Corporate Asset Management:

Investment Planning Manual

Prepared by

Infrastructure
Planning Division

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Corporate Finance Department
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1.0 Introduction

1.1 Purpose of the Manual

The purpose of the manual is to provide a methodology to develop a consistent, efficient and effective process to develop Investment Plans.

1.2 Business Need for IP Process

One of the key requirements to having justifiable and defendable infrastructure project requests and corresponding budgets is to have an appropriate level of documentation that supports the recommended decision. It is important to note that the level of documentation should be proportional to the level of complexity and risk being managed by the infrastructure project. Finally, the amount of documentation should be appropriate to the level at which it will be used and kept to the minimum required for effectiveness and efficiency.

1.3 How to use the AM Document Suite

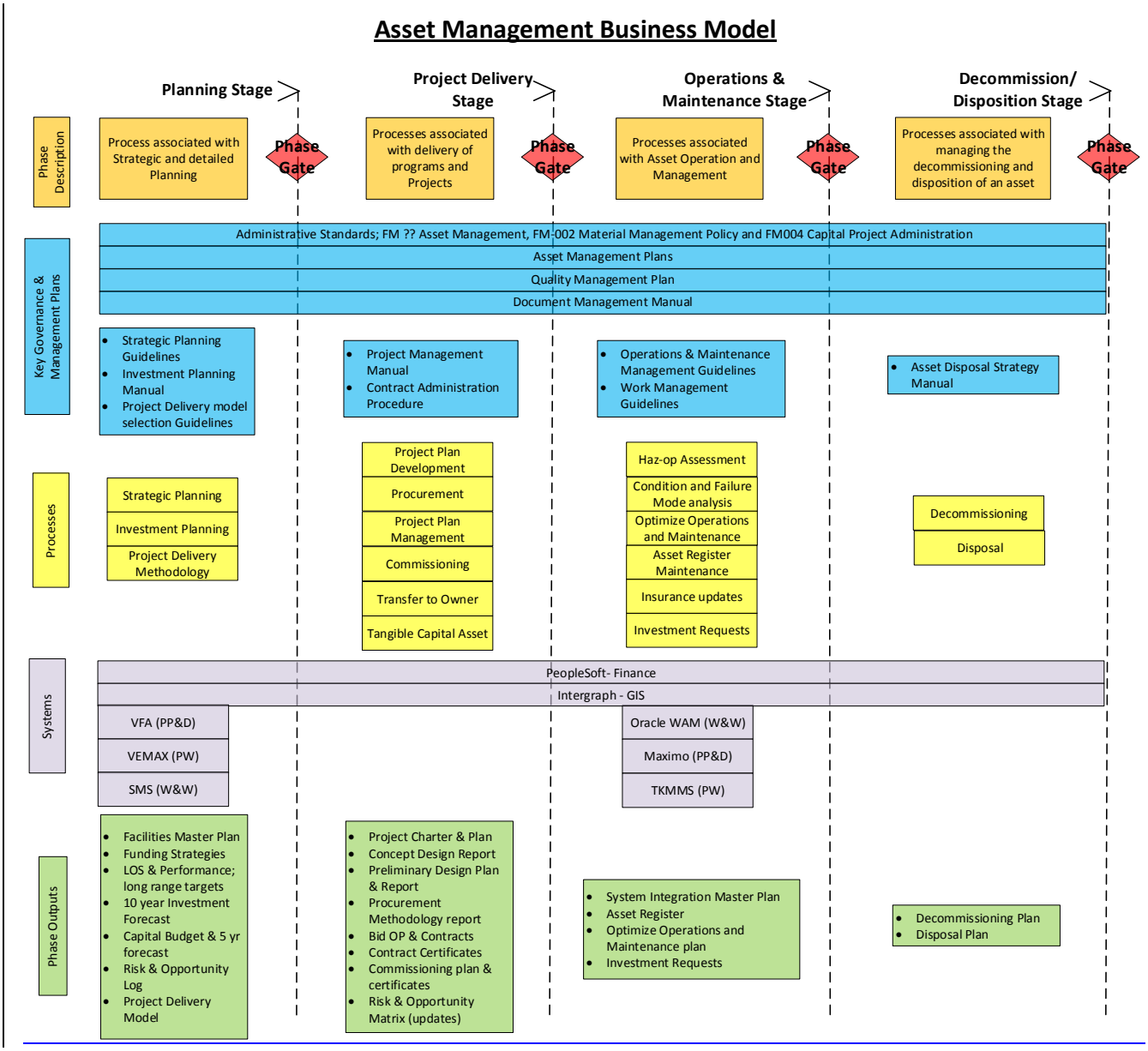
This Manual forms part of the City of Winnipeg Corporate Asset Management Program supporting the effective lifecycle management of City owned infrastructure. The document covers one of four key Planning Phase business processes, as defined by the Asset Management Business Model, as indicated in the chart below.

This Manual contains details on sub-processes guiding the application and use of Levels of Service and other core business drivers to identify, define and prioritize investment needs in the development of the Capital Budget, Five Year Investment Plan, and 10 Year Capital Forecast.

The Manual is meant to be used in conjunction with the suite of AM Governance Documents identified in the Asset Management Administrative Standard and the Asset Management Business Model, as presented in the following section.

2.0 Asset Management Business Model

The City of Winnipeg Asset Management Business Model, described in terms of governance, processes & systems, and outputs, is summarized in the graph below.



The AM Business Model is divided into the four phases of the asset lifecycle: Planning, Project Delivery, Operations and Maintenance, and Decommissioning & Disposal. Each of these phases is governed by a number of core documents, guidelines, and administration manuals and standards, guiding the policies and principles related to Asset Management. Procedures governing the management of city-owned assets are being implemented within responsible business units. These processes generate a number of outputs, such as

plans, reports, contracts, asset registers, etc., driving concrete actions focused on the planning, delivery, maintenance, operation and decommissioning of assets under their control.

The Investment Planning process, part of the Planning phase in the asset lifecycle, plays a major role in shaping the services the City delivers. It focuses the development of annual investment plans, providing consistency, transparency and defensibility to the decisions that are made. It follows a series of steps to ensure that capital investment decisions provide the maximum value for money to tax and ratepayers by focusing on delivering required levels of service at an acceptable level of risks, while minimizing the City's costs of owning, operating, and maintaining its assets over the long-term.

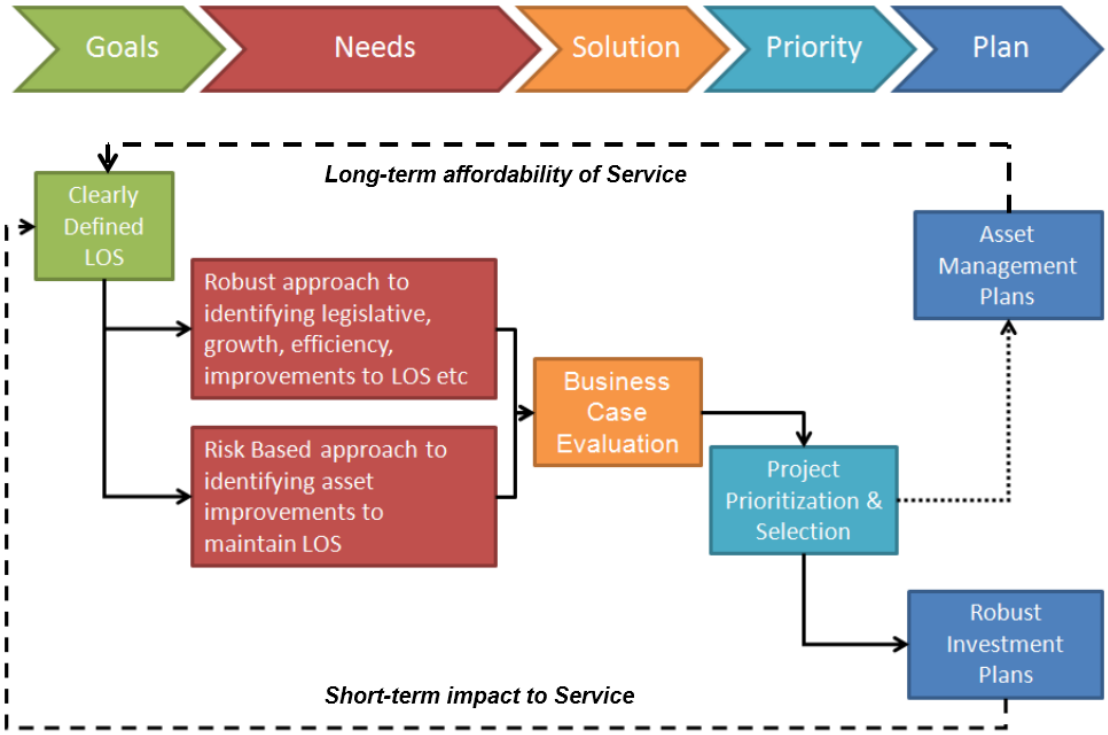
3.0 Roles, Responsibilities and Authority

The following table defines roles, responsibilities and authorities relating to the Investment Planning Process. Roles have been defined in generic terms as Department organizational structures and job role definitions may not align one-to-one with the categories presented. In these cases roles may be split between more than one staff member, or assigned in addition to other operational duties.

Generic Role	Responsibilities	Authority
Asset Manager	Understand and interpret external drivers such as growth, legislation, climate change, customer levels of service preferences and Council requirements. Develop long term asset strategies to respond to external drivers. Identify short term investment projects to implement the asset strategies. Monitor the condition and performance of the existing asset base against levels of service and use risk-based approaches to prioritize asset need. Take responsibility for: • Strategic Planning; • Developing and maintaining Business Cases for all asset need; • Managing the Business Case challenge process; • Managing the investment prioritization (MCP) process; Supervise investments and track benefits from capital projects.	Dependent on the Department organizational structure
Project Manager	Develop and maintain Business Cases for all asset need in coordination with the Asset Manager. Provide cost estimates and other information to support the development of Business Cases Deliver the benefits and outcome identified in the Business Case through delivery of a program or project using the approach documented in the City of Winnipeg Project Management Manual	
Challenge Committee	Scrutinize and challenge Business Cases to verify completeness, robustness and best-value decisions.	Approve the Business Case to go forward to the prioritization process
Prioritization Committee	Recommend the set of projects and programs to be undertaken in the next funding period Understand the residual risks associated with projects and programs that have been deferred, and ensure that appropriate mitigation measures are put in place	Recommend the projects and programs for the investment plan

4.0 Investment Planning Framework

The City of Winnipeg Investment Planning Framework provides all business units with a robust approach for identifying and rationalizing infrastructure investment.



Fundamentally, all infrastructure investment is tied to service delivery. A new roadway is constructed to expand access to a growing development. Boiler maintenance is performed to keep a facility heated and operating through the long, cold winter. A pipe is rehabilitated to maintain flow and eliminate sewer back-up. Understanding the relationship between infrastructure investment and service delivery plays a key role in effective planning and decision-making.

The Investment Planning Framework follows a five-step process to established line-of-sight between each investment and short and long-term service outcomes.

1. Clearly defined Levels of Service are defined and used to evaluate infrastructure's current performance relative to established goals.
2. Risks and opportunities are analyzed to determine investment needs.
3. Business Cases are developed to weigh options and define effective solutions.
4. Business Cases are evaluated relative to corporate values and priorities and ranked using a multi-criteria prioritization model.
5. Resultant investment plans guide budget development and long-range planning.

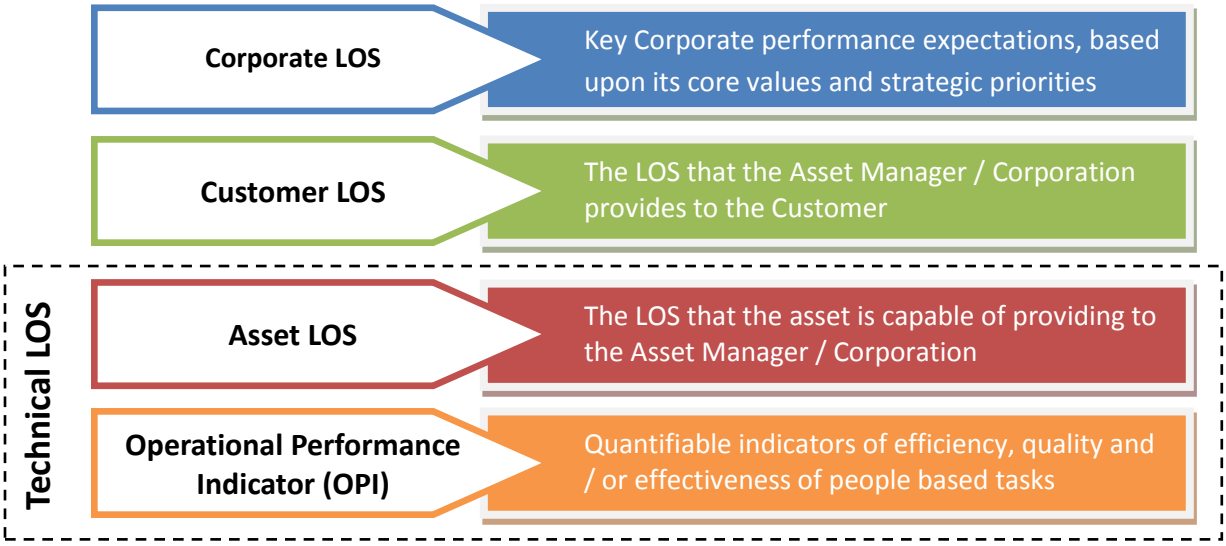
By applying the framework, business units will be able to justify investment, clearly articulating needs and weighing the costs and benefits associated with competing priorities.

5.0 Level of Service Definition Process

5.1 Background

Infrastructure exists to provide service to its users. To meet the service requirements of its growing user base, the City of Winnipeg owns and operates a myriad of infrastructure. Understanding the relationship between these assets and the services they deliver, plays an important role within the City's asset management program.

A cohesive suite of service measures, set at the appropriate levels within the organization, ensures alignment from the corporate performance vision, to the service being delivered, to the capital and operating decisions being made.



Service measures, and corresponding target LOS, can be categorized based on their role within the organization. Corporate LOS provide high-level direction based on an organization's core values and strategic business priorities. Customer LOS is the outward facing measure of service delivered to the customer or end-user. Technical LOS is the combination of the Asset LOS, which measure infrastructure's ability to deliver service, and Operation Performance Indicators (OPIs), which are indicators of the efficiency, quality and / or effectiveness of people based tasks. Asset LOS and OPI are grouped together as these performance measures operate in combination with each other to support the Customer LOS.

The Investment Planning Framework primarily focuses on relating infrastructure investment to tangible Customer LOS outcomes. Through defining a Corporate-Customer-Technical LOS hierarchy, the impact to Corporate or Technical outcomes can also be assessed.

LOS targets or objectives should be commensurate with the expectations of the end-user but also be realistic and practical within the budgetary, timing and external constraints under which the business unit operates. In setting these benchmarks, care must be taken to ensure that definitions are compatible across all levels of

the organization and provide staff at the appropriate level with a relevant and tangible objective which can be influenced by their working practices.

5.2 Customer Level of Service Categories

Customer Levels of Service can typically be categorized as follows:

Outcome/Effectiveness Related	Process/Efficiency Related

• **Quality**
  ○ Is the service of sufficient quality?
• **Quantity**
  ○ Is the service of sufficient quantity?
• **Reliability/Functionality**
  ○ How predictable is the service?
• **Legislative**
  ○ Does the service meet legal requirements?
• **Sustainability**
  ○ Does the service fit with future needs?
• **Accessibility**
  ○ Can the service be easily used?
• **Safety**
  ○ Does the service present a risk to safety?
• **Affordability**
  ○ Does the service offer best value for money?
	• **Shine**
	  ○ Do customer facilities go beyond simple functionality, e.g. appearance of customer facilities?
	• **Responsiveness**
	  ○ Does the organization demonstrate a willingness to help and promptly reply to customers?
	• **Assurance**
	  ○ Do employees demonstrate knowledge and courtesy?
	• **Empathy**
	  ○ Does the organization show it cares about customers?

Asset management primarily focuses on the Outcome/Effectiveness related aspects of service delivery. Process/Efficiency factors are generally addressed through development of a robust Customer Service Plan.

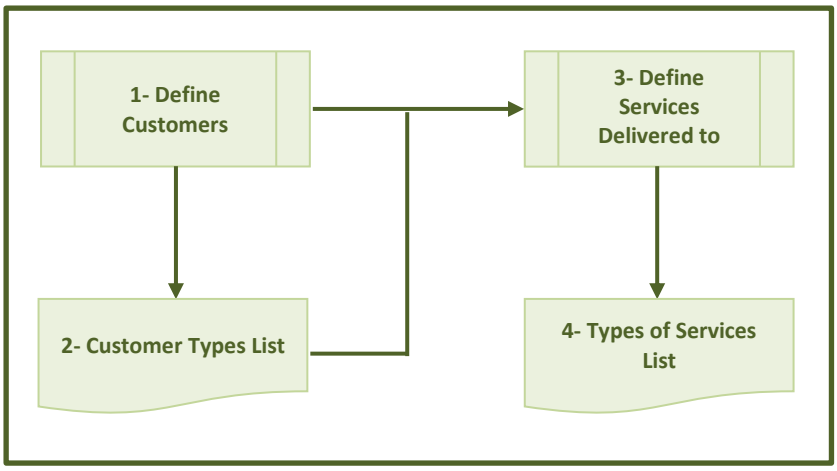
5.3 Customer Level of Service Development Process

5.3.1 Process Overview

The Customer Level of Service Development process consists of five sub-processes, which are described below.

5.3.2 Define Customers

Sub-Process Overview



Description

- 1- ***Define Customers***: to develop Customer Level of Service measures that are meaningful to customers, it is necessary to define who the customer is for any particular service. In some cases, different measures will be required for different customer segments, such as:
    - Internal City Customers
    - Users (residential, disabled, commercial, industrial)
    - Neighbors (to key assets/facilities)
    - Elected Officials (City Council, Mayor)
    - Corporation Senior Management & City Managers
    - Regulatory Agencies
    - Special Interest Groups
    - Other City agencies
    - Special Interest Groups
    - Vendors, Developers

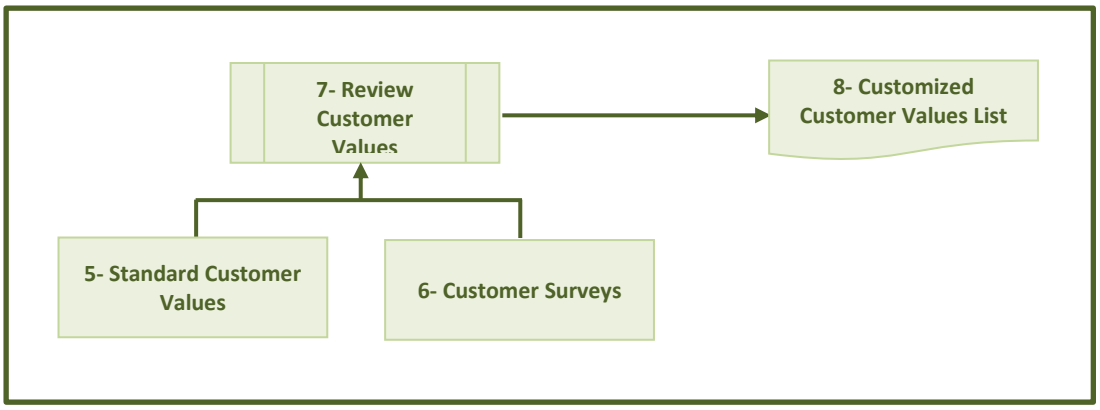
- 2- ***Customer Types List***: the Customer Types List documents the findings of the "*Define Customers*" action. The roles and responsibilities in developing the document are indicated in the table below.

- 3- ***Define Services Delivered to Customers***: Once the customers are clearly identified, the next step is to highlight, in broad terms, services the business unit delivers (or should be delivering) to each customer group.

- 4- ***Types of Services List***: the Types of Services List documents the findings of the "Define Services Delivered to Customers" action.

5.3.3 Establish Customer Values

Sub-Process Overview



Description

- 5- ***Standard Customer Values***: document the known and anticipated values of business unit Customers, as they relate to the services being delivered. For example, for drinking water, customers are likely expecting safe and clean water delivered to their tap in a sustainable manner.

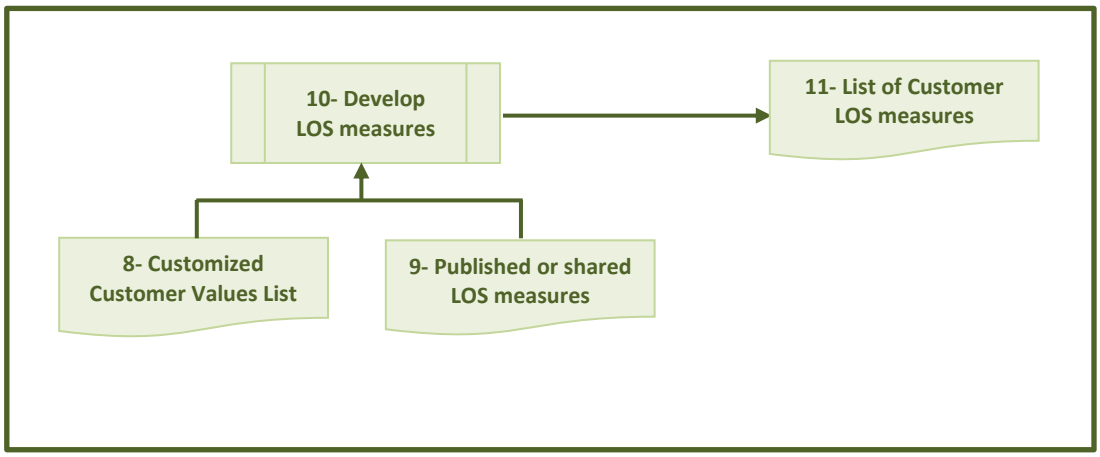
- 6- ***Customer Surveys***: when possible, it is important to verify Customer values through some level of consultation. Formal or informal surveys can often be a low-cost way of collecting this information. Once collected, survey information will provide the business unit with a deeper understanding of the motivations and expectations of their Customers, allowing it to align business practices to increase customer satisfaction.

- 7- ***Review Customer Values***: known and anticipated Customer values should be evaluated and aligned with Corporate and business unit objectives (e.g. the "Our Winnipeg" sets out three core objectives for the City: "a strong economy"; "a sustainable city"; and "quality of life"), to establish line-of-sight between Customer and Corporate LOS objectives.

- 8- ***Customized Customer Values List***: the Customer Values List documents the findings of the "Review Customer Values" action. It includes a detailed list of agreed-to customer values and an explanation of how those customer values relate to Corporate and business unit objectives.

5.3.4 Develop LOS Measures

Sub-Process Overview



Description

- 8- ***Customized Customer Values List***: see previous section.

- 9- ***Published or shared LOS measures***: in developing service measures, it is often helpful to understand what other, similarly focused organizations have put into practice. The business unit can obtain information on service measures and rating systems either through published sources or through its contacts within other organizations. In referencing external information it is important to understand the purpose of the measures and how they are being used within the organization.

- 10- ***Develop LOS measures***: Customer Levels of Service can be defined as statements of desired performance outcome that are high priority to the customers, to the environment, or required by regulators or by governing Legislation. Generally speaking, these outcomes can be divided amongst the Outcome / Effectiveness related service categories presented in Section 5.2. Service measures focused on tracking system performance relative to these categories can then be established.

  Appendix F – Investment Planning Resources contains current Customer LOS measures for business units across the City. To be effective, service measures should follow the SMART rule:

  - **Specific –** What is being measured has to be clear. There has to be one widely-accepted definition of the measure to make sure that it is interpreted the same way throughout the organization, and as a result, everyone comes to the same and right conclusions which can be acted upon.
  - **Measurable** - The measure has to be capable of tracking performance relative to a service standard, requirement or goal, in order to track progress and identify gaps.
  - **Attainable** – Performance ratings need to be attainable, at reasonable cost, with a reasonable level of effort.

- **Relevant** - The measure must give insight in the performance of the organization in meeting its service objective. If a service measure is not measuring an aspect of service delivery, then acting upon it doesn't affect the organizations' performance.
- **Time Phased** - It is important to express measures over a fixed time period, so that performance can be tracked and acted upon. The time scale should relate to the nature of the measurement, and be meaningful from a management and reporting perspective.

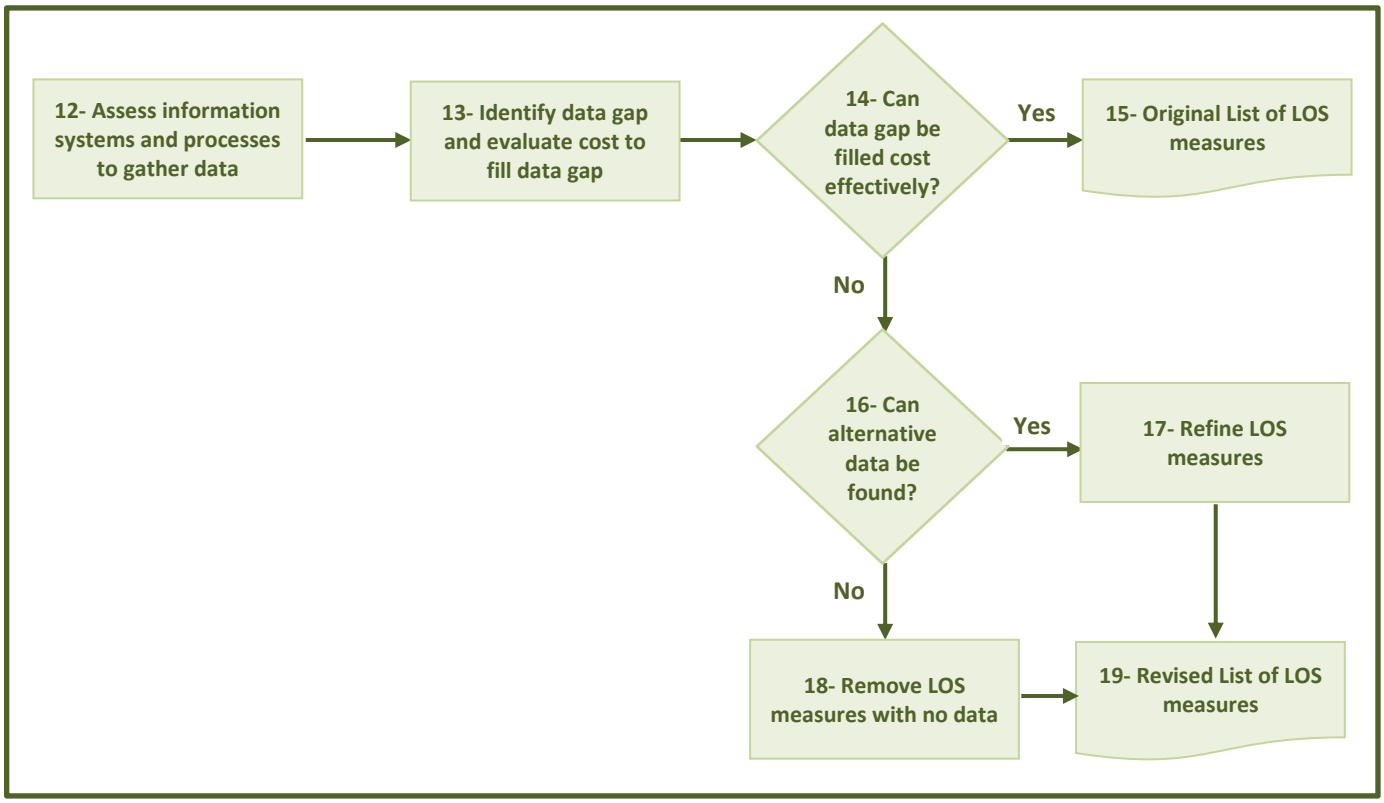
Depending on the nature of service delivery, performance can be measured directly, or quantified using a quality rating system.

- **Direct Measurement -** some assets provide a direct, measurable service, where data can be quantitatively captured and used to measure compliance with pre-defined essential, quality and image related service parameters. (e.g. Number of service interruptions per year)
- **Quality Rating System (QRS)** or "Star Rating" – other assets provide an "experience" as the service, such as libraries, arenas, and corporate properties. A QRS is used to quantify the quality of service based on multiple service attributes, and represented on a fixed rating scale.

- 11- ***List of Customer LOS measures***: document describing Customer Level of Service measures and their rating methodology. If a QRS system is used, the rating scale matrix should also be included in the document.

5.3.5 Review and Refine LOS Measures

Sub-Process Overview



Description

- 12- ***Assess Information systems and processes to gather data***: once LOS measures have been established, current systems and processes collecting related data and information should be identified. Where needed, highlight any necessary conversions, calculations and transformations.

- 13- ***Identify data gap and evaluate cost to fill data gap***: where required data or information is unavailable an assessment should be performed to determine the cost and staff effort associated with capturing the required input.

- 14- ***Can the data gap be filled cost effectively?***: to decide whether the data gap should be filled, a high level cost-benefit evaluation should be performed and a decision as to whether to proceed with the exercise made. Where costs are significant a Business Case for enhanced or expanded data collection should be produced and run through the investment planning process.

- 16- ***Can alternative data be found?***: to evaluate the performance of a LOS measure, specific reliable and accurate data is required. It is however possible, in certain circumstances, to use existing data that will provide a partial or indirect picture of the LOS. In such cases, it may be possible to adopt this measure on an interim basis until a more formal assessment of long-term options is made.

- 17- ***Refine LOS measures***: measures which cannot be effectively evaluated with existing data may be refined or adjusted to take these limitations in to account.

- 18- ***Remove LOS measures***: where adjustment is not possible, measures may be dropped and options re-evaluated at a later date.

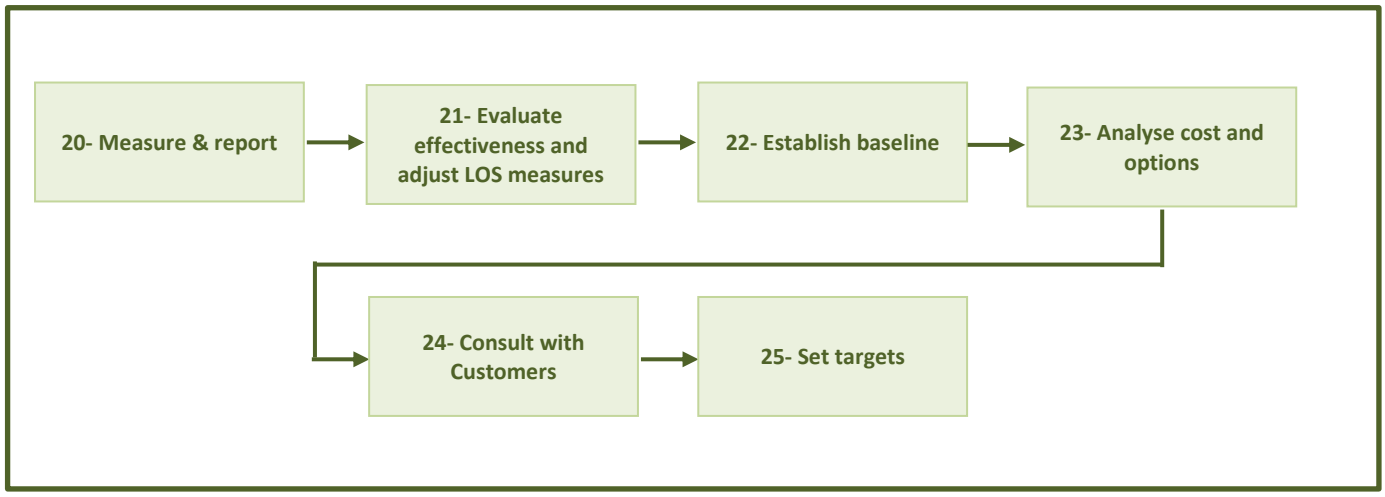
- 19- ***Revised List of Customer LOS measures***: document describing finalized Customer Level of Service measures and their rating methodology.

5.3.6 Implement LOS measures

Performance against the desired LOS should initially be tracked and reported internally to the Management Team. This initial tracking exercise allows assessment of the efficiency and accuracy of the processes associated with data collection, and whether the selected measures are the appropriate ones to accurately measure performance of the assets and the services offered by the assets under the business unit responsibility. With intelligent definition of the LOS, the reason for achievement or non-achievement of desired performance can then be explored and addressed.

Over time, the business unit can then develop a detailed understanding of the relationship between capital expenditure (CAPEX), operating expenditure (OPEX), and changes to working practice, and a given service indicator. Once this has occurred, it will be possible to effectively engage Council, Customers and the public in discussion over service expectations, the trade-off between investment and service, and overall "willingness to pay".

Sub-Process Overview



Description

- 20- ***Measure and Report***: once LOS measures have been fully developed, the business unit should start measuring and reporting on service delivery. Where possible this should include an assessment of historical performance to identify trending (i.e. service is stable, improving or degrading) relative to current values. This will provide an initial comparator against which future performance can be tracked.

- 21- ***Evaluate effectiveness and adjust LOS measures***: during the initial reporting of the LOS measures, it may become apparent that some are redundant (e.g. two similar LOS measures may in fact report the same aspect of the LOS), or do not paint an accurate picture of the Level of Service effectively delivered. After a few reporting cycles, the business unit should refine any problematic measures to accurately reflect the service delivered.

- 22- ***Establish baseline***: baselines should be established to reflect the Level of Service the business until wants to deliver over the short-term. In some cases this may be the same as the initial current reading, in other cases (e.g. where service has undergone a noticeable decline over the last few years) it may be aligned with a previous Level of Service, or a reasonable performance level which the business unit knows that it can achieve based on the current levels of investment.

- 23- ***Analyse Cost and Options***: once baseline Levels of Service have been established, annual capital and operating expenditures (CAPEX and OPEX) expenditures should be evaluated to determine the level and type of investment needed to maintain these Levels of Service. The sensitivity of changing this baseline (i.e. changing the levels of service delivered to the customers) on its capital and operating budgets should also be explored.

- 24- ***Consult with Customers***: once the full LOS model is developed and associated costs are understood, the business unit should engage with Council and its Customers to verify Level of Service expectations and confirm an appropriate service target, based on priority and willingness to pay.

- 25- ***Set Targets***: with a clear understanding of customer expectations and an accurate picture of the costs associated with delivering various levels of service, Level of Service targets can be established and communicated with stakeholders.

5.4 Service Level Agreement

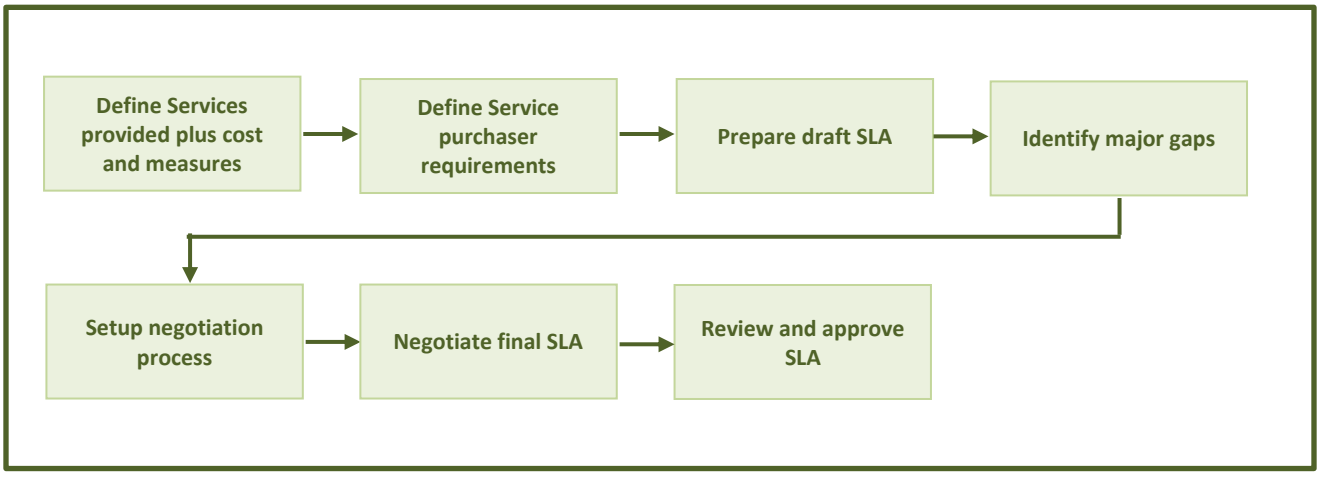
5.4.1 Overview

Throughout the City, there are instances where asset ownership is not clearly defined. This situation creates problems in terms of defining who is responsible for planning, project delivery, operations, maintenance, etc. In such cases, a Service Level Agreement (SLA) should be established to clarify these responsibilities and commitments. This practice aligns with the City of Winnipeg Asset Management Business model.

To aide in producing Service Level Agreements, the City has developed a standard Agreement Template, which defines responsibilities around strategic planning, investment planning, budgeting, project delivery, and O&M. The Service Level Agreement establishes the obligations and expectations between parties and the costs associated with delivering these services. It also includes performance measures, reporting and management rules, as well as a structured process for dealing with issues and non-conformance.

5.4.2 SLA Development Process

The Service Level Agreement Development process is highlighted below.



Description

- **Define the Current Services provided**: Document the current services that are provided, quantify the current level of performance and define the current charging arrangements.

- **Define the Service Purchaser Requirements**: Document the Service Purchaser expectations in terms of:
    - The nature and scope of services provided
    - The level of performance and how this relates to customer-facing goals such as levels of service
    - The scope and frequency of reporting
    - The approach to performance-managing the services
- **Prepare Draft SLA:** Document parties current understanding of requirement in the SLA template. This will facilitate discussion and assist to identify gaps
- **Identify Major Gaps: I**f any, between the Service Purchaser expectations and the current services provided
- **Set up Negotiation Process:** Identify options to close the gaps and estimate costs for the options. Establish a series of negotiation sessions to work through the gaps, options and costs.
- **Negotiate Final SLA:** Find the right balance of services and costs that meets enough of the Service Purchasers expectations without incurring high costs/charges.
- **Review and approve SLA:** Produce a final version of the SLA and submit for approval by senior management of Departments involved.

5.4.3 SLA Governance

Place Holder. To be completed by the City at a later date.

6.0 Needs Assessment Process

6.1 Background

The Needs Assessment process evaluates service risks and opportunities to identify investment needs. Risk assessments are performed at various levels within the organization (strategic, asset, etc.) to evaluate the business unit's current business and asset base, to quantify the impact of infrastructure, resource or technology gaps or issues on the delivery of service to Customers.

Where risks to service delivery are deemed significant then mitigating options are evaluated using a Business Case. These can take on a number of forms depending on the nature of the risk. Common mitigation strategies include operational change (e.g. process improvement, re-organization, resource rationalization, etc.), capital investment (e.g. asset renewal, redundant capacity, etc.), operating investment (e.g. heightened inspection, expanded maintenance, etc.), insurance, etc.

Opportunities for service enhancement are identified through a variety of formal and informal sources (e.g. Masterplans, Strategic/Business Plans, Councillor Requests, etc.). Where an enhancement is identified through a formal process (e.g. Masterplan, Feasibility Study, etc.), some level of rationalization / validation has already occurred. Where the business unit deems this level of validation satisfactory, a Business Case for the recommended work item can be produced. Where enhancements are introduced informally, intermediary screening may be needed to fully define and validate the need before proceeding to the development of a Business Case.

6.2 Risk Analysis

Risk analysis is used to evaluate the likelihood and consequences of business and infrastructure issues impacting service delivery. These can be broken down as follows:

- **Asset Risks** relate to the consequences and likelihood of asset failure on the delivery of service. By understanding the factors driving these parameters, business units can assess an issue's relative urgency, and make informed decisions on how to respond. High risk issues are considered for capital investment (i.e. Business Cases are prepared and evaluated), low risk items are accepted, operationally managed, or tracked and re-evaluated at a future date.
- **Strategic Risks** relate to business, environmental or regulatory factors impacting service delivery. The likelihood and consequences associated with each driver are evaluated to determine the relative urgency of each issue, and where warranted, support the planning of mitigative actions.

6.3 Asset Risks

This section describes the methodology to develop an asset risk assessment framework to evaluate projects under consideration in terms of the relative urgency of performance issues and improvements. Risk issues are managed by focusing on making educated decisions to accept exposure to certain risks or reduce vulnerability by managing its contributing factors. In this context, risk exposure, or the risk of not meeting the target Level of Service, can be expressed with the following risk equation:

Risk Exposure = Consequence of Failure X Likelihood of Failure

Where:

- **Failure** refers to the adverse event driving the Need as it relates to current operations (e.g. loss of capacity, impact on health and safety, unacceptable user experience).
- **Consequence** describes the impacts of this event on the public or the organization. This can be measured in terms of its severity (i.e. how 'bad' is the 'bad' thing that happens) and extent (i.e. how many people are impacted by the event), and is generally examined as the impact to front-line service, from one or more of the following perspectives.
    - **Essential Level of Service** - Aspects of service required by existing legislation/regulation or with regard to public health, such as Health and Safety, Environmental Protection, or Hazardous Materials.
    - **Quality Level of Service** – Aspects of service that are discretionary to the City or business unit but affects the quality of life and experience of citizens and users, such as the availability of primary amenities, reliability of building components, etc.
    - **Image Level of Service** – Aspects of service which maintain image or appearance, such as the availability of secondary amenities, or the visual appeal of landscaping, finishes, etc.

  Additional impacts to finances, operations and staff can also be examined as required.
- **Likelihood** relates to the probability or frequency of the failure occurring within the current planning horizon, and is often represented by the estimated return period or remaining life of the asset. A very low likelihood is a failure that would likely happen once within a 20 year period while a very high likelihood is a failure that is already happening or will happen within one year.

In general terms, relative importance or urgency of a given issue can be evaluated by combining the consequence (or severity of impact) and likelihood of a failure in a Risk Matrix, as indicated below. Issues in the top right corner (very high consequences – very high likelihood) are extreme risks and should be dealt with promptly so as to avoid serious fallout for customers and the City. Issues in the bottom left corner (very low consequences – very low likelihood) pose no significant risk and can be generally ignored. Issues in the middle should be evaluated relative to one another to determine priorities. This process can also be numeritized and mathematically evaluated by establishing numerical rating scales for the various contributors.

Risk issues are managed by focusing on making educated decisions to accept exposure to certain risks or reduce vulnerability by managing its contributing factors (i.e. mitigate consequence and/or likelihood through cost effective measures). Competing management options can be evaluated by comparing the risk reduction associated with each.

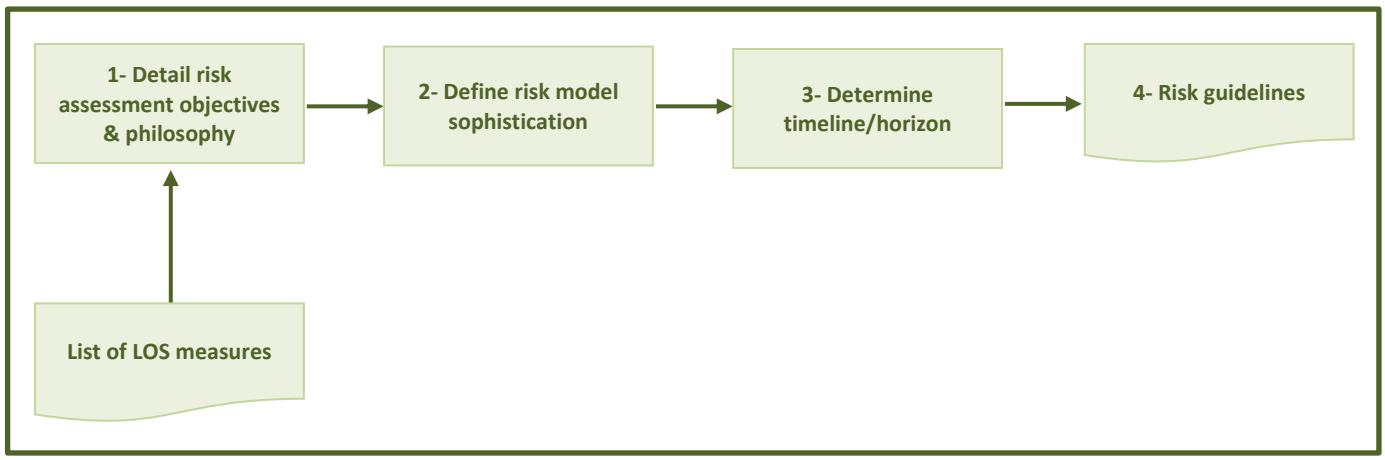
Likelihood \ Consequences	VL	L	M	H	VH
VH	M	H	H	E	E
H	M	M	H	H	E
M	L	M	M	H	H
L	L	L	M	M	H
VL	VL	L	L	M	M

6.3.1 Process Overview

The process below is intended to guide the development of a Risk Assessment model.

6.3.2 Define Risk Philosophy and Objectives

Sub-Process Overview



Description

- 1- ***Detail risk assessment objectives & philosophy***: the risk assessment process provides a consistent means of identifying and quantifying investment needs, by evaluating the consequences and likelihood of service impact associated with various issues and events. The basis for this assessment

should be clearly defined and communicated to ensure that results are consistently interpreted and applied.

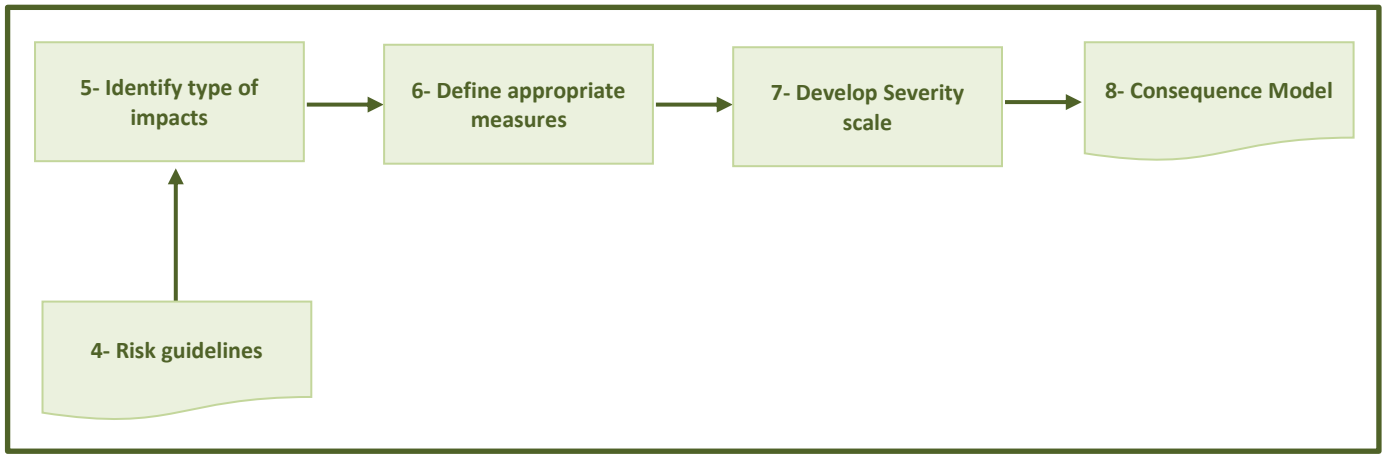
- 2- ***Define risk model sophistication***: in this step, the business unit should determine how detailed and how comprehensive its risk model should be. A risk model can range from a very high level, where only a few well identified risks are taken into consideration, to a very detailed risk model where several parameters are accounted for across a whole system of assets. A more sophisticated risk model requires more resources to be implemented effectively. Ultimately, the decision should be a function of the objectives of the model, nature of the assets being evaluated, the data that is currently available, and the resources required to develop and implement the approach.

- 3- ***Determine timeline/horizon***: the business unit should define an appropriate timeline over which risks will be evaluated. The risk model's configuration will vary, depending upon whether a fixed timeframe (i.e. what will our risk be in 5 years?) or a fixed consequence (i.e. how long until X issue occurs?) approach is used. The selection process should consider the nature of the asset, however generally speaking fixed timeframe models work better with vertical assets (e.g. parks, facilities) and fixed consequence models for linear assets (e.g. sewers, roads).

- 4- ***Risk guidelines***: the Risk Guidelines document the risk objectives and philosophy and provide direction regarding the level of sophistication of the model and the timeline/horizon to be considered. This document is to be used by the person(s) responsible for developing the risk model.

6.3.3 Develop consequence model

Sub-Process Overview



Description

- 5- ***Identify type of impacts***: potential impacts of asset failure should be identified and broken into categories. The model can be structured to meet the business units functional requirements, however the following categories are typical to models currently employed within the City:

- Strategic – Failure impacts the business unit from an economic, environmental or social (Triple-Bottom-Line) perspective.
- Legislative – Failure impacts the business from regulatory or health and safety perspective.
- Functional – Impacts the business from a Customer Level-of-Service perspective.

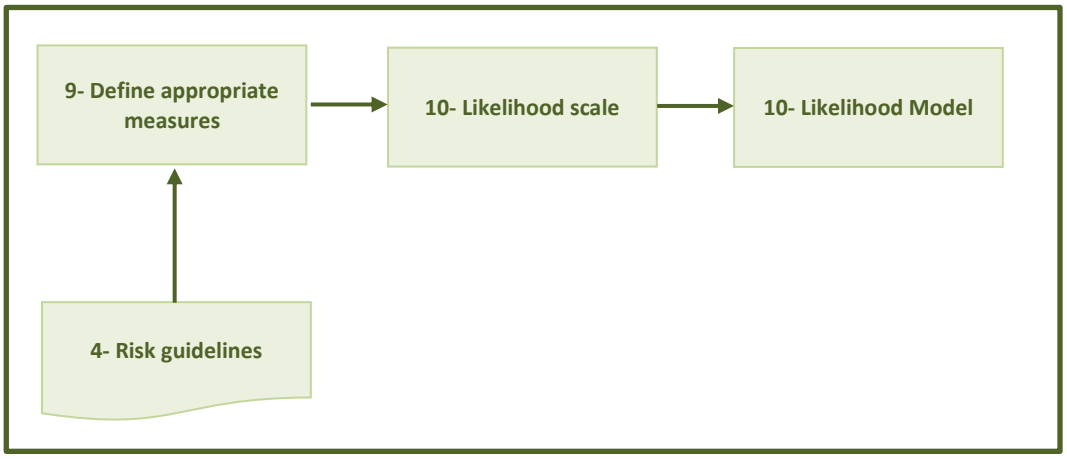
- 6- ***Define appropriate measures***: appropriate measures need to be defined for each of the impacts identified. For some assets these can be related directly to asset attributes or operating characteristics (e.g. size, traffic flow, service area). In other cases these are more qualitative in nature and are manually assigned based on opinion.

- 7- ***Develop Severity scale***: for each consequence measure a severity scale must be established to rate the relative impact of one situation vs. another. For calculated measures the scale may be related to the source data used. For qualitative measures, a five-point rating scale is often used (Very Low to Very High). In all cases, the relative impact must be aligned across all measures, so that a Very High rating in one measure is of approximately the same consequence as a Very High rating in another.

- 8- ***Consequence Model***: the consequence model combines rating scales for all impacts into a single table, allowing the business unit to evaluate (and tabulate) the consequences of any occurrence from all perspectives. F – Investment Planning Resources contains examples of current models used by City business units.

6.3.4 Develop likelihood matrix

Sub-Process Overview



Description

- 9- ***Define appropriate measures***: likelihood measures evaluate the anticipated timeline for loss or reduction of service (i.e. when will the 'bad thing' happen if not properly addressed). Likelihood for certain occurrences can be expressed in terms of a time horizon (e.g. we know that new legislation is coming in in 2018). For uncertain items it is expressed as a probability of occurrence (e.g. Event X is

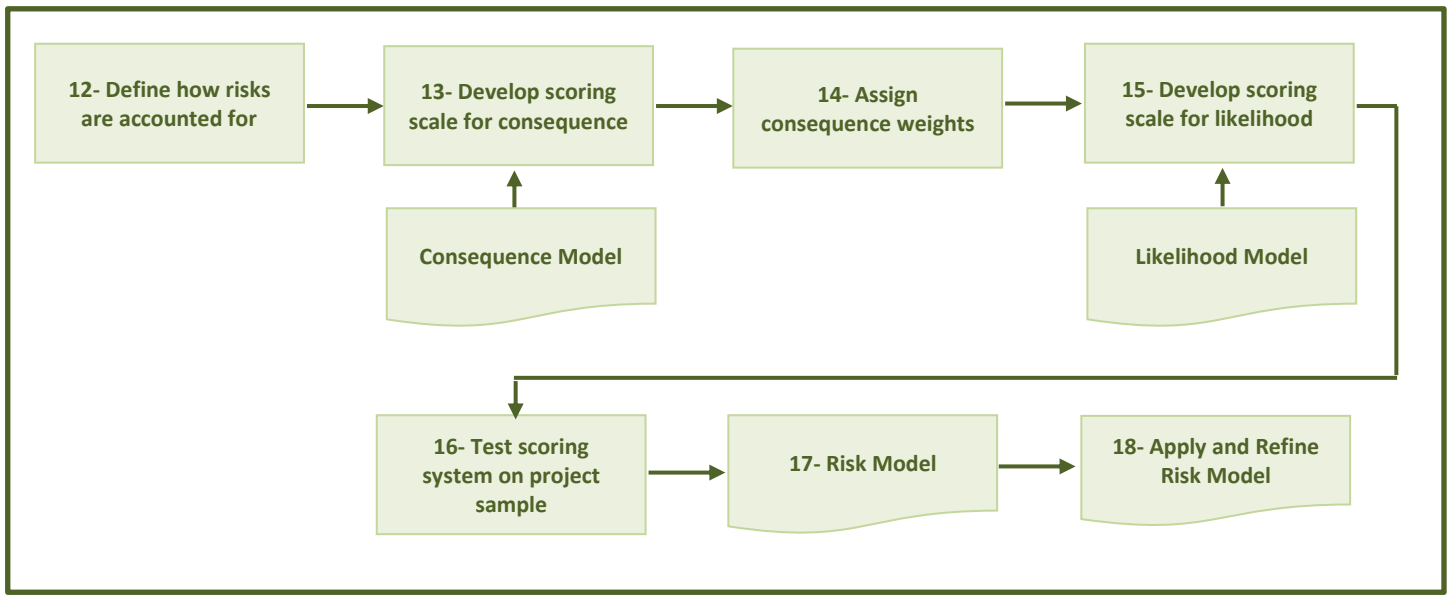
Very Likely to occur within the five-year planning window). The measures selected must align with and support the model Timeline/Horizon established in Step 3.

- 10- ***Develop likelihood scale***: a rating scale appropriate for evaluating likelihood measures must be established. For advanced models this may be an actual numerical rating of probability. In most cases however a five-point rating scale (ranging from Very Low to Very High) will suffice. Conversions may need to be established to consolidate the assessment of several types of failures.

- 11- ***Likelihood Model***: the likelihood model combines the common rating scale with the various types of measures selected, allowing the business unit to evaluate the likelihood of occurrence of any type of event. Appendix F – Investment Planning Resources provides examples of current models used by City business units.

6.3.5 Develop Risk Model

`Sub-Process Overview



Description

- 12- ***Define how risks are accounted for***: risk models are quite flexible and can be tailored to the needs of individual business units. Generally speaking, risk exposure can be calculated based on the cumulative consequences (i.e. economic consequences + environmental consequences + social consequences, etc.) or the largest or most severe consequence (e.g. sewer overflows have regulatory implications) associated with a given event. Method selection should be based on the business unit's preference and can be modified over time based on staff feedback.

- 13- ***Develop scoring scales for consequence***: to establish an overall consequence rating, scoring must be applied to the rating scales developed in Step 7. The points by themselves have no fixed meaning, but allows for the relative comparison risk exposure across several events. The points can be

assigned using a linear or exponential scale, based on the business unit's requirements, however exponential scales tend to do a better job at separating significant and insignificant issues. Consequence models in place throughout the City typically use 1, 2, 4, 7, 10 scales to reflect Very Low, Low, Moderate, High and Very High consequences, respectively.

- 14- ***Assign consequence weights***: in models which evaluate risk exposure based on cumulative consequence, business units may find it beneficial to weight consequence measures against one another to reflect their relative importance in driving investment decisions. Weightings can be assigned using a pair-wise comparison process based on feedback from business unit management and stakeholders, and adjustments made to tune the model to represent required decision logic.

- 15- ***Develop scoring scales for likelihood***: similar to the consequence scoring scales, establishing a scoring scale for likelihood rating will allow risk information to be tabulated in evaluating the relative risk exposure across several events. Again, points can be assigned using on a linear or exponential scale, based on the business unit's requirements, however exponential scales tend to produce better results. Likelihood models in place throughout the City typically use 1, 2, 4, 7, 10 scales to reflect Very Low, Low, Moderate, High and Very High likelihood, respectively.

- 16- ***Test scoring system on project samples***: once the consequence and likelihood rating scales have been fully developed (including the scoring and attributed weights for each consequence criteria), it is important to test the model to ensure that results are consistent with business unit opinion. This is done by evaluating the risk exposure associated with a range of events, and then comparing the scores and drivers to those anticipated based on past experience. This calibration exercise is best performed in a group of stakeholders that can discuss the test cases in detail to ensure that all perspectives are considered. Where needed scales and weighting factors can be adjusted to further calibrate the model to provide meaningful results.

- 17- ***Risk Model***: the Risk Model combines consequence and likelihood calculations with other variables to evaluate the relative risk associated with a variety of events. In addition to risk scores, a number of additional information should be captured on each event to better define the need:
    - Need description: description of the risk exposure the business unit is addressing
    - Driver/expected failure mode: example: obsolescence, age-related deterioration
    - Failure/adverse event: description of what would happen if the need is not addressed
    - Casual chain: identification of the root cause for the failure

  Appendix F – Investment Planning Resources contains example models developed by City business units.

- 18- **Apply and refine risk model**: once established, the risk model should be applied to all needs under investigation and projects should be ranked in terms of risk exposure. Some results may not be consistent with the business unit's logic. In such cases, the needs should be discussed with stakeholders to validate the rationale behind the scoring, and assess the need for further calibration. For consistency and accuracy, it is however important that all projects are analysed and rated the same risk model.

6.4 Strategic Risk

Strategic Risks are evaluated much the same as Asset Risks. A Risk Model is developed using the approach detailed in Section 6.3. It will be structured as a fixed-timeframe model, evaluating the consequences and likelihood of an issue occurring within a designated horizon, typically three to five years. Measures are established to evaluate consequences from several perspectives (e.g. Economic, Environmental, Social, Legislative, Functional) to assess the overall impact to the organization. Appendix F – Investment Planning Resources contains example criteria used by City business units.

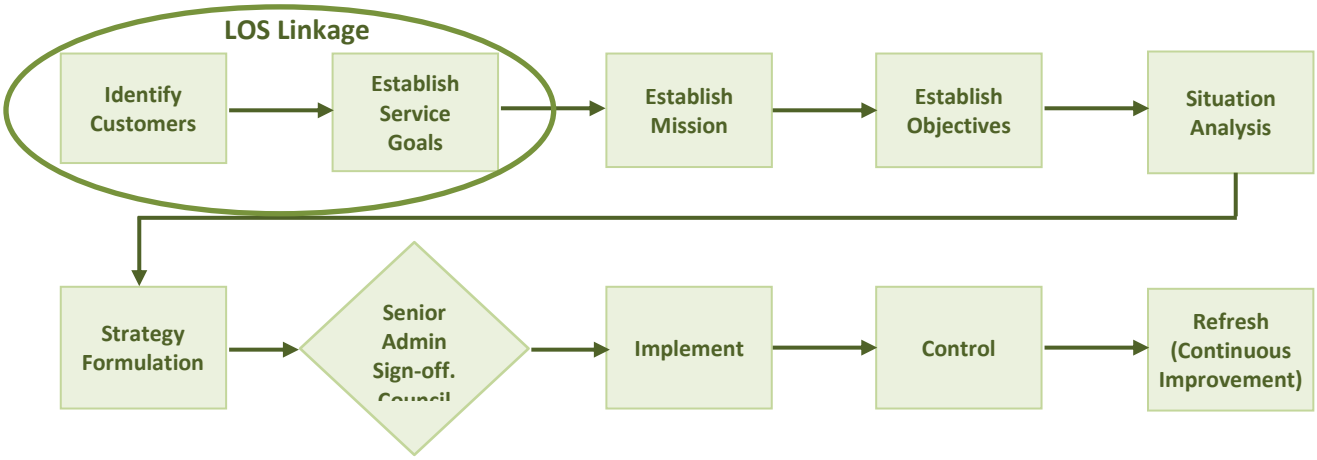
Strategic risk reviews are best performed in a facilitated group representing a range of perspectives within the business unit. Each participant raises one or more issues or events that will impact the business unit's ability to deliver service. Items are presented and discussed amongst the group and rated relative to the consequence and likelihood factors within the model. Risk exposure is evaluated and reviewed.

6.5 Strategic Planning

Section under development. Content to be refined by City.

6.5.1 Process Overview

The following workflow describes the Strategic Planning process.



Description

- ***Establish Service Goals***: Identify long term customer needs based on population growth, distribution and demographics to meet the established service goals.

- ***Establish Mission***: A company's mission is its reason for being. The mission often is expressed in the form of a mission statement, which conveys a sense of purpose to employees and projects an image to customers. The mission statement sets the mood of where the company should go.

- ***Establish Objectives***: Objectives are concrete goals that the organization seeks to reach. The objectives should be challenging but achievable. They also should be measurable so that the company can monitor its progress and make corrections as needed.

- ***Situation Analysis***: Strategic risk to service levels. Identify asset needs based on long term service need assessment. It begins with its current situation to devise a strategic plan to reach the identified objectives. An environmental scan is performed to identify the available opportunities. The situation analysis involves an analysis of both the external and internal environment. The external environment has two aspects: the macro-environment that affects the Department and a micro-environment that affects only a particular service. The macro-environmental analysis includes political, economic, social, and technological factors and sometimes is referred to as a PEST analysis. An important aspect of the micro-environmental analysis internal analysis should considers the situation within, such as:
  - Company culture
  - Company image
  - Organizational structure
  - Key staff
  - Access to resources
  - Position on the experience curve
  - Operational efficiency
  - Operational capacity
  - Brand awareness
  - Financial resources

  A situation analysis can generate a large amount of information, much of which is not particularly relevant to strategy formulation. To make the information more manageable, it sometimes is useful to categorize the internal factors as strengths and weaknesses, and the external environmental factors as opportunities and threats. Such an analysis often is referred to as a SWOT analysis.

- ***Strategy Formulation***: Once a clear picture of the firm and its environment is in hand, specific strategic alternative (s) can be developed.

- ***Implement***: The strategy likely will be expressed in high-level conceptual terms and priorities. For effective implementation, it needs to be translated into more detailed policies that can be understood at the functional level of the organization. The expression of the strategy in terms of functional policies also serves to highlight any practical issues that might not have been visible at a higher level.

- ***Control***: Once implemented, the results of the strategy need to be measured and evaluated, with changes made as required to keep the plan on track. Control systems should be developed and implemented to facilitate this monitoring. Standards of performance are set, the actual performance measured, and appropriate action taken to ensure success.

- ***Refresh (continuous improvement)***: The strategic management process is dynamic and continuous. A change in one component can necessitate a change in the entire strategy. As such, the process must be repeated regularly in order to adapt the strategy to environmental changes.

7.0 Business Case Evaluation Process

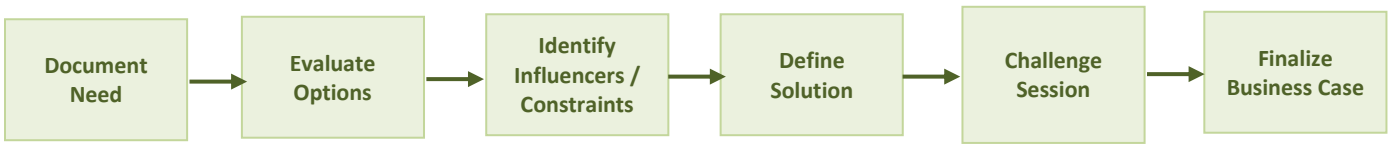
7.1 Background

Business Cases are developed for valid Needs, verified through the Needs Assessment process. They are meant to serve as a consolidated information source for each investment, documenting needs, evaluating options, identifying influencers and constraints, and defining the solution. Once established Business Cases are passed through a "Challenge Session" where they are validated by a panel of business unit and Department managers. Satisfactory Business Cases will be put forth for prioritization and programming. Others will be returned to their authors for update.

A Business Case Template c/w procedure has been developed. Training is offered on an annual basis at Employee Development Branch.

7.2 Process Overview

The following process details the Business Case development and validation process.



7.2.1 Document the Need

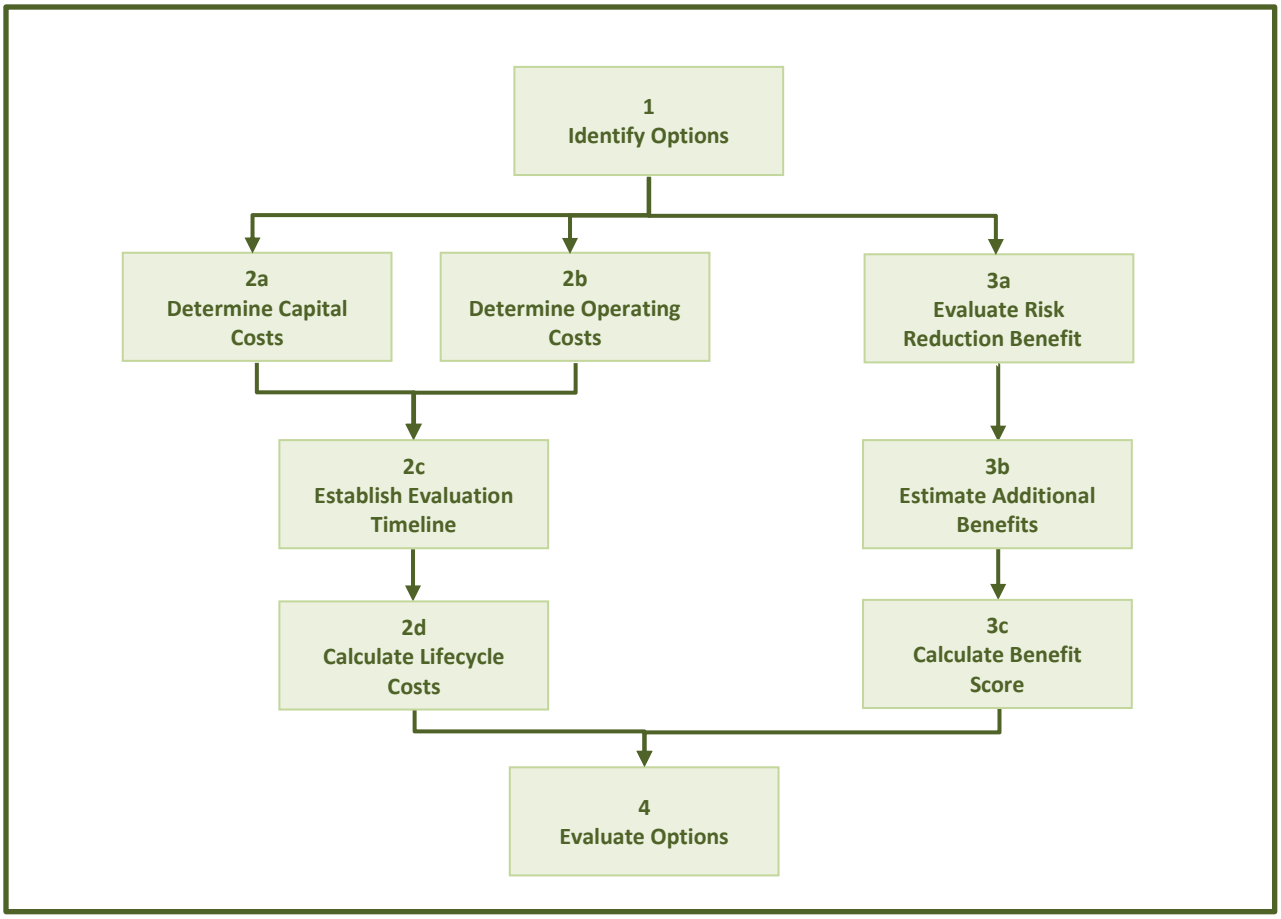
Description

Business Case Authors must clearly articulate the opportunity, or the issue or risk to the City, the business unit, or to service delivery that needs to be addressed. This should include facts and figures demonstrating the magnitude and extent of expected impacts, and the issues or factors driving the urgency of response.

7.2.2 Evaluate Options

Sub-Process Overview

This sub-process details the Evaluate Options step of the Business Case development process.



Description

- **1 – Identify Options**: there are generally several options for addressing a given need. The Business Case Author should consult with City staff familiar with the issue to identify and qualify potential capital, operational and business related options for addressing the defined need. Based on the collective professional judgement of the business unit, a short-list of leading candidates will be selected for detailed review.

- **2 – Evaluate Costs**: the whole-life costs of each of the intervention options can be established using the following steps:

  a) *Determine Capital Costs*: the Business Case Author must estimate the capital costs associated with implementing for each intervention option under consideration. This will include an assessment of the initial construction cost, as well as an estimate of subsequent renewal costs which will occur once the asset reaches the end of its useful life. As a minimum, values must satisfy the requirements of a Class 5 cost estimate, as defined by AACE International. Further information on AACE Class Cost Estimation guidelines is referenced in Appendix F – Investment Planning Resources.

  b) *Determine Operating Costs:* the Business Case Author must assess the net operating impact of each intervention option, as reflected by the expected change in operating costs. Some options

may result in operating cost savings (e.g. decrease in maintenance costs), while other options may be "OPEX neutral" (e.g. replacement of an asset "like-for-like"), or result in increase in operating costs. It is also important to determine the timeline of the variation in operating costs (e.g. some cost savings may only appear for a few years after implementation, and then fade as the asset ages).

c) *Establish Evaluation Timeline:* it is likely that the options under consideration will have different implementation schedules and life spans. For instance, one option may replace an asset as soon as possible and provide 10 more years of life, where another may maintain an asset for 5 years and implement a more expensive solution lasting 25. For the calculation of the lifecycle cost of the options, it is important to identify the timing and lifespan associated with each option.

d) *Calculate Lifecycle Costs:* based on the collected capital and operating costs and lifespans, a Net Present Value should be calculated for each option. A NPV-Benefit Tool has been developed to support this process, details on which are included in Appendix D – Technical Memos.

- **3 – Evaluate Benefits:** implementing prospective solutions can provide direct and indirect benefit to the organization. The following steps support the simplified assessment of benefits across multiple options. This process can be tailored to suit the needs of each business unit. Where a more thorough analysis is required, options can be evaluated using the multi-criteria prioritization model, as detailed in Section 8.

a) Evaluate Risk Reduction Benefits: as most needs are driven by a risk to service delivery, the primary benefit associated with addressing the need involves reduction or mitigation of this risk. Risk reduction can be quantified by evaluating the pre and post-intervention risk exposure. Consideration should be given to the following aspects of service delivery:

- *Essential Levels of Service*: these LOS are such that a failure (e.g. non-compliance to Legislative Requirements) would expose the business unit to serious consequences (e.g. loss of license, jail time, huge fines, etc.)
- *Quality Levels of Service*: these LOS are such that a failure (e.g. severe and recurring reliability problems) would affect the service provided to the customers but would not expose the business unit to the same level of consequences (e.g. loss of license, jail time, huge fines, etc.) as a failure with an Essential LOS.
- *Image Levels of Service*: these LOS are such that a failure would affect the customer's perceived experience, but would not necessarily directly after the delivery of the service itself.

b) Estimate Additional Benefits: in some cases, the implementation of a given solution may generate benefit beyond just the reduction of risk. Indirect benefits associated with each option should be identified and compiled for the options under consideration. A basic rating scale can then be created and used to evaluate each option with respect to the same set of parameters. Common indirect benefits may include the elevation or expansion of service beyond current demand, support for growth and development, support for one of the City's strategic priorities.

c) *Calculate Benefit Scores: once all benefits have been evaluated, scores can be calculated for the direct and indirect benefits associated with each option. As direct benefits are directly focused on the need, these are considered to be the drivers for the Business Case. Indirect benefits are peripheral and should be considered as supplementary information in the evaluation of options.*

- **4 – Evaluate Options:** identify and assess options for addressing the Need, including both capital and non-capital solutions. This should include an assessment of lifecycle costs and the relative benefits realized through implementing each option. The rationale for selecting the preferred solution should be clearly stated.

7.2.3 Identify Influencers and Constraints

Description

Business Case Authors must identify factors influencing implementation of the proposed solution, examining potential issues and constraints. Impacts should be documented along with their respective impact on scope, schedule or cost of the solution. Where the factors significantly alter the solution, options may need to be reevaluated based on this new information.

7.2.4 Define the Solution

Description

Business Case Authors document the proposed solution, including the implementation timeline, capital costs, operating impacts, and required supporting works. This typically involves expanding upon the work performed for options analysis, to better define scope and cost. Where needed, information on required contingencies and dedicated funding (e.g. Grant tied to a high-profile project) should also be provided. A Class 3 cost estimate, as defined by AACE International, is required for all Business Cases driving funding requests within the next three Budget Cycles (i.e. over the next three-year period).

7.2.5 "Challenge Session"

Description

Business Cases will be vetted through a "Challenge Session" where they will be scrutinized by a panel of business unit and Department managers to ensure they provide a comprehensive view and justification for the required investment. Business case authors will "present their case" and make themselves available to answer panel questions. Satisfactory Business Cases will be put forth for prioritization and programming. Others will be returned to their authors for update. Appendix B – Supporting Procedures contains reference to further information on the "Challenge Session" procedure.

7.2.6 Finalize Business Case

Description

A Business Case is considered finalized once it has been signed off by the Author, "Challenge Session" chair, business unit Manager, and Department Director.

8.0 Project Prioritization Process

8.1 Background

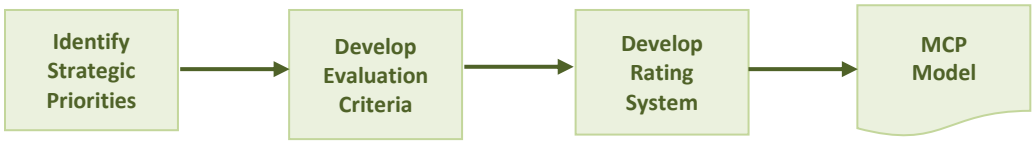
Demand for infrastructure investment is growing within the City of Winnipeg, but funding is limited. While there is no shortage of need (investments reaching this stage all have valid justifications), difficult decisions must be made in order to maintain service, while limiting the strain on City resources, taxpayers and customers. The Investment Planning Framework supports investment planning and rationalization through the introduction of a common model, which will be used by business units to identify and rank spending priorities. Applying this model will measure the respective contribution of a given project to City goals and priorities, providing transparency and assurance that value-for-money is being achieved.

The Prioritization Model uses a Multi Criteria Prioritization (MCP) approach to evaluate a project's contribution to a range of service and business priorities. By comparing these benefits to the project's costs, its relative efficiency can be assessed. Ranking projects based on their respective cost-benefit ratio identifies the best-value Investment Plan for a given level of funding. This information can then be used to develop transparent and defendable budget submissions for each Department.

The City of Winnipeg MCP Model is developed and maintained through the Corporate Asset Management Program, under the guidance of the Corporate Asset Management Steering Committee. The process covering the set-up and calibration process is highlighted below. It is detailed, along with the process for applying the model, in the Multi-Criteria Prioritization Technical Memorandum.

8.2 Prioritization Model Development Process

The following process guides the development of a Multi Criteria Prioritization model capable of identifying investment priorities amongst a group of valid projects.



8.2.1 Identify Strategic Priorities

Description

The first step in the prioritization model development process is to identify the strategic priorities, core values, and objectives that drive investment within the City. Generally speaking these should align with the corporate values of the organization, as detailed in "Our Winnipeg" and other core documents that highlight areas of strategic focus and vision for the future.

8.2.2 Develop Evaluation Criteria

Description

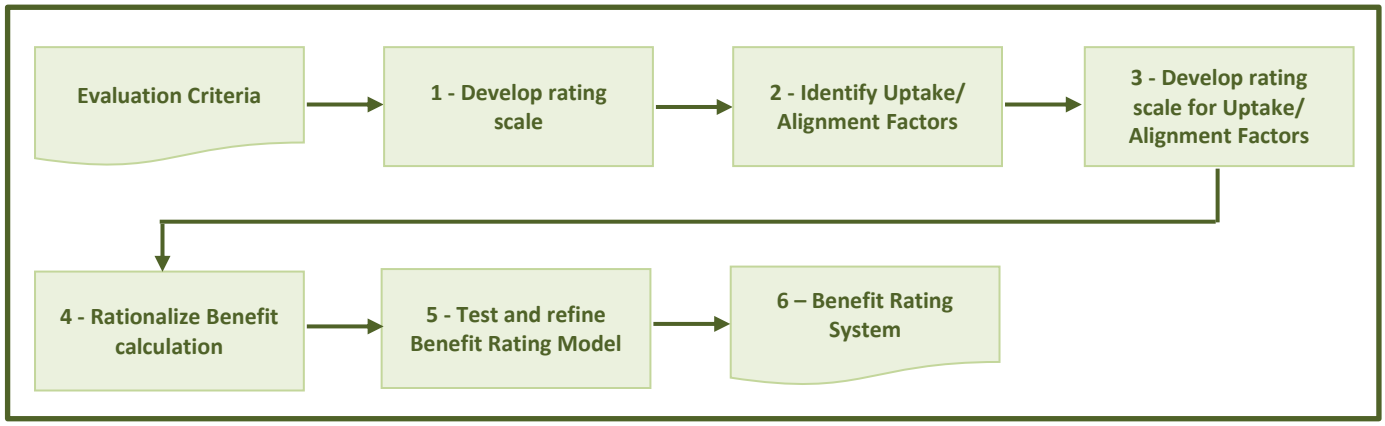
Strategic priorities are combined with service objectives to establish a list of evaluation criteria. Each criteria is weighted to reflect its importance in the planning and decision making process. Descriptions should be developed to ensure that each criteria is interpreted and applied in a consistent manner. The Winnipeg's current prioritization model uses ten evaluation criteria, which have been established and weighted by the Corporate Asset Management Steering Committee, which is comprised of members of the City's Senior Leadership Team.

Category	Criteria	Definition	Examples	Weight
Maintain Service	Maintaining Essential LOS	Project maintains the aspects of service as set down in existing legislation/ regulation or with regard to public health	Safety of Public; Regulatory Compliance; Drinking Water	26%
Maintain Service	Maintaining Quality LOS	Project maintains the aspects of service directed by current Policies, Strategies, etc.	Maintain average time between bus service; recreation coverage	13%
Maintain Service	Maintaining Image LOS	Project maintains aesthetic aspects of a service	Condition of existing streetscaping	6%
Enhance Service	Enhancing Quality LOS	Project enhances the aspects of service as directed by new City Policies, Strategies, etc.	Reduce travel time between points; reduce basement flooding incidents	4%
Enhance Service	Enhancing Image LOS	Project enhances aesthetic aspects of a service	New streetscaping; new decorative landscaping	1%
Regulatory	Adapt to Regulatory Change	Project makes changes to accommodate new regulatory requirements (e.g. H&S, Environmental, etc.)	New nutrient removal in wastewater; install new safety equipment	26%
Environmental	Improve Environment/ Sustainability (Voluntary)	Project supports the improvement of environmental stewardship/ sustainability practices within the City	Reduce greenhouse gases; support active transportation	3%
Growth	Promote the Economy and Enabling Growth	Project supports municipal growth or economic development	Widening/extending major route; extend water supply to new development	12%
Saving $	Operational Efficiency	Project improves operational efficiency (spend to save)	Replace old pumps with new to improve performance and reduce electrical use	7%
Culture	Promoting Culture and Heritage	Project preserves and/or protects historic sites; maintains/creates performance venues	Develop stage in Central Park	2%

8.2.3 Develop Rating System

The Develop Rating System sub-process is broken into six steps.

Sub-Process Overview



Description

4- ***Develop rating scale for Benefit Criteria***: rating scales must be developed to measure a project's contribution to each benefit criteria. Some criteria may have several potential contributors. A project for example can Maintain Quality LOS by contributing to service reliability, functionality, accessibility, etc. In such cases a range of options or definitions may be needed. A five-point rating scale (Very Low to Very High) is sufficient to guide the benefit assessment for each project. Appendix D – Technical Memos references the Multi-Criteria Prioritization Technical Memo, which details the rating scale used by the City's current prioritization model.

5- ***Identify Uptake/Alignment Factors***: certain assets are of strategic importance, serve a large user base, or are located in a critical part of the City. Contributions of this nature are recognized using Uptake Factors, which work to scale benefit criteria based on their coverage. Projects based on sound planning and business acumen should also receive additional consideration to recognize their added benefit to the City; in this case Alignment Factors are similarly applied. The City's current prioritization model considers six Uptake and Alignment factors, in scaling project benefit:

Uptake Factors	Alignment Factors
• Coverage • Strategic Importance • Location Criticality	• Lifecycle Bonus • Coordination Bonus • Cost of Deferral Bonus

6- ***Develop rating scale for Uptake / Alignment Factors***: once identified, a 5-point rating scale - similar to that used in benefit scoring – can be developed to evaluate uptake and alignment with business priorities.

7- ***Rationalize Benefit Calculation***: many factors contribute to the Benefit realized through completion of a project. The calculation method used in combining these factors plays an important role in how projects are

rated and ranked, relative to one another. To be effective, the Benefit Rating calculation must be transparent, follow common logic, and produce results that can be defended and explained. The City's current model uses the following equation to combine the various contributors and arrive at an ultimate Benefit Rating for each project.

Benefit Rating = Σ (Criteria Score x Criteria Weight) x Uptake Factor x Alignment Factor

Based on the model's current calibration, Uptake Factor is expressed as a number between 1 and 4, and Alignment Factor as a number between 1 and 1.1.

8- ***Test and refine benefit scoring model***: the Benefit Rating is an index of relative benefit, and while it is abstract and doesn't relate to a tangible outcome, the results produced must be accurate and defendable. As such, testing and calibration play an important role in the model's set-up and implementation. This is performed by applying the model to a range of project Business Cases where benefits are clear and known, and confirming that the relative outcomes are defendable and fair. Drivers behind discrepancies and inconsistencies should be investigated and discussed, and appropriate adjustments made to the contributing factors and rating scales. Once finalized, the model's factors and rating scales should be endorsed by senior management and published and clearly communicated to investment planning stakeholders throughout the City.

9- ***Benefit Rating Model***: the Benefit Rating Model combines all related factors, rating scales, and calculations into a single tool, which can be consistently applied in evaluating investment opportunities. Information on the City's current Benefit Rating Model and its calibration are included in the Multi-Criteria Prioritization Technical Memo, which is referenced in Appendix D – Technical Memos. The current model has been developed in Microsoft Excel to support flexibility, testing and calibration; it is intended that it will migrate to a robust, centrally managed computing platform, once it has matured and stabilized.

8.2.4 Multi-Criteria Prioritization Model

Description

The Multi-Criteria Prioritization Model evaluates the relative value-for-money of candidate projects by examining the respective Costs and Benefits associated with each investment. Cost values are based on the up-front capital expenditure needed to implement a project, as detailed in its respective Business Case. Benefits are generated using the Benefit Rating Model, detailed in Section 8.2.3. Projects are ranked based on their respective cost-benefit ratio, and then scheduled based on priority, and financial and logistic constraints.

The MCP Model combines project cost information with related Benefit factors, rating scales, and calculations into a single tool, which can be consistently applied in evaluating investment opportunities. Information on the City's current Benefit Rating Model and its calibration are included in the Multi-Criteria Prioritization Technical Memo, which is referenced in Appendix D – Technical Memos. The current model has been developed in Microsoft Excel to support flexibility, testing and calibration; it is intended that it will migrate to a robust, centrally managed computing platform, once it has matured and stabilized.

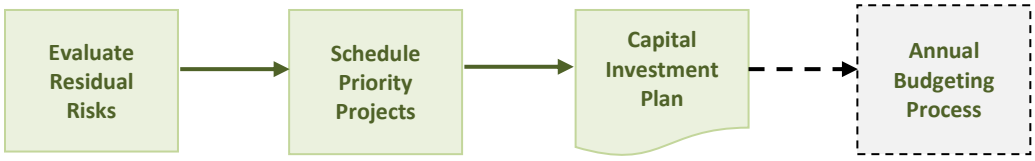
9.0 Investment Planning Process

9.1 Background

The Capital Investment Planning process involves the application of the MCP prioritization model to a list of backlogged business cases, the assessment of residual risks and application of appropriate mitigative measures, and the development of a prioritized Capital Investment Plan (CIP), which feeds the City's Annual Budgeting Process.

9.2 Investment Plan Development Process

The following process guides the development of a Capital Investment Plan which is used to feed the City's Annual Budget Process.



9.2.1 Evaluate Residual Risks

Description

While the prioritized project listing represents the "best value" program based on the allotted criteria and funding limits, sometimes emerging issues, internal and external pressures, and resourcing constraints can influence the timing and staging of works within the investment plan. In order to maintain year-to-year funding limits investment must be balanced on an annual basis and new or accelerated spending accommodated by delaying or deleting other investments from the plan.

The Investment Planning Framework requires that a residual risk assessment be completed on deferred or deleted investments, in order to quantify the implications of varying from the project's recommended staging. Business Cases are prepared and evaluated based on an assumption that work will be delivered within its recommended timeline. Delaying work beyond this window can result in additional risks to service delivery, cost escalations, resourcing issues or loss of opportunity. The likelihood and consequences of these implications will impact a project's flexibility, and ultimately the types of measures that are taken to accommodate this shift.

Where residual risks are low, projects can be moved with little impact to service, cost or public safety, allowing these "Flexible" projects to be deferred where needed to accommodate new or accelerated spending. Where residual risks are high, a significant investment may be needed to accommodate deferral; based on this these projects are said to be "Time-Sensitive", and should generally be avoided when balancing the plan.

The Capital Investment Plan Development Process considers residual risk by evaluating the likelihood and consequences of delaying a project for up to five years. Based on this assessment planners gain insight into the implications of shifting a given investment, to better balance priorities and prepare a suitable mitigation strategies. As with Asset Risk Models, residual risks are evaluated from an economic, environmental, social, legislative, health and safety and service perspective. The City's current rating guide, used in assessing deferral consequences is provided in the Multi-Criteria Prioritization Technical Memo, which is referenced in Appendix D – Technical Memos. Likelihood factors are based on the probability that the consequence will occur should the project be delayed beyond the current (1 + 5 year) investment plan.

9.2.2 Schedule Priority Projects

Description

Once residual risk sensitivities are known, projects can be scheduled within the capital planning window based on MCP model output and annual spending constraints. Projects are banded based on their relative cost-benefit score, as detailed in Prioritization Procedure contained within the MCP Technical Memorandum.

Projects within each band are scheduled as a group. First, Time-Sensitive projects are scheduled to align as closely as possible with the timings recommended within their respective business cases; those requiring significant residual risk mitigation efforts are flagged for further refinement. Flexible projects within the band are then scheduled from highest to lowest priority.

Once all bands have been scheduled, the net impact associated with accelerating flagged projects (i.e. impact of offsetting higher priority flexible project(s) with a flagged lower-priority project) can be objectively assessed. Where adjustment is justified, the associated project business cases must be updated with the associated impact and rationale.

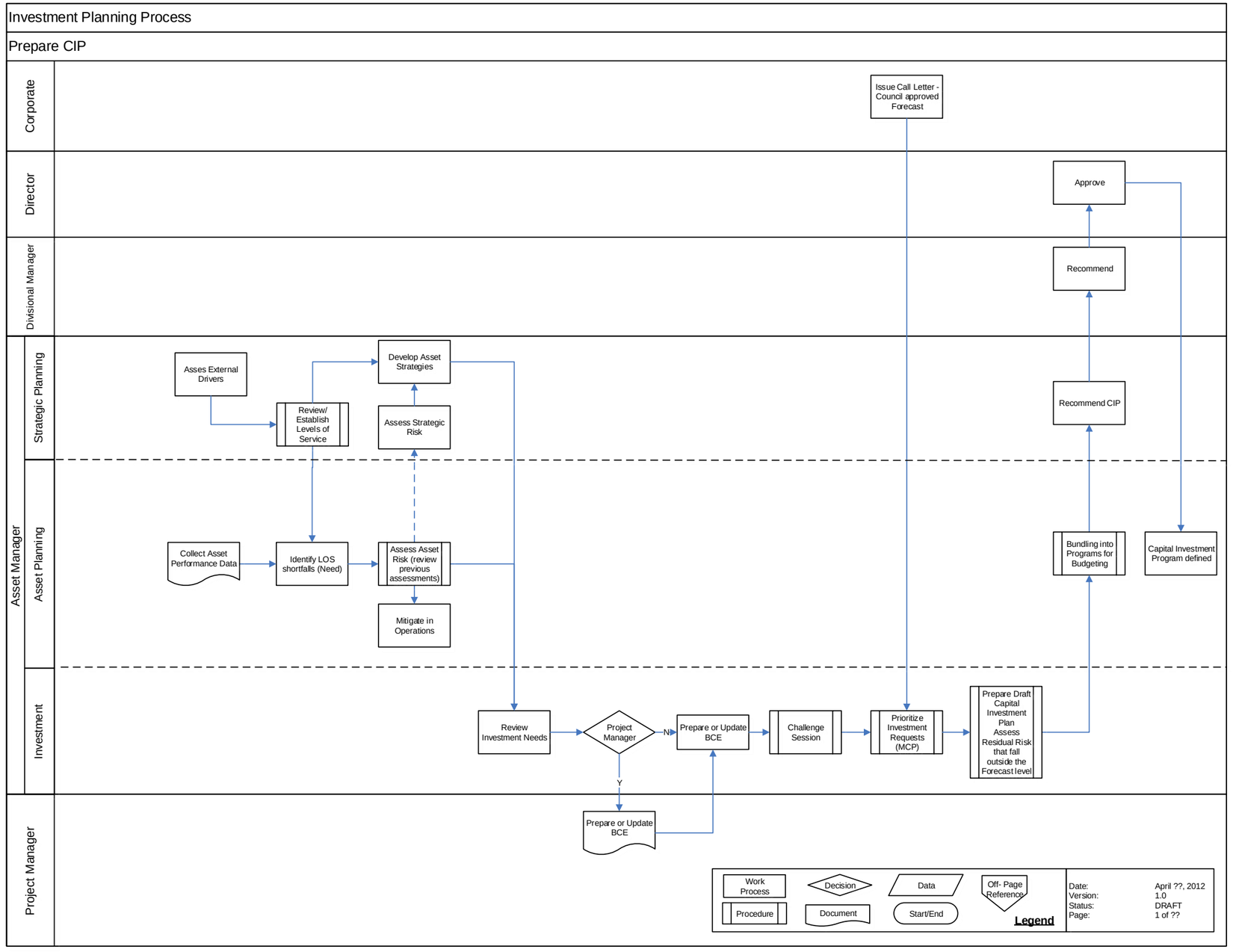
10.0 Performance Management

The City of Winnipeg Investment Planning Framework is being deployed across all business units. The following performance measures have been established to track its application and the value realized through its application. Performance will be reported to the Corporate Asset Management Steering Committee and Council, as part of the Corporate Asset Management Program's annual review.

IP Stage	Performance measures			
	Description	Unit	Target (2015)	Target (2020)
Level of Service	Portion of asset base with CLOS definition	%		100%
	Portion of LOS measures with baseline data	%		100%
	Portion of LOS measures with Customer expectation set	%		100%
Risk Assessment	Portion of asset-base with an up-to-date Risk Assessment	%		100%
	Portion of deferred BCs undergoing Residual Risk Assessment	%		100%
Business Case	Projects in CIP with robust BCs	%		100%
	BCs over $500k based on whole life costs (WLC)	%		100%
	Value of capital savings achieved through BC validation	$		$x
Prioritization	Portion of BCs including review of impact on other City Departments	%		100%
	Value of Capital deferred beyond preferred point in time	$		$x
Investment Plan	Portion of Capital Program that has gone through the Investment Planning Process	%		100%
	Value of Yr1 Capital freed-up through BC deferral	$		$x
	Value of OPEX reductions achieved	$		$x

Appendix A – **Investment Planning Business Processes**

The City of Winnipeg Investment Planning Manual is supported by the following business process.



Appendix B **– Supporting Procedures**

The City of Winnipeg Investment Planning Manual is supported by the following Procedures.

- Business Case Evaluation Instructions Procedure
- NPV and Benefit template procedure
- Challenge Session Procedure
- MCP template procedure
- Benefit Evaluation Sheet procedure
- Benefit Realization Tracking Procedure
- Short Form BC procedure
- MCP Validation Procedure

Appendix C **– Supporting Templates**

The City of Winnipeg Investment Planning Manual is supported by the following Templates.

- Business Case Evaluation Template
- NPV-Benefit calculation template
- MCP Template
- IP process benefit realization tracking template
- Service Level Agreement template

Appendix D **– Technical Memos**

The City of Winnipeg Investment Planning Manual is supported by the following tech memos.

- NPV – Benefit Template tech memo
- Multi-Criteria Prioritization tech memo

TECHNICAL MEMORANDUM CH2MHILL®

Business Case Options Assessment – NPV Tool

PREPARED FOR: City of Winnipeg

COPY: Ron Amman

PREPARED BY: Florent Le Berre / CH2M HILL

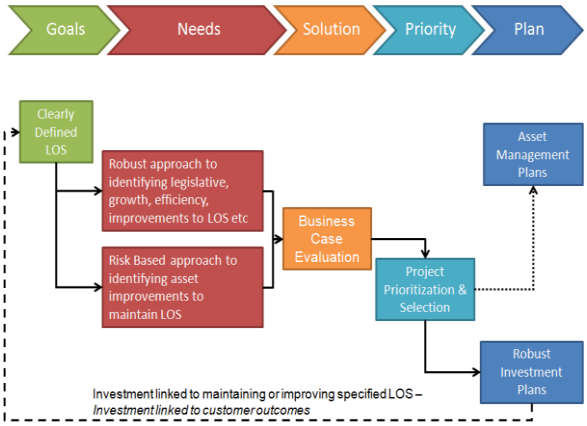
DATE: April 24, 2014

PROJECT NUMBER: 398181

VERSION: Draft 1

1. Introduction

The purpose of this memo is to explain the various parameters and calculations used to Business Case options based on the strategy, values and objectives of the City, and to provide guidance on how to use this tool to help select a preferred option. This tool was developed to support the activities part of the Business Case Evaluation stage of the Investment Planning Framework of the City of Winnipeg.



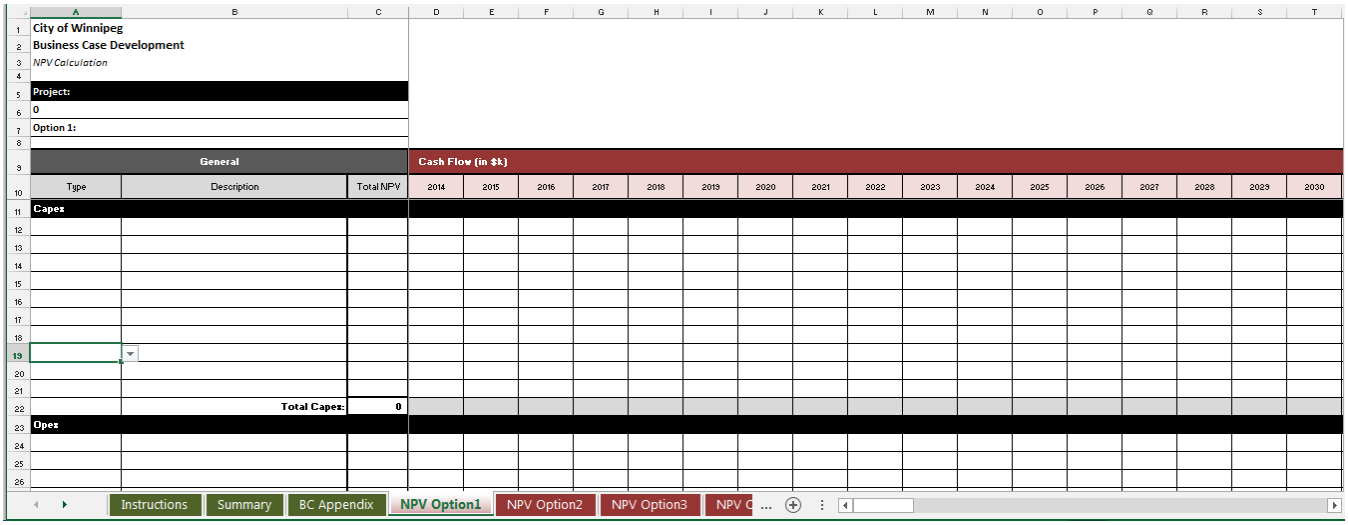
2. General Presentation

The model was developed on Microsoft Excel and includes 11 different sheets:

- **Instructions**: this sheet provides some general background about the Business Case evaluation process, and step by step instructions on how to use the tool, which information to provide, etc.
- **Summary**: this sheet, automatically filled with information from other sheets, provides an overview of the results of the options assessment, including lifecycle cost (total NPV), benefit score, and cost-benefit ratio.
- **BC Appendix**: this sheet generates automatically an appendix summarizing the result of the options assessment that can be attached to the Business Case.
- **NPV Option (1 to 4)**: these sheets allows for the calculations of the Net Present Value of capital and operating costs for up to four options.
- **Options Benefit**: this sheet is used to evaluate the benefits of each option under consideration. The detail of how benefits are evaluated, including assumptions and calculations, is provided in the following sections.
- **Evaluation Sheet**: this sheet provides the information needed to rate projects by evaluating their benefits in the *Project List* sheet
- **Conversion Tables**: this sheet contains a number of tables that are used to calibrate the model. More information on how to calibrate the model is provided in the next sections below
- **Weighting Scale**: this sheet contains the ten benefit criteria and their relative weight established by the City to rate the projects

3. Calculation Options Lifecycle Cost

The lifecycle cost of options is calculated in sheets “NPV Option1” to “NPV Option4”.



To calculate the overall lifecycle cost, each option will be evaluated in terms of capital and operating expense over the next 40 years.

a. General

- **Type**: for Capex (Capital Expenditures), four possible type of expenses that can be selected:

- Pre-Construction: this type of expenses can include all the type of engineering or planning studies (e.g. feasibility or planning study) required prior to the start of the project. This can also include all the procurement costs including preliminary design studies required to prepare the procurement documentation.

- Construction: this include all the cost incurred for the construction of the asset, including all the associated engineering costs.

- Decommission: if the option include some form of decommission of an asset as part of the overall project, the cost associated with it should be included in the overall project cost

- Capex Benefit: Capex Benefit can include proceeds from the sale of land, or other type of assets, that is included in the project.

For Opex (Operating Expenditures), three possible choices are available:

- Operate: this includes the net increase, for the Business Unit, of operating expenses as a result of the project. If the asset is a replacement or an expansion of an existing asset, the Business Unit should evaluate the net impact of the project on operating expenses compared to the current situation (i.e. “do nothing”). If the project is a “new creation”, the overall operating cost of the project should be taken into account.

- Maintain: this includes the net increase, for the Business Unit, of maintenance expenses as a result of the project. If the asset is a replacement or an expansion of an existing asset, the Business Unit should evaluate the net impact of the project on maintenance expenses compared to the current situation (i.e. “do nothing”). If the project is a “new creation”, the overall maintenance cost of the project should be taken into account.

- Opex Benefit: this include the net savings resulting from the project as compared with the current situation (i.e. “do nothing” scenario).

- **Description**: in this column should be provided more detail about the type of Capital or Operating cost or benefit of each line item of the option as described above.

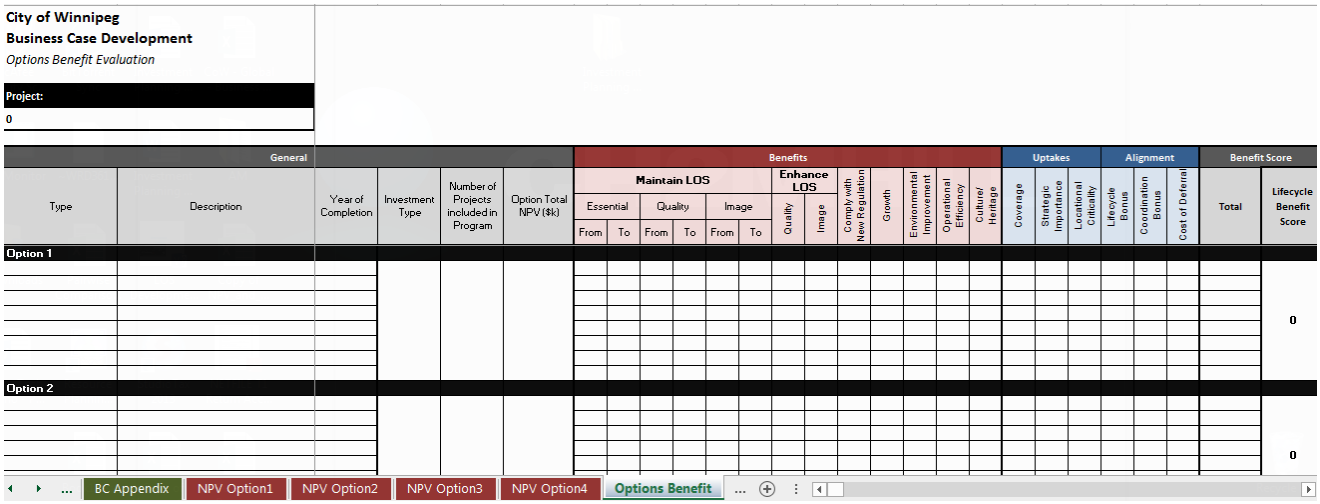
- **Total NPV**: this column calculates automatically the net present value of the cost or benefit of each line item of the option. Information about how Net Present Values are calculated is available in appendix A. Note that for the calculation of the NPV, Base Year and Discount rate should be provided in Cell C7 and C8 of the Summary Sheet.

b. Cash Flow (in $k)

For each Capital and Operating costs identified, the Business Unit should provide a breakdown of the cost per year. For example, if a project is anticipated to start in 2016 and last 3 years, the breakdown of the project costs incurred in 2016, 2017 and 2018 should be provided.

4. Options Benefit Evaluation

The benefits of the project options are evaluated in the *Options Benefit* Sheet:



Project Options are rated with ten benefit criteria, weighted based on established priorities, and scaled up depending on the relative importance of the user base impacted, and the strategic importance of the project to the City. Projects with sound planning and business acumen consistent with the best Asset Management practices are also rewarded with an "alignment factor" bonus. The process to evaluate benefits is similar to the process used during the Multi-Criteria Prioritization phase of the IP framework.

Below are a summary of the information needed, and a detailed explanation of how the benefit scores are calculated.

a. General

For each Option, a number of general information is required:

- **Type**: the Business Unit has the choice between Interim Solution and Final Solution. In most cases, only one solution (i.e. one type of investment) is made to achieve the Business Unit objective. In some cases, a Business Unit might want to consider a temporary, cheaper solution as an interim solution to address the most urgent Needs and delay the large investment required for a final and complete solution. The benefits from a smaller, temporary solution will likely be lower that the benefits from a complete and comprehensive solution that adresses all the Needs.

- **Description**: This is a brief summary of each stage of the solution (temporary of final) for the option.

- **Year of Completion**: This identify when the benefits for each solution will start to be applicable. For example, the benefits from temporary solution may be applicable in year one, while the benefits for the final solution will be applicable in Year 5 upon completion of the project. A solution with immediate benefits will score higher than the same solution for which the investment is made later.

- **Investment Type**: two type of investment can be chosen: Project or Program.

- **Number of Projects included in Program**: for a Program, this is the number of projects included in the program. For linear asset projects, it may be difficult to know the number of Projects included in the Program. In such case, the number of "typical Projects" (i.e. typical average size project to be done for the investment amount requested is estimated. This number will be used to adjust the Cost-Benefit ratio of programs which would be negatively impacted otherwise.

- **Option Total NPV ($k)**: the option NPV will be automatically filled based on the information provided in the NPV Options section.

b. Benefits

For each solution, the proposed investment is evaluated relative to each of the primary benefit criteria. "Maintain LOS" criteria are evaluated, from VLVL to VHVH (Very Low consequence Very Low likelihood to Very High consequence Very High likelihood), based on the anticipated risk reduction; other criteria are evaluated from VL to VH (Very Low benefit to Very High benefit) based on the benefit anticipated by making the proposed investment.

- **Maintain LOS (Essential - Quality - Image) "From"**: the current risk exposure is estimated in terms of Consequence and Likelihood at the time the investment is being made. The Evaluation sheet is used to help assess the current situation (i.e. before the investment is made).

- **Maintain LOS (Essential - Quality - Image) "To"**: the future risk exposure in terms of Consequence and Likelihood after the investment has been made is estimated, using the same evaluation criteria as above.

- **Enhance LOS (Quality, Image), Compliance with New Legislation, Support Growth and Development, Environmental Stewardship, Operational Efficiency, Cultural**: the benefits anticipated from making the required investment are estimated. The benefit descriptions in the Evaluation sheet are used to help identify the type and extent of benefits applicable to the project.

Note 1: **Essential Levels of Service** are such that a failure (e.g. non-compliance to Legislative Requirements) would expose the Business Unit to serious consequences (e.g. loss of license, jail time, huge fines, etc.).

Note 2: If an interim solution has been put in place, the benefit of the final solution should be evaluated based on the situation at the time the final solution is implemented, i.e. after the interim solution has been implemented. For example, if the risk exposure is reduced from VHVH to MM by the interim solution, the risk exposure for the final solution will be reduced from MM to VLVL (and not from VHVH).

Maintain Quality Levels of Service are such that a failure (e.g. severe and recurring reliability problems) would affect the service provided to the customers but would not expose the Business Unit to the same level of consequences (e.g. loss of license, jail time, huge fines, etc.) as a failure with an Essential LOS.

Image Levels of Service are such that a failure would affect the customer's perceived experience, but would not necessarily directly after the delivery of the service itself.

Note 3: when a benefit criteria is not applicable to a project, no benefit is applied (i.e. the column is left blank).

c. Benefit Score Calculation

The following equation broadly describes how benefit scores are calculated:

$$Benefit\ Score = (\sum Benefit\ Ratings \times Uptake) \times Alignment\ Factor$$

The details of the benefit calculations in the *options Benefit* sheet are available from column AN to CW.

The benefit score for "Maintain LOS" and the other benefits are calculated slightly differently, as Maintain LOS benefit is a risk reduction, while the other benefit criteria are "pure benefits".

Note that, unlike in the MCP Benefit calculation, the benefits of the interim and final solutions are discounted at the project discount rate to take into account the temporality of the options considered, i.e. the Net Present Value of the benefits is calculated for comparison purpose to reflect the fact that a solution implemented in year 1 should receive more benefit than the same solution implemented in year 5.

To calculate the "Maintain LOS" (Essential, Quality, and Image) benefit, we subtract the score attributed to the "From" column to the one attributed to the "To" column using this conversion table:

Conversion Table		**Consequence**				
		VL	L	M	H	VH
Likelihood	VL	1	2	4	7	10
	L	2	4	8	14	20
	M	4	8	16	28	40
	H	7	14	28	49	70
	VH	10	20	40	70	100

Example:

	Maintain LOS					
	Essential		Quality		Image	
	From	To	From	To	From	To
Rating	MVH	VLVL	HVH	VLVL	VHVH	VLVL
Score	**40 - 1 = 39**		**70 - 1 = 69**		**100 - 1 = 99**	

For all the other benefits, a score from 1 to 10 is attributed based on the rating received, using the following conversion table:

Other Benefits							
Rating	Enhance LOS		Comply with new Regulation	Growth	Environmental Improvement	Operational Efficiency	Culture/ Heritage
	Quality	Image					
VL	1	1	1	1	1	1	1
L	2	2	2	2	2	2	2
M	4	4	4	4	4	4	4
H	7	7	7	7	7	7	7
VH	10	10	10	10	10	10	10

All benefit scores are subsequently "normalized", meaning that the Maintain LOS benefits and the other benefits are divided by their maximum potential score (100 for Maintain LOS, and 10 for other benefits) to ensure that all the benefits are rated on the same scale, from 0 to 1. This score is then multiplied by a factor (currently at 2,469) that was calculated in such a way that the total maximum potential benefit score a project could get, after uptakes and bonuses, is 10,000. This factor can be found and modified in the *Weighting Scale* sheet.

In the example above, the final score attributed to "Maintain Essential LOS", before uptakes and bonuses, is:

$$Maintain\ Essential\ LOS\ score = \frac{39}{100} \times 2{,}469 = 962.91$$

This score can be found on column AX of the *Project List* sheet.

All conversion tables are available under the *Conversion Tables* sheet in the spreadsheet.

Each benefit score is then multiplied by their relative weight, as attributed by the City senior management, according to the table below:

Benefit Weighting	
Maintain Essential LOS	26%
Maintain Quality LOS	13%
Maintain Image LOS	6%
Comply with New Legislation	26%
Enhance Quality LOS	4%
Enhance Image LOS	1%
Growth	12%
Environmental	3%
Operational Efficiency	7%
Cultural	2%

In the example above, the weighted score is therefore:

$$Maintain\ Essential\ LOS\ weighted\ score = \ 962.91\ \times 0.26 = 250.36$$

The Uptakes are benefit multipliers to reflect the importance of the project in terms of Coverage, Strategic Importance and Locational Criticality. Each of these uptakes can increase the benefits by up to 100% as described in the conversation table below.

Uptakes			
Score	Coverage	Strategic Importance	Locational Criticality
VL	1	1	1
L	2	2	2
M	4	4	4
H	7	7	7
VH	10	10	10
Maximum Uptake	100%	100%	100%

An uptake score of M would increase the benefit of 40%. However, it is important to note that not all uptakes apply to all benefits. The table below shows which Uptake applies to which benefit.

		Uptake Application		
		Coverage	Strategic Importance	Locational Criticality
Maintain LOS	Essential	1	1	1
	Quality	1	1	1
	Image	1	1	1
Enhance LOS	Quality	1	1	1
	Image	1	1	1
Comply with New Regulations		1	1	1
Growth		1	1	1
Environmental Improvement		0	0	0
Operational Efficiency		0	0	0
Culture/ Heritage		1	1	1

A"0" means that the benefit is not scaled up by the uptake. In the current situation as described above, Environmental Improvement and Operational Efficiency do not receive any benefit uptake. The model is built in such a way that those parameters can be modified as needed.

Alignment factors are additional bonuses applied to projects to "reward" good business practices. The total maximum bonus available is 10%, as described in the table below:

Alignment			
Score	Lifecycle Bonus	Coordination Bonus	Cost Deferral
VL	1	1	1
L	2	2	2
M	4	4	4
H	7	7	7
VH	10	10	10
Maximum Bonus	3%	3%	4%

These alignment factors apply to all benefits.

The calibration of the model can be done by modifying the various parameters of the tables in the *Conversion Tables* sheet.

A detailed benefit calculation example (with the full equation) is provided in Appendix B.

5. Specificities & Limitations

The cost-benefit ratio as calculated in the model compares Dollars (cost) to Points (benefits). As such, the cost-benefit ratio of a project by itself is of little significance. However, it provides valuable information in comparison to other options or projects, and allows distinguish between high value projects (low cost – high benefits), lower value projects (low cost low benefit – high cost high benefit) – and poor value projects (high cost low benefit).

a. Rating benefits for studies

A business case for a study is usually put forward because a Need has previously been identified during the previous step of the Investment Planning cycle (Gap in LOS, Needs identification/ Risk Assessment), but we lack the information needed to properly understand and solve the problem. In this case, the rating of the 'study' business case should be based on the expected outcome (i.e. what is expected once the need has been addressed), and not based on the value of the study alone.

For regularly occurring repetitive assessments of similar scope (e.g. sewer CCTV, lift station assessments) the work should be evaluated as a program, using the approach recommended below. For large or occasional assessments (e.g. WTP, Tache Surge Tower, McLean PS) the work should be evaluated as a project.

b. Rating benefits for programs

A program is usually comprised of a number of projects of similar size and scope (i.e. a Project is defined as quantified scope of work at a specific location), and for which an annual budget is allocated. Examples would be the "Local Street renewable program" or the "Water Main replacement program".

When rating a business case for a program, the benefit criteria of the program should be rated as if it was a single representative project, using the front page of the Options Evaluation worksheet, but the Benefit Uptake and Alignment Factors (back page of the Options Evaluation worksheet) should be rated for the program as a whole. A program would score better than several comparable standalone projects as the Benefit Uptake and Alignment Factors would be rated higher.

Appendix A – Net Present Value Calculation

Definition

The definition of the Net Present Value (NPV) is: *"The difference between the present value of cash inflows and the present value of cash outflows. NPV is used in capital budgeting to analyze the profitability of an investment or project." (Investopedia)*

In other words, to recognize that the value of a dollar next year is less than the value of a dollar today, "Present Values" of future revenues and expenses (cash flows) are used to compare various investment options, in today's dollar.

The Present Value is expressed by the following formula:

$$PV = \frac{R_t}{(1+i)^t}$$

Where:

- $\mathbf{R_t}$ is the cash flow (expense or revenue) that will occur in year **t**; and
- **i** is the "discount rate", the rate used to discount future cash flows to the present value.

The Net Present Value is the sum of the present values of all future cash flows, and is expressed by the following formula:

$$NPV = \sum_{t=0}^{N} \frac{R_t}{(1+i)^t}$$

Examples

1. How much $1,000 in 2020 is worth today? (Discount rate i=4%)

$$PV = \frac{1000}{(1+0.04)^7} = \$759{,}92$$

2. You have just won the lottery and you have to choose between getting **$1.5 million now** or **$100,000 every year for the next 20 years**. Which one should you choose? (Discount rate i=4%)

To answer this question, let's calculate how much $100K every year for 20 years is worth in today's dollar:

$$NPV = \sum_{t=0}^{20} \frac{100{,}000}{(1+0.04)^t} = 100{,}000 + \frac{100{,}000}{1.04} + \frac{100{,}000}{(1.04)^2} + \cdots + \frac{100{,}000}{(1.04)^{20}} = \$\mathbf{1{,}459{,}033}$$

The answer is now obvious: you would be better off taking the $1.5 million now.

Since most of you won't win the lottery anytime soon, but will instead have to write lots of business cases, let's use the NPV in a practical example that will help you identify which option under consideration in a business case is the most cost effective.

3. John Doe's house is poorly insulated and has a deficient heating system that requires significant maintenance every year and cost him a lot in utility bills. He is considering four different options to fix it and wants to find which one is the cheapest option. His time frame to consider this investment is 20 years.

- **Option 1**: Do nothing for now and replace the furnace at the end of its lifecycle, in 10 years.
    - Average annual maintenance cost of the old furnace: $500
    - Average annual utility bill with the old furnace: $3,600
    - Cost of a new furnace (including installation): $10,000
    - Average annual maintenance cost of the new furnace: $200
    - Average annual utility bill with the new furnace: $2,700

- **Option 2:** Replace the furnace to a more modern and efficient standard now.
    - Cost of a new furnace (including installation): $10,000
    - Average annual maintenance cost of the new furnace: $200
    - Average annual utility bill with the new furnace: $2,700

- **Option 3:** Replace the furnace to a more modern and efficient standard now and improve insulation of the house.
    - Cost of a new furnace (including installation): $10,000
    - Cost of insulation work: $8,000
    - Average annual maintenance cost of the new furnace: $200
    - Average annual utility bill with the new furnace and new insulation: $2,000

- **Option 4:** Upgrade the insulation of the house up to the *Passivhaus* standard and remove the heating system. (A Passivhaus does not need a heating system).
    - Cost of insulation work to a Passivhaus standard: $45,000
    - Average annual utility bill with the new insulation: $1,000

Question: which option is the most cost effective? (discount rate i=4%)

To find out which option is the cheapest, we have to calculate the net present value of each cost item in each option and sum them up, and compare the total cost of each option:

	NPV	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Option 1																						
Maintenance of furnace	**$5,237.89**	500	500	500	500	500	500	500	500	500	200	200	200	200	200	200	200	200	200	200	200	200
Utility Bill	**$46,353.35**	3600	3600	3600	3600	3600	3600	3600	3600	3600	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700
Cost of new furnace	**$7,025.87**										10000											
Total option 1 Cost	**$58,617.11**																					
Option 2																						
Maintenance of furnace	**$2,918.07**	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Utility Bill	**$39,393.88**	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700
Cost of new furnace	**$10,000.00**	10000																				
Total Option 2 Cost	**$52,311.95**																					
Option 3																						
Maintenance of furnace	**$2,918.07**	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Utility Bill	**$29,180.65**	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Cost of new furnace	**$10,000.00**	10000																				
Cost of insulation	**$8,000.00**	8000																				
Total Option 3 Cost	**$50,098.72**																					
Option 4																						
Utility Bill	**$14,590.33**	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Cost of insulation	**$45,000.00**	45000																				
Total Option 4 Cost	**$59,590.33**																					

In this case, Option 3 is the most cost effective.

Appendix B - Benefit Score Calculation – Example

Each Benefit can be calculated with the following equations. The total Benefit Score is the addition of all these benefits.

Maintain Essential LOS Benefit Score

$$= \frac{MELOSfrom - MELOSto}{100} \times factor \times MELOSweight$$
$$\times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{MELOS-coverage} + \frac{StratImp}{10}\right.$$
$$\times MaxUptake_{stratimp} \times UptakeApplication_{MELOS-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit}$$
$$\left. \times UptakeApplication_{MELOS-loccrit}\right)$$
$$\times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination}\right.$$
$$\left. + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Maintain Quality LOS Benefit Score

$$= \frac{MQLOSfrom - MQLOSto}{100} \times factor \times MQLOSweight$$
$$\times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{MQLOS-coverage} + \frac{StratImp}{10}\right.$$
$$\times MaxUptake_{stratimp} \times UptakeApplication_{MQLOS-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit}$$
$$\left. \times UptakeApplication_{MQLOS-loccrit}\right)$$
$$\times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination}\right.$$
$$\left. + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Maintain Image LOS Benefit Score

$$= \frac{MILOSfrom - MILOSto}{100} \times factor \times MILOSweight$$
$$\times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{MILOS-coverage} + \frac{StratImp}{10}\right.$$
$$\times MaxUptake_{stratimp} \times UptakeApplication_{MILOS-stratimp} 1 + \frac{LocCrit}{10} \times MaxUptake_{loccrit}$$
$$\left. \times UptakeApplication_{MILOS-loccrit}\right)$$
$$\times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination}\right.$$
$$\left. + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Enhance Quality LOS Benefit Score

$$= \frac{EQLOS}{10} \times factor \times EQLOSweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{EQLOS-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{EQLOS-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{EQLOS-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Enhance Image LOS Benefit Score

$$= \frac{EILOS}{10} \times factor \times EILOSweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{EILOS-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{EILOS-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{EILOS-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Comply with New Regulation Score

$$= \frac{NewReg}{10} \times factor \times NewRegweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{newreg-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{newreg-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{newreg-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Growth Score

$$= \frac{Growth}{10} \times factor \times Growthweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{growth-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{growth-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{growth-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Environmental Improvement Score

$$= \frac{EnvImp}{10} \times factor \times EnvImpweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{envimp-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{envimp-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{envimp-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Operational Efficiency Score

$$= \frac{OpEff}{10} \times factor \times OpEffweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{opeff-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{opeff-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{opeff-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Culture Heritage Score

$$= \frac{CultHer}{10} \times factor \times CultHerweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{culther-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{culther-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{culther-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Below is an example that shows in detail the calculation:

General	Project #			1	
	Project ID			Project 1	
	Project Name			Project Alpha	
	Deparment			Public Works	
	Service: sub-service			Engineering	
	Project Owner			John Doe	
	Investment Type			Project	
	Number of Projects included in Program				
	Capex ($k)			2,500	
	Grants and other extenal fundings ($k)			500	**Rate Score**
Benefits	**Maintain LOS**	Essential	From	HVH	70
			To	MM	16
		Quality	From	HM	28
			To	LM	8
		Image	From	LL	4
			To	VLVL	1
	Enhance LOS	Quality		VL	1
		Image		VL	1
	Comply with New Regulation			H	7
	Growth			M	4
	Environmental Improvement			L	2
	Operational Efficiency			M	4
	Culture/ Heritage			VL	1
Uptakes	Coverage			L	2
	Strategic Importance			M	4
	Locational Criticality			H	7
Alignment	Lifecycle Bonus			M	4
	Coordination Bonus			H	7
	Cost of Deferral			H	7
Total Benefit Score				**2,530**	

Maintain Essential LOS Benefit Score

$$= \frac{70-16}{100} \times 2469 \times 0.26 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right)$$
$$\times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 845.92$$

Maintain Quality LOS Benefit Score

$$= \frac{28-8}{100} \times 2469 \times 0.13 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right)$$
$$\times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 156.65$$

Maintain Image LOS Benefit Score

$$= \frac{4-1}{100} \times 2469 \times 0.06 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right)$$
$$\times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 10.84$$

Enhance Quality LOS Benefit Score

$$= \frac{1}{10} \times 2469 \times 0.04 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right)$$
$$\times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 24.10$$

Enhance Image LOS Benefit Score

$$= \frac{1}{10} \times 2469 \times 0.01 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right)$$
$$\times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 6.02$$

Comply with New Regulation Benefit Score

$$= \frac{7}{10} \times 2469 \times 0.26 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right)$$
$$\times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 289.20$$

Growth Benefit Score

$$= \frac{4}{10} \times 2469 \times 0.12 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right)$$
$$\times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 1096.57$$

Environmental Improvement Benefit Score

$$= \frac{2}{10} \times 2469 \times 0.03 \times \left(1 + \frac{2}{10} \times 1 \times 0 + \frac{4}{10} \times 1 \times 0 + \frac{7}{10} \times 1 \times 0\right)$$
$$\times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 15.72$$

Operational Efficiency Benefit Score

$$= \frac{4}{10} \times 2469 \times 0.07 \times \left(1 + \frac{2}{10} \times 1 \times 0 + \frac{4}{10} \times 1 \times 0 + \frac{7}{10} \times 1 \times 0\right)$$
$$\times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 73.35$$

Culture Heritage Benefit Score

$$= \frac{1}{10} \times 2469 \times 0.02 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right)$$
$$\times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 12.05$$

Total Benefit Score

$$= 845.92 + 156.65 + 10.84 + 24.10 + 6.02 + 289.20 + 1096.57 + 15.72 + 73.35 + 12.05$$
$$= \mathbf{2530.42}$$

TECHNICAL MEMORANDUM CH2MHILL®

Multi Criteria Prioritization / Capital Investment Planning tool

PREPARED FOR: City of Winnipeg

COPY: Ron Amman

PREPARED BY: Florent Le Berre / CH2M HILL

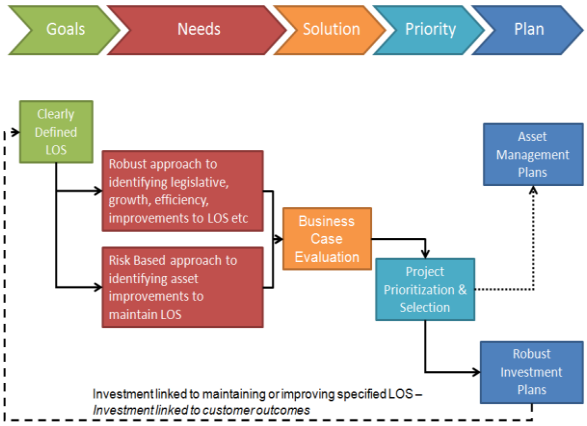
DATE: April 24, 2014

PROJECT NUMBER: 398181

VERSION: Draft 1

1. Introduction

The purpose of this memo is to explain the various parameters and calculations used to create a prioritized list of projects based on the strategy, values and objectives of the City, and to provide guidance on how to use this tool to help develop a Capital Investment Plan. This tool was developed to support the activities part of the Project Prioritization & Selection, and Robust Investment Plan stages of the Investment Planning Framework of the City of Winnipeg.



2. General Presentation

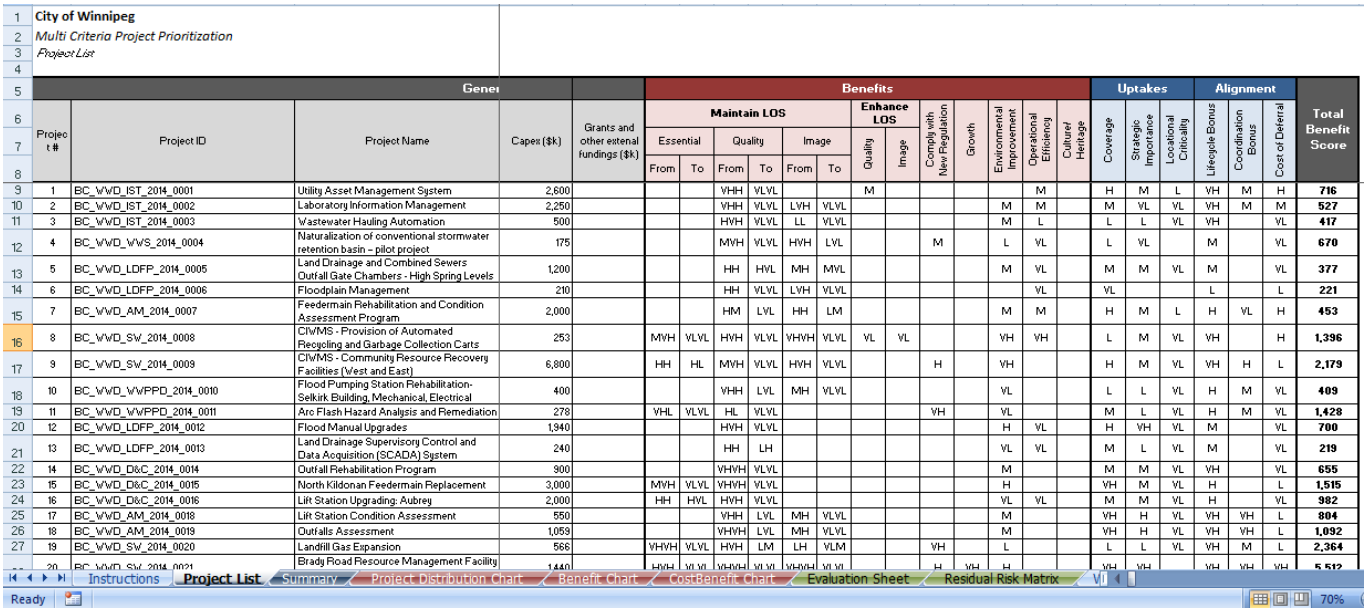
The model was developed on Microsoft Excel and includes 11 different sheets:

- **Instructions**: this sheet provides some general background about the Multi Criteria Prioritization process and Capital investment Plan preparation, and step by step instructions on how to use the tool, which information to provide, etc.
- **Project List**: this sheet is used to record the information of the projects under consideration for the capital budget plan, and evaluate their benefits. The detailed explanation of the project benefit evaluation, including the calculations and assumptions, are provided in the next sections below.
- **Summary**: the sheet provides a detailed report of the benefit scores of each project, and includes a section to build the Capital Investment Plan by refining the prioritization of the projects and evaluate residual risks. More information is available in the next sections below
- **Project Distribution Chart**: this chart displays the project by their cost and benefit, and in which cost-benefit "zone" the projects are located.
- **Benefit Chart**: bar chart comparing the benefits of each project
- **CostBenefit Chart**: bar chart comparing projects by their cost-benefit ratio
- **Evaluation Sheet**: this sheet provides the information needed to rate projects by evaluating their benefits in the *Project List* sheet
- **Residual Risk Matrix**: this sheet contains a consequence and likelihood matrix needed to evaluate the residual risks of projects excluded from the next Capital Investment Plan (in the *Summary* sheet).
- **Weighting Scale**: this sheet contains the ten benefit criteria and their relative weight established by the City to rate the projects
- **Conversion Tables**: this sheet contains a number of tables that are used to calibrate the model. More information on how to calibrate the model is provided in the next sections below

- **Project Distribution Chart Data**: contains the data (automatically filled) to draw the Project Distribution Chart

3. Evaluating Project Benefits

The benefits of the projects are evaluated in the *Project List* Sheet:



City of Winnipeg
Multi Criteria Project Prioritization
Project List

Project #	Project ID	Project Name	Capex ($k)	Grants and other external fundings ($k)	Benefits: Maintain LOS – Essential From	Essential To	Quality From	Quality To	Image From	Image To	Enhance LOS – Quality	Enhance LOS – Image	Comply with New Regulation	Growth	Environmental Improvement	Operational Efficiency	Culture/ Heritage	Uptakes: Coverage	Strategic Importance	Locational Criticality	Alignment: Lifecycle Bonus	Coordination Bonus	Cost of Deferral	Total Benefit Score
1	BC_WWD_IST_2014_0001	Utility Asset Management System	2,600				VHH	VLVL			M					M		H	M	L	VH	M	H	**716**
2	BC_WWD_IST_2014_0002	Laboratory Information Management	2,250				VHH	VLVL	LVH	VLVL					M	M		M	VL	VL	VH	M	M	**527**
3	BC_WWD_IST_2014_0003	Wastewater Hauling Automation	500				HVH	VLVL	LL	VLVL					M	L		L	L	VL	VH		VL	**417**
4	BC_WWD_WWS_2014_0004	Naturalization of conventional stormwater retention basin – pilot project	175				MVH	VLVL	HVH	LVL			M		L	VL		L	VL		M		VL	**670**
5	BC_WWD_LDFP_2014_0005	Land Drainage and Combined Sewers Outfall Gate Chambers - High Spring Levels	1,200				HH	HVL	MH	MVL					M	VL		M	M	VL	M		VL	**377**
6	BC_WWD_LDFP_2014_0006	Floodplain Management	210				HH	VLVL	LVH	VLVL						VL		VL			L		L	**221**
7	BC_WWD_AM_2014_0007	Feedermain Rehabilitation and Condition Assessment Program	2,000				HM	LVL	HH	LM					M	M		H	M	L	H	VL	H	**453**
8	BC_WWD_SW_2014_0008	CIWMS - Provision of Automated Recycling and Garbage Collection Carts	253		MVH	VLVL	HVH	VLVL	VHVH	VLVL	VL	VL			VH	VH		L	M	VL	VH		H	**1,396**
9	BC_WWD_SW_2014_0009	CIWMS - Community Resource Recovery Facilities (West and East)	6,800		HH	HL	MVH	VLVL	HVH	VLVL			H		VH			H	M	VL	VH	H	L	**2,179**
10	BC_WWD_WWPPD_2014_0010	Flood Pumping Station Rehabilitation-Selkirk Building, Mechanical, Electrical	400				VHH	LVL	MH	VLVL					VL			L	L	VL	H	M	VL	**489**
11	BC_WWD_WWPPD_2014_0011	Arc Flash Hazard Analysis and Remediation	278		VHL	VLVL	HL	VLVL					VH		VL			M	L	VL	H	M	VL	**1,428**
12	BC_WWD_LDFP_2014_0012	Flood Manual Upgrades	1,940				HVH	VLVL							H	VL		H	VH	VL	M		VL	**700**
13	BC_WWD_LDFP_2014_0013	Land Drainage Supervisory Control and Data Acquisition (SCADA) System	240				HH	LH							VL	VL		M	L	VL	M		VL	**219**
14	BC_WWD_D&C_2014_0014	Outfall Rehabilitation Program	900				VHVH	VLVL							M			M	M	VL	VH		VL	**655**
15	BC_WWD_D&C_2014_0015	North Kildonan Feedermain Replacement	3,000		MVH	VLVL	VHVH	VLVL							H			VH	M	VL	H		L	**1,515**
16	BC_WWD_D&C_2014_0016	Lift Station Upgrading: Aubrey	2,000		HH	HVL	HVH	VLVL							VL	VL		M	M	VL	H		VL	**982**
17	BC_WWD_AM_2014_0018	Lift Station Condition Assessment	550				VHH	LVL	MH	VLVL					M			VH	H	VL	VH	VH	L	**804**
18	BC_WWD_AM_2014_0019	Outfalls Assessment	1,059				VHVH	LVL	MH	VLVL					M			VH	H	VL	VH	VH	L	**1,092**
19	BC_WWD_SW_2014_0020	Landfill Gas Expansion	566		VHVH	VLVL	HVH	LM	LH	VLM			VH		L			L	L	VL	VH	M	L	**2,364**
20	BC_WWD_SW_2014_0021	Brady Road Resource Management Facility	1,440		HVH	VLVL	VHVH	VLVL	VHVH	VLVL			H	VH	H			VH	VH		VH	VH	VH	**5,512**

Instructions | Project List | Summary | Project Distribution Chart | Benefit Chart | CostBenefit Chart | Evaluation Sheet | Residual Risk Matrix

Ready 70%

Projects are rated with ten benefit criteria, weighted based on established priorities, and scaled up depending on the relative importance of the user base impacted, and the strategic importance of the project to the City. Business Cases with sound planning and business acumen consistent with the best Asset Management practices are also rewarded with an "alignment factor" bonus.

Below are a summary of the information needed, and a detailed explanation of how the benefit scores are calculated.

a. Project Description

For each Project, a number of general information is required:

- **Project #**: unique project number (pre-set by the model) used to identify projects in the Project Distribution chart

- **Project ID**: the unique project identification number used by the business unit (e.g. for WWD Business Unit: BC_WWD_SW_2014_0023). This identification number is used in the Benefit and CostBenefit charts.

- **Project Name**: the project name as it appears on the business case

- **Department**: the department within the Business Unit responsible for this Project

- **Service: sub-service**: the service: sub-service within the Department responsible for this Project

- **Project Owner**: person responsible for the project, preferably the author of the business case

- **Investment Type**: two possible options: Project or Program. A program is defined as a recurring and consistent type of work (in terms of scope and size) (e.g. water main replacement program). A project is a “one time off piece of work”.

- **Number of Projects included in Program**: for a Program, it is the number of discrete projects included in the program. For linear asset projects, it may be difficult to know the number of Projects included in the Program. In that case, the estimated number of "typical Projects" (i.e. typical average size project) that could be done for the

investment amount requested is used. The number of projects in a program is used to adjust the Cost-Benefit ratio of programs.

- **Capex**: this is capital expenditure in $k required to complete the project, regardless of the delivery timeline (i.e. if the project lasts 3 years, or if the project has already started and money spent on it, the full capital amount is required). For programs, a one year worth of capital expenditure is required.

- **Grants and other external funding**: this includes the amount of "free money" received outside of the City's budget that will contribute to fund the project. This amount is deducted from the total project cost in the calculation of the cost-benefit ratio of the project.

b. Benefit Evaluation

For each project, the proposed investment is evaluated relative to each of the primary benefit criteria. "Maintain LOS" criteria are evaluated, from VLVL to VHVH (Very Low consequence Very Low likelihood to Very High consequence Very High likelihood), based on the anticipated risk reduction; other criteria are evaluated from VL to VH (Very Low benefit to Very High benefit) based on the benefit anticipated by making the proposed investment.

- **Maintain LOS (Essential - Quality - Image) "From"**: the current risk exposure is estimated in terms of Consequence and Likelihood. The Evaluation sheet is used to help assess the current situation (i.e. before the investment is made).

- **Maintain LOS (Essential - Quality - Image) "To"**: the future risk exposure in terms of Consequence and Likelihood after the investment has been made is estimated, using the same evaluation criteria as above.

- **Enhance LOS (Quality, Image), Compliance with New Legislation, Support Growth and Development, Environmental Stewardship, Operational Efficiency, Cultural**: the benefits anticipated from making the required investment are estimated. The benefit descriptions in the Evaluation sheet are used to help identify the type and extent of benefits applicable to the project.

Note 1: **Essential Levels of Service** are such that a failure (e.g. non-compliance to Legislative Requirements) would expose the Business Unit to serious consequences (e.g. loss of license, jail time, huge fines, etc.).

Maintain Quality Levels of Service are such that a failure (e.g. severe and recurring reliability problems) would affect the service provided to the customers but would not expose the Business Unit to the same level of consequences (e.g. loss of license, jail time, huge fines, etc.) as a failure with an Essential LOS.

Image Levels of Service are such that a failure would affect the customer's perceived experience, but would not necessarily directly after the delivery of the service itself.

Note 2: when a benefit criteria is not applicable to a project, no benefit is applied (i.e. the column is left blank).

c. Benefit Score Calculation

The following equation broadly describes how benefit scores are calculated:

$$Benefit\ Score = (\sum Benefit\ Ratings\ \times\ Uptake)\ \times\ Alignment\ Factor$$

The details of the benefit calculations in the *Project List* sheet are available from column AV to CV.

The benefit score for “Maintain LOS” and the other benefits are calculated slightly differently, as Maintain LOS benefit is a risk reduction, while the other benefit criteria are “pure benefits”.

To calculate the "Maintain LOS" (Essential, Quality, and Image) benefit, we subtract the score attributed to the "From" column to the one attributed to the "To" column using this conversion table:

Conversion Table		Consequence				
		VL	L	M	H	VH
Likelihood	VL	1	2	4	7	10
	L	2	4	8	14	20
	M	4	8	16	28	40
	H	7	14	28	49	70
	VH	10	20	40	70	100

Example:

	Maintain LOS					
	Essential		Quality		Image	
	From	To	From	To	From	To
Rating	MVH	VLVL	HVH	VLVL	VHVH	VLVL
Score	**40 - 1 = 39**		**70 - 1 = 69**		**100 - 1 = 99**	

For all the other benefits, a score from 1 to 10 is attributed based on the rating received, using the following conversion table:

Other Benefits							
Rating	Enhance LOS		Comply with new Regulation	Growth	Environmental Improvement	Operational Efficiency	Culture/ Heritage
	Quality	Image					
VL	1	1	1	1	1	1	1
L	2	2	2	2	2	2	2
M	4	4	4	4	4	4	4
H	7	7	7	7	7	7	7
VH	10	10	10	10	10	10	10

All benefit scores are subsequently "normalized", meaning that the Maintain LOS benefits and the other benefits are divided by their maximum potential score (100 for Maintain LOS, and 10 for other benefits) to ensure that all the benefits are rated on the same scale, from 0 to 1. This score is then multiplied by a factor (currently at 2,469) that was calculated in such a way that the total maximum potential benefit score a project could get, after uptakes and bonuses, is 10,000. This factor can be found and modified in the *Weighting Scale* sheet.

In the example above, the final score attributed to "Maintain Essential LOS", before uptakes and bonuses, is:

$$Maintain\ Essential\ LOS\ score = \frac{39}{100} \times 2{,}469 = 962.91$$

This score can be found on column AX of the *Project List* sheet.

All conversion tables are available under the *Conversion Tables* sheet in the spreadsheet.

Each benefit score is then multiplied by their relative weight, as attributed by the City senior management, according to the table below:

Benefit Weighting	
Maintain Essential LOS	26%
Maintain Quality LOS	13%
Maintain Image LOS	6%
Comply with New Legislation	26%
Enhance Quality LOS	4%
Enhance Image LOS	1%
Growth	12%
Environmental	3%
Operational Efficiency	7%
Cultural	2%

In the example above, the weighted score is therefore:

$$Maintain\ Essential\ LOS\ weighted\ score = \ 962.91\ \times 0.26 = 250.36$$

The Uptakes are benefit multipliers to reflect the importance of the project in terms of Coverage, Strategic Importance and Locational Criticality. Each of these uptakes can increase the benefits by up to 100% as described in the conversation table below.

Uptakes			
Score	Coverage	Strategic Importance	Locational Criticality
VL	1	1	1
L	2	2	2
M	4	4	4
H	7	7	7
VH	10	10	10
Maximum Uptake	100%	100%	100%

An uptake score of M would increase the benefit of 40%. However, it is important to note that not all uptakes apply to all benefits. The table below shows which Uptake applies to which benefit.

		Uptake Application		
		Coverage	Strategic Importance	Locational Criticality
Maintain LOS	Essential	1	1	1
	Quality	1	1	1
	Image	1	1	1

Enhance LOS	Quality	1	1	1
	Image	1	1	1
Comply with New Regulations		1	1	1
Growth		1	1	1
Environmental Improvement		0	0	0
Operational Efficiency		0	0	0
Culture/ Heritage		1	1	1

A“0” means that the benefit is not scaled up by the uptake. In the current situation as described above, Environmental Improvement and Operational Efficiency do not receive any benefit uptake. The model is built in such a way that those parameters can be modified as needed.

Alignment factors are additional bonuses applied to projects to “reward” good business practices. The total maximum bonus available is 10%, as described in the table below:

Alignment			
Score	Lifecycle Bonus	Coordination Bonus	Cost Deferral
VL	1	1	1
L	2	2	2
M	4	4	4
H	7	7	7
VH	10	10	10
Maximum Bonus	3%	3%	4%

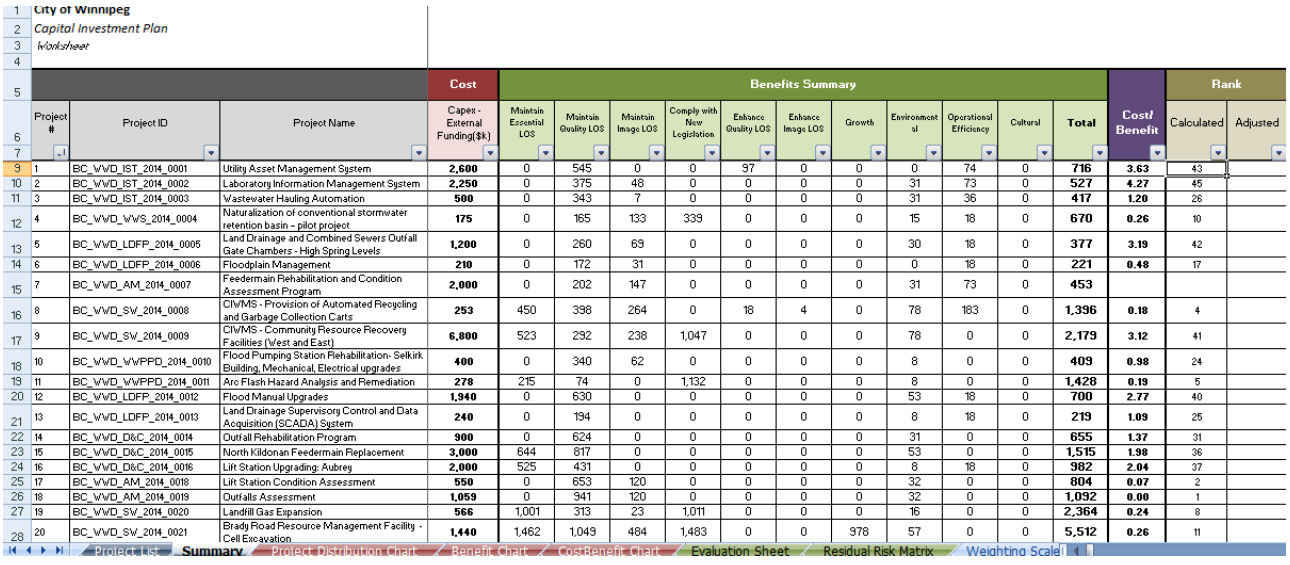
These alignment factors apply to all benefits.

The calibration of the model can be done by modifying the various parameters of the tables in the *Conversion Tables* sheet.

A detailed benefit calculation example (with the full equation) is provided in Appendix A.

4. Capital Investment Plan preparation

Once the project benefits have been estimated, projects are ranked according to their cost benefit ratio, as displayed in the *Summary* sheet below.



City of Winnipeg

Capital Investment Plan

Worksheet

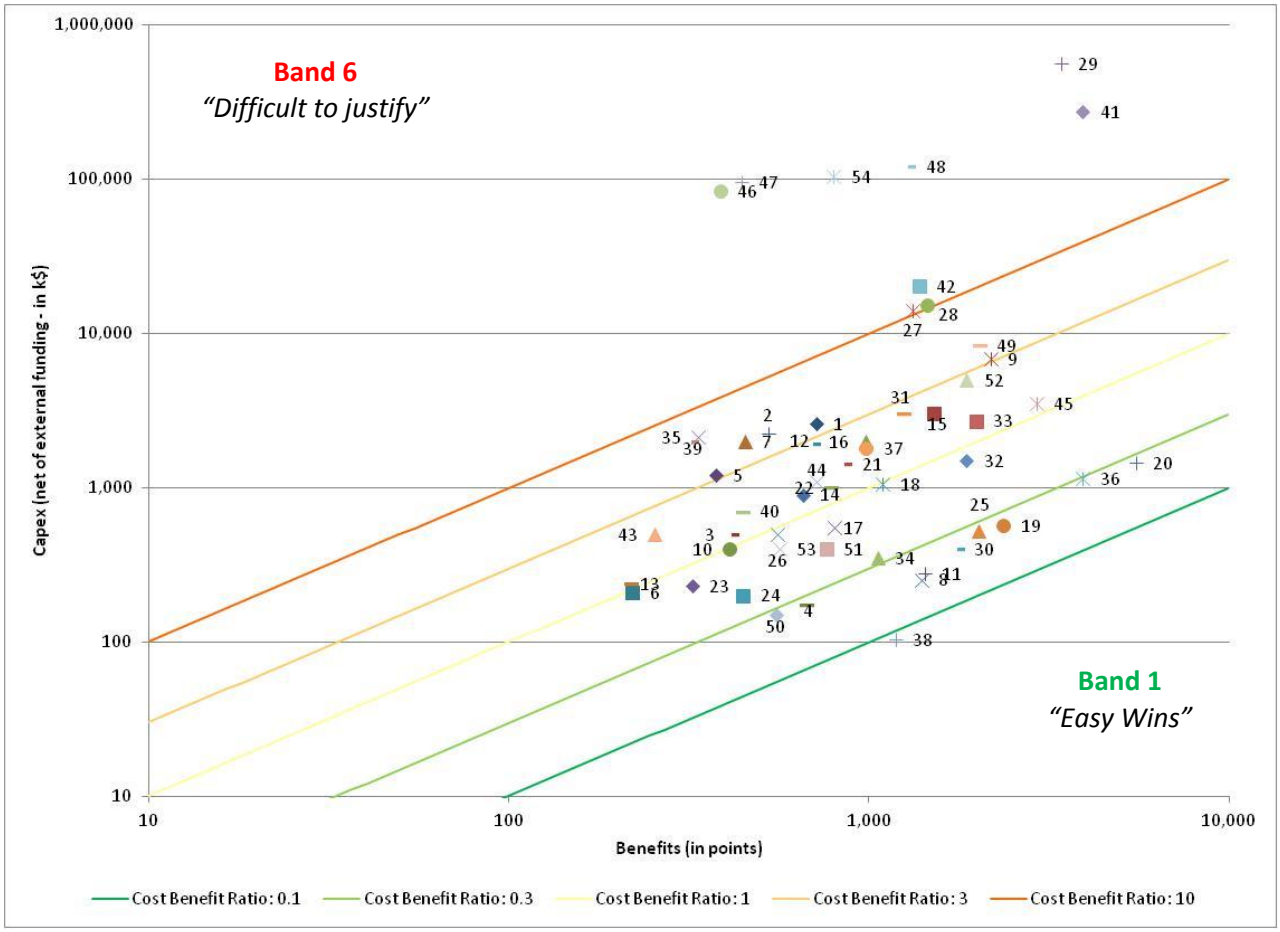
				Cost	Benefits Summary											Cost/ Benefit	Rank	
	Project #	Project ID	Project Name	Capex - External Funding($k)	Maintain Essential LOS	Maintain Quality LOS	Maintain Image LOS	Comply with New Legislation	Enhance Quality LOS	Enhance Image LOS	Growth	Environmental	Operational Efficiency	Cultural	Total		Calculated	Adjusted
9	1	BC_WWD_IST_2014_0001	Utility Asset Management System	2,600	0	545	0	0	97	0	0	0	74	0	716	3.63	43	
10	2	BC_WWD_IST_2014_0002	Laboratory Information Management System	2,250	0	375	48	0	0	0	0	31	73	0	527	4.27	45	
11	3	BC_WWD_IST_2014_0003	Wastewater Hauling Automation	500	0	343	7	0	0	0	0	31	36	0	417	1.20	26	
12	4	BC_WWD_WWS_2014_0004	Naturalization of conventional stormwater retention basin – pilot project	175	0	165	133	339	0	0	0	15	18	0	670	0.26	10	
13	5	BC_WWD_LDFP_2014_0005	Land Drainage and Combined Sewers Outfall Gate Chambers - High Spring Levels	1,200	0	260	69	0	0	0	0	30	18	0	377	3.19	42	
14	6	BC_WWD_LDFP_2014_0006	Floodplain Management	210	0	172	31	0	0	0	0	0	18	0	221	0.48	17	
15	7	BC_WWD_AM_2014_0007	Feedermain Rehabilitation and Condition Assessment Program	2,000	0	202	147	0	0	0	0	31	73	0	453			
16	8	BC_WWD_SW_2014_0008	CIWMS - Provision of Automated Recycling and Garbage Collection Carts	253	450	398	264	0	18	4	0	78	183	0	1,396	0.18	4	
17	9	BC_WWD_SW_2014_0009	CIWMS - Community Resource Recovery Facilities (West and East)	6,800	523	292	238	1,047	0	0	0	78	0	0	2,179	3.12	41	
18	10	BC_WWD_WWPPD_2014_0010	Flood Pumping Station Rehabilitation- Selkirk Building, Mechanical, Electrical upgrades	400	0	340	62	0	0	0	0	8	0	0	409	0.98	24	
19	11	BC_WWD_WWPPD_2014_0011	Arc Flash Hazard Analysis and Remediation	278	215	74	0	1,132	0	0	0	8	0	0	1,428	0.19	5	
20	12	BC_WWD_LDFP_2014_0012	Flood Manual Upgrades	1,940	0	630	0	0	0	0	0	53	18	0	700	2.77	40	
21	13	BC_WWD_LDFP_2014_0013	Land Drainage Supervisory Control and Data Acquisition (SCADA) System	240	0	194	0	0	0	0	0	8	18	0	219	1.09	25	
22	14	BC_WWD_D&C_2014_0014	Outfall Rehabilitation Program	900	0	624	0	0	0	0	0	31	0	0	655	1.37	31	
23	15	BC_WWD_D&C_2014_0015	North Kildonan Feedermain Replacement	3,000	644	817	0	0	0	0	0	53	0	0	1,515	1.98	36	
24	16	BC_WWD_D&C_2014_0016	Lift Station Upgrading: Aubrey	2,000	525	431	0	0	0	0	0	8	18	0	982	2.04	37	
25	17	BC_WWD_AM_2014_0018	Lift Station Condition Assessment	550	0	653	120	0	0	0	0	32	0	0	804	0.07	2	
26	18	BC_WWD_AM_2014_0019	Outfalls Assessment	1,059	0	941	120	0	0	0	0	32	0	0	1,092	0.00	1	
27	19	BC_WWD_SW_2014_0020	Landfill Gas Expansion	566	1,001	313	23	1,011	0	0	0	16	0	0	2,364	0.24	8	
28	20	BC_WWD_SW_2014_0021	Brady Road Resource Management Facility - Cell Excavation	1,440	1,462	1,049	484	1,483	0	0	978	57	0	0	5,512	0.26	11	

Project List | Summary | Project Distribution Chart | Benefit Chart | Cost-Benefit Chart | Evaluation Sheet | Residual Risk Matrix | Weighting Scale

To prepare the Capital Investment Plan, the prioritized list needs to be refined.

Column A to V (Benefit Summary and Cost Benefit ratio) of the *Summary* Sheet are automatically populated based on the information provided in the *Project List* sheet. In column W "**Adjusted Rank**", the user has the possibility to adjust the project ranking. Some projects will indeed need to be moved for various reasons such as Coordination with other projects; Grants or other special funding arrangements; Major event for the City (e.g. Canada Summer Games); or other external factors. The "Adjusted Rank" is meant to reflect the external factors faced by the business units for certain projects that are not otherwise taken into account by the Project Prioritization model. This tool helps to choose which projects need to be included in the Capital Investment Plan, and which projects can be delayed with an acceptable residual risk.

Column X reflects where each project stands. Six Cost-Benefit "bands" have been established to help visualize how projects compare to each other, as displayed in the *Project Distribution* chart below.

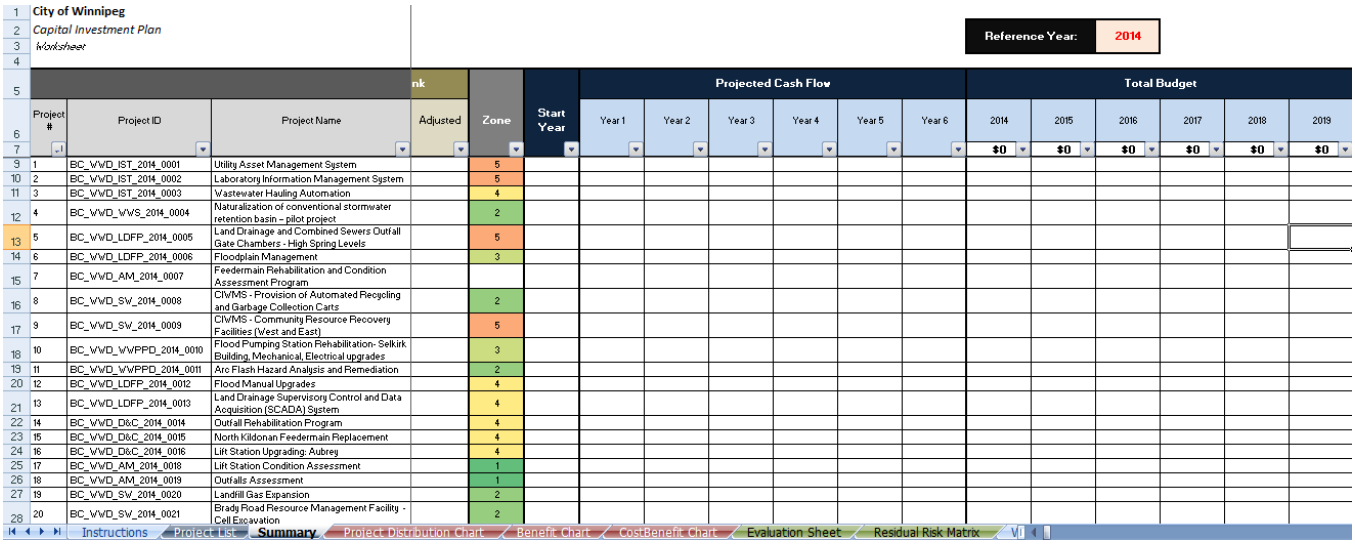


Band 1 includes all the projects with a cost-benefit ratio below 0.1, meaning that these projects provide a high Benefit for a low cost and are the "easy wins" projects (project that should proceed in priority). Band 6 is the opposite of Band 1 and includes all the projects with a cost benefit ratio above 10, meaning that these projects have a high cost for a low Benefit and are more "difficult to justify". When funding is constrained and cannot accommodate all projects, Projects in higher Bands (e.g. Band 6, 5, 4) should be taken out of the Capital Investment Plan in priority.

Column Y "**Start Year**" reflects the start of a project from Year 1 to Year 6 in the investment cycle. Column Z to AE "Projected Cash Flow": provide the cash flow of the project as indicated in the Business Case.

Column AF to AK "**Total Budget**" is automatically populated based on the information provided in Column Y to AE. This section helps estimate the total yearly cash flow profiles of the different scenarios under consideration and balance the spending over the forecast period.

"Reference Year" refers to the year for which the Capital Investment Plan is being prepared.



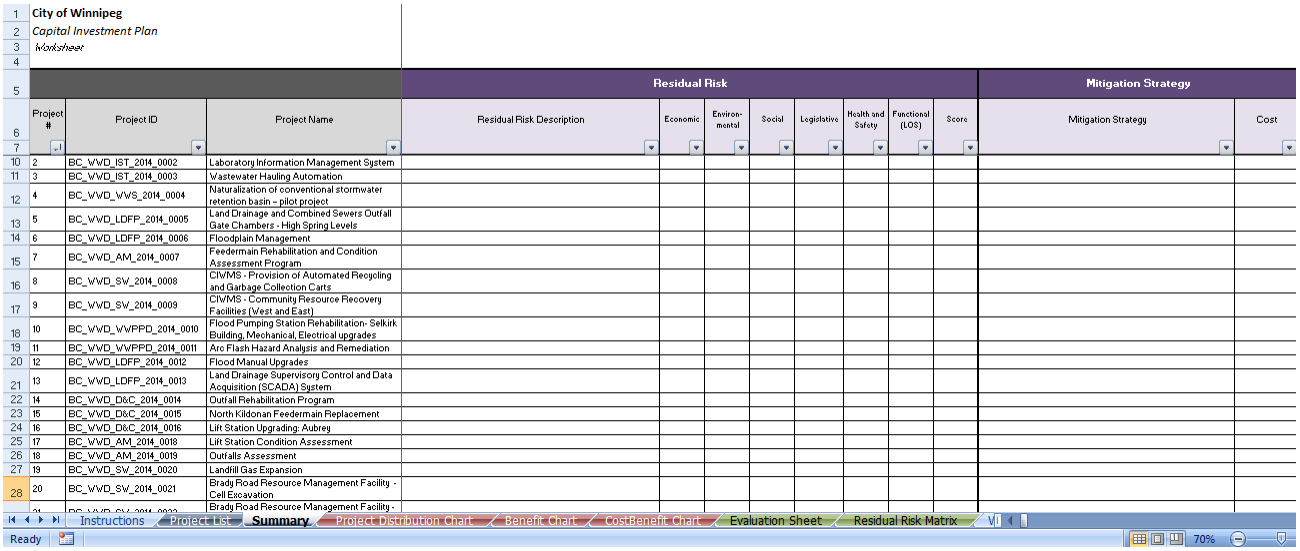
City of Winnipeg
Capital Investment Plan
Worksheet

Reference Year: 2014

Project #	Project ID	Project Name	Adjusted	Zone	Start Year	Projected Cash Flow: Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total Budget: 2014	2015	2016	2017	2018	2019
						$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1	BC_WWD_IST_2014_0001	Utility Asset Management System		5													
2	BC_WWD_IST_2014_0002	Laboratory Information Management System		5													
3	BC_WWD_IST_2014_0003	Wastewater Hauling Automation		4													
4	BC_WWD_WWS_2014_0004	Naturalization of conventional stormwater retention basin – pilot project		2													
5	BC_WWD_LDFP_2014_0005	Land Drainage and Combined Sewers Outfall Gate Chambers - High Spring Levels		5													
6	BC_WWD_LDFP_2014_0006	Floodplain Management		3													
7	BC_WWD_AM_2014_0007	Feedermain Rehabilitation and Condition Assessment Program															
8	BC_WWD_SW_2014_0008	CIVMS - Provision of Automated Recycling and Garbage Collection Carts		2													
9	BC_WWD_SW_2014_0009	CIVMS - Community Resource Recovery Facilities (West and East)		5													
10	BC_WWD_WWPPD_2014_0010	Flood Pumping Station Rehabilitation- Selkirk Building, Mechanical, Electrical upgrades		3													
11	BC_WWD_WWPPD_2014_0011	Arc Flash Hazard Analysis and Remediation		2													
12	BC_WWD_LDFP_2014_0012	Flood Manual Upgrades		4													
13	BC_WWD_LDFP_2014_0013	Land Drainage Supervisory Control and Data Acquisition (SCADA) System		4													
14	BC_WWD_D&C_2014_0014	Outfall Rehabilitation Program		4													
15	BC_WWD_D&C_2014_0015	North Kildonan Feedermain Replacement		4													
16	BC_WWD_D&C_2014_0016	Lift Station Upgrading: Aubrey		4													
17	BC_WWD_AM_2014_0018	Lift Station Condition Assessment		1													
18	BC_WWD_AM_2014_0019	Outfalls Assessment		1													
19	BC_WWD_SW_2014_0020	Landfill Gas Expansion		2													
20	BC_WWD_SW_2014_0021	Brady Road Resource Management Facility - Cell Excavation		2													

Instructions | Project List | Summary | Project Distribution Chart | Benefit Chart | CostBenefit Chart | Evaluation Sheet | Residual Risk Matrix

Column AL to AS "**Residual Risk**": for each project moved to a later start, the residual risks need to be evaluated (i.e. what is the risk of delaying the project by one or more year?). The risk evaluation follows the same principles as in the risk tools developed for stage 2 "Need" of the Investment Planning Framework. The Residual Risk Matrix sheet should be to evaluate the Economic, Environmental, Social, Legislative, Health and Safety, and Operational risks.



City of Winnipeg
Capital Investment Plan
Worksheet

Project #	Project ID	Project Name	Residual Risk: Residual Risk Description	Economic	Environ-mental	Social	Legislative	Health and Safety	Functional (LOS)	Score	Mitigation Strategy: Mitigation Strategy	Cost
2	BC_WWD_IST_2014_0002	Laboratory Information Management System										
3	BC_WWD_IST_2014_0003	Wastewater Hauling Automation										
4	BC_WWD_WWS_2014_0004	Naturalization of conventional stormwater retention basin – pilot project										
5	BC_WWD_LDFP_2014_0005	Land Drainage and Combined Sewers Outfall Gate Chambers - High Spring Levels										
6	BC_WWD_LDFP_2014_0006	Floodplain Management										
7	BC_WWD_AM_2014_0007	Feedermain Rehabilitation and Condition Assessment Program										
8	BC_WWD_SW_2014_0008	CIVMS - Provision of Automated Recycling and Garbage Collection Carts										
9	BC_WWD_SW_2014_0009	CIVMS - Community Resource Recovery Facilities (West and East)										
10	BC_WWD_WWPPD_2014_0010	Flood Pumping Station Rehabilitation- Selkirk Building, Mechanical, Electrical upgrades										
11	BC_WWD_WWPPD_2014_0011	Arc Flash Hazard Analysis and Remediation										
12	BC_WWD_LDFP_2014_0012	Flood Manual Upgrades										
13	BC_WWD_LDFP_2014_0013	Land Drainage Supervisory Control and Data Acquisition (SCADA) System										
14	BC_WWD_D&C_2014_0014	Outfall Rehabilitation Program										
15	BC_WWD_D&C_2014_0015	North Kildonan Feedermain Replacement										
16	BC_WWD_D&C_2014_0016	Lift Station Upgrading: Aubrey										
17	BC_WWD_AM_2014_0018	Lift Station Condition Assessment										
18	BC_WWD_AM_2014_0019	Outfalls Assessment										
19	BC_WWD_SW_2014_0020	Landfill Gas Expansion										
20	BC_WWD_SW_2014_0021	Brady Road Resource Management Facility - Cell Excavation										

Instructions | Project List | Summary | Project Distribution Chart | Benefit Chart | CostBenefit Chart | Evaluation Sheet | Residual Risk Matrix

Ready 70%

Column AT and AU "**Mitigation Strategy**": for each of the projects that are being delayed, a mitigation strategy shall be described for the risk, and the eventual additional cost to the project. After evaluation, if a risk is deemed unacceptable, the project shall be moved back for a Start Year in Year 1 and the Total Budget shall be re-adjusted.

5. Specificities & Limitations

The cost-benefit ratio as calculated in the model compares Dollars (cost) to Points (benefits). As such, the cost-benefit ratio of a project by itself is of little significance. However, it provides valuable information in comparison to other projects, and allows distinguish between high value projects (low cost – high benefits), lower value projects (low cost low benefit – high cost high benefit) – and poor value projects (high cost low benefit).

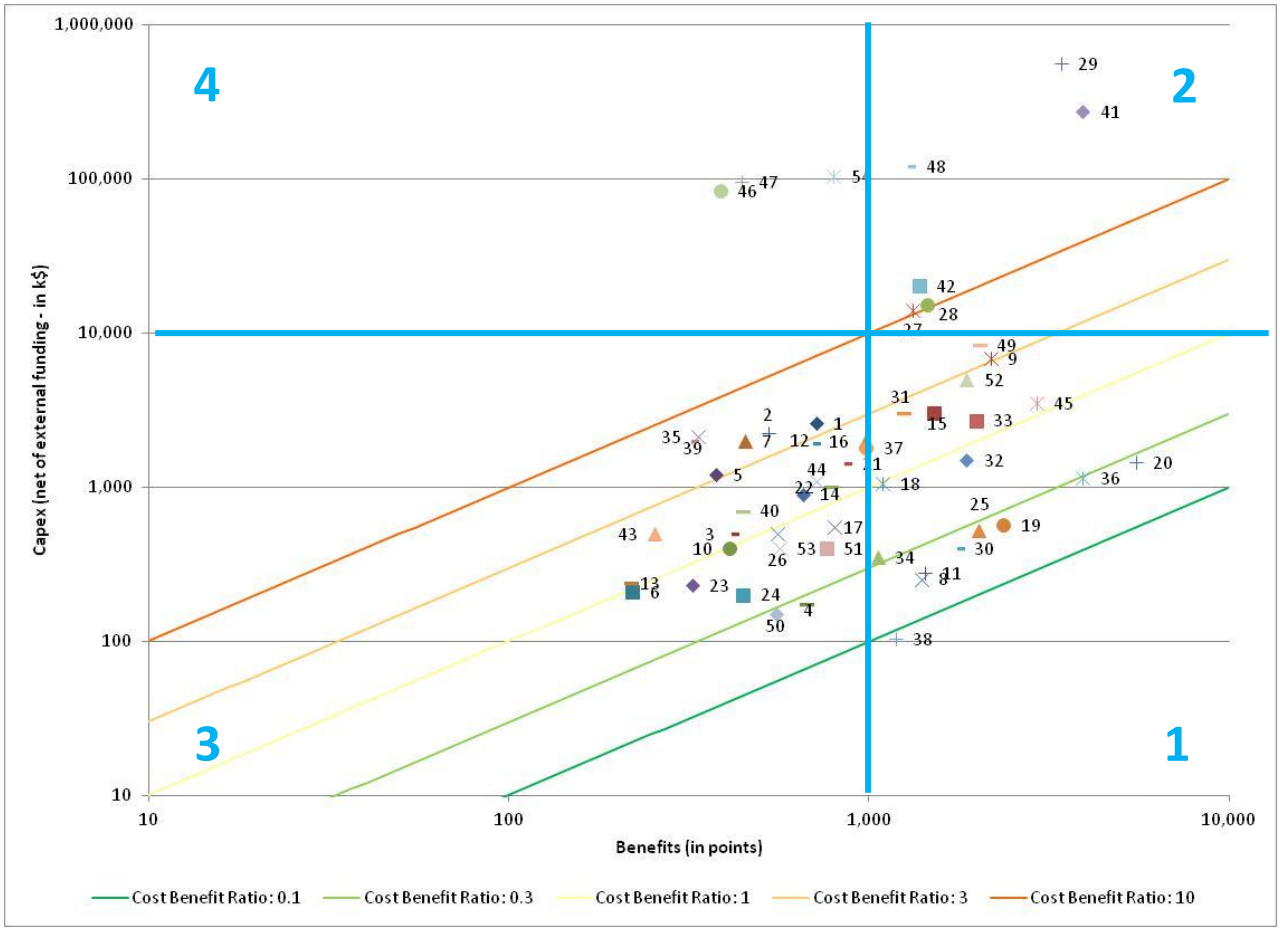
a. Dealing with large projects

The MCP model works well for the vast majority of the projects, but due to the nature of the model (i.e. how the benefit calculation is performed), capital intensive projects (i.e. projects above $10 million) will always perform poorly in terms of cost-benefit ratio and ranking.

While cost-benefit plays an important role in the capital planning process, other factors must also be considered. First, all projects with accepted business cases are valid projects and should be completed at some point. In building the Capital Investment Plan, the staging of a project should be initially set based on the cost-benefit ratio, and then adjusted based on residual risk, opportunities and other external factors (e.g. council directions, regulatory deadlines, etc.) not captured by the model.

In the case of a large project, while the cost benefit ratio will be poor compared to smaller competing projects, the residual risk associated with not doing the project may be unacceptable or the opportunity too great to pass on. In such cases, this project's timing should be moved up in the Capital Investment Plan (regardless of its cost-benefit ratio), and other projects (with better cost benefit ratio but less severe residual risk or lower opportunity) would be delayed to meet annual budget constraints.

Further to the bands as described in section 4, projects can also be broken down into four zones as illustrated below.



While the vast majority of projects will fall in zones 1 and 3 (projects below $10 million), projects in zones 2 and 4 represent the capital intensive projects that perform poorly on a cost-benefit basis. The table below provides additional guidance on how to treat these projects.

Zone	Description	Instructions	Approach
1	Low-Cost/High-Benefits "Easy Wins"	Work represents excellent value-for-money and should proceed resourcing, logistical, or economic issues	Rank projects based on cost-benefit ratio, proceeding from highest to lowest benefit within each band
2	High-Cost/High-Benefits "Return-On-Investment"	Work represents a sound return on investment and should proceed strategically so as to maximize return on investment, coordination and economies of scale	Assess projects on an individual basis. Projects in this zone may have benefits greater than allowed by the model. Project benefits should be re-assessed relative to projects in zone 1 as a datum. The benefits associated with these capital intensive projects may be incrementally larger than can be captured by the model. There are therefore Opportunities that should be considered during the residual risk step in developing a Department's Investment Plan. Evaluate risks related to project timing. Schedule projects to manage residual risks, and maximize return on investment, coordination and economies of scale
3	Low-Cost/Low-Benefits "Incremental Gains"	Works represent a marginal return on investment and should proceed strategically as supported by other work or as resourcing allows	Projects with higher benefits should have priority over low-benefit projects. These projects should therefore be assessed for opportunities relative to other investment opportunities and only considered if funding is a concern (i.e. live within a funding envelope). Rank projects based on cost-benefit ratio, proceeding from highest to lowest benefit within each band
4	High-Cost/Low-Benefits "Difficult to Justify"	Work appear to represent a poor return on investment and should only proceed after further examination or political intervention	The Need and the Solution for these projects need to re-assessed to verify that the LOS established along with the Risk to LOS are appropriate. There is a possible misalignment of the Need with the Benefit to the City. To replace a project zone 1 with a project in zone 4 would require significant justification or direction from council.

b. Rating benefits for studies

A business case for a study is usually put forward because a Need has previously been identified during the previous step of the Investment Planning cycle (Gap in LOS, Needs identification/ Risk Assessment), but we lack the information needed to properly understand and solve the problem. In this case, the rating of the 'study' business case should be based on the expected outcome (i.e. what is expected once the need has been addressed), and not based on the value of the study alone.

For regularly occurring repetitive assessments of similar scope (e.g. sewer CCTV, lift station assessments) the work should be evaluated as a program, using the approach recommended below. For large or occasional assessments (e.g. WTP, Tache Surge Tower, McLean PS) the work should be evaluated as a project.

c. Rating benefits for programs

A program is usually comprised of a number of projects of similar size and scope (i.e. a Project is defined as quantified scope of work at a specific location), and for which an annual budget is allocated. Examples would be the “Local Street renewable program” or the “Water Main replacement program”.

When rating a business case for a program, the benefit criteria of the program should be rated as if it was a single representative project, using the front page of the Business Case Rating worksheet, but the Benefit Uptake and Alignment Factors (back page of the Business Case Rating worksheet) should be rated for the program as a whole. A program would score better than several comparable standalone projects as the Benefit Uptake and Alignment Factors would be rated higher.

d. Rating benefits for rolling capital type programs

These programs cannot be rated as there is no specific need identified to assess the benefits. These programs need to be ranked in the CIP relative to the Risk and Opportunity of the other prioritized projects. A process for how these Rolling Capital type funds will be managed during the year will be detailed in the IP manual.

Appendix A - Benefit Score Calculation – Example

Each Benefit can be calculated with the following equations. The total Benefit Score is the addition of all these benefits.

Maintain Essential LOS Benefit Score

$$= \frac{MELOSfrom - MELOSto}{100} \times factor \times MELOSweight$$
$$\times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{MELOS-coverage} + \frac{StratImp}{10}\right.$$
$$\times MaxUptake_{stratimp} \times UptakeApplication_{MELOS-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit}$$
$$\left. \times UptakeApplication_{MELOS-loccrit}\right)$$
$$\times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination}\right.$$
$$\left. + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Maintain Quality LOS Benefit Score

$$= \frac{MQLOSfrom - MQLOSto}{100} \times factor \times MQLOSweight$$
$$\times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{MQLOS-coverage} + \frac{StratImp}{10}\right.$$
$$\times MaxUptake_{stratimp} \times UptakeApplication_{MQLOS-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit}$$
$$\left. \times UptakeApplication_{MQLOS-loccrit}\right)$$
$$\times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination}\right.$$
$$\left. + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Maintain Image LOS Benefit Score

$$= \frac{MILOSfrom - MILOSto}{100} \times factor \times MILOSweight$$
$$\times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{MILOS-coverage} + \frac{StratImp}{10}\right.$$
$$\times MaxUptake_{stratimp} \times UptakeApplication_{MILOS-stratimp} 1 + \frac{LocCrit}{10} \times MaxUptake_{loccrit}$$
$$\left. \times UptakeApplication_{MILOS-loccrit}\right)$$
$$\times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination}\right.$$
$$\left. + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Enhance Quality LOS Benefit Score

$$= \frac{EQLOS}{10} \times factor \times EQLOSweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{EQLOS-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{EQLOS-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{EQLOS-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Enhance Image LOS Benefit Score

$$= \frac{EILOS}{10} \times factor \times EILOSweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{EILOS-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{EILOS-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{EILOS-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Comply with New Regulation Score

$$= \frac{NewReg}{10} \times factor \times NewRegweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{newreg-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{newreg-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{newreg-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Growth Score

$$= \frac{Growth}{10} \times factor \times Growthweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{growth-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{growth-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{growth-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Environmental Improvement Score

$$= \frac{EnvImp}{10} \times factor \times EnvImpweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{envimp-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{envimp-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{envimp-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Operational Efficiency Score

$$= \frac{OpEff}{10} \times factor \times OpEffweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{opeff-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{opeff-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{opeff-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Culture Heritage Score

$$= \frac{CultHer}{10} \times factor \times CultHerweight \times \left(1 + \frac{Coverage}{10} \times MaxUptake_{Coverage} \times UptakeApplication_{culther-coverage} + \frac{StratImp}{10} \times MaxUptake_{stratimp} \times UptakeApplication_{culther-stratimp} + \frac{LocCrit}{10} \times MaxUptake_{loccrit} \times UptakeApplication_{culther-loccrit}\right) \times \left(1 + \frac{Lifecycle}{10} \times MaxBonus_{lifecycle} + \frac{Coordination}{10} \times MaxBonus_{coordination} + \frac{CostofDef}{10} \times MaxBonus_{costofdef}\right)$$

Below is an example that shows in detail the calculation:

General	Project #			1	
	Project ID			Project 1	
	Project Name			Project Alpha	
	Deparment			Public Works	
	Service: sub-service			Engineering	
	Project Owner			John Doe	
	Investment Type			Project	
	Number of Projects included in Program				
	Capex ($k)			2,500	
	Grants and other extenal fundings ($k)			500	**Rate Score**
Benefits	**Maintain LOS**	Essential	From	HVH	70
			To	MM	16
		Quality	From	HM	28
			To	LM	8
		Image	From	LL	4
			To	VLVL	1
	Enhance LOS	Quality		VL	1
		Image		VL	1
	Comply with New Regulation			H	7
	Growth			M	4
	Environmental Improvement			L	2
	Operational Efficiency			M	4
	Culture/ Heritage			VL	1
Uptakes	Coverage			L	2
	Strategic Importance			M	4
	Locational Criticality			H	7
Alignment	Lifecycle Bonus			M	4
	Coordination Bonus			H	7
	Cost of Deferral			H	7
Total Benefit Score				**2,530**	

Maintain Essential LOS Benefit Score

$$= \frac{70-16}{100} \times 2469 \times 0.26 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right)$$
$$\times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 845.92$$

Maintain Quality LOS Benefit Score

$$= \frac{28-8}{100} \times 2469 \times 0.13 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right) \times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 156.65$$

Maintain Image LOS Benefit Score

$$= \frac{4-1}{100} \times 2469 \times 0.06 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right) \times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 10.84$$

Enhance Quality LOS Benefit Score

$$= \frac{1}{10} \times 2469 \times 0.04 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right) \times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 24.10$$

Enhance Image LOS Benefit Score

$$= \frac{1}{10} \times 2469 \times 0.01 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right) \times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 6.02$$

Comply with New Regulation Benefit Score

$$= \frac{7}{10} \times 2469 \times 0.26 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right) \times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 289.20$$

Growth Benefit Score

$$= \frac{4}{10} \times 2469 \times 0.12 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right) \times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 1096.57$$

Environmental Improvement Benefit Score

$$= \frac{2}{10} \times 2469 \times 0.03 \times \left(1 + \frac{2}{10} \times 1 \times 0 + \frac{4}{10} \times 1 \times 0 + \frac{7}{10} \times 1 \times 0\right) \times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 15.72$$

Operational Efficiency Benefit Score

$$= \frac{4}{10} \times 2469 \times 0.07 \times \left(1 + \frac{2}{10} \times 1 \times 0 + \frac{4}{10} \times 1 \times 0 + \frac{7}{10} \times 1 \times 0\right) \times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 73.35$$

Culture Heritage Benefit Score

$$= \frac{1}{10} \times 2469 \times 0.02 \times \left(1 + \frac{2}{10} \times 1 \times 1 + \frac{4}{10} \times 1 \times 1 + \frac{7}{10} \times 1 \times 1\right) \times \left(1 + \frac{4}{10} \times 0.03 + \frac{7}{10} \times 0.03 + \frac{7}{10} \times 0.04\right) = 12.05$$

Total Benefit Score

$$= 845.92 + 156.65 + 10.84 + 24.10 + 6.02 + 289.20 + 1096.57 + 15.72 + 73.35 + 12.05$$
$$= \mathbf{2530.42}$$

Appendix E **– Glossary of Terms**

- Glossary of Terms

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
***A Guide to the Project Management Body of Knowledge*, Fourth Edition**	PMBOK Guide	A set of standard terminology and guidelines for project management published by the **Project Management Institute**, providing a general guide to managing most projects most of the time.	
advisory committee		A group of stakeholders that works at the request of the project manager and uses consensus to provide advice, options, and recommendations to help the sponsor and project manager make decisions.	
alternative project delivery	APD	Methods of delivery that are not design-bid-build. Alternative methods include design-build, variations of design-build, construction management, and P3. The Project Management Manual has additional requirements for assessing P3s, and treats them differently in this regard.	
As Low As Reasonably Practicable	ALARP	A risk management principle that weighs the risk against the resources (trouble, time, and money) required to further reduce risk.	
as-constructed drawings		The result of revising construction drawings such that the details on the drawings represent what and how the final product was constructed. The two types of as-constructed drawings are: 1) Drawings represent exactly how the project was constructed (e.g., underground works) and are stamped by an engineer. 2) Drawings are produced by the contractor and not stamped by an engineer.	
asset (facility) strategic plan		A plan that outlines how an asset group or a specific asset will meet the needs of an organization based on the organization's strategic plan or other internal or external force. The view is long term, meeting the organization's strategic vision and the life cycle of the specific asset.	
asset "facilities" master plan		The 30-year development plan for a specific asset group or class.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
asset management business model	AMBM	The formalized process for asset management, based on a series of business processes and procedures, adopted by the City of Winnipeg.	
asset management plan		A tactical plan for managing infrastructure assets to deliver an agreed level of service at an acceptable level of risk.	
asset risk		Asset risk relates to the consequences and likelihood of asset failure on the delivery of service	
Association for the Advancement of Cost Engineering International	AACE	Non-profit association that provides its members resources to enhance their performance, and provides certification in cost management disciplines, including cost engineering, cost estimating, planning and scheduling, decision and risk management, project management, project control, cost/schedule control, earned value management, claims, and more.	
Association of Professional Engineers and Geoscientists of the Province of Manitoba	APEGM	Professional association that governs and regulates the practice of professional engineering and professional geoscience in the Province of Manitoba.	
bottom-up estimating		Approximating the size (duration and cost) and risk of a project (or phase) by breaking it down into its smallest work components; estimating the effort, duration, and cost of each component; and aggregating them into a full estimate.	
British Standards Institution	BSI	Multinational business services provider whose principal activity is producing standards and supplying standards-related services.	
business case		Used in the asset management business model context, a document that identifies viable project or program options to address a business need, provides the business rationale and reasoning for a recommended action, and requests approval from the decision-makers to proceed.	
capital budget expenditures	Capex	An expenditure incurred against a capital account for fixed assets or to add to the value of an existing fixed asset.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
capital investment plan	CIP	A plan that provides a detailed understanding of anticipated investments into tangible capital assets, over multiple years.	
challenge session		A process by which business cases are vetted through, where they are scrutinized by a panel of business unit and Department managers to ensure they provide a comprehensive view and justification for the required investment.	
change control process		A formal process that ensures changes to a project, product, system, or approach are introduced in a controlled and coordinated manner. Effective project change control processes allow the proper focus to be maintained to complete projects on time and within budget. It properly integrates or postpones requests for changes to the project's scope that may result in revisions to the project's budget and completion schedule. Change control processes provide an efficient and effective method of change control within a project management framework.	
change of scope		A request to change the agreed scope and objectives of the project to accommodate a need not originally defined to be part of the project.	
change order		A document within the change management process required to change a baseline control document, planning or design document, contract, or specification. Once a revision notice has been signed by the owner, contractor, and consultant, the change can be implemented.	
chief administrative officer	CAO	City of Winnipeg employee holding the position of Chief Administrative Officer	
chief financial officer	CFO	City of Winnipeg employee holding the position of Chief Financial Officer	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
City's General Insurance		The City's General Insurance includes the following: • All risk property insurance • Professional liability coverage • Environmental impairment liability coverage • Automobile liability coverage (city vehicles) • Workers compensation coverage • General liability insurance	
commissioning		The sequence of activities required for a project to become fully operational (intended purpose) and meet the output specifications provided in the performance testing and commissioning plan.	
Commissioning Completion Certificate		The certificate issued by an architect or engineer designated by the project manager and approved by the sponsor and/or owner confirming that the project has met the commissioning requirements provided in the performance testing and commissioning plan.	
comprehensive general liability	CGL	An insurance policy that provides protection from third-party claims of bodily injury or property damage that allegedly arise as a result of the contractor's operations or work on the construction project from persons not associated with the project.	
conceptual design		A design effort that establishes basic processes, rates, sizes, configurations, and levels of technology. Questions relative to obtaining permits and approvals are addressed. Drawings produced at this level of effort are not used for construction or purchasing. Cost estimates range from approximately 30 percent below to 30 percent above the final construction cost of the facilities defined, not considering inflation. A schedule prepared during conceptual design should show general activities only, preferably in bar-chart form, and any critical path would only be inferred, not stated to any detail. The final product of conceptual design is a report containing the consultant's recommendation supplemented by drawings, cost estimates, schedule, and an approach to obtaining permits and approvals.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
consequence		consequence describes the impacts of an event on the public or the organization when performing a risk assessment. Consequence can be measured in terms of its severity (i.e. how 'bad' is the 'bad' thing that happens) and extent (i.e. how many people are impacted by the event), and is generally examined as the impact to front-line service.	
contract administrator	CA		
construction cost estimate		An estimate of the initial capital cost of a constructed facility, not including projected operations and maintenance costs.	
construction phase or implementation phase		The phase that commences immediately following the completion of the preliminary design phase and ends on the commissioning completion date of the capital project.	
design-bid-build	DBB	The traditional approach for project delivery where separate entities provide services for the design and construction of a project.	
detailed design		A design effort that includes the preparation of construction drawings and specifications; procurement of all equipment, materials, and construction services; and development of pre-bid estimates and construction schedules. Drawings produced are sealed, dated, and issued for construction. Cost estimates are used for monitoring construction expenditures and should be within 10 percent of the final construction costs. The critical path schedule prepared during preliminary design is updated to reflect design and construction progress. The final product is a complete package of construction drawings and specifications and firm prices obtained for engineered equipment, materials, and construction services in accordance with the cost estimate and schedule.	
direct costs			
earned value management	EVM	A management technique used for project delivery for integrating and reporting on scope, schedule, and resources.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
Environment Act		The Environment Act is intended "to develop and maintain an environmental management system in Manitoba which will ensure that the environment is maintained in such a manner as to sustain a high quality of life, including social and economic development, recreation and leisure for this and future generations." Administered by the Department of Conservation, the Act is used to assess, regulate, and control discharges to the environment. The primary mechanism for achieving this action is through the licensing of developments under the provisions of the Act. The Classes of Development Regulation 164/88 provides the specific undertakings that are considered to be developments under the Act.	
errors and omissions	E & O	A term used in the insurance industry for fault in professional services in which a mistake is made by not doing something that should have been done, or not including something that should have been included.	
estimate at completion	EAC	An estimate of the projected financial status at project completion.	
estimated costs		The forecasted cost of a project or deliverable.	
facilities			
field instruction	FI	Written instructions that direct the contractor to take a specific action. The formal change order process should be followed concurrently to obtain required approvals and link up with the FI.	
financial reporting standards		Accounting principles generally accepted in Canada as recommended in the Handbook of the Canadian Institute of Chartered Accountants (GAAP), American Financial Accounting Standards Board (FASB) standards, or International Financial Reporting Standards (IFRS), as applicable, or as may be amended or replaced.	
general conditions	GCs	Boiler plate clauses that apply generically to all similar types of work. GCs for City of Winnipeg Consultant Services and Bid Opportunities are published and updated on the City's website.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
International Organization for Standardization	ISO	An international standard-setting body composed of representatives from various national standards organizations that promotes worldwide proprietary, industrial, and commercial standards.	
intervention		An intentional effort, either in the form of a capital project or a change in operational practice, required when an asset is at risk of service delivery failure, an enhanced level of service is required, additional demand needs to be accommodated, or new legislative requirements need to be met.	
investment planning framework		A robust approach for identifying and rationalizing infrastructure investment. The framework follows a five step approach: - Level of Service definition - Risk Assessment - Business Case preparation - Project Prioritization - Capital Investment Plan preparation	
issue		Disagreement among any parties including controversy, conflict, claim, disagreement, or difference of opinion that requires resolution. An issue must be entered into the issue register and resolved via a formal process once the issue has been identified as unresolvable by the initial originating parties.	
key performance indicator	KPI	Performance metrics based on predefined processes and principles.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
level of service	LOS	Level of service is a qualitative measure used to describe the operating condition of a particular asset from a customer/user perspective. Levels of service can be grouped into three separate categories: - **Essential Level of Service**: Aspects of service required by existing legislation/regulation or with regard to public health, such as Health and Safety, Environmental Protection, or Hazardous Materials. - **Quality Level of Service**: Aspects of service that are discretionary to the City or business unit but affects the quality of life and experience of citizens and users, such as the availability of primary amenities, reliability of building components, etc. - **Image Level of Service**: Aspects of service which maintain image or appearance, such as the availability of secondary amenities, or the visual appeal of landscaping, finishes, etc.	
life-cycle costing	LCC	A technique that establishes the total cost of an asset, or its part throughout its cycle life, while fulfilling performance requirements**.** **See "whole-life costing" for explanation of difference between whole-life costing and life-cycle costing.**	
likelihood		When performing a risk assessment, likelihood relates to the probability or frequency of the failure occurring within a planning horizon, and is often represented by the estimated return period or remaining life of the asset.	
Materials Management Policy	Policy	Policy that governs the materials management functions and most types of procurement for the City of Winnipeg.	
Microsoft Project	MS Project	Scheduling software provided by Microsoft Corporation.	
Multi Criteria Prioritization	MCP	An approach to evaluate and rank projects contribution to a range of service and business priorities, to allow for the development of the best-value Investment Plan for a given level of funding.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
net present value	NPV	The total present value of a time series of cash flows. NPV is a standard method for using the time value of money to appraise projects.	
operation and maintenance manuals (O&M manuals)		Manuals that provide concise descriptions, technical details, operating and maintenance instructions and schedules, commissioning records, log books, catalogues, principles of operation, method of operation, and other information that will enable the ongoing operation and maintenance of the plant and equipment. The comprehensive descriptions are accompanied by diagrams and other illustrations to facilitate knowledge and understanding about the operation of the plant and equipment. Examples include hydraulic flow diagrams, electric wiring diagrams, electronic circuit plans, and mechanical air flow diagrams.	
operations and maintenance		Work and services necessary to operate and maintain project facilities.	
Operating expense	OPEX	A category of expenditure that a business incurs as a result of performing its normal business operations.	
overexpenditure		**Contract overexpenditure**: the accumulated expenditure approved exceeds the purchase order amount (contract award amount) for that specific contract. **Budget overexpenditure**: the accumulated expenditure for a specific budget line item exceeds the cumulative amount of approved budget for that specific project.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
partnering		Exercise designed to create a positive, dispute-prevention atmosphere during contract performance. Partnering uses team-building activities to define common goals, improve communication, and foster a problem-solving attitude among individuals who will work together throughout the contract. A central objective of partnering is to encourage contracting parties to change from their adversarial relationships to a cooperative, team-based approach to prevent disputes. Partnering is not about relaxing the contract terms or circumventing the processes, it is not about expecting service providers to do extra work for free, it is not simply about dispute resolution. It is about realizing that time is money, and partnering does mean that if parties can each get what they want out of a situation, by each doing things in a slightly different way, we all win.	
performance testing and commissioning plan		A plan that demonstrates a project can be readily and reliably operated to achieve the predetermined specifications.	
performance verification tests		The testing of systems and subsystems of a project and the entire project to confirm that the project meets or exceeds the performance requirements stipulated in the specifications.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
preliminary design		A design effort that establishes general arrangements, site plans, and floor plans; specifies and selects major engineered equipment; defines design criteria; and initiates the permit approval process. Drawings and specifications produced at this level are considered permanent. Final project documents when completed are used for major engineered equipment purchasing and general site pioneering and layout. Drawings should be sealed and dated. Cost estimates prepared during this phase should range from 20 percent below to 20 percent above the final construction cost of the facilities and include preliminary prices for engineered equipment obtained from manufacturers. Schedules prepared during this phase make be in the form of a network, and critical paths may be developed. The final product of preliminary design is a report containing design criteria, drawings, major engineered specifications, a critical path schedule of activities including construction and procurement, and applications for obtaining permits and approvals.	
preliminary design phase		A sub-phase of the project planning phase, usually included on complex projects prior to detailed design.	
process and instrumentation diagrams	P&IDs	An engineering drawing that shows the interconnection of process equipment and the instrumentation used to control the process.	
procurement plan		The documented defining of the steps and approach for how and when procurement will take place.	
program		A group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually.	
program plan		A document defining a program and how it will be delivered.	
project		A temporary endeavour undertaken to create a unique product, service, or result.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
project charter		A document issued by the sponsor that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities.	
project delivery plan	PDP	A document defining how the project will be executed, monitored, and controlled. The City of Winnipeg's PDP is defined in the Project Management Manual.	
project execution plan	PXP	A document defining how a consultant will execute, monitor, and control a project, similar in content to a project delivery plan.	
Project Management Institute	PMI	Non-profit organization with globally recognized standards, providing advocacy for a project management and certification program for members.	
Project Management Manual	PMM	The document prepared by the City of Winnipeg that provides a standard approach for delivering capital projects.	
project manager	PM	City of Winnipeg employee assigned the responsibility for managing a project.	
Project Management Office	PMO		
project plan		A formal, approved document that outlines how the project manager will deliver the project as defined in the project charter. The project plan references and uses the tools within the IMS for both project execution and project control. The primary goal of the project plan is to obtain approval for how the project will be delivered and managed.	
project schedule		The planned dates, durations, and sequencing for delivering the project, usually defined in terms of tasks and deliverables.	
PRojects IN Controlled Environments 2	PRINCE2	A project management methodology developed by the government of the United Kingdom	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
public consultation		On major projects that may have significant and/or long-term impacts socially, economically, or aesthetically, a platform for public consultation and input during the design process may be required or desirable. If the Clean Environment Commission determines that a public review hearing is required in advance of a project proceeding, the first step of this process is an advertisement in the newspaper regarding the proposed hearing for the project that invites public response. Based upon the amount and nature of the response, a decision will be made regarding the need for a public hearing. If the hearing proceeds, the public has an opportunity to make representations regarding the proposed project. Another way by which public consultation may be required or mandated is through the Community Committee or City Council responding to public pressure. During the design process, t public consultation may be advantageous to provide the public with proper project information and to receive feedback from the public In recent times, there has been an increased usage of public relations consultants to assist the City and project consultants with the preparation and delivery of a clear, concise, and comprehensive message regarding the proposed project. Another opportunity for public consultation is official opening ceremonies for completed major projects. These official openings commemorate the completion of the project and recognize the efforts of the City in completing the projects for the benefit of the public.	
Publicly Available Specification	PAS		
public-private-partnership	P3	A public-private partnership (P3 or PPP) is an alternative approach for project delivery where the private sector assumes a major share of the risks and responsibilities in terms of financing, operating, and maintaining public infrastructure.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
purchase order	PO	A contractually binding document that sets out the details, prices, and terms and conditions of a purchase.	
quality assurance	QA	The process of reviewing and auditing the project as a whole or in part for fitness of use in terms of quality standards. QA makes sure the right things are being done, and in the right way.	
quality control	QC	The process of monitoring, evaluating, and inspecting actions, results, and products during their execution. QC makes sure the results of what is being done are what is expected.	
quality rating system	QRS	A method to quantify the quality of service based on multiple service attributes, and represented by 1 to 5 stars.	
rebase lining		Adjusting the baseline for approved changes.	
request for information	RFI	A formal document used to communicate a request to clarify or more clearly identify requirements of a specific baseline document.	
request for proposals	RFP	Formal request for vendors to provide a service, product, or result in accordance with the way it is defined in the RFP.	
revision notice		A document that is forwarded to the contractor or others wherein the proposed change in the work is outlined and pricing for the change is requested.	
risk assessment		The determination of the quantitative or qualitative value of risk related to a recognized threat (also called a hazard).	
risk management		A systematic approach to setting the best course of action under uncertainty by identifying, assessing, understanding, acting on, and communicating risk issues.	
risk management plan	RMP	A document describing how project risk management will be structured and performed on the project.	
Risk Register		The record of risk events identified and assessed and actions developed to address those risk events.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
safety plan			
steering committee		A group of high-level stakeholders who provide guidance on the overall direction of the project or the business. Steering committees may provide direction to the project within their mandated area of responsibility.	
strategic plan		A plan that outlines an organization's long-term vision (10 to 20 years) of where an organization wants to be and how to get there strategically.	
Strategic risk		Strategic risk relates to business, environmental or regulatory factors impacting service delivery.	
supplemental conditions	SCs	The section of the bid opportunity or request for proposals that supplements or modifies the General Conditions and sets out terms and conditions specific to the Contract.	
The City of Winnipeg	the City	The City of Winnipeg as continued under the City of Winnipeg Charter.	
top-down estimating		Approximating the size (duration and cost) and risk of a project (or phase) by comparing the project as a whole to similar projects. The comparison may be made directly using "analogous estimating," through an algorithm as in "parametric estimating," or from the experience of estimating experts.	
United Kingdom	UK		
useful life		The shortest time span associated with the asset's physical, technological, commercial, and legal life.	
value engineering	VE	Exercise that uses engineering effort to reduce construction costs, optimize life-cycle costs, or improve quality.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
Value for Money	VfM	Term used to assess whether the City has obtained the maximum benefit from the goods and services it acquires and/or provides, within the resources available to it. VfM measures the cost of goods and services and evaluates the mix of quality, cost, resource use, fitness for purpose, timeliness, and convenience to determine whether, when evaluated as a whole, they constitute good value. Achieving VfM may be described in terms of the "three Es" – economy, efficiency, and effectiveness.	
value management		A structured team-based approach that uses concepts and methods to create sustainable value for both the City and stakeholders. Value management identifies functional requirements of projects/contracts to achieve optimum function for minimum cost. The aim of value management is to reconcile stakeholders' views and to achieve the best balance between satisfied needs and available resources.	

GLOSSARY

Term	Acronym	Definition/Explanation	Owner
whole-life costing		The total cost throughout its life including planning, design, acquisition, and support costs and other costs directly attributable to owning or using the asset, including disposal costs. OR An economic assessment considering all agreed projected significant and relevant cost flows over a period of analysis expressed in monetary value. The projected costs are those needed to achieve defined levels of performance, including reliability, safety, and availability. <u>Whole-Life Costing vs Life-Cycle Costing</u> Life-cycle costing refers to the periodic replacement of assets based on typical asset life spans, whereas whole-life costing evaluates investment options, based on an evaluation encompassing all of the relevant costs of ownership over a defined time span. Broadly, life-cycle costs are associated directly with constructing and operating an asset, while whole-life costs include other costs such as land, income from the asset, and support costs associated with the asset. The expertise of the construction industry is best placed to deliver life-cycle costs, which clients can use to calculate whole-life costs.	
work breakdown structure	WBS	A hierarchical representation of the work to be executed in a project to accomplish the project objectives and create the required deliverables.	
Workplace Safety and Health Act		An Act intended to “secure workers and self-employed persons from risks to their safety, health and welfare arising out of, or in conjunction with, activities in their workplaces.” Federal, provincial, and territorial governments are used as a guideline in Manitoba for drinking water quality.	