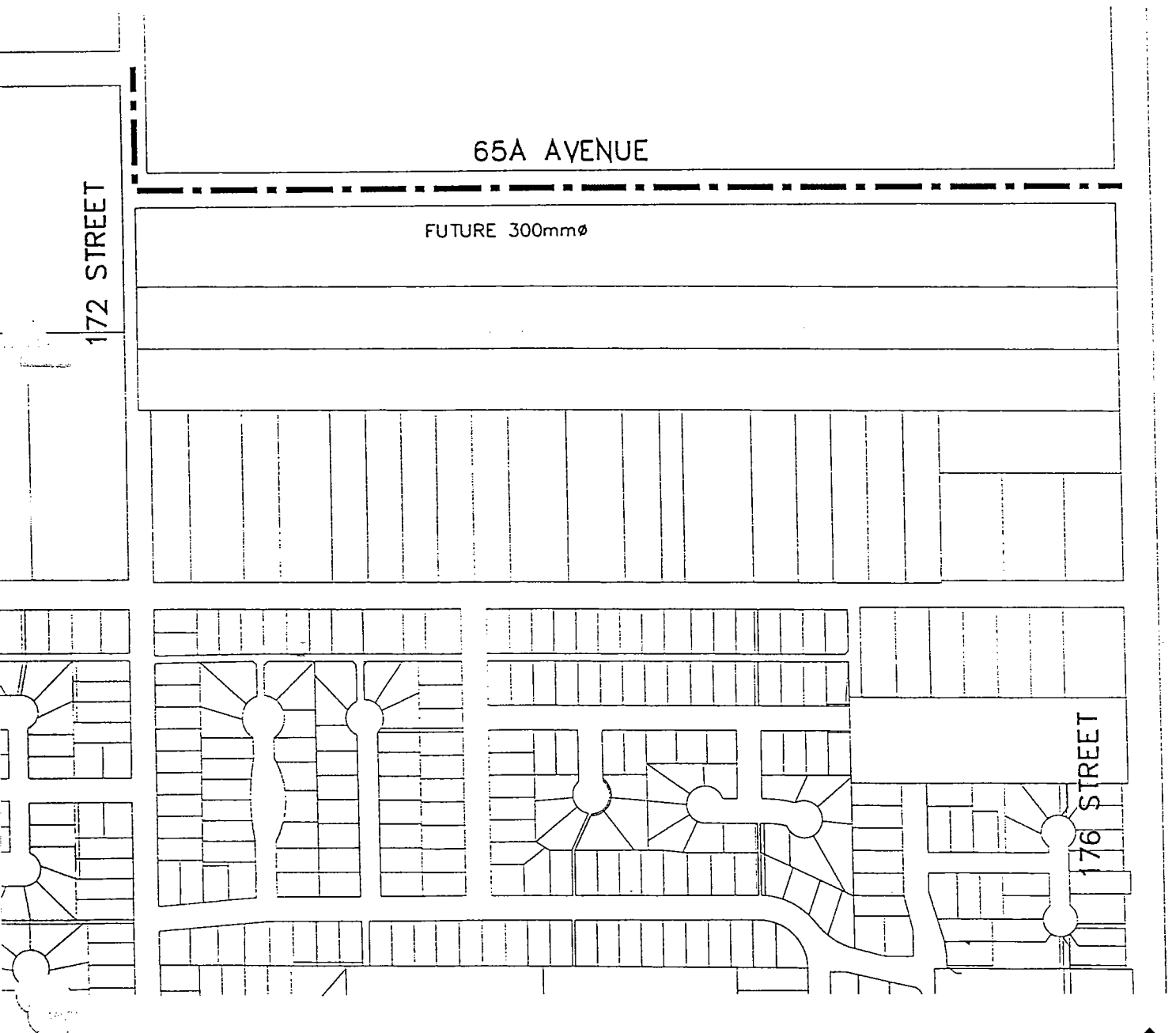
NORTH



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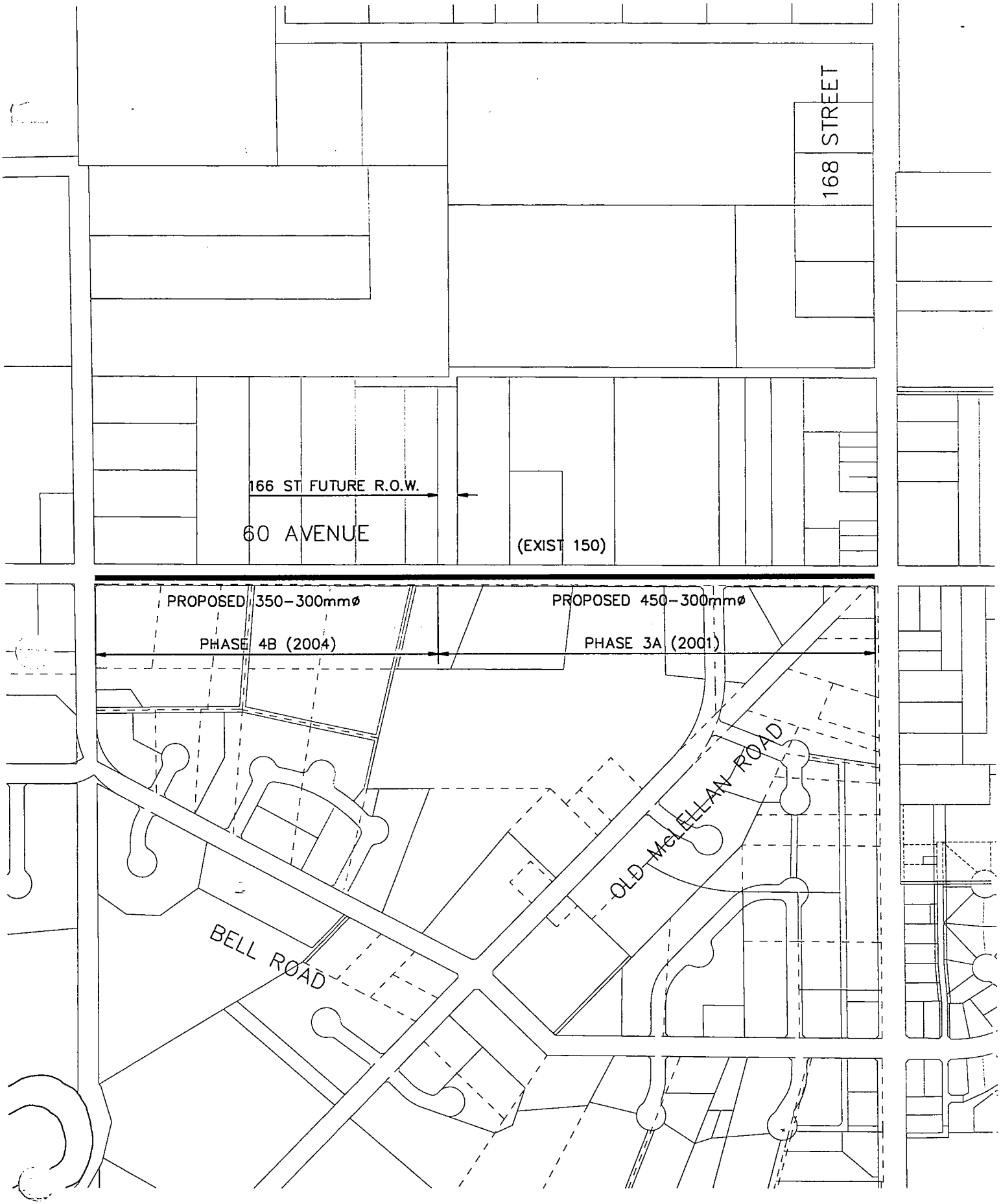
NORTH



2416A
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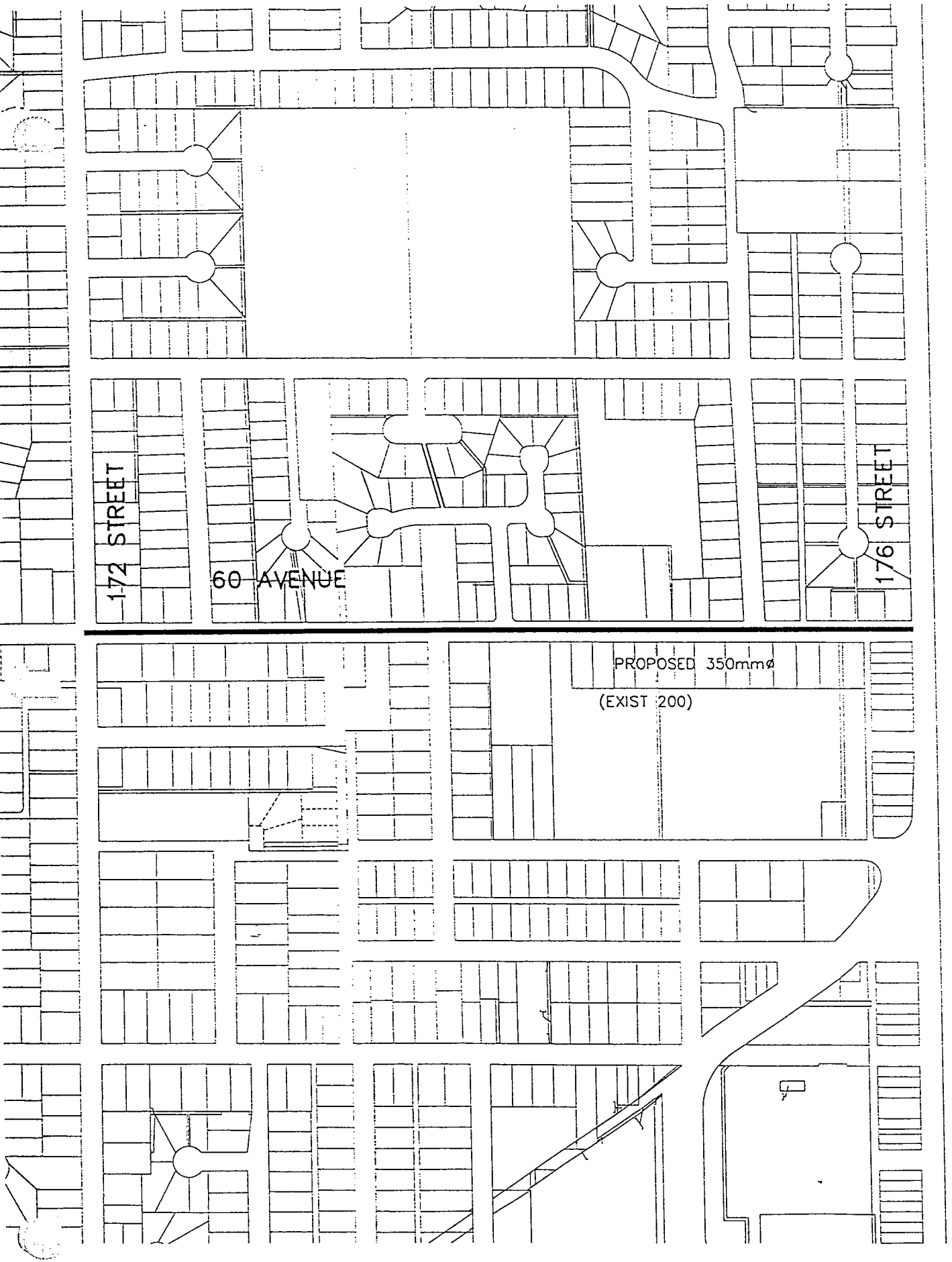
NORTH

2416B
SCALE 1:5000

NORTH



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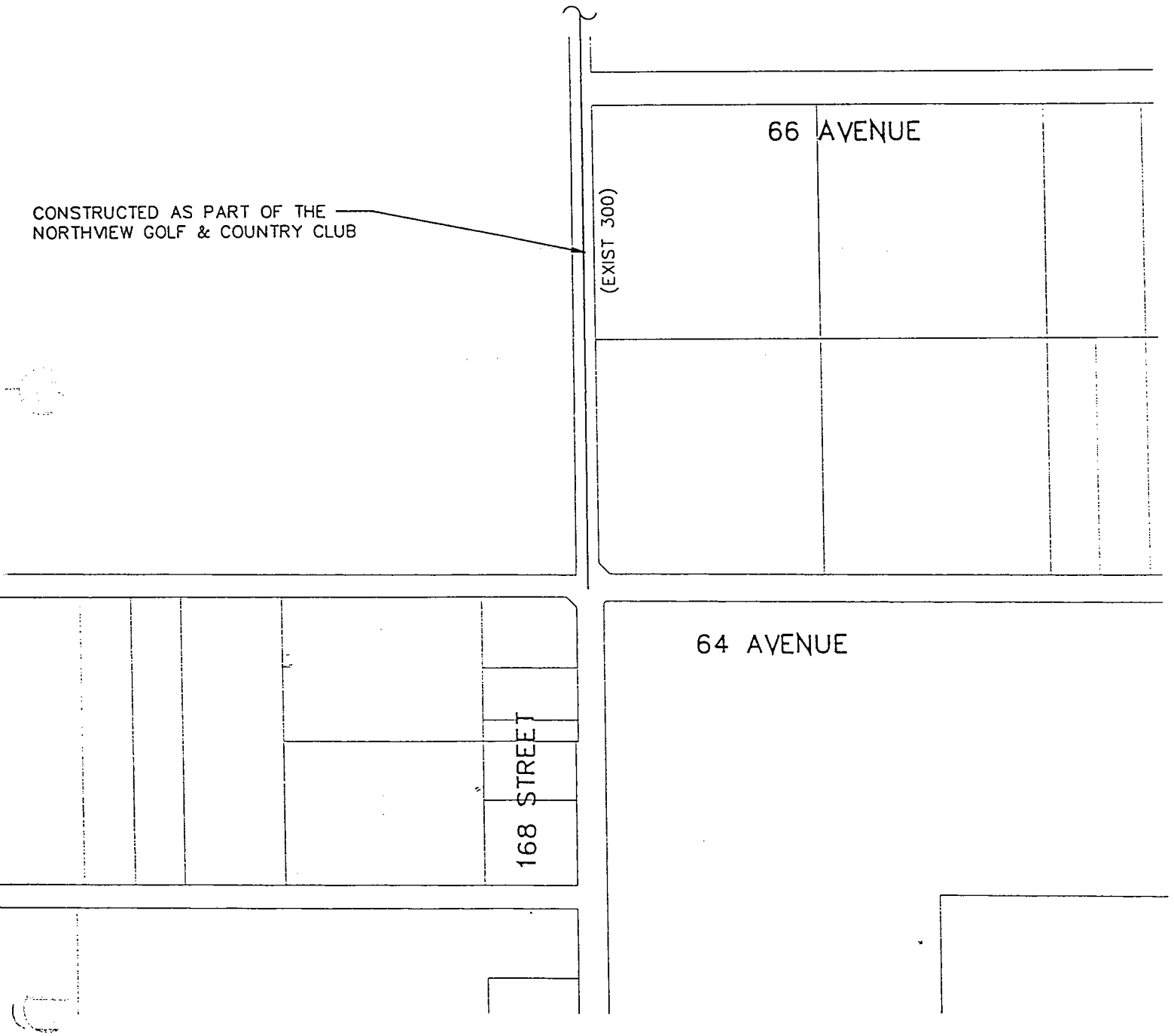
NORTH



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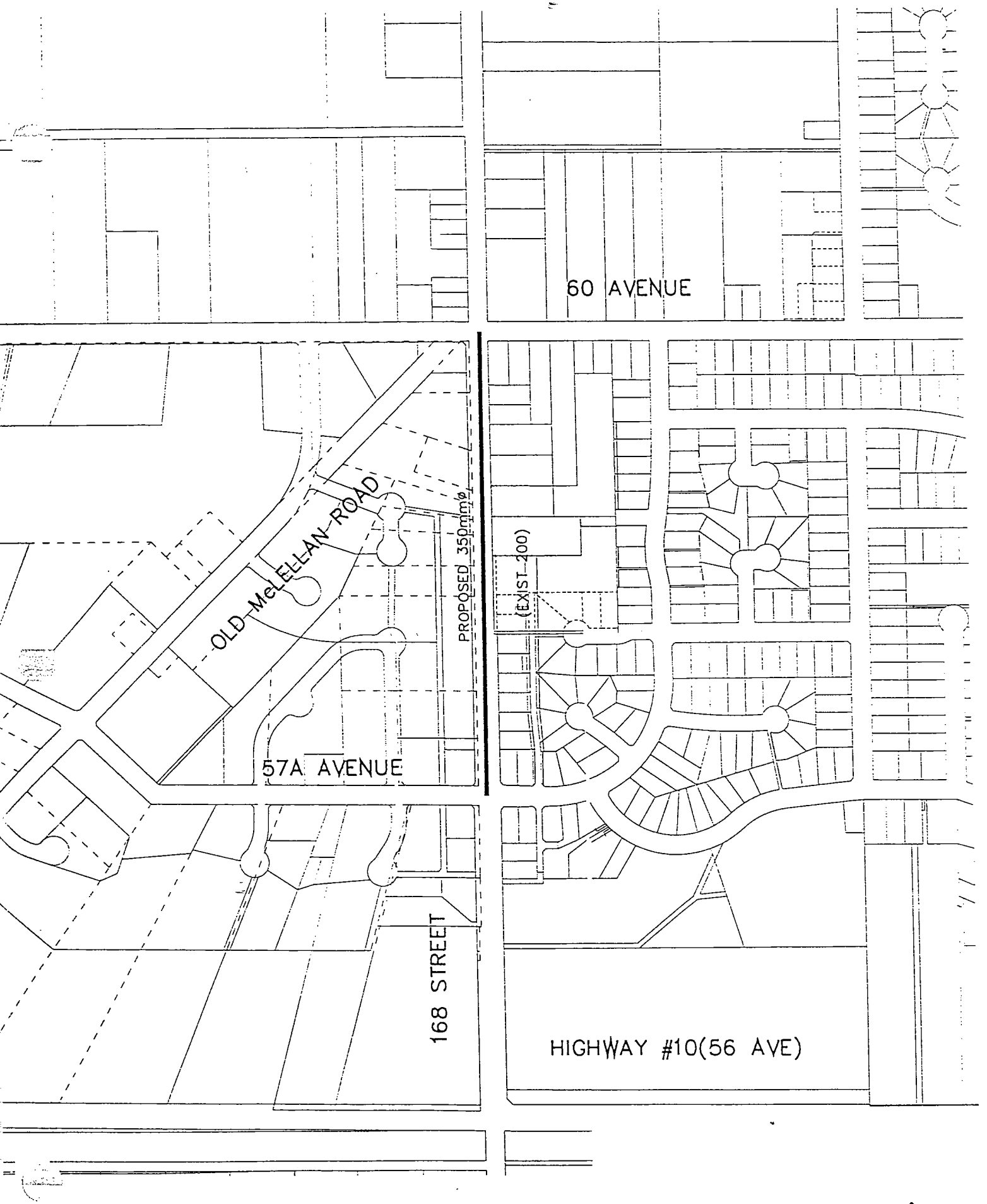
NORTH

2419B
SCALE 1:5000

NORTH



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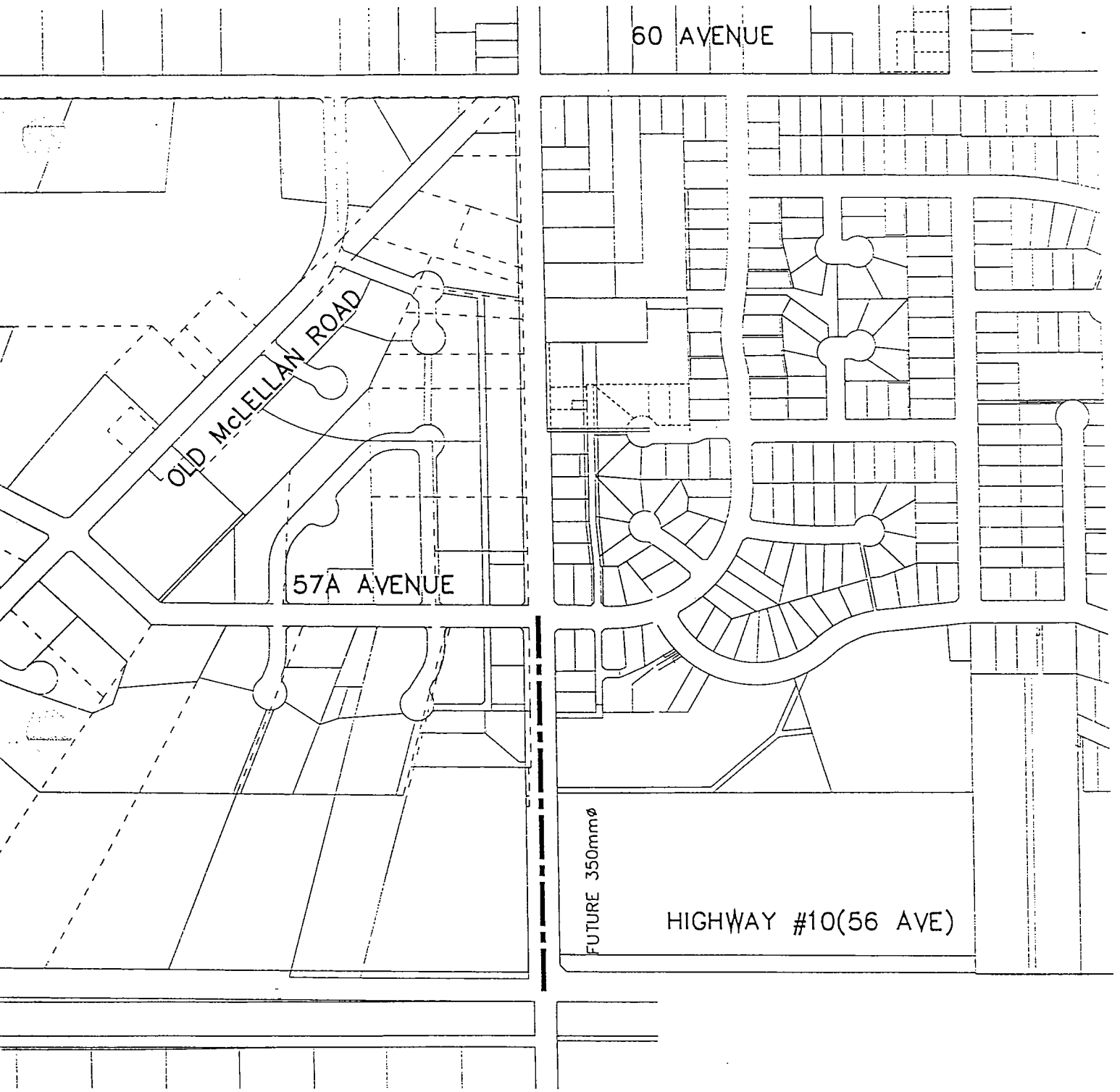
NORTH



2419D
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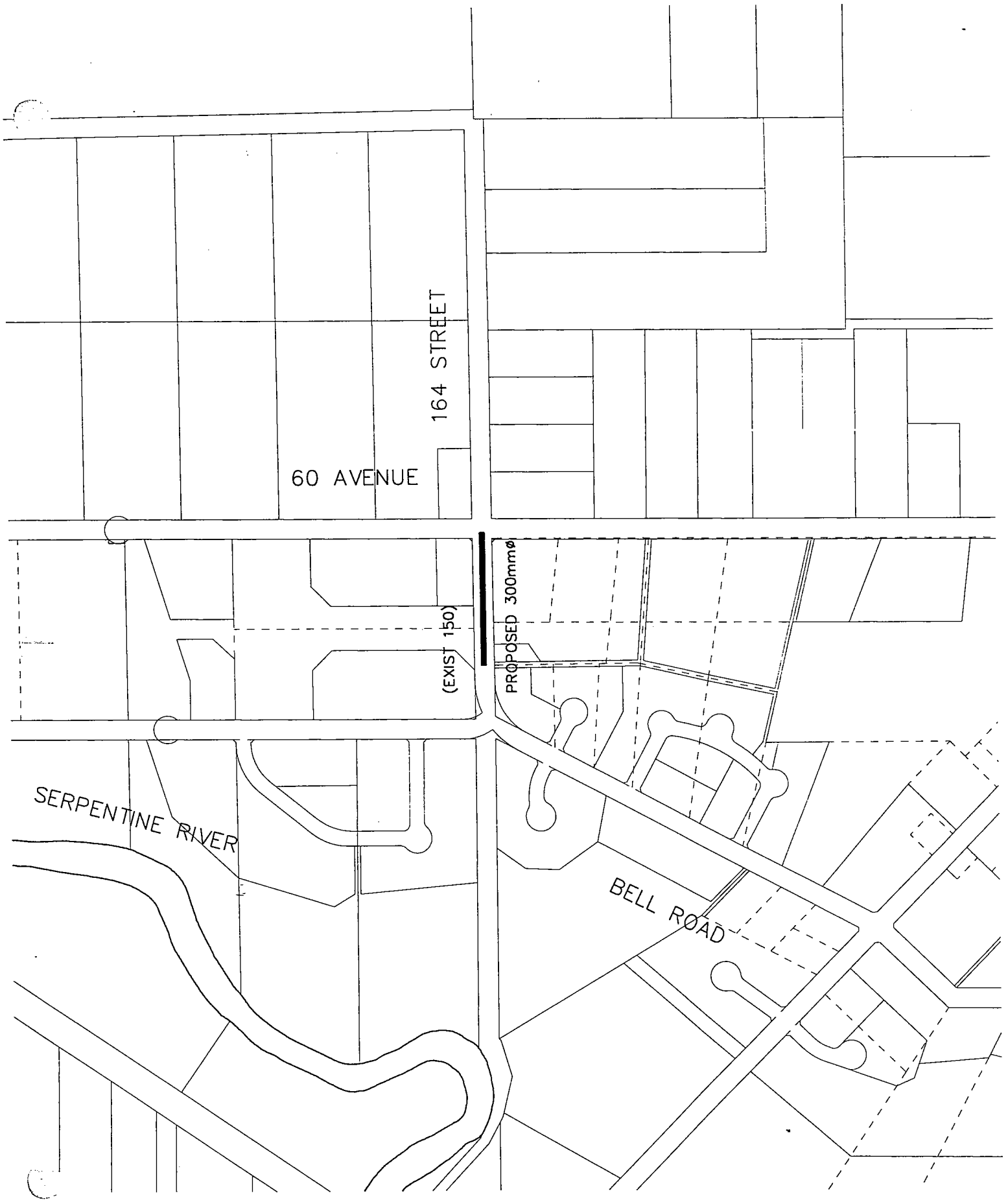
NORTH

2420A
SCALE 1:5000

NORTH

2420B
SCALE 1:5000

NORTH



3605A
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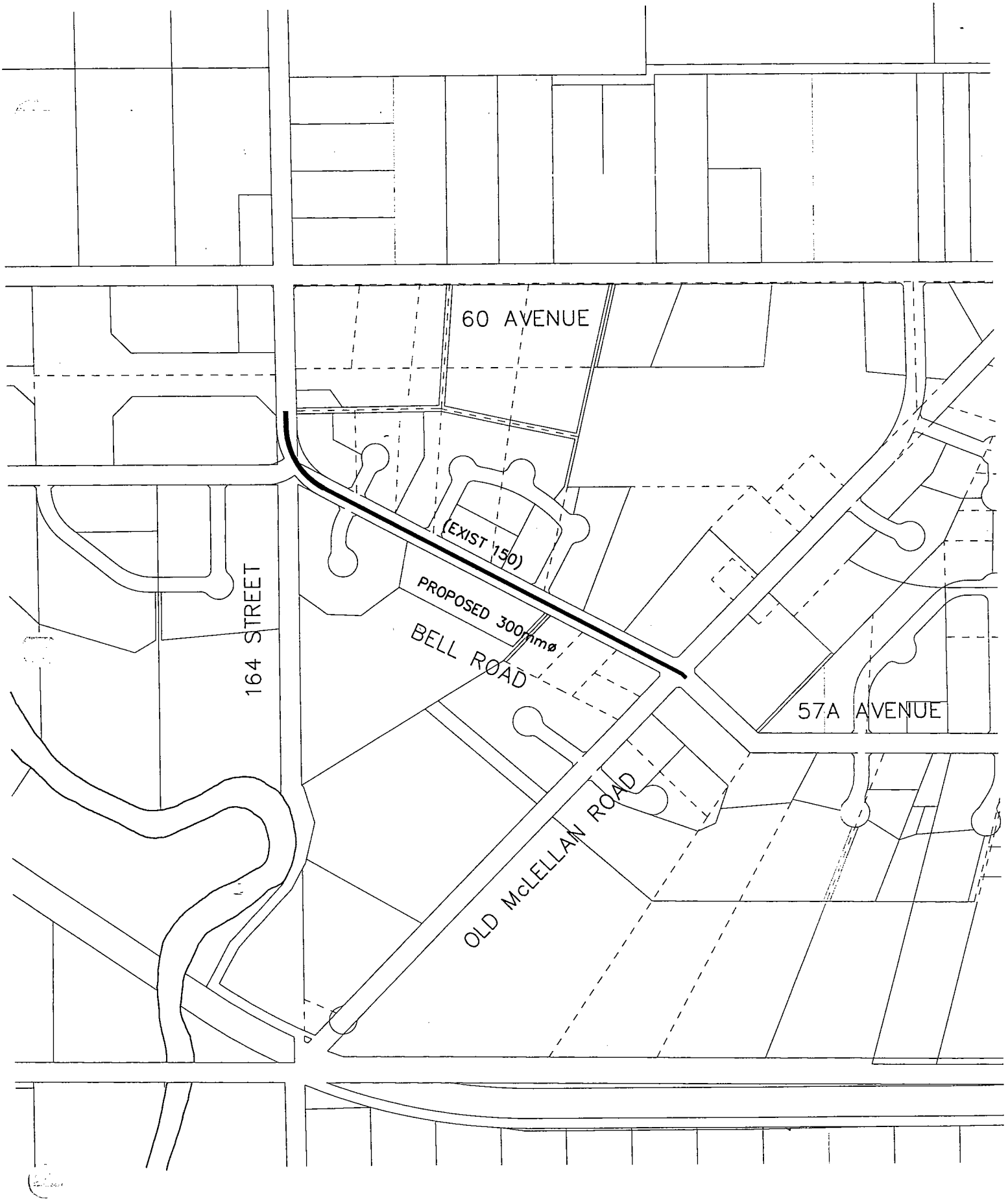
NORTH



3605B
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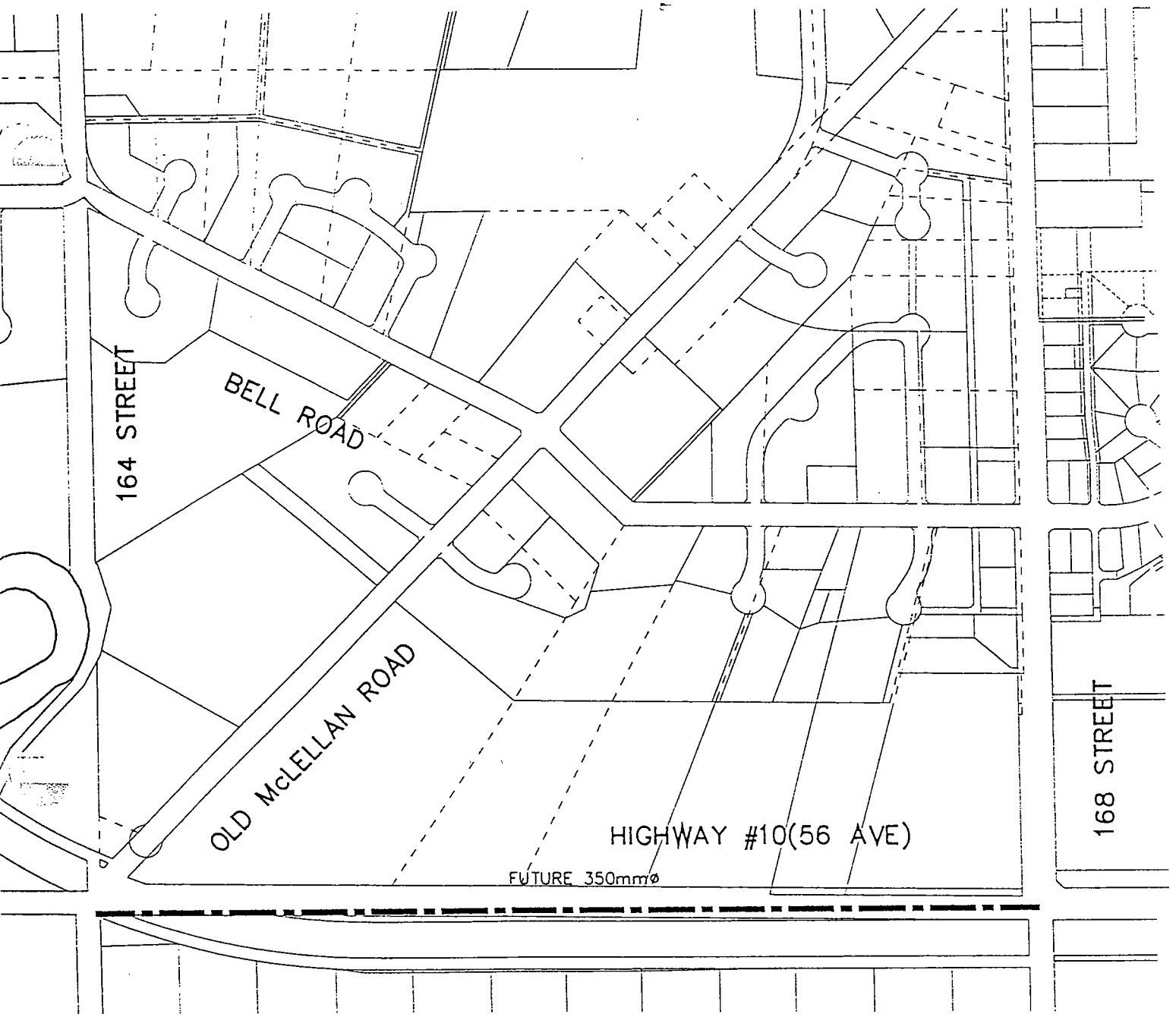
NORTH

3605C
SCALE 1: 5000

NORTH



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7.4 STORM DRAINAGE

7.4.1 10 Year Servicing Plan (June 1993)

Works included in the June 1993 City of Surrey *10 Year Servicing Plan* for drainage and stormwater detention are as follows:

TABLE 7.4A
STORM DRAINAGE - 10 YEAR SERVICING PLAN (JUNE 1993)

REFERENCE NO.	LOCATION (FROM/TO)	DESCRIPTION	ESTIMATED COST	START BEFORE	PAGE NO.	GROWTH RELATED
Drainage: Trunk System						
#4085	164 Str. at 59 Ave.	Serpentine River Dyke Tie-in	$450,000	2002	61	Yes
Drainage: Ditch Enclosure						
#2102	Old McLellan Rd (60 Ave - South)	Enclose East Ditch	$50,000	2002	77	No
#3258	168 Str. (Hwy #10 - 60 Ave.)	Ditch Elimination	$300,000 (1)	1997	78	No
	SUBTOTAL		**$800,000**	N/A	N/A	

Note:

1) It is estimated that 50% or 400 m of the 800 m length of ditch elimination from along 168th Str. from 60th Ave. south has already been completed. As such, required funding for Project #3258 = $600,000 x 0.50 = $300,000.

   Projected DCC Revenues for drainage and stormwater detention is estimated at $1,008,930 and is detailed in Table 7.4B.

2) Item #2102 and #3258 are not growth related and thus are not eligible for DCC rebates.

7.4.2 10 YEAR SERVICING PLAN (UPDATE)

Table 7.4B details projected DCC revenues for drainage and stormwater detention ($1,008,930). *Table 7.4C* provides a phase by phase breakdown of DCC revenue generated. In absence of the Serpentine River Dyke tie-in and the Branch 2 storm sewer being in place, it is proposed that each development application be responsible for providing its own interim stormwater detention in accordance with City of Surrey policy. It is proposed that interim stormwater detention facilities may be a requirement until Phase 3A (2001) or when 203 development units are in place. At this time it is anticipated approximately $428,930 in DCC revenue would be generated, which would be sufficient to cover the $398,000 cost for the Dyke tie-in and the Branch 2 storm sewer.

DCC revenues for Area B are included in the total projected revenues for the NCP south of 60 Avenue. Coastland Engineering & Surveying Ltd. has confirmed that projections for total DCC revenues generated for the NCP north of 60 Avenue are sufficient to accommodate downstream works for runoff generated from Area B.

TABLE 7.4B
DRAINAGE & STORMWATER DETENTION
PROJECTED DCC REVENUES

PROPOSED ZONE	USE	UNITS	DRAINAGE & STORMWATER DETENTION	
			DCC/UNIT	REVENUE
RF	Single Family	120	$2,120	$254,400
RHG	Cluster	10	$3,390	$33,900
RC (Half Acre)	Cluster	100	$3,390	$339,000
RC (One Acre)	Cluster	5	$3,390	$16,950
RM-10	Row Housing	50	$1,140	$57,000
RM-15	Row Housing	180	$1,140	$205,200
RM-30, 45	Apartments	20	$1,140	$22,800
RMS-1	Residential/Care (800 ft^2/Unit)	120	$664/800 ft^2	$79,680
TOTALS		**605**	**N/A**	**$1,008,930**

TABLE 7.4C
DRAINAGE AND STORMWATER DETENTION - PROJECTED DCC REVENUES & EXPENDITURES FOR WEST CLOVERDALE NCP SOUTH OF 60 AVENUE

	NCP South of 60 Avenue			Cumulative No. of Units	Cumulative DCC Revenue	Drainage and Stormwater Detention	Revenue Surplus (+ve)/ Shortfall (-ve)
Phase/Year	Zone/Units	DCC Rate $/Unit	Revenue A			Cost/Description	Cumulative (+ve/-ve)
Phase 1A - 1997	RF - 65	$2,120	$137,800			• N/A	($137,800+ve)
Subtotal	65 Units	N/A	$137,800	65 Units	$137,800	• N/A	($137,800+ve)
Phase 1B - 1998	RC (½)-25 RF - 6	$3,390 $2,120	$84,750 $12,720			• N/A	($97,470+ve)
Subtotal	31 Units	N/A	$97,470	96 Units	$235,270	• N/A	($235,270+ve)
Phase 2A - 1999	RF - 41	$2,120	$86,920			• N/A	($86,920+ve)
Subtotal	41 Units	N/A	$86,920	137 Units	$322,190	• N/A	($322,190+ve)
Phase 2B - 2000	RHG - 2 RC (½)-12	$3,390 $3,390	$6,780 $40,680			• N/A	($47,460+ve)
Subtotal	14 Units	N/A	$47,460	151 Units	$369,650	• N/A	($369,650+ve)
Phase 3A - 2001	RM (15)-52	$1,140	$59,280			• N/A	($59,280+ve)
Subtotal	52 Units	N/A	$59,280	203 Units	$428,930	• N/A	($428,930+ve)
Phase 3B - 2002	RHG - 8 RC (½)-6	$3,390 $3,390	$27,120 $20,340			• Dyke Tie-in @ Serpentine River, #4085 ($245,000) • Branch 2 Storm Sewer ($153,000)	($350,540-ve)
Subtotal	14 Units	N/A	$47,460	217 Units	$476,390	• $398,000	($78,390+ve)
Phase 4A - 2003	RC (1)-5 RC (½)-57	$3,390 $3,390	$16,950 $193,230			• N/A	($210,180+ve)
Subtotal	62 Units	N/A	$210,180	279 Units	$686,570	• N/A	($288,570+ve)
Phase 4B - 2004	RM (15)-97 RM (10)-38	$1,140 $1,140	$110,580 $43,320			• N/A	($153,900+ve)
Subtotal	135 Units	N/A	$153,900	414 Units	$840,470	• N/A	($442,470+ve)
Phase 5A - 2005	RF - 8 RM (10)-12 RM (15)-31	$2,120 $1,140 $1,140	$16,960 $13,680 $35,340			• N/A	($65,980+ve)
Subtotal	51 Units	N/A	$65,980	465 Units	$906,450	• N/A	($508,450+ve)
Phase 5B - 2006	RM (30)-20 RMS-1-120	$1,140 $664	$22,800 $79,680			• N/A	($102,480+ve)
Subtotal	140 Units	N/A	$102,480	605 Units	$1,008,930	• N/A	($610,930+ve)

7.4.3 NCP Infrastructure Financing and Funding (Storm Sewer and Stormwater Detention)

The following section provides Tables and Site Location plans detailing the various stormsewer and stormwater detention infrastructure improvements.

TABLE 7.4D
STORMSEWER & STORMWATER DETENTION
NCP INFRASTRUCTURE FINANCING AND FUNDING (#4085)

ITEM (LOCATION)	TYPE OF WORK	CURRENT OR ADDITIONAL	ID # IN 1993 10 YEAR PLAN	AMOUNT IN CURRENT PROGRAM ($)	UPDATED PROGRAM COST ($)	ELIGIBLE FOR DCC PROGRAM (Y/N)	REFINEMENT OF DCC PROGRAM (Y/N)	ADDITION TO DCC PROGRAM (Y/N)	TYPE OF FUNDING (1)		CONSTRUCTION BY (SURREY/ DEVELOPER)	YEAR REQUESTED
									EXISTING METHOD	PROPOSED METHOD		
164 Str. @ 59 Ave	Dyke Tie-In	Current	#4085	$450,000					DCCR			
164 Str. @ Serpentine River	Dyke Tie-In	Update	#4085	$450,000	$245,000	Y	Y	N		DCCR	Developer	See Note 2
TOTAL				$450,000	$245,000							

NOTE: (1) Funding Methods (Current):

- DCC Rebate — DCCR
- Development Coordinated Works (Drainage, Arterial, Non-Arterial) — DCW
- Upsizing (Water, Sanitary) — UPS
- Frontage Latecomer — FLAT
- Area Latecomer (Sanitary Pump Station and Force Main) — ALAT

(2) Phase 3B - 2002 for NCP South of 60 Avenue

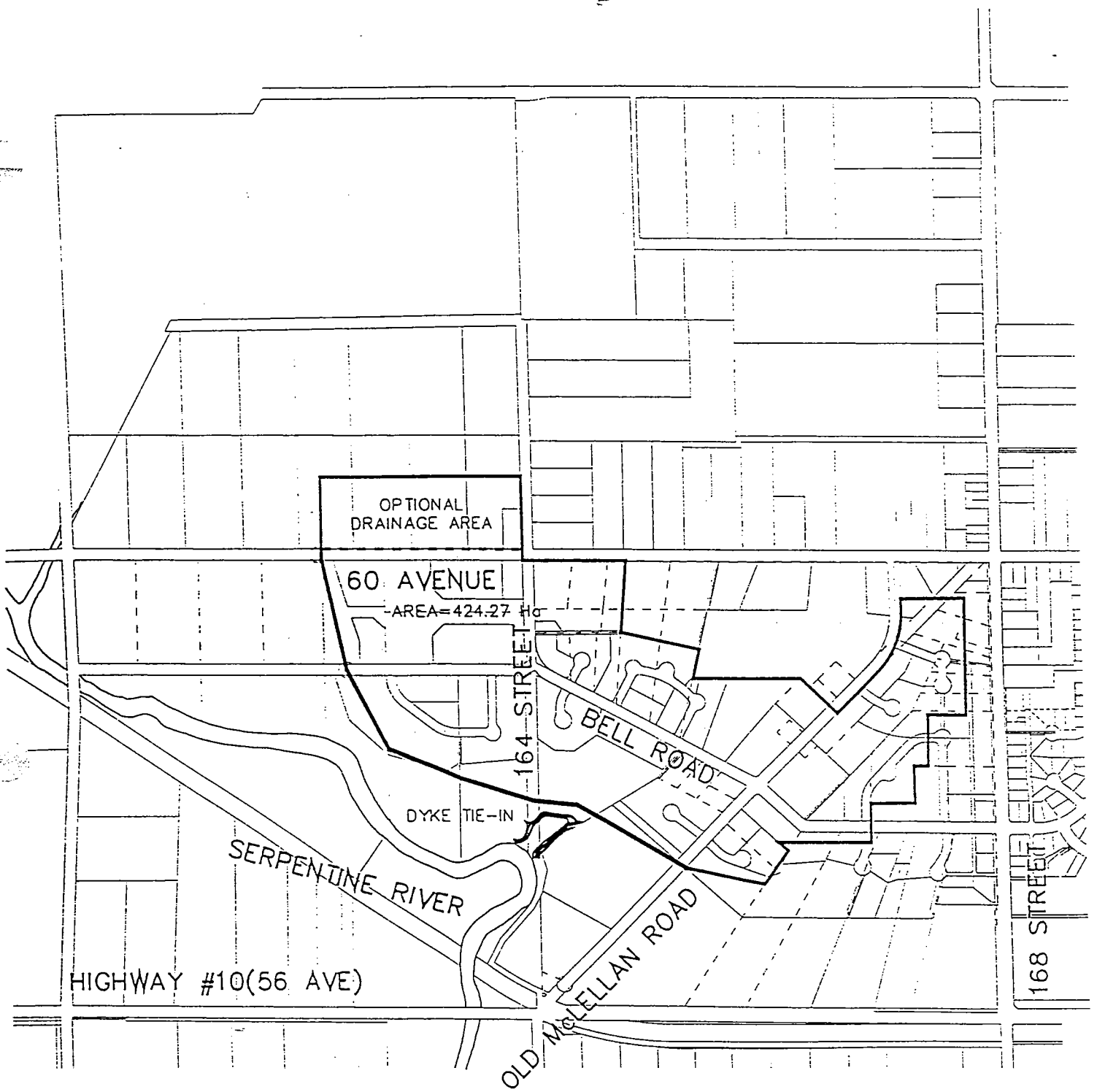
TABLE 7.4E
STORMSEWER & STORMWATER DETENTION
NCP INFRASTRUCTURE FINANCING AND FUNDING (BRANCH 2 STORM SEWER)

ITEM (LOCATION)	TYPE OF WORK	CURRENT OR ADDITIONAL	ID # IN 1993 10 YEAR PLAN	AMOUNT IN CURRENT PROGRAM ($)	UPDATED PROGRAM COST ($)	ELIGIBLE FOR DCC PROGRAM (Y/N)	REFINEMENT OF DCC PROGRAM (Y/N)	ADDITION TO DCC PROGRAM (Y/N)	TYPE OF FUNDING (1)		CONSTRUCTION BY (SURREY/ DEVELOPER)	YEAR REQUESTED
									EXISTING METHOD	PROPOSED METHOD		
Item #1 Toe-of-Slope Old McLellan Rd west to 164 Street	750 mm Ø Branch 2 Stormsewer	Additional	N/A	N/A	$153,000	Y	N	Y	N/A	DCCR	Developer	See Note 2
TOTAL				N/A	$153,000							

NOTE: (1) Funding Methods (Current):

- DCC Rebate — DCCR
- Development Coordinated Works (Drainage, Arterial, Non-Arterial) — DCW
- Upsizing (Water, Sanitary) — UPS
- Frontage Latecomer — FLAT
- Area Latecomer (Sanitary Pump Station and Force Main) — ALAT

(2) Phase 3B - 2002 for the NCP South of 60 Avenue



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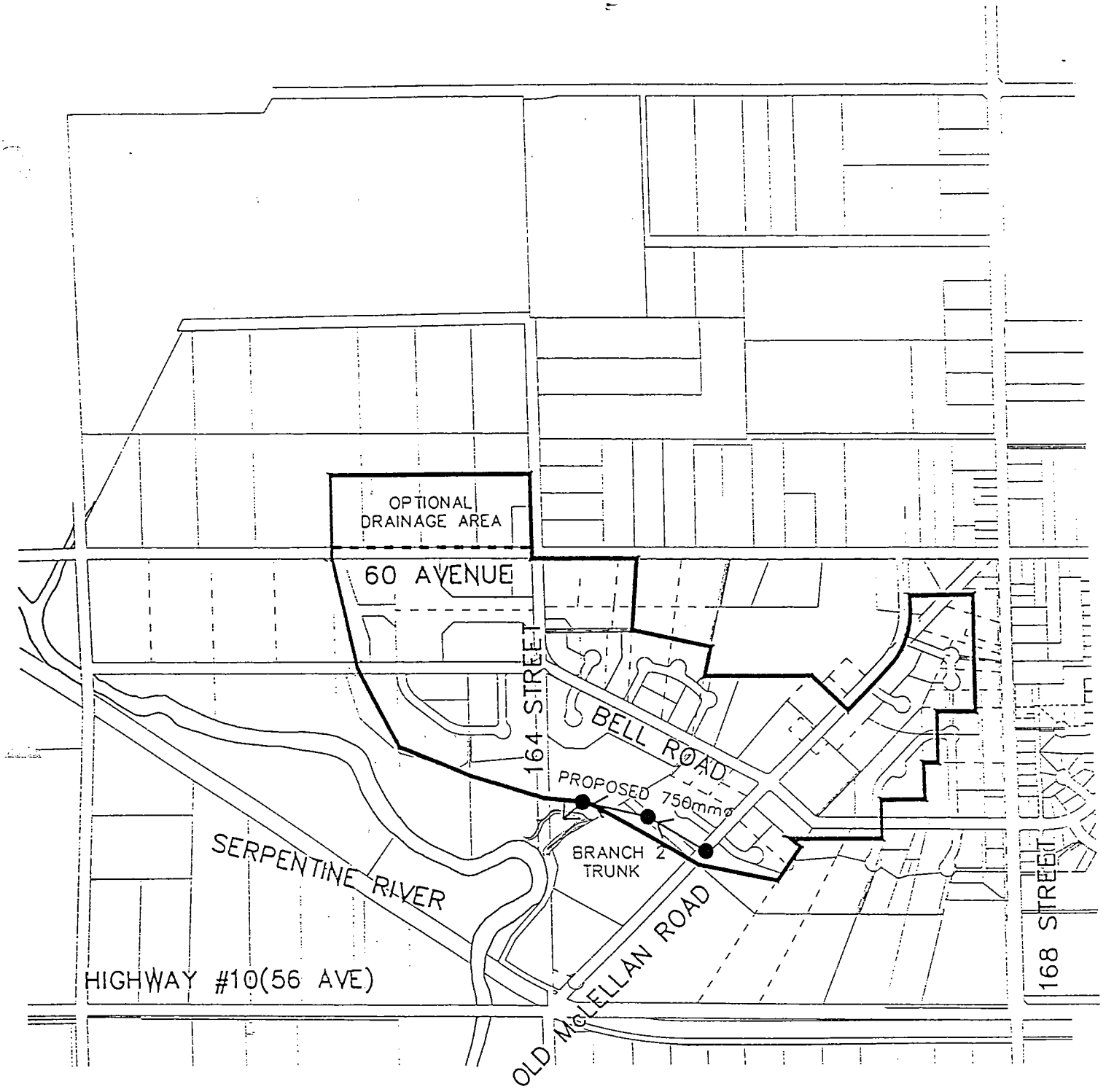

ITEM 1
BRANCH 2 TRUNK
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7.5 SANITARY SEWER

7.5.1 10 Year Servicing Plan (June 1993)

Works included in the June 1993 City of Surrey *10 Year Servicing Plan* for sanitary sewer are as follows:

TABLE 7.5A

SANITARY SEWER - 10 YEAR SERVICING PLAN (JUNE 1993)

REFERENCE NO.	LOCATION (FROM/TO)	DESCRIPTION	ESTIMATED COST	START BEFORE	PAGE NO.	GROWTH RELATED
Sanitary: Major Facility						
#3598	164 Str. & Hwy #10 to 162 Str. & 62 Ave.	West Cloverdale Servicing - 40% Share	$256,000	2002	98	Yes
#4031	168 Str. & 57A Ave. to 169 Str. & 63 Ave.	West Cloverdale Servicing	$670,000	1997	98	Yes
	SUBTOTAL		**$256,000** (1)	N/A	N/A	N/A

Note: 1) #4031 (the Richmond Sanitary Trunk Sewer) has already been completed.

7.5.2 City of Surrey - 10 Year Servicing Plan (Update)

None of the proposed sanitary sewers in the West Cloverdale South NCP area generated the 40 l/sec minimum requirement to be classified as a sanitary trunk sewer. This included oversizing for a 21.3 ± ha north of 60 Avenue. (± 158 units or 474 people)

In summary, project #3598 should be deleted in any update to the City of Surrey *10 Year Servicing Plan.* Projected DCC Revenues generated are estimated to be $448,890 and are detailed in ***Table 7.5B***. ***Table 7.5C*** provides a phase by phase breakdown of DCC revenue generated.

TABLE 7.5B
SANITARY SEWER
PROJECTED DCC REVENUES

PROPOSED ZONE	USE	UNITS	SANITARY SEWER	
			DCC/UNIT	REVENUE
RF	Single Family	120	$930	$111,600
RHG	Cluster	10	$930	$9,300
RC (Half Acre)	Cluster	100	$930	$93,000
RC (One Acre)	Cluster	5	$930	$4,650
RM-10	Row Housing	50	$810	$40,500
RM-15	Row Housing	180	$810	$145,800
RM-30, 45	Apartments	20	$810	$16,200
RMS-1	Residential/Care (800 ft^2/Unit)	120	$232/800 ft^2	$27,840
TOTALS		**605**	**N/A**	**$448,890**

TABLE 7.5C
SANITARY SEWER - PROJECTED DCC REVENUES &
EXPENDITURES FOR WEST CLOVERDALE NCP SOUTH OF 60 AVENUE

Phase/Year	NCP South of 60 Avenue			Cumulative No. of Units	Cumulative DCC Revenue	Sanitary Sewer to be Constructed	Revenue Surplus (+ve)/ Shortfall (-ve)
	Zone/Units	DCC Rate $/Unit	Revenue A			Cost/Description	Cumulative (+ve/-ve)
Phase 1A - 1997	RF - 65	$930	$60,450			• N/A	($60,450+ve)
Subtotal	65 Units	N/A	$60,450	65 Units	$60,450	• N/A	($60,450+ve)
Phase 1B - 1998	RC (½)-25	$930	$23,250			• N/A	($28,830+ve)
	RF - 6	$930	$5,580				
Subtotal	31 Units	N/A	$28,830	96 Units	$89,280	• N/A	($89,280+ve)
Phase 2A - 1999	RF - 41	$930	$38,130			• N/A	($38,130+ve)
Subtotal	41 Units	N/A	$38,130	137 Units	$127,410	• N/A	($127,410+ve)
Phase 2B - 2000	RHG - 2	$930	$1,860			• N/A	($13,020+ve)
	RC (½)-12	$930	$11,160				
Subtotal	14 Units	N/A	$13,020	151 Units	$140,430	• N/A	($140,430+ve)
Phase 3A - 2001	RM (15)-52	$810	$42,120			• N/A	($42,120+ve)
Subtotal	52 Units	N/A	$42,120	203 Units	$182,550	• N/A	($182,550+ve)
Phase 3B - 2002	RHG - 8	$930	$7,440			• N/A	($13,020-ve)
	RC (½)-6	$930	$5,580				
Subtotal	14 Units	N/A	$13,020	217 Units	$195,570	• N/A	($195,570+ve)
Phase 4A - 2003	RC (1)-5	$930	$4,650			• N/A	($57,660+ve)
	RC (½)-57	$930	$53,010				
Subtotal	62 Units	N/A	$57,660	279 Units	$253,230	• N/A	($253,230+ve)
Phase 4B - 2004	RM (15)-97	$810	$78,570			• N/A	($109,350+ve)
	RM (10)-38	$810	$30,780				
Subtotal	135 Units	N/A	$109,350	414 Units	$362,580	• N/A	($362,580+ve)
Phase 5A - 2005	RF - 8	$930	$7,440			• N/A	($42,270+ve)
	RM (10)-12	$810	$9,720				
	RM (15)-31	$810	$25,110				
Subtotal	51 Units	N/A	$42,270	465 Units	$404,850	• N/A	($404,850+ve)
Phase 5B - 2006	RM (30)-20	$810	$16,200			• N/A	($44,040+ve)
	RMS-1-120	$232	$27,840				
Subtotal	140 Units	N/A	$44,040	605 Units	$448,890	• N/A	($448,890+ve)

7.5.3 NCP Infrastructure Financing and Funding (Sanitary Sewer)

The following section provides a Table detailing the status of the various sanitary sewer infrastructure improvements.

TABLE 7.5D
SANITARY SEWER
NCP INFRASTRUCTURE FINANCING AND FUNDING (#3598)

ITEM (LOCATION)	TYPE OF WORK	CURRENT OR ADDITIONAL	ID # IN 1993 10 YEAR PLAN	AMOUNT IN CURRENT PROGRAM ($)	UPDATED PROGRAM COST ($)	ELIGIBLE FOR DCC PROGRAM (Y/N)	REFINEMENT OF DCC PROGRAM (Y/N)	ADDITION TO DCC PROGRAM (Y/N)	TYPE OF FUNDING (1)		CONSTRUCTION BY (SURREY/ DEVELOPER)	YEAR REQUESTED
									EXISTING METHOD	PROPOSED METHOD		
164 Str. & Hwy #10 to 162 Str. & 62 Ave.	West Cloverdale Servicing- 40% Share	Current	#3598	$256,000	$0.00	N	Y	N	--	--	--	See Note 2

NOTE: (1) Funding Methods (Current):

- DCC Rebate — DCCR
- Development Coordinated Works (Drainage, Arterial, Non-Arterial) — DCW
- Upsizing (Water, Sanitary) — UPS
- Frontage Latecomer — FLAT
- Area Latecomer (Sanitary Pump Station and Force Main) — ALAT

(2) Not Required
Delete this item in the 10 Year Servicing Plan Update

7.6 ROADWORKS

7.6.1 10 Year Servicing Plan (June 1993)

Works included in the June 1993 - *10 Year Servicing Plan* for roadworks are detailed in ***Table 7.6A***.

TABLE 7.6A
ROADWORKS - 10 YEAR SERVICING PLAN (JUNE 1993)

REFERENCE NO.	LOCATION (FROM/TO)	DESCRIPTION	ESTIMATED COST	START BEFORE	PAGE NO.	GROWTH RELATED
Roads: Arterial Traffic Signals						
#4557	60 Ave. at 168 Str.	Signal Replacement	$80,000	2002	11	Yes
Roads: Non-Arterial Widening						
#2101	Old McLellan (#16550 to Bell Rd)	Interim 8.5 m/sl/sw	$30,360	2002	22	Yes
#2103	Old McLellan Road (Bell Rd to School)	Interim 8.5 m/ss/sl/sw/de	$388,800	2002	22	Yes
#2104	Old McLellan Road (Hwy #10 to #16550)	Interim 8.5 m/sl/sw	$260,190	2002	22	Yes
#2105	Old McLellan Road (School to 60 Ave.)	Interim 8.5 m/sl/sw	$144,840	2002	22	Yes
Roads: Non-Arterial Paving Condition						
#3325	60 Ave. (164-168 Str.)	Repave at existing width	$88,000	1997	33	No
#3582	Old McLellan Road (Hwy #10 to Bell Rd)	Repave at existing width	$45,000	1997	36	No
#4519	57A Ave. (Bell Rd. to 168 Str.)	Repave at existing width	$44,000	2002	48	No
SUBTOTAL (ARTERIAL)			**$80,000**	N/A	N/A	N/A
SUBTOTAL (NON-ARTERIAL WIDENING GROWTH RELATED)			**$824,190**	N/A	N/A	N/A
SUBTOTAL (NON-ARTERIAL PAVING CONDITION, NON-GROWTH RELATED)			**$177,000**	N/A	N/A	N/A

7.6.2 10 Year Servicing Plan (Update)

Projected DCC revenues for arterial and major collector roadways are detailed in ***Tables 7.6B and 7.6C*** and total $2,466,240 and $627,220 respectively. No expenditures for major collector roadways are anticipated.

All non-arterial widening and non-arterial paving condition projects as identified in **Table 7.6A** should be deleted from any update to the City of Surrey 10 Year Servicing Plan. The project reference no.'s include the following; #2101, 2103, 2104, 2105, 3325, 3582, and 4519.

TABLE 7.6B
ARTERIAL ROADS
PROJECTED DCC REVENUES

PROPOSED ZONE	USE	UNITS	ARTERIAL ROADS	
			DCC/UNIT	REVENUE
RF	Single Family	120	$4,800	$576,000
RHG	Cluster	10	$4,800	$48,000
RC (Half Acre)	Cluster	100	$4,800	$480,000
RC (One Acre)	Cluster	5	$4,800	$24,000
RM-10	Row Housing	50	$4,800	$240,000
RM-15	Row Housing	180	$4,800	$864,000
RM-30, 45	Apartments	20	$4,800	$96,000
RMS-1	Residential/Care (800 ft^2/Unit)	120	$1,152/800 ft^2	$138,240
TOTALS		**605**	**N/A**	**$2,466,240**

TABLE 7.6C
MAJOR COLLECTOR ROADS
PROJECTED DCC REVENUES

PROPOSED ZONE	USE	UNITS	MAJOR COLLECTOR ROADS	
			DCC/UNIT	REVENUE
RF	Single Family	120	$1,220	$146,400
RHG	Cluster	10	$1,220	$12,200
RC (Half Acre)	Cluster	100	$1,220	$122,000
RC (One Acre)	Cluster	5	$1,220	$6,100
RM-10	Row Housing	50	$1,220	$61,000
RM-15	Row Housing	180	$1,220	$219,600
RM-30, 45	Apartments	20	$1,220	$24,400
RMS-1	Residential/Care (800 ft^2/Unit)	120	$296/800 ft^2	$35,520
TOTALS		**605**	**N/A**	**$627,220**

7.7 CASH FLOW ANALYSIS

7.7.1 General

The City of Surrey has taken the position that each NCP must ensure that the short term DCC revenues and expenditures must balance. The implication of this is that should a large expenditure be required, such as a watermain or trunk sewer extension, the NCP must have contributed enough DCC's to fund the extension or develop an alternative new revenue source. It is from this framework that the NCP reviewed various servicing strategies.

The financial strategy for the major infrastructure services adjacent to the West Cloverdale South NCP is based on the following assumptions:

- While various projects meet the criteria established by the City of Surrey for DCC projects, the City is not in a financial position to "front end" the infrastructure projects in the short term which are required for development to proceed. Therefore, any shortfall in development cost charge revenues will have to be made up by financial contributions of developers in order for projects to proceed. In the long term, sufficient DCC revenues would be generated to offset servicing costs of major servicing projects (i.e. DCC projects).

- In view of the extensive financial involvement by developers in front ending the projects, the City is working towards a policy which would allow development cost charge revenues paid by subsequent developers to be used to compensate the initial developers who have "front ended" projects. The new policy is not in place and has not been assumed in any financial analysis.

The strategy for the phasing of the development and meeting the financial constraints of the NCP are as follows;

- Defer major costs for as long possible in view of potential cash flow issue for developers "front ending" services. This will optimize the available capacity in the existing services. This is the rationale used in the development phasing which maximizes single family development areas extending along 57A Avenue and Bell Road.

- Where there are insufficient funds for specific projects required for development, developers would pay for the required projects and would receive DCC credits as per the current DCC policy. Note, the City of Surrey collects DCC's on a city

wide basis. The City can decide where funds are to be expended annually and therefore can prioritize specific works in an NCP.

- Five development phases have been proposed to avoid major cash flow problems for developers. Phasing is preliminary in that land in subsequent phases can be developed provided that developers pay for the required infrastructure projects up front.

- Should the expanded DCC rebate policy be adopted by Council, it would likely only apply to significant DCC elements, (e.g. elements of approximately $1 million or more in value). This would have no direct impact on this NCP.

As part of the cash flow analysis, various development scenarios were investigated. The unit prices used for this analysis are included in ***Appendix B***. The principle used in the phasing incorporates development westward from 168 Street and buildout of single family areas at the project onset.

7.7.2 Watermain - Financing Options

Overview

Two watermain financing options were reviewed for this project. Option 1 reviews revenues and expenditures for the NCP area South of 60th Avenue (as a stand-alone NCP project). Option 2 reviews revenues and expenditures for the West Cloverdale NCP's, North and South of 60th Avenue.

Option 1 (NCP South of 60th Avenue)

Table 7.3C details revenue and expenditures for the NCP south of 60th Avenue. This analysis is based on the assumption that approval of the NCP north of 60th Avenue will be delayed for an indefinite period of time. Projected DCC revenues total $518,130 for an estimated 605 units. Expenditures total $1,262,025. Please note, this total differs from Option 2 in expenditures is that the 300 ∅ watermain along 164th Street, Bell Road, 57A Avenue was determined to be eligible for oversizing in Option 2. In absence of a 300 ∅ grid watermain being in place north of 60th Avenue, and west of 168th Street, a 300 ∅ watermain (minimum size) would be required for Option 1 if it is to be considered as a stand-alone NCP. Furthermore, in Option 1, a 300 ∅ watermain was required to ensure flows for the development area, north of

60th Avenue. In Option 1, a 300 ∅ watermain is required because various grid mains are not anticipated to be in place. A revenue deficit is projected in Phases 3A - 5B (Year 2001 to 2006) for Option 1.

In Phase 3A, ± 150 single family units will have been completed along 57A Avenue and Bell Road (Phase 1A, 1B, 2A, and 2B). This generate $161,570 in revenue. Expenditures in Phase 3A are estimated at $449,925 for a 350 ∅ watermain along 168th Street (from 64th - 60th Avenue) leaving a cash flow deficit of $239,475. Assuming the NCP north of 60th Avenue is not in place, it is unlikely additional development will occur unless offsite grid watermains are installed by the City of Surrey. City of Surrey's policy is not to front-end any work within any NCP to allow development to proceed. Thus, it is our understanding that the City will only construct offsite grid watermains at their priority. Therefore, these watermains will not be constructed by the City in the foreseeable future and will result in delays in future development. The estimated cost and timing of these works to facilitate continuous NCP development are as follows;

OPTION 1 (NCP SOUTH OF 60TH AVENUE)

PHASE/YEAR	LOCATION/DESCRIPTION	ESTIMATED COST
3A - 2001	805 l.m. - 350 ∅ W.M. 168 Str. (60 - 64 Ave.) #2419B	$374,325
5A - 2005	810 l.m. 350 ∅ W.M. 60 Ave (168 - 172 Str) #2416B	$376,650
5B - 2006	810 l.m. 350 ∅ W.M. 60 Ave (170 - 172 Str) #2416C	$376,650
	SUBTOTAL	**$1,127,625 (1)**

Note (1) This total does not include onsite watermain oversizing which amounts to $134,400.

As a result of the cash flow deficit for watermain works, a second financing option (2) was explored. This option is detailed in the following paragraphs.

Option 2 (NCP's North and South of 60th Avenue)

Table 7.3D presents the revenue and expenditures for the combined NCP areas. Projected DCC revenue totals $2,081,570 for an estimated 2,180 units. Expenditures are estimated at $1,473,705 with a positive revenue surplus of $607,865 at buildout. A detail cash flow analysis indicated a minimum revenue surplus of $189,980 in Phase 1A (Year 1997). The peak revenue surplus is at development completion, Phase 5B (Year 2006) at $607,865. A positive cash flow for DCC rebateable watermain works has been achieved for all development stages.

Based on this analysis, the estimated cost and timing of the various offsite grid watermains are as follows.

OPTION 2 (NCP'S NORTH AND SOUTH OF 60TH AVENUE)

PHASE/YEAR	LOCATION/DESCRIPTION	ESTIMATED COST
1997	430 l.m. - 350 ∅ W.M. 168 Str. (60 - 64 Ave.) #2419B	$199,950
1998	170 l.m. - 350 ∅ W.M. 168 Str. (60 - 64 Ave.) #2419B	$79,050
2000	205 l.m. - 350 ∅ W.M. 168 Str. (60 - 64 Ave.) #2419B	$95,325
2001	810 l.m. - 350 ∅ W.M. 60 Ave. (168 - 172 Str.) #2416B	$376,650
2004	810 l.m. - 350 ∅ W.M. 60 Ave. (172 - 170 Str.) #2416C	$376,650
	SUBTOTAL	**$1,127,625 (1)**

Note (1) This total does not include onsite watermain oversizing which amounts to $345,980.

7.7.3 Sanitary Sewer

The annual cash flow analysis for sanitary sewer works is positive. The long term cash flow from the DCC revenues and expenditures proposed in the NCP has a surplus of $448,890. None of the sanitary sewers proposed to be constructed in the NCP study area are eligible for DCC rebates.

7.7.4 Drainage and Stormwater Detention - Financing Options

Overview

The Branch 2 storm sewer and the Serpentine River dyke tie-in total $398,000 and are DCC rebateable items. The Branch 2 storm sewer ($153,000) is a new item recommended for inclusion in a 10 Year Servicing Plan Update. The dyke tie-in ($245,000), is part of the current (1993) 10 Year Servicing Plan (#4085). The objective of the following analysis detailing financing options is to obtain a positive short term cash flow between projected DCC Revenues and Expenditures. Four (4) options were investigated and are described in the following section. Option 3 was recommended and endorsed by the steering committee for this NCP project at the December 3, 1996 meeting.

Option 1

Option 1 evaluated the construction of the Branch 2 storm sewer and the Serpentine River dyke tie-in in conjunction with Phase 1A works. Phase 1A has an estimated 65 units (RF) and generates a total of $137,800 in revenue. Estimated expenditures total $398,000; thus a cash shortfall of $260,200.

When considering the size of Phase 1A, and the fact the developer would only get back what he payed into DCC's for drainage works, the feasibility of this development area proceeding by itself was considered limited. A cash shortfall of $260,200 equates to approximately $4,000/lot and would not be feasible for such a small development area. It should be noted that, only 35 ± of the estimated total of 65 units are to drain west to the Serpentine River dyke tie-in. As such, it would be difficult to justify such a cost increase for initial development stages for areas that do not benefit directly from the dyke tie-in. The remaining ± 30 lots in Phase 1A are proposed to drain east to 168th Street.

Option 2

Option 2 is very similar to Option 1 except it has been assumed that development of Phase 1A and 1B occur concurrently. At the end of Phase 1B, the cummulative number of units is estimated at 96 with a total DCC revenue generated of $235,270. This amounts to a cash shortfall of $162,730 or $1,695/lot. Although financially more

favorable than Option 1, the feasibility of this development scenario proceeding was also viewed as limited.

Option 3

Option 3 evaluated the impact of delaying the dyke tie-in and Branch 2 storm sewer until Phase 3B. An estimated 203 units would have been constructed with a cummulative DCC revenue of $428,930. This would be sufficient to undertake the required works.

To accommodate this option, various interim detention storage facilities have been proposed (**Figure 15**). Anywhere from 3 - 5 interim detention ponds may be required (**Table 7.7A**). Pond 1A would be required for the western portion of Phase 1A. If Phase 1A and 1B occur concurrently, a single larger pond (1B) would only be required. Table 7.7A provides a summary of interim detention facilities. Phase 2A would require an interim pond along Bell Road. This interim pond requires a working agreement to service/develop adjacent land parcels concurrently. Based on the anticipated "local" road layout for the area, this appears to be a logical assumption.

Detention facility 3A is on City owned land (cemetery) and may very well be delayed past Phase 3A or may not be required if the NCP development to the north has been approved and drainage works are in place at the time of development. Detention facility 3B is also contingent on the NCP to the north. If downstream works north of 60th Avenue are in place, 3A and 3B may never be required. Because of the limited size of the drainage catchment areas underground storage facilities may be more appropriate for these areas.

In summary, Ponds 1A and 1B have potential to be combined into a single location (1B). Pond 2A, similar to Pond 1A and 1B, require the cooperation of adjacent land owners. Detention storage facilities for 3A and 3B would only be required if the downstream drainage works for the NCP north of 60th Avenue are not in place. This gives us 2, potentially 3 more interim detention facilities assuming the dyke tie-in can be delayed until Phase 3B.

Siltation control is a standard requirement of all land development projects. This typically can be achieved by construction of a dry bottom detention facility with filter rock/cloths in accordance with Ministry of Environment standards. Detention storage

for the 2 year event is also required. It is proposed that the siltation control pond be modified to incorporate the 5 year detention storage volume as opposed to the 2 year Ministry of Environment requirement. The incremental cost to construct such a facility would be minimal, however the overall maintenance requirements would be higher as the maintenance period would be extended to coincide with the construction of the Branch 2 storm sewer and the Serpentine River dyke tie-in. The effected lot(s) would remain undevelopable until the interim pond was removed.

TABLE 7.7A

INTERIM DETENTION FACILITIES

POND NO.	CATCHMENT AREA (HA)	ESTIMATED INTERIM STORAGE VOLUME (m^3) (2)	METHOD OF STORAGE/ DETENTION	AREA REQUIREMENT	ESTIMATED YEAR OF CONSTRUCTION	ESTIMATED YEAR OF REMOVAL	INTERIM STORAGE REQUIRE-MENT (YEARS)
Pond 1A	2.15	430	Interim Pond	• 1 RF Lot	Phase 1A - 1997	2002	5
Pond 1B	1.54 (2.64)	308	Interim Pond	• In RC ½ Lot Open Space	Phase 1B - 1998	2002	4
Pond 1B (1A & 1B combined)	3.69	738	Interim Pond	• In RC ½ Lot Open Space	Phase 1A & 1B - 1998	2002	4
Pond 2A	3.87	774	Interim Pond	• 1 - 2 RF Lots	Phase 2A - 1999	2002	3
Pond 3A	0.51	102	Underground Storage	• RM-15	Phase 3A - 2001	2002	See Note 1
Pond 3B	1.34	268	Underground Storage or Interim Pond	• RM-15	Phase 3A - 2001	2002	See Note 1

Note 1) Interim detention storage is a function of the construction timing of downstream works north of 60th Avenue

Note 2) Interim storage is based on a minimum of 200 m3/ha of development

It is estimated that Ponds 1A and 1B would have interim detention storage requirements of 4 - 5 years. Assuming a 3 year time frame (initial construction year and a 1½ - 2 year buildout timeframe to achieve 90% of the building construction) interim storage requirements may extend 1 - 2 years longer than that of a standard siltation control pond.

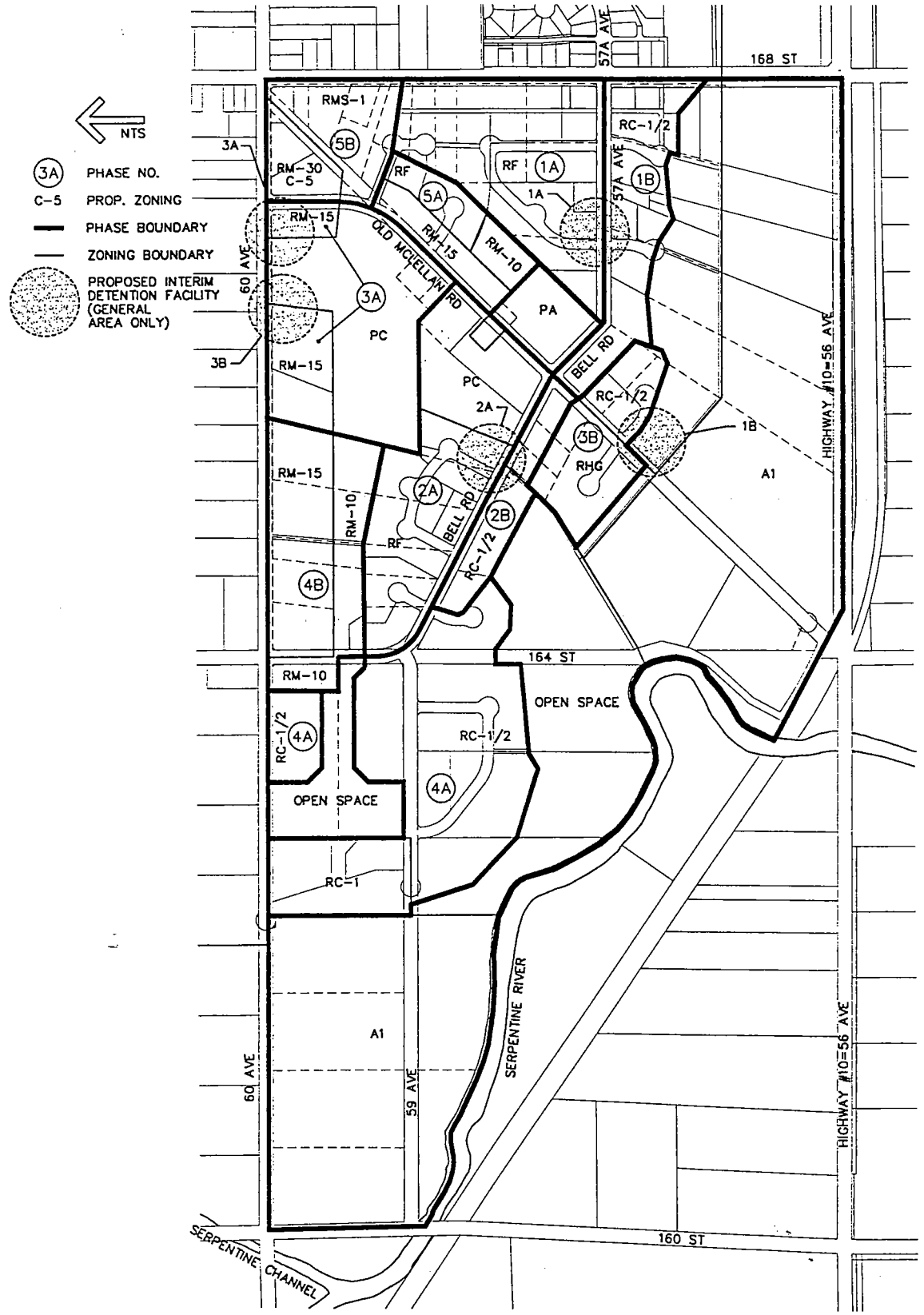


FIGURE 15: INTERIM DETENTION PONDS

In addition, it should be noted that Pond 1B, 3A and 3B fall outside the minimum size of 2.0 Ha for an interim pond. As such, 3A and 3B have been proposed as an underground storage facility. Pond 1B, as a stand-alone pond, would accommodate ± 1.54 Ha of new development in a 2.64 ± Ha catchment area.

Option 4

Option 4 considers the implementation of a "Drainage Levy" for all areas draining to the Serpentine River dyke tie-in. An estimated 340 of the 605 total development units fall within this category. The Drainage Levy would be recoverable over an estimated 10 year period and is based on the following calculations. Please note, the $765/unit "Drainage Levy" does not include any allowances for contingencies, financing and/or carrying charges.

• Construction cost of Serpentine River dyke tie-in and Branch 2 Storm Sewer	$398,000
• Phase 1A-DCC revenue for 65 RF units @ $2,120/unit	$137,800
• Cash shortfall	$260,200
• Estimated no. of units draining to dyke tie-in	340
• Drainage Levy/unit	$765/unit

Summary

Option 3, the construction of interim detention facilities was endorsed by the Steering Committee at the December 3, 1996 meeting and reconfirmed at the January 8, 1997 public information meeting.

Serpentine Dyke Tie-in Construction Phasing

The estimated total cost of the Serpentine River dyke tie-in is $245,000. This cost include allowances for 0.35 HA of potential land acquisition ($105,000) should it be required, dyke modifications and erosion protection ($80,000) and the construction of a water quality feature ($60,000).

Upon further review, it may be considered possible to stage the construction of ultimate Serpentine River dyke tie-in. An interim stormsewer alignment extending within the existing 164th Street R.O.W. directly into the Serpentine River may be

feasible. As such, it may be possible to defer initial expenditures for land acquisition, dyke modification, erosion protection, etc. until later, when additional DCC revenue is available. Please note, a staged construction approach to the Serpentine River dyke tie-in is a preliminary concept that will require a detail field survey to confirm location and hydraulics, and endorsement from approving authorities from B.C. Environment, and the Department of Fisheries and Oceans and the City of Surrey Engineering Department.

7.7.5 Roadworks

General

Tables 7.6B and **7.6C** presented the projected revenues for arterial and major collector roads. No major collection roads fall within the NCP study area and as such none of the proposed roadways are eligible for DCC rebates. The projected DCC revenues for arterial and major collector roads are $2,466,240 and $627,220 respectively.

Old McLellan Road

Old McLellan Road, from 60th Avenue southwest to the southern limit of the school property is an existing 7.50 m ± wide asphalt road. This section of roadway appears to be a relatively good condition and also has an asphalt walkway paralleling the east side. Localized streetlighting is also present as one approaches 60th Avenue. No significant ditches were found in the area however an estimated ±80 meters of asphalt curbing was observed across from the school along the west pavement edge.

The roadway south of the school property narrows to a 6.1 m ± width and continues to Highway #10 (56th Avenue). An open ditch commences along the west side of Old McLellan Road (± 50 m northeast of Bell Road) and drains to the lowland areas.

Through correspondence with the City of Surrey (Nov 22, 1996 letter), we have been advised that the classification of Old McLellan Road will be changed from a major collector to that of a limited collector and thus will not be available for any DCC rebates. The financial analysis presented within this report is based on this clarification.

The impact of development phasing on interim traffic volumes for Old McLellan Road has been investigated. Approximately 500 vehicle trips per day have been projected for Old McLellan Road based on development of the NCP south of 60th Avenue only. Another 500 vehicles have been estimated assuming the school is still in place.

Thus, a 7.5 m ± pavement cross section for Old McLellan Road is anticipated to be sufficient to accommodate a projected traffic volume of approximately 1000 vehicles per day. The pavement width is based on provision of two 3.75 m travel lanes. The existing 6.1 ± m cross section of Old McLellan Road will have to be upgraded to a 7.50 m pavement width continuous to Bell Road. This will be funded through development coordinated works. Please note, pavement width does not include drop off/pick up areas associated along the school frontage.

With regard to the provision of on-street parking, neither the existing 7.5 ± m nor the 6.1 ± m cross section is sufficient to allow parking in addition to two travel lanes. However, the demand for on-street parking would appear minimal in initial phases, and is evaluated as follows:

- the existing church has on-site parking and can likely be expected to contain all parking on-site, particularly during peak periods for the adjacent street system;
- the existing cemetery has no access to Old McLellan Road and therefore is unlikely to generate any demand for on-street parking adjacent to the cemetery; and
- the redevelopment of the school to multi-family residential, and the new development of multi-family residential, will likely create some demand for on-street parking, but this same development may also trigger the construction of a City of Surrey 11 m standard road which can accommodate on-street parking.

In addition to the above, Stanley Associates have held additional discussions with Ward Consulting Group and the City of Surrey regarding Old McLellan Road and the timing for removal or elimination of the "5th" leg at the 60th Avenue intersection. The following comments were obtained.

- A 7.50 ± m pavement width along Old McLellan Road would be sufficient for the needs of the NCP south of 60th Avenue. The ultimate cross-section should be completed when it becomes a priority to the City of Surrey.

- Any interim upgrading works required along Old McLellan Road will be undertaken and funded through Development Coordinated Works when required.

- The elimination of the 5th leg from the 60th Avenue/168th Street intersection should be completed in conjunction with anticipated roadway improvements and at 60th Avenue and 168th Street. Phase 3A involved construction of works fronting the future intersection realignment area along 60th Avenue. This appears to be a logical time frame for these works.

- The specific timing for construction of the ultimate cross-section along Old McLellan Road is unknown. This is largely dependent on the actual construction staging of both NCP areas and the elimination of the 56th Avenue connection. The original traffic study for the area modelled ultimate roadway requirements and did not review interim or specific requirements of each NCP area independent of each other.

7.8 DCC REVENUE AND EXPENDITURE

7.8.1 NCP Revenue Summary (NCP South of 60th Avenue)

Table 7.8A summarizes the projected DCC revenues and construction costs for each engineering service. The revenues are based on the current DCC bylaw. A copy of this bylaw is included in ***Appendix B***. Growth projections are based on a buildout total of 605 units. Both costs and revenues are in 1996 dollars.

TABLE 7.8A

NCP Revenue Summary (NCP South of 60th Avenue)

ITEM/ DESCRIPTION	ESTIMATED NO. OF UNITS (1)	PROJECTED DCC REVENUES	PROJECTED EXPENDITURES		SURPLUS <DEFICIT> (5)	AMOUNT IN 1993 10 YEAR PLAN
			DCCR	DCW		
Sanitary Sewer	605	$448,890	N/A	N/A	$448,890 +ve	$256,000
Drainage & Stormwater Detention	605	$1,008,930	$398,000	N/A	$610,930 +ve	$450,000
Watermain	605	$518,130	$1,127,625	$134,400	$743,895 -ve	$1,960,000
Major Collector Roads	605	$627,220	N/A	N/A	$627,220 +ve	$824,190
TOTAL	**N/A**	**$2,603,170**	**$1,525,625**	**$134,400**	**$943,145 +ve**	**$3,490,190**

Note: 1) The 605 units total is from the NCP south of 60 Avenue.

2) It is recognized that the City of Surrey collects DCC's on a city basis and not on a NCP or area basis. The above table is presented only to show the financial impact of the NCP on the current 10 Year Servicing Plan. This table also shows the magnitude of additional works or refined construction costs required to service the NCP area as compared to the 1993 *10 Year Servicing Plan*.

3) It is assumed that the need for arterial roads is principally driven by the larger community needs and therefore those costs have not been included in the above table. The projected DCC revenue for major collector & arterial roads is $627,220 & $2,466,240 respectively.

4) No major collector roads fall with the NCP boundary.

5) Surplus and (Deficit) is the difference between projected DCC revenues and projected expenditures.

7.8.2 NCP Revenue Summary (NCP North and South of 60th Avenue for Watermain)

Table 7.8B summarizes the projected DCC revenues and construction costs for each engineering service. Growth projections are based on a buildout total of 605 units, except for watermain which includes an additional 1,575 units for the NCP North of 60th Avenue. Both costs and revenues are in 1996 dollars.

TABLE 7.8B

NCP Revenue Summary (NCP North and South of 60th Avenue for Watermain)

ITEM/ DESCRIPTION	ESTIMATED NO. OF UNITS (1)	PROJECTED DCC REVENUES	PROJECTED EXPENDITURES		SURPLUS <DEFICIT> (5)	AMOUNT IN 1993 10 YEAR PLAN
			DCCR	DCW		
Sanitary Sewer	605	$448,890	N/A	N/A	$448,890 +ve	$256,000
Drainage & Stormwater Detention	605	$1,008,930	$398,000	N/A	$610,930 +ve	$450,000
Watermain	2180 (1)	$2,081,570	$1,127,625	$346,080	$607,865 +ve	$1,960,000
Major Collector Roads	605	$627,220	N/A	N/A	$627,220 +ve	$824,190
TOTAL	**N/A**	**$4,166,610**	**$1,525,625**	**$346,080**	**$2,294,905 +ve**	**$3,490,190**

Note:

1) The 2180 total includes 605 units from the NCP south of 60th Avenue and 1575 units from NCP north of 60th Avenue.

2) It is recognized that the City of Surrey collects DCC's on a city basis and not on a NCP or area basis. The above table is presented only to show the financial impact of the NCP on the current 10 Year Servicing Plan. This table also shows the magnitude of additional works or refined construction costs required to service the NCP area as compared to the 1993 *10 Year Servicing Plan*.

3) It is assumed that the need for arterial roads is principally driven by the larger community needs and therefore those costs have not been included in the above table. The projected DCC revenue for major collector & arterial roads is $627,220 & $2,466,240 respectively.

4) No major collector roads fall with the NCP boundary.

5) Surplus and (Deficit) is the difference between projected DCC revenues and projected expenditures.

Table 7.8C provides a detailed breakdown of projected DCC Revenue, for the NCP South of 60th Avenue.

TABLE 7.8C
PROJECTED DCC REVENUE SUMMARY (NCP South of 60th Avenue)

PROPOSAL ZONE	USE	UNITS	WATER		SANITARY SEWER		DRAINAGE & STORMWATER DETENTION		MAJOR COLLECTOR ROADS		TOTAL	
			DCC/UNIT	REVENUE	DCC/UNIT	REVENUE	DCC/UNIT	REVENUE	DCC/UNIT	REVENUE	DCC/UNIT	REVENUE
RF	Single Family	120	$1,070	$128,400	$930	$111,600	$2,120	$254,400	$1,220	$146,400	$5,340	$640,,800
RHG	Cluster	10	$1,070	$10,700	$930	$9,300	$3,390	$33,900	$1,220	$12,200	$6,610	$66,100
RC (Half Acre)	Cluster	100	$1,070	$107,000	$930	$93,000	$3,390	$339,000	$1,220	$122,000	$6,610	$661,000
RC (One Acre)	Cluster	5	$1,070	$5,350	$930	$4,650	$3,390	$16,950	$1,220	$6,100	$6,610	$33,050
RM-10	Row Housing	50	$940	$47,000	$810	$40,500	$1,140	$57,000	$1,220	$61,000	$4,110	$205,500
RM-15	Row Housing	180	$940	$169,200	$810	$145,800	$1,140	$205,200	$1,220	$219,600	$4,110	$739,800
RM-30, 45	Apartments	20	$940	$18,800	$810	$16,200	$1,140	$22,800	$1,220	$24,400	$4,110	$82,200
RMS-1	Residential/Care (800 ft^2/unit)	120	$264/800 ft^2	$31,680	$232/800 ft^2	$27,840	$664/800 ft^2	$79,680	$296/800 ft^2	$35,520	$1,456/800 ft^2	$174,720
TOTALS		**605**	**N/A**	**$518,130**	**N/A**	**$448,890**	**N/A**	**$1,008,930**	**N/A**	**$627,220**	**N/A**	**$2,603,170**

8.0 APPENDIX A (CONSULTATION)

The following information and figures are contained in *Appendix A*:

- ***Figure 16: Ownership*** which shows the fragmented ownership in the area. Public or agency ownership includes the cemetery lands of the City of Surrey, the existing school site of the Surrey School District, and a surplus BC Hydro site at "*5 Corners.*" For the most part, the ownership pattern will require cooperation between owners at the subdivision and rezoning stage.

- ***Figure 17: Questionnaire Sub-Areas*** which shows the detailed sub-areas on which the questionnaire at the public meeting was based. It was used to be able to focus interest on area specific issues.

- ***Response Form Summary*** which compiles the detailed comments received from those who attended the first public meeting. Responses, which were generally favourable about both the plan and the process, were received from 26 interested citizens.

- ***Comment Summary*** which compiles the detailed comments received from those who attended the second open house to review the Stage 2 report.

- ***Comment Summary*** which compiles the detailed comments received from those who attended the third open house to review the Stage 2 report.

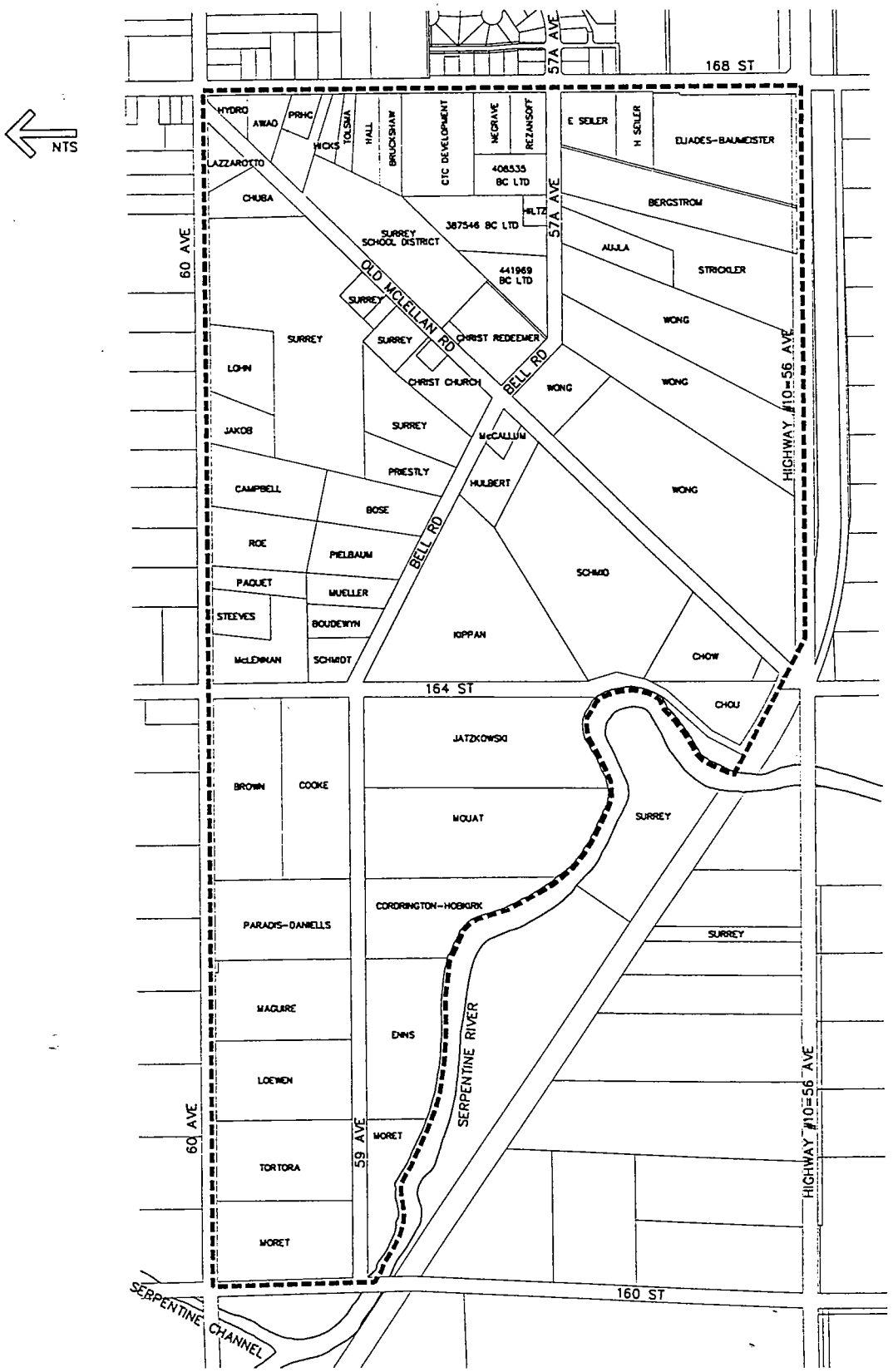


FIGURE 16: OWNERSHIP

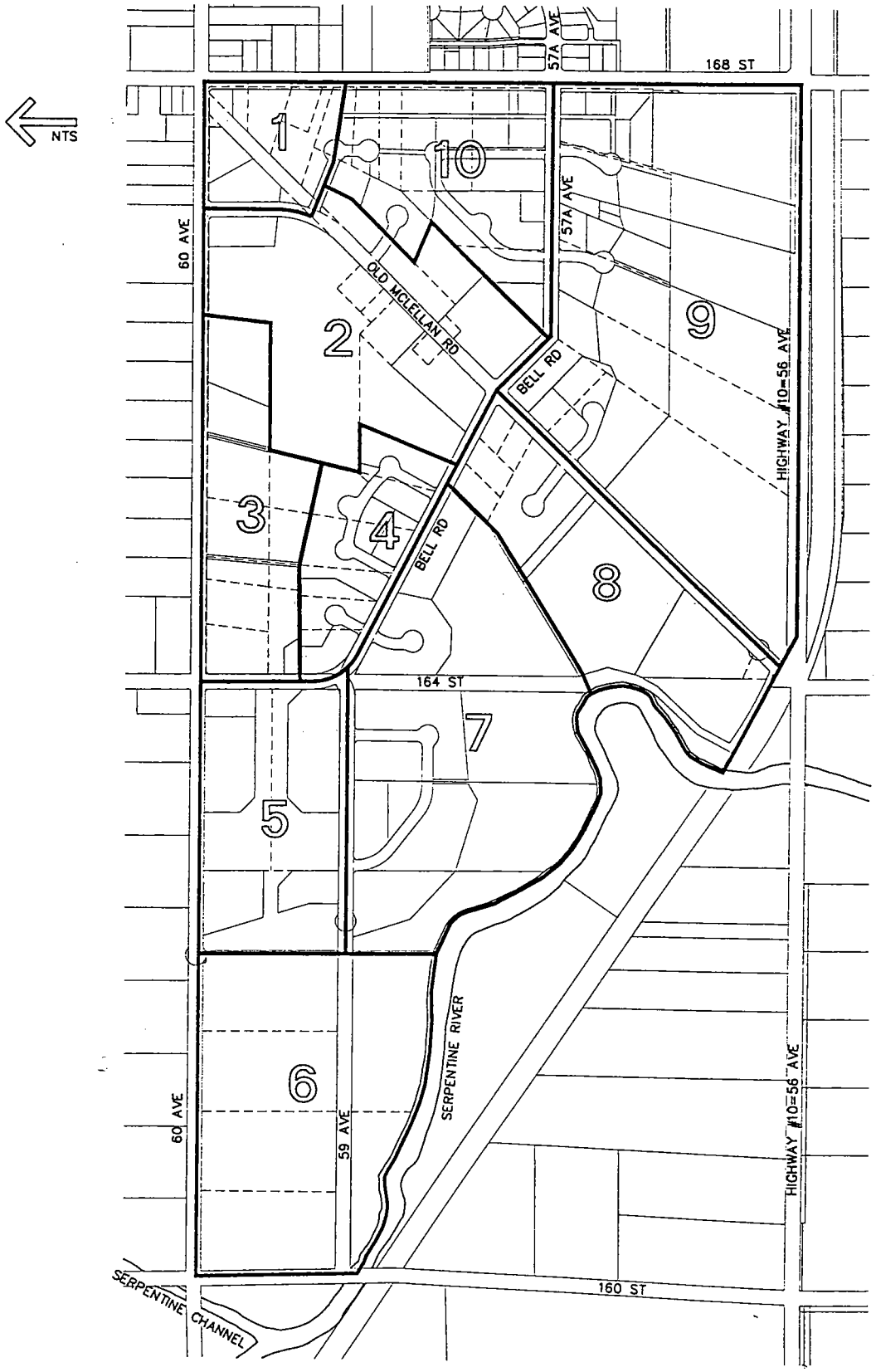


FIGURE 17: QUESTIONNAIRE SUB AREAS

WEST CLOVERDALE SOUTH NCP

- **COMMENT SUMMARY**

From Second Open House on Stage 2 NCP
October 1, 1996 (7:00 to 9:00 P.M.)
Cloverdale Senior Citizen Centre

Number of comment sheets received: 5

Number of persons who attended the meeting: 39

In general, people seemed relatively pleased with the Stage 2 report and it appeared that there was general support for the plan. However, there was a continuing concern by some owners with the issue of land dedication required by the RC zoning.

Specific issues of concern raised by those who attended the meeting included the following points:

- objections to paying the cost of preparing plans for small scale developments and objections to the restrictions on the amount of land that can be developed.
- concerns that the private land owner is being asked to give up too much land to open space dedication without receiving some form of compensation.
- feelings that the Steering Committee did not fairly represent the south slope landowners.
- questions as to what school catchment area would be used to support the increased enrollment from the proposed development.

WEST CLOVERDALE SOUTH NCP

- **COMMENT SUMMARY**

From Third Open House
January 8, 1997 (7:00 to 8:00 P.M.)
Cloverdale Senior Citizen Centre

Number of persons who attended the meeting: 36, plus consultants and City staff.

The purpose of the meeting was to review final recommendations from the Steering Committee that had resulted from discussions with the City of Surrey Engineering Department about the draft Stage 2 report.

The following handout was distributed at the meeting and explained by the consultants. Technical questions were responded to by both the consultants and City staff. There was general support expressed for the staging and interim storm detention proposals. The consultants would add a further option related to piped storm discharge to the Serpentine River down the 164th Street alignment. Of the thirteen comment sheets returned, all but one endorsed the recommendations put forth. One did not indicate an opinion.

Another issue raised was the land dedication related to cluster housing. The consultant described changes incorporated into the NCP report after the last meeting that were intended to address previous concerns. Unrelated to the NCP, there was discussion about traffic safety issues adjacent to the existing school on Old McLellan Road.

WEST CLOVERDALE SOUTH NCP
PUBLIC INFORMATION MEETING

File: 69-104-00
January 8, 1997

INFRASTRUCTURE FINANCING AND FUNDING - OVERVIEW

1.0 CASH FLOW ANALYSIS

The financial strategy for the major infrastructure services adjacent to the West Cloverdale South NCP is based on the following assumptions:

- While various projects meet the criteria established by the City of Surrey for DCC projects, the City is not in a financial position to "front end" the infrastructure projects in the short term which are required for development to proceed. Therefore, any shortfall in development cost charge revenues will have to be made up by financial contributions of developers in order for projects to proceed. In the long term, sufficient DCC revenues will be generated to offset servicing costs of major servicing projects (i.e. DCC projects).

The strategy for the phasing of the development and meeting the financial constraints of the NCP are as follows;

- Defer major costs for as long possible in view of potential cash flow issue for developers "front ending" services. Existing municipal services are to be optimized. This rationale was used in analyzing development phasing which maximizes single family development areas extending along 57A Avenue and Bell Road.

- Where there are insufficient funds for specific projects required for development, the developer(s) would be required to pay for the required project and would receive DCC credits as per the current DCC policy. Note, the City of Surrey collects DCC's on a community-wide basis. The City can thus decide where funds are to be expended annually and therefore can prioritize specific works in an NCP.

- Five development phases have been proposed to avoid major cash flow problems for developers in this NCP. Phasing is preliminary in that land in subsequent phases can be developed provided that developers pay for the required infrastructure projects up front.

- Should an expanded DCC rebate policy be adopted by Council, it would likely only apply to significant DCC elements, (i.e. elements of approximately $1 million or more in value). This would have no direct impact on this NCP.

As part of the cash flow analysis, various development scenarios were investigated. The principle used in the phasing incorporates development westward from 168 Street and buildout of single family areas at the project onset.

2.0 WATERMAIN

2.1 Combined NCP Area(s) Result in Positive Cash Flow

Units =	2, 180	(605 units for NCP South + 1,575 units for NCP North)
Revenue =	$2,081,570	($940 - $1,070/unit)
Expenditures =	$1,473,705	
Revenue Surplus =	$607,865 + ve	

Projected DCC revenue totals $2,081,570 for an estimated 2,180 units. Expenditures are estimated at $1,473,705 with a revenue surplus of $607,865 at buildout. A detail cash flow analysis indicated a minimum revenue surplus of $189,980 in Phase 1A (Year 1997). The peak revenue surplus is at development completion, Phase 5B (Year 2006) at $607,865. A positive cash flow for DCC rebateable watermain works has been achieved for all development stages.

2.2 NCP South of 60th Avenue

Units =	605	
Revenue =	$518,130	($940 - $1,070/unit)
Expenditures =	$1,262,025	
Revenue Surplus =	$743,895 - ve	

The above analysis is based on the assumption that approval of the NCP north of 60th Avenue will be delayed for an indefinite period of time. Projected DCC revenues total $518,130 for an estimated 605 units. Expenditures total $1,262,025. Please note, this total differs from the combined NCP of expenditures as the 300 ∅ watermain along 164th Street, Bell Road, 57A Avenue was previously determined to be eligible for oversizing. In absence of a 300 ∅ grid watermain being in place north of 60th

Avenue, and west of 168th Street, a 300 Ø watermain (minimum size) would be required if this is to be considered as a stand-alone NCP. A revenue deficit is projected in Phases 3A - 5B (Year 2001 to 2006) for the NCP south of 60th Avenue.

In Phase 3A, ± 150 single family units will have been completed along 57A Avenue and Bell Road (Phase 1A, 1B, 2A, and 2B). This generate $161,570 in revenue. Expenditures in Phase 3A are estimated at $449,925 for a 350 Ø watermain along 168th Street (from 64th - 60th Avenue) leaving a cash flow deficit of $239,475. Assuming the NCP north of 60th Avenue is not in place, it is unlikely additional development will occur unless offsite grid watermains are installed by the City of Surrey. The City of Surrey will only construct the offsite grid watermains at their priority.

2.3 Recommendations

- A new phasing plan has been created in order to maximize development areas (see attached).
- In absence of the NCP to the north being in place, development is limited to ± 150 single family (RF) units along 57A Avenue and Bell Road.
- Development of any multi-family areas will require significant off-site grid watermain extensions.

3.0 SANITARY SEWER

3.1 NCP South of 60th Avenue

Units =	605
Revenue =	$448,890
Expenditures =	N/A
Revenue Surplus =	$448,890 + ve

3.2 Area North of 60th Avenue

Allowances have been made to service a 21 ± Ha parcel located north of 60th Avenue and west of 164th Street. Oversizing for these areas should not effect pipe size diameters but will effect depth and location of sewers in order to maximize servicing area.

Compensation for oversizing for future development areas will be considered at the time of development application. It should be noted that Coastland Engineering Ltd. is trying to get the landowners to sign off a preferred servicing alternative (i.e. pump or gravity flow option) for this area.

3.3 Summary

A positive cash flow analysis has been achieved for the sanitary sewer works. None of the sanitary sewers in the study area are eligible for DCC funding.

4.0 DRAINAGE

4.1 NCP South of 60th Avenue

Units =	605	
Revenue =	$1,008,930	($1,140 - $3,390/unit)
Expenditures =	$398,000	
Revenue Surplus =	$610,930 + ve	

The Branch 2 storm sewer and the Serpentine River dyke tie-in total $398,000 and are DCC rebateable items. The Branch 2 storm sewer ($153,000) is a new item recommended for inclusion in a 10 Year Servicing Plan Update. The dyke tie-in ($245,000), is part of the current (1993) 10 Year Servicing Plan (#4085).

The objective of the cash flow is to obtain a positive short term cash flow between projected DCC Revenues and Expenditures. A revenue shortfall has been identified in the cash flow analysis for drainage works. The most feasible financing options are as follows:

Interim Detention Facilities

- An estimated 4 - 5 interim detention facilities may be required.
- Interim Detention Facilities requires the cooperation of land owners/developers to meet City of Surrey Design Criteria.
- Interim Detention Facilities can be incorporated in conjunction with siltation control ponds.
- Interim detention storage requirements will extend 1 - 2 years longer than that of a standard siltation control pond.

Drainage Levy

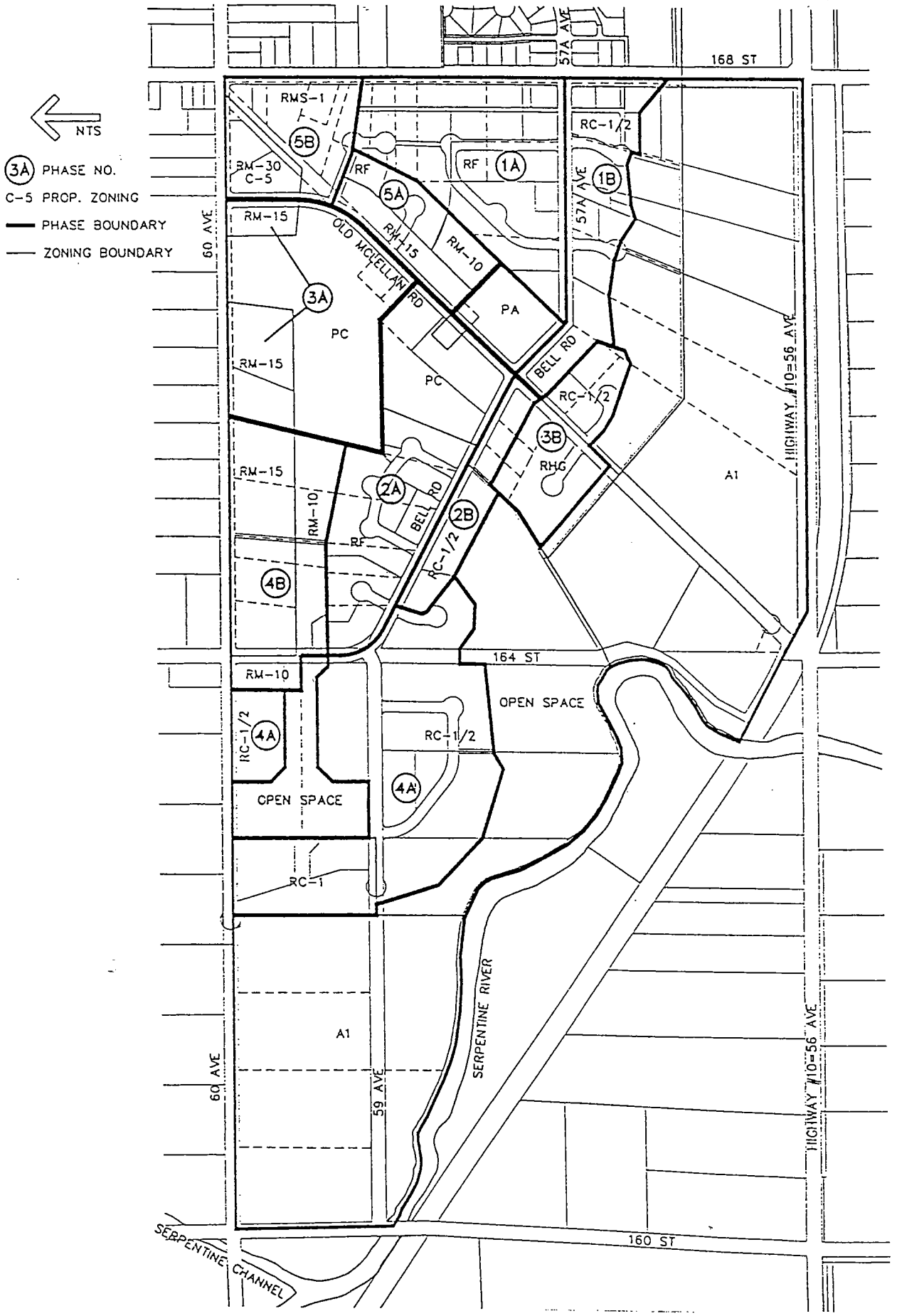
The implementation of a "Drainage Levy" for all areas draining to the Serpentine River dyke tie-in has been considered. An estimated 340 of the 605 total development units fall within this category. The Drainage Levy is based on the following calculations. Please not, the $765/unit "Drainage Levy" does not include any allowances for contingencies, financing and/or carrying charges.

• Construction cost of Serpentine River dyke tie-in and Branch 2 Storm Sewer	$398,000
• Phase 1A-DCC revenue for 65 RF units @ $2,120/unit	$137,800
• Cash shortfall (at end of Phase 1A)	$260,200
• Estimated no. of units draining to dyke tie-in	340
• Drainage Levy/unit	$765/unit

Summary

Both drainage options are acceptable to the City of Surrey. Each option has specific advantages and disadvantages that need to be evaluated. The steering committee has endorsed the interim detention facility option at the December 3, 1996 meeting.

(corresp/miscel/pub-mtg.doc)



DEVELOPMENT STAGING

SECTION 9.0 APPENDIX B - SERVICES & COSTS

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

SECTION 1.0 WATERMAIN

1.0 WATERMAIN

1.1 DESIGN CRITERIA AND SYSTEM MODELLING

All water network analysis and calculations were based on the City of Surrey *Design Criteria Manual*. The Waterworks computer model was used in the analysis. Some of more pertinent design criteria used are as follows:

Water Demand

- Average Day Domestic Consumption (ADC) = 500 l/capita/day
- Maximum Day Domestic Consumption = ADC x 2.0 = 1000 l/capita/day
- Peak Hour Demand (PHD) = ADC x 4.0 = 2000 l/capita/day

Design Fire Flows and Residual Pressures

- Design Flow = Maximum Day Domestic Consumption (MDD) + Applicable Fire Flow
  (14 m min. Hydraulic Head residual pressure at street level hydrant location. All other nodes are to be above 21 m).

or

- Design Flow = Peak Hour Demand (PHD)
  = ADC x 4.0
  (28 m min. Hydraulic Head residual pressure at street level)

- Fire Flow Requirements

LAND USE	DESIGN (LITRES/SEC)	INTERIM (LITRES/SEC)
• Single Family	60	45
• Multi-Family (RM-15)	120	90
• Schools	120	90
• Isolated Commercial	90	65
• Institutional	200	150

Maximum Velocity and Hydraulic Grade

Maximum flow velocity is not to exceed 2.0 m/sec.

PRV Station

The distribution analysis is to be completed with only one source node from the PRV Station located at 176th Street and 68th Avenue.

1.2 SYSTEM MODELLING

In order to determine the timing of various grid watermain extensions, models were set up to reflect anticipated development phasing. ***Table B1.1*** details the ultimate water system (2180 units) and incremental Phases while ***Table B1.2*** defines the NCP development south of 60 Avenue as a stand along project. Detail computer runs for ultimate development and each phase can be found in Section 1.4 of ***Appendix B***.

TABLE B1.1
ULTIMATE WATER SYSTEM (COMBINED NCP'S)

Development Phase	Total No. Of New Units	Maximum Day	Fire Flow/ Node No.	Peak Hour Demand	Critical Node No.	HGL	Peak Hr. Maximum Day Plus Fire	
						Total (M)	Elev. (M)	Res. (M)
Ultimate System (Total Development) (Phases 1-5)	605 +1,575 =2,180	199 L/sec	200 L/Sec @ Node 5	393 L/Sec	529	72.1	44.0	28.1
						62.8	44.0	18.8
Phase 1A & 1B (1997 & 1998)	96 +576 =672	151 L/sec	120 L/Sec @ Node 56	301 L/Sec	56	74.4	28.0	46.0
						64.0	28.0	36.0
Phase 2A & 2B (1999 & 2000)	55 +248 =303	177 L/sec	120 L/Sec @ Node 57	354 L/Sec	57	65.9	40.0	25.9
						57.1	40.0	17.0
Phase 3A & 3B (2001 & 2002)	66 +270 =336	183 L/sec	120 L/Sec @ Node 5	366 L/Sec	529	72.2	44.0	28.2
						60.0	44.0	16.0
Phase 4A & 4B (2003 & 2004)	197 +311 =508	193 L/sec	120 L/Sec @ Node 5	386 L/Sec	529	72.1	44.0	28.1
						62.8	44.0	18.8
Phase 5A & 5B (2005 & 2006)	191 +170 =361	199 L/sec	200 L/Sec @ Node 5	393 L/Sec	529	72.1	44.0	28.1
						62.8	44.0	18.8

Note 1) Peak Hour Residual Pressure = 28 Meters min.
Note 2) Maximum Day + Fire Flow Residual Pressure = 14 Meters min.

TABLE B1.2
ULTIMATE WATER SYSTEM (FOR NCP SOUTH OF 60TH AVENUE)

Development Phase	Total No. Of New Units	Maximum Day	Fire Flow/ Node No.	Peak Hour Demand	Critical Node No.	HGL	Peak Hr. Maximum Day Plus Fire	
						Total (M)	Elev. (M)	Res. (M)
Ultimate System (Total Development) (Phases 1-5)	605	155 L/sec	200 L/Sec @ Node 14	309 L/Sec	57	73.4	40.0	33.4
						69.0	40.0	29.0
Phase 1A & 1B (1997 & 1998)	96	130 L/sec	60 L/Sec @ Node 19	260 L/Sec	5	69.2	40.0	29.2
						63.3	39.0	24.3
Phase 2A & 2B (1999 & 2000)	55	139 L/sec	60 L/Sec @ Node 20	279 L/Sec	57	69.7	40.0	29.7
						60.3	40.0	26.3
Phase 3A & 3B (2001 & 2002)	66	152 L/sec	120 L/Sec @ Node 56	304 L/Sec	57	74.3	40.0	34.3
						63.2	40.0	23.2
Phase 4A & 4B (2003 & 2004)	197	154 L/sec	120 L/Sec @ Node 5	308 L/Sec	57	73.5	40.0	33.5
					5	61.3	39.0	22.3
Phase 5A & 5B (2005 & 2006)	191	155 L/sec	200 L/Sec @ Node14	309 L/Sec	57	73.4	40.0	33.4
						69.0	40.0	29.0

1.3 COST ESTIMATES

Capital cost estimates for various watermain routing options investigated in this report are detailed in ***Table B1.3***. Construction cost estimates are based on unit prices received from the City of Surrey (see Part 5.0 in ***Appendix B***).

TABLE B1.3
WATERMAIN CAPITAL COST ESTIMATES

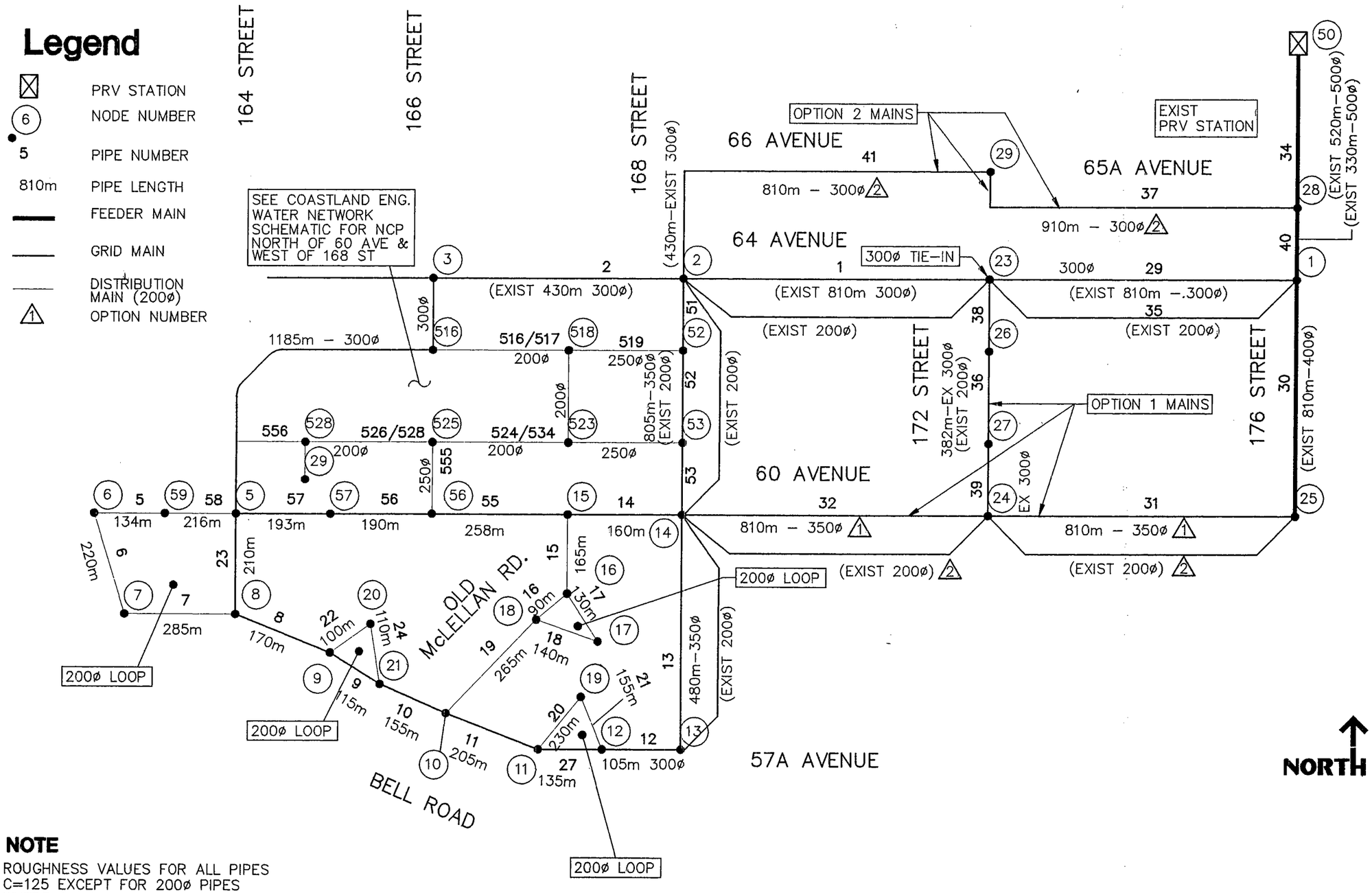
COMMENTS (See Below)	EXIST. PIPE DIA. (MM)	PROJECT NO. (1993 10 Year Plan)	LOCATION	FROM	TO	OPTION 1				OPTION 2			
						LENGTH	DIA. (MM)	UNIT PRICE ($/L.M.)	COST	LENGTH (M)	DIA. (MM)	UNIT PRICE	COST
(1) (6)	N/A	2419A	168 Str.	66 Ave.	64 Ave.	430	N/A	N/A	N/A	430	300 Ø	$420	$180,600
(2) (6)	200 Ø	2419B	168 Str.	64 Ave.	60 Ave.	805	350 Ø	$465	$374,325	805	350 Ø	$465	$374,325
(2) (3) (6)	200 Ø	2419C	168 Str.	60 Ave.	480 m S.	480	350 Ø	$465	$223,200	480	350 Ø	$465	$223,200
(1) (3) (6)	N/A	2419D	168 Str.	56 Ave.	320 m N.	320	350 Ø	N/A	N/A	320	350 Ø	N/A	N/A
(2) (6)	200 Ø	2420A	172 Str.	61A Ave.	62A Ave.	390	300 Ø	$420	$163,800	390	300 Ø	$420	$163,800
(2) (3) (6)	200 Ø	2420B	172 Str.	60 Ave.	56 Ave.	800	350 Ø	N/A	N/A	800	350 Ø	N/A	N/A
(4)	500 Ø	N/A	176 Str.	68 Ave.	64 Ave.	850	N/A	N/A	N/A	850	N/A	N/A	N/A
(4)	400 Ø	N/A	176 Str.	64 Ave.	60 Ave.	810	N/A	N/A	N/A	810	N/A	N/A	N/A
(4)	300 Ø	N/A	64 Ave.	168 Str.	172 Str.	805	N/A	N/A	N/A	805	N/A	N/A	N/A
(4)	300 Ø	N/A	64 Ave.	172 Str.	176 Str.	805	N/A	N/A	N/A	805	N/A	N/A	N/A
(5) (6) (7)	150 Ø	2416A	60 Ave.	164 Str.	168 Str.	800	300 Ø	$168	$134,400	800	300 Ø	$168	$134,400
(2) (6)	200 Ø	2416B	60 Ave.	168 Str.	172 Str.	810	350 Ø	$465	$376,650	810	N/A	N/A	N/A
(2) (6)	200 Ø	2416C	60 Ave.	172 Str.	176 Str.	810	350 Ø	$465	$376,650	810	N/A	N/A	N/A
(1) (6)	N/A	2415A	66 Ave.	168 Str.	172 Str.	810	N/A	N/A	N/A	810	300 Ø	$420	$340,200
(1) (6)	N/A	2415B	65A Ave.	172 Str.	176 Str.	910	N/A	N/A	N/A	910	300 Ø	$420	$382,200
(1) (6) (8)	150 Ø	2418	164 Str./ 63rd Ave.	60 Ave.	166 Str..	N/A	300 Ø	N/A	$30,240	N/A	300 Ø	N/A	$30,240
(5) (6) (7)	150 Ø	3605A	164 Str.	60 Ave.	Bell Road	140	300 Ø	$168	$23,520	140	300 Ø	$168	$23,520
(5) (6) (7)	150 Ø	3605B	Bell Road	164 Str.	Old McLellan	500	300 Ø	$168	$84,000	500	300 Ø	$168	$84,000
(5) (6) (7)	150 Ø	3605C	57A Ave.	Old McLellan	168 Str.	440	300 Ø	$168	$73,920	440	300 Ø	$168	$73,920
						SUBTOTAL - OPTION 1			**$1,514,625**	**SUBTOTAL - OPTION 2**			**$1,664,325**
						OVERSIZING SUBTOTAL - OPTION 1			**$346,080**	**OVERSIZING SUBTOTAL - OPTION 2**			**$346,080**
						TOTAL			**$1,860,705**	**TOTAL**			**$2,010,405**

Comments:

(1) Install new watermain
(2) Parallel existing watermain and install new watermain
(3) Not required for this development
(4) No upgrading required
(5) Remove existing watermain and install new watermain
(6) Growth related and in 1993 10 Year Servicing Plan
(7) Oversizing - Assume 40% share
$420 x 0.40 = $168/l.m.
(8) $30,240 - Estimated Cost from Coastland Engineering Ltd.

1.4 WATERWORKS NETWORK ANALYSIS (COMPUTER RUNS)

FOR THESE COMPUTER RUNS, PLEASE SEE THE ORIGINAL NCP DOCUMENT AVAILABLE AT THE PLANNING & DEVELOPMENT DEPARTMENT OR THE ENGINEERING DEPARTMENT.

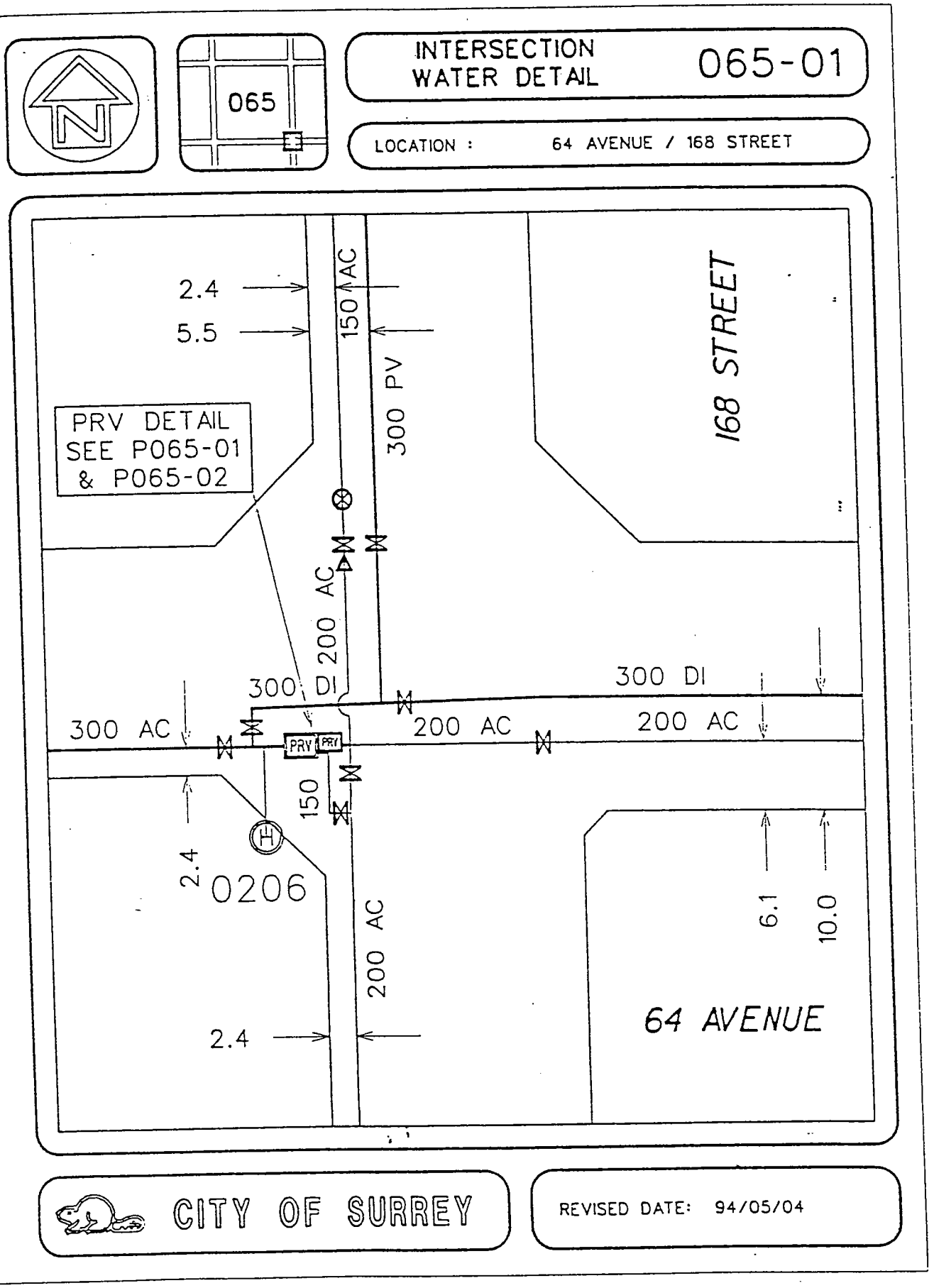


NOTE

ROUGHNESS VALUES FOR ALL PIPES
C=125 EXCEPT FOR 200ø PIPES
WHERE C=100

Figure B1.1: Water System Model Schematic

1.5 WATERWORKS, INTERSECTION DETAILS


065
INTERSECTION
WATER DETAIL
065-01
LOCATION : 64 AVENUE / 168 STREET
168 STREET
64 AVENUE
2.4
5.5
150 AC
300 PV
PRV DETAIL
SEE P065-01
& P065-02
200 AC
300 DI
300 DI
300 AC
200 AC
200 AC
PRV
PRV
150
2.4
0206
200 AC
2.4
6.1
10.0
CITY OF SURREY
REVISED DATE: 94/05/04
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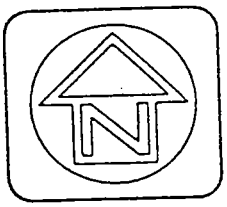
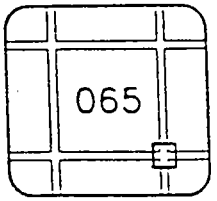


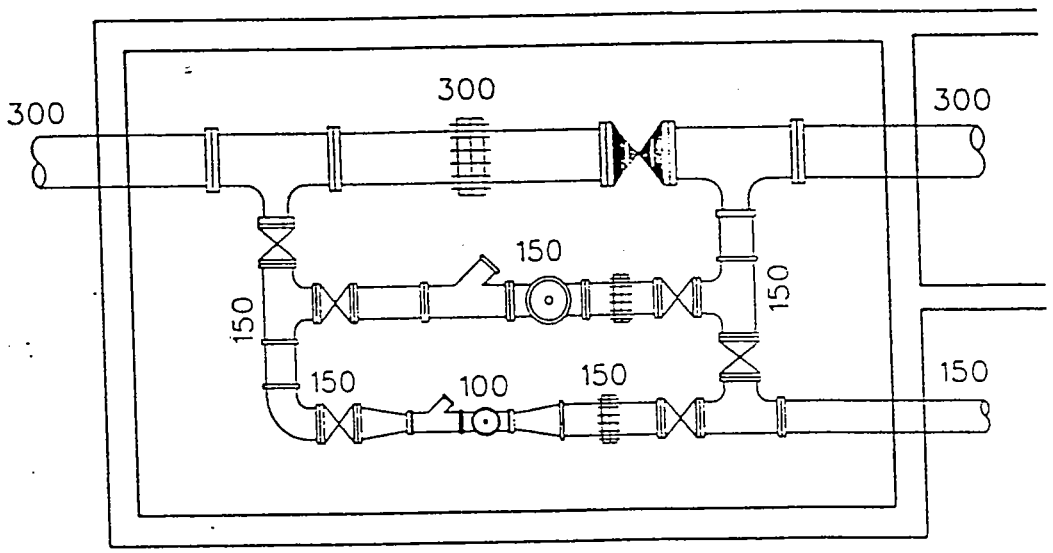


P.R.V. STATION WATER DETAIL

P065-01

LOCATION : 64 AVENUE / 168 STREET

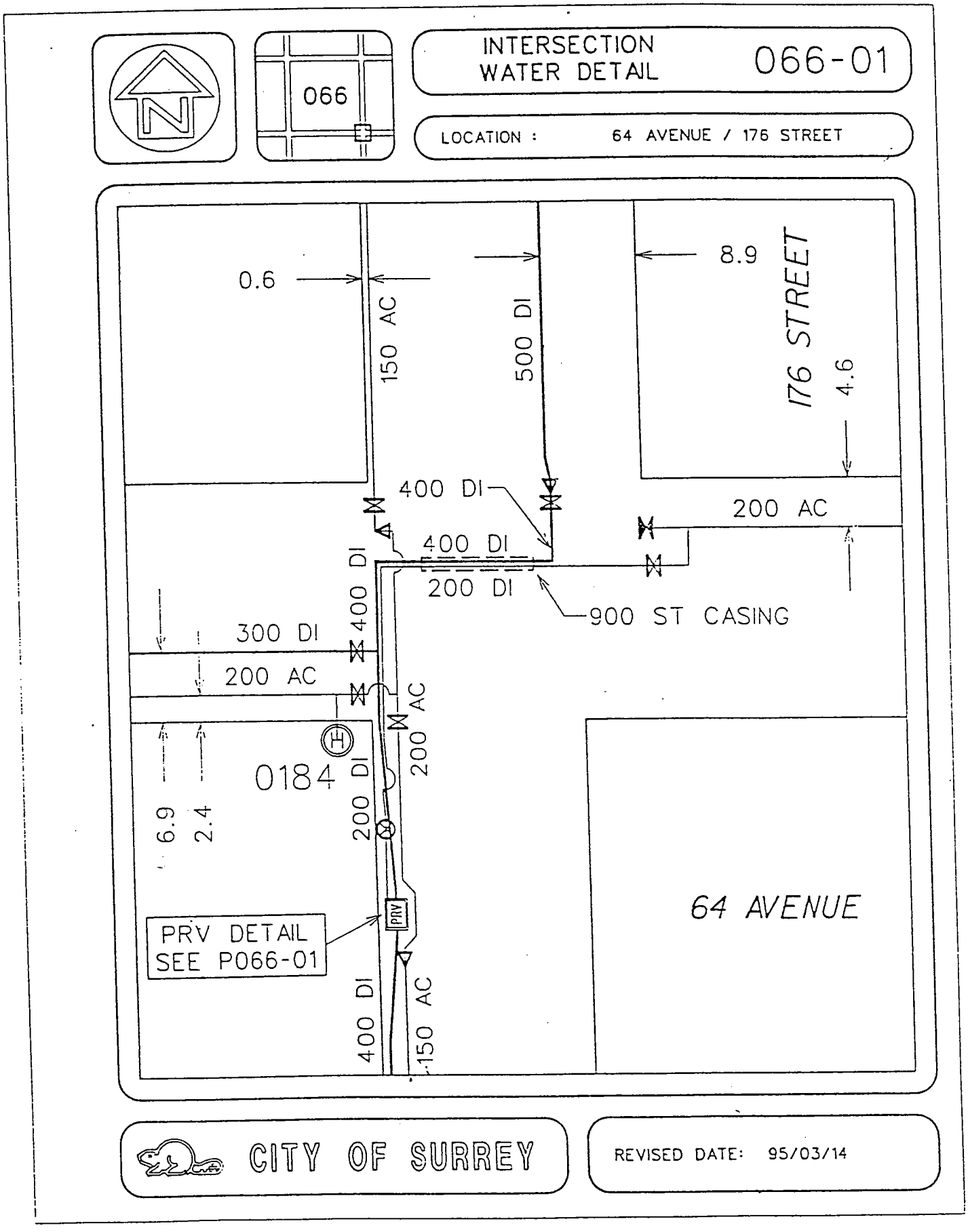
PRV NO LONGER IN ADJACENT CHAMBER SEE P065-02

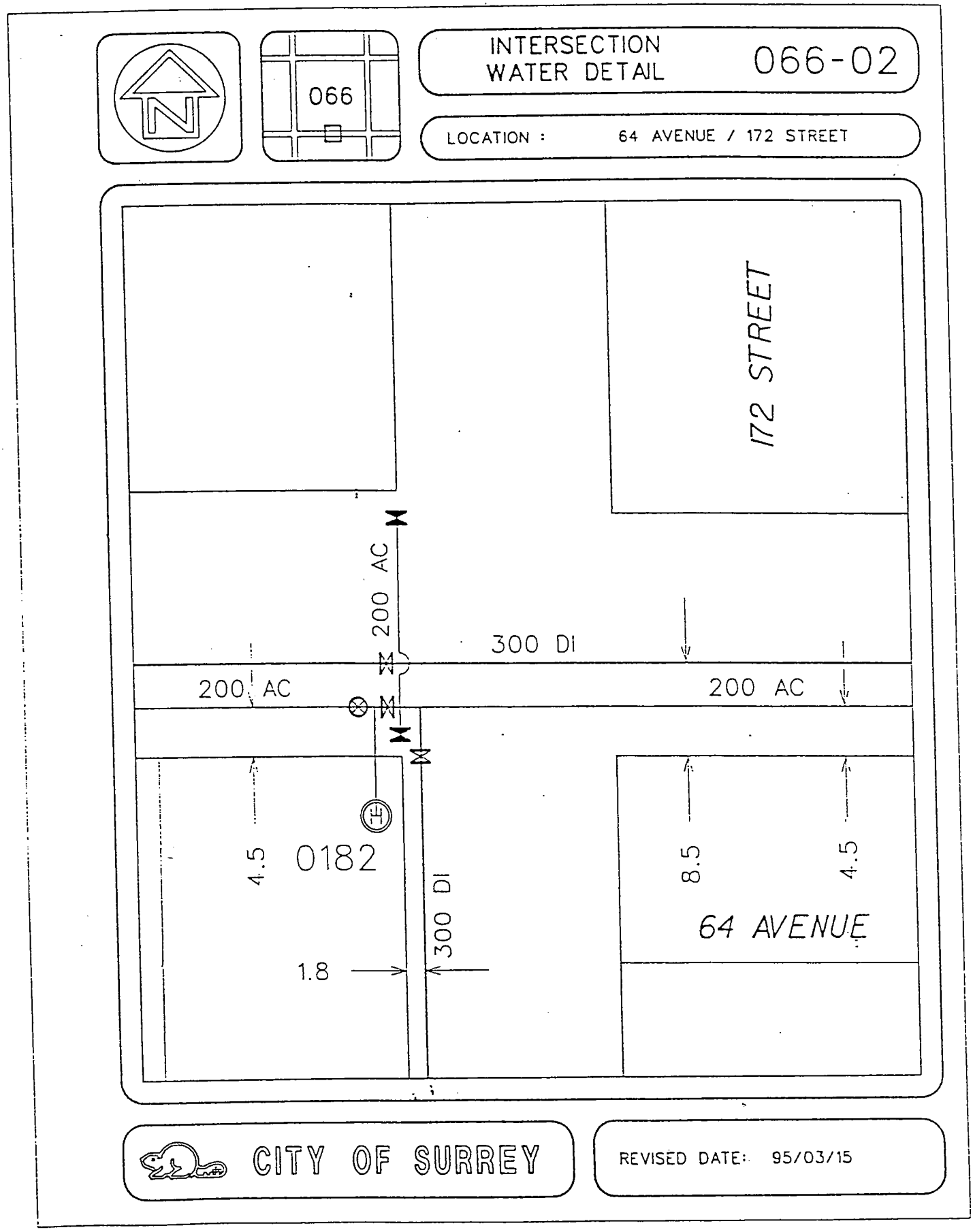


SEE W-75-4

CITY OF SURREY

REVISED DATE: 95/08/17


066
INTERSECTION
WATER DETAIL
066-01
LOCATION : 64 AVENUE / 176 STREET
0.6
150 AC
500 DI
8.9
176 STREET
4.6
400 DI
400 DI
200 AC
400 DI
200 DI
900 ST CASING
300 DI
200 AC
400 DI
200 AC
200 AC
0184
200 DI
6.9
2.4
PRV
PRV DETAIL
SEE P066-01
64 AVENUE
400 DI
150 AC
CITY OF SURREY
REVISED DATE: 95/03/14


066
INTERSECTION
WATER DETAIL
066-02
LOCATION : 64 AVENUE / 172 STREET
172 STREET
200 AC
300 DI
200 AC
200 AC
4.5
0182
300 DI
1.8
8.5
4.5
64 AVENUE
CITY OF SURREY
REVISED DATE: 95/03/15

SECTION 2.0 STORM DRAINAGE

2.0 STORM DRAINAGE

2.1 DESIGN CRITERIA AND SYSTEM MODELLING

Design criteria used is based on the January 1995 Design Criteria Manual issued by the City of Surrey. The preliminary design of the storm drainage pipe network consists of two components, the minor and the major system. The minor system consists of underground conduits, open channels and watercourses to convey a 5 year return flow. The major system consists of surface flood paths and watercourses to convey the 100 year return flow. The design storms used were the 1:5 and 1:100 year events for the Surrey Municipal Hall STP IDF curve. Initial time of concentration was assumed to be 20 minutes, pipe Mannings friction factor was set at 0.013, minimum pipe size was set at 200 mm diameter. Trunk storm sewers were defined as any pipe that drained a minimum of 20 ha. Runoff coefficients were based on values identified in Section 2.8.2.2 a) of the Surrey Design Criteria Manual for the various land uses. A composite runoff 'C' value was calculated for each land use within the subcatchment area based on a weighted value for the percentage of each land use within the subcatchment. No adjustments were made for antecedent moisture conditions for 'C' values from the 1:5 to the 1:100 year events. In addition, no runoff was calculated for the low lying agricultural lands as they do not contribute to the proposed system improvements or developed areas. All preliminary pipe grades were assumed to follow existing ground grades as depicted by Surrey digital 1 m contour data. Additional interim storm drainage criteria is detailed in the November 3, 1995 letter from the City of Surrey (see attached).

CITY OF SURREY
Engineering Department

14245 - 56th Avenue, Surrey
British Columbia, Canada V3X 3A2

Telephone
(604) 591-4340

Fax
(604) 591-8693

November 3, 1995

File: 4895-700

REPLY TO: Utilities Division
ATTENTION: Eric Emery, P.Eng.

Gary Romanetz
Stanely Associates Engineering Ltd.
#1007 - 7445 - 132 Street
Surrey, B.C.
V3W 1J8

Dear Mr. Romanetz:

Re: Interim Storm Drainage Criteria Update

The City of Surrey is in the process of updating the Storm Drainage Design Criteria. One of the main components of the update is criteria to further reduce development impacts on downstream systems. A draft update is anticipated to be ready before the end of this year at which time it will be circulated for peer and industry review. Select consultants who have completed storm drainage projects in Surrey will be asked for input prior to the preparation of the draft.

In the interim period, drainage planning and design of engineering services for new developments shall include the following considerations:

1. Drainage concepts and plans for NCP level studies shall use watershed based total solution approach. This means that plans will identify how drainage will be dealt with from the planning area (including the upper watershed) to the main bodies of receiving watercourses in Surrey. The main receiving watercourses are the Fraser River, Nicomekl River, Serpentine River, Campbell River and Boundary Bay. The total solution will identify how drainage generated by new urban development will not adversely affect the pre-development as well as the downstream system.

2. For consistency across the City, pre-development flow shall be defined as flows generated for the 1978 land use condition, the drainage system including creeks and their crossings, as applicable. The "Sigma" Study of 1978 had documented these conditions for Surrey.

3. Peak flows generated by development shall be considered for the 2 year and 5 year conditions. Measures shall be provided to limit post-development flows to 50% of the 2 year post-development level - this approximately corresponds to the post-development flow for a ten times per year storm event.

4. Detention ponds need to be sized for 5 year, 6, 12 and 24 hour storm events and should provide sufficient volume to provide 0.6 metres of freeboard during a 100 year event. Storm trunks should be sized for critical storm duration starting at the 1 hour duration. Storm distributions to be used for trunk and detention system sizing are attached in Appendix A.

5. Where discharges are directed to creeks/watercourses, with bed slopes exceeding 3% approximately, additional flow attenuation, flow diversion, creek erosion protection works as well as leave strips should be evaluated and incorporated in the total solution plan.

6. Consideration shall be given to storm water quality control with preference given to "wet" detention ponds, extended detention "dry" ponds or the use of wetlands.

7. To the extent possible, community storm water management facilities should be phased in at early stages of development by using innovative approaches to minimize trunk costs and maximize functional benefits. When catchment detention systems are not available, interim ponds need to be sized for the maximum release rates up to the 5 year level critical storm duration as outlined in the table below. Interim ponds are not eligible for DCC rebates and should be designed for a minimum tributary area of 2 hectares.

Release Rates and Storage Volumes for Interim On-Site Detention

Location	Max. Release Rate L/s/ha	Minimum Storage Volume cu.m/ha
North Surrey	6.0	200
Central Surrey	5.0	200
South Surrey	4.5	200

These storage volumes are for residential land uses. For industrial/commercial conditions the storage volumes would be higher and should be computed using the above release rates.

8. Drainage impacts to lowlands areas or cells is more of a function of increased runoff volumes instead of peak inflows. In these cases, the increased volume could lead to longer duration of flooding in farm fields and is a particular problem during the growing season. This can be addressed by improved lowland ditches and berms together with lowland pump stations to limit the duration of flooding in the lowlands.

Please take these interim criteria into consideration in your drainage servicing and phasing studies for the NCP and LAP areas. We would appreciate your comments or suggestions to improve the above criteria, so that more effective drainage management schemes can be developed and implemented in Surrey.

Yours truly,

Eric Emery, P.Eng.
Drainage Planning Manager

EE/dr

c.c. - P. Ham, Manager, Utilities Division
- J. Ng, NCP Utilities Engineer
- C. Whitlock, NCP Project Manager

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Appendix A

Rainfall Distributions for Stormwater Analysis
City of Surrey

There are three locations of AES rain gauges which dictate the selection of appropriate rainfall intensity-duration-frequency statistics for drainage analysis in Surrey. These are Surrey-Kawatlen, Surrey - Municipal Hall, and the former White Rock Sewage Treatment Plant (STP).

The rainfall volumes for various return periods and durations are summarized as follows:

	2 year return storm				5 year return storm			
	2 hour	6 hour	12 hour	24 hour	2 hour	6 hour	12 hour	24 hour
White Rock Gauge (mm)	15.9	27.8	36.2	50.9	23.1	34.3	45.0	63.9
Surrey Municipal Hall Gauge (mm)	14.9	27.4	39.7	55.8	18.1	33.0	47.9	67.3
0Kwantlen Park Gauge (mm)	17.6	31.8	45.6	67.2	24.0	40.2	57.6	84.0
	10 year return storm				100 year return storm			
	2 hour	6 hour	12 hour	24 hour	2 hour	6 hour	12 hour	24 hour
White Rock Gauge (mm)	27.9	38.7	50.9	72.5	42.8	52.3	69.2	99.5
Surrey Municipal Hall Gauge (mm)	20.2	36.6	53.3	75	26.9	48.1	70.3	98.9
Kwantlen Park Gauge (mm)	22.9	42.1	65.1	98.1	37.0	66.0	88.8	124.8

The following pages show the rainfall distribution map which show the areas influenced by the intensity-duration-curves for each station. Also, the storm distributions for the Kwantlen Park rain gauge for different distributions are summarized. Storm distributions for areas influenced by the other guages may be pro-rated using this distribution.

RAINFALL DISTRIBUTION MAP

1:2 YEAR DESIGN STORM INTENSITY
Kwantlan Park Rain Gauge

AES Type distribution		SCS Type distribution				
TIME (min)	Storm Duration 2 hr	TIME (min)	Storm Duration 6 hr	12 hr	TIME (min)	duration 24 hr
5	5.28	10	3.32	1.83	20	1.31
10	5.28	20	3.32	1.83	40	1.34
15	6.34	30	3.32	1.83	60	1.34
20	6.34	40	4.45	2.28	80	1.68
25	9.50	50	4.45	2.28	100	1.68
30	9.50	60	4.45	2.28	120	1.68
35	9.50	70	5.72	2.73	140	2.02
40	9.50	80	5.72	2.73	160	2.02
45	10.55	90	5.72	2.73	180	2.02
50	10.55	100	5.09	3.19	200	2.35
55	11.52	110	5.08	3.19	220	2.35
60	11.52	120	5.09	3.19	240	2.35
65	14.78	130	5.09	4.11	260	3.02
70	14.78	140	5.08	4.11	280	3.02
75	11.52	150	5.09	4.11	300	3.02
80	11.52	160	7.63	5.47	320	4.03
85	8.45	170	7.63	5.47	340	4.03
90	8.45	180	7.63	5.47	360	4.03
95	7.39	190	5.72	7.75	380	5.71
100	7.39	200	5.72	7.75	400	5.71
105	6.34	210	5.72	7.75	420	5.71
110	6.34	220	5.72	9.57	440	7.06
115	4.22	230	5.72	9.57	460	7.06
120	4.22	240	5.72	9.57	480	7.06
125		250	5.72	7.29	500	5.38
130		260	5.72	7.29	520	5.38
135		270	5.72	7.29	540	5.38
140		280	5.09	5.93	560	4.37
145		290	5.08	5.93	580	4.37
150		300	5.09	5.93	600	4.37
155		310	5.09	5.47	620	4.03
160		320	5.08	5.47	640	4.03
165		330	5.09	5.47	660	4.03
170		340	4.45	4.56	680	3.36
175		350	4.45	4.56	700	3.36
180		360	4.45	4.56	720	3.36
185		370		3.65	740	2.69
190		380		3.65	760	2.69
195		390		3.65	780	2.69
200		400		4.11	800	3.02
205		410		4.11	820	3.02
210		420		4.11	840	3.02
215		430		2.73	860	2.02
220		440		2.73	880	2.02
225		450		2.73	900	2.02
230		460		3.65	920	2.69
235		470		3.65	940	2.69
240		480		3.65	960	2.69
245		490		2.63	980	2.02
250		500		2.73	1000	2.02
255		510		2.73	1020	2.02
260		520		2.28	1040	1.68
265		530		2.28	1060	1.68
270		540		2.28	1080	1.68
275		550		1.83	1100	1.34
280		560		1.83	1120	1.34
285		570		1.83	1140	1.34
290		580		2.28	1160	1.68
295		590		2.28	1180	1.68
300		600		2.28	1200	1.68
305		610		1.83	1220	1.34
310		620		1.83	1240	1.34
315		630		1.83	1260	1.34
320		640		1.83	1280	1.34
325		650		1.83	1300	1.34
330		660		1.83	1320	1.34
335		670		2.28	1340	1.68
340		680		2.28	1360	1.68
345		690		2.28	1380	1.68
350		700		1.83	1400	1.34
355		710		1.83	1420	1.34
360		720		1.83	1440	1.34
Rain (mm)	17.50		31.8	45.6		67.20

1:5 YEAR DESIGN STORM INTENSITY
Kwantlan Park Rain Gauge

AES Type distribution		SCS Type distribution				
TIME	Storm Duration	TIME	Storm Duration		TIME	duration
(min)	2 hr	(min)	6 hr	12 hr	(min)	24 hr
5	7.21	10	4.82	2.30	20	1.58
10	7.21	20	4.82	2.30	40	1.58
15	8.66	30	4.82	2.30	60	1.58
20	8.66	40	5.62	2.39	80	2.10
25	12.98	50	5.64	2.39	100	2.10
30	12.98	60	5.62	2.39	120	2.10
35	12.98	70	7.24	3.46	140	2.52
40	12.98	80	7.24	3.46	160	2.52
45	14.43	90	7.24	3.46	180	2.52
50	14.43	100	6.44	4.03	200	2.95
55	15.87	110	6.43	4.03	220	2.95
60	15.87	120	6.44	4.03	240	2.95
65	20.20	130	6.44	5.19	260	3.78
70	20.20	140	6.43	5.19	280	3.78
75	15.87	150	6.44	5.19	300	3.78
80	15.87	160	9.66	6.92	320	5.04
85	11.54	170	9.66	6.92	340	5.04
90	11.54	180	9.66	6.92	360	5.04
95	10.10	190	7.24	9.80	380	7.14
100	10.10	200	7.24	9.80	400	7.14
105	8.66	210	7.24	9.80	420	7.14
110	8.66	220	7.24	12.10	440	8.82
115	5.77	230	7.24	12.10	460	8.82
120	5.77	240	7.24	12.10	480	8.82
125		250	7.24	9.22	500	6.72
130		260	7.24	9.22	520	6.72
135		270	7.24	9.22	540	6.72
140		280	6.44	7.49	560	5.45
145		290	6.43	7.49	580	5.45
150		300	6.44	7.49	600	5.45
155		310	6.44	6.92	620	5.04
160		320	6.43	6.92	640	5.04
165		330	6.44	6.92	660	5.04
170		340	5.62	5.76	680	4.21
175		350	5.64	5.76	700	4.21
180		360	5.62	5.76	720	4.21
185		370		4.61	740	3.36
190		380		4.61	760	3.36
195		390		4.61	780	3.36
200		400		5.19	800	3.78
205		410		5.19	820	3.78
210		420		5.19	840	3.78
215		430		3.46	860	2.52
220		440		3.46	880	2.52
225		450		3.46	900	2.52
230		460		4.61	920	3.36
235		470		4.61	940	3.36
240		480		4.61	960	3.36
245		490		3.46	980	2.52
250		500		3.46	1000	2.52
255		510		3.46	1020	2.52
260		520		2.89	1040	2.10
265		530		2.89	1060	2.10
270		540		2.89	1080	2.10
275		550		2.30	1100	1.68
280		560		2.30	1120	1.68
285		570		2.30	1140	1.68
290		580		2.89	1160	2.10
295		590		2.89	1180	2.10
300		600		2.89	1200	2.10
305		610		2.30	1220	1.68
310		620		2.30	1240	1.68
315		630		2.30	1260	1.68
320		640		2.30	1280	1.68
325		650		2.30	1300	1.68
330		660		2.30	1320	1.68
335		670		2.89	1340	2.10
340		680		2.89	1360	2.10
345		690		2.89	1380	2.10
350		700		2.30	1400	1.68
355		710		2.30	1420	1.68
360		720		2.30	1440	1.68
Rain (mm)	24.00		40.20	57.60		84.00

1:100 YEAR DESIGN STORM INTENSITY
Kwantlan Park Rain Gauge

AES Type distribution		SCS Type distribution				
TIME (min)	Storm Duration 2 hr	TIME (min)	Storm Duration 6 hr	12 hr	TIME (min)	duration 24 hr
5	11.08	10	7.91	3.55	20	2.50
10	11.08	20	7.91	3.55	40	2.50
15	13.31	30	7.91	3.55	60	2.50
20	13.31	40	9.23	4.45	80	3.12
25	19.95	50	9.27	4.45	100	3.12
30	19.95	60	9.23	4.45	120	3.12
35	19.95	70	11.89	5.33	140	3.74
40	19.95	80	11.89	5.33	160	3.74
45	22.17	90	11.89	5.33	180	3.74
50	22.17	100	10.57	6.22	200	4.37
55	24.40	110	10.53	6.22	220	4.37
60	24.40	120	10.57	6.22	240	4.37
65	31.04	130	10.57	8.00	260	5.62
70	31.04	140	10.53	8.00	280	5.62
75	24.40	150	10.57	8.00	300	5.62
80	24.40	160	15.84	10.66	320	7.49
85	17.74	170	15.84	10.66	340	7.49
90	17.74	180	15.84	10.66	360	7.49
95	15.52	190	11.89	15.10	380	10.61
100	15.52	200	11.89	15.10	400	10.61
105	13.31	210	11.89	15.10	420	10.61
110	13.31	220	11.89	18.65	440	13.10
115	8.86	230	11.89	18.65	460	13.10
120	8.86	240	11.89	18.65	480	13.10
125		250	11.89	14.22	500	9.97
130		260	11.89	14.22	520	9.97
135		270	11.89	14.22	540	9.97
140		280	10.57	11.55	560	8.11
145		290	10.53	11.55	580	8.11
150		300	10.57	11.55	600	8.11
155		310	10.57	10.66	620	7.49
160		320	10.53	10.66	640	7.49
165		330	10.57	10.66	660	7.49
170		340	9.23	8.88	680	6.24
175		350	9.27	8.88	700	6.24
180		360	9.23	8.88	720	6.24
185		370		7.11	740	4.99
190		380		7.11	760	4.99
195		390		7.11	780	4.99
200		400		8.00	800	5.62
205		410		8.00	820	5.62
210		420		8.00	840	5.62
215		430		5.33	860	3.74
220		440		5.33	880	3.74
225		450		5.33	900	3.74
230		460		7.11	920	4.99
235		470		7.11	940	4.99
240		480		7.11	960	4.99
245		490		5.33	980	3.74
250		500		5.33	1000	3.74
255		510		5.33	1020	3.74
260		520		4.45	1040	3.12
265		530		4.45	1060	3.12
270		540		4.45	1080	3.12
275		550		3.55	1100	2.50
280		560		3.55	1120	2.50
285		570		3.55	1140	2.50
290		580		4.45	1160	3.12
295		590		4.45	1180	3.12
300		600		4.45	1200	3.12
305		610		3.55	1220	2.50
310		620		3.55	1240	2.50
315		630		3.55	1260	2.50
320		640		3.55	1280	2.50
325		650		3.55	1300	2.50
330		660		3.55	1320	2.50
335		670		4.45	1340	3.12
340		680		4.45	1360	3.12
345		690		4.45	1380	3.12
350		700		3.55	1400	2.50
355		710		3.55	1420	2.50
360		720		3.55	1440	2.50
Rain (mm)	37.00		66.00	88.80		124.80

2.2 COST ESTIMATES

Capital cost estimates have been completed for various storm sewer works investigated in this report. Detailed cost estimates can be found in the following tables and are based on unit prices received from the City of Surrey (see Part 5.0 in ***Appendix B***).

STORM SEWER DESIGN SHEET

Project #: 07-104
Calcs By : P.M.
Checked : P.M.
Date : 96 Sept 29

Client Name: City of Surrey
Project Name: West Cloverdale South N.C.P.
Drainage Area: 60 Ave-Hwy 10; 162 St-168 St. (170712Q3.WQ1)
Design Storm: Surrey Municipal Hall 1:5 Year & 1:100 Year

Remarks: Branch 4 & 4A Drain to West Cloverdale North NCP at two separate points. Branch 3 Area Split to Branch RC 1/2 Area North of 60 Ave & West of 164 St. not included. Associated Figure B 2.2

LOCATION			DRAINAGE AREA		DESIGN FLOW										PIPE DATA						
								Time of Concentration			1:5 Year		1:100 Year								
Street/ Right of Way	From MH	To MH	Area Code	Increm Area A (ha)	Runoff Coeff. R	Increm A*R	Total A*R	To Entry (min)	Critical Time (min)	In Pipe Section (min)	Rain i (mm/hr	Actual Flow (m3/s)	Rain i (mm/hr	Actual Flow (m3/s)	Pipe Q full (m3/s)	Friction Factor n	Pipe Slope (%)	Pipe Size (m)	Pipe Length (m)	Pipe V full (m/s)	Major Route
							0.000		0.00									0.450			
	D8A	D8	12	1.63	0.57	0.929	0.929	20	20.00	0.45	26.6	0.069	51.7	0.133	0.093	0.013	8.000%	0.200	80.00	2.953	In Pipe
							4.220		23.61									0.450			
	D8	D7	13	1.82	0.47	0.855	5.076	25	25.00	0.91	23.5	0.332	44.9	0.633	0.333	0.013	3.600%	0.375	164.00	3.012	Overland
							0.000		0.00									0.450			
	D7A	D7	14	1.64	0.5	0.820	0.820	25	25.00	1.00	23.5	0.054	44.9	0.102	0.084	0.013	6.500%	0.200	160.00	2.662	Overland
							5.896		26.00									0.450			
	D7	D6	15	1.49	0.48	0.715	6.611	20	26.00	0.59	23.0	0.423	43.8	0.804	0.806	0.013	8.000%	0.450	180.00	5.070	Overland
Branch 2	D6	POND	16	2.91	0.45	1.310	12.878	30	30.00	1.87	21.3	0.762	40.0	1.431	0.787	0.013	0.500%	0.750	200.00	1.782	Overland
Branch 5							0		0												
	D18	D17	17	2.27	0.57	1.294	1.294	20	20.00	0.78	26.6	0.095	51.7	0.186	0.137	0.013	2.000%	0.300	90.00	1.935	Overland
							0.000		0.00									0.300			
	D17A	D17	18	1.2	0.58	0.696	0.696	20	20.00	0.88	26.6	0.051	51.7	0.100	0.084	0.013	2.000%	0.250	90.00	1.713	In Pipe
							1.990		20.88									0.300			
	D17	D19A	-	0	0.58	0.000	1.990	20	20.88	1.09	25.9	0.143	50.3	0.278	0.227	0.013	5.500%	0.300	210.00	3.208	Overland
	D19A	D19	21	2.07	0.56	1.159	3.149	20	21.97	1.12	25.2	0.221	48.7	0.426	0.328	0.013	3.500%	0.375	200.00	2.970	Overland
	D19	D20	20	2.23	0.56	1.249	4.398	20	23.09	0.83	24.6	0.300	47.2	0.576	0.319	0.013	1.250%	0.450	100.00	2.004	In Pipe

STORM SEWER DESIGN SHEET

Project #: 07-104
Calcs By : P.M.
Checked : P.M.
Date : 96 Sept 29

Client Name: City of Surrey
Project Name: West Cloverdale South N.C.P.
Drainage Area: 60 Ave-Hwy 10; 162 St-168 St. (170712Q3.WQ1)
Design Storm: Surrey Municipal Hall 1:5 Year & 1:100 Year

Remarks: Branch 4 & 4A Drain to West Cloverdale North NCP at two separate points. Branch 3 Area Split to Branch RC 1/2 Area North of 60 Ave & West of 164 St. not included. Associated Figure B 2.2

LOCATION			DRAINAGE AREA		DESIGN FLOW									PIPE DATA						
								Time of Concentration			1:5 Year		1:100 Year								
Street/ Right of Way	From MH	To MH	Area Code	Increm Area A (ha)	Runoff Coeff. R	Increm A*R	Total A*R	To Entry (min)	Critical Time (min)	In Pipe Section (min)	Rain i (mm/hr	Actual Flow (m3/s)	Rain i (mm/hr	Actual Flow (m3/s)	Pipe Q full (m3/s)	Friction Factor n	Pipe Slope (%)	Pipe Size (m)	Pipe Length (m)	Pipe V full (m/s)	Major Route
	D20	D30	30	0	0.56	0.000	4.398	20	23.92	0.58	24.1	0.294	46.1	0.564	0.351	0.013	4.000%	0.375	110.00	3.175	In Pipe
Branch 5	D30	D6	15A	1	0.56	0.560	4.958	20	24.50	0.95	23.8	0.328	45.5	0.626	0.403	0.013	2.000%	0.450	145.00	2.535	Overland
Branch 3							0.000		0.00												
	D16A	D16	22	0.88	0.55	0.484	0.484	20	20.00	1.41	26.6	0.036	51.7	0.069	0.052	0.013	2.500%	0.200	140.00	1.651	In Pipe
							0.000		0.00									0.200			
	D16B	D16	19	1.66	0.55	0.913	0.913	20	20.00	1.43	26.6	0.067	51.7	0.131	0.077	0.013	5.500%	0.200	210.00	2.448	Overland
							1.397		21.43									0.200			
	D16	D13	23	0.36	0.55	0.198	1.595	20	21.43	0.49	25.6	0.113	49.5	0.219	0.133	0.013	5.000%	0.250	80.00	2.709	Overland
							0.000		0.00									0.300			
	D14	D13	24	2.02	0.49	0.990	0.990	20	20.00	2.08	26.6	0.073	51.7	0.142	0.124	0.013	0.500%	0.375	140.00	1.123	In Pipe
							2.585		22.08									0.450			
Branch 3	D13	D12	25	0.49	0.52	0.255	2.840	20	22.08	1.45	25.2	0.199	48.5	0.383	0.202	0.013	0.500%	0.450	110.00	1.268	Overland
Branch 4																					
	D25	D24	28	0	0.59	0.000	0.000	20	20.00	1.40	26.6	0.000	51.7	0.000	0.146	0.013	6.000%	0.250	250.00	2.967	In Pipe
	D24A	D23	29	5.86	0.48	2.813	2.813	30	30.00	2.42	21.3	0.166	40.0	0.313	0.285	0.013	1.000%	0.450	260.00	1.793	In Pipe
							0.000		0.00									0.000			
	D23A	D23	30	2.14	0.49	1.049	1.049	20	20.00	2.69	26.6	0.077	51.7	0.150	0.118	0.013	1.500%	0.300	270.00	1.675	In Pipe

STORM SEWER DESIGN SHEET

Project #: 07-104
Calcs By : P.M.
Checked : P.M.
Date : 96 Sept 29

Client Name: City of Surrey
Project Name: West Cloverdale South N.C.P.
Drainage Area: 60 Ave-Hwy 10; 162 St-168 St. (170712Q3.WQ1)
Design Storm: Surrey Municipal Hall 1:5 Year & 1:100 Year

Remarks: Branch 4 & 4A Drain to West Cloverdale North NCP at two separate points. Branch 3 Area Split to Branch RC 1/2 Area North of 60 Ave & West of 164 St. not included. Associated Figure B 2.2

LOCATION			DRAINAGE AREA		DESIGN FLOW										PIPE DATA						
								Time of Concentration			1:5 Year		1:100 Year								
Street/ Right of Way	From MH	To MH	Area Code	Increm Area A (ha)	Runoff Coeff. R	Increm A*R	Total A*R	To Entry (min)	Critical Time (min)	In Pipe Section (min)	Rain i (mm/hr	Actual Flow (m3/s)	Rain i (mm/hr	Actual Flow (m3/s)	Pipe Q full (m3/s)	Friction Factor n	Pipe Slope (%)	Pipe Size (m)	Pipe Length (m)	Pipe V full (m/s)	Major Route
							3.861		32.42									0.375			
Branch 4	D23	D22	31	1.4	0.6	0.840	4.701	20	32.42	1.68	20.4	0.267	38.1	0.497	0.476	0.013	0.600%	0.600	170.00	1.682	In Pipe

STORM SEWER DESIGN SHEET

Project #: 07-104
Calcs By : P.M.
Checked : P.M.
Date : 96 Sept 29

Client Name: City of Surrey
Project Name: West Cloverdale South N.C.P.
Drainage Area: 60 Ave-Hwy 10; 162 St-168 St. (170712Q2.WQ1)
Design Storm: Surrey Municipal Hall 1:5 Year & 1:100 Year

Remarks: Branch 4 Drains to West Cloverdale North NCP at two separate points.
RC 1/2 Area North of 60 Ave & West of 164 St. not included. Associated Figure B 2.1

LOCATION			DRAINAGE AREA		DESIGN FLOW										PIPE DATA						
								Time of Concentration			1:5 Year		1:100 Year								
Street/ Right of Way	From MH	To MH	Area Code	Increm Area A (ha)	Runoff Coeff. R	Increm A*R	Total A*R	To Entry (min)	Critical Time (min)	In Pipe Section (min)	Rain i (mm/hr	Actual Flow (m3/s)	Rain i (mm/hr	Actual Flow (m3/s)	Pipe Q full (m3/s)	Friction Factor n	Pipe Slope (%)	Pipe Diamet (m)	Pipe Length (m)	Pipe V full (m/s)	Major Route
Branch 1	D4	D3	1	3.79	0.54	2.047	2.047	25	25.00	1.81	23.5	0.134	44.9	0.255	0.137	0.013	2.000%	0.300	210.00	1.935	Overland
							0.000		0.00									0.300			
	D3A	D3	3	2.93	0.48	1.406	1.406	25	25.00	1.00	23.5	0.092	44.9	0.175	0.163	0.013	7.500%	0.250	200.00	3.318	Overland
							3.453		26.81									0.300			
	D3	D1	4	0.55	0.52	0.286	3.739	15	26.81	1.25	22.6	0.235	42.9	0.446	0.372	0.013	1.700%	0.450	175.00	2.337	Overland
							0.000		0.00									0.450			
	D2A	D2	5	1.88	0.52	0.978	0.978	20	20.00	0.69	26.6	0.072	51.7	0.140	0.083	0.013	6.400%	0.200	110.00	2.641	Overland
	D2	D1	6	1.50	0.52	0.780	1.758	20	20.69	0.89	26.1	0.127	50.6	0.247	0.165	0.013	7.700%	0.250	180.00	3.362	Overland
							5.497		28.06									0.450			
Branch 1	D1	POND	7	2.71	0.40	1.084	6.581	20	28.06	2.32	22.1	0.404	41.7	0.763	0.549	0.013	0.800%	0.600	270.00	1.942	Overland
Branch 2																					
	D11	D10	8	2.76	0.57	1.573	1.573	20	20.00	1.06	26.6	0.116	51.7	0.226	0.139	0.013	5.500%	0.250	180.00	2.841	Overland
	D10	D9	9	1.44	0.56	0.806	2.380	20	21.06	1.94	25.8	0.171	50.0	0.331	0.221	0.013	0.600%	0.450	162.00	1.389	Overland
							0.000		0.00									0.450			
	D9A	D9	10	0.93	0.57	0.530	0.530	20	20.00	0.42	26.6	0.039	51.7	0.076	0.093	0.013	8.000%	0.200	75.00	2.953	In Pipe
							2.910		23.00									0.450			
	D9	D8	11	0.72	0.53	0.382	3.291	20	23.00	0.61	24.6	0.225	47.3	0.432	0.541	0.013	3.600%	0.450	124.00	3.401	In Pipe

STORM SEWER DESIGN SHEET

Project #: 07-104
Calcs By : P.M.
Checked : P.M.
Date : 96 Sept 29

Client Name: City of Surrey
Project Name: West Cloverdale South N.C.P.
Drainage Area: 60 Ave-Hwy 10; 162 St-168 St. (170712Q2.WQ1)
Design Storm: Surrey Municipal Hall 1:5 Year & 1:100 Year

Remarks: Branch 4 Drains to West Cloverdale North NCP at two separate points.
RC 1/2 Area North of 60 Ave & West of 164 St. not included. Associated Figure B 2.1

LOCATION			DRAINAGE AREA		DESIGN FLOW										PIPE DATA						
								Time of Concentration			1:5 Year		1:100 Year								
Street/ Right of Way	From MH	To MH	Area Code	Increm Area A (ha)	Runoff Coeff. R	Increm A*R	Total A*R	To Entry (min)	Critical Time (min)	In Pipe Section (min)	Rain i (mm/hr	Actual Flow (m3/s)	Rain i (mm/hr	Actual Flow (m3/s)	Pipe Q full (m3/s)	Friction Factor n	Pipe Slope (%)	Pipe Diamet (m)	Pipe Length (m)	Pipe V full (m/s)	Major Route
							0.000		0.00									0.450			
	D8A	D8	12	1.63	0.57	0.929	0.929	20	20.00	0.45	26.6	0.069	51.7	0.133	0.093	0.013	8.000%	0.200	80.00	2.953	In Pipe
							4.220		23.61									0.450			
	D8	D7	13	1.82	0.47	0.855	5.076	25	25.00	0.91	23.5	0.332	44.9	0.633	0.333	0.013	3.600%	0.375	164.00	3.012	Overland
							0.000		0.00									0.450			
	D7A	D7	14	1.64	0.50	0.820	0.820	25	25.00	1.00	23.5	0.054	44.9	0.102	0.084	0.013	6.500%	0.200	160.00	2.662	Overland
							5.896		26.00									0.450			
	D7	D6	15	1.49	0.48	0.715	6.611	20	26.00	0.59	23.0	0.423	43.8	0.804	0.806	0.013	8.000%	0.450	180.00	5.070	Overland
Branch 2	D6	POND	15A	2.00	0.48	0.960	7.571	20	26.59	2.01	22.7	0.478	43.2	0.908	0.594	0.013	0.500%	0.675	200.00	1.661	Overland
Branch 3																					
	D18	D17	17	2.27	0.57	1.294	1.294	20	20.00	0.78	26.6	0.095	51.7	0.186	0.137	0.013	2.000%	0.300	90.00	1.935	In Pipe
							0.000		0.00									0.300			
	D17A	D17	18	1.20	0.58	0.696	0.696	20	20.00	0.88	26.6	0.051	51.7	0.100	0.084	0.013	2.000%	0.250	90.00	1.713	In Pipe
							1.990		20.88									0.300			
	D17	D16	19	1.66	0.57	0.946	2.936	20	20.88	1.09	25.9	0.212	50.3	0.410	0.227	0.013	5.500%	0.300	210.00	3.208	Overland
							0.000		0.00									0.300			
	D20	D19	20	2.23	0.56	1.249	1.249	20	20.00	1.48	26.6	0.092	51.7	0.179	0.124	0.013	0.500%	0.375	100.00	1.123	In Pipe

STORM SEWER DESIGN SHEET

Project #: 07-104
Calcs By : P.M.
Checked : P.M.
Date : 96 Sept 29

Client Name: City of Surrey
Project Name: West Cloverdale South N.C.P.
Drainage Area: 60 Ave-Hwy 10; 162 St-168 St. (170712Q2.WQ1)
Design Storm: Surrey Municipal Hall 1:5 Year & 1:100 Year

Remarks: Branch 4 Drains to West Cloverdale North NCP at two separate points.
RC 1/2 Area North of 60 Ave & West of 164 St. not included. Associated Figure B 2.1

LOCATION			DRAINAGE AREA		DESIGN FLOW										PIPE DATA						
								Time of Concentration			1:5 Year		1:100 Year								
Street/ Right of Way	From MH	To MH	Area Code	Increm Area A (ha)	Runoff Coeff. R	Increm A*R	Total A*R	To Entry (min)	Critical Time (min)	In Pipe Section (min)	Rain i (mm/hr	Actual Flow (m3/s)	Rain i (mm/hr	Actual Flow (m3/s)	Pipe Q full (m3/s)	Friction Factor n	Pipe Slope (%)	Pipe Diamet (m)	Pipe Length (m)	Pipe V full (m/s)	Major Route
							0.000		0.00									0.375			
	D19A	D19	21	2.07	0.58	1.201	1.201	20	20.00	1.47	26.6	0.089	51.7	0.172	0.111	0.013	3.500%	0.250	200.00	2.266	Overland
							2.449		21.48									0.375			
	D19	D16	22	0.88	0.55	0.484	2.933	20	21.48	0.93	25.5	0.208	49.4	0.402	0.277	0.013	2.500%	0.375	140.00	2.510	Overland
							5.870		22.41									0.375			
	D16	D13	23	0.36	0.55	0.198	6.068	20	22.41	0.33	25.0	0.421	48.1	0.810	0.638	0.013	5.000%	0.450	80.00	4.008	Overland
							0.000		0.00									0.450			
	D14	D13	24	2.02	0.49	0.990	0.990	20	20.00	2.08	26.6	0.073	51.7	0.142	0.124	0.013	0.500%	0.375	140.00	1.123	In Pipe
							7.057		22.75									0.450			
Branch 3	D13	D12	25	0.49	0.52	0.255	7.312	20	22.75	1.10	24.8	0.503	47.6	0.967	0.594	0.013	0.500%	0.675	110.00	1.661	Overland
Branch 4																					
	D25	D24	28	0.00	0.59	0.000	0.000	20	20.00	1.63	26.6	0.000	51.7	0.000	0.080	0.013	6.000%	0.200	250.00	2.557	
	D24	D23	29	5.86	0.48	2.813	2.813	30	30.00	2.42	21.3	0.166	40.0	0.313	0.285	0.013	1.000%	0.450	260.00	1.793	In Pipe
							0.000		0.00									0.450			
	D23A	D23	30	2.14	0.49	1.049	1.049	20	20.00	2.69	26.6	0.077	51.7	0.150	0.118	0.013	1.500%	0.300	270.00	1.675	In Pipe
							3.861		32.42									0.450			
Branch 4	D23	D22	31	1.40	0.50	0.700	4.561	20	32.42	1.68	20.4	0.259	38.1	0.483	0.476	0.013	0.600%	0.600	170.00	1.682	In Pipe

STORM SEWER DESIGN SHEET

Project #: 07-104
Calcs By : P.M.
Checked : P.M.
Date : 96 Sept 29

Client Name: City of Surrey
Project Name: West Cloverdale South N.C.P.
Drainage Area: 60 Ave-Hwy 10; 162 St-168 St. (170712Q1.WQ1)
Design Storm: Surrey Municipal Hall 1:5 Year & 1:100 Year

Remarks: Branch 4 Drains to West Cloverdale North NCP at two separate points.
Includes RC 1/2 Area North of 60 Ave. & West of 164 St. Associated Figure B 2.1

LOCATION			DRAINAGE AREA		DESIGN FLOW										PIPE DATA						
								Time of Concentration			1:5 Year		1:100 Year								
Street/ Right of Way	From MH	To MH	Area Code	Increm Area A (ha)	Runoff Coeff. R	Increm A*R	Total A*R	To Entry (min)	Critical Time (min)	In Pipe Section (min)	Rain i (mm/hr	Actual Flow (m3/s)	Rain i (mm/hr	Actual Flow (m3/s)	Pipe Q full (m3/s)	Friction Factor n	Pipe Slope (%)	Pipe Size (m)	Pipe Length (m)	Pipe V Full (m/s)	Major Route
Branch 1	D4	D3	1	10.09	0.54	5.449	5.449	25	25.00	1.38	23.5	0.356	44.9	0.679	0.403	0.013	2.000%	0.450	210.00	2.535	Overland
							0.000		0.00									0.450			
	D3A	D3	3	2.93	0.48	1.406	1.406	25	25.00	1.13	23.5	0.092	44.9	0.175	0.093	0.013	8.000%	0.200	200.00	2.953	Overland
							6.855		26.38									0.450			
	D3	D1	4	0.55	0.52	0.286	7.141	15	26.38	1.13	22.8	0.453	43.4	0.860	0.561	0.013	1.700%	0.525	175.00	2.590	Overland
							0.000		0.00									0.525			
	D2A	D2	5	1.88	0.52	0.978	0.978	20	20.00	0.69	26.6	0.072	51.7	0.140	0.083	0.013	6.400%	0.200	110.00	2.641	Overland
	D2	D1	6	1.5	0.52	0.780	1.758	20	20.69	0.89	26.1	0.127	50.6	0.247	0.165	0.013	7.700%	0.250	180.00	3.362	Overland
							8.899		27.51									0.525			
Branch 1	D1	POND	7	2.71	0.4	1.084	9.983	20	27.51	2.02	22.3	0.619	42.3	1.172	0.797	0.013	0.900%	0.675	270.00	2.228	Overland
Branch 2																					
	D11	D10	8	2.76	0.57	1.573	1.573	20	20.00	1.06	26.6	0.116	51.7	0.226	0.139	0.013	5.500%	0.250	180.00	2.841	Overland
	D10	D9	9	1.44	0.56	0.806	2.380	20	21.06	1.94	25.8	0.171	50.0	0.331	0.221	0.013	0.600%	0.450	162.00	1.389	Overland
							0.000		0.00									0.450			
	D9A	D9	10	0.93	0.57	0.530	0.530	20	20.00	0.42	26.6	0.039	51.7	0.076	0.093	0.013	8.000%	0.200	75.00	2.953	In Pipe
							2.910		23.00									0.450			
	D9	D8	11	0.72	0.53	0.382	3.291	20	23.00	0.61	24.6	0.225	47.3	0.432	0.541	0.013	3.600%	0.450	124.00	3.401	In Pipe

STORM SEWER DESIGN SHEET

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Drainage Area: 60 Ave-Hwy 10; 162 St-168 St. (170712Q1.WQ1)
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								Time of Concentration			1:5 Year		1:100 Year								
Street/ Right of Way	From MH	To MH	Area Code	Increm Area A (ha)	Runoff Coeff. R	Increm A*R	Total A*R	To Entry (min)	Critical Time (min)	In Pipe Section (min)	Rain i (mm/hr	Actual Flow (m3/s)	Rain i (mm/hr	Actual Flow (m3/s)	Pipe Q full (m3/s)	Friction Factor n	Pipe Slope (%)	Pipe Size (m)	Pipe Length (m)	Pipe V Full (m/s)	Major Route
							0.000		0.00									0.450			
	D8A	D8	12	1.63	0.57	0.929	0.929	20	20.00	0.45	26.6	0.069	51.7	0.133	0.093	0.013	8.000%	0.200	80.00	2.953	In Pipe
							4.220		23.61									0.450			
	D8	D7	13	1.82	0.47	0.855	5.076	25	25.00	0.91	23.5	0.332	44.9	0.633	0.333	0.013	3.600%	0.375	164.00	3.012	Overland
							0.000		0.00									0.450			
	D7A	D7	14	1.64	0.5	0.820	0.820	25	25.00	1.00	23.5	0.054	44.9	0.102	0.084	0.013	6.500%	0.200	160.00	2.662	Overland
							5.896		26.00									0.450			
	D7	D6	15	1.49	0.48	0.715	6.611	20	26.00	0.59	23.0	0.423	43.8	0.804	0.806	0.013	8.000%	0.450	180.00	5.070	Overland
Branch 2	D6	POND	15A	2	0.48	0.960	7.571	20	26.59	2.01	22.7	0.478	43.2	0.908	0.594	0.013	0.500%	0.675	200.00	1.661	Overland
Branch 3																					
	D18	D17	17	2.27	0.57	1.294	1.294	20	20.00	0.78	26.6	0.095	51.7	0.186	0.137	0.013	2.000%	0.300	90.00	1.935	In Pipe
							0.000		0.00									0.300			
	D17A	D17	18	1.2	0.58	0.696	0.696	20	20.00	0.88	26.6	0.051	51.7	0.100	0.084	0.013	2.000%	0.250	90.00	1.713	In Pipe
							1.990		20.88									0.300			
	D17	D16	19	1.66	0.57	0.946	2.936	20	20.88	1.09	25.9	0.212	50.3	0.410	0.227	0.013	5.500%	0.300	210.00	3.208	Overland
							0.000		0.00									0.300			
	D20	D19	20	2.23	0.56	1.249	1.249	20	20.00	1.48	26.6	0.092	51.7	0.179	0.124	0.013	0.500%	0.375	100.00	1.123	In Pipe

STORM SEWER DESIGN SHEET

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Calcs By : P.M.
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Street/ Right of Way	From MH	To MH	Area Code	Increm Area A (ha)	Runoff Coeff. R	Increm A*R	Total A*R	To Entry (min)	Critical Time (min)	In Pipe Section (min)	Rain i (mm/hr	Actual Flow (m3/s)	Rain i (mm/hr	Actual Flow (m3/s)	Pipe Q full (m3/s)	Friction Factor n	Pipe Slope (%)	Pipe Size (m)	Pipe Length (m)	Pipe V Full (m/s)	Major Route
																		0.375			
							0.000		0.00						0.111	0.013	3.500%	0.250	200.00	2.266	Overland
	D19A	D19	21	2.07	0.58	1.201	1.201	20	20.00	1.47	26.6	0.089	51.7	0.172				0.375			
							2.449		21.48						0.277	0.013	2.500%	0.375	140.00	2.510	Oveland
	D19	D16	22	0.88	0.55	0.484	2.933	20	21.48	0.93	25.5	0.208	49.4	0.402				0.375			
							5.870		22.41						0.638	0.013	5.000%	0.450	80.00	4.008	Overland
	D16	D13	23	0.36	0.55	0.198	6.068	20	22.41	0.33	25.0	0.421	48.1	0.810				0.450			
							0.000		0.00						0.124	0.013	0.500%	0.375	140.00	1.123	In Pipe
	D14	D13	24	2.02	0.49	0.990	0.990	20	20.00	2.08	26.6	0.073	51.7	0.142				0.450			
							7.057		22.75						0.594	0.013	0.500%	0.675	110.00	1.661	Overland
Branch 3	D13	D12	25	0.49	0.52	0.255	7.312	20	22.75	1.10	24.8	0.503	47.6	0.967							
Branch 4																					
	D25	D24	28	0	0.59	0.000	0.000	20	20.00	1.63	26.6	0.000	51.7	0.000	0.080	0.013	6.000%	0.200	250.00	2.557	
	D24	D23	29	5.86	0.48	2.813	2.813	30	30.00	2.42	21.3	0.166	40.0	0.313	0.285	0.013	1.000%	0.450	260.00	1.793	In Pipe
							0.000		0.00									0.525			
	D23A	D23	30	2.14	0.49	1.049	1.049	20	20.00	2.69	26.6	0.077	51.7	0.150	0.118	0.013	1.500%	0.300	270.00	1.675	In Pipe
							3.861		32.42									0.525			
Branch 4	D23	D22	31	1.4	0.5	0.700	4.561	20	32.42	1.68	20.4	0.259	38.1	0.483	0.476	0.013	0.600%	0.600	170.00	1.682	In Pipe

2.4 STORM SEWER REFERENCE DRAWINGS AND DETAILS

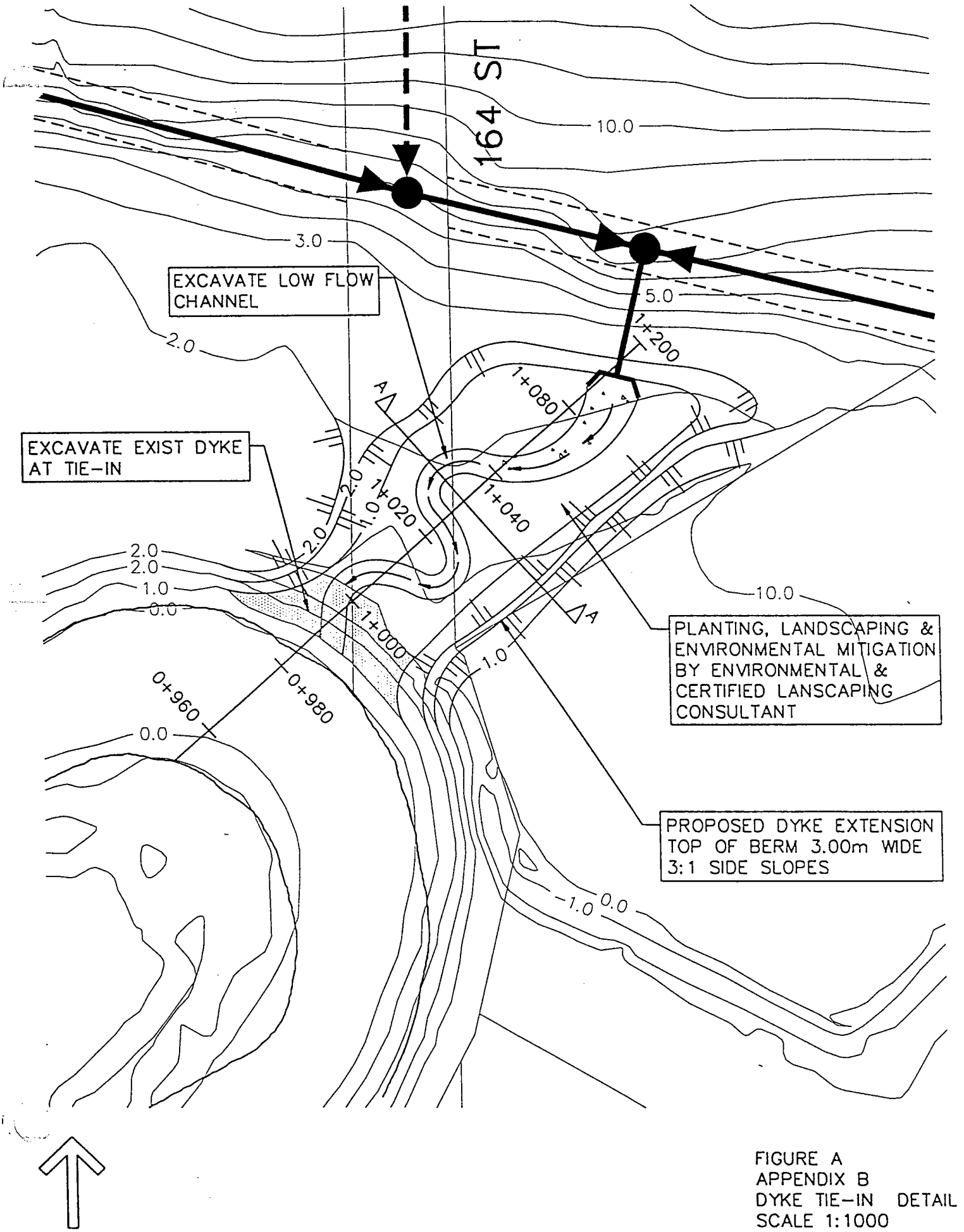


FIGURE A
APPENDIX B
DYKE TIE-IN DETAIL
SCALE 1:1000

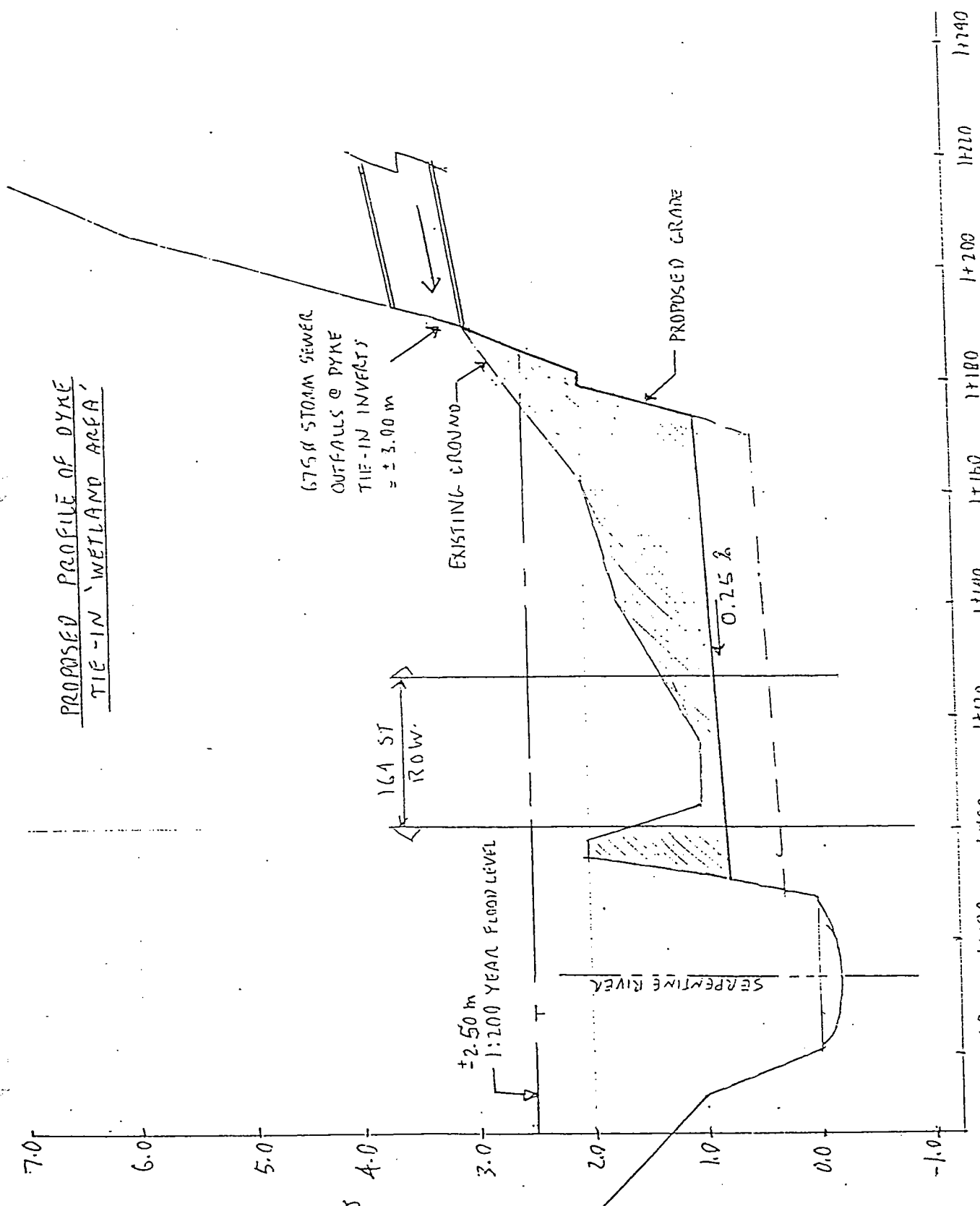
Stanley ASSOCIATES

PROJECT: WEST CLOVERDALE SOUTH NCP STUDY

PROJECT No.: 07-104 DATE: JUNE 18, 1996

PAGE: 1 OF 3 SCALE: 1:1000 (H) 1:50 (V)

PROPOSED PROFILE OF DYKE TIE-IN 'WETLAND AREA'



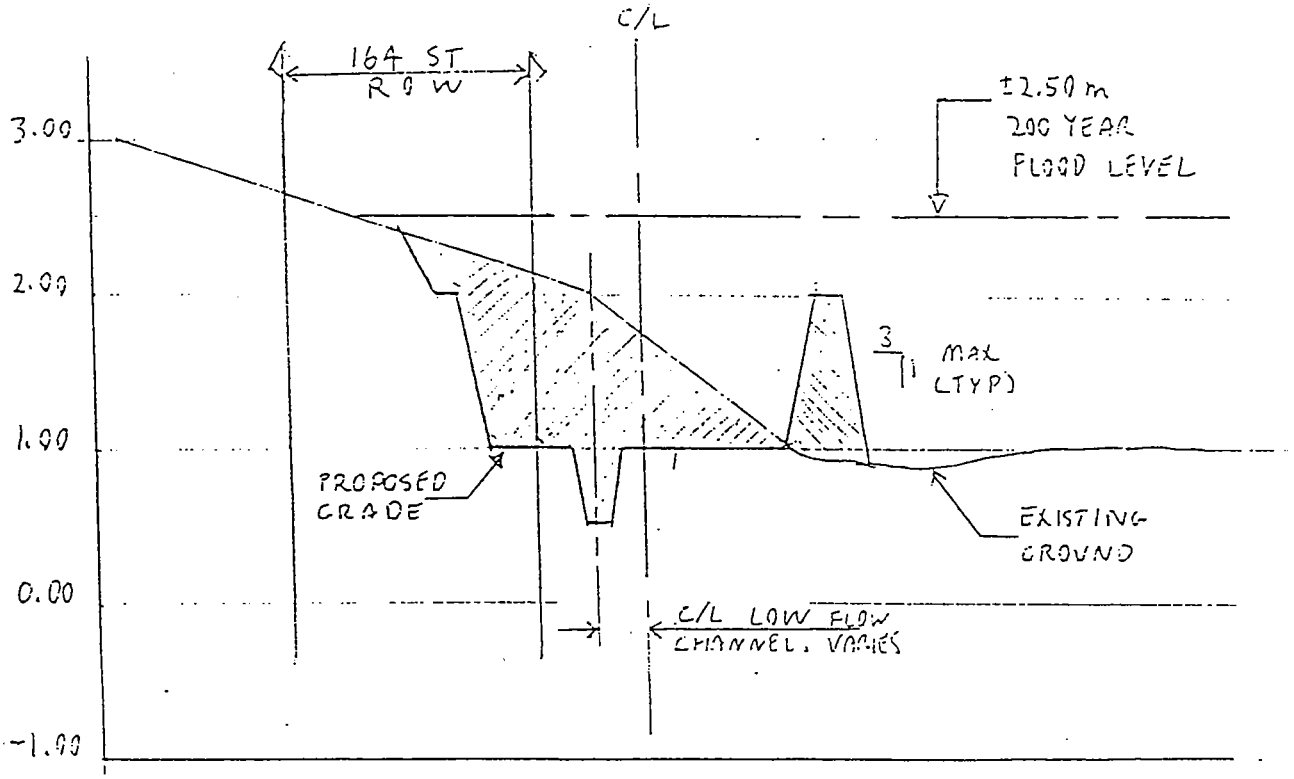
DESIGNED BY: PS. CHECKED BY:

Stanley ASSOCIATES

PROJECT: WEST CLOVERDALE SOUTH NCP STUDY

PROJECT No.: 07-104 DATE: JUNE 19 1996

PAGE: 2 OF 3 SCALE: 1:1000 (H) 1:50 (V)



SECTION A-A
(STA 1+140)

EARTHWORKS CALC

- CUT = 25 × 1.250 m² = 31.25 m²
- FILL = 5.5 × 1.250 m² = 6.88 m²

CUT AVG 31.25 m²/m × 80m = 2496 m³

LOW FLOW CUT = 2.25 m²/m × 150m = 338 m³

SUBTOTAL 2834 m³ ≃ 3000 m³ × 1.5 ≃ 4500 m³

FILL (DYKE BERM) AVG 6.88 m² × 120 m = 826 m³ × 1.5 ≃ 1250 m³

* MAY REQUIRE OVEREXCAVATION FOR BERM, MATERIALS MAY BE COMPRESSIBLE. ∴ 3× CUT TO FILL VOLUME MAY BALANCE

TOTAL EXCAVATION/FILL = 6750 m³ @ $10/m³ = $67,500

PLANTING/LANDSCAPING = 1 @ $30000 = $30,000

*RIP RAP OUTFALLS = 1 @ $10,000 = $10,000

TOTAL DYKE TIE-IN = $107,500

* NO FLOW CONTROL STRUCTURES OR OVERFLOW PATHS REQUIRED

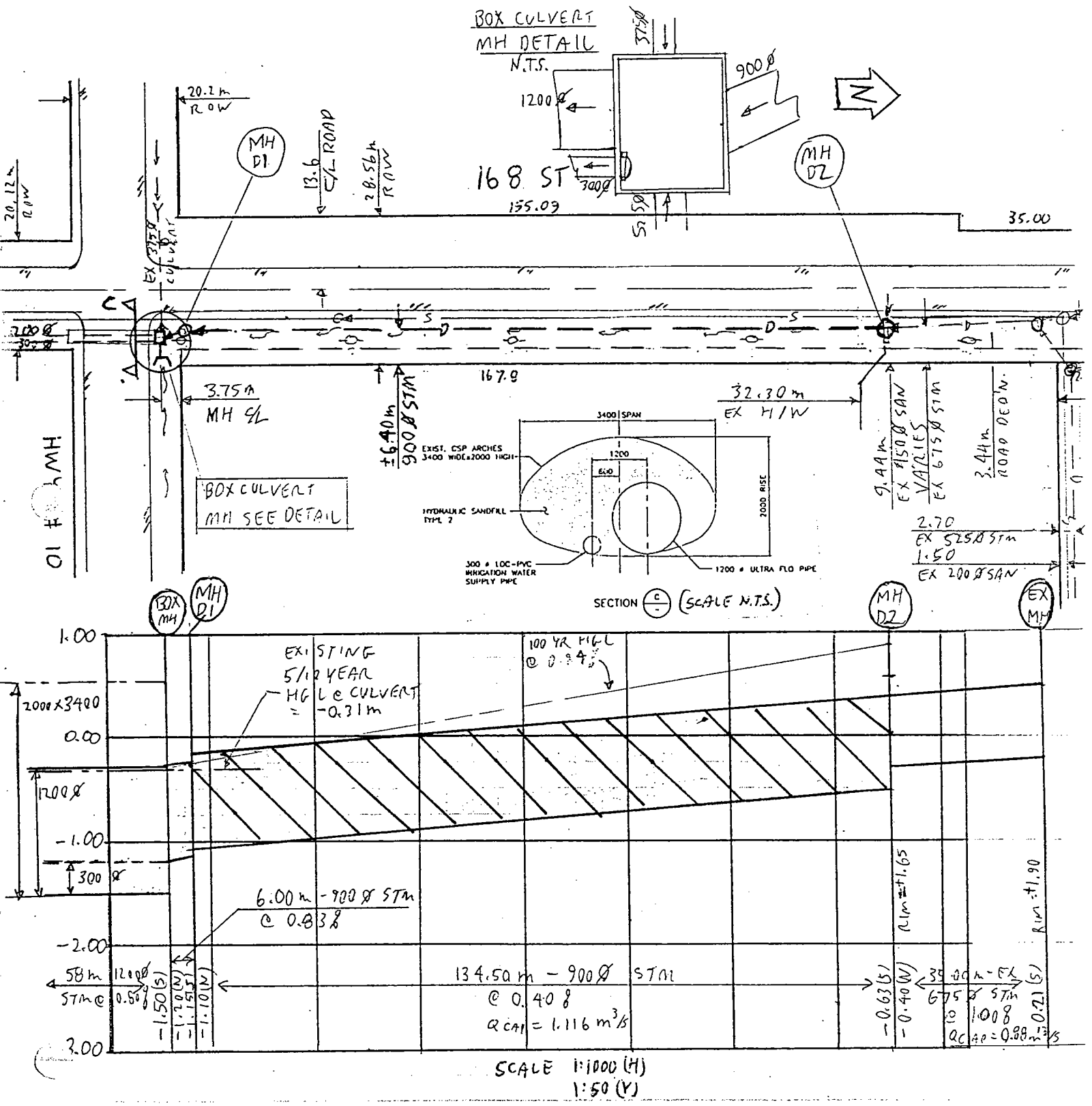
DESIGNED BY: PGM CHECKED BY:

Stanley ASSOCIATES

PROJECT: CITY OF SURREY - SW CLOVERDALE NCP
168 ST PRESSURE STORM SEWER DETAIL

PROJECT No.: 07-104 DATE: NOV 20, 1996

PAGE: SCALE: AS NOTED



SCALE 1:1000 (H)
1:50 (V)

DESIGNED BY: P.M. CHECKED BY:

SURREY
CITY OF PARKS

THE CITY OF SURREY
Engineering Department

S.W. CLOVERDALE CANAL WORKS

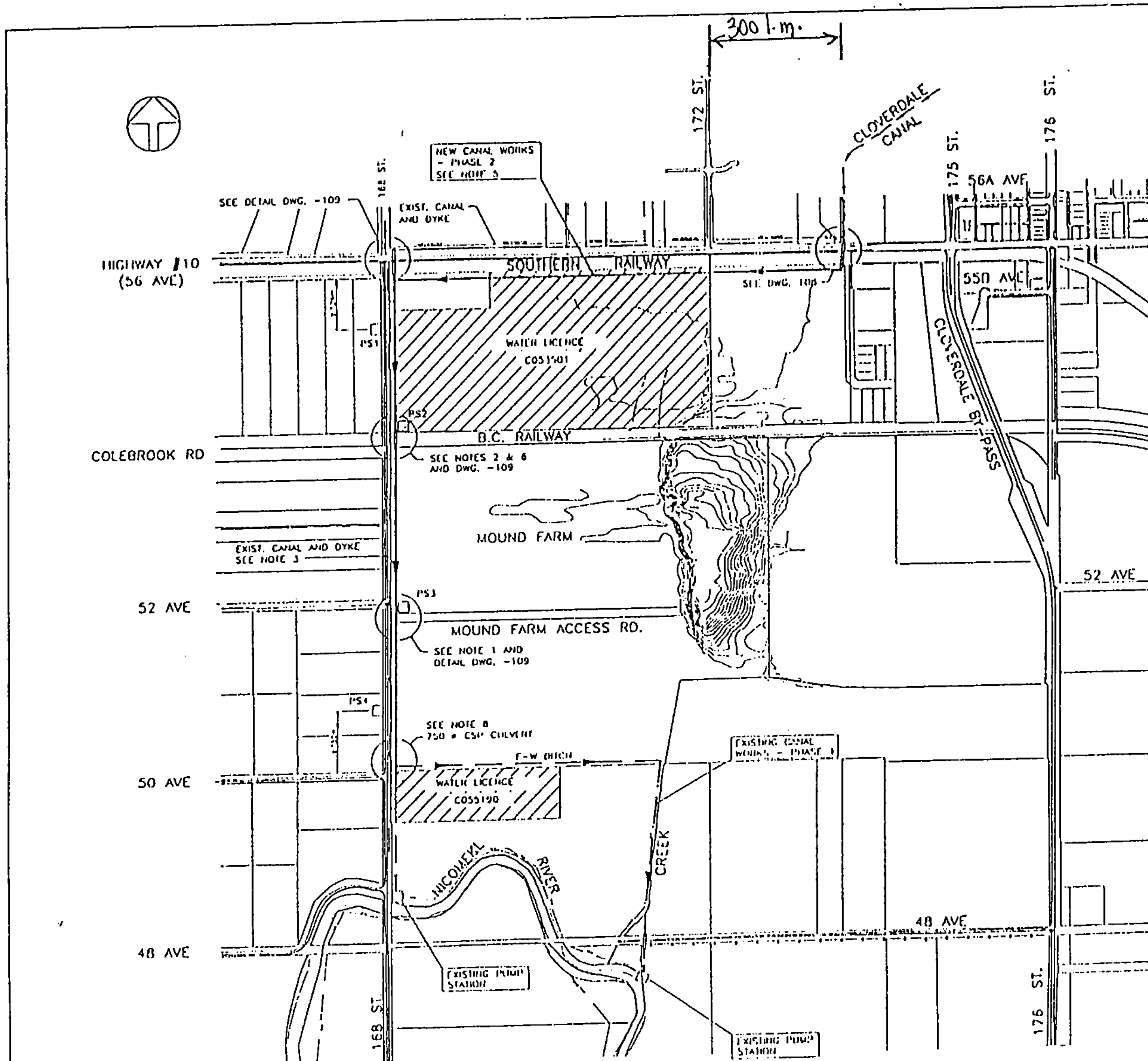
PHASE 2

CONTRACT NO. M.S. 4896-401

LIST OF DRAWINGS

		COVER SHEET
1.	942323-2-100	KEY PLAN
2.	942323-2-101	PLAN AND PROFILE - SHEET 1
3.	942323-2-102	PLAN AND PROFILE - SHEET 2
4.	942323-2-103	PLAN AND PROFILE - SHEET 3
5.	942323-2-104	PLAN AND PROFILE - SHEET 4
6.	942323-2-105	PLAN AND PROFILE - SHEET 5
7.	942323-2-106	PLAN AND PROFILE - SHEET 6
8.	942323-2-107	PLAN AND PROFILE - SHEET 7
9.	942323-2-108	FLOW CONTROL STRUCTURE DETAILS
10.	942323-2-109	CULVERT DETAILS
11.	942323-2-110	CULVERT PLAN

ASSOCIATED ENGINEERING



GENERAL NOTES:

existing farm pump stations and irrigation systems and equipment

1. ACCESS BRIDGE TO MOUND FARM IS NOT SUITABLE FOR CONSTRUCTION TRAFFIC. CONTRACTOR TO PROVIDE A TEMPORARY BRIDGE.
2. RELOCATE ~~[illegible]~~ DRAINAGE DISCHARGE AND IRRIGATION WATER SUPPLY OPERATIONS TO BE IDENTICAL TO THE EXISTING SYSTEM *see descriptions below*
3. BACKFILL EXISTING CANAL ON THE EAST SIDE OF 168th STREET, CREATING A SWALE. THIS WORK CAN BE DONE ONLY AFTER THE COMPLETION OF THE NEW CANAL. STOCKPILE CANAL EXCAVATION AND USE FOR BACKFILLING THE EXISTING CANAL ON 168th STREET. EXCESS EXCAVATION TO BE DISPOSED ON SITES SELECTED BY THE CONTRACTOR.
4. LOCAL DRAINAGE DITCH INVERT VARIES FROM -1.00 TO -1.50 (TYP.).
5. DO NOT CROSS THE EXISTING 1200 ø SANITARY SEWER WITH HEAVY CONSTRUCTION EQUIPMENT.
6. B.C. RAILWAY CULVERTS MAY BE INSTALLED BY OPEN CUT OR JACKING. SAFEGUARD LOSS OF EMBANKMENT FILL WHEN EXCAVATING MATERIAL INSIDE JACKED PIPES.
7. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE NOTED.
8. 750 ø CULVERT AT 50 AVE IS A PROVISIONAL ITEM. SIZE AND LOCATION TO BE CONFIRMED BY THE ENGINEER DURING CONSTRUCTION.

LEGEND:

PROPOSED	EXISTING	DESCRIPTION
		CANAL
		SWALE HIGHPOINT
		DITCH
		DITCH HIGHPOINT
		CONTOUR
		TOP OF SLOPE
		WATER MAIN
		SANITARY SEWER
		STORM SEWER
		GAS LINE
		FENCE
		CATCH BASIN
		UTILITY POLE
		MANHOLE
		IRON PIN
		SIGN
		FIRE HYDRANT
		GAS VALVE
		WATER VALVE
		BERM
		[illegible] SAN SEWER
		CANAL WORKS - PHASE 2
		CANAL WORKS - PHASE 1
		PROPERTY LINE

BRIEF DESCRIPTION OF WORK REQUIRED FOR THE LOCAL IRRIGATION AND DRAINAGE PUMP STATIONS

PUMP STATION NO.	APPROXIMATE LOCATION	WORK REQUIRED UNDER CONTRACT
PS1	120m SOUTH OF SOUTHERN RAILWAY ON THE WEST SIDE OF 168th STREET.	EXTEND 300 ø STEEL DISCHARGE LINE THROUGH EXIST. DYKE INTO NEW CANAL. PROVIDE A 10C-300 ø FLAP GATE.
PS2	NE CORNER OF 168th STREET AND B.C. RAILWAY LINE	RELOCATE THIS STATION TO THE EAST SIDE OF NEW CANAL. CONSTRUCT A NEW CONCRETE SUMP AND BUILDING. RE-INSTALL EXISTING EQUIPMENT CONSISTING OF 2 DRAINAGE PUMPS AND ONE IRRIGATION PUMP. DRAINAGE DISCHARGE PIPES ARE 400 & 300 ø STEEL C/W 10C FLAP GATES. IRRIGATION INTAKE 150 ø. REPLACEMENT STRUCTURE AND EQUIPMENT TO BE EQUAL OR BETTER THAN EXISTING.
PS3	NE CORNER OF MOUND FARM ACCESS ROAD AND 168th STREET	THIS IS A FAIRLY NEW INSTALLATION. RELOCATE THE STATION AND RE-INSTALL EXISTING EQUIPMENT CONSISTING OF A DRAINAGE PUMP WITH 300 ø DISCHARGE AND 150 ø IRRIGATION INTAKE.
PS4	150m NORTH OF 50th AVENUE ON WEST SIDE OF 168th STREET	EXTEND THE EXISTING 300 ø STEEL DISCHARGE LINE INTO THE NEW CANAL AND PROVIDE A 10C-300 ø FLAP GATE.

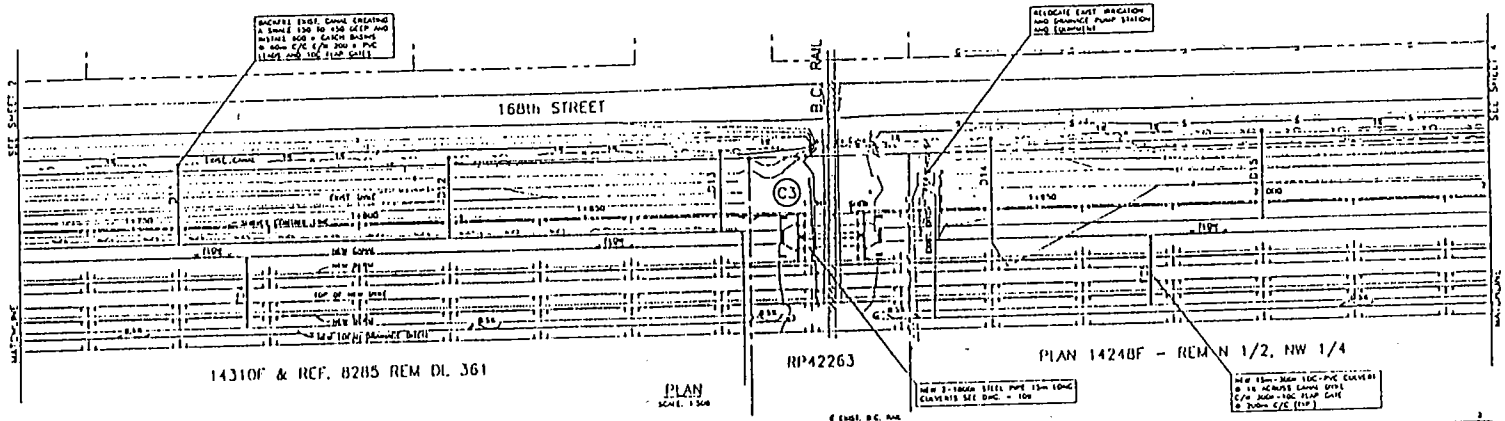
ASSOCIATED ENGINEERING

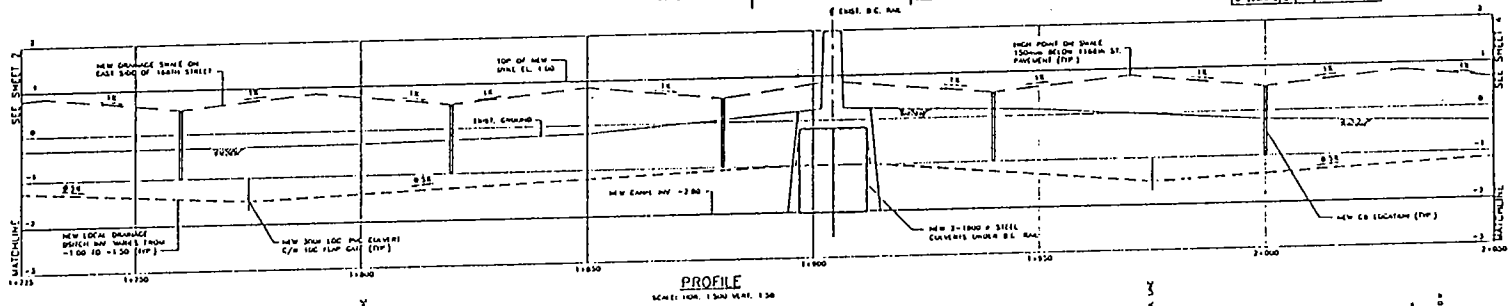
ENGINEERING DEPARTMENT
CITY OF SURREY

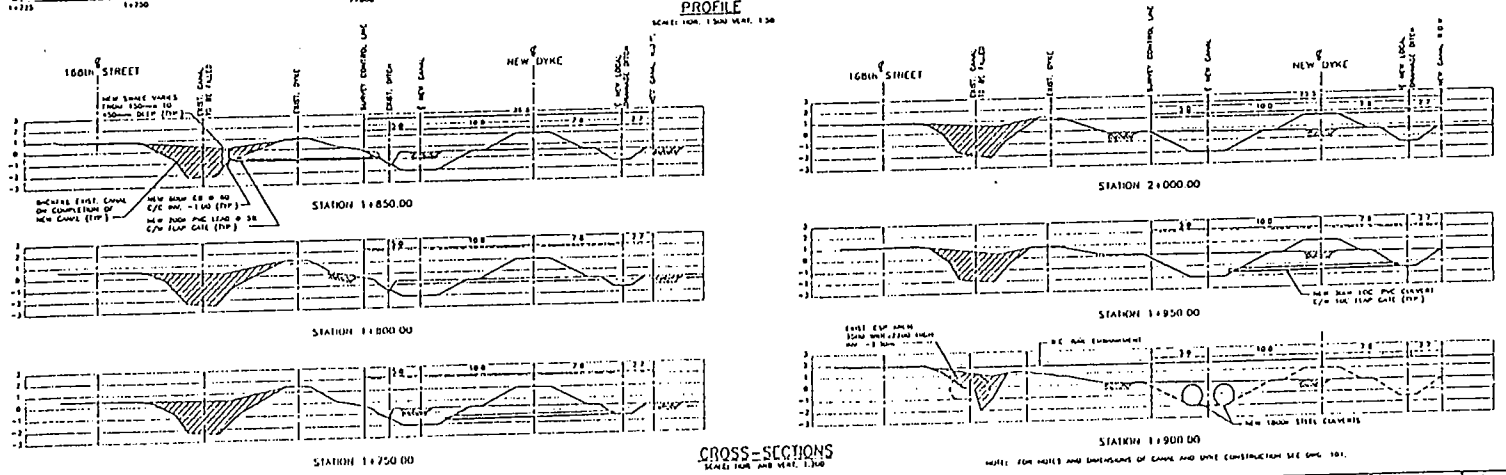
THE CITY OF SURREY
SW CLOVERDALE DRAINAGE CANAL WORKS
PHASE 2 - KEY PLAN

942323

942323-2-100





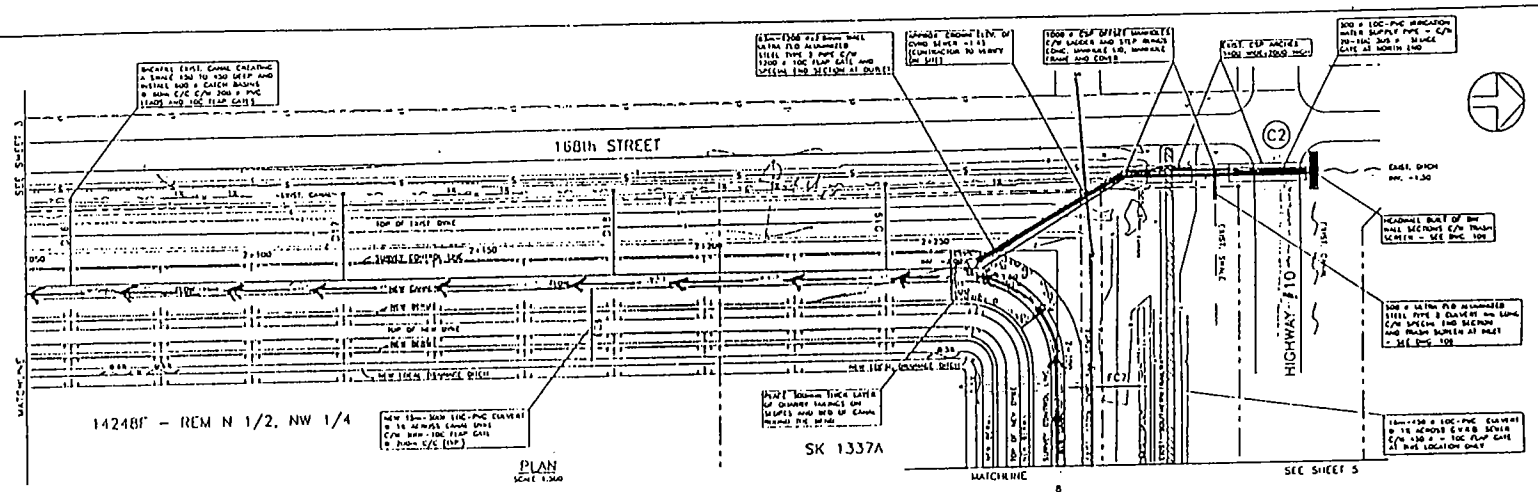


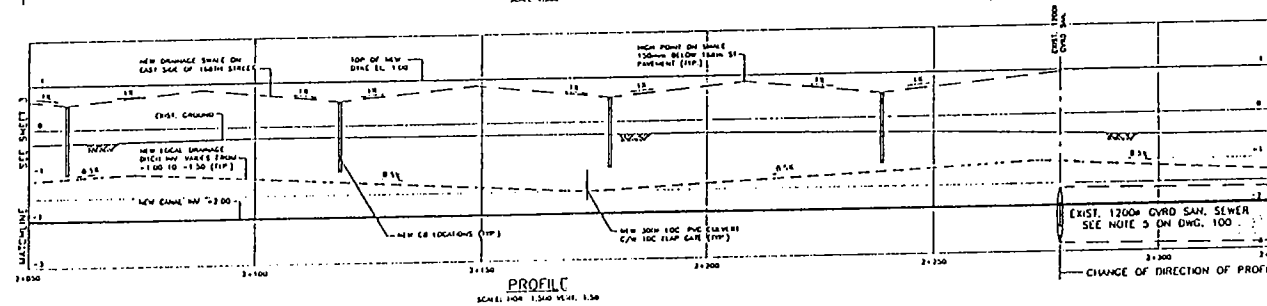
ASSOCIATED ENGINEERING

ENGINEERING DEPARTMENT
CITY OF SURREY

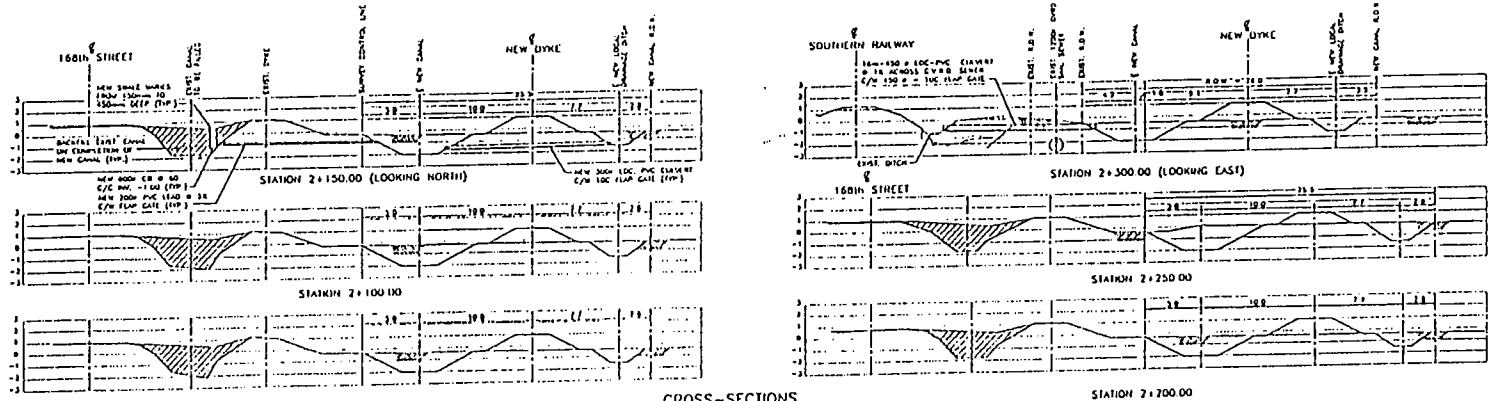
THE CITY OF SURREY
SW CLOVERDALE DRAINAGE CANAL WORKS
PH. 2 - PLAN/PROFILE - SHEET 3

PROJECT NUMBER 942323
DRAWING NUMBER 942323-2-103
SHEET 4 OF 11





PROFILE
SCALES: HOR. 1:500 VERT. 1:50



CROSS-SECTIONS
SCALES: HOR. AND VERT. 1:250

NOTE: FOR NOTES AND DIMENSIONS OF CANAL AND DYKE CONSTRUCTION SEE DWG. 101.

ASSOCIATED ENGINEERING

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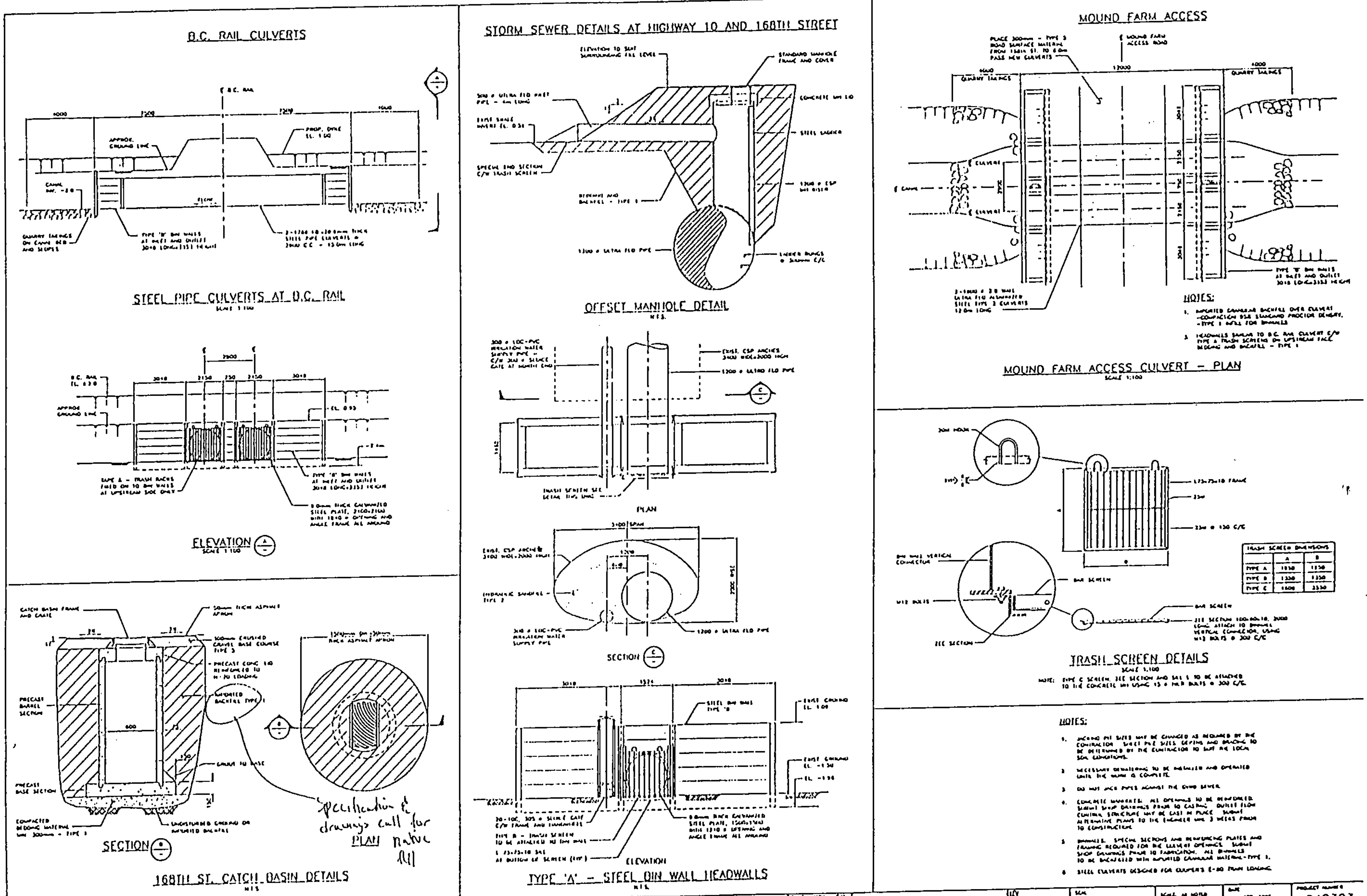
CITY OF SURREY

THE CITY OF SURREY
SW CLOVERDALE DRAINAGE CANAL WORKS
PH. 2 – PLAN/PROFILE – SHEET 4

PROJECT NUMBER 942323
942323-2-104
SHEET 5 OF 11



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ENGINEERING DEPARTMENT
CITY OF SURREY

THE CITY OF SURREY
SW CLOVERDALE DRAINAGE CANAL WORKS
CULVERT DETAILS

Project number: 942323
Drawing number: 942323-2-10
Sheet 10 of 11

APPENDIX B

2.5 SECTION 7 REGULATION UNDER BRITISH COLUMBIA *WATER ACT*

Users Guide

For Works and Changes In and About a Stream

The Section 7 Regulation Under British Columbia's *Water Act*

Province of
British Columbia

Canadian Cataloguing in Publication Data
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A Message From the Minister

For many years now, protection of streams has been provided through Approvals issued under Section 7 of the *Water Act*. However increasing pressures from proposals for work in streams have led to the requirement for a more effective and efficient method of reviewing proposals.

The new Section 7 Regulation sets detailed standards for working in and about a stream. It provides for increased protection of the water quality and quantity, meaning healthier fish and wildlife habitats and a reduction of property damage. The regulation benefits applicants by clarifying and streamlining the administrative process. Under the new regulation, routine proposals will be processed with greater efficiency, enabling ministry staff to spend more time on complex proposals.

Partnership between the applicant and government is the underlying principle of the Section 7 Regulation. This collaboration will result in increased protection of the riparian environment. We are collectively responsible for seeing that our works and changes in and about streams do not damage either the resource or property. This is true whether the proposal is a road culvert, a clear span bridge, a dock, a fence across the stream channel area, or emergency repairs.

This guide is designed to accompany the Section 7 Regulation. It is published to assist you to understand and comply with the regulation. The regulation was written in consultation with the general public, environmental groups, government and industry. I urge you to become familiar with it. The Section 7 Regulation is an important part of our commitment to the future of this province.

I extend thanks to everyone who assisted in developing the regulation, and especially the people and groups who attended our consultations and told us how important it is to protect our environment and property for future generations. Their cooperation and commitment have been invaluable and the results of their work will benefit all British Columbians for generations to come.

The Honourable Moe Sihota
Minister of Environment, Lands and Parks
Victoria, British Columbia

INTRODUCTION

This guide is intended for individuals and organizations who wish to undertake works and changes in and about a stream. It has been developed to assist applicants in complying with the Section 7 Regulation under British Columbia's *Water Act*. The regulation is the main reference (see pages 11 to 17).

The new rules under Section 7 of the *Water Act* were designed to ensure that changes in and about a stream caused by human activities meet a set of standards. Under the regulation a person may undertake a number of routine works, provided that general conditions and the requirements for notifying the government are met.

Abiding by the rules ensures that water quality and quantity and the aquatic and shoreline environment are protected. The regulation also reduces incidents of property damage and the possibility of civil suits which may result among neighbours. Failure to meet standards, notification requirements or general conditions could result in penalties under the *Water Act* and other legislation such as the *Federal Fisheries Act*.

Water Management Principles and the Section 7 Regulation

The Section 7 Regulation of the *Water Act* reflects the principles of sustainability, stewardship, partnership and integrated resource management.

Sustainable use: Water must not be allocated or used beyond its capacity to be naturally replenished, both in quality and in quantity. The new regulation protects water and ecological systems, public health and safety, as well as property and rights.

Stewardship: The regulation minimizes the negative impact of undertakings around streams on the water resource. This ensures that the many uses and values of water will be maintained.

Partnership: Partnership implies sharing responsibilities consistent with provincial goals. As the basis for Section 7 activities, partnership is reflected in the consultation that took place during the development of this regulation and in the applicant's responsibilities under the regulation.

Integrated Management: In accounting for the full range of water uses and values, this regulation will help integrate water management, land planning, environment and socioeconomic well-being.

Ownership of the water and of most stream beds is vested in the Crown. Changes in and about streams have been managed and regulated for many years in order to protect and maintain certain values and resources (and legal rights) associated with the streams. This was done through the issuance of Approvals (formal permit with a fee) under Section 7 of the *Water Act*. These continue to be used for the short term use or diversion of water.

Prior to the Section 7 Regulation, a number of types of works could only be authorized by formal Approval (e.g., bridge construction, culvert installation, pipeline crossings and other types of works that affect water quality and quantity, shoreline habitat and the land). With the Section 7 Regulation however an Approval will only be used in cases involving high risk work. Most works in streams may be undertaken under standard conditions and a requirement for notification.

Key Definitions

"Stream" includes a natural watercourse or source of water s[illegible] whether usually containing water or not, ground water, and a lake, river, creek, spring, ravine, swamp and gulch.

"Changes in and about a stream" means any modification to the nature of the stream including the land, vegetation, natural environment or flow of water within a stream, or any activity or construction within the stream channel that has or may have an impact on a stream.

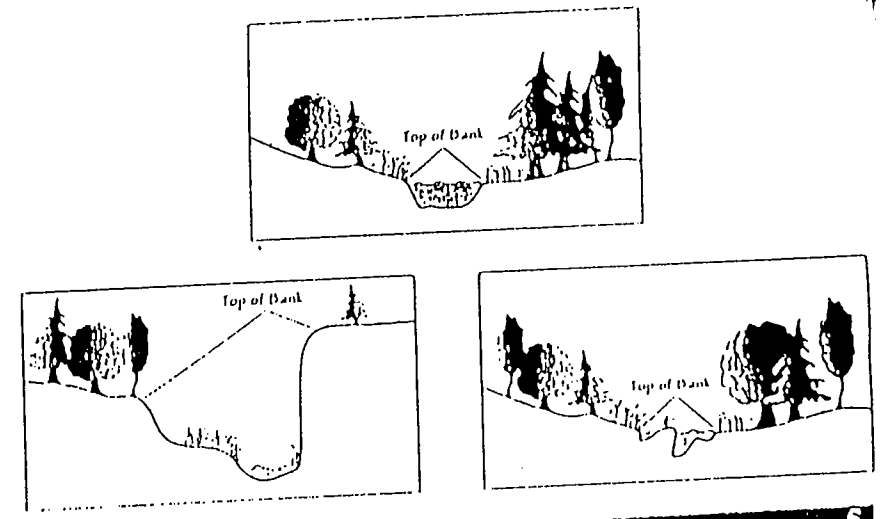
"Stream channel" means the bed of a stream and the banks of a stream, whether above or below the natural boundary and whether usually containing water or not, including all side channels (see Figure 1).

"works" means anything capable of or useful for:

- diverting, storing, measuring, conserving, conveying, retarding, confining or using water, or
- producing, measuring, transmitting or using electricity, or
- collecting, conveying or disposing of sewage or garbage or for preventing or extinguishing fires.

In addition, *"works"* means booms and piles placed in a stream; obstructions placed in or removed from streams or the banks or beds of streams; and changes in and about a stream, and includes access roads to any of them.

Figure 1 A Stream Channel in Various Topographic Settings



Activities Carried Out Under the Section 7 Regulation

Works that *do not involve any diversion of water, that may be completed within a short period of time and that have little impact on the environment* may be conducted in compliance with the Section 7 Regulation. The following projects may be carried out, provided that general conditions, specific standards and notification requirements are met (section 44):

- stream culverts
- clear span bridges
- pipeline crossings
- docks or wharfs
- storm sewer outfalls
- dyke repairs
- cutting of vegetation
- ice bridges
- repair of bridge superstructure
- harvesting of Watermilfoil
- drain tile outlets
- fencing

Government agencies may also construct or authorize:

- stream channel maintenance
- flood emergency works
- fish habitat restoration
- water flow measuring devices
- emergency clearing of an obstruction
- fish or game installations

In addition, a public utility may carry out routine maintenance.

General Conditions

Every project carried out under the regulation must meet the following conditions:

Other legal requirements (section 37 (4) (a)): A person will comply with all applicable federal, provincial, or municipal enactments (e.g. *Fisheries Act*, *Workers Compensation Act*, local zoning and building requirements) and is responsible for obtaining necessary permits.

Land ownership (section 37 (4) (b)): If a person does not own the land, the approval of the landowner must be obtained whether the land is private or Crown land.

Protection of water quality (section 41): A person must ensure that no sediment or other compounds enter the stream, that water quality objectives are met, that the stream channel is not destabilized and that environmentally sound construction practices are followed.

Protection of other water users (section 43): A person must ensure that existing water uses under the *Water Act* are protected and that the users are given three days notice and provided with a supply of water as required.

Public safety issues (section 38 (2)): A person must design, construct and maintain the works so that life, property and the environment are not endangered.

Timing and duration of work (section 38 (1) (b)): The changes must be completed without delay, unless necessary to preserve the nature of the stream.

Use of equipment (sections 44 (a) i, (b) (ii)): Equipment used for site preparation, construction and maintenance must be situated in a naturally dry stream channel or operated from the top of the bank.

Where a person's proposal may have a significant detrimental impact on the nature of the stream or stream channel, an application for an Approval or licence under the *Water Act* may be required (section 37 (3)).

Specific Project Requirements

In addition to the general conditions listed above, all works must be carried out in compliance with specific construction standards (section 44).

A person must also obtain conditions from the habitat officer that may concern: timing considerations, in stream flows, material removal, introduction of material to the stream, fish and wildlife protection or salvage, protection of natural materials, restoration of the site and the requirements of the federal Department of Fisheries and Oceans (section 42).

As outlined in the following section, notification to government is usually required before work commences (section 40).

Notification Requirements

Works Requiring Notification

Most works in and about a stream require notification in writing to BC Environment:

- stream culverts
- clear span bridges
- pipeline crossings
- piers or wharfs
- restoration or maintenance stream channels
- flow or water measuring devices
- maintenance of public utility works
- ice bridges or winter fords
- control of Eurasian watermilfoil
- storm sewer outfalls
- cutting of annual vegetation
- construction of fish fences, screens, fish/game guards
- existing dykes and erosion protection works
- restoration or maintenance of fish habitat

N[illegible]ation forms are available at BC Environment regional offices. A form wi[illegible] an appropriate sketch plan must be filled out by the applicant and forwarded to the nearest BC Environment regional office (section 40 (1), (a), (b)).

The notification form must reach the BC Environment office at least 45 days before the proposed works can be constructed. During this time, the habitat officer may set specific conditions.

If the regional office has not contacted the applicant within 45 days after receipt of notification by BC Environment, the person proposing works may proceed without further contact, under standard conditions contained in the regulation.

Works Not Requiring Notification

The following changes in and about a stream do not require notification before construction providing they are carried out as specified under the regulation (section 40 (3)).

- emergency flood erosion protection works
- emergency clearing of an obstruction from a bridge or a culvert
- installation of drain tile outlets
- repair or maintenance of the superstructure of a bridge
- installation, repair or maintenance of fences

Emergency works for flood protection and the clearing of obstruction must be reported to a habitat officer within 72 hours of making the change (section 40 (4) (a), (b)).

A person holding an agreement under the *Forest Act* or the *Range Act*, or allowed under the *Forest Practices Code of British Columbia Act*, may also carry out works and changes in and about a stream without notification. Such a person must, however, comply with the *Forest Practices Code of British Columbia Act*, including the regulations and standards established under it, and any other applicable legislation (e.g. *Land Act* or *Fisheries Act*).

Enforcement of the Regulation

The person undertaking works must report incidents which result in noncompliance within 72 hours to BC Environment. To remedy the noncompliance, the applicant must take measures specified by the engineer and comply with the terms and conditions that a habitat officer specifies.

To ensure that changes occur in a way which protects water quality and quantity and the aquatic and riparian environment, BC Environment is taking the following measures (section 39):

- Spot inspections and ongoing project monitoring w[illegible] ensure compliance with the requirements of the [illegible]ation, as well as with any project specific terms and conditions;
- Other enforcement measures, remedies or penalties (under the *Water Act* and the *Fisheries Act*) may also be exercised.

For Further Information

For more information about the Section 7 Regulation under British Columbia's *Water Act*, contact the nearest BC Environment regional office listed below:

Kamloops
1259 Dalhousie Drive
Kamloops, BC V2C 5Z5
Phone: 371-6200
Fax: 828-4000

Nanaimo
2569 Kenworth Road
Nanaimo, BC V9T 4P7
Phone: 751-3100
Fax: 751-3103

Nelson
#401 333 Victoria Street
Nelson, BC V1L 4K3
Phone: 354-6370
Fax: 354-6332

Penticton
#201 3547 Skaha Lake Road
Penticton, BC V2A 7K2
Phone: 490-8200
Fax: 492-1314
Toll free: 1-800-461-1127

Surrey (Planning and Assessment)
10334 152 A Street
Surrey, BC V3R 7P8
Phone: 582-5235
Fax: 660-8926

Williams Lake
Ste. 400-640 Borland Street
Williams Lake, BC V2G 4T1
Phone: 398-4531
Fax: 398-4214

Prince George
3rd Floor, 1011 4th Avenue
Prince George, BC V2L 3H9
Phone: 565-6135
Fax: 565-6629

Smithers
Bag 5000, 3726 Alfred Avenue
Smithers, BC V0J 2N0
Phone: 847-7303
Fax: 847-7728

Additional References

1. *Riparian Rights and Public Foreshore Use in the Administration of Aquatic Crown Land*, BC Lands, Ministry of Environment, Lands and Parks, 1995.
2. *Stream Stewardship, A Guide for Planners and Developers*, Ministry of Environment, Lands and Parks, Ministry of Municipal Affairs, Department of Fisheries and Oceans, 1994.
3. *Obtaining Crown Lands for Private Use*, BC Lands, Ministry of Environment, Lands and Parks, 1993.
4. *Land Development Guidelines for the Protection of Aquatic Habitat*, Ministry of Environment, Lands and Parks, Department of Fisheries and Oceans, 1992.

Changes in and about a Stream

Authority to make a change in and about a stream

37. (1) A change in and about a stream must not proceed unless it is
    (a) authorized by an approval, licence or order, or
    (b) made in compliance with this regulation.
    (2) If a change in and about a stream is authorized by an approval, licence or order, this regulation, except subsection (3), does not apply to the change in and about the stream.
    (3) If the engineer is of the opinion that a proposed change in and about a stream may have a significant detrimental impact on the nature of the stream or stream channel, the engineer may require that an application for an approval or a licence be made in connection with the proposed change in and about a stream.
    (4) The fact that a change in and about a stream meets the requirements of subsection (1) does not relieve the person carrying out the change in and about the stream from
        (a) the requirement to comply with all applicable federal, provincial or municipal enactments, and
        (b) if the change in and about a stream will occur on Crown land or land owned by another person, from the requirement to obtain the approval of the owner before proceeding.

Limits on the authority to make a change in and about a stream

38. (1) A person must not make a change in and about a stream unless that person
        (a) provides, on request, information that the engineer, officer or habitat officer requires to assess the impact on the nature of the stream or stream channel, and
        (b) once commenced, completes the change without delay except if a delay is necessary to preserve the nature of the stream or stream channel.
    (2) A change in and about a stream must be designed, constructed and maintained in such a manner that the change does not pose a significant danger to life, property or the environment.

Failure to comply with this regulation when making a change in and about a stream

39. In addition to other remedies or penalties that may be imposed on a person who makes a change in and about a stream that does not comply with this regulation, the person must

(a) within 72 hours report the noncompliance to the closest regional office of the Ministry of Environment, Lands and Parks, and

(b) to remedy the noncompliance,

(i) take the measures the engineer specifies, and

(ii) comply with the terms and conditions described in section 42 that a habitat officer specifies.

Notification

40. (1) A person must not make a change in and about a stream unless that person

(a) notifies a habitat officer of the region of the Ministry of Environment, Lands and Parks in which the change in and about a stream will be located, by providing the information specified in the notification form available from the ministry, of the particulars of the proposed change at least 45 days prior to commencing to make the change, and

(b) obtains from a habitat officer the terms and conditions described in section 42 on which the change can proceed prior to commencing to make the change.

(2) Despite subsection (1), if a habitat officer has not contacted the person giving notice under subsection (1) (a) within 45 days of the receipt of the notice by a habitat officer, the person may proceed to make the change.

(3) A person who makes a change in and about a stream under section 44 (o) to (t) does not have to comply with subsection (1).

(4) A person who makes a change in and about a stream under section 44 (o) or (p) must

(a) within 72 hours report the change to a habitat officer, and

(b) take the measures the engineer specifies and comply with the terms and conditions described in section 42 that a habitat officer specifies respecting the change.

Protection of water quality

41. A person making a change in and about a stream must ensure that

(a) no substance, sediment, debris or material that could adversely impact the stream is

(i) allowed or permitted to enter or leach or seep into the stream from an activity, construction, worksite, machinery or from components used in the construction of any works, or

(ii) placed, used or stored within the stream channel,

(b) no standards or objectives published under section 2 (e) of the Environment Management Act by the Ministry of Environment, Lands and Parks for the protection of ambient water quality are exceeded or not attained now or in the future due to the change,

(c) there is no disturbance or removal of stable [illegible]ral materials and vegetation in and about a stream that c[illegible]ute to stream channel stability except as authorized under this regulation and in accordance with the terms and conditions specified by the habitat officer,

(d) temporary material, fill, bridge, culvert, pump, pipe, conduit, ditch or other structure used to assist in the construction of any works are constructed and maintained only during the period of construction, and are removed on completion of the works,

(e) all cast-in-place concrete and grouting is completely separated from fish bearing waters for a minimum of 48 hours,

(f) rock from acid-generating rock formations is not used for construction, and

(g) the stream is restored to its natural state on completion of the change in and about a stream.

Protection of habitat

42. (1) To protect habitat, a person making a change in and about a stream under this regulation, other than under section 44 (o) to (t), must make that change in accordance with terms and conditions specified by the habitat officer with respect to

(a) the timing window or the period or periods of time in the year during which the change can proceed without causing harm to fish, wildlife or habitat,

(b) the minimum instream flow or the minimum flow of water that must remain in the stream while the change is being made,

(c) the removal of material from the stream or stream channel in connection with the change,

(d) the addition of substance, sediment, debris or material to the stream or stream channel in connection with the change,

(e) the salvage or protection of fish or wildlife while the change is being made or after the change has been made,

(f) the protection of natural materials and vegetation that contribute to habitat or stream channel stability,

(g) the restoration of the work site after the change has been made, and

(h) the requirement to obtain an approval from the federal Department of Fisheries and Oceans in connection with the change.

(2) In addition to other remedies or penalties that may be imposed on a person who makes a change in and about a stream that damages habitat, the person must

(a) within 72 hours report the damage to a habitat officer, and

(b) restore and repair the habitat to its natural state or as directed by the habitat officer.

ction of other water users

43. (1) A person making a change in and about a stream, other than a change under section 44 (o) to (t), must ensure that persons who are lawfully diverting or using water under the Water Act will not be adversely affected.

(2) Despite subsection (1), if persons who are lawfully diverting or using water under the Water Act may be adversely affected, a person proposing to make a change in and about a stream, other than a change under section 44 (o) to (t), must give 3 days notice to those persons prior to commencing to make the change and must provide an adequate supply of water to those persons, if required by those persons.

Authorization for changes in and about a stream

44. For the purposes of section 7.1 of the Water Act, the following changes in and about a stream may be made without the necessity of obtaining an approval or licence for that change, provided that the change is made in accordance with this regulation and in accordance with the terms and conditions, described in section 42, specified by a habitat officer

(a) the installation or maintenance of a stream culvert for a road crossing, provided that

(i) equipment used for site preparation, construction and maintenance of the culvert is situated in a naturally dry stream channel or operated from the top of the bank,

(ii) in fish bearing waters, the culvert allows fish in the stream to pass up or down stream under all flow conditions,

(iii) the culvert inlet and outlet incorporate measures to protect the structure and the stream channel against erosion and scour,

(iv) if debris cannot safely pass, provision is made to prevent the entrance of debris into the culvert,

(v) the installation or maintenance does not destabilize the stream channel,

(vi) the culvert and its approach roads do not produce a backwater effect or increase the head of the stream,

(vii) the culvert capacity is equivalent to the hydraulic capacity of the stream channel or is capable of passing the 1 in 200 year maximum daily flow without the water level at the culvert inlet exceeding the top of the culvert,

(viii) the culvert has a minimum equivalent diameter of 600 mm,

(ix) a culvert having an equivalent diameter of 2 metres or greater, or having a design capacity to pass a flow of more than 6 cubic metres a second, is designed by a professional engineer and constructed in conformance with that design,

(x) the culvert is installed in a manner which will permit the removal of obstacles and debris within the culvert and at the culvert ends,

(xi) the stream channel, located outside the cleared width, is not altered,

(xii) embankment fill materials do not and will not encroach on culvert inlets and outlets,

(xiii) the culvert has a depth of fill cover which is at least 300 mm or as required by the culvert manufacturer's specifications,

(xiv) the maximum fill heights above the top of the culvert do not exceed 2 m, and

(xv) the culvert material meets the standards of the Canadian Standards Association,

(b) the construction or maintenance of a clear span bridge, provided that

(i) the bridge and its approach roads do not produce a back water effect or increase the head in the stream,

(ii) the equipment used for construction, including site preparation, and maintenance of the bridge is situated in a naturally dry stream channel or is operated from the top of the bank,

(iii) the hydraulic capacity of the bridge is equivalent to the hydraulic capacity of the stream channel, or is capable of passing the 1 in 200 year maximum daily flow, and the height of the underside of the bridge is also adequate to provide free passage of flood debris and ice flows, and

(iv) the bridge material meets the standards of the Canadian Standards Association, as applicable,

(c) the construction or maintenance of a pipeline crossing, provided that

(i) the pipeline and associated works are installed in a naturally dry stream channel at a depth so that the top of the pipe is at least 1 metre below the lowest elevation of the bed of the stream, and

(ii) in the case of an aerial crossing, the crossing is constructed in accordance with the requirements prescribed in paragraph (b) for clear span bridges,

(d) the construction or maintenance of a pier or wharf in a stream provided that the ebb and flow of water and movement of material under the influence of waves or currents is not obstructed and that the requirements under section 37 (4) are met,

(e) the construction or maintenance of a flow or water level measuring device in a stream by the Crown in right of either Canada or British Columbia, or their agents,

(f) the construction of a fish fence, screen or fish or game guard across a stream by the Crown in right of either Canada or British Columbia, or their agents, provided that it is designed, constructed, maintained or used so as not to obstruct the flow of water in the stream,

(g) the restoration or maintenance of a stream channel by British Columbia or its agents,

(h) the restoration or maintenance of a stream channel by a municipality,

(i) the mechanical or manual cutting of annual vegetation within a stream channel,

(j) the restoration or maintenance of fish habitat by the Crown in right of either Canada or British Columbia, or their agents,

(k) the repair or maintenance of existing dikes or existing erosion protection works to their original state, provided that the dikes or works were functional during the previous year,

(l) the construction or maintenance of storm sewer outfalls, provided that the storm sewer outfall is designed by a professional engineer, and constructed, maintained and used so as not to obstruct the flow of water in the stream or to cause erosion or scour in the stream,

(m) the mechanical or manual control of Eurasian watermilfoil and other aquatic vegetation by a landowner, a municipality or a local authority,

(n) the construction or maintenance of ice bridges or winter fords, provided that the materials used are removed from the stream channel before ice break-up,

(o) the construction or placement of erosion protection works or flood protection works during a flood emergency, declared under the Emergency Program Act, under the direction of the Crown in right of British Columbia, or its agents,

(p) the clearing of an obstruction from a bridge or culvert by the Crown in right of British Columbia, or its agents, or by a municipality during a flood event when there exists a potential danger to life or property,

(q) the installation or cleaning of drain tile outlets,

(r) the repair or maintenance of the superstructure of a bridge, excluding its foundation,

(s) the installation, repair or maintenance of fences, provided that the fencing materials

(i) are not in the stream channel,

(ii) do not block debris in the stream channel, and

(iii) do not interfere with navigation of the stream,

(t) a change in and about a stream to which a standard or regulation under the Forest Practices Code of British Columbia Act applies that is carried out by a person

(i) holding an agreement under the Forest Act or the Range Act or holding a special use permit under the Forest Practices Code of British Columbia Act, or

(ii) referred to in section 58 (2) (c) of the Forest Practices Code of British Columbia Act, in the construction, modification, maintenance or deactivation of a road under that Act, provided that the person complies with the Forest Practices Code of British Columbia Act, including the regulations and standards established under it, or

(u) the maintenance of a minor and routine nature by a public utility of its works.

[en. B.C. Reg. 241/95.]

DEFINITIONS

"*acid generating rock*" means rock that when ground to paste has a paste pH of less than 4.5;

"*approval*" means an approval of the comptroller, regional water manager or engineer under Section 7 or 7.1 of the *Water Act*;

"*bridge abutment*" means that part of a bridge structure which supports the bridge span at the ends;

"*changes in and about a stream*" means any modification to the nature of a stream including the land, vegetation, natural environment or flow of water within a stream, or any activity or construction within the stream channel that has or may have an impact on a stream;

"*clear span bridge*" means a single span structure without piers which spans the stream channel from top of bank to top of bank, with the bridge abutments outside the stream channel;

"*culvert*" means one or more pipes, pipe arches, or structures covered with soil and lying below the road surface, used to carry water, but does not include log structures;

"*ditch*" means a long narrow excavated channel for drainage or to mark a boundary. A "*ditch*" may also be constructed to replace a stream channel;

"*embankment*" means a structure of earth, gravel or similar material raised above the surrounding land surface;

"*engineer*" means a professional engineer employed by the Crown and designated in writing by the comptroller as an engineer, and includes a regional water manager;

"*erosion*" means the wearing away, by water, of the banks or of the bed of a stream or of the materials used in any works;

"*fish bearing waters*" means a stream having a fish population present at some time during the year;

"*fish passage*" means fish in a stream are able to pass by or through in both upstream and downstream directions;

"*habitat*" means the areas in and about a stream and including the quantity and quality of water, on which fish or wildlife depend directly or indirectly in order to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas;

"*[illegible] officer*" means a public service employee designated in writing by the regional director for the regional office of the Ministry of Environment, Lands and Parks where the public service employee is employed;

"*licence*" means a licence issued under the *Water Act*;

"*municipality*" means a municipality or regional district incorporated under the *Municipal Act* or the City of Vancouver;

"*natural state*" means as close to the original or preconstruction state as possible;

"*public utility*" as defined in the *Utilities Commission Act* means a person, or his lessee, trustee, receiver or liquidator, who owns or operates in the Province, equipment or facilities for:

- the production, generation, storage, transmission, sale, delivery or furnishing of electricity, natural gas, steam or any other agent for the production of light, heat, cold or power to or for the public or a corporation for compensation, or
- the conveyance or transmission of information, messages or communications by guided or unguided electromagnetic waves, including systems of cable, microwave, optical fibre or radiocommunications where that service is offered to the public for compensation,

but "*public utility*" does not include:

- a municipality, regional district in respect of services furnished by the municipality or regional district within its own boundaries,
- a person not otherwise a public utility who furnishes the service or commodity only to himself, his employees or tenants, where the service or commodity is not resold to or used by others,
- a person not otherwise a public utility who is engaged in the petroleum industry or in the wellhead production of oil, natural gas or other natural petroleum substances, or
- a person not otherwise a public utility who is engaged in the production of geothermal resource.

"*professional engineer*" means a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia;

"*scour*" means the removal of stream bed material by water action;

"*stream,*" means a natural watercourse or source of water [illegible]y, whether usually containing water or not, ground water, and a lake, riv[illegible]eek, spring, ravine, swamp and gulch;

"*stream channel*" means the bed of a stream and the banks of a stream, whether above or below the natural boundary and whether usually containing water or not, including all side channels;

"*works*" means anything capable of or useful for:

- diverting, storing, measuring, conserving, conveying, retarding, confining or using water, or
- producing, measuring, transmitting or using electricity, or
- collecting, conveying or disposing of sewage or garbage or for preventing or extinguishing fires.

In addition, "*works*" means booms and piles placed in a stream; obstructions placed in or removed from streams or the banks or beds of streams; and changes in and about a stream, and includes access roads to any of them.

SECTION 3.0 SANITARY SEWER

3.0 SANITARY SEWER

3.1 DESIGN CRITERIA AND SYSTEM MODELLING

All sanitary sewer analysis and calculations are based on the 1995 City of Surrey Design Criteria Manual. Some of the more pertinent design criteria used are as follows:

Sewage Flow

- Average Day per capita Flow (ADF) = 350 l/capita/day (residential)
- Harmon Peaking Factor (HPF) = $1+14/(4+P^{0.5})$
  P = Population (thousands)
  Peak Flow (PF) = ADF x HPF
- Design Peak Flow (DPF) - Peak Flow (PF)+Infiltration (I)
- Infiltration (I) = 0.1 l/sec/HA

3.2 COST ESTIMATES

None of the proposed sanitary sewers in the West Cloverdale South NCP area generated the 40 l/sec minimum requirement to be classified as a sanitary trunk sewer, thus no cost estimates were completed.

3.3 SANITARY SEWERAGE ANALYSIS (COMPUTER RUNS)

Design Criteria File: CLVRDAL2.DCT cloverdale ncp including RC 1/2 n of 60
Sewerage Model File: CLVRDAL2.SAN Cloverdale ncp including RC 1/2 n of 60
Metric units.
Residential Flow= 350.0 lpcd
Infiltration= 0 lphd + 283 l/mm/km/d
Peaking Factor= Harmon formula* 1.00
Industrial*1.00 from residential populations.

Oversized for Area N. w/ 60th Ave.
AREA 3

Pipe Up	Manholes Down	Description	External File	Pump Rate lps	Meas Flow lps	Grade %	Mannings n	Dia mm	Area+Addnl Population
116	103					7.000	0.013	150	17+ 0
115	114					0.500	0.013	150	525+ 0
114	113					0.500	0.013	150	58+ 0
113	111					0.500	0.013	150	47+ 0
112	111					10.000	0.013	150	65+ 0
111	109					0.500	0.013	150	0+ 0
110	112					1.000	0.013	150	0+ 0
109	102					0.500	0.013	150	28+ 0
108	107					5.700	0.013	150	72+ 0
107	106					1.000	0.013	150	70+ 0
106	105					1.500	0.013	150	38+ 0
105	104					3.500	0.013	150	60+ 0
104	103					3.000	0.013	150	73+ 0
103	102					7.000	0.013	150	21+ 0
102	101					0.500	0.013	150	23+ 0

1097+

ZONING: RF RHG RC1/2 RC(1) DC-10 DC-15 DC(C) DC-45
population density (pers/ha) / Industrial flow (l/ha/day)

Infiltr Code	50.0 0	19.0 0	36.0 0	19.0 0	69.0 0	98.0 0	60.0 0	165.0 0
area in hectares								
116	.	0.9	.	.	.	.	.	.
115	.	.	14.1	0.9	.	.	.	.
114	.	.	1.6	.	.	.	.	.
113	.	.	1.3	.	.	.	.	.
112	.	.	1.8	.	.	.	.	.
111	.	.	.	.	.	.	.	.
110	.	.	.	.	.	.	.	.
109	.	1.5	.	.	.	.	.	.
108	.	.	.	.	0.3	0.5	.	.
107	.	.	.	.	1.0	.	.	.
106	0.8	.	.	.	.	.	.	.
105	1.0	.	0.2	.	.	.	.	.
104	1.0	.	0.6	.	.	.	.	.
103	.	0.4	0.4	.	.	.	.	.
102	.	.	0.6	.	.	.	.	.

Up	EXISTING.... Dia mm	Capacity lps	REQ'D Dia mm	PROPOSED.....n=0.013..... Dia mm	Capacity lps	Vfull mps	Vpart mps	Q/Qf	DESIGN FLOWS..... Infiltr lps	Average lps	Peak lps
116	150	40.3	25	200	86.8	2.8	0.5	0.00	0.0	0.1	0.3
115	150	10.8	137	200	23.2	0.7	0.7	0.37	0.1	2.2	8.5

114	150	10.8	143	200	23.2	0.7	0.7	0.41	0.2	2.6	9.5
113	150	10.8	147	200	23.2	0.7	0.7	0.44	0.3	2.8	10.2
112	150	48.2	38	200	103.7	3.3	0.9	0.01	0.1	0.4	1.2
111	150*	10.8	153	200	23.2	0.7	0.7	0.49	0.4	3.2	11.4
110	150	15.2	17	200	32.8	1.0	0.1	0.00	0.0	0.0	0.0
109	150*	10.8	156	200	23.2	0.7	0.7	0.51	0.5	3.4	11.9
108	150	36.4	43	200	78.3	2.5	0.8	0.02	0.1	0.4	1.3
107	150	15.2	77	200	32.8	1.0	0.6	0.08	0.1	0.7	2.5
106	150	18.7	78	200	40.2	1.3	0.8	0.08	0.2	0.9	3.2
105	150	28.5	73	200	61.4	2.0	1.1	0.07	0.2	1.2	4.2
104	150	26.4	83	200	56.8	1.8	1.1	0.10	0.3	1.6	5.5
103	150	40.3	74	200	86.8	2.8	1.6	0.07	0.4	1.9	6.2
102	150*	10.8	181	300	68.4	1.0	0.8	0.26	1.1	5.6	17.9

Design Criteria File: CLVRDAL2.DCT
Sewerage Model File: CLVRDAL2.SAN
Metric units
Residential Flow= 350.0 lpcd
Infiltration= 0 lphd + 283 l/mm/km/d
Peaking Factor= Harmon formula* 1.00
Industrial*1.00 from residential populations.

Sanitary Sewer along 60th Avenue.

AREA 1

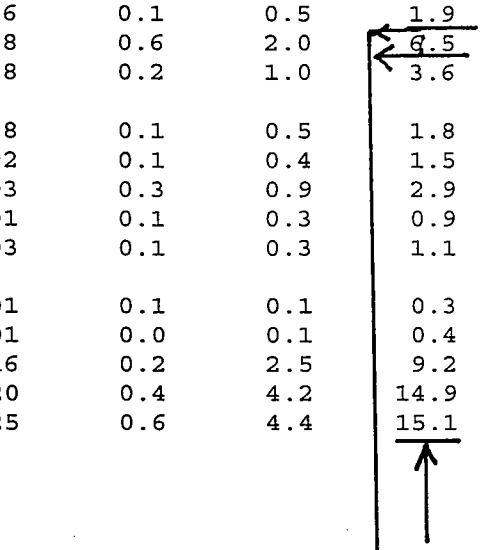
Pipe Up	Manholes Down	Description	External File	Pump Rate lps	Meas Flow lps	Grade %	Mannings n	Dia mm	Area+Addnl Population
101	200					0.250	0.013	150	0+ 0
51	101					0.250	0.013	1200	0+ 0
16	1					1.000	0.013	150	103+ 0
15	2					0.500	0.013	150	0+ 7
14	15					2.000	0.013	150	0+ 21
13	14					0.500	0.013	150	101+ 0
12	14					5.000	0.013	150	81+ 0
11	15					7.000	0.013	150	50+ 0
10	11					4.000	0.013	150	49+ 0
9	11					1.000	0.013	150	40+ 0
8	9					3.000	0.013	150	0+ 14
7	5					1.000	0.013	150	23+ 0
6	5					3.000	0.013	150	558+ 0
5	4					0.600	0.013	200	336+ 21
4	3					0.380	0.013	300	0+ 0

1341 +

	ZONING: RF	RHG	RC1/2	RC(1)	DC-10	DC-15	DC(C)	DC-45
	population density (pers/ha) / Industrial flow (l/ha/day)							
Infiltr	50.0	19.0	36.0	19.0	69.0	98.0	60.0	165.0
Code	0	0	0	0	0	0	0	0
+-area in hectares								
101	.	.	.	.	.	.	.	.
51	.	.	.	.	.	.	.	.
16	0.4	.	2.3	.	.	.	.	.
15	.	.	.	.	.	.	.	.
14	.	.	.	.	.	.	.	.
13	0.4	.	.	.	0.5	0.5	.	.
12	1.6	.	.	.	.	.	.	.
11	1.0	.	.	.	.	.	.	.
10	0.4	.	.	.	.	0.3	.	.
9	0.8	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.
7	.	.	.	.	.	0.2	.	.
6	.	.	.	.	0.6	4.5	.	0.5
5	.	.	.	.	.	0.6	0.7	1.5
4	.	.	.	.	.	.	.	.

Up	EXISTING.... Dia mm	Capacity lps	REQ'D Dia mm	PROPOSED.....n=0.013..... Dia mm	Capacity lps	Vfull mps	Vpart mps	Q/Qf	DESIGN FLOWS..... Infiltr lps	Average lps	Peak lps
101	150*	7.6	397	900	905.2	1.4	0.9	0.11	6.2	37.3	101.8

51	1200	1949.5	377	900	905.2	1.4	0.9	0.10	5.0	31.8	88.7
16	150	15.2	69	200	32.8	1.0	0.6	0.06	0.1	0.5	1.9
15	150	10.8	124	200	23.2	0.7	0.6	0.28	0.6	2.0	6.5
14	150	21.5	77	200	46.4	1.5	0.9	0.08	0.2	1.0	3.6
13	150	10.8	76	200	23.2	0.7	0.4	0.08	0.1	0.5	1.8
12	150	34.1	46	200	73.3	2.3	0.9	0.02	0.1	0.4	1.5
11	150	40.3	56	200	86.8	2.8	1.2	0.03	0.3	0.9	2.9
10	150	30.5	41	200	65.6	2.1	0.6	0.01	0.1	0.3	0.9
9	150	15.2	55	200	32.8	1.0	0.5	0.03	0.1	0.3	1.1
8	150	26.4	29	200	56.8	1.8	0.4	0.01	0.1	0.1	0.3
7	150	15.2	40	200	32.8	1.0	0.3	0.01	0.0	0.1	0.4
6	150	26.4	101	200	56.8	1.8	1.3	0.16	0.2	2.5	9.2
5	200	25.4	164	300	74.9	1.1	0.8	0.20	0.4	4.2	14.9
4	300	59.6	179	300	59.6	0.8	0.7	0.25	0.6	4.4	15.1



AREA 2

TOTAL FLOW
= 8.4 L/sec

pop = 515
in 139 units

SANSYS Sanitary Sewerage Analysis Copyright (C) 1992 by Expertware CivilSystems Corporation 04

Design Criteria File: CLVRDAL2.DCT cloverdale ncp including RC 1/2 n of 60
Sewerage Model File: CLVRDAL2.SAN Cloverdale ncp including RC 1/2 n of 60
Metric units
Residential Flow= 350.0 lpcd
Infiltration= 0 lphd + 283 l/mm/km/d
Peaking Factor= Harmon formula* 1.00
Industrial*1.00 from residential populations.

Pipe Up	Manholes Down	Description	External File	Pump Rate lps	Meas Flow lps	Grade %	Mannings n	Dia mm	Area+Addnl Population
3	2					4.500	0.013	300	110+ 0
2	1					4.200	0.013	450	0+5000
1	51					0.800	0.013	450	0+ 100

	ZONING: RF	RHG	RC1/2	RC(1)	DC-10	DC-15	DC(C)	DC-45
	population density (pers/ha) / Industrial flow (l/ha/day)							
Infiltr	50.0	19.0	36.0	19.0	69.0	98.0	60.0	165.0
Code	0	0	0	0	0	0	0	0
+-area in hectares								
3	2.2	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.
1	.	.	.	.	.	.	.	.

Up	EXISTING.... Dia mm	Capacity lps	REQ'D Dia mm	PROPOSED.....n=0.013..... Dia mm	Capacity lps	Vfull mps	Vpart mps	Q/Qf	DESIGN FLOWS..... Infiltr lps	Average lps	Peak lps
3	300	205.1	118	300	205.1	2.9	1.7	0.08	0.9	5.1	16.9
2	450	584.3	217	450	584.3	3.7	2.6	0.14	1.6	27.5	83.1
1	450	255.0	299	450	255.0	1.6	1.5	0.34	2.1	28.8	85.8

Sewerage Model File: CLVRDAL2.SAN Cloverdale ncp including RC 1/2 n of 60

MH	Northing	Easting	Invert	Hydraulic Grade	Length	Invert Dn	Grnd Elev
	m	m	m	%	m	m	m
200	.	.	.	.	.	.	.
116	.	.	.	.	90.000	.	.
115	.	.	.	.	210.000	.	.
114	.	.	.	.	200.000	.	.
113	.	.	.	.	130.000	.	.
112	.	.	.	.	90.000	.	.
111	.	.	.	.	140.000	.	.
110	.	.	.	.	100.000	.	.
109	.	.	.	.	190.000	.	.
108	.	.	.	.	130.000	.	.
107	.	.	.	.	130.000	.	.
106	.	.	.	.	90.000	.	.
105	.	.	.	.	130.000	.	.
104	.	.	.	.	160.000	.	.
103	.	.	.	.	160.000	.	.
102	.	.	.	.	390.000	.	.
101	.	.	.	.	5.000	.	.
51	.	.	.	.	750.000	.	.
16	.	.	.	.	260.000	.	.
15	.	.	.	.	100.000	.	.
14	.	.	.	.	140.000	.	.
13	.	.	.	.	110.000	.	.
12	.	.	.	.	190.000	.	.
11	.	.	.	.	200.000	.	.
10	.	.	.	.	160.000	.	.
9	.	.	.	.	90.000	.	.
8	.	.	.	.	160.000	.	.
7	.	.	.	.	100.000	.	.
6	.	.	.	.	500.000	.	.
5	.	.	.	.	170.000	.	.
4	.	.	.	.	200.000	.	.
3	.	.	.	.	290.000	.	.
2	.	.	.	.	80.000	.	.
1	.	.	.	.	250.000	.	.

Design Criteria File: CLVRDAL2.DCT cloverdale ncp including RC 1/2 n of 60
Sewerage Model File: CLVRDAL2.SAN Cloverdale ncp including RC 1/2 n of 60

Inriltration Rates:

Code	By Area lphd	By Pipe Size l/mm/km/d	
0	0	0	
1	0	0	
2	0	0	
3	0	0	
4	0	0	
5	0	0	
6	0	0	
7	0	0	
8	0	0	
9	0	0	
	0	283	Default

CURRENT MODEL TOTALS (excluding external models)

Total population from zoning densities and areas = 2547
Total population entered as additional populations= 5163

                                                    7710 total

Total areas for each zone (hectares):

RF =	9.7
RHG =	2.8
RC1/2=	22.9
RC(1)=	0.9
DC-10=	2.4
DC-15=	6.6
DC(C)=	0.7
DC-45=	1.9
	47.8 total

Total pipe lengths by diameter:

	Existing	Proposed Replacement
150 mm=	4355.0 metres	0.0 metres
200 mm=	170.0 metres	3960.0 metres
300 mm=	490.0 metres	560.0 metres
450 mm=	330.0 metres	0.0 metres
900 mm=	0.0 metres	755.0 metres
1200 mm=	750.0 metres	0.0 metres

3.4 GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT

JS/ → File

Stanley
ASSOCIATES

01 October 1996
File: 07-104-00 - C

Greater Vancouver Sewerage and Drainage District
4330 Kingsway
Burnaby, B.C.
V5H 4G8

Attention: **Mr. Fred Nenninger, P.Eng.**
Area Engineer - South Areas Division

Dear Sir:

Reference: **Approval in Principle for Extension of Sanitary Sewer Servicing to S.W. Cloverdale NCP Lands, Surrey, B.C.**

We write on behalf of our client, the City of Surrey, to request your review of the attached sketch and your comments/approval in principle of the proposed tie-in locations of the proposed sanitary sewer main servicing for development of the above mentioned residential lands.

We have determined that two tie-in points are required to service these lands. See Figure B3.1 attached.

- 57th Avenue and 168th Street (450 ϕ Richardson Trunk)
  This connection drains lots east of Old McLellan Road and lots fronting 60th Avenue from 165th Street to 168th Street
  Peak Flows Generated = 35.9 l/s

- 164th Street and Highway #10 (56th Avenue) (1050 ϕ GVS & DD Trunk)
  This connection drains lots west of Old McLellan Road and south of 60th Avenue, except as noted above. Also included is an optional area of ± 6.00 Ha North of 60th Avenue and West of 164th Street. The proposed tie-in point would be the last manhole prior to the lift station at 164th Street and Highway #10.
  Peak Flows Generated = 21.2 l/s
  Peak Flows generated (excluding ± 6.00 Ha area) = 15.4 l/s

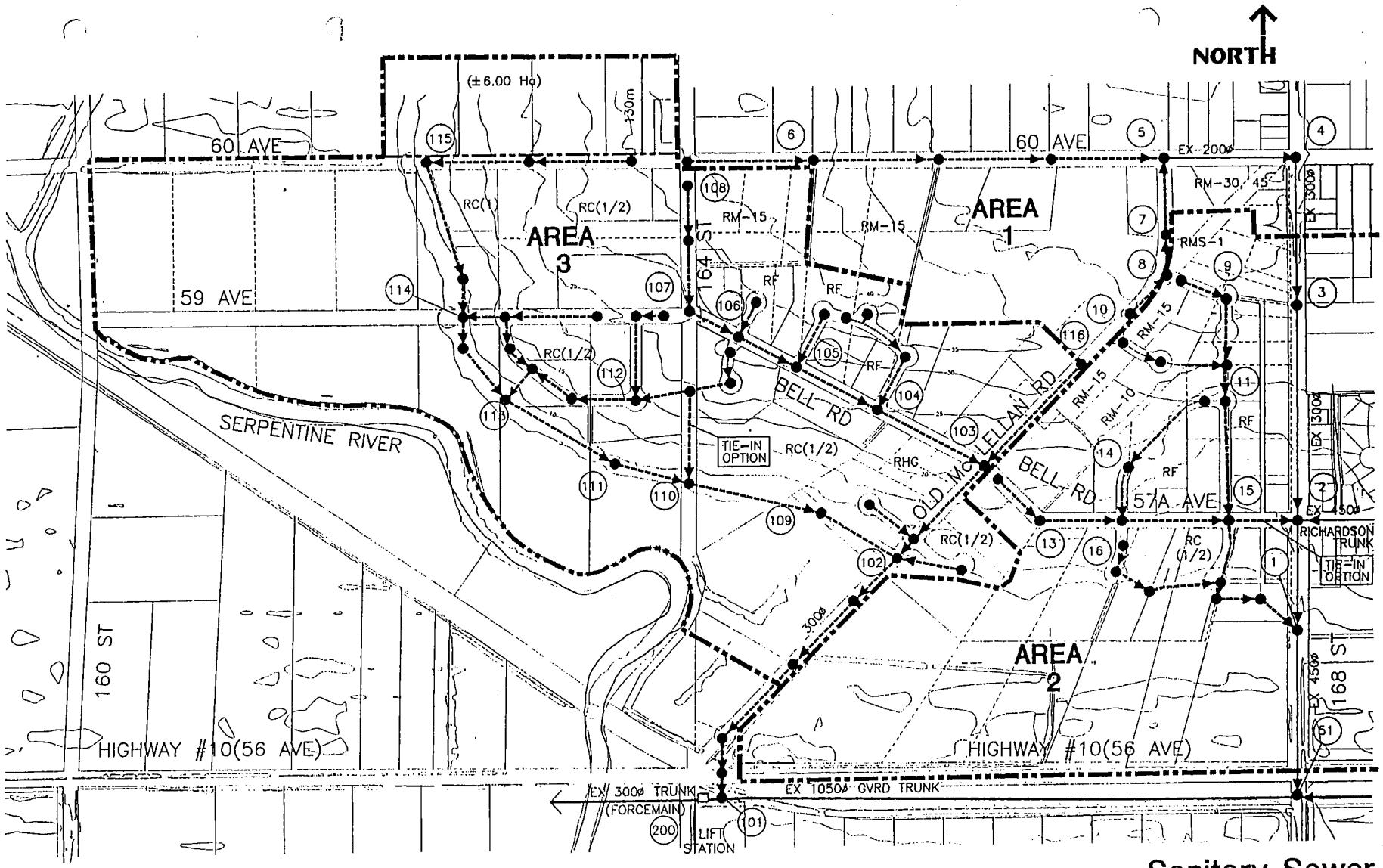
We trust this information is sufficient for your review at this time. However, please contact the undersigned or Garry Romanetz, P.Eng. of our office at any time if you require more details.

Sincerely,

STANLEY ASSOCIATES ENGINEERING LTD.

Peter Moroso, AScT

(07-104/letters/fn30sep.doc)



Legend

- FLOW DIRECTION
- ZONING — R/C(1/2)
- EXISTING MAIN
- PROPOSED TRUNK MAIN
- MANHOLE NUMBERS (111)
- MANHOLE
- PROPOSED LOCAL
- EX GRVD TRUNK
- CATCHMENT AREA

NOTE:
ALL PROPOSED SEWERS ARE 200mmø
UNLESS OTHERWISE SHOWN
TRUNK SEWER = FLOW IS GREATER
THAN 40 l/s GENERATED FLOW

Sanitary Sewer Key Plan Figure B 3.1

SCALE 1:5000

Greater Vancouver Regional District
4330 Kingsway, Burnaby, British Columbia, Canada V5H 4G8

General
Telephone (604) 432-6200
Fax (604) 432-6251

Sewerage and Drainage Department - Telephone (604) 432-6490 - Fax (604) 436-6714

JS

November 13, 1996

File: SD 92.12 10

GKP

FILE

07-104-00

C

Stanley Associates Engineering Ltd.
#1007 - 7445 - 132 Street
Surrey, B.C. V3W 1J8

Attention: Mr. Peter Moroso, A.Sc.T.
Engineering Technologist

Dear Mr. Moroso:

RE: GVS&DD CLOVERDALE SANITARY TRUNK SEWER, PROPOSED CONNECTIONS FOR NCP LANDS, SURREY, B.C.

Thank you for your letter dated October 1, 1996 regarding the proposed connections to our trunk sewer along Highway #10 in Surrey.

The District has reviewed the proposed plans and has no objections in principle to the proposed works. However, some small parcels of the proposed servicing area may require formal applications for an extension of the sewerage area boundary. We will require a copy of the South West Cloverdale - Neighborhood Community Plan so that we can fully assess the peak flow estimates.

Please also note that our Cloverdale Trunk Sewer is subject to surcharge several times a year with maximum HGL's of 0.2m geodetic at our Manhole No. 1 and 0.5m at our Manhole No. 5 respectively.

Please attach a complete set of design drawings and the above requirements to your formal application for connection (to be signed and submitted by the City of Surrey). If you have any questions please contact our Engineering Technician, James Storey at 432-6407.

Yours truly,

Fred Nenninger, P.Eng.
Area Engineer, South Areas Division

JS/lb

cc: Greg Peters
Larry Tenney

SECTION 4.0 ROADWORKS

4.0 ROADWORKS

4.1 COST ESTIMATES

Cost estimates for interim roadway upgrading works along Old McLellan Road is summarized in ***Table B4.1***.

TABLE B4.1

Preliminary Cost Estimate
Old McLellan Rd. Interim Upgrading to 7.5m Width
City of Surrey: West Cloverdale South NCP

Item	Unit	Unit Cost	Quantity	Cost
Branch 1; 60 Ave to South boundary School Site				
Storm Sewer/ Drainage	m	200	200	40,000
1.0m Gravel Shoulders	m	10	200	2,000
Asphalt Curb	m	22.5	360	8,100
Ditch Elimination	m	75	150	11,250
Streetlighting	ea	3000	7	21,000
		SubTotal		82,350
Branch 2; Bell Road to South boundary School Site				
1.4m pavement widening	m2	37.5	154	5,775
Storm Sewer/ Drainage	m	200	110	22,000
1.0m Gravel Shoulders	m	22.5	220	4,950
Asphalt Curb	m	22.5	220	4,950
Ditch Elimination	m	75	220	16,500
Concrete S/W	m	60	110	6,600
Streetlighting	ea	3000	3	9,000
		SubTotal		69,775
Total for Interim Road Works				$152,125

Notes:

1. Above costs include pipe, backfill & bedding, complete manholes, lawnbasins & leads, pavement restorations, fittings and appurtenances,Catchbasins, Service Connections clearing and mass excavation, excavation, import granular fill, and a 50% Contingency including Soft Costs, Engineering, and the GST.

4.2 ROAD STANDARDS

SCHEDULE "A"

TO SURREY SUBDIVISION AND DEVELOPMENT BY-LAW NO. 8830

TABLE 2

HIGHWAY DEDICATION, PAVEMENT WIDTHS AND SIDEWALKS

Amended
B/L 10834
02/18/91
B/L 10603
09/10/90
B/L 11447
03/22/93
B/L 11900
09/13/93

Land Use Note 1	Road Classification Note 1		Dedication Width (m) Note 1	Pavement Width (m) Note 1 & 2	Number of Sidewalks Note 1 & 3	Shoulder or Curbs Note 1 & 4
A-1, A-2, A-3	Local:	Limited	16.5	6.0	0	shoulders
		Through	20.0	6.0	0	shoulders
	Collector:	Limited	20.0	6.0	0	shoulders
		Through	20.0	7.3	1	shoulders
		Major	20.0	7.3	2	shoulders
	Arterial:	Undivided	24.0	7.3	1	shoulders
R-S, RS-SS R-A(G), RAG-SS, R-1, R1-SS, R-H(G), RHG-SS, R-F, RF-SS, R-F(R) RFR-SS, RA, RA-SS, RA-G, RAG-SS, RH, RH-SS, RHG, RHG-SS, RF, RF-SS	Local:	Limited	16.5	8.0	0	roll-over curbs
		Through	20.0	8.5	1	roll-over curbs
	Collector:	Limited	20.0	11.0	1	roll-over curbs
		Through	20.0	12.2	2	roll-over curbs
		Major	20.0	12.2	2	barrier curbs
	Arterial:	Undivided	22.0	14.0	2	barrier curbs
		Divided	27.0	19.0	2	barrier curbs
R-F(F)	Local:	Limited	16.5	6.0	0	shoulders
		Through	20.0	6.0	1	shoulders
	Collector:	Limited	20.0	7.3	1	shoulders
		Through	20.0	7.3	1	shoulders
		Major	20.0	7.3	2	shoulders
	Arterial:	Undivided	22.0	14.0	2	shoulders
R-F(C), RFC-SS, RF-G, RFG-SS, RM-D, RF-D	Local:	Limited	16.5	8.5	0	roll-over curbs
		Through	20.0	11.0	1	roll-over curbs
	Collector:	Limited	20.0	11.0	1	roll-over curbs
		Through	20.0	12.2	2	roll-over curbs
		Major	20.0	12.2	2	barrier curbs
	Arterial:	Undivided	22.0	14.0	2	barrier curbs
		Divided	27.0	19.0	2	barrier curbs
R-F(M), RT-1, RM-M, RM-10, RM-15	Local:	Limited	20.0	11.0	1	barrier curbs See Note 5
RM-1, RM-2, RM-30, RM-45		Through	20.0	11.0	1	barrier curbs See Note 5

Land Use Note 1	Road Classification Note 1		Dedication Width (m) Note 1	Pavement Width (m) Note 1 & 2	Number of Sidewalks Note 1 & 3	Shoulder or Curbs Note 1 & 4
RM-3, RM-4, RM-70, RM-135, RMC-135, RMC-150	Collector:	Limited	20.0	11.0	1	barrier curbs
		Through	20.0	12.2	2	barrier curbs
		Major	20.0	14.0	2	barrier curbs
	Arterial:	Undivided	22.0	14.0	2	barrier curbs
		Divided	27.0	19.0	2	barrier curbs
C-R(1), C-R(2), C-S, C-H, C-L, C-G, C-G(1), C-T(1), C-T(2), C-C, C-15, C-8, C-8A, CHI, C-4, C-5, CG-1, CG-2, CTA, C-35	Local:		20.0	11.0	2	roll-over curbs
	Collector:	Limited	20.0	11.0	2	barrier curbs
		Through	20.0	12.2	2	barrier curbs
		Major	20.0	12.2	2	barrier curbs
	Arterial:	Undivided	22.0	14.0	2	barrier curbs
		Divided	27.0	19.0	2	barrier curbs
I-G, I-H, I-P(2), I-S, I-T, I-C, I-L(S), I-4, IB, IL, IH, IS	Local:	Limited	20.0	11.0	0	roll-over curbs
		Through	20.0	11.0	0	roll-over curbs
	Collector:	Limited	20.0	11.0	1	barrier curbs
		Through	20.0	12.2	1	barrier curbs
		Major	20.0	12.2	2	barrier curbs
	Arterial:	Undivided	22.0	14.0	1	barrier curbs
		Divided	27.0	19.0	1	barrier curbs
I-A, IA, All zones in South Westminster and Bridgeview except R-F(F)	Local:		20.0	11.0	0	shoulders
	Collector		20.0	12.2	1	shoulders
	Major		20.0	12.2	2	barrier curbs
	Arterial:	Undivided	22.0	14.0	1	shoulders
All zones in West Panorama Ridge as shown in Schedule J	Local:	Limited	16.5	6.0	0	2.0m Shoulder
		Through	20.0	6.0	0	2.0m Shoulder
	Collector:	Limited	20.0	7.3	0	2.0m Shoulder
		Through	20.0	7.3	0	2.0m Shoulder
All zones grid				20.0		

SCHEDULE "A"

TO SURREY SUBDIVISION AND DEVELOPMENT BY-LAW NO. 8830

Amended B/L 10834 2/18/91 B/L 11900 09/13/93

TABLE 2

HIGHWAY DEDICATION, PAVEMENT WIDTHS AND SIDEWALKS

NOTES TO TABLE 2

Note 1 These requirements are to be read in conjunction with Part V of this By-law.

Highway dedications for collector and local roads are in accordance with Section 995 of the Municipal Act. Public utilities may not be accommodated in the location preferred by the Public Utility Companies except by additional or separate dedication or statutory right-of-way.

Note 2 Pavement Widths

(a) Where construction of half of the width of the pavement standard is required, and the other half does not exist, the minimum width of pavement for all zones will be 6 metres, and the minimum width of dedication will be 10 metres.

(b) Additional pavement width is needed at the intersection of lanes in order to provide turn radius, and may be needed at intersections with arterial roads in order to provide traffic turn lane channelization. Refer to Schedule "D" hereof, Arterial Road and Channelization Map R-91, and Document 2, Contract Documents, Specifications and standards.

(c) Pavement width may be reduced to 7.3 metres to provide for two travelling lanes only

- for "Local" and "Collector: Limited" roads in the RF(C), RF-G zones;
- when parking spaces are provided within a distance of 60 metres of the intended users destination and in numbers equivalent to the spaces which would otherwise have been available parallel to the curb on the wider pavement.

Document 2 indicates methods of accommodating parking in cul-de-sac heads or in parking bays. When the designated highway dedication to accommodate the parking arrangements together with sidewalks and street lights is insufficient, additional property for parking spaces shall be dedicated.

(d) Visitor-only parking may be provided in cul-de-sac heads, or in offset parking bays, as suggested by Document 2 - Standards.

(e) If a highway dedication already exists or if topographic conditions are extreme, the road requirements shall conform to current Council policy for unopened roads.

Note 3 Sidewalks

Sidewalks are required in accordance with this table and Section 19-(b), in Part V of this By-law.

Note 4 Shoulders

Shoulder details are shown in Document 2 - Standards.

Note 5 Curbs

Where driveway locations can be determined prior to construction and no curb exists, barrier curb shall be installed in that block. Where rollover curb exists in a part block, rollover curb shall be installed to complete that block.

4.3 OLD MCLELLAN ROAD - CITY OF SURREY CORRESPONDENCE

- November 22, 1996 letter
- December 2, 1996 letter

CITY OF SURREY
Engineering Department

14245 - 56th Avenue, Surrey
British Columbia, Canada V3X 3A2

Telephone
(604) 591-4340

Fax
(604) 591-8693

November 22, 1996
File: 2350-005/2

Reply to: Engineering Planning Division
Attention: Gary Vlieg, P.Eng.

Stanley Associates Engineering Ltd.
1007-7445-132 Street
Surrey, B.C.
V3W 1J8

Attention: Peter Moroso, A.Sc.T

Dear Peter:

Re: Financing and Old McLellan Road

Further to our telepohone conversation of November 22, 1996, I wish to document Surrey's position regarding the financing of Old McLellan Road improvements.

The classification of Old McLellan Road is to change from Major Collector to Limited Collector and therefore it will not be available for DCC funding. Your financial analysis should reflect the fact that no DCC monies will be available for this road.

If the ultimate cross section of Old McLellan Road is required to accommodate the needs of the NCP then Stanley must recommend a means of funding the ultimate cross section either with or without Surrey's assistance. If the ultimate cross section is not required then simply state that the Surrey portion of the ultimate widening will be completed when it becomes a priority for Surrey.

If you require any additional information please call me at 591-4573.

Yours truly,

Gary Vlieg, P.Eng.
NCP Transportation Engineer

cc: NCP Project Manager

WCLOVS03.DOC

CITY OF SURREY
Engineering Department

14245 - 56th Avenue, Surrey
British Columbia, Canada V3X 3A2

Telephone
(604) 591-4340

Fax
(604) 591-8693

December 2, 1996
File: 2350-005/2

Reply to: Engineering Planning Division
Attention: Gary Vlieg, P.Eng.

Stanley Associates Engineering Ltd.
1007, 7445 - 132 Street
Surrey, B.C.
V3W 1J8

Attention: Peter Moroso, A.Sc.T.

Dear Peter:

Re: Old McLellan Road

Further to your fax of November 29, 1996, we offer the following comments regarding Old McLellan Road in West Cloverdale South NCP.

1. The interim cross section requirements are set out in Surrey's design criteria and standard construction documents. I have asked Dean Cooper of your office to determine, what, if any, threshold may develop to require the ultimate cross section to be constructed prior to the full buildout of this NCP. I suspect that the ultimate cross section will not be required to accommodate traffic but may be required to accommodate on street parking.
2. The re-alignment of the north end of Old McLellan Road is contingent on one of two events occurring: the City of Surrey requires 168 Street to be constructed to its ultimate cross section which would require the re-alignment OR the property through which the realignment is to occur makes application for redevelopment at which time Surrey would require the realignment to be dedicated and constructed by the applicant.
3. For the portion(s) of road that front municipally owned property, the City of Surrey will construct their portion of the half road, when it becomes a priority for the City. It should be understood, however, that it is likely to be a number of years before this would occur in West Cloverdale.

If you require any additional information please call me at 591-4573.

Yours truly,

Gary Vlieg, P.Eng.
NCP Transportation Engineer

cc: NCP Project Manager

WCLOVS05.DOC

SECTION 5.0

UNIT COSTS FOR CONSTRUCTION COST ESTIMATES
(As received from the City of Surrey)

5.0 UNIT COSTS FOR CONSTRUCTION COST ESTIMATES

5.1 ROAD WORKS

This section describes the unit costs for construction cost estimates provided by the City of Surrey that are used for this Stage 2 report. These costs include engineering, administration, GST, etc., equaling a 50% factor.

Item	Unit Cost
Sidewalk (1.5 m width)	$75/l.m.
Concrete Curbing	$37.5/l.m.
Boulevard Strip (1.1 m width)	$21/l.m.
Pavement Widening	$45/sq.m.
Streetlights and Conduit	$150/l.m.
Asphalt Overlay	$9/sq.m.

5.2 SANITARY AND STORM WORKS

These costs include engineering, administration, GST, etc., equaling a 50% factor. *

Pipe Diameter (mm)	Unit Cost
250	$360/l.m.
300	$375/l.m.
375	$435/l.m.
450	$480/l.m.
525	$510/l.m.
600	$570/l.m.
675	$630/l.m.
750	$765/l.m.
900	$930/l.m.
1050	$1080/l.m.
1200	$1260/l.m.
1350	$1455/l.m.
1500	$1665/l.m.

*Unit costs include catchbasins, manholes, tees, hydrants, valves, house services, restoration, rehabilitation, etc.

5.3 MAJOR COLLECTOR CONSTRUCTION COSTS

Interim Standard (8.5 m)

Including - detail enclosure, gravel swale, streetlights, pavement widening, overlay, sidewalk one side, catchbasins at ultimate and 50% factor for engineering, administration, GST, etc.

$1,014/l.m. per 8.5 m width

5.4 WATERWORKS

These costs include engineering, administration, GST, etc., equaling a 50% factor.*

Pipe Diameter (mm)	Unit Cost
200	$375/l.m.
250	$390/l.m.
300	$420/l.m.
350	$465/l.m.
400	$480/l.m.
450	$525/l.m.

*Unit costs include catchbasins, manholes, tees, hydrants, valves, house services, restoration, rehabilitation, etc.

SECTION 6.0 DEFINITIONS OF CURRENT FUNDING METHODS

6.0 DEFINITIONS OF CURRENT FUNDING METHODS

6.1 DCC REBATES

Where a developer constructs specific works and services which may be outside the boundaries of the land being serviced or developed, and that are included in City of Surrey's *10 Year Servicing Plan* as a *"growth"* item. The cost of the specific works and services shall be reimbursed from only the applicable development cost charges (DCC) element only after being initially paid by the developer.

6.2 DEVELOPMENT COORDINATED WORKS (DCW)

Where the City asks the developer to construct and the City agrees to pay for additional works typically outside of the boundaries of the land being developed. Funds are usually directed to:

- safety related items;
- works that will mitigate the impact of development;
- works which will provide continuity of existing standards; and,
- works which will facilitate the future upgrading of City services;
- works that will logically complete a road or service or condition where redevelopment will not occur and local improvements will not be planned for small works.

This method can be initiated by the developer or the City at the time of development and is subject to approval by Surrey at the time of development, and is also subject to available funds.

6.3 UPSIZING (WATER, SANITARY)

This method is used when the City requests oversizing and agrees to pay for the difference in cost to upsize and construct a new sanitary sewer or watermain from the development's needs to the City's needs. Upsizing is dependent upon available funds at the time of development, and is initiated by the City of Surrey. The City will only pay upsizing from the confirmed level of supply under the design criteria for the subject zone; not just from the minimum pipe size.

6.4 FRONTAGE LATECOMER

Where the City has required a developer to provide highway, water, sewer, or drainage facilities that serve land other than the land being serviced or developed, the developer may submit a latecomer's application to the City; where a specific unit charge will be levied against the benefiting lands for a ten year term. The City shall collect a unit charge on applicants who obtain physical access to, connect to or benefit from the extension. Such a unit charge shall be paid to the City who will, in turn, pay the front-ender on an annual basis.

This method may be initiated by the developer only if front-ending a utility that will benefit his development, and benefit others as identified in the City of Surrey *Latecomer's Procedure Manual.* The developer can then present a latecomer application to the City along with the required fees. The latecomer will require those deemed to be benefiting from the utility to pay a unit charge as per the *Latecomer's Procedure Manual* prior to obtaining physical access. The use of this method is dependent on the development scenario and on the financial benefit to the developer at the time of development.

6.5 AREA (SANITARY PUMP STATION AND FORCE MAIN) LATECOMER

Where a sanitary pump station and/or gravity lines and/or force main that can serve lands other than those being serviced or developed, the developer may submit an area latecomers application to the City, where a specific unit charge will be levied against the benefiting lands for a ten year term. The City shall collect a unit charge from applicants who obtain physical access to, connect to or benefit from the works. Such a unit charge shall be paid to the City, who will in turn, pay the front-ender on an annual basis (as per the *Latecomer's Procedure Manual*).

This method may be initiated by the developer only if front-ending a utility that will benefit his development, and will benefit a larger catchment as well. The developer can then present a latecomer application to the City along with the required fees. The latecomer will require those deemed to be benefiting from the utility to pay a unit charge as per the *Latecomer's Procedure Manual* prior to obtaining physical access. The use of this method is dependent on the development scenario and on the financial benefit to the developer at the time of development.

Note: Consultants must refer to and follow the current edition of the City of Surrey *Latecomer's Procedure Manual.*

6.6 CORPORATE REPORT - NCP INFRASTRUCTURE FINANCING

SURREY
CITY OF PARKS

Corporate Report

NO: R957

JUL - 8 1996

COUNCIL DATE: _____

REGULAR

TO:	Mayor & Council	DATE:	June 19, 1996
FROM:	General Manager, Engineering	FILE:	2350-000 5503-001
SUBJECT:	NCP Infrastructure Financing		

RECOMMENDATION

That Council approve the following principles to help with the financing of infrastructure in NCP areas.

1. Each NCP must be self-financing.
2. Allow frontenders of trunk servicing (i.e., 10 year plan items) to recover costs via DCCs collected in the catchment, or other benefiting, area.
3. Allow NCPs to use special levies to generate additional funds for specific infrastructure needs.
4. Allow the use of interim detention to delay the need for detention ponds serving the larger catchment area.
5. That the City's financial contribution remain at the 10% level.

INTENT

To confirm the direction provided by Council at the "workshop" session of May 23 and to establish principles for assisting with the funding of engineering infrastructure in NCP areas.

DISCUSSION

Over the past two months, the Engineering Department has refined the costs of the engineering infrastructure required to open up the 12 NCPs. The total infrastructure requirements to open up the 12 NCPs if they all proceed in 1996 and 1997 has been reduced to $60 million compared with the $80 million originally, estimated in earlier discussions with Council, not including arterial roads. Arterial roads have not been included in our analysis to date since they are not an issue with respect to the opening up of any of the NCPs.

The annual estimated cost to open up all the NCPs in 1996-97 based upon the refined information is $9 million down from earlier estimates of $14 million. The DCC revenues generated from the NCPs is estimated to be $4 million annually and increasing each year as more development shifts from the infill areas to the NCPs. The cash flow shortfall is estimated to be $5 million in the short-term if all NCPs proceed within a short period of time. It will be less if fewer NCPs open up as the revenue will not go down but the infrastructure costs will. It is important to note that the Development Cost Charges at buildout of all the NCPs will pay for all the identified infrastructure needs.

The main cost issue in the start-up costs of the NCPs is drainage works. Of the 12 NCPs, 10 NCPs have major drainage costs associated with their early development. Seven of these NCPs have community detention pond requirements, three have pump station requirements and four have storm sewer trunk requirements.

Financing of Infrastructure

In view of the number of NCPs, many of which do not have a major developer to facilitate front-ending of services, there is a need for a set of principles to be developed so that all NCP areas can be treated on an equal basis and with consistency.

Based on staff review, consultation with the Development Advisory Committee and the "workshop" session with Council on May 23, the following principles are proposed:

1. Each NCP must be self-financing.

   Comment: Each NCP needs to develop a financing plan such that the NCP can fund the engineering infrastructure required for its development.

2. Allow frontenders of trunk servicing (i.e., 10 year plan items) to recover costs via DCCs collected in the catchment, or other benefiting, area.

   Comment: This proposal expands on the present DCC rebate approach for works constructed by developers. It will permit greater cost recovery and, hence, the ability of developers to front-end more major elements of needed start-up infrastructure.

3. Allow NCPs to use special levies to generate additional funds for specific infrastructure needs.

   Comment: Some NCP areas are proposing special NCP levies to cover DCC cash flow shortfalls for needed start-up infrastructure. Without such additional levies, the DCC revenue flow will be insufficient to fund needed works in the short term.

4. Allow the use of interim detention to delay the need for detention ponds serving the larger catchment area.

Comment: *Where an NCP is unable to fund a required community detention facility, the City will allow the use of a limited number of interim detention ponds within the NCP. These interim ponds must be identified in the NCP Stage 2 Report and fully funded by the developer(s). The Drainage Development Cost Charges will still be paid by the developers and when adequate funds are available, the City will construct the detention pond for the overall catchment area. Interim detention will provide a sound level of control for storm water flows. The ultimate catchment-wide pond will provide a similar, if somewhat enhanced, level of flow control together with the additional benefit of water quality improvements.*

5. That the City's financial contribution remain at the 10%.

Comment: *The City is not in a financial position to front-end services for NCP areas. The City can, however, continue to contribute at the 10% level for growth related works initiated by developers in the NCP areas. By requiring each NCP to be self-financing, the City has removed itself from the sequencing of capital infrastructure required for the NCPs to develop. In place of City sequencing market economics determines the timing for when the various areas develop.*

CONCLUSION

The above principles reflect the direction provided by Council at the May 23 "workshop" session. They will provide a consistent and fair approach to dealing with the infrastructure needed for the NCP areas. The City will work to facilitate the development of these areas by helping coordinate the efforts of the various stake holders in each NCP. Where more major works are required to service a number of NCPs, it is proposed that the City reserve the option to include such works in its DCC capital programs or utility revenue funded programs.

Umendra Mital

Umendra Mital, P.Eng.
General Manager, Engineering

PH:brb
g:\landdev\961411301.ph
WS2R4 06/19/96 01:54 PM

SECTION 7.0 DEVELOPMENT COST CHARGE BY-LAW

7.0 DEVELOPMENT COST CHARGE BY-LAW

7.1 DEVELOPMENT COST CHARGES BY-LAW 12618

BL12618.XLS AM15/03/95

DEVELOPMENT COST CHAR[illegible] AS SET B[illegible] BY-LAW 12618

May 30, 1[illegible]

ZONES	WATER	SEWER	ARTERIAL ROADS	MAJOR COLLECTOR ROADS	DRAINAGE & STORMWATER DETENTION	PARKLAND	TOTAL
A-1, A-2, A-3	0	0	0	0	0	0	0
R-A(G), RS, RA, RA-G (With Parkland Dedication)	1,070 /lot	930 /lot	4,800 /lot	1,220 /lot	3,390 /lot	0 /lot	11,410 /lot
R-A(G), RS, RA, RA-G (No Parkland Dedication)	1,070 /lot	930 /lot	4,800 /lot	1,220 /lot	3,390 /lot	5,120 /lot	16,530 /lot
RS-SS, RA-SS, RAG-SS (With Parkland Dedication)	1,070 /lot	930 /lot	4,800 /lot	1,220 /lot	3,390 /lot	-	11,410 /lot
(Add for each Suite)	670 /suite	580 /suite	3,360 /suite	860 /suite	470 /suite	1,220 /suite	7,160 /suite
RS-SS, RA-SS, RAG-SS (No Parkland Dedication)	1,070 /lot	930 /lot	4,800 /lot	1,220 /lot	3,390 /lot	5,120 /lot	16,530 /lot
(Add for each Suite)	670 /suite	580 /suite	3,360 /suite	860 /suite	470 /suite	3,190 /suite	9,130 /suite
R-H(G), R-1, RH, RH-G (With Parkland Dedication)	1,070 /lot	930 /lot	4,800 /lot	1,220 /lot	3,390 /lot	1,790 /lot	13,200 /lot
R-H(G), R-1, RH, RH-G (No Parkland Dedication)	1,070 /lot	930 /lot	4,800 /lot	1,220 /lot	3,390 /lot	5,540 /lot	16,950 /lot
R1-SS, RH-SS, RHG-SS (With Parkland Dedication)	1,070 /lot	930 /lot	4,800 /lot	1,220 /lot	3,390 /lot	1,790 /lot	13,200 /lot
(Add for each Suite)	670 /suite	580 /suite	3,360 /suite	860 /suite	470 /suite	3,460 /suite	9,400 /suite
R1-SS, RH-SS, RHG-SS (No Parkland Dedication)	1,070 /lot	930 /lot	4,800 /lot	1,220 /lot	3,390 /lot	5,540 /lot	16,950 /lot
(Add for each Suite)	670 /suite	580 /suite	3,360 /suite	860 /suite	470 /suite	3,460 /suite	9,400 /suite
R-F, R-F(C), R-F(D)	1,070 /units	930 /units	4,800 /units	1,220 /units	2,120 /units	5,060 /units	15,200 /units
R-F(F), R-F(R), RF, RF-G, RM-D (With Parkland Dedication)	1,070 /units	930 /units	4,800 /units	1,220 /units	2,120 /units	7,780 /units	17,920 /units
R-F, R-F(C), R-F(D)							
R-F(F), R-F(R), RF, RF-G, RM-D (No Parkland Dedication)							

BL12618.XLS M15/05/95

DEVELOPMENT COST CHAR AS SET BY-LAW 12618
May 30, 1995

ZONES	WATER	SEWER	ARTERIAL ROADS	MAJOR COLLECTOR ROADS	DRAINAGE & STORMWATER DETENTION	PARKLAND	TOTAL
RF-SS, RFR-SS, RFC-SS, RFG-SS	1,070 /lot	930 /lot	4,800 /lot	1,220 /lot	2,120 /lot	5,060 /lot	15,200 /lot
(With Parkland Dedication)							
(Add for each Suite)	670 /suite	580 /suite	3,360 /suite	860 /suite	470 /suite	4,860 /suite	10,800 /suite
RF-SS, RFR-SS, RFC-SS, RFG-SS	1,070 /lot	930 /lot	4,800 /lot	1,220 /lot	2,120 /lot	7,780 /lot	17,920 /lot
(No Parkland Dedication)							
(Add for each Suite)	670 /suite	580 /suite	3,360 /suite	860 /suite	470 /suite	4,860 /suite	10,800 /suite
R-F(M), RM-M	670 /du	580 /du	2,830 /du	720 /du	470 /du	4,880 /du	10,150 /du
RT-1, RM-1/Multi-Family RM-10, RM-15, RM-30	940 /du	810 /du	4,800 /du	1,220 /du	1,140 /du	7,050 /du	15,960 /du
RM-2, RM-3, RM-4, RM-45, RM-70, RM-135, RMC-150							
I) Dwelling unit built as townhouse in RM-2	940 /du	810 /du	4,800 /du	1,220 /du	1,140 /du	7,050 /du	15,960 /du
II) Dwelling unit other than townhouse etc.	670 /du	580 /du	3,360 /du	860 /du	470 /du	6,010 /du	11,950 /du
iii) Retail stores/personal services etc.	330 /1000 sq. ft. bldg.	290 /1000 sq. ft. bldg.	1,870 /1000 sq. ft. bldg.	480 /1000 sq. ft. bldg.	830 /1000 sq. ft. bldg.	2,510 /1000 sq. ft. bldg.	6,310 /1000 sq. ft. bldg.
ALL COMMERCIAL ZONES EXCEPT CCR, CPR, CPG, CPM							
Commercial Component	330 /1000 sq. ft. bldg.	290 /1000 sq. ft. bldg.	1,870 /1000 sq. ft. bldg.	480 /1000 sq. ft. bldg.	830 /1000 sq. ft. bldg.	2,510 /1000 sq. ft. bldg.	6,310 /1000 sq. ft. bldg.
Residential Component	670 /du	580 /du	3,360 /du	860 /du	470 /du	6,010 /du	11,950 /du
P-A, PA-1, PA-2	330 /1000 sq. ft. bldg.	290 /1000 sq. ft. bldg.	- sq. ft. bldg.	- sq. ft. bldg.	830 /1000 sq. ft. bldg.	- sq. ft. bldg.	1,450 /1000 sq. ft. bldg.
P-R, P-D, CPR, CPG, CPM	330 /1000 sq. ft. bldg.	290 /1000 sq. ft. bldg.	1,870 /1000 sq. ft. bldg.	480 /1000 sq. ft. bldg.	830 /1000 sq. ft. bldg.	- sq. ft. bldg.	3,800 /1000 sq. ft. bldg.

DEVELOPMENT COST CHARGES AS SET BY BY-LAW 12618
May 30, 19..

ZONES	WATER	SEWER	ARTERIAL ROADS	MAJOR COLLECTOR ROADS	DRAINAGE & STORMWATER DETENTION	PARKLAND	TOTAL
i) P-P, P-P(1), RMS-1 RMS-2, CCR	330 /1000 sq. ft. bldg.	290 /1000 sq. ft. bldg.	1,440 /1000 sq. ft. bldg.	370 /1000 sq. ft. bldg.	[illegible] /1000 sq. ft. bldg.	- sq. ft. bldg.	3,260 /1000 sq. ft. bldg.
ii) Personal Care Institutional Zone Two P-P(2)	330 /1000 sq. ft. bldg.	290 /1000 sq. ft. bldg.	1,440 /1000 sq. ft. bldg.	370 /1000 sq. ft. bldg.	830 /1000 sq. ft. bldg.	Nil - excluding sq. ft. bldg.	3,260 /1000 sq. ft. bldg.
Per Dwelling Unit	670 /du	580 /du	3,360 /du	860 /du	470 /du	6,010 /du	11,950 /du
ALL INDUSTRIAL ZONES (Development in the Port Kells or South Westminster defined areas may reduce some fees)	7,440 /hec 3,010 /acre	6,450 /hec 2,610 /acre	28,860 /hec 11,680 /acre	7,340 /hec 2,970 /acre	39,720 /hec 16,080 /acre	- -	89,810 /hec 36,350 /acre
SALVAGE ZONE I-L (S), IS	7,440 /acre 3,010 /acre	6,450 /hec 2,610 /acre	28,860 /hec 11,680 /acre	7,340 /hec 2,970 /acre	39,720 /hec 16,080 /acre	- -	89,810 /hec 36,350 /acre
CEMETERY ZONE, P-C, PC	-	-	-	-	-	-	-
SCHOOLS (To Grade 12)	330 /1000 sq. ft. bldg.	290 /1000 sq. ft. bldg.	-	-	830 /1000 sq. ft. bldg.	-	1,450 /1000 sq. ft. bldg.
HOSPITALS	330 /1000 sq. ft. bldg.	290 /1000 sq. ft. bldg.	1,440 /1000 sq. ft. bldg.	370 /1000 sq. ft. bldg.	830 /1000 sq. ft. bldg.	-	3,260 /1000 sq. ft. bldg.
GOVERNMENT BUILDINGS	330 /1000 sq. ft. bldg.	290 /1000 sq. ft. bldg.	1,870 /1000 sq. ft. bldg.	480 /1000 sq. ft. bldg.	830 /1000 sq. ft. bldg.	2,510 /1000 sq. ft. bldg.	6,310 /1000 sq. ft. bldg.
SCHOOLS (Post Secondary)	330 /1000 sq. ft. bldg.	290 /1000 sq. ft. bldg.	1,870 /1000 sq. ft. bldg.	480 /1000 sq. ft. bldg.	830 /1000 sq. ft. bldg.	-	3,800 /1000 sq. ft. bldg.
COMPREHENSIVE DEVELOPMENT ZONE (C-D)	All building construction and/or subdivision shall be suject to the development cost charges as hereinabove provided, based on the uses and/or zones as permitted for the land under the C-D zone.						

SECTION 8.0 AMENITIES

8.0 AMENITY CONTRIBUTIONS

City of Surrey policy uses the *"developer pays"* principle. Development makes a contribution, through the bonusing provisions of the *Zoning Bylaw*, for the provision of the capital costs for police, fire, library, and local parks and recreation facilities that are attributable to new development.

Within the scope of existing practice, the proposed amenity contributions for residential development are as follows (Total amounts are based on approximately 600 dwelling units in the NCP area.):

- **Police**: $50/dwelling unit: (total $30,000)
- **Fire Protection**: $216/dwelling unit: (total $129,600)
- **Library Services**: $112.50/dwelling unit: (total $67,500)
- **Parks and Recreation**: $500/dwelling unit: (total $300,000) based on costs of $50,000 for the small park at 164 Street; $225,000 for the development of a park area at *'5 Corners'*. (This amount could include a $25,000 contribution for 50% of the cost of the rehabilitation of the Orange Hall for community purposes. If the Parks and Recreation Department's upcoming Cloverdale area *Parks and Recreation Facilities Study* determines if this is desirable); and $25,000 for bike racks, seating, and miscellaneous improvements at viewpoints.

- **Affordable Housing**: $750/dwelling unit, although a proposed bonusing provision within the *Zoning Bylaw* (now under consideration) may provide a mechanism attractive to alternative development in some zones.

Commercial and institutional development will be required to provide $2,660/ha specifically for fire and police protection (on the basis of the equivalent of 10 dwelling units/ha), without contribution requirements for library, social housing, or local parks and recreation.

These funds should be confirmed through agreement at the rezoning stage with funds payable upon subdivision for single detached housing and at the building permit stages for other development.

10.0 APPENDIX C (TRANSPORTATION)

This appendix includes the Summary of Recommendations for the *Traffic Impact of West Cloverdale Local Area Plan* prepared by Ward Consulting Group.

This NCP is consistent with the recommendations of the traffic impact analysis with respect to:

- Limitations on access to 168 Street from the adjacent subdivisions;
- Consistency of alignment with roads connecting with the NCP to the north;
- The designation of 60 Avenue between 168 Street and 164 Street as a through collector;
- The designation of Bell Road/57 Avenue and Old McLellan (north of Bell Road) as a limited collector;
- The preferred location of high density housing on 60 Avenue;
- The deletion of traffic circles;
- The need for pedestrian and bicycle routes; and
- Traffic calming measures and crosswalks on 60 Avenue.

This Appendix also includes Figure 3 extracted from the West Cloverdale North NCP which illustrates the schematic design for the traffic circle at the intersection of 60 Avenue with 164 Street.

11.0 APPENDIX D (GUIDELINES)

The City of Surrey has prepared the following guidelines for 60 Avenue, the *"5 Corners"* area, the pedestrian and bikeway network, and street trees.

GENERAL URBAN DESIGN GUIDELINES & HERITAGE SITES WEST CLOVERDALE SOUTH NEIGHBOURHOOD CONCEPT PLAN

OBJECTIVES

These guidelines are intended to assist in creating an identifiable, pedestrian friendly residential neighbourhood in West Cloverdale, where the human scale and a strong ***heritage character*** *define the built environment. The guidelines provide direction to achieve the neighbourhood character, encourage pedestrian/bicycle access to community facilities, and to establish the minimum standards to achieve the neighbourhood design objectives defined in the Neighbourhood Concept Plan.*

The identity and character of the neighbourhood will be largely defined by the appearance of the Main Street (60 Avenue), the bicycle/pedestrian routes, and the public spaces used by the local residents. Therefore, the guidelines are focused on the design principles that are applicable to these public spaces and abutting sites. The guidelines provide for the development of individual sites in a manner that is consistent and co-ordinated with the overall neighbourhood heritage image. Significant heritage sites are identified in Appendix "A". These sites have the potential to be placed on Surrey's Heritage Register.

APPLICABILITY

These guidelines provide the design principles and minimum standards that will permit the co-ordinated design and development of individual sites in the south neighbourhood of West Cloverdale. They will serve as a reference in the preparation and evaluation of specific development proposals. The guidelines may be refined in conjunction with applicants at the time of rezoning and will be used as a reference in preparing Development Permit Area Guidelines for multi-family and commercial developments, and for Neighbourhood Character Studies for single family developments.

Please note that these guidelines are for general use only and are subject to change upon finalization of the engineering road standards for this neighbourhood. The guidelines may be refined in consultation with Surrey's Engineering and Parks and Recreation Departments as standards and requirements are developed for this neighbourhood.

GENERAL URBAN DESIGN GUIDELINES
WEST CLOVERDALE SOUTH
NEIGHBOURHOOD CONCEPT PLAN
CONTENTS

GENERAL URBAN DESIGN GUIDELINES
WEST CLOVERDALE SOUTH
NEIGHBOURHOOD CONCEPT PLAN

DESIGN GUIDELINES FOR YARDS ABUTTING PUBLIC STREETS

1. General Design Principles for Yards Abutting Public Streets

The following general guidelines are intended to improve the quality of the streetscape and reinforce the street oriented character of West Cloverdale (north and south neighbourhoods). Yards abutting the street have a strong impact in determining the character and liveability of the street. Yards of single family lots, townhouses, compact and cluster housing sites should be treated in a similar way to unify the streetscape. The landscaping, definition of yard edges, and design of open areas along public streets should achieve continuity and be complementary.

2. Continuity of Front Yard Character

2.1. To maintain the continuity and the quality of the streetscape, the yards of any townhouse or cluster housing sites along a public street must be treated and landscaped as front yards of single family areas.

3. Gates/Entrances

3.1. Gates are not permitted in townhouse or cluster housing developments.

3.2. Entrances to townhouse or cluster housing sites should consider the use of architectural or landscaping elements which identify the boundary between public and private property. Any minor structure used for this purpose must take elements of the Surrey heritage vocabulary, and should be located at the front yard setback line.

3.3. A combination of walls, pavement change, landscaped medians, treed boulevards, arbours, trellises, pedestrian gatehouses, feature lighting posts, etc. are recommended for identification of the entrances to townhouse, cluster or compact housing sites.

4. Fences *(See Sketch A)*

4.1. General

4.1.1. No chain link fences will be permitted in West Cloverdale's South neighbourhood.

4.1.2. To maintain the semi-rural character of the area, fences will not be permitted in any front yards of single family lots. Consistency of treatment of yards toward the street should be ensured by the use of shrubs and hedges as standard boundary definitions. This is also applicable to cluster and compact housing sites, other than developments along the Main Street (60 Avenue).

4.2. Fences on Single Family Corner Lots

4.2.1. All fences along side property lines abutting a flanking street should start at the midpoint of the depth of the house. To maintain adequate sight angles at the intersection, only low landscaping should be planted at the corner of the site.

4.2.2. To provide additional area for planting, to reinforce overall liveability, and to improve views of fences toward the street, fences along the flanking street of a single family corner lot should be located on private property not closer than **0.60 metres** from the side property line. This portion of private property between the fence and the property line should be landscaped (shrubs and climbers are suggested).

4.3. Permitted Fences Along Streets

4.3.1. Frontages of townhouse or cluster housing sites along the **Main Street** require a uniform, stronger definition of the front yard. In this case, a combination of low stone or brick wall with wrought iron fence (no more than 0.45 metres high) is recommended (with landscaping on both sides of the fence). This type of edge definition should be consistent along both sides of 60 Avenue, between 164 and 168 Streets.

4.3.2. Continuous, straight fences should provide a **0.60 metre**-wide space between the property line and the fence, to accommodate landscaping on private property.

4.4. Side and Back Yard Fences

4.4.1. No fences along side and/or rear property lines should be higher than **1.80 metres.** The upper **0.60 metres** of the fence should be lattice (see Sketch **A**).

4.4.2. Fences between lots should not start less than **3.60 metres** from the front yard setback line (this distance is equivalent to the minimum permitted separation between units).

4.5. Fences Along Multi-Use Corridors

4.5.1. Wherever possible, fences on lots along the major pedestrian/bicycle corridors should be transparent (wrought iron, low stone wall/wrought iron fence combination, etc.) and consider dense landscaping. The intent is to visually increase the overall width of the corridor by incorporating the landscaping on private lots.

5. Driveways

To reinforce pedestrian dominance on the street, to achieve the integration/continuity of landscaping on front yards, and to allow for boulevards with regularly spaced trees, the following conditions apply to all residential developments:

5.1. In single family corner lots, the garage driveway should be provided from the flanking street.

5.2. Driveways of single family lots should be paired to increase the spacing of sidewalk interruptions and curb let-downs. Visual separation between individual parallel driveways must be achieved by way of landscaping (see Sketch **B**).

5.3. Single width driveways and garages toward the back or the side of the unit are recommended.

5.4. Garages doors should not front directly onto the street unless the garage is recessed 1.00 metres from the front of the house.

5.5. Garages should be located toward the back or side of the house. A window should be provided on the side of the garage that is visible from the street.

5.6. Wherever possible, habitable rooms should be provided above the garage.

5.7. Continuity of public sidewalk should not be interrupted by the pavement of driveways (sidewalk pavement should be continued across the driveway pavement).

5.8. The use of paving materials other than asphalt and a strong definition of the driveway edges is recommended. The driveway should be treated as part of the front yard landscaping.

5.9. The above provisions should be included in the required registered building scheme.

6. Service and Parking Areas in Cluster Housing Sites

6.1. Recreational vehicle, visitor/common parking areas, garbage container enclosures, satellite dishes and other service elements should not be visible from a public street.

6.2. If these areas are located toward the street, a **7.50 metre**-wide landscaped area (equivalent to the front yard setback) must be provided toward the street. Shrubs and hedges should be considered to screen direct views to these service areas.

DESIGN GUIDELINES FOR TREES ON AND ADJACENT TO PUBLIC STREETS

7. General Design Principles for Trees On and Adjacent to Public Streets

The following guidelines are intended to ensure an identifiable and integrated public streetscape by establishing the different role and character of the streets through specific species of trees and their locations. This will be accomplished through conformance with the Street Tree Planting Scheme indicated in Map I, and through the general application of these guidelines.

8. Street Trees

8.1. Recommended trees along the major neighbourhood streets and trees at the entrances to the neighbourhood are shown in **Map I. "Street Tree Planting Scheme".**

8.2. Recommended trees along the same street include a combination of species in order to provide bio-diversity, and to promote tree health by lowering the impact of common pests and diseases. Recommended species have been chosen from the list of *Replacement Trees* recommended for boulevards as per "Schedule K" of the Tree Preservation Bylaw (No. 12880).

8.3. Continuity and spacing of street trees along streets should meet the spacing standards defined by the Parks and Recreation Department.

8.4. Only the trees along 60 Avenue (the Main Street) should be planted at **8.00 metres on centre.**

8.5. A gradual increase in spacing should be considered to satisfy the required distances to utilities, instead of creating a gap.

8.6. Tree planting on boulevards should meet the **"Boulevard Tree Planting Standards"** developed by Surrey Park Maintenance.

8.7. It is mandatory that planting of trees on all boulevards is done at the completion of all construction and landscaping in the development where the City boulevard is contiguous with private property and/or where the grade at the root zone will be altered or damaged with further construction or landscaping.

8.8. Trees may be planted in the medians following all other landscape installations, including grass, and only upon completion of final grade of the median. Should the developer not wish to wait until completion of construction and landscaping cash-in-lieu of street trees can be deposited and the Parks and Recreation Department shall undertake the tree planting once development in the area is complete. The developer may plant the entrance boulevards with trees as embellishments to indicate trees will be planted in the future.

9. Trees Adjacent to Streets

9.1. General

9.1.1. To enhance the overall quality of the neighbourhood, the site layout design of new developments should retain and incorporate existing large clusters of trees. This is specifically required for any development along Old McLellan Road.

9.1.2. Native trees must be retained through careful site planning and/or subdivision design. The publication **"Saving Native Trees in the Pacific Northwest"** is recommended as a guideline on this matter.

9.1.3. The **"Tree Preservation Bylaw"** is applicable to any new development in the south neighbourhood of West Cloverdale.

9.1.4. Flowering trees in front yards are recommended to add colour and texture to the streetscape.

9.2. Front Yard Trees

9.2.1. At least two trees should be provided in the front yard of every single family lot; or two trees per dwelling unit in a townhouse or cluster housing project. One of these trees must be a flowering tree; the other should be planted at a distance of 0.60 m. from the property line and 2.10 m. from the sidewalk, follow the planting pattern and be of the same species as the boulevard trees identified along that street.

9.2.2. Some of the trees recommended for yards toward the street are: Stewartia (*Stewartia nonadelpha*), Ivory Silk Tree Lilac (*Syringa reticutata 'Ivory Silk'*), Stag's Horn Sunac (*Rhus typhina*), Magnolia (*Magnolia grandiflora*), Lavalle Hawthorn (*Crataegus lavallei*) and Smoke Tree (*Cotinus coggygria*).

9.2.3. Tree planting on front yards must be co-ordinated with the tree replacement plan required for every proposed development.

9.3. Trees on Flanking Streets

9.3.1. Trees planted along the side property line of single family corner lots, where shallow side yard set-backs may bring the house closer to the street, should be a more vertical form of street tree (fastigiate).

10. Calliper

10.1. All trees are to be 5-6 cm. calliper, branched at or above 1.3 metres. No pruning of the scaffold branches or leader should be undertaken.

11. Consultation with Parks & Recreation

11.1. The Parks and Recreation Department should be consulted for specific suggestions regarding pattern, spacing, frequency of species or possible changes to the species of trees recommended along any of the routes identified.

Addendum

ADDITIONAL CONSIDERATIONS REGARDING STREET TREE PLANTING SCHEME (MAP I).

In addition to the recommended Tree Planting Scheme, the following specific streetscape issues should be taken in consideration:

BELL ROAD/COLLECTOR RING ROAD

1. Recommended trees for Bell Rd./Collector Ring Road, identified as **"D"** in Map I should only be considered if there is substantial development of the areas which slope down to the South and Southwest from this road.
2. If a retention of a more natural state for these sloping areas is achieved during development, then the **recommended trees along Bell Rd./Collector Ring Rd. are the same street trees to be planted along the North Collector Ring Rd. (164 St and 63 Ave.).** That is:

Cercidiphylum japonicum

Acer plat. "Drummondi"

Fraxinus ornus

Gleditsia tricanthos "Shademaster"

Liquidamber styraciflua "Worpelston"

OLD MC LELLAND ROAD.

3. Trees to be planted along Old McLellan Rd .should reinforce the Heritage character of the streetscape. **Every effort should be made to plant trees which match the species of the existing heritage trees along that road.** Trees indicated in the Street Tree Planting Scheme should only be considered as a last resort in the event that technical difficulties associated with the provision of municipal services to the immediate area do not allow the planting of the preferred trees.

(This clarification note was added on March 25, 1997 (after approval of the document by Surrey Council) following additional discussions with the Heritage Advisory Committee and Parks and Recreation Department).

DESIGN GUIDELINES FOR PEDESTRIAN/BICYCLE CORRIDORS (MULTI-USE CORRIDORS) AND LINKAGES

12. General Design Principles for Corridors and Linkages

12.1. The following guidelines are intended to ensure that a continuous, safe and attractive pedestrian/bicycle network is provided in West Cloverdale to allow access to community facilities, to the protected landscaped areas on the west and south slopes of West Cloverdale, and to the City's public transportation corridors and bicycle commuter routes.

12.2. The components of the local multi-use network; corridors, linkages and buffers, have been classified according to their width and local function within the local pedestrian/bicycle transportation network. The main components of the network are indicated on **Map II.**

12.3. The different widths of the various components of the system reflect their hierarchical function within the local pedestrian/bicycle network. Width changes are also intended to maintain a strong sense of safety for users (an appropriate relationship between length and width of the corridor).

12.4. It is noted that ***corridor*** refers to the right-of-way of the bicycle/pedestrian/linear open space network (multi-use corridors), and that ***path*** or ***pathway*** refer to the paved surface for walking/biking contained within the corridor.

12.5. The following guidelines describe the characteristics and function of the various components of the local multi-use network.

13. Landmarks and Focal Points

13.1. The development of focal points along the Main Street and in the linear open space is required at the intersections of view corridors, streets or the pedestrian/bicycle network (amenity buildings, clusters of existing trees, resting and/or play structures, arbours, gateways, landmarks, etc.). These elements will act as reference points within the neighbourhood. The location of these focal points has been indicated in **Map II.** Details of the development concept for these nodes are found in Sketches **D, E, F, G and H.**

13.2. Site planning and the ultimate design of these nodes should be responsive to the contours and natural features of the site, and to the specific conditions of the area (views, noise, slopes, etc.).

14. Reference Standards

14.1. The design of all multi-use pathways should consider the guidelines contained in the document entitled **"Review of Standards for Multi-use Pathways"** and the recommendations on gradients and physical design contained in Section B.1 of the **"City of Surrey Bicycle Blue Print".**

14.2. Lighting of bicycle paths should consider the recommendations contained in the **"Bikeway Design Supplement to the Urban Geometric Design Guide for Canadian Roads".**

15. Perimeter Commuter Bicycle Routes

15.1. These routes form part of the City-wide bicycle route network.

15.2. It is recommended that bicycle routes consist of a **1.50 metre-**wide pathway (one in each direction) incorporated into the paved area of the right-of-way.

16. Local Pedestrian/Bicycle Linkages

16.1. These are pedestrian/bicycle (multi-use) corridors that generally connect two single family residential areas or local streets. They help to expand and interconnect the local circulation network for pedestrians and bicycles through the streets of the neighbourhood.

16.2. To improve the perception of safety and avoid the tunnel, narrow passage effect, the recommended widths are:

- **4.00 metres** (3.00 metre pathway pavement width), if its length is **30 metres or less.**
- **6.00 metres** (3.00 metre pathway pavement width), if its length is **between 30.00 and 60.00 metres.**

17. Neighbourhood Pedestrian /Bicycle Routes

17.1. These multi-use pathways will be integrated as part of the neighbourhood pedestrian/bicycle network and the trails along the perimeter slopes to the west and south.

17.2. It is recommended that these multi-use pathways be not less than **3.00 metres** wide, in order to accommodate various potential users (walkers, joggers, bikers, wheelchairs).

17.3. In some cases, these pathways may meander within the total width of the corridor right-of-way.

18. Primary Linear Open Space/Multi-Use Corridors

18.1.1. These corridors are the neighbourhood's main pedestrian/bicycle route to the central school/park, the commercial portion of the Main Street, and to the plaza at Five Corners.

18.1.2. The minimum width of these corridors will be **12.00 metres**.

19. Secondary Linear Open Space/Multi-Use Corridors

19.1.1. These multi-use corridors are extensions of the primary system toward the park areas and the trails along the west and south slopes and along the river. They complete the network that provides access to the school, parks and to various neighbourhood destination points.

19.1.2. The minimum width of these corridors is **8.00 metres**.

20. Pathway Design Specifics

20.1. Pathway Surface

20.1.1. Asphalt surface will be used for all multi-use pathways in the local pedestrian/bicycle (multi-use) network.

20.1.2. The edges of these pathways should be well identifiable.

20.2. Bollards

20.2.1. Bollards should be used at the approaches to an intersection of the pedestrian/bicycle (multi-use) pathways with a street. In the case of narrow pathways, hinged bicycle baffles should be used instead.

20.2.2. These safety devices should be placed at the setback line from the street (see Sketch **B**).

20.3. Street Crossings

20.3.1. Changes in texture and/or colour must be introduced to the pathway surface, starting at **5.00 metres** before reaching the bollards or bicycle baffles.

20.4. Connections to the Corridors

20.4.1. Direct connections from cluster housing sites to the pedestrian/bicycle corridors should be located central to the corridor's length (if no multiple or direct access from individual units is provided).

21. Safety Aspects - CPTED Recommendations *(Crime Prevention Through Environmental Design)*

21.1. Pathway Alignment

21.1.1. Clear visual continuity of the path must be maintained by careful direct alignment of the various portions of the pedestrian/bicycle (multi-use) network; including local streets that serve as linkages to complete the network.

21.1.2. Sudden changes in alignment or interruptions of the corridors should be avoided.

21.1.3. The alignment and dimensions of corridors should provide wide views and avoid a service alley character.

21.2. Surveillance

21.2.1. It is desirable that dwelling units located along the multi-use corridors provide second floor windows and balconies toward the corridor to increase opportunities for casual surveillance.

21.2.2. To help develop a sense of ownership over these public spaces, the provision of arbours, low gates and sidewalks from individual units to the pedestrian/bicycle corridors is recommended.

21.3. Lighting

21.3.1. Lighting should increase the sense of security for both users and residents of the units fronting on to the corridors. Pedestrian scale, low level lighting that does not interfere with the privacy of adjacent residential units, is favoured for all components of the network.

21.3.2. Wall mounted lighting in units abutting the corridor may help to add to the corridor's lighting level and increase the user's (and resident's) perception of safety.

22. Fences Along Bicycle/Pedestrian Linkages

22.1. Wherever possible, fences along multi-use corridors should be transparent and provided in combination with landscaping.

22.2. No fences should extend within the area of the required building setback from the street.

23. Landscaping

23.1. Landscaping within multi-use corridors that are **6.00 metres** wide or less should consider low shrubs and plants only. In these cases, trees should be planted at various set-backs from the path and on private yards abutting the corridor, to avoid a tunnel effect.

DESIGN GUIDELINES FOR PUBLIC STREETS

24. General Design Principles for Public Streets

24.1. The following general guidelines are focused on providing opportunities for resident's social interaction and achieving a strong residential neighbourhood character; where pedestrian, not the vehicles, define the design and characteristics of the street.

24.2. The overall character of West Cloverdale (north and south neighbourhoods) will be mostly defined by the width of the streets from building face to building face, pavement textures and the way that the buildings and associated uses relate to the street.

24.3. The guidelines identify the development concept to achieve a special character for the neighbourhood's **Main Street** and **Old McLellan Road** (see **Map III** and Sketches **D, E, F, G, H and J**), and to recognize the need to adjust and tailor the City's present road standard cross-sections to achieve this primary objective.

24.4. ***It is noted that the proposed cross-sections identified for the Main Street (60 Avenue) development concept and the specific treatment of the right-of-way may require adjustments and be further detailed to the satisfaction of the City's Engineering Department.***

25. Street Right's-of-Way

25.1. Where possible, in consultation with Surrey's Engineering Department and appropriate to the context, the distance between buildings across the street and the width of pavement should be reduced (a combination of narrower right-of-way and/or reduced front yard setbacks may be appropriate).

26. Access to Garages

26.1. In townhouse or cluster housing sites located along the Main Street (60 Avenue) and Old McLellan Road, all units should have access to the garage from an internal driveway.

27. Treatment of Intersections

27.1. All intersections should consider curb extensions (narrowing) to reduce the crossing distance for pedestrians and to lower vehicle's speed (see Sketch **C**).

27.2. Curb narrowing (chokers) and landscaping (with trees) should be considered ***every 6 to 8 on-street parking spaces***.

27.3. Different texture, decorative pavers or other, should be used at the major street intersections(see Sketch **C**). This treatment of the intersections is spatially important at the intersections with the South Collector Ring Road (57A Avenue/Bell Road and 164 Street), and at the entrances to the neighbourhood.

28. Traffic Signs

28.1. The number of traffic signs at the interior of the neighbourhood should be minimized (other traffic control devices are preferred).

28.2. If traffic signs are unavoidable, wherever possible they should be grouped and mounted on light posts in the immediate area; a single traffic sign on a single pole should be avoided.

29. Special Pavement

29.1. Decorative pavers or other pavement that adds texture and colour differentiation should be used at the entrances to the neighbourhood and on the neighbourhood Main Street.

29.2. The sidewalks of the commercial portion of the Main Street should also consider a unique pavement pattern and formal tree planting on grates (see Sketches **G, H and J**).

30. On-Street Parking

30.1. A concrete band, separating traveling lanes from on-street parking lanes should be used to identify all on-street parking areas. Recommended on-street parking areas are identified in **Map IV.**

31. Street Lighting

31.1. A type of lamp post and single luminaries with a strong heritage rural village flavour should be used throughout West Cloverdale (north and south neighbourhoods). This type of public lighting should be primarily oriented to serve pedestrians (e.g. lower, with a gentler glow and placed at shorter intervals).

31.2. Lamp post and double luminaries which may permit attachments for hanging flower baskets and/or banners, should be considered along the Main Street (60 Avenue).

31.3. For consistency from project to project, the type of lamp, its height, intensity, intervals, etc., will be constant throughout the neighbourhood.

31.4. Implementation of the street lighting concept will be co-ordinated by Surrey Engineering through the servicing agreement process.

DESIGN GUIDELINES FOR BUILDINGS

32. General Design Principles for Buildings

32.1. This set of guidelines focuses on achieving a harmonious architectural relationship and co-ordination among buildings, and between buildings and the street. It is expected that the presence of some **heritage** character architectural details throughout the neighbourhood and the establishment of several landmark/reference points will achieve a unity of character and a strong identity for West Cloverdale (north and south neighbourhoods).

32.2. The design of buildings should achieve architectural coordination and lend visual integration among the various projects in the area.

32.3. Individual proposals should convey a strong heritage character for the neighborhood by incorporating the basic design details found in many heritage residential buildings in Surrey (see Figures **K, L and M** for Surrey heritage character images).

33. Residential Architectural Character

33.1. To convey the semi-rural flavour of the area and to introduce a heritage character to the neighbourhood, the design of single family, townhouse or cluster housing units **along the street** should consider one or various heritage architectural components as a dominant design feature toward the street.

33.2. Some of these architectural elements are:

- Gable roof components with a 10/12 or 12/12 slope; Gabled dormers; Pitched roofs.
- Strong roof overhangs/eave projections.
- Louvered ventilation on gables, shingled or scaled gable end walls, etc.
- Bay windows; Windows with muntins and mullions; Rectangular/square shaped windows; French doors.
- Porches; Verandas; Horizontal siding and wide trim, etc.

33.3. Some restricted architectural elements include:

- Vinyl siding as an exterior cladding material will only be permitted if applied as narrow horizontal siding and in combination with wide trim.
- Stucco should only be used in combination with other exterior finishing materials.
- Maximum height of a roof overhang over the main entrance to a house to be limited to no more than 1 1/2 storeys.

33.4. Garages

33.4.1. Garages should not be the dominant element on the streetscape or dominate the facade of single family units (also, see "Driveways" in "Design Guidelines for Yards Abutting Public Streets").

33.4.2. To achieve this objective, the following is recommended:

- No carports or port-cocheres will be permitted in West Cloverdale (north and south neighbourhoods).

- Garage doors should not occupy more than 40% of the house frontage unless the garage is recessed at least **1.00 metre** from the front line of the house.
- Panel glazing, if used in the garage doors, must complement the top of the garage opening and shall **not** be the sunburst style.
- Garages should preferably be located behind or on the side of the house.

33.5. Roofs

33.5.1. No flat roofs will be permitted anywhere in West Cloverdale (north and south neighbourhoods). The recommended range of roof slopes is between 8/12 to 12/12. Simple roof lines are encouraged.

33.5.2. No metal or red roof tiles will be permitted in residential proposals in West Cloverdale (north and south neighbourhoods). Roof tiles and duroid are acceptable if they resemble cedar shakes in terms of texture, form and colour.

33.6. Corner Units

33.6.1. Corner units of a townhouse development, and any housing unit exposed to side views should provide sufficient architectural detailing to the side and street fronting elevations.

34. Multi-Family Building Form

34.1. Cluster housing along the local streets should provide a variety of forms, details and groupings that relate to a single family street character. The design of townhouse clusters along the street should not be repetitive and duplex clusters should avoid the mirror image effect.

34.2. Where townhouse clusters or cluster housing units front on single family residential areas, the quality of materials and overall design of these units should be compatible with the single family units across the street.

34.3. Simple forms and dominant gable roofs are recommended throughout West Cloverdale (north and south neighbourhoods). This is especially applicable to townhouse and cluster housing units along Old McLellan Road and the Main Street.

34.4. To achieve visual diversity within projects, variations in building height, separations, roof lines and set-backs may be considered between clusters.

34.5. Site layout and designs should be based on the principles of defensible space (CPTED principles) and should provide ample opportunities for casual surveillance of public spaces. These principles attempt to strengthen two kinds of basic social behavior; territoriality and natural surveillance.

34.6. The design of townhouses and cluster housing proposals along a public street, excepting the row housing units along Old McLellan Road and the Main Street, should have a strong single family character. The layout of the units should focus on the street. Direct pedestrian access to the unit from the street must be considered for all townhouse or cluster units along a public road.

35. Privacy from Public Views

35.1. In order to achieve privacy on porches, verandahs and patios/decks of units located toward a public street (especially along the Main Street), the finished grade of these dwelling units should be between **0.60 to 1.00 metre** above the level of the sidewalk. No retaining walls are allowed along the front property lines unless required as a result of strong natural site conditions.

36. Retaining Walls

36.1. Where retaining walls are absolutely necessary, they shall not exceed 1.00 metre in height, and landscaping must be provided in front. The distance to a retaining wall from any property line should be at least equal to the height of the retaining wall (1.00 metre maximum).

36.2. A smooth finished grade or ground level transition from lot to lot is preferred.

37. Old McLellan Road Pedestrian Street

37.1. The northern end of the existing alignment of Old McLellan Road will be retained and converted into a pedestrian street. Some commercial frontage is envisioned at its northern end toward the public plaza at Five Corners. A more urban type of residential development is envisioned along both sides of this pedestrian street.

37.2. The pedestrian street should include planters/seating islands, consider special pavement, pedestrian scale lighting posts with double luminaries, and street furniture associated with a public space.

38. Five Corners Urban Plaza

38.1. An urban plaza is to be developed on the southwest side of Five Corners at the eastern end of the commercial area of Main Street. This plaza must have a formal character that is appropriate for public gatherings and ceremonies (see Sketch H for the general design concept). The detailed design should consider this space as the gateway to West Cloverdale. A Public Art component might be added to establish an urban landmark at this location.

39. Retail Commercial Frontage

39.1. The main commercial street should achieve continuity of frontage along both sides of the Main Street (60 Avenue between Old McLellan Road and 168 Street).

39.2. As specified in the Zoning By-law, the height of the buildings along the main street should not be more than 9.00 metres or three storeys.

39.3. It is desirable that at least 80% of the commercial frontage at street level be dedicated to retail, eating establishments and/or personal service stores.

39.4. Residential uses are preferred above ground level but residential/professional office uses are acceptable if they provide a strong local residential character.

39.5. Narrow bay window and door type of storefronts are encouraged.

39.6. Various narrow frontage CRU bays are preferred instead of a single large commercial area.

40. Commercial Parking Areas

40.1. Parking lots and loading areas for commercial areas should be located behind the buildings; screened and away from direct views from the street. Access to parking areas is recommended from a service lane or driveway at the back of the commercial buildings or as a lane from the Main Street (see Sketch **J**).

40.2. A combination of low planter/wrought iron fence (maximum **1.00 metre** high) is recommended, in combination with landscaping and wide canopy tree planting, to enclose and screen parking areas from views from lanes and adjacent streets.

40.3. Underground parking is desirable for the residential/commercial and residential/institutional land uses at Five Corners, south of the Main Street.

41. Commercial Frontages

41.1. Continuous frontage and small front yard setbacks should be considered for developments along the Main Street and the northern part of Old McLellan Road.
41.2. Second and third levels above the street level should be set back from the ground floor level.

42. Canopies

42.1. Commercial developments along the Main Street should provide canopies over the sidewalk (1.50 metre projection is recommended), in order to achieve weather protection continuity along the whole length of the street.
42.2. Round canopies are not permitted.
42.3. It is recommended that canopies have an inclination between 30 and 45 degree slope toward the street and provide no more than a 0.30 metre wide vertical edge (fascia) for identification signage purposes. No sign or lettering will be permitted on the sloping part of the canopy.

43. Signs

In addition to the canopy identification signs, other recommended signage includes flood lighting over wooden routed signs, neon, or lettering painted on the windows of the retail/office space. No plexiglass backlit illuminated fascia bands, or pylon signs will be permitted in the commercial area.

Pattern of the tree combination to be confirmed by Parks and Recreation Department. Consistancy of tree type, size and pattern to be maintained along the following streets:

(A) MAIN STREET

Median: Cercidiphylum japonicum
Liquidamber styraciflua "Worpelston"
Fraxinus oxycarpa "Raywood"

Boulevard: Acer platanoides "Crimson King" or "Royal Red"
Tillia cordata "Greenspire"
Gleditsia tricanthos "Sunburst"

(B) COLLECTOR RING ROAD

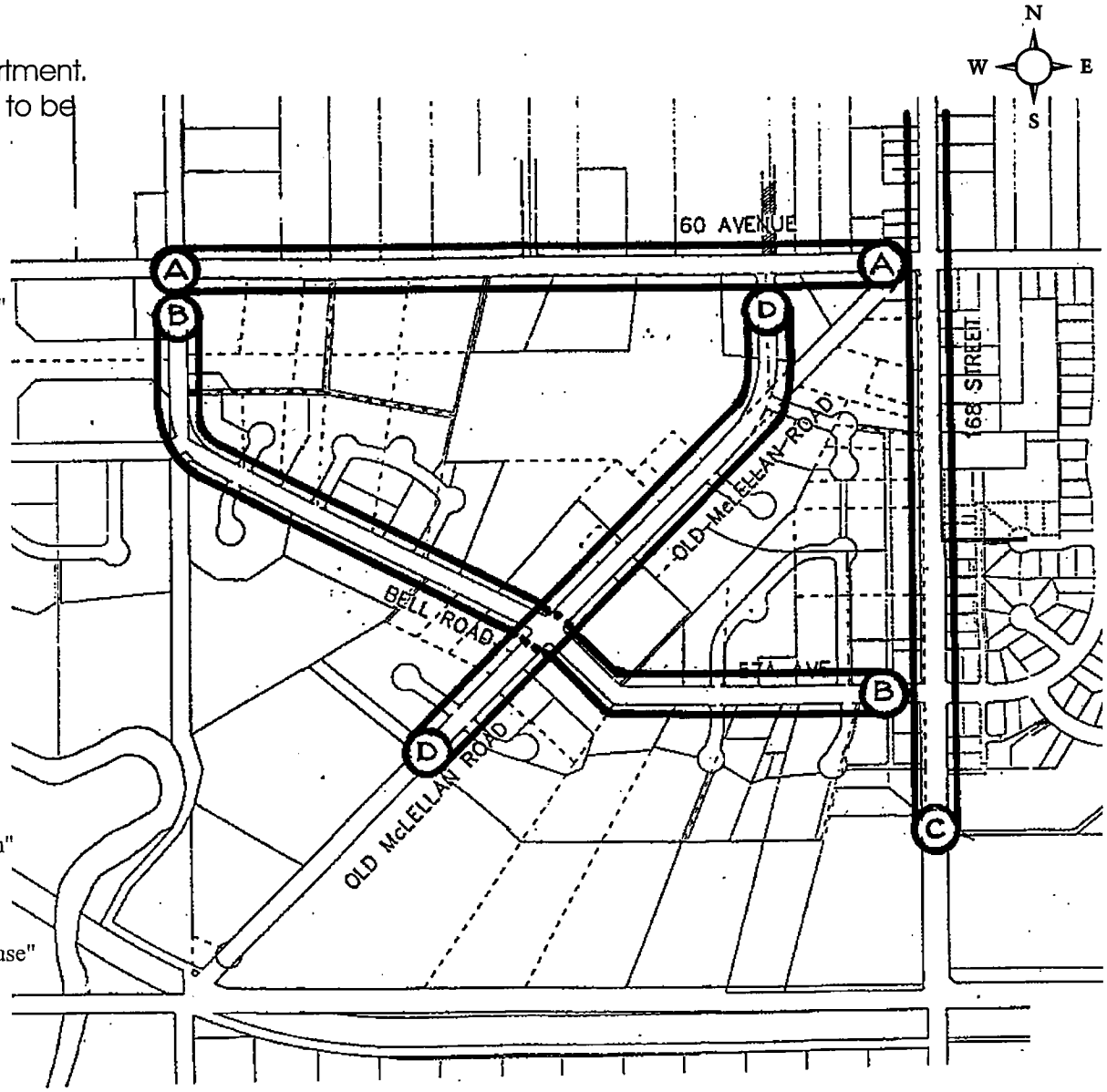
Magnolia Galaxy
Cratageous "Toba"
Syringa reticulata "Ivory Silk"
Malus x zumi "Calocarpa"
Styrax japonica

(C) 168 STREET

Liriodendron Tulipifera
Quercus palustris "Crown Right"
Fagus Sylvatica
Liquidamber sryraciflua "Worpelston"
Gleditsia tricanthos "Sunburst"

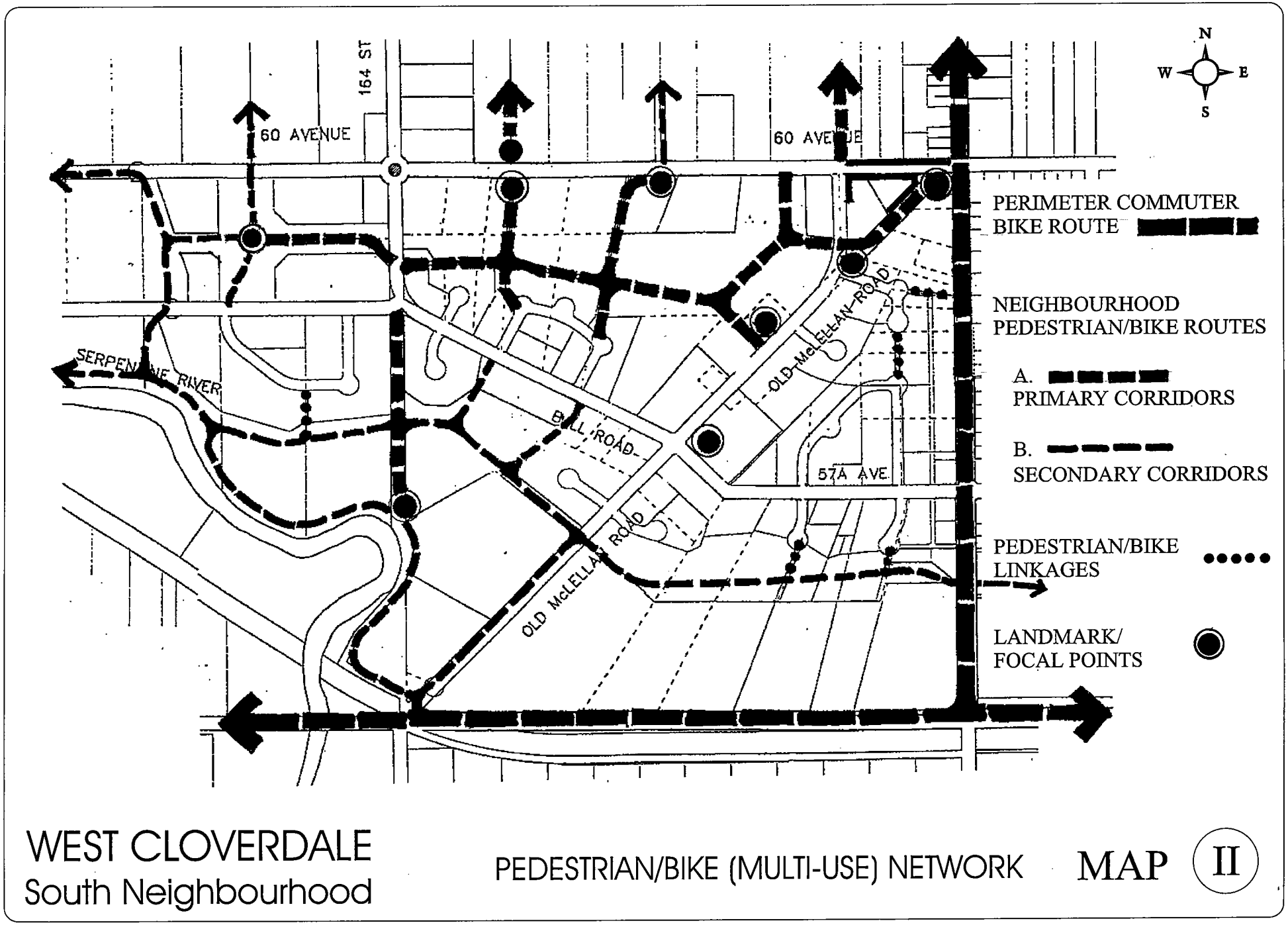
(D) OLD McLELLAND ROAD.

Fraxinus americana "Autumn Applause"
Acer Platanoides "Drummondi"
Tillia x euchlora



WEST CLOVERDALE
South Neighbourhood

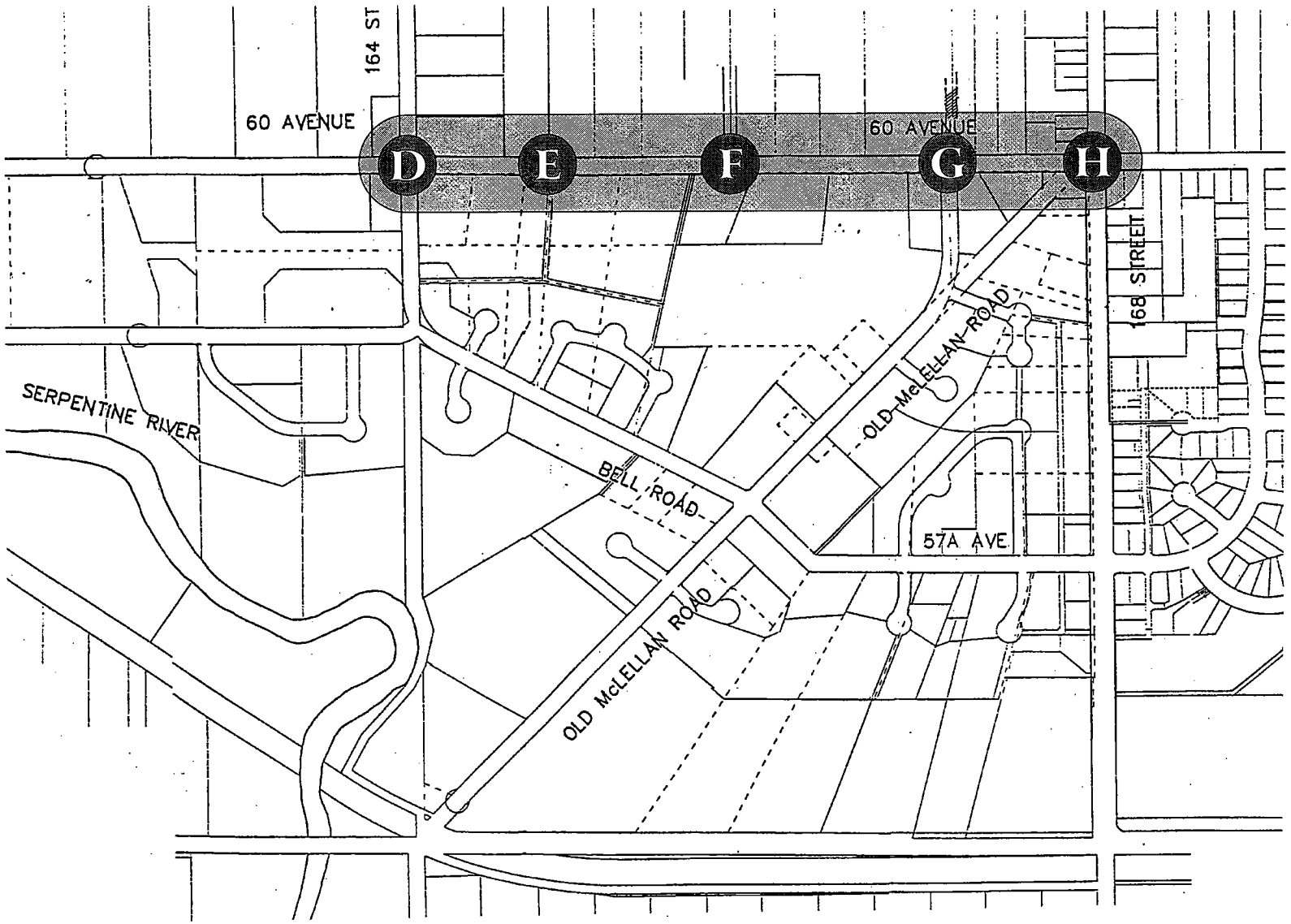
STREET TREE PLANTING SCHEME MAP I



WEST CLOVERDALE
South Neighbourhood

PEDESTRIAN/BIKE (MULTI-USE) NETWORK

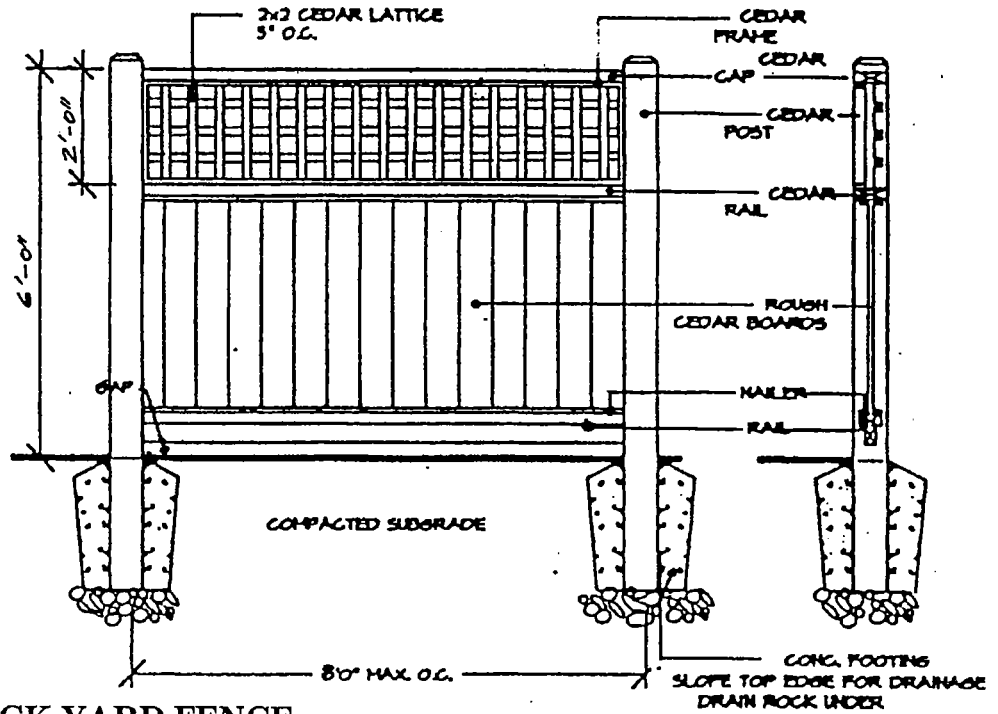
MAP II



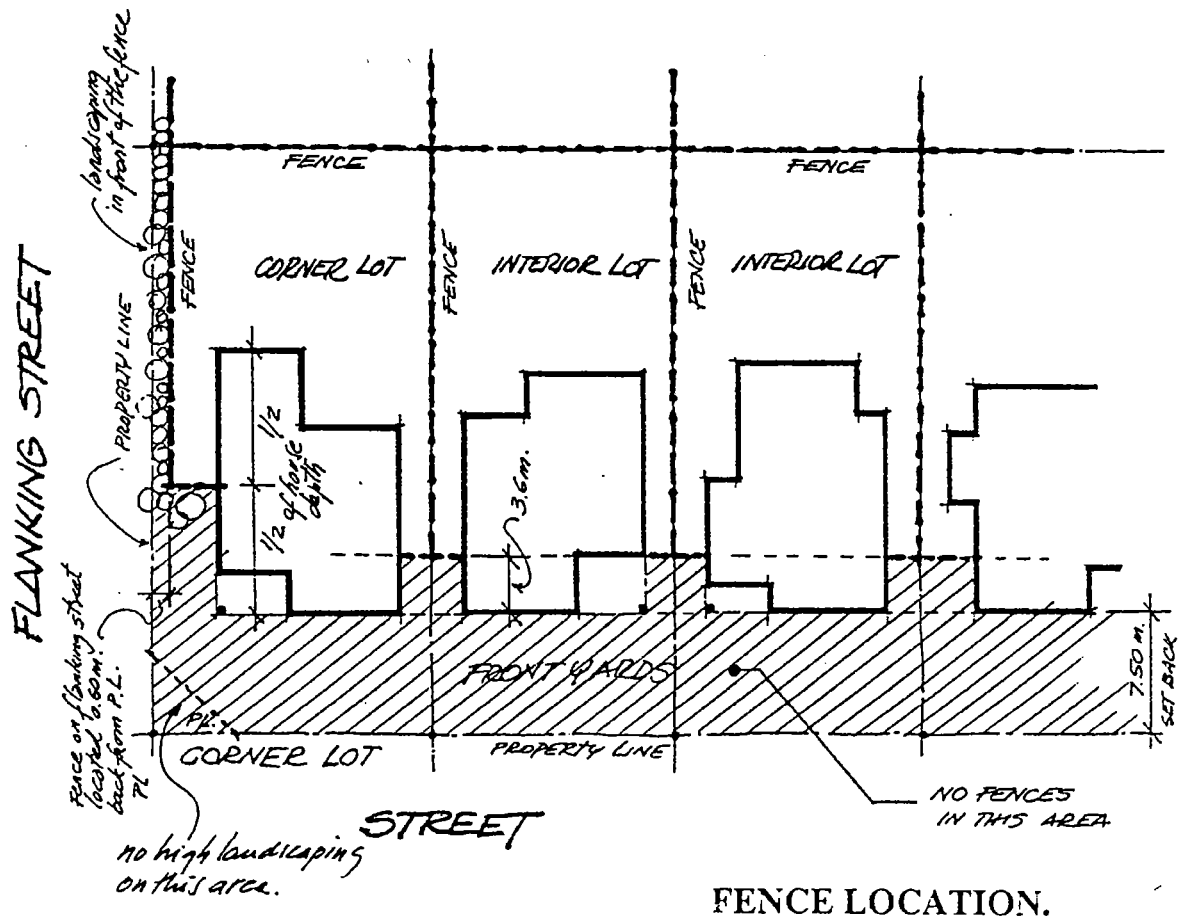
WEST CLOVERDALE
South Neighbourhood

MAIN STREET DEVELOPMENT CONCEPT
MAJOR NODES

MAP III



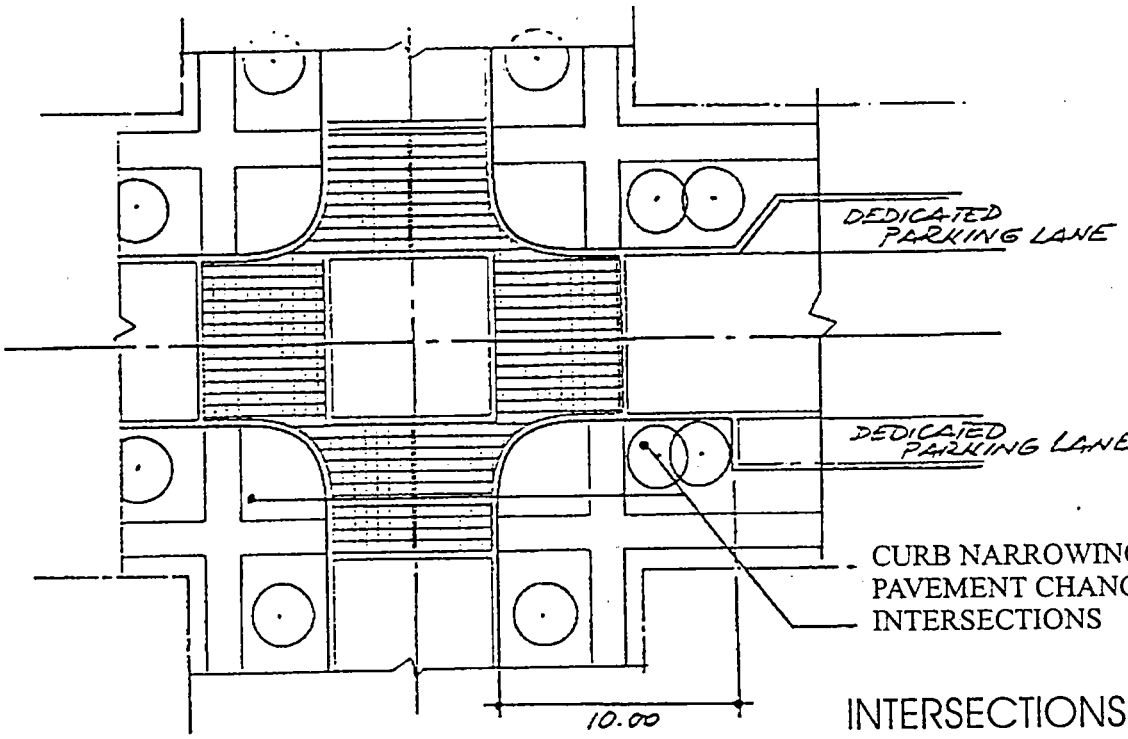
SIDE AND BACK YARD FENCE



FENCE LOCATION.

WEST CLOVERDALE
South Neighbourhood

FENCES A



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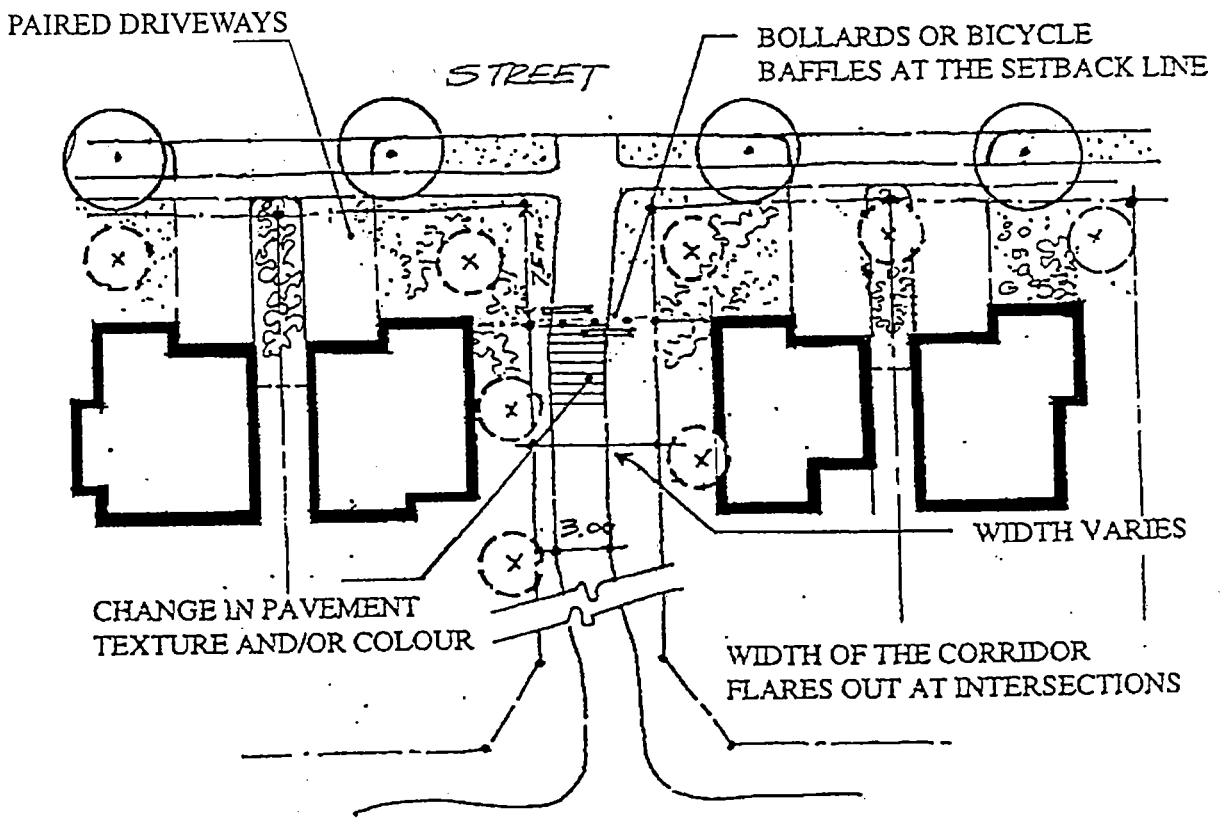
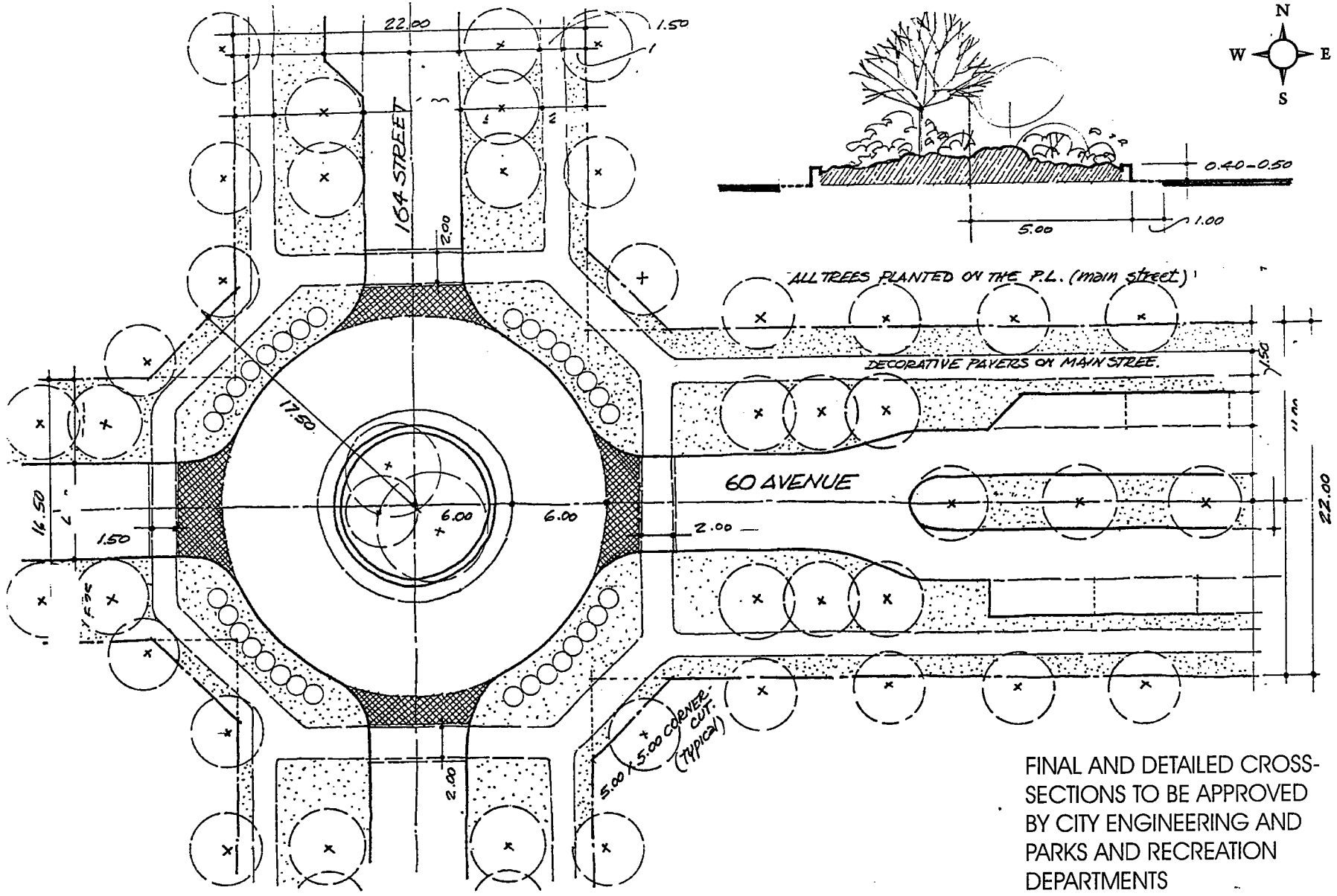


WEST CLOVERDALE
South Neighbourhood

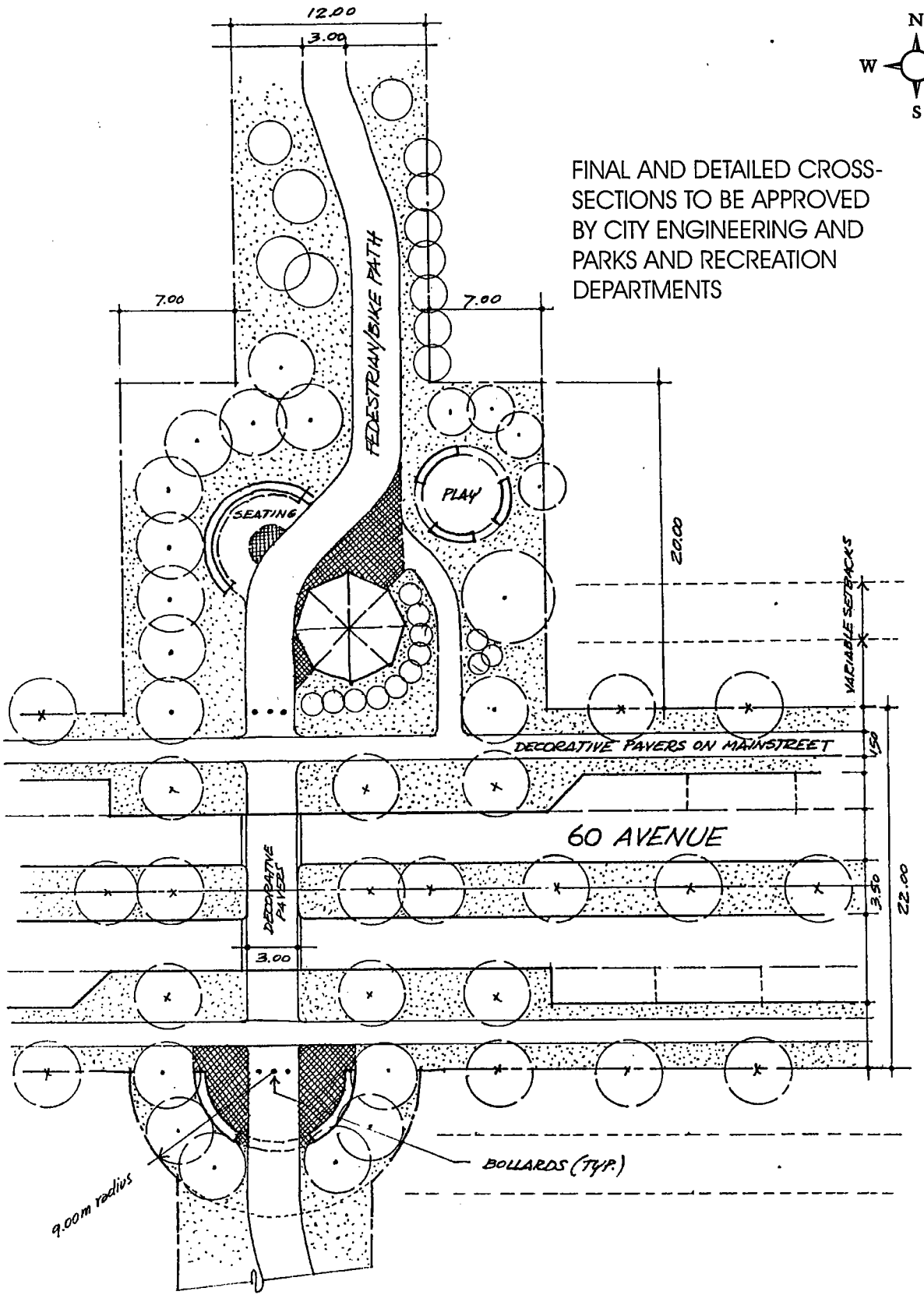
DRIVEWAYS, MULTI-USE CORRIDORS & PATHWAYS (B)



FINAL AND DETAILED CROSS-SECTIONS TO BE APPROVED BY CITY ENGINEERING AND PARKS AND RECREATION DEPARTMENTS

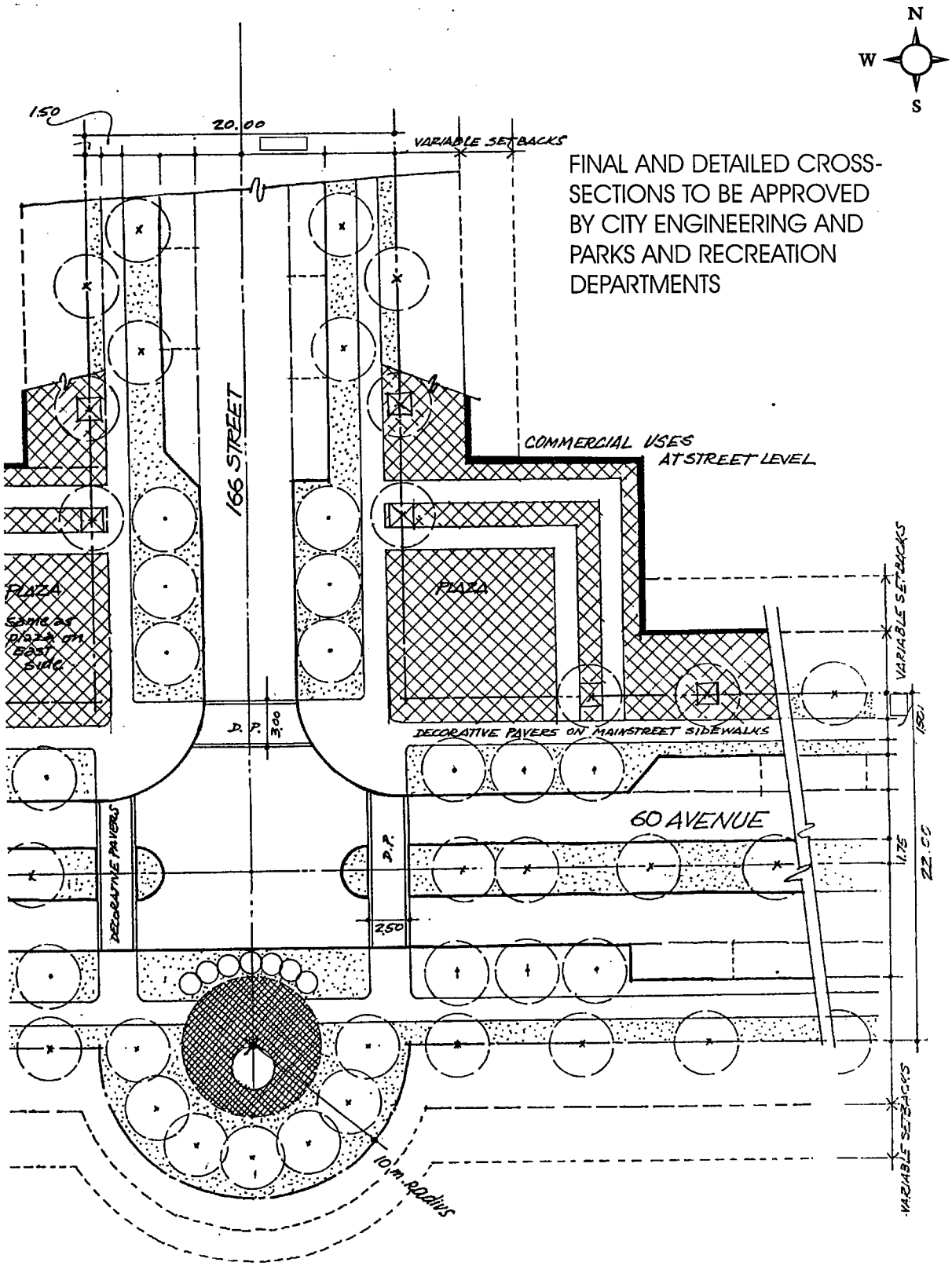
WEST CLOVERDALE
South Neighbourhood

MAIN STREET DEVELOPMENT CONCEPT NODE (D)



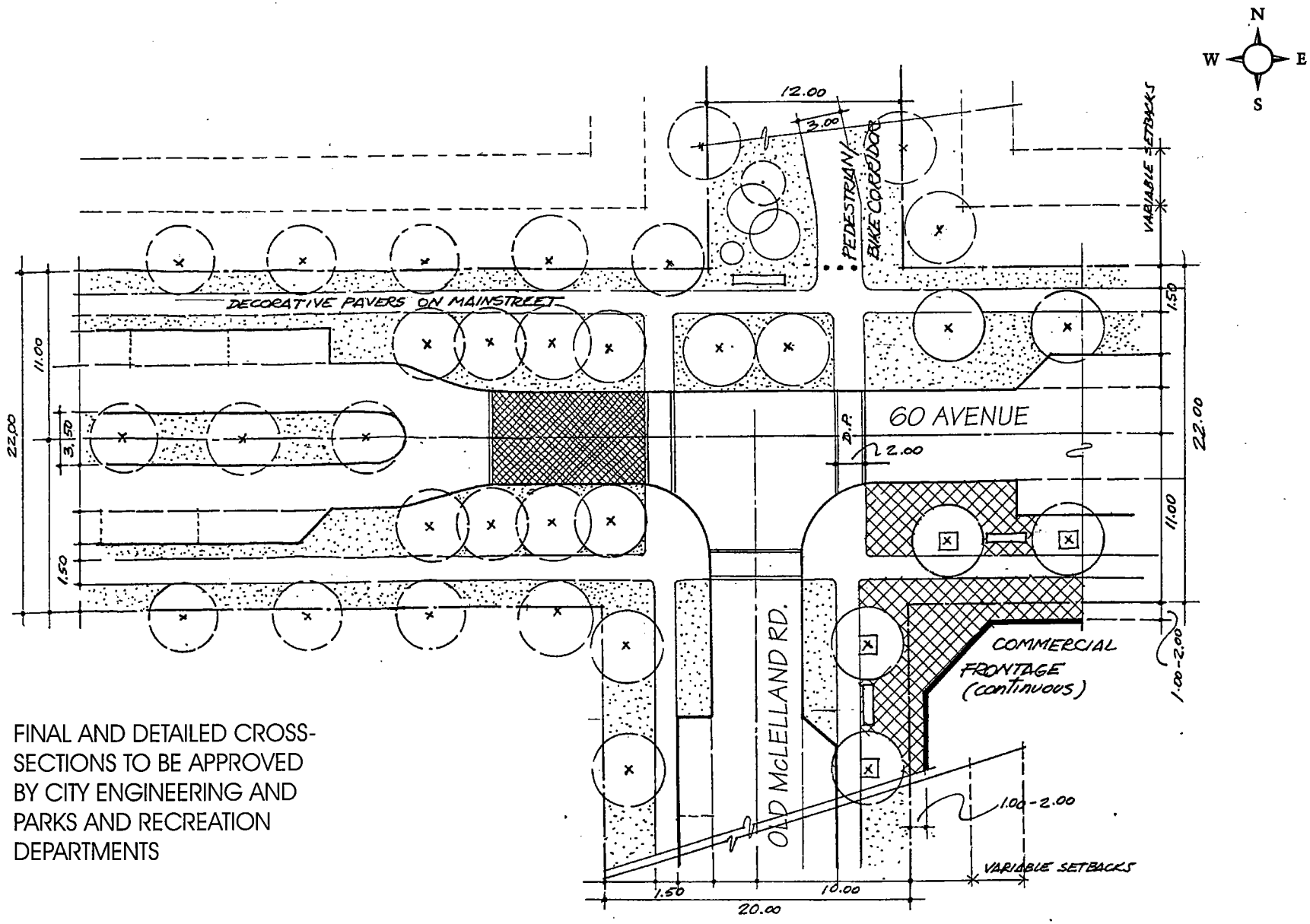
WEST CLOVERDALE
South Neighbourhood

MAIN STREET DEVELOPMENT CONCEPT NODE E



WEST CLOVERDALE
South Neighbourhood

MAIN STREET DEVELOPMENT CONCEPT NODE F

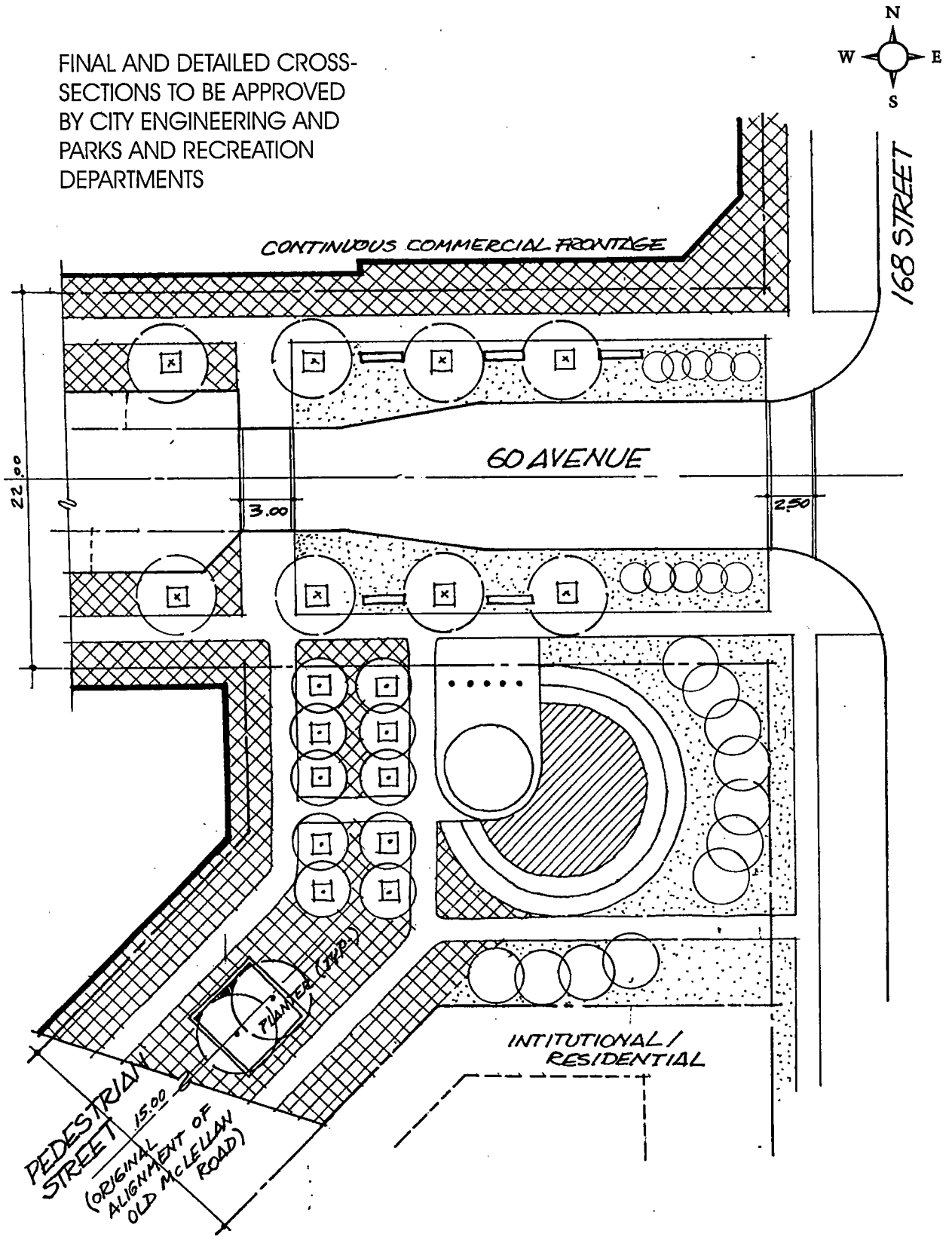


FINAL AND DETAILED CROSS-SECTIONS TO BE APPROVED BY CITY ENGINEERING AND PARKS AND RECREATION DEPARTMENTS

WEST CLOVERDALE
South Neighbourhood

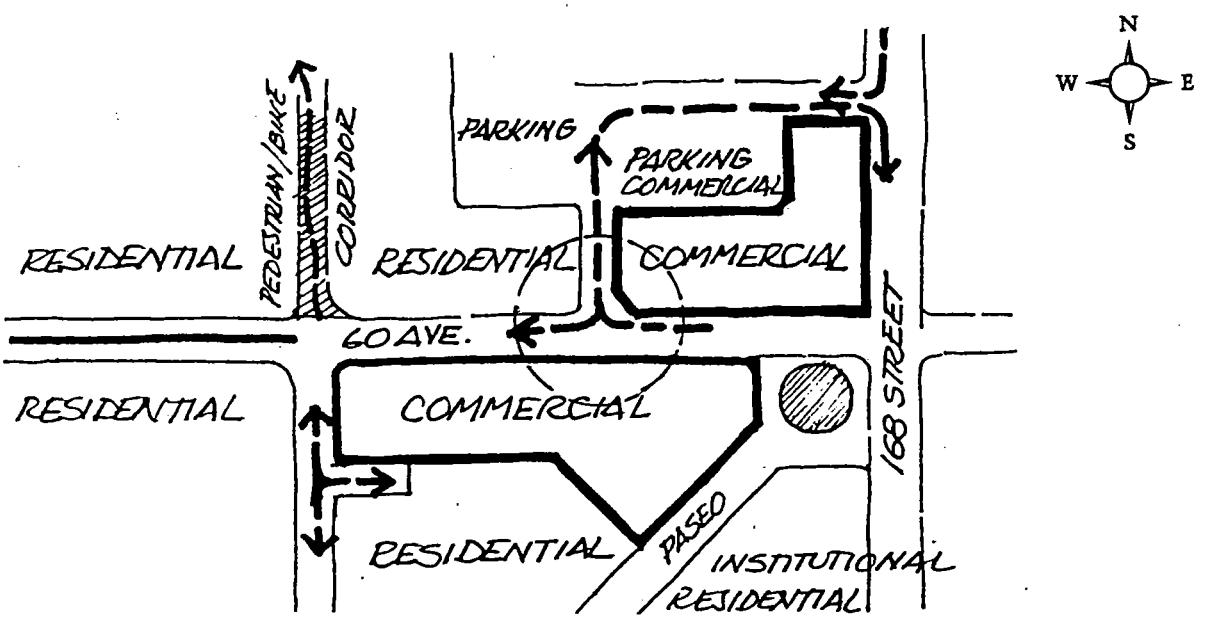
MAIN STREET DEVELOPMENT CONCEPT NODE G

FINAL AND DETAILED CROSS-SECTIONS TO BE APPROVED BY CITY ENGINEERING AND PARKS AND RECREATION DEPARTMENTS



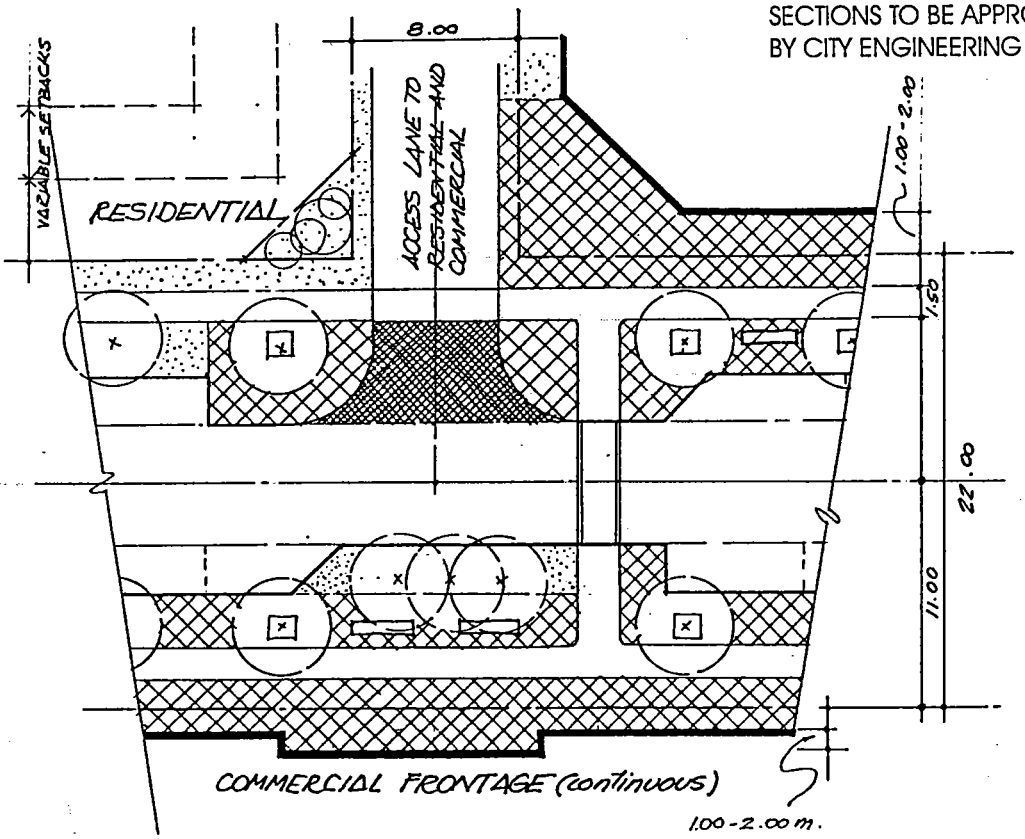
WEST CLOVERDALE
South Neighbourhood

MAIN STREET DEVELOPMENT CONCEPT NODE H



PARKING AND CIRCULATION CONCEPT

FINAL AND DETAILED CROSS-SECTIONS TO BE APPROVED BY CITY ENGINEERING

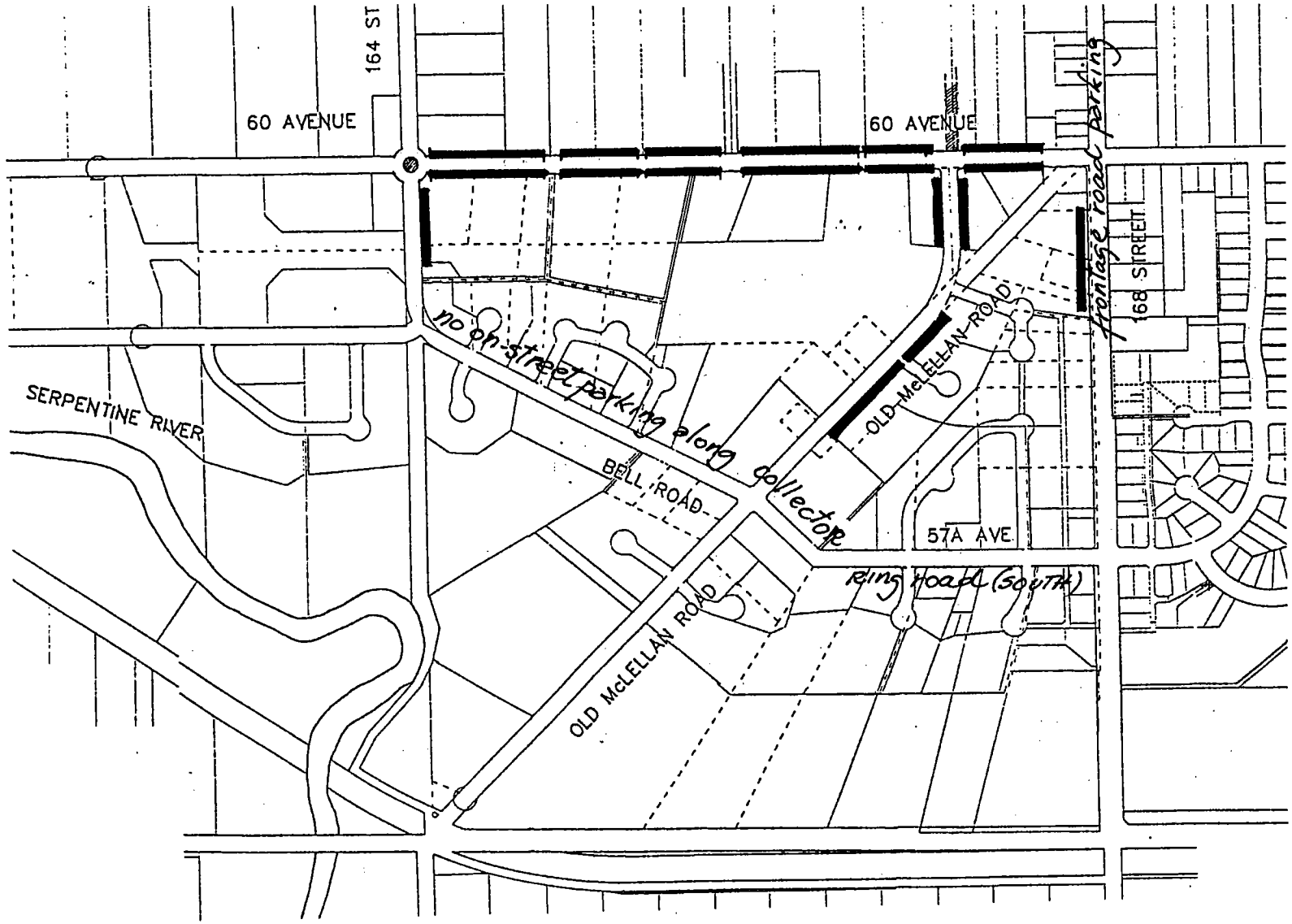


ACCESS LANE TO PARKING AREAS

WEST CLOVERDALE
South Neighbourhood

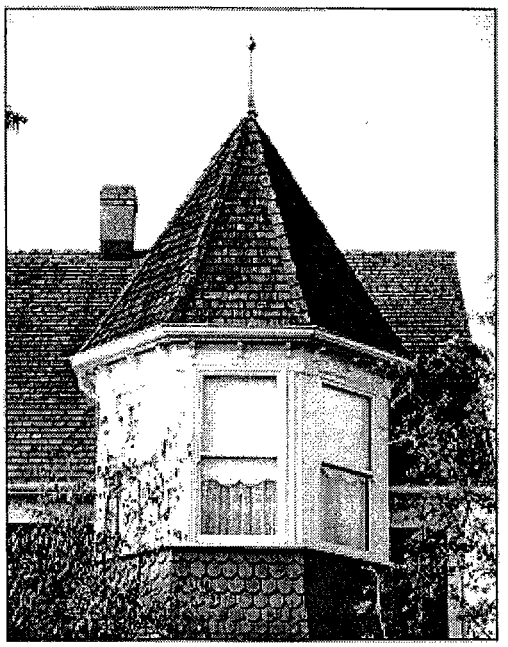
MAIN STREET DEVELOPMENT
CONCEPT. PARKING LOCATION

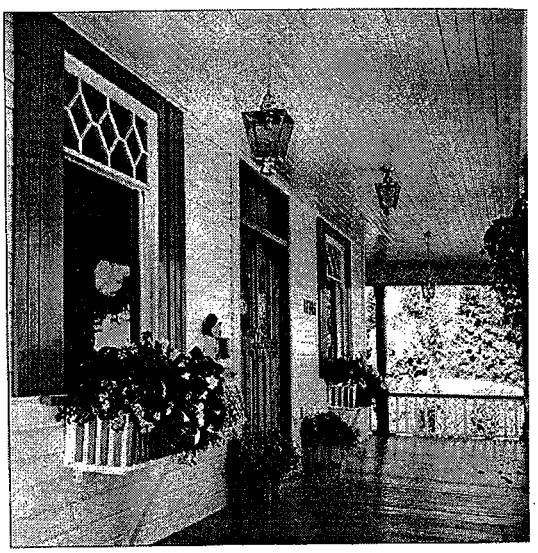
J

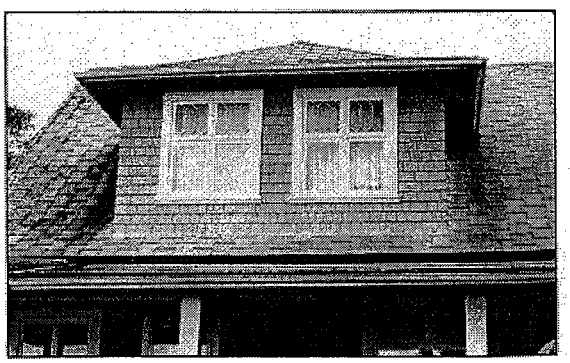


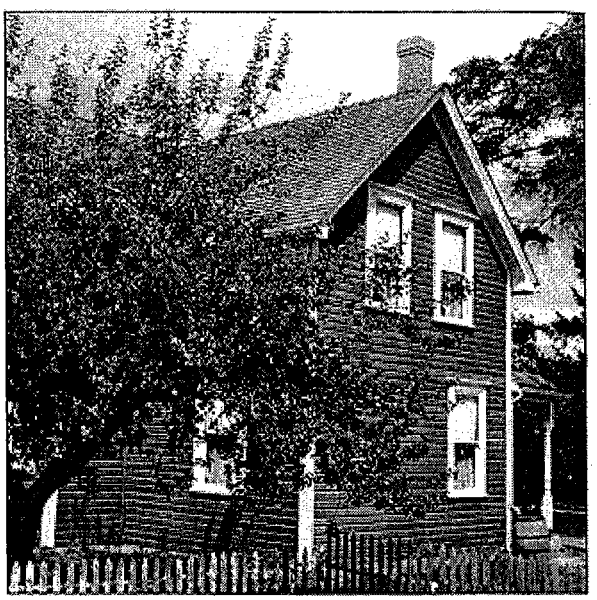
WEST CLOVERDALE
South Neighbourhood

RECOMMENDED ON-STREET PARKING AREAS **MAP** (IV)





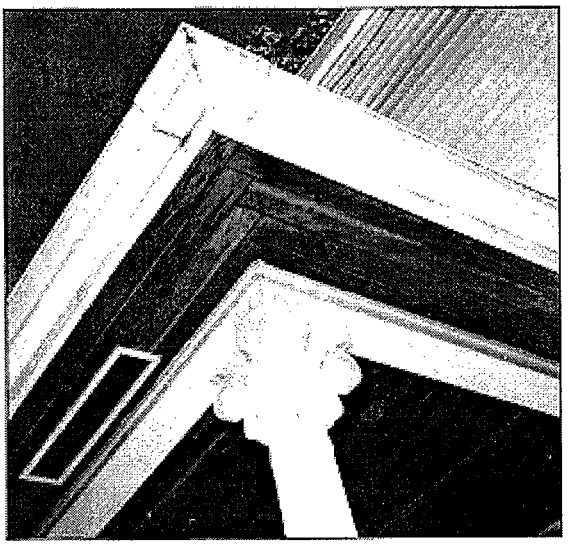




WEST CLOVERDALE
South Neighbourhood

HERITAGE
CHARACTER IMAGES

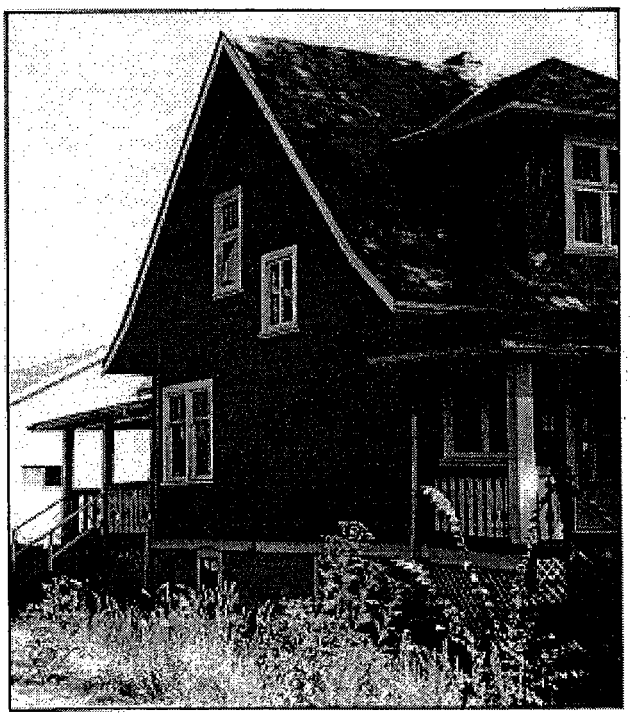
K



WEST CLOVERDALE
South Neighbourhood

HERITAGE
CHARACTER IMAGES

L



WEST CLOVERDALE
South Neighbourhood

HERITAGE
CHARACTER IMAGES

M

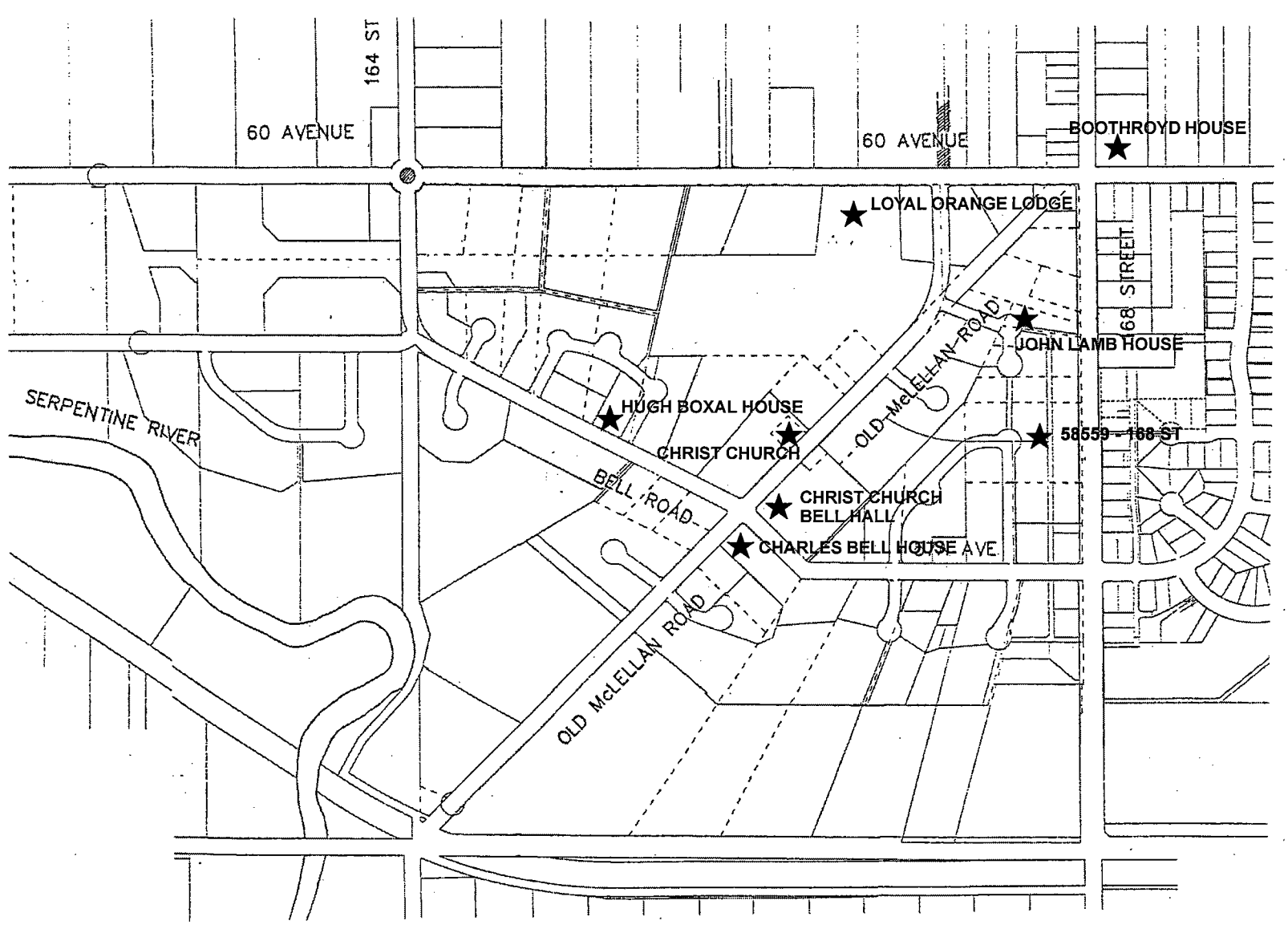
APPENDIX A
SIGNIFICANT HERITAGE SITES
WEST CLOVERDALE SOUTH
NEIGHBOURHOOD CONCEPT PLAN

The heritage sites denoted on the attached map have been identified by the Planning & Development Department as having the potential to be listed on Surrey's Heritage Register.

The following excerpt from Surrey's Official Community Plan provides direction for implementing measures to address the preservation of Surrey's Heritage resources:

G-2 Preserve Surrey's Heritage

- Develop a heritage management plan for the City to provide guidelines and strategies on heritage issues.
- Raise public awareness of historical preservation through the Heritage Advisory Committee.
- Work with the Heritage Advisory Committee to develop and maintain a Heritage Register.
- Evaluate buildings, sites and features on the Heritage Register on an ongoing basis, and work with owners of these properties to develop heritage revitalisation agreements, conservation covenants or heritage designation.
- Work with the private sector and public interest groups to plan for and preserve heritage buildings, features or sites, and to designate Heritage Conservation Areas through the Neighbourhood Concept Plan process.



WEST CLOVERDALE

South Neighbourhood

SIGNIFICANT HERITAGE SITES