Council Meeting Date: February 4, 2008 **Agenda Item:** 6(b)

CITY COUNCIL AGENDA ITEM

CITY OF SHORELINE, WASHINGTON

AGENDA TITLE:	Ronald Bog Drainage System Up-date
DEPARTMENT:	Public works
PRESENTED BY:	**Mark Relph, Public Works Director; Jesus Sanchez, Public Works Operations Manager; Tricia Juhnke, PW Capital Projects Administrator**

PROBLEM/ISSUE STATEMENT:

The City has been pursuing a series of storm water improvements throughout Shoreline since its incorporation in 1995. One of those basins has been the Thornton Creek/Ronald Bog Basin. This report and staff's presentation on February 4th, will review what has been accomplished, our current Capital Improvement Program (CIP) project for 2008 and our strategies for the basin.

The residential area south of Ronald Bog is part of the much larger Thornton Creek drainage basin (attachment A). This basin drains through Shoreline and into Seattle before it eventually ends at Lake Washington. Ronald Bog itself has historically flooded during significant rain storms greater than a 50 year storm. Most recently this neighborhood was severely flooded during the December 3rd storm which was an event greater then a 100 year storm event.

The City has pursued solutions since the flooding of several homes during a large rain-on-snow storm that occurred in early 1997. Currently there is a $3.1 million CIP project under design utilizing primarily Public Works Trust Fund Loans. The project is scheduled for construction in the summer of 2008. It will replace the street drainage on the west side of Corliss Ave, between 171st and 172nd, and remove the 3 restrictive culverts along Corliss Place south of 170th and replacing them with fish passable boxes (attachment B). Though these changes will assist in mitigating some degree of flooding, it is not the complete solution for alleviating flooding in the Ronald Bog area.

To complete the list of projects that will provide the ultimate solution for flood protection beyond the 2008 project will require a more detailed analysis of the entire Thornton Creek basin from the headwaters to the south city limit. This proposed "basin plan" will provide a more complete understanding the projects necessary for flood protection, plus allow a more strategic approach to funding, including surface water rate structure and grant opportunities. Based on the historical nature of Ronald Bog, groundwater must also be considered when analyzing the basin and developing long term solutions.

FINANCIAL IMPACT:

The 2008 – 2013 adopted CIP budget includes four significant projects with the basin that are intended to a large measure address the storm water problem. They include the $3.1M Ronald Bog South project (mentioned above), the $747,000 Cromwell Park Improvement Project (construction of 1 to 2 acre-feet of upstream detention), the $264,000 Pump Station No.25 and the $571,000 Ronald Bog Park Detention/Wetland Project. However, additional projects beyond the current CIP will be needed to provide the residents south of the Bog a higher level of flood protection.

Within the "Discussion" section of this report, there is a funding section that proposes how the City may approach completing the basin plan and the pursuit of other financial opportunities to complete a more detailed and comprehensive project approach for this basin.

RECOMMENDATION

No action is required by the City Council at this time. This report is for information only.

Approved By: City Manager ___ City Attorney ___

INTRODUCTION

On December 3rd, 2007, a storm dropped more than 4 inches of rainfall in about 21 hours on the City and Public Works crews responded to hundreds of calls from residents. This rainfall amount exceeded the 100-year storm, and thereby exceeded the design capacity of the stormwater infrastructure. The volume of runoff from this storm entering Ronald Bog was more than 20 acre-feet above flood stage. Consequently, flooding occurred in the residential area south of Ronald Bog. These homes were flooded with up to 3 feet of water for a second time in 11 years.

The City has pursued solutions to flooding since incorporation, and the Ronald Bog area has been a significant portion of the list. Currently, the City has a 2008 CIP project for improvements to the drainage totaling $3,100,000. If these improvements had been implemented prior to December 3rd, it would not have eliminated the flooding that occurred in December. An additional $3,000,000 in improvements, proposed as part of the 30% design and subsequently dropped due to budget, may have added further protection immediately South of Ronald Bog, but would more likely have caused additional flooding further downstream.

Public Works has prepared an action plan with immediate, near term, and long term approaches aimed at working within available and foreseeable funding to provide the greatest relief to this area. Part of the proposed strategy is the pursuit of grants. If the City is successful, then the completion of projects could be accelerated.

BACKGROUND

Early accounts of Shoreline tell how Native Americans collected wild cranberries at Ronald Bog. Named after Judge James Ronald, an early Shoreline philanthropist and Seattle mayor from 1892-93, Ronald Bog was historically a peat bog wetland. In 1923, the US Geological Survey estimated Ronald Bog peat deposits to be 40 feet deep over 25 acres. After World War II, George Webster obtained ownership of the land it was mined for its peat, forming the square sided shape open water pond that is seen today.

The neighborhood to the south of present day Ronald Bog Park was originally part of the Bog. The area was platted for residential use by King County in 1955 and homes were built on fill not long afterwards. Construction of Interstate 5 began in the area in the early 1960's and fill from the construction was used to reduce the open water portion of the Bog. Runoff from development since then in the 690 acres upstream has been directed to the Bog since it is the low spot in the Upper Thornton Creek basin. Sometime after it began being used as a regional stormwater facility, the Bog was directly connected to Thornton Creek (Bogs are usually isolated and are only connected to other surface waters through groundwater flow).

The studies completed subsequent to the 1997 flood were conventional in design, and did not address the downstream effects, including backwater. None of the studies account for the movement and impact of groundwater. It is clear from the event in December that maintenance completed on the drainage system has significantly restored the flow capacity of the system, and improved the capacity to handle moderate

storms, but has had less impact in providing relief for localized flooding from major severe storms. This is a strong indication that simply building a bigger pipe or a wide open channel is not the entire solution to the flooding in the Ronald Bog area. A basin-wide study, from headwaters to the south city limit, is needed to fully assess the proposed solutions. This study may likely need to include backwater and groundwater analysis of properties beyond the City limits.

In 2005, the city adopted its first Surface Water Master Plan. This Plan was in part an attempt to identify the significant basins within the city and then prioritize a list of projects that were going to be necessary to begin addressing the history of known problems. This Plan was not a complete listing of all projects within the city that were going to be necessary to reduce flooding. This Plan does not provide a detailed correlation between the level of flood protection required and the magnitude of improvements. More specifically, the Plan states that additional engineering analysis will be required to properly determine the appropriate level of infrastructure given the desired level of flood protection[1]. Staff would suggest that the timing of the next CIP process in the spring of this year would be an optimum time to pursue the basin plan for Thornton Creek/Ronald Bog and develop a long term strategy for flood protection within the basin.The initial Ronald Bog Drainage Improvement Project was created by the city in response to the flooding of many homes during a large rain-on-snow storm that occurred in early 1997. Attachment C provides a detailed chronology of events that surround Ronald Bog area.

DISCUSSION

As the threat of flooding continues, an immediate action plan is appropriate and measures have already been taken. The City is also poised to begin construction this summer, and next, on projects that will start to reduce the level of flooding. It is clear that more work beyond what is planned will be needed to resolve the issue. The City's response to the flooding issue has been divided into a three pronged approach:

1. Immediate Action
2. Near term construction
3. Long Term study and plan implementation

1. Immediate Action Plan: This includes installation of an early warning system to alert residents to the pending flooding. The City has placed sand bags at strategic locations and has an ongoing training plan for neighborhood response. A 6" pump will be located at the south end of Corliss to serve as a high-flow bypass on an as needed basis. Maintenance continues on the existing system downstream of the Bog to keep it free flowing. Staff has identified potential grant opportunities and will pursue applications including:

- King County Flood Control Zone District "Opportunity Fund"
- FEMA Disaster Mitigation grant
- FEMA Pre-Disaster Hazard Mitigation Grant.
- Other State and Federal alternatives

[1] Surface Water Master Plan, Adopted July 11, 2005; Section 5.3 - Proposed Flood Protection Projects and Programs.

2. Near Term Plan: This will continue with the replacement of the street drainage system along the west side of Corliss Avenue. The existing system is in need of replacement and a new pipe will increase the effectiveness of the bypass pump. The replacement of the fish barriers on Thornton Creek, west of Corliss Place, will also reduce the likelihood that these will become debris will accumulators in these areas.

The maintenance of the downstream system and the elimination of the fish barriers are aimed at returning the Bog to its historic levels; about 2 feet lower than present. This could add as much as 5 acre-feet of storage at the Bog. Lowering areas within Ronald Bog Park could add an additional 5 acre-feet.

The design and construction of Cromwell Park improvements, scheduled to be completed in 2009, will include 1 to 2 acre-feet of upstream detention and will reduce flooding at Ronald Bog by that amount.

The 2005 Surface Water Master Plan recommended additional hydraulic and hydrologic studies and surveys be completed. FEMA grants will also require additional studies to assess the effectiveness and level of protection that will be provided by proposed solutions, along with the establishment of the 100-year flood plain elevation. The work to date, important, well guided, and intentioned, has been to triage problems with the existing system and effect repairs. To significantly reduce flooding, a more comprehensive long-term plan is necessary.

3. Long-Term Plan: There exists a very shallow or limited hydraulic profile (2 feet of fall from the Bog to N 168th Street), which necessitates a detailed downstream evaluation and analysis; as does any solution that involves more pipe capacity. These dynamic factors have not been studied with the conventional modeling that has been completed.

The scope of the study will need to reach beyond this localized area and will require a look at all of Thornton Creek from the headwaters to the City Limit; and beyond as necessary for analysis. The Long Term Plan will need to analyze and evaluate a variety of alternatives and solutions including:

- Increasing Upstream detention
- Diversion of water away from Ronald Bog
- Terracing the Ronald Bog Park to store more water in the park area
- Additional detention facilities and acquisition of property
- Improving & increasing conveyance capacity of the downstream system
- Identify Grant Funding Opportunities and requirements including the FEMA Pre-Disaster and Hazard Mitigation Programs.
- Evaluate the Surface Water Rate Structure to help fund solutions

With the analysis will come the development of a strategy to fund the proposed solutions. The ultimate goal of the study will be to propose solutions matched to available funding.

Funding

The following table shows the current funding that is available based on the 2008-2013 Capital Improvement Plan (CIP) for the Thornton Creek/Ronald Bog Basin.

Project	Scheduled Year(s)	Surface Water Funded	Public Works Trust Fund Loan	Total Amount
Ronald Bog South	2008	$416,910	$2,052,090	$2,469,000
Ronald Bog Park Wetland	2009-2010	$571,000		$571,000
Cromwell Park Pond/Wet Pond/Wetland	2008-2009	$747,000		$747,000
Pump Station No. 25	2009	$264,000		$264,000
Total		**$1,998,910**	**$2,052,090**	**$4,051,000**

Fundamentally, in developing long range planning for addressing flooding, water quality and habitat enhancements, one needs to understand the hydrologic behavior of the entire basin. To accomplish this, a quality master basin plan that will help guide the City in developing quality CIP projects with reasonably predictable costs needs to be developed. This will assist the city in understanding exactly what we can afford and where surface water rates need to be based on priorities developed on a basin-by-basin basis.

Thornton Creek Basin is ready for such a study and in need of developing not only short term, but long term improvements that address flooding, plus water quality and habitat enhancements. The need for a comprehensive basin plan for Thornton Creek will not only provide a benefit for flood protection, but will also provide benefit for a whole host of other environmental issues. Comprehensive basin plans will help prevent future flooding caused by over development (the root cause of the current problem) since they can provide information on the capacity of the existing systems and, therefore, the City has a rational basis for restricting additional stormwater flows from new or re-development project. The results can also have benefits to water quality compliance with Ecology's Western Washington Municipal Stormwater permit and assist in developing habitat recovery plans for fish and other aquatic organisms in the basin.

The ultimate goal is to provide the maximum flood protection possible to the residents directly south of the Bog, to those adjacent to Pump Station 25 on 2nd Place NE, to all residents upstream of the Bog who were impacted on December 3rd, and to the downstream residents in Shoreline and our neighbors in Seattle. This needs to be accomplished in accordance with all environmental requirements and within reasonable budgetary constraints.

In order to prepare for a comprehensive basin plan, staff proposes to pursue a scoping process in the spring of this year to ultimately assemble a detailed Request for Proposals with a schedule to complete the basin plan. The cost of this work is within the budget of the current 2008 Ronald Bog project. The cost and schedule for the basin plan would be submitted as part of the City's CIP process later this spring. This timing will also allow staff to pursue more information about how possible grants may fit into our financial plan and ultimately our construction schedule.

Staff is also pursuing our periodic review of the Surface Water Utility's rate structure. This will be very valuable information as the Council considers the options for funding all projects within the Surface Water Utility Fund.

RECOMMENDATION

No action is required by the City Council at this time. This report is for information only.

Attachments:

Attachment A – Thornton Creek Drainage Basin
Attachment B – The 2008 CIP project of Ronald Bog South
Attachment C – A Chronology of Events within the Thornton Creek/Ronald Bog Drainage Basin.

Legend

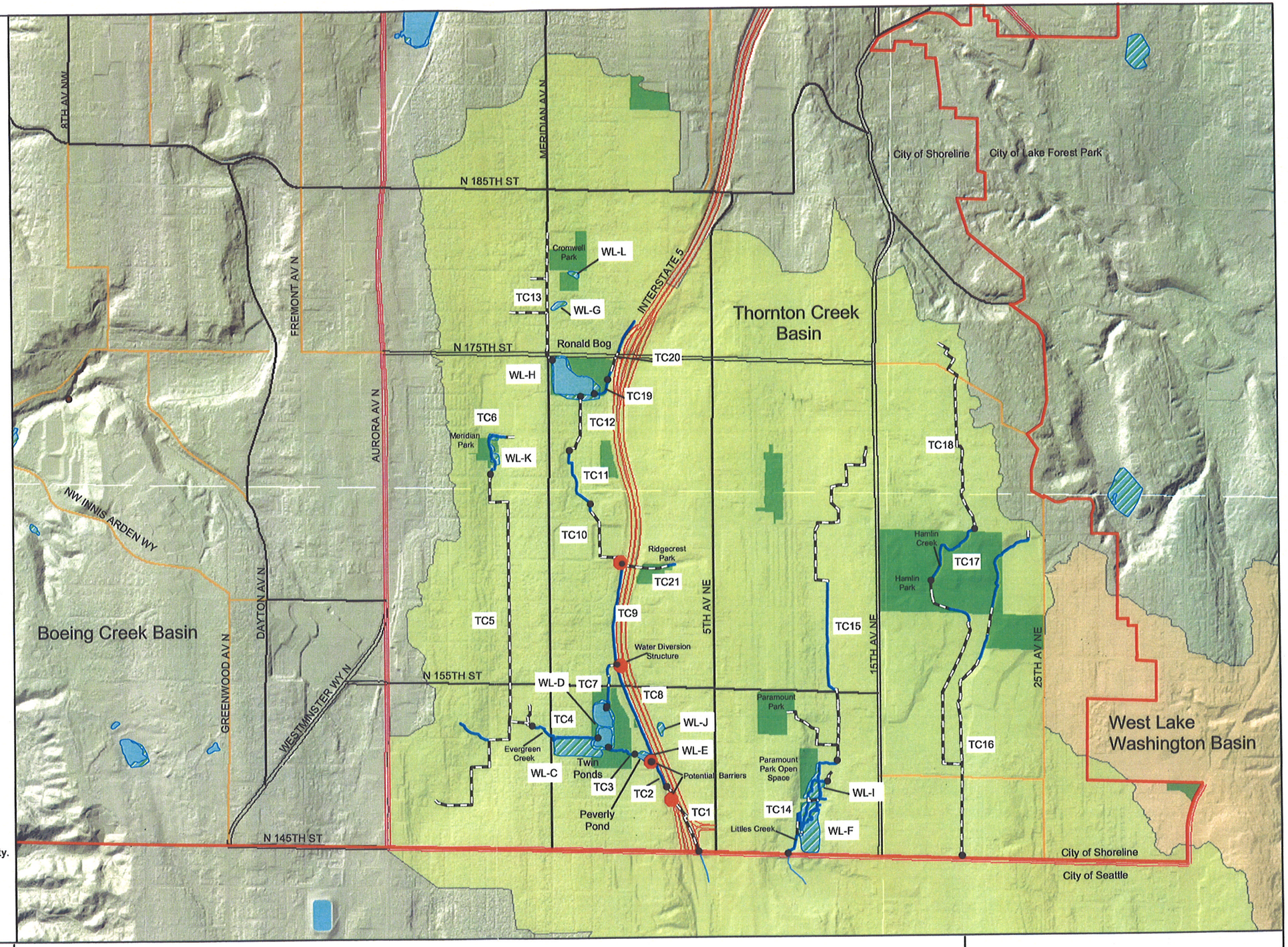
- Open Water Course
- Piped Water Course
- Wetlands
- WL-C Wetland ID
- Parks
- TC1 Reach ID
- Reach Starting Point
- Fish Passage Barrier
- Thornton Creek Basin
- W. Lake Washington Basin
- Waterbodies
- Shoreline City Limits
- Interstate
- State Route
- Principal Arterial
- Minor Arterial
- Collector Arterial

N

1,200 600 0 1,200 Feet

No warranties of any sort accompany this product or are implied including accuracy, fitness, or merchantibility.

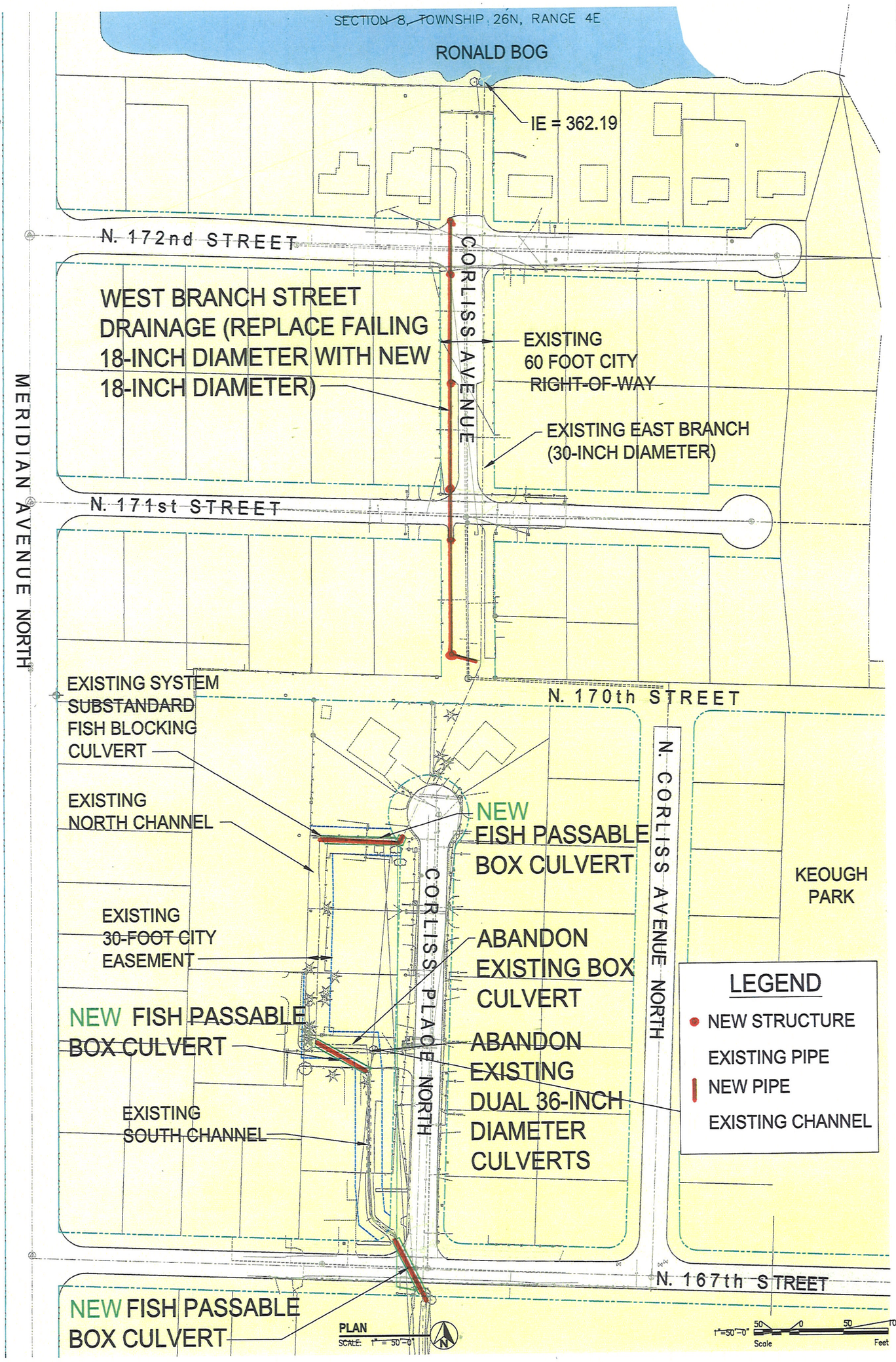
For regulatory purposes, segments within a reach are classified on a site-specific basis.
The mapping in this document provides a general guide to classification.



Tetra Tech / KCM
1917 1st Avenue
Seattle WA 98101

Thornton Creek Basin Characterization Report

Figure 2-3
Stream Reaches, Wetlands and Fish Passage Barriers



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Project No.

UPPER THORNTON CREEK
Basin Drainage Improvement
PUBLIC MEETING EXHIBIT

17544 Midvale Ave. N
Shoreline, WA 98133
(206) 546-1700

R.W. Beck, Inc.
1001 Fourth Ave. Suite 2500
Seattle, WA 98154-1004
RW BECK

	Initials	Date	Description
Designed			
Checked			
Revisions			
Revisions			
Revisions			

	Date	Signature
Accepted for construction by City Engineer		

Attachment C - A Chronology of Events within the Thornton Creek/Ronald Bog Drainage Basin.

- November 1998 - The City Council adopts City's first Capital Improvement Plan (CIP). This CIP includes three separate drainage projects within the Ronald Bog Drainage basin.
- June 1999 - Staff presents to Council the steps for the Ronald Bog project pre-design study titled the "Ronald Bog Subbasin Study." Council approves combining the three previously mentioned CIP projects into one. This Council agenda item authorized the City to hire Otak for a basin solutions analysis.
- Staff works with Technical and Citizen Advisory Committee (CAC) to review subbasin flooding options. Staff meets with citizen and technical advisory committees (Residents, the Departments of Ecology, Transportation, and Fish and Wildlife, and the Army Corps of Engineers) to discuss technical and citizen concerns at same time. This advisory committee meets on June 20, August 1, and October 5, 2000. The final CAC met on January 11, 2001.
- February 2001 - Staff requests Council select a combination of projects as the basin-wide preferred alternative based a document completed by Otak entitled "Ronald Bog Drainage Improvements Phase 1, Thornton Creek Tributary Flood Reduction Study." These basin-wide alternatives include two projects east of I-5 (upgrades to pump station 25 and drainage improvements near 10th Ave NE and Serpentine Place NE), two in Cromwell Park, one in Ronald Bog Park, and one downstream of the Bog.
- June 2001 –Council adopts the preferred basin-wide alternative and authorizes staff to move forward with the design and environmental work. Staff negotiates with Otak to began 30% design and environmental permitting.
- Early 2002 – Former Shoreline City Manager Steve Burkett calls for independent review of Ronald Bog Drainage Improvements Project as well as four other large CIP projects. The 30% design and environmental permitting is stopped while independent review completed.
- Fall 2002 - Following the recommendations of the independent review by Gray & Osborn, the project is broken up into short term and long term improvements by the Council during 2003-2008 CIP process. (Short term improvements for 2003 included:
    - Cleaning/video of pipes and removal of roots in storm lines south of Ronald Bog, and at 10th NE/175th Street (completed in 2003).
    - Full design, permitting, and construction of the Serpentine Place improvements (see below).
- December 2002 – The City completes drainage improvements upstream of Ronald Bog along 1st Ave NE near NE 185th St to detain flows prior to reaching the Bog (oversized storm pipe with some in-line detention).

- March 2003 – The City begins the process of developing a Surface Water Master Plan that will include a discussion of which of the other Ronald Bog drainage improvements are appropriate.

- April 2003 – City decides that it is appropriate to construct the following "early outs" instead of the entire Serpentine Project. The two pieces of storm line to be constructed as early out improvements include: 175th Street (between 10th and 11th Avenues NE) and north on 10th Avenue from 175th Street to catch grade AND Serpentine Avenue from 5th Avenue NE west to 175th Street (this is a portion of the original Serpentine Project). These projects were completed in Mach of 2004 at a cost of $1,100,000.

- Spring 2004 - City begins stepped up annual maintenance schedule for all pipe and catch basins in the Ronald Bog basin. All pipes are cleaned, root cut, and catch basins vacuumed out. This extends the useful life of the pipes.

- November 2004 – Additional drainage improvements are constructed by the City in the area of 10th Ave NE and NE 175th St. $75,000.

- Late 2004 – WSDOT completes construction of detention/water quality pond at intersection of I-5 and N 175th St. that may helps flows entering Ronald Bog.

- Summer 2005 – Council approves the first city-wide Surface Water Master Plan that adopts the projects suggested in the 2001 "Ronald Bog Drainage Improvements Phase 1, Thornton Creek Tributary Flood Reduction Study", with modifications. These projects are priority level 1 and scheduled to be completed during the first 6 years of the plan. The study also recommends further survey, hydrologic analysis, and hydraulic analysis be completed.

  The Surface Water Master Plan did not contain detailed basin modeling. The prioritization of projects was based on know flooding, water quality and habitat problem areas from resident and business service requests.

- Early 2006 – City initiates design contract to design the portion of the Ronald Bog Drainage Improvements from the outlet from the Bog to N. 167th St (Ronald Bog South Project).

- May 2006 – Parks bond measure passes that includes master plan for Cromwell Park. Ronald Bog Drainage Improvements that include Cromwell are integrated into the Parks Master Plan for Cromwell.

- November 2006 – Public Meeting held for preliminary design of Ronald Bog South Project.

- December 2006 – 30% design for Ronald Bog South Project is completed.

- January 2007 – The 30% plan is presented to Council.

- Spring 2007 – Washington Department of Fish & Wildlife insists on either an open channel or fish-passable box culverts from the Bog outlet to the open channel. The cost of this is far in excess of available resources **(doubled the**

costs) and this approach would have increased downstream flows substantially South of the Bog and into the City of Seattle. This result was deemed unacceptable by Staff. A phased approach for completing the downstream portion of the project is currently underway.

- The rain event of December 3rd 2007 provided significant insight into how the Bog functions. In early November 2006, a 50-year storm dropped 3.7 inches of rain on the City. The weather was relatively dry prior to this event and flooding downstream of the Bog did not occur. The December 3rd event was just over 4 inches with a snow and small rain event preceding it and this resulted in over 20 acre-feet of surface water over and around Ronald Bog beyond the capacity of the system. This volume estimate does not include the high ground water that continued to recharge the flooded areas as the water was pumped and subsequently receded. This new information warrants re-looking at alternatives and solutions to include the groundwater contribution component.