CAPITAL PROFILE REPORT

PROFILE NAME:	**LRV REPLACEMENTS**		**FUNDED**
PROFILE NUMBER:	**25-21-1000**	PROFILE STAGE:	**Approved**
DEPARTMENT:	**City Operations**	PROFILE TYPE:	**Standalone**
LEAD BRANCH:	**Edmonton Transit Service**	LEAD MANAGER:	**Carrie Hotton-MacDonald**
PROGRAM NAME:		PARTNER MANAGER:	
PARTNER:		ESTIMATED START:	**January, 2023**
BUDGET CYCLE:	**2023-2026**	ESTIMATED COMPLETION:	**December, 2029**

Service Category: **Major Initiative:**

GROWTH	RENEWAL
2	98

PREVIOUSLY APPROVED:	**240,500**
BUDGET REQUEST:	**-**
TOTAL PROFILE BUDGET:	**240,500**

PROFILE DESCRIPTION

Replacement of the U2 LRV fleet. It includes the procurement of 37 new LRVs to replace the entire aging U2 LRV fleet within the next five years and over the next 2 financial cycles. The U2 fleet will be phased out and decommissioned over a 5-7 year period based on physical condition as the new fleet is commissioned to reduce impact to service.

PROFILE BACKGROUND

Edmonton Transit Service's LRT fleet consists of 94 Light Rail Vehicles, of which 37 are Siemens-Duewag U2 (U2) and 57 LRVs are Siemens SD160 (SD160). The manufacturer designed life-cycles for these vehicles are around 30 years with proper maintenance practices. The first U2s were purchased in 1977 for the opening of the Capital Line and are now over 40 years old. The U2 fleet went through a midlife refurbishment in 2009 to modernize the fleet and to extend the life of the U2s another 10-15 years. As we approach 2023-2024, the U2s beyond the expected life and will be in need of replacement, and will be close to 50 years old by the time replacement LRVs are commissioned if they are ordered early next capital cycle. These replacement LRVs will be procured jointly with the growth LRVs for the Metro Line and Capital South LRT extension projects next Capital Budget cycle. This not only helps to standardize the fleet for many operational benefits, but it also provides more purchasing power and will result in better market pricing from a larger order quantity when the renewal and growth purchases are combined.

PROFILE JUSTIFICATION

The U2 fleet has exceeded its designed life-cycle having the first vehicle purchased in 1977. Keeping the U2 fleet in the service any longer is not only going to increase operation costs due to poor reliability and parts obsolescence. There is also a reputational risk for the City of Edmonton to keep this fleet in service past the design life, increasing LRT service impacts and reduced capacity can expect to increase as it becomes more challenging to keep the older U2 fleet operational.

In 2021, the average age of the U2 fleet is 40 years old and the SD160 fleet is 11 years old. The combined fleet average age is over 22 years old. Amongst North American transit agencies part of the GOAL benchmarking group, Edmonton's LRT fleet ranks 3rd out of 15 agencies for having the oldest active fleet in 2019 (or 6 years over the average).

Amongst North America transit agencies part of GOAL benchmarking, Edmonton's LRT ranks second highest for percentage fleet utilization during peak service (i.e. second lowest spare ratio) in 2019. Fleet utilization for ETS has been gradually increasing since 2014. Compared to other light rail agencies, Edmonton needs to run a very efficient maintenance operation to meet service demands. This leaves little room for error and will be more difficult to meet as the fleet ages.

In the last few years, there have been many maintenance challenges with the U2 fleet. Not only is the cost of operating these vehicles increasing over time, but the reliability of these old vehicles is also decreasing which is starting to impact service levels. In 2022 multiple U2 LRVs were out of service for over 4 months because replacement parts could not be obtained, meaning the existing parts had to go through a custom rebuild.

In terms of customer satisfaction, the vast majority (>80%) of the vehicle related tickets submitted through 311 are due to the U2 fleet. Out of those complaints, the most common complaints received in 2020 were regarding the U2's Public Address System (67%) and the Heating/Ventilation System (17%). The U2 Public Address (PA) system has been modified several times throughout its 40 year life as intercoms, passenger emergency, and digital signage were added to the vehicle. These additions made the PA system more and more complex as new features had to be compatible with the existing system. The end result is a very complex PA system that is difficult to maintain and troubleshoot when there is an issue. The U2 heating and ventilation system has been a pain point for both customers and LRT Operators. The vehicles were originally designed with heaters only, and did not have a way of actively cooling the interior temperature (limited to air flow from open windows and vents). As Edmonton summers are getting warmer, this has led to many customer complaints for excessive heat in the vehicles. Efforts have been made to address these concerns (adding an operator dash fan), but this continues to be a pain point for operators.

The older U2 trains are not equipped with cameras in the passenger compartment like the newer SD 160s. This means that the Operator must leave their operator compartment to check on the passenger alarm putting the operator at risk In order to improve passenger and staff safety, it is important that operators have the ability to monitor the passenger compartments more closely for transit rider safety. Also when a passenger alarm is sounded the Operator can not view the situation from the safety of their operator compartment and immediately respond to the situation. With the older U2 fleet the

The older U2 fleet is not equipment with air conditioning and during extreme heat events we get multiple complaints from our Transit Operators and the public. Following OH&S guidelines the maximum temperature threshold that employees can be exposed to for the duration of their shift is 28 degrees, which means the U2 fleet should not be operated during extreme heat waves. It can also be uncomfortable for Transit riders in the passenger compartments especially on a full train. As a result LRT Operations has been minimizing the usage of U2 LRVs during extreme heat events however with more transit riders returning to the LRT after the COVID 19 pandemic this may not be possible anymore.

LRT Expansion & Renewal Branch will be procuring growth LRVs for the Metro Line and Capital South LRT extension projects next Capital Budget cycle. This not only helps to standardize the fleet for many operational benefits, but it also provides more purchasing power and will result in better market pricing from a larger order quantity when the renewal and growth purchases are combined.

STRATEGIC ALIGNMENT

Greener As We Grow: Replacing the old LRVs supports supports retaining and attracting new ridership, thereby reducing GHG emissions. Inclusive and Compassionate: Maintaining the LRT in a state of good repair ensures reliable access to an affordable transportation choice. Catalyze and Converge: A modern LRT fleet enhances the City's reputation, and supports attracting major events and employers. The high floor LRT aligns with the Innovation Corridor in the City Plan. Rebuildable City: Renewal of the Capital and Metro line infrastructure supports development along several Node and Corridors.

ALTERNATIVES CONSIDERED

A complete replacement is recommended over a partial replacement (i.e. keep a portion of the U2 fleet in operation along with the renewal fleet). Operating three different fleets in LRT instead of two will have a large impact on operation and maintenance.

COST BENEFITS

The U2 fleet has been more costly and has more downtime compared to the newer SD160 fleet. Over a period of one year in 2019-2020, the U2 fleet had an average downtime of 18.3%, compared to 12.6% for the SD160 fleet. The average cost of reactive maintenance on the U2 fleet is approximately $0.30/km, compared to $0.19/km for the SD160 fleet, meaning the U2 fleet costs 58% more to maintain than the SD160s. As many components in the U2 fleet are past it's expected life, more component failures are to be expected. Failures such as worn cable insulation, broken solder joints on circuit boards, and failed heater/resistor elements are all age related failures that are common in the U2 vehicles.

KEY RISKS & MITIGATING STRATEGY

Maintaining these vehicles beyond their useful designed life cycle poses a high risk and cost due to vehicles parts obsolescence, increased breakdowns and potential reputational risk to the City caused by more unplanned service delays and reduced LRT service from increasing fleet downtime. This will also impact the quality of service to passengers, and have higher cost implications due to higher vehicle maintenance costs and having to operate three non-interoperable fleets. There would also be a potential loss of cost savings for a large vehicle order. Also because of parts obsolescence, it is estimated that these vehicles can only be kept in service for another 5 to 10 years at which time they will likely need to be permanently parked which will significantly reduce LRT capacity.

RESOURCES

Procurement of replacement LRVs will be supported by LRT Expansion & Renewal in coordination with procurement of growth LRVs for the Metro Line and Capital Line extensions. Commissioning and ongoing maintenance of high floor LRVs is done by ETS LRT Operations and Maintenance.

CONCLUSIONS AND RECOMMENDATIONS

The work in this profile is required to maintain service levels on the high floor LRT system, ensuring a reliable transportation choice for Edmontonians and visitors. This once in a generation investment is essential to maintaining the core of Edmonton's mass transit network, as a necessary underpinning to support mass transit expansion. If these vehicles are not replaced, it is estimated that they can only be kept in service for another 5 to 10 years do to parts obsolescence. Taking the 37 U2 LRVs out of service permanently will significantly reduce LRT Capacity, the current ridership demands will not be met without these 37 vehicles.

CAPITAL PROFILE REPORT

PROFILE NAME: **LRV Replacements** **FUNDED**

PROFILE NUMBER: **25-21-1000** PROFILE TYPE: **Standalone**

BRANCH: **Edmonton Transit Service**

CAPITAL BUDGET AND FUNDING SOURCES (000's)

		Prior Years	2022	2023	2024	2025	2026	2027	2028	2029	2030	Beyond 2030	Total
APPROVED BUDGET	Approved Budget												
	Original Budget Approved	-	-	-	-	-	-	-	-	-	-	-	-
	2022 Cap Budget Request for Next Cycle	-	-	-	-	36,000	19,000	49,000	68,000	68,500	-	-	240,500
	Current Approved Budget	-	-	-	-	36,000	19,000	49,000	68,000	68,500	-	-	240,500
	Approved Funding Sources												
	Tax-Supported Debt	-	-	-	-	36,000	19,000	49,000	68,000	68,500	-	-	240,500
	Current Approved Funding Sources	-	-	-	-	36,000	19,000	49,000	68,000	68,500	-	-	240,500
BUDGET REQUEST	Budget Request	-	-	-	-	-	-	-	-	-	-	-	-
REVISED BUDGET (IF APPROVED)	Revised Budget (if Approved)	-	-	-	-	36,000	19,000	49,000	68,000	68,500	-	-	240,500
	Requested Funding Source												
	Tax-Supported Debt	-	-	-	-	36,000	19,000	49,000	68,000	68,500	-	-	240,500
	Requested Funding Source	-	-	-	-	36,000	19,000	49,000	68,000	68,500	-	-	240,500

CAPITAL BUDGET BY ACTIVITY TYPE (000's)

REVISED BUDGET (IF APPROVED)	Activity Type	Prior Years	2022	2023	2024	2025	2026	2027	2028	2029	2030	Beyond 2030	Total
	Fleet Equipment	-	-	-	-	36,000	19,000	49,000	68,000	68,500	-	-	240,500
	Total	-	-	-	-	36,000	19,000	49,000	68,000	68,500	-	-	240,500

OPERATING IMPACT OF CAPITAL

Type of Impact:

Branch:	Rev	Exp	Net	FTE	Rev	Exp	Net	FTE	Rev	Exp	Net	FTE	Rev	Exp	Net	FTE
Total Operating Impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-