

The City of Edmonton

# MEASURING PERFORMANCE OF EDMONTON TRANSIT

Transit Strategy Guiding Perspectives Report



Sustainable Development; Transportation Strategies  
6/23/2016

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# 1. MEASURING WHAT MATTERS

## 1.1. WHY MEASURE TRANSIT?

Before any attempt to understand transit performance metrics, it is critical to understand what they are meant to accomplish and why the measurements are being taken in the first place. The obvious answer is typically along the lines of “measurements are taken to see how well the system is working” or “measurements are taken to identify what is working well and what areas need work”. However, these simple statements belie the true complexity of performance measurements which will be discussed throughout this section.

## 1.2. WHO IS PERFORMANCE MEASURED FOR?

One of the first complicating factors is that measurements are typically reported to these five audiences: [1]

- External agencies, such as the Canadian Urban Transit Association (CUTA), and the Federal and Provincial Governments are given reports to comply with regulations and to secure funding. These groups are typically only interested in system wide performance and regulatory compliance;
- The general public, who make up the vast majority of users and who increasingly demand transparency, accountability and involvement in decisions;
- Agency Management, who are largely concerned with strategic goals, public perception and support from city council and other governmental agencies;
- Agency Administration, who plan, evaluate and revise individual routes and schedules to accomplish strategic goals, match supply and demand and ensure efficient operation of the network; and
- Operations staff, who ensure vehicles are maintained, operators are engaged and countless other day-to-day tasks required to keep the transit system running.

Each of these groups is interested in different types of information, which must be delivered and presented in different ways. For example, operations staff is primarily concerned with the performance of individual vehicles and operators, while CUTA is only concerned with the overall system.

## 1.3. WHAT SHOULD BE MEASURED?

Determining what to measure in a transit system is surprisingly difficult due to the vast array of items to choose from and ways each could be measured. Countless items could potentially be measured for each vehicle, facility, line, or the system, each of which could be useful.

For instance, coloration is a factor in the cosmetic appearance of shelters. Edmonton could then measure how faded painted surfaces are on each of the 7,200 shelters each year. An annual report could then be made showing how many shelters are faded and the average level of fading throughout the city. This report might be used when determining how much paint to buy the following year. While this information might have some value to the paint purchaser, it would not be particularly useful for evaluating strategic goals. Furthermore, unless painting was identified as a priority, this information would have such limited value that it is unlikely to justify the cost of collection.

This example demonstrates what the most important aspect of any measurement is arguably: It must be meaningful, that is, it must matter. This obvious point leads to two difficult questions: 1) What exactly is it that

matters? and 2) How should what matters be measured? The first question demonstrates the critical importance of well-defined goals and priorities. The second question implies the difficulty in finding relevant measurable indicators for each of the goals.

#### 1.4. DETERMINING WHAT MATTERS

The question of what matters is surprisingly difficult for two reasons. [2] [1] First there is no consensus between agencies, municipalities or users on what the goals of transit are. Instead, these goals vary between groups, between individuals and over time. The second reason is that many goals are in direct opposition to other goals, or at least competing for limited resources. Resolving such conflicting goals requires defining priorities in order to add or remove services and find compromises.

This highlights a fundamental challenge when attempting to measure the performance of a transit system: reconciling the differing objectives. This issue is at the very heart of the Transit Strategy, and is no small task. As with any public service, there are a variety of stakeholders with different views of what constitutes a “good” transit system. At the highest level, public transit has three groups of stakeholders: Users, operators and the community, as shown in Table 1 below.

**TABLE 1: BREAKDOWN OF GOALS BY GROUPS**

[2]	Users	Operators	Community
<b>Primary Goal</b>	Positive individual experience with a low perceived individual cost	Meet predefined requirements with available budget	Maximize benefits to community while minimizing costs to community
<b>Time Frame</b>	Current operations	Current operations and short term plans	Long term plans
<b>Target Group</b>	Personal/individual	Users, municipal leaders & management	Community as a whole
<b>Example Indicators</b>	<ul style="list-style-type: none"> <li>• Easy to access service <ul style="list-style-type: none"> <li>○ Temporally</li> <li>○ Physically</li> </ul> </li> <li>• Easy to understand and plan trips</li> <li>• Predictable and reliable service</li> <li>• Short door-to-door travel time</li> <li>• Frequent service</li> <li>• Comfortable &amp; safe facilities</li> <li>• Reasonable cost to use</li> </ul>	<ul style="list-style-type: none"> <li>• Operational requirements</li> <li>• Total operating costs</li> <li>• Total capital costs</li> <li>• Efficiency: <ul style="list-style-type: none"> <li>○ Cost per passenger-trip</li> <li>○ Cost per capita</li> <li>○ Ridership per capita</li> </ul> </li> <li>• Km traveled per passenger-Km</li> </ul>	<ul style="list-style-type: none"> <li>• Long term public costs</li> <li>• Social goals</li> <li>• Equity</li> <li>• Worker access</li> <li>• Access for Special needs groups</li> <li>• Economic goals</li> <li>• Livability &amp; sustainability</li> <li>• Environmental pollution</li> <li>• Urban form &amp; density</li> </ul>

The transit agency is thus given the challenge of determining a coherent set of goals and priorities that best reflect the needs of all stakeholders within budgetary and regulatory constraints. Historically, such decisions have been made by technical experts, bureaucrats, political leaders or combinations thereof, with minimal public engagement. Over the past few decades, there has been a growing trend for more public engagement, which has prompted many large municipalities to conduct reviews of their transit systems.

## 1.5. SO HOW DO WE MEASURE WHAT MATTERS?

### 1.5.1. CONVERTING GOALS TO MEASURES

In order to measure performance in terms of a goal, that goal must be clearly understood, and there must be a clear connection to one or more aspects of transit operation. A common way of determining measures and targets uses the acronym “S.M.A.R.T.” [3] which stands for “Specific, Measureable, Achievable, Relevant and Time Bound”. Specific, Measurable and Relevant apply to both the goal and the performance measure itself while Achievable and Time bound are primarily applicable to target values and outcomes.

**Specific:** This item denotes that the goal and metric are both clear and unambiguous. [3] For example, a goal of “100 transit riders per capita” is much clearer than “good transit usage”. Even in the absence of a target value, each performance metric should be clearly defined so that it can be used for comparisons and to identify trends. For example, ETS measures the average cost per passenger-trip which is currently \$3.18. [4] While no target has been provided, this value is a clear indication of cost effectiveness that can be compared with other agencies.

**Measureable:** This indicates that there must be a way to quantify the item, and that the frequency and method of making measurements is clear and consistent. [3] For example, sales figures are easily quantified and reported monthly, quarterly and annually.

**Achievable:** This indicates that the goal must be reasonable to attain with the resources available. Unattainable goals are likely to be not taken seriously by workers, increase worker frustration and/or cause a loss in credibility. However, goals should not be easily attainable or they are unlikely to drive change or improve productivity. [3]

**Relevant:** This indicates that the performance indicator must have a strong relationship (known or assumed) with the goal it is linked to and that chosen target values should align with that goal. [3] For example, a goal of increased ridership is a good indicator of transit usage, but a poor indicator of social equity. [1]

**Time-Bound:** This defines when the goal will be met as well as any incremental milestones. [3] For example, ETS has a ridership goal of 105 passenger-trips per capita by 2018. To track progress, annual goals are defined (99.3 in 2014, 100.7 in 2015, 102.1 in 2016, and 103.6 in 2017). [5]

Establishing performance metrics is typically straightforward for goals related to ridership, finances and operational characteristics (such as efficiency, speed and frequency). [1] These are easily quantifiable and external agencies, such as CUTA, have created many standardized metrics, which can often be readily adopted or modified to meet the specific needs of the agency. [4]

Unfortunately, this is not true of all potential goals. Many common goals (such as ease of use, equity and other social goals) are difficult to quantify and others (such as public health and economic and environmental goals) have poorly understood connections to transit operation. [1] [2] Two common strategies are used to obtain measurements in these cases. The first is to use customer opinion surveys, which ETS uses to measure perceptions of safety and customer satisfaction with various aspects of transit. While insightful, these are limited to the perceptions of the individuals polled (which may not reflect actual operation), and of limited use for complicated issues such as economic impacts. The second is to use a surrogate measure based on an understood relationship, although the precision and accuracy of such measures is often low. [2] For example, fuel consumption might be

used to estimate environmental impact and trips to work might be used to estimate how transit supports the economy.

Another important limitation is the cost of data collection, processing and reporting. This cost is largely dependent on required labor, equipment and expertise, which are in turn dependent on a variety of factors including: the amount of data required, the difficulty in collecting it, how often it must be collected, the level of required precision, the collection method and the amount of analysis required before it is usable.

### 1.5.2. REFERENCE VALUES

For the measured value to be meaningful, it must be compared to a reference of some type. [6] For example, if ETS was to find they spend \$100/day in windshields, would this be good or bad? Reference values are often a predefined target value, previously measured baseline values, and reported values from similar systems. [2] Ideally all three would be available as each reference provides unique insights. Unfortunately, this is often not possible.

The most directly useful reference is a predefined target value as it provides a clear, simple way to judge if improvement is needed or not. However, establishing such target values can be problematic as they must reflect functional limitations (such as funding and bus capacity) as well as the goals and priorities of the agency. This is particularly problematic for opposing goals, as has been mentioned previously.

Whether a target is available or not, baseline data using previous measurements is usually available. Comparisons with baseline data can indicate trends toward or away from target values and even when a target is not available, a preferable direction of change is often known. For example, it is typically desirable for ridership to increase and for costs to decrease. As such, the observed trend can indicate if the item is improving or degrading, and potentially be used in place of a target if one is not available.

Such baselines require data collected in a consistent way over a period of time (usually one or more years) so as to reflect patterns of fluctuation over time (daily, weekly, monthly and seasonal). If the agency makes changes to how measurements are taken or reported, baseline data may be unavailable for months or years. For example, ETS has implemented new software used to report and track collisions, changeovers (breakdowns) and safety incidents and is in the process of establishing new baselines.

### DIFFICULTY OF USING DATA FROM OTHER AGENCIES

Another source of reference values for measurements is those reported by other transit agencies. These can be useful as surrogate target values and as a way to anticipate likely trends and relationships between measures. While very useful, such comparisons are fraught with difficulties due to inherent heterogeneity in transit systems, the agencies that run them and the areas they serve. [2]

In order to be useful for comparison, metrics must be standardized in terms of how they are measured and reported. Such standardization is in direct conflict with the differing goals and priorities discussed previously in this paper. As such, standardized metrics are only possible for a narrow range of items, which are primarily focused on functional and financial aspects of the transit system.

Recorded values reflect the unique character of the area and needs of the users the transit system serves. As such, even with standardized metrics, values will vary dramatically between agencies. [2] Further complicating this is

determining which agencies perform well on any given metric. Such inherent heterogeneity means that identifying a comparison group is both critical and very challenging.

To partially overcome these pitfalls, organizations such as Canadian Urban Transit Association (CUTA) and the American Public Transportation Association (APTA) have developed standardized metrics and comparison groupings. They then collect reported values on transit performance along with characteristics of the area service from many agencies. Each system is assigned to various groups based on population and location. While far from a true “apples-to-apples” comparison, this provides logical groups for transit systems to be compared to. [1]

### 1.5.3. DEVELOPING A MONITORING PROGRAM

In order for metrics to be consistently measured and reported, agencies typically develop some form of performance monitoring program. The Transportation Cooperative Research Program (TCRP) recommends that a program of performance measures be considered in terms of seven important characteristics:

- Stakeholder acceptance
- Linkage to agency and community goals
- Clarity
- Reliability and credibility
- Variety of measures
- Number of measures
- Level of detail
- Flexibility
- Realism of goals and targets
- Timeliness
- Integration into agency decision-making

#### STAKEHOLDER ACCEPTANCE

Measures should be accepted as meaningful by those collecting them and analyzing them and those expected to use them. A lack of buy-in by those collecting or processing the data is likely to indicate poorly chosen measures, which are likely to be of poor quality or of limited use. Alternately, if management does not value the measures, it is unlikely that they will be used in decision-making. [1]

#### LINKAGE TO AGENCY AND COMMUNITY GOALS

This item corresponds to “Relevant” from the SMART goals and cannot be overstated. It is very tempting for agencies to simply use technical experts to develop performance measures, but such programs reflect the values and goals of the individuals making the measures, not the community being served. In order for the performance of a transit agency to be meaningfully measured, the measures must have a clear link to agency and community goals. [1]

#### CLARITY

This item corresponds to “Specific” from the SMART goals mentioned earlier. Goals and metrics must be stated in a clear and unambiguous way to avoid misinterpretation and misuse. How this is accomplished, however, will vary between goals and between audiences the information is being presented too. [1]

#### RELIABILITY AND CREDIBILITY

Bad data is often worse than no data at all and unfortunately, data collection will always include some amount of error. However, some types of data are inherently less accurate than others due to the nature of the item being measured and limitations in methodology and collection tools. As much as practical, best practices and careful analysis should be used.

#### VARIETY OF MEASURES

Each measure, provides insight into only a limited aspect of the operation of the transit system. In order to gain a better understanding it is important to consider numerous aspects, so a variety of different measures is recommended. Furthermore, additional insight can often be found by considering different levels of aggregation of the same measure. [1] For example, averaging values for an entire day may dilute problems occurring only during the peak period while the magnitude of ongoing construction delays may only be apparent from such averaged values.

#### NUMBER OF MEASURES

The number of measures must be carefully considered. Typically, a greater number of measures provide greater insight, although at a cost. This cost may be in terms of additional time or equipment or it may be in terms of the quality of the data collected if operators become overwhelmed. Each agency must find a balance where adequate data is collected with the needed quality and within the budget. [1]

#### LEVEL OF DETAIL

According to the TCRP “Measures used within a performance-measurement program should be sufficiently detailed to allow accurate identification of areas where goals are not being achieved, but should not be more complex than needed to accomplish this task.” [1]

#### FLEXIBILITY

Over time, goals, methodology and technology will change, and the program must be able to accommodate those changes. [1]

#### REALISM OF GOALS AND TARGETS

As with “Achievable” from the SMART goals, transit goals should reflect the types of changes that are needed, but also be attainable. Unattainable goals are likely to be not taken seriously by workers, increase worker frustration and/or cause a loss in credibility. However, goals should not be easily attainable or they are unlikely to drive change or improve productivity. [1]

#### TIMELINESS

How quickly data becomes available plays a large role in how useful it will be. So long as the data is complete and accurate, it should be reported as quickly as practical so that it may be used to identify growing problems and see the impact of recent changes. [1]

#### INTEGRATION INTO AGENCY DECISION-MAKING

The value of data is in how it is used and thus decision-making should reflect performance data, along with other considerations. When decisions appear to conflict with performance data, due to other considerations, the rationale should be explained to avoid loss of credibility [1].

## 1.6. HOW DO WE USE WHAT WAS MEASURED?

Measured values on each of the metrics or indicators should be used to evaluate how well the system is meeting the stated goals, identify areas that are not performing well and assess the impact of various policies and initiatives. This information is then disseminated throughout the agency for action by management and/or City Council. The degree to which it is used in decision-making will depend on countless external items (such as budgets and the political landscape). [2]

Ideally, stated goals and priorities give administration tools to make decisions. This can come in several forms, such as indicating the type of activities the administration should be focusing on, helping to evaluate alternatives and identifying problem. In either case, the amount of guidance provided by each goal will tend to decrease as the number of such goals increases. For example, if an agency has only a single goal, it should be clear that agency should focus on that one goal. However if an agency has dozens of goals, the direction is less clear.

As will be discussed in the next section, this is one of the challenges currently facing Edmonton Transit. ETS currently has 7 City of Edmonton Objectives, 16 ETS Outcomes, 9 Desired Outcomes, 4 focus areas, 2 mandates, one vision, one mission and 3 Branch Goals, for a total of 43 results to be working toward. [7] The diversity and broad scope of these provides limited guidance when considering alternative services as most options will align with at least one of these goals and conflict with others.

## 2. EDMONTON CONTEXT

### 2.1. SERVICE AREA

The city of Edmonton is the 5<sup>th</sup> largest city in Canada with a population of approximately 878,000. However, ETS serves only the 8<sup>th</sup> largest population due to Toronto, Vancouver and Montreal having multiple transit agencies. Edmonton Transit provides service to an area approximately 700km<sup>2</sup>, which is the 7<sup>th</sup> largest transit service area. [4]

### 2.2. CHANGES GOING ON WITHIN ETS

ETS is currently in the process of dramatic change in many areas, of which performance metrics is one. Other fundamental changes include:

- Complete implementation of smart-bus and related real-time, customer facing bus tracking information [7]
- Initiation of Smart Fare along with a revised fare strategy [7]
- Adoption of new software packages, such as Minibus and Transit Master, to improve data collection, analysis and network optimization. [7]
- Infrastructure projects such as LRT expansion and testing of electric, hybrid and alternative fuel buses. [7]
- Internal initiatives intended to improve organizational culture and corporate accountability. [8]

In terms of performance monitoring, ETS is continuing to better align “Key Performance Indicators” (KPIs) with the corporate strategic goals and council initiatives discussed below. [8] As of January 2016, much of the initial work in identifying measurable strategic goals and establishing potential KPIs has been completed and several have been integrated into the departmental scorecard and ETS business plan. [9] Over the course of 2016 - 2018, ETS will

continue working to build on this at three levels. At the functional level, administration is working to better understand the data needs and collection throughout ETS and then integrate these into a coherent system. At the strategic level, initiatives such as the Transit Strategy and Fare Strategy will be used to clarify and prioritize the goals and objectives for ETS. At the administrative level, ETS will then adjust KPIs as needed to better match with strategic goals. [7]

Currently, data collection and reporting within ETS is a patchwork of at least 250 separate items. [8] It is expected that within this list there is redundant data collection, useful data some groups were unaware of and items no longer being used. A committee with members from all divisions within ETS was formed in Q4 of 2015 to overhaul this system. Over the course of 2016 and 2017 these items, along with new sources of data, will be systematically reviewed and combined into a coherent system. Even before alignment with strategic goals, ETS expects to see improvements from better integration of current data needs, collection and reporting throughout the branch. [9]

Concurrently, the Transit Strategy and the Fare Strategy project will be working on establishing strategic goals, which will lead to refinements of the metrics themselves.

## 2.3. TRANSIT NETWORK & FLEET

As mentioned earlier, Edmonton Transit System serves a population of approximately 878,000 persons in an area approximately 700km<sup>2</sup>, and thus has the 8<sup>th</sup> largest service population and the 7<sup>th</sup> largest service area of any Canadian transit authority (According to CUTA). The Edmonton Transit network consists of 205 fixed routes with another 210 routes providing various forms of specialized service, such as school specials and contingency for LRT outages. [10] ETS currently operates 26 transit centres, 18 LRT stations (6 of which are adjacent to transit centres), and 7369 bus stops. 2257 shelters and 2655 benches are placed at various bus stops, transit centres and LRT stations. [11]

The Edmonton Transit Fleet of fully accessible vehicles has an average age of 9.3. [4] The bus fleet consists of 963 New Flyer Low Floor Buses, 33 New Flyer Low Floor Articulated buses, 49 community buses and 4 hybrid buses along with 2 electric buses which are temporary additions for evaluation purposes. The LRT fleet consists of 37 Siemens-Duewag U2 cars and 57 Siemens SD-160 cars. [11] The U2 cars are older, and several have been in service since 1978. The newer SD-160 cars have all been purchased since the U2 was discontinued in 1990. [11]

In 2014, the fleet was in service for 2,243,893 hours and traveled a total of 47,329,713 kilometers. Transit operations, including vehicles, transit centres and LRT stations consumed 24,233,037 liters of diesel, 494,552 liters of biodiesel 24,789 cubic meters of natural gas and 25,237,804 kilowatt hours of electricity. [4]

## 2.4. SO WHAT MATTERS TO EDMONTON & ETS?

Establishing a set of goals and priorities is a large part of the current “Transit Strategy” project, however this is not the first iteration of such goals. Currently, ETS has a variety of goals provided through [7]:

- City of Edmonton Vision and Strategic Plans (referred to as “The Ways”)
- Council Initiatives
- Corporate Leadership Team focus areas
- Visions and goals of the branch and department
- Other administrative documents

#### 2.4.1. FROM “THE WAYS”

The strategic plans for the City of Edmonton consist of 7 documents; The Way Ahead, The Way We Finance, The Way We Green, The Way We Grow, The Way We Live, The Way We Move and The Way We Prosper, collectively called “The Ways”<sup>1</sup>. Together they provide strategic goals and outcomes for the entire city and apply to all City of Edmonton programs and initiatives. In the Edmonton Transit business plan, 7 Strategic outcomes were identified that are relevant specifically to transit. In order to accomplish these city wide outcomes, 16 ETS outcomes were created, shown in the Table 2 below. [7]

**TABLE 2: ETS OUTCOMES FROM “THE WAYS”**

Strategic Document	City of Edmonton Outcome	ETS Outcomes
<b>The Way We Move:</b>	Edmontonians use Public Transit	ETS service is geographically accessible
		ETS is accessible to persons with disabilities
		ETS provides reliable service
		Operators are professional and helpful service
		Ridership grows as population grows
		Public Transit is affordable
		Edmontonians use public transit to go to work
<b>The Way We Grow:</b>	Edmonton has sustainable and accessible Infrastructure	ETS infrastructure is well maintained
	Edmonton is attractive and compact	ETS facilities are clean
		ETS vehicles are clean
		Public transit supports compact living
<b>The Way We Live:</b>	Edmonton is a safe city	ETS facilities are safe and secure
		ETS transit vehicles are safe and secure
<b>The Way We Finance:</b>	Edmonton has a resilient financial position	ETS strives to become more self-sufficient
<b>The Way We Green:</b>	City's operations are environmentally sustainable	ETS operations are environmentally sustainable
<b>The Way We Prosper</b>	Edmonton has a globally competitive and entrepreneurial business climate	Public Transit supports economic activities

#### 2.4.2. FROM COUNCIL INITIATIVES

To supplement the strategic goals in The Ways plans, City Council has created a Public Transit initiative which provides additional “Desired Outcomes” [12]:

1. Citizens use more public transit and active modes of transportation
2. The transportation system is integrated, safe and gives citizen choice to their mode of movement
3. The expansion of LRT to all sectors of the City with a goal to increase transit ridership and transit mode split, and spur the development of compact, urban communities
4. An efficient, effective, accessible and integrated regional bus network to service Edmonton and the Region with the collaboration of Regional Partners
5. A comprehensive system of transit options for persons with mobility challenges
6. A series of Park and Ride facilities located towards the extremities of LRT lines or at key transit centres where land cannot be used for more intensive transit oriented development
7. An accessible, efficient and compact urban form through the Integration of land use planning and public transportation planning
8. A safe, enjoyable and well-maintained public transportation system through the use of asset management best practices.

9. Ensure essential supporting measures are in place to enhance the viability and success of the public transportation system (TOD, Transit Fares, Safety and Security, Integration with other Modes, Automobile parking)

In addition to the council initiative specific to transit, ETS is expected to support other initiatives, such as End Poverty Edmonton and the Council Initiative on Public Engagement. ETS supports poverty elimination through a number of programs including “Donate a Ride”, “Stuff a Bus” and a pilot Low Income Transit Pass that was recently approved. [7]

#### 2.4.3. GOALS OF CITY MANAGEMENT

Within the City of Edmonton, the Corporate Leadership Team (CLT) provides “Strategic Focus Areas” intended to help ETS better align itself with the stated priorities of City Council, as shown in Table 3 below [7].

**TABLE 3: CLT STRATEGIC FOCUS AREAS**

Administrative Governance - Organizational Culture:	Edmonton Transit is developing a communication strategy to ensure that ETS employees are informed and engaged.
Corporate Oversight - Corporate Accountability:	Continued development of strategic and operational performance measures that are aligned to the Department scorecard.
Major Initiative – Transit Strategy:	The objective of the Transit Strategy is to develop a strategic plan that provides a framework to guide transit development and investment into the future. It will outline the broader vision for public transit, including strategic development and refinement and recommended policy changes. Public engagement will be undertaken at different stages of the strategy development.
Major Initiative - LRT:	Continued expansion of Edmonton’s Light Rail network by supporting design and construction of the Valley Line.

Within the transportation department and Edmonton Transit Branch, are additional strategic statements intended to further clarify the priorities and goals for transit service within the City of Edmonton as shown in Tables 4 and 5 below. [7]

Finally, ETS also has a number of internal goals and initiatives, which are focused on the administration and operation of ETS. These include items such as work culture, implementation of items such as “MinBus”, “Smart Bus” and “Smart Fare” and restatements of the goals of the higher level documents. [7]

#### 2.4.4. REDUCING BACK TO THE WAYS

Collectively the above statements provide 7 City of Edmonton Objectives, 16 ETS Outcomes, 9 Desired Outcomes, 4 focus areas, 2 mandates, one vision, one mission and 3 Branch Goals, for a total of 43 results to work towards. Fortunately, ETS has worked to align with “The Ways”, and so nearly all of these can be reduced to the 7 strategic objectives mentioned previously. The other 36 items provide detail and describe specific methods. This simplifies performance reporting at the strategic level to those 7 objectives and the 16 ETS Outcomes that are linked to them.

**TABLE 4: TRANSPORTATION DEPARTMENT STRATEGIC GOALS**

Transportation Department Mandate	Transportation Services provides a safe, reliable and integrated transportation network designed to meet the needs of Edmonton's citizens and the future demand of an increasing population. Transportation Services plans and operates Edmonton's roads, sidewalks, multi-use trails, bicycle infrastructure and transit system. It also works to reduce traffic congestion and collisions, and promote efficient, sustainable and active ways to travel.
ETS Branch Mandate	ETS operates a variety of public transportation services including buses, Light Rail Transit (LRT) and Disabled Adult Transportation Services (DATS). This branch provides customer focused, safe, reliable and affordable public transportation services that link people, jobs and communities.
ETS Vision	A fully integrated, progressive, easy-to-use public transit system that supports economic development and improves the quality of life in Edmonton.
ETS Mission	Customer-focused, safe, reliable and affordable public transit services that link people and places.

**TABLE 5: ETS BRANCH GOALS**

Connecting Citizens	Provide an accessible, reliable and enjoyable transit system
Urban Form	Fosters increased density of the city's built form, thus promoting the efficient use of land.
Workforce Engagement	Reduces congestion, reduces greenhouse gas emissions and enhances economic growth, job creation and productivity.

## 2.5. SERVICE STANDARDS COMPLIANCE:

City policy C539 lays out clear standards for minimum service levels and for evaluating route performance (ridership) in terms of the type of route, area served and time period. However, no guidance is given on how to address routes that do not comply with one or more of these. For example, should ETS prioritize routes with severe overloads or those with schedule adherence problems? Should routes operating well below the minimum ridership be canceled, even if they are the only service to that area? Because of this, a number of routes operate well beyond the suggested service criteria. For example, routes such as 80 & 169 routinely see ridership well below the minimum while routes like 8 and 100 and see regular overloads and reliability problems. [13]

## 3. EVALUATING EDMONTON TRANSIT

### 3.1. PERFORMANCE METRICS BY ETS

#### 3.1.1. A SYSTEM UNDERGOING CHANGE

The reader must appreciate that ETS is in the process of dramatic operational change that includes adoption of new technologies and software as well as revising performance indicators and prioritizing strategic values. [7] [8] Because of changes to data collection, many items are now reported that previously had not been or are recorded differently, limiting comparisons between recent measurements and previous data. [14] [15] Furthermore, targets for many items are still being developed.

### 3.1.2. DIFFERENT INFORMATION USED FOR DIFFERENT PURPOSES

As with any large organization, Edmonton Transit has a multi-tiered hierarchy with several sections working together to plan and provide services. For this paper, these have been simplified into three basic groups: Controllers & Dispatchers, Planners & Schedulers and ETS Leadership.

### 3.1.3. PERFORMANCE REPORTING BY CONTROL & DISPATCH:

Dispatchers, inspectors, and the operators in the control centre handle the day to day operation of the system and so their primary concerns are the countless short term problems such as detours, breakdowns, overloads and delays. In order to monitor and track the system, ETS has been phasing in a software package called “Transit Master” and moved to a new control centre (shown in Figure 1 below). In addition, collisions and safety incidents are being tracked with a new software package called “Accident/Incident Management Information System (AMIS)” [14]

The transition to Transit Master began in mid-2013 and is continuing to evolve as operators have become more proficient with the software, while the software has been modified to better meet the needs of ETS. While the new software is largely implemented, many aspects of the transition are not yet complete. Reporting methods and targets are still being developed and refined and so operational data is currently limited. [14]

**FIGURE 1: THE NEW CONTROL CENTRE**



The most recent data provided is from 2014. ETS control reports on numerous items including collisions, passenger mishaps, change-overs, fluid spills, inspector response times and call volume to control. Data on spills and inspector response times is not yet available. In 2014, the control centre received 4,643 calls in 2014, 51% related to Bus Operations, 17% related to LRT Operations and 32% were related to Security Dispatch. As this was the first year with the new command centre, no previous data was available for comparison. In 2014, collisions decreased by 6.3% and passenger mishaps decreased by 5.1%, despite a slight increase in the amount of service provided. “Change-overs” are when a bus must be taken out of service due to a mechanical failure or unsanitary conditions. In 2014, the system reported 5% more change-overs but the total delays caused by them actually decreased 2.5%. This unusual finding is thought to be largely the result of changes in the reporting system. [14]

Collisions and passenger mishaps vary between time periods as shown in Figures 2 & 3 below. This is because both correlated to passenger demand, number of buses in service, traffic volumes and inclement weather. On the daily scale, both occur most often at peak times. Over the course of the year, they follow different patterns. Passenger mishaps tend to be slightly more common in the winter, but otherwise correlate with travel demand and bus volumes. Collisions are dramatically lower in the summer months due to lower demand, service reductions, reduced traffic volumes and less severe inclement weather. Autumn months see a slight increase in collisions due to increased demand and vehicle traffic related to the start of the school year. Winter months typically have the highest rates of collisions and mishaps due to inclement weather. November and December see many more collisions due to additional traffic from holiday shoppers. This impact is most apparent at transit centres that share a driveway with retail centers, such as Northgate, Southgate and WEM. [14]

### 3.1.4. PERFORMANCE REPORTING BY PLANNERS & SCHEDULERS

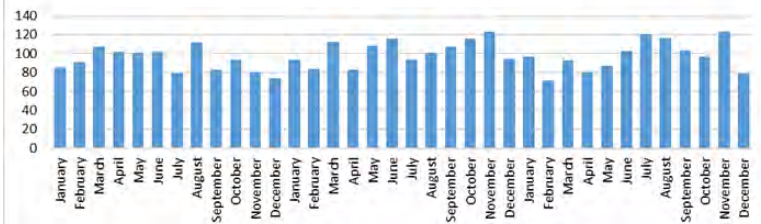
Planners determine the level of service to be provided, design and revise routes while schedulers build schedules and work closely with planners to develop and maintain schedules. Both schedulers and planners work closely together to monitor route performance, identify problem areas and then take corrective actions.

In order to assess performance, schedules and planners use information gathered from specialized, In-house, software package named, "Automatic Passenger Counter" (APC). As the name implies, this provides information about when and where passengers board and alight on each route, but also provides information on travel times and schedule adherence. The data is collected by electronic counters which are installed on approximately 27% of the buses in service. Over the course of several months, these buses travel along every part of every route numerous times. This is then compared to the standards in Policy C539 which contains thresholds for ridership, frequency, schedule adherence and walking distance.

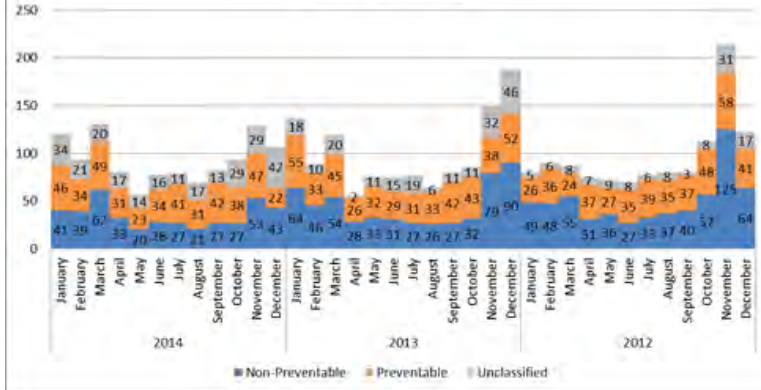
Each route is divided both temporally and spatially. Temporally, the route is divided into multiple "trips", with each trip representing a single bus traveling along the route (or a portion of the route). Each route is spatially divided into segments, at "timing points" which may be at transit centres or regular stops along the route. The schedule defines when the bus should depart from each timing point, and so the bus may layover at these locations if it gets ahead of schedule. ETS schedules also include additional "recovery time" that can account for as much as 10% of the total round trip time. Recovery time allows the bus an opportunity to catch up from any delays it might have, as well as provides the operator time for a short break. Route performance will vary between trips and segments for each route, but often follows trends that can only be seen when aggregating data temporally, spatially or both. As such, the planners must consider route performance at multiple levels of aggregation.

APC reports such as the "Route Ridership Report" provide the planners with average boardings, alightings and passenger loads for each trip along each segment of the route, as well as totals for each trip and for each stop. If needed, the planners can follow links to access the individual records. APC provides similar data for travel times for each segment of each trip, for buses that travel along multiple routes and for individual stops. In addition, APC produces "Exception Reports" that log bus overloads and delays.

**FIGURE 2: PASSENGER MISSHAPS**



**FIGURE 3: COLLISION PREVENTABILITY**



Each year, APC is used to generate the “System Performance Review” (SPR) using aggregated data for the entire route, for each time-period the route operates. Ridership is summarized to show how often buses are underutilized, overloaded and the boardings per hour.

This report can be used to identify routes that are consistently problematic, and is part of a system wide review of each route that is done annually.

**TABLE 6: ROUTES BY TYPE AND TIME PERIOD**

	AM Peak	PM Peak	Midday	Evening	Weekend	Total
Regular	130	131	147	170	129	182
Community	5	11	11	4	9	13
Special	116	167	104	1	1	220
<b>Total</b>	<b>251</b>	<b>309</b>	<b>262</b>	<b>175</b>	<b>139</b>	<b>415</b>

### 3.1.5. SERVICE UTILIZATION

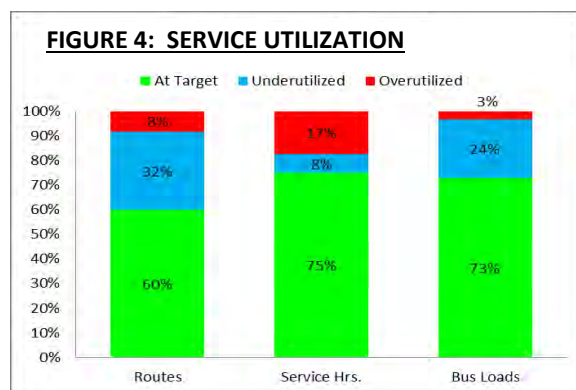
As of the end of 2015, ETS operated 415 routes of which 182 provide regular service, 220 provide specialized service (such as school specials) and 13 are community routes. Collectively, these provide service in all time periods (summarized in Table 6). Most routes follow a numbering scheme where regular routes are numbered 1-199, regional routes use numbers 200-299 (St Albert) and 400-499 (Sherwood Park), community routes are numbered 300-399, 500-599 are special purpose routes (such as LRT, Special events and contingency service), 600-999 are school specials and 747 provides service Edmonton International Airport. [10]

Bus utilization can be measured in several ways with each having limitations. As can be seen in Figure 4 below, these three methods produce very different results. In all cases the data is limited by the fact only 27% of buses have passenger counters and that the counters themselves are imperfect. Routes that only run a few trips a week may have very few samples recorded while more common routes have dozens or hundreds for a given time period. For this reason, it is not uncommon to use only measurements on “regular” service, which usually has many samples. Furthermore, the SPR data does not take location into account at all and aggregates boardings over the entire time period. Also, separate service standards are used when evaluating individual bus loads or average boardings per hour.

The easiest way is to use the average boardings per hour and simply count how many routes are flagged as potentially underutilized and overutilized. While useful, this is limited as it gives uses boarding rates that are averaged over the entire time period which tends to mask problems that are only present for a portion of that time period. In addition, this does not take into account the importance of each route in terms of number of buses or distance traveled. Using this method 60% are at target, 32% are underutilized and 8% are underutilized.

This can be improved by instead of counting each route equally, to instead weight each route based on how many hours of service are allocated to it. This accounts for both the number of buses operating, as well as how long each bus is traveling along that route. However, this method still relies on boarding volumes that are averaged over the entire time period. Using this method about 81% of hours are going to service performing at target, 8% of service is underutilized and 12% is overutilized.

A third way to measure utilization is to count the number of individual samples (buses) that had loads beyond the performance standards. This method does not use the average values, but it does not take into account how long the bus was overloaded. For instance a bus that is overloaded for only a few stops will show up the same as a bus that is overloaded from one end of the route to the



other. Furthermore, because this method is using individual samples instead of average values, a different service standard must be used, which will provide a very different result from the other two methods. Using this method, 73% are at target, 24% are underutilized and 3% are overutilized.

This can be further complicated by considering each time period separately. When considered in terms of peak and offpeak service, both routes and bus loads showed an increase in underutilized service during offpeak while service hours changed very little. This information is shown in the appendices. [13]

### 3.1.6. ON TIME PERFORMANCE & RELIABILITY

Currently, a larger concern is On Time Performance (OTP) (also called “schedule adherence” or “reliability”). As with utilization, this can be considered in several ways with the most important distinction being between On-Time Arrival (OTA) and On-Time Departure (OTD). Typically the TOA is much lower than OTD because “recovery time”, mentioned previously, allows buses a chance to catch up at timing points. For example: If a route has five minutes of recovery time at a timing point, a bus that arrives three minutes late still has two minutes of recovery time once it arrives, and thus most likely will depart on time. OTP is shown in Figures 5-7 to the right. Figure 5 shows how OTP varies between time periods, Figure 6 shows the overall performance trends and Figure 7 shows only vehicles behind schedule.

Edmonton Transit uses a Timed Transfer Network (TTN), which can be described as a “pulse” where many routes are present at transit centres simultaneously. This allows passengers to easily transfer between any of these routes. However if buses are delayed, passengers are likely to miss the pulse, which may force transferring passengers to wait 15-30 minutes until the next one. Because of this, ETS uses OTP criteria that are significantly more stringent than the industry standard. As shown in Table 7 below, early on time arrival (which is not disruptive for a TTN) is the only item where ETS does not use a more restrictive standard [16].

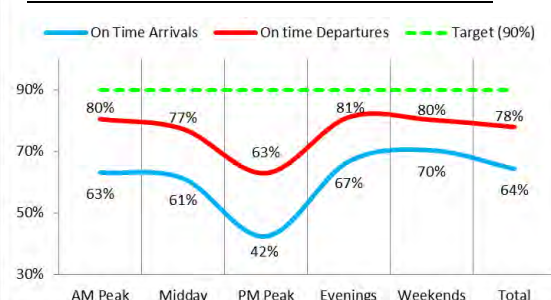
**TABLE 7: OTP STANDARDS**

	On-Time Arrival		On-Time Departure	
	Early	Late	Early	Late
Industry Standard	> 1-5 min	> 3-5 min	> 1 min	> 5 min
Edmonton Transit	> 5 min	> 1 min	> 0 min	> 3 min

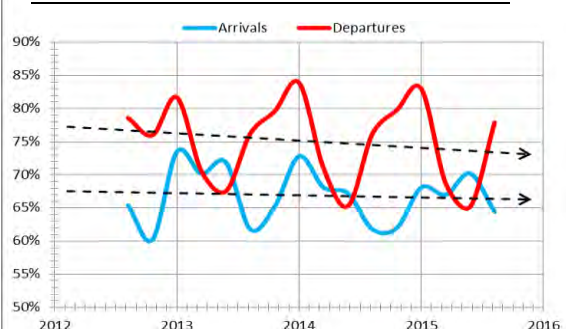
In terms of on time arrivals, at the end of 2015 only 64% of buses were arriving schedule. When broken down by time period, the PM peak is the most severe with only 42% OTA, although the highest (70% on weekends) is still far below the target of 90%.

On time departures are also falling short of the target,

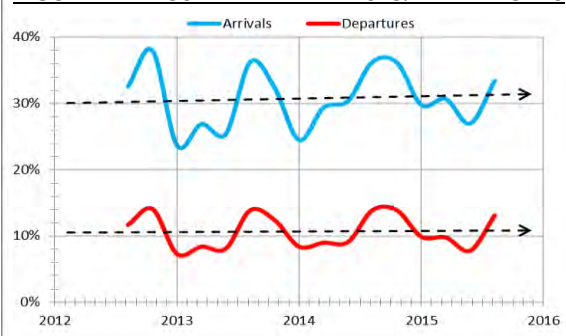
**FIGURE 5: CURRENT OTP BY TIME PERIOD**



**FIGURE 6: ON TIME PERFORMANCE TREND**



**FIGURE 7: BUS LATE ARRIVALS & DEPARTURES**



although the problem is much less severe with 78% of buses on time overall and 63% on time during PM Peaks. Early arrival is uncommon at only 2.2% with late arrivals making up the remaining 33.4%. Early departures are far more common, currently at about 8.9%, and 13.1% of buses are leaving late. The high level of early departure is likely caused by buses leaving only a few seconds early, which is counted the same as if the bus had left several minutes early.

It is important to consider trends over time as well as the current performance. Data for the past 3 years is shown in Figure 6 above, and shows both OTD and OTA following very different annual patterns, although both show an overall downward trend. Both reach a high point during the December-January time period. OTD then declines dramatically during the spring and summer and recovers in the fall while OTA does much the opposite, with the poorest performance during the fall and early winter.

A closer inspection of the data (included in the appendices) shows that the different patterns are largely the result of dramatic fluctuation of early departures that can be as high as 25% during the spring and summer. When only considering vehicles behind schedule (late arrivals and late departures), OTA and OTD follow similar patterns. OTA is both higher and more dramatic than OTD due to the buffering effect of recovery time. The pattern, shown in Figure 7, shows better performance during the spring and summer months with the most severe problems in the autumn and early winter. While difficult to see in these charts, late arrivals and departures have both been slowly increasing since at least mid 2012 (the oldest APC data available). [13]

### 3.1.7. PERFORMANCE REPORTING BY OTHER SECTIONS OF ETS ADMINISTRATION

ETS administration includes many other sections such as “Customer Experience & Innovation”, “Research Revenue & Expenditure Control” and “Engineering and Maintenance”. Each of these sections collects data and tracks performance related to the services they provide and their function within the organization. While each is important, most are tangential to this paper and are thus not included. As mentioned previously, ETS has an ongoing initiative to better coordinate the data collection and reporting of these sections.

Ridership and ETS finances are closely linked, as ridership is estimated from fare sales. ETS has developed a “multiplier” for each type of fare (cash ticket, monthly pass, ETS@ Work, U-Pass, etc.) that is used to estimate total ridership. For example, each adult monthly pass sold is estimated to result in 58 passenger-trips in that month. This method must be used due to limitations of the automatic passenger counters, which are only on approximately 27% of buses, not present at all on LRT vehicles, and count transferring passengers multiple times. These multipliers are periodically calibrated against manual counts and survey data.

ETS produces an internal “Sales Revenue and Ridership” (SRR) each month. This report includes sales, revenue and ridership figures for the current month and year to date. Each of these is accompanied with the figures from the previous year and the current budget (projection), for reference. The totals from this report are used when preparing the budget for the next year, as well as being included in the Transportation departmental scorecard and reported to external agencies such as CUTA.

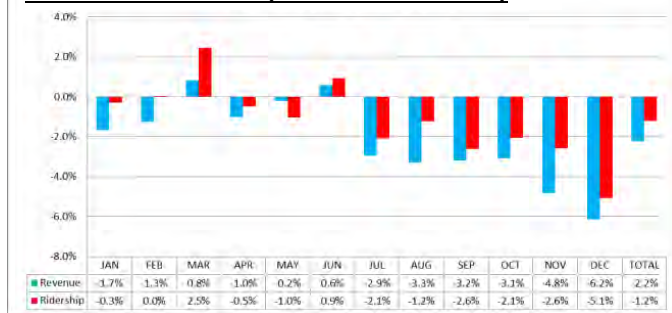
As shown in Figure 8, ridership and performance fluctuated within +/-2.5% of the budget for the first half of 2015, with a sudden drop in July that kept it below predictions for the rest of the year. When compared with 2014 (shown in Figure 9), the total still declined although the magnitude of the trend is less consistent. Ridership and revenue follow somewhat different trends which is most apparent where the two even varied in opposite directions in February and March. This disassociation is likely due to changes in sales of the various types of fares (Cash, Monthly Passes, U-Pass), which is shown in the Figure 10. [17]

Operating costs area also recorded and reported for internal uses. Potentially the most important use is the “Recovery” or “R/C Ratio” which is simply the total revenue divided by the total costs. This ratio shows the degree to which the transit system is self-sufficient, or said another way, the amount of subsidy required to operate the system. This simple indicator can be problematic, or at least misleading, as it reflects the cumulative effect of all programs, initiatives and operations. For instance, a low value (for example .2 or 20%) indicates only that the system is dependent on subsidy for 80% of the cost to operate the system, which might be due to inefficiency, overly high operator salaries, or costly social, economic, and environmental programs. Obvious examples of such programs include discounts to students, seniors and persons with disabilities, and providing “life-line” service to areas with high dependency on transit.

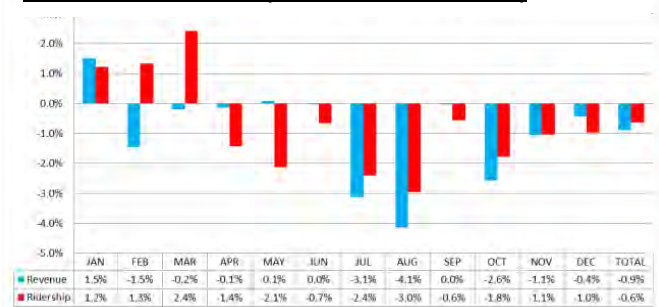
The data for 2015 is not yet available, but in 2014 transit operating costs were approximately \$289 million, revenue was approximately \$132 million and the remaining \$156 million was paid for with subsidy from the City of Edmonton. This resulted in a recovery of 45%, which was a slight increase over 2013. While trends within Edmonton are discussed in this section, comparison with other municipalities will be discussed in a later section focusing on CUTA data. [4]

As both population and transit usage change over time, cost and revenue figures are often more useful when presented in terms of population or ridership, which are presented in the Figures 11 and 12 below. From 2004 to 2014, total operating cost has increased by 7.8% per year, while revenue only increased 7.5%, thus resulting in the subsidy increasing 8.3% per year. When the increasing population is taken into account, the annual increase in cost per capita has been 6.1% per year during this period. Taking into account increasing ridership, the cost per

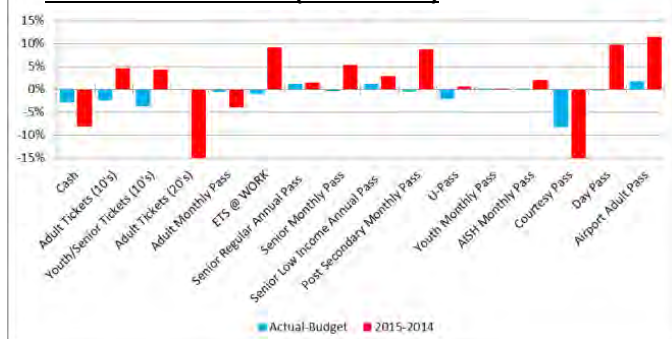
**FIGURE 8: VARIANCE (BUDGET TO ACTUAL)**



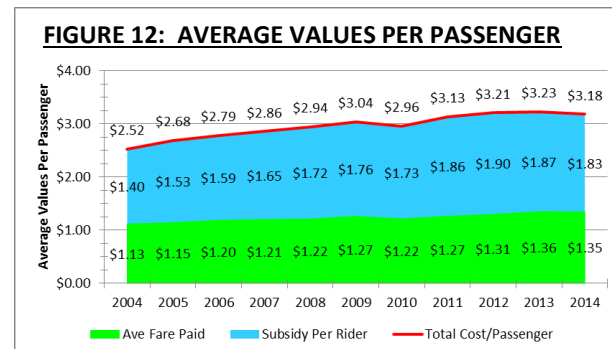
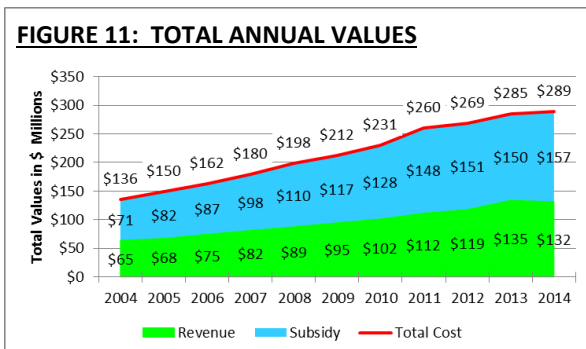
**FIGURE 9: VARIANCE (2014 TO 2015 ACTUAL)**



**FIGURE 10: VARIANCE (FARE SALES)**



rider has increased by 2.4% on average, while the average fare has only increased by 1.9%, thus requiring an average annual increase of 2.9% on the subsidy. Also of note is that over the past 10 years, transit ridership has usually grown at a faster rate than population. [4] This is particularly true between 2011-14 where ETS ridership has grown 15.1% which is higher than both Calgary (8.4%) and Ottawa (2.8%). In 2014, while ETS ridership only grew by 2.6% this was still more than twice the national average of 1%. [18]



### 3.1.8. PERFORMANCE REPORTING BY ETS MANAGEMENT

ETS management is responsible for providing strategic direction, establishing goals, objectives and priorities to be used to provide transit service. They are also responsible for ensuring that ETS is in alignment with these goals and are ultimately responsible for ensuring that ETS is operating effectively and efficiently. To accomplish this, ETS has identified seven Strategic Goals from “The Ways”, each of which is connected to one or more “ETS Outcomes” and most of those are linked to one or more “Branch Performance Measures”. As ETS is currently updating the internal reporting, many of these items are likely to change in the near future

As of the end of 2015, Edmonton Transit has identified 16 ETS outcomes, which are linked to 30 performance measures. [7] As shown in Table 8 (also included in the appendices), 14 performance indicators are currently meeting targets and 8 are not. Of the remaining 8, 5 are being reported but do not have a target and 3 do not yet have a measure defined. Table 8 below shows each of these measures, along with the most current data available. “No Data” indicates that data is measured but not yet available and “N/A” indicates that data is not currently being collected. The table also includes outcomes from the “City Council Initiative on Public Transit”, which uses two of the performance measures from “The Way We Move”.

ETS Management uses a number of reports to track performance, alignment with The Ways strategic goals, as well as to identify problems and the overall health of ETS. While many are confidential, two reports were made available for this report and provide the most relevant information: The Transportation Department Scorecard and “Customer Satisfaction Tracking Survey”. Other information is provided in financial and performance reports that were previously mentioned.

The primary strategic level report is the “Transportation Departmental Scorecard” which, as the name implies, includes metrics for all branches within the Transportation Services department. The 21 metrics for Edmonton Transit are shown in a condensed form in the Table 9 below. Due to limited data, the table only shows values for 2014 and Q3 of 2015. The metrics shown include both performance and customer perception information; however, the only financial targets are for increased sales (variance >0). [19]

**TABLE 8: BRANCH PERFORMANCE MEASURES**

Strategic Document	City of Edmonton Outcome	ETS Outcomes	Branch Performance Measures	Reported in	Measurement	
					2014	2015
The Way We Move: Edmontonians use Public Transit	Edmontonians use Public Transit	ETS service is geographically accessible	% of service warranted by policy that is funded	TBD	No Data	96.50%
		ETS is accessible to persons with disabilities	DATS ride accommodation rate	Departmental Scorecard	99%	99%
		ETS provides reliable service	% customer satisfaction with LRT Reliability	Departmental Scorecard	92%	89.50%
			% customer satisfaction with Bus Reliability	Departmental Scorecard	72%	65%
			% On Time Schedule Adherence (Bus)	Departmental Scorecard	65%	64%
			% customer satisfaction with LRT Frequency	Departmental Scorecard	89%	86%
			% customer satisfaction with Bus Frequency	Departmental Scorecard	69%	63%
			DATS on-time performance	Departmental Scorecard	95%	95%
		Operators are professional and helpful service	% customer satisfaction with operators' behavior (helpful & courteous)	Departmental Scorecard	89%	85%
			% customer satisfaction with operators' driving performance	Departmental Scorecard	90%	90%
	Edmonton has sustainable and accessible infrastructure	Ridership grows as population grows	Ridership Per Capita	Departmental Scorecard	101.1	No Data
		Public Transit is affordable	% customer satisfaction with value for fare paid	Customer Satisfaction *	N/A	75%
		Edmontonians use public transit to go to work	% of Edmontonians who use transit, carpooling, walking or cycling	Departmental Scorecard	24%	No Data
		ETS infrastructure is well maintained	% availability of Escalators	Departmental Scorecard	82%	89%
			% availability of Elevators	Departmental Scorecard	99%	98%
The Way We Grow: Edmonton is attractive and compact	Edmonton is attractive and compact	ETS facilities are clean	% customer satisfaction that LRT clean & tidy stations	Customer Satisfaction *	No Data	88%
			% customer satisfaction BUS & TRANSIT CENTRE clean & tidy shelters	Customer Satisfaction *	No Data	72%
		ETS vehicles are clean	% customer satisfaction LRT clean & tidy interiors	Customer Satisfaction *	No Data	88%
			% customer satisfaction Buses clean & tidy interiors	Customer Satisfaction *	No Data	79%
The Way We Live: Edmonton is a safe city	Edmonton is a safe city	ETS transit supports compact living	TBD	TBD	N/A	N/A
			% customer satisfaction with personal safety at Bus Stops	Departmental Scorecard	82%	79%
			% customer satisfaction with personal safety at Transit Centres	Departmental Scorecard	76%	80%
			% customer satisfaction with personal safety at LRT Stations	Departmental Scorecard	80%	77%
			% customer satisfaction with personal safety on Buses	Departmental Scorecard	91%	89%
			% customer satisfaction with personal safety on LRT	Departmental Scorecard	88%	85%
The Way We Finance: Edmonton has a resilient financial position	Edmonton has a resilient financial position	ETS strives to become more self-sufficient	ETS security disorder rate per 100,000 boardings	Departmental Scorecard	7.8	7.6
			Subsidy per capita	CUTA	\$178	No Data
The Way We Green: City's operations are environmentally sustainable	City's operations are environmentally sustainable	ETS operations are environmentally sustainable	Revenue / Cost Ratio	CUTA	45%	No Data
			TBD	TBD	N/A	N/A
The Way We Prosper: Edmonton has a globally competitive and entrepreneurial business climate	Edmonton has a globally competitive and entrepreneurial business climate	Public Transit supports economic activities	TBD	TBD	N/A	N/A

\* Custom Satisfaction Surveys contain no targets, so 80% was assumed by the consultant

Exceeds Target	8
At Target	6
Below Target	8
No Target Set	6
Awaiting Data	2
<b>Total</b>	<b>30</b>

The data shows three interesting items. The first is that safety incidents, while declining, are well above the target; however, customer perception of safety only indicates a slight problem at LRT stations. Second is that frequency and reliability of both bus and LRT service has declined since 2014 and is currently well below targets. The third is that bus service has much lower target values, and yet is still further below the targets than LRT.

While customer satisfaction reporting has been done in various forms for many years, such reporting has been inconsistent. In 2014, ETS launched an initiative to better track customer satisfaction in a more thorough and systematic way. This information has been compiled quarterly for the past year and the first annual report was produced in December of 2015. Some of these items have been included in the departmental scorecard, but many have not. Due to a lack of previous data to provide a baseline, it is difficult to identify precise targets or identify important trends. However, some preliminary interpretations have been made using professional experience and statistical methods.

**TABLE 9: TRANSPORTATION DEPARTMENT SCORECARD**

Performance Indicator	Operational Performance	Actual	
	Target	2014	2015
<b>TRANSIT</b>			
Escalator Up-Time	90%	82.0%	89.0%
Elevator Up-Time	95%	99.0%	98.0%
DATS Rides Accommodation	98%	99.0%	99.0%
Transit Ridership/Capita	"101, 102"	101.1	TBA
Monthly Transit Sales Variance - Cash	Actual 2015 to Actual 2014 Variance >= 0%	No Data	-0.087
Monthly Transit Sales Variance - Adult Monthly Pass		No Data	-0.035
Monthly Transit Sales Variance - UPass		No Data	0.026
% DATS on Time	90%	95.0%	95.0%
Monthly Bus Service Hours/Capita	Maintain (.20)	0.2	0.2
Transit Disorder Rate (per 100,000 Boardings)	6.50	7.80	7.61
On Time Schedule Adherence (Bus)	90%	65.0%	64.0%
Reliability Satisfaction - Bus	70%	72.0%	65.0%
Reliability Satisfaction - LRT	90%	92.0%	89.5%
Service Frequency Satisfaction - Bus	70%	69.0%	63.0%
Service Frequency Satisfaction - LRT	90%	89.0%	86.0%
Personal Safety Perception - At Bus Stops	80%	82.0%	79.0%
Personal Safety Perception - At Transit Centres	80%	76.0%	80.0%
Personal Safety Perception - At LRT Stations	80%	80.0%	77.0%
Personal Safety Perception - On Board Bus	80%	91.0%	89.0%
Personal Safety Perception - On Board LRT	80%	88.0%	85.0%
Operator Performance Satisfaction - Helpful and Considerate	85%	89.0%	85.0%

<b>Legend:</b>	
Exceeds	Does not meet
Within 1%	No Data

Table 10 and Figure 13 below summarize the key findings from the customer satisfaction survey reports. The table shows the various stages of a transit trip along with "Service Attributes" that shape customer experience at those stages. For each item, "Satisfied" indicates the % of respondents that were satisfied or very satisfied. (For example, for "Hours of Operation" 22% of respondents were not satisfied, 42% were only satisfied and 36% were very satisfied.). As no baseline data was available, 80% was chosen to indicate an item was "Top Tier" and values below 70% indicated a problem area. The consultants also determined the relative importance each attribute plays when passengers, which was then normalized with items having higher than average importance (weight above 1) denoted as "Key Driver".

Of the 30 attributes, 14 were "top Tier", 3 of which are key drivers. Top tier key drivers ("Bus convenient bus stop locations", Bus helpful, considerate bus operator" and "Total trip duration") were indicated as aspects of particular success. "Hours of Operation" was also indicated as being a successful aspect, although the reasoning for this is unclear as it rated only slightly better than "Perceived value for fare paid" which was identified as an opportunity for improvement. [20]

6 items are problematic, and of those 4 are key drivers. Problematic key drivers ("Good Connections & Reasonable Wait Time", "Bus on-time, reliable service", "Bus Service Frequent Enough" and "Communications") are identified as opportunities for improvement. "Perceived value for fare paid" was also identified as an opportunity; however it is less problematic than the other four. [20]

**TABLE 10: CUSTOMER SATISFACTION RESULTS**

Stage	Customer Experience Stage & Service Attribute	Satisfied	Very Satisfied	Relative Importance	
1: Trip Planning	Hours of operation	78%	36%	1.18	Key Driver
	Communications	69%	32%	1.03	Key Driver
	Ease of trip planning	83%	47%	0.98	
2: Fare Purchase	Convenient fare purchase options	79%	44%	0.83	
3: Go to Stop	BUS convenient bus stop locations	86%	45%	1.08	Key Driver
4: Wait at Stop	BUS service frequently enough	65%	24%	1.35	Key Driver
	LRT personal safety waiting at station	77%	34%	0.95	
	LRT service frequently enough	87%	49%	0.90	
	TRANSIT CENTRE personal safety waiting at transit centre	77%	35%	0.88	
	LRT clean & tidy stations	88%	43%	0.88	
	Overall satisfaction with Park & Ride facilities	74%	34%	0.85	
	BUS personal safety waiting at bus stop	79%	36%	0.85	
	BUS enough shelters	64%	25%	0.85	
	BUS & TRANSIT CENTRE clean & tidy shelters	72%	25%	0.83	
5: Boarding	BUS on-time, reliable service	68%	28%	1.40	Key Driver
	LRT on-time, reliable service	90%	55%	0.93	
6: In Transit	BUS helpful, considerate bus operator	86%	49%	1.03	Key Driver
	LRT clean & tidy interiors	88%	42%	0.98	
	LRT operator drives smoothly when starting/stopping	95%	65%	0.98	
	BUS operator drives smoothly when starting/stopping	83%	42%	0.98	
	BUS clean & tidy interiors	79%	32%	0.95	
	BUS not overcrowded onboard	64%	23%	0.93	
	BUS operator drives safely & professionally	89%	54%	0.93	
	BUS personal safety onboard	89%	49%	0.93	
	LRT personal safety onboard	85%	43%	0.93	
	LRT not overcrowded onboard	70%	27%	0.73	
7: Transfer	Good connections & reasonable wait time	64%	22%	1.38	Key Driver
8: Arrival	Total trip duration	82%	34%	1.33	Key Driver
9: Post-trip Reflection	Likelihood to recommend ETS	85%	44%	1.25	Key Driver
	Perceived value for fare paid	75%	32%	1.20	Key Driver

Indicates an opportunity for improvement

Indicates an aspect where ETS is currently very successful

The remaining 10 items were neither top tier or problematic, and these include 2 key drivers. Of these, “Hours of operation” was identified as a success while “perceived value for fare” was identified as an “opportunity for improvement”. [20]

**FIGURE 13: OPEN QUESTION TO CUSTOMERS**

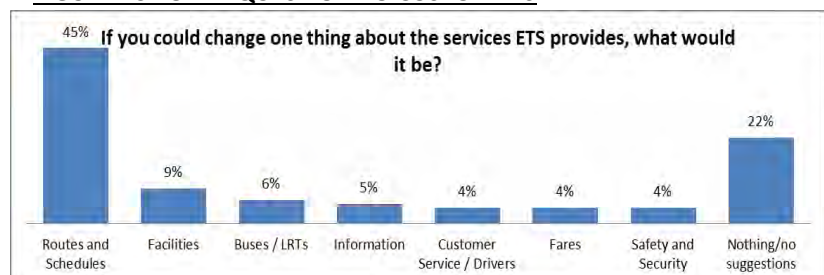


Figure 13 shows responses from the question “If you could change one thing about the service ETS provides, what would it be?” The largest number (45%) indicated “Routes and schedules”, followed by “Nothing/No suggestions” at 22% and “Facilities” at 9% and the other 5 items were much lower. [20] Considered with the table, it appears that customers feel bus frequency and reliability are unacceptable.

## 3.2. REPORTING OUTSIDE OF ETS

### 3.2.1. CUTA

In addition to measuring compliance with internal targets and trends over time, ETS reports data to agencies such as the Canadian Urban Transit Association (CUTA). 103 municipalities provide specific information to CUTA which is then compiled and grouped in population categories to provide a means to compare performance. The information relates to the financial and functional operation of the system along with the size of the city, but does not include information on geography, culture, financing, wealth or strategic goals.

For comparison, municipalities are grouped into categories based on their population with Edmonton being in population group 2 (400,000 to 2,000,000). Due to the diversity within the group, it is also useful to compare Edmonton against a subset of these municipalities that are more similar to Edmonton. In previous reports such as the “Transit Review” and ETS audit Edmonton was compared to Ottawa and Calgary. Table 11 below summarizes many of the key items reported from CUTA, additional information is available in the appendices.

**TABLE 11: CUTA DATA SUMMARY**

Municipality	Pop (000's)	Size KM <sup>2</sup>	Trips (000's)	Per Capita	Per Rev Veh Hr	Total Pass-Km (000's)	Adult Cash Fare	Ave Paid	Cost / Rider	Sub / Rider	Total # of Vehicles	Average Bus Age	Spare Ratio	R/C Ratio	Routes
Montréal	1,938	501	417,220	215.3	61.8	3,487,956	\$ 3.00	\$1.43	\$ 2.56	\$1.13	2,781	6.5	0.389		224
Calgary	1,195	896	110,275	92.3	44.0	1,598,981	\$ 3.00	\$1.59	\$ 3.35	\$1.63	1,245	7.3	0.504	0.512	159
York Region	1,003	1,776	22,445	22.4	18.3	-	\$ 4.00	\$2.87	\$ 7.35	\$4.44	520	6.3	0.453	0.396	128
<b>Edmonton</b>	<b>878</b>	<b>700</b>	<b>89,283</b>	<b>101.7</b>	<b>41.1</b>	<b>696,407</b>	<b>\$ 3.20</b>	<b>\$1.35</b>	<b>\$ 3.18</b>	<b>\$1.75</b>	<b>1,009</b>	<b>9.3</b>	<b>0.244</b>	<b>0.449</b>	<b>205</b>
Ottawa	858	466	97,077	113.2	44.2	951,353	\$ 3.45	\$1.85	\$ 3.60	\$1.70	939	5.5	0.215	0.527	145
Mississauga	756	179	36,608	48.4	27.8	344,056	\$ 3.25	\$2.03	\$ 4.43	\$2.26	463	6.2	0.297	0.490	84
Winnipeg	675	229	49,868	73.8	35.6	359,721	\$ 2.55	\$1.55	\$ 2.80	\$1.20	583	9.6	0.171	0.572	89
Québec	585	548	46,610	79.7	39.9	744,571	\$ 3.25	\$1.39	\$ 3.79	\$2.24	604	8.3	0.177	0.408	135
Brampton	564	267	20,411	36.2	21.4	-	\$ 3.75	\$2.46	\$ 5.50	\$2.99	359	6.3	0.251	0.457	45
Durham Regio	550	406	10,791	19.6	21.2	-	\$ 3.25	\$2.10	\$ 6.13	\$3.95	195	5.8	0.373	0.356	71
Hamilton	490	235	22,234	45.4	30.5	-	\$ 2.55	\$1.65	\$ 3.56	\$1.88	221	6.6	0.188	0.473	34
Waterloo Reg	434	217	21,597	49.7	32.3	-	\$ 3.00	\$1.38	\$ 3.61	\$2.19	235	6.3	0.284	0.394	62
Laval	421	245	21,564	51.2	35.4	155,263	\$ 3.25	\$1.46	\$ 4.49	\$2.97	276	8.3	0.14	0.340	51
Longueuil	411	282	34,448	83.8	41.5	362,927	\$ 3.25	\$1.66	\$ 2.30	\$1.68	452	8.5	0.209	N/A	98
<b>Average</b>	<b>769</b>	<b>496</b>	<b>71,459</b>	<b>73.8</b>	<b>35.3</b>	<b>621,517</b>	<b>\$ 3.20</b>	<b>\$1.77</b>	<b>\$ 4.05</b>	<b>\$2.29</b>	<b>706</b>	<b>7.2</b>	<b>0.278</b>	<b>0.448</b>	<b>109</b>
ETS Rank	4 of 14	3 of 14	4 of 14	3 of 14	5 of 14	5 of 14	9 of 14	14 of 14	11 of 14	9 of 14	3 of 14	2 of 14	8 of 14	7 of 13	2 of 14

In general, Edmonton compares well to the population group and the smaller subset. Particularly, the system appears to be very efficient having one of the lowest cost per passenger (\$3.18) and lower cost per hour (\$127.27) than Calgary or Ottawa. Another item of note is that ETS has a large number of routes compared to the group. Only Montreal, with nearly twice the population, has more regular routes than ETS [4]

ETS provides a comparatively high amount of service with service hours per capita (2.476) being lower only than Montreal and Ottawa. Service utilization (41.1 passengers per revenue hour) is above the group average, but below both Calgary and Ottawa which is likely due to ETS using fewer articulated buses than those agencies. Ridership per capita (101.7) is also well above Calgary and the group average, only being behind Montreal and Ottawa. [4]

In terms of finances, ETS has the single lowest average fare paid (\$1.35), despite the adult fare being at average (\$3.20). This is likely to be due to both high levels of discounts and a large number of riders who take advantage of them. [4] The high operating efficiency is able to offset the low revenue and is able to keep recovery at the group average (45%).

### 3.2.2. OPERATING BUDGETS

The budgets are another source of information regarding the priorities of the City of Edmonton. The development of municipal budgets is the result of a complicated series of compromises reflecting the political and financial landscape, as well as Council's priorities. While it may be safe to assume projects that receive funding are important, it is not true necessarily that unfunded items are less important. Instead, items might be left unfunded for any of a number of reasons including those that neither the public nor administration is aware of.

Every year the Service Planning section of ETS identifies additional service that is warranted by the service standards, but cannot be provided without additional funding. Transit planners then estimate the additional time (in annual service hours) that would be required for each item. These are then grouped into packages that are then passed to higher levels of management for consideration in the ETS budget. For a variety of reasons, only a small portion of the warranted additional service is funded each year. Since 2012, no additional funding has been approved for addressing problems with existing service such as delays and overloads. Furthermore, only a small fraction of warranted service to new areas or during new time periods has been approved. [21]

While bus service additions are often the most expensive, they are not the only item that ETS requests in annual operating budgets. Other requests are made for LRT service, facility maintenance, security, new technologies (such as Smart Bus and Smart Fare) and projects, such as the Transit Review and Transit Strategy. Considering which of these are ultimately funded can also be insightful although interpretation of these is beyond the scope of this paper. [22]

### 3.2.3. OTHER INTERNAL DATA & REPORTS

#### ETS AUDIT REPORT

ETS underwent an internal audit in 2015 that focused on trends and comparisons with other cities in ETS between 2011 and 2014. This report relied on CUTA data and so restated several of the findings from previous sections of this paper including the efficient operation but declining reliability of service. In addition, this report drew attention to several important items:

- While ETS records cost and revenue information, no clear targets or priorities are given. As a result, *“Effectively, the tax levy is the difference between the operating costs and revenues generated, rather than a reflection of the value of broader societal benefits.”* Because of this, the report recommended that a fare procedure be determined that provides a clear target for R/C ratios and fare structure that reflect the societal benefits of transit
- Total collisions were reduced by approximately 8% and preventable collisions were reduced by 7% between 2011-2014. [18]
- Disorders reported annually increased from 4,264 to 6,871 (61% increase). Crimes against persons increased 14% from 297 to 339. When compared with boardings, this translates to a 45% increase in disorders (from 5.3 to 7.7 per 100,000 boardings) with a negligible increase in crimes against persons (0.37 to 0.38 per 100,000 boardings). It was noted, however that the increase in incidents reported is thought to be largely due to better reporting. [18]
- Ridership increases between 2011-2014 was 2.8% per capita which was above the average for the CUTA group, but less than either Calgary or Ottawa. This growth was divided into three categories based on fare type: The largest increase was in “U-Pass Holders” at 4.9 million (23.2% increase) followed by “Regular Riders”

with an increase of 3.6 million annual trips (8.2% increase) and the lowest was “Casual Riders” which only increased by 0.5 million riders (3.2% increase). [18]

- ETS and Fleet services were found to have a reasonable level of staffing and provide an efficient service. The cost per passenger (\$3.18) has only gone up 1.6% between 2011 and 2014, as compared to 9.5% for CUTA group 2, 7.7% for Calgary and 19.2% in Ottawa [18]
- Reliability and schedule adherence is poor and, despite efforts to improve it, is continuing to decline. The stated reasons are an increase in the number of riders with mobility issues, increased congestion. Additional detail was provided to indicate the severity and cause of this issue. For example:

*In the fall of 2013 on-time arrival performance averaged 63%. On-time performance at individual transit centres ranged from 31% to 100%. 14 of the 26 transit centres experienced on-time performance of 50% or less for at least one weekday time period (i.e., AM Peak, Midday, PM Peak and Evenings).*

*In the fall of 2014 on-time arrival performance averaged 60%. On-time performance at individual transit centres ranged from 18% to 100%. 19 of the 26 transit centres experienced performance of 50% or less for on-time arrival.*

*ETS management advised us that they believe the decline in performance is a reflection of an increase in the number of persons with mobility devices and strollers, construction activity, and increased traffic congestion on city streets. They also advised us that the 2012 through 2015 operating budgets did not include funding to address schedule adherence and overload issues.*

And

*In total there were 1,328 pass-by incidents reported in 2014. Bus Operators estimated that more than 21,700 customers were affected. We were able to group the explanation for pass-bys provided by bus operators into four themes:*

- 1) An increase in the number of strollers and mobility devices reducing the overall bus capacity;*
- 2) Scheduled buses missing or running late (in a few cases, the reason given for pass-bys indicated that another bus was immediately behind to pick up the remaining customers);*
- 3) Insufficient capacity to handle major events (e.g., FIFA, school exams); and*
- 4) Repeat overload conditions. Some explanations included a suggestion that an articulated bus be used on the route or frequency of service be increased. [18]*

- ETS has 41.1 riders per hour which is higher than average, but lower than Calgary or Ottawa. It was pointed out that the ETS fleet has a much lower number of high-capacity buses (such as articulated or double decker). [18]
- The authors raised a concern regarding the bus-LRT integration along with the cost effectiveness of the LRT expansions and noted “*In our opinion, with the wide range of options and cost of rapid transit infrastructure, the comprehensive long-term strategy needs to encompass an integrated review of all aspects of bus and LRT service to ensure the City is getting maximum benefit from its investment in rapid transit*” [18]

#### FROM TRANSIT REVIEW [23] [24]

The transit review, completed in 2014, contains many important findings relating to ETS service and fare policies. This project was done by Stantec with Jarret Walker, who is associated with “High Frequency Networks” and so may contain a bias toward that type of system. None the less, it confirms that ETS is operationally efficient and provides several additional insights.

The first is “the transit network is complex, as measured in the high number of distinct routes and patterns. The complexity is exacerbated by the current style of mapping and public information, which makes it hard to pick out the most useful services from a sea of overlapping route numbers”. This observation, which has also been noted by others including Tarras Gresco, indicates that ETS may benefit from simplifying the network, and revising the way routes appear on system maps. [24]

The second is that ETS is attempting to accomplish competing goals with no clear method of prioritizing them. The most apparent example of this is providing coverage to within 400 meters of every home, while also providing high frequency service along important corridors. This is also seen in the fare structure (shown in Table 12), which uses low fares to encourage ridership, provides discounts based on age and student status, but provides no discount to individuals with low incomes. [24]

**TABLE 12: FARE STRUCTURES**

The third observation relates to decisions city leadership which hinder the ability of ETS to provide transit service. Examples cited include, “Current policy rewards horizontal growth with immediate new transit service, but does not have a corresponding reward for infill growth” and approval of numerous “curvilinear/cul-de-sac” road networks. Outward growth forces transit to transport passengers further, while curvilinear roads result in overlapping service and slower travel speeds. [24]

City/Organization	Adult Fares		Student Fares		Senior Fares	
	Cash Fare	Monthly Pass	Cash Fare	Monthly Pass	Cash Fare	Monthly Pass/Annual Pass
Edmonton	\$3.20	\$89.00	\$3.20	\$69.00	\$3.20	\$14.00/ \$125.00
Calgary	\$3.00	\$96.00	\$2.00	\$60.00	\$3.00	n/a/ \$95.00*
Ottawa	\$3.45	\$100.75	n/a	\$80.25	n/a	\$40.75/ n/a
Range for CUTA Group 2 Organizations	\$2.55 - \$4.00	\$76.00 - \$133.00	\$2.00 - \$4.00	\$42.00 - \$105.00	\$1.00 - \$4.00	\$14.00 - \$87.00/ \$95.00 - \$205.00
CUTA Group 2 Average	\$3.21	\$97.55	\$3.05	\$73.45	\$2.79	\$53.30/ 141.67
Edmonton Fares as a Percentage of the Group Average	100%	91%	105%	94%	115%	26%/ 88%

\* Calgary sells a low income senior annual pass for \$15.00

A fourth observation was that “inner city transit investments, and transit-oriented development thinking, are focused on light rail but do not have a strong policy focus on other potentially high-quality transit corridors. Light rail is so good at driving up property values that station areas tend to become unaffordable to much of the population.” Providing an efficient LRT network is in the best interest of Edmonton, but it will never entirely replace bus service or even serve every important transit corridor. Furthermore, those with the lowest incomes, who depend on transit the most, are least likely to benefit from the LRT. As such, promoting LRT while allowing bus service to deteriorate may result in serious equity and operational problems. [24]

### 3.3. OTHER OBSERVATIONS

#### 3.3.1. EDMONTON’S ROAD NETWORK

The City of Edmonton has a unique road network that reflects both organic growth and changes in planning policy as the city has grown. In a sense, a map of Edmonton roads resembles the rings of a tree, where periods of growth are clearly indicated by sudden changes in road patterns. These periods of growth roughly correspond with the neighborhood classifications currently used (Ex; Mature, Established, Developing) and show a gradual transition from a rectilinear grid pattern in the core areas to meandering curvilinear roads and cul-de-sacs in more peripheral areas.

A more detailed description of the road network and how it impacts transit is included in the Guiding Perspective Report on Transit Service Delivery Models, with only the key items summarized here. Linear, parallel roads in a roughly rectangular pattern typically allow for very efficient transit service, while irregular patterns of winding curvilinear roads tend to result in slow service, overlapping routes and a more confusing transit network. As said by Terras Grescoe when describing similar curvilinear road patterns in Calgary *“it’s a landscape that’s singularly resistant to transit.”* [25]

### 3.3.2. ROUTES

The current network is a hub and spoke network with a large scale radial appearance. However, many routes deviate from that pattern due to organic, incremental growth and direct service customized for specific connections. [24] The result is a networks with redundant, overlapping service to many areas resulting from four driving factors: 400 meter walking distance to transit stops, road patterns & urban form, use of the hub & spoke network and use of multiple service types.

In order to provide transit access within 400 meters of homes and businesses in low density areas of the city, ETS is forced to run service along a large number of smaller roadways. As many of the roads are closely spaced, a large number of routes are required, many of which must follow circuitous paths. Furthermore, close stop spacing forces buses to stop more often which can dramatically increase travel times.

The impact of road patterns is mentioned above, and urban form is discussed in more detail in “The Land Use Transit Connection”. In general, large, low density urban forms with, heavy use of curvilinear, irregularly spaced, non-parallel roads and 3 way intersections are inefficient for transit service. Unfortunately, preventing such development is a challenge for most growing cities in North America, including Edmonton. [2]

While the Hub and Spoke type of network has worked well in Edmonton, it does tend to result in an increase in overlapping service near the hub location due to the large number of routes converging. This is particularly noticeable along major roads approaching the transit centre. Where multiple hubs serve a single area, the networks are likely to result in some degree of additional overlapping coverage. [2]

Where additional direct service is provided it often overlaps portions of existing routes. Each direct route serving a given area will only provide service to a small number of other locations. In order to provide access to additional locations, additional direct routes are required. These typically overlap with other routes including both other direct routes and non-direct routes providing local access to transit centers. [2]

Another contributing factor is that local and express routes often travel along common roadways. While express routes use only a subset of the stops used by the local route, they do often provide access to the same areas and often between the same areas. Even where they do not share any stops, the fact that they share a common ROW gives the appearance of overlapping service.

Feeder lines (such as 49, 153, 118, and 184) provide local neighborhood service and then connect to transit centres where passengers must transfer to express (trunk) lines such as (97, 98, 100 and 133). Other lines, such as 14, 16, and 161 function as an express trunk for much of their route and then transition into a branch line to provide local service to neighborhoods. [26]

The ETS network also contains many very long, local routes such as 151, 87, 8, 9, 3, 7, and 1. [26] These provide slower connections between distant locations, as they provide local service along the entire route. In addition, ETS has a variety of “special service” routes (those with numbers 300 and higher). [10] These provide several roles, such as school specials, community routes for those with limited mobility, and minimum service to areas where demand does not meet minimum ridership criteria. [13]

## 4. SUMMARY & CONCLUSIONS

### 4.1. SUMMARY OF FINDINGS:

Each of the above sections provides insights into one or more aspect of the transit service provided by ETS. When taken together, several common characteristics and challenges emerge:

The first characteristic is that ETS provides reasonable transit service in an efficient and cost effective manner. Data from CUTA indicates that transit service is provided at a lower cost than similar municipalities. Also, the amount of service and cost recovery is appropriate for the city’s population. Utilization is reasonable with ridership per capita and per service hour above the group average. In addition, ridership growth has regularly outpaced population growth.

The second characteristic is that reliability, or schedule adherence has been steadily declining for years and reached an unacceptable level in 2015. Currently an average of only 58% of buses arrive at transit centres on time, which drops to 40% during the PM peak and as low as 18% at specific transit centres. While late departures are indicating the problem may be overstated, this is still critical because ETS uses a timed transfer network where delayed buses result in missed connections and excessive transfer times.

Third is that the ETS network is very complicated with an abundance of overlapping routes. These routes appear inconsistent with different types of service in similar neighborhoods, and routes that do not follow the “Hub and spoke” design philosophy. This is further complicated by policies that provide service to outlying neighborhoods preferentially over redevelopments and areas closer to the city core.

Fourth is that ETS is working hard to improve customer experience as well as operation and administration of the transit system. This is shown by the fact that this transit strategy is being undertaken, and the transit review that was done in 2014. ETS is also near completion of SmartBus and in the initial stages of migration to a SmartFare system. While not apparent to customers, ETS is also radically upgrading internal reporting through both operational integration and new software packages such as Transit Master and “Accident/Incident Management Information System” (AMIS).

ETS clearly takes customer safety and security seriously, although the current level of safety is unclear. Customer satisfaction reports seem to indicate that most customers feel safe, collisions have decreased and ETS has introduced several security targets initiatives. However, the perception of safety appears to be slightly declining and ETS is currently unable to meet safety targets. It is unclear if this is due to better reporting and awareness by passengers or if the quantity of incidents is truly problematic.

Among the challenges facing ETS, the most frequently stated is the lack of clear strategic direction. As a result, ETS is attempting to do everything for everyone in terms of both service and fare policy, which is leading to inconsistencies and declining service quality. In terms of service, ETS is attempting to travel to within 400 meters of every home while also providing high frequency service along critical corridors. In terms of fares, ETS provides numerous discounts to various groups without any clear reasoning. This results in low fare revenue, and while no financial targets exist, other funding is not available for service improvements.

Another apparent challenge is funding. As with any transit agency, the quality and quantity of service that can be provided is limited by the funding available from revenue and subsidies. Data from CUTA shows that ETS provides service at a high level of cost efficiency, although additional funding will inevitably be required as the city grows in size and population. The ability of ETS to generate revenue is hindered by the wide range of deep fare discounts, and so subsidies are the only potential source of additional funding. Unfortunately, over the past 6 years, only a small portion of warranted service expansion has been funded and service quality has received no additional funding whatsoever.

Finally, the urban form and transportation network of Edmonton poses three types of challenges for Edmonton Transit. The first is the continued horizontal expansion of the city which requires that buses provide coverage over an expanding area while also increasing travel distances. The second is the increasing use of curvilinear road patterns that cannot be efficiently served by transit. The third challenge is conflicts between LRT and bus transit at crossings and transit centres

## 4.2. CONCLUSION

### ALIGNING WITH THE GOALS OF THE WAYS PLANS

ETS is clearly attempting to better align reporting with the stated goals found in “The Ways”. This is evident through the items appearing on the department scorecard, customer satisfaction surveying and ongoing internal initiative to reorganize performance metrics.

ETS is also striving to align transit service with the goals stated in The Ways plans, which is shown by the number of identified objectives that are being met and internal programs that have been initiated to promote social and environmental sustainability. Unfortunately, several of these goals are in conflict, or at least competing for limited resources and ETS currently lacks direction on how to prioritize the use of the limited operating budget.

### SAFETY

The safety of users, both while traveling on vehicles and while waiting or transferring at facilities is a clear focus of ETS. Perceived safety, safety incidents and traffic collisions are items that appear frequently in internal reports. Several initiatives are currently ongoing to identify and address safety concerns, which have already led to changes in driver training, advertising campaigns and changes in onboard emergency equipment.

### IMPROVING SERVICE THROUGH NEW TECHNOLOGY, AND PUBLIC ENGAGEMENT:

Over the past few years, ETS has been gradually developing and implementing several new technologies that are intended to improve customer experience, service delivery and efficiency. These include on-board items such as Smart-Bus and Smart-Fare, as well as software programs such as Transit Master and MinBus used by administration.

ETS uses customer satisfaction data as a primary measure for nearly every objective which reflects that customer experience is at least as important as operational characteristics. In addition, The Transit Strategy Project is one of the largest customer engagement initiatives ever undertaken by the city of Edmonton and represents a clear focus of ETS toward better public engagement and service.

#### PERSONS WITH SPECIAL NEEDS:

ETS shows a very high priority on providing service to those with special needs, particularly those with limited mobility, seniors and students. This is most clearly demonstrated by the fare structure which provides high discounts for those groups. In addition, ETS currently provides a number of school specials and numerous routes with low ridership to ensure life-line service to those who are dependent on it.

ETS strives to support low-income groups through life-line service, charity programs and the proposed "Low income pass". However, most low-income groups currently do not benefit from the same types of targeted subsidies and specialized service as seniors, students and people with disabilities.

#### EFFICIENTLY SERVING ALL EDMONTONIANS:

Despite declining reliability and customer satisfaction, ETS strives to efficiently provide service to all Edmontonians. This focus is shown by the low cost per passenger and low cost per hour in CUTA statistics, which is restated in both the transit review and the recent auditors report. This focus is also shown by the provision of multiple types of overlapping service, in an attempt to meet the needs of each community. Unfortunately, this priority is challenged by budgetary limitations, curvilinear urban sprawl, and a lack of strategic direction.

## 5. WORKS CITED

- [1] KITTELSON & ASSOCIATES, INC. et al, "TCRP Report 88 A Guidebook for Developing a Transit Performance-Measuring System," Transportation Research Board of the National Academies, Washington D.C., 2003.
- [2] V. R. Vuchic, Urban Transit Operations, Planning, and Economics, New Jersey: John Wiley & Sons, Inc., 2005.
- [3] B. S. Frey, Successful Management by Motivation Balancing Intrinsic Incentives, Berlin: Springer-Verlag Berlin Heidelberg New York, 2002.
- [4] The Canadian Urban Transit Association (CUTA), "Canadian Transit Fact Book," Canadian Transit Fact Book, Toronto, Ontario, 2014.
- [5] C. S. S. "City of Edmonton, "Our Progress on The Way Ahead, 2014 Results," Edmonton, Alberta, 2014.
- [6] D. Huff, How to Lie with Statistics, New York: W.W. Norton & Company, 1954.
- [7] Edmonton Transit, "2016-2018 Business Plan," Edmonton, Alberta, 2015.
- [8] T. S. & N. Walters, "ETS Strategic Measures Aligning ETS with Corporate Goals, Outcomes & KPIs," Edmonton,

Alberta, 2015.

- [9] D. Chernuka, Interviewee, *Discussions on ETS internal performance Reporting*. [Interview]. October - December 2015.
- [10] Edmonton Transit Service Planning , "Available Route Numbers - September 6, 2015.xls," Edmonton, Accessed December 2015.
- [11] Edmonton transit, "ETS Statistics," City of Edmonton, [Online]. Available: <http://www.edmonton.ca/ets/ets-statistics.aspx>. [Accessed 20 February 2016].
- [12] C. A. S. a. C. A. Knack, "Council Report # CR\_1057: Initiative on Public Transit," Edmonton, 2014.
- [13] ETS Service Development, *A.P.C. Version 2015.6.18.0*, Edmonton: City of Edmonton, 2015.
- [14] Edmonton Transit Operations, "Edmonton Transit System Safety Operations Annual Report," Edmonton, 2014.
- [15] N. H. & D. Johnson, Interviewee, *Strategic Overview and Tour of ETS Control*. [Interview]. 7 December 2015.
- [16] S. A. & E. C. Noel, "Evaluation of Bus Transit Reliability in the District of Columbia," Mineta National Transit Research Consortium, San Jose, California, 2013.
- [17] City of Edmonton Financial Services, "Edmonton Transit Sales Anaylsis for the Period Ending December 31, 2015," Edmonton, 2015.
- [18] City of Edmonton Office of the City Auditor, "15391-Edmonton transit System Bus and Light Rail Transit Review," Edmonton, Alberta, 2016.
- [19] Edmonton Transit, "TRANSPORTATION SERVICES DEPARTMENTAL SCORECARD - OCTOBER 2015," Edmonton, 2015.
- [20] Mustel Group, "Edmonton Transit System Customer Satisfaction Tracking Survey October 2014 - September 2015 12 Month Report," Edmonton, 2015.
- [21] Edmonton Transit Service Planning , *Proposed Additional Hours*, Edmonton, 2012, 2013, 2014, 2015, 2016.
- [22] City of Edmonton Financial Services and Utilities, "2016-18 Operating Budget," Edmonton, 2015.
- [23] Stantec Consulting with Jarrett Walker & Associates, "Edmonton Transit System Comprehensive Review," Edmonton, 2013.
- [24] Stantec with Jarrett Walker & Associates , "Edmonton Transit Steps Towards a Decision on Strategic Planning Version 5.0," Edmonton, 2014.

[25] T. Grescoe, Writer, *Lets Talk Transit part of the Great Ideas, Great City Speaker Series*. [Performance]. 2015.

[26] Edmonton Transit, "Maps, Routes, Schedules and Service," [Online]. Available: <http://www.edmonton.ca/ets/route-brochures-in-pdf.aspx>. [Accessed 20 February 2016].

[27] City of Edmonton Financial Services, "Operating Budgets," Edmonotn, 2014, 2015.

## 6. APPENDICES:

### COLLISIONS

Year	2012	2013	2014
Kilometers Driven	44,831,948	45,082,418	45,227,776
Collisions	1,161	1,197	1,122
Collisions per 100,000 Km	2.6	2.7	2.5

Collision Preventability	2012	2013	2014
Non-Preventable	602 (-8.1%)	537 (-10.8%)	421 (-21.6%)
Preventable	443 (-4.3%)	459 (+3.6%)	438 (-4.6%)
Unclassified	116 (+17.2%)	201 (+73.3%)	263 (+30.8%)
Total	1,161 (-4.6%)	1,197 (+3.0%)	1,122 (-6.3%)

### CHANGEOVERS/BREAKDOWNS

Misc.	Tires, Suspension, Brakes, Steering	Equipment Related	Warning Lights	Dead Bus	Fluid Leaks	No Heat, Fan, AC	Lost Air Pressure	SICK BUS (Sanitation Request)	Door Issues
2226	264	924	755	675	576	497	463	447	400

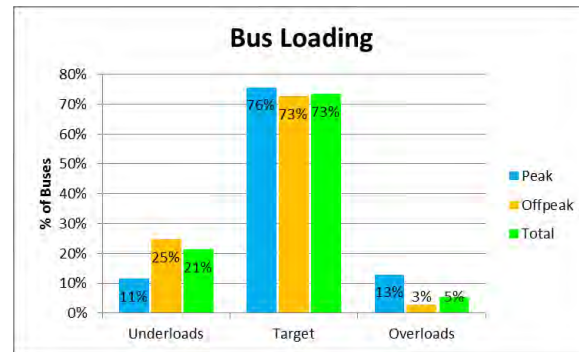
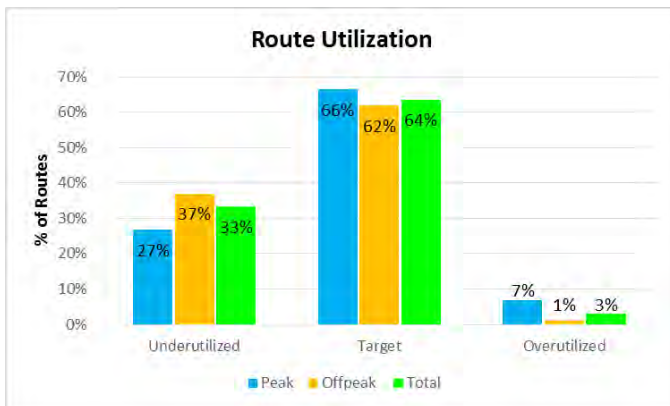
# UTILIZATION

Regular Service only							
Time Period		Routes			%		
		Underutilized	Overutilized	Total	Underutilized	Overutilized	At Target
Peaks		27	8	112	24%	7%	69%
Offpeak 1		30	8	149	20%	5%	74%
OffPeak2		66	-	118	56%	0%	44%
Total	Peak	27	8	112	24%	7%	69%
	Offpeak	96	8	267	36%	3%	61%
	Total	123	16	379	32%	4%	63%

All Service							
Time Period		Routes			%		
		Underutilized	Overutilized	Total	Underutilized	Overutilized	At Target
Peaks		96	40	386	25%	10%	65%
Offpeak 1		75	23	247	30%	9%	60%
OffPeak2		68	-	120	57%	0%	43%
Total	Peak	96	40	386	25%	10%	65%
	Offpeak	143	23	367	39%	6%	55%
	Total	239	63	753	32%	8%	60%

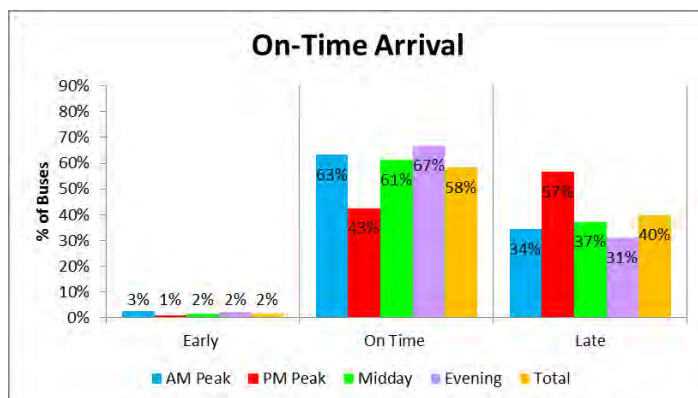
Regular Service only							
Time Period		Bus Samples			%		
		Underutilized	Overutilized	Total	Underutilized	Overutilized	At Target
Peaks		511	316	3,464	15%	9%	76%
Offpeak 1		2,064	115	8,619	24%	1%	75%
OffPeak2		971	7	2,528	38%	0%	61%
Total	Peak	511	316	3,464	15%	9%	76%
	Offpeak	3,035	122	11,147	27%	1%	72%
	Total	3,546	438	14,611	24%	3%	73%

All Service							
Time Period		Bus Samples			%		
		Underutilized	Overutilized	Total	Underutilized	Overutilized	At Target
Peaks		772	425	5,044	15%	8%	76%
Offpeak 1		2,265	139	9,366	24%	1%	74%
OffPeak2		991	7	2,557	39%	0%	61%
Total	Peak	772	425	5,044	15%	8%	76%
	Offpeak	3,256	146	11,923	27%	1%	71%
	Total	4,028	571	16,967	24%	3%	73%

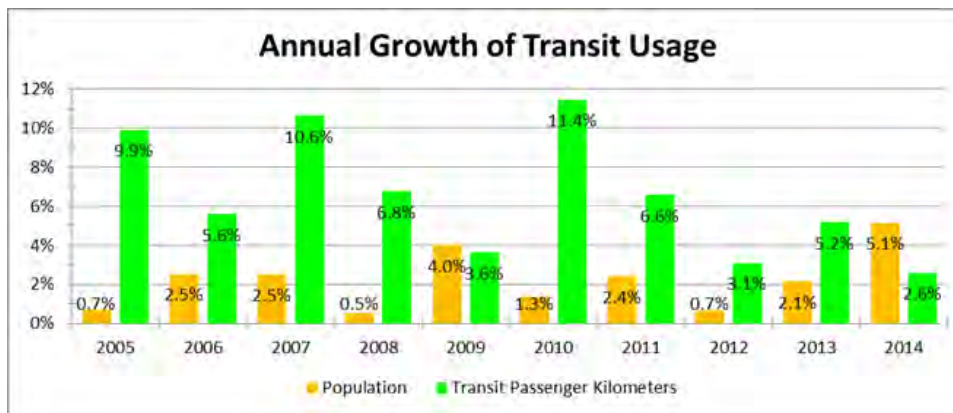
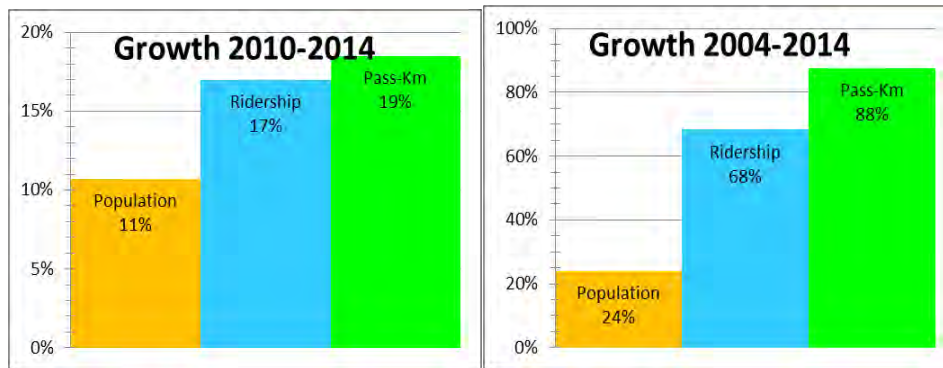


## ON TIME PERFORMANCE (OTP)

On Time Performance Data 2012-2015							
Period		Arrival			Departures		
Signup	Start-End	Early	On-Time	Late	Early	On-Time	Late
Jun 12	Jun -Aug	3.5%	74.2%	22.3%	9.0%	81.6%	9.5%
Sep 12	Sep-Nov	2.0%	65.4%	32.6%	9.8%	78.6%	11.7%
Dec 12	Dec-Jan	1.7%	60.2%	38.0%	9.9%	76.0%	14.1%
Feb 13	Feb-Mar	2.8%	73.5%	23.7%	11.0%	81.7%	7.3%
Apr 13	Apr-May	2.9%	70.2%	26.9%	20.9%	70.6%	8.4%
Jun 13	Jun-Aug	2.7%	71.9%	25.4%	24.4%	67.5%	8.1%
Sep 13	Sept-Nov	1.8%	61.8%	36.3%	9.9%	76.2%	13.9%
Dec 13	Dec-Jan	2.4%	65.2%	32.4%	7.9%	79.6%	12.4%
Feb 14	Feb-Mar	2.7%	72.8%	24.5%	7.7%	83.9%	8.4%
Apr 14	Apr-May	2.4%	68.1%	29.4%	19.9%	71.0%	9.0%
Jun 14	Jun-Aug	2.5%	67.2%	30.4%	25.5%	65.3%	9.1%
Sep 14	Sep-Nov	1.8%	61.8%	36.3%	9.9%	76.2%	13.9%
Dec 14	Dec-Jan	1.8%	62.0%	36.2%	6.3%	79.8%	13.9%
Feb 15	Feb-Mar	2.2%	68.1%	29.8%	7.1%	83.0%	9.9%
Apr 15	Apr-May	2.3%	67.0%	30.7%	21.5%	68.7%	9.8%
Jun 15	Jun-Aug	2.8%	70.2%	27.0%	26.9%	65.2%	7.8%
Sep 15	Sep-Nov	2.2%	64.4%	33.4%	8.9%	77.9%	13.1%
Dec 15	Dec-Jan	2.7%	71.1%	26.1%	6.5%	84.8%	8.7%



## 5 AND 10 YEAR GROWTH



## STRATEGIC OUTCOMES AND “THE WAYS”

Strategic Document	City of Edmonton Outcome	ETS Outcomes	Branch Performance Measures	Reported In	Measurement	
					2014	2015
The Way We Move:	Edmontonians use Public Transit	ETS service is geographically accessible	% of service warranted by policy that is funded	TBD	No Data	96.50%
		ETS is accessible to persons with disabilities	DATS ride accommodation rate	Departmental Scorecard	99%	99%
		ETS provides reliable service	% customer satisfaction with LRT Reliability	Departmental Scorecard	92%	89.50%
			% customer satisfaction with Bus Reliability	Departmental Scorecard	72%	65%
			% On Time Schedule Adherence (Bus)	Departmental Scorecard	65%	64%
			% customer satisfaction with LRT Frequency	Departmental Scorecard	89%	86%
			% customer satisfaction with Bus Frequency	Departmental Scorecard	69%	63%
			DATS on-time performance	Departmental Scorecard	95%	95%
		Operators are professional and helpful service	% customer satisfaction with operators' behavior (helpful & courteous)	Departmental Scorecard	89%	85%
			% customer satisfaction with operators' driving performance	Departmental Scorecard	90%	90%
			Ridership Per Capita	Departmental Scorecard	101.1	No Data
The Way We Grow:	Edmonton has sustainable and accessible Infrastructure	Ridership grows as population grows	% customer satisfaction with value for fare paid	Customer Satisfaction *	N/A	75%
		Public Transit is affordable	% of Edmontonians who use transit,carpooling, walking or cycling	Departmental Scorecard	24%	No Data
		ETS infrastructure is well maintained	% of Edmontonians who use transit,carpooling, walking or cycling	Departmental Scorecard	82%	89%
			% availability of Escalators	Departmental Scorecard	99%	98%
			% availability of Elevators	Departmental Scorecard	99%	98%
			% customer satisfaction that LRT clean & tidy stations	Customer Satisfaction *	No Data	88%
			% customer satisfaction BUS & TRANSIT CENTRE clean & tidy shelters	Customer Satisfaction *	No Data	72%
		ETS facilities are clean	% customer satisfaction LRT clean & tidy interiors	Customer Satisfaction *	No Data	88%
			% customer satisfaction Buses clean & tidy interiors	Customer Satisfaction *	No Data	79%
			TBD	TBD	N/A	N/A
The Way We Live:	Edmonton is a safe city	ETS transit vehicles are safe and secure	% customer satisfaction with personal safety at Bus Stops	Departmental Scorecard	82%	79%
			% customer satisfaction with personal safety at Transit Centres	Departmental Scorecard	76%	80%
			% customer satisfaction with personal safety at LRT Stations	Departmental Scorecard	80%	77%
			% customer satisfaction with personal safety on Buses	Departmental Scorecard	91%	89%
			% customer satisfaction with personal safety on LRT	Departmental Scorecard	88%	85%
		ETS strives to become more self-sufficient	ETS security disorder rate per 100,000 boardings	Departmental Scorecard	7.8	7.6
			Subsidy per capita	CUTA	\$178	No Data
			Revenue / Cost Ratio	CUTA	45%	No Data
		ETS operations are environmentally sustainable	TBD	TBD	N/A	N/A
			TBD	TBD	N/A	N/A
The Way We Prosper	Edmonton has a globally competitive and entrepreneurial business climate	Public Transit supports economic activities	TBD	TBD	N/A	N/A
			TBD	TBD	N/A	N/A
			TBD	TBD	N/A	N/A
			TBD	TBD	N/A	N/A
			TBD	TBD	N/A	N/A
		Public Transit supports economic activities	TBD	TBD	N/A	N/A
			TBD	TBD	N/A	N/A
			TBD	TBD	N/A	N/A
			TBD	TBD	N/A	N/A
			TBD	TBD	N/A	N/A

\* Custom Satisfaction Surveys contain no targets, so 80% was assumed by the consultant

Exceeds Target	8
At Target	6
Below Target	8
No Target Set	6
Awaiting Data	2
<b>Total</b>	<b>30</b>

Service Area		Ridership					Fare				Fleet			Other				
	Pop	Size	Trips	Per	Per Rev	Total Pass-	Adult	Ave	Cost /	Sub /	Total # of	Average	Spare	R/C	Routes	Cost / Hr	Rev Hrs /	Ave Speed
Municipality	(000's)	KM <sup>2</sup>	(000's)	Capita	Veh Hr	Km (000's)	Cash Fare	Paid	Rider	Rider	Vehicles	Bus Age	Ratio	Ratio			Capita	(Km/Hr)
Montréal	1,938	501	417,220	215.3	61.8	3,487,956	\$ 3.00	\$1.43	\$ 2.56	\$1.13	2,781	6.5	0.389	0.512	224	\$ 131.45	3,490	21.6
Calgary	1,195	896	110,275	92.3	44.0	1,598,981	\$ 3.00	\$1.59	\$ 3.35	\$1.63	1,245	7.3	0.504	0.512	159	\$ 131.45	2,095	27.1
York Region	1,003	1,776	22,445	22.4	18.3	-	\$ 4.00	\$2.87	\$ 7.35	\$4.44	520	6.3	0.453	0.396	128	\$ 123.29	1,226	22.1
Edmonton	878	700	89,283	101.7	41.1	696,407	\$ 3.20	\$1.35	\$ 3.18	\$1.75	1,009	9.3	0.244	0.449	205	\$ 127.27	2,476	21.1
Ottawa	858	466	97,077	113.2	44.2	951,353	\$ 3.45	\$1.85	\$ 3.60	\$1.70	939	5.5	0.215	0.527	145	\$ 139.78	2,558	22.2
Mississauga	756	179	36,608	48.4	27.8	344,056	\$ 3.25	\$2.03	\$ 4.43	\$2.26	463	6.2	0.297	0.490	84	\$ 115.14	1,742	21.7
Winnipeg	675	229	49,868	73.8	35.6	359,721	\$ 2.55	\$1.55	\$ 2.80	\$1.20	583	9.6	0.171	0.572	89	\$ 91.59	2,074	18.7
Québec	585	548	46,610	79.7	39.9	744,571	\$ 3.25	\$1.39	\$ 3.79	\$2.24	604	8.3	0.177	0.408	135	\$ 130.22	1,999	20.8
Brampton	564	267	20,411	36.2	21.4	-	\$ 3.75	\$2.46	\$ 5.50	\$2.99	359	6.3	0.251	0.457	45	\$ 108.42	1,691	22.0
Durham Regid	550	406	10,791	19.6	21.2	-	\$ 3.25	\$2.10	\$ 6.13	\$3.95	195	5.8	0.373	0.356	71	\$ 121.22	0.927	24.2
Hamilton	490	235	22,234	45.4	30.5	-	\$ 2.55	\$1.65	\$ 3.56	\$1.88	221	6.6	0.188	0.473	34	\$ 101.67	1,488	18.8
Waterloo Reg	434	217	21,597	49.7	32.3	-	\$ 3.00	\$1.38	\$ 3.61	\$2.19	235	6.3	0.284	0.394	62	\$ 110.56	1,541	20.9
Laval	421	245	21,564	51.2	35.4	155,263	\$ 3.25	\$1.46	\$ 4.49	\$2.97	276	8.3	0.14	0.340	51	\$ 111.42	1,444	20.6
Longueuil	411	282	34,448	83.8	41.5	362,927	\$ 3.25	\$1.66	\$ 2.30	\$1.68	452	8.5	0.209	N/A	98		2,020	22.0
Average	769	496	71,459	73.8	35.3	621,517	\$ 3.20	\$1.77	\$ 4.05	\$2.29	706	7.2	0.278	0.448	109	\$ 117.67	1,912	21.7
ETS Rank	4 of 14	3 of 14	4 of 14	3 of 14	5 of 14	5 of 14	9 of 14	14 of 14	11 of 14	9 of 14	3 of 14	2 of 14	8 of 14	7 of 13	2 of 14	4 of 12	3 of 14	9 of 14

CUTA DATA