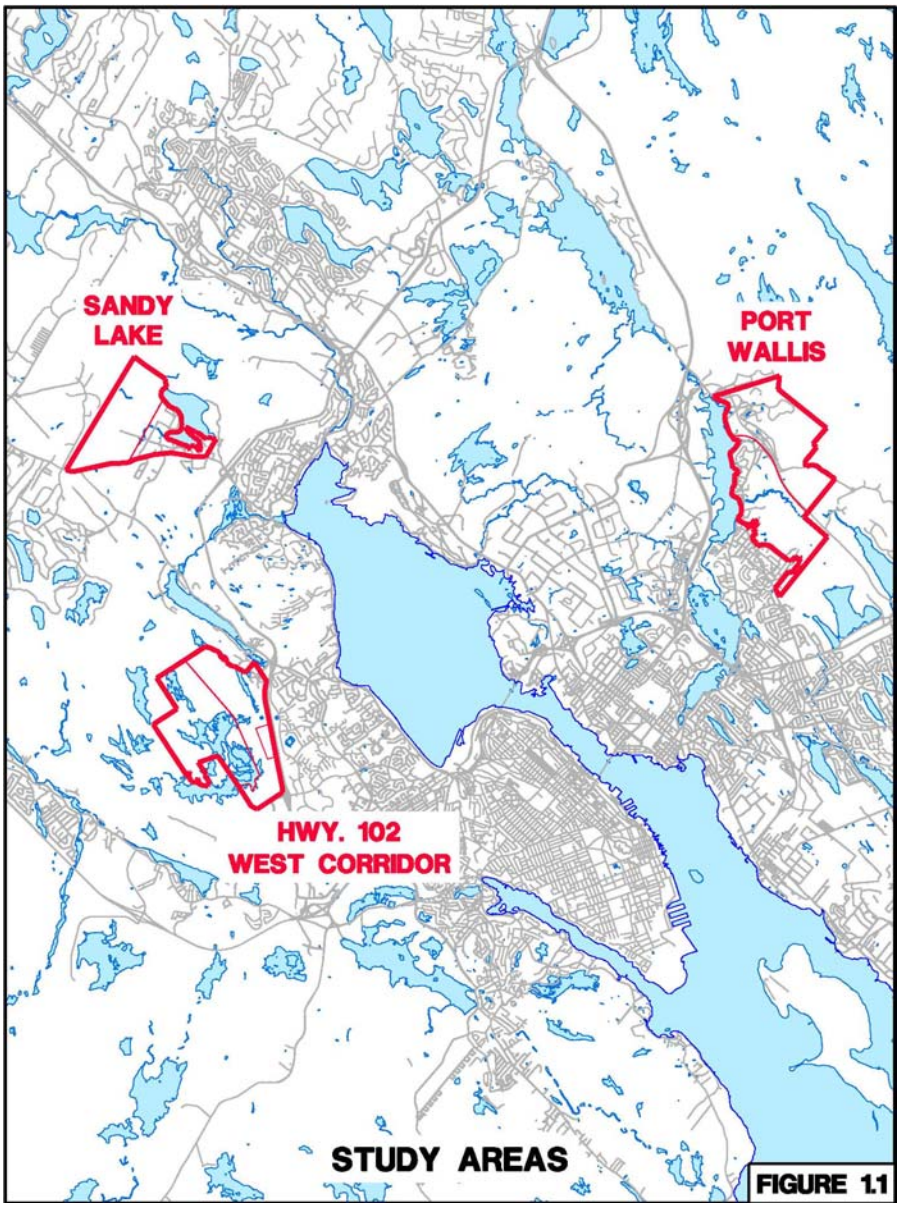

Report No. 071065

Prepared for:

HALIFAX
REGIONAL MUNICIPALITY

Cost of Servicing Plan

Regional Planning
Greenfield Sites

February 2009

CBCL LIMITED
Consulting Engineers

ISO 9001
Registered Company

Report No. 071065

Prepared for:

HALIFAX
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Cost of Servicing Plan

Regional Planning
Greenfield Sites

Final Report		Feb. 3/09	
Draft Report	CJK	Jan. 8/09	DNB
Issue or Revision	***Reviewed By:***	***Date:***	***Issued By:***

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Contents

Chapter 1 Introduction

1.1 Study Scope

The Cost of Servicing Study was commissioned by Halifax Regional Municipality (HRM) to evaluate costs to provide municipal services and transportation links to areas designated "Urban Settlement" under the HRM Regional Plan. "Urban Settlement" lands have not yet been considered for secondary planning.

The previous "Greenfield Study" assessed 10 potential development sites throughout the Halifax-Dartmouth-Bedford-Sackville metropolitan area and determined costs to provide water, sanitary, and stormwater servicing and transportation links under various development scenarios.

This study assesses three primarily "Urban Settlement Areas" to determine if they warrant advancing to the "Secondary Planning" stage while protecting the fiscal health of HRM and addressing deficiencies in the municipal and transportation service system. The three study areas are:

- Port Wallis;
- Sandy Lake; and
- Highway 102 West Corridor.

A portion of the Highway 102 West Corridor Study Area is designated "Urban Settlement" while a portion of the Port Wallis Study Area is designated "Rural Commuter".

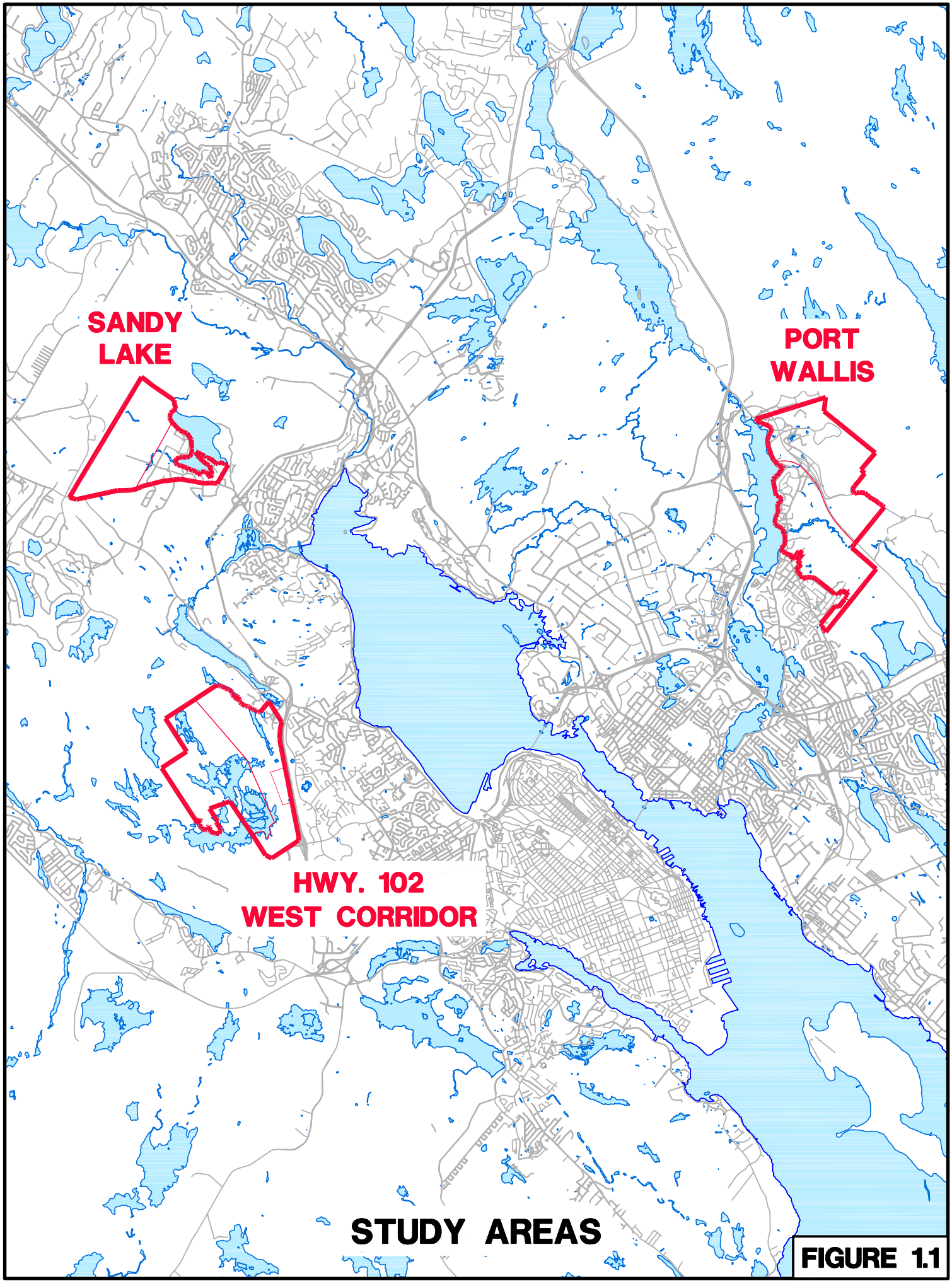
The study areas are depicted on Figure No. 1.1 at the end of this chapter.

The Terms of Reference for this study described the areas as transit linked "centres" that fall into the following category:

"Serviced mixed use, residential development in new "Greenfield" locations which have not been previously urbanized;….."

The overall purpose of this study is to:

- **Identify and estimate cost thresholds** for each of the Greenfield sites, in terms of piped services, treatment plants, roads and transit system.
- **Estimate, compare and explain life cycle costs** (operating, capital and replacement) over the next 25 years associated with development in each of the Greenfield areas.



STUDY AREAS

FIGURE 1.1

1.2 Study Methodology

The Steering Committee for this project included representatives from HRM's planning, engineering, transit and parkland planning as well as representatives from Nova Scotia Transportation and Infrastructure Renewal (NSTIR). Meetings were also held with landowners in each of the three study sites.

The meetings were held to review and advance the baseline information for a number of study elements. The following is a brief summary of the methodology used to develop the baseline information:

- Confirm each of the Study Boundaries. Two of the study areas (Port Wallis, Highway 102 West Corridor) were broken down into two sub-areas that are defined by HRM's Regional Plan-"Urban Settlement" and "Urban Reserve" designations.
- Document development densities to be applied to each study area.
- Select an appropriate population growth rate to be used to determine infrastructure thresholds (first major capacity improvement requirement) and 25 year population projections.
- Produce concept level land use maps showing basic land uses, open spaces, road layouts, environmentally sensitive wet-lands, and parkland.
- Produce concept level plans for water, sanitary and stormwater servicing and transportation infrastructure for each of the study areas.
- Meetings with landowners to review the study concept plans and review plans and development projections that landowners may have produced.
- Advance servicing scenarios incorporating information obtained from the landowners.
- Document servicing requirements and construction costs for infrastructure thresholds, 25 year projections and ultimate full build-out development.
- Summarize the results and present the information in a form for ease of a "comparative analyses".

2.1 Land Use and Transportation Concepts

The intent of the planning portion of this study is to determine a potential development pattern and road network upon which to base anticipated infrastructure requirements. Land uses are based on a high-level review of site conditions and preliminary plans provided by the landowners. Road layouts are based on providing logical route connections to existing and proposed new transportation networks adjacent to the study areas while allowing for efficient road layouts within areas that can be developed.

Each study area was assessed to determine a logical mix of residential and commercial development. Commercial zones were assumed to be located adjacent to transportation hubs, including feasible connections to 100 series highways.

The study assumes medium-density residential development averaging up to 9 units per acre, with a mix of smaller-lot single-family dwellings, duplexes, townhouses and low-rise apartments, with commercial uses integrated with apartments, and with other commercial uses in nearby smaller-footprint, mid-rise buildings.

The transportation component of the study was carried out using projected traffic results and HRM's QRSII computer model. The projected populations under several scenarios were used to generate traffic amounts generated both inside and outside of the study areas, including traffic likely to be induced by any network improvements.

2.2 Population Projections

Population estimates are required in order to assess infrastructure requirements under several development scenarios so that HRM can use the results of the comparative analysis in determining whether lands can proceed to the secondary planning stage.

The following is a summary of each development scenario and the related population projections:

2.2.1 Population Growth Rate

As indicated in Chapter 1, estimating infrastructure cost thresholds requires using population growth projections to determine when capacity limitations of services trigger the requirement for major upgrades. Servicing requirements can be assessed using an estimated development rate based on a reasonable number of units that may be built per year and

an estimate for the number of people per unit. Table 2.1 presents several scenarios of population growth projections based on the number of units per year and the number of people per unit.

Table 2.1 Population Growth Projections for 25 Years

Units per year	people / unit	Year 1 Population	Year 10 Population	Year 25 Population
100	2	200	2,000	5,000
150	2	300	3,000	7,500
200	2	400	4,000	10,000
250	2	500	5,000	12,500
300	2	600	6,000	15,000
400	2	800	8,000	20,000
Units per year	**people / unit**	**Year 1 Population**	**Year 10 Population**	**Year 25 Population**
100	3	300	3,000	7,500
150	3	450	4,500	11,250
200	***3***	***600***	***6,000***	***15,000***
250	3	750	7,500	18,750
300	3	900	9,000	22,500
400	3	1200	12,000	30,000
Units per year	**people / unit**	**Year 1 Population**	**Year 10 Population**	**Year 25 Population**
100	3.5	350	3,500	8,750
150	3.5	525	5,250	13,125
200	3.5	700	7,000	17,500
250	3.5	875	8,750	21,875
300	3.5	1050	10,500	26,250
400	3.5	1400	14,000	35,000

The Steering Committee has agreed that the population growth projection using 200 units per year with 3 people per unit is a reasonable estimate for the purposes of this study.

HRM's Regional Plan included development growth estimates based on a 25 year population projection from the year 2001 to 2026. Table 2.2 presents population growth estimates for 2026 and 2033 based on 200 units per year and 3 people per unit.

Table 2.2 Population Growth Based on 200 Units per Year

Greenfield		Area (hectares)	2026 Projection (18 Years)		25 Year Projection (2033)	
			Units per year	200	Units per year	200
			People per unit (people)	3	People per unit (people)	3
Port Wallis	Small Area (B)	317	10,800		15,000	
	Large Area (A+B)	667				
Sandy Lake	Total Area	361	10,800		15,000	
Highway 102 West Corridor	Small Area (A)	268	10,800		15,000	
	Large Area (A+B)	503				

The Regional Plan predicts a population growth of 38,000 people to the year 2026 for the "Suburban Center" portion of HRM. Table 2.3 presents the estimated distribution of the projected population growth among the three development areas that have had the Secondary Planning Approval stage completed; Bedford South, Bedford West, and Morris/Russell Lake.

Table 2.3 Regional Plan – 2026 Population Projections Areas – Regional Centre

Regional Plan Projections - Regional Centre	
Area	**2026 Population**
Bedford South	9,000
Bedford West	17,000
Morris / Russell Lake	12,000
TOTAL	**38,000**

Bedford South has an approved Capital Cost Contribution Policy (CCC) and development is underway. Morris/Russell Lake has an approved CCC on approximately 1/3 of the plan area and development is underway. Bedford West has an interim CCC approved on a portion of the plan area and negotiations with developers are underway to finalize the CCC on the entire Bedford West plan area.

Based on an assumption that the projected 2026 population growth of 38,000 people for the "Suburban Centre" area of HRM will remain regardless of the location of land developed, the projected populations in Table 2.3 were adjusted by distributing the total projected population among lands with approved "Secondary Planning" and lands that are subject of this study. Table 2.4 summarizes the distribution of projected populations based on a number of scenarios.

Table 2.4 Development Growth - 2026 - Redistributed

Study Area	Population Projections				Comment
Scenario #1 - Port Wallis	Bedford West / Bedford South	Morris / Russell Lake	Port Wallis	Total	
	17,000 + 9,000 = 26,000	6,000	6,000	38,000	50 / 50 Split
Scenario #2 - HWY 102 West Corridor	Bedford West / Bedford South	Morris / Russell Lake	HWY 102 West	Total	Split Based on Area
	12,410 + 9,000 = 21,410	12,000	4,590	38,000	
Scenario #3 - Sandy Lake	Bedford West / Bedford South	Morris / Russell Lake	Sandy Lake	Total	Split Based on Area
	11,220 + 9,000 = 20,220	12,000	5,780	38,000	

Table 2.5 presents the ultimate projected population for each of the study areas based on a development density of 45 people per hectare.

Table 2.5 Ultimate Population Projections

Study Area		Area (hectares)	Ultimate Projection	
			People per hectare	45
			(people)	
Port Wallis	Small Area (B)	317	14,000	
	Large Area (A+B)	667	30,000	
Sandy Lake	Total Area	361	16,000	
Highway 102 West Corridor	Small Area (A)	268	12,000	
	Large Area (A+B)	503	23,000	

Chapter 3 Land Use and Transportation Study Results

3.1 Land Use Overview

Generalized land use plans and road layouts were produced for each of the study areas. Representatives for landowners provided concept layouts for land development which was used as a guide to advance the plans. Land use in general was assumed to be primarily residential with commercial and business park development located at or near key transportation hubs and transit nodes and along major collector roads. The plans were developed with consideration of parklands and open spaces, wetlands and environmentally sensitive areas. Basic inter-relationships with existing communities and infrastructure were key concepts used to produce the land use plans.

3.2 Transportation Overview

The proposed road network internal to each of the three (3) study areas was assumed to determine the location and lengths of minor and major collector roads and related connections to external road networks.

HRM's computer transportation model "QRSII" was updated and used to assess the traffic impact of various development scenarios on the transportation network. Each model run included the existing road network in Halifax, Dartmouth, Bedford and Sackville and surrounding adjacent lands. Future improvements and additions to road networks were modelled, including:

- Highway 113 = 2 lanes
- Highway 102 = 6 lanes (Bedford to Kearney Lake Road Interchange)
- Bayers Road = 6 lanes (Bicentennial Highway to Connaught Avenue)
- Mount Hope Avenue to Caldwell Road
- All road improvement recommendations implemented for the Bedford West Capital Cost Contribution Study Area.

Two key modelling scenarios were assessed to determine transportation infrastructure improvements required to adequately service the study area as well as address the impacts on the external transportation network. Baseline conditions for the year 2026 were modelled without development within the three study areas. Then the baseline results were compared to:

1) Year 2026 with the projected population increase of 38,000 people distributed among the study areas as well as areas with approved "Secondary Planning", similar to the distribution presented in Table 2.4.

2) Ultimate development in each of the three study areas as well as full development in Bedford South, Bedford West and Morris/Russell Lake.

Key assumptions used for the Transportation study include:

- PM Peak Hour Traffic and related volume capacity factors used to determine transportation infrastructure requirements.
- HRM's Regional Plan 2026 population projections used to determine Baseline transportation requirements.
- Employment/Population Ratio of 0.16 used based on Clayton Park data.
- Model split adjustments taken from 2006 QRSII model.
- Road Capacity Criteria:
  - Two lane roadway = 1,100 vph per lane
  - Multi-lane roadway = 1,200 vph per lane
  - Expressways = 1,600 vph per lane (i.e., Burnside Drive)
  - 100 series highways = 1600 vph per lane.

3.3 Land Use – Road Layout Concept Plans

3.3.1 Port Wallis

Drawing 1A illustrates a potential generalized land use plan and road layout for the Port Wallis study area. The study area covers approximately 667 hectares with 350 hectares located west of Highway 107 and 317 hectares to the east (Area B and A respectively).

The area is predominantly residential with a commercial node and transit hub being developed at the Montague Road / Highway 107 overpass (Exit 14).

It is anticipated that the future Highway 107 Bypass (Cherry Brook Bypass) will be constructed with the traffic from the existing Highway 107 taking precedence over the traffic from the Forest Hills Parkway Extension route from Main Street. This will allow the eastern portion of the Forest Hills Parkway Extension paralleling Loon Lake to be changed from a controlled access highway into a collector road. This in turn will allow the development of intersections along this route and the development of a collector road connecting the eastern end of the study area to the Forest Hills Parkway Extension.

Within the southern portion of the study area (Area B), a collector road extends from Avenue du Portage through the site to connect to the Montague Road / Highway 107 Interchange, where the roads have been reconfigured to create a roundabout with five access points. Two road connections are proposed to connect from the interior of the study area to Waverley Road.

In the northern portion of the study area (Area A, the Conrad Brothers Limited lands), a direct connection is made to the Montague Road / Highway 107 Interchange. A loop collector road is developed within the area with connections to adjacent road stubs.

3.3.2 Sandy Lake

Drawing 2A illustrates a potential generalized land use plan and road layout for the Sandy Lake study area. The study area covers approximately 361 hectares of land north of Hammonds Plains Road, adjacent to Sandy Lake.

It is assumed that the Farmer's Dairy plant will remain. The area between the plant and Hammonds Plains Road will maintain its industrial character complementing the development across the road in Atlantic Acres Industrial Park and the Farmer's Dairy Plant. The lands owned by the Seventh Day Adventist Church and Sandy Lake Developments south of Sandy Lake will be developed for residential. The lands to the west of Farmer's Dairy will be residential with commercial development and a transit hub occurring at the Kearney Lake Road / Hammonds Plains Road intersection.

A new collector road will enter the site from the existing Kearney Lake Road / Hammonds Plains Road intersection and loop through the site, coming back out utilizing the intersection at the existing entrance to Farmers Dairy (Farmer's Dairy Lane). A new collector road extends into the site from the existing Bluewater Road / Hammonds Plains Road intersection and connects to the new collector road looping through the site.

3.3.3 Highway 102 West Corridor

Drawing 3A illustrates a potential generalized land use plan and road layout for the Highway 102 West Corridor study area. The study area covers approximately 503 hectares with 268 hectares located adjacent to Highway 104 and 235 hectares further west (Area A and B respectively).

The Bayers Lake Business Park is located to the south of the study area. It is anticipated that commercial development will extend north in a corridor close to Highway 102, where businesses can take advantage of high visibility from the highway. A mix of commercial and business campus type development is expected. The remainder of the site is residential including a band extending around the southern end of Susie's Lake, where higher density residential could take advantage of lakefront views and proximity to retail developments in Bayer's Lake.

A collector road connection will be made into Bayer's Lake Business Park. Given land ownership in the area, this connection is shown at the Lacewood Drive / Chain Lake Drive intersection, although this location will have

challenges due to existing traffic congestion in the area. A roundabout may be appropriate for this connection.

The proposed internal collector road runs parallel to Highway 102 and a connection is made to Kearney Lake Road at the north end of the site. This northern connection also poses challenges due to the lack of space which will create the need for bridges over the lakes in the area and create difficulties in obtaining an appropriate distance between the new collector and the on-ramp onto Highway 102. A third connection into the site is anticipated to cross under Highway 102 from the Heathside Crescent / Parkland Drive intersection connecting to the north-south collector through the study area. Within the study area, a collector road loops through the area providing access throughout.

3.4 Transportation Infrastructure Requirements

Requirements and capital cost estimates have been produced for transportation infrastructure required to adequately address the projected traffic from each of the three study areas.

Costs for the internal road networks were calculated for the minor and major collector roads, based on costs to upsize from a minor urban road to a collector road, where appropriate.

Results from the QRSII modelling were used to determine required transportation upgrades on the extended road networks.

The assessments were based on a number of development scenarios:

A: Baseline Year 2026 with no development in the three study areas.

B: Baseline Year 2026 with development in the study areas. The population estimates used for the assessment are those contained in Table 2.4 – Development Growth – 2026 – Redistributed.

C: Ultimate build-out of each of three study areas. (Refer to Table 2.5 – Ultimate Population Projections)

The following sections are summaries of the results of the transportation infrastructure assessment.

3.4.1 Port Wallis Transportation Requirements

The study area for Port Wallis is divided into two sections, Area B west of Highway 107 and Area A north-east of the Highway. It is unlikely Area A will be developed before Area B because of servicing constraints as

explained in Chapters 4 and 5. Therefore the transportation assessment was based on Area B developing first and would continue to near full build-out before development began in Area A.

Primary links between the study area and the external transportation network include:

- Highway 118 to the north;
- Highway 107 - Forest Hills Parkway - Main Street in the south-east; and
- Waverley Road – Braemar Drive – Caledonia Road in the south-west.

A: Baseline Year 2026 – No Development in the Three Study Areas

Results of the analysis indicate the projected population growth in HRM, excluding the three study areas, to the year 2026 results in the following transportation network requirements in the vicinity of the study areas:

- Additional two lanes along Braemar Drive between the Mic Mac Parclo and Maple Drive (400 m).
- Additional two lanes along Main Street, between the Mic Mac Parclo and Caledonia Road/Woodlawn Avenue intersection (1100 m).
- Road widening along Prince Albert Road, between the Mic Mac Parclo and Celtic Drive.

The above transportation requirements are based on existing road infrastructure that will be only marginally over capacity by 2026 and therefore do not warrant the road widening.

B: Baseline Year 2026 – Development in Port Wallis Study Area

The transportation analysis with year 2026 development, including development in the Port Wallis Study Area, was based on the population projections shown in Table 2.4 applied to the HRM transportation network. Transportation infrastructure requirements for land internal to the study area were assessed based on population projections in Table 2.2 “Population Growth Based on 200 Units per Year”. Table 2.2 presents the 2026 population projection of 10,800 people for the Port Wallis Study Area B. The full build-out population for Area B is 14,000 people (Table 2.5). For the purposes of this study it is assumed the projected 2026 population is a close approximation of the full build-out of Area B. The following are results of the transportation analysis:

Network Requirements in the Vicinity of Port Wallis (2026)

- Extend Road Widening along Braemar Drive, from Maple Drive to Mic Mac Drive (600 m); and
- Construct Major Collector Road from Study Area east boundary to Forest Hills Parkway. This assumes the Highway 107 – Cherry Brook By-pass is constructed (1000 m). If the by-pass is not constructed

before 2026 and development proceeds in the Port Wallis Study area, then an interchange will be required where the major collector road servicing Port Wallis connects to Highway 107. (Interchange construction cost: $10 M - $12 M).

Internal Transportation Requirements (2026)

- Major Collector Roads- 3000 m;
- Minor Collector Roads – 2700 m;
- Roundabout at Montague Road / Collector Road Intersection; and
- Traffic signals at east collector road/Highway 107 (Forest Hills Parkway) intersection.

C: Ultimate Build-out – Port Wallis

The ultimate build-out population projection for Port Wallis is shown in Table 2.5. Population growth from 2026 to ultimate development occurs primarily in Area A of Port Wallis, resulting in a total population of 30,000 people (Area B + A). The following are results of the transportation analysis:

Network Requirements in the Vicinity of Port Wallis (Ultimate)

- Extend Road Widening along Braemar Drive, from Mic Mac Drive to Montebello Drive (550 m).

Internal Transportation Requirements (Ultimate)

- Major Collector Roads – 500 m; and
- Minor Collector Roads – 4,100 m.

3.4.2 Sandy Lake Transportation Requirements

The Sandy Lake Study Area is bounded to the south by Hammonds Plains Road and to the east by Sandy Lake. Primary transportation links within the vicinity of Sandy Lake Road include:

- Kearney Lake Road to the west;
- Highway 102 / Hammonds Plains Road Interchange to the east; and
- Two secondary links; Bluewater Road and the new entrance to Bedford West.

B: Baseline Year 2026 – No Development in the Three Study Areas

Results of the 2026 transportation analysis with no development in the three study areas indicate there is no additional infrastructure required, in the vicinity of the Sandy lake Study Area, primarily because transportation infrastructure upgrades and additions have already been accounted for as part of the Bedford West Capital Cost Contribution Study requirements.

B: Baseline Year 2026 – Development in the Sandy Lake Study Area

Population projections in Table 2.2 and 2.4 were used to carry out the transportation analysis to a similar methodology presented for the Port Wallis Study Area. The following are results of the transportation analysis:

Network Requirements in the Vicinity of Sandy Lake (2026)

- Continue Kearney lake Road Widening (2 additional lanes) from Bluewater Road to Hammonds Plains Road/Kearney Lake Road intersection (1600 m);
- Widen Hammonds Plains Road (2 additional lanes) from new entrance to Bedford West to proposed east entrance to Sandy Lake (800 m);
- Intersection improvements at Hammonds Plains Road / Kearney Lake Road intersection (re-alignment – lane widening); and
- Traffic signal upgrades at Hammonds Plains Road / Kearney Lake Road intersection.

Internal Transportation Requirements (2026)

- Minor Collector Roads – 6000 m; and
- Lane widening at Hammonds Plains Road / Bluewater Road / Sandy Lake east access intersection.

C: Ultimate Build-out – Sandy Lake

The projected build-out population for the Sandy Lake Study Area is not significantly greater than the projected 2026 population, therefore the required transportation infrastructure remains unchanged from that required for year 2026.

3.4.3 Highway 102 West Corridor Transportation Requirements

The Highway 102 West Corridor Study Area is bounded by Highway 102 to the east and Lacewood Drive / Bayers Lake Business Park to the south. Primary potential transportation links within the vicinity of the study area are:

- Lacewood Drive to the south;
- Kearney Lake Road to the north; and
- Parkland Drive to the east, on the east side of Highway 102.

A: Baseline Year 2026 – No Development in the Three Study Areas

Results of the transportation analysis indicate the projected population growth in HRM, excluding the three study areas, to the year 2026 results in no transportation network upgrades.

B: Baseline Year 2026 – Development in the Highway 102 West Corridor Study Area

Population projections in Table 2.2 and 2.4 were used to carry out the transportation analysis to a similar methodology presented for the Port

Wallis Study Area. The following are results of the transportation analysis:

Network Requirements in the Vicinity of the Highway 102 West Corridor Study Area (2026)

- Widen Bedford Highway (2 additional lanes) from Kearney Lake Road to Lodge Drive (1100 m);
- Roundabout at Lacewood Drive;
- Tunnel and access road under Highway 102 (400 m);
- Roundabout at Parkland Drive / Heathside Court intersection; and
- Bridge structure over Kearney Lake.

Internal Transportation Requirements (2026)

- Major Collector Roads – 3900 m;
- Minor Collector Roads – 2800 m; and
- Roundabout at internal intersection.

C: Ultimate Build-out – Highway 102 West Corridor

The ultimate build-out population projection for the Highway 102 West Corridor Study Area is shown in Table 2.5. Population growth from 2026 to ultimate build-out development occurs primarily in Area B of the study area, resulting in a total population of 23,000 people (Area A + B). The following are results of the transportation analysis for infrastructure required in addition to that required for Baseline Year 2026:

Internal Transportation Requirements (Ultimate)

- Minor Collector Roads – 5,300 m.

NOTES:

NORTH

STUDY AREAS	
A	350 hectares
B	317 hectares
TOTAL A & B	667 hectares

LEGEND:

- STUDY BOUNDARY
- POTENTIAL BOUNDARY
- WATER LINES
- SEWER LINES
- PROPOSED TRANSPORTATION ROUTE
- INLAND WATER ROUTES
- COASTAL WATER ROUTES
- TRANSIT ROUTES
- FUTURE TRANSIT ROUTES
- TRAILS
- FUTURE TRANSIT HUB
- PROPOSED RESIDENTIAL
- PROPOSED COMMERCIAL
- LAKES
- WETLAND AREAS & BUFFERS
- WETLAND/WATERCOURSE BUFFER

No.	Description	Date	By
A	DRAFT REVIEW	DEC.18/08	.

Revision or Issue

HALIFAX REGIONAL MUNICIPALITY
COST OF SERVICING ANALYSIS
REGIONAL PLANNING
GREENFIELD SITES

LAND USE AND TRANSPORTATION PLAN PORT WALLIS

CBCL LIMITED
Consulting Engineers
ISO 9001 CERTIFIED

Scale 1:10,000 (0 100 200 300 400 500m; 1:10,000)

Date	Drawn
FEBRUARY 2008	MS
Designed DNB	Checked	Approved DNB
Contract No 071065	Revision
Drawing No **1A**	

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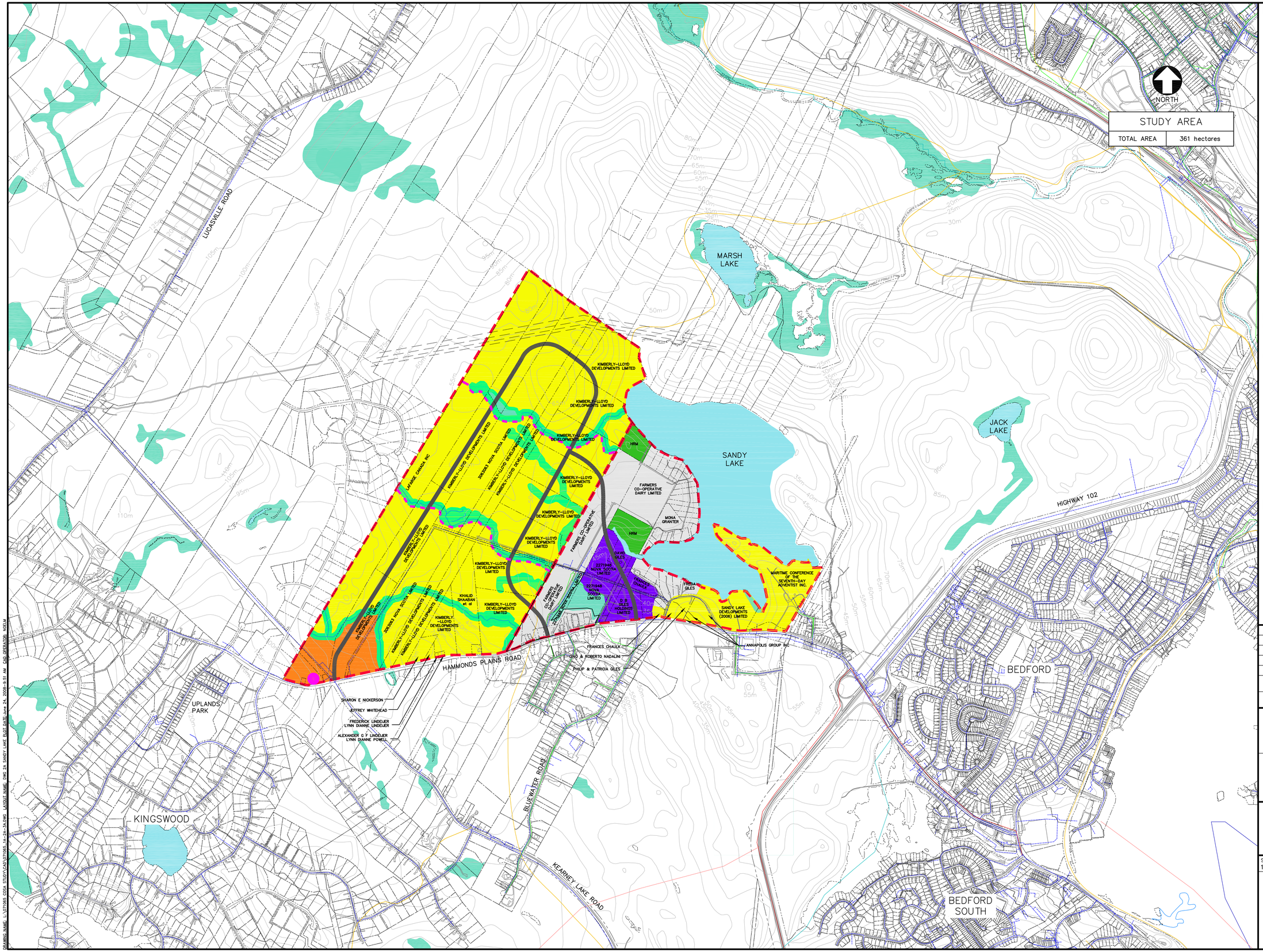

NOTES:

LEGEND:

- STUDY BOUNDARY
- PHASE BOUNDARY
- WATER LINES
- SEWER LINES
- PROPOSED TRANSPORTATION ROUTE
- INLAND WATER ROUTES
- COASTAL WATER ROUTES
- TRANSIT ROUTES
- FUTURE TRANSIT ROUTES
- TRAILS
- FUTURE TRANSIT HUB
- PROPOSED RESIDENTIAL
- PROPOSED COMMERCIAL
- PROPOSED INDUSTRIAL
- HRM LANDS
- EXISTING DEVELOPMENT
- LAKES
- WETLAND AREAS & BUFFERS
- WETLAND/WATERCOURSE BUFFER

No.	Description	Date	By
A	DRAFT REVIEW	DEC.18/08	.

Revision or Issue

HALIFAX REGIONAL MUNICIPALITY
COST OF SERVICING ANALYSIS
REGIONAL PLANNING
GREENFIELD SITES

LAND USE AND TRANSPORTATION PLAN SANDY LAKE

CBCL LIMITED
Consulting Engineers
ISO 9001 CERTIFIED

Scale 1:10,000
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Date	Drawn
FEBRUARY 2008	MS
Designed DNB	Checked	Approved DNB
Contract No 071065	Revision
Drawing No **2A**	

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KEARNEY LAKE ROAD

KEARNEY LAKE

BEDFORD SOUTH

NORTH

STUDY AREAS	
A	268 hectares
B	235 hectares
TOTAL A & B	503 hectares

CHARLIES LAKE

HEMLOCK RAVINE PARK

HAMSHAW DRIVE

BEDFORD BASIN

ARMCO CAPITAL 64 hectares

GATEWAY MATERIALS LTD. 4 hectares

GATEWAY MATERIALS LTD. 24 hectares

FOX LAKE

ARMCO CAPITAL 54 hectares

WASHMILL LAKE

A

PARKLAND DRIVE

WEDGEWOOD RAVINE

ANNAPOLIS GROUP INC. 145 hectares

B

QUARRY LAKE

GATEWAY MATERIALS LTD. 24 hectares

HIGHWAY 102

QUARRY/FUTURE LAKE

GATEWAY MATERIALS LTD. 20 hectares

DUNBRACK STREET

FUTURE BLUE MOUNTAIN–
BIRCH COVE LAKES
WILDERNESS AREA

PROVINCE OF NOVA SCOTIA

ANNAPOLIS GROUP INC. 93 hectares

PROVINCE OF NOVA SCOTIA

SISTERS OF CHARITY 53 hectares

SUSIE'S LAKE

CLAYTON PARK

LACEWOOD DRIVE

PROVINCE OF NOVA SCOTIA

BAYER'S LAKE BUSINESS PARK

FAIRVIEW

NOTES:

LEGEND:

- STUDY BOUNDARY
- POTENTIAL BOUNDARY
- WATER LINES
- SEWER LINES
- PROPOSED TRANSPORTATION ROUTE
- INLAND WATER ROUTES
- COASTAL WATER ROUTES
- TRANSIT ROUTES
- FUTURE TRANSIT ROUTES
- TRAILS
- PROPOSED RESIDENTIAL
- PROPOSED COMMERCIAL & HIGH DENSITY RESIDENTIAL
- LAKES
- WETLAND AREAS & BUFFERS
- WETLAND/WATERCOURSE BUFFER

No.	Description	Date	By
A	DRAFT REVIEW	DEC.18/08	.

Revision or Issue

HALIFAX REGIONAL MUNICIPALITY
COST OF SERVICING ANALYSIS
REGIONAL PLANNING
GREENFIELD SITES

LAND USE AND TRANSPORTATION PLAN
HIGHWAY 102 WEST CORRIDOR

CBCL LIMITED
Consulting Engineers
ISO 9001 CERTIFIED

Scale 1:10,000 (0 100 200 300 400 500m, 1:10,000)

Date	Drawn
FEBRUARY 2008	MS
Designed DNB / Checked / Approved DNB	
Contract No 071065	Revision
Drawing No **3A**	

DRAWING NAME: L:\071065 CGSA STUDY\CAD\071065_3A-24-34.DWG LAYOUT NAME: DWG 3A HIGHWAY 102 CORRIDOR PLOT DATE: June 24, 2008 - 9:51 AM CAD OPERATOR: NKELM

4.1 Water Supply Overview

The Cost of Servicing Study includes an analysis of water supply infrastructure requirements to provide a safe and reliable potable water system for each of the study areas. The analysis was carried out using Halifax Water's water system guidelines for water demands, service pressures and storage requirements. Computer hydraulic modelling was used to carry out the analysis, using population projections and proposed road networks developed for this study. Fire flow requirements for each of the study areas were based on residential and school fire flows of 4,000 LPM and 13,200 LPM, respectively (880 IGPM, 2,900 IGPM).

The demand allocations and hydraulic modelling were based on development scenarios similar to those presented in the Transportation Infrastructure Requirements – Section 3.4, with a change to development scenario "B". The following is a summary of the development scenarios used for the water supply infrastructure analysis:

A: Baseline Year 2026 with no development in the three study areas.

B: Baseline Year 2026 with development in the study areas. The population estimates used for the assessment are those contained in Table 2.2 – Population Growth Based on 200 Units per year.

C: Ultimate build-out of each of the three study areas. (Refer to Table 2.5 – Ultimate Population Projections).

Development Scenario "B" was adjusted to reflect the larger population projections in Table 2.2 because piped systems are typically sized for the largest population projection and installed up front, whereas most transportation infrastructure requirements can be installed as the population (and therefore traffic) approaches the restraint threshold.

4.2 Port Wallis Water Infrastructure Requirements

The Port Wallis Study area can be serviced from the existing East Region (Dartmouth) Water Supply System. The existing and proposed water system network is shown on Drawing 1B located at the end of Chapter 6. The existing Waverley Road / Port Wallis area is serviced by the East Region (Mount Edward) High Zone, with a hydraulic grade line of 119 m (390 ft), and links to the Mount Edward Road Reservoir (top water level = 119 m) and the Lake Major Water Treatment Plant transmission main. The

proposed water distribution system to service the Port Wallis Study Area can be fed by two (2) primary watermains:

- 600 mm diameter transmission main, located along Caledonia Road, through Shubie Park and along Highway 118 to Burnside and North Dartmouth; and
- 350 mm diameter watermain along Waverley Road.

A: Baseline Year 2026 – No Development in the Three Study Areas

Previous water master plan studies carried out for Halifax Water (formerly Halifax Regional Water Commission) indicated the existing 600 mm diameter water transmission main connecting the supply lines near Mount Edward Road / Main Street to Burnside / North Dartmouth will require portions to be twinned with a second 600 mm diameter transmission main. The twinning is required to ensure hydraulic grade line losses due to future demand growth does not reduce the capacity to feed the Akerley Reservoir in Burnside from the Mount Edward Road Reservoirs. Both the Akerley and Mount Edward Reservoirs are at the same top water level (TWL = 119 m).

Results of the analysis indicate that without development within the Port Wallis Study Area, the proposed 600 mm diameter transmission main twinning will be required after the year 2026. This is based on growth projections for Burnside and the assumption that no development will occur between Burnside and Bedford that may potentially be driven by construction a road link (Highway 107 extension).

B: Baseline Year 2026 – Development in Port Wallis Study Area

Population projections for the Port Wallis Study Area were based on Table 2.2 and, similar to the Transportation Analysis for Port Wallis, it is assumed the projected 2026 population is a close approximation of the full build-out of Area B, located west of Highway 107.

Water Infrastructure Requirements in the Vicinity of Port Wallis (2026)

- A few years before 2026, twinning of 600 mm diameter transmission main, Avenue du Portage to Dartmouth Crossing, including a tunnel section under the Shubenacadie Canal (2026); and
- 400 mm diameter watermain along existing Avenue de Portage to Caledonia Road (1,000 m).

Internal Water Infrastructure Requirements (2026)

- 400 mm diameter watermain (3,000 m)

C: Ultimate Build-out – Port Wallis

The analysis for ultimate build-out was carried out by adding the area north-east of Highway 107 (Area A). The watermain proposed in Area B would be extended to service Area A, along the proposed route for the

gravity sanitary sewer line. To provide looping, the proposed water distribution system in Area A can be connected to the existing 300 mm diameter main on Spider Lake Road.

As the Port Wallis Study Area approaches full build-out (Area A and B), a 6.8 ML (1.5 MIgal) water storage reservoir would be required to service the entire study area. It would be located on the high land as shown on Drawing 1B and would have a top water level of 119 m. The following is a summary of the additional water infrastructure required to service Port Wallis under the ultimate build-out scenario:

Water Infrastructure Requirements in the Vicinity of Port Wallis (Ultimate)

- Twinning of 600 mm diameter transmission main, Main Street to Avenue de Portage, through Halifax Water's Lake Lamont watershed (1,800 m).

Internal Water Infrastructure Requirements (Ultimate)

- 400 mm diameter watermain (3,500 m); and
- 6.8 ML water storage reservoir.

4.3 Sandy lake Water Infrastructure Requirements

The Sandy Lake Study Area can be serviced by providing pressure reduced connections to the adjacent Pockwock and Bedford Connector water transmission mains and as an extension to the proposed water distribution system for Bedford West. The existing and proposed water system network is shown on Drawing 2B located at the end of Chapter 6. At the west end of the Study Area, a pressure reduced connection from the 750 mm diameter Bedford Connector is proposed as part of the Bedford West water supply network. Service to Sandy Lake can be brought off the connection for Bedford West. On the east side of the study area, two (2) existing pressure reducing valve chambers off the Bedford Connector transmission main, one (1) on Giles Road and one (1) on Dairy Road, can be upgraded to provide service to Sandy Lake.

A: Baseline Year 2026 – No Development in the Three Study Areas

Future requirements for water supply infrastructure to service the proposed development other than Sandy Lake have been accounted for as part of the Bedford West water system master plan.

B: Baseline Year 2026 – Development in Sandy Lake Study Area

Population projections for the Sandy Lake Study Area were based on Table 2.2 which is based on a development rate of 200 units per year with three people per unit. The water assessment also included an analysis using the projected ultimate population of 16,000 people (Refer to Table 2.5).

Results of the analysis concludes the required water infrastructure is applicable to both the Baseline Year 2026 and Ultimate population projections.

As development in Sandy Lake approaches full build-out, a 3.9 ML (0.9 MIgal) water storage reservoir will be required to service a full developed Sandy lake Study Area. The reservoir could be located on high ground at the west end of the study area, and have a top water level of 107 m (350 ft). As a result, the Sandy Lake water service zone will be at the same hydraulic grade line as the adjacent land in Bedford West.

Internal Infrastructure Requirements (2026 and Ultimate)

- 400 mm diameter watermain (6,000 m);
- 3.9 ML water storage reservoir; and
- Existing pressure reducing chamber upgrades (2).

4.4 Highway 102 West Corridor Water Infrastructure Requirements

The Highway 102 West Corridor Study Area can be serviced by making connections to several water transmission and primary distribution mains in the vicinity. They are:

- 1,200 mm diameter Pockwock water transmission main on Kearney Lake Road, to the north of the Study Area;
- 750 mm diameter Mainland North water transmission main located east of Highway 102, along the Crown Road Reserve and multi-use trail; and
- 400 mm diameter watermain on Lacewood Drive, to the south of the Study Area.

The existing and proposed water system network is shown on Drawing 3B located at the end of Chapter 6. The existing distribution system consists of thee pressure zones:

- Geizer 158 High Zone (HGL = 158 m) to the south;
- Farnham Gate Intermediate Zone (HGL = 138 m); and
- Pockwock High Zone (HGL = 170 m) to the north on Kearney Lake Road and to the east in the Mainland North transmission main.

Several pressure zones will be created using pressure reducing valve chambers within the water distribution network.

A: Baseline Year 2026 – No Development in the Three Study Areas

Results of the hydraulic analysis indicate no significant water system upgrades are required within the existing distribution system that would require further upgrading when the Highway 102 West Corridor Study Area is developed.

B: Baseline Year 2026 – Development in the Highway 102 West Corridor Study Area

Population projections for the Highway 102 West Corridor Study Area were based on Table 2.2 and, similar to the Transportation Analysis for Port Wallis, it is assumed the projected 2026 population is a close approximation of the full build-out of Area A, located west of Highway 102.

Water Infrastructure Requirements in the Vicinity of Highway 102 West Corridor (2026)

- 400 mm diameter waterline extension from the 1,200 mm diameter Pockwock Transmission Main on Kearney Lake Road to the Study Area (350 m);
- 400 mm diameter waterline extension from Parkland Drive to the Study Area (350 m);
- 300 mm diameter watermain extension on Lacewood Drive (500 m); and
- Two pressure reducing valve chambers.

Internal Water Infrastructure Requirements (2026)

- 400 mm diameter watermain (5,800 m); and
- Two pressure reducing valve chambers.

C: Ultimate Build-out – Highway 102 West Corridor

The analysis for ultimate build-out for the study area was carried out by adding Area B, on the west side of the study area. As the Highway 102 West Corridor Study Area approaches full build-out (Area A and B), a 5.3 ML (1.2 MIgal) water storage reservoir would be required to service the entire area. It would be located on the high land as shown on Drawing 3B and would have a top water level of 137 m. The following is a summary of the additional water infrastructure required to service Highway 102 West Corridor under the ultimate build-out scenario:

Internal Water Infrastructure Requirements (Ultimate)

- 400 mm diameter watermain (2,000 m); and
- 5.3 ML water storage reservoir.

Chapter 5 Sanitary Servicing Infrastructure Analysis

5.1 Sanitary Servicing Overview

The Cost of Servicing Study includes an analysis of infrastructure required to provide sanitary services to each of the study areas. The analysis was carried out using HRM's "Red Book" design guidelines, including relevant design criteria for determining sanitary flows and sizing infrastructure to meet minimum and maximum pipeline velocities, pump station requirements and related items.

The sanitary sewage flows and service areas were based in a similar methodology presented for the water supply analysis (Section 4.1), including the following development scenarios:

A: Baseline Year 2026 with no development in the three study areas.

B: Baseline Year 2026 with development in the study areas. The population estimates used for the assessment are those contained in Table 2.2 – Population Growth Based on 200 Units per year.

C: Ultimate build-out of each of the three study areas. (Refer to Table 2.5 – Ultimate Population Projections).

Table 5.1 presents the calculated peak sanitary flows and relevant areas for each of the study areas.

Table 5.1 Ultimate Population – Sanitary Flows

Study Area		**Area** (hectares)	**Projected Projection** People per hectare 45 (people)	***Ultimate Sanitary Flow*** (Full Build-Out) *Based on HRM formula* (Litres/Sec.)
Port Wallis	Small Area (B)	317	15,000	*482*
	Total Area (A+B)	667	30,000	*922*
Sandy Lake	Total Area	361	16,000	*540*
Highway 102 West Corridor	Small Area (A)	268	12,000	*416*
	Total Area (A+B)	503	23,000	*722*

5.2 Port Wallis Sanitary Infrastructure Requirements

The Port Wallis Study Area was the subject of several sanitary servicing analysis, the latest being "North Dartmouth Trunk Sewer Study, CBCL Limited, June 2007" for HRM. Its study area included most of the Port Wallis area. Portions of the North Dartmouth Trunk Sewer have been

extended through Dartmouth Crossing and a final section of trunk sewer is presently being constructed downstream of Highway 111 in order to complete the pipeline from Dartmouth Cove to Dartmouth Crossing.

Two options exist for sanitary servicing of Port Wallis, one option with the sanitary trunk sewer on the east side of Lake Charles and crossing the Shubenacadie Canal / Highway 118 at the south end of Lake Charles and on to Dartmouth Crossing, and the other option consisting of the sanitary trunk sewer being directed around the north end of Lake Charles and along the west side of Lake Charles to Dartmouth Crossing.

The "North Dartmouth Trunk Sewer" Study investigated both options. The Study presented construction cost estimates for both:

- **Option 1**: Trunk Sewer from East Side Lake Charles, across south end of lake to Dartmouth Crossing - $68 M
- **Option 2**: Trunk Sewer around north end of Lake Charles and along west side of lake to Dartmouth Crossing - $81 M

In addition to the higher construction costs, Option 2 presents some challenges, including:

- It would be more feasible to have development begin at the north end of the Study Area to avoid constructing sewer infrastructure almost entirely around the east, north and west sides of Lake Charles in year one. However, from a planning perspective, landowners most likely would prefer to have development begin in the southern end of the study area.
- Installation of the trunk sewer along the west side of Highway 118, in Dartmouth Crossing lands presents challenges. Nova Scotia Transportation and Infrastructure Renewal typically require pipe infrastructure be installed outside of 100 series highway right-of-ways. As a result, the location of the trunk sewer will require rock excavation to depths of up to 7.5 m. Additional pumping or alternative routing along the Lake Charles Trail may be an option.
- For the north of Lake Charles option, the location of sewer infrastructure along or within the Highway ROW and under the Lake Charles outlet (Shubenacadie Canal) presents challenges.

Based on the above information, Option 1, locating the trunk sewer at the south end of Lake Charles, was selected for this study. The existing and proposed sanitary sewer system for Option 1 is shown on Drawing 1B located at the end of Chapter 6.

The proposed sanitary collection system generally consists of:

- Pump Station, forcemain and gravity sewer system in Area "A" (Conrads Pit area) flowing to Area "B".

- Gravity sewer in Area "B" flowing to the proposed Pump Station "A" (390 Waverley Road Pump Station).
- Dual forcemains from Pump Station "A" to Dartmouth Crossing, including tunnelling under the Shubenacadie Canal and carrier pipe crossing at Highway 118.

A: Baseline Year 2026 – No Development in the Three Study Areas

Sanitary infrastructure upgrading and expansions necessary to service the sewershed area for the North Dartmouth Trunk Sewer has been completed up to the north end of Wright Avenue in Dartmouth Crossing.

With no development in the Port Wallis Study Area, the North Dartmouth Trunk Sewer will have to be extended northward to service future land development in Burnside Industrial Park and Dartmouth Crossing.

B: Baseline Year 2026 – Development in Port Wallis Study Area

Population projections in Table 2.2 were used for sanitary servicing assessment and, similar to the Transportation Analysis for Port Wallis, it is assumed the projected 2026 population is a close approximation of the full build-out of Area B, lands located west of Highway 107.

Sanitary Infrastructure Requirements in the Vicinity of Port Wallis (2026)

- Pump Station "A"
- 500 mm and 350 mm dual forcemains, Pump Station "A" to Canal Crossing (1,300 m);
- Shubenacadie Canal Tunnelling with 1-500 mm and 1 – 350 mm forcemains (100 m);
- Highway 118 crossing with carrier pipes and 1-500 mm and 1-350 mm forcemains (90 m);
- Remaining 500 mm and 350 mm diameter forcemains to connect to the existing North Dartmouth Trunk Sewer in Dartmouth Crossing (255 m).

Internal Sanitary Infrastructure Requirements (2026)

- 375 mm diameter gravity sewer collection system, flowing to Pump Station "A" (3,000 m).

C: Ultimate Build-out – Port Wallis

The analysis for ultimate build-out for the study area was carried out by adding Area "A", on the east side of Highway 107 to Area "B". The proposed gravity sewer and pump station – forcemain will deliver sanitary flow to the collection system in Area "B" and development is assumed to occur after year 2026. Therefore, the infrastructure sized for Area "B" will require upsizing to provide for the additional flows for Area "A".

Sanitary Infrastructure in Area "B" with Upsizing

- 600 mm diameter gravity sewer Area "A" to Pump Station "A" (1,800 m);
- 375 mm diameter gravity sewer (1,200 m);
- Pump Station "A";
- 600 mm and 400 mm dual forcemains, Pump Station "A" to Canal Crossing (1,300 m);
- Shubenacadie Canal Tunnelling with 1-600 mm and 1-400 mm forcemains (100 m);
- Highway 118 crossing with carrier pipes and 1-600 mm and 1-400 mm forcemains (90 m); and
- Remaining 600 mm and 400 mm diameter forcemains to connect to the existing North Dartmouth Trunk Sewer in Dartmouth Crossing (255 m).

Internal Sanitary Infrastructure for Area "A" (Ultimate)

- Pump Station "B";
- Twin 350 mm diameter forcemains Pump Station "B" to high point (1,200 m);
- 375 mm diameter gravity sewer (1,800 m); and
- 600 mm diameter gravity sewer (1,000 m), to Area "B".

5.3 Sandy Lake Infrastructure Requirements

The Sandy Lake Study Area is located north of the Bedford West Development, which has had a detailed assessment of the capacity of existing sanitary infrastructure in the surrounding area. As a result of the assessment, sizes and layouts of sanitary infrastructure for full development of Bedford West have been documented.

Two options exist for sanitary servicing of the Sandy Lake Study Area. One is to direct sanitary flows to the existing gravity sewer on Hammonds Plains Road, which flows to the existing Mill Cove Sewage Treatment Plant. The other is to direct sanitary flows towards the Halifax Sewage Treatment Plant through planned sanitary infrastructure in Bedford West. Areas within Bedford West (Area 3 and 1) are to be serviced by the existing gravity line on Hammonds Plains Road. The servicing strategy for directing Bedford West flows to Mill Cove include utilizing the existing Twin Cities Dairy Pump Station with a planned pump upgrade.

The calculated peak sanitary flow from a fully developed Sandy Lake Study Area is 540 L/s. The existing and estimated Bedford West flows to Hammonds Plains Road total approximately 490 L/s, resulting in a total flow of just over 1,000 L/s if flows from Sandy Lake were directed to Mill Cove. The 1,000 L/s flow would require significant pipeline upsizing (replacement) along most of the length of existing sewer on Hammonds

Plains Road (approximately 1,950 m of 600 mm ϕ and 750 mm ϕ replacement pipe). The total cost to direct the Sandy Lake sanitary flows to Mill Cove is approximately $4.3 M, including a new pump station. The total cost to direct the Sandy Lake sanitary flows through Bedford West to the Halifax system is approximately $3.4 M, including a new pump station. The ultimate capacity of the Mill Cove Sewage Treatment Plant is presently under review as a result of recent, more detailed flow measurements.

For the purposes of this study, based on the above information, the option to direct sanitary flows from Sandy Lake to Halifax has been advanced and presented for the comparative analysis with the other two study areas.

Drawing 2B, located at the end of Chapter 6, shows the existing and proposed sanitary infrastructure for the Sandy Lake Study Area. For servicing Sandy Lake, the sanitary collection system for the majority of the developable land can flow to a pump station located on low land near the Dairy Road / Hammonds Plains Road, with forcemains directing pumped flows through Bedford West's Area 12 to the high point on Bluewater Road. Area 12 sanitary flows can be directed by gravity to the proposed pump station in the Sandy Lake Study Area.

As a result, sanitary flows from Sandy Lake and Area 12 of Bedford West will be conveyed through the sanitary infrastructure in Bedford West that delivers flows to the Kearney Lake Road trunk sewer and Bedford Tunnel. Upsizing of the Bedford West sanitary trunk sewer infrastructure will be required.

A second option for diverting sanitary flow from Sandy Lake to Halifax is to have the gravity flow from Sandy Lake go to the proposed pump station (with upsizing) that is located in Area 12 of Bedford West.

The first option, locating the pump station in Sandy Lake, allows for the possible option to temporarily direct flows, in the initial stages of development, to the Hammonds Plains Road gravity sewer. The first option has been advanced and presented for the comparative analysis with the other two study areas.

The analysis for sanitary servicing of the Sandy Lake Study Area was carried out using a similar methodology used for the other study areas.

A: Baseline Year 2026 – No Development in the Three Study Areas

The Bedford West Development has gone through the Capital Cost Contribution analysis and portions of land have been approved for development (Secondary Development Phase). Sanitary infrastructure has been sized to service Bedford West and some adjacent lands. The

infrastructure requirements include pipe upsizing of the existing trunk sewer along the lower end of Kearney Lake Road.

For the purposes of this study, it is assumed the Bedford West sanitary infrastructure will be constructed and, if sanitary flows from Sandy Lake are directed through Bedford West, only the infrastructure upsizing required to service Sandy Lake will be accounted for in this study. The analysis assumes no development in the Highway 102 West Corridor Study Area, which could also have flows going through the lower end of the Kearney Lake Road trunk sewer.

B: Baseline Year 2026 – Development in Sandy Lake Study Area

Population projections were based on Table 2.2 and, as previously indicated, the projected 2026 population is a close approximation of the full build-out projections for the entire study area. The total peak sanitary flow form Sandy Lake is 540 L/s.

Sanitary Infrastructure Requirements in the Vicinity of Sandy lake (2026 – Ultimate)

- One 500 mm and one 350 mm diameter forcemain from Sandy Lake pump station to high point Bluewater Road (625 m upsizing in Area 12 in Bedford West, 650 m remaining);
- Upsize 450 mm diameter gravity sewer to 600 diameter from Bluewater Road to pump station #1 (Bedford West) (1,752 m);
- Upsize pump station #1 Bedford West;
- Upsize 2-500 diameter forcemains to 2-600 diameter, pump station #1 to high point near Larry Uteck Interchange (1,300 m);
- Upsize gravity sewer, high point to pump station #2, 675 diameter to 750 diameter (590 m);
- Upsize pump station #2;
- Upsize 2-500 diameter forcemains to 2-600 diameter, pump station #2 to high point on Kearney Lake Road (1,200 m); and
- Upsize Kearney Lake Road trunk sewer:
  - 600 diameter to 750 diameter (420 m);
  - 750 diameter to 900 diameter (119 m); and
  - 900 diameter to 1050 diameter (550 m).

Internal Sanitary Infrastructure Requirements (2026)

- Sandy Lake Pump Station;
- 450 diameter gravity sewer (500 m); and
- 375 diameter gravity sewer (1,000 m).

5.4 Highway 102 West Corridor Infrastructure Requirements

The Highway 102 West Corridor Study Area can be provided with sanitary service by directing sanitary flows to the existing sanitary trunk sewer along Wedgewood Ravine and the lower end of Kearney Lake Road. The existing and proposed sanitary infrastructure is shown on Drawing 3B, located at the end of Chapter 6.

The proposed sanitary collection system generally consists of:

- Internal sanitary collection system, including pump station and forcemain at the west end of the study area, in Area "B".
- Trunk sewer from the study area, across Highway 102 is a tunnel (new bridge), and connecting to the existing trunk sewer at Wedgewood Ravine.
- Replacement (for upsizing) of the Wedgewood Ravine trunk sewer up to the Kearney lake Road trunk sewer.
- Upsizing of the Kearney Lake Road trunk sewer over and above that required to service Bedford West (assumes no development in the Sandy Lake Study Area).

The calculated peak sanitary flows for Area A and Area B, respectively, are 416 L/s and 306 L/s for a total of 722 L/s for a fully developed study area.

A: Baseline Year 2026 – No Development in the Three Study Areas

As indicated in Section 5.3 "Sandy Lake Sanitary Infrastructure Requirements", the existing sanitary trunk sewer along Kearney Lake Road will be upsized (replaced) in order to accommodate flows from the Bedford West Development. Only further pipe upsizing required as a result of directing flows from the Highway 102 West Corridor Study Area to the trunk sewer will be used to calculate development costs for this study.

B: Baseline Year 2026 – Development in Highway 102 West Corridor Study Area

Population projections were based on Table 2.2 and, as previously indicated, the projected 2026 population is a close approximation of the full build-out of Area "A". The total peak sanitary flow from the Highway 102 West Corridor Study Area is 416 L/s.

Sanitary Infrastructure Requirements in the Vicinity of Highway 102 West Corridor (2026)

- 600 diameter gravity sewer, study area – under Highway 102 to existing Wedgewood Ravine Trunk Sewer (350 m); and
- Replace 450 diameter sanitary with 600 diameter (290 m) along Wedgewood Ravine trunk sewer (lower end).
- Kearney lake Road trunk sewer:

- Upsize 600 diameter to 750 diameter (420 m);
- Upsize 750 diameter to 900 diameter (119 m); and
- Upsize 900 diameter to 1050 diameter (550 m).

Internal Sanitary Infrastructure Requirements (2026)

- 375 diameter gravity sewer (3600 m);
- 450 diameter gravity sewer (500 m); and

C: Ultimate Build-out – Highway 102 West Corridor

The analysis for ultimate build-out was carried out by adding Area "B", on the west side of the study area, to Area "A". The proposed sanitary collection system for Area "B" is an extension of the proposed system for Area "A", with approximate infrastructure upsizing for the downstream portions of the collection system.

Sanitary Infrastructure in the Vicinity of Highway 102 West Corridor

- 600 diameter gravity sewer, study area – under Highway 102 to existing Wedgewood Ravine Trunk Sewer (350 m);
- Wedgewood Ravine Trunk Sewer:
  - Upsize 450 diameter to 750 diameter (lower end 290 m); and
  - Upsize 675 diameter to 750 diameter (upper end 410 m).
- Kearney Lake Road Trunk Sewer:
  - Upsize 600 diameter to 900 diameter (420 m);
  - Upsize 750 diameter to 1050 diameter (119 m); and
  - Upsize 900 diameter to 1050 diameter (550 m).

Internal Sanitary Infrastructure Requirements (2026)

- Area B Pump Station;
- Twin 350 mm diameter forcemains Pump Station "B" to high point(700 m)
- 375 diameter gravity sewer (6,000 m);
- 450 diameter gravity sewer (1,500 m); and
- 600 diameter gravity sewer (500 m).

Chapter 6 Cost Comparative Analysis

6.1 Overview

Tables 1.0, 2.0, and 3.0, located at the end of this chapter, are summaries of infrastructure construction costs for each of the three study areas for the two development scenarios, Baseline – Year 2026 and Ultimate Development. The estimates are based on results of the infrastructure needs assessment and the general layouts presented in the Drawings at the end of this chapter.

The construction cost estimates were produced based on the following assumptions and background information.

- Estimates do not include taxes, engineering, or interest/escalation and are based on 2008 construction costs.
- Internal transportation, water, and sanitary infrastructure costs for new development have been based on upsizing infrastructure from that which an individual developer would install for their development to infrastructure which is required to service the entire study area. Key upsizing criteria are:
  - ***Highway:*** Minor Collector Road upsized from urban local roads and Major Collector Roads upsized from minor collector roads;
  - ***Water Infrastructure:*** Upsizing from a 300 mm diameter watermain; and
  - ***Sanitary Infrastructure:*** Upsizing from a 250 mm diameter sanitary collection system.
- Cost estimates do not include wastewater treatment or regional stormwater infrastructure. The ultimate capacity of existing regional wastewater treatment plants is presently under review. It is assumed stormwater facilities will be managed on-site or will be addressed when detailed Capital Cost Contribution studies and master plans are completed.
- Cost estimates do not include improvements to the Highway 102 Interchanges at Lacewood Drive, Kearney Lake Road and Hammonds Plains Road.

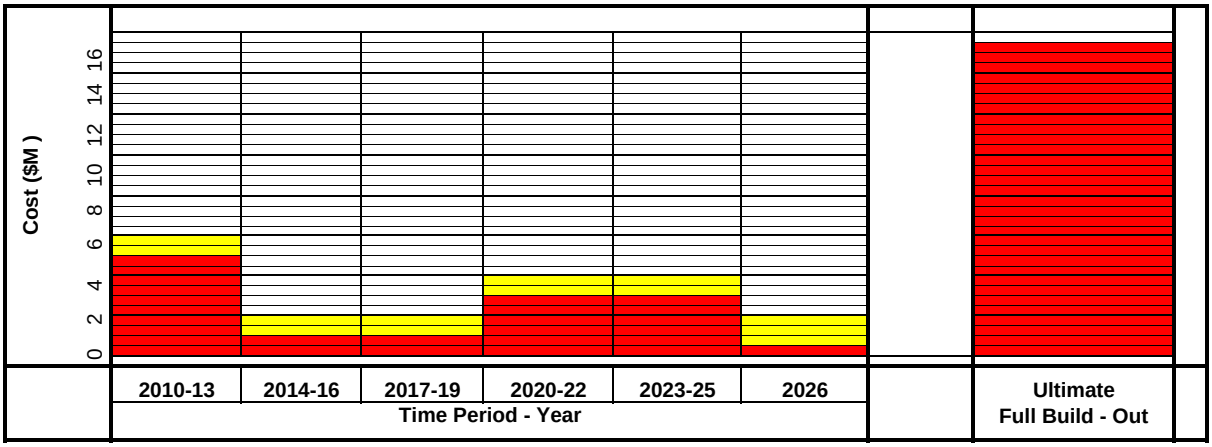
6.2 Cost Comparative Analysis

Tables 1.0, 2.0, and 3.0 present breakdowns of costs as well as overall study area costs for each of the three study areas. The tables also include an estimated timeline for each of the infrastructure items.

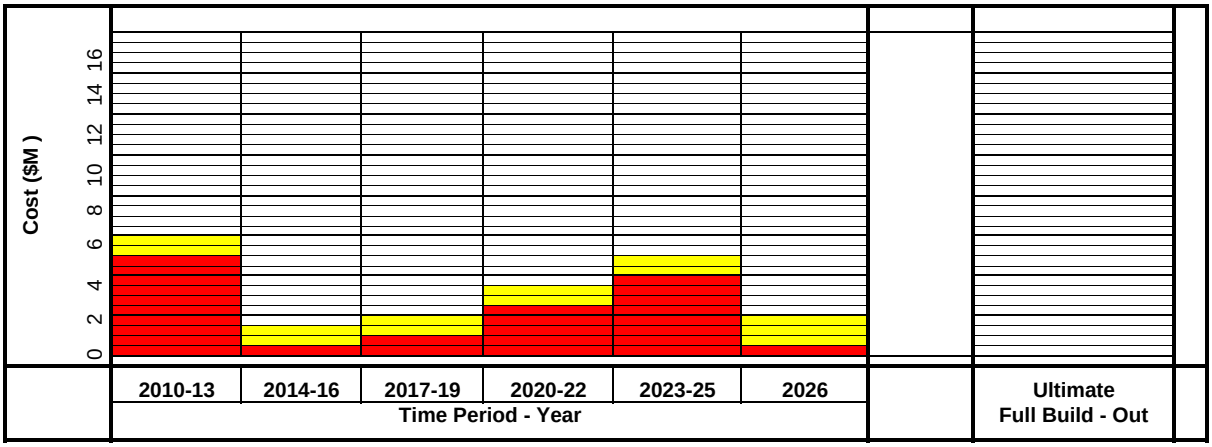
Table 6.1 presents a graphical summary of costs for each of the study areas and the relative timeline and estimated cost expenditure for the Baseline-

Table 6.1 Construction Cost / Timeline for Three Study Areas

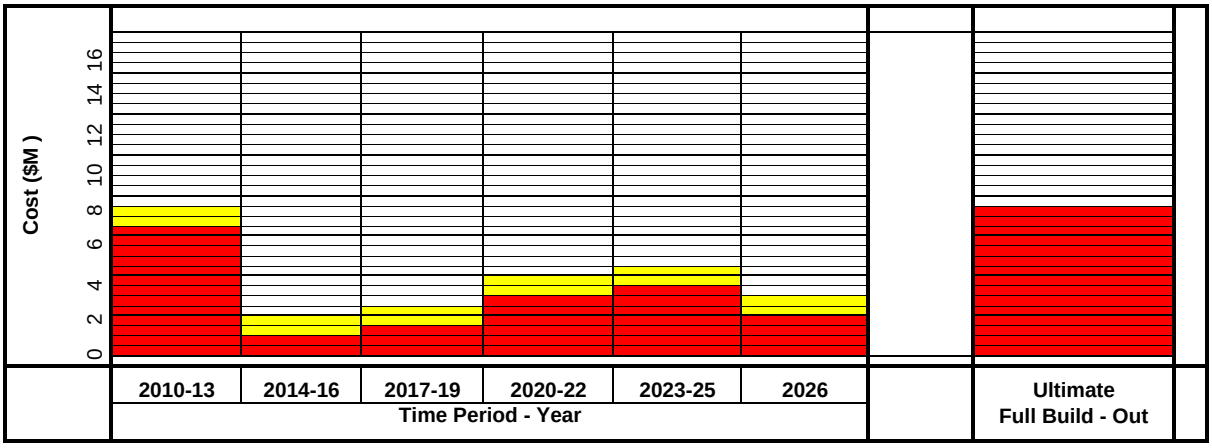
Port Wallace



Sandy Lake



Highway 102 West Corridor



Operation and Maintenance costs

Capital Costs

Year 2026 development scenario. The total ultimate build-out cost is also presented.

Table 6.2 presents the cost per unit area summary of the three study areas. This table is presented to assist in the comparative analysis because of the variation in land area.

Table 6.2 Infrastructure Cost Summary – Cost Per Unit Area

Scenario	Port Wallis	Sandy Lake	HWY 102 West Corridor
Baseline Year 2026			
Infrastructure Cost	$13,749,000	$13,012,400	$14,304,250
Developed Area (hectares)	317	361	268
Cost per Unit Area ($ / ha)	**$43,370** (Area B)	**$36,050** (Full Build – Out)	**$53,380** (Area A)
Full Development (Ultimate)			
Infrastructure Cost (Area A + B)	$23,234,500		$21,147,150
Developed Area (hectares)	667		503
Cost per Unit Area ($ / ha)	**$34,850** (Area A plus B)		**$42,050** (Area A plus B)

Important considerations for a comparative analysis of the three study areas are:

Port Wallis

- Significant infrastructure required at the beginning of development.
- Development growth will be dependent on construction of the proposed Highway 107 "Cherry Brook" bypass in order to allow construction of the south access from the study area to Forest Hills Parkway.
- As development growth advances, traffic on Waverley Road and Main Street will be a constraint unless residents make use of the Highway 107/Highway 118 Highway connection to Burnside and Halifax.
- Development in the Study Area will require construction of the 600 mm diameter watermain twinning at an earlier time, however, the cost of the watermain is not presented as it is regional infrastructure.

Sandy Lake

- Development of the study area relies on construction of a significant amount of infrastructure through the Bedford West Development. A significant amount of the Bedford West infrastructure is slated for

construction over the next few years, however, for areas at the northern end of Bedford West (Area 12 etc), development timing is not known.

Highway 102 West Corridor

- At the beginning of development, the sanitary connection to the Wedgewood Ravine trunk sewer will have to be constructed, along with the road tunnel (bridge) under Highway 102.
- It has been assumed that at the beginning of construction, the road network will have to include at least two connections to the adjacent transportation network. This study presents the option of constructing the Lacewood Drive and Parkland Road access roads first. The Parkland Road access road would be constructed at the same time as the sanitary sewer connection to the Wedgewood Ravine trunk sewer.

6.3 Operation and Maintenance Costs

Operation and Maintenance costs over the next 25 years have been calculated for the infrastructure required for each of the three study areas. The methodology and assumptions used are those that CBCL have provided for similar studies for HRM, and in particular the " North Dartmouth Trunk Sewer Study – 2007". The following is a brief outline of the key assumptions:

Transportation

- Operating and maintenance costs allow for annual repairs, crack sealing, patching, etc - $1,300 annual per lane per kilometre
- Asphalt resurfacing required twice within the 2026 time frame. Costs include allowances for raising manhole covers and valve boxes, and a 40 mm thick lift of asphalt.
- Snow removal allowance - $2700 annual per lane per kilometre

Water and Sanitary Servicing

- The design life (replacement time) for watermain and sanitary sewers - 100 years
- The design life for sanitary forcemains - 50 years
- The design life for pump stations is 25 years, therefore costs are included for pump replacement in the year 2026 (60% of Capital Cost)
- Pump Station annual operating and maintenance costs based on pump capacity and power costs of $0.10 per kilowatt/hour.
- Annual operating and maintenance costs for buried pipework - $10 per metre length of pipe ($2 per metre for pipe upsizing).
- Annual repair costs 1.0% of capital costs for buried pipes, 2.0% of capital cost for pump stations

Table 6.1 includes the estimated operation and maintenance costs for the infrastructure. Tables 4 to 9 present life cycle costs for each of the study areas to the year 2026. The operating and maintenance costs were calculated based on the above assumptions. Only two items are included that involve replacement or rehabilitation costs:

- Sanitary pumps and related mechanical and electrical equipment will be replaced in 2026.
- All roads to receive 40 mm asphalt lift two times within the 2026 time frame.

All remaining infrastructure have a design life greater than the 2026 time frame, as indicated above.

Table 6.3 presents a summary of the total life cycle costs for the infrastructure to the year 2026.

Table 6.3 2026 Life Cycle Cost Comparison

Study Area	Capital Cost	2026 O&M & Replacement Costs	Total Life Cycle Costs - 2026
Port Wallis			
Area "B"			
Transportation	$9,010,000	$1,935,000	$10,945,000
Water	$600,000	$192,000	$792,000
Sanitary Services	$4,139,000	$4,569,440	$8,708,440
Totals	**$13,749,000**	**$6,696,440**	***$20,445,440***
Sandy Lake			
Transportation	$6,170,000	$1,455,200	$7,625,200
Water	$3,255,000	$584,000	$3,839,000
Sanitary Services	$3,587,400	$4,219,471	$7,806,871
Totals	**$13,012,400**	**$6,258,671**	***$19,271,071***
Highway 102 West Corridor			
Area "A"			
Transportation	$10,650,000	$2,567,000	$13,217,000
Water	$2,960,000	$1,005,200	$3,965,200
Sanitary Services	$1,444,250	$443,748	$1,887,998
Totals	**$15,054,250**	**$4,015,948**	***$19,070,198***

Cost of Servicing Analysis Regional Planning Greenfield Sites

Table 1.0 *Port Wallis* Transportation - Water - Sanitary Infrastructure Requirements (FEB 2-09)

Development Scenario	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Cost
Transportation							
Baseline - Year 2026			**Area "B"**				
	2023 - 25	T1	Braemar Dr Widening,Maple to Mic Mac Dr.	m	600	$3,500	$2,100,000
	2020 - 22	T2	Maj. Collector, Study Area to Hwy 107	m	1000	$2,500	$2,500,000
	2010 - 26	T3	Major Collector (Upsizing)	m	3000	$900	$2,700,000
	2010 - 26	T4	Minor Collector (Upsizing)	m	2700	$300	$810,000
	2014 - 16	T5	Roundabout	each	1	$750,000	$750,000
	2020 - 22	T6	Traffic Signals at Hwy 107	each	1	$150,000	$150,000
		T7					$0
		T8					$0
			Area "B" Transportation Baseline 2026 Sub-Total				*$9,010,000*
Ultimate Development			**Area "A"**				
		T1	Braemar Dr Widening, Mic Mac Dr to Montebello	m	550	$3,500	$1,925,000
		T2	Major Collector (Upsizing)	m	500	$900	$450,000
		T3	Minor Collector (Upsizing)	m	4100	$300	$1,230,000
		T4					$0
		T5					$0
		T6					$0
		T7					$0
			Area "A" Transportation Ultimate Sub-Total				*$3,605,000*
			Area "A + B" Transportation Total				**$12,615,000**

Development Scenario	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Cost
Water Supply							
			Area "B"				
	N/A	W1	600 dia WM Twinning, Ave de Port.To Dart Cross	m	2600	$0	$0
	2010 - 26	W2	400 dia WM (Upsizing)	m	3000	$200	$600,000
		W3					$0
		W4					$0
		W5					$0
		W6					$0
		W7					$0
		W8					$0
			Area "B" Water Supply Baseline 2026 Sub-Total				*$600,000*
			Area "A"				
		W1	600 dia WM Twinning, Main St to Ave de Port.	m	1800	$0	$0
		W2	400 dia WM (Upsizing)	m	3500	$200	$700,000
		W3	Water Storage Reservoir (6.8ML, 1.5 Migal)	ML	6.8	$450,000	$3,060,000
		W4					$0
		W5					$0
		W6					$0
		W7					$0
			Area "A" Water Supply Ultimate Sub-Total				*$3,760,000*
			Area "A+B" Water Supply Total				**$4,360,000**

Development Scenario	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Cost
Sanitary Servicing							
			Area "B"				
	2010 - 13	S1	Pump Sta. "A"	each	1	$1,800,000	$1,800,000
	2010 - 13	S2	500 & 350 dia Forcemains,PS "A" to Canal Crossing	m	1300	$900	$1,170,000
	2010 - 13	S3	500 & 350 dia Forcemains and Canal Crossing (Tunnel)	m	100	$5,000	$500,000
	2010 - 13	S4	500 & 350 dia Forcemains & Hwy 118 Crossing (Carrier)	m	90	$1,000	$90,000
	2010 - 13	S5	500 & 350 dia Forcemains to Dartmouth Crossing	m	255	$800	$204,000
	2010 - 26	S6	350 dia Gravity Sewer (Upsizing)	m	3000	$125	$375,000
		S7					$0
		S8					$0
			Area "A" Sanitary Servicing Baseline 2026 Sub-Total				*$4,139,000*
			Area "A" and "B"				
		S1	Pump Sta. "A"	each	1	$1,800,000	$1,800,000
		S2	600 & 400 dia Forcemains,PS "A" to Canal Crossing	m	1300	$1,000	$1,300,000
		S3	600 & 400 dia Forcemains and Canal Crossing (Tunnel)	m	100	$6,000	$600,000
		S4	600 & 400 dia Forcemains & Hwy 118 Crossing (Carrier)	m	90	$500	$45,000
		S5	600 & 400 dia Forcemains to Dartmouth Crossing	m	255	$900	$229,500
		S6	375 dia Gravity Sewer (Upsizing)	m	3000	$125	$375,000
		S7	600 dia Gravity Sewer (Upsizing) Area "B" to PS "A"	m	1000	$600	$600,000
		S8	Pump Station "B"	each	1	$800,000	$800,000
		S9	Twin 350 dia Forcemains, PS "B" to High Point	m	1200	$425	$510,000
			Area "A+B" Sanitary Servicing Ultimate Sub-Total				*$6,259,500*
			Area "A+B" Sanitary Servicing Total				**$6,259,500**

***Ultimate: Port Wallis* Transportation - Water - Sanitary Total Servicing Cost** **$23,234,500**

Table 2.0 *Sandy Lake* Transportation - Water - Sanitary Infrastructure Requirements

Development Scenario	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Cost
Transportation							
Baseline - Year 2026 (Ultimate)	2023 - 25	T1	Kearney Lk Rd Widening, Bluewater Rd to HPR	m	1600	$1,200	$1,920,000
	2020 - 22	T2	Hammonds Pl Rd Widening, ext from Bed West	m	800	$2,000	$1,600,000
	2010 - 13	T3	Intersection Improvements, HPR / KLR	each	1	$200,000	$200,000
	2010 - 13	T4	Traffic Signals Upgrades, HPR / KLR	each	1	$150,000	$150,000
	2010 - 26	T5	Minor Collector (upsizing)	m	6000	$300	$1,800,000
	2017 - 19	T6	Lane Widening, HPR / Blue Water / Sandy Lk Int.	each	1	$500,000	$500,000
		T7					$0
		T8					$0
			Transportation Ultimate Sub-Total				*$6,170,000*
			Transportation Total				**$6,170,000**

Development Scenario	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Cost
Water Supply							
	2010 - 26	W1	400 dia WM (upsizing)	m	6000	$200	$1,200,000
	2023 - 25	W2	Water Storage Reservoir (3.9ML, 0.9 Migal)	ML	3.9	$450,000	$1,755,000
	2010 - 26	W3	Pressure Reducing Valve Chambers	each	2	$150,000	$300,000
		W4					$0
		W5					$0
		W6					$0
		W7					$0
		W8					$0
			Water Supply Ultimate Sub-Total				*$3,255,000*
			Water Supply Total				**$3,255,000**

Development Scenario	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Cost
Sanitary Servicing							
	2010 - 13	S1	500 &350 dia Forcemain, Sandy Lk PS to Area 12	m	650	$850	$552,500
	2010 - 13	S2	500 &350 dia Forcemain, Thru Area 12 to Bluewater (Upsize from Bed W	m	625	$200	$125,000
			(Upsizing 1-350 to 500 Forcemain)				
	2010 - 13	S3	Upsize 450 dia to 600 dia gravity, Bluewater to PS #1 in BW	m	1752	$200	$350,400
	2010 - 13	S4	Upsize PS#1 in Bedford West	each	1	$200,000	$200,000
	2010 - 13	S5	Upsize 2-500 dia Forcemains to 2-600, PS #1 near Larry Uteck	m	1300	$250	$325,000
	2010 - 13	S6	Upsize 675 dia gravity to 750 dia, High Pt to PS#2	m	590	$225	$132,750
	2010 - 13	S7	Upsize PS #2	each	1	$200,000	$200,000
	2010 - 13	S8	Upsize 2-500 dia Forcemains to 2-600, PS#2 to High Pt on KLR	m	1200	$250	$300,000
	2020 - 22	S9	Upsize KLR Trunk Sewer: 600 dia to 750 dia	m	420	$225	$94,500
	2020 - 22	S10	750 dia to 900 dia	m	119	$250	$29,750
	2020 - 22	S11	900 dia to 1050 dia	m	550	$300	$165,000
	2010 - 13	S12	Sandy Lake Pump Station	each	1	$900,000	$900,000
	2010 - 22	S13	450 dia gravity Sewer (Upsizing)	m	500	$175	$87,500
	2010 - 26	S14	375 dia gravity sewer (Upsizing)	m	1000	$125	$125,000
			Sanitary Servicing Ultimate Sub-Total				*$3,587,400*
			Ultimate Sanitary Servicing Total				**$3,587,400**

***Ultimate: Sandy Lake* Transportation - Water - Sanitary Total Servicing Cost** **$13,012,400**

Table 3.0 *Highway 102 West Corridor* Transportation - Water - Sanitary Infrastructure Requirements

Development Scenario	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Cost
Transportation							
Baseline - Year 2026			**Area "A"**				
	2010 - 13	T1	Roundabout - Lacewood Dr	each	1	$750,000	$750,000
	2010 - 13	T2	Tunnel Under Hwy 102 (Bridge)	each	1	$2,500,000	$2,500,000
	2010 - 13	T3	Access Rd Through Tunnel	m	400	$2,000	$800,000
	2010 - 13	T4	Roundabout - Parkland Dr	each	1	$750,000	$750,000
	2010 - 26	T5	Major Collector (Upsizing)	m	3900	$900	$3,510,000
	2010 - 26	T6	Minor Collector (Upsizing)	m	2800	$300	$840,000
	2020 - 22	T7	Bridge Structure over Kearney Lake	each	1	$1,500,000	$1,500,000
		T8					
		T9					
			Area "A" Transportation Baseline 2026 Sub-Total				*$10,650,000*
Ultimate Development			**Area "B"**				
		T1	Minor Collector (Upsizing)	m	5300	$300	$1,590,000
		T2					$0
		T3					$0
		T4					$0
		T5					$0
		T6					$0
		T7					$0
			Area "B" Transportation Ultimate Sub-Total				*$1,590,000*
			Area "A + B" Transportation Total				**$12,240,000**

Development Scenario	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Cost
Water Supply							
			Area "A"				
	2020 - 22	W1	400 dia WM, KLR to North End Study Area	m	350	$1,000	$350,000
	2010 - 13	W2	400 dia WM, Parkland Dr to East Study Area	m	350	$1,000	$350,000
	2010 - 13	W3	400 dia WM, Lacewood Dr to South Study Area	m	500	$1,000	$500,000
	2010 - 13	W4	Pressure Reducing Valve Chambers	each	2	$150,000	$300,000
	2010 - 26	W5	400 dia WM (Upsizing)	m	5800	$200	$1,160,000
	2010 - 26	W6	Pressure Reducing Valve Chambers	each	2	$150,000	$300,000
		W7					$0
		W8					$0
		W9					$0
			Area "A" Water Supply Baseline 2026 Sub-Total				*$2,960,000*
			Area "B"				
		W1	400 dia WM (Upsizing)	m	2000	$200	$400,000
		W2	Water Storage Reservoir (5.3ML, 1.2 Migal)	ML	5.3	$450,000	$2,385,000
		W3					$0
		W4					$0
		W5					$0
		W6					$0
		W7					$0
			Area "B" Water Supply Ultimate Sub-Total				*$2,785,000*
			Area "A+B" Water Supply Total				**$5,745,000**

Development Scenario	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Cost
Sanitary Servicing							
			Area "A"				
	2010 - 13	S1	600 dia gravity, study area to Wedgewood Trunk (Hwy 102 x-ing)	m	350	$700	$245,000
	2017 - 19	S2	Replace 450 dia with 600 dia gravity in Wedgewood Trunk Sewer	m	290	$750	$217,500
			Upsize Kearney Lk Rd Trunk Sewer:				$0
	2020 - 22	S3	600 dia to 750 dia.	m	420	$225	$94,500
	2020 - 22	S4	750 dia to 900 dia.	m	119	$250	$29,750
	2020 - 22	S5	900 dia to 1050 dia	m	550	$300	$165,000
	2010 - 26	S6	375 dia gravity sewer (Upsizing)	m	3600	$175	$630,000
	2010 - 26	S7	450 dia gravity sewer (Upsizing)	m	500	$125	$62,500
		S8					$0
			Area "A" Sanitary Servicing Baseline 2026 Sub-Tota				*$1,444,250*
			Area "A" and "B"				
		S1	600 dia gravity, study area to Wedgewood Trunk (Hwy 102 x-ing)	m	350	$700	$245,000
			Wedgewood Ravine Trunk Sewer:				$0
		S2	Replace 450 dia to 750 dia (lower end)	m	290	$850	$246,500
		S3	Replace 675 dia to 750 dia (upper end)	m	410	$850	$348,500
			Upsize Kearney Lk Rd Trunk Sewer:				$0
		S4	600 dia to 900 dia.	m	420	$400	$168,000
		S5	750 dia to 1050 dia.	m	119	$350	$41,650
		S6	900 dia to 1050 dia	m	550	$300	$165,000
		S7	375 dia gravity sewer (Upsizing)	m	6000	$125	$750,000
		S8	600 dia gravity sewer (Upsizing)	m	500	$200	$100,000
		S9	Area "B' Pump Station	each	1	$800,000	$800,000
		S10	Twin 350 dia Forcemains, PS "B" to High Point	m	700	$425	$297,500
			Area "A+B" Sanitary Servicing Ultimate Sub-Tota				*$3,162,150*
			Ultimate Sanitary Servicing Total				**$3,162,150**

***Ultimate: Highway 102 West Corridor* Transportation - Water - Sanitary Total Servicing Cost** **$21,147,150**

Table 4.0 ***Port Wallis*** **Infrastructure Operation & Maintenaance Costs - Transportation**

Development Scenario	Transportation							Operational Costs				Total 2026 Life Cycle Cost (Including Initial Capital)
	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Capital Cost	No. of Years	Annual Maintenance and Repair	O&M Costs to 2026	40mm Overlay	
Baseline - Year 2026			**Area "B"**									
	2023 - 25	**T1**	Braemar Dr Widening,Maple to Mic Mac Dr.	m	600	$3,500	$2,100,000	3	$4,800	$14,400	$57,600	$2,172,000
	2020 - 22	**T2**	Maj. Collector, Study Area to Hwy 107	m	1000	$2,500	$2,500,000	6	$16,000	$96,000	$192,000	$2,788,000
	2010 - 26	**T3**	Internal Major Collector (Upsizing)	m	3000	$900	$2,700,000	16	$24,000	$384,000	$576,000	$3,660,000
	2010 - 26	**T4**	Internal Minor Collector (Upsizing)	m	2700	$300	$810,000	16	$10,800	$172,800	$259,200	$1,242,000
	2014 - 16	**T5**	Roundabout	each	1	$750,000	$750,000	12	$7,500	$90,000	$90,000	$930,000
	2020 - 22	**T6**	Traffic Signals at Hwy 107	each	1	$150,000	$150,000	6	$500	$3,000	N/A	$153,000
			Area B Transportation Baseline 2026 Sub-Total				***$9,010,000***			***$760,200***	***$1,174,800***	***$10,945,000***

Table 5.0 ***Sandy Lake*** **Infrastructure Operation & Maintenaance Costs - Transportation**

Development Scenario	Transportation							Operational Costs				Total 2026 Life Cycle Cost (Including Initial Capital)
	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Capital Cost	No. of Years	Annual Maintenance and Repair	O&M Costs to 2026	40mm Overlay	
Baseline - Year 2026 (Ultimate)												
	2023 - 25	**T1**	Kearney Lk Rd Widening, Bluewater Rd to HPR	m	1600	$1,200	$1,920,000	3	$12,800	$38,400	$153,600	$2,112,000
	2020 - 22	**T2**	Hammonds Pl Rd Widening, ext from Bed West	m	800	$2,000	$1,600,000	6	$6,400	$38,400	$76,800	$1,715,200
	2010 - 13	**T3**	Intersection Improvements, HPR / KLR	each	1	$200,000	$200,000	16	$2,000	$32,000	$48,000	$280,000
	2010 - 13	**T4**	Traffic Signals Upgrades, HPR / KLR	each	1	$150,000	$150,000	16	$188	$3,000	N/A	$153,000
	2010 - 26	**T5**	Internal Minor Collector (upsizing)	m	6000	$300	$1,800,000	16	$24,000	$384,000	$576,000	$2,760,000
	2017 - 19	**T6**	Lane Widening, HPR / Blue Water / Sandy Lk Int.	each	1	$500,000	$500,000	9	$5,000	$45,000	$60,000	$605,000
			Transportation Ultimate Sub-Total				***$6,170,000***			***$540,800***	***$914,400***	***$7,625,200***

Table 6.0 ***Highway 102 West Corridor*** **Infrastructure Operation & Maintenaance Costs - Transportation**

Development Scenario	Transportation - Capital Costs							Operational Costs				Total 2026 Life Cycle Cost (Including Initial Capital)
	Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Capital Cost	No. of Years	Annual Maintenance and Repair	O&M Costs to 2026	40mm Overlay	
Baseline - Year 2026			**Area "A"**									
	2010 - 13	**T1**	Roundabout - Lacewood Dr	each	1	$750,000	$750,000	16	$5,000	$80,000	$120,000	$950,000
	2010 - 13	**T2**	Tunnel Under Hwy 102 (Bridge)	each	1	$2,500,000	$2,500,000	16	$6,250	$100,000	N/A	$2,600,000
	2010 - 13	**T3**	Access Rd Through Tunnel	m	400	$2,000	$800,000	16	$6,400	$102,400	$153,600	$1,056,000
	2010 - 13	**T4**	Roundabout - Parkland Dr	each	1	$750,000	$750,000	16	$7,500	$120,000	$180,000	$1,050,000
	2010 - 26	**T5**	Internal Major Collector (Upsizing)	m	3900	$900	$3,510,000	16	$31,200	$499,200	$748,800	$4,758,000
	2010 - 26	**T6**	Internal Minor Collector (Upsizing)	m	2800	$300	$840,000	16	$11,200	$179,200	$268,800	$1,288,000
	2020 - 22	**T7**	Bridge Structure over Kearney Lake	each	1	$1,500,000	$1,500,000	6	$2,500	$15,000	N/A	$1,515,000
			Area A Transportation Baseline 2026 Sub-Total				***$10,650,000***			***$1,095,800***	***$1,471,200***	***$13,217,000***

Table 7.0 *Port Wallis* Infrastructure Operation and Maintenance Costs - Water and Sanitary

(Feb 2-09)

Water Supply

Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	CapitalCost	No. of Years	Annual Maintenance and Repair	O&M Costs to 2026	Total 2026 Life Cycle Cost (Including Initial Capital)
		Area "B"								
N/A	**W1**	600 dia WM Twinning, Ave de Port.To Dart Cross	m	2600	$0	$0				
2010 - 26	**W2**	400 dia WM (Upsizing)	m	3000	$200	$600,000	16	$12,000	$192,000	$792,000
	W3									
	W4									
		Area "B" Water Supply Total				**$600,000**		$12,000	**$192,000**	**$792,000**

Sanitary Servicing

Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Capital Cost	No. of Years	Annual Maintenance and Repair	Pump Annual Operating Costs	2026 Year Total O&M	2026 year Pump Replacement	Total 2026 Life Cycle Cost (Including Initial Capital)
		Area "B"										
2010 - 13	**S1**	Pump Sta. "A"	each	1	$1,800,000	$1,800,000	16	$36,000	$115,000	$2,416,000	$1,080,000	$5,296,000
2010 - 13	**S2**	500 & 350 dia Forcemains,PS "A" to Canal Crossing	m	1300	$900	$1,170,000	16	$24,700		$395,200		$1,565,200
2010 - 13	**S3**	500 & 350 dia Forcemains and Canal Crossing (Tunnel)	m	100	$5,000	$500,000	16	$6,000		$96,000		$596,000
2010 - 13	**S4**	500 & 350 dia Forcemains & Hwy 118 Crossing (Carrier)	m	90	$1,000	$90,000	16	$1,800		$28,800		$118,800
2010 - 13	**S5**	500 & 350 dia Forcemains to Dartmouth Crossing	m	255	$800	$204,000	16	$4,590		$73,440		$277,440
2010 - 26	**S6**	350 dia Gravity Sewer (Upsizing)	m	3000	$125	$375,000	16	$9,750		$480,000		$855,000
	S7					$0						
	S8					$0						
		Area "B" Sanitary Servicing Total				**$4,139,000**		$82,840	$115,000	**$3,489,440**	**$1,080,000**	***$8,708,440***

Table 8.0 *Sandy Lake* Infrastructure Operation and Maintenance Costs - Water and Sanitary

Water Supply

Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Capital Cost	No. of Years	Annual Maintenance and Repair	O&M Costs to 2026	Total 2026 Life Cycle Cost (Including Initial Capital)
2010 - 26	**W1**	400 dia WM (upsizing)	m	6000	$200	$1,200,000	16	$24,000	$384,000	$1,584,000
2023 - 25	**W2**	Water Storage Reservoir (3.9ML, 0.9 Migal)	ML	3.9	$450,000	$1,755,000	4	$10,000	$40,000	$1,795,000
2010 - 26	**W3**	Pressure Reducing Valve Chambers	each	2	$150,000	$300,000	16	$10,000	$160,000	$460,000
	W4									
	W5									
		Water Supply Total				**$3,255,000**		$44,000	**$584,000**	**$3,839,000**

Sanitary Servicing

Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Capital Cost	No. of Years	Annual Maintenance and Repair	Pump Annual Operating Costs	25 Year Total O&M	25 year Pump Replacement	Total 2026 Life Cycle Cost (Including Initial Capital)
2010 - 13	**S1**	500 &350 dia Forcemain, Sandy Lk PS to Area 12	m	650	$850	$552,500	16	$12,025		$192,400		$744,900
2010 - 13	**S2**	500 &350 dia Forcemain, Thru Area 12 to Bluewater (Upsize from Bed We	m	625	$200	$125,000	16	$2,500		$40,000		$165,000
		(Upsizing 1-350 to 500 Forcemain)										$0
2010 - 13	**S3**	Upsize 450 dia to 600 dia gravity, Bluewater to PS #1 in BW	m	1752	$200	$350,400	16	$7,008		$112,128		$462,528
2010 - 13	**S4**	Upsize PS#1 in Bedford West	each	1	$200,000	$200,000	16	$4,000	$20,000	$384,000	$120,000	$704,000
2010 - 13	**S5**	Upsize 2-500 dia Forcemains to 2-600, PS #1 near Larry Uteck	m	1300	$250	$325,000	16	$5,850		$93,600		$418,600
2010 - 13	**S6**	Upsize 675 dia gravity to 750 dia, High Pt to PS#2	m	590	$225	$132,750	16	$2,508		$40,120		$172,870
2010 - 13	**S7**	Upsize PS #2	each	1	$200,000	$200,000	16	$4,000	$30,000	$544,000	$120,000	$864,000
2010 - 13	**S8**	Upsize 2-500 dia Forcemains to 2-600, PS#2 to High Pt on KLR	m	1200	$250	$300,000	16	$5,400		$86,400		$386,400
2020 - 22	**S9**	Upsize KLR Trunk Sewer: 600 dia to 750 dia	m	420	$225	$94,500	6	$1,785		$10,710		$105,210
2020 - 22	**S10**	750 dia to 900 dia	m	119	$250	$29,750	6	$536		$3,213		$32,963
2020 - 22	**S11**	900 dia to 1050 dia	m	550	$300	$165,000	6	$7,150		$42,900		$207,900
2010 - 13	**S12**	Sandy Lake Pump Station	each	1	$900,000	$900,000	16	$18,000	$95,000	$1,808,000	$540,000	$3,248,000
2010 - 22	**S13**	450 dia gravity Sewer (Upsizing)	m	500	$175	$87,500	16	$1,875		$30,000		$117,500
2010 - 26	**S14**	375 dia gravity sewer (Upsizing)	m	1000	$125	$125,000	16	$3,250		$52,000		$177,000
		Sanitary Servicing Total				**$3,587,400**		$75,886	$145,000	**$3,439,471**	**$780,000**	***$7,806,871***

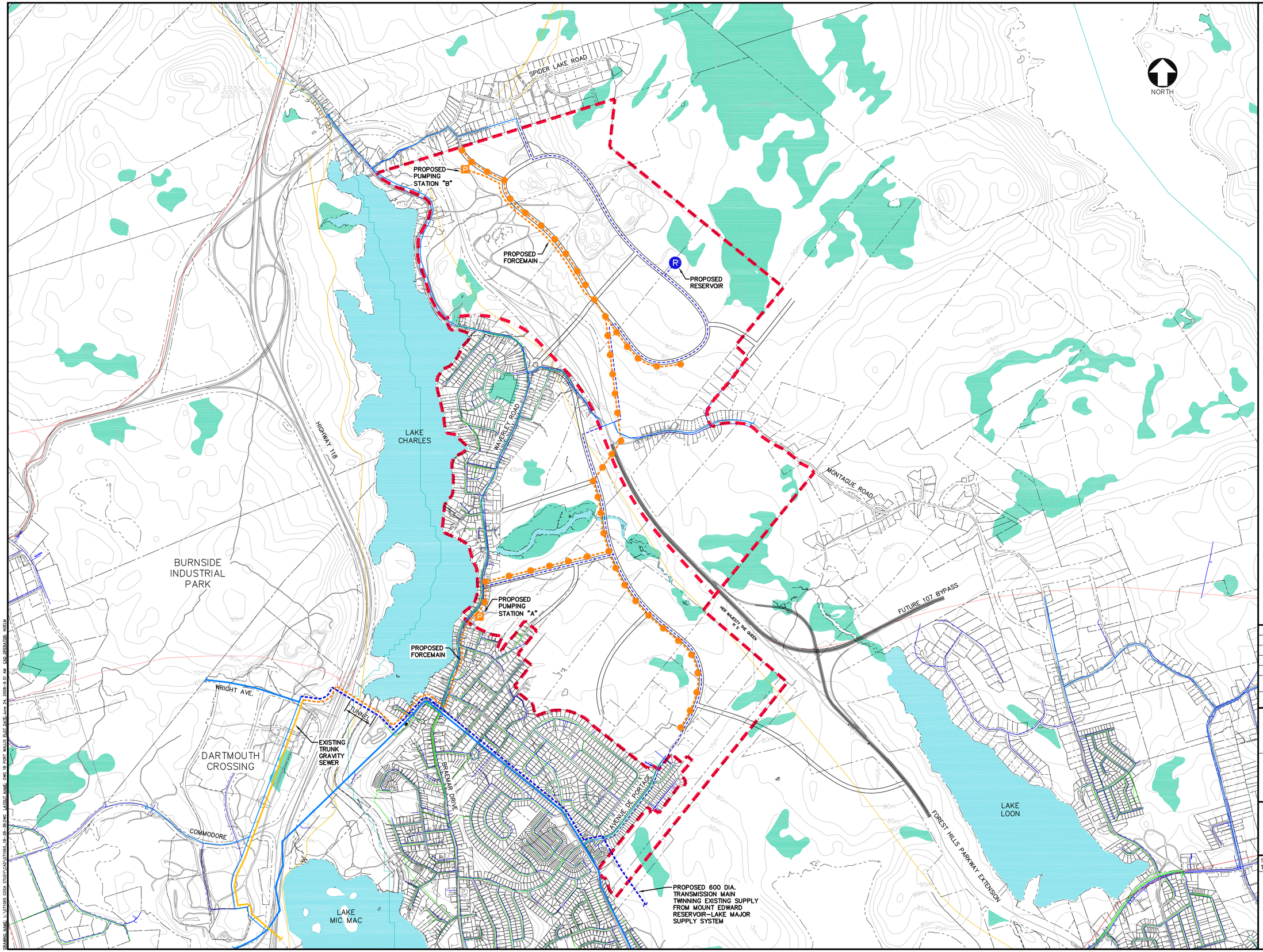
Table 9.0 *Highway 102 West Corridor* Infrastructure Operation and Maintenance Costs

Water Supply

Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Capital Cost	No. of Years	Annual Maintenance and Repair	O&M Costs to 2026	Total 2026 Life Cycle Cost (Including Initial Capital)
		Area "A"								
2020 - 22	**W1**	400 dia WM, KLR to North End Stusy Area	m	350	$1,000	$350,000	6	$7,000	$42,000	$392,000
2010 - 13	**W2**	400 dia WM, Parkland Dr to East Study Area	m	350	$1,000	$350,000	16	$7,000	$112,000	$462,000
2010 - 13	**W3**	400 dia WM, Lacewood Dr to South Study Area	m	500	$1,000	$500,000	16	$10,000	$160,000	$660,000
2010 - 13	**W4**	Pressure Reducing Valve Chambers	each	2	$150,000	$300,000	16	$10,000	$160,000	$460,000
2010 - 26	**W5**	400 dia WM (Upsizing)	m	5800	$200	$1,160,000	16	$23,200	$371,200	$1,531,200
2010 - 26	**W6**	Pressure Reducing Valve Chambers	each	2	$150,000	$300,000	16	$10,000	$160,000	$460,000
	W7					$0				
	W8					$0				
		Area "A" Water Supply Total				**$2,960,000**		**$67,200**	**$1,005,200**	**$3,965,200**

Sanitary Servicing

Time Frame	Item No.	Item Description	Unit	Length / Item No.	Unit Rate	Capital Cost	No. of Years	Annual Maintenance and Repair	Pump Annual Operating Costs	25 Year Total O&M	25 year Pump Replacement	Total 2026 Life Cycle Cost (Including Initial Capital)
		Area "A"										
2010 - 13	**S1**	600 dia gravity, study area to Wedgewood Trunk (Hwy 102 x-ing)	m	350	$700	$245,000	16	$5,950		$95,200		$340,200
2017 - 19	**S2**	Replace 450 dia with 600 dia gravity in Wedgewood Trunk Sewer	m	290	$750	$217,500	15	$5,075		$76,125		$293,625
		Upsize Kearney Lk Rd Trunk Sewer:										$0
2020 - 22	**S3**	600 dia to 750 dia.	m	420	$225	$94,500	6	$1,785		$10,710		$105,210
2020 - 22	**S4**	750 dia to 900 dia.	m	119	$250	$29,750	6	$536		$3,213		$32,963
2020 - 22	**S5**	900 dia to 1050 dia	m	550	$300	$165,000	6	$2,750		$16,500		$181,500
2010 - 26	**S6**	375 dia gravity sewer (Upsizing)	m	3600	$175	$630,000	16	$13,500		$216,000		$846,000
2010 - 26	**S7**	450 dia gravity sewer (Upsizing)	m	500	$125	$62,500	16	$1,625		$26,000		$88,500
	S8					$0						
		Area "A" Sanitary Servicing Total				**$1,444,250**		$31,221		**$443,748**		***$1,887,998***



NOTES:

LEGEND:

- STUDY AREA
- PROPOSED GRAVITY SANITARY SEWER
- EXISTING GRAVITY SANITARY SEWER
- PROPOSED FORCEMAIN
- PROPOSED SANITARY PUMPING STATION
- EXISTING SANITARY PUMPING STATION
- PROPOSED SANITARY MANHOLE
- EXISTING SANITARY MANHOLE
- PROPOSED WATERMAIN
- EXISTING WATERMAIN
- PROPOSED RESERVOIR
- EXISTING RESERVOIR
- PROPOSED PRESSURE REDUCING VALVE CHAMBER
- EXISTING PRESSURE REDUCING VALVE CHAMBER

No.	Description	Date	By
A	DRAFT REVIEW	DEC.18/08	.

Revision or Issue

HALIFAX REGIONAL MUNICIPALITY
COST OF SERVICING ANALYSIS
REGIONAL PLANNING
GREENFIELD SITES

SERVICING

PORT WALLIS

CBCL LIMITED
Consulting Engineers
ISO 9001 CERTIFIED

Scale 1:10,000 (0 100 200 300 400 500m; 1:10,000)

Date FEBRUARY 2008			Drawn N.H.M.
Designed DNB	Checked		Approved DNB
Contract No 071065			Revision

Drawing No 1B

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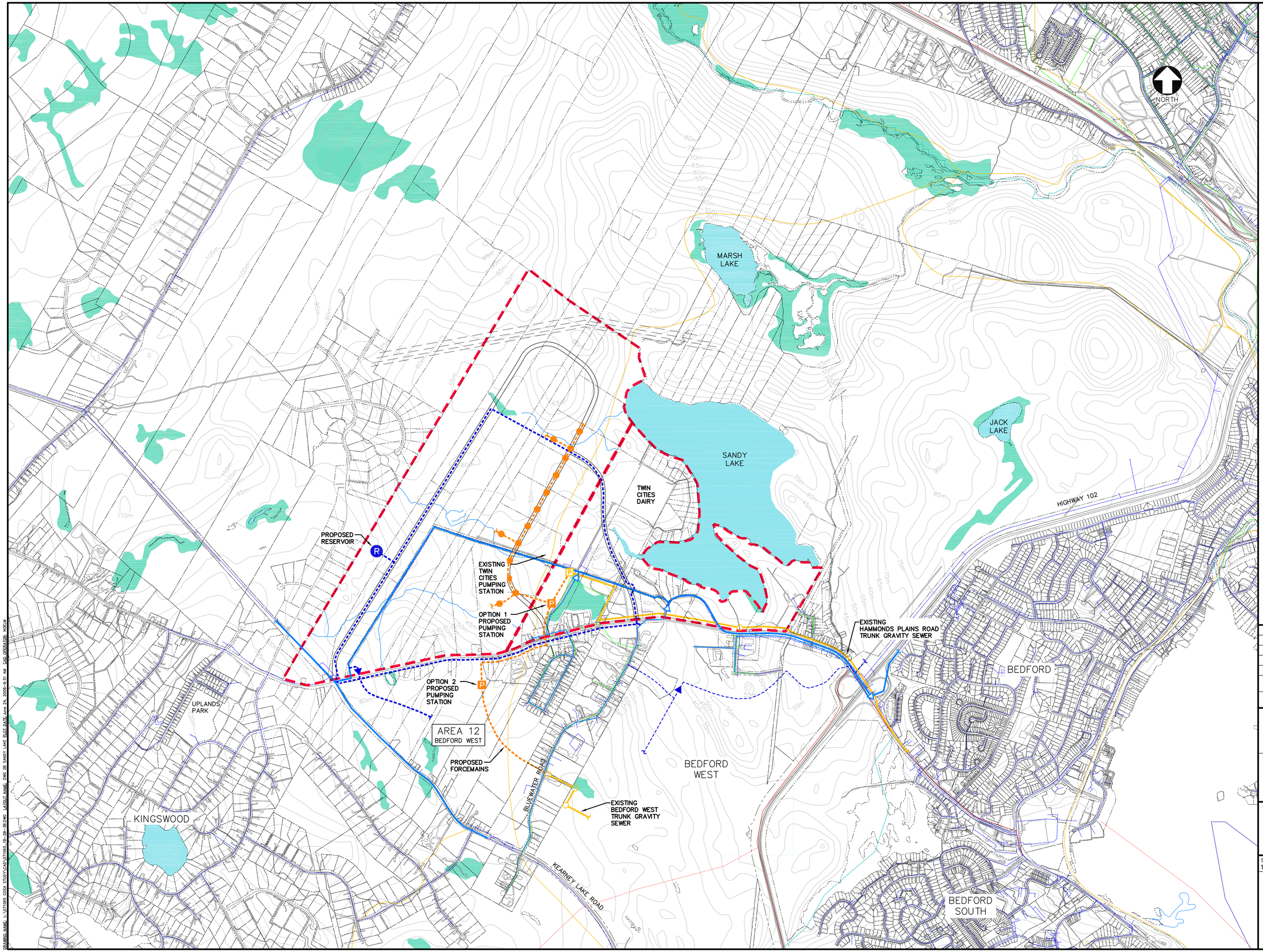

NOTES:

LEGEND:

- STUDY AREA
- PROPOSED GRAVITY SANITARY SEWER
- EXISTING GRAVITY SANITARY SEWER
- PROPOSED FORCEMAIN
- PROPOSED SANITARY PUMPING STATION
- EXISTING SANITARY PUMPING STATION
- PROPOSED SANITARY MANHOLE
- EXISTING SANITARY MANHOLE
- PROPOSED WATERMAIN
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- PROPOSED RESERVOIR
- EXISTING RESERVOIR
- PROPOSED PRESSURE REDUCING VALVE CHAMBER
- EXISTING PRESSURE REDUCING VALVE CHAMBER

No.	Description	Date	By
A	DRAFT REVIEW	DEC.18/08	.

Revision or Issue

HALIFAX REGIONAL MUNICIPALITY
COST OF SERVICING ANALYSIS
REGIONAL PLANNING
GREENFIELD SITES

SERVICING

SANDY LAKE

CBCL LIMITED
Consulting Engineers
ISO 9001 CERTIFIED

Scale 1:10,000 (0 100 200 300 400 500m)

Date	Drawn
FEBRUARY 2008	MS
Designed DNB / Checked / Approved DNB	
Contract No 071065	Revision
Drawing No **2B**	

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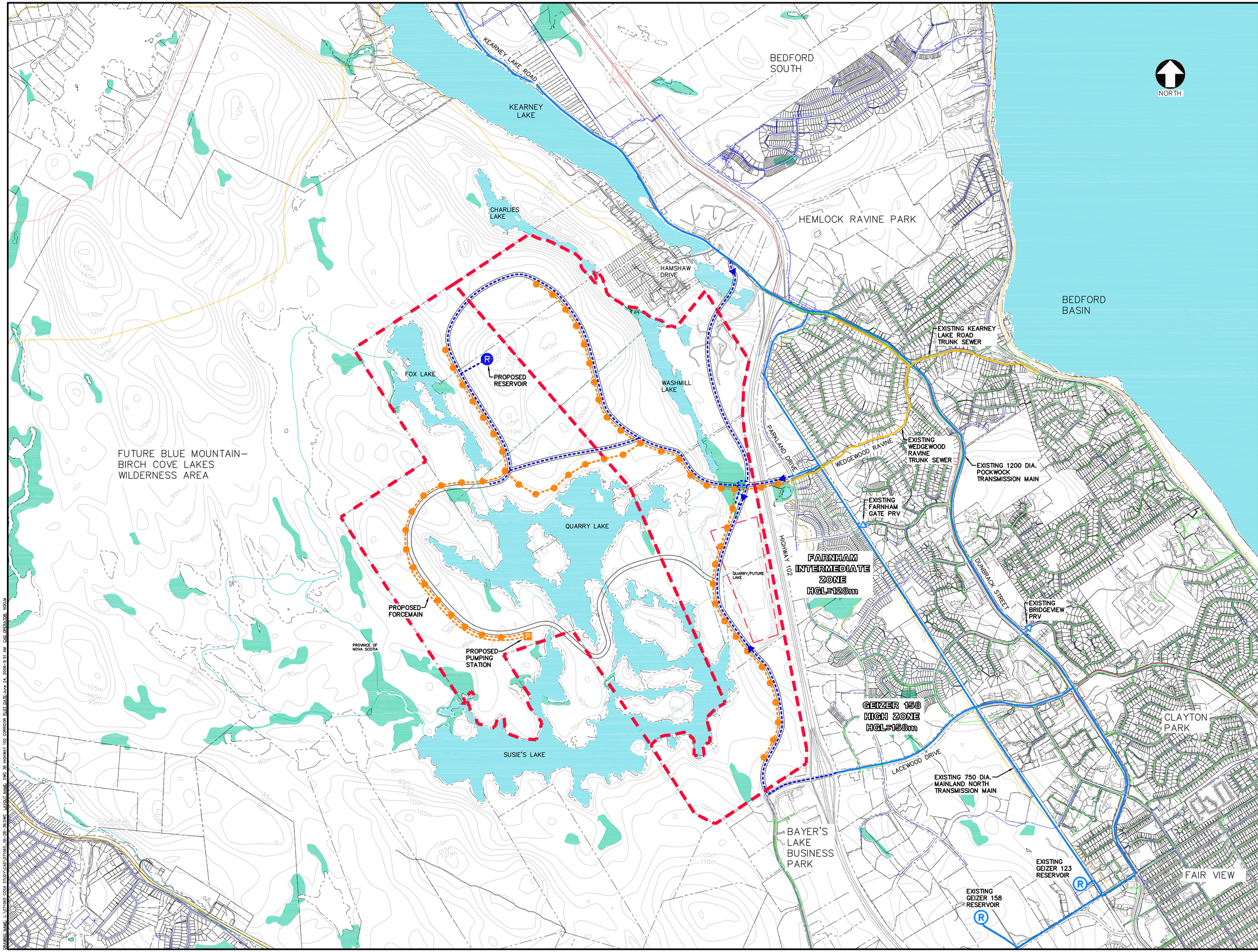

NOTES:

LEGEND:

- STUDY AREA
- PROPOSED GRAVITY SANITARY SEWER
- EXISTING GRAVITY SANITARY SEWER
- PROPOSED FORCEMAIN
- PROPOSED SANITARY PUMPING STATION
- EXISTING SANITARY PUMPING STATION
- PROPOSED SANITARY MANHOLE
- EXISTING SANITARY MANHOLE
- PROPOSED WATERMAIN
- EXISTING WATERMAIN
- PROPOSED RESERVOIR
- EXISTING RESERVOIR
- PROPOSED PRESSURE REDUCING VALVE CHAMBER
- EXISTING PRESSURE REDUCING VALVE CHAMBER

No.	Description	Date	By
A	DRAFT REVIEW	DEC.18/08	-

Revision or Issue

HALIFAX REGIONAL MUNICIPALITY
COST OF SERVICING ANALYSIS
REGIONAL PLANNING
GREENFIELD SITES

SERVICING HIGHWAY 102 WEST CORRIDOR

CBCL LIMITED
Consulting Engineers
ISO 9001 CERTIFIED

Scale 1:10,000 (0, 100, 200, 300, 400, 500m; 1:10,000)

Date	Drawn
FEBRUARY 2008	MS
Designed DNB	Checked	Approved DNB
Contract No 071065	Revision

Drawing No **3B**

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