CLACKAMAS COUNTY BOARD OF COUNTY COMMISSIONERS

Sitting as the Governing Body of Clackamas County Service District No. 1

Policy Session Worksheet

Presentation Date: 1/24/2017 **Approximate Start Time:** 11:00a **Approximate Length:** 30 min

Presentation Title: Hoodland Master Plan

Department: Water Environment Services

Presenters: Greg Geist, Matt House, & Mark Johnson (CH2M)

Other Invitees: Lynne Chicoine, Amanda Keller, Ed Nieto, Gari Johnson, Matt Glazewski

WHAT ACTION ARE YOU REQUESTING FROM THE BOARD?

None, this is an informational item.

EXECUTIVE SUMMARY:

Water Environment Services (WES) provides wastewater collection and treatment services in the Hoodland region of Eastern Clackamas County to a population of approximately 4000 with approximately 1,000 billable customers. As most of the infrastructure and facilities within this service area are over 30 years old, WES commissioned CH2M Engineers, Inc. and Century West Engineering to develop the Hoodland Master Plan for Wastewater Services. WES' goal was to evaluate the Hoodland wastewater conveyance system and Hoodland Sewage Treatment Plant capacity and condition. This was done to develop sustainable service recommendations that meet the service needs of WES customers and protects water quality and public health in the area.

The Hoodland service area conveyance and treatment system is located in an environment where major risks result from aging infrastructure and proximity to the Sandy River, which has a dynamically shifting river channel. Damage to the conveyance system has occurred during large flood events, (1996 and 2011) when the Sandy River channel shifted and widened catastrophically. The environmental, public health, and community impacts from potential loss of service are significant.

The Hoodland Master Plan considers an exhaustive list of options and alternatives, and WES staff have subsequently analyzed the findings to generate a strategy for the capital project and operational needs in this region.

FINANCIAL IMPLICATIONS:

Is this item in your current budget? ☒ YES ☐ NO

What is the cost? Staff time What is the funding source? FY16-17 CCSD1 Budget

STRATEGIC PLAN ALIGNMENT

This aligns with WES' strategic goals in that it will achieve sewer improvements to support the expected regional 20-year growth horizon.

This aligns with the County's strategic goals in that it helps build a strong infrastructure.

LEGAL/POLICY REQUIREMENTS:

None

PUBLIC/GOVERNMENTAL PARTICIPATION:

The Riverhealth Advisory Committee has been involved in discussion and advice on this process, and various outreach materials have been created for this need and effort. WES staff have engaged with the ratepayers in the Hoodland service area during the "Flood of Information" events and educated them about their sanitary sewer collection system.

OPTIONS:

None, this is an informational item.

RECOMMENDATION:

None, this is an informational item.

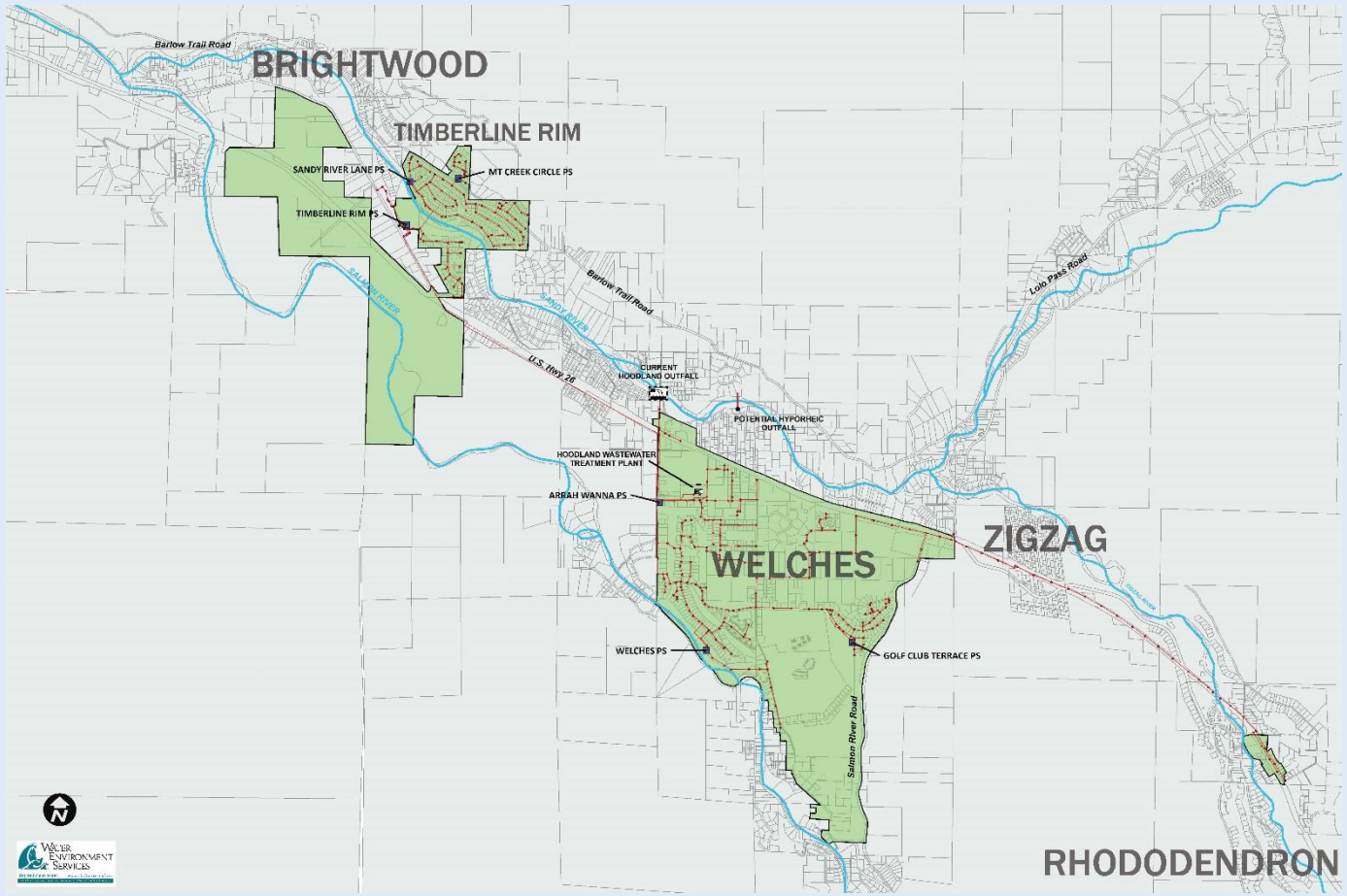
ATTACHMENTS:
- Slide Show Presentation
- Hoodland Master Plan Executive Summary

SUBMITTED BY:
Division Director/Head Approval _____LEC_____
Department Director/Head Approval ____GG_____
County Administrator Approval _____

For information on this issue or copies of attachments, please contact Matt House at 503-742-4601

Hoodland Master Plan

January 24, 2017

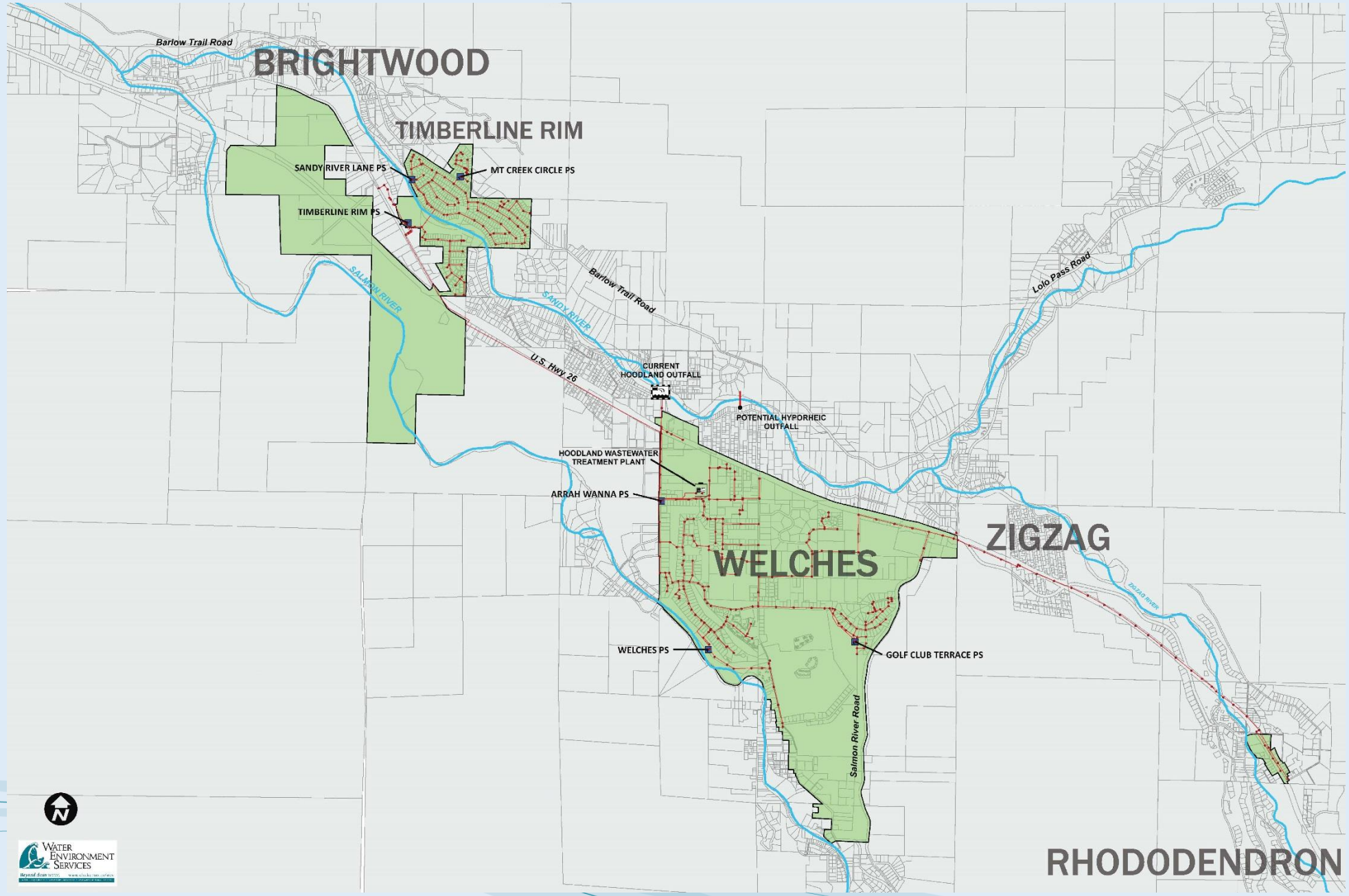


Overview

- Background
- Purpose and Need for Master Plan
- Activities Completed
- Risk-based Asset Management Approach
- Alternatives Evaluated
- Alternatives Selected
- Recommendations for Future Actions

Background

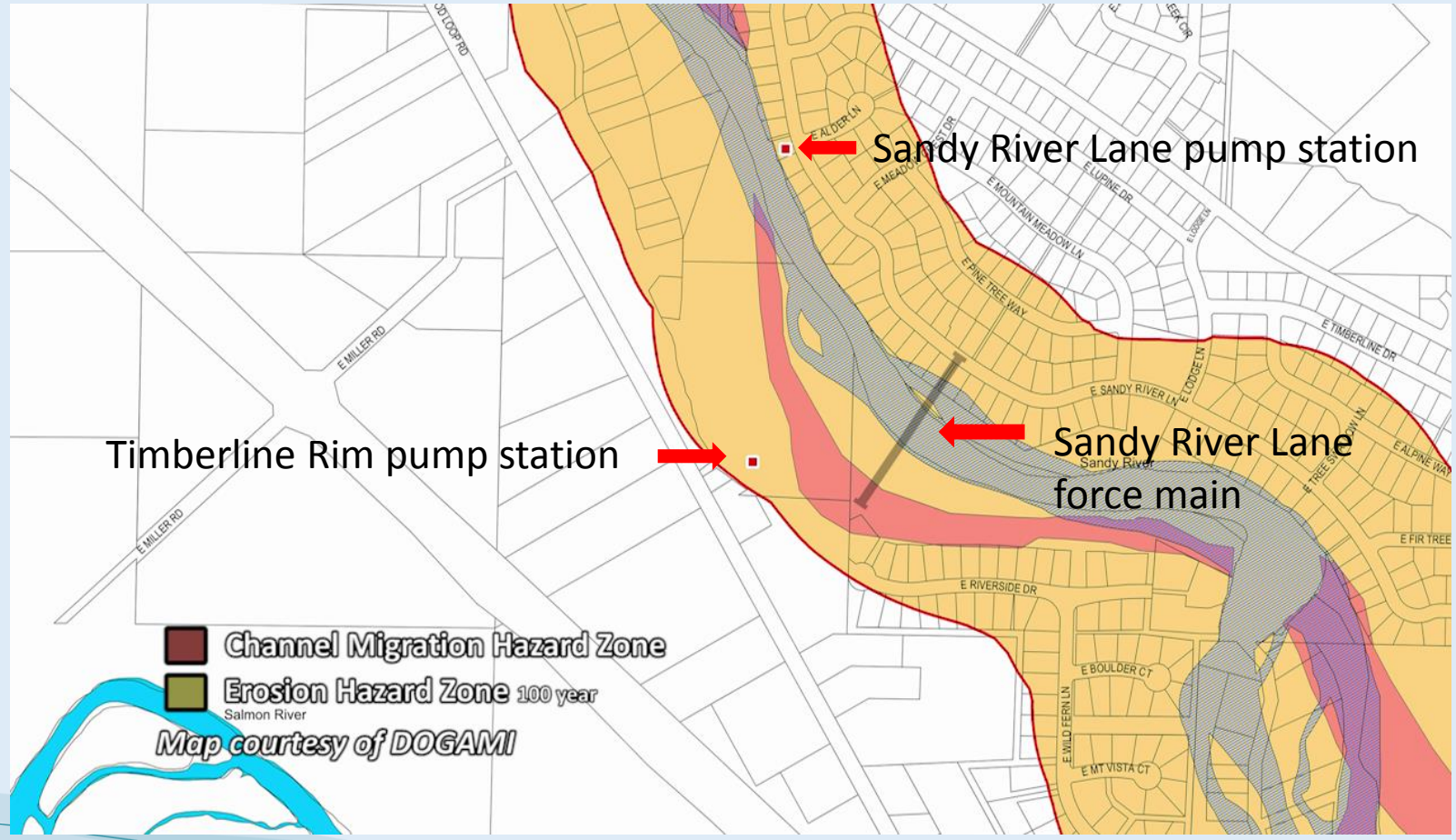
- Historically, the Hoodland service area (HSA) consisted of three private systems, each with their own treatment plant
- County assessment district formed in 1980 to consolidate and expand services
- Hoodland Sewage Treatment Plant (HSTP) and expanded conveyance system became operational in 1982
- HSA serves a population of approximately 4,000 of the 74,000 that comprise CCSD#1
- WES equalized HSA and CCSD#1 rates during the mid-2000s
- HSA includes 22 miles of pipe, six pump stations and a treatment plant with Sandy River outfall


BRIGHTWOOD
TIMBERLINE RIM
Barlow Trail Road
SANDY RIVER LANE PS
MT CREEK CIRCLE PS
TIMBERLINE RIM PS
SALMON RIVER
SANDY RIVER
Barlow Trail Road
U.S. Hwy 26
Lolo Pass Road
CURRENT HOODLAND OUTFALL
POTENTIAL HYPORHEIC OUTFALL
HOODLAND WASTEWATER TREATMENT PLANT
ARRAH WANNA PS
WELCHES
ZIGZAG
ZIGZAG RIVER
WELCHES PS
GOLF CLUB TERRACE PS
Salmon River Road
RHODODENDRON

Sandy River Lane pump station

Sandy River Lane pump station

Sandy River Lane force main



Sandy River Lane force main

Timberline Rim pump station

Timberline Rim pump station

Hoodland Sewage Treatment Plant

Hoodland Sewage Treatment Plant

Sandy River pipe outfall

Sandy River pipe outfall

Need for Master Plan

- Individual project needs had been identified, including potential outfall improvements, but never as part of a comprehensive Master Plan
- To inform new project investment decisions to meet new challenges from the perspective of the entire system
- Damage to conveyance system and treatment plant outfall occurred during Sandy River flood events in 1996 and 2011
- Timberline Rim pump station, Sandy River Lane pump station, and the interconnecting pipe beneath the river are vulnerable to channel migration and erosion
- Aging treatment plant: over 30 years old and potentially in need of upgrades
- Environmental, public health, and community impacts from potential loss of service are significant

Purpose of the Master Plan

- Evaluate the Hoodland area wastewater conveyance and treatment system
- Assess condition and capacity
- Provide customers with quality and reliable service
- Protect river quality and public health
- Prepare for natural disasters or catastrophic events
- Identify solutions to reduce risk

Activities completed

Outfall Alternatives Evaluation (separate effort 2012 - 2013)

Condition assessments of HSTP, collection system, and pump stations

Risk evaluation of infrastructure assets, including those influenced by Sandy River erosion and migration

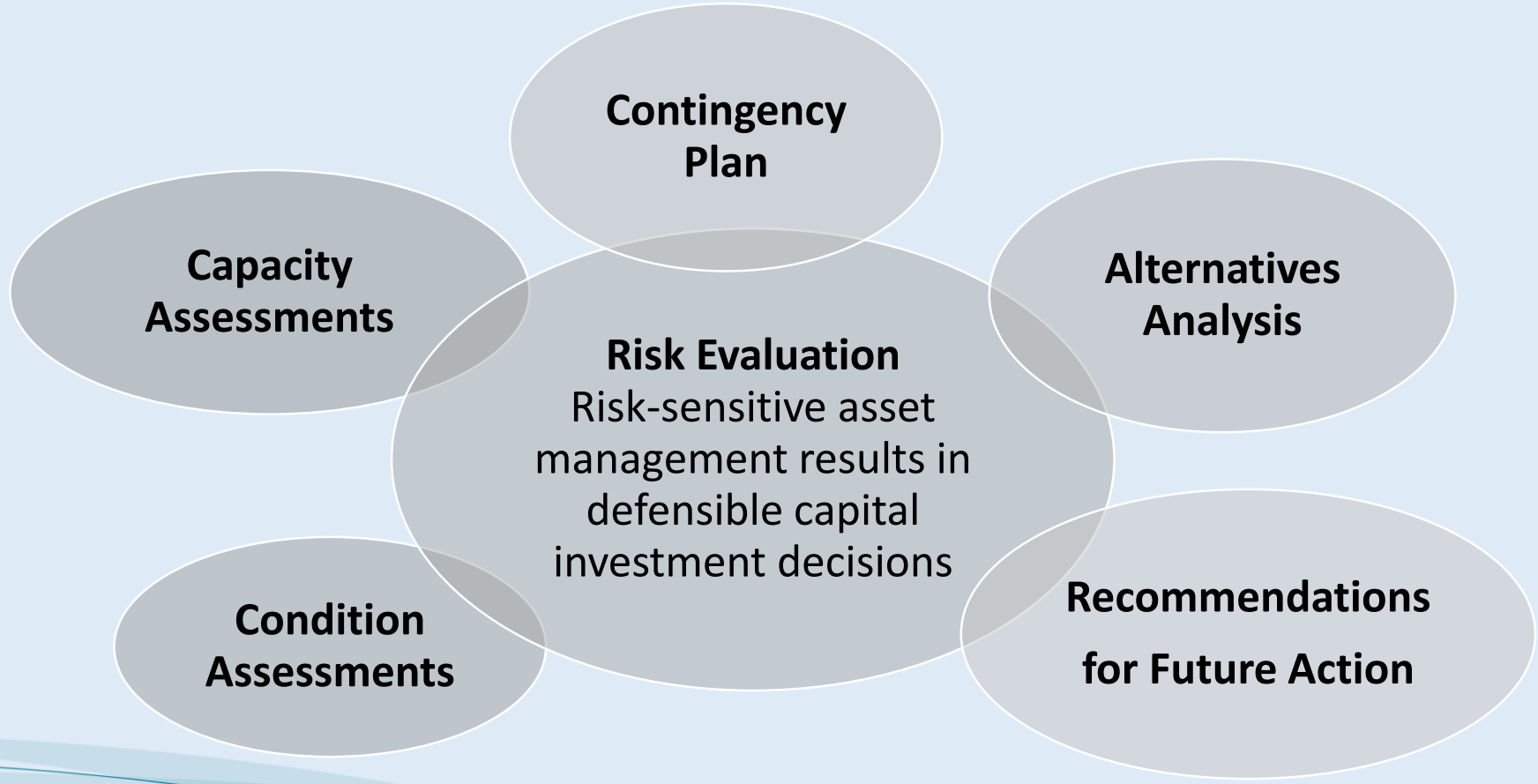
Alternatives analysis of more than 20 system-wide options for reducing risk for high-level assets (HSTP, pump stations, force mains, and gravity sewer basins)

Emergency contingency plan development

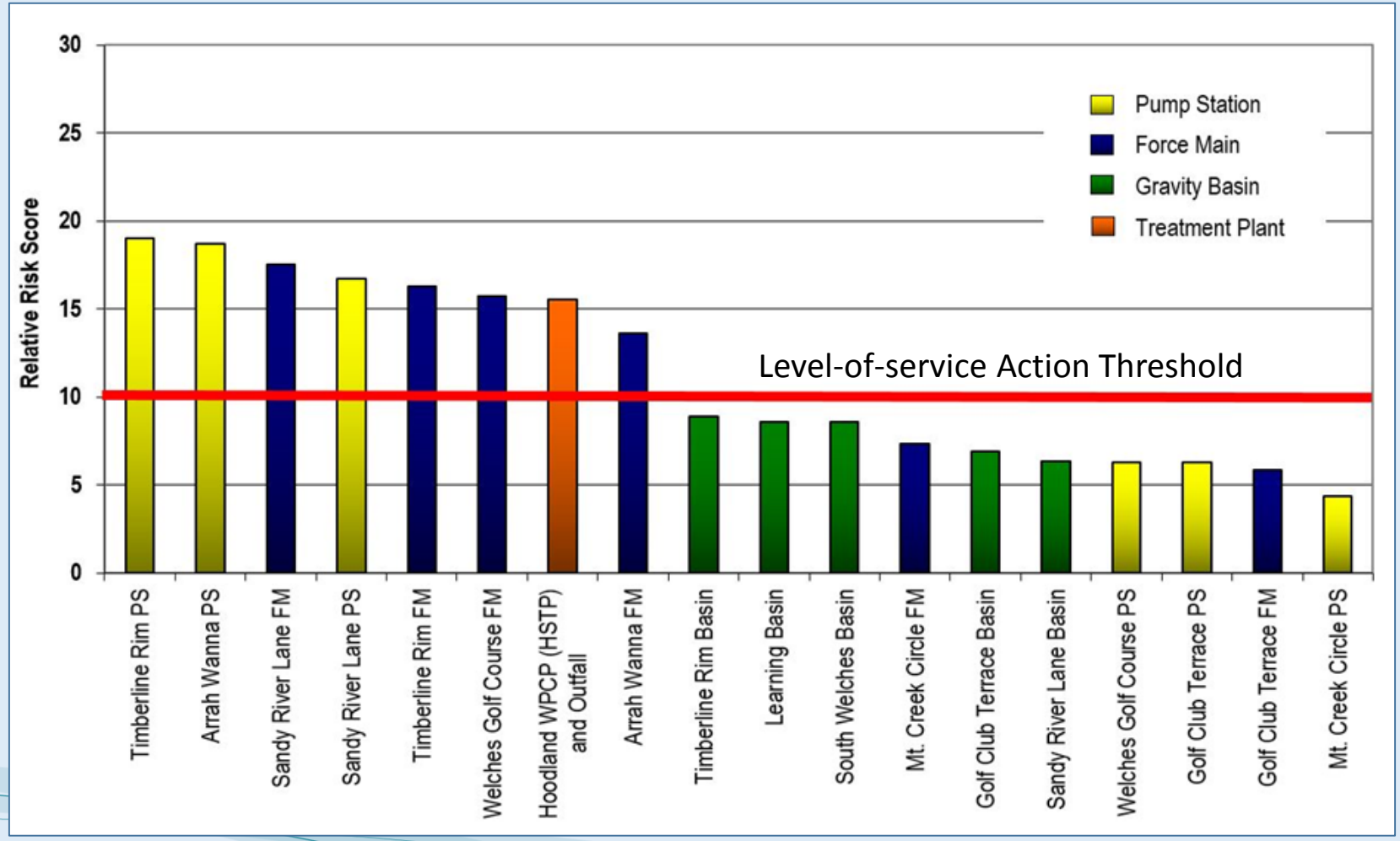
Capital and non-capital (operational reliability) risk reduction recommendations

Capacity assessments of treatment, collection, and pump stations

Risk-based asset management serves as a guide to the Master Planning process

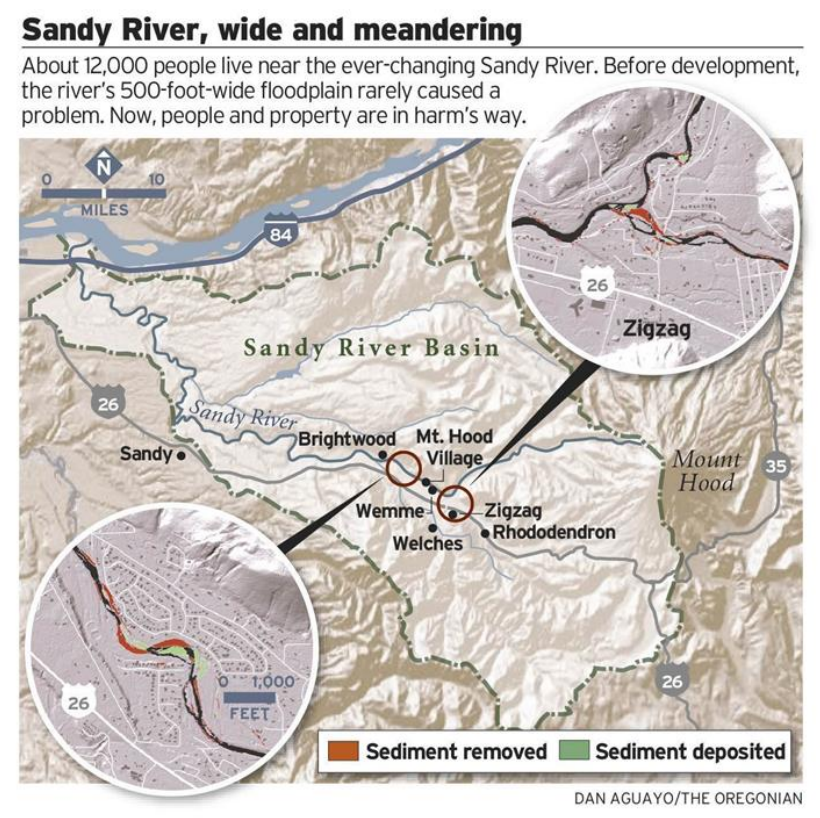


Risk-sensitive asset management results in defensible capital investment decisions



Risk Scores for High-level Assets

Sandy River migration creates greatest exposure to existing infrastructure



Welches flooding causes raw sewage overflow into Sandy River

By Yuxing Zheng | The Oregonian/OregonLive
Email the author
on January 19, 2011 at 4:33 PM, updated January 19, 2011 at 4:38 PM

Heavy rains and flooding caused raw sewage to spill into the Sandy River near Welches during a 14-hour shutdown of a pump station on Sunday, a Clackamas County official said.

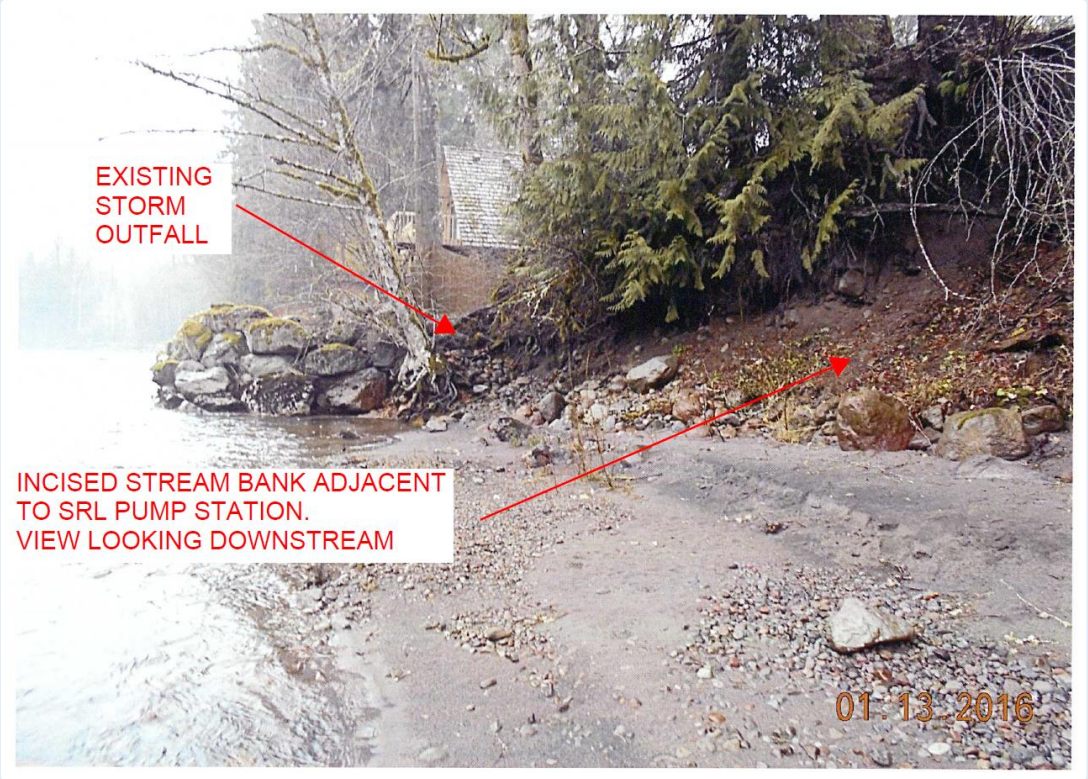
Clackamas County Service District No. 1 workers restored the Timberline Rim sanitary sewer pump station around 8 a.m. Monday, said Amy Kyle, a spokeswoman for the county's Water Environment Services. The pump station was not in a residential area.

Crews had to walk to the flooded pump station on foot and are still in the process of assessing the extent and size of the spill, Kyle said.

"It was difficult to get into the pump station because of the damage to the roadway, and we still can't get vehicles into the roadway," she said. "It just was difficult for them to get in there with the equipment they would normally take in."

Bank erosion in the vicinity of the Sandy River Lane (SRL) pump station – April 2013 to January 2016

April 2013



January 2016

Risk reduction addresses infrastructure exposure to Sandy River migration, treatment, and collection

- Sandy River migration creates greatest exposure to existing infrastructure
  - Sandy River Lane force main and pump station
  - Timberline Rim pump station
  - Treatment plant outfall
- Treatment plant
  - Approaching capacity limits but limited new growth
  - Obsolescence of some equipment drives recommended improvements
- Collection system
  - Capacity is generally adequate
  - Spot repairs and additional condition inspection recommended

Exhaustive alternatives development and rigorous evaluation process creates a set of solutions

More than 20 treatment and conveyance options were evaluated.

Most were eliminated from consideration based on implementation challenges and/or prohibitive cost.

Some solutions were unconventional but were investigated to ensure that all potential options were considered.

Ultimately the analysis focused only on viable alternatives.

Options carried forward to develop viable alternatives:

Arrah Wanna pump station firm capacity deficiency	**1.** Replace two pumps, add an additional pump, and add variable speed drives.
Sandy River Lane force main crossing of Sandy River	**2.** Remote treatment of areas served by Sandy River Lane pump station with infiltration disposal.
	3. Construct longer deeper force main.
Timberline Rim pump station and local collection system failure due to Sandy River migration and flooding	**4.** Construct new deep submersible pump station located in the bank south of the existing pump station, served by gravity.
	5. Construct new shallow submersible pump station located in the bank south of the existing pump station, convert collection system to pressure system with grinder pumps at each residence.
	6. New Timberline Rim pump station outside CMZ in vicinity of E. Riverside Drive; served by gravity.
	7. Eliminate Timberline Rim pump station and gravity flow to Sandy River Lane pump station and the new remote treatment plant north of the Sandy River.
	8. Eliminate Timberline Rim pump station and have grinder pumps pump to Arrah Wanna system.
Sandy River Lane pump station at risk of structural damage from flooding and CMZ risk and firm capacity deficiency	**9.** Relocate pump station with increased pumping capacity approximately 50 to 60 feet inland.
	10. Individual grinder pumps to remote treatment plant.
	11. Increase pumping capacity in current location to address lack of adequate firm capacity.
HSTP outfall stability and vulnerability	**12.** Change to hyporheic discharge option (use existing outfall as wet weather discharge option).
	13. Maintain existing discharge configuration. Provide in-stream protection at existing outfall location.
	14. Move direct discharge to Emigrant Trail or other permanent outfall configuration.

Alternative comparison

Alternatives were compared on the basis of:

- Capital costs
- Life-cycle costs
- Risk-reduction
- Overall performance*

*Overall performance criteria:

- Financial: effects on O&M costs
- Financial: source of capital funding
- Human resources
- Environmental
- Implementation
- Synergies
- System integrity
- Public/social
- Risk reduction relative to asset failure

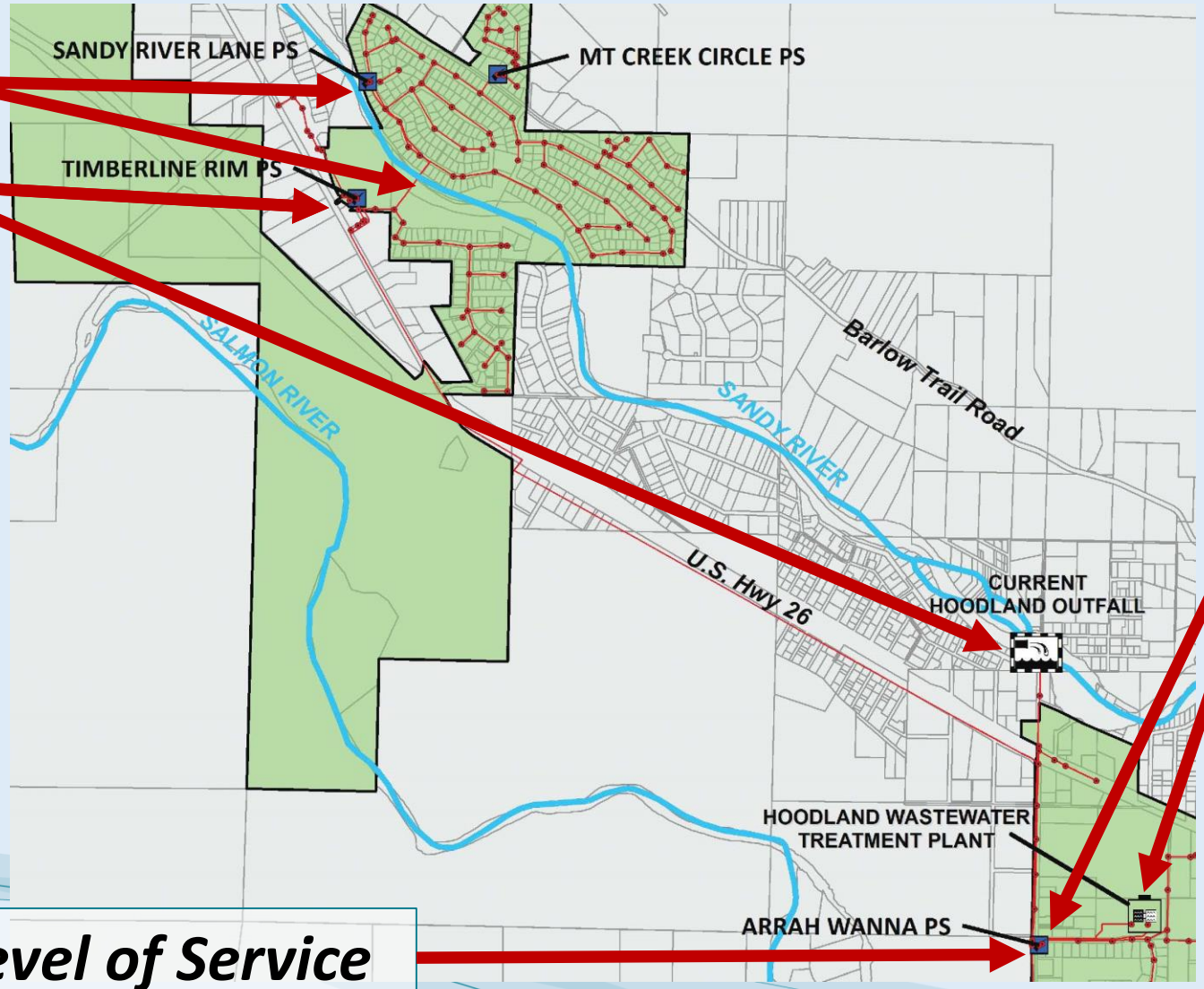
Recommendations for future actions are in four categories

Response to Sandy River Impacts

Non-capital

Operational Reliability

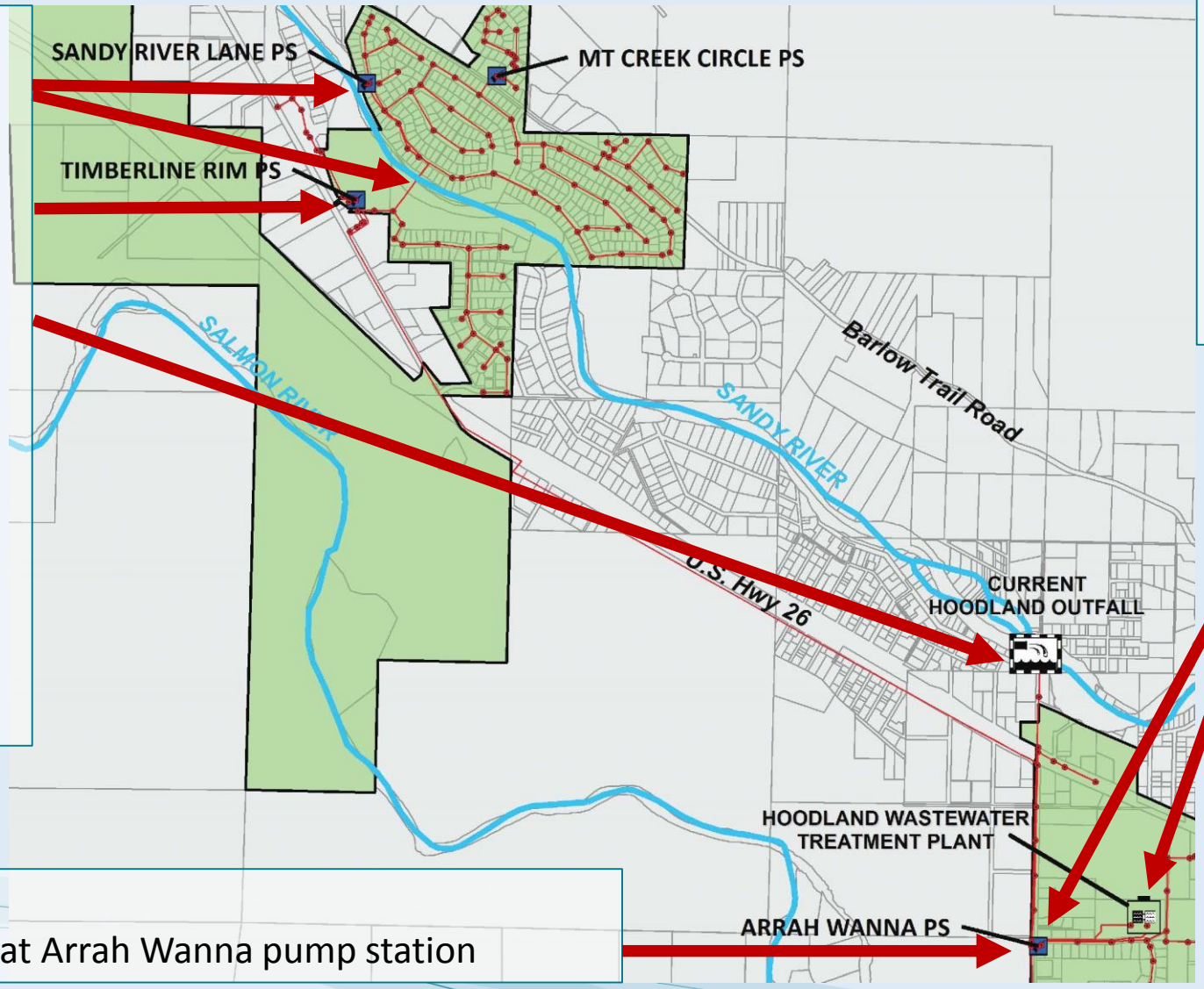
Level of Service



Recommended future actions

Response to Sandy River Impacts

- Restore service
- Implement engineering solutions in response to imminent or actual failure of
  - Sandy River and Timberline Rim pump stations
  - Sandy River force main
  - Hoodland STP outfall



Level-of-Service

Increase capacity at Arrah Wanna pump station

Non-capital

- Hoodland STP facility planning
- Pipeline condition assessment
- Collection system spot repairs
- Risk-based asset management
- Modified operating protocols
- Monitor collection system flow
- Monitor Sandy River erosion
- Reserve fund for response to Sandy River impacts

Operational Reliability

- Install new generator at Arrah Wanna pump station
- Replace motor control center and automatic transfer switch at Hoodland STP
- Replace rotating biological contactors at Hoodland STP

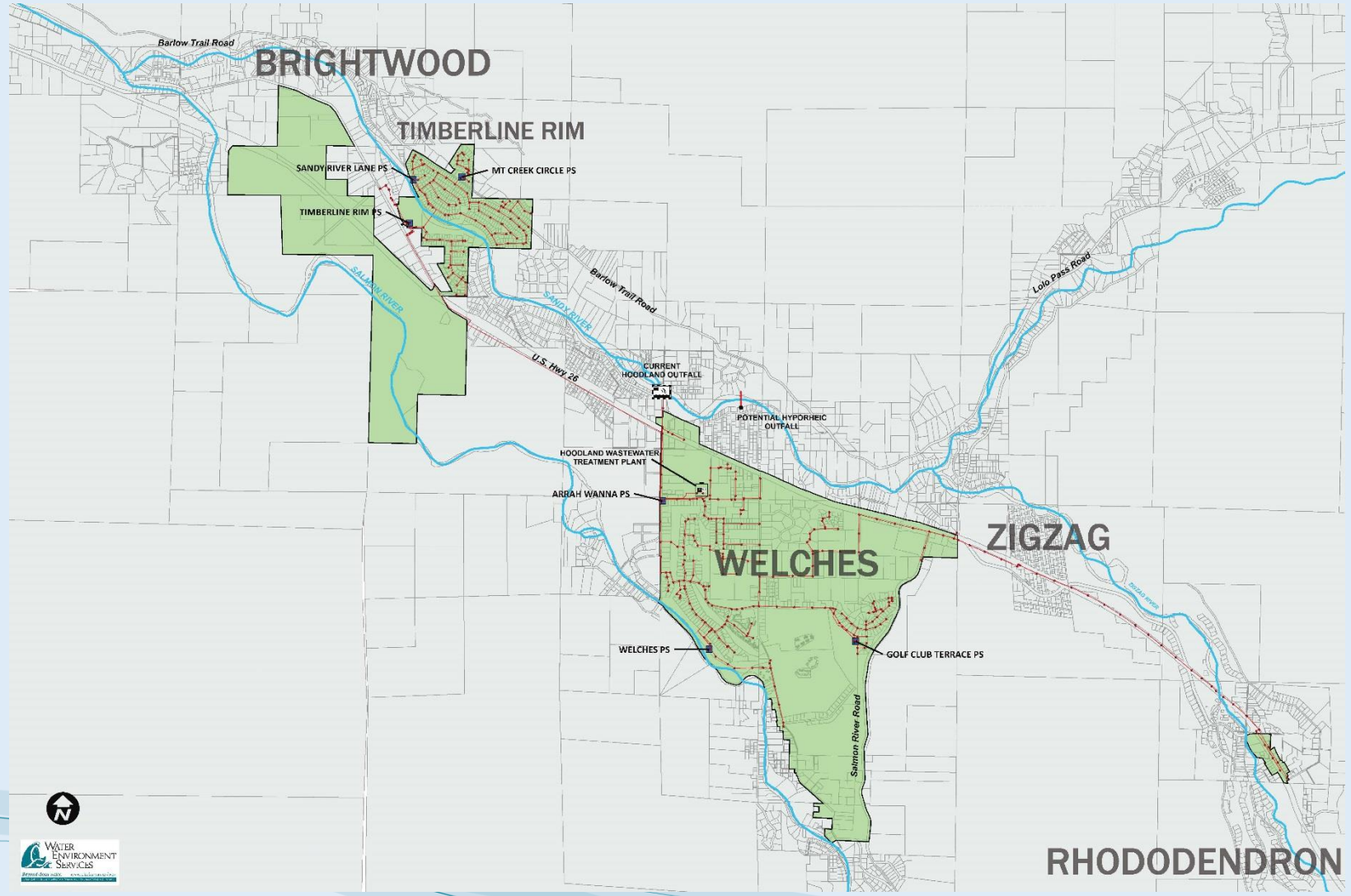
Recommended capital improvements

Summary of Recommended Improvements		
Improvement Category	**Recommended Improvement**	**Estimated Capital Cost 2016, $M**
Level of Service	Increase capacity at Arrah Wanna pump station.	$1.2
Operational Reliability	Electrical improvements at HSTP.	$1.2
	Update secondary treatment technology at HSTP.	$4.7
Response to Sandy Impacts	Relocate pump stations, replace force main and replace Sandy River outfall (one time).	$4.3
Total		$11.4
Create a HSA contingency fund in the capital budget		

Non-capital recommendations

- HSTP facility plan
- Monitor Sandy River erosion
- Condition assessments
- Collection system spot repairs

Questions/other items for discussion



Executive Summary

Water Environment Services (WES) provides wastewater management services to a population of approximately 4,000 with approximately 1,000 billable customers in the Hoodland service area of Clackamas County Service District No. 1 (District). WES, CH2M HILL Engineers, Inc. (CH2M), and Century West Engineering, have developed the Hoodland Master Plan for Wastewater Services (Master Plan). WES's goal was to evaluate the Hoodland wastewater conveyance system and Hoodland Sewage Treatment Plant (HSTP) to develop sustainable service alternatives that protect water quality and public health in the area and meet the service needs of its customers.

Purpose and Need

The Hoodland service area is shown on Figure 1. The Hoodland conveyance and treatment system is located in an environment where major risks result from aging infrastructure and proximity to a dynamically shifting river channel. The HSTP is over 30 years old and potentially in need of upgrades. Damage to the conveyance system and HSTP outfall has occurred during large flood events, specifically in 1996 and 2011, in which the Sandy River channel shifted and widened catastrophically. Timberline Rim pump station, Sandy River Lane pump station, and the interconnecting pipe beneath the river are vulnerable to channel migration and erosion. The environmental, public health, and community impacts from potential loss of service are significant.

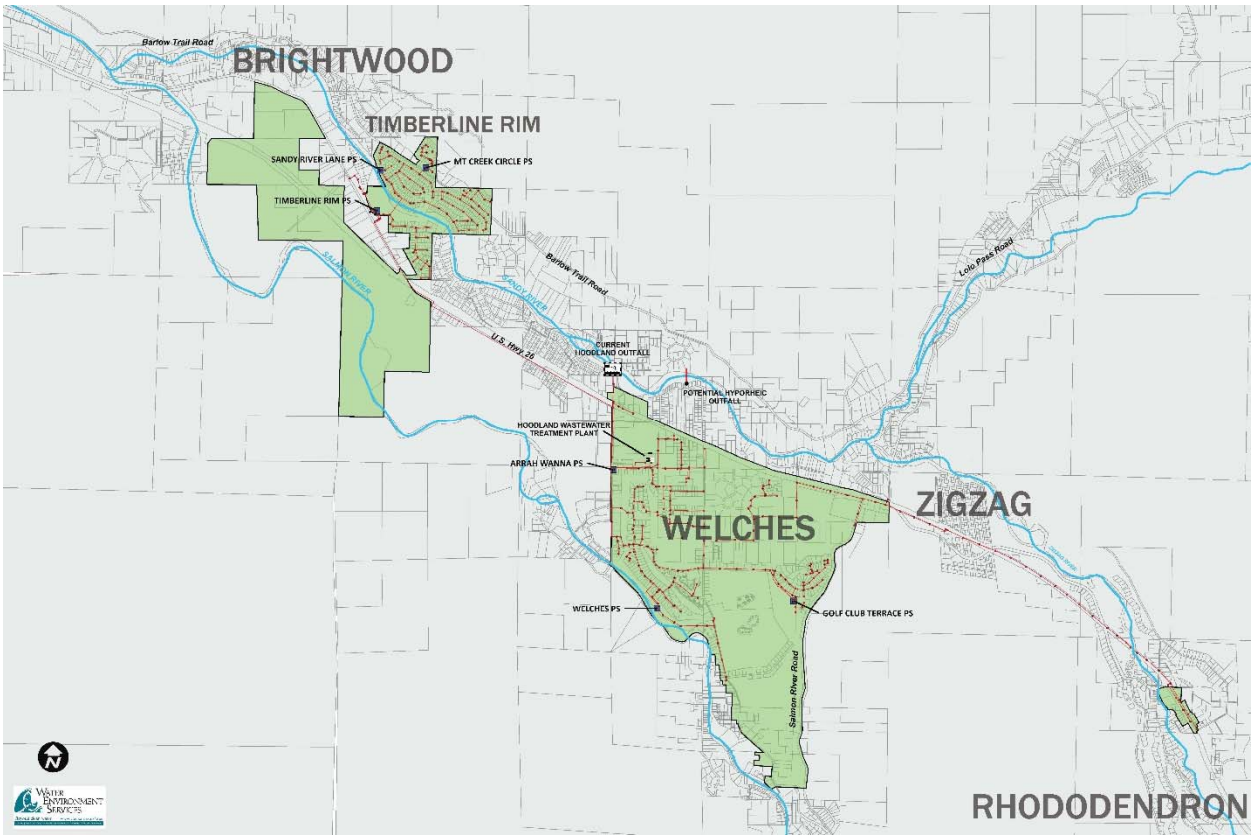


Figure 1. Hoodland Service Area

Previously, the District has identified project needs (including potential outfall improvements) individually. A Master Plan is needed to inform new project investment decisions to meet new challenges from the perspective of the entire system.

This Master Plan evaluates the Hoodland service area wastewater conveyance and treatment system through a combination of condition assessments and capacity analyses, and identifies solutions to mitigate the overall risk. The goal is to provide customers with quality and reliable service, prepare for natural disasters or catastrophic events, and protect river quality and public health.

Summary of Actions Completed

The Master Plan process resulted in completion of the following actions, which are further described in corresponding sections of the Master Plan document:

- Capacity assessments of the Hoodland service area collection system and the HSTP to identify improvements for conveying and treating future flows and loads from the service area (Section 2)
- Condition assessments of the pump stations, gravity sewer pipelines, and HSTP to understand the current condition of individual components and determine which components require attention to reduce the risk of asset failure (Section 3)
- Identification of infrastructure assets posing a high risk (likelihood and consequence) of failure and prioritization of risk-reduction measures (Section 4)
- Development of system-wide options and alternatives targeted to reduce risk and create operational and financial efficiencies (Sections 5 and 6)
- Evaluation of the financial, environmental, and regulatory impacts of each alternative to put forward recommended operational and capital improvements (Section 6)
- Development of an emergency contingency plan in the event of Sandy River flooding or erosion impacts to high-risk facilities in the Hoodland service area (Section 7)
- Organization of recommended future actions into four categories: level-of-service improvements, operational reliability improvements, risk-reduction measures to be implemented in response to potential future Sandy River impacts, and non-capital improvement recommendations (Section 8)

Breadth of Alternatives Evaluated

The alternatives considered were exhaustive, particularly the alternatives associated with Sandy River impacts. The alternatives were evaluated to assess efficacy. In light of the cost of the solutions relative to the size of the service area, the potential options included those that may be thought to be unconventional, but these were investigated to ensure that as many potential alternatives as possible were considered. For example, the following conveyance alternatives were considered:

- Lengthy force main reroute to the Brightwood Bridge or installation of a cable-supported overhead river crossing to avoid a Sandy River undercrossing that is vulnerable to erosion
- District installation of small, high-efficiency grinder pumps for each residence to allow for the removal of high-risk pump stations from migration zone impacts
- Pumping to and contracting with adjacent service providers

Ultimately more than 20 treatment and conveyance scenarios were considered. Many were deemed unworthy of future consideration based on implementation challenges or cost. Given the assumption that the current service areas will continue to be served by the District, the analysis focused on viable service alternatives.

Alternatives Selected

Seven preliminary alternatives were compared on the basis of capital costs, life-cycle costs, risk-reduction points, risk-reduction ratio, and life-cycle costs versus risk-reduction ratio. Three alternatives were selected for further evaluation. Of those three alternatives, two (Alternatives A and B) were carried forward for full development. Table ES-1 describes Alternatives A and B relative to each high-risk asset.

Table ES-1. Alternatives Carried Forward

High-risk Asset	Alternative A Minimize Existing Channel Migration Zone Risk	Alternative B Highest Regulatory Risk Reduction
Arrah Wanna pump station firm capacity deficiency	Replace two pumps, add an additional pump, and add variable speed drives	
Sandy River Lane force main crossing of Sandy River	Construct longer deeper force main	
Timberline Rim pump station and local collection system failure from Sandy River migration and flooding	Construct new Timberline Rim pump station outside channel migration zone, in vicinity of E. Riverside Drive; served by gravity	Eliminate Timberline Rim pump station and have grinder pumps pump to Arrah Wanna system
Sandy River Lane pump station at risk of structural damage from flooding and channel migration zone risk and firm capacity deficiency	Relocate pump station with increased pumping capacity approximately 50 to 60 feet inland; pump to relocated Timberline Rim pump station	Relocate pump station with increased pumping capacity approximately 50 to 60 feet inland; pump to Arrah Wanna system
HSTP outfall stability and vulnerability	Maintain outfall location, with future enhancement of existing outfall	Move outfall to Emigrant Trail
HSTP maintenance and obsolescence	Implement electrical upgrades (motor control center, automatic transfer switch, and generator)	

Recommendations for Future Actions

WES and CH2M worked together to develop recommendations for future actions. The recommendations are organized into categories based on known and predictable conditions (for example, the structural condition of a pump station), and on deficiencies resulting from potential future natural events (for example, river erosion and channel migration).

The categories are as follows:

- Capital projects associated with providing or maintaining a desired level of service.
- Capital projects that improve operational reliability, associated with system elements that are considered obsolete but currently provide an adequate level of service.
- Responses to Sandy River impacts, associated with potential improvement projects and actions that reduce exposure or respond to a failure from Sandy River channel migration, erosion, or avulsion. Alternative A in Table ES-1 was recommended as the response actions to Sandy River impacts.
- Non-capital improvements.

Table ES-2 summarizes each recommended improvement according to these four categories, with anticipated benefits and estimated costs.

Table ES-2. Summary of Recommended Improvements

Improvement Category	Recommended Improvement	Anticipated Benefit	Estimated Capital Cost*
Level of Service	Increase capacity at Arrah Wanna pump station.	Increases capacity to meet existing and future land use flow conditions. Improves regulation of flow to the plant from variable frequency drives, eliminating need for headworks modifications in the HSTP.	$1.2 million
Operational Reliability	Install new generator at Arrah Wanna pump station. Replace motor control center and automatic transfer switch at HSTP.	Supplements existing emergency power to meet Arrah Wanna and HSTP demand. Replaces obsolete equipment for which parts are not readily available.	$1.2 million
	Replace rotating biological contactors with new activated sludge bioreactor.	Replaces obsolete equipment for which parts are not readily available.	$4.7 million
Response to Sandy River Impacts	Restore service.	Ensures ongoing service before the implementation of longer-term solutions.	To be determined
	Implement engineering solutions in response to imminent or actual failure: relocate Sandy River and Timberline Rim pump stations and replace Sandy River force main, and repair and improve HSTP outfall; all are subject to channel erosion and migration.	Removes high-risk assets from areas subject to channel erosion and migration or increases resilience in their current location (HSTP Outfall).	$4.3 million Recommend establishment of reserve fund for response to Sandy River impacts ($1 to $2 million/year)
Non-capital	Implement HSTP facility planning, pipeline condition assessment, collection system spot repairs, risk-based asset management, adopt modified operating protocols, monitor collection system flow and Sandy River erosion, consider reserve to fund solutions for Sandy River impacts to the wastewater system.	Continues proactive management of collection and treatment systems.	To be determined

*In 2016 dollars. A 30 percent construction contingency was added to the estimate and a 30 percent factor for indirect costs (design, construction management, administration, and permitting). These are Class 4 estimates as defined by the Association for the Advancement of Cost Engineering (AACE) International and adopted by the American National Standards Institute in *Recommended Practice No. 17R-97: Cost Estimate Classification System* (2011) and *Recommended Practice No. 18R-97: Cost Estimating Classification System as Applied in Engineering, Procurement, and Construction for the Process Industries* (2011). An estimate of this type is normally expected to be within +50 percent or –30 percent of the actual construction cost and is appropriate for detailed strategic planning. The final cost of the projects will depend on actual labor and materials costs, actual site conditions, productivity, competitive market conditions, bid dates, seasonal fluctuations, final project scope, final project schedule, and other variables. As a result, the final project costs will vary from the estimates presented.