



Evolution Site Servicing Report

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Design Brief

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1.0 Introduction

ISL Engineering and Land Services Ltd. (ISL) was retained by Evolution Lands to complete a preliminary sanitary sewer and water analyses for the full buildout of the subdevelopment. Evolution Lands Claresholm (the subject property / proposed new development) is located south of 39 Avenue W and West of Highway 2 in Claresholm, Alberta. Legally described as part of SE ¼ Section 23-12-27-4. It covers roughly 54 ha (133 ac).

The brief evaluates the estimated sanitary sewer flow and water demand and reviews the existing municipal system. Capacities of the existing system will be evaluated by the Town of Claresholm based on information detailed in this brief. The analyses contained in this design brief based on the Town of Claresholm Water and Sewer Utility Bylaw #1659 ("the SDS Bylaw").

1.1 Existing Conditions

The development is located in the southernmost part of Claresholm. It borders the Bridges at Claresholm Golf Course to the west, with Highway AB-2 bordering the eastern property line of the development. The parcel currently is undeveloped and is in use as farmland with no tributaries or vegetated areas to note. Cutting through the development North-South on the western side of the parcel is a utility right of way containing a public sanitary sewer main. To the immediate north of the parcel is another utility right of way containing a public water main. The proposed development will likely utilize connections to these existing services as a means of providing water and sanitary services to the community.

2.0 Proposed Development

The proposed development is currently slated to consist of eighteen (18) full phases of development, with a single offsite phase consisting of construction of a stormwater management facility and sewer and water connections to public utilities. The aforementioned phases will consist primarily of single-family lots, medium density lots, medium density housing, seniors' facilities, highway commercial, and open spaces. Once the full buildout of the eighteen phases is completed, the entire 54 ha parcel will be developed consisting of the land-uses previously described. Refer to Appendix A for the most current planning concept, in addition to the preliminary utility alignment.

2.1 Population

The estimated population for the proposed subdevelopment is derived from the concept plan and layout outlined in the ASP document and included in Appendix A. Included in the proposed layout of the development are various property types, including residential estates, residential single-family, residential single and semi-detached, townhouses, and a medium-density seniors' facility. With an estimated 506 total units, the projected population stands at 1478 yielding a density of 21 residents per hectare. Population summaries for residential zones are detailed below in Table 1, while commercial populations will be addressed in section 3.0: Servicing. It is important to note that these estimates are subject to refinement, as the product type and lot counts for Evolution Claresholm are currently in preliminary stages and will be finalized before submission for detailed engineering design and construction approval to the Town of Claresholm.

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Table 1: Population Density Based Upon Zoning

Zoning	Area (ha.)	Units	Population
Residential Estate	3.22	36	111
Single Family	17.82	288	894
Multi-Family Residential (Seniors)	1.45	87	226
Multi-Family Residential	1.57	94	245
	Σ	506	1476

3.0 Servicing

ISL has prepared a preliminary utility alignment concept (Refer to Appendix A). The utilities for this development are proposed within the new roadways and right-of-ways and follow the road alignment to service the development.

For the initial phases of the development (primarily Phase 1 and Phase 1 Offsites), the water connection to service the development is proposed to connect to an existing private watermain along 39 Avenue W in two locations along the alignment, which is maintained by the Town of Claresholm. For this connection to work, the Town will have to grant access to the public watermain allowing the connections.

As part of future phases of the development, an estimated one additional connection to the public waterman along 39 Ave W could be necessary to provide the required flow to the commercial and residential developments. This connection will be an additional expansion to the previous connection to the water main primarily extending southbound along Township Road 123 connecting the south end of the site to the water services stemming from the 39 Ave W water main.

In addition to the watermain access required for the initial and complete development phases, the sanitary sewer system is proposed to connect to the Town's main sewer line running through the parcel at multiple locations, as detailed in later Section 4.0. Furthermore, the 36 Estate Lots are expected to be tied directly into the 450 mm diameter Town sanitary sewer trunk. The sanitary conveyance system will collect flows from within the subdivision and convey them to multiple connections to the 450mm sanitary main (Six connections in total). This connection ideology was confirmed by the Town at time of installation with the 450mm sanitary trunk through the Evolutions lands. The remaining residential and commercial lot servicing will tie into the proposed sanitary sewer system.

It should also be noted that ISL has identified an active ATCO natural gas line within the current proposed Estate Lotting area. With the intent of relocating said line to within the current utility right of way running through the west end of the site from north to west, this relocation will consider the appropriate road and utility cross-sections applied to the development.

3.1 Sanitary Sewer Demand

Majority of the sanitary sewage for the development will be collected via gravity through a minimum 100 mm diameter PVC lot servicing pipe from each unit that will connect to 200 mm minimum diameter PVC main, with a minimum 250mm diameter in industrial and commercial areas. The peak sanitary sewage flow rate expected from the full-phase buildout is shown below in Table 2. These are based on the design criteria listed in Section 4.1.1 of the Town Servicing Standards (2018) outlining an average per capita flow of 400 L/person/day for sanitary flow generated by single family homes, with an additional peaking factor applied. In addition to the single-family rate, a modified rate will be applied to the multi-family zones of 250 L/person/day based on previous project experience of a similar nature. To address infiltration and inflow of the sanitary system, a rate of 0.28 L/s/ha. will be adopted

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based on Government of Alberta Wastewater Systems Guidelines (2013) section 4.1.1.3. Additionally, an applied average flow rate prescribed of 20,000 L/ha/d will be applied to the industrial and commercial development areas to determine an estimated flow rate. Through the application of a peaking factor and the infiltration rate prescribed by Alberta Environment, a peak wet weather flow for both the residential and commercial phases can be determined as shown in Table 2 below.

It is worth noting that the average daily flow rate of 400 L/capita/day being applied according to the Town of Claresholm guidelines. In ISL's experience with sanitary municipal sewer flows throughout Western Canada, the prescribed flow is a widely used rate for this type of application and is considered to be a conservative rate. As such, this information needs to be kept in context with any infrastructure impacts determined in this brief.

Table 2: Peak Sewage Flow Rates

Phase	Total Population	Average Peak Factor	Peak Dry Weather Flow (L/s)	Peak Wet Weather Flow (L/s)
Residential	1476	3.68	22.17	33.70
Commercial	-	5.00	14.87	18.47

The minimum diameter sewer main to service residential zoning is 200 mm diameter PVC pipe with a slope of 0.4% (the minimum pipe slope for a 200 mm diameter pipe per Section 3.3.1.2 of Alberta Environment Wastewater Standards). At the peak wet weather flow rate, the sanitary system will be designed so that the chosen pipe sizes will flow at no more than 80% depth when conveying the estimated design peak flow (Section 4.2.1.2 of the Alberta Environment Wastewater Guidelines (2013)). However, it is not possible to select a sanitary sewer pipe diameter to meet the town requirement without either decreasing the minimum pipe diameter for a sewer main or decreasing the minimum grade for a 200 mm pipe. The velocity of the pipe will be factored in as well, as lower velocities in sewer pipes have a higher likelihood of solids accumulation, requiring additional maintenance. Based on this assessment, the likely course of action will be to increase the pipe size in areas where the capacity is deemed to meet or exceed the maximum capacity as outlined in the Alberta Environment Wastewater Standards as a means to increase pipe capacity, from the minimum 200 mm diameter to an estimated maximum of 450 mm at the existing main tie-in. The majority of connections to the 450mm trunk are 200-300mm diameter. Also, it is important to note that due to the conservative nature of the sizing ideology the pipe diameters may be reduced at the time of detailed design.

3.2 Water Demand

Domestic potable water service and fire protection will be provided via watermain within the new roadways and right-of-ways. A range of 20-50 mm diameter PEX service pipes from each residential building and 100-150 mm diameter PVC pipes will connect to a minimum 200 mm diameter PVC main for residential, and 250 mm for commercial. For fire protection, the new water main will connect to new onsite hydrants, spaced no more than 180 m apart in the residential areas, and 90 m apart in the commercial zones.

Water demands were calculated using the design criteria listed under 3.1.3 of the Town of Claresholm Servicing Standards (2018). The two demands were calculated and compared (see Table 3 below) and the highest demand was used. Based on an Average Daily Demand (ADD) of 520 L/person/day, with a Maximum Daily Demand (MDD) of 2.6 times the ADD, and Peak Hourly Demand of 5.2 times the ADD. Fire Flow requirements as outlined in section 3.1.7 of the servicing standards list requirements of 67 L/s, 151 L/s, and 189 L/s for Single family, multi family, and commercial zones, respectively. The results of the calculations for the full-buildout of the residential and

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commercial development phases are below in Table 3. For the commercial zones of the development, the consumption demands were calculated based on applying a factor of 125% of the estimated sanitary generation rate. As such, applying the factor to the sanitary generation of 20,000 L/d/ha, the water demand in commercial areas can be determined to be 25,000 L/d/ha. Additionally applying a peaking factor equal to MDD multiplier of 2.6 times the ADD, a peak hourly demand is determined that can be added to the fire flow required as per Claresholm servicing standards. Required Fire Flow will need to be verified using Fire Underwriters Survey Water Supply for Public Fire Protection, edition 2020.

It is worth noting that the average daily demand of 520 L/capita/day being applied per Town guidelines, ISL's experience with water municipal demands throughout Western Canada, is a very conversative rate for this type of application and needs to be kept in context with any infrastructure impacts determined in this brief.

Table 3: Water Demand

Phase	Q1, Maximum Day Rate + Fire Flow (L/s)	Q2, Peak Hour Rate (L/s)
Residential	158.37	31.45
Commercial	198.67	9.66

Using the Hazen-Williams formula to calculate the minimum diameter (D) of the main, the scenario with maximum daily flow rate plus fire flow rate resulted in the highest demand. An average slope (s) of 3% and a roughness coefficient (C) of 130 were used to determine the pipe diameter. The resulting minimum diameters are shown in Table 4, and are in line with the estimated pipe sizes to be required in subdevelopments of a similar size completed by the project team.

$$D = \left(\frac{Q}{0.285Cs^{0.54}}\right)^{\frac{1}{2.63}}$$

Table 4: Minimum Watermain Diameters

Phase	Minimum Watermain Diameter (mm)
Residential	259
Commercial	281

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4.0 Existing City Utilities

ISL reviewed the Infrastructure Master Plan (IMP) prepared by Associated Engineering for the Town of Claresholm in May 2021 to assess the status of the existing sanitary sewer and watermain near the proposed development.

As detailed in the IMP, existing and future scenarios were run for both sanitary sewer and watermain. The existing scenario was based on the Town's cadastral files, existing population and water consumption data. The future scenario was calculated using the Town of Claresholm's growth projections to the year 2041 based on population models. This included three growth scenarios (low, medium, and high) and ICI (Institutional, Commercial, and Industrial) development projects, and accounts for numerous development areas and growth within the town limits. Included in these projections is the proposed development parcel, with growth values and considerations already accounted for in the future projections as set forth in the IMP.

4.1 Sanitary Sewer

As the development plans to utilize a public existing sanitary sewer main running through the development, it is necessary to assess the existing capacity of the main and its likelihood of supporting the future development. Based on information provided in the Town IMP figures 5-2 and 5-3 (included in the Appendix B of this document), the 450 mm PVC sanitary trunk cutting though the west edge of the development was determined to have a 'pipe full capacity' of greater that 100 L/s at the time of the report, in addition to the determination of the conduit ratio non surcharged of less than 86% in wet weather flow. As a result of these findings, the calculated flow to be produced by the development in both residential and commercial peak wet weather flows (33.70 L/s and 18.47 L/s, respectively) can be handled by the existing sanitary sewer system servicing the development. As shown in Figure 8, the development seeks to tie into the sanitary trunk running through the parcels ROW allotment in 6 locations along the existing alignment. This increase in connections to the existing sanitary trunk from a single connection to six aims to both reduce the linear length of pipe required, and the overall pipe sizes required to handle the estimated sewage flows.

The IMP (see Section 5.5.2 and Figure 5-6) suggests various improvements to the Towns sanitary system and includes the 450 mm PVC sanitary trunk that runs through the development, offering the main sanitary system connection for the development. This upgrade, named "SG7 – East Boundary Phase 1A" in the IMP, would see the first phase of an upgrade to the existing aforementioned sanitary trunk that services Claresholm East of Highway 2, replacing the existing trunk with 845 m of 525 mm sanitary trunk sewer. As this sanitary trunk upgrade has been identified by Associated Engineering as a future upgrade, and there is significant available capacity within the trunk for this development (Under a conservative sizing ideology) it is to be considered beyond the proposed development's scope.

4.1.1 Lift Stations

As outlined in the IMP (2021) section 5.4.1, there are two lift stations that service the Town of Claresholm: Havest Square and Main Lift Station at the Towns lagoon. At the time of the writing of the IMP, both of the lift stations were deemed to be sufficient in meeting the requirements of the sanitary sewer demands through the design horizon of 2041. At this time no action is required as the current and future demand for Claresholm's sanitary needs are met with the current state of the lift stations.

4.1.2 Wastewater Treatment

The existing Town of Claresholm wastewater treatment system consists of four anaerobic cells, a transfer pump station, two facultative cells and two storage cells. As part of the 2021 Infrastructure Master Plan sections 5.4.2 carried out by Associated Engineering, a desktop review of the lagoon capacity was completed with and without the

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consideration of the effect of evaporation on the systems storage. In both scenarios a maximum serviceable population was provided for each active component of the treatment facility, at which the existing lagoons will require an upgrade. As such, the maximum populations of 4,312 and 6,126 were assigned to the non-evaporation scenario and the evaporation scenarios, respectively. According to the most recent population estimate by the Government of Alberta in 2022, the population of Claresholm is 3,847 residents. When comparing the current population to the future population upon the completion of the subdevelopment (5,204), and the maximum serviceable population estimates set forth in the IMP, it is possible that the former of the maximum serviceable population considering evaporation is likely the most accurate estimate to existing and future conditions in the Claresholm area as well as at its treatment facility. As such, the need for a wastewater treatment facility upgrade with respect to the proposed development can be deemed unnecessary and outside of the scope of this report.

4.2 Watermain

The proposed development in the area will connect it to the existing watermain situated to its north. The existing watermain, a 300 mm PVC service, has been previously assessed for rehabilitation and upgrade requirements as part of the IMP (2021). As shown in figures 4-7, 4-8, and 4-9, there is no future rehabilitation and upgrades to the existing water system near the site, figures included in Appendix A. From this previous assessment of the existing water system near the site, in addition to the IMP considering the proposed site in the overall assessment of the system as 'growth area', suggests that the system is well-equipped to meet the demands of the future development.

4.2.1 Pump Capacity

According to the data presented in Figure 4-6 of the Infrastructure Master Plan (IMP), the watermain in proximity to the development site has been evaluated and found to possess a significant capacity, ranging between 180-250 liters per second (L/s). This capacity is calculated based on the Maximum Day Demand (MDD) coupled with the Fire Flow requirements. Such a range indicates a robust capacity of the existing watermain, suggesting that it is well-equipped to meet the demands of the new development without overburdening the system. This analysis aligns with the minor changes observed in available flow in similar developments, reinforcing the conclusion that the existing infrastructure can adequately support the proposed expansion.

4.2.2 Water Storage Capacity

From the IMP (2021) analysis of the storage and pumping needs section 4.4.1, the report takes the towns growth and ultimate buildout areas into consideration including the proposed development area, up to 2041 and to the full buildout of expansion areas of the town. As a result of the system requirements investigation, the current storage was determined to be nearing capacity and will require the addition of a new facility to provide the required storage as well as needed redundancy in the pumping and storage facilities of the town. As this upgrade to the storage facility is to be expected by the Town as new developments are added, it falls outside of the scope of this development.

4.2.3 Proposed Upgrades

There are recommendations in the IMP (see Section 4.5.2) regarding replacement and upgrading various components of the City's water distribution system, which includes the addition of storage capacity. There are currently no watermain upgrades proposed in the immediate area of the development, and as a result this work would fall outside of the proposed development' scope.

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5.0 Summary

The following are our findings based on our analyses:

- Peak wet weather sanitary sewer flow leaving the proposed development is an estimated 18.57 L/s. The development plans for the development involve utilizing an existing 450 mm PVC sanitary sewer main with six connection along multiple tie in points of the existing trunk through evolution lands. The existing trunk has been assessed as capable of handling the projected residential and commercial peak wet weather flows from the development. While the current system, including two lift stations, is sufficient for the town's needs through 2041, there's a proposal for a future upgrade, "SG7 East Boundary Phase 1A", focusing on the 450 mm PVC sanitary trunk. This upgrade, however, is beyond the scope of the current project. Additionally, the town's wastewater treatment system, comprising various treatment cells, has been evaluated for capacity. With Claresholm's current and projected population growth, the treatment system is likely to remain adequate, especially considering the higher capacity scenario that accounts for evaporation effects.
- Water demand for the proposed development is an estimated 353.53 L/s, taking into account both residential and commercial needs for maximum daily demand and fire flows. The proposed development in the area will be connected to an existing 300 mm PVC watermain to its north, which has been deemed sufficient in capacity and does not require immediate rehabilitation or upgrades.
- Both sanitary and water demands have been sized utilizing the Towns published demand rates. These rates in ISL's experience are conservative relative to actual demands seen in many municipalities throughout Western Canada. As a result it should be noted that conveyance main sizes could be reduced in diameter at time of detailed design.

6.0 Closure

The material contained herein reflects ISL's best judgement considering the information available during the writing of this design brief.

Any use which a third party makes of this design brief, reliance or decision made using this design brief is the sole responsibility of the third party. ISL accepts no responsibility for the damages, if any, suffered by the third party as a result of decisions made or actions taken based on this design brief.

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Appendix A Site Concept Plan & Servicing Layouts



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May 2024



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Town of Claresholm **Evolution Area Structure Plan**

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May 2024

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Appendix B IMP Supporting Figures





1 Claresholm

ESRI World Imagary: Esri, DigitalGlobe, GeoEye, H-cubed, USDA FSA, USGS, AEX, Getma Aerogrid, IGN, IGP, swisstopo, and the GIS User Community; Town: Altals Ltd., 2019; ATS Attals Ltd., 2005.

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TOWN OF CLARESHOLM INFRASTRUCTURE MASTER PLAN