TECHNICAL MEMORANDUM

Hawthorne Avenue Bridge

PREPARED FOR:	City of Bend, OR
COPY TO:	File
PREPARED BY:	John Hinman
DATE:	August 8, 2016
PROJECT NUMBER:	665109

The BNSF Railroad and the Bend Parkway cut through the City of Bend, limiting east-west movement of vehicles, bicycles, and pedestrians to a series of existing undercrossings. Many of these undercrossings have either substandard bicycle/pedestrian facilities or none at all.

No provisions are currently available for crossing at Hawthorne Avenue. 0.3 miles north of Hawthorne Avenue, the Greenwood Avenue undercrossing has only 4-foot-wide sidewalks, constrained between guardrail and the bridge abutments. The next undercrossing is NE Olney Avenue, 0.47 miles north of Hawthorne. NE Olney has bicycle lanes and narrow sidewalks.

0.27 miles south of Hawthorne Avenue, the Franklin Avenue undercrossing has narrow (5-feet-wide) and short (7-feet-tall) pedestrian tunnels and no bike lanes. The next undercrossing is Cascade Lakes Scenic Byway, 0.44 miles south of Hawthorne Avenue. Cascade Lakes Scenic byway has both sidewalks and bicycle lanes.

Project Purpose

The purpose of a project at Hawthorne Avenue Bridge is improvement of pedestrian and bicyclist safety by providing pedestrian and bicycle access across the BNSF Railroad and the Bend Parkway.

Alternatives Considered

Alternative 1 – Construct a Pedestrian Tunnel

This alternative consists of constructing a pedestrian underpass under both the BNSF right of way and the Bend Parkway. This tunnel would be approximately 200 to 210 feet long, portal to portal. Extensive ramps would be required to transition from existing ground to the tunnel invert.

Pedestrian tunnels are not viewed favorably in the United States. They are frequently isolated from view, which contributes to a perception that users may not be safe. The width of the tunnel can range from 10 feet to 14 feet, not including shy distance from the main path to the edges. Considering the length of the tunnel, a wider passageway would be desirable. The tunnel would have a clear height of 10 feet. The roof of the tunnel would be at least a few feet below the grade of the Bend Parkway and railroad.

Undercrossings at railroads are much more expensive than overcrossings, due to the need to construct shoofly structures and to rebuild tracks. Even without railroad involvement, excavation and construction of tunnels costs more than do bridge structures.

Underground structures require more maintenance than do overcrossings. Lighting, cleaning, security, drainage and dewatering, and ventilation are required. All of these elements add to construction costs and require on-going maintenance and operations costs.

Access to the tunnels would involve ramps with switchbacks get from the existing ground to the tunnel portals. Ramps must comply with the Americans with Disabilities Act (ADA). The ADA requires ramps to be constructed with 30-ft horizontal runs separated by horizontal landings that are at least 5 feet long. Each run can rise no more than 2.5 feet. Over multiple runs, this is an average slope of approximately 7%. To descend 18 feet below grade would require horizontal runs of ramps totaling at least 275 feet at each end.

Vacant lots are available to construct stairs and ramps. The lot on the west side is only about 0.10 acres, making it difficult to fit the necessary ramps into the available space. The lot on the east side is much larger, providing more options for layout of the ramps.

Tunnels can be extremely expensive per square foot of plan area. In addition, the involvement of the railroad increases engineering, agency review, and construction time and costs. However, the ramps leading to the portals would be less expensive per square foot than the tunnel. Cost of this alternative is over $10,000,000, including design, construction, rail road involvement, and construction engineering and inspection.

Alternative 2 – Construct a Pedestrian Overcrossing

This alternative consists of constructing an overcrossing, or bridge, to provide for bicycle and pedestrian traffic. A combination of ramps and stairs would be provided for access to the bridge deck. Screens and barriers would be provided to protect the railroad and the Bend Parkway from objects thrown by pedestrians.

The overall length of the overcrossing would be approximately 200 to 210 feet. A minimum width of 12 feet clear is recommended, and a width of 14 to 16 feet is preferred. The bottom of the structure would be a minimum of 17’-6” feet above the Bend Parkway, and 23’-6” above the railroad tracks. A pier would be constructed between the Bend Parkway and the railroad. Additional piers would occur at each end of the main crossing and as needed to support the ramps.

As with the tunnel, ADA mandates the use of ramps to meet accessibility requirements. Ramps adjacent to the Bend Parkway must total approximately 275 feet in length in order to provide clearance over the street. Ramps adjacent to the railroad must total approximately 345 feet in order to provide clearance over the tracks. This normally requires switchback ramps and would require acquisition of the adjacent lots same as for the tunnel alternative.

Given the length of ramps and switchbacks required, some of the ramps will have to be only 10 feet wide, especially over the west lot. ADA does allow the ramps to be less wide than the main bridge. The plan view shows a possible scheme where the overcrossing is longer than needed for crossing the parkway and railroad. The additional length allows the ramps to occupy as much of the lot at the west end as possible.

Cost of this alternative is approximately $5,000,000, including design, construction, rail road involvement, and construction engineering and inspection. This assumes that the square footage of the ramps would require structures comparable to the main spans (i.e., similar unit cost).

Recommendation

An overcrossing structure will be less costly to build and to operate than an undercrossing, and will be more likely to be used than an undercrossing. In the event that a pedestrian facility is proposed for the Hawthorne location, an overcrossing is the recommended approach.

As each alternative is expensive, further study of pedestrian/bicycle movement is warranted. Improvements of alternative routes, such as the Greenwood Avenue undercrossing, may be more cost effective.

Basis of Costs

Cost estimates included are Class 5 estimates as defined by ASTM E2516, *Standard Classification for Cost Estimate Classification System*. Class 5 estimates can be expected to have an accuracy range of approximately +100% to -50%.

PROJECT PROSPECTUS

Part 1 — Project Request (Page 1 of 2)

Key Number:	Jurisdiction:

Section:	Region:	Area:	District:
Pedestrian Overcrossing at Highway 97	4	Central Oregon	10

State Highway No.:	Highway Name:	Mile Point From:	To:	Length: (mi) (km)
	Highway 97			

Urban / Rural	City:	MPO:	Within UGB	County:	Road/Street Name:
☑ Urban ☐ Rural	Bend		☑ Yes ☐ No	Deschutes	NW Hawthorne Ave

Route No.:	NHS	HPMS:	FC:	Applicant (If other than State):
	☐ YES ☑ NO			City of Bend

US Congressional District:	State Senate District:	State Representative District:
Rep. Walden	Sen. Knopp	Rep. Whisnant

Cost Estimates (x $ 1,000)			Project Components		Right Of Way		
Preliminary Engineering		$768	Grading	x	Files	(#)	
Right Of Way		$100	Paving		Hectares	(#)	
Utility Reimbursement			Structures	x	Relocations	(#)	
			Signing		Acquisitions	(#)	2
Roadway	$23		Signals		Easements	(#)	
Structures	$2,268		Illumination		Work By: State / Consultant / Applicant		
Signals	$0				Preliminary Engineering	(S,C,A)	C
Illumination	$0				Construction Engineering	(S,C,A)	C
Temp. Protection	$20				Right of Way Descriptions	(S,C,A)	C
Const. Contingencies	$768				Right Of Way Acquisitions	(S,C,A)	C
Const. Engineering	$384		Project Categories		Constructed By		
Remove Exist Bridge	$0		Environmental Class (1, 2, 3, PCE)		☑ Contract ☐ County Force		
Other	$247		Design Category (1-7)		☐ State Force ☐ Other		
Total CE and Construction:		$3,710	Work Type Code (1-13)		☐ City Force		
Total Estimate:		$ 4,577	Primary STIP Work Type:	Bridge			
Recommended Let Date By Federal Fiscal Year (Quarter-Year):							

PE Fund:	R/W Fund:	UR Fund:	CE-CN Fund:
PE EA:	R/W EA:	UR EA:	CE-CN EA:

Item	Existing	Proposed
Travel Lanes (#)		
Structures (#)	0	1
Signals (#)	0	0
Bike Way (#)	0	1
Average Daily Traffic		
Year of ADT		
Throughway Y/N		

Define The Problem:

Hawthorne Avenue is discontinuous between Highway 97 and NE 1st Street. There are few adequate means for pedestrians and bicyclists to safely cross Highway 97 and the adjacent 4 tracks of railroad. Nearby roads which undercross the highway and railroad do not provide adequate recommended widths to accommodate pedestrians and bicyclists.

Describe Proposed Solution: - Attach Sketch Map

Construct a new pedestrian bridge across Highway 97 and railroad with the main spans totalling 235'. ADA-complaint ramps will use switchbacks to rise to the level of the main spans. Right-of-way must be obtained at the corner of NW Hawthorne and Highway 97 and NE 1st Street and the railroad. Main span width is 16' . To fit in proposed ROW, some of the ramps are only 10' wide (average width is 12.625')

Prepared By:	Date:	OTC Approval Date:	Program Year:	Funding Amount:
X City of Bend	7/29/16			

(5-2003)

PROJECT PROSPECTUS

Part 1 Project Request (Page 2 of 2)

Key Number:	Jurisdiction:

Section:	Region:	Area:	District:
Pedestrian Overcrossing at Highway 97	4	Central Oregon	10

Project Justification

A pedestrian/bicycle overcrossing would allow for adequate and safe movement across Highway 97 and the adjacent railroad.

Additional Information For Project Requested By Local Jurisdictions

Responsible Local Office To Be Contacted For The Following Activities:

1. **Public Hearing / Citizen Involvement** _____ **(Office)** _____ **(Phone)**
2. **Environmental / Planning** _____ **(Office)** _____ **(Phone)**
3. **Pre-Engineering** _____ **(Office)** _____ **(Phone)**

This Official Request is From:

City of: Bend **and/or** _____ **County**

By: _____ **By:** _____

By: _____ **By:** _____

By: _____

Applicable Intergovernmental Agreements:

IGA Number:	Jurisdiction Name:	Agreement Date:

Administrative Recommendation

(5-2003)

Bridge Prospectus Cost Estimate

		NBIS Bridge No.			
Applicant:	City of Bend				
Project / Section	Pedestrian Overcrossing at Highway 97	Region: 4	Area: Central Oregon		District: 10

New Bridge / Roadway Configuration:			Existing Bridge:		
Left Side Rail	0.5	feet	Bridge Length	0	feet
Left Sidewalk	0	feet	Bridge Width	0	feet
Shoulder	0	feet	Area	0	square yds.
Lane 2	0	feet			
Lane 1	0	feet	New AC Top Width	0	feet
---CL---	16	feet	New AC Depth	0	inches
Lane 1	0	feet	New Base Depth	12	inches
Lane 2	0	feet	Project Length	150	feet
Shoulder	0	feet	Net Road Work Length	100	feet
Right Sidewalk	0	feet	X-S Side Slope	4	
Right Side Rail	0.5	feet	AC Avg Width	0	feet
			Base Avg Width	20	feet
Bridge Length	210	feet	Asphalt Density	2.025	tons / yd
Bridge Width	17	feet	Base Density	2.025	tons / yd
New Area	1400	square yds.	New AC Received	0	tons
			New Base Required	150	tons

COST ESTIMATE:	Quantity	Unit	Price per unit	Cost ($x1000s)
Right-of-Way	1	Acre	$ 100,000	$100
	==Roadway==			
Clear & Grub	$ 20,000	lump sum		$20
General Excavation	75	cubic yards	$ 25.00	$2
Embankment in Place	75	cubic yards	$ 20.00	$2
Pavement Removal	-	square feet	$ 2.00	$0
Aggregate Base	-	tons	$ 25.00	$0
Asphalt Concrete	-	tons	$ 85.00	$0
Riprap	-	cubic yards	$ 34.00	$0
Guardrail, Type 2A	-	feet	$ 24.00	$0
Guardrail, Type 3	-	feet	$ 55.00	$0
Guardrail Trans	-	feet	$ 110.00	$0
Flared Terminals	-	each	$ 2,100.00	$0
			Subtotal Roadway	$23
Structures	12,600	square feet	$ 180.00	$2,268
Signals		lump sum		$0
Illumination	$ -	lump sum		$0
Temporary Protection	$ 20,000	lump sum		$20
Remove Existing Bridge	$ -	square feet		$0
Stormwater	$ 20,000	lump sum		$20
Mobilization	227,000	lump sum		$227
			Subtotal Structures	$2,535
			Subtotal Construction	$2,558
	==Engineering==			
Construction Engineering	15	percent of construction		$384
Contingency	30	percent of construction		$768
			Subtotal Const. Eng.	$1,151
Preliminary Engineering				
Consultant	20	percent of construction		$512
State	5	percent of construction		$128
County	5	percent of construction		$128
			Subtotal PE	$768
			Total Estimate	$4,577

Bridge Project Prospectus
Additional Bridge Information

Applicant: City of Bend		**NBIS Bridge Number:** 0	
Project Name Pedestrian Overcrossing at Highway 97 **Section:**		**Region:** 4	**Area:** Central Oregon / **District:** 10

Funding

Preferred Source:

- ☐ OTIA III
- ☐ Federal HBRR

Acceptable Source:

- ☐ OTIA III
- ☐ Federal HBRR

Heavy Vehicle Usage

	Existing	Proposed
Truck AADT:	0%	0%

Fire Truck Usage:

- ☐ YES, at least 25% of trips use bridge.
- ☐ No. Less than 25% of trips

Detour

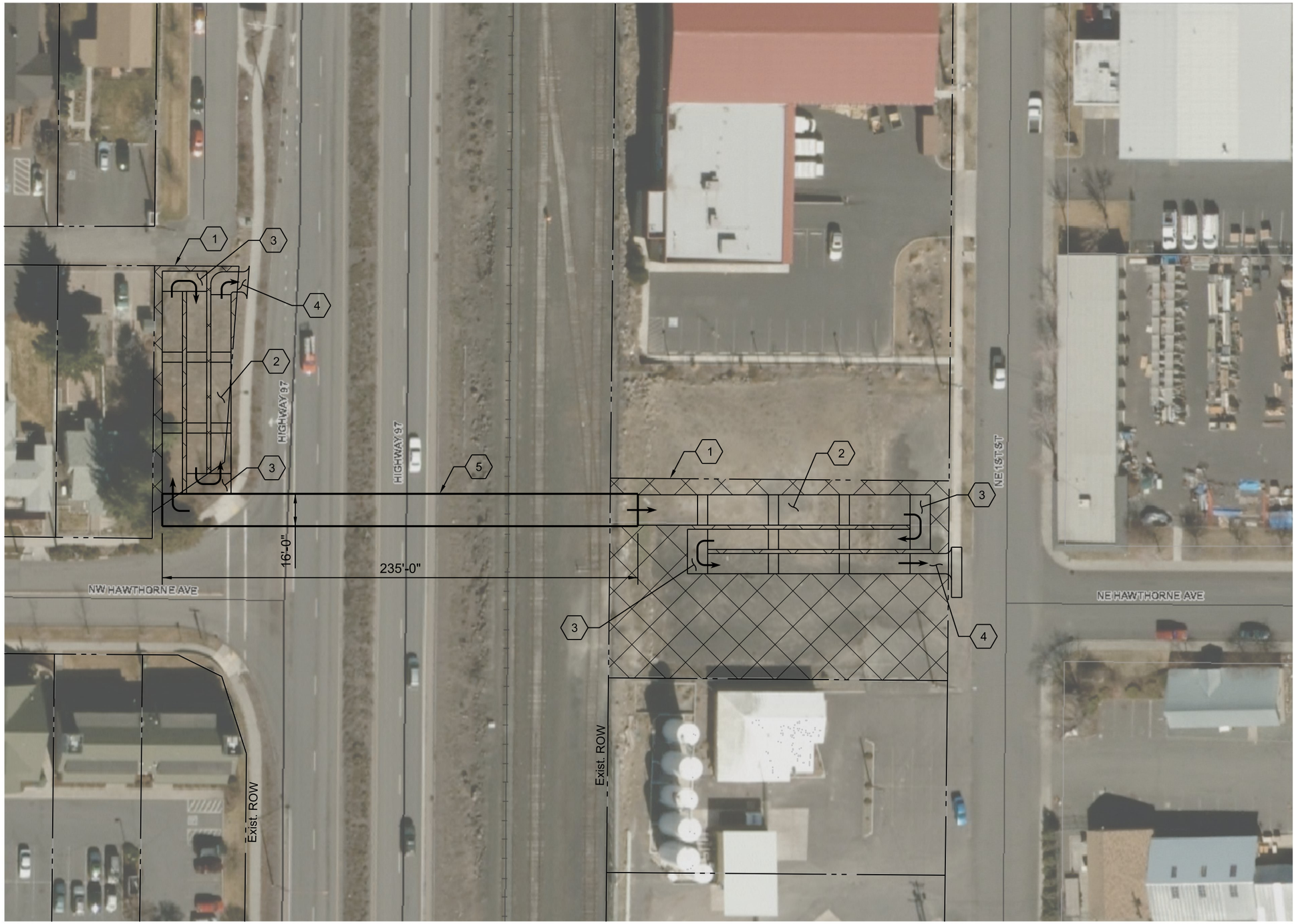
Detour Route:

Length: 0

Map: (Please attach map)

Regional Freight Corridor Analysis:

Special Consideration:



KEY NOTES:

1. ACQUIRE RIGHT-OF-WAY.
2. INSTALL ACCESS RAMP.
3. SWITCH BACK FOR ACCESS RAMP.
4. CONNECT SIDEWALK TO ACCESS RAMP.
5. INSTALL BICYCLE/PEDESTRIAN OVERPASS.

N

PLAN
1"=50'-0"

HAWTHORNE AVE.