

**The City of Edmonton
Combined Sewer Overflow (CSO) Control Strategy**

Implementation Plan

Prepared for:

Alberta Environment

June 2000

Prepared by:

City of Edmonton

Asset Management and Public Works

Drainage Services



Combined Sewer Overflow Control Strategy
Implementation Plan

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Combined Sewer Overflow Control Strategy Implementation Plan

Costing about \$150 million, the CSO Control Strategy will mitigate the environmental impacts of Edmonton's combined sewer system.

1.0 INTRODUCTION

The City of Edmonton's, Asset Management and Public Works, Drainage Services has developed a long-term capital works implementation plan to reduce the environmental impacts of the City's combined sewer system.

The Combined Sewer Overflow Control Strategy involved five years of study activity and several submissions to Alberta Environment as required by the City's Approval-to-Operate (No. 95-MUN-117). The Strategy was developed with the support of numerous consultants and with the involvement of the general public and various stakeholder groups. A special committee of Edmontonians, each representing a special interest group, called the Project Working Committee, was struck in November 1997 to provide input to the development of the Strategy.

The Combined Sewer Overflow Control Strategy involves the construction of works to reduce the spillage of untreated runoff and sewage to the North Saskatchewan River. The 16-year plan will cost in the order of \$150 million (in 1999 dollars). Although the majority of the expenditures begin in the year 2005, some activities have been programmed into the 2000-2004 Capital Priorities Plan for Drainage Services. The Strategy is expected to result in an increase in the average annual capture and treatment of wet weather flows in the sewer system from 56% to 86%, and a reduction in average annual CSO occurrences from 89 to 46. A re-evaluation of system performance and any new environmental issues will occur as the Strategy nears completion. If additional future CSO controls are required, additional program elements could be added and the work program extended.

The City of Edmonton is committed to the protection of the environment. To "maximize environmental protection" is one of the five fundamental operating principles of the City's Drainage Services. In addition, CSO control is an expectation of Alberta Environment in both its Municipal Policies and Procedures Manual and in the City's Approval-to-Operate (No. 95-MUN-117). The proposed Combined Sewer Overflow Control Strategy will mitigate the environmental impacts of Edmonton's combined sewer system in fulfillment of all of these expectations.

Combined Sewer Overflow Control Strategy Implementation Plan

2.0 THE IMPLEMENTATION PLAN

2.1 Strategy Components

The Implementation Plan for the Combined Sewer Overflow Control Strategy is comprised of the following components which are located on the plan in Attachment 1:

Early Action Control Plan (\$10.6 million)

Better ways of utilizing existing infrastructure.

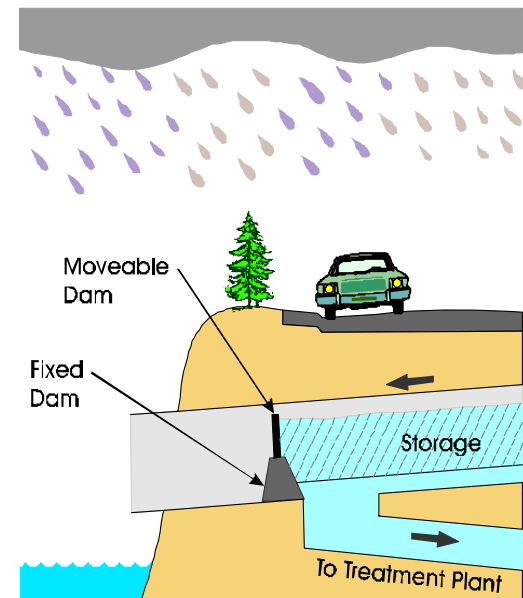
The Early Action Control Plan generally involves better ways of utilizing the existing sewer system, along with other low cost remedial measures that can be implemented immediately to provide both immediate and long term environmental benefits in CSO control.

The main component of the Early Action Control Plan involves the mobilization of in-line system storage through the “Real Time Control” of moveable gates/dams. Implementation of Real Time Control installations is being considered at up to five priority locations in the sewer system. These will collectively result in a reduction of over 200,000 m³ of combined sewer overflows, and about 180,000 m³ of plant secondary bypass flows to the river annually.

Components of the Early Action Control Plan include:

- real time control,
- solids and floatables control measures,
- roof leader disconnection work,
- a wet weather flow management strategy for the treatment plant,
- monitoring network upgrades, and
- improved maintenance procedures.

Early Action Control Plan – In-Line System Storage



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Higher capacity and new processes to treat wet weather flows.

Gold Bar Wastewater Treatment Plant Upgrades (\$84.2 million)

This component involves increasing the plant's capacity to provide high rate treatment for excess flow during wet weather. This involves the construction of an additional 650 megalitres per day (ML/d) to the existing 950 ML/d of primary treatment capacity. Later, upgrading of this 1600 ML/d wet weather treatment facility will be done to include Enhanced Primary Treatment. The constructed works would generally be located at the upstream end of the plant.

The Enhanced Primary Treatment would involve:

- the addition of a flocculent (e.g. Alum) to help settle out more contaminants (called chemical coagulation), and
- wet weather flow disinfection, possibly using a chlorination/dechlorination process.

The Enhanced Primary Treatment upgrades will involve the construction of a new, stand-alone wet weather flow treatment facilities at the plant. As a result, the plant's dry weather flow capacity of 310 ML/d will not be affected. Disinfection of the plant's secondary/tertiary bypass stream will also be provided as part of these plant upgrades.

Wastewater Treatment Enhanced Primary Treatment



— Potential plant upgrade sites

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New tunnels to bring more flow to the plant.

Tunnel Conveyance Upgrades (\$17.3 million)

Additional sewer conveyance capacity will allow more flow to reach the plant during wet weather. Two new sewer tunnels are proposed:

- one going from the Rat Creek CSO site, under the river to an existing sewer near McNally High School; and
- one going from the Highlands CSO site, under the river to an existing sewer in Capilano Park.

The Rat Creek crossing will increase the conveyance of flows from the largest CSO site to the plant, significantly increasing the flows to the plant during wet weather. The Highlands crossing and upstream system optimization will also increase wet weather flows from north Edmonton to the plant.

Tunnel Conveyance



Raised weirs will keep more flow in the system.

Modifications to Existing Weirs (\$4.7 million)

Combined Sewer Overflow structures (weirs) at four CSO sites will be modified to retain more flow in the sewers, reducing the frequency and volume of discharges at those sites. Modifications include raising weir elevations to retain more flow in the pipes, and constructing chambers with weirs designed to minimize the local head loss. The four sites include:

- Cromdale CSO (overflow level raised by 0.3 m),
- Kennedale CSO (overflow level raised by 0.6 m),
- Calder CSO (overflow level raised by 1.73 m), and
- Namao CSO (overflow level raised by 0.6 m).

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Storage at small sites will reduce the frequency and volume of spills.

Underground Storage (\$4.7 million)

Underground storage facilities capture CSO flows for later release back into the system and treatment at the plant. The storage facilities capture all of the small, frequent overflow events and portions of the larger infrequent events. Consequently, storage facilities can result in a significant reduction in both frequency and volume of CSO discharges at that site. A 3,000 m³ storage facility is planned at the Strathearn CSO site (near the 98th Avenue and 65th Street traffic circle).

Underground Storage

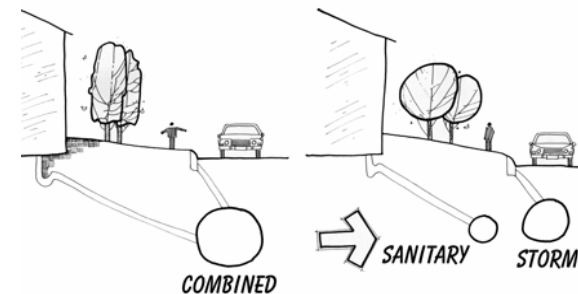


Steps towards sewer separation through neighbourhood renewal work.

Opportunistic Sewer Separation (\$27.6 million)

This component involves upgrading/converting combined sewer systems into separate sanitary sewers and storm sewers on an opportunistic basis. Opportunities arise when infrastructure (roads, buried utilities, etc.) in older neighbourhoods is rehabilitated as part of ongoing neighbourhood renewal programs.

Opportunistic Sewer Separation



Some separation projects have been identified for the near term. These include:

- storm separation as part of the 100th Street road widening work (2000-2001);
- a storm outfall connection in the Ottewell neighbourhood (2000-2001); and
- opportunistic separation work as part of the Queen Mary Park neighbourhood infrastructure renewal program work in that area (2001-2004).

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2.2 Implementation Schedule and Costs

A 16 year implementation plan with expenditures of between \$6 to \$14 million per year.

Implementation of the Combined Sewer Overflow Control Strategy is scheduled between 2000 and 2016. A schedule and budget allocation for the individual plan components is shown on Attachment 2. The majority of the expenditures will occur at the Gold Bar Wastewater Treatment Plant. The key sequence of activities has the construction of additional primary treatment capacity at the plant, followed by system conveyance capacity increases, followed by upgrading to enhanced primary treatment (solids removal and disinfection).

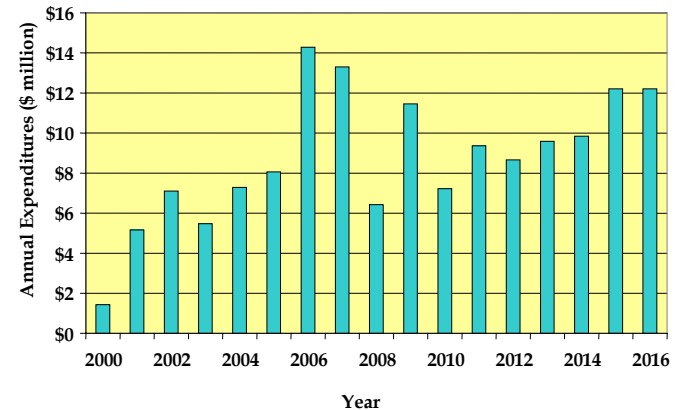
This revised implementation plan involves the following three benefits that are in addition to the conceptual implementation plan provided in the June, 1999 submission:

- the scheduled completion date has been moved forward four years, from 2020 to 2016;
- an additional \$10.8 million will be spent over the next five years towards opportunistic sewer separation on three neighbourhood renewal projects scheduled for this time period; and
- two more components have been added to the treatment plant upgrades that were not originally accounted for (those include additional improvements to the headworks/screens facilities and a new digester to process a different sludge expected from enhanced primary treatment process).

Consideration has been given to a number of constructability, operational and financial constraints in the development of the implementation plan, including:

- reasonable timeframes are given to design and construct each component;
- the treatment plant upgrades are distributed to allow for the continuous, uninterrupted operation of the plant during construction; the treatment plant upgrades are distributed into two phases – the first would provide for the primary treatment capacity of the full 1600 ML/d – these facilities would later be upgraded to provide enhanced primary treatment including disinfection;
- once increased primary treatment is available at the plant, the tunnel conveyance upgrades would be built, bringing more flow to the plant;

CSO Control Strategy Annual Expenditures



Combined Sewer Overflow Control Strategy Implementation Plan

- large capital expenditures are delayed until after 2005, when the tertiary treatment upgrades at the plant are scheduled to be complete;
- an attempt is made to balance the post 2005 expenditures to within about \$10 to \$12 million per year to minimize the impact on the Drainage Services' long range financial planning;
- components that can be constructed and operate relatively independently of the other components are scheduled relative to the benefits they will provide (e.g. earlier for higher benefits) and in support of balanced total annual CSO expenditures; and
- about \$1.5 million per year is allocated towards opportunistic sewer separation projects starting in 2005, but specific projects are identified through the 2000 to 2004 period including: the Ottewell Storm Outfall, 100th Street Storm Separation work, and separation work as part of the Queen Mary Park Neighbourhood Infrastructure (renewal) Program.

Financial constraints are a significant factor governing the 16-year schedule. There is some potential to further shorten the schedule if additional funding sources become available.

2.3 Benefits

The system will capture more flows and spill less often.

The Strategy is expected to result in an increase in the average annual capture and treatment of wet weather flows in the sewer system from 56% to 86% and a reduction in average annual combined sewer overflow occurrences from 89 to 46.

2.4 Financial Implications

The CSO Control Strategy and other Drainage Services issues can be accommodated with utility rate increases close to the rates of inflation.

The costs of the Combined Sewer Overflow Control Strategy will be borne by over 170,000 residential customers and over 16,000 non-residential customers of the sewer utility.

The inclusion of the Combined Sewer Overflow Control Strategy in Drainage Services' 20-year financial planning horizon has not resulted in a need to adjust customer rate charges beyond the changes which were previously planned. This is likely due to the following factors:

- Early Action Control Plan activities were included in previous capital budgeting;
- 20-year planning had previously included some CSO Control Strategy funding;
- the large expenditures on the Strategy was purposely planned for after 2005 when the large scale

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- environmental expenditures on Tertiary Treatment at the Gold Bar plant will be complete; and implementation of the Strategy is to be distributed over a long period (about 16 years) to minimize funding impacts.

Customers can still expect annual rate increases on their sewer utility bills to accommodate the ongoing costs of sewerage services. Drainage Services' objective is to keep those increases close to the annual rates of inflation.

Expenditures on the Combined Sewer Overflow Control Strategy are currently included in the 5-Year Capital Priorities Plan and 20 –Year Financial Plan for Drainage Services.

3.0 LEVEL OF SUPPORT

Edmontonians

Most Edmontonians support river quality improvements.

Edmontonians' opinion of the Strategy were sought through numerous venues. Most responses received were favourable to the Strategy. Most people indicated that they are offended by the notion of raw sewage entering the river. Most are willing to accept the costs associated with combined sewer overflow control.

Public Outreach at Home Show



Project Working Committee

This public committee contributed to the development of the Strategy.

The Project Working Committee, a group of Edmontonians, each representing a special interest group, was established in 1997 to provide input to the development of the Strategy. While the range of views on the Project Working Committee is diverse, all support the components within the Strategy. The Project Working Committee has prepared a report which summarizes its perspectives on their involvement in the development of Edmonton's Combined Sewer Overflow Control Strategy and their level of support for the Strategy (Attachment 3).

CSO Project Working Committee



Combined Sewer Overflow Control Strategy Implementation Plan

City Council's TPW Committee

City Council's TPW Committee approved the Strategy.

On March 14, 2000, City Council's Transportation and Public Works Committee (TPW) approved the Combined Sewer Overflow Control Strategy Implementation Plan. The 5-Year Capital Priorities Plan and 20-Year Financial Plan for Drainage Services are being adjusted to reflect the current version of this Strategy.

Alberta Environment

Alberta Environment staff have supported the Strategy development process.

Alberta Environment has received submissions required in the Approval-to-Operate, including the "Phase IV and V" report that outlined the proposed Strategy on June 1, 1999. Staff from Alberta Environment have also been involved at key junctures in the study process. Drainage Services has continued the dialogue with Alberta Environment to ensure the CSO Control Strategy finds acceptance with provincial and community interests in the North Saskatchewan River.

In response to the June 1, 1999 submission, Alberta Environment responded with a letter dated November 22, 1999 indicating that they were in favour of the Strategy, but were also looking for an accelerated implementation plan. The City replied with a letter dated November 23, 1999 which outlined some further improvements that had been made to the Implementation Plan since the June 1 submission, including a shortened schedule. The City also offered the possibility to further shorten the schedule if additional funding sources became available.

Combined Sewer Overflow Control Strategy Implementation Plan

REFERENCES

1. Combined Sewer Overflow Control Strategy Implementation Plan, to City Council's Transportation and Public Works Committee, dated February 9, 2000.
2. Letter on Edmonton's Combined Sewer Overflow Control Strategy, Alberta Environment, November 22, 1999.
3. Letter on Edmonton's Combined Sewer Overflow Control Strategy, City of Edmonton, November 23, 1999.
4. CSO Long Term Control Plan, UMA Engineering Ltd., April, 1999
5. Combined Sewer Overflow Control Strategy Report on Phase IV: Long Term Control Plan and Phase V: Implementation Plan, to Alberta Environmental Protection, June 1, 1999.
6. Combined Sewer Overflow Control Strategy Long Term Control Plan, to Alberta Environmental Protection, June 1, 1998.
7. Combined Sewer Overflow (CSO) Control Strategy Report on Phase II: Existing System Characterization and Impact Assessment and Phase III: Early Action Control Plan, to Alberta Environmental Protection, June 1, 1997.
8. Combined Sewer Overflow Control Strategy Phase I: Strategy Development Outline (DRAFT), City of Edmonton, Drainage Branch, January 10, 1995.
9. City of Edmonton's Approval-to-Operate (No. 95-MUN-117), May 30, 1995.

June 1, 2000

File: 51-255-100-000
0405.15 AEP

Mr. Jay Nagendran, P.Eng., DEE, QEP
Regional Director, Northeast Boreal Region
Alberta Environmental Protection
6th floor, 9820 – 106 Street
Edmonton, Alberta T5K 2J6

Dear Mr. Nagendran:

Subject: Combined Sewer Overflow Control Strategy – Implementation Plan

Please find enclosed three copies of the above noted report. This fulfills the following requirement in the City of Edmonton's Approval-to-Operate No. 95-MUN-117 issued on May 30, 1995:

- "3.1.8 The approval holder shall develop:
(a) a comprehensive Combined Sewer Overflow Control Strategy ... to minimize the impacts of discharges on the North Saskatchewan River, and a plan for implementing these strategies by June 1, 2000."

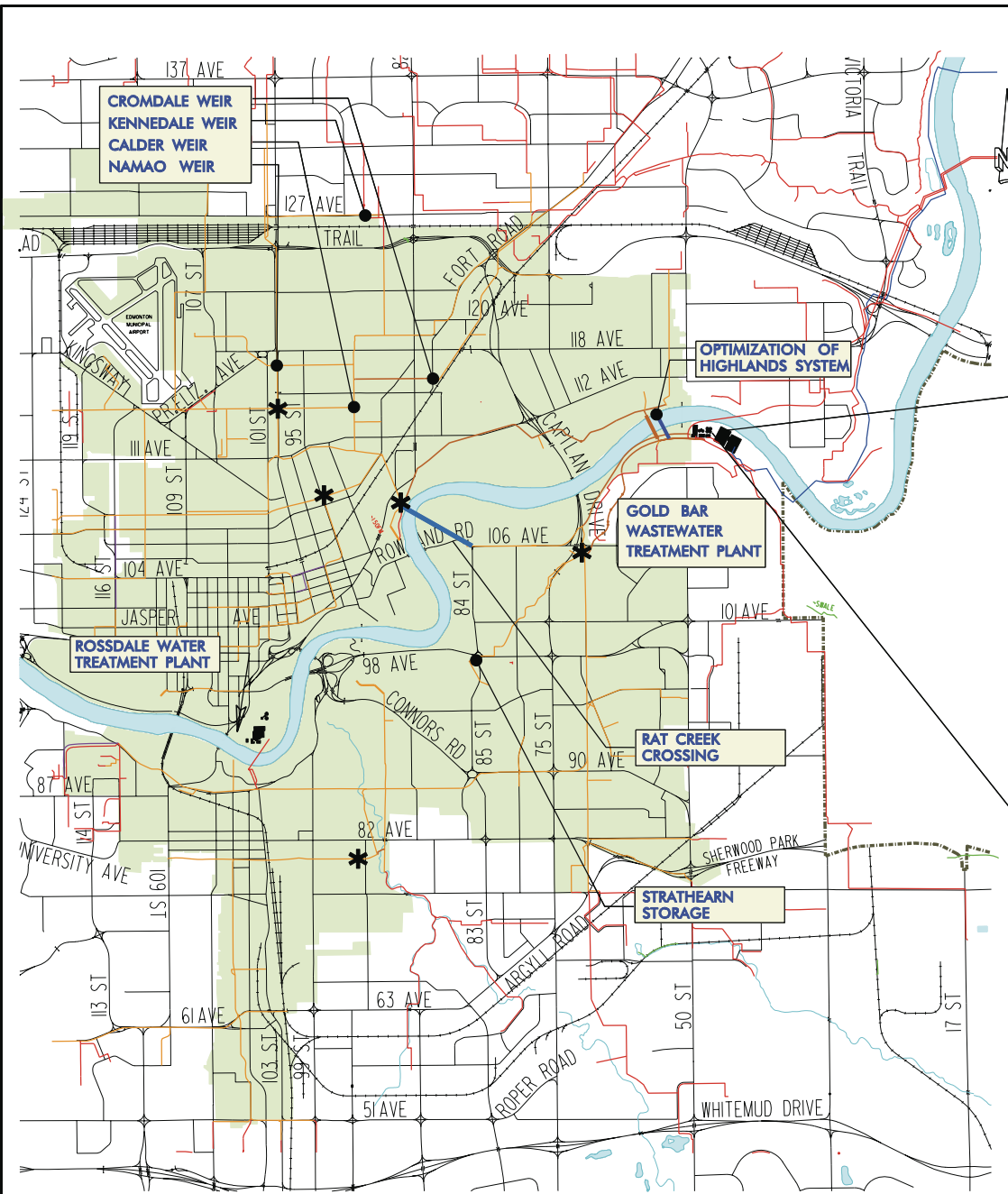
We would appreciate Alberta Environment's positive response of our Combined Sewer Overflow Control Strategy Implementation Plan, as it will provide the support needed to implement the Strategy in our five year Capital Priorities Plan and our 20-year Financial Plan.

Should you wish further information on any aspect of the Strategy, please contact the undersigned (496-5593) or John Hodgson, Ph.D., P.Eng. (496-5658).

Yours truly,

Kurt Sawatzky, P.Eng.
Manager, Drainage Services

RB/jh
Enclosure

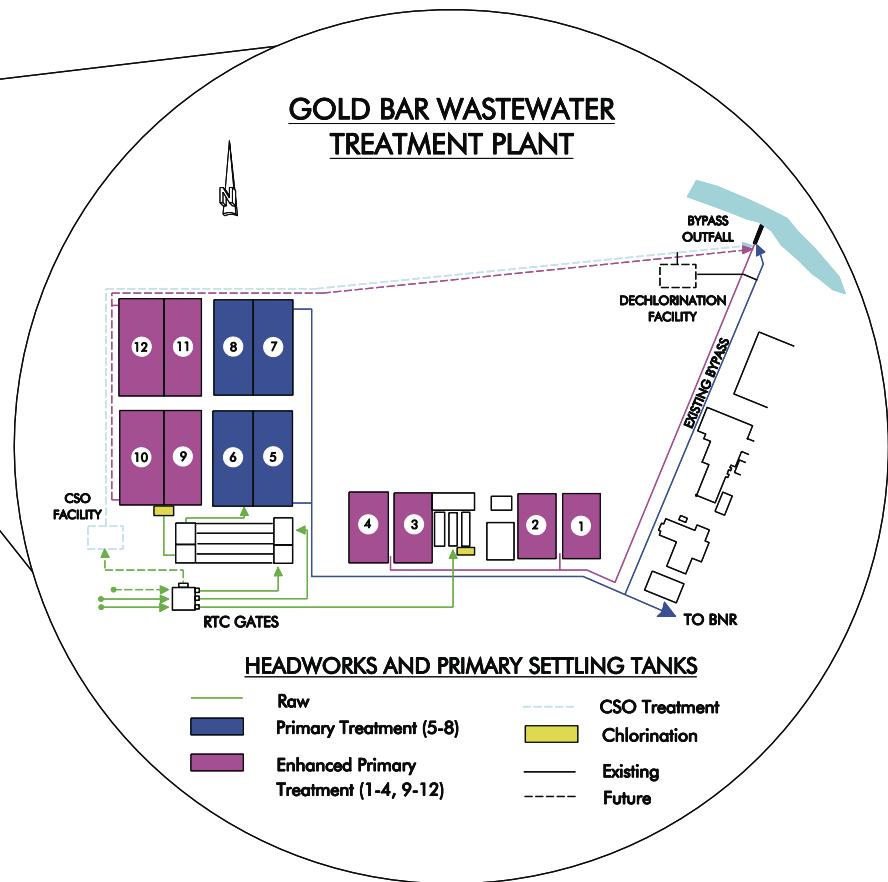


STRATEGY COMPONENTS

- Early Action Control Plan (EACP)
- Gold Bar Wastewater Treatment Plant Upgrades - 1600ML/d of improved treatment capacity
- Complete Rat Creek Crossing
- Storage at Strathearn CSO site
- Opportunistic Separation
- Modify Existing Weirs
- Optimize the Highlands System Hydraulics

LEGEND

- COMBINED SEWER AREA
- SANITARY TRUNK SEWERS
- COMBINED TRUNK SEWERS
- * EACP PRIORITY REAL TIME CONTROL LOCATIONS



COMBINED SEWER OVERFLOW CONTROL STRATEGY LOCATION OF STRATEGY COMPONENTS

Combined Sewer Overflow Control Strategy Implementation Plan Schedule and Budget Allocation

Plan Components	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Totals
EARLY ACTION CONTROL PLAN																		
	\$1.0	\$1.0	\$1.1	\$2.5	\$2.5	\$2.5												\$10.6
CSO LONG TERM CONTROL PLAN - TREATMENT PLANT UPGRADES																		
Headworks/Screens		\$5.8																\$5.8
Plant Bypass/Outfall Improvements							\$0.2	\$4.9	\$7.7									\$12.8
Primaries 9 & 10				\$0.9	\$1.5	\$6.0	\$5.0											\$13.4
Primaries 11 & 12						\$6.8	\$6.6											\$13.4
Digester # 7												\$1.0	\$7.4	\$4.3				\$12.7
Enhanced Primaries Retrofit													\$0.7	\$4.0	\$10.7	\$10.7		\$26.1
Subtotal :		\$5.8	\$0.0	\$0.9	\$1.5	\$12.8	\$11.8	\$4.9	\$7.7	\$0.0	\$0.0	\$1.0	\$8.1	\$8.3	\$10.7	\$10.7		\$84.2
CSO LONG TERM CONTROL PLAN - SEWER SYSTEM UPGRADES																		
Opportunistic Separation	\$0.4	\$4.1	\$0.3	\$3.0	\$3.0	\$0.3	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$27.6
Modify Existing Weirs				\$0.9	\$3.8													\$4.7
Strathearn Storage											\$0.9	\$3.8						\$4.7
Rat Creek Crossing								\$2.3	\$4.5	\$4.5								\$11.3
Highlands Conveyance Optimization										\$1.2	\$2.4	\$2.4						\$6.0
Subtotal :	\$0.4	\$4.1	\$0.3	\$3.0	\$3.9	\$4.1	\$1.5	\$1.5	\$1.5	\$3.8	\$7.2	\$9.4	\$7.7	\$1.5	\$1.5	\$1.5	\$1.5	\$54.3
CSO Totals :	\$1.4	\$5.2	\$7.1	\$5.5	\$7.3	\$8.1	\$14.3	\$13.3	\$6.4	\$11.5	\$7.2	\$9.4	\$8.7	\$9.6	\$9.8	\$12.2	\$12.2	\$149.0

- Notes : 1. The above costs are in millions of dollars.
 2. The above LTCP costs are capital costs and are based on construction costs plus 75% to cover contingencies, engineering and administration costs.
 3. The above costs are in 1999 dollars and are not inflated.

Project Working Committee Report
(Attached Separately)

Attachment 3