LAND AND WATER BRITISH COLUMBIA INC.

WESSNER HEIGHTS DEVELOPMENT PRINCE GEORGE, BC

NEIGHBOURHOOD PLAN AND CONCEPTUAL SERVICING REPORT

Date: June 2004
File: 1010-10-01

LAND AND WATER BRITISH COLUMBIA INC.
WESSNER HEIGHTS DEVELOPMENT
TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LAND AND WATER BRITISH COLUMBIA INC.
WESSNER HEIGHTS DEVELOPMENT
LIST OF DRAWINGS

DWG. NO.	
001	*WESSNER HEIGHTS NEIGHBOURHOOD PLAN*
002	*SLOPE ANALYSIS*
003	*EARTHWORKS AND MAJOR LOT FILLS*
004	*DEVELOPMENT PHASING AND ROAD WORKS*
005	*DEVELOPMENT TRAFFIC – A.M. PEAK*
006	*DEVELOPMENT TRAFFIC – P.M. PEAK*
007	*HANDLEN ROAD EXTENSION (PLAN/PROFILE)*
008	*HEATHER ROAD EXTENSION (PLAN/PROFILE)*
009	*CONCEPTUAL SANITARY SEWER SERVICING PLAN*
010	*CONCEPTUAL STORM SERVICING PLAN*
011	*CONCEPTUAL WATER SERVICING PLAN*

LAND AND WATER BRITISH COLUMBIA INC.
WESSNER HEIGHTS DEVELOPMENT
PRINCE GEORGE, BC
NEIGHBOURHOOD PLAN AND
CONCEPTUAL SERVICING REPORT

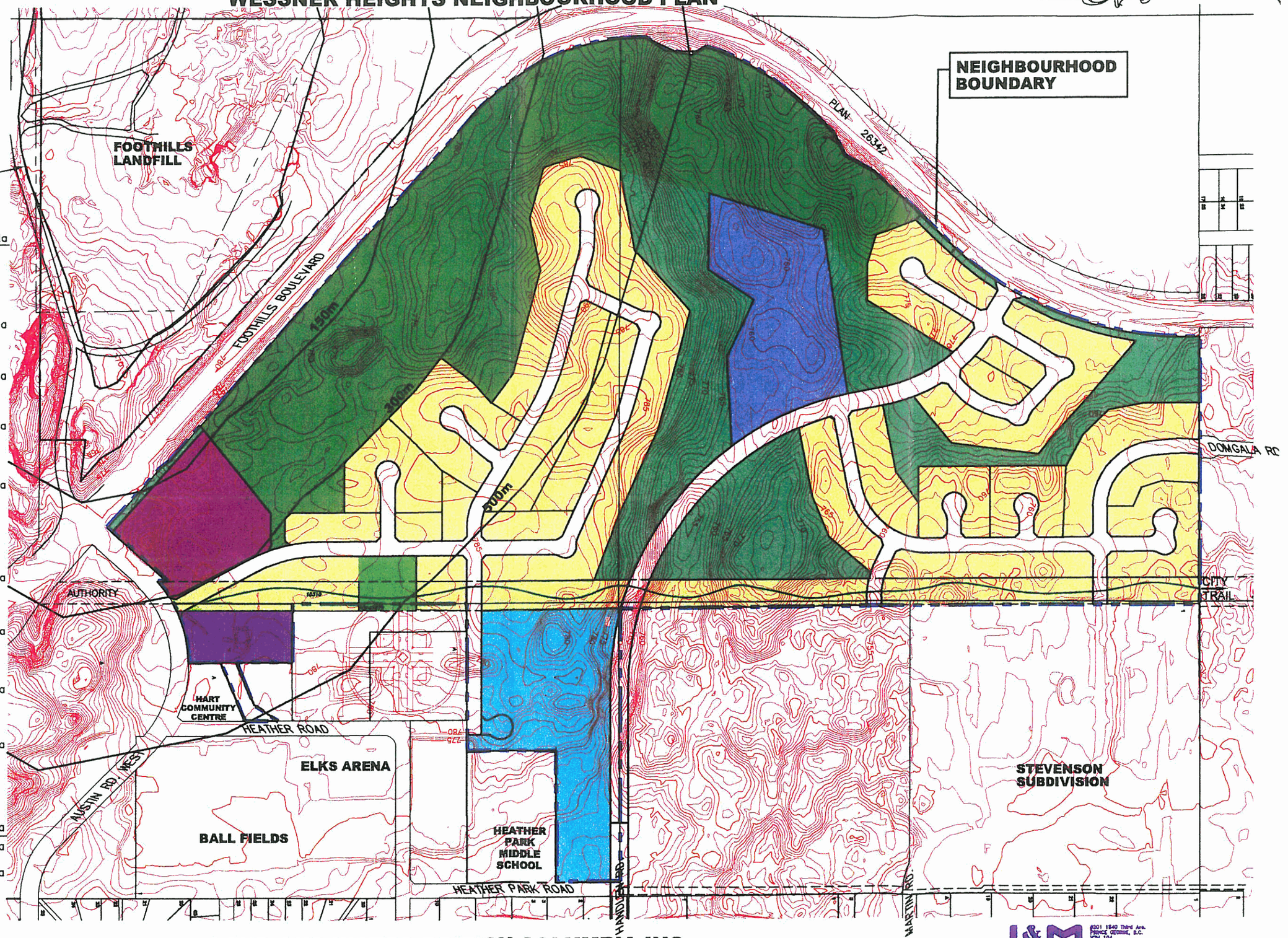
1.0 INTRODUCTION

The Wessner Heights lands are owned by the Land and Water British Columbia Inc. (LWBC) and are located in the north end of the City of Prince George, adjacent to Foothills Boulevard. The proposed development area is located in close proximity to the Hart Highlands Subdivision (a vibrant residential area), Heather Park Middle School, Heather Road Ball Fields, Elks Centre Skating Rink, Kelly Road High School, and The Hart Community Centre.

The proposed development consists of approximately 80 hectares of crown land and is surrounded by a number of small parcel landowners to the north, east, and south. The subject property is bounded on the west by Foothills Boulevard, the longest municipal arterial road in the City of Prince George.

Following extensive consultation with LWBC and the City of Prince George, a Neighbourhood Plan for the development has been prepared by L&M Engineering Limited (see Drawing No. 001). The Preliminary Neighborhood Plan has been utilized to indicate the intended land uses, lot configuration, road layout and open spaces. The development is a part of the Hart Area housing sector as designated by the new City of Prince George Official Community Plan (Plan PG). The proposed Neighbourhood Plan layout contains a mixture of land uses including low density residential, medium density town housing, medium density multi-family, neighbourhood commercial development, as well as extensive open space and park land.

WESSNER HEIGHTS NEIGHBOURHOOD PLAN



TOTAL SITE = 87.03 Ha

LAND USE LEGEND

LOW DENSITY RESIDENTIAL	25.00 Ha
MEDIUM DENSITY TOWNHOUSING	4.94 Ha
MEDIUM DENSITY MULTIPLE FAMILY (PHASE II)	4.05 Ha
MEDIUM DENSITY MULTIPLE FAMILY OR COMMUNITY CENTRE EXPANSION (PHASE I)	1.05 Ha
LOCAL COMMERCIAL / COMMERCIAL RECREATION	2.83 Ha
GREENBELT / SIGNIFICANT SLOPE	12.59 Ha
SPECIAL PURPOSE PARK	21.21 Ha
NEIGHBOURHOOD PARK	0.56 Ha
MAJOR PUBLIC UTILITIES INCLUDING CITY TRAIL	4.80 Ha
	77.03 Ha
ROAD R.O.W.'s =	10.00 Ha

60 0 50 100 150
Scale 1 : 5000

LAND AND WATER BRITISH COLUMBIA INC.

L&M ENGINEERING LIMITED
#301 1540 Third Ave.
PRINCE GEORGE, B.C.
V2M 1G4
Tel. (250) 562-1377
Fax (250) 562-1567
lmeng@lmengineering.bc.ca

DWG. 001

1.1 Residential/Commercial Land Use

As mentioned in the introduction, the proposed Neighbourhood Plan has been developed following extensive consultation with LWBC and the City of Prince George. The Neighbourhood Plan attempts to recognize the objectives of the City of Prince George Official Community Plan (OCP), with "complete" neighbourhood development including schools, parks, and open spaces, recreation facilities, local commercial and transit facilities.

The proposed Wessner Heights development area is located within the Hart Sector Urban Settlement Area as designated by the OCP Growth Management Plan. In accordance with the general objectives of Section 6 - Residential (Urban) Development (and the Long Range Land Use Plan) the housing mix includes 26% Medium Density multi-family townhouse/apartment development and 74% low density single family residential.

Adequate access to schools, parks and transit are critical to the siting of multi-family and townhouse developments. Accordingly the proposed multi-family sites have been located close to Handlen and Austin Roads and in close proximity to the Heather Park Middle School, Elk Centre and the ball fields.

The proposed neighbourhood will be designed in accordance with the following principles:

- Develop a more compact community by increasing density;
- Provide sufficient variety of housing types;
- Encourage the creation of affordable and special needs housing within the neighbourhoods;
- Encourage innovative and creative housing design;
- Ensure the provision of neighbourhood amenities including neighbourhood parks and pedestrian facilities.

The OCP also indicates a preference for neighbourhood access to local neighbourhood commercial development for such purposes as convenience stores, small offices or clinics. The proposed Neighbourhood Plan includes a 2.83 Ha. parcel to be designated Local Commercial/Commercial Recreation at the intersection of Foothills Boulevard and Austin Road. Of this total 2.83 Ha. area, a total maximum of 3,000m^2 will be designated as Local Commercial. It is envisaged that the remaining 2.83 Ha. Commercial Recreation lands will be developed in conjunction with the neighboring golf course.

1.2 Parks and Open Spaces

The City of Prince George OCP states that "park and open space contribute significantly to the lifestyle in the city." These spaces include parks, buffer strips, school grounds and trails.

Neighbourhood Park

Park land includes areas developed and maintained for active and passive recreational use. The immediate area surrounding Wessner Heights already includes significant park land such as the Heather Park soccer fields, and basketball courts, the ball fields and the Elk Centre.

A 0.56 Ha. portion of the development area is proposed to be designated as Neighbourhood Park. The Neighbourhood Park will be located immediately adjacent to the new Nechako Little League complex to best meet the neighbourhood needs for parkland and to provide access to existing recreational facilities from the new subdivision area. This parcel will be allocated as park land dedication during the subdivision process in conjunction with portions of the adjacent BC Hydro R.O.W. which will form a part of the City trail network.

Greenbelt

Approximately 12.59 Ha. of land has been allocated as Greenbelt/Significant Slope due primarily to steep slopes which are environmentally sensitive and unsuitable for development.

Special Purpose Park

The Special Purpose Park use includes areas that may be developed for a singular use. In this case, a large 21.21 Ha. portion of the development has been allocated for potential golf course development. Other than a golf course or similar development, this area will likely remain undeveloped, due to other constraints such as the proximity to the Foothills Land Fill (discussed in detail in Section 4.0).

Trails

The City Wide Trail System Master Plan (1998) provides a framework for future trail development within the City of Prince George. This plan includes a proposed Ferguson Lake Rustic Trail to link the Chief and Ferguson Lake area to the Hart and Harper Valley areas. The Wessner Heights Neighbourhood Plan proposes to utilize the existing wide BC Hydro right-of-way to facilitate this trail.

1.3 Schools

The proposed Wessner Heights development directly abuts the recently constructed Heather Park Middle School and is close to the Kelly Road Senior Secondary School.

School District No. 57 was contacted early in the planning process with regards to future school site requirements and has indicated that no future school sites are required in the Wessner Heights development area.

1.4 Public Consultation

Following a detailed review by the City of Prince George planning staff, the Neighbourhood plan was presented to the public in a Public Open House held at the Hart Community Centre on May 27th, 2004.

2.0 TOPOGRAPHY AND SITE CONDITIONS

The existing site topography varies greatly across the site with many steep slopes, hills, and depressions. The topography has resulted in a neighbourhood plan with many view lots and extensive open spaces.

Drawing No. 002 entitled "Slope Analysis," illustrates the topography.

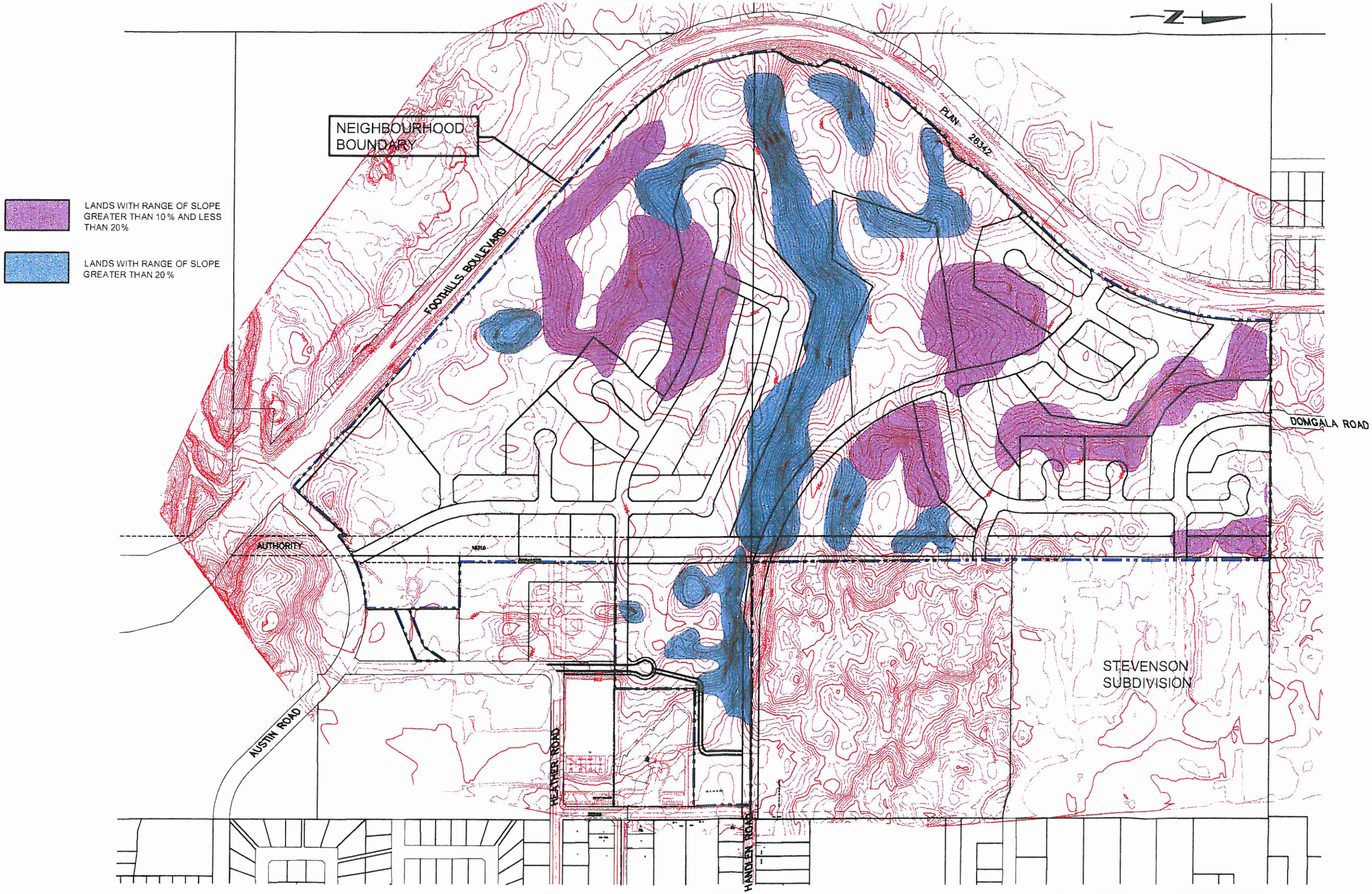
The steep topography has dictated much of the resultant road layout and servicing strategies, and will likely result in large scale earthworks requirements for some phases of the works.

The existing site area is primarily forested and undeveloped with the exception of the wide BC Hydro R.O.W. which traverses the site. Maintaining the existing forest/ground cover on the spaces indicated as greenbelt will protect the slopes from erosion/land slide.

As mentioned above, the proposed development will require earthworks. These earthworks will include the following:

1. Cut/fill of the Phase I-C residential area to approximately the 785m contour.

2. Cut/fill to construct Handlen Road.



L&M ENGINEERING LIMITED
#201 1840 Third Ave.
PRINCE GEORGE, B.C.
V2M 1G4
Tel. (250) 562-1977
Fax (250) 562-1967
lmeng@lmengineering.bc.ca

JOB No: 1010-10-01	LAND AND WATER BRITISH COLUMBIA INC.	DWG No
DATE: MARCH 2003	WESSNER HEIGHTS DEVELOPMENT SLOPE ANALYSIS	002
DRAWN BY: HA		
SCALE: 1:6000		

CUT/EXCAVATION

FILL/EMBANKMENT

NEIGHBOURHOOD BOUNDARY

FOOTHILLS BOULEVARD

PLAN 28342

FLOOR ELEVATIONS TO BE LIMITED TO APPROXIMATELY 766m DUE TO PRESSURE ZONE "D" WATER SERVICING LIMITATIONS

DONGALA ROAD

1.0–2.0m FILL DEPTHS TO ACHIEVE GRAVITY SANITARY SEWER AND STORM DRAINAGE TO MARTIN ROAD

AUTHORITY

AUSTIN ROAD

HANDLEN ROAD

HANDLEN ROAD EXCAVATION EMBANKMENT

STEVENSON SUBDIVISION

L&M ENGINEERING LIMITED
201 1840 Third Ave.
PRINCE GEORGE, B.C.
V2M 1G4
Tel. (250) 562-1977
Fax (250) 562-1967
lmeng@lmengineering.bc.ca

JOB No: 1010-10-01	LAND AND WATER BRITISH COLUMBIA INC.	DWG No
DATE: MARCH 2003	WESSNER HEIGHTS DEVELOPMENT EARTHWORKS AND MAJOR LOT FILLS	003
DRAWN BY: HA		
SCALE: 1:6000		

3. Lot fill on the lower bench of the Phase II land to approximately the 759 contour in order to achieve elevations which can be serviced by gravity sanitary sewer.

These earthworks are illustrated on Drawing No. 003, entitled "Earthworks and Major Lot Fills."

Fortunately, the site area is known to contain soils with significant amounts of sand and gravel as the City of Prince George Community Plan had previously identified the site as a potential source for sand/gravel extraction. While the site is no longer proposed for bulk sand or gravel removal, the existence of these materials will be much more conducive to successful cut/fill works than other areas of the City.

3.0 DESIGN POPULATION BY ZONING OR LAND USE DESIGNATION

The City of Prince George Design Guidelines and Official Community Plan contain criteria for development density and design population based on proposed land uses.

Based upon these proposed land uses and the Neighbourhood Plan, design populations and the number of proposed residential dwelling units were calculated. Table 1, overleaf, provides a summary of Phases, Land Use and Population Projections.

These population projections will be utilized for later sections for such criteria as traffic volume/trip generation, fire flows, and sanitary sewer flows.

LAND AND WATER BRITISH COLUMBIA INC.
WESSNER HEIGHTS NEIGHBOURHOOD PLAN

TABLE 1
Design Population by Land use Designation

Phase	Land Use	Area (Ha.)	People/Ha.	Units/Ha.	No. of Dwelling Units	People/Unit	Design Population
I-A	Medium Density Townhouses	4.94	120	40	198	3	594
I-B	Local Commercial	2.83	60				168
	Special Purpose Park (Golf Course)	21.2					
	Medium Density Multi-Family	1.05	120	40	42	3	126
I-C	Low Density Residential	13.2			163*	3	489
II	Low Density Residential	12.06			126*	3	378
	Medium Density Multi-Family	4.05	120	40	162	3	486

* Number of dwelling units determined by lot count.

4.0 FOOTHILLS BOULEVARD LANDFILL

The development of the Wessner Heights area is significantly impacted by the Foothills Boulevard Landfill site which is operated by the Fraser-Fort George Regional District. The Foothills Boulevard Landfill site is located on the south side of Foothills Boulevard, immediately adjacent to the Wessner Heights Development area. During the preparation of the Neighbourhood Plan, the Fraser-Fort George Regional District (FFGRD), was contacted for their input. The recommendations contained in a recent Landfill Gas Management Study, prepared by Sperling Hansen Associates Ltd. were reviewed by LWBC and by the City of Prince George. The study provided a number of setback recommendations which were incorporated into the final Neighbourhood Plan, and are illustrated on Drawing No. 001. The setback limitations from the Foothills Boulevard Landfill are as follows:

0 - 150 metres: No development whatsoever to be permitted within this setback.

150 - 300 metres: Limited development is permitted within this setback zone. The City of Prince George favours "open" land uses, but also considers other land uses, provided that the gas ventilation system is incorporated in the design of any buildings. The City of Prince George does not recommend any kind of residential development in this particular zone. A full facility golf course would be appropriate for this particular zone.

300 - 500 metres: Urban residential land uses will be permitted by the City of Prince George in this particular zone. The Fraser-Fort George Regional District recommends that this zone is an area where there should be an awareness of the proximity to the Foothills Boulevard Landfill site. The City of Prince George may require a Restrictive Covenant to be placed on the title of any new development.

5.0 PROJECT PHASING

The proposed development area is divided into two distinctly separate areas, separated by a steep, undevelopable escarpment which bisects the site. The lands are also divided on an east-west axis by the future extension of Handlen Road. The most southerly section (Phase I) is located much closer to existing City of Prince George infrastructure and will involve much lower development costs than the areas to the north of the future Handlen Road alignment (Phase II).

The Phase I lands may also be sub-phased (A, B, C and D) based on servicing requirements as outlined in the following sections. The proposed phases are shown on Drawing No. 004 entitled Development Phasing and Roadworks.

The Phase II lands do not abut City storm, sewer or water service areas and will require offsite service extensions of existing City of Prince George infrastructure. The ultimate development of the Phase II areas will also require the future extension of Handlen Road. Due to the numerous offsite requirements for servicing Phase II, it is envisaged that Phase II will not be economically feasible until Phase I is fully complete.

The proposed phasing, servicing requirements and costs are illustrated in detail in Section 10 - Recommendations.

6.0 ROADS

The Wessner Heights development area can be accessed by Foothills Boulevard, Austin Road West, and Handlen Road. Other minor road connections include Heather Road, Domgala Road and possible future connections to Martin and Sabyam Road through the undeveloped

Stevenson Subdivision area. The proposed road works are illustrated on Drawing No. 004 entitled "Development Phasing and Road Works."

The Phase I lands are directly serviceable by Austin Road West, Handlen Road and Heather Road which would provide access to the Hart Middle School, Kelly Road Senior Secondary, Hart Area shopping, Foothills Boulevard and Highway 97.

The Phase II lands are directly accessible by Foothills Boulevard but will required a long extension of Handlen Road, beyond the Phase I lands. It is envisaged that the Phase II lands will be developed in conjunction with the future extension of Handlen Road. Minor road connections to the future extension of Handlen will be determined in conjunction with detailed subdivision planning.

6.1 Trip Generation/Distribution

The proposed development may have an impact on the neighbouring collector and arterial roads. In order to provide preliminary indications of the expected impacts on the surrounding road network, trip characteristics for the proposed development have been developed including trip generation, trip distribution and trip assignment and development traffic.

The proposed neighbourhood plan and land uses shown in Drawing No. 001 and Table 1 have been utilized in conjunction with the Ministry of Transportation Parking and Trip Generation Rates Manual for the calculation of trip generation and inbound/outbound trip distribution for a.m. and p.m. peak periods.

The trip generation rates for all residential areas have been used from Table 7-1 from the manual.

The trip generation rate for the proposed local commercial parcel has been used from Table 7-2 from the manual, based upon a Gross Leasable area of 3,000 m^2.

Table 2A and 2B illustrate the trip generation rates. Table 3A and 3B illustrate the total trip generation for the proposed development.

6.2 Trip Assignment/Development Traffic

Trip assignment involves estimating the amount of traffic that will use certain routes on the proposed road network, and is somewhat subjective.

Making assumptions regarding minimal travel times from the Hart Shopping Centre via Austin Road and the downtown core via Foothills Boulevard, and variances in travel destinations to downtown via Foothills during the a.m. peak and to the Hart Shopping vs. Foothills Boulevard during the p.m. peak, we have assigned the inbound and outbound trips to the development access intersections. The resulting development traffic is shown on Drawing No. 005 for the a.m. peak and Drawing No. 006 for the p.m. peak.

It is clearly demonstrated that the p.m. peak is the critical traffic generation period. This will likely coincide with the critical period for the existing background traffic.

Analysis of the p.m. peak development traffic illustrates that the proposed Phase I-B and I-C access at Austin Road will likely have the most impact on the area road network; largely due to the relatively large commercial parcel. Prior to the rezoning/subdivision, a more detailed traffic analysis (including traffic counts for background traffic) is recommended to evaluate the Austin Road access.

LAND AND WATER BRITISH COLUMBIA INC.
WESSNER HEIGHTS NEIGHBOURHOOD PLAN

TABLE 2A
Trip Generation Rates
(A.M. Peak)

Phase	Land Use	Development Size	Traffic Generation Variable	Trip Generation Rate (50th Percentile)	% Inbound	% Outbound
I-A	Medium Density Townhouses	198 Units	Dwelling Unit	0.49	17	83
I-B	Local Commercial	3,000m^2	100m^2	2.9	63	37
	Special Purpose Park (Golf Course)	21.2	# Holes			
	Medium Density Multi-Family	42 Units	Dwelling Unit	0.49	17	83
I-C	Low Density Residential	163 Units	Dwelling Unit	1.0	26	74
II	Low Density Residential	126 Units	Dwelling Unit	1.0	26	74
	Medium Density Multi-Family	162 Units	Dwelling Unit	0.49	17	83

TABLE 2B
Trip Generation Rates
(P.M. Peak)

Phase	Land Use	Development Size	Traffic Generation Variable	Trip Generation Rate (50th Percentile)	% Inbound	% Outbound
I-A	Medium Density Townhouses	198 Units	Dwelling Unit	0.68	66	34
I-B	Local Commercial	3,000m^2	100m^2	10.4	50	50
	Special Purpose Park (Golf Course)	21.2	# Holes			
	Medium Density Multi-Family	42 Units	Dwelling Unit	0.68	66	34
I-C	Low Density Residential	163 Units	Dwelling Unit	1.2	64	36
II	Low Density Residential	126 Units	Dwelling Unit	1.2	64	36
	Medium Density Multi-Family	162 Units	Dwelling Unit	0.68	66	34

TABLE 3A
Total Trip Generation
(A.M. Peak)

Phase	Land Use	Inbound Traffic (VPH)	Outbound Traffic (VPH)	Total Traffic (VPH)
I-A	Medium Density Townhouses	16	81	97
I-B	Local Commercial	55	32	87
	Medium Density Multi-Family	4	17	21
I-C	Low Density residential	42	121	163
Total Phase I		117	261	378
II	Low Density residential	33	93	126
	Medium Density Multi-Family	13	66	79
Total Phase II		46	159	205

Notes: The Total Traffic (vph) is derived from Table 2A.

TABLE 3B
Total Trip Generation
(P.M. Peak)

Phase	Land Use	Inbound Traffic (VPH)	Outbound Traffic (VPH)	Total Traffic (VPH)
I-A	Medium Density Townhouses	89	46	135
I-B	Local Commercial	156	156	312
	Medium Density Multi-Family	19	10	29
I-C	Low Density residential	125	71	196
Total Phase I		389	283	672
II	Low Density residential	97	54	151
	Medium Density Multi-Family	73	37	110
Total Phase II		170	91	261

Notes: The Total Traffic (vph) is derived from Table 2B.

N

NEIGHBOURHOOD BOUNDARY

PLAN 28342

FOOTHILLS BOULEVARD

FOOTHILLS
102 (60%)
8 (5%)
HANDLEN
50 (55%)
5 (5%)

192 (68%)
62 (22%)
ROAD
257 (66%)
AUSTIN
66 (17%)

PHASE 2
IN = 170
OUT = 91

DOMGALA ROAD

AUTHORITY

PHASE 1
IN = 389
OUT = 283

AUSTIN ROAD

HEATHER
14 (5%)
HEATHER
39 (10%)

HEATHER ROAD

PRIVATE ACCESS
14 (5%)
27 (7%)
HANDLEN

HEATHER PARK
50
87
HANDLEN

36 (40%)
60 (35%)
HANDLEN

STEVENSON SUBDIVISION

G:\St3-HA\1010-10\servicing\hc10PMPEAK.dwg, 03/10/03 01:29:10 PM

L&M ENGINEERING LIMITED #201 1840 Third Ave. PRINCE GEORGE, B.C. V2M 1G4 Tel. (250) 562-1977 Fax (250) 562-1967 lmeng@lmengineering.bc.ca	JOB No: 1010-10-01 DATE: MARCH 2003 DRAWN BY: HA SCALE: 1:6000	LAND AND WATER BRITISH COLUMBIA INC. WESSNER HEIGHTS DEVELOPMENT DEVELOPMENT TRAFFIC PM PEAK	DWG No 006

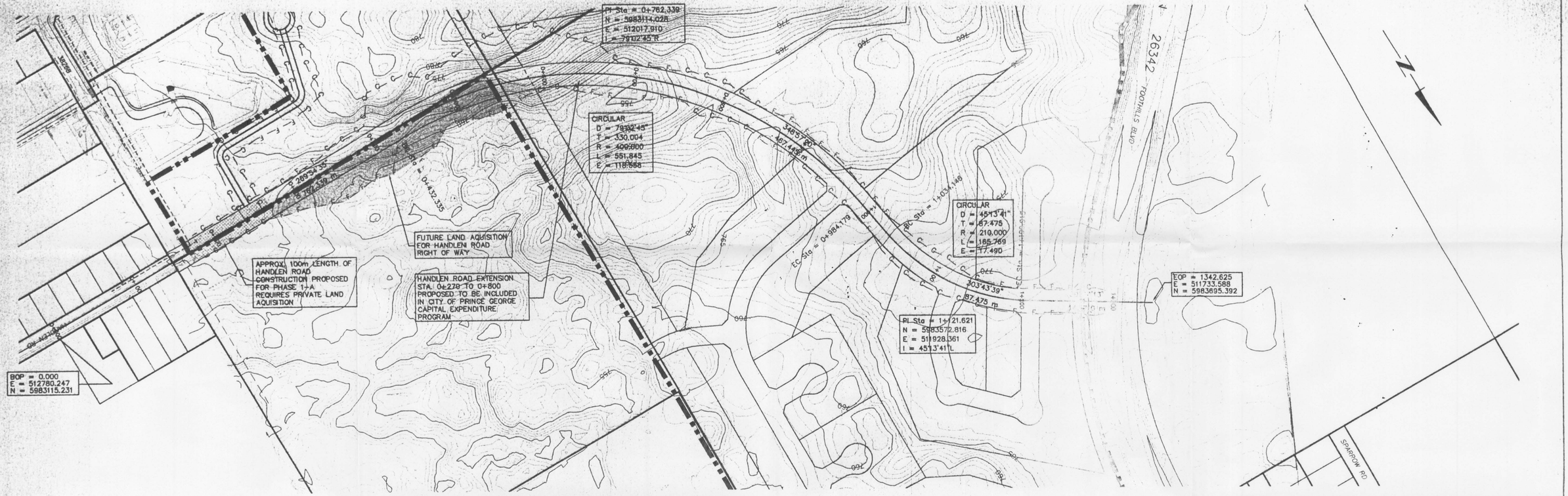
6.3 Handlen Road

Handlen Road currently terminates at the development area Eastern Boundary, with a recently constructed connection to Heather Park Road.

Reconstructed in 2000, Handlen Road has been upgraded to a local collector standard, including full storm sewer, curb and gutter and concrete sidewalk. Ultimately it is envisaged that Handlen Road will be extended to connect to Foothills Boulevard by traversing the steep escarpment which bisects the Wessner Heights development.

The proposed extension of Handlen Road has previously been illustrated on the Greater Prince George Area Major Street Network Plan prepared by the Ministry of Highways, and will provide a direct connection between Highway 97 and Foothills Boulevard. Additionally, this route may be utilized by public transit and the school district transit access Kelly Road Senior Secondary and Hart Junior Middle School.

The Neighbourhood Plan includes a proposed horizontal alignment for the future extension of Handlen Road to Foothills Boulevard. As previously indicated, the future extension of Handlen Road will be required to traverse a steep escarpment. Accordingly, L&M Engineering Limited has examined a number of potential routes, in order to confirm that the construction of Handlen Road is technically feasible. Drawing No. 007 entitled "Future Handlen Road Extension" (proposed alignment) illustrates the horizontal and vertical alignment of the proposed road extension, as well as the proposed cut/fill lines. The proposed road extension is approximately 1,160 metres in length, measured from Foothills Boulevard to Heather Park Road. It should be noted that the proposed alignment (horizontal and vertical) is preliminary, and the final alignment will be determined in conjunction with the development of the Phase II area. The extension of Handlen Road includes a right-of-way



Rev.No.	Date	Drawn	Description
1	MAR.2003	KCV	SERVICING REPORT REVISIONS

LAND AND WATER BRITISH COLUMBIA INC.

WESSNER HEIGHTS DEVELOPMENT

FUTURE HANDLEN ROAD EXTENSION
(PROPOSED ALIGNMENT)

L&M ENGINEERING LIMITED
#201, 1640 Third Ave.
PRINCE GEORGE, B.C.
V2L 3G4
Tel. (250) 563-1977
Fax (250) 563-1987

DATE	SCALE	DRAWN	DESIGNED	CHECKED	PROJECT No.	DWG. No.
10 MAR. 03	HOR: 1:2000 VER: 1:200	HA	SRB	DJM	1010-10-01	007

allowance which straddles the LWBC land and private land to the north. Construction of these works will require land acquisition for road allowance to the toe of the proposed fill.

As a result of the preliminary design efforts for Handlen Road, it has been determined that a City of Prince George road connection between Handlen Road and Phase I will likely not be feasible due to steep vertical grades. The proposed Phase 1-A townhouse site will, however, provide a private road link between the Handlen Road extension and Heather Road. This private road connection would have a much lower design speed than City road requirements and would facilitate several additional purposes.

1. Secondary site access.

2. Efficient emergency vehicle/snow clearing access.

3. A possible location of a City of Prince George right-of-way for trunk storm, sanitary sewer, and watermain right-of-way required to service the Phase I-C lands.

The extension of Handlen Road to Foothills Boulevard (beyond the Phase I access requirements) includes approximately 430 lm of road construction which does not service or access the proposed Phase II development lots.

As the development of Phase II will not be economically feasible with the burden of excessive offsite road construction costs, it is recommended that the City of Prince George consider adding the Handlen Road extension to the Capital Expenditure Program.

The construction of Handlen Road may not occur for several years and would be driven by factors such as traffic volumes on Austin Road West, and Chief Lake Road and further development in the Hart Sector.

The City of Prince George has indicated that they will require a future geotechnical analysis to confirm the constructability of Handlen Road. It is proposed that this be postponed until development of Phase II is more imminent.

6.4 Austin Road West

The proposed connection to Austin Road West would provide a key access for the Phase I (B and C) development area, providing access to Foothills Boulevard and Highway 97 via Austin Road West.

Austin Road West will need to be reconstructed with the extension of storm and sanitary sewer mains including upgrading at least the north side abutting the development to include curb and gutter.

The critical factor in determining the location of the proposed Austin Road West connection to the Wessner Heights Development area is the provision of adequate turning site distance and adequate separation from the intersection of Foothills Boulevard. The Transportation Association of Canada (Geometric Design Guide for Canadian Roads, 1999) specifies a minimum turning sight distance of 120 metres for a 50 km/hr design speed. On site measurements have confirmed an available intersection sight distance of at least 120m.

Currently Austin Road West, where it abuts the proposed development, is approximately 15m wide with no curb and gutter, as shown by existing City digital data. The existing developed section of Austin Road West, between Kelly Road and Delisle Place, has been constructed to a 16m wide collector standard with barrier curb and gutter. It is proposed

that the north side of Austin Road West, where it abuts the proposed Wessner Heights development, be reconstructed to an 8m width from centerline complete with curb and gutter.

Installation of curb and gutter on the south side of Austin Road West and on the portion of Austin Road West that abuts the Hart Community Centre property may be requested by the City of Prince George. These works would be subject to negotiations with the City of Prince George at the subdivision stage. It may be suggested that Austin Road West be reconstructed to full collector standard (including the south side) in lieu of a LWBC contribution to 50% of the construction of Handlen Road (where it abuts Phase I-A) from Sta. 0+270 to 0+540).

6.5 Foothills Boulevard/Austin Road West Intersection

The proposed development access to Austin Road West is located in close proximity to the existing intersection of Austin Road West and Foothills Boulevard (approximately 120 metres). This distance would allow for the addition of a future left-turn lane at Austin Road West. However, as through traffic from Austin Road West is limited to vehicles from the existing Fraser-Fort George Regional District Landfill, it is unlikely that traffic volume warrants would ever indicate a requirement for the provision of a left-turn lane. Similarly, we do not anticipate that future traffic volumes will warrant the signalization of this intersection.

6.6 Heather Road

It is proposed that a new connection to Heather Road be constructed to access Phase I-A between the existing Heather Park ball fields and the Heather Park Middle School site.

This offsite road connection would require acquisition of approximately 0.16 Ha. or road allowance from the City of Prince George Parcel Lot.

It is proposed that this road extension will provide secondary access to the Phase I-C residential site. As this connection will provide secondary access and will realize low traffic volumes, it is proposed that this connection be constructed to a 10m wide, curb and gutter, local residential standard. This standard would also be modified on the east side to a 2m wide boulevard with 2:1 fill slopes in order to avoid encroaching on the existing City of Prince George playing fields.

Figure 008 illustrates the proposed Heather Road extension works.

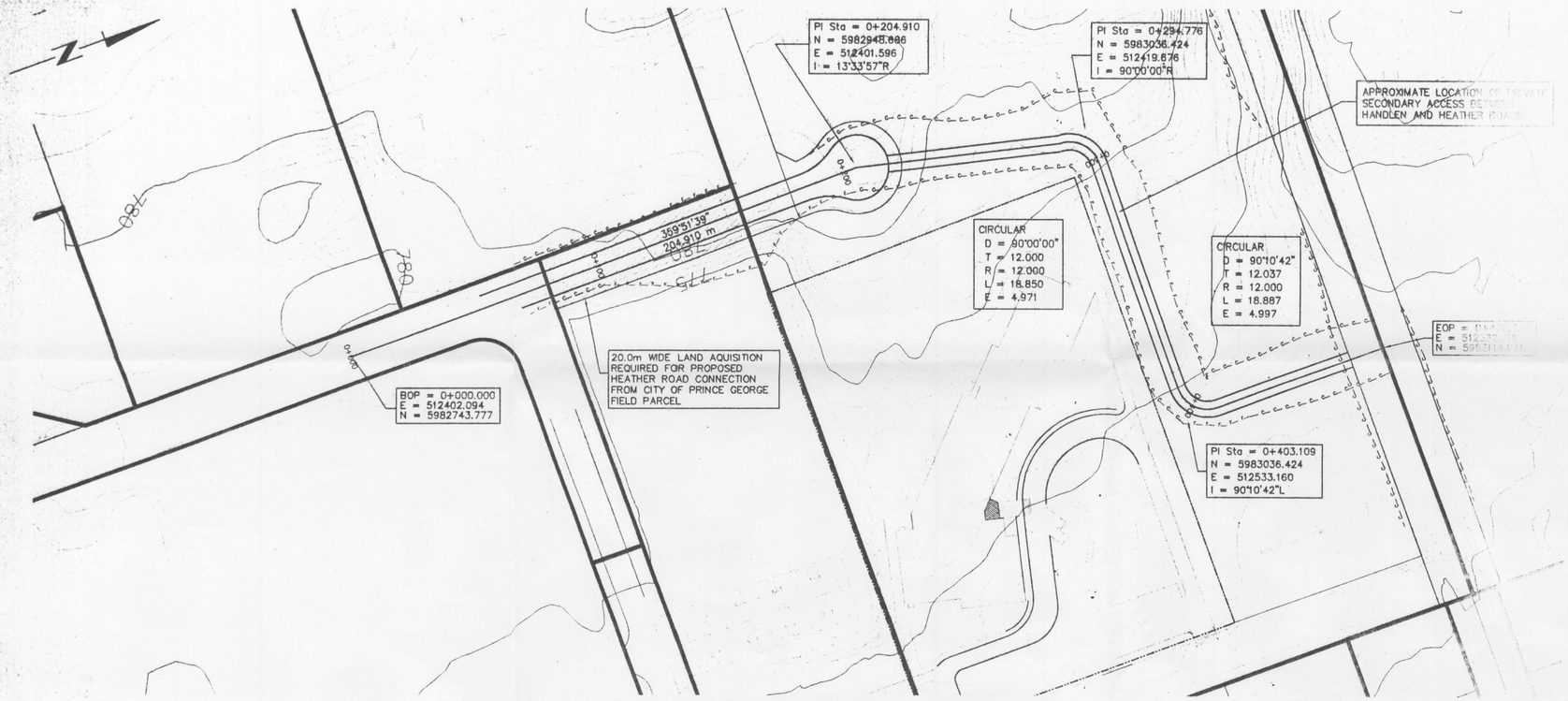
7.0 SANITARY SEWER

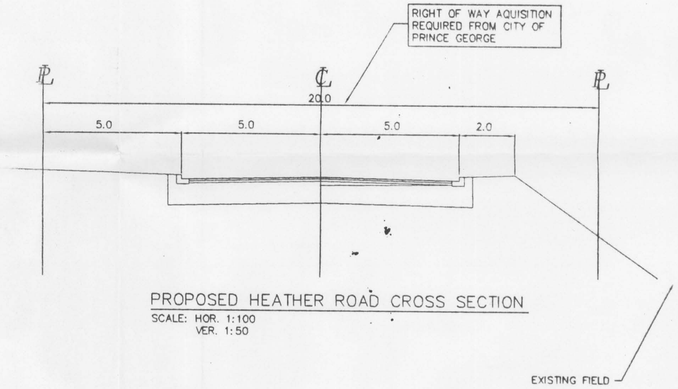
7.1 Phase I - Sanitary Sewer Service

Phase I-A and I-C of the Wessner Heights Development area are directly serviceable by an existing 375 mm diameter sanitary sewermain located along Handlen Road. The Handlen Road sanitary sewer includes a 375mm diameter stub which was extended towards the Phase I-A lands in 1999/2000. The trunk sanitary sewermain along Handlen Road has excess capacity, and is proposed to service all of the Phase 1-A and I-C single family and multi-family development.

The extension of the City of Prince George sanitary sewermain from Handlen Road to service Phase I-A and I-C will require a right-of-way across the private (Phase I-A) multi-family townhouse site.

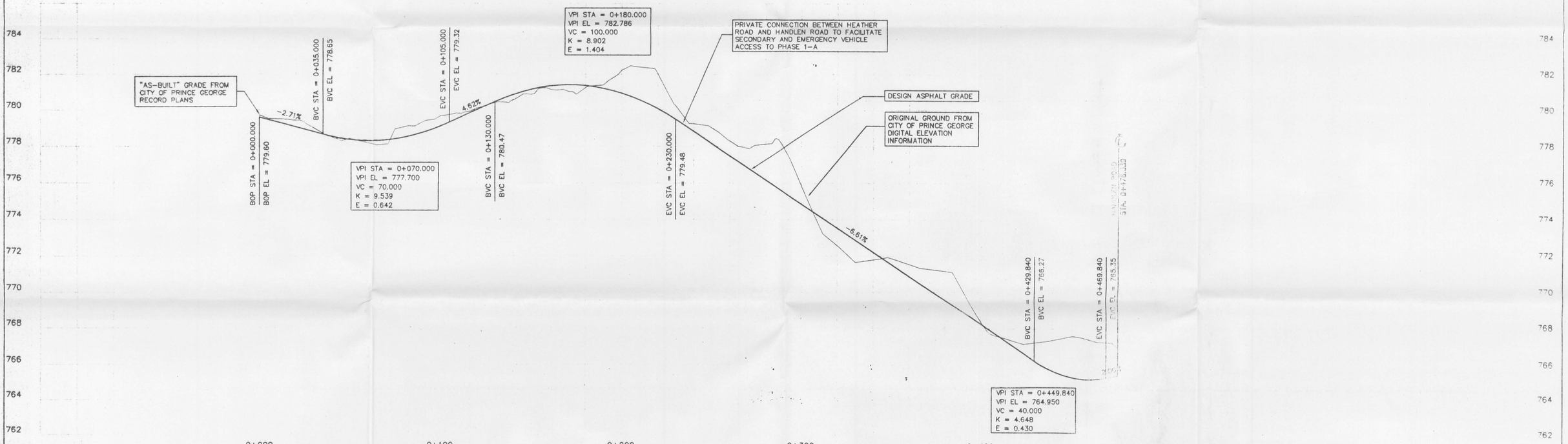
As the City of Prince George watermain and storm main extensions are also proposed to cross this site, it is proposed that all three utility extensions be located within a 12m wide utility right-of-way; most likely utilizing the alignment of the private access connection from the Heather Road extension to Handlen Road.





PROPOSED HEATHER ROAD CROSS SECTION

SCALE: HOR. 1:100
VER. 1:50



Rev.No.	Date	Drawn	Description
1	MAR 2003	KCV	SERVICING REPORT REVISIONS

LAND AND WATER BRITISH COLUMBIA INC.

WESSNER HEIGHTS DEVELOPMENT

HEATHER ROAD EXTENSION
(PROPOSED ALIGNMENT)

L&M ENGINEERING LIMITED
#201, 1540 Third Ave.
PRINCE GEORGE, B.C.
V2M 1G6
Tel. (250) 563-1977
Fax (250) 562-1987
lmeng@lmengineering.bc.ca

DATE	SCALE	DRAWN	DESIGNED	CHECKED	PROJECT No.	DWG. No.
JAN 2002	HOR 1:1000 VER 1:100	SRB	SRB		1010-10-01	008

Due to the lower elevation of the proposed local commercial and multi-family sites at the end of Austin Road (Phase 1-B), the existing 200mm diameter sanitary sewermain along Austin Road West is proposed to be extended for gravity sanitary sewer service to these parcels. The conceptual sanitary sewer servicing for the Wessner Heights area is illustrated in Drawing No. 009, entitled "Conceptual Sanitary Sewer Servicing Plan."

Detailed calculations of the Handlen Road sanitary sewer capacity are presented in Section 7.3.

7.2 *Phase II - Sanitary Sewer Service*

The Phase II lands can be serviced by an offsite connection to existing sanitary sewermains at Martin Road and Sabyam Road. Review of existing "as-builts" indicates the sanitary sewer invert at the end of Martin Road is approximately 752.9 metres. This invert, with attention to minimum gradient and road grades, will be adequate to service the Phase II low point elevation of approximately 758 metres. Alternate connection points also exist along Sabyam Road with similar sewer invert elevations. It is likely that the development of the Stevenson Subdivision will precede the development of the Phase II lands.

Either option for servicing the Phase II lands will require at least 500 metres of offsite sewermain construction, through the privately owned, undeveloped Stevenson Subdivision area.

Detailed calculations of the Martin Road sanitary sewermain capacity are presented in Section 7.4.

The proposed Phase II medium density multiple-family site will require a private lift station to lift sewage to the Handlen Road extension at approximately the 767m elevation.

7.3 Handlen Road Sanitary Sewer Capacity

The capacity of the existing Handlen Road sanitary sewermain is limited by the stub constructed in 2000 at a 0.48% grade. Utilizing Manning's formula for gravity pipe flow:

$Q_{capacity} = 0.11\ m^3/s$

The required sanitary sewermain capacity is calculated utilizing projected populations and flows as follows:

Peak flow (Q_p) = $Q_c * f * Q_i$
Q_c = average daily sanitary sewer flow
f = sewer flow peak factor
Q_i = allowance for infiltration

Assumed: Per capita sewage flow 455 l/day/person
Peaking factor 5.0
Infiltration 10,000 l/day/Ha
Population 175 people/Ha - low density residential
270 people/Ha - multi-family residential

Therefore:

Q_c = [12Ha (175 people/Ha) + 6Ha (270 people/Ha)] * 455 l/day/person
= 1,692,600 l/day
Q_p = 1,692,600 (5) + 10,000 l/day/Ha (18Ha)
= 8,643,000 l/day
= 0.10 m^3/s

As shown above the critical Handlen Road section of sewermain has sufficient capacity to service full development of the upstream Phase I

N

NEIGHBOURHOOD BOUNDARY

PLAN 28342

PRIVATE FORCEMAIN / LIFT STATION TO SERVICE MULTI FAMILY SITE TO MH AT APRROX. 765m INVERT

FOOTHILLS BOULEVARD

HANDLEN SEWER EXTENSION CATCHMENT AREA

AUSTIN ROAD SEWER EXTENSION CATCHMENT AREA

OFFSITE CITY OF P.G. SEWERMAIN EXTENSION THROUGH PHASE 1-A TO SERVICE PHASE 1-C

MARTIN ROAD SEWER EXTENSION CATCHMENT AREA INCLUDING STEVENSON SUBDIVISION

DOMGALA ROAD

AUTHORITY

ATTENTION TO DETAIL REQUIRED TO SERVICE LOWER PHASE 2 WITH MARTIN ROAD SANITARY SEWER (APPROX. 1.0-2.0m DEPTH LOT FILL REQUIRED)

OFFSITE SANITARY SEWERMAIN EXTENSION AT MINIMUM PIPE GRADES

PROPOSED SANITARY SEWERMAIN EXTENSION TO SERVICE PHASE 1B

STEVENSON SUBDIVISION

EXISTING 375mm DIA. SANITARY SEWER MAIN AT 0.48% TO SERVICE PHASE 1A, 1C

EXISTING 375mm DIA SANITARY SEWER STUB AT 752.9m ELEVATION TO SERVICE PHASE 2 LANDS

AUSTIN ROAD

HEATHER ROAD

HANDLEN ROAD

MARTIN RD

G:\St3-HA\1010-10\servicing\bc10009.dwg, 03/10/03 01:30:13 PM

L&M ENGINEERING LIMITED
#201 1840 Third Ave.
PRINCE GEORGE, B.C.
V2M 1G4
Tel. (250) 562-1977
Fax (250) 562-1967
lmeng@lmengineering.bc.ca

JOB No: 1010-10-01	LAND AND WATER BRITISH COLUMBIA INC.	DWG No
DATE: MARCH 2003	WESSNER HEIGHTS DEVELOPMENT CONCEPTUAL SANITARY SEWER SERVICING PLAN	009
DRAWN BY: HA		
SCALE: 1:6000		

lands. It should be noted that the design criteria above is deemed very conservative since the topographical/layout constraints of this development will not permit the population density assumed by City of Prince George Design Guidelines.

7.4 Martin Road Sanitary Sewer Capacity

The existing sanitary sewer stub at the end of Martin Road consists of 375mm diameter SDR 35 PVC pipe at 0.4% grade.

Utilizing Mannings formula for gravity pipe flow, the capacity of this pipe is calculated to be

$Q_{capacity} = 0.11\ m^3/s$

The required sanitary sewermain capacity is calculated utilizing projected populations from Table 1 and assuming the entire proposed Stevenson Subdivision area of 15 Ha. is developed as single family residential units as follows:

Phase II Residential	=	378 people
Phase II Medium Density Multi-Family	=	486 people
Stevenson Subdivision 15 Ha. (175 people/Ha.)	=	2,625 people
TOTAL MARTIN ROAD SANITARY SEWER DESIGN POPULATION	=	3,489 people

Peak flow (Q_p) $= Q_c * f * Q_i$

$= 3,489\ p\ (455\ l/day/p) * 5 + 10,000\ l\ (12.06 + 4.05 + 15)$

$= 8,248,575\ l/day$

$= 0.095\ m^3/s$

As shown above, the Martin Road sanitary sewermain has sufficient capacity to service all Phase II lands and the Stevenson Subdivision land. As previously mentioned, the offsite sanitary sewermain extension (across Stevenson Subdivision lands) would be required to be installed at minimum grades in order to minimize lot fills required on the lower Phase II bench.

Note: Previous preliminary design from the Stevenson Subdivision has utilized the Sabyam road sewermain, thus the above calculations are likely conservative.

8.0 STORM DRAINAGE

The Wessner Heights catchment area is distinctly separable by the Phase I area which can be serviced by existing City of Prince George storm mains, and the Phase II area, much of which lies at too low an elevation to drain towards existing City of Prince George infrastructure.

8.1 Phase I

The Phase I development area is located on a bench land which is situated at a higher elevation than all surrounding areas.

Most of the Phase I lands can be drained to the existing City of Prince George storm mains located along Handlen Road (installed in 2000 to accommodate the Heather Park Middle School). The portions of land immediately adjacent to Austin Road West (Phase I-B), however, are at too low an elevation to connect to the City of Prince George storm system on Handlen Road.

The proposed Phase I-B multi-family parcel adjacent to Austin Road West may be drained via an extension of the existing Austin Road storm

sewer. As this storm main has limited capacity, other options need to be identified for disposal of storm water from the proposed local commercial parcel at the end of Austin Road West.

8.2 Handlen Road Storm Drainage

Drawing No. 010 entitled "Conceptual Storm Servicing Plan," illustrates that the higher bench land portion of the Phase I development area consists of approximately 12 hectares of proposed residential single family development and six hectares of medium density multi-family development which can be drained towards Handlen Road.

A detailed storm drainage study was performed in 1999 by L&M Engineering Limited for School District No.57 and the development of the Heather Park Middle School. The previous study data has been revised slightly to reflect the "as-built" Handlen Road storm drainage, see Appendix A - Storm Flow Design Sheet. This data confirms that the Handlen Road storm sewer has adequate capacity to drain the Phase I lands.

The existing storm main along Handlen Road includes a 675mm diameter PVC storm connection which was installed in 2000 specifically to allow for connection from the Wessner Heights area. While the Handlen Road storm mains have been designed to accommodate the Wessner Heights lands, the current discharge of storm water beyond Handlen Road has limited capacity.

Storm water beyond the intersection of Handlen Road and South Kelly Road currently discharges to Kelly Road/Nordic Drive with an orifice controlled overflow storm main along Handlen Road (towards Highway 97). It is proposed that the Highway 97 discharge will be abandoned by the City of Prince George upon completion of a trunk storm main installation along Nordic Drive. The Nordic Drive trunk storm main works

PHASE 2 SUB CATCHMENT PROPOSED TO DRAIN TOWARDS NORDIC DRIVE (WITH LOT FILL TO APPROX. 759m ELEVATION)

EXISTING GREENBELT/NATURAL LOW DRAINAGE WILL REQUIRE FURTHER DETAILED ANALYSIS FOR USE AS A POTENTIAL STORM WATER DISPOSAL AREA

PROPOSED TRUNK STORM MAIN IN CITY OF PRINCE GEORGE CAPITAL EXPENDITURE PROGRAM

EXISTING 1200mmø STORM

TO THE PROPOSED OUTFALL AT THE END OF NORDIC DRIVE

PHASE 2 SUB CATCHMENT WILL NOT DRAIN TOWARDS MORDIC DRIVE AND WILL REQUIRE ALTERNATIVE STORM WATER DISPOSAL

EXISTING ORIFICE CONTROLLED STORM MANHOLE

HANDLEN/KELLY ROAD SUB CATCHMENT AREA BOUNDARY

30m STORM MAIN EXTENSION TO ACCOMODATE HEATHER ROAD/INTERSECTION DRAINAGE

HANDLEN/KELLY ROAD CATCHMENT AREA BOUNDARY SEE APPENDIX A FOR STORM FLOW CALCULATIONS

EXISTING AUSTIN ROAD STORM DRAINAGE CANNOT ACCOMODATE THE PROPOSED COMMERCIAL DEVELOPMENT AND WILL REQUIRE UPGRADING OR AN ALTERNATIVE METHOD OF STORM WATER DISPOSAL.

PROPOSED AUSTIN ROAD DEVELOPMENT TO BE SERVICED BY AUSTIN ROAD STORM SEWER EXTENSION

Rev.No.	Date	Drown	Description
1	MAR.2003	KCV	SERVICING REPORT REVISIONS

LAND AND WATER BRITISH COLUMBIA INC.

WESSNER HEIGHTS DEVELOPMENT

CONCEPTUAL STORM SERVICING PLAN

L&M ENGINEERING LIMITED

DATE	SCALE	DRAWN	DESIGNED	CHECKED	PROJECT No.	DWG. No.
JULY 2001	1:3000	SRB	SRB		1010-10-01	010

have been included in the City of Prince George Capital Expenditure Program with the intent of constructing the works in the future.

8.3 *Austin Road Storm Drainage*

The Austin Road storm drainage currently terminates at the intersection of Heather Road and consists of a 300mm diameter storm at 5.95% grade. The critical section of pipe is a 400mm asphalt coated csp pipe upstream of Delisle Place at 0.53% grade.

Utilizing Mannings formula for open channel flow, the capacity for this pipe is 0.15m^3/s.

Pre-development Flows

Currently, storm drainage entering the 300mm diameter Austin Road storm main is limited to the Hart Community Centre (approximately 8,000m^2 catchment area).

Utilizing the Rational Method

$$Q = ciA\ (.00278)$$

Where

$c = 0.70$

$i = 43mm/hr$

$A = 0.8\ Ha.$

$$Q = .066m^3/s$$

Thus, the existing pre-development flows are approximately 1/2 of the current pipe capacity.

If the entire Phase I-B area were included in the Austin Road catchment area at current development levels, the pre-development flows are approximately as follows:

$$Q = ciA\ (.00278)$$

Where

$c = 0.24$

$i = 43mm/hr$

$A = 4.65Ha.$

$$Q = .133m^3/s$$

Thus, the existing main has capacity for pre-development flows including the existing Phase I-B commercial and multi-family parcels.

Post-development Flows

The Phase I-B lands consist of approximately 2.8 Ha. of commercial development and 1.05 Ha. of multiple-family development.

Development of the entire Phase I-B area would result in an additional flow of $0.238m^3/s$ and an approximate total Austin Road post-development flow of $0.30m^3/s$, well in excess of the current pipe capacity.

Development of only the multiple family portion of Phase I-B (1.05 Ha., $C=0.6$) would result in an increased flow of $0.075m^3/s$ and a total post-development flow of $0.14m^3/s$.

Thus, the existing Austin Road storm main has capacity for development of the multi-family portion of Phase I-B.

Development of the commercial portion of Phase I-B would require replacement of the existing 300mm dia. and 400mm dia. Storm pipe along Austin Road and would likely cause further downstream capacity problems with other sections of existing storm pipe.

Alternatively, the commercial site could be limited to alternative means of storm water disposal such as ground water recharge/infiltration. The native soils appear to be conducive to such an approach and extensive open spaces/greenbelt are proposed north and south of the commercial site to facilitate emergency and 1:100 year storm overflows.

As groundwater recharge/infiltration is an infrequently used method in Prince George, no consistent standards or criteria exist for storm drainage by these means. As such, further discussion of this concept is suggested.

8.4 Phase I-D Drainage - Special Purpose Park

The proposed special purpose park area is intended to be developed into a golf course or similar use. This area sits at too low an elevation to be serviced by any City of Prince George storm sewer infrastructure, and (similar to Phase I-B commercial) will require alternative means of storm water disposal such as groundwater recharge/infiltration, storage ponds, etc. As a golf course use requires extensive amounts of water for irrigation, it may be possible to store the water on site for such a use.

Storm water overflow from the special purpose park/golf course area would likely affect Phase II lands and may need to be deferred until the extensive Phase II drainage concerns are addressed.

8.5 Phase II - Storm Drainage

The Phase II development area is located at too low an elevation to be drained by existing City of Prince George Storm Drainage systems. The Phase II catchment area presently drains towards a large greenbelt area which is significantly lower than all other surrounding lands (see Drawing No. 010).

The proposed Phase II low density residential lands consist of approximately 30 Ha. of land with a low elevation of 757m. If lot fill was placed to establish a minimum floor elevation of approximately 759m, these lands could be drained via storm mains connected to the future Nordic Drive trunk storm main at Highway 97.

As this same lot elevation is required for sanitary sewer service to the Phase II lands, it is proposed that the City of Prince George include these lands in the design of the Nordic Drive storm trunk main (which, as previously mentioned, has been included in the City of Prince George Capital Expenditure Program).

A portion of the Phase II drainage (Handlen Road and the multi-family site) will not drain by gravity to the Martin Road/Nordic Drive and will need to be disposed of by alternative means. It is proposed that the existing offsite low lying greenbelt area be utilized for some form of storm water disposal such as groundwater recharge/infiltration, surface detention, wetland, etc.

As these low lands are privately held and the development of the Phase II lands will be well into the future, detailed analysis of Phase II storm

water disposal is seen as too onerous for this servicing report, and will need to be re-visited in the future. The development of the Phase II lands cannot proceed until the storm sewer servicing issues are resolved to the satisfaction of the City of Prince George.

8.6 Phase II - Storm Flows

Pre-development Flows

The Phase II lands consist of approximately 47 Ha. of undeveloped, well vegetated land with highly permeable soil.

Currently, storm drainage is disposed of via ground percolation, low point/depression storage, or flows by slow overland flow to the low lying offsite greenbelt area.

The approximate catchment area which drains offsite via overland flow is shown on Drawing No. 010 entitled "Conceptual Storm Servicing."

Utilizing the Rational Method for an approximation of the pre-development flows which may enter the offsite greenbelt gives:

$$Q = ciA\ (.00278)$$

Where

$c = 0.15$

$i = 35mm/hr$

$A = 25$ Ha. (Tc = 20 min. 5 year return period)

$Q = .03766 m^3/s$

Post-development Flows

All of the Phase II low density residential land will drain either offsite by storm trunk main or to the low lying greenbelt areas. Accordingly, the post-development flows will be required for design of storm trunk mains or storm ponds.

This area is approximately 19.5 Ha.

Assuming a 20 minute time of concentration to Nordic Drive (similar to the Handlen and Heather Road times of concentration) gives:

$$Q = ciA\ (.00278)$$

Where

$c = 0.4$

$i = 35mm/hr$

$A = 19.5$ Ha.

$$Q = .75m^3/s$$

It is proposed that this flow be included in the design of the Nordic Drive trunk storm main, in addition to the proposed Stevenson Subdivision.

As previously mentioned, the Handlen Road extension (Sta. 460 to Sta. 960 and the proposed Phase II multiple-family development cannot be drained towards Nordic Drive and will require alternative means of storm water disposal.

The area is approximately 21.5 Ha. as shown on Drawing No. 010.

Utilizing the Rationale Method, the post-development flows for these areas area:

$$Q = ciA\ (.00278)$$

Where

c = 0.40 (including extensive open space land)
i = 43mm/hr
A = 21.5 Ha. (Tc = 15 min. 5 year return period)

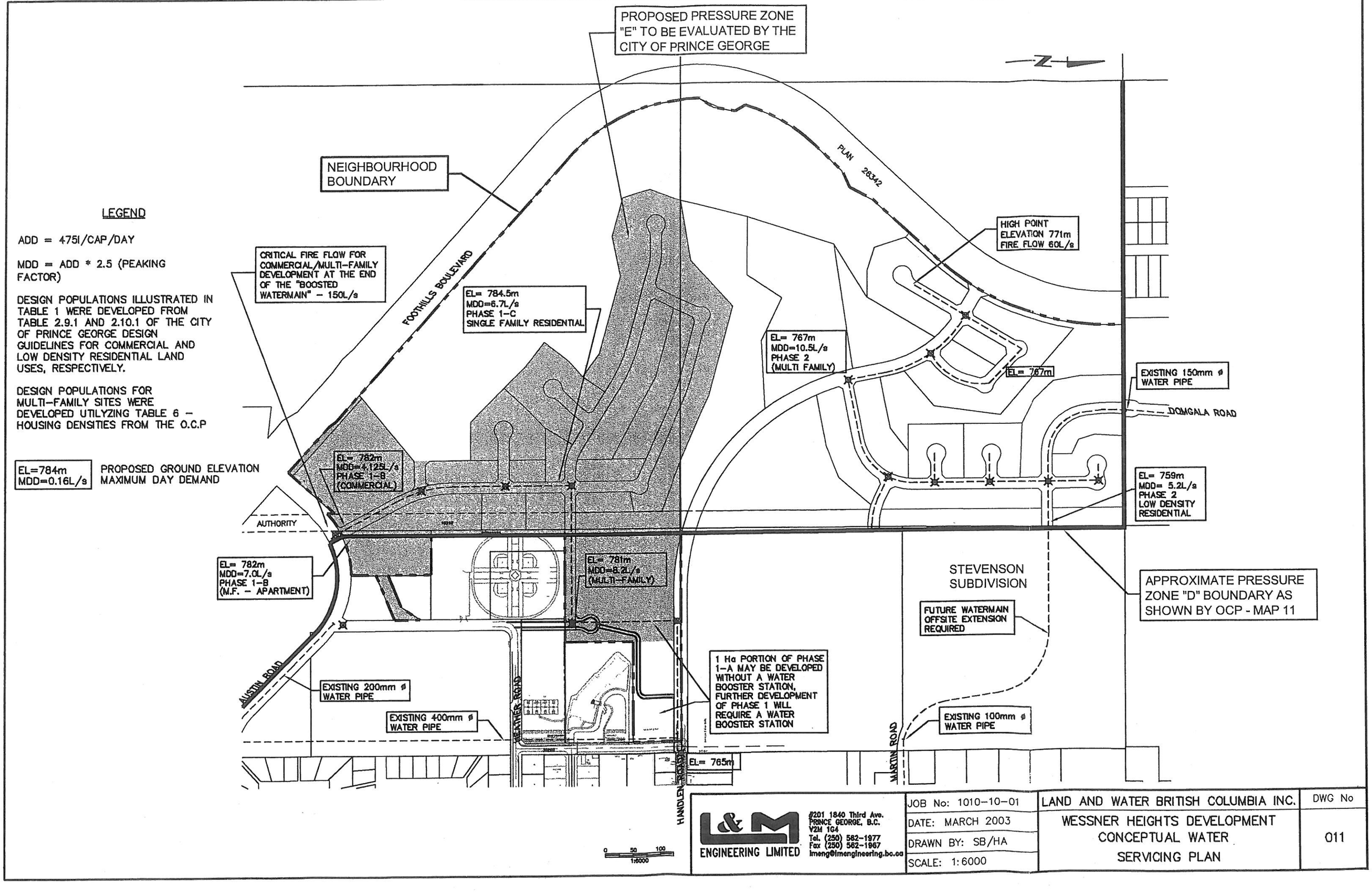
$$Q = 0.8 m^3/s$$

9.0 WATER

The Wessner Heights development area is located near the boundary of City of Prince George pressure zone D and can be connected to existing watermains at Handlen Road, Heather Road, Austin Road (Phase I), Martin Road, and Domagala Road (Phase II). Pressure Zone D is supplied with water from reservoir #817, with a low operating water level of 801.3 metres. The limit of pressure zone 'D' is indicated approximately on Drawing No. 011 but varies between the 771 m elevations and 780 m elevation; depending on water demand and distance from reservoir #817.

9.1 Phase I

The lowest elevation of the Phase I development area is approximately 770m, resulting in a static water pressure of approximately 44 psi at the end of the Handlen Road. The highest elevation of Phase I development area is approximately 785m, resulting in a static water pressure of only 23.14 psi.



LEGEND

ADD = 475l/CAP/DAY

MDD = ADD * 2.5 (PEAKING FACTOR)

DESIGN POPULATIONS ILLUSTRATED IN TABLE 1 WERE DEVELOPED FROM TABLE 2.9.1 AND 2.10.1 OF THE CITY OF PRINCE GEORGE DESIGN GUIDELINES FOR COMMERCIAL AND LOW DENSITY RESIDENTIAL LAND USES, RESPECTIVELY.

DESIGN POPULATIONS FOR MULTI-FAMILY SITES WERE DEVELOPED UTILYZING TABLE 6 - HOUSING DENSITIES FROM THE O.C.P

EL=784m
MDD=0.16L/s

PROPOSED GROUND ELEVATION
MAXIMUM DAY DEMAND

L&M ENGINEERING LIMITED
#201 1840 Third Ave.
PRINCE GEORGE, B.C.
V2M 1G4
Tel. (250) 562-1977
Fax (250) 562-1967
lmeng@lmengineering.bc.ca

JOB No: 1010-10-01	LAND AND WATER BRITISH COLUMBIA INC.
DATE: MARCH 2003	WESSNER HEIGHTS DEVELOPMENT CONCEPTUAL WATER SERVICING PLAN
DRAWN BY: SB/HA	DWG No 011
SCALE: 1:6000	

The above calculations and our experience with the development of the Heather Park Middle School indicate that a water booster station will likely be required for the development of Phase I. A detailed site Water Servicing Plan (Drawing No. 011) has been prepared in accordance with new City of Prince George Design Guidelines which illustrates:

- proposed watermain locations, connections, extensions;
- proposed geodetic development elevations at proposed system nodes;
- proposed maximum day water demands and fire flow demands.

The City of Prince George has used the City's computerized water network to analyse the proposed connections and provide design input for the required water works. The City of Prince George Water Modelling/Analysis is included as Appendix B.

In addition to the construction of a water booster station, the development of Phase I lands will require extension of the existing watermains with a connection to the existing 400mm trunk watermain near Handlen Road.

Phase 1-A

The Phase I-A Medium Density Residential/Townhouse consists of a smaller area immediately north of the Heather Park Middle School (1 Ha.) and a larger portion (4 Ha.) immediately west of the Heather Park Middle School. The smaller 1 Ha. site sits at a lower elevation (770 m) and is close to the existing 400 mm large diameter pressure zone D trunk watermain. This smaller portion of Phase I-A can be developed in advance of the larger portions, without requiring a water booster station.

This has been confirmed by the City of Prince George water network analysis - Phase I - Existing Fire Flow Conditions, which demonstrates an available flow of 280 l/s @ 20psi residual.

9.2 Phase II

In addition to the previously identified pressure supply problems, development of Phase II will require the construction of considerable offsite watermains to connect to existing watermains at the end of Martin Road and Domagala Road.

While the City of Prince George has provided comments on the watermain extensions for the Phase II lands, it is envisaged that the required offsite watermain extensions through the privately held Stevenson Subdivision area will preclude development of the Phase II lands at this time.

10.0 RECOMMENDATIONS

As illustrated by the previous text, development of the Wessner Heights area will require phasing; controlled by logical extensions of existing City of Prince George roads, water, sewer and storm infrastructure as follows:

10.1 Phase I

The Phase I area is serviceable by existing City of Prince George infrastructure, with the appropriate extensions and improvements.

Phase I-A

The smaller 1 hectare portion of Phase I-A could proceed at any time, with extensions of the existing Handlen Road infrastructure.

The larger 4 hectare portion of Phase I-A will require the extension of Heather Road, construction of a water booster station, and further extensions of water, storm, and sanitary mains.

Phase I-B

The Phase I-B lands will require a watermain extension from Phase I-A to connect to the proposed "Water Booster Station - Pressure Zone E."

Extension of the Austin Road sanitary sewermain will be required.

Extension of the Austin Road storm sewer will also be required to service the proposed Phase IB multi-family site. Storm sewer to service the proposed commercial site will require further detailed investigation into storm water detention, ground water recharge or other "Best Management Practices" of the drainage control.

Austin Road will require reconstruction following the extension of storm and sewermains; including concrete curb and gutter, at least where Austin Road abuts Wessner Heights. Specific requirements for Austin Road and the proposed Phase I-B, I-C access may require a Traffic Impact Study prior to development of the commercial site or Phase I-C.

Phase I-C

As previously mentioned, the development of Phase I-C will likely be preceded by Phase I-A and I-B. Infrastructure required to either service

or pass through Phase I-A and I-B will result in minimal offsite requirements for Phase I-C.

Phase I-D

The special purpose (golf course) area will require further study to solve two constraints:

1. **Storm Drainage** - Storm drainage is proposed to be stored onsite for irrigation purposes.

2. **Water Supply** - Water supply for irrigation will likely be too expensive at commercial City of Prince George Bylaw rates. Beyond water available from onsite storm water detention, further investigation into the possibility of a private well may be required.

10.2 Phase II

As previously demonstrated, the Phase II area has too many servicing deficiencies to support cost effective development until development occurs in neighbouring areas, such as the Stevenson Subdivision.

It is recommended that the future servicing requirements of the Phase II area be accounted for in future design of City of Prince George infrastructure as follows:

1. Investigate including the Handlen road extension in the Capital Expenditure Program.

2. Include the Phase II areas in the design of the future Nordic Drive trunk storm main.

3. Ensure that future Stevenson Subdivision sewermain extension from Martin Road is installed at minimum grade to allow sanitary sewer service to Phase II lands.

4. Ensure that future Stevenson Subdivision watermains are sized with allowances to service the Phase II area within Pressure Zone D, including future re-analysis of the Pressure Zone watermain network.

11.0 SUMMARY

In general, the Phase I lands are serviceable and could be developed in the near future (1-5 years), depending on market conditions. It is recommended that the Phase I area proceed to the rezoning process.

The Phase II lands are not immediately serviceable without excessive offsite servicing costs. It is recommended that the Phase II Neighbourhood Plan and servicing requirements be utilized in the design of the future City of Prince George infrastructure.

12.0 OFFSITE CONSTRUCTION COSTS

The cost estimates contained in this section are "order of magnitude" construction cost estimates only. Unit construction costs are based on anticipated 2004 construction costs in the Prince George area.

Offsite works consist of those works which are required to extend, oversize, or upgrade existing City of Prince George infrastructure or are required to service future phases of development and do not include onsite development costs for water, sewer, road works, etc.

Further cost analysis including onsite costs is recommended prior to subdivision to fully demonstrate development cost/feasibility.

12.1 Phase I

Phase I-A

Phase I-A is deemed to consist of the development of approximately five hectares of medium density multi-family housing between the current end of Handlen Road, and existing BC Hydro right-of-way and the Heather Park ball fields.

Water Booster Station

Development of Phase I will require the construction of a water booster station at an approximate cost of . . . . . $ 250,000.00

Total Water Booster Station . . . . . $ 250,000.00

Heather Road Extension

150 lm	Road Reconstruction	@$570.00/m . . .	$ 85,500.00
30 m	Storm Main Extension	@$180.00/m	5,400.00
Total Heather Road Works		. . . . .	$ 90,900.00

Local/Internal Road Construction

to provide secondary access to Phase I-C.

150 lm road construction @ $570/m . . . . . $ 85,500.00

Handlen Road

The extension of Handlen Road and cost thereof, will likely be subject to negotiation with the City of Prince George. At this time it is envisaged that Phase I-A will require the construction of approximately 100 metres of new road to a collector standard. Beyond 100m length, the extension of Handlen Road does not service Phase I lands, but will be required for Phase II.

100m new road construction @ $750/lm . . . . . $ 75,000.00

As the water, sanitary sewer, and storm sewer works to connect to Handlen Road will be required for upstream phases of Phase I-C, they are deemed to be offsite works. These works will however, minimize onsite costs for Phase I-A.

600m Watermain Extension(300mm dia.) @$150/m	$	90 ,000.00
600m Storm Main Extension(675mm dia.) @$180/m		108,000.00
600m Sanitary Sewermain Extension (375mm dia.) @$150/m		90,000.00
Total Handlen Main Extension Works	$	288,000.00
**Subtotal Phase I-A Offsite Costs . . . . . **	**$**	**789,400.00**
**25% Engineering & Contingencies . . . . . **		**197,350.00**
**Subtotal . . . . . **	**$**	**986,750.00**
**7% GST . . . . . **		**69,072.50**
**TOTAL PHASE 1-A OFFSITE COSTS (Say) . . . . . **	**$**	**1,056.000.00**

Note: As previously mentioned in Section 9.1, the lower bench (1.0 Ha.) area of Phase I-A can be developed without the water booster station or the Heather Road extension, reducing construction costs approximately as follows:

Handlen Road - 100lm	$	75,000.00
300 lm 300mm dia. watermain		45,000.00
300 lm storm main extension		54,000.00
300 lm sanitary sewer main extensions		45,000.00
**Subtotal . . . . . **	**$**	**219,000.00**
**25% Engineering & Contingency Allowance . . **		**54,750.00**
**7% GST . . . . . **		**19,162.50**
**TOTAL PHASE 1-A, 1.0 Ha. (Say) . . . . . **	**$**	**293,000.00**

LOWER BENCH ONLY

Phase I-B

Phase I-B consists of the development of the proposed local commercial and multi-family sites adjacent to Austin Road West and will require the extension of Austin Road sewer, and storm mains, with road reconstruction and watermains from Phase I-C

400 lm	300 mm dia. Watermain	@$220.00/m .	$	60,000.00
160 lm	Sanitary Sewermain	@$150.00/m .		24,000.00
160 lm	Storm Main	@$180.00/m .		28,800.00
Austin Road West Reconstruction:				
300 lm	@$800.00/m	. . . . .		240,000.00
Subtotal Phase I-B Offsite Costs (Say)		. . . . .	$	**352,800.00**
25% Engineering & Contingency		. . . . .		**88,200.00**
Subtotal		. . . . .	$	**441,000.00**
7% GST		. . . . .		**30,870.00**
TOTAL PHASE I-B OFFSITE COSTS (Say)		. . . . .	$	**472,000.00**

NOTE: 1. The above costs do not include an allowance for onsite storm water management of post-development flows. Onsite development costs will be increased accordingly.

2. The Austin Road West reconstruction costs include full reconstruction including both sides and curb and gutter. This may be in excess of Municipal Act/subdivision requirements, and will be subject to negotiations with the City of Prince George.

Phase I-C

Phase I-C is deemed to consist of the single family residential development area of approximately 12 hectares. Development of Phase I-A and I-B will require the installation of offsite works to accommodate Phase I-C such that Phase I-C should have no offsite costs.

12.2 Phase II

As the development of Phase II is deemed to be well into the future, the following offsite development costs are very preliminary and would require re-visiting prior to any development.

Handlen Road Extension (Including Utility Extension):		
1,060 m @$1,200.00/m	. . . . .	$ 1,272,000.00
Offsite Watermain to Connect to Martin Road:		
500 m @$150.00/m	. . . . .	75,000.00
Offsite Sanitary Sewermain:		
500m @$150.00/m	. . . . .	75,000.00
Storm Water Detention/Disposal System (Say):	. . . .	200,000.00
Subtotal Phase II Offsite Costs	. . . . .	**$ 1,592,000.00**
25% Engineering & Contingencies	. . . . .	**398,000.00**
Subtotal	. . . . .	**$ 1,990,000.00**
7% GST	. . . . .	**139,300.00**
TOTAL PHASE II OFFSITE COSTS OR STORM MAIN EXTENSION TO NORDIC DRIVE	. . . . .	**$ 2,130,000.00**

As demonstrated by the very high offsite costs, development of Phase II will likely not occur until further Hart Area development (such as the Stevenson Subdivision) occurs to extend City of Prince George infrastructure and services.

APPENDIX "A" -
STORM SEWER CALCULATIONS

APPENDIX "B" -
CITY OF PRINCE GEORGE WATER MODELLING

WESSNER HEIGHTS DEVELOPMENT
STORM SEWER DESIGN CALCULATIONS
PHASE 1 - BENCHLANDS

File: 1010STUDY.wk4
1010-10-01
REVISED FEB 2002

DESIGNED BY: SRB
CHECKED BY: TAF

D= 1.50 1:5yr
A= 354.22 Rainfall
C= 0.77 Intensity

i=A/(Tc+D)^C

Pipe Section	INLET Areas	AREA (m2)		FLOW Q=(C)(A)(I)/360/10000				I	DESIGN	PIPE DATA							MANHOLE ELEVATIONS						COMMENTS
				INLET	COMBINED	tc (MIN)				CAPAC	MAN.	SLOPE	DIA	VEL	DIST	TIME	UPSTREAM			DOWNSTREAM			
		A	SUM	C	C	INLET	TOTAL	mm/hr	Q(m3/s)	Q(m3/s)	N	(%)	(m)	(m/s)	(m)	(MIN)	Rim(m)	OBV(m)	cover	Rim(m)	OBV(m)	cover	
1.00		40000	40000	0.10	0.10	20.0	20.00	33	0.037	0.079	0.024	2.30%	0.300	1.12	70.000	1.038							
2.10		8000	8000	0.65	0.65	10.0	10.00	54	0.078	0.023	0.024	0.50%	0.250	0.46	67.000	2.407							
2.11		2500	10500	0.67	0.65	2.4	12.41	46	0.089	0.037	0.024	0.50%	0.300	0.52	40.000	1.272							
1.20		0	50500	0.00	0.22	1.0	21.00	32	0.097	0.168	0.024	4.50%	0.350	1.74	40.000	0.383							
3.00		3600	3600	0.60	0.60	10.0	10.00	54	0.032	0.032	0.024	1.00%	0.250	0.66	58.000	1.473							
3.01		4000	7600	0.60	0.60	1.5	11.47	49	0.062	0.083	0.024	2.50%	0.300	1.17	28.000	0.398							
1.30		0	58100	0.00	0.27	10.0	13.70	43	0.186	0.328	0.024	4.50%	0.450	2.06	80.000	0.647							
1.40		18000	76100	0.30	0.27		14.35	42	0.243	0.241	0.024	2.43%	0.450	1.51	95.000	1.048							
1.50		9000	85100	0.40	0.29		15.39	40	0.271	0.267	0.024	3.00%	0.450	1.68	95.000	0.941							
1.60		10000	95100	0.40	0.30		16.33	38	0.303	0.308	0.024	3.97%	0.450	1.93	95.000	0.818							
1.70		9000	104100	0.40	0.31		17.15	37	0.329	0.174	0.024	1.27%	0.450	1.09	49.000	0.746							
1.80		0	104100	0.40	0.31		17.90	36	0.319	0.174	0.024	1.27%	0.450	1.09	68.400	1.042							
4.00		7500	7500	0.40	0.40	10.0	10.00	54	0.045	0.036	0.024	1.25%	0.250	0.73	120.000	2.726							
1.90		20000	131600	0.40	0.33	10.0	18.94	34	0.412	0.191	0.024	0.67%	0.525	0.88	100.000	1.892							
5.10		5000	5000	0.70	0.70	10.0	10.00	54	0.052	0.091	0.013	2.35%	0.250	1.86	119.000	1.068							
5.20		10000	15000	0.40	0.50		11.07	50	0.105	0.091	0.013	2.35%	0.250	1.86	83.000	0.745							
5.30		9300	24300	0.40	0.46		11.81	48	0.150	0.140	0.013	2.10%	0.300	1.98	100.000	0.841							
5.40		10000	34300	0.40	0.44		12.65	46	0.194	0.118	0.013	1.50%	0.300	1.68	100.000	0.995							
1.11		13000	178900	0.16	0.34	18.9	18.90	35	0.579	0.182	0.024	0.30%	0.600	0.64	100.000	2.587							
1.12		44000	230900	0.16	0.29	0.0	21.48	31	0.590	0.182	0.024	0.30%	0.600	0.64	84.000	2.173							
P1		0	120000	0.40	0.40	10.0	17.00	37	0.497	0.594	0.013	0.50%	0.675	1.66	600.000	6.02							
P1.1		120000	120000	0.40	0.40	0.0	16.00	39	0.518	1.189	0.013	2.00%	0.675	3.32	250.000	1.254							
P1.2		60000	180000	0.70	0.50		17.25	37	0.921	1.681	0.013	4.00%	0.675	4.70	400.000	1.419							
STUB			180000	0.50	0.50		18.66	35	0.871	0.841	0.013	1.00%	0.675	2.35	13.000	0.092							
6.00			22500	0.60	0.60		10.00	10.00	54	0.202	0.403	0.013	2.00%	0.450	2.54	120.000	0.789							
6.10		180000	202500	0.50	0.51	0.00	18.75	35	0.999	1.402	0.013	2.78%	0.675	3.92	110.000	0.468							
6.20		9000	211500	0.50	0.51	0.00	19.25	34	1.022	1.113	0.013	1.00%	0.750	2.52	300.000	1.984							
6.30		53000	405400	0.65	0.42	0.00	23.70	29	1.695	2.648	0.013	0.94%	1.050	3.06	270.000	1.472							
6.40		40000	535400	0.35	0.41		25.20	28	1.731	0.810	0.024	0.30%	1.050	0.94	60.000	1.089							
7.10										1.280	0.013	0.50%	0.900	2.01	120.000	0.994							
8.00		20000	20000	0.70	0.70		15.00	41	0.158	0.152	0.013	0.53%	0.400	1.21	60.000	0.829							

CITY OF PRINCE GEORGE
Development Services

Infrastructure Planning Division
1100 Patricia Boulevard, Prince George, BC V2L 3V9
Telephone (250) 561-7679 Fax (250) 561-7721

Memo

File: 2150-03-01
Project: 2001-035

To: Scott Billbrough, P.Eng.,
L&M Engineering Ltd.

From: Barry Woods, A.Sc.T.,
City of Prince George

cc: Dave Dyer, P.Eng.,
City of Prince George

Date: February 15, 2002

Subject: Water Modeling – Wessner Heights – Phase 1 and 2.

As requested, we've investigated the requirements for watermain sizing for the proposed Wessner Heights Development, Phases 1 and 2.

Our analysis was based on your drawings " Wessner Heights Development – Conceptual Water Servicing Plan – 006" dated 24 Aug, 01 and " Wessner Heights Development – Development Phasing and Road Works – 004" dated 24 Aug, 01 and the "Wessner Heights Neighbourhood Plan" data sheet that lists the number and type of units in each phase of the development.

Phase 1 - General

Phase 1 comprises:

198 units of Medium Density Townhouse development
2.8 hectares of Local Commercial development
21.2 hectares of Special Purpose Open Space (Golf Course)
163 units of Low Density Residential development

Based on 3 people per unit for residential development and 60 people per hectare for commercial development the population served in Phase 1 is calculated to be 1759.

Using 475 litres/person/day as the water demand, the Average Daily Demand (ADD) for Phase 1 is 9.67 litres per second, and,

Maximum Day Demand (MDD) = 2.50 x ADD = 24.18 litres / second
Peak Hour Demand (PHD) = 4.25 x ADD = 41.10 litres / second

The Medium Density residential flow was assigned to Nodes 20010 and 20011. The commercial flow was assigned to Node 20016. The remaining Low Density residential flow was spread over the rest of the nodes in Phase 1.

Phase 1 – Fire Flow

Phase 1 was analyzed for fire flow at two locations (Refer to Figure 1 attached):

- 150 litres / second (plus MDD) for commercial development at Node J20016
- 60 litres / second (plus MDD) for residential development at Node J20019

Results of the analysis show that 300mm diameter and 200mm diameter mains are required for the development. These are indicated on Figure 1.

Phase 1 – Booster Station

Phase 1 of the development will require a booster station located at the west end of Handlen Road, equipped with fire flow supply pumps and domestic supply pumps.

Fire Flow Supply

Fire pumps will be required to provide at least 150 litres / second plus Maximum Day flow for the development at a total operating head of 56 metres.

Domestic Supply

Domestic pumps will be required to provide at least Peak Hour Flow of 41.10 litres / second at an operating head of 56 metres. This will provide approximately 50 psi operating pressure at the highest point in Phase 1.

Note: Once pump selection has been done, please submit the pump curves and design parameters so we can update the model and check on the adequacy of the pump selection.

Phase 1 – Existing Fire Flow conditions

It was requested that we determine the current fire flow (without Wessner Heights development being considered) at the west end of Handlen Road and on Austin Road. The following results were obtained:

Node J11217 on Austin Road delivers approximately 55 litres / second with a residual pressure of 20 psi.

Node J11242 on Handlen Road delivers approximately 280 litres / second with a residual pressure of 20 psi.

All other nodes in the network are above 20 psi.

Phase 2 - General

Phase 2 comprises:

126 units of Low Density Residential development
258 units of Medium Density Multi-Family development

Based on 3 people per unit for residential development the population served in Phase 2 is calculated to be 1139.

Using 475 litres/person/day as the water demand, the Average Daily Demand (ADD) for Phase 2 is 6.26 litres per second, and,

Maximum Day Demand (MDD) = 2.50 x ADD = 15.65 litres / second
Peak Hour Demand (PHD) = 4.25 x ADD = 26.61 litres / second

The Medium Density Multi-Family residential flow was assigned to Nodes 20033 and the remaining Low Density residential flow was spread over the rest of the nodes in Phase 2.

Phase 2 – Fire Flow

Phase 2 was analyzed for fire flow at two locations (Refer to Figure 2 attached):

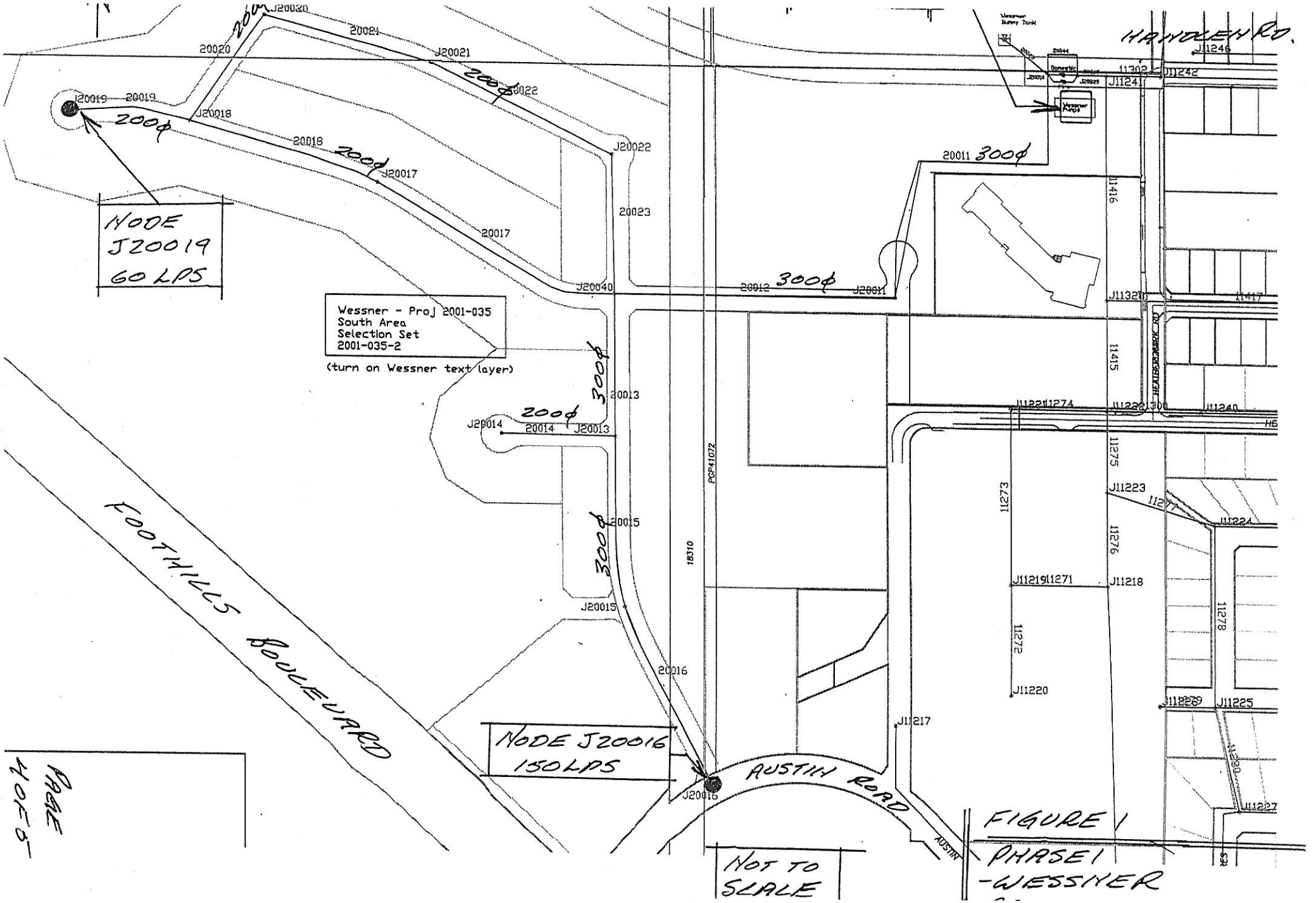
- 125 litres / second (plus MDD) for apartment/townhouse development at Node J20033
- 60 litres / second (plus MDD) for residential development at Node J20036

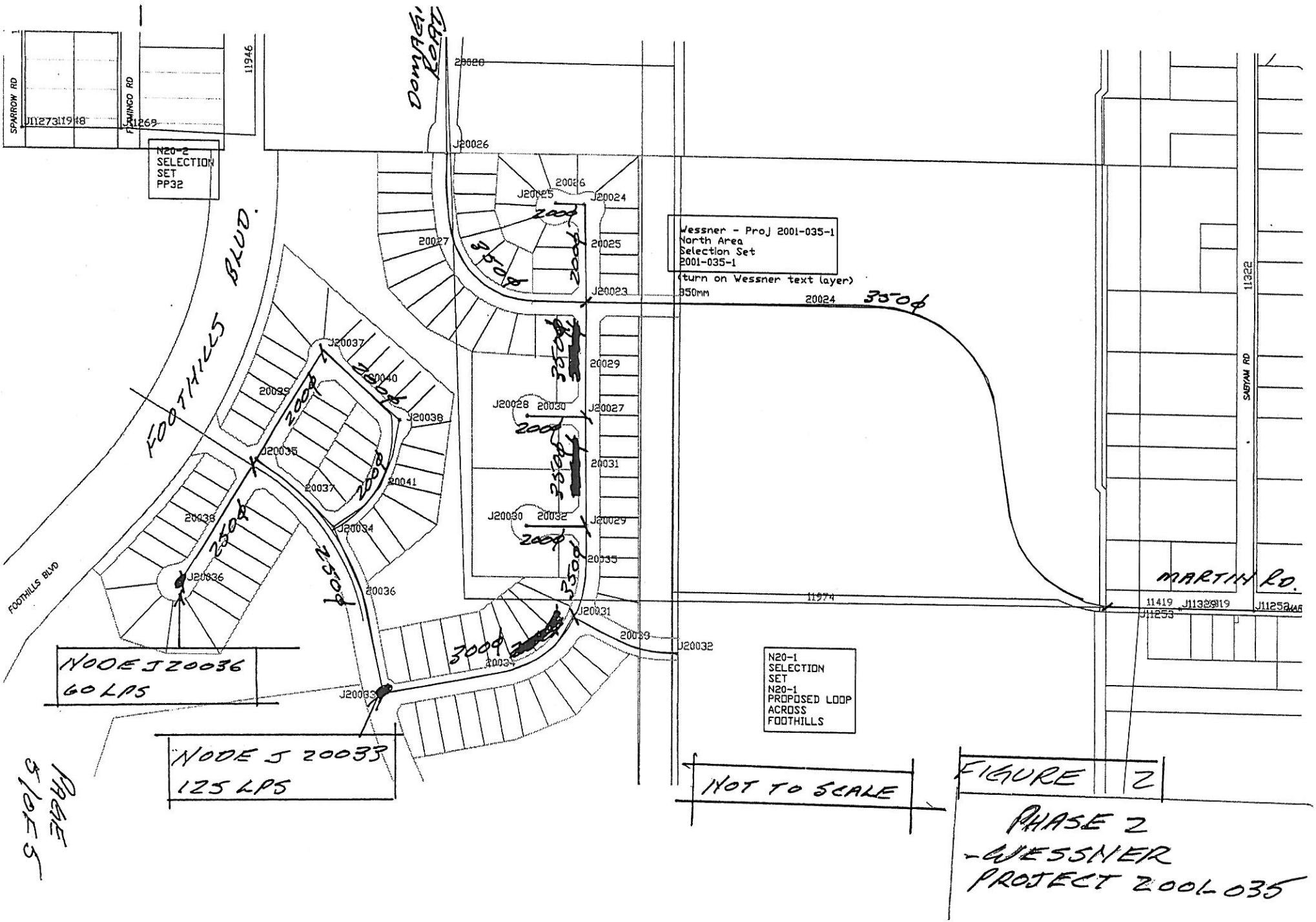
Results of the analysis show that 350mm diameter, 250mm diameter and 200mm diameter mains are required for the development. These are indicated on Figure 2.

If you have any questions or required additional information, please contact me.

Regards,

Barry Woods, AScT, Engineering Assistant
Infrastructure Planning Division, City of Prince George, BC
Phone: (250) 614-7841 Fax: (250) 561-7721 Email: bwoods@city.pg.bc.ca


HAWOLEN RD.
NODE J20019 60 LPS
Wessner - Proj 2001-035
South Area
Selection Set
2001-035-2
(turn on Wessner text layer)
FOOTHILLS BOULEVARD
NODE J20016 150 LPS
AUSTIN ROAD
NOT TO SCALE
FIGURE 1
PHASE 1 -WESSNER
PAGE 4 OF 5


SPARROW RD
J11273
11948
FLAMINGO RD
J11269
11946
N20-2
SELECTION
SET
PP32
DONAHUE ROAD
J20026
20026
J20025
20025
J20024
20024
20027
20025
J20023
20024
Wessner - Proj 2001-035-1
North Area
Selection Set
2001-035-1
(turn on Wessner text layer)
350mm
FOOTHILLS BLVD.
J20037
20040
20039
J20038
J20035
20037
20041
20038
J20034
J20036
20036
FOOTHILLS BLVD
20029
J20028
20030
J20027
20031
J20030
20032
J20029
20035
J20031
20033
J20032
20034
11322
SABYAN RD
MARTIN RD.
11974
11419
J11253
J11252
J11251
N20-1
SELECTION
SET
N20-1
PROPOSED LOOP
ACROSS
FOOTHILLS
NODE J20036
60 LPS
NODE J 20033
125 LPS
NOT TO SCALE
FIGURE 2
PHASE 2
-WESSNER
PROJECT 2001-035
PHASE 2 LOTS