

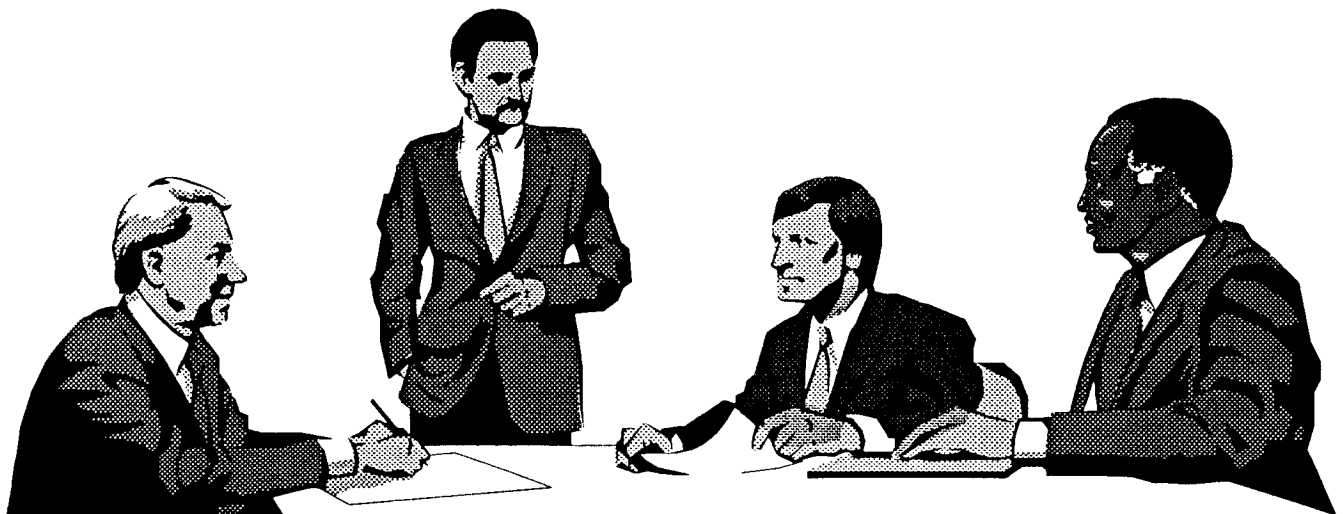


City of Winnipeg
Waterworks, Waste
and Disposal Department

Phase 1 Technical Memorandum for
**Combined Sewer Overflow
Management Study**

PHASE 1 WORKSHOP

Technical Memorandum No. 9



Internal Document by:

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Engineering Inc.

and

TetrES
CONSULTANTS INC.

August 1994

In Association With:

Gore & Storrie Limited and **EMA Services Inc.**

TABLE OF CONTENTS

1.0	INTRODUCTION	- 1 -
1.1	PURPOSE	- 1 -
1.2	PARTICIPANTS	- 1 -
1.3	RIVER TOUR	- 3 -
2.0	BACKGROUND INFORMATION	- 4 -
2.1	TECHNICAL MEMORANDA OVERVIEW	- 4 -
2.1.1	Background	- 4 -
2.1.2	Infrastructure	- 5 -
2.1.3	WWF Perspective on Loadings	- 6 -
2.1.4	Receiving Water	- 6 -
2.1.5	Regulatory Perspective	- 7 -
3.0	WORKING SESSIONS	- 10 -
3.1	CSO ISSUES	- 11 -
3.2	TECHNICAL APPROACH	- 13 -
3.3	DATA ASSESSMENT AND MONITORING NEEDS	- 18 -
3.3.1	Water Pollution Control Centres	- 18 -
3.3.2	Infrastructure	- 20 -
3.3.3	Interceptor	- 21 -
3.3.4	Receiving Stream	- 23 -
3.4	CSO CONTROL TECHNOLOGY	- 24 -
3.4.1	Working Group Results	- 26 -
3.4.2	End of Pipe Treatment	- 28 -
3.4.3	CSO Coliform Control	- 29 -
3.4.4	Other Technology	- 29 -
3.5	EXTERNAL LIAISON	- 30 -
4.0	PHASE 2 WORKPLAN	- 32 -
5.0	CLOSURE	- 33 -

APPENDICES

LIST OF ILLUSTRATIONS

		FOLLOWING PAGE #
Figure 1-1	City of Winnipeg Sewer Districts and Boat Tour Route	3 -
Figure 2-5	Relative Importance of Projected 2011 River Loading (from Technical Memorandum No. 1)	6 -
Figure 3	CSO Management Study Public Communication Program (from Technical Memorandum No. 8)	30 -
Table 3-2	Receiving Stream (from Technical Memorandum No. 7)	14 -
Table 3-5	Hierarchy of Model Application - modified (from Technical Memorandum No. 7)	17 -
Table 3-1	Phase 2 Monitoring Possibilities	24 -

1.0 INTRODUCTION

1.1 PURPOSE

The workplan for the CSO Study provided for conducting a Phase 1 Workshop to review the current WWF perspective, available information and deficiencies, objectives of control, proposed workplans and methods to analyze problems, and define public communication programs. The Phase 1 Workshop was the first of a series of such workshops, which will be undertaken at the end of each phase prior to the preparation of the report for that phase. The purpose of these workshops is to provide the study team, the City's project management committee and the technical specialists with the opportunity to review and discuss progress to date on all of the activity streams and, in the case of the technical specialists, to provide an expert opinion on the various aspects of the project.

The workshop process is enhanced by the participation of a group of technical specialists, each of whom has relevant experience in dealing with CSO issues and in assessing the overall feasibility of technical solutions, taking into account financial, social and environmental factors. Their participation provides the City with the benefit of a broad range of relevant experience and mature judgement on existing and evolving trends in wet-weather flow management. Their participation will provide a forum of quality assurance (QA), similar to an ongoing value engineering process.

The workshop was chaired by G. Rempel, Project Manager for the Consulting Team. The Agenda for the two day workshop is attached in **Appendix A**.

1.2 PARTICIPANTS

The participants in the Phase 1 Workshop were as follows:

1. City of Winnipeg Project Management Committee
 - Ed Sharp, P. Eng., Project Manager
 - Barry MacBride, P. Eng., Manager of Engineering
 - Bill Borlase, P. Eng., Manager of Regional Operations

- Arnold Permut, P. Eng., Manager of Laboratory Services
- Paul Lagassé, P. Eng., Wastewater Engineer
- Mike Shkolny, P. Eng., Pollution Control Planning Engineer
- Dave Wardrop, P. Eng., Engineer
- Richard Sawchuk (part-time), Senior Training Officer

and regrets from:

- Dick Girling, P. Eng., Engineer, Design and Construction
- Paul Kowalyk, P. Eng., District Engineer, Southeast District

2. Consulting Study Team

- George Rempel, P. Eng., Project Manager (President, TetrES Consultants) and Chair of the Workshop

- Wardrop Engineering Inc.
 - Bob Foster, P. Eng., Managing Director
 - Bob Gladding, P. Eng., Senior Engineer
 - Gord Steiss, Senior Technologist

- TetrES Consultants Inc.
 - Mike McKernan, Coordinator (Vice-President TetrES Consultants Inc.)
 - David Morgan, P. Eng., Senior Engineer
 - Nick Szoke, P. Eng., Senior Engineer

- Gore & Storrie
 - Charles Rowney, P. Eng., Manager, Water Resources Division
 - Mario Parente, P. Eng., Senior Project Manager

- EMA Limited
 - Bob Skrentner, P.E., Senior Engineer

3. Technical Specialists

- Nancy Wheatley, Director of Technical Support, Sewage Division, Massachusetts Water Resources Authority
- Peter E. Moffa, P.E., Principal, Moffa and Associates Consulting Engineering, Syracuse, New York
- Donald G. Weatherbe, P. Eng., President, Donald G. Weatherbe Associates Inc.
- George Zukovs, P. Eng., President, W2O Inc.

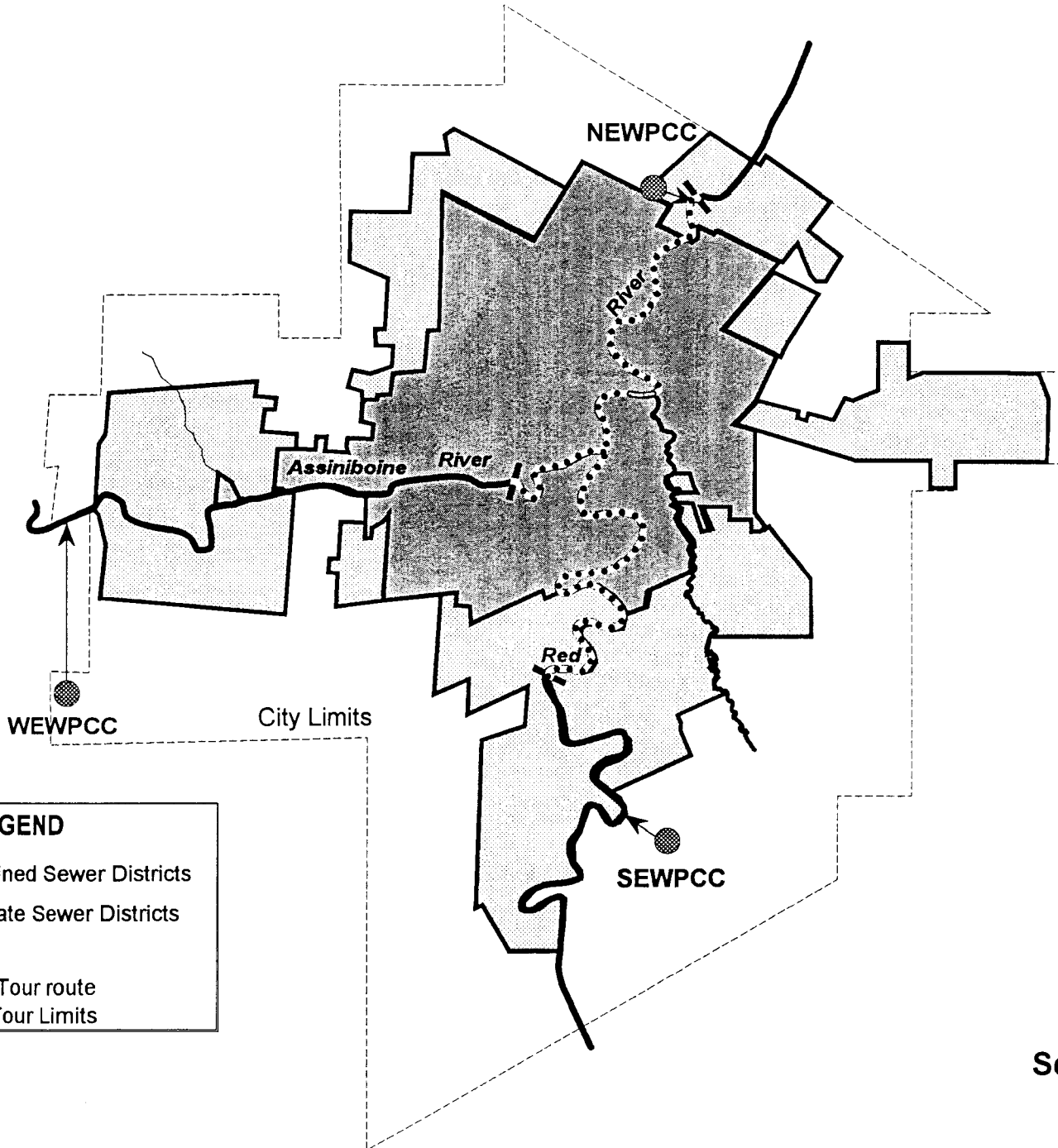
The addresses and phone numbers of these various individuals is provided in **Appendix B**.

1.3 RIVER TOUR






On Sunday June 19, 1994, a majority of the study team toured a substantial portion of the Red River within the City and the downstream end of the Assiniboine River, on the motor launch "Wendebec". The route is shown on **Figure 1-1** and commenced at Pier 7, on the Red River, proceeded north to The Forks dock, where additional passengers boarded; thence west along the Assiniboine to the Maryland Bridge; back to the Red and north to the NEWPCC outfall. The tour ended after a return trip to The Forks dock. The itinerary for the CSO boat cruise is included in **Appendix C**.

This tour provided an excellent opportunity for the attendees, comprising the City staff, local and out-of-town members of the study team and the technical specialists, with an opportunity to view the rivers and a significant number of the CSOs from the City's combined sewer (CS) districts. Bill Borlase's knowledge of the City's CS system was a significant benefit to all aboard.

As an introduction to the nature of Winnipeg's rivers, at the beginning of a two-day workshop, the tour provided a valuable perspective to the CSO issues. It provided context to all of the subsequent discussions. It illustrated the fact that south of The Forks there is generally ample space at the CSOs to permit the construction of "end-of-pipe" facilities. This is not the case in most of the CSOs north of The Forks, on the Red, and west of The Forks, on the Assiniboine. The nature of the river, particularly its high turbidity, impressed the technical specialists particularly. It was obvious to all that the City's rivers are not inviting from the



LEGEND

	Combined Sewer Districts
	Separate Sewer Districts
	Rivers
	River Tour route
	Boat Tour Limits

**City of Winnipeg
Sewer Districts and
Boat Tour Route**

Figure 1-1

point of view of the majority of swimmers. There was surprisingly little recreational activity on the river, even though the tour took place on a pleasant late Sunday afternoon.

2.0 BACKGROUND INFORMATION

2.1 TECHNICAL MEMORANDA OVERVIEW

Prior to the workshop each attendee was provided with a Technical Memorandum dealing with the Phase 1 study workstreams. These comprised:

- Technical Memorandum (TM) No. 1 - Problem Definition
- TM No. 2 - Infrastructure
- TM No. 3 - Treatment
- TM No. 4 - Receiving Stream
- TM No. 5 - Control Alternatives
- TM No. 6 - Experience Elsewhere
- TM No. 7 - Technical Framework
- TM No. 8 - Public Presentation

2.1.1 Background

During the first morning of the workshop, attendees were provided with an overview of key aspects of the Phase 1 study. These are discussed briefly below.

G. Rempel provided the background for the study, discussing the Red and Assiniboine River watershed; the significance of combined sewers as a part of the City's sewerage system (i.e., it serves some 40% of the developed area within the city) and described the complexity of the wet-weather flow system:

- five interceptors;
- three pollution control centres (without effluent disinfection);

- two major river systems; and
- 76 CSO locations (multiple outlets in some districts).

He set the framework within which the study is working:

- the CEC recommendation to the Minister of Environment, implies that the City will be required to undertake seasonal disinfection of WPCC effluents (not yet a formal requirement);
- the CEC's recommendation also implies that WWF microbiological objectives will be set following the CSO study (by their definition, the study is a "fecal coliform" study).

The City of Winnipeg's Terms of Reference expanded the study to include:

- assessment of the relevant impacts of various sources on the receiving streams (as well as Lake Winnipeg);
- the practicability of CSO abatement as an independent approach;
- a key product of the study will be to develop a cost-effective, prioritized implementation plan for remedial works.

The study is to be executed in four phases:

- Phase 1 - Issues and Objectives
- Phase 2 - Wet-Weather Flow Problems
- Phase 3 - Options
- Phase 4 - Recommended Plan

2.1.2 Infrastructure

R. Gladding's discussion of infrastructure was essentially a distillation of Technical Memorandum No. 2. The only new piece of information presented was the fact that the 1,500 mm diameter overflow associated with the St. John's combined sewer overflow did indeed have a working flap gate which prevented backflow from the combined sewer into the interceptor. In addition, the flap gate on the Jefferson overflow also appeared to be workable.

This information had been obtained the week previous to the workshop as a result of the Phase 2 infrastructure inspection. This knowledge will simplify the complexity of the interceptor operation to a degree.

During the discussion, it was noted that the City currently has alarms for sanitary sewer overflows. **It was suggested that the duration and quantity of the discharges should be monitored.** There may also be locations within the system that overflow under high wet-weather flows without any indication at all, e.g., Killarney Avenue sanitary sewer.

The City is looking for feedback on the adequacy of the existing CSO quantity and quality monitoring system. The current system comprises the measurement of flow using Manning Dipper level recorders for flow measurement. Quality is monitored through the use of an automatic sewage sampler. The latter is electrically connected to the level recorder so sampling takes place during CSO events. Sample frequency is programmed to be proportional to the flow level.

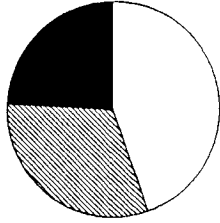
2.1.3 WWF Perspective on Loadings

N. Szoke presented a summary and overview of Technical Memorandum No. 1, "Problem Definition". This technical memorandum outlined the extensive database assembled by the City relating to CSO (quantity and quality). It also described the rainfall gauging network. A perspective on WWF loadings, based on uniform rainfall over the City (airport gauge) was presented (Figure 2-5 of Technical Memorandum No. 1).

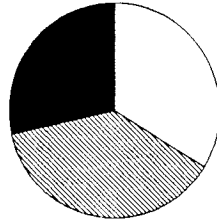
2.1.4 Receiving Water

D. Morgan presented background information on the receiving stream, as presented in Technical Memorandum No. 4. This technical memorandum covered river use and river characteristics (flow and water quality). Historical water quality profiles and projected quality

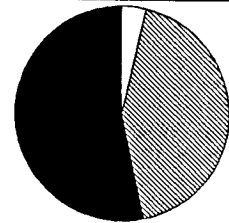
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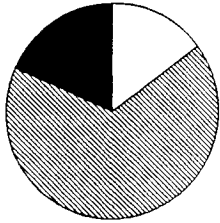


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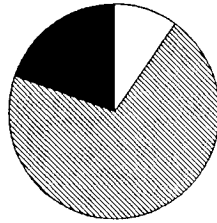


SINGLE EVENT

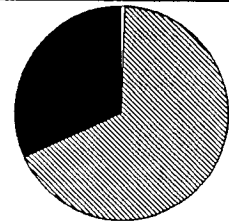
SUSPENDED SOLIDS



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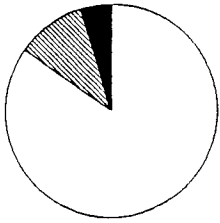


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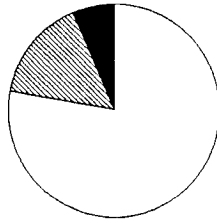


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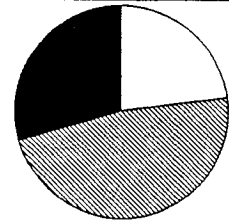
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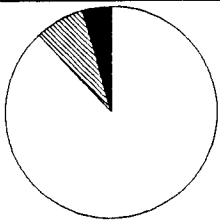


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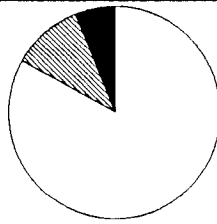


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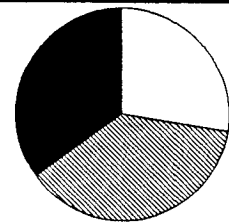
TOTAL PHOSPHORUS



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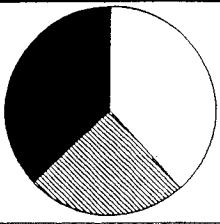


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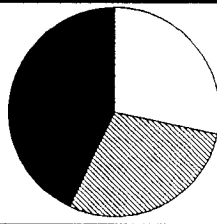


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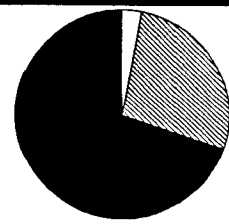
FECAL COLIFORM



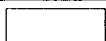


ANNUAL



SEASONAL



SINGLE EVENT

-  TREATMENT PLANTS
-  SEPARATE SEWERS*
-  COMBINED SEWERS

(*- includes sanitary sewer loading)

Relative Importance of Projected
2011 River Loading

Figure 2-5

regimes, based on water quality simulations, were presented. The technical memorandum concluded that:

- The key river issues potentially affected by CSOs are recreational activities, aesthetics and aquatic life.
- The key water quality parameters associated with these uses are fecal coliforms, floatables and ammonia and dissolved oxygen, respectively.
- CSOs are a major contributor to the frequent exceedances of the MSWQO limits for fecal coliforms. Modelling of control options will have to simulate peak, duration and extent of non-compliance with the fecal coliform objective.
- Ammonia concentrations do not comply with the MSWQO. These are not considered to be a CSO issue.
- Dissolved Oxygen (DO) does not appear to be seriously impacted by CSOs. Additional monitoring may be required.
- Aesthetics issues are significantly impacted by CSOs but will not be modelled.
- There is limited information on CSO impacts on river sediments (may need monitoring).
- The river water quality model will need to accept pollutographs.

2.1.5 Regulatory Perspective

The regulatory perspective was provided in three parts:

- Canada was addressed by D. Weatherbe;
- U.S.A. was addressed by N. Wheatley; and
- Europe was addressed by G. Zukovs.

The essence of the presentations by Weatherbe and Zukovs is given in Technical Memorandum No. 6. N. Wheatley presented new information from a U.S. perspective.

N. Wheatley's presentation was enlightening since it was presented from the point of view of one of the participants in the US EPA regulation-negotiation process. Her overview paralleled the article on "A New Policy on CSOs", published in the June 1994 Volume of the Water Environment and Technology Journal (Appendix D). Under the new policy, the EPA has developed a method to coordinate the planning, selection, design and implementation of CSO management practices and controls to meet the requirements of the *Clean Water Act*. Under the new policy, the EPA has nine minimum controls which must be implemented by 1997. These are outlined below and in Technical Memorandum No. 6 and in the WEF Article. Municipalities are also required to develop a long term CSO control plan which shall include:

- a comprehensive characterization of their CSS, CSOs and their impacts on the receiving water bodies;
- special consideration for sensitive environmental areas;
- an evaluation of a range of alternatives to meet water quality standards;
- coordination with the National Pollutant Discharge Elimination System (NPDES) permitting authority and State water quality standards authority when selecting control measures from the range of alternatives;
- the development of a public participation plan to ensure that the general public is involved in the development of the municipality's comprehensive CSO control program;
- the development of a schedule for implementation of the selected CSO control measures that considers the municipality's financial capability; and
- the development and implementation of a post-construction water quality monitoring program.

The EPA Policy provides for two approaches to show that its selected controls will achieve water quality standards: presumptive and demonstration. Under the presumptive approach the program must be designed to meet specific water quality based requirements. Briefly these are:

- 1) No more than 4 overflow events per year not receiving treatment.

- 2) Eliminate or capture for treatment, no less than 85% of the volume of combined sewage.
- 3) Eliminate or remove no less than the mass of pollutants that would be eliminated in 2.

Under the demonstration approach the municipality can provide information and data showing that the selected CSO controls will meet water quality standards. If subsequent monitoring demonstrates this not to obtain, the municipality will have to revert to the objectives of the presumptive approach.

The critical issue under the subsequent long-term plan is what is the goal versus the money available. An example of this concern is the economic impact (i.e., high costs) of trying to meet water quality objectives on the basis of Q_{7-10} flows. This could result in the expenditure of many dollars with a minimal benefit. In the development of the long-term plan, the EPA has recognized cost/benefit arguments, but the test for economic hardship could be severe. The fact that cost factors have become part of the process could augur well for the long-range implementation plans.

In summary, the key elements of the current situation in the U.S. are:

1. Compliance with the nine minimum controls is mandatory and are considered to be reasonable.
2. The focus in the longer term will be on sensitive areas, i.e., municipalities will target the areas they care about most (shellfish areas, bathing areas, beaches, etc.) and spend early dollars in these areas.
3. The EPA recognizes financial resources as a factor in scheduling but not for inaction.
4. The emphasis of the program is on public information, that is, presenting goals, reasonable solutions, costs and benefits.

The EPA are in the process of completing several guidance documents (five are already in a draft form) for the CSO policy. These documents include:

- a manual for permit writers;
- a guidance document on how to monitor and model CS discharges and their effects on receiving waters;
- a guide for developing a long term CSO plan;
- a guide for municipalities on implementing the nine minimum controls;
- a guidance manual providing criteria for establishing priorities for permitting and controlling CSOs; and
- a manual providing guidelines on what is affordable and how this affordability affects the planing of CSO control implementations.

The European regulatory perspective is covered in Technical Memorandum No. 6.

3.0 WORKING SESSIONS

On completion of the background presentations, the workshop was organized into six working sessions:

- CSO Issues
- Technical Approach
- Data Assessment and Monitoring
- CSO Control Technology
- External Liaison
- Phase 2 Workplan

The results of these sessions are summarized below.

3.1 CSO ISSUES

G. Rempel introduced the discussion on CSO Issues. He tabled some potential questions and a suggested format for responses, in order to initiate the discussion process in the group sessions. (Copies of the overheads of G. Rempel's presentation are included in **Appendix E**). The members of the Workshop then separated into three discussion groups.

All groups outlined a similar range of issues. One of the three sub-groups proposed priorities for the tasks on the basis of individual scoring. The first four CSO issues listed below are ranked in order of their weighted priorities. The remainder are not necessarily listed in order of priority or concern.

1. Floatables
2. Basement flooding
3. Aesthetics
4. Public Perception
 - Coliforms
 - Environmental policy (regulations)
 - Habitat and biota health
 - Cost/benefit
 - Cost effectiveness (dry-weather flow versus wet-weather flow considerations)
 - Practicability

In setting up the basis for the development of issues, one of the sub-groups indicated that CSO issues had to be considered within the context that there are two categories of river with regard to classification of recreational uses: the Red River has been designated for primary and secondary recreation; and the Assiniboine River, for secondary recreational use only. The regulatory implication of this is on the fecal coliform limits, being 200 fecal coliform per 100 ml for primary recreation and 1,000, for secondary recreation. These may be viable limits for permissible use but from the perspective of disinfection both limits would require virtually the same technology and dose. In the final analysis, the different designation might mean that the Red River would be given priority for a wet-weather flow disinfection. Another perspective was given that a selected reach of the Red River, e.g., south of The Forks area,

could be designated for primary and secondary recreation, with other reaches not requiring protection for primary use.

In the discussion of **floatables**, it was considered that floatables would have a real impact on all aspects of recreational use (passive and active). This impact is direct. It is also indirect in that floatables, attributed to sanitary sewage, are visible evidence of non-compliance with good environment objectives, i.e., no overflow of raw sewage. It was considered that whether or not WPC effluents were disinfected for bacteria control, floatables control could still be needed. It was noted that floatables associated with sanitary sewage are a primarily concern but that debris from roads etc. was also an objectionable feature. It was agreed that the floatables on the rivers were probably the item of priority concern.

The impact of **basement flooding** caused by combined sewer surcharge was recognized as being real and direct. Although the results are short-term, the impacts can be considerable. The estimated cost of basement flood damage in 1993 was \$200 Million. This aspect of combined sewers can be evaluated through hydraulic and economic analysis. The control of basement flooding, in combination with street flooding, must be considered as part of any plan to control CSOs. Because of the potentially large economic impact, it is likely that these two factors could influence how money is spent. In this regard, it was noted that CSO control must not impact on basement flooding and vice versa. These two aspects of combined sewers must be addressed together.

Aesthetics was considered to be an important issue with regard to the CSOs and the Red and Assiniboine Rivers. The aesthetics of the rivers will directly determine the recreational capacity. The natural conditions in the rivers (turbidity, muddy banks, erratic currents) discourage primary recreational use. If such use is limited, the question arises as to whether disinfection of effluents will improve river use significantly. The most controllable aesthetic issue, from a CSO perspective, is floatables. This issue applies also to land drainage sewers.

Public perception and public education were considered to be key CSO issues. CSO control is a costly program and involves policy issues and choices. Public education is considered to be a key factor in any program of CSO control.

Public health was considered to be a water quality issue, with regard to active or primary recreation. Whether or not public health concerns justify CSO control (to the extent of disinfection) depend on the numbers and frequency of users and value judgements of the public. Accordingly, the study must include a cost/benefit analysis and public feedback as to whether the benefits justify the investment. It was agreed that bacterial control of wet-weather events (CSO) is not sensible without disinfection of water pollution control centre effluents.

Environment regulation/policy is a key issue. A key question in this regard is how much control is enough, i.e., is compliance with water quality criteria a requirement at all times? It will be necessary to develop a matrix of potential programs with their associated costs and benefits to assist in decision-making. This matrix will have to consider the full array of options.

Based on the historical data, as shown in Technical Memorandum No. 4, **Receiving Streams, aquatic life** is a key river issue but is of mixed concern, with regard to CSOs. So far it appears that dissolved oxygen is not significantly impacted by CSOs. This can be confirmed by more monitoring as discussed later. Whether or not sediments resulting from CSOs are a concern, with respect to degradation of habitat, is currently unknown. Again, monitoring could clarify the situation.

Cost/benefit analyses are an integral aspect of many of the key issues discussed above. A part of this evaluation will be to determine the **cost effectiveness** of dry-weather flow controls versus wet-weather flow controls. **Practicability** will also enter into the cost/benefit analyses.

3.2 TECHNICAL APPROACH

G. Rempel gave an overview of the Technical Memorandum No. 7 on Technical Framework. This aspect of the study dealt with the development of a suitable set of models needed to address the whole CSO issue from rainfall/runoff to river water quality.

During the course of the presentation a number of related issues were raised. These are recorded here for completeness.

Sanitary Sewer Overflows

The question arose as to whether or not there was monitoring information available on sanitary sewer overflows (SSO). B. Borlase noted that the City received high-level alarms, but had no information on quantity, quality or duration. These SSOs apparently only occur under extreme rainstorms. Prior studies on extraneous flow had estimated these overflows. It was agreed that monitoring would be required to obtain a better understanding of these events. A case in point, for example, is the Killarney Avenue sanitary sewer which can overflow under wet-weather flow conditions without sending any alarm.

Cross-Connections

The possibility of sanitary sewer/LDS cross-connections was raised. It was acknowledged that these do exist. The City monitors the LDS overflows in the winter to assist in locating such cross-connections. **B. MacBride noted that the long-term plan should include in-depth investigations to locate and correct such cross-connections.** The City also monitors CSOs in winter for DWF overflows.

Benthic Studies

In **Table 3-2** of the Technical Memorandum No. 7, on Receiving Stream monitoring requirements, it was noted that benthic studies should be rated as being of medium importance not high importance (corrected copy follows).

River Modelling

In modelling the river, it was noted that the variability of quality at the upstream boundary of the two rivers (particularly fecal coliform during wet-weather events), was important as a "base" condition for modelling. Likewise, the additional bacteriological information for WPCCs should also be obtained. These requirements are noted under monitoring section.

The River model should consider sub-dividing the receiving stream into reaches for specific use, for example, water skiing in the south leg of the Red River, downstream of the SEWPCC, should be considered for such potential in the river analyses.

Copy of Table: 3-2 (Technical Memorandum No. 7) Receiving Stream

	Issue				Monitoring			Modeling	
	<ul style="list-style-type: none"> • Potential CSO Issue • CSO Elsewhere • Winnipeg CSO Issue 				<ul style="list-style-type: none"> • Winnipeg CSO Study 			<ul style="list-style-type: none"> • Winnipeg CSO Study 	
Parameter	↓	↓	↓	Comments	↓	Comments	↓	Comments	
Hydraulic							●	Hydrodynamics	
DO - BOD	●	○	○		●	Confirmation Information	○	As Required	
Nutrients	●	⊙		Unlikely as Winnipeg Issue		Adequate		Loading Perspective	
Ammonia	●	○	○	Unlikely as Winnipeg Issue		Separate Study		Loading Perspective	
Fecal Coliforms	●	●	●			Adequate	●	Dynamic	
Mixing Zone	●	○				Some Information Available	○	If Required as Detail	
Toxic Substances	●	●	?		○	Some Information Available			
Sedimentation	●	○	○		○	Possibly, if Fisheries Issue			
Aquatic Health	●	●	○		⊙	Benthic Studies, More ?			
Aesthetics	●	●	●		?	Some Limited Information			

- - HIGH
- ⊙ - MEDIUM
- - LOW
- ? - UNCERTAIN

In discussing the models, it was noted that they would be used to assess the impact of a multiplicity of control alternatives.

In modelling fecal coliform, and considering particular reaches where use may dictate that treatment/disinfection is not needed, N. Wheatley and P. Moffa cautioned that modelling must also determine whether or not there are other impacts on such reaches (for example, land drainage sewer discharges).

Modelling aesthetics was considered virtually impossible. A model cannot simulate floatables behaviour with any degree of accuracy. It was recommended that this aspect of river quality not be modelled, but the number of overflows is a proxy for floatable overflows. Alternatively, the quantity and nature of floatables could be determined at the end of the pipe. Some river reaches will be more prone to trapping than others. B. Borlase noted that because of boats and currents, floatables generally end up at the shoreline. The City has coarse bar screens on their combined sewer outfalls (primarily to keep people out).

With regard to DO monitoring, it was agreed that the extensive, available information, as summarized in Technical Memorandum No. 4, indicated that this is not a CSO issue. It was recommended that a full profile of DO level could be provided by the installation of a continuous monitor for DO at the sag point downstream of the NEWPCC (or a downstream monitoring campaign). This monitoring would be used to build up a data base for subsequent hearings. N. Wheatley noted that if modelling of DO ever became an issue, it should not be done with wet-weather flow imposed on Q_{7-10} in the river. She noted that this would be a worst case scenario and joint probability analysis should be used to determine the real probability of such an event.

The question of sediment transport modelling arose. This was discounted on the basis that the river carries so much sediment that it is far in excess of any additional load in wet-weather conditions. Other means of monitoring wet-weather sediment impacts were discussed. The possibility of taking a number of sonar transects of the river bed downstream of selected CSOs was discussed. It was considered to be a low cost measure that could monitor the build-up in the summer, if any, and the subsequent flushing out (if it happens) in the spring.

G. Rempel noted that future modelling requirements for the rivers may include DO modelling and ammonia modelling. Such requirements may be needed to assess the impacts of water withdrawals from the Assiniboine River (e.g., water supply for the Pembina triangle area). P. Moffa noted that assessment of sediment oxygen demand may also be needed. All of these potential needs for the river model required the use of a model such as US EPA's WASP, which is capable of dynamic simulation of the important water quality variables. The WASP model has been used by local modellers on the team and has a similar structure to US EPA steady-state receiving stream model QUAL2E. QUAL2E has been used extensively by the local modelling team on the Red and Assiniboine Rivers. This experience should assist in the setup and running of WASP.

The treatment/storage model will require total suspended solids (TSS) in, in order to predict TSS out. With a TSS of 400 mg/l, disinfection with chlorine can be effective with five minutes retention time. With TSS of 1,000 mg/l, there can be problems in achieving effective disinfection of fecal coliform. Similar constraints will also apply to UV disinfection. **P. Moffa noted that he has information on die-off of fecal streptococci and the relationship of fecal coli to fecal streptococci (Mildrich's ratio).**

The discussion of models considered the initial ranking shown in Technical Memorandum No. 7, namely:

Screening Level Models

- Custom developed for:
 - Runoff
 - Interceptor
 - Treatment
 - Receiving Stream

Planning Level Models

- EPA or XP SWMM for:
 - Runoff
 - Interceptor

- HIRATE for:
 - Treatment
- WASP5 for:
 - Receiving Stream (DO and NH₃ can be added if required)

or

- QUALHYMO for:
 - Runoff
 - Receiving Stream

Design Detail Level Models

- EPA or XP SWMM for
 - Runoff
 - Interceptor
 - HIRATE for:
 - Treatment
 - WASP5 for
 - Receiving Stream (DO and NH₃ can be added if required)
- or
- RUNSTDY for
 - Interceptor or district collector systems if real-time control are needed.

Model Selection

Models will be employed in a progressive manner through the study phases. **Table 3-5** of Technical Memorandum No. 7 summarizes the hierarchy of models and their tentative use for specific systems. This progression will allow the refinement of detail and modelling focus as the level of model sophistication increases. Modelling results will be subject to peer review and "reality checks". This information will be used to refine the previous level of modelling and to provide a feedback mechanism to check earlier model indications.

It is important to note that detailed modelling will not be performed on all of the combined sewer districts. It is planned that detailed modelling will be performed on some representative

TABLE 3-5 - modified
(Technical Memorandum #7)

HIERARCHY OF MODEL APPLICATION

MODEL SYSTEM	SCREENING LEVEL (PHASE 2)	PLANNING LEVEL (PHASE 2 AND 3)	DETAIL LEVEL (PHASE 3 AND 4)
RUNOFF	• <u>custom developed</u>	• <u>SWMM (EPA or XP)</u>	• <u>SWMM (EPA or XP)</u>
INTECEPTOR	• <u>custom developed</u>	• <u>SWMM (EPA or XP)</u>	• <u>SWMM (EPA or XP)</u>
TREATMENT	• <u>custom developed</u>	• <u>HIRATE</u>	• <u>HIRATE</u>
RIVER	• <u>custom developed</u>	• <u>WASP5</u>	• <u>WASP5</u>

micro-districts, say 3 districts, and the results of this detailed modelling effort will be translated to the overall region.

SWMM XP was considered to be the most appropriate model since it has the ability to do both planning and detailed level modelling of runoff and interceptor. SWMM XP has an easy to use interface which can assist in setup and display of results. The US EPA indicates that the output from SWMM can be directly used by WASP5.

These items were discussed at the workshop and there was general consensus that SWMM and WASP would comprise an appropriate model system. HIRATE could be used for assessing end of pipe systems.

The discussion on models concluded with the selection of models included in **Table 3-5** of Technical Memorandum No. 7 as modified during the discussion.

3.3 DATA ASSESSMENT AND MONITORING NEEDS

R. Gladding presented a series of overheads outlining the study team's perception of the information available, the data gaps which need filling, and the approaches to providing that information. The discussion below summarizes subsequent discussion which resulted from considerations of the three discussion groups. The summary outlines the information on hand, the data needs, and approaches to gaining the recovery data. A summary table of the monitoring proposals, which will require further study, consideration and development, is included at the end of this section.

3.3.1 Water Pollution Control Centres

HAVE:

- *Composite Sampling of effluents*
- *No record of by-passed flows*
- *Cumulative daily pumped flows*
- *No records of surge well levels (being acquired now)*

- *No records of diurnal pumping rate variations*
- *No monitoring of fecal coliforms*

NEEDS:

- *WWF qualities (including variation with time) for:*
 - *raw sewage*
 - *primary effluent (PE) bypass*
 - *final effluent*
- *Records of PE bypass flows*
- *Records (real time) of pumped raw sewage flows and surge well levels*
- *Measurement of fecal coliforms in WWF plant effluent and PE bypass*

APPROACHES:

- *Collect and analyze non-composited samples of:*
 - *raw sewage* } *in several WWF events*
 - *PE bypass* } *at all 3 plants*
 - *final effluent* }
- *Collect and analyze non-composited samples of effluent and PE bypass fecal coliform concentrations during WWF events*
- *Record PE bypass flows in several WWF events at all 3 plants*
- *Record (real time) on a continuous basis:*
 - *daily pumped flows* } *at all 3 plants (already started at NEWPCC)*
 - *surge well levels*

B. Borlase noted that the current fecal coliform analyses which are done have an upper limit of 150,000 + fecal coliform per 100 ml. If the CSO study needs better characterization, then the City must be so informed.

3.3.2 Infrastructure

HAVE:

- *DWF and WWF (CSO and LDS) quality - the City already has an extensive database, which is reasonably consistent regionally and with other cities' data. There are some data gaps. Accordingly, there are some needs, as follows.*

NEEDS:

- *Assess the merits of testing the settleability of the sediment fraction of CSOs to determine performance of end-of-pipe treatment.*
- *Analyze combined sewer sediment quality (one sample from each district type) was discussed. The results of this discussion are elaborated upon below.*
- *There are some gaps in the long list of quality data on WWF. These can be filled by monitoring the following:*
 - *quality of primarily commercial combined sewer district discharges*
 - *a land drainage district, upstream and downstream of a storage pond.*

One of the work groups recommended that the in-sewer sediment chemistry be determined. This would include: metals, biocides, organics, pathogens, oil and grease, etc. The group also contended that the sediments in the river be tested for the same parameters. P. Moffa noted that this is an emerging issue and very likely will come to the fore in the U.S. in about three years time. It is becoming a watershed issue. The general consensus was that there are so many discharges into the rivers other than CSOs, that it would be difficult to partition the effects of CSOs. If combined sewers are tested, then land drainage sewer sediments should also be tested. The consensus of the group was to proceed cautiously in this area, G. Rempel suggested that the subject be taken forward to the scientific community before any further action is taken. N. Wheatley suggested that another means of investigating specific chemicals would be to identify industries which could potentially be discharging such materials to the sewers.

With respect to lethality of discharges, one of the discussions groups recommended that no lethality tests be undertaken, unless the in-system chemical analyses indicated a potential for a problem.

3.3.3 Interceptor

HAVE:

- *A general knowledge of existing system, the intended operation of regulators, interceptor weirs, pumping stations, but specified details are lacking. We do know that the actual operation has changed over the years and it is complex.*

NEED:

- *An understanding of the way the interceptor actually operates in WWF, i.e, the real interception rates at the various districts.*

APPROACH:

- *Gather specific information at each interception point in order to eliminate as many unknowns as possible*
- *Develop a coarse interceptor model to simulate actual operation, monitor to confirm*
- *Confirm details of diversion structures (CSO --> Interceptor), for use in model (Inspection program is currently underway).*

NEED:

- *To determine real time flow in the three main NEWPCC interceptors, plus the fourth, north, interceptor, under WWF conditions*

APPROACH:

- *Establish depth monitoring stations on all four NEWPCC interceptors (i.e., 2 or 3 points on each for hydraulic gradeline) and hence calculate flows. Where possible measure flow velocities.*

NEED:

- *To establish, on a real time basis, hydraulic conditions in NEWPCC raw sewage pumping system*

APPROACH:

- *Record NEWPCC surge well level and pumping rate (under way).*

One of the sub-groups dealt exclusively with the interceptor. Their proposals, to meet the above needs were as follows:

1. Determine the hydraulic gradeline through level sensing under dry-weather flow conditions during relatively constant pumping. This will enable the determination of the suitable roughness co-efficient for the interceptors. This program could be conducted in conjunction with a concurrent velocity check. The latter could be effected using a dye (Lithium or Rhodamine) or it could be done with a velocity probe where feasible. These details will have to be worked out.
2. The flow in the main interceptor during WWF should also be determined. In order to compensate for the potential complications (both overflow and inflow), the main effort would be concentrated on the three new interceptors. Flows in the main interceptor would be confirmed by subtracting the accumulative flow from the WPCC total flow.
3. Direct measurement of WWF in the interceptor could be undertaken, by a specialty group such as ADS. The results can be accurate, but they are also costly. The general consensus of the groups was that a suitably accurate monitoring program could be effected without such methods.

In the discussion, it was noted that Infiltration/Inflow (I/I) are very important. In this regard, good metering may be very valuable even if costly. This could be organized and executed by the City with proper instrumentation. To determine I/I would require several locations for metering. The main factor affected by excess I/I is the available capacity at the treatment plant.

The group also noted that there should be an understanding of the manner in which the regulators work, as well as an understanding of those orifices that have no regulator device. They also noted that the weir elevations should be checked. It was noted that the height of the current weirs was being checked during the current inspection program.

3.3.4 Receiving Stream

KEY RIVER USES:

- *Recreation: swimming, water skiing, boating*
- *Aesthetics*
- *Aquatic life*

KEY QUALITY PARAMETERS:

- *Fecal Coliform*
- *Floatables*
- *Ammonia/Dissolved Oxygen*

MODELLING NEEDS TO ASSESS CONCERNS:

- *Fecal Coliform: need WWF data on WPCC discharges*
- *Aesthetic Issues: no special model proposed*
- *DO: ALMOST sufficient data to confirm little CSO impact*
- *Ammonia: subject of separate study*

ADDITIONAL NEEDS:

- *The modest impact of CSOs on DO has to be demonstrated conclusively to eliminate concerns*

APPROACH:

- *Further review of DO sag downstream of NEWPCC, possibly by installing continuous DO monitor downstream of the NEWPCC*

NEED:

- *More information is needed on CSO impacts on river sediments*

APPROACHES:

- *Sample and analyze river sediments*
- *Sample and analyze aquatic species for toxic accumulation*
- *Select and monitor a bio-indicator*

- *Periodic SONAR transects below several CSOs: after Lockport is in service, mid-summer, fall.*

One of the groups recommended a bioassay of invertebrates (clams) to determine the biomagnification potential of CSO discharges. As with the chemical analyses of in-sewer sediments, caution should be observed before proceeding with these tests. Further, if the decision is made to proceed, tests should also be made with land drainage system discharges.

The workshop agreed that the SONAR transects should be done.

Additional monitoring was identified for floatables and for hydrocarbons. For floatables, it was proposed that efforts would be made to obtain qualitative and semi-quantitative data. The methodology would comprise photography, booms and/or nets, (i.e., a program such as undertaken by Hydroqual for New York). The hydrocarbons would be determined through the use of booms and photos.

The various potential monitoring approaches have been summarized in **Table 3-1**. The activity stream and potential implementation date have also been provided. The advisability and usefulness of each item need to be considered and the details need to be defined.

The study team will address the various items in the near future, in cooperation with the Technical Specialists, and will recommend the appropriate action to the City staff.

3.4 CSO CONTROL TECHNOLOGY

The session commenced with a presentation of an overview of experience elsewhere with CSO control by Mario Parente (essentially, material in Technical Memorandum No. 6), followed by a presentation by G. Zukovs on CSO control experience in Europe (primarily Germany and Switzerland) as determined from a recent tour by G. Zukovs, and followed by P. Moffa, who discussed control technology in the U.S.

TABLE 3-1

PHASE 2 MONITORING POSSIBILITIES

WORKSTREAM	SUGGESTED ACTIVITY	POTENTIAL DATE IN PLACE
Problem Definition	<ul style="list-style-type: none"> DWF & WWF qualities at WPCCS (including fecal coliform) - need to establish precision beyond 150,000 + F.C./100 ml 	1995 WWF season
	<ul style="list-style-type: none"> Quality information on CSO (Commercial District) and SRB (Upstream and Downstream) 	1995 WWF season
	<ul style="list-style-type: none"> Toxicity tests on CSO and LDS sediments [need to evaluate merits] 	1995 season
	<ul style="list-style-type: none"> Review merits of acute lethality test on CSO and LDS liquid phase 	1995
Infrastructure	<ul style="list-style-type: none"> Flow in NEWPCC Interceptors (DWF & WWF) 	1995 season
	<ul style="list-style-type: none"> I & I Analysis 	1995 - 1996
	<ul style="list-style-type: none"> Monitor frequency and duration of SSOs 	1995
Receiving Stream	<ul style="list-style-type: none"> Sonar transects of river bottom (downstream of CSO and LDS) 	1994 possible start
	<ul style="list-style-type: none"> Bioaccumulation tests (downstream of CSO and LDS) 	1994 possible start
	<ul style="list-style-type: none"> Review current river sampling program and suggest modifications for 1995 	1994
	<ul style="list-style-type: none"> Sampling and analysis of river sediments 	Benthic invertebrates initiated
	<ul style="list-style-type: none"> DO Monitoring in river (probe or sampling campaigns downstream of WPCC?) 	1995
	<ul style="list-style-type: none"> Determine quantity and nature of CSO floatables and hydrocarbons 	1995 WWF season
Control Options	<ul style="list-style-type: none"> Settleability test on CS discharges 	1995

G. Zukovs' presentation included a number of specific items and technology worth noting:

- some Swiss storage tank installations included 4 mm rotary screens at the head-end of the tank to remove coarse solids and floatables;
- a vortex throttle valve was used on the vortex solid separators (VSS) in Europe to control the rate of underflow storage. This generally ranged from 2 to 15% of flow-through;
- a stainless steel bending weir was used in some cases for in-system storage. This performs the same function as partial deflation of an inflatable weir;
- clarifiers (that is, retention/treatment basins) were operated at an overflow rate of 10 m per hour.

Some highlights from the Moffa presentation are:

- VSSs were developed specifically for removal of heavier type of material. It was originally designed, and is still intended, primarily for pre-treatment for disinfection;
- disinfection of CSO at the Syracuse VSS installation was effected by a 5-minute contact time with 12 mg per litre of chlorine;
- P. Moffa felt that there were a sufficient number of VSS installations in place that visits by the City, in a combination with adequate characterization of the nature of the Winnipeg combined sewer suspended solids, could avoid the need for a demonstration (i.e., pilot) test.

In the general discussion of control technologies, following these presentations, a number of points were made:

- **Dave Wardrop noted that the City is in the process of updating their design storms for the combined sewer basement flooding programs.**
- It was noted that the City have separated, and continue to separate, sewers in some districts, for example, Mager and Colony, in the course of providing flood relief piping.
- It may be that different technologies will be appropriate to protect different reaches of the rivers, e.g., there could be a designated water skiing reach or an area suitable for docking, etc., which have different needs than do other reaches.

The workshop broke into three groups to discuss CSO technologies. The results of these discussions are discussed below.

3.4.1 Working Group Results

Best Management Practices (BMP)

One of the working groups focussed on BMPs as being the first line of attack in CSO control. The recommended procedure would be to implement all practicable BMPs as an interim solution and then evaluate their effect and effectiveness. This is generally consistent with EPA and Ontario regulatory policy. Based on the results of these measures, the City would determine how much more control needs to be done and at what cost. The first focus of this group was the 9 minimum control measures as proposed by the U.S.E.P.A. These are:

- proper operation and regular maintenance programs for the sewer system and combined sewer overflow points;
- maximum use of the collection system for storage;
- review and modification of pre-treatment programs to assure CSO impacts are minimized;
- maximization of flow to the WPCP for treatment;
- prohibition of CSO discharges during dry-weather;
- control of solid and floatable materials in CSO discharges;
- pollution prevention programs that focus on contaminant reduction activities;
- public notification to ensure that the public receives adequate notification of CSO occurrences and CSO impacts (especially on areas such as beach and recreational areas); and
- monitoring to effectively characterize CSO impacts and the accuracy of CSO controls.

The EPA's CSO policy requires that municipalities with CSOs begin implementing the 9 minimum control measures immediately and demonstrate their implementation by January 1997.

Proper operation and regular maintenance is already a part of the City of Winnipeg routine practices. The current inspection program will identify areas of concern, if any.

In-line storage has always been considered as a part of CSO control strategy for the City of Winnipeg. This has obtained since the first of the studies relating to basement flooding relief. This technology will be a part of the final control program. As noted there are still some DWF discharges in the CS system. The City has a continuing program of identification and rectification. The elimination of these discharges will be an objective of the final program.

With regard to maximizing flow to the WPCCs, the groups indicated that the studies should include a determination of how much flow can be diverted to the plant (mainly the NEWPCC). This would include:

- an evaluation of the WPCC's ability to treat additional flows from the perspective of primary plant treatment capacity (possibly at an increased overflow rate);
- PE bypass hydraulic capacity;
- solids handling capability at the WPCC;
- increased secondary treatment capacity through step feed, if practicable.

With regard to control of floatables from CSO, it was suggested that in-river booms could be an interim solution. This could also include end-of-pipe netting for trapping debris. It was also suggested that simple screens be considered. The City already have very coarse screens at the outfall of the CSOs, although they are not designed to remove normal floatables. The negative aspect of the outfall booms/nets is that they are unsightly. On the other hand, these measures would heighten public awareness of litter control (street and toilet). Installation of these devices would demonstrate positive efforts on the part of the City and would permit monitoring of litter and debris quantities in CSOs. This could also form a part of a pilot project.

In discussing pre-treatment programs, the group proposed targeting industry to determine which are tributary to the CSOs and enhance at-source pollution prevention programs.

In addition to the above 9 minimum BMPs, **the group proposed that the City expand its litter control program.** This expansion would include:

- **ongoing education**, such as the bill stuffer prepared by the City; **the possible implementation of a program such as plastic bags used in Switzerland for collecting dog feces ("Doggy-Bags?")**;
- **possible installation of inlet controls** (hoods on catchbasin outlets such as used in New York);
- **painting of a fish on the curb at each catchbasin inlet** to inform people that what is dumped in the catchbasin or thrown on the street, will end up with the fish in the river.

The group also recommended **a review of the current street-cleaning program** and recommended that, where economically feasible (these operations are labour intensive) street-cleaning frequency be increased. This should be evaluated during the course of the study, although it is often found not to be cost-effective in itself.

The group endorsed water conservation as a means of reducing dry-weather flows and hence increasing treatment plant capacity. They also **encouraged the elimination of the residual roof connections** to the sewer system (apparently about 95% of the residential roof downspouts are disconnected in Winnipeg combined sewer districts), wherever practicable. The group also recommended that **the basement flooding relief program should be integrated with the CSO control program** and also that the City educate the public as to the aspects of CSO control that are part of the basement flood relief program. **In executing the basement flood relief program, it was proposed that consideration be given to oversizing pipes so as to increase in-line storage capacity.**

3.4.2 End of Pipe Treatment

One of the study groups noted the following concerns with implementing end-of-pipe treatment:

- These measures incur environmental impacts, which can be significant.
- There is a concern with regard to handling hazardous materials (chlorine, sulphur dioxide).

- Public acceptance is an important issue. Local residents will suffer from the NIMBY syndrome. This can be addressed by site enhancement but will add to the cost.
- In many combined sewer districts there is insufficient space available at the combined sewer outlet, as these areas are often completely developed.
- Other concerns associated with end-of-pipe treatment are:
 - maintenance issues;
 - cleaning;
 - odour (an environmental concern); and
 - operating costs.

Hybrid alternatives were considered by one group, which would be designed to remove floatables and solids. These would comprise screens with VSSs and/or retention treatment basins. These would be initiated in conjunction with WPCC disinfection but, in the concept considered, would not involve disinfection of the CSOs.

3.4.3 CSO Coliform Control

Careful study and evaluation will be required of the full CSO disinfection option. Concerns relate to handling of chemical disinfectants and other public concerns. It could be considered as a limited control option designed to protect specific river-use zones. In the opinion of the group, benefits of this technology would have to be assessed. This control technology is a variation of the hybrid alternative and would remove floatables and solids prior to the disinfection process.

3.4.4 Other Technology

A number of miscellaneous points were raised by one of the discussion groups which must be considered in the final assessment of control alternatives. These are as follows:

- **Consideration must be given to multiple district solutions** whenever practicable and economically justified. Such solutions could comprise shared off-line storage, shared VSS, shared tunnel storage/transport, etc.
- **Selected separation should continue to be considered** as part of the basement flood relief programs where economically feasible. It must, however, be borne in mind that there will still be floatables from the separated land drainage sewers.
- **Distributed storage within the districts should be considered.** Such distributed storage could be accommodated by sewer oversizing in the basement flood relief program.
- **Dry-weather flow data should be refined,** including monitoring and evaluation of inflow/infiltration.
- Weir lengths for **inline storage control** could be minimized by air syphons (a design detail, but valid).
- **End-of-pipe screening of CSOs is a practical alternative and could possibly incorporate the use of the flood pumping stations.**

3.5 EXTERNAL LIAISON

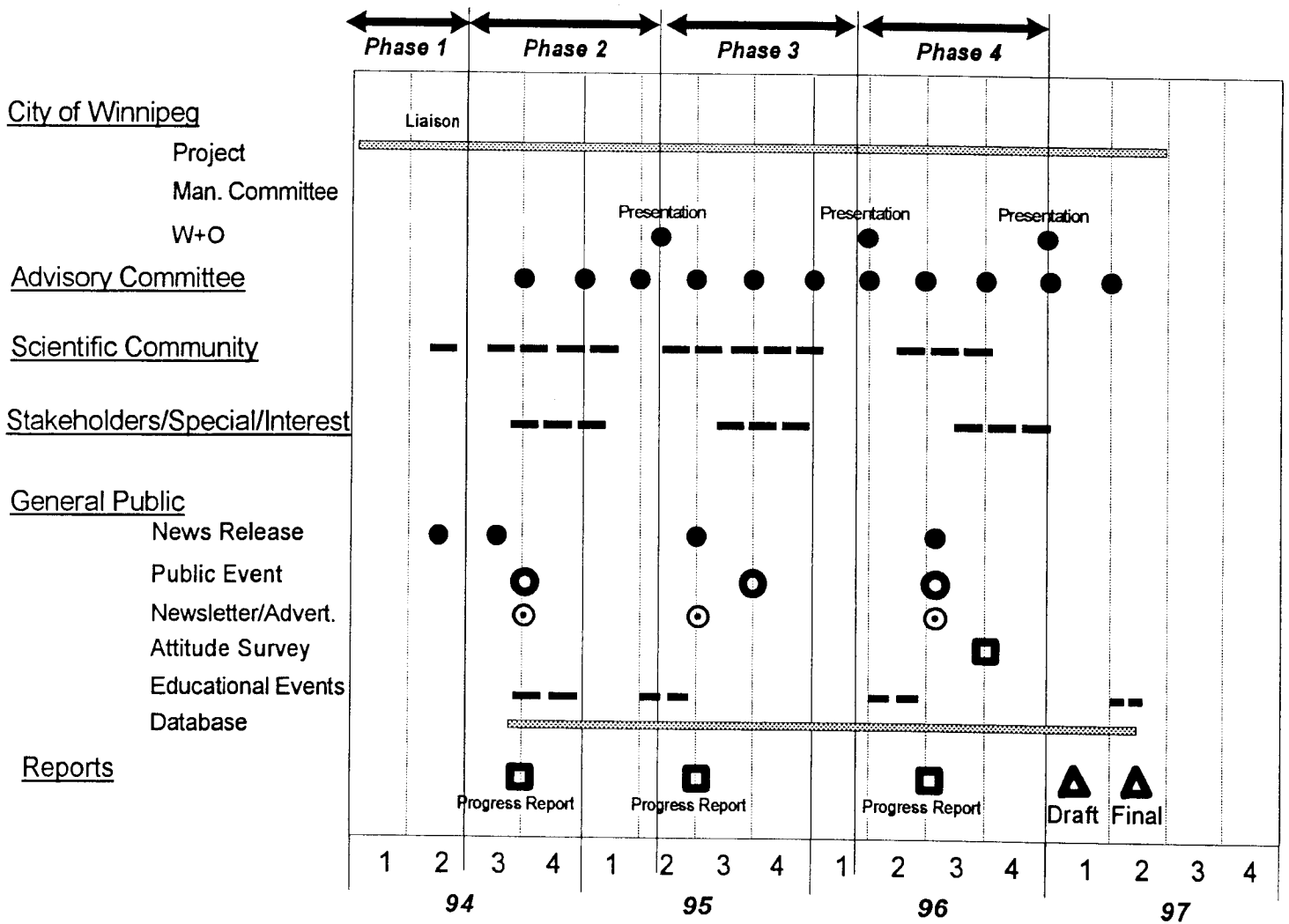
M. McKernan and G. Rempel gave an overview of the Technical Memorandum No. 8 "Public Communication". The program as outlined included a discussion of the issues related to CSOs, communication structure (advisory committee, scientific and public consultation) and a potential consultation program. The program as described is shown on **Figure 3** from the Technical Memorandum No. 8.

After the overview, a meeting of the whole workshop was held to discuss content and to make suggestions as to the program.

The group agreed that the objective of the public communication program is to raise awareness. It can be expected that people will react differently to the information offered, but the intent is to provide the basis for the public to evaluate the proposals. A central message of the public communications is to invite people to participate in making important choices. N. Wheatley suggested that **this awareness of the CSO issues should be raised as soon as possible and should be kept in front of the public throughout the duration of the study (and beyond).** As part of this awareness program, G. Rempel noted that the study team was

CSO MANAGEMENT STUDY

PUBLIC COMMUNICATION PROGRAM



June 8, 1994
Figure 3

proposing to produce a Phase 1 "reader-friendly" report, with the technical memoranda used as stand-alone appendices. Under this concept, a Phase 1 technical report would not be produced. A technical memorandum on the workshop results would be provided. B. MacBride supported this concept and the group agreed.

N. Wheatley felt that the theme for public education should reflect our perception of how people see the river. In the case of Boston, the catchphrase was "clean, alive and accessible". She suggested something along these lines should be developed for Winnipeg rivers. P. Moffa/Rowney noted that **the study team should decide what they want to find out, for example, "how do people think the river should be"**. P. Moffa noted that **Hartford, Connecticut had put together a video which laid out the objectives of their program.** He suggested that **W. Gray might be able to obtain a copy of this video.**

P. Moffa noted that **the communication program should get people sufficiently involved so as to feel that they are participating in the overall program and in the decision-making.** He suggested that consideration should be given to selecting a group and a leader to reflect public opinion. This could be academic or otherwise. G. Zukovs suggested creating a "community profile" to identify their interests and therefore how to target the information. In this regard, B. Borlase noted that the information should be tailored to the listening public.

One of the main factors under control of the public is litter control and floatables in the CSOs. N. Wheatley proposed that **pollution prevention should become one of the main thrusts of the public communication program and that the message should be taken to the schools.** This could be done through an essay contest in connection with a public event for example. The advantage of such an approach is that the children will bring out the parents.

With regard to the holding of a public event, an example was given of the recent City of Windsor (Ontario) event called "A Day at the River". This included free hot dogs, balloons and displays, and was associated with a number of other City events. It included different locations within the City and a passport which was stamped at each event. The two major focuses of this event were the CSO study which is currently being undertaken, as well as the opening of an extension to one of the two sewage treatment plants within the City. It was very successful.

A number of specific suggestions were made. P. Moffa noted that **making a connection with the editorial board of the newspaper can be worthwhile if it can be done.** TetrES suggested that a **Bulletin Board Service (BBS) as a "free-net" could be used as an information line and/or a forum for public feedback.**

The possibility of **interviews on a radio talk show (e.g., Peter Warren show)** was suggested. G. Zukovs noted that the team's effort in public communication could provide a valuable contribution to future hearings and their results.

4.0 PHASE 2 WORKPLAN

G. Rempel reviewed the background of the overall study, the role to be played by the Phase 2 Program ("Addressing the Wet-Weather Flow Problem") and circulated copies of the workplan for review and comments. Since there was limited time available to complete the workshop, the participants were asked to study the activity diagram and to comment back to the study team as to suggested modifications. N. Wheatley did comment that **the workstream on control alternatives should include a section on BMP, i.e., the EPA 9 minimum control requirements. This activity would probably fall in one of those already included on the activity diagram but would probably require an additional time allowance for an increase in the scope of this review.** It was suggested that **E. Sharp arrange for the City to develop their perspective on the City's current practices with regard to BMP, i.e., disconnection of roof drains, street-sweeping, catchbasin cleaning, sewer flushing and the like.**

As part of the Phase 2 Workplan, it is intended that the study team (hopefully, in association with City representatives) make site visits to CSO control facilities. These would either be full-scale or pilot devices. Among the possibilities discussed were:

- a two-day trip to southern Ontario which could include visits to:
 - the Hamilton real time control/RTB facility;
 - a second storage basin currently under construction at the beaches in the City of Toronto;

- the high-rate treatment demonstration unit, VSS (Storm King) plus disinfection, pilot study in Scarborough.
- such a visit could also include a visit to Saginaw, Michigan to visit a recently installed VSS in combination with an RTB.

P. Moffa noted that the City of New York will be running side-by-side tests on three different VSSs in 1995. He is involved in these tests which will provide an opportunity to witness the performance of different technology on the same CSOs.

5.0 CLOSURE

G. Rempel closed the session by asking for people's comments on the workshop. The general consensus was that the workshop was well organized. Adequate background material was provided for participants. The individual group discussions were considered useful. The agenda was considered ambitious but attainable. It was felt that the workshop had achieved its goal of getting feedback from the key players. There was concurrence by the participants in the general direction taken in Phase 1 and being proposed for Phase 2.

The results of the working sessions are summarized below:

CSO Issues:

- The main river quality concerns are floatables and bacteriological quality;
- CSO control and basement flooding must be addressed together;
- public perception and public education will play a key role in the final solution; and
- cost/benefit analyses of a range of options will be mandatory to assist the public in participating in decision-making.

Technical Approach

The hierarchy of model applications developed in Technical Memorandum No. 7 was accepted.

Data Assessment and Monitoring Needs

The list of possible monitoring activities developed at the Workshop was referred to the study team for evaluation. Proposed activities will be developed and discussed with the City.

Control Technology

The whole range of control alternatives will continue to be evaluated as potential technology. BMP will be considered as a first priority for CSO control measures.

Public Communication

Raising public awareness was endorsed by the Workshop participants as essential for the CSO study. The general direction of the program was considered appropriate.

Phase 2 Workplan

As a result of the Workshop, the Study Team proposes to continue with the general direction outlined for Phase 2 in the Proposal. The interrelationship of these activities is shown on the attached Phase 2 - Activity Diagram. This diagram has been modified from that tabled at the Workshop to reflect the workshop results. The Public Communication workstream has been revised significantly and many specific activities in other workstreams will be altered in their character to reflect the comments made at the Workshop.

APPENDIX A

AGENDA FOR THE TWO-DAY WORKSHOP

ITINERARY FOR PHASE 1 WORKSHOP

HELD AT THE WINNIPEG SQUASH CLUB, 275 STRADBROOK

DAY 1: 20 June 1994 (morning)

8:00 to 8:30 Coffee and Muffins

8:30 to 9:00 1. INTRODUCTIONS (G. Rempel)

9:00 to 9:30 2. BACKGROUND (G. Rempel)

- CSOs in Winnipeg
- Local Regulatory Perspective
- Terms of Reference
- Objectives of Phase 1 Workshop

9:30 to 10:00 3. INFRASTRUCTURE (B. Gladding)

- Wastewater Systems
- Treatment Centre
- WWF Operation

10:00 to 10:30 4. WWF PERSPECTIVE ON LOADINGS (N. Szoke)

10:30 to 11:15 5. RECEIVING WATER (D. Morgan)

- Red River
- Assiniboine River
- Lake Winnipeg

11:15 to noon 6. REGULATORY PERSPECTIVE

- Canada - D. Weatherbe (15 min)
- USA - N. Wheatley (15 min)
- Europe - G. Zukovs (15 min)

noon - 1:00 Lunch

DAY 1: 20 June 1994 (afternoon)

- 1:00 TO 2:10 7. CSO ISSUES (G. Rempel)
- WORKING SESSION
 - preparation/direction (10 min)
 - 3 individual sub-groups and group discussion (20 min)
 - 3 individual group presentations (10 min each)
 - summary of group presentations (10 min)
- 2:10 to 2:30 8. TECHNICAL APPROACH (G. Rempel)
- OVERVIEW
 - Needs
 - Methods/Models/Evaluation
 - RECOMMENDED APPROACH
(Runoff/Transport/Treatment/Receiving Stream)
- 2:30 to 3:20
- WORKING SESSION
 - Group-wide discussions
- 3:20 to 3:50 9. DATA ASSESSMENT AND MONITORING
- OVERVIEW (Runoff, Interceptor/Treatment, River)
 - Data Deficiencies
 - Potential Monitoring
- 3:50 to 5:00
- WORKING SESSION
 - preparation/direction (10 min)
 - 3 individual sub-groups and group discussion (20 min)
 - 3 individual group presentations (10 min each)
 - summary of group presentations (10 min)

DAY 2: 21 June 1994

8:30 - 9:00 Coffee and Muffins

9:00 to 9:50 10. CSO CONTROL TECHNOLOGY

- Overview of Experience Elsewhere
 - M. Parente (20 min)
- Presentation by
 - G. Zukovs (15 min)
 - P. Moffa (15 min)

- 10:00 to 11:00
- WORKING SESSION - POTENTIAL CONTROLS FOR WINNIPEG
 - preparation/direction (10 min)
 - 3 individual sub-groups and group discussion (20 min)
 - 3 individual group presentations (10 min each)
 - summary of group presentations (10 min)

11:00 to 11:20 11. EXTERNAL LIAISON

- OVERVIEW

- 11:20 to 12:30
- WORKING SESSION: COMMUNICATION STRATEGY
 - preparation/direction (10 min)
 - 3 individual sub-groups and group discussion (20 min)
 - 3 individual group presentations (10 min each)
 - summary of group presentations (10 min)

12:30 to 1:30 Lunch

1:30 to 2:30 12. PHASE 2 WORKPLAN (G. Rempel)

- Conceptual Overview of Phases 2, 3, and 4
- WORKING SESSION - PHASE 2 WORKPLAN
 - Group discussions

2:30 to 3:00 13. SYNOPSIS OF WORKSHOP (G. Rempel)



APPENDIX B

ADDRESSES, PHONE AND FAX NUMBERS OF WORKSHOP PARTICIPANTS

NAMES	ADDRESS	PHONE AND FAX #
E. Sharp, P.Eng. B. MacBride, P.Eng. B. Borlase, P.Eng. A. Permut, P.Eng. P. Lagasse, P.Eng. M. Shkolny, P.Eng. D. Wardrop, P.Eng. R. Sawchuk	City of Winnipeg Waterworks, Waste & Disposal Dept. 1500 Plessis Road Winnipeg, Manitoba R3C 5G6	Direct lines: (204) 986-4476 986-4479 986-4435 986-3252 986-4434 986-4488 986-4469 986-???????? Fax: (204) 224-0032
G. Rempel, P.Eng. J.M. McKernan N. Szoke, P.Eng. D. Morgan, P.Eng.	TetrES Consultants Inc. 603-386 Broadway Winnipeg, Manitoba R3C 3R6	Phone: (204) 942-2505 Fax: (204) 942-2505
R.J. Gladding, P.Eng. R. Foster, P.Eng. G. Steiss, Senior Technologist	Wardrop Engineering Inc. 400-386 Broadway Winnipeg, Manitoba R3C 4M8	Phone: (204) 956-0980 Fax: (204) 957-5389
D. Weatherbe, P.Eng.	Donald G. Weatherbe Associates Inc. 1352 Safeway Crescent Mississauga, Ontario L4X 1H7	Phone: (905) 896-4759 Fax: (905) 896-7954
G. Zukovs, P.Eng.	W ₂ O Suite 201 - 1 Port Street East Mississauga, Ontario L5N 4N1	Phone: (905) 891-2400 Fax: (905) 891-2554
M. Parente, P.Eng.	Gore & Storrie 7th Floor - 3660 Hurontario Street Mississauga, Ontario L5B 3C4	Phone: (905) 566-4666 Fax: (905) 566-4670
C. Rowney, P.Eng.	Gore & Storrie Suite 720 - 135 West Central Blvd. Orlando, Florida 32801 U.S.A.	Phone: (407) 872-3339 Fax: (407) 872-3336
R. Skrentner, P.E.	EMA Services Inc. 1970 Oakcrest Avenue St. Paul, Minnesota 55113 U.S.A.	Phone: (612) 639-5635 Fax: (612) 639-5600
N. Wheatley Director of Technical Support	Massachusetts Water Resources Authority Charlestown Navy Yard 100 First Avenue Boston, MA 02129	Phone: (617) 242-7310 Fax: (617) 241-6550
P. Moffa, P.E.	Moffa and Associates 5710 Commons Park P.O. Box 26 Syracuse, NY 13214	Phone: (315) 449-3010 Fax: (315) 449-0443

APPENDIX C

ITINERARY FOR CSO BOAT CRUISE

MEMORANDUM

TetrES CONSULTANTS INC.

TO: CSO Workshop Participants
(see distribution list) **DATE:** June 9, 1994

FROM: Nick Szoke **PROJECT:** 0510-A-38-09

SUBJECT: CSO WORKSHOP INFORMATION

Following is some useful information with respect to the upcoming Workshop which you may find helpful.

A block of rooms are available at the Hotel Fort Garry (222 Broadway). This hotel is located in downtown Winnipeg and in close proximity to the Winnipeg Squash Club, which is where the workshop will be held. If you would like to stay at the Hotel Fort Garry, call 1-800-665-8088, and indicate that a block of rooms have been reserved under the name TetrES at a rate of \$69.00 Canadian per night.

We are still in the process of arranging a boat cruise for Sunday night (June 19) from 6:00 p.m. to 10:00 p.m. The tentative schedule is as follows:

- Workshop delegates requiring transportation to the Kildonan Yacht Club (33 Valhalla) meet in the Hotel Fort Garry Lobby at 5:30 p.m.
- We will board the Windabee II at 6:00 p.m. from the Kildonan Yacht Club. Refreshments and finger foods will be served during the cruise. The Windabee II will travel down the Red River to the North Perimeter near the NEWPCC outfall then back up the Red River to the Forks (confluence of the Red and Assiniboine River). The tour will then travel up the Assiniboine River to the Maryland Street bridge, and then return to the Forks where it will continue to travel upstream of the Red River to the South Perimeter Bridge near the SEWPCC outfall. The Windabee will then turn around and travel back to Pier 7 (restaurant) where it will dock. The tour should be completed by 10:00 p.m.
- Those requiring transportation back to the Hotel Fort Garry are asked to make arrangements with Roger Rempel during the cruise.

The Workshop is scheduled to start at 8:00 a.m. the following morning at the Winnipeg Squash Club (275 Stradbrook), which is a short taxi cab ride from the Hotel Fort Garry.

Please let us know if you decide to stay at a different hotel during your visit to Winnipeg. Any alteration to this schedule will be left as a message to you with your Hotel receptionist when you arrive.

MEMORANDUM

TetrES CONSULTANTS INC.

TO: CSO Team and City Committee DATE: June 15, 1994
FROM: Nick Szoke PROJECT: 0510-A-38-09
SUBJECT: **REVISED ITINERARY, CSO BOAT CRUISE, JUNE 19, 1994**

On June 8 and June 9 a memorandum was sent to all participants and included a tentative schedule for the CSO Boat Cruise planned for Sunday June 19, 1994. The schedule has been finalized and is discussed in detail below.

There will be two boarding times for this cruise, the full tour will begin at 6:30 p.m. at Pier 7 and the shorter version at 8:00 p.m. at the Forks.

- For the full tour, pre-boarding on the Wendeeb II is scheduled between 6:30 and 7:00 p.m. at Pier 7.
- Out of town workshop participants along with City, TetrES and Wardrop participants who wish to take in the full river tour are asked to meet in the lobby of the Hotel Fort Garry no later than 6:15 p.m. Transportation will be provided to Grapes Pier 7 (1700 Pembina Hwy).

Please contact Nick Szoke to specify which boarding time you have chosen as well as your transportation needs, no later than noon Friday June 17, 1994, so all the arrangements can be made (204-942-2505).

- The boat will leave Pier 7 at 7:00 p.m. and travel down the Red River to The Forks (confluence with the Assiniboine River).
- The Wendeeb II will dock at the Forks at 8:00 p.m. (using the Red River Dock) and all remaining workshop participants will board.
- The Wendeeb will cast off shortly after 8:00 p.m. and travel downstream to the North Perimeter near the NEWPCC. It will reach this destination between 8:45 - 9:00 p.m., depending on cast off time.
- We will then turn around, return to the Forks area arriving at about 10:00 p.m.
- At this point we will travel up the Assiniboine River to the Maryland Bridge, turn around and return to the Forks area at approx. 10:30 p.m.
- The Wendeeb II will dock at the Forks and all workshop participants will disembark.
- TetrES staff will escort the out of town participants back to the Hotel Fort Garry (located only a short walk from the Forks area).

Please make your own transportation arrangements from the Forks (if required).

Finger foods and refreshments will be served.

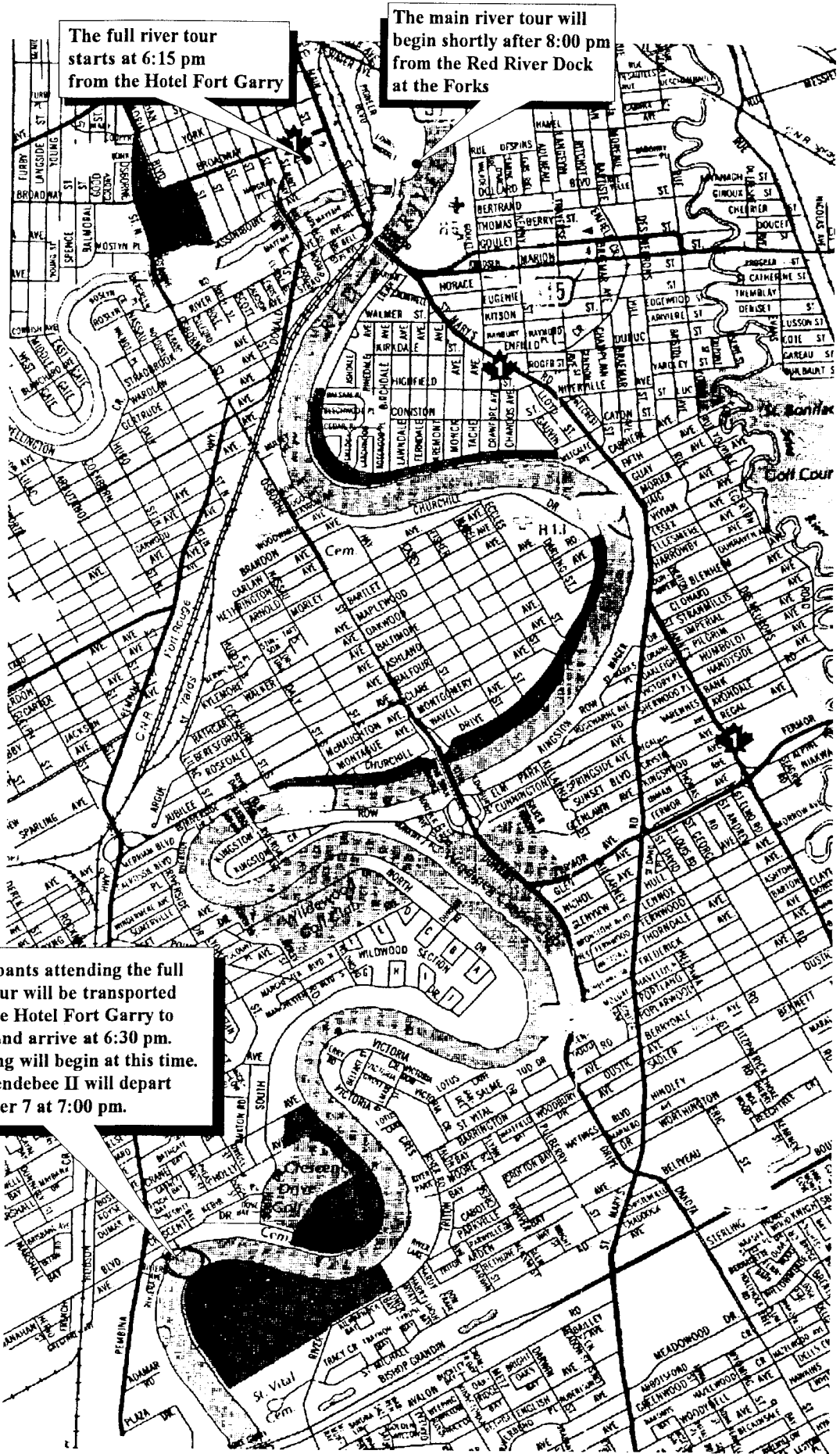
The tour will give a "river view perspective" of the CSO districts in relation to two of the three outfall areas in Winnipeg (NEWPCC and SEWPCC). The route taken will cover approximately 80% of the CSO districts.

dd/

The full river tour starts at 6:15 pm from the Hotel Fort Garry

The main river tour will begin shortly after 8:00 pm from the Red River Dock at the Forks

Participants attending the full river tour will be transported from the Hotel Fort Garry to Pier 7 and arrive at 6:30 pm. Boarding will begin at this time. The Wendee II will depart from Pier 7 at 7:00 pm.



APPENDIX D

"A NEW POLICY ON CSOs"

A New Policy

On April 11, 1994, EPA administrator Carol Browner signed a final regulation that outlines the National Combined Sewer Overflow (CSO) Policy. The new policy culminates years of effort by federal regulators, state and local governments, and environmental and

industry groups to deal with a complex technical problem.

Combined sewer systems are found primarily in older metropolitan communities of the northeast, Mid-Atlantic, and Great Lakes regions of the U.S. Some are found in the west coastal and northwestern states. Approximately 85% of systems with CSOs are in 11 states (Maine, Mich., Conn., N.Y., N.J., Pa., Ill., Ind., Ohio, W.Va., and Vt.). Although most visible CSO problems are associated with large cities, 90% of the systems with CSOs are found in communities with populations of less than 100,000, and about 60% serve communities of fewer than 10,000.

Like all point sources of pollution discharging to water of the U.S., CSOs are covered under the Clean Water Act. But until recently, limited guidance was developed at the federal level to translate the general requirements of the

Clean Water Act into detailed procedures for issuing permits that are specifically aimed at CSO discharges. This was partly because CSOs pose technical problems that are much more complex than those posed by other point sources and industrial facilities.

With the new CSO control policy, EPA has developed a method to coordinate the planning, selection, design, and implementation of CSO management practices and controls to meet the requirements of the Clean Water Act and to involve the public fully in the decisionmaking process.

It was long believed that combined sewer flows would be diluted by stormwater in the

sewer and by high stream levels during wet weather, and would have little impact on the receiving waters. However, in 1984, an EPA study concluded that "the amount of toxic priority pollutants found in the influent to publicly owned treatment works (POTWs) served by combined sewers increases significantly during and immediately following a storm event." This conclusion is not surprising because the systems are meant to deliver pollutants to the treatment plant. But the study, which included eight drainage areas in four cities, also found 46 toxic pollutants in CSOs, 11 of which were detected more than 50% of the time. Metals and toxic organics were present at high levels.

Numerous studies have concluded that CSOs are major contributors to water pollution in some municipalities. Recreational beach closings and shellfish bed closings have been attributed to CSOs. They are a major cause of contaminated shellfish beds and fish kills. Between 10% and 20% of harvest-limited shellfish beds, amounting to 239,000 ha (597,000 ac), were directly attributable to combined sewer discharge.

ISSUES IN CSO PERMITTING

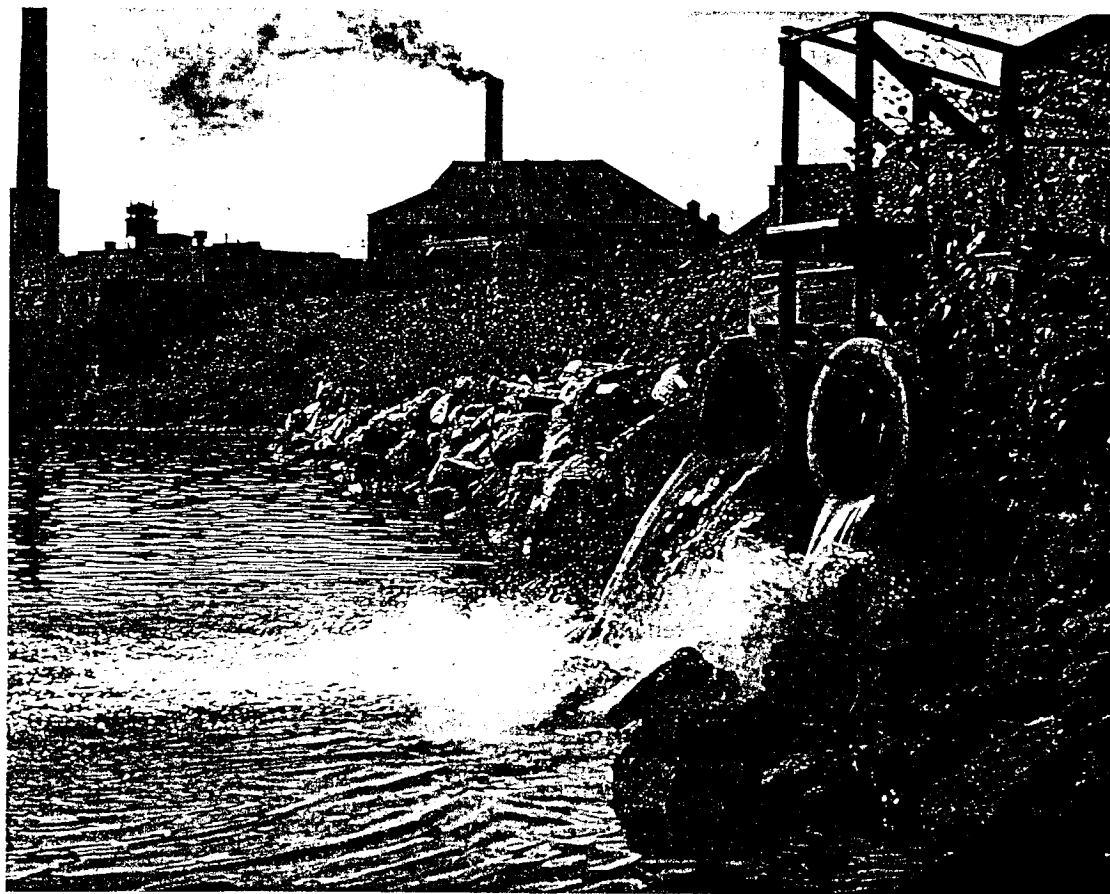
One of the major issues involved in the application of CSO controls is how the technologies should be applied. Combined sewer overflows differ widely in the design problems they present. They contain different pollutants, have variable flow rates over time, and produce different impacts on receiving water bodies. Control technologies must be matched to each set of conditions. A wide range of technologies is available, with a wide range of associated costs. A specific technology should be selected to prove effective control at the lowest required cost. This decision is difficult because the effectiveness of

How EPA's new control policy evolved

Jeffrey L. Lape

Timothy J. Dwyer

on CSOs



Combined sewer overflows are a major contributor to water pollution in some municipalities.

some control technologies has not been demonstrated under long term service conditions. Control technologies for CSOs range from simple measures, such as improved operation and maintenance, to major capital programs, such as the addition of advanced treatment and sewer separation.

Other major issues include the way in which water quality-based requirements are applied. Most EPA and state standards are based on dry-weather conditions. Dry-weather CSOs are banned under the Clean Water Act. Since CSOs occur under wet-weather conditions, existing standards may not be appropriate.

Another barrier to an effective CSO program

is the scarcity of useful information. There is little agreement on how to characterize, monitor, and model combined sewer systems and CSOs.

BACKGROUND OF THE NEW POLICY

From 1972 through 1988, CSOs received relatively little attention in terms of rule-making at the federal level or permit conditions at the individual facility level. In part, this lack of attention was because discharges from treatment plants and industrial point source categories were a higher priority for federal regulatory action. Additionally, EPA, for various reasons, did not develop and promulgate any national effluent guidelines and limitations for CSOs. Until the

late 1980s, individual states and local jurisdictions made the most progress in addressing CSO problems.

In August 1989, EPA's Office of Water issued the National Combined Sewer Overflow Strategy, which was published in September 1989 (54 FR 37370). The strategy reaffirmed that CSO are point sources subject to National Pollutant Discharge Elimination System (NPDES) permit requirements and the Clean Water Act. The strategy set forth three objectives:

- to ensure that, if CSO discharges occur, they are only a result of wet weather;
- to bring all wet-weather CSO discharge points into compliance with technology-based requirements of the Clean Water Act and applicable state water quality standards; and
- to minimize water quality, aquatic biota, and human health impacts from wet-weather overflows.

In addition, the strategy called upon states to develop by January 15, 1990, statewide CSO permit strategies. To date, 29 states have submitted strategies and received approval; 1 state has received conditional approval; and 21 states have documented that they do not need strategies because they do not have CSOs.

The 1989 strategy recommended that NPDES permits which included CSOs contain, as minimum controls, the following six control measures:

- proper operation and regular maintenance;
- maximum use of the collection system for storage;
- review and modification of pretreatment programs;
- maximum flow delivery to the treatment plant;
- prohibition of dry-weather overflows; and
- control of solid and floatable materials in CSO discharges.

The strategy further recommended that communities should choose the most cost-effective control measures to ensure compliance with water quality standards.

A NEW APPROACH

By mid-1991, EPA had concluded that the implementation of the 1989 strategy was not proceeding rapidly enough. To help develop an expedited permitting strategy, the Office of Water requested the advice of the Management Advisory Group, a committee formally constituted to provide guidance to the EPA assistant administrator for water, to help determine which CSO controls were appropriate, when they should be implemented, and how they should be

funded. As a result, the group recommended that the following three additional control measures be added to the six included in the 1989 strategy:

- required inspection, monitoring, and reporting of CSOs;
- pollution prevention measures, including water conservation to reduce CSO impacts; and
- analysis of public impacts for any areas affected by CSOs, especially beach and recreational areas.

The committee further recommended that a group be convened under a modified regulation and negotiation process to develop a nationally consistent permitting policy for controlling CSOs as expeditiously as possible.

In response to this recommendation, and in the interest of including all affected interest groups in the development of permit guidance, EPA initiated a consultative process. A work group was established with membership from key organizations (see below). The objective of the group was "to develop consensus on a consistent set of criteria with an adequate degree of specificity to be used in determining long-term CSO control programs and implementing NPDES permits."

Between July 23 and September 9, 1992, the

For the first time in 20 years, representatives of groups with different objectives and a stake in the CSO issue sat face-to-face.

Participants in CSO Policy Development

American Public Works Association

Association of Metropolitan Sewerage Agencies

Association of State and Interstate Water Pollution Control Administrators

Center for Marine Conservation

The CSO Partnership

Environmental Defense Fund

Lower James River Association

National Association of Flood and Stormwater Management Agencies

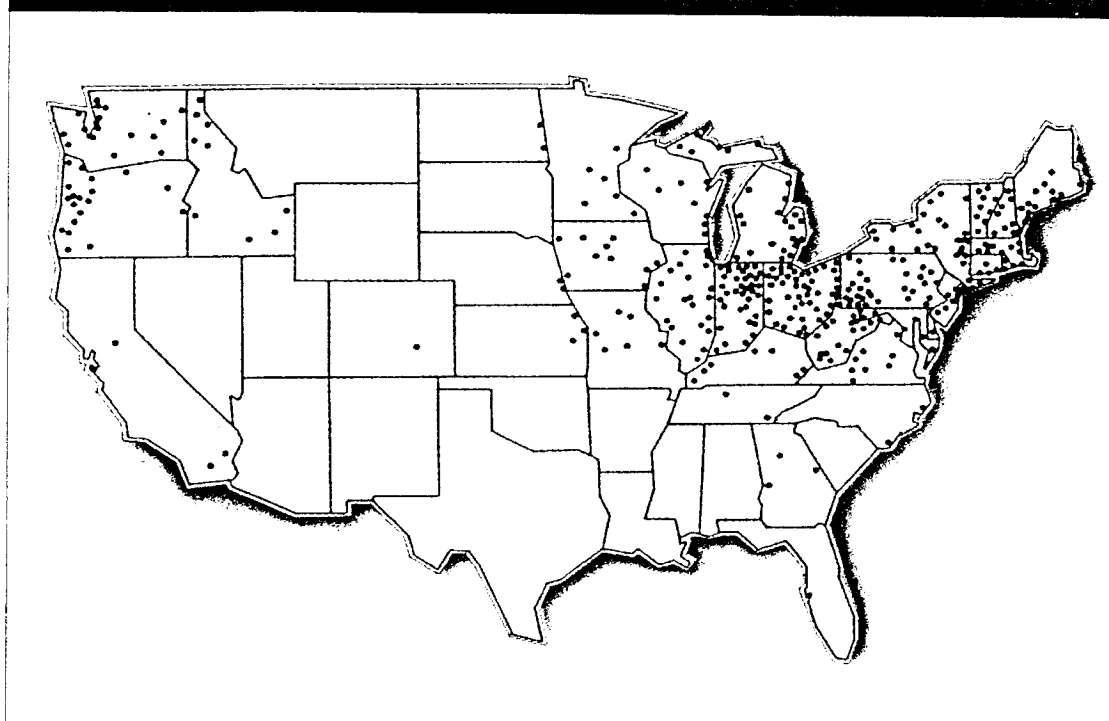
National League of Cities

Natural Resources Defense Council

Safely Treating Our Pollution

Water Environment Federation

Communities with Combined Sewer Overflow Points



Combined sewers serve about 43,000,000 people in an estimated 1,100 communities. Most of the CSO communities are located in the Northeast and Great Lakes regions. More than three-quarters of the communities are located in only 11 states.

work group met three times, and two smaller groups met for 3 days. The work group did reach a consensus on several major elements of a framework document for controlling CSOs, although several topics could not be resolved to the satisfaction of all participants at that time. Yet, the benefits of the work group's dialogue were that for the first time in over 20 years, representatives of groups with different objectives and a stake in the CSO issue sat face-to-face and shared their perceptions, interests, and goals. The work group was able to clarify the technical and economic issues that needed to be resolved before a national CSO control policy could be developed.

Strictly speaking, the participants in the negotiation process failed to achieve complete consensus. However, representatives from the environmental groups, municipalities, and states agreed to continue the attempt to draft a strategy. A subset of the original participants met in October 1992 under the auspices of the Association of Metropolitan Sewerage Agencies and the Natural Resources Defense Council, and produced a "CSO Framework Document" based in large part on the draft strategies submitted during the previous negotiation sessions.

EMERGENCE OF THE FINAL POLICY

On December 22, 1992, EPA's assistant administrators for water and enforcement signed the draft CSO control policy. The policy was

announced in January 1993 in the *Federal Register* with a comment period ending on March 22, 1993. EPA received 41 written submissions on the draft policy, including those of eight states, 13 municipal governments or associations, one environmental group representing five different organizations, and five professional or trade associations. The overwhelming tenor of the comments was supportive, with only one submission that could be classified as negative. During, and after, the public comment period, discussions continued and support for the policy continued to grow.

EPA proceeded to finalize the draft policy, on the basis of the submitted comments. It was published as the *Final Combined Sewer Overflow (CSO) Control Policy* in the *Federal Register* on April 19, 1994 (59 FR 18688).

The policy establishes a framework and lays out clear expectations for municipalities, NPDES permitting and enforcement authorities, and state water quality standard authorities for controlling CSOs. The policy contains provision for developing appropriate, site specific permit requirements. It provides for review of water quality standards in conjunction with development of a long-term CSO control plan. The policy also provides for enforcement initiatives to require the immediate elimination of overflows that occur during dry weather and ensure that the remaining Clean Water Act requirements are met as soon as possible.

The role that permitting authorities will play in implementing CSO controls is not the traditional one.

EXPECTATIONS FOR MUNICIPALITIES

Municipalities are expected to implement immediately the nine minimum controls and to submit documentation of their implementation as soon as possible but no later than January 1, 1997. The nine minimum controls are the six control measures from the 1989 EPA strategy and the three controls recommended by EPA's Office of Water Management Advisory Group.

Municipalities also are expected to undertake immediately the development of a long-term CSO control plan. Elements of the long term plan should include the following:

- a comprehensive characterization of the combined sewer system, CSOs, and impacts on the receiving water bodies;
- special consideration for sensitive environmental areas;
- an evaluation of a range of CSO control alternatives;
- coordination with the NPDES permitting authority and state water quality standard authorities when selecting control measures;
- development of a public participation plan;
- a schedule for implementing the selected CSO control measure that considers the municipality's financial capability; and
- implementation of a post-construction water quality monitoring program.

The policy provides the municipality with two approaches for showing that its selected CSO control will be sufficient to meet water quality standards. Under the "presumption" approach, the municipality can provide a specified level of control that is presumed to meet water quality standards unless there is data showing otherwise. For example, one of the specified levels of control is no more than an average of four to six overflow events per year.

Under the demonstration approach, the municipality can provide information and data showing that the selected CSO controls actually meet water quality standards.

EXPECTATIONS FOR PERMITTING AUTHORITIES

The policy expects the appropriate permitting authority (EPA or an approved state) to undertake the following activities:

- review and revise, as appropriate, the state CSO permitting strategy developed in response to the 1989 EPA strategy;
- develop and issue Phase I permits requiring the municipality to implement immediately the nine minimum controls, submit documentation of their implementation, and develop and submit a long-term CSO control plan;

- develop and issue Phase II permits requiring continued implementation of the nine minimum controls, implement the CSO control measures selected from the long-term CSOs control plan; and take appropriate enforcement measures.

Because the compliance dates in the Clean Water Act have passed, permitting authorities will issue or re-issue permits to require immediate compliance. When immediate compliance is not possible, schedules must be developed and included in an appropriate enforceable mechanism.

The role that permitting authorities will play in implementing CSO controls is not the traditional one associated with other permitting point source categories. The policy envisions that the permitting authority will maintain an on-going relationship with municipalities, state standards authority, and the public over the extended period of time that will be required to develop and implement the controls.

State water quality standard authorities involvement could include redefining more explicitly the recreational and aquatic life uses to be met in those bodies of water which have a CSO impact during wet weather.

NEXT STEPS

EPA is completing several guidance documents aimed at helping municipalities and permit authorities implement the final CSO policy. These include a manual for permit writers, a document on how to monitor and model combined sewer systems and CSOs, a guide for developing a long-term plan, a guide for municipalities on implementing the nine minimum controls, a guide for ranking and prioritizing CSOs, and a manual providing guidance on determining which measures are "affordable," and how this affordability affects the timing of implementation. EPA also has an outreach plan for promoting the policy. The agency will sponsor a series of workshops with information on the policy in an easily understandable format, to be held in various locations through the summer of 1994. ■

Jeffrey L. Lape is CSO matrix manager and Timothy J. Dwyer is an environmental engineer at the U.S. Environmental Protection Agency in Washington, D.C. Opinions expressed herein are those of the authors and do not necessarily represent the position of EPA.

Please rate this form by completing the article on page 79.

APPENDIX E

G. REMPEL'S PRESENTATION

WORKING SESSION CSO ISSUES

GENERAL ISSUES

- Water Quality (Fecal Coliform plus...)
- Basement Flooding
- Sewer Rehabilitation

WORKING SESSION

- Separate into 3 groups:
 - Red
 - Green
 - Blue
- Each group appoints "group leader/reporter", takes 20 minutes to develop their assessment
- Reconvene, each of the 3 "reporters" presents group assessment (10 min each)
- Entire group considers the individual reports

POTENTIAL QUESTIONS

- What are the key issues related to combined sewers?
 - basement flooding
 - environment policy
 - aesthetics, etc.
 - floatables
- What river use is likely to be affected?
- Is the impact likely:
 - real, perceived
 - short-term, long-term
 - direct, indirect
- Can the impact be evaluated?
 - technical analysis?
 - monitoring?
 - other
- Will CSO control likely enhance the river use?
 - If so, can enhancement be measured? How?
- Are there emerging regulatory issues?

Consider a matrix?

ISSUES	RIVER USE	IMPACT	EVALUATION	
---	---	---	---	---

OTHER POTENTIAL QUESTIONS

- Can CSO control be considered in the absence of WWPCC effluent disinfection?
 - Is it too early to say?

- Are WWF waivers of numerical objectives reasonable, e.g., exceedances of bacteriological levels for "x" duration after rainfall?

- If so, what durations, frequency are reasonable?

- How can priorities for WWF control be established?
 - source
 - river reach and associated uses
 - cost/benefit

- How important are the following in decision-making for CSO control?
 - public policy
 - environmental ethics/value judgements
 - regulatory policy
 - cost/benefit
 - economic justification

PHASE 1 WORKSHOP QUESTIONNAIRE

Please rate the following aspects of the CSO Workshop using the following scale:

A = Excellent, B = Good, C = Fair, D = Poor, E = Unacceptable

Aspects of CSO Workshop	RATING (please circle one)	COMMENTS
• Technical Memoranda		
- Content	A B C D E	
- Quality	A B C D E	
- Readability	A B C D E	
- Provided in adequate time for workshop	A B C D E	
• Boat Tour		
- Perspective of local conditions	A B C D E	
- Identification of outfalls	A B C D E	
- Discussion of river issues	A B C D E	
- Length of tour	A B C D E	
- Arrangements	A B C D E	
• Out-of-Town Participants		
- Advance notice of Workshop date	A B C D E	
- Hotel arrangement	A B C D E	
- Hotel accommodation	A B C D E	

Phase 1 Workshop Questionnaire (cont'd)
Page 2

Aspects of CSO Workshop	RATING (please circle one)	COMMENTS
• Workshop General		
- Location	A B C D E	
- Workshop Facilities/Meeting Rooms	A B C D E	
- Agenda	A B C D E	
- Lunch	A B C D E	
- Coffee and snacks	A B C D E	
- Visuals	A B C D E	
Was time scheduled reasonably?	A B C D E	
Were presentations helpful?	A B C D E	
Would you suggest more or less presentation material (A = much more, E = much less)?	A B C D E	
Were the "break-out" sessions useful?	A B C D E	
Should we allow more time for discussion (A = much more, E = much less)?	A B C D E	
Would you prefer an outside chairperson rather than a study team member (Yes or No)?	Y N	
Do you feel you had adequate opportunity to contribute to discussions?	A B C D E	
Was the main workshop room setup conducive to open discussions?	A B C D E	

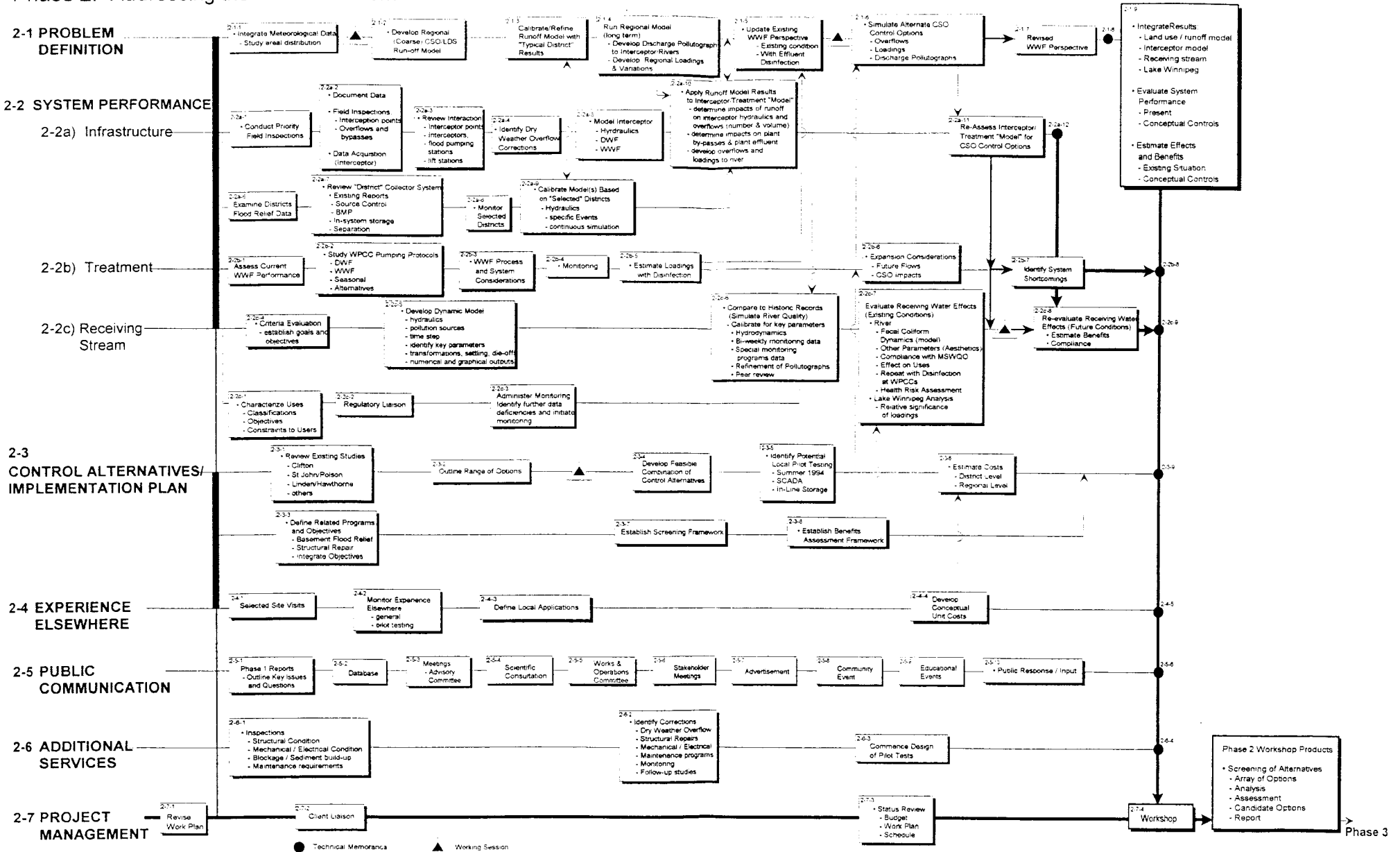


Figure 3.2