Agenda - Council - April 25, 2007

Report - Standing Policy Committee on Infrastructure Renewal and Public Works – April 10, 2007

Item No. 1 Project to raise level of flood protection for existing properties below 20.0 ft James Avenue
File PD

STANDING COMMITTEE RECOMMENDATION:

On April 18, 2007, the Executive Policy Committee concurred in the recommendation of the Standing Policy Committee on Infrastructure Renewal and Public Works and submits the following to Council:

1. That discussion with owners of properties meeting the proposed project criterion be initiated to determine their interest in upgrading their level of flood protection as outlined in the report from the Director of Water and Waste dated February 26, 2007.

2. That funds in the total amount of $378,000.00 be used from the current Floodplain Management Project (Account No. 003 181000 200652 2070000402) to fund projects for this year.

3. That the Proper Officers of the City be authorized to do all things necessary to implement the intent of the foregoing.

Report - Standing Policy Committee on Infrastructure Renewal and Public Works - April 10, 2007

DECISION MAKING HISTORY:

EXECUTIVE POLICY COMMITTEE RECOMMENDATION:

On April 18, 2007, the Executive Policy Committee concurred in the recommendation of the Standing Policy Committee on Infrastructure Renewal and Public Works and submitted the matter to Council.

STANDING COMMITTEE RECOMMENDATION:

On April 10, 2007, the Standing Policy Committee on Infrastructure Renewal and Public Works concurred in the administrative recommendations and submitted the matter to the Executive Policy Committee and Council.

On September 12, 2006, the Standing Policy Committee on Infrastructure Renewal and Public Works concurred in the recommendation of the Riel Community Committee, namely, that the Water and Waste Department be requested to prepare a cost benefit analysis and funding plan with respect to a program to assist property and home owners with the installation of permanent flood protection works.

COMMUNITY COMMITTEE RECOMMENDATION:

On July 18, 2006, the Riel Community Committee recommended to the Standing Policy Committee on Infrastructure Renewal and Public Works:

WHEREAS the frequency of flood events in the past several years has resulted in the expenditure of approximately one million ($1,000,000.00) dollars on average per event;

AND WHEREAS taxpayers at large are paying for the current protection;

AND WHEREAS the number of properties requiring protection has been significantly reduced as a result of flood protection improvements made after the flood in 1997;

AND WHEREAS flood protection to a level lower than the current requirement of 1997 flood level plus two (2) feet could provide a financial benefit to all three levels of government and, in particular, the taxpayers of the City of Winnipeg;

Report - Standing Policy Committee on Infrastructure Renewal and Public Works - April 10, 2007

DECISION MAKING HISTORY: (continued)

COMMUNITY COMMITTEE RECOMMENDATION: (continued)

THEREFORE BE IT RESOLVED that the Standing Policy Committee on Infrastructure Renewal and Public Works request the Water and Waste Department prepare a cost benefit analysis and funding plan with respect to a program to assist property and home owners with the installation of permanent flood protection works.

RE: PROJECT TO RAISE LEVEL OF FLOOD PROTECTION FOR EXISTING PROPERTIES BELOW 20.0 FT JAMES AVENUE

FOR SUBMISSION TO: THE STANDING POLICY COMMITTEE ON INFRASTRUCTURE RENEWAL AND PUBLIC WORKS

ORIGINAL REPORT SIGNED BY: Barry D. MacBride, P. Eng.
Director, Water and Waste Department

REPORT DATE: February 26, 2007

RECOMMENDATION(S):

1. That discussion with owners of properties meeting the proposed project criterion be initiated to determine their interest in upgrading their level of flood protection as outlined herein.

2. That funds in the total amount of $378,000.00 be used from the current Floodplain Management Project (Account No. 003 181000 200652 2070000402) to fund projects for this year.

REPORT SUMMARY

KEY ISSUES:

1. On September 12, 2006, the Standing Policy Committee on Infrastructure Renewal and Public Works concurred with the recommendation of the Riel Community Committee that a cost benefit analysis and funding program be developed to assist property owners with the installation of permanent flood protection works.

2. Recent high water levels of 20.1 ft James (July 2005) and 20.4 ft James Avenue (April 2006) have required sandbagging of a number of properties outside of the City's primary dikes. These high levels were as a result of large flood events and problems with reduced flow conveyance in the Floodway channel. The flow conveyance problem was due to a buildup of willow growth in the bottom of the Floodway channel as discussed in the Provincial Red River Floodway Operation Report Spring 2006. The Department's analysis indicates with regular vegetation maintenance of the Floodway channel, levels of 19 to 19.5 ft James Avenue would be more typical.

3. A methodology has been developed to assess the cost savings to the City for flood proofing properties below a flood level of 20.0 ft James Avenue.

4. The City would pay 90% of the flood protection costs for properties with a benefit/cost ratio greater than 1. Property owners would pay 10% of the cost (or work in-kind).

IMPLICATIONS OF THE RECOMMENDATION(S):

General Implications

	None
x	For the organization overall and/or for other departments
x	For the community and/or organizations external to the City of Winnipeg
	Involves a multi-year contract

Comment(s): Raising the level of flood protection for existing properties, where economically justified, would benefit the residents by providing permanent protection for recent flood events. This program would also reduce the City's recurring costs for preparing and delivering sandbags to these properties.

Policy Implications

	No
x	Yes

Comment(s): Requires a City financial contribution of 90% towards permanent dike protection when there is benefit/cost ratio greater than 1. This amount of assistance for flood proofing individual properties is different than previous programs.

Regulatory Implications

x	None
	Eliminates or reduces regulatory impact
	Proposes regulatory impact

Environmental Implications

x	None
	Yes - Comment(s):

Human Resources Implications

x	No
	Yes - Comment(s):

Financial Implications

x	Within approved current and/or capital budget
	Current and/or capital budget adjustment required

Comment(s): Funding for this project is included in the approved Capital Budget.

REPORT

REASON FOR THE REPORT:

On September 12, 2006 the Standing Policy Committee on Infrastructure Renewal and Public Works concurred with the recommendation of the Riel Community Committee (of July 18, 2006) that "the Water and Waste Department be requested to prepare a cost benefit analysis and funding plan with respect to assist property and home owners with the installation of permanent flood protection works".

HISTORY:

Funds in the amount of $300,000.00 are included in the 1999 to 2003 Capital budgets for the Floodplain Management Project.

On June 23, 1999, Council adopted the Report of the Standing Policy Committee on Public Works dated May 31, 1999 titled "Secondary Diking Enhancements – Community Ring Dikes – Policy on Funding and Maintenance." With this report, Council formally adopted a policy for funding community dikes and individual flood protection projects. Council also adopted a Policy on Assistance During Floods as discussed later.

On September 27, 2006, Council adopted the Report of the Standing Policy Committee on Infrastructure Renewal and Public Works that recommended the conversion of the temporary clay dike that was constructed in the spring of 2006 between 275 and 299 Scotia Street be converted to a permanent clay dike, with the residents paying 10% of the cost or "work in-kind" contributions. Funding for the project estimated to cost $197,000 came from the Floodplain Management Project Account.

DISCUSSION:

<u>Past Flood Proofing Initiatives for Areas Outside City's Primary Dikes</u>

Since 1981, there has been a requirement that all new properties built within the floodplain should be built to a Flood Protection Level (FPL) of 27.8 ft James Avenue in accordance with the *Designated Floodway Fringe Area Regulation (266/91)*. However, the majority of riverbank properties predates this regulation and even predates the devastating 1950 flood.

Following the 1996 flood, when the Red River reached 19.4 ft James Avenue the City funded a program to convert temporary sand bag dikes to permanent clay dikes. Details of the program were that the City would provide engineering services, obtain the

necessary Waterway Permits, and place clay material. The property owners were responsible for final finishing of the clay dikes, namely topsoil, and seeding or sodding.

Following the 1997 flood, the City entered into a tripartite agreement with the federal and provincial governments to raise secondary dikes within Winnipeg up to the legislated flood protection level (FPL) where possible. The agreement provided $11,135,000 cost shared $5,200,000 each with the federal and provincial governments and $735,000 from the City. The City adopted funding level varied depending on the type of project:

- For community ring dike projects, 10% of the total dike cost not covered by the Federal and Provincial Governments, were recovered from the benefiting properties protected by the dike through a local improvement; and,
- For individual flood proofing projects, the same funding formula applied by the Province in the Red River Valley was applied within the City. The cost sharing basis for the individual sites was based on a contribution by the property owner of 25% up to a maximum of $10,000 and property owners were responsible for all costs over $70,000. Typically flood proofing projects could be done for under $70,000 if it did not involve costly bank stabilization works.

Of the 850 properties identified as potentially eligible for the program, 219 homes or approximately 25% elected to participate in the program, which included 200 properties from 5 community ring dike projects and 13 individual sites. The largest community ring dike project was Kingston Row which saw extensive erosion protection and bank stabilization works done to provide long-term protection to 188 houses in the peninsula. The program also saw 6 condo/apartment projects flood proofed.

The program had a relatively low rate of participation for individual property protection. One of the reasons for the low rate was the funding formula. As indicated above, for those projects where bank stabilization works were required, a project could well exceed $70,000 and the homeowner would be responsible for 100% of the cost over $70,000. The program had a requirement that all individual properties would be flood proofed to the FPL of 27.8 ft James Avenue. Whether dikes could be built to a lower level and avoid costly bank stabilization works was not investigated. Of the 13 individual properties that participated in the program, 3 were demolitions and 10 had dikes or assembly walls built that flood proofed the property to the City's FPL.

It is also noted that on June 23, 1999 Council adopted policy on Secondary Diking Enhancement, there was a section called Policy on Assistance During [Future] Floods in which the following recommendation was adopted.

> *"Accordingly, it is recommended that the City recover the full cost of future flood protection assistance, including supply of material for temporary secondary dikes, from those property owners who elect not to participate in the Canada- Manitoba Flood Proofing Program"*

To date, the policy of recovery of costs for supplying sandbags has not been implemented. This is discussed in more detail later in the report.

The City entered a Tripartite agreement called Secondary Dike Enhancement Agreement which ended March 31, 2005.

Objective of New Program

The objective of this new initiative is to protect properties against frequently recurring flood levels where economically justified. Property owners would then only have to use temporary measures (i.e., sandbag dikes) for infrequent larger flood events like a 1997 type of flood.

Review of Historical River Levels

To establish an appropriate level of flood protection a review of recent flood events was undertaken. Up until quite recently it was very unusual for flood levels to exceed the 19 to 19.5 ft range as shown in the Table below.

Summary of Peak James Ave Flood Levels over 19 ft*

year	river level	remarks
1979	19.2	
1996	19.4	
1997	24.5	
2004	19.0	
2005 spring**	19.2	willow growth in bottom of channel reduces flow conveyance by 4000 cfs at peak
2005 summer**	20.1	"leafing" willow growth in bottom of Floodway channel reduces flow conveyance by 6000 cfs at peak
2006**	20.4	uncertainty in actual Floodway flows results in higher levels in Winnipeg.

* - peak James Ave levels following Floodway completion in 1968
** - levels in the City are higher than normal due to unusual flow conveyance issues with the Floodway channel

The peaks that occurred in 2005 summer and 2006 spring represent the 2nd and 3rd highest peaks since the Floodway was completed in 1968. However, these years represent unusual Floodway flow/level circumstances as noted in the table and footnote below[1].

[1] In 2006, the Province reported that initial Floodway operation for spring 2006 were based on Floodway flow estimates from spring and summer 2005. In 2005, Floodway flows had been greatly reduced by growth of willows in the channel. While some maintenance had been done on the channel it was generally felt this was not likely to cause a significant improvement in conveyance. A number of flow measurements during the spring 2006 flood confirmed that the flow in the channel was back to 94% of its 2001 capacity. This indicated that the partial removal of willows was quite effective. With an adjustment in Floodway flows, the 2006 spring peak would have been closer to 19.5 ft James Avenue versus the 20.4 ft recorded. (adapted from Red River Floodway Operation Report Spring 2006, Manitoba Water Stewardship, June 2006)

Almost all properties within Winnipeg are protected to a flood stage of at least18 ft. Raising the flood stage level to 19.5 ft would protect for all but one of the historical floods in the last 38 years since the Floodway was completed which was the 1997 "Flood of the Century". For flood protection purposes the City typically adds 0.5 ft to the Provincial James Avenue forecast mostly to account for uncertainties in projecting flood levels along the entire Red and Assiniboine River. Therefore for this benefit/cost analysis a level of 20.0 ft James was chosen.

The expansion of the Floodway will have no affect on floods in the 19 or 20 foot James Avenue range, as the expansion project is meant to mitigate floods of a 1997 magnitude or larger.

Based on the past 38 years of data, since the Floodway was placed into operation there have been 7 events where levels have exceeded 19 ft James. If the 1997 event is excluded as the proposed program is not designed for flood protection to such a high level there would have been 6 events or approximately 1.5 events in 10 years (1.5:10). Examining just the last 10 years, again assuming 1997 is not included, there have been 5 events in 11 years or approximately (5:10). Using a time period of 20 years as a reasonable period for this benefit/cost analysis given some of the inherent uncertainties in this type of analysis gives a potential range of floods from 3 to 10 with an average of 6.5. For purposes of conducting a benefit/cost analysis it was not considered appropriate to include the high and low ends of this range but to test the sensitivity of the benefit cost analysis for a potential 5, 6, 7 and 8 floods in the next 20 years. The average value of 6.5 floods falls within this range of events.

Benefit/Cost Analysis Using Sandbag Estimates from Flood Manual

To calculate the benefit cost ratio, the Department compared the cost of temporary flood proofing over a 20 year time frame to the cost of installing permanent flood protection at properties below a flood level of 20.0 ft. James Avenue.

The cost of permanent flood proofing was estimated from recent program experience and the cost of temporary dikes was estimated based upon the City's 2005 unit cost for production and distribution of sandbags. The following key assumptions were made:

- the number of sandbags required per house was calculated from City's Flood Manual;
- sandbags cost $5 per bag which includes production, distribution, surveying and supervisory time[2].

[2] Sandbag cost estimates are derived from the City's application to the Province for 2005 Flood Disaster Financial Assistance. Sandbag production cost is estimated $2.74 /bag based on a production of 67,400 bags. The cost of delivery, monitoring and surveying is $1.99 /bag based on a delivery of 38,200 bags. Total blended cost $4.73 /bag, for estimating purposes a cost of $5 /bag was used

- a community ring dike costs $30,000 per property;
- an individual ring dike costs $60,000;
- moving a house to higher ground costs $100,000;
- costs include an external geotechnical assessment of property; and,
- permanent flood protection costs do not include riverbank stabilization costs.

The cost values shown above are typical values for flood protection improvements based on past experience. However, these values will be confirmed at each eligible property and will depend on individual circumstances. Final costs will impact the benefit/cost determination for each particular property.

Any property with a benefit cost ratio of greater than one would be eligible for permanent flood proofing. The following table shows the results of the benefit cost analysis for a flood level of 20.0 ft James Avenue.

Benefit/Cost Analysis of Flood Proofing Properties Outside of the Primary Dikes

James Ave level (ft)	Proper-ties at risk	Potential no. of high flood events next 20 yrs	No. of properties with b/c ratios > 1	Estimated cost to raise level of flood protection for b/c >1	City avoided (sandbag) cost for protected properties	City cost to protect remaining properties with sandbags with b/c <1
20.0	33	5	9	$ 460,000	$ 1,280,000	$ 572,500
20.0	33	6	13	$ 670,000	$ 1,740,000	$ 483,000
20.0	**33**	**7**	**17**	**$ 880,000**	**$ 2,236,500**	**$ 357,000**
20.0	33	8	19	$ 970,000	$ 2,640,000	$ 324,000

The above analysis was conducted in constant dollars. A net present value analysis was not done as it is uncertain when future flood events would occur (and sandbag costs incurred) over the next twenty years.

Based upon the above table:

- 33 properties require sandbag protection to protect to James Ave flood of 20 feet.
- If the City were to experience 5 flood events in the next 20 years it would be less costly to permanently protect 8 properties. The City would spend $460,000 but avoid future sandbagging costs of $1,280,000.
- The sensitivity analysis shows that as the number of flood events increases so does the number of properties with a cost-benefit ratio of greater than 1.

Benefit/Cost Analysis Using Actual Sandbag Usage in 2005 and 2006

The previous benefit cost analysis was based on sandbag counts from the City's Flood Manual. In deriving sandbag counts, the Flood Manual assumes:

- that the dike is located where it was built in 1997;

- the dike is built according to City of Winnipeg sandbag template; and
- an assumption that a dike would be built if the ground elevation where the dike is to be built, is less than the projected flood water-level + 2 feet of freeboard.

In practice actual sandbag counts will be lower if:
- a dike alignment closer to the house is chosen;
- a non-traditional dike is built, for example a combination plywood and sandbags dike; and
- if the owner chooses to encroach on dike freeboard or the house is slightly higher than the location where the dike is to be built and provides additional freeboard to the homeowner.

The flood events in the summer of 2005 and spring 2006 where flood levels reached 20.1 and 20.4 ft respectively, represent a check of the James Avenue 20.0 ft flood scenario. While the spring 20.4 ft is slightly above the 20.0 ft threshold, the Province was alerting the public that this peak was short term and would drop to 19.5 ft the following day which it did.

Analyzing provisional sandbag usage numbers against the James 20.0 ft scenario, the following observation are made:

- The 20 ft James Avenue flood scenario predicts a sandbag usage of 74,100 bags for the identified 33 properties. In summer of 2005, only 23,700 bags were used at these properties. [In 2005 a total of 38,200 bags were delivered as noted in the previous footnote. The 14,500 differential (38,200 – 23,700) was for sandbags delivered to other properties not in the 33 property list.] In the spring of 2006, only 35,200 bags were used. Usage numbers for both years are less than half of the projected usage.
- In both the 2005 and 2006 flood, 12 properties out of 33 chose not to build a sandbag dike. Nine of these 12 properties had sandbag counts of less than 1000 bags.
- In either 2005 or 2006 flood, a further 5 houses chose not to build a sandbag dike.
- Only 11 properties in 2005 and 12 properties in 2006 had sandbag counts greater than 1000 bags.
- Only 5 properties in 2005 and 7 properties in 2006 had sandbag counts greater than 1700 bags.
- Two properties with the highest sandbag counts (according to the Flood Manual) used a modified dike structure significantly reducing sandbag usage. Based on field observation these dikes did stand up to these floods however, there were concerns about structural integrity and the potential of failure.

The above analysis indicates that there is potential that fewer properties may want to participate in this flood proofing program based on past sandbagging efforts and there is the potential that some of the original sand bag counts in the Flood Manual need to be reviewed.

Program

Enhanced flood protection would be via individual dikes, community ring dike or moving a home. Scotia Street is the only area where there are clusters of homes that would make a community ring dike feasible.

The initial focus of the program would be based on protecting properties below a flood level of 20 ft and raising dikes to a level 2.5 feet above this level, i.e., 22.5 ft. Raising dikes to 22.5 ft allows protection to a slightly higher 20.5 ft flood without encroaching on the customary 2 ft of freeboard. If a house has to be moved to higher ground, the property owner would need to conform to the Floodway Fringe Area Regulation that would require that the ground elevation around the house be at the Flood Protection Level.

Based on a potential 7 floods in the next 20 years (i.e., a roundup of the 6.5 average discussed previously), the proposed program would be based on a benefit/cost analysis where the cost of raising level of flood protection (e.g. clay dike) against the City cost of providing sandbags 7 times over the next 20 years. Only those houses with a benefit/cost ratio greater than 1 would be included in the program.

The past sandbag usage in both the 2005 summer and 2006 spring flood of greater than 1000 bags will also be used as a factor in determining initial eligibility into the program.

The intent would be to re-examine the program and criteria in 3 years, i.e., 2009 to validate protection level, cost analyses and flood frequency.

Program Criteria

- Only those properties below a flood level of 20.0 ft James Avenue would be included in the program initially.

- Eligible properties will be initially priorized based on highest to lowest benefit/cost ratio based on Flood Manual sandbag counts, and also priorized on sandbag usage from 2005 and 2006.

- Prior to inclusion in the program a more rigorous cost estimate would be done to verify initial estimates.

- Property owners would be required to contribute 10% towards the cost or work in-kind. This is consistent with previous City on Scotia and provincial flood proofing programs for community ring dikes.

- Properties requiring riverbank stabilization works would be excluded from the program. This is consistent with City policy that the City only funds bank stabilization works on public lands.

Additional Considerations:

There are additional past practices, assistance programs and Council policies that exist that Council should be aware of when establishing a new assistance program for enhanced flood protection.

1. As noted previously, the previous Canada-Manitoba-City program for individual flood proofing provided that a homeowner needed to contribute 25% of the project to a maximum of $10,000 towards a maximum allowable project value of $70,000. If the maximum project value was realized the homeowner's contribution was approximately 14%. For those projects over $70,000 the homeowner would pay 100% of the cost over $70,000. This new program as currently proposed requires a 10% contribution from property owners and establishes no maximum limit for assistance.
2. Council approved the construction of a permanent community ring dike for 9 properties on Scotia Street that had a temporary clay dike built during the 2006 flood event. Those residents will be contributing work-in-kind estimated at 10% of the project value consisting of final landscaping (seeding or sodding) to finish the dike project.
3. For community ring dike projects, such as Kingston Row/Crescent, constructed under the Secondary Dike Enhancement Agreement, the benefiting properties were required to pay the 10% of the total dike cost not covered by the Federal and Provincial Governments through local improvement.
4. Council has a policy to recover the costs for sandbags distributed to protect private property as per the June 23, 1999 adopted policy. In providing sandbags to residents the City has not informed residents of this policy and the potential cost to them. The Department has not charged for sandbags as it could result in a property owner reducing or refusing sandbags which may result in a greater level of property damage, and need for follow up restoration.
5. After the many recent flood events that have been experienced in Winnipeg, there have been property owners that proceeded with upgrading at their locations without the benefit of any assistance program.

Funding

Funding for this program could come from the Floodplain Management Project, which has an objective of developing programs to deal with high-risk properties that are subject to frequent high river levels. This project has the following guidelines as included in the Capital Program project description:

1. Protect and ensure permanency of current and future secondary dike installations;
2. Prevent construction of new structures with secondary dikes and within unprotected areas subject to frequent high river levels;
3. Purchase and remove existing structures from the floodplain, and;
4. Investigate a process and develop guidelines to control or prevent improvements/re-developments at unprotected private properties with potential acquisition of such high risk properties starting in 2007.

The financial status of the Floodplain Management Project is as follows:

Authorized Capital	$600,000.00
Amount of Previous Awards or Expenditures	$222,000.00
Funds Remaining	$378,000.00
Estimated Cost of Project	$880,000.00
Capital Shortfall	$502,000.00

Projects undertaken in 2007 would be limited to the $378,000. Remaining projects would be undertaken in 2009 when additional funding becomes available according to the 2008 to 2012 Five Year forecast as submitted, or when Council approved funds become available.

FINANCIAL IMPACT:

The following financial impact statement for this project has been prepared in accordance with the recommendation adopted by Council on December 13, 2000.

Project Name: **First Year of Program 2007**

PROJECT TO RAISE LEVEL OF FLOOD PROTECTION FOR EXISTING PROPERTIES BELOW A FLOOD LEVEL OF 20.0 FT JAMES AVE

	2007	2008	2009	2010	2011
Capital					
Capital Expenditures Required	$ 378,000	$ -	$ 501,970	$ -	$ -
Less: Existing Budgeted Costs	378,000	-	501,970	-	-
Additional Capital Budget Required	$ -	$ -	$ -	$ -	$ -
Funding Sources:					
Debt - Internal	$ -	$ -	$ -	$ -	$ -
Debt - External	-	-	-	-	-
Grants (Enter Description Here)	-	-	-	-	-
Reserves, Equity, Surplus	-	-	-	-	-
Other - Enter Description Here	-	-	-	-	-
Total Funding	$ -	$ -	$ -	$ -	$ -
Total Additional Capital Budget Required	$ -				
Total Additional Debt Required	$ -				
Current Expenditures/Revenues					
Direct Costs	$ 10,185	$ 37,800	$ 51,360	$ 87,997	$ 87,997
Less: Incremental Revenue/Recovery	10,185	-	13,560	-	-
Net Cost/(Benefit)	$ -	$ 37,800	$ 37,800	$ 87,997	$ 87,997
Less: Existing Budget Amounts	-	37,800	37,800	87,997	87,997
Net Budget Adjustment Required	$ -	$ -	$ -	$ -	$ -

Additional Comments: Funds for this project are included in the approved 2007Capital Budget and are financed by the Equity in Capital Assets Fund and have been forecast in the future 2009 Capital.

"Original signed by M. L. Geer, C.A."

gem
26-Feb-07

Moira L. Geer C.A.
Manager of Finance & Administration

IN PREPARING THIS REPORT THERE WAS:

Internal Consultation With and Concurrence By: N/A

External Consultation With: N/A

THIS REPORT SUBMITTED BY:

Water and Waste Department
Engineering Division
Prepared by: G. Mohr
File No. 020-08-00-00-00