
Water and Sewer Master Servicing Plan

Recommendation

That the report of the Acting General Manager, Utilities & Environment Department, dated March 4, 2019, be received as information and forwarded to the Standing Policy Committee on Planning, Development and Community Services for information.

Topic and Purpose

Underground servicing is a critical component of any city's growth strategy. The purpose of this report is to provide an overview of the servicing strategy for the water distribution system, sanitary sewer collection system, and storm sewer collection system. These systems have been comprehensively planned to achieve the City's growth plan.

Report Highlights

1. Bylaw No. 8769, The Official Community Plan, 2009 (OCP), provides a plan to ensure growth and development to a population of 500,000 takes place in an orderly and rational manner, balancing the environmental, social, and economic needs of the community.
2. The existing Water Treatment Plant and Wastewater Treatment Plant can each be expanded on their current sites to serve up to 375,000 and 550,000 people respectively. Beyond those population limits, new additional plants will be required.
3. Water distribution system expansion includes the extension of pipes dedicated to filling reservoirs (fill mains), water mains, and construction of reservoirs and pump stations. As water mains reach further out from the Water Treatment Plant, new reservoirs, expansions to existing facilities, and eventually a new Water Treatment Plant will be required to support the distribution system to serve a growing population.
4. Sanitary sewer system expansion includes the extension of major collection pipes (trunks) and new sanitary sewer lift stations and force mains. A new wastewater system, including piping and construction of a second Wastewater Treatment Plant, will be required to support growth beyond existing city limits.
5. Storm sewer collection systems follow the natural topography within a watershed zone. Natural waterbodies and drainage paths are incorporated into the storm water system design.

Strategic Goals

This report supports the Strategic Goals of Asset and Financial Sustainability and Sustainable Growth, by providing a Water and Sewer Master Servicing Plan that

incorporates current bylaws and approved plans, such as the OCP and the Growth Plan, in guiding growth, development, and the efficient use of infrastructure.

Background

Since the early 1900's, the City has approached growth with a long-term vision. In 1913, C.J. Yorath created the Plan of Greater Saskatoon. At that time, key engineering decisions were made:

1. Keep the storm water and sanitary sewer collection systems separate. Many other cities in Canada are now dealing with costly retrofitting and disruption required to separate these systems in established areas; and,
2. At a population of approximately 13,800, the City approved the design and construction of a large sanitary sewer (interceptor) along the west side of the river from Avenue D to the existing Spadina Lift Station near Prince of Wales Avenue. This interceptor was later extended to the existing Wastewater Treatment Plant. The interceptor has served as the backbone of the sanitary sewer system for over 100 years, accommodating established and new neighbourhoods and a variety of infill development. Attachment 1 shows a figure of the large diameter interceptor sewer being installed.

This integrated approach to planning, design, and construction of major critical infrastructure in an efficient, holistic, and cost effective manner ensures that current and future generations benefit from efficient and effective servicing.

The majority of costs related to infrastructure expansion are funded through development levies paid by land developers to the City. Trunk sewers, lift stations, storm ponds, and primary water mains in growth areas are examples of infrastructure funded through these development levies. The exceptions are treatment plant expansions, new treatment plant construction, fill mains, and water reservoirs, which have historically been funded through water and sewer utility rates.

The Growth Plan adopted by the City in 2016 identified a refreshed and comprehensive approach to growth that is based on both densification along strategic corridors as well as continued greenfield development. The result of the Growth Plan will be a City that is planned and built in a way that enables future residents of Saskatoon to experience a quality of life equal to or even better than today.

The servicing strategies outlined in this report have been developed in order to set in place a framework for making the significant infrastructure investments that will be required to fulfill the Growth Plan in the coming decades. Having a clear plan for how the City will be serviced at a population of 500,000 and beyond will ensure that each decision the City makes along the way is made in the context of achieving the City's growth vision.

Report

Role of the OCP as it Relates to Water and Sewer Planning

A companion report is being submitted to the Standing Policy Committee on Planning, Development and Community Services in March 2019 titled Urban Land Development Process in Saskatoon. The report provides an overview of the planning principles used to guide orderly development of land for new neighbourhoods. This report provides the engineering framework associated with that plan to provide an overall coordinated approach for sustainable growth.

The OCP is the most critical document in guiding the decision-making process for long-term planning and development. An important component of this plan is the provision of a planning framework that ensures growth and development to a population of 500,000 takes place in an orderly and rational manner, balancing the environmental, social, and economic needs of the community.

Providing a rational and efficient phasing system for the servicing and development of urban land is a key objective of the OCP. Compact, orderly, and adjoining development is promoted within the plan to ensure efficient extension of services. These services often require the identification and securing of utility rights-of-way and/or easements well in advance of development to facilitate appropriate long-range planning. An integrated long-term plan provides important information for investing stakeholders to consider before committing resources to their long-term strategies. Any unplanned deviations from the plan can have a significant impact on the stakeholders, therefore, must be carefully considered.

The current OCP only allows for the extension of services beyond city limits (approximately 500,000 population) under specific circumstances. One such circumstance relates to water and sewer capacity and notes that the nature or volume of the service being provided must not place limitations on the provision of services within the City of Saskatoon, now or in the future. This requirement is important since any remaining capacity in existing pipes and treatment systems must first consider infill and Greenfield developable lands within city limits, as addressed within the Growth Plan, before any capacity can be allocated for other land outside of the city.

Water and Sewer Master Servicing Plan

The Water and Sewer Master Servicing Plan considers three system components, those being the water distribution system, sanitary sewer collection system, and the storm water collection system. The focus of the plan is on future water and sewer infrastructure including fill mains, water mains, sewer pipes/channels, retention ponds, lift stations, reservoirs, and pump stations.

The City utilizes detailed computerized flow models for all pipes within the water and sewer systems. InfoSWMM is the modeling software used for analysis of the sanitary sewer collection system and includes over 10,000 nodes (manholes) and sections of pipe. Similar modeling packages exist for the water and storm water systems and each is continuously calibrated and validated through a comprehensive flow monitoring

program. Understanding how each existing system operates assists the Administration in identifying capacity constraints and opportunities which provides the basis for planning how each system can be extended and built up in phases with the growth of Saskatoon. Future growth projections including population density, growth rate, and water consumption are important factors that influence the sizing and timing of new infrastructure. The Master Plan has focused on the growth of the city to a population of 500,000 in detail and to 1,000,000 at a higher regional growth level.

Plans for New Water Treatment Plant and Wastewater Treatment Plant

Saskatoon is well positioned with its existing Water Treatment Plant and Wastewater Treatment Plant to meet the growth-related demand for both the short and medium term. Longer term growth, however, will necessitate the construction of new plants.

The existing Water Treatment Plant can be expanded to serve up to 375,000 people. Prior to reaching that population, plans will need to be made for the construction of a new plant. Preliminary projections indicate construction may begin on this additional plant near 2028, but this timeframe will continue to be monitored and adjusted annually based on growth rates. Both Water Treatment Plants will operate concurrently to provide the capacity needed. Having two plants will provide a level redundancy that will enable maintenance shut-downs to occur and will provide more robust backup systems in the event of component failures. The location of the future new plant is shown on Attachment 2, labelled WTP2. The City acquired that property and configured the modern water intake with this ultimate vision in mind.

The existing Wastewater Treatment Plant can be expanded to serve up to 550,000 people, providing growth opportunities for Saskatoon both in infill areas as well as new development neighbourhoods within current city limits. There has historically been interest expressed by developers operating outside of city limits to access wastewater treatment service for their developments. An important consideration to be taken into account with any future proposals will be whether providing service outside of city limits restricts the City's ability to provide adequate service to all growth areas currently within city limits. Long-term plans are being prepared for a second plant further downstream along the river (northeast) to accommodate additional growth to 1,000,000 people.

Future reports will be submitted with more detail outlining the long-term capital plans for these treatment plants.

Water Distribution System

Expansion of the water distribution system includes the extension of fill mains, water mains, and addition of future reservoirs and pump stations. The sizing and timing of future mains and storage reservoirs is based on a variety of parameters including average and maximum daily demand, maximum allowable velocity (of water moving through pipe), population growth, and market conditions.

At the Master Plan level, large sectors are serviced with a looping water main network to circulate water through several neighbourhoods and to provide redundancy through

multiple supply points. As water mains reach further out from the Water Treatment Plant, new reservoirs, or expansions to existing facilities, are required to serve a growing population. In some cases, new fill mains may be required to extend through current city neighbourhoods to support existing reservoirs in servicing future growth areas. Attachment 2 shows a map of the conceptual servicing layout.

Sanitary Sewer Collection System

Sanitary sewer system expansion includes the extension of major collection pipes (trunks) and planning for locations of new sanitary sewer lift stations and force mains. Whether a future growth area is serviced only by gravity pipe, or also requires a lift station, is very much dependant on the topography of the land being serviced and the availability of capacity in the downstream system. For example, the majority of the Riel Sector is able to drain by gravity into the north industrial trunk system due to favorable topography and the size and depth of the trunk sewer serving the area. Whereas the Blairmore Sector requires a large lift station and long force main to pump sewage around the city and into the Riel system. Growth areas that require lift stations and force mains can be more expensive due to the cost of this additional infrastructure and also long-term operation and energy costs.

At the Master Plan level, the city is divided into large sectors and through the use of topographical information and flow calculations, required sizing, depth, and length of future sewer systems can be determined. Each length of sewer pipe that is extended supports a corresponding catchment area. Attachment 3 shows a map of the conceptual servicing layout. Attachment 4 shows a map of the projected development phasing within city limits.

Storm Sewer Collection System

The storm sewer system follows natural watershed zones and conveys storm water from developed areas to the river through minor (pipes), and major (ponds, ditches, and roadways) systems. During minor storms (1:2 year) the pipe system conveys runoff to the river. For all storms greater than this, the piped system works at capacity and is joined by designed overland drainage to convey the runoff to storage areas until it can be directed into the river through the minor system after a storm has passed. Storm water management for infill and redevelopment areas is largely reliant on on-site storage and delayed release of storm water to ensure flows do not exceed existing storm sewer capacities.

For storm sewer master planning, extensions of storm sewer and drainage ditches follow the natural topography within a watershed zone. Existing natural waterbodies and drainage paths are incorporated into the storm water system design. These often require some form of modification to function within an urban landscape. Attachment 5 shows a map of the conceptual servicing layout.

Financial Implications

Land developers in Saskatoon are required to build and pay for the water and sewer systems within the neighbourhood boundaries directly serving their developments.

Outside of the neighbourhood boundaries, development levies are collected by the City to fund the planning, design and construction of primary water mains and trunk sewer expansions. These levies recuperate the cost of the infrastructure by collecting fees from all developments within the growth areas of the city. If growth is not planned in an orderly fashion, issues can arise where additional infrastructure is required to support leapfrog development, leading to inefficiencies and difficulty with recuperating any additional costs. Development levies are reassessed on a yearly basis using prior construction season costs.

Environmental Implications

The water distribution servicing plan aims to optimize operational output of the Water Treatment Plant by sizing and locating future reservoirs and distribution mains in a way that reduces pressure fluctuations and operational strain at the Water Treatment Plant. This approach ensures water service levels will be met while minimizing operational costs and output of greenhouse gas emissions.

The sanitary sewer collection servicing plan makes best use of the natural topography to minimize both the depth of required sewer pipe and also areas that will require lift stations and force mains to function. The plan centers on the use of gravity systems where ever possible to minimize operational costs and greenhouse gas emissions associated with lift stations.

The storm sewer collection servicing plan utilizes natural depressions and flow channels within the existing topography to minimize earthwork and disruption to natural features. Storm water retention ponds and wetlands are used to buffer peak flows and control contaminates before discharging water to the river.

Other Considerations/Implications

There are no options, public and/or stakeholder involvement, communications, policy, privacy or CPTED implications or considerations.

Due Date for Follow-up and/or Project Completion

There is no due date for follow-up.

Public Notice

Public notice, pursuant to Section 3 of Policy No. C01-021, Public Notice Policy, is not required.

Attachments

1. Interceptor Sanitary Sewer Trunk Installation (Circa 1910-1915)
2. Water Distribution System Plan within City Limits
3. Sanitary Sewer Collection System Plan within City Limits
4. Projected Development Phasing within City Limits
5. Storm Sewer Collection System Plan within City Limits

Report Approval

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Department

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