

**From:** [Brian Shay](#)  
**To:** [Sukola, Katrina](#); [Scott Boettcher](#)  
**Cc:** [Johnson, Ty](#)  
**Subject:** Chehalis Basin Flood Authority Local Projects Grant Application-City of Hoquiam-K Street Storm Water Pumpstation Construction  
**Date:** Wednesday, April 24, 2024 4:07:24 PM  
**Attachments:** [Local Projects Grant Application.K Street Stormwater Pump Station Project.City of Hoquiam.docx](#)  
[K Street SW Pump Station Preliminary Design Report.March 2024.pdf](#)

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Hi Scott and Katrina,  
Here is our second project application for the K Street Pumpstation Construction. Thanks.  
-Brian

Brian Shay, City Administrator  
City of Hoquiam  
360-538-3983



*City Mission Statement: The City of Hoquiam is committed to improving the quality of life for our citizens by diversifying the industrial base, increasing business, housing and recreation opportunities, while providing safe neighborhoods for all.*

## Part IB

### 2025-27 Local Projects Recruitment Process, Schedule

#### FINAL Recruitment Form for Construction, Implementation Projects

##### Instructions:

1. Please submit project requests (via this recruitment form) to [katrina.sukola@icf.com](mailto:katrina.sukola@icf.com) no later than 5:00 p.m., 5/10/2024.
2. Please submit one recruitment form for each project proposed, even past projects previously or partially funded.
3. Note: Sections III and IV [marked by "(\*\*)"] will be scored for review/evaluation. Sections I, II, and V will not be scored.
4. Note: Section V is necessary to help the Chehalis River Basin Flood Authority, Office of Chehalis Basin, and Chehalis Basin Board understand the scope and scale of future Local Projects.
5. See [https://www.ezview.wa.gov/site/alias\\_1492/39938/2025-27\\_local\\_projects.aspx](https://www.ezview.wa.gov/site/alias_1492/39938/2025-27_local_projects.aspx) for more information.

##### Schedule:

April 4, 2024	Flood Authority posts/distributes FINAL 2025-27 local project recruitment request.
May 10, 2024 *	Project sponsors submit proposals no later than 5:00 p.m., Friday, May 10, 2024, to Katrina Sukola, <a href="mailto:katrina.sukola@icf.com">katrina.sukola@icf.com</a> .
May 16, 2024	Flood Authority presented with local project proposals received.
June 4, 2024	Chehalis Basin Board presented with local project proposals received.
Multiple Dates	Review and ranking of proposals with Projects Committee and Review Team.
July 18, 2024	Flood Authority approves ranked, prioritized funding recommendation to Chehalis Basin Board.
August 1, 2024	Chehalis Basin Board approves ranked, prioritized funding recommendation to OCB/Ecology/Governor.

\* Proposal submitters will likely be asked for additional information between May 10 through July 18.

Section I General	
1. <b>Date:</b>	April 17, 2024
2. <b>Project Name and Project Phase/Stage:</b>	K Street Pump Station - Construction
3. <b>Project Location</b> -- Please provide location of project and latitude, longitude coordinates (e.g., 46.712222, -122.977811).	46 58' N 123 52 W
4. <b>Project Manager/Contact</b> -- Please identify who will be responsible for overseeing, implementing the project on a day-to-day basis (i.e., name, organization, contact information).	Brian Shay, City Administrator 609 - 8th Street, Hoquiam, WA 98550 360-538-3983 <a href="mailto:bshay@cityofhoquiam.com">bshay@cityofhoquiam.com</a>
5. <b>Project Sponsor and Key Partners</b> -- Please identify project sponsor and key partners who will assist in project delivery and implementation.	City of Hoquiam is the lead agency and will manage the overall construction project for K Street PS project. The City hired HDR Engineering who is completing the design of the pump station to be bid ready by June 2024. Upon receiving construction funding, HDR engineering will have their current contract amended to include bidding services and construction management to lead the project from start to finish.

Section II Description, Timing and Cost	
6. <b>Project Description</b> -- Please describe the project, what is intended to be accomplished, flood hazard reduction benefits to be accrued to whom and when. Please identify what phase/stage of the project funding is sought (e.g., construction/implementation phase/stage). Please identify any local or state funding previously secured for this project.	The City is requesting funding to construct the new K Street PS in Hoquiam WA. The project will upgrade the existing failing pump station facility that consists of two existing stormwater pumps that are undersized and have reached the end of their useful life. The project includes new vertical turbine pumps, new controls, backup generator, telemetry upgrades, piling, site security fencing, demo, and site improvements. This project was identified in the City of Hoquiam's 2000 Comprehensive Stormwater Plan and previously received funding from the Chehalis Basin Flood Authority to complete the design and pre-purchase the pumps and emergency generator which will be ordered by June 2024. The pumpstation collects surface waters in a large area of Hoquiam where there has been frequent flooding.
7. <b>Project Timeline</b> -- Please describe the timeline	Construction of the K Street PS is anticipated to be

and phases/stages for completing the overall project and the timeline for completing the phase/stage to be funded by 2025-27 funding.	completed within 9 months of receiving construction funding. Assuming funding is awarded after the 2025 Legislative Session, the project could be completed by the end of 2025 or early 2026.
8. <b>Project Cost and Funding</b> -- What is the cost of the overall project (or anticipated cost)? What is the cost of the phase/stage to be funded by 2025-27 funding? What are the on-going maintenance and operation requirements and costs? Who will cover on-going maintenance and operation requirements and costs?	The City is seeking \$3.1M to complete the construction phase of the project. This total includes \$3M in construction costs and \$100K in professional services for bidding assistance, inspection services and construction management. The project design will be completed by HDR engineering in 2024 at an anticipated final cost of \$350,000. With all costs combined, the project totals 3.45M. On-going maintenance will be performed by the city of Hoquiam maintenance staff utilizing stormwater utility revenue. If the flood authority is unable to fully fund construction, the City would request \$500,000 to pre-purchase the pumps and emergency generator until construction funding is secured in a later grant cycle or other funding source.
9. <b>Other Funding</b> -- Please describe other funding sources and partners that have already contributed (or could contribute in the future) to this project and for what phase/stage.	The City of Hoquiam will cover any additional project costs above the funding amount that is awarded to the City for construction of this project. The Chehalis Basin Flood Authority and the Office of Chehalis Basin has allocated \$350,000 previously to complete the design of the pumpstation.

Section III (**) Completion, Feasibility, Alternatives, and Impacts	
10. <b>Project Completion</b> -- Does the funding requested complete, substantially complete, or continue a project already started? If so, please explain.	Funding would complete the project by providing the dollars required to get the project constructed within 9 months of grant award. The facility could be in service prior to the 2025/2026 rainy weather season and be completed prior to the construction of the North Shore Levee West Segment.
11. <b>Project Feasibility</b> -- Can this project or the phase/stage for which funding is sought be completed by June 30, 2027? Please describe any circumstances with potential to impact the project's feasibility or timeline (e.g., permitting or regulatory unknowns, lack of availability of other funding resources, etc.). Please describe any advance coordination or vetting with agencies, tribes, other entities, etc. and the outcomes of that effort.	The project is certain to be completed by June 2027 upon receiving funding. With bid ready plans and specifications that will be completed by the end of 2024 this project will be completed within 12 months of grant award. This project is beyond 200 feet of the shoreline and likely will only need a building permit for construction. The City has been in communication with Ecology and RCO on this project as it previously received design funding.



<p>12. <b>Project Alternatives</b> -- Please describe alternatives to the project that were considered (including doing nothing), and the rationale for selecting the project described, proposed here.</p>	<p>Do Nothing – Flooding will continue to occur upstream. If the pump station fails local residents, and businesses will be flooded during storm events. The project is located in railroad right of way. The project is required to be constructed as part of the flood reduction project needed for handling interior drainage flood as part of Hoquiam’s North Shore Levee West project. The existing site discharge is a conveyance ditch into the Hoquiam River. Routine flooding happens at the K Street site which contains both a stormwater and wastewater pump station.</p> <p>HDR prepared Preliminary Design Report evaluating the flows within the basin as well as different layouts and sizing for pumps, piping, backup onsite power and new outfall with piping from the discharge structure to the existing ditch tributary to the Hoquiam River. The City utilized the most cost-effective alternative evaluated during their review period.</p>
<p>13. <b>Project Impacts Avoided, Mitigated</b> -- Please identify how project impacts will be avoided and mitigated, and if that mitigation will be accomplished by June 30, 2027?</p>	<p>At this point no mitigation is anticipated or required.</p>
<p>14. <b>*NEW* Investment Planning</b> -- Please describe the extent to which this project is derived from or connects to a local investment planning (or master planning) process.</p>	<p>This project is part of the Stormwater Pump Station upgrade improvement projects within this basin. Currently HDR (Consultant) is preparing a stormwater comprehensive plan for the City that will prioritize required pump station and conveyance improvement projects to limit flooding within stormwater basins. It is essential that as many pump station projects be completed prior to the North Shore Levee West construction. These projects allow for pumped and gravity flow into the river and not allow for king tides to backup into the system causing surcharge routinely in the existing collection system. The project was also identified in the 2020 Comprehensive Surface Water Plan.</p>

<p align="center"><b>Section IV (**)</b> <b>Benefits Stated and Quantified</b></p>	
<p>15. <b>Emergency Response Benefits</b> -- Please describe (and quantify) how this project</p>	<p>This project will reduce the potential for flooding of roadways and businesses upstream of the K Street</p>

enhances emergency response in a flood emergency (e.g., does it keep critical access roads and transportation facilities open/functional, does it enable easy movement of cattle, equipment and farm chemicals out of harm's way, is it part of a larger hazard mitigation plan, etc.).	pump station which consists of approximately 170 acres. This project is needed now and is necessary for the protection of residential dwellings, low income housing, businesses, the Hoquiam Fire Station, City Hall, Post Office, and local citizens. During the Jan. 2022 flood event, this basin was completely flooded. The Ramer Street Pump station located with the Cities UGA, was constructed and designed in a similar manner to K Street PS, this was the only basin (Ramer) that did not experience flooding during this occurrence.
<b>16. Essential Infrastructure Protection Benefits --</b> Please describe (and quantify) how this project protects essential infrastructure and the risks or consequences of not acting this funding cycle.	There are existing residences and buildings within this basin including critical facilities such as Hoquiam City Hall, the Fire Station, Post Office, Social Security Office and Low Income Housing managed by the Housing Authority of Grays Harbor. This facility will protect this infrastructure from flooding.
<b>17. Public Health, Safety and Welfare Benefits --</b> Please describe (and quantify) how this project protects public health, safety, and welfare.	The project will prevent flooding within the K Street Basin which happens on an annual basis. Extreme flooding has caused closures of arterial streets including SR 101 S through this area and impacts hundreds of homes, businesses and Lincoln Elementary impacting their safety and welfare.
<b>18. Residential, Commercial and/or Agricultural Protection Benefits --</b> Please describe (and quantify) how this project protects residential communities, commercial and/or agricultural interests, and benefits of acting (or consequences of not acting) this funding cycle. Consider factors like number of structures and people at risk, historic frequency of flood damage, magnitude of benefit for the cost, etc.	The City of Hoquiam experiences major flooding. This Pump Station along with the proposed levee will provide internal and external flood protection for this basin and the adjacent railroad. This project will reduce the potential for flooding of roadways and businesses upstream of the K Street pump station which consists of approximately 170 acres. This project is needed now and is necessary for the protection of residential dwellings, low income housing, businesses, the Hoquiam Fire Station, City Hall, Post Office, and local citizens.
<b>19. Habitat Benefits –</b> Please describe (and quantify) how this project benefits or improves existing or future habitat conditions.	No damage upstream of the existing facility. New tide gates and check valve to prevent any habitat from going into the City's system.
<b>20. Costs, Benefits, Impacts –</b> Please describe (and quantify) anticipated:  (a) <u>Costs</u> of this phase/stage of the project if funded, and if not funded? This would include any costs (beyond the direct cost of the project) that might be incurred or avoided because of the project being funded (or not funded) and when.	(a) Construction cost prepared for the Preliminary Engineering Report OPCC is estimated to be approx. 3 million. <b>An additional 100K is anticipated for construction administration and special inspections during construction.</b> (b) Flood reduction and fixing failing facility. (c) If the project is not funded the facility will

<p>(b) <u>Benefits</u> of this phase/stage of the project if funded and when those benefits would be realized?</p> <p>(c) <u>Impacts</u> of this phase/stage of the project if funded, if not funded, and when those impacts would occur.</p>	<p>eventually fail. The lack of improvements won't coincide with the net benefits of the levee construction for flood reduction. This will result in millions of dollars of damage to residents, businesses, and habitat.</p> <p>The pump station will also provide for accessibility for emergency vehicles during emergency flood events within this basin.</p>
<p>21. <b>Other Project Benefits</b> -- Please describe (and quantify) any other project benefits not already discussed. This could include how this project compliments, leverages, or implements another project or planning process already underway.</p>	<p>This project compliments the flood reduction projects within the City as well as the City's platform to standardize all stormwater pump stations City wide to improve operation and maintenance costs. Like Ramer Street, 10<sup>th</sup> Street, and Queen Ave this will be a required improvement for the City. This Project is part of the start of the Stormwater Comprehensive planning projects in Grays Harbor County for the Aberdeen, Hoquiam, and Cosmopolis. To prioritize projects, this being one of them, to design and construct in the near future to reduce interior and coastal flooding to the cities.</p>
<p>22. <b>Anything Else</b> -- Please offer any additional information (e.g., links, photos, maps, video, drawings, drone, etc.) that would help to better understand the scope, timing, and benefits of this project.</p>	<p>Attached is the Preliminary Engineering Report. The City can provide updated plans, specs, and estimate to the OCB as completed. The City of Hoquiam prepared a Comprehensive Surface Water management plan in July 2000. The K Street pumps were undersized and required replacement and upgrade over 24 years ago.</p>

<p><b>Section V</b></p> <p><b>Local Construction, Implementation Projects Beyond 2025-27</b></p>	
<p>23. <b>Project Name and Project Phases/Stage:</b></p>	<p>Riverside Avenue Pump Station Project</p>
<p>24. <b>Project Location</b> -- Please provide location of project and latitude, longitude coordinates (e.g., 46.712222, -122.977811).</p>	<p>46°58'50.4"N 123°53'00.9"W</p> <p>Intersection of C Street and 13<sup>th</sup> Street</p>
<p>25. <b>Project Sponsor and Key Partners</b> -- Please identify who would be sponsoring the project and key partners who would assist with project delivery and implementation.</p>	<p>HDR Engineering will lead the design and grant funding will be requested from the Office of Chehalis Basin and state or federal agencies.</p>
<p>26. <b>Project Description</b> -- Please describe the project, what is intended to be accomplished, the flood hazard reduction benefits to be accrued and to who and when. Please identify</p>	<p>The project will upgrade a failing pump station and make drainage improvements to eliminate flooding from the Hoquiam River that impacts the Riverside Avenue neighborhood and State Route 101 N. The</p>

what phase/stage of the project funding would be sought (e.g., construction/implementation phase/stage).	pumpstation collects surface waters in a large area of north Hoquiam where there has been frequent flooding.
27. <b>Costs</b> -- Please describe (quantify) anticipated project costs.	\$2M
28. <b>Benefits</b> -- Please describe (quantify) anticipated project benefits.	The project will eliminate flooding that impacts several blocks of homes, businesses and along SR 101 N.
29. <b>Impacts</b> -- Please describe (quantify) anticipated project impacts.	The project will eliminate flooding that impacts several blocks of homes, businesses and along SR 101 N.

Attachment 1

# **City of Hoquiam**

K Street Pump Station

Preliminary Design Report



# Preliminary Design Report

K Street Pump Station

*Hoquiam, Washington*  
March 5, 2024



## Contents

1	Introduction.....	1
2	Existing Pump Station .....	1
3	Previous Design Studies .....	3
4	Basin Delineation and Design Flows.....	8
5	Conveyance Piping Modifications .....	13
5.1	K Street Storm Conveyance System.....	13
5.2	K Street Stormwater Pump Station Discharge .....	14
6	Pump Station Design.....	19
6.1	Hydraulics.....	19
6.1.1	Hoquiam River Levels .....	19
6.1.2	Design Flow Rate and Pump Selection.....	19
6.2	Discharge Structure.....	25
6.3	Wet Well Structure .....	25
6.4	Overflow Pipe .....	26
6.5	Building Design .....	26
6.6	Electrical Design.....	26
6.7	Site Security .....	26
6.8	Site Layout .....	27
6.8.1	Capacity Expansion Option .....	31
7	Geotechnical Investigation .....	35
8	Opinion of Probable Construction Cost.....	35

## Tables

Table 4-1.	Flow estimate comparison from modeling methods .....	9
Table 6-1.	Water surface elevations for Grays Harbor .....	19
Table 6-2.	Wet well elevations .....	22
Table 8-1.	Preliminary design opinion of probable construction cost .....	36

## Figures

Figure 2-1.	Existing K Street Stormwater Pump Station.....	1
Figure 2-2.	Existing K Street Stormwater Pump Station controls building (left) .....	2
Figure 2-3.	Existing K Street Stormwater Pump Station discharge .....	3
Figure 3-1.	Basin description from 2000 Plan.....	5
Figure 3-2.	Improvements from 2000 Plan .....	7
Figure 4-1.	K Street Pump Station basin delineation .....	11
Figure 4-2.	PCSWMM modeled basin .....	13
Figure 5-1.	Project layout .....	17
Figure 5-2.	Proposed channel excavation .....	18
Figure 6-1.	Pump and system curves .....	21

Figure 6-2. Preliminary pump station cross section .....	23
Figure 6-3. Grass area for siting pump station.....	27
Figure 6-4. Example shoring system for pump station construction.....	28
Figure 6-5. Preliminary site layout .....	29
Figure 6-6. Site layout with future adjacent pump station.....	33

## Abbreviations

2000 Plan	City of Hoquiam 2000 Comprehensive Surface Water Management Plan
AC	acre
AACE	Association for the Advancement of Cost Engineering
CCI	Construction Cost Index
cfs	cubic foot/feet per second
City	City of Hoquiam
CY	cubic yard(s)
EA	each
Ecology	Washington State Department of Ecology
ENR	Engineering News-Record
FRP	fiber-reinforced plastic
ft	foot/feet
GIS	geographic information system
gpm	gallon(s) per minute
HAT	highest astronomical tide
HDR	HDR Engineering, Inc.
HMI	human-machine interface
H:V	horizontal:vertical ( <i>slope</i> )
I&C	instrumentation and controls
LAT	lowest astronomical tide
LF	linear foot/feet
LS	lump sum
MCC	motor control center
MDTL	Mean diurnal tide level
MHHW	mean higher-high water
MHW	mean high water
MLLW	mean lower-low water
MLW	mean low water
MSL	mean sea level
MTL	mean tide level
NAVD88	North American Vertical Datum of 1988
NOAA	National Oceanic and Atmospheric Administration
NSLW	North Shore Levee West
OPCC	opinion of probable construction cost
PCSWMM	Personal Computer Storm Water Management Model
PDR	Preliminary Design Report
PLC	programmable logic controller
POR	preferred operating region
PUD	Public Utility District
RCP	reinforced concrete pipe
rpm	revolution(s) per minute
SF	square foot/feet
SWMM	Storm Water Management Model
SY	square yard(s)
TDH	total dynamic head
VFD	variable-frequency drive





WWHM      Western Washington Hydrology Model 2012

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# 1 Introduction

The City of Hoquiam (City) selected HDR Engineering, Inc. (HDR) to provide design and permitting for the construction of a new stormwater pump station to replace the existing K Street Pump Station facility in Hoquiam Washington.

The purpose of this Preliminary Design Report (PDR) is to provide a preliminary design of the proposed pump station as well as a planning-level cost estimate for City review and selection. The preliminary design will include a review of the K Street stormwater pump station drainage basin and determination of existing flow rates to the pump station for design storm frequencies. This PDR includes an evaluation of the storm conveyance system, proposed pump station layout, and preliminary pump selection based on the drainage basin and determines flow rate for design storm frequencies.

## 2 Existing Pump Station

The K Street Pump Station is located at the southeast end of K Street west of the Hoquiam River and was constructed in 1981. The site includes both a wastewater lift station and a stormwater pump station. The wastewater lift station will be evaluated under a separate contract with HDR. The stormwater pump station only pumps stormwater and is not a combined sewer pump station. The stormwater pump station consists of a circular concrete structure (see Figure 2-1) where the pump station wet well is located. The controls are housed in a separate building adjacent to the sewer pump station building (see Figure 2-2).



**Figure 2-1. Existing K Street Stormwater Pump Station**



**Figure 2-2. Existing K Street Stormwater Pump Station controls building (left)**

Two submersible, centrifugal Flygt Model 3201 pumps are in the existing wet well. Each pump has a name plate capacity of 3,500 gallons per minute (gpm) discharging to an 8-inch-diameter outlet, for a total pump station capacity of 7,000 gpm (15.6 cubic feet per second [cfs]). This flow rate matches what is indicated in the City's July 2000 Comprehensive Surface Water Management Plan (2000 Plan) prepared by Tetra Tech/KCM Inc.. Each pump has a 35-horsepower (hp) motor requiring 3-phase power. The pumps deliver a total dynamic head (TDH) range between approximately 10 feet at 3,500 gpm and approximately 81 feet at maximum operating capacity of 7,000 gpm. City Staff have not observed the need for both pumps to operate at the same time, however the pumps do run during periods of dry weather.

A variable-frequency drive (VFD) controls the speed of the pumps based on the water level in the wet well, which is measured by an ultrasonic level sensor with float switches. A human-machine interface (HMI) is provided to view the operation status of the pumps and manually operate the pumps if needed.

There are guide rails to allow for pump removal through the access hatches on top of the wet well structures (see Figure 2-1), but City staff have stated there are tight clearances that make removal of the pumps difficult.

An emergency generator on site provides backup power for both the stormwater and sewer pumps.

The pumps discharge through a flap gate to a drainage ditch (see Figure 2-3), ultimately discharging approximately 900 feet downstream to the Hoquiam River, which is considered flow control exempt.



Figure 2-3. Existing K Street Stormwater Pump Station discharge

### 3 Previous Design Studies

The 2000 Plan provides information on the City's stormwater system, including conveyance piping, pump stations, stormwater basins, and recommended future capital improvement projects. The K Street basin description and main trunk lines from the 2000 Plan are illustrated in Figure 3-1.

The 2000 Plan indicated that the K Street basin has experienced flooding problems in the upper reaches of the conveyance system north of 6th Street and that some of the flooded stormwater around Emerson Avenue, due in part to the low ground elevation near this road. The other challenge in this basin are older pipes which were constructed with minimal slope or potential adverse grade. This has been witnessed by HDR staff in other City stormwater basins.



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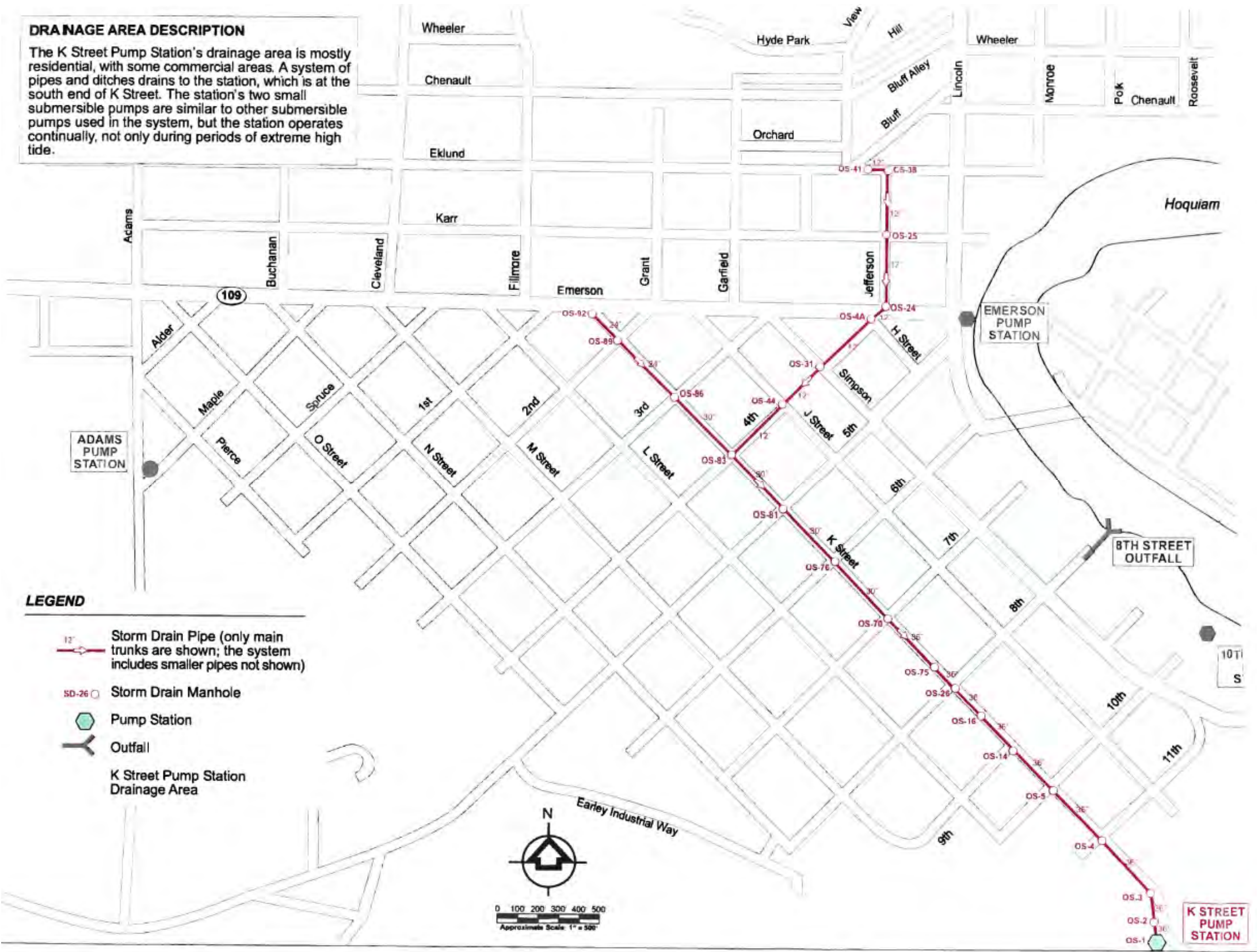


Figure 3-1. Basin description from 2000 Plan



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The 2000 Plan also included recommended improvements related to the K Street Pump Station. These are summarized in Figure 3-2. Because the 8th Street outfall had experienced back flow from the Hoquiam River during high tides, it was recommended to hydraulically separate the 8th Street outfall from the river by rerouting it to the 10th Street Pump Station and diverting the 8th Street basin upstream of K Street into the K Street conveyance system. However, HDR has recently prepared a design that included diverting the 8th Street storm flow for the entire 8th Street basin to a proposed 10th Street Pump Station rather than diverting a portion of it to the K Street Pump Station. This modification is currently under contract and the work will be completed by the fall 2024.

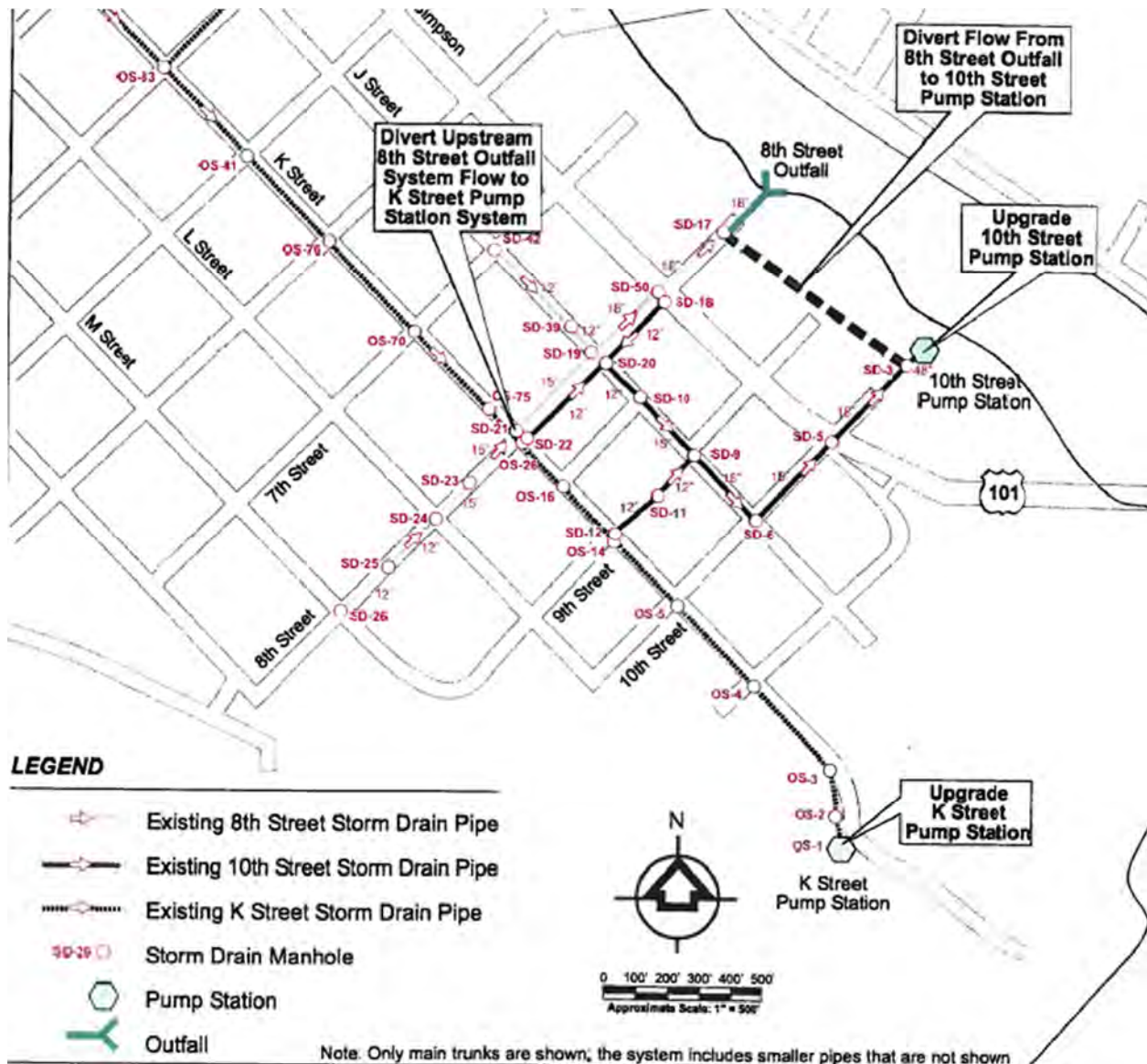


Figure 3-2. Improvements from 2000 Plan

## 4 Basin Delineation and Design Flows

The drainage basin delineation from the 2000 Plan was validated using available record drawings and geographic information system (GIS) data for the system.

The 2000 Plan was based on design criteria of piping sized for the 10-year, 24-hour event and pump stations sized for the 100-year, 24-hour event. The 2000 Plan had estimated storm flows to the K Street Pump Station of 63.5 cfs and 68.4 cfs for the 10-year and 100-year 24-hour events, respectively, as shown in Table 4-1 below.

The basin delineation performed by HDR is approximately 170 acres based on the available information illustrated in Figure 4-1. Due to lack of survey for the entire City storm system and overlapping stormwater basins, the estimated area may be inaccurate and the delineation in the 2000 Plan was assumed where information was lacking. However, the basin delineation accuracy is considered sufficient for approximating the peak flow for the basin.

Hydrologic soil group, slope, and land cover types were mapped within the delineated basins to determine areas to input into the Washington State Department of Ecology's (Ecology's) Western Washington Hydrology Model 2012 (WWHM) model to estimate peak flows. WWHM is the approved continuous-simulation stormwater model per the City's stormwater codes and was the first method used to approximate flows to the pump station. The estimated flow output from WWHM is included in Table 4-1 under Method 1.

The 10-year and 100-year flow rates from the WWHM model in Table 4-1 are more than twice those reported in the 2000 Plan. Additionally, the 2-year flow of 37,369 gpm is significantly larger than the current pump station capacity of 7,000 gpm, indicating that the pump station would currently be experiencing significant capacity issues that have not been observed if the flows in Table 4-1 were accurate. This indicates that the WWHM modeling method is likely overestimating flows to the pump station. The WWHM model also does not take into account time of concentration to the pump station facility.

The 2000 Plan used the U.S. Environmental Protection Agency's Storm Water Management Model (SWMM). SWMM is capable of modeling conveyance systems, accounting for the time needed for flow from the farthest point in a watershed to reach the K Street Pump Station. The peak flow generated at the farthest points in the basin will arrive at the pump station after the peak flow from closer areas has already passed through because it has to travel through the conveyance system, so the peak flow that the pump station sees at one time is lower than the total peak flow from the entire basin area calculated from the WWHM, likely leading to the significant flow discrepancy.

Therefore, a Personal Computer Storm Water Management Model (PCSWMM) was used to estimate flows to the K Street Basin. This is the modeling method used for North Shore Levee West project. The subcatchment areas modeled in PCSWMM to approximate the basin delineation in Figure 4-1 are shown in Figure 4-2 and are consistent with the North Shore Levee West project. The PCSWMM modeling results for the existing system are shown in Table 4-1 as Method 2, which showed surcharging in the existing system, indicating that some pipes were undersized or not constructed at minimal slopes to convey the runoff for the return interval. This resulted in lower flows

observed at the pump station. This aligns with the 2000 Plan, in which flooding problems were observed in the upper reaches of the K Street conveyance system.

The third method used to estimate flows used the PCSWMM model and added the flows at each junction contributing to the K Street Pump Station, circled in Figure 4-2, to approximate the flows that would be conveyed if there was sufficient capacity. These flows are also reported in Table 4-1 as Method 3 and are significantly higher than those from Method 2, representing the existing conveyance system. This method still does not account for the time delay due to conveyance, so in a fourth flow estimating method reported in Table 4-1 as Method 4, the conveyance system in PCSWMM was upsized to remove surcharging and still account for the conveyance system.

The existing pump station capacity is 15.6 cfs (7,000 gpm), and the 2-year events for all flow estimating methods are two to five times higher than the existing pumping capacity. Additionally, designing for the flows conveyed by a future conveyance system with sufficient capacity, as estimated in Methods 1, 3, and 4, would require a much larger outfall and pumping system than what is currently needed by the existing system, estimated with Method 2. Therefore, the design flows selected for the pump station and outfall will be for the existing conveyance system (Method 2) to avoid overdesigning for a future, upsized K Street basin conveyance system that is not anticipated to be designed and constructed within the 20-year design horizon. HDR will perform further evaluation of the conveyance system as part of the City's updates stormwater comprehensive plan in 2024. Additional pace will be provided onsite for a future wet well and discharge structure adjacent to the proposed structures to provide additional pumping capacity if the conveyance system is upsized and higher flows are witnessed at the pump station.

**Table 4-1. Flow estimate comparison from modeling methods**

Flow estimating method	24-hour flow by storm event cfs (gpm)					
	2-year	5-year	10-year	25-year	50-year	100-year
1: WWHM model (conveyance system not accounted for)	83.3 (37,369)	104.1 (46,742)	115.6 (51,867)	127.9 (57,419)	135.9 (61,009)	143.1 (64,223)
2: PCSWMM model (existing conveyance system with surcharging)	33.3 (14,928)	42.9 (19,232)	47.0 (21,108)	51.6 (23,155)	54.4 (24,407)	57.9 (25,987)
3: PCSWMM model (conveyance system not accounted for— adding the flows at each junction)	40.2 (18,038)	62.4 (27,998)	77.0 (34,573)	95.8 (42,993)	109.4 (49,084)	123.9 (55,610)
4: PCSWMM model (upsized conveyance system without surcharging)	49.0 (21,993)	66.0 (29,623)	78 (35,009)	94 (42,190)	105 (47,127)	116 (52,064)
2000 Comprehensive Surface Water Management Plan SWMM modeling	-	-	63.5 (28,501)	-	-	68.4 (30,700)

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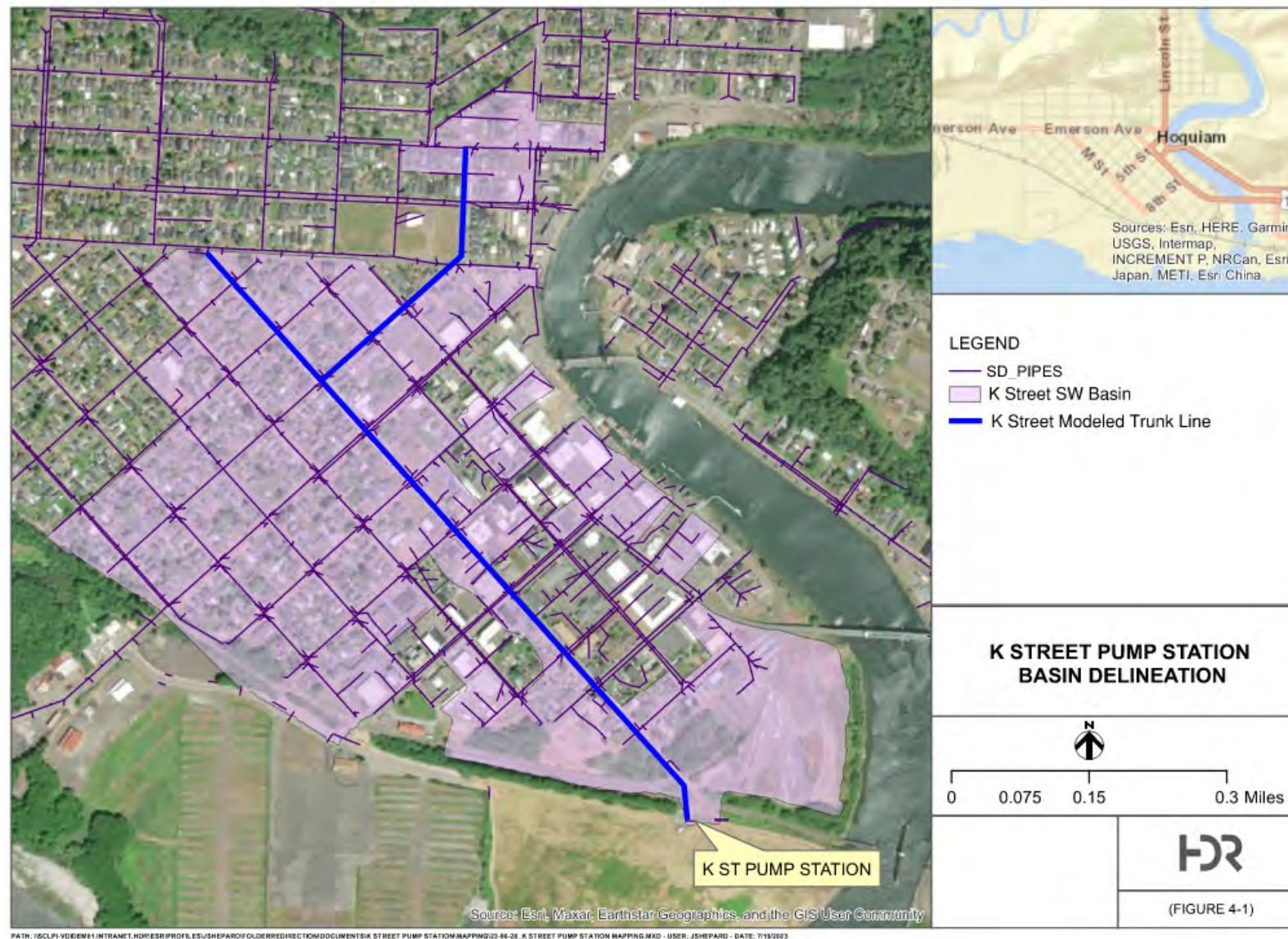


Figure 4-1. K Street Pump Station basin delineation

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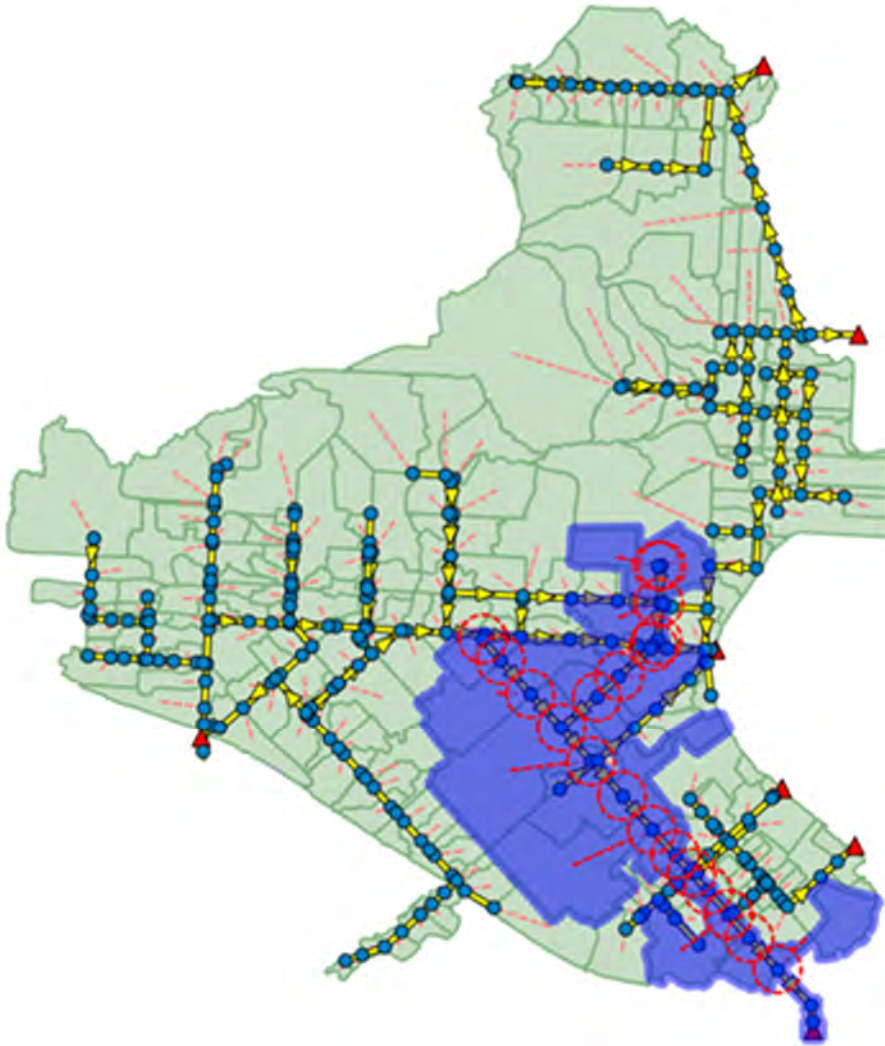


Figure 4-2. PCSWMM modeled basin

## 5 Conveyance Piping Modifications

This section describes proposed conveyance piping modifications to the K Street storm conveyance system and the K Street Stormwater Pump Station discharge.

### 5.1 K Street Storm Conveyance System

The K Street inlet storm drain will be rerouted to the proposed wet well structure as shown in Figure 5-1. A new manhole will be installed to divert the stormwater flows from the existing 36-inch-diameter line to the new pump station through a 48-inch-diameter pipe at a 0.2 percent slope. This piping has capacity of 64.4 cfs, which exceeds the 100-year design flow of 57.90 cfs in Table 4-1.

Survey information will need to be obtained on the invert elevations in the existing pump station wet well and upstream manholes to confirm the slope of the pipe and invert

elevation of the existing storm drain at the connection point. Additionally, the record drawings of the pump station do not show the invert elevation of the 36-inch-diameter storm drain flowing into the existing wet well.

For the purposes of the preliminary design, the invert elevations reported in the 2000 Plan and the available information in the existing pump station record drawings were used to determine the invert elevation of the existing storm drain at the connection point shown in Figure 5-1. The 2000 Plan reported an invert elevation of -4.55 feet at the wet well (named OS-1 in the 2000 Plan), which is 17.05 feet deep given the reported ground surface elevation of 12.5 feet. The record drawings of the pump station show a total wet well depth of 18 feet, indicating that this starting invert elevation from the 2000 Plan is a reasonable assumption. OS-2 in the 2000 Plan was assumed to be the vault structure in the survey data north of the existing pump station shown in Figure 5-1 because this vault structure is 82 feet from the existing wet well and the reported distance between OS-2 and OS-1 in the 2000 Plan was 75 feet. Therefore, the invert elevation at the vault structure was assumed to be the same as OS-2 in the 2000 Plan, -2.12 feet. This results in an assumed pipe slope of 2.96 percent between the vault and wet well. The slope between OS-2 and OS-3, the upstream manhole in the 2000 Plan, was calculated as 0.86 percent, which was the assumed slope from the vault structure to the proposed manhole at the connection point to the existing system in Figure 5-1. This resulted in an estimated invert elevation of the existing 36-inch-diameter reinforced concrete pipe (RCP) storm sewer of -2.03 feet at the connection point to the proposed manhole shown in Figure 5-1. However, prior to the next design phase, pipe inverts will need to be confirmed via potholing and survey.

The proposed 48-inch-diameter pipe was designed to match the assumed crown elevation of the existing storm drain at the connection point. The 36-inch-diameter RCP storm sewer with an invert elevation of -2.03 feet would have a crown elevation of 0.97 foot. The proposed 48-inch-diameter pipe will flow to a manhole just upstream of the wet well to allow the influent pipe to enter the pump station at a 180-degree angle to the alignment of the pump station. At a 0.2 percent slope and 52-foot length, the 48-inch-diameter pipe is estimated to enter the wet well at an invert elevation of -3.15 feet.

## 5.2 K Street Stormwater Pump Station Discharge

The proposed pump station's vertical-turbine pumps will discharge into a discharge structure directly adjacent to the wet well (similar to Ramer, Queen, and 10<sup>th</sup> Street City stormwater pump station). The discharge structure will connect to a 48-inch-diameter gravity line at a 0.2 percent slope; this pipe size and slope has a capacity of 64.4 cfs, which is sufficient to gravity-flow the 100-year event (57.9 cfs). A slide gate will be installed within the discharge structure to meet FEMA requirements for outfalls as outlined for the North Shore Levee West project.

The existing pump station discharges to a ditch just east of the existing wet well. This ditch flows to an 18-inch-diameter storm drain that runs under a gravel road and discharges into another ditch that flows to the Hoquiam River (see Figure 5-1).

The proposed 48-inch-diameter pipe will change direction at a 96-inch diameter manhole and a 72-inch-diameter manhole to align with the existing ditch outside of the proposed North Shore Levee West (NSLW) that flows by gravity to the Hoquiam River. The



manholes will need to be equipped with lockable lids to ensure that they can function under pressurized conditions. Pressures will not exceed 5 psi as measured at the invert of the pipe. The proposed 48-inch diameter pipe will discharge to a proposed headwall and rock pad to the channel that flow to Hoquiam River.

The bottom elevation of the existing ditch at the headwall is about 8 feet. The length of the piping back to the discharge structure is about 325 feet, so at a 0.2 percent slope, the invert elevation of the overflow pipe at the wet well would have to be about 8.64 feet. For a 48-inch-diameter pipe, this would result in a crown elevation of about 12.64 feet. The existing ground elevation at the wet well is around 11.6 feet, so this would result in the top of the pipe being above ground. Additionally, the resulting hydraulic grade line at the 100-year flow would be approximately 14.0 feet, which is higher than the elevation of the inside lid of the wet well (13.5 feet) and the ground elevations of upstream manholes (approximately 11.0 feet), which would result in significant surcharging of the system upstream. The elevation of the wet well rim is set to match the elevation of the proposed North Shore Levee at 16 feet. The lid thickness needed to prevent vibration is 2.5 feet, which sets the inside lid elevation of the wet well at 13.5 feet. Another reason why the channel needs to be excavated is that the normal depth of the flow of the 100-year flow event (57.9 cfs) is 3.65 feet, and the existing channel is only 1 or 2 feet deep in some locations, as shown in the channel sections provided in Figure 5-2.

Excavating the channel will result in a lower piping profile that prevents exposed piping and allows for the rim of the pump station to be at the same elevation as the proposed levee. Lowering the ditch is also necessary to lower the hydraulic grade line to allow for a gravity overflow of the 100-year flow event that reduces surcharging in the upstream system.

The maximum depth that the channel can be excavated is approximately 4 feet. The existing channel slopes at 0.18 percent to an elevation of 6.98 feet and then drops off to a low elevation of 2.74 feet based on the available surface data.

It is recommended that the downstream channel be excavated by approximately 4 feet to provide a 6-foot-deep, 1.5 horizontal (H):1 vertical (V) side-sloped channel with a 4-foot-wide bottom. The proposed channel excavation would maintain the existing slope of 0.18 percent. The depth of flow in the channel during the 100-year flow event (57.9 cfs) during higher high tide (8.47 feet) would be 5.73 feet at the end of the channel where the invert elevation is 2.74 feet and would be around 5.00 feet deep at the entrance to the channel. The channel velocity under this condition would be approximately 0.8 ft/s. Normal flow depth in the channel would be 4.16 feet at the 100-year flow event (57.9 cfs) when the Hoquiam River is at mean sea level (3.96 feet). The channel velocity under this condition would be approximately 1.4 ft/s. The limits of the excavation and project layout are shown in Figure 5-1. Additional details of the proposed channel excavation are shown in Figure 5-2.

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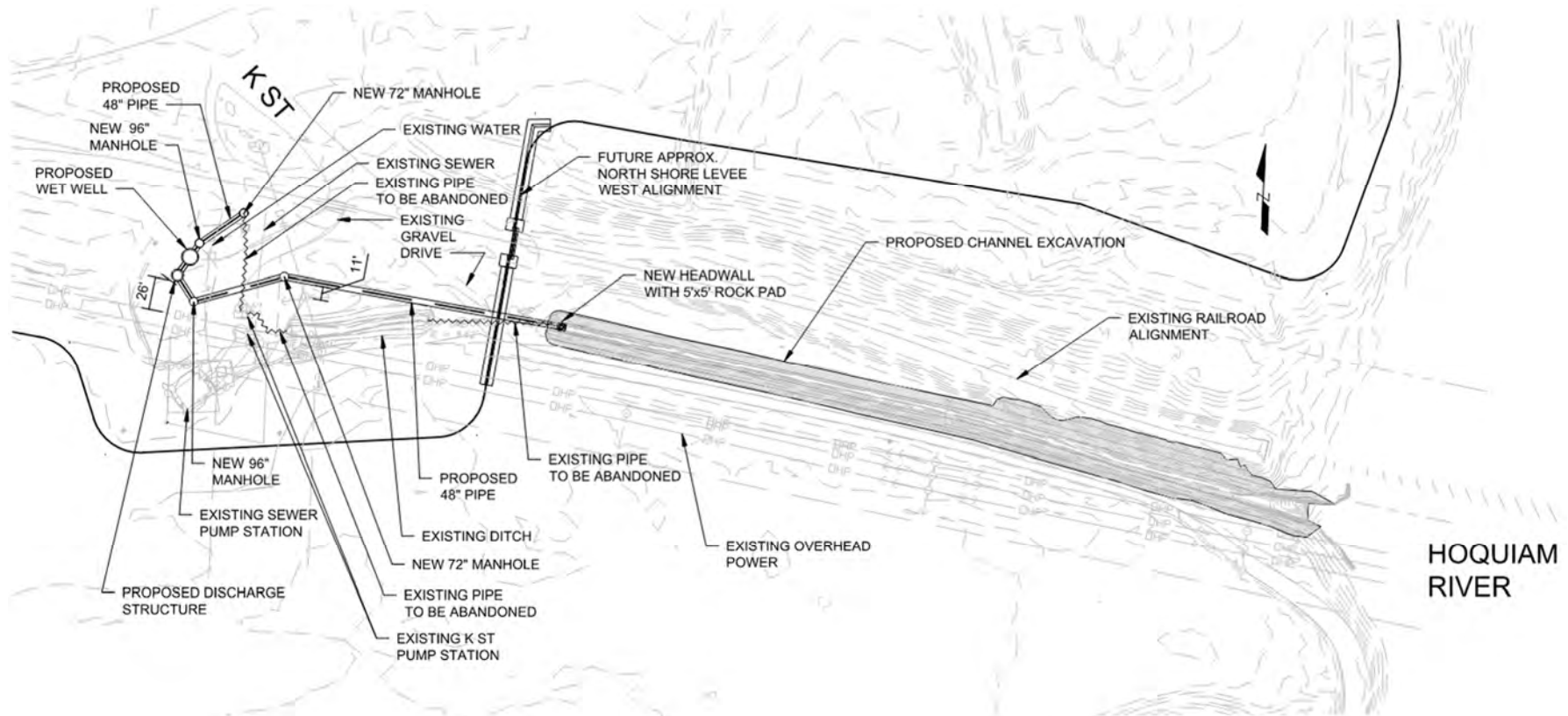


Figure 5-1. Project layout

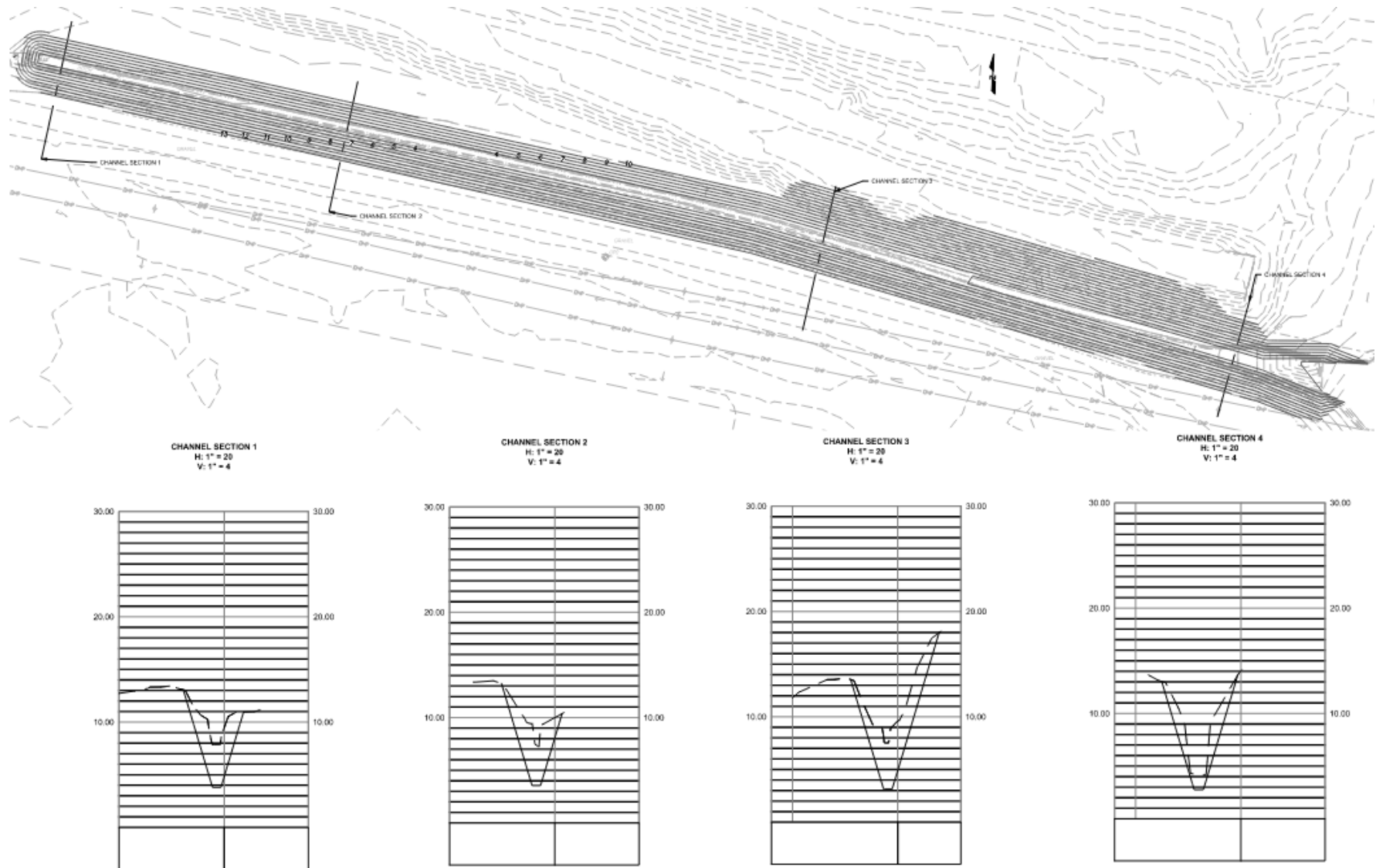


Figure 5-2. Proposed channel excavation

## 6 Pump Station Design

This section presents the design of the K Street Stormwater Pump Station.

### 6.1 Hydraulics

This section describes the hydraulic calculations performed for sizing the pumps.

#### 6.1.1 Hoquiam River Levels

The pump station discharges to the Hoquiam River at approximately 0.2 mile from the river's connection to Grays Harbor, causing the river to be tidally influenced. Water surface elevations for the discharge are assumed to match those of Grays Harbor, which are summarized in Table 6-1.

**Table 6-1. Water surface elevations for Grays Harbor**

Datum	Elevation (ft) <sup>a</sup>
Highest observed tide (max tide) 12/3/1982 2:06 p.m.	12.22
Highest astronomical tide (HAT) 12/22/1999 8:12 p.m.	10.75
Mean higher-high water (MHHW)	8.47
Mean high water (MHW)	7.77
Mean sea level (MSL)	3.96
Mean tide level (MTL)	3.8
Mean diurnal tide level (MDTL)	3.41
Mean low water (MLW)	-0.17
Mean lower-low water (MLLW)	-1.64
Lowest astronomical tide (LAT) 6/14/1995 3:48 p.m.	-4.38
Lowest observed tide (min tide) 7/22/1982 8:12 a.m.	-4.99

Source: NOAA Tides and Currents for station 9441187, Aberdeen, Washington.

<sup>a</sup> Elevations to NAVD88 datum for the present (1983–2001) epoch.

#### 6.1.2 Design Flow Rate and Pump Selection

The City plans to standardize pumps at its stormwater pump stations as much as possible with the Ramer Street Stormwater Pump Station's pumps serving as the standard. This includes having pumps of the same model and impeller size along with pump column lengths of the same size if possible. This will allow the City to use a spare pump at multiple pump stations. The pumps were selected to not exceed 5,000 gpm per pump to not require a physical model per Hydraulic Institute Standards (HI).

To align with this goal, the basis of design pump for the K Street Pump Station was initially matched to the Ramer Street, Queen Ave, and 10th Street stormwater pumps as the following:

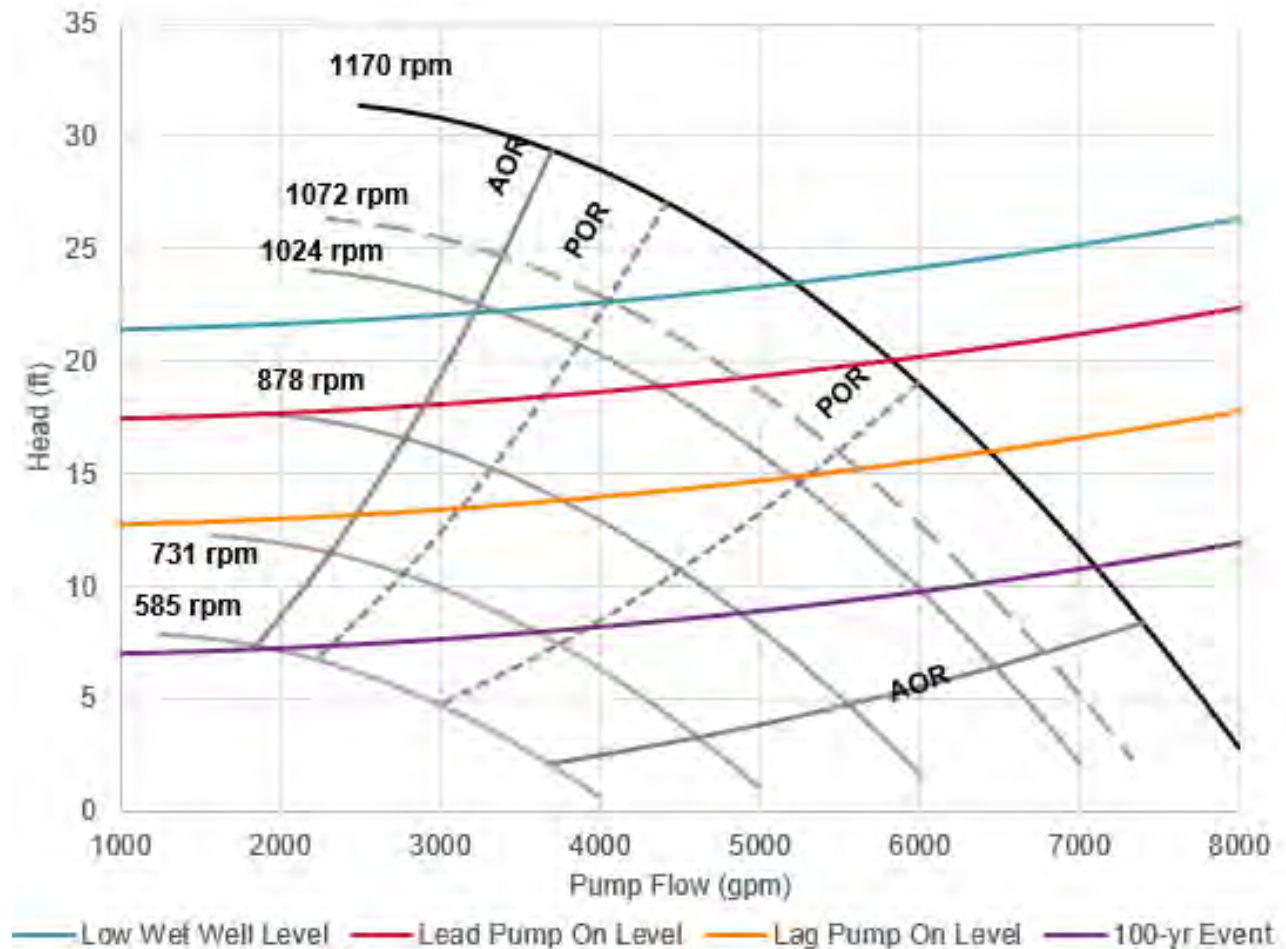
- **Manufacturer:** Fairbanks Nijhuis

- **Model:** 14-inch 8312AE
- **Impeller:** A-311-T
- **Stages:** one
- **Speed:** 1,170 revolutions per minute (rpm)
- **Motor:** US Electric 50 hp, model 17701795-100, 3-phase 460 volts, inverter duty
- **Driver:** VFD
- **Design point:** 5,000 gpm at 22.5 feet

The City plans on procuring the pumps and providing to the Contractor for installation similar to the previous projects.

This would correspond to a pumping capacity of approximately 10,000 gpm with both pumps operating, and it was determined that this pumping capacity is sufficient for the design flows from the K Street basin. A pumping capacity of 10,000 gpm is approximately 67 percent of the 2-year, 24-hour storm event, with larger events up to the 100-year storm event (57.9 cfs) being conveyed via a combination of pumping and gravity flows. Additionally, the 10,000 gpm pumping capacity is an increase over the existing 7,000 gpm pumping capacity, and the City has not observed any issues with this existing capacity.

System curves were developed for the K Street Pump Station and compared with the factory test curves for the Ramer Street Pump Station pumps and are shown on Figure 6-1.



**Figure 6-1. Pump and system curves**

Key elevations within the wet well for features and control points are provided in Table 6-2. The bottom of the receiving channel that flows to the Hoquiam River is at an elevation of 3.82 feet at the discharge to the channel, and the invert elevation of the influent pipe into the wet well is estimated to be -3.15 feet. Because the invert elevation at the discharge to the existing channel is higher than the influent invert elevation to the wet well, the system cannot normally flow by gravity through the pump station. Therefore, typically, flows will have to be pumped out to the receiving channel to flow to the Hoquiam River.

Under normal operation, the water level in the wet well will rise to an elevation of 0.85 feet, or the crown elevation of the influent pipe, at which point the lead pump will turn on at minimum speed. Per Figure 6-1, the minimum speed to remain within the preferred operating region (POR) for the range of wet well levels is approximately 1,072 rpm and corresponds to a flow of roughly 4,880 gpm (10.87 cfs) at the lead pump on elevation of 0.85 feet. If the influent flow is less than this flow, the lead pump will draw the wet well water surface level down until reaching an elevation of -3.15 feet, or the invert elevation of the influent pipe, at which point the pump will shut off.

If the influent flow increases, the lead pump will increase its speed to maintain the lead pump on level. If the water surface elevation continues to rise, the lag pump will turn on

at an elevation of 5.5 feet and both the lead and lag pumps will operate at a minimum speed corresponding to a flow of approximately 5,620 gpm per pump or 11,240 gpm total (25.0 cfs).

The maximum pump speed is 1,170 rpm and the pumps will deliver a peak flow of approximately 6,440 gpm per pump or 12,880 gpm total (28.7 cfs) at the lag pump on level. This is slightly below the 2-year, 24-hour peak flow of 33.26 cfs (see Table 4-1).

If influent flows continue to increase, water levels will continue to rise and the TDH for the pumps will decrease, allowing them to operate further to the right on their pump curve. For the 100-year, 24-hour peak flow of 57.9 cfs during the mean higher high tide, the wet well water surface elevation will be at 11.27 feet. This corresponds to a pumped flow of 7,100 gpm, or 14,200 gpm (31.63 cfs) with both pumps running. This is just under the 2-year, 24-hour peak flow of 33.26 cfs. The remaining flow greater than the pumped flow would gravity flow through the overflow pipe and check valve into the discharge structure.

Pump operation will be controlled via an ultrasonic level sensor with float backups.

These elevations and the preliminary pump station cross section are shown in Figure 6-2.

**Table 6-2. Wet well elevations**

Elevation (ft)	Description
16.00	Wet well rim NSLW levee rim
11.27	100-year peak flow water surface elevation during mean higher high tide
13.50	Bottom of wet well lid elevation
8.50	Overflow pipe crown elevation
4.50	Overflow pipe invert elevation
6.00	Maintenance access platform
5.50	Lag pump on and both pumps adjust to 1,072 rpm (min speed; adjust speed to maintain level)
0.85	Inlet pipe crown elevation
0.85	Lead pump on at 1,072 rpm (min speed; adjust speed to maintain level)
-1.15	Lead pump off if two pumps operating (lag pump changes to lead pump)
-3.15	Inlet pipe invert elevation
-3.15	Pump off Minimum pump submergence
-9.00	Wet well invert elevation



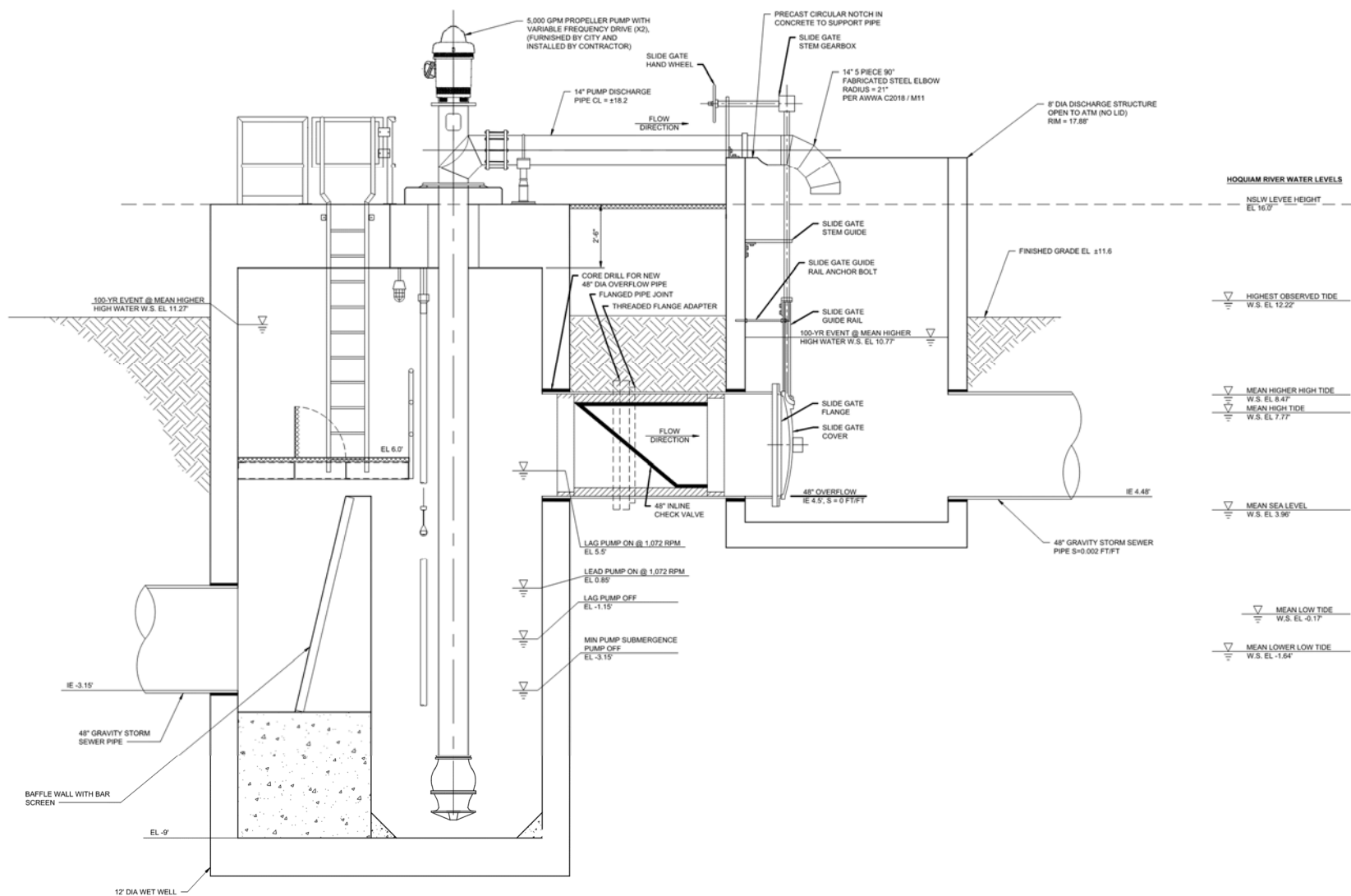


Figure 6-2. Preliminary pump station cross section



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## 6.2 Discharge Structure

The discharge structure will have an internal diameter of 8 feet, which is sized to accommodate the two 14-inch-diameter discharge pipes downstream from the pumps. The rim elevation will be set to allow it to support pump discharge pipes and exceeds the top elevation of the future North Shore Levee of 16 feet.

The invert elevation of the discharge structure was selected as 1 foot below the invert elevation of the gravity line out of the structure. The invert elevation of the 48-inch-diameter gravity line leaving the discharge structure was set by working up at a 0.2 percent slope from the invert elevation at the discharge to the proposed ditch (3.82 feet). This corresponds to a pipe invert elevation of 4.48 feet and an invert elevation of the structure of 3.48 feet.

An access platform will be added spanning from the discharge structure to the wet well structure with an elevation equal to the rim of the wet well structure. Access to the platform is available from the wet well structure or via steps. The platform will allow visual inspection into the inside of the discharge structure. Ladder access will also be placed on the inside of the structure for maintenance access.

The discharge structure will have an open top (no lid). The inline check valve can be removed through the open top of the discharge structure.

The discharge structure itself will use precast construction. The discharge structure will be lowered onto a pile cap slab that will be cast-in-place over a grid of piles to prevent settlement.

A cross section of the proposed preliminary discharge structure is illustrated on Figure 6-2.

## 6.3 Wet Well Structure

The wet well structure will have an internal diameter of 12 feet, similar to the Ramer Street and 10th Street Pump Stations. The rim elevation of the wet well will be at an elevation of 16 feet to match the height of the NSLW.

The top of the wet well will have a three-quarter lid (one quarter of the lid is open) with a thickness of 2.5 feet. The thickness of the lid was selected to have the lid weight be approximately five times the weight of the pumps to mitigate vibration potential.

The invert elevation of the wet well was selected so that the same pumps used at the Ramer Street Pump Station would fit in the wet well without having to remove lengths of pump column/shaft and to allow for minimum pump submergence and clearance between the bottom of the pump and the bottom of the wet well.

Access to the wet well will be via steps to an access platform that wraps around a portion of the exterior of the structure. A ladder will then provide access into the interior of the structure with a maintenance access platform fabricated from fiber-reinforced plastic (FRP) grating placed inside of the structure. Located below the access platform will be a baffle wall with bar screening to prevent large solids from passing into the pumps. An opening will be placed on the platform grating to allow access to maintain the screen.

During high flows, the baffle wall will overtop and the maintenance platform will be submerged. This is expected for storm events exceeding the pumping capacity at the

maximum speed at the lag pump on level with both pumps operating, which is 12,880 gpm (28.7 cfs) and is just under the 2-year, 24-hour storm event (33.26 cfs). The top of the baffle structure will also have vertical posts to snag oil booms placed upstream of the baffle wall so that they do not overtop the baffle wall during high flows.

Similar to the discharge structure, the wet well will use precast construction. The wet well will be lowered onto a pile cap slab that will be cast-in-place over a grid of piles to prevent settlement.

A cross section of the wet well is shown on Figure 6-2.

## 6.4 Overflow Pipe

An overflow pipe with a 48-inch nominal diameter is placed between the wet well and discharge structure that allows flows in excess of the pumping capacity to be passed to the river without surcharging the pump station.

The invert elevation of the overflow pipe is at 4.5 feet which is below the 6 foot elevation of the access platform within the wet well allowing overflows to begin prior to the platform becoming submerged. The overflow pipe also contains a check valve to prevent backflows from the river. The basis of design check valve is Tideflex Inline Check Valve similar to what was installed at the Ramer Street Pump Station.

As an additional backup to the check valve, a slide gate is placed on the end of the overflow pipe to allow for the closing of the overflow pipe in the event that the check valve failed.

## 6.5 Building Design

The VFDs, motor control centers (MCCs), programmable logic controllers (PLCs), and other electrical and controls equipment will be located in the existing sanitary sewer pump station building. The locations of the MCCs will be coordinated with the design of the upgrades to the wastewater pumps under a separate contract.

## 6.6 Electrical Design

The City will perform the necessary electrical work and Coast Controls will provide the instrumentation design.

Electrical and instrumentation and controls (I&C) needs for the project will be similar to the Ramer Street and 10th Street Pump Station projects as the same pumps, motors, and control scheme will be used.

An on-site generator (sized by the City) will be included as part of the project for running the pump station. This will be located next to the proposed pump station as shown in Figure 6-5.

## 6.7 Site Security

A 10-foot-high chain-link fence is recommended to be constructed around the pump station site to limit the potential for vandalism. The fence will be black powder coated with black privacy slats. Site lighting will be evaluated as part of the design. Additionally, site security cameras will be installed.

## 6.8 Site Layout

The pump station wet well and discharge structure will be located in a grassed area located next to the existing gravel drive (see Figure 6-3). This location was selected to minimize the pipe length required for diverting flows from the existing pump station to the existing channel while keeping the existing pump station in service during construction, maintaining access to the existing gravel drive, and maintaining a minimum 19-foot horizontal separation from the above Public Utility District (PUD) power lines. The existing K Street Stormwater Pump Station will be decommissioned after the proposed K Street Stormwater Pump Station is operational. Existing storm drain piping downstream of the connection point with the new pump station will be abandoned. The selected location is in railroad right of way.



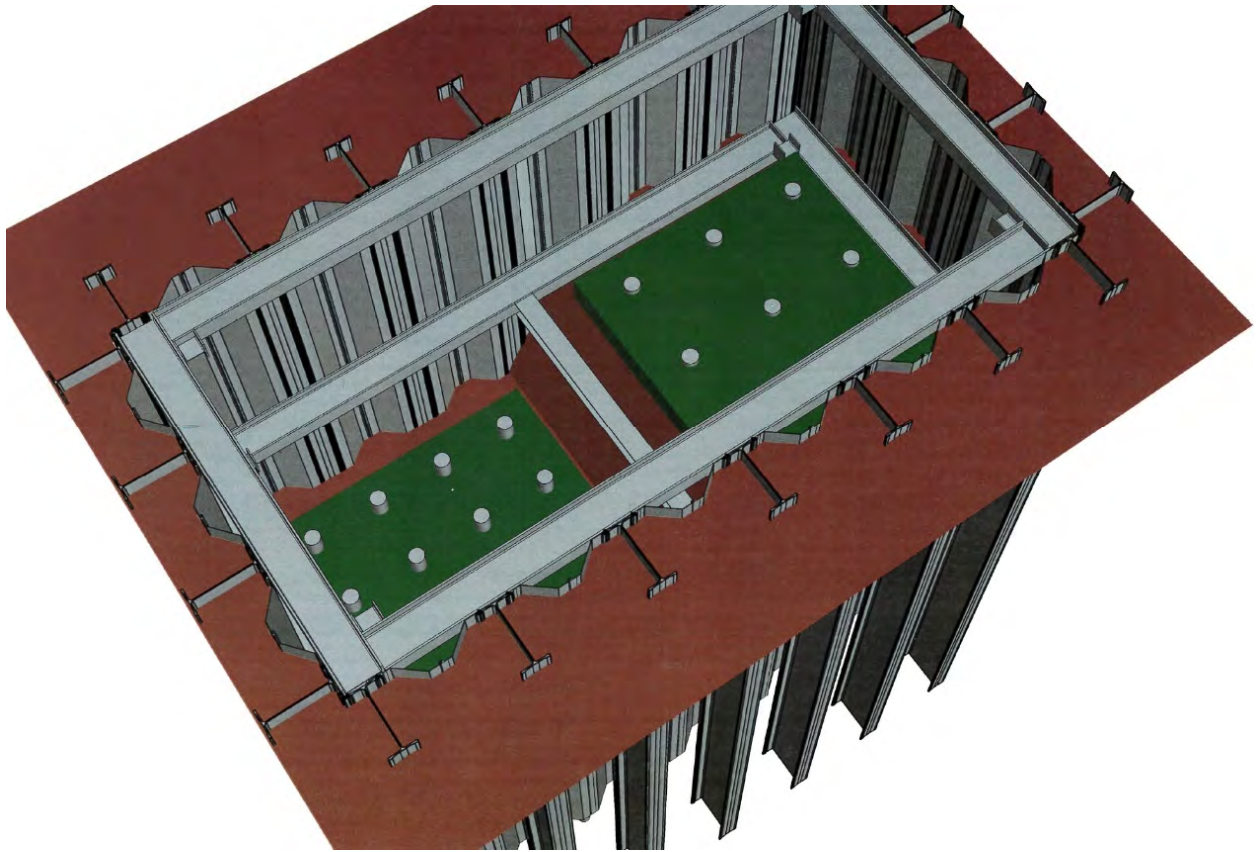
**Figure 6-3. Grass area for siting pump station**

The entry drive adjacent to the grassed area will be impacted by construction. To build the pump station wet well and discharge structure, a sheet pile shoring system would likely be used by the contractor that has a footprint larger than the pump station structures. An example of this is illustrated in Figure 6-4. The shoring system used for construction of the pump station will be similar to the Ramer Street and 10th Street Pump Station design. Groundwater is anticipated during construction.

Any land cover or gravel drive within the footprint of the shoring system will need to be restored after the completion of the project.

Figure 6-5 shows the current site layout. Included in this layout are the proposed locations of a water meter, reduced pressure backflow assembly (RPBA), and yard hydrant to serve the site.





**Figure 6-4. Example shoring system for pump station construction**

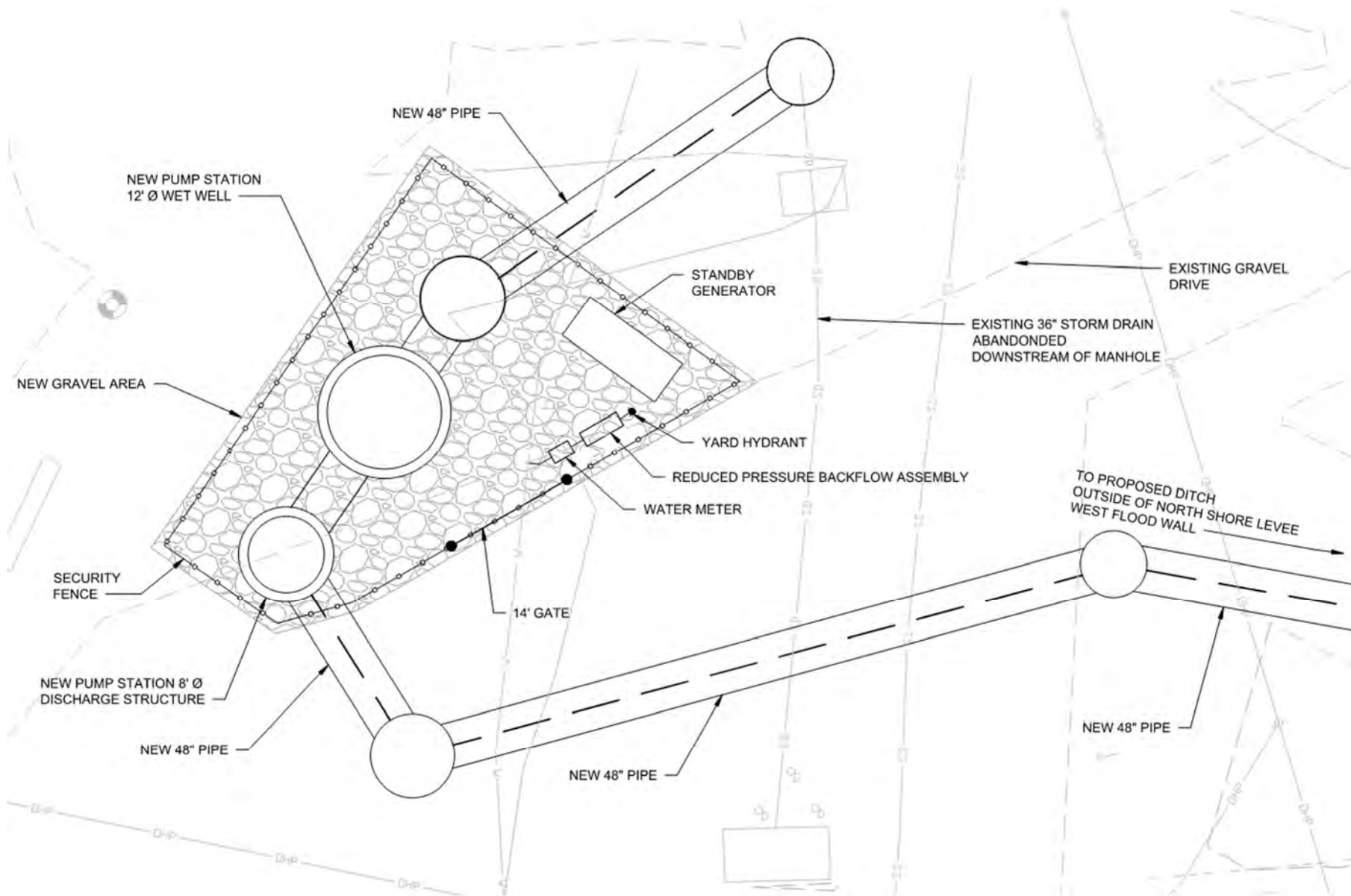


Figure 6-5. Preliminary site layout



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### 6.8.1 Capacity Expansion Option

The flow capacity of the proposed pump station is approximately 12,880 gpm (28.7 cfs) at maximum pump speed with both pumps on at the lag pump on level. This is just under the 2-year, 24-hour flow (33.26 cfs). Additionally, the proposed pump station would have the capacity to convey the 100-year flow of 57.9 cfs from the existing system via the overflow pipe. However, there is space adjacent to the proposed pump station for a future wet well and discharge structure if additional pumping capacity is needed or if improvements to the upstream conveyance system increase flows to the pump station as modeled by Method 4 in Table 4-1. This corresponds to a 100-year flow of 116 cfs with an upsized conveyance system without surcharging. A layout showing where a future pump station would be located if necessary in the future is shown in Figure 6-6.

If it were necessary to pump the 116 cfs 100-year flow, the 48-inch-diameter outfall to the channel outside the levee wall would become pressurized and would have a velocity of about 9 feet per second. The hydraulic grade line in the discharge structure would be approximately 15.96 feet in this condition; this is below the centerline elevation of the pump discharge (16.42 feet), so if needed, another pump of the same type could be installed adjacent to the proposed pump station and pump the higher flows through the pressurized 48-inch-diameter outfall line. The proposed channel to which the 48-inch-diameter outfall discharges has sufficient capacity to pass the 116 cfs flow with a flow depth of about 5.72 feet at the mean higher high tide level in the river.

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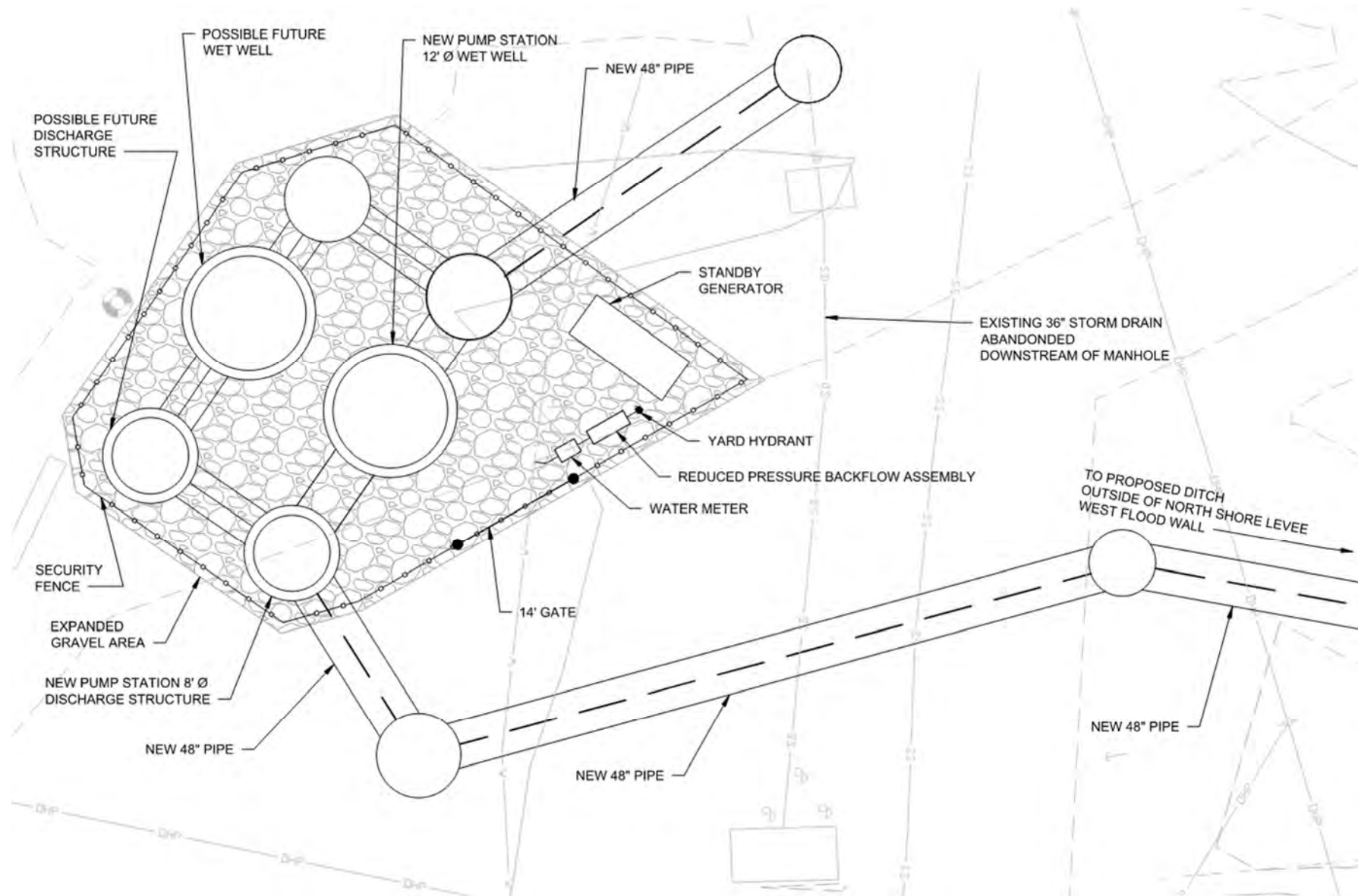


Figure 6-6. Site layout with future adjacent pump station

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## 7 Geotechnical Investigation

A geotechnical investigation was completed by Sage Geotechnical and summarized in *Summary of Geotechnical Engineering Services: K Street Stormwater Pump Station* (August 21, 2023).

Key conclusions and recommendations included the following:

- **Dewatering and shoring:** Excavations should be shored and dewatered as they are likely to encounter saturated, low-permeability silt and silty sand. Feasible shoring methods include sheet pile walls, slide rail systems, and caissons. Dewatering construction excavations can be done by sumps and pumps rather than well points or deep wells.
- **Foundation support:** Soft alluvium, susceptible to consolidation settlement, is present at the proposed foundation elevations. Structures should be supported by timber piles; lightweight backfill should be placed above deep utility pipelines, and use of flexible utility connections should be considered.
- **Buoyancy:** Design of underground structures (including manholes) should account for potential uplift. The design should include a groundwater table at ground surface. Timber pile foundations can be used to provide uplift resistance if a structural foundation connection is used.
- **Pipe foundation support:** Quarry spalls may be installed at the bottom of excavations to provide a firm working surface. The quarry spalls should be pushed into the native subgrade with the bucket of an excavator. Material placed between the quarry spalls and gravel backfill for pipe zone bedding should meet the requirements for Class A foundation material. A geotextile for separation may be placed beneath the quarry spalls to limit quantities.
- **Trench backfill/lightweight fill:** To limit differential settlement between utility pipelines and structures, utility lines with more than 5 feet of cover should be partially backfilled with lightweight fill material, such as “hog fuel,” cellular concrete, or expanded shale aggregate. Granular material should be placed above the hog fuel to counteract buoyant forces. Pipes with less than 5 feet of cover should be backfilled with select borrow or bank run gravel. Site soils are not suitable for reuse as fill.

Additional information regarding the geotechnical investigation can be found in the geotechnical technical memorandum.

## 8 Opinion of Probable Construction Cost

An opinion of probable construction cost (OPCC) was completed based on the preliminary design outlined in this PDR. The OPCC represents a Class 4 Engineer’s Opinion of Probable Construction Cost per Association for the Advancement of Cost Engineering (AACE) 18R-97, which has an accuracy range of -30 percent to +50 percent. Sources of costs include the Ramer Street Pump Station project, Emerson Pump Station project, 10th Street Pump Station project, and other projects bid in the

area, as well as RSMeans and Washington State Department of Transportation Unit Bid Analysis. Past estimates were escalated to today's dollars using the *Engineering News-Record* (ENR) Construction Cost Index (CCI).

The ENR CCI for Seattle from January 2022 to October 2023 had a monthly average increase of 0.54 percent. The national average ENR CCI from January 2022 to October 2023 had a monthly average increase of 0.35 percent. It is assumed that costs will continue to inflate at a monthly rate of 0.5 percent, which is equivalent to a 6 percent annual inflation rate.

The preliminary design OPCC is provided in Table 8-1. The total project cost is estimated to be between \$2.3 million and \$4.8 million.

**Table 8-1. Preliminary design opinion of probable construction cost**

Item	Unit	Qty	Unit price	Amount
Minor changes	Allowance	1	\$40,000	\$40,000
Mobilization/demobilization	LS	1	\$105,000	\$105,000
Construction staking	LS	1	\$15,000	\$15,000
Erosion control and water pollution prevention	LS	1	\$10,000	\$10,000
Project temporary traffic control	LS	1	\$20,000	\$20,000
Removing gravel drive	SY	130	\$30	\$3,892
Pre-construction survey	LS	1	\$15,000	\$15,000
Plug existing pipe	EA	2	\$1,500	\$3,000
Clearing and grubbing	AC	0.10	\$202,907	\$20,962
Trench excavation safety system	LS	1	\$140,000	\$140,000
Trench dewatering	LF	383	\$36	\$13,600
Bank run gravel for trench backfill	CY	106	\$80	\$8,480
Lightweight material for trench backfill	CY	458	\$30	\$13,740
Shoring or extra excavation trench	SF	4,122	\$5	\$20,610
Unsuitable excavation including hauling	CY	53	\$25	\$1,325
Quarry spalls	Ton	98	\$75	\$7,350
Crushed surfacing top course	Ton	47	\$100	\$4,706
Schedule A storm sewer pipe 48" diameter	LF	383	\$457	\$175,031
Testing storm sewer pipe	LF	383	\$15	\$5,829
Concrete headwall, 48" diameter pipe	EA	1	\$7,102	\$7,102
Catch basin Type 2 72" diameter	EA	2	\$40,000	\$80,000
Catch basin Type 2 96" diameter	EA	2	\$50,000	\$100,000
Connection to drainage structure	EA	1	\$5,073	\$5,073
Structure excavation Class B including hauling	CY	1,145	\$41	\$46,466
Dewatering	LS	1	\$30,436	\$30,436
Chain-link fence	LF	145	\$51	\$7,355

Item	Unit	Qty	Unit price	Amount
Chain-link gate 14 ft wide	EA	1	\$3,044	\$3,044
Install standby generator	LS	1	\$25,363	\$25,363
Pump station	LS	1	\$1,032,000	\$1,032,000
Ditch excavation including hauling	CY	2,220	\$30	\$66,600
Subtotal				\$2,026,962
Miscellaneous unaccounted-for Items			25%	\$506,741
Subtotal				\$2,533,703
Sales tax			8.90%	\$225,500
Bid price today				\$2,759,202
<i>Months to midpoint of construction</i>				12
<i>Inflation per month</i>				0.50%
<b>Expected bid price</b>				<b>\$2,929,384</b>
Standby generator purchase by City				\$100,000
Project electrical by City				\$100,000
Engineering services during construction				\$90,000
<b>Total project cost</b>				<b>\$3,219,384</b>
Project cost range (rounded)	Low		-30%	\$2,300,000
	High		50%	\$4,800,000