INTRODUCTION

The purpose of this memorandum is to provide the Rice Creek Watershed District (RCWD) with an analysis and description of the proposed repair for the Anoka-Ramsey Judicial Ditch 1 (ARJD 1), Branch 4. This repair memorandum provides the measures recommended by the District Engineer to provide an outlet for the ARJD 1, Branch 4 public drainage system, as well as the probable costs and environmental consequences associated with repair.

The technical analysis to follow includes the historic activities related to Branch 4, a description and evaluation of the function of the proposed repair, hydrologic and hydraulic modeling results, potential conflicts with utilities, and a review of permitting issues. The memorandum also includes a Preliminary Opinion of Probable Construction Cost and a concept level engineering drawing showing the proposed repair.

BACKGROUND

CURRENT CONDITION OF PUBLIC DRAINAGE SYSTEM

The Addendum to Anoka Ramsey Judicial Ditch 1 Historical Review, dated July 16, 2014, identified the lack of an outlet for the contributing drainage area to Branch 4. Figure 1 shows the alignment of Branch 4 as it was originally constructed, beginning at the Main Trunk near its crossing of County Road J (85th Avenue NE). The expansion of County Road J (CR J) in 1990 removed the east-west segment of Branch 4 open channel, and no replacement of its function was provided. (No records of a RCWD permit were found for this project). Based on input from the public at a May 20, 2014 informational meeting and during subsequent site investigations, the Historical Review Memorandum identified the potential for flood damage to structures following a large (100-year recurrence)
flood event and thus recommended that restoration of an outlet to lands previously drained by Branch 4 be examined thoroughly as part of a future repair proceedings.

**Figure 1: Location of ARJD 1, Branch 4 as originally constructed.**

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**DESIGN GOALS AND OBJECTIVES AND RECOMMENDED REPAIR**

To guide the development of the ARJD 1 Branch 4 repair memorandum, design goals and objectives were outlined in a May 15, 2015 memorandum by Houston Engineering, Inc. (HEI) (see Appendix A). Within that memorandum, five concept alternatives were evaluated based on several potential project goals and objectives. Because the historic drainage function of Branch 4 was intended to provide agricultural drainage, and the lands served by Branch 4 are no longer used for agricultural production, HEI recommended that the restoration of historic drainage function not be considered as a project goal, but instead that providing flood protection to existing structures from the 100-year, 24-hour rainfall event be considered the primary design goal. Note that the analysis presented later in this memorandum demonstrates that an additional, and likely greatest, flood risk results from substantial rainfall events occurring during periods of high seasonal water.

A conceptual repair alternative was recommended by the Engineer in the memorandum, and the Board of Managers concurred with the recommended repair alternative at the July 2015 Board Workshop. The recommended alternative consists of connecting into the existing CR J storm sewer to provide an outlet elevation of 904.81 (see Figure 2).
EVALUATION OF THE FUNCTION OF THE PROPOSED REPAIR

The proposed new outlet for the Branch 4 system will restore its historic drainage function, but will reduce flood risk of structures and parking lots.

SURVEY AND OBSERVATIONS OF FLOOD RISK

One known flooding problem within the ARJD 1 Branch 4 Watershed is the parking lot of the LRP Properties located west of Xylite Street (see Figure 2) The frequent inundation of this parking lot is caused by sustained high water levels of the adjacent public water wetland resulting from multiple rainfall events throughout the spring and summer, with no functioning outlet to alleviate the flooding.

A July 9, 2014 photograph of flooding in the LRP Properties parking lot west of Xlite Street is shown in Figure 3 below. Based on LiDAR and survey data, the water elevation on that date was approximately 905.3 to 905.5,¹ which corresponds to about 7 inches of standing water in the parking lot. Water surface elevations surveyed by HEI on three different dates within the last four years, shown in Table 1, confirm that this parking lot is frequently at risk of flooding.

Table 1: Surveyed Water Surface Elevations of Public Water Wetland. 2-603W within ARJD 1 Branch 4 Watershed

<table>
<thead>
<tr>
<th>Date of Survey</th>
<th>Water Surface Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 20, 2011</td>
<td>904.9</td>
</tr>
<tr>
<td>April 5, 2013</td>
<td>905.3</td>
</tr>
<tr>
<td>August 25, 2015</td>
<td>904.1</td>
</tr>
</tbody>
</table>

¹ All elevations provided herein are in NAVD 88 datum.
HEI surveyed both the low floor and parking lot at the Blue Tow Service Inc., the LOR Reinz Bus Service, and the LRP Properties LLC properties, each of which are in the drainage area to Branch 4 (see Figure 2 and Table 2).

<table>
<thead>
<tr>
<th>Property</th>
<th>Low Floor Elevation</th>
<th>Low Parking Lot Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Tow Service Inc.</td>
<td>905.9</td>
<td>905.4</td>
</tr>
<tr>
<td>LOR Reinz Bus Service</td>
<td>908.4</td>
<td>905.0</td>
</tr>
<tr>
<td>LRP Properties LLC</td>
<td>907.9</td>
<td>904.9</td>
</tr>
</tbody>
</table>

**PERFORMANCE OF PROPOSED REPAIR IN ALLEVIATING FLOODING DURING SINGLE RAINFALL EVENTS**

The ability of the project to provide flood protection during single large rainfall events was evaluated with hydrologic and hydraulic modeling. Although the primary goal of the repair is to provide flood protection to structures during the 100-year, 24-hour storm event, Table 3 presents the results of simulating four different storm events in order to assess the flood risk at other rainfall and snowmelt events as well. Because the water surface in the public water wetland currently fluctuates throughout the year, and because there is no current outlet, it can be assumed that at least some infiltration and evaporation is occurring. Therefore, the starting water surface elevation at the beginning of a rainfall event will vary throughout the year. In addition to simulating a condition in which the wetland is essentially empty at the beginning of the simulation (the least conservative
analysis), a model simulation was also created assuming the rainfall event begins at the highest observed/anticipated seasonal elevation (the most conservative analysis). For the “conservative” scenario, the existing conditions model was simulated with an initial water surface elevation at 905.3, the highest surveyed water surface elevation (see Table 1). In the proposed scenario, the initial water surface elevation was set at 904.81, the elevation of the proposed outlet and thus the highest likely seasonal water elevation. Note that this approach conservatively assumes that no infiltration or evaporation has occurred since the previous significant rainfall event. The modeling results are presented in Table 3.

The modeling indicates that the outlet will have little effect on the peak water elevations for rainfall events that occur during low water conditions in the public water because of the storage available below the elevation of the proposed outlet. However, for rainfalls that occur under high seasonal water conditions, the proposed outlet will provide a substantial lowering of peak water elevations. For example, under the 2-year, and 10-year rainfall events, the peak flood depth in the adjacent parking lots is reduced by over half a foot. For the 100-year rainfall event, the peak flood depth at the Blue Tow Service building is reduced from seven inches to an inch.

Just as important, the length of time the parking lots and buildings are inundated is shortened significantly due to the construction of the proposed outlet. The parking lot of the LOR Reinz Bus Service is inundated for less than six days after construction of the proposed outlet, as opposed to the current condition which could result in indefinite long-term inundation. Per the owner of LOR Reinz Bus Service, this has repeatedly been the cause of interruptions in daily business operations.

Table 3: Estimated High Water Elevations in Public Water Wetland No. 2-603W for Various Rainfall Events and Various Starting Water Surface Elevations

<table>
<thead>
<tr>
<th>Event</th>
<th>Starts empty</th>
<th>Starts @ Seasonal High Water Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
<td>Proposed</td>
</tr>
<tr>
<td>2-year 24-hr Rainfall</td>
<td>903.9</td>
<td>903.9</td>
</tr>
<tr>
<td>10-year 24-hr Rainfall</td>
<td>904.8</td>
<td>904.8</td>
</tr>
<tr>
<td>100-year 24-hr Rainfall</td>
<td>905.8</td>
<td>905.7</td>
</tr>
<tr>
<td>100-year 10-Day Snowmelt</td>
<td>903.1</td>
<td>903.1</td>
</tr>
</tbody>
</table>

POTENTIAL CONFLICTS WITH UTILITIES

Gopher 1 services were solicited to identify potential conflicts with utilities. It appears that a Connexus Energy electrical line, a Centurylink cable, and active fiber pass through the location of the proposed outlet and connection to the CR J storm sewer. The depth of these utilities is unknown. However, none of these utilities are likely to result in a substantial hindrance or cost to the project.

PERMITS AND REGULATORY

At the request of the RCWD, the MnDNR conducted a field survey of the landlocked Unnamed Basin 2-603 on February 11, 2015 (see Figure 1 and Appendix B). The survey concluded that the basin is considered to be landlocked, and that the Ordinary High Water Level (OHW) for the public water wetland is 903.9 (NAVD88).
The proposed Branch 4 outlet consists of tapping into the existing CR J storm sewer to provide an outlet elevation of 904.81, which is above the OHW of the MnDNR public water of 903.90. The proposed project would therefore not require a MnDNR permit.

Tapping into the existing storm sewer in CR J, however, will require a permit from Anoka County. The permit application requires construction plans, specifications, and drainage computations. A preliminary construction drawing is provided in Appendix C. A permit for work in the right-of-way also needs to be obtained from Anoka County.

**PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST**

The Preliminary Opinion of Probable Construction Cost (POGCC) is $32,000. The details are included in Appendix D.

The cost estimates provided above assume current construction pricing. The cost of engineering, legal, and administrative services assumes that District staff will provide the majority of on-site inspection, and that the work will be contracted through a quotes process (and not a public bid process).

**CONCLUSION AND RECOMMENDATION**

The frequent inundation of this parking lots and flooding risk to structures is caused by sustained high water levels of the adjacent public water wetland resulting from multiple rainfall events throughout the spring and summer, with no functioning outlet to alleviate the flooding. The proposed outlet for Branch-4, which consists of connecting into the existing CR J storm sewer to provide an outlet elevation of 904.81, will reduce the risk for flooding and the inundation time of parking lots following rainfall events, which will significantly reduce interruption to business activities. We therefore recommend the District proceed with the repairs outlined in Appendix C.

Because the existing Branch 4 open channel serves no functional purpose, we recommend that Branch 4 be abandoned as part of the public drainage system once the construction is completed. The proposed outlet may then be managed by the County as a municipal stormwater conveyance system.

I hereby certify that the attached plan, specification, or report was prepared by me or under my direct supervision and that I am a duly registered Professional Engineer under the laws of the State of Minnesota.

Nancy Stowe
MN Reg. No 48259
APPENDIX A

ARJD 1, Branchy 4 Repair – Design Goals and Objectives Memorandum, May 15, 2015
1. **INTRODUCTION**

The Addendum to Anoka Ramsey Judicial Ditch 1 Historical Review, dated July 16, 2014, identified a need to restore an outlet for the Branch 4 portion of the system. **Figure 1** shows Branch 4 as it was originally constructed as an open channel, beginning at the Main Trunk near its current confluence with County Road J (85th Avenue NE). The expansion of County Road J in 1990 removed the east-west segment of Branch 4, and no replacement of its function was provided (no records of a RCWD permit were found for this project). Based on input from the public at a May 20, 2014 informational meeting and during subsequent site investigations, the Historical Review Memorandum identified the potential for flood damage to structures following a large (100-year recurrence) flood event and thus recommended that restoration of an outlet to lands previously drained by Branch 4 be examined thoroughly as part of a future repair proceedings.

To initiate the preparation of the ARJD 1 Branch 4 repair memorandum, it is important to establish design goals and objectives which will help guide the selection of the most appropriate repair alternative. Specific project goals for the project are identified in this memorandum, along with technical objectives, which are used to evaluate concept alternatives. The intent of this memorandum is to provide the Rice Creek Watershed District (RCWD) Board of Managers an evaluation of a maximum of five concept alternatives based on several potential project goals and objectives, so that ultimately they may concur upon an alternative to perform further technical analysis.
2. DESIGN GOALS AND OBJECTIVES

The following are potential design goals for the repair of ARJD 1 Branch 4 that the Board of Managers may consider which can be used to evaluate and select a repair alternative:

1. Restore Historic Drainage Function: Branch 4 originally was constructed at an elevation of 900.3\(^\text{1}\) to provide drainage to agricultural lands. This public drainage system has not served that purpose for many years. We do not know of an apparent benefit that restoring historic drainage function to this branch may provide. However, as the Drainage Authority it remains an option of the District to restore the drainage function of the public drainage system to as constructed and subsequently improved condition, or a lesser capacity.

\(^{1}\) All elevations provided in this memorandum are based on North American Vertical Datum 88.
2. **Provide 100-year Flood Protection**: The lowest adjacent building to Branch 4, with an elevation of 905.9, will be close to being inundated by the 100-year, 24-hour rainfall (peak flood elevation of 905.8). The Board may consider a design to protect adjacent buildings, or even adjacent parking lots, to a 100-year flood event.

3. **Minimize Need for Permits**: The historic alignment of Branch 4 drained a basin which is currently listed as a Mn/DNR public water (#2-603W). Construction of an outlet above the ordinary high water (OHW) elevation of 903.9 will not require regulatory engagement or processes with the Mn/DNR.

4. **Maintain Functionality of Existing County and City Storm Infrastructure**: Restoring Branch 4 to its original alignment would require the disturbance of County and City streets, utilities, and storm sewer infrastructure. Alternatives that utilize existing stormwater infrastructure to convey Branch 4 flows may potentially be overtaxed. The effect of any alternative on this infrastructure should be considered.

5. **Provide Drainage for Properties East of Xylite Street NE**: Several landowners east of Xylite Street have expressed concerns regarding lack of drainage. Providing this area with drainage functionality for 2-year rainfall event may be a consideration for the Board (see Section 5 below).

6. **Minimize Project Cost**: The alternatives described below represent several magnitudes of overall project cost.

3. **CONCEPT ALTERNATIVES**

Five alternative repair scenarios have been conceptualized to provide drainage for the ARJD 1, Branch 4 system (see Figure 2):

Alternative 1: Do nothing and abandon Branch 4,

The current overflow elevation is 906.1, which is above the lowest building elevation of 905.9.

Alternative 2: Restore the Branch 4 open channel to its As Constructed and Subsequently Improved Condition (ACSC)

This alternative would involve constructing a pipe along the north side of CR J. It would provide drainage at the ACSC elevation of 900.3. This alternative will require the disturbance of infrastructure (pavements and/or utilities) along CR J.

Alternative 3: Construct a new outlet north of Blue Tow Service

This outlet would consist of a pipe leading from the MnDNR public water at an elevation of 902.0, passing just north of Blue Two Service and crossing Xylite Street, and then follow an alignment straight east to the ARJD 1 Main Trunk. The pipe would be sized to maintain the Blue Two Service parking lot dry in a 100-year, 24-hour rainfall event.
Alternative 4: Construct a new outlet to County Road J storm sewer

This alternative would consist of tapping into the existing CR J storm sewer and would provide an outlet elevation of 904.61, which is above the OHW of the MnDNR public water and thus not requiring a MnDNR permit. The outlet would no longer be a public drainage system but rather a municipal stormwater conveyance system. This would be accomplished through the abandonment of Branch 4 and the County approval for the use of the CR J storm sewer.

Alternative 5: Construct a new outlet between LRP Properties and Lorenz Bus Service.

This outlet would consist of a pipe beginning just outside the MnDNR public water at an elevation of 904.0, running across Xylite Street, and then straight east to the ARJD 1 Main Trunk. The pipe would be sized to provide 100-year flood protection to all structures.

4. COMPARISON OF THE CONCEPT ALTERNATIVES

Table 1 summarizes the goals and technical objectives used to evaluate concept alternatives for the repair of ARJD 1 Branch 4, along with an indication of whether or not each of the goals will be met by the implementation of each concept alternative.

Doing nothing and abandoning Branch 4 is the least expensive alternative. However, it would not provide any drainage nor provide any relief from the risk of flooding, which has been reported by property owners as an ongoing problem. Alternatives 2 (restore to ACSIC) and 3 (new outlet north of Blue Tow Service) provide the greatest drainage function, but both would likely require substantial regulatory engagement with the Mn/DNR (including potentially a permit and mitigation) and are the most expensive alternatives.

Alternative 4 (new outlet to CR J storm sewer) and Alternative 5 (new outlet between LRP Properties and Lorenz Bus Service), provide similar functionality. Neither would restore historic drainage function, but both would reduce flood risk below the lowest structure elevation. Neither Alternative 4 nor 5 would require regulatory engagement with the Mn/DNR, and each will maintain functionality of existing County and City storm infrastructure. The primary difference between Alternatives 4 and 5 is the cost, Alternative 4 being less expensive than Alternative 5.
<table>
<thead>
<tr>
<th>Goals</th>
<th>Technical Objectives / Design Criteria</th>
<th>1 Do nothing and abandon (current overflow at 906.1)</th>
<th>2 Restore to its ACSIC (ACDIC at CR J at 908.3)</th>
<th>3 New outlet north of Blue Tow Service</th>
<th>4 New outlet to CR J Storm Sewer</th>
<th>5 New outlet between LRP Properties and Lorenz Bus Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Restore Historic Drainage Function</td>
<td>a) Repair Branch 4 to the as-constructed and subsequently improved condition OR b) Provide drainage below current OHW (903.9) of Public Water Wetland (PWW 2-603W)</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>2. Provide 100-year Flood Protection (current 100-year HWL at 905.8)</td>
<td>a) Repair Branch 4 with a HWL below the lowest structure elevation (905.9) OR b) Repair Branch 4 with a HWL below the lowest parking lot (905.1)</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>3. Minimize Need for Permits</td>
<td>Repair Branch 4 with an outlet above the OHW (903.9) of Public Water Wetland (PWW 2-603W)</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>4. Maintain functionality of existing County and City storm infrastructure</td>
<td>Repair Branch 4 to which would not negatively impact drainage provided by existing County or City infrastructure</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>5. Provide drainage for properties east of Xylite Street NE</td>
<td></td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>6. Relative Cost</td>
<td>Repair Branch 4 at a reasonable cost</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

- Goal Met
- Goal Not Met
5. **AREA EAST OF XYLITE STREET**

During the ARJD 1 Historical Review public information meeting, some property owners east of Xylite Street and north of Branch 4 expressed drainage concerns. It appears that the lands located east of Xylite Street have historically drained east into the main trunk of ARJD 1, rather than to Branch 4. The cause of the drainage problems may be related to the construction of an adjacent City trail.

During the In the fall of 1999, the City of Blaine constructed a bituminous pedestrian trail north of County Road J along the west bank of the main trunk of ARJD 1, under RCWD Permit 99-113. As part of this project, an 18” RCP culvert was installed from the west side of the trail to allow drainage to ARJD 1 (see Figure 3).

The 18” culvert was not readily seen in the field and may be clogged with debris. Cleaning this culvert out and/or adding a second culvert under the trail may relieve some of the drainage issues. The City is responsible for maintenance of the drainage under the trail. However, since the trail is along the spoil bank of the public drainage system, the District does have the authority to make drainage modifications at this location or order the City to do so.

**Figure 3: Excerpt from South Central and Central Planning Area Storm Drainage and Pedestrian Walkway**
**RECOMMENDATIONS**

The intent of this memorandum is to provide the Rice Creek Watershed District (RCWD) Board of Managers several potential project goals and objectives, along with an evaluation and recommendation with respect to their prioritization. This memorandum also provides the Board of Managers with an evaluation of alternative repair concepts in reference to the potential design goals and objectives, with the intent of serving as a guide in the selection of the most appropriate repair alternative, prior to incurring the cost of completing a more detailed analysis.

Because the historic drainage function of Branch 4 was intended to provide agricultural drainage, and the lands served by Branch 4 are no longer used for agricultural production, we are not recommending that the restoration of historic drainage function be considered as a project goal. Instead, we recommend that providing flood protection to existing structures from the 100-year, 24-hour rainfall event be considered the primary design goal. We further recommend that the minimization of the need for permits related to the MnDNR public water be considered in selecting an alternative repair. A design that would require regulatory engagement with the MnDNR will likely result in a costly and time-consuming permit process. Likewise, disruption of existing County and City infrastructure will substantially increase cost and require time-consuming planning and coordination with the City or County.

Since it appears that the properties east of Xylite Street historically drained east directly into the ARJD 1 Main Trunk, no modification or restoration of Branch 4 has the ability to address the drainage concerns east of Xylite Street, and thus these concerns should not be a consideration when selecting an alternative.

Based on the evaluation and comparison of each concept alternative, it is recommended that Alternative 4 be selected as the concept to be further analyzed in the forthcoming repair memorandum. Alternative 4 has the ability to reduce flood risk to the properties being served by Branch 4, will not have the additional costs related to replacement of infrastructure, and it will not require regulatory engagement with the Mn/DNR.
APPENDIX B
Minnesota DNR Waters Field Survey Report
Ordinary High Water Determination for Unnamed Basin 2-603
Minnesota DNR Waters
Field Survey Report

Project: Unnamed Basin 2-603  
Lake No.: 2-603
City: Blaine  
County: Anoka  
Sec.: 33  
Twp.: 31  
Rng.: 23  
Watershed: 

SURVEY DATE: 2/11/2015
SURVEY CREW: Woodrich/Schaffer/Cameron

LAKE SIZE
- Meandered Area
- Acres
- X Non-meandered
- Planimetered Area
- 7 Acres
- □ Unknown

DATUM ADJUSTMENT
- Assumed
- 1912
- 1929
- X 1988
- Source: MNDOT “BR 02048 SW”

CONTROL BENCHMARK
- Location: SE ¼, Sec. 33-31-23
- Elevation: 937.38 (subtract 0.15’ to equate to NGVD 29)
- Description: survey disc in bridge railing at SW corner of County Road J bridge #02048 over T.H. 10, on Anoka-Ramsey County line.

SURVEY WORK COMPLETED
- X levels
- topography
- cross sections
- profiles
- X OHW
- X establish benchmarks
- X outlet elevations
- X other: GPS/VRS/RTK survey

WATER LEVELS
- Highest Recorded: Water Surface: ice surface 903.4
- Lowest Recorded: OHW Elev: 903.9
- Range: Highest Known: 906.0, possible stain on tree.

OUTLET
- General Description: considered to be landlocked
- Runout Elevation and Description: highwater runout at least 905.7 in vicinity of old ditch on SE corner of basin.

BENCHMARKS SET
- Location: NW-SE-SE, Sec.33-31-23
- Elevation: 907.28
- Description: On WNW side of basin on SE end of airport property, 3/8 x 8” spike with ribbon 1.3’ above ground in the NW side of a 1.6’ cottonwood, 8’ south of trail to dump area, 75’ east of concrete barrier across trail at edge of field on airport property.
- Location:
- Elevation:
- Description:

Prepared By: Kurt Woodrich
Title: Sr. Engineering Specialist
Date: 2/13/2015
Unnamed Basin 2-603 is fully contained within the property boundaries of the Anoka County-Blaine Airport on the SE corner of the airport property. The basin has a history of manipulation with an old north-south railroad grade that bisects the basin. There is a ridge (old RR grade) that separates the main portion of the basin with a small portion to the east of the ridge. The lowest connecting spot we located along this ridge was 905.3. The ice surfaces on each side of the ridge are very close in elevation suggesting a potentially lower connection. The USGS quad shows a ditch thru the west portion of the basin. This ditch is no longer visible. The east–west segment of the ditch into the wetland known as Anoka-Ramsey Judicial Ditch Branch 4 has been removed with the construction and improvement of nearby roads. The outlet properties of the ditch have been cut off and are no longer functioning. The basin has very little open water at present or historically as shown on aerial photos dating back to 1991. The 1967 USGS quadrangle shows the basin as predominantly aquatic vegetation.

The OHW level of Unnamed Basin 2-603 is based on the average reduced elevation of the best 9 of 11 trees (ash, oak, and aspen) we documented around the basin. We documented the elevation at the landward edge of the cattail vegetation ranging from 904.0-904.8. No washlines were observed. A possible stainline on a tree was recorded at 906.0.

The basin is presently considered to be landlocked as we found no active outlet channel. We recorded a potential highwater outlet elevation in the north road ditch of County Road J at 905.7 approximately 150-200’ east of the extreme SE corner of the basin. We could not locate where the water would go to the east from here. We did not locate any culverts further east through Xylite Ave. in the direction of the main Judicial Ditch.
APPENDIX C
ARJD 1, Branchy 4 Repair – Preliminary Construction Drawing
## APPENDIX D

### ARJD 1 Branch 4 Repair

**Engineers Cost Estimate**

Date: 10/3/2014

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Description</th>
<th>Units</th>
<th>Quantity</th>
<th>Unit Cost</th>
<th>Total Estimated Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization</td>
<td>Lump Sum</td>
<td>1</td>
<td>$4,000</td>
<td>$4,000</td>
</tr>
<tr>
<td>2</td>
<td>Traffic Control</td>
<td>Lump Sum</td>
<td>1</td>
<td>$3,000</td>
<td>$3,000</td>
</tr>
<tr>
<td>3</td>
<td>Remove Bituminous</td>
<td>Square Feet</td>
<td>440</td>
<td>$1</td>
<td>$440</td>
</tr>
<tr>
<td>4</td>
<td>Remove Concrete Curb &amp; Gutter</td>
<td>Linear Foot</td>
<td>20</td>
<td>$5</td>
<td>$100</td>
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<tr>
<td>5</td>
<td>Sawcut Bituminous</td>
<td>Linear Foot</td>
<td>64</td>
<td>$4</td>
<td>$256</td>
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<tr>
<td>6</td>
<td>Bituminous Patch (bike path)</td>
<td>Square Feet</td>
<td>200</td>
<td>$10</td>
<td>$2,000</td>
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<tr>
<td>7</td>
<td>Bituminous Patch (street)</td>
<td>Square Feet</td>
<td>240</td>
<td>$10</td>
<td>$2,400</td>
</tr>
<tr>
<td>8</td>
<td>Concrete Curb &amp; Gutter (B6-12)</td>
<td>Linear Foot</td>
<td>20</td>
<td>$60</td>
<td>$1,200</td>
</tr>
<tr>
<td>9</td>
<td>12&quot; RCP Culvert</td>
<td>Linear Foot</td>
<td>40</td>
<td>$35</td>
<td>$1,400</td>
</tr>
<tr>
<td>10</td>
<td>12&quot; GS Apron</td>
<td>Each</td>
<td>1</td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>11</td>
<td>Connection to Existing Manhole</td>
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<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>12</td>
<td>Seeding &amp; Mulch</td>
<td>Lump Sum</td>
<td>1</td>
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<td>13</td>
<td>Silt Fence</td>
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<td>$10</td>
<td>$300</td>
</tr>
<tr>
<td>14</td>
<td>Erosion Control Blanket</td>
<td>Square Yard</td>
<td>93</td>
<td>$4</td>
<td>$373</td>
</tr>
</tbody>
</table>

Subtotal = $17,969

ROW = $200

Anoka County Utility Permit = $200

Engineering/Legal/Administrative = $10,000

20% contingency = $3,594

TOTAL $31,963