EDMONTON

Project Management Manual

Update 2006

TRANSPORTATION DEPARTMENT

Project Management Manual Update 2006

Transportation Department
City of Edmonton

PROJECT MANAGEMENT MANUAL FOR THE PLANNING, DESIGN, CONSTRUCTION AND OPERATION OF TRANSPORTATION FACILITIES.

Transportation Department
March 2006 UPDATE

General Manager

Manager, Streets Engineering

Manager, Transportation Planning

Manager, Traffic Operations

Manager, Edmonton Transit

Manager, Transit Projects

EXECUTIVE SUMMARY

This document has been updated to fulfill the requirements of the Value for Money Audit (Project Management - Cost Estimating), to reflect the present corporate organization, and to include work done in the following areas:

- ***Risk Management***
- ***Phase Interface End Products***
- ***Cost Estimating Accuracy and Reporting Tools***

The intent of the update is to improve on what has been done to date. The goal of the original project was to improve on the way we manage projects – from the concept phase through to the operations phase. A number of improvements and enhancements have been developed since this manual was first produced. As well, a major reorganization of the corporate structure occurred in the fall of 1997. The changes to the organization have been reflected in this updated manual.

This procedural document is provided to fulfill the requirements of the Project Management Audit dated March 9th, 1993, City Policy No. A1424 entitled "Project Management for Projects" which was approved in October, 1994 and the Project Management Manual approved by the Senior Management Team on January 24th, 1997. It formalizes many of the procedures that have been developed over the years for each of the three Branches involved in the planning, design, construction and operations and maintenance of the transportation facilities in the City of Edmonton. This procedural document will act as a guide for the project management of Transportation projects and has been developed as a result of agreement between the Transportation Planning Branch and the Streets Engineering Branch. The model used throughout this document was originally developed by the Project Management Institute. The Project Management Institute is internationally recognized and respected for its philosophies associated with the practice of project management.

It is important for the reader to recognize the difference between the project life cycle and the product life cycle. A project is defined as "Any undertaking with a defined starting point and defined objectives by which completion is identified." The project starting point is defined as the beginning of the Strategic planning phase when the project is first identified in the Capital Priorities Plan, and the end is reached when the Final Acceptance Certificate is approved. On the other hand, the product life cycle encompasses the whole life of the roadway (or other transportation facility) from the time that it is identified in the Transportation Master Plan through the project life cycle and the operation and maintenance to the time that it requires a total reconstruction. This procedural document is concerned primarily with the project life cycle.

The procedural document recognizes five distinct project phases: Concept Planning; Preliminary Design; Detailed Design; Construction and Post Construction. Concept Planning involves the preparation of a problem/needs and scope statement; development of alternatives; user input and recommended plan. Preliminary Design involves the preparation of preliminary plans and reports addressing all issues and detailed design develops the preliminary plans into contract drawings and documents. The construction phase includes contract tendering, evaluation and award, contract implementation, contract supervision, (including quality control and assurance) and construction completion. The Post Construction phase includes the final acceptance of the construction, completion of all reporting associated with the project, pass-off of operational functions (street sweeping, snow clearing etc.) to The Roadway Maintenance Section and review of actual project costs and schedule against estimates.

The project management procedural document also recognizes the Strategic Planning and Operations/Maintenance components as the beginning and end of the product life cycle for transportation projects. Strategic planning, in the case of transportation projects, is completed

every ten to fifteen years in the form of a Transportation Master plan. The preparation of the Master Plan can be recognized as a project in its own right and the basic terms of reference for this project are included here for completeness. The operation and maintenance of roadways facilities includes street cleaning, snow removal, maintenance repairs to the street system and so on.

The Project Management Institute recognizes that there are many demands on the project manager. In its book, "The Project Management Body of Knowledge", the Project Management Institute defines these many demands as "Project Management Knowledge Areas". The procedural document uses six project management knowledge areas: These are Scope Management; Quality Management; Time Management; Cost Management; Risk Management and Communications Management. The scope of a project is defined as the work content and products of a project or component of a project. Quality Management is the function required to determine and implement quality policy throughout the project life cycle and Time Management is the function required to maintain appropriate allocation of time to the overall conduct of the project through the successive stages of its natural life cycle. Cost Management is defined as the function required to maintain effective financial control of [the] project throughout its life cycle. Risk Management is defined as the process and science of identifying, analyzing and responding to risk factors throughout the life of a project and in the best interests of its objective. Lastly, Communications Management is defined as the proper organization and control of information transmitted by whatever means to satisfy the needs of the project.

The project management process defined in this document is provided in terms of an end product for each of these six knowledge areas for each of the five phases. It is interesting to note that the majority of the end products are reports/documents that are created already in one form or another by the Transportation Department.

Table of Contents

APPENDICES

APPENDIX A: Gantt Chart Of The Transportation Facility Concept, Preliminary And Detailed Design, Construction And Post Construction Phases

APPENDIX B: Responsibility Matrix for Streetscape Projects

APPENDIX C: Responsibility Matrix for Rehabilitation Projects

APPENDIX D: Gantt Chart for Geotechnical Projects

APPENDIX E: **Phase End Product Checklists**

1. **Concept**
2. **Preliminary Design**
3. **Detailed Design**
4. **Construction**
5. **Post Construction**

APPENDIX F: **Risk Management Process**

1. **Description of the Structured Risk Analysis Process**
2. **Risk Management Plan for 156 St & Yellowhead Trail Interchange**

APPENDIX G: **Value Engineering Process**

APPENDIX H: **Post Project Evaluation**

1. **Cost Estimating Accuracy Report**
2. **Post Project Evaluation – Exception Criteria**
3. **Post Project Evaluation Report**

APPENDIX I: **City Policy A1424A – Project Management for Projects**

List of Tables

1. INTRODUCTION

1.1 Purpose of this Document

This procedural document is provided to fulfill the requirements of the Project Management Audit dated March 9th, 1993, City Policy No. A1424 entitled "Project Management for Projects" which was approved in October, 1994 and the Project Management Manual approved by the Senior Management Team on January 24th, 1997. ***This document has been updated to reflect the improvements and enhancements that have taken place since the manual was first produced and to fulfill the requirements of the Value for Money Audit (Project Management - Cost Estimating).*** It formalizes many of the procedures that have been developed over the years for each of the ***two*** Branches involved in the planning, design, construction and operations and maintenance of the transportation facilities in the City of Edmonton. The Project Management Manual describes in broad terms the project management process for all corporate projects, and the details of management roles and responsibilities with respect to communication with City Council and the professional development of staff involved with projects. This procedural document will act as a guide for the project management of the planning, design construction and warranty of transportation facilities. It has been developed as a result of agreement between the Transportation Planning and Streets Engineering Branches of the Transportation Department, City of Edmonton.

1.2 Purpose of City Policy A1424

City Policy No. A1424A entitled "Project Management for Projects" was approved in November, 1999. This policy has four defined purposes:

1. *Provide a corporate wide, professionally accepted framework for managing the scope, quality, time, cost, risk and human resources of corporate projects. In so doing, the probability is increased that optimal solutions will be selected and that they will be implemented at the "right" time and at the "right" cost. The project management framework model is to be flexible and adaptable to the nature of each operating unit within the corporation and to the work being done.*

2. *Establish clear lines of accountability/responsibility for project management decisions and the achievement of project objectives and deliverables. Clear lines of accountability/responsibility are required to facilitate optimal decision making, minimize misunderstandings and delays, and understand the causes of problems as they may arise.*

3. *Explain project management principles and concepts that provide for the foundation for the development of a corporate project management framework.*

4. *Utilize the principles, findings and recommendations contained in the Auditor General's report of March 9, 1993 to develop departmental project management policies and procedures.*

1.3 Introduction to the Project Management Institute Model

The model used throughout this document was originally developed by the Project Management Institute. The Project Management Institute is internationally recognized and respected for its philosophies and practice of the project management profession. In its book "The Project Management Body of Knowledge (PMBOK)," the Project Management Institute provides an outline that can be followed for any type of project, large or small. This model has been applied to the documentation of the roadways planning, design and construction procedures described herein. This example is also followed (to a certain extent) in the Project Management Audit.

1.4 Document Organization

The document is organized as follows:

Section 1: Purpose, Introduction and Definitions.
Section 2: Explains the management disciplines that need to be developed in each of the phases.

Section 3: Gives a description of the details of the work for each of the five project life cycle phases. This is done by examining the end products for each management discipline.

Section 4: Gives a description of the details of the work for the Strategic Planning and Operations and Maintenance phase.

Appendix A: The majority of the processes can be found within the Gantt charts in Appendix A which forms an integral part of this document. The Gantt charts outline the following information:

- A check-list of tasks for each phase. Note: Not all of these tasks are required for each and every project.
- The timing of the tasks for each project. Note: The times outlined for each of the tasks is generic in nature. The timing of the tasks for each individual project is assessed by the functional manager at the beginning of the project and continually reassessed as the project progresses.
- The responsibilities of each member of the project team.
- The requirements for passing the project from one phase to another.
- Who is accountable for each task in the project.

Appendix B: The planning of streetscaping projects is undertaken by the Planning and Development Department rather than the Transportation Planning Branch. These types of projects follow slightly different processes and procedures which are summarized in Appendix B.

Appendix C: The planning of rehabilitation projects is undertaken by the Streets Engineering Branch. These types of projects are outlined in Appendix C.

Appendix D: The planning of geotechnical projects (especially slide repairs) is undertaken by the Streets Engineering Branch. These procedures are outlined in Appendix D.

Appendix E: ***Phase End Product checklists have been developed to assist staff with the hand-off of the project between phases. The intent of the checklists is to identify all items that should be considered during each phase, and what items should be delivered to the next phase. It is understood that not all items will be delivered for every project, but all items should at least be discussed during the hand-off process between phases. These checklists are found in Appendix E.***

Appendix F: ***The Risk Management Process should start during the Concept Phase of a project. All Branches must be included during the development of the Risk Management Plan. The Plan is then transferred from Phase to Phase as the project moves from Concept to Construction. Descriptions of the structured risk analysis process as well as two case studies are included in Appendix F.***

Appendix G: ***The City of Edmonton recognizes the benefit of Value Engineering (VE) to ensure good value for money spent. For roadway projects, a VE exercise is undertaken either by the Transportation Planning Branch during the concept phase, or by the Streets Engineering Branch during the design phase. VE may be required as part of a Risk Management Plan as detailed in Appendix F. VE procedures are outlined in Appendix G.***

Appendix H: ***Post project evaluations (PPE) on an exception basis are identified in City Policy A1424A . All projects are evaluated after construction is completed. Scope, quality, time, cost, risk, and communication are all evaluated to determine if any element was not managed in a satisfactory manner. As well, all cost estimates, from concept level to actual costs, are tracked for the purpose of identifying projects that fall outside of the cost estimating accuracy envelope. Exceptions to the criteria will then be reported to the Senior Management Team on an annual basis. The Cost Estimating Accuracy Report, the Post Project Evaluation Criteria and Forms are found in Appendix H.***

Appendix I: ***City Policy A1424A – Project Management for Projects is provided.***

This procedural document has used the Project Management Institute Body of Knowledge as its base. The document also takes into account the recommendations and principles outlined in four reports:

- Office Of The Auditor General - Report On Project Management
- Corporate Project Management Policy
- Transportation Planning Audit
- Project Management Manual

1.5 Definitions

1.5.1 Life Cycles

1.5.1.1 Project Life Cycle

Under Policy A1424 - "Project Management for Projects", a project is defined as:

> *"Any undertaking with a defined starting point and defined objectives by which completion is identified."*

For City of Edmonton projects, the start of a project is defined as the start of the conceptual planning phase. Completion is identified at the end of the warranty period when the Final Acceptance Certificate is approved.

1.5.1.2 Product Life Cycle

The product life cycle is defined as the total life of the facility. The product life cycle begins when the transportation element is identified in the strategic planning phase (the Transportation Master Plan). The product life cycle ends when the product has reached the end of its service life and requires total reconstruction.

1.5.2 Project Phases

1.5.2.1 Phases Defined by City Policy A1424

Four phases of a project are identified in Policy A1424 "Project Management for Projects." These are:

- Concept Phase
- Development Phase
- Implementation Phase and
- Termination Phase

1.5.2.2 Phases Defined for the Purposes of this Procedural Document

The Project Management Institute recognizes that the phases of a project may take many names, depending upon the type of work being completed. For the purposes of this procedural document, the phases have been renamed to better describe the type of work that is completed within them. The development phase has also been split into two phases - Preliminary Design and Detailed Design, and the Implementation Phase has been renamed the Construction Phase. The Termination Phase has been renamed the Warranty or Post Construction Phase, making a total of five phases in the **project life cycle**. Each of these phases is described in general terms below.

- **Concept**: - Preparation of a problem/needs and scope statement and assessment of feasible engineering alternatives allowing cost estimates to a ***± 50% level of accuracy***.
- **Preliminary Design**: - Preparation of Preliminary Plans and reports addressing all issues and allowing cost estimates to a ***± 30% level of accuracy***.
- **Detailed Design**: - Preparation of Contract Drawings and Documents, Pre-tender cost estimates to a ***± 20% level of accuracy***.
- **Construction**: - Contract Tendering, Evaluation and Award, Contract Implementation, contract supervision, Quality Control and Assurance and Construction Completion. ***Post-tender cost estimates to a ± 10% level of accuracy.***
- **Warranty or Post Construction**: - Final Acceptance of Construction, Completion of all reporting associated with the project, Pass-off of Operation functions (street sweeping, snow clearing etc.) to the Roadway Maintenance Section and review of actual project costs and schedule against estimates.

Also, for the purposes of this procedural document two additional phases have been added to the beginning and end of the defined project life cycle, to show how the project originates and to identify what happens after project completion. This gives a total of seven phases that describe the whole **product life cycle**.

- **Strategic Planning:** - Before the start of the project and its identification in the five year Capital Priorities Plan, a strategic plan is undertaken. Strategic Planning is the study of the City wide implications of projects being planned. This is undertaken on a cyclical basis for ongoing City projects with continuous Capital Budgets and provides a snapshot of the direction that the City is taking.
- **Operations/Maintenance:** - After project completion, the responsibility is passed to the Operations and Maintenance authority who operate, maintain and monitor the completed work until it requires major rehabilitation or reconstruction.

1.5.3 Responsibility

As stated in City Policy A1424A, one of the key purposes of the Project Management Policy is to "establish clear lines of accountability/responsibility for project management decisions and the achievement of project objectives and deliverables. Clear lines of accountability/responsibility are required to facilitate optimal decision making, minimize misunderstandings and delays, and understand the causes of problems as they may arise."

Responsibility for the project must be transferred from phase to phase. That is, for a road project, the Transportation Planning Branch is responsible for the project during the concept phase. The other Branches should be providing input, but the responsibility for decision making resides with the Transportation Planning Branch. Once the project moves to the preliminary design phase, responsibility and decision making authority is transferred to the Design Section, Streets Engineering Branch. Once the Design is complete, the responsibility for the project is then transferred to the Construction Section, Streets Engineering Branch. Finally, after the construction is completed and the warranty has expired, responsibility for the project is transferred to the Roadway Maintenance Section, Streets Engineering Branch who manage the infrastructure for the rest of the product's life

1.5.3.1 Project Manager

The Project Manager is defined in Policy A1424 as *"the individual authorized and accountable for managing the project and achieving the project objectives"*. The project manager is appointed at the beginning of the preliminary design phase. Project Management responsibility is identified in the Budget Profile Sheet. The project manager for the majority of transportation facility projects is the Branch Manager of the Streets Engineering Branch.

1.5.3.2 Budget Manager

The Budget Manager is responsible for the project budget. The responsibility for the budget for the majority of roadways projects parallels that of the project manager.

1.5.3.3 Delegation of Responsibility to Functional Managers

Because of the complex nature of roadways projects, different technical experts are assigned to each phase of the project. These technical experts (Director of Design and Director of Construction) report directly to the project manager (Branch Manager - Streets Engineering Branch)

2. MANAGEMENT DISCIPLINES

The Project Management Institute recognizes that there are many demands on a project manager. In the Project Management Institute Body of Knowledge, these are known as Project Management Knowledge Areas.

2.1 The Project Management Institute Model

The Project Management Institute model suggests a total of nine Project Management Knowledge Areas, to be incorporated into each of the five phases. These are:

- Project Integration;
- Project Scope Management;

- Project Quality Management;
- Project Time Management;
- Project Cost Management;
- Project Human Resource Management;
- Project Communications Management;
- Project Risk Management; and
- Project Procurement Management.

2.2 Procedural Document Model

The management knowledge areas described above have been reduced somewhat for the purposes of this document:

- Project Integration Management is the process that needs to be followed to ensure that all the other knowledge areas are coordinated and incorporated into the project management plan. The project integration management knowledge area is not dealt with on its own, rather, it is the underlying theme of this whole document.

- Human Resources Management is defined as the processes required to make the most effective use of the people involved in the project. Because of the very repetitive nature of the types of projects completed by the personnel involved, there is not a lot of staff turnover or a need to hire and train new staff on a regular basis. Therefore, the human resources management component is not included in this document. However, it is expected that this document will act as an orientation for new employees.

- The majority of the Project Procurement Management is handled by the Materials Management Branch of the Corporate Services Department. The design and construction personnel involved in the procurement of services (Consultants, Contractors etc.) follow pre-determined procedures that they do not have any real control over. Therefore, the majority of the project procurement management is considered to be outside of the scope of this document. Those parts of procurement management in which the project staff do take an active role are included as part of the cost management knowledge area.

Consequently, for the purposes of this document, there are six management knowledge areas that need to be understood and addressed. These are:

- Project Scope Management;
- Project Quality Management;
- Project Time Management;
- Project Cost Management;
- Project Risk Management; and
- Project Communications Management.

2.2.1 Scope Management

Scope is defined in City Policy A1424 as "*the work content and products of a project or component of a project."* The PMBOK recognizes the following steps for the scope management of each phase of the project in a project management process:

- ***Initiation***
- ***Scope Planning*** *- developing a written scope statement as the basis for future project decisions.*
- ***Scope Definition*** *- subdividing the major project deliverables into smaller, more manageable components.*
- ***Scope Verification*** *- formalizing acceptance of the project scope.*
- ***Scope Change Control*** *- controlling changes to project scope.*

The tools, techniques and end products used to follow these steps are outlined in Table 1:

PHASE	SCOPE PLANNING	SCOPE DEFINITION	SCOPE VERIFICATION	SCOPE CHANGE CONTROL	* END PRODUCTS
CONCEPT	Problem/Needs and scope statement prepared	Decomposition into individual alternative solutions	Review by Manager of Transportation Planning	Approval by Manager of Transportation Planning	***Problem / Needs & Scope Statement. Development of Alternatives.***
PRELIMINARY DESIGN	Expert judgment (from in-house, TAC and AASHTO design standards	Work Breakdown Structure template (MS Project)	Review of plan by Transportation Planning	Formal acceptance of plan by Transportation Planning	***Appointment of Project Manager and staff Preliminary Design Plans and/or report***
DETAILED DESIGN	Expert judgment (from in-house TAC and AASHTO design standards)	Work Breakdown Structure template (MS Project)	Review of plan by Roadway Construction Section	Formal acceptance of plan by Transp. Planning if changed from preliminary plan	***Contract Drawings***
CONSTRUCTION	Expert judgment (from in-house)	Decomposition of whole contract into smaller units	Survey control of work	Changes in field approved by designers.	***Constructed Facility***
WARRANTY	Use of As-Built drawing procedures	As-built drawings completed by design	Review of as-built drawings by Design staff	Approval of as-built drawings	***As-Built drawings***

Table 1: Scope Management Tools, Techniques and End Products

**** Phase End Product checklists are found in Appendix E. The intent of the checklists is to identify all items that should be considered during each phase, and what items should be delivered to the next phase. It is understood that not all items will be delivered for every project, but all items should at least be discussed during the hand-off process between phases.***

2.2.2 Quality Management

Quality Management is defined in the policy as *"the function required to determine and implement quality policy throughout the project life cycle."* The quality management of each phase of the project should observe the following steps:

- ***Quality Planning*** - *identifying which quality standards are relevant to the project and determining how to satisfy them.*
- ***Quality Assurance*** - *evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards.*
- ***Quality Control*** - *monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance.*

The tools, techniques and end products used to follow these steps are outlined in Table 2:

PHASE	QUALITY PLANNING	QUALITY ASSURANCE	QUALITY CONTROL	*END PRODUCTS
CONCEPT	Weighting system of alternative solutions	Evaluation and end user input	Inspection and acceptance of plan by majority of stakeholders and Professional Engineering Stamp applied	***Evaluation of alternatives Input from end users***
PRELIMINARY DESIGN	Benchmarking (from in-house, TAC and AASHTO)	Professionally engineered drawings and/or report.	Professional Engineering Stamp applied.	***P.Eng Stamp on Drawings***
DETAILED DESIGN	Benchmarking from in-house, TAC, AASHTO and Specification Review Committee	Professionally engineered contract documents (including drawings)	Permit to Practice Stamp applied to contract documents (including drawings).	***Construction Specifications and Contract Documents***
CONSTRUCTION	Benchmarking (in-house Specification Review Committee and external contacts)	Laboratory testing of engineering materials	Inspection of construction methods and approval of the Construction Completion Certificate	***QA Test Results, Daily Inspection Reports and Construction Completion Certificate***
WARRANTY	Use of City Specifications and Final Acceptance Guidelines	Final Acceptance Inspection after warranty period	Approval of the Final Acceptance Certificate	***Final Acceptance Certificate***

Table 2: Quality Management Tools, Techniques and End Products

**** Phase End Product checklists are found in Appendix E. The intent of the checklists is to identify all items that should be considered during each phase, and what items should be delivered to the next phase. It is understood that not all items will be delivered for every project, but all items should at least be discussed during the hand-off process between phases.***

2.2.3 Time Management

Time Management is defined in the policy as *"the function required to maintain appropriate allocation of time to the overall conduct of the project through the successive stages of its natural life cycle."* The PMBOK suggests that time management should observe the following steps for each phase:

- ***Activity Definition -*** *identifying the specific activities that must be performed to produce the various project deliverables.*
- ***Activity Sequencing*** *- identifying and documenting interactivity dependencies.*
- ***Activity Duration Estimating*** *- estimating the number of work periods which will be needed to complete individual activities.*
- ***Schedule Development*** *- analyzing activity sequences, activity durations, and resource requirements to create the project schedule.*
- ***Schedule Control*** *- controlling changes to the project schedule.*

The tools, techniques and end products used to follow these steps are outlined in Table 3:

PHASE	ACTIVITY DEFINITION	ACTIVITY SEQUENCING	DURATION ESTIMATING	SCHEDULE DEVELOPMENT	SCHEDULE CONTROL	*END PRODUCTS
CONCEPT	Expert judgment	Expert judgment	Expert judgment and analogous estimating from similar projects	Using Capital Priorities Plan	Annual review of Capital Priorities plan	***Implementation Schedule***
PRELIMINARY DESIGN	From schedule templates and/or checklists	From schedule templates and/or checklists	Expert judgment and analogous estimating from similar projects	Using MS Project and/or checklists	Using MS Project and/or checklists	***Preliminary Design Schedule***
DETAILED DESIGN	From schedule templates and/or checklists	From schedule templates and/or checklists	Expert judgment and analogous estimating from similar projects	Using MS Project and/or checklists	Using MS Project and/or checklists	***Detailed Design Schedule***
CONSTRUCTION	From schedule templates and/or checklists	From schedule templates and/or checklists	Expert judgment and analogous estimating from similar projects	Using MS Project and/or checklists	Using MS Project and/or checklists	***Construction Schedule***
WARRANTY					Final Time Reporting	***Final Time Report***

Table 3: Time Management Tools, Techniques and End Products

**** Phase End Product checklists are found in Appendix E. The intent of the checklists is to identify all items that should be considered during each phase, and what items should be delivered to the next phase. It is understood that not all items will be delivered for every project, but all items should at least be discussed during the hand-off process between phases.***

2.2.4 Cost Management

Cost Management is defined as *"the function required to maintain effective financial control of* [the] *project throughout its life cycle."* PMBOK suggests the cost management follows these steps for each phase of the project:

- ***Resource Planning****- determining what resources (people, equipment, materials) and what quantities of each should be used to perform project activities.*
- ***Cost Estimating*** *- developing an approximation (estimate) of the costs of the resources needed to complete project activities.*
- ***Cost Budgeting*** *- allocating the overall cost estimate to individual work items.*
- ***Cost Control -*** *controlling changes to the project budget.*

The tools, techniques and end products used to follow these steps are outlined:

PHASE	RESOURCE PLANNING	COST ESTIMATING	COST BUDGETING	COST CONTROL	**END PRODUCTS
CONCEPT	Expert judgment using experience gained from previous projects	Analogous estimating using costs per metre from Streets Branch	Capital Priorities Plan Process		***Concept Plan Estimates ±50% and Capital Priorities Plan budget***
PRELIMINARY DESIGN	Take off from preliminary plans using expert judgment using experience gained from previous projects	Analogous estimating using unit prices from previous contracts	Budget Adjustment process (as necessary)	Approval of budget adjustment (as necessary)	***Preliminary Estimates ±30% and CPP budget adjustment (as necessary)***
DETAILED DESIGN	Take off from contract plans using expert judgment using experience gained from previous projects	Analogous estimating using unit prices from previous contracts	Budget Adjustment process (as necessary)	Approval of budget adjustment (as necessary)	***Pre-tender estimates ±20% and CPP budget adjustment (as necessary)***
CONSTRUCTION	Actual quantities from field operations	Input of awarded tender unit prices	Budget Adjustment process (as necessary)	Bid analysis and award and approval of budget adjustment (as necessary)	***Tender, Post-tender estimates ±10%, Bid analysis and award,* Actual construction costs and CPP budget adjustment (as necessary***
WARRANTY				Final Cost Reporting	***Final Cost Report & Exception Report as required***

***** Actually procurement management

Table 4: Cost Management Tools, Techniques and End Products

***** Phase End Product checklists are found in Appendix E. The intent of the checklists is to identify all items that should be considered during each phase, and what items should be delivered to the next phase. It is understood that not all items will be delivered for every project, but all items should at least be discussed during the hand-off process between phases.***

2.2.4.1 Project Re-evaluation

Should a project cost estimate fall out of the acceptable accuracy envelope prior to the construction phase, the project should be re-evaluated to ensure that it is still justified. For example, if a project with a concept level estimate of $100,000 is estimated during the detailed design phase (pretender) at $200,000, the project should be transferred back to the concept phase to reevaluate its justification.

2.2.5 Risk Management

Risk Management is defined as *"the process and science of identifying, analyzing and responding to risk factors throughout the life of a project and in the best interests of its objective."* Two types of "risk" are identified: Those which involve the possibility of suffering harm or loss and those which could be associated with an opportunity. The PMBOK suggests that risk management should follow these steps:

- ***Risk Identification*** *- determining which risks are likely to affect the project and documenting the characteristics of each.*
- ***Risk Quantification****- evaluating risks and risk interactions to assess the range of possible project outcomes.*
- ***Risk Response Development*** *- defining enhancement steps for opportunities and responses to threats.*
- ***Risk Response Control*** *- responding to changes in risk over the course of the project.*

The tools, techniques and end products used to follow these steps are outlined in Table 5. ***As well, Risk Analysis process and two case studies are found in Appendix F.***

PHASE	RISK IDENTIFICATION	RISK QUANTI-FICATION	RISK RESPONSE DEVELOPMENT	RISK RESPONSE CONTROL	**END PRODUCTS
CONCEPT	Stakeholder Analysis	Risk assessment by in-house or external staff	N/A *	N/A *	***Risk Assessment***
PRELIMINARY DESIGN	Preparation of Design Brief	Preparation of Design Brief and EIA in some cases	N/A *	N/A *	***Design Brief and EIA/Screening Report***
DETAILED DESIGN	Professional engineer identifies risks associated with project in design summary	Professional engineer identifies risks associated with project	N/A *	N/A *	***P.Eng. stamp on drawings Design Summary***
CONSTRUCTION	Deficient test results reporting Hazard assessment of site	Deficient test results reporting Hazard assessment of site	Deficient test results correction or penalties assessed. Design services are used during construction to minimize risks.	Problems with construction are corrected at contractors expense	***Deficient Test results Reports and correction Design Services during construction Hazard assessment report***
WARRANTY	Final Acceptance Inspection	Final Acceptance Deficiency list	Correction of deficiencies	Final Acceptance of work	***Final report identifying areas requiring special monitoring***

* PMBOK recognizes that products involving largely proven technology involve less risk than those which involve new methods. Consequently there is very little risk associated with roadways projects unless they involve a new design or construction technique. Therefore, there is no risk response development or risk response control for the planning and design of roadway projects.

Table 5: Risk Management Tools, Techniques and End Products

*****Phase End Product checklists are found in Appendix E. The intent of the checklists is to identify all items that should be considered during each phase, and what items should be delivered to the next phase. It is understood that not all items will be delivered for every project, but all items should at least be discussed during the hand-off process between phases.***

2.2.5.1 Risk Management and Contingency

The amount of contingency is directly related to the amount of unknowns that the project manager has to deal with. The range of acceptable cost estimating accuracy is a reflection of the reduction of unknowns through the project life. At the concept phase, the number of unknowns is much greater than at the construction phase, and therefore the +/-50% accuracy range is satisfactory. Once the design begins to take shape, those unknowns should be reduced, and therefore, the accuracy of the cost estimate increases.

Many project managers use the standard 10-20-30% contingency of total costs without really looking at what the unknowns are. Project Managers should understand the risks associated with the project, and determine the appropriate amount of contingency for various elements. This will produce more accurate cost estimates.

2.2.6 Communications Management

Communications Management is defined in the policy as *"the proper organization and control of information transmitted by whatever means to satisfy the needs of the project."* Information control follows these steps:

- ***Communications Planning*** - *determining the information and communications needs of the stakeholders: who needs what information, when will they need it, and how will it be given.*
- ***Information Distribution*** - *making needed information available to project stakeholders in a timely manner.*
- ***Performance Reporting*** - *collecting and disseminating performance information. This includes status reporting, progress measurement*

- ***Administrative Closure*** *- generating, gathering, and disseminating information to formalize phase or project completion.*

The tools, techniques and end products used to follow these steps are outlined in Table 6:

PHASE	COMMUNICATIONS PLANNING	INFORMATION DISTRIBUTION	PERFORMANCE REPORTING	ADMINISTRATIVE CLOSURE	*END PRODUCTS
FUNCTIONAL PLANNING	Stakeholder analysis through public meetings	Using communications skills at public meetings and bulletin distribution	Performance reviews of individuals and project including consultant evaluations	Formal Approval from City Council	***Formal Approval from City Council Project Evaluation***
PRELIMINARY DESIGN	Stakeholder analysis through public meetings	Using communications skills at public meetings and bulletin distribution	Performance reviews of individuals and project	Formal approval of owner	***Approval of Owner Project Evaluation and performance measures***
DETAILED DESIGN	Stakeholder analysis through public meetings	Using communications skills at public meetings and bulletin distribution	Performance reviews of individuals and project	Approval of owner as necessary and documentation of design of projects	***Approval of Owner (as necessary) Project Evaluation and performance measures***
CONSTRUCTION	Stakeholder analysis through public meetings	Using communications skills at public meetings and bulletin distribution	Performance reviews of individuals and project	Documentation of construction of projects	***Project Evaluation and performance measures***
WARRANTY	Preparation of project evaluation	Project Evaluation	Documentation of FAC inspection and results	Collection of all documentation in one central area	***Project Evaluation and performance measures***

Table 6: Communications Management Tools, Techniques and End Products

****Phase End Product checklists are found in Appendix E. The intent of the checklists is to identify all items that should be considered during each phase, and what items should be delivered to the next phase. It is understood that not all items will be delivered for every project, but all items should at least be discussed during the hand-off process between phases.***

One of the objectives of this document is to ensure that sufficient work has been completed at each phase of the project to make the decision of whether or not the project should proceed to the next phase. In order to do this, each of the management knowledge areas should be addressed at each phase, and an end product produced for that particular management area as shown above.

The following matrix, Table 7, is based on one found in the Project Management Audit, and summarizes each of these end products. It is interesting to note that the majority of these end products are things that have been produced by the Branches involved for many years. Detailed checklists of deliverables for each phase have been developed for this update and can be found in Appendix E.

		PROJECT LIFE CYCLE					
FUNCTIONS	**STRATEGIC PLANNING**	**CONCEPT (FUNCTIONAL PLANNING) PHASE**	**PRELIMINARY DESIGN (DEVELOPMENT) PHASE**	**DETAILED DESIGN (DEVELOPMENT) PHASE**	**CONSTRUCTION (IMPLEMENTATION) PHASE**	**POST CONSTRUCTION (WARRANTY) PHASE**	**OPERATIONS/ MAINTENANCE PHASE**
PROJECT MANAGER	**MANAGER OF TRANSPORTATION PLANNING**	**MANAGER OF TRANSPORTATION PLANNING**	**MANAGER OF STREETS ENGINEERING**				**MANAGERS OF STREETS ENGINEERING, TRAFFIC OPERATIONS AND EDMONTON TRANSIT**
FUNCTIONAL MANAGER	**Manager of Transportation Planning**	**Manager of Transportation Planning**	**Director of Roadways Design**		**Director of Roadways Construction**		
SCOPE MANAGEMENT	*Problem/Needs Statement prepared* *Completed analysis conducted by expert personnel* *Constraints/Alternatives considered* *Scope statement prepared*	*Problem/Needs Statement prepared* *Completed analysis conducted by expert personnel* *Constraints/Alternatives considered* *Scope statement prepared*	*Project Manager appointed.* *Sketch Drawings Developed* *Preliminary Design Report prepared*	*Final engineering drawings and professional specifications produced*	*Decision to perform work in-house or contract out based on quality/time/cost considerations* *As-Built drawings are produced as construction proceeds*	*As-Built drawings are finalized and approved by the Project Manager*	*Operation, Maintenance and monitoring of facilities*
END PRODUCTS	*Problem/Needs Statement.* *Alternatives considered* *Scope Statement*	*Problem/Needs and Scope Statement* *Development of Alternatives, concept plans and report*	*Appointment of Project Manager and staff* *Preliminary Design Plans and/or Report*	*Contract Drawings*	*Constructed Facility*	*As-Built Drawings*	*Safe and reliable infrastructure from commissioning to closure*
QUALITY MANAGEMENT	*Technical assessment of alternatives performed by qualified experts* *Formal input from end users/public*	*Technical assessment of alternatives performed by qualified experts* *Formal input from end users/public*	*Project Manager assesses whether prior work is sufficient i.e.: all necessary approvals, estimates, justifications in place* *Regulatory requirements addressed*	*Quality control program to control all aspects of design work* *Critical analysis of detailed designs plus an assessment of the constructibility of the project is performed*	*Quality control program monitors construction quality* *Construction Completion Certificate issued to the Owner*	*A Warranty Control System is established to the end of the warranty period.* *Final Acceptance Certificate are issued to the Owner*	*Management System monitoring of the ongoing condition of the inventory and comparison to the design life expectancy*
END PRODUCTS	*Evaluation of Alternatives* *Input from End Users*	*Evaluation of Alternatives* *Input from End Users*	*P.Eng. Stamp on drawings*[1]	*Construction Specifications and Contract Documents*	*QA Test Results,* *Daily Construction Progress Reports and Construction Completion Certificate*	*Final Acceptance Certificate*	*Regular condition reports*
TIME MANAGEMENT	*A preliminary time budget should be prepared for the completion of this phase* *Utilization of Work Breakdown Structure*	*A preliminary time budget should be prepared for the completion of this phase* *Utilization of Work Breakdown Structure*	*Establish time milestones relating to meeting objectives* *Project Manager produces overall project schedule*	*Project Manager may need to update project schedule*	*Contractors prepare construction schedule to be approved by Project Manager* *Any changes to completion dates are communicated to users*	*A final time report is included in Project evaluation report and variances explained*	*Timely scheduling of rehabilitation and maintenance activities through the Management System*
END PRODUCTS	*Initial Schedule*	*Implementation Schedule*	*Preliminary design schedule*	*Detailed design schedule*	*Tender Schedule* *Construction schedule*	*Final Time Report*	*List of priorized locations requiring rehabilitation or reconstruction*
COST MANAGEMENT	*Qualified experts understand the cost constraints Project Profile Sheet submitted - indicates accuracy of the estimate* *City Council approves budget*	*Qualified experts understand the cost constraints Project Profile Sheet submitted - indicates accuracy of the estimate* *City Council approves budget*	*Project cost estimates may require updating as a result of preliminary engineering work*	*Pre-Tender estimates produced* *Scope change or budget adjustment may be required*	*Tendering proceeds upon approval by the Owner* *Bid evaluations are performed and in-house estimates are evaluated by the Owner and the Project Manager*	*A final cost report is produced and variances explained*	*Maximize the effectiveness of available budgets through optimization sub-programs*
END PRODUCTS	*Transportation Master Plan Estimates ±50%*	*Concept Plan Estimates ±50%* *CPP Budget*	*Preliminary Estimates ±30%* *CPP Budget Adjustment (as necessary)*	*Pre-tender Estimates ±20%* *CPP Budget Adjustment (as necessary)*	*Tender, Post Tender Estimate +/-10%, Bid Analysis and Award, Actual Construction Costs, CPP Budget Adjustment (as necessary)*	*Final Cost Report*	*Cost Reporting of Maintenance Activities*
RISK MANAGEMENT	*Contingency Plans produced for sensitive projects* *Risks associated with problem identified and quantified if possible*	*Contingency Plans produced for sensitive projects* *Risks associated with problem identified and quantified if possible*	*Status reporting on those variables that are of greatest concern and of highest risk*	*Professional stamps applied to drawings after all professionals have checked the documents*	*A deficiency Control System identifies and corrects all construction/design deficiencies* *Commissioning Plan submitted to Project Manager*	*A final Commissioning report is produced to verify that all sub-components of the system function effectively as a whole*	*Optimization of the available budgeted capital and maintenance funds to minimize overall long term infrastructure costs*
END PRODUCTS	*Risk Assessment*	*Risk Assessment*	*Design Brief* *Environmental Impact Assessment / Screening Report*	*P.Eng. stamps on drawings and documents*	*Deficient Test Reporting and Correction* *Design Services during Construction* *Hazard Assessment*	*Final Commissioning Report with areas requiring specific monitoring*	*Scheduled and unscheduled inspections of facilities*
COMMUNI-CATIONS MANAGEMENT	*Documented Work Authorization given by Owner before proceeding to Developmental Phase* *Formal Organization/responsibility matrix prepared*	*Documented Work Authorization given by Owner before proceeding to Developmental Phase* *Formal Organization/responsibility matrix prepared*	*The project manager must be a communicator to upper management, to the project team and to the interested outside parties* *Owner should meet regularly with the Project Manager*	*Formal written agreement exists between the owner department and participants employed outside the department, i.e. designers, other civic departments, contractors*	*End users of the final product are trained in its use and maintenance* *Relevant maintenance and operating manuals are received and approved before project is complete*	*Project evaluation report is produced which summarizes lessons learned by the project management team*	*Interface points established between planners, designers and construction entities to relay operational concerns*
END PRODUCTS	*Formal Approval from City Council*	*Formal Approval from City Council* *Performance measures for individual projects*	*Approval of Owner* *Preliminary design evaluation including performance measures for individual projects*	*Approval of Owner (as necessary)* *Detailed design evaluation including performance measures for individual projects*[2]	*Construction evaluation including performance measures for individual projects*[2]	*Project Evaluation including performance measures for individual projects*	*Formal responsibility matrix*

Table 7: Project Management Responsibility and End Products Matrix For Transportation Facility Projects

[1] The engineer who takes professional responsibility is accepting the responsibility that all issues have been addressed.
[2] Includes Consultant Completion Advice Forms, Contractor Completion Reports; Contractor Safety Evaluation; Customer (public) Satisfaction Reports; Construction Return Reports etc.

2.3 Value Engineering Process

Value Engineering (VE) is an organized process that looks at removing unnecessary costs from products and services while assuring that quality, reliability, product performance, and other critical factors meet or exceed the customer's expectations. The objectives of a VE study are to improve quality, minimize total project costs, reduce construction time, make the project easier to construct, insure safe operations, and assure environmental goals.

The improvements are the result of the systematic application of recognized techniques by a multi-disciplinary team which identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and provides the needed functions, reliably, at the lowest cost. The team can be comprised of those involved in the design, construction, and maintenance as well as technical experts.

Value Engineering studies are guided by a specific job plan that has the following steps:

- ***Project Selection***
- ***Team Selection***
- ***Information***
- ***Functional Analysis***
- ***Speculation***
- ***Evaluation***
- ***Life Cycle Costing***
- ***Development***
- ***Reporting***
- ***Implementation***
- ***Audit***

For more information on Value engineering , see Appendix G – Value Engineering Process

3. WORKFLOW THROUGH THE FIVE PROJECT PHASES

The following provides further detail on how each of the end products of the five project phases are obtained. In some cases, the end products are produced in the form of one summary report for many projects, in other cases the end products are produced individually for each project.

3.1 CONCEPT

3.1.1 Goals, Objectives And Responsibilities

The beginning of the concept phase is defined as the true beginning of the project, and therefore the start of the project life cycle. It is undertaken on individual projects identified in the Strategic Plan (Transportation Master Plan). The goals, objectives and responsibilities of the concept planning phase are:

- to take the individual projects identified in the Transportation Master Plan and develop a problem/needs statement
- to generate a series of alternative solutions to the problems
- to gather formal input from end users
- to complete a technical analysis of the alternatives and recommend the best solution based on economic and other factors
- to provide an estimate of the cost of the selected alternative
- to compile this information in a report with plans

Each of these objectives results in one or more end products that fall into one of the previously defined management knowledge areas. These end products are listed below, with a brief description of how each one is derived.

3.1.1.1 Scope Management

Initiation stems from the Strategic plan

- *Problem/Needs and Scope Statement*

  A concise statement which clearly defines the problem to be solved, the need to find a solution and to document the overall objectives of the owner.

  " The existing at - grade intersection at Road A and Road B is approaching capacity. To reduce anticipated delays, minimize accidents and to accommodate future growth in traffic demand, a grade separated interchange is required. The costs for such an interchange must be justifiable. A report documenting alternatives should be available for review and discussion within 3 months." A scope statement or terms of reference should then be developed. For the concept planning component of the concept phase, this document will include the problem / needs statement together with a definition of the end product, activities to be undertaken, resources required to conduct those activities and quality performance measures. Activities to be undertaken include :

  ◊ Compile existing information
    - Limits of study
    - Traffic volumes
    - Land uses / population and employment
    - Geotechnical data
    - Pavement structures
    - Environmentally sensitive areas / issues
    - Accident statistics
    - Adjacent property ownership
    - Utilities / stormwater facilities

  ◊ Future information
    - Land uses / population and employment
    - Traffic volumes

- *Development of Alternatives*
  - Define required level of service
  - Development of alternative solutions
  - Identify issues, impacts and constraints (e.g. staging, traffic noise, property requirements, drainage requirements, operations, access, gradelines, environmental and utility relocation's)
  - Address mitigation of issues, impacts and constraints
  - Estimate costs of alternative in current dollars (using unit rates)
  - Define range of costs based on accuracy of unit rates

3.1.1.2 Quality Management

- *Evaluation of Alternatives*
  - Define impact of " do nothing"
  - Tabulate alternative solutions against issues and costs
  - Develop weighting / ranking system
  - Recommend preferred alternative
- *Input from end users*

  Input from stake-holder groups is essential at the concept planning stage of the process. Typically the design and construction phases of a major transportation project such a grade separated interchange, new roadway or L.R.T. extensions are cost shared with Alberta Transportation & Utilities. Their input to the project at this crucial stage is essential to help define level of service, timing and financial constraints. The project manager for the design and construction phase of the project is the Manager of Streets Engineering. Input from their area of expertise covers topics such as geometrics, staging/constructibility and costing. Similarly, the Manager of Streets Engineering is ultimately responsible to operate and maintain the facility upon completion of the construction phase and their input is also valuable at this time.

  For major projects, community leagues and business associations are contacted to request their participation in project concept planning. These groups provide input on social, economic, community and environmental issues. For minor projects the individual community leagues are contacted. Stake-holders are also involved in the development of evaluation criteria and selection of recommended solution.

3.1.1.3 Time Management

- *Implementation Schedule*

  The implementation schedule, which is set during the strategic planning phase, is reviewed to ensure that no major conflicts exist. The schedule should also include a project plan describing the shelf life of the report, and the timing of the remaining components of the overall project management process. If there is any lag time between the long range / strategic planning report and the conceptual / concept planning phase then the long range report must be reviewed prior to commencing conceptual planning to ensure that the problem / needs statement and evaluation criteria are still current. The concept planning phase usually commences before the individual projects are placed in the five year capital priorities plan.

3.1.1.4 Cost Management

- *Cost Estimates*

  Projects that are identified in a five year period, which have concept plans completed have estimates that are accurate to within ***±50% of the actual costs***.
- *Capital Priorities Plan Budget*

  The estimated costs from the concept planning study are used in the Capital Priorities Plan as the budget for the work.

3.1.1.5 Risk Management

- *Risk Assessment*
  - For major projects, following the development of the problem/needs statement, a risk assessment is undertaken with representation from the major stake-holders. With all major projects, the highest cost saving potential and the lowest cost to change is during the concept phase of the project.
  - For smaller projects an internal risk review is conducted. The internal risk review has the objectives of ensuring projects are cost effective and justifiable, priorized properly in the capital priorities plan and are scheduled properly to minimize disruption.

See Appendix F – Risk Management Process

3.1.1.6 Communications Management

- *Capital Priorities Plan Approved by Council*

The Capital Priorities Plan is approved by Council.

- *Performance Measures*

  A comparison of the concept planning estimate given in the capital priorities plan to the actual construction costs will indicate the success of the planning process in foreseeing the potential problems and obstacles.

See Appendix E – End Phase Checklists for a detailed list of deliverables for the Concept Phase

3.2 PRELIMINARY DESIGN PHASE

3.2.1 Goals, Objectives And Responsibilities

The individual goals of the Preliminary or Developmental phase of the project are in broad terms to take what has been produced at the Conceptual Phase and develop it into a Preliminary plan, ensuring that:

- the project is feasible (cost effective)
- all pertinent issues are addressed and
- all major cost components are evaluated.

The main objective of the Preliminary (Developmental) Design Phase is to develop a feasible project, and define by an engineering plan and/or report, with a cost estimate that is correct to within 15% of the actual cost.

3.2.2 End Products

3.2.2.1 Scope Management

- *Appointment of Project Manager and Staff*

  The Manager of Streets Engineering acts as the Project Manager during the Design and Construction phases of the project. The Roadways Design Section is responsible for the Preliminary (Developmental) and Detailed Design Phases. The Roadways Construction Section is responsible for the Construction and Post Construction (Warranty) Phases. The Director of Roadways Design and the assigned General Supervisor assess the resources required to complete the project and how much time will be required. In-house staff are supplemented with engineering consultants to meet the requirements of the project. Consultant appointments are made in accordance with the appropriate City Policy.

- *Preliminary Design plans and/or Reports*

  The preparation of the Preliminary Design Plans involves several steps:
  The Cadastral Base maps are obtained from the corporate Geographic Base Information System.
  The existing utilities are also obtained from the same system.
  Additional site data, as required, is obtained by means of surveying or by using photogrammetric techniques.
  If a pavement structure is required, this is also obtained. This may involve obtaining some specialized traffic projections from the Transportation Department and possibly existing soils or pavement information.
  For the Developmental (Preliminary) plans, the horizontal alignment is established, then the vertical alignment is reviewed and some construction details are addressed.
  A preliminary design report for structures, geotechnical work, drainage and other specialized works is usually completed by consultants or by staff from other City Departments. The preliminary design report covers all issues arising from the scope statement provided by the Owner.

3.2.2.2 Quality Management

- *Professional Responsibility for Quality*

  It is imperative that the individuals preparing the project design understand the problem and issues that require attention. This requires a review of the Problem/Needs Statement and/or concept plan/report.
  All regulatory requirements such as land requirements, pipeline and railway crossing requirements and environmental requirements are considered as part of the Preliminary Design Phase to ensure feasibility from a regulations perspective. For example, if a major project encroaches in the North Saskatchewan River Valley, Bylaw 7188 states that an Environmental Impact Assessment must be completed. The results of this assessment may add considerable costs to a project in mitigative measures to overcome any environmental issues. This could potentially bring the cost/benefit ratio down to where the project was no longer economically feasible. All regulatory issues must be known and addressed at the end of the Developmental (Preliminary) Design phase. The professional engineer, in stamping the design, is taking responsibility that all these tasks have been performed.

3.2.2.3 Time Management

- *Preliminary Design Schedule*

  Because of the repetitive nature of the various roadways projects, many of the activities can be defined in advance. For larger projects, a preliminary design schedule is completed, using the one given in Appendix A as a base. For smaller projects, the schedule may take the form of a checklist. The schedule or checklist takes into account fixed dates such as the dates of any required Council appearances, as well as any dates that are part of regulatory requirements.

3.2.2.4 Cost Management

- *Preliminary Estimates*

  All estimates within the Streets Engineering Branch are calculated on unit prices of standard items. There are two components that have an impact on the quality of an estimate. These are the quantities and the unit rates used. The accuracy of the estimate is dependent largely on the detail of plan that is available when the estimate is calculated. At the preliminary design phase, the detail of the plan is such that the major cost implications have been identified, however, the exact quantities of each item may not be known.

For rate bases, a tabulation of bids is produced by the Construction Estimator each year, to compare each of the unit prices for each of the contracts, bid by each contractor. The lowest bid in each case for the annually repetitive contracts, such as lanes, roadway rehabilitation contracts, miscellaneous minor contract is used as a rate base for the following years' work. Each of the individual item prices are reviewed against the bid tabulations, to ensure that they are representative of the average bids. If they are not, they are adjusted to be in line with the average. The rate bases are approved by the Director of Roadways Construction, and the Manager of Streets Engineering.

The preliminary (budget) estimate of the roadways work is typically completed and summarized by the Construction Estimator in the Construction Section of the Streets Engineering Branch. This is done using the rate bases described previously. Preliminary estimates of other work is completed by consultants. All preliminary cost estimates are produced from preliminary plans, and as such are expected to be accurate to **within *30*%** of the actual construction cost. This does not imply that a ***30***% contingency is added to the project costs, rather that the estimate will be accurate to within ***30***% of the final construction cost. All estimates are approved by the General Supervisor and Director of Construction and reviewed with the Manager of the Streets Engineering Branch.

- *Capital Priorities Plan Budget Adjustment*

  Funding for the design and construction of transportation projects is provided by the Capital Priorities Plan budget. The budget estimate is compared with the original CPP budget estimate prepared by Transportation Planning at the Concept Phase. If the budget requires adjustment, this is completed in accordance with the appropriate policy.

3.2.2.5 Risk Management

- *Design Brief*

  It is noted that in projects that are very repetitive, there is little risk of failure; however, if a new design method has been applied, or if a new construction method is being proposed, this will add a degree of uncertainty to the project. A design brief is completed which outlines the key decisions made during the Developmental Phase of the project. This brief should provide the function manager responsible for the next phase with all issues and problems that have not been completely resolved, or that have some degree of risk associated with them.
- *Environmental Impact Assessment / Screening Report*

  On projects that are environmentally sensitive, such as those in the river valley or ravine system, an Environmental Impact Assessment or Screening Report must be completed in accordance with Bylaw 7188. This report identifies the types of environmental concerns and provides mitigative measures to minimize the effects on the environment.

See Appendix F – Risk Management Process

3.2.2.6 Communications Management

- *Approval of Owner*

  The Client Department (usually the Transportation Planning Branch) approves the plans as required to ensure that the original intent of the design has been met.
- *Preliminary Design Evaluation*

  At the end of the preliminary design phase an evaluation is completed which studies the performance of the design team with respect to the original objectives of the preliminary design exercise. This evaluation includes:
  - ◊ Comparing the design costs as a percentage of the total construction.
  - ◊ Ensuring that any concerns raised by members of the general public or other stakeholders were effectively dealt with.

See APPENDIX E – End Phase Checklists for a detailed list of deliverables for the Preliminary Design Phase

3.3 DETAILED DESIGN PHASE

3.3.1 Goals, Objectives And Responsibilities

The detailed design improves upon the details given in the preliminary plan. It provides the information required to construct the work in accordance with the engineering plans and specifications. The detailed design can be prepared by in-house staff and/or engineering consultants, dependent upon the project and the resources required. Consultants are appointed in accordance with the appropriate City policy. The detailed design is the responsibility of the Roadways Design Section. The goal of the detailed design phase is to prepare contract plans and specifications so that the project can be implemented. The pre-tender or project construction estimate is taken from these plans.

3.3.2 End Products

3.3.2.1 Scope Management

- *Contract Drawings*

  The final engineered drawings are the contract plans that form part of the contract documents. These plans consist of the alignment coordinate geometry, the vertical alignment grades, the existing and proposed utility plans and the construction details. Other plans are also produced (land requirements, pipeline crossing plans, railway crossing plans etc.) on an as-required basis. These plans must contain all the necessary details to construct the project. In the case of bridge structures and major drainage improvements, the construction drawings and specifications are prepared by consultants. The final drawings must meet all the requirements of the scope statement provided by the Owner, and are approved by the Director of Design.

3.3.2.2 Quality Management

- *Construction Specifications*

  The construction specifications for Transportation work are part of the City of Edmonton Standard Construction Documents and Specifications for Watermains, Sewers, Roadways Hard Surfacing and Landscaping. These documents are updated on an as-required basis. Modifications to the roadways specifications are approved by the Specification Review Committee which consists of Professional Engineer members of the Roadway Construction, Roadway Design, and Roadway Maintenance Sections of the Streets Engineering Branch. Modifications to other specifications that are common to all areas covered by the Specifications books are approved by the Standard Specifications Sub-Committee of the Standard Documents Committee which has a Professional Engineer member from the Streets Engineering Branch as well as Professional Engineer members from other Branches.

  Specifications for specialized items which do not appear in the City of Edmonton Standard Construction Documents and Specifications for Watermains, Sewers, Roadways Hard Surfacing and Landscaping book are prepared on a project by project basis, and added as Special Provisions to the Contract Documents. These specifications may be developed in-house by the Construction Supervisor, and approved by the General Supervisor of Construction, or by qualified professional engineers as part of a consulting assignment.

- *Contract Documents*

  The contract documents are controlled by the Materials Management Branch of the Finance Department through the Standard Documents Committee. The Streets Engineering Branch also has representation in this committee. The contracts are assembled by the Construction Supervisor who will be responsible for the work. The final contract document is approved (P.Eng stamp) by the General Supervisor of Construction, and reviewed by the Director of Construction. A Permit to Practice stamp is then placed on the documents by the Manager of Streets Engineering.

3.3.2.3 Time Management

- *Detailed Design Schedule*

  Again, because of the repetitive nature of much of the roadways detailed design, many of the activities are pre-determined. For larger projects a detailed design schedule is updated, using the one given in Appendix

A as a base. For smaller projects, the schedule may take the form of a checklist. The schedule or checklist takes into account fixed dates such as the dates of any required Council appearances, and the dates of tendering and construction, as well as any dates that are part of regulatory requirements. The most important dates at this stage are the proposed tender dates. All plans should be completed by this date.

3.3.2.4 Cost Management

- *Pre-Tender Estimates*

  The pre-tender estimate is prepared by the individual construction supervisor who will be responsible for the construction of the contract work. If the work is outside of the scope of experience there is input from the design engineering consultants. The rate base is essentially the same as for the preliminary estimate. However, where abnormal working conditions occur, within a certain contract, which in the professional opinion and experience of the supervisor would cause the price to change, the unit price is adjusted. Contract plans are used at this stage of the project estimation These estimates are expected to be accurate to **within 20%** of the actual construction cost, and are used for budgeting the work for construction. This does not imply that a ***20***% contingency is added to the project costs, rather that the estimate will be accurate to within ***20***% of the final construction cost. These estimates are approved by the General Supervisor and Director of Construction and reviewed with the Manager of the Streets Engineering Branch.
- *Capital Priorities Plan Budget Adjustment*

  The budget estimate is compared with the original CPP budget estimate prepared by Transportation Planning at the Concept Phase. If the budget requires adjustment, this is completed in accordance with the appropriate policy.

3.3.2.5 Risk Management

- *Professional Responsibility for Design*

  For in-house designs, the detailed plans are approved (P.Eng stamp) by the Design General Supervisor or Design Engineer and the Permit to Practice stamp is applied by the Director of Roadways Design. For designs completed outside the Branch, the plans are approved (P. Eng. stamp) by the design engineer taking professional responsibility for the work, and the Permit to Practice is applied by the company or outside Branch/Department responsible. The engineer is taking responsibility for any risks associated with the design.

  To ensure that the work has been reviewed for constructibility by the Design and Construction General Supervisors, they are both required to initial the plans before the Manager of Streets Engineering approves the project for construction.

See Appendix F – Risk Management Process

3.3.2.6 Communications Management

- *Approval of Owner (as necessary)*

If the design has changed measurably since the Preliminary drawings were approved, the detailed design drawings are re-approved.

- *Detailed Design Evaluation*

  At the end of the detailed design phase an evaluation is completed which studies the performance of the design team with respect to the original objectives of the detailed design exercise. This evaluation includes:
  - ◊ Comparing the design costs as a percentage of the total construction costs.
  - ◊ Ensuring that any concerns raised by members of the general public or other stakeholders were effectively dealt with.

See APPENDIX E – End Phase Checklists for a detailed list of deliverables for the Detailed Design Phase

3.4 CONSTRUCTION PHASE

3.4.1 Goals, Objectives And Responsibilities

The Construction of Transportation Facilities in the City of Edmonton is the responsibility of the Roadways Construction Section of the Streets Engineering Branch. The objective of the construction phase is to ensure that the facilities are constructed to the prepared plans and to the specifications outlined in the contract books. The project should be kept within schedule and budget. The management responsibilities are transferred to the Roadways Construction Section from the Roadways Design Section. A single contract may be comprised of many different locations and groups of plans as described above.

3.4.2 End Products

3.4.2.1 Scope Management

- *Constructed Facilities*

  The construction supervisor requests a project schedule from the selected contractor to ensure compliance with the outside time constraints. The construction of the facilities then begins with a full time inspector on site ensuring that all requirements of the plans and specifications are met. The inspector is also responsible for completing the construction returns as the project progresses.

3.4.2.2 Quality Management

- *Quality Assurance Test Results*

  The quality control of materials is the responsibility of the contractor. The contractor ensures that all materials provided on the job are within the prescribed specification tolerances. A quality assurance program is completed by the Materials Engineering Laboratory by the Engineering Services Section of the Streets Engineering Branch. All testing is conducted using ASTM/CSA approved procedures, in accordance with the construction specifications. Quality Assurance is performed by qualified materials laboratory technicians on all materials incorporated into transportation facility projects. Quality Assurance is also performed by materials consultants on an as-required basis.

  The results of the quality assurance testing are forwarded to the Construction Supervisor. If the materials tested are not within the limits identified in the specifications, either a penalty is assessed or the contractor removes and replaces the faulty work at his expense.
- *Daily Construction Progress Reports*

  The construction inspectors complete Daily Construction Progress Reports that provide information about the construction provided each day.
- *Construction Completion Certificate*

  The completion of the Construction Phase is formalized by the approval of the Construction Completion Certificate. The Construction Completion Certificate is prepared by the Construction Supervisor, reviewed by the Director of Construction and approved by the Manager of the Streets Engineering Branch.

3.4.2.3 Time Management

- *Tender Schedule*

  A tender schedule is completed at the beginning of the year, outlining the advertising, pick-up and closing dates of all tenders. This is issued to all the design and construction personnel, as well as Materials Management Branch and Transportation Operations.
- *Construction Schedule*

  A construction schedule is requested from the contractor. The schedule must show all key tasks at all locations in the contract, as well as the completion date as shown in the original contract. The schedule is then used to monitor the progress of the contract. If, in the professional opinion of the Construction Supervisor, the contract is falling behind schedule, the contractor may be requested to assign additional resources to make up the time. Under certain circumstances, the contractor may be asked to pay for the additional site inspection costs to make up this time.

The individual schedules are also collated into an overall Roadways Construction Schedule showing the timing for all the work being completed by the Streets Engineering Branch which is issued to Council, the Utility companies and Departments and Transportation Department.

3.4.2.4 Cost Management

- *Tender*
  The first stage in the construction process is the tendering of the contract. Once the contract documents have been assembled as noted above, there is a tender period during which the prospective contractors pick-up the tender package and bid on the contract. The Construction Supervisor will answer questions from the contractor during this period and may, if necessary, issue addenda to the contract. At the end of the tender period, each of the supplied bids are opened at a pre-determined time and place.
- *Bid Analysis and Award*
  The bids for each contract are tabulated and the calculations from unit prices to totals are checked. If a consultant has been involved with the design, they become involved in the bid evaluation process. The other documentation that accompanies the tender is also checked. If everything else is in order, the contract is awarded to the lowest evaluated tender.
- *Post Tender Cost Analysis*
  If for some reason, the project is bid higher than the budget estimate, the budget is adjusted in accordance with the pertinent City policy. ***The pretender estimate is revised with the actual bid unit prices. This "post tender" estimate is expected to be accurate to within 10% of the actual construction cost***.
- *Actual Construction Costs*
  The contract inspectors submit Contract Quantity Reports as the work progresses. These are entered into the Contract Payment System which gives the Contract Cost Summaries. The contractors are paid for the work completed.
- *Capital Priorities Plan Budget Adjustment*
  The budget estimate is compared with the original CPP budget estimate prepared by Transportation Planning at the Concept Phase. If the budget requires some adjustment, this is completed in accordance with the Delegation of Authority Guidelines.

3.4.2.5 Risk Management

- *Deficient Test Reporting and Correction*
  Deficient test results are summarized in a quarterly report from the quality assurance laboratory. Each deficient result is reported to the Construction General Supervisor, who reports the action taken to correct the deficiency (i.e. penalty applied, removed and replaced etc.).
- *Design Services During Construction*
  During the construction of the facilities, unforeseen circumstances may require a change in the design in order to make the facilities fit in the field. If, in the professional opinion of the Construction Supervisor, the design change warrants a change in the Engineered drawings, the Construction Supervisor will request this change and the drawings are re-approved.
- *Hazard Assessment*
  At construction start, a formal hazard assessment must be completed by the contractor. The hazard assessment reviews all hazards on or near the site such as the presence of overhead cables, the proximity of schools, underground utilities and provides a formal report that on-site hazards have been noted.

See Appendix F – Risk Management Process

3.4.2.6 Communications Management

- *Project Evaluation Reports*
  A construction evaluation is completed at the end of the construction phase which includes the following:
  - ◊ Consultant Completion Reports
  - ◊ Contractor Completion Reports
  - ◊ Contractor Safety Evaluation
  - ◊ Customer (Public) Satisfaction Reports in residential areas

- ◊ Construction Return (Commissioning) Reports outlining any special construction techniques that were used.

See APPENDIX E – End Phase Checklists for a detailed list of deliverables for the Construction Phase

3.4.3 Post Project Evaluation

City Policy A1424A states that "a formal Post Project Evaluation should be performed on an exception basis when criteria defined in the Project Management Manual are not met. The Post Project Evaluation should assess the reasons for the non-compliance, and recommend changes to reduce the likelihood of future non-compliance".

Upon completion of construction, all projects will be evaluated based on exception criteria for scope, quality, time, cost, risk, and communication. The goal of this process is to identify areas for improvement, and to learn from past experiences. Cost estimates from all phases are compared to the actual cost. Cost estimates falling outside of the acceptable accuracy envelope are identified and analyzed to determine the reason. Projects that do not meet the exception criteria for scope, quality, time, cost, risk, and communication are reported to Senior Management on an annual basis.

See Appendix H – Post Project Evaluations

3.5 POST-CONSTRUCTION (WARRANTY) PHASE

3.5.1 Goals, Objectives And Responsibilities

The objectives of the Post Construction Phase is to provide the Roadway Maintenance Section with the necessary information to allow them to continue their operations and maintenance of the facilities. The Post Construction Phase involves the warranty period of the roadway. At the beginning of this period the Roadway Design Section (?) provides the Roadway Maintenance Section with the As-Built plans and records. The operation of the newly constructed roadway (street sweeping, snow clearing etc. begins immediately) and is the responsibility of the Roadway Maintenance Section. After the warranty period, the Roadway Construction Section turns over the completed facility to the Roadway Maintenance Section along with the Final Acceptance Certificate.

3.5.2 End Products

3.5.2.1 Scope Management

- *As Built Drawings*

  As-built drawings are completed in accordance with the as-built drawing procedures. The surveyor provides the as-built survey of the facility, once constructed. The as-built records of the construction will include the red-lined construction returns showing what changed on the design plans from the design to the field. The Design Section of the Streets Engineering Branch acts as the clearing house for all as-built plans. The signed contract plan mylars that were originally completed by Roadways Design are updated with the as-built information. For plans that were completed by consultants or other departments, the original mylars are returned to the consultant/department for updating. The original mylars are then returned to the Design Section. Whenever possible, the Roadways Design Section will update and forward the digital design files to the Mapping and Graphics area, and changes to curb, gutter and walk alignments will be made on the corporate Geographic Base Information System. Copies of the completed as built plans are then forwarded to Drainage and Roadway Maintenance Section so that any modifications may be made to their inventory systems. Two microfilm cards are also made for the Roadways card file system.

3.5.2.2 Quality Management

- *Final Acceptance Certificate*

  The Final Acceptance Certificate is issued at the end of the warranty period to complete the post-construction phase. The facilities are inspected by the contractor and the Streets Engineering Branch at the end of the warranty period. The inspection and repair requirements are outlined in the Final Acceptance

Guidelines developed by the Streets Engineering Branch with input from the contractors, and the Urban Development Industry.

The Roadway Maintenance Section is sent copies of the Final Acceptance Certificate which notifies them that the complete responsibility for the facility has been transferred to them. Guidelines for the final acceptance of roadways projects are prepared and approved by the Streets Engineering. The Final Acceptance Certificate is approved by the Manager of the Streets Engineering Branch.

3.5.2.3 Time Management

- *Time Report*

  The amount of time that the construction supervisors and inspectors spent on site during the construction is totaled and compared to the original construction schedule and time budget. Any variances are explained.

3.5.2.4 Cost Management

- *Cost Report*

  A final cost report is produced and variances explained.

3.5.2.5 Risk Management

- *Final Commissioning Report*

  The final commissioning report includes a list of locations where construction was completed with areas of the various types of work done. This report is used in the Streets Engineering Annual Report and this information is also forwarded to the Roadway Maintenance Section. The information is then input into the Pavement Inventory. The construction records also note any special construction techniques used, so that these areas may be monitored.

See Appendix F – Risk Management Process

3.5.2.6 Communications Management

- *Project Evaluation Report*

  Each of the above documents are compared to the original objectives of the project to ensure that the original scope, quality, time, cost, and risk objectives were achieved, and, if not, a satisfactory explanation of why not is given.

4. STRATEGIC PLANNING AND OPERATIONS AND MAINTENANCE PHASES

The Strategic Planning and Operations and Maintenance phases lie outside of the project life cycle. Indeed, the Strategic planning phase could be viewed as a project in its own right. However, these two phases are important to the project: the strategic plan helps define the project and the operations and maintenance keep the project in existence long after the Final Acceptance Certificate is approved, and is instrumental in defining the problems that go to make up the strategic plan. Therefore, these two very important parts of the roadway product life cycle are provided here for completeness of the whole product life cycle.

4.1 STRATEGIC PLANNING

The duration of a major Roadways project can extend over 25 years. Typically the concept phase can extend 10 - 15 years before a project is approved for design and construction and included in a 5 year construction program. The strategic planning of Roadways Projects is undertaken by the Transportation Planning Branch. The Capital Priorities Plan is developed annually by the Transportation Planning Branch in accordance with the strategic transportation plans. (i.e. Transportation Master Plan, Pavement Investment Strategy, Bridge Investment Strategy, etc.). For individual projects, concept plans are developed and approved.

4.1.1 Goals, Objectives And Responsibilities

The City of Edmonton's General Municipal Plan (G.M.P.) provides a vision for the City's future and defines the main transportation objective of " Providing transportation and utility systems which support and enhance the City's development needs" To meet this objective the following policies have been developed :

- Provide and maintain an integrated system of roadway and transit facilities.
- Minimize the adverse impacts of existing or improved transportation facilities on communities through the use of measures such as noise attenuation, buffering, setbacks, landscaping and traffic management.
- Provide newly developing residential areas with permanent road access and an appropriate level of transit service.
- Ensure major business, employment and commercial areas are adequately served by roads and transit service.
- Accommodate increased travel demand to the Downtown through enhancements to the L.R.T. and surface bus system, and through the implementation of transportation management measures on existing arterial roads.
- Accommodate city - wide travel demands through the on going implementation of network modifications and improvements consistent with the Transportation Systems Bylaw.
- Encourage the continued development of pedestrian and bicycle facilities, exploiting opportunities to expand facilities and promote their use.
- Continue to work closely with the public in the planning and approval of new or enhanced transportation facilities.
- Provide newly developing residential and industrial areas with reliable water, sewer and storm utilities to meet the long term needs of area residents.
- Ensure that older areas of the City are supported by water, sewer and storm utilities at service levels compatible with the needs of the present and future land uses.

The Concept Phase of a project is divided into two components. Strategic Planning is undertaken in the form of a Transportation Master Plan every 10 to 15 years. The responsibility for both these areas lies with the Transportation Planning Branch of the Transportation Department.

The strategic plan is undertaken as five separate stages:
Stage 1 - Problem/Needs Statement
Stage 2 - Development of Transportation System Alternatives
Stage 3 - Evaluation of Transportation System Alternatives
Stage 4 - Definition of a Recommended Transportation Master Plan
Stage 5 - Approval Process

Throughout each stage of the technical work program, there will be a corresponding and concurrent stage in a Public Consultation Process. Each stage of the work program results in one or more end products which are conveyed to City Council either for information or for approval.

4.1.2 End Products

4.1.2.1 Scope Management

- *Problem/Needs Statement for Strategic (Transportation Master) Plan*

  The primary objective of the first stage of the Work Program is to define a problem/needs statement to define goals through addressing key questions such as:

  ◊ What is the concurrent state of the City's transportation system and factors which may affect it?;
  ◊ What are the social, economic and technological trends which may affect travel?;
  ◊ How will travel patterns and modal choices change in future?;
  ◊ How do Edmontonians wish to have their mobility needs addressed?;
  ◊ What criteria should be used to assess alternative responses to future travel demands?

  It is important to seek answers to these questions in order to set the development of the Master Plan in the context of current realities which affect future actions, possibilities and expectations. In order to answer the foregoing questions and to set the needed context, the following tasks must be completed:

  a) Development of an Inventory of Existing Conditions

  The inventory should provide a snapshot view of the transportation system for the base year of the strategic planing process. The inventory should include such items as:

  * Relevant Bylaws

- Existing Land Use Patterns and Built Form
- Existing Travel Patterns
- Existing Environmental or Community Concerns
- Current Service Standards
- Current Transportation Costs
- Current Funding Levels
- Transportation System Performance

b) Identification of Significant Trends
In addition to the inventory data which is assembled, it is necessary to investigate and define trends which may affect future travel behavior.

c) Identification and Validation of Issues
One of the important tasks which is completed early in the Plan development process is the identification and validation of issues of concerns to the public, elected officials and the City administration. This task requires considerable consultation between all parties so as to establish a clear understanding of public needs, opinions, values, perceptions, priorities and expectations. Together with the inventory and trend information which is assembled, the relevant issues form a strong foundation for the definition of goals and objectives for the City's transportation systems.

d) Definition of Goals and Objectives
Following a review of the identified issues, it is necessary to undertake a visioning exercise with considerable public consultation. The main objective of this exercise is to develop a set of goals and objectives for the transportation system which are consistent with Edmontonian's needs, values, priorities and vision for the future.

e) Definition of Evaluation Criteria
In order to assess the effectiveness of a Transportation Plan alternative in relation to the stakeholders' desired objectives, it is necessary to define evaluation (or measurement) criteria. The definition of these criteria and the reaching of consensus on them, is one of the most critical steps in the development of the Master Plan. The process must be flexible and cognizant of quantifiable, subjective and value-based criteria.

- *Development of Transportation Plan Alternatives*

The second stage of the plan development process requires the definition of a number of plan alternatives which can be tested as to their ability to achieve the pre-defined goals and objectives. The alternatives that are developed should reflect a distinctive theme, philosophy or policy orientation. Likewise, there must be a clear definition of all the components, assumptions, constraints and implications for each of the alternatives. The alternatives must also include a BASE CASE alternative which would represent the transportation system which would evolve over time without any explicit or dramatic policy shifts. Such a BASE CASE is required as a benchmark against which the other alternatives can be compared or differentiated. For each of the alternatives to be adequately defined, the following tasks must be undertaken:

a) Prepare twenty year or planning horizon forecasts for factors which may affect future travel demand, such as:
   - ◊ Population and Employment Changes
   - ◊ Lifestyle and Value Changes
   - ◊ Land Use Changes
   - ◊ Funding Changes
   - ◊ Environmental Standards or Controls
   - ◊ Technological Changes
   - ◊ Economic Changes
   - ◊ Transportation Network Changes
   - ◊ Growth in Transportation Inventory and Associated Rehabilitation

b) Define the governing theme, philosophy or policy orientation or each alternative.

c) Define the land use assumptions for each alternative.

d) Define a transportation system which represents or supports the pre-defined theme, philosophy or policy orientation.

e) Define operating service levels and standards for each Plan alternative.

f) Define other attributes which add to the definition of an alternative.

A number of the foregoing tasks require the commissioning of specialized studies aimed at defining specific options for the various Plan alternatives. The specialized studies could include the following such items as goals movement, public transit and community/environmental impacts.

To define transportation network alternatives, it is necessary to undertake preliminary feasibility assessments of road, transit, LRT and other transportation network on policy options. This process includes the following:

- ◊ Identify existing deficiencies, areas of congestion, safety issues and document major constraints that may impact transportation solutions;
- ◊ Identify and evaluate conceptual alternative solutions to deficiencies required to accommodate projected 20 year traffic volumes;
- ◊ Develop strategic network plans (single line 1:5000) and evaluate feasibility of solutions to include, but not limited to, new roadway links, intersection improvements, grade separated interchange requirements, roadway widening, roadway alignment upgrades, transit options (bus lanes/LRT), access control, pedestrian/bicycle requirements, and transportation management schemes;
- ◊ Estimate planning level costs of improvements;
- ◊ Reviewing staging feasibility for improvement.

- *Development of a Scope Statement for the Transportation Master Plan*

  Following a review of the results of the evaluation of Plan alternatives, it will be necessary to determine which alternative should be pursued as the basis for a recommended plan. It is possible that the difference between alternatives is small or that none of the tested alternatives fully satisfies the originally defined goals. In this case, it may be necessary to develop and test a hybrid alternative which incorporates desirable features from some or all of the alternatives. A number of different variations of such a hybrid may need to be evaluated before a final version is selected as the one which comes closest to meeting the desired objectives.

  The process of settling on a Transportation Master Plan requires a collective acceptance of the possibility that the Plan may not satisfy all the pre-defined objectives, or that it may not achieve them to the same degree. The evolution of the final plan therefore requires that the interests of all Edmontonians, as a whole be met, above the interests of particular individuals or groups.

  Once a final version of the Plan is selected, there must be a complete and clear documentation of the policies and actions which are needed to bring the Transportation Master Plan to fruition over an extended period of time. This may include recommendations on issues which can materially affect travel behavior and travel patterns, but which may lie outside the Transportation Department's or even the City of Edmonton's area of responsibility.

4.1.2.2 Quality Management

- *Evaluation of Transportation Plan Alternatives*

  There are a number of technical tools available which can assist in assessing the impacts of changing conditions over time. These tools include computer assisted models which are able to predict travel demand, traffic volumes, operating conditions and mode choice for any given set of assumptions. These forecasting models will be used to determine the effects of land use changes, economic changes and transportation network changes. The alternatives developed in Stage 2 are tested and evaluated relative to the goals and objectives defined in Stage 1. The purpose of this evaluation process is to determine the degree to which the pre-defined goals and objectives are met by the various alternatives. The evaluation process will likely occur on both a technical and non-technical level, depending on the evaluation criteria selected in Stage 1. The technical evaluation will include the following:

  a) Building a computerized model which best reflects the attributes of each of the transportation plan alternatives, including the BASE CASE alternative.

  b) Running each model and based on the results, adjusting the models in order to improve the representation of any given alternative.

  c) After adjusting the models for each alternative, they are re-run in order to test the effectiveness of the adjustments. Additional iterations of adjustment and review may be made until it is felt that the alternatives have been modeled as best as possible within the capabilities of the available tools.

d) Once the model runs have been completed, salient data about the performance of each alternative is extracted, tabulated and interpreted along with other data.
e) Assessment of the technical feasibility of the plan alternatives.
f) Determination of the costs associated with each alternative.

In addition to the technical evaluation, a non-technical assessment of the alternatives is required to address subjective and value based issues. This task poses a particular challenge because it involves values, perceptions and attitudes which can often be the focus of public debate and conflict. The exact form of the non-technical component of the evaluation will be a direct function of the goals/objectives and evaluation criteria selected in Stage 1.

- *Input To Master Plan From End Users*
  - ◊ *Public Consultation Process*

The Transportation Master Plan affects all Edmontonians to some degree. As such, they will all have a stake in the Plan and the process used to develop it. In order for the Transportation Master Plan to have validity and credibility as a basis for short and long term decisions, it must reflect the concerns, values, aspirations and priorities of the stakeholders on whose behalf it is being prepared. The effectiveness of a public consultation process depends on who is consulted, how they are consulted and what is done with the results of the consultation.

Goals and Objectives of Public Consultation

The primary goals of the Public Consultation Process are:

* to identify public concerns, values, aspirations and priorities;
* to convey information to, and collect information from the public;
* to acknowledge and reflect public input in the final product;
* to maintain an open, honest and flexible forum for public input;
* to provide City Council with a Transportation Master Plan which will have broad stakeholder support.

The Stakeholders

At the broadest level, all Edmontonians should be given opportunities to offer their views on transportation issues. Citizens may choose to participate either as private individuals acting on their own or their families' behalf, or they may be involved through some formal organization or interest group.

The consultation process must be flexible enough to accommodate input by both individuals and groups. The process must reflect the fact that there will be varying degrees of interest and commitment to the process by different stakeholders. Efforts will therefore be made to tailor the consultation process to meet varying levels of public involvement.

In addition to citizens-at-large, there are many organizations representing diverse interests in our society. The following represents a preliminary listing of organizations which may be inclined to participate in a consultative process:

* Area Councils and Community Leagues
* Business Groups
* Environmental Groups
* Seniors' Groups
* Educational Institutions
* Trucking, Automotive or Bicycle Associations
* Organizations representing mobility challenged persons
* Rail and other transport companies
* Advocacy Groups
* Satellite Municipalities
* Edmonton Metropolitan Regional Planning Commission

Mechanisms of Public Consultation

There are many ways in which people can be consulted. It is important to recognize at the outset, that there is no generically correct mechanism. Each situation needs to be assessed on its own merits and a consultation mechanism appropriate to that specific situation applied. Given the diversity and complexity of issues, the mechanisms of consultation used for the Transportation Master Plan may include public meetings, workshops, focus group sessions, surveys and formal

public hearings. In addition, there may be a need to meet with individual stakeholders whose issues may require more focused attention.

Communication Program

A critical component of good public consultation is good communication. The development of a Communication Program will be one of the key, early components of the Public Consultation Process. The Communication Program has the following objectives:

- to convey project information to stakeholders in a clear and timely manner;
- to facilitate communication between stakeholders and the project team;
- to maintain public awareness and interest in the Transportation Master Plan project.

◊ *Internal Stakeholders*

The following key internal stakeholders are required to provide input to the process and/or review products generated by the process.

Table 8: City of Edmonton Responsibilities in Transportation Planning

City Department & Branch	*Primary Responsibilities*
Transit	***1. Prepare Inventory Info.:*** • *Infrastructure/Service Inventory* • *Performance Indicators* • *Service Levels* ***2. Develop/Code Plan Alternatives:*** • *Assist T.P.B. & Consultants* • *Review Transit Service Alternatives* ***3. Evaluate Plan Alternatives:*** • *Assist T.P.B.*
Roadway Maintenance	***1. Prepare Inventory Info.:*** • *Infrastructure/Service Inventory* • *Performance Indicators* • *Service Levels* ***2. Review Special Studies (If Any)***
Administration	***1. Prepare Inventory Info.:*** • *Costs, Revenues* • *Financial Performance Indicators* ***2. Review Financial Issues***

4.1.2.3 Time Management

- *Initial Schedule for Strategic Plans*

  Long range strategic planning processes require periodic review when the assumptions used in the original are no longer current. This could include, for example, change in land use, funding levels, demographics, public attitudes and expectations. A shelf life of 10 to 15 years would normally be expected for the overall plan. It would be necessary however, to formally monitor the degree to which policy and strategies are being fulfilled. A review of funding requirements and implementation priorities is appropriate every three to five years. This may also be affected by the overall Municipal Development Plan process as transportation policies must also be compatible with a MDP.

4.1.2.4 Cost Management

- *Cost Estimates from the Transportation Master Plan*

  The need for the project within a five year period is reviewed through the Transportation Master Plan. The Capital Priorities Plan budget is prepared from the individual project estimates, based on a ±50% level of accuracy.

4.1.2.5 Risk Management

- *Risk Assessment*

In developing alternatives for the Transportation Master Plan, risk is one of he evaluation criteria. In particular long range roadway or LRT options to changes in land use, or underlying transportation policy directions provides an indication of the level of risk associated with certain facilities. This is particularly important when considering Capital projects that are high cost and cannot be easily staged.

4.1.2.6 Communications Management

- *Transportation Master Plan Approved By Council*

  The Transportation Master Plan is prepared under the authority of the City Transportation Act. This Act prescribes certain conditions for preparation and approval of the Master Plan, namely that:

A comprehensive transportation study report must be prepared.
City Council must, by bylaw, establish a transportation system in accordance with the transportation study (i.e. the Transportation Master Plan), and the bylaw must designate (or identify) the transportation system.
The bylaw must include a map showing the approximate location of the transportation facilities, present and future, which are designated as being a part of the City's transportation system.
After hearing presentations on the proposed bylaw, City Council may:

a) pass the bylaw as proposed, or
b) amend the bylaw and pass it, or
c) defeat the proposed bylaw

Following approval of the bylaw, it must be submitted for approval by the Lieutenant Governor in Council of Alberta. The Lieutenant Governor in Council has the right to amend the bylaw in whole or in part, prior to approving it. The bylaw only takes effect upon its approval by the Lieutenant Governor.
Given the rigidity and limitations of the statutory public hearing process, stakeholders will be encouraged to take advantage of the extensive public consultation process, prior to the public hearing, as a means of conveying their input to the process and the end product. In the same vein, members of City Council will be advised of the public's input during the course of the Transportation Master Plan's development.
The final report of a Strategic Planning Process, in addition to defining policies and facility requirements must also define an implementation and monitoring process. The implementation process will define the priority for specific facility planning studies that follow.

The approval of long range / strategic planning reports would be dependent on where the requirement for the project was initiated. If the project was initiated by City Council then the report would be reviewed and approved by Council. If the project was generated as part of a larger project such as the Transportation Master Plan then the report would only require the approval of the owner, the General Manager of the Transportation Department.

Upon completion of this component of the project a priority or weighting should be allocated to this project and added to a City wide listing of strategic planning projects. Such a listing would be beneficial in recording completed studies, identifying projected timing for the next phase of the project and for defining future work programs and resource allocations.

4.2 OPERATIONS/MAINTENANCE PHASE

4.2.1 Goals, Objectives And Responsibilities

The operation and maintenance of the roadway network represents the majority of the product life cycle for roadways. The Roadway Maintenance Section of the Transportation Department is responsible for the operation and maintenance of the Transportation Network within the City of Edmonton. This includes the clearing of snow in winter, street sweeping in the spring, and the regularly scheduled maintenance such as the filling of potholes and preventative maintenance of the roadway infrastructure. The Traffic Operations Branch of the Transportation Department is responsible for the continued operation of the Traffic Control Devices such as signals and signs.

4.2.2 End Products

4.2.2.1 Scope Management

- *Safe and Reliable Roadway Network*

  A safe and reliable roadway network from commissioning to closure is the main function of this project phase. Although this basic responsibility comprises the majority of activities, a significant component of this scope also includes monitoring the performance of the roadway network. This scope is to ensure that in addition to the safe and reliable aspects of the roadway network, the life cycle economics are also included as a major component of total road network management.

4.2.2.2 Quality Management

- *Regular Condition Reports*

The quality of the roadway network is reported through regular condition reports. Roadway quality is maintained or improved through introduction of ongoing operational or traffic modifications throughout the operational life of the roadway. Input from users is an integral component of the measure of the quality road network. Careful monitoring and inspection of public inquiries and complaints helps to direct resources to areas requiring improvement.

4.2.2.3 Time Management

- *List of Priorized Locations*

  In the context of managing the serviceable life of the roadway project, the timely application of preventative maintenance, rehabilitation or reconstruction activities is crucial to time management in this context. A list of priorized locations requiring rehabilitation or reconstruction is supplied to Transportation Planning to be reintroduced into the project management cycle. In the purely operating sense of time management, an efficiently functioning road network while maintenance, rehabilitative or reconstruction work is being undertaken is another measure of the end product of time management from the users perspective.

4.2.2.4 Cost Management

- *Cost Reporting of Maintenance Activities*

  Throughout the life of the roadway, cost reporting of all maintenance and operational activities is tracked to measure roadway performance against life cycle costs to operate the roadway network. When the operating costs of a roadway exceeds the annualized costs to rehabilitate or replace that roadway, it is considered and programmed for cost effective rehabilitation.

4.2.2.5 Risk Management

- *Inspections of Facilities*

  This aspect of the roadway project can be considered from 2 perspectives. In the life cycle cost perspective, the timely scheduling of cost effective rehabilitation versus costly reconstruction's reduces the overall economic risk to the City. From the operational perspective, scheduled and inquiry based inspections of facilities will ensure safe and efficient traffic movement through ongoing addressing of safety and operational concerns thereby limiting the risk associated with the operation of this type of facility.

4.2.2.6 Communications Management

- *Effective Communication*

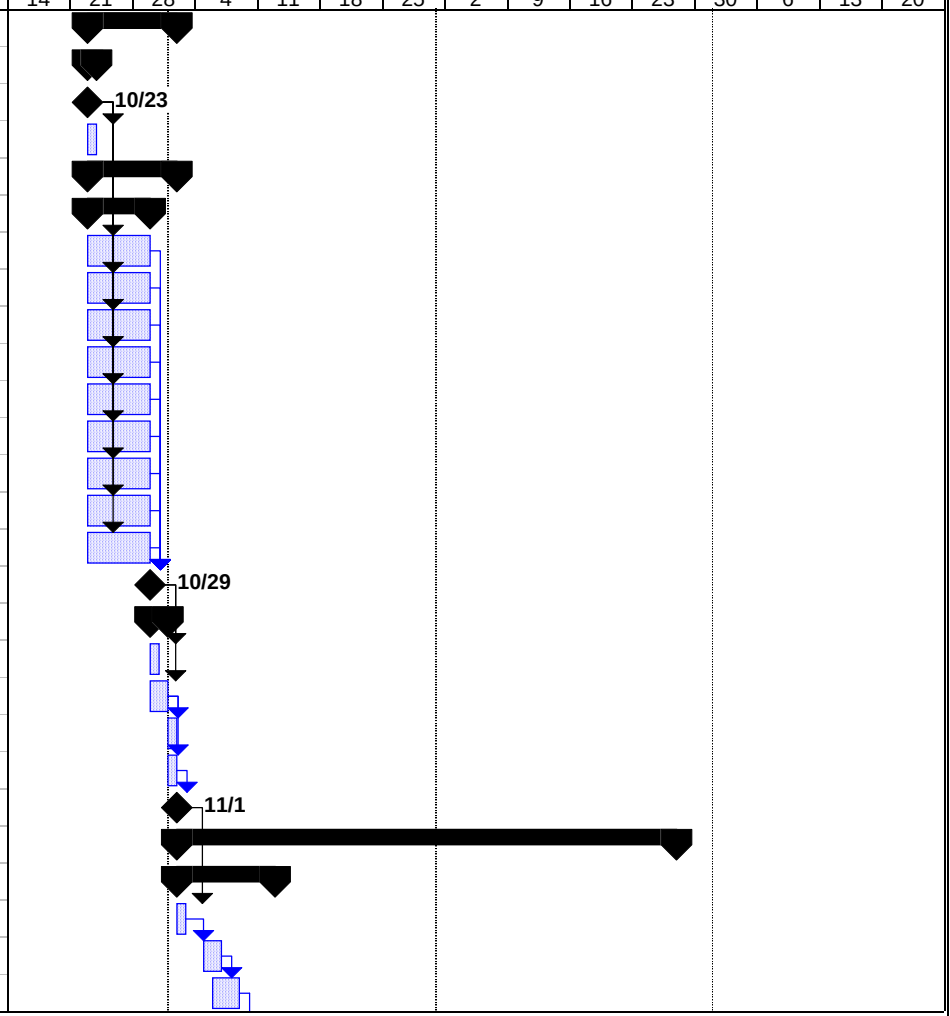
  An efficiently functioning roadway network will ultimately result from the effective communication of the operational and maintenance concerns of a roadway system. The communication of an effective and timely priorized rehabilitation program will also meet this goal over the longer term.

APPENDIX A: GANTT CHART OF THE TRANSPORTATION FACILITY CONCEPT, PRELIMINARY AND DETAILED DESIGN, CONSTRUCTION AND POST CONSTRUCTION PHASES

The Gantt charts are provided as an example for a generic project only, to provide samples of the activities, sequencing and timing of the individual tasks. The Gantt charts should be reviewed on a project by project basis.

Concept Phase

ID	Task Name
1	**SCOPE MANAGEMENT**
2	**Problem/Needs and Scope Statement**
3	Identify Network Deficiencies from TMP
4	Develop Problem/Needs and Scope Statement
5	**Develop Alternatives**
6	**Compile Existing Information**
7	Study Limits
8	Traffic Volumes
9	Land Use: Population / Employment
10	Geotechnical Data
11	Property Ownership
12	Pavement Structure
13	Accident Statistics
14	Utilities
15	Environmental
16	Existing Information Collated
17	**Collate Future Information**
18	Projected Land Uses: Population / Employment
19	Project Traffic Volumes
20	Identification of Service Levels
21	Identification of Issues/Constraints
22	**Problem/Needs and Scope Statement Approval**
23	**QUALITY MANAGEMENT**
24	**Evaluation of Alternatives**
25	Impacts of "Do Nothing"
26	Develop Evaluation Matrix
27	Develop Ranking Matrix

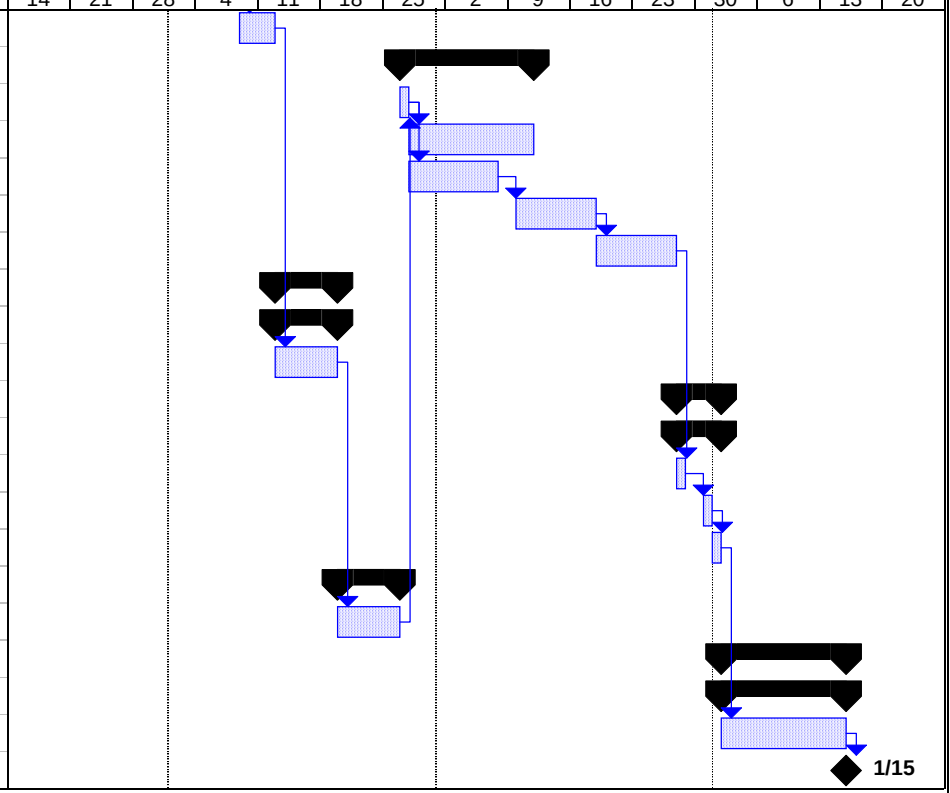


Project: CONCEPT.MPP
Date: Thu 3/9/06

Task	Rolled Up Milestone	Rolled Up Split	
Progress	Rolled Up Progress	External Milestone	
Milestone	External Tasks	Deadline	
Summary	Project Summary		
Rolled Up Task	Split		

Concept Phase

ID	Task Name
28	Recommend Prefered Alternative
29	**Input from End Users**
30	Identify Major Stakeholders
31	Develop communication plan
32	Constraints/Alternatives Considered
33	**Develop Solutions**
34	**Mitigation of Issues**
35	**COST MANAGEMENT**
36	**Prepare cost estimates**
37	Estimate Costs
38	**TIME MANAGEMENT**
39	**Implementation Schedule**
40	Prepare Activity Definitions
41	Prepare activity sequencing
42	Estimate durations
43	**RISK MANAGEMENT**
44	Assess Risks
45	**COMMUNICATIONS MANAGEMENT**
46	**Council Authorization of CPP**
47	Profile Sheet Submitted
48	Council Authorizes CPP

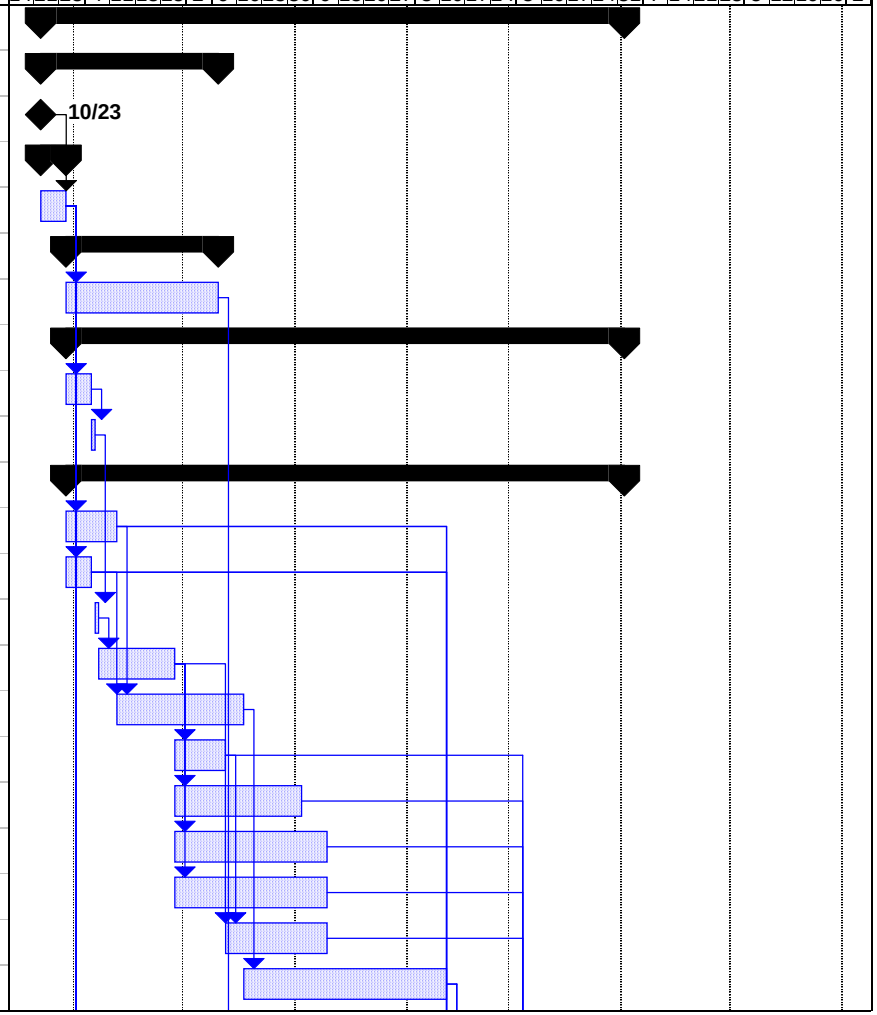


Project: CONCEPT.MPP
Date: Thu 3/9/06

Task	Rolled Up Milestone	Rolled Up Split	
Progress	Rolled Up Progress	External Milestone	
Milestone	External Tasks	Deadline	
Summary	Project Summary		
Rolled Up Task	Split		

Preliminary Design Phase

ID	Task Name
1	**SCOPE MANAGEMENT**
2	**Appointment of Project Manager and Staff**
3	Assign Project Manager
4	**Design Engineer's assessment**
5	Review Functional Plan
6	**Allocate Resources**
7	Consultant Appointment
8	**Preliminary Design Plans**
9	Prepare list of contacts
10	Visit Site
11	**Sketch Drawings developed**
12	Obtain Cadastral Bases from GBIS
13	Obtain Utility Plans from GBIS
14	Identify Survey / Mapping Req.
15	Obtain Survey/Mapping
16	Design Preliminary Pavement Structure
17	Define Lane Markings
18	Street Lighting Layout
19	Design Horizontal Alignment
20	Design Vertical Alignment
21	Locate Traffic Signals/Signs
22	Cross Sectional/ Plan Details

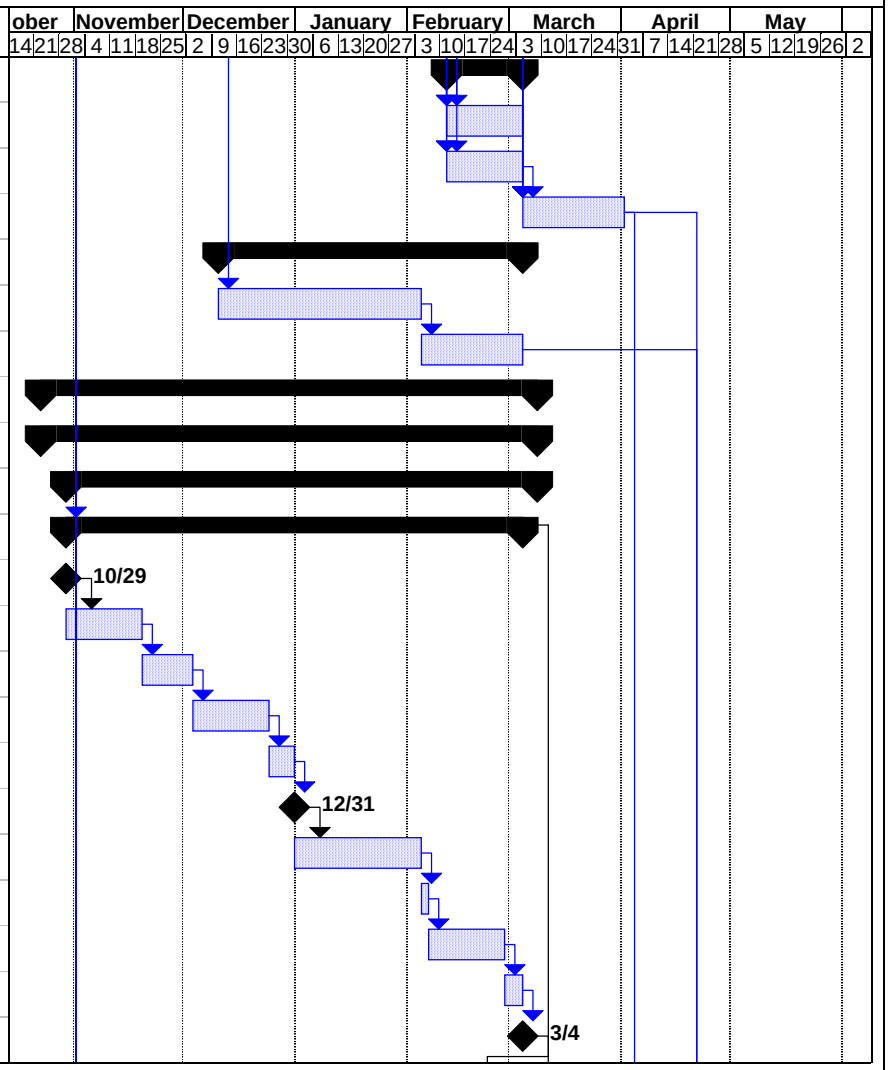


Project: 2PRELIM.MPP
Date: Thu 3/9/06

Task		Rolled Up Milestone		Rolled Up Split	
Progress		Rolled Up Progress		External Milestone	
Milestone		External Tasks		Deadline	
Summary		Project Summary			
Rolled Up Task		Split			

Preliminary Design Phase

ID	Task Name
23	**Landscaping / Aesthetics**
24	Request estimate for landscaping
25	Request estimate for streetscaping/aesthetics
26	Preliminary Plans Prepared
27	**Prelim. Design Report prepared**
28	Undertake Preliminary Design
29	Preparation of Preliminary Report
30	**QUALITY MANAGEMENT**
31	**P. Eng. Stamp on Drawings**
32	**Regulatory Requirements addressed**
33	**Resolve Major Utility Crossings/Relocation's**
34	Crossing Initiated
35	Verification of Crossing Conflict
36	Dig Ups
37	Crossing Plan Preparation
38	Preparation of Permit Documents
39	Submission of Permit Documents
40	Partially Executed Agreement Received
41	Permit Approved by City Engineer
42	Permit Approved by City Solicitor
43	Permit Approved by CityClerk
44	Return Fully Executed Copy to Pipeline Co.

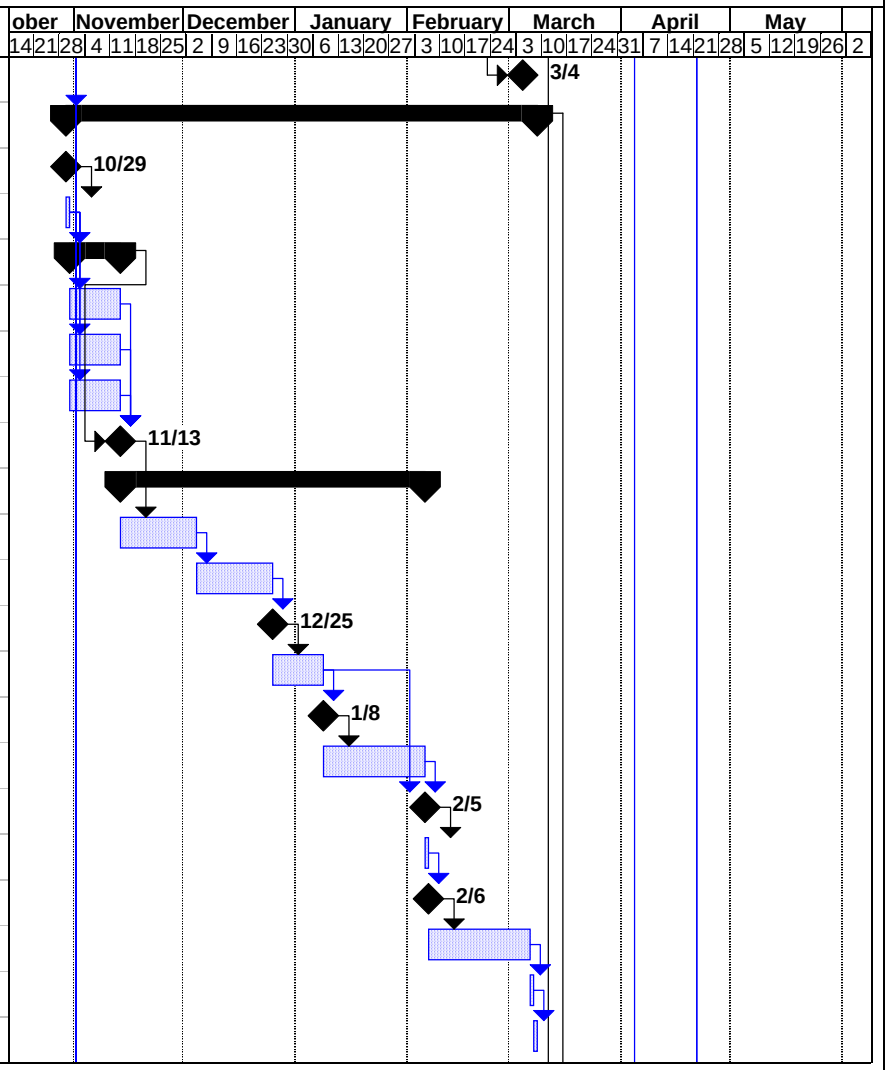


Project: 2PRELIM.MPP
Date: Thu 3/9/06

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split
External Milestone
Deadline

Preliminary Design Phase

ID	Task Name
45	Copies of Permit to Construction
46	**Initiate Resolution of Railway Crossings**
47	Requirement Identified
48	Site meeting
49	**Crossing Document Preparation**
50	Environmental Statement
51	Application to NTA
52	Crossing Plans
53	Submission of Application
54	**Review by NTA**
55	NTA Circulation
56	Railway Review
57	Comments received from Railway Co.
58	Revisions
59	Resubmission to NTA
60	Final Circulation & Review
61	Board Order Issued
62	Prepare Notice of Proposed Railway Works
63	Issue Notice to affected Parties
64	Receive Comments
65	Revisions to Documents
66	Affidavit Submission upon Completion

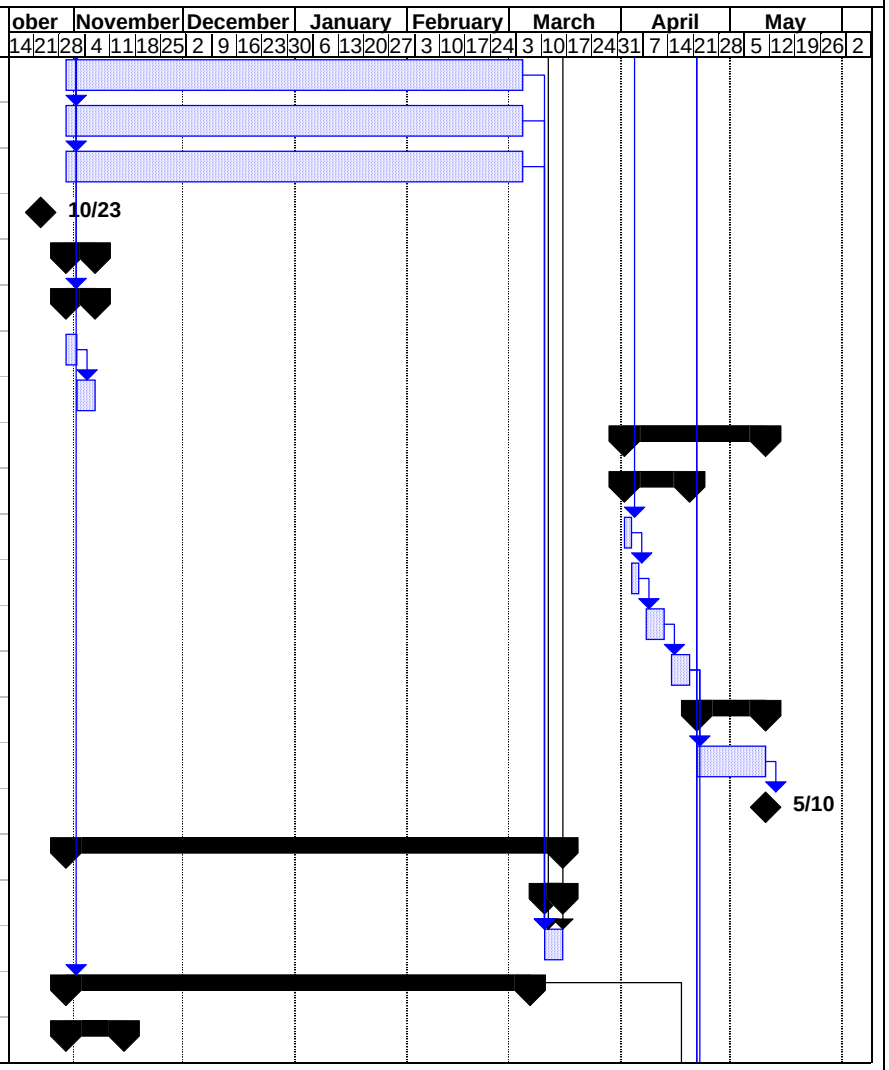


Project: 2PRELIM.MPP
Date: Thu 3/9/06

Task		Rolled Up Milestone		Rolled Up Split	
Progress		Rolled Up Progress		External Milestone	
Milestone		External Tasks		Deadline	
Summary		Project Summary			
Rolled Up Task		Split			

Preliminary Design Phase

ID	Task Name
67	Resolve Land Requirements
68	Resolve Drainage Requirements
69	Resolve other affected programs
70	**Affix Stamp to Drawings**
71	**TIME MANAGEMENT**
72	**Preliminary Design Schedule**
73	Establish Milestones
74	Prepare Project Schedule
75	**COST MANAGEMENT**
76	**Preliminary Estimate**
77	Take-off quantities
78	Apply unit prices
79	Estimate Local Impr.. charges
80	Approval of Estimate
81	**Budget Adjustments**
82	Budget Adjustments (as necessary)
83	Budget Approved
84	**RISK MANAGEMENT**
85	**Design Brief**
86	Prepare Concerns/Risk Status Report
87	**Environmental Impact Assessment / Screening Report**
88	**First Draft**

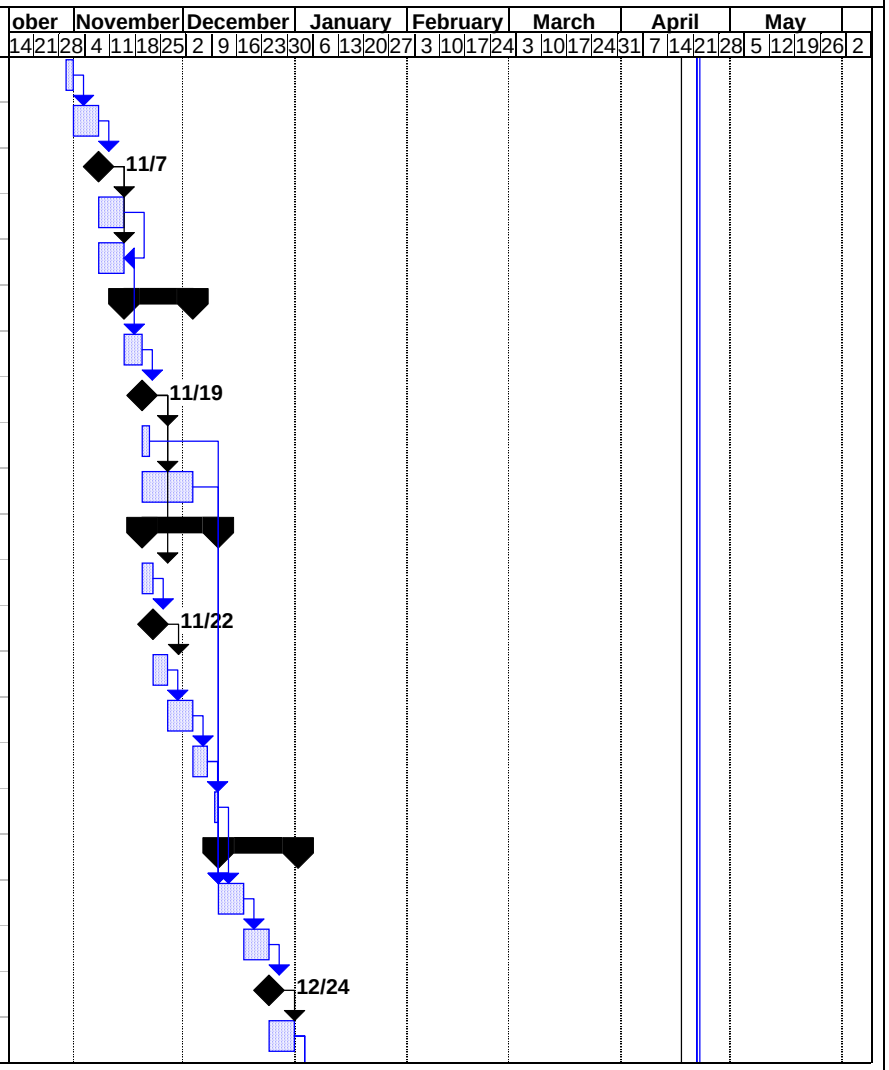


Project: 2PRELIM.MPP
Date: Thu 3/9/06

Task		Rolled Up Milestone		Rolled Up Split	
Progress		Rolled Up Progress		External Milestone	
Milestone		External Tasks		Deadline	
Summary		Project Summary			
Rolled Up Task		Split			

Preliminary Design Phase

ID	Task Name
89	Review of Project
90	Prepare first draft EIA Report
91	Submit first draft EIA Report
92	Review of report by Roadways
93	Review of report by Plnng, Trans, Parks
94	**Second Draft**
95	Revise First draft EIA Report
96	Submit second draft EIA report
97	Review by Public Wks, Plnng, Trans, Parks
98	Review of report by special interest groups
99	**Public Interaction**
100	Prepare newsletter
101	Submit draft of newsletter
102	Review of newsletter by Public Works
103	Prepare final newsletter
104	Circulation of newsletter
105	Public / SIG Meeting
106	**Final Report**
107	Assessment of Comments
108	Preparation of Final Report
109	Submit Final Report
110	Review of Final Report by City

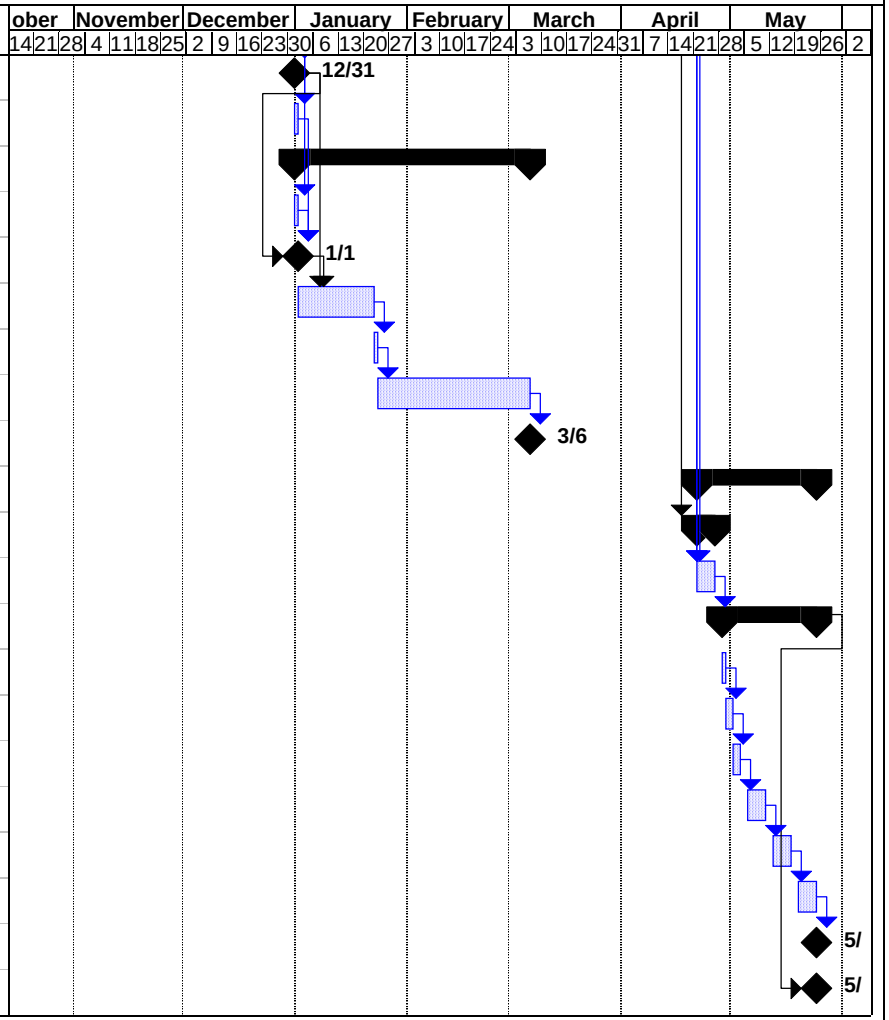


Project: 2PRELIM.MPP
Date: Thu 3/9/06

Task		Rolled Up Milestone		Rolled Up Split	
Progress		Rolled Up Progress		External Milestone	
Milestone		External Tasks		Deadline	
Summary		Project Summary			
Rolled Up Task		Split			

Preliminary Design Phase

ID	Task Name
111	Approval of Report by Public Works
112	Approval of Report by Planning
113	**Council Approval**
114	Preparation of Memo of Conv., etc
115	Submission to City Manager
116	Circulation by City Manager
117	Council Meeting
118	Deferals
119	Council Direction
120	**COMMUNICATIONS MANAGEMENT**
121	**Project Evaluation Report**
122	Prepare Developmental Design Report
123	**Obtain Approvals from Owner**
124	Approval of Engineer
125	Approval of Director of Design
126	Approval of Director of Construction
127	Approval of Branch Manager
128	Approval of Manager of Transportation Planning
129	Approval of Manager of Operations
130	Plans Complete
131	**Preliminary Design Phase Complete**

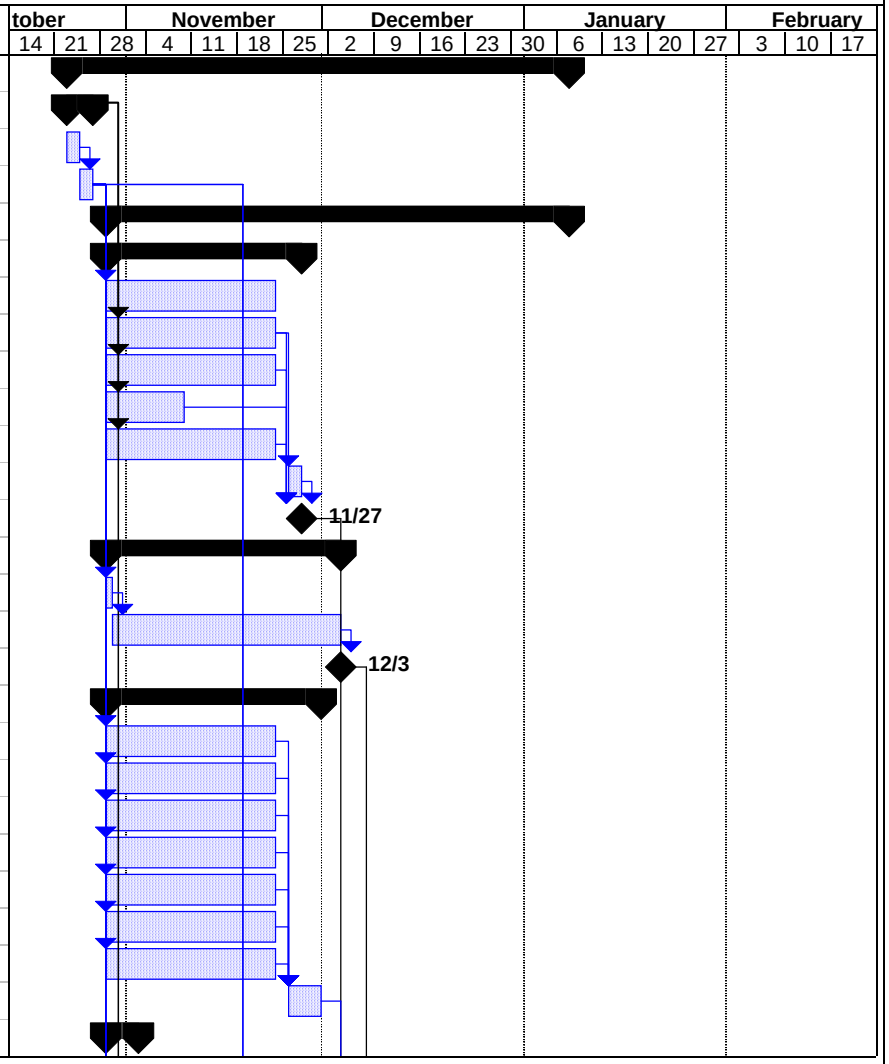


Project: 2PRELIM.MPP
Date: Thu 3/9/06

Task		Rolled Up Milestone		Rolled Up Split	
Progress		Rolled Up Progress		External Milestone	
Milestone		External Tasks		Deadline	
Summary		Project Summary			
Rolled Up Task		Split			

Detailed Design Phase

ID	Task Name
1	**SCOPE MANAGEMENT**
2	**Review Prelim Design/Report/Estimate**
3	Review Preliminary Design Report
4	Allocate Resources
5	**Contract Drawings**
6	**Detailed Geometric Design**
7	Obtain Survey
8	Design Alignment
9	Design Grades
10	Design Construction Details
11	Detours/Staging Plans
12	Design Paint markings
13	Geometric Design Complete
14	**Detailed Structural Design**
15	Contact structural Consultants
16	Structural Design
17	Structural Design complete
18	**Design of utility relocation's**
19	Drainage
20	Water
21	Streetlighting/Trolley Poles
22	Traffic Signals/Sign Structures
23	Utility Structures
24	Secondary Electrical
25	Shallow Trench Utilities
26	Utility Conflict Check
27	**Detailed Pavement Design**

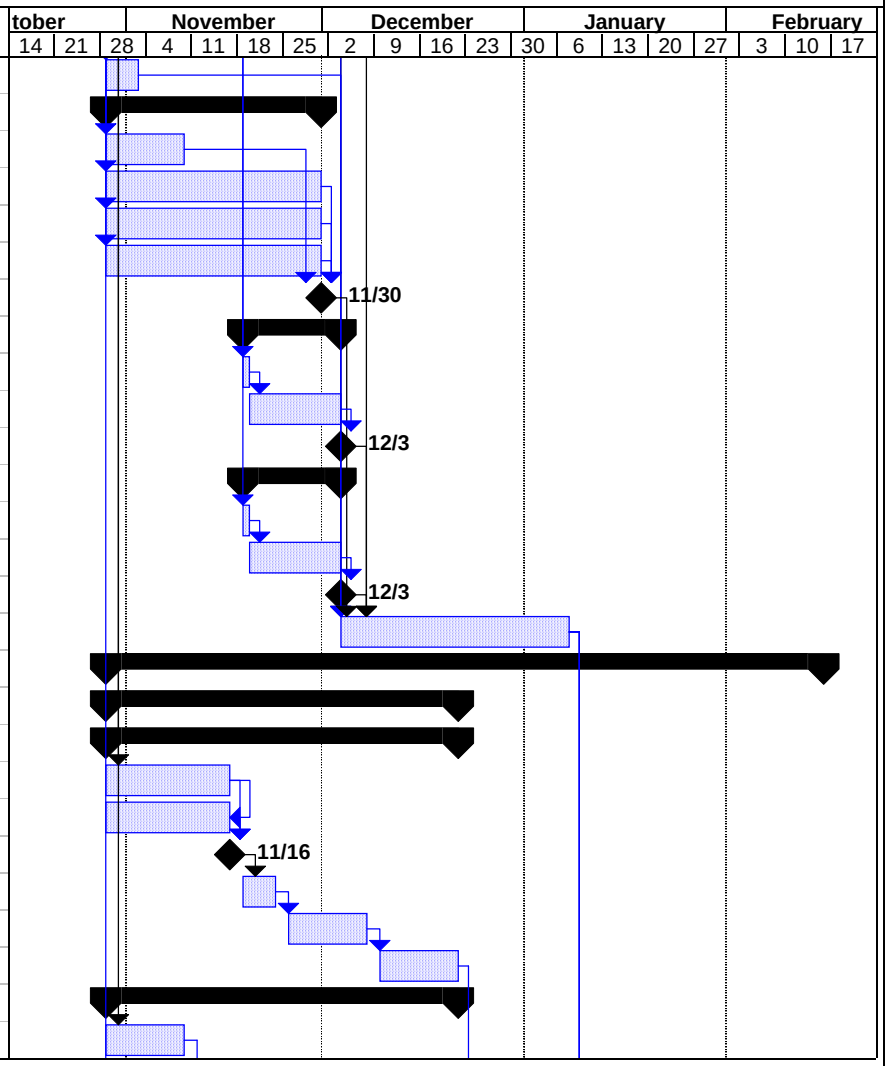


Project: 3DETAIL.MPP
Date: Thu 3/9/06

Task		Rolled Up Milestone		Rolled Up Split	
Progress		Rolled Up Progress		External Milestone	
Milestone		External Tasks		Deadline	
Summary		Project Summary			
Rolled Up Task		Split			

Detailed Design Phase

ID	Task Name
28	Refine Pavement Design
29	**Resolve Regulatory Requirements**
30	Resolve Environmental Issues
31	Land Acquisition
32	Pipeline Crossing Permits
33	Railway Crossing Permits
34	**All Regulatory Requirements Resolved**
35	**Detailed Landscaping Design**
36	Contact Parks and Recreation
37	Parks and Recreation design Landscaping
38	Landscape Design Complete
39	**Detailed Streetscaping Details**
40	Contact Planning and Development
41	Design Streetscaping/Street Furniture
42	Streetscaping Design Complete
43	Prepare Contract Plans
44	**QUALITY MANAGEMENT**
45	**Construction Specifications**
46	**In-House Development of Specifications**
47	Review Requirement for New Specifications
48	Collect modifications to existing roadways specifications
49	Specification Review Meeting
50	Prepare new Specification
51	Circulate and Correct
52	Approval
53	**External Development of Specifications**
54	Consultant prepares Draft

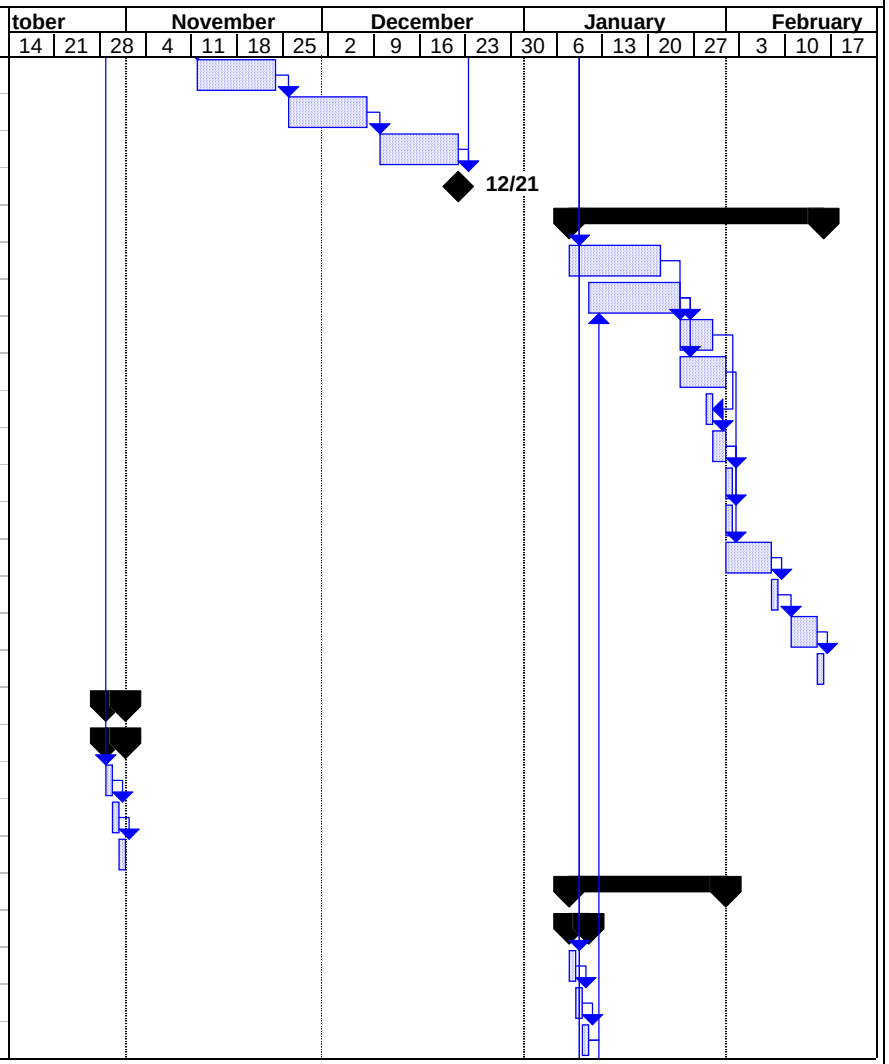


Project: 3DETAIL.MPP
Date: Thu 3/9/06

Task		Rolled Up Milestone		Rolled Up Split	
Progress		Rolled Up Progress		External Milestone	
Milestone		External Tasks		Deadline	
Summary		Project Summary			
Rolled Up Task		Split			

Detailed Design Phase

ID	Task Name
55	Draft circulated for review
56	Consultant Correct Draft
57	Approval
58	**New Specification Included in Book**
59	**TenderDocuments**
60	Obtain estimate information from outside agencies
61	Prepare contract estimates/tender documents
62	Prepare "A" req.
63	Prepare supplementary general conditions/special provisions
64	Prepare advertising request
65	Approval of Director/Finance Section
66	Deliver "A" req. /ad req./ copy of Inv. Tender to Materials Mngmt.
67	Forward ad request to Corporate Communications
68	Approval of Special Provisions by GS/Director/Manager
69	Forward to G.S. a title page for stamping
70	Assemble tender package
71	Deliver book copy to Materials Mngmt.
72	**TIME MANAGEMENT**
73	**Detailed Design Schedule**
74	Define Activities and durations
75	Sequence Activities
76	Develop schedule
77	**COST MANAGEMENT**
78	**Produce pre-tender estimates**
79	Take-off of quantities
80	Apply unit prices
81	Approval of Director of Construction

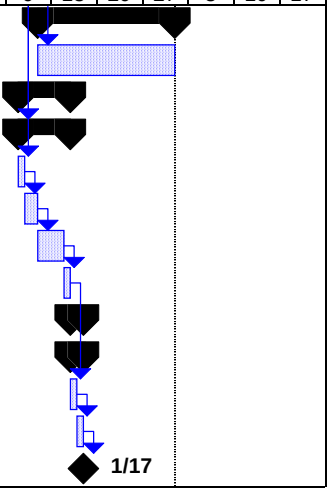


Project: 3DETAIL.MPP
Date: Thu 3/9/06

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split
External Milestone
Deadline

Detailed Design Phase

ID	Task Name
82	**Budget Adjustment (as necessary)**
83	Make Budget adjustment
84	**RISK MANAGEMENT**
85	**Professional Stamps Applied**
86	Approval of Engineer
87	Approval of Director of Design
88	Approval of Director of Construction
89	Permit to Practice
90	**COMMUNICATIONS MANAGEMENT**
91	**Approval of Owner (As required)**
92	Approval of Manager of Transportation Planning (as required)
93	Approval of Manager of Operations (as required)
94	**Detailed Design Phase Complete**

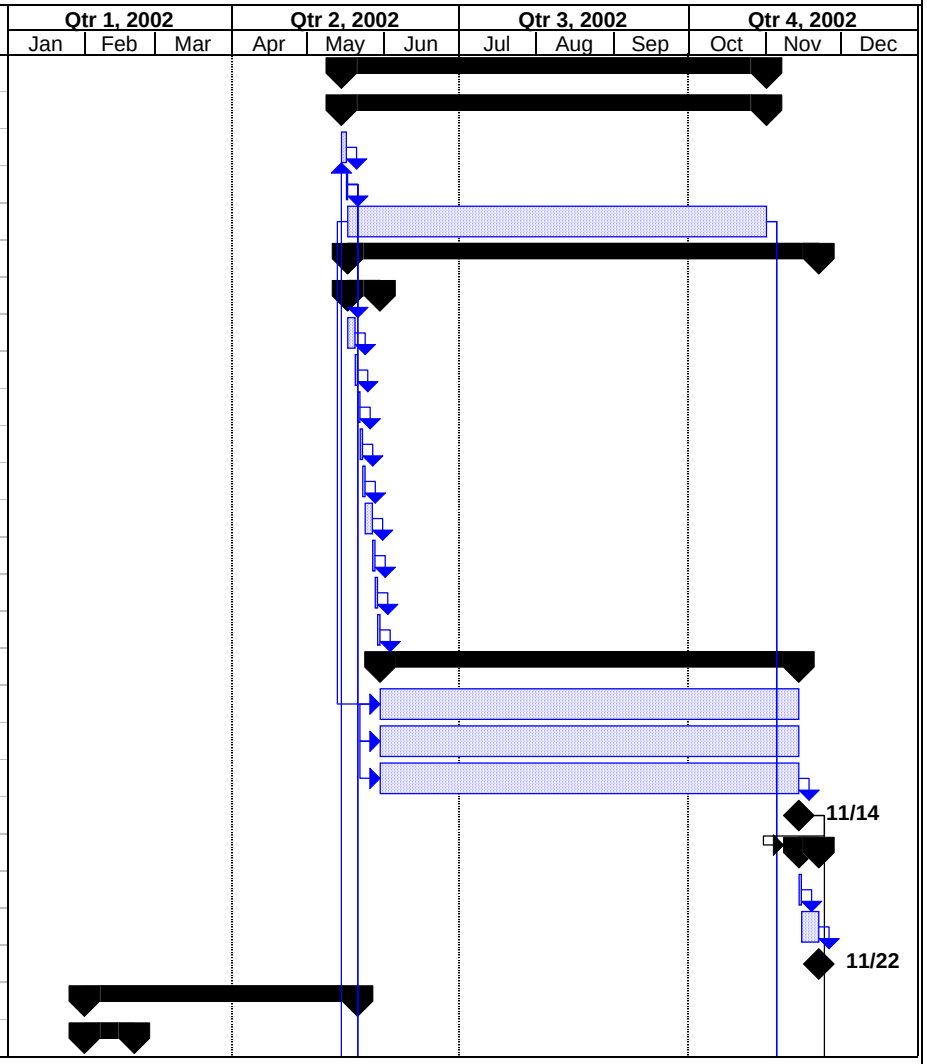


Project: 3DETAIL.MPP
Date: Thu 3/9/06

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split
External Milestone
Deadline

Construction Phase

ID	Task Name	Duration
1	**SCOPE MANAGEMENT**	**122.5 days**
2	**Preconstruction Meeting**	**122.5 days**
3	Arrange Preconstruction Meeting	2 days
4	Hold Preconstruction Meeting	0.5 days
5	Construct Facilities	120 days
6	**QUALITY MANAGEMENT**	**135 days**
7	**Quality Assurance Test Results**	**9 days**
8	Enter Info into Material Testing Frequency Update	1 day
9	Arrange testing requirements with Materials Engineering	1 day
10	Receive materials information	1 day
11	Review documentation/plant calibration for S/C and A/C	1 day
12	Review data and request scale certification	1 day
13	Approve mix design per plant	1 day
14	Approve sieve analysis per plant	1 day
15	Request any trial mixes deemed necessary	1 day
16	Forward approved mix designs to G.S.	1 day
17	**Construction Progress Reports**	**120 days**
18	Construction Survey	120 days
19	Inspection of Construction	120 days
20	Payment of Contractors	120 days
21	Construction Complete	0 days
22	**Construction Completion Certificate**	**6 days**
23	Initiate the C.C.C. Process	1 day
24	C.C.C. Inspection	5 days
25	Approve C.C.C.	0 days
26	**TIME MANAGEMENT**	**77.5 days**
27	**Tender Schedule**	**14 days**

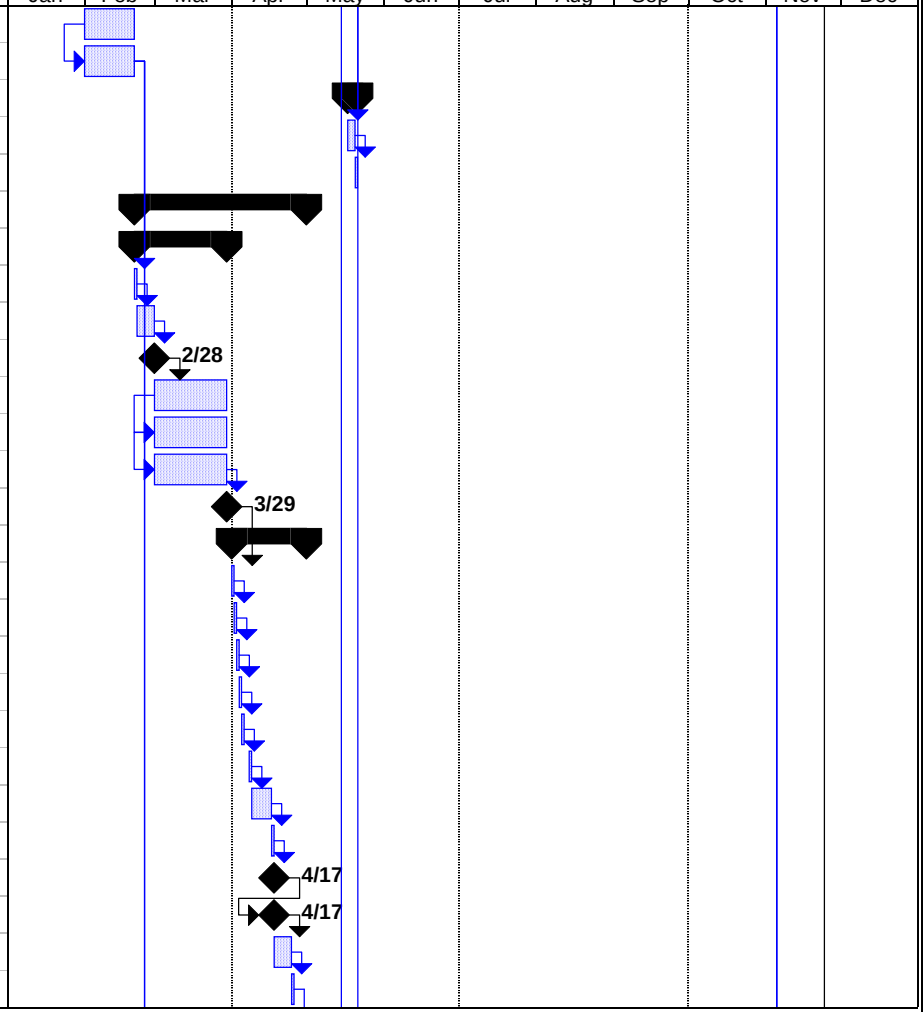


Project: POSTCON.MPP
Date: Thu 3/9/06

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split
External Milestone
Deadline

Construction Phase

ID	Task Name	Duration
28	Prepare contract List and assign supervisors	14 days
29	Prepare tender schedule	14 days
30	**Construction Schedule**	**2 days**
31	Receive construction schedule	1 day
32	Approve construction schedule	1 day
33	**COST MANAGEMENT**	**49 days**
34	**Tender**	**27 days**
35	Receive Documents approval from Materials Management	1 day
36	Print Tender Books	5 days
37	Deliver tender packages to Materials Management	0 days
38	Tender sets available to bidders	21 days
39	Issue Addendum if required - send to Materials Management	21 days
40	Tender Period	21 days
41	Tender closes at 2:00PM	0 days
42	**Bid evaluation and estimate compariosn**	**22 days**
43	Receive tender returns	1 day
44	Check tender returns	1 day
45	Select successful bidder	1 day
46	Adjust Contract size	1 day
47	Give copy bides for tabulation	1 day
48	Prepare contract award recommendation	1 day
49	Have award recommendation approved	6 days
50	Documents to Materials Management	1 day
51	Receive copy of letter of intent	0 days
52	Receive notification of Receipt of Bonds, Insurance, etc.	0 days
53	Send plans for microfiche	5 days
54	Complete "Course of Construction" application	1 day

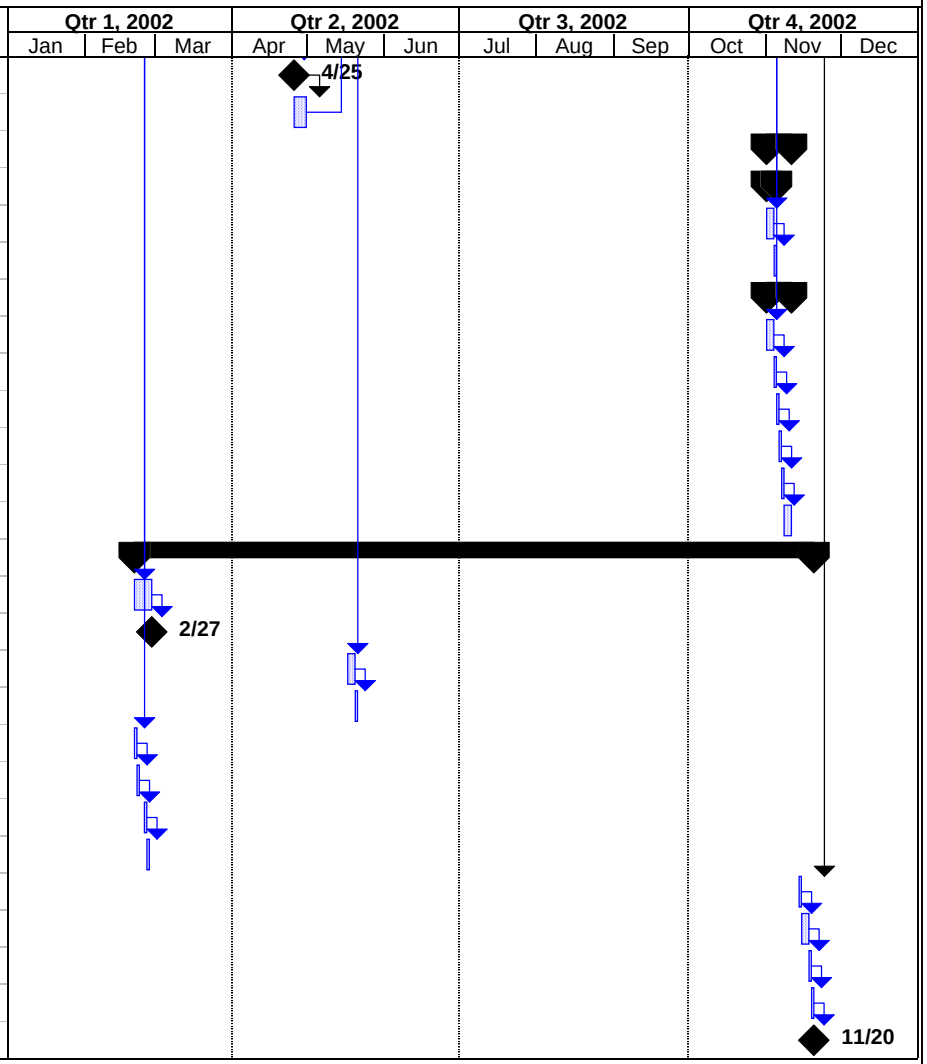


Project: POSTCON.MPP
Date: Thu 3/9/06

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split
External Milestone
Deadline

Construction Phase

ID	Task Name	Duration
55	Receive one signed contrat copy	0 days
56	Approval for Construction	3 days
57	**RISK MANAGEMENT**	**6 days**
58	**Design Services During Construction**	**2 days**
59	Review of changes in design	1 day
60	Approval of change Orders	1 day
61	**Deficient Testing Reporting**	**6 days**
62	Quaterly Report 1 Issued	1 day
63	Deficient Result corrected	1 day
64	Quaterly Report 2 Issued	1 day
65	Deficient Result corrected	1 day
66	Quaterly Report 3 Issued	1 day
67	Deficient Result corrected	1 day
68	**COMMUNICATIONS/HUMAN RESOURCES MANAGEMENT**	**194.5 days**
69	Construction Evaluation	5 days
70	Public Meetings	0 days
71	Prepare and deliver Construction Bulletins	1 day
72	Send notification to the Post Office	1 day
73	Arrange public meetings	1 day
74	Arrange school talks	1 day
75	Hold Public Meetings	1 day
76	Hold School Talks	1 day
77	Evaliuations	1 day
78	Deliver evaluations	1 day
79	Receive evaluations	1 day
80	Complete Evaluation report	1 day
81	Construction Phase Complete	0 days

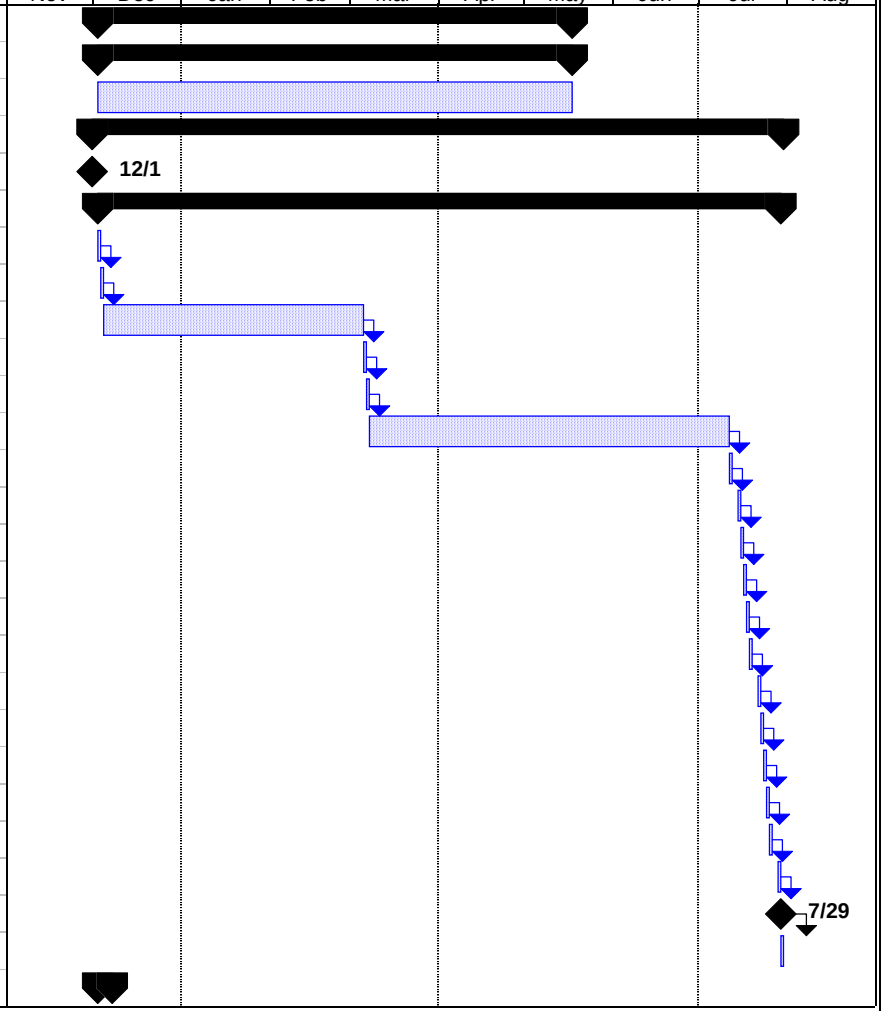


Project: POSTCON.MPP
Date: Thu 3/9/06

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split
External Milestone
Deadline

Warranty Phase

ID	Task Name	Duration
1	**SCOPE MANAGEMENT**	**120 days**
2	**As-Built drawings**	**120 days**
3	See As-Built Procedures	120 days
4	**QUALITY MANAGEMENT**	**172 days**
5	Warranty Control System to end of warranty period (varies)	0 days
6	**Final Acceptance Certificate**	**171 days**
7	Note all defects on numbered list or FAC form	1 day
8	Analyze all deficiencies	1 day
9	Carry out joint inspection three months prior to F.A.C.	65 days
10	Send notification of deficiencies to Contractor	1 day
11	Request schedule of repairs and due notice for inspection	1 day
12	Correct deficiencies	90 days
13	Give Contractor 15 days notice	1 day
14	Request bond extension	1 day
15	Request City Solicitor take action	1 day
16	Receive notice from City Solicitor	1 day
17	Risk Mngmt. oversees correction of defects	1 day
18	City Solicitor indicates that F.A.C. may be issued	1 day
19	Send Copies of Warranty Status Log	1 day
20	Verify and date all F.A.C. deficiencies	1 day
21	Forward signed original to Contractor	1 day
22	Signed original for Contract file	1 day
23	Update the Contract Warranty Log	1 day
24	Circulate contract Warranty Log	1 day
25	Send Contract Log	0 days
26	Issue FAC to owner	1 day
27	**TIME MANAGEMENT**	**5 days**

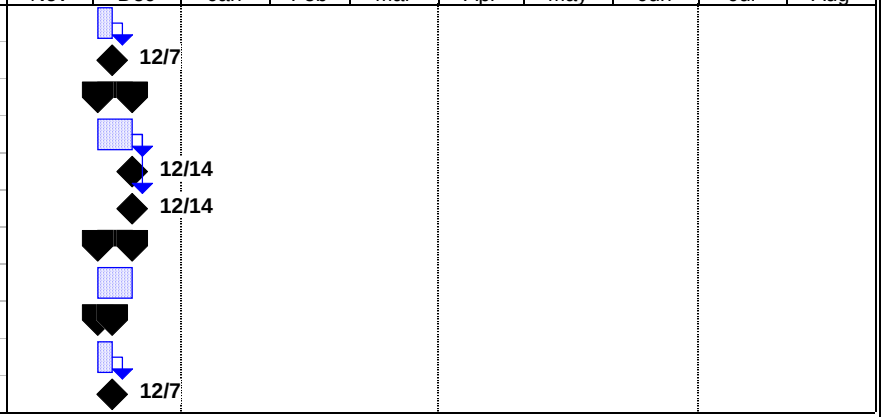


Project: POSTCON.MPP
Date: Thu 3/9/06

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split
External Milestone
Deadline

Warranty Phase

ID	Task Name	Duration
28	Prepare Final time report	5 days
29	Final Time Report Approved	0 days
30	**COST MANAGEMENT**	**10 days**
31	Prepare Final cost report	10 days
32	Local Imp Charges to Finance	0 days
33	Final Cost Report Approved	0 days
34	**RISK MANAGEMENT**	**10 days**
35	Final Commissioning report prepared	10 days
36	**COMMUNICATIONS/HUMAN RESOURCES MANAGEMENT**	**5 days**
37	Prepare Project evaluation report	5 days
38	Project Evaluation Report Approved	0 days



Project: POSTCON.MPP
Date: Thu 3/9/06

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split
External Milestone
Deadline

APPENDIX B: RESPONSIBILITY MATRIX OF THE STREETSCAPE CONCEPT, PRELIMINARY AND DETAILED DESIGN, CONSTRUCTION AND POST CONSTRUCTION PHASES

APPENDIX B: RESPONSIBILITY MATRIX OF THE STREETSCAPE CONCEPT, PRELIMINARY AND DETAILED DESIGN, CONSTRUCTION AND POST CONSTRUCTION PHASES

PHASE	PLANNING & DEVELOPMENT	TRANSPORTATION	TRANSPORTATION	TRANSPORTATION	TRANSPORTATION
	PLANNING & POLICY SERVICES BRANCH	PLANNING BRANCH	STREETS ENGINEERING – ROADWAYS DESIGN	STREETS ENGINEERING – ROADWAYS CONSTRUCTION	STREETS ENGINEERING – ROADWAYS MAINTENANCE
1. STRATEGIC	Develop project needs & scope statement Co-ordinate BRZ interests and public information exchange, document input from end users. Develop initial schedule with milestones and deadlines.. Develop alternatives and recommendation. Undertake technical assessment. Develop estimate. Prepare streetscape concept plans/report. Receive approval "in principle" from owner Obtain Council approval via CPP process. Develop contingency plan. Prepare project evaluation report.	Develop project needs relative to roadway requirements. Determine policy objectives Attend public information exchange and address public concerns. Provide environmental impact review Undertake technical assessment. Review -financial strategy for rehab -economic justifications -funding sources -performance review Undertake a value for money analysis. Obtain Council approval via CPP process	Provide input on schedule and cost Identify safety concerns Evaluate alternatives	Provide input on schedule and cost Evaluate alternatives	Provide input on schedule and cost Evaluate alternatives Identify safety concerns
2. CONCEPT	Develop project needs & scope statement Co-ordinate BRZ interests and public information exchange, document input from end users. Develop initial schedule with milestones and deadlines.. Develop alternatives and recommendation. Undertake technical assessment. Develop estimate. Prepare streetscape functional plans/report. Receive approval "in principle" from owner Obtain Council approval via CPP process. Develop contingency plan. Identify utility conflicts Prepare project evaluation report	Develop project needs & scope statement relative to roadway requirements, prioritize. Develop alternatives and recommendation. Define problem areas and identify risks. Undertake technical assessment. Develop estimate and cost constraints. Undertake a value for money analysis. Prepare streetscape functional plans/report. Identify utility conflicts Obtain Council approval via CPP process. Address public concerns. Develop contingency plan. Prepare project evaluation report Identify safety and environmental concerns. Obtain Departmental approvals.	Review 3 year priority list. Initiate field reviews Identify utility conflict Review geometric alignments and design standards.	Provide preliminary structural design to Roadway Maintenance Section. Attend field reviews. Provide advice on constructibility of concept. Identify utility conflict	Obtain pavement information ■ rut depth measurement. ■ concrete/asphalt ratings ■ Dynaflect data Identify areas of concern Identify utility conflict. Assess technical analysis
3. PRELIMINARY DESIGN	Attend field review Prepare Streetscape preliminary plans and report in conjunction with Roads prelim. plan. Approve plans and obtain approval of owners. Identify and review special issues with construction experts.	Attend field review Approve plans.	Co-ordinate field review Assess concept reports and approvals. Develop preliminary drawings / reports in conjunction with Streetscape prelim. plans. Obtain owners approval of local improvement rates. Provide quantities and submit plan for estimating. Identify/resolve utility conflicts. Complete EIA screening. Evaluate road safety improvements. Provide special issues/structural expertise analysis. Update overall project schedule. Ensure regulatory requirements are met.	Attend field review Estimate construction costs and provide local improvement rates. Adjust CPP budget as required. Co-ordinate road infrastructure core testing. Undertake pavement structure design. Provide preliminary construction quantities. Provide special issues/structural expertise analysis.	Attend field review Approve preliminary plans. Identify special maintenance issues.

APPENDIX B: RESPONSIBILITY MATRIX FOR STREETSCAPE PROJECTS

FUNCTIONS	STRATEGIC PHASE	CONCEPT PHASE	PRELIMINARY DESIGN PHASE	DETAILED DESIGN PHASE	CONSTRUCTION PHASE	WARRANTY PHASE	OPERATIONS/ MAINTENANCE PHASE
PROJECT MANAGER	**MANAGER, Planning and Policy Services, Planning and Development Department**	**MANAGER OF TRANSPORTATION PLANNING**	**MANAGER OF STREETS ENGINEERING**				**MANAGER OF STREETS ENGINEERING**
FUNCTIONAL MANAGER	**Director of Strategic Areas Services**	**Manager of Transportation Planning**	**Director of Roadways Design G.S. of Design**		**Director of Roadways Construction**		**Director of Roadway Maintenance**
SCOPE MANAGEMENT	*Develop project needs statement* *Co-ordinate BRZ interests* *Identify project priority* *Address public concerns and requirements* *Prepare conceptual plans/reports*	*Develop project needs relative to roadway requirements* *Identify project priority* *Assess technical analysis* *Address public concerns* *Prepare conceptual plans/report*	*Review Concept Plans & Reports (Functional and Streetscape)* *Develop sketch drawings* *Prepare preliminary design report.*	*Produce final engineering drawings and professional specifications.* *Detail: street furniture; soft/hard landscaping features; secondary electrical; structures; standard infrastructure replacement; and signing.*	*Decide to perform work in-house or contract out based on quality/time/cost considerations* *Produce "as-built" drawings as construction proceeds*	*Finalize and approve "as-built" drawings.*	*Operate, Maintain and monitor roadway facilities*
END PRODUCTS	*Streetscape concept plan/report* *Problem/needs statement* *Alternatives/recommendation* *Scope statement*	*Functional concept plan/report* *Problem/needs statement* *Alternatives/recommendation* *Scope statement*	*Preliminary Design Plans and/or Report*	*Contract Plans*	*Constructed Facility*	*As-Built Drawings*	*A safe and reliable roadway network from commissioning to closure*
QUALITY MANAGEMENT	*Receive formal input from end users and property owners.* *Undertake technical assessment of alternatives by experts.*	*Receive formal input from end users and property owners.* *Undertake technical assessment of alternatives by experts.*	*Assess concept reports and approvals.* *Review estimates and justifications.* *Address regulatory requirements.*	*Perform: critical analysis of* *-detailed design* *-assessment of the constructibility of the project* *-structural analysis* *-review with the industry on specialty items* *-review maintainability of product and finishes.*	*Undertake quality control program to monitor construction quality.* *Consult with consultants/specialists to ensure product quality and esthetics.* *Issue Construction Completion Certificates to the owner*	*Establish a Warranty Control System to the end of the warranty period.* *Issue Final Acceptance Certificate to the Owner*	*Monitor the ongoing condition of the roadway and Streetscape inventory and compare to the design life expectancy (Pavement Management System)*
END PRODUCTS	*Technical assessment* *Documented input from end users*	*Technical assessment* *Documented input from end users*	*P.Eng. Stamp on drawings*[1]	*Construction specifications and contract documents.* *Permit to Practice and signatures.*	*QA Test Results,* *Daily Construction Progress Reports and regular progress meetings with specialists.* *Construction Completion Certificate*	*Final Acceptance Certificate*	*Regular condition reports*
TIME MANAGEMENT	*Prepare conceptual time estimate with milestones and deadlines.*	*Prepare conceptual time estimate with milestones and deadlines.*	*Establish time milestones relating to meeting objectives.* *Produce overall project schedule.*	*Update project schedule* *-local improvement schedule* *-acceptance by owner* *-delivery of specialty items* *-development of proto type* *-detours and special event plans*	*Prepare construction schedule (Contractor)* *Communicate changes to completion dates to users.* *Prepare construction bulletins to provide owners with progress reports and information on pending construction.*	*Include a final time report within the project evaluation report and explain variances.*	*Schedule timely rehabilitation and maintenance activities through the Pavement Management System*
END PRODUCTS	*Initial schedule*	*Initial schedule*	*Updated schedule*	*Updated schedule*	*Updated schedule*	*Project evaluation report* *Time Report*	*List of prioritized locations requiring rehabilitation or reconstruction*

[1] The engineer who takes professional responsibility is accepting the responsibility that all issues have been addressed.

FUNCTIONS	STRATEGIC PHASE	CONCEPT PHASE	PRELIMINARY DESIGN PHASE	DETAILED DESIGN PHASE	CONSTRUCTION PHASE	WARRANTY PHASE	OPERATIONS/ MAINTENANCE PHASE
PROJECT MANAGER	**MANAGER, Planning and Policy Services, Planning and Development Department**	**MANAGER OF TRANSPORTATION PLANNING**	**MANAGER OF STREETS ENGINEERING**				**MANAGER OF STREETS ENGINEERING**
FUNCTIONAL MANAGER	**Director of Strategic Areas Services**	**Manager of Transportation Planning**	**Director of Roadways Design G.S. of Design**		**Director of Roadways Construction**		**Director of Roadway Maintenance**
COST MANAGEMENT	*Identify cost constraints. Submit project profile sheet. Obtain City Council approval. Undertake a value for money analysis.*	*Identify cost constraints. Submit project profile sheet. Obtain City Council approval. Undertake a value for money analysis.*	*Update project cost estimates. Estimate local improvement charges.*	*Produce a pre-tender estimate. Adjust scope and/or budget as required subsequent to review by owner and to reflect dollars available in Local Improvement Bylaw.*	*Proceed with tender upon approval by the Owner. Evaluate bid and in-house estimates. Analyze quantity reports. Scrutinize and pay consultant invoices.*	*Produce a final cost report and explain variances.*	*Maximize the effectiveness of available budgets through PMS optimization sub-programs*
END PRODUCTS	*estimate 50%+_ CPP Budget. Approval "in principle" by owner.*	*Estimate 50%+_ CPP Budget. Approval "in principle" by owners.*	*Preliminary Estimates 30%+_ CPP Budget Adjustment. Approval by owners.*	*Pre-tender Estimates 20%+_ Local Improvement Bylaw CPP Budget Adjustment*	*Tender,Bid Analysis and Award,Actual Construction Costs,CPP Budget Adjustment Post-tender Estimates 10%+ ,*	*Final Cost Report*	*Cost Reporting of Maintenance Activities*
RISK MANAGEMENT	*Identify contingency plans for sensitive projects. Identify and quantify risks associated with problems. Identify safety concerns. Identify environmental concerns.*	*Identify contingency plans for sensitive projects. Identify and quantify risks associated with problems. Identify safety concerns. Identify environmental concerns.*	*Prepare status report on variables that are of greatest concern and of highest risk.*	*Apply professional stamps to drawings after all professionals have checked the documents. Ensure consultants have stamped and signed permit to practice on all structural and electrical drawings.*	*Identify and correct all construction/design deficiencies with a Deficiency Control System. Submit Commissioning Plan to Project Manager. Monitor site safety.*	*Produce a final Commissioning report to verify that all sub-components of the system function effectively as a whole.*	*Minimize overall long term infrastructure costs by PMS optimization of the available budgeted capital and maintenance funds.*
END PRODUCTS	*Contingency plans*	*Contingency plans*	*Design Brief Environmental Impact Assessment / Screening Report*	*P.Eng. stamps on drawings, documents, and reports.*	*Deficient Test Reporting and Correction. Hazard Assessment.*	*Final Commissioning Report with areas requiring specific monitoring*	*Inspections of facilities.*
COMMUNI-CATIONS/ HUMAN RESOURCES MANAGEMENT	*Obtain approval of the owners/users. Prepare organization responsibility matrix. Define problem areas. Establish community contacts.*	*Obtain approval of the owners/users. Prepare organization responsibility matrix. Define problem areas. Establish community contacts.*	*Provide communication link between senior management, the project team, and interested outside parties. Meet regularly with the owners.*	*Formalize written agreement for all consultant contracts. Obtain approval of project by owner representatives. Document meetings with owner representatives. Provide written notification of public meetings. Provide formal notification of local improvement bylaws.*	*Train end users of the final product in its use and maintenance. Provide and approve relevant maintenance and operating manuals before project is complete*	*Produce project evaluation report which summarizes lessons learned by the project management team. Distribute customer evaluation questionnaire to the BRZ for response.*	*Establish interface between planners, designers and construction entities to relay operational concerns.*
END PRODUCTS	*Project evaluation report.*	*Project evaluation report.*	*Project Evaluation Report*	*Project Evaluation Report[2].*	*Project Evaluation Report[3].*	*Project Evaluation Report with as-built quantities.*	*Performance measures for individual projects.*

[2] Includes Consultant Completion Advice Forms
[3] Includes Contractor Completion Reports; Contractor Safety Evaluation; Customer (public) Satisfaction Reports; Construction Return Reports

APPENDIX C: RESPONSIBILITY MATRIX FOR REHABILITATION PROJECTS

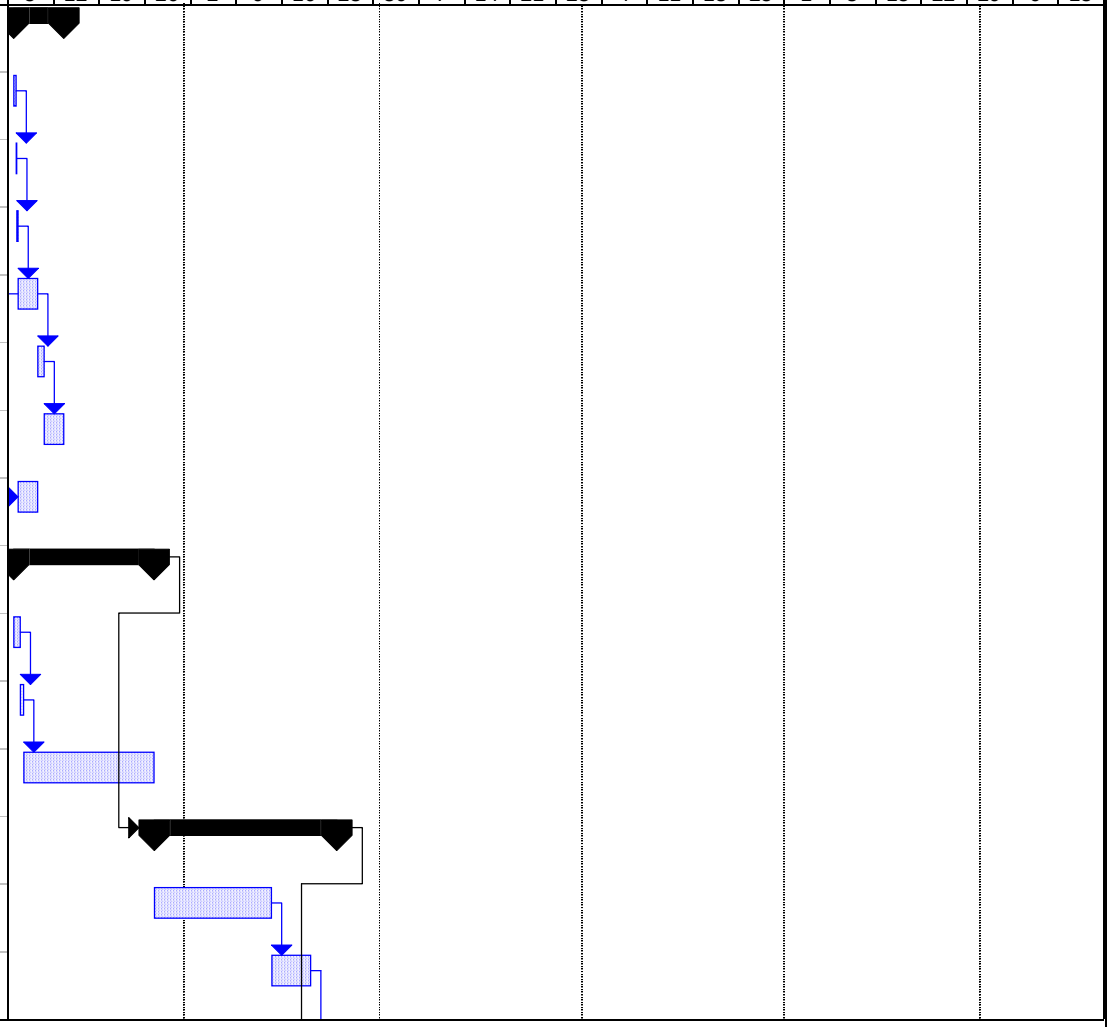
APPENDIX C: RESPONSIBILITY MATRIX FOR REHABILITATION PROJECTS

PHASE	STREETS ENGINEERING BRANCH ROADWAY MAINTENANCE SECTION	STREETS ENGINEERING BRANCH ROADWAYS DESIGN SECTION	STREETS ENGINEERING BRANCH – ROADWAYS DESIGN SECTION	STREETS ENGINEERING BRANCH – ROADWAY CONSTRUCTION SECTION
1. CONCEPT	- Produce 3 year priority list (2001-2003) **MARCH 2001** - Attend field reviews for high priority 2003 locations. **SEPTEMBER 2001** - Obtain pavement information a) concrete/asphalt ratings (P.M.S.) b) rut depth measurements c) Dynaflect data - Identify areas of concern - Identify public concern areas - Produce preliminary priority list based on P.M.S. output - Identify priority locations (1998 and 3 year) - Assess technical analysis opportunities - Initiate public information exchange - Respond to all rehabilitation inquiries - Utility conflict resolution - Obtain Project quantities for a) Overlay (PWD) b) Base c) Concrete **NOVEMBER 2001**	- Determine policy objectives a) funding levels b) target ratings - Review and Integrate 3 year priority list with 5 year CPP - Attend public information exchange (as required) - Provide Environmental Impact Review - Provide priority list #1 (year 1) and scope statement - Annual PIS update a) financial strategy for rehab/constr. b) economic justifications c) funding sources/review d) performance review **NOVEMBER 2001**	- Review 3 year priority list (2001 - 2003) **MARCH 2001** - Initiate field review for high priority 1998 locations **SEPTEMBER 2001** - Review 3 year priority list (2002 - 2004) **MARCH 2002**	- Provide preliminary structural design to Roadway Maintenance Section for 1998 locations - Attend field reviews for high priority 1998 locations (Pavement Engineer) **SEPTEMBER 2001** - Review information of 3 year priority list (2002 – 2004) **MARCH 2002**
2. DEVELOPMENT/ PRELIMINARY DESIGN	- Attend field reviews - Approve preliminary plans - Identify specialized maintenance issues - Finalize technical analysis activities - Provide priority list #2 - Public information exchange (as required). **JUNE 2002**	- Review priority list per preliminary cost summary (additions or deletions) **JUNE 2002**	- Initiate remaining field reviews - Determine the extent of work required - Complete E.I.A./Screening - Evaluate road safety/boulevard improvements - Resolve/identify utility conflicts - Determine curb heights - Prepare and approve preliminary plan - Submit prelim plans for estimating **JUNE 2002**	- Coordinate core testing - Pavement structure design a) traffic data b) growth rates - Attend field reviews (Pavement Engineer) - Provide prelim construction/quantities a) Overlay b) Base c) Concrete - Complete project report to Transportation/Design (Priority confirmation list #2/Cost Summary/Quantities) **JUNE 2002**

APPENDIX D: GANTT CHART FOR THE MANAGEMENT OF GEOTECHNICAL PROJECTS

Geotechnical Projects

ID	Task Name
1	**INITIALIZE PROJECT**
2	Set up work order
3	Library search
4	Stake test hole locations
5	Utility search
6	Obtain OSCAM Permit
7	Arrange for barricades with Traffic Operations
8	Obtain GBIS base map
9	**FIELD INVESTIGATION**
10	Drill test holes
11	Survey test holes
12	Monitor groundwater levels
13	**LABORATORY TESTING**
14	Laboratory testing
15	Prepare logs

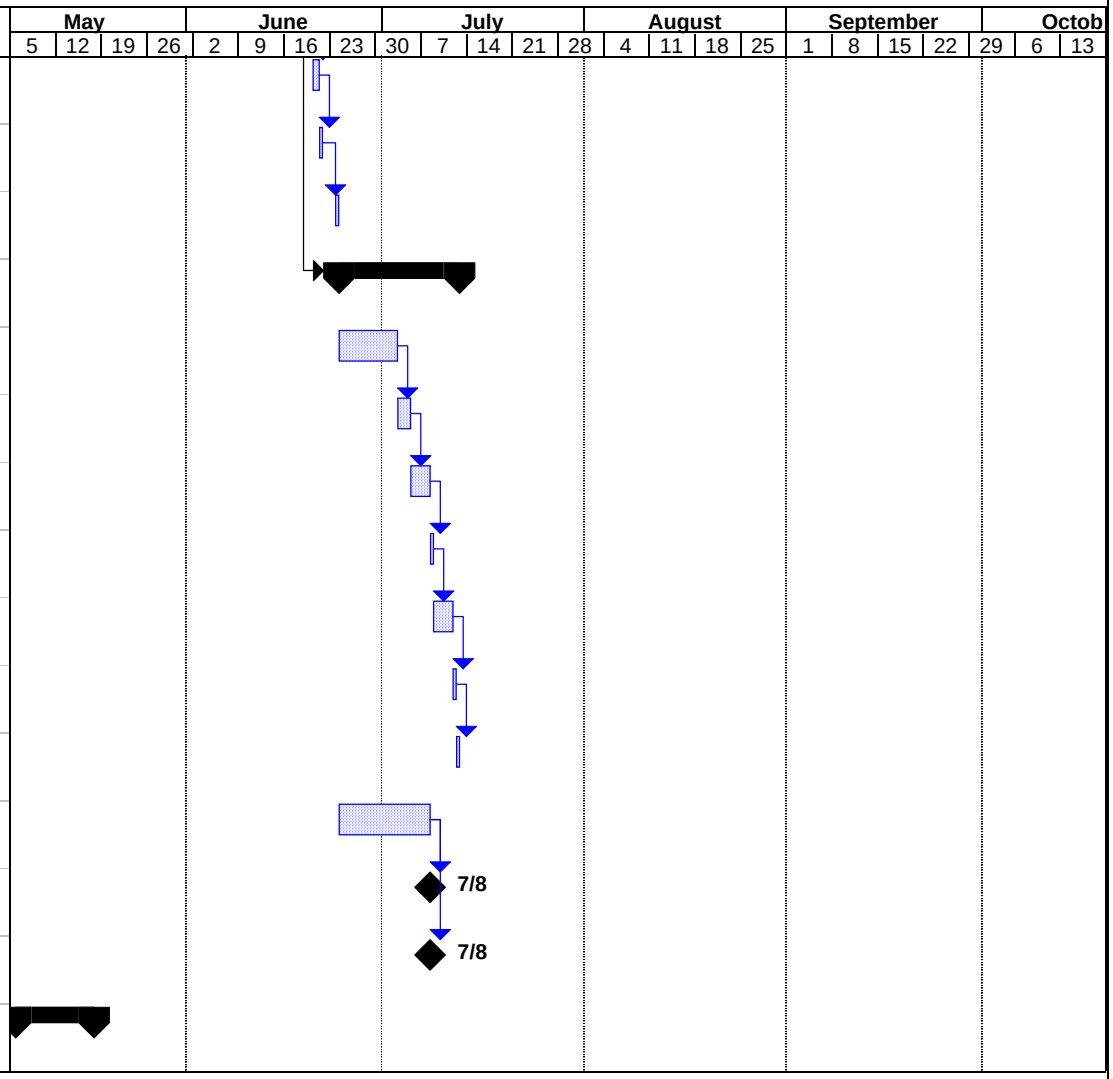


Project: POSTCON.MPP
Date: Thu 3/9/06

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split
External Milestone
Deadline

Geotechnical Projects

ID	Task Name
16	Review and revise logs
17	Prepare site plans
18	review and revise site plans
19	**REPORT PREPARATION**
20	Prepare report
21	Review and revise report
22	Review by Director
23	Copy and Bind Report
24	Obtain Permit to Practice Stamp
25	Mail report to client
26	Catelogue report for library
27	Prepare Final cost report
28	Local Imp Charges to Finance
29	Final Cost Report Approved
30	**RISK MANAGEMENT**

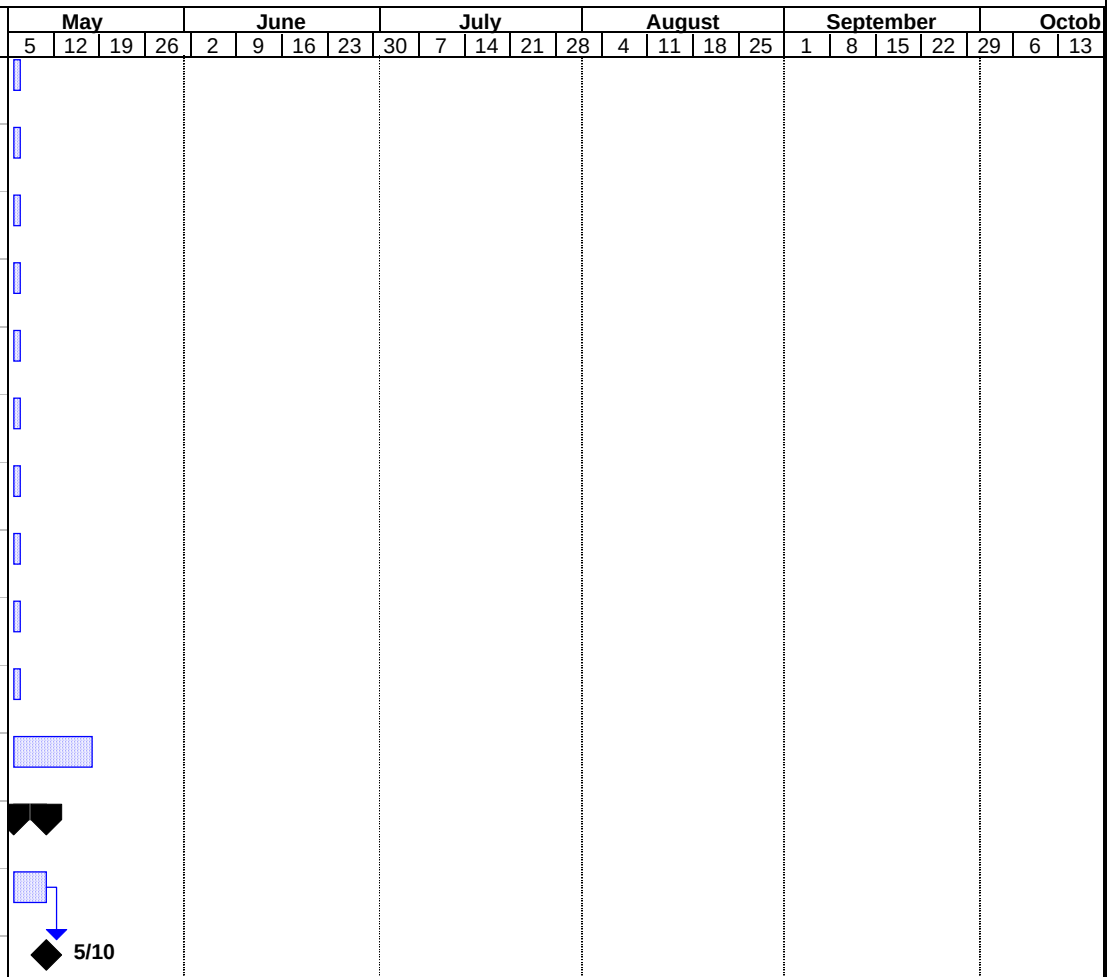


Project: POSTCON.MPP
Date: Thu 3/9/06

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split
External Milestone
Deadline

Geotechnical Projects

ID	Task Name
31	Design Services During Construction
32	Review of changes in design
33	Approval of change Orders
34	Deficient Testing Reporting
35	Quaterly Report 1 Issued
36	Deficient Result corrected
37	Quaterly Report 2 Issued
38	Deficient Result corrected
39	Quaterly Report 3 Issued
40	Deficient Result corrected
41	Final Commissioning report prepared
42	**COMMUNICATIONS/HUMAN RESOURCES MANAGEMENT**
43	Prepare Project evaluation report
44	Project Evaluation Report Approved

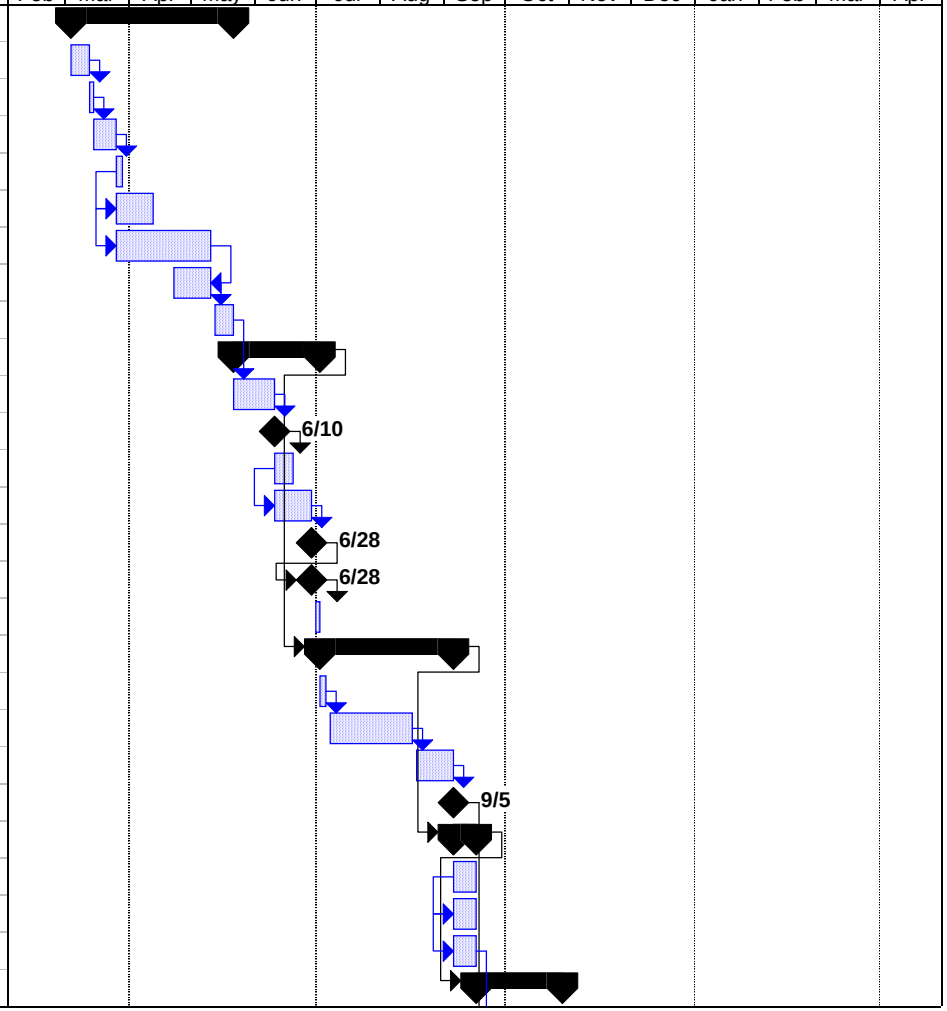


Project: POSTCON.MPP
Date: Thu 3/9/06

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split
External Milestone
Deadline

Slide Repair Projects

ID	Task Name
1	**PRELIMINARY GEOTECH INVESTIGATION**
2	Call for review of proposals
3	Send Letter of Acceptance to Consultant
4	Drilling Program and Site Instrumentation
5	Site Survey
6	Preparation of Base Map by Roadways Design
7	Monitor Instrumentation
8	Prepare analysis, preliminary design and costs
9	Report review and acceptance by Streets Engineering
10	**ENVIRONMENTAL IMPACT ASSESSMENT**
11	Report preparation
12	Submission to Planning and Development Department
13	Review of report by Planning and Development Department
14	Review of report by Community Services
15	Public Meeting
16	Report Approval
17	Select Remedial Measures
18	**DETAILED DESIGN BY CONSULTANT**
19	Detailed site survey
20	Detailed design and analysis
21	Plan and document preparation
22	Submission of final design
23	**APPROVAL OF CONSTRUCTION DRAWINGS**
24	Review by Roadways Construction
25	Review by Roadways Design
26	Review by Drainage Branch, AMPW
27	**PERMITS AND AGREEMENTS**

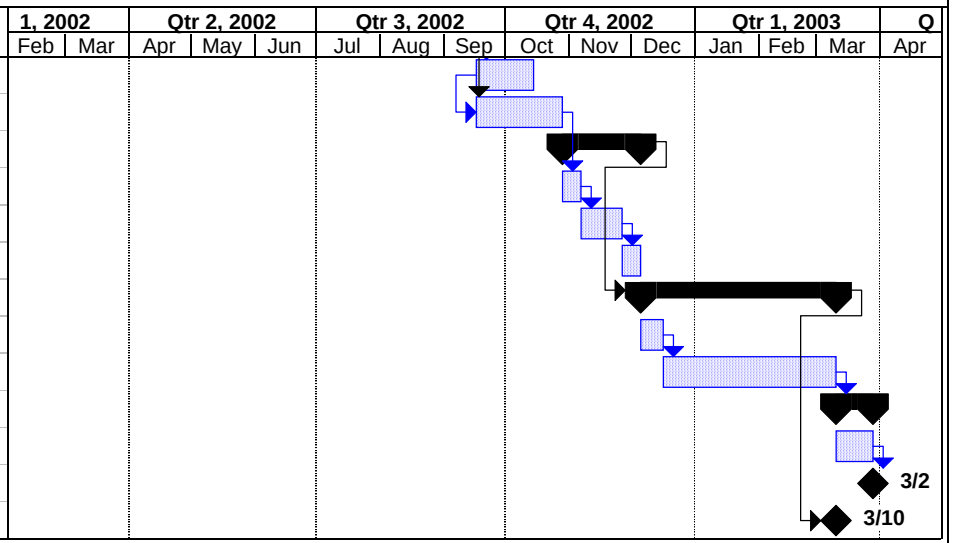


Project: CONCEPT.MPP
Date: Thu 3/9/06

Task	Rolled Up Milestone	Rolled Up Split	
Progress	Rolled Up Progress	External Milestone	
Milestone	External Tasks	Deadline	
Summary	Project Summary		
Rolled Up Task	Split		

Slide Repair Projects

ID	Task Name
28	Review permits from Alberta Environment
29	Right-of-Access Agreements
30	**TENDERING**
31	Prepare tender documents
32	Tender period
33	Acceptance of tender
34	**CONSTRUCTION**
35	Prepare and send out construction notices
36	Construction
37	**AS-BUILT DRAWINGS**
38	Prepare as-built drawings
39	Submission and approval of drawings
40	**PROJECT COMPLETION**



Project: CONCEPT.MPP
Date: Thu 3/9/06

Task	Rolled Up Milestone	Rolled Up Split	
Progress	Rolled Up Progress	External Milestone	
Milestone	External Tasks	Deadline	
Summary	Project Summary		
Rolled Up Task	Split		

APPENDIX E: PHASE END PRODUCT CHECKLISTS

1. **Concept**
2. **Preliminary Design**
3. **Detailed Design**
4. **Construction**
5. **Post Construction**

Concept Phase End Product Checklist

	Interchanges & Bridges	Arterial/Collectors/Residential Roads			Slides	Walkways & Bikeways
		New/widening	Rehabilitation	Reconstruction		
1. Background information						
a) City Council report and approval	X	X				X
b) Limits/Study Area	X	X				X
c) Existing land use	X	X				X
d) Right-of-way requirements	X	X				X
e) Property Ownership	X	X				
f) Projected land use	X	X				
h) Field visit	X	X				X
I) Description of existing conditions.	X	X				X
j) Existing and projected Traffic volumes	X	X				
k) Accident history	X	X				
2. Products						
a) Conceptual Drainage Plan	X	X				
b) Identify geotechnical conditions	X	X				
c) Identify requirements and constraints for existing and proposed utilities, R.R. x-ing, pipeline x-ing.	X	X				X
d) Identify potential environmental issues	X	X				X
e) Operational Safety Review	X	X				X
f) Documentation of alternatives considered	X	X				X
h) Operational analyses	X	X				
I) Horizontal alignment 1:1000 double line alignment (photo mosaic base optional)	X	X				X
j) Vertical alignment (single line, typical cross-section) based on contours when available	X	X				
k) Pedestrian/Bicycle circulation	X	X				X
l) Major lighting/Signing – identify type / quantity – cost	X	X				
m) Noise attenuation requirements	X	X				
n) Cost Estimate	X	X				X
o) Staging/Detours schematic	X	X				
p) Identify landscaping needs – cost (scope may vary with project)	X	X				X
q) Business/residential access requirements	X	X				
r) Transit requirements	X	X				
3. Support products and Conclusions/Recommendations						
a) Input from End Users/Public consultation report.	X	X				X
b) Capital Priorities Program schedule	X	X				X
c) Risk Analysis	X	X				
d) Value Engineering	X	X				
e) Historical Resources Inventory	X	X				X
f) Conclusions/Recommendations	X	X				X

Preliminary Design Phase End Product Checklist

	Interchanges & Bridges	Arterial/Collectors/Residential Roads			Slides	Walkways & Bikeways
		New/widening	Rehabilitation	Reconstruction		
1.1. History of Project / Communication – Background information including:						
a) Cover letter	X	X		X	X	
b) Table of contents	X	X		X	X	
c) Executive summary	X	X		X	X	
d) Project description	X	X	X	X	X	
e) Review of existing conditions	X	X		X	X	X
f) Functional plan review / confirmed rational for the project (Project justification)	X	X		X	X	X
g) Terms of Reference	X	X		X	X	
h) Summary of people involved in project to date	X	X	X	X	X	X
i) Commitments made to anyone and who made them	X	X	X	X	X	X
j) Public meeting results	X	X	X	X	X	X
e) Stakeholder input reports,	X	X	X	X	X	X
f) Copy of previous consultant agreement (if any)	X	X		X	X	
g) Copy of environmental agreements	X	X		X	X	X
h) Copy of conceptual geotech report	X	X	X	X	X	X
i) Existing land uses	X	X		X	X	X
1.2. Information collected on the project including:						
a) Design Criteria / Standards /Considerations	X	X	X	X	X	X
b) Utility agencies contacted (and names of contacts)	X	X	X	X	X	X
c) Check of Utility Agency's work program (ie: water break count)	X	X	X	X	X	X
d) Utility relocation cost agreement (who pays for what)	X	X	X	X	X	
e) Copies of conceptual estimates from utility agencies	X	X	X	X	X	
f) Budget Program and funding source (developer funded, general financing, grants)	X	X	X	X	X	X
g) Risk Analysis and Risk Management Plan Update	X	X		X	X	X
h) Value Engineering Report	X	X		X	X	X
I) Safety Audit (if required)	X	X		X	X	X
j) Environmental Impact Assessment and audit setup	X	X	X	X	X	X
k) Geotech report including boreholes and recommendations on poor soils	X	X	X	X	X	X
l) Maintenance input including required surplus material	X	X	X	X	X	X
m) Accessibility requirements (pedestrians and cyclists)	X	X	X	X	X	X
n) Bus pads, bays, shelters including power feed for ad shelters	X	X	X	X		X
o) Concept and preliminary cost estimates	X	X	X	X	X	X
p) High pressure pipeline conflict review	X	X	X	X	X	X
1.3. Field visit reports						
a) Observations	X	X	X	X	X	X
b) Photos and/or videos	X	X	X	X	X	X
c) Preliminary Hazard Assessment	X	X	X	X	X	X
1.4. Status of Land Acquisition						
a) Land requirements	X	X	X	X	X	X
b) Land acquisition status	X	X	X	X	X	X
c) Review encroachments on road right of way	X	X	X	X	X	X
d) Access permission to enter onto private property (if required)	X	X	X	X	X	X
e) Cost of Land	X	X	X	X	X	X
f) Estimated possession date	X	X	X	X	X	X
2. Products						
2.1. Preliminary Design Drawings / Reports						
2.1.1 Roads						
a) Horizontal and Vertical Alignment	X	X	X	X	X	X
b) Preliminary design grades	X	X		X	X	X
c) Grade match at adjacent buildings, driveways, and road tie ins	X	X	X	X	X	X
d) Specific Construction Details	X	X	X	X	X	X
e) Location of all curbs and gutters and sidewalks	X	X	X	X	X	X
f) Detour/Staging Plans	X	X		X	X	
g) Paint Marking Plan	X	X	X	X	X	
h) Utility (Existing and Proposed) conflicts review	X	X	X	X	X	X
I) Layout info defined in the following coordinates:	X	X	X	X	X	X
NAD83 Adopted Horizontal Datum - 3TM (114W) map projection	X	X	X	X	X	X
j) Location of Streetlights, traffic signals, trolley poles, ground mount/overhead traffic signs, etc.	X	X	X	X	X	X
k) Legal property lines, (proposed and existing)	X	X	X	X	X	X
l) Identify existing encroachments	X	X	X	X	X	X
m) Identify if legal survey is required to re-establish legal pins after construction is completed	X	X	X	X	X	X
n) Identify existing pipeline / railway crossings and identify upgrade requirements	X	X	X	X	X	X
o) Prepare estimates	X	X	X	X	X	X
p) Identify design and construction schedule	X	X	X	X	X	X
q) Plan approvals (P. Eng. & Permit)	X	X	X	X	X	X
2.1.2 Structures						
a) Horizontal and Vertical Alignment	X	X	X	X	X	X
b) Preliminary design grades	X	X	X	X	X	X
c) Grade match at road tie ins	X	X	X	X	X	X
d) Specific Construction Details	X	X	X	X	X	X
e) Location of all curbs and gutters and sidewalks	X	X	X	X	X	X
f) Utility (Existing and Proposed) conflicts review	X	X	X	X	X	X
g) Layout info defined in the following coordinates:	X	X	X	X	X	X
NAD83 Adopted Horizontal Datum - 3TM (114W) map projection	X	X	X	X	X	X
h) Location of Streetlights, traffic signals, trolley poles, ground mount/overhead traffic signs, etc.	X	X	X	X	X	X
I) Legal property lines, (proposed and existing)	X	X	X	X	X	X
j) Identify existing encroachments	X	X	X	X	X	X
k) Prepare estimates	X	X	X	X	X	X
l) Identify design and construction schedule	X	X	X	X	X	X
m) Plan approvals (P. Eng. & Permit)	X	X	X	X	X	X
2.1.3 Drainage						
a) Horizontal and Vertical Alignment	X	X		X	X	
b) Preliminary design grades	X	X	X	X	X	X
c) Overland drainage review /confirmation	X	X		X	X	
d) Specific Construction Details	X	X	X	X	X	X
e) Location of all curbs and gutters and sidewalks	X	X	X	X	X	X
f) Utility (Existing and Proposed) conflicts review	X	X	X	X	X	X
g) Layout info defined in the following coordinates:	X	X	X	X	X	X
NAD83 Adopted Horizontal Datum - 3TM (114W) map projection	X	X	X	X	X	X
h) Location of Streetlights, traffic signals, trolley poles, ground mount/overhead traffic signs, etc.	X	X	X	X	X	X
I) Legal property lines, (proposed and existing)	X	X	X	X	X	X
j) Identify existing encroachments	X	X	X	X	X	X
k) Prepare estimates	X	X	X	X	X	X
l) Identify design and construction schedule	X	X	X	X	X	X
m) Plan approvals (P. Eng. & Permit)	X	X	X	X	X	X
2.1.4 Streetlighting / Secondary Electrical						
a) show all preliminary road /property line base information	X	X	X	X	X	X
b) existing pole locations	X	X	X	X	X	X
c) new pole locations	X	X	X	X	X	X
d) identify proposed luminaire types	X	X	X	X	X	X
e) typical detail of pole and base / pole height	X	X	X	X	X	X
f) identify offsets to curb face/edge of pavement	X	X	X	X	X	X
g) typical and specific cross section(s)	X	X	X	X	X	X
h) hardware requirements – locations, wire type, etc.	X	X	X	X	X	X
I) Layout info defined in the following coordinates:	X	X	X	X	X	X
NAD83 Adopted Horizontal Datum - 3TM (114W) map projection	X	X	X	X	X	X
j) Condition survey of existing lighting system	X	X	X	X	X	X
k) Existing and proposed lumination	X	X	X	X	X	X
l) Report (report requirement depends on project size)	X	X	X	X	X	X
m) Coordinate with existing and proposed utilities (shaw, telus, fiber optics, etc.)	X	X	X	X	X	X
n) Review / coordinate trolley requirements (if applicable)	X	X	X	X	X	X
o) Coordinate new street lighting with landscaping	X	X	X	X	X	X

p)	Prepare quantities and estimates	X	X	X	X	X	X
q)	Proposed design and construction schedule	X	X	X	X	X	X
r)	Plan approvals (P. Eng. & Permit) & Design (T&S) Section and Traffic (T&S) Section	X	X	X	X	X	X
s)	Line assignment co-ordination	X	X	X	X	X	X
t)	Consultant contacts for design and construction	X	X	X	X	X	X
2.1.5	**Streetscaping**						
a)	Attend/coordinate field review		X	X			
b)	Prepare 10 yr. and 20 yr. rehab. plans		X	X			
c)	Obtain 10 yr. and 20 yr. rehab. estimates		X	X			
d)	Prepare preliminary roadway plans and report in conjunction with prelim. streetscaping plans		X	X			
e)	Identify / resolve utility conflicts		X	X			
f)	Undertake pavement structure design		X	X			
g)	Complete EIA screening (as required)		X	X			
h)	Evaluate road safety improvements		X	X			
I)	Provide special issues / structural expertise analysis		X	X			
j)	Produce overall project schedule		X	X			
k)	Ensure regulatory requirements are met		X	X			
l)	Coordinate Local Improvement process		X	X			
m)	Approve preliminary streetscaping and roadway plans		X	X			
n)	Provide written notification of public meetings.		X	X			
o)	Identify special maintenance issues		X	X			
p)	Obtain owners approvals		X	X			
2.1.6	**Landscaping**						
a)	Assess existing site conditions	X	X	X	X	X	X
b)	review design objectives	X	X		X	X	X
c)	Liason with Community Services Department	X	X	X	X	X	X
d)	Prepare plans per City format	X	X	X	X	X	X
e)	Layout info defined in the following coordinates:	X	X	X	X	X	X
	NAD83 Adopted Horizontal Datum - 3TM (114W) map projection	X	X	X	X	X	X
f)	Review various alternatives	X	X		X	X	X
g)	Obtain required approvals	X	X	X	X	X	X
h)	Prepare quantities and cost estimates	X	X		X	X	X
I)	Prepare design and construction schedule	X	X	X	X	X	X
j)	Specific Construction Details	X	X	X	X	X	X
k)	Show all preliminary road /property line base information	X	X	X	X	X	X
l)	Location of all curbs and gutters and sidewalks	X	X	X	X	X	X
m)	Utility (Existing and Proposed) conflicts review	X	X	X	X	X	X
n)	Sight line review	X	X	X	X	X	X
o)	Prepare estimates	X	X	X	X	X	X
p)	Identify design and construction schedule	X	X	X	X	X	X
q)	Plan approvals (P. Eng. & Permit)	X	X	X	X	X	X

3.0 Notes

3.1 Hand-off of "Project Manager" role when conceptual plans are approved

3.2 Input required from Planning , Construction and Operations during the preliminary design phase

Detailed Design Phase End Product Checklist

	Interchanges & Bridges	Arterial/Collectors/Residential Roads			Slides	Walkways & Bikeways
		New/widening	Rehabilitation	Reconstruction		
1. Background information						
1.1. History of Project – Background information including:						
a) people involved in project to date	X	X	X	X	X	X
b) rational for the project (why are we doing it), project justification	X	X	X	X		X
c) commitments made to anyone and who made them	X	X	X	X	X	X
1.2. History of Communication						
a) public meeting results	X	X	X	X	X	X
b) stakeholder input reports,	X	X				
c) copy of consultant agreement	X	X				
d) copy of agreement with environmental auditor	X	X			X	
e) copy of geotech preliminary report					X	
1.3. Information collected on the project including:						
a) Utility agencies contacted (and names of contacts)	X	X	X	X	X	X
b) Check of Utility Agency's work program (water break count)	X	X	X	X	X	X
c) Utility relocation cost agreement (who pays for what)	X	X	X	X	X	X
d) Estimates requested and received from utility agencies	X	X	X	X	X	X
e) Budget Program and funding source (developer funded, general financing, grants)	X	X	X	X	X	X
f) Risk Analysis and Risk Management Plan Update	X	X	X	X	X	X
g) Value Engineering Report	X	X				
h) Safety Audit	X	X			X	
I) Environmental Impact Assessment and audit setup	X	X			X	
j) Geotech report including boreholes and recommendations on poor soils	X	X		X		
k) Maintenance input including required surplus material	X	X			X	X
l) Accessibility requirements (pedestrians and cyclists)	X	X	X	X	X	X
m) Bus pads, bays, shelters including power feed for ad shelters						
n) Concept and preliminary cost estimates	X	X	X	X	X	X
1.4. Field visit reports						
a) Observations	X	X	X	X	X	X
b) Photos and/or videos	X	X	X	X	X	X
c) Preliminary Hazard Assessment	X	X	X	X	X	X
1.5. Status of Land Acquisition						
a) Do we have enough land	X	X	X	X	X	X
b) Has the land acquisition process been started	X	X	X	X	X	X
c) Are there any existing encroachments on road right of way	X	X	X	X	X	X
d) Do we have the right to enter onto private property	X	X	X	X	X	X
e) Is land expropriation a potential	X	X	X	X	X	X
f) Cost of Land	X	X	X	X	X	X
g) Estimated possession date	X	X	X	X	X	X
2. Products						
2.1. Detailed Design Drawings						
a) Horizontal and Vertical Alignment	X	X	X	X	X	X

b) Design Grades	X	X	X	X	X	X
c) Tie in grades at adjacent buildings, driveways, and road tie in limits.	X	X	X	X	X	X
d) Construction Details	X	X	X	X	X	X
e) Location of all curbs and gutters and sidewalks	X	X	X	X	X	X
f) Detour/Staging Plan	X	X	X	X	X	
g) Paint Marking Plan	X	X	X	X		X
h) Utility Existing and Proposed and conflicts if any	X	X	X	X	X	X
I) Layout info defined in the following coordinates:						
NAD83 Adopted Horizontal Datum - 3TM (114W) map projection	X	X	X	X	X	X
j) Location of Streetlights, traffic signals, trolley poles, ground mount/overhead traffic signs	X	X	X	X	X	X
k) Legal property lines, both proposed and existing	X	X	X	X	X	X
l) Show existing encroachments	X	X	X	X	X	X
m) Identify if legal survey is required to re-establish legal pins after construction is completed				X	X	
2.2. Structural Design Drawings where applicable						
a) Details of structural items	X	X			X	X
b) Construction cost estimate for structures	X	X			X	X
c) Contract specifications for structural tems	X	X			X	X
2.3..Detailed Utility Plans						
a) Drainage – existing, abandoned, and relocations that are required	X	X	X	X	X	X
b) Water – existing and required relocations	X	X	X	X	X	X
c) Power (underground & overhead) – existing and required relocations	X	X	X	X	X	X
d) Telephones – existing and required relocations	X	X	X	X	X	X
e) Fibre Optics – existing location (not always shown on GBIS)	X	X	X	X	X	X
f) Gas – existing and required relocations	X	X	X	X	X	X
g) Streetlights– existing and required relocations	X	X	X	X	X	X
h) Traffic Signals– existing and required relocations	X	X	X	X	X	X
i) Railway Agreements and Board Orders	X	X	X	X	X	X
2.4. Streetscape Design Drawings where applicable						
a) Details of streetscape items			X			X
b) Construction cost estimate for non standard streetscape elements			X			X
c) Contract specifications for nonstandard streetscape items			X			X
2.5. Landscape Plan						
a) approved by Community Services	X	X			X	X
2.6. Pipeline Crossing plan showing:						
a) agreement number, contact name, and rules of conduct (48 hrs notice, etc.)	X	X	X	X	X	X
b) Date executed	X	X	X	X	X	X
2.7 Detailed Pavement Design						
a) Road cross section	X	X	X	X	X	
b) Bikeway/walkway cross section	X				X	X

Notes

3.1 Hand-off of "project manager" role when mylars are signed or some other

3.2 Needs to be input from construction and operations during the design phase and even the conceptual phase for some projects

3.3 Hand-off required for Program Manager at some point between CPP approval and construction start

Construction Phase End Product Checklist

	Interchanges & Bridges	Arterial/Collectors/Residential Roads			Slides	Walkways & Bikeways
		New/widening	Rehabilitation	Reconstruction		
1. Background information						
1.1. History of Project – Background information including:						
a) people involved in project to date	X	X	X	X	X	X
1.2. History of Communication						
a) Copy of consultant agreement	X					
b) Copy of geotech preliminary report					X	
1.3. Information collected on the project including:						
a) Risk Analysis and Risk Management Plan Update	X					
b) Maintenance input including required surplus material	X	X			X	X
2. Products						
2.1. Detailed As-built Drawings (hard copy)						
a) Horizontal and Vertical Alignment	X	X		X	X	X
b) As-built Design Grades	X	X	X	X	X	X
c) As-built tie in grades at adjacent buildings, driveways, and road tie in limits.	X	X	X	X		
d) Construction Details (Limits of construction, HIP, Grind and Overlay depths)	X	X	X	X	X	X
e) Paint Marking Plan	X	X	X	X		X
f) As-built utility information	X	X	X	X	X	X
g) Location of Streetlights, traffic signals, trolley poles, ground mount/overhead traffic signs	X	X	X	X	X	X
h) Details of structural items	X	X			X	X
I) Contract specifications for structural tems	X	X			X	X
j) Railway Agreements and Board Orders	X	X	X	X		
k) As-built Shop drawings for bearingsand exansion joints	X					
l) Details of streetscape items		X				
m) Contract specifications for nonstandard streetscape items		X				
n) Road cross section	X	X		X		
o) Bikeway/walkway cross section	X	X	X	X		X
2.2. Pipeline Crossing plan showing:						
a) Agreement number, contact name, and rules of conduct (48 hrs notice, etc.)	X	X	X	X	X	X
b) Date executed	X	X	X	X	X	X
2.3. Final Acceptance Certificate (FAC)						
a) FAC Document signed off by Branch Manager	X	X	X	X	X	X
b) Inventory of items supplied as per contract	X	X			X	X

APPENDIX F: RISK MANAGEMENT PROCESS

1. **Description of the Structured Risk Analysis Process**
2. **Risk Management Plan for 156 St & Yellowhead Trail Interchange**

DESCRIPTION OF THE STRUCTURED RISK ANALYSIS PROCESS

Definitions:

- **Risk:** Risk relates to the "potential of all threats (and opportunities) which can affect (adversely or favourably) the achievement of objectives for an investment." (Institute of Civil Engineers 1998)
- **Uncertainty:** "The gap between the information required to estimate an outcome and the information already possessed by the decision maker." (CII 1989)
- **Risk Management:** The process of identifying, analyzing, and responding (response development and response control) to project risk (PMI 1996).
- **Risk Analysis or Assessment:** A combination of processes of risk identification and risk quantification.
- **Risk Mitigation:** Development of a response or plan for dealing with risk.

Structured Risk Analysis

In completing this project we will apply the "Structured Risk Analysis Process" which will enhance the chances of providing a comprehensive review of all risk factors related to this project, and enable a useful quantification from subjective information. The process can be summarized as follows:

1. **Preparation**
    a. Assemble a risk review team representing key stakeholders in the project. We secured the participation of a number of experts for this assignment.
    b. Prepare background material for the project, conduct any required research of specific areas of the project.
    c. Develop a plan and schedule for the risk analysis process.
    d. Distribute the background material to the risk review team and initiate the risk assessment process.

2. **Risk Assessment**
    a. Identify risk factors for the project through a workshop. This step can make use of checklists and/or published literature on risk but is mostly effective through properly facilitated brainstorming session(s). In this project we will apply both checklists and workshops to identify all relevant risk factors.
    b. Quantify risk factors:
        i. Subjectively assess each factor and what may happen if it occurs. This step will qualitatively describe the cause of each factor and the impact. We will use the results of the research done in the previous step to better understand the risk factor. The involvements of experts ensure that this step is comprehensive and complete.
        ii. Determine the likelihood of the factor being encountered (e.g. probability, or a subjective descriptor). In this project we will use tables similar to the one shown in Table 1 for this purpose. The tables shown in here are only for purpose of illustration[1].
        iii. Determine the magnitude of the impact if the factor is encountered (e.g. dollar value or a subjective descriptor). In this project we will use tables similar to the one shown in Table 2 for this purpose[1].
        iv. Determine the overall severity of the factor by multiplying likelihood (ii) by magnitude (iii).

[1] . Appropriate tables may have to be derived for the intended application.

v. Sort factors into groups based on overall severity.
vi. Group the factors based on the overall severity score according to the grouping in Table 3[1].

In general, if the risk factors that scored in the "intolerable" range cannot be mitigated or a process for their mitigation foreseen, then the project should not be approved.
The remaining factors in the other zones can be accepted with a proper risk management plan establish to secure reduction in their quantum.

3. Risk Response

a. Decide on the actions to be taken in response to key risks. Actions can include:
   i. Reduce uncertainty by obtaining more information. (This generally leads to a re-evaluation of the likelihood)
   ii. Eliminate or avoid the risk factor through means such as partial or complete modifications to the proposed ideas, a different strategy or method etc.
   iii. Transfer the risk element to other parties.
   iv. Insure against the occurrence of the factor if and when possible.
   v. Abort the project if the risk is intolerable and no other means can be undertaken to mitigate its damages.
b. Plan response to key risks.
c. Communicate mitigating strategy and response plan to risk review team.

4. Risk Management

a. Develop a risk control plan. This should be composed of a set of tasks for each risk factor with responsibility and delivery date assigned (relative to a given project).
b. Require that the risk control plan be properly maintained.
c. Report changes and repeat Step (2) if conditions require (i.e. full risk review).

5. Post project evaluation

If project was approved, then for each project that is built undertake a post project evaluation during key milestones (e.g. when a significant thing happens).

a. Compare risk impacts with those anticipated.
b. Draw lessons for future.
c. Propose improvements.
d. Communicate results.

Concluding comments

This process has been applied in many projects ranging in size from $1 million to $100 million. Its provides advantage over other approaches in that it is structured, makes use of experts in a brainstorming sessions, quantifies outcomes which enables one to make informed decisions about how to proceed and at what cost, and can be used to derive the expected value for a given risk factor (i.e. cost of that factor occurring) which can greatly help making go/no go decisions about the project.

Table 1. Assessment of likelihood/probability of risk occurrence

Descriptor	*Explanation*	*Probability*	*Value to use*
Highly Likely	Almost certain that it will happen, very frequent occurrence	over 70%	20
Likely	more than 50-50 chance	50-70%	15
Somewhat likely	less than 50-50 chance	15% - 50%	10
Unlikely	small likelihood but could well happen	1% - 15%	5
Very unlikely	not expected to happen	0.01% - 1%	2
Extremely unlikely	just possible but would be very surprising	less than 0.01%	1

Table 2 Assessment of the magnitude of risk

Descriptor	*Explanation*	*Value to use*
Disastrous	The impact is totally unacceptable to the organization –value established in workshop or by owner.	1000
Severe	Serious threat to the organization, public etc.	100
Substantial	Considerably affects cost	50
Moderate	Moderately effects costs	10
Marginal	Small effect on costs	5
Negligible	Trivial effect on costs	1

Table 3. Assessment of the consequence of a risk factor

Total severity score	*Category*	*Response*
Over 2000	Intolerable	Must eliminate or transfer risk
500-1999	Undesirable	Attempt to avoid or transfer risk
50-499	Acceptable	Accept and manage risk
Less than 50	Negligible	Can be ignored but should be managed

S.M.A. Consulting

RISK ANALYSIS REPORT --PHASE 1

YELLOWHEAD TRAIL / 156 STREET INTERCHANGE PROJECT

DATE: NOVEMBER 29, 2000

SUBMITTED TO: CITY OF EDMONTON

PREPARED BY: S. ABOURIZK.

TABLE OF CONTENTS

1. Introduction

This report summarizes the results of the risk analysis for the Yellowhead Trail/ 156 street interchange Project undertaken by the Transportation and Streets Department of the City of Edmonton. The risk analysis process was based on the "Risk Analysis and Management for Projects –RAMP".

A workshop format was utilized over two six-hour sessions completed on April 5, 2000 and April 26, 2000. Participants included Chuan Kua, Randall Sonnenberg, Frank Vanderlaan, Don MacDonald, Glenn Jones, Roland Aitchison, Mike Marlow and Lubko Stebelsky. The facilitator for the workshops was S. AbouRizk.

Prior to the workshops, a preliminary meeting was held to identify "*known*" risk factors in "*interchange projects*". This involved Frank Vanderlaan, Chuan Kua, Randall Sonnenberg and Simon AbouRizk on April 3, 2000.

2. Project Background

Trans-Canada Highway #16, also referred to as Yellowhead Trail, passes through north-central Edmonton. Within the City, this 25-kilometer section of Canada's primary highway system also serves as a critical east-west arterial truck route and dangerous goods corridor.

Over the past number of years, the City has continued to upgrade Yellowhead Trail to a freer-flowing high standard by limiting access locations and grade separating major intersections. The Transportation Master Plan approved by City Council in April 1999 designates Yellowhead Trail as the northern leg of the Inner Ring Loop and calls for the roadway to "***be further enhanced to an ultimate free-flow standard through progressively more stringent access management practices and the progressive replacement of at-grade intersections with interchanges.***"

Yellowhead Trail/156 Street is on of eight remaining at-grade arterial-arterial intersections on Yellowhead Trail. At this location, Yellowhead Trail is a six lane divided highway that carries in excess of 50,000 vehicles per day (vpd), with 12% truck traffic. 156 Street is a four lane undivided arterial roadway carrying in excess of 20,000 vpd, with 20% truck traffic. During peak hours this intersection is already operating near capacity, resulting in significant traffic congestion and a high accident frequency. The intersection currently ranks as one of the top 20 accident locations in the City.

Traffic flow at this location is further impacted by the close proximity of a heavily used, four-track, at-grade CNR railway crossing on 156 Street north of the Yellowhead Trail intersection. At present, there are 30 – 50 train movements per day over this crossing. As a result, traffic flow through the area is severely restricted, providing only limited access to the Javelin/Voyager Industrial Parks from the south. (In light of emergency response access concerns, particularly while trains block vehicle traffic along 156 street, a temporary alternative emergency access into these industrial parks was constructed via 170 Street in 1998.)

As a result of existing traffic congestion, excessive delays, safety concerns and the access management issues, combined with the projected increase in traffic volumes, this location has been identified as a priority for an interchange and grade separation of 156 Street and CNR.

3. Risk Analysis Process --Background& Methodology

Risk relates to *"potential impact of all threats (and opportunities) which can affect the achievement of objectives for an investment."* For risk to be an issue, the event and/or its outcome must be associated with a certain degree of uncertainty (*the possibility*).

In practice it is virtually impossible to avoid all risks. Risks can be reduced and sometimes transferred (e.g. through contracts, financial agreements, concessions, insurance policies.). The risk analysis described herein can help in arriving at the right decisions, which can reduce overall risk to the Corporation on this project.

The following summarizes the process:

I. Assemble a risk review team composed of representatives from engineering, operations, and maintenance (and others as necessary).
II. Prepare the background material for the risk analysis. This is composed of the pre-design, or design documents that have been generated on the project at this point.
III. Develop a plan and schedule for the risk analysis process.
IV. Distribute the background material to the risk review team and initiate the risk review process by scheduling the first risk analysis session.
V. Risk review
    a. Identify risk factors for the project.
    b. Evaluate risk factors.
    c. Decide on the actions to be taken in response to residual risks.
    d. Plan response to residual risks.
    e. Communicate mitigating strategy and response plan to risk review team.
VI. Risk management
    a. Implement risk strategy through integration with mainstream management.
    b. Manage the agreed risk mitigation initiatives.
    c. Report changes
    d. Control risks
VII. Close down

4. Risk Analysis Process Followed on this Project

The risk analysis on this project commenced with a review of known risk factors (i.e. encountered in the past on various interchange projects). Input for this process was obtained from key personnel in the planning, design and construction units of the Department and by reviewing similar projects. Leaders of the risk analysis workshop who participated in this step included Chuan Kua, Randall Sonnenberg and Frank Vanderlaan.

A risk analysis team was assembled to represent various stakeholders within the Corporation as shown in Table1.

Table 1. Risk Analysis Team

Risk Analysis Team Member	Affiliation	Workshop No.	Group in Workshop 2
Chuan Kua	Transportation Planning	1 and 2	B
Randall Sonnenberg	Streets Engineering	1 and 2	A
Frank Vanderlaan	Transportation Planning	1 and 2	A
Don MacDonald	Traffic Operations	1 and 2	A
Glenn Jones	Roadway Design	1	N/A
Roland Aitchison	Roadway Maintenance	1 and 2	B
Mike Marlow	Streets Engineering	1	N/A
Lubko Stebelsky.	Drainage Services	1 and 2	B

Two workshops were then organized to identify the risk factors for the project and to quantify the factors and suggest mitigating actions for each factor.

WORKSHOP NO. 1 (6 HOURS, APRIL 5, 2000).

The following process was followed in the first workshop:

1. Chuan Kua and Frank Vanderlaan provided a brief overview of the project.

2. Simon AbouRizk described the risk analysis process.

3. Each of the risk analysis team participants used the "*Risk Identification and Assessment Form*" shown in Appendix 1 to identify risk factors in the categories of Design, Contractual Agreements, Project Approval, Raising of Capital, Construction, Operations, and others.

4. For each category of risks, the identified factors were presented and discussed amongst the team members until all were satisfied with their content. When different factors presented an opportunity to combine them in one factors they were consolidated resulting in forty (40) unique factors as shown in Appendix 2.

WORKSHOP NO. 2. (6 HOURS APRIL 26, 2000)

The second workshop focused on quantifying the risk factors and suggesting mitigating actions for the identified risk factors for the project. The risk analysis team was divided into two groups A and B as shown in Table 1 above.

The quantification process was first reviewed and each of the two groups was given a set of forms that displayed the risk factor and its assessment. The forms shown in Appendix 3 facilitate entry of the likelihood and magnitude values given in Tables 2 and 3 below which form an integral part of the risk analysis process.

Table 2. Assessment of likelihood/probability of risk occurrence

Descriptor	*Explanation*	*Probability*	*Value to use*
Highly Likely	Very frequent occurrence	over 70%	20
Likely	more than 50-50 chance	50-70%	15
Somewhat likely	less than 50-50 chance	15% - 50%	10
Unlikely	small likelihood but could well happen	1% - 15%	5
Very unlikely	not expected to happen	0.01% - 1%	2
Extremely unlikely	just possible but would be very surprising	less than 0.01%	1

Table 3 Assessment of the magnitude of risk

Descriptor	*Explanation*	*Value to use*
Disastrous	Business investment could not be sustained (e.g. bankruptcy)	1000
Severe	Serious threat to entire investment	100
Substantial	Adds considerably to cost	50
Moderate	Moderately effects costs	10
Marginal	Small effect on added costs	5
Negligible	Trivial effect on added costs	1

Members of each group reach a consensus amongst each other regarding the quantum of the risk factor. Once both groups were complete with a certain category presentations from each group were made and discussions held to rectify any differences of opinion. The end result of this process is the quantification that is shown in Appendix 2. Interpretation as to the severity of each factor is obtained from Table 4.

Table 4. Assessment of the consequence of a risk factor

Total severity score	*Category*	*Response*
Over 2000	Intolerable	Must eliminate or transfer risk
500-1999	Undesirable	Attempt to avoid or transfer risk
50-499	Acceptable	Accept and manage risk
Less than 50	Negligible	Can be ignored but should be managed

4. Results of the Analysis

Table 5 summarizes risk identified in the workshops where the total severity exceeded a value of 150 (note that Table 4 shows the threshold value of severity is 49 for "*acceptable*" while it is 500 for "*undesirable*". In Table 5 factors exceeding 150 are shown for brevity). The entire tabulation of factors as well as a summary of assessment of each, the likelihood of its occurrence, the impact of the factor, and recommended mitigating actions are given in Appendix 2.

Table 5. Risk Factors in decreasing severity order where the total severity exceeded 150.

ID	Description	Severity	Type
7	Compromising design to meet stakeholders desires	750	2
25	Uncertainty with sources of funding for project (e.g. Federal infrastructures program may be there or may not)	750	2
24	Failure to predict inflation and market conditions properly.	750	2
26	Failure to obtain stakeholder approval (City council approval may depend on that).	500	1
2	Proximity of site to CN Rail contributes to uncertainty in cost/schedule/safety/environment/politics	200	1
18	Uncertainty associated with proposed provincial takeover of all major roads (impact of having different standards and practices than the City).	200	2
23	Provincial- Federal funding may affect ability to select contractor.	150	2
1	Uncertainty in ground conditions.	150	2
8	Uncertainty associated with land acquisition	150	2
3	Uncertainty about agreement with CN to allow access from CN property N.W. of 156 Street to Yellowhead Trail eastbound.	150	1

Factors on this project can be conveniently categorized into two types: 1) those that require resolution prior to major decisions on the project are made and 2) those that can be managed as the project evolves.

Column 3 in Table 5 denotes the category of risk for each factor. Type 1 requires action prior to the next major decision on the project while type 2 should be managed in a proactive manner.

FACTORS REQUIRING RESOLUTION PRIOR TO NEXT PHASE OF DESIGN (OR NEXT MAJOR DECISION)

The uncertainty associated with CN (factors 2 and 3) should be dealt with as soon as practical as many other factors are dependent on this issue. In addition the design cannot be properly finalized unless these issues are resolved.

Similarly stakeholder approvals should be addressed prior to completion of this phase of the design (factor 26). It should be noted that the Planning Branch and the Design Consultant (UMA) are already into this process.

FACTORS THAT SHOULD BE PROACTIVELY MANAGED

Risk factors on this project within the manageable category can be classified into one of three types:

1. Factors, which are dependent on issues outside the City's control (e.g. Federal funding (factor 25), Provincial takeover of highways (factor 18) etc.).

2. Factors, which are dependent on issues within the City's Control (Compromising design to meet stakeholders demands (factor (7).

3. Other factors traditionally associated with high degrees of uncertainty (e.g. ground conditions (factor 1), land acquisition (factor 8), inflation predictability (factor 25).

The risk management plan described in the following section provides a control strategy for each of the risk factors identified for this project. In general, however, upper management should be more proactive in defining mitigating strategies for factors of the type within the City's control (i.e. item 2 above). The project team should strive to maintain the risk management plan throughout the project and attempt to reduce uncertainty by collecting/ generating more information as each factor requires.

5. Risk Management Plan

Risk management includes development of a plan to manage the risk factors and executing the plan over the life of the project. The risk management steps for this project involves the following:

1. Assign responsibility.
2. Define individual tasks that need to be taken to:
    a. Reduce the quantum of a given factor (i.e. reduce likelihood or impact).
    b. Eliminate the factor or transfer it to others.
    c. Control the risk and mitigate its effects when it develops/occurs (e.g. contingency plan).
3. Define time/resource requirements and follow-up dates.
4. Produce solutions and implement them.
5. Communicate to others.
6. Identify any new risk factors that may arise as the project evolves.
7. Repeat the process until the project is complete for all residual risk factors

The risk management plan for this project was completed by Frank Vanderlaan, Chuan Kua, Randall Sonnenberg and Simon AbouRizk. The plan is given in Appendix 4. A review of the plan should take place on a monthly basis with a comprehensive review by the risk analysis team to take place when the preliminary design is complete.

Appendix 1
Risk Identification and Assessment Forms

Appendix 2
Risk Factors Identified for the Project

Appendix 3
Risk Quantification Forms

Appendix 4
Risk Management Plan

APPENDIX G: VALUE ENGINEERING PROCESS

VALUE ENGINEERING

The objectives of a Value Engineering (VE) study are to improve quality, minimize total project costs, reduce construction time, make the project easier to construct, insure safe operations, and assure environmental goals. Value engineering is an organized process that looks at removing unnecessary costs from products and services while assuring that quality, reliability, product performance, and other critical factors meet or exceed the customer's expectations.

The improvements are the result of the systematic application of recognized techniques by a multi-disciplinary team which identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and provides the needed functions, reliably, at the lowest cost. The team can be comprised of those involved in the design, construction, and maintenance as well as technical experts

VE studies are guided by a specific job plan that has the following steps:

1. Project Selection
2. Team Selection
3. Information
4. Function Analysis
5. Speculation
6. Evaluation
7. Life Cycle Costing
8. Development
9. Reporting
10. Implementation & Audit

1. Project Selection

Project selection is outside the scope of the value study team. In general, the criteria used to select projects for a VE study includes:

- High project costs – typically >$2,000,000
- Projects which "are not worth the expenditure necessary to complete them"
- Important projects that fail to meet the budget cut-off
- Problem projects
- Technically complex, unique projects

2. Team Selection

The key to the VE study is the people who are involved. Value Engineering uses a multidisciplinary team to provide a broader perspective with greater opportunity to achieve significant, meaningful results. The expertise required for the team should be dictated by the projects selected. Having varied disciplines represented on the team is essential.

3. Information

The information phase is where the value study team first becomes involved. In this phase, the team determines what they know about the project from readily available information and what they must know in order to really define and/or solve the problem. It is in this phase of the VE study that we identify the elements that have the greatest potential for value improvement.

Information Steps

- Review project
- Gather Background information
- Update customer needs and requirements
- Establish objectives and goals
- Define Scope
- Understand current costs

The information phase brings the three fundamental concepts of VE (Function, cost, and worth) to bear on the problem. This phase requires the team to ask and answer the following basic questions:

- What is it?
- What does it do?
- What must it do?
- What is it worth?
- What does it cost?

Pareto's Law of Distribution states that 80% of a project's cost will be in 20% of the work. Following this law, VE attempts to identify and isolate that 20% of elements in a project that contribute 80% of the costs of the project. Those with the greatest potential for impact on cost then become the candidates for the application of VE.

4. Function Analysis

Functional analysis techniques are used in defining, analyzing and understanding the functions of a project, how the functions relate to one another, and which functions require attention if the value of a project is to be improved.

Function Analysis Steps

- Determine functions
- Develop Function Analysis Systems Technique (FAST) Diagram
- Determine Cost/Function or Cost/Worth relationships
- Identify functions requiring improvement

Function

The two types of functions within the scope are basic and secondary.

Basic Function – the specific work that a project is designed to accomplish.
Secondary Function – are all other functions that are performed. There are three classifications of secondary functions: required, aesthetic, or unwanted.

Function Analysis Systems Technique (FAST) Diagram

FAST diagram is a powerful VE tool that:

- Shows specific relationships of all functions
- Test validity of functions
- Helps to identify missing functions
- Deepens the understanding of the problem to be solved

Cost/Function Relationships

The technique of establishing cost-function relationship:

- Allocates costs to functions
- Identifies the amount of cost doing basic function work versus secondary function work
- Identifies functions that represent poor value
- Points direction as to where to go to work first, second, etc.

Cost/Worth Relationships

The technique of establishing cost-worth relationship:

- Speculates on the least cost approach to accomplish a function
- Identifies functions that represent poor value due to costing more than they are worth
- Identifies areas where there is savings potential

5. Speculation

The speculation phase is where the power of the VE technique manifests itself. The team applies brainstorming and other creativity techniques to develop good alternatives to the way the project is currently designed. The VE team applies creativity to its functional statements that it has selected from the cost/worth estimates. The team speculates on all possible solutions to the problem presented in the functional statement and generates a large list of potential solutions.

6. Evaluation

Evaluation of the best alternatives is next. The purpose of this phase is to systematically reduce the large number of ideas generated during the Speculation Phase to a number of concepts that appear promising in meeting the project'' objectives.

Evaluation Steps

- Determine Effective Criteria
- Evaluate Ideas
- Rate Ideas
- Select Best Alternatives

7. Life Cycle Costing

Life cycle costing is the total economic cost of owning and operating a facility. The life cycle costing analysis reflects the present and future costs of the project over its useful life. It allows an assessment of a given solution and it is a tool for making comparisons.

Cost categories to be used in life cycle cost analysis encompass a broad area. Moneys for a project may be spent from the time frame of years leading up to the completion of an actual facility to the time when the facility has outlived its usefulness and must be disposed of. The following list of costs may factor into a facility's life.

Types of Life Cycle Costs

- Investment Costs
- Land Acquisition
- Engineering (planning, design, construction inspection)
- Redesign costs
- Construction costs
- Administrative costs
- Replacement costs
- Salvage costs
- Operating costs

- Maintenance Costs
- Time and Cost of Money

Using life cycle costing will aid in the decision making process and increase the sensitivity to cost for operating facilities. Life cycle analyses are impacted by time, cost, and the cost of money.

8. Development

Once the team selects the best alternative, it is fully developed through sketches, cost estimates, validation of test data, and other technical work to determine if any assumptions made during the study are in fact true. The final step before presenting the teams' recommendations to management is to formulate an implementation plan that describes the process that must be followed to implement any recommendations.

9. Reporting

In the reporting phase, the team present specific recommendations for change to their management group and requests that action be taken on these proposals.

10. Implementation & Audit

Once the management team has concurred with the VE team's recommendation, the following tasks are necessary to facilitate the implementation effort:

- Minutes of the management meeting should be published hilighting the acceptance of the VE team's proposals.
- The proposed implementation plan should be forwarded to each of the implementing departments for their review.
- Implementing department managers should verify or amend the proposed implementation effort. Documentation regarding specific assignments should include names of those responsible for implementation of tasks as well as an estimate starting and completion date for each assignment.
- The team should be available on an as-needed basis to assist in overcoming unforeseen difficulties.

Verification of actual improvements and financial impact should take place as implementation occurs. Follow-up reviews should be done to ensure continuous improvement.

References:

Value Engineering and the Federal Highway Administration – US Department of Transportation

Value Engineering Workshop – Lewis & Zimmerman Associates, Inc.

APPENDIX H: POST PROJECT EVALUATION

1. **Cost Estimating Accuracy Report**
2. **Post Project Evaluation – Exception Criteria**
3. **Post Project Evaluation Report**

Streets Engineering Branch - Cost Estimating Accuracy Report - 2004 ($ x 1000)

Recommendation #7: That performance measures for capital cost estimates be established and monitored by each department with annual reports provided to the Senior Management Team.

Project	Project	Proj.	Capital	Const.	**Conceptual Plan** - Enter CPP Process			**Prelim Design** - CPP Budget Approval			Detailed Design **(Pre-Tender)**			Award - Tender Price **(Post-Tender)**			**Actual**
			Funding	Superv.	Expected **+/- 50%**			Expected **+/- 30%**			Expected **+/- 20%**			Expected **+/- 10%**			
							Reasons for Differences			Reasons for Differences			Reasons for Differences			Reasons for Differences	
Number	Name	Type	Budget		Estimate	% of Actual	Conceptual / Actual	Estimate	% of Actual	Preliminary / Actual	Estimate	% of Actual	Detail / Actual	Bid	% of Actual	Award / Actual	**Cost**
	PROPOSED FUNDED																
XX-66-1010	**NEIGHBORHOOD REHABILITATION**																
	Neighborhood improvements	RD	0														
XX-66-1020	**ARTERIAL / PRIMARY HWY. REHAE**																
	Arterial Roadway Rehabilitation (Base)	RD	11,377,000														
	Aggressive Collector Roadway Rehab	RD															
	Trolley (Arterial	RD	260,000														
	Sreetlighting (Arterial)	RD	600,000														
	Primary Highway Rehabilitation	RD	5,321,000														
	Yellowhead Trail: 89 Street - 97 Street	RD		AH	1,736,000	-21%	Acceptable	1,631,000	-16%	Acceptable	1,631,000	-16%	Acceptable	1,449,000	-6%	Acceptable	$ 1,369,304
	184 Street: Yellowhead Trail Wbd - 137 Avenue	RD		LJ	739,000	-43%	Acceptable	558,000	-25%	Acceptable	515,000	-19%	Acceptable	442,000	-5%	Acceptable	$ 418,000
	Kingsway Avenue: 111 Avenue - 118 Avenue	RD		AG	1,687,000	55%	Scope change	3,221,000	-19%	Acceptable	3,221,000	-19%	Acceptable	2,600,000	0%	Acceptable	$ 2,612,196
	104 Street: 63 Avenue - University Avenue	RD		GM	819,000	289%	Scope change	2,768,000	15%	Acceptable	3,532,000	-10%	Acceptable	3,240,000	-2%	Acceptable	$ 3,187,981
	104 Street: University Avenue - 82 Avenue	RD		GM	502,000	-15%	Acceptable	355,000	21%	Acceptable	484,000	-12%	Acceptable	485,000	-12%	Lower pricing	$ 427,801
	102A Avenue: Jasper Avenue - 97 Street	RD		GM	300,000	280%	Scope change	1,342,445	-15%	Acceptable	938,000	22%	Increase in concrete work	1,134,000	1%	Acceptable	$ 1,140,463
	95 Street: Jasper Avenue - 103A Avenue	RD		GM	174,000	157%	Scope change	436,800	2%	Acceptable	395,000	13%	Acceptable	447,000	0%	Acceptable	$ 447,192
	101 Street: 111 Avenue - 118 Avenue	RD		AG	905,000	15%	Acceptable	1,595,000	-35%	Decrease in overlay	1,595,000	-35%	Decrease in overlay	1,032,000	1%	Acceptable	$ 1,040,720
	Groat Road: 107 Avenue - 118 Avenue	RD		DN	1,119,000	5%	Acceptable	1,144,000	2%	Acceptable	1,297,000	-10%	Acceptable	1,294,000	-9%	Acceptable	$ 1,171,965
	23 Avenue WBD: 66 Street - 91 Street	RD		DN	756,000	19%	Acceptable	741,000	21%	Acceptable	741,000	21%	Increase in concrete work	894,000	0%	Acceptable	$ 897,957
	23 Avenue WBD: 91 Street - Parsons Road	RD		LJ	309,000	102%	Scope change	588,000	6%	Acceptable	588,000	6%	Acceptable	652,000	-4%	Acceptable	$ 625,461
	23 Avenue EBD: 111 Street - 119 Street	RD		DN	460,000	32%	Acceptable	466,000	30%	Acceptable	466,000	30%	Increase in concrete work	613,000	-1%	Acceptable	$ 605,227
	82 Street: 118 Avenue - Yellowhead Tr EBD Ramp	RD		AH	715,000	-3%	Acceptable	1,215,000	-43%	Scope change	720,000	-3%	Acceptable	720,000	-3%	Acceptable	$ 695,675
	104 Street: Rossdale Road - 97 Avenue	RD		GM	190,000	-3%	Acceptable	253,100	-27%	Acceptable	236,000	-22%	Decrease in streetlight cost	259,000	-29%	Decrease in streetlight cost	$ 183,510
	109 Street: 82 Avenue - Walterdale Hill	RD		GM	558,000	17%	Acceptable	644,000	2%	Acceptable	644,000	2%	Acceptable	688,000	-5%	Acceptable	$ 653,888
	127 Street: 132 Avenue - 137 Avenue	RD		DN	490,000	29%	Acceptable	493,000	28%	Acceptable	493,000	28%	Increase in scope	569,000	11%	Increase in scope	$ 631,496
	163 Street: Stony Plain Rd - 107 Avenue	RD		AH	565,000	84%	Scope change	956,100	9%	Acceptable	1,028,000	1%	Acceptable	983,000	6%	Acceptable	$ 1,041,100
	Alex Taylor Rd: Rowland Rd - Jasper Avenue	RD		GM	81,000	31%	Acceptable	145,350	-27%	Acceptable	125,000	-15%	Acceptable	114,000	-7%	Acceptable	$ 105,962
	MacDonald Dr: 100 Street - 102 Street	RD		GM	228,000	88%	Scope change	353,900	21%	Acceptable	385,000	11%	Acceptable	407,000	5%	Acceptable	$ 427,762
	Stony Plain Rd: Connaught Dr - 142 Street	RD		DN	527,000	183%	Scope change	1,685,000	-12%	Acceptable	1,474,000	1%	Acceptable	1,668,000	-11%	Decrease in services	$ 1,490,285
	95 Avenue: 170 Street - 178 Street	RD		LJ	770,000	-26%	Acceptable	1,018,000	-44%	Scope change	959,000	-40%	Scope change	624,000	-8%	Acceptable	$ 572,443
	87 Avenue: 178 Street - 189 Street	RD		DN	890,000	-23%	Acceptable	735,100	-7%	Acceptable	738,000	-8%	Acceptable	698,000	-2%	Acceptable	$ 681,435
XX-66-1030	**OILED & GRAVELED RD REHABILITATION**																
	Rural Roads Reconstruction	RD	550,000														
	Ellerslie Road: 17 Street East	RD					No cost available			No cost available			No cost available	373,000	-13%	Lower pricing	$ 325,479
XX-66-1040	**BRIDGE REHABILITATION**	BR	3,505,000														
	Walterdale Bridge	BR		MM			No cost available			No cost available	3,109,340	-25%	Lower pricing	2,476,660	-6%	Acceptable	$ 2,326,184
XX-66-1050	**COLLECTOR, LOCAL RDS, LANEWAY & CRACKS**																
	Collector Roadway Rehabilitation	RD	3,845,000														
	Aggressive Collector Roadway Rehab	RD															
	Residential Rd Rehabilitation	RD															
	Laneway Rehabilitation	RD															
	Crack Sealing	RD															
	Pavement Investment Strategy	RD															
	99 Street: Jasper Avenue - 103A Avenue	RD		GM	464,000	-26%	Acceptable			No cost available	326,500	5%	Acceptable	646,000	-47%	Structural cost under budget	$ 342,269
	95 Avenue: 156 Street - 163 Street	RD		AG	615,000	31%	Acceptable	885,600	-9%	Acceptable	885,600	-9%	Acceptable	765,400	5%	Acceptable	$ 803,869
	97 Avenue: 110 Street - 111 Street	RD		GM	75,000	95%	Scope change	77,500	88%	Scope change	124,300	18%	Acceptable	130,000	12%	Increase in concrete work	$ 146,069
	104 Street: 97 Avenue - 98 Avenue	RD		GM	116,600	59%	Scope change	116,600	59%	Scope change	171,200	8%	Acceptable	189,000	-2%	Acceptable	$ 185,655
	118A Avenue: 199 Street - 215 Street	RD		LJ	481,000	-48%	Acceptable			No cost available	299,200	-16%	Acceptable	272,000	-8%	Acceptable	$ 251,344
XX-66-1055	**LOCAL ROADS, ALLEY & CRACKSEALING REHAE**																
	Residential Roadway Rehab		0														
	Land		100,000														
	Pavement Investment Strategy/Slurry Seal		356,000														
	61 Street; 120 Avenue concrete	RD		JM			No cost available			No cost available	10,700	234%	Not complete	12,700	182%	Not complete	$ 35,791

Streets Engineering Branch - Cost Estimating Accuracy Report - 2004 ($ x 1000)

Recommendation #7: That performance measures for capital cost estimates be established and monitored by each department with annual reports provided to the Senior Management Team.

Project	Project	Proj.	Capital	Const.	**Conceptual Plan** - Enter CPP Process			**Prelim Design** - CPP Budget Approval			Detailed Design **(Pre-Tender)**			Award - Tender Price **(Post-Tender)**			**Actual**
			Funding	Superv.	Expected **+/- 50%**			Expected **+/- 30%**			Expected **+/- 20%**			Expected **+/- 10%**			
							Reasons for Differences			Reasons for Differences			Reasons for Differences			Reasons for Differences	
Number	Name	Type	Budget		Estimate	% of Actual	Conceptual / Actual	Estimate	% of Actual	Preliminary / Actual	Estimate	% of Actual	Detail / Actual	Bid	% of Actual	Award / Actual	**Cost**
	PROPOSED FUNDED																
XX-66-1060	**SURVEY MAPPING & CONTROL**																
	Surveying and Mapping Development	RD	200,000				No cost required			No cost required			No cost required	196,000		No cost required	**$ 196,000**
XX-66-1070	**YARDS REHABILITATION**																
	Operating Yards Rehabilitation	RD	220,000				No cost required			No cost required			No cost required	215,000		No cost required	**$ 215,000**
XX-66-1080	**BRIDGE RECONSTRUCTION**		0														
		RD					No cost required			No cost required			No cost required	140,000		No cost required	**$ 140,000**
XX-66-1090	**ARTERIAL RECONSTRUCTION PAVED**																
		RD	0				No cost required			No cost required			No cost required			No cost required	**$ -**
XX-66-1230	**STREETS SAFETY IMPROVEMENT**																
	Miscellaneous Minor Construction	RD	1,995,000														
	106 Street at 60 Avenue	RD		JM			No cost available	76,400	-14%	Acceptable	71,500	-14%	Acceptable	87,500	-30%	Design change	**$ 61,500**
	106 Street at 63 Avenue	RD		JM			No cost available	83,500	-14%	Acceptable	97,800	-27%	Design change	95,500	-25%	Design change	**$ 71,700**
	106 Street at 64 Avenue	RD		JM			No cost available			No cost available	69,600	-6%	Acceptable	87,500	-25%	Design change	**$ 65,500**
	106 Street at 65 Avenue	RD		JM			No cost available			No cost available	84,400	4%	Acceptable	93,000	-6%	Acceptable	**$ 87,700**
	106 Street at 72 Avenue	RD		JM			No cost available			No cost available	76,400	-42%	Design change	72,500	-39%	Design change	**$ 44,400**
	61 Avenue / 106 Street Service Road	RD		JM	26,300	14%	Acceptable	42,000	-29%	Acceptable	44,500	-33%	Design change	49,000	-39%	Design change	**$ 30,000**
	St.Mary's School: Riverbend / Rhatigan Rd	RD		JM	250,000	-20%	Acceptable	192,000	4%	Acceptable	234,200	-15%	Acceptable	210,000	-5%	Acceptable	**$ 200,000**
	178 Street at 87 Avenue	RD		JM			No cost available	136,000	13%	Acceptable	147,200	4%	Acceptable	149,200	3%	Acceptable	**$ 153,000**
	172 Street at 99 Avenue	RD		JM			No cost available			No cost available	38,500	8%	Acceptable	41,600	0%	Acceptable	**$ 41,600**
	175 Street at Stony Plain Rd	RD		JM			No cost available			No cost available	228,500	3%	Acceptable	235,500	0%	Acceptable	**$ 235,500**
	76 Avenue at 105A Street	RD		JM			No cost available	155,300	-35%	Design change	156,800	-35%	Design change	163,000	-38%	Design change	**$ 101,500**
XX-66-1430	**ACCESSIBILITY-STREETS (Bikeways,walks etc.)**																
	Multi-Use Facilities	RD	540,000														
	23 Avenue: 85 Street - Parsons Rd	RD					No cost available			No cost available	315,000	-23%	Lower pricing	288,000	-15%	Lower pricing	**$ 243,793**
	91 Street: Millwoods Rd-Whitemud-51 Avenue	RD					No cost available	789,000	-48%	Streetlights deleted	497,000	-18%	Acceptable	470,000	-13%	Lower pricing	**$ 407,237**
	94 Street: - Cameron Avenue	RD					No cost available	16,000	38%	Increase in Transportion Cost	21,600	2%	Acceptable	23,000	-4%	Acceptable	**$ 22,134**
		RD															
	Sidewalks	RD	437,000														
		RD															
	Curb Ramps	RD	418,000														
		RD					No estimate required			No estimate required			No estimate required	400,000	0%	No estimate required	**$ 401,988**
	Wooden Walks & Stairways	RD	139,000														
	North side of Sask Drive W/100 Street	RD					No cost available			No cost available			No cost available	18,590	1%	Acceptable	**$ 18,760**
	North side of Sask Drive W/101 Street	RD					No cost available			No cost available			No cost available	10,120	1%	Acceptable	**$ 10,212**
	Sask Drive E / Queen Eliz part road	RD					No cost available			No cost available			No cost available	15,950	1%	Acceptable	**$ 16,095**
	Sask Drive E / Queen Eliz part road	RD					No cost available			No cost available			No cost available	2,600	-15%	Lower pricing	**$ 2,220**
		RD												**47,260**	-13%	Lower pricing	**$ 40,918**
	88 Avenue W/95 Street	RD					No cost available			No cost available			No cost available	50,050	6%	Acceptable	**$ 53,179**
	Strathearn Drive - 91 Street	RD					No cost available			No cost available			No cost available	41,600	13%	Lower pricing	**$ 46,934**
XX-66-1440	**ARTERIAL NETWORK IMPROVEMENTS (Resid)**		5,095,000														
	Arterial Access to Subdivisions																
	82 Street: 153 - 160 Avenue (widen to 4 lanes)	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	82 Street: 160 - 167 Avenue (reconstruct & widen to 4l)	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	167 Avenue: 115 - 127 Street (reconstruct 2 lanes)	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	137 Avenue: 156 - 170 Street (streetlighting)	RD	450,000				No construction cost in 2004			No construction cost in 2004			No construction cost in 2004	450,000		No construction cost in 2004	**$ 450,000**
	137 Avenue: 127 - 156 Street (widen to 6 lanes)Design	RD	130,000				No construction cost in 2005			No construction cost in 2005			No construction cost in 2005	78,796		No construction cost in 2005	**$ 78,796**
	23 Avenue: 119 Street - E/142 Street	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	137 Avenue: 156 Street - 170 Street (widen to 4 lanes)	RD	3,315,000	MB			No cost available			No cost available	4,498,600	2%	Acceptable	4,308,700	7%	Acceptable	**$ 4,593,157**
XX-66-1450	**ARTERIAL NETWORK IMPROVEMENTS (Commerc)**																
	Arterial Access to Industrial Lands	RD															
	Roper Rd: 59 - 61 St - Construct 3-lane	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	Roper Rd: 50 - 60 St (streetlighting)	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	Parsons Road (within TUC) construct 2 lanes	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	Parsons Road: 12 Avenue-Ellerslie Rd (const 2 lanes)	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**

Streets Engineering Branch - Cost Estimating Accuracy Report - 2004 ($ x 1000)

Recommendation #7: That performance measures for capital cost estimates be established and monitored by each department with annual reports provided to the Senior Management Team.

Project	Project	Proj.	Capital	Const.	**Conceptual Plan** - Enter CPP Process			**Prelim Design** - CPP Budget Approval			Detailed Design **(Pre-Tender)**			Award - Tender Price **(Post-Tender)**			**Actual**
			Funding	Superv.	Expected **+/- 50%**			Expected **+/- 30%**			Expected **+/- 20%**			Expected **+/- 10%**			
							Reasons for Differences			Reasons for Differences			Reasons for Differences			Reasons for Differences	
Number	Name	Type	Budget		Estimate	% of Actual	Conceptual / Actual	Estimate	% of Actual	Preliminary / Actual	Estimate	% of Actual	Detail / Actual	Bid	% of Actual	Award / Actual	**Cost**
	PROPOSED FUNDED																
	Ellerslie Road: E/Parsons Rd-101 Street (upgrade)Design	RD	10,000				No estimate required			No estimate required			No estimate required	10,000	0%	No estimate required	**$ 10,000**
	West Edmonton Study Improvement (design)	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
XX-66-1461	**WHITEMUD / TERWILLEGAR STAGE 1**																
	Noise Attenuation & Visual Screening	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	North Saskatchewan River Pedestrian Bridge	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	Rabbit Hill Road Widening	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	WMD: 149 St-53 Ave widen Quesnell & Fox Dr Bridge	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	Terwillegar Dr / 40 Avenue Interchange Stage 1	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	142 Street pedestrian bridge	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
XX-66-1462	**YELLOWHEAD OPERATIONAL IMPROVEMENTS**																
	Special Provision - Land	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	Yellowhead Trail: 127 Street - 156 Street	RD	585,000														
	Yellowhead Trail: 97 Street - 127 Street	RD	1,443,000														
		RD					No cost available			No cost available	**1,231,500**	**6%**	Acceptable	**1,396,200**	-7%	Acceptable	**$ 1,302,510**
XX-66-1463	**YELLOWHEAD TRAIL - 156 STREET INTERCHANGE**																
	Yellowhead Trail - 156 Street Interchange	RD	1,500,000				Composite ongoing			Composite ongoing			Composite ongoing	8,067,693		Composite ongoing	**$8,067,693**
XX-66-1464	**YELLOWHEAD TRAIL - 156 STREET INTERCHANGE**																
	Stony Plain Road: 184 Street - AHD	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	103 Avenue: Mayfield - 170 Street (inters improv)	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	170 Street: 95 - 100 Avenue (upgrades)	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	184 Street:100-105 Ave (widen to 4 lanes	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	178 Street / Stony Plain Road	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	170 Street: Whitemud Dr - 90 Ave(widen to 4 lanes	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
XX-66-1480	**PRIMARY/SECONDARY HWY. CONNECTOR**		0														
	23 Avenue / Gateway Blvd Interch - Prel & Det Design	RD	1,875,000				Design and Land costs			Design and Land costs			Design and Land costs	1,720,039		Design and Land costs	**$ 1,720,039**
XX-66-1481	**YELLOWHEAD TRAIL / 184 STREET INTERCHANGE**																
	Yellowhead Trail / 184 Street Interchange	RD	18,196,000				Composite ongoing			Composite ongoing			Composite ongoing	12,847,957		Composite ongoing	**$ 12,847,957**
	184 Street Railway Separation	RD	2,998,000				Composite ongoing			Composite ongoing			Composite ongoing	1,018,436		Composite ongoing	**$ 1,018,436**
04-66-1483	**23 AVENUE / GATEWAY BOULEVARD**																
	Design	RD	1,575,000				No construction cost in 2004			No construction cost in 2004			No construction cost in 2004	80,705		No construction cost in 2004	**$ 80,705**
	Property Acquisition	RD	2,200,000				No construction cost in 2004			No construction cost in 2004			No construction cost in 2004	1,683,142		No construction cost in 2004	**$ 1,683,142**
		RD															
04-66-1484	**FORT ROAD REDEVELOPMENT**																
	Design	RD	300,000				No construction cost in 2004			No construction cost in 2004			No construction cost in 2004	131,232		No construction cost in 2004	**$ 131,232**
	Property Acquisition	RD	5,000,000				No construction cost in 2004			No construction cost in 2004			No construction cost in 2004	346,243		No construction cost in 2004	**$ 346,243**
XX-66-1490	**LOCAL IMPROVEMENT CONSTRUCTION**																
	Local Improvement Construction	RD	5,000,000														
	108 Street: 99 Avenue-104 Avenue Streetscape	RD		MB			Cancelled for 2004			Cancelled for 2004			Cancelled for 2004			Cancelled for 2004	**$ -**
XX-66-1491	**STREETSCAPE REHABILITATION**																
	Streetscape Rehabilitation	RD	50,000				No construction cost in 2004			No construction cost in 2004			No construction cost in 2004			No construction cost in 2004	**$ -**
00-66-1610	**SOUTHWEST RING ROAD**																
	111 Avenue (within RDA) construct 1st half	RD	0				No construction cost in 2004			No construction cost in 2004			No construction cost in 2004			No construction cost in 2004	**$ -**
	Whitemud: 199 Street - 207 Street (widen to 4 lanes)	RD	4,609,000				No cost available			No cost available			No cost available	5,178,129	1%	Acceptable	**$ 5,239,853**
	Lessard Road:TUC-AHD (construct 1st half)	RD	0				No construction cost in 2004			No construction cost in 2004			No construction cost in 2004			No construction cost in 2004	**$ -**
	Terwillegar:23 Ave-TUC (construct+ped overpass)	RD	4,688,000	TS			No cost available	4,286,700	-19%	Acceptable	4,835,700	-29%	To be completed in 2005	4,627,900	-25%	To be completed in 2005	**$ 3,453,877**
	Terwillegar: 23 Avenue - TUC (land)	RD	600,000				Land cost only			Land cost only			Land cost only	1,032,537		Land cost only	**$ 1,032,537**
	23 Ave:Terwillegar Towne-Terwillegar Gdns Acc	RD	1,500,000	TS			No cost available			No cost available	2,252,300	-61%	To be completed in 2005	2,359,900	-63%	To be completed in 2005	**$ 869,947**
	23 Ave: Terwillegar-Terwillegar Towne Blvd	RD	0				No construction cost in 2004			No construction cost in 2004			No construction cost in 2004			No construction cost in 2004	**$ -**
	170 St:TUC - Ellerslie Rd (Ellerslie Rd:170-156 St	RD	53,000	LJ			No cost available			No cost available				751,900	-17%	To be completed in 2005	**$ 621,010**

Streets Engineering Branch - Cost Estimating Accuracy Report - 2004 ($ x 1000)

Recommendation #7: That performance measures for capital cost estimates be established and monitored by each department with annual reports provided to the Senior Management Team.

Project	Project	Proj.	Capital	Const.	**Conceptual Plan** - Enter CPP Process			**Prelim Design** - CPP Budget Approval			Detailed Design **(Pre-Tender)**			Award - Tender Price **(Post-Tender)**			**Actual**
			Funding	Superv.	Expected **+/- 50%**			Expected **+/- 30%**			Expected **+/- 20%**			Expected **+/- 10%**			
							Reasons for Differences			Reasons for Differences			Reasons for Differences			Reasons for Differences	
Number	Name	Type	Budget		Estimate	% of Actual	Conceptual / Actual	Estimate	% of Actual	Preliminary / Actual	Estimate	% of Actual	Detail / Actual	Bid	% of Actual	Award / Actual	**Cost**
	PROPOSED FUNDED																
		RD															
00-66-1611	**SOUTHEAST RING ROAD**																
	91 Street: TUC - 23 Avenue (widen to 4 lanes)	RD	85,000				Design only			Design only			Design only	83,000		Design only	**83,000**
	66 Street: TUC to existing alignments	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	50 Street: Millwoods Rd South - TUC (widen to 4 lanes)	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	50 Street: TUC - Ellerslie Rd (widen to 4 lanes)	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
	Multi-Use Trails	RD	0				No Cost in 2004			No Cost in 2004			No Cost in 2004			No Cost in 2004	**$ -**
XX-66-8305	**NORTH / SOUTH TRADE HWY. / RING ROAD**																
		RD	0				Composite ongoing			Composite ongoing			Composite ongoing	3,830,033		Composite ongoing	**$ 3,830,033**
XX-66-1935	**SLIDE REPAIRS**																
	Ravine & River Bank Slide Repair	SL	1,090,000			#DIV/0!			#DIV/0!			#DIV/0!		600,000	1%		**$ 608,821**
93-66-1940	**SNOW STORAGE SITES**																
	Permanent Snow Storage Sites	RD	220,000				Not applicable			Not applicable			Not applicable	257,028		Not applicable	**$ 257,028**
	APPROVED FUNDED BY TAX SUPPORTED DEBT																
03-66-9155	**NEIGHBOURHOOD INFRASTRUCTURE RDS/PARKS**																
	Britannia Youngstown Reconstruction	RD	3,000,000		1,987,000	91%			#DIV/0!		3,386,400	12%	Acceptable	3,139,900	21%		**$ 3,792,985**
03-66-9540	**IMPROVEMENT TO ARTERIAL ROADS**																
	23 Avenue: Millwoods Rd E-50 St (widen to 4 lanes)	RD	0				No construction cost in 2004			No construction cost in 2004			No construction cost in 2004			No construction cost in 2004	**$ -**
	153 Avenue:59A Street-82 Street (widen to 4 lanes	RD	3,230,000				Construction not complete			Construction not complete			Construction not complete	3,432,400	-17%	Construction not complete	**$ 2,837,723**
	Landscaping	RD	405,000				Landscaping cost only			Landscaping cost only			Landscaping cost only	497,379		Landscaping cost only	**$ 497,379**
03-66-9581	**WHITEMUD DRIVE EAST (34 STREET INTERCHANGE)**																
	Whitemud Drive East (34 Street Interchange	RD	9,950,000				Composite ongoing			Composite ongoing			Composite ongoing	13,074,093		Composite ongoing	**$ 13,074,093**
	PROPOSED FUNDED BY TAX SUPPORTED DEBT (BORROWING)																
04-66-9157	**MATURE NEIGHBOURHOOD ROAD REHABILITATION**																
	York Overlay	RD	4,900,000	JF			No cost available			No cost available	4,563,700	-22%	Construction not complete	4,210,000	-15%	Construction not complete	**$ 3,580,621**
04-66-9542	**IMPROVEMENT TO ARTERIAL ROADS**																
	153 Avenue: 50 Street - 59A Street (widen to 4 lanes)	RD	2,030,000	Jme			No cost available			No cost available	2,496,600	-27%	Construction not complete	2,496,600	-27%	Construction not complete	**$ 1,812,028**
	50 Street: 146 - 153 Avenue (widen to 4 lanes)	RD	2,300,000	Jme			No cost available			No cost available	1,653,600	-49%	Construction not complete	1,653,600	-49%	Construction not complete	**$ 839,625**
	111 Street: Ellerslie Rd - Blackburne Dr (widen to 4 lanes)	RD	730,000	TS			No cost available			No cost available	658,850	23%	Reduced contract work	779,050	4%	Acceptable	**$ 811,442**
04-66-9542	**23 AVENUE/GATEWAY BOULEVARD**																
	Drainage	RD	9,800,000				Drainage cost only			Drainage cost only			Drainage cost only	2,465,370	0%	Drainage cost only	**$ 2,465,370**
	Rd= Road BR=Bridges SL=Slides STS=Streetscape																
		RD												**17,833,675**	**0%**	**Mayor jobs stil ongoing**	**17,890,007**
	Footnote for ESTIMATES OVER 15%																
*1481	Completed work in 2002 that was scheduled for 2003													**% of Projects Within Estimate Accuarcy Envelope**			
*1450	Defect assessment of $66,000 / Retest $12,000 and													Concept	Prelim	Detailed Design (Pre-Tender)	Construction
	Reduced Construction Services.												Year	(+/-50%)	(+/-30%)	(+/-20%)	(+/-10%)

Streets Engineering Branch - Cost Estimating Accuracy Report - 2004 ($ x 1000)

Recommendation #7: That performance measures for capital cost estimates be established and monitored by each department with annual reports provided to the Senior Management Team.

Project	Project	Proj.	Capital	Const.	**Conceptual Plan** - Enter CPP Process			**Prelim Design** - CPP Budget Approval			Detailed Design **(Pre-Tender)**			Award - Tender Price **(Post-Tender)**			**Actual**
			Funding	Superv.	Expected **+/- 50%**			Expected **+/- 30%**			Expected **+/- 20%**			Expected **+/- 10%**			
							Reasons for Differences			Reasons for Differences			Reasons for Differences			Reasons for Differences	
Number	Name	Type	Budget		Estimate	% of Actual	Conceptual / Actual	Estimate	% of Actual	Preliminary / Actual	Estimate	% of Actual	Detail / Actual	Bid	% of Actual	Award / Actual	**Cost**
	PROPOSED FUNDED																
													2001	**0%**	**0%**	**0%**	**0%**
													2002				
													2003				
													2004				
														Example: 0% of projects were within +/- 50% comparing concept level estimates to actual cos			

Transportation and Streets
Streets Engineering Branch and Transportation Planning Branch

Post Project Evaluation – Exception Criteria

Scope/Quantities

Condition:	bid price and actual cost are different by greater than the contingency amount
Causes:	changes in scope
	inaccurate quantity estimates

Quality

Condition:	quality penalties are applied to any portion of the work
	work stopped or contract terminated due to quality problems
Causes:	poor contractor performance
	constructability issues
	inadequate or improper QC/QA monitoring

Time/Schedule

Condition:	5% deviation from schedule, 5 day minimum
	tender opening or closing dates extended
Causes:	poor contractor performance
	constructability issues
	unusual weather conditions
	labour disputes
	unresolved constraints (i.e. property acquisition, budget approval)

Cost/Budget

Condition:	project estimates do not meet accuracy standards (for any phase of project)
	pre-tender estimate is not within 10% of bid price (freeways within 5%)
Causes:	incorrect quantity estimation
	changes in scope
	incorrect inflation rate
	incorrect labour and material costs
	constructability issues
	economic/labour issues

Risk/Safety

Condition:	injury requiring EMS treatment
	property damage greater than $5000
	WCB claim
	shutdown or work stoppage for safety reasons
	OH&S complaint/shutdown
	course of construction insurance claim
	claim related to construction or traffic issues
	unexpected environmental issues during construction
	provincial or federal environmental complaint
Causes:	inadequate safety program/monitoring
	poor contractor performance
	inadequate site security
	improper barricading/detours
	incomplete or inaccurate environmental assessment

Communication

Condition:	council inquiry
	negative media coverage
Causes:	inadequate public participation in design process
	inadequate public notification of construction
	improper barricading/detours

Transportation and Streets
Streets Engineering Branch and Transportation Planning Branch

Post Project Evaluation Report

Contract: _____

Location: _____

Scope/Quantities (yes) (no)

Condition: _____

_____

Cause: _____

_____

_____

Remedial Action: _____

_____

_____

Quality (yes) (no)

Condition: _____

_____

Cause: _____

_____

_____

Remedial Action: _____

_____

_____

Time/Schedule (yes) (no)

Condition: _____

_____

Cause: _____

_____

_____

Remedial Action: _____

_____

_____

Cost/Budget (yes) (no)

Condition: _____

_____

Cause: _____

_____

_____

Remedial Action: _____

_____

_____

Risk/Safety (yes) (no)

Condition: _____

_____

Cause: _____

_____

_____

Remedial Action: _____

_____

_____

Communication (yes) (no)

Condition: _____

_____

Cause: _____

_____

_____

Remedial Action: _____

_____

_____

Prepared by: _____

Date: _____

APPENDIX I: City Policy A1424A – PROJECT MANAGEMENT FOR PROJECTS

CITY POLICY

POLICY NUMBER: A1424A

REFERENCE:
City Manager 1999 11 12
City Manager 1994 10 19

ADOPTED BY:
City Manager

SUPERSEDES:
A1424

PREPARED BY:	Transportation and Streets	**DATE:**	1999 11 12
TITLE:	PROJECT MANAGEMENT FOR PROJECTS		

Policy Statement:

PROJECTS UNDERTAKEN BY, OR ON THE BEHALF OF THE CITY OF EDMONTON AND ANY OF ITS MEMBER DEPARTMENTS, OFFICES, AGENCIES, ASSOCIATIONS OR AUTHORITIES IN ACCORDANCE WITH THE CRITERIA, GUIDELINES AND PRINCIPLES OF THIS POLICY.

The purpose of this policy is to:

1. Provide a corporate wide, professionally accepted framework for managing the scope, quality, time, cost, risk and human resources of corporate projects. In so doing, the probability is increased that optimal solutions will be selected and that they will be implemented at the "right" time and at the "right" cost. The project management framework model is to be flexible and adaptable to the nature of each operating unit within the corporation and to the work being done.
2. Establish clear lines of accountability/responsibility for project management decisions and the achievement of project objectives and deliverables. Clear lines of accountability/responsibility are required to facilitate optimal decision making, minimize misunderstandings and delays, and understand the causes of problems as they may arise.
3. Explain project management principles and concepts that provide for the foundation for the development of a corporate project management framework.
4. Utilize the principles, findings and recommendations contained in the Auditor General's report of March 9, 1993 to develop departmental project management policies and procedures.

CITY PROCEDURE

POLICY NUMBER: A1424A

AUTHORITY: City Manager **EFFECTIVE DATE:** 1999 11 12

TITLE: PROJECT MANAGEMENT FOR PROJECTS

1. DEFINITIONS

1.01 Accountability - being answerable for results.

1.02 Authority - one who is invested with power to give final endorsement, which requires no further approval.

1.03 Conceptual Analysis - a process of choosing/documenting the best approach to achieve project objectives.

1.04 Function - (Project Management Function) the series of processes by which the project objectives in that particular area of project management (e.g. scope, quality, time and cost and participant satisfaction) are achieved.

1.05 Operator - the individuals who are responsible for operating and maintaining the completed project.

1.06 Owner - (also referred to as the sponsor, client, user, operator) the designated departmental individual responsible for identifying the needs and budget and for undertaking the programming, operation and maintenance of the end product resulting from the project management process.

1.07 Project - any undertaking with a defined starting point and defined objectives by which completion is identified.

1.08 Project Director - the individual that provides a singular owner direction for the project and through whom proper authority, responsibility and accountability must flow to the project manager of the project.

1.09 Project Life Cycle - the four sequential phases through which any project passes, namely concept, development, implementation or operation and termination or close out.

1.10 Project Manager - the individual authorized and accountable for managing the project and achieving the project objectives.

1.11 Project Management - the process of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, quality, time and cost and participant satisfaction.

1.12 Project Manual - (Project Policy/Procedure) general guidelines/formalized methodologies on how a project will be managed. The methods, practices and policies (both written and verbal communications) that will be used during the project life.

1.13 Project Plan - a management summary document that gives the essentials of a project in terms of its objectives, justification and how the objectives are to be achieved. It should describe how all the major activities under each project management function are to be accomplished, including that of overall project control.

CITY PROCEDURE

1.14 Responsibility - charged personally with the duties, assignments and accountability for results associated with a designated position in the organization.

1.15 Risk Assessment - a review, examination and judgement whether or not the identified risks are acceptable in the proposed actions.

2. RESPONSIBILITIES

2.01 The City Manager shall:

(a) Approve this policy and any amendments thereto.

(b) Ensure a consistent project management body of knowledge is developed and utilized across the corporation. The principles, findings and recommendations contained in the Auditor General's report of March 9, 1993 will be used as input to develop departmental project management policies and procedures.

(c) Ensure, where possible, that standardized project management software/systems are used across the corporation to estimate costs, develop schedules and report the status of projects.

(d) Ensure a standardized education and training program is implemented to develop staff in the discipline of project management.

2.02 General Managers shall:

(a) Utilize the principles, findings and recommendations contained in the Auditor General's report of March 9, 1993 to develop departmental project management policies and procedures.

(b) Develop a project management framework and procedures to set out basic expectations/standards encompassing the project management responsibilities and functions of scope, quality, time, cost, risk, human resources, contract/procurement, and information/communications. Procedures are to include organizational/working relationships for departments working on common projects of those projects crossing departmental functions.

(c) Establish minimum educational and experience qualifications for project management practitioners and implement educational and training programs.

(d) Ensure that long range plans are developed and maintained and are the primary means of controlling the initiation and ongoing justification of projects.

(e) Develop a mediation process to resolve disputes between departments.

2.03 Departmental Functional Managers shall:

(a) Ensure project staff meet the intent of educational standards and receive training on an ongoing basis to maintain standards in project management as required.

(b) Develop and maintain procedures for the major project management functions, in particular the information/communication function for those projects crossing departmental boundaries.

(c) Develop and maintain design, implementation and operating/maintenance standards for projects.

(d) Develop and maintain organization structures consistent with project management functions to provide the necessary expertise, specialists and support of those tasks to be accomplished for a project.

(e) Act as project director for those projects directly under their jurisdiction.

2.04 Owner shall:

(a) Develop a project plan, including project terms of reference defining parameters for scope cost, time and quality objectives for specific design, operation and user requirements.

(b) Appoint a project manager, establish a project team commensurate with the size and complexity of the project and identify significant stakeholders. In so doing, this will provide singular owner/sponsor direction for the project, and through whom proper authority, responsibility and accountability must flow to the party managing the project, namely, the project manager.

(c) Conduct a conceptual analysis including options considered, assumptions relating to each option and the final assessment of each option.

(d) Provide advice and information to the project manager on the project and on specific departmental operations and requirements.

(e) Participate in quality management of the project.

2.05 Project Manager shall:

(a) Act in a service role to the owner, and in so doing, take the delegated authority, responsibility, and accountability and in turn delegate them fully, consistently and completely for the proper functioning of the project management process. The project manager remains fully responsible and accountable for the project to the owner.

(b) Plan, organize, direct and control the project.

(c) Accept the project plan and develop a purpose and goals statement supporting the plan.

(d) Develop a project management manual in concert with the project plan. This document will expand on the project terms of reference document to include the management functions of:

- Scope
- Quality

- Time
- Cost
- Risk
- Human Resources
- Contract/Procurement
- Information/Communications

The manual will also include project procedures of:

- Filing and Document Circulation
- Project Forms
- Progress Reporting
- Cost/Schedule Controls

2.06 Operators shall:

(a) Develop operating, commissioning and user requirements for the project terms of reference and project management manual.

(b) Provide information to the project manager on the project and on specific departmental operations and requirements.

(c) Participate in quality management of the project.

3. PRINCIPLES

Departmental project management processes must incorporate the following project management principles:

3.01 General

(a) Effecting control over the core functions of scope, quality, time and cost must be exercised throughout the project life cycle, by the four facilitating functions of risk, human resources, contract/procurement and information/communication.

(b) Project management integrates the functions progressively throughout the project life cycle with the aim of satisfying stakeholders according to the established project requirements.

(c) The project life cycle is seen as two sequential steps - planning and accomplishment. These steps may be subdivided into four sequential phases - concept, development, implementation and termination. These in turn will be subdivided into departmental specific stages and many project activities/tasks. The passage from one phase to another should not proceed without owner or project manager approval. Each phase is terminated by a report and approval to proceed to the next phase. A more comprehensive sign-off procedure is required whenever projects pass from one operational group to another.

(d) A performance management tracking system should be established to monitor and report cost, time and quality objectives in relation to expectations.

3.02 Concept Phase

Conceptual development entails the identification, definition and documentation of the project objectives to meet the goals of the owner.

The first phase of the project - Concept Phase should meet the following requirements before proceeding to the second phase - Development Phase:

(a) A conceptual analysis should be conducted by the owner to provide a listing of:

- Problem/needs statement defining the problem to be solved and the owner's needs.
- Basic economics, feasibility, service level constraints
- Cost estimate at the project summary level
- Cost/benefit analysis
- Stakeholders (internal and external)
- Risk level
- Strategy
- Potential team (level of expertise and resources required)
- Constraints and alternatives considered

(b) The conceptual development should conclude with:

- The problem and solution at the summary level
- Recommendation to proceed (or not to proceed) to the development phase.
- Project objectives
- Summary of the work breakdown structure and project master schedule.

(c) The project plan should describe the project outputs, approach and content, including activities to be performed, resources to be consumed and quality standards to be met.

(d) A budget should be produced by the owner at the inception of a project. A project profile sheet incorporating this budget should be submitted to City Council for approval. This document should indicate the accuracy of the estimate.

(e) The accuracy of cost estimates must be adequate for owners to accurately evaluate project alternatives and decide whether the project should proceed (make correct investment decisions).

(f) Projects should not be submitted for capital budget consideration until completion of the Concept Phase of the project.

(g) Input should be sought from end users and where appropriate citizens and interest groups regarding the acceptability of proposed solutions. Guidelines may vary among departments depending on the types of projects performed by a department and the sensitivity of those projects.

(h) Consideration should be given to the production of a contingency plan based on the magnitude and sensitivity of the project.

3.03 Development Phase

The second phase of a project - Development Phase should meet the following requirements before proceeding to the third phase - Implementation Phase:

(a) A project manager should be appointed by the owner to manage/direct the overall project from start to finish. Appointment of the project manager should occur no later than the beginning of this phase. Key team members should also be appointed at this time.

(b) On assignment to a project, the project manager should be notified of all major and critical decisions occurring to that point in the project. The project manager should:

(i) ensure the project has proceeded in accordance with a corporately defined process,

(ii) assess the accuracy of budget estimates and, if necessary, request a budget adjustment,

(iii) ensure budget approval has been received from City Council , and

(iv) complete a formal sign-on to indicate approval of the process to date, including the reasonableness of budget estimates.

c) The project manager should supplement the project plan with a cost estimate, master project schedule setting out major activities and milestones, cash flow, work breakdown structure, and technical aspects of the project. Project studies and project risk assessments should be conducted, as well, confirmation of project justification should be obtained. A project brief should be prepared in concert with the project plan to obtain project approval to proceed.

3.04 Implementation Phase

The third phase of a project - Implementation Phase should meet the following requirements before proceeding to the fourth phase - Termination Phase.

(a) The project organization should be set up and should occur no later than this stage. This would include the establishment of a communication plan and a final design brief.

(b) The final design brief should include:

- Detailed technical requirements
- Work packages
- Detailed schedule
- Information and project performance management systems

(c) Procure goods and services and execute work packages.

(d) The project manager should direct, monitor, forecast and control the scope, quality, time and cost. Quality assurance standards should be developed and performance verified.

3.05 Termination Phase

The fourth phase of a project - Termination Phase should meet the following requirements:

(a) The output from work packages is finalized with acceptance from the owner.

(b) The responsibility for the completed product should be transferred to the owner or operator.

(c) The final cost accounting should be completed and settled.

(d) A project completion brief should be produced to verify that all sub-components of the project system function efficiently, individually and as a whole. It should also include a final review, evaluation and acceptance. The brief should include a final documentation of results and lessons learned by the project team.

(e) A formal Post Project Evaluation should be performed on an exception basis when criteria defined in the Project Management Manual are not met. The Post Project Evaluation should assess the reasons for the non-compliance, and recommend changes to reduce the likelihood of future non-compliance.

4. GLOSSARY OF GENERAL PROJECT MANAGEMENT TERMINOLOGY

4.01 Budget - a planned allocation of resources.

4.02 Commissioning - activities performed for the purpose of substantiating the capability of the project to function as designed. These activities can occur from the concept phase through to normal operations of the project.

4.03 Communications Management - the proper organization and control of information transmitted by whatever means to satisfy the needs of the project. It includes the processes of transmitting, filtering, receiving and interpreting or understanding information using appropriate skills according to the application in the project environment.

4.04 Contingency Plan - a plan that identified key assumptions beyond the project manager's control and their probability of occurrence. The plan identifies alternative strategies for achieving project success.

4.05 Contact/Procurement Management - the function through which resources are acquired for the project in order to produce the end requirements. Contract/Procurement includes both internal (informal) commitments and external (formal) contracts for people, services, materials and equipment.

4.06 Cost/Schedule Controls - the processes of gathering, accumulating, analyzing, reporting and managing the costs on an ongoing basis. Includes project procedures, project cost changes,

monitoring actual vs. planned, variance analysis, integrated cost/schedule reporting, progress analysis and corrective action.

4.07 Cost Effective - value for money or the optimum balance between performance and cost, including maintenance/operating and disposal costs.

4.08 Cost Estimating - the process of assembling and predicting the costs of a project. It encompasses the economic evaluation, project investment cost and predicting and forecasting of future trends and costs.

4.09 Cost Management - the function required to maintain effective financial control of project throughout its life cycle.

4.10 Design - the creation of the final approach for executing the project work.

4.11 Human Resources Management - the function of directing and coordinating of human resources throughout the life of the project by applying the art and science of behavioural and administrative knowledge to achieve the predetermined project objectives of scope, quality, time and cost and participant satisfaction.

4.12 Matrix Organization - a two dimensional organizational structure in which the horizontal (project) and vertical (functional) intersections represent different staffing positions with responsibility divided between the horizontal and vertical authorities.

4.13 Milestone - (Key Item or Key Event) a significant event in the project.

4.14 Operation - the operation of a new facility is described by a variety of terms, each depicting an event in its early operating life. Defined in chronological order:

Initial Operation - the project milestone date on which material is first introduced into the system for the purpose of producing products.

Normal Operation - the project milestone date on which the facility has demonstrated the capability of sustained operations as design conditions and the facility is accepted by the owner.

4.15 Organization Structure - identification of participants and their hierarchical relationships.

4.16 Problem/Needs Statement - documentation to define the problem, to document the need to find the solution and to document the overall aim of the owner.

4.17 Procedure - a prescribed method of performing specified work.

4.18 Process - the set of activities by means of which an output is achieved.

4.19 Project Management Body of Knowledge - all those topics, subject areas and intellectual processes which are involved in the application of sound management principles to the collective execution of any type of effort which qualify as projects.

4.20 Project Management Framework (Principles) - the name given to an area of concentration which provides the opportunity to document the broader issues of project management and the inter-relationship between the eight major project management functions of scope, quality, time, cost, risk, human resources, contract/procurement and information/communications.

4.21 Quality Management - the function required to determine and implement quality policy throughout the project life cycle.

4.22 Risk Management - the process and science of identifying, analyzing and responding to risk factors throughout the life of a project and in the best interests of its objectives.

4.23 Schedule - a display of the time sequence of activities.

4.24 Scope - the work content and products of a project or component of a project. Scope is fully described by naming all activities performed, the resources consumed and the end products which result, including quality standards. A statement of scope should be introduced by a brief background to the project or component and the general objectives.

4.25 Scope Management - the function of developing and maintaining project scope.

4.26 Scope Statement - a documented description of the project as to its output, approach and content.

4.27 Standard - a basis for the uniformity of measuring performance. Also a measurement or document that prescribes a specific consensus solution to a repetitive design, operating or maintenance need.

4.28 Status - the condition of the project at a specified point in time.

4.29 System - a methodical assembly of actions, processes or things forming a logical and connected scheme or unit.

4.30 Time Management - the function required to maintain appropriate allocation of time to the overall conduct of the project through the successive stages of its natural life cycle.

4.31 Work Breakdown Structure - a task-oriented family tree of activities which organizes, defines and graphically displays the total work to be accomplished in order to achieve the final objectives of the project.