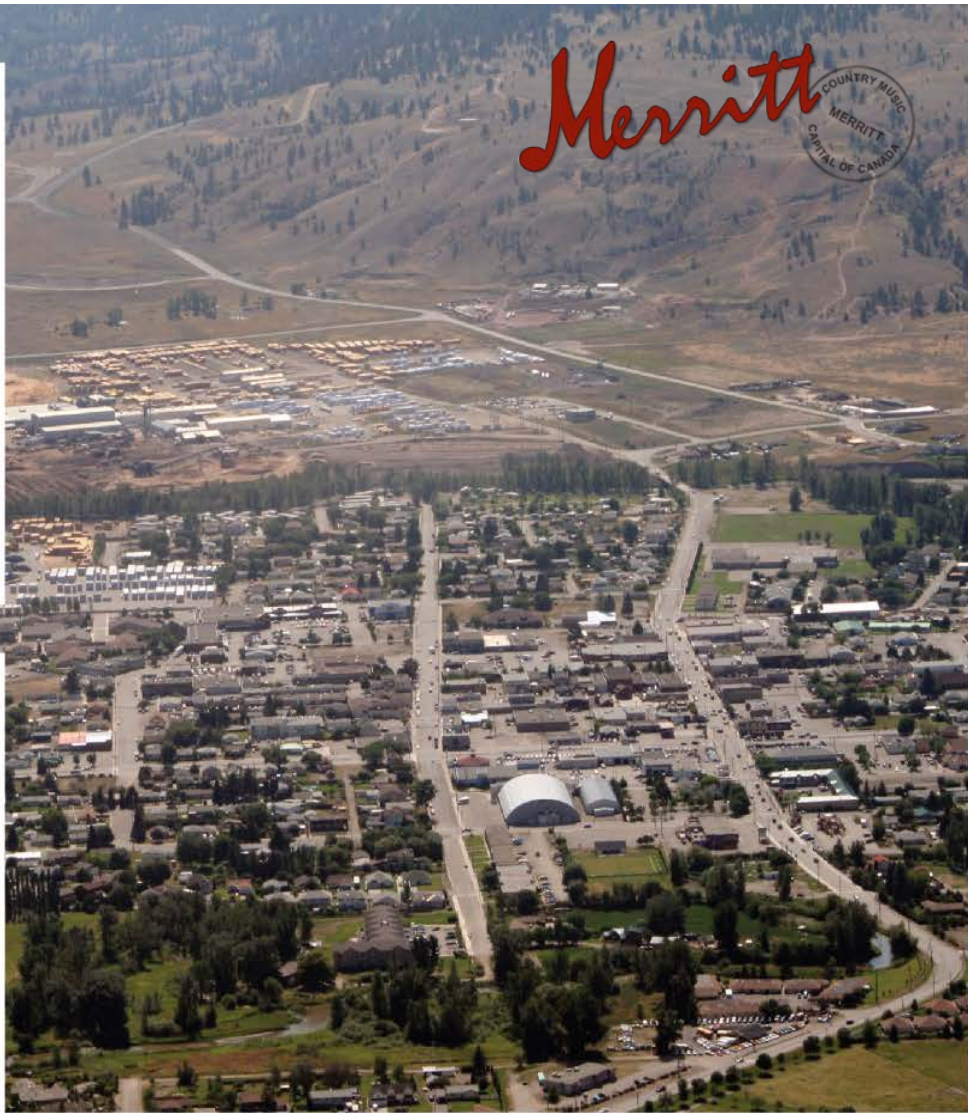


Merritt COUNTRY MUSIC
MERRITT
CAPITAL OF CANADA



Asset Management Investment Plan

Prepared for the City of Merritt

June 10, 2016

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URBAN
systems

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- Appendix B** Inputs and Assumptions Technical Memo's
- Appendix C** Summary Maps of Key Asset Assumptions

TERMS AND DEFINITIONS

The following commonly used terms and definitions have been described as they relate to the City of Merritt's Asset Management Program:

ANNUAL AVERAGE LIFE CYCLE INVESTMENT (AALCI): Annual budget based on annual average of the total replacement value of an asset over its expected service life determined by the asset management plan

ASSET: A physical component of a system that has value, enables services to be provided, and has an economic life of greater than 12 months

ASSET CONDITION: The state of an asset, particularly regarding its appearance, quality, or working order

ASSET MANAGEMENT: The process of making decisions about the use and care of infrastructure to deliver services in a way that considers current and future needs, manages risks and opportunities, and makes the best use of resources

ASSET MANAGEMENT PLAN: A long term plan to identify asset management needs, establish longer term financing means, and regularly schedule maintenance, rehabilitation and replacement works for the long-term sustainability of the asset

ASSET MANAGEMENT POLICY: Principles and mandated requirements derived from, and consistent with, the organizational strategic plan, providing a framework for the development and implementation of the asset management strategy and the setting of the asset management objectives

ASSET MANAGEMENT STRATEGY: Long-term optimized approach to management of the assets, derived from, and consistent with, the organizational strategic plan and the asset management policy

ASSET RENEWAL: Work on an asset (or component) that brings the asset back to new condition or the complete replacement of the asset (in situ) with a new asset providing the original (intended) level of service

COST: In asset management, the financial and human resources required throughout the lifecycle of the asset

INFRASTRUCTURE RENEWAL DEFICIT (BACKLOG): A measure of the amount of infrastructure that has passed its theoretical service life but is still providing service to the community

LEVEL OF SERVICE: A measure of the quality, quantity, and/or reliability of a service from the perspective of residents, businesses, and customers in the community

LIFE CYCLE COSTS: The total costs estimated to be incurred in the design, construction, operation, maintenance, and final disposition of a physical asset or system over its anticipated useful life span

LIFE CYCLE MANAGEMENT: Retaining an asset as near as practicable to its original condition, from the point when a need for it is first established, through its design, construction, acquisition, operation and any maintenance or renewal, to its disposal

REVENUE: The income received by the City from taxes, user fees, government transfers and other sources. Own sources revenues is income received from taxation, user fees, and any interest income.

RISK(S): Events or occurrences that will have an undesired impact on services (**Risk = Impact x Likelihood**)

Asset Risk – An event where an asset failing to perform as you need it to. Examples of asset risks are a broken sewer pipe or potholed road surface.

Strategic Risk – Events or occurrences that impact your ability to achieve objectives.

REGULATORY REQUIREMENT: Capital works to meet existing or new provincially or federally legislated standards.

SERVICE: A system that fulfills a public need such as transportation and sewage collection

SERVICE LIFE: The estimated lifespan of a depreciable fixed asset, during which it can be expected to contribute to a municipality's operations/service delivery

TANGIBLE CAPITAL ASSET (TCA): An Asset that has a physical form for use in the operations and delivery of services. Tangible assets include fixed assets, such as water, sewer, roadways and buildings (fixed assets are sometimes referred to as 'plant'). Tangible capital assets must be accounted for and reported as assets on the Statement of Financial Position as part of PS 3150.

TRIPLE BOTTOM LINE APPROACH: Utilizing economic, social and environmental metrics (i.e. quantifiable impacts to costs, mobility, and watercourses/habitats) in assessing and/or prioritizing investments.

USEFUL LIFE: The minimum life expectancy commonly used for asset life. This is typically used for TCA reporting (as opposed to for asset management purposes).

1.0 INTRODUCTION

Communities, like Merritt, are turning toward asset management as a process for making informed infrastructure decisions, build financial capacity to renew, operate and maintain existing infrastructure so that the City can continue to provide services, effectively manage risks, and provide tax payers with the best value for money.

In 2011, the City completed an assessment of its current asset management practices. The assessment of practices provided a baseline of the City's current asset management capacity (information, finances, assets and people) as well as provided a recommended strategy for next steps to improve its capacity. These proposed key actions all relate to improving the City's information regarding costs, funding, risk and service to better inform and guide infrastructure decision-making.

One of the key next steps was to complete a detailed asset assessment (cost forecast) of the community's future infrastructure renewal investment requirements. This forecast will provide staff with improved information (cost and timing) and key indicators to inform infrastructure investment decision-making and assist in aligning priorities. To accomplish this, the City engaged Urban Systems to complete a long term (integrated) Asset Management Investment Plan (AMIP).

The AMIP is based on the BC Framework (see **Figure 1**) and was developed to identify and assess the expected replacement costs and needs for each of Merritt's assets. The AMIP (**Appendix A**) consolidates all of the long term costs and timing for a community's major infrastructure categories. This enables the City to see all of their infrastructure's life cycle cost pressures in one place, at a glance. The AMIP is also an ideal tool to engage rate payers by showing how infrastructure performance and age is linked to annual investments. The AMIP includes details and summaries of:

- ▶ Current replacement value
- ▶ Infrastructure deficit
- ▶ Looming future costs
- ▶ Average Annual Life Cycle Investment (AALCI) required for the ongoing renewal of public infrastructure

What is Asset Management?

The process of bringing together the skills and activities of people; with information about the community's physical infrastructure assets and financial resources to ensure long term sustainable service delivery.

Sound asset management practices support sustainable service delivery by considering community priorities, informed by an understanding of the trade-offs between the available resources, risk and the desired services.

Sustainable service delivery ensures that current community services are delivered in a social, economic, and environmentally responsible manner that does not compromise the ability of future generations to meet their own needs.

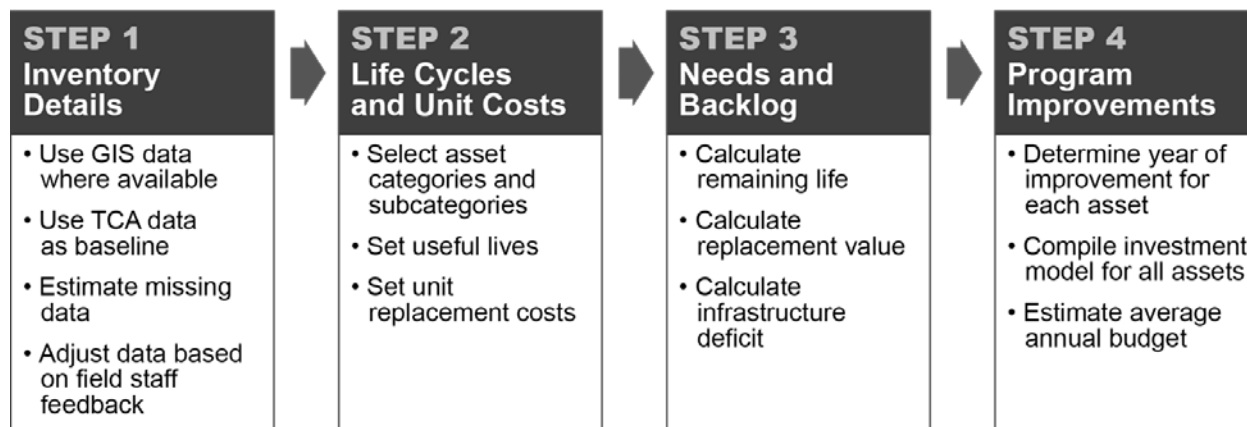


Figure 1.1: Asset Management for Sustainable Service Delivery, A BC Framework

2.0 AMIP METHODOLOGY

The AMIP is predominantly based upon infrastructure service lives, but also considers condition assessment information where available. To develop the AMIP, a 4-Step analytical approach was used (see **Figure 2.1** below).

Figure 2.1: AMIP Development Steps



Merritt's AMIP for asset renewal was built using the best linear and non-linear asset data available. The most recent digital infrastructure information for Merritt has been reviewed for use in developing the AMIP. This information is primarily based on a compiled infrastructure AutoCAD drawing received from the City, coupled with information from the Tangible Capital Assets (TCA) inventory. An estimate was made for missing data where possible. The TCA record information was the primary source used for the majority of the asset inventory which was cross checked against the engineering department's record information and infrastructure master plans. A more detailed review of the City's data is contained in **Appendix B**.

The City's road data was updated using TCA inventory and the National Road Network (NRN) database. The NRN was used to update the spatial geometry of the roads, while attribute information, such as width and in-service year, were incorporated from the TCA. Merritt's building appraisal report was used to inform the building and facility valuation and expected remaining life. The existing asset inventory was found to be missing some key spatial attributes and age information which is comparable to other communities similar in size to Merritt. Summary maps illustrating the assumed ages of key assets (water and sewer pipes, and roads) is included in **Appendix C**.

As a next step in the evolution of the City's asset management process, the AMIP inventory should be built upon to develop a centralized database for all assets that includes all existing spatial and attribute data from each department. This database would become the hub to feed all other applications (web-mapping, desktop mapping, mobile data access, asset management). It is also the place where any data updates would be made. Initially focus on the linear assets- water, wastewater, drainage and roads and integrate web services when ready. It is suggested that the City continue to undertake an on-going program for improving data collection in order to refine the complete data set for long term asset management purposes.

The AMIP outlines the following:

- ▶ Current replacement value;
- ▶ Remaining value;
- ▶ Expected life remaining¹;
- ▶ Infrastructure deficit (backlog);
- ▶ 20 year renewal costs and timing (including future looming costs); and,
- ▶ Average Annual Life Cycle Investment (AALCI)².

The AMIP is a spreadsheet which is delivered in three (3) inter-connected levels:

- Level 1.** Summary for investment planning and decision-makers;
- Level 2.** Detailed data for ongoing reporting, operations and maintenance; and
- Level 3.** Highly detailed segment by segment information regarding the linear infrastructure such as pipe and roads.

The benefits of the AMIP's Level 1 summary include:

- ▶ Presents a complete and concise summary of all infrastructure assets on 1 page;
- ▶ Provides a comprehensive focus and format for community infrastructure outreach programs;
- ▶ Uses very detailed information from Level 2, which provides invaluable asset details for more credible and defensible decisions on infrastructure re-investment; and
- ▶ Encourages exploration of sustainable infrastructure renewal funding levels.

2.1. ASSET CATEGORIES

In order to provide an appropriate level of accuracy for the analysis of linear and non-linear asset categories, each category was divided into sub-categories. Sub-categories were based upon similar infrastructure components and limited to major sub-categories that are significant for investment planning and trade-off analysis. The asset categories and sub-categories are shown in **Table 2.2**.

¹ The expected life remaining is a ratio between remaining life and replacement value. This is based on straight line depreciation of the asset over its service life.

² AALCI is the annual depreciation of the replacement value. The AALCI represents the ideal annual budget allocation. Annual surpluses would go into reserves and be drawn upon for renewal of assets. When the annual budget is less than the AALCI, the sustainability gap grows.

Table 2.2: Merritt's Asset Categories and Sub-Categories

Water System	Sanitary System	Storm System	Road System	Buildings	Fleet	Parks
Mains	Mains	Mains	Roads	Recreation	Vehicles	Land Improvements
Appurtenances	Force Mains	Manholes	Sidewalks	Administration	Equipment	Natural Assets
Pressure Reducing Valves & Booster Stations	Appurtenances	Catch basins	Bridges	Protective Services		
Reservoirs	Lift Stations/Siphons	Outfalls	Traffic Signals	Public Works		
Well Supply & Treatment	Treatment		Streetlights			
			Signage			

2.2 HOW TO USE THE INVESTMENT PLAN MODEL

The model is driven by input tables; however, when sufficient data is not available for the input tables, or asset-specific changes are made, then estimates are done in the excel worksheets. In addition to its financial information, the investment plan database also uses the following asset attributes:

- ▶ Location;
- ▶ Material or Make;
- ▶ Size or Model;
- ▶ Dimensions;
- ▶ Quantity;
- ▶ Year Built;
- ▶ Service Life;
- ▶ Condition rating (where available); and
- ▶ Installation cost:
 - Recent Tendered Construction costs;
 - Construction contingency costs;
 - Planning and design costs;
 - Project management costs; and
 - Construction administration costs.

The AMIP model is designed to keep calculating year after year. The AMIP can be updated each year by adjusting the model to the current year (Input Table), updating unit costs and other replacement values to reflect inflation, and updating the asset inventory to include annual project renewals, decommissioning, and new acquisitions.

The power of the AMIP model is that it uses actual replacement costs, service lives based upon healthy maintenance programs, and summarizes all infrastructure information in Level 1 to assist Merritt in better understanding their cost pressures to help inform their budgeting and infrastructure decisions.



Figure 2.2: Informed Decision Making

3.0 AMIP RESULTS

The AMIP's Level 1 summary (see **Appendix A**) presents a one page overview of asset renewal needs, rolled-up for all asset categories and sub-categories in Merritt. It presents the current renewal investment for Merritt's major asset categories over a 20 year period and includes indicators for determining a sustainable infrastructure funding level.

This AMIP scenario assumes that an adequate annual operations and maintenance (O&M) budget is in place to optimize asset service lives. Reduced or inadequate O&M budget levels would reduce the service lives. More detailed information regarding each individual asset category can be seen in the level 2 summaries (section 4). **Table 3.1** summarizes the key results of the AMIP.

Table 3.1: AMIP Summary

Asset Category	Replacement Value	Expected Remaining Life	Infrastructure Deficit (Backlog)	20 Year Total	Average Annual Life Cycle Investment (AALCI)
Water System	\$60,076,000	46%	\$8,873,400	\$31,032,750	\$1,337,450
Wastewater System	\$45,138,650	37%	\$5,758,050	\$30,638,300	\$733,700
Stormwater System	\$25,233,300	30%	\$3,922,650	\$7,420,950	\$439,300
Roadway System	\$76,008,137	34%	\$26,719,754	\$35,992,204	\$1,927,250
Vehicles & Equipment	\$9,177,502	45%	\$1,205,878	\$9,700,818	\$488,583
Buildings	\$31,452,000	27%	\$1,397,000	\$25,384,000	\$945,000
Parks & Recreation	\$3,042,000	55%	\$254,000	\$1,780,000	\$122,000
Total	\$250,127,589	37%	\$48,130,732	\$141,949,022	\$5,993,283

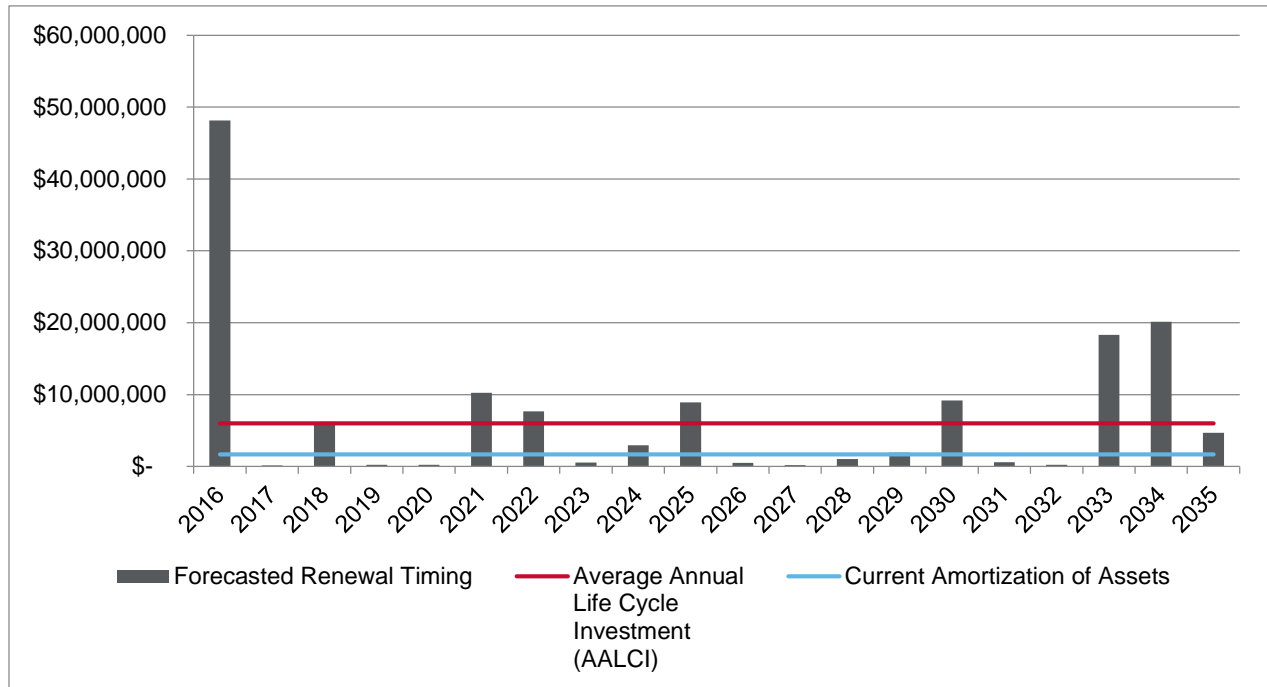
Average Annual Life Cycle Investment (AALCI): forecasted annual investment needed to sustain existing infrastructure over its service life (over the next 20 years and beyond).

20 Year Total: total forecasted investment needed to pay for expected infrastructure replacements over the next 20 years.

Infrastructure Deficit: is a measure of the amount of infrastructure that has passed its theoretical service life but is still providing service to the community. This infrastructure should be inspected to determine if replacement is necessary for not.

Figure 3.1 below illustrates the asset renewal investment profile for the next twenty years.

Figure 3.1: Forecasted Asset Renewal Investment Profile



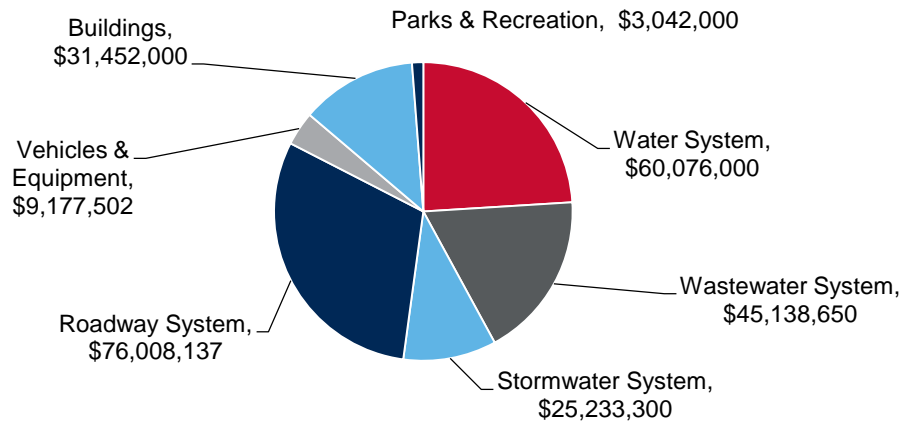
3.1. ASSET REPLACEMENT VALUE

The estimated full replacement value of Merritt's major infrastructure assets is approximately **\$250 million** (2016) based on current tender prices in the BC Interior region and best practices for setting service lives. A copy of the inputs (unit costs and service lives) is located in **Appendix B**.

Table 3.1 (above) provides a summary of the replacement value of existing infrastructure only; it does not touch on regulatory requirements, growth/expansion, safety improvements, and economic development. The AMIP should be integrated into a comprehensive capital plan so that these items can be integrated together.

Figure 3.2 illustrates the percent breakdown of Merritt's infrastructure value by asset category.

Figure 3.2: Infrastructure Value Distribution



Over 82% of Merritt's infrastructure is made of up Road, Drainage, Water, Sanitary assets which mean majority of the total long term expenditures should be on these assets. On average, Merritt assets are considered to be in fair to poor condition with an average expected remaining life of 37% and there are assets (**\$48M**) that have passed their theoretical service life which should be inspected in the field prior to investing in their replacement. In the twenty year horizon there is approximately \$142M forecasted in assets that may need to be renewed. These results are comparable to other communities of similar size and age to Merritt.

3.2. INFRASTRUCTURE DEFICIT

Infrastructure deficit (\$48M) is a measure of the amount of infrastructure that has passed its theoretical service life but is still providing service to the community.

Current Year > Year of Asset Replacement

Although the asset is still providing service, it is typically nearing the end of its life and will require field investigation to determine if the asset needs to be replaced or not. Changes in the asset service life can turn future expenditures to a deficit or vice versa. For example: an asset is scheduled for replacement in 2016 which means the asset has passed its theoretical service life and will be recorded as a deficit. If that assets service life is extended, the asset is now scheduled in a future year as an asset replacement and not a deficit.

3.3. AVERAGE ANNUAL LIFE CYCLE INVESTMENT (AALCI)

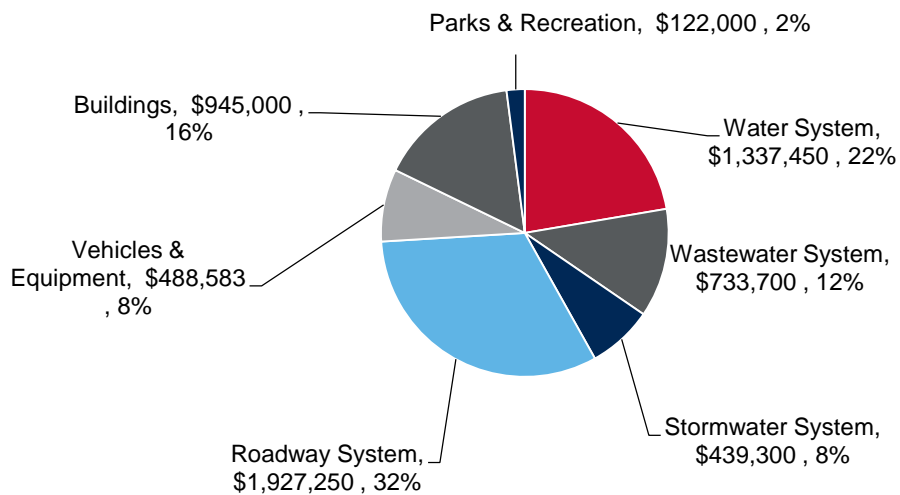
The Average Annual Life Cycle Investment (AALCI) is defined as the summation of each asset's annual depreciation which is based on the assets replacement cost and service life.

$$\sum \frac{\text{Replacement Cost}}{\text{Service Life}}$$

The AALCI (\$5,99,283) is the ideal (**maximum**) funding level for sustaining existing infrastructure over the life cycle of the assets and should be a long term target for the community. When planned for appropriately, the AALCI can be used in ensuring long term revenue stability, preventing unnecessary risk, and enabling a community to apply one-time funding to support new asset/capital needs as opposed to addressing emergency situations.

Ideally Merritt should endeavor to budget for this amount each year, and what is not spent goes into infrastructure reserve accounts for future renewal. **Figure 3.3** illustrates the value and percent breakdown of Merritt's AALCI distribution.

Figure 3.3: AALCI Value Distribution



4.0 STATE OF MERRITT'S INFRASTRUCTURE

This section details the AMIP findings by each of the Merritt's seven (7) asset categories.

4.1. WATER SYSTEM

The water system has a total replacement value of approximately \$60 million with 75km of mains. It has an expected remaining life of 46%, meaning that the overall condition of the water system is fair. The current backlog is \$8.8M (see **Table 4.1**). The backlog is the replacement value of infrastructure that is in service but has exceeded its expected service life. The majority of this backlog is attributable to the assumed dates in the TCA data for the City's curb stop and valve asset data.

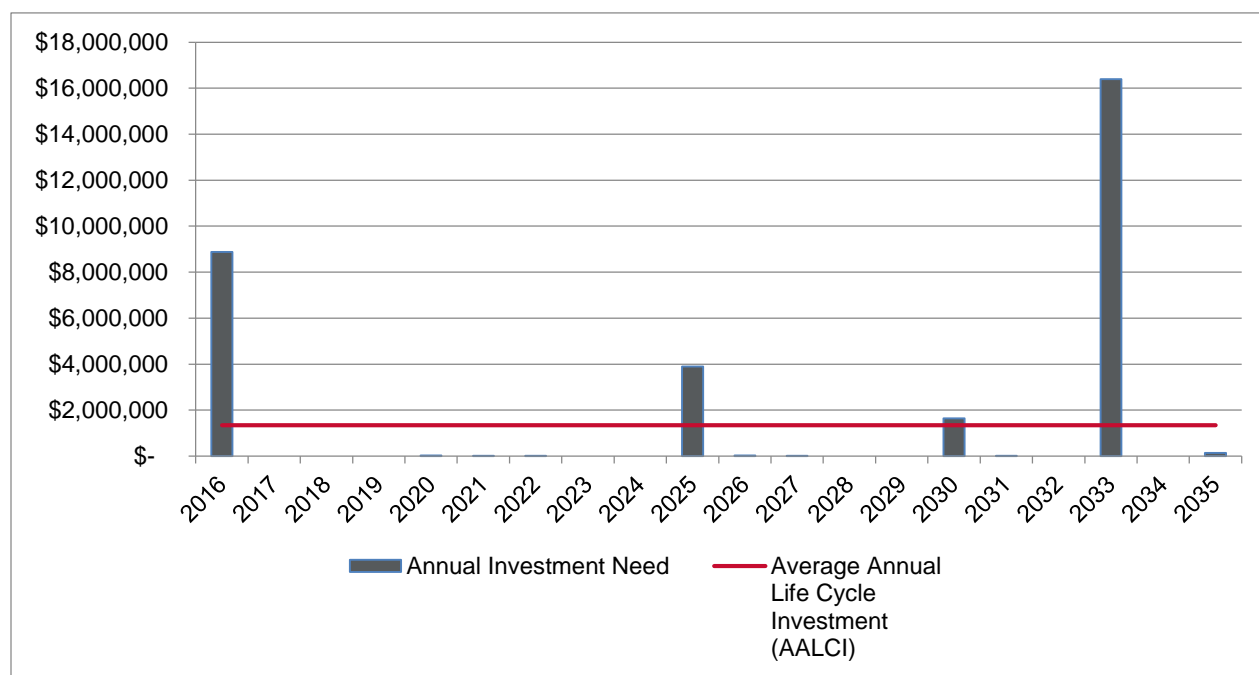
Table 4.1: Water System Details

Asset Category	Replacement Value	Expected Remaining Life	Infrastructure Deficit (Backlog)	20 Year Total	Average Annual Life Cycle Investment (AALCI)
Pipe	\$33,749,050	49%	\$0	\$18,119,400	\$422,050
Appurtenances	\$13,501,000	20%	\$8,125,900	\$12,165,850	\$573,850
Pressure Reducing Valves and Booster Stations	\$805,000	85%	\$0	\$0	\$16,100
Reservoirs	\$8,280,000	66%	\$0	\$0	\$138,000
Well Supply and Treatment	\$3,740,950	60%	\$747,500	\$747,500	\$187,450
Sub-total	\$60,076,000	46%	\$8,873,400	\$31,032,750	\$1,337,450

The AALCI for the water system is \$1,337,450 and the weighted life of all water system assets is 45 years. The forecasted water system capital renewal schedule for the next 20 years is shown in **Figure 4.1**.

There are investment spikes forecasted for 2025, 2030 and 2033 when some of the other appurtenances and the pipe assets have passed their design service life.

Figure 4.1: Water 20 Year Forecasted Funding Needs



4.2. WASTEWATER SYSTEM

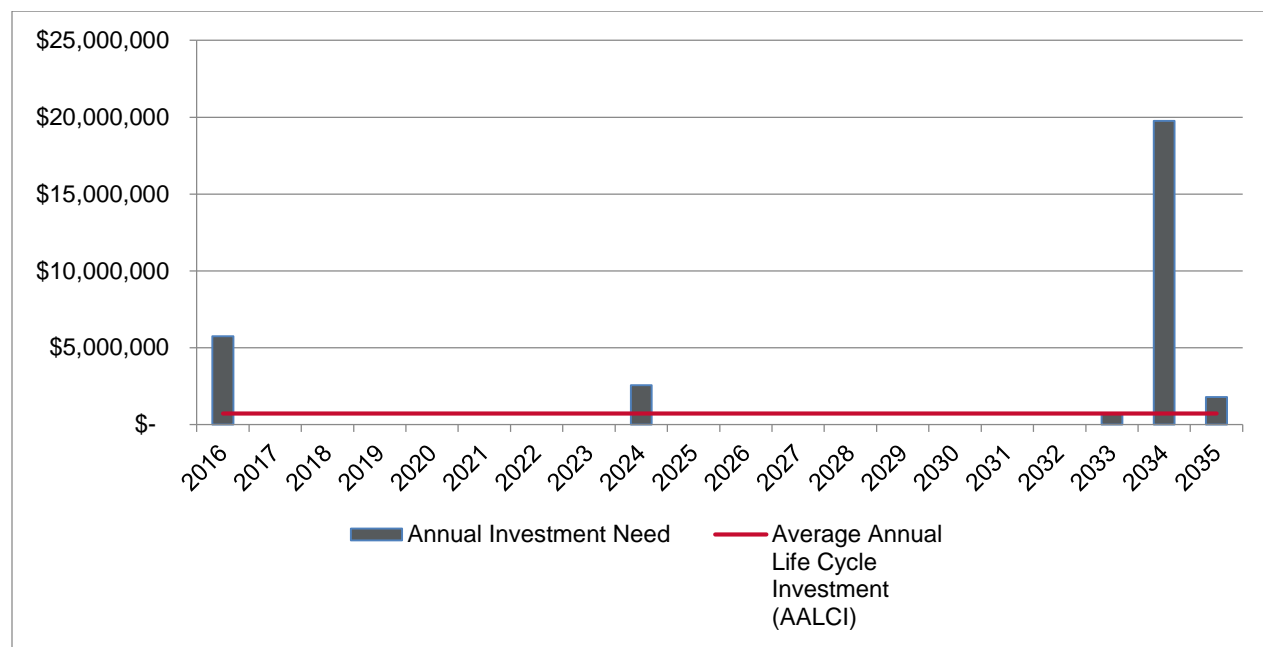
The wastewater system has a total replacement value of approximately \$45 million with 62km of mains. It has an expected remaining life of 37%, meaning that the overall condition of the wastewater system is fair to poor. The current backlog is \$5.7 million (see **Table 4.2**). The majority of this backlog is attributable to the assumed dates in the TCA data for the City's manhole and clean-out asset data.

Table 4.2: Wastewater System Details

Asset Category	Replacement Value	Expected Remaining Life	Infrastructure Deficit (Backlog)	20 Year Total	Average Annual Life Cycle Investment (AALCI)
Gravity Pipe	\$30,945,350	42%	\$0	\$22,320,350	\$404,800
Forcemains	\$241,500	80%	\$0	\$0	\$2,300
Appurtenances	\$7,282,950	9%	\$4,321,700	\$6,881,600	\$136,850
Lift Stations/Siphons	\$776,250	62%	\$172,500	\$172,500	\$23,000
Treatment	\$5,892,600	38%	\$1,263,850	\$1,263,850	\$166,750
Sub-total	\$45,138,650	37%	\$5,758,050	\$30,638,300	\$733,700

The AALCI for the wastewater system is \$733,700 and the weighted life of all wastewater system assets is 62 years. The forecasted wastewater system capital renewal schedule for the next 20 years is shown in **Figure 4.2**. There is an investment spike forecasted for 2024 (inspection chambers) and 2034 when the majority of the piping assets have passed their design service life.

Figure 4.2: Forecasted Wastewater 20 Year Funding Needs



4.3. STORMWATER SYSTEM

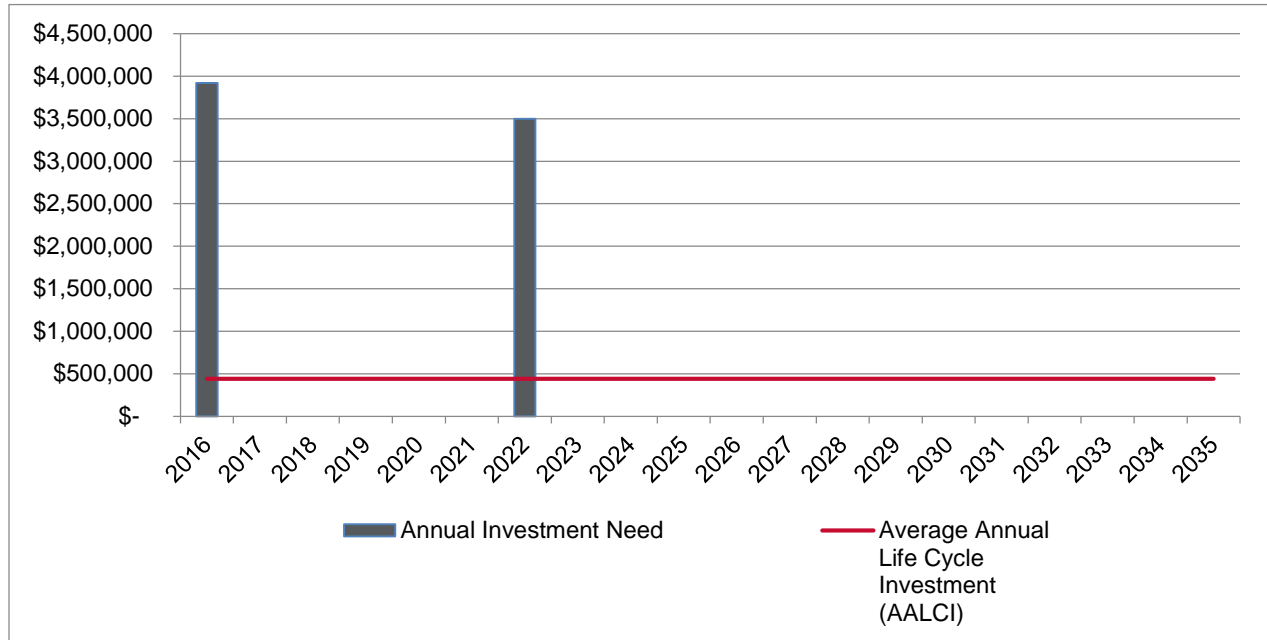
The stormwater system has a total replacement value of approximately \$25 million with 26km of mains. It has an expected remaining life of 30%, meaning that the overall condition of the wastewater system is poor. The current backlog is \$4 million (see **Table 4.3**). The majority of this backlog is attributable to age of the pipe assets.

Table 4.2: Stormwater System Details

Asset Category	Replacement Value	Expected Remaining Life	Infrastructure Deficit (Backlog)	20 Year Total	Average Annual Life Cycle Investment (AALCI)
Gravity Mains	\$14,350,850	26%	\$3,922,650	\$3,922,650	\$277,150
Manholes	\$3,570,750	14%	\$0	\$3,498,300	\$71,300
Catchbasins	\$6,822,950	43%	\$0	\$0	\$85,100
Outfalls	\$488,750	94%	\$0	\$0	\$5,750
Gravity Mains	\$14,350,850	26%	\$3,922,650	\$3,922,650	\$277,150
Sub-total	\$25,233,300	30%	\$3,922,650	\$7,420,950	\$439,300

The AALCI for the stormwater system is \$439,300 and the weighted life of all stormwater system assets is 57 years. The forecasted stormwater system capital renewal schedule for the next 20 years is shown in **Figure 4.2**. There is an investment spike forecasted for 2022 when the majority of the manhole assets have passed their design service life.

Figure 4.3: Forecasted Stormwater 20 Year Funding Needs



4.4. TRANSPORTATION SYSTEM

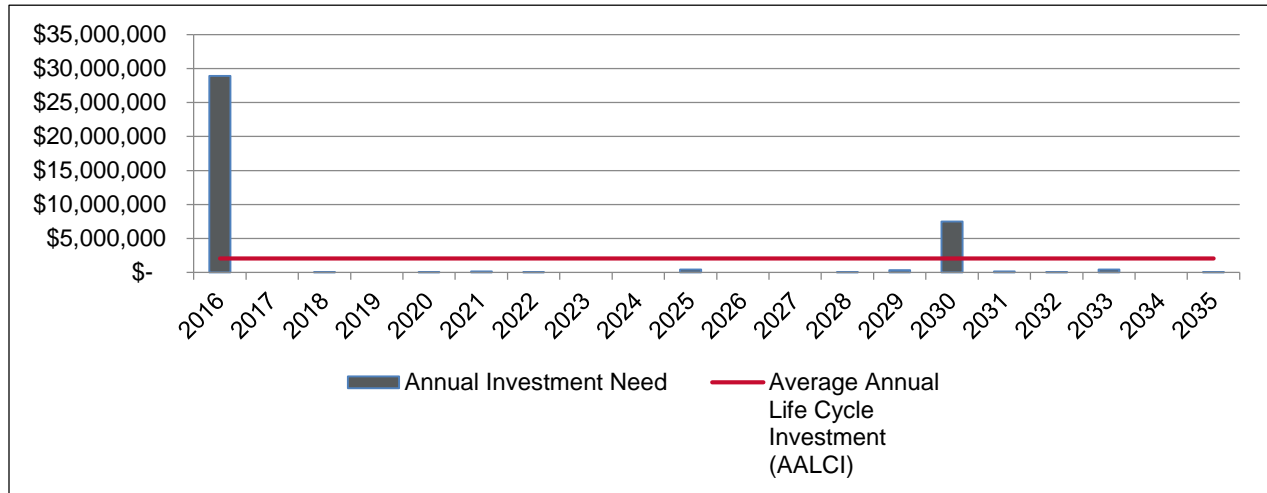
The transportation system has a total replacement value of approximately \$76 million. It has an expected remaining life of 34%, meaning that the overall condition of the transportation system is in the fair to poor range. The current backlog is \$26 million (see **Table 4.4**) of transportation assets that are past their design service life and require renewal.

Table 4.4: Roadway System Details

Asset Category	Replacement Value	Expected Remaining Life	Infrastructure Deficit (Backlog)	20 Year Total	Average Annual Life Cycle Investment (AALCI)
Roads	\$49,030,287	29%	\$26,301,154	\$26,301,154	\$1,427,000
Sidewalk	\$9,448,400	62%	\$0	\$7,040,300	\$188,600
Bridges	\$12,844,350	28%	\$0	\$0	\$164,450
Traffic Signals	\$1,725,000	33%	\$0	\$1,035,000	\$69,000
Streetlights	\$2,527,700	55%	\$418,600	\$1,183,350	\$63,250
Signs	\$432,400	70%	\$0	\$432,400	\$14,950
Sub-total	\$76,008,137	34%	\$26,719,754	\$35,992,204	\$1,927,250

The AALCI for the transportation system is \$1,927,250 and the weighted life of the assets is 39 years. The forecasted capital renewal schedule for the next 20 years is shown in **Figure 4.4**. The \$26 million backlog is included as part of the 2016 investment renewal needs. There is an investment spike forecasted for 2030 when the majority of the sidewalk assets have passed their design service life.

Figure 4.4: Forecasted Roadway 20 Year Funding Needs



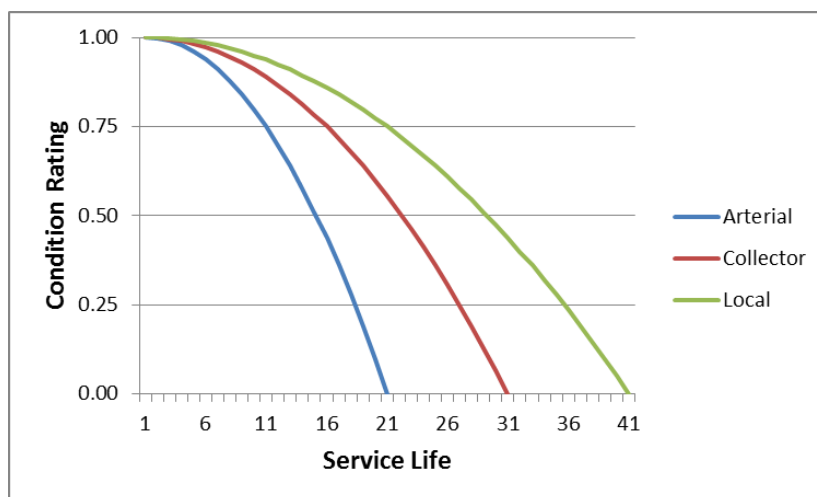
The following table summarizes some of the key results by classification for roads from the AMIP.

Table 4.5: Results by Roadway Classification

Roadway Class	Length (km)	AALCI (Rounded)	Infrastructure Deficit	Remaining Life
Arterial	5.8	\$212,950	\$4,812,738	6%
Collector	20.5	\$451,600	\$8,040,126	25%
Local	56.5	\$739,000	\$12,844,313	35%
Lanes	2.7	\$24,000	\$603,978	0%
Sub-Total	85.6	\$1,427,500	\$28,507,764	29%

Figure 4.5 illustrates three curves to represent the relationship between remaining life, service life and condition (deterioration) of the roadway.

Figure 4.5: Deterioration Curves by Roadway Classification



Based on the infrastructure deficit value of **\$14M** and a remaining life of 20% for **arterial** and **collector** roads, these roads are likely in poor condition (<0.25 in Figure 4.5). We suggest Merritt focus its roadway capital re-investment and maintenance efforts into its arterials and collector roadways to extend the service life and protect the integrity of the service provided by these important high capacity assets.

4.5. VEHICLES AND EQUIPMENT

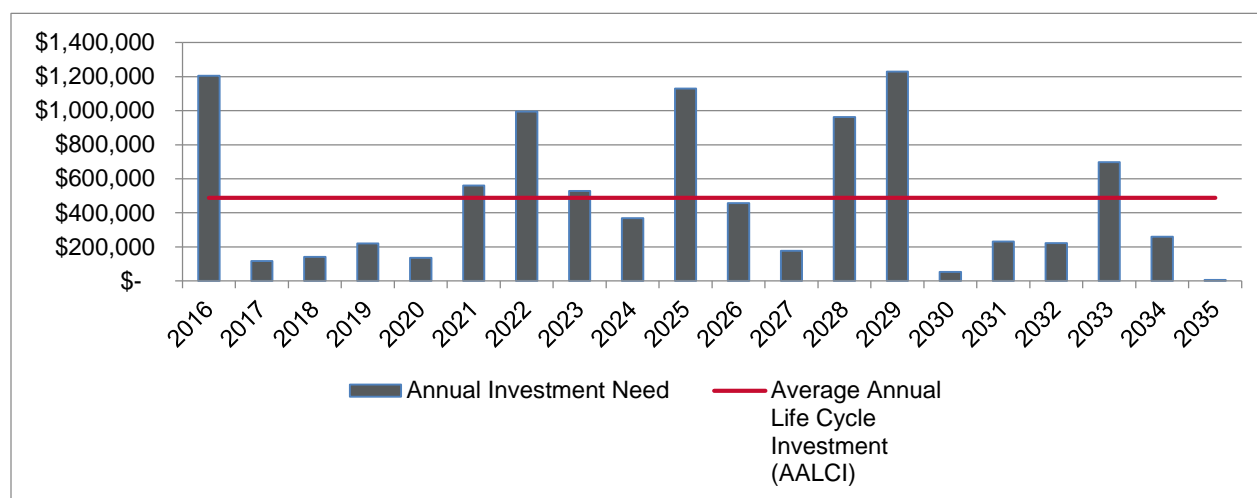
Merritt owns a significant amount of equipment and vehicles. These assets have a total replacement value of approximately \$9.1M. These assets typically have a shorter service life than other assets and only have an expected remaining life of 45%, meaning that the overall condition of the assets is in the fair to poor range. The current backlog is \$1.2M (see **Table 4.6**).

Table 4.6: Vehicles and Equipment Details

Asset Category	Replacement Value	Expected Remaining Life	Infrastructure Deficit (Backlog)	20 Year Total	Average Annual Life Cycle Investment (AALCI)
Vehicles	\$2,993,000	36%	\$875,000	\$3,190,000	\$176,000
Equipment	\$4,459,502	48%	\$101,878	\$4,761,818	\$221,583
Emergency Services	\$1,725,000	55%	\$229,000	\$1,749,000	\$91,000
Sub-total	\$9,177,502	45%	\$1,205,878	\$9,700,818	\$488,583

The AALCI for these assets is \$488,000 and the weighted life of all vehicle and equipment assets is 18 years. The forecasted capital renewal schedule for the next 20 years is shown in **Figure 4.6**. The backlog is included as part of the 2016 investment renewal needs.

Figure 4.6: Forecasted Vehicle and Equipment 20 Year Funding Needs



4.6. BUILDINGS

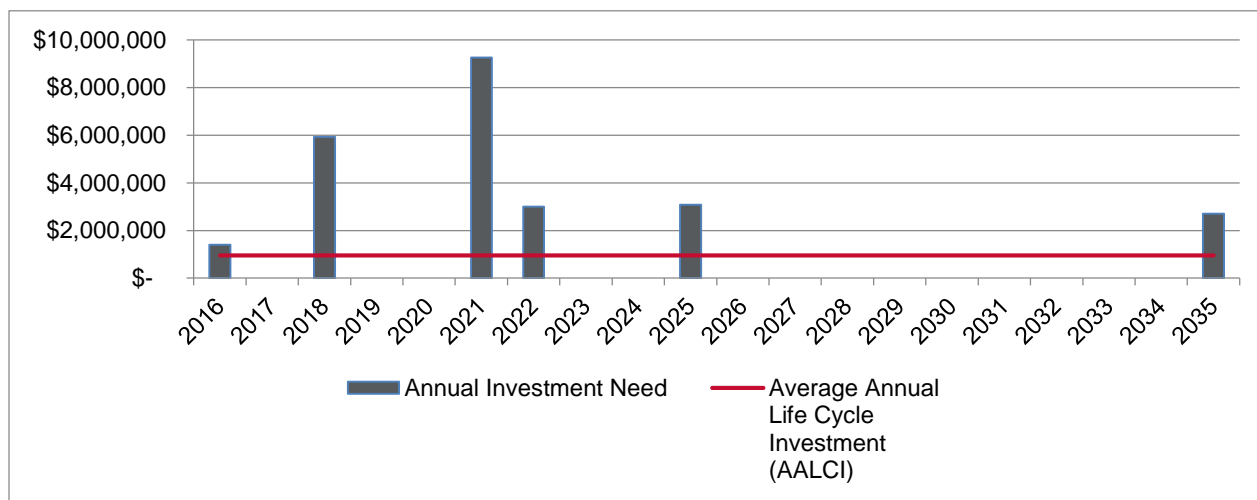
Merritt's buildings have a total replacement value of approximately \$31 million. It has an expected remaining life of 27%, meaning that the overall condition of the buildings is in the poor range. There is a current backlog (see **Table 4.7**) of \$1.4M based on the age of the buildings.

Table 4.7: Building Details

Asset Category	Replacement Value	Expected Remaining Life	Infrastructure Deficit (Backlog)	20 Year Total	Average Annual Life Cycle Investment (AALCI)
Recreational	\$24,740,000	26%	\$661,000	\$21,483,000	\$757,000
Administrative	\$3,730,000	30%	\$0	\$3,002,000	\$129,000
Protective Services	\$1,703,000	27%	\$736,000	\$736,000	\$42,000
Public Works	\$1,279,000	38%	\$0	\$163,000	\$17,000
Sub-total	\$31,452,000	27%	\$1,397,000	\$25,384,000	\$945,000

The AALCI for the buildings is \$945,000 and the weighted life of all buildings is 34 years. The forecasted building capital renewal schedule for the next 20 years is shown in **Figure 4.7**. There are investment spikes forecasted for 2018, 2021, 2022, 2025, and 2035 when some of the short lived assets (i.e. building components) for the recreational and administrative buildings will have past their design service life. In order to improve this information, a building condition assessment and energy audit should be completed in the future.

Figure 4.7: Forecasted Buildings 20 Year Funding Needs



4.7. PARKS

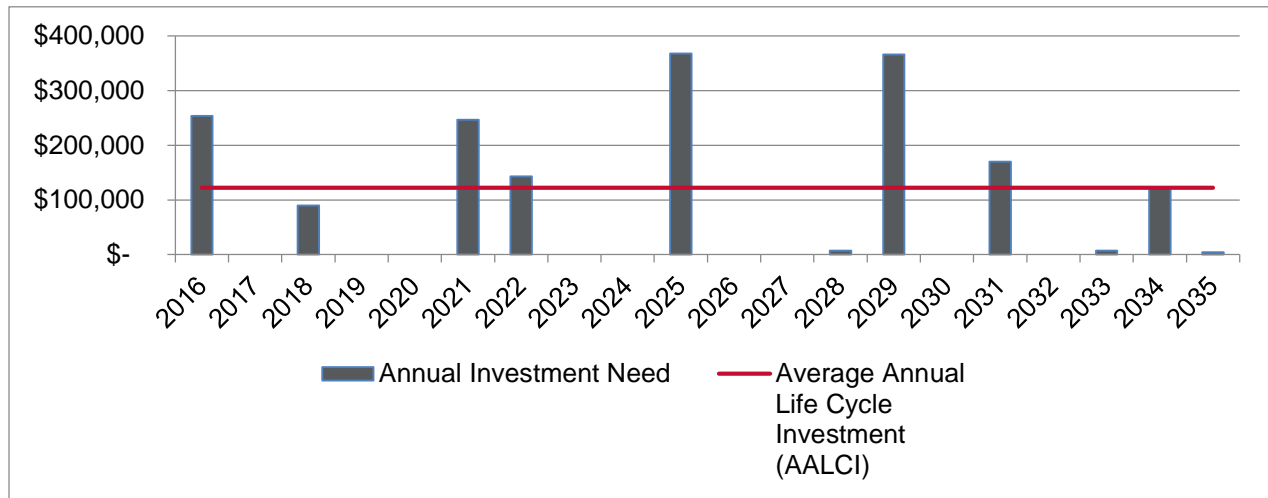
Merritt's parks have a total replacement value of approximately \$3 million. It has an expected remaining life of 55%, meaning that the overall condition of the parks is in the fair range. There is a current backlog (see **Table 4.8**) based on the estimated age of the park improvements. A placeholder for natural assets has been included in this asset category. Natural assets are discussed further in Section 5.

Table 4.8: Parks Details

Asset Category	Replacement Value	Expected Remaining Life	Infrastructure Deficit (Backlog)	20 Year Total	Average Annual Life Cycle Investment (AALCI)
Land Improvements	\$3,042,000	55%	\$254,000	\$1,780,000	\$122,000
Natural Assets	\$0	0%	\$0	\$0	\$0
Sub-total	\$3,042,000	55%	\$254,000	\$1,780,000	\$122,000

The AALCI for the parks is \$122,000 and the weighted life of the assets is 25 years. The forecasted parks capital renewal schedule for the next 20 years is shown in **Figure 4.8** with several assets exceeding their design service life within the 20 year horizon.

Figure 4.8: Forecasted Parks 20 Year Funding Needs



5.0 OTHER ASSET MANAGEMENT CONSIDERATIONS

The following sections are included to introduce some additional topics related to asset management implementation to support on-going informed infrastructure decision-making.

5.1. DECISION-MAKING THROUGH AN UNDERSTANDING OF SERVICE, RISK, AND COST

Making good decisions requires that the right people have the right information at the right time. Achieving this requires a process of communication and ongoing information management. Asset management is not about having perfect information, but it's about ensuring decisions are informed by the best information available, and then working to improve information where appropriate.

The collection and use of information about services, risk, and cost can be integrated into Merritt's existing budget processes based on the **Figure 5.1**.

Often, the best way of implementing asset management is not through building new and complicated processes or purchasing software – it is through making incremental improvements to your current processes. The collection and use of information about services, risk, and cost can be integrated into the existing budget processes.

Figure 5.1: Typical Budget Process



What to do:

- ▶ Include considerations of level of service, risk, and cost at each stage of the budget process.
- ▶ Service, risk, and cost cannot be fully understood in isolation – the three need to be brought together to understand connections and trade-offs.
- ▶ Use best information is available at the time.
- ▶ If there are gaps in important information, include actions to fill those data gaps in your budget.

Software & Asset Management

Software systems are tools that can support management of information, but they can also cause problems when staff with specialized training are lost, or people who need information cannot access it. Basic asset management in small communities can be conducted with simple spreadsheets and maps. Think you probably need a software program to make sense of it all?

Here are some things you should consider before selecting one:

1. Know your information and communication needs clearly first. For example, if you want to be able to access information though GIS but you don't need to edit it regularly, you might be able to make use of an externally hosted service which could save you a lot of money.
2. Identify what existing software programs you have and whether they need to be linked to asset management software.
3. Think about who will have the training to access the system, and what you will do if those people aren't around.
4. Software needs to be maintained over time. Have a plan for who will be responsible for maintaining the system as the program changes.

UNDERSTANDING SERVICE AND RISK

Level of service is a measure of the quality, quantity, and/or reliability of a service from the perspective of members, businesses, and customers in the community. Understanding service means having a clear and consistent understanding of:

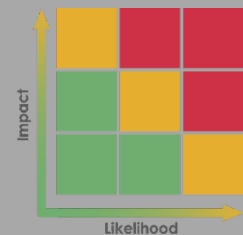
1. The types of services you provide;
2. The groups of residents, businesses, and institutions that you provide them to;
3. The level of service being delivered currently (your performance); and
4. The level of service you're aiming to provide (your target).

Infrastructure is not inherently valuable; it is only as valuable as the service it provides to the community. Rather than jumping straight to pipe breakage rates or pavement quality index, it's important to start with defining the service in terms that residents and businesses would understand – like water service outages, or driving comfort. This helps to ensure the priorities for limited resources are aligned with what the community values.

Risk(s) are events or occurrences that will have undesired impacts on services ($\text{Risk} = \text{Impact} \times \text{Likelihood}$). Some events that impact delivery of services will have a higher probability or greater impact than others – which make them a bigger risk. Often, with the right planning and actions, the likelihood or impact of these events can be reduced. To understand risk, you need to understand:

1. What your risks are and where they are;
2. The impact and likelihood of these risks;
3. What can be done to control or mitigate them and what resources are required; and
4. Whether they are worth mitigating or if they should be tolerated.

Risks are assessed by identifying the impact and the likelihood of the event, and then finding the corresponding level of risk. Doing this for each risk helps you to figure out which are your biggest risks



5.2. INFORMATION AND DATA MANAGEMENT

As circumstances change over time, information needs to be updated or improved. Information updates may be done on an ongoing basis, or may be completed as part of an annual process. Updates should reflect new assets, retired assets, refurbished or replaced assets, replacement cost changes, updates to operating costs to repair and maintain and asset condition information.

Updates may also be made to improve the accuracy of information, such as replacing anecdotal condition information with results from a condition assessment. Collecting more data or more accurate data can be very valuable in decision making, but it can be time consuming and expensive, so it's not worth investing in unless you know it will improve your decision making. When working with vendors or consultants, ask them (at the beginning of the project) to provide you information in a format that makes updating your inventory as easy as possible.

Figure 5.2 – Information Management Process



5.3. COMMUNICATION AND ENGAGEMENT

Communication is considered to be a set of ongoing activities that are applied within each stage of the asset management process. The purpose of communicating is to ensure that people and departments within an organization are aligned, working towards the same goals, and efficiently implementing asset management by applying the information and outputs in decision-making and programming. Communication and engagement is also important in obtaining support for asset management from City Council, staff, members, and other ratepayers. Common topics for asset management communication and engagement include:

- ▶ The importance of infrastructure in service delivery
- ▶ State of assets
- ▶ State of finances and funding challenges
- ▶ Levels of service
- ▶ Service delivery costs and trade-offs
- ▶ The organization's approach to asset management
- ▶ Staff and community members roles
- ▶ The work being done to ensure long-term sustainable service delivery

It is often advisable to develop internal alignment and an understanding of assets, services, and related costs and risks prior to external communication and engagement.

5.4. POLICY

Asset management and financial policies assist to align priorities, guide annual decisions which give the community direction on how investments should be made to achieve Merritt's annual and long term infrastructure needs and how much of the AALCI should be budgeted. In particular, policies can guide infrastructure investments and revenue generation with regards to reserves, debt, grants, asset renewal, growth and capital priorities. This will help Merritt work towards their stretch target of funding the AALCI.

5.5. NATURAL ASSETS

There is a growing recognition of the pivotal role that all natural areas play in providing services to communities. Natural Capital Assets are defined as the natural assets which provide a value and service to the community over time and are essential to the delivery of services. Examples would include the Nicola and Coldwater Rivers for receiving stormwater run-off and the Merritt aquifer which provides the supply of source water for Merritt's drinking water system.

It will be important for Merritt to identify and quantify the economic benefits of protecting its natural assets and understand the costs associated with replicating these natural functions in response to the loss or destruction of any components of these 'eco-assets'. Natural capital assets do not have a market value so assessing their importance and assigning an economic value will aid in raising awareness of their importance to the community. The substitutes for natural capital can be much more expensive to duplicate and operate than those provided by nature. Also, there are many services only nature can provide.

We suggest that Merritt identify all of its significant natural capital assets and the value of they provide. This value could be considered in future infrastructure decision-making, planning and budgeting for the protection of these assets.

6.0 RECOMMENDED NEXT STEPS

Based on the results of the AMIP, the previously completed assessment of current practices, and the process outlined in the *Asset Management for Sustainable Service Delivery, A BC Framework*, the following section outlines a matrix with a list of possible next steps (tools) and priorities for consideration to achieve an advanced level of practicing asset management.

The steps outlined below are organized deliberately in order to promote successful implementation and improve understanding in the three pillars that inform infrastructure decisions – Cost, Risk and Service.

Table 6.1 – Key Next Steps

Number	Priority Name	BC Asset Management Framework Process	Description
1	Cross-Functional Team	People	Create a collaborative cross functional team made up of core departmental representatives to support and mentor on infrastructure decision-making and budgeting within the Merritt and their respective departments.
2	Centralized asset database	Information	Create a centralized database for all assets that includes all existing spatial and attribute data from each department. Initially focus on the linear assets- water, wastewater, drainage and roads. Integrate web services when ready.
3	Asset Management/Financial Policy(s)	Plan	Develop an asset management policy that encompasses procedures for data handling/tracking/updating and sharing, project prioritization, risk, and infrastructure investment decisions. The policy could also include principles and policy statements on how infrastructure investment will be funded whether it's through building reserves, debt or taxes, levies, user fees. etc.
4	Setting Annual Infrastructure Investment Levels	Plan	Consider the results of the AMIP and policy discussions to determine the affordable annual contribution to infrastructure investment (likely somewhere between the current amortization and the AALCI amount \$5.9M).
5	Building Assessments	Information	In order to improve your understanding of the costs and risks associated with buildings, undertake an energy audit and condition assessments for community owned buildings.

Number	Priority Name	BC Asset Management Framework Process	Description
6	Risk and Level of Service based Asset Management Plans	Plan	Based on the AMIP, the creation of a risk-based decision support tool that incorporates technical level of service to create a prioritized capital plan that embraces a triple bottom line approach to set levels of service, performance and addresses all legislation/regulations, aging infrastructure (condition and capacity priorities), consider climate change and future growth.
7	Maintenance Management Plans	Implement Asset Management Practices	The importance of maintenance in extending service lives of assets and deferring their inevitable replacement (reducing the annual capital investment) is paramount to provide acceptable levels of service with fewer financial resources. Develop plans (including work orders, standard operating procedures, etc) for the O&M of assets to optimize/extend asset service lives.
8	Communications /Engagement	Core Element	Develop asset management/infrastructure communications with staff and Council and the public (e.g. benefits, requirements, products, progress). Community buy-in will be essential for setting levels of service and achieving financial sustainability/full cost recovery for service delivery.
9	Performance Measures	Measure and Report	Develop performance metrics to measure and report out on the service delivery/asset management status to both Council and the community. These would include a set of both “leading” and “lagging” indicators that evaluate the sustainability of services (E.g. number of m of pipe replaced, number of m ² of pavement replaced or avoided etc.)
10	Refine Asset Inventory	Information	Continually update and refine your infrastructure data over time with new spatial and attribute data to improve accuracy as it becomes available through field activities. Consider completing an inventory and valuation of your natural Assets.

APPENDIX A

AMIP LEVEL 1

City of Merritt Asset Management Investment Plan Level 1 - Summary																												
Physical Details						Forecasted Funding Needs and Timing																		Budget Requirements				
Asset Category	Replacement Value	Loss in Value	Remaining Value	Expected Remaining Life	Infrastructure Deficit (Backlog)	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	20 Year Total	Average Annual Life Cycle Investment (AALCI)	
Water System																												
Pipe	\$ 33,749,050	\$ 17,155,700	\$ 16,593,350	49%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,589,300	\$ -	\$ -	\$ 16,392,100	\$ -	\$ 138,000	\$ 18,119,400	\$ 422,050	
Appurtenances	\$ 13,501,000	\$ 10,801,950	\$ 2,699,050	20%	\$ 8,125,900	\$ 8,125,900	\$ -	\$ -	\$ -	\$ 20,700	\$ 13,800	\$ 13,800	\$ -	\$ -	\$ 3,901,950	\$ 20,700	\$ 6,900	\$ -	\$ -	\$ 55,200	\$ 6,900	\$ -	\$ -	\$ -	\$ -	\$ 12,165,850	\$ 573,850	
Pressure Reducing Valves and Booster Stations	\$ 805,000	\$ 121,900	\$ 683,100	85%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 16,100		
Reservoirs	\$ 8,280,000	\$ 2,781,850	\$ 5,498,150	66%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 138,000		
Well Supply and Treatment	\$ 3,740,950	\$ 1,496,150	\$ 2,244,800	60%	\$ 747,500	\$ 747,500	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 747,500	\$ 187,450		
Sub-total	\$ 60,076,000	\$ 32,357,550	\$ 27,718,450	46%	\$ 8,873,400	\$ 8,873,400	\$ -	\$ -	\$ -	\$ 20,700	\$ 13,800	\$ 13,800	\$ -	\$ -	\$ 3,901,950	\$ 20,700	\$ 6,900	\$ -	\$ -	\$ 1,644,500	\$ 6,900	\$ -	\$ 16,392,100	\$ -	\$ 138,000	\$ 31,032,750	\$ 1,337,450	
Wastewater System																												
Gravity Pipe	\$ 30,945,350	\$ 17,949,200	\$ 12,996,150	42%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 760,150	\$ 19,755,850	\$ 1,803,200	\$ 22,320,350	\$ 404,800	
Force mains	\$ 241,500	\$ 49,450	\$ 192,050	80%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,300		
Appurtenances	\$ 7,282,950	\$ 6,611,350	\$ 671,600	9%	\$ 4,321,700	\$ 4,321,700	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,559,900	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 6,881,600	\$ 136,850	
Lift Stations/Siphons	\$ 776,250	\$ 293,250	\$ 483,000	62%	\$ 172,500	\$ 172,500	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 172,500	\$ 23,000	
Treatment	\$ 5,892,600	\$ 3,669,650	\$ 2,222,950	38%	\$ 1,263,850	\$ 1,263,850	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,263,850	\$ 166,750		
Sub-total	\$ 45,138,650	\$ 28,572,900	\$ 16,565,750	37%	\$ 5,758,050	\$ 5,758,050	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,559,900	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 760,150	\$ 19,755,850	\$ 1,803,200	\$ 30,638,300	\$ 733,700
Stormwater System																												
Gravity Mains	\$ 14,350,850	\$ 10,596,100	\$ 3,754,750	26%	\$ 3,922,650	\$ 3,922,650	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,922,650	\$ 277,150	
Manholes	\$ 3,570,750	\$ 3,086,600	\$ 484,150	14%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,498,300	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,498,300	\$ 71,300	
Catchbasins	\$ 6,822,950	\$ 3,883,550	\$ 2,939,400	43%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 85,100	
Outfalls	\$ 488,750	\$ 31,050	\$ 457,700	94%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5,750	
Sub-total	\$ 25,233,300	\$ 17,597,300	\$ 7,636,000	30%	\$ 3,922,650	\$ 3,922,650	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,498,300	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 7,420,950	\$ 439,300	
Roadway System																												
Roads	\$ 49,030,287	\$ 35,046,654	\$ 13,983,633	29%	\$ 26,301,154	\$ 26,301,154	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 26,301,154	\$ 1,427,000	
Sidewalk	\$ 9,448,400	\$ 3,593,750	\$ 5,855,800	62%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 7,040,300	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 7,040,300	\$ 188,600	
Bridges	\$ 12,844,350	\$ 9,237,950	\$ 3,606,400	28%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 164,450	
Traffic Signals	\$ 1,725,000	\$ 1,159,200	\$ 565,800	33%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 345,000	\$ -	\$ -	\$ -	\$ 345,000	\$ -	\$ -	\$ 1,035,000	\$ 69,000	
Streetslights	\$ 2,527,700	\$ 1,125,850	\$ 1,401,850	55%	\$ 418,600	\$ 418,600	\$ -	\$ 16,100	\$ -	\$ 48,300	\$ 177,100	\$ 32,200	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 40,250	\$ -	\$ 112,700	\$ 169,050	\$ 24,150	\$ 120,750	\$ -	\$ 24,150	\$ 1,183,350	\$ 63,250	
Signs	\$ 432,400	\$ 129,950	\$ 302,450	70%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 432,400	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 432,400	\$ 14,950	
Sub-total	\$ 76,008,137	\$ 50,293,354	\$ 25,715,933	34%	\$ 26,719,754	\$ 26,719,754	\$ -	\$ 16,100	\$ -	\$ 48,300	\$ 177,100	\$ 32,200	\$ -	\$ -	\$ 432,400	\$ -	\$ -	\$ 40,250	\$ 345,000	\$ 7,498,000	\$ 169,050	\$ 24,150	\$ 465,750	\$ -	\$ 24,150	\$ 35,992,204	\$ 1,927,250	
Vehicles & Equipment																												
Vehicles	\$ 2,993,000	\$ 1,913,000	\$ 1,079,000	36%	\$ 875,000	\$ 875,000	\$ 30,000	\$ 31,000	\$ 79,000	\$ -	\$ 26,000	\$ 541,000	\$ 223,000	\$ 296,000	\$ 293,000	\$ 262,000	\$ 124,000	\$ 66,000	\$ 147,000	\$ -	\$ 62,000	\$ 76,000	\$ 52,000	\$ 7,000	\$ -	\$ 3,190,000	\$ 176,000	
Equipment	\$ 4,459,502	\$ 2,326,412	\$ 2,133,090	48%	\$ 101,878	\$ 101,878	\$ 86,511	\$ 111,360	\$ 103,188	\$ 136,120	\$ 535,080	\$ 453,675	\$ 305,714	\$ 33,528	\$ 823,340	\$ 51,790	\$ 52,600	\$ 461,366	\$ 271,502	\$ 53,092	\$ 170,031	\$ 145,596	\$ 645,255	\$ 214,652	\$ 5,538	\$ 4,761,818	\$ 221,583	
Emergency Services	\$ 1,725,000	\$ 783,000	\$ 942,000	55%	\$ 229,000	\$ 229,000	\$ -	\$ -	\$ 39,000	\$ -	\$ -	\$ -	\$ -	\$ 40,000	\$ 13,000	\$ 143,000	\$ -	\$ 436,000	\$ 810,000	\$ -	\$ -	\$ -	\$ 39,000	\$ -	\$ -	\$ 1,749,000	\$ 91,000	
Sub-total	\$ 9,177,502	\$ 5,022,412	\$ 4,154,090	45%	\$ 1,205,878	\$ 1,205,878	\$ 116,511	\$ 142,360	\$ 221,188	\$ 136,120	\$ 561,080	\$ 994,675	\$ 528,714	\$ 369,528	\$ 1,129,340	\$ 456,790	\$ 176,600	\$ 963,366	\$ 1,228,502	\$ 53,092	\$ 232,031	\$ 221,596	\$ 697,255	\$ 260,652	\$ 5,538	\$ 9,700,818	\$ 488,583	
Buildings																												
Recreational	\$ 24,740,000	\$ 18,341,000	\$ 6,399,000	26%	\$ 661,000	\$ 661,000	\$ -	\$ 5,935,000	\$ -	\$ -	\$ 9,260,000	\$ -	\$ -	\$ -	\$ 3,005,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,622,000	\$ 21,483,000	\$ 757,000
Administrative	\$ 3,730,000	\$ 2,595,000	\$ 1,135,000	30%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,002,000	\$ 129,000	
Protective Services	\$ 1,703,000	\$ 1,243,000	\$ 459,000	27%	\$ 736,000	\$ 736,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 736,000	\$ 42,000	
Public Works	\$ 1,279,000	\$ 800,000	\$ 480,000	38%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 74,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 89,000	\$ 163,000	\$ 17,000	
Sub-total	\$ 31,452,000	\$ 22,979,000	\$ 8,473,000	27%	\$ 1,397,000	\$ 1,397,000	\$ -	\$ 5,935,000	\$ -	\$ -	\$ 9,260,000	\$ 3,002,000	\$ -	\$ -	\$ 3,079,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,711,000	\$ 25,384,000	\$ 945,000
Parks & Recreation																												
Land Improvements	\$ 3,042,000	\$ 1,363,000	\$ 1,680,000	55%	\$ 254,000	\$ 254,000	\$ -	\$ 90,000	\$ -	\$ -	\$ 247,000	\$ 143,000	\$ -	\$ -	\$ 368,000	\$ -	\$ -	\$ 7,000	\$ 366,000	\$ -	\$ 170,000	\$ -	\$ 7,000	\$ 123,000	\$ 4,000	\$ 1,780,000	\$ 122,000	
Natural Assets	\$ -	\$ -	\$ -	0%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Sub-total	\$ 3,042,000	\$ 1,363,000	\$ 1,680,000	55%	\$ 254,000	\$ 254,000	\$ -	\$ 90,000	\$ -	\$ -	\$ 247,000	\$ 143,000	\$ -	\$ -	\$ 368,000	\$ -	\$ -	\$ 7,000	\$ 366,000	\$ -	\$ 170,000	\$ -	\$ 7,000	\$ 123,000	\$ 4,000	\$ 1,780,000	\$ 122,000	
Total Infrastructure	\$ 250,127,589	\$ 158,185,516	\$ 91,943,224	37%	\$ 48,130,732	\$ 48,130,732	\$ 116,511	\$ 6,183,460	\$ 221,188	\$ 205,120	\$ 10,258,980	\$ 7,683,975	\$ 528,714	\$ 2,929,428	\$ 8,910,690	\$ 477,490	\$ 183,500	\$ 1,010,616	\$ 1,939,502	\$ 9,195,592	\$ 577,981	\$ 245,746	\$ 18,322,255	\$ 20,139,502	\$ 4,685,888	\$ 141,949,022	\$ 5,993,283	

APPENDIX B

Inputs

MEMORANDUM

Date: October 1, 2015
To: Shawn Boven, CAO
cc: Brendan Pauls
From: Scott Shepherd, BA, ASCT
File: 0521.0199.01
Subject: AMIP Assumptions - Revised

The following memo outlines the assumptions that were used for life expectancy and cost.

Assumptions

The tables below summarize the assumptions for the key assets.

1.1 Life Expectancy

Water Distribution System	
Pipe Material	Life Expectancy (years)
AC	70
CI	70
DI	80
GALV	70
STEEL	60
PVC	100
Component	
Wells/Pumps/Treatment	25
Reservoirs	80
Flow Meters	30
Appurtenances	20

Sanitary (Storm) Sewer System	
Pipe Material	Life Expectancy (years)
AC	70
CONC	70

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VCT	70
STEEL	70
PVC/HDPE	100
Component	
Treatment Plant	25
Pump Stations	25
Appurtenances	50

Storm System	
Pipe Material	Life Expectancy (years)
CMP/CSP	30
Component	
Pits	80
Catchbasins	80
Appurtenances	50

Road	
Road Material	Life Expectancy (years)
Lane Paved Surface	40
Local Paved Surface	40
Collector Paved Surface	30
Arterial Paved Surface	20
Sidewalks, Curb and Gutter	50
Streetlights	40
Appurtenances	30

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1.2 Unit Costs

The following is intended to outline how the unit costs included in the AMIP for the asset sub-categories were developed. The primary basis for most unit costs for the assets is recent Okanagan tender pricing.

1.2.1 Storm Sewer

Gravity Mains

Inputs- Pipe, Appurtenances (catchbasins, manholes, drywells), road restoration, removals, Soft Costs (traffic control/mob/demob/ins/bonds).

In order to determine a per metre price, it was assumed a 100m long segment would include:

- 2 cb's, 1 manhole, 1 drywell
- 3.5m wide trench wide- asphalt restoration, and asphalt restoration
- Soft Costs- Traffic Control, Mob/de-mob/insurance and bonding

Pipe- per metre price (i.e. 250mm pipe=\$115.04/m)

Appurtenances- 2 catchbasins = $\$1478.57 \times 2 / 100\text{m} =$ \$29.57/m

1 Manhole = $\$2583.33/100\text{m} =$ \$25.83/m

1 drywell = $\$2955.50/100\text{m} =$ \$29.55/m

Total= **\$84.96/m**

Road Restoration- 3.5m wide trench per metre of pipe.

Asphalt (assume 75mm thick unit price) $\$23.19 \times 3.5\text{m} \times 1\text{m} = \81.17

Base gravel (assume 100mm thick) $\$56.09 \times 3.5\text{m} \times 1\text{m} \times 0.1\text{m} = \underline{\$19.63}$

Total: **\$100.80/m**

Soft Costs- Traffic Control=3.3%, Mob/De-Mobilization=8.2%, Insurance/Bonding=1.5%, = **13.0%**

Total = Pipe cost per metre + \$84.96 + \$100.80 + 13.30%

1.2.2 Sanitary Sewer

Gravity Mains

Inputs- Pipe, Appurtenances (connection, manholes, services), road restoration, removals, mob/demob/ins/bonds.

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The following outlines how the unit cost for each input was derived. In order to determine a per metre price, it was assumed a 100m long segment would include:

- 1 manhole (incl. 1m riser), 1 tie-in connection, 6 services
- 3.5m wide trench wide- asphalt restoration, and asphalt restoration
- Soft Costs- Traffic Control, Mob/de-mob/insurance and bonding

Pipe- per metre price

<i>Appurtenances-</i> 6 services (assume 10m long c/w IC) =	\$1250/100m=	\$91.80/m
1 Connection =	\$1700/100m =	\$17.00/m
1 Manhole =	\$4,980/100m =	<u>\$49.80/m</u>
	Total=	\$158.60/m
<i>Road Restoration-</i> (as per above)	Total:	\$100.80/m
<i>Soft Costs-</i> (as per above)	Total:	13.3%

Total = Pipe cost per metre + \$158.60 + \$100.80 + 13.3%

1.2.3 Water

Mains

Inputs- Pipe, Appurtenances (connection, hydrants, valves, fittings, services), road restoration, removals, mob/demob/ins/bonds.

The following outlines how the unit cost for each input was derived. In order to determine a per metre price, it was assumed a 100m long segment would include:

- 1 tie-in connection,
- 6 services, 1 hydrant assembly, 1 gate valve, 2 fittings
- 3.5m wide trench wide- asphalt restoration, and asphalt restoration
- Soft Costs- Traffic Control, Mob/de-mob/insurance and bonding

Pipe- per metre price directly from tender summaries

<i>Appurtenances-</i> 6 services (assume 10m long c/w IC) =	\$1250/100m=	\$91.80/m
1 Connection =	\$1220/100m =	\$12.20/m
1 hydrant =	\$3,780/100m =	\$37.80/m
2 fittings: \$475/ea x 2=	\$950/100m=	<u>\$9.50/m</u>

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Total= **\$151.30/m**

Road Restoration- (as per above)

Total: **\$100.80/m**

Soft Costs- (as per above)

Total: **13.3%**

Total = Pipe cost per metre + \$151.30 + \$100.80 + 13.45%

1.2.4 Roads

The following outlines how the unit cost for each road classification was derived.

Local

Pavement Structure– 50mm asphalt, 75mm base, and 300mm subbase

Surface

50mm Asphalt - \$14/m²

Removals- \$6/m²

\$20/m²

Base

75mm Base- \$3.47/m²

300mm Subbase- \$9.82/m²

Removals/Restoration- \$16.71/m²

\$35/m²

Collector

Pavement Structure– 75mm asphalt, 75mm base, and 400mm subbase

Surface

75mm Asphalt - \$21/m²

Removals - \$6/m²

\$27/m²

Base

75mm Base- \$3.47/m²

400mm Subbase- \$11.36/m²

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Excavation- \$4.40/m2
Subgrade Prep- \$1.09/m2
Removals/Restoration- \$13.65/m2
\$33/m2

Arterial

Pavement Structure– 100mm asphalt, 75mm base, and 450mm subbase

Surface

100mm Asphalt - \$25.53/m2
Removals - \$5.47/m2
\$31/m2

Base

75mm Base- \$3.47/m2
450mm Subbase- \$16.14/m2
Excavation- \$4.40/m2
Subgrade Prep- \$1.09/m2
Removals/Restoration- \$13.90/m2
\$39/m2

Sincerely,

URBAN SYSTEMS LTD.

A handwritten signature in blue ink, appearing to read "Scott Shepherd", with a horizontal line underneath.

Scott Shepherd, BA, ASCT
Principal

MEMORANDUM



Date: October 1, 2015
To: Shawn Boven, CAO
cc: Brendan Pauls
From: Scott Shepherd, BA, ASCT
File: 0521.0199.01
Subject: AMIP Data Gaps - Revised

Data Gaps

The most recent digital infrastructure information for Merritt has been reviewed for use in developing the City's Asset Management Investment Plan. This information is primarily based on GIS and CAD data received from the City, coupled with information from the Tangible Capital Assets (TCA) inventory. Further preparation of a base dataset will be completed in conjunction with City staff to ensure the City has one dataset with the most accurate infrastructure information.

A number of assumptions will be made to narrow information gaps in the City's infrastructure information base for a broad level overview of the status of Merritt's infrastructure.

1.1 Water System

The most recent water system drawing received in AutoCAD format appears to hold two different versions of Merritt's water system, each with its own pros and cons. One version (1829 segments) appears to be drawn with greater spatial accuracy, with pipe segments split at appropriate locations, more water services included, and all diameters provided as attributes. However, there seems to be areas of the City where watermains are missing, and important connection pipes are not drawn. This version has no attribute information relating to pipe material or installation date.

The second version (605 segments) has no attribute information, but has many of the missing connection pipes drawn, which are absent in the first version. Conversely, there are different areas of the City that this version does not include, but which are shown on the first version. In addition, it appears that the second version was connected in some way to the watermain data in the TCA inventory, as approximately 50% of the pipe segments can be linked based on their length (to 3 decimal places).

Finally, a watermains GIS file from 2011 was analyzed. It appears to be the originating file for the TCA report, as it contained Asset ID linkages between the two files. That being said, the TCA report has been updated since 2011, while this dataset has not. It appears that the City had made some assumptions in the TCA by assigning a 'year-in service' to the water main assets, with the majority being 1963.

It is recommended that these three different versions of the water system be reconciled, as each contains important attribute and/or geometry data. Once they are reconciled, gaps in attribute information (material, size, install date) can be properly addressed.

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1.2 Sanitary System

There are two sources for the sanitary data – GIS and CAD. The sanitary system in the AutoCAD dataset has 100% of the diameters populated, but no other attributes available. The GIS file appears to be an export from the CAD dataset, with some minor geometry changes and additions. Although the GIS file contains no further attributes, it has an Asset ID which can be used to link to the TCA inventory. In this manner, attributes from the TCA can be transferred back to GIS. However, not all records join accurately, resulting in the following remaining data gaps:

- material (missing 492 of 818),
- installation date (missing 7 of 818),

There is a significant gap in material information, while installation date and diameter information is present. It appears that the City had made some assumptions in the TCA by assigning a 'year-in service' to the sewer main assets, with the majority being 1965 or earlier.

1.3 Stormwater System

The dataset is partially complete for the stormwater system. Similar to the Water and Sanitary, the source of this dataset is the AutoCAD file provided by the City as well as the TCA report. No GIS data can be found to link to the TCA. The AutoCAD dataset has 100% of the diameters populated, but no other attributes available. Some attributes can be gleaned from the TCA report by joining the TCA tables to the storm mains dataset, using pipe length as a common field (to 3 decimal places). However, not all records join accurately, resulting in the following remaining data gaps:

- stormwater main installation dates (missing 573 of 730),
- stormwater main material (missing 730 of 730)

There is a significant gap in installation date information, and there remains no information about material. It appears that the City had made some assumptions for the TCA in assigning a 'year-in service' to the storm sewer main assets, with the majority being 1970.

1.4 Roadway System

There was no road system included in the AutoCAD drawings received from the City, however the TCA report has detailed information available, including:

- Road Name (all available)
- From/To (all available)

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- Pavement Width (missing 249 of 623)
- Pavement Length (missing 249 of 623)
- Pavement Area (missing 249 of 623)
- Year Installed (all available)
- Road Class (missing all)

The City's road data was updated using TCA inventory and the National Road Network (NRN) database. The NRN was used to update the spatial geometry of the roads, while attribute information, such as width and in-service year, were incorporated from the TCA.

1.5 Parks, Fleet, Buildings & Facilities

There is a good dataset for these asset categories, provided by City staff in the TCA. Gaps in buildings and facilities TCA information were filled by the City's 2008 Appraisal Report of Specified Property prepared by Suncorp Valuations.

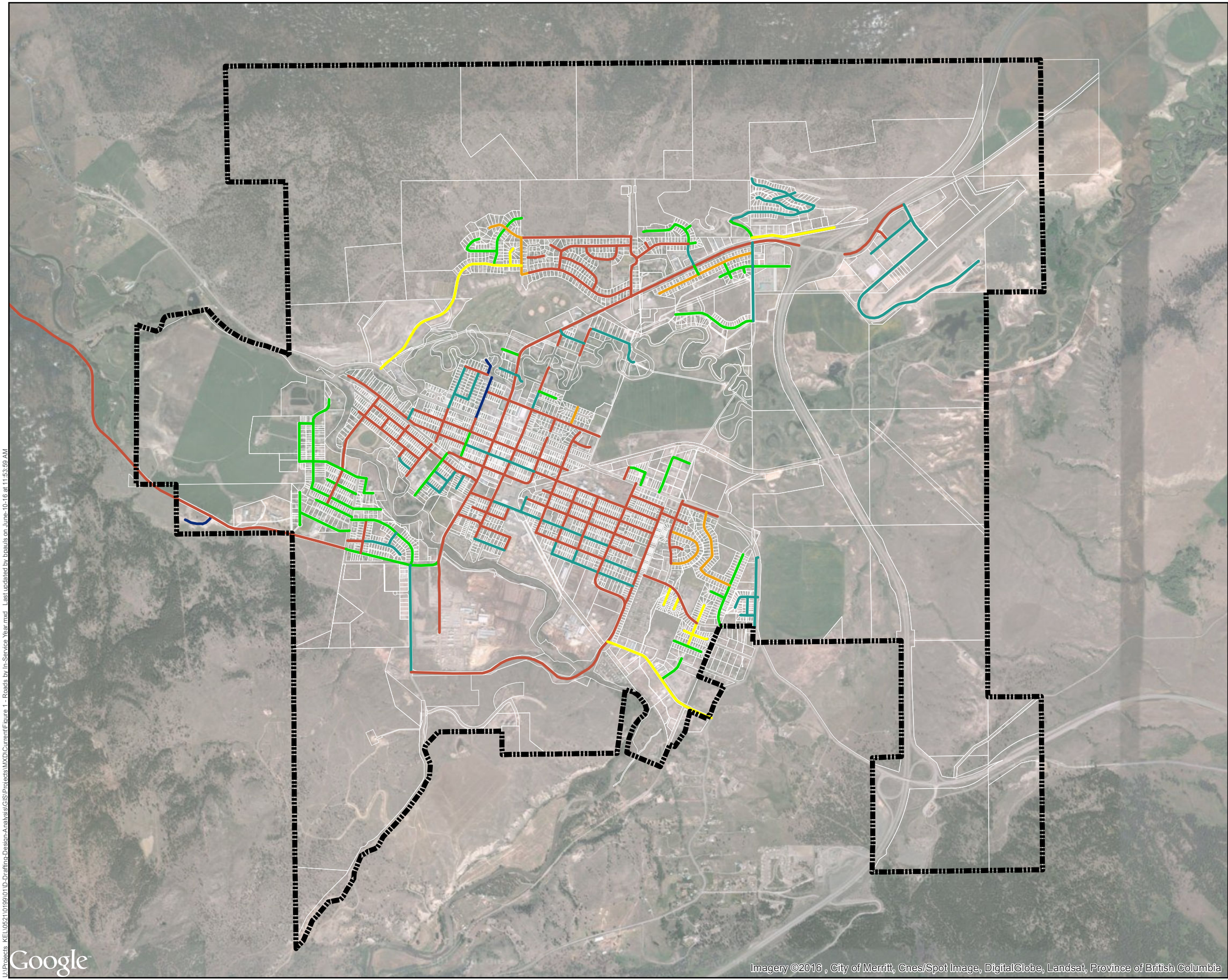
Sincerely,

URBAN SYSTEMS LTD.

Brendan Pauls, B.A. GISP
GIS Specialist

APPENDIX C

Summary Maps

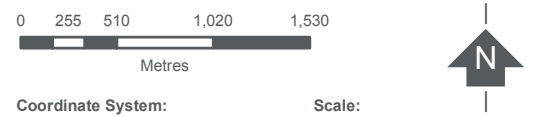


City of Merritt
AMIP

**City Roads
In-Service Year**

- Legend
- Road Network In-Service Year**
- 1960 - 1969
 - 1970 - 1979
 - 1980 - 1989
 - 1990 - 1999
 - 2000 - 2009
 - >= 2010
 - Year not available or road not owned by City

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.



Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Scale: 40,000

Data Sources:
Data provided by -

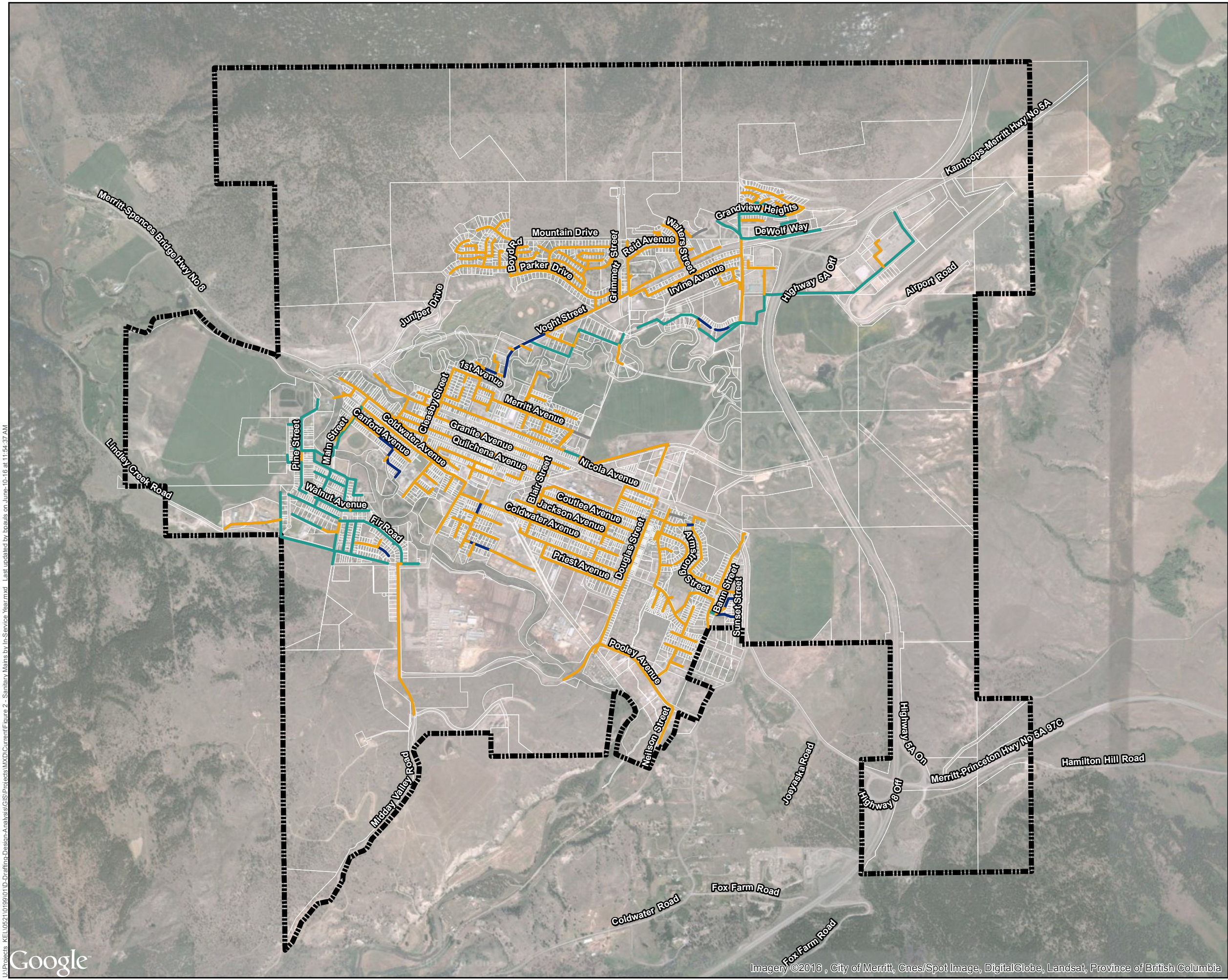
Project #: 0521.0199.01
Author: BP
Checked: SS
Status: ~ DRAFT ~
Revision: A
Date: 2016 / 6 / 10



FIGURE 1

U:\Projects KEL\0521\0199\01\0-Drafting-Design-Analysis\GIS\Projects\MXD\Current\Figure 1 - Roads by In-Service Year.mxd Last updated by bpaule on June-10-16 at 11:53:59 AM





City of Merritt
AMIP

Sanitary Mains In-Service Year

Legend
Sanitary Main In-Service Year

- 1960 - 1969
- 1970 - 1979
- 1980 - 1989
- 1990 - 1999
- 2000 - 2009
- Year not available

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

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Metres

Coordinate System:

WGS 1984 Web Mercator Auxiliary Spherid:40,000

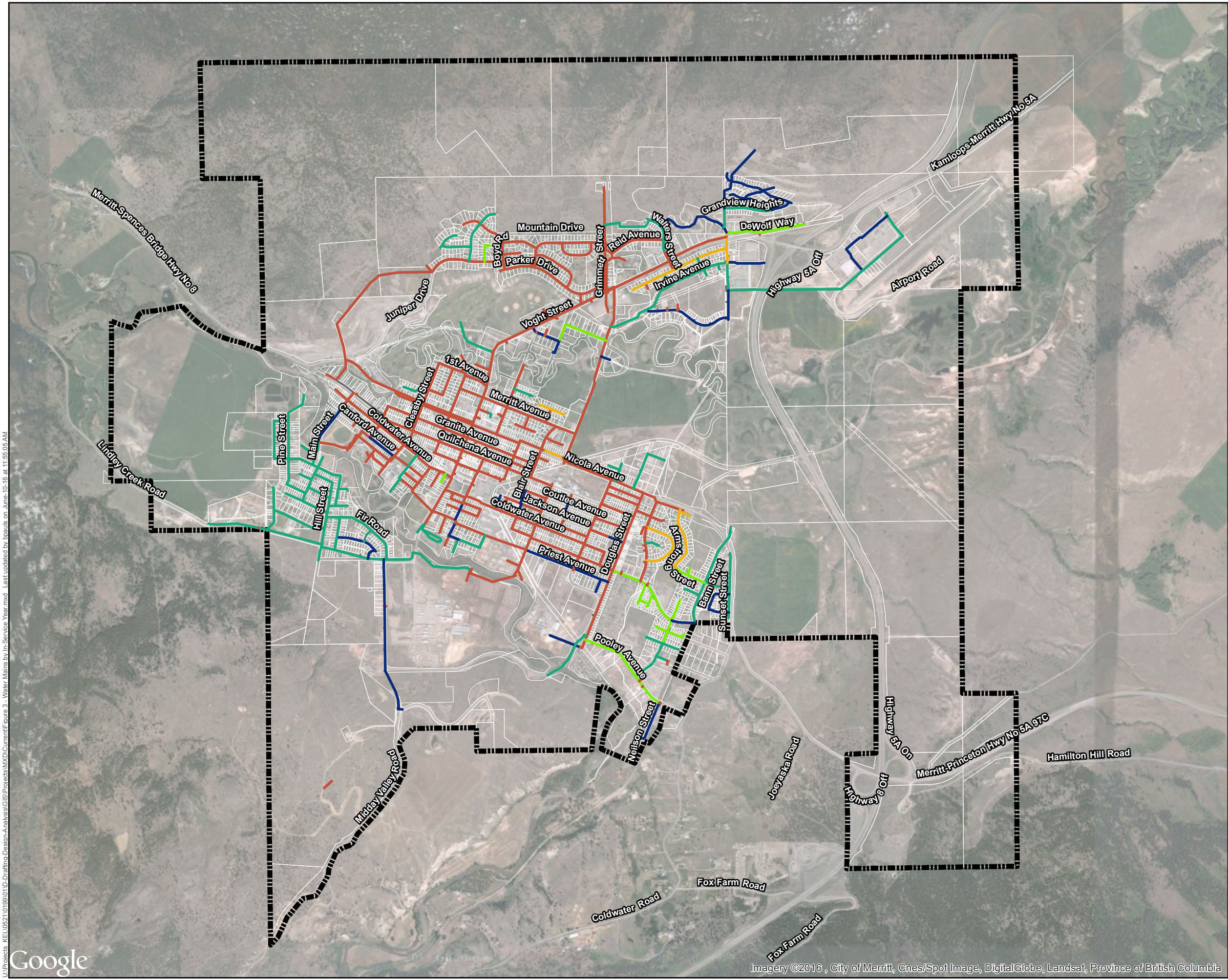
Scale:

Scale:40,000

Data Sources:

Data provided by -

Project #:	0521.0199.01	<div>URBANSYSTEMS</div> <div>FIGURE 2</div>
Author:	BP	
Checked:	SS	
Status:	~ DRAFT ~	
Revision:	A	
Date:	2016 / 6 / 10	



City of Merritt
AMIP

**Water Mains
In-Service Year**

- Legend
- Water Main by In-Service Year**
- 1960 - 1969
 - 1970 - 1979
 - 1980 - 1989
 - 1990 - 1999
 - 2000 - 2009
 - Year not available

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

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Metres

N

Coordinate System:

WGS 1984 Web Mercator Auxiliary Spherid:40,000

Scale:

Data Sources:

Data provided by -

Project #: 0521.0199.01
Author: BP
Checked: SS
Status: ~ DRAFT ~
Revision: A
Date: 2016 / 6 / 10

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FIGURE 3