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TECHNICAL MEMORANDUM D.1.1

Regional Municipality of Wood Buffalo

Wastewater Master Plan

Existing Assets

September 2014

CANADA'S BEST MANAGED COMPANIES

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1 Introduction

The Regional Municipality of Wood Buffalo (Municipality) has retained Associated Engineering (AE) to assist in undertaking an inventory of their existing assets, and assessing the following:

- Review existing asset information and inventory databases;
- Identify data gaps in the GIS data and Citywide Financial data;
- Prepare an inventory of all wastewater and stormwater assets;
- Report on the financial book value for the assets; and
- Analyze the age of the assets, and identify those assets that may be at risk of reaching the end of their useful life.

The objective of this task will be to compile a summary of the existing treatment, sanitary sewer, stormwater and snow storage assets operated by the Municipality. This will provide a basis of the book value and generalized age of the existing system from the existing Municipal Tangible Capital Database.

This Task will review the Municipality's work to date and provide a summary report.

2 Methodology

The data used for this analysis was derived from both the Municipality's GIS database of assets and infrastructure, and the Citywide asset management software used by the Finance Department for reporting Tangible Capital Assets.

The GIS database reflected the most up-to-date status of the infrastructure in the ground of which Associated Engineering and the project team were aware, including capital projects recently undertaken by the Municipality. In the GIS database, each asset is identified as either a node (i.e. manholes and outfalls on storm and sanitary gravity mains, valves and fittings on pressurized systems), or a link (i.e. a pipe that connects two given nodes). The GIS database is expected to contain all of the pertinent information about each asset, including the year of installation, the pipe diameter (if applicable), and material.

The Citywide database maintains discrete assets for pipes (i.e. links) where the asset identifier is expected to uniquely match the corresponding asset identifier in the GIS database, for a one-to-one join between data sets. Conversely, much of the nodal assets (i.e. manholes, catch basins, valves, fittings, etc.) are "pooled" into a single entry into the database based on the year they were put into service. For example, all manholes from 2007 would form a single asset in Citywide.

All of the assets in Citywide have a valuation, which can be amortized over the expected life cycle of the asset based on the book value and the asset life expectancy. The book value of the assets is based on the actual construction costs as provided by the Municipality's consultants (for Capital Projects) or by the Developer (in the case of contributed assets). For the pooled assets, the costs are reflective of the number of discrete assets in the pool.

The Municipality uses a straight-line depreciation model within the Citywide system to determine the useful life, and the book value for a given year. This information is used for reporting on the value of Tangible Capital Assets. It is also used for knowing how much to write-down when replacing assets before they have reached the end of their useful life. For pooled assets, replacing an individual asset from a particular year requires decrementing the number of assets in the pool, in addition to writing down a proportional share of the book value.

In determining the current value of the Municipality's assets, we undertook a spatial and database analysis of both the GIS and Citywide data, to evaluate the relative completeness of each value set, and provide an estimate on the "error" of any subsequent calculations. We then used the data from the Citywide database to report on the Wastewater Collection assets, Wastewater pumping assets, Wastewater Treatment assets, Stormwater Collection assets, and Stormwater Management assets. It should be noted that in reporting the value of the Tangible Capital Assets, the value for land is not included.

Under the Municipality's current project execution procedures, the Citywide database in the Finance Department is only updated upon receipt of the record information and TCA reports upon the project completion. Therefore, some lag between the installation of the infrastructure and the reporting of assets in the Citywide TCA database may be encountered.

3 Results

3.1 ABANDONED AND PRIVATE ASSETS

The Citywide database only contains information about assets which are owned (and operated) by the Municipality. Many of the assets in the GIS database, however, are either abandoned or are listed as "Private", in the status. Based on our assessment of those assets currently reported as "Private", there are two scenarios: assets belonging to a condo corporation, or assets that have been constructed by a developer and have received Construction Completion Certificate (CCC), but have not yet received Final Acceptance Certificate (FAC) and therefore do not yet belong to the Municipality. In the opinion of Associated Engineering, we do not agree with the second usage of "Private", as this infrastructure will be added to the Municipality's assets upon issuance of the Final Acceptance Certificate. Nonetheless, as the assets are not yet in the Municipality's pool, we have excluded them from the analysis.

The attached Figures 3-1 and 3-2 show those assets listed in the GIS database which are identified as Abandoned, and those that are Private.

3.2 DATA ALIGNMENT

Once the Abandoned and Private assets have been excluded from the dataset, Associated Engineering undertook a one-to-one analysis on the linear assets in the wastewater and stormwater collection systems, and a many-to-one analysis on the nodal assets. The results are presented in Table 3-1.

Table 3-1
Data Alignment of Linear Assets

Asset	Total GIS Records	Total Citywide Records	Matched Records	Total GIS Length (km)	Total Citywide Length (km)	Matched Length (km)
Sanitary	3389	3532	3167	248	262	228
Stormwater	2623	2732	2357	173	182	160

For the stormwater assets, it should be noted that catchbasin leads were not included in the analysis, as the leads and catchbasins appeared to have been pooled in Citywide. Open ditches, swales, and culverts were also excluded as these do not appear to be recorded in Citywide currently.

On average, the alignment of the data between the Citywide and GIS databases was approximately 90%. When processing the data, it was noted that many of the non-matching assets in the GIS database had comments indicating that the data was not in the financial records, and/or that further review is required by the Municipality (such as reviewing either record drawings or the conditions encountered in the field). Thus, while the alignment is acceptable at over 90%, we would expect greater data alignment to be achieved once the Municipality completes the data reconciliation, and processes those records already flagged for review.

Maps of all those assets which did NOT join in the one-to-one analysis between the GIS database and the Citywide database are presented in the attached Figures 3-3 and 3-4. These maps help to identify those locations which require further review, and/or provide insight into reasons for the discrepancy between the databases if the financial reporting has not been completed for either capital or development projects.

Upon review of the Unmatched Sanitary Asset map in particular, the twin 750 mm forcemains connecting from the Lower Townsite to the Wastewater Treatment Plant is an obvious discrepancy. We have assumed that this asset is not listed in the Citywide database yet because the Tangible Capital Asset reporting for this particular project has not yet been completed. This asset represents a critical piece of infrastructure, providing the only linkage of wastewater from the entire south catchment area to the Wastewater Treatment Plant, and has an estimated value of over $XX,XXX,XXX based on the capital budgets for the installation. We therefore recommended that the TCA evaluation of this project be completed as soon as possible, to ensure the value of this critical infrastructure is captured.

Table 3-2
Data Alignment of Nodal Assets

Asset		Total GIS Records	Total Citywide Records	Matched Records
Wastewater	Sanitary MH's	3177	3335	(pooled)
	Sanitary Valves	18	15	10
	Underground Chambers	22	14	3
	Pump/Lift Stations	14	22	12
	Sewage Holding Tanks	0	1	0
	Lagoons	0	2	0
	WW treatment Plants	1	1	0
Stormwater	Storm MH's	2591	2658	(pooled)
	Catchbasins	2708	2952	(pooled)
	Stormwater Treatment Units/ Grit Separators	0	4	0
	Storm Ponds	0	21	0
	Outfalls	64	58	34

As discussed previously, data for nodal assets in the Citywide database is pooled. If the number of discrete assets does not match the number in each pool, it is also difficult to accurately undertake a many-to-one analysis. For example, in the GIS database there are 11 manholes from the year 1999, whereas the Citywide pool of manholes from the same year is 3.

There is reasonably good data alignment for those nodal assets which are not pooled but rather reported individually in Citywide. For example, the stormwater outfalls have 64 listed in the GIS database, while the Citywide database lists 58 outfalls. This is an alignment of 90%. However, only 34 of the 64 outfalls identified in the GIS database match an asset identifier in the Citywide database. It is recommended that both databases be reviewed and updated based on the findings of Tech Memo C.2.1 – Outfall Inventory.

3.3 BOOK VALUE OF ASSETS

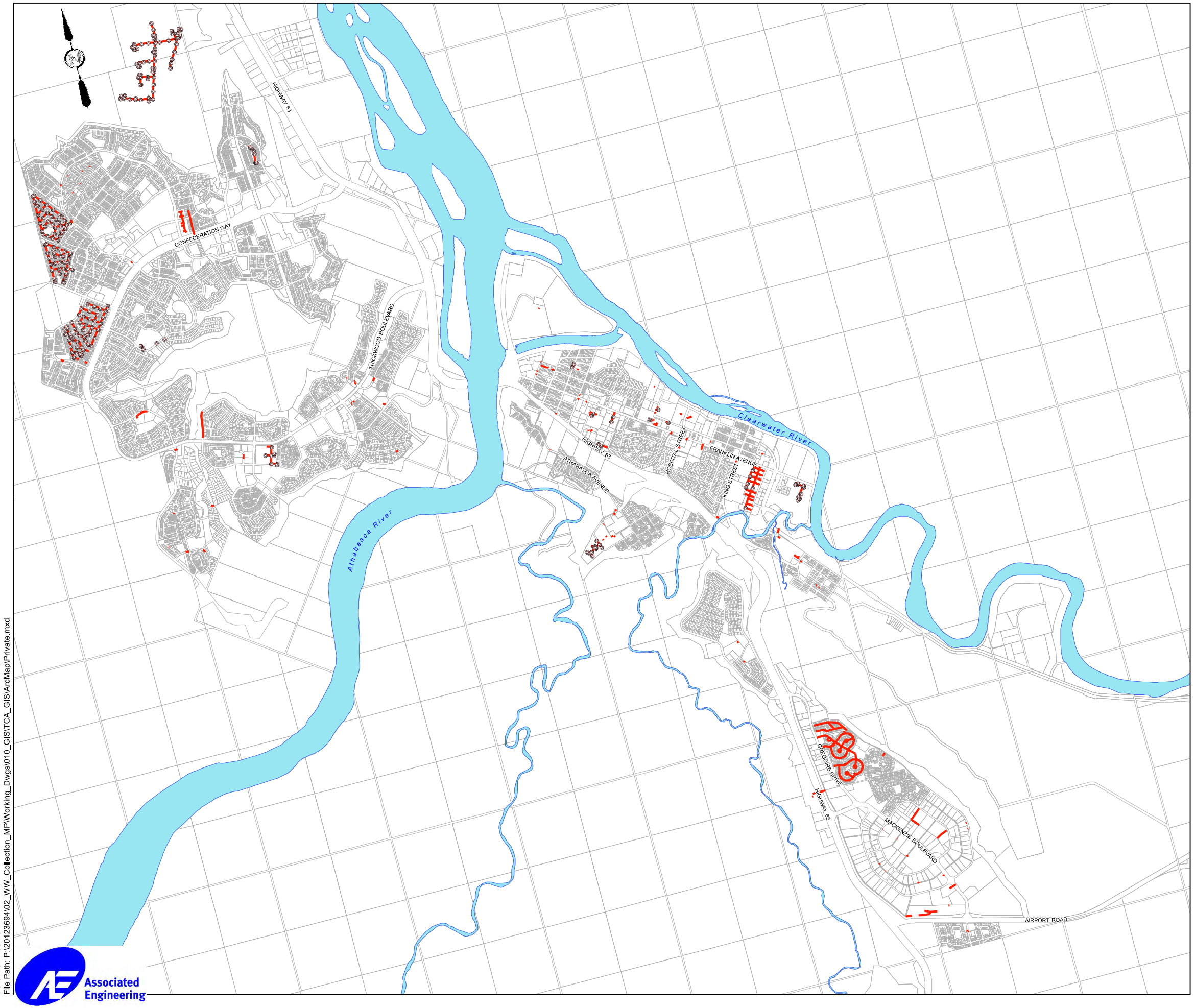
The reported book value used in this analysis is the "2013 Closing Net Book Value", as reported by the Finance Department to the Municipal Auditors. Because only the Citywide database contains financial information, regarding the Municipality's assets, all of the analysis regarding book values was done using only the current status of the Citywide database. It should be cautioned, therefore, that with only 90% data alignment between the GIS and Citywide databases, these reported total values should only be considered accurate to within +/- 10%.

The book value accounts for depreciation of assets and therefore does not reflect the replacement cost. We therefore also present the "Replacement Cost (at End of Life)" results from the Citywide data. It should be noted that only about 90% of sanitary records contain data for this field, and 61% of storm records contain data for this field within the Citywide database.

Table 3-3
Estimated Replacement Costs

Asset Category	2013 Book Value	End-of-Life Replacement Value
Wastewater Collection (pipes, manholes, valves)	$231,281,490	$1,188,380,370
Underground Chambers	$8,623,598	$ —
Pump/Lift Stations	$27,839,708	$ —
Sewage Holding Tanks	$57,750	$ —
Lagoons	$492,770	$ —
Wastewater Treatment Plants*	$198,329,745	$250,000,000
Total Sanitary Assets	**$466,625,061**	**$1,338,380,370**
Stormwater Collection (pipes, catch basins, manholes)	$94,602,354	$557,197,380
Stormwater Treatment/Grit Separators	$12,070	$59,718
Storm Ponds	$10,441,915	$8,600,9329
Outfalls	$390,772	$933,654
Total Stormwater	**$105,447,111**	**$644,200,081**
Total Wastewater and Stormwater	**$572,072,172**	**$2,082,580,451**

The 2013 book value of the Wastewater and Stormwater collection and treatment assets is $572 million, accurate to +/-10%. The Total Replacement Value of the Wastewater and Stormwater assets is $2.1 Billion, based on the data available.



REGIONAL MUNICIPALITY OF WOOD BUFFALO

Waste Water Management Plan
Asset Assessment

Private Sanitary Features

Legend:

- Sanitary Node Private - 258 Features
- Sanitary Line Private - 706 Features - 27540m

Scale 1:25,000

May 2014

Associated Engineering

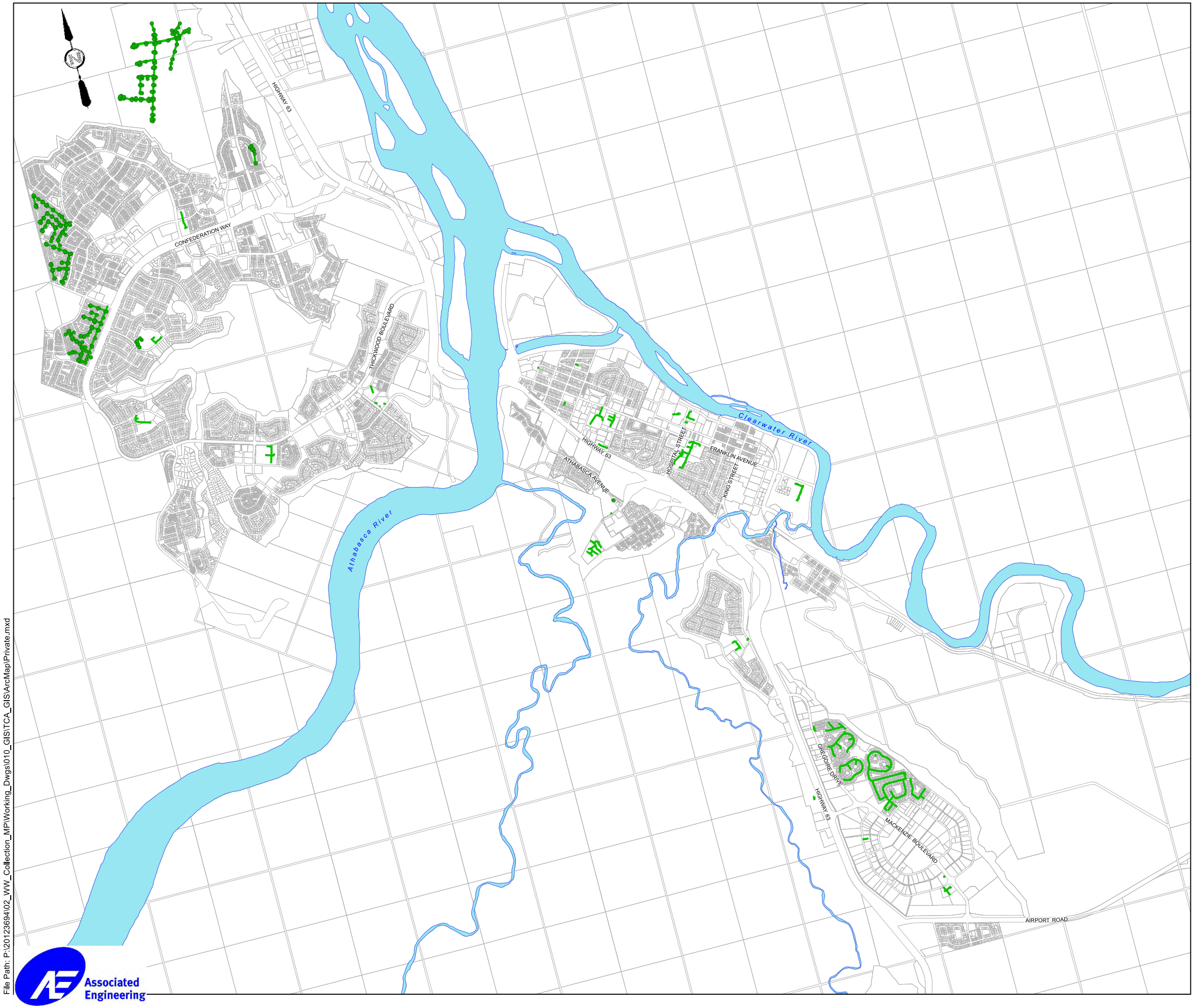
Date: 2014-05-16
File Path: P:\2012369\4102_WW_Collection_MP\Working_Dwgs\010_GIS\TCA_GIS\ArcMap\Private.mxd

Figure 3-1

REGIONAL MUNICIPALITY OF WOOD BUFFALO

Waste Water Management Plan
Asset Assessment

Private Storm Features



Legend:

- Storm Node Private - 413 Features
- Storm Line Private - 677 Features - 269729m

Scale 1:25,000

May 2014

Associated Engineering

Date: 2014-05-16
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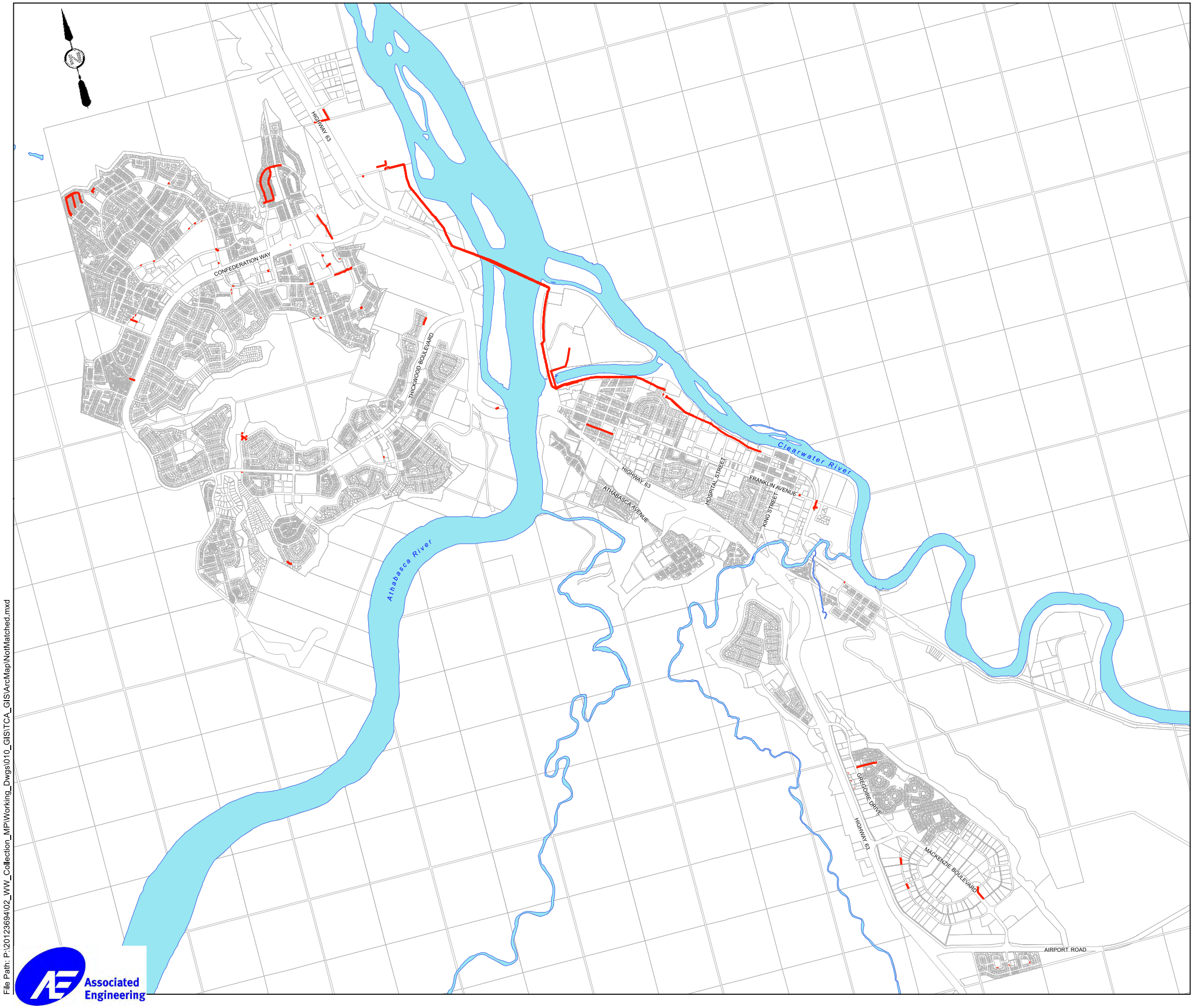
Figure 3-2



REGIONAL MUNICIPALITY OF WOOD BUFFALO

Waste Water Management Plan
Asset Assessment

Sanitary Assets
Not Matched In CityWide

Legend:

Sanitary Line - GIS data not joined to CityWide

222 un-matched storm line features

*Note:
Most appurtenances are pooled in CityWide and do not join 1:1 with GIS data.

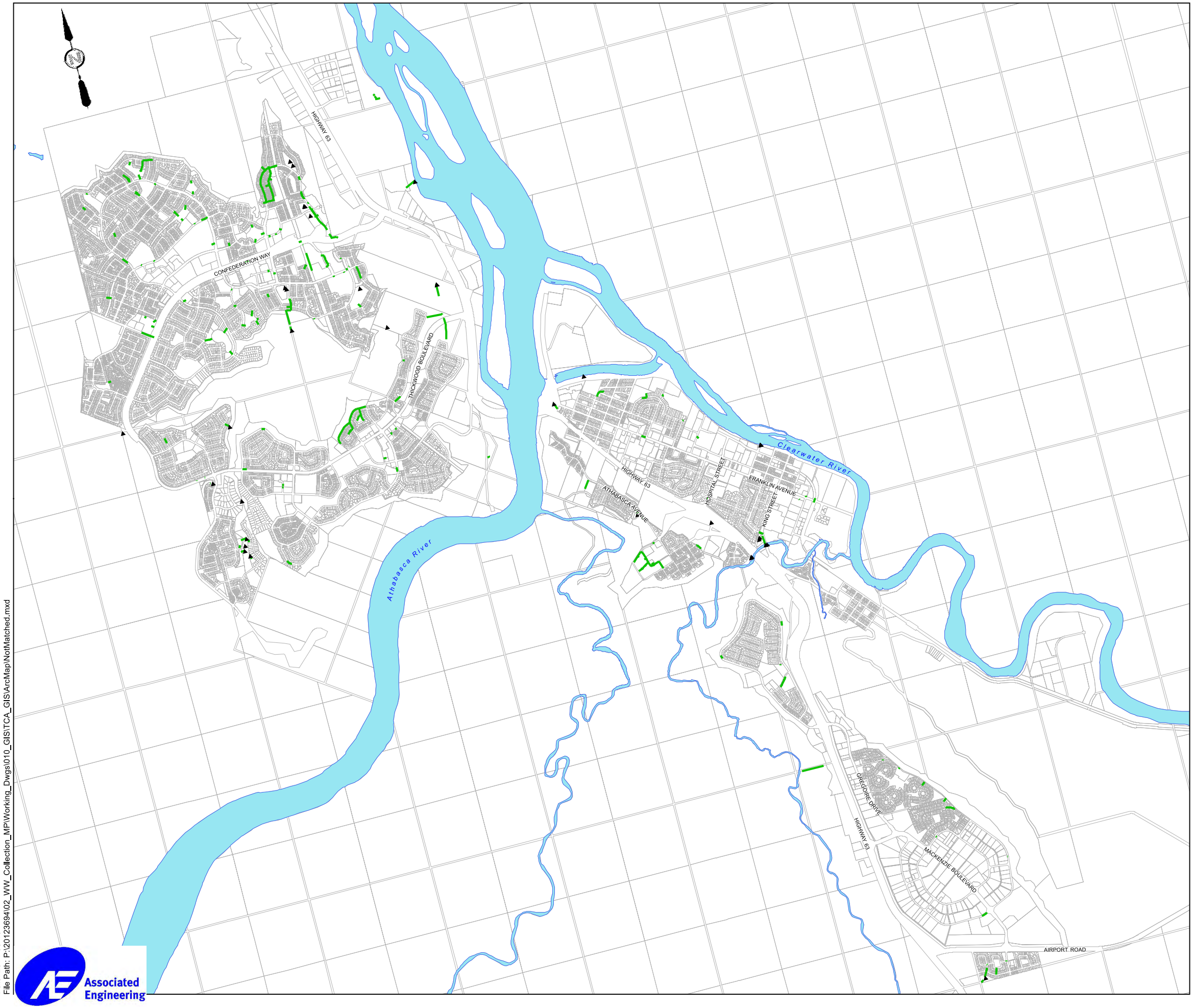
Scale 1:25,000

May 2014

Associated Engineering

Date: 2014-05-16
File Path: P:\20123694\02_WW_Collection_MP\Working_Dwgs\010_GIS\TCA_GIS\ArcMap\NotMatched.mxd

Figure 3-3



Regional Municipality of Wood Buffalo

Waste Water Management Plan
Asset Assessment

Storm Assets
Not Matched In CityWide

Legend:

- Storm Line - GIS data not joined to CityWide
- Storm Outfall - GIS data not joined to CityWide

222 un-matched storm line features

*Note:
Most appurtenances are pooled in CityWide and do not join 1:1 with GIS data.

Scale 1:25,000

May 2014

Associated Engineering

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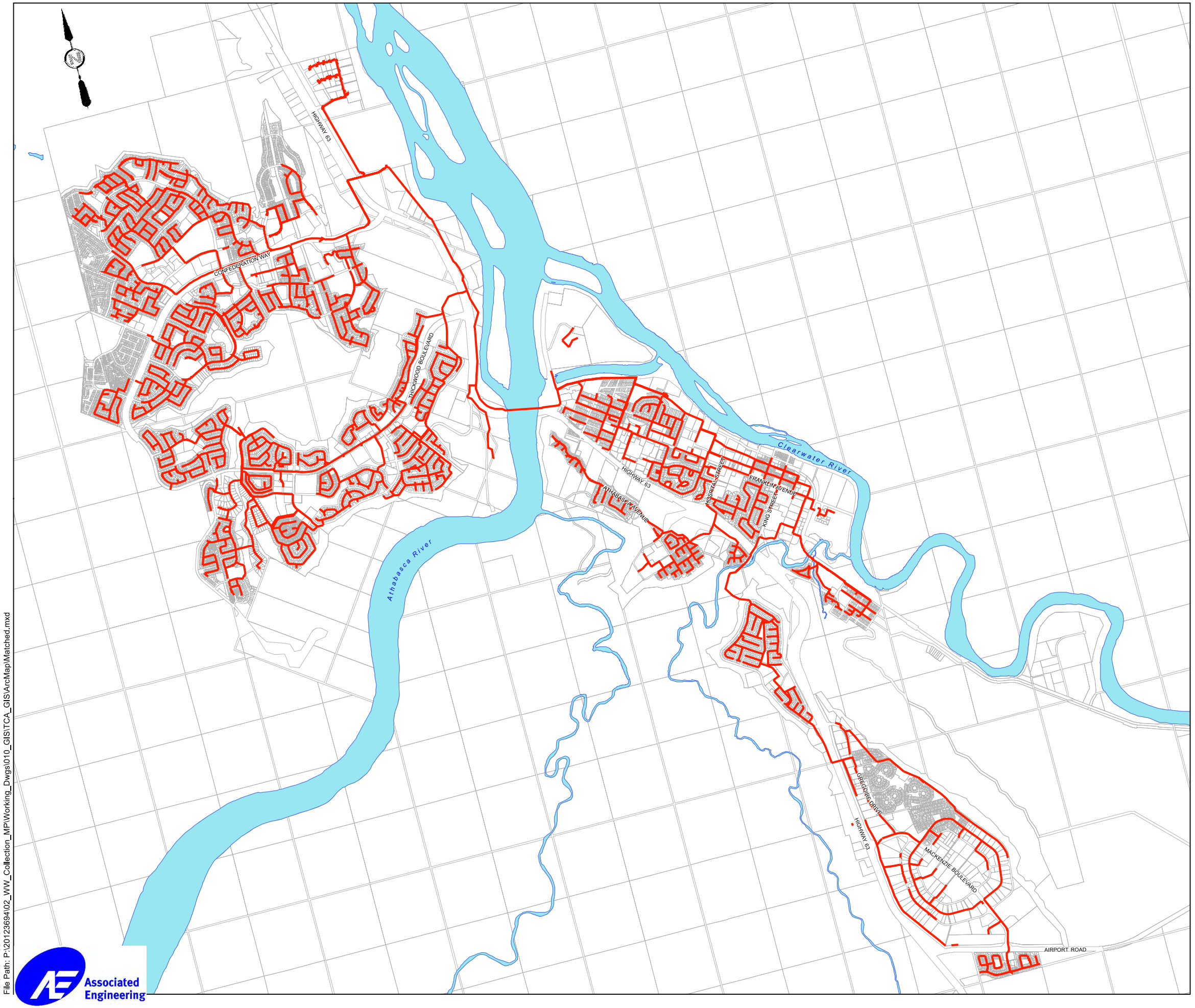
Figure 3-4



Date: 2014-05-16
File Path: P:\2012369\402_WW_Collection_MP\Working_Dwgs\010_GIS\TCA_GIS\ArcMap\Matched.mxd

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REGIONAL MUNICIPALITY OF WOOD BUFFALO

Waste Water Management Plan
Asset Assessment

Sanitary Assets
Successfully Matched In CityWide

Legend:

Sanitary Sewer - Joined to CityWide

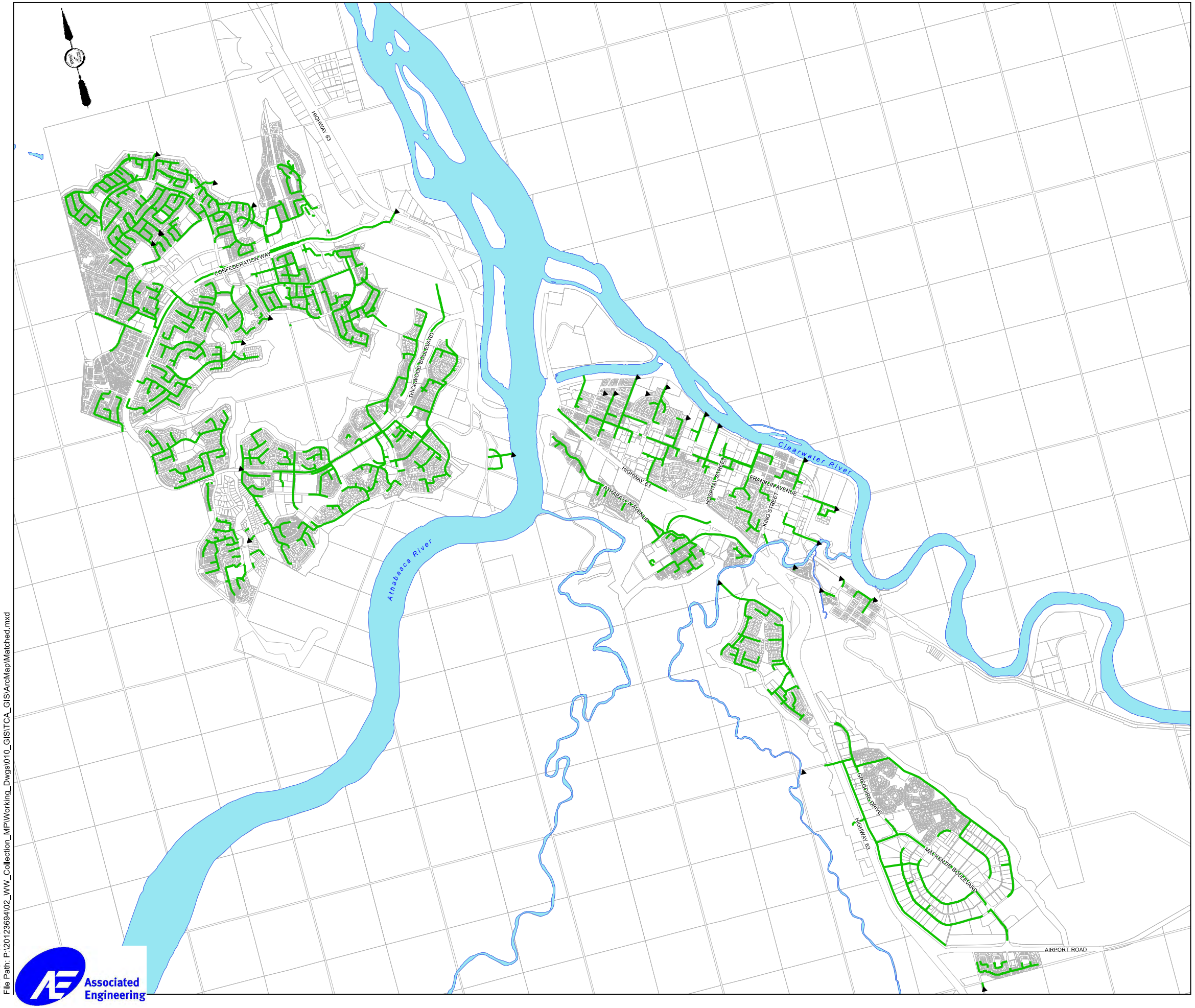
93% of GIS features joined 1:1 to CityWide.

*Note:
Most appurtenances are pooled in CityWide and do not join 1:1 with GIS data.

Scale 1:25,000

May 2014

Figure 3-5



Date: 2014-05-16
File Path: P:\2012\3694\02_WW_Collection_MP\Working_Dwgs\010_GIS\TCA_GIS\ArcMap\Matched.mxd

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REGIONAL MUNICIPALITY OF WOOD BUFFALO

Waste Water Management Plan
Asset Assessment

Storm Assets
Successfully Matched In CityWide

Legend:

- ▲ Storm Outfall - Joined to City Wide
- — Storm Sewer - Joined to City Wide

87% of GIS features joined 1:1 to CityWide.

*Note:
Most appurtenances are pooled in CityWide and do not join 1:1 with GIS data.
Catch Basin Leads not included.

Scale 1:25,000

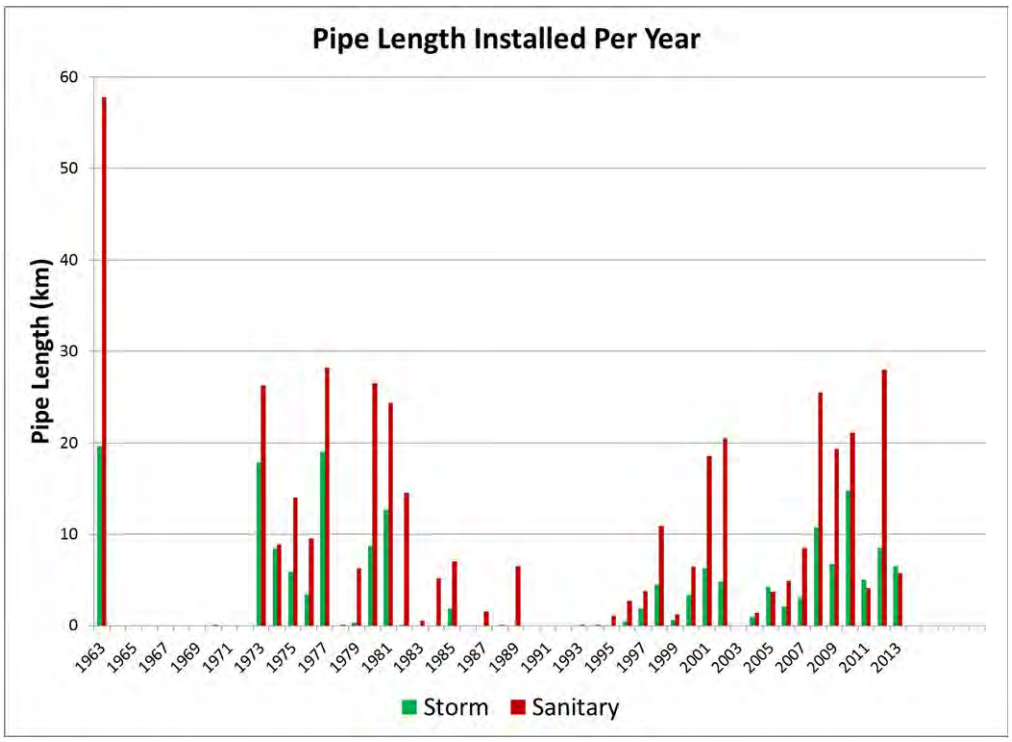
May 2014

Figure 3-6

4 Aging Infrastructure

The data from Citywide was analyzed to produce a histogram plot of the total pipe length that went into service in each year over the history of the data. The results of this histogram analysis are provided in the following figure. The earliest records date back to 1963; however, we have assumed that this was used as the default earliest start date for the data within the Citywide database, as much of the infrastructure was constructed as the town grew in the early-to-mid part of the 20th Century.

Figure 4-1
Histogram Analysis

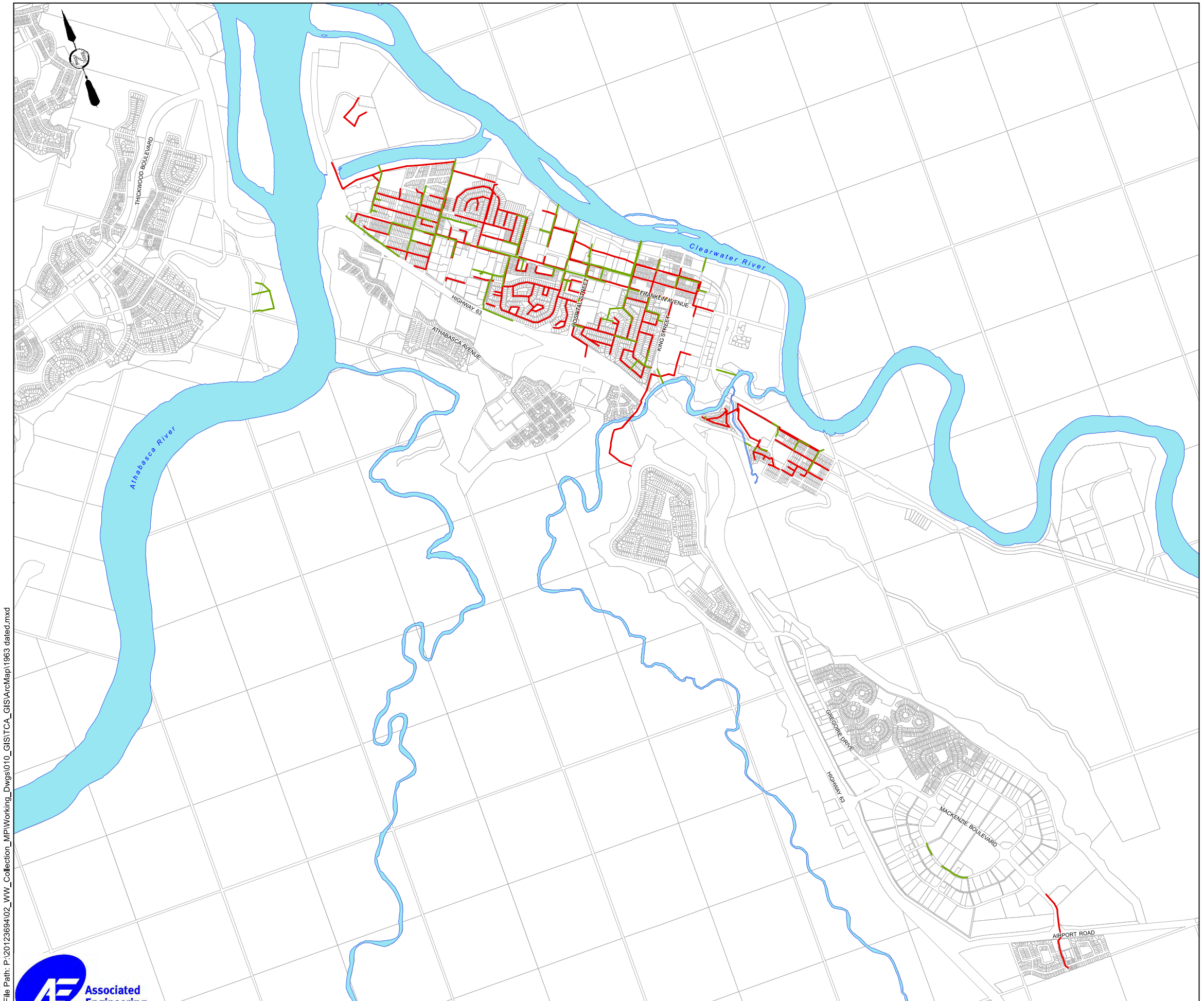


There are three general temporal ranges of when the significant majority of the infrastructure was constructed in Fort McMurray: 1963 and prior, 1973 to 1989, and then 1995 to present. This pattern reflects the growth of Fort McMurray itself, with pre-existing infrastructure from the original town and settlement in the Waterways and Lower Townsite areas, growth in the seventies with the rise of oil sands development, drastic decline in the late 1980's and early 1990's as growth in the region stalled, and the gradually increasing re-investment into Infrastructure following amalgamation with the Municipality, in 1995.

From a risk management perspective, this figure suggests a strategy that can be used to prioritize which infrastructure should be identified for investigation and review, based on life-cycle analysis. Prioritizing the infrastructure with an in-service date from 1963 and prior provides a finite starting point for CCTV inspection and other methods to identify those assets which may be at a moderate risk of reaching the end of their

useful life. This should be followed by those assets with in-service date of 1973 to 1989, which may have a moderate-to-low risk, and then finally those assets from 1995 and later, which have a low risk.

The attached map shows those assets that have an in-service date of 1963, or prior. Refer to Figure 4-2. As can be seen, this infrastructure covers the Lower Townsite and Waterways communities.



Regional Municipality of Wood Buffalo

Waste Water Management Plan
Asset Assessment

Utilities Dated 1963

Legend:

- Storm Lines - 208 Features
- Sanitary Lines - 494 Features

Scale 1:17,500

May 2014

Associated Engineering

Date: 2014-05-16
File Path: P:\20123694\02_WW_Collection_MP\Working_Dwgs\010_GIS\TCA_GIS\ArcMap\1963 dated.mxd

Figure 4-2

5 Conclusions

The Municipality currently has two parallel data sets to store the information about their assets. These systems are the GIS database, used by the Engineering and GIS Departments, and the Citywide data, used by the Finance Department.

The reconciliation between the two data sets is not complete. At this time, the data sets appear to be approximately 90% in alignment. Some significant infrastructure projects, such as the twin 750 mm forcemains between the Lower Townsite and the Wastewater Treatment Plant do not appear to have been entered into the Citywide database at this time.

The Municipality has between 248 km and 262 km of sanitary sewer pipes and between 173 km and 182 km of storm sewer pipes. The discrepancy is on account of the two data sets being as-of-yet unreconciled to 100% status.

Based on data in the Citywide database, the 2013 book value for wastewater collection and treatment assets is approximately $467 million. The 2013 book value for stormwater management, including storm ponds, is approximately $105 million. The combined total value of these assets is approximately $572 million.

The End-of-Life replacement value of wastewater collection and treatment assets is $1.4 billion. The end-of-life replacement value of stormwater assets, including storm ponds, is approximately $700 million. The combined total End-of-Life replacement value of these assets is $2.1 billion.

6 Recommendations

It is recommended that the Municipality begin planning for the adoption of a single Corporate-wide Asset Management Strategy. Rather than having multiple data sets, it is recommended that the Asset Management Strategy consist of a single data set for recording and reporting all assets which is able to interface to all of the departments in a manner which provides users with the information they need.

As part of the steps to achieving a single database of asset information, Associated Engineering recommends that the Municipality complete the data reconciliation between the current Citywide and GIS databases.

Associated Engineering recommends that the Municipality review their data input and management processes in consideration of their Asset Management Strategy. The review should take into consideration the needs of various departments, the timely and efficient sharing of data, tracking assets that are under construction or have been CCC'd or FAC'd, and the flow of financial information related to projects and assets.

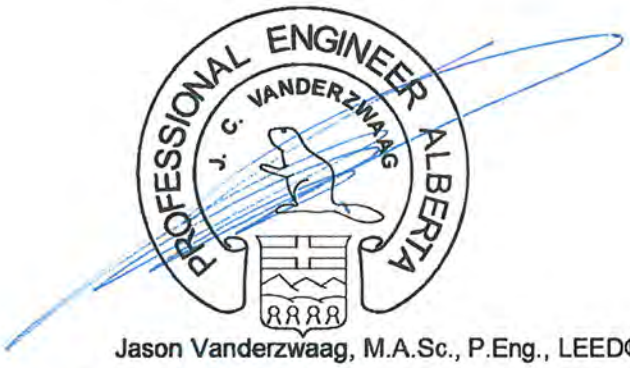
Associated Engineering recommends that the Municipality focus their condition assessments on those sanitary and storm sewers with in-service dates of 1963 (and prior). These assets have been identified in Figure 4-2, and are primarily located in the Lower Townsite and Waterways communities. The information developed through these condition assessments should be integrated with other assessment and planning tools such as the Master Plans and Flow Monitoring Programs, to direct the priorities of the Capital Infrastructure Planning and Budgets for infrastructure rehabilitation.

Closure

This report was prepared for the Regional Municipality of Wood Buffalo Wastewater Master Plan to assist in undertaking an inventory of their existing assets, and to compile a summary of the existing treatment, sanitary sewer, stormwater and snow storage assets operated by the Regional Municipality of Wood Buffalo.

The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
Associated Engineering Alberta Ltd.



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ASSOCIATED ENGINEERING
QUALITY MANAGEMENT SIGN-OFF
Signature: _____
Date: Sept. 29, 2014

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TECHNICAL MEMORANDUMS D.1.2 & D.1.3

Regional Municipality of Wood Buffalo

Wastewater Master Plan

Future Upgrades and Capital Plan

September 2014

CANADA'S BEST MANAGED COMPANIES

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1 Introduction

This technical memorandum provides a summary of the recommended upgrades for the treatment, sanitary sewer, stormwater, and snow storage assets, identified through all the elements of the Wastewater Master Plan Study. The objective beyond a capital project summary is to provide a basis for priority based decisions for existing system upgrades, in coordination with other municipal needs and systems extensions, based on development plans.

Upgrades to existing wastewater and stormwater collection systems are required to improve the level of service, or further protect public safety, to current standards, or to meet new regulatory standards within previously developed areas. The Regional Municipality of Wood Buffalo (the Municipality) has also completed a 5-year urban road prioritized rehabilitation strategy that considers roadway and water main conditions. The road rehabilitation strategy does not consider the future hydraulic capacity of the sanitary or stormwater systems and can, in cases, overlook upsizing needs or re-routing needs to meet future goals. This memorandum correlates the hydraulic capacity needs derived from the Wastewater Master Plan with the 5-year Road Rehabilitation Program to provide a comprehensive basis to plan and prioritize infrastructure rehabilitation.

System extensions are driven solely by development needs and are either constructed directly by the developer, or by the Municipality with costs recovered through developer charges and offsite levies.

Developer contributed assets generally include systems that solely service the development, such as:

- Local wastewater collection systems, services and mains;
- Trunk sewer mains, forcemains and lift stations isolated to one development;
- Local stormwater collection systems;
- Stormwater storage ponds; and
- Stormwater outfalls.

Municipal capital assets generally include systems that service more than one development, such as:

- Treatment facilities; and
- Trunk sewer mains, forcemains, and lift stations.

The Municipality's best strategy for planning and construction of system extensions is to focus development around existing infrastructure and construct new infrastructure with a controlled approach to avoid unnecessary over-investments, or investments with excessively long payback periods from developer charges.

2 Summary

A summary of all future upgrades, the drivers, and costs is presented in Table 2-1.

Table 2-1
Upgrade Summary

	Summary of Recommended Upgrades	Key Drivers				Cost $M	Planning Initiation Year	Tech Memo (TM) Reference
		Growth	Level of Service	Environmental/ Regulatory	Public Health and Safety			
Wastewater Collection	Upgrade Existing System for Existing Development*		✔	✔	✔	90	2014	B.2.5/Table 5-1
	Upgrade Existing System to Accommodate Re-Development*	✔			✔	40	2015	B.2.5/Table 5-1
	Main Lines for New Development**	✔				353	2017	B.2.5/Table 5-2
	Lift Stations & Force Mains for New Development**	✔				204	2017	B.2.5/Table 5-2
	Inflow/Infiltration Reduction Program	✔	✔	✔	✔	6.5	2014	B.2.5/Table 5-1
Wastewater Treatment	Verify Influent Flows					0.1	2014	A.1.4/Section 3
	Evaluate Septage Impacts on WWTF			✔		0.1	2014	A.1.4/Section 3
	Mud Pit Wastes Concept Design		✔			0.2	2015	A.1.4/Section 3
	Confirm/Implement Decentralized WWT Strategy**	✔				235	2017	A.2.1.2/Section 6
	Effluent Filtration at WWTF			✔		60	2014	2014-04-15 letter to AD
	Full WWTF Build-out	✔		✔		130	2015	2014-04-15 letter to AD
	Update Total Loadings Plan			✔		0.1	2015	A.3.3.2/Section 10
	Evaluate Longer Term Options for Biosolids Management	✔		✔		0.2	2015	A.3.4/Section 9.1
	Implement Longer Term Biosolids Management Consistent with Green Initiatives	✔		✔		100	2018	A.3.4/Section 9.2
	Second Wet Scrubber for Reliable Odour Control		✔	✔		2	2018	A.3.5/Section 7.1
	Upgrade Odour Control Systems to Suit Longer Term Biosolids Management Plan		✔	✔		0.1	2018	A.3.5/Section 7.2

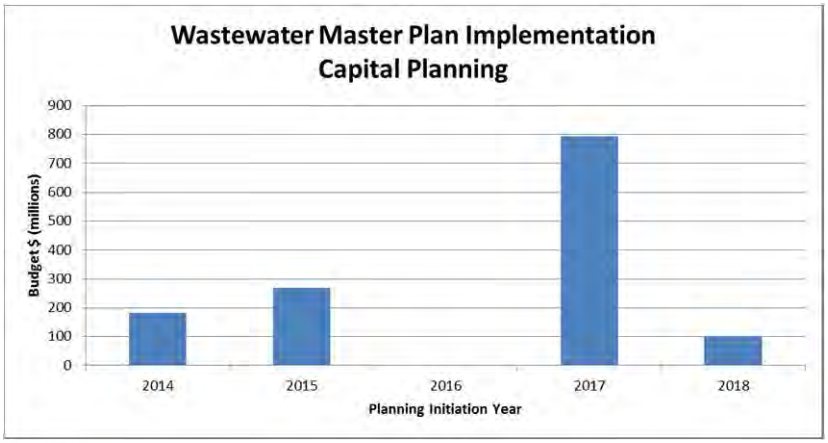
	Summary of Recommended Upgrades	Key Drivers: Growth	Key Drivers: Level of Service	Key Drivers: Environmental/ Regulatory	Key Drivers: Public Health and Safety	Cost $M	Planning Initiation Year	Tech Memo (TM) Reference
Stormwater Collection	Reduce flooding of private property*		✔		✔	63.5	2015	C.1.2/Table 6-1
	Prevent Overbank Spills, Erosion, & Property Damage*		✔	✔	✔	2.7	2015	C.1.2/Table 6-1
	Reduce Street Flooding and Obstruction to Traffic*		✔		✔	42.3	2015	C.1.2/Table 6-1
	Drainage Planning for Future Development Areas**	✔				2	2017	C.1.2 Table 6-1
	Lower Townsite Storm Pumping Facilities		✔		✔	2	2015	C.3.4
	Outfall Repairs and Cleaning		✔		✔	2.3	2014	C.2.1/Figures 4-1 to 4-4/Table 5-1
	Outfall Monitoring Program		✔	✔		0.2	2014	C.2.2/Table 3-1
	Snow Reclamation Facility Phase 1a	✔	✔	✔		22	2014	C.3.3/Section 3.2
	Outfall Inventory		✔	✔		2.3	2014	C.2.1

* Prioritization details in Section 3

**Denotes items that are driven solely by new development

Figure 2-1 shows the recommended allocated budgets for capital planning purchases, based on the aggregation of projects by the year for which the planning is to be initiated. Note that Figure 2-1 does not present a projected cash flow, but rather indicates the starting year for which budgets need to begin to be allocated. The cash flow of each individual project will depend on the nature, scope, and duration of each project and should be resolved during the pre-design or project planning phase.

Figure 2-1
Initial Project Implementation



The significant budget allocation for 2017 is composed primarily of the costs associated with the South Wastewater Treatment Facility, as part of the decentralized wastewater treatment strategy ($235 million), as well as sanitary lift stations and trunk lines needed to service the new development areas ($204 and $353 million, respectively). The actual cash flow for new development areas will be driven by population growth. It is also anticipated that some of these costs may be borne by private developers.

3 Existing Infrastructure Upgrades

The following presents the recommended existing system upgrades to the treatment, sanitary sewer collection, and stormwater management systems. Upgrades to the treatment facilities are independent of the collection system and other Municipal improvements, and are driven primarily by population growth and regulatory needs. The collection systems require more detailed consideration to coordinate projects with others elements (e.g., road rehabilitation) to avoid completing a roadway overlay one year only to remove it to upgrade a sewer the next year.

3.1 TREATMENT

The following projects (Table 3-1) have been identified as the required upgrades to the existing Wastewater Treatment Facility and are recommended to be commenced as part of the 2015 Capital Plan. These are complex, multi-year projects that are planned to be initiated in 2015, with an anticipated project cycle of 2-3 years.

Table 3-1
Existing Wastewater Treatment Facility Upgrades

Project	Sub-Project	TM Reference	Cost
Effluent Filtration at the WWTF	Filtration Facility Design and Construction	A.2.2.3	$60,000,000
	Operating Procedure Review of Vortex Grit Chamber and Foul Air Scrubber	A.2.2.3	$200,000
Full WWTF Facility Build-Out	Fourth Bioreactor Design and Construction	A.2.2.3	$90,000,000
	Fourth Secondary Clarifier Design and Construction	A.2.2.3	$40,000,000
	SCADA Back-up	A.2.2.3	$100,000

Further treatment facility action items are listed in Table 3-2, in order of priority. Further details of each recommendation can be found in the relevant Technical Memorandum, as indicated. These items are important to gauge future asset management decisions, as they will define other long term needs.

Table 3-2
Secondary Wastewater Treatment Studies

Action Item	Cost (Millions)	Planning Initiation Year	TM Reference
Verify influent flows	0.1	2014	A.1.4 Section 3
Evaluate septage impacts on WWTF	0.1	2014	A.1.4 Section 3
Mud pit wastes concept design	0.2	2015	A.1.4 Section 3
Update Total Loadings Plan	0.1	2015	A.3.3.2 Section 10
Evaluate longer term options for biosolids management	0.2	2015	A.3.4 Section 9.1
Second wet scrubber for reliable odour control	2	2018	A.3.5 Section 7.1
Upgrade odour control systems to suit longer term biosolids management plan	0.1	2018	A.3.5 Section 7.2
Implement longer term biosolids management consistent with green initiatives	100	2018	A.3.4 Section 9.2

3.2 SANITARY COLLECTION SYSTEM

All of the recommended upgrades from Technical Memorandum B.2.5: Final Model and Upgrade Report were broken into individual projects, based on geographic location, are listed in Table 3-3. All of the upgrades are categorized as either being driven by hydraulic constraints in the existing condition, and therefore, require upgrade within the next 0 to 5 year period, or will be hydraulically constrained subject to future growth and/or redevelopment, and therefore, require upgrades within approximately 5 to 20 years.

Table 3-3
Wastewater Collection Upgrade Project List

Urgency	Project	TM B.2.5 Reference	Cost $M
0 to 5 years	Mackenzie Boulevard North	13 (partial)	5.7
	Birch, Bennett and Centennial	10	4.9
	Dickens Drive	2 (partial)	3.05
	Mackenzie Boulevard South	13 (partial)	5.7

Urgency	Project	TM B.2.5 Reference	Cost $M
	Gregoire Drive	12	10.1
	Leigh Crescent	2 (partial)	8.25
	Timberlea Perimeter Sewer - A	1A	26.35
	Timberlea Perimeter Sewer - B	1B	11.3
	Wood Buffalo Way	4	3.9
	Thickwood Perimeter Sewer - A	6A	9.93
	Thickwood Perimeter Sewer - B	6B	4.61
	Thickwood Perimeter Sewer - C	6C	8.74
	McKay Crescent Sewer	13 (partial)	11.5
5 to 20 years	Alberta Drive	9 (partial)	3.0
	Main Street	7	5.4
	Cornwall Outfall	3	0.8
	Haineault Street	8	1.5
	Father Mercredi and Hill Drive West	9 (partial)	7.0
	Timberlea Sewer Outfall	1C	3.85
	Railway Ave	11	3.2
	Westwood Drive	5	3.7
	Franklin - Haineault to Alberta Drive	9 (partial)	2.0

In addition to the upgrades identified above, new sanitary lift stations and mains will be required to service new growth areas. The identification and prioritization of these projects are discussed in Section 4.

3.3 STORMWATER MANAGEMENT SYSTEM UPGRADES

All of the recommended upgrades, regarding stormwater conveyance or management from Technical Memorandum C.1.2: Stormwater Management Plan, are presented in Table 3-4. The driver for each project was identified to mitigate one of the following: erosion concern or other environmental risk, and flooding on private property or on a public roadway, either arterial or collector of local road.

Note that localized improvements, in particular the installation of individual catch basins as detailed in the Stormwater Management Plan, are not included below. It is recommended that these works be reviewed and included in the appropriate road re-surfacing or paving projects when those works are scheduled.

Table 3-4
Stormwater Collection System Upgrade Project List

Project Name	TM C.1.2 Reference	Driver	Cost $M
Beacon Hill Outfall	BH-4	Erosion/Environmental	0.63
Gregoire Outfall	MG-1	Erosion/Environmental	2.12
Thickwood Heights Stormwater Management	TH-12, TH-11	Flooding on Private Property	9.72
Beaconwood Place	BH-3	Flooding on Private Property	1.37
Mackenzie Storm Improvements	MG-4, MG-5	Flooding on Private Property	5.33
Mackenzie Boulevard North	MG-7	Flooding on Arterial	13.64
Thickwood Boulevard Stormwater Management	TH-9, TH-8	Flooding on Arterial	3.13
Gregoire Drive	MG-2	Flooding on Arterial	15.62
MacLeod Street	LTS-6 (partial)	Flooding on Collector	3.9
Father Mercredi	LTS-5	Flooding on Collector	1.7
Birch, Bennett and Centennial	LTS-10	Flooding on Collector	6.6
Wolverine	TH-4, TH-5	Flooding on Collector	5.09
Alberta Drive	LTS-8, LTS-6 (partial)	Flooding on Collector	15.3
Franklin Drive	LTS-6 (partial)	Flooding on Arterial	4.6

Project Name	TM C.1.2 Reference	Driver	Cost $M
Main Street	LTS-3	Flooding on Collector	2.4
King and Fraser	LTS-11	Flooding on Collector	3.2
Signal Road Stormwater Management	TH-3, TH-7	Flooding on Collector	11.62
Waterways Storm Outfall	WW-1	Flooding on Local Road	0.46
Beaverridge Close	BH-2 (partial)	Flooding on Local Road	1.6
Rae Crescent	LTS-13	Flooding on Local Road	3.6
Simcoe Way	TH-2	Flooding on Local Road	0.35
Hardin Street	LTS-4	Flooding on Local Road	2.9
Walmart and Canadian Tire	LTS-9	Flooding on Local Road	1.5
Beaconsfield Road	BH-2 (partial)	Flooding on Local Road	3.72

In addition to the upgrades identified above, new Stormwater Management assets and strategies will be required to service the new growth areas. However, the nature of the topology of the Fort McMurray region is such that each development area on each plateau must accommodate its own stormwater infrastructure.

It is assumed that the planning, design, and construction of this infrastructure will be undertaken in general conformance with the recommendations shown in TM C.1.2, but that the prioritization and funding for these will be driven by the developers in the new growth areas. As such, the stormwater management assets for future growth areas are not included in the funding and prioritization analysis.

3.4 CORRELATION WITH OTHER INFRASTRUCTURE ASSESSMENTS AND MASTER PLANS

In 2013, Associated Engineering assisted the Municipality in the project planning for the 2014 to 2016 Urban Infrastructure Rehabilitation Program (UIRP). This exercise included a systematic inventory of the pavement condition on every length of road within the Urban Service Area. This information was supplemented with watermain break history, as reported by the Underground Services Department, as a surrogate for the condition of the watermain underneath each road. These two data sources were then used to: (a) identify those roads requiring repair; and (b) of those roads requiring repair, whether the road can be resurfaced, or if a total rehabilitation (i.e., underground and surface) will be required. The outcome of this exercise is a list of recommended road resurfacing and full rehabilitation projects, and the prioritization of individual projects over a three year period.

For the purpose of capital planning, the UIRP projects, which overlapped with the recommended infrastructure upgrades described in the Wastewater Master Plan, were identified, and grouped together into single projects. The purpose of this was three-fold: (1) to identify any road re-surfacing projects where a pipe upgrade is also recommended, so that the resurfacing projects can be expanded to include the underground infrastructure; (2) to ensure that any full rehabilitation projects included the recommended pipe sizes in accordance with the Wastewater Master Plan; and (3) to determine if the prioritization of any of the UIRP projects needs to be adjusted as a result of the findings of the Wastewater Master Plan.

While not included in the current analysis, it is recommended that the Municipality revisit this assessment in light of other assets data sources or information about the condition and status of infrastructure that may be available. Potential sources include the Water Master Plan, any Transportation Master Planning documentation (i.e., where additional lanes or channelization may be required on existing roads), and the outcome of the sanitary sewer condition assessments in the Lower Townsite and Waterways, as recommended to be undertaken in Technical Memorandum D.1.1.

3.5 SCORING AND PRIORITIZATION

All of the recommended upgrades, on the sanitary collection and stormwater management systems, were compiled into a single spreadsheet. Scoring was assigned as shown in Table 3-5, below:

Table 3-5
Project Prioritization Scoring

Points	Location and Upgrade
Sanitary	
5 Points	Upgrades required in the next 0 to 5 years (i.e., pipe is under-capacity for existing condition)
1 Point	Upgrades required in the next 5 to 20 years (i.e., pipe is under-capacity for future growth)
Storm	
5 Points	Project Mitigates Erosion or Environmental Risks
4 Points	Project Mitigates Flooding on Private Property
3 Points	Project Mitigates Flooding on Arterial Roads
2 Points	Project Mitigates Flooding on Collector Roads
1 Point	Project Mitigates Flooding on Local Roads
UIRP (i.e., if the Sanitary or Storm Upgraded Overlapped with a UIRP Project)	
4 Points	1st Year Priority
3 Points	2nd Year Priority
2 Points	3rd Year Priority
1 Points	No Priority Given in First 3 Years

Further to the points assigned in Table 3-5, an additional 5 points were assigned to any project which is within the immediate vicinity of any other project already under construction. In these instances, it is recommended that the projects be reviewed for opportunities to achieve substantial cost savings and project efficiencies by expanding the scope of the construction works to include the recommended upgrade. These projects were identified as follows: Alberta Drive, Wolverine Drive, Prairie Loop Boulevard related storm upgrades (McLeod Street and Father Mercredi), and the Waterways Storm Outfall.

Table 3.6 presents the outcome of the scoring and prioritization analysis, and a map of the identified projects is presented in Figure 3-1. Figure 3-1-1 to 3-1-4 demonstration the prohibited projects over 4 stages of roughly $50M in annual wastewater and stormwater capital expenses.

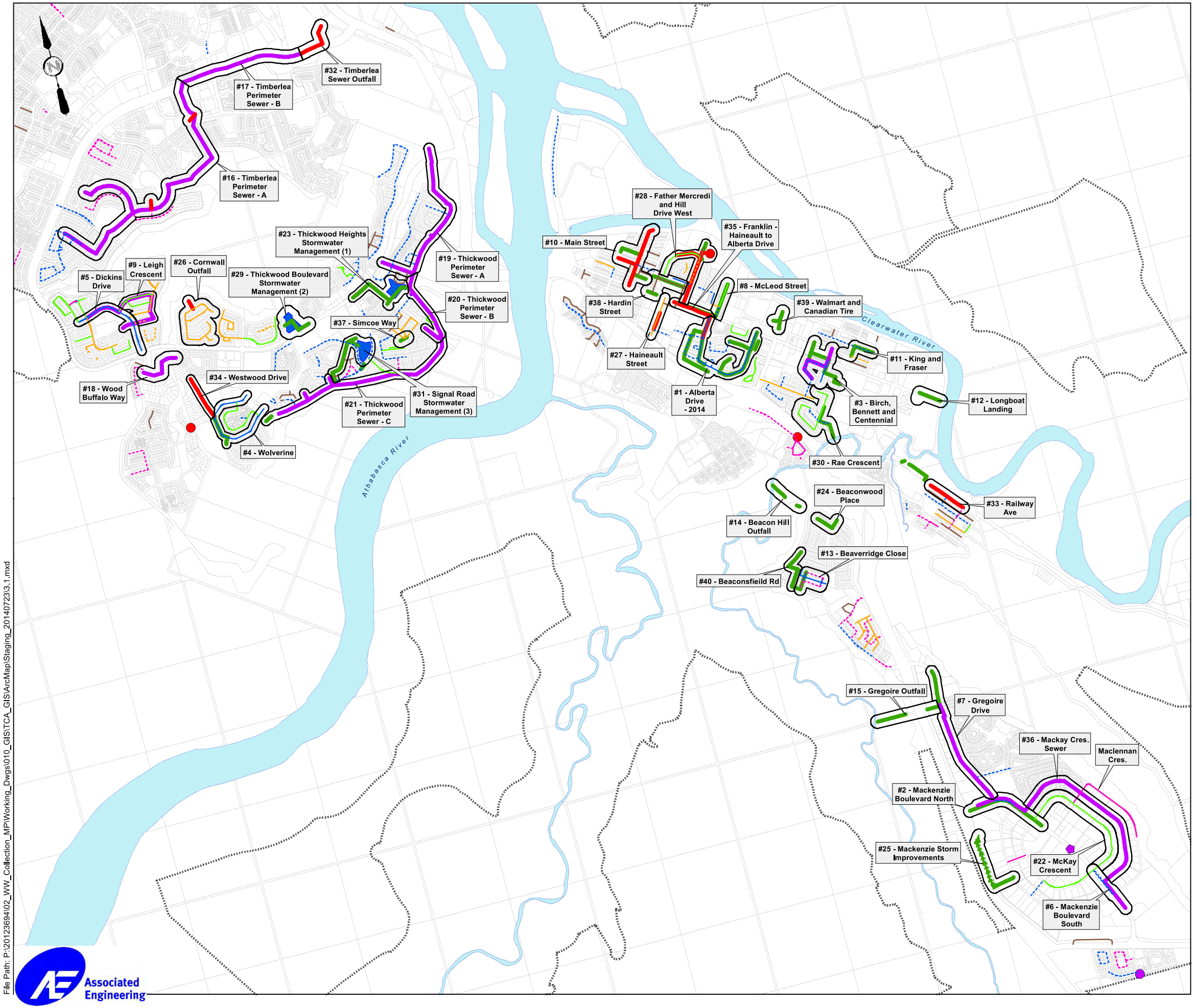
Some of the road segments within and/or in the immediate vicinity of the following projects were originally scheduled to be re-surfaced within the next three years, under the UIRP. It is recommended that these projects be expanded to include a full urban rehabilitation program to replace the underground infrastructure, including the pipe upgrades identified above.

- Mackenzie Boulevard North
- Birch, Bennett and Centennial
- Leigh Crescent
- Main Street
- King and Fraser
- Beaverridge Close
- Father Mercredi and Hill Drive West
- Rae Crescent

As the Wastewater Master Plan is focused on sanitary and stormwater assets, it should be noted that those projects already identified in the UIRP that do not overlap nor can be combined with any of the recommended storm or sanitary sewer upgrades were not included in the analysis. These projects are still recommended to proceed in accordance with their own prioritization. It is recommended that once all data has been obtained from the other project sources identified Section 2.2 (water master plan, condition assessments, etc.) and the appropriate metrics assigned for the various project drivers that a multi-faceted prioritization analysis be undertaken to update the list with a full and comprehensive Master Infrastructure Rehabilitation Plan.

Table 3-6
Project Prioritization

Project Name	Anticipated 2014 Project Costs	Sewer			Storm						Construction Underway	UIRP				Score	Priority	Cost*	Notes
		ID	0-5 yr	5-20 yr	ID	Erosion / Environment	Private	Arterial	Collector	Local		Year 1	Year 2	Year 3	Year 3+				
Points			**5**	**1**		**5**	**4**	**3**	**2**	**1**	**5**	**4**	**3**	**2**	**1**				
Alberta Drive	Ongoing	9 (partial)		√	LTS-8, LTS-6 (partial)				√		√	√				12	1	$ 18.34 M	Existing 2014 Project, Internal local roads remain
Mackenzie Boulevard North		13 (partial)	√		MG-7			√				√				12	2	$ 13.64 M	Mackenzie Diversion (?)
Birch, Bennett and Centennial		10	√		LTS-10				√			√				11	3	$ 11.48 M	Install new Storm on Birch, not Franklin
Wolverine	Ongoing				TH-4, TH-5				√		√	√				11	4	$ 5.09 M	Existing 2014 Project
Dickens Drive	Ongoing	2 (partial)	√									√				9	5	$ 3.05 M	Existing 2014 Project
Mackenzie Boulevard South		13 (partial)	√									√				9	6	$ 5.74 M	
Gregoire Drive		12	√		MG-2			√								8	7	$ 15.62 M	Combine with Beacon Hill Watermain?
Macleod Street					LTS-6 (partial)			√			√					8	8	$ 3.90 M	
Leigh Crescent		2 (partial)	√											√		7	9	$ 8.25 M	
Main Street		7		√	LTS-3				√			√				7	10	$ 12.27 M	
King and Fraser					LTS-11				√			√				6	11	$ 3.16 M	
Waterways Storm Outfall					WW-1					√	√					6	12	$ 0.46 M	
Beaverridge Close					BH-2 (partial)					√		√				5	13	$ 1.59 M	
Beacon Hill Outfall					BH-4	√										5	14	$ 0.63 M	
Gregoire Outfall					MG-1	√										5	15	$ 2.12 M	
Timberlea Perimeter Sewer - A		1A	√													5	16	$ 26.35 M	High Priority Based on level of Service Requirements
Timberlea Perimeter Sewer - B		1B	√													5	17	$ 11.30 M	Verify priority w.r.t. part A
Wood Buffalo Way		4	√													5	18	$ 3.85 M	
Thickwood Perimeter Sewer - A		6A	√													5	19	$ 9.93 M	Verify priority. Combine with T.wood SWMP?
Thickwood Perimeter Sewer - B		6B	√													5	20	$ 4.61 M	Verify priority. Combine with T.wood SWMP?
Thickwood Perimeter Sewer - C		6C	√													5	21	$ 8.74 M	Verify priority. Combine with T.wood SWMP?
McKay Crescent Sewer		13 (partial)	√													5	22	$ 11.49 M	New Sewer along McKay Crescent?
Thickwood Heights Stormwater Management					TH-12, TH-11		√									4	23	$ 9.72 M	Or upsize storm pipe with T.wood Perimeter San Sewer?
Beaconwood Place					BH-3		√									4	24	$ 1.37 M	
Mackenzie Storm Improvements					MG-4, MG-5		√									4	25	$ 5.33 M	
Cornwall Outfall		3		√										√		3	26	$ 0.75 M	
Haineault Street		8		√										√		3	27	$ 1.49 M	
Father Mercredi and Hill Drive West		9 (partial)		√	LTS-5									√		3	28	$ 8.74 M	
Thickwood Boulevard Stormwater Management					TH-9, TH-8			√								3	29	$ 3.13 M	
Rae Crescent					LTS-13					√					√	2	30	$ 3.67 M	
Signal Road Stormwater Management					TH-3, TH-7				√							2	31	$ 11.62 M	Or upsize storm pipe with T.wood Perimeter San Sewer?
Timberlea Sewer Outfall		1C		√												1	32	$ 3.85 M	
Railway Ave		11		√												1	33	$ 3.20 M	
Westwood Drive		5		√												1	34	$ 3.73 M	
Franklin - Haineault to Alberta Drive		9 (partial)		√	LTS-6 (partial)			√								4	35	$ 4.80 M	
McKay Crescent															√	1	36		Possibly add sewer to divert flow from Prairie Creek?
Simcoe Way					TH-2					√						1	37	$ 0.35 M	
Hardin Street					LTS-4					√						1	38	$ 2.90 M	
Walmart and Canadian Tire					LTS-9					√						1	39	$ 1.50 M	
Beaconsfield Road					BH-2 (partial)					√						1	40	$ 3.72 M	
* Cost is only for the replacement or construction of assets identified in the WWMP. It does not account for the costs for rehabilitation of other assets or utilities, including those identified in the UIRP																**TOTAL**		**$ 251.47 M**	



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REGIONAL MUNICIPALITY OF WOOD BUFFALO

Wastewater Master Plan
Future Costs and Capital Plan

Summary of All Recommended Wastewater Collection and Stormwater Projects

Legend:

WWMP Projects

- Sanitary Pipe Upgrade 0-5 Years
- Sanitary Pipe Upgrade 5-20 Years
- Sanitary Lift Station Upgrade 0-5 Years
- Sanitary Lift Station Upgrade 5-20 Years
- Sanitary I/I Reduction 0-5 Years
- Storm - Pipe
- Storm - Ditch
- Storm Pond Upgrade

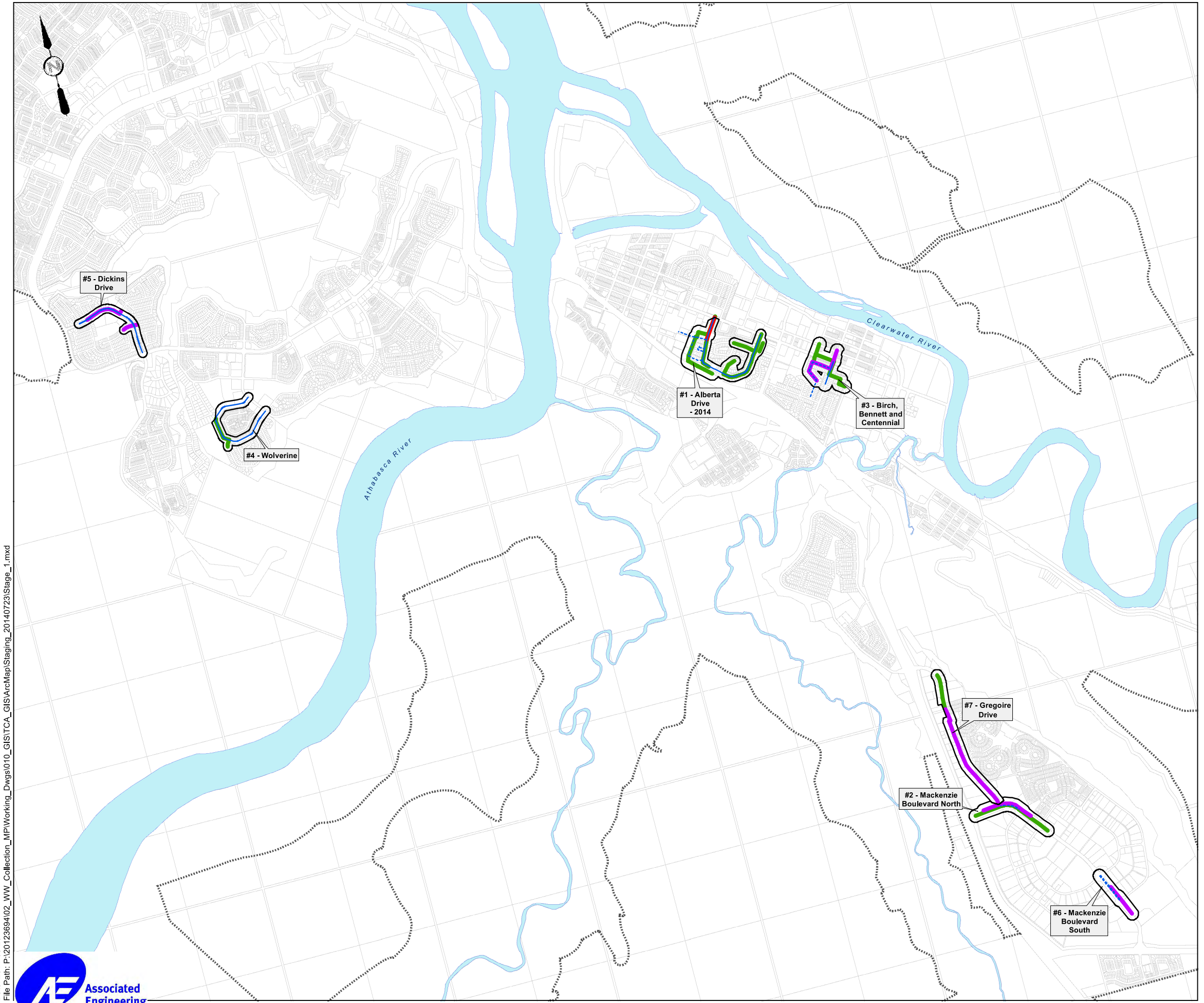
Roadway Rehabilitation

- Year 1, Reconstruction
- Year 1, Surface Only
- Year 2, Reconstruction
- Year 2, Surface Only
- Year 3, Reconstruction
- Year 3, Surface Only
- Roadway - Reconstruction >3 Years
- Alley - Reconstruction >3 Years

Scale 1:20,000

September 2014

Figure 3.1



REGIONAL MUNICIPALITY OF WOOD BUFFALO

Wastewater Master Plan
Future Costs and Capital Plan

Stage 1
Recommended Wastewater Collection and Stormwater Projects

Legend:

WWMP Projects

- Sanitary Pipe Upgrade 0-5 Years
- Sanitary Pipe Upgrade 5-20 Years
- Sanitary Lift Station Upgrade 0-5 Years
- Sanitary Lift Station Upgrade 5-20 Years
- Sanitary I/I Reduction 0-5 Years
- Storm - Pipe
- Storm - Ditch
- Storm Pond Upgrade

Roadway Rehabilitation

- Year 1, Reconstruction
- Year 1, Surface Only
- Year 2, Reconstruction
- Year 2, Surface Only
- Year 3, Reconstruction
- Year 3, Surface Only
- Roadway - Reconstruction >3 Years
- Alley - Reconstruction >3 Years

Scale 1:20,000

September 2014

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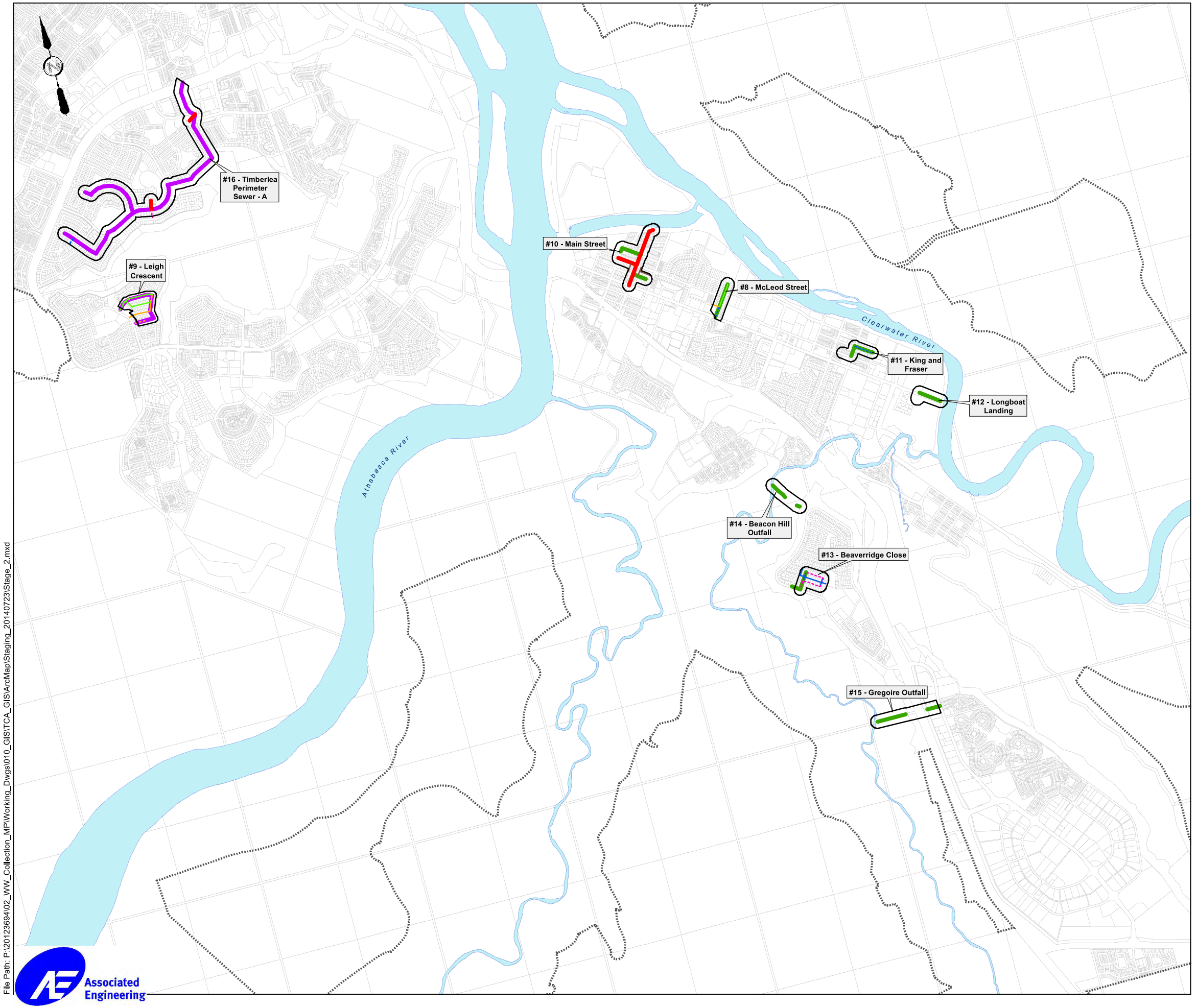
Associated Engineering

Figure 3.1-1



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Associated Engineering

REGIONAL MUNICIPALITY OF WOOD BUFFALO

Wastewater Master Plan
Future Costs and Capital Plan

Stage 2
Recommended Wastewater Collection and Stormwater Projects

Legend:

WWMP Projects

- Sanitary Pipe Upgrade 0-5 Years
- Sanitary Pipe Upgrade 5-20 Years
- Sanitary Lift Station Upgrade 0-5 Years
- Sanitary Lift Station Upgrade 5-20 Years
- Sanitary I/I Reduction 0-5 Years
- Storm - Pipe
- Storm - Ditch
- Storm Pond Upgrade

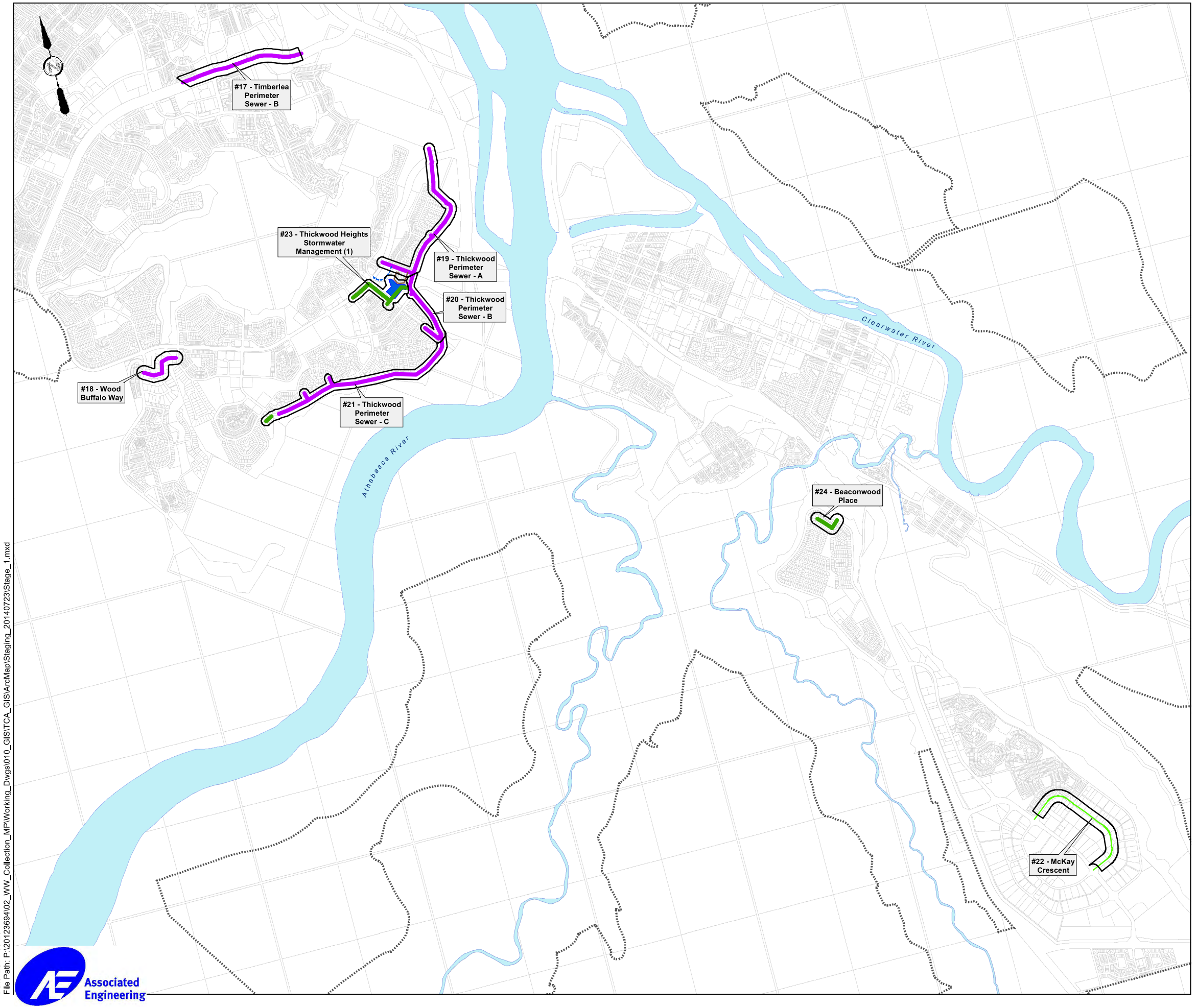
Roadway Rehabilitation

- Year 1, Reconstruction
- Year 1, Surface Only
- Year 2, Reconstruction
- Year 2, Surface Only
- Year 3, Reconstruction
- Year 3, Surface Only
- Roadway - Reconstruction >3 Years
- Alley - Reconstruction >3 Years

Scale 1:20,000

September 2014

Figure 3.1-2



REGIONAL MUNICIPALITY OF WOOD BUFFALO

Wastewater Master Plan
Future Costs and Capital Plan

Stage 3
Recommended Wastewater Collection and Stormwater Projects

Legend:

WWMP Projects

- Sanitary Pipe Upgrade 0-5 Years
- Sanitary Pipe Upgrade 5-20 Years
- Sanitary Lift Station Upgrade 0-5 Years
- Sanitary Lift Station Upgrade 5-20 Years
- Sanitary I/I Reduction 0-5 Years
- Storm - Pipe
- Storm - Ditch
- Storm Pond Upgrade

Roadway Rehabilitation

- Year 1, Reconstruction
- Year 1, Surface Only
- Year 2, Reconstruction
- Year 2, Surface Only
- Year 3, Reconstruction
- Year 3, Surface Only
- Roadway - Reconstruction >3 Years
- Alley - Reconstruction >3 Years

Scale 1:20,000

September 2014

Associated Engineering

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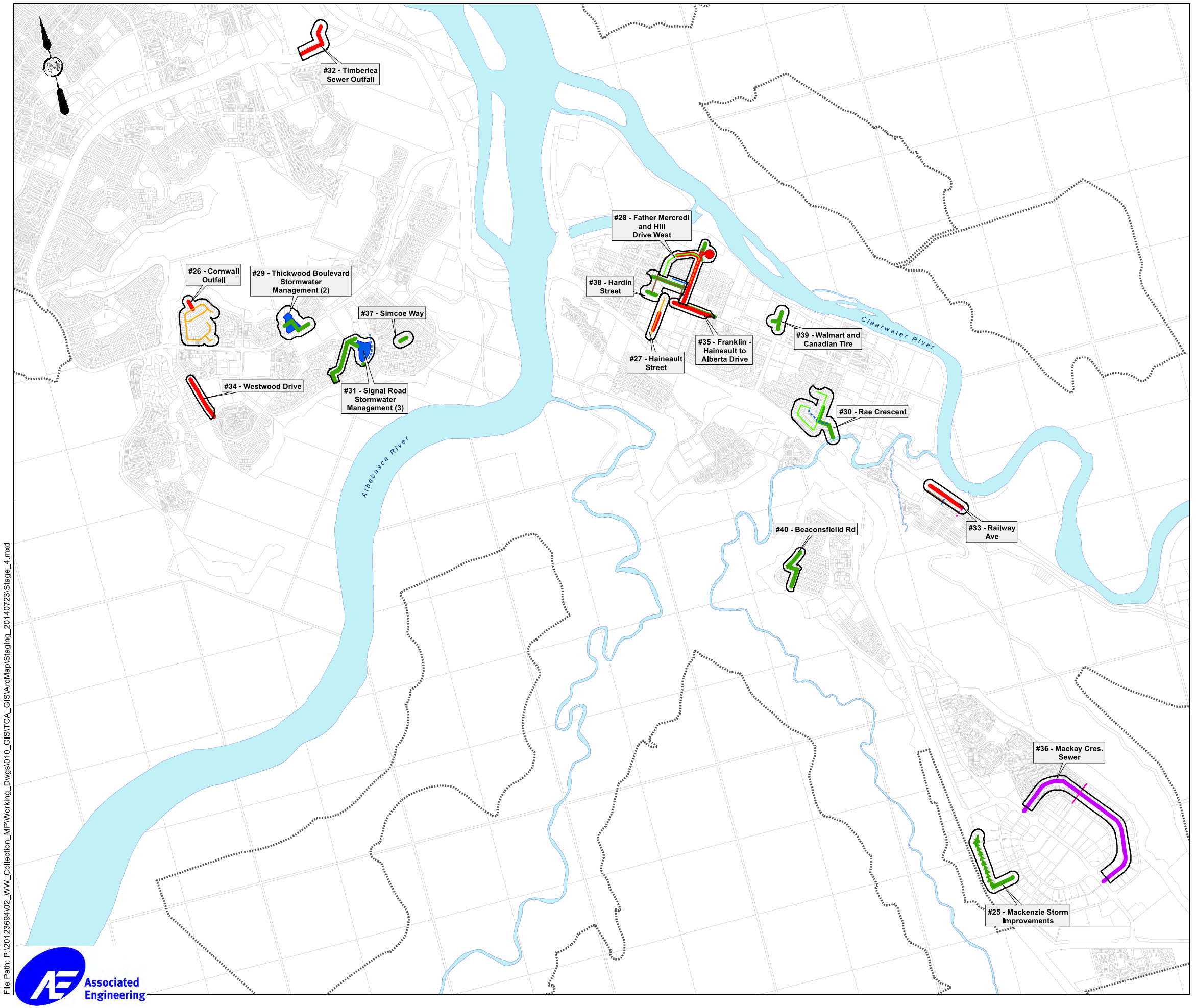
Figure 3.1-3



REGIONAL MUNICIPALITY OF WOOD BUFFALO

Wastewater Master Plan
Future Costs and Capital Plan

Stage 4
Recommended Wastewater Collection and Stormwater Projects

Legend:

WWMP Projects

- Sanitary Pipe Upgrade 0-5 Years
- Sanitary Pipe Upgrade 5-20 Years
- Sanitary Lift Station Upgrade 0-5 Years
- Sanitary Lift Station Upgrade 5-20 Years
- Sanitary I/I Reduction 0-5 Years
- Storm - Pipe
- Storm - Ditch
- Storm Pond Upgrade

Roadway Rehabilitation

- Year 1, Reconstruction
- Year 1, Surface Only
- Year 2, Reconstruction
- Year 2, Surface Only
- Year 3, Reconstruction
- Year 3, Surface Only
- Roadway - Reconstruction >3 Years
- Alley - Reconstruction >3 Years

Scale 1:20,000

September 2014

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Figure 3.1-4

4 Future Expansion Needs

The future expansion needs for the systems area defined in the following Technical Memorandums, submitted separately:

- **TM A.1.5 - Urban Sub-Regional Population Projection:** Defines the basis for long-term development staging and population growth demands based on the current Municipal growth plans.
- **TM A.3.6 – Wastewater Treatment Summary Report:** Defines the future plans for a new wastewater treatment plant to service the south growth areas.
- **TM B.2.5 – Wastewater Collection System, Final Model and Collection System Upgrades:** Includes a plan for providing sanitary sewer servicing of future growth areas.
- **TM C.1.2 – Stormwater Management, Stormwater Management Plan:** Includes a plan for stormwater management requirements for future growth areas.

4.1 FUTURE GROWTH AREA SERVICING CONCEPTS

Figure 4-1 provides an overview of the current development phasing and major wastewater and stormwater infrastructure to service the areas. The stormwater systems are anticipated to be isolated to benefitting development areas and contributed directly by development. The wastewater systems require significant offsite systems to service the multitude of potential developments, including the following key items previously discussed (Table 2-1) that represent significant up-front capital expense for the Municipality:

- Confirm/Implement Decentralized South Treatment Facility $235 M
- Main Lines for New Development $353 M
- Lift Stations and Force Mains for New Development $204 M

These future projects to facilitate development represent a potential investment of approximately $700 M for the Municipality. For comparison, the anticipated costs for developer contributed assets of the wastewater collection system are approximately $350 M. Even though the significant majority of the Municipality's costs are recoverable from developers, the Municipality has significant interest in managing future development to avoid "leap-frog" developments, requiring premature infrastructure investment to avoid extended financing costs and over-expenditures. The priority is to maximize the use of existing assets and infrastructure.

4.2 DEVELOPMENT SCENARIOS

Phasing of development, based on the existing planning documents, can be discretely discussed between the areas north of the Athabasca River and those that are south of the river.

North Areas – Phasing is well defined, based on available infrastructure and current plans. All of these areas are ultimately planned to be serviced by the existing wastewater treatment facility.

- North Parsons Creek will continue to develop in the foreseeable future.
- West Growth will likely not be developed until the long term, but requires minimal offsite wastewater upgrades as the trunk sewers installed in Parsons Creek have been oversized to accommodate this growth area.
- Growth within the Highway 63 Corridor is planned on the intermediate-to-long term, including a "Power Center" at the Parsons Creek interchange.
- Forrest Heights, north of the Clearwater River, will likely be the last area to develop.

South Area – Phasing is defined assuming aggressive growth and relatively short term construction of a new South Wastewater Treatment Facility SWWTF.

- The City Center will continue to redevelop and increase in density. The City Center will continue to be serviced by the existing WWTF.
- Saline Creek will continue to develop in the short term and does not require the SWWTF.
- Southlands 1A and the landfill Eco-Park are planned to develop within the next five years. On an interim basis, Southlands 1A may be serviced by truck haul, and could also potentially be serviced through the Highway 69 lift station.
- The Hangingstone Plateau, Horse River Plateau, and Southlands 2A are scheduled to develop in the 5 to 10 year timeframe and would certainly require the SWWTF.
- The Airport Industrial areas and extension of the Horse and Hangingstone Plateaus are planned to follow in the long term.

The intent of the Master Plan is to provide the ultimate system plans and general staging strategy, based on current development plans. In actuality, the timelines and priority of developments are very dynamic, based on many factors that cannot be projected; and as a result, the staging plans may need to be continuously modified. The pace of development in Saline Creek and the City Centre will govern how much additional area could potentially be serviced by the new and existing infrastructure, until the SWWTF is absolutely required.

The current staging plans, based on development within Hangingstone being prioritized and alternate scenarios, are discussed below to demonstrate the options and potential impacts.

4.2.1 Hangingstone Plateau Prioritized – Current

The current development plans require the SWWTF to be constructed in relatively short term (5 years) at an expense of $235 M, in order to enable development of the Hangingstone and service to Southlands 1A. Design, construction, and commissioning of the new SWWTF is anticipated to take 4 to 5 years, which means this process should start soon, if development of Hangingstone remains a priority. The staging, as shown in Figures 4-2, 4-3, and 4-4, would result in the cash flow presented below (2014 dollars):

- 0 to 5 Years $341,500,000
- 5 to 10 years $114,000,000
- 10+ Years $49,900,000

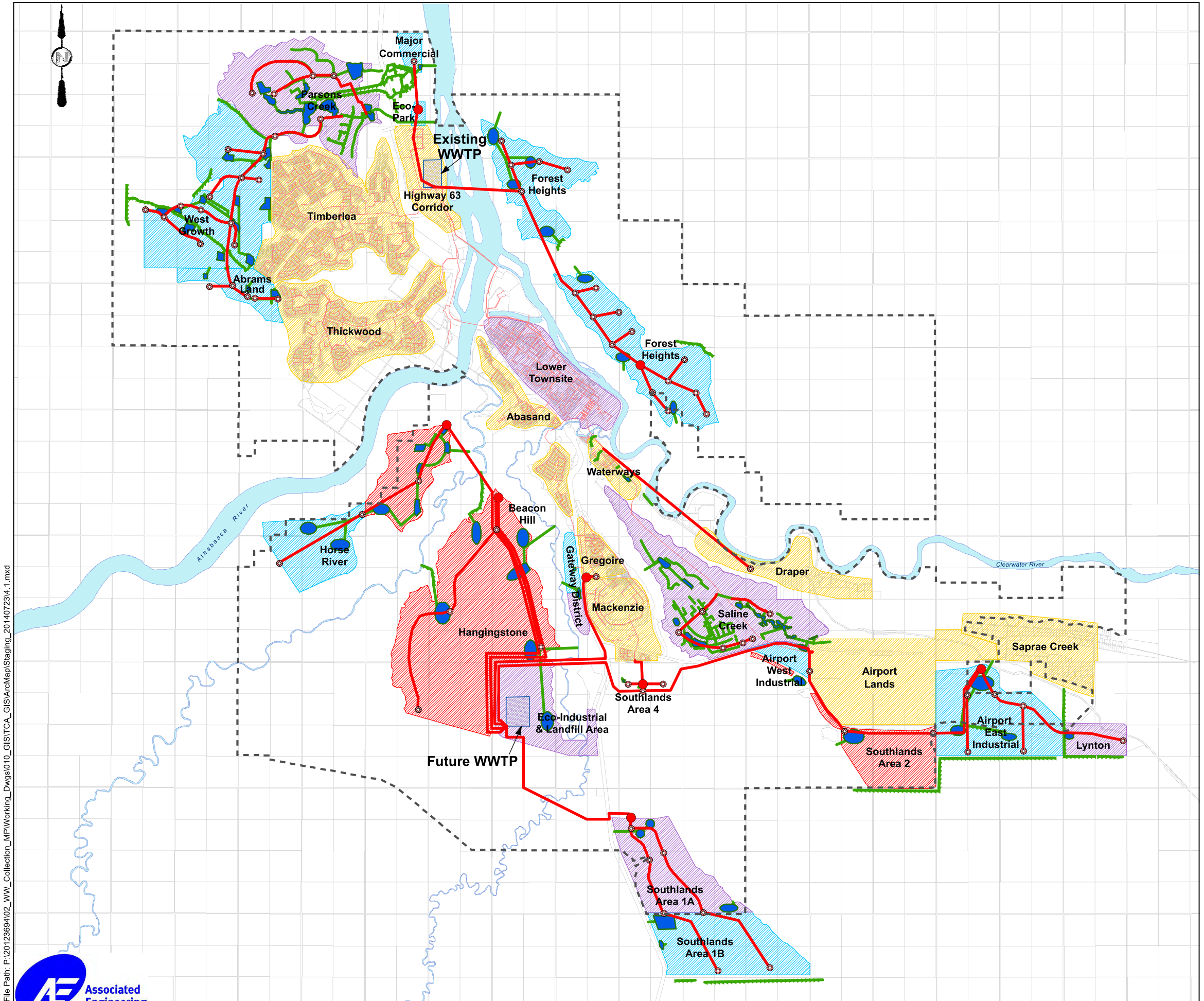
4.2.2 Hangingstone Plateau Deferred – Alternate

An alternate scenario would be to defer development within the Hangingstone Plateau to delay the required SWWTF. Without the SWWTF, Southlands 1A could be serviced via truck haul or through the new Airport Lift Station and Saline Creek transmission system. This is only an option until the Saline Creek area develops and the combined catchment area services an equivalent population of approximately 20,000 people. The current population projections, outlined in TM 1.5, project the total equivalent population within Saline Creek, Saprae Creek, Airport, Airport Industrial (east and west), and Southlands 1A to be approximately 15,000 within 10 years, based on the 5% growth scenario.

This alternate staging scheme, as shown in Figures 4-5, 4-6, and 4-7, would result in a significant shift in cash flow for the construction of Municipal capital assets largely due to the deferral of the SWWTF and transmission system to convey wastewater to the new plant from new development areas. The revised cash flow is presented below.

- 0 to 5 Years $ 84,600,000
- 5 to 10 years $ 20,600,000
- 10+ Years $400,200,000

It should be stressed that deferred cash flows come at the trade-off of deferring the development on the Hangingstone Plateau.



Regional Municipality of Wood Buffalo

Wastewater Master Plan
Future Costs and Capital Plan

Future Growth Areas and Wastewater Systems

Legend:

- Existing Sanitary
- Future Sanitary Trunk
- Future Lift Station
- Future Storm Pipe
- Future Culvert
- Future Ditch
- Future Storm Pond

Development Areas:

- Existing Development Area
- Likely To Develop Within Next 0-5 Years
- Likely To Develop Within Next 5-10 Years
- Future Development Area >10 Years

- Urban Development Sub-Region (UDSR)

Scale 1:50,000

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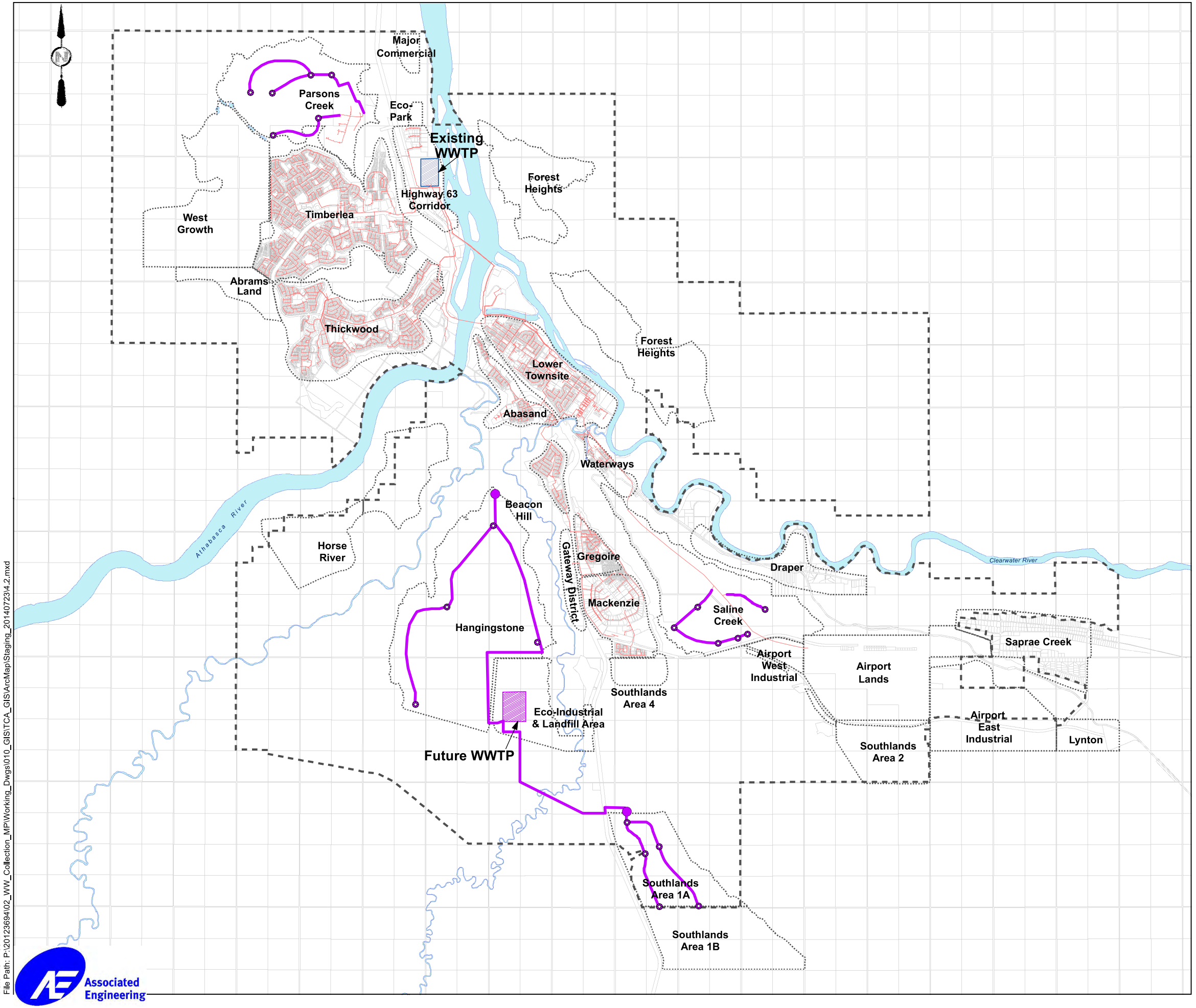
Figure 4.1



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REGIONAL MUNICIPALITY OF WOOD BUFFALO

Wastewater Master Plan
Future Costs and Capital Plan

Future Wastewater Collection Systems

Default Staging 0-5 Years

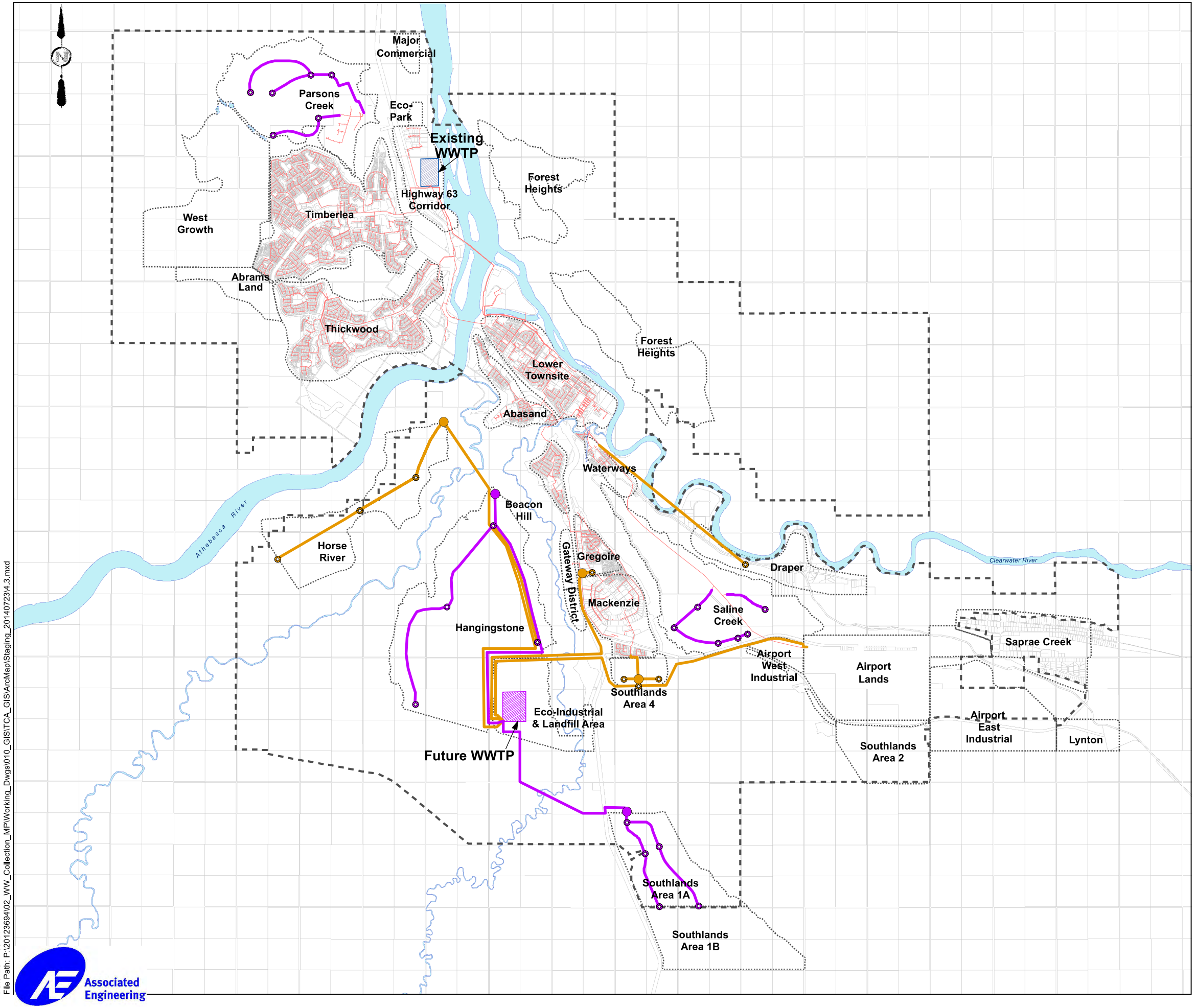
Legend:

- Existing Sanitary
- Staging 0-5 Years
- Lift Station 0-5 Years

Scale 1:50,000

September 2014

Figure 4.2



Regional Municipality of Wood Buffalo

Wastewater Master Plan
Future Costs and Capital Plan

Future Wastewater Collection Systems

Default Staging 5-10 Years

Legend:

- Existing Sanitary
- Staging 0-5 Years
- Lift Station 0-5 Years
- Staging 5-10 Years
- Lift Station 5-10 Years

Scale 1:50,000

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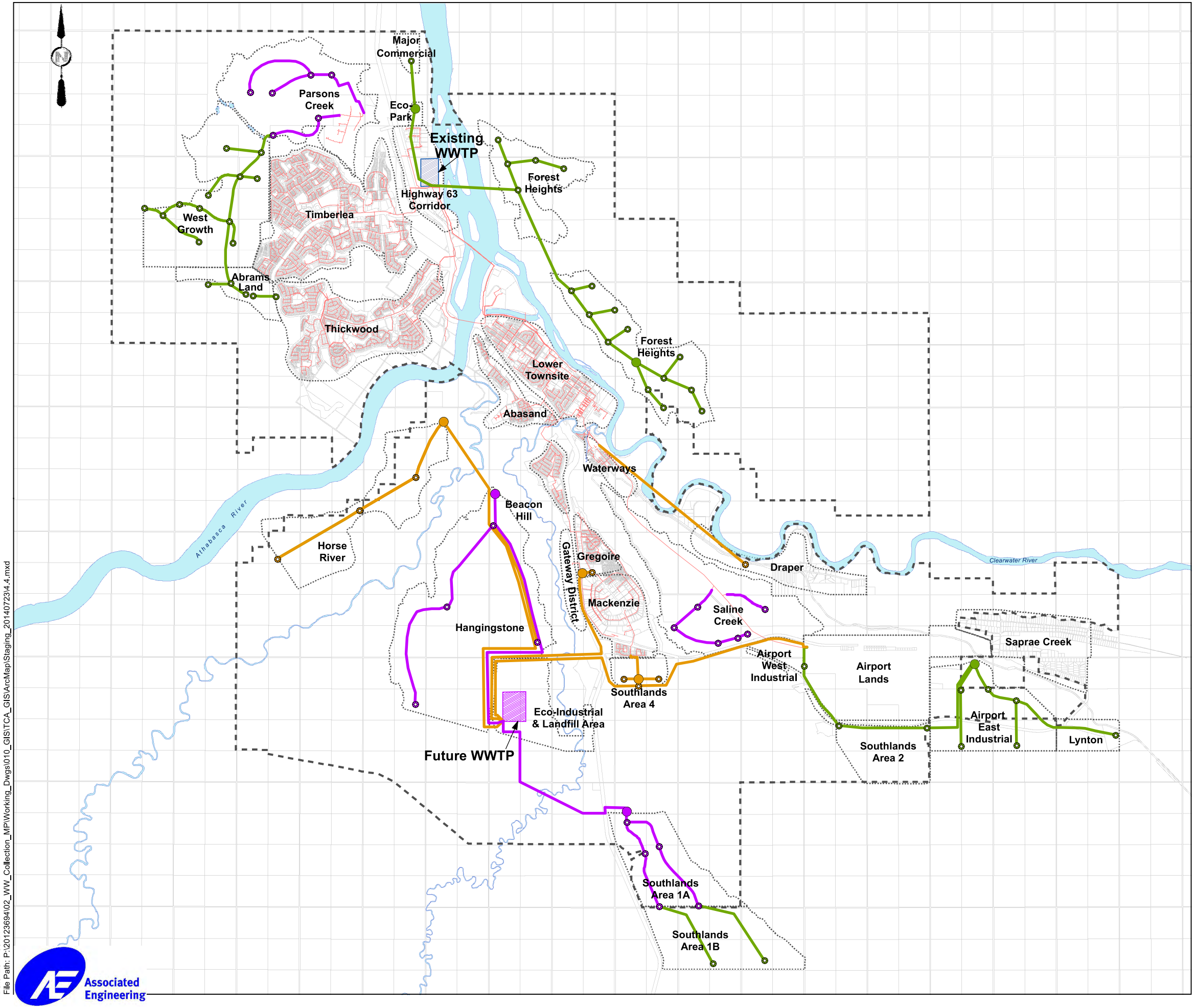
Figure 4.3



Regional Municipality of Wood Buffalo

Wastewater Master Plan
Future Costs and Capital Plan

Future Wastewater Collection Systems

Default Staging 10+ Years

Legend:

- Existing Sanitary
- Staging 0-5 Years
- Lift Station 0-5 Years
- Staging 5-10 Years
- Lift Station 5-10 Years
- Staging 10+ Years
- Lift Station 10+ Years

Scale 1:50,000

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Figure 4.4

Major Commercial
Parsons Creek
Eco-Park
Existing WWTP
Forest Heights
Highway 63 Corridor
West Growth
Timberlea
Abrams Land
Thickwood
Forest Heights
Lower Townsite
Abasand
Waterways
Beacon Hill
Horse River
Athabasca River
Gateway District
Gregoire
Draper
Clearwater River
Mackenzie
Saline Creek
Hangingstone
Saprae Creek
Airport West Industrial
Airport Lands
Southlands Area 4
Eco-Industrial & Landfill Area
Airport East Industrial
Lynton
Temporary Line
Southlands Area 2
Southlands Area 1A
Southlands Area 1B

REGIONAL MUNICIPALITY OF WOOD BUFFALO

Wastewater Master Plan
Future Costs and Capital Plan

Future Wastewater Collection Systems

Alternate Staging 0-5 Years

Legend:

- Existing Sanitary
- Staging 0-5 Years
- Lift Station 0-5 Years

Scale 1:50,000

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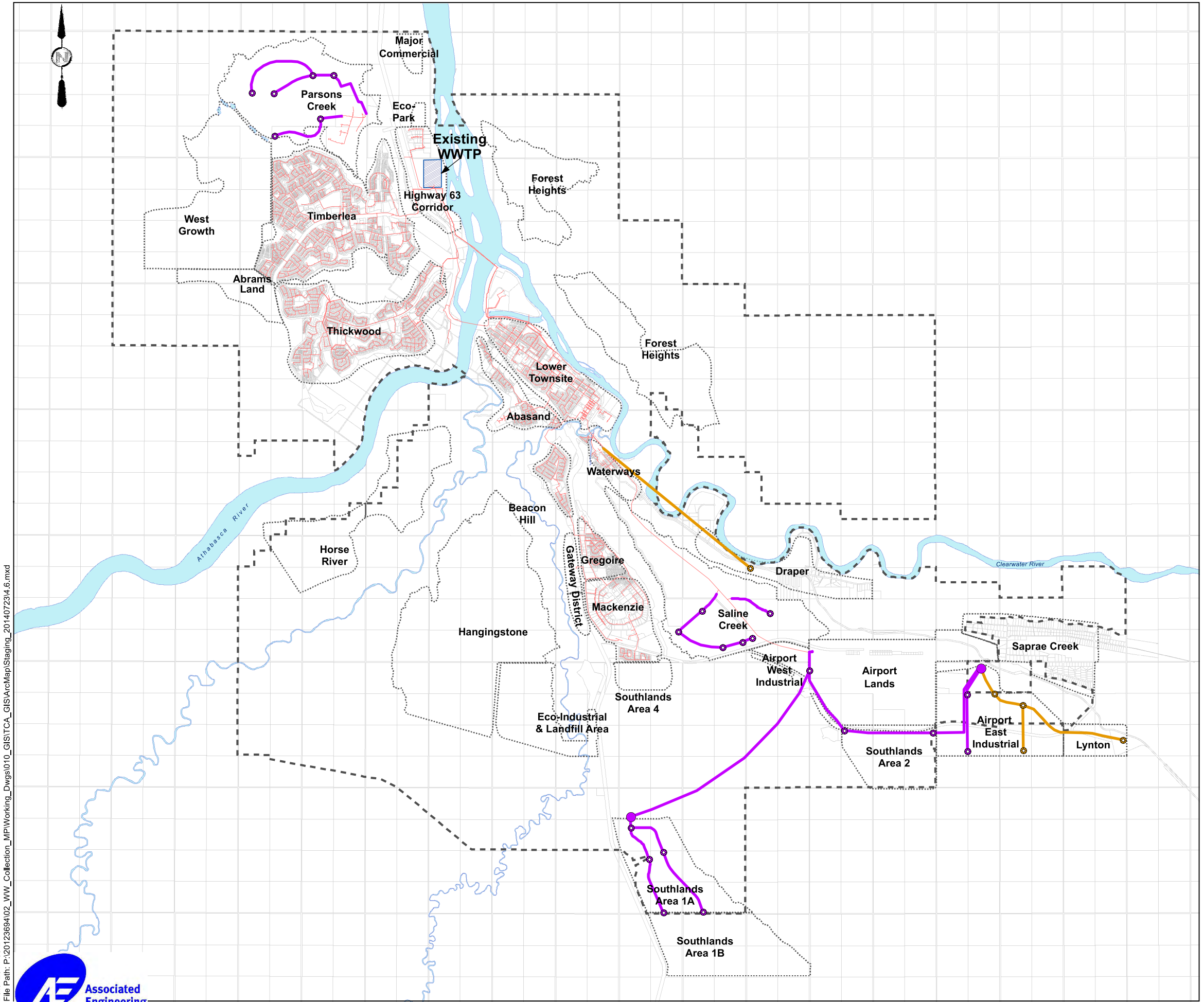
Figure 4.5



Regional Municipality of Wood Buffalo

Wastewater Master Plan
Future Costs and Capital Plan

Future Wastewater Collection Systems

Alternate Staging 5-10 Years

Legend:

- Existing Sanitary
- Staging 0-5 Years
- Lift Station 0-5 Years
- Staging 5-10 Years
- Lift Station 5-10 Years

Scale 1:50,000

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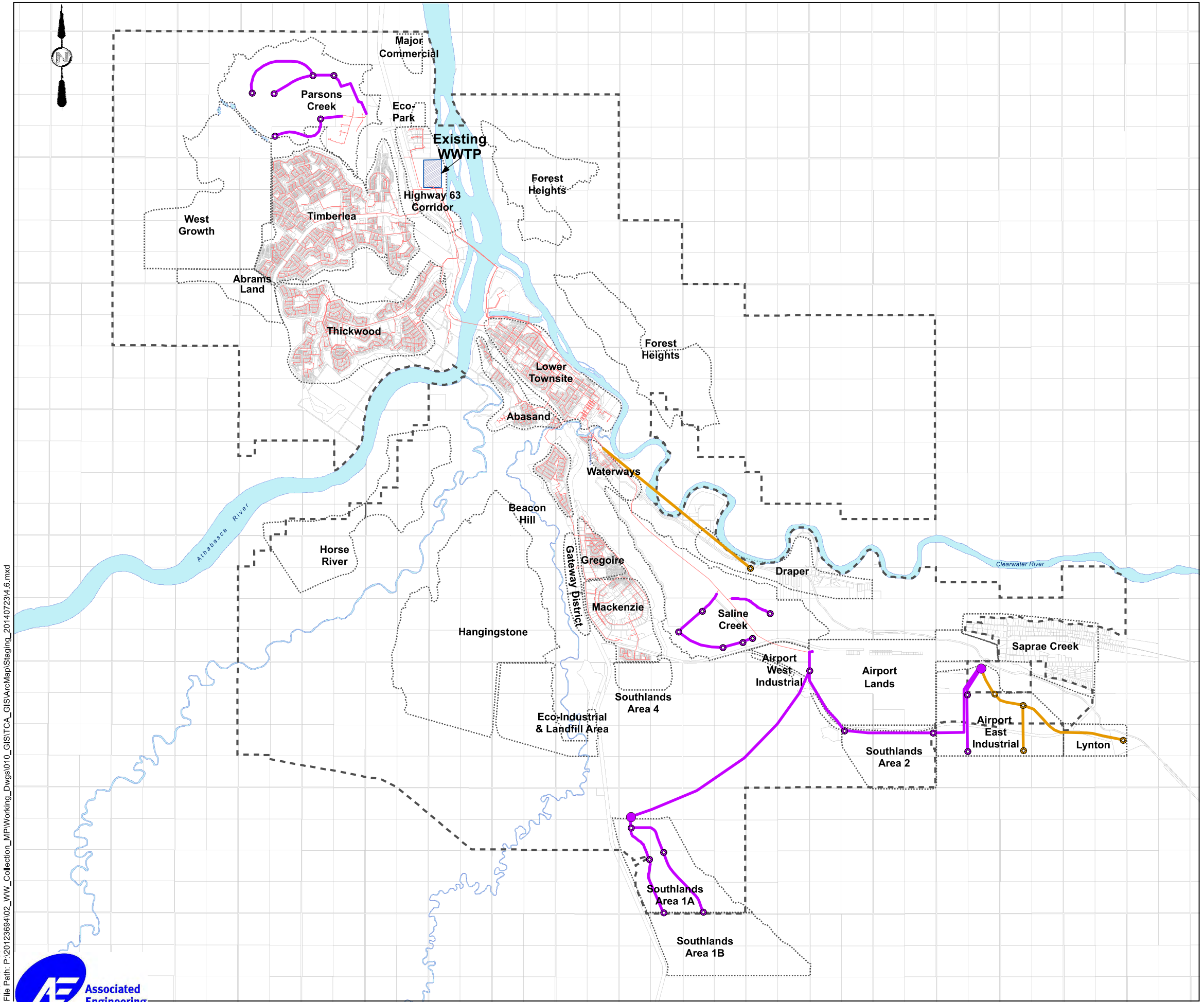
Figure 4.6



Regional Municipality of Wood Buffalo

Wastewater Master Plan
Future Costs and Capital Plan

Future Wastewater Collection Systems

Alternate Staging 5-10 Years

Legend:

- Existing Sanitary
- Staging 0-5 Years
- Lift Station 0-5 Years
- Staging 5-10 Years
- Lift Station 5-10 Years

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Figure 4.6

5 Conclusions

Associated Engineering provides the following conclusions:

- The Wastewater Master Plan Technical Memorandums provide drivers and plans for the upgrade of the existing systems and development of new systems to continue to provide a suitable level of service and facilitate growth.
- Treatment:
  - Upgrades to the existing water treatment plant are required to facilitate growth and maintain compliance with regulatory standards and will be initiated in 2015.
  - Additional action Items, outlined in Table 3-2, are required to gauge future needs at the wastewater treatment facility.
  - Development of the new South Wastewater Treatment Facility is required to service new development in the Hangingstone Plateau area. The long term strategy is to divert some of the flows from the south catchment area into the SWWTF.
- Management of snow continues to be an operational challenge for the Municipality. Snow reclamation is one management strategy that may reduce the required land footprint; the subsequent snowmelt water needs to be contemplated in the overall wastewater management strategy.
- Collection Systems:
  - Future asset management efforts need to coordinate upgrades of the existing roadway, water, wastewater, and stormwater systems to avoid conflicts and unnecessary maintenance.
  - Efficiencies can be realized if projects in an area are bundled.
- Consideration of revised staging plans based on development pressures can defer significant expenses, for example the construction of the South Wastewater Treatment Facility. The deferred cash flow comes at the trade-off of opening new development areas, for example the Hangingstone Plateau. This can be properly managed by tracking the pace of development in other development areas, and the up-take of those lands which can be effectively serviced by existing assets and infrastructure.

6 Recommendations

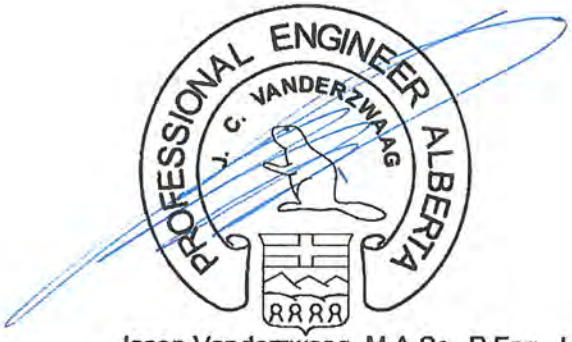
- Utilize the prioritization Table 3-6 and Figure 3-1 to coordinate ongoing infrastructure rehabilitation programs.
- Begin capital planning of all of the recommended upgrades at the existing Wastewater Treatment Facility.
- Continue with development of Phase 1A of the Snow Reclamation project and closely monitor the success of the project to gauge a future, north facility. Utilize the Dickensfield site until a north facility is required and/or feasible, based on available waste heat sources. Determine the appropriate timeline for development of the SWWTF, based on project development pressures, the pace of development, and the up-take of land in other new and existing development areas.

Closure

This report was prepared for the Regional Municipality of Wood Buffalo Wastewater Master Plan to provide a summary of and prioritization of capital improvements recommended throughout the Wastewater Master Plan.

The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
Associated Engineering Alberta Ltd.



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QUALITY MANAGEMENT SIGN-OFF
Signature: _____
Date: Sept. 29, 2014

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