

City of Bend – 2017 Bridge Program Update

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Overall Condition of City Bridges

The City of Bend’s bridges are generally in good condition with sufficiency ratings, ranging from 57 to 98 with an average of 84. The sufficiency rating is a composite assessment between 0 and 100 considering structural, condition and geometric bridge issues. Of the 32 bridges routinely inspected, only the two Deschutes River bridges on Archie Briggs Road and the Main COI, American Lane Road pedestrian/bicycle bridges are rated as structurally deficient. Structurally deficient bridges require load posting or closing to vehicular traffic.

Background

There are over 150 bridges and culverts within the Bend area fire district, DCRFPD #2. Many of these bridges are within the City of Bend Urban Growth Boundary and are owned by the city. Only 29 of these bridges are on the National Bridge Inventory (NBI). For a bridge to be part of the NBI, it must carry traffic or be used to move loads and be at least 20’ long. A more precise definition is established by the FHWA as:

“A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.”*

The Oregon State Department of Transportation (ODOT) is responsible for inspecting NBI bridges every 24 months. The inspection reports include an overall sufficiency rating, condition ratings, deficiencies, and maintenance recommendations. It is the city’s responsibility to perform the maintenance on all city-owned bridges. Bridges with low sufficiency ratings are eligible for grant funding through the Highway Bridge Program (HBP) for rehabilitation or replacement. Through the HBP, bridges with sufficiency ratings less than 80 may be considered for rehabilitation and bridges with sufficiency ratings less than 50 may be considered for replacement.

Privately owned, bicycle/pedestrian only and bridges or culverts less than 20 feet in length are not part of the NBI. The city must inspect and maintain city-owned small bridges and culvert crossings.

Program Update & Tracking Database

In 2012 the city developed a Bridge Program. The primary objective of the bridge program is to provide an inventory of all bridges within the Urban Growth Boundary of the City of Bend, their ownership, their condition, and their maintenance needs. The initial effort included populating the City's GeoBlade GIS System with current condition data and tracking information. From that GIS System, in 2012, the city prepared a Bridge Program Annual Report that collected and summarized the sufficiency ratings, load ratings and maintenance needs for city-owned bridges.

This 2017 program update has been commissioned to develop a better tool to track local bridge information, as well as update the rating, condition and inspection data. In the past, non-NBI and pedestrian/bicycle bridges have not been routinely inspected and maintenance has not been well documented. To mitigate potential risks and better program maintenance needs, approximately 20 bike/pedestrian and city-owned canal crossings were observed in the field and recommendations incorporated into a new Bridge Information Tool. This program update will also be used to help plan and prioritize improvements on the City's bridges.

Bridge Summary

The City of Bend owns 29 bridges that are part of the national bridge inventory, and four other smaller bridges that are routinely inspected. There are also several culvert crossings that are not routinely inspected. Table 1 provides a summary of the sufficiency and load ratings for the bridges owned by the City of Bend. This summary indicates that the City's bridges are typically in good condition (Sufficiency Ratings greater than 80) or fair condition (Sufficiency Ratings between 50 and 80) with operating load ratings adequate for legal trucks (80,000 lbs or 40 tons).

Table 1 – Sufficiency Ratings and Load Ratings for City-Owned Bridges

Bridge ID	Structure Name	Suff. Rating	Op. Rating (tons)	Inv. Rating (tons)	Load Rating Update Needed	Notes
18374	Pilot Butte Canal, Empire Blvd	98	80	48		
22935	Main COI, American Lane Rd (new)	97	75	45		
21153	Deschutes River, Mt. Washington Dr.	97	75	45	Yes	
3205-02	COI Canal, Bear Creek Rd #2	96.9	98	-	Yes	Non-NBI
18718	Pilot Butte Canal, Brinson Blvd	96.5	60	36		
18719	North Unit Main Canal, Brinson Blvd	96.5	60	36		
16372	Dirmain COI Canal, 15th St	96.4	70	39		
17C52	Arnold Canal, China Hat Rd	96.4	78	41		
19642	COI Main Canal, Brookwood Blvd	96.4	92	55		
3168-01	Arnold Canal, Knott Rd	95	47.2	-	Yes	Non-NBI
09C74A	North Unit Canal, Deschutes Market Rd	94.9	98	64		
16852	Deschutes River, Colorado Ave	94.3	81	49		
16853	Colorado Ave over Shevlin Hixon Dr.	94.3	72	43		
20669	Deschutes Southern River Crossing, Reed Market Rd	93	75	45		
09C60	COI Main Canal, Blakely Rd	92.1	91	55		
09815	COI Canal, 27th St SE	91.3	83	50		
17B002	Pilot Butte Canal, Division St	90.2	53	32		
15453A	COI Main Canal, Brosterhus Rd	85.3	97	58		
09C47A	COI Canal, Ferguson Rd	84.2	54	24		

Bridge ID	Structure Name	Suff. Rating	Op. Rating (tons)	Inv. Rating (tons)	Load Rating Update Needed	Notes
17C29	North Unit Main Canal, Purcell Rd	79.1	60	36		
20613	Deschutes River, Newport Ave	77.5	24.8	19.1	Yes	Rating appears to be for old bridge
17B001	North Unit Main Canal, Division St	76	49	29		
17B003	Deschutes River, Portland Ave	76	74	45		
17B005	Deschutes River, Galveston Ave	75.8	34	21	Yes	Update and/or confirm rating
3197-01	Arnold Canal, Benham Rd	74.2	-	-	Yes	Non-NBI
3199-01	COI Canal, Pettigrew Rd	73.8	-	-	Yes	Non-NBI
09409	North Unit Main Canal, Boyd Acres Rd	72.8	89	34		
09410	Pilot Butte Canal North, Boyd Acres Rd	71.3	87	32		
01134A	Central Oregon Canal, Hwy 4 Spur	70.7	86	52		
17C05	Deschutes River, Archie Briggs Rd	64.8	12	7		Load Posted Dec. 2016
17C38	Main COI, American Lane Rd	62	92	55		Converted to Bike/Ped – Nov. 2015
17C59	Empire Ave over BNRR	61.7	50	14	Yes	
17C040	Deschutes River, Archie Briggs Rd East	57.2	12	7		Load Posted Dec. 2016
	Tumalo Footbridge		N/R	N/R		Non NBI
	Mt. Washington Dr Footbridge		N/R	N/R		Non NBI
	Drake Footbridge		N/R	N/R		Non NBI
	Gilchrist Footbridge		N/R	N/R		Non NBI
	Colorado Ave Footbridge		N/R	N/R		Non NBI

Bridge Capital Improvements

The City Transportation System Plan (TSP) policies require bike facilities on collectors and arterials and this includes bridges on those roadways. The city's urban growth plan is dependent on increasing reliance on walking and biking for everyday transportation needs. As part of the UGB implementation plan, the city reviewed several bridges to determine level of effort necessary to create system connectivity for walking and biking routes. A preliminary design was conducted as part of this Bridge Program update to determine preliminary cost for providing adequate facilities for people walking and biking that included modifications to existing structures or entire structure replacements.

Table 2 provides a list of these needed improvements along with general priority with Priority A being the highest and Priority C being the lowest. The priority is expected to be refined further through the capital improvement planning process. About \$12 million of the estimated \$16 million cost below is attributed to replacing Archie Briggs and a new Hawthorne bike and walking bridge over the railroad and US97/Parkway.

Table 2 – Bridge Capital Improvement Projects

Structure Name	Work Item	Description	Priority	Est cost	Method
Drake Footbridge	Bridge Widening	Widening and deck replacement recommended per CH2M 08/08/16 Scoping report	A	\$1,203,000	Contract
Central Oregon Canal, Hwy 4 Spur	Bridge Widening	Improve bike/ped connectivity with widening to both sides. See CH2M 08/08/16 scoping report	A	\$969,000	Contract
COI Main Canal, Brosterhaus Rd	Bridge Widening	Widening or separate adjacent structure to provide ped/bike facility. See CH2M 08/08/16 scoping report	A	\$945,000	Contract
BNSF Over Franklin Ave	Other	Lighting, drainage, and screening improvements for the pathways. See CH2M 08/08/16 Scoping Report.	A	\$8,000	City Forces
Deschutes River, Archie Briggs Rd East	Replace	The City has been awarded \$700k in Federal Funds for replacement design.	A	\$3,000,000	Contract
Deschutes River, Archie Briggs Rd	Replace	The City has been awarded \$700k in Federal Funds for replacement design.	A	\$3,000,000	Contract
North Unit Main Canal, Purcell Boulevard	Bridge Widening	Widen both sides or construct separate bridge for bike/ped connectivity. See CH2M 08/08/16 Scoping Report.	B	\$853,500	Contract
BNSF Over Greenwood Ave	Other	Implement Complete Street Project with new walls and wider pathways. See CH2M 08/08/16 Scoping Report.	B	\$800,000	Contract
Hawthorne Ave Bike/Pedestrian Bridge	New Structure	New ped/bike bridge over BNSF and Bend Parkway. See CH2M 08/08/16 Scoping Report.	B	\$6,000,000	Contract
TOTAL				\$16,779,000	

Bridge Maintenance and Safety Needs

To maximize the structural life of the City's bridges it is important to monitor noted issues and maintain the bridges. Table 3 provides a prioritized summary of the current maintenance and safety needs on the City's Bridges. Priority A includes work that is urgent because of the severity of the need, or work for which the cost to benefit ratio is very attractive. Priority B includes work that is not as important for safety or for preservation, or where the cost benefit ratio may be less attractive. Priority C activities are not urgent and/or considerations for future work. These priorities are somewhat subjective. Table 3 includes \$73,000 in minor repair and cleaning work items that may be performed by City maintenance staff and \$947,000 in more specialized or extensive repairs that are expected to be performed by specialty contractors.

Table 3 – Bridge Maintenance and Safety Needs

Bridge ID	Structure Name	Work Item	Description	Prior.	Est. cost	Method
	Yeoman Footbridge over Pilot Butte Canal	Monitor Condition	Plans show spread footing on 3/4" rock. Structure crosses canal - footing is exposed with no undermining	A	\$0	City Forces
	Yeoman Footbridge over Pilot Butte Canal	Rail Repair	Add pedestrian rail to footbridge. Also fill holes in deck.	A	\$2,000	City Forces
15453A	COI Main Canal, Brosterhous Rd	Joint Repair	Repair leaking deck joints. Consider installing an asphaltic plug joint.	A	\$7,500	Contract
16852	Deschutes River, Colorado Ave	Joint Repair	Seal joints over bents	A	\$2,250	City Forces
17B001	North Unit Main Canal, Division St	Monitor Condition	Monitor all Concrete Girders for structural cracks	A	\$0	City Forces
17B002	Pilot Butte Canal, Division St	Monitor Condition	Monitor the wingwall movement at the NE wingwall	A	\$0	City Forces
17B003	Deschutes River, Portland Ave	Monitor Condition	Monitor scour at abutments	A	\$0	City Forces
17B003	Deschutes River, Portland Ave	Monitor Condition	Monitor for scour at interior bents	A	\$0	City Forces
17B003	Deschutes River, Portland Ave	Drain Cleaning	Clean debris from drains	A	\$300	City Forces
17B003	Deschutes River, Portland Ave	Approach Slab/Pavement Repair	Repair approach pavement - See 06/16/16 CH2M Memo	A	\$3,000	City Forces
17B003	Deschutes River, Portland Ave	Deck Overlay - Rigid	See 6/16/16 CH2M memo recommending SFC overlay	A	\$288,000	Contract
17B003	Deschutes River, Portland Ave	Sidewalk Repair	Duplicate Entry - Rebuild all sidewalk approaches, dowel into deck and old sidewalk to prevent settling	A	\$1,500	Contract
17B003	Deschutes River, Portland Ave	Sidewalk Repair	Repair settled sidewalks - See 6/16/16 CH2M memo	A	\$15,000	Contract
17B005	Deschutes River, Galveston Ave	Monitor Condition	Monitor interior pile caps for delamination	A	\$0	City Forces
17C38	Main COI, American Lane Rd	Monitor Condition	Monitor fatigue prone welds	A	\$0	City Forces
18374	Pilot Butte Canal, Empire Blvd	Rail Repair	Repair broken rail post	A	\$750	City Forces
20669	Deschutes Southern River Crossing Reed Market Rd	Bearing Repair	Replace missing anchor nuts, and remove steel bracket on bearings 1 & 2 at bent 1.	A	\$1,500	City Forces
	SUBTOTAL – A				\$321,800	
	Mt. Washington Dr Footbridge	Monitor Condition	3/14/17 - Minor scour east footing. Monitor for potential future repair.	B		
	Tumalo Footbridge	Monitor Condition	Monitor Deck Condition - Minor splitting evidence	B	\$0	City Forces
	Mt. Washington Dr Footbridge	Deck Cleaning	Clean Debris off top of ext slabs, P/S Concrete box girder	B	\$150	City Forces
	Mt. Washington Dr Footbridge	Substructure Concrete Repair	Seal settlement cracks, concrete pier wall	B	\$3,750	City Forces

Bridge ID	Structure Name	Work Item	Description	Prior.	Est. cost	Method
	Mt. Washington Dr Footbridge	Monitor Condition	Consider grinding AC to deck and installing a waterproofing membrane	B	\$30,000	Contract
09409	North Unit Main Canal, Boyd Acres Rd	Sidewalk Repair	Repair sidewalks and joints at corners. Consider sealing or replacing sidewalks.	B	\$7,500	Contract
09409	North Unit Main Canal, Boyd Acres Rd	Rail Repair	Rehab concrete rail	B	\$22,500	Contract
09410	Pilot Butte Canal North, Boyd Acres Rd	Sidewalk Repair	Repair sidewalks and joints at corners. Consider sealing or replacing sidewalks.	B	\$7,500	Contract
09410	Pilot Butte Canal North, Boyd Acres Rd	Rail Repair	Repair bridge rail and parapet	B	\$22,500	Contract
09815	COI Canal, 27th St SE	Deck Overlay - Flexible	Improve wearing surface on west southbound lane	B	\$37,500	Contract
09C60	COI Main Canal, Blakely Rd	Deck Repair	Repair ext slab ends, P/S Conc Box Girder	B	\$2,250	City Forces
09C60	COI Main Canal, Blakely Rd	Substructure Concrete Repair	Patch spalls at drift pins, concrete pier wall	B	\$3,000	City Forces
09C74A	North Unit Canal, Deschutes Market Rd	Substructure Concrete Repair	Patch spalls. Inject cracks at ends of walls with epoxy, Concrete Pier Wall	B	\$6,000	City Forces
15453A	COI Main Canal, Brosterhous Rd	Substructure Concrete Repair	Repair concrete spalls & delaminations, Concrete Abutment	B	\$7,500	City Forces
16372	Dirmain COI Canal, 15th St	Substructure Concrete Repair	Patch spalls, Concrete Abutment	B	\$2,250	City Forces
17B001	North Unit Main Canal, Division St	Concrete Girder Repair	Consider epoxy injection of all concrete cracks greater than 0.013 inches	B	\$15,000	Contract
17B002	Pilot Butte Canal, Division St	Approach Slab/Pavement Repair	Repair the shoulder erosion at the NE Shoulder under the guardrail	B	\$0	City Forces
17B005	Deschutes River, Galveston Ave	Approach Slab/Pavement Repair	Repair approach and deck pavement	B	\$7,500	City Forces
17B005	Deschutes River, Galveston Ave	Foundation Repair	Repair interior piles. Consider wrapping piles	B	\$12,000	Contract
17C040	Deschutes River, Archie Briggs Rd East	Scour Countermeasures	Awarded Federal Funding for replacement design. ODOT hydrologist to review item 113 (scour critical bridge)	B	\$0	Contract
17C05	Deschutes River, Archie Briggs Rd	Scour Countermeasures	Awarded Federal Funding for replacement design. ODOT hydrologist to review item 113 (scour critical bridge)	B	\$0	City Forces
17C29	North Unit Main Canal, Purcell Rd (previously Yeoman Rd)	Deck Repair	Patch spalls underside of P/S slabs	B	\$750	City Forces
17C29	North Unit Main Canal, Purcell Rd (previously Yeoman Rd)	Deck Overlay - Flexible	Consider grinding of some of the AC to reduce the dead load and help the rail height	B	\$7,500	Contract

Bridge ID	Structure Name	Work Item	Description	Prior.	Est. cost	Method
17C38	Main COI, American Lane Rd	Substructure Cleaning	Clean debris from girders and caps	B	\$750	City Forces
17C52	Arnold Canal, China Hat Rd	Approach Slab/Pavement Repair	Repair approach transitions	B	\$2,250	City Forces
17C52	Arnold Canal, China Hat Rd	Deck Overlay - Flexible	Repair wearing surface	B	\$3,000	City Forces
17C52	Arnold Canal, China Hat Rd	Substructure Concrete Repair	Patch Spalls	B	\$1,500	City Forces
20613	Deschutes River, Newport Ave	Approach Slab/Pavement Repair	Seal the pourable joints at the ends of the impact panels	B	\$3,000	City Forces
20669	Deschutes Southern River Crossing Reed Market Rd	Rail Repair	Repair post cap at south side rail	B	\$750	City Forces
20669	Deschutes Southern River Crossing Reed Market Rd	Deck Sealant	Seal deck cracks. See ODOT approved products list for suitable products. Recommend a flexible polymer (Percol)	B	\$30,000	Contract
21153	Deschutes River, Mt. Washington Dr.	Sidewalk Repair	Repair SW at SE	B	\$1,500	City Forces
	SUBTOTAL – B				\$237,900	
	Gilchrist Footbridge	Deck Repair	Worn timber deck not ADA compliant. Consider flexible topping or deck sanding. Also monitor west abutment concrete spalling and east abutment for scour.	C	\$7,500	City Forces
09410	Pilot Butte Canal North, Boyd Acres Rd	Deck Overlay - Flexible	Consider grinding AC to deck and installing a waterproofing membrane	C	\$30,000	Contract
09C74A	North Unit Canal, Deschutes Market Rd	Utilities	Consider improving the utility anchorage system	C	\$12,000	City Forces
17C59	Empire Ave over BNRR	Deck Overlay - Flexible	Consider grind, membrane, and overlay; 3/14/17 - Monitor staining under bent caps for signs of deterioration.	C	\$262,500	Contract
20613	Deschutes River, Newport Ave	Deck Overlay - Flexible	Consider a seal coat/protective wearing system to extend deck life	C	\$150,000	Contract
	SUBTOTAL – C				\$462,000	
	TOTAL				\$1,021,700	

Summary

In summary, the City of Bend's bridges are generally in good or fair condition but require inspection, maintenance and capital improvements to meet future needs. The number and condition of the City of Bend's bridges is similar to other Oregon communities. Currently, only the Archie Briggs Road bridges over the Deschutes River have been identified as structurally deficient and eligible for replacement funding under the federal Highway Bridge Program. However, many bridges would benefit from bridge preservation work, in particular maintenance and replacement of bridge joints.

Recommendations

Specific bridge program recommendations are:

- Complete rating of eight bridges that do not have current load ratings or have questionable existing load ratings. ODOT is in the process of updating load ratings for all NBI bridges but the rating of Non-NBI bridges would need to be performed by the City or its consultant.
- Develop a bridge-specific maintenance plan. This plan should identify preservation actions such as cleaning, joint maintenance, deck treatments, and repair of structural and non-structural components. The recommendations in the inspection reports, as summarized in the Bridge Information Tool, are a good basis for the maintenance plan. Note that preservation work is very cost-effective, as it avoids and minimizes capital expenditures.
- Develop a bridge-specific capital improvement plan. This can include bridge replacement, widenings, multi-modal provisions, and safety improvements such as bridge and approach rail improvements. While the improvement plan may be bridge-specific, the plan should be coordinated with the overall City transportation plan.
- Use the Bridge Program Update and Bridge Information Tool to prepare budgets for bridge maintenance and replacement.
- Use the Bridge Information Tool to track bridge work and associated costs. This includes comparing budgets to actual costs, which will improve the accuracy of future budgets.