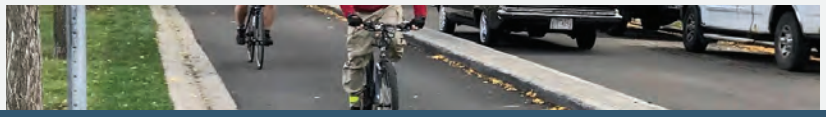


Infrastructure Capacity Review – Summary Report

Land Acknowledgment

The lands on which Edmonton sits and the North Saskatchewan River that runs through it have been the sites of natural abundance, ceremony and culture, travel and rest, relationship building, making and trading for Indigenous peoples since time immemorial. Edmonton is located within Treaty 6 Territory and within the Métis homelands and Métis Nation of Alberta Region 4. We acknowledge this land as the traditional territories of many First Nations such as the Nehiyaw (Cree), Denesuliné (Dene), Nakota Sioux (Stoney), Anishinaabe (Saulteaux) and Niitsitapi (Blackfoot). The city of Edmonton owes its strength and vibrancy to these lands and the diverse Indigenous peoples whose ancestors' footsteps have marked this territory as well as settlers from around the world who continue to be welcomed here and call Edmonton home. Together we call upon all our collective honored traditions and spirits to work in building a great city for today and future generations.

Disclaimer

Contents

Chapter 1. Introduction

Executive Summary

As of 2021, just over 1 million people lived in Edmonton. Over the coming 50 years, that number will likely double. This change will require all of Edmonton to adapt, including the city's transportation and utilities systems. To understand how these particular systems will need change in order to accommodate 2 million people, the City of Edmonton recently conducted what it refers to as the Infrastructure Capacity Review.

The Infrastructure Capacity Review is made up of two long documents full of very technical information. In short, though, it provides something simple: a look at nine specific areas in Edmonton, and details about what kinds of demands more people and more jobs will place on the transportation and utilities systems in those places.

The document that you are reading now, the Infrastructure Capacity Review Summary Report, is a high-level overview of those documents that is written in conversational terms.

Change is coming

The Infrastructure Capacity Review is rooted in this reality: Edmonton is going to grow, and as that happens, its transportation and utilities systems will need to evolve.

Edmonton's transportation systems make it possible to walk, ride in a wheelchair, bike, take transit and drive. Likewise, its utilities allow people to wash dishes, flush toilets, stream videos and fight fires. A population of 2 million people will mean a lot more people using these systems for all kinds of activities.

A growing population is reason enough to make smart preparations. Given that this growth will unfold alongside the ongoing climate crisis, we have no choice but to ensure that our streets and utilities are resilient and flexible.

Different areas of Edmonton will grow differently

This growth will not occur uniformly across Edmonton. Instead, it will be concentrated in various parts of the city that are best suited to welcome residents. Known throughout this document as Nodes and Corridors, these areas will need to be healthy, sustainable and ready to support people of all ages, abilities and backgrounds living and spending time within them. The Infrastructure Capacity Review looks at nine of these areas, selected because they are anticipation to grow at the next population threshold of 1.25 million.

The Infrastructure Capacity Review's purpose, and what it's inside it

The Infrastructure Capacity Review's specific goal is to understand more about what is needed for the transportation and utilities infrastructure within these Nodes and Corridors to be able to accommodate the City's future growth. As Edmonton plans for the types and level of investment needed in the future, this information will help inform future capital budget and planning decisions.

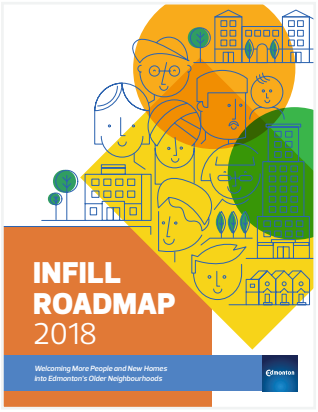
Regarding transportation, the Infrastructure Capacity Review finds that Edmonton must make a number of changes in order to have the multimodal future that The City Plan envisions. When it comes to utilities, it reinforces the idea that systems will need to adapt as demand in the Nodes and Corridors grows.

For both cases, the Infrastructure Capacity Review provides a broad explanation of the types of changes that will be required. Its pages outline how streets will need to change so that they not only move more people, but also improve accessibility and create great places for people to live, work and play. It also speaks to how sewers, water supply and other underground utilities will need to adapt.

You may be familiar with these Nodes and Corridors as they are today, with their current mix of houses and shops, but the Infrastructure Capacity Review invites you to imagine a very different city— one with a population of 2 million people. In the Edmonton of the future, thousands more people live in these areas, and thousands more travel to them daily to work, shop and visit. The buildings and the public spaces between them only distantly resemble what they are today, as they have been transformed to accommodate these people.

Two Key Documents: The City Plan and Infill Roadmap

The Infrastructure Capacity Review is an extension of two City of Edmonton documents: The City Plan and the Infill Roadmap. This section provides a brief summary of both, along with a high-level explanation of how they're connected.



What is The City Plan?

The City Plan is a guide for the City of Edmonton to use in planning for long-term growth and development. Adopted in 2020, it covers not just how people get around and how we use utilities, but also everything from social programs to climate initiatives. The City Plan governs how Edmonton will grow, adapt and succeed, and all other City policies, budget decisions and programs look to it for guidance.

Relative to transportation and utilities, The City Plan makes clear the City of Edmonton must do the following:

- Ensure that the street environment prioritizes people-capacity, safety and comfort for people of all ages and abilities
- Manage stormwater sustainably
- Integrate considerations for winter
- Consider the changing climate and utility demands

The City Plan calls for these four points to be a priority as redevelopment occurs in Edmonton. The Infrastructure Capacity Review supports a better understanding of the types of transportation and utilities investments that will be required to make that happen.

What's in The City Plan?

The City Plan breaks the effort to accommodate 2 million residents down into specific targets, which it calls "Big City Moves." The following list comes directly from The City Plan:

- Achieve total community-wide carbon budget of 135 megatonnes
- Two million new urban trees planted
- Net per-person GHG emissions are zero
- 50% of net new units added through infill city wide
- 600,000 additional residents will be welcomed into redeveloping area
- 50% of trips are made by transit and active transportation
- 15-minute districts that allow people to easily complete their daily needs
- Less than 35% of average household expenditures are spent on housing and transportation
- Nobody is in core housing need
- There is no chronic or episodic homelessness in Edmonton
- Nodes and corridors support 50% of all employment in Edmonton
- Innovation Corridor attracts 50,000 more jobs
- Hold 70% of total regional employment in Edmonton

These excerpts from The City Plan describe the City of Edmonton's philosophy in three areas that are crucial to city infrastructure: Planning and Design, Mobility, and Managing Growth.

PLANNING & DESIGN

"As we double our population within our existing city boundary, how will we create great places for people to live and businesses to thrive? Planning and Design in Edmonton is about working with what we have today and continuously adapting and reimagining our built environment to meet the needs of two million people in the future. To begin with, it means we are going to grow and change in all areas of the city while stewarding the resources, places and stories we have inherited for future generations. We will be sensitive as we design and renew Edmonton's urban form, density, image and identity...The proportion of city-wide growth that occurs through redevelopment will strategically increase over time. This will result in more activity, destinations and different types of development closer to home. We will be healthier as we use a variety of modes of transportation to get around, which also reduces our environmental impact..."

MOBILITY

"As Edmonton grows from one to two million people, the way we move around our city needs to evolve to meet the needs of people and respond to changing contexts and technologies...A mobility system is essentially about moving people and goods in an efficient and accessible manner. Any vibrant and prosperous city must have integrated transportation networks that provide residents with convenient options. Such a system should facilitate opportunity, connection, and health while being safe, inclusive and barrier free for all users...The City Plan is a plan for people, and a vision for mobility that reflects the importance of people and creates the opportunity to make a collective commitment to strive together to achieve that vision."

MANAGING GROWTH

"As Edmonton's population expands to accommodate two million people within our current boundary, when, where and how will we grow? The City Plan welcomes ongoing change and opens up new opportunities for development across Edmonton...[and] is a critical part of Edmonton's investment strategy. It sets out high level development priorities around physical, environmental and social infrastructure investments and their fiscal implications. Growth management considers the regional context and starts at the city-wide scale; it provides the direction needed to prepare more detailed development and investment plans at the district and local levels. The City Plan carefully considers how to phase growth areas over time to ensure the best social, environmental and economic return on investment for Edmonton. It's about being smart with your money...Supporting diverse development opportunities, intentionally, allows the City to provide guidance over the long term while staying relevant through emerging industry trends."

What is it The Infill Roadmap?

Before The City Plan, there was the Infill Roadmap. Adopted in 2018, Infill Roadmap provides 25 actions for ensuring that Edmonton is ready to welcome new people, homes, and businesses into older neighbourhoods.

The Infill Road Map's Action 2 reads as follows:

> Action 2: Review infrastructure capacity in Edmonton's older neighbourhoods and identify the infrastructure investments needed to support infill.

Action 2 is all about gaining an understanding of the kind of redevelopment that's possible in Edmonton's older neighbourhoods, including specifics like how utilities and transportation systems function and what kinds of changes might be necessary as the population grows. The Infrastructure Capacity Review provides the specific analysis needed for this understanding.

How The City Plan builds on the Infill Roadmap

The original goal of Action 2 was to collect specific and detailed information about infrastructure capacity across a very large area in order to clarify what kind of infill was possible. As the projectCity proceeded, however, it became clear that because of the dynamic and interrelated nature of infrastructure, particularly utilities, this data alone would not answer the question of whether a particular location had capacity for a particular development.

The City Plan moved Action 2 forward by identifying sub areas within Edmonton and providing development concepts for these areas, which are descriptions of how much and what types of development should occur. Starting with specific concepts for these sub areas has made it possible to actually test infrastructure capacity.

For all areas of Edmonton, The City Plan provides a development concept that accounts for a total city population of 2 million people. While these concepts don't suit determining immediate needs since we're not at that number just yet, they provide a clearer picture of what kinds of demands future residents and businesses will place on the city as well as lay the groundwork for analysis of future infrastructure needs.

A Closer Look at How the Infrastructure Capacity Review Works

Nodes and Corridors

Really, the Infrastructure Capacity Review can be seen as just a piece of the overall changes that will be necessary as our population grows by 1 million.

The City Plan says that growth will happen all over Edmonton, and also that Edmonton will grow outward. It states that there are 66 specific places that are crucial to ensuring that Edmonton is ready to welcome new people and jobs. It calls these 66 places Nodes and Corridors.

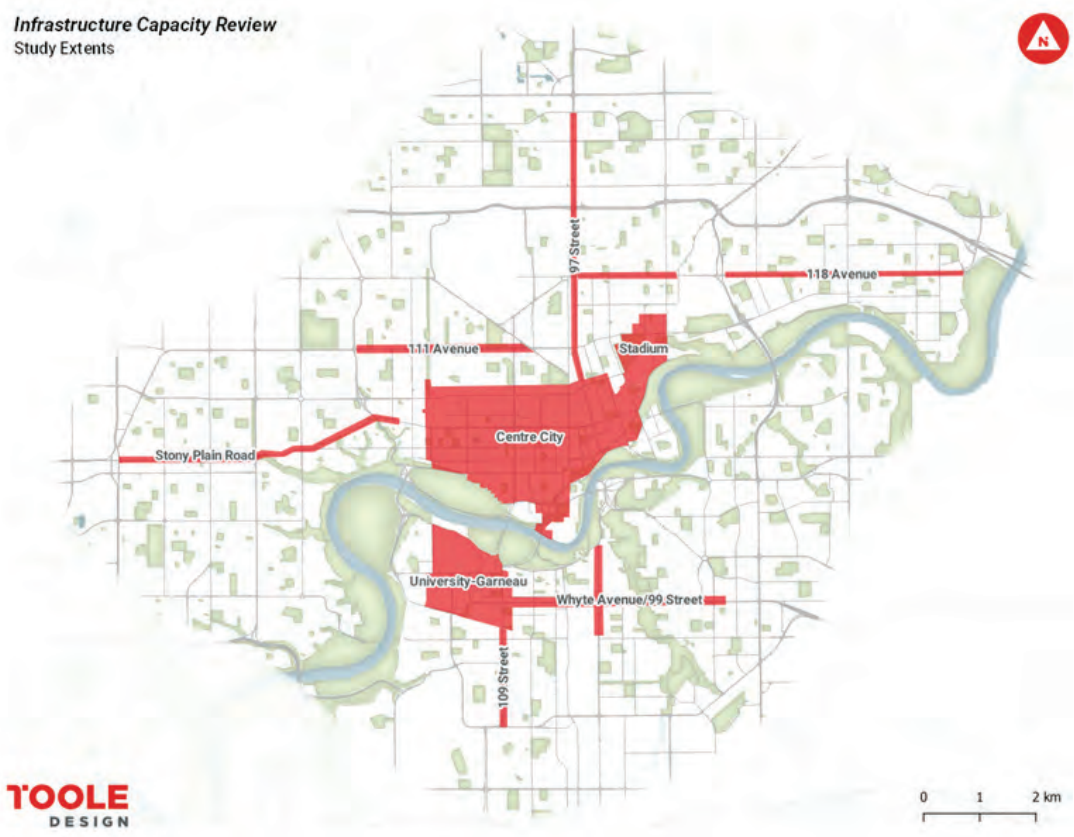
After completing The City Plan, the City of Edmonton identified nine specific Nodes and Corridors as the ones most important to understand today. These nine places— three neighbourhoods and six roads— are in older parts of the city where the major changes might occur at the next 1.25 million population horizon. For these areas to absorb new growth, we need to understand their capacity.

The Infrastructure Capacity Review identifies infrastructure upgrades needed in those nine specific Nodes and Corridors, and what these upgrades might cost.

The Nodes and Corridors are listed below and shown on a map in Figure 1:

1. Centre City Node
2. University–Garneau Node
3. Stadium Node
4. 97 Street Corridor
5. 118 Avenue Corridor
6. 111 Avenue Corridor
7. Stony Plain Road Corridor
8. 109 Street Corridor
9. Whyte Avenue / 99 Street Corridor

Figure 1: Infrastructure Capacity Review study extents



Methodology

At a more detailed level, the Infrastructure Capacity Review provides a look at the kinds of transportation and utilities systems needed for each of the nine Nodes and Corridors to function within what is called the Target Development Scenario.

Created as part of The City Plan, the Target Development Scenario is a tool that the City used to test The City Plan's long-term growth projections.

The table below provides the Target Development Scenario's projections for the nine Nodes and Corridors that the Infrastructure Capacity Review considers.

With these projections in mind, the Infrastructure Capacity Review considers the following for each of the Nodes and Corridors:

- Transportation Systems
- Water Distribution Systems
- Stormwater and Wastewater Drainage Systems
- Power and Other Shallow Utility Systems

To conduct the Infrastructure Capacity Review, the City of Edmonton took the following steps for each of the four categories:

Table 5: Population and employment projections

NODE/CORRIDOR	EXISTING PEOPLE + JOBS	FUTURE PEOPLE + JOBS
109 STREET	1,064	5,635
111 AVENUE	2,513	13,806
118 AVENUE	10,773	34,183
97 STREET	8,586	25,342
CENTRE CITY	136,033	290,438
STADIUM	4,723	12,012
STONY PLAIN ROAD	11,527	36,711
UNIVERSITY-GARNEAU	38,980	73,027
WHYTE AVENUE / 99 STREET	13,357	54,002
TOTAL	**227,557**	**545,156**

Assess Existing Systems → Understand Governing Policies and Standards → Complie Proposed Improvements and Expansions → Identify Additional Improvements and Expansions → Estimate Cost (high-level)

What will infrastructure upgrades cost?

Of course, the upgrades necessary for the transportation and utilities infrastructure in each of the nine Nodes and Corridors will require significant investment over the coming 50 years, with some areas needing more resources than others. The Infrastructure Capacity Review includes high-level cost estimates for these investments.

The Infrastructure Capacity Review assumes that each person or job will require an infrastructure investment of just over $5,000. Of all the Nodes and Corridors, the Centre City Node, the Whyte Avenue/99 Street Corridor and the University-Garneau Node have the lowest levels of infrastructure investment required per added person or job.

It's important to note that "estimates" is a key word here: while the Infrastructure Capacity Review's analysis is extensive, it is also fairly general, meaning that we do not yet have a clear picture of what, exactly, will be built. More detailed infrastructure information will become available as the City moves forward with specific redevelopment proposals, which will allow for more accurate cost analysis.

It is also worth noting that the Infrastructure Capacity Review doesn't include a breakdown of who– between taxpayers, utility ratepayers, and developers/homebuyers– should pay for infrastructure improvements. However, development industry stakeholders who contributed to the Infrastructure Capacity Review shared that changes to funding processes for transportation and utility infrastructure would help to further support infill development.

Estimated costs for upgrades at each of the Nodes and Corridors

The table below provides estimates for what it will cost to provide the transportation and utilities systems that Edmonton will need in the future.

Table 6: Transportation & Utility Infrastructure Costs by Node and Corridor

Node/Corridor	Current People + Jobs	Future People + Jobs	People+Jobs Growth	Total Cost	Cost per Added Person or Job
109 Street	1,100	5,600	409%	$40 million	$8,800
111 Avenue	2,500	13,800	452%	$75 million	$6,600
118 Avenue	10,800	32,200	198%	$180 million	$8,400
97 Street	8,600	25,300	194%	$147 million	$8,800
Centre City	136,000	290,400	114%	$566 million	$3,700
Stadium	4,700	12,000	155%	$85 million	$11,700
Stony Plain Road	11,500	36,700	219%	$170 million	$6,750
University / Garneau	39,000	73,000	87%	$149 million	$4,400
Whyte Avenue / 99 Street	13,400	54,000	303%	$177 million	$4,350
TOTAL	**227,600**	**545,300**	**139%**	**$1.6 billion**	**$5,035**


DONALD GLOVER
SETH ROGEN
King St W

Chapter 2. Transportation Capacity Review

Introduction to Transportation

As mentioned before, Edmonton is likely to double in size, from 1 million to 2 million residents, between now and 2070. The City Plan lays out a vision for accommodating this population growth, and the Infrastructure Capacity Review supports that vision by providing more detail on how the city's transportation and utilities systems might change as part of this effort.

This section of the Summary Report explains the Infrastructure Capacity Review's analysis and recommendations for Edmonton's transportation systems.

In Edmonton, "transportation" has many meanings

Transportation is much more than just cars on roads. Transportation systems make it possible for people to get around in all kinds of ways, from walking or rolling in a wheelchair, to riding a bike, scooter or skateboard, to hopping on the bus or light rail.

The City Plan provides a breakdown of Edmonton's three core transportation systems:

- The Active Transportation Network – This includes sidewalks, crosswalks, bike lanes and shared use paths.
- The Transit Network – This includes LRT lines, bus routes and transit centres.
- The Roadway and Goods Movement Network – This includes the roads and bridges where cars and trucks drive, as well as on-street parking spaces.

Streets are used by many different people in many ways, and for many different reasons. People and companies use them to deliver goods, seniors to walk and get exercise, children to get to school and meet friends, families to drive for errands, workers to walk or ride their bicycles to work, and transit drivers to get their passengers where they need to go. In addition to connecting people to places, streets create public spaces for people to stop, linger and enjoy the city.

Placemaking

The process of imagining and reinventing public spaces as the heart of every community. Strengthening the connection between people and the places they share.

Being clear that transportation is more than just car travel is about embracing what makes Edmonton vibrant: people spending time in public spaces rather than simply passing through. Known as placemaking, this philosophy harkens back to the history of cities as true *places*, where streets existed to support social, economic and cultural exchange between people.

Where does transportation happen?

While roads typically come to mind first when we think about transportation, it's important to understand that they are only one way of using public property known as the right-of-way. The right-of-way includes the road, bike lanes and paths, sidewalks, street lights and trees, bus stops and other landscaping and street furniture such as benches and signs. We call the sum of all of these elements a "street."

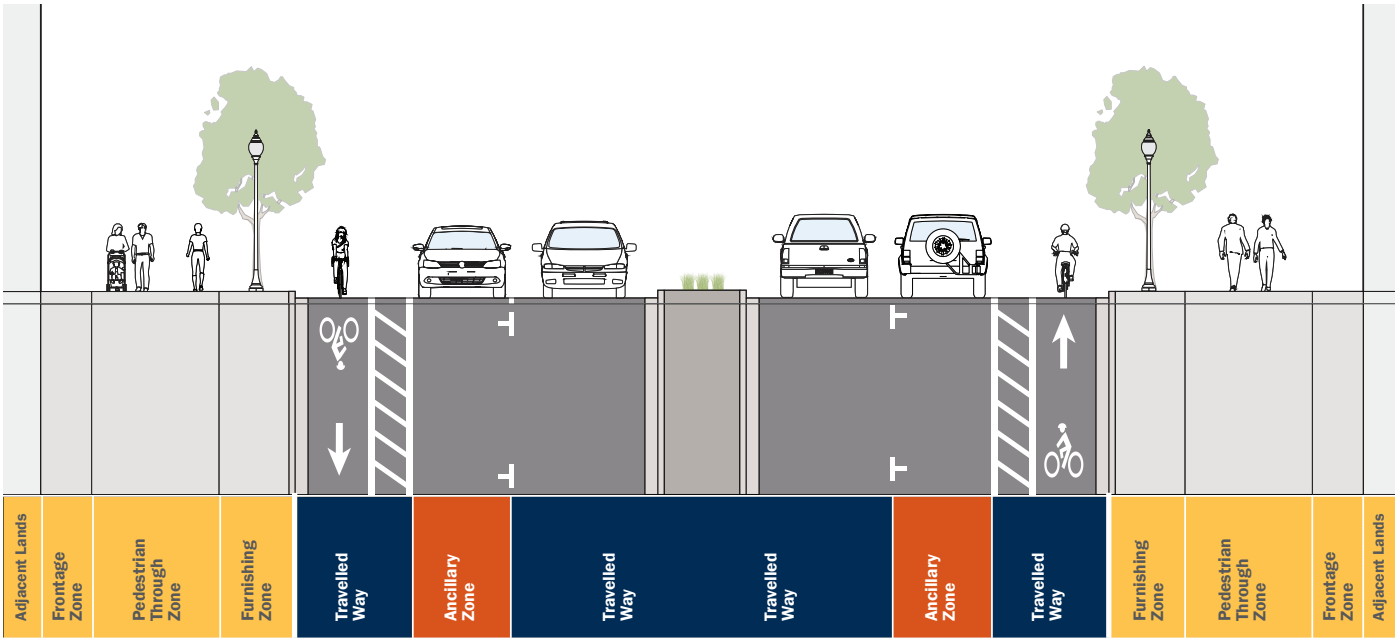
Along some streets, the right-of-way can extend to the edge of the buildings that flank it. In other cases, the street extends only to the landscaping in front of buildings. Often, the edge of the street blends seamlessly with private land, looking like part of the lawn or landscaping of the building that fronts onto it.

Beyond what you can see and touch, the right-of-way also extends below the surface, where it is home to sewers, water pipes, power and gas lines, telecommunication lines and other utilities. Some forms of utilities can be visible on the right-of-way's surface and will look like landscaping. This is the case for "low impact development," which is used to slow and hold rainwater instead of having it flow immediately into a sewer. For more on utilities, please see the Summary Report's Utility Capacity Review section.

The City of Edmonton breaks all right-of-way down into different zones, designating particular activities and uses for each zone. These zones, initially identified in Edmonton's Complete Streets Design & Construction Standards, are listed below:

- **Travelled Way**: This zone serves movement of people in motor vehicles and transit, and movement of goods. Facilities for bicycling can also be provided in the Travelled Way or the Travelled Way may be split with a Furnishing Zone, Ancillary Zone, or medians to create protected bike lanes. Medians can also be an element in the Travelled Way.
- **Ancillary Zone**: This zone is flexible and may support public realm functions such as patio/parklet space or it may support vehicle parking, bicycle parking, loading zones, bus stops zones or curb extensions.
- **Furnishing Zone**: This zone supports street furniture such as signage, light and signal poles, landscape elements, low impact development features and transit amenities.
- **Pedestrian Through Zone**: This zone supports mobility for people walking and rolling of all ages and abilities and should be a space that is free of obstructions to support Universal Access. Shared-use paths can also be a form for the Pedestrian Through Zone and can be used by a wider variety of active forms of travel.
- **Frontage Zone**: This zone supports activation of the adjacent land uses and can include features such as signage and seating.
- **Adjacent Lands**: This area includes the land uses that serve as origins and destinations of people's trips.

Figure 2: Zones that make up the street environment



What transportation choices can Edmonton make?

Public space is like a budget: it's fixed, and we have choices to make about how to allocate it. We can choose to use right-of-way for roads, but we can also use it for sidewalks, dedicated bus lanes, patio space for restaurants, urban gardens and tree plantings and more. Just as a city re-evaluates its budget decisions as it grows, Edmonton will need to change how it uses public space in order to meet its residents' changing needs.

The Infrastructure Capacity Review is intended to help answer this question: as Edmonton grows toward 2 million people, what are the best ways to use the right-of-way? The City Plan says the answer should account for these two criteria:

- Each of the nine Nodes and Corridors that it examines should be a "15-minute district" that allows people to easily complete their daily needs by taking shorter trips.
- 50% of all trips in Edmonton should be made by active or sustainable modes of travel, such as walking, riding a bike, or taking transit.

Success with these two goals will ensure that as Edmonton's population grows, its transportation systems remain functional and efficient. While achieving them will require residents to make different travel and behaviour choices than those they make today, we know that such a shift is possible: winter cities similar to Edmonton, such as Helsinki, Hamburg, Cologne, and Warsaw, have achieved 50% or greater mode shares for walking, cycling, and transit.

Measuring Transportation Capacity

To provide detail on how the streets in Edmonton will have to change to support this goal, the Infrastructure Capacity Review evaluated the following for each of the Nodes and Corridors:

It's worth noting that you can't measure all types of trips the same way. While capacity is paramount for cars and transit, quality is a more important factor for walking and biking, as people pay more attention to how much they enjoy and how safe they feel travelling through a given area when using these modes.

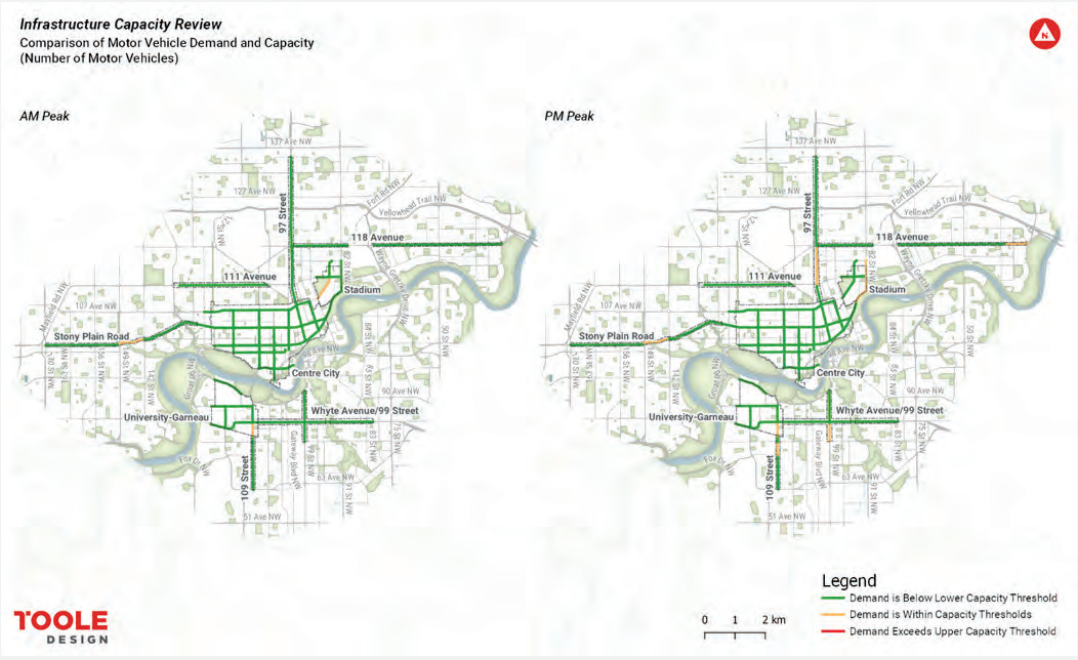
1. Evaluate the capacity along each Corridor and on arterial streets within each Node
2. Evaluate the capacity of the driving and transit systems along key streets
3. Evaluate the quality of the walking and cycling systems based on principles of urban design and level of traffic stress that are shown to impact comfort, safety, and levels of use of walking and cycling
4. Evaluate future demand vs. existing capacity and quality
5. Identify how space might be reallocated to address capacity and/or quality issues (this was done in places where existing capacity and quality will not meet future demands)
6. Develop high-level cost estimates for making changes to right-of-way use

Why is achieving 50% sustainable mode share important?

The Infrastructure Capacity Review includes the finding that if Edmonton doesn't shift away from a car-centric approach to transportation, about 70% of daily trips across the city will be made in a private motor vehicle. The increased number of driving trips will result in higher demands along streets and increased travel delays as demands meet or exceed capacity. A "business as usual" future scenario would mean an Edmonton that isn't people-friendly and where we're all stuck in traffic all the time.

In addition, creating the high-quality street environments envisioned in The City Plan requires more right-of-way for public realm zones. That means there just isn't very much space within the right-of-way to accommodate more motor vehicles. Adding right-of-way for motor vehicle travel would require the demolition of existing buildings, homes, and businesses along the corridors, all of which would conflict with The City Plan's the goals and objectives.

The Infrastructure Capacity Review underscores how critical infrastructure investments are to achieve increased capacity, safety, and comfort for travel modes like transit, walking, and biking. It also calls on the City to pair these investments with policies and programs that incentivize travelling by these modes.



Example – 97 Street from 108 to 111 Avenue

As an example of how the Infrastructure Capacity Review looks at transportation capacity and quality, the following provides a look at the analysis completed for a segment of 97 Street.

Current allocation of right-of-way

The right-of-way width for 97 Street from 108 to 111 Avenue is approximately 20m. There are sidewalks on both sides, aka pedestrian through zones, that are about 2.5m, and the sidewalks are separated from the street by a very narrow furnishing zone that includes street light poles and benches. In many locations, street light poles are located on the building side of the sidewalk away from the street. In some locations, there may be a small frontage zone adjacent to businesses that are used for street displays and advertising signs, but these are located where buildings are setback from the edge of the right-of-way. The width of the public realm, which includes the pedestrian through zone, furnishing zone, and frontage zone, is approximately 6m or 3m on each side of the street.

The remaining 14m of right-of-way is located between the curbs and is used for on-street parking and general purpose travel lanes that can be used by people driving, biking and delivering goods as well as transit services. There are four lanes in total, two in each direction. During the morning and afternoon peak periods of travel, all four lanes are used for movement. During off-peak periods, on-street parking is allowed in the curbside lanes.

Current capacity for driving & transit vs. estimated future demand

Based on the types of transportation facilities provided— sidewalks, general purpose travel lanes used by drivers, people riding bikes, and public transit buses— 97 Street can move between about 11,000 and 19,000 people per hour, but 7,500 to 10,000 of this capacity is for people walking because so many people can be accommodated within sidewalks (i.e., 6,000 or more per hour on a 3m sidewalk).

The people moving-capacity of a street includes assumptions related to the number of people in a vehicle, the following distances people keep between their vehicles, bicycles, and themselves and other people, vehicles, and bicycle users, as well as the number of people riding in a bus and the number of buses that serve a corridor. The capacity is also impacted by the operation of intersections and travel delays associated with yielding, stopping, and waiting at intersections before passing through the intersection.

The capacity for motor vehicle travel, in terms of the number of motor vehicles that can travel along 97 Street within an hour, was calculated as being between 2,300 and 3,700 vehicles per hour. The transit capacity of buses operating along 97 Street with other vehicles in mixed traffic was calculated as being between 1,400 and 4,300 people per hour, which is highly dependent on the number of riders in each bus and the number of buses per hour.

These numbers were then compared to the number of motor vehicles and transit passengers operating along 97 Street when Edmonton reaches a population of 2 million people.

The increased number of people and jobs along 97 Street will increase travel demands, and the city-wide increase in people and jobs will also increase travel along 97 Street as people travel to homes and jobs across the city via 97 Street. The modelled travel demands were estimated using the City of Edmonton's Regional Travel Model.

The driving demand is 1,200 vehicles per hour during the morning peak hour and 1,300 vehicles per hour in the afternoon peak hour. When the estimated future motor vehicle demands are compared to the existing capacity, there is more capacity than is required and this space could be reallocated to other modes of transportation including the public realm to address potential capacity and quality issues for walking, biking, and transit.

The transit demand for the morning and afternoon peak hours is estimated to be 250 to 650 people per hour. When compared to the existing capacity, the estimated transit demand can be served by the current capacity of 97 Street using shared general purpose travel lanes with private motor vehicle traffic.

Current quality for walking and biking

The Regional Travel Model also estimates the number of walking and biking trips that start and end throughout Edmonton. In the model, Edmonton is broken up into a number of zones. The trips for walking, biking, transit, and driving are estimated for each zone and the model estimates the trips by each of these travel modes to and from each zone. Unlike the longer distance trips that are focused more on arterial streets and freeways that are made by people driving and using transit, walking and biking trips are shorter in distance and the routes people take to make these trips are dispersed to many potential routes. Because of this, the Regional Travel Model does not estimate walking and biking trips along individual corridors the same way it does for driving and transit trips. This factor and the fact that walking and biking are very space-efficient modes of transportation (the number of people walking or biking within a 3 m wide space is many times larger than the number of people that can move in private vehicles within that same amount of space) led to the analysis being focused on quality of the walking and biking environments rather than capacity.

97 Street is a primary corridor and is expected to have a high number of people walking and a lot of activity related to shopping at retail shops and eating or drinking at restaurants and pubs. As a primary corridor in The City Plan, the width of the sidewalks should be wider than a minimum width that accommodates basic accessibility; with more people walking and more activity at businesses, wider sidewalks better support movement and socialising. These types of corridors should have a buffer from moving traffic and this can be accomplished by a furnishing zone that has trees and, where possible, low impact development that will manage stormwater run-off while adding landscaping. Due to the walkable retail environment, having space for seating and displays, as well as benches for sitting, are preferable and support a higher quality walking environment. Buffers from moving traffic can also include on-street parking and loading spaces. Due to the current width of the public realm of 3m on each side of the street and the preferred width of 5.5m, as well as only off-peak parking being available, the quality of the walking environment is not meeting and will not meet the needs of people walking and is rated as poor. Additional public realm widths are required to improve walking quality.

The quality of the street for biking is based on the concept of "Level of Traffic Stress." Level of Traffic Stress is a measure of how stressful an environment is for someone biking based on interactions with vehicle traffic and considering the diverse needs of people and their comfort levels biking around traffic. Level of Traffic Stress is evaluated based on the 4-point scale that has been developed by the transportation engineering industry:

- Level of Traffic Stress 1 – Strong separation from all traffic except low speed, low volume traffic and has simple crossings. This rating indicates a facility suitable for children.
- Level of Traffic Stress 2 – Except in low speed / low volume traffic situations, people cycling have their own place to ride that keeps them from having to interact with traffic except at formal crossings. Limits traffic stress to what the mainstream adult population can tolerate.
- Level of Traffic Stress 3 – Involves interaction with moderate speed or multi-lane traffic or close proximity to higher speed traffic.
- Level of Traffic Stress 4 – Involves being forced to mix with moderate speed traffic or close proximity to high speed traffic.

The objective from The City Plan and the Bike Plan is to create a high-comfort environment for people of all ages and abilities. In terms of Level of Traffic Stress, that means the lowest level of stress. When 97 Street is evaluated for Level of Traffic Stress, it is rated at Level of Traffic Stress 3 and 4 indicating the current street is not designed for safe and comfortable biking. Due to the levels of activity projected to occur along 97 Street, separated facilities for biking are required to achieve a rating of Level of Traffic Stress 1.

Reallocating the right-of-way

The analysis of existing capacity and quality of 97 Street as compared to the estimated future travel demands and space requirements to create a walkable environment that supports businesses

showed right-of-way can be reallocated. The large amount of space that is currently provided for travel in private motor vehicles requires reallocation for other purposes.

The quality of the street environment for walking is impacted by how much space is being provided to moving motor vehicles through the corridor instead of supporting access to the destinations along this main street and space for people to linger. The capacity for motor vehicle travel is higher than necessary to meet the future travel demands. Finally, the comfort of biking along the corridor is poor and biking facilities that are separated from motor vehicle traffic as well as busy sidewalks are required.

Like many streets in Edmonton, 97 Street is also constrained in terms of the width of its right-of-way. Meeting all the mobility, accessibility and livability needs of 97 Street in the future will require more space than is available along the corridor. The history of the street and the buildings along it is an important part of creating interesting and attractive street environments. Widening the public right-of-way would require removing historic buildings and homes, which would significantly alter the character of the street. Meeting the transportation capacity and quality needs must fit within the existing right-of-way widths.

Multiple cross-section options were developed to reallocate the 97 Street street right-of-way to better meet the transportation capacity and quality requirements in the future. Each had benefits and trade-offs. The option that was identified as recommended is as follows:

- Public realm that supports accessibility and placemaking including side sidewalks on both sides of the street
- Two-way protected bikeway
- One general purpose travel lane in each direction for driving, goods, and transit
- On-street parking and loading is located within the furnishing zone in pockets between street trees on one side of the street

How well does the reallocated right-of-way meet future needs?

While having a continuous boulevard with street trees and protected bike lanes that operate one-way on both sides of the street are preferred, the constrained right-of-way along this segment of 97 Street only allowed street trees to be provided on one side of the street. One travel lane in each direction requires transit to share a lane with private motor vehicle traffic.

The quality of the walking environment meets or exceeds the needs based on sidewalk width and a buffer from moving traffic. Biking is comfortable with a Level of Traffic Stress 1 facility. Transit demands and driving demands can be accommodated within the 1,200 to 1,900 vehicles per hour that can operate along 97 Street, although travel will be congested during the morning and afternoon peak periods.

Key Findings

The Infrastructure Capacity Review's key transportation findings are that meeting The City Plan's transportation goals will require 50% of city residents to use sustainable modes of transportation like walking, cycling and taking transit, and that more of Edmonton's right-of-way is dedicated to car travel than necessary.

If we are to meet the goals laid out in The City Plan, we will need to devote more public space— space that is currently set aside for car travel— to active transportation. Using more right-of-way for walking, bicycling and transit will support The City Plan's goals and targets related to climate, health, safety, equity, economic development and mobility.

The following list elaborates on the Infrastructure Capacity Review's transportation findings:

- In order to accommodate the future travel demand envisioned in The City Plan, Edmonton will need dedicated transit facilities along many main streets. This may not be possible in some constrained places, and other measures concentrated at intersections could be used to increase travel time reliability and transit capacity. Using higher capacity transit vehicles is another measure that could increase capacity to better support demand.
- A significant number of the streets within the Nodes and Corridors have poor quality walking and public realm environments. This includes streets that do not have walking facilities that are possible for all users to access, as well as streets without room for healthy trees, comfortable bus stops or snow storage.
- Almost all streets within the Nodes and Corridors have poor quality bicycling environments. In some cases, for example Whyte Avenue or Jasper Avenue, there are high quality bicycling environments running parallel and one block away, but The City Plan envisions an Edmonton where bicycling demand has gone up, meaning a more robust and quality bicycling network will be needed.

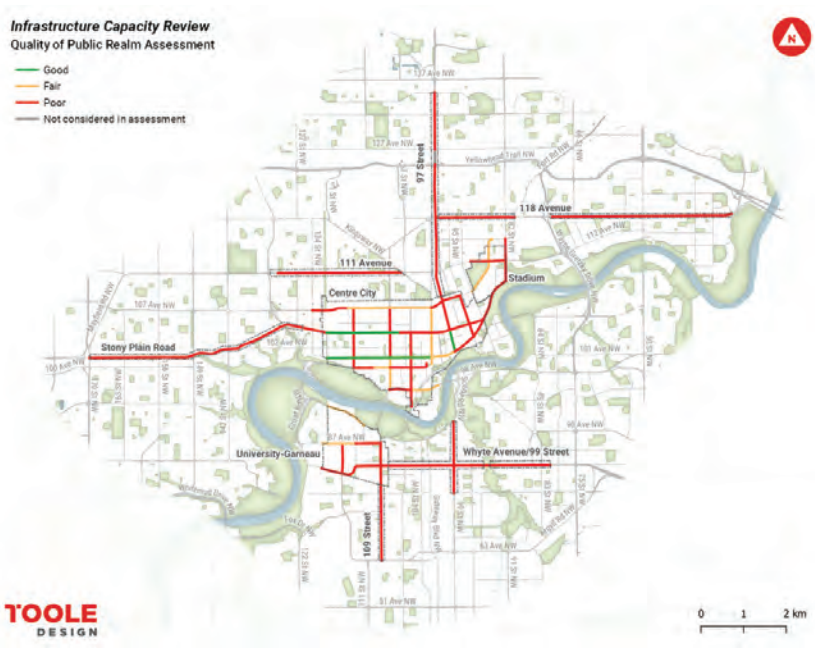
Recommended changes for Edmonton's transportation systems

The Infrastructure Capacity Review provides a number of recommendations for reallocating right-of-way within the Nodes and Corridors to ensure transportation systems that work for a city of 2 million people.

Each of the recommendations within the document requires considering trade-offs. In some cases where there are very constrained corridors and high travel demands for multiple modes of transportation, mitigations are required to accommodate the travel and placemaking needs and to avoid right-of-way allocation and deterioration of the quality of the public realm.

It is also important to note that for all recommendations, the Infrastructure Capacity Review considers only existing the right-of-way. While it is possible to make changes to how public space is used— it is possible to make a street smaller in order to add a bike lane or a larger sidewalk, for example— the Infrastructure Capacity Review does not allow for the possibility of expanding the right-of-way itself.

Figure 3: Existing transportation capacity and quality vs. future travel demands and needs



What are the recommendations?

This section of the Summary Report includes a cross-section (an illustration of a street's infrastructure and elements within the right-of-way) for each of the Nodes and Corridors. Each of the Infrastructure Capacity Review's recommendations is illustrated in one of the cross-sections.

The cross-sections essentially demonstrate how each Node and Corridor can accommodate Edmonton's future needs for walking, public realm, cycling, transit, and driving. They are intended to guide the redesign of the streets and should be used as the basis for expanding multimodal capacity and improving public realm quality. However, further design work will be required along each corridor to account for the variations in width, location of buildings, and types of land uses, including the design of intersections.

There are more details on the Infrastructure Capacity Review's analysis of Edmonton's transportation systems in the Infrastructure Capacity Review – Mobility Technical Report.

The following icons have been used in illustrating the cross-sections.

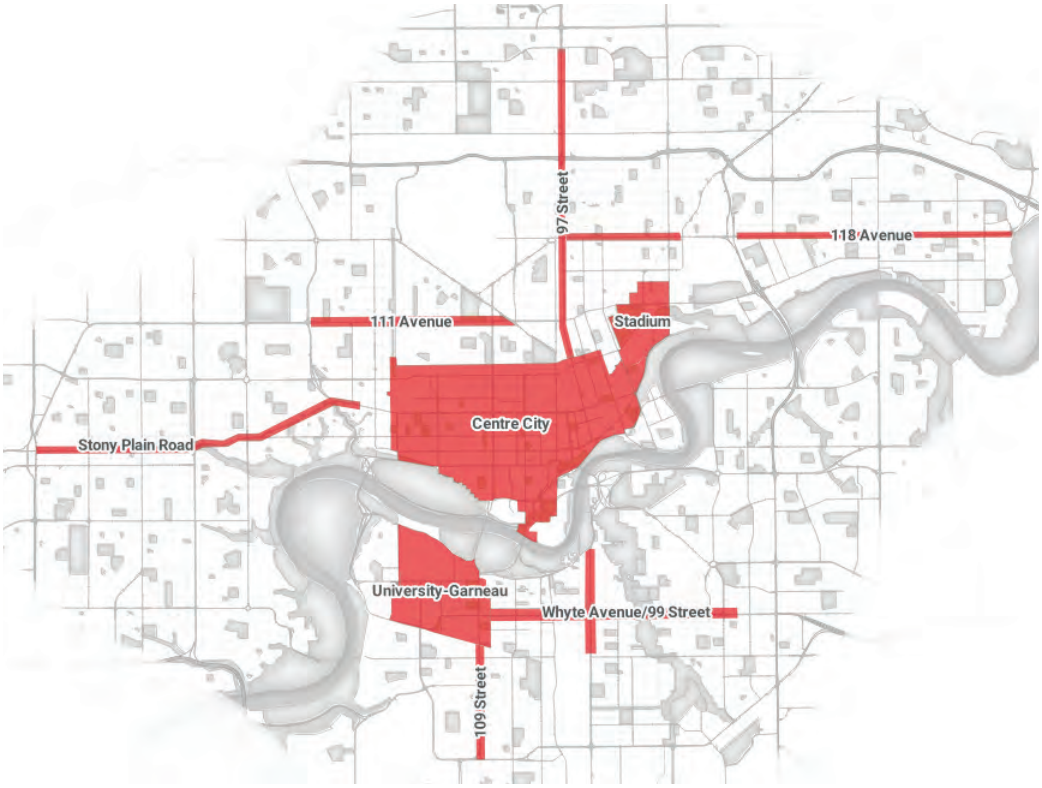


Table 7: Cross-section elements

Cross-section Element	Icon	Cross-section Element	Icon	Cross-section Element	Icon
Pedestrian Through Zone (Sidewalk)		General Purpose Travel Lane		Furnishing Zone / Parking (wide enough for healthy trees with pockets of parking along the street's length)	
Shared-use Path		Parking Lane		Furnishing Zone (wide enough for healthy trees)	
Protected Bike Lane		Peak Hour Bus Lane / Off-Peak General Purpose Travel Lane of Parking Lane		Furnishing Zone (not wide enough for healthy trees)	
Dedicated Bus Lane		LRT		North Arrow	

Corridors

Table 8: 97 Street Performance

Segment	Existing				Recommended			
111 Ave to 108 Ave								
111 Ave to 118 Ave								
118 Ave to Yellowhead Tr								
Railway Underpass								
Railway Underpass to 135 Ave								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	⚠	✗	✗	⚠	✓	✓	✓
Direction of North:								

Table 9: 109 Street Performance

Segment	Existing	Recommended
61 Ave to 72 Ave		
72 Ave to 76 Ave		
76 Ave to University Ave		

Segment	Existing				Recommended			
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✗	✗	✗	✓	✓	✓	✓
Direction of North:								

Table 10: 118 Avenue Performance

Segment	Existing	Recommended (with cycling facilities along 117 and 119 Avenue)
97 St to 80 St		
71 St to 51 St		
51 St to 36 St		
36 St to Rundle Park Rd		

Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✗	✗	✗	✓	✓	⚠	✓
Direction of North:								

Table 11: 111 Avenue Performance

Segment	Existing	Recommended
131 St to Shared-use Path west of 120 St		
Shared-use Path west of 120 St to 110 St		
110 St to Kingsway Ave		

Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✗	✗	✗	✗	✓	✓	✓
Direction of North:								

Table 12: Stony Plain Road Performance

Segment	Existing				**Recommended** (with cycling facilities provided on parallel routes ~ 1 block north and south of each corridor segment)			
170 St to 166 St								
166 St to 156 St								
156 St to 149 St								
149 St to 142 St								
142 St to 121 St								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
								
Direction of North: 								

Table 13: Whyte Avenue Performance

Segment	Existing				Recommended			
109 St to 97 St								
97 St to 91 St								
91 St to 85 St								
85 St to 81 St								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
								
Direction of North: 								

Table 14: 99 Street Performance

Segment	Existing				Recommended			
Saskatchewan Drive to 81 Ave								
81 Ave to 76 Ave								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
								
Direction of North: 								

Stadium and University/ Garneau Nodes

Table 15: Stadium Road / 86 Street Performance

Segment	Existing				Recommended			
92 St to 112 Ave								
112 Ave to 115 Ave								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✓	✗	✓	✗	✓	✓	✓
Direction of North:								

Table 16: 82 Street Performance

Segment	Existing				**Recommended** (with cycling facilities along the LRT corridor or Stadium Road)			
Jasper Ave to 114 Ave								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✓	✗	✗	✓	✓	✗	✓
Direction of North:								

Table 17: 112 Avenue Performance

Segment	Existing				Recommended			
89 St to 82 St								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✓	✗	✗	✓	✓	✓	✓
Direction of North:								

Table 18: Jasper Avenue (87 Street to 82 Street) Performance

Segment	Existing				Recommended			
87 St to 82 St								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✓	✗	✗	✓	✓	✓	✓
Direction of North:								

Table 19: 109 Street (University Avenue to 87 Avenue) Performance

Segment	Existing				Recommended			
University Ave to Whyte Ave								
Whyte Ave to 87 Ave								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✗	✗	✗	✗	✓	✓	✓
Direction of North:								

Table 20: 82 Avenue / Whyte Avenue (114 Street to 109 Street) Performance

Segment	Existing				Recommended			
109 St to 114 St								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✓	✗	✗	✓	✓	✓	✓
Direction of North:								

Table 21: 114 Street Performance

Segment	Existing				Recommended			
University Ave to 87 Ave								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
	✓	✗	✗	✗	✓	⚠	✓	✓
Direction of North: 								

Table 22: 87 Avenue Performance

Segment	Existing				Recommended			
116 St to 112 St								
112 St to 109 St								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
	✓	✗	✗	✗	✓	✓	✓	✓
Direction of North: 								

Table 23: University Avenue Performance

Segment	Existing				Recommended			
117 St to 114 St								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
	✓	✓	✗	✗	✓	✓	✓	✓
Direction of North: 								

Table 24: Saskatchewan Drive Performance

Segment	Existing				Recommended			
116 St to 111 St								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
	✓	✓	✓	✓	✓	✓	✓	✓
Direction of North: 								

Centre City Node

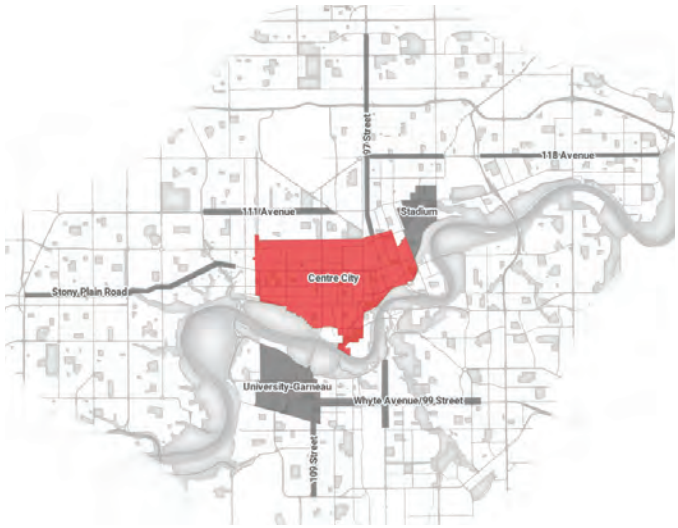


Table 25: 95 Street Performance

Segment	Existing				Recommended			
Jasper Ave to 103A Ave								
103A Ave to 107 Ave								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✓	✗	✗	✓	✓	✓	✓
Direction of North: N								

Table 26: 97 Street Performance

Segment	Existing				Recommended			
Jasper Ave to 103A Ave								
103A Ave to 108 Ave								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✓	✗	✗	✓	✓	✓	✓
Direction of North: N								

Table 27: 101 Street Performance

Segment	Existing				Recommended (with cycling facilities on 103 Street)			
Macdonald Dr to 104 Ave								
104 Ave to 105A Ave								
105A Ave to 107 Ave								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
								
Direction of North: 								

Table 28: 105 Street Performance

Segment	Existing				Recommended			
95 Ave to 100 Ave	 (Note: this is a one-way northbound)				 (Note: this is a one-way northbound)			
100 Ave to 104 Ave								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
								
Direction of North: 								

Table 29: 109 Street Performance

Segment	Existing				Recommended			
97 Ave to Jasper Ave								
Jasper Ave to 104 Ave								
104 Ave to 107 Ave								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
								
Direction of North: 								

Table 30: 116 Street Performance

Segment	Existing				Recommended			
100 Ave to 104 Ave								
104 Ave to 107 Ave								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
	✓	✓	✗	✗	✓	✓	✓	✓
Direction of North: 								

Table 31: 97 Avenue Performance

Segment	Existing				Recommended			
109 St to 105 St								
105 St to 100 St								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
	✓	✗	✗	✗	✓	✓	✓	✓
Direction of North: 								

Table 32: 100 Avenue Performance

Segment	Existing				Recommended			
116 St to 112 St								
112 St to 109 St								
109 St to 102 St								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
	✓	✓	✗	✗	✓	✓	✓	✓
Direction of North: 								

Table 34: Jasper Avenue (121 Street to 109 Street) Performance

Segment	Existing				Imagine Jasper Design (with cycling facilities on 100 and 102 Avenues)			
121 St to 114 St								
114 St to 109 St								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✓	✗	✓	✓	✓	⚠	✓
Direction of North:								

Table 35: Jasper Avenue (109 Street to 87 Street) Performance

Segment	Existing				Imagine Jasper/Jasper Ave New Vision Design (with cycling facilities on 102/102A and 100 Avenues)			
109 St to 97 St								
97 St to 92 St								
92 St to 87 St								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✗	✗	✓	✓	✓	⚠	✗
Direction of North:								

Table 36: 104 Avenue (121 Street to 97 Street) Performance

Segment	Existing				West LRT Design (with cycling facilities along 103 and 105 Avenues)			
121 St to 107 St								
Corridor Performance	Motor Vehicle	Transit	Cycling	Walking / Public Realm	Motor Vehicle	Transit	Cycling	Walking / Public Realm
	✓	✓	✗	✓	✓	✓	⚠	✓
Direction of North:								

Table 38: 104 Avenue (107 Street to 92 Street) Performance

Segment	Existing				Recommended			
107 St to 97 St								
97 St to 92 St								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
	✓	✓	✗	✗	✓	✓	✓	✓
Direction of North:								

Table 40: 107 Avenue (124 Street to 117 Street) Performance

Segment	Existing				Recommended			
124 St to 117 St								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
	✓	✓	✗	✗	⚠	✓	✓	✓
Direction of North:								

Table 41: 107 Avenue (117 Street to 95 Street) Performance

Segment	Existing				Recommended			
117 St to 101 St								
101 St to 95 St								
Corridor Performance	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**	**Motor Vehicle**	**Transit**	**Cycling**	**Walking / Public Realm**
	✓	✗	✗	✗	✓	✓	✓	✓
Direction of North:								

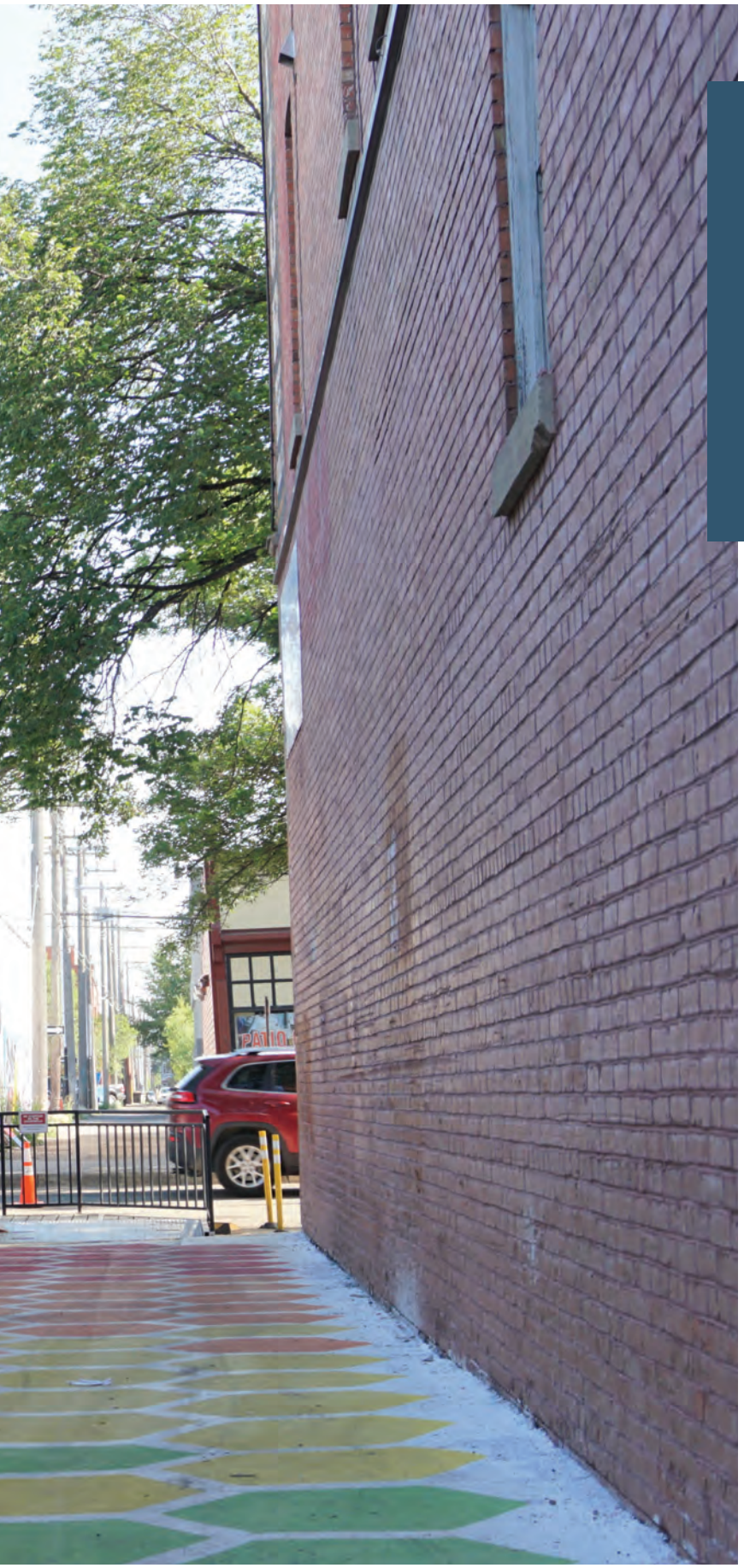
Managing Remaining Issues

There are a few places where the recommendations contained in these cross sections may not fully meet future demands.

To fully prepare for a growing population, the City will need to monitor travel demand as travel patterns change over time. Evolving technology will need to factor into the equation too, as connected and autonomous vehicles could change the capacity of a street.

Also, there are select locations (Jasper Avenue, 104 Avenue, 101 Street, Stony Plain Road, and 118 Avenue) where the right-of-way isn't wide enough to allow for a high quality walking environment, high quality cycling environment, or high capacity transit facilities. In these cases, facilities on parallel streets or pathways, with connections to the main corridor at every block, may be the best way forward. For example, creating a safe and comfortable bikeway along a neighbourhood street may be a good option to support cycling for people of all ages and abilities and make it easier to live in the neighbourhood.

Finally, it may be difficult to provide opportunities to meet walking, cycling, and public realm needs. In these locations, requiring building setbacks of redeveloping properties along the street may provide an opportunity to support adjacent businesses with higher quality public realms, wider sidewalks, and other public realm elements.



Chapter 3. Utility Capacity Review

Introduction to Utilities

As mentioned before, Edmonton is likely to double in size, from 1 million to 2 million residents, between now and 2070. The City Plan lays out a vision for accommodating this population growth, and the Infrastructure Capacity Review supports that vision by providing more detail on how the city's transportation and utilities systems might change as part of this effort. This section of the Summary Report explains the Infrastructure Capacity Review's analysis and recommendations for Edmonton's utilities systems.

Every home and business within the City of Edmonton is connected to a number of utilities that keep it running. The Infrastructure Capacity Review considers the following utilities, each of which is provided by EPCOR, a public utility based in Edmonton:

- **Water utilities** supply water for home use (washing, drinking, cleaning, etc.) and fire protection
- The **drainage system** manages stormwater (both rainfall and snowmelt) and wastewater
- The **shallow utilities system** supplies electricity, gas, and services like telephone, cable and internet (which run both below and above the ground).

The Infrastructure Capacity Review includes an analysis of how each of these utilities functions within the nine Nodes and Corridors. It looks at the following criteria in particular:

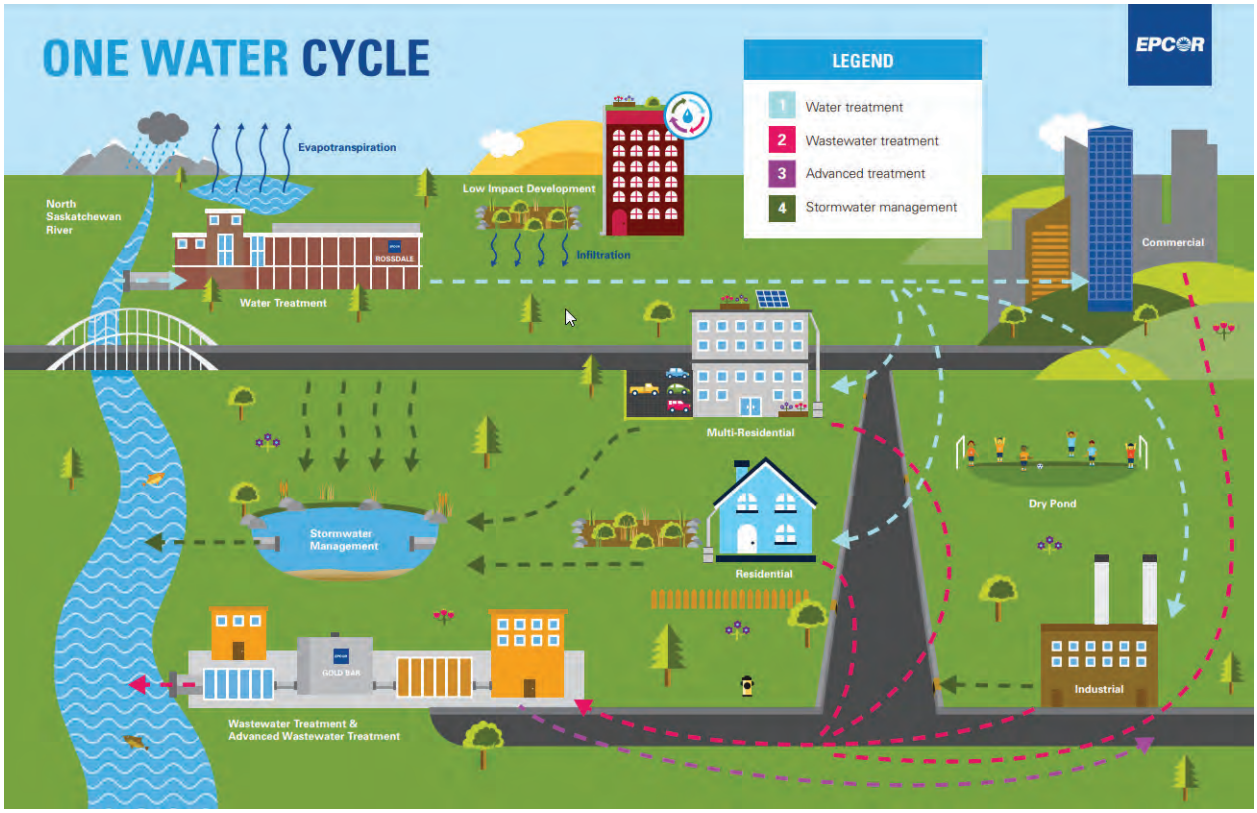
- How well today's systems could accommodate more people and uses
- The City of Edmonton's design standards for each utility (for example, there are standards that say how much water flow must be available to each building)
- Existing plans for expanding and/or improving today's systems

Please see the Infrastructure Capacity Review – Utility Technical Report for more details on the methodology for analyzing water distribution, stormwater and wastewater drainage, and shallow utility systems.

A closer look at water, drainage and shallow utilities

This section provides more information on each of these utilities, including notes on how the Infrastructure Capacity Review measures their capacity.

Figure 4: Figure x.x EPCOR One Water Cycle: water and drainage system



Water

Edmonton's water system consists of water treatment plants, storage reservoirs and pumphouses and water mains (which serve two functions: transmission throughout the system and distribution to customers). The water distribution network is made up of various pipe sizes and materials whose scale depends on the size of the development they service and when the development was built.

The City of Edmonton stipulates that a certain amount of water must be available to each of the city's buildings; these water needs are determined by fire flows, or the water needed to fight potential fires, which is far more than typical water usage. This applies at the building level, which is to say that bigger buildings need more water because they could have larger fires, not because they have more toilets.

The Infrastructure Capacity Review considers the ability of the existing system to provide fire flows, and it also identifies areas where the available flows and hydrant coverage do not currently meet City standards. For the Target Development Scenario (see pg. 7), the standard for water flow is 300 litres per second (L/s), and a minimum hydrant spacing of 90 m is considered adequate.

Water Main Renewal Program

The material that Edmonton's water are made of pipes varies depending on the age of the pipe. Older pipes generally consist of asbestos cement and iron, and newer pipes consisting primarily of plastic (PVC). EPCOR has a renewal program that targets water main renewals based on risk (the balance of 1. the consequences of a failure and 2. the probability of failure). When a water main is selected for renewal, EPCOR also reviews the pipes to ensure the pipe size is adequate to provide the required water flows.

Approximately 90% of all water main breaks occur on the cast iron portion of the distribution system, and since 1986, EPCOR has replaced or rehabilitated approximately 50% of the cast iron mains within the city.

Infill Fire Protection Program

When new buildings go up, the developer has to pay for the right size pipes, which can be so expensive that projects sometimes get cancelled. The Infill Fire Protection Program allows developers to apply for funds and scores projects against a set of criteria. If they score well, EPCOR shares some of the costs.

This approach is based on the fact that some upgrades to the water system that improve fire protection in established areas benefit the entire neighbourhood. Examples include replacing existing water mains with larger mains or adding hydrants to improve fire protection, and relocating existing water mains and hydrants from an alley to the street to provide additional fire protection.

Infill Fire Protection Assessment

Sometimes, rather than needing bigger pipes, a building can be designed to be more fire resistant, using things like sprinkler systems and concrete instead of wood. The City can reduce the requirements for costly pipe upgrades when a developer can reduce fire hazard in other ways. The Infill Fire Protection Program allows for this process.

Drainage

Drainage utilities is an umbrella term for the collection, conveyance, storage and treatment of both stormwater and wastewater.

In the older parts of Edmonton, including where most of the Infrastructure Capacity Review's nine Nodes and Corridors are located, sewage and rainwater flow into the same pipes on their way to the wastewater treatment plant. There is plenty of capacity in these pipes for regular amounts of sewage and light rainfall, but when a big rainstorm happens it can overwhelm the system, and the excess storm water then flows directly into the North Saskatchewan River without being treated. Given that the drainage system is already at risk of being overwhelmed, the Infrastructure Capacity Review assumes that changes will be required in order to accommodate a larger population.

Areas with more hard surfaces, such as roadways and buildings, produce more runoff than areas with more grass, landscaping and natural areas. The Infrastructure Capacity Review uses these discrepancies to project runoff from future redevelopment within the Nodes and Corridors.

Current Drainage Servicing Programs

Stormwater Integrated Resource Plan (SIRP)

The Stormwater Integrated Resource Plan (SIRP), which was developed by EPCOR, provides a risk-based approach to addressing stormwater flooding Edmonton. The SIRP will guide future stormwater management practices, addressing both existing drainage problems and accommodating increase flows resulting from future development.

Sanitary Integrated Resource Plan (SanIRP)

The Sanitary Integrated Resource Plan (SanIRP). Using a "One Water" approach, the SanIRP will provide a holistic and integrated long-range plan for the wastewater system to ensure the long term operational, environmental and financial sustainability of the utility. EPCOR is currently consulting with stakeholders and targeting the end of 2022 for publication of the SanIRP.

Shallow Utilities

Shallow utility services include the following:

- Power supply, transmission and distribution
- Natural gas supply and distribution
- Telecommunications, including telephone, cable and internet

In some parts of the city, some of these utilities are provided underground (cables running through pipes). In other parts, it's overhead wires.

All of Edmonton's shallow utility providers follow a "Just in Time" delivery model, which means they don't do proactive upgrades to the network based on expected growth; the system only gets upgrades when demand for the service is increasing.

Key Findings

The text below provides an overview of the Infrastructure Capacity Review's findings for water, drainage and shallow utilities at each of the nine Nodes and Corridors.

Water

Edmonton's growth will mean an increased need for water for fire protection, which will require expanding the water distribution system, replacing smaller sized pipes with larger ones and adding hydrants.

Water mains

The Infrastructure Capacity Review notes that in order to provide the required water flow for fire protection within all Nodes and Corridors, the City will need to renew existing water mains and build new ones. While EPCOR already operates a water main renewal program, infill development is likely to mean that renewals will need to happen sooner than currently scheduled.

A note about water mains: EPCOR has a schedule to replace water mains over time, because eventually they break and need to be replaced. When EPCOR replaces water mains, they often put in bigger ones to anticipate bigger development nearby.

Fire Hydrants

The Infrastructure Capacity Review also identifies places where new hydrants will be needed, both because new development will require it and because existing hydrant coverage does not currently achieve the goals set in the current City of Edmonton Design and Construction Standards.

A note about fire hydrants: Fire hydrants are required to be spaced more closely together near big buildings than around smaller buildings. There is no program to replace or add hydrants over time like there is for water mains; new buildings just have to pay for new hydrants where they are needed.

How will changes to water utilities happen?

Water mains should be upgraded as infill development progresses at the Nodes and Corridors. Where possible, new water mains should be built in conjunction with other projects to minimise disruption to residents and businesses. The Infrastructure Capacity Report recommends that system hydraulics and required upgrades are periodically reviewed/revisited, as available water flows will improve over time through the City's cast iron renewal program.

- Developers will be responsible for improvements to meet water flow and hydrant spacing requirements unless the project qualifies for the water main renewal program or the infill fire protection program.

Drainage

More people and jobs will mean more sewage. Also, new development can mean more operational water use, more pavement and less green space, all of which can mean more rainwater running off into the city's pipes. As Edmonton grows, it will need to offset this additional wastewater by creating temporary storage for rainfall.

Policy changes

The Infrastructure Capacity Review notes that the following policy decisions could help to accommodate additional wastewater:

- Allocate surplus land in Edmonton, or create parks/open space with infill developments, to provide storage and reduce hard surfaces in the priority Nodes and Corridors.
- Encourage developers to use green or blue roofs for on-site stormwater management.
- Develop policies that encourage on-site runoff management and reuse.
- Investigate the potential for reduction of rainwater in the wastewater system and water conservation in the catchment areas for the Nodes and Corridor to free up capacity in the sewer systems.

Infrastructure changes

There are also a number of tools that the City can use to increase stormwater storage capacity, which is crucial for managing runoff because many of the Nodes and Corridors areas are serviced with combined sewers.

Dry Ponds

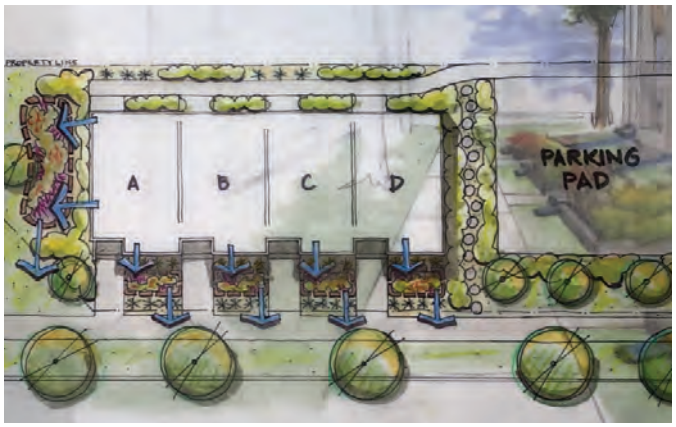
Dry ponds are ponds constructed within the drainage basin to store stormwater during the rainfall event while discharging at a slower rate back into the storm sewer system. They are typically dry, as their name implies, and are only wet when the stormwater runoff resulting from a rainfall or snow melt event exceeds the capacity of the storm sewer system. A dry pond requires both an inlet and outlet to the storm sewer system, and typically requires significant land to construct. However, when designed properly, dry ponds can be used as park areas and sports fields during dry weather.

If there is insufficient space provided to construct a dry pond, then underground storage can be an option. This is provided through large pipes or buried tanks, which can require a pumping facility to drain the stored runoff back into the storm sewer system.

Low Impact Development

Low impact development (LID) facilities, also known as green infrastructure, can also have a positive impact on reducing total stormwater runoff. LID involves the construction of facilities which allow more of the runoff to seep into the ground. There are a number of LID facility options that can be included within street right-of-way and in park space or other off-street areas. Common options include bioretention or rain gardens complete with topsoil to allow runoff to enter and seep into the soil.

Other LID options to provide storage and/or reduce stormwater runoff for infill development include incorporating green spaces and parks in the redevelopment planning, green roofs on new buildings, or the reuse of stormwater. These LID facilities are designed to retain and store runoff from smaller rainfall events, which ultimately drain back into the storm sewer system once the soil has become saturated. They also provide a water quality benefit.



Pocket Storage Facilities

Pocket storage facilities are small, constructed depressions that provide water storage within existing boulevards, roadway medians or green areas.

How will changes to drainage utilities happen?

As development occurs in the Nodes and Corridors, developers will need to work with the City to determine the relevant storage requirements and the types and locations of storage facilities. Generally speaking, development will need to accommodate water storage through a combination of shared storage within the catchment, on-site smaller scale storage and LID.

To further support drainage improvements, the City of Edmonton and EPCOR may choose to explore different funding opportunities, including a mix of investments from developers, the City and EPCOR. (A variety of parties fund infrastructure spending, including private developers, EPCOR and the City. A handful of programs whose purpose is to streamline or "right-size" infrastructure upgrades in order to keep costs low are noted on page 38).

Shallow utilities

Shallow utilities, such as power, gas, telephone, internet and cable TV, will also experience a greater demand through population growth, expansion of existing businesses, and introduction of new businesses. It is difficult to predict what kinds of improvements will be needed to address increased demand for shallow utilities, as they will be highly dependent on the type and rate of development as well as changes in technology. Shallow utilities are also generally reactionary, meaning that providers do not expand systems until there is a development that requires doing so.

That said, all of Edmonton's shallow utility providers are confident that they can meet demand as shallow utility infrastructure capacity in the Nodes and Corridors as Edmonton grows. Each provider continuously monitors growth in demand and plans to adapt accordingly.

Process for Shallow Utility Improvements

There is nothing to suggest that shallow utilities will be unable to keep up with Edmonton's growth. Since the period of this growth is anticipated to stretch over several decades, the Infrastructure Capacity Review recommends that the City's agreements and standards be open to review and that the City update them on a regular basis in anticipation of changing technology and circumstances.

Generally speaking, even though capacity is not likely to be an issue, the Infrastructure Capacity Review found that the City should continue to work with shallow utilities to streamline and improve permitting and other administrative processes.


RAILTOWN PARK
STOP
ALL WAY
ROUTE

Chapter 4. Next Steps

Next Steps and Incremental Change

As The City Plan makes clear, Edmonton is on track to add 1 million new residents in the coming 50 years, and redevelopment in the city must account for this growth in population. A street environment that is safe, comfortable and practical for everyone, and utilities systems ready to absorb increased demand will be key when it comes to ensuring that Edmonton remains a great place to live.

Moving forward, the City and stakeholders will look to the Infrastructure Capacity Report's insights into the type of upgrades needed to improve the public realm, transit, walking and biking conditions. These findings may inform capital investment priorities moving forward. Likewise, the Infrastructure Capacity Report's utilities analysis could be used as a foundation for conducting further detailed analyses to inform potential cost-share programs, incentives and investments for sanitary, storm, water and power upgrades in the Nodes and Corridors

Change will be incremental

The Infrastructure Capacity Review should not be taken to mean that no new redevelopment can occur within the Nodes and Corridors until the transportation and utilities systems have been updated for future needs. The climb toward 2 million residents will be incremental, as will the renewal of transportation and utilities systems. Changes could occur at any point between now and the 2 million horizon, and they could be based on various factors.

As the Infrastructure Capacity Review only provides high-level cost estimates, it should be understood that the actual timing and implementation of its recommendations will happen over a much longer term.