Attachment 1 - Changes to SSSF Planned Trunks

Purpose – To Support UPE03010 Council Report

Summary

This report provides the technical rationale to remove the following trunk segments from the overall Sanitary Servicing Strategy Fund (SSSF) plan and approve the following changes as detailed below:

North Edmonton Sanitary Trunk (NEST) / Clareview Sanitary Trunk (CST)
- Elimination of N2, N3, N4, N5A, N5B, N6, C6A
- Inclusion of the new Fraser trunk in the SSSF funding model

West Edmonton Sanitary Sewer (WESS)
- Elimination of W3, W4, W5, W6, W7, W8, W9, W10, W11

South Edmonton Sanitary Sewer (SESS)
- Elimination of SA2, SA5, SA6, SA7, SA8, SA9
- Inclusion of the 99 Street bypass trunk in the SSSF funding model

The sizing and timing for construction of major sanitary infrastructure is primarily driven by two factors:
- per customer sanitary generation.
- inflow/infiltration (I&I) which is the excess water that enters the sanitary system either during a rain event or from groundwater.

Through a detailed analysis of the actual flows throughout the city (Year 2023) and projected future sanitary flows (Year 2062) in the City of Edmonton and region, EPCOR confirmed that the original design assumptions that determined the configuration and timing of these portions of the SSSF growth supporting sanitary trunks are no longer valid.

Average per person sanitary generation in new areas of development is currently less than 140 L/capita/day, whereas the SSSF strategy developed before 1997 assumed 350 L/capita/day. Existing homes have also been retrofitting their fixtures and reducing their consumption. Research also suggests that future indoor per capita water consumption will continue to reduce to 140 L/capita/day in all parts of the city. Inflow and infiltration (I&I) rates, which determine the wet weather flow capacity requirements for sanitary trunk lines, are also considerably lower than

the original design assumptions from 1997. This is primarily due to improved construction practices and materials in new subdivisions and in rehabilitated pipe installations. In addition, EPCOR continues to execute its Stormwater Integrated Resource Plan strategy through its capital programs such as Low Impact Development (LID) installation, dry ponds, proactive pipe relining and proactive maintenance hole sealing in the existing areas of the city. These capital programs are aimed at slowing and preventing entry of I&I into the sanitary sewer system, thereby further reducing the requirement for wet weather volume storage and increasing the available capacity in the existing sewer system. This supports the City of Edmonton's growth plans.

The changes in trunk alignment for the remaining segments also eliminate complex river and creek and industrial oil pipeline crossings. From a customer perspective, this also eliminates significant construction and traffic disturbances in southeast and central Edmonton residential areas. The servicing change also reduces the overall forecasted SSSF eligible trunk expenditures for servicing the city growth needs over the next 25 years. The exact timing of the construction will be determined by actual growth patterns and observed flows; construction is expected to begin no earlier than 2035 and may begin later. The table below summarizes the associated future cost savings in 2025 construction dollars, which amounts to an estimated reduction in capital costs of over $570 million dollars.

Table 1: SSSF Adjustments Associated Cost Savings

Currently Identified SSSF Segments		
WESS	W3-W11	$256 Million
NEST/CST	N2-N6, C6A	$186 Million
SESS	SA2, SA5-SA6	$283 Million
Total Estimated Cost (2025 Dollars)		$725 Million
Proposed SSSF Segments Replacing Above Segments		
NEST	Fraser Trunk	$39 Million
SESS	99 Street Bypass	$115 Million*
Total Estimated Cost (2025 Dollars)		$154 Million
Difference between Current System Plan and Proposed System Plan		$571 Million

*Further assessment is needed to determine the portion of costs to be contributed by the SSSF Reserve.

With its integrated resource planning approach, EPCOR will move forward in ensuring that any proposed sanitary trunks and storage segments proposed are based on actual customer

sanitary generation rates.The Utility will also utilize a system monitoring and real time control approach to validate timing, alignment and servicing options. This will ensure the efficient and sustainable expansion of the sanitary system (utilizing the most up-to-date design metrics) and maximize the use of existing infrastructure.

Background

The City of Edmonton's original Sanitary Servicing Strategy Fund (SSSF) was developed in the 1990s to address wastewater servicing needs for new development areas in the north, west and south parts of the city. At the time the primary growth in Edmonton was greenfield focused and limited water conservation efforts or I&I reduction initiatives were contemplated. The strategy was based on funding the following four major wastewater trunk systems:

- North Edmonton Sanitary Trunk (NEST)
- Clareview Sanitary Trunk (CST)
- West Edmonton Sanitary Sewer (WESS)
- South Edmonton Sanitary Sewer (SESS)

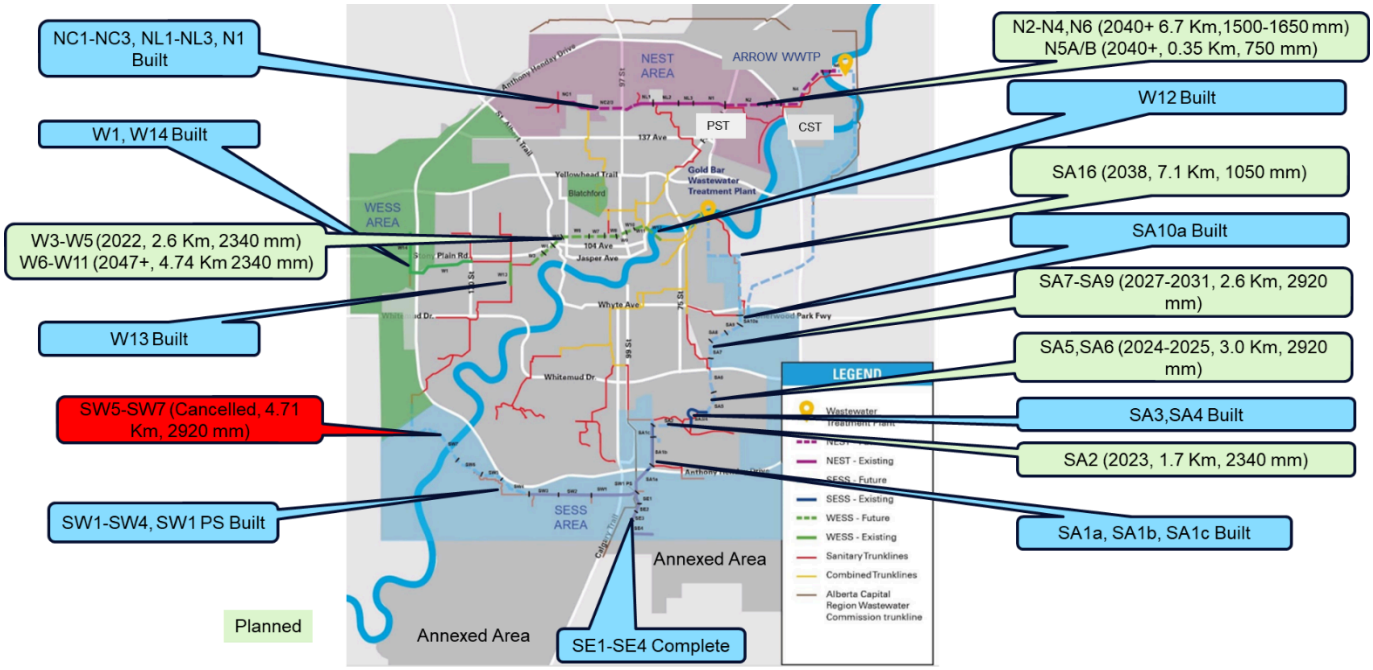
In 1999, the City established the SSSF to collect funds from the development industry and construct the necessary trunk segments to support growth in the new areas. Funds would be collected in advance of construction via development fees. The trunks were intentionally large to provide storage of wet weather flows to avoid overloading the downstream system and also provided conveyance of flows to the wastewater treatment plants. Another key aspect of the servicing strategy was the extensive use of staged construction with interim servicing via existing sanitary and combined sewer systems. The City of Edmonton updated the plan in early 2017 with the publication of the SSSF Integrated Study. This included revised construction timelines for various SSSF trunk segments, but did not consider updated design flow assumptions.

In late 2017, the Drainage utility transferred to EPCOR who shifted the approach to leverage integrated resource planning techniques and strategies to inform sanitary trunk planning. Over the last four years, EPCOR has systematically reviewed the original SSSF planned segments based on factors that include: updated design assumptions, actual monitored flows, modernized construction techniques and the current City of Edmonton and region growth plans.

In January 2023, the City and EPCOR obtained Utility Committee approval for the replacement of the SSSF segments SW5/6/7 with a new Riverview force main and pumpstation. Since that time EPCOR has completed the review of additional pipe segments in the SSSF plan considering the City Plan and regional growth projections to 2062.

Figure 1 provides a map summary of SSSF trunks identified in 1997, the ones constructed since inception and the 1997 planned trunks that remain to be built. The trunk segments changed in January 2023 are also shown.

Figure 1: Approved SSSF Servicing Plan (As of January 2023)



The following sections provide a brief overview of the drivers for the design changes and the details of the changes requiring City Council approval.

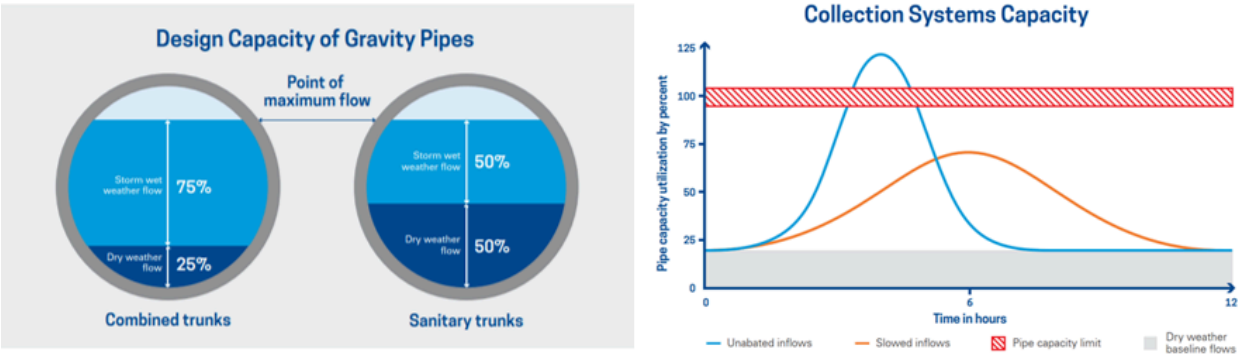
Changing Sanitary Flows

Since the 1990s when the SSSF concept was initiated, water conservation and efficiency has reduced the amount of wastewater customers generate. Present day wastewater generation in the newly developed areas is more than 50% lower compared to the original SSSF planning projections. These changes reduce the dry weather flow requirements. Further, the measured I&I in the newly developed areas is also considerably less than originally designed for. The combined reductions to sanitary flow result in adequate capacity within the existing trunk system to support the City growth plans with fewer new trunk segments required.

Inflow and infiltration allowance is a significant factor in sewer design for wet weather peak flows. EPCOR confirmed that this is also lower when compared to the earlier Design and

Construction Standards due to improved construction methods and materials. Additionally, within the existing network, EPCOR has initiatives identified to focus on the further reduction of I&I throughout the sanitary and combined network, which will also free up capacity in the existing trunk network and further support growth across the city (greenfield and infill). Ensuring pipes in the sanitary system are accurately sized to effectively move the sanitary flows to the wastewater treatment plants through the trunk network is important as it mitigates sewer gas and odours and advanced corrosion of the sanitary network.

Figure 2: Illustration of Dry Weather and Wet Weather Flow considerations in Trunk design



Key Inflow/Infiltration Reduction Initiatives

- Proactive Pipe Relining Program: The program focuses on relining sanitary and combined sewer pipes in low lying areas with surface ponding.
- Maintenance Hole (MH) Sealing Program: The program aims to reduce I&I into the sanitary and combined sewer system in areas where MH are in street sags. This initiative is to reline and seal the top 1.5m portion of MH in sag locations. The MH in sag locations will also have their covers replaced with one pick hole only covers
- Flow Monitor Installation Program: The program's focus is on the installation of sanitary flow monitors throughout the city of Edmonton where priority is given to the areas with high I&I. The flow monitors will help in understanding the factors leading to high I&I and in the development of targeted programs to reduce I&I
- Green Infrastructure: Large, intense rainfall events, such as thunderstorms, tend to cause very large but short duration "pulses" of flow through the storm, sanitary and combined sewer trunks. It is these pulses of wet weather flow that test the limits of a collection system's capacity. EPCOR's green infrastructure investments in Low Impact Development and increased realtime control systems to manage storage volumes slows the entry and reduces the peak flows into the collection system, thereby creating capacity in the collection system

- Stormwater Management Rebate Program - RainWise: The program supports private-side property modifications, such as LID installation and downspouts disconnects.

EPCOR Design Standards Modernization

The SSSF program was developed in the 1990s to support growth in new areas and the concept was to store wet weather flows in these newly constructed large storage trunks to avoid overloading the downstream system. This concept is still an element of the SSSF trunk design but requires updates due to the changing flows described above.

The table below summarizes the evolution of the design standards for SSSF trunks from inception to current planning approaches.

Table 2: SSSF and Current/Future Design Standards

	SSSF Concept Development	COE 2017 SSSF Plan	EPCOR Modernized Design Standards
Sewage Generation Rate (L/capital/day)	350	300	160
I/I Allowance (L/s/ha)	0.28	0.28	0.14
Number of Sag Maintenance Holes	3 per 10 ha	3 per 10 ha	3 per 10 ha
Sag Maintenance Hole Inflow Allowance (L/s/ha) – Based on 0.4 L/s/MH	0.12	0.12	0.0
Net I&I Allowance (L/s/ha)	0.40	0.40	0.14
Storage requirement (m3/capita)	0.491	0.457	0.217
Storage requirement (m3/lot)	1.72	1.6	0.624

Wastewater Flow Forecast (2062)

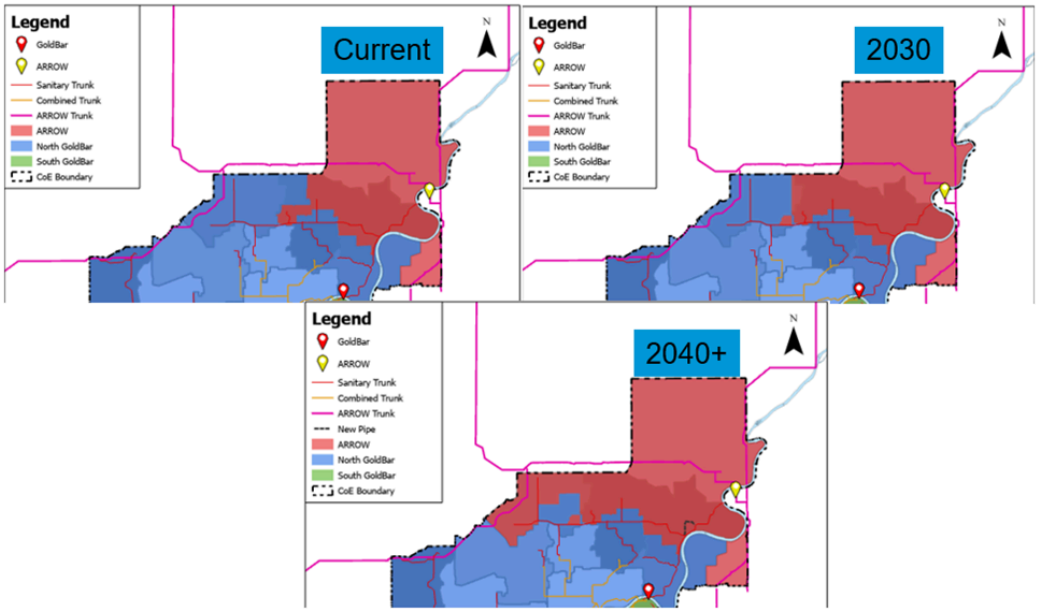
Table 2 provides the average wastewater flow forecast to 2062 for the sanitary system. The forecast is based on an expected gradual decline in the City's annual water consumption from 163 L/c/d in 2023 to 145 L/c/d in 2062. The population forecast was obtained from the City of Edmonton and includes growth in the annexed areas south of 41 Ave SW.

Table 3: City of Edmonton Wastewater Flow Forecast (2062)

Year	Population	Residential Sanitary Generation Rate (L/c/d)	Residential ADWF (m3/s)	Non-Residential ADWF (m3/s)	Average DWF (m3/s)
2023	1,140,300	155	2.05	0.77	3.05
2025	1,211,310	154	2.17	0.78	3.18
2030	1,330,810	153	2.35	0.82	3.41
2040	1,529,470	149	2.64	0.96	3.87
2050	1,739,350	146	2.94	1.04	4.27
2062	2,006,900	143	3.33	1.19	4.83

EPCOR and ARROW Utilities have a Regional Wastewater Exchange Agreement that establishes how the two entities accept each other's wastewater. This agreement is the basis for ARROW providing treatment to the north Edmonton service areas and EPCOR Water Services providing transmission and treatment at Gold Bar WWTP to ARROW's south communities (Beaumont, Leduc County and the City of Leduc). As the population grows additional regions in north Edmonton will be redirected towards the ARROW facility through the NEST system to offset increases in flows from the south and growth within the Edmonton core as illustrated in the figure below.

Figure 3: EPCOR/ARROW Forecast Flow transfer reconfiguration projected timelines

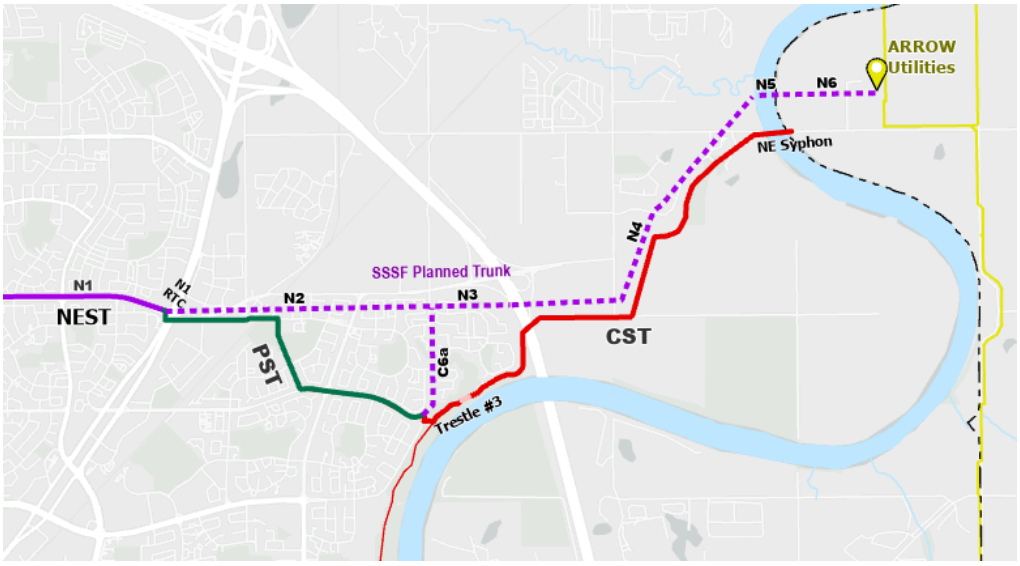


Changes to SSSF Planned Trunks

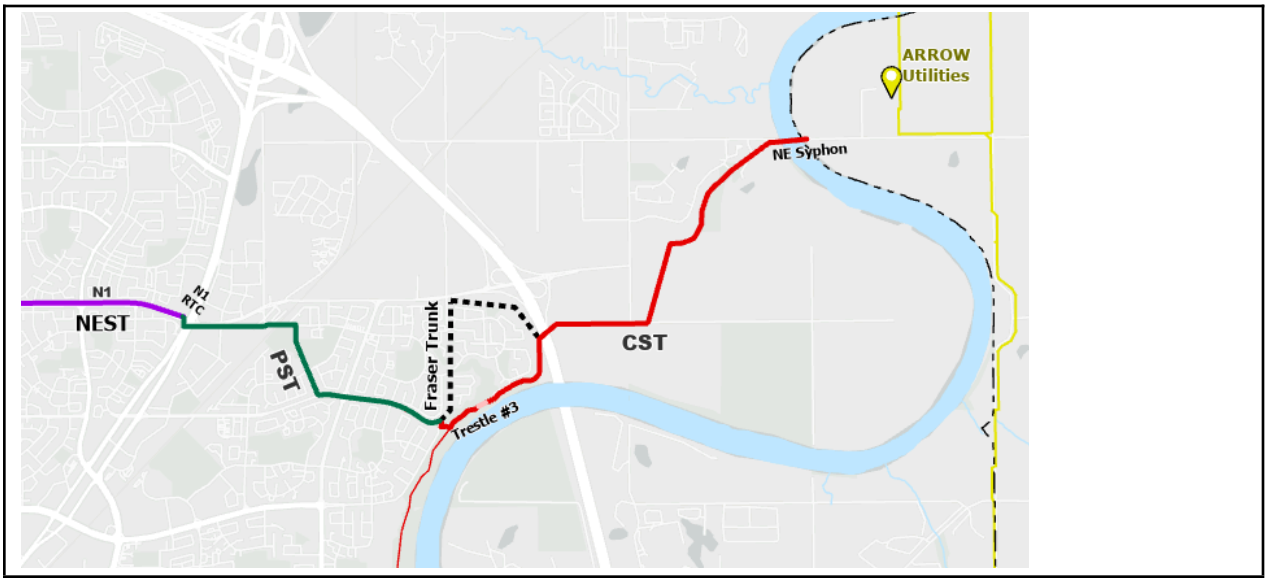
The following figures provide details of the changes to the SSSF planned trunks requiring City Council approval.

NEST/CST

Previous Plan - $186 Million estimated cost with complex River crossing

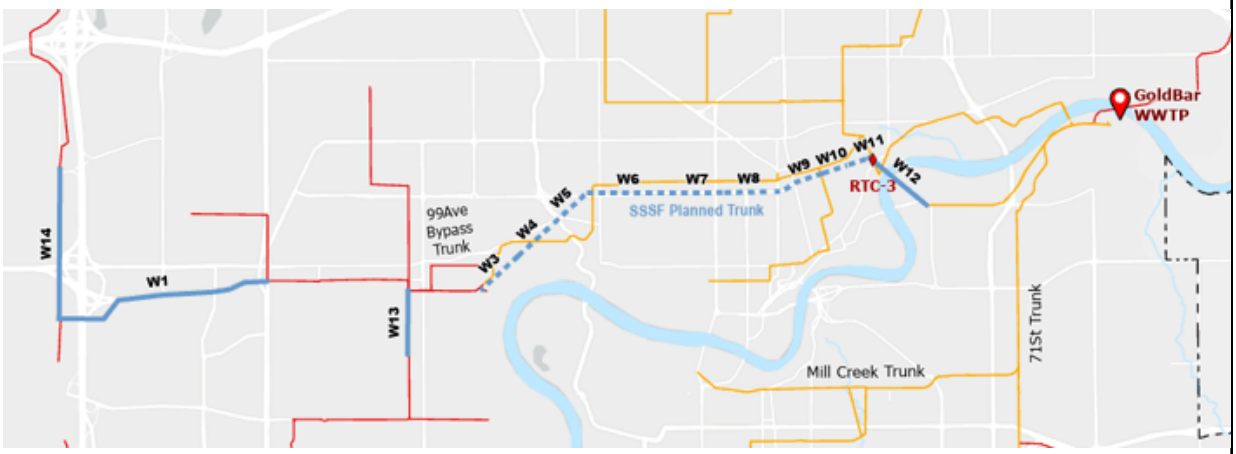


Proposed Plan - $39 Million Fraser trunk. No additional River Crossing, improved reliability for Trestle 3



WESS

Proposed Plan – $256 Million estimated cost through space constrained downtown corridor

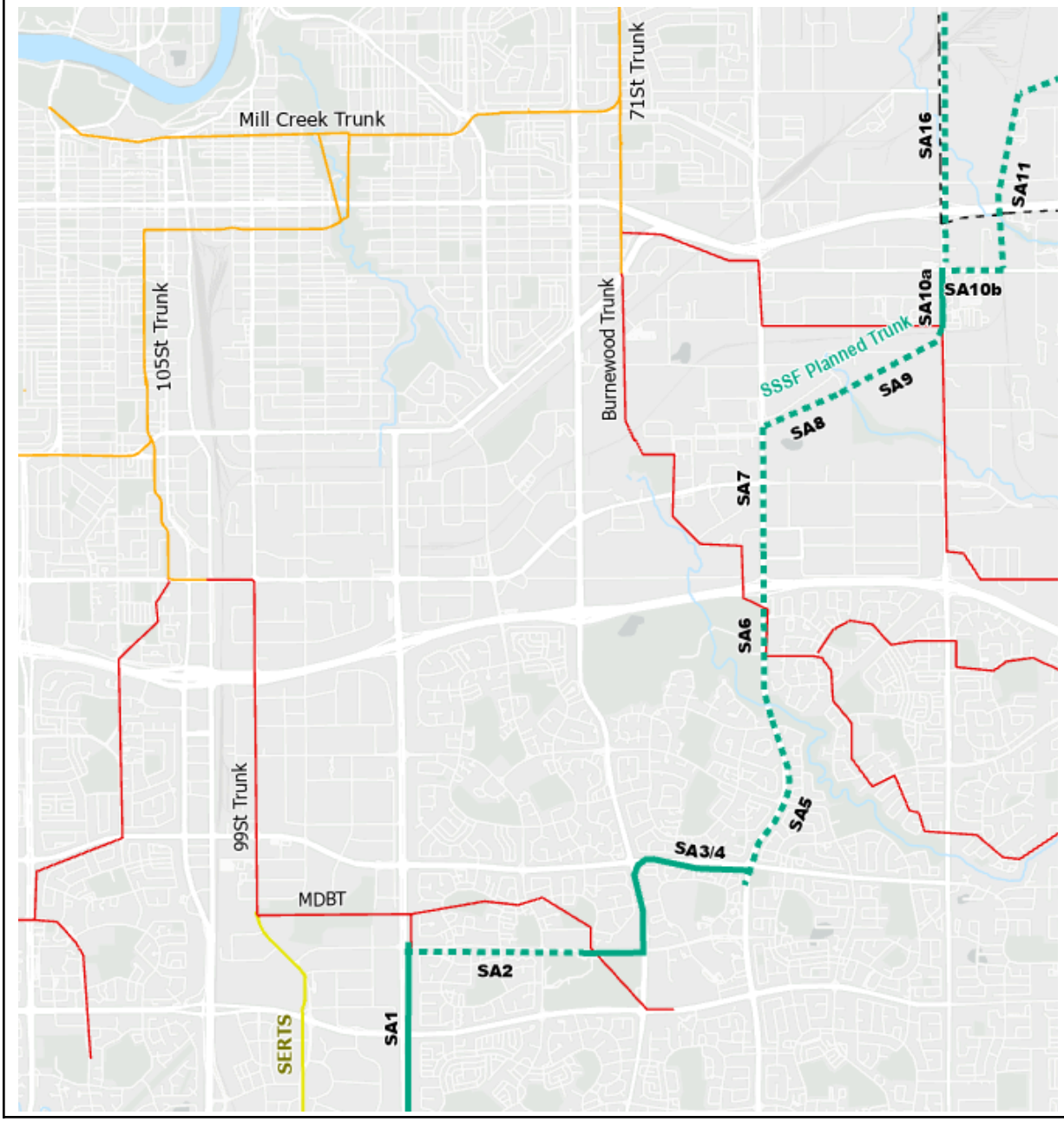


Proposed Plan - No additional infrastructure required

All future planned segments are no longer required due to sufficient storage to accommodate growth for this area of the City. This storage is provided in WESS segments constructed to date and the 99th Avenue bypass tunnel storage that was recently constructed to support rehabilitation of the existing trunk line (rate payer funded).

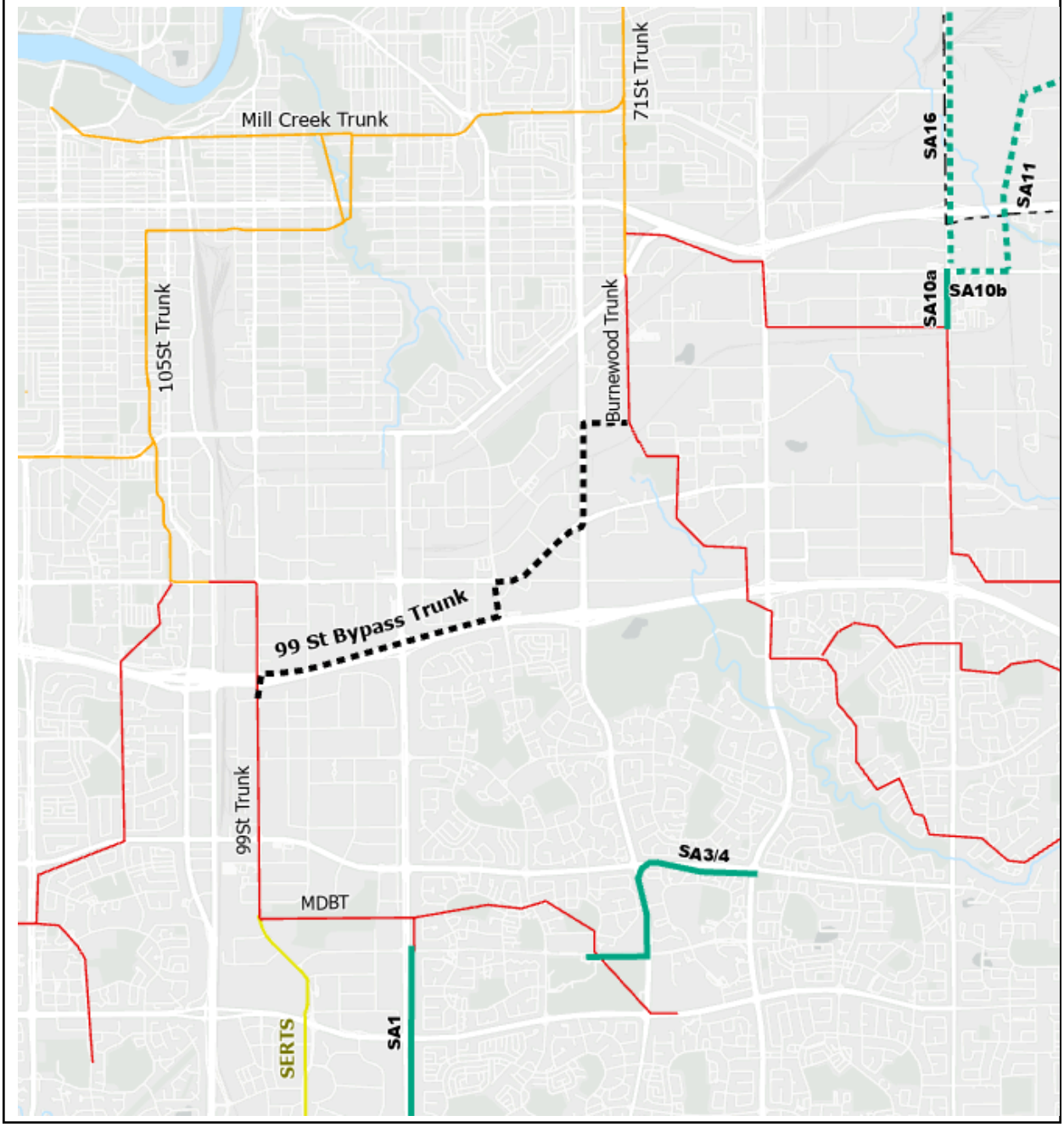
SESS

Previous Plan - $283 Million with Creek Crossing, Freeway Crossing and Major Industrial Pipeline Corridor Crossing



SESS Proposed Plan - $115 Million 99 Street Bypass Trunk

No creek, freeway or Pipeline corridor crossing, fewer tunnel boring machine realignments and construction primarily in commercial industrial zone with reduced impact for residential customers



Next Steps

- EPCOR and City of Edmonton Development Services will work with the developers to update the Area and Neighbourhood servicing plans to reflect these changes in design standards and sanitary trunk alignments.
- EPCOR will be installing additional flow monitoring throughout the city in the coming years to allow continued focus and identification and removal of Inflow & Infiltration sources into the sanitary network to provide additional capacity for growth. The results of this monitoring and pace of anticipated City Plan growth and actual growth trends will determine the timing for decisions on future SESS segments that connect directly to Gold Bar or ARROW wastewater treatment plants. A decision on these future segments is not required at this time, nor in the near future and not recommended until the City Plan has further evolved and the analysis of the additional flow monitoring being installed by EPCOR is available.
- EPCOR will continue to participate in the SSSF Oversight Committee and the SSSF Transformation Project and will continue to support a growing city.