

# 2009 BEAR CREEK CORRIDOR OUTFALL INSPECTION REPORT

---

BEAR CREEK CORRIDOR  
GRANDE PRAIRIE, ALBERTA

## PREPARED FOR

THE CITY OF GRANDE PRAIRIE

GRANDE PRAIRIE, ALBERTA

## PREPARED BY

PARKLAND GEOTECHNICAL LTD.

GRANDE PRAIRIE, ALBERTA



PROJECT No.:

GP-1433

DATE:

MARCH 16, 2010

## EXECUTIVE SUMMARY

The City of Grande Prairie has undertaken an extensive review of geohazards within the Bear Creek corridor. This review has included assessments of erosion and slope instability for the length of Bear Creek from north of the City limit to the southeastern boundary, where the creek enters the adjacent County of Grande Prairie. Over 60 active stormwater outfalls were identified within the municipal boundary, all of which eventually drain into the Bear Creek. This report documents the findings of the 2009 inspection and assessment, along with recommended actions for future work for each identified outfall.

The geohazard assessment of the stormwater outfalls consisted of a visual ground level inspection was conducted at each outfall location, GPS survey, a visual inspection of the outfall structure, pipe, adjacent areas beside and upslope of the outfall, and areas downslope extending to the creek or to where the surface discharge entered heavy tree cover and prevented further inspection. The inspection identified any concerns with the outfall, pipe condition, blockage, alignment, corrosion or separation, outfall structure condition, slopes around the outfall looking for evidence of instability, erosion and safety hazards.

Our assessment identified maintenance issues and recommendations, rehabilitation recommendations, further monitoring recommendations or rehabilitation needs. A priority ranking was assigned based on the assessment findings.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	i
TABLE OF CONTENTS .....	ii
1.0 INTRODUCTION .....	1
2.0 SCOPE OF WORK .....	1
3.0 METHODOLOGY .....	2
4.0 CONDITION ASSESSMENT SCALE .....	3
4.1 Maintenance Costs .....	4
4.2 Remedial Costs .....	4
5.0 GEOLOGICAL SETTING AND HISTORICAL ISSUES .....	4
6.0 OUTFALL ASSESSMENT .....	5
6.1 Critical Priority Sites (Priority 1) .....	6
6.2 High Priority Non-Capital Funding (Priority 2) .....	6
6.3 Capital Improvement Projects (Priority 3) .....	6
6.4 Long-Term Monitoring Sites (Priority 4) .....	6
7.0 LIMITATIONS AND CLOSURE .....	7

## FIGURES

Figure 1	Key Plan
Figure 2	Outfall Location Plan - 117 Avenue to Reservoir
Figure 3	Outfall Location Plan - Reservoir to 94 Avenue
Figure 4	Outfall Location Plan - 95 Avenue to 84 Avenue
Figure 5	Outfall Location Plan - 84 Avenue to 71 Avenue
Figure 6	Outfall Location Plan - 71 Avenue to 62 Avenue

## APPENDICES

Figures	Figures 1 to 6
Appendix A	Outfall Reports
Appendix B	Outfall Maintenance and Repair Cost Estimates
Limitations	General Terms and Conditions

## 1.0 INTRODUCTION

The City of Grande Prairie has undertaken an extensive review of geohazards within the Bear Creek corridor. This review has included assessments of erosion and slope instability for the length of Bear Creek from north of the City limit to the southeastern boundary, where the creek enters the adjacent County of Grande Prairie. ParklandGEO was retained to conduct the geotechnical assessment and prepare evaluations on several geohazard issues within the corridor.

Over 60 active stormwater outfalls were identified within the municipal boundary, all of which eventually drain into the Bear Creek. The structures range from several simple CSP culverts to larger concrete outfall structures. Several of the smaller culverts were located some distance from the actual creek, while all of the larger outfall structures, and the majority of smaller ones, drain directly into the watercourse. This report documents the findings of the 2009 inspection and assessment, along with recommended actions for future work for each identified outfall. The outfall inspection reports are presented in Appendix A. These reports are intended to be stand-alone reports that can be used to plan existing remedial work and document the outfall condition over time.

## 2.0 SCOPE OF WORK

The scope for this assessment was outlined in a letter to the City of Grande Prairie dated February 2, 2009 (Project GP1433), and included the following tasks:

- Inspect all outfalls along Bear Creek and provide remedial recommendations to meet the Alberta Environment Outfalls Code of Practice. The areas of interest included all areas along and adjacent to Bear Creek, within the City limits, and immediate surroundings.
- Assess and document areas of significant erosion resulting from stormwater flow or river erosion that is impacting outfalls.
- Document the condition of City storm sewer outfalls along Bear Creek. Identify outfalls that are experiencing distress due to erosion, or are causing erosion of the creek bed or banks. Prioritize outfalls that are in need of repair. Prepare preliminary remedial designs and costs, based on the priority rankings.
- Prepare a report on the condition of outfalls, including: confirmation of GPS coordinates, photographic documentation, evaluation of the current structure condition, description of erosion from stream flow and flow from the outfall. Prepare remediation recommendations and preliminary cost estimates for each outfall, as required.

Authorization was provided by the City of Grande Prairie based on an engineering services contract dated March 16, 2009.

### 3.0 METHODOLOGY

The geohazard assessment of the stormwater outfalls consisted of the following work:

- ☐ A visual ground level inspection was conducted at each outfall location. The outfalls were identified from drawings provided by the City of Grande Prairie. Additional outfalls that were observed but not shown on the City plans were also inspected.
- ☐ Where outfalls could not be found by visual inspection, a thorough visual inspection was conducted of the surrounding area to confirm if the outfall was no longer present at the expected location.
- ☐ Each identified outfall was photographed. Where outfalls were missing, the suspected location was also photographed.
- ☐ All confirmed outfall locations were identified by a hand-held Garmin GPS with the locations recorded in UTM coordinates. The GPS accuracy was typically 3 m or less and tree cover did not significantly hamper the GPS accuracy. The outfall coordinates refer to the pipe termination point, which was often several metres from the creek.
- ☐ A visual inspection was conducted of the outfall structure, pipe, adjacent areas around the outfall, and areas downslope extending to the creek. In some areas heavy tree cover did not permit a visual inspection to the creek. The inspection identified any concerns with the outfall, which included:
  - Pipe condition including: blockage, alignment, corrosion or separation;
  - Outfall structure condition, specifically: aprons or pads, noting signs of settlement, cracking, damage or blockage;
  - Slopes above, below and beside the outfall, looking for evidence of instability caused by the outfall or if instability was causing damage to the outfall;
  - Erosion caused by the stormwater flow or by the creek;
  - Assessment of the condition, damage, vandalism and effectiveness of erosion protection mechanisms, typically gabion blankets, baskets, rip rap and vegetation;
  - Safety hazards such as: erosion trenches, missing grate covers or other potential risks to the public; and
  - Access restrictions were identified and assessed for planning of maintenance work.

The information was compiled to provide an assessment of each outfall location and a priority ranking was assigned based on the assessment findings. Where recommendations were provided, they were generally classed in one of three categories:

1. Maintenance issues;

2. Rehabilitation recommendations where work beyond simple maintenance would be required to repair the structure or surrounding area; and
3. Further monitoring where no maintenance or rehabilitation was required, or where the performance following maintenance or rehabilitation needed to be reviewed.

## 4.0 CONDITION ASSESSMENT SCALE

In order to prioritize maintenance and rehabilitation efforts, the following rating scale was used:

Priority	Class	Description
1	Critical	Outfalls with the highest priority where immediate action is recommended to minimize the damage to, or loss of infrastructure or where immediate safety concerns were identified. Costs would exceed \$5,000 and require heavy equipment or specialized contractors and delays in implementation could result in significantly higher costs.
2	High	<p>Assigned to outfalls typically where immediate maintenance is necessary but where significant capital expenditures are not required. Typical work includes unclogging pipes, gabion repairs or maintenance using minimal equipment and labour costing less than \$5,000. Delaying the work will likely result in the loss or damage to infrastructure and significantly greater costs.</p> <p>Currently, this category was assigned to the largest number of outfalls, but with undertaking the recommended maintenance work the majority of outfalls will become Priority 4 sites.</p>
3	Improvement	Sites where capital funding for improvements will be required over a 1 to 5 year time frame. Costs can include reconstruction and will exceed \$5000. These sites but do not require immediate action but if ignored could result in the loss or damage to infrastructure and significantly greater long-term costs.
4	Monitor	Assigned to outfall locations where routine follow-up inspections should be conducted on a yearly basis to assess the condition and identify maintenance issues, or if conditions have significantly changed such that a more detailed assessment is required. Over time, it is expected that some sites will be re-classified to a higher priority level.

The long-term goal of the City's outfall review program will be to rehabilitate all Priority/Class 1, 2 and 3 sites to a Priority/Class 4 status, whereby only monitoring and routine maintenance are required.

#### **4.1 Maintenance Costs**

Maintenance costs were estimated based on local equipment rates, material costs and using an estimated labour rate of \$60.00 per hour. Our assumption was that either City staff or subcontractors will perform the necessary work. The time required to complete the maintenance work was estimated based on the visual assessment.

Maintenance projects are typically those with a budget of less than \$5000 in labour and materials, and where DFO or Alberta Environment approvals would not be required. Tenders for each individual project would likely be impractical. The work could be performed by force account or a large group tender for all or a number of selected sites.

#### **4.2 Remedial Costs**

Remedial costs include labour, materials, equipment, engineering and other costs that would be necessary to complete the repair of any outfall structure back to its originally intended condition. This would include upgrading of erosion control measures, as necessary. Since the remediation work would involve larger, more complex projects, the budgets should be confirmed by either public tender or consulting with local contractors prior to finalizing the project budget.

These costs were also estimated based on local equipment rates, material costs and using a labour rate of \$60.00 per hour. Some typical unit costs were also used in the developing the estimate. Historical unit rates for smaller projects tend to under-estimate costs, therefore, ParklandGEO has not heavily relied upon unit rates derived from larger projects.

## **5.0 GEOLOGICAL SETTING AND HISTORICAL ISSUES**

The historical and current issues with geohazards experienced in the City of Grande Prairie is directly related to the geological setting and development of the City in the area of Bear Creek.

The City is entirely located within a large upland plain, with the unconsolidated post-glacial sediments and the near surface bedrock being heavily influenced by the last glacial period. Three separate glacial storms advanced from the north and northeast during the Pleistocene period (the last of which was about 10,000 years ago) which deposited material during ice advance and retreat sequences. The glaciation deposited glacial sediments (till) directly over the weathered clayshale, siltstone and sandstone bedrock deposits. The till was later overlain by lacustrine and glacio-lacustrine deposits predominantly consisting of silty clays. The drift thickness above the bedrock in the Grande Prairie area is in the range of about 15 m to 50 m.

Present day water courses such as Bear Creek have actively downcut and sidecut valleys through the lacustrine clay and clay till. The creek has not yet eroded into the underlying bedrock for most of the channel length, with the exception of the portion of the creek that runs mostly east towards the City limits.

Towards the north portion of the City, Bear Creek is a very shallow channel with low water flow throughout most of the year, with slope heights of less than 4 metres in most areas, particularly north of the Reservoir. South of the weir, the channel becomes progressively deeper, with the upland areas rising about 30 m above the creek bed at the far southeast corner of the City. From the weir to about 68 Avenue, the creek channel has been highly modified, including significant straightening through some sections.

Bear Creek is highly meandering within a wide valley. The creek has kept on changing alignments, forming terraces and oxbow lakes features. Some oxbow lakes with water still exist between 84 Avenue and 98 Avenue. Old oxbow features with dense tree cover are present within the creek valley. For much of the lower valley, small discontinuous flood plain areas exist, with some sewer outfalls being located in these zones. Some paved walking trails are also present within the floodplain but the trails are more commonly located along the top-of-bank, well above the high water level. The largest development within the floodplain occurs immediately south of the reservoir weir, where public parks and a museum are located on the east and west river banks.

The lowering and widening of the creek channel has resulted in landslides and erosion. The silty lacustrine clay is highly erodible, with the clay till being less erodible and more stable. The lacustrine clay is typically medium to highly plastic, while the clay till is a high plastic soil with peculiar engineering properties, possessing a relatively high cohesion and moderate friction angle which give the till a high intact strength that is quickly lost once the till begins to move. Hence, the northern reaches of the creek are eroding the lacustrine deposits, while areas south of the creek tend to be eroding the clay till. Due to the different soil types and valley depth, slope failures in the northern portion of the City tend to be smaller in both lateral and vertical extent, yet they are more frequent, while south of the reservoir the failures tend to be larger, extending further back but there are fewer failures.

## **6.0   OUTFALL ASSESSMENT**

A report for each outfall is presented in Appendix A, along with a brief description of the maintenance or repair work required. Cost estimates for any repair work exceeding \$1000 is presented in Appendix B.

The following is a summary of the outfalls by Priority classification (outlined in Section 4.0).

## **6.1 Critical Priority Sites (Priority 1)**

Eleven (11) outfalls were identified as needed immediate expenditures to protect the asset. These include outfall #'s: 20, 24, 28, 29, 30, 34, 36, 46, 47, 50 and 51. Of these, Outfall #46 located east of Bear Creek and north of 75 Avenue is considered to be the most significant.

The cost for the repair of Outfall 46 is currently being investigated by ParklandGEO as part of a detailed geotechnical study, but it is expected that the costs will be between \$1 and \$2 Million. Outfall 24 will require in excess of \$50,000, while all others will cost between \$5,000 and \$45,000 to remediate. Excluding outfall 46 costs, the total Priority 1 remedial/maintenance costs are estimated to be \$155,700.

Remedial costs are presented in Appendix B for all of these outfalls, except for #46.

## **6.2 High Priority Non-Capital Funding (Priority 2)**

A large number of the outfalls fall into this category, whereby they require maintenance and minor upgrading, typically for erosion protection, but the costs are considered low.

Currently outfall #'s 2, 4, 5, 6, 7, 8, 10, 11, 12, 14, 16, 17, 18, 25, 31, 32, 37, 38, 40, 42, 48, 55 and 58 are in need of maintenance. Due to the relative ease of the recommended work and potential savings by performing the work in the upcoming field season, it is strongly recommended to perform this work as soon as practicable.

The total Priority 2 remedial/maintenance costs are estimated to be \$88,800.

## **6.3 Capital Improvement Projects (Priority 3)**

Outfalls that will require capital expenditures, but where the work can be delayed for between 1 and 3 years include the following #'s: 1, 3, 13, 15, 19, 39, 41 and 44.

Outfalls 1 and 13 will require in excess of \$50,000, and Outfalls 41 and 44 will cost in excess of \$100,000 to remediate.

The total Priority 3 remedial costs are estimated to be \$490,000.

## **6.4 Long-Term Monitoring Sites (Priority 4)**

Outfalls that were found to be in good condition and should only require periodic monitoring and routine maintenance included #'s: 9, 21, 22, 23, 26, 27, 33, 35, 45, 52, 53, 54 and 57.

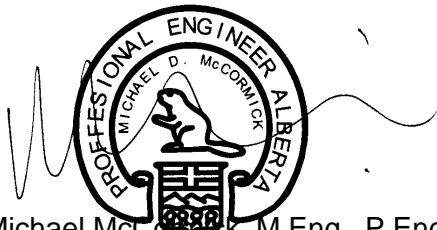
## 7.0 LIMITATIONS AND CLOSURE

This report has been prepared for the exclusive use of **The City of Grande Prairie**. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. PARKLAND GEOTECHNICAL LTD., and The ParklandGEO Consulting Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. No other warranty, expressed or implied, is made. The General Terms and Conditions of this report are attached and should be considered part of this report.

We trust that this report meets with your current requirements. If there are any questions, please contact the undersigned at 780 / 416 - 1755.

Respectfully Submitted,

**PARKLAND GEOTECHNICAL LTD.**  
APEGGA Permit to Practice No. P - 9516



Michael McCormick, M.Eng., P.Eng.  
Principal Geo-Environmental Engineer

Reviewed by:

Mark Brotherton, P.Eng.  
Principal Geotechnical Engineer

Neal Maloney, C.Tech.  
Principal Technologist

## FIGURES

FIGURE 1: KEY PLAN

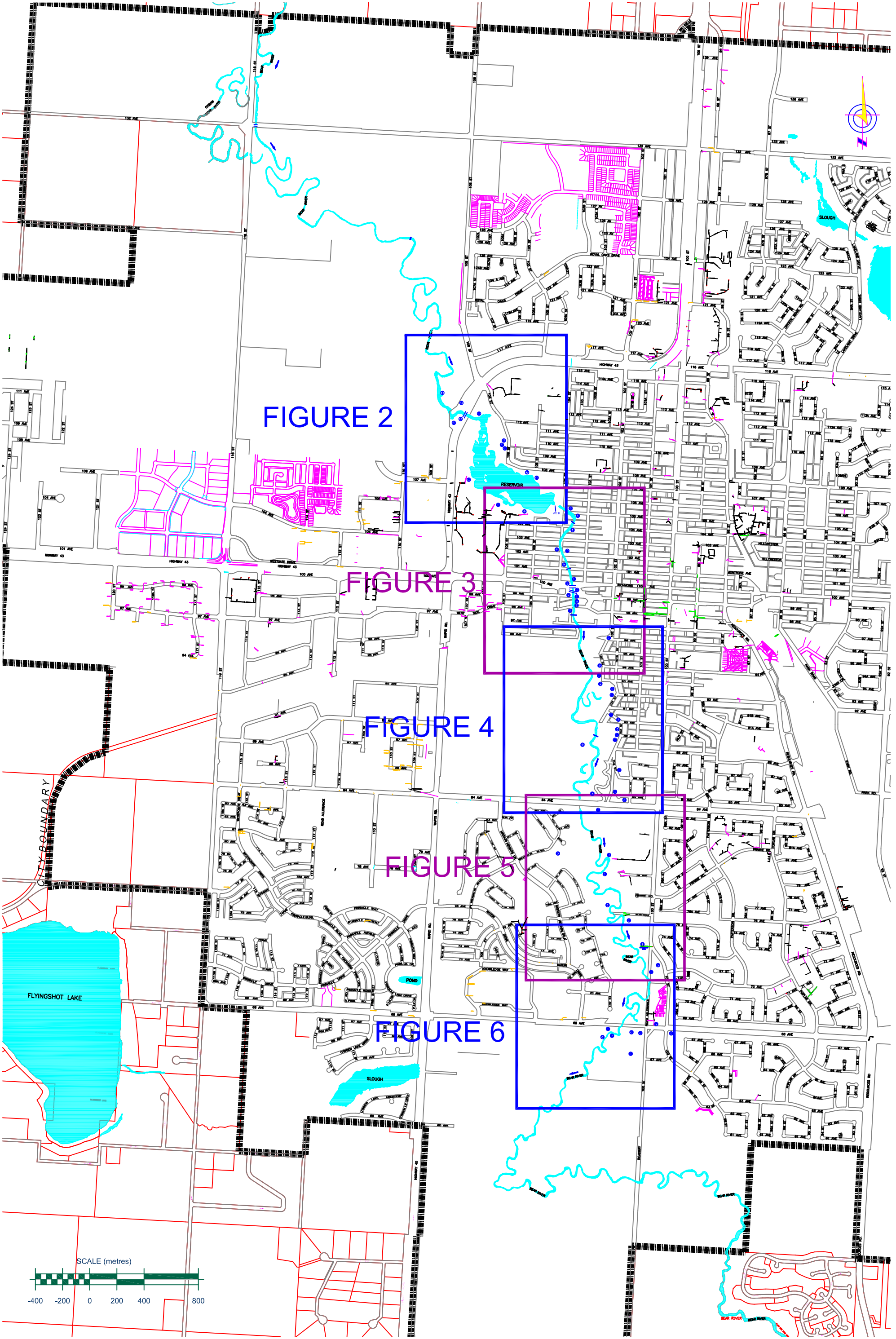
FIGURE 2: OUTFALL LOCATION PLAN  
117 AVENUE TO RESERVOIR

FIGURE 3: OUTFALL LOCATION PLAN  
RESERVOIR TO 94 AVENUE

FIGURE 4: OUTFALL LOCATION PLAN  
95 AVENUE TO 84 AVENUE

FIGURE 5: OUTFALL LOCATION PLAN  
84 AVENUE TO 71 AVENUE

FIGURE 6: OUTFALL LOCATION PLAN  
71 AVENUE TO 62 AVENUE

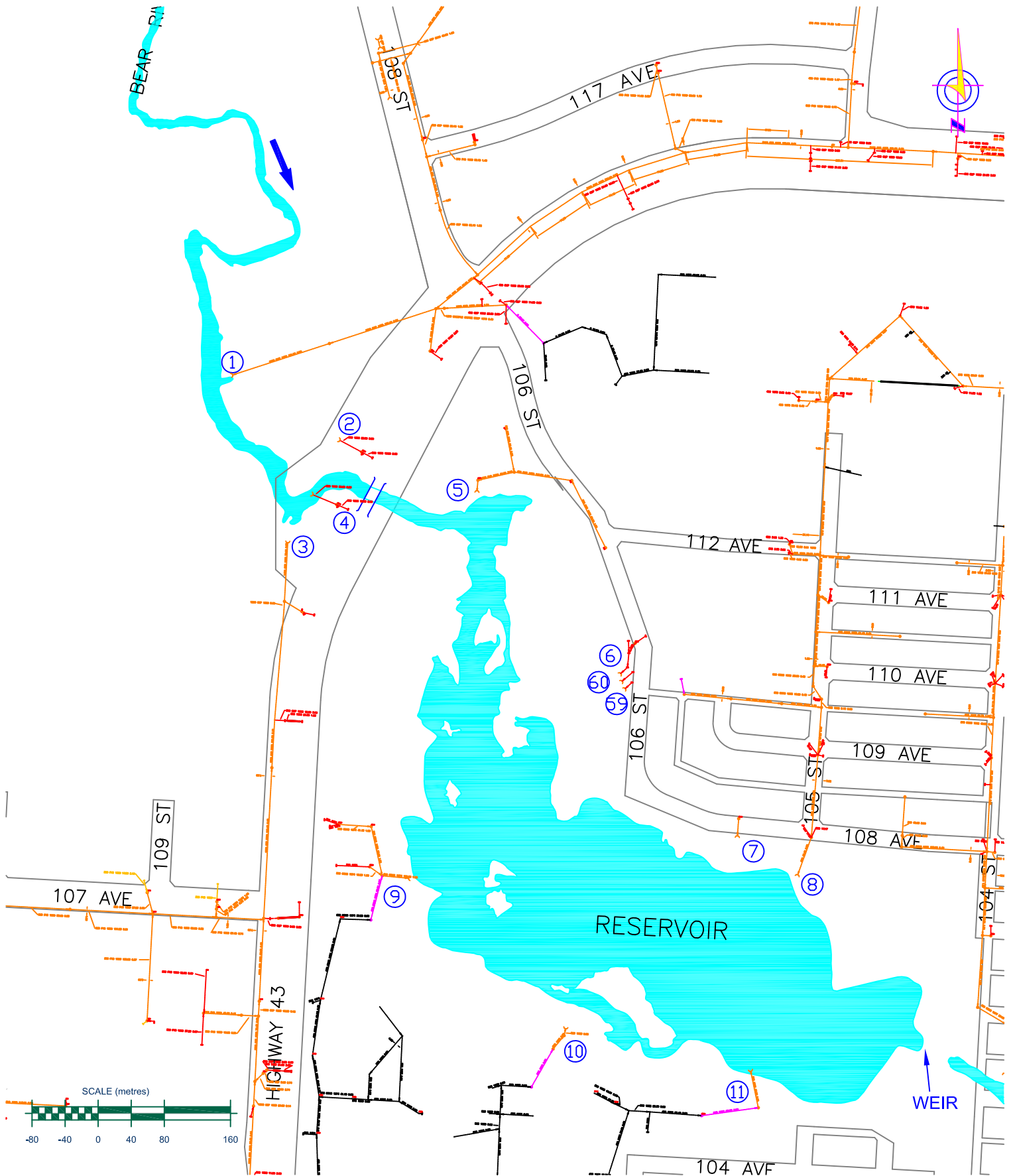


REV #		DATE		DETAILS	
DRAWN:		CHK'D.:	REV #:	DATE:	
AM		MMc	0	JUNE 2009	



CLIENT:  
**THE CITY OF  
GRANDE PRAIRIE**

KEY PLAN		
BEAR CREEK SEWER OUTFALL EVALUATION GRANDE PRAIRIE, ALBERTA		
SCALE: 1:25000	JOB NO. GP1433	DRAWING NO. FIGURE 1



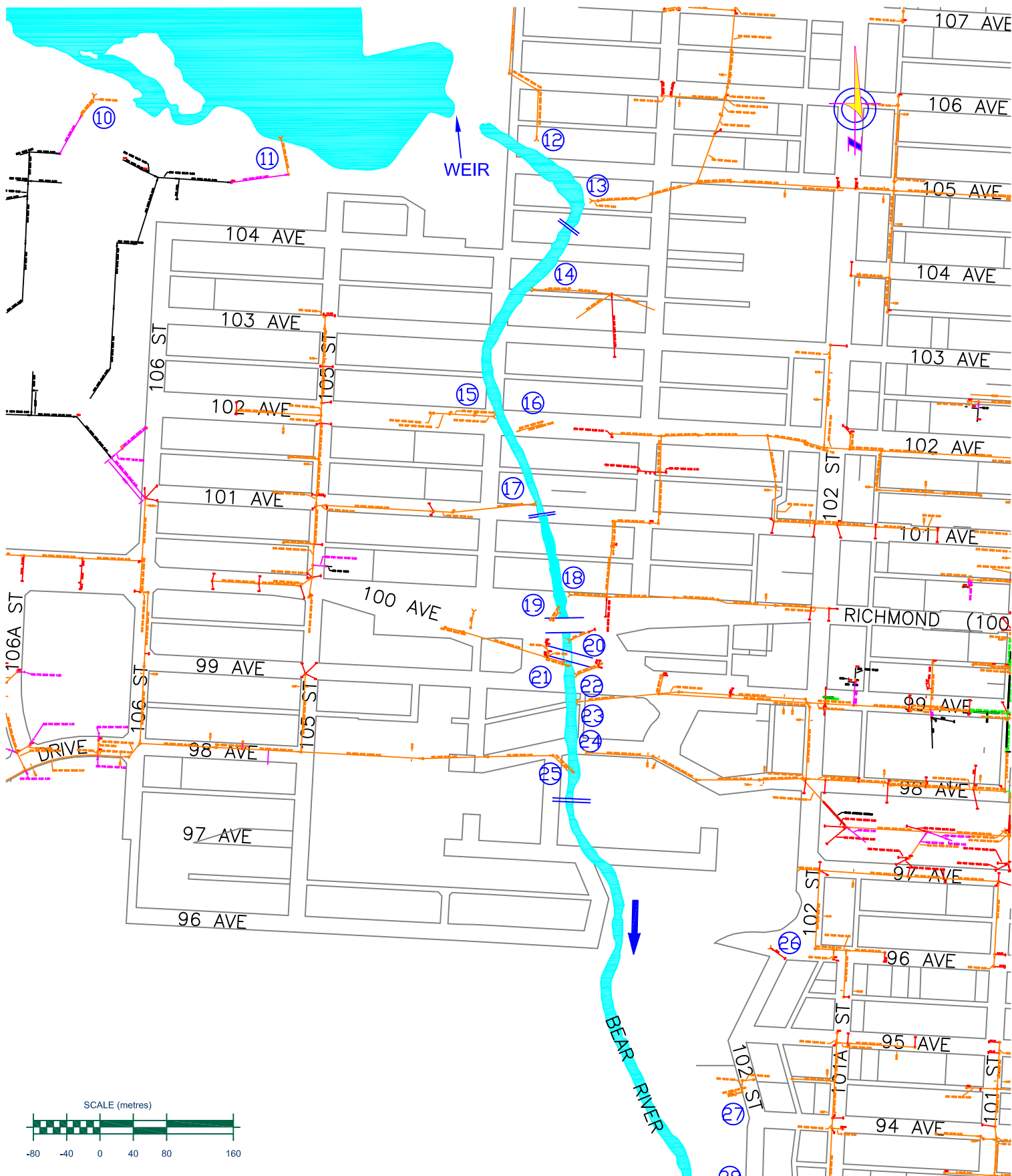
CLIENT:

THE CITY OF  
GRANDE PRAIRIE

## OUTFALL LOCATIONS PLAN 117 AVE TO RESERVOIR

BEAR CREEK SEWER OUTFALL EVALUATION  
GRANDE PRAIRIE, ALBERTA

DRAWN: AM	CHK'D.: MMc	REV #: 0	DATE: JUNE 2009
SCALE: 1:6000	JOB NO. GP1433	DRAWING NO. FIGURE 2	

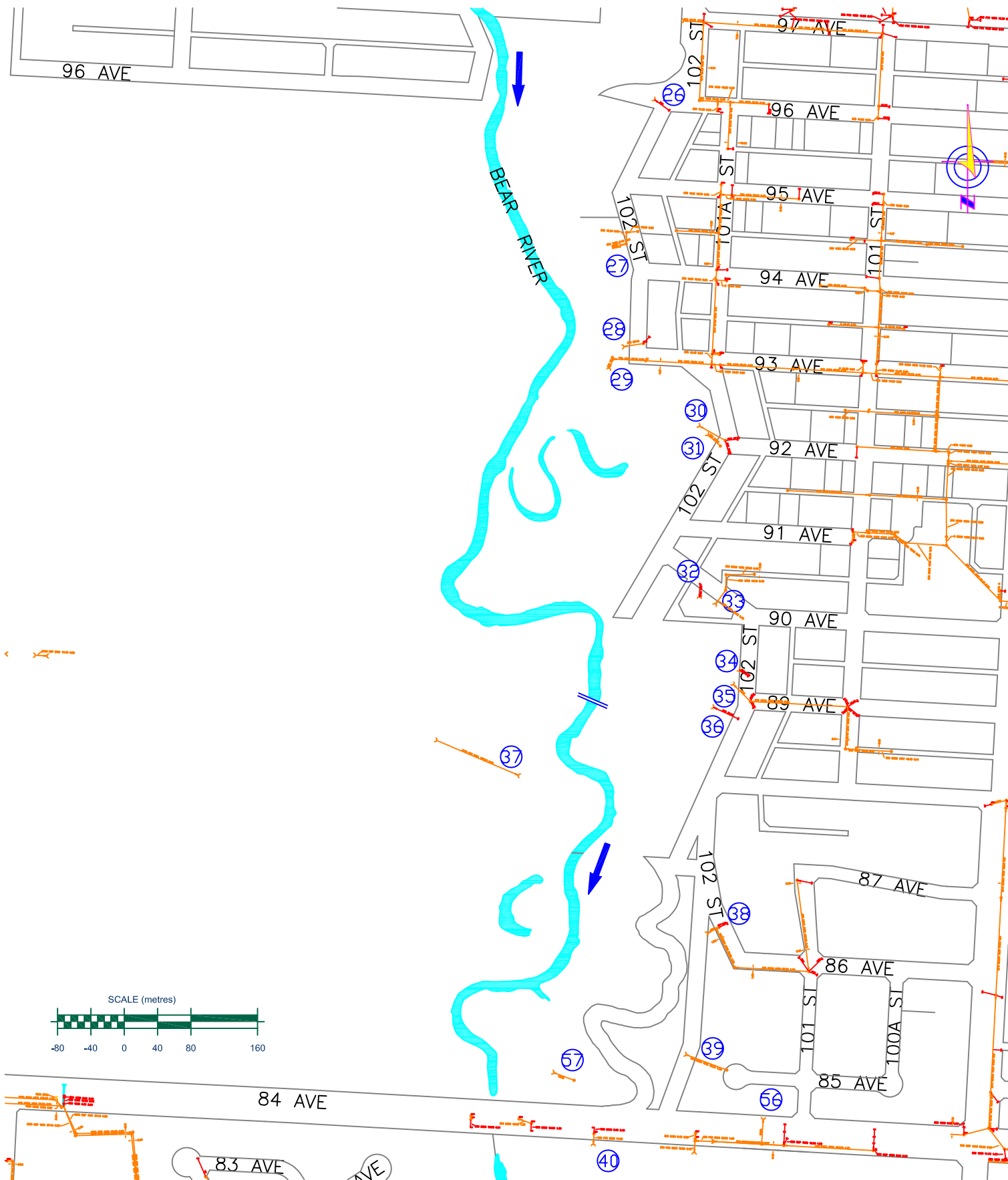


THE CITY OF  
GRANDE PRAIRIE

## OUTFALL LOCATIONS PLAN RESERVOIR TO 94 AVE

BEAR CREEK SEWER OUTFALL EVALUATION  
GRANDE PRAIRIE, ALBERTA

DRAWN: AM	CHK'D.: MMc	REV #: 0	DATE: JUNE 2009
SCALE: 1:6000	JOB NO. GP1433	DRAWING NO. FIGURE 3	



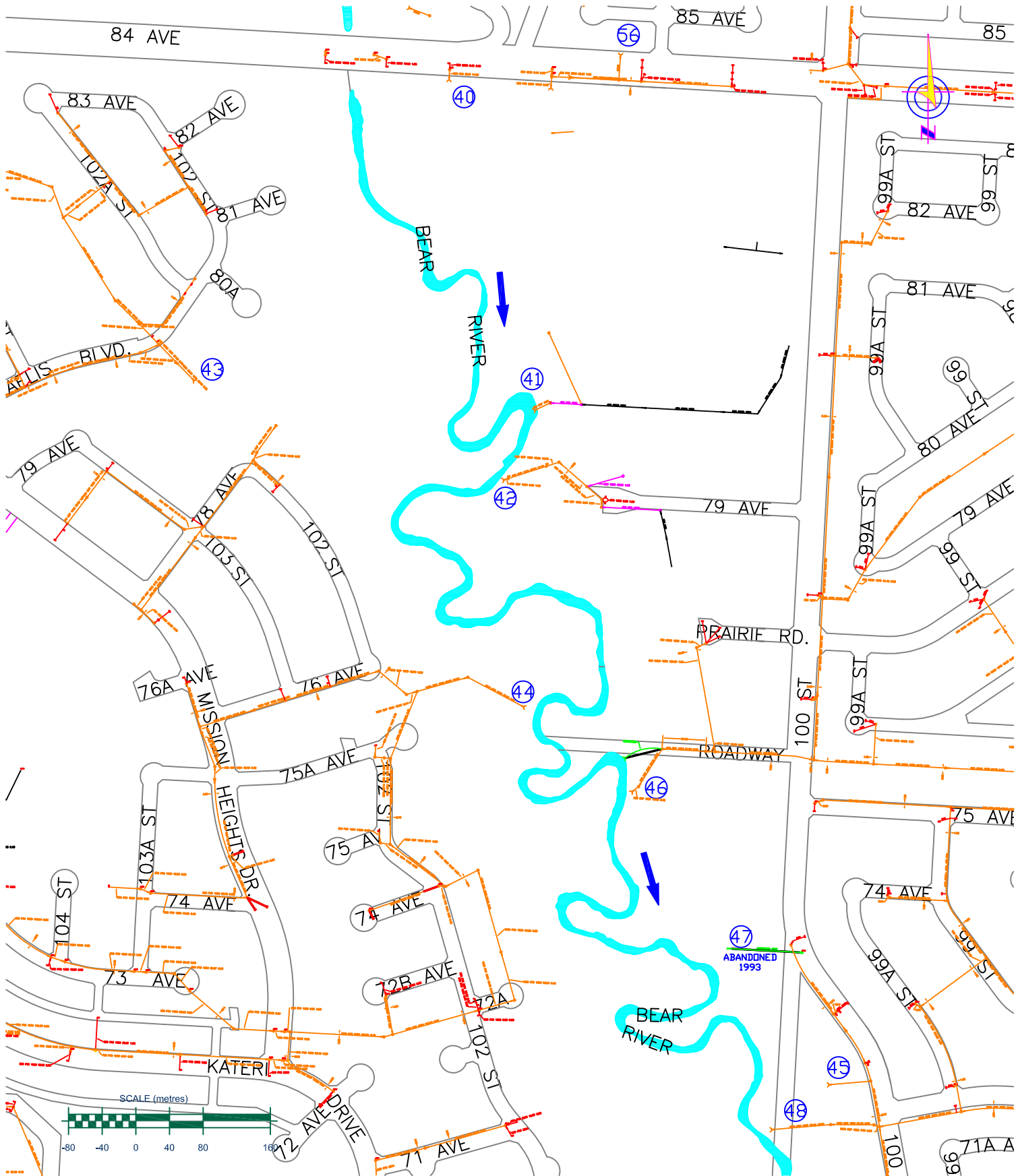
CLIENT:

THE CITY OF  
GRANDE PRAIRIE

## OUTFALL LOCATIONS PLAN 95 AVE TO 84 AVE

BEAR CREEK SEWER OUTFALL EVALUATION  
LOCATION/ADDRESS

DRAWN: AM	CHK'D.: MMc	REV #: 0	DATE: JUNE 2009
SCALE: 1:6000	JOB NO. GP1433	DRAWING NO. FIGURE 4	



CLIENT:

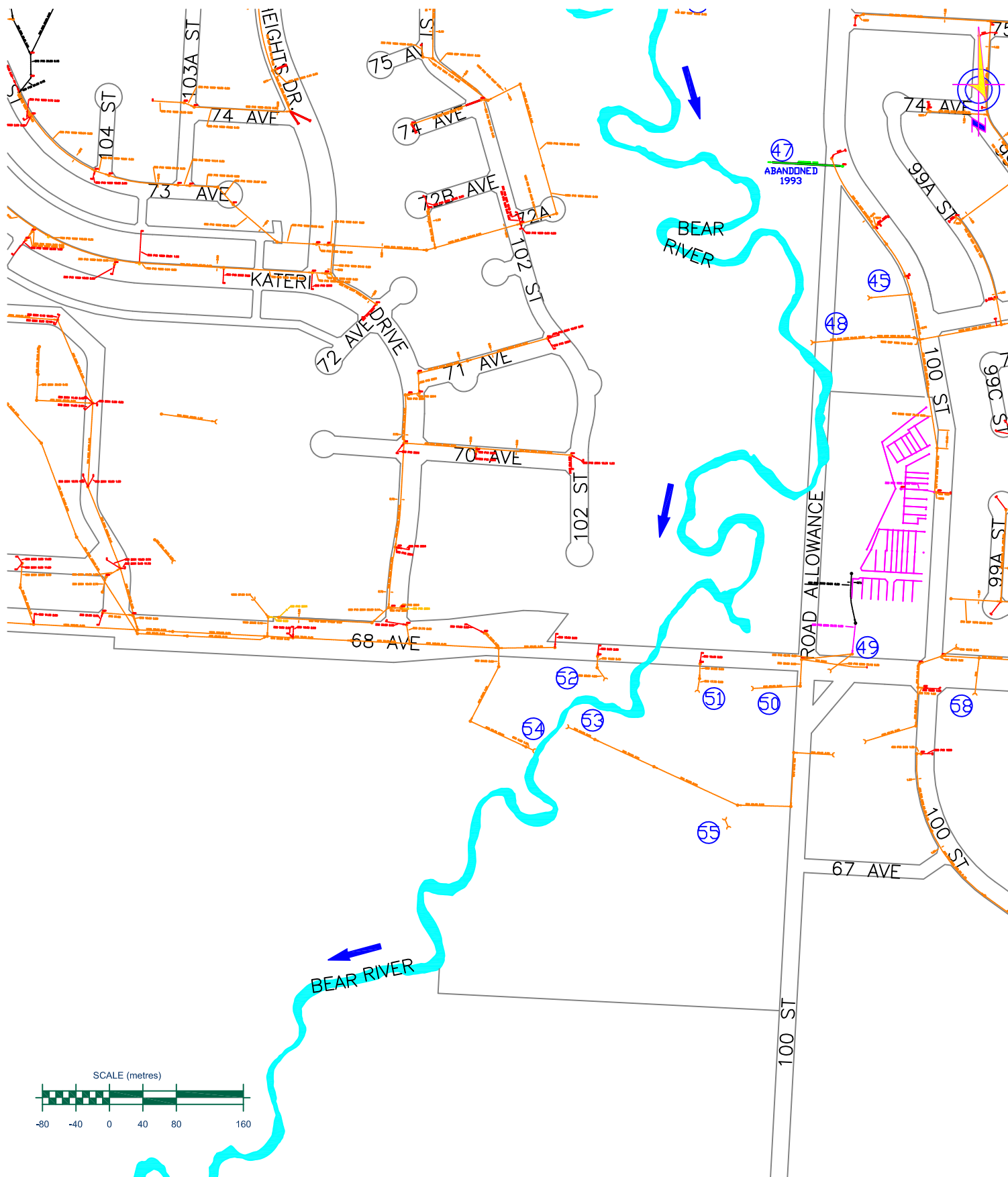
**THE CITY OF  
GRANDE PRAIRIE**

## OUTFALL LOCATIONS PLAN

**84 AVE TO 71 AVE**

**BEAR CREEK SEWER OUTFALL EVALUATION  
GRANDE PRAIRIE, ALBERTA**

DRAWN: AM	CHK'D.: MMc	REV #: 0	DATE: JUNE 2009
SCALE: 1:6000	JOB NO. GP1433	DRAWING NO. FIGURE 5	



CLIENT:

**THE CITY OF  
GRANDE PRAIRIE**

**OUTFALL LOCATIONS PLAN  
71 AVE TO 62 AVE**

**BEAR CREEK CORRIDOR SLOPE STABILITY STUDY  
GRANDE PRAIRIE, ALBERTA**

DRAWN: AM	CHK'D.: MMc	REV #: 0	DATE: JUNE 2009
SCALE: 1:6000	JOB NO. GP1433	DRAWING NO. FIGURE 6	

## **APPENDIX A**

### **2009 OUTFALL INSPECTION REPORTS**

<b>STORM SEWER OUTFALL SUMMARY</b>			
<b>Outfall No.</b>	1	<b>Drawing Ref.</b>	Figure 2
<b>Location (UTM)</b>	0383970 6116629	<b>Year</b>	1978
<b>Material</b>	CMP	<b>Diameter (mm)</b>	1500
<b>Location Description</b>	East of Bear Creek, west of Highway 43 and south of 117 Ave.		
<b>Overall Condition</b>		<b>Comments</b>	
<b>Pipe Condition</b>	Good		
<b>Outfall Structure Condition</b>	Good		
<b>Gabions/Rip Rap Condition</b>	Fair	-gabion is partially damaged; settlement likely due to erosion of the base	
<b>Erosion by River</b>	Yes	- river flow likely undercutting base of gabion	
<b>Erosion by Sewer Flow</b>	Yes	- possible scour - needs to be confirmed	
<b>Debris Present</b>	No		
<b>Safety Hazard Identified</b>	No		
<b>Surrounding Slope</b>	Stable		
<b>Maintenance Required</b>	No		
<b>Rehabilitation Required</b>	Yes	-gabions need repair, additional baskets, fencing	
<b>Access Restrictions</b>	No		
<b>Priority</b>	3	-repair and reconstruction will minimize future costs. Existing materials can substantially be re-used to minimize costs.	

Portions of the gabion structure appear to have settled (Photographs 1 and 2), likely due to undercutting of the base support. Subcutting down the base and reinstalling the existing gabion on top of another deeper basket will be required.

Scope of repairs to include:

- remove and replace about 20 lm of chain link fence;
- remove and stockpile about 15 to 20 lm of gabions;
- excavate 1 m below current river base;
- install new gabion basket, stack existing baskets (with new mesh as necessary) on new foundation;
- obtain permits from DFO, AENV and Navigable Waters.

The estimated remedial cost is presented in Table 1 (Appendix B), and is expected to range from \$70,000 to \$80,000.



**Photograph 1: Outfall #1, looking north from the edge of Bear Creek.**



**Photograph 2: Gabion damage due to settlement, likely from erosion of base/foundation soils. May appear exaggerated if gabion initially constructed at angle.**

<b>STORM SEWER OUTFALL SUMMARY</b>			
<b>Outfall No.</b>	2	<b>Drawing Ref.</b>	Figure 2
<b>Location (UTM)</b>	0384144 6116676	<b>Year</b>	1996
<b>Material</b>	CONC	<b>Diameter (mm)</b>	300
<b>Location Description</b>	Within Highway 43 ROW and north of Bear Creek		
<b>Overall Condition</b>		<b>Comments</b>	
<b>Pipe Condition</b>	Good		
<b>Outfall Structure Condition</b>	Good		
<b>Gabions/Rip Rap Condition</b>	Good		
<b>Erosion by River</b>	No		
<b>Erosion by Sewer Flow</b>	Yes	-minor erosion in drainage ditch, generally lacking topsoil	
<b>Debris Present</b>	No		
<b>Safety Hazard Identified</b>	No		
<b>Surrounding Slope</b>	Stable	-sparse areas of vegetation on portions of slope	
<b>Maintenance Required</b>	Yes	-channel should be revegetated	
<b>Rehabilitation Required</b>	No		
<b>Access Restrictions</b>	No		
<b>Priority</b>	2	-prompt maintenance will minimize future remedial costs	

Sewer in good condition but lack of topsoil is hindering grass growth. Topsoil should have an erosion control blanket covering. Need to determine design flows to design erosion protection measures.

Remedial work required includes:

- Remove existing weeds;
- Supply and spread approximately 100 m3 topsoil;
- Seed; and
- Supply and install S150BN erosion control matting (ECM).

The estimated remedial cost is presented in Table 2 (Appendix B), and is expected to range from \$20,000 to \$24,000.



**Photographs 1 & 2: Outfall #2.**



**Photograph 3: Sparse vegetation and minor erosion in drainage channel.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	3	Drawing Ref.	Figure 2
Location (UTM)	0384039 6116426	Year	1996
Material	CSP	Diameter (mm)	1400
Location Description	Within Highway 43 ROW (bypass) and south of Bear Creek		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-erosion along slope of drainage channel	
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable	-some over-steepened areas of highway embankment should be inspected yearly to confirm long-term stability	
Maintenance Required	No		
Rehabilitation Required	Yes	-erosion control measures should be constructed along channel to minimize erosion	
Access Restrictions	No		
Priority	3	- ECM and vegetation	

Outfall structure is in good condition.

Over-steepened sides of drainage channel leading to Bear Creek should be stabilized with a combination of cutting back and addition of erosion control blanket and aquatic vegetation. Gabions may be considered but vegetation is likely the best control measure.

The recommended remedial work should include:

- Shape the existing ditch to provide a uniform section and base;
- Supply and install erosion control matting;
- Supply and install aquatic vegetation plantings to the sides and base of channel.

The estimated remedial cost is presented in Table 3 (Appendix B), and is expected to range from \$30,000 to \$35,000.



**Photograph 1: Outfall #3.**



**Photograph 2: Outfall #3.**



**Photograph 3: Erosion caused from outfall flow.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	4	Drawing Ref.	Figure 2
Location (UTM)	0384069 6116483	Year	1996
Material	Unknown	Diameter (mm)	300
Location Description	Within Highway 43 ROW, south of Bear Creek and east of Outfall #3		
Overall Condition		Comments	
Pipe Condition	Unknown	-no visible pipe - Location coordinates estimated.	
Outfall Structure Condition	Good	-overgrown with vegetation but rip rap intact	
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-the pipe needs to be uncovered	
Rehabilitation Required	No		
Access Restrictions	No		
Priority	2	-blocked pipe may be leading to water flow and erosion of the highway embankment	

The outfall pipe could not be located but vegetation was present with the pipe should be located. The City drawings show that the outfall is located within the river - therefore the actual location should be found and updated on the City GIS.

Cost to uncover the pipe, clear accumulated debris and adjust rip-rap is estimate to be less than \$1000.



**Photograph 1: The estimated location of Outfall #4 is shown located west of the bypass bridge.**



**Photograph 2: Likely location of Outfall #4 with overgrown vegetation.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	5	Drawing Ref.	Figure 2
Location (UTM)	0384259 6116502	Year	2000
Material	CSP	Diameter (mm)	500
Location Description	East of Highway 43 (bypass), north of 112 Ave and south of Chamber of Commerce building.		
Overall Condition		Comments	
Pipe Condition	Good	Pipe is structurally intact but plugged with sediment	
Outfall Structure Condition	N/A	No structure other than pipe.	
Gabions/Rip Rap Condition	None		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	Yes	-outfall is covered in branches and thick vegetation	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-vegetation should be cleared	
Rehabilitation Required	No		
Access Restrictions	Yes	-difficult access for maintenance equipment due to steep slope and thick vegetation	
Priority	2		

Clearing of fallen and overgrown vegetation will minimize potential issues of restricting flow. The pipe is partially plugged with silt (Photograph 1). Vegetation removal should consist of thinning but not complete removal. Hand clearing recommended.

A concrete pipe and concrete debris is present near the outfall and it is unclear if this is an active pipe. A concrete vault is sitting above ground at this location.

The estimated remedial cost is presented in Table 4 (Appendix B), and is expected to be about \$5000.



**Photograph 1: Outfall #5 and thick vegetation.**



**Photographs 2 and 3: Showing buried concrete pipe of unknown purpose and a concrete vault both located in the trees near Outfall 5.**

<b>STORM SEWER OUTFALL SUMMARY</b>			
<b>Outfall No.</b>	6	<b>Drawing Ref.</b>	Figure 2
<b>Location (UTM)</b>	0384423 6116280	<b>Year</b>	Unknown
<b>Material</b>	CONC	<b>Diameter (mm)</b>	Approx. 400
<b>Location Description</b>	West of 106 St at 112 Avenue; east of the Reservoir		
<b>Overall Condition</b>		<b>Comments</b>	
<b>Pipe Condition</b>	Good		
<b>Outfall Structure Condition</b>	Good		
<b>Gabions/Rip Rap Condition</b>	Good		
<b>Erosion by River</b>	No		
<b>Erosion by Sewer Flow</b>	Yes	-minimal erosion	
<b>Debris Present</b>	No	-minor vegetation debris	
<b>Safety Hazard Identified</b>	No		
<b>Surrounding Slope</b>	Stable		
<b>Maintenance Required</b>	Yes	-vegetation should be removed from pipe	
<b>Rehabilitation Required</b>	No		
<b>Access Restrictions</b>	No		
<b>Priority</b>	2		

Planting vegetation from the outfall to the Reservoir would help minimize sedimentation and minimize erosion. Existing gabion mat in fair condition and would not need replacement if a thick vegetation mat can be established.

The remedial work would entail removing excess vegetation, removing/thinning dead vegetation to promote growth; install 75 mm topsoil and seed. The topsoil should be covered with a biodegradable erosion control blanket to promote seed growth.

The estimated remedial cost is presented in Table 5 (Appendix B), and is expected to cost about \$4000.

Three other drainage pipes were present at this location. A CSP culvert below a paved pathway. The ends of the CSP pipe were slightly damaged but the pipe was clear of debris and in otherwise good condition. This pipe was not considered an outfall and is not shown on the figures.

A 600 to 800 mm diameter CSP culvert was located below a walking trail and was found to have significant erosion problems. Due to the size of the culvert and erosion problems, this pipe was assigned Outfall 59 and is included as its own report.

A 300 mm diameter concrete outfall was located approximately 10 m from Outfall 6 and was assigned designation Outfall 60 and is included as its own report.



**Photograph 1: Outfall #6 with gabion mat. Sparse vegetation growth immediately downstream of outfall.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	7	Drawing Ref.	Figure 3
Location (UTM)	0384581 6116085	Year	Unknown
Material	CONC	Diameter (mm)	Unknown
Location Description	East of 106 St., north of the Reservoir and west of 105 St.		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Fair	-excess vegetation present	
Gabions/Rip Rap Condition	Fair		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	Yes	-vegetation present surrounding pipe	
Safety Hazard Identified	No		
Surrounding Slope	Unstable	-ongoing and worsening slope movement upslope of outfall	
Maintenance Required	Yes	-excess vegetation should be removed	
Rehabilitation Required	No		
Access Restrictions	No		
Priority	2		

Slope instability upslope of the outfall will cause distress to public pathway. Large slope movement will cause distress to outfall. Slope movement does not appear to be related to outfall. Recommendations for slope assessment provided in separate report.

The dense vegetation around the outfall is choking off growth. Hand thinning and possible re-planting of grass may be required. Total maintenance costs are estimated to be less than \$600.



**Photograph 1: Outfall #7.**



**Photograph 2: Outfall #7 with excess vegetation.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	8	Drawing Ref.	Figure 3
Location (UTM)	0384649 6116029	Year	Unknown
Material	CONC	Diameter (mm)	600
Location Description	East of Outfall #7, south of 108 Ave., west of 104 St. and north of the Reservoir		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good	-rip rap needs minor repositioning	
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	2		

The rip rap appears to have been stacked up in front of the outfall pipe. Minor repositioning to provide better coverage/protection of the area is recommended.

Given the weed growth, spaying followed by re-seeding is recommended.

The cost of maintenance is estimated to be less \$2000, as presented in Table 6 (Appendix B).



**Photograph 1: Outfall #8.**



**Photograph 2: Looking from the public path down to Outfall #8 and towards the Reservoir.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	9	Drawing Ref.	Figure 2
Location (UTM)	0384193 6116038	Year	1974
Material	CONC	Diameter (mm)	600
Location Description	East of Highway 43 and west side of the Reservoir		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Fair		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-minor erosion	
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	Minor		
Priority	4		

Minor erosion where minimal rip rap present. Recommend some additional rock to be added to minimize future erosion problems. Due to thick vegetation and slight slope down to outfall, hand placement of rock will be required.

The placement of additional rip-rap could be delayed as the amount of erosion is currently minimal and the outfall has is over 30 years old.



**Photograph 1: Outfall #9 with minor erosion.**



**Photograph 2: Minor erosion in channel.**

<b>STORM SEWER OUTFALL SUMMARY</b>			
<b>Outfall No.</b>	10	<b>Drawing Ref.</b>	Figure 2
<b>Location (UTM)</b>	0384291 6115909	<b>Year</b>	1983
<b>Material</b>	Blue Brute - PVC	<b>Diameter (mm)</b>	525
<b>Location Description</b>	East of Outfall #9 and on the south side of the Reservoir		
<b>Overall Condition</b>		<b>Comments</b>	
<b>Pipe Condition</b>	Good		
<b>Outfall Structure Condition</b>	Good		
<b>Gabions/Rip Rap Condition</b>	Good		
<b>Erosion by River</b>	No		
<b>Erosion by Sewer Flow</b>	Yes	-minor erosion when flow enters the reservoir	
<b>Debris Present</b>	Yes	- Siltation is building up in apron with vegetation.	
<b>Safety Hazard Identified</b>	No		
<b>Surrounding Slope</b>	Stable		
<b>Maintenance Required</b>	Yes	- Accumulated silt should be removed to clear flow path.	
<b>Rehabilitation Required</b>	No		
<b>Access Restrictions</b>	No		
<b>Priority</b>	2		

The outfall apron is lined with rip-rap. Silt is building up with vegetation that should be cleared to improve the hydraulic performance. The cost for cleaning out the silt and vegetation is less than \$500.

A minor erosion gully is forming where the run off enters the reservoir. This should be monitored and erosion control matting installed if the erosion becomes worse.



**Photograph 1: Outfall #10.**



**Photograph 2: Silt is building up in the rip-rap apron area and may be starting to block or restrict flow.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	11	Drawing Ref.	Figure 2
Location (UTM)	0384674 6115758	Year	1982
Material	CSP	Diameter (mm)	595
Location Description	East of Outfall #10 and on the south side of the Reservoir		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	Yes	-vegetation surrounding pipe	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-vegetation should be removed/thinned from pipe flow path	
Rehabilitation Required	No		
Access Restrictions	No		
Priority	2		

Minor vegetation clearing/thinning recommended to ensure unrestricted flow. Only minor hand clearing required. The cost of clearing is estimated at less than \$500.



**Photograph 1: Outfall #11 located east of the GPRC campus. A paved path is located immediately south of the outfall.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	12	Drawing Ref.	Figure 3
Location (UTM)	0384895 6115821	Year	1977
Material	CONC	Diameter (mm)	450
Location Description	East of the Reservoir and south of 106 Ave.		
Overall Condition		Comments	
Pipe Condition	Unknown	-pipe covered by rip rap	
Outfall Structure Condition	Fair		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	Yes	-pipe covered by rip rap	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-rip rap should be removed to expose pipe	
Rehabilitation Required	No		
Access Restrictions	No		
Priority	2		

Pipe should be uncovered as the pipe cannot be visually located. Hand positioning of rip-rap required and is expected to cost less than \$500.



**Photograph 1: Expected location of Outfall #12.**



**Photograph 2: showing Outfall 12 and surrounding embankment. Water velocity is high due to proximity to the weir but no significant erosion was noted along the banks.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	13	Drawing Ref.	Figure 3
Location (UTM)	0384979 6115746	Year	Unknown
Material	CSP	Diameter (mm)	750
Location Description	East of Bear Creek, west of 102 St. and south of 105 Ave.		
Overall Condition		Comments	
Pipe Condition	Poor	- significant corrosion of the pipe invert (Photographs 3 and 4)	
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Fair	-additional erosion protection should be installed as part of upgrading	
Erosion by River	No		
Erosion by Sewer Flow	Yes		
Debris Present	Yes	-minor amounts of garbage present within pipe	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-garbage should be removed	
Rehabilitation Required	Yes		
Access Restrictions	No		
Priority	3		

The CSP pipe is badly corroded along the invert, resulting in 5 pgm flow occurring below the pipe within the bedding. This is likely resulting in erosion below the apron.

Complete replacement of the CSP pipe to the manhole structure located approximately 20 m to the north is required, but camera inspection of the lines upgradient from the last manhole is recommended. A liner may be considered rather than complete removal and replacement, provided the voids below the invert are grouted to provide adequate support.

The cost of the remedial work is presented in Table 7 (Appendix B), and is estimated to cost about \$56,500.



**Photographs 1 and 2: Outfall #13 with garbage present within pipe. Water is flowing below the pipe due to corrosion of pipe invert and is likely contributing to the scour below the apron.**



**Photographs 3 and 4: Corroded CSP. All water flow was occurring below the pipe within the bedding material. The pipe joints appear damaged and the pipe is not straight.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	14	Drawing Ref.	Figure 3
Location (UTM)	Unknown	Year	Unknown
Material	Unknown	Diameter (mm)	250
Location Description	East of Bear Creek and south of 104 Ave.		
Overall Condition		Comments	
Pipe Condition	Unknown	- pipe could not be located	
Outfall Structure Condition	Unknown	- no rip-rap or outfall structure visible	
Gabions/Rip Rap Condition	Unknown		
Erosion by River	Unknown		
Erosion by Sewer Flow	Unknown		
Debris Present	Unknown		
Safety Hazard Identified	Unknown		
Surrounding Slope	Unknown		
Maintenance Required	Yes		
Rehabilitation Required	Unknown		
Access Restrictions	Unknown		
Priority	2		

Pipe could not be located and no rip rap present. A camera inspection may necessary to locate the pipe exit.

The expected cost to find and uncover the pipe is estimate to be less than \$1000 if a camera inspection is not required.

STORM SEWER OUTFALL SUMMARY			
Outfall No.	15	Drawing Ref.	Figure 3
Location (UTM)	0384870 6115492	Year	1975
Material	CMP	Diameter (mm)	375
Location Description	West of Bear Creek and north of 102 Ave.		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	None	- erosion control measures necessary	
Erosion by River	Yes		
Erosion by Sewer Flow	No		
Debris Present	Yes	- some garbage in the outfall grate and excess vegetation present	
Safety Hazard Identified	No		
Surrounding Slope	Unstable	-slump block located at edge of apron	
Maintenance Required	Yes	-the garbage should be removed from apron	
Rehabilitation Required	Yes	- erosion control measures recommended within 2 years	
Access Restrictions	No		
Priority	3		

The outfall structure is in good condition. River erosion has caused a localized slope failure extending north and south of the outfall. The slump block is being actively eroded by Bear Creek. The soils currently protect the outfall from erosion and will need to be replaced with a gabion structure, A-Jacks or similar protection measures.

Alternatively, a new line could be installed to divert sewer flow to Outfall 17 and this structure could be decommissioned. This would likely be more costly but would remove long term maintenance costs associated with this structure

The cost of the remedial work is presented in Table 8 (Appendix B), and is estimated to cost about \$40,000.



**Photograph 1: Outfall #15 showing garbage on the apron and the slump block in the foreground.**



**Photograph 2: Outfall #15. The slump block is the very green vegetation located between the creek and the outfall structure.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	16	Drawing Ref.	Figure 3
Location (UTM)	0384873 6115445	Year	1984
Material	PVC	Diameter (mm)	200
Location Description	East of Bear Creek and north of 102 Ave.		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Fair	-pipe partially covered by rip rap	
Gabions/Rip Rap Condition	Fair		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	Yes	-pipe covered by rip rap and soil debris	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-rip rap needs to be removed from pipe	
Rehabilitation Required	No		
Access Restrictions	No		
Priority	2		

Hand clearing of rip rap, organic matter and silt build-up from pipe and immediate outflow area required.

The estimated cost of thinning vegetation and hand adjustment of the rip-rap is less than \$500.



**Photograph 1: Outfall #16 showing partial pipe blockage and vegetation growth.**



**Photograph 2: looking south along Bear Creek with the edge of the outfall rip-rap in the bottom left.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	17	Drawing Ref.	Figure 3
Location (UTM)	0384917 6115391	Year	1967
Material	CSP	Diameter (mm)	525
Location Description	West of Bear Creek and north of 101 Ave.		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Fair		
Gabions/Rip Rap Condition	None		
Erosion by River	Yes		
Erosion by Sewer Flow	No		
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	Yes		
Access Restrictions	No		
Priority	2		

Stream flow is undercutting the concrete apron. A gabion blanket or high performance geosynthetic turf reinforcement mat should be placed between edge of apron and the edge of river. Concrete may need to be placed below the apron to provide support if erosion extends more than 300 mm below the structure.

The cost of the erosion control remedial work is presented in Table 9 (Appendix B), and is estimated to cost about \$2,200.



**Photograph 1: Outfall #17 with undercutting.**



**Photograph 2: Outfall #17.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	18	Drawing Ref.	Figure 3
Location (UTM)	0384936 6115251	Year	1984
Material	CSP	Diameter (mm)	1200
Location Description	East of Bear Creek and north of 100 Ave.		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-minor erosion	
Debris Present	Yes	-garbage present within pipe, on grate	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-garbage should be removed	
Rehabilitation Required	Yes	- minor removal of silt debris but can be delayed until a more significant build-up occurs.	
Access Restrictions	No		
Priority	2		

Grass and collected sediment should be cut back from the end of the outfall to improve hydraulic performance. The area between the concrete apron and the creek should be cut down, and re-vegetated. This work can be delayed for up to 3 years.

Garbage should be removed from the grate.



**Photograph 1: Outfall #18.**



**Photograph 2: Minor erosion due to sewer flow.**

<b>STORM SEWER OUTFALL SUMMARY</b>			
<b>Outfall No.</b>	19	<b>Drawing Ref.</b>	Figure 3
<b>Location (UTM)</b>	0384946 6115266	<b>Year</b>	1969
<b>Material</b>	CMP	<b>Diameter (mm)</b>	300
<b>Location Description</b>	West of Bear Creek, within the 100 Ave. ROW		
<b>Overall Condition</b>		<b>Comments</b>	
<b>Pipe Condition</b>	Fair	-pipe appears to be rusted	
<b>Outfall Structure Condition</b>	Good		
<b>Gabions/Rip Rap Condition</b>	Fair		
<b>Erosion by River</b>	No		
<b>Erosion by Sewer Flow</b>	Yes	-erosion present to the right of the outfall and due to sewer flow	
<b>Debris Present</b>	No		
<b>Safety Hazard Identified</b>	No		
<b>Surrounding Slope</b>	Stable		
<b>Maintenance Required</b>	Yes	-areas with minor erosion should be revegetated	
<b>Rehabilitation Required</b>	No	- Not immediately necessary - periodically re-evaluate	
<b>Access Restrictions</b>	No		
<b>Priority</b>	3		

Minor erosion observed. Pipe beginning to rust through and may need replacement within five years. Re-inspect and evaluate pipe condition and erosion every two years.

The area around the pipe discharge should be sub-excavated, new topsoil and seed applied and an erosion control matting installed to promote a proper vegetative mat to be established.

The cost of the erosion control remedial work is presented in Table 10 (Appendix B), and is estimated to cost about \$4,000. It may be more economical to delay this repair until replacement of the sewer line is necessary.



**Photograph 1: Outfall #19.**



**Photograph 2: Slightly rusted pipe.**



**Photograph 3: Minor erosion to the right of the pipe due to sewer flow.**

<b>STORM SEWER OUTFALL SUMMARY</b>			
<b>Outfall No.</b>	20	<b>Drawing Ref.</b>	Figure 3
<b>Location (UTM)</b>	0384978 6115222	<b>Year</b>	1982
<b>Material</b>	Unknown	<b>Diameter (mm)</b>	300
<b>Location Description</b>	East of Bear Creek and south of 100 Ave.		
<b>Overall Condition</b>		<b>Comments</b>	
<b>Pipe Condition</b>	Unknown	-pipe is covered with vegetation	
<b>Outfall Structure Condition</b>	Poor		
<b>Gabions/Rip Rap Condition</b>	Fair		
<b>Erosion by River</b>	No		
<b>Erosion by Sewer Flow</b>	No		
<b>Debris Present</b>	Yes	-pipe is covered with vegetation	
<b>Safety Hazard Identified</b>	No		
<b>Surrounding Slope</b>	Stable		
<b>Maintenance Required</b>	Yes	-pipe should be cleared of excess vegetation and sediment	
<b>Rehabilitation Required</b>	No		
<b>Access Restrictions</b>	No		
<b>Priority</b>	1		

The end of the pipe could not be found but is presumed to be blocked. Sediment has pushed through a clean-out manhole. Once cleared out, the manhole and pipe need to be re-inspected.

The cost of the cleaning and re-inspection work is presented in Table 11 (Appendix B), and is estimated to cost about \$5,000.



**Photograph 1: Suspected location of Outfall #20, or clean-out manhole immediately before the outfall.**



**Photograph 2: Outfall #20.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	21	Drawing Ref.	Figure 3
Location (UTM)	0384960 6115201	Year	1973
Material	CSP	Diameter (mm)	300
Location Description	West of Bear Creek, within 99 Ave. ROW		
Overall Condition		Comments	
Pipe Condition	Good	-pipe is slightly rusted	
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	None	- No gabions or other erosion control is present.	
Erosion by River	No		
Erosion by Sewer Flow	Yes	-minor erosion is present to side of outfall	
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	4		

The current CSP pipe is showing signs of rust/corrosion but is otherwise in good condition. The vegetation on either side of the apron is sparse in some areas and a minor top dressing of sand with grass seed may help to keep weed growth down.

There is a very narrow erosion channel leading down from the apron to the creek that could be infilled with gravel but given the age of the structure and minor nature of the erosion, the work could likely be delayed until such time that the structure needs replacement.

Continued monitoring is recommended, particularly to check for pipe corrosion. A camera inspection may be necessary within the next 3 years as the pipe is likely nearing the end of its expected life span.



**Photograph 1: Outfall #21.**



**Photographs 2 and 3: showing the small erosion channel leading down to the creek and the sparse vegetation and weed growth to the sides.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	22	Drawing Ref.	Figure 3
Location (UTM)	0384983 6115192	Year	1973
Material	CONC	Diameter (mm)	200
Location Description	East side of Bear Creek, within 99 Ave. ROW		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	4		

The pipe is in good condition and there is no evidence of erosion. The rip rap covered areas of the slope are in good condition but thinly vegetated.

Routine monitoring is recommended every 2 years.



**Photograph 1: Looking up slope at Outfall #22. There is significant amount of rip rap on the slope adjacent and above the pipe, and on the slope above the bike path.**



**Photographs 2 and 3: Looking upslope and downslope of the outfall. The rip rap areas are generally poorly vegetated but do not show signs of erosion.**

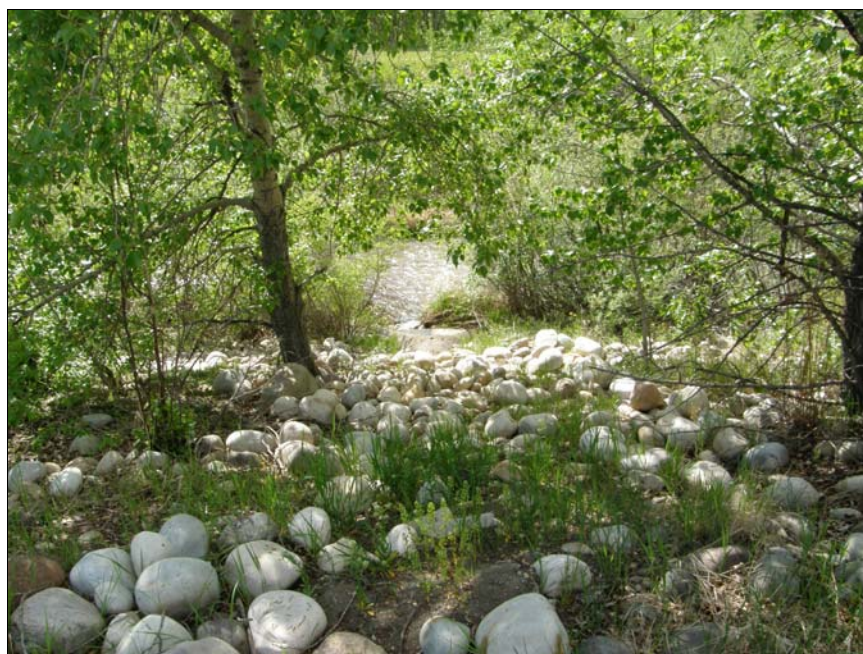
STORM SEWER OUTFALL SUMMARY			
Outfall No.	23	Drawing Ref.	Figure 3
Location (UTM)	0384996 6115158	Year	1973
Material	CONC	Diameter (mm)	900
Location Description	East of Bear Creek and south of 99 Ave		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	4		

The outfall structure is in good condition, with only one security grate missing from the pipe. Given the potential of vandalism, consideration to installing a new bar to close the pipe opening is recommended.

The slope above the outfall structure leading up to the paved bike path is covered with large rip-rap which is in good condition but there is moderate weed growth and minimal grassy vegetation. Consideration should be given to removing the rip rap, replacing the topsoil and installing an erosion control blanket to help secure a grass vegetation cover.



**Photographs 1 & 2: Outfall #23 with a partially damaged security grate and apron leading down to Bear Creek.**



**Photograph 3: Taken from the bike path looking down towards the outfall structure. The area is covered with coarse rip-rap and weed growth.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	24	Drawing Ref.	Figure 3
Location (UTM)	0384994 6115096	Year	1983
Material	CONC	Diameter (mm)	1500
Location Description	East of Bear Creek, within the 98 Ave. ROW		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good	-large amounts of garbage present within the pipe and throughout the gabion area	
Gabions/Rip Rap Condition	Poor		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-erosion subcutting gabion blankets and baskets	
Debris Present	Yes	-large amounts of garbage present throughout the area	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-the garbage should be removed from the outfall	
Rehabilitation Required	Yes	- new erosion control structures are recommended	
Access Restrictions	None		
Priority	1		

Erosion by sewer flow is cutting around and below gabion structures, including blankets and baskets. Significant garbage is present in the outfall grate and in the gabions. The gabion baskets are leaning and erosion is occurring behind the baskets and below the blankets. Large amount of plastic debris (plastic bags, etc.) needs to be removed from the outfall grate and surrounding gabions.

Reconstruction of the erosion control measures is recommended to minimize siltation of the creek, and minimize the potential of a landslide triggered by uncontrolled sewer flow. The overall structure is in excellent condition. The recommended remedial work would include:

- Excavate and remove all existing erosion control gabions;
- excavate and re-contour the slope below the apron to remove erosion channels;
- install a gabion blanket immediately below the apron;
- install new topsoil and grass seed throughout the remedial area;
- cover the main discharge channel with high performance turn reinforcement mat which should extend into Bear Creek; and
- plant aquatic vegetation in the fringe where the flow channel enters the creek.

The estimated remedial costs are presented in Table 12 (Appendix B).



**Photograph 1: Looking east from the pedestrian bridge at Outfall #24. The erosion channels are visible to the north and south of the main channel. Garbage is visible along the length of the channel.**



**Photograph 2: Large amounts of garbage were present in the pipe.**



**Photograph 3: Looking downslope from the outfall showing the garbage in the gabions as well as the erosion channels.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	25	Drawing Ref.	Figure 3
Location (UTM)	0384932 6115045	Year	1967
Material	CSP	Diameter (mm)	750
Location Description	West of Bear Creek and south of 98 Ave.		
Overall Condition		Comments	
Pipe Condition	Good	- A close visual inspection was not possible	
Outfall Structure Condition	Good	- Based on a distant visual inspection	
Gabions/Rip Rap Condition	Good	- There was no evidence of erosion	
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	Yes	-garbage present on the apron and rip rap.	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-garbage should be removed	
Rehabilitation Required	No		
Access Restrictions	Yes	-access could be difficult for maintenance	
Priority	2		

Minor clearing of plastic debris recommended. Closer inspection of the outfall recommended but thinning of the underbrush would be required.

The cost of garbage removal and thinning tree growth to allow access is estimated to be less an \$500.

Periodic yearly inspection to monitor for erosion and garbage debris is recommended.



**Photograph 1: Looking west at Outfall #25 as viewed from the pedestrian bridge.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	26	Drawing Ref.	Figures 3 & 4
Location (UTM)	0385205 6114876	Year	Unknown
Material	CSP	Diameter (mm)	350
Location Description	East of Bear Creek, within 96 Ave. ROW		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	None	-no erosion control measure present.	
Erosion by River	No		
Erosion by Sewer Flow	Yes	-minor erosion present due to sewer flow	
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	- old CSP culvert should be removed from slope.	
Rehabilitation Required	No		
Access Restrictions	No		
Priority	4		

Outfall looks to have only minimal flow. Periodic inspection to assess for changes over time is recommended. A small gully has formed below the outfall, about 200 mm deep but it is well vegetated and is not currently eroding.

Removal of the old CSP culvert lying in the grass above the outfall is recommended.



**Photograph 1: Detailed view of Outfall #26 with blue marker post adjacent to the pipe. A scrap piece of CSP culvert is located in the top left of photograph (see arrow).**



**Photograph 2: showing the slope leading down from the outfall discharge with a shallow erosion channel approximately 200 mm deep but well vegetated. Minor weed growth visible.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	27	Drawing Ref.	Figures 4
Location (UTM)	0385180 6114695	Year	1972
Material	CONC	Diameter (mm)	300
Location Description	East of Bear Creek, west of 102 St. and north of 94 Ave.		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Fair		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-minor erosion present	
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	Yes	-vegetation is thick and slope is relatively steep	
Priority	4		

This outfall only has 2 catch basins feeding into it. The flow volume is relatively low and the discharge point is well above Bear Creek, with any flow directed into the trees located on the uppermost valley wall.

Minor erosion was observed below the pipe but given the very steep slope and thick vegetation tree cover, establishing additional vegetation or rip-rap facing would be very difficult. It is recommended that the slope be inspected for erosion damage every 2 years but long term consideration should be given to complete decommissioning of this outfall and directing drainage to 101 A Street.



**Photograph 1: Outfall #27.**



**Photograph 2: Steep slope leading down from the outfall, with coarse rip rap embedded in the slope.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	28	Drawing Ref.	Figure 4
Location (UTM)	0385172 6114540	Year	Unknown
Material	CSP	Diameter (mm)	300
Location Description	East of Bear Creek, west of 102 St. and north of 93 Ave.		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Fair		
Gabions/Rip Rap Condition	N/A	-no erosion control present	
Erosion by River	No		
Erosion by Sewer Flow	Yes	-erosion is present due to water flow	
Debris Present	Yes	-some fallen trees and other vegetation have collected debris	
Safety Hazard Identified	No		
Surrounding Slope	Stable	-steep	
Maintenance Required	Yes	-brush needs to be cleared	
Rehabilitation Required	Yes	-erosion control needed	
Access Restrictions	Yes	-steep hill surrounding the outfall	
Priority	1		

The CSP outfall is in good condition but the observed water flow is significantly higher than expected given that only 2 catch basins feed into this outfall. The foam on the water suggests a potential discharge from a sanitary sewer connection. It is also possible that the City GIS drawing is inaccurate and that Outfalls 28 and 29 have been mis-labeled. A detailed inspection, possibly including CCTV is recommended.

A relatively deeply incised channel leads downslope from the outfall. This erosion channel should be backfilled and erosion control measures installed as the present sewer flow may be sufficient to cause downcutting and lead to slope instability.

The scope of recommended maintenance work would include:

- Hand clearing of fallen trees and dead vegetation;
- backfilling the channel with gravel fill;
- add topsoil and grass seed; and
- install erosion control matting suitable for steel slope applications.

The estimated cost for remediation is \$15,000 and is outlined in Table 13 (Appendix B).



**Photograph 1: Outfall #28 and eroded trench.**



**Photograph 2: Fallen vegetation and debris.**



**Photograph 3: Outfall #28.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	29	Drawing Ref.	Figure 4
Location (UTM)	0385121 6114512	Year	Unknown
Material	CONC	Diameter (mm)	300
Location Description	East of Bear Creek and south of 93 Ave.		
Overall Condition		Comments	
Pipe Condition	Fair	-cracked concrete	
Outfall Structure Condition	Fair	-trench created due to erosion by sewer flow; pipe apron cracked	
Gabions/Rip Rap Condition	N/A		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-eroded trench	
Debris Present	No		
Safety Hazard Identified	Yes	-eroded trench hidden by tall grass	
Surrounding Slope	Stable		
Maintenance Required	Yes	-erosion should be mitigated through installation of gabions/rip rap	
Rehabilitation Required	Yes	-cracked pipe should be repaired	
Access Restrictions	Yes	-moderately steep slope	
Priority	1		

Erosion by outflow is causing an erosion trench approximately 600 mm deep and 250 mm wide which extends downslope from the outfall approximately 20 m. The trench is difficult to see and is a significant tripping hazard, and as such should be backfilled immediately. Active erosion can result in slope instability by allowing infiltration to saturate soils or by undercutting the slope support, such as vegetation. The cracked pipe apron is a minor concern but should be repaired along with repairs to the slope.

It is also possible that the City GIS drawing is inaccurate and that Outfalls 28 and 29 have been mis-labeled. A detailed inspection, possibly including CCTV is recommended.

The scope for repairs would include:

- Backfill the erosion trench with 20 or 25 mm crush gravel and compact with hand equipment;
- Replace the last section of concrete pipe or otherwise patch existing;
- remove upper topsoil about 1 to 1.5 m on each side of erosion trench;
- Re-grade with 100 mm new topsoil and grass seed;
- Install erosion control blanket to aid vegetation growth.

The estimated cost for remediation is \$10,500 and is outlined in Table 14 (Appendix B).



**Photograph 1: Outfall #29 and eroded trench.**



**Photograph 2: Cracked concrete pipe.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	30	Drawing Ref.	Figure 4
Location (UTM)	0385276 6114476	Year	Unknown
Material	CSP	Diameter (mm)	375
Location Description	West of 101A St. and north of 92 Ave.		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Fair		
Gabions/Rip Rap Condition	N/A		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-eroded trench due to water flow	
Debris Present	No		
Safety Hazard Identified	Yes	-eroded trench presents a tripping hazard	
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	Yes		
Access Restrictions	No		
Priority	1		

CSP pipe is being prevented from shifting by a steel marker post. Erosion at the pipe discharge extends vertically >300 mm and extends away from the discharge point more than 5 m.

We are recommending that:

- the end of the CSP culvert be cut back to reduce the exposed pipe length;
- add a small concrete flared end with integral apron;
- backfill the eroded trench with 20 mm crush gravel and hand compact;
- cut back existing topsoil about 1 m on either side of the trench and below the current culvert extension;
- re-grade site using 100 mm topsoil and add grass seed; and
- install erosion control mat to help establish vegetation growth.

The estimated cost for remediation is \$10,500 and is outlined in Table 15 (Appendix B).



**Photograph 1: Outfall #30.**



**Photograph 2: Outfall #30 and erosion trench.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	31	Drawing Ref.	Figure 4
Location (UTM)	0385288 6114475	Year	Unknown
Material	CONC	Diameter (mm)	200
Location Description	West of 102 St. and south of 92 Ave.		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	N/A		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-minor erosion present	
Debris Present	Yes	-pipe is half-filled with soil and other debris	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-debris should be removed from pipe	
Rehabilitation Required	Yes	-slight re-grading of discharge area to promote flow	
Access Restrictions	No		
Priority	2		

Cleaning of pipe is recommended to remove flow restriction.

Re-grading of area immediately downslope recommended to increase water velocity and minimize future siltation may be necessary in the future if continued siltation causes future clogging.

ParklandGEO recommends that the City consider tying Outfall #31 to Outfall #30 to eliminate future maintenance issues (Outfall #30 is located less than 13 m from Outfall #31). This can be accomplished with the recommended repairs to Outfall #30.

The estimated remedial cost is less than \$2,000. A detailed estimate has not been prepared due to the minor nature of the maintenance work required.

An estimated cost for re-location of the line to Outfall 30 can be prepared.



**Photograph 1: Outfall #31 and debris.**



**Photograph 2: Minor soil erosion.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	32	Drawing Ref.	Figure 4
Location (UTM)	0385288 6114276	Year	Unknown
Material	CONC	Diameter (mm)	200
Location Description	East of 102 St., within the 90 Ave. ROW		
Overall Condition		Comments	
Pipe Condition	Poor	-pipe is cracked and broken	
Outfall Structure Condition	Poor		
Gabions/Rip Rap Condition	N/A		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-eroded trench is present	
Debris Present	Yes	-outfall is covered by vegetation and debris	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-excess vegetation debris should be removed	
Rehabilitation Required	Yes	-erosion should be mitigated through the installation of gabions/rip rap	
Access Restrictions	No		
Priority	2		

Debris from the erosion trench and the pipe should be removed.

ParklandGEO recommends that the following remedial work be undertaken:

- Remove all debris and dead vegetation;
- Backfill the erosion trench with 20 mm gravel and compact with hoe pack or hand equipment;
- spread 100 mm topsoil and seed;
- Repair cracked concrete pipe with epoxy sealer or replace pipe end; and
- Install erosion control mat.

Consideration may be given to combining Outfall 32 and 33 as both require remedial work and are located in close proximity.

The estimated remedial cost is \$8,000 and is presented in Table 16 (Appendix B).



**Photograph 1: Outfall #32 with eroded trench and debris.**



**Photograph 2: Outfall #32 with eroded trench and debris.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	33	Drawing Ref.	Figure 4
Location (UTM)	0385300 6114267	Year	1972
Material	CONC	Diameter (mm)	300
Location Description	East side of Bear Creek; East of Outfall #32, within the 90 Ave. ROW		
Overall Condition		Comments	
Pipe Condition	Poor	-pipe is cracked and broken	
Outfall Structure Condition	Fair	-outfall is covered with vegetation	
Gabions/Rip Rap Condition	Fair	-some erosion present. Current erosion control measures are a gravel fill below and beside the pipe outlet.	
Erosion by River	No		
Erosion by Sewer Flow	Yes	- minor erosion observed	
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable	- the gravel fill is loose in some areas and prone to disturbance	
Maintenance Required	No		
Rehabilitation Required	No	-erosion should be monitored but an erosion control blanket may be necessary in the future	
Access Restrictions	No		
Priority	4		

Dead vegetation is accumulating above the outfall but nothing is blocking the pipe flow so clearing is not recommended at the present time. Erosion should be monitored but given the age of the structure the rate of erosion is minor and should not require maintenance. If erosion control measures are required, a hard armouring would be necessary due to lack of sunlight that will limit vegetation growth.

It is likely that this outfall should be upgraded in the future, with the possible inclusion of several other outfalls into one single structure.

Consideration may be given to combining Outfall 32 and 33 as both require remedial work and are located in close proximity.



**Photograph 1: Outfall #33 showing cracked end with wooden support post at right that appears to be present as a marker post or possibly support during original construction.**



**Photograph 2: Vegetation debris and soil erosion. The lack of sunlight will limit the ability to establish additional vegetation but the erosion is not significant.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	34	Drawing Ref.	Figure 4
Location (UTM)	0385328 6114180	Year	Unknown
Material	CSP	Diameter (mm)	200
Location Description	East side of Bear Creek, on west side of 102 St. and south of 90 Ave.		
Overall Condition		Comments	
Pipe Condition	Poor	-structure is cracked, bent and partially buried	
Outfall Structure Condition	Poor	-the area is covered with soil and other vegetation	
Gabions/Rip Rap Condition	Poor	-none appears to be present	
Erosion by River	No		
Erosion by Sewer Flow	Yes	-erosion present throughout outfall area; little to no vegetation growth	
Debris Present	Yes	-outfall is partially covered by soil and vegetation	
Safety Hazard Identified	Yes	-fallen trees and unstable slope	
Surrounding Slope	Unstable	-the slope above and below outfall appears to be unstable	
Maintenance Required	Yes	-excess debris should be removed	
Rehabilitation Required	Yes	-gabions/rip rap should be constructed to stabilize the slope and minimize erosion	
Access Restrictions	Yes	-slope is very steep near outfall	
Priority	1		

This outfall receives flow from a single catch basin on 102 Street. The slope above and below the outfall is unstable, with slide debris partially covering the outfall. Significant fallen vegetation is also blocking access.

Given the proximity to Outfall 35 to the south (about 19 m), re-routing this outfall and decommissioning the pipe would be less costly and have lower long term risk of triggering a slope failure at this location.

Remedial measures should include: open cut or HDD installation of a new line to drain into Outfall 35; decommission Outfall 34 and backfill the pipe with concrete; and plant additional vegetation at Outfall 34 to minimize future erosion.

The estimated remedial cost is \$33,000 and is presented in Table 17 (Appendix B).



**Photograph 1: Outfall #34 partially covered with soil and vegetation; unstable slope above and below outfall.**



**Photograph 2: Damaged pipe.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	35	Drawing Ref.	Figure 4
Location (UTM)	0385330 6114178	Year	1963
Material	PVC	Diameter (mm)	Unknown
Location Description	West of 102 St. and south of Outfall #34		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	4		

Original date of installation is 1963 but new PVC is present, indicating a more recent upgrade. Continued periodic monitoring is recommended every 3 to 4 years.

Additional topsoil and grass seed should be added to the area above the pipe to minimize weed growth.



**Photograph 1: Outfall #35 showing the newer PVC pipe, rip rap and marker post.**



**Photograph 2: Looking from the upper slope down to the outfall. Rip rap and a marker post were present. Bare soil at the top requires topsoil and seeding.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	36	Drawing Ref.	Figure 4
Location (UTM)	0385309 6114147	Year	Unknown
Material	CONC	Diameter (mm)	200
Location Description	West of 102 St. and south of 89 Ave.		
Overall Condition		Comments	
Pipe Condition	Fair	-pipe was cracked and broken	
Outfall Structure Condition	Fair	-erosion present on both sides of outfall	
Gabions/Rip Rap Condition	None	- no erosion control measures were found	
Erosion by River	No		
Erosion by Sewer Flow	Yes	-erosion present within outfall area	
Debris Present	No		
Safety Hazard Identified	Yes	- the erosion and grading next to the outfall could present a tripping hazard. Children are using the drop as a bike jump ramp.	
Surrounding Slope	Unstable	-cracks present in the ground along the top of slope	
Maintenance Required	Yes	-rip rap areas should be improved to minimize erosion	
Rehabilitation Required	No		
Access Restrictions	No		
Priority	1		

Re-grading of outfall discharge to minimize steep drop to the left and right of the pipe, as well as installing fresh topsoil, erosion control blanket and seed is recommended. Alternatively, the single CB could be re-routed to Outfall #35 and this outfall abandoned (re-routing distance approximately 50 m).

To protect the outfall and minimize the potential hazard to the public, the use of trees and landscaping to create a natural barrier is recommended.

The estimated remedial cost is \$16,500 and is presented in Table 18 (Appendix B).

Tension cracks near the top of slope should be surveyed and backfilled. Yearly monitoring of the outfall and slope is recommended. Although the slope is not very steep, the presence of tension cracks suggest possible movement that should be monitored. A slope failure is unlikely to damage the roadway or houses further east but stabilization may be required.



**Photographs 1 and 2: Outfall #36 showing soil erosion and lack of vegetation below the outfall, as well as cracked pipe.**



**Photograph 3: Tension crack along top of slope. The crack may be due to dry conditions but monitoring is recommended as cracks were not observed on other slopes in the area.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	37	Drawing Ref.	Figure 4
Location (UTM)	0385081 6114060	Year	2001
Material	CSP	Diameter (mm)	1200
Location Description	West of Bear Creek and south of Outfall #36		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Fair	-concrete cracked in several places - minor but should be repaired to minimize future damages	
Gabions/Rip Rap Condition	Fair	-rip rap has been eroded away near the concrete structure; remaining rip rap in good condition	
Erosion by River	No		
Erosion by Sewer Flow	Yes	-erosion present beneath concrete structure	
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-rip rap should be replaced near the concrete structure	
Rehabilitation Required	No		
Access Restrictions	Yes	-outfall located within trees and a pedestrian bridge must be crossed for access	
Priority	2		

Minor cracks in the concrete outfall structure should be sealed to minimize weathering and deterioration. Various epoxy sealants would be appropriate and can be applied by local labour forces.

The sewer flow has caused erosion of the drainage channel leading down from the outfall for approximately 6 m. Extensive repairs are not necessary but adding additional large diameter rock would minimize future undercutting.

The estimated remedial cost is \$7,300 and is presented in Table 19 (Appendix B).



**Photographs 1 & 2: Outfall #37 and eroded soil/rip rap.**



**Photograph 2: Cracked concrete apron surrounding CSP pipe.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	38	Drawing Ref.	Figure 4
Location (UTM)	0385238 6113842	Year	Unknown
Material	Unknown	Diameter (mm)	450
Location Description	East of 102 Street and north of 86 Avenue		
Overall Condition		Comments	
Pipe Condition	Unknown	-pipe covered by vegetation	
Outfall Structure Condition	Unknown		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-minor erosion present	
Debris Present	Yes	-pipe covered by vegetation	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-pipe should be uncovered	
Rehabilitation Required	No		
Access Restrictions	No		
Priority	2		

The outfall should be cleared of vegetation. A more complete inspection will be required after cleaning to assess pipe condition and potential erosion problems.

Cleaning and uncovering of the outfall is estimated to cost approximately \$2000.



**Photograph 1: Outfall #38.**



**Photograph 2: Outfall #38 showing rip-rap and depression where pipe should be located.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	39	Drawing Ref.	Figure 4
Location (UTM)	0385219 6113799	Year	1972
Material	CSP	Diameter (mm)	375
Location Description	East of 102 Street and south of 86 Avenue		
Overall Condition		Comments	
Pipe Condition	Poor	-pipe runs beneath an asphalt pathway and is visible on both sides; pipe is rusted through on the bottom	
Outfall Structure Condition	Fair	-erosion is present	
Gabions/Rip Rap Condition	Fair	-some rip rap has been eroded away near pipe	
Erosion by River	No		
Erosion by Sewer Flow	Yes	-one side of the outfall has significant erosion on both the sides and the bottom creating a trench	
Debris Present	Yes	-minor vegetation debris present	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-debris should be removed	
Rehabilitation Required	Yes	-rip rap should be replaced to minimize erosion; pipe should potentially be replaced due to rust	
Access Restrictions	No		
Priority	3		

The CSP pipe should be camera inspected to determine extent of rust/corrosion damage, however, it is likely that the culvert will need to be completely replaced.

Erosion control blanket (hard amouring) should be placed immediately below the outfall and turf reinforcement matting throughout the erosion area. A shade tolerant vegetation should be planted and the erosion trench must be backfilled.

An alternative to complete pipe replacement would be to install a liner system which would minimize surface disturbance. Erosion control measures would still require upgrading.

The estimated remedial cost for complete replacement is \$28,900 and is presented in Table 20 (Appendix B).



**Photographs 1 & 2: Both sides of Outfall #39.**



**Photograph 3: Rusted out pipe.**



**Photograph 4: Eroded rip rap and trench.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	40	Drawing Ref.	Figures 4 & 5
Location (UTM)	0385180 6113629	Year	2000
Material	CONC	Diameter (mm)	300
Location Description	East of Bear Creek and south of 84 Ave.		
Overall Condition		Comments	
Pipe Condition	Fair	-concrete is cracked and broken in areas; half-filled with soil debris	
Outfall Structure Condition	Fair		
Gabions/Rip Rap Condition	N/A	-no gabions or rip-rap present	
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	Yes	-soil is present within the concrete pipe	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-the soil within the pipe should be removed, patching concrete	
Rehabilitation Required	No		
Access Restrictions	Yes	-slope is relatively steep, vacuum truck access may be difficult	
Priority	2		

The pipe needs to be steam/hand cleaned as flow is significantly restricted. Flared end of concrete is broken but replacement is not critical.

Patching of the exposed rebar is recommended to extend the outfall life.

Flushing and camera inspection may be necessary.

The estimated remedial cost is \$5,300 and is presented in Table 21 (Appendix B).



**Photograph 1: Outfall #40.**



**Photograph 2: Broken concrete structure and soil debris.**

<b>STORM SEWER OUTFALL SUMMARY</b>			
<b>Outfall No.</b>	41	<b>Drawing Ref.</b>	Figure 5
<b>Location (UTM)</b>	0385291 6113220	<b>Year</b>	1981
<b>Material</b>	CSP	<b>Diameter (mm)</b>	450
<b>Location Description</b>	East of Bear Creek and north of 79 Ave. Accessed through Southview MHP.		
<b>Overall Condition</b>		<b>Comments</b>	
<b>Pipe Condition</b>	Good		
<b>Outfall Structure Condition</b>	Fair		
<b>Gabions/Rip Rap Condition</b>	Fair	-erosion has caused movement and undercutting of the supports	
<b>Erosion by River</b>	Yes	-river is undercutting the gabions and outfall	
<b>Erosion by Sewer Flow</b>	Yes	-erosion present to the side of the outfall	
<b>Debris Present</b>	No		
<b>Safety Hazard Identified</b>	No		
<b>Surrounding Slope</b>	Stable		
<b>Maintenance Required</b>	No		
<b>Rehabilitation Required</b>	Yes	-erosion protection should be installed	
<b>Access Restrictions</b>	Yes	-moderate slope; access through southview MHP	
<b>Priority</b>	3		

Erosion by Bear Creek is undercutting the toe support of the slope resulting in the shifting of the gabion baskets and supporting soils surrounding the outfall. A small failure was observed in the fall of 2009 adjacent to the pathway, over the pipe locations about mid slope, which may suggest leakage from the pipe is causing erosion.

The City of Grande Prairie reportedly had a camera inspection performed on the line which did not indicate any pipe separation.

Movement and sloughing of the soils supporting the outfall have been observed since at least 2007.

Rehabilitation of this outfall is proposed that would include armoring of the creek bank, reconstruction of the gabions and erosion protection measures, re-installing the concrete apron and re-installing vegetation. An estimated cost of \$126,000 is presented in Table 22 (Appendix B).



**Photograph 1: Outfall #41 showing voids below the apron sides. The water flow clearly shows that the apron is leaning towards the west (to the creek).**



**Photograph 2: Soil erosion have caused the rip rap to settle.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	42	Drawing Ref.	Figure 5
Location (UTM)	0385250 6113149	Year	1980
Material	CMP	Diameter (mm)	600
Location Description	East of Bear Creek and west of 79 Avenue		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Fair	-soil debris located within pipe and on outfall apron	
Gabions/Rip Rap Condition	N/A	- no rip-rap present	
Erosion by River	No		
Erosion by Sewer Flow	Yes	-erosion present below outfall	
Debris Present	Yes	-deadfall and other vegetation within the flow path downstream of the outfall pipe.	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-soil should be removed from pipe	
Rehabilitation Required	Yes	-erosion control methods should be used to minimize erosion	
Access Restrictions	Yes	-steep slope and vegetated	
Priority	2		

Soil was found to be plugging the pipe and the apron structure. The soil needs to be removed, likely by hand but steam cleaning may be necessary. The sewer line may require camera inspection and flushing.

An erosion control system should be installed leading down from the outfall to the river.

An estimated remedial cost is presented in Table 23 (Appendix B).



**Photograph 1: Outfall #42 showing the soil blocking the pipe and covering the apron. The area is generally overgrown with vegetation.**



**Photograph 2: showing erosion below the outfall.**

<b>STORM SEWER OUTFALL SUMMARY</b>			
<b>Outfall No.</b>	44	<b>Drawing Ref.</b>	Figure 5
<b>Location (UTM)</b>	0385310 6112888	<b>Year</b>	1980
<b>Material</b>	CSP	<b>Diameter (mm)</b>	1200
<b>Location Description</b>	West of Bear Creek and south of Prairie Rd.		
<b>Overall Condition</b>		<b>Comments</b>	
<b>Pipe Condition</b>	Good		
<b>Outfall Structure Condition</b>	Fair		
<b>Gabions/Rip Rap Condition</b>	Poor	-soil erosion present below the pipe	
<b>Erosion by River</b>	Yes	- minor erosion of the bank by the river flow, compounded by sewer flow	
<b>Erosion by Sewer Flow</b>	Yes	-soil erosion present below the pipe down to the river	
<b>Debris Present</b>	No	- vegetation debris is building up near the river	
<b>Safety Hazard Identified</b>	No		
<b>Surrounding Slope</b>	Stable	-slope beside and below outfall has significant erosion; above slope is stable	
<b>Maintenance Required</b>	No		
<b>Rehabilitation Required</b>	Yes	-An apron with gabions should be installed below and beside outfall to stabilize the slope and minimize erosion	
<b>Access Restrictions</b>	Yes	-steep slope below the outfall	
<b>Priority</b>	3		

Significant erosion was observed below the outfall, leading down to the creek. Some erosion caused by the creek appears to be further resulting in the erosion of the river bank by the creek at the outfall location. The rip-rap appears to be sliding down into the river and is ineffective.

Construction of a proper concrete outfall structure with erosion control measures is recommended. A detailed engineering design and tender will be required due to the scale of the work program.

A preliminary estimated cost is presented in Table 24 (Appendix B).



**Photograph 1: Outfall #44.**



**Photograph 2: Soil erosion to the side of the outfall.**



**Photograph 3: Soil erosion to the side of the outfall and below.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	45	Drawing Ref.	Figure 5
Location (UTM)	0385549 6112408	Year	Unknown
Material	CONC.	Diameter (mm)	450 (approx.)
Location Description	Abandoned outfall west side of Bear Creek, north of footbridge at 71 Avenue		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	N/A		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	4		

The outfall is no longer in use. No issues were noted other than some minor vandalism with the grate covering the pipe outlet.

Periodic monitoring is recommended to ensure this does not become a safety concern.



**Photograph 1: Outfall #45 is abandoned and becoming overgrown. The outfall is in good condition and does not present a safety hazard.**



**Photograph 2: The abandoned outfall is in good condition, with only minor vandalism damage to the re-bar grate. Minor repairs may be necessary to repair the grate for security and safety concerns.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	46	Drawing Ref.	Figure 5
Location (UTM)	0385424 6112803	Year	1987
Material	CSP	Diameter (mm)	900
Location Description	East of Bear Creek and north of 75 Ave.		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Poor	-outfall is in fair condition but concrete structure above the outflow has significant soil erosion below	
Gabions/Rip Rap Condition	Poor	- gabions are settling and shifting due to river erosion	
Erosion by River	Yes	-soil erosion below the concrete structure is potentially caused by river flow	
Erosion by Sewer Flow	No		
Debris Present	No		
Safety Hazard Identified	Yes	-active slope failure area; drop manhole is leaning.	
Surrounding Slope	Unstable	-the slope beneath the concrete structure is unstable	
Maintenance Required	No		
Rehabilitation Required	Yes	-A complete slope rehabilitation is required.	
Access Restrictions	Yes	-steep slope	
Priority	1		

A detailed geotechnical investigation is on-going which will present slope and outfall rehabilitation options and costs.



**Photograph 1: Outfall #46 with concrete drop structure and visible soil erosion.**



**Photograph 2: Outfall and gabions in good condition but evidence of settlement due to erosion of the soil below the structure.**



**Photograph 3: Soil erosion below the concrete drop structure.**



**Photograph 4: River flow causing soil erosion.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	47	Drawing Ref.	Figure 5
Location (UTM)	0385437 6112690	Year	Abandoned 1993
Material	Unknown	Diameter (mm)	Unknown
Location Description	Abandoned outfall east side of Bear Creek, south of 74 Avenue		
Overall Condition		Comments	
Pipe Condition	Unknown		
Outfall Structure Condition	Unknown		
Gabions/Rip Rap Condition	Unknown		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-see notes below	
Debris Present	No		
Safety Hazard Identified	Yes		
Surrounding Slope	Stable		
Maintenance Required	Yes		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	1		

This outfall was reportedly abandoned in 1993. Nothing was found of the actual outfall structure, however, a large void with a pipe was observed at the bottom of a hole, approximately 1 to 1.3 m deep. This void is a safety hazard and must be backfilled.

It appears that the void was formed by flowing water indicating that the old sewer pipe may still be carrying water during storm events. The method of abandonment and condition of the old pipe should be confirmed by visual inspection.

Plugging of any old pipe may be necessary.

Due to the unknown extent of work required to inspect and block this former storm line, a budget has not been prepared.



**Photograph 1: showing a large void near the location of abandoned Outfall #47. The inset shows the location in proximity to Bear Creek.**



**Photograph 2: Looking upslope towards 100 Street. The slope appears stable and no other evidence of the former outfall was found.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	48	Drawing Ref.	Figures 5 & 6
Location (UTM)	0385592 6112409	Year	1977
Material	CMP	Diameter (mm)	1200
Location Description	East of Bear Creek, west of 100 St. and north of 71 Ave.		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good	-concrete surrounding pipe is cracked	
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	Yes	-minor soil erosion along the sides of trench	
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	2		

Concrete apron should have cracks sealed to minimize deterioration.

Erosion control measures consisting of a geotextile blanket and seeded topsoil should be added to the flow channel extending from the outfall down to the creek. Only minor hand clearing would be required to facilitate installation of the erosion control measures.

The estimate cost is \$ 8500, and is presented in Table 25 (Appendix B).



**Photograph 1: Outfall #48.**



**Photograph 2: Erosion channel.**

STORM SEWER OUTFALL SUMMARY			
<b>Outfall No.</b>	50	<b>Drawing Ref.</b>	Figure 6
<b>Location (UTM)</b>	0385542 6111991	<b>Year</b>	Unknown
<b>Material</b>	PVC	<b>Diameter (mm)</b>	300
<b>Location Description</b>	West of 100 St. and north of 68 Ave.		
Overall Condition		Comments	
<b>Pipe Condition</b>	Poor	-pipe is submerged in water and potentially blocked	
<b>Outfall Structure Condition</b>	Poor	-concrete apron has separated from the pipe creating a gap; concrete structure is also submerged in water; channel created for the outfall is not functioning properly and water is flowing towards Outfall #51	
<b>Gabions/Rip Rap Condition</b>	Fair		
<b>Erosion by River</b>	No		
<b>Erosion by Sewer Flow</b>	Yes	-erosion is present all around outfall	
<b>Debris Present</b>	Yes	-excess vegetation	
<b>Safety Hazard Identified</b>	No		
<b>Surrounding Slope</b>	Stable		
<b>Maintenance Required</b>	No		
<b>Rehabilitation Required</b>	Yes	-concrete structure and pipe should be repaired	
<b>Access Restrictions</b>	No		
<b>Priority</b>	1		

Reconstruction of the outfall, including the erosion control mechanisms are required. Replacement of rip-rap with hard-armor erosion control blankets and vegetation supported by matting is recommended. Backfilling and re-contouring the erosion gullies is required. A detailed erosion control plan is also required.

This is a relatively new outfall and the shifting of the apron away from the pipe is likely due to settlement of the embankment fill for the 68 Avenue bridge. Continued periodic monitoring for other evidence of settlement is recommended.

The size of the existing rip-rap may be too large to minimize erosion.

The estimated repair costs are \$12,000 and are presented in Table 26 (Appendix B).



**Photograph 1: Outfall #50 with soil erosion and vegetation growth.**



**Photograph 2: Outfall #50.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	51	Drawing Ref.	Figure 6
Location (UTM)	0385468 6111984	Year	Unknown
Material	PVC	Diameter (mm)	300
Location Description	East of Bear Creek, west of 100 St. and south of 68 Ave.		
Overall Condition		Comments	
Pipe Condition	Good	-pipe end is almost fully blocked with soil and other debris	
Outfall Structure Condition	Poor	-concrete apron structure surrounding pipe appears to have slid off creating a gap between the apron and pipe; the concrete is also plugged and cracked	
Gabions/Rip Rap Condition	Fair	-excessive weed growth is choking out grass species; spraying and seeding is needed	
Erosion by River	No		
Erosion by Sewer Flow	Yes	-some erosion is evident above and beside outfall; establishment of a grass turf will minimize erosion.	
Debris Present	Yes	-pipe is filled with soil and other debris	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-pipe should be cleaned out and concrete structure should be replaced	
Rehabilitation Required	No		
Access Restrictions	Yes	-moderately steep slope	
Priority	1		

The concrete apron has slid down slope exposing the underlying blue-brute PVC pipe. The end of the pipe has been filled with soil and debris and will need hand cleaning, and possibly flushing.

Erosion was noted above and beside the outfall, but this should be minimized with the establishment of a good grass cover. Elimination of weeds will be necessary to ensure that the planted grass species can be established. The apron needs to be re-set into proper location.

The cost of remedial work is approximately \$3300, and is detailed in Table 27 (Appendix B).



**Photograph 1: Looking north at Outfall #51. 68 Avenue is at the top of the photograph. Weed growth is prevalent within the rip-rap facing.**



**Photograph 2: Concrete apron structure separated from the pipe, likely due to creep movement of the new embankment fill.**



**Photograph 3: Soil erosion.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	52	Drawing Ref.	Figure 6
Location (UTM)	0385236 6111958	Year	Unknown
Material	CSP	Diameter (mm)	300
Location Description	West of Bear Creek and south of 68 Ave.		
Overall Condition		Comments	
Pipe Condition	Good	-slightly bent pipe	
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	4		

This outfall is in good condition with no evidence of erosion or other problems that would require maintenance or rehabilitation.

Periodic monitoring every 12 to 18 months is recommended to assess performance.



**Photograph 1: Looking north to Outfall #52, with 68 Avenue above the slope.**



**Photograph 2: Looking down to Bear Creek from Outfall #52.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	53	Drawing Ref.	Figure 6
Location (UTM)	0385193 6111900	Year	Unknown
Material	CONC	Diameter (mm)	300
Location Description	East of Bear Creek, west of Outfall #51; north of pedestrian footbridge		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable	-small slump is present to the side of the outfall	
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	4		

The outfall is in good condition with only a small slump noted immediately downstream of the outfall, on the north side. The addition of grass seed, and a light coconut straw matting to assist with seed germination will help stabilize the slump.

The estimate cost of installing matting and grass seed is less than \$1000.



**Photograph 1: Outfall #53 with small slump to the north of the outfall.**



**Photograph 2: Outfall #53 taken from the west bank of the creek.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	54	Drawing Ref.	Figure 6
Location (UTM)	0385267 6111911	Year	Unknown
Material	CSP	Diameter (mm)	600
Location Description	West of Bear Creek and south of Outfall #52		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good	-minor erosion directly below concrete structure	
Erosion by River	No		
Erosion by Sewer Flow	Yes	-minor erosion	
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	4		

The outfall is in good condition with the only issue being a void located below the apron that may undermine support for the outfall structure over time.

We recommend that the outfall be inspected in 2010 and if gap below structure has not increased then use grout to fill void. If void is larger, redesign of the erosion control measures will be required.



**Photograph 1: Outfall #54 on the west side of Bear Creek, taken from the adjacent footbridge.**



**Photograph 2: Outfall with minor erosion below the apron.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	55	Drawing Ref.	Figure 6
Location (UTM)	0385631 6111191	Year	Unknown
Material	CONC	Diameter (mm)	Unknown
Location Description	East of 100 St. and north of 67 Ave.		
Overall Condition		Comments	
Pipe Condition	Good	-pipe is plugged	
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	Yes	-pipe is plugged with debris due to vandalism	
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	Yes	-pipe must be cleared out	
Rehabilitation Required	No		
Access Restrictions	No		
Priority	2		

Debris in pipe partly due to vandalism. Hand clearing required.

The cost of clearing out the pipe is estimated to be 2 hours of labour and cost less than \$300.



**Photograph 1: Outfall #1.**



**Photograph 2: Plugged pipe due partly to vandalism.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	56	Drawing Ref.	Figure 4 & 5
Location (UTM)	0385304 6113621	Year	Unknown
Material	CONC	Diameter (mm)	Unknown
Location Description	South of 84 Avenue, west of 101 Street, east of Bear Creek		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Fair	-erosion present	
Erosion by River	No		
Erosion by Sewer Flow	Yes	-erosion present along the trench wall	
Debris Present	No		
Safety Hazard Identified	Yes	- the erosion channel is a tripping hazard and is accessible by green space users.	
Surrounding Slope	Stable		
Maintenance Required	Yes	-improve the rip rap to minimize erosion	
Rehabilitation Required	No		
Access Restrictions	Yes	-steep slope	
Priority	1		

Backfilling erosion channel and installation of erosion control blanket is recommended. Re-vegetate with topsoil and seed. Hand place existing rip-rap once the ECB is installed.

The cost of remedial work is approximately \$2300, and is detailed in Table 28 (Appendix B).



**Photograph 1: Outfall #56.**



**Photograph 2: Outfall #56.**

STORM SEWER OUTFALL SUMMARY			
Outfall No.	57	Drawing Ref.	Figure 4
Location (UTM)	0385055 6113676	Year	Unknown
Material	CONC	Diameter (mm)	Unknown
Location Description	116 Street, north of 132 Avenue and south of Outfall #56		
Overall Condition		Comments	
Pipe Condition	Good		
Outfall Structure Condition	Good		
Gabions/Rip Rap Condition	Good		
Erosion by River	No		
Erosion by Sewer Flow	No		
Debris Present	No		
Safety Hazard Identified	No		
Surrounding Slope	Stable		
Maintenance Required	No		
Rehabilitation Required	No		
Access Restrictions	No		
Priority	4		

Outfall in good condition. No repairs necessary. Inspect every 3 to 4 years.



Photograph 1: Outfall #57 on the west side of Bear Creek, immediately north of 84 Avenue bridge.

STORM SEWER OUTFALL SUMMARY			
<b>Outfall No.</b>	58	<b>Drawing Ref.</b>	Figure 6
<b>Location (UTM)</b>	0385674 6111940	<b>Year</b>	Unknown
<b>Material</b>	PVC	<b>Diameter (mm)</b>	Unknown
<b>Location Description</b>	South of 68 Avenue, east of 100 Street		
Overall Condition		Comments	
<b>Pipe Condition</b>	Good	-gap between concrete structure and pipe	
<b>Outfall Structure Condition</b>	Fair	-concrete apron structure has pulled away from pipe, exposing the blue brute pipe	
<b>Gabions/Rip Rap Condition</b>	Fair	-minor erosion present below the concrete structure but grass is dead weeds are prevalent	
<b>Erosion by River</b>	No		
<b>Erosion by Sewer Flow</b>	Yes	-erosion present below the outfall	
<b>Debris Present</b>	Yes	-debris is present within the concrete structure	
<b>Safety Hazard Identified</b>	No		
<b>Surrounding Slope</b>	Stable		
<b>Maintenance Required</b>	Yes	-concrete structure should be cleaned out and replaced	
<b>Rehabilitation Required</b>	No	-areas with rip rap should be increased to minimize erosion	
<b>Access Restrictions</b>	No		
<b>Priority</b>	2		

Concrete apron has separated from pipe. Apron must be re-installed, erosion control measures upgraded to include geotextile erosion control blankets and vegetation. Garbage and debris to be removed.

The cost of remedial work is approximately \$5100, and is detailed in Table 29 (Appendix B).



**Photograph 1: Outfall #58.**

**Photograph 2: Concrete apron separated from pipe.**



## **APPENDIX B**

### **OUTFALL REPAIR AND MAINTENANCE COST ESTIMATES**

**TABLE: 1**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 1**

PROJECT#: GP1433  
 CLIENT: The City of Grande Prairie  
 PROJECT: Outfall Remediation and/or Maintenance  
 LOCATION: East of Bear Creek, west of Hwy 43, south of 117 Avenue

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 53,088	%	5.0%	\$ 2,654	
	Field Engineering	\$ 53,088	%	10.0%	\$ 5,309	
	City of GP - Engineering Services Time	\$ 53,088	%	3.0%	\$ 1,593	
	Engineering & Design, Tender	1	allow	\$ 3,500.00	\$ 3,500	
	Permits (DFO, NavWaters, AENV)	1	allow	\$ 4,500.00	\$ 4,500	
Subtotal - Engineering					\$ 17,556	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 2,500	\$ 2,500	
Clearing	Clearing & Grubbing	60	m2	\$ 4.50	\$ 270	
	Labour to clear	4	hr	\$ 60.00	\$ 240	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	40	lm	\$ 30.00	\$ 1,200	
	Install silt curtain/fencing	6	hr	\$ 60.00	\$ 360	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	30	lm	\$ 150	\$ 4,500	
	Re-install Gabions	30	lm	\$ 200	\$ 6,000	
	Gravel for Gabions	40	m3	\$ 345	\$ 13,800	
	Baskets - new, S&I	40	m3	\$ 250	\$ 10,000	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	0	hr	\$ 60.00	\$ -	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	0	m2	\$ 5	\$ -	
	Supply and place topsoil (100mm)	0	m2	\$ 10	\$ -	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other	Remove and replace chain link fence	30	lm	\$ 150	\$ 4,500	
	Contingency Allowance		%	25%	\$ 9,718	
Subtotal - Contractor & Materials					\$ 53,088	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 70,643</b>	

**TABLE: 2**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 2**

PROJECT#: GP1433  
 CLIENT: The City of Grande Prairie  
 PROJECT: Outfall Remediation and/or Maintenance  
 LOCATION: Within Hwy 43 ROW, north of Bear Creek

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 18,906	%	5.0%	\$ 945	
	Field Engineering	\$ 18,906	%	10.0%	\$ 1,891	
	City of GP - Engineering Services Time	\$ 18,906	%	3.0%	\$ 567	
	Engineering & Design, Tender	0.5	allow	\$ 3,500.00	\$ 1,750	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 5,153	
<b>Contractor</b>	Mob/Demob	0.25	allow	\$ 2,500	\$ 625	
Clearing	Clearing & Grubbing	1	allow	\$ 1,000	\$ 1,000	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	800	m2	\$ 2.75	\$ 2,200	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	30	hr	\$ 60.00	\$ 1,800	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	1	allow	\$ 1,500	\$ 1,500	
	Supply and place topsoil (100mm)	800	m2	\$ 10	\$ 8,000	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 3,781	
Subtotal - Contractor & Materials					\$ 18,906	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 24,059</b>	

**TABLE: 3**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 3**

PROJECT#: GP1433  
 CLIENT: The City of Grande Prairie  
 PROJECT: Outfall Remediation and/or Maintenance  
 LOCATION: south of Bear Creek, within Hwy 43 ROW (bypass)

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 30,300	%	5.0%	\$ 1,515	
	Field Engineering	\$ 30,300	%	10.0%	\$ 3,030	
	City of GP - Engineering Services Time	\$ 30,300	%	3.0%	\$ 909	
	Engineering & Design, Tender	0.75	allow	\$ 3,500.00	\$ 2,625	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 8,079	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 2,500	\$ 2,500	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	20	lm	\$ 30.00	\$ 600	
	Install silt curtain/fencing	4	hr	\$ 60.00	\$ 240	2 man crew
Prep	Excavate and shape slope	20	hr	\$ 180.00	\$ 3,600	
	Load, haul, dispose cuttings	1	allow	\$ 3,500	\$ 3,500	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	400	m2	\$ 10.75	\$ 4,300	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	40	hr	\$ 60.00	\$ 2,400	2 man crew (place, staple, N/I vegetation)
Structure	Re-align Pad	0	hr	\$ 180.00	\$ -	
Repairs	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	300	m2	\$ 5	\$ 1,500	
	Supply and place topsoil (100mm)	0	m2	\$ 10	\$ -	
	Planting - labour	40	hr	\$ 60.00	\$ 2,400	2 man crew
	Plantings - willow/cattails	1	allow	\$ 4,000	\$ 4,000	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 5,260	
Subtotal - Contractor & Materials					\$ 30,300	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 38,379</b>	

**TABLE: 4**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 5**

PROJECT#: GP1433  
 CLIENT: The City of Grande Prairie  
 PROJECT: Outfall Remediation and/or Maintenance  
 LOCATION: East of Hwy 43 (bypass) and south of Chamber of Commerce building

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ -	%	5.0%	\$ -	
	Field Engineering	\$ -	allow		\$ 120	
	City of GP - Engineering Services Time	\$ 4,794	%	5.0%	\$ 240	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 360	
<b>Contractor</b>	Mob/Demob	0	allow	\$ 2,500	\$ -	
Clearing	Clearing & Grubbing	250	m2	\$ 4.50	\$ 1,125	
	Labour to clear	16	hr	\$ 60.00	\$ 960	
	Disposal Costs	1	allow	\$ 250.00	\$ 250	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	4	hr	\$ 250	\$ 1,000	
	Disposal Charges	1	allow	\$ 500	\$ 500	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	0	hr	\$ 60.00	\$ -	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	0	m2	\$ 5	\$ -	
	Supply and place topsoil (100mm)	0	m2	\$ 10	\$ -	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
Contingency Allowance			%	25%	\$ 959	
Subtotal - Contractor & Materials					\$ 4,794	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 5,153</b>	

**TABLE: 5**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 6**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: North side of reservoir, west of 104 Street, south of 108 Avenue

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 2,706	%	5.0%	\$ 135	
	Field Engineering	\$ 2,706	%	10.0%	\$ 271	
	City of GP - Engineering Services Time	\$ 2,706	%	3.0%	\$ 81	
	Engineering & Design, Tender	0.25	allow	\$ 3,500.00	\$ 875	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 1,362	
<b>Contractor</b>	Mob/Demob	0	allow	\$ 2,500	\$ -	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	10	hr	\$ 60.00	\$ 600	
	Disposal Costs	0	allow	\$ 60.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	100	m2	\$ 2.75	\$ 275	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	4	hr	\$ 60.00	\$ 240	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	100	m2	\$ 0.50	\$ 50	
	Supply and place topsoil (100mm)	100	m2	\$ 10	\$ 1,000	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
Contingency Allowance			%	25%	\$ 541	
Subtotal - Contractor & Materials					\$ 2,706	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 4,068</b>	

**TABLE: 6**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 8**

PROJECT#: GP1433  
 CLIENT: The City of Grande Prairie  
 PROJECT: Outfall Remediation and/or Maintenance  
 LOCATION: South of 108 Avenue, west of 104 Street on the north side of the Reservoir

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 1,700	%	5.0%	\$ -	
	Field Engineering	\$ 1,700	%	10.0%	\$ 170	
	City of GP - Engineering Services Time	\$ 1,700	%	5.0%	\$ 85	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 255	
<b>Contractor</b>	Mob/Demob	0	allow	\$ 2,500	\$ -	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	6	hr	\$ 60.00	\$ 360	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	0	hr	\$ 60.00	\$ -	2 man crew (place, staple, N/I vegetation)
Structure	Re-align Pad	0	hr	\$ 180.00	\$ -	
Repairs	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	1	allow	\$ 1,000	\$ 1,000	
	Supply and place topsoil (100mm)	0	m2	\$ 10	\$ -	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 340	
Subtotal - Contractor & Materials					\$ 1,700	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 1,955</b>	

**TABLE: 7**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 13**

PROJECT#: GP1433  
 CLIENT: The City of Grande Prairie  
 PROJECT: Outfall Remediation and/or Maintenance  
 LOCATION: East of Bear Creek, west of 102 Street and South of 105 Avenue within park area

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 44,925	%	5.0%	\$ 2,246	
	Field Engineering	\$ 44,925	%	10.0%	\$ 4,493	
	City of GP - Engineering Services Time	\$ 44,925	%	3.0%	\$ 1,348	
	Engineering & Design, Tender	1	allow	\$ 3,500.00	\$ 3,500	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 11,587	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 2,500	\$ 2,500	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Construction Supervision	30	hr	\$ 60.00	\$ 1,800	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	1	allow	\$ 4,500	\$ 4,500	Safety fencing, remove trees, barricades
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	15	lm	\$ 30.00	\$ 450	
	Install silt curtain/fencing	2	hr	\$ 60.00	\$ 120	2 man crew
Prep	Excavate & backfill	30	hr	\$ 180.00	\$ 5,400	
	Load, haul, dispose cuttings, waste material	0.5	allow	\$ 3,500	\$ 1,750	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (Pyramat or equiv.)	80	m2	\$ 10.75	\$ 860	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	16	hr	\$ 60.00	\$ 960	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials (20 m x 800 CSP x 2mm)	20	lm	\$ 190	\$ 3,800	
Re-seeding	Clean site, re-seed damage grass	0	m2	\$ 5	\$ -	
	Supply and place topsoil (100mm)	0	m2	\$ 10	\$ -	
	Planting - labour	6	hr	\$ 60.00	\$ 360	2 man crew
	Plantings - willow/cattails	0.25	allow	\$ 4,000	\$ 1,000	
Asphalt	Supply and place 20 mm gravel (200mm)	10	t	\$ 30	\$ 300	
	Supply and place 50 mm ACP	1	allow	\$ 5,500	\$ 5,500	
Other	Concrete Apron - precast (if necessary)	1	allow	\$ 10,000	\$ 10,000	
	Contingency Allowance		%	25%	\$ 5,625	
Subtotal - Contractor & Materials					\$ 44,925	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 56,512</b>	

**TABLE: 8**
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**
**OUTFALL # 15**

PROJECT#: GP1433

CLIENT: The City of Grande Prairie

PROJECT: Outfall Remediation and/or Maintenance

LOCATION: West of Bear Creek, North of 102 Avenue

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 27,661	%	5.0%	\$ 1,383	
	Field Engineering	\$ 27,661	%	10.0%	\$ 2,766	
	City of GP - Engineering Services Time	\$ 27,661	%	3.0%	\$ 830	
	Engineering & Design, Tender	1	allow	\$ 3,500.00	\$ 3,500	
	Permits (DFO, NavWaters, AENV)	1	allow	\$ 4,500.00	\$ 4,500	
Subtotal - Engineering					\$ 12,979	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 2,500	\$ 2,500	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	30	lm	\$ 30.00	\$ 900	
	Install silt curtain/fencing	6	hr	\$ 60.00	\$ 360	2 man crew
Prep	Excavate and shape slope	4	hr	\$ 180.00	\$ 720	
	Load, haul, dispose cuttings	1	allow	\$ 3,500	\$ 3,500	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	30	m2	\$ 275	\$ 8,239	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	50	m2	\$ 3.00	\$ 150	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	48	hr	\$ 60.00	\$ 2,880	3 man crew - 3 days
	Excavator - during Ajacks install	16	hr	\$ 180.00	\$ 2,880	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	0	hr	\$ 60.00	\$ -	2 man crew (place, staple, N/I vegetation)
Structure	Re-align Pad	0	hr	\$ 180.00	\$ -	
Repairs	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	0	m2	\$ 5	\$ -	
	Supply and place topsoil (100mm)	0	m2	\$ 10	\$ -	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 5,532	
Subtotal - Contractor & Materials					\$ 27,661	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 40,640</b>	

**TABLE: 9**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 17**

PROJECT#: GP1433  
 CLIENT: The City of Grande Prairie  
 PROJECT: Outfall Remediation and/or Maintenance  
 LOCATION: West of Bear Creek, North of 101 Avenue

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 1,850	%	5.0%	\$ 93	
	Field Engineering	\$ 1,850	%	10.0%	\$ 185	
	City of GP - Engineering Services Time	\$ 1,850	%	3.0%	\$ 56	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 333	
<b>Contractor</b>	Mob/Demob	0	allow	\$ 2,500	\$ -	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	4	lm	\$ 30.00	\$ 120	
	Install silt curtain/fencing	2	hr	\$ 60.00	\$ 120	2 man crew
Prep	Excavate and shape base	4	hr	\$ 60.00	\$ 240	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	20	m2	\$ 3.00	\$ 60	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (Pyramat Turf Reinforcement)	20	m2	\$ 15.00	\$ 300	Permanent turf mat.
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	0	hr	\$ 60.00	\$ -	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	0	m2	\$ 5	\$ -	
	Supply and place topsoil (100mm)	0	m2	\$ 10	\$ -	
	Planting - labour	4	hr	\$ 60.00	\$ 240	2 man crew
	Plantings - willow/cattails	1	allow	\$ 500	\$ 500	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 270	
Subtotal - Contractor & Materials					\$ 1,850	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 2,183</b>	

**TABLE: 10**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 19**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: West side of Bear Creek, at 100 Avenue

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 3,297	%	5.0%	\$ 165	
	Field Engineering	\$ 3,297	%	10.0%	\$ 330	
	City of GP - Engineering Services Time	\$ 3,297	%	3.0%	\$ 99	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 593	
<b>Contractor</b>	Mob/Demob	0.2	allow	\$ 2,500	\$ 500	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	1.5	hr	\$ 180.00	\$ 270	
	Load, haul, dispose cuttings	0.5	allow	\$ 1,000	\$ 500	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	50	m2	\$ 2.75	\$ 138	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	4	hr	\$ 60.00	\$ 240	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	50	m2	\$ 5	\$ 250	
	Supply and place topsoil (100mm)	50	m2	\$ 10	\$ 500	
	Planting - labour	4	hr	\$ 60.00	\$ 240	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
Contingency Allowance			%	25%	\$ 659	
Subtotal - Contractor & Materials					\$ 3,297	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 3,890</b>	

**TABLE: 11**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 20**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: East side of Bear Creek, at 100th Avenue

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 4,350	%	5.0%	\$ 218	
	Field Engineering	\$ 4,350	%	10.0%	\$ 435	
	City of GP - Engineering Services Time	\$ 4,350	%	3.0%	\$ 131	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 783	
<b>Contractor</b>	Mob/Demob	0	allow	\$ 2,500	\$ -	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	8	hr	\$ 60.00	\$ 480	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	8	hr	\$ 250	\$ 2,000	
	Disposal Charges	2	allow	\$ 500	\$ 1,000	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	0	hr	\$ 60.00	\$ -	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	0	m2	\$ 5	\$ -	
	Supply and place topsoil (100mm)	0	m2	\$ 10	\$ -	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
Contingency Allowance			%	25%	\$ 870	
Subtotal - Contractor & Materials					\$ 4,350	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 5,133</b>	

**TABLE: 12**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 24**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: East side of Bear Creek, at 98 Avenue

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 39,447	%	5.0%	\$ 1,972	
	Field Engineering	\$ 39,447	%	10.0%	\$ 3,945	
	City of GP - Engineering Services Time	\$ 39,447	%	3.0%	\$ 1,183	
	Engineering & Design, Tender	1	allow	\$ 3,500.00	\$ 3,500	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 10,600	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 2,500	\$ 2,500	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	20	lm	\$ 30.00	\$ 600	
	Install silt curtain/fencing	3	hr	\$ 60.00	\$ 180	2 man crew
Prep	Excavate and shape slope	16	hr	\$ 180.00	\$ 2,880	
	Load, haul, dispose waste	1	allow	\$ 3,500	\$ 3,500	
Erosion Control Measures	Remove and salvage existing Gabions	1	allow	\$ 3,000	\$ 3,000	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	Re-use existing gabion gravel
	Blanket - new, S&I	24	m2	\$ 250	\$ 6,000	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	50	m2	\$ 3.00	\$ 150	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	450	m2	\$ 10.75	\$ 4,838	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	6	hr	\$ 60.00	\$ 360	2 man crew (place, staple, N/I vegetation)
Structure	Re-align Pad	0	hr	\$ 180.00	\$ -	
Repairs	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	450	m2	\$ 5	\$ 2,250	
	Supply and place topsoil (100mm)	450	m2	\$ 10	\$ 4,500	
	Planting - labour	8	hr	\$ 60.00	\$ 480	2 man crew
	Plantings - willow/cattails	0.1	allow	\$ 4,000	\$ 400	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 7,809	
Subtotal - Contractor & Materials					\$ 39,447	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 50,047</b>	

**TABLE: 13**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 28**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: East side of Bear Creek, at 93 Avenue and 102 Street, in dense tree cover

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 10,975	%	5.0%	\$ 549	
	Field Engineering	\$ 10,975	%	10.0%	\$ 1,098	
	City of GP - Engineering Services Time	\$ 10,975	%	3.0%	\$ 329	
	Engineering & Design, Tender	0.5	allow	\$ 3,500.00	\$ 1,750	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 3,726	
<b>Contractor</b>	Mob/Demob	0.25	allow	\$ 2,500	\$ 625	
Clearing	Clearing & Grubbing	300	m2	\$ 4.50	\$ 1,350	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	1	allow	\$ 800.00	\$ 800	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	300	m2	\$ 2.75	\$ 825	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	12	hr	\$ 60.00	\$ 720	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	300	m2	\$ 5	\$ 1,500	
	Supply and place topsoil (100mm)	200	m2	\$ 10	\$ 2,000	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	40	t	\$ 30	\$ 1,200	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 1,955	
Subtotal - Contractor & Materials					\$ 10,975	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 14,701</b>	

**TABLE: 14**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 29**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: East side of Bear Creek, at 93 Avenue and 102 Street, south of park bench

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 8,110	%	5.0%	\$ 406	
	Field Engineering	\$ 8,110	%	10.0%	\$ 811	
	City of GP - Engineering Services Time	\$ 8,110	%	3.0%	\$ 243	
	Engineering & Design, Tender	0.25	allow	\$ 3,500.00	\$ 875	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 2,335	
<b>Contractor</b>	Mob/Demob	0.25	allow	\$ 2,500	\$ 625	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	3	hr	\$ 180.00	\$ 540	
	Load, haul, dispose cuttings	0.5	allow	\$ 3,500	\$ 1,750	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	60	m2	\$ 2.75	\$ 165	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	4	hr	\$ 60.00	\$ 240	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Excavate and backfill pipe end	2	hr	\$ 180.00	\$ 360	
	Labour	2	hr	\$ 60.00	\$ 120	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	1	allow	\$ 1,500	\$ 1,500	
Re-seeding	Clean site, re-seed damage grass	60	m2	\$ 5	\$ 300	
	Supply and place topsoil (100mm)	60	m2	\$ 10	\$ 600	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	12	t	\$ 30	\$ 360	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 1,550	
Subtotal - Contractor & Materials					\$ 8,110	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 10,445</b>	

**TABLE: 15**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 30**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: East side of Bear Creek; at 92 Avenue; west of 101A Street

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 7,378	%	5.0%	\$ 369	
	Field Engineering	\$ 7,378	%	10.0%	\$ 738	
	City of GP - Engineering Services Time	\$ 7,378	%	3.0%	\$ 221	
	Engineering & Design, Tender	0.5	allow	\$ 3,500.00	\$ 1,750	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 3,078	
<b>Contractor</b>	Mob/Demob	0.5	allow	\$ 2,500	\$ 1,250	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	4	hr	\$ 180.00	\$ 720	
	Load, haul, dispose cuttings	0.25	allow	\$ 3,500	\$ 875	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	50	m2	\$ 2.75	\$ 138	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	0	hr	\$ 60.00	\$ -	2 man crew (place, staple, N/I vegetation)
Structure	Install Pad/Flare End	1	hr	\$ 180.00	\$ 180	
Repairs	Labour	2	hr	\$ 60.00	\$ 120	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0.5	allow	\$ 3,500	\$ 1,750	
Re-seeding	Clean site, re-seed damage grass	50	m2	\$ 5	\$ 250	
	Supply and place topsoil (100mm)	50	m2	\$ 10	\$ 500	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	5	t	\$ 30	\$ 150	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 1,446	
Subtotal - Contractor & Materials					\$ 7,378	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 10,456</b>	

**TABLE: 16**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 32**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: On 102 Street, between 90 and 91 Avenue within heavy tree cover

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 6,144	%	5.0%	\$ 307	
	Field Engineering	\$ 6,144	%	5.0%	\$ 307	
	City of GP - Engineering Services Time	\$ 6,144	%	5.0%	\$ 307	
	Engineering & Design, Tender	0.25	allow	\$ 3,500.00	\$ 875	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 1,797	
<b>Contractor</b>	Mob/Demob	0.5	allow	\$ 2,500	\$ 1,250	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	4	hr	\$ 60.00	\$ 240	
	Disposal Costs	1	allow	\$ 50.00	\$ 50	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	8	hr	\$ 180.00	\$ 1,440	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	60	m2	\$ 2.75	\$ 165	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	4	hr	\$ 60.00	\$ 240	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	4	hr	\$ 60.00	\$ 240	2 man crew
	Materials	1	allow	\$ 150	\$ 150	
Re-seeding	Clean site, re-seed damage grass	60	m2	\$ 5	\$ 300	
	Supply and place topsoil (100mm)	60	m2	\$ 10	\$ 600	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	10	t	\$ 30	\$ 300	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
Contingency Allowance			%	25%	\$ 1,169	
Subtotal - Contractor & Materials					\$ 6,144	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 7,940</b>	

**TABLE: 17**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 34**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: On 102 Street, between 89 and 90 Avenue within heavy tree cover

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 24,934	%	5.0%	\$ 1,247	
	Field Engineering	\$ 24,934	%	10.0%	\$ 2,493	
	City of GP - Engineering Services Time	\$ 24,934	%	3.0%	\$ 748	
	Engineering & Design, Tender	1	allow	\$ 3,500.00	\$ 3,500	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 7,988	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 2,500	\$ 2,500	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	50	m2	\$ 2.75	\$ 138	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	0	hr	\$ 60.00	\$ -	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials 200 mm HDPE	25	allow	\$ 200	\$ 5,000	
Re-seeding	Clean site, re-seed damage grass	50	m2	\$ 5	\$ 250	
	Supply and place topsoil (50mm)	50	m2	\$ 10	\$ 500	
	Planting - labour	4	hr	\$ 60.00	\$ 240	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	5	t	\$ 30	\$ 150	
	Supply and place 50 mm ACP	1	allow	\$ 5,500	\$ 5,500	
Other	HDD Drilling	25	lm	\$ 200	\$ 5,000	
	Manhole	1	allow	\$ 3,500	\$ 3,500	
	Contingency Allowance		%	25%	\$ 2,157	
Subtotal - Contractor & Materials					\$ 24,934	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 32,923</b>	

**TABLE: 18**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 36**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: West of 102 Street and south of 89 Avenue

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 13,281	%	5.0%	\$ 664	
	Field Engineering	\$ 13,281	%	10.0%	\$ 1,328	
	City of GP - Engineering Services Time	\$ 13,281	%	3.0%	\$ 398	
	Engineering & Design, Tender	0.25	allow	\$ 3,500.00	\$ 875	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 3,266	
<b>Contractor</b>	Mob/Demob	0.25	allow	\$ 2,500	\$ 625	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	8	hr	\$ 180.00	\$ 1,440	
	Load, haul, dispose cuttings	0.5	allow	\$ 3,500	\$ 1,750	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	100	m2	\$ 2.75	\$ 275	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	2	hr	\$ 60.00	\$ 120	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	4	hr	\$ 60.00	\$ 240	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0.25	allow	\$ 3,500	\$ 875	New pipe end with flare.
Re-seeding	Clean site, re-seed damage grass	100	m2	\$ 5	\$ 500	
	Supply and place topsoil (100mm)	100	m2	\$ 10	\$ 1,000	
	Planting - labour	10	hr	\$ 60.00	\$ 600	2 man crew
	Plantings - trees, shrubs	1	allow	\$ 4,000	\$ 4,000	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
Contingency Allowance			%	25%	\$ 1,856	
Subtotal - Contractor & Materials					\$ 13,281	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 16,547</b>	

**TABLE: 19**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 37**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: West of Bear Creek, south of Outfall 36

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 6,963	%	0.0%	\$ -	
	Field Engineering	\$ 6,963	%	0.0%	\$ -	
	City of GP - Engineering Services Time	\$ 6,963	%	5.0%	\$ 348	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 348	
<b>Contractor</b>	Mob/Demob	0	allow	\$ 2,500	\$ -	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	20	tonnes	\$ 150	\$ 3,000	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install Gravel	24	hr	\$ 60.00	\$ 1,440	2 man crew
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	4	hr	\$ 60.00	\$ 240	2 man crew
	Materials	1	allow	\$ 250	\$ 250	
Re-seeding	Clean site, re-seed damage grass	0	m2	\$ 5	\$ -	
	Supply and place topsoil (100mm)	0	m2	\$ 10	\$ -	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other	Gator or small dump trailer for quads	1	allow	\$ 800	\$ 800	
	Contingency Allowance		%	25%	\$ 1,233	
Subtotal - Contractor & Materials					\$ 6,963	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 7,311</b>	

**TABLE: 20**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 39**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall and Pipe Remediation  
LOCATION: East of 102 Street & South of 86 Avenue

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 23,003	%	5.0%	\$ 1,150	
	Field Engineering	\$ 23,003	%	10.0%	\$ 2,300	
	City of GP - Engineering Services Time	\$ 23,003	%	3.0%	\$ 690	
	Engineering & Design, Tender	0.5	allow	\$ 3,500.00	\$ 1,750	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 5,891	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 2,500	\$ 2,500	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	8	hr	\$ 60.00	\$ 480	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Prep	Excavate and remove old pipe	8	hr	\$ 180.00	\$ 1,440	
	Install new CSP, backfill	12	allow	\$ 180.00	\$ 2,160	
	Labour to install CSP	24	hr	\$ 60.00	\$ 1,440	
Erosion Control Measures	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	150	m2	\$ 2.75	\$ 413	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	4	hr	\$ 60.00	\$ 240	2 man crew (place, staple, N/I vegetation)
	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	150	m2	\$ 5	\$ 750	
	Supply and place topsoil (100mm)	150	m2	\$ 10	\$ 1,500	
	Planting - labour	8	hr	\$ 60.00	\$ 480	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	25	t	\$ 30	\$ 750	
	Supply and place 50 mm ACP	1	allow	\$ 3,500	\$ 3,500	
Other	CSP Culvert (375mm)	1	allow	\$ 4,500	\$ 4,500	
	Contingency Allowance		%	25%	\$ 2,851	
Subtotal - Contractor & Materials					\$ 23,003	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 28,894</b>	

**TABLE: 21**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 40**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and Maintenance  
LOCATION: South of 84Ave., east side of Bear Creek

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 4,725	%	0.0%	\$ -	
	Field Engineering	\$ 4,725	%	10.0%	\$ 473	
	City of GP - Engineering Services Time	\$ 4,725	%	3.0%	\$ 142	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 614	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 600	\$ 600	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	3	hr	\$ 60.00	\$ 180	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Camera inspection	1	allow	\$ 1,500	\$ 1,500	
Vacuum Truck	Vacuum Truck	4	hr	\$ 250	\$ 1,000	
	Disposal Charges	1	allow	\$ 500	\$ 500	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	0	hr	\$ 60.00	\$ -	2 man crew (place, staple, N/I vegetation)
Structure	Re-align Pad	0	hr	\$ 180.00	\$ -	
Repairs	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	0	m2	\$ 5	\$ -	
	Supply and place topsoil (100mm)	0	m2	\$ 10	\$ -	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 945	
Subtotal - Contractor & Materials					\$ 4,725	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 5,339</b>	

TABLE: 22

TITLE: MAINTENANCE AND REMEDIATION ESTIMATE

OUTFALL # 41

PROJECT#: GP1433

CLIENT: The City of Grande Prairie

PROJECT: Outfall Remediation and Slope Stabilization

LOCATION: Bear Creek, North of 79 Avenue

	Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>					
Project Management	\$ 102,861	%	5.0%	\$ 5,143	
Field Engineering	\$ 102,861	%	10.0%	\$ 10,286	
Engineering & Design, Tender	1	allow	\$ 3,500.00	\$ 3,500	
Permits (DFO, NavWaters, AENV)	1	allow	\$ 4,500.00	\$ 4,500	
Subtotal - Engineering				\$ 23,429	
<b>Excavation</b>					
Mob/Demob	1	allow	\$ 2,500	\$ 2,500	
A-Jacks armour - Supply	100	m2	\$ 275	\$ 27,464	\$25.50/sqft FOB GP
Geotextile Filter Fabric - S&I	100	m2	\$ 3.00	\$ 300	Nilex 8oz non-woven
Clearing & Grubbing	250	m2	\$ 4.50	\$ 1,125	
Site Access, Remove and Repair Fence	1	allow	\$ 4,500	\$ 4,500	
Silt fence/curtain	100	lm	\$ 30.00	\$ 3,000	
Remove and salvage existing Gabions	1	allow	\$ 3,500	\$ 3,500	
Install silt curtain/fencing	4	hr	\$ 60.00	\$ 240	2 man crew
Excavate and shape slope	20	hr	\$ 180.00	\$ 3,600	
Labour to install geotextile and Ajacks	120	hr	\$ 60.00	\$ 7,200	3 man crew
Mud jack and grout to level existing outfall	1	allow	\$ 7,500	\$ 7,500	
Excavator - during Ajacks install	40	hr	\$ 180.00	\$ 7,200	
Re-install Gabions	1	allow	\$ 6,500	\$ 6,500	
Clean site, re-seed damage grass	1	allow	\$ 3,500	\$ 3,500	
Planting - labour	16	hr	\$ 60.00	\$ 960	2 man crew
Plantings - willow/cattails	1	allow	\$ 4,000	\$ 4,000	
Contingency Allowance		%	25%	\$ 19,772	
Subtotal - Contractor & Materials				\$ 102,861	
<b>TOTAL ESTIMATED COSTS</b>				<b>\$ 126,290</b>	

**TABLE: 23**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 42**

PROJECT#: GP1433  
 CLIENT: The City of Grande Prairie  
 PROJECT: Outfall Remediation and Erosion Control Measures  
 LOCATION: East side of Bear Creek at 79 Avenue ROW.

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 6,144	%	5.0%	\$ 307	
	Field Engineering	\$ 6,144	%	10.0%	\$ 614	
	City of GP - Engineering Services Time	\$ 6,144	%	3.0%	\$ 184	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 1,106	
<b>Contractor</b>	Mob/Demob	0	allow	\$ 2,500	\$ -	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	10	hr	\$ 60.00	\$ 600	
	Disposal Costs	1	allow	\$ 500.00	\$ 500	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	20	lm	\$ 30.00	\$ 600	
	Install silt curtain/fencing	4	hr	\$ 60.00	\$ 240	2 man crew
Prep	Excavate and shape drainage path	8	hr	\$ 60.00	\$ 480	2 man crew
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	100	m2	\$ 2.75	\$ 275	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	4	hr	\$ 60.00	\$ 240	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	100	m2	\$ 5	\$ 500	
	Supply and place topsoil (100mm)	100	m2	\$ 10	\$ 1,000	
	Planting - labour	8	hr	\$ 60.00	\$ 480	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 1,229	
Subtotal - Contractor & Materials					\$ 6,144	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 7,250</b>	

**TABLE: 24**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 44**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: West side of Bear Creek between 75A and 76 Avenue.

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 94,647	%	5.0%	\$ 4,732	
	Field Engineering	\$ 94,647	%	10.0%	\$ 9,465	
	City of GP - Engineering Services Time	\$ 94,647	%	3.0%	\$ 2,839	
	Engineering & Design, Tender	1	allow	\$ 8,500.00	\$ 8,500	
	Permits (DFO, NavWaters, AENV)	1	allow	\$ 4,500.00	\$ 4,500	
Subtotal - Engineering					\$ 30,036	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 4,500	\$ 4,500	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	1	allow	\$ 2,500	\$ 2,500	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	20	lm	\$ 30.00	\$ 600	
	Install silt curtain/fencing	6	hr	\$ 60.00	\$ 360	2 man crew
Prep	Excavate and shape slope	6	hr	\$ 180.00	\$ 1,080	
	Load, haul, dispose cuttings	1	allow	\$ 3,500	\$ 3,500	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	80	m3	\$ 250	\$ 20,000	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	50	m2	\$ 2.75	\$ 138	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	4	hr	\$ 60.00	\$ 240	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	500	m2	\$ 5	\$ 2,500	
	Supply and place topsoil (100mm)	50	m2	\$ 10	\$ 500	
	Planting - labour	10	hr	\$ 60.00	\$ 600	2 man crew
	Plantings - willow/cattails	1	allow	\$ 1,000	\$ 1,000	
Asphalt	Supply and place 20 mm gravel (200mm)	100	t	\$ 30	\$ 3,000	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other	Construct concrete apron	1	allow	\$ 45,000	\$ 45,000	
Contingency Allowance				% 25%	\$ 9,129	
Subtotal - Contractor & Materials					\$ 94,647	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 124,683</b>	

**TABLE: 25**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 48**

PROJECT#: GP1433  
 CLIENT: The City of Grande Prairie  
 PROJECT: Outfall Remediation  
 LOCATION: East side of Bear Creek at 72 Avenue.

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 7,159	%	5.0%	\$ 358	
	Field Engineering	\$ 7,159	%	10.0%	\$ 716	
	City of GP - Engineering Services Time	\$ 7,159	%	3.0%	\$ 215	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 1,289	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 500	\$ 500	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	8	hr	\$ 60.00	\$ 480	
	Disposal Costs	0	allow	\$ 250.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	8	lm	\$ 30.00	\$ 240	
	Install silt curtain/fencing	2	hr	\$ 60.00	\$ 120	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	90	m2	\$ 10.75	\$ 968	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	10	hr	\$ 60.00	\$ 600	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	4	hr	\$ 60.00	\$ 240	2 man crew
	Materials	1	allow	\$ 400	\$ 400	
Re-seeding	Clean site, re-seed damage grass	0	m2	\$ 5	\$ -	
	Supply and place topsoil (100mm)	90	m2	\$ 10	\$ 900	
	Planting - labour	8	hr	\$ 60.00	\$ 480	2 man crew
	Plantings - willow/cattails	1	allow	\$ 1,000	\$ 1,000	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
Contingency Allowance			%	25%	\$ 1,232	
Subtotal - Contractor & Materials					\$ 7,159	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 8,448</b>	

**TABLE: 26**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 50**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: West of 100 Street and north of 68 Avenue

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 7,294	%	5.0%	\$ 365	
	Field Engineering	\$ 7,294	%	10.0%	\$ 729	
	City of GP - Engineering Services Time	\$ 7,294	%	3.0%	\$ 219	
	Engineering & Design, Tender	1	allow	\$ 3,500.00	\$ 3,500	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 4,813	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 600	\$ 600	
Clearing	Clearing	200	m2	\$ 4.50	\$ 900	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	3	hr	\$ 180.00	\$ 540	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Rip-Rap	4	hr	\$ 60.00	\$ 240	
	Re-install Rip-rap	6	hr	\$ 60.00	\$ 360	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	Hard armour	0	m2	\$ 125	\$ -	estimated
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and hard armour	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	200	m2	\$ 2.75	\$ 550	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	60	m2	\$ 10.75	\$ 645	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	8	hr	\$ 60.00	\$ 480	2 man crew (place, staple, N/I vegetation)
Structure	Re-align Pad	2	hr	\$ 180.00	\$ 360	
Repairs	Labour	2	hr	\$ 60.00	\$ 120	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	1	allow	\$ 300	\$ 300	
	Supply and place topsoil (100mm)	1	allow	\$ 500	\$ 500	
	Planting - labour	4	hr	\$ 60.00	\$ 240	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 1,459	
Subtotal - Contractor & Materials					\$ 7,294	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 12,107</b>	

**TABLE: 27**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 51**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: East of Bear Creek, west of 100 St. and south of 68 Ave.

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 3,056	%	5.0%	\$ 153	
	Field Engineering	\$ 3,056	%	0.0%	\$ -	
	City of GP - Engineering Services Time	\$ 3,056	%	3.0%	\$ 92	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 245	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 500	\$ 500	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear weeds	10	hr	\$ 60.00	\$ 600	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	0	m2	\$ 2.75	\$ -	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	0	hr	\$ 60.00	\$ -	2 man crew (place, staple, N/I vegetation)
Structure	Re-align Flared end/apron	3	hr	\$ 180.00	\$ 540	
Repairs	Labour	3	hr	\$ 60.00	\$ 180	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	125	m2	\$ 5	\$ 625	
	Supply and place topsoil (100mm)	0	m2	\$ 10	\$ -	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
Contingency Allowance			%	25%	\$ 611	
Subtotal - Contractor & Materials					\$ 3,056	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 3,301</b>	

**TABLE: 28**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 56**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: South of 84 Avenue, west of 101 Street, east of Bear Creek

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 2,075	%	5.0%	\$ 104	
	Field Engineering	\$ 2,075	%	10.0%	\$ 208	
	City of GP - Engineering Services Time	\$ 2,075	%	3.0%	\$ 62	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 374	
<b>Contractor</b>	Mob/Demob	0	allow	\$ 600	\$ -	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	0	hr	\$ 60.00	\$ -	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	80	m2	\$ 2.75	\$ 220	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	4	hr	\$ 60.00	\$ 240	2 man crew (place, staple, N/I vegetation)
Structure Repairs	Re-align Pad	0	hr	\$ 180.00	\$ -	
	Labour	0	hr	\$ 60.00	\$ -	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	80	m2	\$ 5	\$ 400	
	Supply and place topsoil (100mm)	80	m2	\$ 10	\$ 800	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 415	
Subtotal - Contractor & Materials					\$ 2,075	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 2,449</b>	

**TABLE: 29**  
**TITLE: MAINTENANCE AND REMEDIATION ESTIMATE**

**OUTFALL # 58**

PROJECT#: GP1433  
CLIENT: The City of Grande Prairie  
PROJECT: Outfall Remediation and/or Maintenance  
LOCATION: South of 68 Avenue, east of 100 Street

		Quantity	Unit	Rates	Extension	Notes
<b>Engineering</b>	Project Management	\$ 4,325	%	5.0%	\$ 216	
	Field Engineering	\$ 4,325	%	10.0%	\$ 433	
	City of GP - Engineering Services Time	\$ 4,325	%	3.0%	\$ 130	
	Engineering & Design, Tender	0	allow	\$ 3,500.00	\$ -	
	Permits (DFO, NavWaters, AENV)	0	allow	\$ 4,500.00	\$ -	
Subtotal - Engineering					\$ 779	
<b>Contractor</b>	Mob/Demob	1	allow	\$ 600	\$ 600	
Clearing	Clearing & Grubbing	0	m2	\$ 4.50	\$ -	
	Labour to clear	4	hr	\$ 60.00	\$ 240	
	Disposal Costs	0	allow	\$ 50.00	\$ -	
	Site Access, Remove and Repair Fence	0	allow	\$ 4,500	\$ -	
Vacuum Truck	Vacuum Truck	0	hr	\$ 250	\$ -	
	Disposal Charges	0	allow	\$ 500	\$ -	
Silt Fence	Silt fence/curtain	0	lm	\$ 30.00	\$ -	
	Install silt curtain/fencing	0	hr	\$ 60.00	\$ -	2 man crew
Prep	Excavate and shape slope	0	hr	\$ 180.00	\$ -	
	Load, haul, dispose cuttings	0	allow	\$ 3,500	\$ -	
Erosion Control Measures	Remove and salvage existing Gabions	0	lm	\$ 150	\$ -	
	Re-install Gabions	0	lm	\$ 200	\$ -	
	Gravel for Gabions	0	tonnes	\$ 150	\$ -	
	Baskets - new, S&I	0	m3	\$ 250	\$ -	
	A-Jacks armour - Supply	0	m2	\$ 275	\$ -	\$25.50/sqft FOB GP
	Geotextile Filter Fabric - S&I	0	m2	\$ 3.00	\$ -	Nilex 8oz non-woven
	Labour to install geotextile and Ajacks	0	hr	\$ 60.00	\$ -	3 man crew
	Excavator - during Ajacks install	0	hr	\$ 180.00	\$ -	
	S&I ECM (NAG S150BN)	80	m2	\$ 2.75	\$ 220	Nilex Straw temp ECM 1:1 or 2:1; medium flow
	S&I ECM (NAG P550)	0	m2	\$ 10.75	\$ -	Nilex polyprop. shoreline, high flow, 1:1 slopes
	Labour to install ECM	4	hr	\$ 60.00	\$ 240	2 man crew (place, staple, N/I vegetation)
Structure	Re-align Pad	4	hr	\$ 180.00	\$ 720	
Repairs	Labour	4	hr	\$ 60.00	\$ 240	2 man crew
	Crack sealing	0	hr	\$ 60.00	\$ -	2 man crew
	Materials	0	allow	\$ 3,500	\$ -	
Re-seeding	Clean site, re-seed damage grass	80	m2	\$ 5	\$ 400	
	Supply and place topsoil (100mm)	80	m2	\$ 10	\$ 800	
	Planting - labour	0	hr	\$ 60.00	\$ -	2 man crew
	Plantings - willow/cattails	0	allow	\$ 4,000	\$ -	
Asphalt	Supply and place 20 mm gravel (200mm)	0	t	\$ 30	\$ -	
	Supply and place 50 mm ACP	0	allow	\$ 5,500	\$ -	
Other						
	Contingency Allowance		%	25%	\$ 865	
Subtotal - Contractor & Materials					\$ 4,325	
<b>TOTAL ESTIMATED COSTS</b>					<b>\$ 5,104</b>	

## LIMITATIONS

REPORT LIMITATIONS AND USAGE

---

THIS AGREEMENT IS ENTERED INTO this 16 day of March, 2009 between  
The City of Grande Prairie "CLIENT" and  
PARKLAND GEOTECHNICAL LTD., hereinafter referred to as "CONSULTANT".

---

WHEREAS CLIENT desires CONSULTANT to perform certain technical services, the CLIENT and CONSULTANT have agreed that such services shall be performed in accordance with the terms and conditions set forth herein.

THE PARTIES HERETO AGREE AS FOLLOWS:

1. **STANDARD OF CARE** - In the performance of professional services, the CONSULTANT will use that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession practicing in the same or similar localities. No other warranty expressed or implied is made or intended by this agreement or by furnishing oral or written reports of the findings made. The CONSULTANT is to be liable only for damage directly caused by the negligence of the CONSULTANT. The CLIENT recognizes that subsurface conditions will vary from those encountered at the location where borings, surveys, or explorations are made and that the data, interpretations and recommendation of the CONSULTANT are based solely on the information available to him. Classification and identification of soils, rocks, geological units, contaminated materials and contaminant quantities will be based on commonly accepted practices in geotechnical consulting practice in this area. The CONSULTANT will not be responsible for the interpretation by others of the information developed.
2. **SITE INFORMATION** - The CLIENT agrees to fully cooperate with the CONSULTANT and provide all information with respect to the past, present and proposed conditions and use of the Site whether specifically requested or not. The CLIENT acknowledges that in order for the CONSULTANT to properly advise and assist the CLIENT in respect of the investigation of the Site, the CONSULTANT is relying upon full disclosure by the CLIENT of all matters pertinent to an investigation of the Site.

Where specifically stated in the scope of work, the CONSULTANT will perform a review of the historical information obtained or provided by the Client to assist in the investigation of the Site unless and except to the extent that such a review is limited or excluded from the scope of work.

3. **COMPLETE REPORT** - The Report is of a summary nature and is not intended to stand alone without reference to the instructions given to the CONSULTANT by the CLIENT, communications between the CONSULTANT and the CLIENT, and to any other reports, writings or documents prepared by the CONSULTANT for the CLIENT relative to the specific Site, all of which constitute the Report. The word "Report" shall refer to any and all of the documents referred to herein. In order to properly understand the suggestions, recommendations and opinions expressed by the CONSULTANT, reference must be made to the whole of the Report. The CONSULTANT cannot be responsible for use of any part or portions of the report without reference to the whole report. The CLIENT agrees that any and all reports prepared by the CONSULTANT shall contain the following statement:

"This report has been prepared for the exclusive use of (CLIENT NAME). Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. PARKLAND GEOTECHNICAL LTD. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report."

The CLIENT agrees that in the event that any such report is released to a third party, such disclaimer shall not be obliterated or altered in any manner. The CLIENT further agrees that all such reports shall be used solely for the purposes of the CLIENT and shall not be released or used by others without the prior written permission of the CONSULTANT.

4. **LIMITATIONS ON SCOPE OF INVESTIGATION AND WARRANTY DISCLAIMER**  
There is no warranty, expressed or implied, by the CONSULTANT that:
  - a) the investigation shall uncover all potential contaminants or environmental liabilities on the Site; or
  - b) the Site will be entirely free of all contaminants as a result of any investigation or cleanup work undertaken on the Site, since it is not possible, even with exhaustive sampling, testing and analysis, to document all potential contaminants on the Site.

The CLIENT acknowledges that:

- a) the investigation findings are based solely on the information generated as a result of the specific scope of the investigation authorized by the CLIENT;
- b) unless specifically stated in the agreed Scope of Work, the investigation will not, nor is it intended to assess or detect potential contaminants or environmental liabilities on the Site;
- c) any assessment regarding geological conditions on the Site is based on the interpretation of conditions determined at specific sampling locations and depths and that conditions may vary between sampling locations, hence there can be no assurance that undetected geological conditions, including soils or groundwater are not located on the Site;
- d) any assessment is also limited by the scientific possibility of determining the presence of unsuitable geological conditions for which scientific analyses have been conducted; and

5. **COST ESTIMATES** - Estimates of remediation or construction costs can only be based on the specific information generated and the technical limitations of the investigation authorized by the CLIENT. Accordingly, estimated costs for construction are based on the known site conditions, which can vary as new information is discovered during construction. As some construction activities are an iterative exercise, the CONSULTANT shall therefore not be liable for the accuracy of any estimates of remediation or construction costs provided.

6. **CONTROL OF WORK SITE AND JOBSITE SAFETY** - The CONSULTANT is only responsible for the activities of its employees on the jobsite. The presence of the CONSULTANT personnel on the Site shall not be construed in any way to relieve the CLIENT or any contractors on Site from their responsibilities for Site safety. The CLIENT undertakes to inform the CONSULTANT of all hazardous conditions, or possible hazardous conditions which are known to him. The CLIENT also recognizes that the activities of the CONSULTANT may uncover previously unknown hazardous materials and that such a discovery may result in the necessity to undertake emergency procedures to protect the CONSULTANT employees as well as the public at large and the environment in general. The CLIENT also acknowledges that in some cases the discovery of hazardous conditions and materials will require that certain regulatory bodies be informed and the CLIENT agrees that notification to such bodies by the CONSULTANT will not be a cause of action or dispute.

7. **LIMITATION OF RESPONSIBILITY**

**LIMITATION OF LIABILITY** - The CLIENT hereby agrees that to the fullest extent permitted by the law the CONSULTANT's total liability to CLIENT for any and all injuries, claims, losses, expenses or damages whatsoever arising out of or in anyway relating to the Project, the Site, or this agreement from any cause or causes including but not limited to the CONSULTANT's negligence, errors, omissions, strict liability, breach of contract, or breach of warranty shall not exceed the total amount paid by the CLIENT for the services of the CONSULTANT under this contract or \$50,000, whichever is greater.

**NO SPECIAL OR CONSEQUENTIAL DAMAGES** - The CLIENT and CONSULTANT agree that to the fullest extent permitted by law the CONSULTANT shall not be liable to the CLIENT for any special, indirect or consequential damages whatsoever, whether caused by the CONSULTANT's negligence, errors, omissions, strict liability, breach of contract, breach of warranty or other cause of causes whatsoever.

**INDEMNIFICATION** - To the fullest extent permitted by law, the CLIENT agrees to defend, indemnify and hold the CONSULTANT, its directors, officers, employees, agents and subcontractors, harmless from and against any and all claims, defence costs, including legal fees on a full indemnity basis, damages, and other liabilities arising out of or in any way related to the CONSULTANT's reports or recommendations concerning this Agreement, the CONSULTANT's work and presence on the project property, or the presence, release, or threatened release of hazardous substances or pollutants on or from the Site; provided that the CLIENT shall not indemnify the CONSULTANT against liability for damages to the extent caused by the negligence or intentional misconduct of the CONSULTANT, its agents or subcontractors.