

HAZARDOUS MATERIALS

Federal and state databases were searched on August 14 and 15, 2014, for identified hazardous waste sites. The U.S. Environmental Protection Agency (EPA) keeps detailed information on all businesses dealing with hazardous materials, water discharge, Superfund sites, toxic releases and air emissions. According to the EPA Facility Register Service website, which includes Resource Conservation and Recovery Act (RCRA) sites, there are no National Priorities List (Superfund) sites within 5 miles of the study area (EPA 2014). There is one RCRA site with 0.25 mile of the study area. The RCRA site is a Conditionally Exempt Small Quantity hazardous waste generator for the United States Forest Service, MHNZ Zigzag Ranger District, that supports activities for forestry.

The Oregon Department of Environmental Quality (DEQ) regulates or permits facilities and sites in the state. The DEQ Facilitator website identifies the following hazardous material sites in or within 0.25 mile of the study area (DEQ 2014):

- 4 Leaking Underground Storage Tanks: three with documented cleanup completed and one with cleanup started.
- 2 Water Quality Permits: one individual (Zig Zag Village Homeowners Association) and one industrial (Mt. Hood Asphalt Products, Inc.).

Background data files for each identified site are in Appendix A (specifically, Appendix D in the reconnaissance report). The hazardous materials sites listed above include only those which have been identified through online database review. Further ground-level survey and more detailed site reconnaissance could identify additional hazardous materials locations.

COST ANALYSIS

This section presents planning-level construction cost estimates for each alternative. It also presents potential maintenance and emergency maintenance costs for the different alternatives, including the estimated costs of the no action alternative (maintaining the existing road). The cost estimates were developed for the following three build alternatives:

- Modify Existing Lolo Pass Road
- Zigzag Mountain West, originating near Autumn Lane
- Zigzag Mountain East, originating near Mountain Drive

Costs were not developed for the Powerline Corridor alignment or the No Action alternative. The Powerline Corridor is described in the alternatives section at the beginning of the report and was not developed further.

Table 8, Table 9, and Table 10 present planning-level construction costs for the three build alternatives. The costs include the major known construction items using planning-level construction quantity estimates and unit costs. The costs do not include preliminary engineering, right-of-way, or utility relocation costs. The most significant items are bridge and wall structures, earthwork grading, paving, drainage and water quality features. The earthwork item intentionally uses a lower unit price for the Zigzag Mountain alternatives because of the very large quantities and ability to use off-road equipment compared to the other alternative. The estimates also include costs for bank stabilization in three locations along Lolo Pass Road (all three apply to the Modify Existing Road Alternative, only the southernmost location applies to the Zigzag Mountain West Alternative, and none apply to the Zigzag Mountain East Alternative, as it would not use those sections of Lolo Pass Road). Items not specifically listed are assumed to be included in the contingency percentages. These estimates, however, do not include significant known items such as design and permitting, right-of-way acquisition or utility relocation.

Table 11 shows the anticipated maintenance costs for each alternative, itemized by type of activity.

Table 8. Planning-Level Construction Cost: Modify Existing Lolo Pass Road

ITEM	UNIT	QUANTITY	UNIT COST	TOTAL	SECTION TOTALS
Mobilization and Traffic Management					\$908,000.00
MOBILIZATION (10%)	LS	1	10.00%	\$504,000.00	
TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC (8%)	LS	1	8.00%	\$404,000.00	
Roadwork					\$1,258,700.00
GENERAL EXCAVATION	CUYD	4,000	\$18.00	\$72,000.00	
EMBANKMENT IN PLACE	CUYD	12,000	\$18.00	\$216,000.00	
CLEARING AND GRUBBING	ACRE	5	\$4,000.00	\$20,000.00	
AGGREGATE BASE	TON	9,800	\$24.00	\$235,200.00	
ASPHALT CONCRETE PAVEMENT	TON	4,000	\$100.00	\$400,000.00	
GUARDRAIL	FOOT	1,500	\$35.00	\$52,500.00	
STRIPING	LS	1	\$10,000.00	\$10,000.00	
SIGNING (3%)	LS	1	\$0.03	\$152,000.00	
LANDSCAPING (2%)	LS	1	\$0.02	\$101,000.00	
Drainage and Sewers					\$155,000.00
CULVERT PIPE	FOOT	150	\$100.00	\$15,000.00	
BIOSLOPES	FOOT	800	\$60.00	\$48,000.00	
BIORETENTION SWALE	FOOT	600	\$70.00	\$42,000.00	
BIORETENTION POND	EACH	1	\$50,000.00	\$50,000.00	
Bridges					\$3,878,900.00
REMOVE EXISTING SANDY RIVER BRIDGE	LS	1	\$100,000.00	\$100,000.00	
BRIDGE SUPERSTRUCTURE (INCL. RAILS & APPROACH PANELS)	SQFT	14,800	\$199.00	\$2,945,200.00	
BRIDGE SUBSTRUCTURE & FOUNDATION	SQFT	14,800	\$50.00	\$740,000.00	
CENTER FILL MSE WALLS	SQFT	1,874	\$50.00	\$93,700.00	
Riverbank Protection					\$2,970,000.00
RIPRAP RIVERBANK PROTECTION (#1)	FOOT	300	\$3,300.00	\$990,000.00	
RIPRAP RIVERBANK PROTECTION (#2)	FOOT	300	\$3,300.00	\$990,000.00	
RIPRAP RIVERBANK PROTECTION (#3)	FOOT	300	\$3,300.00	\$990,000.00	
SUBTOTAL					\$9,170,600.00
CONTINGENCIES (40%)		40%			\$3,668,240.00
TOTAL					\$12,838,840.00

Table 9. Planning-Level Construction Cost: Zigzag Mountain West

ITEM	UNIT	QUANTIT Y	UNITCOST	TOTAL	SECTION TOTALS
Mobilization and Traffic Management					\$2,463,000.00
MOBILIZATION (10%)	LS	1	10.00%	\$1,368,000.00	
TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC (8%)	LS	1	8.00%	\$1,095,000.00	
Roadwork					\$6,169,400.00
GENERAL EXCAVATION	CUYD	184,000	\$10.00	\$1,840,000.00	
EMBANKMENT IN PLACE	CUYD	155,000	\$10.00	\$1,550,000.00	
CLEARING AND GRUBBING	ACRE	24	\$4,000.00	\$96,000.00	
AGGREGATE BASE	TON	29,600	\$24.00	\$710,400.00	
ASPHALT CONCRETE PAVEMENT	TON	11,800	\$100.00	\$1,180,000.00	
GUARDRAIL	FOOT	2,800	\$35.00	\$98,000.00	
PEDESTRIAN RAILING	FOOT		\$-	\$-	
STRIPING	LS	1	\$10,000.00	\$10,000.00	
SIGNING (3%)	LS	1	3.00%	\$411,000.00	
LANDSCAPING (2%)	LS	1	2.00%	\$274,000.00	
Drainage and Sewers					\$296,000.00
CULVERT PIPE	FOOT	300	\$100.00	\$30,000.00	
BIOSLOPES	FOOT	800	\$60.00	\$48,000.00	
BIORETENTION SWALE	FOOT	2,400	\$70.00	\$168,000.00	
BIOINFILTRATION POND	EACH	1	\$50,000.00	\$50,000.00	
Bridges					\$7,697,300.00
REMOVE EXISTING SANDY RIVER BRIDGE	LS	0	\$-	\$-	
BRIDGE SUPERSTRUCTURE (INCL. RAILS & APPROACH PANELS)	SQFT	29,600	\$188.00	\$5,564,800.00	
BRIDGE SUBSTRUCTURE & FOUNDATION	SQFT	29,600	\$50.00	\$1,480,000.00	
APPROACH FILL MSE WALLS	SQFT	13,050	\$50.00	\$652,500.00	
Riverbank Protection					\$990,000.00
RIPRAP RIVERBANK PROTECTION (#1)	FOOT	300	\$3,300.00	\$990,000.00	
RIPRAP RIVERBANK PROTECTION (#2)	FOOT	0	\$-		
RIPRAP RIVERBANK PROTECTION (#3)	FOOT	0	\$-		
SUBTOTAL					\$17,615,700.00
CONTINGENCIES (40%)		40%			\$7,046,280.00
TOTAL					\$24,661,980.00

Table 10. Planning-Level Construction Cost: Zigzag Mountain East

ITEM	UNIT	QUANTITY	UNITCOST	TOTAL	SECTION TOTALS
Mobilization and Traffic Management					\$2,839,000.00
MOBILIZATION (10%)	LS	1	10.00%	\$1,577,000.00	
TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC (8%)	LS	1	8.00%	\$1,262,000.00	
Roadwork					\$8,757,400.00
GENERAL EXCAVATION	CUYD	230,000	\$10.00	\$2,300,000.00	
EMBANKMENT IN PLACE	CUYD	148,500	\$10.00	\$1,485,000.00	
RIPRAP RIVERBANK PROTECTION	LS	1	\$200,000.00	\$200,000.00	
CLEARING AND GRUBBING	ACRE	27	\$4,000.00	\$108,000.00	
AGGREGATE BASE	TON	30,600	\$24.00	\$734,400.00	
ASPHALT CONCRETE PAVEMENT	TON	30,600	\$100.00	\$3,060,000.00	
GUARDRAIL	FOOT	2,000	\$35.00	\$70,000.00	
PEDESTRIAN RAILING	FOOT		\$-	\$-	
STRIPING	LS	1	\$10,000.00	\$10,000.00	
SIGNING (3%)	LS	1	\$0.03	\$474,000.00	
LANDSCAPING (2%)	LS	1	2.00%	\$316,000.00	
Drainage and Sewers					\$380,000.00
CULVERT PIPE	FOOT	300	\$100.00	\$30,000.00	
BIOSLOPES	FOOT	800	\$60.00	\$48,000.00	
BIORETENTION SWALE	FOOT	3,600	\$70.00	\$252,000.00	
BIOINFILTRATION POND	EACH	1	\$50,000.00	\$50,000.00	
Bridges					\$7,419,800.00
REMOVE EXISTING SANDY RIVER BRIDGE	LS	0	\$-	\$-	
BRIDGE SUPERSTRUCTURE (INCL. RAILS & APPROACH PANELS)	SQFT	29,600	\$188.00	\$5,564,800.00	
BRIDGE SUBSTRUCTURE & FOUNDATION	SQFT	29,600	\$48.00	\$1,420,800.00	
APPROACH FILL MSE WALLS	SQFT	8,684	\$50.00	\$434,200.00	
Riverbank Protection					\$-
RIPRAP RIVERBANK PROTECTION (#1)	LS	0	\$-	\$-	
RIPRAP RIVERBANK PROTECTION (#2)	LS	0	\$-		
RIPRAP RIVERBANK PROTECTION (#3)	LS	0	\$-		
SUBTOTAL					\$19,396,200.00
CONTINGENCIES (40%)		40%			\$7,758,480.00
TOTAL					\$27,154,680.00

Table 11. Anticipated Maintenance Costs

Maintenance Activity	Unit Cost
Minimal Roadway Maintenance, primary road ¹	\$10,000 per mile per year
Minimal Roadway Maintenance, minor road ¹	\$1,000 per mile per year
Roadway Repair for Washout	\$3 million per incident
Roadway Repair for Washout	\$1 million per 300 feet

¹ This cost is an average across Clackamas County as a whole. It does not account for the additional risk due to seeps and washouts that could occur on Lolo Pass Road or the new alignment.

EVALUATION MATRIX

Table 12 presents an initial evaluation matrix for the three build alternatives developed for this report. The matrix will be vetted by the County, WFLHD, stakeholders and the public, and modified as appropriate.

Table 12. Potential Build Alternatives: Evaluation Matrix

Topic	Subtopic/Criteria	How to Measure	No Action	Modify Existing Alternative	Zigzag Mountain West Alternative	Zigzag Mountain East Alternative
Flooding and Hazards	Floodplains <ul style="list-style-type: none"> Does not increase risk for flooding to residences Provides County the ability to remove infrastructure out of flood migration zone in the future 	Satisfies, partially satisfies, does not satisfy	Does not satisfy	Partially satisfies	Satisfies	Satisfies
	Channel migration <ul style="list-style-type: none"> Minimizes risk of infrastructure in or near channel migration zone 	Satisfies, partially satisfies, does not satisfy	Does not satisfy	Partially satisfies	Partially satisfies	Partially satisfies
	Geological hazards	Avoids, partially avoids, does not avoid	Does not avoid	Does not avoid	Partially avoids	Partially avoids

Topic	Subtopic/Criteria	How to Measure	No Action	Modify Existing Alternative	Zigzag Mountain West Alternative	Zigzag Mountain East Alternative
Transportation	Provides practical access to: <ul style="list-style-type: none"> Residences Forest lands (private) Forest lands (public) 	Satisfies, partially satisfies, does not satisfy	Partially satisfies (currently satisfies but does not provide improvement)	Partially satisfies	Satisfies	Satisfies
	Able to maintain access to public and private properties after future event <ul style="list-style-type: none"> Number of conflict points Route geometry 	Satisfies, partially satisfies, does not satisfy	Does not satisfy	Does not satisfy	Partially satisfies	Partially satisfies
	Alternative improves roadway safety at: <ul style="list-style-type: none"> Access points Intersections Achieves design standards 	Satisfies, partially satisfies, does not satisfy	Does not satisfy (no change)	Does not satisfy (no change)	Improves safety (fewer driveways)	Improves safety (fewer driveways)
Environmental	Biological resources (Threatened and Endangered species, habitat, water resources, wetlands, stream crossings)	Acres wetland, Number of water crossings, Presence of critical habitat	No change	Avoids wetland impact; ESA compliance required	Some wetland impact; New culverts constructed; ESA compliance required	Avoids wetland impact; New culverts constructed; ESA compliance required
	Geological hazards (slides)	Avoids, partially avoids, does not avoid	No change	Avoids slide areas	Avoids slide areas	Avoids slide areas
	Cultural resources (historic)	Known resources	No impact	3 unevaluated residences impacted	Avoids historic resources	2 known resources potentially affected
	Cultural (archaeological)	Known resources	No impact	Least potential; more analysis required	Potential; more analysis required	Potential; more analysis required
	Impacts to public utilities	High, medium, low impact	No impact	Low	Low	Low

Topic	Subtopic/Criteria	How to Measure	No Action	Modify Existing Alternative	Zigzag Mountain West Alternative	Zigzag Mountain East Alternative
Land Use	Potential displacements	Range	0	4-5	1-2	1-2
	Emergency services	Improves or restricts service access	No change	No change	Restricts (Slower to residences on Lolo Pass Road)	Restricts (Slower to residences on Lolo Pass Road)
	Business impacts	Maximum number	0	0	0	0
	Compatible with Sandy River Floodplain Study	Compatible or not compatible	Not compatible	Compatible	Compatible	Compatible
	Compatible with County Comprehensive Plan	Compatible or not compatible	Compatible	Compatible	Requires Goal Exception	Requires Goal Exception
	Compatible with Forest Plan	Compatible or not compatible	Compatible	Compatible	Compatible	Compatible
Constructability / Engineering	Planning-level construction cost (does not include engineering, permitting, or right-of-way acquisition)	Cost	\$0	\$12.8 M	\$24.7 M	\$27.2 M
	Emergency maintenance cost (estimate)	Average annual estimate	Same or higher than today	Reduced risk from today	Reduced risk from today	Reduced risk from today
	Maintenance cost of primary road plus local access road	Average annual estimate	Same as current conditions (\$16,000/yr)	Same as current conditions (\$16,000/yr)	Higher; 1.6 miles primary road, adding 1.2 miles secondary road (\$17,200/yr)	Higher; 1.7 miles primary road and 1.6 miles secondary road (\$18,600/yr)
	Roadway infrastructure has a long-term ability to withstand flooding	Qualitative	No change	Improved from existing at crossing, remainder of existing roadway unimproved	Existing road at risk from flooding; new road reduced risk from flooding	Existing road at risk from flooding; new road reduced risk from flooding
	Positive effect					
	Moderate effect					
	Negative effect					

PUBLIC INVOLVEMENT SUMMARY

Clackamas County has led public involvement efforts on the project, including organizing and facilitating a stakeholder group to vet project concepts and issues and review alternatives, and engaging with the public during an open house in the fall of 2014 (County-sponsored public workshop titled, “Flood of Information III: Preparing for Winter on the Sandy River and Its Tributaries,” held on September 27, 2014). There will be public outreach event associated with the publication of this draft Alternatives Analysis Report at the Flood of Information IV on October 24, 2015, and then subsequent activity as warranted by project development.

FUTURE PROJECT DEVELOPMENT

In order to develop the project further, action by Clackamas County would be needed to support advancing past this Alternatives Analysis and securing additional funding needed to further develop and refine this into a project that could be implemented in the future. Contingent upon this support and funding, the following steps would need to be taken, including additional project area-specific studies and site investigations.

STUDIES NEEDED TO SUPPORT SELECTION OF A PREFERRED ALTERNATIVE

- **National Environmental Policy Act (NEPA).** Due to federal permits and potential federal funding, the project would need to comply with NEPA requirements, which would likely include additional public involvement and engagement.
- **Threatened and Endangered Species.** Endangered Species Act compliance would be required.
- **Land Use.** The new alignments are new roadway alignments through forest resource lands protected by Oregon Land Use Goal 4, and would require the County to make Goal Exceptions before construction.
- **Geotechnical—Zigzag Mountain Alternatives.** The project would need to complete a preliminary geotechnical investigation to evaluate the depth of rock and characteristics of the sediments at the proposed bridge location. The geotechnical engineer recommends using sonic drilling methods to complete three borings: one on each the north and south sides of the river, and one in the area of landslide debris in the vicinity of the north bridge approach.
- **Floodplain.** All of the alternatives have potential to affect the floodplain. Specific flood information would need to be evaluated from the DOGAMI mapping project. An updated analysis would be required if new floodplain maps are adopted. A floodplain permit would be required if the selected project would affect the floodplain.

- **Cultural Resources.** Federal funding would require the project to comply with the National Historic Preservation Act and make a Section 106 Finding.
- **Cultural Resources: Archaeology.** A qualified archaeologist would need to perform a site reconnaissance and determine the archaeological and historic resources within the area of potential impact (APE, to be determined at a later date), and potential project effects. Additional studies could include a pedestrian survey along the alignment of the selected alternative (or proposed alternatives), and shovel testing in areas with low ground surface visibility and high probability for containing archaeological resources, including terraced landforms and areas where the Barlow Road may cross the alignment.
- **Cultural resources: Historic.** A historic resource survey would need to be conducted for the preferred alignment to record and evaluate the resources for their eligibility for listing in the NRHP. Any resources found to be eligible for listing in the NRHP would need to be evaluated for potential direct and indirect project effects that could cause alterations to the character and use of the historic building or structure.
- **Hazardous materials.** A qualified engineer would need to perform a Level I Site Assessment within a 5-mile radius of the area of potential impact (to be defined at later date).

REFERENCES

Oetting, Albert C.

2004 Site Discovery Probes for the Zigzag River (Lolo Pass Rd.) Bridge #6401 Replacement Project, Clackamas County, Oregon. Heritage Research Associates, Inc. Letter Report No. 04-47. Submitted to William Hall, OBEC Consulting Engineers, Inc., Eugene, Oregon.

Koler/Morrison Planning Consultants

1991a Clackamas County Historic Resources Inventory 1989-92, Historic Name: Barlow Trail Stage Stop Chimneys. On file, State Historic Preservation Office, Salem, Oregon.

1991b Clackamas County Historic Resources Inventory 1989-92, Historic Name: Morton, Harry, House. On file, State Historic Preservation Office, Salem, Oregon.

U.S. Army Corps of Engineers.

1966. Postflood Report December 1964, January 1965 Flood, Portland District, Portland, OR.