



Central Oregon Irrigation District Pilot Butte Canal EIS Draft Transportation Technical Report Deschutes County, Oregon

Prepared for

Central Oregon Irrigation District



May 2024

Prepared by

Parametrix

Some documents included in this are provided as they were originally produced and may not fully comply with Section 508 of the Rehabilitation Act. These materials include third-party reports, historical documents, maps, and technical drawings that cannot be readily converted into accessible formats.

Upon request, the Natural Resources Conservation Service will provide reasonable accommodations or accessible alternatives for individuals with disabilities. To request assistance, please contact Gary Diridoni, gary.diridoni@usda.gov, (503) 414-3092 within a reasonable time frame.

Central Oregon Irrigation District Pilot Butte Canal EIS Draft Transportation Technical Report

Prepared for

Central Oregon Irrigation District

1055 SW Lake Road
Redmond, OR 97756

Prepared by

Parametrix

150 NW Pacific Park Lane, Suite 110
Bend, OR 97701
T. 541.508.7710 F. 1.855.542.6353
www.parametrix.com

CITATION

Parametrix, 2024. Central Oregon Irrigation District Pilot Butte Canal EIS Draft Transportation Technical Report. Prepared by Parametrix, Bend, Oregon. May 2024.

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

Prepared by Kendra Ely, PE (Transportation Engineer)	Signature reserved for final version
Checked by Jessie Rykels-Wilson, PE (Senior Transportation Engineer)	Signature reserved for final version
Approved by Shane Phelps (Consultant Project Manager)	Signature reserved for final version

Central Oregon Irrigation District
Pilot Butte Canal EIS
Draft Transportation Technical Report
Central Oregon Irrigation District

This page intentionally left blank.

CONTENTS

EXECUTIVE SUMMARY	ES-1
1. INTRODUCTION	1
1.1 Project Location	1
1.2 Project Purpose and Need	2
2. PROJECT ALTERNATIVES	3
2.1 No Action (Future without Federal Investment)	3
2.2 Modernization Alternative (Future with Federal Investment)	3
2.2.1 Deschutes County/North Bend Alignment Options	6
2.2.2 City of Redmond Alignment Options	8
3. DEFINITIONS	10
4. LEGAL REGULATIONS AND STANDARDS	10
4.1 Laws, Plans, Policies, and Regulations	10
4.1.1 State of Oregon	10
4.1.2 City of Bend	11
4.1.3 City of Redmond	11
4.1.4 Deschutes County	11
4.1.5 BNSF Railroad	12
4.2 Design Standards	12
5. AFFECTED ENVIRONMENT	12
5.1 Area of Potential Impact	12
5.2 Resource Identification and Evaluation Methods	12
5.2.1 Published Sources and Databases	12
5.2.2 Field Visits and Surveys	13
5.3 Existing Conditions	13
5.3.1 Project Area	13
5.3.2 Deschutes County/North Bend Options	17
5.3.3 City of Redmond Options	18
6. IMPACT ASSESSMENT METHODOLOGY AND DATA SOURCES	19
6.1 Long-Term Impact Assessment Methods	19
6.2 Short-Term Impact Assessment Methods	19

CONTENTS (CONTINUED)

6.3 Indirect Impact Assessment Methods	20
6.4 Cumulative Impact Assessment Methods.....	20
7. ENVIRONMENTAL CONSEQUENCES.....	20
7.1 Long-Term Impacts	20
7.1.1 No Action Alternative.....	20
7.1.2 Modernization Alternative (Full Piping).....	20
7.2 Construction Impacts	22
7.2.1 Modernization Alternative (Full Piping).....	22
7.2.2 Potential Off-Site Staging Areas	31
7.3 Cumulative Effects	31
7.4 Compliance with Laws, Regulations, and Standards.....	31
7.5 Conclusion.....	32
8. MITIGATION MEASURES.....	32
8.1 Common to Piping.....	32
9. CONTACTS AND COORDINATION	32
10. PREPARERS.....	33
11. REFERENCES.....	34
FIGURES	
Figure 1. Project Area	2
Figure 2. Project Groups.....	5
Figure 3. Deschutes County/North Bend Alignment Options	7
Figure 4. Redmond Alignment Options	9
TABLES	
Table 1. Project Group and Construction Sequence	4
Table 2. Existing Canal Crossings	14
Table 3. Existing Facilities – Pilot Butte Canal Option	17
Table 4. Existing Facilities – NE 18th Street Option.....	17
Table 5. Existing Facilities – Old Deschutes Road Option.....	18

CONTENTS (CONTINUED)

Table 6. Existing Facilities – Pilot Butte Canal Option	18
Table 7. Existing Facilities – Watermaster’s Access Road Option	19
Table 8. Existing Facilities – Northwest Canal Boulevard Option.....	19
Table 9. Crossing Types	22
Table 10. Planned Improvements – Pilot Butte Canal Option.....	24
Table 11. Planned Improvements – NE 18th Street Option	25
Table 12. Planned Improvements – Old Deschutes Road Option	26
Table 13. Planned Improvements	27
Table 14. Permitting Requirements.....	32

ACRONYMS, INITIALISMS, AND ABBREVIATIONS

COID	Central Oregon Irrigation District
Ditstrict	Central Oregon Irrigation District
EIS	environmental impact statement
GIS	geographic information system
NRHP	National Register of Historic Places
ODOT	Oregon Department of Transportation
PBC	Pilot Butte Canal
Project	Pilot Butte Canal Piping Project
ROW	right-of-way
TSP	transportation system plan

EXECUTIVE SUMMARY

The Pilot Butte Canal alignment stretches across Deschutes County from the north side of the city of Redmond to the center of the city of Bend. The proposed alignment intersects 44 facilities owned by several agencies including Deschutes County, the City of Redmond, the City of Bend, the Oregon Department of Transportation, and BNSF Railway.

During construction of the Pilot Butte Canal Piping Project (Project), traffic throughout Central Oregon would be significantly impacted. There are several existing canal crossings that would be removed requiring detours for vehicles, cyclists, and pedestrians. Additionally, pipe alignment options to the historical segments may increase impacts to traffic. However, the Project would only be impactful during construction. As described in Section 2 of this technical report, the construction at any one location would occur over a single non-irrigation (winter) season.

Long-term impacts from the Pilot Butte Canal Piping Project are not expected. Transportation infrastructure would be replaced to match existing conditions or would be improved to meet current design standards. With the removal and subsequent fill of the open channel canal, several bridge crossings would be converted to an at-grade road or rail track. This would be a positive impact in reducing long-term maintenance costs for the owner.

1. INTRODUCTION

As a part of the preparation of the Environmental Impact Statement (EIS) for the Pilot Butte Canal (PBC) Piping Project (Project), this technical report has been prepared to identify and evaluate transportation impacts within the project area.

1.1 Project Location

The Central Oregon Irrigation District (COID or District) is analyzing piping approximately 18 to 21 miles of the PBC from NE 17th Street in Redmond, Oregon, to the diversion point from the Deschutes River in Bend, Oregon (Figure 1). The piping would extend from the piped section of the PBC approved under the 2020 *Smith Rock-King Way Infrastructure Modernization Project Final Watershed Plan-Environmental Assessment* (NRCS, USDA 2020). Additional portions along the existing alignment that have been piped or converted to box culverts during previous construction projects include the following:

- Major freeway or roadway crossings of US 97, Hwy 20, and Hwy 126, in Bend and Redmond (0.2 miles)
- Within the City of Bend and Deschutes County for the Juniper Ridge hydroelectric facility (3.3 miles)
- Within Deschutes County north of the Juniper Ridge hydroelectric plant (0.1 miles)
- Within urbanized Redmond (1.5 miles)

The portions proposed for piping under this Project are shown in Figure 1.

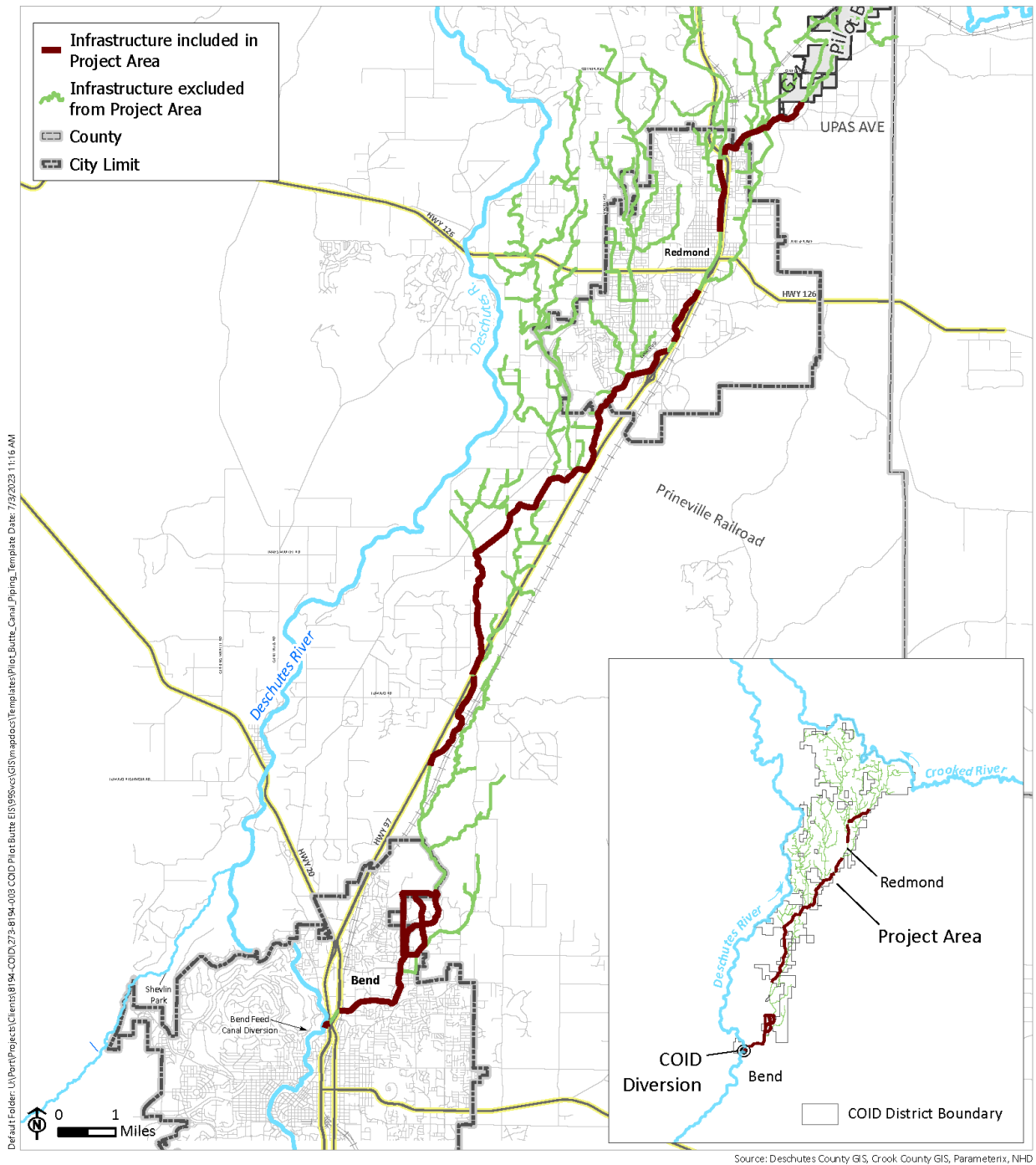


Figure 1. Project Area

1.2 Project Purpose and Need

The purpose of this Project is Agricultural Water Management through irrigation water conservation in District-owned infrastructure, improvement of water delivery reliability to District patrons, and

reduction of long-term operation and maintenance costs on approximately 21 miles of the District-owned PBC. The Project is needed to address the following watershed problems and resource concerns: water loss in District conveyance systems and water delivery and operation and maintenance inefficiencies. Implementation of the proposed action would address the sponsors' objectives and goals to reduce seepage loss and provide better-managed water diversions for farm use; support agricultural land use; improve streamflow for fish, aquatic, and riparian habitat; and increase public safety.

2. PROJECT ALTERNATIVES

2.1 No Action (Future without Federal Investment)

Under the No Action Alternative, the District would continue to operate and maintain the existing delivery system within the Project Area in its current condition. This alternative assumes that modernization of the District's PBC infrastructure would not be reasonably certain to occur, as funding at the scale necessary to modernize District infrastructure is not anticipated from other sources. The No Action Alternative would be a continuation of the District's current operations and maintenance.

The No Action Alternative would not meet the project purpose and need. Water would continue to be lost to seepage and evaporation in District infrastructure. Water delivery reliability for farmers, streamflow and habitat conditions for fish and aquatic species, public safety, and sediment levels in irrigation water would not improve. The No Action Alternative would fail to achieve the goal of maximizing sustainable economic development as identified in the Federal Objective to protect the environment. It would not resolve current water supply problems stemming from the loss of water from District infrastructure. It would not resolve the public safety risk posed by the potential failure of canal walls and resulting flooding. Further, it would not foster the economic well-being of present and future generations through sustainable use and management of water resources to provide water supply and water quality for irrigated agriculture in the Deschutes Basin.

2.2 Modernization Alternative (Future with Federal Investment)

The Modernization Alternative would focus on a single priority infrastructure modernization project: the District would replace the existing open PBC within the Project Area with a pressurized, closed conduit pipeline system (see Figure 2). When completed, the pipe would extend over approximately 18 to 21 miles of the COID system from the diversion point from the Deschutes River in Bend, Oregon, to NE 17th Street in Redmond, Oregon. Pipeline construction would begin in the northern portion of the Project Area at the piped section of the PBC that was approved under the 2020 Smith Rock-King Way Infrastructure Modernization Project Final Watershed Plan-Environmental Assessment (USDA, NRCS 2020), and progress south to the North Canal Dam. Construction of the Modernization Alternative would occur over the course of 3 years; two project groups would be constructed each construction season. The six project groups are described in Table 1.

Table 1. Project Group and Construction Sequence

Project Groups	Project Group Length (feet)	Construction Year	Construction Start	Construction End
1 – King Way	11,000	0	October 2026	April 2027
2 – Redmond				
Pilot Butte Canal Alignment Option	13,500	1	October 2027	April 2028
Watermaster Road Alignment Option	13,500	1	October 2027	April 2028
NW Canal Boulevard Alignment Option	13,500	1	October 2027	April 2028
3 – Veterans Way	16,700	2	October 2028	April 2029
4 – Canal	13,900	2	October 2028	April 2029
5 – Deschutes Market	22,000	1	October 2027	April 2028
6 – Rivers Edge				
Pilot Butte Canal Alignment Option	18,100	0	October 2026	April 2027
18th Street Alignment Option	19,300	0	October 2026	April 2027
Old Deschutes Road Alignment Option	19,800	0	October 2026	April 2027

Construction would occur during the non-irrigation season (October to April), with Project Group 1 (King Way) and Project Group 6 (Rivers Edge) construction beginning as early as the 2026–2027 non-irrigation season. The construction sequencing may be changed to provide flexibility for the construction contractor. Construction of each project group is anticipated to require one non-irrigation season to complete, and all six project groups would be completed over the course of three construction seasons. Two project groups—Redmond and Rivers Edge—each contain a segment with multiple alignment options. The alignment options are discussed below. Under the Modernization Alternative, federal funding through Public Law 83-566 would be available and would be expected to cover approximately 75% of total costs. The District would cover the remaining 25% of total costs.

A section of the PBC in Deschutes County just south of the Juniper Ridge hydroelectric facility, in the Rivers Edge project group, and another section in the downtown area of Redmond, in the Redmond project group, include historic features listed in the National Register of Historic Places (NRHP). In 2019, a Section 106 programmatic agreement was signed by COID, the Oregon State Historic Preservation Office, and the Bureau of Reclamation. The Natural Resources Conservation Service (NRCS) was added as a signatory in 2023. The programmatic agreement identified that COID will maintain the downtown Redmond reach “such that the historic integrity of and identification of the historic property as representative of an irrigation conveyance system will not be adversely affected.” The alignment options for the Deschutes County/North Bend (in the Rivers Edge project group) and the City of Redmond (in the Redmond project group) NRHP-listed historic sections of the Project Area are described in Section 2.2.1 and Section 2.2.2, respectively.

Central Oregon Irrigation District
Pilot Butte Canal EIS
Draft Transportation Technical Report
Central Oregon Irrigation District

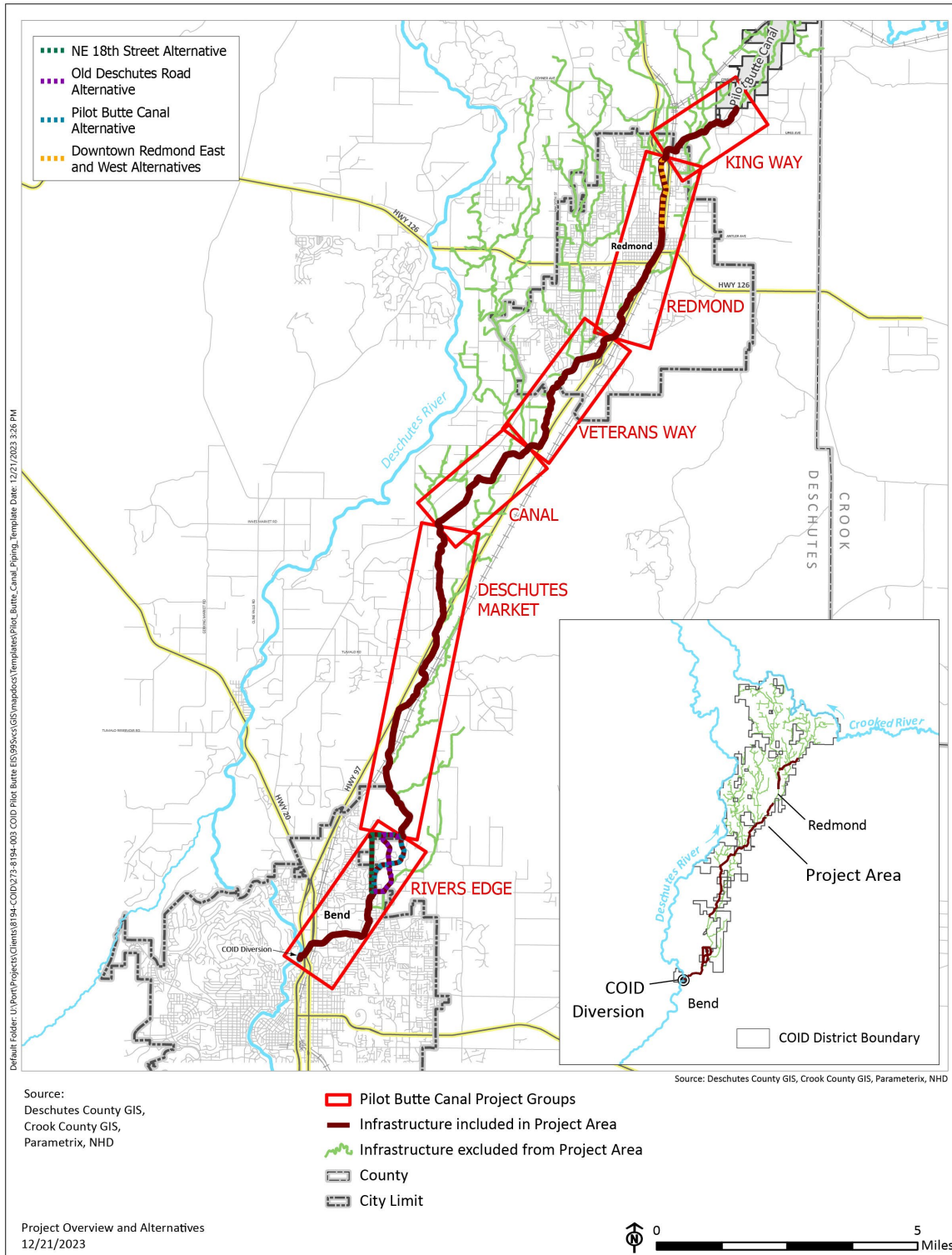


Figure 2. Project Groups

2.2.1 Deschutes County/North Bend Alignment Options

The Modernization Alternative has four options for piping between Yeoman Road and Cooley Road in Deschutes County and north Bend (see Figure 3).

- No Modernization within this Segment (no piping)
- Pilot Butte Canal Alignment (existing canal alignment)
- NE 18th Street Alignment
- Old Deschutes Road Alignment

2.2.1.1 No Modernization within this Segment (No Piping)

This alignment option would keep the 7,800-foot NRHP-listed stretch of the PBC between Yeoman and Cooley Roads in its current configuration and functionality as an open canal. This option would require a pressure reducing station south of Yeoman Road to slow the flow velocity as it exits the pressurized pipe so that the existing open canal can function as currently designed.

2.2.1.2 Pilot Butte Canal Alignment (Existing Canal Route)

This alignment option would replace the open channel with pipe directly within the existing open channel alignment. This alignment option would be built wholly within the section of canal that is listed in the NRHP. This option would not pipe the open channel section immediately south of the Juniper Ridge hydroelectric facility (approximately 170 feet), and it would require installing a pressure reducing station prior to where flow enters the hydroelectric facility.

2.2.1.3 NE 18th Street Alignment

This option would pipe the PBC within a new alignment beginning at the intersection of the existing alignment and Yeoman Road. It would travel west and then north to follow NE 18th Street to its intersection with Cooley Road. At Cooley Road, the alignment option would make an approximately 90-degree turn to follow an alignment extending from near the eastern terminus of Cooley Road to the existing PBC. This option would avoid impacts to a portion of the PBC that is listed in the NRHP. The historic section of canal would be left in place, but it would no longer receive irrigation water from the COID system.

2.2.1.4 Old Deschutes Road Alignment

The Old Deschutes Road Alignment option would place pipe in a new alignment beginning at Yeoman Road. It would travel east along Yeoman Road and then northeast to follow Old Deschutes Road. The alignment would travel generally north, cross the existing PBC, then continue north to Cooley Road. The alignment would make an approximately 90-degree turn to follow Cooley Road to the existing PBC. This option would avoid impacts to the NRHP-listed portion of PBC. The historic section of canal would be left in place, but it would no longer receive irrigation water from the COID system.

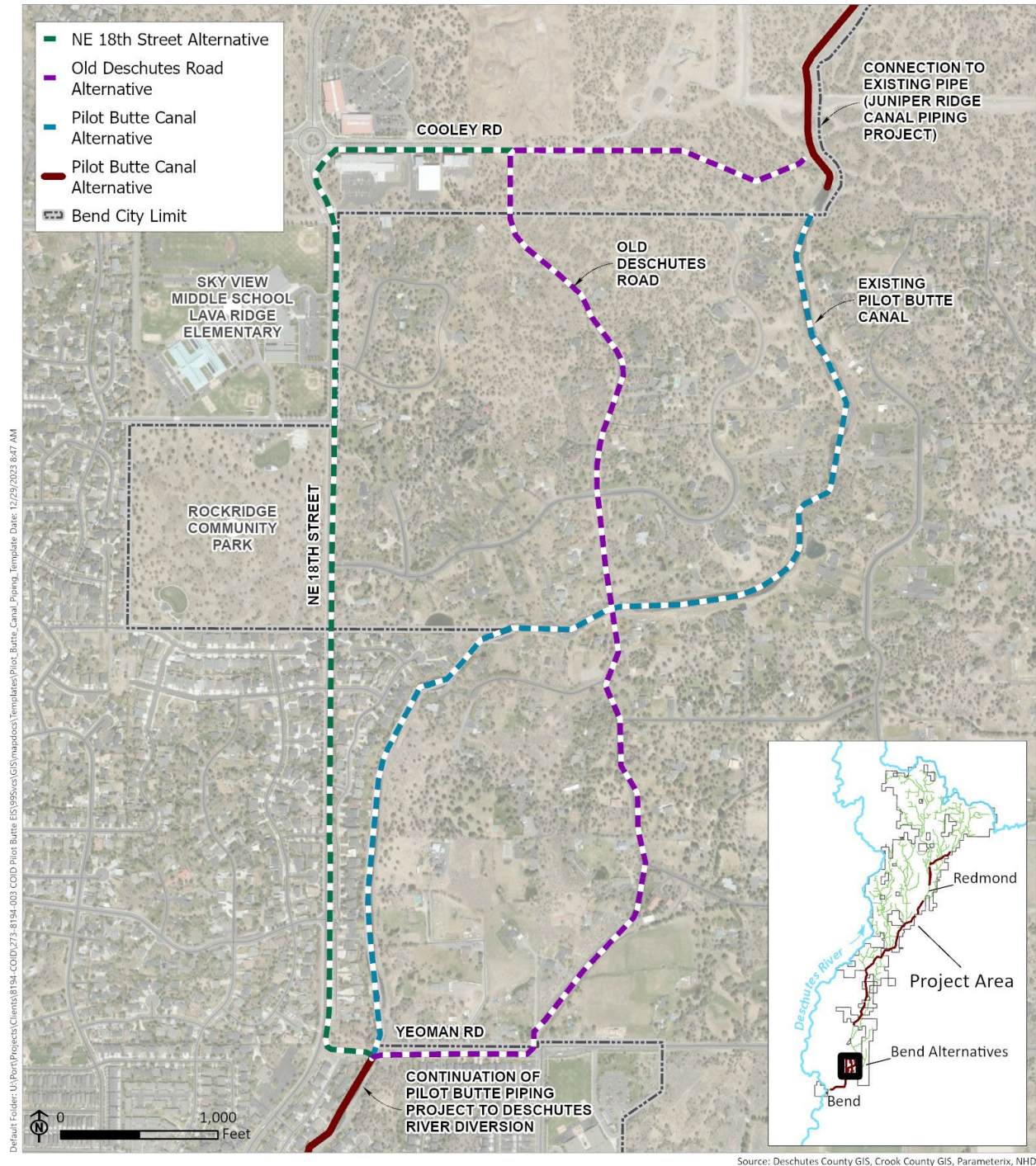


Figure 3. Deschutes County/North Bend Alignment Options

2.2.2 City of Redmond Alignment Options

The Modernization Alternative has four options for piping within the NRHP-listed historic Downtown Redmond section between NW Dogwood Avenue and NW Quince Avenue (see Figure 4).

- No Modernization within this Segment (no piping)
- Pilot Butte Canal Alignment (existing canal alignment)
- Piping to the east in the Watermaster's Access Road
- Piping to the west within Northwest Canal Boulevard

2.2.2.1 No Modernization within this Segment (No Piping)

This alignment option would keep the 6,800-foot NRHP-listed stretch of the PBC in Redmond in its current configuration and functionality as an open canal. This option would require installing a pressure reducing station near the intersection of SW Veteran's Way and US 97 to slow the flow velocity as it exits the pressurized pipe so that the existing open canal can function as currently designed.

2.2.2.2 Pilot Butte Canal Alignment (Existing Canal Route)

This alignment option would replace the open channel with pipe directly within the existing open channel alignment. This alignment option would be built wholly within the section of canal that is listed in the NRHP.

2.2.2.3 Piping to the east in the Watermaster's Access Road

This alignment option would install pipe to the east of the existing PBC and avoid impacts to the section of canal that is listed in the NRHP. The historic section of canal would be left in place, but it would no longer receive irrigation water from the COID system.

2.2.2.4 Piping to the west within Northwest Canal Boulevard

This alignment option would pipe to the west of the existing PBC, primarily within NW Canal Boulevard, and avoid impacts to the section of canal that is listed in the NRHP. The historic section of canal would be left in place, but it would no longer receive irrigation water from the COID system.

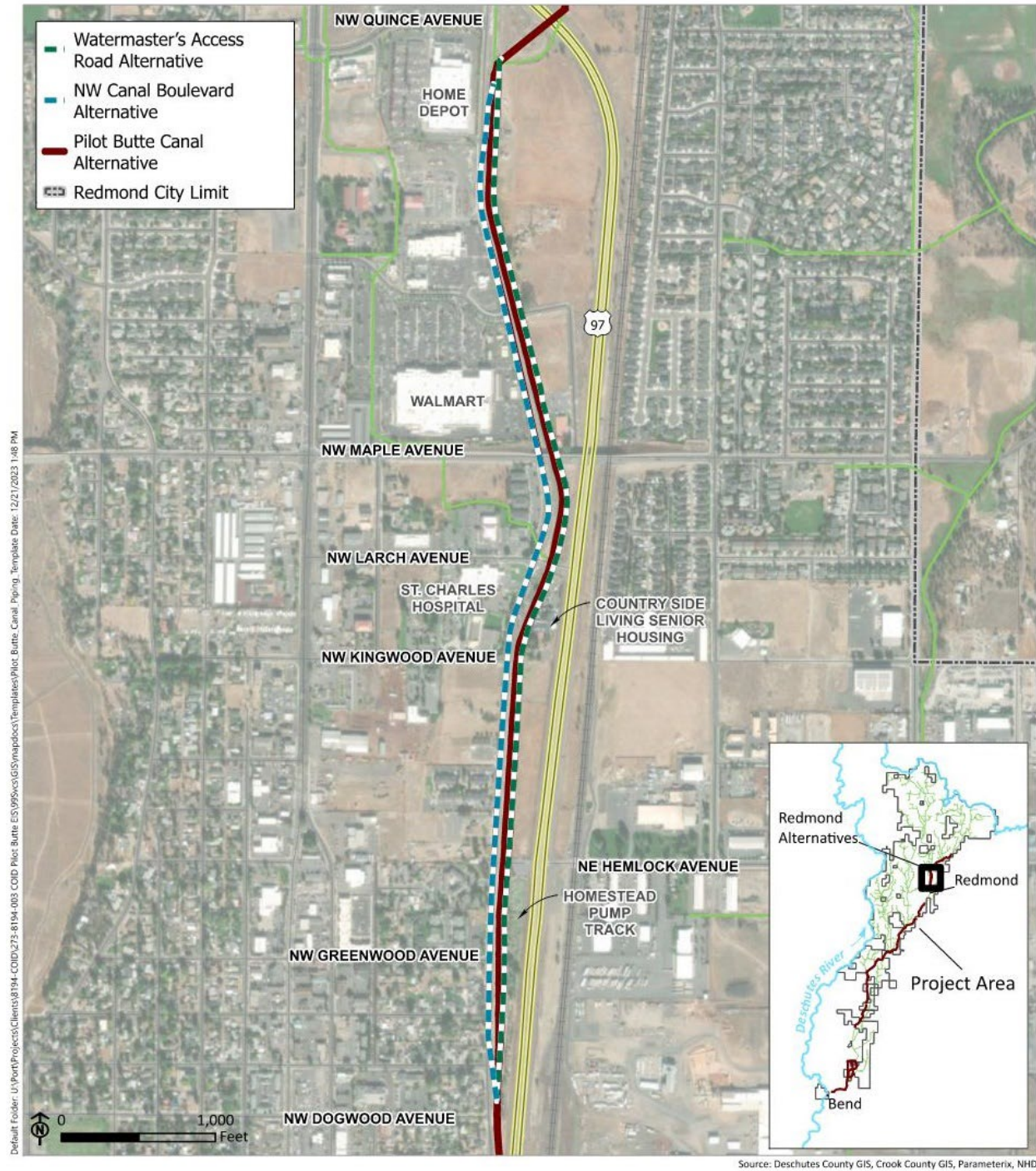


Figure 4. Redmond Alignment Options

3. DEFINITIONS

The following terminology is used when discussing geographic areas and roadway classifications in this technical report.

Arterial. Roadway classification for roads intended to be main routes used through a region and that provide connectivity to key activity centers. Arterials are also intended to provide movement of goods and services.

Collector. Roadway classification for roads intended to move traffic from local streets to arterial roads. Collectors typically experience higher traffic volumes and higher speeds than local streets.

Local. Roadway classification for roads or streets used for neighborhood circulation and that provide direct access to residences and businesses. Traffic volumes and speeds are typically low.

Project Area. The area within which improvements associated with the project alignment options would occur and the area needed to construct these improvements. The Project Area includes the area needed to construct all permanent infrastructure, including adjacent parcels where modifications would be required for associated work such as utility realignments or upgrades.

Project vicinity. The environs surrounding the project area. The project vicinity does not have a distinct geographic boundary but is used in general discussion to denote the larger area.

Study Area. This is the general geographic area within which physical impacts to the environment could occur with the project alignment options. The Study Area is resource-specific and differs depending on the environmental topic being addressed. For all topics, the Study Area encompasses the Project Area, and for some topics (such as for utilities), the geographic extent of the Study Area is the same as that for the Project Area. For other topics (such as transportation), the Study Area is substantially larger to account for impacts that could occur outside of the Project Area. The Study Area for transportation resources is defined in Section 5.1.

4. LEGAL REGULATIONS AND STANDARDS

4.1 Laws, Plans, Policies, and Regulations

Transportation facilities in the Project Area are supported and regulated by state, local, and regional plans, policies, and regulations.

4.1.1 State of Oregon

Oregon Administrative Rules Chapter 734, Division 55 applies to and governs the location, installation, construction, maintenance and use of pole lines, buried cables, pipelines, signs, and miscellaneous operations upon state highway right-of-way and properties under the jurisdiction of the Oregon Department of Transportation (ODOT).

4.1.2 City of Bend

4.1.2.1 City of Bend Transportation System Plan

Adopted in 2020, Bend's *Transportation System Plan* (TSP) establishes a system of transportation facilities, programs, and policies that will guide transportation infrastructure development over the next 20 years (City of Bend 2020). Projects identified through the TSP overlap with this Project.

4.1.2.2 City of Bend Capital Improvement Program

Adopted in 2023, City of Bend's Road Capital Improvement Program sets priorities for capital investments within the city for 2024 through 2028 (City of Bend 2023). No projects identified in the capital improvement program conflict with this Project.

4.1.3 City of Redmond

4.1.3.1 City of Redmond Transportation System Plan

Adopted in 2020, Redmond's TSP establishes a system of transportation facilities, programs, and policies that will guide transportation infrastructure development over the next 20 years (City of Redmond 2020). Projects identified through the TSP overlap with this Project.

4.1.3.2 City of Redmond Capital Improvement Plan

Updated annually, Redmond's *5-Year Capital Improvement Plan* sets priorities for capital investments and how they will be financed in 5-year increments (City of Redmond 2024a). Projects identified by the Capital Improvement Plan overlap with this Project.

4.1.4 Deschutes County

4.1.4.1 Deschutes County Transportation System Plan

Deschutes County's TSP was adopted in 2012 (Deschutes County 2012), and it is currently under revision. A draft of the updated TSP became available in August 2023 and was used in the development of this report (Deschutes County 2023). The draft TSP establishes a system of transportation facilities, programs, and policies that will guide transportation infrastructure development over the next 20 years. Projects identified through the TSP overlap with this Project.

4.1.4.2 Deschutes County Road Capital Improvement Plan

Adopted in 2023, Deschutes County's *Road Capital Improvement Plan Fiscal Years 2024–2028* sets priorities for capital investments within the county for 2024 through 2028 (Deschutes County Road Department 2023). No projects identified on the capital improvement plan conflict with this Project.

4.1.5 BNSF Railroad

BNSF Railroad maintains a utility accommodation policy (BNSF Railway 2024). Utility license agreements are required when utility facilities are installed, relocated, removed, or maintained along or across all BNSF property.

4.2 Design Standards

Transportation facilities in the Project Area are designed to jurisdictional standards including the following:

- City of Bend Standards and Specifications, July 2023 (City of Bend 2023)
- City of Redmond Public Works 2010 Standards and Specifications (City of Redmond 2010)
- Deschutes County Standards and Specifications (Deschutes County 2024d)
- Deschutes Transportation System Plan (Deschutes County 2023)

5. AFFECTED ENVIRONMENT

5.1 Area of Potential Impact

The PBC alignment stretches across Deschutes County from the north side of the city of Redmond to the center of the city of Bend. The proposed alignment intersects facilities owned by several agencies including Deschutes County, the City of Redmond, the City of Bend, ODOT, and BNSF Railway. The area of potential impact for the transportation analysis is consistent with the Project Area and includes all land adjacent to or intersected by the existing PBC alignment and all alternative alignments, including a 50-foot buffer on either side of the canal alignment to account for potential construction impacts.

5.2 Resource Identification and Evaluation Methods

5.2.1 Published Sources and Databases

Sources used to conduct this evaluation include the following:

- Google Earth
- Parametrix Interactive GIS Map
- Deschutes County Atlas (Deschutes County Road Department 2021)
- Deschutes County Property Information (Deschutes County 2024b)
- Oregon Traffic Monitoring System (ODOT 2024)
- City of Bend GIS (City of Bend 2024)
- Deschutes County GIS (Deschutes County 2024a)
- ODOT GIS (State of Oregon 2024)

5.2.2 Field Visits and Surveys

No field visits were conducted to identify existing transportation infrastructure.

5.3 Existing Conditions

5.3.1 Project Area

Table 2 catalogs the crossings of transportation facilities intersecting the existing PBC alignment. These crossings are on bridges or culverts that have the potential to be affected as a result of the proposed piping of the PBC as described above in Section 5.1. Crossings for potential route options are tabulated separately. Crossings are identified in order beginning on the south end of the Project Area and extending to the north.

Table 2. Existing Canal Crossings

Crossing No.	Crossing	Owner	Roadway Classification	ODOT Bridge No.	Bridge Notes ¹	Average Annual Daily Traffic
1	NE Division Street	City of Bend	City Minor Arterial	17B002	23-ft single-span reinforced concrete Existing culvert to remain	At US 97 intx, SB: 2,845 vehicles (2022) NB: 3,945 vehicles (2022)
2	US 97 – multiple crossings (between MP 136 and MP 137)	ODOT	State Highway	17389	12-ft-diameter steel pipe Existing culvert to remain	Butler Market Rd Interchange, two-way: 49,852 vehicles (2022) Butler Market Rd On-ramp, NB: 2,989 vehicles (2022)
3	Railroad Crossing	BNSF	-	-	Single track crossing Existing culvert to remain	-
4	Jeld-Wen Parking Lot Bridge	Private	-	-	Privately owned single-lane bridge	-
5	Jeld-Wen Pedestrian Crossing	Private	-	-	Privately owned pedestrian bridge	-
6	NE Boyd Acres Rd	City of Bend	City Minor Arterial	09410	49-ft single-span prestressed concrete	Near Brinson Blvd intx, two-way: 7,959 vehicles (2022)
7	NE Brinson Blvd	City of Bend	City Collector	18718	33-ft two-span concrete culvert	-
8	NE Empire Ave	City of Bend	City Major Arterial	18374	52-ft single-span prestressed concrete	East leg of Empire/18th RAB, two- way: 7,959 vehicles (2022)
9	Yeoman Rd	City of Bend	City Local	-	Steel footbridge	Pedestrians only
10	Old Deschutes Rd	Deschutes County	Rural Local	-	Timber footbridge	-
11	Access to COID Property 64580 US 97	Private	-	-	Bridge closed	-
12	Jack Robinson & Sons Access (64999 Deschutes Market Rd and 64993 Deschutes Market Rd)	Private	-	-	Bridge crosses between properties; No other access to 64999 Deschutes Market Rd	-

¹ Abbreviations are defined at the end of the table.

Central Oregon Irrigation District
Pilot Butte Canal EIS
Draft Transportation Technical Report
Central Oregon Irrigation District

Crossing No.	Crossing	Owner	Roadway Classification	ODOT Bridge No.	Bridge Notes ¹	Average Annual Daily Traffic
13	Tumalo Rd	Deschutes County	Rural Collector	15454A	56-ft single-span prestressed concrete	West of US 97, two-way: 7,942 vehicles (2021) East US 97, two-way: 7,627 (2022)
14	Deschutes Pleasant Ridge Rd	Deschutes County	Rural Collector	18299	56-ft single-span prestressed concrete	Between canal and US 97, two-way: 4,805 vehicles (2022)
15	US 97 (between MP 129 and MP 130)	ODOT	State Highway	21825	9-ft-diameter steel culvert	Near Deschutes Market Rd, two-way: 38,761 vehicles (2022)
16	Central Oregon Forklift and Equipment Access (65301 N Highway 97)	Private	-	-	Access to single business	-
17	SW Gift Rd	Deschutes County	Rural Local	17C06	32-ft two-span timber stringer bridge	-
18	SW Young Ave	Deschutes County	Rural Local	17C07	60-ft two-span prestressed concrete	East of Old Bend Redmond Hwy intx, two-way: 159 vehicles (2022)
19	SW 61st St	Deschutes County	Rural Collector	17C10	30-ft single-span prestressed concrete	-
20	Private Access (7260 SW 61st St)	Private	-	-	Bridge connects property	-
21	Private Access (5680 SW Quarry Ave)	Private	-	-	Primary access to residence (connects property)	-
22	SW Quarry Ave	Deschutes County	Rural Local	17C09	48-ft single-span prestressed concrete	-
23	SW 46th Ave	Deschutes County	Rural Local	17C15A	33-ft single-span timber bridge	-
24	SW Greens Blvd	City of Redmond	City Local	-	Concrete culvert	-
25	SW Yew Ave	City of Redmond	City Arterial	-	Concrete culvert	At US 97 ramps, two-way: 11,735 vehicles (2022)
26	SW Yew Ct	City of Redmond	City Local	-	Single-span prestressed concrete; Comfort Suites Access	-
27	Business Access (2905 S Hwy 97 and 2795 S Hwy 97)	Private	-	-	Connects 17th Place to US 97 (right-in, right-out only)	-
28	SW Odem Medo Way	City of Redmond	City Collector	-	-	West of US 97 intx, two-way: 9,951 vehicles (2022)
29	SW Pumice Ave	City of Redmond	City Local	17C560	41-ft single-span prestressed concrete	Not available

Central Oregon Irrigation District
Pilot Butte Canal EIS
Draft Transportation Technical Report
Central Oregon Irrigation District

Crossing No.	Crossing	Owner	Roadway Classification	ODOT Bridge No.	Bridge Notes ¹	Average Annual Daily Traffic
30	SW Veterans Way	City of Redmond	City Arterial	-	-	West of US 97 intx, two-way: 13,190 vehicles (2022)
31	NW Fir Ave	City of Redmond	City Local	-	Single-span prestressed concrete	-
32	NW Greenwood Ave	City of Redmond	City Local	-	Secondary access to Homestead Park	-
33	NE Hemlock Ave	City of Redmond	City Local	-	33-ft two-span timber bridge Primary access to Homestead Park	-
34	NW Kingwood	City of Redmond	City Local	-	Single-span prestressed concrete Access to single home	-
35	Country Side Living Access	Private	-	-	Single-span prestressed concrete	-
36	NW Larch Ave	City of Redmond	City Local	-	43-ft single-span prestressed concrete	-
37	NE Negus Way	City of Redmond	City Arterial	19838	141-ft two-span prestressed concrete	Maple Ave at 6th St, two-way: 10,063 vehicles (2022)
38	NE 2nd St	City of Redmond	City Local	19839	Redmond Athletic Club private entrance	-
39	US 97 (between MP 119 and MP 120)	ODOT	State Highway	D045013	5-ft-diameter circular PVC	North of Canal Blvd interchange, two-way: 24,352 vehicles (2022)
40	Railroad Crossing	BNSF	-	-	Single track crossing	-
41	NE 5th St	City of Redmond	City Local	20465	32-ft single-span prestressed concrete	-
42	Private Access (730 NE King Way)	Private	-	-	Primary access to residence	-
43	Private Access (910 NE King Way)	Private	-	-	Primary access to two residences – 910 NE King Way and 930 NE King Way	-
44	NW 17th St	Deschutes County	Rural Collector	-	Single-span timber bridge	South of Yucca Ave intx, two-way: 1,077 vehicles (2022)

Ave = avenue; Blvd = boulevard; COID = Central Oregon Irrigation District; Ct = court; ft = feet; intx = intersection; MP = milepost; NB = northbound; ODOT = Oregon Department of Transportation; PVC = polyvinyl chloride; RAB = roundabout; Rd = Road; SB = southbound; St = street

5.3.2 Deschutes County/North Bend Options

5.3.2.1 Pilot Butte Canal Option

Table 3 is a summary of the facilities that would be impacted by converting the existing open PBC canal to pipe using the current PBC alignment.

Table 3. Existing Facilities – Pilot Butte Canal Option

Facility	Owner	Length of Impact	Right-of-Way Width	Existing Facilities
Pilot Butte Canal	Central Oregon Irrigation District	7,500 feet	Dedicated right-of-way width is 50 feet either side of the canal.	Existing open channel canal. Sections of dirt and gravel road/trails parallel the canal and are used as an operation and maintenance access road.

Smith v. Tumalo Irrigation Dist., 6:20-cv-00345-MK (D. Or. May. 2, 2022)

5.3.2.2 NE 18th Street Option

Table 4 is a summary of the facilities that would be impacted by this alignment which would install the proposed pipeline within the street.

Table 4. Existing Facilities – NE 18th Street Option

Facility	Classification	Owner	Length of Impact	Right-of-Way Width	Existing Facilities
Cooley Rd	Minor Arterial	City of Bend	950 feet	100 feet	Three-lane roadway with bike lanes and sidewalks. Asphalt width varies from 34 to 42 feet. Mostly curbed with sections of gravel shoulder.
NE 18th St	Minor Arterial	City of Bend	5,800 feet	80 feet	Two-lane curbed roadway with bike lanes, landscaped median, and sidewalks. Asphalt width varies from 54 to 68 feet.
Yeoman Rd	Collector	City of Bend	300 feet	80 feet	No existing road between NE 18th Street and the canal. Existing 8-foot-wide asphalt path.

Rd = Road; St = street

5.3.2.3 Old Deschutes Road Option

Table 5 is a summary of the facilities that would be impacted by the proposed pipe alignment within the road as well as crossing open space up to Cooley Road.

Table 5. Existing Facilities – Old Deschutes Road Option

Facility	Classification	Owner	Length of Impact	Right-of-Way Width	Existing Facilities
Old Deschutes Rd	Rural Local	Deschutes County	5,800 feet	60 to 65 feet	Two-lane asphalt roadway with gravel shoulders. No sidewalks. Asphalt width varies 20 to 34 feet. Route includes one bridge crossing the existing COID canal.
Yeoman Rd	Collector	City of Bend	1,050 feet	80 feet	Two-lane asphalt roadway with parking, curbs and sidewalk along south side. Asphalt width varies 37 to 44 feet.

COID = Central Oregon Irrigation District; Rd = road

5.3.3 City of Redmond Options

5.3.3.1 Pilot Butte Canal Alignment (Existing Canal)

Table 6 is a summary of the facilities that would be impacted by the proposed pipe alignment. The Homestead Canal Trail is described in detail in the Parks and Recreation Technical Report.

Table 6. Existing Facilities – Pilot Butte Canal Option

Facility	Owner	Length of Impact	Right-of-Way Width	Existing Facilities
Pilot Butte Canal	Central Oregon Irrigation District	6,800 feet	Dedicated right of-way width is 50 feet either side of the canal.	Existing open channel canal with a dirt/gravel road parallel to the east. An asphalt trail (Homestead Canal Trail) parallels the canal on a north-south alignment, crossing over from the east side to the west side of the canal.

Smith v. Tumalo Irrigation Dist., 6:20-cv-00345-MK (D. Or. May. 2, 2022)

5.3.3.2 Piping to the East in the Watermaster's Access Road

Table 7 is a summary of the facilities that would be impacted by the proposed pipe alignment within the Watermaster's access road. The Homestead Canal Trail is described in detail in the Parks and Recreation Technical Report.

Table 7. Existing Facilities – Watermaster’s Access Road Option

Facility	Owner	Length of Impact	Right-of-Way Width	Existing Facilities
Watermaster’s Access Road; part of the Pilot Butte Canal right-of-way	Central Oregon Irrigation District	6,700 feet	Dedicated right of-way width is 50 feet either side of the canal.	Existing open channel canal with a dirt/gravel road parallel to the east. An asphalt trail (Homestead Canal Trail) parallels the canal on a north-south alignment, crossing over from the east side to west side of the canal.

Smith v. Tumalo Irrigation Dist., 6:20-cv-00345-MK (D. Or. May. 2, 2022)

5.3.3.3 Piping to the West within Northwest Canal Boulevard

Table 8 is a summary of the facilities that would be impacted by the proposed pipe alignment which would install the proposed pipeline within the street.

Table 8. Existing Facilities – Northwest Canal Boulevard Option

Facility	Classification	Owner	Length of Impact	Right-of-Way Width	Existing Facilities
NW Canal Boulevard	Minor Arterial	City of Redmond	6,700 feet	60 to 70 feet	Two-lane asphalt roadway, width varies 28 to 36 feet. Mostly curbed, with gravel parking sections parallel to roadway. Sidewalk along the west. An asphalt trail (Homestead Canal Trail) parallels the canal, to the east of NW Canal Boulevard.

6. IMPACT ASSESSMENT METHODOLOGY AND DATA SOURCES

6.1 Long-Term Impact Assessment Methods

All existing transportation crossings within the Project Area were evaluated for potential long-term impacts. Project design and engineering and anticipated construction and operation and maintenance were evaluated alongside property boundary maps and transportation facility ownership to determine potential physical impacts. No long-term traffic impacts are anticipated from the Pilot Butte Canal Piping Project, including all alignment options. Transportation infrastructure would be replaced to match existing conditions or would be improved to meet current design standards; this Project would not create additional vehicle trips.

6.2 Short-Term Impact Assessment Methods

Short-term impacts are primarily related to the effects of construction during the Pilot Butte Canal Piping Project that would be temporary in nature. Detours would be required for all modes of travel—vehicles, bicycles, and pedestrians. Impacts could include increased traffic along detour routes, out-of-direction travel due to detours, and limited access to residences, businesses, and recreational

facilities. Several properties are accessible only by existing bridge crossings of the canal so construction would be highly impactful.

6.3 Indirect Impact Assessment Methods

Indirect impacts are changes to transportation service levels and functionality based on how the project alternatives would affect existing and future transportation infrastructure in the Project Area. No indirect impacts are expected from the Pilot Butte Canal Piping Project, as no long-term direct impacts were identified in Section 6.1.

6.4 Cumulative Impact Assessment Methods

The cumulative impacts analysis addressed the long-term and short-term cumulative impacts of the project alternatives. Other projects considered in the analysis included major transportation, development, utility infrastructure, and environmental enhancement projects recently constructed, under development, or scheduled for construction, as well as the planned projects that are reasonably likely to be constructed.

No cumulative impacts are expected from the Pilot Butte Canal Piping Project. Once the Project is completed, transportation facilities would be returned to preconstruction conditions or would be replaced meeting current design standards.

7. ENVIRONMENTAL CONSEQUENCES

7.1 Long-Term Impacts

7.1.1 No Action Alternative

Under the No Action Alternative, there would be no changes or impacts to transportation facilities.

7.1.2 Modernization Alternative (Full Piping)

Long-term impacts from the Pilot Butte Canal Piping Project are not expected. Transportation infrastructure would be replaced to match existing conditions or would be improved to meet current design standards. With the removal of the open channel canal, several bridge crossings would no longer be needed and could be removed, including the two BNSF Railroad bridges over the open canal. This would be a positive impact in reducing long-term maintenance costs for the owner.

7.1.2.1 Deschutes County/North Bend Options

No Modernization within this Segment (No Piping)

Under the No Modernization within this Segment option, there would be no changes or impacts to transportation facilities.

Pilot Butte Canal Alignment (Existing Canal Route)

The existing COID bridge crossing at Old Deschutes Road would be removed during construction and infilled to maintain the roadway grade. This would maintain the existing connectivity for the residences along Old Deschutes Road north of the existing canal crossing. The new crossing would sit on top of the pipe and would look like a continuous road surface to the traveling public. Removing the bridge would be a positive impact as it would lessen long-term maintenance costs.

NE 18th Street Option

Cooley Road and NE 18th Street would require half-street to full-street roadway reconstruction due to the large pipe diameter. Reconstruction to meet City of Bend standards for a minor arterial would require widening the road to create a consistent median, adding striped bike buffers, and installing consistent landscape strips and wider sidewalks. Additionally, there are several noncompliant curb ramps along the corridor that would need to be replaced.

Old Deschutes Road Option

Old Deschutes Road would require half-street to full-street roadway reconstruction due to the large pipe diameter. Reconstruction to meet Deschutes County standards for a local road would require widening the paved roadway to a width of 20 feet with 2-foot-wide gravel shoulders. The widening would bring the road up to current design standard. The existing COID bridge crossing would need to be removed and infilled to maintain the roadway elevation. This would maintain the existing connectivity for the residences along Old Deschutes Road north of the existing canal crossing. The new crossing would sit on top of the pipe and would look like a continuous road surface to the traveling public. This would be a positive impact in reducing long-term maintenance costs for the owner.

7.1.2.2 City of Redmond Options

No Modernization within this Segment (No Piping)

Under the No Action Alternative, there would be no changes or impacts to transportation facilities.

Pilot Butte Canal Alignment (Existing Canal Route)

The existing Homestead Canal Trail may require reconstruction or resurfacing due to the large diameter of the pipe; changes would depend on its proximity to construction activities. The existing bridges at NW Fir Avenue, NW Greenwood Avenue, NE Hemlock Avenue, NW Kingwood Avenue, and private access to Country Side Living would need to be removed and infilled to maintain connection. This would be a positive impact in reducing long-term maintenance costs for the owner.

Piping to the East in the Watermaster's Access Road

The existing Homestead Canal Trail may require reconstruction or resurfacing due to the large diameter of the pipe; changes would depend on its proximity to construction activities. The existing bridges at NW Fir Avenue, NW Greenwood Avenue, NE Hemlock Avenue, NW Kingwood Avenue, and private

access to Country Side Living would need to be removed and infilled to maintain connection. This would be a positive impact in reducing long-term maintenance costs for the owner.

Piping to the west within Northwest Canal Boulevard

Northwest Canal Boulevard would require half-street to full-street roadway reconstruction due to the large pipe diameter. Reconstruction to meet City of Redmond standards for a minor arterial would require widening the street and replacing the sidewalk. There are also several noncompliant or missing curb ramps along the corridor that would need to be constructed.

The existing bridges at NW Fir Avenue, NW Greenwood Avenue, NE Hemlock Avenue, NW Kingwood Avenue, and private access to Country Side Living would need to be removed and infilled to maintain connection. This would be a positive impact in reducing long-term maintenance costs for the owner.

7.2 Construction Impacts

7.2.1 Modernization Alternative (Full Piping)

7.2.1.1 Project Area

Construction of the Piping of the PBC would be a high impact to the existing roadway and BNSF Railway crossings of the canal. Details of the crossings are contained in Table 2.

Table 9 is a summary of the types of crossings.

Table 9. Crossing Types

Crossing Types/Roadway Classifications	Number of Crossings
Rail	2
State Highway	3
Arterial	6
Collector	6
Local	16
Private	11

Railroad Crossings

There are two existing active railroad crossings of the PBC. Construction would be challenging around these crossings, and coordination with BNSF Railway should begin as soon as possible to further understand the constraints.

1. BNSF Railway crossing near US 97 and Butler Market Road. Preliminary plans identify the bridge slab as being removed and replaced with existing footings and abutments protected in place. Removing the rail bridge slab would require a diversion or “shoo-fly” of train tracks to maintain active train traffic. A shoo-fly is constrained by an at-grade roadway crossing at Butler Market Road, approximately 700 feet to the south. There is also an existing rail overcrossing at Empire Avenue

located approximately 4,000 feet to the north. Additionally, space is constrained by US 97 and power transmission lines to the west and industrial businesses to the east. Such a diversion would be a significant cost and schedule impact to the Project.

2. BNSF Railway crossing near NE King Way. Preliminary plans identify the bridge as being removed and the trench backfilled. Removing the rail bridge would require a diversion or “shoo-fly” of train tracks to maintain active train traffic. A shoo-fly is constrained by an existing at-grade roadway crossing at King Way, 180 feet to the north. Additionally, to the south, space is constrained by US 97 to the west and housing to the east. Such a diversion would be a significant cost and schedule impact to the Project.

State Highway Crossings

Of the existing roadway crossings, US 97 crosses the PBC three times. US 97 in Oregon is a state highway owned by ODOT. US 97 is a critical north-south highway in Central Oregon and supports 24,000 to 50,000 vehicles a day. Installation of the pipe would need to be staged to avoid full closures, as there is no alternate route of this classification. Typically, traffic would be detoured on the same or higher classification of roadway to maintain operations. Night work would also be considered to limit impacts to traffic.

Arterial, Collector, and Local Roadway Crossings

As listed in Table 2, there are many public roadway crossings of the existing canal. These public roadways range in classification from local to arterial. Typically, traffic would be detoured on the same or higher classification of roadway to maintain operations. For arterials and collectors, this may require lengthy out-of-direction travel to route to the nearest alternative route. Local roads often have more options for alternative routes and may have shorter, less impactful detours.

Improvements would need to be coordinated with the City of Bend, City of Redmond, or Deschutes County to identify opportunities to combine projects or avoid overlapping projects. Several of the crossing locations coincide with future projects identified by local TSPs. Note that the City of Bend does not allow pavement cuts (openings in the pavement) in pavement sections that are 5 years old or less, and the City of Redmond does not allow pavement cuts in pavement sections that are 2 years old or less.

Private Road Crossings

As listed in Table 2, several of the existing canal crossings are on privately owned roads. These are a challenge as the property may not be accessible by another route. Construction staging would need to be developed to maintain access to these properties, and work may include constructing a temporary bridge or temporary access overtop already installed pipe sections.

7.2.1.2 Deschutes County/North Bend Option

No Modernization within this Segment (No Piping)

Under the No Action Alternative, there would be no changes or impacts to transportation facilities.

Pilot Butte Canal Option

Destinations

This alternative would not impact destinations that attract higher traffic volumes, such as the schools along NE 18th Street.

Planned Improvements

This alternative would overlap with one project identified by Deschutes County on the 2023 TSP (see Table 10).

Table 10. Planned Improvements – Pilot Butte Canal Option

Agency	Project Description	Expected Time Frame	Expected Budget
Deschutes County	TSP Project BR-10: Replacement of Pilot Butte Canal Bridge.	11–20 years	\$400,000

TSP = transportation system plan

Detour Routes

Below is a description of the vehicle and pedestrian detour routes that would be needed for construction of the pipe alignment.

Vehicles

This alternative would have minimal impact to traffic with the exception of the existing Old Deschutes Road bridge crossing which provides neighborhood connectivity. If the bridge requires a full closure during construction, traffic could be detoured to Scottsdale Drive and Yeoman Road to provide local access.

Pedestrians and Cyclists

There are sections of existing dirt and gravel road or trail parallel to the canal, but the trail is not continuous. The trail should be clearly marked as closed, but a detour would likely not be needed.

NE 18th Street Option

Destinations

This alignment touches the following traffic generators, which attract higher-than-typical neighborhood traffic volumes:

- Sky View Middle School
- Lava Ridge Elementary School
- Rockridge Community Park
- Industrial area on the east leg of the Cooley Road and NE 18th Street roundabout
- Lava Ridge Natural Area and connecting trails

Planned Improvements

This alternative overlaps with several projects identified by the City of Bend TSP and the Deschutes County TSP (see Table 11).

Table 11. Planned Improvements – NE 18th Street Option

Agency	Project Description	Expected Time Frame	Expected Budget
City of Bend	TSP Project C-23: NE 18th Street arterial corridor upgrade from Cooley Road to Butler Market Road, includes upgrade to three-lane arterial.	11–15 years	\$7.8 million
City of Bend	TSP Project C-1: Yeoman Road extension from NE 18th Street to western terminus, includes two-lane extension and bridge to cross canal.	1–10 years	\$5 million
City of Bend	Extension of Cooley Road east of NE 18th Street terminus.	Not identified	Not identified
Deschutes County	Extension of Cooley Road from urban growth boundary to Deschutes Market Road.	11–20 years	\$2.9 million

TSP = transportation system plan

Detour Routes

The following vehicle and pedestrian detour routes would be needed for construction of the pipe alignment.

NE 18th Street

Due to the large pipe diameter, NE 18th Street would need to be fully closed during construction for half-street to full-street reconstruction. As NE 18th Street is a minor arterial, the nearest north-south alternative route is US 97. Traffic could be detoured between Cooley Road and Empire Avenue from Cooley Road to US 97. This route is approximately 3 miles out of direction. This would require coordination with the City of Bend to determine acceptable traffic delays.

Additionally, local access would need to be accommodated. There are two areas of housing that are accessible only via NE 18th Street. Royal Oak Circle provides access to seven properties and would need to be accessible at all times. Cross streets Canal View Drive, Brightwater Place, and Bridgewater Drive provide access to 61 properties. At least one of these intersections would need to be accessible at all times. The remaining cross streets (Egypt Drive, Scottsdale Drive, Rorick Drive, Top Knot Lane, and Morningstar Drive) could be accessed by way of Boyd Acres or Old Deschutes Road and could therefore be fully closed.

Cooley Road

The proposed pipe alignment is east of the NE 18th Street and Cooley Road roundabout. Cooley Road terminates approximately 1,000 feet east of the NE 18th Street and Cooley Road roundabout. Construction impact would be minimal as this section does not have through traffic. However, access for employees and deliveries to the industrial area would need to be maintained. The proposed pipe alignment should aim to reduce impacts to the roundabout by staying out of the roundabout.

Yeoman Road

The section of Yeoman Road that would be impacted is currently a pedestrian- and bicycle-only path. Construction would not impact vehicle traffic.

Pedestrians

The schools, park, and nearby trails make NE 18th Street an important corridor for pedestrians. Construction staging would need to consider maintaining sidewalks on one side of NE 18th Street to maintain a pedestrian access route. Otherwise, pedestrians would need to be routed through neighborhoods which may require curb ramp upgrades and sidewalk infills to provide a complete route; this would add significant out-of-direction travel. The dirt path between NE 18th Street and Yeoman Road is identified as a trail by Bend Parks and Recreation and could act as a connection to Ponderosa Elementary School to the east. A detour for pedestrians and bicycles could be provided by routing south to Empire Avenue which may add up to 1 mile of out-of-direction travel.

Old Deschutes Road Option

Destinations

This route touches the following traffic generators, which attract higher-than-typical neighborhood traffic volumes.

- Ponderosa Elementary School
- Lava Ridge Natural Area and connecting trails

Planned Improvements

This alternative overlaps with one project identified by the City of Bend TSP (see Table 12).

Table 12. Planned Improvements – Old Deschutes Road Option

Agency	Project Description	Expected Time Frame	Expected Budget
City of Bend	TSP Project C-1: Yeoman Road extension from NE 18th Street to western terminus, includes two-lane extension and bridge to cross canal	1–10 years	\$5 million

Detour Routes

The following vehicle and pedestrian detour routes would be needed for construction of the alignment.

Old Deschutes Road

Old Deschutes Road would be impacted from the Yeoman Road intersection to the northern terminus. Because Old Deschutes Road dead ends, a detour for through traffic would not be required. However, several residences are accessible only from Old Deschutes Road. From a review of tax lot maps, at least 35 properties have accesses directly from Old Deschutes Road, and an additional 28 depend on local road access directly from Old Deschutes Road. Due to these accesses, construction would need to occur in stages that allow for short local detours and access for residents. Local detours could be used to redirect traffic for homes that are accessible from Scottsdale Drive and Overtree Road.

Yeoman Road

The section of Yeoman Road that would be impacted is a collector road, but because the road does not connect to NE 18th Street, through traffic is not expected. There are several driveways along the south side for which access would need to be maintained through construction. An alignment of the proposed pipeline route along the north side could be considered to minimize access impacts.

Pedestrians

The existing Old Deschutes Road does not have pedestrian facilities. ODOT standards state that the temporary pedestrian route must provide a pathway that meets or exceeds the existing level of accessibility. Given this, a section of the existing asphalt could be protected in place to allow pedestrian access. Yeoman Road has existing sidewalk along the south side; therefore, the sidewalk would need to be maintained or the existing sidewalks through the neighborhood could be used for a pedestrian detour. The dirt path between NE 18th Street and Yeoman Road is identified as a trail by Bend Park and Recreation District and could serve as a connection to Ponderosa Elementary School to the east. A detour for pedestrians and bicycles could be provided by routing south to Empire Avenue which could add up to 1 mile of out-of-direction travel.

7.2.1.3 City of Redmond Option

No Modernization within this Segment (No Piping)

Under the No Action Alternative, there would be no changes or impacts to transportation facilities.

Pilot Butte Canal Alignment (Existing Canal Route)

Destinations

This alignment touches the following traffic generators, attracting higher-than-typical neighborhood traffic volumes.

- Homestead Park
- Country Side Living – Memory Care
- Cascade Foot Clinic
- Rebound Physical Therapy

Planned Improvements

This alternative does not overlap with projects identified in the City of Redmond's TSP. However, there are projects in the vicinity of NW Canal Boulevard that should be coordinated with the City (see Table 13).

Table 13. Planned Improvements

Agency	Project Description	Expected Time Frame	Expected Budget
City of Redmond	Project TRA145: N Canal – Kingwood to Maple Reconstruction: Street and water improvements of NW Canal Boulevard from Kingwood Avenue to Maple Avenue.	5–10 years	\$1.1 million

Agency	Project Description	Expected Time Frame	Expected Budget
City of Redmond	Project WW118: North Canal Sewer Replacement: Replace old asbestos pipe sewer line in NW Canal Boulevard.	1–2 years	\$200,000
City of Redmond	NW 4th Street and Greenwood Waterline Replacement: Replace old steel waterlines on NW 4th Street from Elm Avenue to Hemlock Avenue and NW Greenwood from 5th Street to NW Canal Boulevard.	1–5 years	\$1.2 million

Detour Routes

The following vehicle, pedestrian, and bicycle detour routes would be needed for construction of the alignment.

Vehicles

A detour route for through traffic on NW Canal Boulevard would not be needed for this alternative if construction activities stay outside of the City of Redmond’s right-of-way. However, there are 10 canal crossings in this section. Several properties are dependent on these bridges as they are located between US 97 and the canal. Construction staging or temporary bridges would be required to maintain access to these properties. Larch Avenue is a right-in entrance and right-out exit onto US 97, so removal of the bridge would require a detour of highway traffic. Traffic could be routed to the 6th Street interchange, approximately 1 mile north, or to the Antler Avenue right-in entrance and right-out exit, approximately 0.9 mile south.

Pedestrians

The Homestead Canal Trail parallels the PBC from NW Dogwood Avenue to NW Quince Avenue. Through construction, the trail could be fully closed with pedestrians routed to the west side of NW Canal Boulevard. This could require curb ramp upgrades and sidewalk infill to complete a pedestrian route.

Bicycles

Cyclists intending to use the Homestead Canal Trail could be routed to existing bike lanes on NW Canal Boulevard.

Piping to the East in the Watermaster’s Access Road

Destinations

This route touches the following traffic generators, attracting higher-than-typical neighborhood traffic volumes:

- Homestead Park
- Country Side Living – Memory Care
- Cascade Foot Clinic
- Rebound Physical Therapy

Planned Improvements

This alternative does not overlap with projects identified in the City of Redmond's TSP. However, there are projects in the vicinity of NW Canal Boulevard that should be coordinated with the City (see Table 13).

Detour Routes

The following vehicle, pedestrian, and bicycle detour routes would be needed for construction of the alignment.

Vehicles

A detour route for through traffic on NW Canal Boulevard would not be needed for this alternative if construction activities stay out of City of Redmond right-of-way. However, there are 10 canal crossings in this section. Several properties are dependent on these bridges as they are located between US 97 and the canal. Construction staging or temporary bridges would be required to provide access to these properties. Larch Avenue is a right-in entrance and right-out exit onto US 97, so removal of the bridge would require a detour of highway traffic. Traffic could be routed to the 6th Street interchange, approximately 1 mile north, or to the Antler Avenue right-in entrance and right-out exit, approximately 0.9 miles south.

Pedestrians

The Homestead Canal Trail parallels the PBC from NW Dogwood Avenue to NW Quince Avenue. Through construction, the trail could be fully closed with pedestrians routed to the west side of NW Canal Boulevard. This could require curb ramp upgrades and sidewalk infill to complete a pedestrian route.

Bicycles

Cyclists intending to use the Homestead Canal Trail could be routed to existing bike lanes on NW Canal Boulevard.

Piping to the West within Northwest Canal Boulevard

Destinations

This route touches the following traffic generators, attracting higher-than-typical neighborhood traffic volumes:

- Homestead Park
- Country Side Living – Memory Care
- Rebound Physical Therapy
- Kingdom Hall of Jehovah's Witnesses
- High Lakes Health Care
- St. Charles Redmond
- Chiropractic Associates
- Central Cascade Medical Campus
- Walmart Supercenter

- Red Rock Shopping Center
- Home Depot
- TEC Equipment Redmond
- Redmond Triangle
- Aspen Villas

Planned Improvements

This alternative overlaps with projects identified in the City of Redmond's TSP (see Table 13).

Detour Routes

The following vehicle, pedestrian, and bicycle detour routes would be needed for construction of the alignment.

Vehicles

Pipe installation, utility relocations, and street reconstruction would require a full closure, and a detour for through traffic on NW Canal Boulevard would be needed for this alternative. The detour route could use NW 5th Street and NW 6th Street which parallel NW Canal Boulevard approximately 0.25 mile to the west. Since 5th and 6th Streets share the same cross streets as NW Canal Boulevard, all side street traffic could be routed this way.

There are several properties including single residences, apartment complexes, businesses, and medical services along both sides of the street that are accessible only from NW Canal Boulevard. Most notably, the exit for the St. Charles Emergency Room is on NW Canal Boulevard. This is a critical driveway that is needed to maintain access to emergency services. Access to these properties would need to be provided through the detour. Along the east, there are 10 canal crossings in this section. Access for several properties depends on these bridges as the properties are locked in between US 97 and the canal. Construction staging or temporary bridges would be required to provide access to these properties. Larch Avenue is a right-in entrance and right-out exit to US 97, so removal of the bridge would require a detour of highway traffic. Traffic could be routed to the 6th Street interchange, approximately 1 mile north, or to the Antler Avenue right-in entrance and right-out exit, approximately 0.9 mile south.

Pedestrians

The network of existing sidewalks along NW Canal Boulevard is inconsistent. From Dogwood Avenue to Larch Avenue, there is no sidewalk along the east side and intermittent sidewalk on the west side. Due to the lack of existing facilities, a detour would not need to be provided. From Larch Avenue to Quincy Avenue, there is sidewalk along the west side and the Homestead Canal Trail meanders close to the roadway on the east side. The trail would need to be clearly marked that it is closed, and pedestrians would be routed to local streets. This may require curb ramp upgrades and sidewalk infill to complete a pedestrian route.

Bicycles

With existing conditions, cyclists can use the Homestead Canal Trail, intermittent bike lanes, or the travel lane on NW Canal Boulevard. If NW Canal Boulevard is closed to through traffic, cyclists could also be detoured to local streets.

7.2.2 Potential Off-Site Staging Areas

The construction contractor may use one or more off-site staging areas outside the Study Area to store or assemble materials that would then be transported by truck to the construction site. Off-site staging could occur with any of the alternatives. Whether, where, and how to use such sites would be the choice of the contractor; therefore, the actual site or sites cannot be known at this time. Given this uncertainty, detailed analysis of impacts is not possible at this time. It is assumed that because of regulatory and time constraints on the contractor, any site they choose would need to be already developed with road access. It is also assumed that the contractor would be responsible for relevant permitting or mitigation that could be required for use of a chosen site. The EIS identifies the types of impacts that could occur from off-site staging, based on the above assumptions. This analysis is not intended to “clear” any specific site, but rather to ensure disclosure of the general types of impacts.

If a contractor chooses to use an off-site staging area, the following local, state and federal regulations could apply:

- When selecting an off-site staging area, vehicle trips added to the existing facilities should be considered. Continual use of construction vehicles may increase the rate of pavement wearing. Depending on the number of vehicles and trips per day, this may add trip delay.

7.3 Cumulative Effects

No cumulative impacts are expected from the Pilot Butte Canal Piping Project related to transportation facilities. Transportation infrastructure would be replaced to match existing conditions or improved to meet current design standards.

7.4 Compliance with Laws, Regulations, and Standards

Roadway reconstruction would need to comply with City of Bend, City of Redmond, Deschutes County or ODOT standards as applicable or request the appropriate design deviations. Standards are listed in Section 4.2.

Table 14 lists the permits likely needed for construction.

Table 14. Permitting Requirements

Agency	Permit
City of Bend (City of Bend 2020)	Tier 3 Right-of-Way Permit
City of Redmond (City of Redmond 2024b)	Site Development Permit
Deschutes County (Deschutes County 2024c)	Public Right-of-Way Permit
Oregon Department of Transportation (ODOT Maintenance and Operations 2024)	Permit to Occupy or Perform Operations on a State Highway Rail Right-of-Way Permit Application for Pipeline Crossing or Longitudinal
BNSF (ODOT Public Transportation 2024)	Temporary Occupancy Permit Utility Crossing Permit

7.5 Conclusion

During construction of the Pilot Butte Canal Piping Project, traffic throughout Central Oregon would be significantly impacted. There are several existing canal crossings that would be removed requiring detours for vehicles, cyclists, and pedestrians. Additionally, pipe alignment options to the historical segments may increase impacts to traffic. However, the Project would only be impactful during construction. As described in Section 2 of this technical report, the construction at any one location would occur over a single non-irrigation (winter) season. Long-term impacts to transportation facilities are not expected from the Project.

8. MITIGATION MEASURES

8.1 Common to Piping

Impacts to traffic due to construction cannot be avoided due to the nature of the Project. Measures would be taken to appropriately detour traffic and coordinate with other nearby projects. Maintenance of traffic plans would be developed as part of final design. This would include wayfinding signs for alternative vehicle and pedestrian routes around the construction zones. Additionally, nearby landowners and residents would be notified of planned construction activities affecting their access.

9. CONTACTS AND COORDINATION

No individuals or organizations were contacted as part of the preparation of this technical report.

10. PREPARERS

Name	Professional Affiliation	Education	Years of Experience
Kendra Ely, PE	Parametrix	BS, Civil Engineering Professional Engineer, OR - Civil	8
Jessie Rykels-Wilson, PE	Parametrix	BS, Civil Engineering Professional Engineer, OR - Civil	17

11. REFERENCES

- BNSF Railway. 2024. Utility Accommodation Policy. Accessed February 28, 2024.
<https://www.bnsf.com/bnsf-resources/pdf/about-bnsf/utility.pdf>.
- City of Bend. 2020. Right-of-Way Permits and Traffic Control Plans Quick Reference Guide. Accessed February 28, 2024.
<https://www.bendoregon.gov/home/showpublisheddocument/47887/637390489984470000>.
- City of Bend. 2020. Transportation System Plan. Accessed February 28, 2024.
<https://www.bendoregon.gov/city-projects/transportation-system-plan>.
- City of Bend. 2023. 2023 Standards and Specifications. Accessed February 28, 2024.
<https://www.bendoregon.gov/government/departments/engineering/standards-and-specifications>.
- City of Bend. 2023. Capital Improvement Program. Accessed February 28, 2024.
<https://www.bendoregon.gov/home/showpublisheddocument/56185/638231264422400000>.
- City of Bend. 2024. Bend Data Viewer. Accessed February 28, 2024.
<https://experience.arcgis.com/experience/34a4bc300bfe4f028929b2c708b8e175>.
- City of Redmond. 2010. Public Works 2010 Standards and Specifications. Accessed February 28, 2024.
<https://www.redmondoregon.gov/home/showpublisheddocument/24232/638072096675700000>.
- City of Redmond. 2020. Transportation System Plan. Accessed February 28, 2024.
<https://www.redmondoregon.gov/home/showpublisheddocument/24042/637998884772900000>.
- City of Redmond. 2024a. Capital Improvement Program. Accessed February 28, 2024.
<https://www.redmondoregon.gov/government/departments/engineering/capital-improvement-projects>.
- City of Redmond. 2024b. Engineering Applications. Accessed February 28, 2024.
<https://www.redmondoregon.gov/government/departments/engineering/engineering-applications>.
- Deschutes County. 2012. Deschutes County Transportation System Plan 2010–2030. Accessed February 28, 2024.
https://www.oregon.gov/ODOT/Planning/TPOD/tsp/county/county_of_deschutes_tsp_2012.pdf.
- Deschutes County. 2023. Deschutes County Transportation System Plan. Accessed February 28, 2024.
<https://www.deschutescountytsp.com/>.
- Deschutes County. 2024a. Deschutes County Data Portal. Accessed February 28, 2024.
<https://data.deschutes.org/search?tags=transportation%2520features>.
- Deschutes County. 2024b. Deschutes County Property Information. Accessed February 28, 2024.
<https://dial.deschutes.org/Real/InteractiveMap>.

Deschutes County. 2024c. Right of Way Activity Permit – Online Application. Accessed February 28, 2024. <https://weblink.deschutes.org/Forms/UtilityRowPermit>.

Deschutes County. 2024d. Standards and Specifications. Accessed February 28, 2024.
<https://www.deschutes.org/road/page/standards-and-specifications>.

Deschutes County Road Department. 2021. Deschutes County Road Atlas. Accessed August 22, 2023.
https://www.deschutes.org/sites/default/files/fileattachments/road/page/538/compiled_atlas_2021.pdf.

Deschutes County Road Department. 2023. Road Capital Improvement Plan Fiscal Years 2024–2028. Accessed February 28, 2024.
https://www.deschutes.org/sites/default/files/fileattachments/road/page/15971/cip_report_-_final_051523.pdf.

NRCS, USDA (Natural Resources Conservation Service, United States Department of Agriculture). 2020. Smith Rock-King Way Infrastructure Modernization Project. Available at
<https://img1.wsimg.com/blobby/go/4c8b915d-c9c0-4a10-86d6-3ac6eb749f65/downloads/COID%20Final%20Plan%20EA%207.8.2020_compress.pdf?ver=1608009561477>. Accessed October 8, 2023.

ODOT (Oregon Department of Transportation). 2024. Oregon Traffic Monitoring System. Accessed February 28, 2024. <https://ordot.public.ms2soft.com/tcds/tsearch.asp?loc=Ordot&mod=TCDS>.

ODOT Maintenance and Operations. 2024. Permits. Accessed February 28, 2024.
<https://www.oregon.gov/odot/maintenance/pages/permits.aspx>.

ODOT Public Transportation. 2024. Email Forms and Publications. Accessed February 28, 2024.
<https://www.oregon.gov/odot/rptd/pages/rail-forms.aspx>

State of Oregon. 2024. Oregon.Gov Open Data Portal. Accessed February 28, 2024.
<https://data.oregon.gov/dataset/Milepost-Map/5hxa-j63r>.